Engine

Engine Mechanical (4JJ1)

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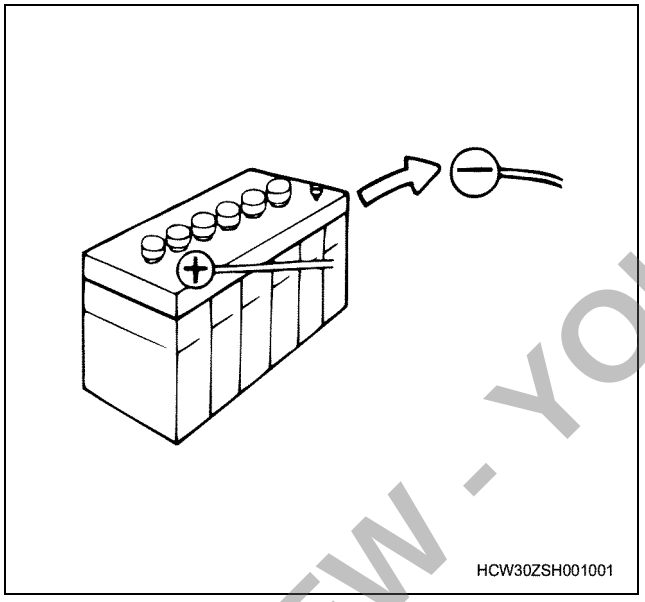
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General Information

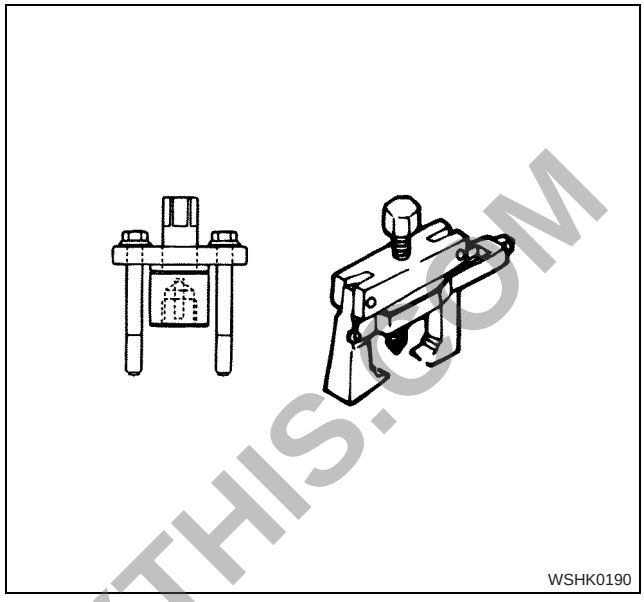
Service Precautions

In order to carry out work safely

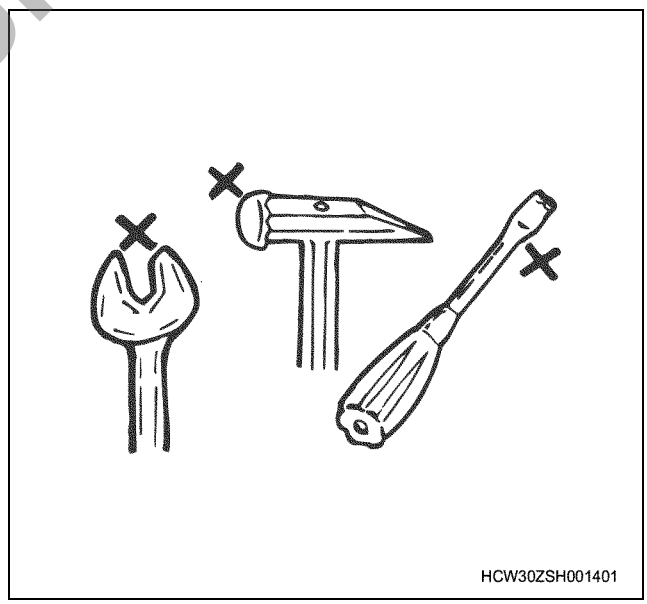
1. Always use an engine stand when taking the engine down from the vehicle.
   Do not place the engine directly onto the ground, or place in a manner that interferes with the oil pan.
2. If you are working together with others, always pay attention to each other's safety.
3. If you are repairing any part of the electrical system, always remove the minus side cable from the battery terminal before starting work. If you are removing the battery cover, always remove the cover in a place that is away from sources of fire/ heat.



4. Do not perform painting work or leave the engine running for long periods of time in an enclosed or badly ventilated indoor workshop.
5. Always use the correct specialized tool indicated in the instructions. Using the incorrect tool may cause damage to the parts or injury to the person using the tool.



6. All regular tools, gauges and special tools should be regularly inspected, and prepared before starting work. Do not use bent spanners, hammers with damaged edges, chipped chisels, or any other faulty or damaged tools.



