

ENGINE

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ENGINE COMPONENTS REMOVABLE WITH ENGINE IN PLACE

The parts listed below can be removed and installed without removing the engine from the frame. Refer to the page listed in each section for removal and installation instructions.

ENGINE LEFT SIDE

PARTS	REMOVAL	INSTALLATION
Engine sprocket	3-5	3-8
Starter drive/driven gear	3-12	—
Generator rotor	3-16	3-50
Starter clutch	3-16	3-50
Neutral switch	3-17	3-56

ENGINE RIGHT SIDE

PARTS	REMOVAL	INSTALLATION
Exhaust pipe/muffler	3-6	3-7
Oil filter	2-13	—
Clutch pressure plate, drive plates, and driven plates	3-13	3-55
Clutch sleeve hub	3-13	3-54, 55
Primary driven gear assembly	3-14	3-54
Oil pump idle gear and driven gear	3-14	3-53
Oil pump	3-14	3-53
Gearshift shaft	3-15	—
Gearshift cam driven gear	3-15	3-52
Balancer drive/driven gear	3-15, 16	3-51

ENGINE CENTER

PARTS	REMOVAL	INSTALLATION
Carburetor	4-7	4-14
Starter motor	3-9	—
Cam chain tension adjuster	3-9	3-63
Cylinder head cover	3-9	3-62
Camshaft/automatic decompression assembly	3-10	3-60
Cylinder head	3-10, 11	3-59
Cylinder	3-11	3-58, 59
Piston	3-11	3-58
Cam chain	3-14	3-53

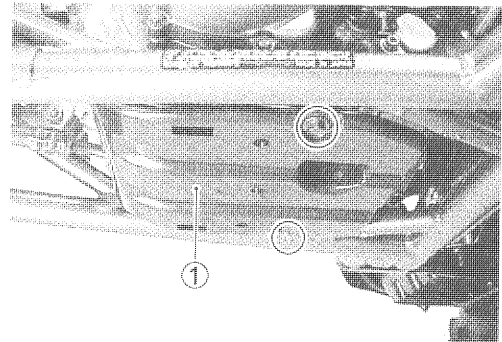
ENGINE REMOVAL AND REMOUNTING

ENGINE REMOVAL

Before taking the engine out of the frame, wash the engine using a steam cleaner. Engine removal is sequentially explained in the following steps.

- Drain engine coolant. (☞ 2-14)

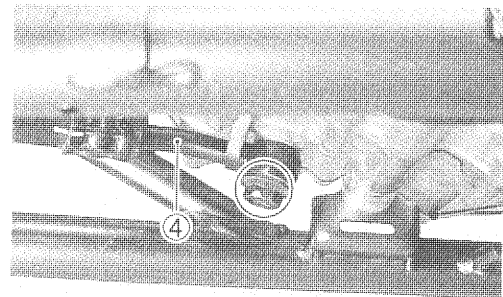
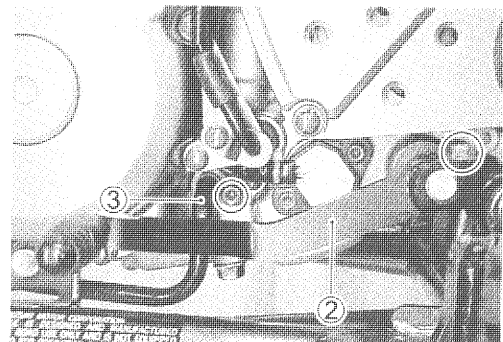
- Remove the engine under cover ①.



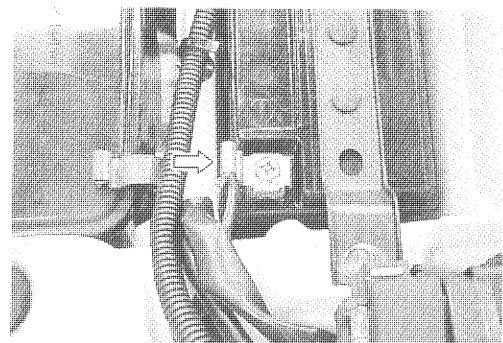
- Drain engine oil. (☞ 2-12)
- Remove the gearshift lever ② and spacers.
- Remove the engine oil outlet pipe ③ and inlet pipe ④.

CAUTION

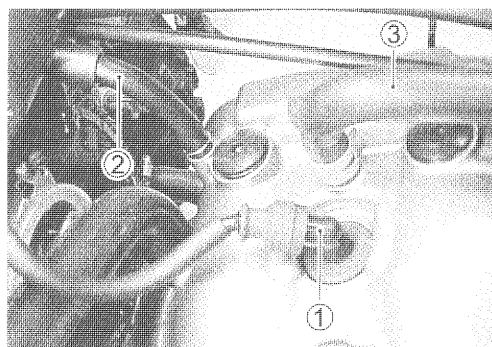
Do not lose the spacer with O-ring behind the outlet oil pipe.



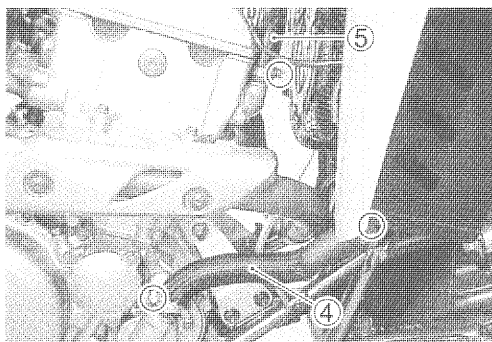
- Remove the seat. (☞ 6-4)
- Disconnect the battery ⎓ lead wire.



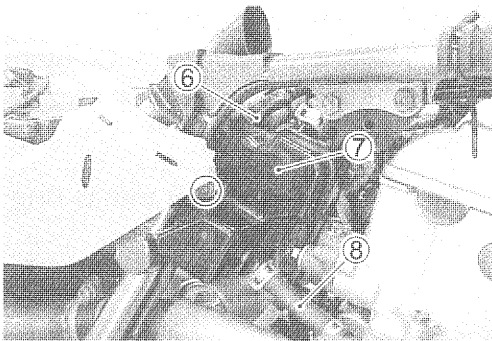
- Remove the fuel tank. (4-3)
- Disconnect the spark plug cap ① oil tank overflow hose ② and breather hose ③.



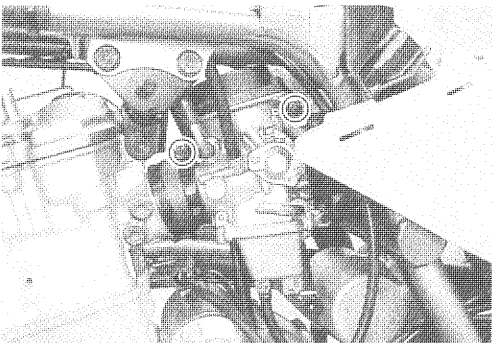
- Remove the engine coolant inlet hose ④ and disconnect the outlet hose ⑤.



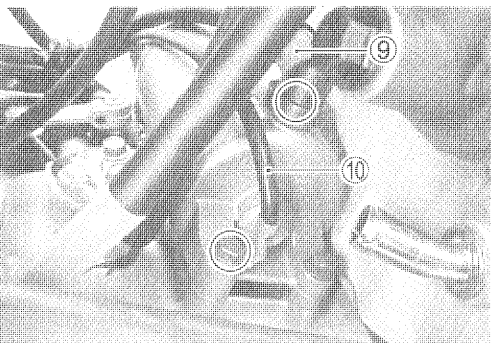
- Disconnect the breather hose ⑥ and remove the oil return tank ⑦ with hose ⑧.



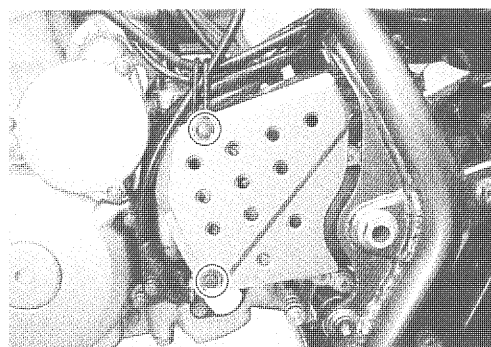
- Remove the carburetor with throttle cable.



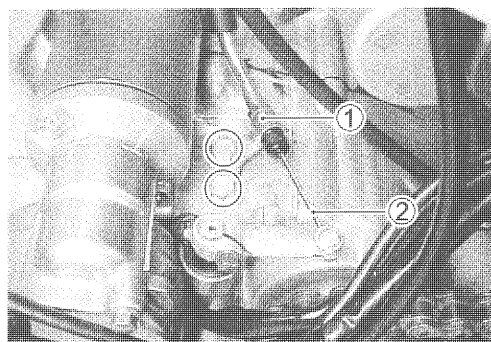
- Disconnect the starter motor lead wire ⑨ and ground wire ⑩.



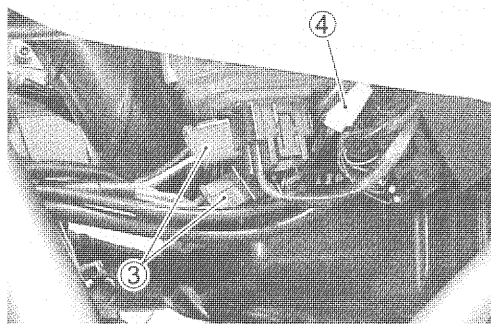
- Remove the engine sprocket cover.



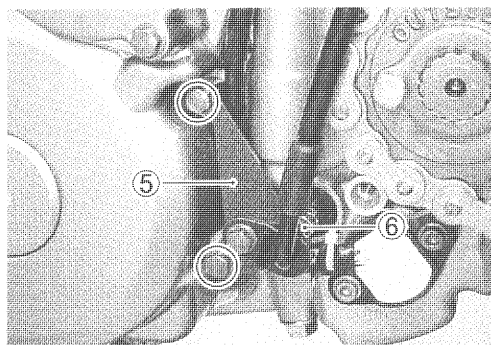
- Remove the clutch cable bracket ①.
- Disconnect the clutch inner cable ② from the cam lever.



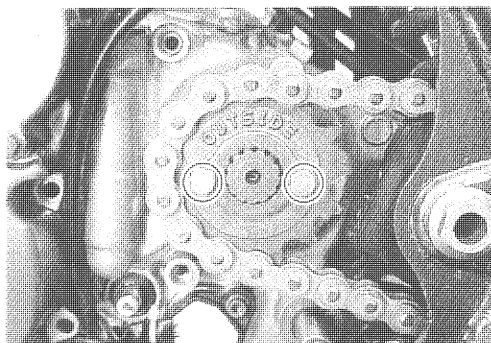
- Disconnect the generator lead wire couplers ③ and neutral switch lead wire coupler ④.



