WSM

WORKSHOP MANUAL
DIESEL ENGINE

V2607-CR-E4B,V2607-CR-TE4B,
V2607-CR-TIE4B (DOC only),
V3307-CR-TE4B,
V3307-CR-TIE4B (DOC only)

Kubota

KiSC issued 04, 2017 A

TO THE READER

This Workshop Manual tells the servicing personnel about the mechanism, servicing and maintenance of the V2607-CR-E4B, V2607-CR-TE4B and V3307-CR-TE4B. It contains 4 parts: **"Information"**, **"General"**, **"Mechanism"** and **"Servicing"**.

■ **Information**

This section primarily contains information below.

- Safety First
- Specification
- Performance Curve
- Dimension
- Wiring Diagram

■ **General**

This section primarily contains information below.

- Engine Identification
- Muffler Full Assembly Identification
- General Precautions
- Maintenance Check List
- Check and Maintenance
- Special Tools

■ **Mechanism**

This section contains information on the structure and the function of the unit. Before you continue with the subsequent sections, make sure that you read this section.

Refer to Workshop Manual (Code No. 9Y021-01870) for the diesel engine mechanism that this workshop manual does not include.

■ **Servicing**

This section primarily contains information below.

- Troubleshooting
- Servicing Specifications
- Tightening Torques
- Checking, Disassembling and Servicing

All illustrations, photographs and specifications contained in this manual are of the newest information available at the time of publication.

KUBOTA reserves the right to change all information at any time without notice.

Since this manual includes many models, information or illustrations and photographs can show more than one model.

December, 2012

KiSC issued 04, 2017 A

Record of Revisions

For pdf, use search function {Search word} to find the all revised locations.

Last digit of the Code No.	Issue month	Main Revised Point and Corrective Measures {Search word}	Reference Page
1	2013.03	Numbering from (1) to (36) were added in the system wiring diagram. Number of missing sealing parts was corrected. Number of actual sell depth was corrected. **(a)** and **(b)** were corrected.	I-25, G-28, G-29, G-54
2	2013.06	Pressure limiter information about replacement unit was added.	1-M14, 1-S42
		Applying engine oil to the injector O-ring was added.	1-S45
3	2014.06	Correction of Workshop Manual 4. MAINTENANCE CHECK LIST [9] EVERY 1500 HOURS Replacement of Oil Separator Element Check of PCV (Positive Crankcase Ventilation) Valve	 G-6 G-21 G-22 G-22
4	2015.01	Added the information of V2607-CR-TIE4 / V3307-CR-TIE4 (DOC only)	
5	2016.08	Design change of DPF muffler full assy serial number label mounting position Added the information of timing gear alignment marks	G-4 1-S55
6	2016.12	Added the following information (1) Decision on Reusability According to the Pin Gauge Measurement of Actual Cell Depth (2) Decision on Reusability According to the Differential Pressure (Differential Pressure Measuring Instrument Manufactured by FSX) Differential Pressure Measurement	 G-29 G-30
7	2017.04	Correction of Workshop Manual The procedure of removing and installing for following parts 1. SCV 2. Fuel Temperature Sensor Correction of Biodiesel fuel information	 1-S52 1-S54

I INFORMATION

INFORMATION

CONTENTS

1. SAFETY FIRST

⚠ SAFETY FIRST

- **This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully.**
- **It is essential that you read the instructions and safety regulations before you try to repair or use this unit.**

⚠ DANGER
- **Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

⚠ WARNING
- **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

⚠ CAUTION
- **Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.**

■ IMPORTANT
- **Indicates that equipment or property damage could result if instructions are not followed.**

■ NOTE
- **Gives helpful information.**

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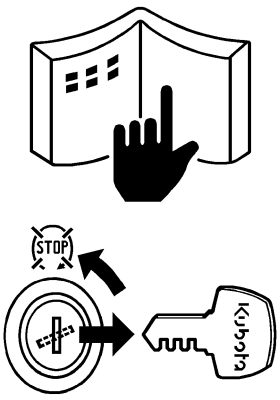

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BEFORE YOU START SERVICE

- Read all instructions and safety instructions in this manual and on your engine safety decals.
- Clean the work area and engine.
- Park the machine on a stable and level ground.
- Let the temperature of the engine decrease before you start a job.
- Stop the engine, then remove the key.
- Disconnect the battery negative cable.
- Hang a **"DO NOT OPERATE"** tag in the operator station.

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START SAFELY

- Do not do the procedures below when you start the engine.
  - short across starter terminals
  - bypass the safety start switch
- Do not make unauthorized modifications to the engine. This can cause damage and decrease the engine life.

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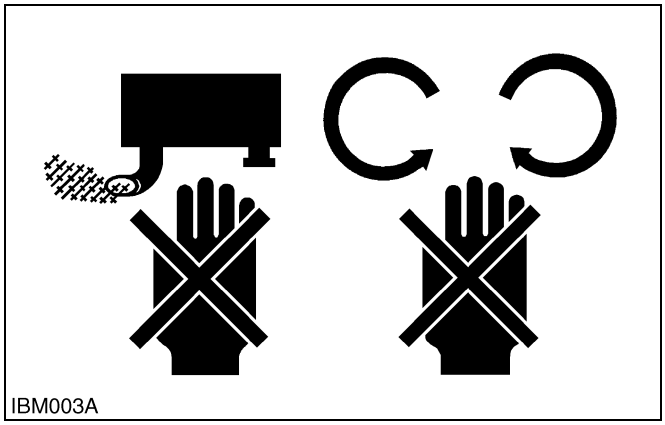
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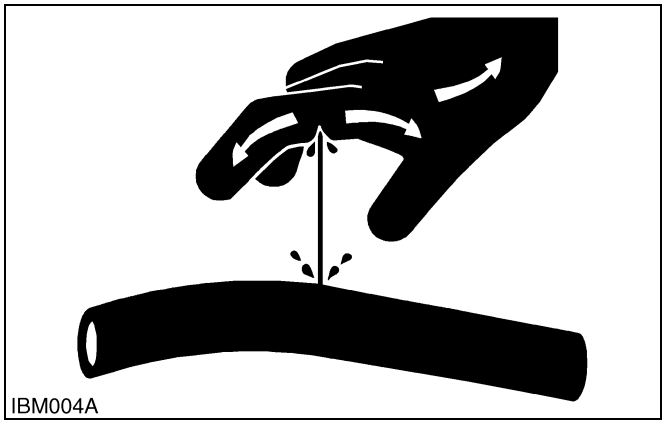
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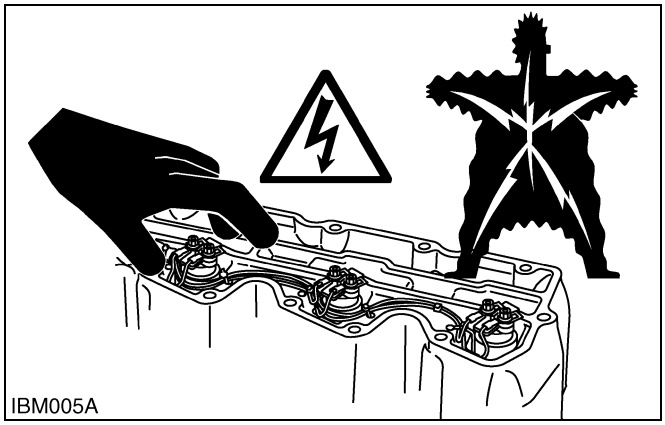
IBM005A


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OPERATE SAFELY

- Do not use the machine after you consume alcohol or medication or when you are tired.
- Put on applicable clothing and safety equipment.
- Use applicable tools only. Do not use alternative tools or parts.
- When 2 or more persons do servicing, make sure that you do it safely.
- Do not touch the hot parts or parts that turn when the engine operates.
- Do not remove the radiator cap when the engine operates, or immediately after it stops. If not, hot water can spout out from the radiator. Only remove the radiator cap when it is at a sufficiently low temperature to touch with bare hands. Slowly loosen the cap to release the pressure before you remove it fully.
- Released fluid (fuel or hydraulic oil) under pressure can cause damage to the skin and cause serious injury. Release the pressure before you disconnect hydraulic or fuel lines. Tighten all connections before you apply the pressure.
- Do not open a fuel system under high pressure.
  The fluid under high pressure that stays in fuel lines can cause serious injury. Do not disconnect or repair the fuel lines, sensors, or any other components between the fuel pump and injectors on engines with a common rail fuel system under high pressure.
- Put on an applicable ear protective device (earmuffs or earplugs) to prevent injury against loud noises.
- Be careful about electric shock. The engine generates a high voltage of more than DC100 V in the ECU and is applied to the injector.

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PROTECT AGAINST HIGH PRESSURE SPRAY

- Spray from high pressure nozzles can penetrate the skin and cause serious injury. Keep spray from contacting hands or body.
- If an accident occurs, see a doctor immediately. Any high pressure spray injected into the skin must be surgically removed within a few hours or gangrene may result.
  Doctors unfamiliar with this type of injury should reference a knowledgeable medical source.

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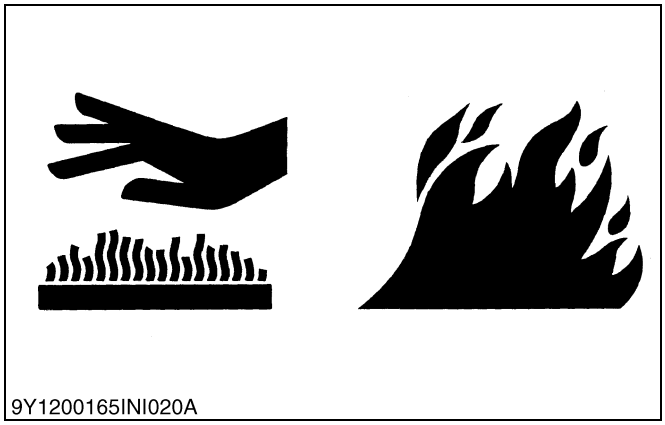

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AVOID HOT EXHAUST

- Servicing machine or attachments with engine operating can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and components.
- Exhaust parts and streams become very hot during operation. Exhaust gases and components reach temperatures hot enough to burn people, ignite, or melt common materials.

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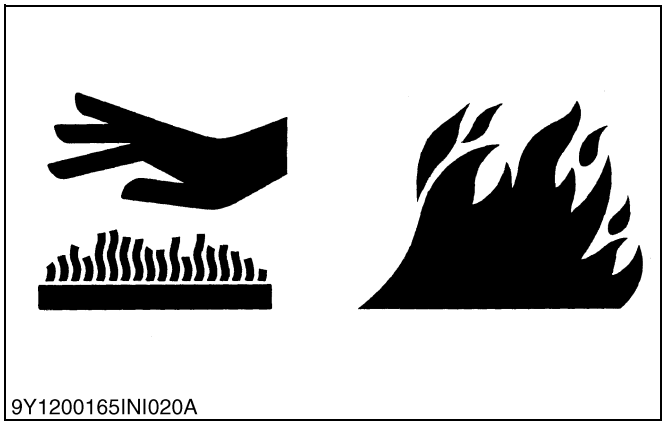

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EXHAUST FILTER CLEANING

- Servicing machine or attachments during exhaust filter cleaning can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and components.
- During auto or manual/stationary exhaust filter cleaning operations, the engine will operate at elevated idle and hot temperatures for an extended period of time. Exhaust gases and exhaust filter components reach temperatures hot enough to burn people, or ignite, or melt common materials.

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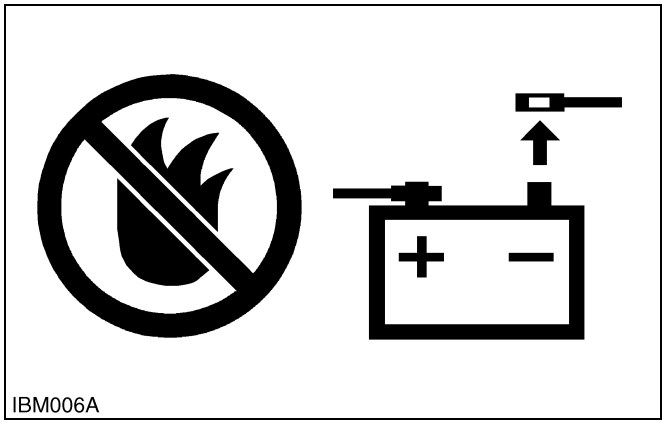

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PREVENT A FIRE

- Fuel is very flammable and explosive under some conditions. Do not smoke or let flames or sparks in your work area.
- To prevent sparks from an accidental short circuit, always disconnect the battery negative cable first and connect it last.
- The battery gas can cause an explosion. Keep the sparks and open flame away from the top of battery, especially when you charge the battery.
- Make sure that you do not spill fuel on the engine.

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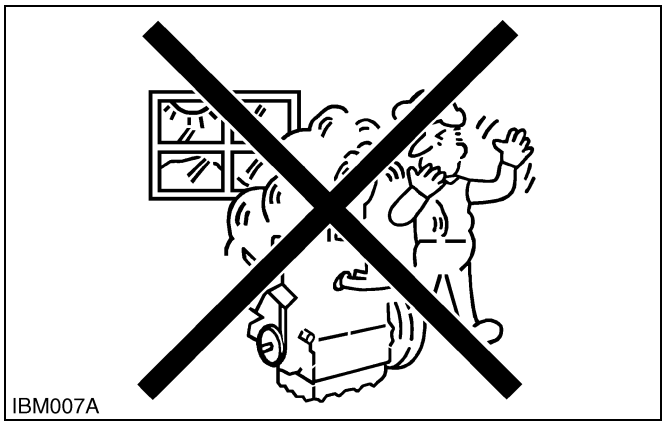

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KEEP A GOOD AIRFLOW IN THE WORK AREA

- If the engine is in operation, make sure that the area has good airflow. Do not operate the engine in a closed area. The exhaust gas contains poisonous carbon monoxide.

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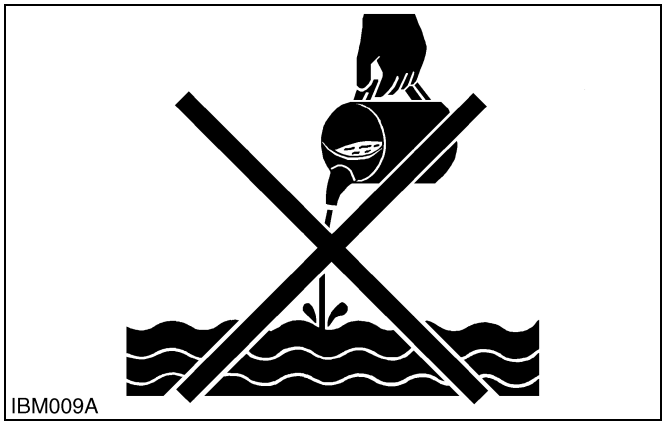
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DISCARD FLUIDS CORRECTLY

- Do not discard fluids on the ground, down the drain, into a stream, pond, or lake. Obey related environmental protection regulations when you discard oil, fuel, coolant, electrolyte and other dangerous waste.

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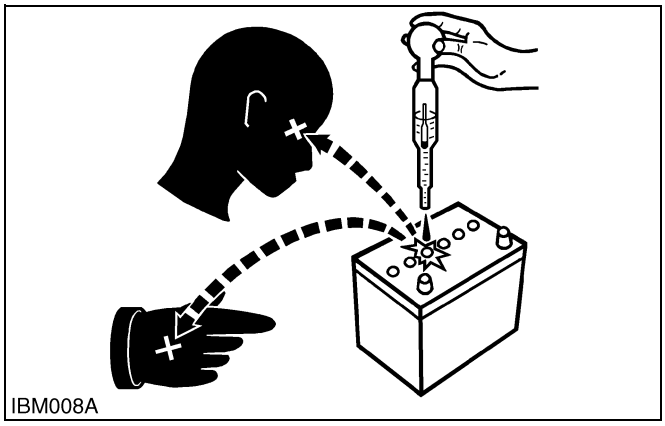
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PREVENT ACID BURNS

- Keep electrolyte away from your eyes, hands and clothing. Sulfuric acid in battery electrolyte is poisonous and it can burn your skin and clothing and cause blindness. If you spill electrolyte on yourself, clean yourself with water, and get medical aid immediately.

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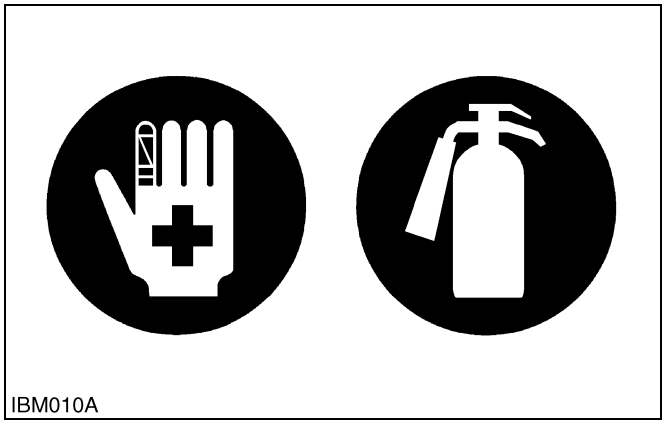
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PREPARE FOR EMERGENCIES

- Keep a first aid kit and fire extinguisher ready at all times.
- Keep the emergency contact telephone numbers near your telephone at all times.

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2. SPECIFICATIONS

Model	V2607-CR-E4B	V2607-CR-TE4B	V3307-CR-TE4B
Number of Cylinder	4		
Engine Type	Vertical, water-cooled, 4-cycle DI diesel engine		
Bore × Stroke	87.0 × 110 mm (3.43 × 4.33 in.)		94.0 × 120 mm (3.70 × 4.72 in.)
Total Displacement	2615 cm^3 (159.6 cu.in.)		3331 cm^3 (203.3 cu.in.)
SAE Net Continuous	34.3 kW / 2700 min^{-1} (rpm) (46.0 HP / 2700 min^{-1} (rpm))	43.5 kW / 2700 min^{-1} (rpm) (58.3 HP / 2700 min^{-1} (rpm))	45.6 kW / 2600 min^{-1} (rpm) (61.2 HP / 2600 min^{-1} (rpm))
SAE Gross Intermittent	42.0 kW / 2700 min^{-1} (rpm) (56.3 HP / 2700 min^{-1} (rpm))	53.0 kW / 2700 min^{-1} (rpm) (71.1 HP / 2700 min^{-1} (rpm))	55.4 kW / 2600 min^{-1} (rpm) (74.3 HP / 2600 min^{-1} (rpm))
Maximum Bare Speed	2900 min^{-1} (rpm)		2800 min^{-1} (rpm)
Minimum Bare Idling Speed	800 min^{-1} (rpm)		
Combustion Chamber	Reentrant Type, Center Direct Injection Type (E-CDIS)		
Fuel Injection Pump	DENSO Common Rail System		
Governor			
Injector			
Fuel Injection Timing			
Fuel Injection Pressure			
Direction of Rotation	Counter-clockwise (Viewed from flywheel side)		
Firing Order	1-3-4-2		
Compression Ratio	18.0	16.8	17.5
Lubricating System	Forced lubrication by trochoid pump		
Oil Pressure Indicating	Electrical Type Switch		
Lubricating Filter	Full Flow Paper Filter (Cartridge Type)		
Cooling System	Pressurized radiator, forced circulation with water pump		
Starting System	Electric Starting with Starter		
Starter Motor	12 V, 2.5 kW		12 V, 3.0 kW
Starting Support Device	By Glow Plug in Combustion Chamber		
EGR	External EGR (EGR Cooler + Electric EGR Valve + Reed Valve)		
Battery	12 V, 92 AH equivalent		12 V, 108 AH equivalent
Charging Alternator	12 V, 720 W		
Fuel	Diesel Fuel No. 2-D S15, see page G-8.		
Lubricating Oil	Class CJ-4 lubricating oil as per API classification is recommended. For details on recommended lubricating oils, see page G-8.		
Lubricating Oil Capacity	10.2 L (2.69 U.S.gals)		11.2 L (2.96 U.S.gals)
Weight (Dry)	267 kg (589 lbs)	272 kg (600 lbs)	305 kg (672 lbs)

- The specification described above is of the standard engine of each model.
- Conversion Formula: HP = 0.746 kW, PS = 0.7355 kW

9Y1210674INI0001US0

Model	V2607-CR-TIE4B	V3307-CR-TIE4B
Number of Cylinder	4	
Engine Type	Vertical, water-cooled, 4-cycle DI diesel engine	
Bore × Stroke	87.0 × 110 mm (3.43 × 4.33 in.)	94.0 × 120 mm (3.70 × 4.72 in.)
Total Displacement	2615 cm^3 (159.6 cu.in.)	3331 cm^3 (203.3 cu.in.)
SAE Net Continuous	44.5 kW / 2700 min^{-1} (rpm) (59.7 HP / 2700 min^{-1} (rpm))	46.7 kW / 2600 min^{-1} (rpm) (62.6 HP / 2600 min^{-1} (rpm))
SAE Gross Intermittent	53.0 kW / 2700 min^{-1} (rpm) (71.1 HP / 2700 min^{-1} (rpm))	55.4 kW / 2600 min^{-1} (rpm) (74.3 HP / 2600 min^{-1} (rpm))
Maximum Bare Speed	2900 min^{-1} (rpm)	2800 min^{-1} (rpm)
Minimum Bare Idling Speed	800 min^{-1} (rpm)	
Combustion Chamber	Reentrant Type, Center Direct Injection Type (E-CDIS)	
Fuel Injection Pump	DENSO Common Rail System	
Governor		
Injector		
Fuel Injection Timing		
Fuel Injection Pressure		
Direction of Rotation	Counter-clockwise (Viewed from flywheel side)	
Firing Order	1-3-4-2	
Compression Ratio	16.0	15.6
Lubricating System	Forced lubrication by trochoid pump	
Oil Pressure Indicating	Electrical Type Switch	
Lubricating Filter	Full Flow Paper Filter (Cartridge Type)	
Cooling System	Pressurized radiator, forced circulation with water pump	
Starting System	Electric Starting with Starter	
Starter Motor	12 V, 2.5 kW	12 V, 3.0 kW
Starting Support Device	By Glow Plug in Combustion Chamber	
EGR	External EGR (EGR Cooler + Electric EGR Valve + Reed Valve)	
Battery	12 V, 92 AH equivalent	12 V, 108 AH equivalent
Charging Alternator	12 V, 720 W	
Fuel	Diesel Fuel No. 2-D S15, see page G-8.	
Lubricating Oil	Class CJ-4 lubricating oil as per API classification is recommended. For details on recommended lubricating oils, see page G-8.	
Lubricating Oil Capacity	10.2 L (2.69 U.S.gals)	11.2 L (2.96 U.S.gals)
Weight (Dry)	259 kg (571 lbs)	295 kg (650 lbs)

- The specification described above is of the standard engine of each model.
- Conversion Formula: HP = 0.746 kW, PS = 0.7355 kW

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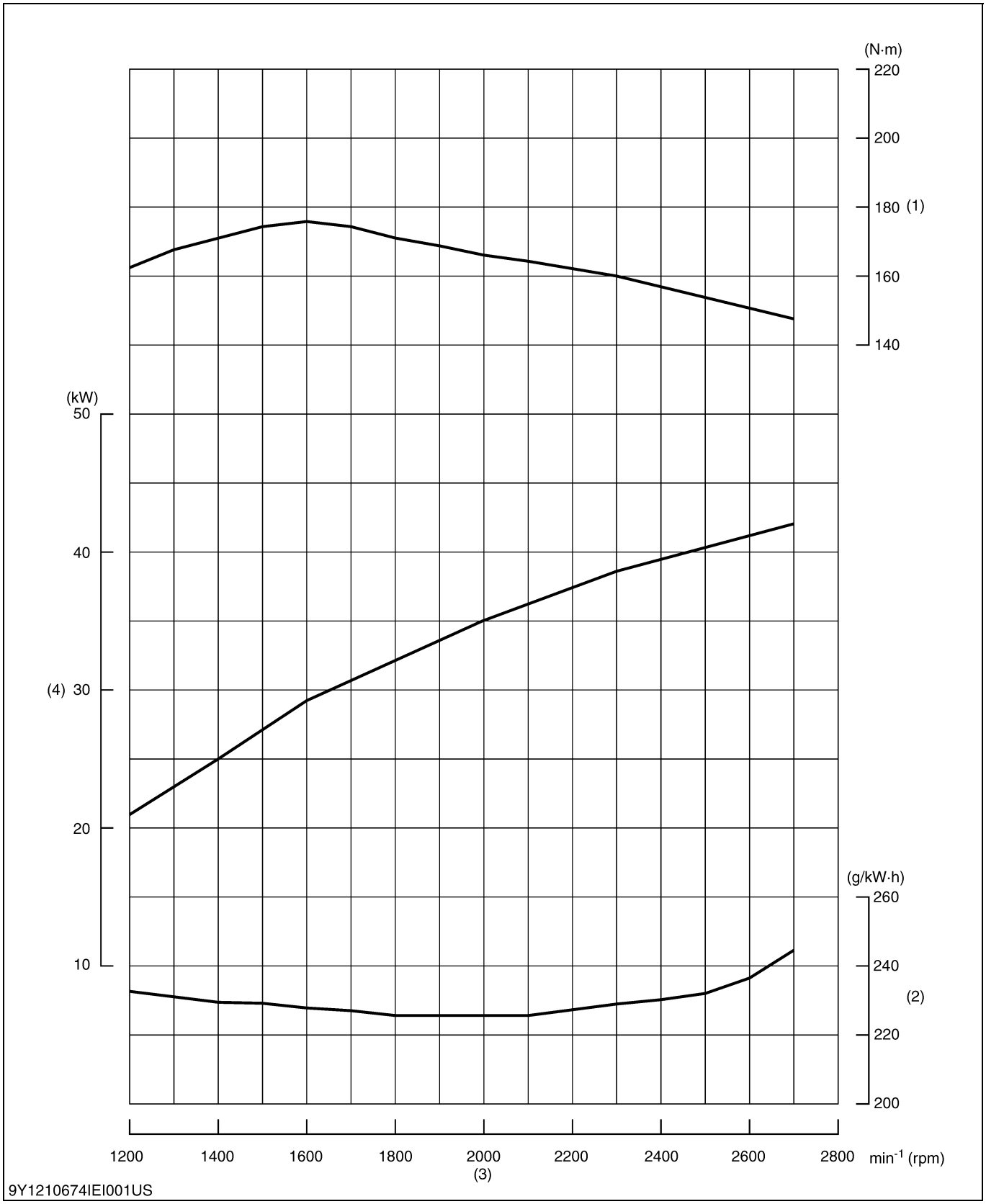
3. PERFORMANCE CURVES

V2607-CR-E4B



(1) Torque
(2) B.S.F.C. (Brake Specific Fuel Consumption)
(3) Engine Speed
(4) Brake Horsepower

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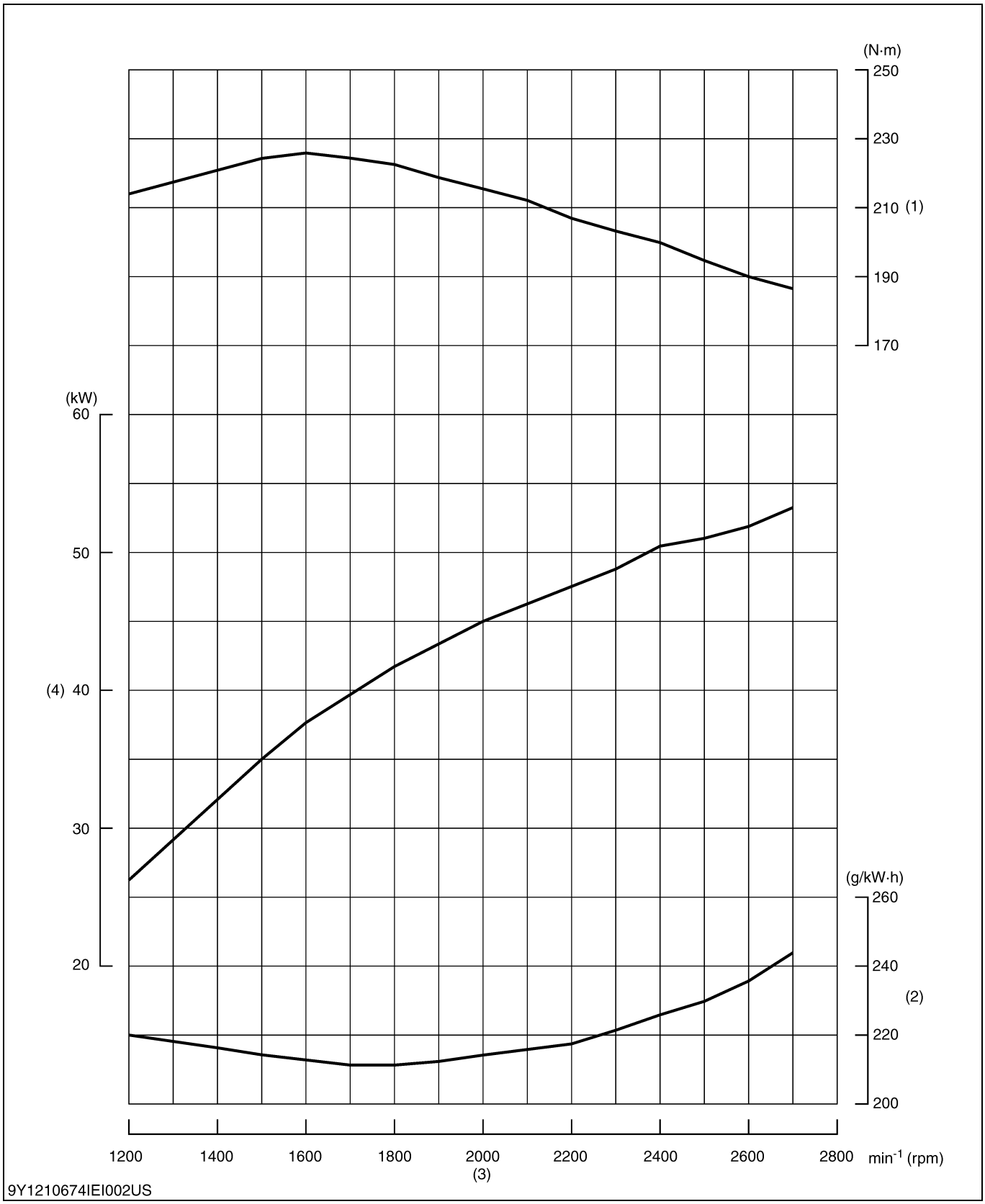
V2607-CR-TE4B



(1) Torque
(2) B.S.F.C. (Brake Specific Fuel Comsumption)
(3) Engine Speed
(4) Brake Horsepower

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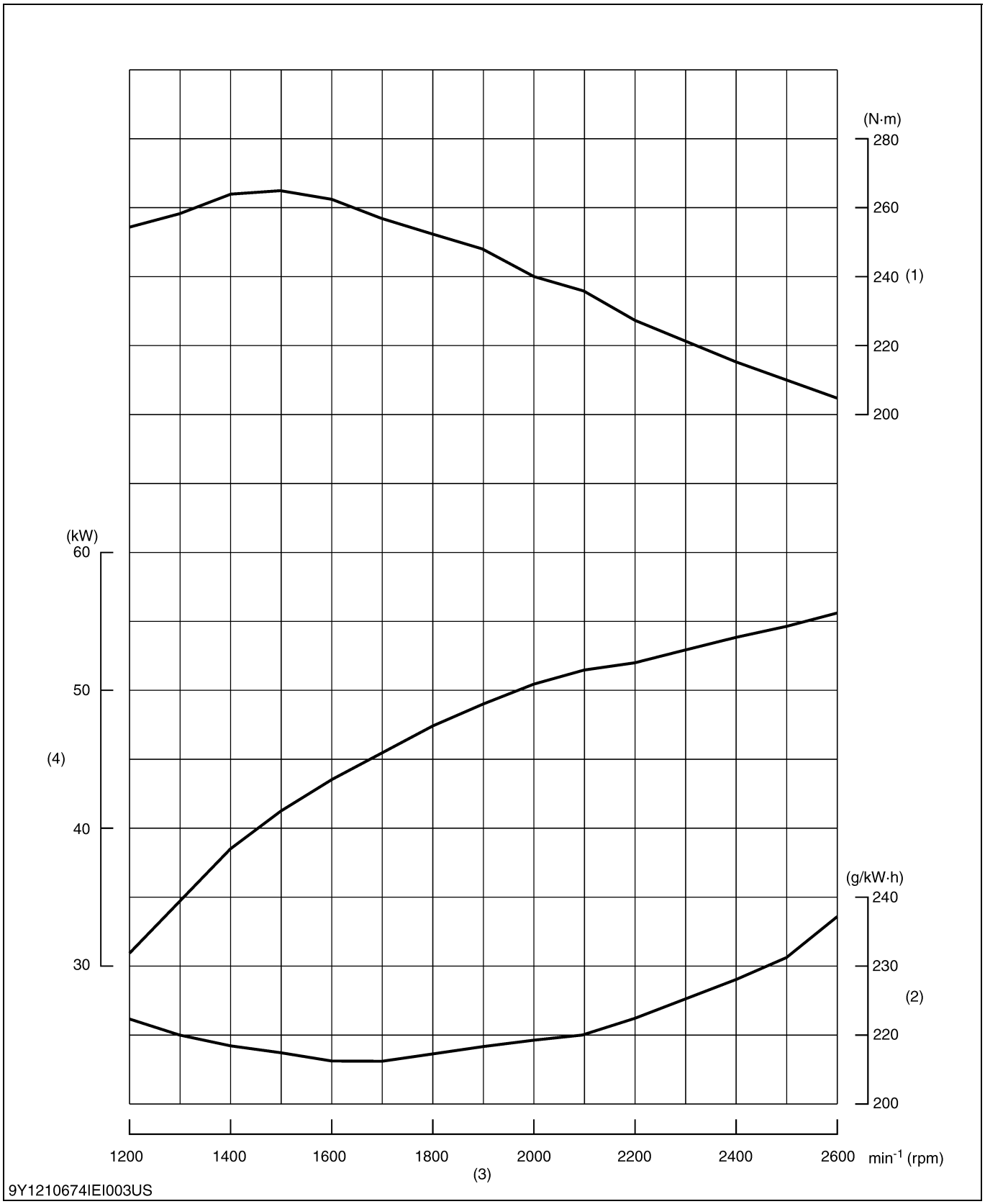
V3307-CR-TE4B



(1) Torque
(2) B.S.F.C. (Brake Specific Fuel Comsumption)
(3) Engine Speed
(4) Brake Horsepower

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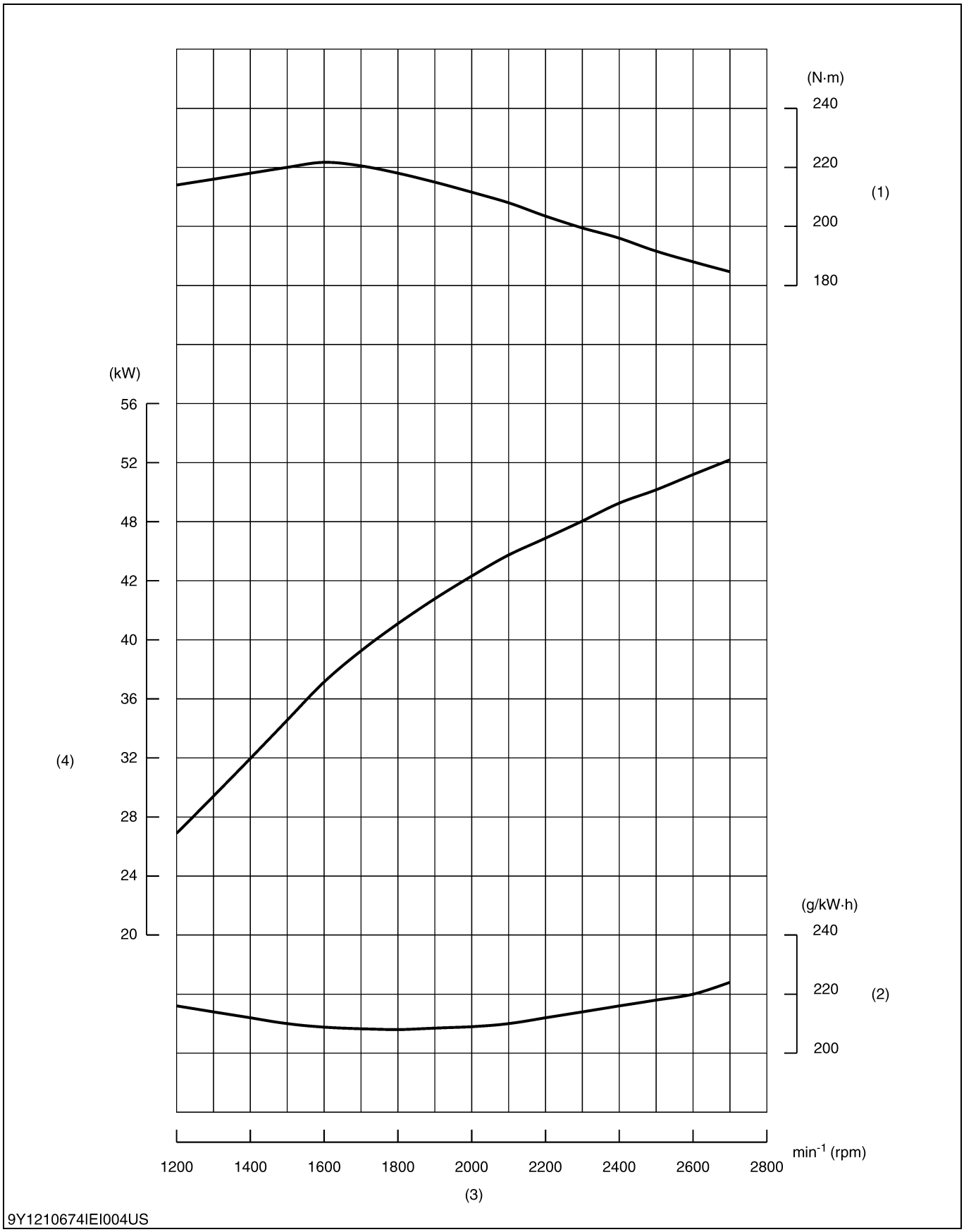
V2607-CR-TIE4B



(1) Torque
(2) B.S.F.C. (Brake Specific Fuel Comsumption)
(3) Engine Speed
(4) Brake Horsepower

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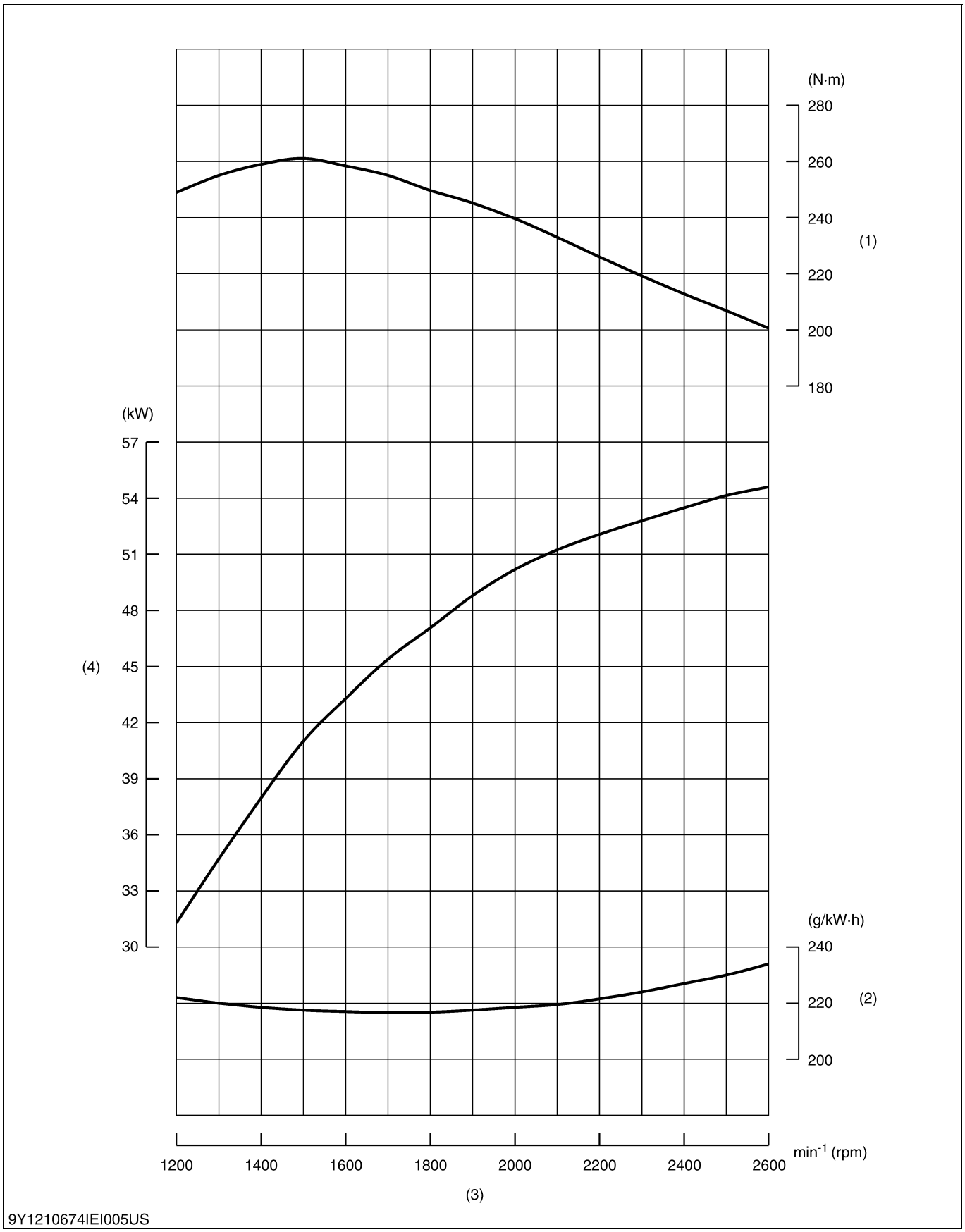
V3307-CR-TIE4B



(1) Torque
(2) B.S.F.C. (Brake Specific Fuel Comsumption)
(3) Engine Speed
(4) Brake Horsepower

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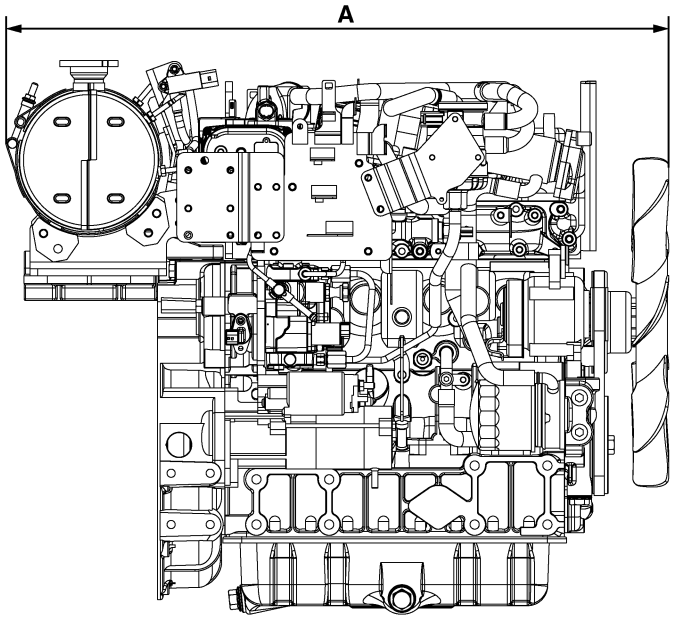
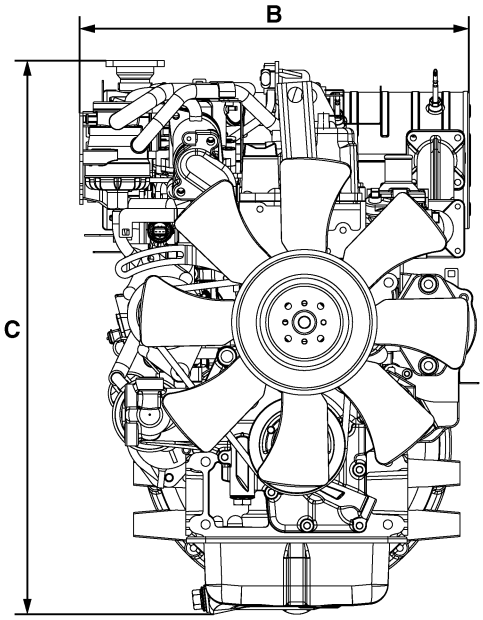
4. DIMENSIONS

V2607-CR-E4B



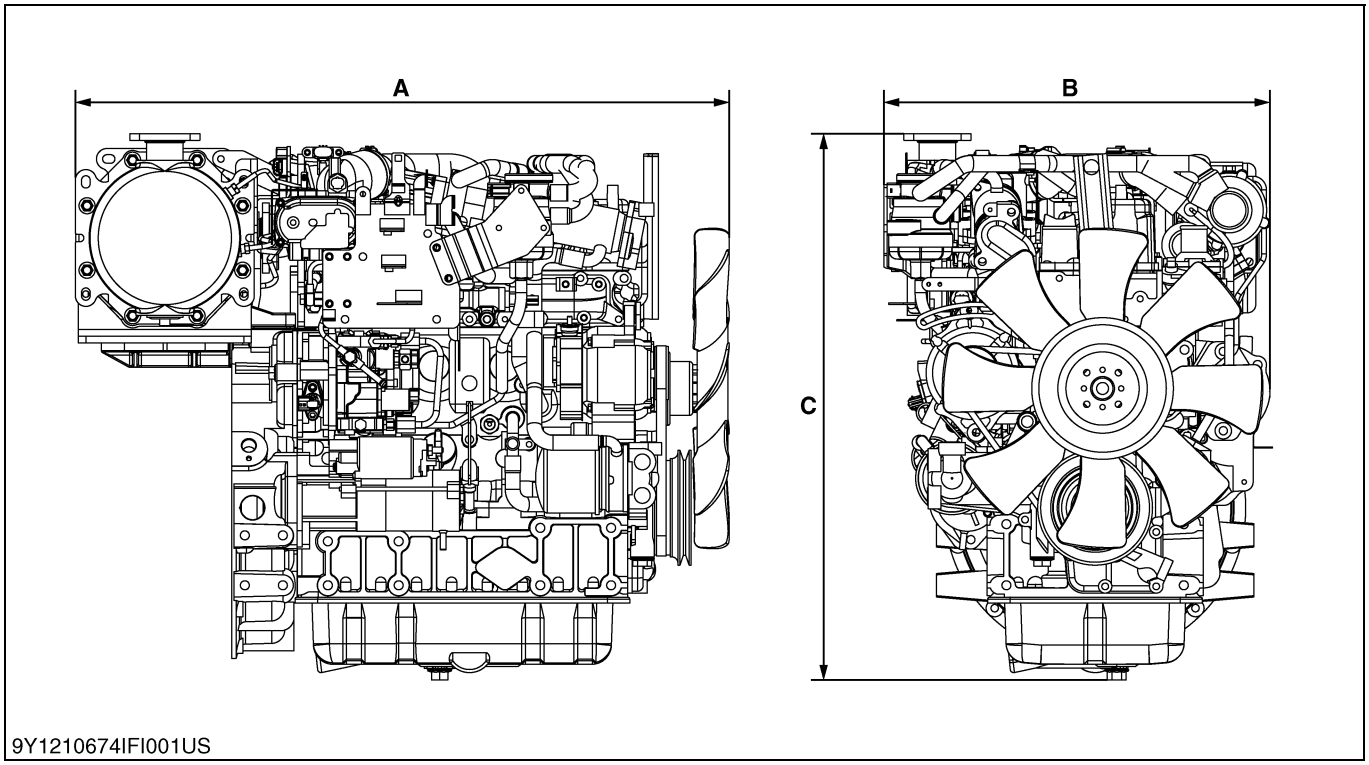


9Y1210674IFI003US

	V2607-CR-E4B
A	875 mm (34.4 in.)
B	542 mm (21.3 in.)
C	723 mm (28.5 in.)

9Y1210674INI0004US0

V2607-CR-TE4B

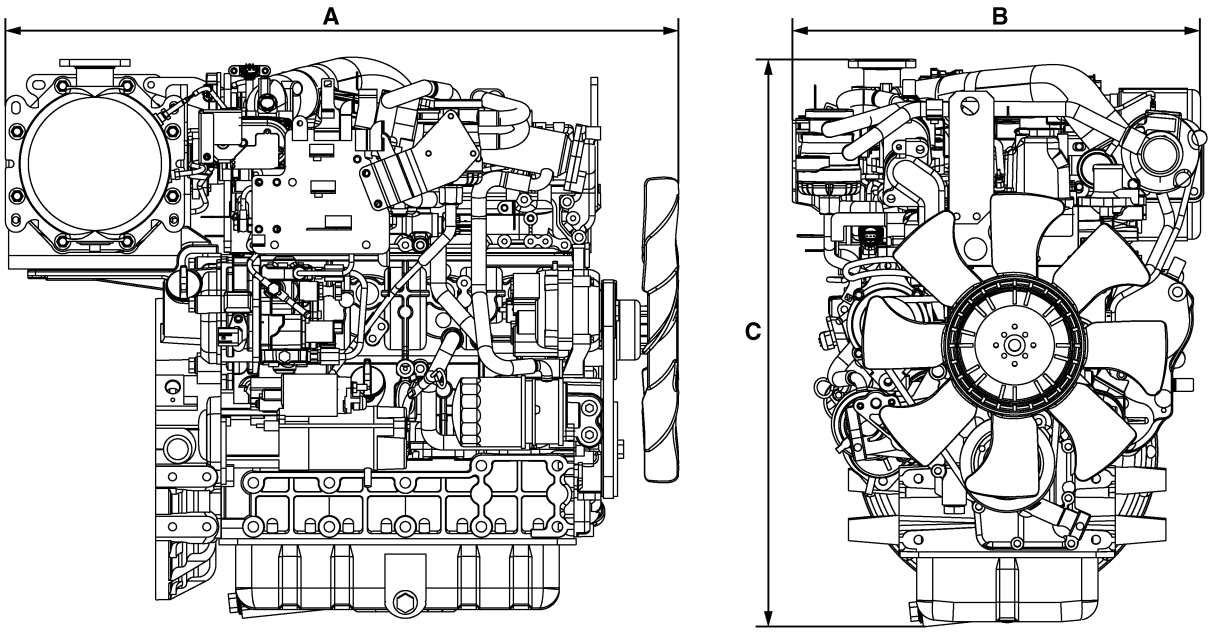


9Y1210674IFI001US

	V2607-CR-TE4B
A	875 mm (34.4 in.)
B	542 mm (21.3 in.)
C	723 mm (28.5 in.)

9Y1210674INI0015US0

V3307-CR-TE4B



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	V3307-CR-TE4B
A	900 mm (35.4 in.)
B	592 mm (23.3 in.)
C	753 mm (29.6 in.)

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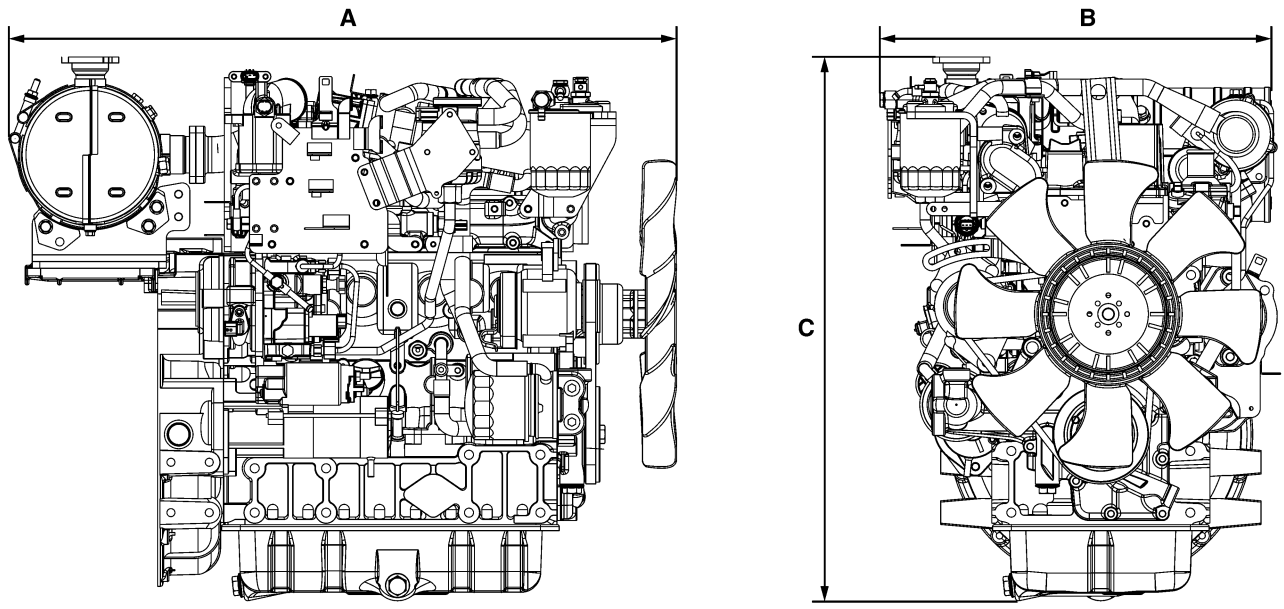
V2607-CR-TIE4B

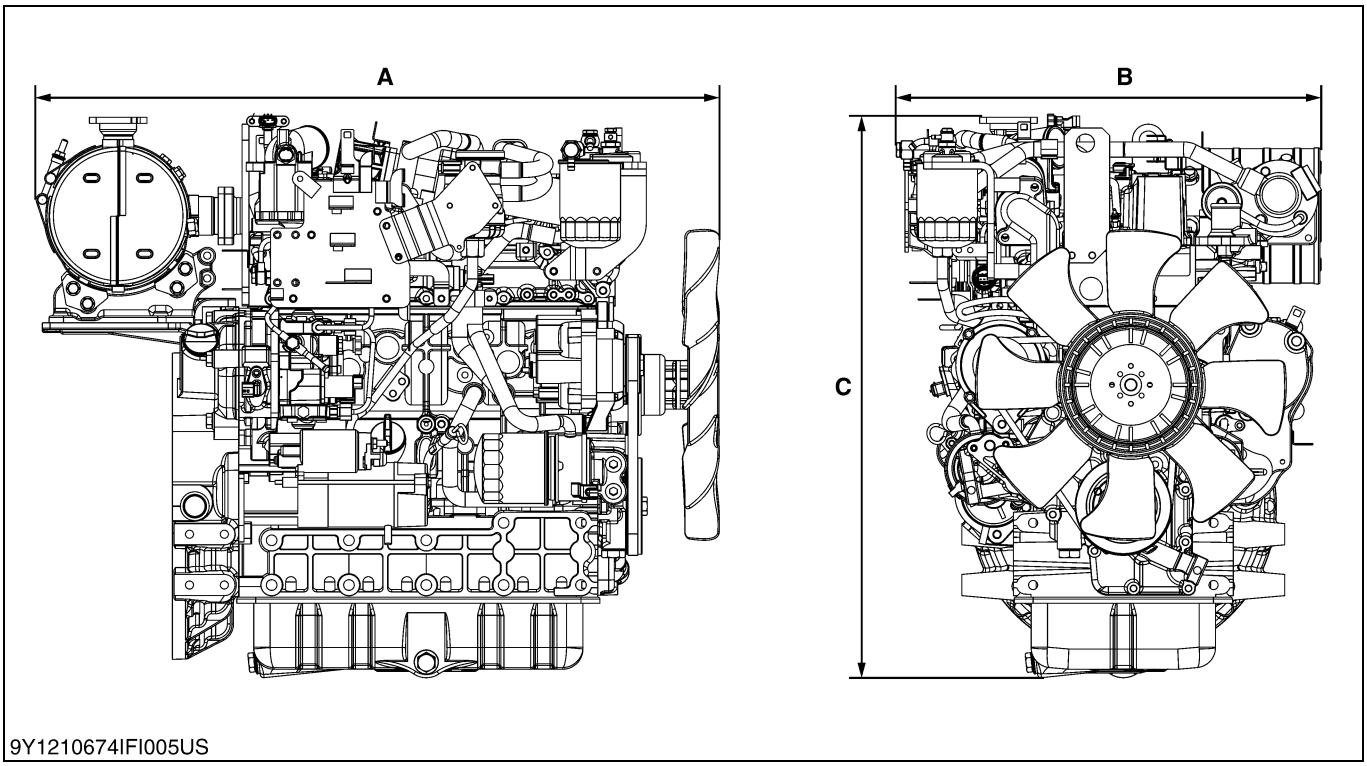


9Y1210674IFI004US

	V2607-CR-TIE4B
A	888 mm (35.0 in.)
B	524 mm (20.6 in.)
C	723 mm (28.5 in.)

9Y1210674INI0022US0

V3307-CR-TIE4B



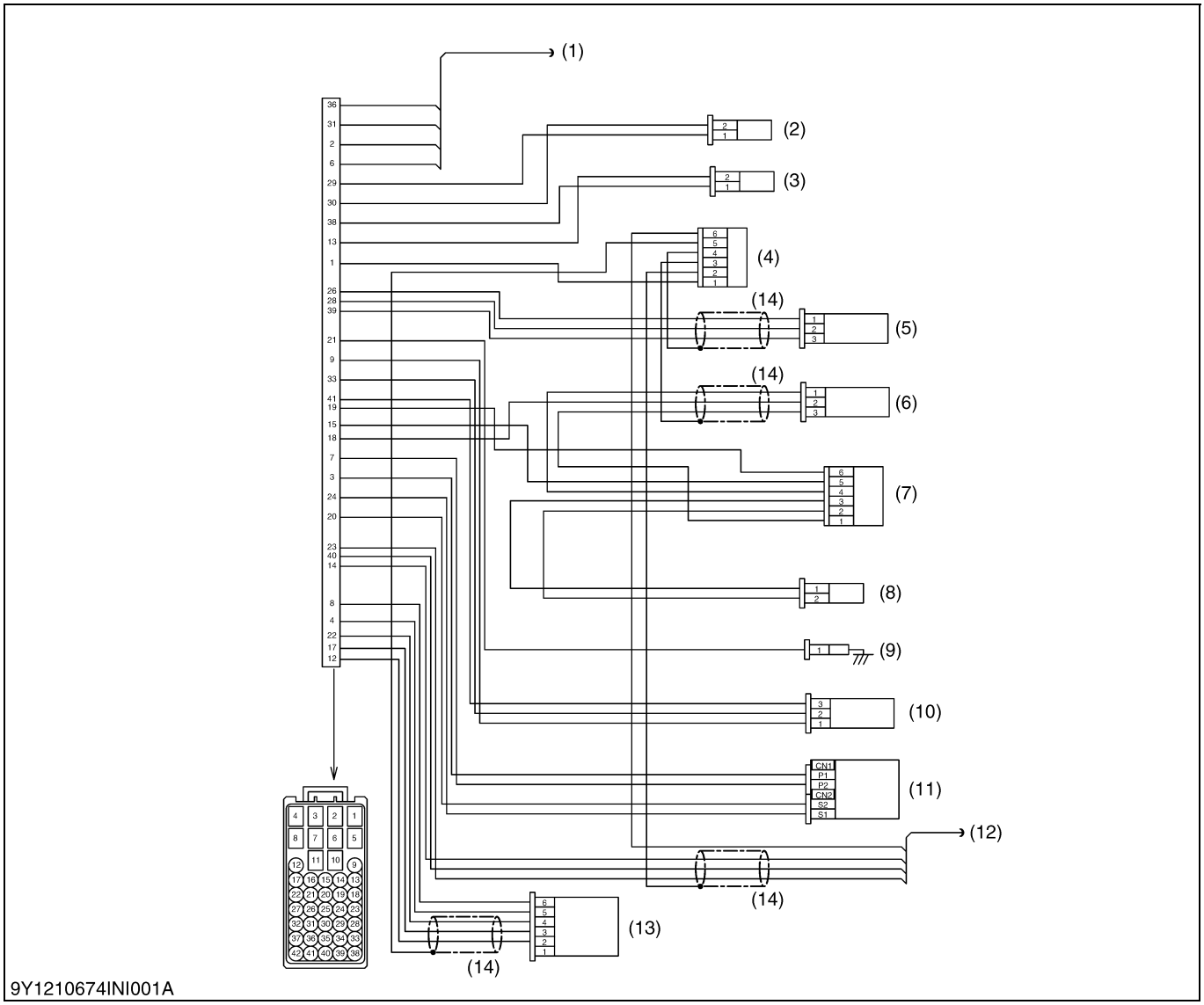
9Y1210674IFI005US

	V3307-CR-TIE4B
A	901 mm (35.5 in.)
B	559 mm (22.0 in.)
C	739 mm (29.1 in.)

9Y1210674INI0023US0

5. WIRING DIAGRAM

[1] ENGINE INTERMEDIATE HARNESS (ENGINE SIDE HARNESS)



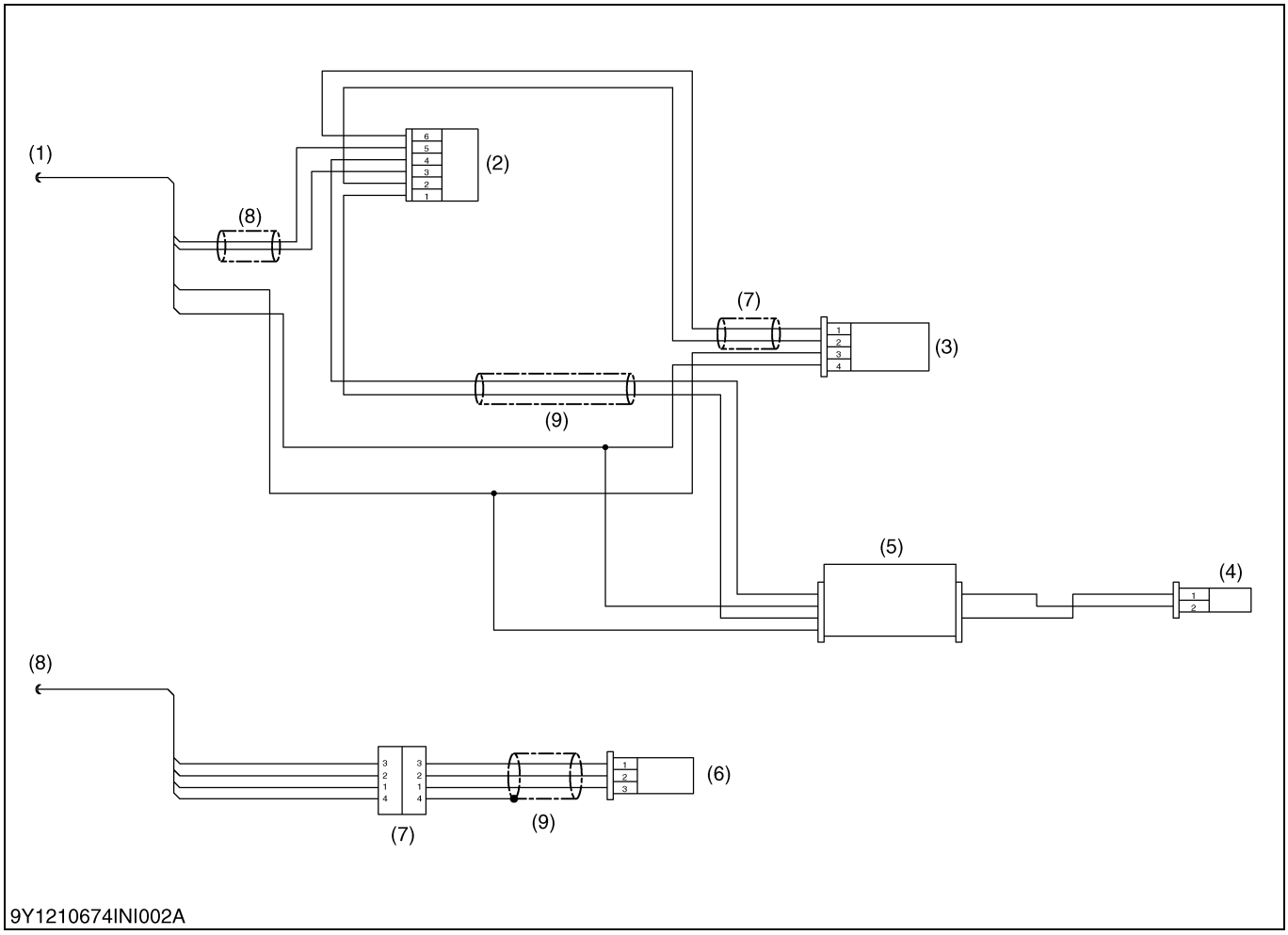
9Y1210674INI001A

(1)	–	CAN and EGR
(2)	CN202	Intake Air Temperature Sensor
(3)	CN203	Coolant Temperature Sensor
(4)	CN215	Engine Joint Connector 1
(5)	CN204	Rail Pressure Sensor
(6)	CN205	Crankshaft Position Sensor
(7)	CN216	Engine Joint Connector 2
(8)	CN206	Resistance Connector (1.1 kΩ)
(9)	CN207	Oil Pressure Switch
(10)	CN208	Boost Pressure Sensor
(11)	CN209 / 210	Supply Pump
(12)	–	Camshaft Position Sensor
(13)	CN212	Intake Throttle Valve (V2607-CR-E4 / V2607-CR-TE4 / V3307-CR-TE4)
(14)	–	Shield Cable

■ **NOTE**

- **The picture shows the pin arrangement of the connector housing viewed from wire side, not mating side.**

9Y1210674INI0024US0



9Y1210674INI002A

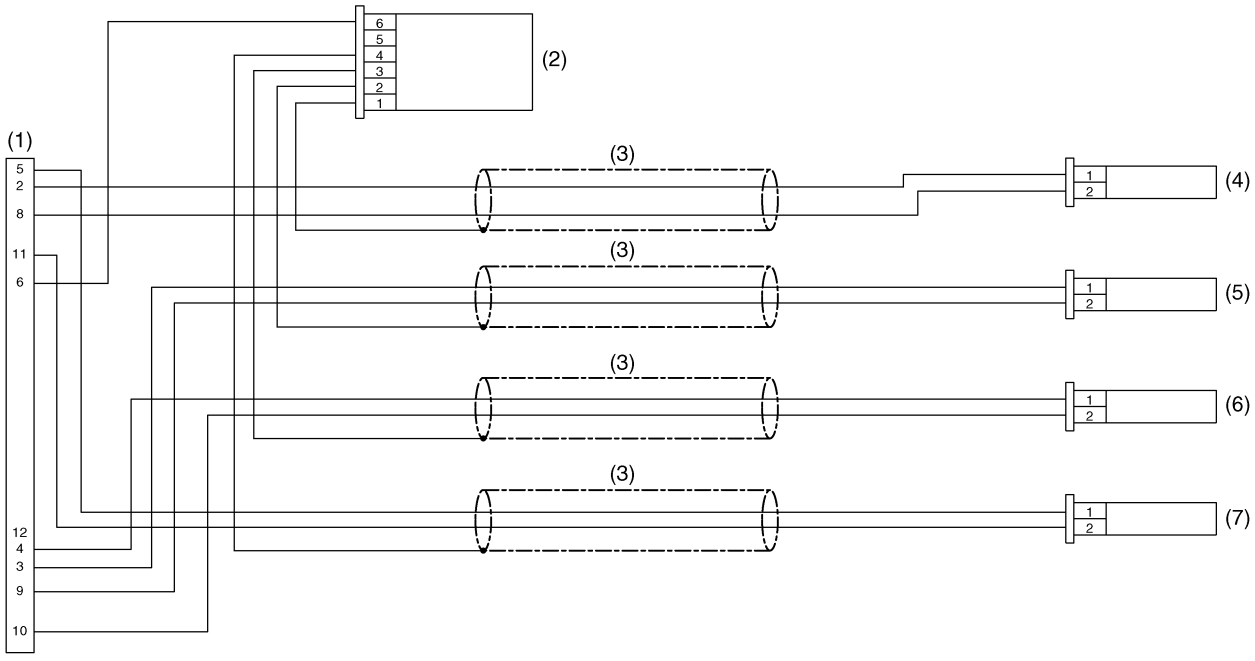
(1)	–	CAN and EGR
(2)	CN221	Engine Joint Connector 3
(3)	CN223	EGR Valve
(4)	CN226	Resistance Connector (120 Ω)
(5)	CN224 / 225	Can Tool
(6)	C227	Crankshaft Angle Sensor
(7)	CN228 / 229	Connector
(8)	CN222	Camshaft Position Sensor
(9)	–	Shield Cable

■ **NOTE**

- **The picture shows the pin arrangement of the connector housing viewed from wire side, not mating side.**

9Y1210674INI0006US0

[2] INJECTOR INTERMEDIATE HARNESS (ENGINE SIDE HARNESS)



9Y1210674INI003A

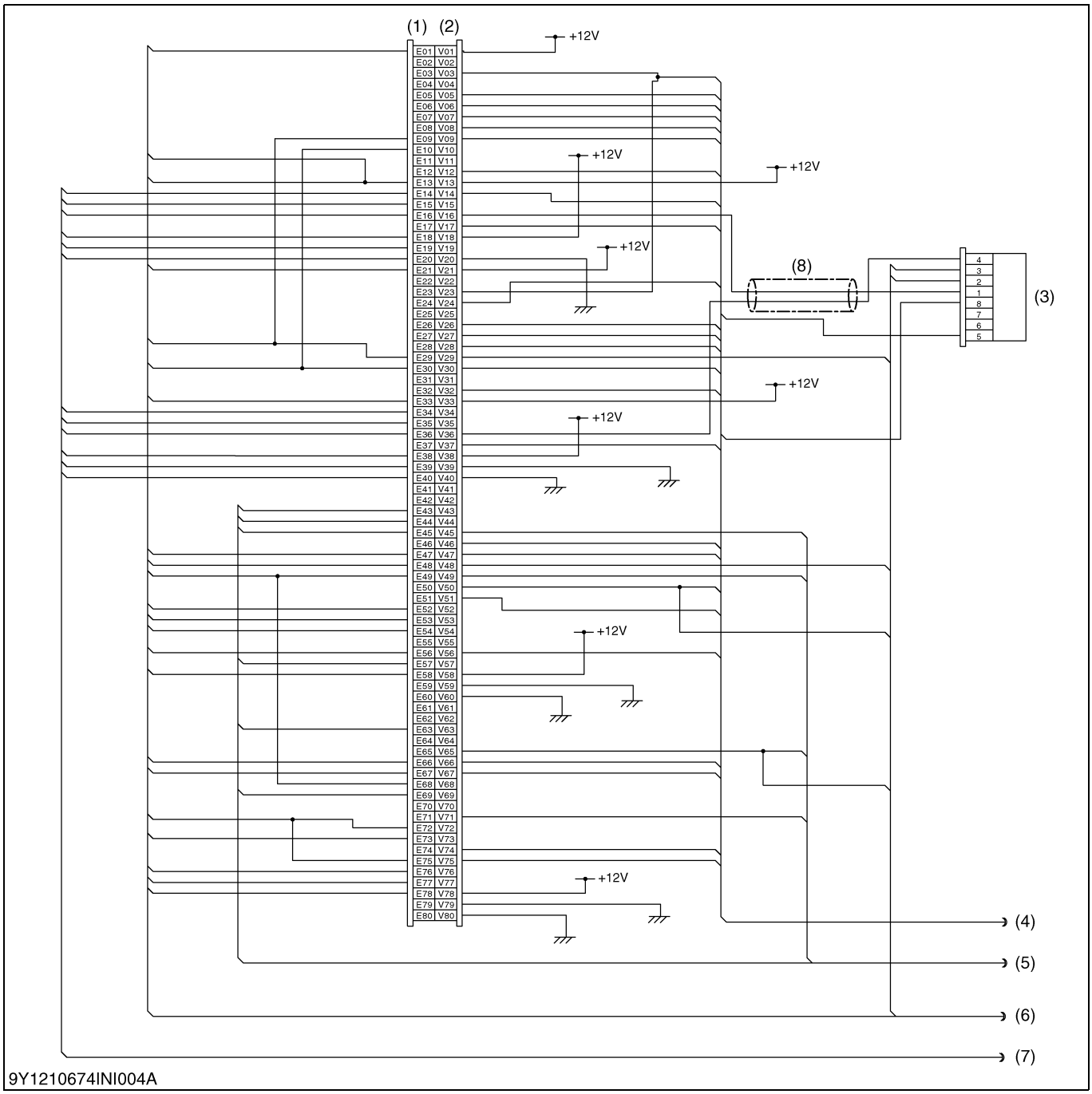
(1)	CN306	Injector Intermediate Connector
(2)	CN305	Injector Joint Connector 1
(3)	–	Shield Cable
(4)	CN301	Injector #1
(5)	CN302	Injector #2
(6)	CN303	Injector #3
(7)	CN304	Injector #4

■ **NOTE**

- **The picture shows the pin arrangement of the connector housing viewed from wire side, not mating side.**

9Y1210674INI0007US0

[3] ECU INTERMEDIATE HARNESS (OEM SIDE HARNESS)

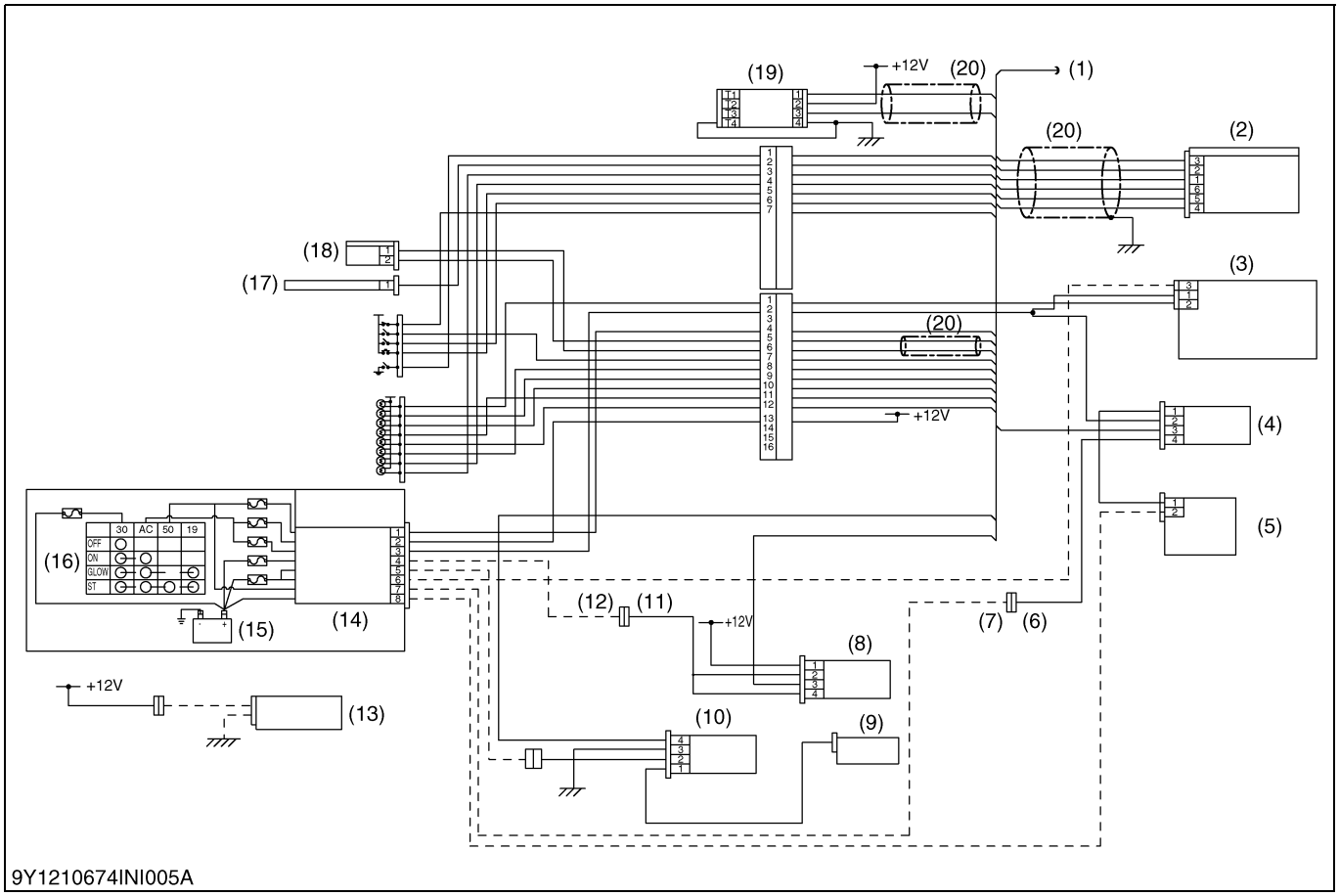


(1)	CN501	ECU (1)
(2)	CN502	ECU (2)
(3)	CN503	ECU Joint Connector 1
(4)	–	Power Unit
(5)	–	Diesel Particulate Filter (hereinafter referred to as the "DPF")
(6)	–	Engine
(7)	–	Injector
(8)	–	Shield Cable

■ **NOTE**

- **The picture shows the pin arrangement of the connector housing viewed from wire side, not mating side.**

9Y1210674INI0008US0



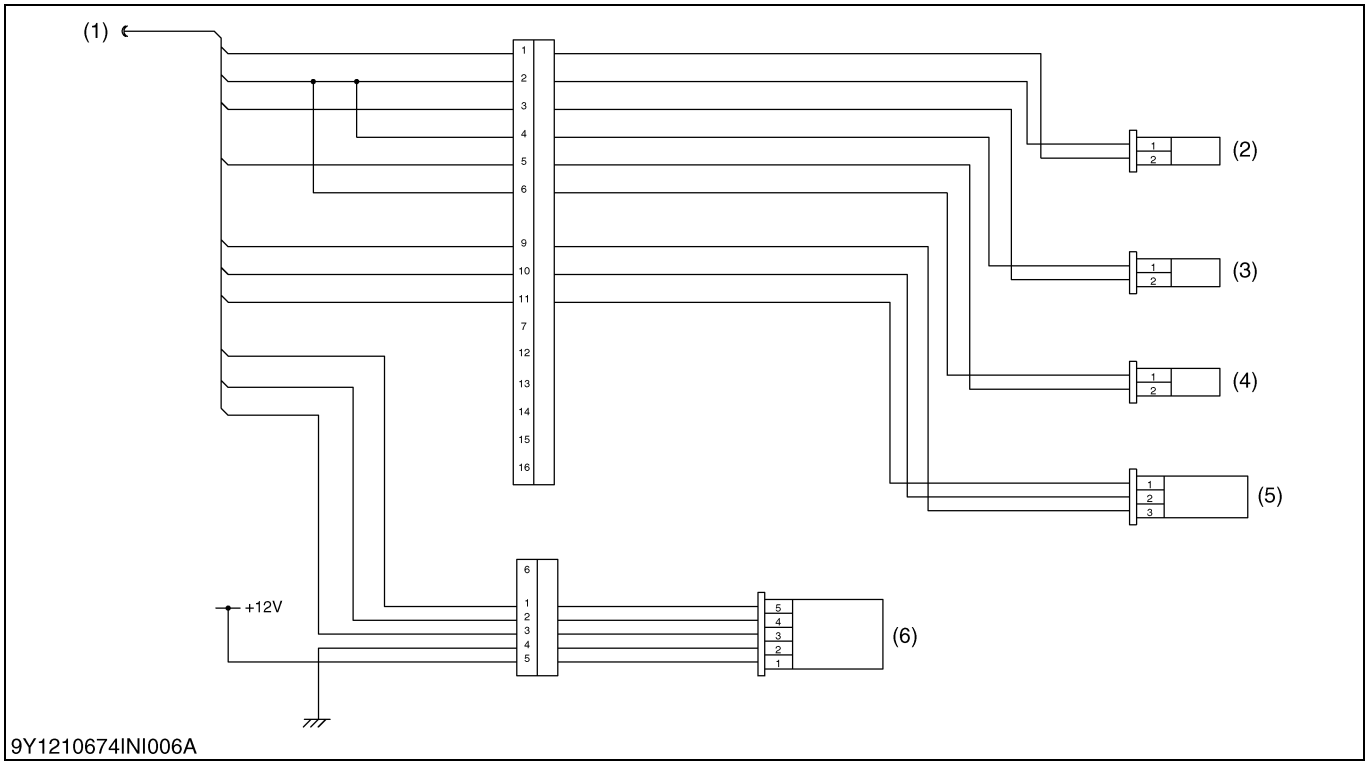
9Y1210674INI005A

(1)	–	Power Unit
(2)	CN401	Accel Sensor
(3)	CN402	Alternator
(4)	CN403	Starter Relay
(5)	CN404	Starter
(6)	CN405	Connector
(7)	CN406	Connector
(8)	CN413	Main Relay
(9)	–	Glow Plug
(10)	CN416	Glow Relay
(11)	CN414	Connector
(12)	CN415	Connector
(13)	–	Fuel Feed Pump
(14)	–	Battery Unit
(15)	–	Battery
(16)	–	Key Switch
(17)	–	Speed Sensor
(18)	–	CAN for Vehicle
(19)	CN407 / 408	CAN Tool
(20)	–	Shield Cable

■ **NOTE**

- **The picture shows the pin arrangement of the connector housing viewed from wire side, not mating side.**

9Y1210674INI0009US0

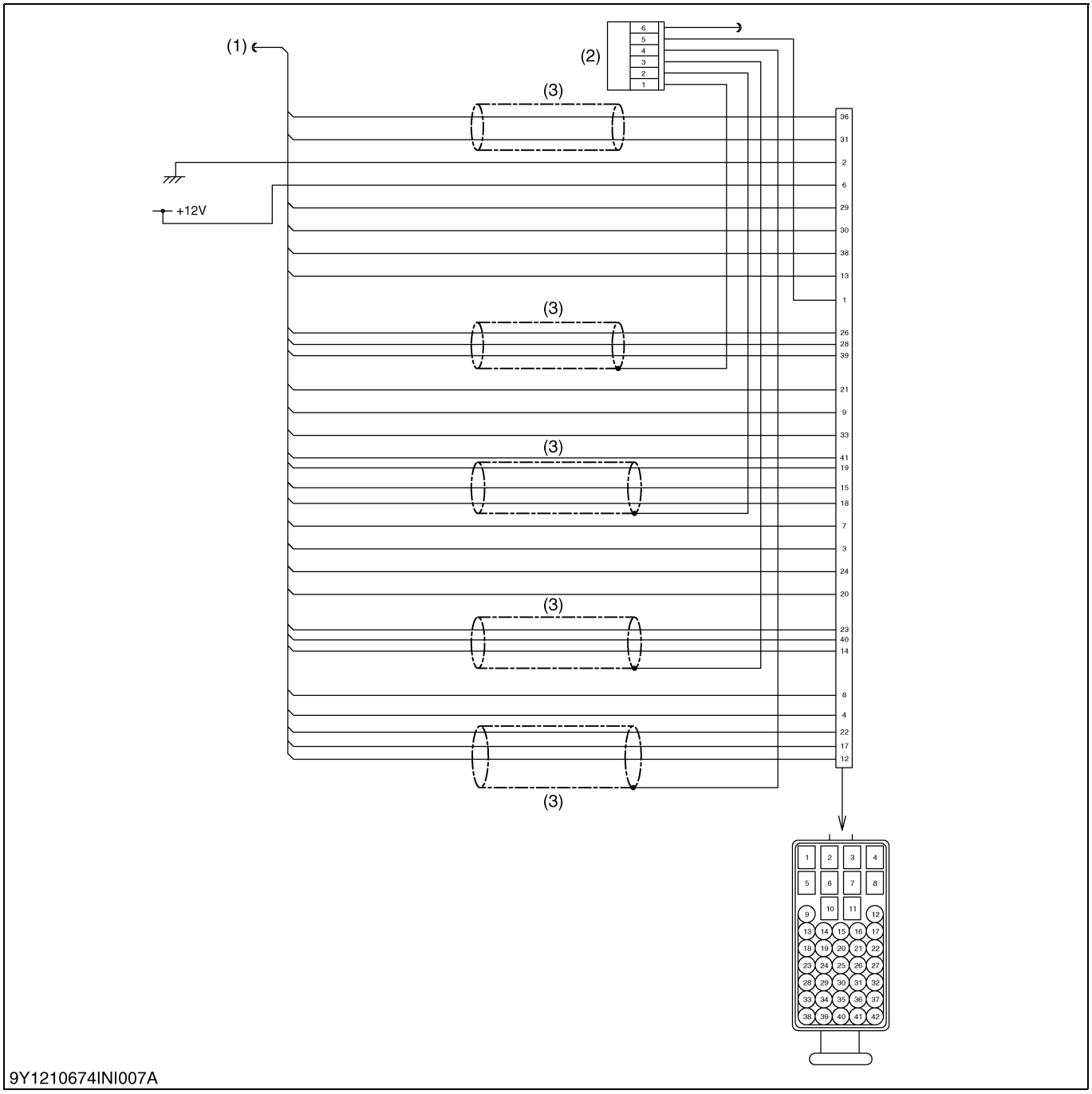


(1)	–	Diesel Particulate Filter (DPF)
(2)	CN101	DPF Temperature Sensor (T_2) (V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B)
(3)	CN102	DPF Temperature Sensor (T_1) (V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B)
(4)	CN103	DPF Temperature Sensor (T_0) (V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B)
(5)	CN104	DPF Differential Pressure Sensor (ΔP) (V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B)
(6)	CN105	Air Flow Sensor

■ **NOTE**

- **The picture shows the pin arrangement of the connector housing viewed from wire side, not mating side.**

9Y1210674INI0025US0

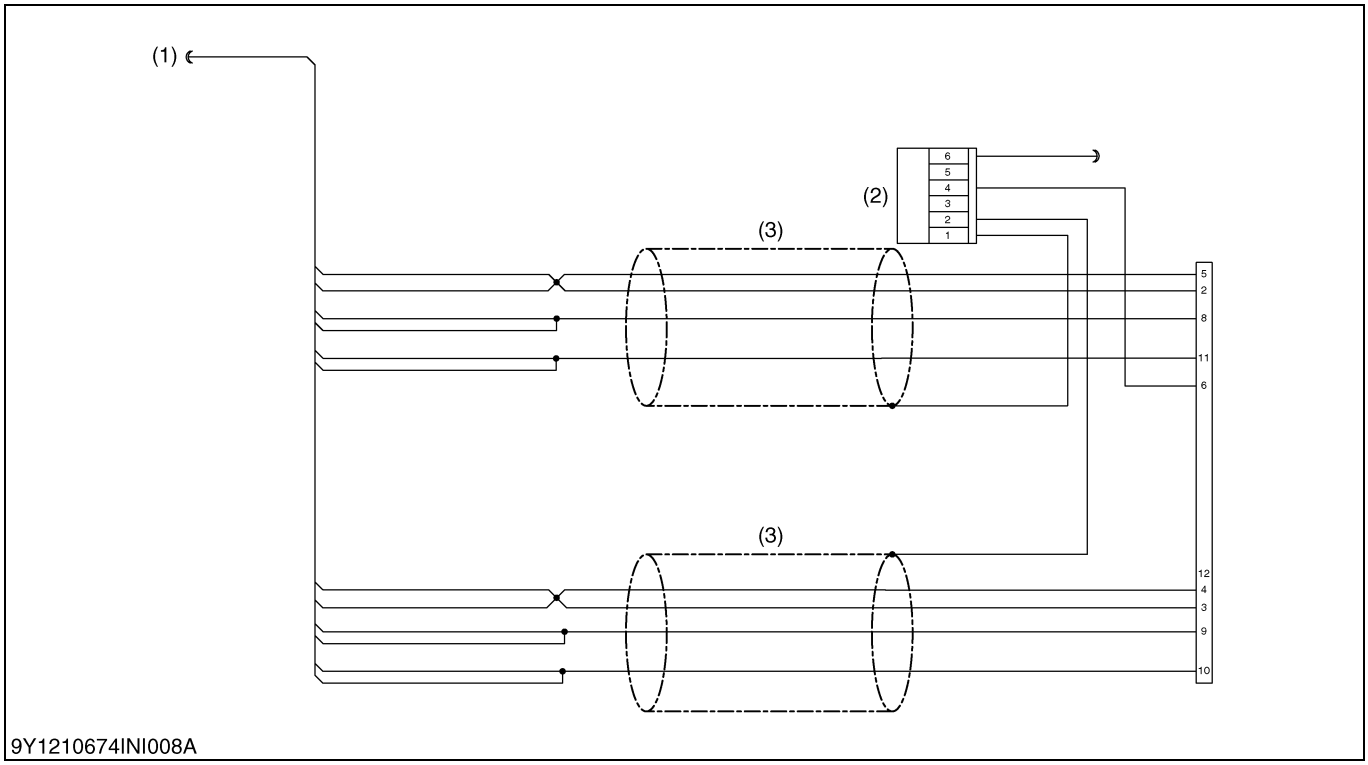


(1)	–	Engine
(2)	CN217	ECU Joint Connector 2
(3)	–	Shield Cable

■ **NOTE**

- **The picture shows the pin arrangement of the connector housing viewed from wire side, not mating side.**

9Y1210674INI0011US0



(1)	–	Injector
(2)	CN308	ECU Joint Connector 3
(3)	–	Shield Cable

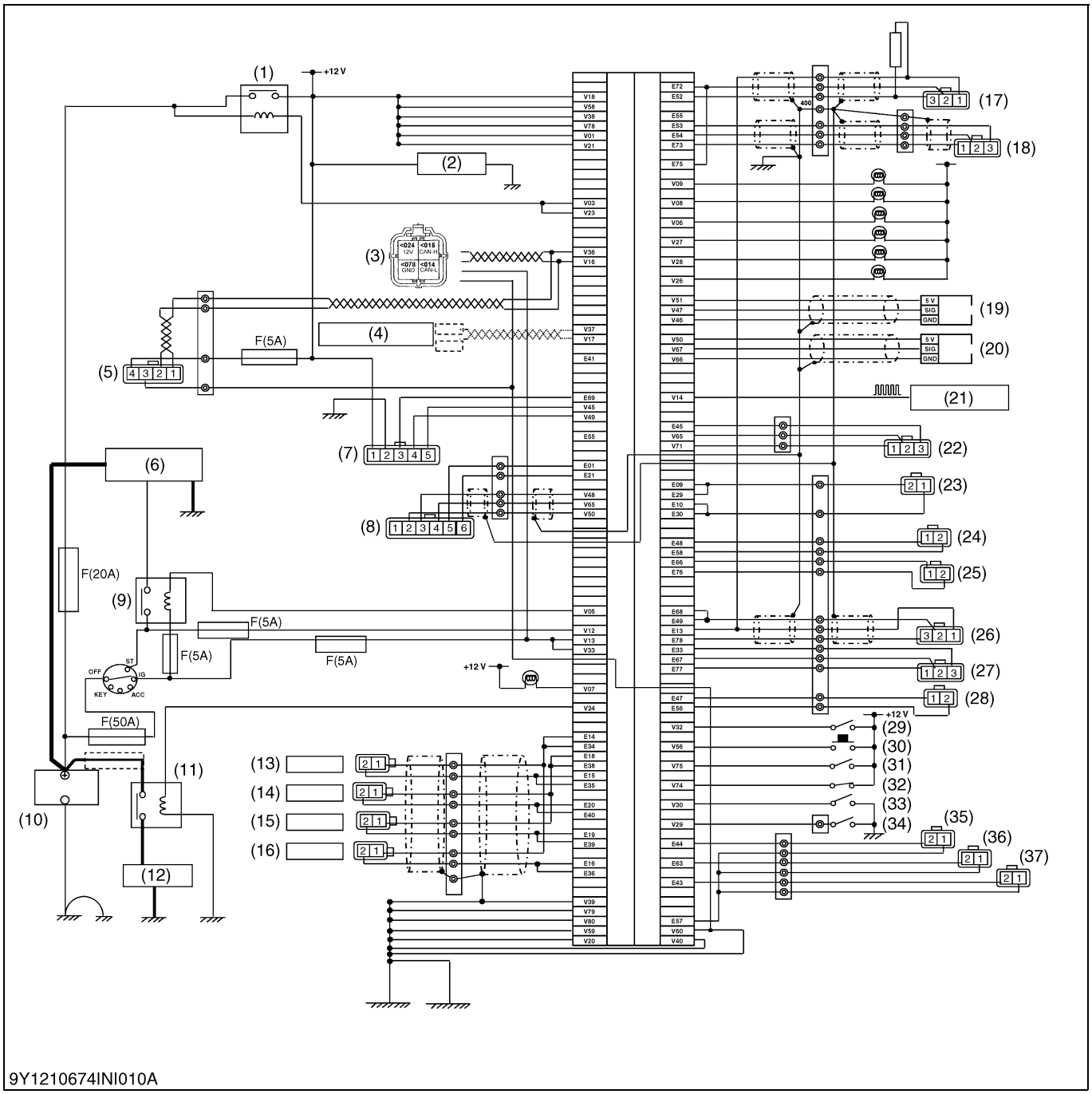
■ **NOTE**

- **The picture shows the pin arrangement of the connector housing viewed from wire side, not mating side.**

9Y1210674INI0012US0

[4] SYSTEM WIRING DIAGRAM

V2607-CR-E4B, V2607-CR-TE4B, V3307-CR-TE4B



9Y1210674INI010A

(1) Main Relay
(2) Fuel Feed Pump
(3) CAN1 Connector (For Service)
(4) CAN2 Connector (For OEM Machine)
(5) EGR Valve
(6) Starter
(7) Air Flow Sensor
(8) Intake Throttle Valve
(9) Starter Relay
(10) Battery
(11) Glow Relay
(12) Glow Plug
(13) Injector 1
(14) Injector 2
(15) Injector 3
(16) Injector 4
(17) Crankshaft Position Sensor
(18) Camshaft Position Sensor
(19) Accel Sensor 1
(20) Accel Sensor 2
(21) Vehicle Speed Sensor
(22) DPF Differential Pressure Sensor (ΔP)
(23) SCV (Suction Control Valve)
(24) Fuel Temperature Sensor
(25) Coolant Temperature Sensor
(26) Rail Pressure Sensor
(27) Boost Sensor
(28) Intake Air Temperature Sensor
(29) Stop Switch
(30) Parked Regeneration Switch
(31) Parking Switch
(32) Regeneration Inhibit Switch
(33) Neutral Switch
(34) Oil Switch
(35) DPF Temperature Sensor (T_0)
(36) DPF Temperature Sensor (T_1)
(37) DPF Temperature Sensor (T_2)

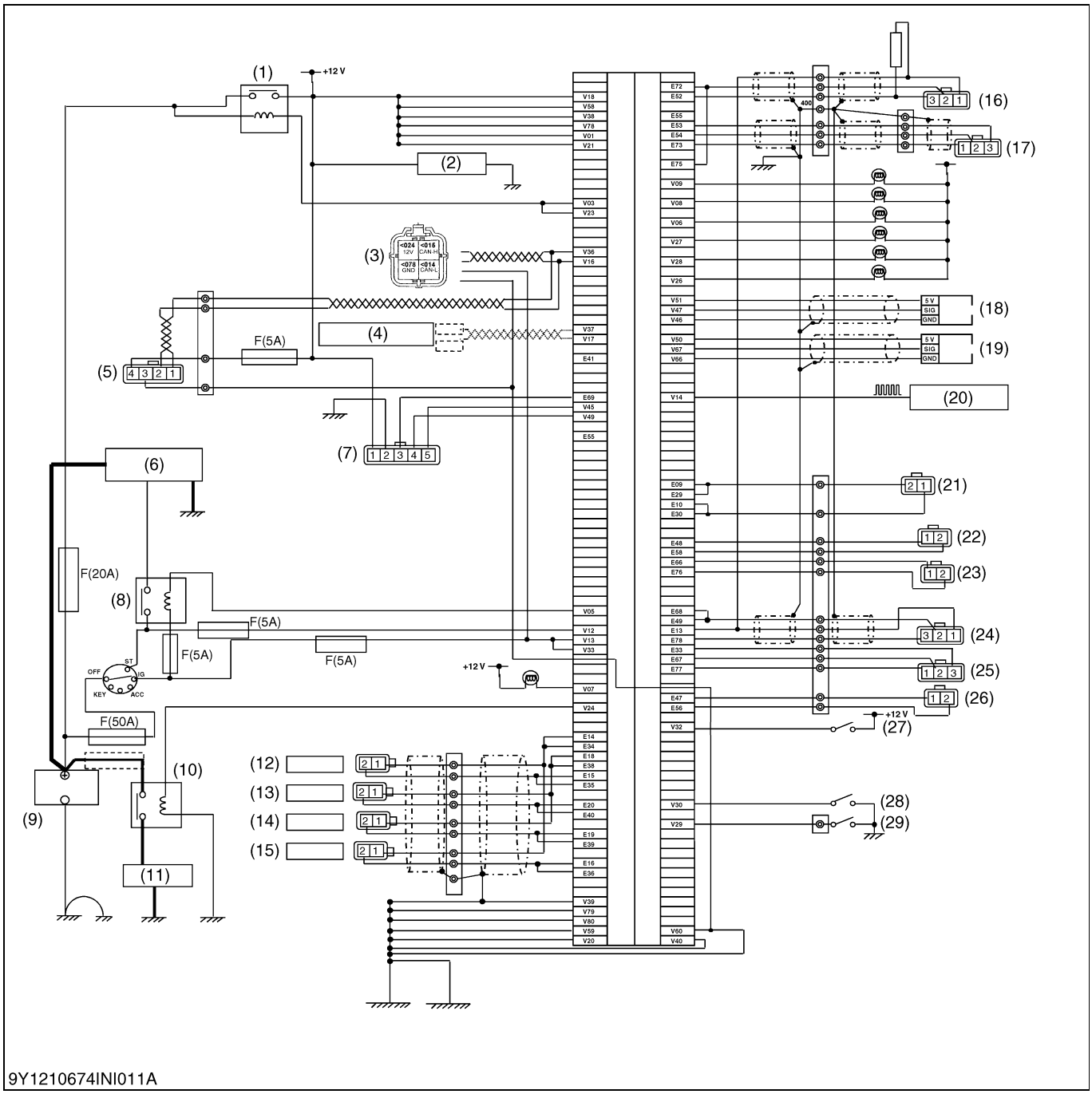
DPF: Diesel Particulate Filter

■ **NOTE**

- **Terminal names and terminal numbers marked with * have become invalid.**

9Y1210674INI0026US0

V2607-CR-TIE4B, V3307-CR-TIE4B



(1) Main Relay
(2) Fuel Feed Pump
(3) CAN1 Connector (For Service)
(4) CAN2 Connector (For OEM Machine)
(5) EGR Valve
(6) Starter
(7) Air Flow Sensor
(8) Starter Relay
(9) Battery
(10) Glow Relay
(11) Glow Plug
(12) Injector 1
(13) Injector 2
(14) Injector 3
(15) Injector 4
(16) Crankshaft Position Sensor
(17) Camshaft Position Sensor
(18) Accel Sensor 1
(19) Accel Sensor 2
(20) Vehicle Speed Sensor
(21) SCV (Suction Control Valve)
(22) Fuel Temperature Sensor
(23) Coolant Temperature Sensor
(24) Rail Pressure Sensor
(25) Boost Sensor
(26) Intake Air Temperature Sensor
(27) Stop Switch
(28) Neutral Switch
(29) Oil Switch

■ **NOTE**

- **Terminal names and terminal numbers marked with * have become invalid.**

9Y1210674INI0027US0

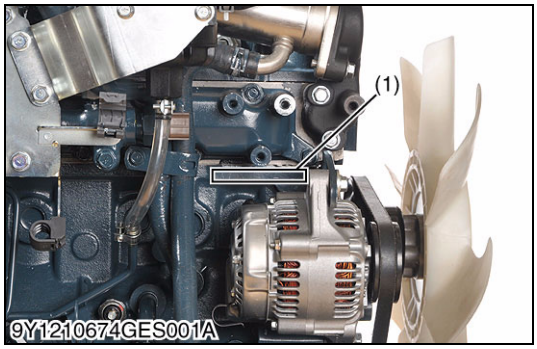
G GENERAL

GENERAL

CONTENTS

1. ENGINE IDENTIFICATION

[1] MODEL NAME AND ENGINE SERIAL NUMBER



You must identify the engine model name and serial number before you start a job. When you get in touch with the manufacturer, always tell your engine model name and serial number.