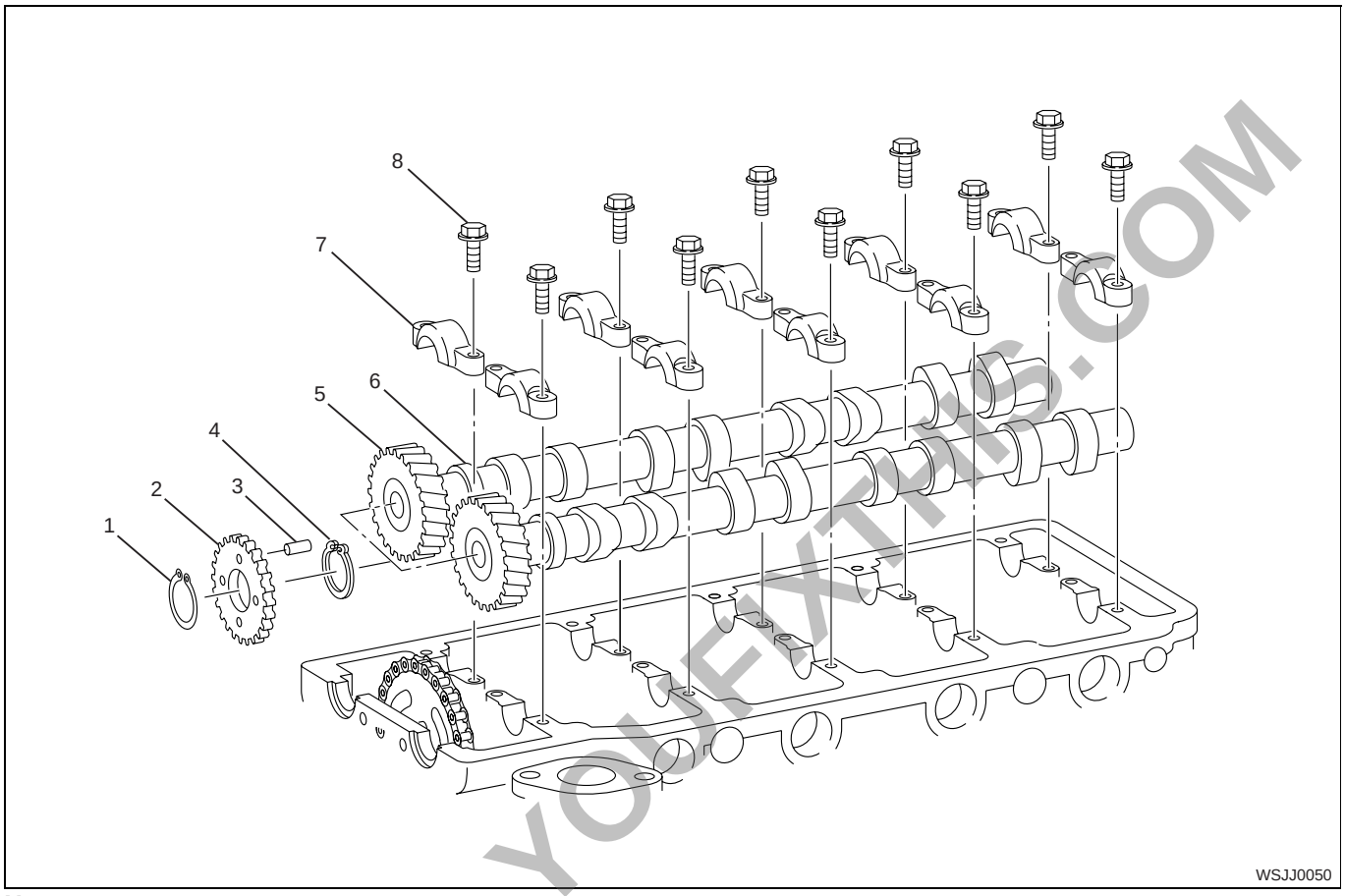
7. Always pay close attention to safety and handling requirements when using grinders, cranes, welders, and other such equipment.
   Moreover, always wear the correct protective garments and use the necessary safety tools for the job in hand.

