WSM

WORKSHOP MANUAL

DIESEL ENGINE

V2607-CR-E5,V2607-CR-TE5, V2607-CR-TIE5,V3307-CR-TE5, V3307-CR-TIE5

Kubota

KiSC issued 08, 2019 A

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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.**

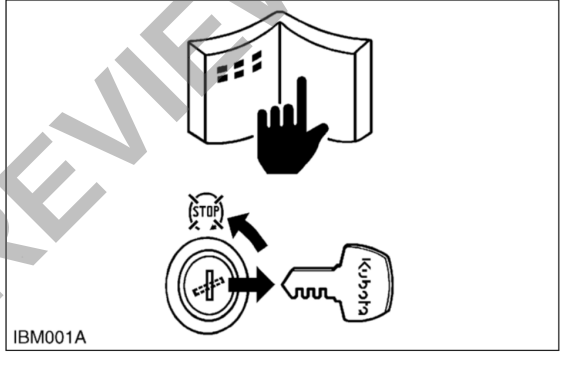
WARNING
- **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

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.**

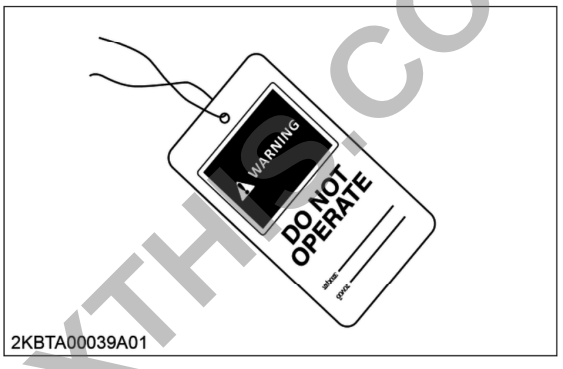
NOTE
- **Gives helpful information.**

1. Working precautions



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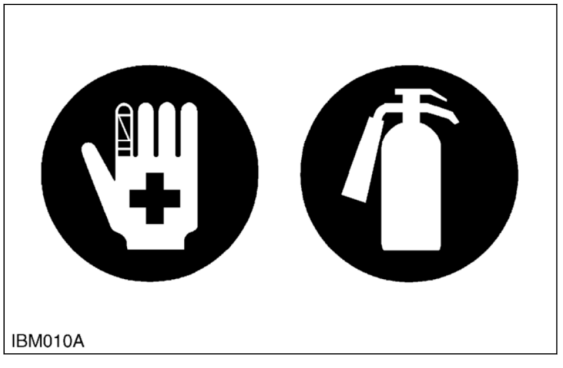
- Understand all safety instructions and safety labels in this manual.
- Park the machine on a stable and level ground then lower the attachment to check the machine safely.
- Stop the engine and remove the key when leaving the operator's seat for cleaning, maintenance, and servicing.



2KBTA00039A01

- Hang a DO NOT OPERATE tag near the operator's seat.
- Do not use worn or cracked tools. Use tools in a proper way with enough strength.
- In regards to the facility which is used in the workshop, follow each safety instruction.