Engine Serial Number

The engine serial number is an identified number for the engine.

It appears after the engine model name.

It shows the month and year of manufacture as below.

Engine Series

Number or Alphabet	Series	Number or Alphabet	Series
1	05 (include: WG)	6	GZ, OC, AC, EA, E
2	V3	7	03
3	08	8	07
4	SM (include: WG)	A	EA, RK
5	Air Cooled Gasoline	B	03 (KET Production)

Production Year

Alphabet or Number	Year	Alphabet or Number	Year
1	2001	F	2015
2	2002	G	2016
3	2003	H	2017
4	2004	J	2018
5	2005	K	2019
6	2006	L	2020
7	2007	M	2021
8	2008	N	2022
9	2009	P	2023
A	2010	R	2024
B	2011	S	2025
C	2012	T	2026
D	2013	V	2027
E	2014		

(1) Engine Model Name and Serial Number

(To be continued)

(Continued)

Production Month and Lot Number

Month	Engine Lot Number	
January	A0001 ~ A9999	B0001 ~
February	C0001 ~ C9999	D0001 ~
March	E0001 ~ E9999	F0001 ~
April	G0001 ~ G9999	H0001 ~
May	J0001 ~ J9999	K0001 ~
June	L0001 ~ L9999	M0001 ~
July	N0001 ~ N9999	P0001 ~
August	Q0001 ~ Q9999	R0001 ~
September	S0001 ~ S9999	T0001 ~
October	U0001 ~ U9999	V0001 ~
November	W0001 ~ W9999	X0001 ~
December	Y0001 ~ Y9999	Z0001 ~

* Alphabetical letters "I" and "O" are not used.

(a) (b)(c)(d) (e)
e.g. V2607 - 8 C L A001

(a) **V2607**: Engine Model Name
(b) **8**: Engine Series (07 series)
(c) **C**: Production Year (2012)
(d) **L**: Production Month (June)
(e) **A001**: Lot Number: (**0001 ~ 9999** or **A001 ~ Z999**)

9Y1210674GEG0001US0

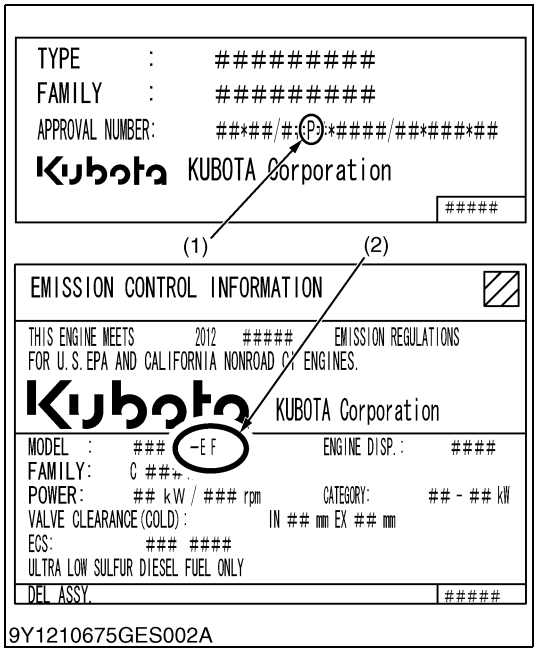
[2] E4B ENGINE

[Example: Engine Model Name V2607-CR-E4B-XXXX]

The emission controls previously implemented in various countries to prevent air pollution will be stepped up as Nonroad Emission Standards continue to change. The timing or applicable date of the specific Nonroad Emission regulations depends on the engine output classification.

Over the past several years, KUBOTA has been supplying diesel engines that comply with regulations in the respective countries affected by Nonroad Emission regulations. For KUBOTA Engines, E4B will be the designation that identifies engine models affected by the next emission phase (See the table below).

When servicing or repairing ###-E4B series engines, use only replacement parts for that specific E4B engine, designated by the appropriate E4B KUBOTA Parts List and perform all maintenance services listed in the appropriate KUBOTA Operator's Manual or in the appropriate E4B KUBOTA Workshop Manual. Use of incorrect replacement parts or replacement parts from other emission level engines (for example: E3B engines), may result in emission levels out of compliance with the original E4B design and EPA or other applicable regulations.Please refer to the emission label located on the engine head cover to identify Output classification and Emission Control Information. E4B engines are identified with "EF" at the end of the Model designation, on the US EPA label. Please note: E4B is not marked on the engine.



9Y1210675GES002A

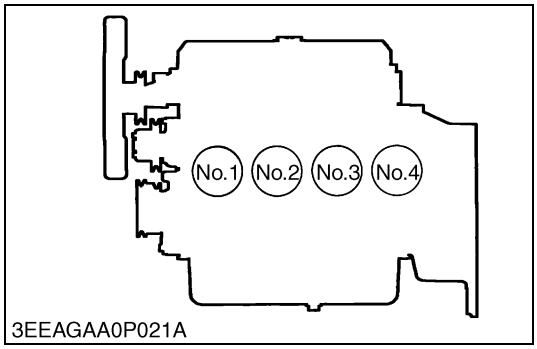
Category (1)	Engine output classification	EU regulation
P	From 37 to less than 56 kW	STAGE IIIB
N	From 56 to less than 75 kW	STAGE IIIB
M	From 75 to less than 130 kW	STAGE IIIB

Category (2)	Engine output classification	EPA regulation
EF	Less than 19 kW	Tier 4
	From 19 to less than 56 kW	Interim Tier 4
	From 56 to less than 75 kW	Interim Tier 4
	From 75 to less than 130 kW	Interim Tier 4

(1) EU regulation engine output classification category
(2) "E4B" engines are identified with "EF" at the end of the Model designation, on the US EPA label.
"E4B" designates some Interim Tier 4 / Tier 4 models, depending on engine output classification.

9Y1210674GEG0002US0

[3] CYLINDER NUMBER



3EEAGAA0P021A

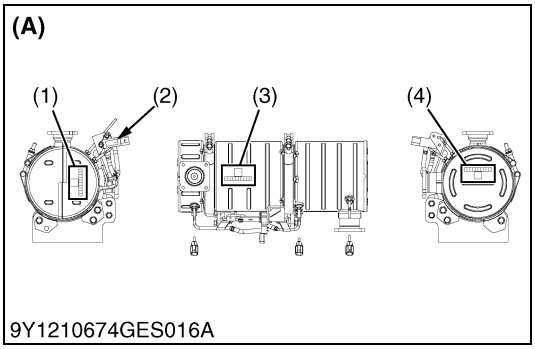
You can see the cylinder numbers of KUBOTA diesel engine in the figure.

The sequence of cylinder numbers is No.1, No.2, No.3 and No.4 and it starts from the front cover side.

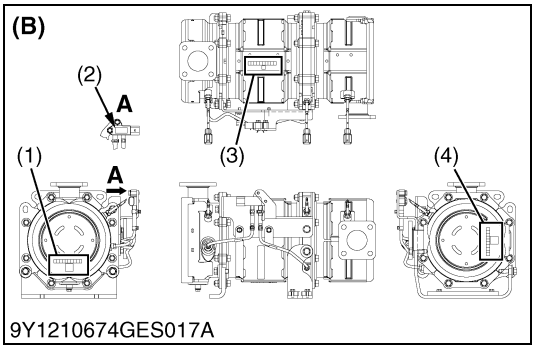
9Y1210674GEG0003US0

2. MUFFLER FULL ASSEMBLY IDENTIFICATION

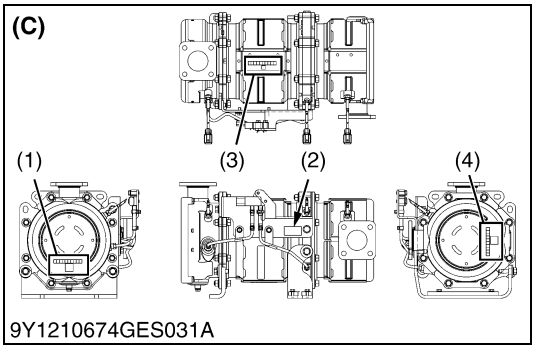
[1] PART NUMBER AND SERIAL NUMBER



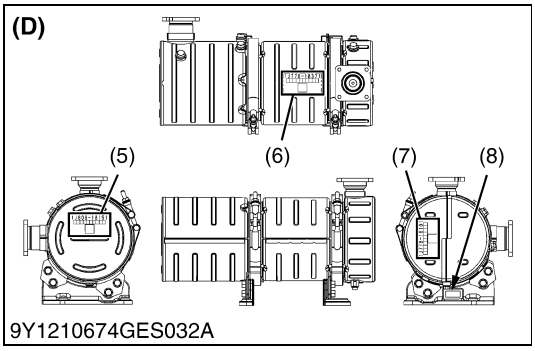
9Y1210674GES016A



9Y1210674GES017A



9Y1210674GES031A



9Y1210674GES032A

Diesel Particulate Filter (hereinafter referred to as the "DPF") Muffler Full Assembly Serial Number

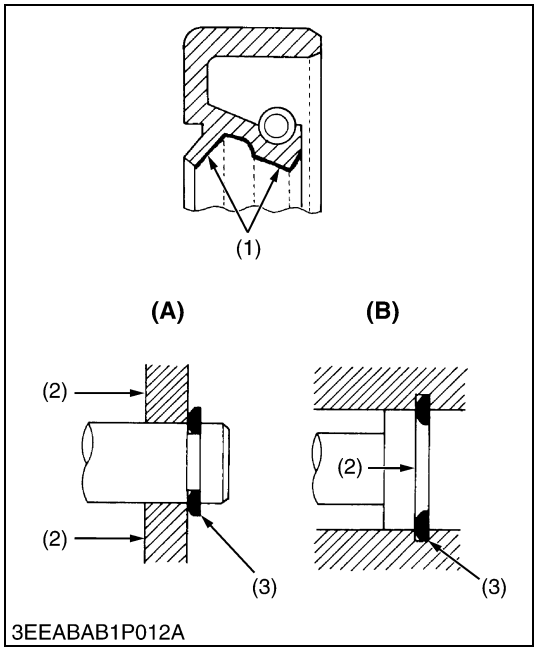
You must keep the records of the DPF part number and serial number (3) and catalyst (DOC) part number and serial number (4) before you remove the DPF for cleaning.

(1) Muffler Assy Part Number and Serial Number
(2) DPF Muffler Full Assy Part Number and Serial Number
(3) DPF Part Number and Serial Number
(4) Catalyst (DOC) Part Number and Serial Number
(5) Catalyst Comp (DOC 1) Part Number and Serial Number
(6) Catalyst Comp (DOC 2) Part Number and Serial Number
(7) Muffler Assy (DOC) Part Number and Serial Number
(8) Muffler Full Assy (DOC) Part Number and Serial Number

(A) V2607-CR-E4B
(B) V2607-CR-TE4B, V3307-CR-TE4B (Engine Serial Number: 8CZZ999 and below)
(C) V2607-CR-TE4B, V3307-CR-TE4B (Engine Serial Number: 8DA0001 and above)
(D) V2607-CR-TIE4B, V3307-CR-TIE4B

9Y1210674GEG0005US0

3. GENERAL PRECAUTIONS



3EEABAB1P012A

- When you disassemble, carefully put the parts in a clean area to make it easy to find the parts.
  You must install the screws, bolts and nuts in their initial position to prevent the reassembly errors.
- When it is necessary to use special tools, use KUBOTA special tools. Refer to the drawings when you make special tools that you do not use frequently.
- Before you disassemble or repair machine, make sure that you always disconnect the ground cable from the battery first.
- Remove oil and dirt from parts before you measure.
- Use only KUBOTA genuine parts for replacement to keep the machine performance and to make sure of safety.
- You must replace the gaskets and O-rings when you assemble again. Apply grease (1) to new O-rings or oil seals before you assemble.
- When you assemble the external or internal snap rings, make sure that the sharp edge (3) faces against the direction from which force (2) is applied.
- Make sure that you try to operate the engine after you repair or assemble it.

(1) Grease
(2) Force
(3) Sharp Edge
(A) External Snap Ring
(B) Internal Snap Ring

9Y1210674GEG0006US0

4. MAINTENANCE CHECK LIST

To make sure that the engine operates safely for a long time, refer to the table below to do regular inspections.

Inspection Item		Service Interval									
		Daily	Initial 50 hrs	Every 50 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1500 hrs	Every 3000 hrs	Every 1 year	Every 2 years
	Check of engine oil level	❍									
	Check of fuel level	❍									
	Check of coolant level	❍									
	Check of fan belt	❍									
	Check of fuel hoses and clamp bands			❍							
	Check of draining of water separator			❍							
	Check of radiator hoses and clamp bands				❍						
	Cleaning of air cleaner element (Replace the element after 6-times cleaning)				❍						
	Adjustment of fan belt tension				❍						
	Check of intake air line				❍						
	Change of engine oil		❍			❍					
	Replacement of oil filter cartridge		❍			❍					
	Replacement of fuel filter cartridge					❍					
	Cleaning of water separator					❍					
★1	Cleaning of fuel tank interior					❍					
★1	Cleaning of water jacket and radiator interior					❍					
★1	Replacement of fan belt					❍					❍
★1	Check of valve clearance						❍				
★1,★2	Check of injector							❍			
★1,★2	Check of EGR cooler							❍			
★2	Replacement of oil separator element							❍			
★1,★2	Check of PCV (Positive Crankcase Ventilation) Valve							❍			
★1,★2	Check of turbocharger								❍		
★1,★2	Cleaning of DPF								❍		
★1,★2	Check of EGR system								❍		
★1	Replacement of air cleaner element									❍	
★1	Check of DPF differential pressure pipes and hoses									❍	
★1	Check of EGR piping									❍	
	Check of intake air line									❍	
	Check of exhaust manifold (Crack, gas leakage and mounting screw)									❍	
★1	Replacement of oil separator rubber hose										❍
★1	Replacement of rubber hose of DPF differential pressure sensor										❍
★1	Replacement of intake hose (After air flow sensor)										❍
★1	Replacement of pressure detection hose of boost sensor										❍
★1	Replacement of EGR cooler hose										❍
★1	Replacement of water hose										❍
★1	Replacement of lubricant hose										❍
	Change of radiator coolant (L.L.C.)										❍
★1	Replacement of radiator hoses and clamp bands										❍
★1	Replacement of fuel hoses and clamps										❍

Inspection Item		Service Interval									
		Daily	Initial 50 hrs	Every 50 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1500 hrs	Every 3000 hrs	Every 1 year	Every 2 years
★1	Replacement of intake air line										❍

- When the battery is used for less than 100 hours in a year, check its electrolyte yearly. (for refillable battery's only)
- ★1: Consult your local KUBOTA dealer for this service.
- The items above (★2 marked) are registered as emission related critical parts by KUBOTA in the U.S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.
  Please see the warranty statement in detail.
- The items listed above other than ★2 marked are not necessary to keep the emission-related warranty valid.
- Failure to perform the maintenance will cause problems that will significantly degrade the engine performance.

9Y1210674GEG0007US0

CAUTION

- **When changing or inspecting, be sure to level and stop the engine.**

■ **NOTE**

- **Changing interval of engine oil:**

Models	Interval
V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B V3307-CR-TE4B V3307-CR-TIE4B	Initial 50 hrs, Every 500 hrs or 1 year whichever comes first

API service classification: above CJ-4 grade
Ambient temperature: below 35 °C (95 °F)

9Y1210674GEG0008US0

■ **NOTE**

Engine Oil:

- Refer to the following table for the suitable American Petroleum Institute (API) classification of engine oil according to the engine type and the Fuel Type.

Fuel Type	Engine oil classification (API classification)
	Engines with DPF
Ultra Low Sulfur Fuel [Sulfur Content < 0.0015 % (15 ppm)]	**CJ-4**

- Engine oil should be API classification CJ-4.
- Change the type of engine oil according to the ambient temperature.
- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.
- On DPF-equipped engines, part of the fuel may get mixed with engine oil during the regenerating process. This may dilute the oil and increase its quantity. If the oil rises above the oil level gauge upper limit, it means the oil has been diluted too much, resulting in a trouble. In such case, immediately change the oil for new one.
- If the interval of DPF regeneration becomes 5 hours or less, be sure to change the oil for new one.

Fuel:

- Cetane Rating: The minimum recommended Fuel Cetane Rating is 45. A cetane rating greater than 50 is preferred, especially for ambient temperatures below −20 °C (−4 °F) or elevations above 1500 m (4921 ft).
- Diesel Fuel Specification Type and Sulfur Content % (ppm) used, must be compliant with all applicable emission regulations for the area in which the engine is operated.
- DO NOT USE Fuels that have sulfur content greater than 0.0015 % (15 ppm).
- Diesel fuels specified to EN 590 or ASTM D975 are recommended.
- No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)
- These engines use Interim Tier 4 standards, the use of ultra low sulfur fuel is mandatory for these engines, when operated in US EPA regulated areas. Therefore, please use No.2-D S15 diesel fuel as an alternative to No.2-D, and use No.1-D S15 diesel fuel as an alternative to No.1-D for ambient temperature below −10 °C (14 °F).
  a) SAE: Society of Automotive Engineers
  b) EN: European Norm
  c) ASTM: American Society of Testing and Materials
  d) US EPA: United States Environmental Protection Agency
  e) No.1-D or No.2-D, S15: Ultra Low Sulfur Diesel (ULSD)) 15 ppm or 0.0015 wt.%

■ **IMPORTANT**

- **Be sure to use a strainer when filling the fuel tank, or dirt or sand in the fuel may cause trouble.**
- **Do not operate the fuel tank level too low or completely out of fuel. You may experience improper engine operating and/or a DTC (Diagnostic Trouble Code) error code may be recorded in the Engine Control. Additionally, fuel system bleeding may be necessary if air enters the fuel system.**

(To be continued)

(Continued)

■ **Biodiesel fuel**

[When the B7 blended fuel is used]

When the finally blended Biodiesel fuel is B7, make sure it conforms to the updated EN590 (European) standard. Be also sure that the mineral oil diesel fuel, if used, conforms to the updated EN590 (European) standard and that the B100 blend conforms to the updated EN14214 (European) standard.

[When the B5 blended fuel is used]

When the finally blended Biodiesel fuel is B5, make sure it conforms to the updated EN590 (European) standard. Be also sure that the mineral oil diesel fuel, if used, conforms to the updated EN5950 (European) standard or the ASTM D975 (U.S.) standard and that the B100 blend conforms to the updated EN 14214 (European) standard or the ASTM D6751 (U.S.) standard.

■ **Precautions in handling Biodiesel fuels**

1. Keep the fuel tank full whenever possible to prevent water vapor from accumulating inside the fuel tank. Tighten up the fuel tank filler cap to avoid the entry of moisture.
2. Routinely check the oil level before the operation. Also strictly follow the specified oil change intervals.
3. Biodiesel fuels (BDF) during the supply process or in the machine easily deteriorate due to oxygen, water, heat and other foreign substances. With this in mind, take the following precautions.
   - Do not leave those fuels in the fuel tank or a metallic drum longer than 3 months.
   - Before storing the machine for a prolonged period, change such fuel for a conventional type of diesel fuel and operate the machine for 30 minutes or longer to clean up the fuel system.
4. Bear it in mind that Biodiesel fuels have the characteristics below. Referring to the servicing intervals specified in the KUBOTA products' Operator's Manuals, be sure to keep and clean up the fuel system, replace the fuel hose with new ones and take other necessary measures. It is advisable to replace the fuel filter with a new one after half the specified replacement intervals. (Compared with the use of mineral oil diesel fuels, the filtration performance of fuel filters gets degraded earlier than expected.)

- Biodiesel fuels easily induce the growth of microorganisms and foul themselves. This may get the fuel system corroded and the fuel filter clogged.
- In cold weather, some problems may occur: the clog of the fuel line or fuel system, starting failure, and other unforeseen troubles.
- Biodiesel fuels easily soak up moisture, which means that they may contain higher moisture content than conventional diesel fuels.

5. Palm oil-based Biodiesel fuels are inferior in low-temperature fluidity to soy-based and rapeseed-based Biodiesel fuels. In cold season in particular, this may clog the fuel filter.
6. If Biodiesel fuels are spilt on a coated surface, the coating may get damaged. Immediately wipe the spill off the surface.

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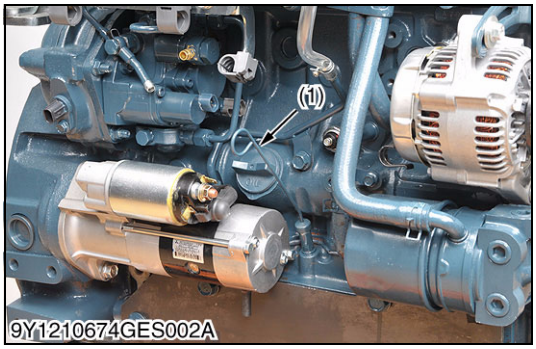
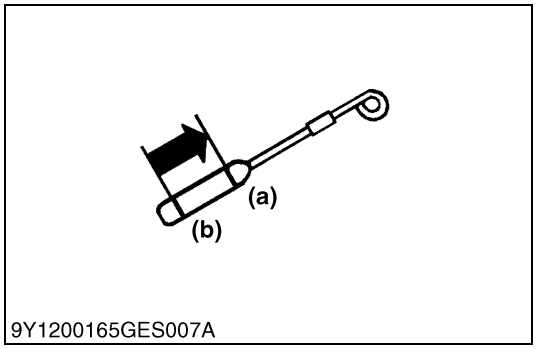
5. CHECK AND MAINTENANCE

[1] DAILY CHECK POINTS





Check of Engine Oil Level

1. Make the engine level.
2. Pull out the dipstick (1) and clean it. Put in and pull it out again. Make sure that the oil level is between the 2 notches.
3. If the level is too low, add new oil to the specified level.

■ **IMPORTANT**

- **On Diesel Particulate Filter (DPF) equipped engines, part of the fuel may get mixed with engine oil during the regenerating process. This may dilute the oil and increase its quantity. If the oil rises above the dipstick upper limit, it means the oil has been diluted too much, resulting in a trouble. In such case, immediately change the oil for new one.**
- **When you use an oil of different brand or viscosity from the previous, drain the remaining oil. Do not mix 2 different types of oil.**

■ **NOTE**

- **When you check the engine oil level, make sure that you put it in a level position. If not, you cannot measure oil quantity accurately.**
- **Make sure that you keep the oil level between the upper and lower lines of the dipstick. Too much oil can decrease the output or cause too much blow-by gas. On the closed breather type engine, the port absorbs the mist and too much oil can cause oil hammer.**
  But if the oil level is not sufficient, the moving parts of engine can get a seizure.

(1) Dipstick

(a) Upper Line
(b) Lower Line

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Check of Fuel Level

1. Make the engine level.
2. Make sure that the fuel level is above the lower limit of the fuel level gauge.
3. If the fuel level is too low, add fuel to the upper limit.

■ **IMPORTANT**

- **Be sure to use a strainer when filling the fuel tank, or dirt or sand in the fuel may cause trouble.**
- **Do not operate the fuel tank level too low or completely out of fuel. You may experience improper engine operating and/or a DTC (Diagnostic Trouble Code) error code may be recorded in the Engine Control. Additionally, fuel system bleeding may be necessary if air enters the fuel system.**

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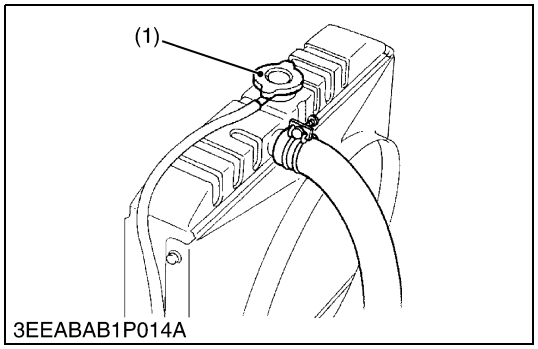

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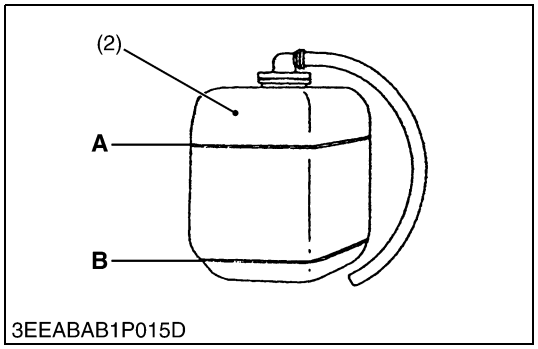

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Check of Coolant Level

CAUTION

- **Do not remove the radiator cap when the engine is hot. Then loosen the cap slightly to release unwanted pressure before you remove the cap fully.**

1. Without recovery tank: Remove the radiator cap (1). Make sure that the coolant level is immediately below the port.
   With recovery tank (2): Make sure that the coolant level is between **FULL A** and **LOW B**.
2. If the coolant level is too low, find out the cause that there is less coolant. **Case 1** If the coolant decreases by evaporation, add only clean and soft water. **Case 2** If the coolant decreases by leak, add coolant of the same manufacturer and brand in the specified mixture ratio (clean, soft water and L.L.C.). If you cannot identify the coolant brand, drain all the remaining coolant and add a new brand of coolant mix.

IMPORTANT

- **When you add the coolant, release the air from the engine coolant channels. The engine releases the air when it shakes the radiator upper and lower hoses.**
- **Make sure that you close the radiator cap correctly. If the cap is loose or incorrectly closed, coolant can flow out and the engine can overheat.**
- **Do not use an anti-freeze and scale inhibitor at the same time.**
- **Do not mix the different type or brand of L.L.C..**

(1) Radiator Cap
(2) Recovery Tank
A: FULL
B: LOW

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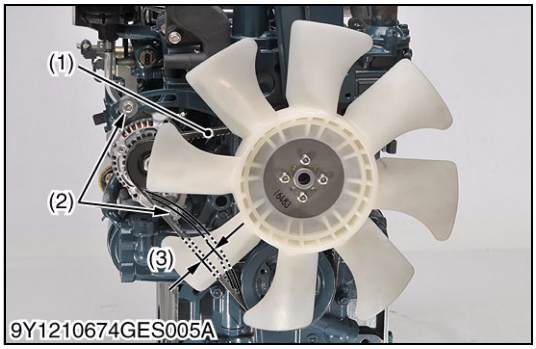

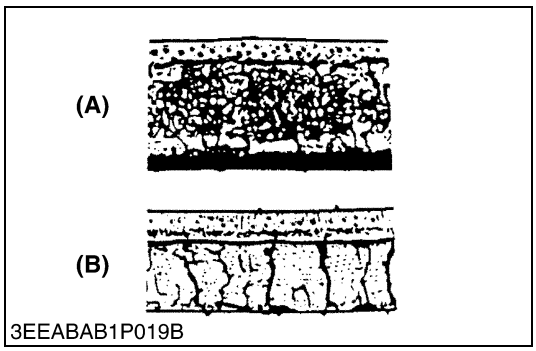

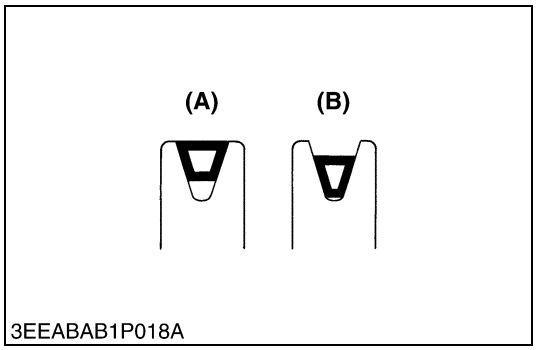

Check of Fan Belt

1. Check if the fan belt is worn out and sunk in the pulley groove, and if it is, replace it.
2. Push the belt halfway between the fan drive pulley and alternator pulley at a specified force 98 N (10 kgf, 22 lbf) to measure the deflection (3).
3. If the measurement is out of the factory specifications, loosen the alternator mounting screws and adjust its position.

Deflection (3)	Factory specification	10 to 12 mm 0.40 to 0.47 in.

(1) Fan Belt
(2) Alternator Mounting Screw
(3) Deflection

(A) OK
(B) Wear

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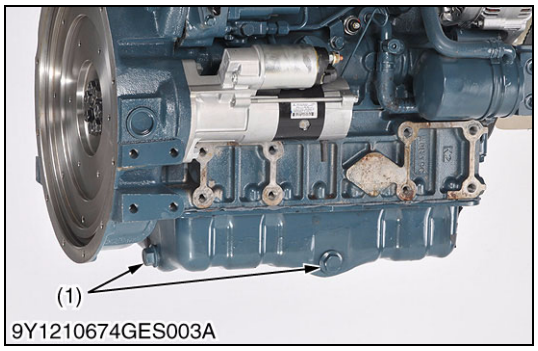
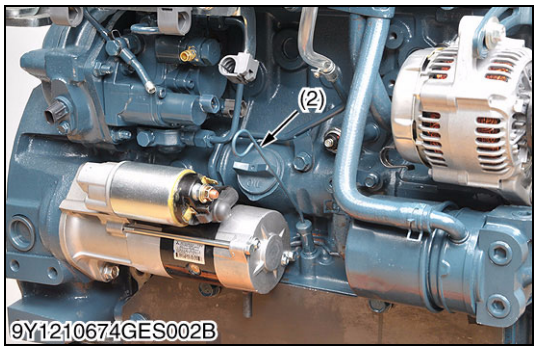
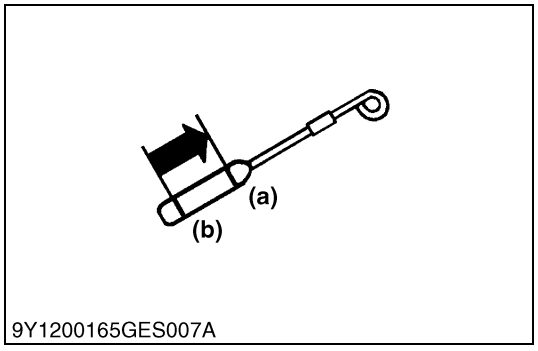
[2] INITIAL 50 HOURS







Change of Engine Oil

CAUTION

- **Make sure that you stop the engine before you change the engine oil.**

1. Start and warm-up the engine for approximately 5 minutes.
2. Put an oil pan below the engine.
3. Remove the drain plug (1) at the bottom of the engine and drain the oil fully.
4. Tighten the drain plug (1).
5. Fill new oil until the upper line on the dipstick (2).

IMPORTANT

- **When you use an oil of different brand or viscosity from the previous, drain the remaining oil.**
- **Do not mix 2 different types of oil.**
- **Engine oil must have the properties of API classification CJ-4. Use the correct SAE Engine Oil by reference to the ambient temperature.**

Above 25 °C (77 °F)	SAE 30 or SAE 10W-30, SAE 15W-40
0 °C to 25 °C (32 °F to 77 °F)	SAE 20 or SAE 10W-30, SAE 15W-40
Below 0 °C (32 °F)	SAE 10W or SAE 10W-30, SAE 15W-40

Engine oil capacity	V2607-CR-E4B, V2607-CR-TE4B, V2607-CR-TIE4B	10.2 L 2.69 U.S.gals
	V3307-CR-TE4B, V3307-CR-TIE4B	11.2 L 2.96 U.S.gals

Tightening torque	Drain plug	45 to 53 N·m 4.5 to 5.5 kgf·m 33 to 39 lbf·ft

(1) Drain Plug
(2) Dipstick
(a) Upper Line
(b) Lower Line

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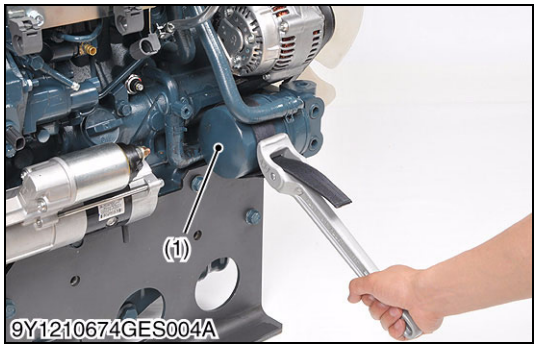

Replacement of Oil Filter Cartridge

CAUTION

- **Make sure that you stop the engine before you replace the oil filter cartridge.**

1. Remove the oil filter cartridge (1) with the filter wrench.
2. Apply a thin layer of oil on the new cartridge gasket.
3. Install the new cartridge by hand. Do not tighten too much because it can cause deformation of the rubber gasket.
4. After you replace the cartridge, the engine oil usually decrease by a small level. Make sure that the engine oil does not flow through the seal and read the oil level on the dipstick. Fill the engine oil until the specified level.

IMPORTANT

- **To prevent serious damage to the engine, replacement element must be highly efficient. Use only a KUBOTA genuine filter or its equivalent.**

(1) Oil Filter Cartridge

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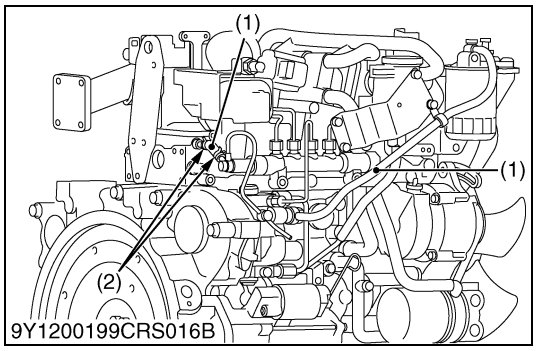
[3] EVERY 50 HOURS



Check of Fuel Hoses and Clamp Bands

1. If the clamp (2) is loose, apply oil to the threads and tighten it again correctly.
2. Replace the fuel hose (1) together with the clamp in a 2 years interval.
3. But if the fuel hose and clamp has damages before 2 years, then replace them.
4. After you replace the fuel hose and the clamp, bleed the fuel system.

(1) Fuel Hose (2) Clamp Band

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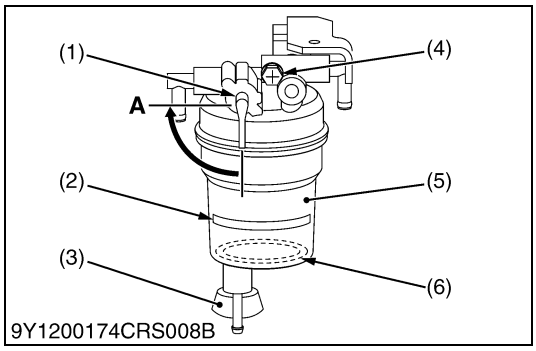

Check and Draining of Water Separator

1. Check if water and dirt contained in fuel precipitate inside the water separator.
2. When such foreign substances are precipitated, set the water separator handle (1) to the "CLOSE" **(A)** position.
3. Loosen the top screw (4) first and then the bottom valve (3) to let the foreign substances out of the separator.
4. Loosen and remove the cup (5) properly, and clean its inside with diesel fuel.
5. Tighten up the cup (5) properly.
6. Finally be sure to air-bleed the fuel system.

■ **IMPORTANT**

- **As water is accumulated, the red float (6) goes up. When the float (6) has reached the specified line (2), immediately drain the water separator.**
- **In reattaching the water separator, be careful to keep off dust and dirt.**
- **Be sure to air-bleed the fuel system before operating engine.**

(1) Water Separator Handle **(A) Close**
(2) Line
(3) Valve
(4) Screw
(5) Cup
(6) Float

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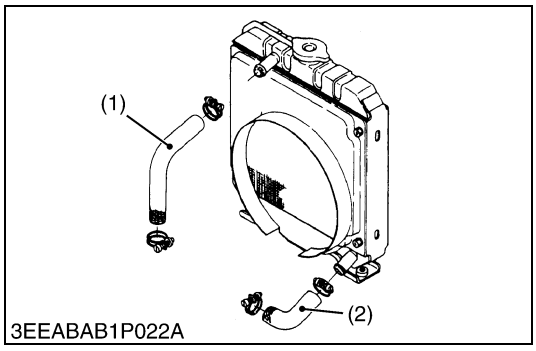
[4] EVERY 250 HOURS



Check of Radiator Hoses and Clamp Bands

1. Make sure that the radiator hoses connections (1), (2) are correct for every 250 hours of operation.
2. If the clamp is loose, apply oil to the threads and tighten it again correctly.
3. You must replace the radiator hose(s) every 2 years. Also replace the clamp every 2 years and tighten it correctly.

(1) Upper Hose (2) Lower Hose

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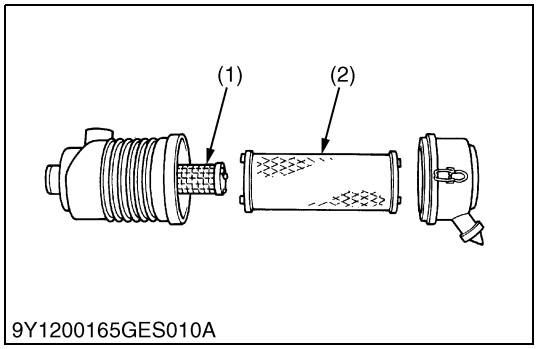

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Cleaning of Air Cleaner Primary Element

1. Remove the primary element (2).
2. Use clean dry compressed air on the inner side of the primary element (2). The pressure of compressed air must be less than 205 kPa (2.1 kgf/cm^2, 30 psi).

■ **NOTE**

- **Replace the primary element once a year or every sixth cleaning.**
- **The air cleaner uses a dry element, never apply oil.**
- **Do not operate the engine with filter element removed.**
- **Do not touch the secondary element (1) except in cases where replacing is required.**

(1) Secondary Element (2) Primary Element

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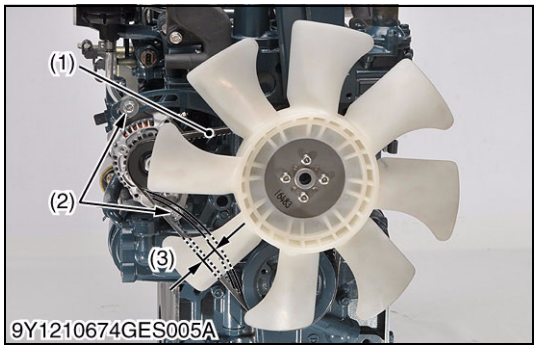

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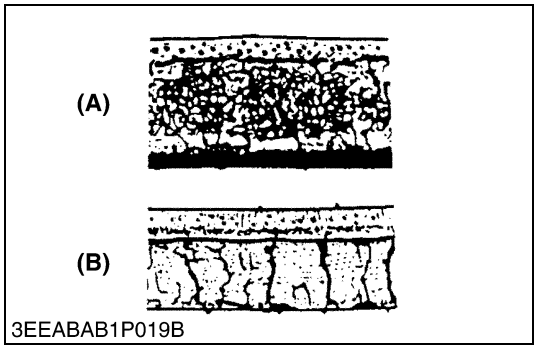
Adjustment of Fan Belt Tension

1. Check if the fan belt is worn out and sunk in the pulley groove, and if it is, replace it.
2. Push the belt halfway between the fan drive pulley and alternator pulley at a specified force 98 N (10 kgf, 22 lbf) to measure the deflection (3).
3. If the measurement is out of the factory specifications, loosen the alternator mounting screws and adjust its position.

Deflection (3)	Factory specification	10 to 12 mm 0.40 to 0.47 in.



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(1) Fan Belt
(2) Alternator Mounting Screw
(3) Deflection
(A) OK
(B) Wear

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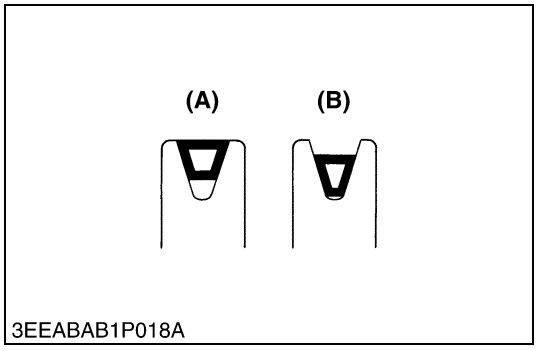

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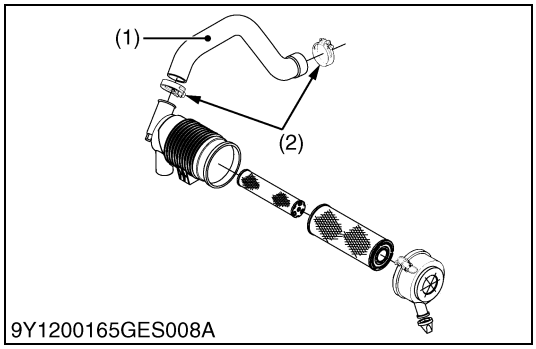

Check of Intake Air Line

1. Make sure that the intake air hose(s) (1) connections are correct for every 250 hours of operation.
2. If the clamp (2) is loose, apply oil to the threads and tighten it again correctly.
3. You must replace the intake air hose(s) every 2 years. Also replace the clamp every 2 years and tighten it correctly.

■ **IMPORTANT**

- **To prevent serious damage to the engine, keep out dust in the intake air line.**

(1) Intake Air Hose (2) Clamp

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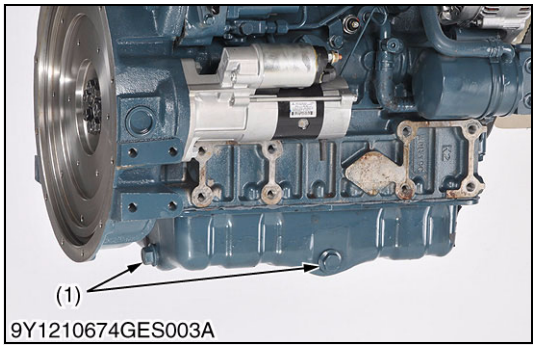
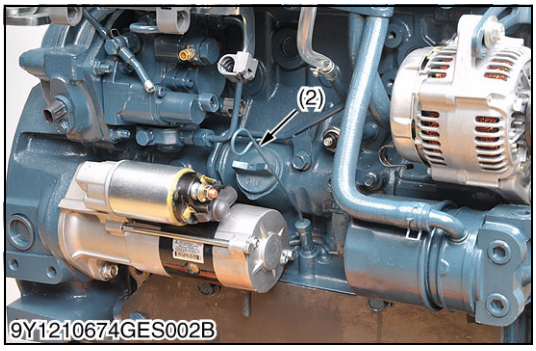
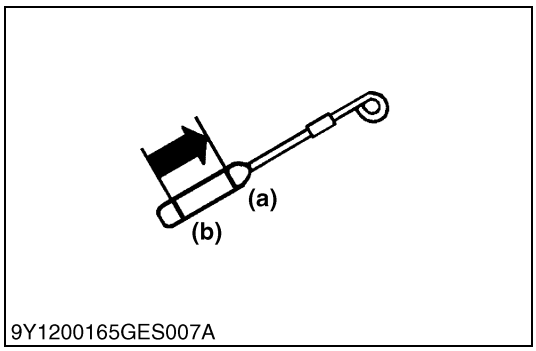
[5] EVERY 500 HOURS







Change of Engine Oil

CAUTION

- **Make sure that you stop the engine before you change the engine oil.**

1. Start and warm-up the engine for approximately 5 minutes.
2. Put an oil pan below the engine.
3. Remove the drain plug (1) at the bottom of the engine and drain the oil fully.
4. Tighten the drain plug (1).
5. Fill new oil until the upper line on the dipstick (2).

■ **IMPORTANT**

- **When you use an oil of different brand or viscosity from the previous, drain the remaining oil.**
- **Do not mix 2 different types of oil.**
- **Engine oil must have the properties of API classification CJ-4. Use the correct SAE Engine Oil by reference to the ambient temperature.**

Above 25 °C (77 °F)	SAE 30 or SAE 10W-30, SAE 15W-40
0 °C to 25 °C (32 °F to 77 °F)	SAE 20 or SAE 10W-30, SAE 15W-40
Below 0 °C (32 °F)	SAE 10W or SAE 10W-30, SAE 15W-40

Engine oil capacity	V2607-CR-E4B, V2607-CR-TE4B, V2607-CR-TIE4B	10.2 L 2.69 U.S.gals
	V3307-CR-TE4B, V3307-CR-TIE4B	11.2 L 2.96 U.S.gals

Tightening torque	Drain plug	45 to 53 N·m 4.5 to 5.5 kgf·m 33 to 39 lbf·ft

(1) Drain Plug **(a) Upper Line**
(2) Dipstick **(b) Lower Line**

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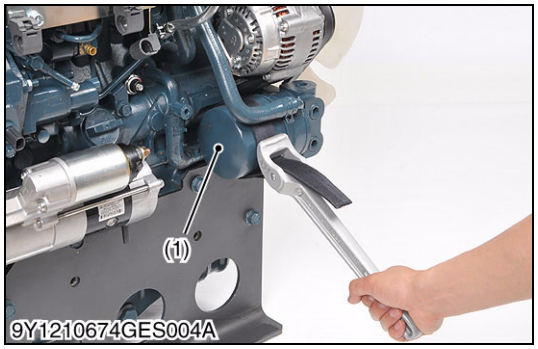

Replacement of Oil Filter Cartridge

CAUTION

- **Make sure that you stop the engine before you replace the oil filter cartridge.**

1. Remove the oil filter cartridge (1) with the filter wrench.
2. Apply a thin layer of oil on the new cartridge gasket.
3. Install the new cartridge by hand. Do not tighten too much because it can cause deformation of the rubber gasket.
4. After you replace the cartridge, the engine oil usually decrease by a small level. Make sure that the engine oil does not flow through the seal and read the oil level on the dipstick. Fill the engine oil until the specified level.

IMPORTANT

- **To prevent serious damage to the engine, replacement element must be highly efficient. Use only a KUBOTA genuine filter or its equivalent.**

(1) Oil Filter Cartridge

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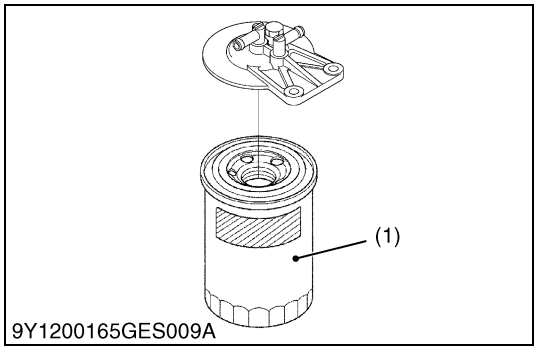

Replacement of Fuel Filter Cartridge

1. Remove the fuel filter cartridge (1) with filter wrench.
2. Apply a thin layer of fuel to the surface of the new filter cartridge gasket before you put it on.
3. Tighten the new cartridge by hand.
4. Open the fuel valve and bleed the fuel system.
5. Operate the engine for a while and check if there is not the fuel leakage from the filter.

(1) Fuel Filter Cartridge

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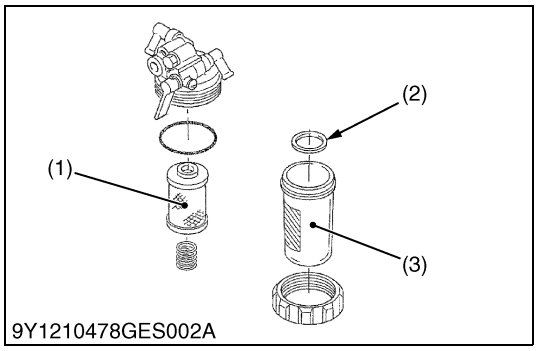

Cleaning of Water Separator

1. Remove and flush the filter cup (3) if the float (2) goes up with water, or the filter cup (3) has the dust.
2. Flush the element (1) with kerosene to prevent dust to go into the inner element (1).
3. After you replace, bleed the fuel system.

(1) Element
(2) Float
(3) Filter Cup

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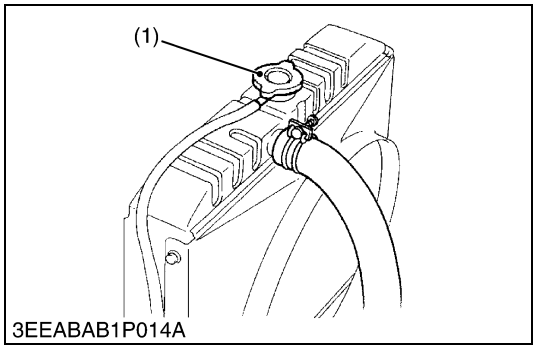

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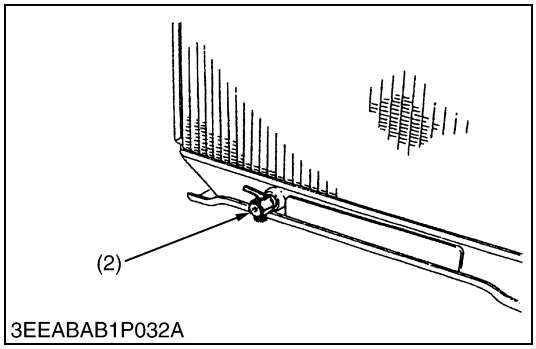

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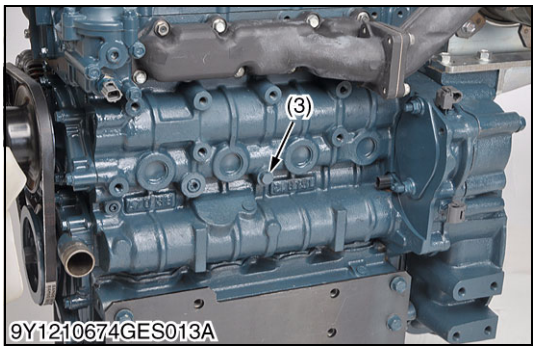

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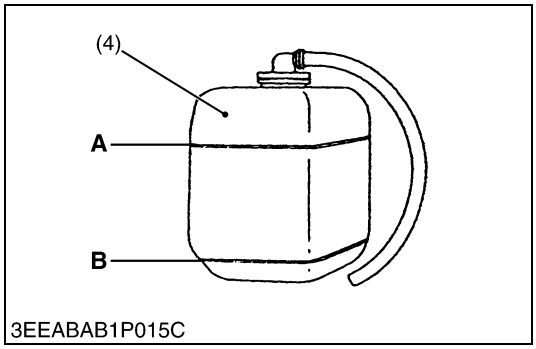

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Cleaning of Water Jacket and Radiator Interior

CAUTION

- **Do not remove the radiator cap when the engine is hot. Then loosen the cap slightly to release unwanted pressure before you remove the cap fully.**

1. Stop the engine and let the coolant temperature decreases.
2. Remove the radiator cap (1) to drain the coolant fully.
3. Open the drain valve (2) and drain plug (3).
4. After you drained all coolant, close the drain valve (2) and plug (3).
5. Fill with clean water and cooling system cleaner.
6. Obey the directions of the cleaner instruction.
7. After you flush, fill with clean water and anti-freeze until the coolant level is immediately below the port. Install the radiator cap (1) correctly.
8. Fill with the coolant until the "FULL" **A** mark on the recovery tank (4).
9. Start and operate the engine for a few minutes.
10. Stop the engine and let the coolant temperature decreases. Check the coolant level of radiator and recovery tank (4) and add coolant if necessary.

IMPORTANT

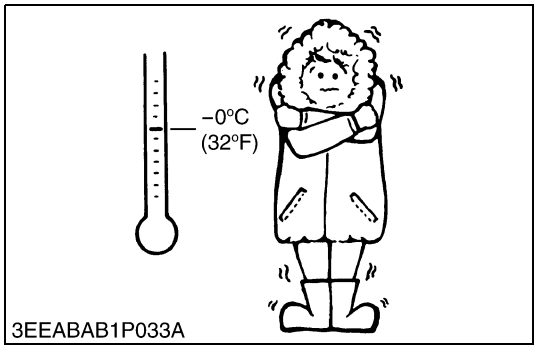
- **Do not start the engine without coolant.**
- **Use clean and soft water with anti-freeze to fill the radiator and recovery tank.**
- **Make sure that when you mix the anti-freeze and water, the ratio of anti-freeze is less than 50 %.**
- **Make sure that you close the radiator cap correctly. If the cap is loose or incorrectly closed, coolant can flow out and the engine can overheat.**

(1) Radiator Cap
(2) Drain Valve
(3) Drain Plug
(4) Recovery Tank

A: FULL
B: LOW

(To be continued)

(Continued)



■ **Anti-freeze**

- There are 2 types of anti-freeze available: use the permanent type (PT) for this engine.
- When you add anti-freeze for the first time, flush the water jacket and radiator interior with clean, soft water several times.
- The brand of the anti-freeze and the ambient temperature have an effect on the procedure to mix water and anti-freeze. Refer to the SAE J1034 standard, especially to the SAE J814c.
- Mix the anti-freeze with clean, soft water, and then fill into the radiator.

■ **IMPORTANT**

- **Make sure that when you mix the anti-freeze and water, the ratio of anti-freeze is less than 50 %.**

Vol % Anti-freeze	Freezing Point		Boiling Point*	
	°C	°F	°C	°F
40	−24	−11	106	223
50	−37	−35	108	226

* At 1.01 × 100000 Pa (760 mmHg) pressure (atmospheric). Use a radiator pressure cap that lets the pressure collect in the cooling system to get a higher boiling point.

■ **NOTE**

- **The above data is the industrial standards that shows the minimum glycol content necessary in the concentrated anti-freeze.**
- **When the coolant level decreases because of evaporation, add clean, soft water only to keep the anti-freeze mixing ratio less than 50 %. If there is a leakage, add anti-freeze and clean, soft water in the specified mixing ratio.**
- **The anti-freeze absorbs moisture. Keep new anti-freeze in a tightly sealed container.**
- **Do not use the radiator cleaning agents after you add anti-freeze to the coolant. Anti-freeze contains an anti-corrosive agent, which reacts with the radiator cleaning agent to make sludge and cause damages to the engine parts.**

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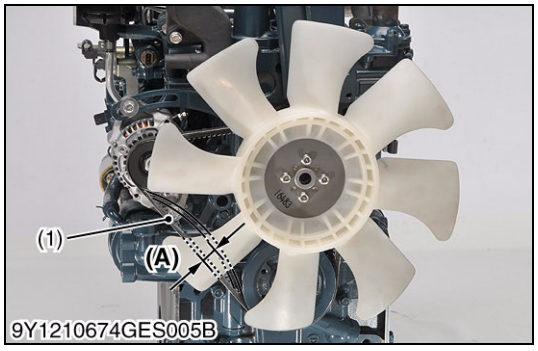


Replacement of Fan Belt

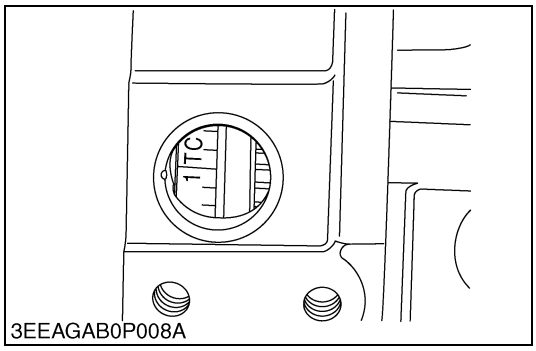
1. Remove the alternator.
2. Remove the fan belt (1).
3. Replace the fan belt with a new one.
4. Install the alternator.
5. Check the deflection **(A)** of fan belt.

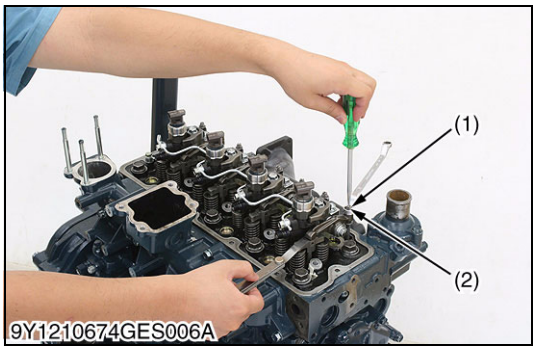
Deflection **(A)**	Factory specification	10 to 12 mm / 98 N 0.40 to 0.47 in. / 98 N (10 kgf, 22 lbf)

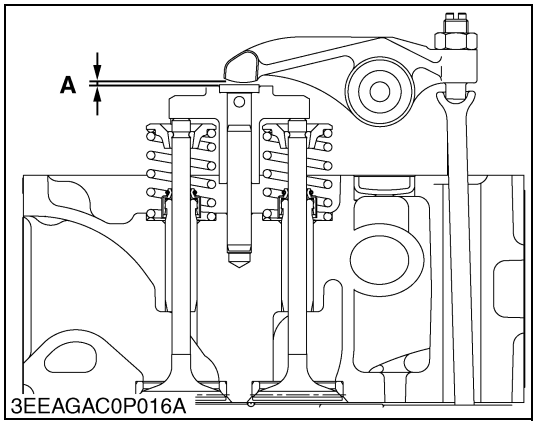
(1) Fan Belt **(A) Deflection**

9Y1210674GEG0024US0

[6] EVERY 1000 HOURS







Check of Valve Clearance

■ **IMPORTANT**

- **You must check and adjust the valve clearance when the engine is cold.**

1. Remove the injection pipes, glow lead, glow plugs and cylinder head cover.
2. Align the "1TC" mark line on the flywheel and projection on the housing. Make sure that the No.1 piston (front cover side) comes to the compression or overlap top dead center.
3. Check the subsequent valve clearance at the mark "1TC" with a feeler gauge. If the clearance is out of the factory specifications, adjust with the adjusting screw (1) and tighten the lock nut (2) of the adjusting screw.

Valve Clearance **(A)**	Factory specification	0.13 to 0.17 mm 0.0052 to 0.0066 in.

■ **NOTE**

- **After you adjust the valve clearance, tighten the lock nut (2) of the adjusting screw.**

Adjustable Cylinder Location of Piston		IN.	EX.
When No. 1 piston is at compression top dead center	1	☆	☆
	2	☆	
	3		☆
	4		
When No. 1 piston is at overlap position	1		
	2		☆
	3	☆	
	4	☆	☆

Tightening Torque	Cylinder head cover screw	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Injection pipe retaining nut	30 to 40 N·m 3.1 to 4.0 kgf·m 23 to 29 lbf·ft

(1) Adjusting Screw
(2) Lock Nut

A: Valve Clearance

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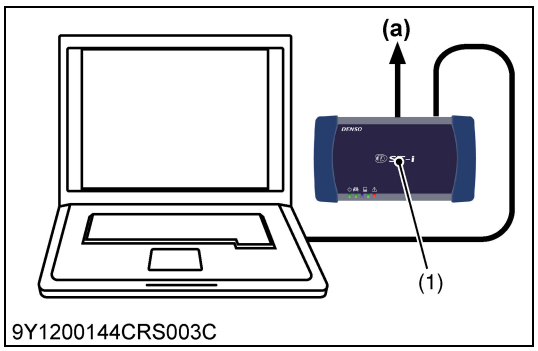
[7] EVERY 1500 HOURS



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Check of Injector

1. Connect the diagnosis tool.
2. Stop the injector for each cylinder using active testing and make sure that the injectors are injecting normally.
   If it is injecting normally, the engine vibration and noise will increase and engine speed will fluctuate when the injector is stopped.
3. If it is determined that there is a failure, check for a plug in the injection pipe.
4. If the injector pipe is normal, this may be an injector failure so replace the injector using the procedure for replacing injectors.

(1) Interface **(a) CAN1 Connector**

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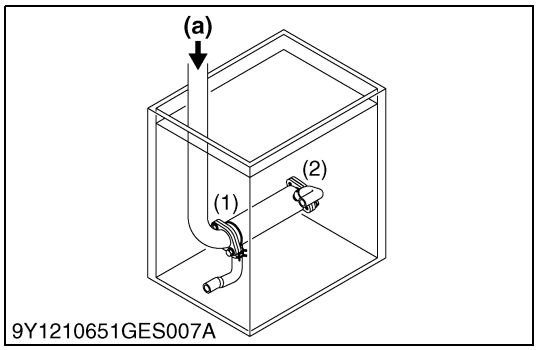

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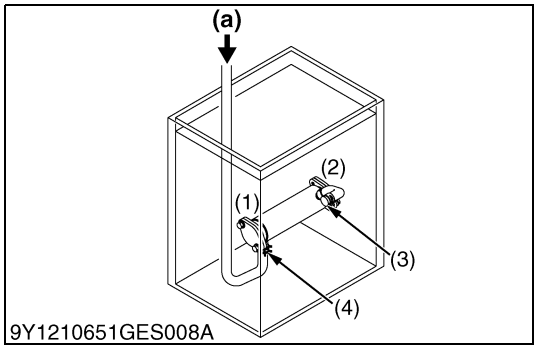

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Check of EGR Cooler

(Exhaust gas passage)

1. Block the EGR cooler exhaust gas outlet (2).
2. Attach an air hose to the EGR cooler exhaust gas inlet (1) and then submerge it in a water tank.
3. Check that the coolant passage is full of water.
4. Apply the specified amount of air pressure **(a)** (290 kPa, 3.0 kgf/cm^2, 43 psi) to the air hose side, and check that there are no air leaks in any of the EGR cooler parts.
5. If there are air leaks, replace the EGR cooler.

(Coolant passage)

1. Block the EGR cooler exhaust gas inlet (1), EGR cooler exhaust gas outlet (2), and the coolant outlet (3).
2. Attach an air hose to the EGR cooler coolant inlet (4), and then submerge it in a water tank.
3. Apply the specified amount of air pressure **(a)** (250 kPa, 2.5 kgf/cm^2, 36 psi) to the air hose side, and check that there are no air leaks in any of the EGR cooler parts.
4. If there are air leaks, replace the EGR cooler.

EGR cooler leakage test pressure	Factory specification	Exhaust gas passage	290 kPa 3.0 kgf/cm^2 43 psi
		Coolant passage	250 kPa 2.5 kgf/cm^2 36 psi

(1) Exhaust Gas Inlet
(2) Exhaust Gas Outlet
(3) Coolant Outlet
(4) Coolant Inlet

(a) Air Pressure

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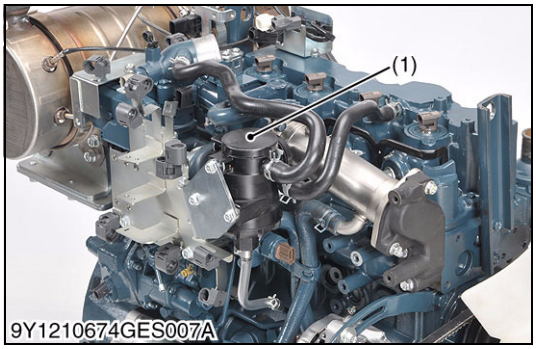

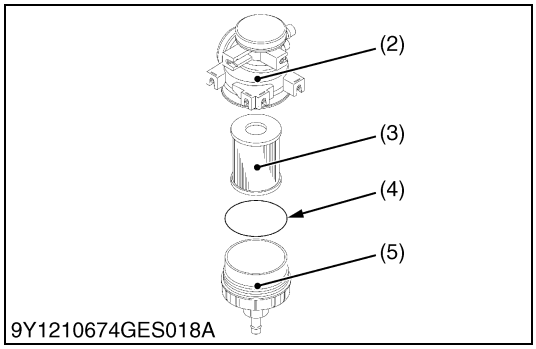

Replacement of Oil Separator Element

CAUTION

- **Be sure to stop the engine before replacement the oil separator element.**

1. Remove the case (5).
2. Remove the oil separator element (3) and O-ring (4).
3. Replace the oil separator element and O-ring with a new one.

Tightening torque	Case of oil separator	9.50 to 10.5 N·m 0.969 to 1.07 kgf·m 7.01 to 7.74 lbf·ft

(1) Oil Separator Assembly
(2) Body
(3) Element
(4) O-ring
(5) Case

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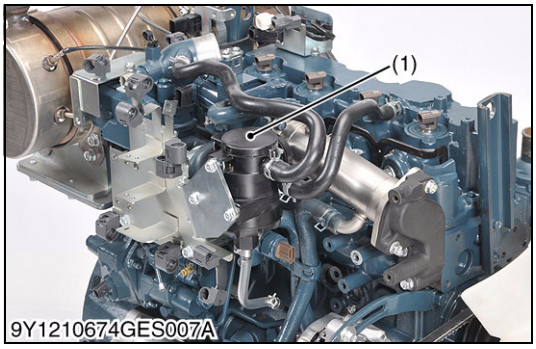

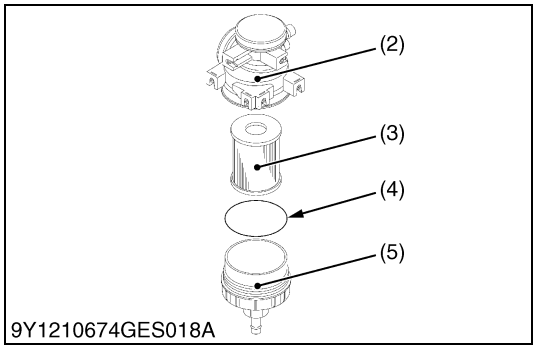

Check of PCV (Positive Crankcase Ventilation) Valve

1. After you remove the oil separator case (5) and element (3), look into the hole leading to the PCV valve of the oil separator body (2) inside, and then check if there is no crack, break or abnormal sediment in the PCV valve.
2. Check the oil separator assembly (1) for crack, oil leakage and loose connections.
3. If you find a crack or oil leakage, replace the oil separator assembly (1) with a new one.
4. If you find loose connections, tighten the clamp or replace the hoses.

(1) Oil Separator Assembly
(2) Body
(3) Element
(4) O-ring
(5) Case

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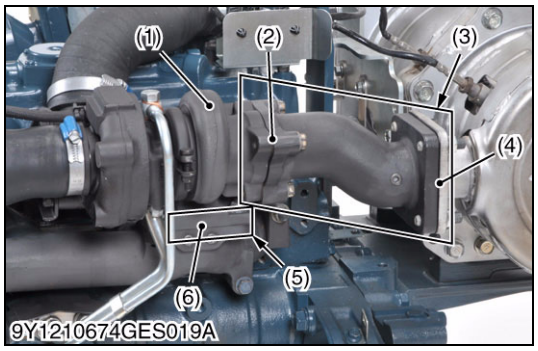
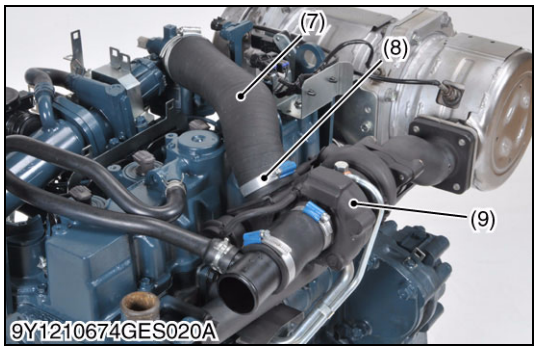
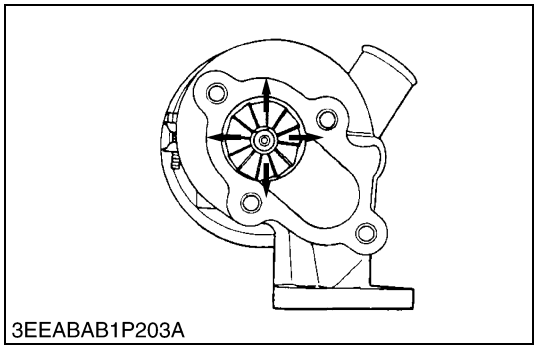
[8] EVERY 3000 HOURS







Check of Turbocharger

(Turbine Side)

1. Check the exhaust port (3) and the inlet port (5) side of the turbine housing (1) for exhaust gas leakage.
2. If you find a gas leakage, tighten the bolts and nuts again or replace the gasket (2), (4), (6) with a new one.

(Compressor Side)

1. Check the inlet hose of the compressor cover (9) for air leakage.
2. If you find an air leakage, change the clamp (8) and / or the inlet hoses.
3. Replace the inlet hose (7) and check the suction side of the intake hose for loose connections or cracks.
4. If you find loose connections or cracks, tighten the clamp or replace the hoses.

(Radial Clearance)

1. If the wheel touches the housing, replace the turbocharger assembly with a new one.

(1) Turbine Housing
(2) Gasket
(3) Exhaust Port
(4) Gasket
(5) Inlet Port
(6) Gasket
(7) Inlet Hose
(8) Clamp
(9) Compressor Cover

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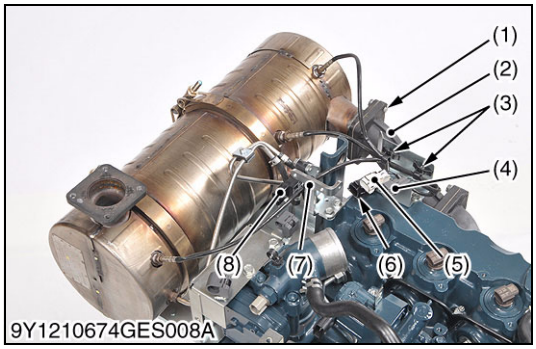

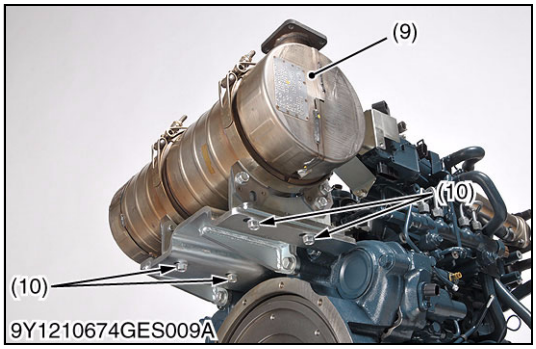

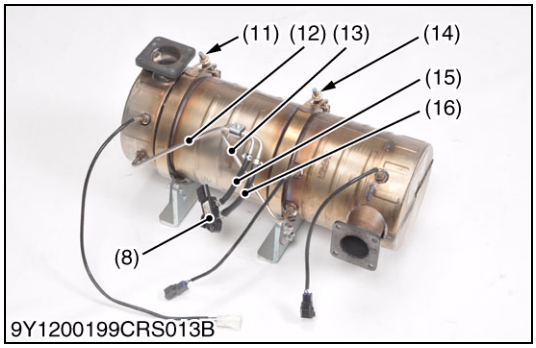

Cleaning of DPF (V2607-CR-E4B)

■ **IMPORTANT**

- **Since the DPF that was dropped or given a shock cannot be reused even if there is no damage outwardly, replace it with a new one.**
- **Be sure to loosen the temperature sensor tightening nut or the differential pressure pipe tightening nut with crowfoot wrench to prevent the damage of the sensor or pipe.**
  If it is still hard to loosen, apply the lubricant spray to threaded portion and soak it with lubricant.

■ **NOTE**

- **Always work in the workshop equipped with a electric hoist (including mobile hoist).**
- **Put a product (engine) on a stable ground, and set the parking brake.**
- **As the DPF muffler full assembly is hot just after the engine shutdown, make sure to start operation after it gets cool.**
- **Make sure not to let any foreign substances enter the opening section during the operation.**
- **Make sure not to damage the DPF muffler full assembly by falling or impact as it contains a ceramic filter.**
- **Before removing the DPF muffler full assembly from a product (engine), connect the diagnosis tool (Diagmaster), check the failure history, and save the project.**
- **Before removing the DPF for cleaning, keep the records of the engine serial number, DPF part number, DPF serial number, catalyst (DOC) part number, catalyst (DOC) serial number, and engine operating time, which are required in preparing the DPF cleaning order form.**
  Since the engine operating time is recorded in the ECU, check the operating time by connecting the service tool (Diagmaster).
- **When installing and removing the muffler full assembly (DPF), make sure that the temperature sensor, differential pressure sensor, and differential pressure pipe do not make contact with surrounding parts.**

1. Disconnect the harness from the connector (4), (5), (6) of temperature sensor and differential pressure sensor (8).
2. Remove the connector (4), (5), (6) of temperature sensor from the bracket.
3. Remove the 2 clamps (3).
4. Remove the differential pressure sensor bracket (7).
5. Remove the 4 screws (1) of muffler flange (2).
6. Remove the muffler full assembly (DPF) mounting screws (10).
7. Remove the DPF muffler assembly (9).
8. Remove the tube (15), (16) from the differential pressure pipe (12), (13).
9. Remove the differential pressure sensor (8).
10. Loosen the DPF mounting bracket (11), (14) and remove the DPF (19).

(To be continued)

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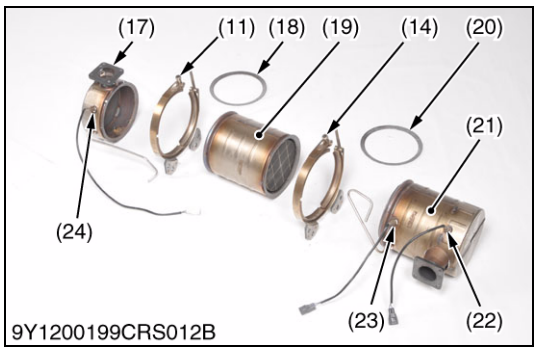

(When reassembling)

- Replace the gaskets (18), (20) with new ones.
- If the differential pressure tube is damaged or cracked, replace it.
- When the differential pressure pipe (12), (13) and temperature sensor (22), (23), (24) is removed, wipe off the anti-seize & lubricating compound, apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach them to their correct position.
- When replacing the differential pressure pipe (12), (13) apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach it to its correct position.
- When replacing the temperature sensor, check that it is coated with anti-seize & lubricating compound, and then attach it to its correct position.
- Tighten bolts and nuts to their specified torque. Also tighten the temperature sensor tightening nut or the differential pressure pipe tightening nut to the specified torque with crowfoot wrench.
- After attaching the assembly, start the engine and make sure that there are no gas leaks.
- Reassemble the DPF (19) in the correct direction.

Tightening torque	Screw of muffler flange	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Muffler full assembly (DPF) mounting screw	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft
	DPF mounting bracket	16 to 20 N·m 1.7 to 2.0 kgf·m 12 to 14 lbf·ft
	Temperature sensor	25 to 34 N·m 2.5 to 3.5 kgf·m 18 to 25 lbf·ft
	Differential pressure pipe	16 to 22 N·m 1.6 to 2.3 kgf·m 12 to 16 lbf·ft

(1) Screw of Muffler Flange
(2) Muffler Flange
(3) Clamp
(4) Connector of Temperature Sensor (T_1)
(5) Connector of Temperature Sensor (T_2)
(6) Connector of Temperature Sensor (T_0)
(7) Differential Pressure Sensor Bracket
(8) Differential Pressure Sensor
(9) Muffler Full Assembly (DPF)
(10) Muffler Full Assembly (DPF) Mounting Screw
(11) DPF Mounting Bracket
(12) Differential Pressure Pipe
(13) Differential Pressure Pipe
(14) DPF Mounting Bracket
(15) Tube
(16) Tube
(17) Body (DPF Outlet)
(18) Gasket
(19) DPF
(20) Gasket
(21) Catalyst (DOC)
(22) Temperature Sensor (T_0)
(23) Temperature Sensor (T_1)
(24) Temperature Sensor (T_2)

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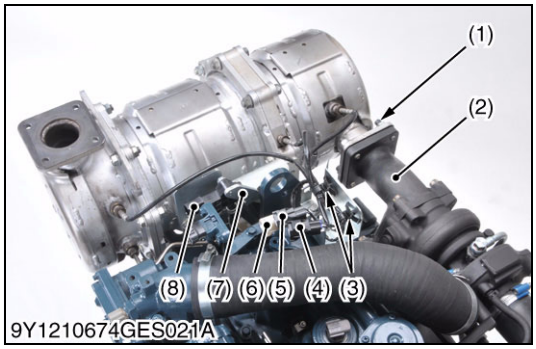

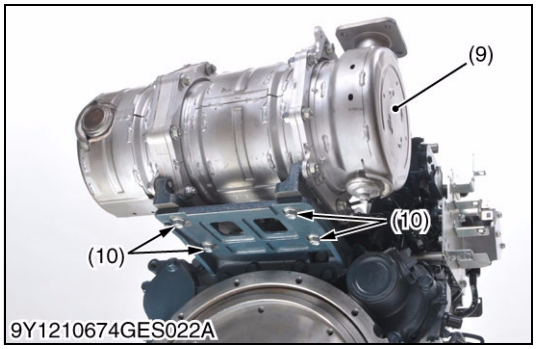

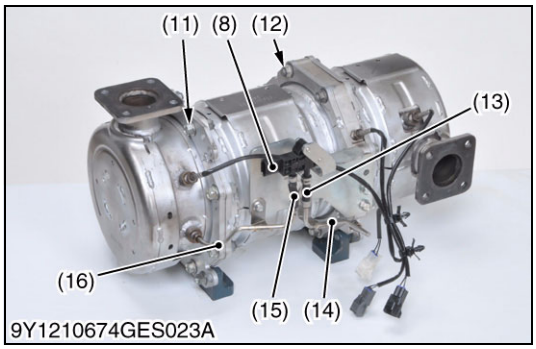

Cleaning of DPF (V2607-CR-TE4B / V3307-CR-TE4B)

■ **IMPORTANT**

- **Since the DPF that was dropped or given a shock cannot be reused even if there is no damage outwardly, replace it with a new one.**
- **Be sure to loosen the temperature sensor tightening nut or the differential pressure pipe tightening nut with crowfoot wrench to prevent the damage of the sensor or pipe.**
  If it is still hard to loosen, apply the lubricant spray to threaded portion and soak it with lubricant.

■ **NOTE**

- **Always work in the workshop equipped with a electric hoist (including mobile hoist).**
- **Put a product (engine) on a stable ground, and set the parking brake.**
- **As the DPF muffler full assembly is hot just after the engine shutdown, make sure to start operation after it gets cool.**
- **Make sure not to let any foreign substances enter the opening section during the operation.**
- **Make sure not to damage the DPF muffler full assembly by falling or impact as it contains a ceramic filter.**
- **Before removing the DPF muffler full assembly from a product (engine), connect the diagnosis tool (Diagmaster), check the failure history, and save the project.**
- **Before removing the DPF for cleaning, keep the records of the engine serial number, DPF part number, DPF serial number, catalyst (DOC) part number, catalyst (DOC) serial number, and engine operating time, which are required in preparing the DPF cleaning order form.**
  Since the engine operating time is recorded in the ECU, check the operating time by connecting the service tool (Diagmaster).
- **When installing and removing the muffler full assembly (DPF), make sure that the temperature sensor, differential pressure sensor, and differential pressure pipe do not make contact with surrounding parts.**

1. Disconnect the harness from the connector (4), (5), (6) of temperature sensor and differential pressure sensor (8).
2. Remove the connector (4), (5), (6) of temperature sensor from the bracket.
3. Remove the 2 clamps (3).
4. Remove the differential pressure sensor bracket (7).
5. Remove the 4 nuts (1) of muffler flange (2).
6. Remove the muffler full assembly (DPF) mounting screws (10).
7. Remove the DPF muffler assembly (9).
8. Remove the tube (13), (15) from the differential pressure pipe (14), (16).
9. Remove the differential pressure sensor (8).
10. Loosen the DPF mounting screw (11), (12) and remove the DPF (18).

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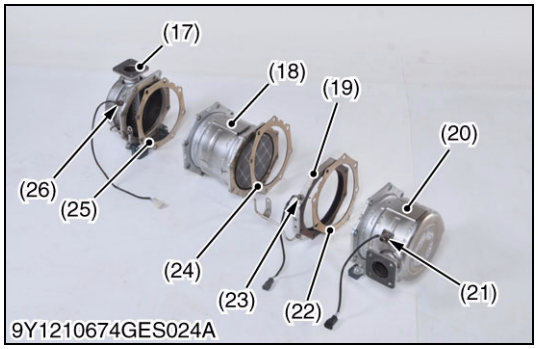

(When reassembling)

- Replace the gaskets (22), (24), (25) with new ones.
- If the differential pressure tube is damaged or cracked, replace it.
- When the differential pressure pipe (14), (16) and temperature sensor (21), (23), (26) is removed, wipe off the anti-seize & lubricating compound, apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach them to their correct position.
- When replacing the differential pressure pipe (14), (16) apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach it to its correct position.
- When replacing the temperature sensor, check that it is coated with anti-seize & lubricating compound, and then attach it to its correct position.
- Tighten bolts and nuts to their specified torque. Also tighten the temperature sensor tightening nut or the differential pressure pipe tightening nut to the specified torque with crowfoot wrench.
- After attaching the assembly, start the engine and make sure that there are no gas leaks.
- Reassemble the DPF (18) in the correct direction.