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Camshaft ASM

Components



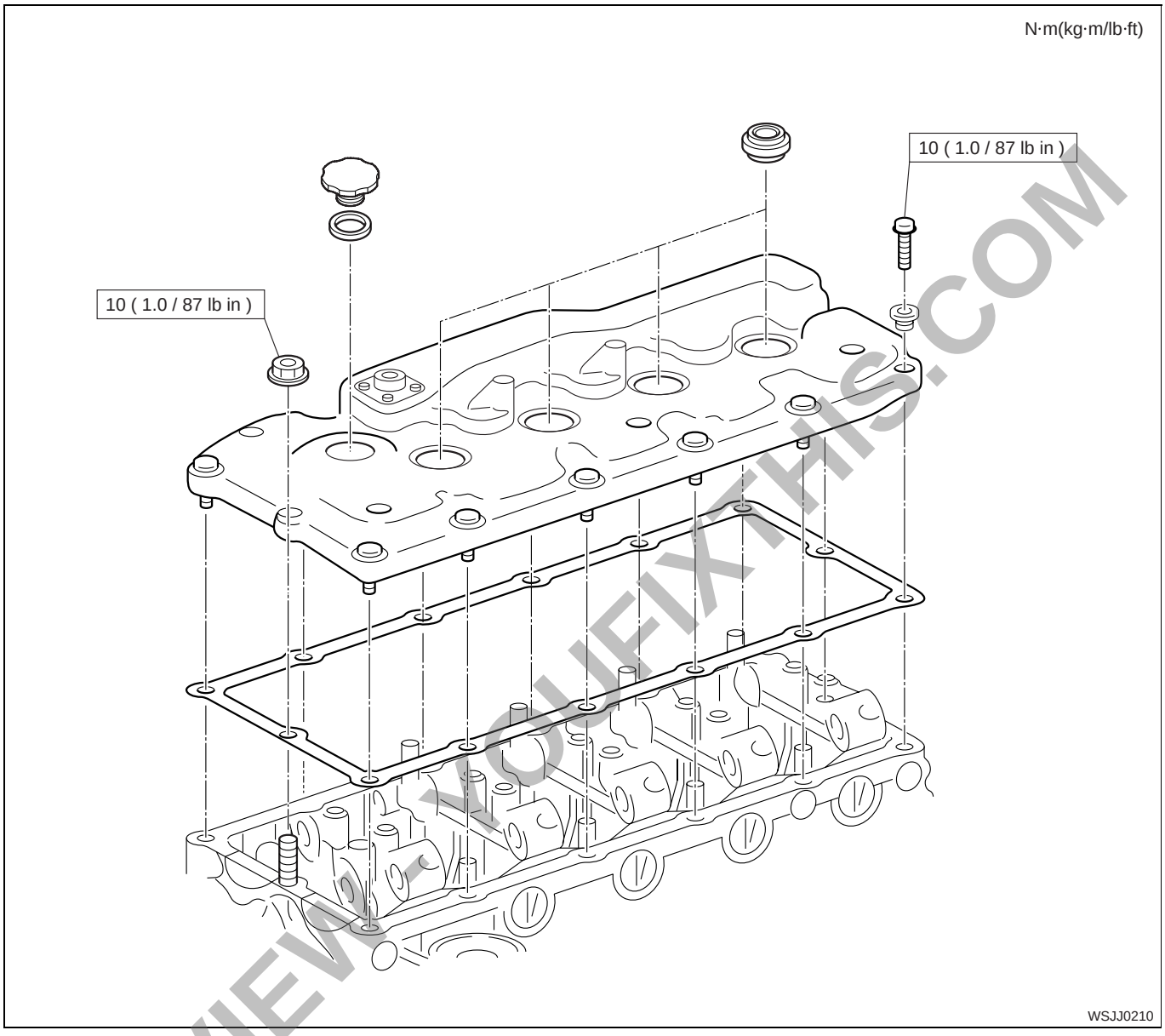
Name

1. Snap Ring
2. Camshaft Scissors Gear
3. Knock Pin
4. Damper Spring
5. Camshaft Gear
6. Camshaft
7. Bearing Cap
8. Bolt

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Torque Specifications



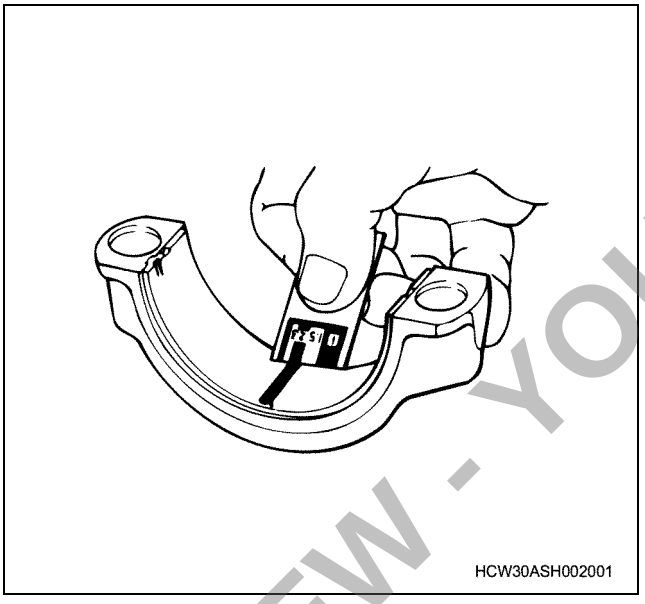
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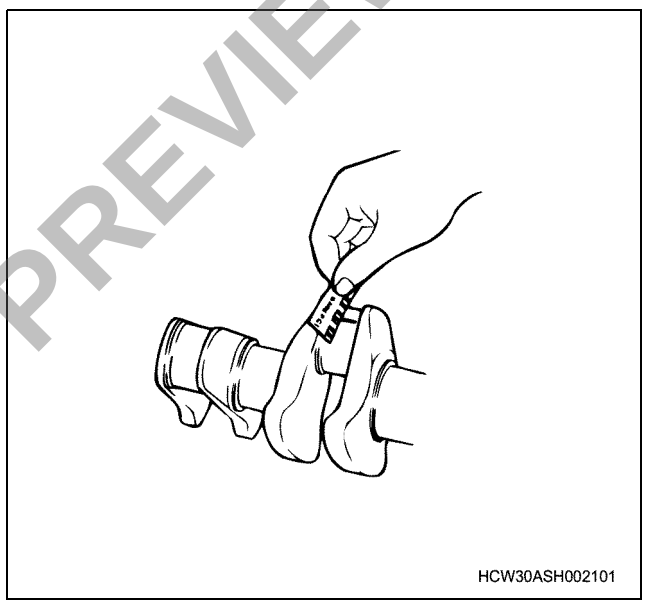
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- Clean the connecting rod and bearing, and install the bearing to the rod.
- Cut the plastigauge to the same width as the crank pin, and while avoiding the oil pore of the crank pin lay the gauge parallel to the pin.
- Line up the marks on the connecting rod and cap and install the crank pin, apply molybdenum disulfide to the thread section and bearing surface of the fastening bolt, and rotate both cap and bolt to the correct torque.

Important:
Do not move the connecting rod while using the plastigauge.

- Gently remove the cap and connecting rod, and measure the crushed width of the plastigauge (clearance between rod and pin) using the scale printed on the bag.


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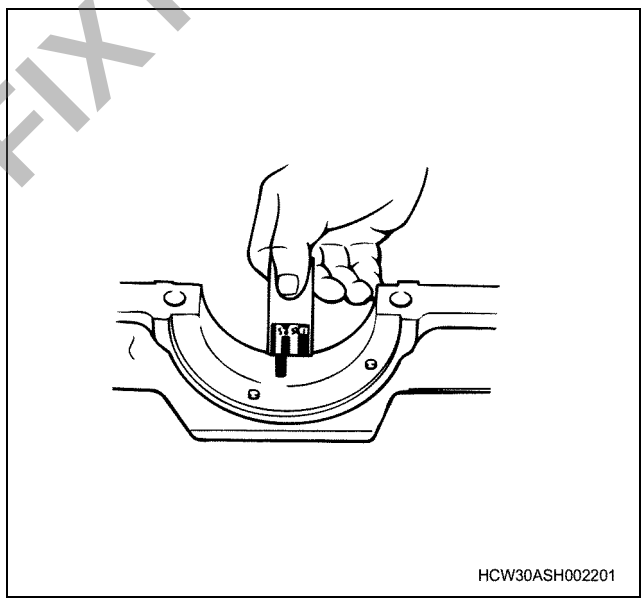

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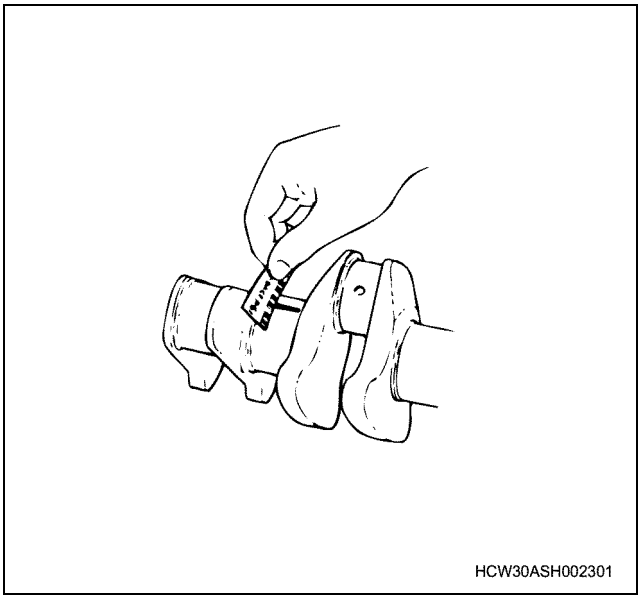
Example: Measuring the clearance between the crank bearing and crank journal

- Clean the clamp face of the cylinder block and crankcase bearing, and also the bearing, and install the cylinder block to the crankcase.
- Gently rest the crankshaft on the cylinder block, and rotate it approximately 30 degree to stabilize it.
- Cut the plastigauge to the same size as the journal width, and while avoiding the oil pore of the journal lay the gauge parallel to the journal.
- Gently rest the crank case on the cylinder block, apply molybdenum disulfide to the thread section and bearing surface of the fastening bolt, and tighten in sequence to the correct torque.