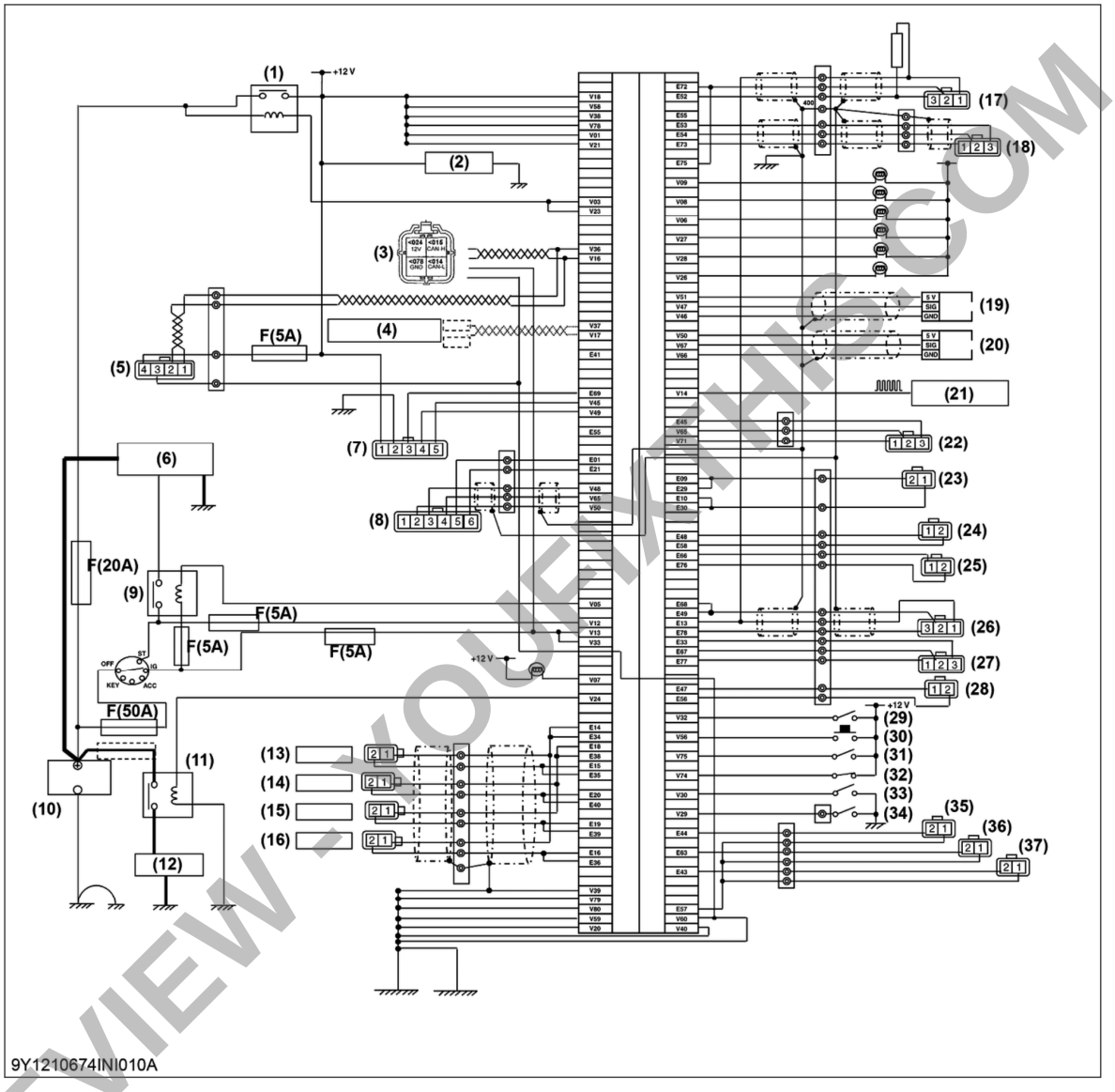
2. Preparing for emergencies


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

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4.4 System wiring diagram



(1)	Main relay	(14)	Injector 2	(27)	Boost pressure sensor
(2)	Fuel feed pump	(15)	Injector 3	(28)	Intake air temperature sensor
(3)	CAN 1 connector (for service)	(16)	Injector 4	(29)	Stop switch
(4)	CAN 2 connector (for OEM machine)	(17)	Crankshaft position sensor	(30)	Parked regeneration switch
(5)	EGR valve	(18)	Camshaft position sensor	(31)	Parking switch
(6)	Starter	(19)	Accel sensor 1	(32)	Regeneration inhibit switch

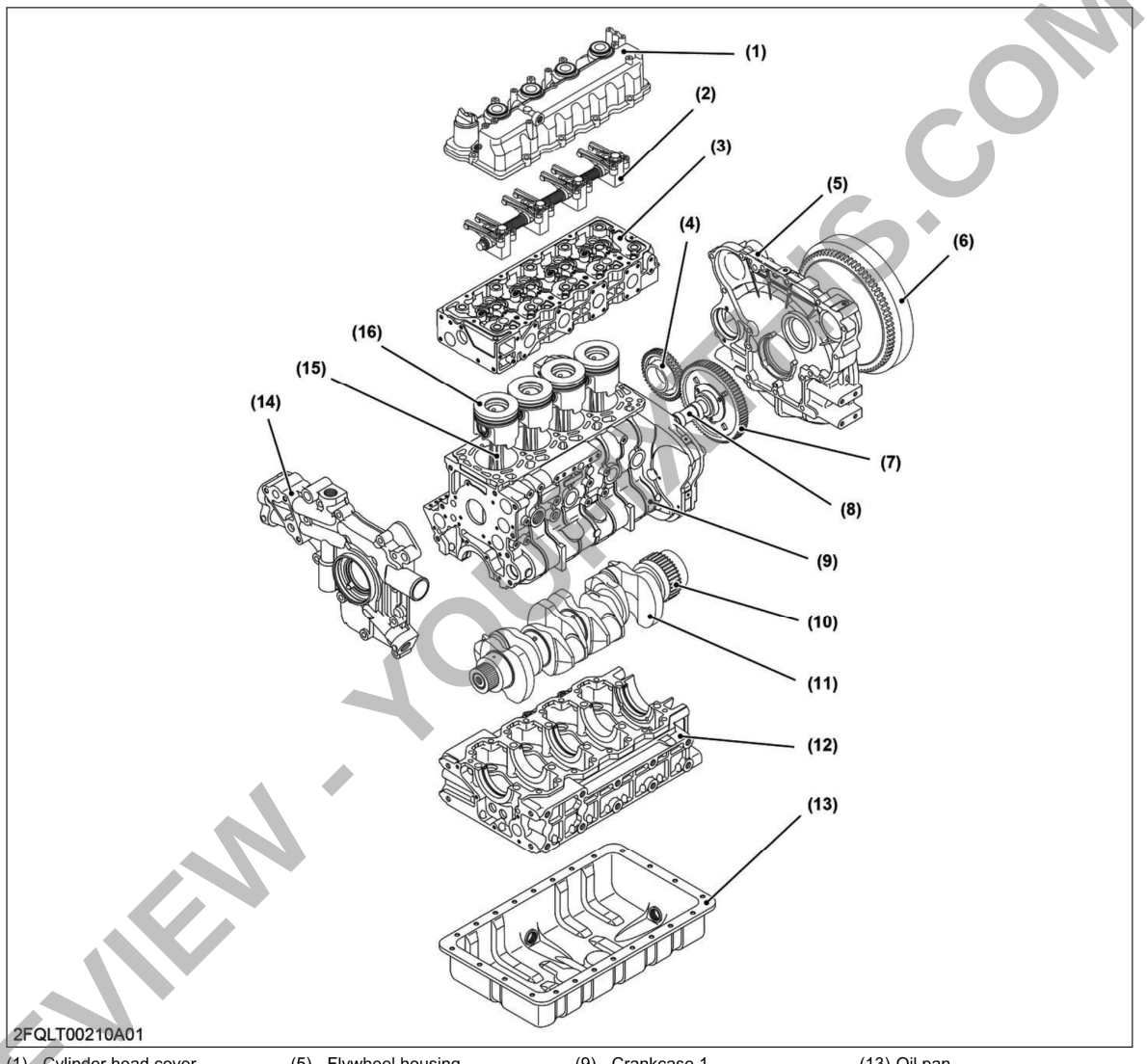
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2. Engine body