Tightening torque	Nut of muffler flange	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Muffler full assembly (DPF) mounting screw	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft
	DPF mounting screw	49.0 to 63.7 N·m 5.00 to 6.49 kgf·m 36.2 to 46.9 lbf·ft
	Temperature sensor	25 to 34 N·m 2.5 to 3.5 kgf·m 18 to 25 lbf·ft
	Differential pressure pipe	16 to 22 N·m 1.6 to 2.3 kgf·m 12 to 16 lbf·ft

(1) Nut of Muffler Flange
(2) Muffler Flange
(3) Clamp
(4) Connector of Temperature Sensor (T_0)
(5) Connector of Temperature Sensor (T_1)
(6) Connector of Temperature Sensor (T_2)
(7) Differential Pressure Sensor Bracket
(8) Differential Pressure Sensor
(9) Muffler Full Assembly (DPF)
(10) Muffler Full Assembly (DPF) Mounting Screw
(11) DPF Mounting Screw
(12) DPF Mounting Screw
(13) Tube
(14) Differential Pressure Pipe
(15) Tube
(16) Differential Pressure Pipe
(17) Body (DPF Outlet)
(18) DPF
(19) Collar (DPF)
(20) Catalyst (DOC)
(21) Temperature Sensor (T_0)
(22) Gasket
(23) Temperature Sensor (T_1)
(24) Gasket
(25) Gasket
(26) Temperature Sensor (T_2)

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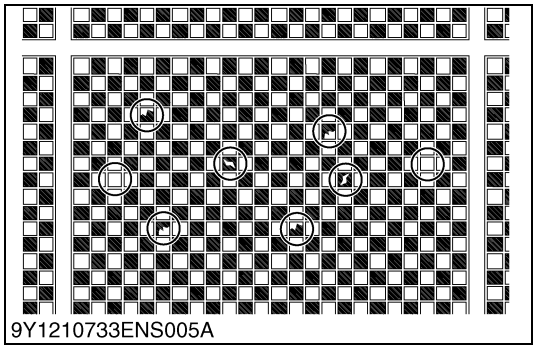
Judgment of Reuse of DPF Before Cleaning [V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B]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Judgment of Reuse by Service Dealer

■ **IMPORTANT**

- **Before ordering to a cleaning contractor, follow the procedures below to make a Judgment on whether the separated DPF is reusable.**

1. Check to see that the surface of the removed DPF on the exhaust gas outlet side is not darkened.
2. Check whether there is no crack or loss of the sealing part of the cell holes on both ends of the filter (inlet side and outlet side).
   If the number of missing sealing parts more than the allowable limit, the filter comp cannot be reused even after cleaning.

Number for Judgment of non-reusability of filter	Allowable limit	V2607-CR-E4B	Number of missing sealing parts: 10 or more
		V2607-CR-TE4B V3307-CR-TE4B	Number of missing sealing parts: 15 or more

3. Check whether there is no crack and loss of the ceramics element.
   If there are any cracks or losses of the ceramics element, the DPF cannot be reused even if it is cleaned.
4. If it is judged that the DPF is not reusable, report the result of the evaluation to the customer that requested the filter cleaning, and replace the DPF with a new one.

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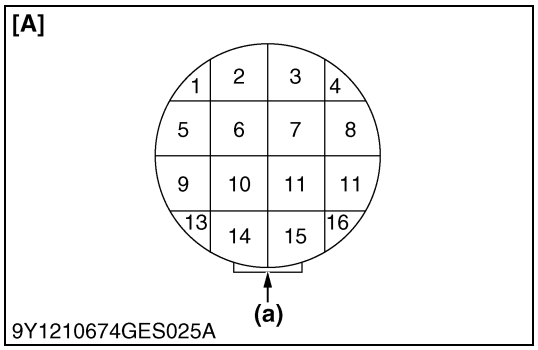
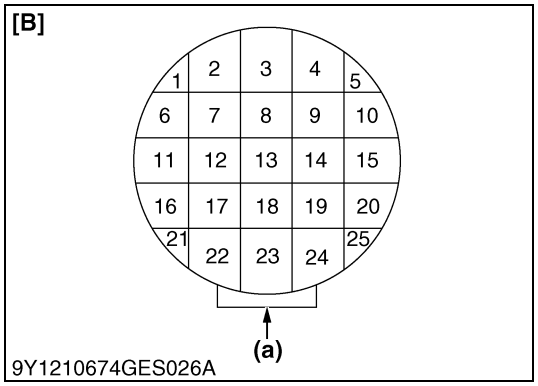
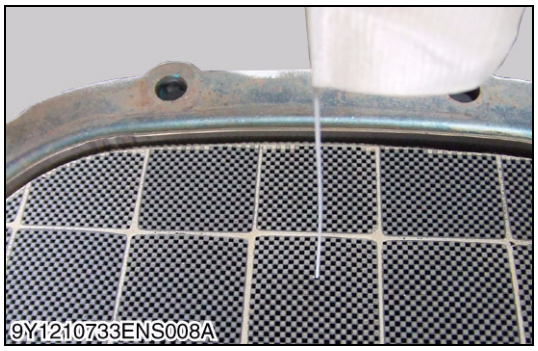
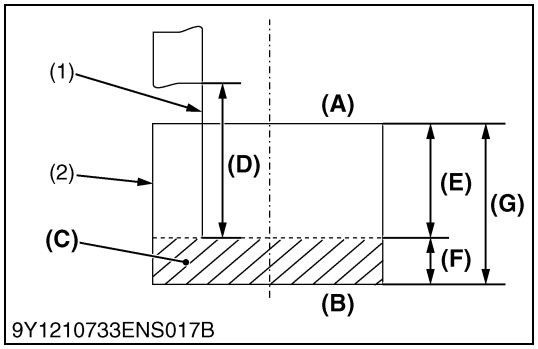
Judgment of Reuse of DPF After Cleaning (Cleaning Contractor) [V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B]

(1) Decision on Reusability According to the Pin Gauge









Measurement of Actual Cell Depth

■ **IMPORTANT**

- **After the cleaning contractor has cleaned the DPF, measure the quantity of remaining ash in the following procedure, and evaluate the reusability.**

1. After having cleaned the DPF, measure the actual cell depth **(E)** with a pin gauge in the each block shown in the figure. One cell (The measurement point is not specified) is measured in each block.

Model	Measurement total
V2607-CR-E4B	16 blocks
V2607-CR-TE4B	25 blocks
V3307-CR-TE4B	25 blocks

2. If the actual cell depth **(E)** is less than the allowable limit, the DPF cannot be reused.
   If the DPF is judged as non-reusable, report the result of the judgment to the customer that requested the filter cleaning via the service dealer, and replace the DPF with a new one.

(Reference)

Actual Cell Depth **(E)** = Cell Depth **(G)** − Accumulated Ash Depth **(F)**

■ **NOTE**

- **Select a metal pin gauge having a wire size slightly thinner than the cell width (0.60 to 0.80 mm dia., 0.024 to 0.031 in. dia.).**
- **When the pin gauge is inserted into the cell hole, insert it by lightly tapping on the gage end with a finger tip.**
- **If the pin gauge is forcibly pushed in, the pin pierces through the accumulated ash and it cannot be measured accurately. So be careful not to push the pin forcibly.**

Actual Cell Depth (Average of all measurement blocks)	Allowable limit	119 mm (4.68 in.)

(1) Pin Gauge (0.60 to 0.80 mm dia., 0.024 to 0.031 in. dia.)
(2) DPF

(A) Exhaust Inlet Side
(B) Exhaust Outlet Side
(C) Accumulated Ash
(D) 150 mm (5.91 in.)
(E) Actual Cell Depth
(F) Accumulated Ash Depth
(G) Cell Depth

(a) Serial Number

[A] V2607-CR-E4B
[B] V2607-CR-TE4B, V3307-CR-TE4B

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Check of EGR System

1. Perform an EGR actuation test.
2. Based on test results, check that the EGR valve gas passage and coolant passage are not clogged.
3. Clean any soot from the gas passage so that it does not damage the EGR valve.
4. Clean the coolant passage by operating it with water.

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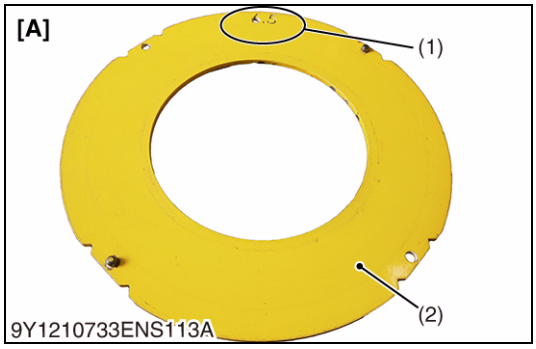
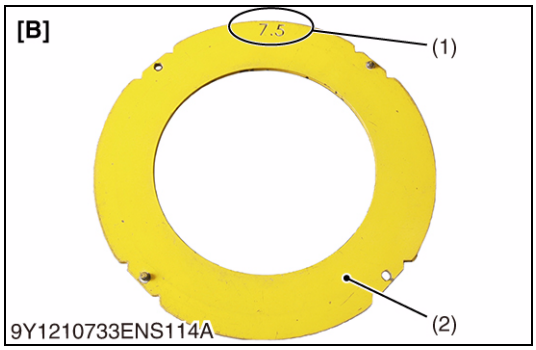
(2) Decision on Reusability According to the Differential Pressure (Differential Pressure Measuring Instrument Manufactured by FSX)





Differential Pressure Measurement

■ **IMPORTANT**

- **After the DPF is cleaned by a cleaning contractor, use the procedure below to measure the amount of soot remaining, and evaluate the reusability.**
- **Set the DPF so that the exhaust inlet is on top.**
- **The decision on reusability depends on the differential pressure of the DPF, however, this is assuming no issues are found on inspection of the exterior.**

■ **NOTE**

- **There are 22 types of standard ring, ranging from 4.0 in. to 14.5 in. in diameter (0.5 in. increments).**
- **Use a ring that is compatible with the DPF to be measured.**
- **Measurement cannot be performed accurately if there is a gap between the flow adaptor and differential pressure measuring instrument.**

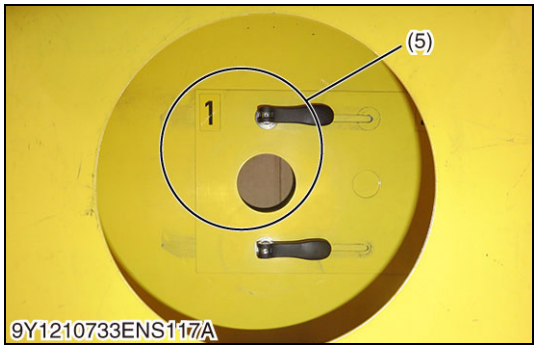
1. Because the size is different for each DPF, use ring type **[A]** or **[B]** and select a ring (2) that fits the size of the DPF (7).
2. Set the Flow Adaptor (3) on the FSX-manufactured differential pressure measurement device (4).
3. Select orifice (5) **"1"** or **"2"** of the flow adaptor (3).
4. Set the selected ring (2) on the flow adaptor (3).
5. Set the DPF (7) to be measured on the ring, while ensuring that the exhaust inlet is on top.
6. Measure the differential pressure of the DPF. (air flow during measurement (6))
7. If the measured differential pressure of the DPF is within the factory spec for determining reusability, it is deemed reusable.
8. If the measurement is outside the factory spec, the DPF cannot be reused.

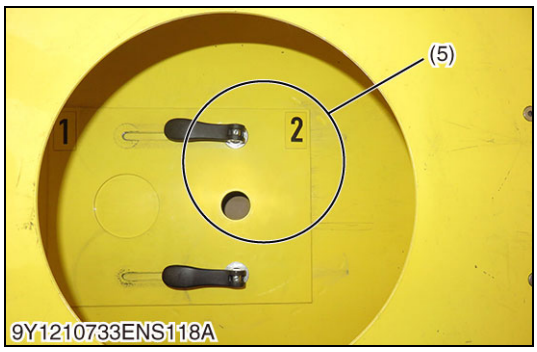
(1) Ring Size
(2) Ring
(3) Flow Adaptor
(4) FSX-manufactured Differential Pressure Measurement Device
(5) Orifice
(6) Air Flow Direction
(7) DPF

[A] V2607-CR-E4B
[B] V2607-CR-TE4B, V3307-CR-TE4B

(To be continued)

(Continued)





Engine Model	Ring Type	Ring Size (1)	Flow Adaptor Orifice (5)
V2607-CR-E4B	**[A]**	6.5 in. dia. (170 mm dia.)	**2**
V2607-CR-TE4B, V3307-CR-TE4B	**[B]**	7.5 in. dia. (190 mm dia.)	**1**

Reusability evaluation standard	V2607-CR-E4B	0.90 to 1.2 in. Aq (23 to 30 mm Aq)
	V2607-CR-TE4, V3307-CR-TE4	2.7 to 3.5 in. Aq (69 to 88 mm Aq)

(2) Ring
(3) Flow Adaptor
(5) Orifice
(6) Air Flow Direction
(7) DPF

[A] V2607-CR-E4B
[B] V2607-CR-TE4B, V3307-CR-TE4B

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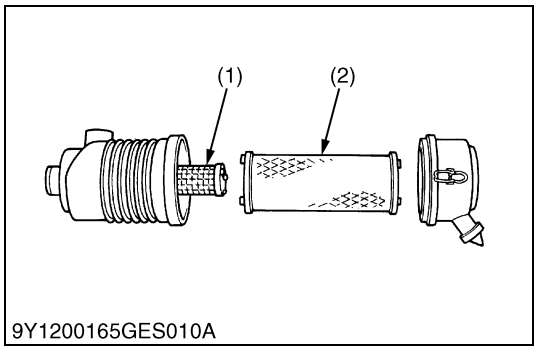
[9] EVERY 1 YEAR



Replacement of Air Cleaner Element

1. Remove used air cleaner primary (2) and secondary (1) element.
2. Replace new air cleaner primary (2) and secondary (1) element.

■ **NOTE**
- **The air cleaner uses a dry element. Never apply oil to it.**
- **Do not operate the engine with filter element removed.**

(1) Secondary Element
(2) Primary Element

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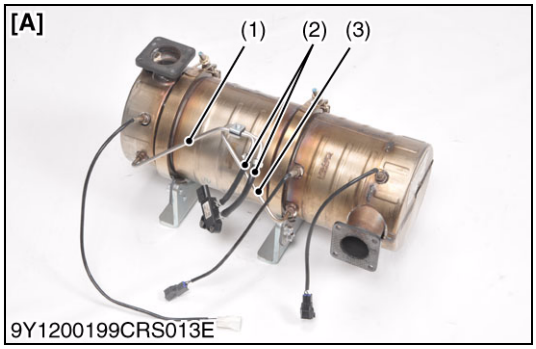

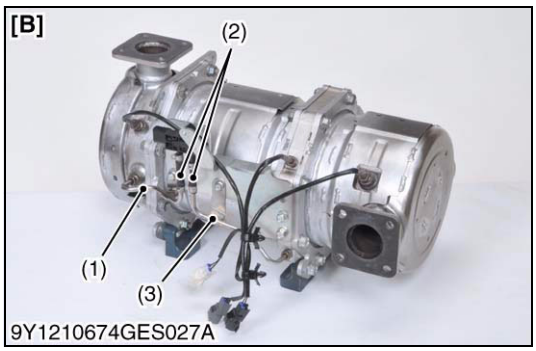

Check of DPF Differential Pressure Pipes and Hoses [V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B]

■ **IMPORTANT**

- **Be sure to loosen the differential pressure pipe tightening nut with crowfoot wrench to prevent the damage of the sensor or pipe.**
  If it is still hard to loosen, apply the lubricant spray to threaded portion and soak it with lubricant.
- **Tighten bolts and nuts to their specified torque.**
  Also tighten the differential pressure pipe tightening nut to the specified torque with crowfoot wrench.

1. Check the DPF differential pressure pipe (1), (3) for crack, gas leakage and loose mounting nut.
2. If you find a crack, change the DPF differential pressure pipe.
3. If you find a gas leakage, remove the DPF differential pressure pipe and wipe off the anti-seize & lubricating compound.
4. Apply the anti-seize & lubricating compound again, then tighten the DPF differential pressure pipe to the specified torque.
5. Check the DPF differential pressure hose (2) for crack, gas leakage.
6. If you find a crack or gas leakage, change the DPF differential pressure hose.

■ **NOTE**

- **When you change the DPF differential pressure pipe, apply the anti-seize & lubricating compound (Bostik, NEVER-SEEZ, Pure nickel special grade) to the DPF differential pressure pipe.**

(1) DPF Differential Pressure Pipe
(2) DPF Differential Pressure Hose
(3) DPF Differential Pressure Pipe

[A] V2607-CR-E4B
[B] V2607-CR-TE4B, V3307-CR-TE4B

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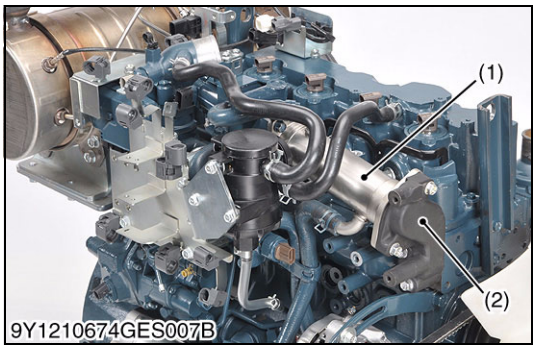

Check of EGR Piping

1. Check the EGR cooler (1) and the EGR cooler base (2) for crack, gas leakage and loose mounting screw.
2. If you find a crack, the cracked EGR cooler (1) or the cracked EGR cooler base (2).
3. If you find a gas leakage, tighten the mounting screw again or replace the gasket with a new one.
4. If you find a loose mounting screw, tighten the mounting screw again.

(1) EGR Cooler
(2) EGR Cooler Base

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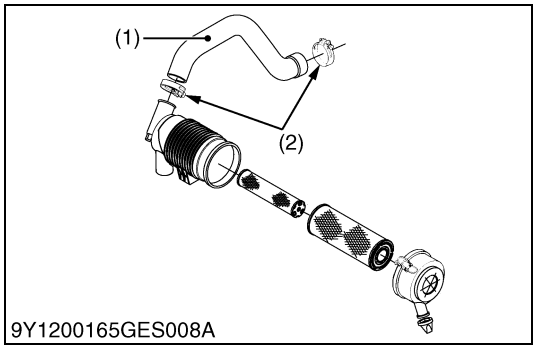

Check of Intake Air Line

1. Make sure that the intake air hose(s) (1) connections are correct for every year of operation.
2. If the clamp (2) is loose, apply oil to the threads and tighten it again correctly.
3. You must replace the intake air hose(s) every 2 years. Also replace the clamp every 2 years and tighten it correctly.

■ **IMPORTANT**

- **To prevent serious damage to the engine, keep out dust in the intake air line.**

(1) Intake Air Hose
(2) Clamp

9Y1210674GEG0038US0

Check of Exhaust Manifold

1. Check the exhaust manifold for crack, exhaust gas leakage and loose mounting screw.
2. If you find a crack, change the exhaust manifold.
3. If you find a gas leakage, tighten the mounting screw again or replace the gasket with a new one.
4. If you find a loose mounting screw, tighten the mounting screw again.

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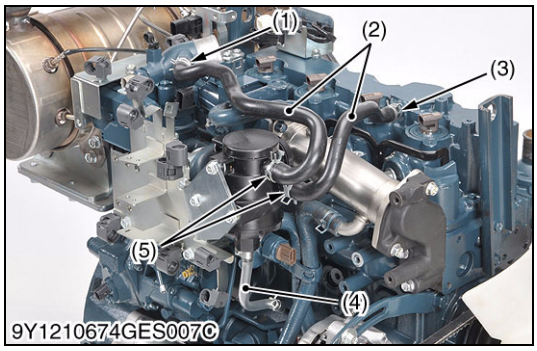
[10] EVERY 2 YEARS



Replacement of Oil Separator Rubber Hose

1. Loosen the clamp (1), (3), (5) and remove the rubber hose (2), (4).
2. Replace the rubber hose (2), (4) and clamp (1), (3), (5) with new ones.
3. Tighten the clamp correctly.

(1) Clamp
(2) Rubber Hose
(3) Clamp
(4) Rubber Hose
(5) Clamp

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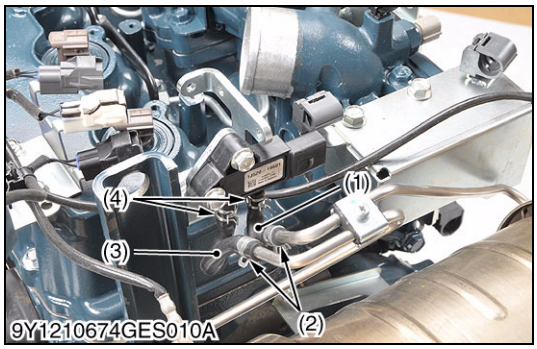

Replacement of Rubber Hose of DPF Differential Pressure Sensor [V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B]

1. Loosen the clamp (2), (4) and remove the rubber hose (1), (3).
2. Replace the rubber hose (1), (3) and clamp (2), (4) with new ones.
3. Tighten the clamp correctly.

(1) Rubber Hose
(2) Clamp
(3) Rubber Hose
(4) Clamp

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Replacement of Intake Hose (After Air Flow Sensor)

1. Loosen the clamp and remove the hose.
2. Replace the hose and clamp with new ones.
3. Tighten the clamp correctly.

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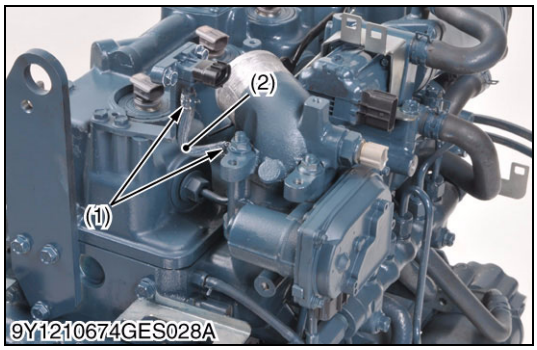

Replacement of Pressure Detection Hose of Boost Sensor

1. Loosen the clamp (1) and remove the hose (2).
2. Replace the hose (2) and clamp (1) with new ones.
3. Tighten the clamp correctly.

(1) Clamp
(2) Hose

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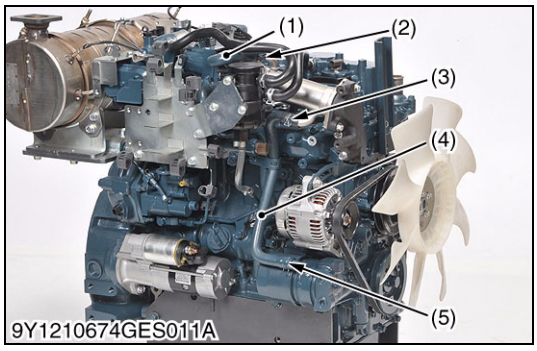

Replacement of EGR Cooler Hose

1. Loosen the clamp (2), (3), (5) and remove the hose (1), (4).
2. Replace the hose (1), (4) with new ones.
3. Tighten the clamp correctly.

(1) Hose
(2) Clamp
(3) Clamp
(4) Hose
(5) Clamp

9Y1210674GEG0044US0

Replacement of Water Hose

1. Loosen the clamp and remove the hose.
2. Replace the hose with new ones.
3. Tighten the clamp correctly.

9Y1210674GEG0045US0

Replacement of Lubricant Hose

1. Loosen the clamp and remove the hose.
2. Replace the hose with new ones.
3. Tighten the clamp correctly.

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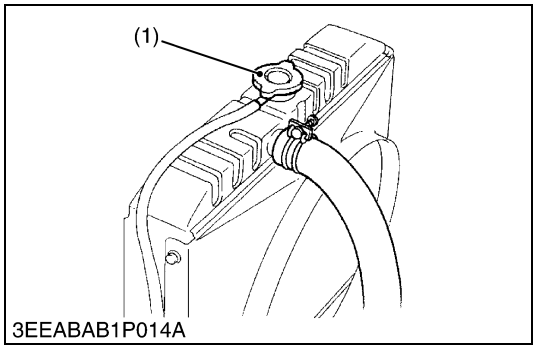
Change of Radiator Coolant (L.L.C.)



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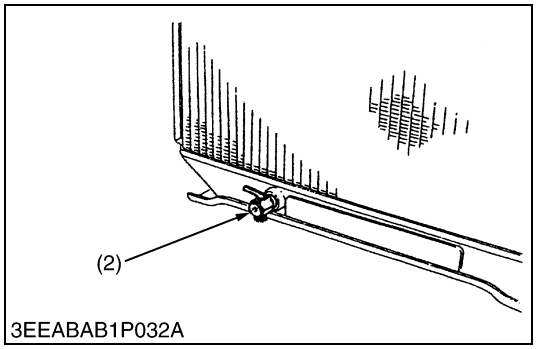

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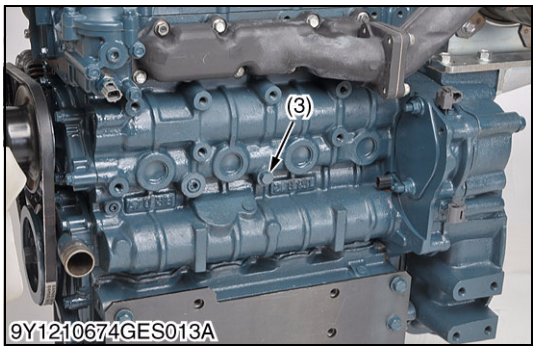

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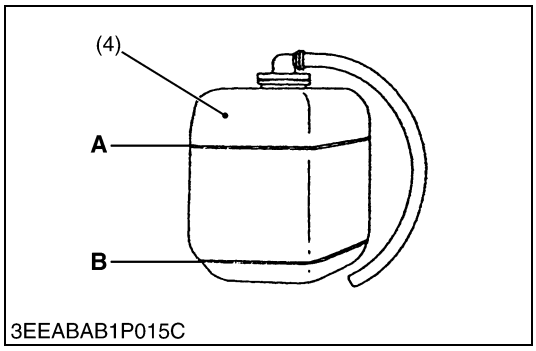

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CAUTION

- **Do not remove the radiator cap when the engine is hot. Then loosen the cap slightly to release unwanted pressure before you remove the cap fully.**

1. Stop the engine and let the coolant temperature decreases.
2. Remove the radiator cap (1) to drain the coolant fully. Open the drain valve (2) and drain plug (3).
3. After you drained all coolant, close the drain valve (2) and drain plug (3).
4. Fill with the coolant until the "FULL" **A** mark on the recovery tank (4).
5. Start and operate the engine for a few minutes.
6. Stop the engine and let the coolant temperature decreases. Check the coolant level of radiator and recovery tank (4) and add coolant if necessary.

IMPORTANT

- **Do not start the engine without coolant.**
- **Use clean and soft water with anti-freeze to fill the radiator and recovery tank.**
- **Make sure that when you mix the anti-freeze and water, the ratio of anti-freeze is less than 50 %.**
- **Make sure that you close the radiator cap correctly. If the cap is loose or incorrectly closed, coolant can flow out and the engine can overheat.**

(1) Radiator Cap
(2) Drain Valve
(3) Drain Plug
(4) Recovery Tank

A: FULL
B: LOW

(To be continued)

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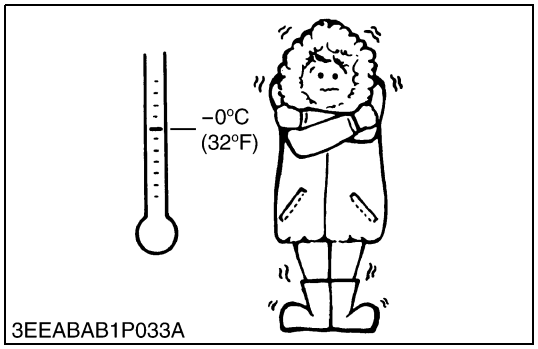

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■ **Anti-freeze**

- There are 2 types of anti-freeze available: use the permanent type (PT) for this engine.
- When you add anti-freeze for the first time, flush the water jacket and radiator interior with clean, soft water several times.
- The brand of the anti-freeze and the ambient temperature have an effect on the procedure to mix water and anti-freeze. Refer to the SAE J1034 standard, especially to the SAE J814c.
- Mix the anti-freeze with clean, soft water, and then fill into the radiator.

■ **IMPORTANT**

- **Make sure that when you mix the anti-freeze and water, the ratio of anti-freeze is less than 50 %.**

Vol % Anti-freeze	Freezing Point		Boiling Point*	
	°C	°F	°C	°F
40	−24	−11	106	223
50	−37	−35	108	226

* At 1.01 × 100000 Pa (760 mmHg) pressure (atmospheric). Use a radiator pressure cap that lets the pressure collect in the cooling system to get a higher boiling point.

■ **NOTE**

- **The above data is the industrial standards that shows the minimum glycol content necessary in the concentrated anti-freeze.**
- **When the coolant level decreases because of evaporation, add clean, soft water only to keep the anti-freeze mixing ratio less than 50 %. If there is a leakage, add anti-freeze and clean, soft water in the specified mixing ratio.**
- **The anti-freeze absorbs moisture. Keep new anti-freeze in a tightly sealed container.**
- **Do not use the radiator cleaning agents after you add anti-freeze to the coolant. Anti-freeze contains an anti-corrosive agent, which reacts with the radiator cleaning agent to make sludge and cause damages to the engine parts.**

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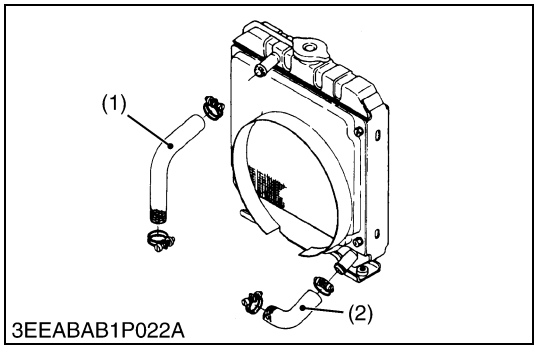


3EEABAB1P022A

Replacement of Radiator Hoses and Clamp Bands

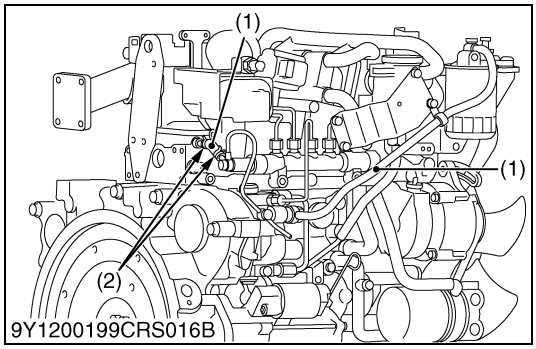
CAUTION

- **Do not remove the radiator cap when the engine is hot. Then loosen the cap slightly to release unwanted pressure before you remove the cap fully.**

1. Drain the coolant.
2. Loosen the clamp bands.
3. Remove the upper hose (1) and lower hose (2).
4. Replace the upper / lower hose (1), (2) and clamp bands with new ones.
5. Tighten the clamp bands correctly.

(1) Upper Hose (2) Lower Hose

9Y1210674GEG0048US0



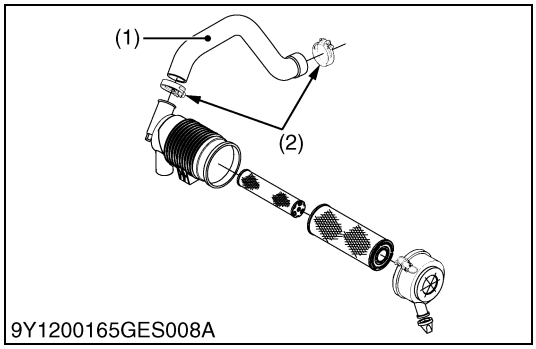
9Y1200199CRS016B

Replacement of Fuel Hoses and Clamps

1. Loosen the clamp (2) and remove the fuel hose (1).
2. Replace the fuel hose (1) and clamp (2) with new ones.
3. Tighten the clamp correctly.
4. After you replace the fuel hose and the clamp, bleed the fuel system.

(1) Fuel Hose (2) Clamp

9Y1210674GEG0049US0



9Y1200165GES008A

Replacement of Intake Air Line

1. Loosen the clamp (2).
2. Remove the intake air hose (1) and clamp (2).
3. Replace the intake air hose (1) and clamp (2) with new ones.
4. Tighten the clamp (2) correctly.

■ **IMPORTANT**

- **To prevent serious damage to the engine, keep out dust in the intake air line.**

(1) Intake Air Hose (2) Clamp

9Y1210674GEG0050US0

6. SPECIAL TOOLS

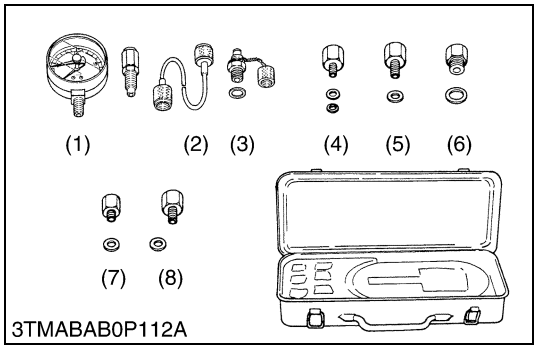
Diesel Engine Compression Tester

Code No.
- 07909-30208 (Assembly)

Application
- To measure the diesel engine compression and to make a decision for a large overhaul if necessary.

(1) Gauge

WSM000001GEG0113US0



Oil Pressure Tester

Code No.
- 07916-32032

Application
- To measure the engine oil pressure.

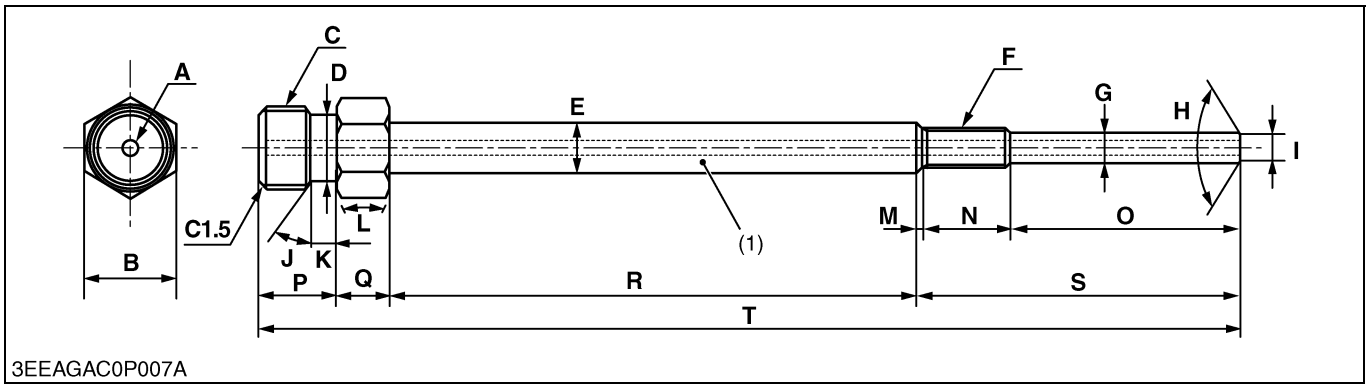
(1) Gauge
(2) Cable
(3) Threaded Joint
(4) Adaptor **1**
(5) Adaptor **2**
(6) Adaptor **3**
(7) Adaptor **4**
(8) Adaptor **5**

WSM000001GEG0114US0

Glow Plug Adapter (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

Application
- Use to check compression pressure through glow plug hole.

■ **NOTE**
- **This special tool is not provided, so make it referring to the figure.**



A	3.0 mm dia. (0.12 in. dia.) through hole	**L**	1.0 rad (60 °)
B	17.0 mm (0.669 in.)	**M**	1.0 mm (0.039 in.)
C	16.0 mm dia. (0.630 in. dia.) P0.5	**N**	17.0 mm (0.669 in.)
D	13.0 mm dia. (0.512 in. dia.)	**O**	47.0 mm (1.85 in.)
E	9.5 mm dia. (0.37 in. dia.)	**P**	15.0 mm (0.591 in.)
F	M8 x 1.0	**Q**	10.0 mm (0.394 in.)
G	6.50 to 6.70 mm dia. (0.256 to 0.263 in. dia.)	**R**	100 mm (3.94 in.)
H	2.12 to 2.18 rad (121 to 125 °)	**S**	65.0 mm (2.56 in.)
I	4.90 to 5.50 mm dia. (0.193 to 0.216 in. dia.)	**T**	190 mm (7.48 in.)
J	0.52 rad (30 °)	**C1.5**	Chamfer 1.5 mm (0.059 in.)
K	5.0 mm (0.20 in.)		

(1) Material: SS400

9Y1210674GEG0053US0

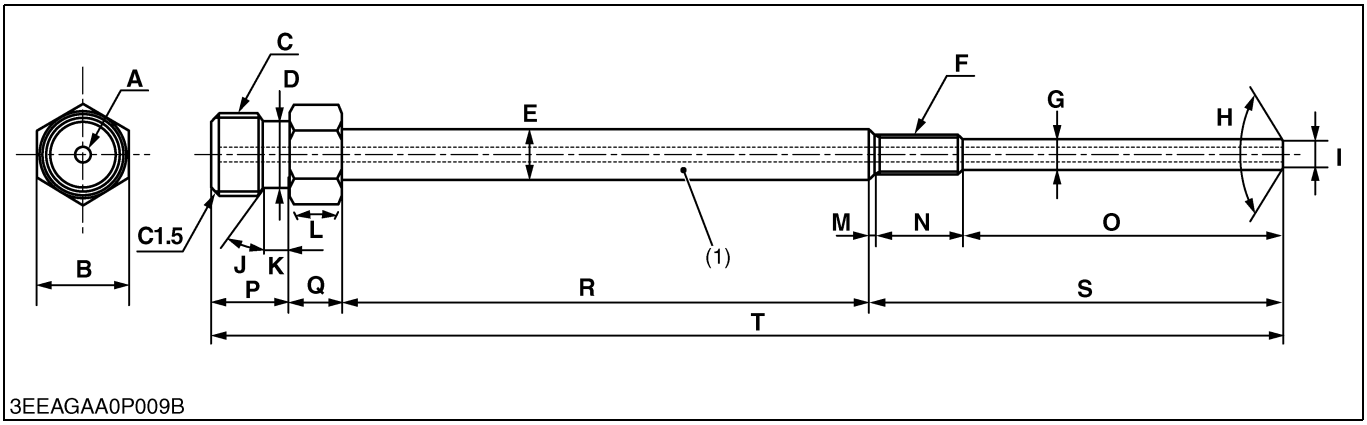
Glow Plug Adapter (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use to check compression pressure through glow plug hole.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**

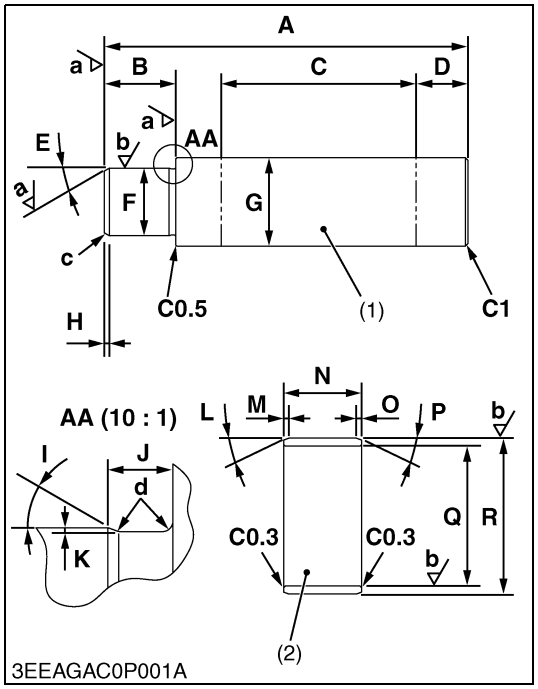


3EEAGAA0P009B

A	3.0 mm dia. (0.12 in. dia.) through hole	**L**	1.0 rad (60 °)
B	17.0 mm (0.669 in.)	**M**	1.0 mm (0.039 in.)
C	16.0 mm dia. (0.630 in. dia.) P0.5	**N**	17.0 mm (0.669 in.)
D	13.0 mm dia. (0.512 in. dia.)	**O**	61.5 mm (2.42 in.)
E	9.5 mm dia. (0.37 in. dia.)	**P**	15.0 mm (0.591 in.)
F	M8 x 1.0	**Q**	10.0 mm (0.394 in.)
G	6.50 to 6.70 mm dia. (0.256 to 0.263 in. dia.)	**R**	100 mm (3.94 in.)
H	2.145 to 2.148 rad (122.9 to 123.1 °)	**S**	79.5 mm (3.13 in.)
I	4.90 to 5.50 mm dia. (0.193 to 0.216 in. dia.)	**T**	204.5 mm (8.051 in.)
J	0.52 rad (30 °)	**C1.5**	Chamfer 1.5 mm (0.059 in.)
K	5.0 mm (0.20 in.)		

(1) Material: SS400

9Y1210674GEG0054US0



Small End Bushing Replacing Tool (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

Application

- Use to press fit the small end bushing.

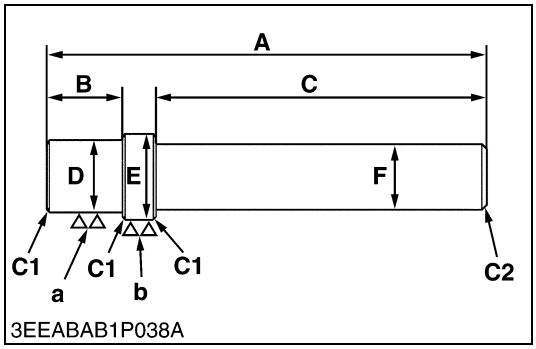
■ **NOTE**

- **These special tools are not provided, so make it referring to the figure.**

A	140 mm (5.51 in.)
B	27.2 to 27.5 mm (1.07 to 1.08 in.)
C	75.0 mm (2.95 in.): Roulette
D	20.0 mm (0.787 in.)
E	0.52 rad (30 °)
F	25.967 to 25.980 mm dia. (1.0224 to 1.0228 in. dia.)
G	34.0 mm dia. (1.34 in. dia.)
H	2.0 mm (0.079 in.)
I	0.35 rad (20 °)
J	2.5 mm (0.098 in.)
K	0.15 to 0.25 mm (0.0059 to 0.0098 in.)
L	0.35 rad (20 °)
M	1.0 mm (0.039 in.)
N	14.5 mm (0.571 in.)
O	1.0 mm (0.039 in.)
P	0.35 rad (20 °)
Q	26.000 to 26.021 mm (1.0237 to 1.0244 in.)
R	28.900 to 28.950 mm (1.1378 to 1.1397 in.)
a	Ra = 3.2a
b	Ra = 1.6a
c	1.0 mm radius (0.039 in radius)
d	0.40 mm radius (0.016 in. radius)
C0.3	Chamfer 0.30 mm (0.012 in.)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)

(1) Shaft Material: SS400 (2) Guide Material: STKM12A

9Y1210674GEG0055US0



3EEABAB1P038A

Small End Bushing Replacing Tool (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use to press out and to press fit the small end bushing.

■ **NOTE**

- **These special tools are not provided, so make it referring to the figure.**

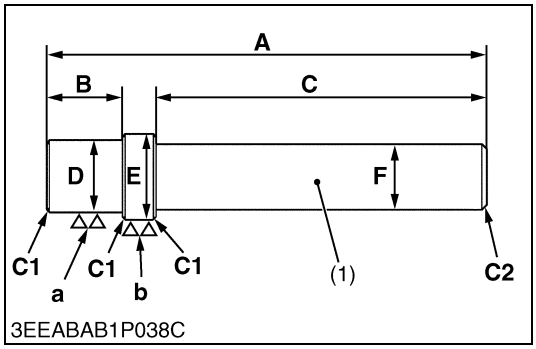
[Press out]

A	157 mm (6.181 in.)
B	14.0 mm (0.5512 in.)
C	120 mm (4.7244 in.)
D	27.4 mm dia. (1.0787 in. dia.)
E	30.95 mm dia. (1.2185 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 µm (250 µin.)
b	6.3 µm (250 µin.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

[Press fit]

A	157 mm (6.181 in.)
B	14.0 mm (0.5512 in.)
C	120 mm (4.7244 in.)
D	27.4 mm dia. (1.0787 in. dia.)
E	42.000 mm dia. (1.6535 in. dia.)
F	20 mm dia. (0.7874 in. dia.)
a	6.3 µm (250 µin.)
b	6.3 µm (250 µin.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

9Y1210674GEG0056US0



3EEABAB1P038C

Idle Gear Bushing Replacing Tool

Application

- Use to press out and to press fit the bushing.

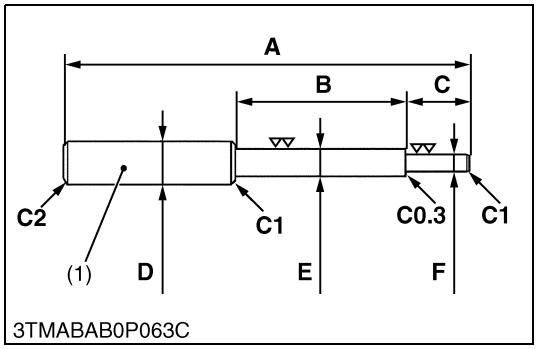
■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**

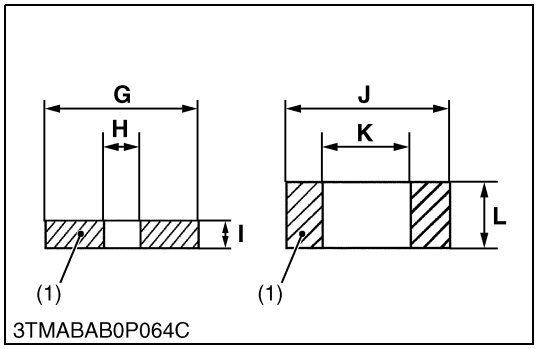
A	196 mm (7.72 in.)
B	25.0 mm (0.984 in.)
C	150 mm (5.91 in.)
D	34.5 mm dia. (1.36 in. dia.)
E	38.075 to 38.100 mm dia. (1.4991 to 1.5000 in. dia.)
F	20 mm dia. (0.79 in. dia.)
a	6.3 µm (250 µin.)
b	6.3 µm (250 µin.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

(1) Material: SS400

9Y1210674GEG0057US0



3TMABAB0P063C



3TMABAB0P064C

Valve Guide Replacing Tool

Application

- Use to press out and press fit the valve guide.

■ **NOTE**

- **These special tools are not provided, so make it referring to the figure.**

[for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]

A	220 mm (8.66 in.)
B	80 mm (3.1 in.)
C	40 mm (1.6 in.)
D	20 mm dia. (0.79 in dia.)
E	9.960 to 9.980 mm dia. (0.3922 to 0.3929 in. dia.)
F	5.50 to 5.70 mm dia. (0.217 to 0.224 in. dia.)
G	25 mm dia. (0.98 in. dia.)
H	6.00 to 6.10 mm dia. (0.237 to 0.240 in. dia.)
I	5.0 mm (0.20 in.)
J	18 mm dia. (0.71 in. dia.)
K	10.6 to 10.7 mm dia. (0.418 to 0.421 in. dia.)
L	6.90 to 7.10 mm (0.272 to 0.279 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.30 mm (0.012 in.)

[for V3307-CR-TE4B / V3307-CR-TIE4B]

A	225 mm (8.86 in.)
B	70 mm (2.8 in.)
C	45 mm (1.8 in.)
D	20 mm dia. (0.79 in dia.)
E	11.7 to 11.9 mm dia. (0.461 to 0.468 in. dia.)
F	6.50 to 6.60 mm dia. (0.256 to 0.259 in. dia.)
G	25 mm dia. (0.98 in. dia.)
H	6.70 to 7.00 mm dia. (0.264 to 0.275 in. dia.)
I	5.0 mm (0.20 in.)
J	20 mm dia. (0.79 in. dia.)
K	12.5 to 12.8 mm dia. (0.493 to 0.503 in. dia.)
L	8.50 to 8.90 mm (0.335 to 0.350 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.30 mm (0.012 in.)

(1) Material: SS400

9Y1210674GEG0058US0

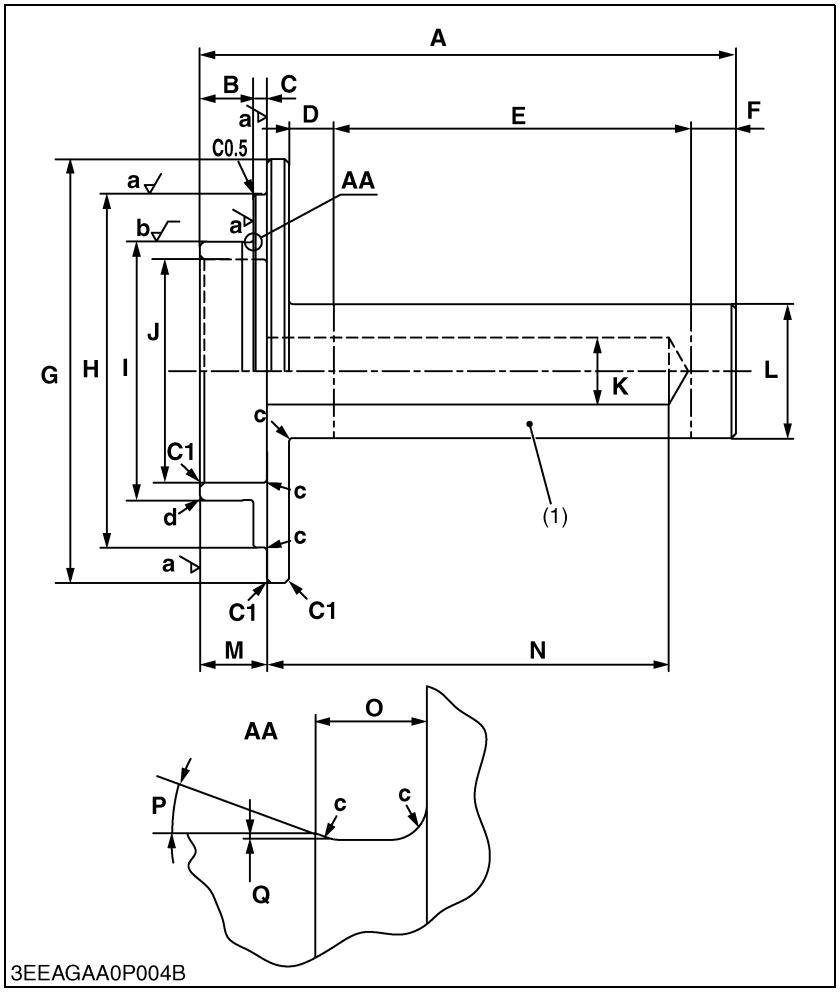
Front Cover Oil Seal Replacing Tool

Application

- Use to press fit the front cover oil seal.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**



3EEAGAA0P004B

A	120 mm (4.72 in.)
B	12.0 mm (0.472 in.)
C	2.90 to 3.00 mm (0.115 to 0.118 in.)
D	10.0 mm (0.394 in.)
E	80.0 mm (3.15 in.)
F	10.0 mm (0.394 in.)
G	95.0 mm dia. (3.74 in. dia.)
H	78.900 to 79.100 mm dia. (3.1063 to 3.1141 in. dia.)
I	57.971 to 57.990 mm dia. (2.2824 to 2.2830 in. dia.)
J	50.0 mm dia. (1.97 in. dia.)
K	15.0 mm dia. (0.591 in. dia.)
L	30.0 mm dia. (1.18 in. dia.)
M	15.0 mm (0.591 in.)
N	90.0 mm (3.54 in.)
O	2.50 mm (0.0984 in.)
P	0.35 rad (20 °)
Q	0.15 to 0.25 mm (0.0059 to 0.0098 in.)
a	Ra = 3.2 a
b	Ra = 1.6 a
c	0.80 mm radius (0.031 in. radius)
d	1.5 mm radius (0.059 in. radius)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)

(1) Material: S43C-D

9Y1210674GEG0062US0

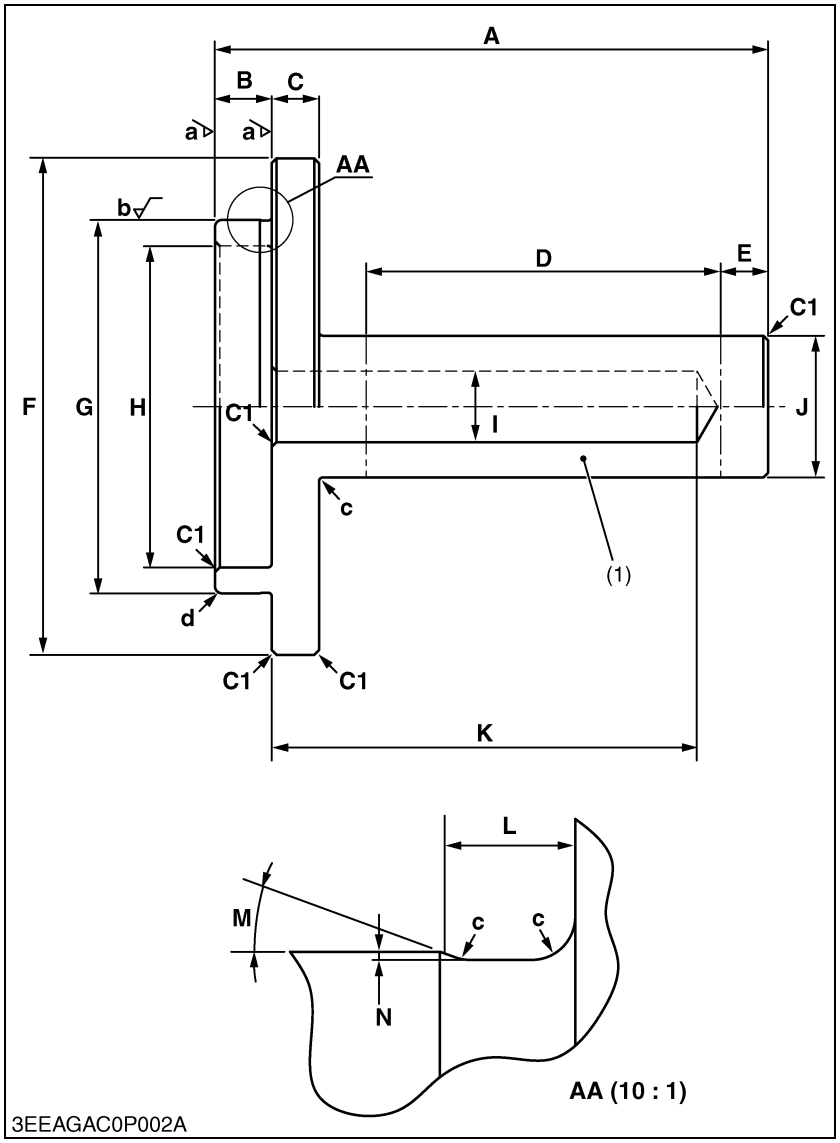
Flywheel Housing Oil Seal Replacing Tool (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

Application

- Use to press fit the flywheel housing oil seal.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**



A	117 mm (4.61 in.)
B	12.0 mm (0.472 in.)
C	10.0 mm (0.394 in.)
D	75.0 mm (2.95 in.): Roulette
E	10.0 mm (0.394 in.)
F	105 mm dia. (4.13 in. dia.)
G	78.9971 to 78.9990 mm dia. (3.11013 to 3.11019 in. dia.)
H	68.0 mm dia. (2.68 in. dia.)
I	15.0 mm dia. (0.591 in. dia.)
J	30.0 mm dia. (1.18 in. dia.)
K	90.0 mm (3.54 in.)
L	2.5 mm (0.098 in.)
M	0.35 rad (20 °)
N	0.15 to 0.25 mm (0.0059 to 0.0098 in.)
a	Ra = 3.2 a
b	Ra = 1.6 a
c	0.80 mm radius (0.031 in. radius)
d	1.5 mm radius (0.059 in. radius)
C1	Chamfer 1.0 mm (0.039 in.)

(1) Material: SS400

9Y1210674GEG0063US0

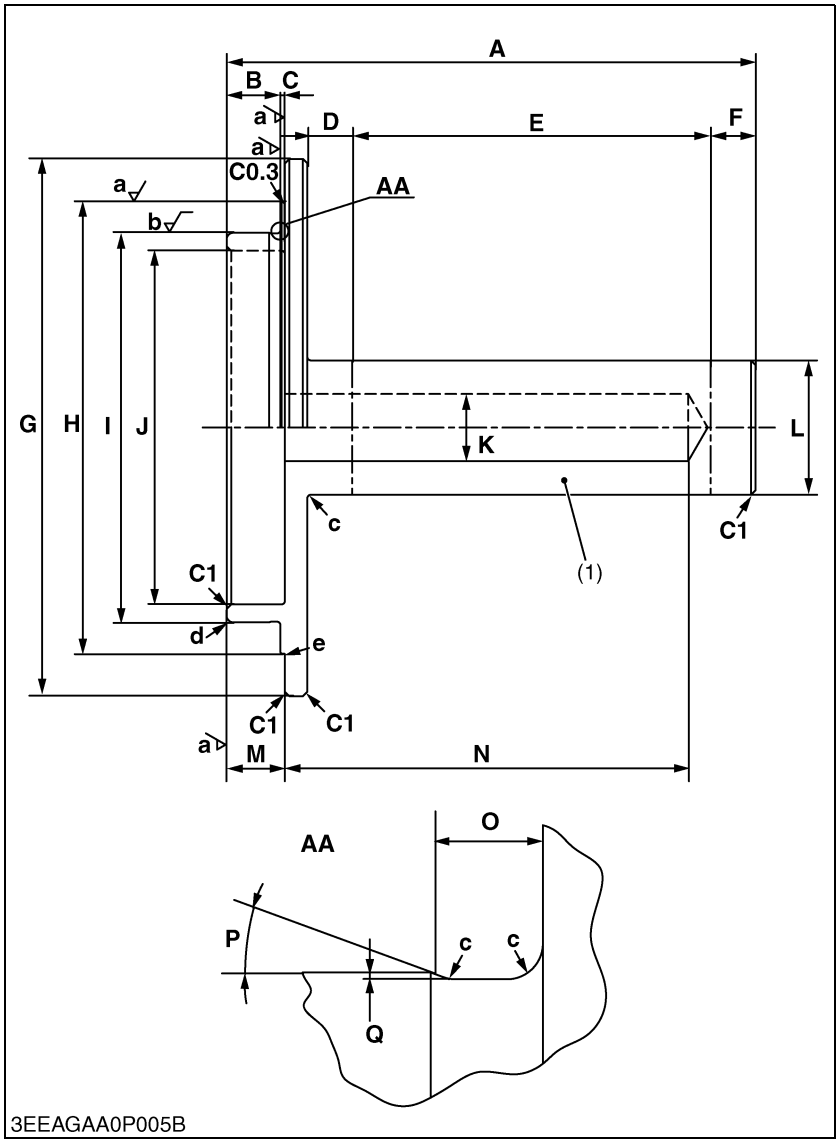
Flywheel Housing Oil Seal Replacing Tool (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use to press fit the flywheel housing oil seal.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**



3EEAGAA0P005B

A	118 mm (4.65 in.)
B	12.0 mm (0.472 in.)
C	0.90 to 1.0 mm (0.036 to 0.039 in.)
D	10.0 mm (0.394 in.)
E	80.0 mm (3.15 in.)
F	10.0 mm (0.394 in.)
G	120 mm dia. (4.72 in. dia.)
H	100.90 to 101.10 mm dia. (3.9725 to 3.9803 in. dia.)
I	86.966 to 86.988 mm dia. (3.4239 to 3.4247 in. dia.)
J	79.0 mm dia. (3.11 in. dia.)
K	15.0 mm dia. (0.591 in. dia.)
L	30.0 mm dia. (1.18 in. dia.)
M	13.0 mm (0.512 in.)
N	90.0 mm (3.54 in.)
O	2.50 mm (0.0984 in.)
P	0.35 rad (20 °)
Q	0.15 to 0.25 mm (0.0059 to 0.0098 in.)
a	Ra = 3.2 a
b	Ra = 1.6 a
c	0.80 mm radius (0.031 in. radius)
d	1.5 mm radius (0.059 in. radius)
e	0.20 mm radius (0.0079 in. radius)
C0.3	Chamfer 0.30 mm (0.012 in.)
C1	Chamfer 1.0 mm (0.039 in.)

(1) Material: S43C-D

9Y1210674GEG0064US0

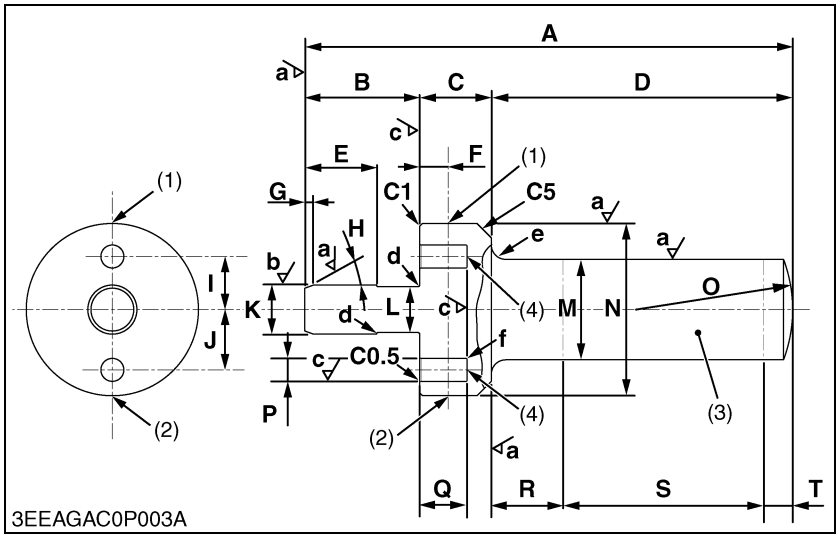
Valve Bridge Shaft Replacing Tool (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

Application

- Use to press fit the valve bridge shaft.

■ **NOTE**

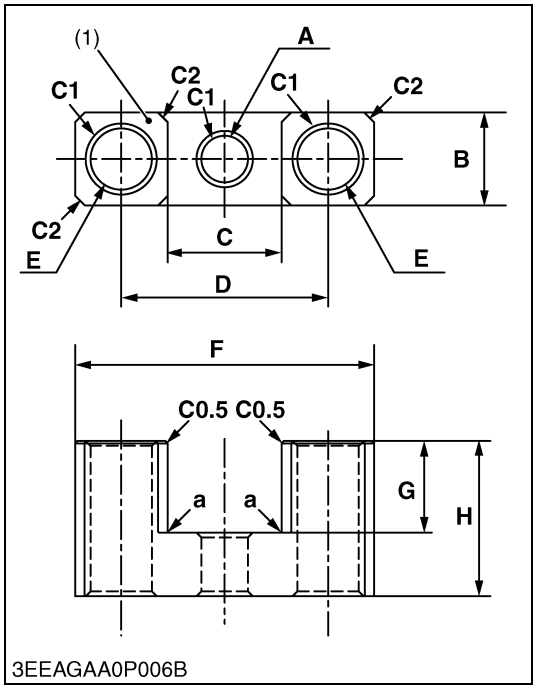
- **This special tool is not provided, so make it referring to the figure.**



A	170 mm (6.69 in.)
B	40.0 mm (1.57 in.)
C	25.0 mm (0.984 in.)
D	105 mm (4.13 in.)
E	25.0 mm (0.984 in.)
F	10.0 mm (0.394 in.)
G	3.0 mm (0.12 in.)
H	0.35 rad (20 °)
I	18.45 to 18.55 mm (0.7264 to 0.7303 in.)
J	20.95 to 21.05 mm (0.8248 to 0.8287 in.)
K	17.057 to 17.084 mm dia. (0.67154 to 0.67259 in. dia.)
L	16.0 mm dia. (0.630 in. dia.)
M	35.0 mm dia. (1.38 in. dia.)
N	60.0 mm dia. (2.36 in. dia.)
O	SR 50.0 mm (1.97 in.)
P	8.10 to 8.15 mm dia. (0.319 to 0.320 in. dia.)
Q	16.4 to 16.6 mm (0.646 to 0.653 in.)
R	25.0 mm (0.984 in.)
S	70.0 mm (2.76 in.): Roulette
T	10.0 mm (0.394 in.)
a	Ra = 6.3 a
b	Ra = 1.6 a
c	Ra = 3.2 a
d	0.50 mm radius (0.020 in. radius)
e	5.0 mm radius (0.20 in. radius)
f	under 0.30 mm radius (0.012 in. radius)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C5	Chamfer 5.0 mm (0.20 in.)

(1) "IN" side
(2) "EX" side
(3) Material: S43C-D
(4) Bottom flat

9Y1210674GEG0065US0



3EEAGAA0P006B

Valve Bridge Shaft Replacing Tool (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use to press fit the valve bridge shaft.

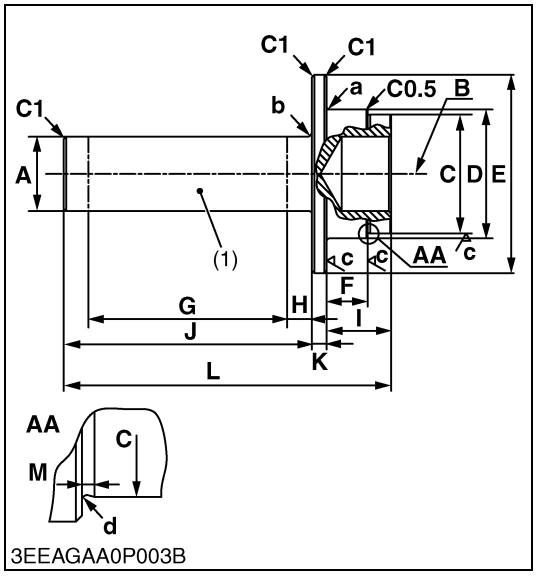
■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**

A	9.50 mm dia. (0.374 in. dia.) through hole
B	19.0 mm (0.748 in.)
C	23.2 mm (0.913 in.)
D	42.00 to 42.40 mm (1.654 to 1.669 in.)
E	12.5 mm dia. (0.492 in. dia.) through hole
F	61.0 mm (2.40 in.)
G	18.7 mm (0.736 in.)
H	30.90 to 31.70 mm (1.217 to 1.248 in.)
a	0.30 mm radius (0.012 in. radius)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)

(1) Material: SS400

9Y1210674GEG0066US0



3EEAGAA0P003B

Camshaft Cover Replacing Tool (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use to press fit the camshaft cover.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**

A	30.0 mm (1.18 in.)
B	30.0 mm dia., 20.0 mm depth (1.18 in. dia., 0.79 in. depth)
C	47.975 to 48.000 mm (1.8888 to 1.8897 in.)
D	52.0 mm (2.05 in.)
E	80.0 mm (3.15 in.)
F	16.5 to 16.6 mm (0.650 to 0.653 in.)
G	80.0 mm (3.15 in.)
H	10.0 mm (0.394 in.)
I	26.0 mm (1.02 in.)
J	100 mm (3.94 in.)
K	6.0 mm (0.24 in.)
L	132 mm (5.20 in.)
M	1.0 mm (0.039 in.)
a	1.0 mm radius (0.039 in. radius)
b	2.0 mm radius (0.079 in. radius)
c	Ra = 3.2a
d	0.40 mm radius (0.016 in. radius)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)

(1) Material: S43C

9Y1210674GEG0067US0

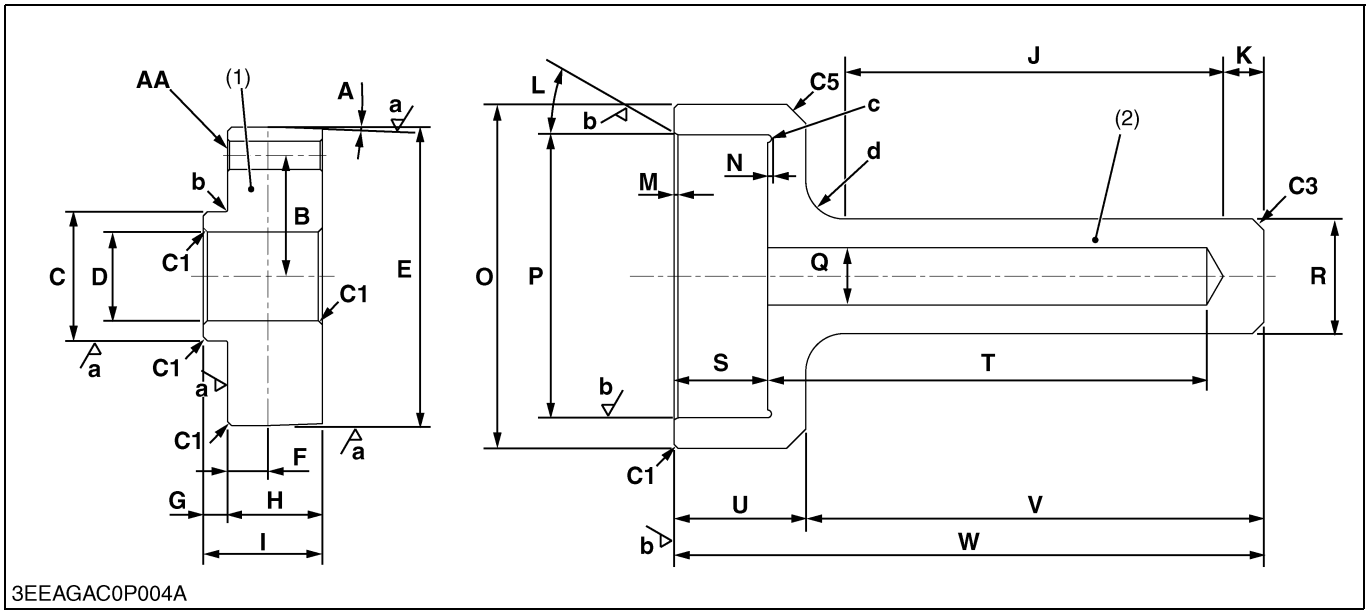
Crankshaft Sleeve Replacing Tool (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

Application

- Use to fix the crankshaft sleeve of the diesel engine.

■ **NOTE**

- **These special tools are not provided, so make it referring to the figure.**



3EEAGAC0P004A

A	0.035 rad (2.0 °)	**Q**	15.0 mm dia. (0.591 in. dia.)
B	30.0 mm (1.18 in.)	**R**	30.0 mm dia. (1.18 in. dia.)
C	31.925 to 31.950 mm dia. (1.2569 to 1.2578 in. dia.)	**S**	24.45 to 24.55 mm (0.9626 to 0.9665 in.)
D	22.0 mm dia. (0.866 in. dia.)	**T**	115 mm depth (4.53 in. depth)
E	73.60 to 73.70 mm dia. (2.898 to 2.901 in. dia.)	**U**	34.5 mm (1.36 in.)
F	10.0 mm (0.394 in.)	**V**	120 mm (4.72 in.)
G	6.0 mm (0.24 in.)	**W**	154.5 mm (6.083 in.)
H	23.45 to 23.55 mm (0.9233 to 0.9272 in.)	**AA**	7.0 mm dia. (0.28 in. dia.), Chamfer 0.50 mm (0.020 in.) both side
I	29.5 mm (1.16 in.)	**a**	Ra = 1.6 a
J	95.0 mm (3.74 in.): Roulette	**b**	Ra = 3.2 a
K	10.0 mm (0.394 in.)	**c**	1.0 mm radius (0.039 in. radius)
L	0.52 rad (30 °)	**d**	10.0 mm radius (0.394 in. radius)
M	0.70 to 1.0 mm dia. (0.028 to 0.039 in. dia.)	**C1**	Chamfer 1.0 mm (0.039 in.)
N	1.0 mm (0.039 in.)	**C3**	Chamfer 3.0 mm (0.12 in.)
O	90.0 mm dia. (3.54 in. dia.)	**C5**	Chamfer 5.0 mm (0.20 in.)
P	74.10 to 74.20 mm dia. (2.918 to 2.921 in. dia.)		

(1) Sleeve Guide Material: SGD400-D

(2) Shaft Material: SGD400-D

9Y1210674GEG0068US0

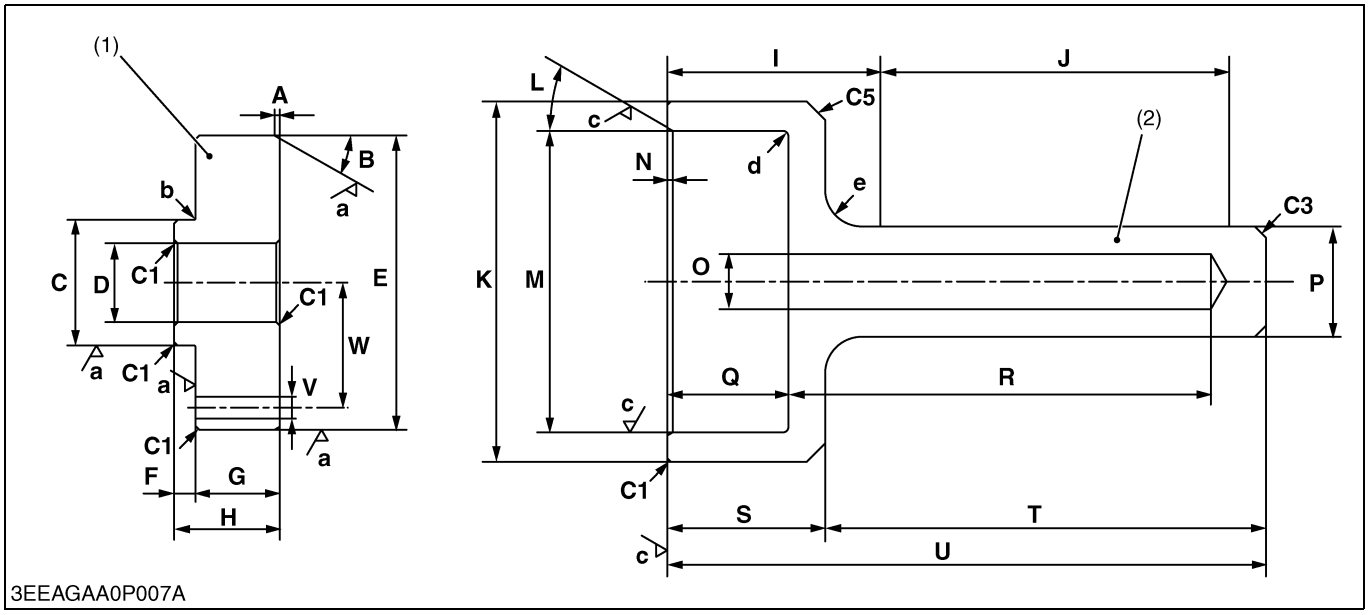
Crankshaft Sleeve Replacing Tool (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use to fix the crankshaft sleeve of the diesel engine.

■ **NOTE**

- **These special tools are not provided, so make it referring to the figure.**



3EEAGAA0P007A

A	1.50 mm (0.0591 in.)	**Q**	33.0 mm (1.30 in.)
B	0.52 rad (30 °)	**R**	115 mm depth (4.53 in. depth)
C	34.925 to 34.950 mm dia. (1.3750 to 1.3759 in. dia.)	**S**	43.0 mm (1.69 in.)
D	22 mm dia. (0.8661 in. dia.)	**T**	120 mm (4.72 in.)
E	81.980 to 81.985 mm dia. (3.2276 to 3.2277 in. dia.)	**U**	163 mm (6.42 in.)
F	6.0 mm (0.24 in.)	**V**	8.0 mm dia. (0.31 in. dia.)
G	23.5 mm (0.925 in.)	**W**	33.475 to 33.525 mm (1.3180 to 1.3198 in.)
H	29.5 mm (1.16 in.)	**a**	Ra = 1.6 a
I	58.0 mm (2.28 in.)	**b**	0.50 mm radius (0.020 in. radius)
J	95.0 mm (3.74 in.)	**c**	Ra = 3.2 a
K	98.0 mm dia. (3.86 in. dia.)	**d**	1.50 mm radius (0.0591 in. radius)
L	0.52 rad (30 °)	**e**	10.0 mm radius (0.394 in. radius)
M	82.100 to 82.200 mm dia. (3.2323 to 3.2362 in. dia.)	**C1**	Chamfer 1.0 mm (0.039 in.)
N	1.50 mm (0.0591 in.)	**C3**	Chamfer 3.0 mm (0.12 in.)
O	15.0 mm dia. (0.591 in. dia.)	**C5**	Chamfer 5.0 mm (0.20 in.)
P	30.0 mm dia. (1.18 in. dia.)		

(1) Sleeve Guide Material: S43C (2) Shaft Material: S43C

9Y1210674GEG0069US0

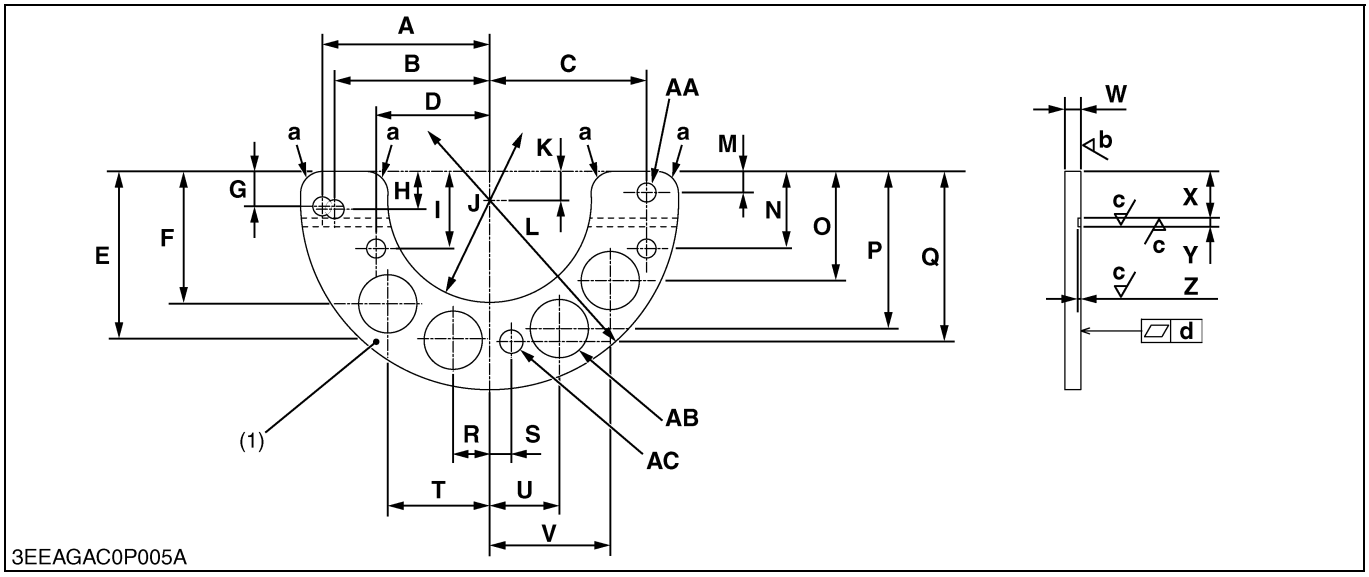
Crankcase Aligning Plate (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

Application

- Use for aligning the crankcase 1 and 2.

■ **NOTE**

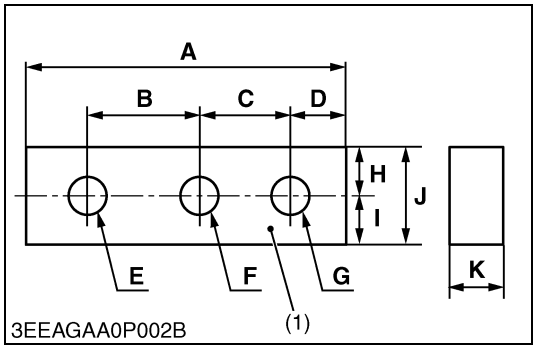
- **This special tool is not provided, so make it referring to the figure.**



A	115 mm (4.53 in.)	**R**	25.0 mm (0.984 in.)
B	106.5 mm (4.193 in.)	**S**	15.0 mm (0.591 in.)
C	108 mm (4.25 in.)	**T**	70.0 mm (2.76 in.)
D	78.0 mm (3.07 in.)	**U**	48.0 mm (1.89 in.)
E	115 mm (4.53 in.)	**V**	83.0 mm (3.27 in.)
F	91.0 mm (3.58 in.)	**W**	11.0 mm (0.433 in.)
G	24.0 mm (0.945 in.)	**X**	32.0 mm (1.26 in.)
H	26.0 mm (1.02 in.)	**Y**	6.0 mm (0.24 in.)
I	53.0 mm (2.09 in.)	**Z**	2.0 mm (0.079 in.)
J	140 mm dia. (5.51 in. dia.)	**AA**	5 X 13.0 mm dia. (0.512 in. dia.), Chamfer 0.50 mm (0.020 in.)
K	20.0 mm (0.787 in.)	**AB**	4 X 40.0 mm dia. (1.57 in. dia.), Chamfer 0.50 mm (0.020 in.)
L	260 mm dia. (10.2 in. dia.)	**AC**	16.0 mm dia. (0.630 in. dia.), Chamfer 0.50 mm (0.020 in.)
M	14.5 mm (0.571 in.)	**a**	15.0 mm radius (0.591 in. radius)
N	53.0 mm (2.09 in.)	**b**	Ra = 3.2 a
O	75.0 mm (2.95 in.)	**c**	Ra = 6.3 a
P	108 mm (4.25 in.)	**d**	0.05 mm (0.002 in.)
Q	117 mm (4.61 in.)		

(1) Material: SS400

9Y1210674GEG0070US0



Crankcase Aligning Plate (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use for aligning the crankcase 1 and 2.

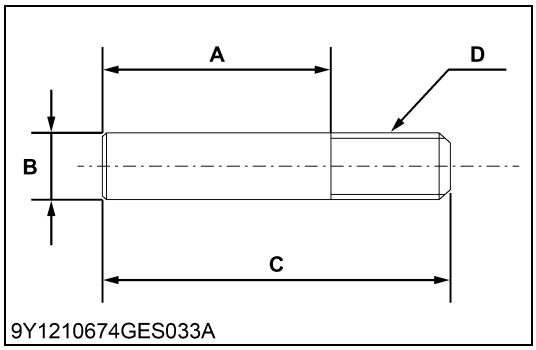
■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**

A	126.6 mm (4.984 in.)
B	49.1 mm (1.93 in.)
C	37.5 mm (1.48 in.)
D	20 mm (0.79 in.)
E	14 mm dia. (0.55 in. dia.)
F	14 mm dia. (0.55 in. dia.)
G	14 mm dia. (0.55 in. dia.)
H	17.5 mm (0.689 in.)
I	17.5 mm (0.689 in.)
J	35 mm (1.4 in.)
K	19 mm (0.75 in.)

(1) Material: S43C

9Y1210674GEG0071US0



Guide Pin

Application

- To remove and install the suction control valve (SCV).

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**

A	30 mm (1.2 in.)
B	6.0 mm dia. (0.24 in. dia.)
C	45 mm (1.8 in.)
D	M6 × Pitch 1.0

9Y1210674GEG0082US0

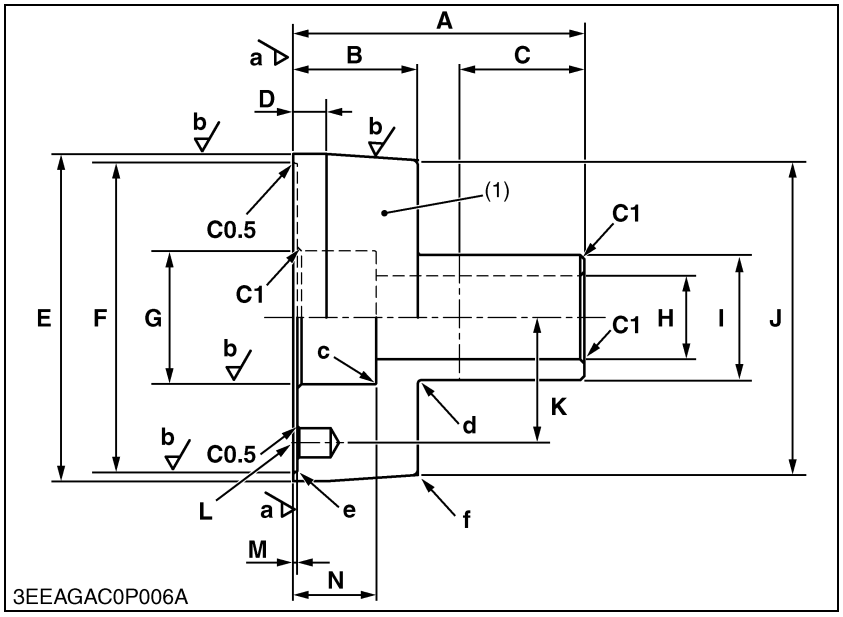
Flywheel Housing Guide (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

Application

- Use to install the flywheel housing to the crankcase.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**



A	70.0 mm (2.76 in.)
B	30.0 mm (1.18 in.)
C	30.0 mm (1.18 in.): Roulette
D	8.0 mm (0.31 in.)
E	78.60 to 78.70 mm dia. (3.095 to 3.098 in. dia.)
F	73.8 to 74.2 mm dia. (2.91 to 2.92 in. dia.)
G	32.009 to 32.034 mm dia. (1.2602 to 1.2611 in. dia.)
H	20.0 mm dia. (0.787 in. dia.)
I	30.0 mm dia. (1.18 in. dia.)
J	75.5 mm dia. (2.97 in. dia.)
K	30.0 mm (1.18 in.)
L	7.0 mm dia., 8.0 mm depth (0.28 in. dia., 0.31 in. depth)
M	1.1 to 1.3 mm (0.044 to 0.051 in.)
N	20.0 mm (0.787 in.)
a	Ra = 3.2 a
b	Ra = 1.6 a
c	0.40 mm radius (0.016 in. radius)
d	0.80 mm radius (0.031 in. radius)
e	0.20 mm radius (0.0079 in. radius)
f	1.5 mm radius (0.059 in. radius)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)

(1) Material: SS400

9Y1210674GEG0072US0

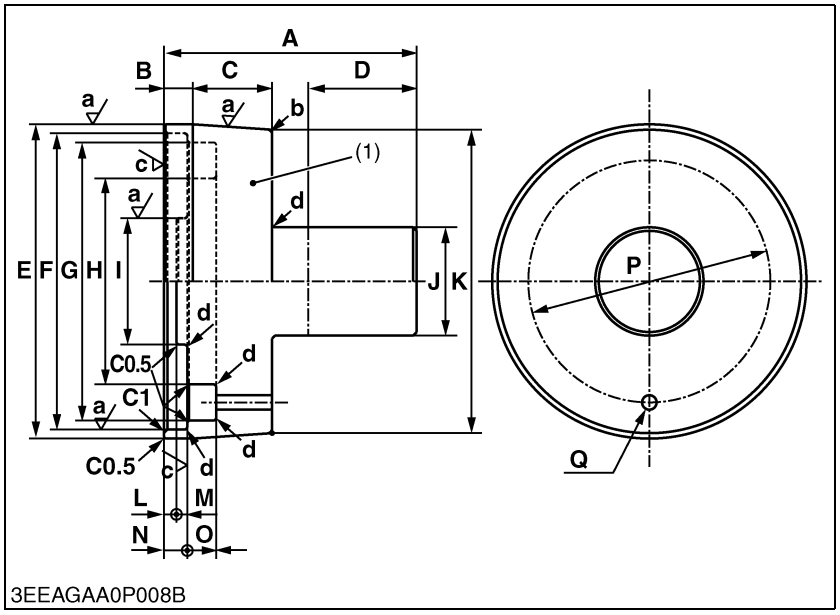
Flywheel Housing Guide (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use to install the flywheel housing to the crankcase.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**



3EEAGAA0P008B

A	70.0 mm (2.76 in.)
B	8.0 mm (0.31 in.)
C	22.0 mm (0.866 in.)
D	30.0 mm (1.18 in.)
E	87.0 mm dia. (3.43 in. dia.)
F	82.036 to 82.071 mm dia. (3.2298 to 3.2311 in. dia.)
G	77.0 mm dia. (3.03 in. dia.)
H	57.0 mm dia. (2.24 in. dia.)
I	35.0 mm dia. (1.38 in. dia.)
J	30.0 mm dia. (1.18 in. dia.)
K	84.0 mm dia. (3.31 in. dia.)
L	3.5 mm (0.14 in.)
M	3.0 mm (0.12 in.)
N	6.60 to 6.80 mm (0.260 to 0.267 in.)
O	8.0 mm (0.31 in.)
P	67.0 mm dia. (2.64 in. dia.)
Q	4.0 mm dia. (0.16 in. dia.) through hole
a	Ra = 1.6 a
b	1.5 mm radius (0.059 in. radius)
c	Ra = 3.2 a
d	0.80 mm radius (0.031 in. radius)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)

(1) Material: SS400

9Y1210674GEG0073US0

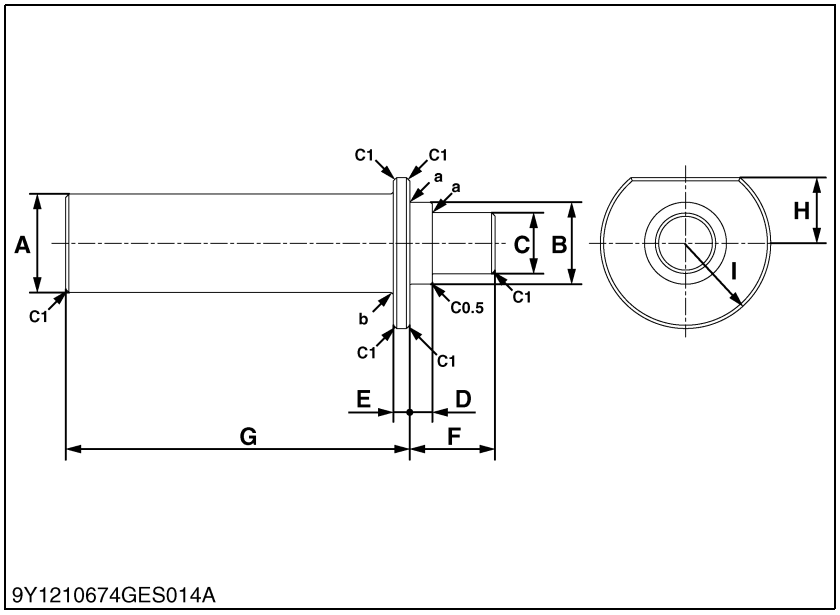
Camshaft Position Sensor Bushing Replacing Tool (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

Application

- Use to press fit the camshaft position sensor bushing.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**



9Y1210674GES014A

A	30.0 mm dia. (1.18 in. dia.)
B	24.8 to 25.2 mm dia. (0.977 to 0.992 in. dia.)
C	18.4 to 18.5 mm dia. (0.725 to 0.728 in. dia.)
D	6.80 to 6.90 mm (0.268 to 0.271 in.)
E	5.0 mm (0.20 in.)
F	26.0 mm (1.02 in.)
G	105.0 mm (4.134 in.)
H	20.0 mm (0.787 in.)
I	26.0 mm (1.02 in.)
a	0.40 mm radius (0.016 in. radius)
b	1.0 mm radius (0.039 in. radius)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)

9Y1210674GEG0074US0

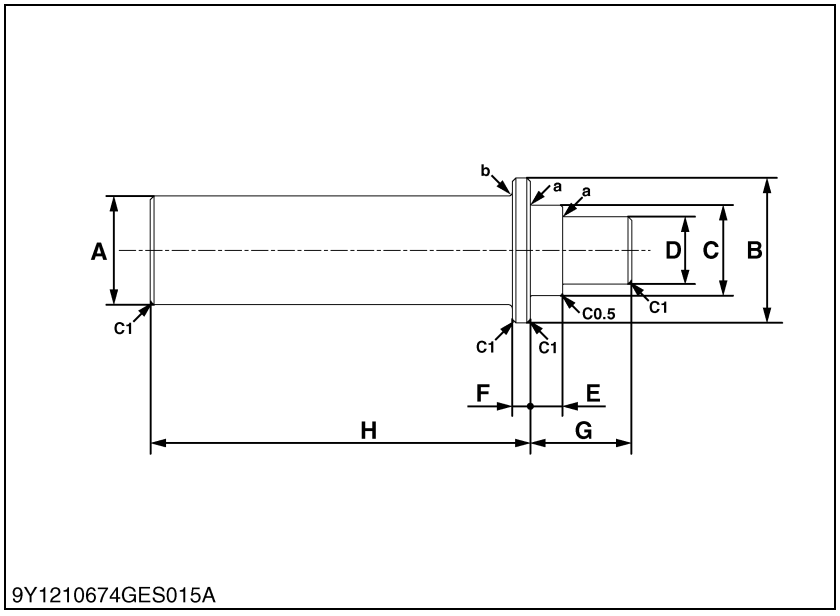
Camshaft Position Sensor Bushing Replacing Tool (for V3307-CR-TE4B / V3307-CR-TIE4B)

Application

- Use to press fit the camshaft position sensor bushing.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**



9Y1210674GES015A

A	30.0 mm dia. (1.18 in. dia.)
B	40.0 mm dia. (1.57 in. dia.)
C	24.8 to 25.2 mm dia. (0.977 to 0.992 in. dia.)
D	18.4 to 18.5 mm dia. (0.725 to 0.728 in. dia.)
E	8.80 to 8.90 mm (0.347 to 0.350 in.)
F	5.0 mm (0.20 in.)
G	28.0 mm (1.10 in.)
H	105.0 mm (4.134 in.)
a	0.40 mm radius (0.016 in. radius)
b	1.0 mm radius (0.039 in. radius)
C0.5	Chamfer 0.50 mm (0.020 in.)
C1	Chamfer 1.0 mm (0.039 in.)

