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 attempt 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, may 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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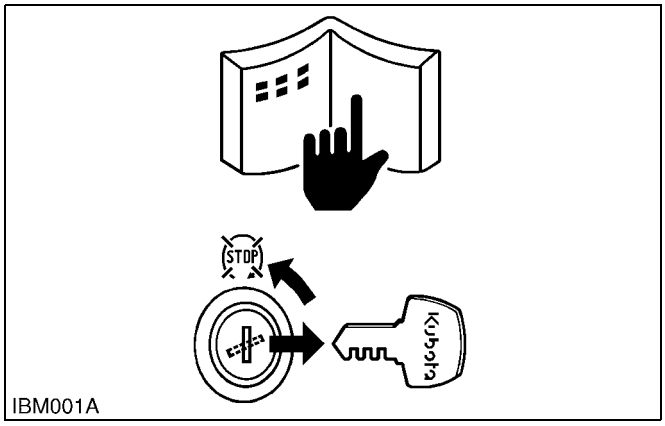

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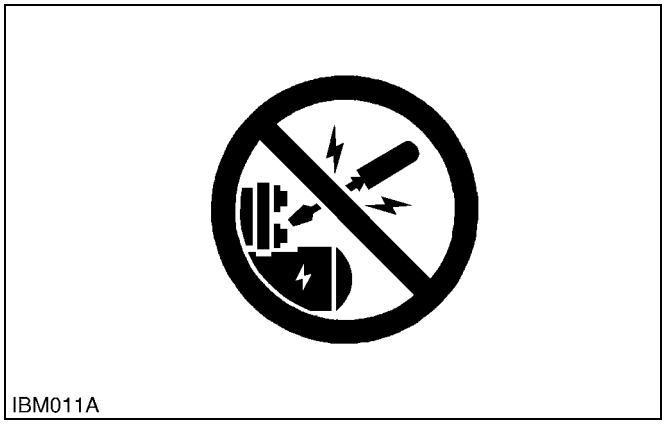
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BEFORE YOU START SERVICE

- 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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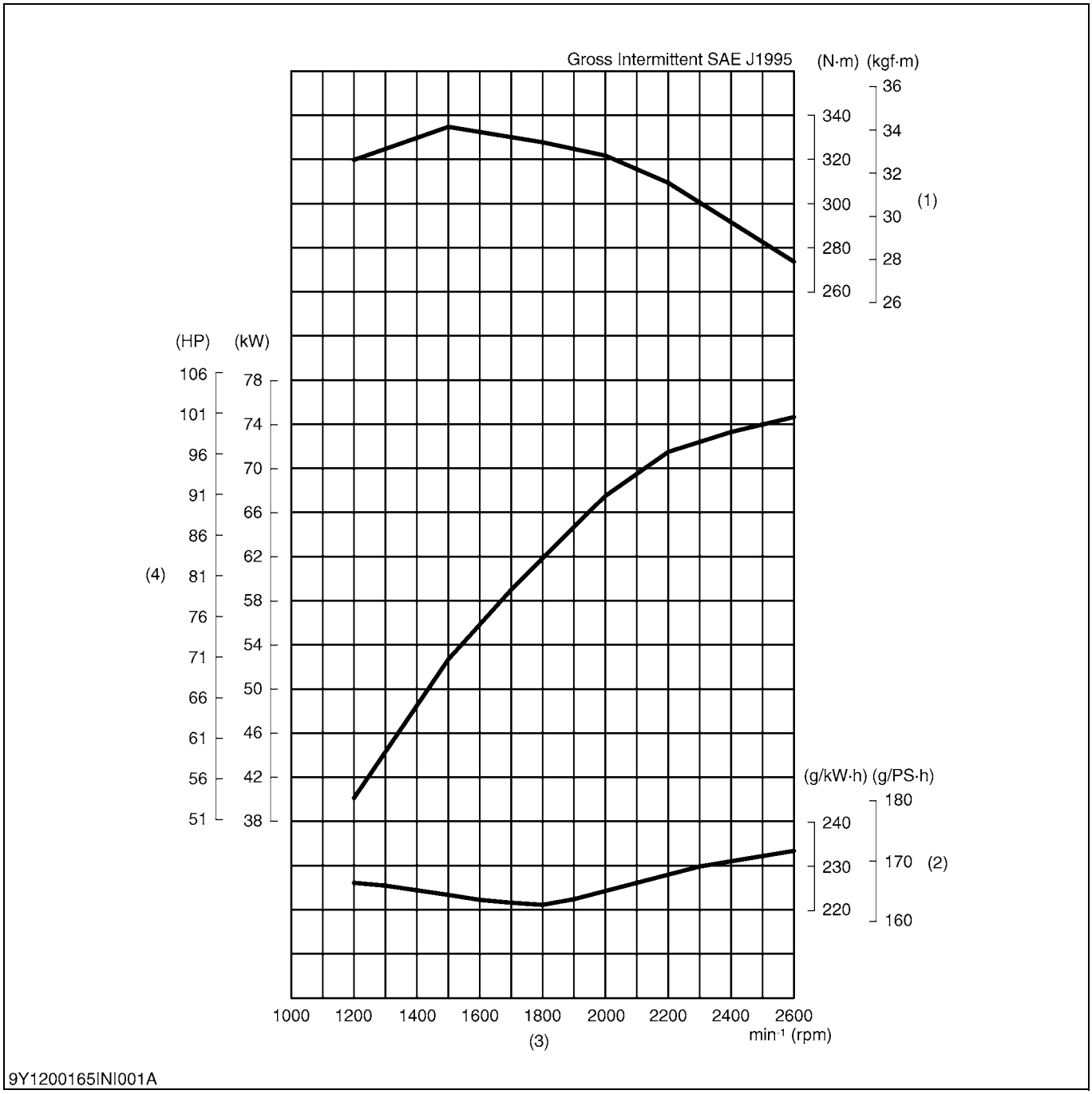
3. PREFORMANCE CURVES