Important:
Do not rotate the crankshaft while using the plastigauge.

- Gently remove the crankcase, and measure the crushed width of the plastigauge (clearance between bearing and journal) using the scale printed on the bag.


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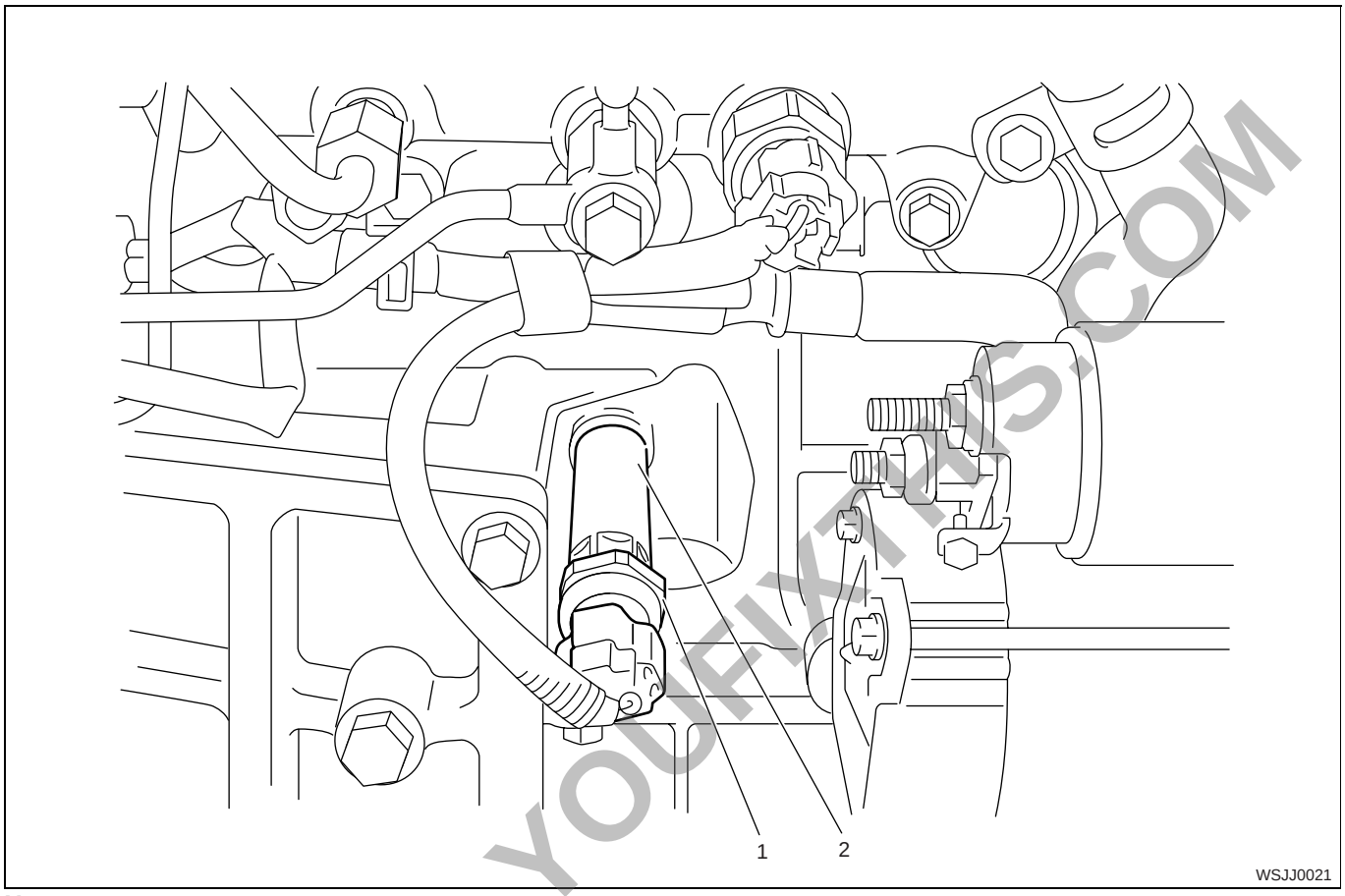

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Oil Pressure Switch

Components



Name

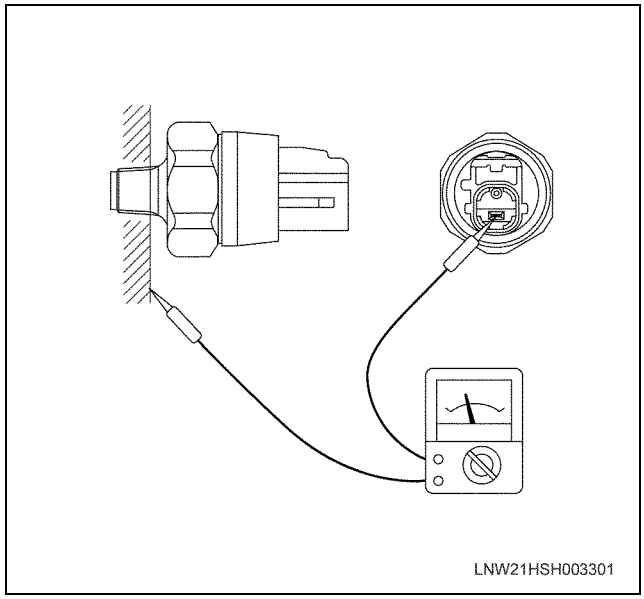
1. Oil Pressure Switch
2. Nipple

Removal

1. Remove the oil pressure switch.
2. Remove the nipple.

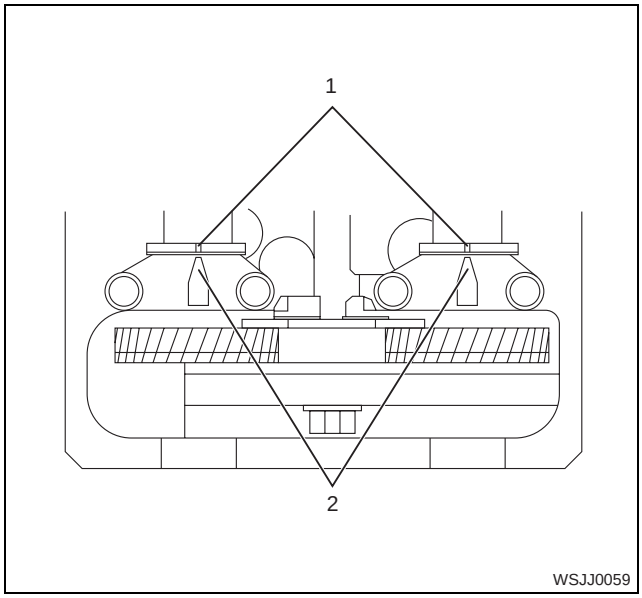
Inspection

Check for continuity between the switch terminal and the body grounding in the no-load condition.
If there is no continuity, replace with normal parts.