9Y1210674GEG0075US0

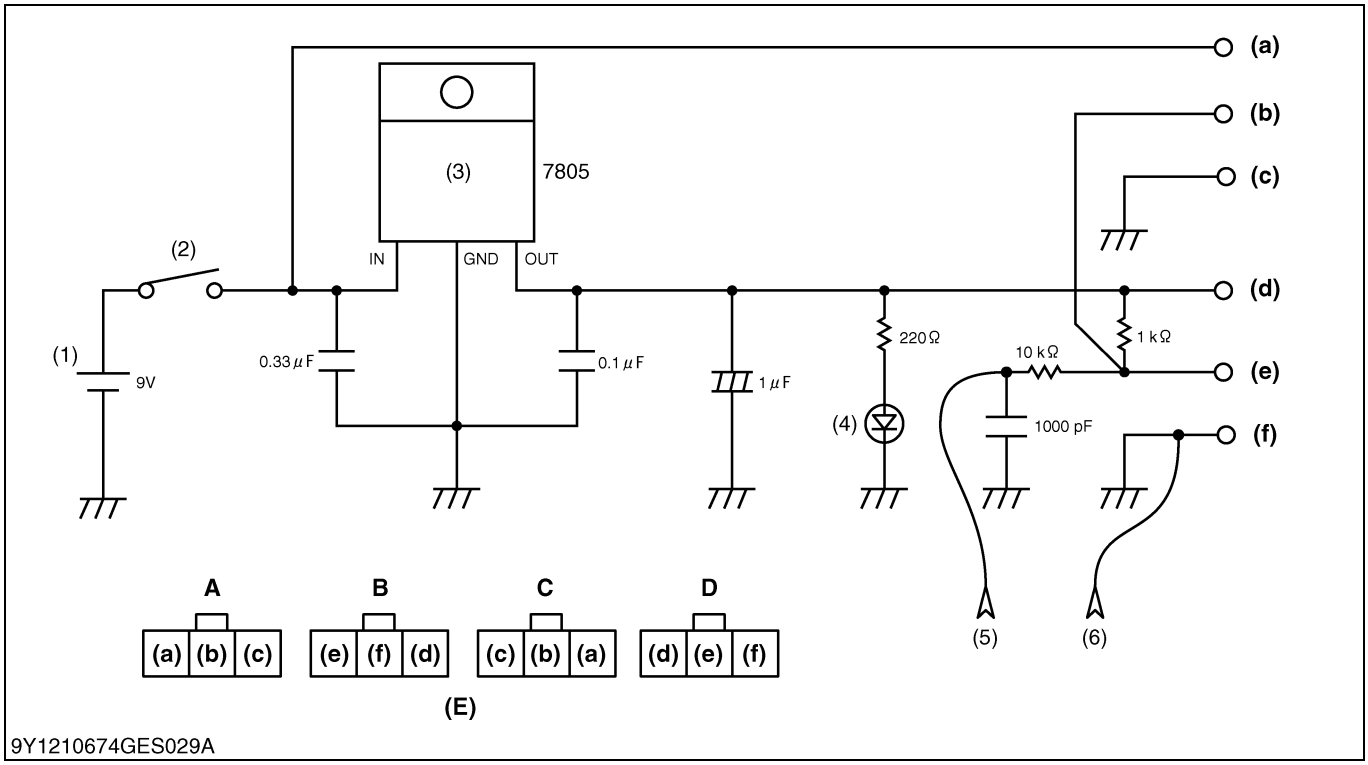
Rotation Sensor Signal Interface Unit

Application

- Use for reading rotation sensor signal.

■ **NOTE**

- **This special tool is not provided, so make it referring to the figure.**



(1) 9V Battery
(2) Switch
(3) 3-Terminal Regulator
(4) LED
(5) Clip (Red)
(6) Clip (Black)

A: for Panasonic
B: for DENSO
C: for BOSCH cam angle
D: for BOSCH crank angle
(E) Connector Side

(a) +9 V
(b) Signal
(c) GND
(d) +5 V
(e) Signal
(f) GND

9Y1210674GEG0076US0

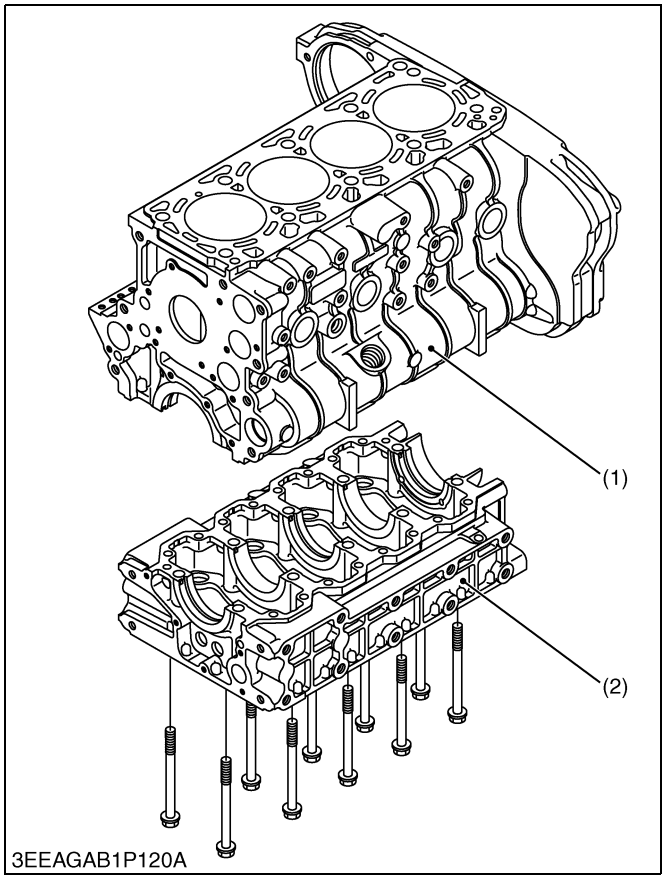
1 ENGINE

MECHANISM

CONTENTS

1. ENGINE BODY

[1] CYLINDER BLOCK



3EEAGAB1P120A

The 07 series DI engine employs ladder frame structure type crankcases - the crankcase 1 (1) with combustion part and the crankcase 2 (2) which supports the crankcase 1 (1).

The following benefits are in the ladder frame structure.

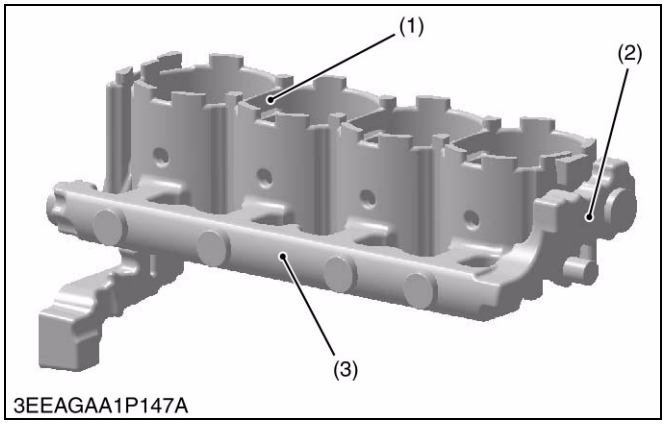
1. Minimizing parts.
2. Noise reduction.
3. Reduction of loss and dispersion on friction thanks to accuracy of axial concentricity.

The cylinder is a linerless type which enables good cooling operation, less strain and good abrasion resistance.

(1) Crankcase 1 (2) Crankcase 2

9Y1210674ENM0033US0

[2] COOLING JACKET



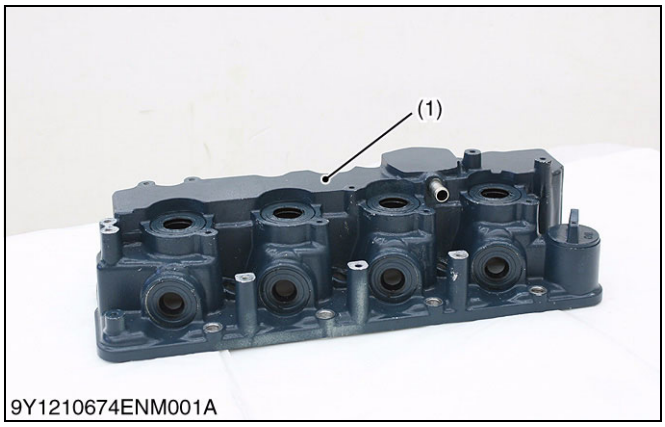
3EEAGAA1P147A

The 07 series DI engine employs coolant evenness distribution type cooling jacket inside crankcase 1. The coolant is evenly supplied to each cylinder through the main gallery (3) in the jacket mold core (2).

(1) Coolant Passage between Cylinder (2) Jacket Mold Core
(3) Main Gallery

9Y1210674ENM0034US0

[3] HALF-FLOATING HEAD COVER



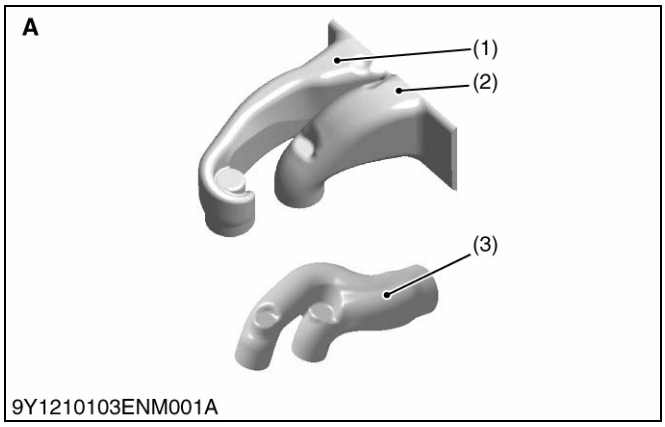
9Y1210674ENM001A

The rubber packing is fitted in to keep the head cover 0.5 mm (0.02 in.) or so off the cylinder head. This arrangement helps reduce noise coming from the cylinder head.

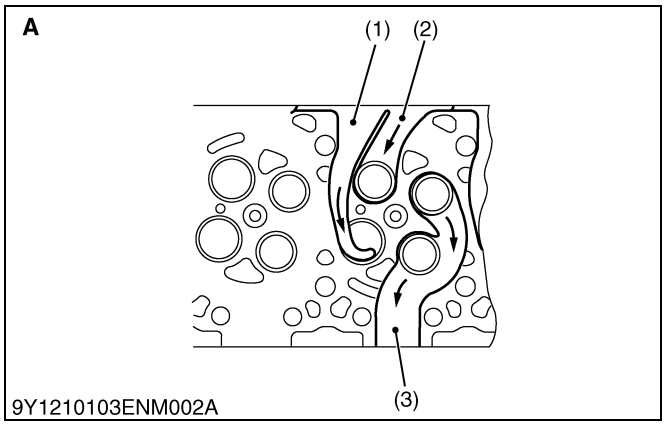
(1) Cylinder Head Cover

9Y1210674ENM0035US0

[4] CYLINDER HEAD



9Y1210103ENM001A



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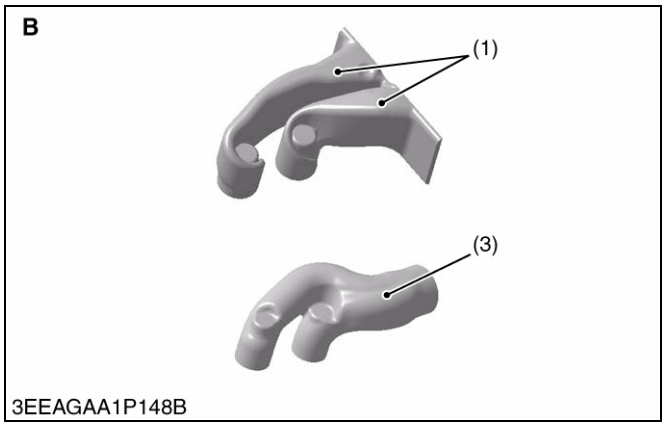
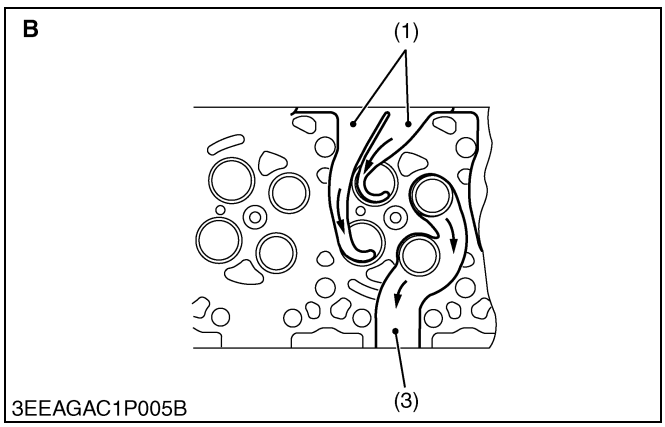


3EEAGAA1P148B



3EEAGAC1P005B

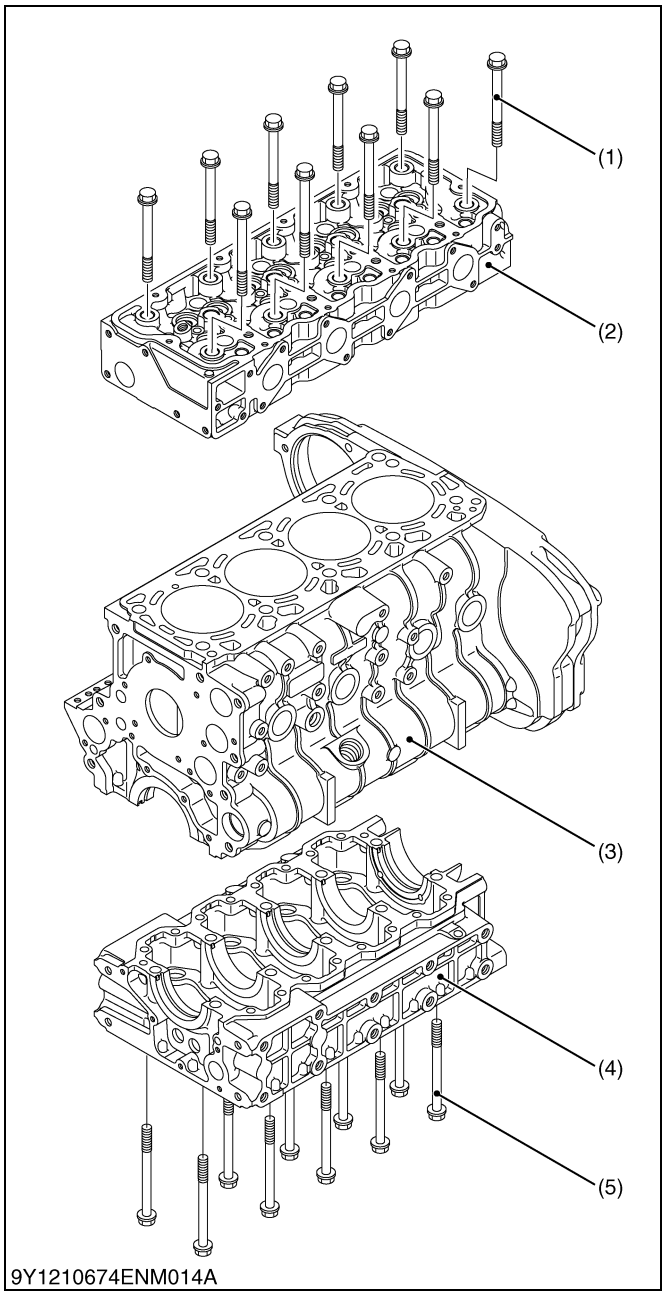
This engine employs four valve system, the cylinder head is provided with double intake passage in order to ensure appropriate air suction and give an optimum swirl.

(1) Intake Port (Helical)
(2) Intake Port (Direct)
(3) Exhaust Port

A: V2607-CR-E4B / V2607-CR-TE4B
B: V3307-CR-TE4B

9Y1210674ENM0036US0

[5] 4 SCREWS PER EACH CYLINDER ASSEMBLING STRUCTURE



9Y1210674ENM014A

The 07 series DI engine employs 4 screws per each cylinder assembling structure.

The cylinder head (2) and the crankcase 2 (4) are assembled from the top and bottom to the crankcase 1 (3) with each of 10 screws.

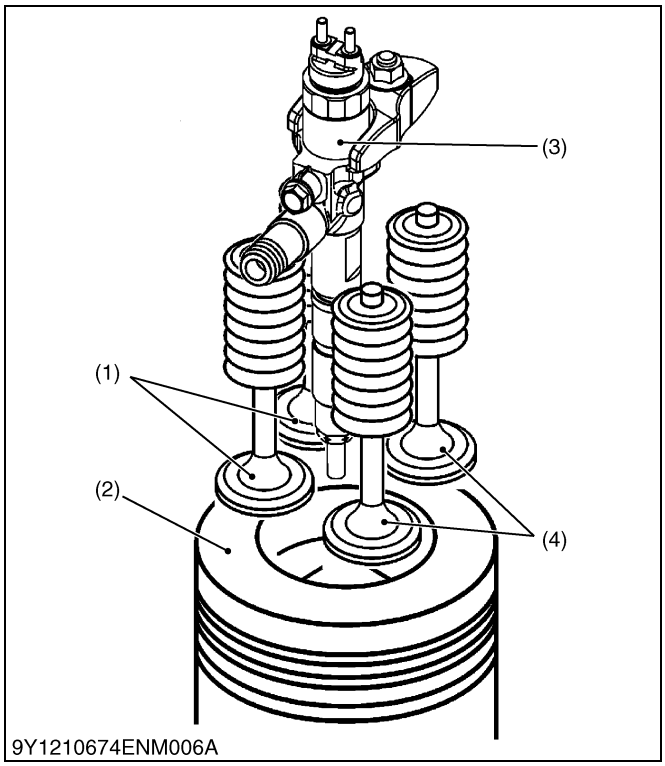
The following objectives are in the 4 screws per each cylinder assembling structure.

1. Reduce the load share rate of combustion pressure on outer block surface wall.
2. Flexibility of cylinder head design.

(1) Cylinder Head Mounting Screw
(2) Cylinder Head
(3) Crankcase 1
(4) Crankcase 2
(5) Crankcase 2 Mounting Screw

9Y1210674ENM0037US0

[6] CENTER DIRECT INJECTION SYSTEM (E-CDIS)



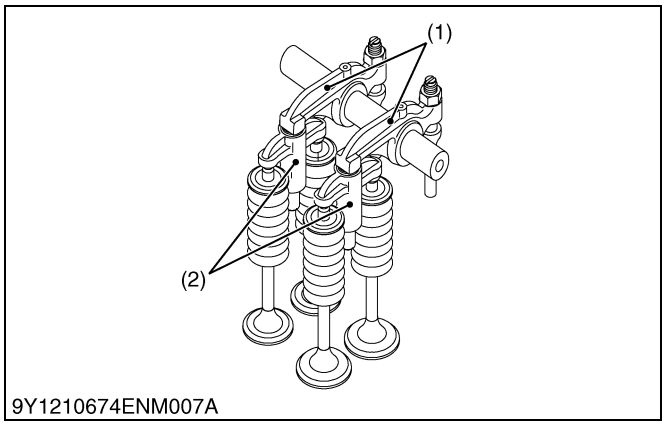
9Y1210674ENM006A

The 07 series DI engine adopts the Center Direct Injection System (E-CDIS), in which the injector (3) is set upright at the center of the cylinder.

This system serves to inject fuel directly at the center of the cylinder. By so doing, injected fuel and suction air can be mixed more uniformly, leading to more stable, higher combustion performance. In other words, cleaner emission, higher power output, lower fuel consumption, lower operating noise and higher start-up performance have been achieved.

(1) Exhaust Valves
(2) Piston
(3) Injector
(4) Intake Valves

9Y1210674ENM0038US0



9Y1210674ENM007A

The 07 series DI engine has two intake valves and two exhaust valves per each cylinder.

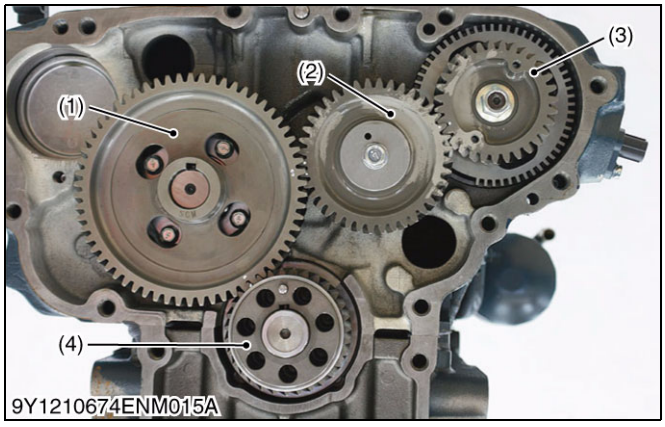
The rocker arm (1) contacts a valve bridge arm (2) instead of the valves stem tip.

The valve bridge arm (2) then contacts both intake valves or both exhaust valves and causes two valves to open simultaneously.

(1) Rocker Arm
(2) Valve Bridge Arm

9Y1210674ENM0039US0

[7] GEAR TRAIN CONFIGURATION



9Y1210674ENM015A

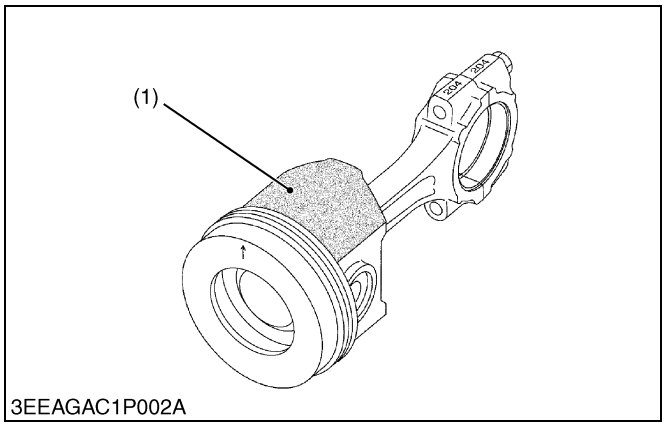
The 07 series DI engine employs gear train located at flywheel side. The following benefits are in the rear gear train configuration.

1. Flexibility of auxiliary parts arrangement.
2. Reduction of gear chattering noise from crankshaft of torsional and bending vibration.

(1) Cam Gear
(2) Idle Gear
(3) Supply Pump Gear
(4) Crank Gear

9Y1210674ENM0040US0

[8] PISTON



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Piston's skirt is coated with **molybdenum disulfide★**, which reduces the piston slap noise and thus the entire operating noise.

★Molybdenum disulfide (MoS_2)

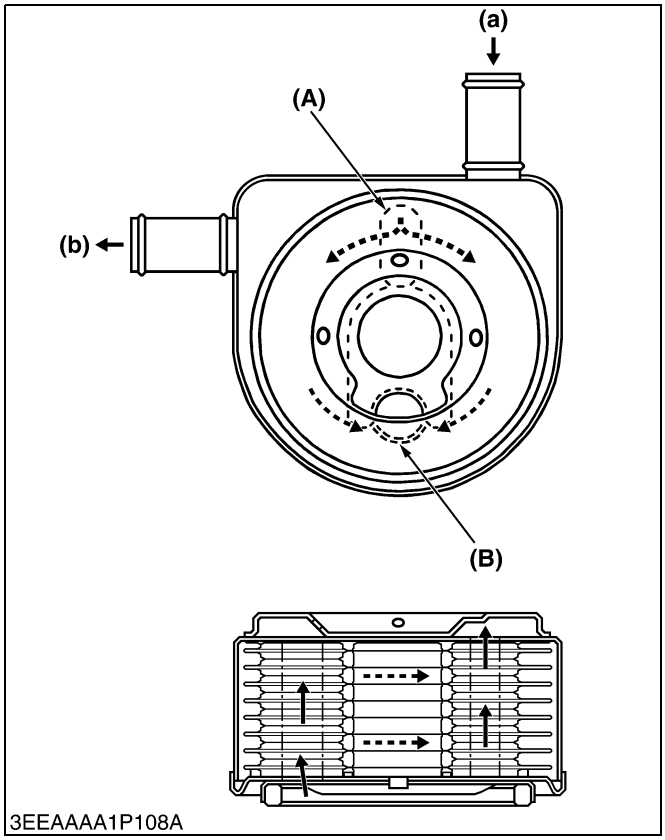
The molybdenum disulfide (1) serves as a solid lubricant, like a Graphite or Teflon. This material helps resist metal wears even with little lube oil.

(1) Molybdenum Disulfide

9Y1210674ENM0041US0

2. LUBRICATING SYSTEM

[1] OIL COOLER



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The 07 series engine has a coolant-cooled oil cooler that not only cools hot oil, but also warms the cool engine oil shortly after start up.

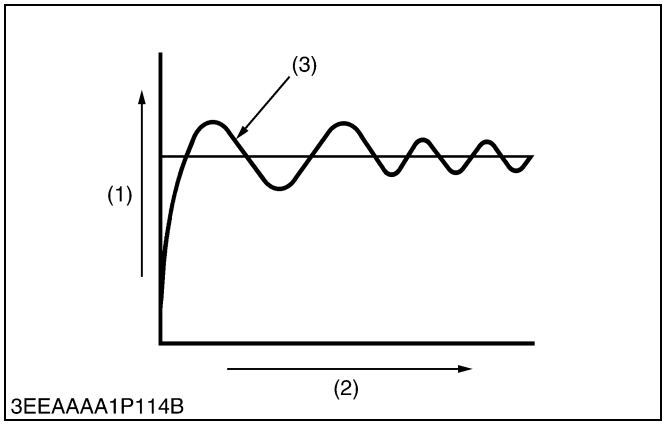
As shown in the figure, the oil flows inside the connected cooler plate, whereas coolant is kept circulating outside the cooler plate, thereby cooling down or warming the oil.

(A) Oil Inlet Port
(B) Oil Outlet Port
(a) Coolant Inlet Port
(b) Coolant Outlet Port

9Y1210674ENM0042US0

3. COOLING SYSTEM

[1] THERMOSTAT



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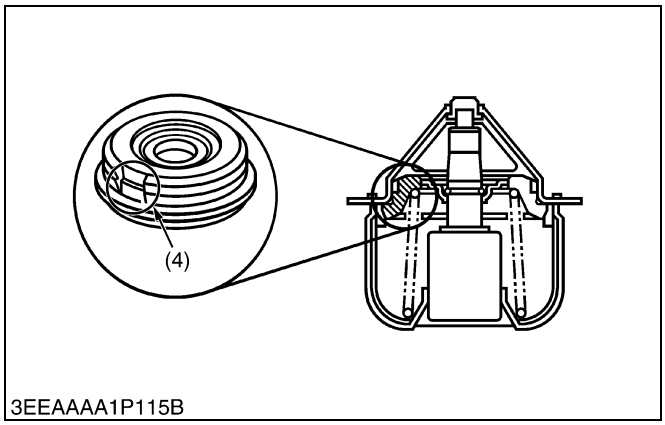

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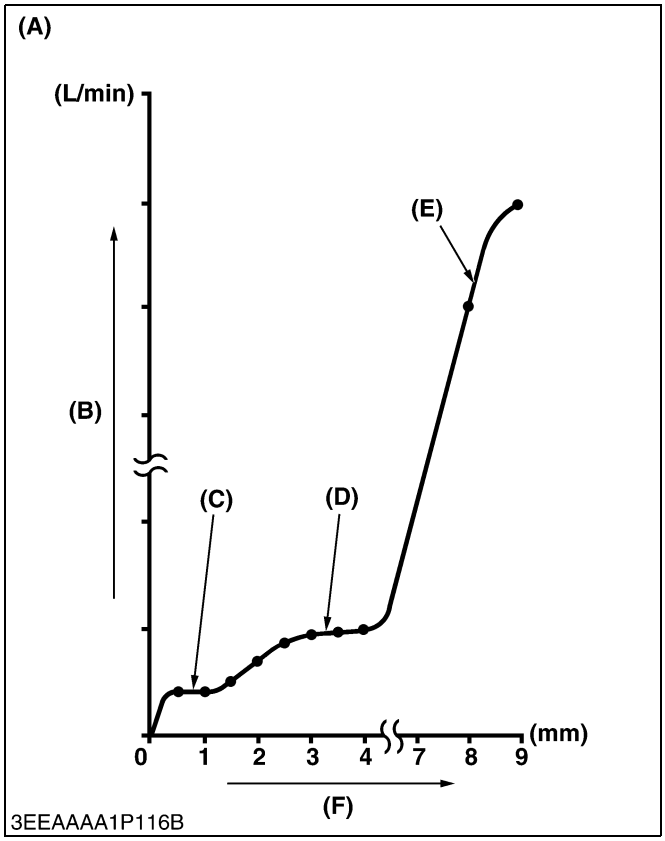

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Conventional thermostatically-controlled valves (outlet water temperature control type) open against the flow of coolant. In this design, the pressure (steam pressure + water pump's discharge pressure) affects the open/close performance of such valve. In other words, the valve may be delayed in opening at a preset opening temperature opening suddenly, above the preset temperature. This is called the overshoot phenomenon.

The overshoot problem invites the undershoot phenomenon too. Too much water cooled by the radiator flows through the water passage, which suddenly closes the valve below the thermostat's preset valve closing temperature.

A repeated cycle of such overshoot (3) and undershoot phenomena is called the water temperature hunting. This hunting problem may adversely affect the cooling system parts, and also the engine and its related components.

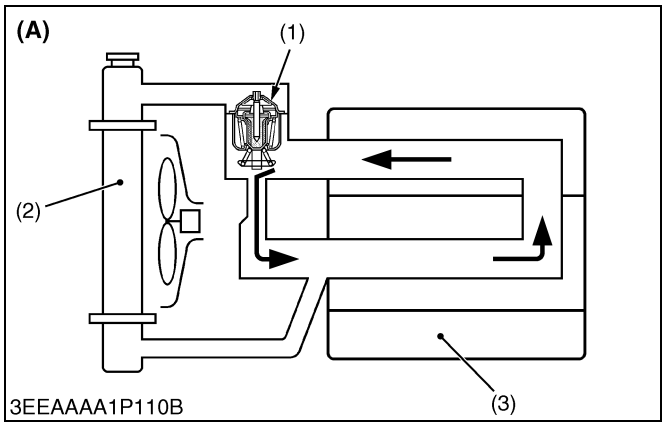
To cope with this trouble, the 07 series engine is equipped with the flow control thermostat. The valve has a notch (4) to control the coolant flow-rate smoothly in small steps.

(1) Coolant Temperature
(2) Time
(3) Overshoot
(4) Notch

(A) Valve Lift Versus Flow-rate
(B) Flow-rate
(C) At Short Valve Lift
(D) At Medium Valve Lift
(E) At High Valve Lift
(F) Valve Lift

9Y1210674ENM0043US0

[2] BOTTOM BYPASS SYSTEM



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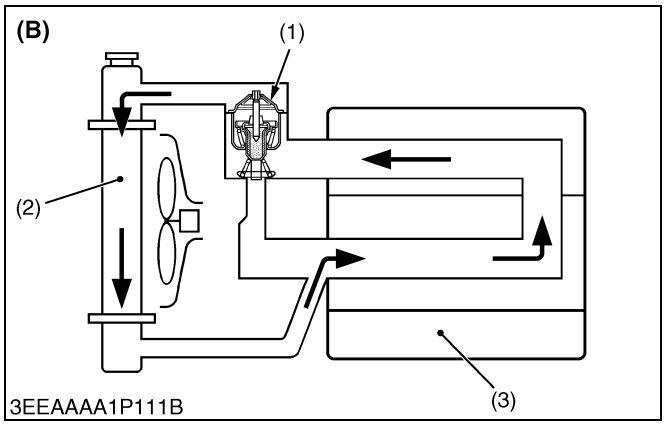

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Bottom bypass system is introduced in the 07 series for improving the cooling performance of the radiator.

While the temperature of coolant in the engine is low, the thermostat (1) is held closed and the coolant is allowed to flow through the bypass pipe and to circulate in the engine.

When the temperature exceeds the thermostat (1) valve opening level, the thermostat (1) fully opens itself to prevent the hot coolant from flowing through the bypass into the engine.

In this way, the radiator can increase its cooling performance.

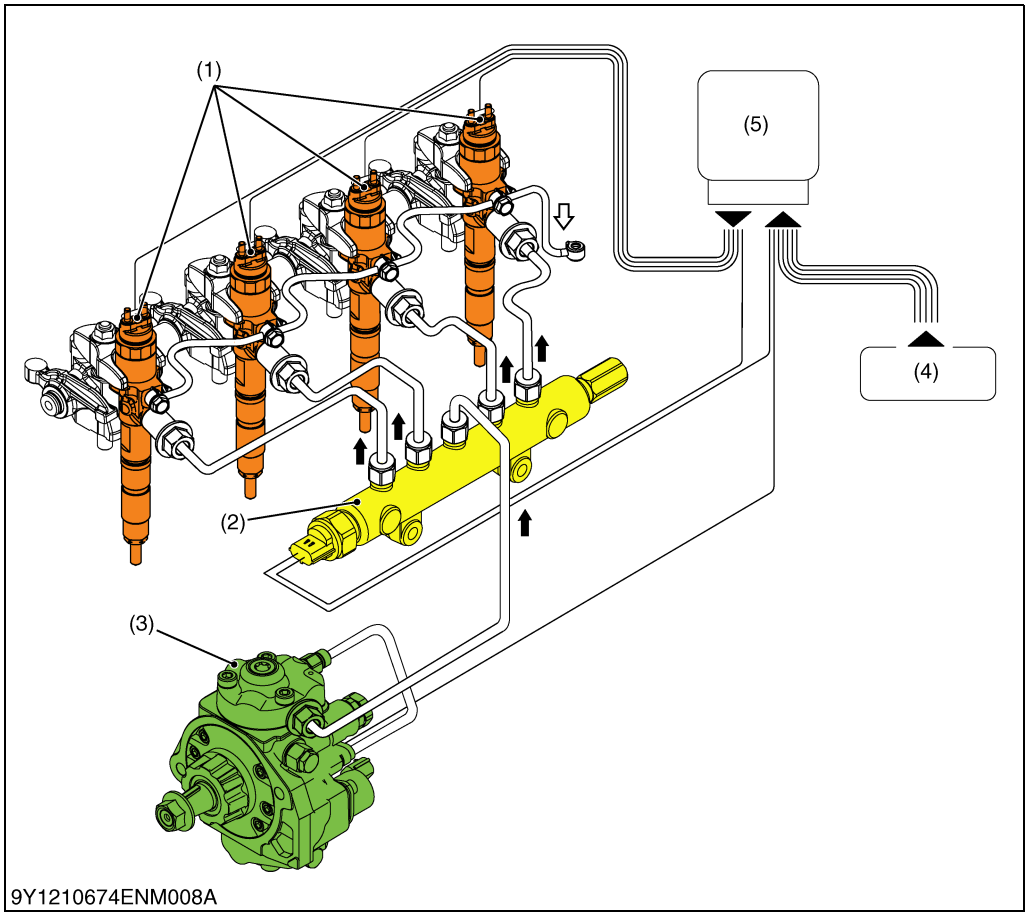
(1) Thermostat
(2) Radiator
(3) Engine

(A) Bypass Opened
(B) Bypass Closed

9Y1210674ENM0044US0

4. FUEL SYSTEM

[1] OVERVIEW



9Y1210674ENM008A

(1) Injector
(2) Rail
(3) Supply Pump
(4) Different Sensors
(5) Engine ECU

The fuel system of this engine is completely different from previous jerk fuel injection pumps. Our common rail system not only complies with strict emission regulations, it enables multiple, precise high-pressure injections that do not vary with engine RPM.

The system is an electronically controlled fuel injection device, with a supply pump (3) that pressurizes the fuel, a rail (2) that stores the high-pressure fuel, injectors (1) that inject the fuel under high-pressure via solenoids into each cylinder and an engine ECU that controls them all.

Various parameters are controlled by the engine ECU, such as the amount of fuel from the injectors and their timing, the pressure of fuel in the rail, etc., as sensed via signals from each sensor and CAN communications from the engine's ECU.

This results in fuel always being injected under ideal conditions, which suppresses the hallmark of a diesel engine, the black smoke during takeoff and acceleration, so there is less smoke, it is cleaner and with a higher output of power.

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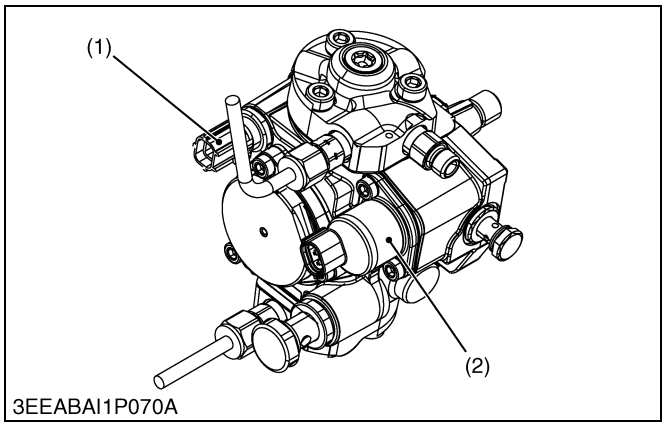
[2] SUPPLY PUMP



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The supply pump is equivalent to previously used injection pumps and it delivers fuel to the rail at a pressure more than double that of previous pumps.

It consists of a feed pump (10), regulating valve (6), SCV (suction control valve) (2), pump unit, delivery valve (3) and a fuel temperature sensor (1).

(1) Fuel Temperature Sensor
(2) SCV (Suction Control Valve)
(3) Delivery Valve
(4) Plunger
(5) Suction Valve
(6) Regulating Valve
(7) Drive Shaft
(8) Eccentric Cam
(9) Ring Cam
(10) Feed Pump

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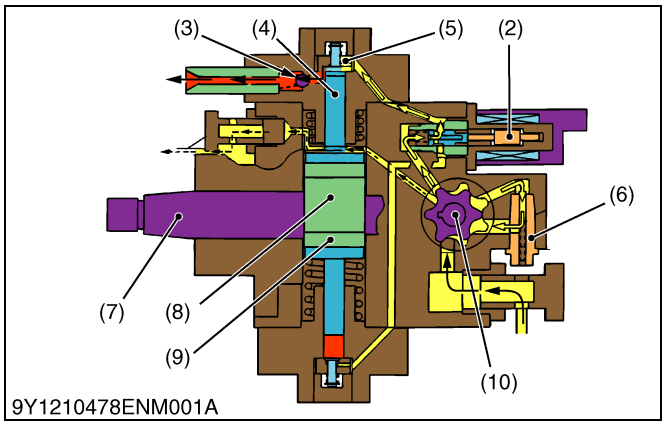

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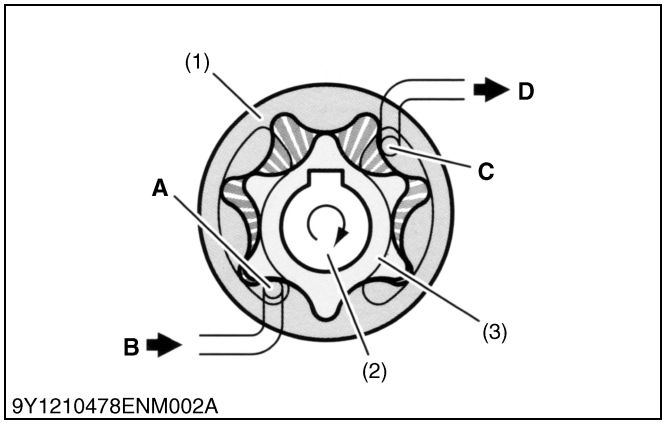
Feed Pump

The feed pump sucks up fuel filtered by the fuel filter and supplies it to the pump unit.

The feed pump is a trochoid pump with an inner rotor and outer rotor (1) geared elliptically; the inner rotor (3) is driven by the drive shaft (2) and drives the outer rotor in turn in the same direction. In the process, the volume of the part enclosed by the teeth of the rotor changes and thus pumps the fuel.



9Y1210478ENM002A

(1) Outer Rotor
(2) Drive Shaft
(3) Inner Rotor

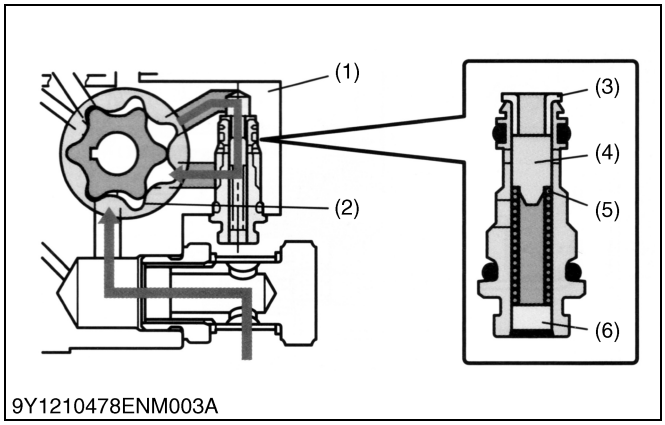
A: Suction Port
B: From The Fuel Tank
C: Discharge Port
D: To Pump Chamber

9Y1210674ENM0003US0

Regulating Valve

The regulating valve controls the fuel feed pressure (feed pump discharge pressure) so it always stays at the set pressure.

When the feed pressure exceeds the set pressure due to changes in the pump's RPM, the piston (4) overcomes the pressure of the spring, opening the valve and returning fuel to the suction side of the feed pump (2).

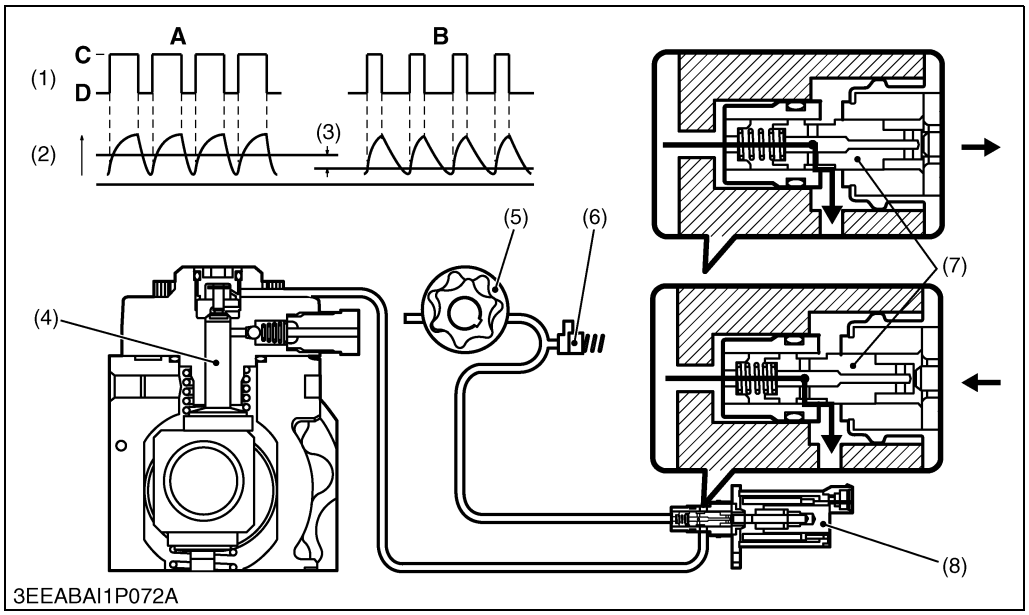


9Y1210478ENM003A

(1) Pump Housing
(2) Feed Pump
(3) Bushing
(4) Piston
(5) Spring
(6) Plug

9Y1210674ENM0004US0

SCV (suction control valve)



(1) Drive Voltage
(2) Amperage
(3) Average Current Differential
(4) Plunger
(5) Feed Pump
(6) Regulating Valve
(7) Cylinder
(8) SCV (Suction Control Valve)

A: Low Suction Volume
B: High Suction Volume
C: ON
D: OFF

By regulating the amount of fuel supplied to the plunger (4), the SCV (8) controls the pressure of fuel in the rail. The SCV uses a linear solenoid valve and the fuel flow is controlled by controlling how long the SCV is energized by the ECU.

There are two types of SCV valve, the fail-open type (max flow with no power) and the fail-closed type (min flow with no power) and the engine uses a fail-open SCV.

When power flows to the SCV (8), the actuator inside moves according to the duty ratio, pressing on the cylinder (7) and altering the flow of fuel corresponding to the size of the cylinder opening and establishing the appropriate amount.

1) Fail-open type

With no power to the solenoid, the cylinder is returned via spring force and the valve opens wide, supplying a large quantity of fuel to the plunger.

When the solenoid is energized, the armature presses on the cylinder, compressing the spring and reducing the quantity of fuel supplied. The solenoid turns ON & OFF according to the duty ratio. The quantity of fuel supplied to the plunger is in proportion to the size of the cylinder opening.

2) Duty ratio control

The engine's ECU outputs a waveform signal for a set interval. The current amperage is the average amperage of the average current differential. When this average value rises, the size of the valve opening is reduced, and conversely, when it drops, the valve opens wider.

3) When the SCV operates for a short time

The average current to the solenoid is low, so the cylinder is returned via spring force and the valve opens wide, supplying a large quantity of fuel to the plunger.

4) When the SCV operates for a long time

The average current to the solenoid is high, so the armature presses on the cylinder, compressing the spring, closing the valve opening and supplying a smaller quantity of fuel to the plunger.

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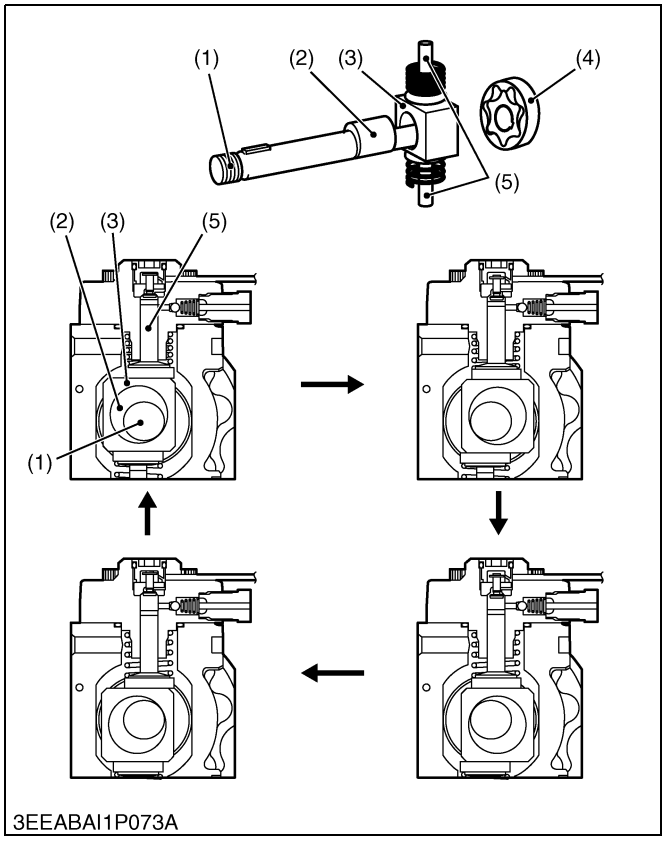

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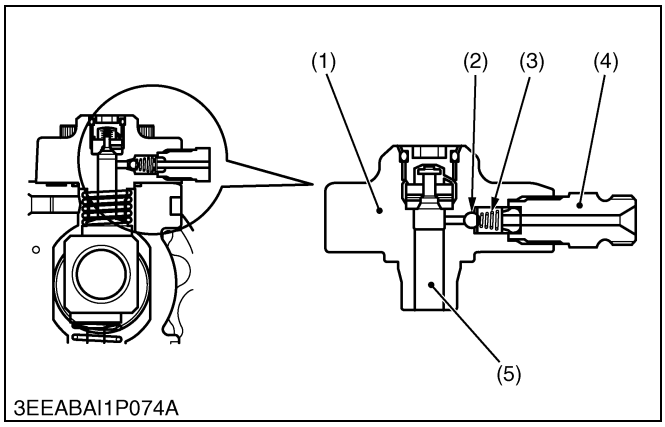
Pump Unit

The pump unit works to increase the pressure of fuel received from the SCV and consists of a drive shaft (1), ring cam (3) and two plungers (5). A ring cam (3) is mounted on the outside of the eccentric cam (2), which is on the same axle as the drive shaft; the plungers are arranged symmetrically vertically on the ring cam.

When the drive shaft rotates, the eccentric cam rotates eccentrically and the ring cam (3) is driven up and down by it, which operates the two plungers (5) through their cycles.

(1) Drive Shaft
(2) Eccentric Cam
(3) Ring Cam
(4) Feed Pump
(5) Plunger

9Y1210674ENM0006US0



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Delivery Valve

The delivery valve is integrated with the element (1) and consists of a check ball (2), spring (3) and holder (4).

When the pressure on the plunger side (5) equals/exceeds the pressure on the rail side, the check ball opens and discharges fuel. As soon as the fuel pressure feed is complete, the check ball is pressed back by the spring and when it touches the seat of the element, it cuts off the rail side from the plunger side, thus preventing any backflow of fuel.

(1) Element
(2) Check Ball
(3) Spring
(4) Holder
(5) Plunger

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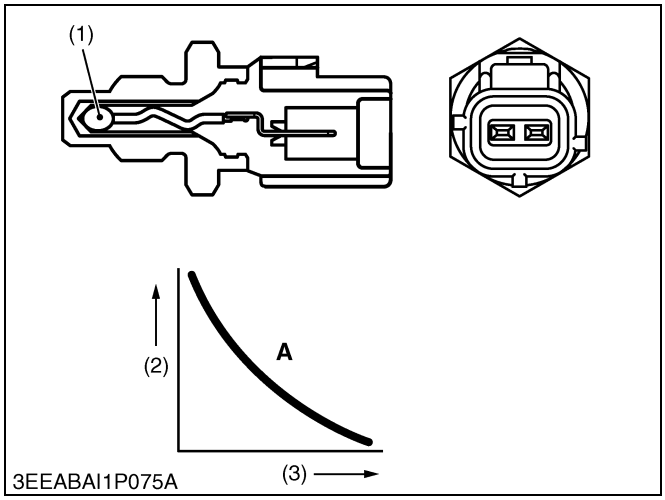

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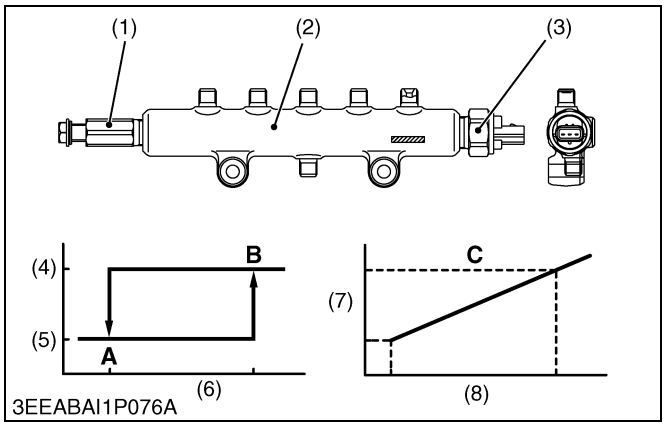
Fuel Temperature Sensor

The fuel temperature sensor is mounted on the fuel intake side and detects the temperature of the fuel using the characteristic of the thermistor (1), whose electrical conductivity varies with temperature.

(1) Thermistor
(2) Resistance
(3) Temperature
A: Thermistor Temperature Change Curve

9Y1210674ENM0052US0

[3] RAIL



The rail (2) stores fuel at the high pressure applied by the supply pump and supplies the shared pressure to the injectors of each cylinder. The rail incorporates control parts-a rail pressure sensor (3) and a pressure limiter (1).

The pressure of the fuel in the rail is detected by the rail pressure sensor, and optimal feedback control is provided for the engine RPM and load. This greatly improves the ability to raise the pressure at low RPMs and enables high-pressure injection from low speed ranges.

Pressure Limiter

The pressure limiter operates when the pressure inside the rail becomes excessively high (valve opens), and then once the pressure drops to a certain pressure, it acts to keep the pressure (valve closes).

Fuel discharged by the pressure limiter returns to the fuel tank.

Please note that the pressure limiter is not treated as a part, so replacement requires replacing the rail assembly.

Valve opening pressure	Reference value	Approx. 220 MPa (2240 kgf/cm^2, 31900 psi)
Valve closing pressure		Approx. 50 MPa (510 kgf/cm^2, 7300 psi)

Rail Pressure Sensor

The rail pressure sensor is mounted on the rail, detects the pressure inside the rail and sends a signal to the engine ECU.

This sensor is a semiconductor type of pressure sensor, which uses the piezo resistance effect, in which increasing the pressure on its silicon element changes its electrical resistance. Please note that the rail pressure sensor is not treated as a part, so replacement requires replacing the rail assembly.

(1) Pressure Limiter
(2) Rail
(3) Rail Pressure Sensor
(4) Valve (Open)
(5) Valve (Close)
(6) Rail Pressure
(7) Output Voltage
(8) Rail Pressure

A: Return
B: Abnormally High Pressure
C: Rail Pressure Characteristics

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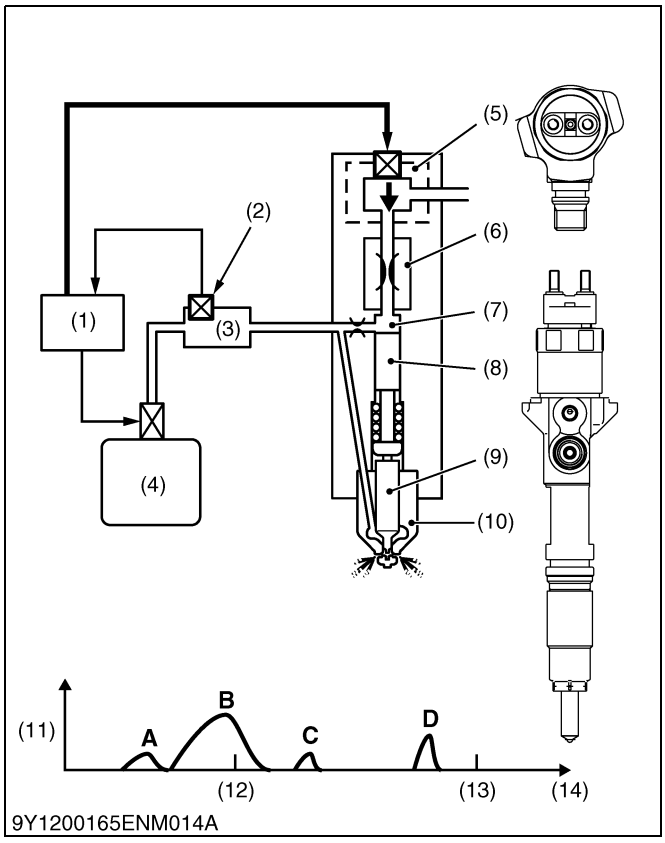
[4] INJECTOR



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The injectors inject high-pressure fuel from the rail into the combustion chamber of the engine, using signals from the engine's ECU to produce the ideal timing, amount of fuel, mixture and spray.

The injector injects a finely tuned spray in three pulses during the combustion stage. First a small amount is injected, mitigating the effect of the initial burn and reducing NOx (oxides of nitrogen) and noise. The main injection follows with the real burn, and in the last stage, a diffuse combustion is induced, thus reducing particulate matter (PM) generated by the main injection.

Injector Architecture

Injectors consist of nozzle components (nozzle (10) and needle valve (9)), a TWV (two-way valve) (5), which controls the volume and mixture of fuel, a control chamber (7) with an intake orifice and discharge orifice (6), a command piston (8) and a nozzle spring.

(1) Engine ECU
(2) Rail Pressure Sensor
(3) Rail
(4) Supply Pump
(5) TWV (Two-way Valve)
(6) Discharge Orifice
(7) Control Chamber
(8) Command Piston
(9) Needle Valve
(10) Nozzle
(11) Injection Amount
(12) T.D.C (Top Dead Center)
(13) B.D.C (Bottom Dead Center)
(14) Crank Angle

A: Pre-injection
B: Main Injection
C: After Injection
D: Post Injection

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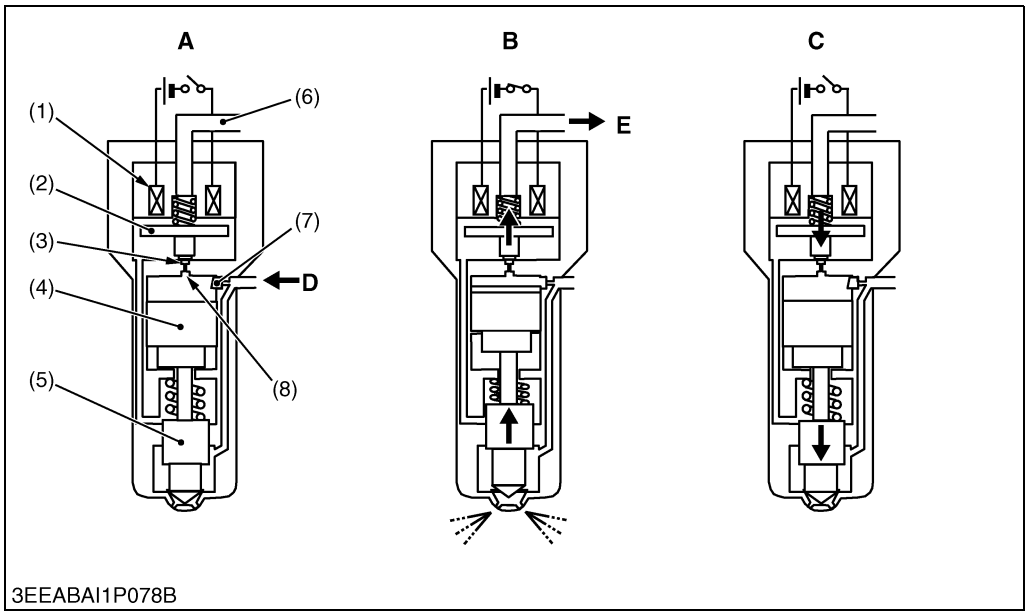
Injector Operation



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(1) Solenoid
(2) TWV (Two-way Valve)
(3) Discharge Orifice
(4) Command Piston
(5) Needle Valve
(6) Leak Passage
(7) Intake Orifice
(8) Control Chamber

A: Injection Stop
B: Injection Start
C: Injection Finish
D: From Rail
E: To Fuel Tank

The injector uses the signal output from the engine ECU to control the injection with the fuel pressure in the control chamber.

The system for controlling the pressure of the control chamber works by energizing the solenoid, which opens the passage of the chamber's discharge orifice and the fuel is injected due to the drop in pressure. When the current stops, the pressure in the control chamber returns to what it was and injection ceases.

1) Injection Stop

With no current to the solenoid (1), the TWV (2) cuts off the discharge orifice (3) passage, so rail pressure is applied to the control chamber (8) and the bottom of the needle valve (5). As the diameter of the command piston (4) on the control chamber side is larger than the diameter of the bottom of the needle valve, it works to push the needle valve down, which is compounded by the nozzle spring pushing it down, and the needle valve is closed.

2) Injection Start

When the solenoid (1) is energized, it draws the TWV (2) up, opening the passage of the discharge orifice (3), returning fuel in the control chamber (8) to the fuel tank via the leak passage (6) and dropping the pressure.

The drop in the pressure of the control chamber causes the pressure applied to the bottom of the needle valve (5) to become greater than the pressure on the control chamber side, and the needle valve compresses the nozzle spring and starts injecting fuel.

3) Injection Finish

When current to the solenoid (1) stops, the TWV (2) lowers and the discharge orifice (3) passage is closed.

When the passage of the discharge orifice closes, the fuel pressure in the control chamber (8) recovers to the rail pressure, so the needle valve (5) is pressed back via the command piston (4), stopping the injection.

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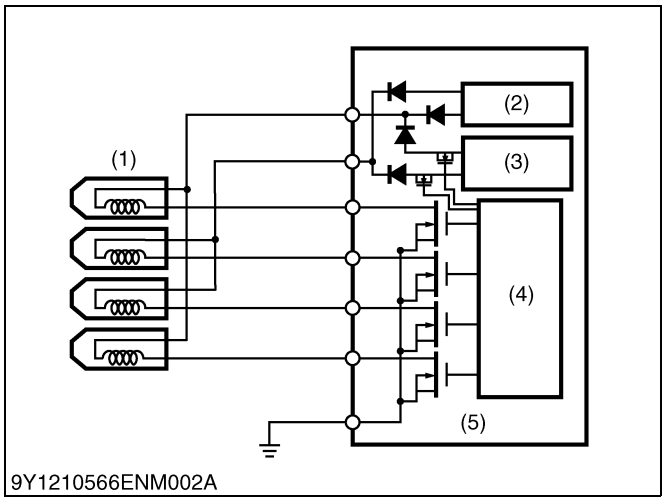

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Injector Drive Circuit

To increase the responsiveness of the injector, the voltage that drives the injector is raised to a high voltage, accelerating the magnetization of the solenoid and increasing the responsiveness of the TWV.

The battery voltage is raised to about 110 V by a high-voltage generating circuit inside the ECU and that voltage is supplied to the injector to actuate it.

(1) Injector
(2) Rated Amperage Circuit
(3) High-voltage Generating Circuit
(4) Control Circuit
(5) Engine ECU

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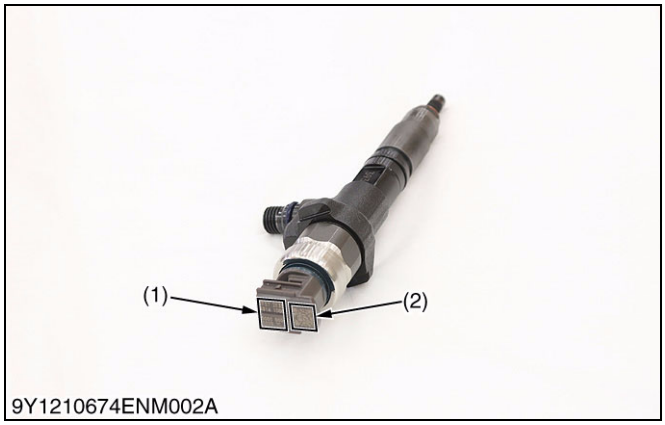

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Injector QR/ID Codes

Injectors are processed to exacting tolerances, but there are minute variations in the amount they inject, so to correct for these variations, a correction volume is recorded on the QR/ID codes of the injectors.

During manufacture, the QR code is read by a scanner and the correction value is registered in the ECU.

(1) ID Code (2) QR Code

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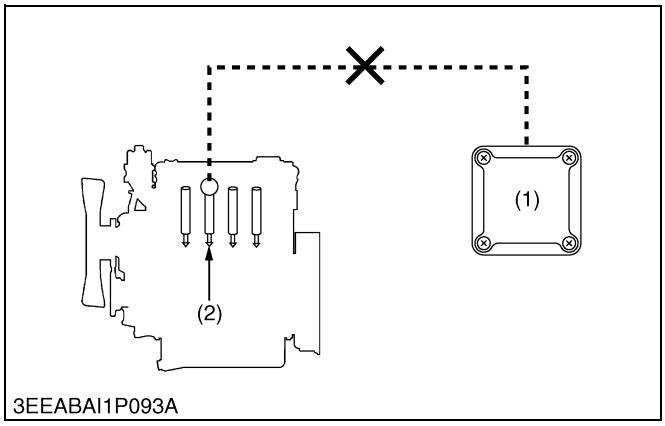

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When Replacing an Injector

Register the ID code of the replacement injector into the ECU.

(1) Engine ECU (2) Replacement Injector

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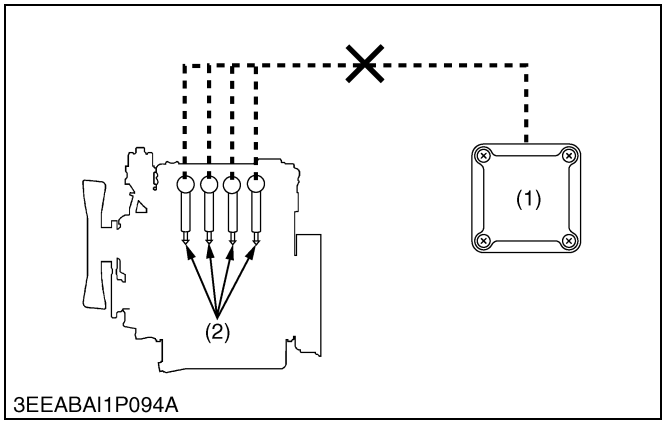

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When Replacing the Engine ECU

Register the ID codes of all of the injectors into the replacement engine ECU.

When replacing an ECU, as it is necessary to write all of the data, including the injector corrections, only KUBOTA can write the data to the ECU.

(1) Replacement ECU (2) Injector

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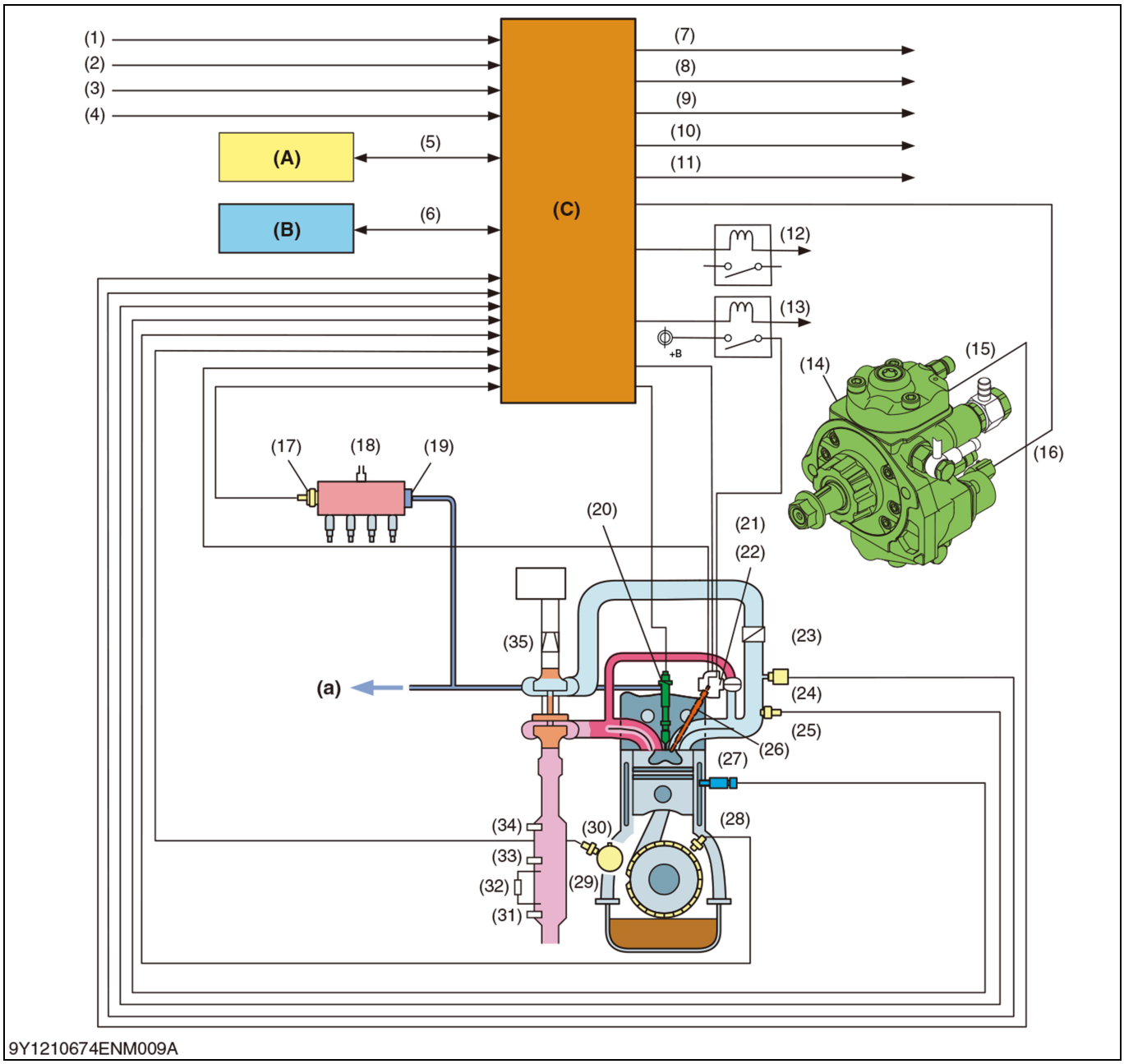
[5] ENGINE CONTROL SYSTEM



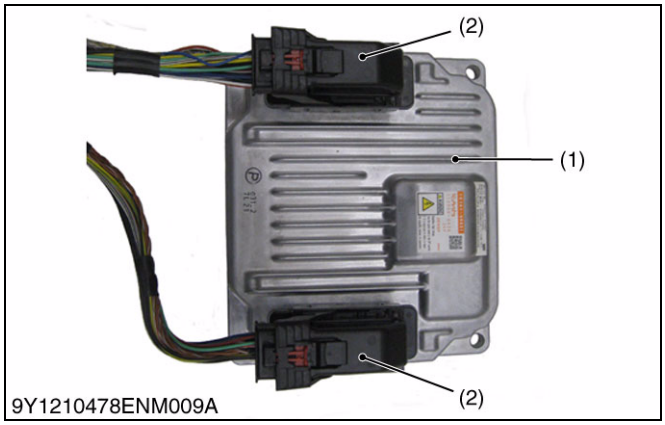
(1) Key Switch ON Signal
(2) Starter Switch Signal
(3) Emergency Stop Switch
(4) Oil Pressure Switch
(5) CAN Communication for OEM Machine (*Accelerator Position Signal, *Neutral Switch, *Machine Travel Speed Signal)
(6) CAN Communication for Service
(7) Engine Warning Light Signal
(8) Stop Lamp Signal
(9) Oil Pressure Warning Lamp Signal
(10) Overheat Lamp Signal
(11) Glow (Air Heater) Lamp Signal
(12) Starter Relay
(13) Glow Relay
(14) Supply Pump
(15) Fuel Temperature Sensor
(16) SCV (Suction Control Valve)
(17) Rail Pressure Sensor
(18) Rail
(19) Pressure Limiter
(20) Injector
(21) EGR DC Motor
(22) EGR Lift Sensor
(23) **Intake Throttle Valve
(24) Intake Air Pressure Sensor
(25) Intake Air Temperature Sensor
(26) Glow Plug
(27) Coolant Temperature Sensor
(28) Crankshaft Position Sensor
(29) Diesel Particulate Filter (Hereinafter Referred To As The "DPF") Muffler
(30) Camshaft Position Sensor
(31) **Temperature Sensor (DPF Outlet Exhaust Temperature) (T_2)
(32) **Differential Pressure Sensor (DPF Differential Pressure) (ΔP)
(33) **Temperature Sensor (DPF Inlet Exhaust Temperature) (T_1)
(34) **Temperature Sensor (DOC Inlet Exhaust Temperature) (T_0)
(35) Air Flow Sensor

(A) CAN2 Connector (For OEM Machine)
(B) CAN1 Connector (For Service)
(C) Engine ECU
(a) To Fuel Tank

■ **NOTE**
- **The signals marked with * are CAN communication.**
- **The parts marked with ** are only for -E4B, -TE4B. (TIE4B do not equip the parts).**

9Y1210674ENM0049US0

(1) Engine ECU



9Y1210478ENM009A

The engine ECU (1) controls the amount, timing, mixture and pressure of fuel that is injected. The engine ECU (1) operates each kind of control based on the signals from each type of sensor.

The actuator for controlling the amount, timing and mixture of fuel injection is the injector, while the actuator for controlling fuel pressure is the supply pump.

■ **Fuel Quantity Control**

The amount of fuel to be injected is determined using a basic injection amount, which is calculated based on the state of the engine and driving conditions, with corrections added for parameters such as water temperature, fuel temperature, intake air temperature, intake pressure, etc.

■ **Injection Timing Control**

The ECU controls the timing for starting to energize the injectors, first determining the timing for the main injection and then setting the timing of other injections, such as pilot injections.

■ **Fuel Mixture Control**

By conducting a pilot injection, the initial fuel mixture is kept to a minimum, mitigating the explosive initial combustion and reducing NOx and noise.

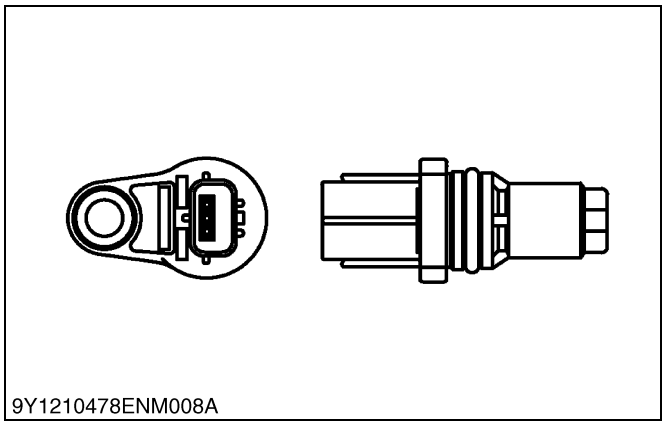
■ **Fuel Pressure Control**

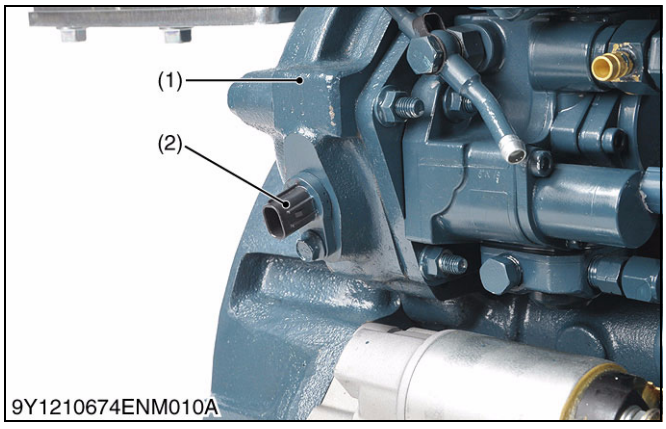
The ECU calculates the set fuel injection pressure based on the engine load (last injection amount and engine RPM) and controls the amount the supply pump supplies and the fuel pressure inside the rail.

(1) Engine ECU (2) ECU Connector

9Y1210674ENM0029US0

(2) Sensor


9Y1210478ENM008A



9Y1210674ENM010A

Crankshaft Position Sensor

The crankshaft position sensor (2) is mounted near the supply pump gear of the flyweel housing (1) and the sensor uses an MRE (magnetic resistance element) type of sensor.

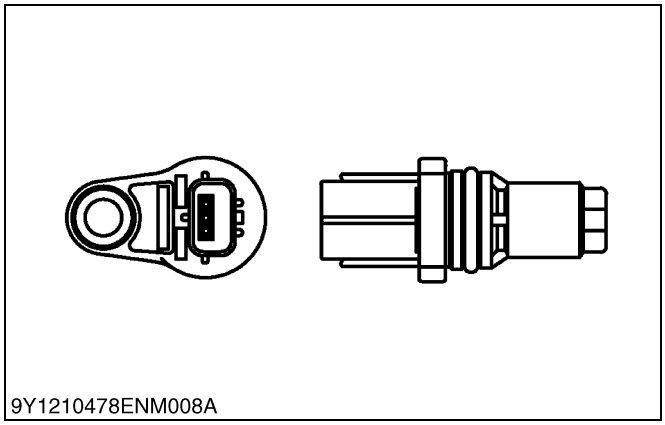
When the pulsar gear passes by the sensor, it alters the magnetic field inside the sensor, generating an AC voltage, which is output to the engine ECU.

Further, the gear has a wide part between teeth, which alters the waveform of the AC voltage and the sensor detects the crankshaft position with every revolution; this change in the voltage is amplified by the IC circuit inside the sensor and outputs it to the engine ECU.

The engine ECU uses the signals to calculate the piston position and engine RPM.

(1) Flyweel Housing (2) Crankshaft Position Sensor

9Y1210674ENM0030US0



9Y1210478ENM008A

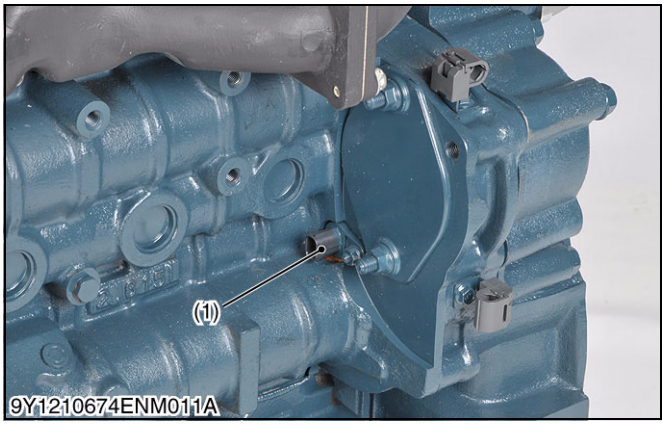
Camshaft Position Sensor

The camshaft position sensor (1) is mounted near the camshaft gear and the sensor functions in the same way as the crankshaft position sensor.

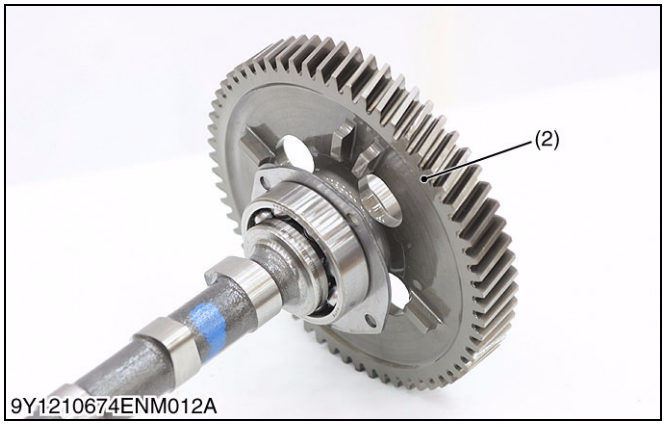
This sensor detects the extra teeth (two teeth) of the camshaft pulsar gear (2) and the engine ECU uses the signal to calculate the piston position.

(1) Camshaft Position Sensor (2) Camshaft Pulsar Gear

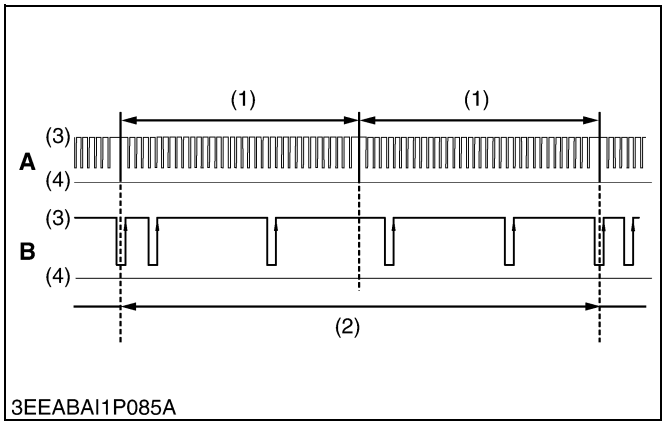
9Y1210674ENM0031US0



9Y1210674ENM011A



9Y1210674ENM012A



3EEABAI1P085A

This figure shows the pulse chart of the crankshaft position sensor output signal and camshaft position sensor output signal.

The camshaft pulsar gear rotates once when the crankshaft pulsar gear rotates twice (12.6 rad (720 °) crank angle).

there is a gearless section in the crankshaft pulsar gear. The ECU determines whether it is TDC if the camshaft position sensor signal is detected while the crankshaft position sensor is passing this gearless section.

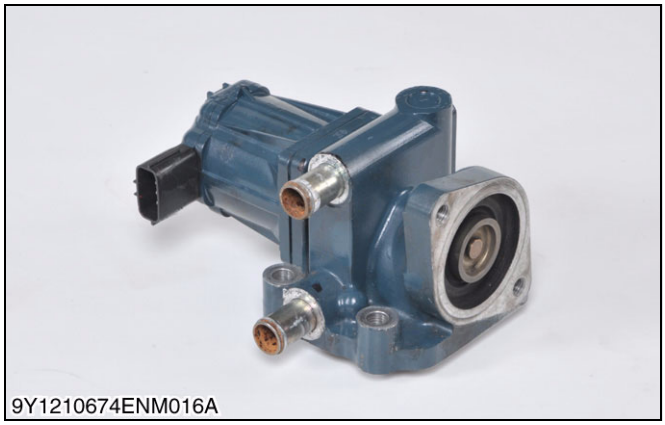
(1) 56 pulses (6.28 rad (360 °) crank angle)
(2) 5 pulses (12.6 rad (720 °) crank angle)
(3) 5 V
(4) 0 V

A: Crankshaft Position Sensor Output Voltage
B: Camshaft Position Sensor Output Voltage

9Y1210674ENM0032US0

5. EGR SYSTEM

[1] EGR VALVE

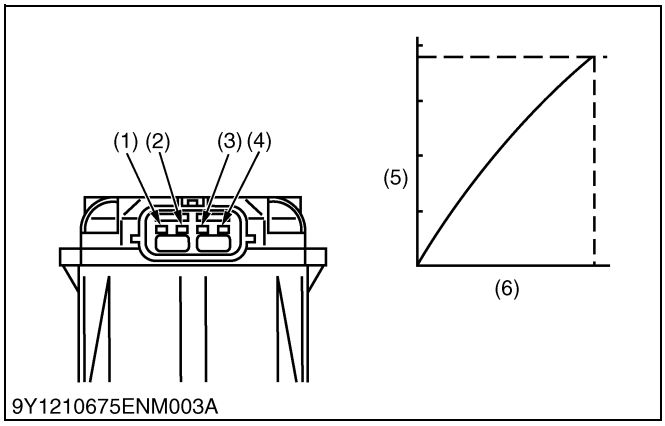

9Y1210674ENM016A

Water Cooled EGR Valve

This is a device that regulates EGR gas flow. The degree the valve is open is detected using a lift sensor and a motor is used to set this to the degree of open calculated using signals including the engine speed.

Also, passing engine coolant through the housing enables controlling temperature rise of the EGR valve.

9Y1210674ENM0016US0



9Y1210675ENM003A

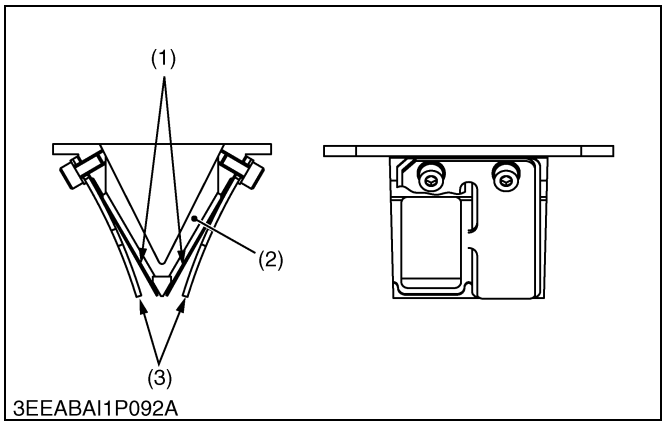
EGR Valve Lift Sensor

How far the EGR valve is open is detected by a contact type of position sensor that detects the movement of the motor's shaft. The motor's shaft opens and closes the valve by changing the rotation of the motor into linear motion via a screw deceleration mechanism.

(1) CAN H
(2) CAN L
(3) GND (−)
(4) Power (+)
(5) Exhaust Gas Flow
(6) CAN Communication Data

9Y1210674ENM0046US0

[2] REED VALVE



3EEABAI1P092A

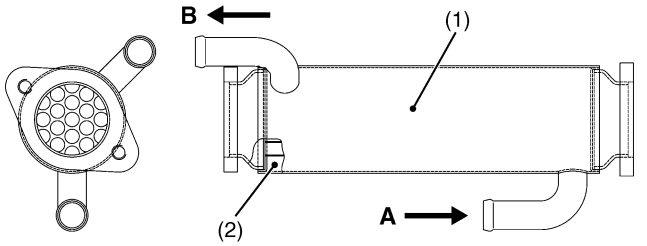
The reed valves are set at the point where exhaust gases that have passed through the EGR valve mix with intake air and they prevent air on the air cleaner side from flowing to the EGR cooler side.

These thin plate springs (reed valves) mounted at the bottom of the EGR valve motor open and close the EGR gas passage (during intake: reed valve is closed; during exhaust: open) and prevent the intake air from backflowing to the exhaust side.

(1) Valve
(2) Case
(3) Stopper

9Y1210674ENM0018US0

[3] EGR COOLER



3EEAAAA1P193F

The EGR (Exhaust Gas Recirculation) cooler (1) is used to lower combustion temperature and efficiently cool EGR gas, with the aim of reducing the NOx that is in the exhaust gas of diesel engine.

The EGR cooler (1) is set between the cylinder head and the EGR valve and returns the cooled exhaust gases to the engine suction side.

The EGR cooler (1) has resistant to clogging up, compact and efficient tubes (2) internally.