V3800-CR-TE4, V3800-CR-TE4C

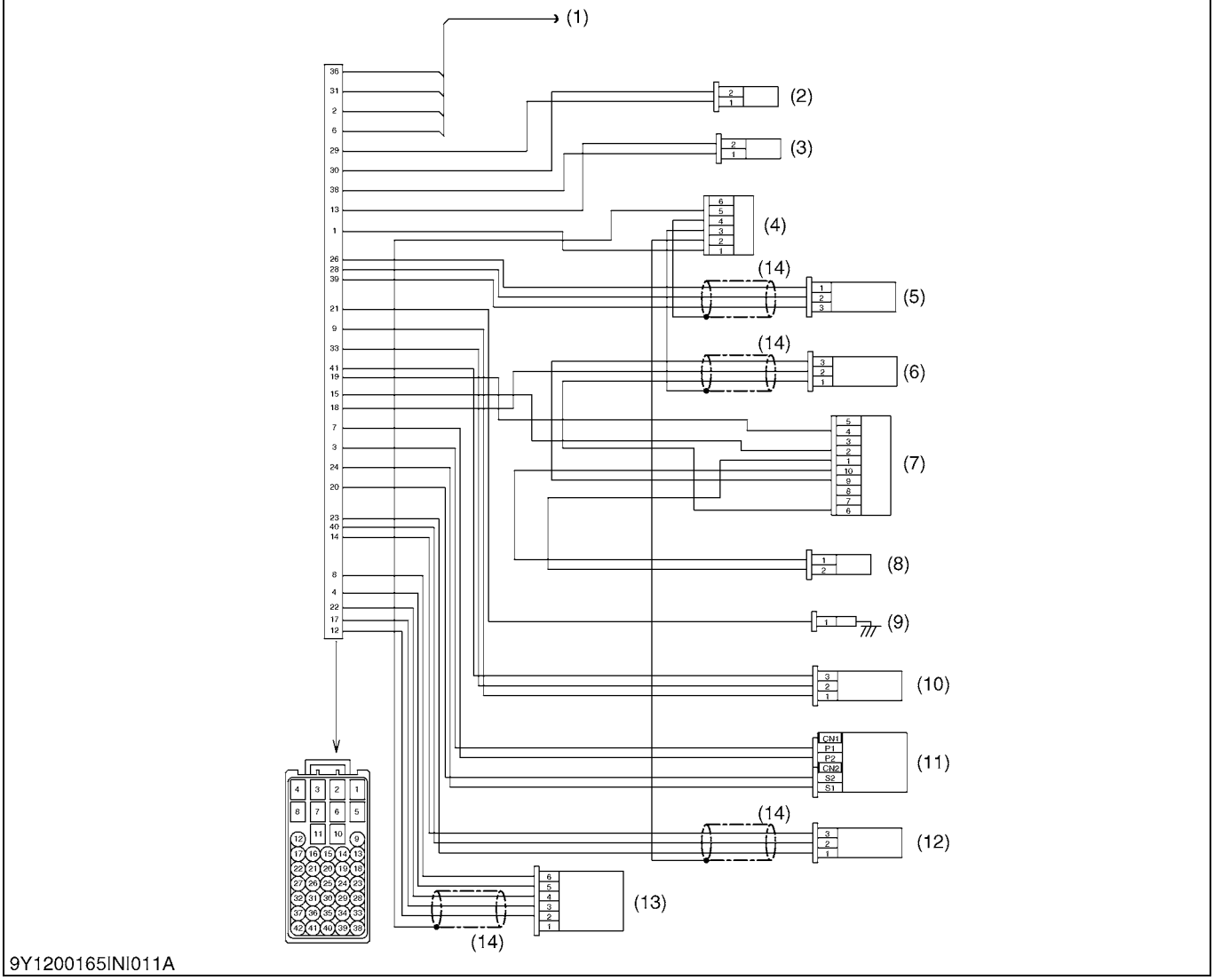


(1) Torque
(2) B.S.F.C. (Brake Specific Fuel Comsumption)
(3) Engine Speed
(4) Brake Horsepower

9Y1210651INI0002US0

5. WIRING DIAGRAM

[1] ENGINE INTERMEDIATE HARNESS (ENGINE SIDE HARNESS)



(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)	CN211	Camshaft Position Sensor
(13)	CN212	Intake Throttle Valve
(14)	–	Shield Cable