2.1 Structure of engine body

The engine body is the main part of the engine.



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(1) Cylinder head cover
(2) Rocker arm
(3) Cylinder head
(4) Idle gear
(5) Flywheel housing
(6) Flywheel
(7) Cam gear
(8) Camshaft
(9) Crankcase 1
(10) Crank gear
(11) Crankshaft
(12) Crankcase 2
(13) Oil pan
(14) Front cover
(15) Connecting rod
(16) Piston

It is made up of cylinder related, primary motion, and valve train mechanisms.

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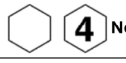
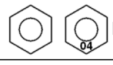
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3. Tightening torques

Refer to the following table if the tightening torques of screws, bolts and nuts are not specified in each part.

3.1 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	7.8 to 9.3	0.80 to 0.94	5.8 to 6.8	9.80 to 11.3	1.00 to 1.15	7.23 to 8.33
M8	17.7 to 20.6	1.81 to 2.10	13.1 to 15.1	23.5 to 27.5	2.40 to 2.80	17.4 to 20.2
M10	39.2 to 45.1	4.00 to 4.59	29.0 to 33.2	49.0 to 55.9	5.00 to 5.70	36.2 to 41.2
M12	62.8 to 72.6	6.41 to 7.40	46.4 to 53.5	77.5 to 90.2	7.91 to 9.19	57.2 to 66.5

3.2 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.**

Disassembling and assembling

Item	Dimension × Pitch	N·m	kgf·m	lbf·ft
Drain plug	M22 × 1.5	44.1 to 53.9	4.50 to 5.49	32.6 to 39.7
Alternator pulley nut **[V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5]**	M14	58.4 to 78.9	5.96 to 8.04	43.1 to 58.1
Alternator pulley nut **[V3307-CR-TE5, V3307-CR-TIE5]**	M17	98.0 to 137	10.0 to 13.9	72.3 to 101
*Crankcase 2 mounting screw **[V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5]**	M13 × 1.25	127.5 to 137.3	13.01 to 14.00	94.04 to 101.2
*Crankcase 2 mounting screw **[V3307-CR-TE5, V3307-CR-TIE5]**	M14 × 1.5	137.3 to 147.1	14.00 to 15.00	101.3 to 108.4
*Crankcase 2 flange screw **[V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5]**	M10 × 1.25	49.0 to 55.9	5.00 to 5.70	36.2 to 41.2
*Crankcase 2 flange screw **[V3307-CR-TE5, V3307-CR-TIE5]**	M10 × 1.25	58.8 to 63.7	6.00 to 6.49	43.4 to 46.9

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SERVICING

1. Troubleshooting

1.1 Troubleshooting for V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5, V3307-CR-TE5, V3307-CR-TIE5

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.

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	3-12
	The fuel pump is damaged	Replace	—
	The fuel hose is clogged	Replace	3-32
	The fuel filter is clogged	Replace	3-11
	The viscosity of fuel at low temperature is too high	Replace the specified fuel	2-13 2-14 3-1
	The cetane number of fuel is low	Replace the specified fuel	2-13 2-14 3-1
	Fuel leakage because of loose injection pipe retaining nut	Tighten the retaining nut	4-169
	The injector is clogged	Replace	4-224
	The supply pump is damaged	Replace	4-221
	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	4-131 4-163 4-111 4-112
	Incorrect valve timing	Check the timing gear	4-137 4-138 4-152 4-153
	Piston ring and cylinder are worn out	Replace	4-200 4-201 4-208 4-209