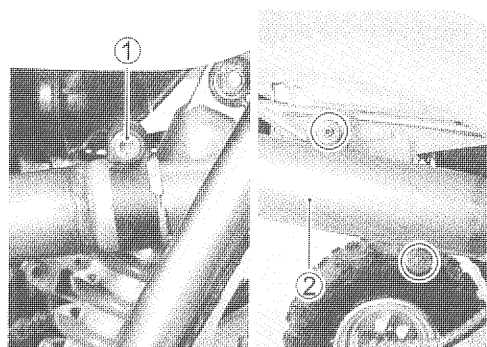
- Remove the reverse gear cable bracket ⑤.
- Disconnect the reverse gear cable inner wire ⑥.



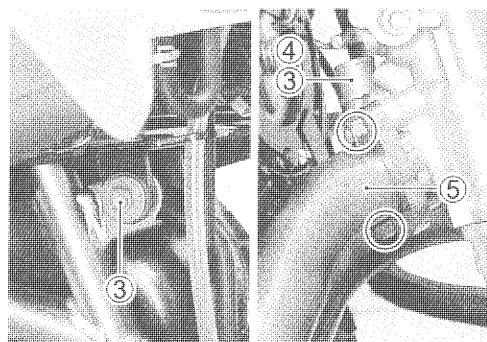
- Remove the engine sprocket with drive chain.



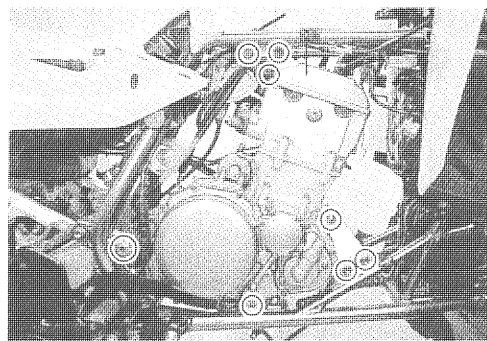
- Loosen the muffler clamp bolt ①.
- Remove the muffler ②.



- Remove the radiator lower mounting bolt ③ and push lower of the radiator forward.
- Remove the thermostat cover ④ and thermostat.
- Remove the exhaust pipe ⑤.



- Remove the engine mounting bolts and nut.
- Remove the engine mounting brackets.



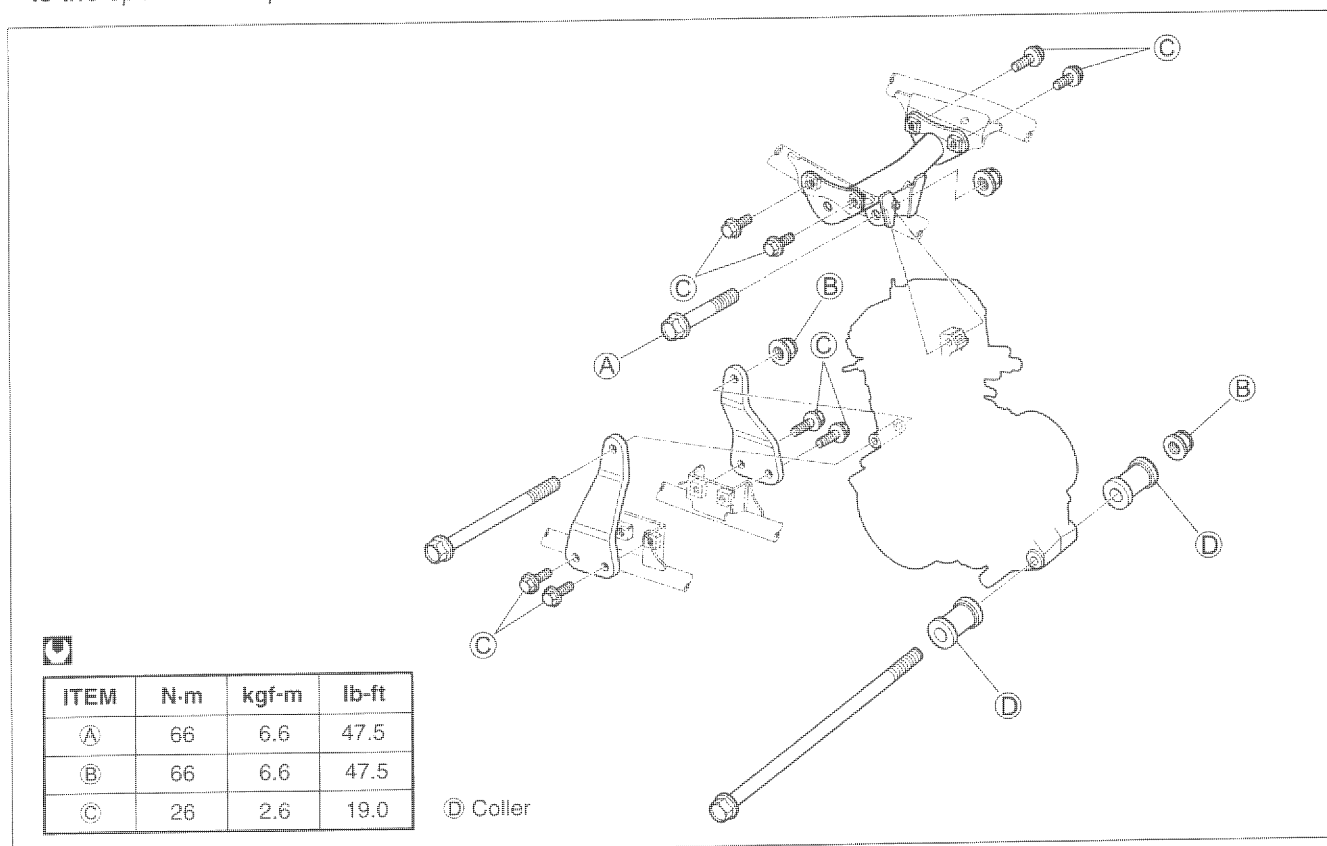
- Remove the engine from the left side.

ENGINE REMOUNTING

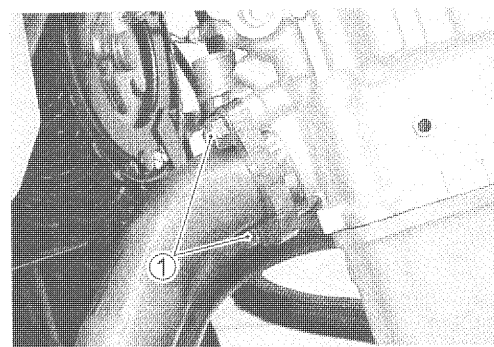
Remount the engine in the reverse order of engine removal.
Pay attention to the following points:

NOTE:

- * The engine mounting nuts are self-locking.
- * Once the nut has been removed, it is no longer of any use. Be sure to use new nuts, and then tighten them to the specified torque.

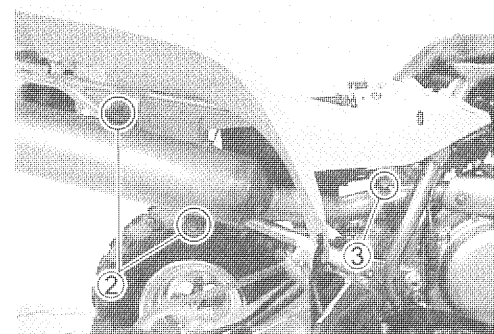


- Install the exhaust pipe and muffler.
- Install the thermostat and thermostat cover. (➡ 5-12)



- Tighten the exhaust pipe nuts ①, muffler mounting bolts ② and connecting bolt ③ to the specified torque.

- Ⓜ Exhaust pipe nut: 23 N·m (2.3 kgf-m, 16.5 lb-ft)
- Muffler mounting bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)
- Muffler connecting bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)



- Install the engine sprocket with drive chain after loosening the chain adjuster bolts.

NOTE:

The letter **A** on the engine sprocket should face to the outside.

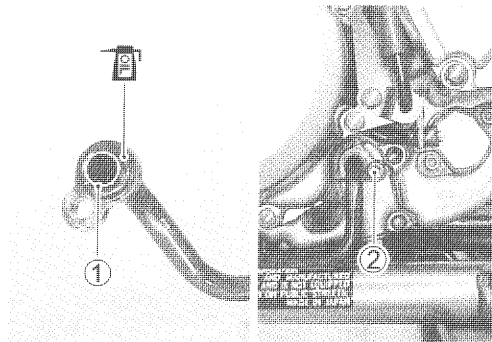
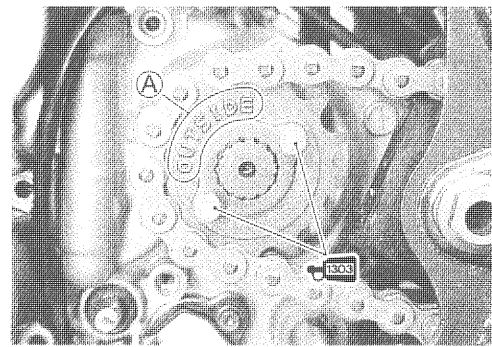
- Apply THREAD LOCK SUPER "1303" to the sprocket bolts.

 **99000-32030: THREAD LOCK SUPER "1303"**

- Tighten the engine sprocket bolts to the specified torque.

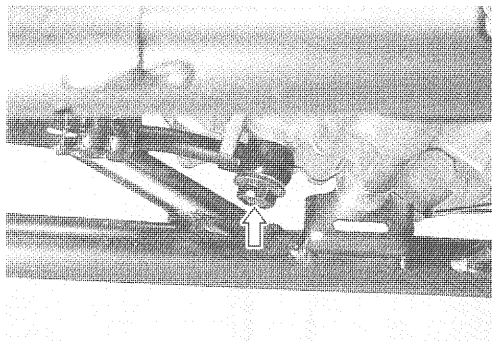
 **Engine sprocket bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)**

- Install the engine coolant hose. (☞ 8-18)
- Install the spacer **①** with O-ring to the engine oil outlet pipe.
- Tighten the engine oil outlet pipe bolt **②** securely.



- Tighten the engine oil inlet pipe union bolt to the specified torque.

 **Inlet pipe union bolt: 23 N·m (2.3 kgf-m, 16.5 lb-ft)**



- After installing the engine, route the wiring harness, cables and hoses properly. (☞ 8-11 to 8-18)
- Adjust the following items.

* Engine oil ☞ 2-12

DATA Engine oil capacity

Oil change: 2 000 ml (2.1/1.8 US/Imp qt)

Oil and filter change: 2 100 ml (2.2/1.8 US/Imp qt)

Engine overhaul: 2 200 ml (2.3/1.9 US/Imp qt)

* Adjust the drive chain slack ☞ 2-22

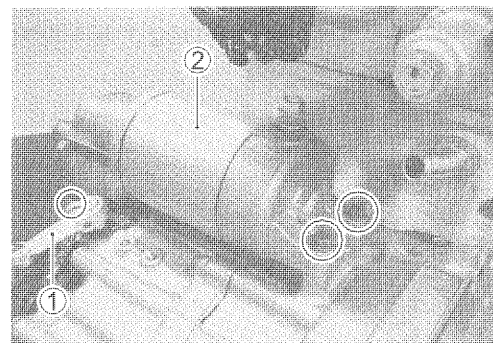
* Throttle cable play ☞ 2-11

* Engine idle speed ☞ 2-11

* Clutch cable play ☞ 2-16

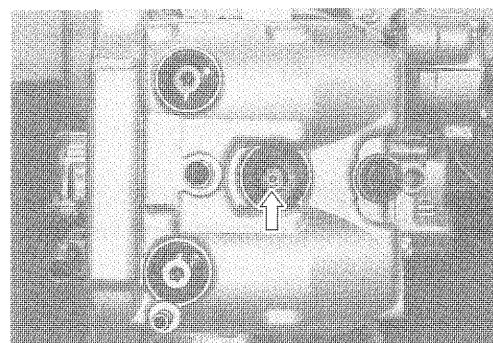
ENGINE DISASSEMBLY

- Remove the clutch release arm ①.
- Remove the starter motor ②.