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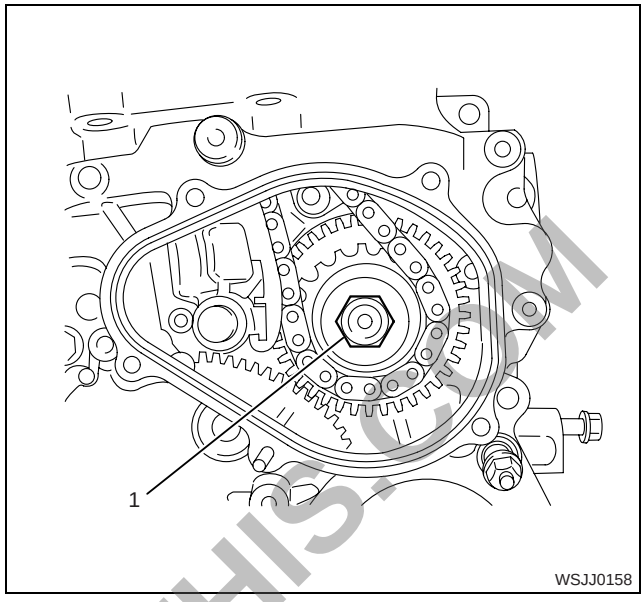
Name
1. Camshaft Alignment Marks
2. Bearing Cap Alignment Marks

13. Remove the starter motor.
    Refer to “Starter” in Engine Electrical section.
14. Loosen the nut.
    - Loosen the nut after blocking the crankshaft from turning by placing a crankshaft stopper on the starter mounting position on the flywheel housing.

Caution:
Make sure that the stopper is properly fitted and engaged with the ring gear.

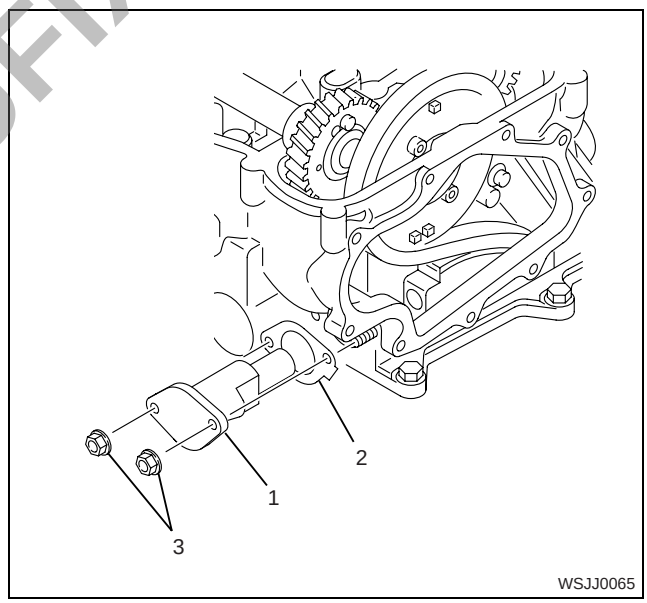
Special tool
Crankshaft stopper





Name
1. Nut

15. Remove the timing chain tensioner.



Name
1. Timing Chain Tensioner
2. Packing
3. Nut

16. Remove the timing chain tension lever pivot.
17. Remove the nut and sprocket.

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Main Data and Specifications

Items			Engine model 4JJ1
Type			Diesel/4-cycle/water cooled-type, in-line four-cylinder DOHC
Combustion chamber form			Direct injection type
Cylinder liner type			Linerless
Number of cylinders - cylinder bore × strokes		mm (in)	4-95.4 (3.76) × 104.9 (4.13)
Displacement		cc (cu.in)	2999 (183)
Compression ratio			17.5
Compression pressure		MPa (psi)/rpm	3 (435)/200
Idle speed		rpm	800 ± 25
Valve clearance	Intake		0.15 (0.006) (cold)
mm (in)	Exhaust		0.15 (0.006) (cold)
Ignition type			Compressed ignition
Injection order			1 - 3 - 4 - 2
Lubricating system			
Lubricating type			Pressure type
Oil pump type			Gear type
Volume of lubricating oil		L (qts)	15.0 (15.8)
Oil filter type			Full flow filter (cartridge type)
Oil cooling type			Built-in, water-cooling
Cooling system			
Cooling type			Water cooling type
Water pump type			Centrifugal, belt type
Thermostat type			Wax-type unit
Thermostat valve-opening temperature		°C (°F)	85 (185)
Volume of coolant		L (qts)	6 (6.3) (Engine only)
Fuel system			
Injection pump type			Electronic control common rail type
Governor type			Electronic type
Timer type			Electronic type
Injection nozzle type			Multi-hole type 6-hole
Charging system			
Generator type			AC type
Power output		V/A	24 - 50
Regulator type			IC

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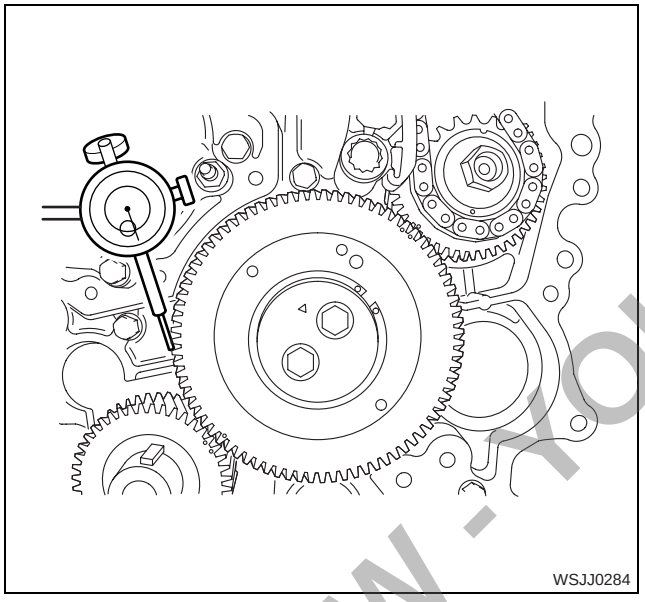
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Inspection

1. Measurement of idle gear backlash
   - Apply a dial gauge on the teeth of the idle gear to be measured and move the gear to right and left lightly to read how much the dial gauge shook (never fail to fix the gear).
   - If the measurement exceeds the limit, replace the idle gear.