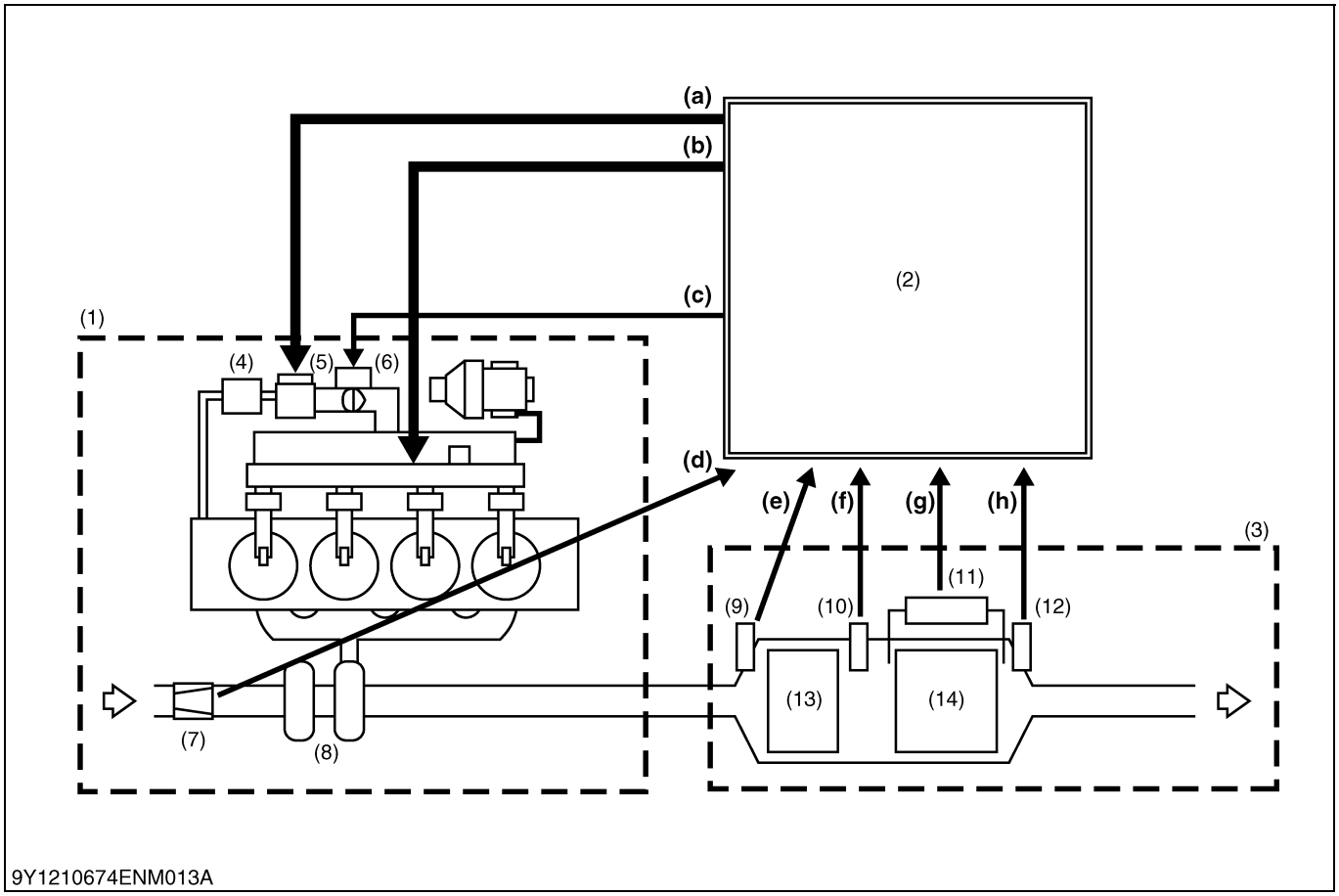
(1) EGR Cooler
(2) Tube

A: Coolant Inlet Port
B: Coolant Outlet Port

9Y1210674ENM0047US0

6. AFTER TREATMENT SYSTEM

[1] AFTER TREATMENT DEVICES [V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B]



(1) Common Rail System
(2) ECU
(3) After Treatment Devices
(4) EGR Cooler
(5) EGR Valve
(6) Intake Throttle Valve
(7) Air Flow Sensor
(8) Turbo Charger
(9) Temperature Sensor (DOC Inlet Exhaust Temperature) (T_0)
(10) Temperature Sensor (DPF Inlet Exhaust Temperature) (T_1)
(11) Differential Pressure Sensor (DPF Differential Pressure) (ΔP)
(12) Temperature Sensor (DPF Outlet Exhaust Temperature) (T_2)
(13) Diesel Oxidation Catalyst (DOC)
(14) Diesel Particulate Filter (DPF)

(a) EGR Valve Opening
(b) Injection Pattern
(c) Inlet Throttle Valve Angle
(d) Air Flow Sensor
(e) T_0 (DOC Inlet Exhaust Temperature)
(f) T_1 (DPF Inlet Exhaust Temperature)
(g) ΔP (DPF Differential Pressure)
(h) T_2 (DPF Outlet Exhaust Temperature)

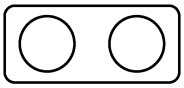
9Y1210674ENM0019US0

■ **NOTE**

- **Lighting patterns when the lamp is lighted by ECU directly.**

9Y1210674ENM0048US0

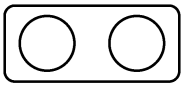
Permit

Auto Regeneration Permit	RGN and Inhibit Lamp	Manual RGN Demand Lamp	Warning Lamp	State of Regeneration
				
Level 0 (No need Regeneration)				Regeneration is not required
Level 1 (Auto Regeneration)	●			Regeneration starts automatically when the PM level reachs to this level. Parked regeneration is impossible in this level.
Level 2 (Request parked Regeneration)	●	★		ECU requests parked regeneration if the PM level does not decrease to automatic regeneration level in 1800 seconds after automatic regeneration starts. (Automatic regeneration does not stop in this level.)
Level 3 (Parked Regeneration)	●	★	●	Automatic regeneration stops. Operator had better park the machine and start manual regeneration as soon as possible. During parked regeneration, machine operation is restricted.
Level 4 (Regeneration with service tools)			●	Parked regeneration is impossible. Regeneration is possible with service tools only. (Service tools are available among all levels without level 5)
Level 5 (DPF Cleaning)			●	Regeneration is impossible even with service tools. DPF cleaning is necessary.

●: Lighting, ★: Blinking

9Y1210674ENM0020US0

Inhibit

Auto Regeneration Inhibit	RGN and Inhibit Lamp	Manual RGN Demand Lamp	Warning Lamp	State of Regeneration
				
Level 0 (No need Regeneration)	★			Regeneration is not required
Level 1 (Auto Regeneration)	★			Automatic regeneration inhibit
Level 2 (Request parked Regeneration)	★	★		ECU requests parked regeneration if the PM level does not decrease to automatic regeneration level in 1800 seconds after automatic regeneration starts. (Automatic regeneration does not stop in this level.)
Level 3 (Parked Regeneration)	★	★	●	Automatic regeneration stops. Operator had better park the machine and start manual regeneration as soon as possible. During parked regeneration, machine operation is restricted.
Level 4 (Regeneration with service tools)	★		●	Parked regeneration is impossible. Regeneration is possible with service tools only. (Service tools are available among all levels without level 5)
Level 5 (DPF Cleaning)	★		●	Regeneration is impossible even with service tools. DPF cleaning is necessary.

●: Lighting, ★: Blinking

9Y1210674ENM0021US0

Diesel Oxidation Catalyst (DOC)

An oxidizing catalyst set in front of the Diesel Particulate Filter (DPF) step that uses post injection unburned fuel to actively regenerate the DPF.

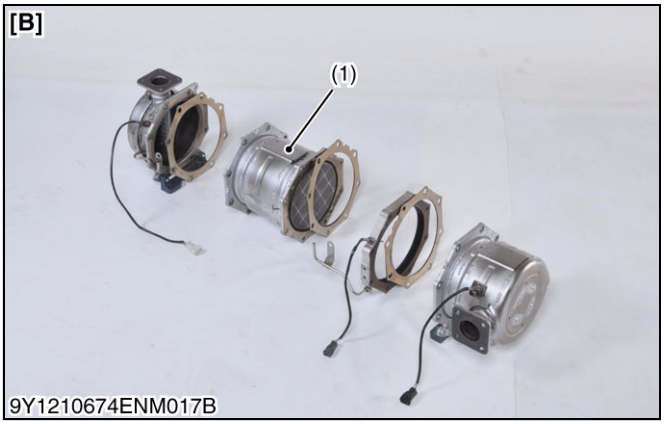
(1)	Diesel Oxidation Catalyst (DOC)	**[A]**	**V2607-CR-E4B**
		[B]	**V2607-CR-TE4B, V3307-CR-TE4B**

9Y1210674ENM0022US0

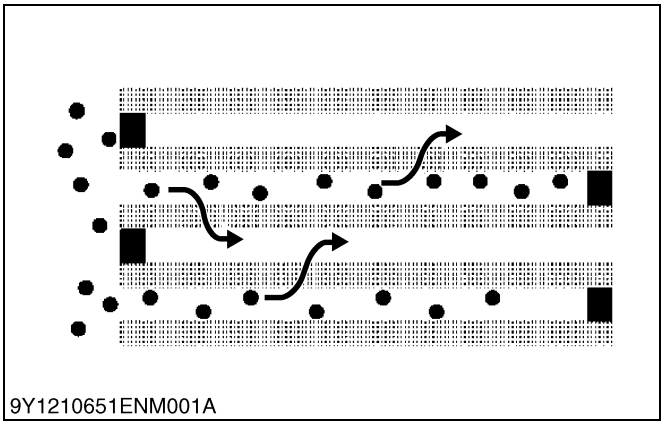
[A]

9Y1210674ENM003D

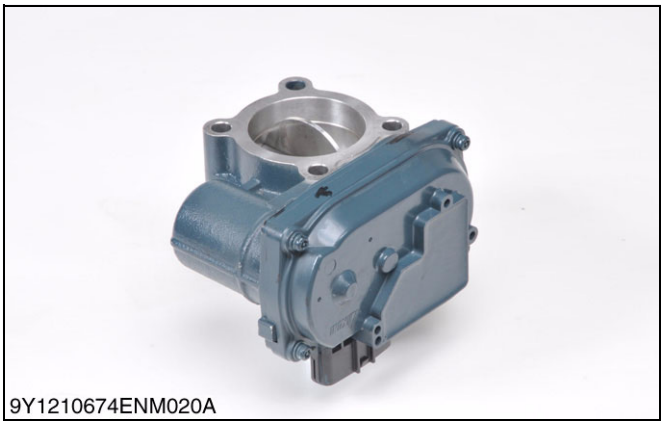
[B]



9Y1210674ENM017B



9Y1210651ENM001A



9Y1210674ENM020A

Diesel Particulate Filter (DPF)

The Diesel Particulate Filter (DPF) is a device that captures and combusts PM in the exhaust gas.

Physically captures the PM using a filter which spontaneously combusts when exhaust gas temperature is high.

However, while exhaust gas temperature is low PM does not spontaneously combust the pressure differential between the inlet and outlet of the DPF is detected and the PM is combusted using a heat source generated using DOC to regenerate the filter.

(1) Diesel Particulate Filter (DPF)

[A] V2607-CR-E4B
[B] V2607-CR-TE4B, V3307-CR-TE4B

9Y1210674ENM0023US0

Intake Throttle Valve

The amount of air intake is regulated by the angle of the throttle valve and the exhaust temperature is controlled when regenerating the DPF muffler.

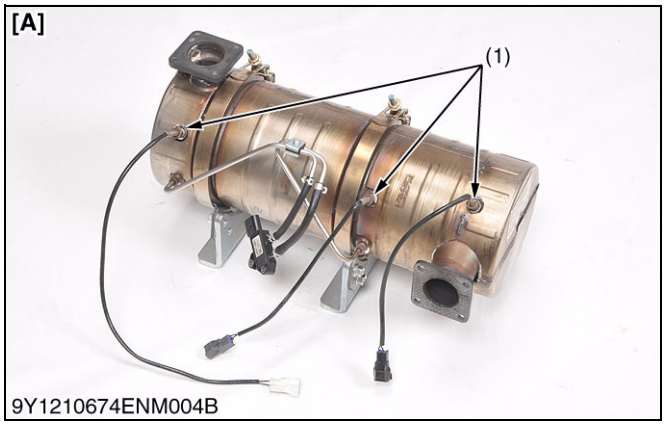
9Y1210674ENM0024US0


9Y1200165ENM004A

Air Flow Sensor

The amount of air intake required for control of the EGR valve used to reduce NOx is measured.

9Y1210674ENM0025US0



9Y1210674ENM004B

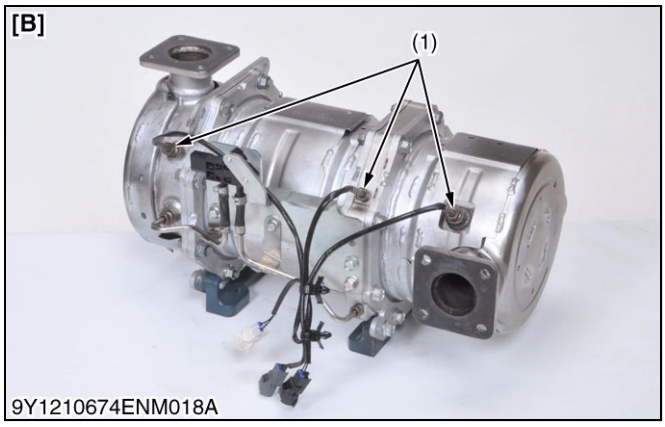
Temperature Sensor

This is mounted on the DPF muffler and the DPF muffler DOC intake, DPF intake, and DPF discharge exhaust temperature, needed for the post processing system, are measured.

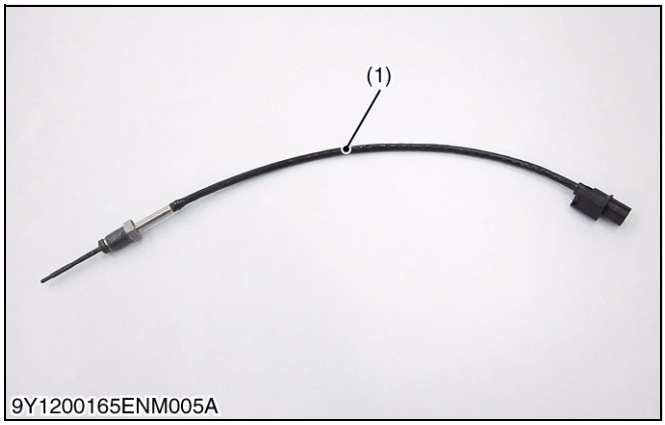
(1) Temperature Sensor

[A] V2607-CR-E4B
[B] V2607-CR-TE4B, V3307-CR-TE4B

9Y1210674ENM0026US0



9Y1210674ENM018A



9Y1200165ENM005A

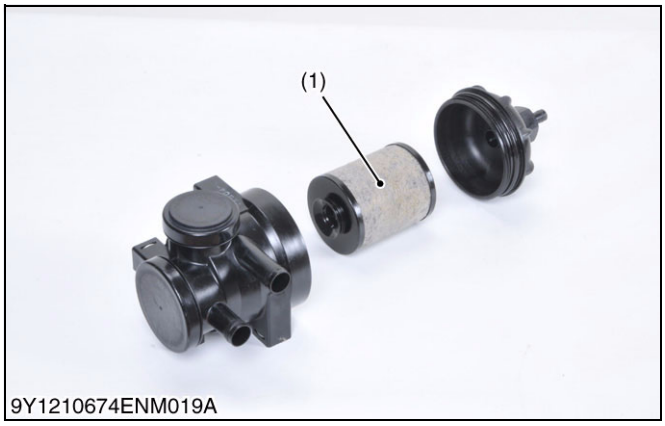
Differential Pressure Sensor

The differential pressure sensor is a sensor that detects the pressure differential between the inlet and the outlet of the DPF.

The engine ECU calculates the amount of accumulated PM in the DPF using this signal.

(1) Differential Pressure Sensor

9Y1210674ENM0027US0



Oil Separator

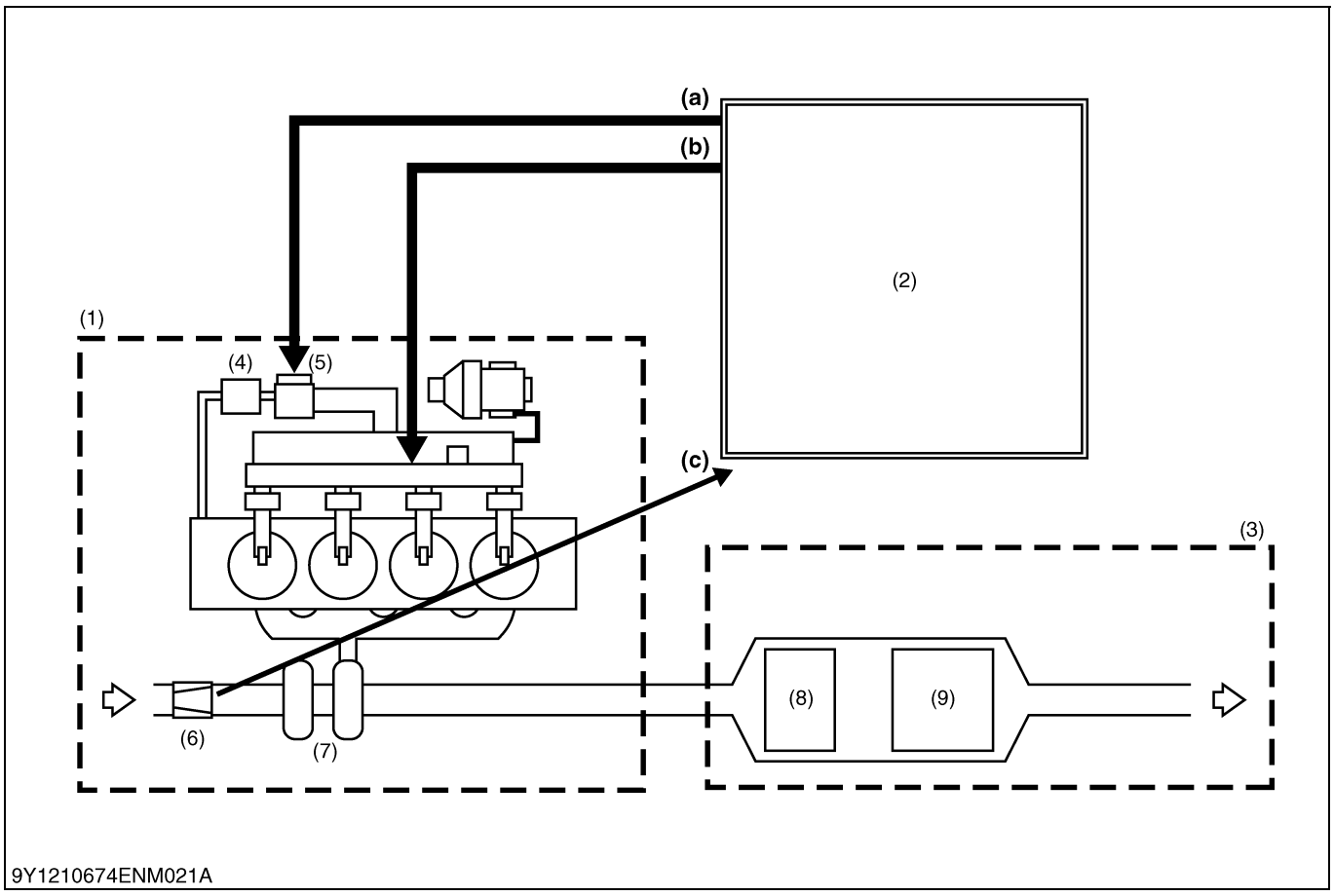
Removes oil in the blowby gases that pass through the element (1) and the oil is returned to the oil pan.

Blowby gases that pass through the element (1) are mixed into the intake upstream from the turbo charger.

(1) Element

9Y1210674ENM0028US0

[2] AFTER TREATMENT DEVICES [V2607-CR-TIE4B / V3307-CR-TIE4B]

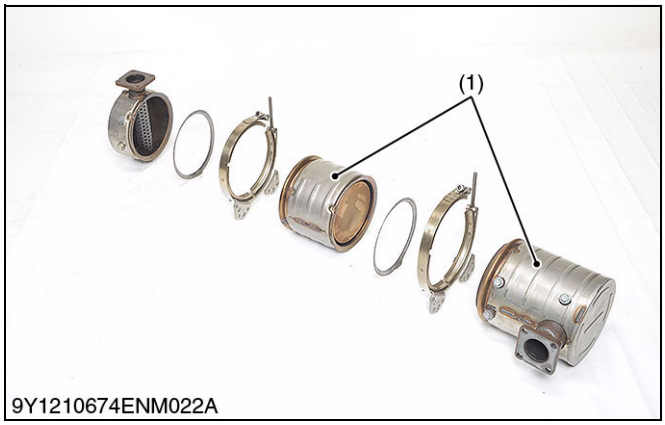


9Y1210674ENM021A

(1) Common Rail System
(2) ECU
(3) After Treatment Devices
(4) EGR Cooler
(5) EGR Valve
(6) Air Flow Sensor
(7) Turbo Charger
(8) Diesel Oxidation Catalyst 1 (DOC 1)
(9) Diesel Oxidation Catalyst 2 (DOC 2)

(a) EGR Valve Opening
(b) Injection Pattern
(c) Air Flow Sensor

9Y1210674ENM0050US0



9Y1210674ENM022A

Diesel Oxidation Catalyst (DOC) [V2607-CR-TIE4B / V3307-CR-TIE4B]

Output of "DOC only" with intercooler is equivalent with one of "DOC + DPF". "DOC only" does not require manual regeneration and ash cleaning.

(1) Diesel Oxidation Catalyst (DOC)

9Y1210674ENM0051US0

SERVICING

CONTENTS

1. TROUBLESHOOTING

This "TROUBLESHOOTING" shows only mechanical failures. The failures related to the common rail system (CRS), refer to the diagnosis manual (DM) for common rail system engine (9Y120-01990).

Symptom	Probable Cause	Solution	Reference Page
The engine does not start	No fuel	Fill up the fuel	–
	Air in the fuel system	Bleed the air	–
	Water in the fuel system	Change the fuel and repair or replace the fuel system	G-14
	The fuel pump is damaged	Replace	–
	The fuel hose is clogged	Clean or replace	G-14
	The fuel filter is clogged	Replace	G-17
	The viscosity of fuel at low temperature is too high	Replace the specified fuel	I-5, G-8
	The cetane number of fuel is low	Replace the specified fuel	I-5, G-8
	Fuel leakage because of loose injection pipe retaining nut	Tighten the retaining nut	1-S42
	The injector is clogged	Replace	G-21, 1-S45
	The supply pump is damaged	Replace	1-S55
	Seizure of the crankshaft, camshaft, piston or bearing	Repair or replace	–
	Compression leakage from the cylinder	Replace the head gasket Tighten the cylinder head screw	1-S48, 1-S49, 1-S50
	Incorrect valve timing	Check the timing gear	1-S65, 1-S66
	Piston ring and cylinder are worn out	Replace	1-S92, 1-S93, 1-S100
	Incorrect valve clearance	Adjust valve clearance	1-S19
The starter does not operate	Discharged battery	Charge or replace	–
	Starter is damaged	Repair or replace	1-S24
	The key switch is damaged	Replace	–
	The connection of the wires is incorrect	Check or correct	–

Symptom	Probable Cause	Solution	Reference Page
The engine revolution is not smooth	The fuel filter is clogged	Replace	G-17
	The air cleaner is clogged	Clean or replace the air cleaner element	G-15
	Fuel leakage because of loose injection pipe retaining nut	Tighten the retaining nut	1-S42
	The supply pump is damaged	Replace	1-S55
	The injector is damaged	Replace	G-21, 1-S45
	The turbocharger bearing is worn out	Replace the turbocharger assembly	1-S41
	The turbocharger shaft is bent	Replace the turbocharger assembly	1-S41
	The turbocharger fin or other part has a damage because of unwanted materials	Replace the turbocharger assembly	1-S41
The exhaust gas is white or blue	Too much engine oil	Reduce it to the specified level	G-10
	The piston ring, piston and cylinder is worn out	Replace the piston ring or piston, or repair the cylinder	1-S92, 1-S93, 1-S100
There is oil leakage into the exhaust pipe or suction pipe	The oil pipe is clogged or has a damage	Check, replace or clean the oil pipe	–
	The piston ring seal of the turbocharger is damaged	Replace the turbocharger assembly	1-S41
The exhaust gas is black or dark gray	DPF is damaged	Replace	1-S34, 1-S36
	Overload	Decrease the load	–
	The grade of the fuel is low	Replace the specified fuel	I-5 G-8
	The fuel filter is clogged	Replace	G-17
	The air cleaner is clogged	Clean or replace the element	G-15
	The injector is damaged	Replace	G-21, 1-S45

Symptom	Probable Cause	Solution	Reference Page
The output is deficient	The moving parts of engine have a seizure	Repair or replace	–
	The supply pump is damaged	Replace	1-S55
	The injector is damaged	Replace	G-21, 1-S45
	There is compression leakage	Check the compression pressure and repair	1-S18
	There is a gas leakage from the exhaust system	Repair or replace	1-S26, 1-S41
	The air cleaner is clogged	Clean or replace the element	G-15
	There is an air leakage from the compressor discharge side	Replace the turbocharger assembly	1-S41
The lubricant oil consumption is too much	The gap of the piston ring points to the same direction	Move the ring gap direction	1-S69
	The oil ring is worn out or cannot move	Replace	1-S70, 1-S92, 1-S93
	The piston ring groove is worn out	Replace the piston and piston ring	1-S92, 1-S93
	The valve stem and valve guide are worn out	Replace	1-S51
	The crankshaft bearing and the crank pin bearing is worn out	Replace	1-S95, 1-S96
The fuel is mixed into the lubricant oil	The injector is damaged	Replace	G-21, 1-S45
	Fuel leak from the overflow pipe of the inner cylinder head cover	Replace the gasket	–
	Oil dilution due to regeneration	Change the engine oil	G-10
Water is mixed into the lubricant oil	The head gasket is damaged	Replace	1-S48, 1-S49, 1-S50
	The cylinder block or cylinder head is damaged	Replace	1-S48
The oil pressure is low	The engine oil is not sufficient	Fill oil to the specified amount	G-10
	The oil strainer is clogged	Clean	1-S67
	The relief valve does not operate with dirt	Repair or replace	1-S59
	The oil clearance of the bearings are too much	Replace the metal, bushing or shaft	1-S68, 1-S71, 1-S95, 1-S96
	The oil passage is clogged	Clean	–
	The type of oil used is incorrect	Use the specified type of oil	I-5, G-8
	The oil pump is damaged	Replace	1-S101
The oil pressure is high	The type of oil used is incorrect	Use the specified type of oil	I-5, G-8
	The relief valve is damaged	Repair or replace	1-S59

Symptom	Probable Cause	Solution	Reference Page
The engine is overheated	The engine oil is not sufficient	Fill oil to the specified amount	I-5, G-8
	The fan belt is broken or the fan belt tension is too loose	Replace or adjust	1-S20, 1-S21
	The coolant is not sufficient	Fill to the specified amount	G-11
	The radiator net and the radiator fin are clogged with dust	Clean	–
	There is corrosion in the inner side of the radiator	Clean or replace	G-34, G-35
	There is clogged in the coolant flow route	Clean or replace	G-34, G-35
	The radiator or radiator cap is damaged	Replace	1-S21
	The load is too much	Reduce the load	–
	The head gasket is damaged	Replace	1-S48, 1-S49, 1-S50
	The fuel used is incorrect	Replace the specified fuel	I-5, G-8

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2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Cylinder Head Surface	Flatness	–	0.05 mm 0.002 in.
Top Clearance		0.60 to 0.80 mm 0.024 to 0.031 in.	–
Compression Pressure **[V2607-CR-TE4B]**		3.20 MPa / 250 min^{-1} (rpm) 32.6 kgf/cm^2 / 250 min^{-1} (rpm) 464 psi / 250 min^{-1} (rpm)	2.20 MPa / 250 min^{-1} (rpm) 22.4 kgf/cm^2 / 250 min^{-1} (rpm) 319 psi / 250 min^{-1} (rpm)
[V2607-CR-E4B / V3307-CR-TE4B]		3.92 MPa / 250 min^{-1} (rpm) 40.0 kgf/cm^2 / 250 min^{-1} (rpm) 569 psi / 250 min^{-1} (rpm)	2.90 MPa / 250 min^{-1} (rpm) 29.6 kgf/cm^2 / 250 min^{-1} (rpm) 421 psi / 250 min^{-1} (rpm)
[V2607-CR-TIE4 / V3307-CR-TIE4]		2.6 MPa / 250 min^{-1} (rpm) 27 kgf/cm^2 / 250 min^{-1} (rpm) 380 psi / 250 min^{-1} (rpm)	1.6 MPa / 250 min^{-1} (rpm) 16 kgf/cm^2 / 250 min^{-1} (rpm) 230 psi / 250 min^{-1} (rpm)
Variance Among Cylinders		–	10 % or less
Valve Seat	Angle	0.79 rad 45 °	–
	Width	3.3 to 3.6 mm 0.13 to 0.14 in.	–
Valve Face	Angle	0.79 rad 45 °	–
Valve Recessing		0.65 to 0.85 mm 0.026 to 0.033 in.	1.20 mm 0.0472 in.
Valve Stem to Valve Guide **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Clearance (Intake)	0.030 to 0.057 mm 0.0012 to 0.0022 in.	0.10 mm 0.0039 in.
• Valve Stem	O.D. (Intake)	5.968 to 5.980 mm 0.2350 to 0.2354 in.	–
• Valve Guide	I.D. (Intake)	6.010 to 6.025 mm 0.2367 to 0.2372 in.	–

Item		Factory Specification	Allowable Limit
Valve Stem to Valve Guide **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Clearance (Exhaust)	0.045 to 0.072 mm 0.0018 to 0.0028 in.	0.10 mm 0.0039 in.
• Valve Stem	O.D. (Exhaust)	5.953 to 5.965 mm 0.2344 to 0.2348 in.	–
• Valve Guide	I.D. (Exhaust)	6.010 to 6.025 mm 0.2367 to 0.2372 in.	–
Valve Stem to Valve Guide **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Clearance	0.055 to 0.085 mm 0.0022 to 0.0033 in.	0.10 mm 0.0039 in.
• Valve Stem	O.D.	6.960 to 6.975 mm 0.2741 to 0.2746 in.	–
• Valve Guide	I.D.	7.030 to 7.045 mm 0.2768 to 0.2773 in.	–
Valve Clearance (Cold)		0.13 to 0.17 mm 0.0052 to 0.0066 in	–
Intake Valve Timing **[V2607-CR-TE4B / V2607-CR-TIE4B]**	Open	0.21 rad (12 °) before T.D.C.	–
	Close	0.77 rad (44 °) after B.D.C.	–
Exhaust Valve Timing **[V2607-CR-TE4B / V2607-CR-TIE4B]**	Open	0.86 rad (49 °) before B.D.C.	–
	Close	0.30 rad (17 °) after T.D.C.	–
Intake Valve Timing **[V2607-CR-E4B / V3307-CR-TE4B / V3307-CR-TIE4B]**	Open	0.24 rad (14 °) before T.D.C.	–
	Close	0.70 rad (40 °) after B.D.C.	–
Exhaust Valve Timing **[V2607-CR-E4B / V3307-CR-TE4B / V3307-CR-TIE4B]**	Open	0.87 rad (50 °) before B.D.C.	–
	Close	0.24 rad (14 °) after T.D.C.	–
Valve Spring **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Free Length	35.4 to 35.9 mm 1.40 to 1.41 in.	34.9 mm 1.37 in.
[V3307-CR-TE4B / V3307-CR-TIE4B]	Free Length	35.1 to 35.6 mm 1.39 to 1.40 in.	34.6 mm 1.36 in.
	Tilt	–	1.0 mm 0.039 in.

Item		Factory Specification	Allowable Limit
Valve Spring **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Setting Load / Setting Length	60.8 N / 29.7 mm 6.20 kgf / 29.7 mm 13.7 lbf / 1.17 in.	45.9 N / 29.7 mm 4.68 kgf / 29.7 mm 10.3 lbf / 1.17 in.
[V3307-CR-TE4B / V3307-CR-TIE4B]	Setting Load / Setting Length	63.5 N / 31.5 mm 6.48 kgf / 31.5 mm 14.3 lbf / 1.24 in.	45.9 N / 31.5 mm 4.68 kgf / 31.5 mm 10.3 lbf / 1.24 in.
Rocker Arm Shaft to Rocker Arm **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Oil Clearance	0.016 to 0.054 mm 0.00063 to 0.0021 in.	0.15 mm 0.0059 in.
• Rocker Arm Shaft	O.D.	13.973 to 13.984 mm 0.55012 to 0.55055 in.	–
• Rocker Arm	I.D.	14.000 to 14.027 mm 0.55119 to 0.55224 in.	–
Rocker Arm Shaft to Rocker Arm **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Oil Clearance	0.016 to 0.054 mm 0.00063 to 0.0021 in.	0.15 mm 0.0059 in.
• Rocker Arm Shaft	O.D.	14.973 to 14.984 mm 0.58949 to 0.58992 in.	–
• Rocker Arm	I.D.	15.000 to 15.027 mm 0.59056 to 0.59161 in.	–
Valve Bridge Arm to Valve Bridge Shaft **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Oil Clearance	0.018 to 0.057 mm 0.00071 to 0.0022 in.	0.15 mm 0.0059 in.
• Valve Bridge Arm	I.D.	8.050 to 8.080 mm 0.3170 to 0.3181 in.	–
• Valve Bridge Shaft	O.D.	8.023 to 8.032 mm 0.3159 to 0.3162 in.	–
Valve Bridge Arm to Valve Bridge Shaft **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Oil Clearance	0.018 to 0.057 mm 0.00071 to 0.0022 in.	0.15 mm 0.0059 in.
• Valve Bridge Arm	I.D.	9.050 to 9.080 mm 0.3563 to 0.3574 in.	–
• Valve Bridge Shaft	O.D.	9.023 to 9.032 mm 0.3553 to 0.3555 in.	–
Push Rod	Alignment	–	0.25 mm 0.0098 in.
Tappet to Tappet Bore	Oil Clearance	0.020 to 0.050 mm 0.00079 to 0.0019 in.	0.07 mm 0.003 in.
• Tappet Bore	I.D.	10.000 to 10.015 mm 0.39370 to 0.39429 in.	–
• Tappet	O.D.	9.965 to 9.980 mm 0.3924 to 0.3929 in.	–

Item		Factory Specification	Allowable Limit
Camshaft	Side Clearance	–	0.10 mm 0.0039in.
	Alignment	–	0.01 mm 0.0004 in.
Cam Height **[V2607-CR-E4B]**	Intake	32.70 mm 1.287 in.	32.20 mm 1.268 in.
	Exhaust	33.20 mm 1.307 in.	32.70 mm 1.287 in.
Cam Height **[V2607-CR-TE4B / V2607-CR-TIE4B]**	Intake	32.60 mm 1.283 in.	32.10 mm 1.264 in.
	Exhaust	33.00 mm 1.299 in.	32.50 mm 1.280 in.
Cam Height **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Intake	37.50 mm 1.476 in.	37.00 mm 1.457 in.
	Exhaust	37.90 mm 1.492 in.	37.40 mm 1.472 in.
Camshaft **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Oil Clearance	0.050 to 0.091 mm 0.0020 to 0.0035 in.	0.15 mm 0.0059 in.
• Camshaft Journal 1	O.D.	34.934 to 34.950 mm 1.3754 to 1.3759 in.	–
• Cylinder Block Bore 1	I.D.	35.000 to 35.025 mm 1.3780 to 1.3789 in.	–
• Camshaft Journal 2	O.D.	41.934 to 41.950 mm 1.6510 to 1.6515 in.	–
• Cylinder Block Bore 2	I.D.	42.000 to 42.025 mm 1.6536 to 1.6545 in.	–
Camshaft **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Oil Clearance	0.050 to 0.091 mm 0.0020 to 0.0035 in.	0.15 mm 0.0059 in.
• Camshaft Journal 1	O.D.	34.934 to 34.950 mm 1.3754 to 1.3759 in.	–
• Cylinder Block Bore 1	I.D.	35.000 to 35.025 mm 1.3780 to 1.3789 in.	–
• Camshaft Journal 2	O.D.	43.934 to 43.950 mm 1.7297 to 1.7303 in.	–
• Cylinder Block Bore 2	I.D.	44.000 to 44.025 mm 1.7323 to 1.7332 in.	–

Item		Factory Specification	Allowable Limit
Timing Gear **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**			
• Crank Gear to Cam Gear	Backlash	0.0400 to 0.118 mm 0.00158 to 0.00464 in.	0.22 mm 0.0087 in.
• Cam Gear to Idle Gear	Backlash	0.0400 to 0.159 mm 0.00158 to 0.00625 in.	0.22 mm 0.0087 in.
• Idle Gear to Supply Pump Gear	Backlash	0.0400 to 0.168 mm 0.00158 to 0.00661 in.	0.22 mm 0.0087 in.
Timing Gear **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Backlash	0.0410 to 0.139 mm 0.00162 to 0.00547 in.	0.22 mm 0.0087 in.
• Crank Gear to Cam Gear			
• Cam Gear to Idle Gear	Backlash	0.0410 to 0.145 mm 0.00162 to 0.00570 in.	0.22 mm 0.0087 in.
• Idle Gear to Supply Pump Gear	Backlash	0.0410 to 0.139 mm 0.00162 to 0.00547 in.	0.22 mm 0.0087 in.
Idle Gear Shaft to Idle Gear Bushing **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Oil Clearance	0.025 to 0.096 mm 0.00099 to 0.0037 in.	0.10 mm 0.0039 in.
• Idle Gear Bushing	I.D.	35.000 to 35.055 mm 1.3780 to 1.3801 in.	–
• Idle Gear Shaft	O.D.	34.959 to 34.975 mm 1.3764 to 1.3769 in.	–
Idle Gear Shaft to Idle Gear Bushing **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Oil Clearance	0.0250 to 0.106 mm 0.00985 to 0.00417 in.	0.11 mm 0.0043 in.
• Idle Gear Bushing	I.D.	47.000 to 47.065 mm 1.8504 to 1.8529 in.	–
• Idle Gear Shaft	O.D.	46.959 to 46.975 mm 1.8488 to 1.8494 in.	–
Idle Gear **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Side Clearance	0.050 to 0.20 mm 0.0020 to 0.0078 in.	0.90 mm 0.035 in.
Idle Gear **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Side Clearance	0.15 to 0.25 mm 0.0059 to 0.0098 in.	0.90 mm 0.035 in.
Piston Pin Bore **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	I.D.	26.000 to 26.013 mm 1.0237 to 1.0241 in.	26.05 mm 1.026 in.
Piston Pin Bore **[V3307-CR-TE4B / V3307-CR-TIE4B]**	I.D.	28.000 to 28.013 mm 1.1024 to 1.1028 in.	28.05 mm 1.104in.
Top Ring to Ring Groove	Clearance	0.050 to 0.090 mm 0.0020 to 0.0035 in.	0.15 mm 0.0059 in.
Second Ring to Ring Groove	Clearance	0.090 to 0.12 mm 0.0036 to 0.0047 in.	0.20 mm 0.0079 in.
Oil Ring to Ring Groove	Clearance	0.020 to 0.060 mm 0.00079 to 0.0023 in.	0.15 mm 0.0059 in.

Item		Factory Specification	Allowable Limit
Piston Ring Gap **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Top Ring	0.20 to 0.35 mm 0.0079 to 0.013 in.	1.25 mm 0.0492 in.
	Second Ring	0.30 to 0.45 mm 0.012 to 0.017 in.	1.25 mm 0.0492 in.
	Oil Ring	0.25 to 0.45 mm 0.0099 to 0.017 in.	1.25 mm 0.0492 in.
Piston Ring Gap **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Top Ring	0.25 to 0.40 mm 0.0099 to 0.015 in.	1.25 mm 0.0492 in.
	Second Ring	0.30 to 0.45 mm 0.012 to 0.017 in.	1.25 mm 0.0492 in.
	Oil Ring	0.25 to 0.45 mm 0.0099 to 0.017 in.	1.25 mm 0.0492 in.
Connecting Rod	Alignment	–	0.05 mm 0.002 in.
Piston Pin to Small End Bushing **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Oil Clearance	0.014 to 0.034 mm 0.00056 to 0.0013 in.	0.15 mm 0.0059 in.
• Piston Pin	O.D.	26.006 to 26.011 mm 1.0239 to 1.0240 in.	–
• Small End Bushing	I.D.	26.025 to 26.040 mm 1.0246 to 1.0251 in.	–
Piston Pin to Small End Bushing **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Oil Clearance	0.020 to 0.040 mm 0.00079 to 0.0015 in.	0.15 mm 0.0059 in.
• Piston Pin	O.D.	28.006 to 28.011 mm 1.1026 to 1.1027 in.	–
• Small End Bushing	I.D.	28.031 to 28.046 mm 1.1036 to 1.1041 in.	–
Crankshaft	Side Clearance	0.15 to 0.35 mm 0.0059 to 0.013 in.	0.50 mm 0.020 in.
	Alignment	–	0.02 mm 0.0008 in.
Crankshaft Journal to Crankshaft Bearing **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Oil Clearance	0.030 to 0.051 mm 0.0012 to 0.0020 in.	0.20 mm 0.0079 in.
• Crankshaft Journal	O.D.	72.977 to 72.990 mm 2.8732 to 2.8736 in.	–
Crankshaft Journal to Crankshaft Bearing **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Oil Clearance	0.030 to 0.073 mm 0.0012 to 0.0028 in.	0.20 mm 0.0079 in.
• Crankshaft Journal	O.D.	79.977 to 79.990 mm 3.1487 to 3.1492 in.	–

Item		Factory Specification	Allowable Limit
Crank Pin to Crank Pin Bearing **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Oil Clearance	0.011 to 0.058 mm 0.00044 to 0.0022 in.	0.20 mm 0.0079 in.
• Crank Pin	O.D	46.980 to 46.991 mm 1.8496 to 1.8500 in.	–
Crank Pin to Crank Pin Bearing **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Oil Clearance	0.017 to 0.048 mm 0.00067 to 0.0018 in.	0.20 mm 0.0079 in.
• Crank Pin	O.D	49.980 to 49.991 mm 1.9678 to 1.9681 in.	–
Cylinder Bore **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	I.D.	87.000 to 87.022 mm 3.4252 to 3.4260 in.	87.15 mm 3.431 in.
Cylinder Bore **[V3307-CR-TE4B / V3307-CR-TIE4B]**	I.D.	94.000 to 94.022 mm 3.7008 to 3.7016 in.	94.15 mm 3.707 in.
Cylinder Bore (Oversize) **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	I.D.	87.250 to 87.272 mm 3.4351 to 3.4359 in.	87.40 mm 3.441 in.
Cylinder Bore (Oversize) **[V3307-CR-TE4B / V3307-CR-TIE4B]**	I.D.	94.500 to 94.522 mm 3.7205 to 3.7213 in.	94.65 mm 3.726 in.

LUBRICATING SYSTEM

Item		Factory Specification	Allowable Limit
Engine Oil Pressure **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	At Idle Speed	–	50 kPa 0.5 kgf/cm^2 7 psi
	At Rated Speed	250 to 440 kPa 2.5 to 4.5 kgf/cm^2 36 to 64 psi	150 kPa 1.5 kgf/cm^2 21 psi
Engine Oil Pressure **[V3307-CR-TE4B / V3307-CR-TIE4B]**	At Idle Speed	–	50 kPa 0.5 kgf/cm^2 7 psi
	At Rated Speed	200 to 390 kPa 2.0 to 4.0 kgf/cm^2 29 to 56 psi	150 kPa 1.5 kgf/cm^2 21 psi
Engine Oil Pressure Switch	Working Pressure	40 to 50 kPa 0.4 to 0.6 kgf/cm^2 6 to 8 psi	–
Inner Rotor to Outer Rotor	Clearance	0.030 to 0.090 mm 0.0012 to 0.0035 in.	0.3 mm 0.01 in.
Outer Rotor to Pump Body	Clearance	0.100 to 0.184 mm 0.00394 to 0.00724 in.	0.3 mm 0.01 in.
Inner Rotor to Cover	Clearance	0.025 to 0.075 mm 0.00099 to 0.0029 in.	0.225 mm 0.00886 in.
Relief Valve **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Spring Free Length	60.0 to 60.5 mm 2.37 to 2.38 in.	55.0 mm 2.17 in.
	Working Pressure	392 kPa 4.00 kgf/cm^2 56.9 psi	–
Relief Valve **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Spring Free Length	60.0 to 60.5 mm 2.37 to 2.38 in.	55.0 mm 2.17 in.
	Working Pressure	294 kPa 3.00 kgf/cm^2 42.7 psi	–

COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Thermostat **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	Valve Opening Temperature	80 to 84 °C 176 to 183 °F	–
	Valve Full Opening Temperature (Opened Completely)	95 °C 203 °F	–
Thermostat **[V3307-CR-TE4B / V3307-CR-TIE4B]**	Valve Opening Temperature	74.5 to 78.5 °C 166.1 to 173.3 °F	–
	Valve Full Opening Temperature (Opened Completely)	90 °C 194 °F	–
Radiator	Water Tightness	No leak at specified pressure	–
Radiator Cap	Air Leakage	10 seconds or more 90 → 60 kPa 0.9 → 0.6 kgf/cm^2 10 → 9 psi	
Fan Belt	Tension	10 to 12 mm / 98 N 0.40 to 0.47 in. / 98 N (10 kgf, 22 lbf)	–

ELECTRICAL SYSTEM

Item		Factory Specification	Allowable Limit
Glow Plug	Resistance	Approx. 0.95 Ω	–
Commutator	O.D.	32.0 mm 1.26 in.	31.4 mm 1.24 in.
Mica	Undercut	0.50 mm 0.020 in.	0.2 mm 0.0079 in.
Brush (Starter)	Length	18.0 mm 0.709 in.	11.0 mm 0.433 in.
Rotor Coil	Resistance	2.8 to 3.3 Ω	–
Slip Ring	O.D.	22.7 mm 0.894 in.	22.1 mm 0.870 in.
Brush (Alternator)	Length	18.5 mm 0.728 in.	5.0 mm 0.20 in.

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3. TIGHTENING TORQUES

Use a torque wrench to tighten the screws, bolts and nuts to the specified torque. Tighten the screws, bolts and nuts used, such as on the cylinder head in the correct sequence and torque.

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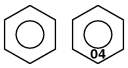
[1] TIGHTENING TORQUES OF SCREWS, BOLTS AND NUTS FOR GENERAL USE

If the tightening torque is not specified, refer to the table below for the none specified torques values.

Indication on top of bolt	 **No-grade or 4T**			 **7T**		
Indication on top of nut	 **No-grade or 4T**					
Unit	**N·m**	**kgf·m**	**lbf·ft**	**N·m**	**kgf·m**	**lbf·ft**
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
M8	18 to 20	1.8 to 2.1	13 to 15	24 to 27	2.4 to 2.8	18 to 20
M10	40 to 45	4.0 to 4.6	29 to 33	49 to 55	5.0 to 5.7	37 to 41
M12	63 to 72	6.4 to 7.4	47 to 53	78 to 90	7.9 to 9.2	58 to 66

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[2] TIGHTENING TORQUES OF SCREWS, BOLTS AND NUTS FOR SPECIAL USE

■ **NOTE**

- **For the screws, bolts and nuts with the mark "*", apply engine oil to their threads and seats before you tighten.**
- **The alphabet "M" in Dimension × Pitch shows that the screw, bolt or nut dimensions are in the metric system. The dimension is the nominal external diameter in mm of the threads. The pitch is the nominal distance in mm between 2 threads.**

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
Glow lead mounting nut	M4 × 0.7	0.98 to 1.7	0.10 to 0.18	0.73 to 1.3
Glow plug	M8 × 1.0	7.7 to 9.3	0.78 to 0.95	5.7 to 6.8
Cylinder head cover screw	M6 × 1.0	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
Injection pipe retaining nut	M12 × 1.5	30 to 40	3.1 to 4.0	23 to 29
Oil switch taper screw	R 1/8	15 to 19	1.5 to 2.0	11 to 14
Supply pump mounting nut	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Injector clamp nut	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Supply pump gear mounting nut	M14 × 1.5	59 to 68	6.0 to 7.0	44 to 50
Overflow pipe joint screw (Cylinder head side)	M8	11 to 15	1.2 to 1.5	8.2 to 11
Overflow pipe joint screw (Common rail side)	M10	7.9 to 12	0.80 to 1.3	5.8 to 9.4
Overflow pipe joint screw (Supply pump side)	M10	7.9 to 12	0.80 to 1.3	5.8 to 9.4
Common rail mounting screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Coolant temperature sensor	–	16 to 19	1.6 to 2.0	12 to 14
Camshaft position sensor mounting screw	–	8.0 to 12	0.82 to 1.2	5.9 to 8.8
Crankshaft position sensor mounting screw	–	8.0 to 12	0.82 to 1.2	5.9 to 8.8
Intake air temperature sensor	–	30 to 39	3.0 to 4.0	22 to 28
Boost sensor mounting screw (Turbocharger model)	M6 × 1.0	4 to 5	0.4 to 0.6	3 to 4
Air flow sensor mounting screw	M4 × 0.7	1.17 to 1.77	0.120 to 0.180	0.863 to 1.30
Front cover mounting screw	M8 × 1.25	30 to 34	3.0 to 3.5	22 to 25
Idle gear mounting screw	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
Mounting screw of crankshaft position pulsar gear	M6 × 1.0	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
DPF bracket mounting screw	M12 × 1.25	78 to 90	7.9 to 9.2	58 to 66
Reed valve of EGR valve	M6 × 1.0	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
Exhaust manifold mounting nut	M8 × 1.25	30 to 34	3.0 to 3.5	22 to 25
EGR cooler flange screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Case of oil separator	–	9.50 to 10.5	0.969 to 1.07	7.01 to 7.74
Drain plug	M22 × 1.5	45 to 53	4.5 to 5.5	33 to 39
Overflow pipe joint screw	M6 × 1.0	9.81 to 11.2	1.00 to 1.15	7.24 to 8.31
*Crankshaft screw	M16 × 1.5	255 to 274	26.0 to 28.0	188 to 202
Relief valve retaining screw	M22 × 1.5	69 to 78	7.0 to 8.0	51 to 57

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
*Flywheel screw	M12 × 1.25	98.1 to 107	10.0 to 11.0	72.4 to 79.5
Camshaft set screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
B terminal nut of starter	M8 × 1.25	9.8 to 11	1.0 to 1.2	7.3 to 8.6
Pulley nut of alternator	M24	58.4 to 78.9	5.95 to 8.05	43.1 to 58.2
Oil pump cover screw	M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.8

V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
Rocker arm bracket screw	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
*Cylinder head mounting screw	M13 × 1.25	147 to 156	15.0 to 16.0	109 to 115
Oil cooler joint screw	M20 × 1.5	64 to 73	6.5 to 7.5	47 to 54
Flywheel housing mounting screw	M12 × 1.25	78 to 90	7.9 to 9.2	58 to 66
Flywheel housing mounting screw (9T)	M12 × 1.25	103 to 117	10.5 to 12.0	76.0 to 86.7
*Connecting rod screw	M8 × 1.0	41 to 45	4.1 to 4.6	30 to 33
*Crankcase 2 mounting screw	M13 × 1.25	128 to 137	13.0 to 14.0	94.1 to 101
Crankcase 2 flange screw	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
Screw of muffler flange (V2607-CR-E4)	M8 × 1.25	24 to 27	2.4 to 2.8	18 to 20
Nut of muffler flange (V2607-CR-TE4)	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
Nut of muffler flange (V2607-CR-TIE4B)	M8 × 1.25	29.4 to 34.3	3.00 to 3.49	21.7 to 25.2
DPF mounting bracket (V2607-CR-E4B)	–	16 to 20	1.7 to 2.0	12 to 14
DPF mounting screw (V2607-CR-TE4B)	M10 × 1.25	49.0 to 63.7	5.00 to 6.49	36.2 to 46.9
Muffler full assembly (DPF) mounting screw (V2607-CR-E4B / V2607-CR-TE4B)	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
Muffler full assembly (DOC) mounting screw (V2607-CR-TIE4B)	M10 × 1.25	60.8 to 70.8	6.20 to 7.21	44.9 to 52.2
Temperature sensor (V2607-CR-E4B / V2607-CR-TE4B)	M12 × 1.25	25 to 34	2.5 to 3.5	18 to 25
Differential pressure pipe (V2607-CR-E4B / V2607-CR-TE4B)	M12 × 1.0	16 to 22	1.6 to 2.3	12 to 16

V3307-CR-TE4B / V3307-CR-TIE4B

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
Rocker arm bracket screw	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
*Cylinder head mounting screw	M14 × 1.5	187 to 196	19.0 to 20.0	138 to 144
Oil cooler joint screw	M20 × 1.5	40 to 44	4.0 to 4.5	29 to 32
Flywheel housing mounting screw (9T)	M12 × 1.25	103 to 117	10.5 to 12.0	76.0 to 86.7
*Connecting rod screw	M9 × 1.0	69 to 73	7.0 to 7.5	51 to 54
*Crankcase 2 mounting screw	M14 × 1.5	138 to 147	14.0 to 15.0	102 to 108
Crankcase 2 flange screw (9T)	M10 × 1.25	59 to 63	6.0 to 6.5	44 to 47
Nut of muffler flange (V3307-CR-TE4B)	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
Nut of muffler flange (V3307-CR-TIE4B)	M8 × 1.25	29.4 to 34.3	3.00 to 3.49	21.7 to 25.2
DPF mounting screw	M10 × 1.25	49.0 to 63.7	5.00 to 6.49	36.2 to 46.9
Muffler full assembly (DPF) mounting screw (V3307-CR-TE4B)	M10 × 1.25	49 to 55	5.0 to 5.7	37 to 41
Muffler full assembly (DOC) mounting screw (V3307-CR-TIE4B)	M10 × 1.25	60.8 to 70.8	6.20 to 7.21	44.9 to 52.2
Temperature sensor (V2607-CR-E4B / V2607-CR-TE4B)	M12 × 1.25	25 to 34	2.5 to 3.5	18 to 25
Differential pressure pipe (V2607-CR-E4B / V2607-CR-TE4B)	M12 × 1.0	16 to 22	1.6 to 2.3	12 to 16
SCV mounting screw	M6 × 1.0	6.90 to 10.8	0.704 to 1.10	5.09 to 7.96
Fuel temperature sensor	–	17.6 to 26.5	1.80 to 2.70	13.0 to 19.5

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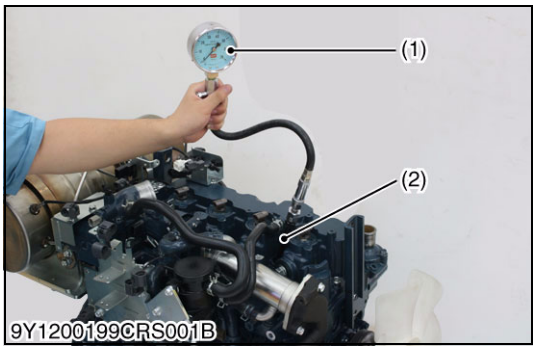
4. CHECKING, DISASSEMBLING AND SERVICING

[1] CHECKING AND ADJUSTING

(1) Engine Body



Compression pressure

1. After warming-up the engine, remove the air cleaner, muffler, glow lead, and glow plugs.
2. Set a compression tester (1) (Code No.: 07909-30208) with the adaptor (2) to the glow plug hole.
3. Crank the engine with the starter to operate the engine approx. 200 to 300 min^{-1} (rpm).
4. Measure a maximum value of the compression pressure. Do the same steps twice for each cylinder.

■ **NOTE**

- **Check the compression pressure with the specified valve clearance.**
- **Always use a fully charged battery for you do this test.**
- **Variances in cylinder compression values must be less than 10 %.**

Compression pressure	V2607-CR-TE4B	Factory specification	3.20 MPa / 250 min^{-1} (rpm) 32.6 kgf/cm^2 / 250 min^{-1} (rpm) 464 psi / 250 min^{-1} (rpm)
		Allowable limit	2.20 MPa / 250 min^{-1} (rpm) 22.4 kgf/cm^2 / 250 min^{-1} (rpm) 319 psi / 250 min^{-1} (rpm)
	V2607-CR-E4B V3307-CR-TE4B	Factory specification	3.92 MPa / 250 min^{-1} (rpm) 40.0 kgf/cm^2 / 250 min^{-1} (rpm) 569 psi / 250 min^{-1} (rpm)
		Allowable limit	2.90 MPa / 250 min^{-1} (rpm) 29.6 kgf/cm^2 / 250 min^{-1} (rpm) 421 psi / 250 min^{-1} (rpm)
	V2607-CR-TIE4 V3307-CR-TIE4	Factory specification	2.6 MPa / 250 min^{-1} (rpm) 27 kgf/cm^2 / 250 min^{-1} (rpm) 380 psi / 250 min^{-1} (rpm)
		Allowable limit	1.6 MPa / 250 min^{-1} (rpm) 16 kgf/cm^2 / 250 min^{-1} (rpm) 230 psi / 250 min^{-1} (rpm)

Tightening torque	Glow lead mounting nut	0.98 to 1.7 N·m 0.10 to 0.18 kgf·m 0.73 to 1.3 lbf·ft
	Glow plug	7.7 to 9.3 N·m 0.78 to 0.95 kgf·m 5.7 to 6.8 lbf·ft

(1) Compression Tester (2) Glow Plug Adaptor

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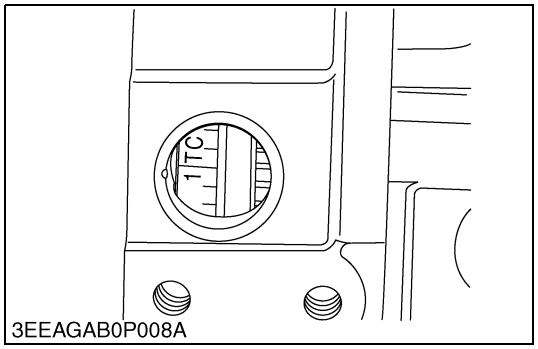

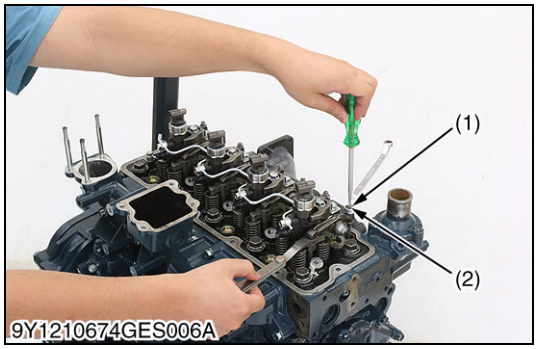

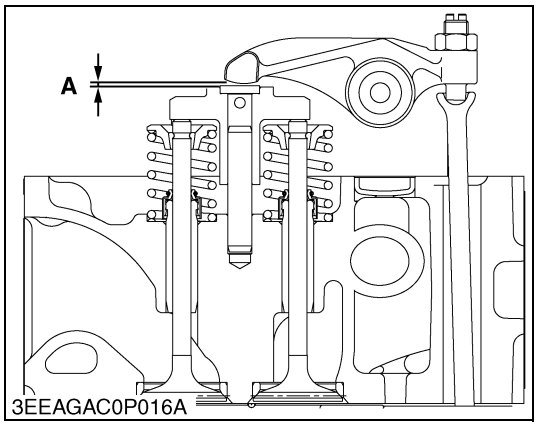

Valve Clearance

■ **IMPORTANT**

- **You must check and adjust the valve clearance when the engine is cold.**

1. Remove the injection pipes, glow lead, glow plugs and the cylinder head cover.
2. Align the "1TC" mark line on the flywheel and projection on the housing. Make sure that the No.1 piston (front cover side) comes to the compression or overlap top dead center.
3. Check the subsequent valve clearance at the mark "1TC" with a feeler gauge. If the clearance is out of the factory specifications, adjust with the adjusting screw (1) and tighten the lock nut (2) of the adjusting screw.

Valve clearance (**A**)	Factory specification	0.13 to 0.17 mm 0.0052 to 0.0066 in.

■ **NOTE**

- **After you adjust the valve clearance, tighten the lock nut (2) of the adjusting screw.**

Adjustable Cylinder Location of Piston		IN.	EX.
When No. 1 piston is at compression top dead center	1st	☆	☆
	2nd	☆	
	3rd		☆
	4th		
When No. 1 piston is at overlap position	1st		
	2nd		☆
	3rd	☆	
	4th	☆	☆

Tightening torque	Cylinder head cover screw	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Injection pipe retaining nut	30 to 40 N·m 3.1 to 4.0 kgf·m 23 to 29 lbf·ft

(1) Adjusting Screw
(2) Lock Nut

A: Valve Clearance

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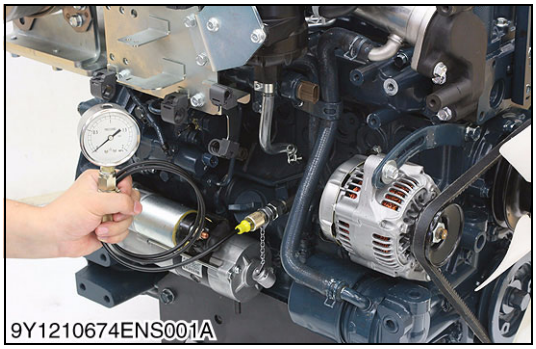
(2) Lubricating System



Engine Oil Pressure

1. Remove the engine oil pressure switch, and set the oil pressure tester (Code No.: 07916-32032).
2. Operate the engine for warming-up.
3. Measure the oil pressure at the idle speed and rated speed.
4. If the oil pressure is less than the allowable limit, do a check below.

- Engine oil level
- Oil pump
- Oil strainer
- Oil filter cartridge
- Oil passage
- Oil clearance
- Relief valve

(When reassembling)

- After you check the oil pressure of the engine, tighten its oil pressure switch to the specified torque.

Engine oil pressure **[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]**	At idle speed	Allowable limit	50 kPa 0.5 kgf/cm^2 7 psi
	At rated speed	Factory specification	250 to 440 kPa 2.5 to 4.5 kgf/cm^2 36 to 64 psi
		Allowable limit	150 kPa 1.5 kgf/cm^2 21 psi
Engine oil pressure **[V3307-CR-TE4B / V3307-CR-TIE4B]**	At idle speed	Allowable limit	50 kPa 0.5 kgf/cm^2 7 psi
	At rated speed	Factory specification	200 to 390 kPa 2.0 to 4.0 kgf/cm^2 29 to 56 psi
		Allowable limit	150 kPa 1.5 kgf/cm^2 21 psi

Tightening torque	Oil switch taper screw	15 to 19 N·m 1.5 to 2.0 kgf·m 11 to 14 lbf·ft

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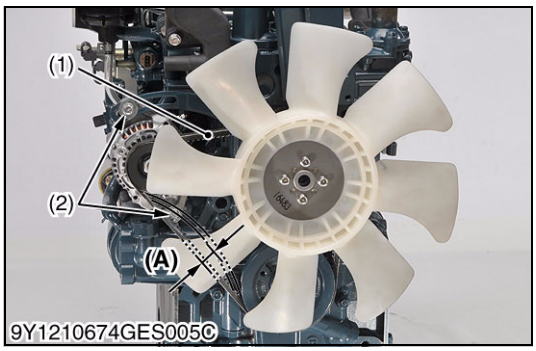
(3) Cooling System



Fan Belt Tension

1. Push the fan belt (1) halfway between the fan drive pulley and alternator pulley at a specified force 98 N (10 kgf, 22 lbf) to measure the deflection **(A)**.
2. If the measurement is out of the factory specifications, loosen the alternator mounting screw (2) and adjust its position.

Deflection **(A)**	Factory specification	10 to 12 mm 0.40 to 0.47 in.

(1) Fan Belt
(2) Alternator Mounting Screw
(A) Deflection

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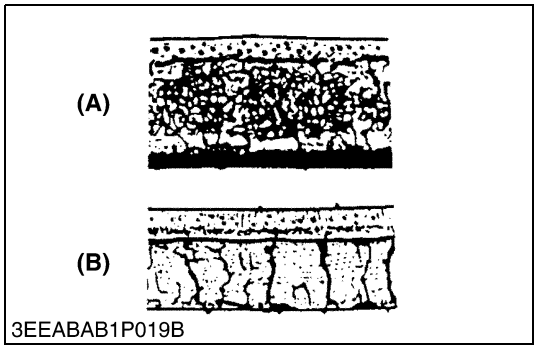

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Fan Belt Damage and Wear

1. Check the fan belt for damage.
2. If the fan belt has a damage, replace it.
3. Check if the fan belt is worn out and sunk in the pulley groove.
4. If it is, replace it.

(A) Good **(B) Bad**

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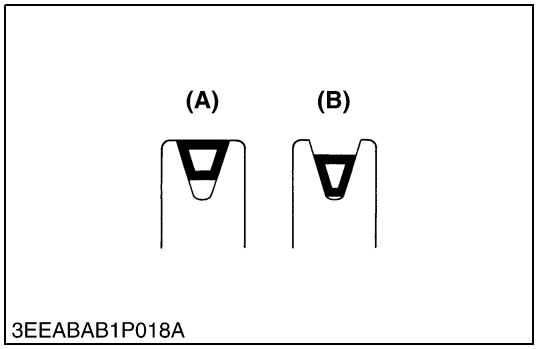

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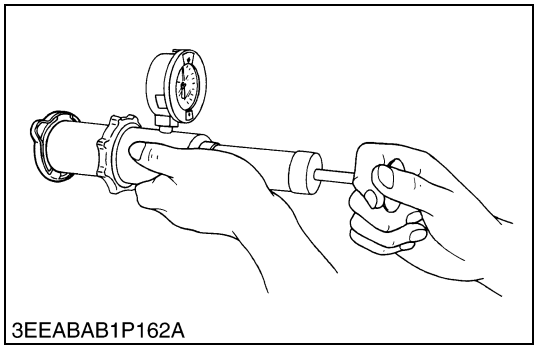
Radiator Cap Air Leakage

CAUTION

- **Remove the radiator cap only after you stop the engine for a minimum of 10 minutes to decrease its temperature. If not, hot water can gush out and cause injury.**

1. Set a radiator tester and an adaptor on the radiator cap.
2. Apply the specified pressure 90 kPa (0.9 kgf/cm^2, 10 psi).
3. Measure the time for the pressure to decrease to 60 kPa (0.6 kgf/cm^2, 9 psi).
4. If the measurement is less than the factory specification, replace the radiator cap.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Pressure decreasing time	Factory specification	More than 10 seconds for pressure decrease from 90 to 60 kPa (from 0.9 to 0.6 kgf/cm^2, from 10 to 9 psi)

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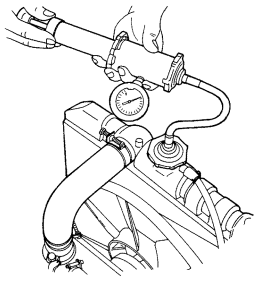
Radiator Water Leakage

1. Fill a specified quantity of water into the radiator.
2. Set a radiator tester and an adaptor on the radiator. Increase the water pressure to the specified pressure with the radiator tester and adaptor.
3. Check the radiator for water leakage.
4. For water leakages from the pinhole, replace the radiator or repair with the radiator cement. When water leak is too much, replace the radiator.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Radiator water leakage test	Factory specification	No leak at specified pressure

NOTE

- **The pressure of the leak test is different for each radiator specification. Thus, refer to the test pressure of each radiator specification to do the leakage test.**

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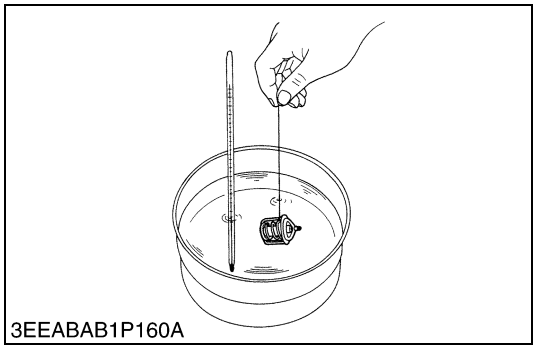
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Opening-temperature of Thermostat Valve

1. Push down the thermostat valve and put the thread between the valve and the valve seat.
2. Put the thermostat and the thermometer in the container and increase the temperature of the water gradually.
3. Take the thread, and float the thermostat in the water. As the water temperature rises, the valve will open, and the thermostat will separate from the thread. Measure the temperature at this moment.
4. Continue to increase the temperature and read the temperature when the valve opens approximately 8 mm (0.3 in.).
5. If the measurement is out of the factory specifications, replace the thermostat.

Thermostat's valve opening temperature	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	80 to 84 °C 176 to 183 °F
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	74.5 to 78.5 °C 166.1 to 173.3 °F

Temperature at which thermostat completely opens	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	95 °C 203 °F
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	90 °C 194 °F

9Y1210674ENS0013US0

(4) Electrical System

CAUTION

- **To prevent an accidental short circuit, attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.**
- **Do not remove the battery cap while the engine operates.**
- **Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, clean with water immediately.**
- **Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.**

IMPORTANT

- **Do not disconnect or remove the battery when you operate engine.**

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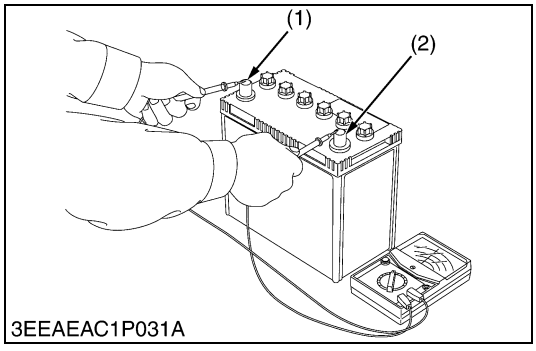

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Battery Voltage

1. Stop the engine.
2. Measure the voltage with a circuit tester between the battery terminals.
3. If the battery voltage is less than the factory specification, check the battery specific gravity and charge the battery.

Battery voltage	Factory specification	More than 12 V

(1) Positive Terminal (2) Negative Terminal

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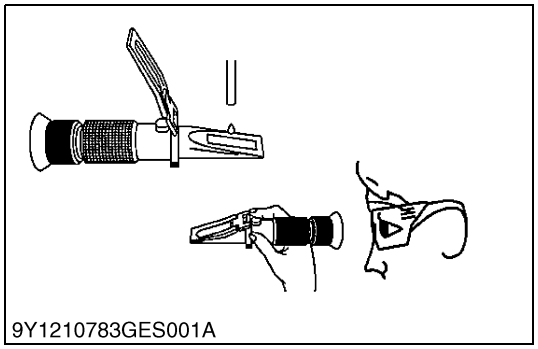
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Battery Specific Gravity

CAUTION

- **If battery acid (dilute sulfuric acid) gets on you it could cause blindness or burns, or could cause corrosion of machinery and tools so please be careful when handling.**
- **Wear safety glasses and rubber gloves when performing battery maintenance and inspection (measuring specific gravity, filling water, or charging).**
- **If the gas that is generated is ignited by an ignition source, it may explode so be very careful with sparks and fire.**
- **Keep your body and face as far away from the battery as you can when performing maintenance and inspection.**
- **Do not allow people who do not know how to handle a battery or who do not sufficiently understand the danger perform inspection or maintenance.**

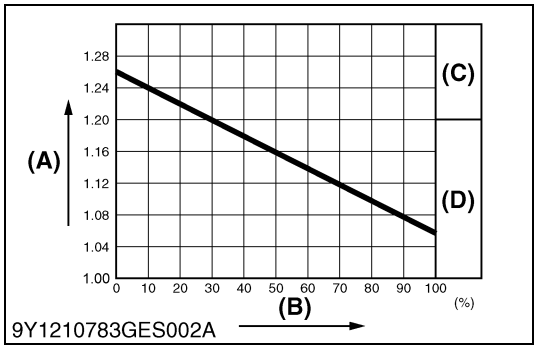
(Measurement items)

■ **Zero adjustment**

1. Open the cover and drip water on the prism surface using the included rod.
2. Close the cover.
3. Aim in a direction that is bright, look into the lens, and adjust the focus until the gradations can be seen clearly.
4. If the boundary line is not on the gradation baseline (0 position), turn the adjustment screw until it matches.
5. When zero adjustment is complete, wipe the prism and cover surface with a soft cloth or tissue paper.

■ **Measurement of test fluid**

1. Open the cover and drip test fluid on the prism surface using the included rod.
2. Close the cover.
3. Aim in a direction that is bright, look into the lens and read the gradation of the blue boundary line.
4. When the measurement is complete, wipe the prism and cover surface with a soft cloth or tissue paper.



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(Reference)

Electrolyte specific gravity and amount of discharge.
Use the following table as a reference.

(A) Electrolyte Specific Gravity
(B) Discharge
(C) Good
(D) Charging is necessary.

■ **NOTE**

Temperature conversion of electrolyte specific gravity

- **Battery electrolyte specific gravity changes based on temperature.**
- **Insert the value identified on a specific gravity meter into the following conversion equation for temperature correction to learn an accurate specific gravity value. (Standard temperature assumed to be 20 °C (68 °F))**
  D_{20} = Dt + 0.0007 (t - 20)
  D_{20} = specific gravity value converted to standard temperature of 20 °C (68 °F)
  D_t = measured specific gravity value at the electrolyte temperature t °C

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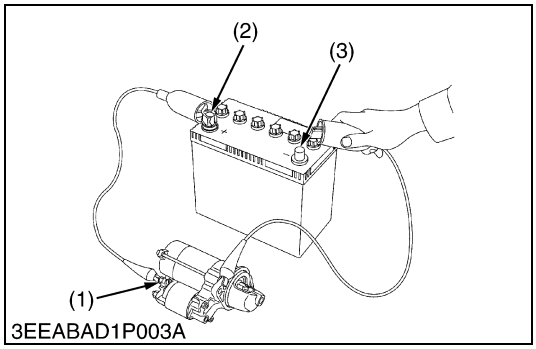

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Motor Test

CAUTION

- **Hold the starter to prevent its movement when you do a test on the motor.**

1. Disconnect the negative cable from the battery.
2. Disconnect the positive cable from the battery.
3. Disconnect the leads from the starter **B** terminal.
4. Remove the starter from the engine.
5. Connect a jumper lead from the starter **C** terminal (1) to the battery positive terminal (2).
6. Connect a jumper lead momentarily between the starter body and the battery negative terminal (3).
7. If the motor does not operate, starter is damaged. Repair or replace the starter.

NOTE

- **B terminal: It is the terminal that connects the cable from the battery to the starter.**
- **C terminal: It is the terminal that connects the cable from the motor to the magnet switch.**

(1) **C** Terminal
(2) Positive Terminal
(3) Negative Terminal

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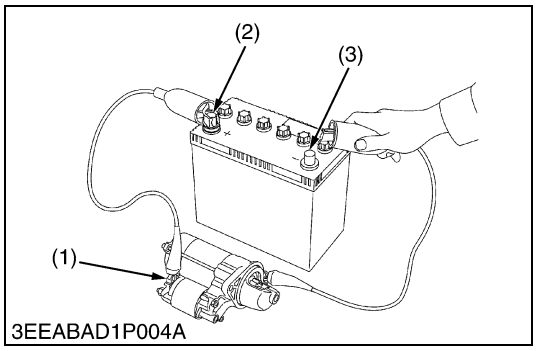

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Magnetic Switch Test

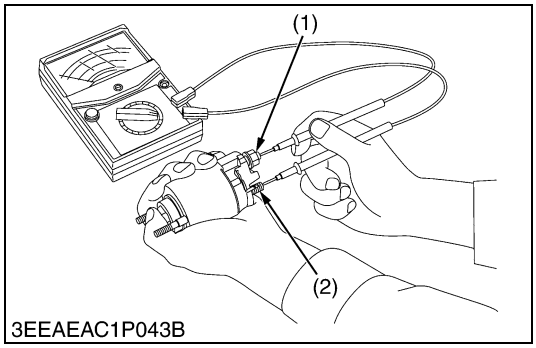
1. Disconnect the negative cable from the battery.
2. Disconnect the positive cable from the battery.
3. Disconnect the leads from the starter **B** terminal.
4. Remove the starter from the engine.
5. Connect a jumper lead from the starter **S** terminal (1) to the battery positive terminal (2).
6. Connect a jumper lead momentarily between the starter body and the battery negative terminal (3).
7. If the pinion gear does not come out, the magnetic switch is damaged. Repair or replace the starter.

NOTE

- **B terminal: It is the terminal that connects the cable from the battery to the starter.**
- **S terminal: It is the terminal that connects the cable from the starter switch to the magnetic switch.**

(1) **S** Terminal
(2) Positive Terminal
(3) Negative Terminal

9Y1210674ENS0018US0



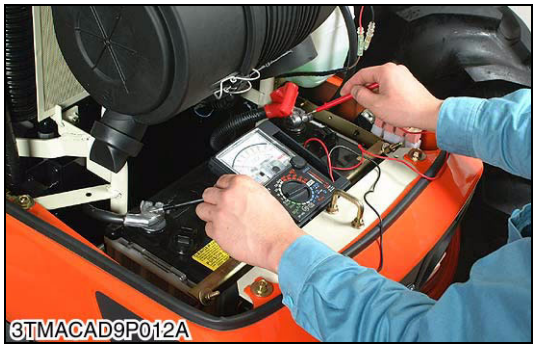
3EEAEAC1P043B

Magnetic Switch Continuity Test

1. Push in the plunger. Then check the continuity across the **C** terminal (1) and the **B** terminal (2) with a circuit tester.
2. If it is not continuous or it shows a value, replace the magnetic switch.

(1) **C** Terminal
(2) **B** Terminal

9Y1210674ENS0020US0



Alternator-on Unit Test

Before testing

- Before the alternator-on unit test, do a check of the list below :
  - Battery terminal connections
  - Circuit connection
  - Fan belt tension
  - Charge indicator lamp
  - Fuses on the circuit
  - Abnormal noise from the alternator
- Prepare full charged battery for the test.

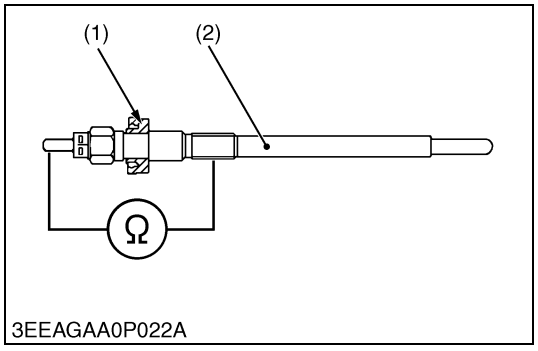
■ **NOTE**

- **Do not touch the engine parts that turns while the engine operates.**
  Keep a safety distance from the engine parts that turn.

1. Start the engine.
2. When the engine operates, measure the voltage between battery terminals. If the voltage is between 13.8 V and 14.8 V, the alternator operates correctly.
3. If the results of alternator-on unit test are not in the factory specifications, disassemble the alternator. Check each component part to find out the problem. Refer to "DISASSEMBLING AND ASSEMBLING" and "SERVICING" for the alternator.

Regulating voltage at no load	Factory specification	13.8 to 14.8 V at 25 °C (77 °F)

9Y1210674ENS0021US0



Glow Plug Continuity

1. Remove the glow plug (2).
2. Measure the resistance with a circuit tester between the glow plug terminal and the glow plug housing.
3. If the measurement does not show the factory specification, the glow plug (2) is damaged.

■ **NOTE**

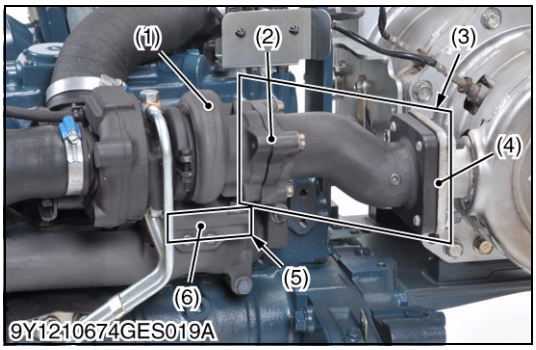
- **Adjust the direction of the ditch to the terminal side when the seal (1) is installed in the glow plug (2).**

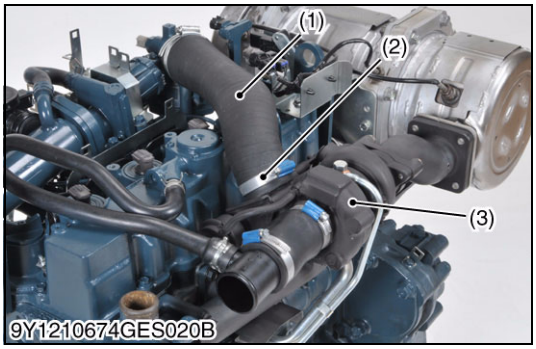
Resistance	Factory specification	Approx. 0.95 Ω

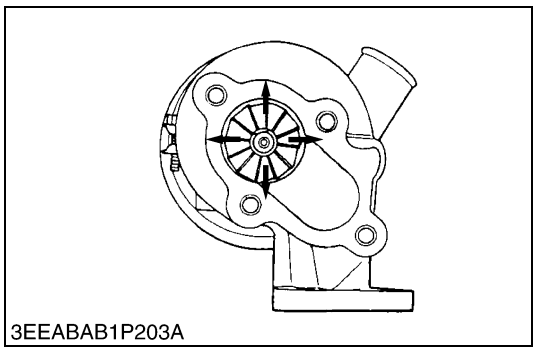
(1) Seal (2) Glow Plug

9Y1210674ENS0022US0

(5) Turbocharger







Exhaust Gas Leakage of Turbine Side

1. Check the exhaust port (3) and the inlet port (5) side of the turbine housing (1) for exhaust gas leakage.
2. If you find a gas leakage, tighten the screws and nuts again or replace the gasket (2) / (4) / (6) with a new one.

(1) Turbine Housing
(2) Gasket
(3) Exhaust Port
(4) Gasket
(5) Inlet Port
(6) Gasket

9Y1210674ENS0023US0

Air Leakage of Compressor Side

1. Check the inlet hose (1) of the compressor cover (3) for air leakage.
2. Check the suction side of the inlet hose for loose connections or cracks.
3. If you find an air leakage, change the clamps (2) and / or the inlet hose.

(1) Inlet Hose
(2) Clamp Band
(3) Compressor Cover

9Y1210674ENS0024US0

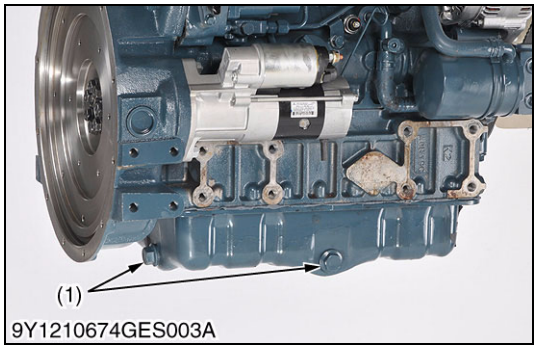
Radial Clearance

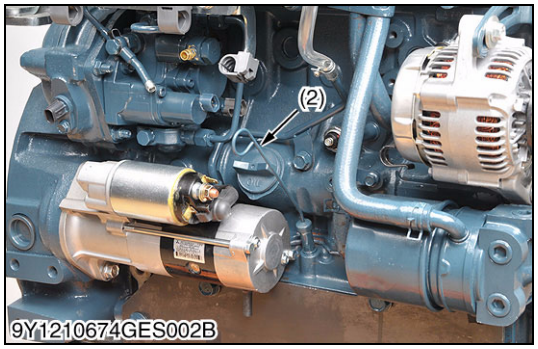
1. If the wheel touches the housing, replace the turbocharger assembly with a new one.

9Y1210674ENS0025US0

[2] DISASSEMBLING AND ASSEMBLING

(1) Draining Engine Oil and Coolant





Draining Engine Oil

1. Start and increase the temperature of the engine for approximately 5 minutes.
2. Put an oil pan below the engine.
3. Remove the drain plug (1) to drain the oil.
4. After you drain, tighten the drain plug (1).

(When reassembling)

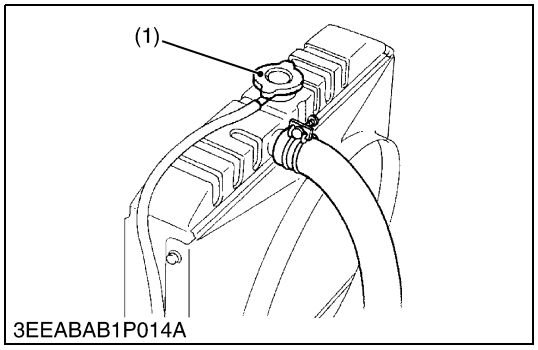
- Fill the engine oil until the upper line on the dipstick (2).

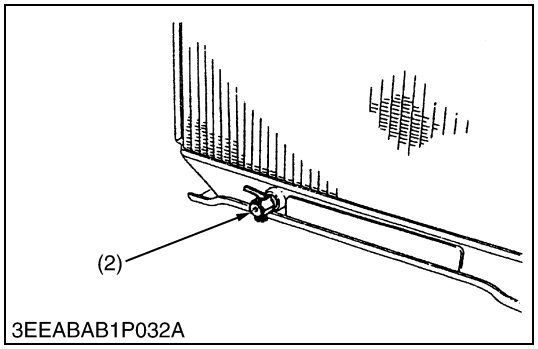
IMPORTANT

- **Do not mix different types of oil.**
- **Use the correct SAE Engine Oil by reference to the ambient temperature.**

(1) Drain Plug (2) Dipstick

9Y1210674ENS0026US0





Draining Coolant

CAUTION

- **Do not remove the radiator cap while you operate or immediately after you stop the engine. If not, hot water can flow out from the radiator. Only open the cap after more than 10 minutes for the temperature of the radiator to decrease.**

1. Prepare a bucket.
2. Open the drain valve (2) to drain the coolant.
3. After you drain, close the drain valve (2).

(1) Radiator Cap (2) Drain Valve

9Y1210674ENS0112US0

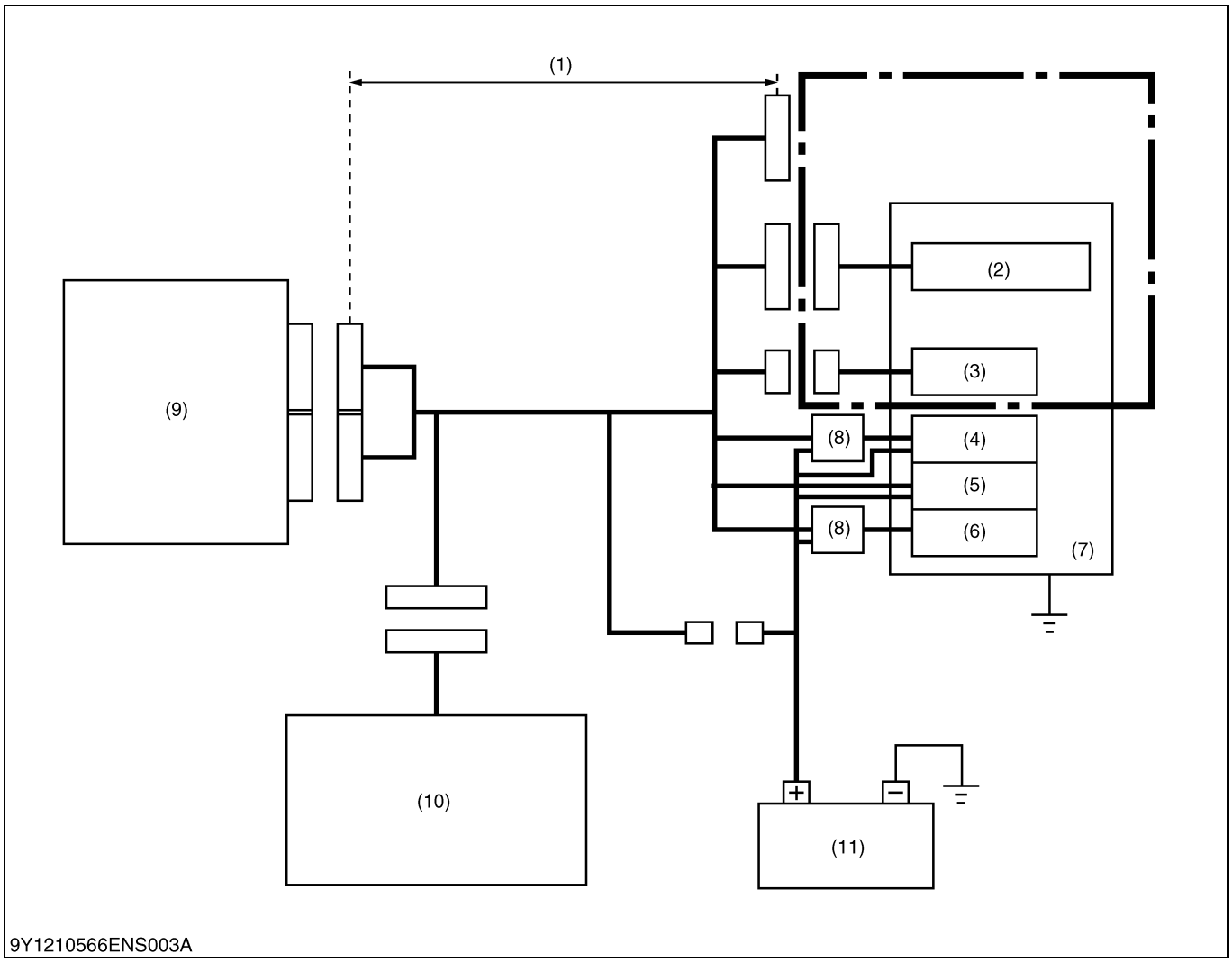
(2) External Components

CRS Intermediate Harness

1. Disconnect the ECU intermediate harness.
2. Remove the injector intermediate harness from the bracket.
3. Remove the engine intermediate harness from the bracket.

(When reassembling)

- Make sure that bracket is installed correct position.
- Make sure to install wire and clamp to specified position.