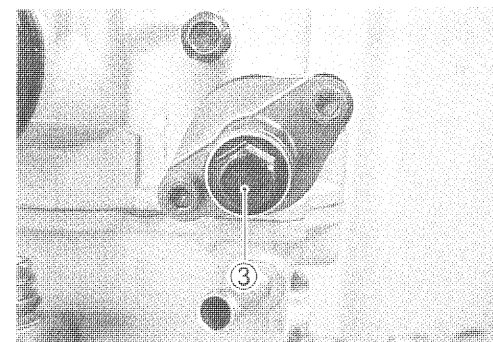


- Remove the spark plug.

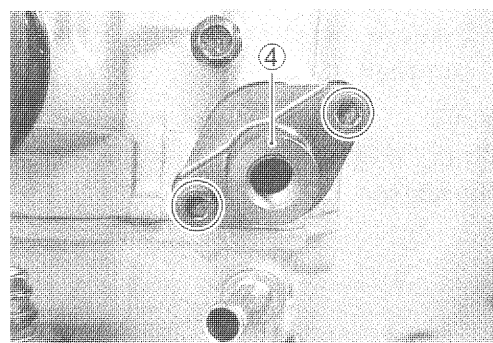
 09930-10121: Spark plug wrench set



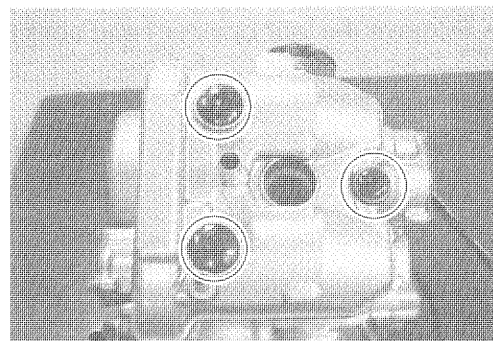
- Remove the spring holder bolt ③ of the cam chain tension adjuster with spring.



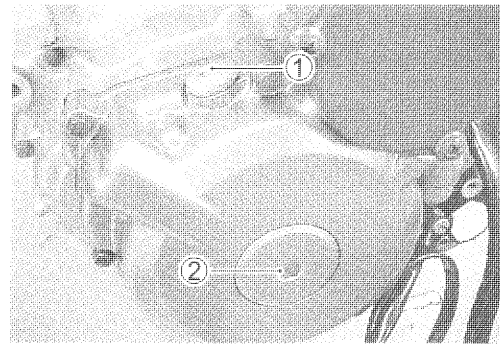
- Remove the cam chain tension adjuster ④.



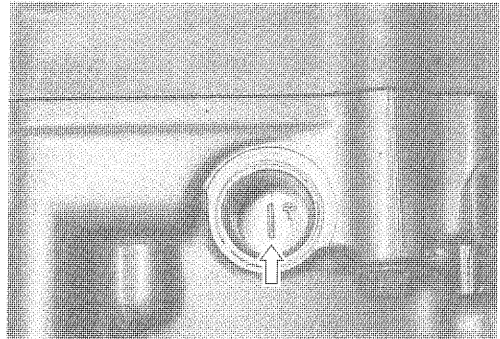
- Remove the cylinder head cover bolts in diagonal stages, and then remove the cylinder head cover.



- Remove the valve timing inspection plug ① and generator cover cap ②.



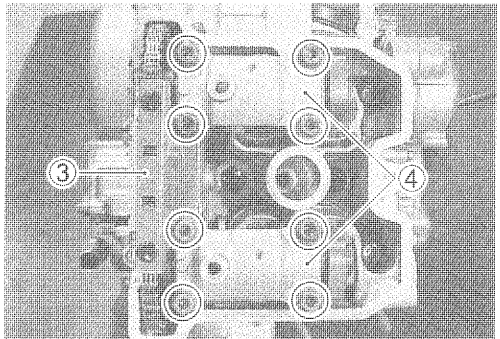
- Turn the generator rotor until the "T" line on the generator rotor is aligned with the center of the hole in the generator cover.



NOTE:

Before removing the camshaft journal holders, the piston must be at TDC of the compression stroke.

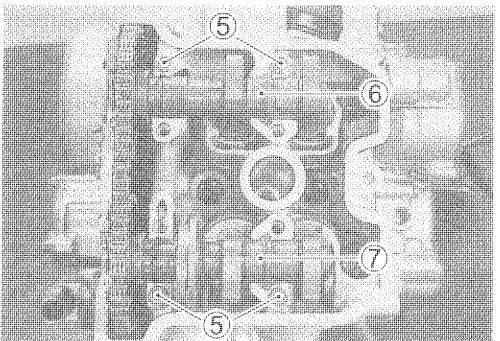
- Remove the cam chain guide ③ and camshaft journal holders ④.



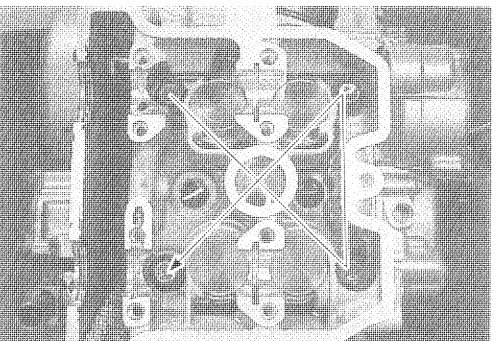
- Remove the dowel pins ⑤, intake camshaft ⑥ and exhaust camshaft ⑦.

NOTE:

Do not drop the dowel pins and camshaft drive chain into the crankcase.



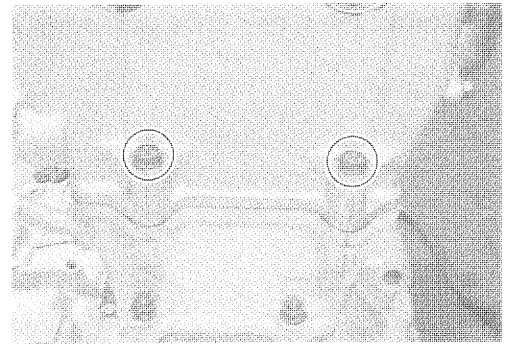
- Remove the four cylinder head bolts in diagonal stages.



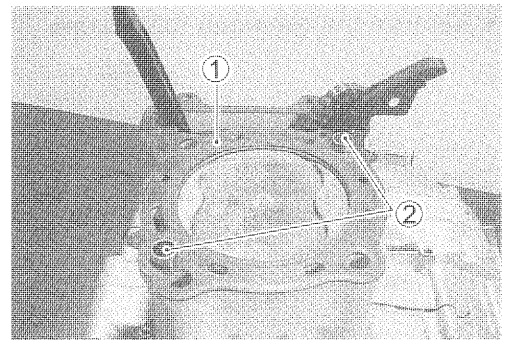
- Remove the cylinder head bolts, and then remove the cylinder head.

NOTE:

If the cylinder head does not come off easily, lightly tap it using a plastic mallet.



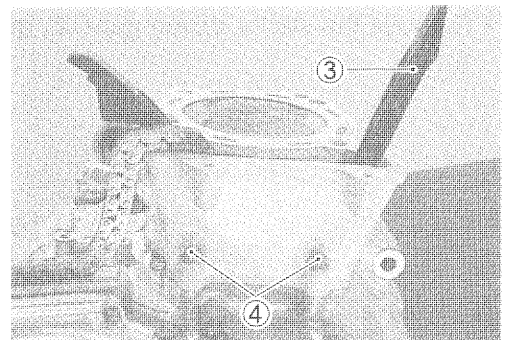
- Remove the cylinder head gasket ① and dowel pins ②.



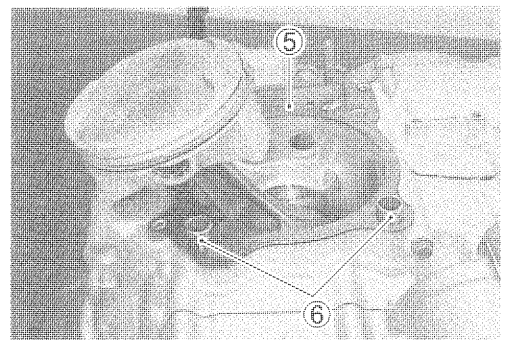
- Remove the cam chain guide ③.
- Remove the cylinder base nuts ④, and then remove the cylinder.

NOTE:

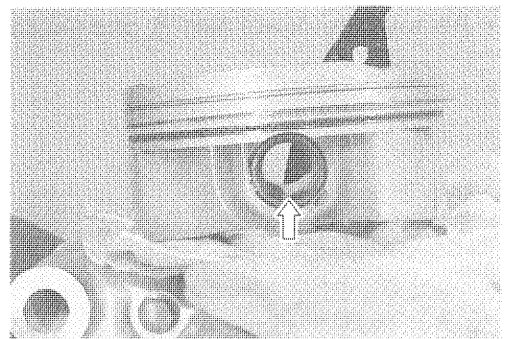
If the cylinder does not come off easily, lightly tap it using a plastic mallet.



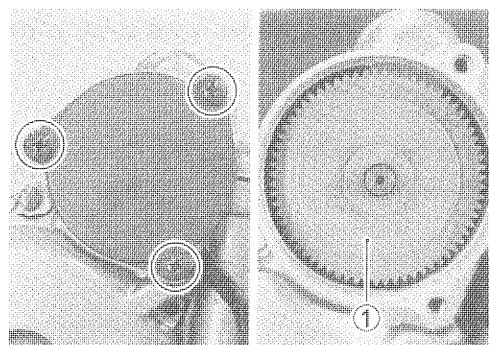
- Remove the cylinder gasket ⑤ and dowel pins ⑥.



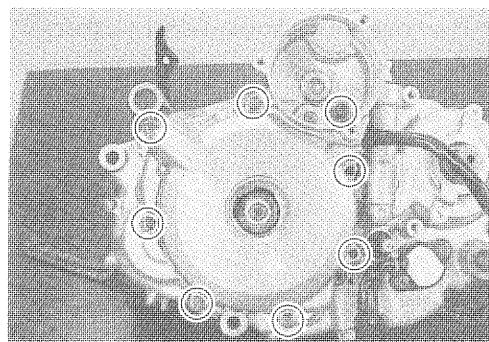
- Place a clean rag over the cylinder base to prevent the piston pin circlip from dropping into the crankcase.
- Remove the piston pin circlip.
- Draw out the piston pin and remove the piston.