Backlash of the timing gear	mm (in)
Standard	0.10 — 0.17 (0.004 — 0.006)
Limit	0.30 (0.01)

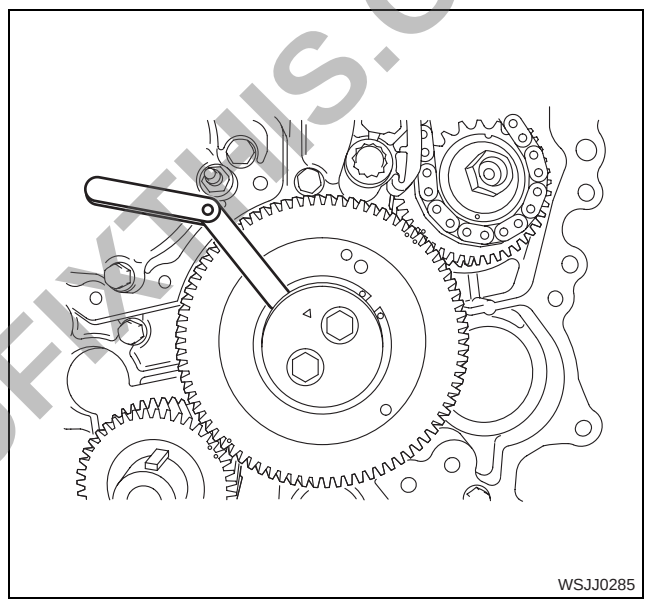
- Measure backlash of the idle gear before removing the idle gear A.



2. Measurement of end clearance of the idle gear.
   - Insert a thickness gauge between the idle gear and the thrust collar to measure a clearance.
   - If the measurement exceeds the limit, replace either the idle gear or the thrust collar.

Axial play of idle gear	mm (in)
Standard	0.080 — 0.155 (0.003 — 0.006)
Limit	0.20 (0.008)

- Measure an end clearance of the idle gear before removing the idle gear A.



3. Outside diameter of idle gear shaft
   - Use a micrometer to measure an external diameter of the idle gear A shaft.
   - If the measurement exceeds the limit, replace the shaft.

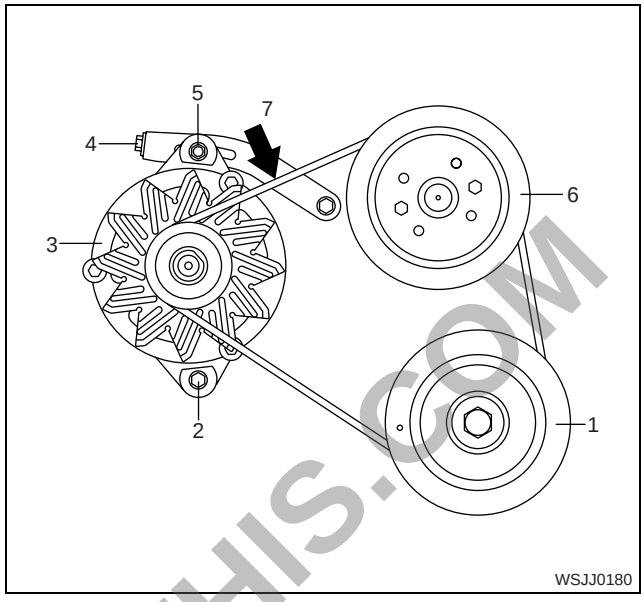
External diameter of the idle gear A shaft	mm (in)
Standard	44.950 — 44.975 (1.7697 — 1.7707)
Limit	44.80 (1.764)

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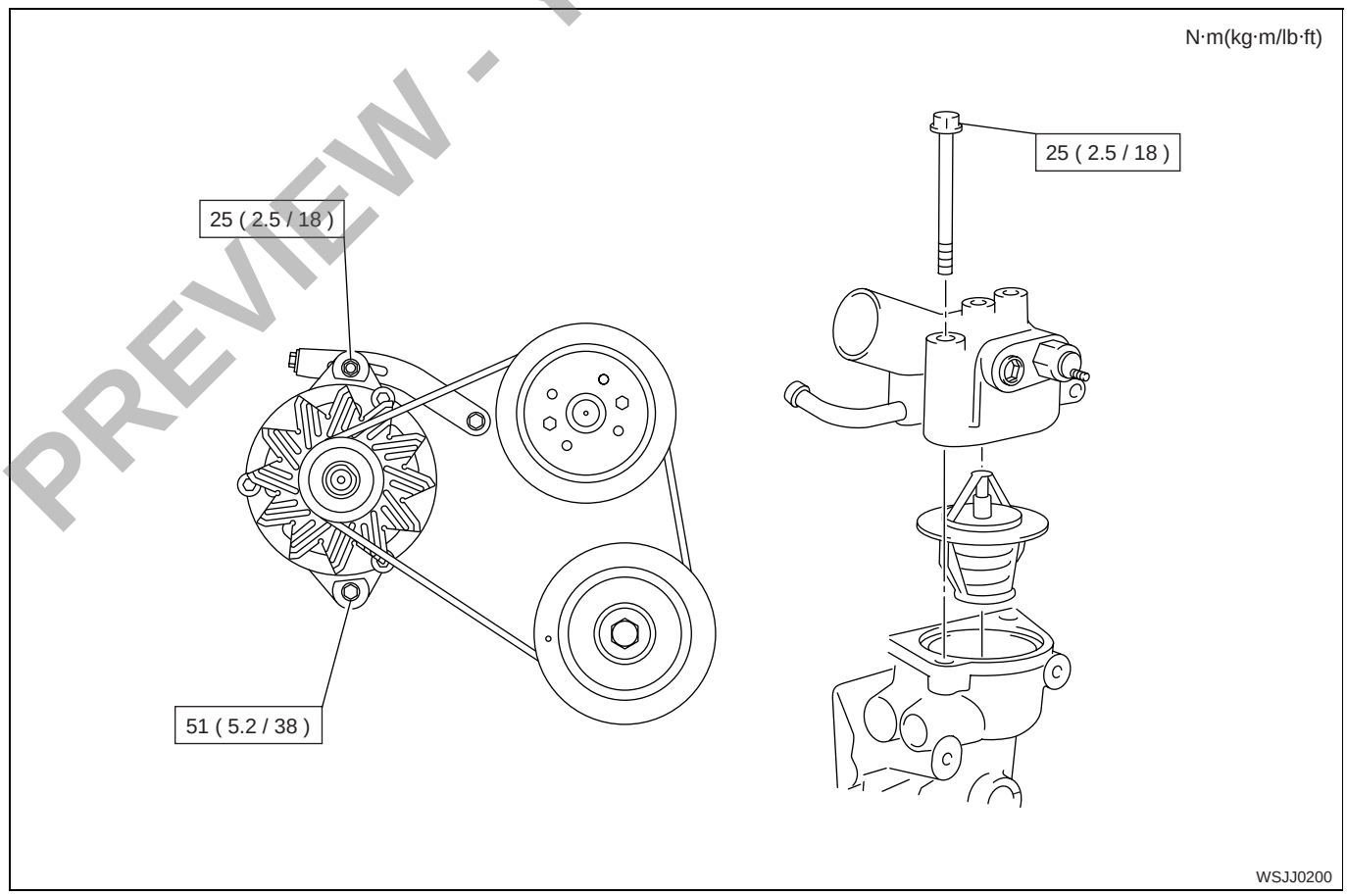
- Loosen the installing bolt under the generator while holding the nut on the back using a tool.