(1) ECU Intermediate Harness (OEM Side Harness)
(2) Engine Intermediate Harness (Engine Side Harness)
(3) Injector Intermediate Harness (Engine Side Harness)
(4) Starter
(5) Alternator
(6) Glow Plug
(7) Engine
(8) Relay
(9) Engine ECU
(10) OEM Designed Interface
(11) Battery

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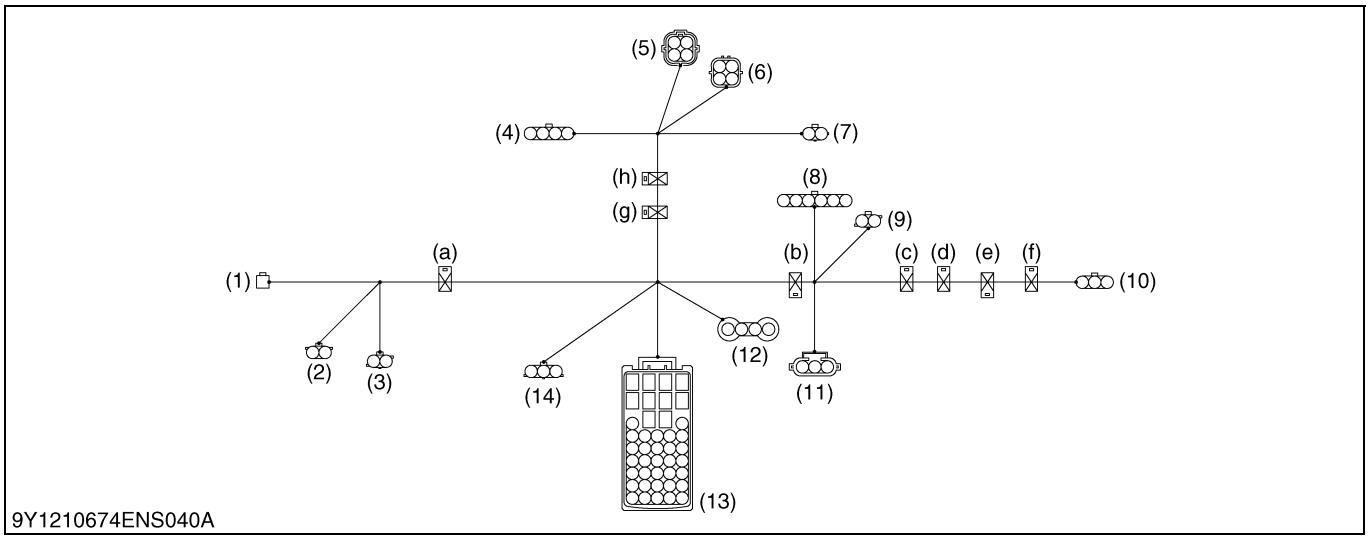
[A] Engine Intermediate Harness (Engine Side Harness)

V2607-CR-E4B

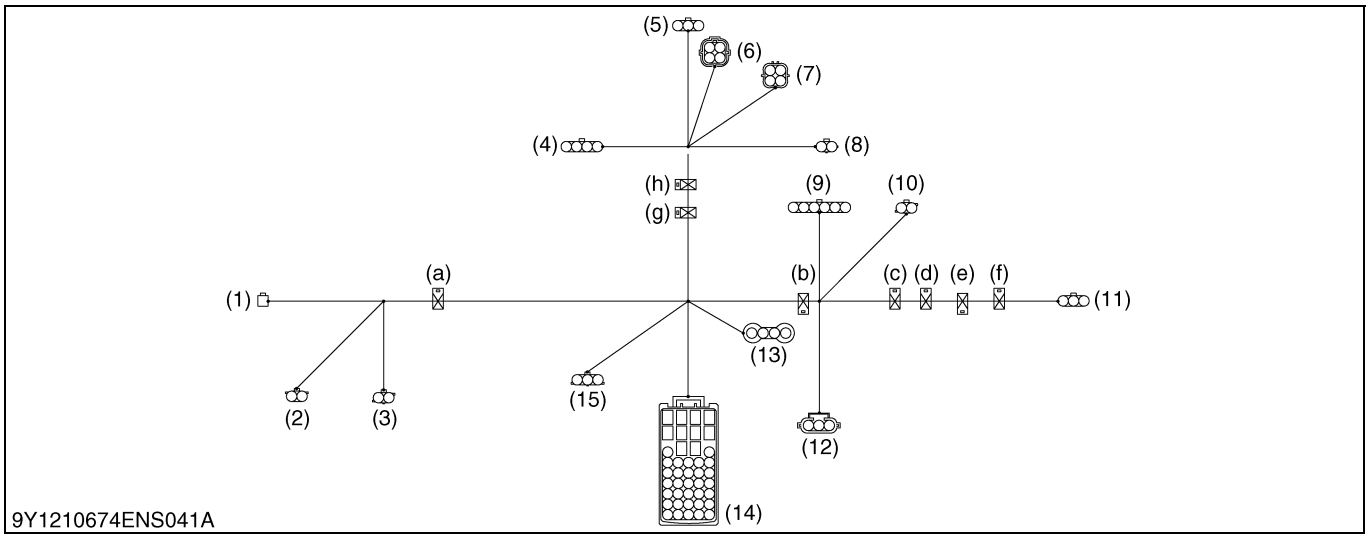


(1) Oil Pressure Switch Connector (1P)
(2) SCV (Suction Control Valve) Connector (2P)
(3) Fuel Temperature Sensor Connector (2P)
(4) EGR Valve Connector (4P)
(5) CAN Connector (4P)
(6) CAN Connector (4P)
(7) Intake Air Temperature Sensor Connector (2P)
(8) Intake Throttle Valve Connector (6P)
(9) Coolant Temperature Sensor Connector (2P)
(10) Camshaft Position (G) Sensor Connector (3P)
(11) Crankshaft Position (NE) Sensor Connector (3P)
(12) Resistor 120 Ω (2P) / Resistor 1.1 kΩ (2P)
(13) Engine Intermediate Connector
(14) Rail Pressure Sensor Connector (3P)

(a) to (h): Clamp

9Y1210674ENS0028US0

V2607-CR-TE4B / V3307-CR-TE4B

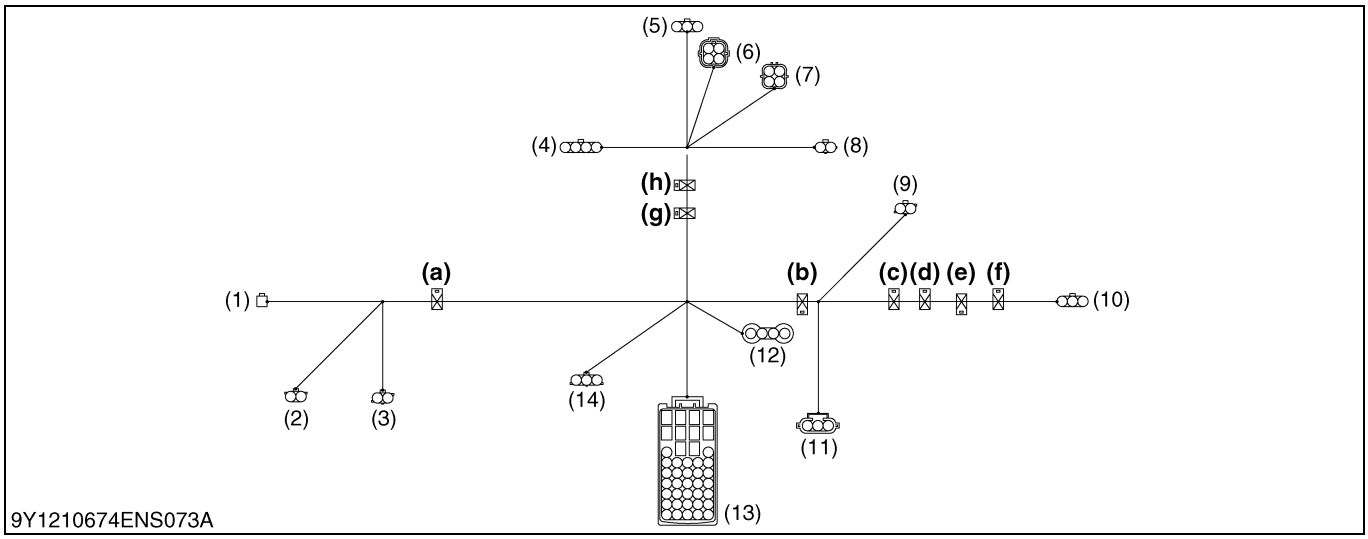


(1) Oil Pressure Switch Connector (1P)
(2) SCV (Suction Control Valve) Connector (2P)
(3) Fuel Temperature Sensor Connector (2P)
(4) EGR Valve Connector (4P)
(5) Boost Pressure Sensor Connector (3P)
(6) CAN Connector (4P)
(7) CAN Connector (4P)
(8) Intake Air Temperature Sensor Connector (2P)
(9) Intake Throttle Valve?Connector (6P)
(10) Coolant Temperature Sensor Connector (2P)
(11) Camshaft Position (G) Sensor Connector (3P)
(12) Crankshaft Position (NE) Sensor Connector (3P)
(13) Resistor 120 Ω (2P) / Resistor 1.1 kΩ (2P)
(14) Engine Intermediate Connector
(15) Rail Pressure Sensor Connector (3P)

(a) to (h): Clamp

9Y1210674ENS0113US0

V2607-CR-TIE4B / V3307-CR-TIE4B

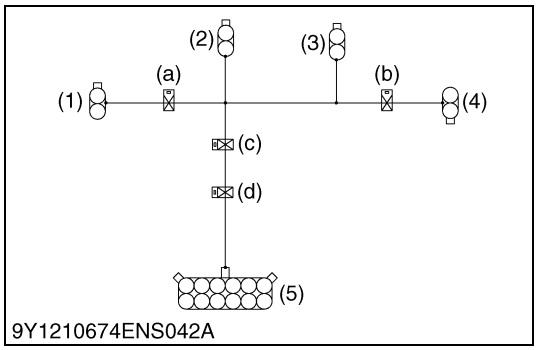


(1) Oil Pressure Switch Connector (1P)
(2) SCV (Suction Control Valve) Connector (2P)
(3) Fuel Temperature Sensor Connector (2P)
(4) EGR Valve Connector (4P)
(5) Boost Pressure Sensor Connector (3P)
(6) CAN Connector (4P)
(7) CAN Connector (4P)
(8) Intake Air Temperature Sensor Connector (2P)
(9) Coolant Temperature Sensor Connector (2P)
(10) Camshaft Position (G) Sensor Connector (3P)
(11) Crankshaft Position (NE) Sensor Connector (3P)
(12) Resistor 120 Ω (2P) / Resistor 1.1 kΩ (2P)
(13) Engine Intermediate Connector
(14) Rail Pressure Sensor Connector (3P)

(a) to (h): Clamp

9Y1210674ENS0152US0

[B] Injector Intermediate Harness (Engine Side Harness)
V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B / V3307-CR-TE4B / V3307-CR-TIE4B



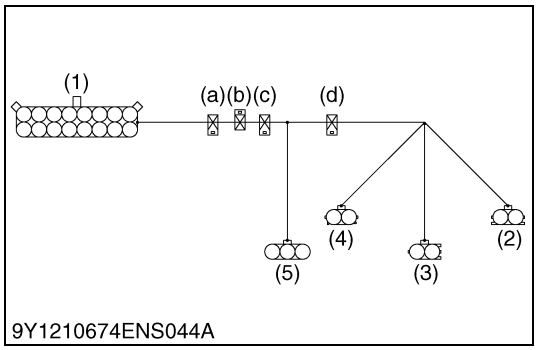
9Y1210674ENS042A

(1) Injector #4 Connector (2P)
(2) Injector #3 Connector (2P)
(3) Injector #2 Connector (2P)
(4) Injector #1 Connector (2P)
(5) Injector Intermediate Connector (12P)

(a) to (d): Clamp

9Y1210674ENS0114US0

[C] DPF Intermediate Harness (Engine Side Harness)
V2607-CR-E4B / V2607-CR-TE4B / V3307-CR-TE4B

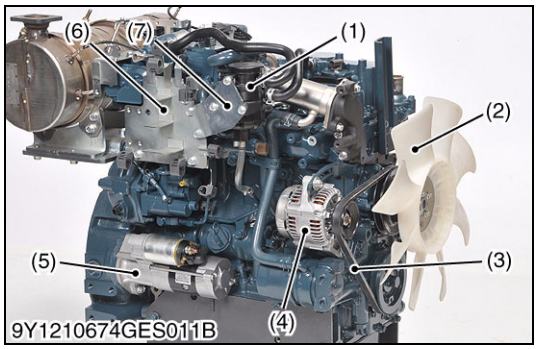


9Y1210674ENS044A

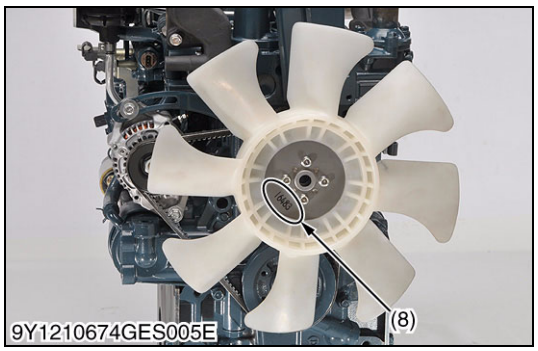
(1) DPF Intermediate Connector (16P)
(2) DPF Temperature Sensor (T_0) (2P)
(3) DPF Temperature Sensor (T_1) (2P)
(4) DPF Temperature Sensor (T_2) (2P)
(5) Differential Pressure Sensor (ΔP) (3P)

(a) to (d): Clamp

9Y1210674ENS0115US0



9Y1210674GES011B



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Air Cleaner and Others

1. Remove the air cleaner.
2. Remove the fan (2), fan belt (3), alternator (4) and starter (5).
3. Remove the oil separator assembly (1), wire harness bracket (6) and oil separator bracket (7).

(When reassembling)

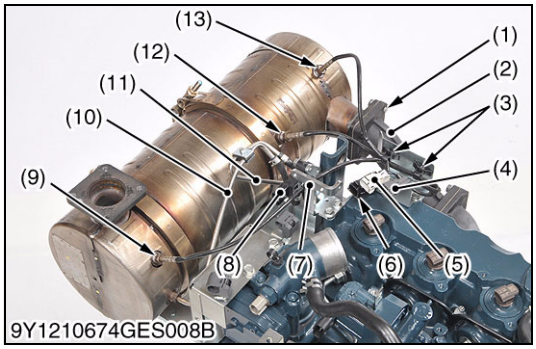
- Check for cracks on the belt surface.

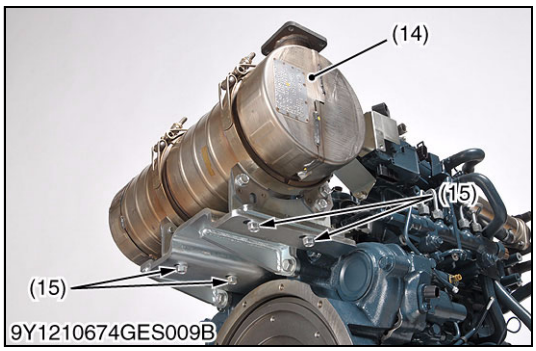
■ **IMPORTANT**

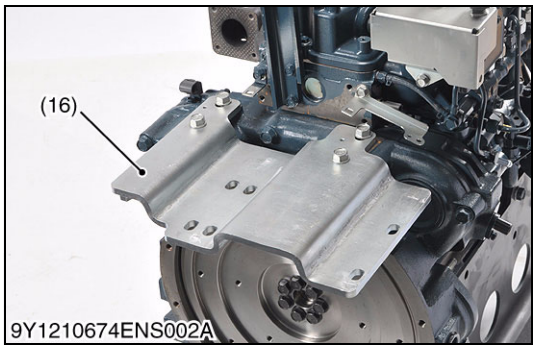
- **After you assemble the fan belt, adjust the fan belt tension.**
- **Do not put the fan in the incorrect direction. Install the fan so that the parts number (8) of the fan is toward the front side. (radiator side)**

(1) Oil Separator Assembly
(2) Fan
(3) Fan Belt
(4) Alternator
(5) Starter
(6) Wire Harness Bracket
(7) Oil Separator Bracket
(8) Parts Number

9Y1210674ENS0029US0







Muffler Full Assembly (DPF) (V2607-CR-E4B)

■ **IMPORTANT**

- **Since the DPF that was dropped or given a shock cannot be reused even if there is no damage outwardly, replace it with a new one.**
- **Be sure to loosen the temperature sensor tightening nut or the differential pressure pipe tightening nut with crowfoot wrench to prevent the damage of the sensor or pipe.**
  If it is still hard to loosen, apply the lubricant spray to threaded portion and soak it with lubricant.

■ **NOTE**

- **Always work in the workshop equipped with a electric hoist (including mobile hoist).**
- **Put a product (engine) on a stable ground, and set the parking brake.**
- **As the DPF muffler full assembly is hot just after the engine shutdown, make sure to start operation after it gets cool.**
- **Make sure not to let any foreign substances enter the opening section during the operation.**
- **Make sure not to damage the DPF muffler full assembly by falling or impact as it contains a ceramic filter.**
- **Before removing the DPF muffler full assembly from a product (engine), connect the diagnosis tool (Diagmaster), check the failure history, and save the project.**
- **Before removing the DPF for cleaning, keep the records of the engine serial number, DPF part number, DPF serial number, catalyst (DOC) part number, catalyst (DOC) serial number, and engine operating time, which are required in preparing the DPF cleaning order from.**
  Since the engine operating time is recorded in the ECU, check the operating time by connecting the service tool (Diagmaster).
- **When installing and removing the muffler full assembly (DPF), make sure that the temperature sensor, differential pressure sensor, and differential pressure pipe do not make contact with surrounding parts.**

1. Disconnect the harness from the connector (4), (5), (6) of temperature sensor and differential pressure sensor (8).
2. Remove the connector (4), (5), (6) of temperature sensor from the bracket.
3. Remove the 2 clamps (3).
4. Remove the differential pressure sensor bracket (7).
5. Remove the 4 screws (1) of muffler flange (2).
6. Remove the muffler full assembly (DPF) mounting screws (15).
7. Remove the muffler full assembly (DPF) (14).
8. Remove the DPF bracket (16).

(1) Screw of Muffler Flange
(2) Muffler Flange
(3) Clamp
(4) Connector of Temperature Sensor (T_2)
(5) Connector of Temperature Sensor (T_1)
(6) Connector of Temperature Sensor (T_0)
(7) Differential Pressure Sensor Bracket
(8) Differential Pressure Sensor
(9) Temperature Sensor (T_2)
(10) Differential Pressure Pipe
(11) Differential Pressure Pipe
(12) Temperature Sensor (T_1)
(13) Temperature Sensor (T_0)
(14) Muffler Full Assembly (DPF)
(15) Muffler Full Assembly (DPF) Mounting Screw
(16) DPF Bracket

(To be continued)

(Continued)

(When reassembling)

- Replace the gaskets with new ones.
- If the differential pressure tube is damaged or cracked, replace it.
- When the differential pressure pipe (10), (11) and temperature sensor (9), (12), (13) is removed, wipe off the anti-seize & lubricating compound, apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach them to their correct position.
- When replacing the differential pressure pipe (10), (11), apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach it to its correct position.
- When replacing the temperature sensor, check that it is coated with anti-seize & lubricating compound, and then attach it to its correct position.
- Tighten bolts and nuts to their specified torque. Also tighten the temperature sensor tightening nut or the differential pressure pipe tightening nut to the specified torque with crowfoot wrench.
- After attaching the assembly, start the engine and make sure that there are no gas leaks.

Tightening torque	Screw of muffler flange	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Muffler full assembly (DPF) mounting screw	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft
	DPF bracket mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Screw of Muffler Flange
(2) Muffler Flange
(3) Clamp
(4) Connector of Temperature Sensor (T_2)
(5) Connector of Temperature Sensor (T_1)
(6) Connector of Temperature Sensor (T_0)
(7) Differential Pressure Sensor Bracket
(8) Differential Pressure Sensor
(9) Temperature Sensor (T_2)
(10) Differential Pressure Pipe
(11) Differential Pressure Pipe
(12) Temperature Sensor (T_1)
(13) Temperature Sensor (T_0)
(14) Muffler Full Assembly (DPF)
(15) Muffler Full Assembly (DPF) Mounting Screw
(16) DPF Bracket

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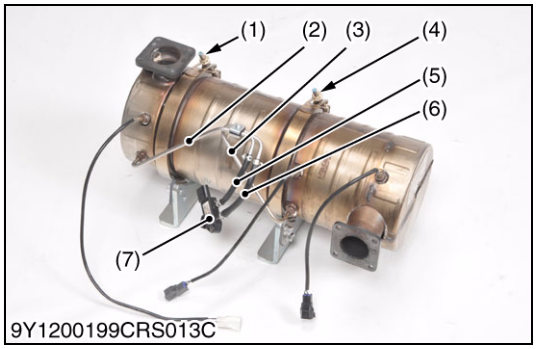

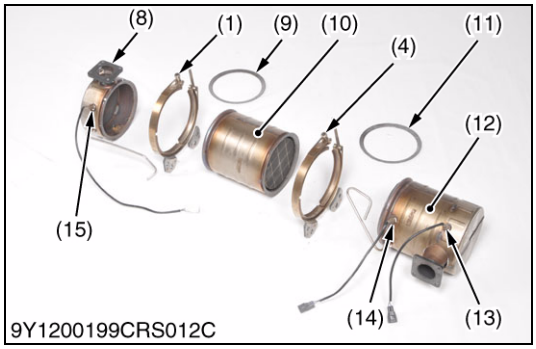

DPF (If necessary) (V2607-CR-E4B)

■ **NOTE**

- **Always work in the workshop equipped with a electric hoist (including mobile hoist).**
- **Put a product (engine) on a stable ground, and set the parking brake.**
- **As the DPF muffler full assembly is hot just after the engine shutdown, make sure to start operation after it gets cool.**
- **Make sure not to let any foreign substances enter the opening section during the operation.**
- **Make sure not to damage the DPF muffler full assembly by falling or impact as it contains a ceramic filter.**
- **Before removing the DPF for cleaning, keep the records of the engine serial number, DPF part number, DPF serial number, catalyst (DOC) part number, catalyst (DOC) serial number, and engine operating time, which are required in preparing the DPF cleaning order from.**
  Since the engine operating time is recorded in the ECU, check the operating time by connecting the service tool (Diagmaster).
- **When installing and removing the muffler full assembly (DPF), make sure that the temperature sensor, differential pressure sensor, and differential pressure pipe do not make contact with surrounding parts.**

1. Remove the tube (5), (6) from the differential pressure pipe (2), (3).
2. Remove the differential pressure sensor (7).
3. Loosen the DPF mounting bracket (1), (4) and remove the DPF (10).

(1) DPF Mounting Bracket
(2) Differential Pressure Pipe
(3) Differential Pressure Pipe
(4) DPF Mounting Bracket
(5) Tube
(6) Tube
(7) Differential Pressure Sensor
(8) Body (DPF Outlet)
(9) Gasket
(10) DPF
(11) Gasket
(12) Catalyst (DOC)
(13) Temperature Sensor (T_0)
(14) Temperature Sensor (T_1)
(15) Temperature Sensor (T_2)

(To be continued)

(Continued)

(When reassembling)

- Replacing the gaskets (9), (11) with new ones.
- If the differential pressure tube is damaged or cracked, replace it.
- When the differential pressure pipe (2), (3) and temperature sensor (13), (14), (15) is removed, wipe off the anti-seize & lubricating compound, apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach them to their correct position.
- When replacing the differential pressure pipe (2), (3) apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach it to its correct position.
- When replacing the temperature sensor, check that it is coated with anti-seize & lubricating compound, and then attach it to its correct position.
- Tighten bolts and nuts to their specified torque. Also tighten the temperature sensor tightening nut or the differential pressure pipe tightening nut to the specified torque with crowfoot wrench.
- After attaching the assembly, start the engine and make sure that there are no gas leaks.
- Reassemble the DPF (10) in the correct direction.

Tightening torque	DPF mounting bracket	16 to 20 N·m 1.7 to 2.0 kgf·m 12 to 14 lbf·ft
	Temperature sensor	25 to 34 N·m 2.5 to 3.5 kgf·m 18 to 25 lbf·ft
	Differential pressure pipe	16 to 22 N·m 1.6 to 2.3 kgf·m 12 to 16 lbf·ft

(1) DPF Mounting Bracket
(2) Differential Pressure Pipe
(3) Differential Pressure Pipe
(4) DPF Mounting Bracket
(5) Tube
(6) Tube
(7) Differential Pressure Sensor
(8) Body (DPF Outlet)
(9) Gasket
(10) DPF
(11) Gasket
(12) Catalyst (DOC)
(13) Temperature Sensor (T_0)
(14) Temperature Sensor (T_1)
(15) Temperature Sensor (T_2)

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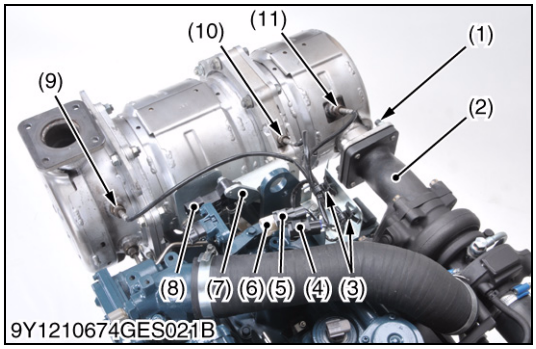

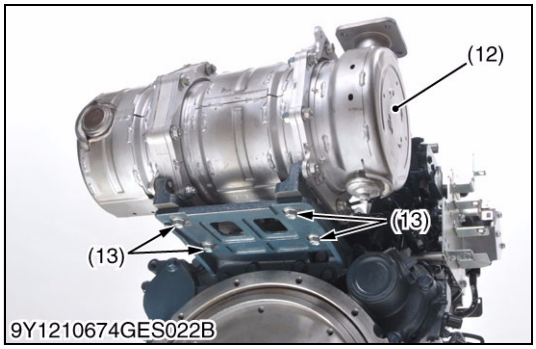

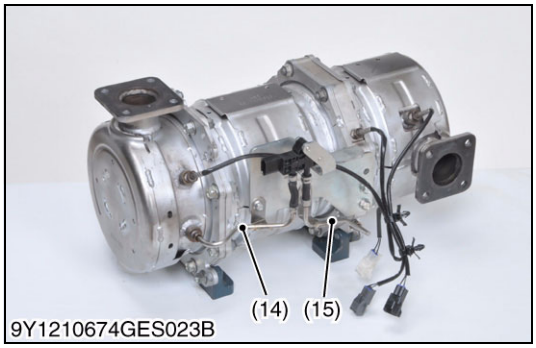

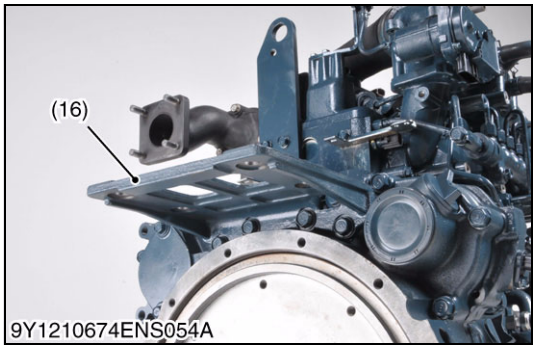

Muffler Full Assembly (DPF) (V2607-CR-TE4B, V3307-CR-TE4B)

■ **IMPORTANT**

- **Since the DPF that was dropped or given a shock cannot be reused even if there is no damage outwardly, replace it with a new one.**
- **Be sure to loosen the temperature sensor tightening nut or the differential pressure pipe tightening nut with crowfoot wrench to prevent the damage of the sensor or pipe.**
  If it is still hard to loosen, apply the lubricant spray to threaded portion and soak it with lubricant.

■ **NOTE**

- **Always work in the workshop equipped with a electric hoist (including mobile hoist).**
- **Put a product (engine) on a stable ground, and set the parking brake.**
- **As the DPF muffler full assembly is hot just after the engine shutdown, make sure to start operation after it gets cool.**
- **Make sure not to let any foreign substances enter the opening section during the operation.**
- **Make sure not to damage the DPF muffler full assembly by falling or impact as it contains a ceramic filter.**
- **Before removing the DPF muffler full assembly from a product (engine), connect the diagnosis tool (Diagmaster), check the failure history, and save the project.**
- **Before removing the DPF for cleaning, keep the records of the engine serial number, DPF part number, DPF serial number, catalyst (DOC) part number, catalyst (DOC) serial number, and engine operating time, which are required in preparing the DPF cleaning order from.**
  Since the engine operating time is recorded in the ECU, check the operating time by connecting the service tool (Diagmaster).
- **When installing and removing the muffler full assembly (DPF), make sure that the temperature sensor, differential pressure sensor, and differential pressure pipe do not make contact with surrounding parts.**

1. Disconnect the harness from the connector (4), (5), (6) of temperature sensor and differential pressure sensor (8).
2. Remove the connector (4), (5), (6) of temperature sensor from the bracket.
3. Remove the 2 clamps (3).
4. Remove the differential pressure sensor bracket (7).
5. Remove the 4 nuts (1) of muffler flange (2).
6. Remove the muffler full assembly (DPF) mounting screws (13).
7. Remove the muffler full assembly (DPF) (12).
8. Remove the DPF bracket (16).

(1) Nut of Muffler Flange
(2) Muffler Flange
(3) Clamp
(4) Connector of Temperature Sensor (T_0)
(5) Connector of Temperature Sensor (T_1)
(6) Connector of Temperature Sensor (T_2)
(7) Differential Pressure Sensor Bracket
(8) Differential Pressure Sensor
(9) Temperature Sensor (T_2)
(10) Temperature Sensor (T_1)
(11) Temperature Sensor (T_0)
(12) Muffler Full Assembly (DPF)
(13) Muffler Full Assembly (DPF) Mounting Screw
(14) Differential Pressure Pipe
(15) Differential Pressure Pipe
(16) DPF Bracket

(To be continued)

(Continued)

(When reassembling)

- Replace the gaskets with new ones.
- If the differential pressure tube is damaged or cracked, replace it.
- When the differential pressure pipe (14), (15) and temperature sensor (9), (10), (11) is removed, wipe off the anti-seize & lubricating compound, apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach them to their correct position.
- When replacing the differential pressure pipe (14), (15), apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach it to its correct position.
- When replacing the temperature sensor, check that it is coated with anti-seize & lubricating compound, and then attach it to its correct position.
- Tighten bolts and nuts to their specified torque. Also tighten the temperature sensor tightening nut or the differential pressure pipe tightening nut to the specified torque with crowfoot wrench.
- After attaching the assembly, start the engine and make sure that there are no gas leaks.

Tightening torque	Nut of muffler flange	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft
	Muffler full assembly (DPF) mounting screw	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft
	DPF bracket mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Nut of Muffler Flange
(2) Muffler Flange
(3) Clamp
(4) Connector of Temperature Sensor (T_0)
(5) Connector of Temperature Sensor (T_1)
(6) Connector of Temperature Sensor (T_2)
(7) Differential Pressure Sensor Bracket
(8) Differential Pressure Sensor
(9) Temperature Sensor (T_2)
(10) Temperature Sensor (T_1)
(11) Temperature Sensor (T_0)
(12) Muffler Full Assembly (DPF)
(13) Muffler Full Assembly (DPF) Mounting Screw
(14) Differential Pressure Pipe
(15) Differential Pressure Pipe
(16) DPF Bracket

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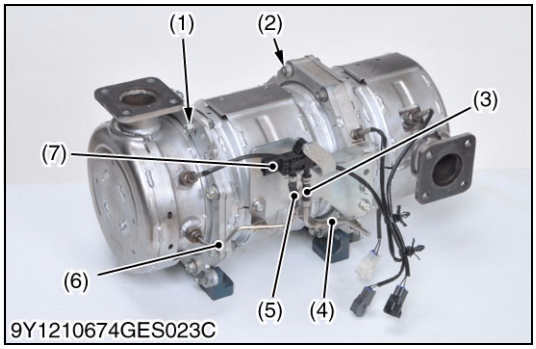

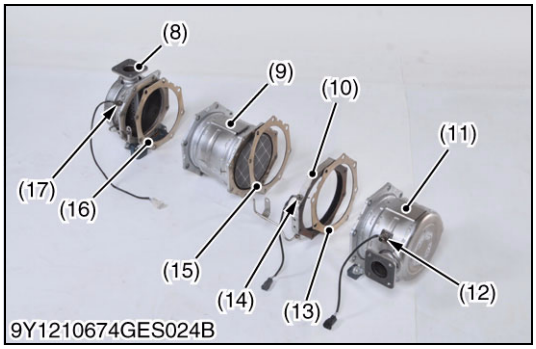

DPF (If necessary) (V2607-CR-TE4B, V3307-CR-TE4B)

■ **NOTE**

- **Always work in the workshop equipped with a electric hoist (including mobile hoist).**
- **Put a product (engine) on a stable ground, and set the parking brake.**
- **As the DPF muffler full assembly is hot just after the engine shutdown, make sure to start operation after it gets cool.**
- **Make sure not to let any foreign substances enter the opening section during the operation.**
- **Make sure not to damage the DPF muffler full assembly by falling or impact as it contains a ceramic filter.**
- **Before removing the DPF for cleaning, keep the records of the engine serial number, DPF part number, DPF serial number, catalyst (DOC) part number, catalyst (DOC) serial number, and engine operating time, which are required in preparing the DPF cleaning order from.**
  Since the engine operating time is recorded in the ECU, check the operating time by connecting the service tool (Diagmaster).
- **When installing and removing the muffler full assembly (DPF), make sure that the temperature sensor, differential pressure sensor, and differential pressure pipe do not make contact with surrounding parts.**

1. Remove the tube (3), (5) from the differential pressure pipe (4), (6).
2. Remove the differential pressure sensor (7).
3. Loosen the DPF mounting screw (1), (2) and remove the DPF (9).

(1) DPF Mounting Screw
(2) DPF Mounting Screw
(3) Tube
(4) Differential Pressure Pipe
(5) Tube
(6) Differential Pressure Pipe
(7) Differential Pressure Sensor
(8) Body (DPF Outlet)
(9) DPF
(10) Collar (DPF)
(11) Catalyst (DOC)
(12) Temperature Sensor (T_0)
(13) Gasket
(14) Temperature Sensor (T_1)
(15) Gasket
(16) Gasket
(17) Temperature Sensor (T_2)

(To be continued)

(Continued)

(When reassembling)

- Replacing the gaskets (13), (15), (16) with new ones.
- If the differential pressure tube is damaged or cracked, replace it.
- When the differential pressure pipe (4), (6) and temperature sensor (12), (14), (17) is removed, wipe off the anti-seize & lubricating compound, apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach them to their correct position.
- When replacing the differential pressure pipe (4), (6) apply a anti-seize & lubricating compound (Bostik, NEVER SEEZ, Pure Nickel Special Grade), and then attach it to its correct position.
- When replacing the temperature sensor, check that it is coated with anti-seize & lubricating compound, and then attach it to its correct position.
- Tighten bolts and nuts to their specified torque. Also tighten the temperature sensor tightening nut or the differential pressure pipe tightening nut to the specified torque with crowfoot wrench.
- After attaching the assembly, start the engine and make sure that there are no gas leaks.
- Reassemble the DPF (9) in the correct direction.

Tightening torque	DPF mounting screw	49.0 to 63.7 N·m 5.00 to 6.49 kgf·m 36.2 to 46.9 lbf·ft
	Temperature sensor	25 to 34 N·m 2.5 to 3.5 kgf·m 18 to 25 lbf·ft
	Differential pressure pipe	16 to 22 N·m 1.6 to 2.3 kgf·m 12 to 16 lbf·ft

(1) DPF Mounting Screw
(2) DPF Mounting Screw
(3) Tube
(4) Differential Pressure Pipe
(5) Tube
(6) Differential Pressure Pipe
(7) Differential Pressure Sensor
(8) Body (DPF Outlet)
(9) DPF
(10) Collar (DPF)
(11) Catalyst (DOC)
(12) Temperature Sensor (T_0)
(13) Gasket
(14) Temperature Sensor (T_1)
(15) Gasket
(16) Gasket
(17) Temperature Sensor (T_2)

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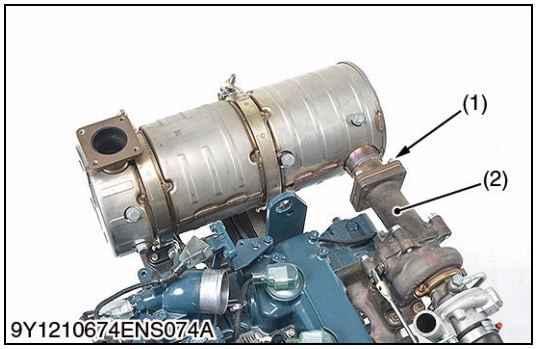

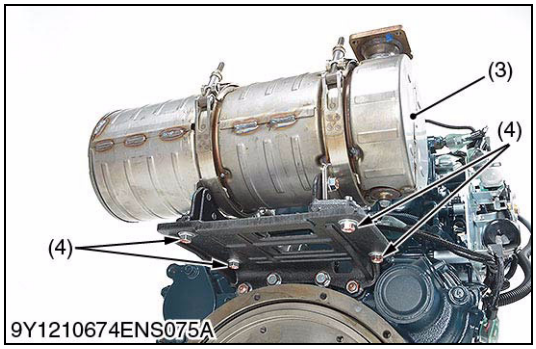

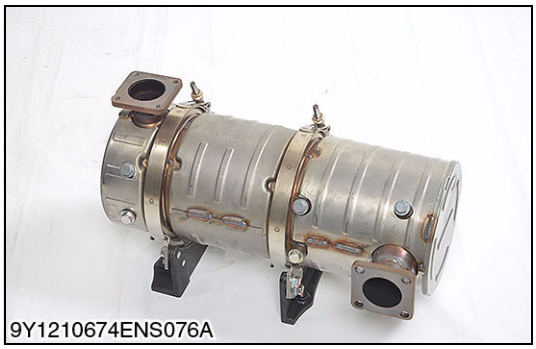

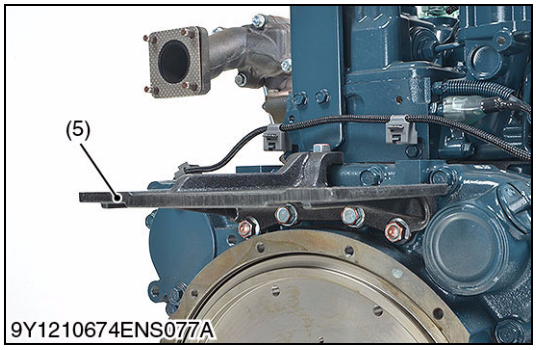

Muffler Full Assembly (DOC) (V2607-CR-TIE4B, V3307-CR-TIE4B)

■ **IMPORTANT**

- **Since the DOC that was dropped or given a shock cannot be reused even if there is no damage outwardly, replace it with a new one.**

■ **NOTE**

- **Always work in the workshop equipped with a electric hoist (including mobile hoist).**
- **Put a product (engine) on a stable ground, and set the parking brake.**
- **As the DOC muffler full assembly is hot just after the engine shutdown, make sure to start operation after it gets cool.**
- **Make sure not to let any foreign substances enter the opening section during the operation.**
- **Make sure not to damage the DOC muffler full assembly by falling or impact as it contains a ceramic filter.**

1. Remove the 4 nuts (1) of muffler flange (2).
2. Remove the muffler full assembly (DOC) mounting screws (4).
3. Remove the muffler full assembly (DOC) (3).
4. Remove the bracket (5).

(When reassembling)

- Replace the gaskets with new ones.
- If the differential pressure tube is damaged or cracked, replace it.
- Tighten bolts and nuts to their specified torque.
- After attaching the assembly, start the engine and make sure that there are no gas leaks.

Tightening torque	Nut of muffler flange	29.4 to 34.3 N·m 3.00 to 3.49 kgf·m 21.7 to 25.2 lbf·ft
	Muffler full assembly (DOC) mounting screw	60.8 to 70.8 N·m 6.20 to 7.21 kgf·m 44.9 to 52.2 lbf·ft
	DPF bracket mounting screw	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft

(1) Nut of Muffler Flange
(2) Muffler Flange
(3) Muffler Full Assembly (DOC)
(4) Muffler Full Assembly (DOC) Mounting Screw
(5) Bracket

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(3) Turbocharger and EGR

CAUTION

- **While the engine operates or just after it stops, do not touch the hot turbocharger.**

NOTE

- **When you remove or install the turbocharger assembly, do not let dust, dirt and other unwanted materials in the oil pipes.**
- **After you replace the turbocharger assembly, fill clean engine oil through the oil filter port of the turbocharger.**
- **Before you start the engine, make sure that the air cleaner is in the correct position.**

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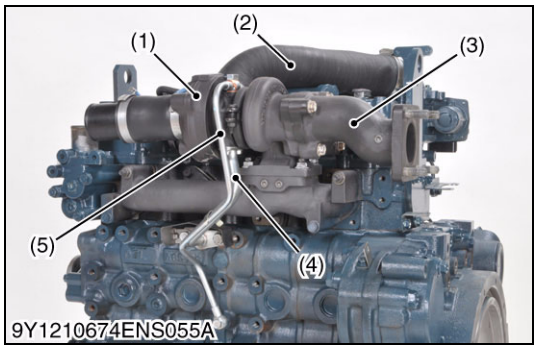

Turbocharger

1. Remove the inlet hose (2).
2. Remove the muffler flange (3).
3. Remove the oil pipe (5).
4. Remove the return pipe (4).
5. Remove the turbocharger assembly (1).

(When reassembling)

- Fill clean engine oil through the oil filter port of the turbocharger.
- Replace the gaskets with new ones.
- Do not to let dust, dirt and other unwanted materials in the oil pipes.

NOTE

- **Put tape or cover on all openings to prevent damage in the oil holes in the turbocharger by unwanted materials.**

(1) Turbocharger Assembly
(2) Inlet Hose
(3) Muffler Flange
(4) Return Pipe
(5) Oil Pipe

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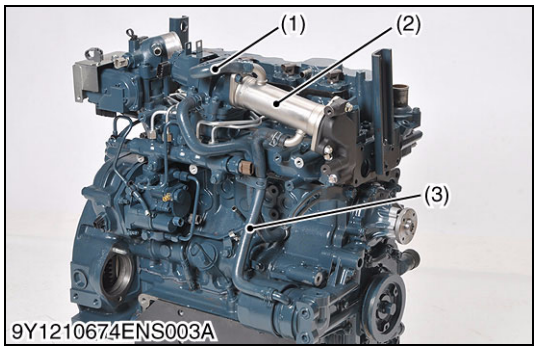

EGR Cooler

1. Disconnect the EGR cooler pipe (1), (3).
2. Remove the EGR cooler (2).

Tightening torque	EGR cooler flange screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft

(1) EGR Cooler Pipe
(2) EGR Cooler
(3) EGR Cooler Pipe

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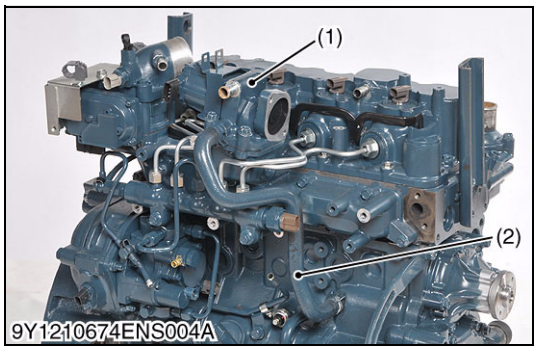

EGR Valve

1. Disconnect the cooler pipe (2) of EGR valve.
2. Remove the EGR valve (1).

NOTE

- **Do not disassemble the EGR valve assembly.**

(When reassembling)

- Replace the gaskets with new ones.

(1) EGR Valve
(2) Cooler Pipe

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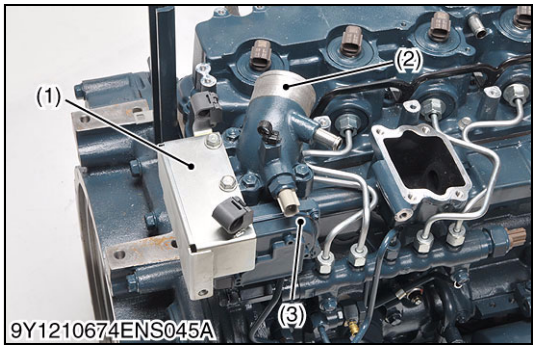

Intake Throttle Valve

1. Remove the cover (1) and the air cleaner flange (2).
2. Remove the intake throttle valve (3).

■ **NOTE**
- **Do not disassemble the intake throttle valve.**

(When reassembling)
- Replace the gaskets with new ones.

(1) Cover
(2) Air Cleaner Flange
(3) Intake Throttle Valve

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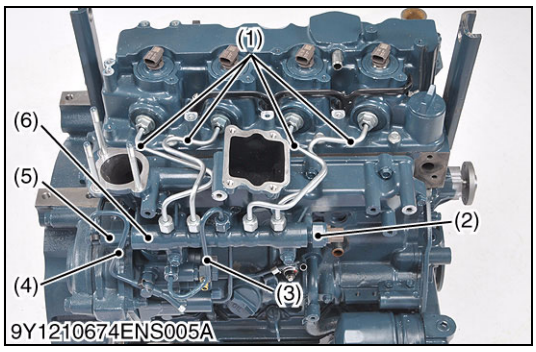
(4) Common Rail



Common Rail and Injection Pipes

CAUTION
- **Do not loosen the injection pipe when the fuel is under high pressure (within five minutes of stopping the engine).**

■ **NOTE**
- **Please replace the rail assembly, if the exchange of the pressure limiter or the rail pressure sensor is necessary.**
- **Do not remove the pressure limiter (5) and rail pressure sensor (2) from the common rail (6).**
- **When removing the common rail (6), do not hold it by the pressure limiter (5) and rail pressure sensor (2).**

1. Remove the injection pipe (3).
2. Remove the overflow pipe (4).
3. Remove the injection pipes (1).
4. Remove the common rail (6).

■ **IMPORTANT**
- **Store the injection pipes (1), (3) so it does not get any dust in it.**
- **Store the common rail (6) so it does not get any dust in it.**

(When reassembling)

■ **NOTE**
- **Tighten the injection pipes securely to their specified torques.**

Tightening torque	Common rail mounting screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Injection pipe retaining nut	30 to 40 N·m 3.1 to 4.0 kgf·m 23 to 29 lbf·ft
	Overflow pipe joint screw (Cylinder head side) M8	11 to 15 N·m 1.2 to 1.5 kgf·m 8.2 to 11 lbf·ft
	Overflow pipe joint screw (Common rail side) M10	7.9 to 12 N·m 0.80 to 1.3 kgf·m 5.8 to 9.4 lbf·ft
	Overflow pipe joint screw (Supply pump side) M10	7.9 to 12 N·m 0.80 to 1.3 kgf·m 5.8 to 9.4 lbf·ft

(1) Injection Pipe
(2) Rail Pressure Sensor
(3) Injection Pipe
(4) Overflow Pipe
(5) Pressure Limiter
(6) Common Rail

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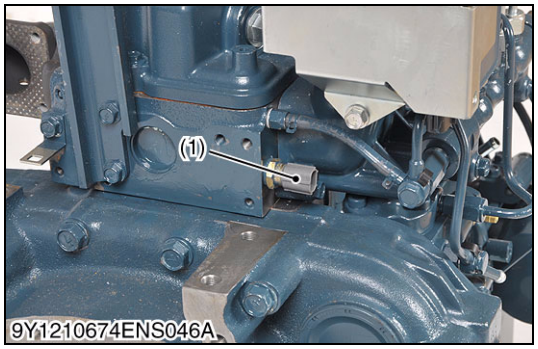

Coolant Temperature Sensor

1. Remove the coolant temperature sensor (1).

(When reassembling)

- Replace the gaskets with new ones.

Tightening torque	Coolant Temperature Sensor	16 to 19 N·m 1.6 to 2.0 kgf·m 12 to 14 lbf·ft

(1) Coolant Temperature Sensor

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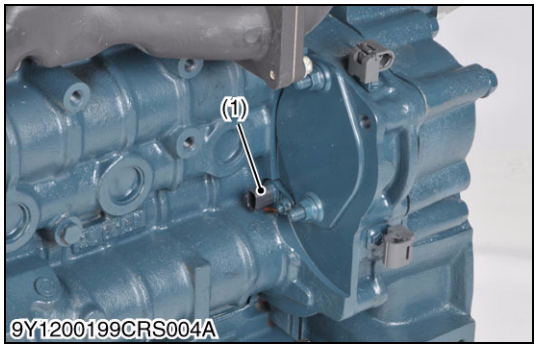

Camshaft Position Sensor

1. Remove the camshaft position sensor mounting screw.
2. Remove the camshaft position sensor (1).

(When reassembling)

- Replace the O-ring with a new one.

Tightening torque	Camshaft position sensor mounting screw	8.0 to 12 N·m 0.82 to 1.2 kgf·m 5.9 to 8.8 lbf·ft

(1) Camshaft Position Sensor

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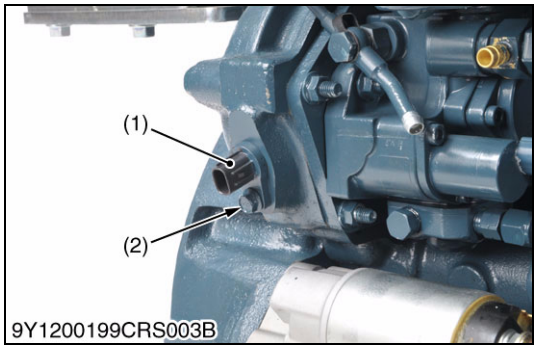

Crankshaft Position Sensor

1. Remove the crankshaft position sensor mounting screw (2).
2. Remove the crankshaft position sensor (1).

(When reassembling)

- Replace the O-ring with a new one.

■ **IMPORTANT**

- **If you drop the sensor, do not reuse it.**

Tightening torque	Crankshaft position sensor mounting screw	8.0 to 12 N·m 0.82 to 1.2 kgf·m 5.9 to 8.8 lbf·ft

(1) Crankshaft Position Sensor
(2) Crankshaft Position Sensor Mounting Screw

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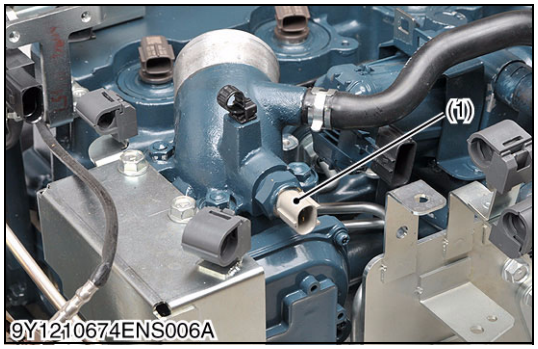

Intake Air Temperature Sensor

1. Remove the intake air temperature sensor (1).

(When reassembling)

- Replace the gaskets with new ones.

Tightening torque	Intake air temperature sensor	30 to 39 N·m 3.0 to 4.0 kgf·m 22 to 28 lbf·ft

(1) Intake Air Temperature Sensor

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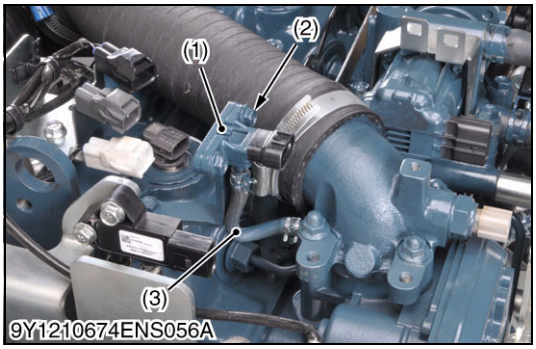

Boost Sensor

■ **IMPORTANT**
- **Be careful not to damage the sensor when removing the hose from the boost sensor.**

1. Remove the hose (3) from the boost sensor (1).
2. Remove the boost sensor mounting screw (2).
3. Remove the boost sensor (1).

(When reassembling)
- Replace the gaskets with new ones.
- If the hose is damaged, replace it with a new hose.

Tightening torque	Boost sensor mounting screw	4 to 5 N·m 0.4 to 0.6 kgf·m 3 to 4 lbf·ft

(1) Boost Sensor
(2) Boost Sensor Mounting Screw
(3) Hose

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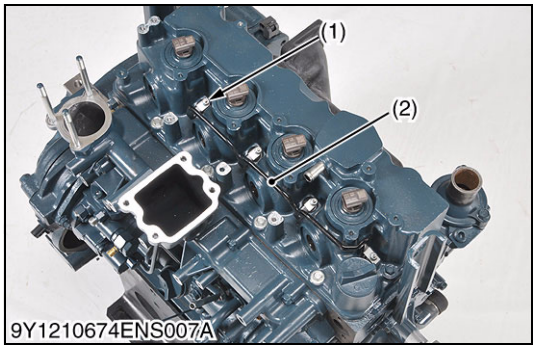
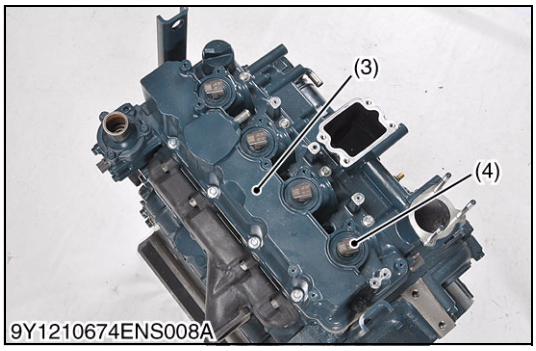
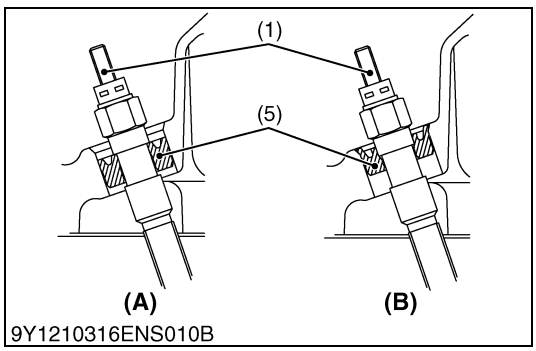
(5) Cylinder Head and Valves







Cylinder Head Cover and Glow Plug

1. Remove the glow lead (2) and the glow plugs (1).
2. Remove the cylinder head cover (3).

(When reassembling)
- Check to see that the cylinder head cover gasket is not detective.
- Tighten the head cover mounting screws to specified torque.
- Do not damage injector QR code tags (4) when installing cylinder head cover (3).
- Replace the gasket of cylinder head cover with a new one.
- Adjust the direction of the ditch to the terminal side when the seal (5) is installed in the glow plug (1).
- After installing the glow plug (1), make sure that the seal (5) was set to the specified position.

Tightening torque	Cylinder head cover screw	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft
	Glow lead mounting nut	0.98 to 1.7 N·m 0.10 to 0.18 kgf·m 0.73 to 1.3 lbf·ft
	Glow plug	7.7 to 9.3 N·m 0.78 to 0.95 kgf·m 5.7 to 6.8 lbf·ft

(1) Glow Plug
(2) Glow Lead
(3) Cylinder Head Cover
(4) Injector QR Code Tag
(5) Seal
(A) Good
(B) Bad

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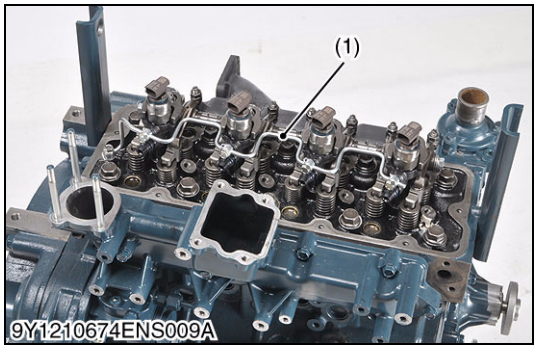

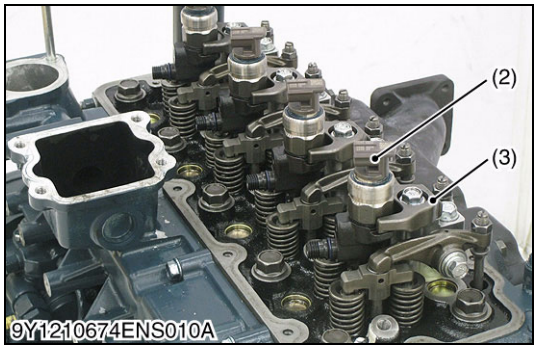

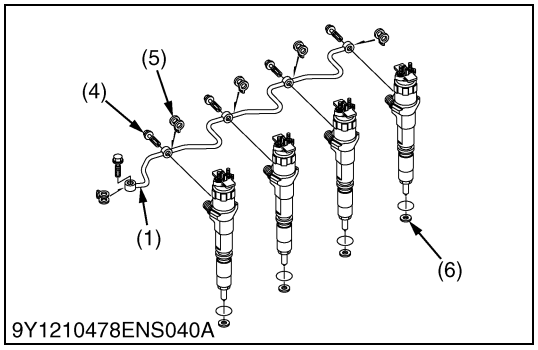

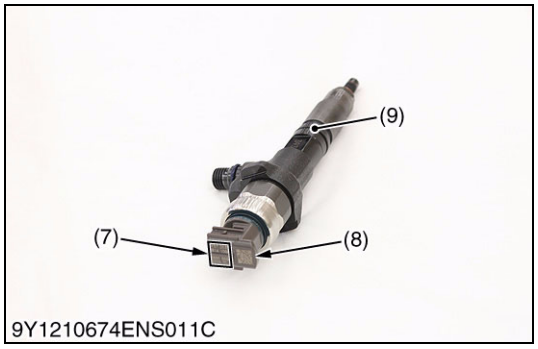

Overflow Pipe and Injectors

1. Remove the overflow pipe (1).
2. Remove the injector clamp (3).
3. Remove the injector (2) and its gasket (6).

■ **IMPORTANT**

- **Do not disassemble the injector (2).**
- **Do not remove the injector QR code tag (8).**
- **Do not damage the injector QR code tag (8).**
- **Do not get the injectors out of order. If the injectors get out of order, it is necessary to perform injector correction (writing the injector ID codes (7) to the ECU).**
- **Store the injectors so they do not get any dust in them.**

(When reassembling)

- Apply a thin layer of engine oil to an O-ring (9) when you install the injector.
- Replace the injectors' gaskets (6) with new ones.
- When attaching the overflow pipe (1) to the injector, replace the gasket (5) with a new one.
- Install the overflow pipe joint screw (4).
- Tighten the injector clamp nuts securely to their specified torques.
- Tighten the overflow pipe joint screws (4) securely to their specified torques.
- After installing the overflow pipe, in order to check the fuel leakage, add pressure by air from the fuel pipe joint, and check the fuel leakage of overflow pipe and gasket (5).
- In case there is fuel leakage, replace the gasket (5), then check the fuel leakage again.

■ **NOTE**

- **If you replace the injectors, it is necessary to perform injector correction (writing the injector ID codes (7) to the ECU).**

Tightening torque	Injector clamp nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Overflow pipe joint screw (M6 × 1.0)	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft

(1) Overflow Pipe
(2) Injector
(3) Injector Clamp
(4) Overflow Pipe Joint Screw
(5) Gasket
(6) Gasket
(7) Injector ID Code
(8) Injector QR Code Tag
(9) O-ring

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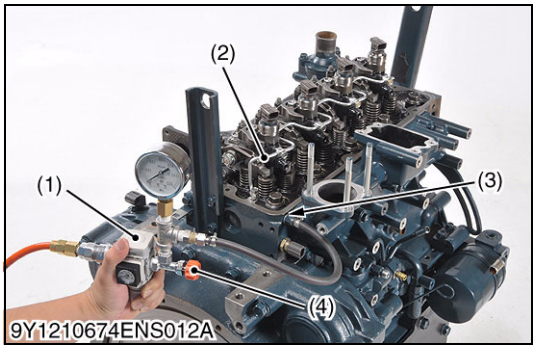

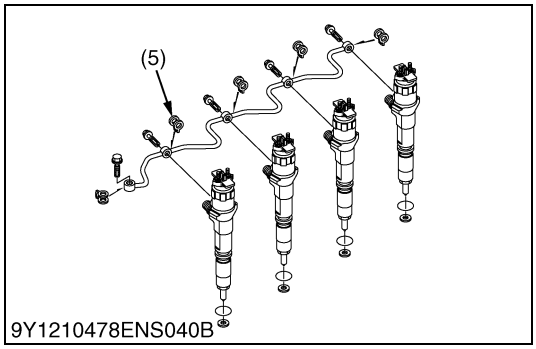

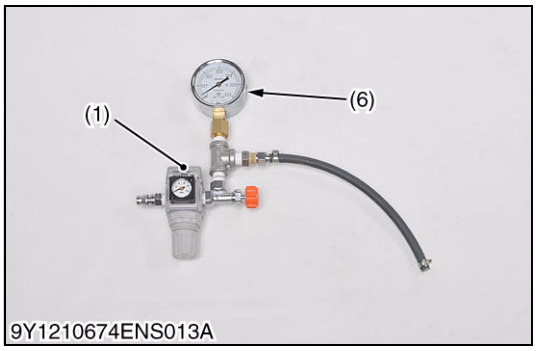

Check the Fuel Leakage of the Overflow Pipe

1. Connect the fuel hose of air pressure adjustment equipment to the fuel tube (3).
2. Tighten the valve (4).
3. Connect the air hose to the air pressure adjustment equipment.
4. Adjust air pressure of the regulator (1) between 0.03 and 0.05 MPa (0.3 and 0.5 kgf/cm^2, 5 and 7 psi).
5. Open the valve (4) gradually, then add 0.03 MPa (0.3 kgf/cm^2, 4 psi) pressure.
6. Tighten the valve (4).
7. Check the decreased pressure after 4 seconds.

■ **NOTE**

- **If the decreased pressure is higher than 0.001 MPa (0.01 kgf/cm^2, 0.1 psi), it means that there is fuel leakage. Replace the gasket (5), then check the fuel leakage again.**

Leakage Check	Decreased pressure after 4 seconds is lower than 0.001 MPa (0.01 kgf/cm^2, 0.1 psi)

Specification of components

Parts Name	Specification or Code No.
Regulator (1)	0.030 to 0.86 MPa 0.31 to 8.7 kgf/cm^2 4.4 to 120 psi
Pressure Gauge (6)	0 to 0.06 MPa 0 to 0.6 kgf/cm^2 0 to 8 psi

(1) Regulator
(2) Overflow Pipe
(3) Fuel Tube
(4) Valve
(5) Gasket
(6) Pressure Gauge

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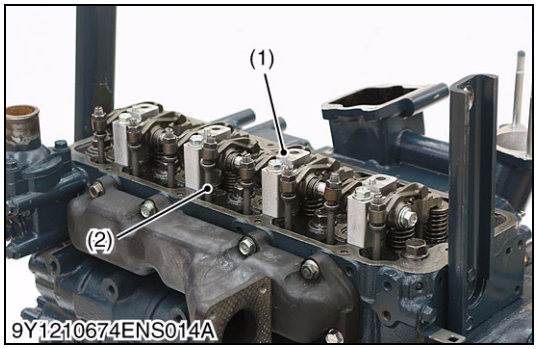

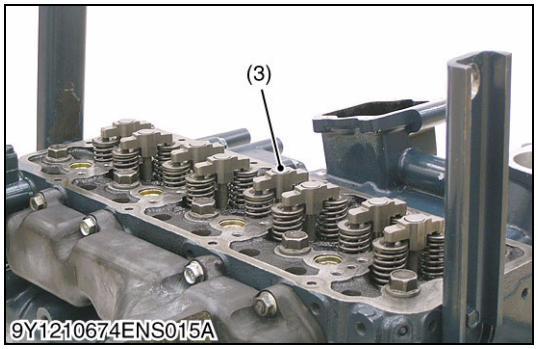

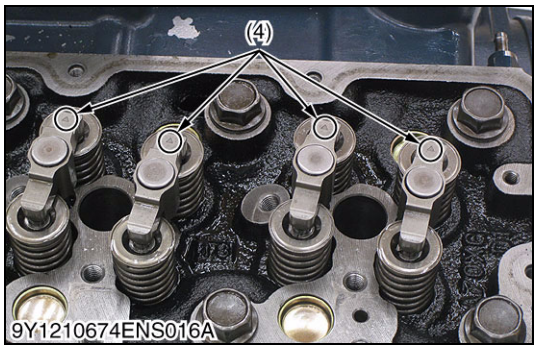

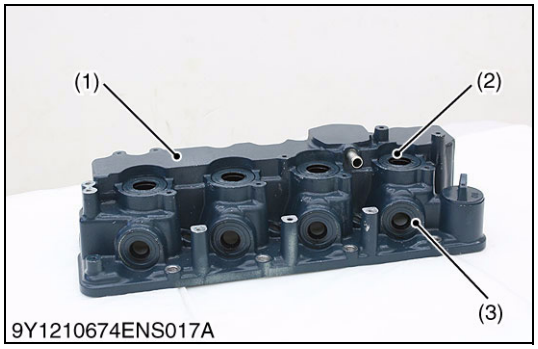

Rocker Arm, Push Rod and Valve Bridge Arm

1. Remove the rocker arm (1) as a unit.
2. Remove the push rods (2).
3. Remove the valve bridge arm (3).

(When reassembling)

- When installing the push rod (2), mount it securely in the groove of the tappet.
- When installing the valve bridge arm (3), apply engine oil to the valve bridge shaft sufficiently and check whether to move smoothly.
- When installing the valve bridge arm (3), face the mark (4) to intake side.

■ **IMPORTANT**

- **After installing the rocker arm, adjust the valve clearance.**

Tightening torque	Rocker arm bracket screw	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
		V3307-CR-TE4B V3307-CR-TIE4B	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft

(1) Rocker Arm
(2) Push Rod
(3) Valve Bridge Arm
(4) Mark

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Injector Oil Seal and Injection Pipe Oil Seal (If necessary)

1. Remove the injector oil seal (2) and injection pipe oil seal (3) from cylinder head cover (1).

(When reassembling)

- When installing the injector oil seal (2) and injection pipe oil seal (3), use the new one.

(1) Cylinder Head Cover
(2) Injector Oil Seal
(3) Injection Pipe Oil Seal

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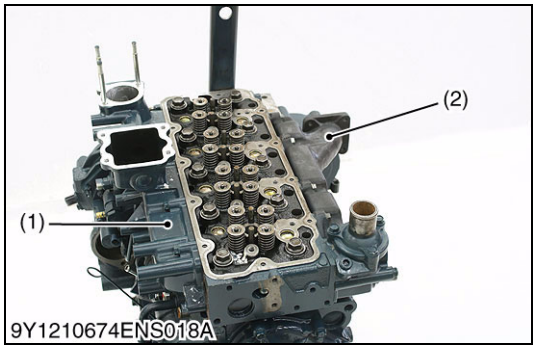

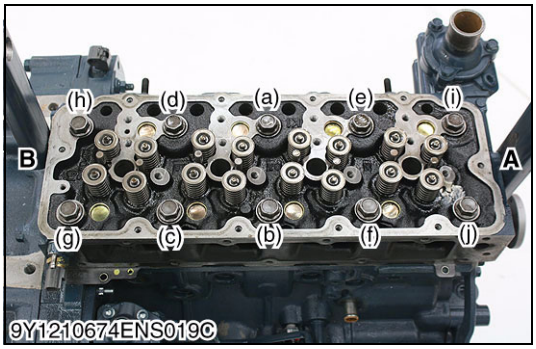

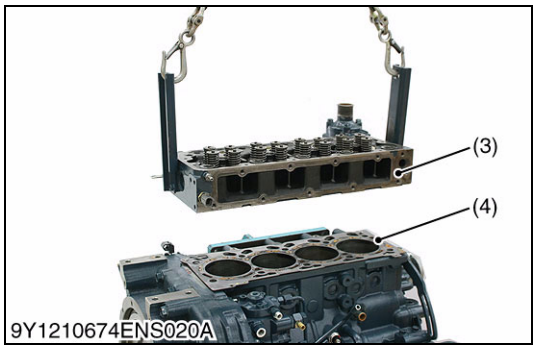

Cylinder Head

1. Remove the inlet manifold (1) and exhaust manifold (2).
2. Remove the cylinder head mounting screw in the sequence of **(j)** to **(a)**, and remove the cylinder head (3).
3. Remove the cylinder head gasket (4).

(When reassembling)

- Replace the cylinder head gasket (4) with a new one.
- When mounting the gasket, set it to the knock pin hole. Be careful not to mount it reversely.
- The cylinder head should be free of scratches and dust.
- Be careful for handling the gasket not to damage it.
- Install the cylinder head.
- Tighten the cylinder head mounting screw gradually in the sequence of **(a)** to **(j)** after applying engine oil.
- Be sure to adjust the valve clearance. (Refer to the "Valve Clearance")
- It is not necessary to retighten the cylinder head mounting screw after operating the engine for 30 minutes.

■ **IMPORTANT**

- **When replacing the piston, piston pin bushing, connecting rod or crank pin bearing, select the cylinder head gasket thickness to meet with the top clearance refer to the "To Select the Cylinder Head Gasket".**

Tightening torque	Cylinder head mounting screw	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	147 to 156 N·m 15.0 to 16.0 kgf·m 109 to 115 lbf·ft
		V3307-CR-TE4B V3307-CR-TIE4B	187 to 196 N·m 19.0 to 20.0 kgf·m 138 to 144 lbf·ft
	Exhaust manifold mounting nut		30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft

(1) Inlet Manifold
(2) Exhaust Manifold
(3) Cylinder Head
(4) Cylinder Head Gasket

A: Front Cover Side
B: Flywheel Housing Side

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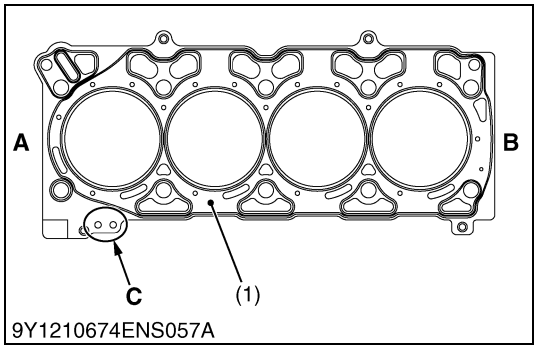

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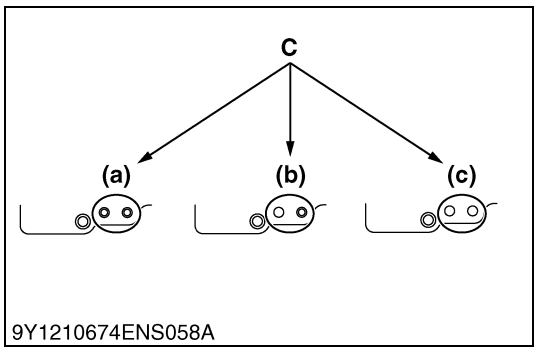

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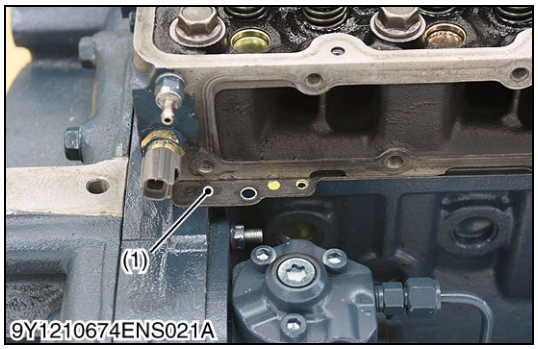

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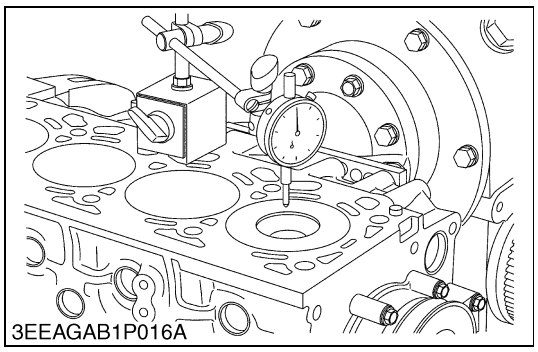
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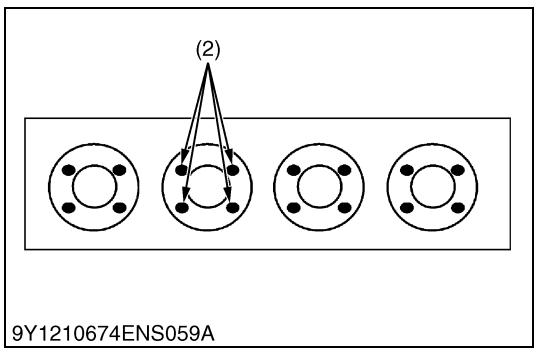

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To Select the Cylinder Head Gasket (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

■ Replacement of Cylinder Head Gasket

1. Make sure to note the hole **(a)**, **(b)** or **(c)** of cylinder head gasket (1) in advance.
2. Replace the same hole **(a)**, **(b)** or **(c)** as the original cylinder head gasket (1).

■ To Select the Cylinder Head Gasket

- When replacing the piston, piston pin bushing, connecting rod or crank pin bearing, select the cylinder head gasket (1) thickness to meet with the top clearance refer to the "To Select the Cylinder Head Gasket".

1. Measure the piston head's protrusion from the crankcase cylinder face 4 spots per each piston using the dial gauge as shown in figure, and get the average of the measurements.
2. Use the table below to select an applicable cylinder head gasket (1).

Hole of Cylinder Head Gasket	Thickness of cylinder head gasket		Code Number	Piston Head's protrusion from the level of crankcase cylinder face. (average of 4 pistons)
	Before tighten-ing	After tighten-ing		
2 holes **(a)**	1.30 mm 0.0512 in.	1.20 mm 0.0472 in.	1J700-03330	0.451 to 0.550 mm 0.0178 to 0.0216 in.
1 hole **(b)**	1.20 mm 0.0472 in.	1.10 mm 0.0433 in.	1J700-03320	0.351 to 0.450 mm 0.0139 to 0.0177 in.
Without hole **(c)**	1.10 mm 0.0433 in.	1.00 mm 0.0394 in.	1J700-03310	0.250 to 0.350 mm 0.00985 to 0.0137 in.

(1) Cylinder Head Gasket
(2) Points of Measurement
A: Flywheel Housing Side
B: Front Cover Side
C: Hole of Cylinder Head Gasket
(a) 2 Holes (2 Through Holes)
(b) 1 Hole (1 Through Hole)
(c) Without Hole (0 Through Hole)

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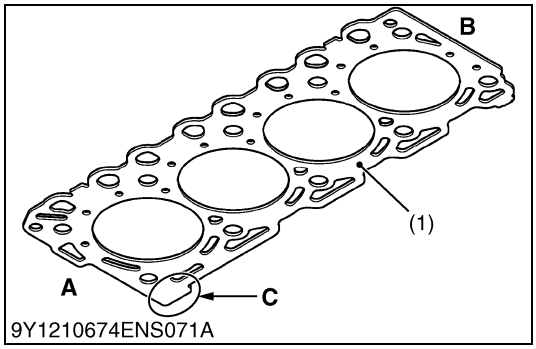

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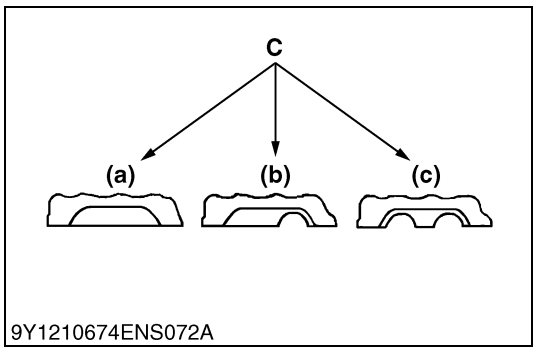

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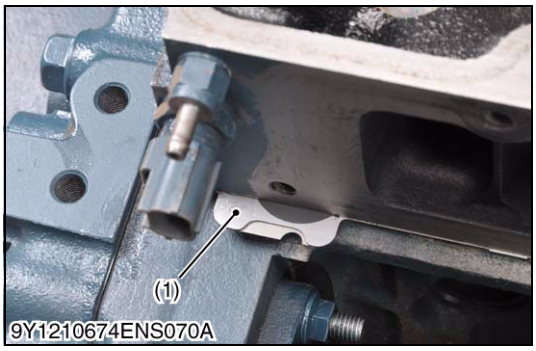

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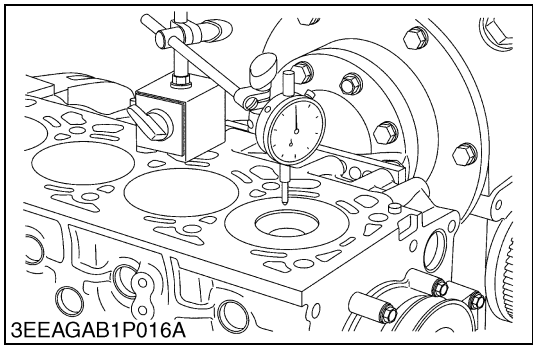
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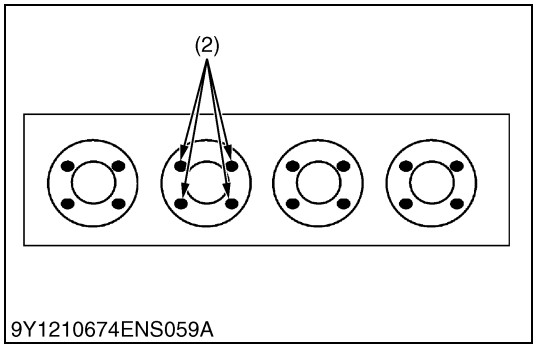

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To Select the Cylinder Head Gasket (for V3307-CR-TE4B / V3307-CR-TIE4B)

■ Replacement of Cylinder Head Gasket

1. Make sure to note the notch **(a)**, **(b)** or **(c)** of cylinder head gasket (1) in advance.
2. Replace the same notch **(a)**, **(b)** or **(c)** as the original cylinder head gasket (1).

■ To Select the Cylinder Head Gasket

- When replacing the piston, piston pin bushing, connecting rod or crank pin bearing, select the cylinder head gasket (1) thickness to meet with the top clearance refer to the "To Select the Cylinder Head Gasket".

1. Measure the piston head's protrusion or recessing from the crankcase cylinder face 4 spots per each piston using the dial gauge as shown in figure, and get the average of the measurements.
2. Use the table below to select an applicable cylinder head gasket (1).

Notch of Cylinder Head Gasket	Thickness of cylinder head gasket		Code Number	Piston Head's protrusion from the level of crankcase cylinder face. (average of 4 pistons)
	Before tighten-ing	After tighten-ing		
Without notch **(a)**	1.10 mm 0.0433 in.	1.00 mm 0.0394 in.	1J770-03610	0.2510 to 0.3425 mm 0.009882 to 0.01348 in.
1 notch **(b)**	1.00 mm 0.0394 in.	0.900 mm 0.0354 in.	1J770-03600	0.151 to 0.250 mm 0.00595 to 0.00984 in.
2 notches **(c)**	0.900 mm 0.0354 in.	0.800 mm 0.0315 in.	1J770-03310	0.0775 to 0.150 mm 0.00306 to 0.00590 in.

(1) Cylinder Head Gasket
(2) Points of Measurement
A: Flywheel Housing Side
B: Front Cover Side
C: Notch of Cylinder Head Gasket
(a) Without Notch
(b) 1 Notch
(c) 2 Notches

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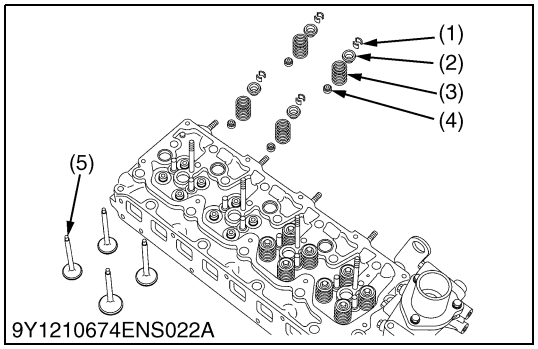

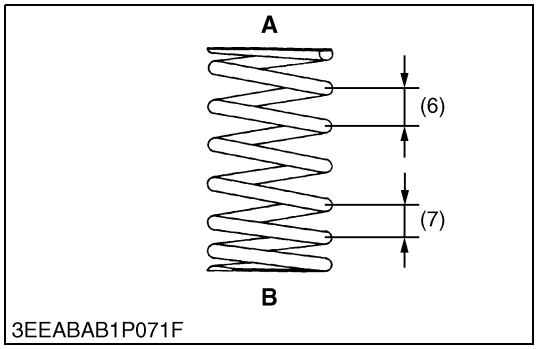

Valve

1. Push the valve spring (3) with the valve spring retainer (2) and remove the valve spring collets (1).
2. Remove the valve spring (3) and valve (5).

(When reassembling)

- Clean the valve stem and valve guide hole, and apply engine oil sufficiently.
- After you install the valve spring collets (1), lightly tap the stem tip to attach it correctly with the plastic hammer.

[V3307-CR-TE4B / V3307-CR-TIE4B]

- Install the valve spring (3) with its smaller pitch (7) end downward (at the cylinder head side **"B"**).

(1) Valve Spring Collet
(2) Valve Spring Retainer
(3) Valve Spring
(4) Valve Stem Seal
(5) Valve
(6) Large Pitch
(7) Smaller Pitch

A: Valve Spring Retainer Side
B: Cylinder Head Side

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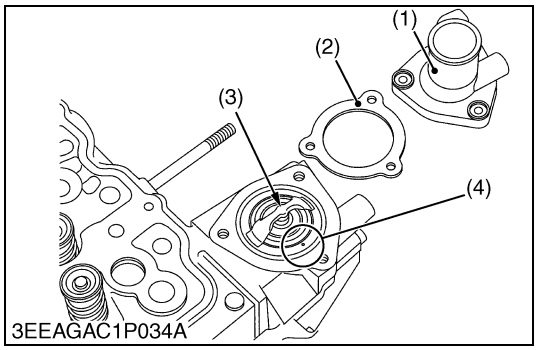
(6) Thermostat



Thermostat Assembly

1. Remove the thermostat cover mounting screws, and remove the thermostat cover (1).
2. Remove the thermostat assembly (3).

(When reassembling)

- Replace the gasket with a new one.
- Attach the thermostat assembly with its hole (4) facing toward the front cover side.

(1) Thermostat Cover
(2) Thermostat Cover Gasket
(3) Thermostat Assembly
(4) Hole

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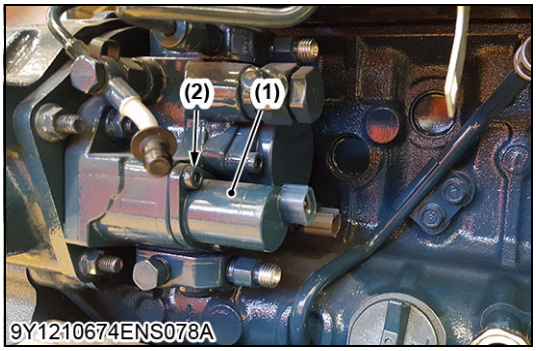
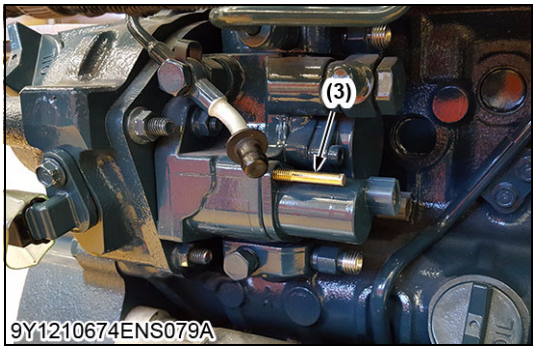
(7) SCV





Removal of SCV

1. Carefully wash circumference of the SCV (1) in advance with cleaning solution, nylon brush, air blow, etc.
2. Remove fittings around the SCV (1) that disturb removing and the harness connector of the SCV.
3. Loosen the SCV mounting screw (2) with hexagon wrench (5 mm-square) and remove them (2 places).
4. Install a guide pin (refer to the "SPECIAL TOOL") in the SCV mounting screw (2) attaching portion manually.
5. Pull the SCV (1) straight along with the guide pin (3).

■ **NOTE**

- **No foreign materials shall be attached inside the supply pump and on the SCV mounting surface during SCV replacement. After removal, keep the removed part of supply pump side without wipe with waste cloth.**
- **Do not work with slanted and insufficient installation of hexagon wrench. (Do not crush the hexagon socket.)**
- **Used SCV and O-ring shall not be reused.**
- **Confirm that no O-ring remains at the supply pump body side. To be removed if remained.**

(1) Suction Control Valve (SCV)
(2) SCV Mounting Screw
(3) Guide Pin

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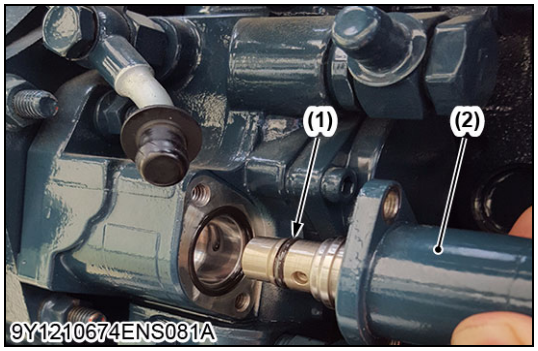

Installation of SCV

1. Apply clean silicon grease on the O-ring (1) and set into the O-ring groove of housing. If the gasket is attached in the kit, replace the gasket. (May not included depending on specification.)
2. Apply clean silicon grease on the O-ring of the SCV (2) tip.
3. Turn the connector of the SCV in the same direction at installation and install the SCV (2) straight along with the guide pin without twisting.
4. After installation of the SCV (2), remove the guide pin installed with pressing the SCV and tighten the SCV mounting screw temporary. Hand tighten the two bolts alternately so as to hit the seat surface evenly (so as not to tighten unevenly).
5. Tighten finally the SCV mounting screw with hexagon wrench (5 mm-square) and torque wrench with specified torque value.
6. Install the harness connector of the SCV and removed parts as before.
7. After completion of works, confirm that the parts are replaced correctly by execution of dispersion of pumps of diagnosis tool (Diagmaster), and that there is no fuel leak with visual check.

■ **NOTE**

- **To be no foreign materials and scratches on the Oring groove and the SCV mounting surface. To be no adhesion of foreign materials during grease application.**
- **The O-ring shall not be jammed between the pump housing and the SCV to prevent fuel leak and malfunction due to burr of the O-ring.**
- **Install the SCV surely until the SCV hits the supply pump housing.**
- **The bolts shall not be tightened over the specified torque value to prevent bolt damage due to excessive torque.**
- **To be no foreign materials inside the SCV connector to prevent malfunction, open circuit, and short circuit. If there are foreign materials, remove them surely with air blow, etc. The wire harness of the SCV shall be wired with the route of installation to ensure no excessive looseness and tension.**
- **When replacing the SCV with a new one, use the diagnosis tool to conduct learning of discrepancies in the new SCV.**

Tightening torque	SCV mounting screw	6.90 to 10.8 N·m 0.704 to 1.10 kgf·m 5.09 to 7.96 lbf·ft

(1) O-ring (2) Suction Control Valve (SCV)

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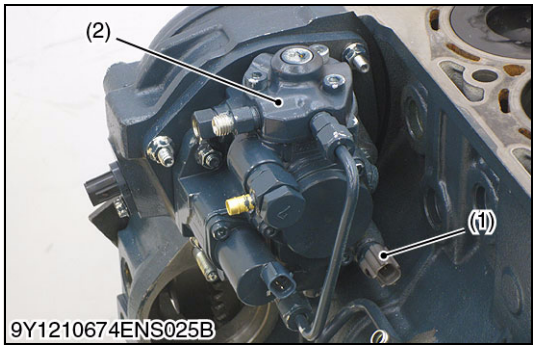
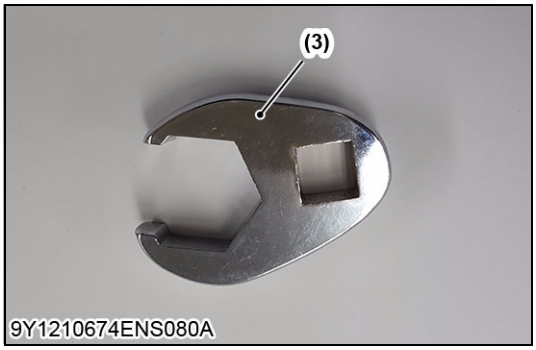
(8) Fuel Temperature Sensor





Removal of Fuel Temperature Sensor

1. Carefully wash circumference of the fuel temperature sensor (1) in advance with cleaning solution, nylon brush, air blow, etc.
2. Remove fittings around the fuel temperature sensor (1) that disturb removing and the harness connector of the fuel temperature sensor.
3. After slight turning the fuel temperature sensor (1) counterclockwise with the crow foot wrench (3) to loose, wash the fuel temperature sensor (1) joint again to remove foreign materials such as paint chips generated during loosening.
4. Remove the fuel temperature sensor (1) from the supply pump body.