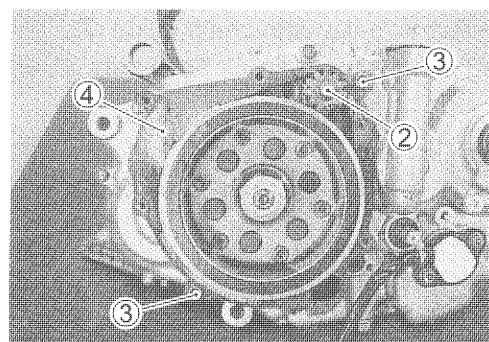
- Remove the starter drive gear cover and starter drive gear ①.



- Remove the generator rotor cover.

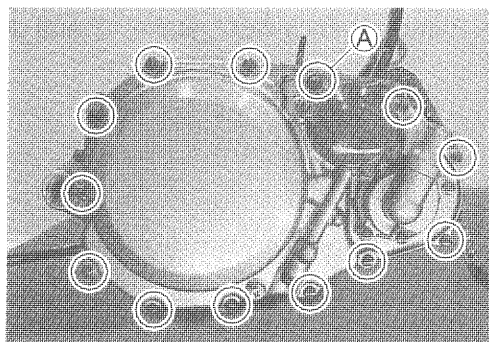


- Remove the starter driven gear ②, dowel pins ③, and gasket ④.

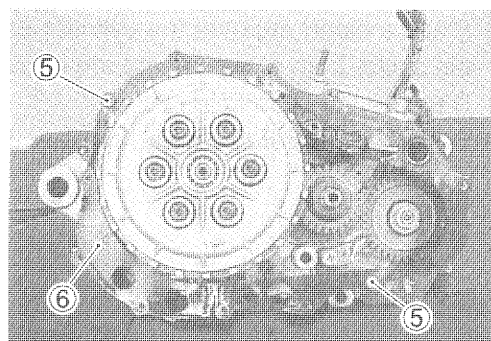


- Remove the clutch cover.

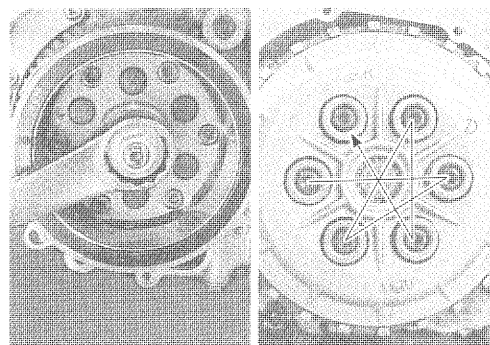
Ⓐ: Bolt with washer



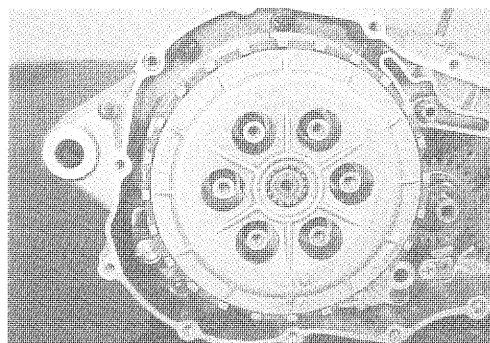
- Remove the dowel pins ⑤ and gasket ⑥.



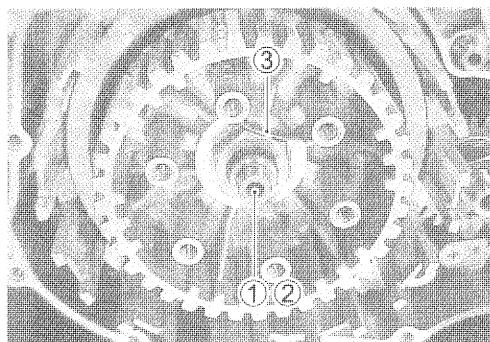
- Hold the generator rotor using a 27-mm offset wrench.
- Loosen the clutch spring set bolts working in diagonal stages.
- Remove the bolts and springs.



- Remove the clutch pressure plate, clutch drive plates, and clutch driven plates.

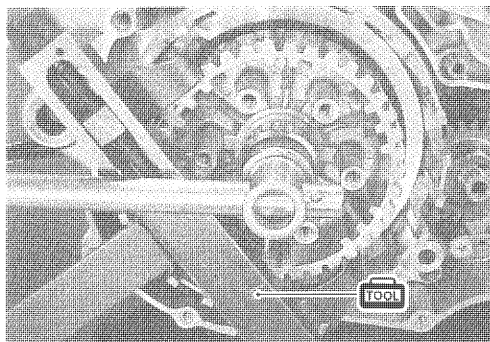


- Remove the clutch push piece ①, push rod ②.
- Flatten the clutch sleeve hub washer ③.

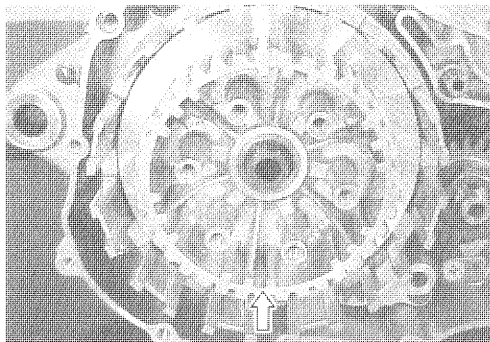


- Hold the clutch sleeve hub using the special tool, and then remove the clutch sleeve hub nut.

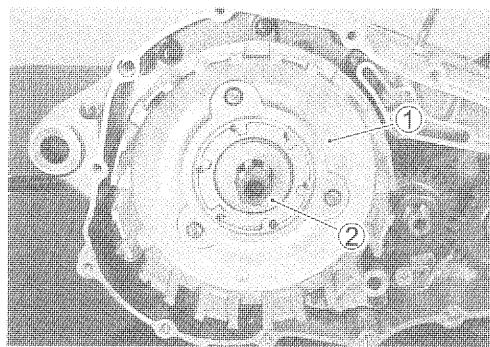
 **09920-53740: Clutch sleeve hub holder**



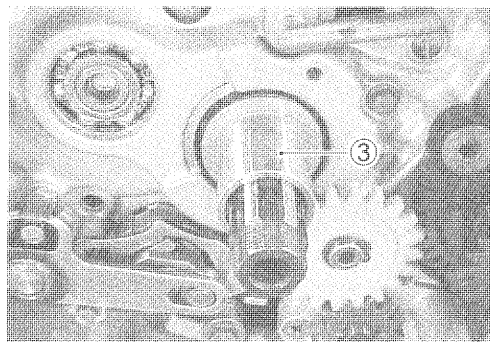
- Remove the clutch sleeve hub.



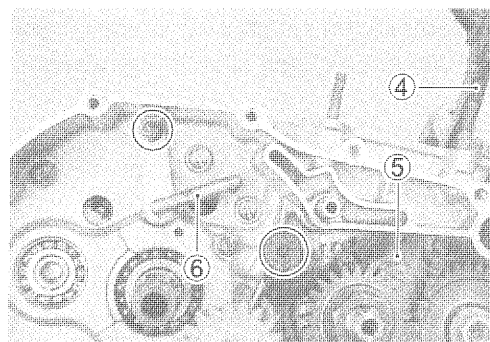
- Remove the primary driven gear assembly ① and washer ②.



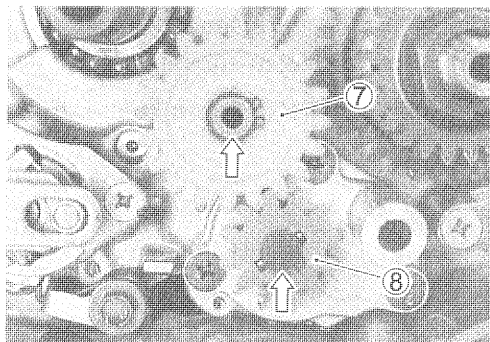
- Remove the collar ③.



- Remove the cam chain tensioner ④ and cam chain ⑤.
- Remove the oil pipe ⑥.



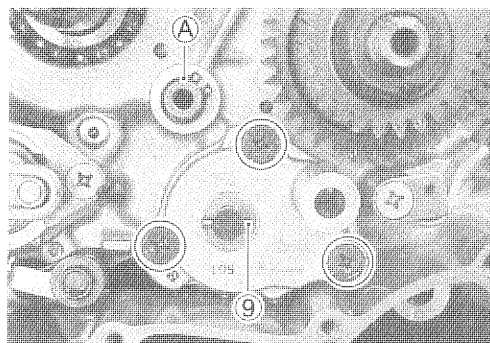
- Remove the oil pump idle gear ⑦ and oil pump driven gear ⑧.



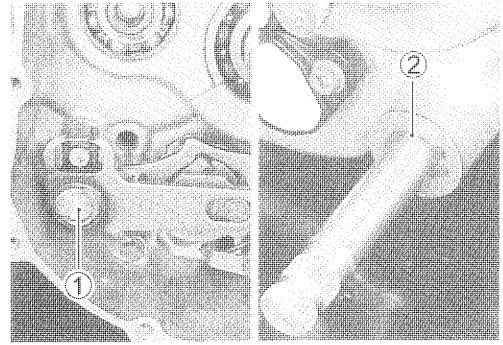
- Remove the pin ⑨ and oil pump assembly.

CAUTION

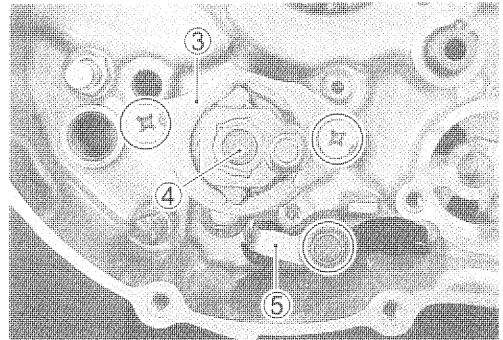
Do not remove the snap ring (A), before separating the crankcase to prevent the oil pump idle gear shaft from dropping into the crankcase.



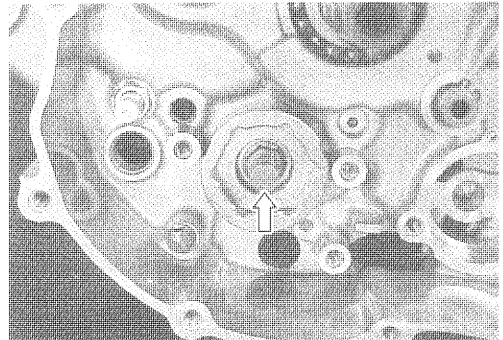
- Remove the gearshift shaft ① by removing the snap ring ②.