■ **NOTE**

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

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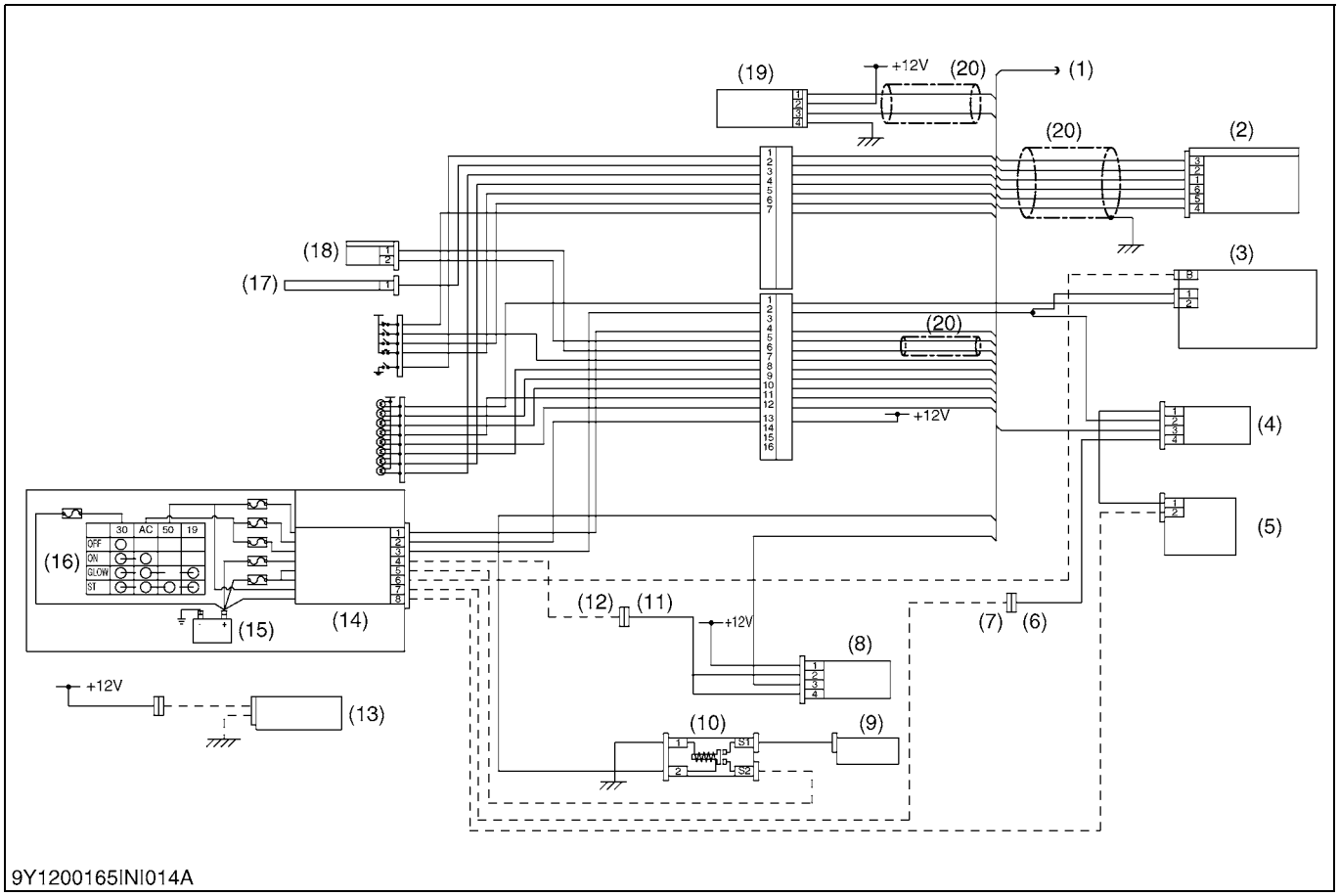

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(1)	–	Power Unit
(2)	CN401	Accel Sensor
(3)	CN402	Alternator
(4)	CN403	Starter Relay
(5)	CN404	Starter
(6)	CN405	Connector
(7)	CN406	Connector
(8)	CN413	Main Relay
(9)	–	Intake Air Heater
(10)	CN416	Intake Air Heater Relay
(11)	CN414	Connector
(12)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

■ **NOTE**

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

9Y1210651INI0009US0

2. MUFFLER FULL ASSEMBLY IDENTIFICATION

[1] PART NUMBER AND SERIAL NUMBER

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

The DPF mullfer full assembly serial number is an identified number for the DPF muffler full assembly.

It shows the month and year of manufacture as below.

(1) DPF Muffler Full Assembly Part Number and Serial Number

Year of manufacture

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		

Month of manufacture

Month	DPF Muffler Full Assembly Lot Number	
January	A0001 ~ A9999	B0001 ~ BZ999
February	C0001 ~ C9999	D0001 ~ DZ999
March	E0001 ~ E9999	F0001 ~ FZ999
April	G0001 ~ G9999	H0001 ~ HZ999
May	J0001 ~ J9999	K0001 ~ KZ999
June	L0001 ~ L9999	M0001 ~ MZ999
July	N0001 ~ N9999	P0001 ~ PZ999
August	Q0001 ~ Q9999	R0001 ~ RZ999
September	S0001 ~ S9999	T0001 ~ TZ999
October	U0001 ~ U9999	V0001 ~ VZ999
November	W0001 ~ W9999	X0001 ~ XZ999
December	Y0001 ~ Y9999	Z0001 ~ ZZ999

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

(a)(b) (c)
e.g. B L 0019

(a) Year: B indicates 2011
(b) Month: L or M indicates June
(c) Lot Number: (**0001 ~ 9999** or **A001 ~ Z999**)

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(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 Biodeisel 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 run 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 maintain 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, fuel hose and clamp bands with new ones 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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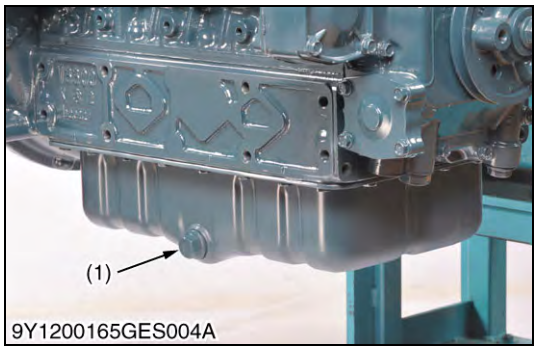
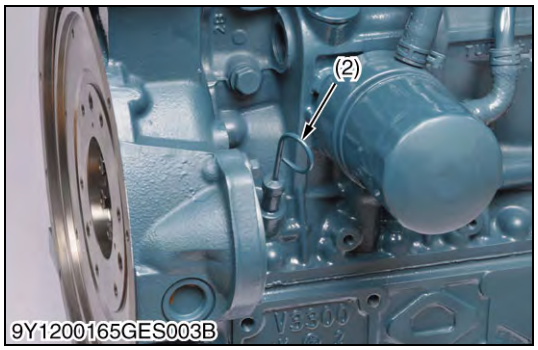
[2] INITIAL 50 HOURS