Tightening torque:
Nut: 25 N·m (2.5 kg·m/18 lb ft)
Bolt: 51 N·m (5.2 kg·m/38 lb ft)



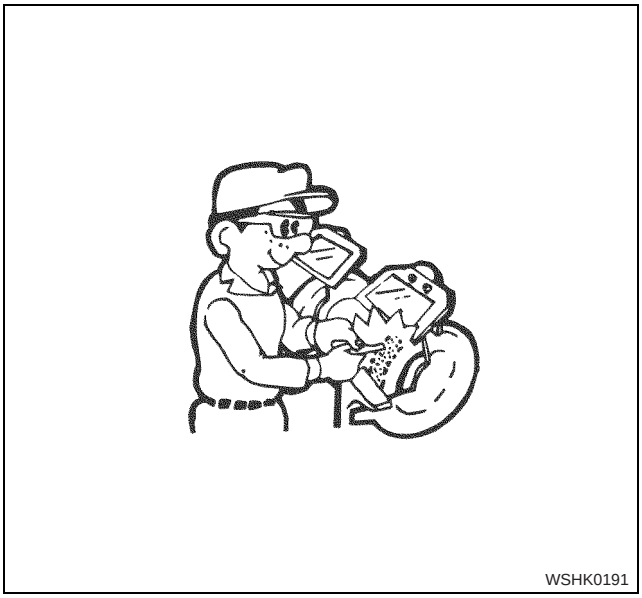
Name
1. Crankshaft Pulley
2. Bolt
3. Generator
4. Tension Adjusting Bolt
5. Lock Nut
6. Water Pump Pulley
7. Generator Drive Belt

Torque Specifications

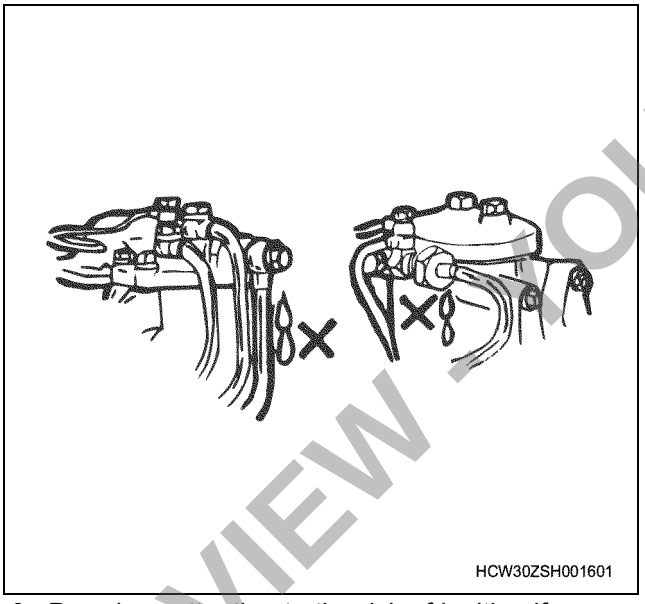


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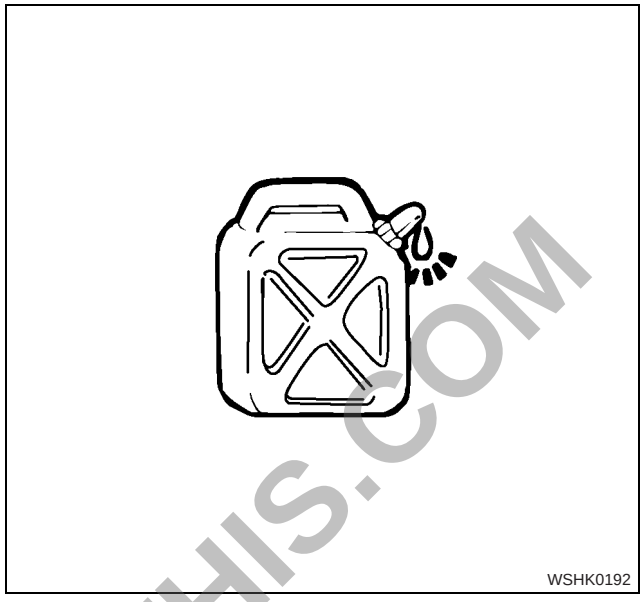
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8. Always check that there are no fuel leaks when performing maintenance work on the fuel system. (It may cause a fire.)


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9. Pay close attention to the risk of ignition if you are handling parts that carry a high voltage.
   Furthermore, any oil or grease spilt onto rubber parts must be wiped off immediately, as it will cause deterioration of the rubber.


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Replacement parts and part numbers.