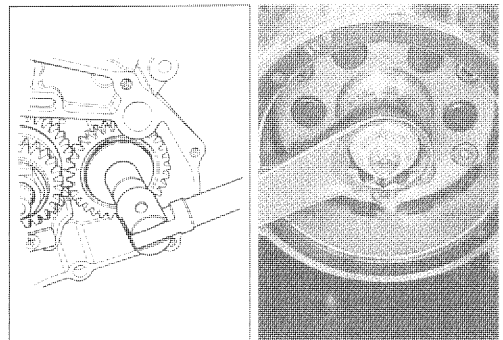
- Remove the gearshift pawl lifter ③ and gearshift cam driven gear ④.
- Remove the gearshift cam stopper arm ⑤.



- Remove the gearshift cam driven gear bolt.



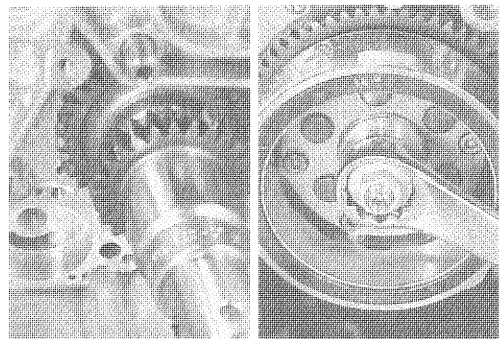
- Hold the generator rotor using a 27-mm offset wrench, and then remove the balancer driven gear nut.
- Remove the washer, balancer driven gear, and pin.



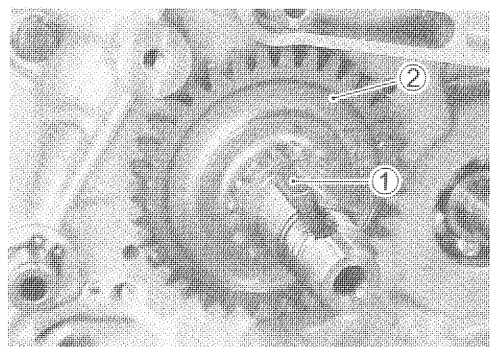
- Hold the generator rotor using a 27-mm offset wrench, and then remove the primary drive gear nut, washer and primary drive gear.

CAUTION

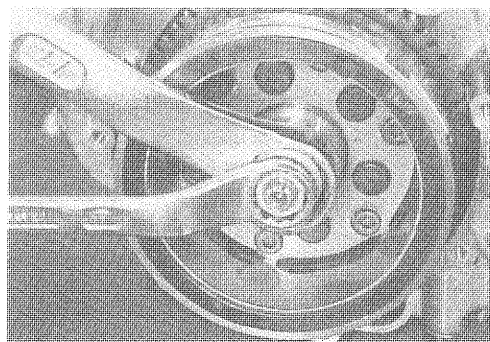
The primary drive gear nut has left-hand threads.



- Remove the key ①, balancer drive gear ② and pin.



- Hold the generator rotor using a 27-mm offset wrench, and then remove the generator rotor nut.



- Remove the generator rotor using the special tool.

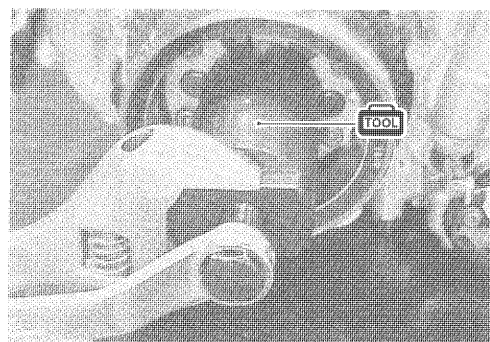
TOOL 09930-31921: Rotor remover

NOTE:

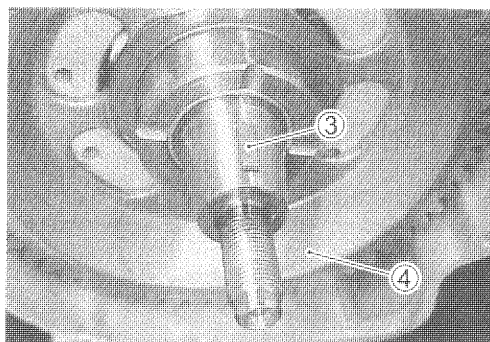
Temporarily install the generator rotor nut to the crankshaft, and then remove the generator rotor using the special tool.

CAUTION

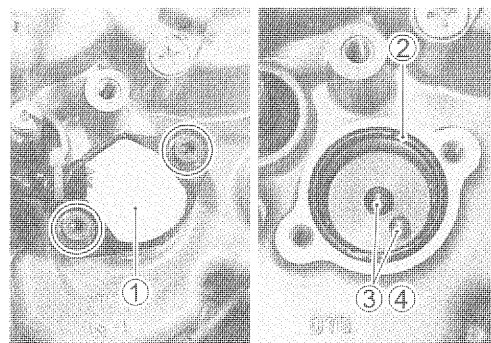
Do not hit the generator rotor with a hammer, otherwise the rotor may be damaged.



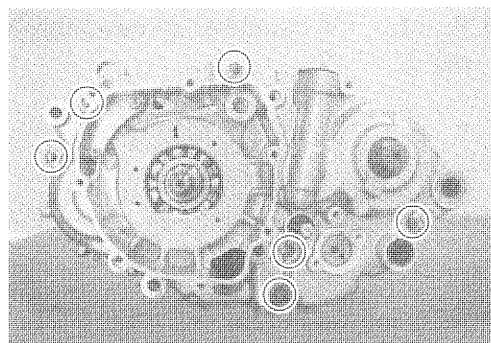
- Remove the generator rotor key ③.
- Remove the starter driven gear ④.



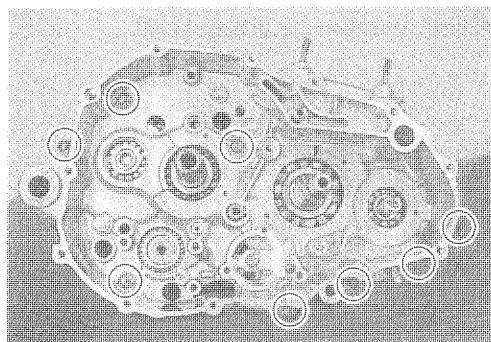
- Remove the neutral switch ①.
- Remove the O-ring ②, switch contacts ③ and springs ④.



- Remove the left crankcase securing bolts.



- Remove the right crankcase securing bolts.

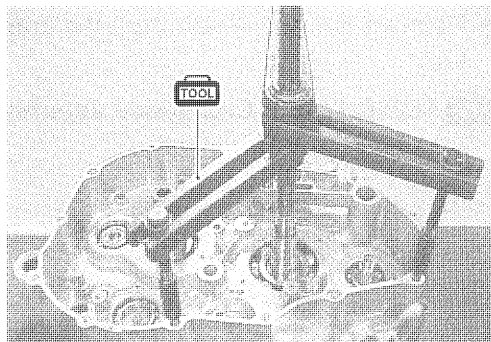


- Separate the crankcase using the special tool.

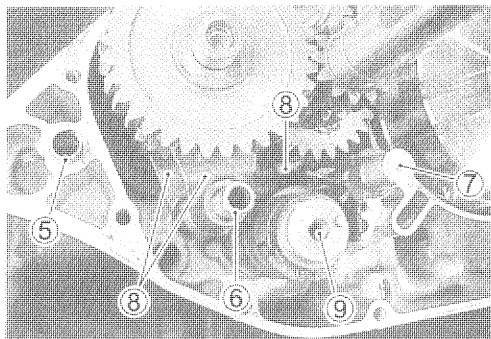
TOOL 09920-13120: Crankcase separating tool

NOTE:

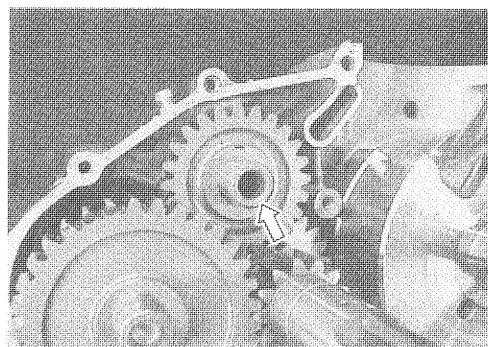
Fit the crankcase separating tool to the right crankcase, so that the tool plate is paralleled with the end face of the crankcase.



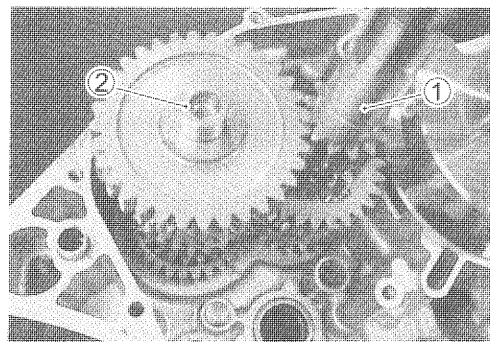
- Remove the dowel pin ⑤.
- Remove the gearshift fork shaft ⑥, reverse lock shaft ⑦, gearshift forks ⑧ and gearshift cam ⑨.



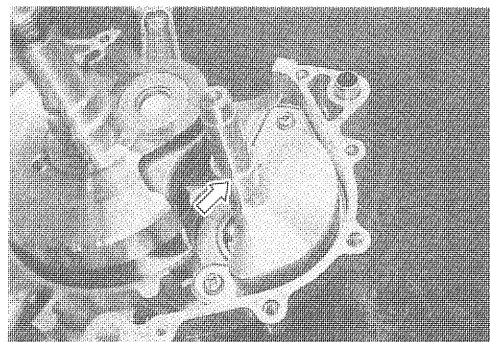
- Remove the reverse idle gear with its shaft.



- Remove the countershaft assembly ① and driveshaft assembly ②.

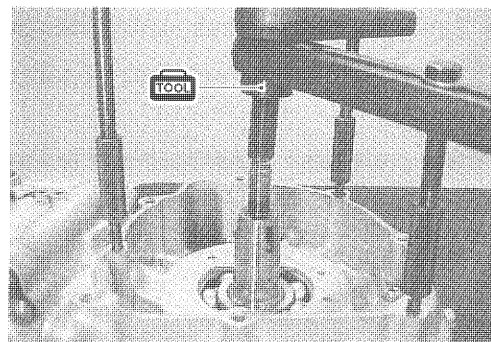


- Remove the balancer shaft.



- Remove the crankshaft from the crankcase using the special tool.