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	13.2 L 3.49 U.S.gals

(1) Drain Plug (2) Dipstick

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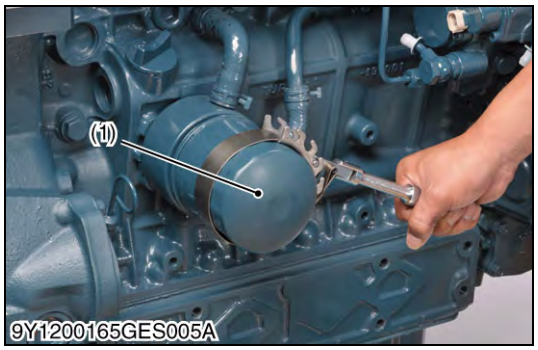

Replacement of Oil Filter Cartridge

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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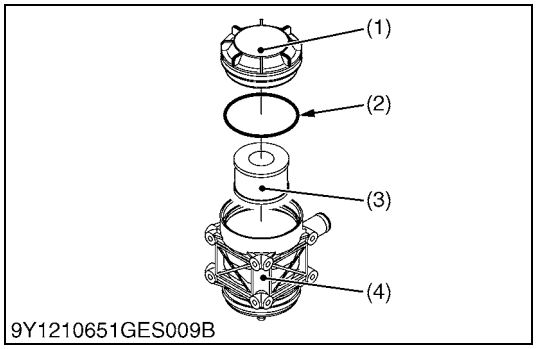

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Check of PCV (Positive Crankcase Ventilation) Valve

1. Remove the cover (1) and element (3).
2. Press on the PCV valve and check that it moves smoothly.
3. If it does not move smoothly, replace the oil separator.

(1) Cover
(2) O-ring
(3) Element
(4) Body

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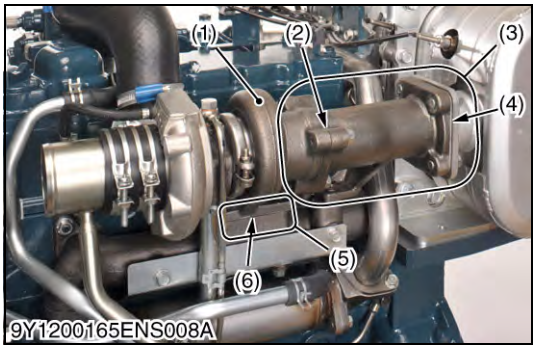
[8] EVERY 3000 HOURS



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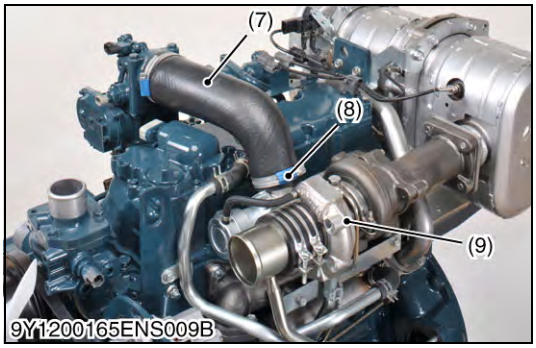

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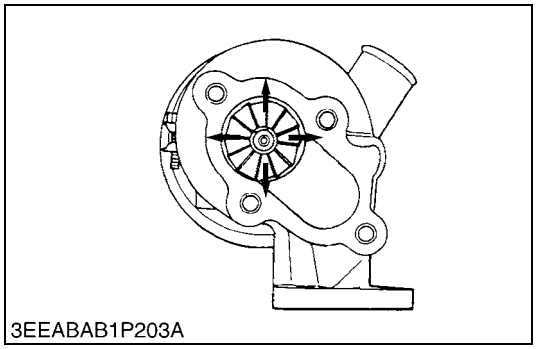
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Check of Turbocharger

(Turbine Side)

1. Examine 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. Examine 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 examine 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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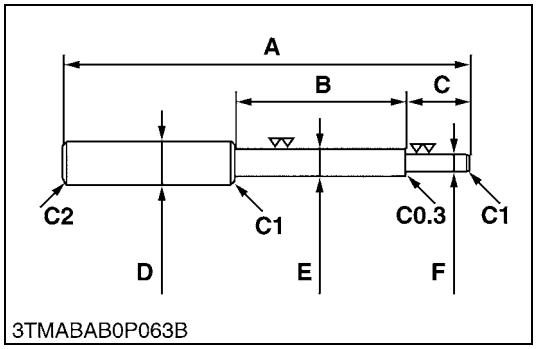

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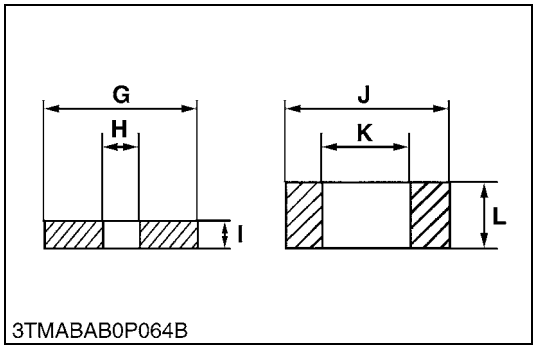

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Valve Guide Replacing Tool

Application

- To press out and press fit the valve guide.