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INFORMATION

1. Specifications

1.1 Specification for V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5

Model	V2607-CR-E5	V2607-CR-TE5	V2607-CR-TIE5
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.)		
Total displacement	2615 cm^3 (159.6 cu.in.)		
SAE gross continuous	36.5 kW / 2700 min^{-1}(rpm) (48.9 HP / 2700 min^{-1}(rpm))	46.1 kW / 2700 min^{-1}(rpm) (61.8 HP / 2700 min^{-1}(rpm))	48.2 kW / 2700 min^{-1}(rpm) (64.6 HP / 2700 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 / 2700 min^{-1}(rpm) (74.3 HP / 2700 min^{-1}(rpm))
Maximum bare speed	2900 min^{-1}(rpm)		
Minimum bare idling speed	800 min^{-1}		
Combustion chamber	Reentrant type, Center direct injection system (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	
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		
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		
Charging alternator	12 V, 720 W		
Fuel	Diesel Fuel No. 2-D S15		
Lubricating oil	Class CJ-4 lubricating oil as per API classification is recommended. For details on recommended lubricating oils.		
Lubricating oil capacity	10.2 L (2.69 U.S.gals, 2.24 Imp.gals)		
Weight (Dry)	267 kg (589 lbs)	272 kg (600 lbs)	

■ NOTE

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

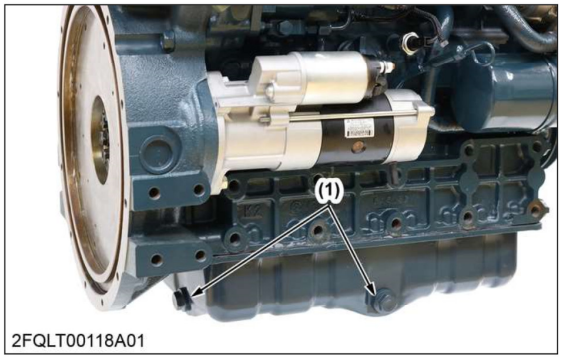
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5. Disassembling

5.1 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 engine oil.



(1) Drain plug

4. After you drain, tighten the drain plug (1) to the specified torque.

Tightening torque	Drain plug (1)	44.1 to 53.9 N·m 4.50 to 5.49 kgf·m 32.6 to 39.7 lbf·ft

5.2 Draining coolant

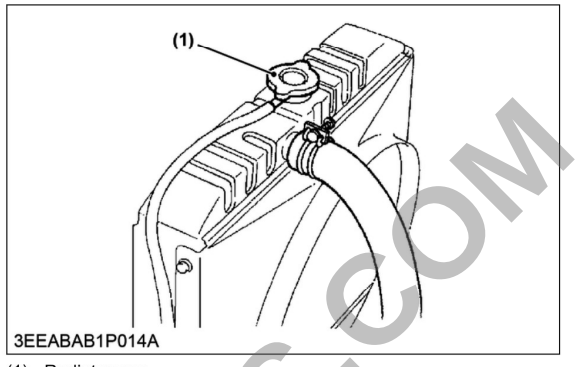
⚠ CAUTION

- **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.**

Tools required

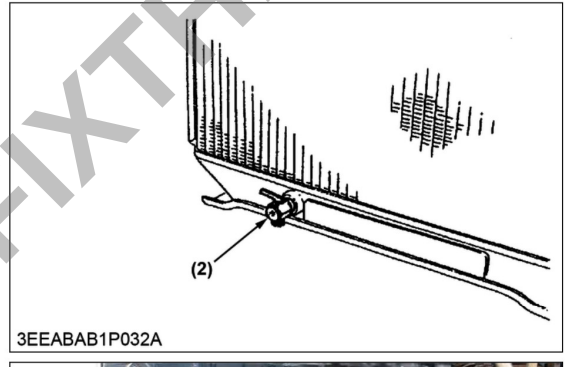
- Silicon gasket (Three Bond 2353)

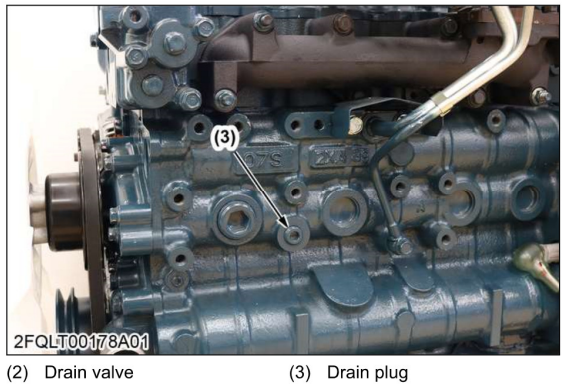
1. Prepare a bucket.
2. Remove the radiator cap (1) to drain the coolant fully.