 09920-13120: Crankcase separating tool



ENGINE COMPONENTS INSPECTION AND SERVICE

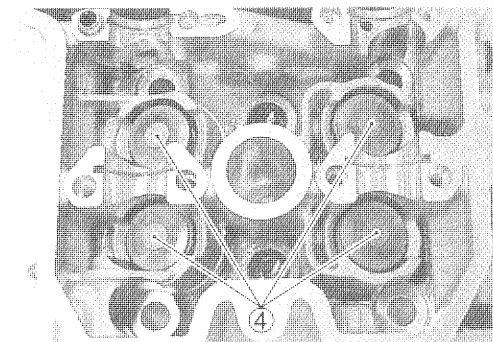
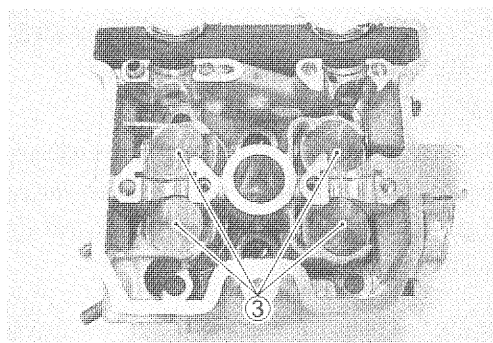
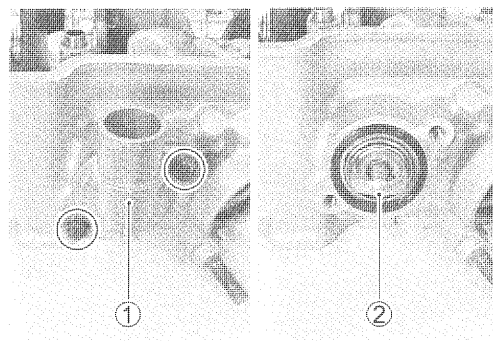
CYLINDER HEAD

DISASSEMBLY

CAUTION

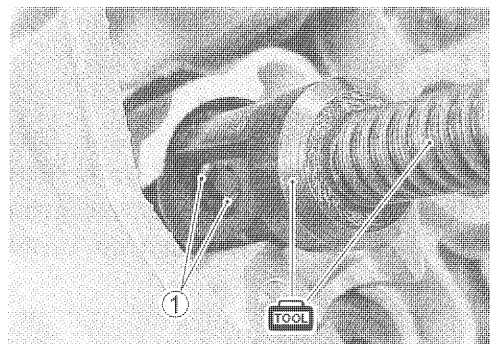
Identify the position of each removed part. Organize the parts in their respective groups (i.e., exhaust or intake) so that they can be installed in their original positions.

- Remove the intake pipe.
- Remove the engine coolant hose housing ① and thermostat ②.
- Remove the tappets ③ and shims ④ by hand or by using a magnet.

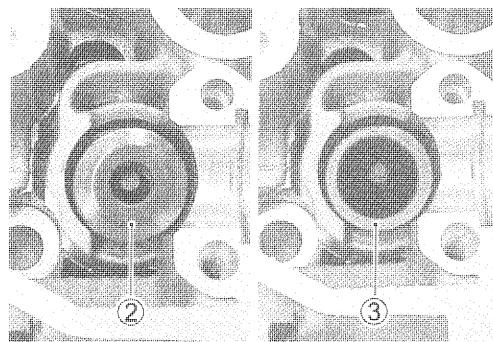


- Compress the valve springs, and then remove the valve cot-
ters ① from the valve stem using the special tools.

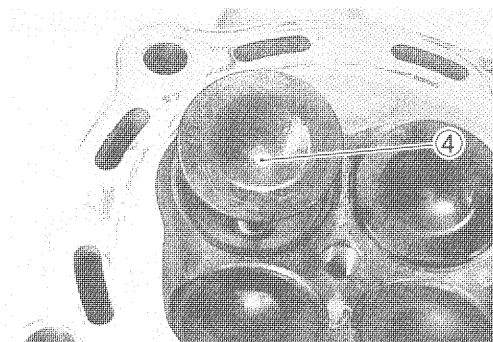
TOOL 09916-14510: Valve spring compressor
 09916-14910: Attachment
 09916-84511: Tweezers



- Remove the valve spring retainer ② and valve spring ③.



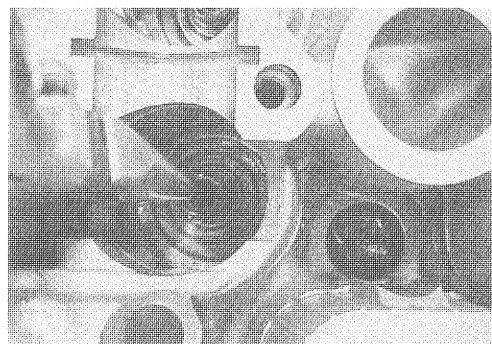
- Remove the valve ④ from the other side.



- Remove the oil seal with long-nose pliers.
- Remove the valve spring seat.

NOTE:

Removal of valves completes ordinary disassembling work. If valve guides have to be removed for replacement after inspecting the related parts, carry out the steps shown in the valve guide servicing.



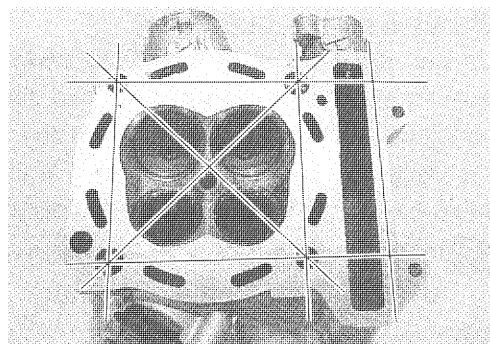
CYLINDER HEAD DISTORTION

Decarbonize the combustion chamber.

Check the gasket surface of the cylinder head for distortion using a straightedge and thickness gauge. Take clearance readings at several places. If any clearance reading exceeds the service limit, replace the cylinder head with a new one.

TOOL 09900-20803: Thickness gauge

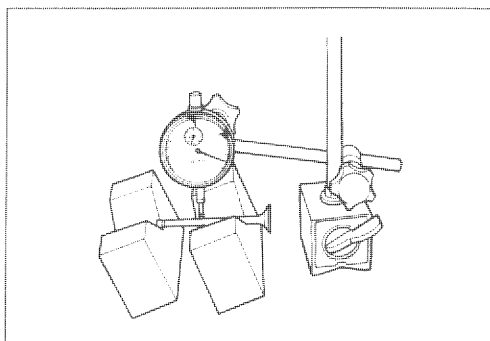
DATA Cylinder head distortion
Service Limit: 0.05 mm (0.002 in)

**VALVE STEM RUNOUT**

Support the valve using V-blocks and measure the valve stem runout using the dial gauge, as shown. If the runout exceeds the service limit, replace the valve with a new one.

TOOL 09900-20606: Dial gauge (1/100 mm)
09900-20701: Magnetic stand
09900-21304: V-block set (100 mm)

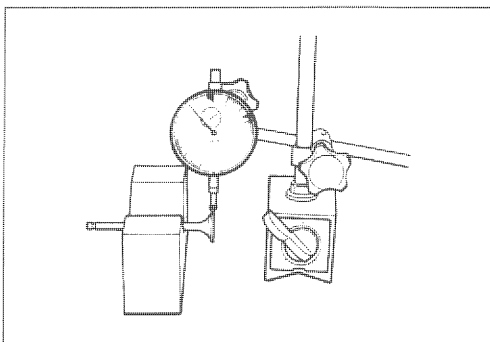
DATA Valve stem runout
Service Limit: 0.05 mm (0.002 in)

**VALVE HEAD RADIAL RUNOUT**

Support the valve using a V-block and measure the valve head radial runout using the dial gauge, as shown. If the runout exceeds the service limit, replace the valve with a new one.

TOOL 09900-20606: Dial gauge (1/100 mm)
09900-20701: Magnetic stand
09900-21304: V-block set (100 mm)

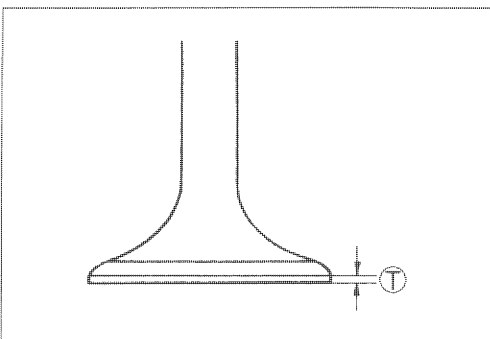
DATA Valve head radial runout
Service Limit: 0.03 mm (0.001 in)

**VALVE FACE WEAR**

Visually inspect each valve face for wear or damage. If any abnormal wear is found, replace the respective valve with a new one. Measure the valve head thickness $\textcircled{T}$. If the valve head thickness is not within the specified value, replace the valve with a new one.

TOOL 09900-20101: Vernier calipers

DATA Valve head thickness $\textcircled{T}$
Service Limit: 0.5 mm (0.02 in)

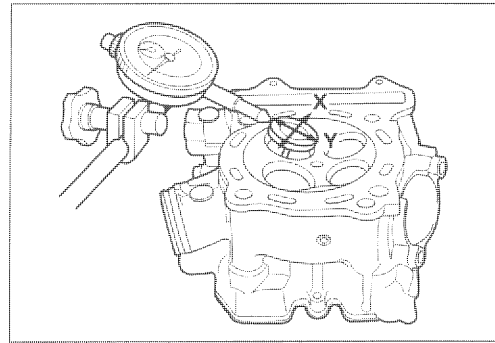


VALVE STEM DEFLECTION

Lift the valve about 10 mm (0.39 in) from the valve seat. Measure the valve stem deflection in two directions, "X" and "Y", perpendicular to each other. Position the dial gauge as shown. If the deflection exceeds the service limit, determine whether the valve or the guide should be replaced with a new one.

TOOL 09900-20606: Dial gauge (1/100 mm)
09900-20701: Magnetic stand

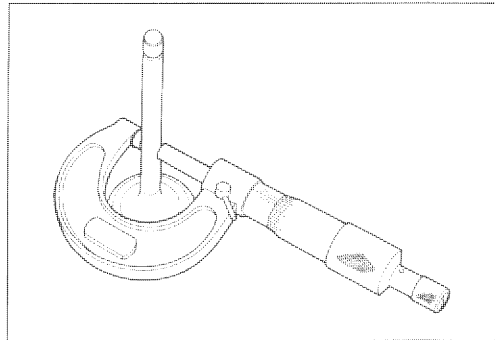
DATA Valve stem deflection
Service Limit: 0.35 mm (0.014 in)

**VALVE STEM WEAR**

Measure the valve stem outside diameter using the micrometer. If the outside diameter is not within the specified value, replace the valve with a new one. If the valve stem outside diameter is within specification, but the valve stem deflection is not, replace the valve guide with a new one. After replacing the valve or valve guide, check the deflection.

TOOL 09900-20205: Micrometer (0 – 25 mm)

DATA Valve stem O.D.
Standard
IN: 4.975 – 4.990 mm (0.1959 – 0.1965 in)
EX: 4.955 – 4.970 mm (0.1951 – 0.1957 in)

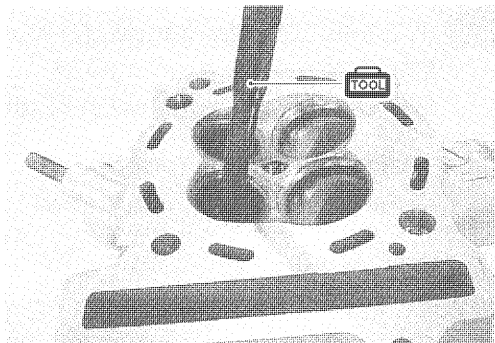
**VALVE GUIDE SERVICING**

- Drive the valve guide out toward the camshaft side using the valve guide remover.