■ **NOTE**

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

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 mm (0.2 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	7.90 to 8.10 mm (0.311 to 0.318 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C2	Chamfer 2.0 mm (0.079 in.)
C0.3	Chamfer 0.3 mm (0.01 in.)

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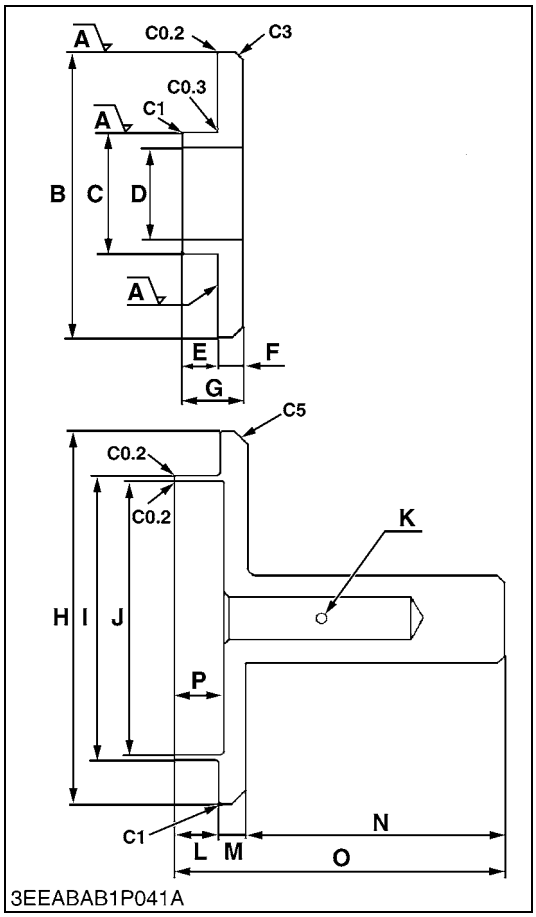

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Crankshaft Sleeve Press Fit Tool

Application

- To press fit the crankshaft sleeve.

■ **NOTE**

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

A	Rmax = 12.5 S
B	94.5 to 95.0 mm dia. (3.72 to 3.74 in. dia.)
C	40 mm dia. (1.6 in. dia.)
D	30 mm dia. (1.2 in. dia.)
E	12 mm (0.47 in.)
F	7.90 to 8.10 mm (0.311 to 0.318 in.)
G	20 mm (0.79 in.)
H	130 mm dia. (5.12 in. dia.)
I	99.40 to 99.60 mm dia. (3.914 to 3.921 in. dia.)
J	95.05 to 95.20 mm dia. (3.743 to 3.748 in. dia.)
K	3 mm dia. (0.1 in. dia.)
L	15 mm (0.59 in.)
M	10 mm (0.39 in.)
N	90 mm (3.5 in.)
O	115 mm (4.53 in.)
P	16.9 to 17.1 mm (0.666 to 0.673 in.)
C1	Chamfer 1.0 mm (0.039 in.)
C3	Chamfer 3.0 mm (0.12 in.)
C5	Chamfer 5.0 mm (0.20 in.)
C0.2	Chamfer 0.2 mm (0.008 in.)
C0.3	Chamfer 0.3 mm (0.01 in.)

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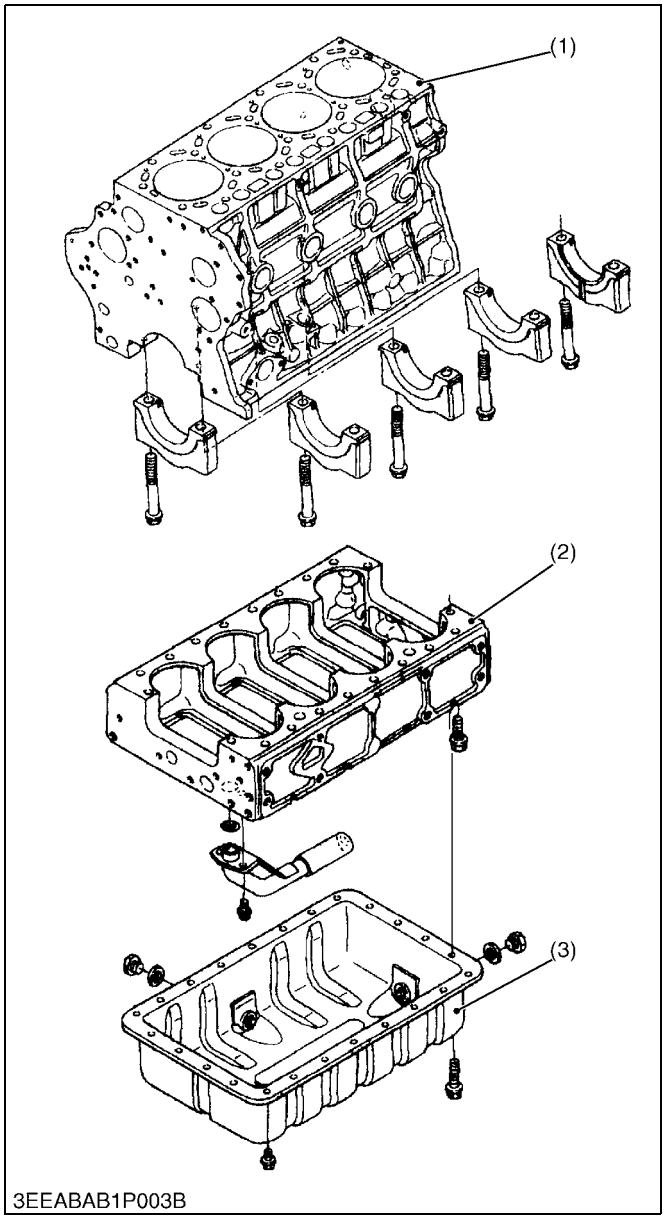
1. ENGINE

[1] CYLINDER BLOCK



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The engine utilizes a split crankcase to produce greater durability and operate more quietly; the crankcase is split into two parts, crankcase 1 (1), which houses the parts for combustion and crankcase 2 (2), which completes crankcase 1 and produces low-noise.