■ **NOTE**

- **To be no foreign materials in the supply pump.**
- **Used fuel temperature sensor and O-ring shall not be reused.**
- **Confirm that no O-ring remains at the supply pump body side. To be removed if remained.**
- **After removal of the fuel temperature sensor, installation of the fuel temperature sensor shall be conducted at once.**

(1) Fuel Temperature Sensor
(2) Supply Pump
(3) Crow Foot Wrench (Spanner Type 19 mm)

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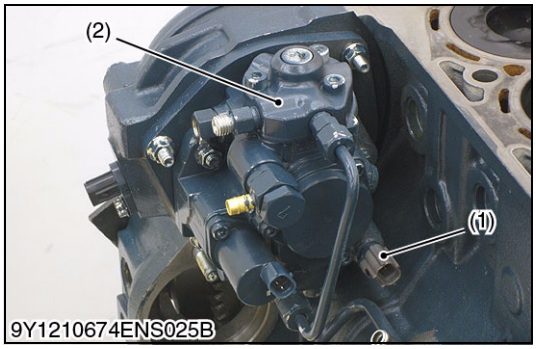

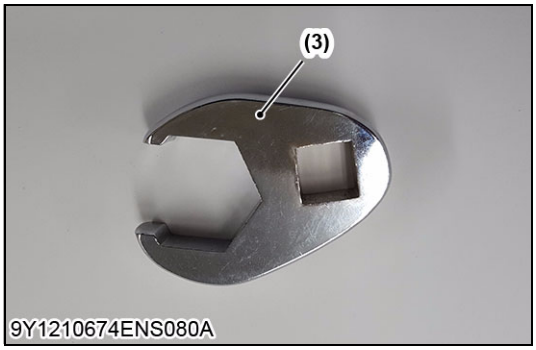

Installation of Fuel Temperature Sensor

1. Install the O-ring in the fuel temperature sensor (1).
2. Install the fuel temperature sensor (1) in the fuel temperature sensor attaching portion of the supply pump (2) manually by turning clockwise.
3. Tighten finally the fuel temperature sensor (1) by turning clockwise with crow foot wrench (3) with specified torque value.
4. Install the harness connector of the fuel temperature sensor (1) and removed parts as before.
5. After completion of works, confirm that the parts are replaced correctly by execution of dispersion of pumps of diagnosis tool (Diagmaster), and that there is no fuel leak with visual check.

■ **NOTE**

- **To be no foreign materials and scratches on the fuel temperature sensor mounting surface. To be no adhesion of foreign materials on the O-ring.**
- **Install the combustion temperature sensor to the supply pump after confirming that the O-ring is installed in the fuel temperature sensor correctly.**
- **Do not tighten the fuel temperature sensor with holding the connector to prevent the damage of connector.**
- **To be no foreign materials inside the fuel temperature sensor connector to prevent malfunction, open circuit, and short circuit. If there are foreign materials, remove them surely with air blow, etc. The wire harness of the fuel temperature sensor shall be wired with the route of installation to ensure no excessive looseness and tension.**

Tightening torque	Fuel temperature sensor	17.6 to 26.5 N·m 1.80 to 2.70 kgf·m 13.0 to 19.5 lbf·ft

(1) Fuel Temperature Sensor
(2) Supply Pump
(3) Crow Foot Wrench (Spanner Type 19 mm)

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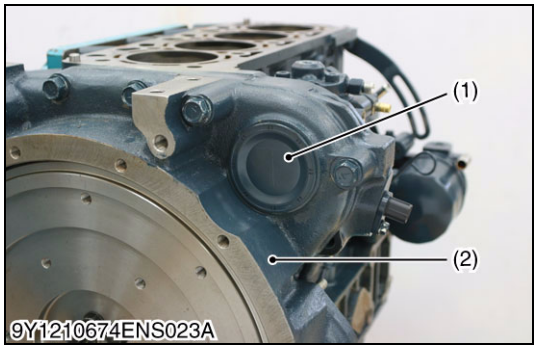
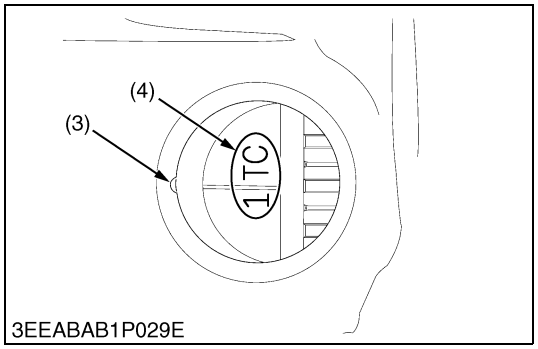
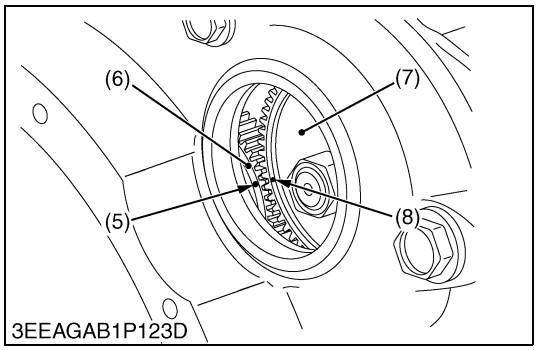
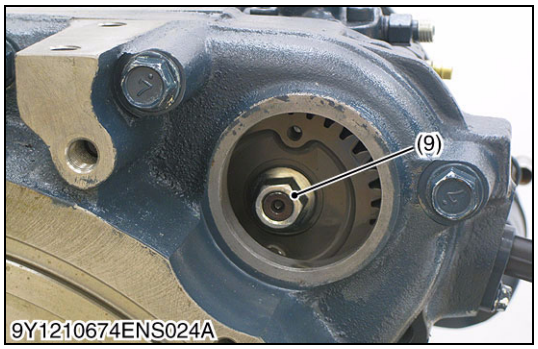
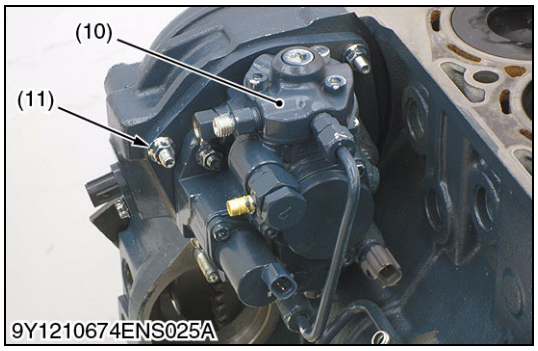
(9) Supply Pump











Supply Pump

CAUTION

- **Do not loosen the injection pipe when the fuel is under high pressure (within five minutes of stopping the engine).**

1. Remove the window cover (1) from the flywheel housing (2).
2. Put the piston of the number 4 cylinder at TDC.

NOTE

- **When positioning the piston of the 4th cylinder to TDC, rotate the flywheel counterclockwise and align the TC mark (4) on the flywheel with the mark (3) on the housing of the flywheel. If the supply pump gear timing mark (8) meshes with idle gear (6), then the piston of the 4th cylinder is TDC. If they do not mesh, rotate the flywheel counterclockwise one revolution.**

3. Make a temporary mark (5) with a white paint marker pen on the tooth of idle gear (6).

NOTE

- **This mark is extremely useful during reassembly of the supply pump gear and idle gear (6) to get the timing right.**

4. Fix the flywheel in place.
5. Loosen the supply pump gear's mounting nut (9).
6. Remove the supply pump (10).

NOTE

- **Do not disassemble the supply pump.**
- **Store the supply pump so it does not get any dust in it.**

(1) Window Cover
(2) Flywheel Housing
(3) Mark
(4) TC Mark
(5) Mark
(6) Idle Gear
(7) Supply Pump Gear
(8) Timing Mark
(9) Supply Pump Gear Mounting Nut
(10) Supply Pump
(11) Supply Pump Mounting Nut

(To be continued)

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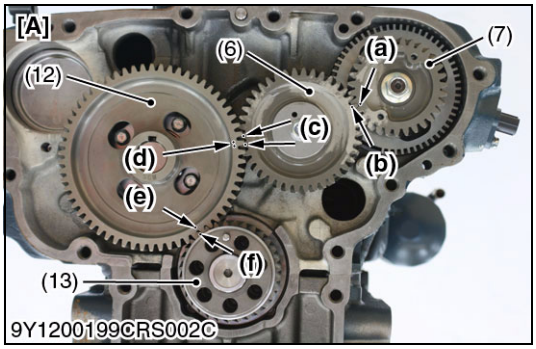

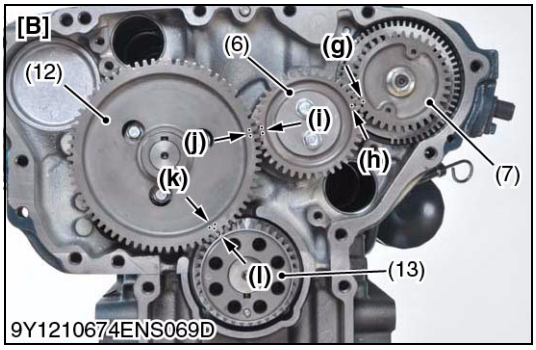

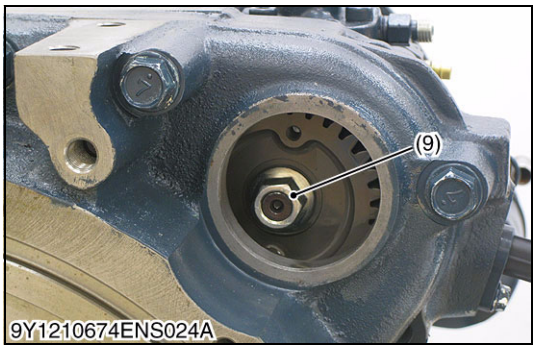

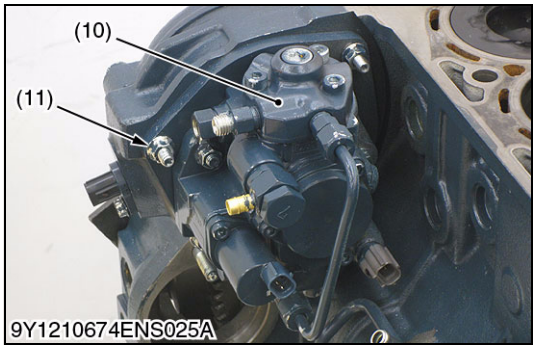

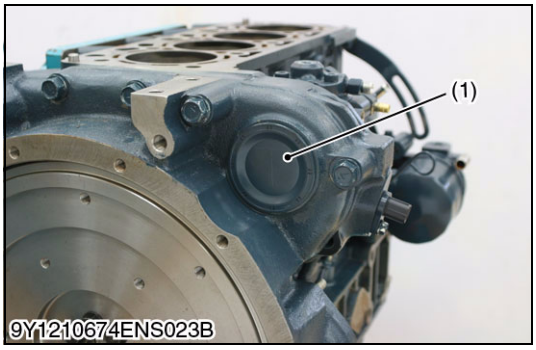

(When reassembling)

- Align the alignment marks of the supply pump gear (7) and idle gear (6).
- Replace the O-ring of the supply pump (10) with a new one.
- Install the supply pump (10).
- Tighten the supply pump mounting nut (11).
- Tighten the supply pump gear mounting nut (9) to its specified torque.
- Mount the window cover (1).

■ **NOTE**

- **When replacing the supply pump with a new one, use the diagnosis tool to conduct "Supply Pump Learning" in the new supply pump.**

Tightening torque	Supply pump mounting nut	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Supply pump gear mounting nut	59 to 68 N·m 6.0 to 7.0 kgf·m 44 to 50 lbf·ft

(1) Window Cover
(6) Idle Gear
(7) Supply Pump Gear
(9) Supply Pump Gear Mounting Nut
(10) Supply Pump
(11) Supply Pump Mounting Nut
(12) Cam Gear
(13) Crankshaft Gear

(a) 1 dot on the center of the valley between 2 teeth
(b) 1 dot on the tooth center
(c) 1 dot on the tooth center
(d) 2 dots on the tooth center
(e) 1 dot on the center of the valley between 2 teeth
(f) 1 dot on the tooth center
(g) 1 dot on the tooth center
(h) 1 dot on the center of the valley between 2 teeth
(i) 2 dots on the tooth center
(j) 2 dots on the center of the valley between 2 teeth
(k) 3 dots on the center of the valley between 2 teeth
(l) "3" on the tooth center

[A] Alignment Marks for V2607-CR-E4B, V2607-CR-TE4B and V2607-CR-TIE4B
[B] Alignment Marks for V3307-CR-TE4B and V3307-CR-TIE4B

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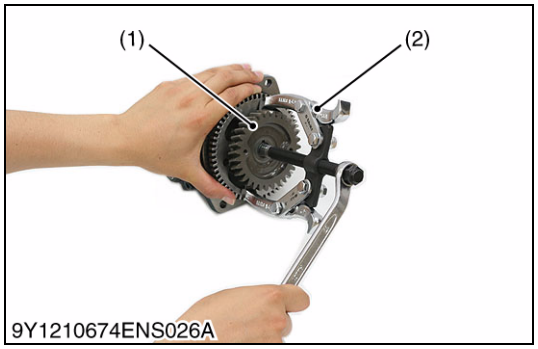

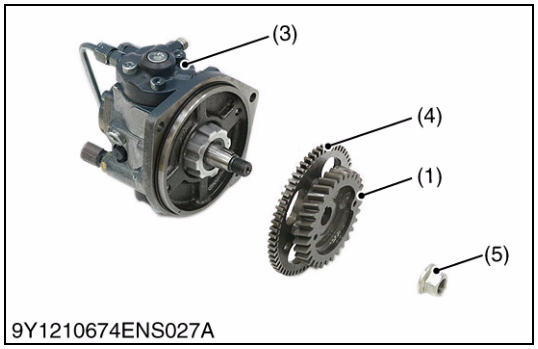

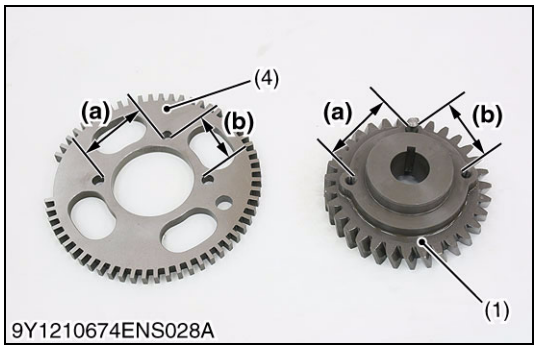

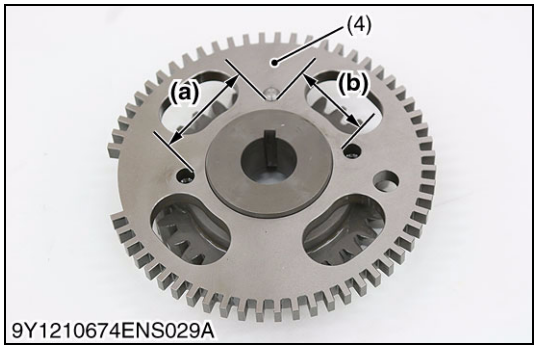

Supply Pump Gear and Crankshaft Position Pulsar Gear (If necessary)

1. Remove the supply pump gear (1) and crankshaft position pulsar gear (4) with gear puller (2) from the supply pump (3).
2. Remove the mounting screws of crankshaft position pulsar gear (4).
3. Remove the crankshaft position pulsar gear (4).

(When reassembling)

- Install the crankshaft position pulsar gear (4) to the supply pump gear (1).
- Align each pitch **(a)** and **(b)** of the crankshaft position pulsar gear (4) and the supply pump gear (1)

Tightening torque	Mounting screw of crankshaft position pulsar gear	9.81 to 11.2 N·m 1.00 to 1.15 kgf·m 7.24 to 8.31 lbf·ft

(1) Supply Pump Gear
(2) Gear Puller
(3) Supply Pump
(4) Crankshaft Position Pulsar Gear
(5) Supply Pump Gear Mounting Nut

(a) Large Pitch
(b) Small Pitch

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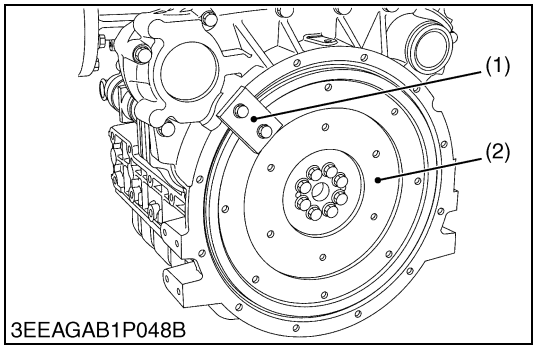
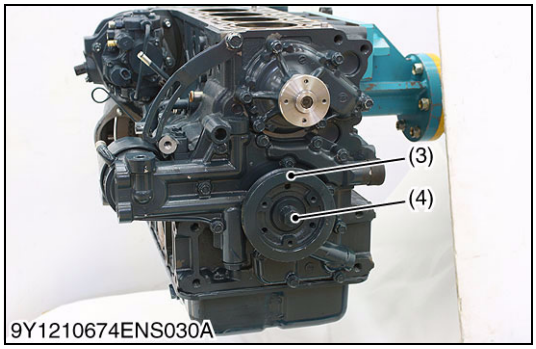




Fan Drive Pulley

1. Mount a flywheel stopper (1) on the flywheel (2).
2. Remove the crankshaft screw (4).
3. Remove the fan drive pulley (3).

(When reassembling)

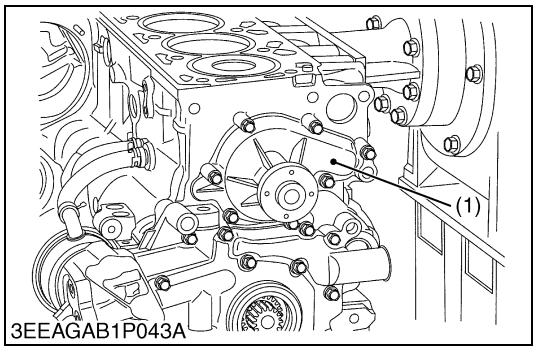
- Tighten the crankshaft screw (4) to specified torque after applying engine oil.

Tightening torque	Crankshaft screw	255 to 274 N·m 26.0 to 28.0 kgf·m 188 to 202 lbf·ft

(1) Stopper
(2) Flywheel
(3) Fan Drive Pulley
(4) Crankshaft Screw

9Y1210674ENS0118US0

(10) Water Pump and Oil Cooler



Water Pump (If necessary)

1. Remove the water pump (1).

(When reassembling)

- When mounting the water pump (1), use the new water pump gasket.

(1) Water Pump

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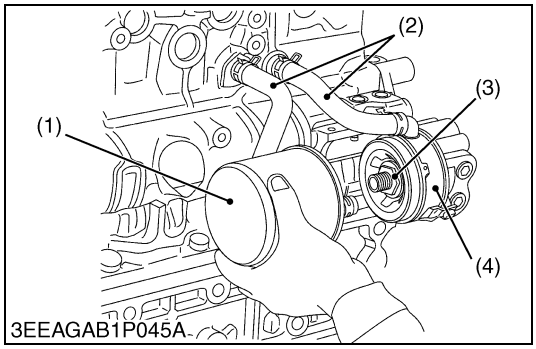

Oil Cooler

1. Remove the water pipe (2).
2. Remove the oil filter cartridge (1).
3. Remove the oil cooler joint screw (3).
4. Remove the oil cooler (4).

Tightening torque	Oil cooler joint screw	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	64 to 73 N·m 6.5 to 7.5 kgf·m 47 to 54 lbf·ft
		V3307-CR-TE4B V3307-CR-TIE4B	40 to 44 N·m 4.0 to 4.5 kgf·m 29 to 32 lbf·ft

(1) Oil Filter Cartridge
(2) Water Pipe
(3) Oil Cooler Joint Screw
(4) Oil Cooler

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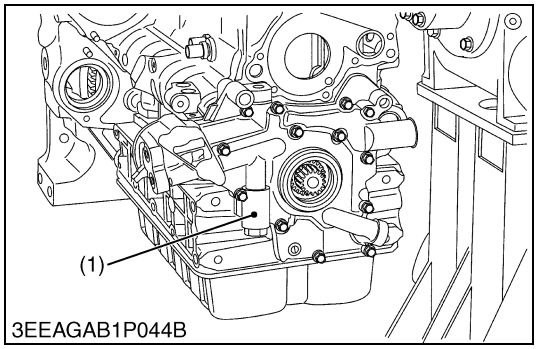
(11) Front Cover



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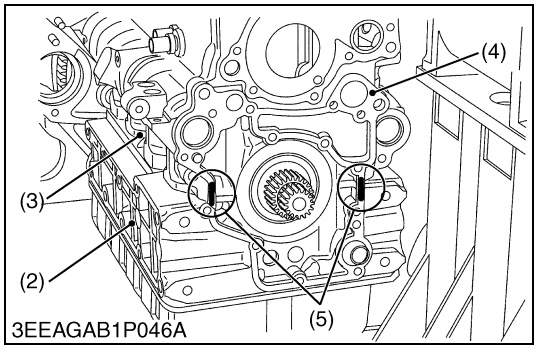

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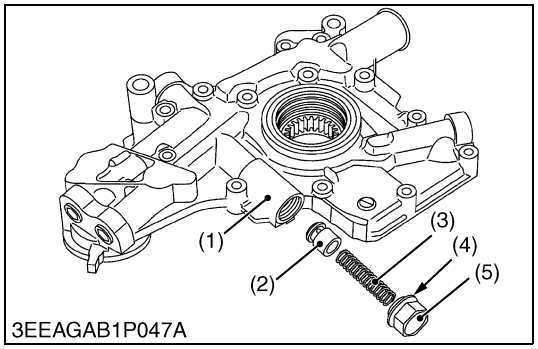

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Front Cover

1. Remove the front cover (1).

(When reassembling)

- Make sure that the front cover gasket (4) set in position.
- Make sure that the liquid gasket coating surface is free of water, dust and oil in order to keep sealing effect.

■ **NOTE**

- **Assemble the adhesive-applied parts within ten minutes.**
- **Apply a liquid gasket (Three Bond 1217H or equivalent) (5) to the seam between crankcase 1 (3) and crankcase 2 (2).**

Tightening torque	Front cover mounting screw	30 to 34 N·m 3.0 to 3.5 kgf·m 22 to 25 lbf·ft

(1) Front Cover
(2) Crankcase 2
(3) Crankcase 1
(4) Front Cover Gasket
(5) Liquid Gasket

9Y1210674ENS0121US0

Relief Valve

1. Remove the relief valve retaining screw (5).
2. Remove the relief valve (2), the spring (3) and the packing (4).

Tightening torque	Relief valve retaining screw	69 to 78 N·m 7.0 to 8.0 kgf·m 51 to 57 lbf·ft

(1) Front Cover
(2) Relief Valve
(3) Spring
(4) Packing
(5) Relief Valve Retaining Screw

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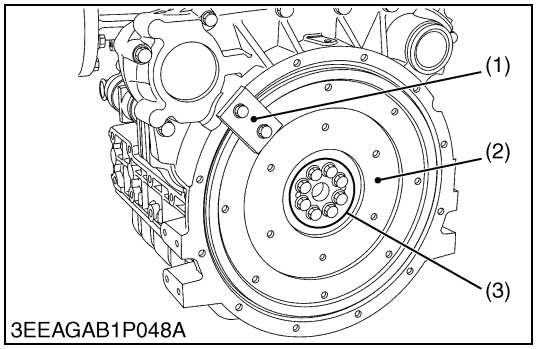
(12) Flywheel and Timing Gears



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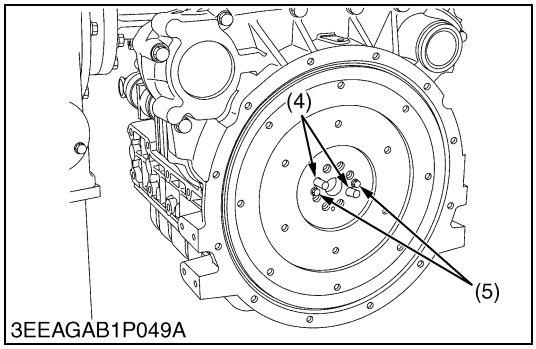

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Flywheel

1. Install the stopper (1) to the flywheel (2) so that the flywheel (2) does not turn.

■ **NOTE**
- **Do not use an impact wrench. Serious damage will occur.**
- **There is one positioning pin in the crankshaft gear and it is installed in the flywheel (2).**

2. Remove the flywheel screws (3) and set the flywheel guide screws (4).

[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]

3. Remove the flywheel (2).

[V3307-CR-TE4B / V3307-CR-TIE4B]

3. Remove the flywheel (2) with jack-up screws (5).

(When reassembling)
- Apply engine oil to the flywheel screws (3).
- Before fitting the flywheel (2) and the crankshaft gear together, wipe oil, dust and other foreign substances off their mating faces.
- The flywheel (2) and the crankshaft gear are fitting together in just one position. Make sure they are tightly fit and drive the screws.

Tightening torque	Flywheel screw	98.1 to 107 N·m 10.0 to 11.0 kgf·m 72.4 to 79.5 lbf·ft

(1) Stopper
(2) Flywheel
(3) Flywheel Screw
(4) Flywheel Guide Screw
(5) Jack-up Screw

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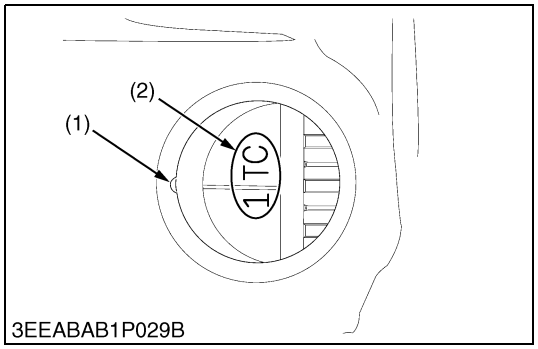
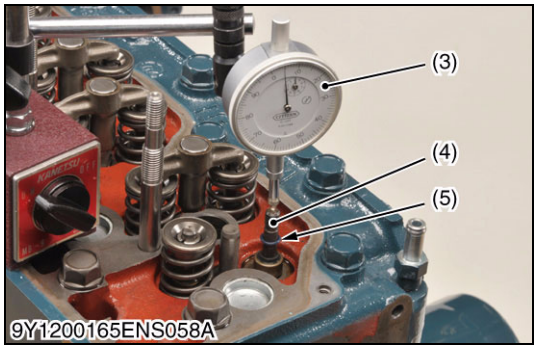
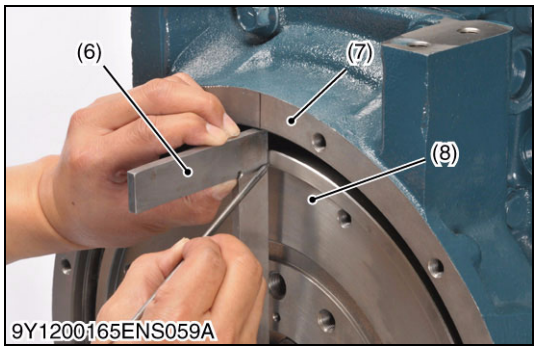
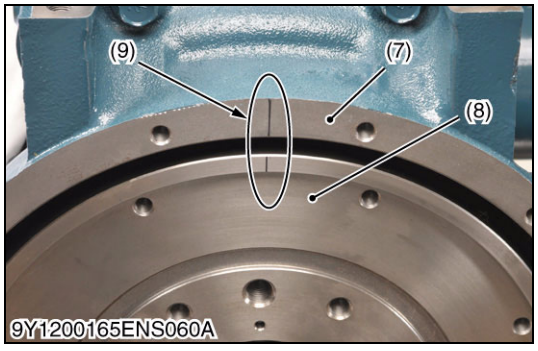








Measuring Angular Deviation between Crankshaft TDC and Crank Position Sensor Detected TDC

1. Remove the cylinder head cover, an injector and rocker arm.
2. Bring the piston of cylinder 4 to TDC.
3. Remove the #4 exhaust valve bridge arm and valve spring.
4. Insert a small O-ring (5) so the valve does not fall into the cylinder.
5. Set a dial gauge (3) on the tip of the valve (4).
6. Turn the flywheel counterclockwise and measure the position where the tip of the valve is the highest.
7. Stop the flywheel at the position where the tip of the valve is the highest.
8. Put a tri-square (6) on the flywheel housing (7) and flywheel (8) and draw a reference line (9).

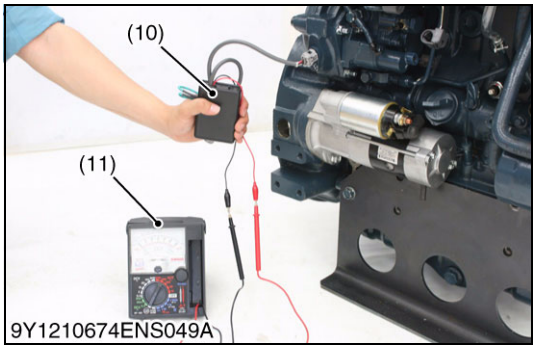
■ **IMPORTANT**

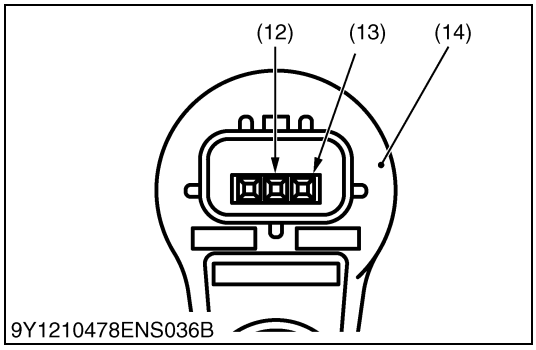
- **Do not drop the valve (4) into the cylinder.**
- **When measuring the highest position of the tip of the valve, do not rotate the flywheel clockwise. If you go past the highest point of the valve, back the flywheel up slightly and measure the highest point of the valve.**
- **The reference line (9) indicates the TDC of the crankshaft.**

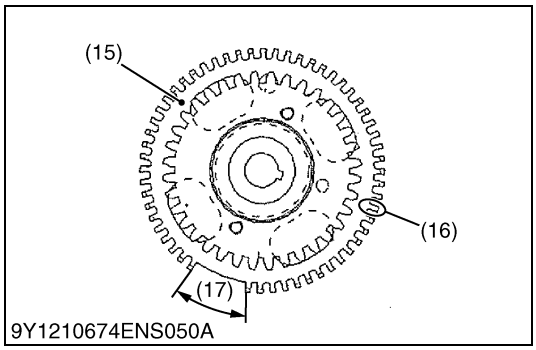
(1) TC Mark (Flywheel Housing)
(2) TC Mark (Flywheel)
(3) Dial Gauge
(4) Valve
(5) O-ring
(6) Tri-square
(7) Flywheel Housing
(8) Flywheel
(9) Reference Line

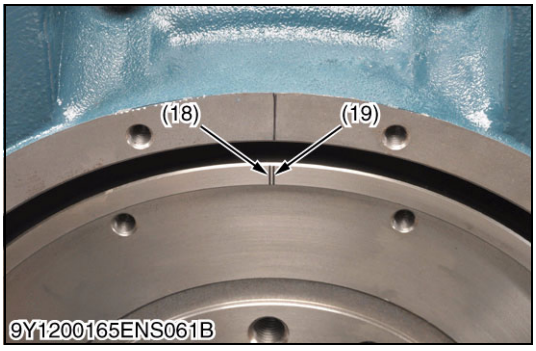
(To be continued)

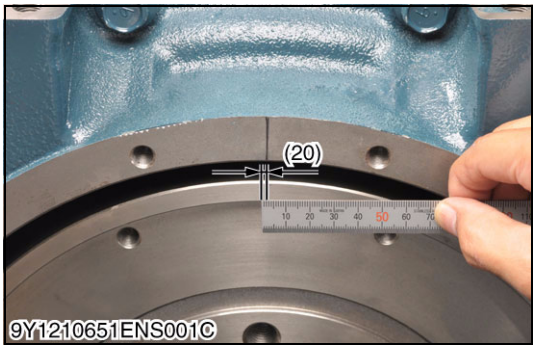
(Continued)











9. Connect a connector of the rotation sensor signal interface unit (10) (see page G-54) to the crankshaft position sensor (14).
10. Connect each clip of the rotation sensor signal interface unit (10) to the same test lead color of the tester (11).
11. Switch on the rotation sensor signal interface unit (10).
12. Turn the flywheel and make sure that the voltage of the crankshaft position sensor goes from 0 → 5 V or 5 → 0 V.
13. Rotate the flywheel and align the crankshaft position sensor to the part of the pulsar gear (15) that is missing teeth (17).
14. The 14th tooth (16) from the missing teeth is the standard.
15. Slowly turn the flywheel counterclockwise and stop the flywheel at the point where the needle of the tester changes momentarily from 0 → 5 V, the 14th tooth.
16. That point is where the crankshaft position sensor detects TDC.
17. Set the tri-square (6) on the reference line (9) on the flywheel housing side and mark the detection point of crankshaft position sensor TDC (19) on the flywheel.
18. Measure the interval (20) between the crankshaft TDC (18) and the detection point of crankshaft position sensor TDC (19).
19. Calculation of fuel injection timing correction 1.0 mm (0.039 in.): 0.321 °.
    Corrected angle = 0.321 ° X actual interval
20. Overwrite the injection timing correction value in the ECU.

■ **NOTE**

- **Using analog tester is easier to see the voltage change.**

■ **IMPORTANT**

- **When the crankshaft position sensor detects the teeth of the pulsar gear, the tester indicates 0 V.**
- **The position where the needle of the tester changes momentarily from 0 → 5 V is the detection point of crankshaft position sensor TDC (19).**
- **The reference line indicates the crankshaft TDC (18) of the crankshaft. If the detected TDC is ahead of the crankshaft TDC, it is considered minus. If the detected TDC lags behind the crankshaft TDC, it is considered plus.**

(10) Rotation Sensor Signal Interface Unit
(11) Tester
(12) Ground Terminal
(13) Output Terminal
(14) Crankshaft Position Sensor
(15) Pulsar Gear
(16) 14th Tooth
(17) Missing Teeth
(18) Crankshaft TDC
(19) Detection Point of Crankshaft Position Sensor TDC
(20) Interval

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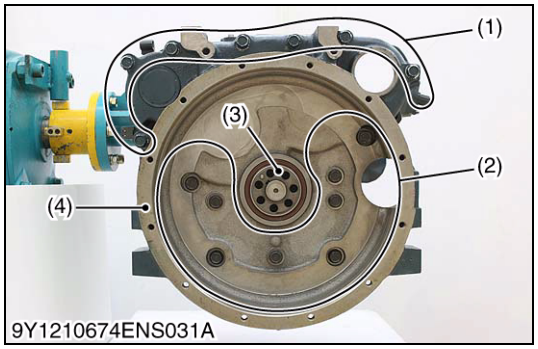

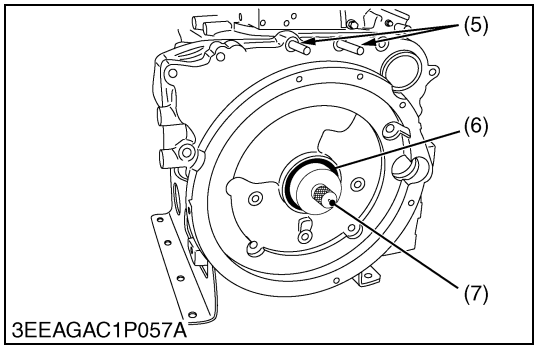

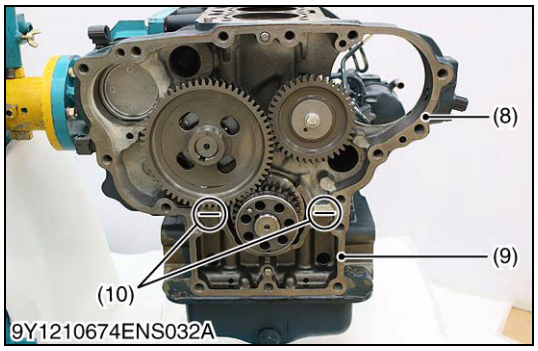

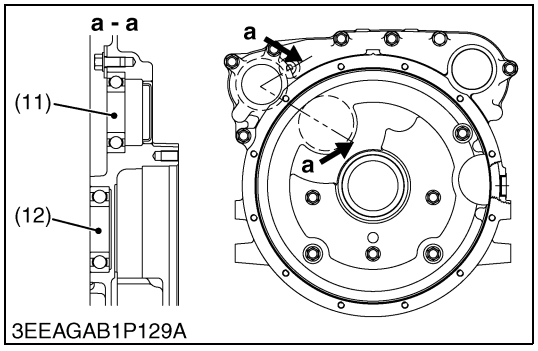

Flywheel Housing (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

1. Remove the outside flywheel housing mounting screws (1).
2. Remove the inside flywheel housing mounting screws (2).
3. Remove the flywheel housing (4).

(When reassembling)

- Apply engine oil to the flywheel housing oil seal (6).
- Set the flywheel guide screws (5) and the flywheel housing guide jig (7) to the crankshaft gear (3). (Refer to "5. SPECIAL TOOLS"at "GENERAL" section.)
- Apply a liquid gasket (Three Bond 1217H or equivalent) (10) to the seam between crankcase 1 (8) and crankcase 2 (9), and set gasket.
- Assemble the adhesive-applied parts within ten minutes.
- Make sure that the bearing 1 (11) and the bearing 2 (12) set in position.

Tightening torque	Flywheel housing mounting screw (7T screw)	78 to 90 N·m 7.9 to 9.2 kgf·m 58 to 66 lbf·ft
	Flywheel housing mounting screw (9T screw)	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft

(1) Flywheel Housing Mounting Screw (Outside) (7T)
(2) Flywheel Housing Mounting Screw (Inside) (9T)
(3) Crankshaft Gear
(4) Flywheel Housing
(5) Flywheel Guide Screw
(6) Oil Seal
(7) Jig
(8) Crankcase 1
(9) Crankcase 2
(10) Liquid Gasket
(11) Bearing 1
(12) Bearing 2

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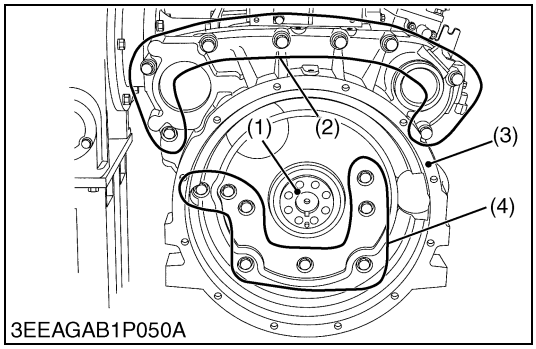

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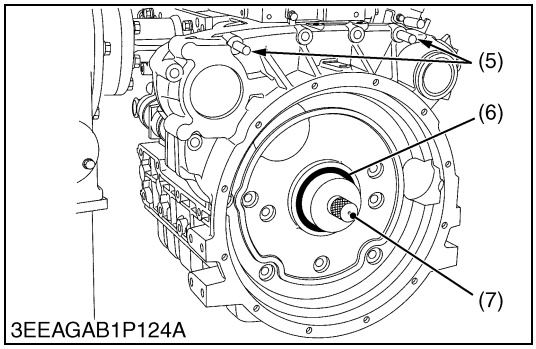

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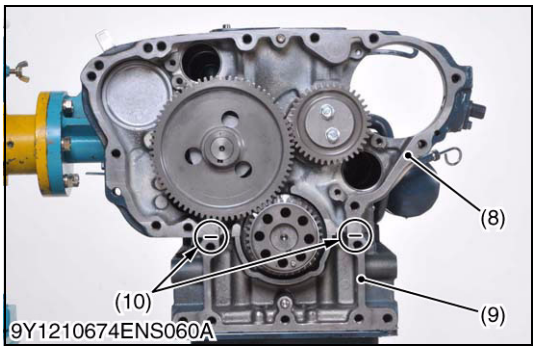

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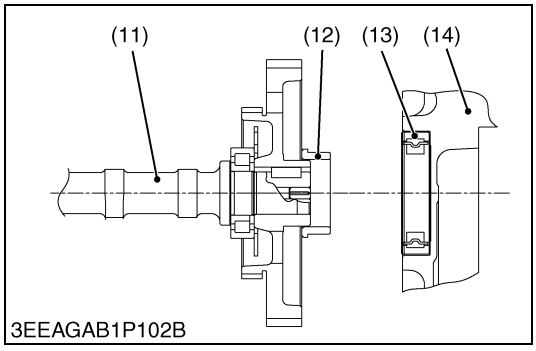

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Flywheel Housing (for V3307-CR-TE4B / V3307-CR-TIE4B)

1. Remove the outside flywheel housing mounting screws (2).
2. Remove the inside flywheel housing mounting screws (4).
3. Remove the flywheel housing (3).

(When reassembling)

- Apply engine oil to the flywheel housing oil seal (6).
- Set the flywheel guide screw (5) and the flywheel housing guide jig (7) to the crankshaft gear (1). (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)
- Apply a liquid gasket (Three Bond 1217H or equivalent) (10) to the seam between crankcase 1 (8) and crankcase 2 (9).
- Assemble the adhesive-applied parts within ten minutes.

For Side PTO Model (Option)

- Install the inside roller bearing (12) of the camshaft (11) in the outside roller bearing (13) of the flywheel housing (14).

Tightening torque	Flywheel housing mounting screw (9T)	103 to 117 N·m 10.5 to 12.0 kgf·m 76.0 to 86.7 lbf·ft

(1) Crankshaft Gear
(2) Flywheel Housing Mounting Screw (Outside) (9T)
(3) Flywheel Housing
(4) Flywheel Housing Mounting Screw (Inside) (9T)
(5) Flywheel Guide Screw
(6) Oil Seal
(7) Jig
(8) Crankcase 1
(9) Crankcase 2
(10) Liquid Gasket
(11) Camshaft
(12) Roller Bearing (Inside)
(13) Roller Bearing (Outside)
(14) Flywheel Housing

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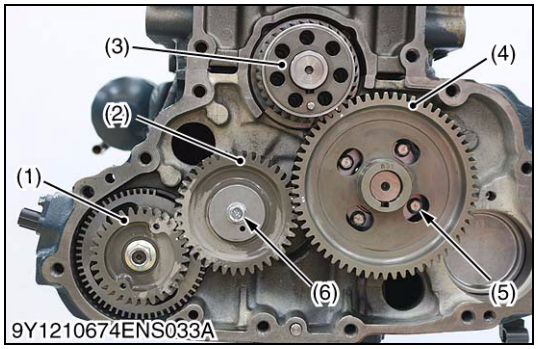

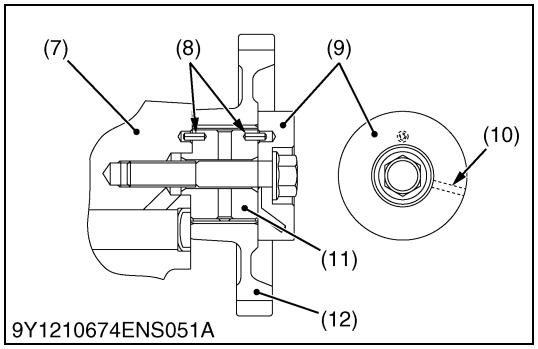

Camshaft and Idle Gear (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

1. Rotate the cylinder head side of the engine crankcase to the lower side.
2. Remove the idle gear mounting screws (6) and draw out the idle gear (2).
3. Remove the camshaft set screws (5) and draw out the cam gear (4).

■ **NOTE**

- **If the cylinder head side of the engine crankcase does not become lower side, the tappets drop and become the trouble to the camshaft. The camshaft will not be able to be drawn out.**

(When reassembling)

- When installing the idle gear (2) and cam gear (4), be sure to place the 4th cylinder piston at the top dead center in compression then, align all mating marks on each gear to assemble the timing gears, set the idle gear last.
- Mount the supply pump gear (1) after installing the flywheel housing.
- Make sure the idle gear shaft (11) is clean.
- Apply oil to the idle gear shaft (11) and set the crankcase 1 (7).
- Set the idle gear (12) and the collar (9) with the oil groove (10) facing crankcase 1 side.

Tightening torque	Camshaft set screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Idle gear mounting screw	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft

(1) Supply Pump Gear
(2) Idle Gear
(3) Crank Gear
(4) Cam Gear
(5) Camshaft Set Screw
(6) Idle Gear Mounting Screw
(7) Crankcase 1
(8) Spring Pin
(9) Collar
(10) Oil Groove
(11) Idle Gear Shaft
(12) Idle Gear

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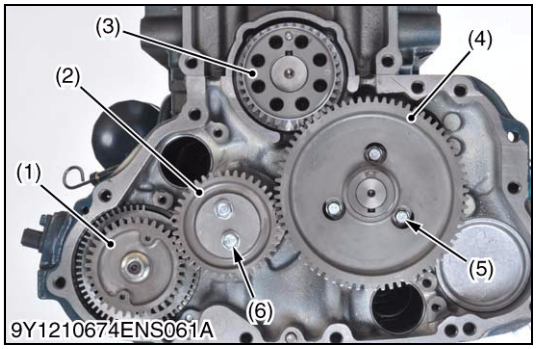

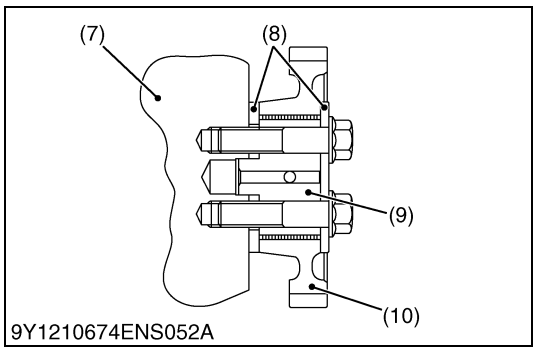

Camshaft and Idle Gear (for V3307-CR-TE4B / V3307-CR-TIE4B)

1. Rotate the cylinder head side of the engine crankcase to the lower side.
2. Remove the idle gear mounting screws (6) and draw out the idle gear (2).
3. Remove the camshaft set screws (5) and draw out the cam gear (4).

■ **NOTE**

- **If the cylinder head side of the engine crankcase does not become lower side, the tappets drop and become the trouble to the camshaft. The camshaft will not be able to be drawn out.**

(When reassembling)

- When installing the idle gear (2) and cam gear (4), be sure to place the 4th cylinder piston at the top dead center in compression then, align all mating marks on each gear to assemble the timing gears, set the idle gear last.
- Mount the supply pump gear (1) after installing the flywheel housing.
- Make sure the idle gear shaft (9) is clean.
- Apply oil to the idle gear shaft (9) and set the crankcase 1 (7).

Tightening torque	Camshaft set screw	24 to 27 N·m 2.4 to 2.8 kgf·m 18 to 20 lbf·ft
	Idle gear mounting screw	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft

(1) Supply Pump Gear
(2) Idle Gear
(3) Crank Gear
(4) Cam Gear
(5) Camshaft Set Screw
(6) Idle Gear Mounting Screw
(7) Crankcase 1
(8) Collar
(9) Idle Gear Shaft
(10) Idle Gear

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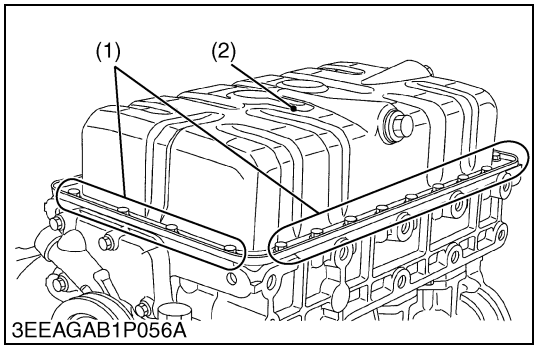
(13) Piston and Connecting Rod



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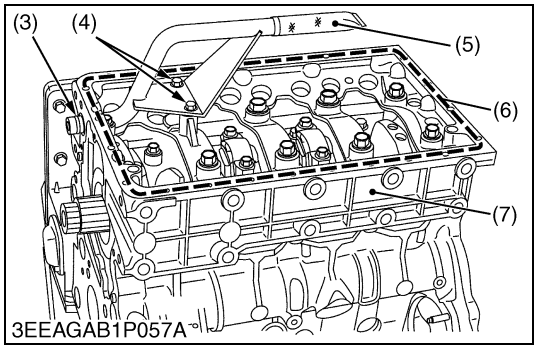

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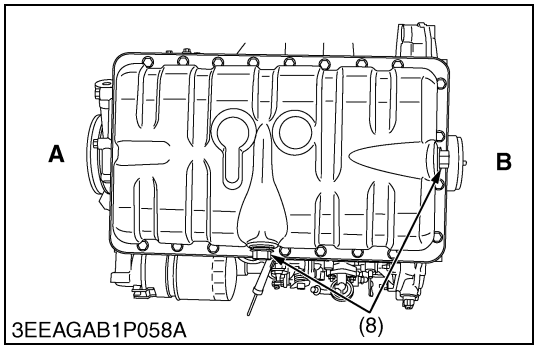

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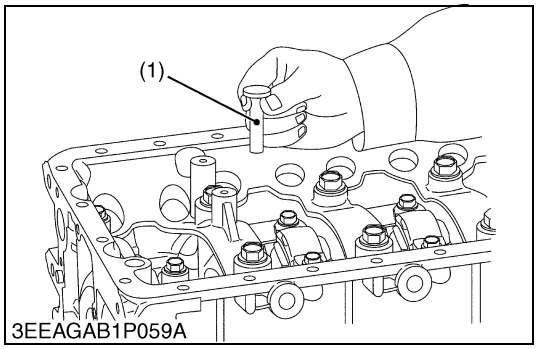

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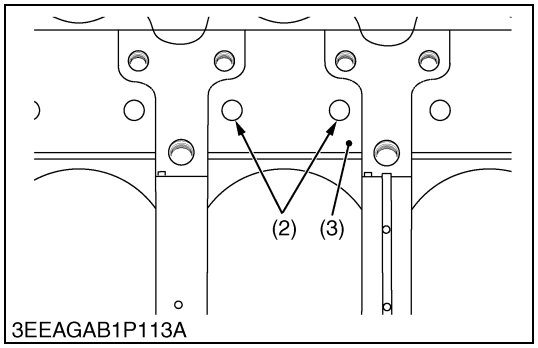

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Oil Pan and Oil Strainer

1. Remove the oil pan mounting screws (1) and remove the oil pan (2).
2. Remove the oil strainer mounting screws (4), and remove the oil strainer (5).

(When reassembling)

- Install the oil strainer (5), using care not to damage the O-ring (3).
- Apply liquid gasket (Three Bond 1217H or equivalent) (6) to the crankcase 2 (7) as shown in the figure.
- Make sure that the liquid gasket coating surface is free of water, dust and oil in order to keep sealing effect.
- Carefully apply the adhesive evenly.

■ **NOTE**

- **When mounting the adhesive-applied parts, be careful to fit them to the mating parts.**
- **Assemble the adhesive-applied parts within ten minutes.**
- **To avoid uneven tightening, tighten mounting screws (1) in diagonal order from the center.**
- **After cleaning the oil strainer (5), install it.**
- **Attach the oil pan (2) so that the drain plugs (8) will approach the flywheel housing side (B).**

(1) Oil Pan Mounting Screw
(2) Oil Pan
(3) O-ring
(4) Oil Strainer Mounting Screw
(5) Oil Strainer
(6) Liquid Gasket
(7) Crankcase 2
(8) Drain Plug
A: Front Cover Side
B: Flywheel Housing Side

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Tappet

1. Remove the tappets (1) from the tappet bore (2) of the crankcase 1 (3) using magnetic tool.

(When reassembling)

- Before installing the tappets (1), apply engine oil thinly around them.

■ **NOTE**

- **Mark the cylinder number to the tappets (1) to prevent interchanging.**

(1) Tappet
(2) Tappet Bore
(3) Crankcase 1

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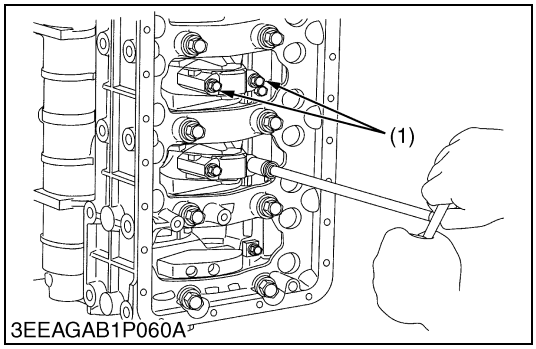

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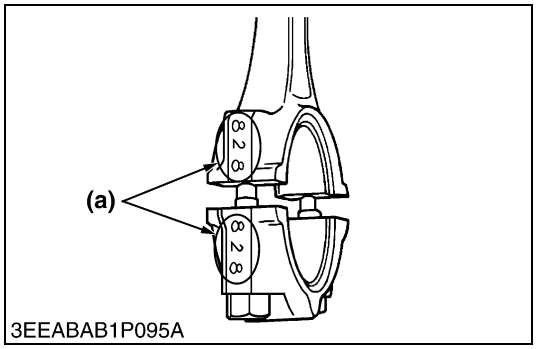

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Connecting Rod Cap

1. Remove the connecting rod screws (1) from connecting rod cap.
2. Remove the connecting rod caps.

(When reassembling)

- Align the marks **(a)** with each other. (Face the marks toward the injection pump.)
- Apply engine oil to the connecting rod screws (1) and lightly screw it in by hand, then tighten it to the specified torque.
  If the connecting rod screw (1) won't be screwed in smoothly, clean the threads.
  If the connecting rod screw (1) is still hard to screw in, replace it.
- When using the existing crank pin metal again, put tally marks on the crank pin metal and the connecting rod in order to keep their positioning.

■ **NOTE**

- **At the time of reassembling the connecting rod caps, use a combination of the connecting rod screws with the same specified tightening torque.**

Tightening torque	Connecting rod screw	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	41 to 45 N·m 4.1 to 4.6 kgf·m 30 to 33 lbf·ft
		V3307-CR-TE4B V3307-CR-TIE4B	69 to 73 N·m 7.0 to 7.5 kgf·m 51 to 54 lbf·ft

(1) Connecting Rod Screw **(a) Mark**

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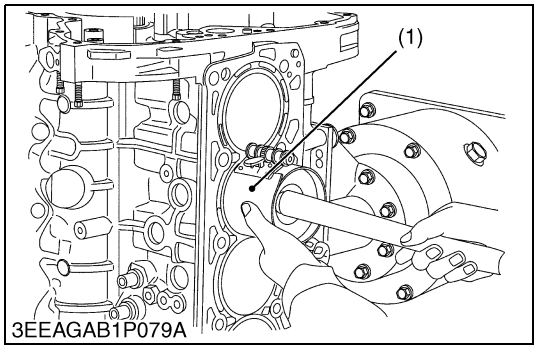

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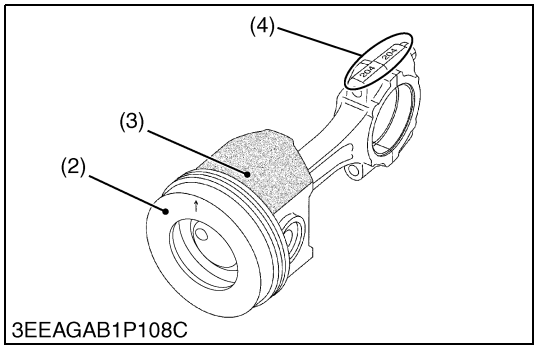

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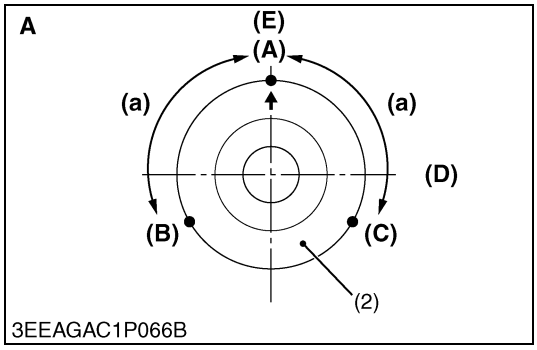

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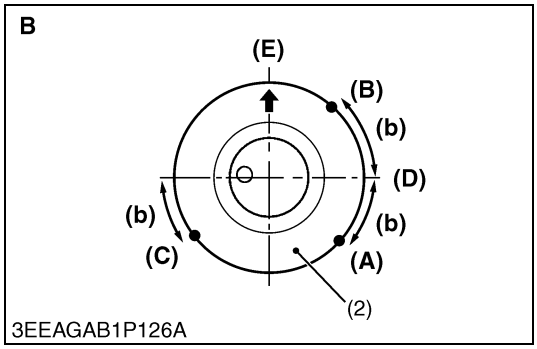

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Piston

1. Completely clean carbon in the cylinders.
2. Turn the flywheel and set a piston to the top dead center.
3. Pull out the piston upward by lightly tapping it from the bottom of the crankcase with the grip of a hammer.

(When reassembling)

- Before inserting the piston into the cylinder, apply enough engine oil to the cylinder.
- When inserting the piston into the cylinder, face the mark (4) on the connecting rod to the injection pump.

■ **IMPORTANT**

- **Do not change the combination of cylinder and piston. Make sure of the position of each piston by marking. For example, mark "1" on the No. 1 position.**
- **When inserting the piston into the cylinder, place the gap of each piston ring like the figure.**
- **Carefully insert the pistons using a piston ring compressor (1). Otherwise, their chrome-plated section of piston rings may be scratched, causing trouble inside the liner.**
- **When inserting the piston in place, be careful not to get the molybdenum disulfide coating (3) torn off its skirt. This coating is useful in minimizing the clearance with the cylinder liner. Just after the piston pin has been press-fitted, in particular, the piston is still hot and the coating is easy to peel off. Wait until the piston cools down.**

(1) Piston Ring Compressor
(2) Piston
(3) Molybdenum Disulfide Coating
(4) Mark

(a) 2.09 rad (120 °)
(b) 0.79 rad (45 °)

(A) Top Ring Gap
(B) Second Ring Gap
(C) Oil Ring Gap
(D) Piston Pin Hole
(E) Injection Pump Side

A: V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B
B: V3307-CR-TE4B / V3307-CR-TIE4B

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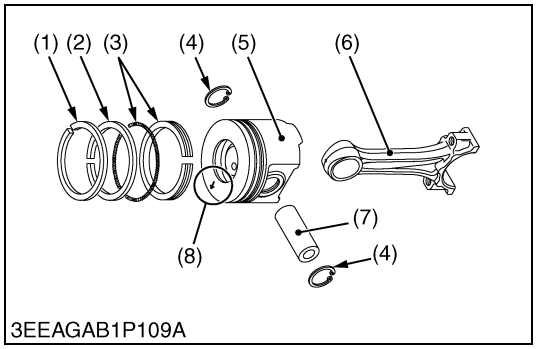

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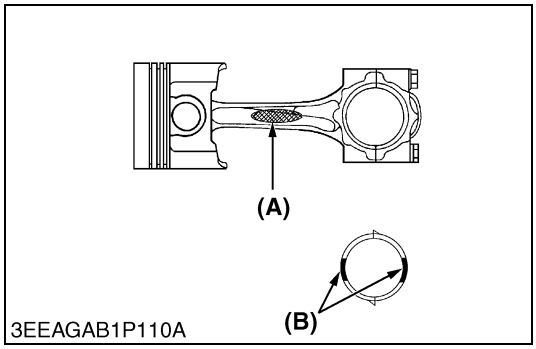

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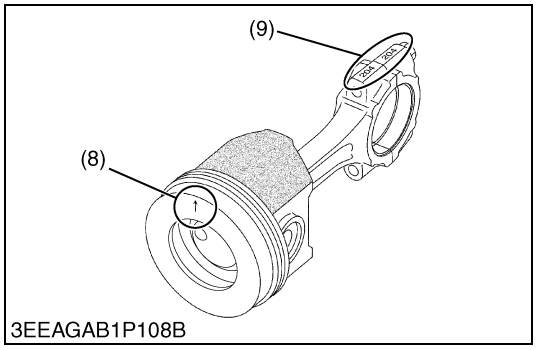

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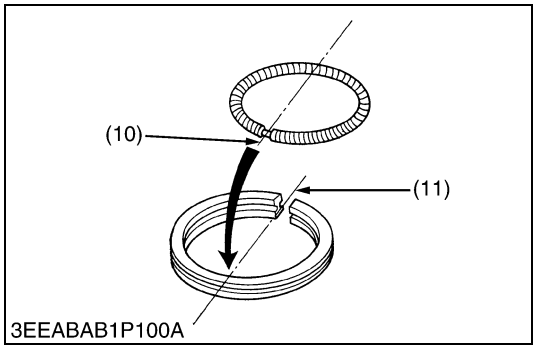

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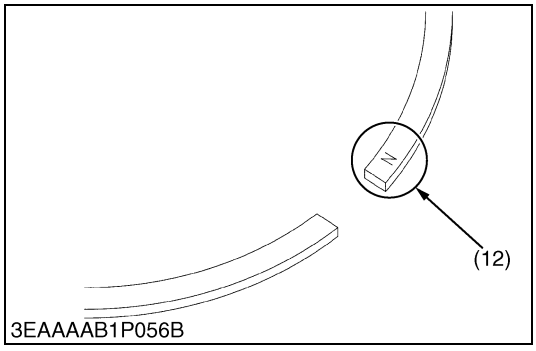

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Piston Ring and Connecting Rod

1. Remove the piston rings using a piston ring tool.
2. Remove the piston pin (7), and separate the connecting rod (6) from the piston (5).

(When reassembling)

- Be sure to fix the crank pin bearing I.D.color **(B)** and the connecting rod I.D.color **(A)** are same colors.
- When installing the ring, assemble the rings so that the manufacture's mark (12) near the gap faces the top of the piston (5).
- When installing the oil ring (3) onto the piston (5), place the expander joint (10) on the opposite side of the oil ring gap (11).
- Apply engine oil to the piston pin (7).
- When installing the piston pin (7), immerse the piston (5) in 80 °C (176 °F) oil for 10 to 15 minutes and insert the piston pin (7) to the piston (5).
- Assemble the piston (5) to the connecting rod (6) with the ↑ mark (8) and the connecting rod numbering mark (9) facing same side.
- The end faces of the oil ring (3) are plated with hard chrome. In putting the piston (5) into the cylinder, be careful not to get the oil ring (3) scratched by the cylinder. Use the piston ring fitter to tighten up the oil ring (3). If the ring's planting is scratched, it may get stuck on the cylinder wall, causing a serious trouble.

■ **IMPORTANT**

- **Mark the same number on the connecting rod (6) and the piston (5) so as not to change the combination.**

(1) Top Ring
(2) Second Ring
(3) Oil Ring
(4) Piston Pin Snap Pin
(5) Piston
(6) Connecting Rod
(7) Piston Pin
(8) Mark (↑)
(9) Numbering Mark
(10) Expander Joint
(11) Oil Ring Gap
(12) Manufacture's Mark

(A) Connecting Rod ID Color: Blue or without Color
(B) Crank Pin Bearing ID Color: Blue or without Color

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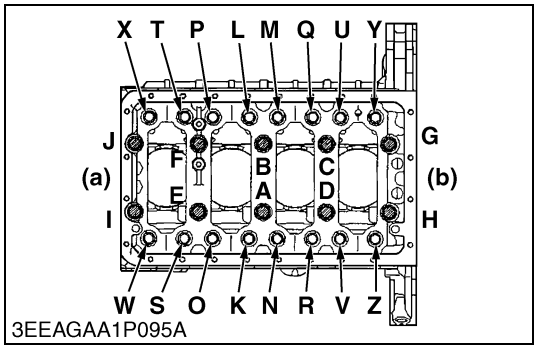
(14) Crankshaft and Crankcase



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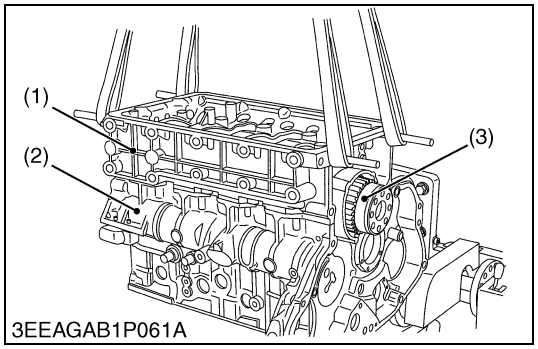

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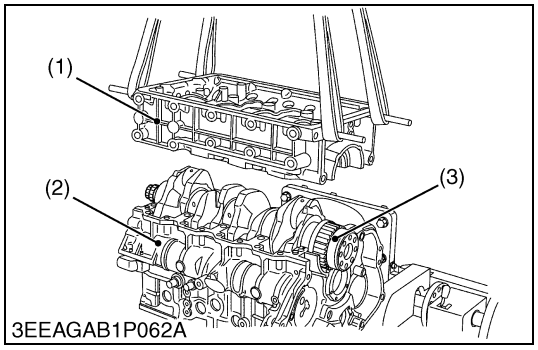

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Crankshaft and Crankcase

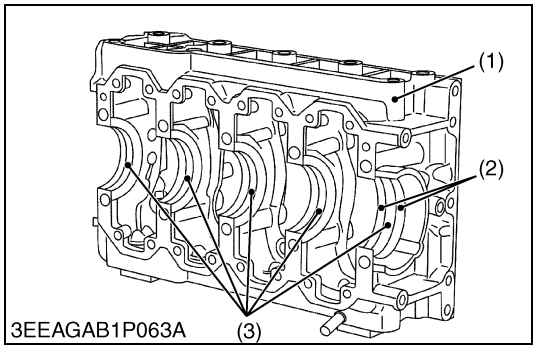
1. Remove the crankcase 2 mounting screw and crankcase 2 flange screw in the order of **Z** to **A**.
2. Remove the crankcase 2 (1) from the crankcase 1 (2).
3. Remove the crankshaft (3).

(1) Crankcase 2
(2) Crankcase 1
(3) Crankshaft

(a) Front Cover Side
(b) Flywheel Housing Side
A to J: Crankcase 2 Mounting Screw
K to Z: Crankcase 2 Flange Screw

(To be continued)

(Continued)



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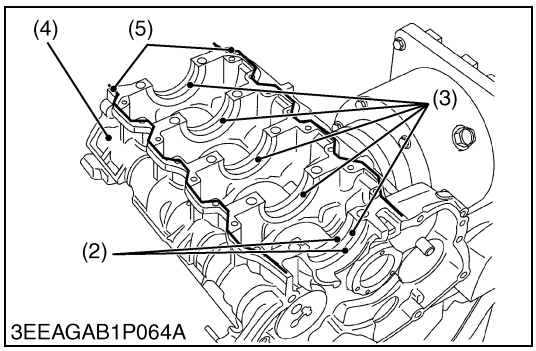

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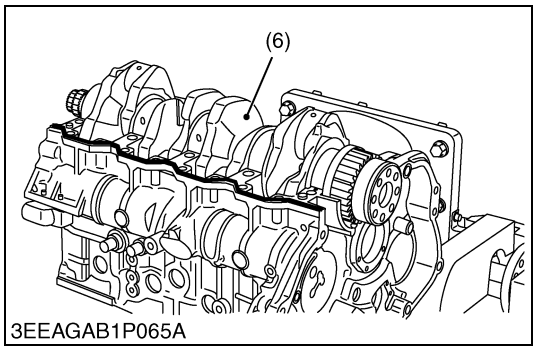

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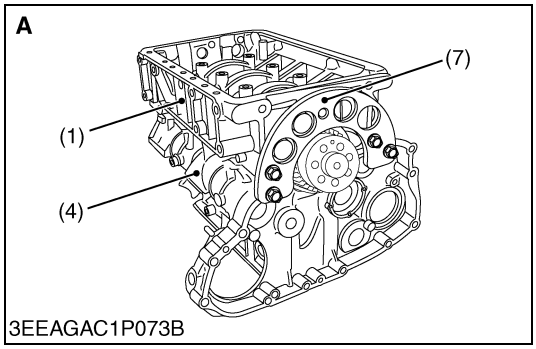

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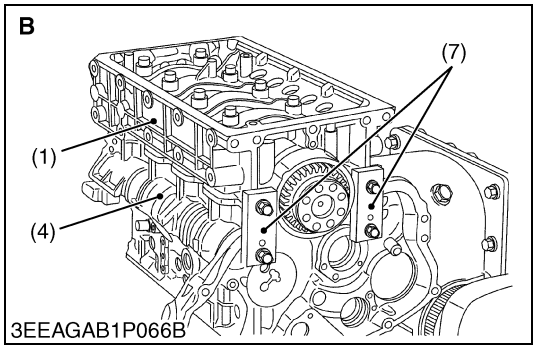

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(When reassembling)

- Make sure the crankcase 1 (4) and 2 (1) are clean.
- Reassemble the crankshaft bearing (3) into crankcase 1 (4) and 2 (1).
- Reassemble the thrust bearing (2), with the oil groove facing outside, into both flywheel housing edge journal side of the crankcase 1 (4) and 2 (1).
- Apply oil to the thrust bearing and set the crankshaft (6).
- Apply liquid gasket (Three Bond 1217H or equivalent) (5) to the crankcase 1 as shown in the figure.
- Make sure that the liquid gasket coating surface is free of water, dust and oil in order to keep sealing effect.
- Carefully apply the adhesive evenly.
- Match the crankcase 1 (4) and 2 (1), referring to the flywheel housing's contoured face.
- Tighten the crankcase 2 mounting screws (**A** to **J**) and the crankcase 2 flange screws (**K** to **Z**) loosely after applying engine oil.
- Tighten up the jig (7) to the specified torque same as the flywheel housing screw. (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.) This helps to minimize the level difference between the crankcase 1 (4) and the crankcase 2 (1) (at the flywheel side). Possible gap must be 0.05 mm (0.002 in.) or smaller.
- Tighten the crankcase 2 mounting screw and the crankcase 2 flange screw in the order of **A** to **Z**. (Refer to previous page.)

■ **NOTE**

- **When mounting the adhesive-applied parts, be careful to fit them to the mating parts.**
- **Assemble the adhesive-applied parts within ten minutes.**

Tightening torque	Crankcase 2 mounting screw (**A** to **J**)	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	128 to 137 N·m 13.0 to 14.0 kgf·m 94.1 to 101 lbf·ft
		V3307-CR-TE4B V3307-CR-TIE4B	138 to 147 N·m 14.0 to 15.0 kgf·m 102 to 108 lbf·ft
	Crankcase 2 flange screw (**K** to **Z**)	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	49 to 55 N·m 5.0 to 5.7 kgf·m 37 to 41 lbf·ft
		V3307-CR-TE4B V3307-CR-TIE4B	59 to 63 N·m 6.0 to 6.5 kgf·m 44 to 47 lbf·ft

(1) Crankcase 2
(2) Thrust Bearing
(3) Crankshaft Bearing
(4) Crankcase 1
(5) Liquid Gasket
(6) Crankshaft
(7) Jig

A: V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B
B: V3307-CR-TE4B / V3307-CR-TIE4B

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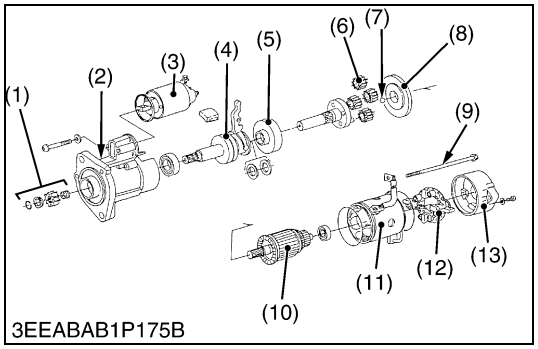
(15) Starter



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Disassembling Motor

1. Disconnect the solenoid switch (3).
2. Remove the 2 through screws (9) and the 2 brush holder lock screws. Remove the rear end frame (13) and the brush holder (12). Disconnect the armature (10) and the yoke (11). Remove also the ball (7) from the tip of the armature.
3. Remove the set of packings (8), the 4 planetary gears and another packing.
4. Remove the shaft assembly. Take note of the position of the lever.

■ **IMPORTANT**

- **Before disconnecting the yoke, put tally marks on the yoke and the front bracket.**
- **Take note of the positions of the set of packings and the setup bolt.**
- **Apply grease to the gears, bearings, shaft's sliding part and ball.**

■ **NOTE**

- **Do not damage to the brush and commutator.**

(When reassembling)

- Apply grease to the parts indicated in the figure.

Tightening torque	**B** terminal nut	9.8 to 11 N·m 1.0 to 1.2 kgf·m 7.3 to 8.6 lbf·ft

(1) Gear
(2) Front Bracket
(3) Solenoid Switch
(4) Overrunning Clutch
(5) Internal Gear
(6) Planetary Gear
(7) Ball
(8) Set of Packings
(9) Through Screws
(10) Armature
(11) Yoke
(12) Brush Holder
(13) Rear End Frame

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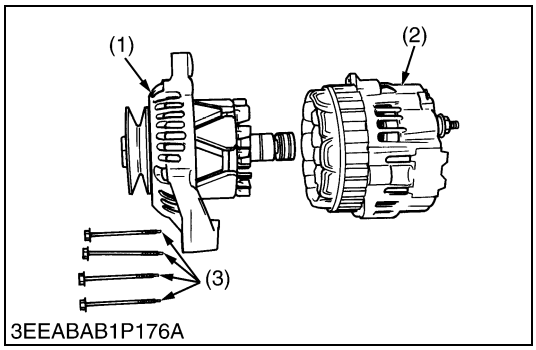
(16) Alternator



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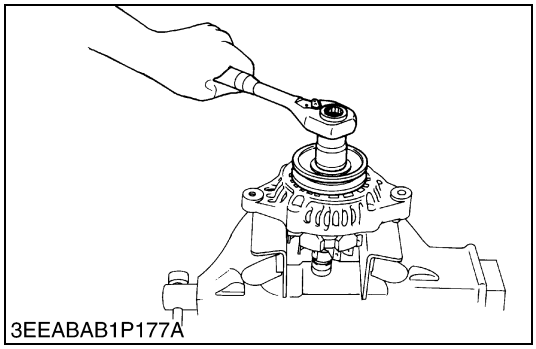
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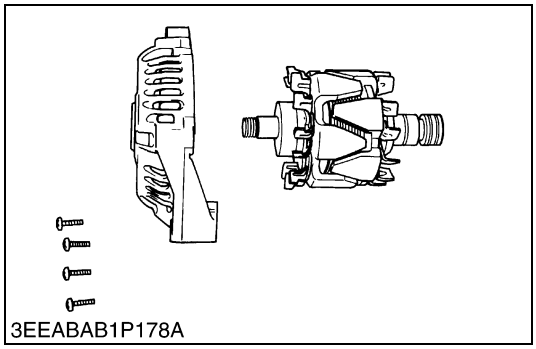
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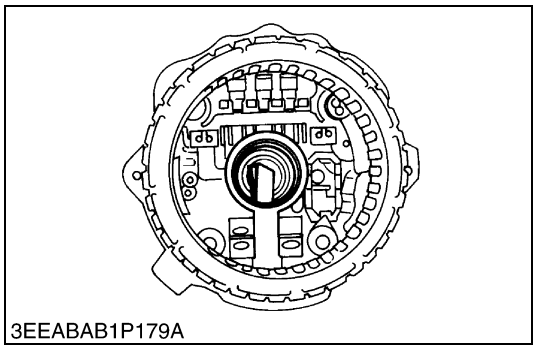
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Front Bracket

1. Remove the 4 screws (3).
2. Separate the front bracket (1) and the rear bracket (2) from each other.

■ **IMPORTANT**

- **Put a tally line on the front bracket (1) and the rear bracket (2) for reassembling them later.**

(1) Front Bracket
(2) Rear Bracket
(3) Screw

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Pulley

1. Hold the rotor (base of the claw) in a vise. Loosen the lock nut using a M24 box wrench.

Tightening torque	Alternator pulley nut	58.4 to 78.9 N·m 5.95 to 8.05 kgf·m 43.1 to 58.2 lbf·ft

9Y1210674ENS0055US0

Rotor

1. Remove the 4 screws and remove the bearing retainer.
2. Temporarily install the nut on the pulley screw, and remove the rotor.

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Brush

1. When the rotor is removed, the 2 brushes are found to stretch out of the shaft hole.

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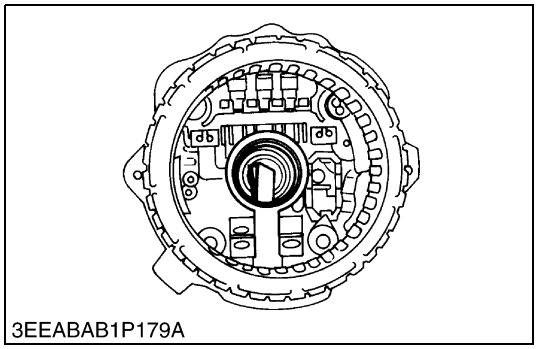
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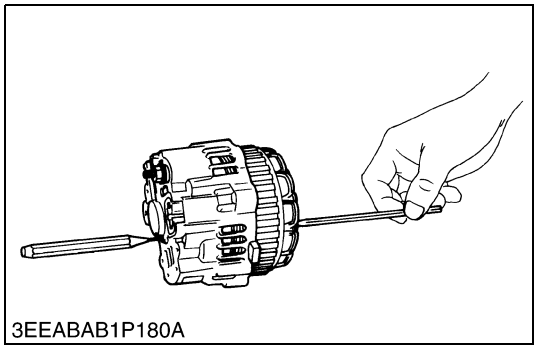
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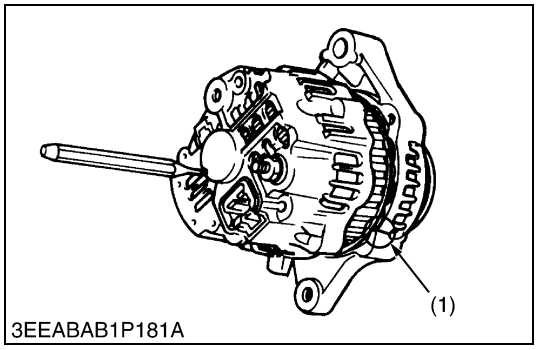

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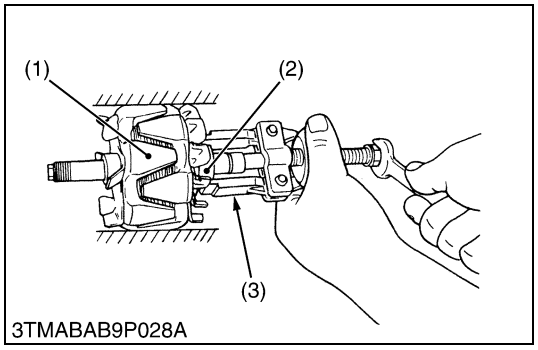

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Reassembling the Brush

1. Fit the brush with its sliding face in the clockwise direction when viewed from front.

■ **IMPORTANT**

- **Be sure to keep the 2 brushes deep in the brush holder. Otherwise the rotor and the rear section can not be fitted into the position.**
- **Use a 4.0 mm (0.16 in.) hex. wrench to push the brushes into place.**
- **Using a pin-pointed (2.0 mm (0.079 in.)) punch, keep the brushes from popping out.**

2. Match the tally line of the front section with that of the rear section.
3. Tighten the 4 screws, and draw out the pin-pointed punch out of the brush holder.

(1) Marking

9Y1210674ENS0058US0

Bearing at Slip Ring Side

1. Lightly secure the rotor (1) with a vise to prevent damage, and remove the bearing (2) with a puller (3).

(1) Rotor
(2) Bearing
(3) Puller

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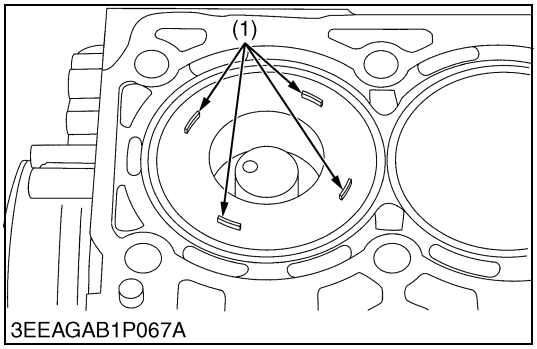
[3] SERVICING
(1) Cylinder Head and Valves



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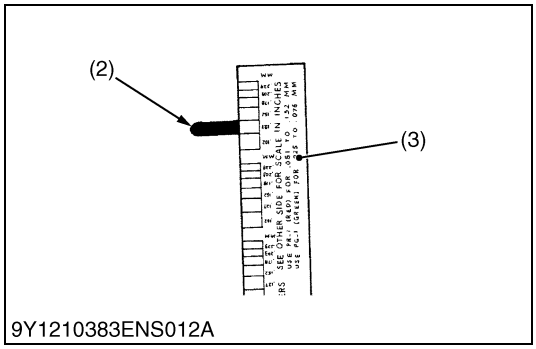

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Top clearance

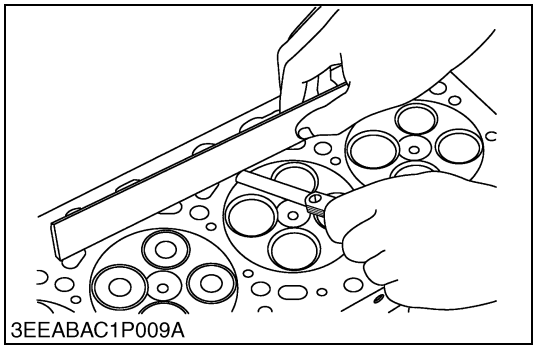
1. Remove the cylinder head.
2. With the piston at TDC, use grease to affix three or four plastigauges (1) of a diameter 1.5 mm (0.059 in.) × 5.0 to 7.0 mm (0.20 to 0.27 in.) long to the crown of the piston; keep the gauges away from the intake valve and combustion chamber fittings.
3. Take the piston to an intermediate position, install the cylinder head and tighten the head bolts to the specified torque.
4. Turn the crankshaft so the piston goes through TDC.
5. Remove the cylinder head and compare the width of the crushed plastigauges (2) with the scale (3).
6. If they are out of spec, check the oil clearance of the crank pin, journal and piston pins

■ **NOTE**
- **Top clearance = Width of the crushed plastigauge (2)**

Top clearance		Factory Specification	0.60 to 0.80 mm 0.024 to 0.031 in.
Tightening torque	Cylinder head mounting screw	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	147 to 156 N·m 15.0 to 16.0 kgf·m 109 to 115 lbf·ft
		V3307-CR-TE4B V3307-CR-TIE4B	187 to 196 N·m 19.0 to 20.0 kgf·m 138 to 144 lbf·ft

(1) Plastigauge
(2) Crushed Plastigauge
(3) Scale

9Y1210674ENS0060US0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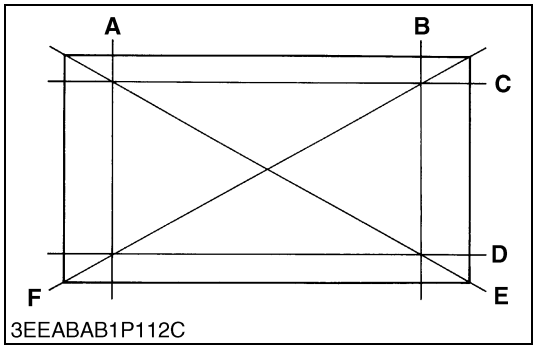
Cylinder Head Surface Flatness

1. Clean the cylinder head surface.
2. Place a straightedge on the cylinder head's four sides **"A"**, **"B"**, **"C"** and **"D"** and two diagonal **"E"** and **"F"** as shown in the figure. Measure the clearance with a feeler gauge.
3. If the measurement is more than the allowable limit, make it straight with a surface grinder.

■ **IMPORTANT**
- **Check the valve recessing after you correct.**



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Cylinder head surface flatness	Allowable limit	0.05 mm 0.002 in.

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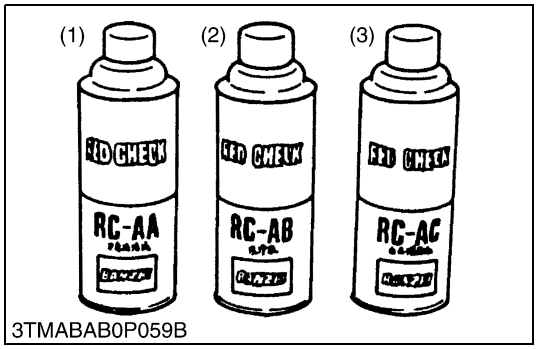

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Cylinder Head Flaw

1. Prepare an air spray red check.
2. Clean the surface of the cylinder head with detergent (2).
3. Apply some red permeative liquid (1) on the cylinder head surface. After you apply, do not touch it for 5 to 10 minutes.
4. Clean away the red permeative liquid on the cylinder head surface with detergent (2).
5. Apply the white developer (3) on the cylinder head surface.
6. If you found a red flaw, replace the cylinder head.

(1) Red Permeative Liquid
(2) Detergent
(3) White Developer

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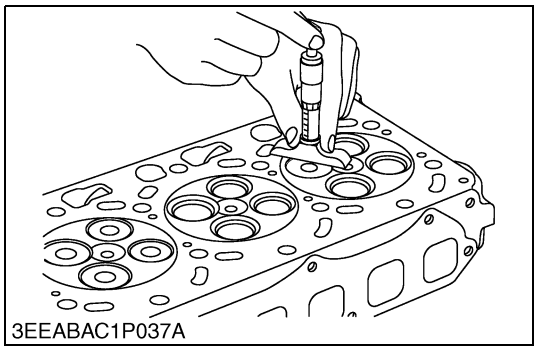
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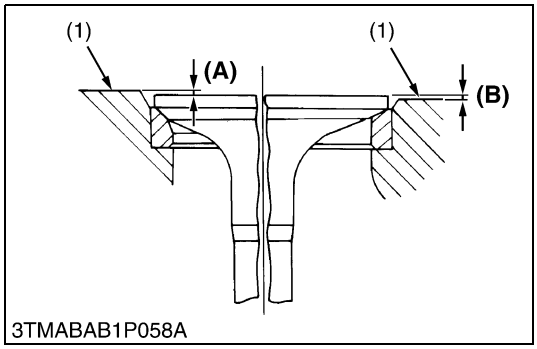
Valve Recessing

1. Clean the cylinder head surface, valve face and valve seat.
2. Set the valve into the valve guide.
3. Measure the valve recessing with a depth gauge.
4. If the measurement is more than the allowable limit, replace the valve. If it stays more than the allowable limit after you replace the valve, replace the cylinder head.

Valve recessing	Factory specification	(recessing) 0.65 to 0.85 mm 0.026 to 0.033 in.
	Allowable limit	(recessing) 1.20 mm 0.0472 in.



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(1) Cylinder Head Surface

(A) Recessing
(B) Protrusion

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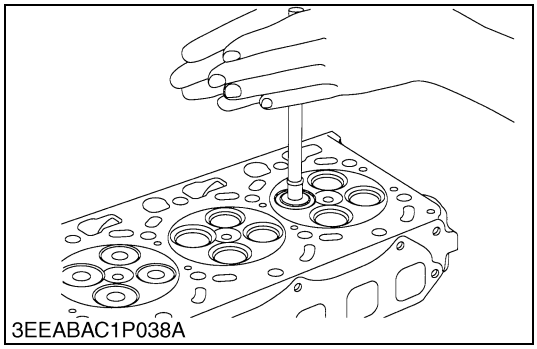
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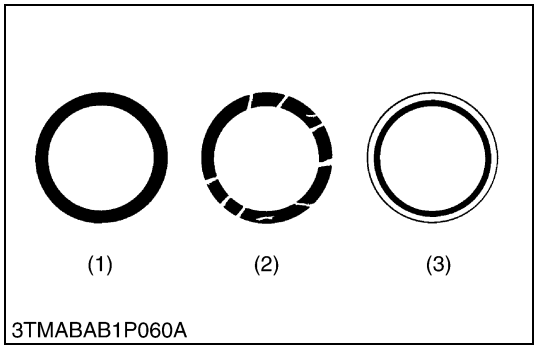
Valve Lapping

1. Apply the compound equally to the valve lapping surface.
2. Put the valve into the valve guide. Lap the valve on its seat with a valve lapping tool.
3. After you lap the valve, clean away the compound and apply oil, then lap the valve again with oil.
4. Apply Prussian Blue to the contact surface to measure the seated rate. If the seated rate is less than 70 %, lap the valve again.

■ **IMPORTANT**

- **After you complete the valve lapping and assemble the valve, check the valve recessing and adjust the valve clearance.**



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(1) Good
(2) Bad
(3) Bad

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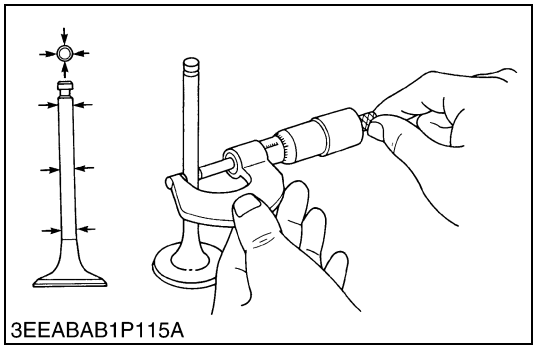
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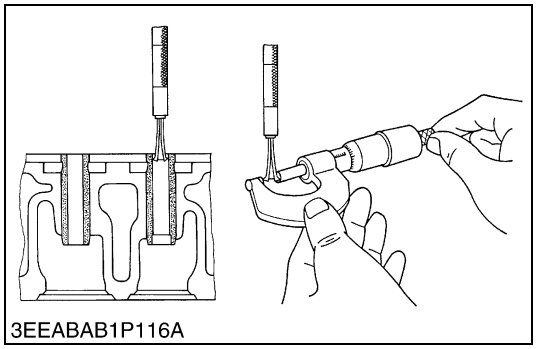
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Clearance between Valve Stem and Valve Guide

1. Remove carbon from the valve guide section.
2. Measure the valve stem O.D. with an external micrometer.
3. Measure the valve guide I.D. with a small hole gauge. Calculate the clearance.
4. If the clearance is more than the allowable limit, replace the valves. If the clearance stays more than the allowable limit, replace the valve guide also.

Clearance between valve stem and guide (Intake)	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	0.030 to 0.057 mm 0.0012 to 0.0022 in.
		Allowable limit	0.10 mm 0.0039 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	0.055 to 0.085 mm 0.0022 to 0.0033 in.
		Allowable limit	0.10 mm 0.0039 in.
Clearance between valve stem and guide (Exhaust)	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	0.045 to 0.072 mm 0.0018 to 0.0028 in.
		Allowable limit	0.10 mm 0.0039 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	0.055 to 0.085 mm 0.0022 to 0.0033 in.
		Allowable limit	0.10 mm 0.0039 in.