TOOL 09916-44310: Valve guide remover/installer

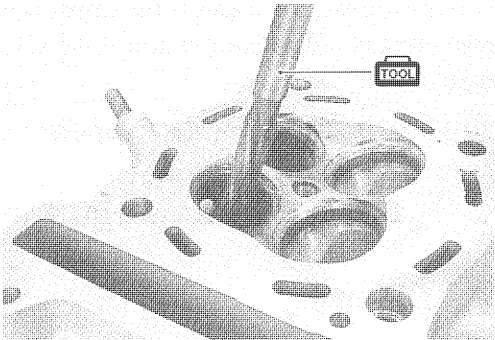
NOTE:

- * Discard the removed valve guide.
- * Only oversized valve guides are available as replacement parts.



- Refinish the valve guide holes in the cylinder head using the valve guide reamer and handle.

TOOL 09916-34580: Valve guide reamer (10.8 mm)
09916-34542: Reamer handle



- Oil the stem hole of each valve guide and drive the guide into the guide hole using the valve guide installer and attachment.

TOOL 09916-44310: Valve guide remover/installer
09916-53360: Valve guide installer attachment

CAUTION

Failure to oil the valve guide hole before driving the new guide into place may result in a damaged guide or head.

- After fitting the valve guides, refinish their guiding bores with the valve guide reamer. Be sure to clean and oil the guides after reaming.

TOOL 09916-34570: Valve guide reamer (5.0 mm)
09916-34542: Reamer handle

VALVE SEAT WIDTH

- Coat the valve seat uniformly with prussian blue. Install the valve and attach a valve lapper onto it. Tap the coated seat with the valve face in a rotating manner, in order to obtain a clear impression of the seating contact.

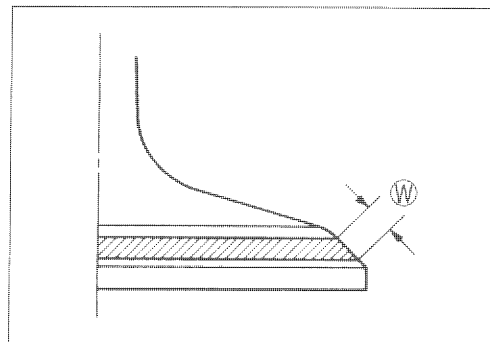
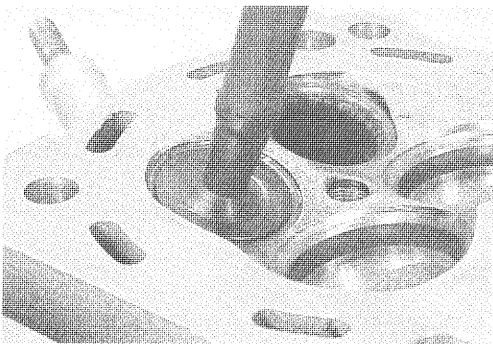
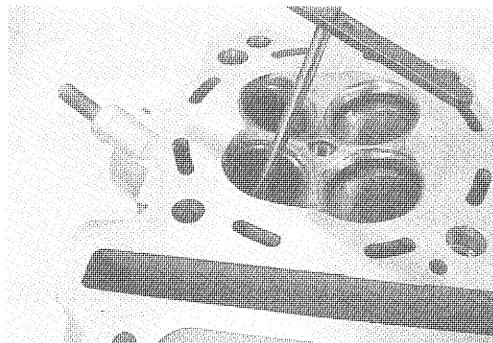
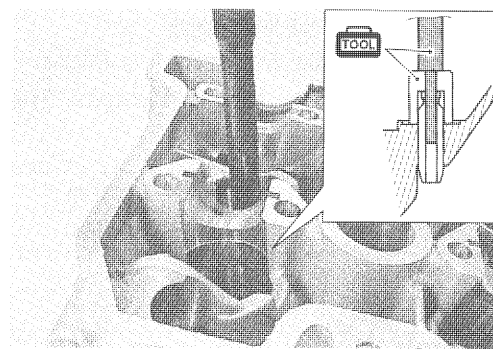
TOOL 09916-10911: Valve lapper set

- The ring-like dye impression left on the valve face must be continuous, without any breaks. In addition, the width of the dye ring, which is the valve seat width, must be within the following specification.

DATA Valve seat width W

Standard: 0.9 – 1.1 mm (0.035 ± 0.043 in)

If the valve seat is out of specification, re-cut the seat.



VALVE SEAT SERVICING

The valve seats for both the intake and exhaust valves are machined to three different angles. The seat contact surface is cut at 45°.

	Intake	Exhaust
45°	N-128	N-128
15°	—	N-121
30°	N-128	—
60°	N-114	N-114

For USA

 Valve seat cutter: N-114, N-121 and N-128

Solid pilot: N-100-5.0

For the other countries

 09916-21110: Valve seat cutter set

09916-22420: Cutter N-128

09916-22430: Cutter N-114

09916-20610: Cutter N-121

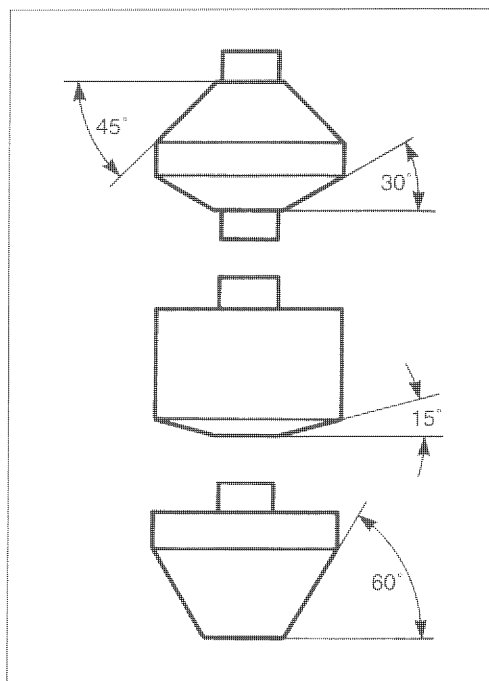
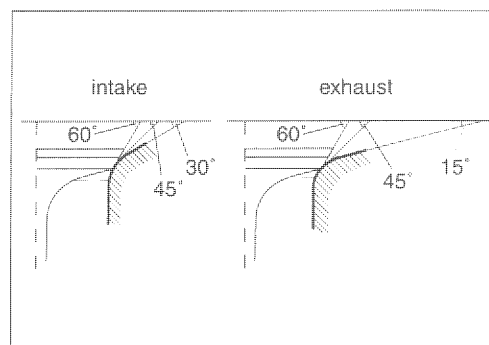
09916-24311: Solid pilot N-100-5.0

NOTE:

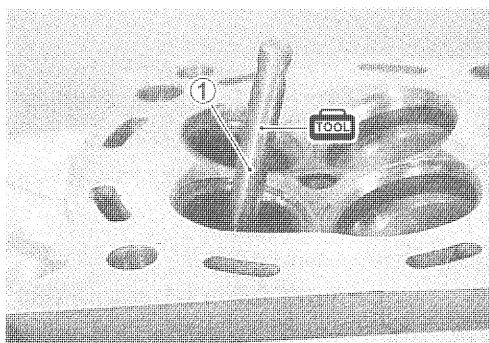
Use the solid pilot N-100-5.0 along with the valve seat cutters N-114, N-121, and N-128.

CAUTION

The valve seat contact area must be inspected after each cut.



- When installing the solid pilot ① rotate it slightly.

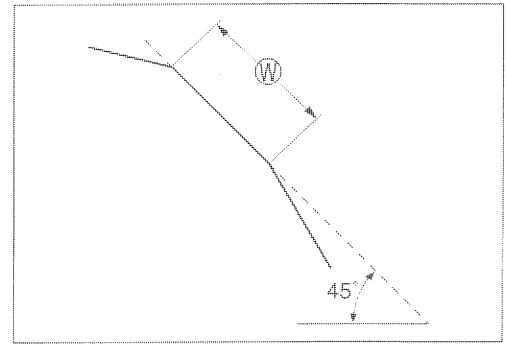


- Seat the pilot snugly. Install the 45° cutter ②, attachment and T-handle.



INITIAL SEAT CUT

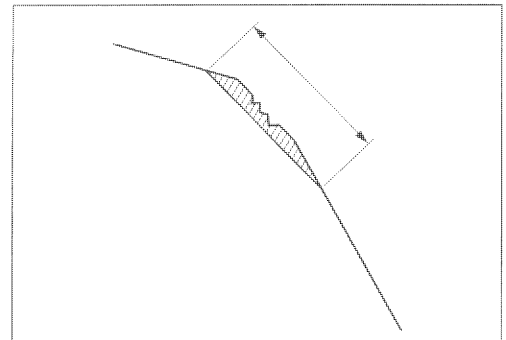
- Descal and clean up the seat using the 45° cutter. Rotate the cutter one or two turns.
- Measure the valve seat width $\textcircled{W}$ after every cut.



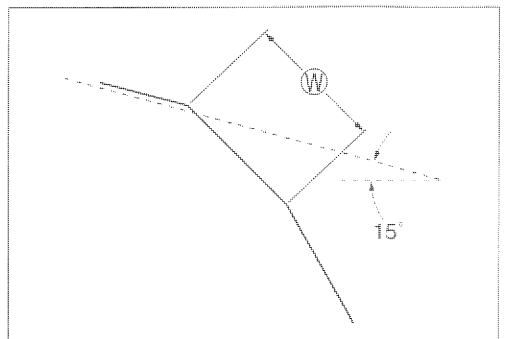
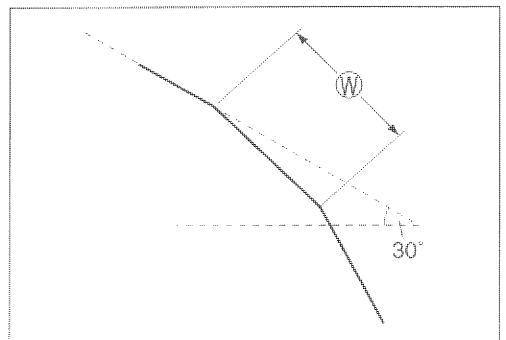
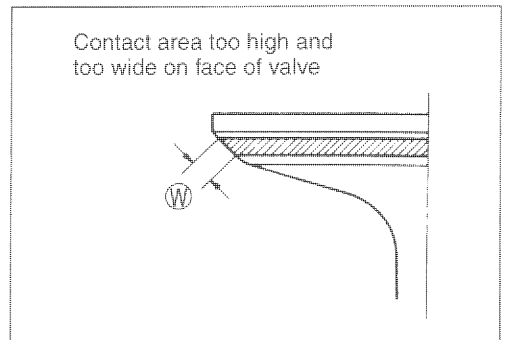
- If the valve seat is pitted or burned, use the 45° cutter to condition the seat some more.