It uses a hanger type of crankshaft support which allows for easy dis/assembly and the lining of the cylinder is a linerless type, which offers good cooling performance and excellent resistance to wear as it is little affected by distortion.

(1) Crankcase 1
(2) Crankcase 2
(3) Oil Pan

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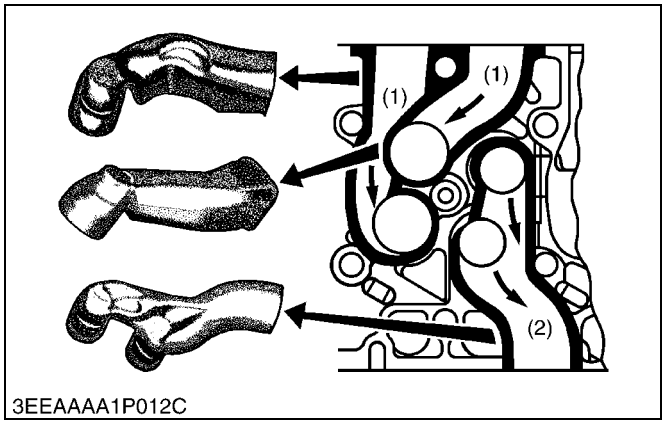
[2] CYLINDER HEAD



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We have improved the helical shaped 2-valve, 2-stage ports in order to generate an ideal swirl and intake air inertia at the intake port and to gain a greater amount of air for the air/fuel mixture.

(1) Intake Port
(2) Exhaust Port

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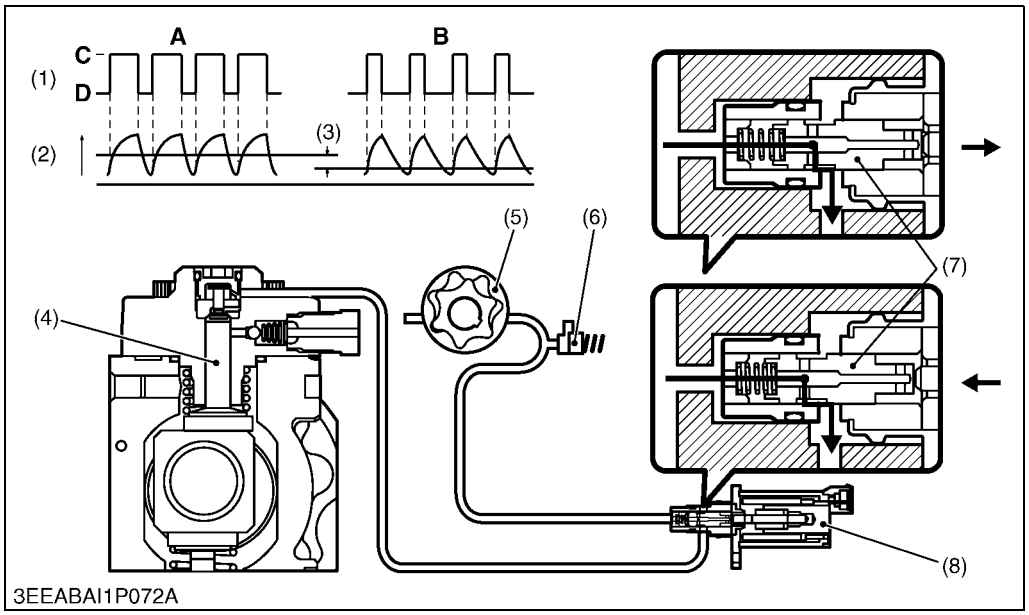
SCV (suction control valve)



(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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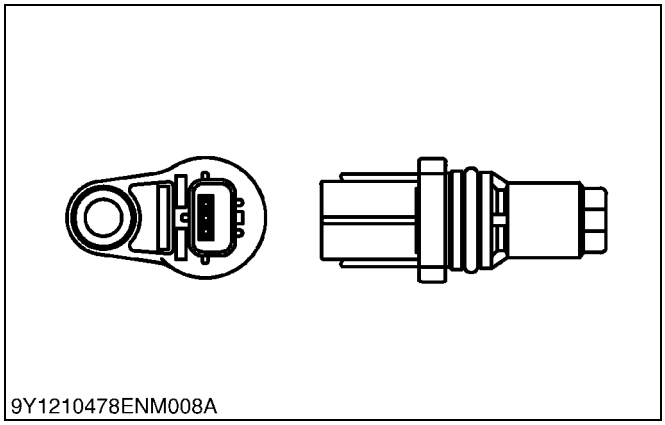
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Camshaft Position Sensor

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

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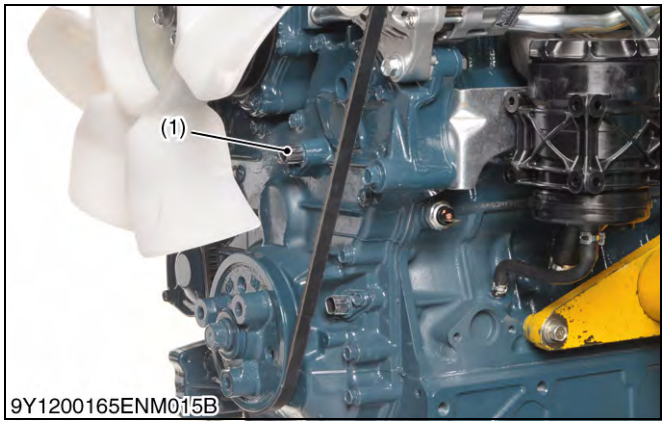