(1) Radiator cap

3. Open the drain valve (2) and drain plug (3) to drain the coolant.





(2) Drain valve (3) Drain plug

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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											Reference page
		Daily	Initial 50 hrs	Every 50 hrs	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 1500 hrs	Every 3000 hrs	Every 3000 to 6000 hrs	Every 1 year	Every 2 years	
	Checking engine oil level	○											3-5
	Checking fuel level	○											3-5
	Checking coolant level	○											3-6
	Checking fan belt	○											3-7
	Changing engine oil		○			○							3-7
	Replacing oil filter cartridge		○			○							3-8
	Checking fuel hoses and clamp bands			○									3-8
	Checking radiator hose and clamp bands				○								3-8
*2	Cleaning air cleaner primary element				○								3-9
	Adjusting fan belt tension				○								3-9
	Checking intake air line				○								3-10
*1	Replacing fuel filter cartridge					○							3-11
	Replacing water separator filter (Type 2)					○					○		3-12
	Cleaning water jacket and radiator interior					○							3-12
	Replacing fan belt					○						○	3-14
	Checking valve clearance						○						3-15
*3	Checking injector (with Diagmaster)							○					3-16
*3	Checking EGR cooler							○					3-17
*3	Replacing oil separator element							○					3-17
*3	Checking the positive crankcase ventilation (PCV) valve							○					3-18
*3	Checking turbocharger								○				3-18
*3	Checking EGR system (with Diagmaster)								○				3-19
*3	Cleaning DPF									○			3-20 3-22
*3	Judging to reuse DPF filter comp before cleaning (only service dealer)									○			3-24
*3	Judging to reuse DPF filter comp after cleaning (only cleaning contractor)									○			3-24
*2	Replacing air cleaner element										○		3-25
	Checking DPF differential pressure pipes and hoses										○		3-26

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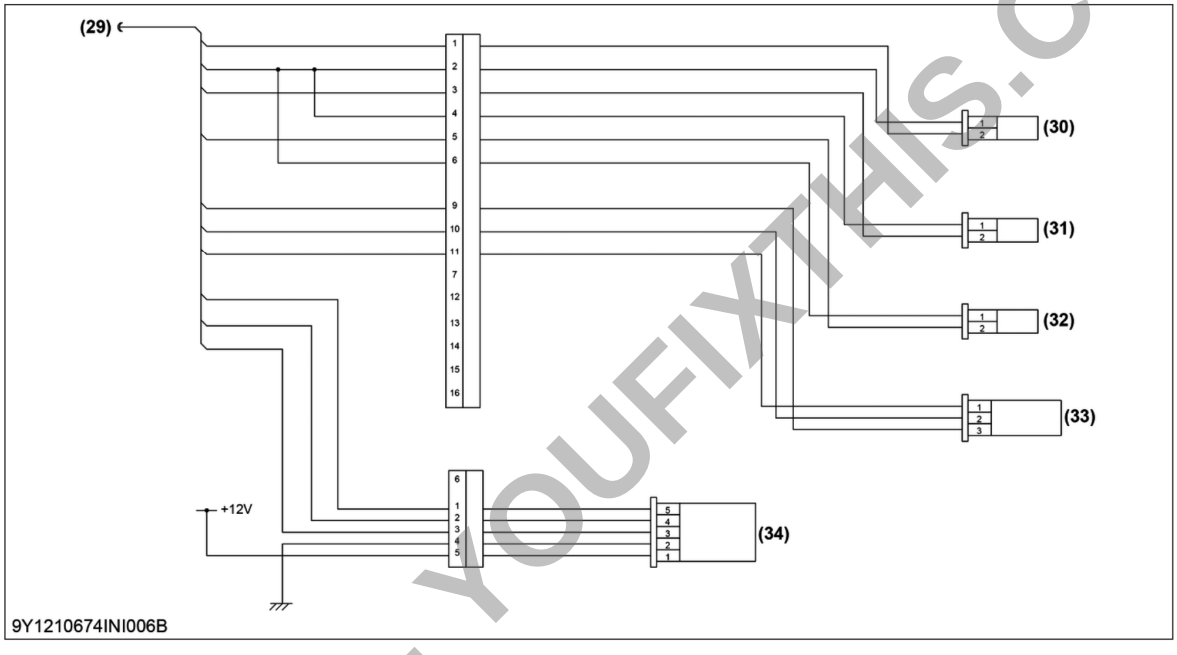
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(24)	—	Key switch
(25)	—	Speed sensor
(26)	—	CAN for vehicle
(27)	CN407 / 408	CAN 1 for service tool
(28)	—	Shield cable

■ NOTE

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



(29)	—	DPF
(30)	CN101	DPF exhaust gas temperature sensor (T_2)
(31)	CN102	DPF exhaust gas temperature sensor (T_1)
(32)	CN103	DPF exhaust gas temperature sensor (T_0)
(33)	CN104	DPF differential pressure sensor (ΔP)
(34)	CN105	Air flow sensor

■ NOTE

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

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7.65 Replacing DPF on page 4-229

9.2 Cleaning DPF (V2607-CR-TE5, V2607-CR-TIE5, V3307-CR-TE5, V3307-CR-TIE5)

■ 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 exhaust gas 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.
- **When you install the other catalyst (DOC) or filter comp (DPF), you have to check the part number because E5 model of them are similar to E4 model.**

Engine model	Part number	
	Catalyst (DOC)	Filter comp (DPF)
V2607-CR-TE5 V2607-CR-TIE5 V3307-CR-TE5 V3307-CR-TIE5	1J783-18151	1J783-18251