Valve stem O.D. (Intake)	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	5.968 to 5.980 mm 0.2350 to 0.2354 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	6.960 to 6.975 mm 0.2741 to 0.2746 in.
Valve stem O.D. (Exhaust)	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	5.953 to 5.965 mm 0.2344 to 0.2348 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	6.960 to 6.975 mm 0.2741 to 0.2746 in.

Valve guide I.D. (Intake and exhaust)	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	6.010 to 6.025 mm 0.2367 to 0.2372 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	7.030 to 7.045 mm 0.2768 to 0.2773 in.

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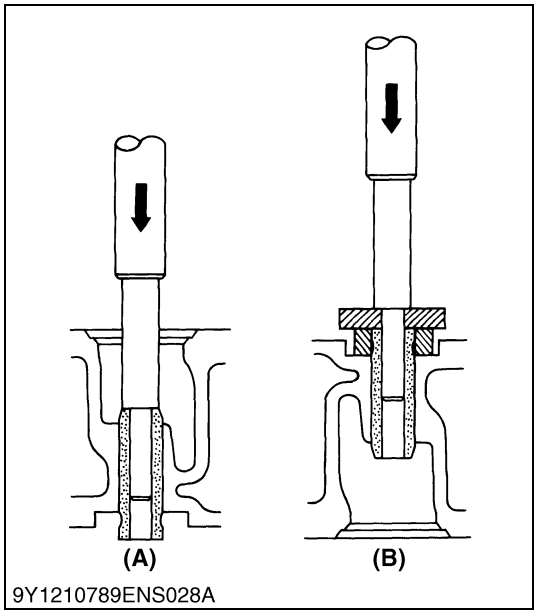

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Replacement of Valve Guide

(When removing)

1. Press out the used valve guide with the valve guide replacing tool.

(When installing)

1. Clean the new valve guide and valve guide bore, and apply engine oil to them.
2. Press fit the new valve guide with the valve guide replacing tool.
3. Ream accurately the I.D. of the valve guide to the specified dimension.

Valve guide I.D. (Intake and exhaust)	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	6.010 to 6.025 mm 0.2367 to 0.2372 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	7.030 to 7.045 mm 0.2768 to 0.2773 in.

■ **IMPORTANT**

- **Do not hit the valve guide with a hammer during replacement.**

(A) When Removing **(B) When Installing**

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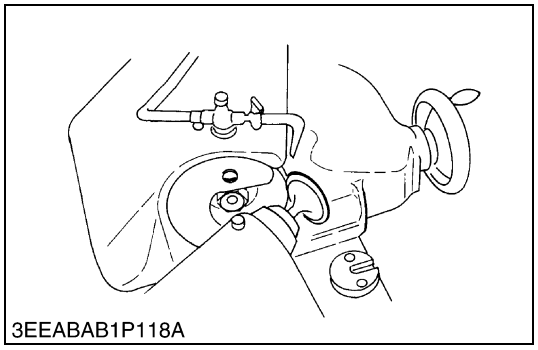
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Correction of Valve and Valve Seat

■ **NOTE**

- **Before you correct the valve and seat, check the valve stem and measure the I.D. of the valve guide section. Repair them if necessary.**
- **After you correct the valve seat, be sure to check the valve recessing.**

1) Correction of valve

1. Correct the valve with a valve refacer.

Valve face angle	Factory specification	0.79 rad 45 °

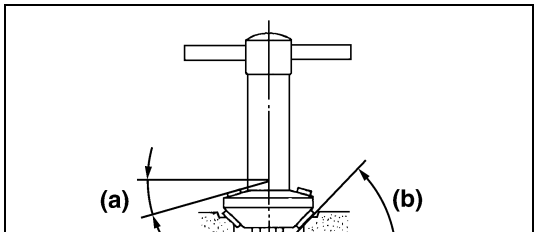
2) Correction of valve seat

1. Slightly correct the seat surface with a 1.0 rad (60 °) or 0.79 rad (45 °) valve seat cutter.
2. Correct the seat surface with a 0.52 rad (30 °) or 0.26 rad (15 °) valve seat cutter.

Valve seat width	Factory specification	3.3 to 3.6 mm 0.13 to 0.14 in.

3. After you correct the seat, check that the valve seating is flat. Apply a thin layer of compound between the valve face and valve seat, and lap them with a valve lapping tool.
4. Check the valve seating with Prussian Blue. The valve seating surface must show good contact on all sides.

Valve seat angle	Factory specification	0.79 rad 45 °



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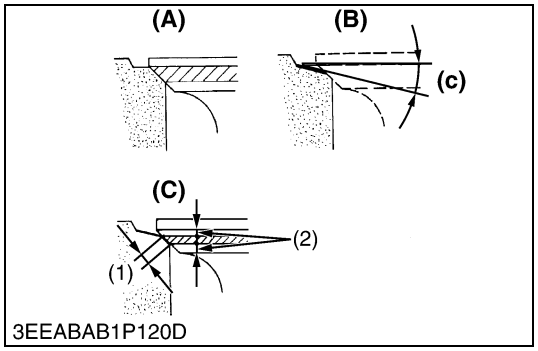

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(1) Valve Seat Width
(2) Identical Dimensions

(A) Check the Contact
(B) Correct Seat Width
(C) Check the Contact
(a) 0.26 rad (15 °) or 0.52 rad (30 °)
(b) 0.79 rad (45 °) or 1.0 rad (60 °)
(c) 0.52 rad (30 °) or 0.26 rad (15 °)

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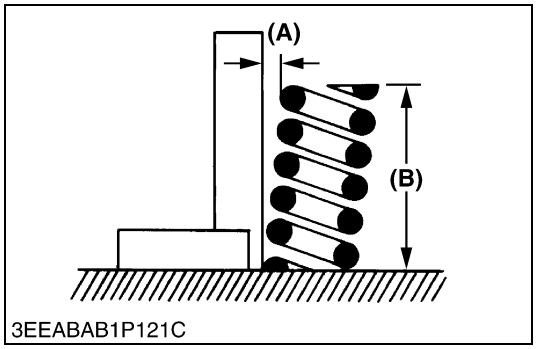

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Free Length and Tilt of Valve Spring

1. Measure the free length **(B)** of valve spring with a vernier calipers. If the measurement is less than the allowable limit, replace it.
2. Put the valve spring on a surface plate, and put a square on the side of the valve spring. Turn the valve spring to measure the maximum tilt **(A)**. If the measurement is more than the allowable limit, replace it.
3. Check the full surface of the valve spring for scratches. If there is a problem, replace it.

Tilt **(A)**	Allowable limit	1.0 mm 0.039 in.

Free length **(B)**	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	35.4 to 35.9 mm 1.40 to 1.41 in.
		Allowable limit	34.9 mm 1.37 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	35.1 to 35.6 mm 1.39 to 1.40 in.
		Allowable limit	34.6 mm 1.36 in.

(A) Tilt **(B) Free Length**

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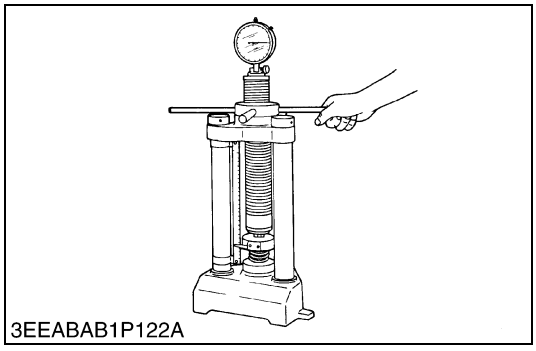
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Setting Load of Valve Spring

1. Put the valve spring on a tester and compress the valve spring to the specified setting length.
2. Read the compression load on the gauge.
3. If the measurement is less than the allowable limit, replace the valve spring.

Setting load / setting length	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	60.8 N / 29.7 mm 6.20 kgf / 29.7 mm 13.7 lbf / 1.17 in.
		Allowable limit	45.9 N / 29.7 mm 4.68 kgf / 29.7 mm 10.3 lbf / 1.17 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	63.5 N / 31.5 mm 6.48 kgf / 31.5 mm 14.3 lbf / 1.24 in.
		Allowable limit	45.9 N / 31.5 mm 4.68 kgf / 31.5 mm 10.3 lbf / 1.24 in.

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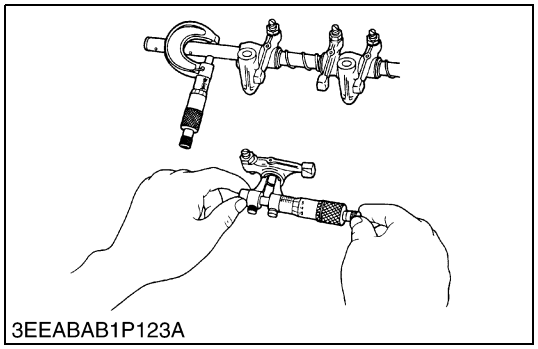
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Oil Clearance between Rocker Arm and Rocker Arm Shaft

1. Measure the rocker arm I.D. with an internal micrometer.
2. Measure the rocker arm shaft O.D. with an external micrometer.
3. Calculate the oil clearance.
4. If the oil clearance is more than the allowable limit, replace the rocker arm and measure the oil clearance again. If the oil clearance stays more than the allowable limit, replace the rocker arm shaft also.

Oil clearance between rocker arm and rocker arm shaft	Factory specification	0.016 to 0.054 mm 0.00063 to 0.0021 in.
	Allowable limit	0.15 mm 0.0059 in.

Rocker arm shaft O.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	13.973 to 13.984 mm 0.55012 to 0.55055 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	14.973 to 14.984 mm 0.58949 to 0.58992 in.

Rocker arm I.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	14.000 to 14.027 mm 0.55119 to 0.55224 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	15.000 to 15.027 mm 0.59056 to 0.59161 in.

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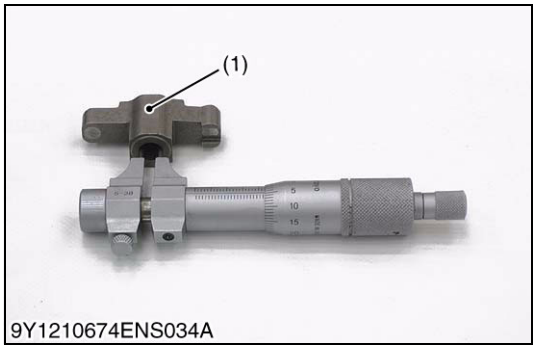

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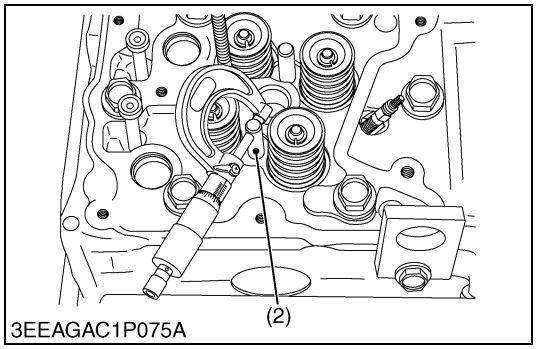

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Oil Clearance between Valve Bridge Arm Shaft and Valve Bridge Arm

1. Measure the valve bridge arm (1) I.D. with an internal micrometer.
2. Measure the valve bridge shaft (2) O.D with an external micrometer.
3. Calculate the oil clearance.
4. If the oil clearance is more than allowable limit, replace the valve bridge arm (1) and measure the oil clearance again. If the oil clearance stays more than the allowable limit, replace the valve bridge shaft (2) also.

Oil clearance between valve bridge arm and valve bridge shaft	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	0.018 to 0.057 mm 0.00071 to 0.0022 in.
		Allowable limit	0.015 mm 0.0059 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	0.018 to 0.057 mm 0.00071 to 0.0022 in.
		Allowable limit	0.015 mm 0.0059 in.

Valve bridge shaft O.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	8.023 to 8.032 mm 0.3159 to 0.3162 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	9.023 to 9.032 mm 0.3553 to 0.3555 in.

Valve bridge arm I.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	8.050 to 8.080 mm 0.3170 to 0.3181 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	9.050 to 9.080 mm 0.3563 to 0.3574 in.

(1) Valve Bridge Arm (2) Valve Bridge Shaft

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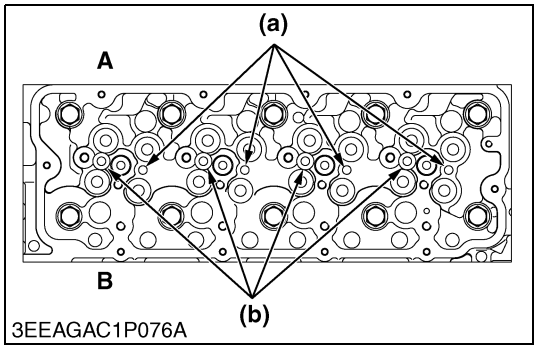

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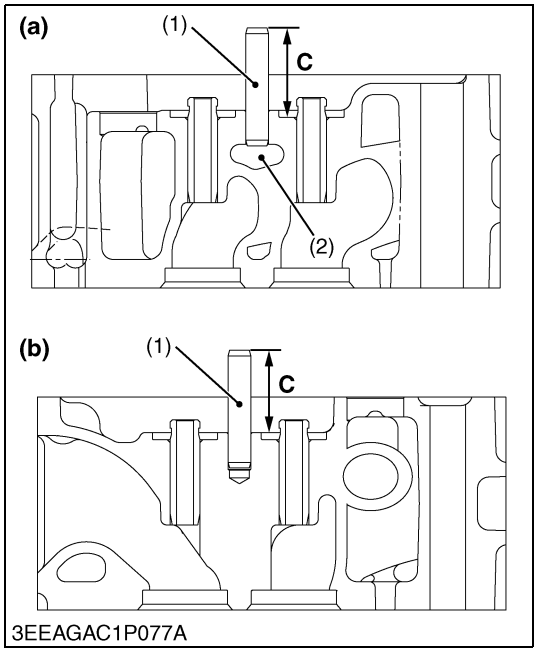

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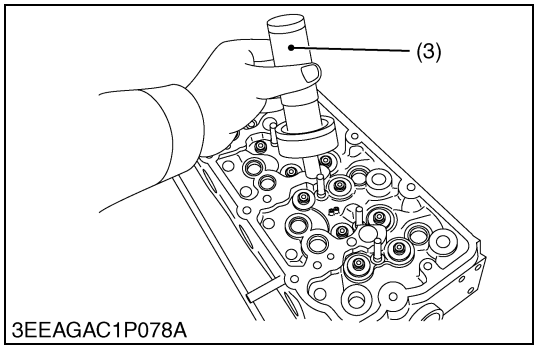

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Replacement of Valve Bridge Shaft (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B) (If necessary)

1. Remove the used valve bridge shaft (1).
2. Clean the valve bridge shaft mounting hole.
3. Apply the liquid seal (Three Bond 1386B or equivalent) to the tip of the valve bridge shaft when installing shaft at the position shown in figure **(a)**.
4. Using valve bridge shaft replacing tool (3), press in the new shaft. (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)

(1) Valve Bridge Shaft
(2) Coolant Passage
(3) Valve Bridge Shaft Replacing Tool

A: Intake Side
B: Exhaust Side
C: 31.30 to 31.70 mm (1.233 to 1.248 in.)
(a) Shaft Hole (Through To The Coolant Passage)
(b) Shaft Hole (Not Through To The Coolant Passage)

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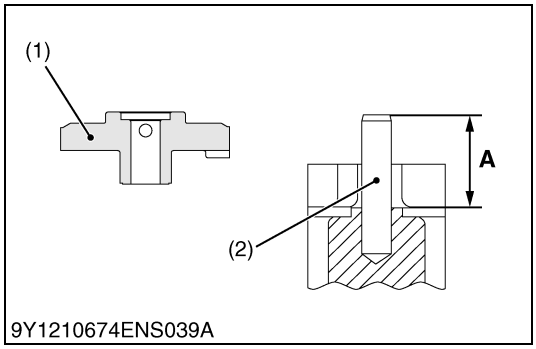

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Replacement of Valve Bridge Shaft (for V3307-CR-TE4B / V3307-CR-TIE4B) (If necessary)

1. Remove the used valve bridge shaft (2).
2. Clean the valve bridge shaft mounting hole.
3. Using valve bridge shaft replacing tool (3), press in the new shaft. (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)

(1) Valve Bridge Arm
(2) Valve Bridge Shaft
(3) Valve Bridge Shaft Replacing Tool

A: 31.1 to 31.7 mm (1.23 to 1.24 in.)

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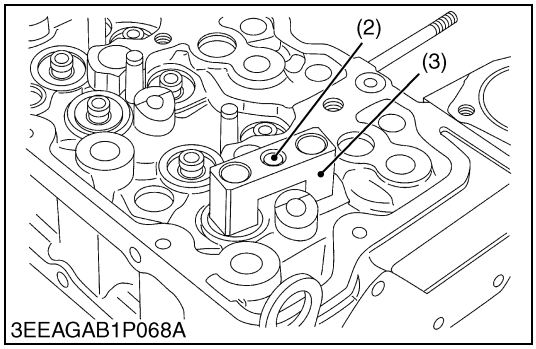

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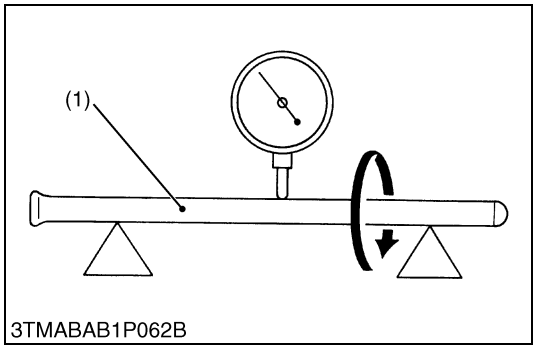

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Push Rod Alignment

1. Put the push rod on V blocks.
2. Measure the push rod alignment.
3. If the measurement is more than the allowable limit, replace the push rod.

Push rod alignment	Allowable limit	0.25 mm 0.0099 in.

(1) Push Rod

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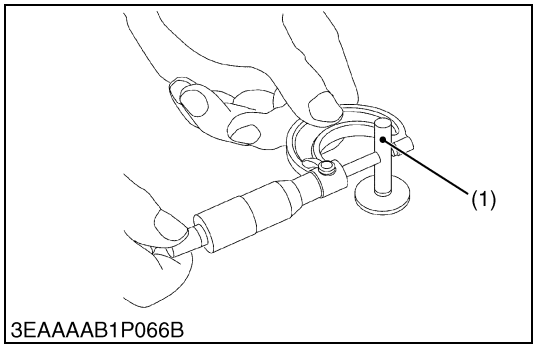

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Oil Clearance between Tappet and Tappet Guide Bore

1. Measure the tappet O.D. with an external micrometer.
2. Measure the tappet guide bore I.D. with a small hole gauge.
3. Calculate the oil clearance.
4. If the oil clearance is more than the allowable limit or the tappet has a damage, replace the tappet.

Oil Clearance between tappet and tappet guide bore	Factory specification	0.020 to 0.050 mm 0.00079 to 0.0019 in.
	Allowable limit	0.07 mm 0.003 in.

Tappet O.D.	Factory specification	9.965 to 9.980 mm 0.3924 to 0.3929 in.
Tappet guide bore I.D.	Factory specification	10.000 to 10.015 mm 0.39370 to 0.39429 in.

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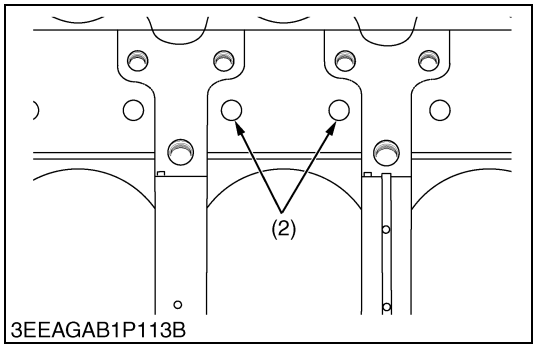

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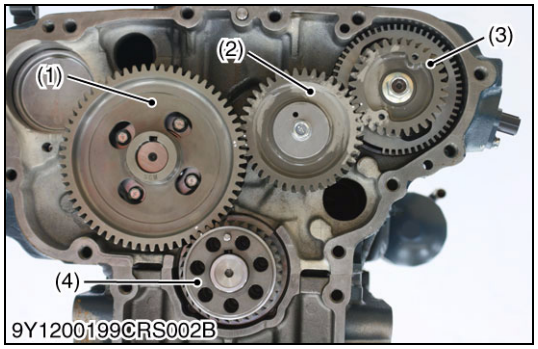
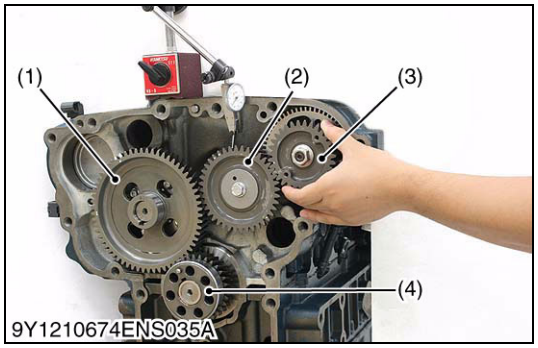
(2) Timing Gears





Timing Gear Backlash (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

1. Set a dial indicator (lever type) with its point on the gear tooth.
2. Hold the mating gear and move the gear to measure the backlash.
3. If the backlash is more than the allowable limit, measure the oil clearance in the journal part of each shaft.
4. If the oil clearance is correct, replace the gear.

Backlash between crank gear and cam gear	Factory specification	0.0400 to 0.118 mm 0.00158 to 0.00464 in.
	Allowable limit	0.22 mm 0.0087 in.
Backlash between cam gear and idle gear	Factory specification	0.0400 to 0.159 mm 0.00158 to 0.00625 in.
	Allowable limit	0.22 mm 0.0087 in.
Backlash between idle gear and supply pump gear	Factory specification	0.0400 to 0.168 mm 0.00158 to 0.00661 in.
	Allowable limit	0.22 mm 0.0087 in.

(1) Cam Gear
(2) Idle Gear
(3) Supply Pump Gear
(4) Crank Gear

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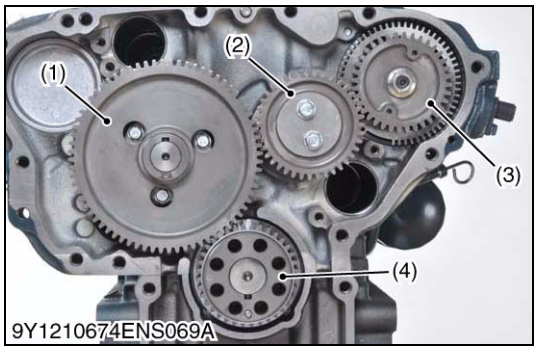

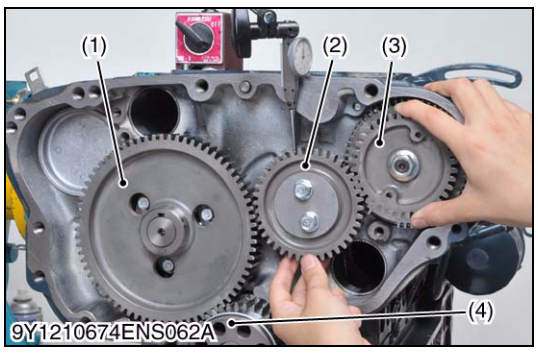

Timing Gear Backlash (for V3307-CR-TE4B / V3307-CR-TIE4B)

1. Set a dial indicator (lever type) with its point on the gear tooth.
2. Hold the mating gear and move the gear to measure the backlash.
3. If the backlash is more than the allowable limit, measure the oil clearance in the journal part of each shaft.
4. If the oil clearance is correct, replace the gear.

Backlash between crank gear and cam gear	Factory specification	0.0410 to 0.139 mm 0.00162 to 0.00547 in.
	Allowable limit	0.22 mm 0.0087 in.
Backlash between cam gear and idle gear	Factory specification	0.0410 to 0.145 mm 0.00162 to 0.00570 in.
	Allowable limit	0.22 mm 0.0087 in.
Backlash between idle gear and supply pump gear	Factory specification	0.0410 to 0.139 mm 0.00162 to 0.00547 in.
	Allowable limit	0.22 mm 0.0087 in.

(1) Cam Gear
(2) Idle Gear
(3) Supply Pump Gear
(4) Crank Gear

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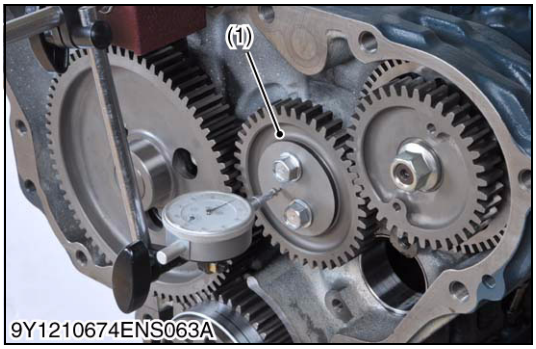

Side Clearance of Idle Gear

1. Set a dial indicator with its point on the idle gear (1).
2. Move the idle gear (1) to the front and rear to measure the side clearance.
3. If the measurement is more than the allowable limit, replace the idle gear collar.

Side clearance of idle gear	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	0.050 to 0.20 mm 0.0020 to 0.0078 in.
		Allowable limit	0.90 mm 0.035 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	0.15 to 0.25 mm 0.0059 to 0.0098 in.
		Allowable limit	0.90 mm 0.035 in.

(1) Idle Gear

9Y1210674ENS0075US0

Oil Clearance between Idle Gear Shaft and Idle Gear Bushing

1. Measure the idle gear shaft O.D. with an external micrometer.
2. Measure the idle gear bushing I.D. with an internal micrometer.
3. Calculate the oil clearance.
4. If the oil clearance is more than the allowable limit, replace the bushing.

Oil clearance between idle gear shaft and idle gear bushing	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	0.025 to 0.096 mm 0.00099 to 0.0037 in.
		Allowable limit	0.10 mm 0.0039 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	0.0250 to 0.106 mm 0.0020 to 0.0035 in.
		Allowable limit	0.11 mm 0.0043 in.

Idle gear shaft O.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	34.959 to 34.975 mm 1.3764 to 1.3769 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	46.959 to 46.975 mm 1.8488 to 1.8494 in.

Idle gear bushing I.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	35.000 to 35.055 mm 1.3780 to 1.3801 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	47.000 to 47.065 mm 1.8504 to 1.8529 in.

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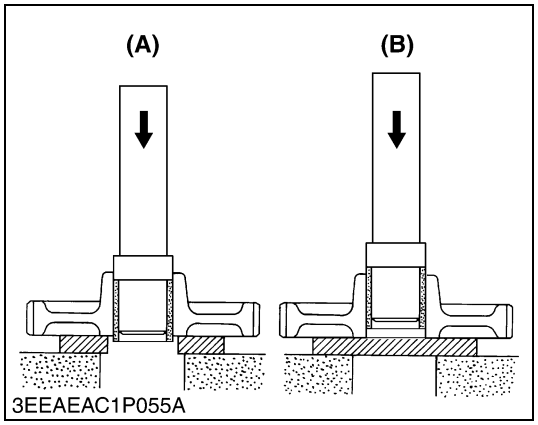

Replacement of Idle Gear Bushing

(When removing)

1. Press out the used idle gear bushing with the replacing tool.

(When installing)

1. Clean a new idle gear bushing and idle gear bore, and apply engine oil to them.
2. Press fit the new bushing with the replacing tool. Make sure that the bushing end aligns the end of the idle gear.

(A) When Removing **(B) When Installing**

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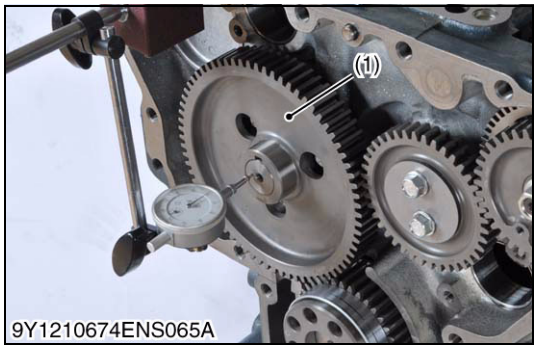

Side Clearance of Camshaft

1. Set a dial indicator with its point on the camshaft.
2. Move the cam gear (1) to the front and rear to measure the side clearance.
3. If the measurement is more than the allowable limit, replace the camshaft stopper.

Side clearance of camshaft	Allowable limit	0.10 mm 0.0039 in.

(1) Cam Gear

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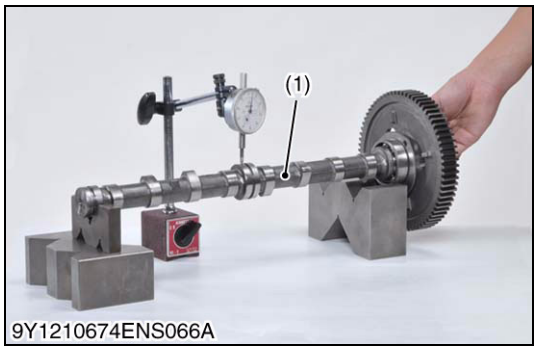

Camshaft Alignment

1. Hold the 2 end journals of camshaft (1) with V blocks on the surface plate.
2. Set a dial indicator with its point on the middle journal.
3. Turn the camshaft (1) slowly and read the variation on the indicator. (Half of the measurement)
4. If the measurement is more than the allowable limit, replace the camshaft (1).

Camshaft alignment	Allowable limit	0.01 mm 0.0004 in.

(1) Camshaft

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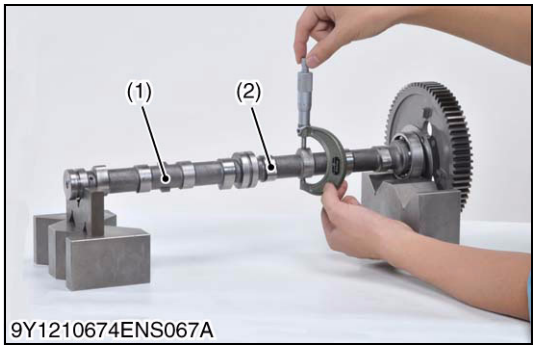

Cam Height

1. Measure the height of the cam (2) at its highest point with an external micrometer.
2. If the measurement is less than the allowable limit, replace the camshaft (1).

Intake cam height	V2607-CR-E4B	Factory specification	32.70 mm 1.287 in.
		Allowable limit	32.20 mm 1.268 in.
	V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	32.60 mm 1.283 in.
		Allowable limit	32.10 mm 1.264 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	37.50 mm 1.476 in.
		Allowable limit	37.00 mm 1.457 in.
Exhaust cam height	V2607-CR-E4B	Factory specification	33.20 mm 1.307 in.
		Allowable limit	32.70 mm 1.287 in.
	V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	33.00 mm 1.299 in.
		Allowable limit	32.50 mm 1.280 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	37.90 mm 1.492 in.
		Allowable limit	37.40 mm 1.472 in.

(1) Camshaft (2) Cam

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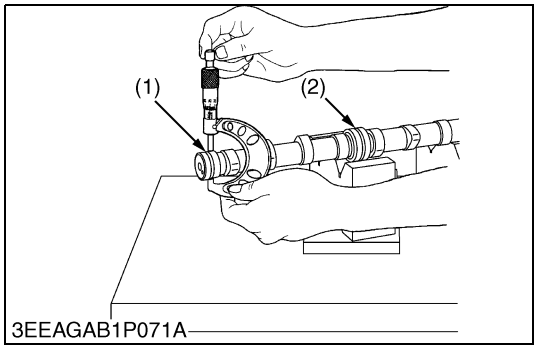

Oil Clearance between Camshaft Journal and Cylinder Block Bore

1. Measure the camshaft journal O.D. with an external micrometer.
2. Measure the cylinder block bore I.D. for the camshaft with an internal micrometer or a cylinder gauge.
3. Calculate the oil clearance.
4. If the oil clearance is more than the allowable limit, replace the camshaft.

Oil clearance between camshaft journal and cylinder block bore	Factory specification	0.050 to 0.091 mm 0.0020 to 0.0035 in.
	Allowable limit	0.15 mm 0.0059 in.

Camshaft journal 1 O.D.	Factory specification	34.934 to 34.950 mm 1.3754 to 1.3759 in.
Cylinder block bore 1 I.D.	Factory specification	35.000 to 35.025 mm 1.3780 to 1.3789 in.

Camshaft journal 2 O.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	41.934 to 41.950 mm 1.6510 to 1.6515 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	43.934 to 43.950 mm 1.7297 to 1.7303 in.

Cylinder block bore 2 I.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	42.000 to 42.025 mm 1.6536 to 1.6545 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	44.000 to 44.025 mm 1.7323 to 1.7332 in.

(1) Camshaft Journal 1 (2) Camshaft Journal 2

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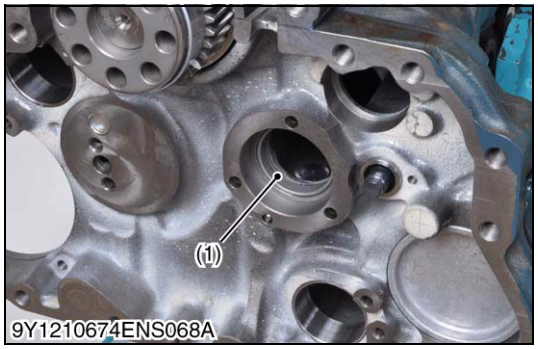

Replacement of Camshaft Cover (for V3307-CR-TE4B) (If necessary)

1. Remove the used camshaft cover and clean the hole.
2. Install the new camshaft cover (1) until bumping using camshaft cover replacing tool. (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)

(1) Camshaft Cover

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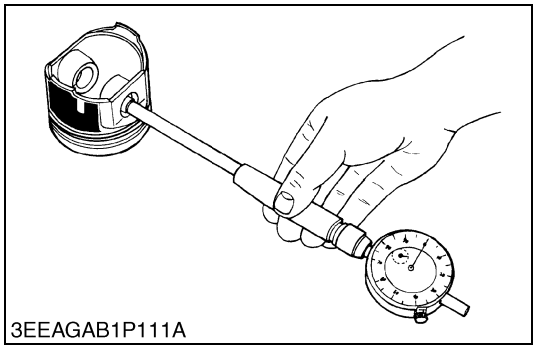
(3) Piston and Connecting Rod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Piston Pin Bore I.D.

1. Measure the piston pin bore I.D. in the horizontal and vertical directions with a cylinder gauge.
2. If the measurement is more than the allowable limit, replace the piston.

Piston pin bore I.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	26.000 to 26.013 mm 1.0237 to 1.0241 in.
		Allowable limit	26.05 mm 1.026 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	28.000 to 28.013 mm 1.1024 to 1.1028 in.
		Allowable limit	28.05 mm 1.104 in.

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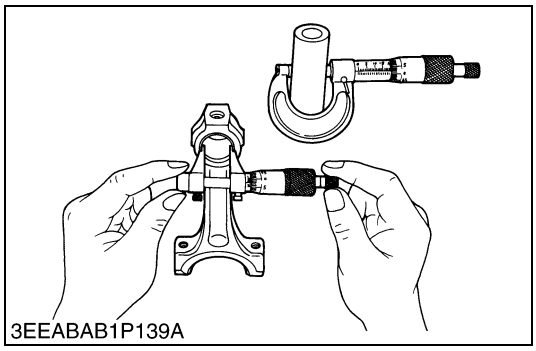
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Oil Clearance between Piston Pin and Small End Bushing

1. Measure the piston pin O.D. where it contacts the bushing with an external micrometer.
2. Measure the piston pin bushing I.D. at the connecting rod small end with an internal micrometer.
3. Calculate the oil clearance.
4. If the oil clearance is more than the allowable limit, replace the bushing and measure the oil clearance again. If the oil clearance stays more than the allowable limit, replace the piston pin.

Oil clearance between piston pin and small end bushing	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	0.014 to 0.034 mm 0.00056 to 0.0013 in.
		Allowable limit	0.15 mm 0.0059 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	0.020 to 0.040 mm 0.00079 to 0.0015 in.
		Allowable limit	0.15 mm 0.0059 in.

Piston pin O.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	26.006 to 26.011 mm 1.0239 to 1.0240 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	28.006 to 28.011 mm 1.1026 to 1.1027 in.

Small end bushing I.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	26.025 to 26.040 mm 1.0246 to 1.0251 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	28.031 to 28.046 mm 1.1036 to 1.1041 in.

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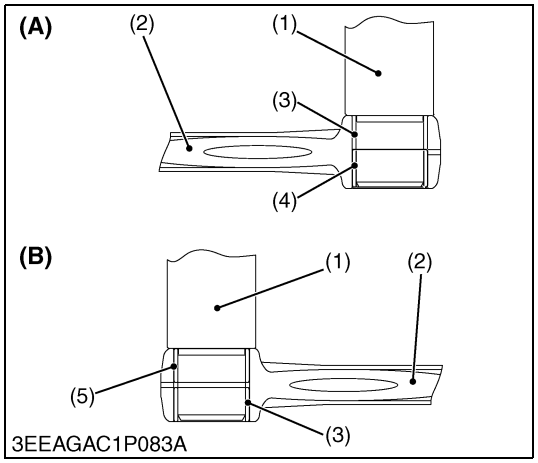

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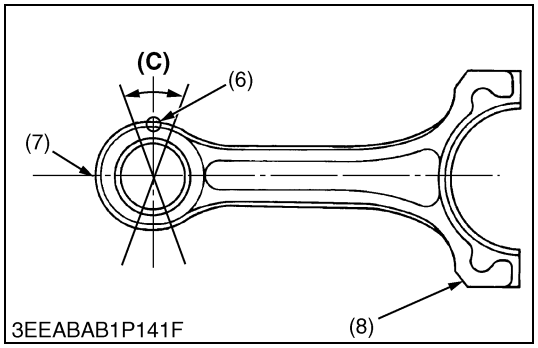

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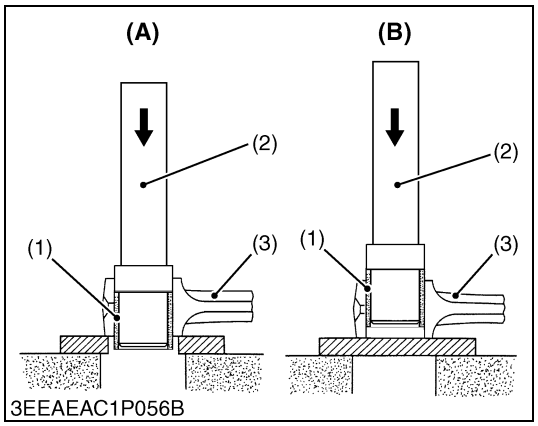

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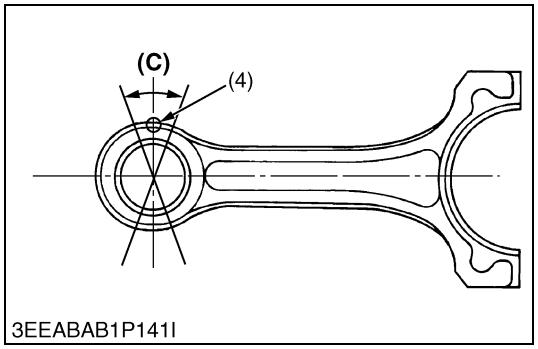

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Replacement of Small End Bushing (for V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B)

(When removing)

1. Press out the used bushing.

(When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Set the guide (4) to the bore of the connecting rod (2).
3. Insert a new first bushing (3) onto the small end bushing replacing tool. (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)
4. Press-fit it with a press so that the seam (6) of bushing position as shown in the figure.
5. Turn the connecting rod inside out, and press-fit the second bushing similarly.

(1) Small End Bushing Replacing Tool
(2) Connecting Rod
(3) First Bushing
(4) Guide
(5) Second Bushing
(6) Seam
(7) Oil Hole
(8) Mark

(A) When Installing First Bushing
(B) When Installing Second Bushing
(C) 0.26 rad (15 °)

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Replacement of Small End Bushing (for V3307-CR-TE4B / V3307-CR-TIE4B)

(When removing)

1. Press out the used bushing using a small end bushing replacing tool. (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)

(When installing)

1. Clean a new small end bushing and bore, and apply engine oil to them.
2. Insert a new bushing onto the tool and press-fit it with a press so that the seam (4) of bushing position as shown in the figure, until it is flash with the connecting rod.

(1) Bushing
(2) Small End Bushing Replacing Tool
(3) Connecting Rod
(4) Seam

(A) When Removing
(B) When Installing
(C) 0.26 rad (15 °)

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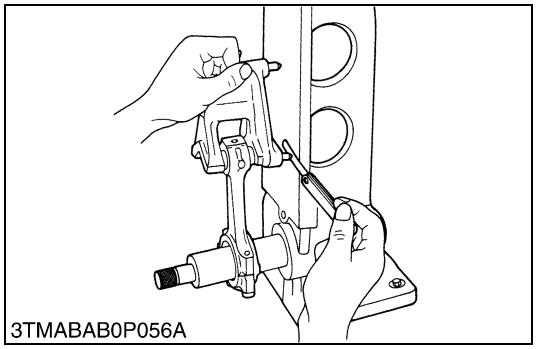
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Connecting Rod Alignment

■ **NOTE**

- **Make sure that the oil clearance of the small end bushing is less than the allowable limit.**

1. Remove the piston pin from the piston.
2. Install the piston pin into the connecting rod.
3. Install the connecting rod on the alignment tool of the connecting rod.
4. Put a gauge on the piston pin, and move it against the face plate.
5. If the gauge does not touch fully against the face plate, measure the space between the gauge pin and face plate.
6. If the measurement is more than the allowable limit, replace the connecting rod.

Connecting rod alignment	Allowable limit	0.05 mm 0.002 in.

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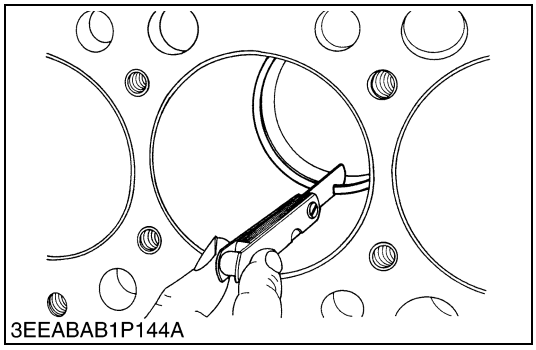
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Piston Ring Gap

1. Put the piston ring into the lower part of the liner (the least worn out part) with the piston.
2. Measure the ring gap with a feeler gauge.
3. If the ring gap is more than the allowable limit, replace the ring.

Piston ring gap	Top ring	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	0.20 to 0.35 mm 0.0079 to 0.013 in.
			Allowable limit	1.25 mm 0.0492 in.
		V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	0.25 to 0.40 mm 0.0099 to 0.015 in.
			Allowable limit	1.25 mm 0.0492 in.
	Second ring	Factory specification		0.30 to 0.45 mm 0.012 to 0.017 in.
		Allowable limit		1.25 mm 0.0492 in.
	Oil ring	Factory specification		0.25 to 0.45 mm 0.0099 to 0.017 in.
		Allowable limit		1.25 mm 0.0492 in.

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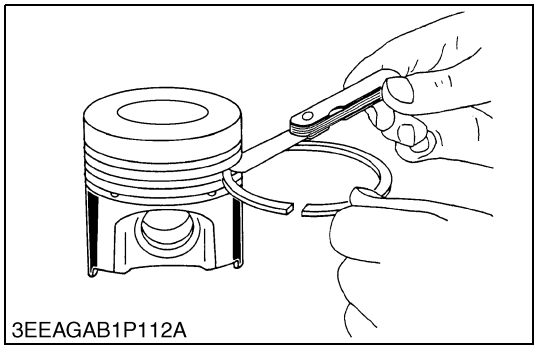
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Clearance between Piston Ring and Ring Groove

1. Clean the rings and the ring grooves, and install each ring in its groove.
2. Measure the clearance between the ring and the groove with a feeler gauge or depth gauge.
3. If the clearance is more than the allowable limit, replace the piston ring.
4. If the clearance stays more than the allowable limit with new ring, replace the piston also.

Clearance between piston ring and ring groove	Top ring	Factory specification	0.050 to 0.090 mm 0.0020 to 0.0035 in.
	Second ring		0.090 to 0.12 mm 0.0036 to 0.0047 in.
	Oil ring		0.020 to 0.060 mm 0.00079 to 0.0023 in.
	Top ring	Allowable limit	0.15 mm 0.0059 in.
	Second ring		0.20 mm 0.0079 in.
	Oil ring		0.15 mm 0.0059 in.

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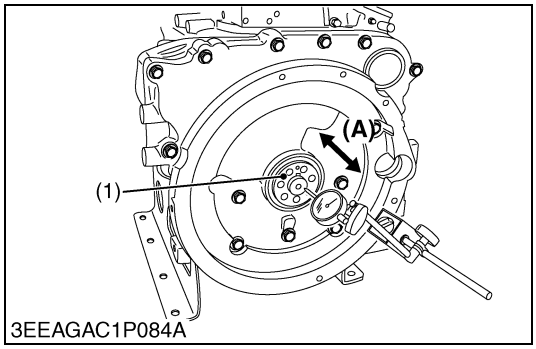
(4) Crankshaft



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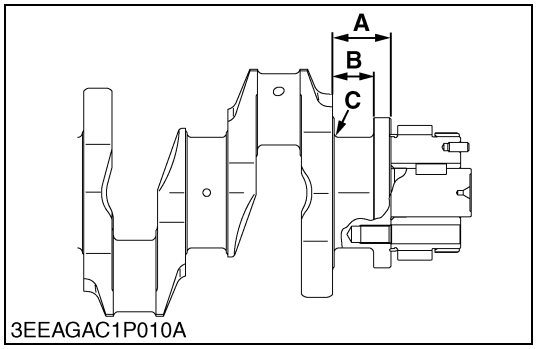

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Side Clearance of Crankshaft

1. Set a dial indicator with its point on the end of the crankshaft (1).
2. Move the crankshaft (1) to the front and rear to measure the side clearance.
3. If the measurement is more than the allowable limit, replace the thrust bearings.
4. If the same dimension bearing is not applicable because of the crankshaft journal wear, replace it with an oversize one. Refer to the table and figure.

Side clearance of crankshaft	Factory specification	0.15 to 0.35 mm 0.0059 to 0.013 in.
	Allowable limit	0.50 mm 0.020 in.

(Reference)

- Oversize dimensions of crankshaft journal

[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]

Oversize	0.2 mm 0.008 in.	0.4 mm 0.02 in.
Dimension **A**	37.50 to 37.70 mm 1.477 to 1.484 in.	37.60 to 37.80 mm 1.481 to 1.488 in.
Dimension **B**	26.20 to 26.25 mm 1.032 to 1.035 in.	26.40 to 26.45 mm 1.040 to 1.041 in.
Dimension **C**	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S		

[V3307-CR-TE4B / V3307-CR-TIE4B]

Oversize	0.2 mm 0.008 in.	0.4 mm 0.02 in.
Dimension **A**	41.10 to 42.10 mm 1.619 to 1.657 in.	41.20 to 42.20 mm 1.622 to 1.661 in.
Dimension **B**	28.20 to 28.25 mm 1.111 to 1.112 in.	28.40 to 28.45 mm 1.119 to 1.120 in.
Dimension **C**	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S		

(1) Crankshaft **(A) Side Clearance of Crankshaft**

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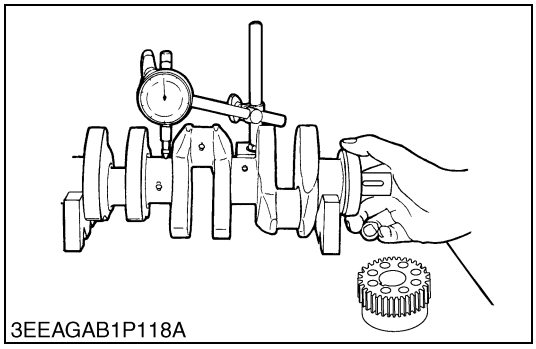
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Crankshaft Alignment

1. Hold the 2 end journals of crankshaft with V blocks on the surface plate.
2. Set a dial indicator with its point on the middle journal.
3. Turn the crankshaft slowly and read the variation on the indicator. (Half of the measurement)
4. If the measurement is more than the allowable limit, replace the crankshaft.

Crankshaft alignment	Allowable limit	0.02 mm 0.0008 in.

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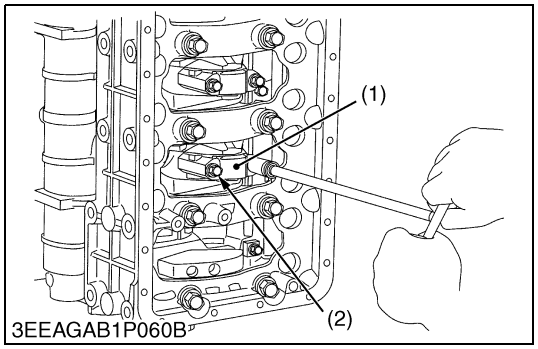

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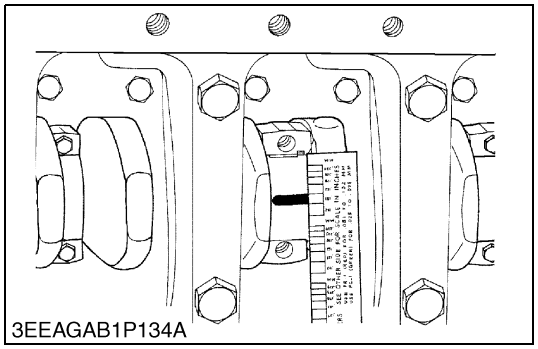
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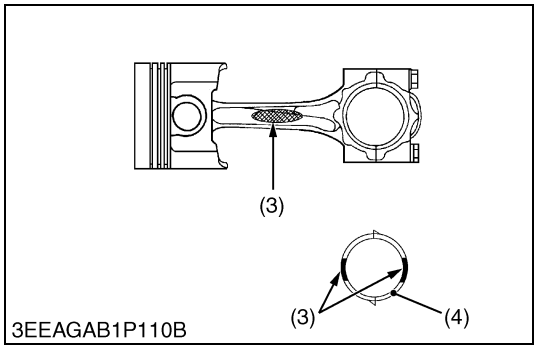

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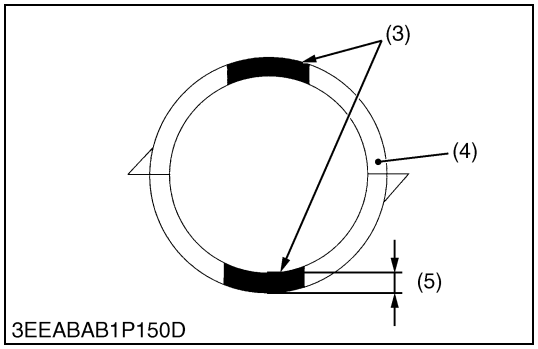

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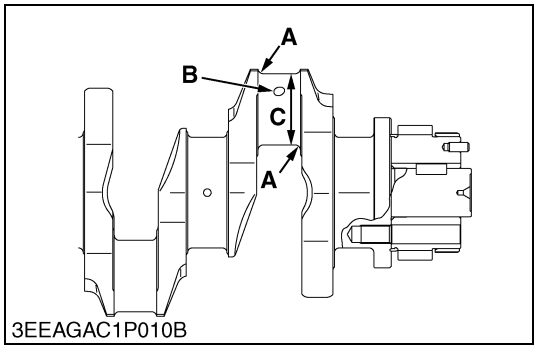

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Oil Clearance between Crank Pin and Crank Pin Bearing

1. Clean the crank pin and crank pin bearing (4).
2. Put a strip of Plastigauge on the center of the crank pin.
3. Install the connecting rod cap (1).
4. Tighten the connecting rod screws (2) to the specified torque.
5. Remove the connecting rod cap again.
6. Measure the width that it becomes flat with the scale to get the oil clearance.
7. If the oil clearance is more than the allowable limit, replace the crank pin bearing (4).
8. If the same dimension bearing is not applicable because of the crank pin wear, replace it with an undersize one. Refer to the table and figure.

■ **NOTE**
- **Do not put the Plastigauge into the crank pin oil hole.**
- **When you tighten the connecting rod screws (2), do not move the crankshaft.**

Crank pin O.D.	Factory specification	49.980 to 49.991 mm 1.9678 to 1.9681 in.

Oil clearance between crank pin and crank pin bearing	Factory specification	0.017 to 0.048 mm 0.00067 to 0.0018 in.
	Allowable limit	0.20 mm 0.0079 in.

■ **IMPORTANT**
- **To replace it with a specific STD service part, make sure the crank pin bearing (4) has the same ID color (3) as the connecting rod.**

ID Color	Connecting rod	Crank pin bearing		
	Large-end in. dia.	Class	Part code	Center wall thick
Blue	53.010 to 53.020 mm 2.0870 to 2.0874 in.	L	1G772-22310	1.496 to 1.501 mm 0.05890 to 0.05909 in.
Without color	53.000 to 53.010 mm 2.0867 to 2.0870 in.	S	1G772-22330	1.491 to 1.496 mm 0.05870 to 0.05889 in.

(Reference)
- Undersize dimensions of crank pin

Undersize	0.2 mm 0.008 in.	0.4 mm 0.02 in.
Dimension **A**	3.3 to 3.7 mm radius 0.13 to 0.14 in. radius	3.3 to 3.7 mm radius 0.13 to 0.14 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	49.780 to 49.791 mm dia. 1.9599 to 1.9602 in. dia.	49.580 to 49.591 mm dia. 1.9520 to 1.9524 in. dia.
The crank pin must be fine-finished to higher than Rmax = 0.8S *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

(1) Connecting Rod Cap
(2) Connecting Rod Screw
(3) ID Color
(4) Crank Pin Bearing
(5) Center Wall Thick

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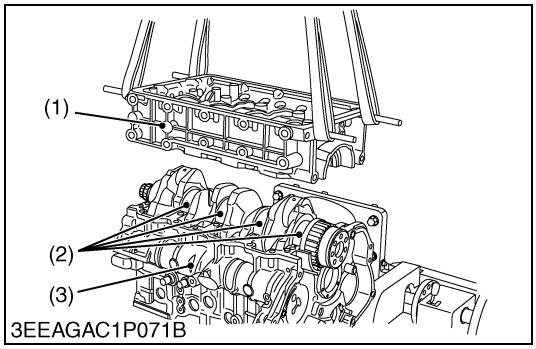

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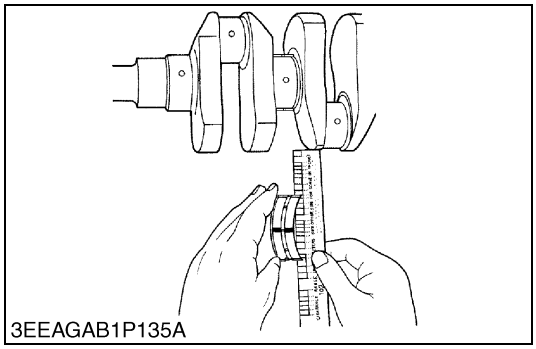
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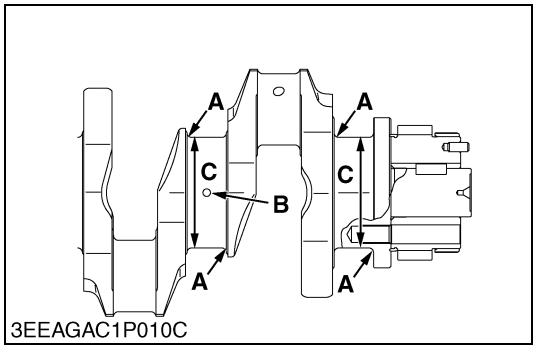

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Oil Clearance between Crankshaft Journal and Crankshaft Bearing

1. Clean the crankshaft journal (2) and crankshaft bearing.
2. Put a strip of plastigauge on the center of the journal.

■ **IMPORTANT**

- **Do not put the Plastigauge into the oil hole of the journal.**

3. Install the crankcase 2 (1).
4. Tighten the crankcase 2 mounting screws to the specified torque.
5. Remove the crankcase 2 (1) again.
6. Measure the width that it becomes flat with the scale to get the oil clearance.
7. If the clearance more than the allowable limit, replace the crankshaft bearing.
8. If the same dimension bearing is not applicable because of the crankshaft journal wear, replace it with an undersize one. Refer to the table and figure.

Crankshaft journal O.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	72.977 to 72.990 mm 2.8732 to 2.8736 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	79.977 to 79.990 mm 3.1487 to 3.1492 in.

Oil clearance between crankshaft journal and crankshaft bearing	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	0.030 to 0.051 mm 0.0012 to 0.0020 in.
		Allowable limit	0.20 mm 0.0079 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	0.030 to 0.073 mm 0.0012 to 0.0028 in.
		Allowable limit	0.20 mm 0.0079 in.

(1) Crankcase 2
(2) Crankshaft Journal
(3) Crankcase 1

(To be continued)

(Continued)

(Reference)

- Undersize dimensions of crankshaft journal

[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]

Undersize	0.2 mm 0.008 in.	0.4 mm 0.02 in.
Dimension **A**	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	72.777 to 72.790 mm dia. 2.8653 to 2.8657 in. dia.	72.577 to 72.590 mm dia. 2.8574 to 2.8578 in. dia.
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

[V3307-CR-TE4B / V3307-CR-TIE4B]

Undersize	0.2 mm 0.008 in.	0.4 mm 0.02 in.
Dimension **A**	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius	2.8 to 3.2 mm radius 0.11 to 0.12 in. radius
*Dimension **B**	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief	1.0 to 1.5 mm relief 0.040 to 0.059 in. relief
Dimension **C**	79.777 to 79.790 mm dia. 3.1409 to 3.1413 in. dia.	79.577 to 79.590 mm dia. 3.1330 to 3.1334 in. dia.
The crankshaft journal must be fine-finished to higher than Rmax = 0.8S *Holes to be de-burred and edges rounded with 1.0 to 1.5 mm (0.040 to 0.059 in.) relief.		

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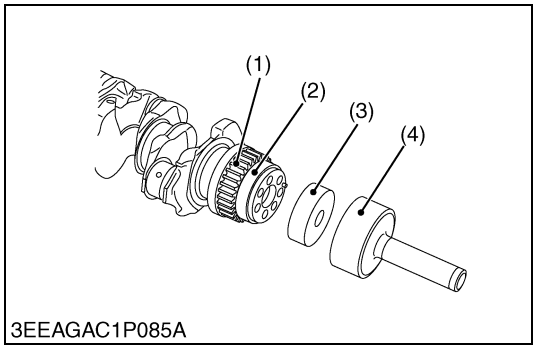

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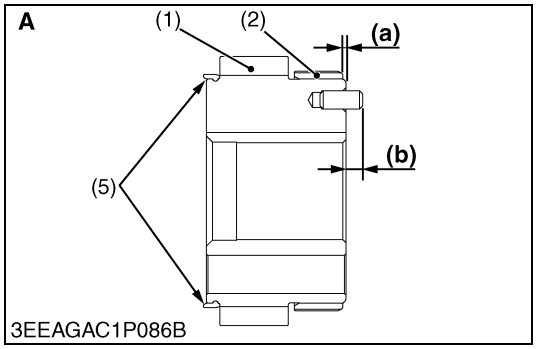

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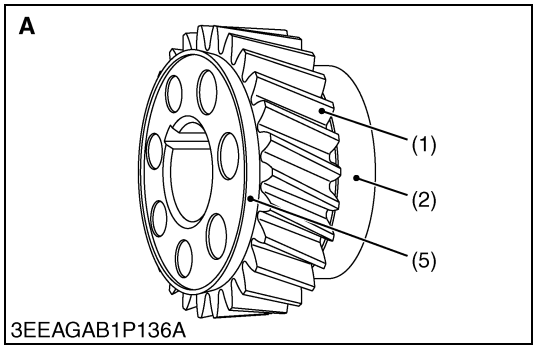

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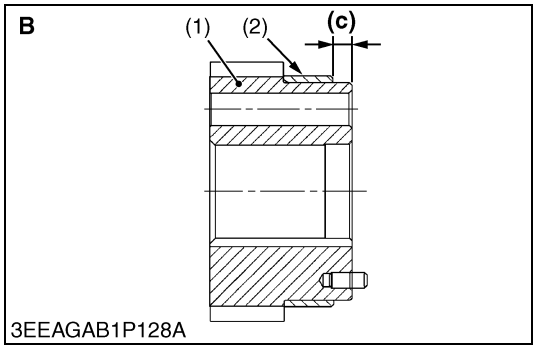

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Replacement of Crankshaft Sleeve

1. Remove the used crankshaft sleeve (2).
2. Set the sleeve guide (3) to the crankshaft (1).
3. Increase the temperature of a new sleeve to between 150 and 200 °C (302 and 392 °F).
4. Set the sleeve to the crankshaft as shown in figure.
5. Press fit the sleeve using the crankshaft sleeve replacing tool (4). (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)

■ **NOTE**

- **Make sure that the large chamfer of the sleeve points to outward.**
- **Keep the space ((a) or (c)) between the edge of the crankshaft gear (1) and the crankshaft sleeve (2).**
- **Be sure to place the seal (5) when reassembling.**

(1) Crankshaft Gear
(2) Crankshaft Sleeve
(3) Sleeve Guide
(4) Crankshaft Sleeve Replacing Tool
(5) Seal

(a) 0.850 to 1.15 mm (0.0335 to 0.0452 in.)
(b) 5.5 mm (0.22 in.)
(c) More than 6.5 mm (0.26 in.)

A: V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B
B: V3307-CR-TE4B / V3307-CR-TIE4B

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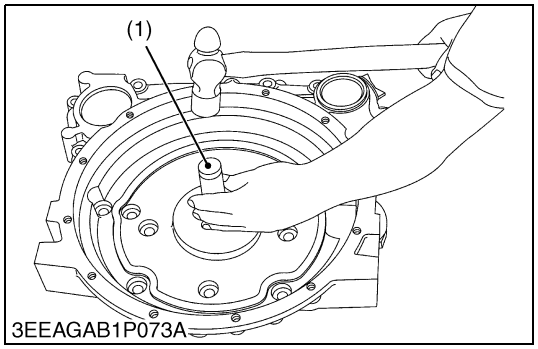

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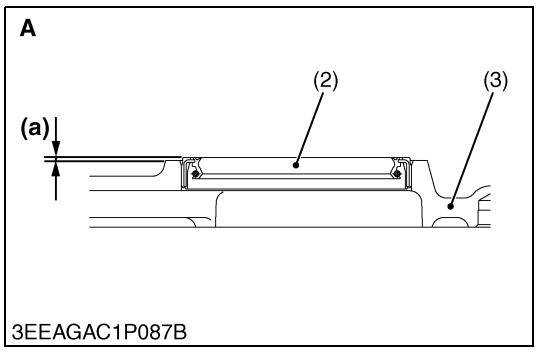

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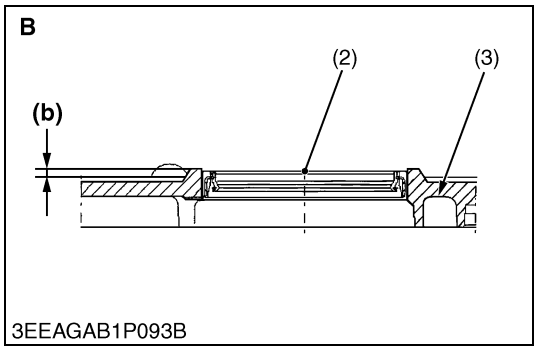

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Replacement of Flywheel Housing Oil Seal

1. Remove the used oil seal (2).
2. Clean the new flywheel housing oil seal (2) and apply engine oil to it.
3. Install the new oil seal (2) to the specific position using the flywheel housing oil seal replacing tool (1). (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)

(1) Flywheel Housing Oil Seal Replacing Tool
(2) Oil Seal
(3) Flywheel Housing

(a) 0 to 0.50 mm (0 to 0.019 in.)
(b) 1.0 mm (0.039 in.)

A: V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B
B: V3307-CR-TE4B / V3307-CR-TIE4B

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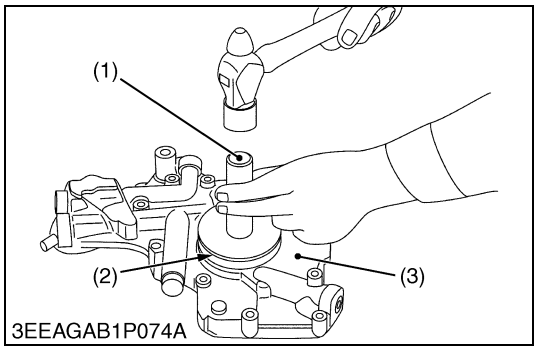

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Replacement of Front Cover Oil Seal

1. Remove the used front cover oil seal (2).
2. Clean a new front cover oil seal (2) and apply engine oil to it.
3. Install the new oil seal (2) using the front cover oil seal replacing tool (1). (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)

(1) Front Cover Oil Seal Replacing Tool
(2) Oil Seal
(3) Front Cover

A: 2.0 mm (0.079 in.)

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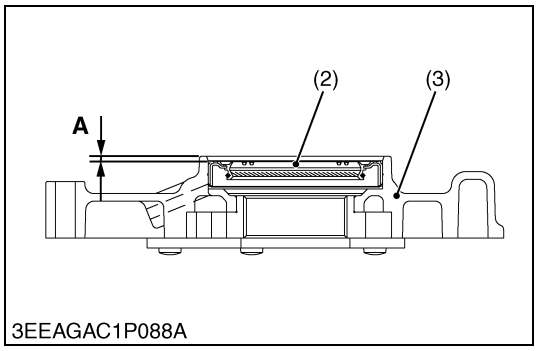

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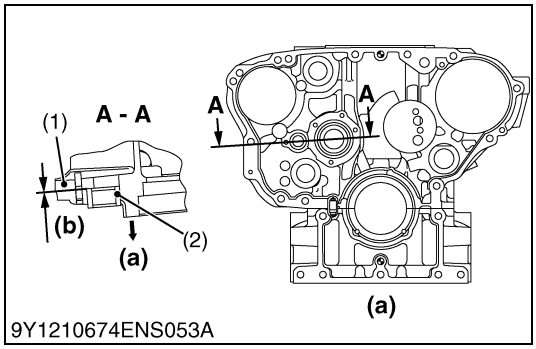

Replacement of Camshaft Position Sensor Bushing

(When removing)

1. Press out the used bushing using a camshaft position sensor bushing replacing tool. (Refer to "5. SPECIAL TOOLS" at "GENERAL" section.)

(When installing)

1. Clean a new camshaft position sensor bushing and bore.
2. Apply Loctite 962T or Three Bond 1386B to new camshaft position sensor bushing.
3. Insert a new bushing onto the tool.
4. Press-fit the new bushing with the replacing tool. Make sure that the bushing end aligns the end of the crankcase.

■ **NOTE**

- **Keep the space (b) between the edge of the crankcase (1) and the camshaft position sensor bushing (2).**

(1) Crankcase
(2) Camshaft Position Sensor Bushing
(a) Flywheel Side
(b) 0.1 to 0.6 mm (0.004 to 0.02 in.)

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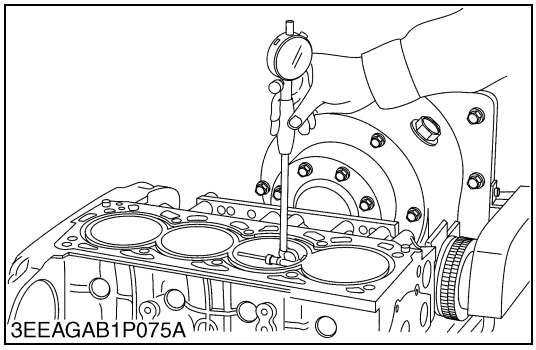
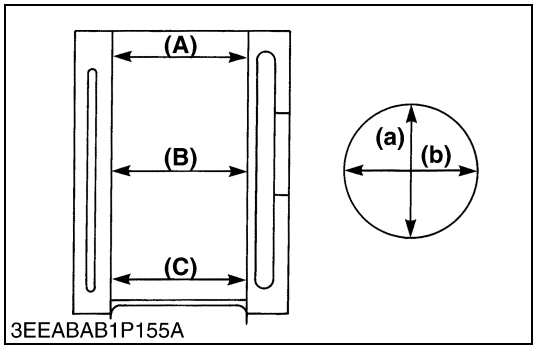
(5) Cylinder





Cylinder Wear

1. Measure the I.D. of the cylinder at the 6 positions (see figure) with a cylinder gauge and find the maximum and minimum inner diameters.
2. Find the difference between the maximum and the minimum inner diameters.
3. If the maximum I.D. or the difference is more than the allowable limit, bore and hone it to the oversize dimension. (Refer to "Cylinder Correction (Oversize)".)
4. Check the cylinder wall for scratches. If you find deep scratches, bore the cylinder. (Refer to "Cylinder Correction (Oversize)".)

Cylinder Bore I.D.	V2607-CR-E4B V2607-CR-TE4B V2607-CR-TIE4B	Factory specification	87.000 to 87.022 mm 3.4252 to 3.4260 in.
		Allowable limit	87.15 mm 3.431 in.
	V3307-CR-TE4B V3307-CR-TIE4B	Factory specification	94.000 to 94.022 mm 3.7008 to 3.7016 in.
		Allowable limit	94.15 mm 3.707 in.

(A) Top
(B) Middle
(C) Bottom (Skirt)
(a) Right-angled to Piston Pin
(b) Piston Pin Direction

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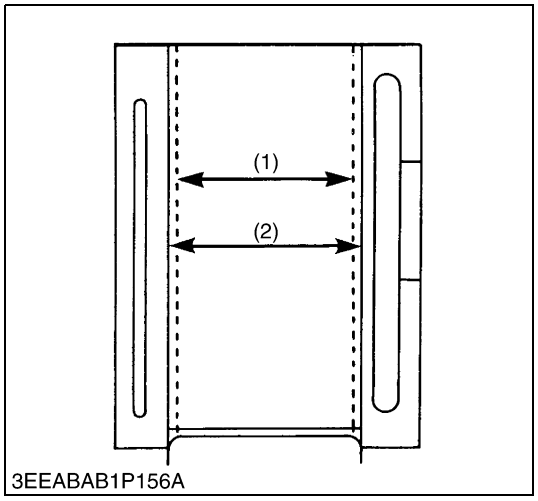

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Cylinder Correction (Oversize)

1. If the cylinder wear is more than the allowable limit, bore and hone it to the specified dimension.

[V2607-CR-E4B / V2607-CR-TE4B / V2607-CR-TIE4B]

Oversize cylinder I.D.	Factory specification	87.250 to 87.272 mm 3.4351 to 3.4359 in.
Maximum wear	Allowable limit	87.40 mm 3.441 in.
Finishing	Hone to 2.2 to 3.0 μmRz (0.000087 to 0.00011 in.Rz)	

2. Replace the piston and piston rings with oversize ones (0.25 mm, 0.0098 in.).

[V3307-CR-TE4B / V3307-CR-TIE4B]

Oversize cylinder I.D.	Factory specification	94.500 to 94.522 mm 3.7205 to 3.7213 in.
Maximum wear	Allowable limit	94.65 mm 3.726 in.
Finishing	Hone to 2.2 to 3.0 μmRz (0.000087 to 0.00011 in.Rz)	

2. Replace the piston and piston rings with oversize ones (0.5 mm, 0.02 in.).

■ **NOTE**

- **If the maximum I.D. or the difference for the oversize cylinder is more than the allowable limit, replace the cylinder block with a new one.**

(1) Cylinder I.D. (Before Correction) (2) Cylinder I.D. (Oversize)

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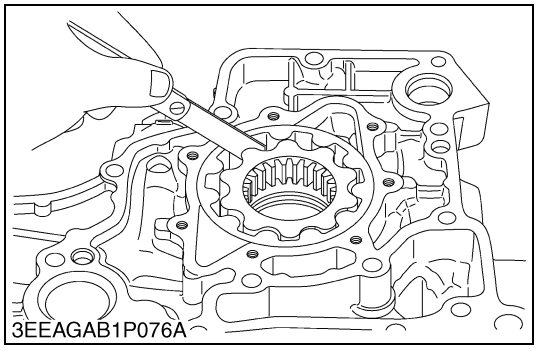
(6) Oil Pump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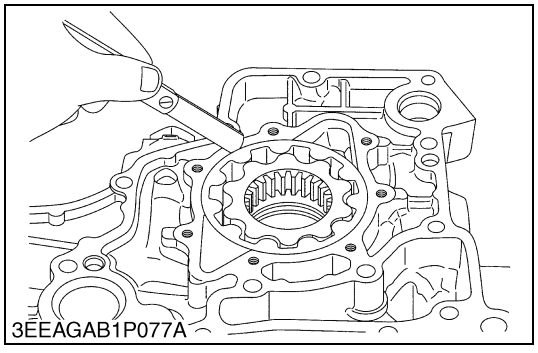
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Clearance between Inner Rotor and Outer Rotor

1. Measure the clearance between the lobes of the inner rotor and the outer rotor with a feeler gauge.
2. If the clearance more than the allowable limit, replace the oil pump rotor assembly.

Clearance between inner rotor and outer rotor	Factory specification	0.030 to 0.090 mm 0.0012 to 0.0035 in.
	Allowable limit	0.30 mm 0.012 in.

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Clearance between Outer Rotor and Pump Body

1. Measure the clearance between the outer rotor and the pump body with a feeler gauge.
2. If the clearance more than the allowable limit, replace the oil pump rotor assembly.
3. If the clearance stays more than the allowable limit after replacing the oil pump rotor assembly, replace the gear case.

Clearance between outer rotor and pump body	Factory specification	0.100 to 0.184 mm 0.00394 to 0.00724 in.
	Allowable limit	0.30 mm 0.012 in.

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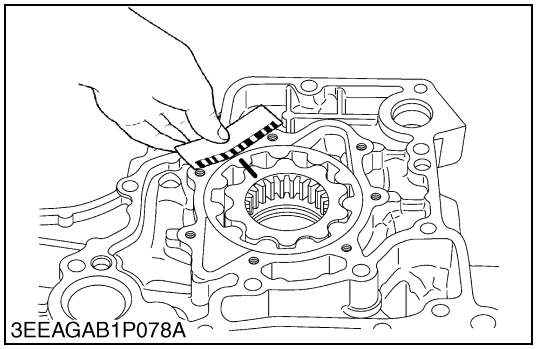
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Clearance between Rotor and Cover

1. Put a strip of Plastigauge on the rotor face with grease.
2. Install the cover and tighten the screws with the specified torque.
3. Remove the cover carefully.
4. Measure the width that Plastigauge becomes flat with the scale to get the oil clearance.
5. If the clearance is more than the allowable limit, replace oil pump rotor assembly and the cover.

Clearance between rotor and cover	Factory specification	0.025 to 0.075 mm 0.00099 to 0.0029 in.
	Allowable limit	0.225 mm 0.00886 in.

Tightening torque	Oil pump cover screw	7.9 to 9.3 N·m 0.80 to 0.95 kgf·m 5.8 to 6.8 lbf·ft

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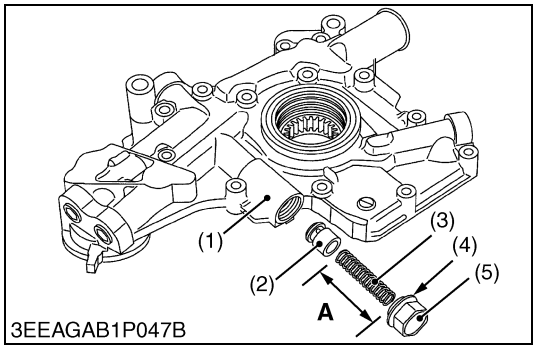
(7) Relief Valve



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Free Length of Relief Valve Spring

1. Measure the free length **"A"** with vernier calipers. If the measurement is less than the allowable limit, replace it.
2. Check the entire surface of the spring for scratches. Replace it, if any.

Free length **"A"**	Factory specification	60.0 to 60.5 mm 2.37 to 2.38 in.
	Allowable limit	55.0 mm 2.17 in.

Tightening torque	Relief valve retaining screw	69 to 78 N·m 7.0 to 8.0 kgf·m 51 to 57 lbf·ft

(1) Front Cover
(2) Relief Valve
(3) Spring
(4) Packing
(5) Relief Valve Retaining Screw
A: Free Length

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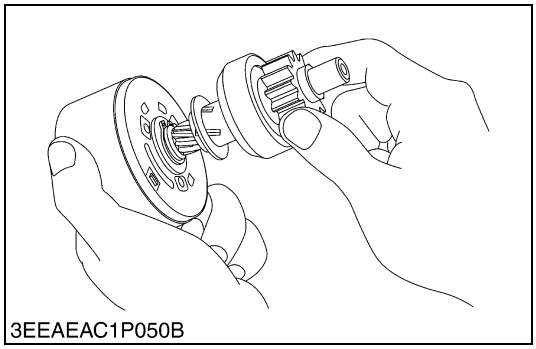
(8) Starter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Overrunning Clutch

1. Check the pinion for wear or damage.
2. If there is any problem, replace the overrunning clutch assembly.
3. Check that the pinion turns freely and smoothly in the direction that it overruns. (Check the overrunning function.)
4. If there is any problem, replace the overrunning clutch assembly.

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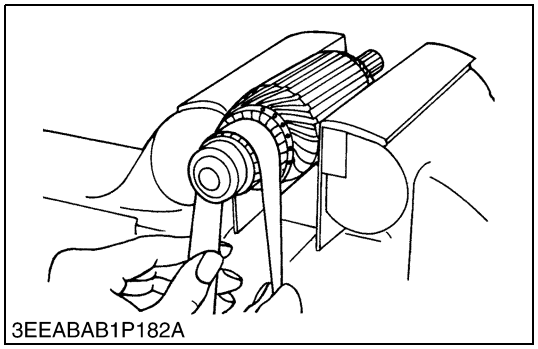
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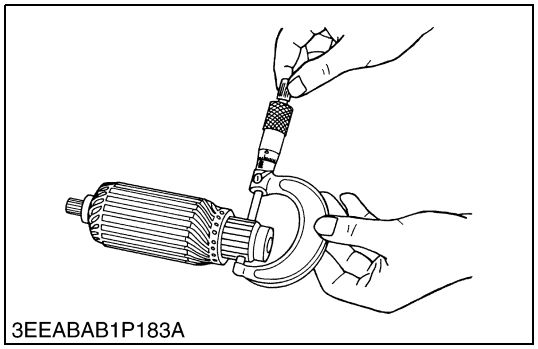
Commutator and Mica

1. Check the contact of the commutator for wear.
2. Grind the commutator with emery paper (#300) if it is lightly worn.
3. Measure the commutator O.D. with an outside micrometer at several points.
4. If the minimum O.D. is less than the allowable limit, replace the armature assembly.
5. If the difference of the O.D.'s exceeds the allowable limit, correct the commutator on a lathe to the factory specification.
6. Measure the mica undercut.
7. If the undercut is less than the allowable limit, correct it with a saw blade. Chamfer the segment edges.

Commutator O.D.	Factory specification	32.0 mm 1.26 in.
	Allowable limit	31.4 mm 1.24 in.
Mica under cut	Factory specification	0.50 mm 0.020 in.
	Allowable limit	0.20 mm 0.0079 in.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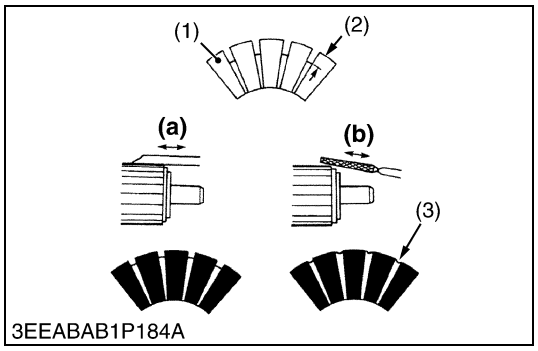

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(1) Segment
(2) Depth of Mica
(3) Mica

(a) Good
(b) Bad

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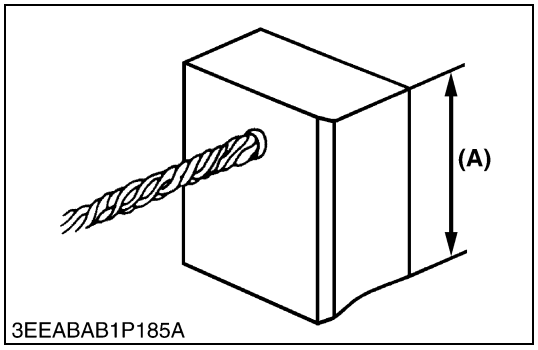

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Brush Wear

1. Measure the brush length **(A)** with a vernier caliper.
2. If the length is less than the allowable limit, replace the yoke assembly and brush holder assembly.
3. After you replace the brush, put an emery paper (#300 or above) on the commutator and correct the contact position.

Brush length **(A)**	Factory specification	18.0 mm 0.709 in.
	Allowable limit	11.0 mm 0.433 in.

(A) Brush Length

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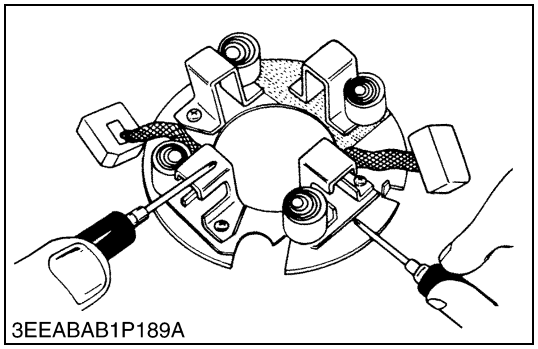
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Brush Holder

1. Check the continuity across the brush holder and the holder support with a circuit tester.
2. If electricity flows, replace the brush holder assembly.

Resistance between brush holder and holder support	Factory specification	Infinity

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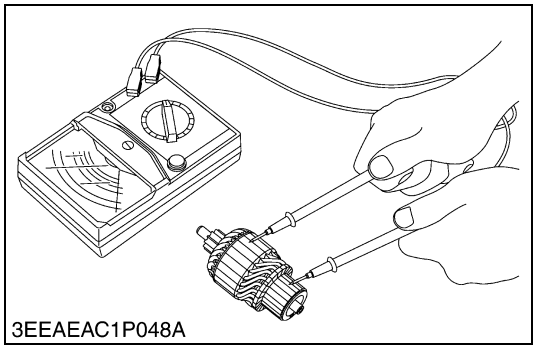
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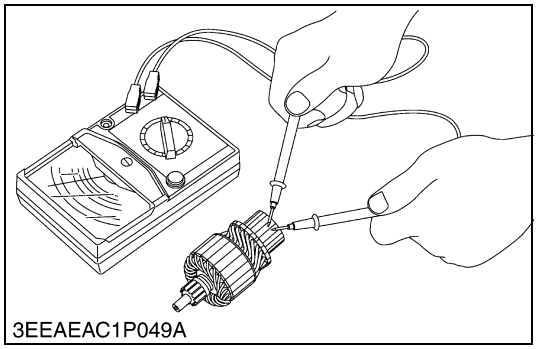
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Armature Coil

1. Check the continuity across the commutator and armature coil core with the resistance range of circuit tester.
2. Check the continuity across the segments of the commutator with the resistance range of circuit tester.
3. If electricity is out of factory specification, replace the armature assembly.

Resistance between commutator and armature coil core	Factory specification	Infinity
Resistance between commutator and segment	Factory specification	0 Ω

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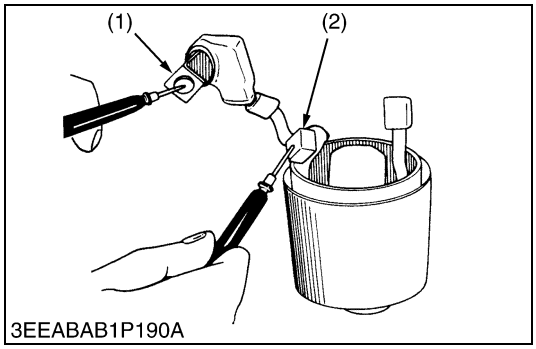

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Field Coil

1. Check the continuity across the lead (1) and brush (2) with a circuit tester.
2. Check the continuity across the brush (2) and yoke (3) with a circuit tester.
3. If electricity is out of factory specification, replace the yoke assembly.

Resistance between lead and brush	Factory specification	0 Ω
Resistance between brush and yoke		Infinity

(1) Lead
(2) Brush
(3) Yoke

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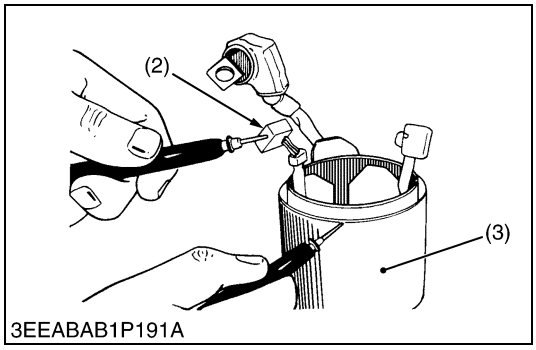

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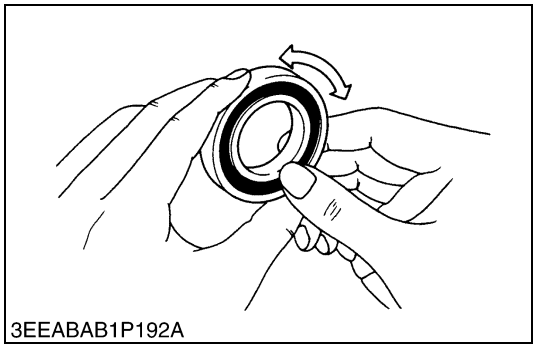
(9) Alternator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Bearing

1. Check that the bearing can turn smoothly.
2. If not, replace it.

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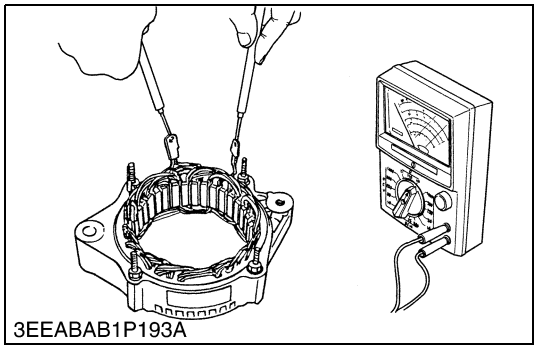
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Stator

1. Measure the resistance across each lead of the stator coil with the resistance range of circuit tester.
2. If the measurement is not in the factory specification, replace the stator assembly.
3. Check the continuity across each stator coil lead and core with the resistance range of circuit tester.
4. If it does not show infinity, replace the stator assembly.

Resistance	Factory specification	Less than 1.0 Ω

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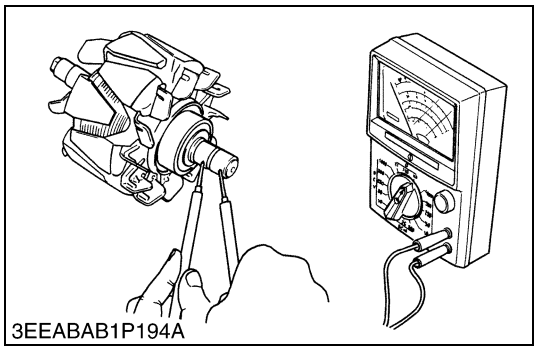
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Rotor

1. Measure the resistance across the slip rings.
2. Check the continuity across the slip ring and core with the resistance range of circuit tester.
3. If electricity is out of factory specification, replace the rotor.

Resistance between slip rings	Factory specification	2.8 to 3.3 Ω
Resistance between slip ring and rotor core		Infinity

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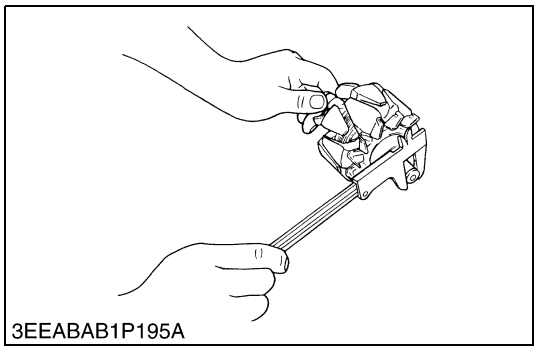
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Slip Ring

1. Check the slip ring for dirt or scratch.
2. If dirt is detected, clean the slip ring using a cloth soaked in alcohol.
3. If there is slight score, correct with an emery paper (#500 to 600).
4. Measure the O.D. of the slip ring with a vernier calipers.
5. If the measurement is less than the allowable limit, replace the rotor assembly.

Slip ring O.D.	Factory specification	22.7 mm 0.894 in.
	Allowable limit	22.1 mm 0.870 in.

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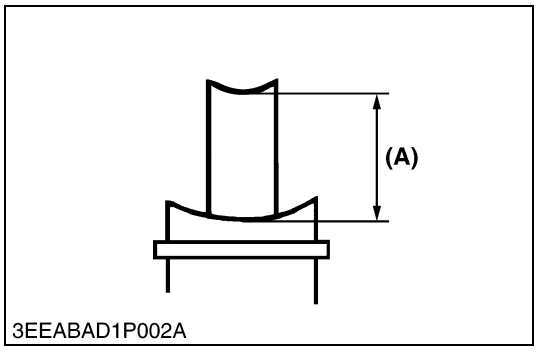

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Brush Wear

1. Measure the brush length **(A)** with vernier calipers.
2. If the measurement is less than the allowable limit, replace it.
3. Make sure that the brush moves smoothly.
4. If the brush is damaged, replace it.

Brush length **(A)**	Factory specification	18.5 mm 0.728 in.
	Allowable limit	5.0 mm 0.20 in.

(A) Brush Length

9Y1210674ENS0110US0

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