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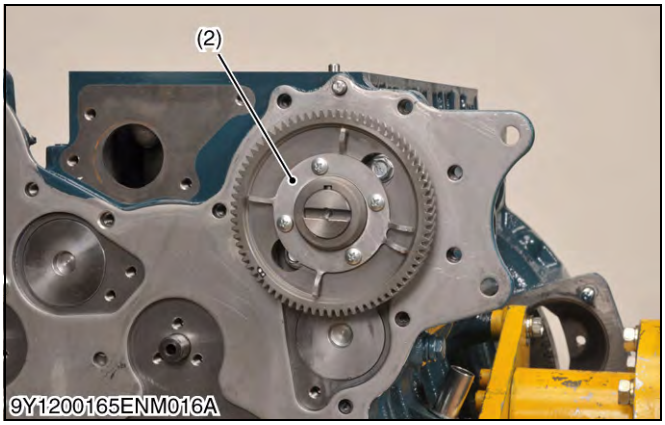

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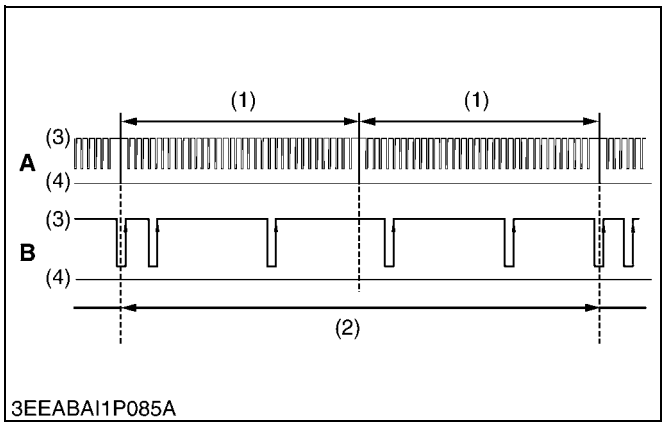

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This figure shows the pulse chart of the crankshaft position sensor output signal and camshaft position sensor output signal.

The camshaft pulsar gear rotates once when the crankshaft pulsar gear rotates twice (12.56 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 (12.56 rad (720 °) crank angle)
(3) 5 V
(4) 0 V

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

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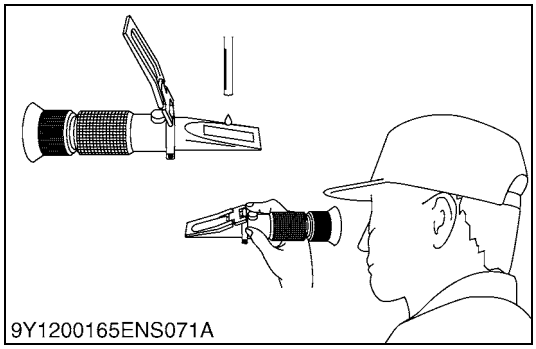
Symptom	Probable Cause	Solution	Reference Page
The engine revolution is not smooth	The fuel filter is clogged	Replace	G-16
	The air cleaner is clogged	Clean or replace the air cleaner element	G-14
	Fuel leakage because of loose injection pipe retaining nut	Tighten the retaining nut	1-S30
	The supply pump is defective	Replace	1-S40
	The injector is defective	Replace	1-S34
	The turbocharger bearing is worn out	Replace the turbocharger assembly	1-S29
	The turbocharger shaft is bent	Replace the turbocharger assembly	1-S29
	The turbocharger fin or other part has a damage because of unwanted materials	Replace the turbocharger assembly	1-S29
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-S67, 1-S71
There is oil leakage into the exhaust pipe or suction pipe	The oil pipe is clogged or has a damage	Examine, replace or clean the oil pipe	–
	The piston ring seal of the turbocharger is defective	Replace the turbocharger assembly	1-S29
The exhaust gas is black or dark gray	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-16
	The air cleaner is clogged	Clean or replace the element	G-14
	The injector is defective	Replace	1-S34
The output is deficient	The moving parts of engine have a seizure	Repair or replace	–
	The supply pump is defective	Replace	1-S40
	The injector is defective	Replace	1-S34
	There is compression leakage	Examine the compression pressure and repair	1-S13
	There is a gas leakage from the exhaust system	Repair or replace	1-S20, 1-S29
	The air cleaner is clogged	Clean or replace the element	G-14
	There is an air leakage from the compressor discharge side	Replace the turbocharger assembly	1-S29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Battery Specific Gravity

1. Measure the specific gravity of the electrolyte in each cell with a battery and coolant tester.
2. If the electrolyte temperature is different from the one that the battery and coolant tester calibrated, correct the specific gravity measurement. Use the formula below in **(Reference)**.
3. If the specific gravity is less than 1.215 (after it is corrected for temperature), charge or replace the battery.
4. If the specific gravity is different between 2 cells by more than 0.05, replace the battery.