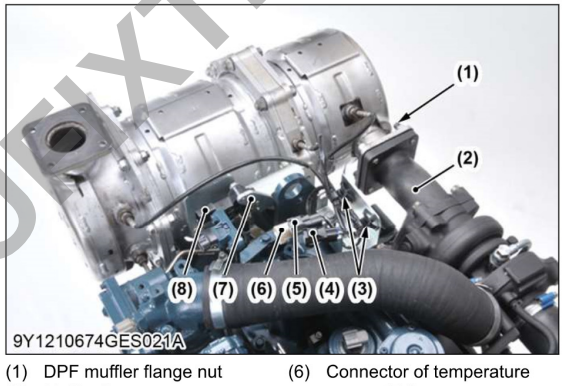
■ NOTE

- **Always work in the workshop equipped with a electric lift (including mobile lift).**
- **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, filter comp (DPF) part number, filter comp (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 engine ECU, check the operating time by connecting the service tool (Diagmaster).**
- **When installing and removing the muffler full assembly (DPF), make sure that the exhaust gas temperature sensor, differential pressure sensor, and differential pressure pipe do not make contact with surrounding parts.**

Tools required

- Crowfoot wrench

1. Disconnect the harness of exhaust gas temperature sensor from the connector (4), (5), (6) and the harness of differential pressure sensor (8).
2. Remove the connector of exhaust gas temperature sensor (4), (5), (6) from the bracket.
3. Remove the clamp (3).
4. Remove the differential sensor bracket (7).
5. Remove the 4 DPF muffler flange nut (1).



(1) DPF muffler flange nut
(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

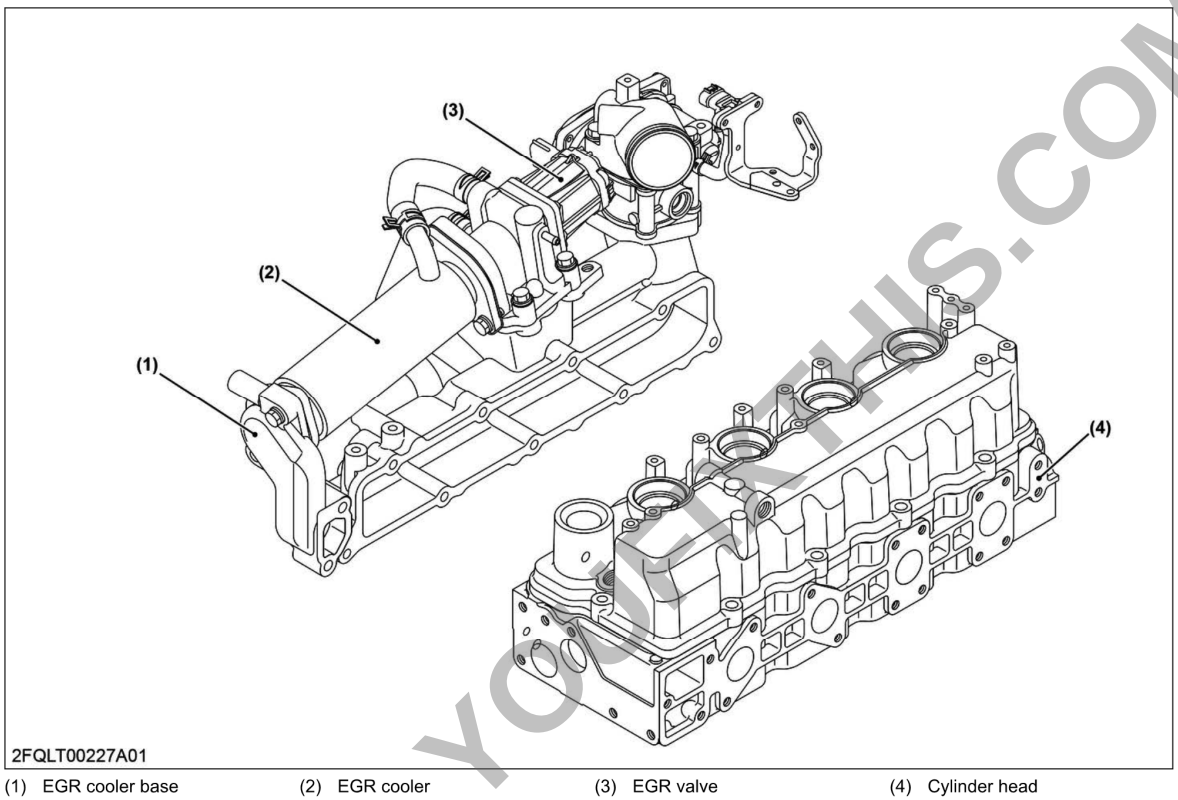
6. Remove the muffler full assembly (DPF) mounting screws (10).

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5. Exhaust gas recirculation (EGR) system

5.1 Structure of EGR system

The EGR system is made up of the EGR valve, the EGR cooler and EGR cooler base.