1. Always replace packing, oil seals, o-rings, caulking lock nuts, folding lock plates, split pins and other such parts with brand new parts.
2. The parts numbers contained in this manual may not represent the supply condition of the parts, and the part numbers may be changed due to revisions. Therefore, parts should always be checked against a parts catalogue before use.

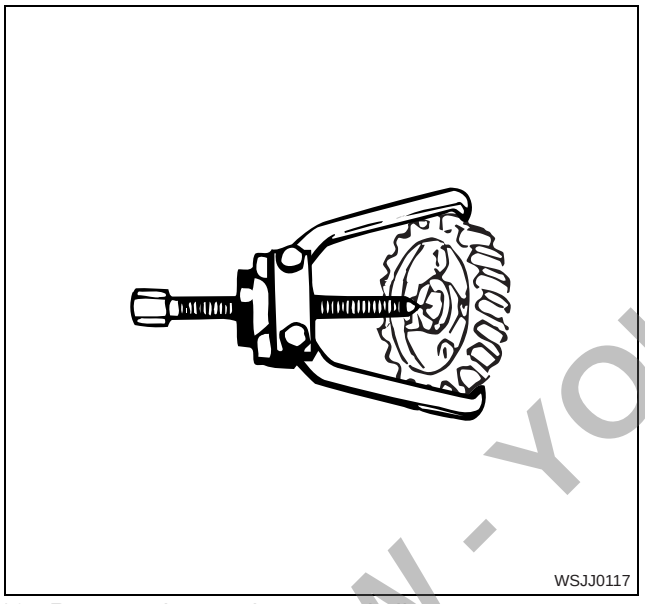
Liquid gasket

1. Each time you disassemble parts that use liquid gasket, completely remove the old gasket residue from each of the parts and matching sections using a scraper, then clean each of the parts to completely remove oil, water, and dirt etc. from the various surfaces. Using the specified type of liquid gasket, apply new liquid gasket to each of the surfaces before reassembling the parts.
2. In order to make it easier to clean liquid gasket surfaces, apply gasket remover liquid (Pando-391D made by Three Bond Co., Ltd.) and leave the part to stand for approximately 10 minutes, after which the old liquid gasket residue will be easier to remove.
   However, this should not be used on resin components or painted components.
3. Please take care not to apply too much or too little liquid gasket.
   Also, you should always re-apply the liquid gasket upon itself when you start and finish application.
4. Make sure that there are no gaps when re-installing the liquid gasket parts to each other. If there are gaps between the two parts, re-apply the liquid gasket. Some parts, especially the oil pan, use the same size studs as a guide to eliminate the need for knock pin positioning etc.
5. Re-install these parts within 5 minutes of applying the liquid gasket.

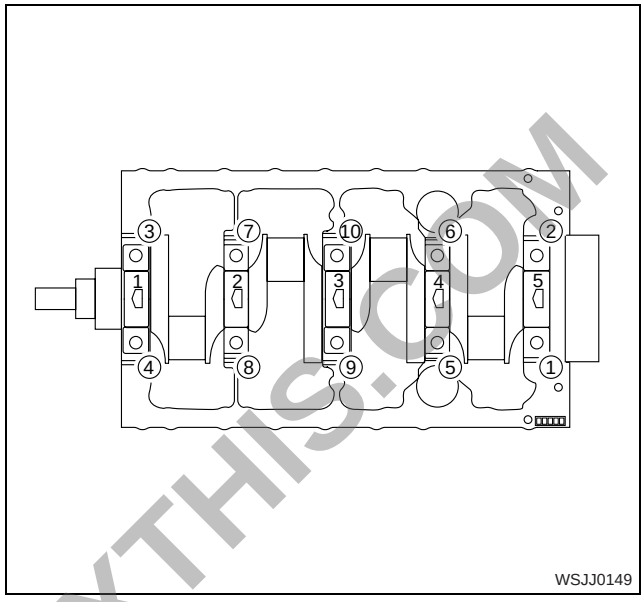
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9. Remove the crankshaft rear oil seal.
   Refer to the “Crankshaft Rear Oil Seal”.
10. Remove the water pump.
    Refer to the “Water Pump” in the Cooling System Section.
11. Remove the gear case cover.
    Refer to the “Timing Gear Train”.
12. Remove the timing gear train.
    Refer to the “Timing Gear Train”.
13. Remove the oil pump.
    Refer to the “Oil Pump”.
14. Remove the gear case ASM.
    Refer to “Gear Case ASM”.
15. Remove the crankshaft gear.
    - Remove the gear using a gear puller.



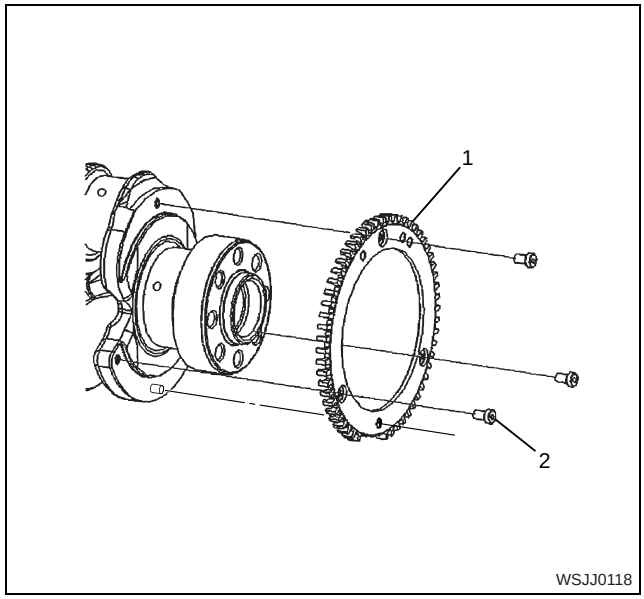
16. Remove the crankcase and oil pan.
    Refer to “Crankcase, Oil Pan”.
17. Remove the piston and connecting rod.
    Refer to the “Piston, Connecting Rod”.
18. Remove the bearing cap.
    - Gradually loosen the installation bolts of crankshaft bearing cap in the order shown in the illustration.



19. Remove the lower crankshaft bearings.
20. Remove the crankshaft ASM.
21. Remove the thrust bearing.
22. Remove the upper crankshaft bearings.

Disassembly

1. Remove the CKP sensor rotor.



Name

1. CKP Sensor Rotor
2. Bolt

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