(Reference)

- The specific gravity changes with temperature.
  To be accurate, the specific gravity
  decreases by 0.0007 when temperature increases by 1 °C (decreases by 0.0004 when temperature increases by 1 °F),
  increases by 0.0007 when temperature decreases by 1 °C (increases by 0.0004 when temperature decreases by 1 °F).
  Thus, if you refer to 20 °C (68 °F), correct the specific gravity reading by the formula below:
  – Specific gravity at 20 °C = Measured value + 0.0007 × (electrolyte temperature −20 °C)
  – Specific gravity at 68 °F = Measured value + 0.0004 × (electrolyte temperature −68 °F)

Specific Gravity	State of Charge
1.260 Sp. Gr.	100 % Charged
1.230 Sp. Gr.	75 % Charged
1.200 Sp. Gr.	50 % Charged
1.170 Sp. Gr.	25 % Charged
1.140 Sp. Gr.	Very Little Useful Capacity
1.110 Sp. Gr.	Discharged

At an electrolyte temperature of 20 °C (68 °F)

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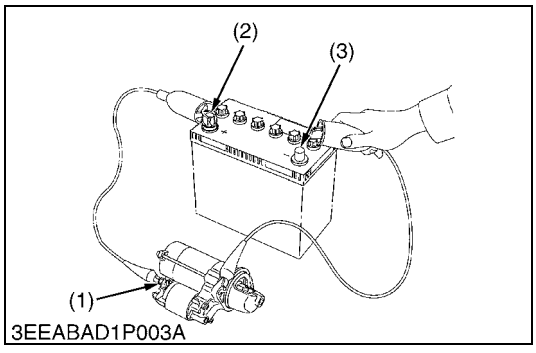

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Motor Test

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 defective.
   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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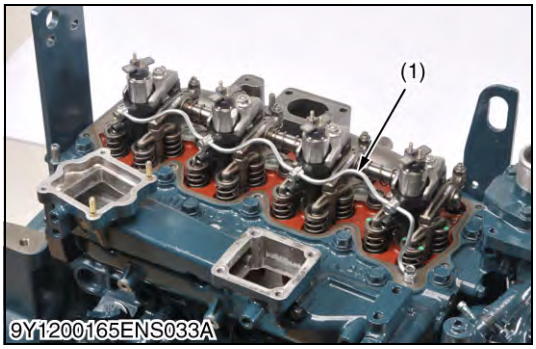

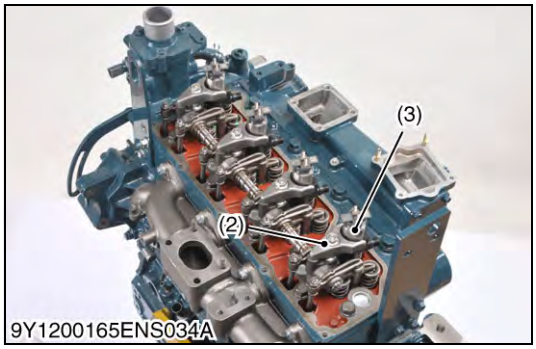

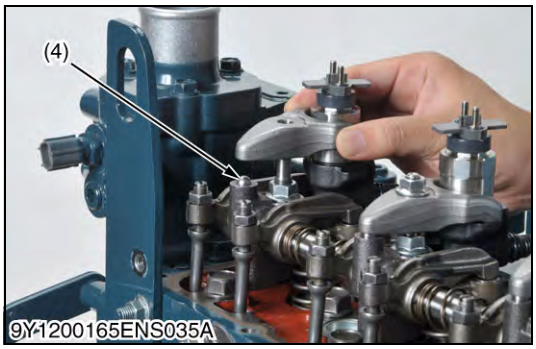

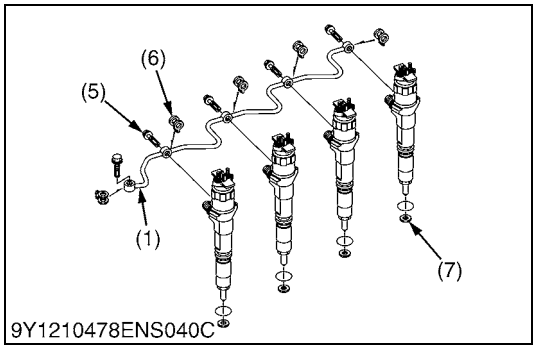

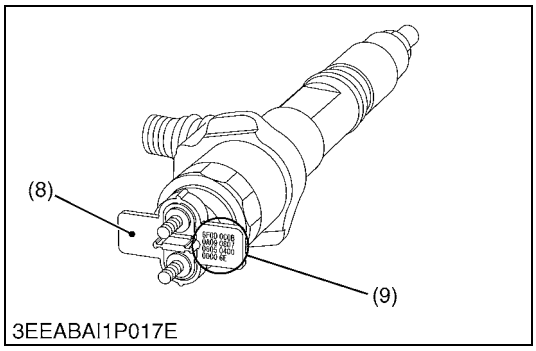

Overflow Pipe and Injectors

1. Remove the overflow pipe (1).
2. Remove the injector clamp (2).
3. Remove the injector (3) and its gasket (7).

■ **IMPORTANT**

- **Do not disassemble the injector (3).**
- **Do not remove the injector QR code tag (8).**
- **Do not damage the injector QR code tag (8).**
- **Do not lose the ball (4) of the rocker arm bracket.**
- **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 (9) to the ECU).**
- **Store the injectors so they do not get any dust in them.**

(When reassembling)

- Replace the injectors' gaskets (7) with new ones.
- When installing injector clamps (2), check and make sure the ball (4) is in the rocker arm bracket.
- When attaching the overflow pipe (1) to the injector, replace the gasket (6) with a new one.
- Install the overflow pipe joint screw (5).
- Tighten the injector clamp nuts securely to their specified torques.
- Tighten the overflow pipe joint screws (5) 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 (6).
- In case there is fuel leakage, replace the gasket (6), then check the fuel leakage again.

■ **NOTE**

- **If you replace the injectors, it is necessary to perform injector correction (writing the injector ID codes (9) 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 Clamp
(3) Injector
(4) Ball
(5) Overflow Pipe Joint Screw
(6) Gasket
(7) Gasket
(8) Injector QR Code Tag
(9) Injector ID Code

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