(1) EGR cooler base (2) EGR cooler (3) EGR valve (4) Cylinder head

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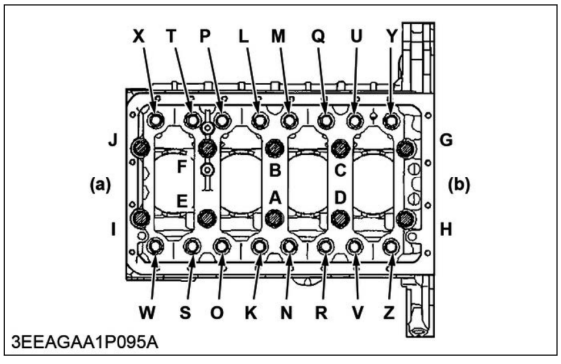
Item		Service specification	Service limit
Crankshaft	Side clearance	0.15 to 0.35 mm 0.0059 to 0.013 in.	0.50 mm 0.020 in.
	Alignment	—	0.02 mm 0.0008 in.
Crankshaft journal to crankshaft bearing **[V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5]**	Oil clearance	0.030 to 0.070 mm 0.0012 to 0.0027 in.	0.20 mm 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-TE5, V3307-CR-TIE5]**	Oil clearance	0.030 to 0.070 mm 0.0012 to 0.0027 in.	0.20 mm 0.0079 in.
• Crankshaft journal	O.D.	79.977 to 79.990 mm 3.1487 to 3.1492 in.	—
Crankpin to crankpin bearing **[V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5]**	Oil clearance	0.017 to 0.048 mm 0.00067 to 0.0018 in.	0.20 mm 0.0079 in.
• Crankpin	O.D.	46.980 to 46.991 mm 1.8496 to 1.8500 in.	—
Crankpin to crankpin bearing **[V3307-CR-TE5, V3307-CR-TIE5]**	Oil clearance	0.017 to 0.048 mm 0.00067 to 0.0018 in.	0.20 mm 0.0079 in.
• Crankpin	O.D.	49.980 to 49.991 mm 1.9678 to 1.9681 in.	—
Cylinder bore **[V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5]**	I.D.	87.000 to 87.022 mm 3.4252 to 3.4260 in.	87.150 mm 3.4311 in.
Cylinder bore **[V3307-CR-TE5, V3307-CR-TIE5]**	I.D.	94.000 to 94.022 mm 3.7008 to 3.7016 in.	94.150 mm 3.7067 in.
Cylinder bore (Oversize) **[V2607-CR-E5, V2607-CR-TE5, V2607-CR-TIE5]**	I.D.	87.250 to 87.272 mm 3.4351 to 3.4359 in.	87.400 mm 3.4409 in.
Cylinder bore (Oversize) **[V3307-CR-TE5, V3307-CR-TIE5]**	I.D.	94.500 to 94.522 mm 3.7205 to 3.7213 in.	94.650 mm 3.7264 in.

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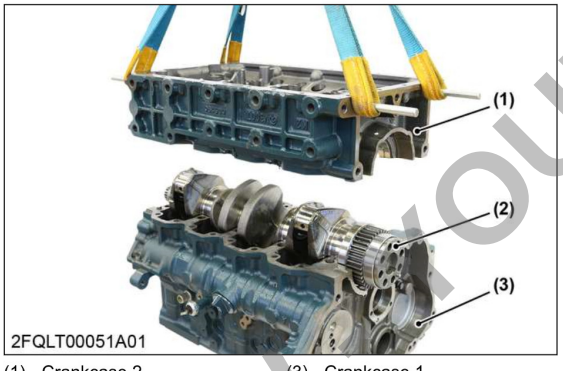
5.42 Removing crankcase 2

1. Remove the crankcase 2 mounting screw and crankcase 2 flange screw in the order of (Z to A).



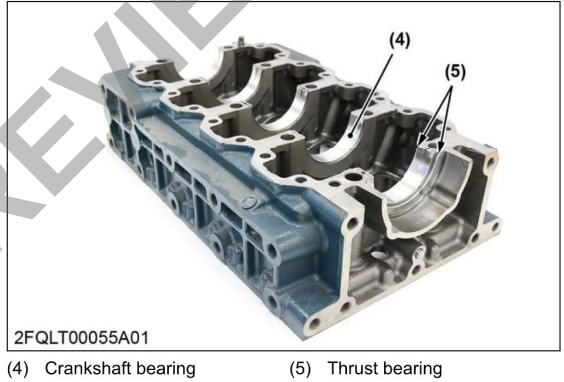
A to Crankcase 2 mounting screw J
K to Crankcase 2 flange screw Z
(a) Front cover side
(b) Flywheel side

2. Remove the crankcase 2 (1).



(1) Crankcase 2
(2) Crankshaft
(3) Crankcase 1

3. Remove the crankshaft bearing (4).
4. Remove the thrust bearing (5).



(4) Crankshaft bearing
(5) Thrust bearing

5.42.1 Installing tappet

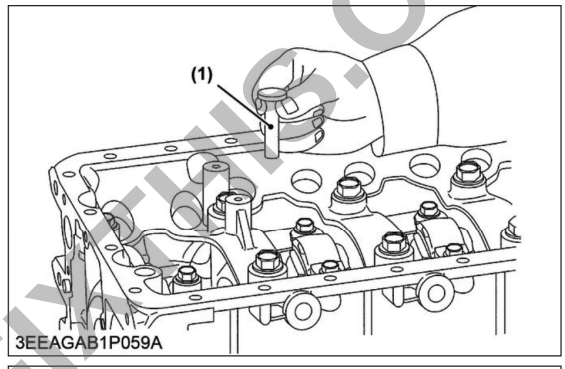
■ IMPORTANT

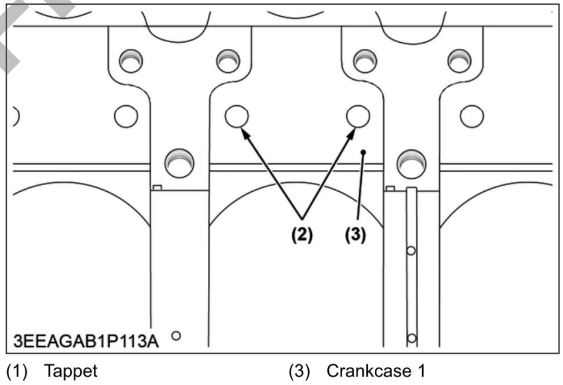
- **Do not change the combination of cylinder number and tappet.**

■ NOTE

- **Apply engine oil thinly around tappets.**

1. Install the tappets (1) to the tappet bore (2) of the crankcase 1 (3) using magnetic tool.





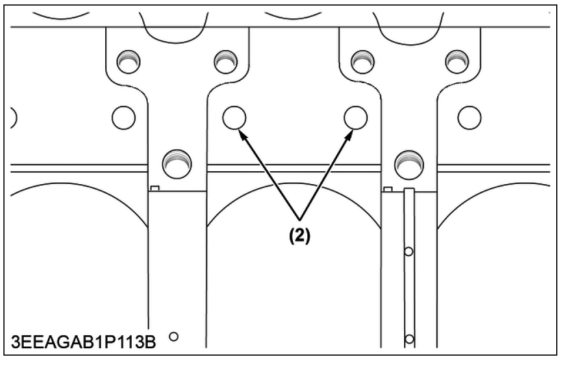
(1) Tappet
(2) Tappet bore
(3) Crankcase 1

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2. Measure the tappet guide bore (2) I.D. with a small hole gauge.

Tappet guide bore I.D.	Service specification	10.000 to 10.015 mm 0.39370 to 0.39429 in.



(2) Tappet guide bore

3. Calculate the oil clearance.

■ NOTE
- **If the oil clearance is more than the service limit or the tappet has a damage, replace the tappet.**

Oil clearance between tappet and tappet guide bore	Service specification	0.020 to 0.050 mm 0.00079 to 0.0019 in.
	Service limit	0.07 mm 0.003 in.

7.19 Checking timing gear backlash

Tools required
- Dial gauge (lever type)

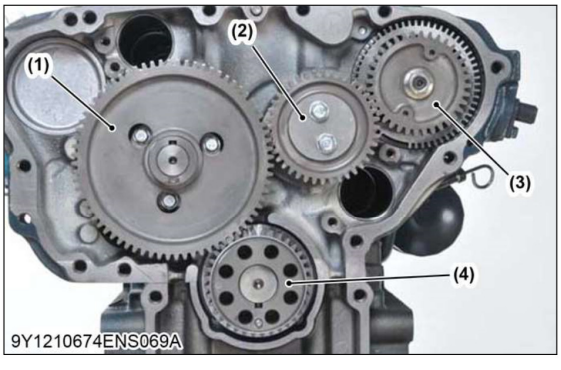
1. Set a dial gauge (lever type) with its point on the gear tooth.
2. Hold the mating gear and move the gear to measure the backlash.

■ NOTE
- **If the backlash is more than the service limit, measure the oil clearance in the journal part of each shaft.**
- **If the oil clearance is correct, replace the gear.**
- **If the crank gear is replaced, it is necessary to calibrate the injection timing with the diagnosis tool.**

Backlash between crank gear and cam gear	V2607-CR-E5 V2607-CR-TE5 V2607-CR-TIE5	Service specification	0.0400 to 0.118 mm 0.00158 to 0.00464 in.
		Service limit	0.22 mm 0.0087 in.
	V3307-CR-TE5 V3307-CR-TIE5	Service specification	0.0410 to 0.139 mm 0.00162 to 0.00547 in.
		Service limit	0.22 mm 0.0087 in.

Backlash between cam gear and idle gear	V2607-CR-E5 V2607-CR-TE5 V2607-CR-TIE5	Service specification	0.0400 to 0.159 mm 0.00158 to 0.00625 in.
		Service limit	0.22 mm 0.0087 in.
	V3307-CR-TE5 V3307-CR-TIE5	Service specification	0.0410 to 0.145 mm 0.00162 to 0.00570 in.
		Service limit	0.22 mm 0.0087 in.

Backlash between idle gear and supply pump gear	V2607-CR-E5 V2607-CR-TE5 V2607-CR-TIE5	Service specification	0.0400 to 0.168 mm 0.00158 to 0.00661 in.
		Service limit	0.22 mm 0.0087 in.
	V3307-CR-TE5 V3307-CR-TIE5	Service specification	0.0410 to 0.139 mm 0.00162 to 0.00547 in.
		Service limit	0.22 mm 0.0087 in.



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