NOTE:

Cut only the minimum amount necessary from the seat to prevent the possibility of the tappet shim replacement.

**TOP NARROWING CUT**

- If the contact area is too high on the valve, or if it is too wide, use the 30° cutter (for the intake side) and the 15° cutter (for the exhaust side) to lower and narrow the contact area.



FINAL SEAT CUT

- If the contact area is too low or too narrow, use the 60° cutter to raise and widen the contact area. If the contact area is too high or too wide, use the 15° or 30° cutter to lower and narrow it to the correct width.
- After the desired seat position and width is achieved, use the 60° cutter very lightly to clean up any burrs caused by the previous cutting operations.

CAUTION

DO NOT use a lapping compound after the final cut is made. The finished valve seat should have a velvety smooth finish but not a highly polished or shiny one. This will provide a soft surface for the final seating of the valve which will occur during the first few seconds of engine operation.

NOTE:

After servicing the valve seats, be sure to check the tappet clearance after the cylinder head has been installed. (➡ 2-5 to 2-9)

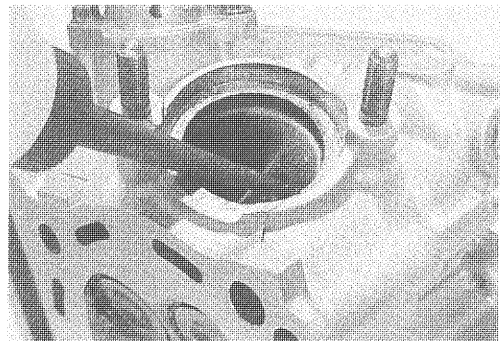
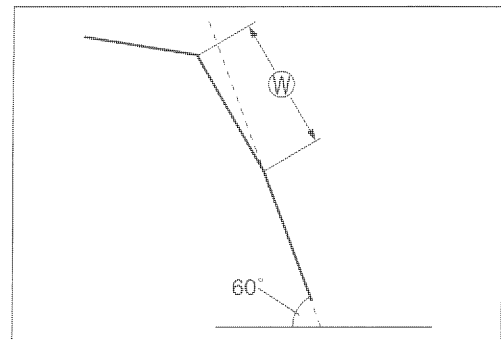
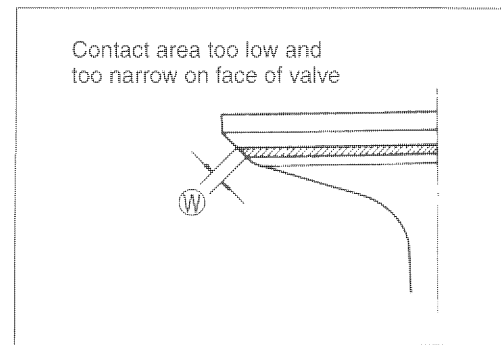
VALVE SEAT SEALING CONDITION INSPECTION

With the valve and valve spring assembled, pour a small quantity of gasoline into the intake or exhaust port.

Check that no gasoline leaks through the valve seat. If leakage is found, correct the sealing surface.

⚠ WARNING

Gasoline is highly flammable and explosive.
Keep heat, sparks, and flames away from gasoline.



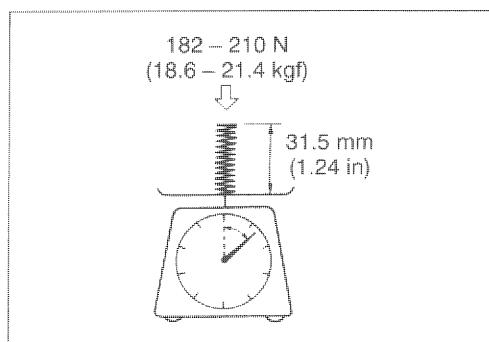
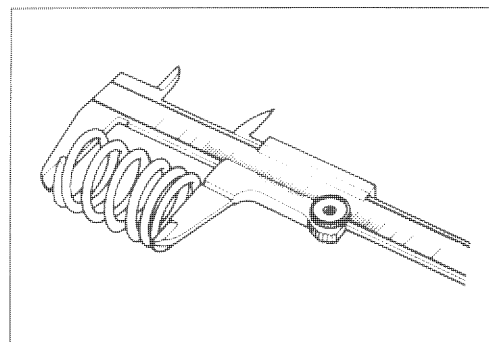
VALVE SPRING

The force of the coil spring keeps the valve seat tight. A weakened spring results in reduced engine power output and accounts for the chattering noise coming from the valve mechanism.

Check the valve springs for proper strength by measuring their free length and also by the force required to compress them. If the spring length is less than the service limit or if the force required to compress the valve spring is not within specification, replace both the inner and outer springs as a set.

DATA Valve spring free length (IN & EX)
Service Limit: 38.8 mm (1.53 in)

DATA Valve spring tension (IN & EX)
Standard: 182 – 210 N (18.6 – 21.4 kgf, 41.0 – 47.2 lbs)
at length 31.5 mm (1.24 in)

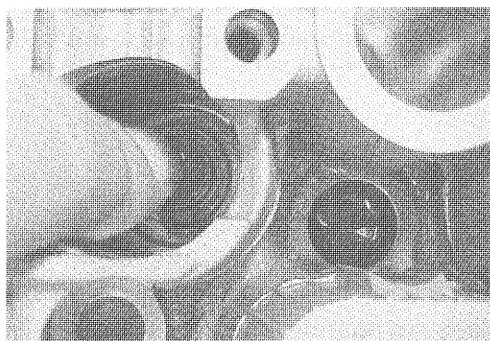


REASSEMBLY

- Install each valve spring seat.
- Apply molybdenum oil solution to each oil seal and press-fit them into position.

CAUTION

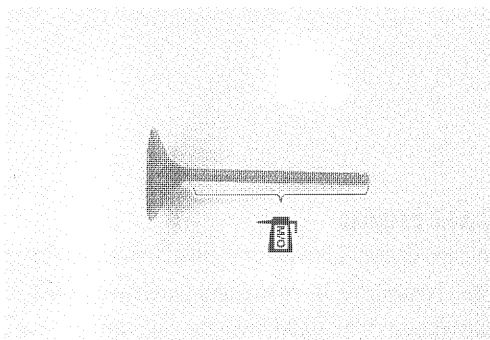
Do not reuse the oil seals.



- Apply molybdenum oil solution to the valve as shown, and then insert them into the valve guides.

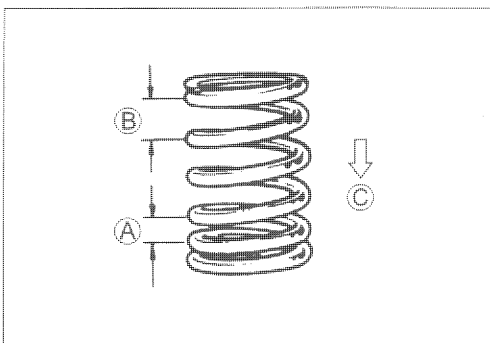
CAUTION

When inserting each valve into the valve guides, make sure not to damage the lip of the oil seal.



- Install the valve spring with the smaller pitch (A) facing the cylinder head.

- (B) Larger pitch
- (C) Down



- Install the valve spring retainer by pressing down the spring using the valve lifter. Fit the cotter halves to the stem end and release the lifter to allow the cotter ① to wedge between the retainer and the valve stem. Make sure that the rounded lip ② of the cotter fits snugly into the groove ③ in the stem end.

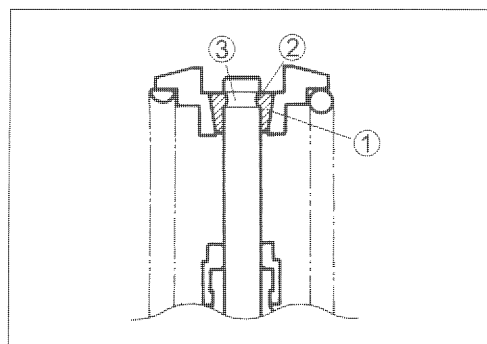
TOOL 09916-14510: Valve spring compressor

09916-14910: Attachment

09916-84511: Tweezers

CAUTION

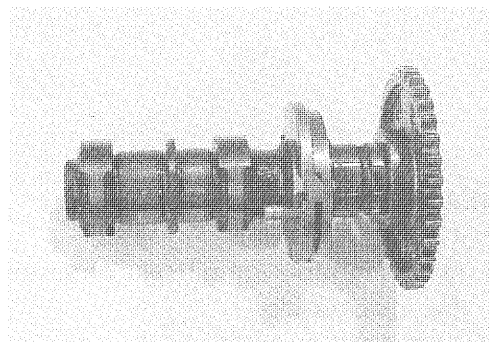
Be sure to install all of the parts in their original positions.



CAMSHAFT/AUTOMATIC DECOMPRESSION ASSEMBLY

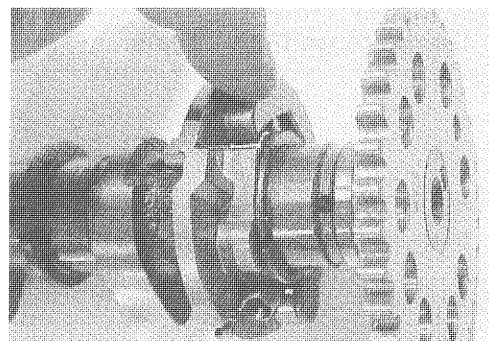
CAUTION

Do not attempt to disassemble the camshaft/automatic decompression assembly. It is not serviceable.



AUTOMATIC DECOMPRESSION

Move the automatic decompression weight by hand to inspect if it is operating smoothly. If the automatic decompression weight does not operate smoothly, replace it with a new one.



CAM WEAR

Worn-down cams are often the cause of mistimed valve operation resulting in reduced power output.

Measure the cam height $\oplus$ using the micrometer. If the cams are worn to the service limit, replace the camshaft with a new one.

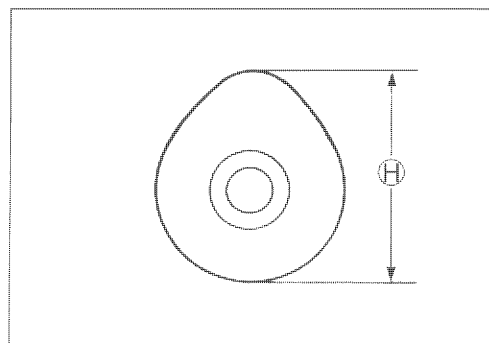
TOOL 09900-20202: Micrometer (25 – 50 mm)

DATA Cam height $\oplus$

Service Limit

IN: 36.020 mm (1.4181 in)

EX: 34.900 mm (1.3740 in)



CAMSHAFT JOURNAL WEAR

Measure the oil clearance, with the camshaft installed, using the plastigauge.

TOOL 09900-22301: Plastigauge
09900-22302: Plastigauge

DATA Camshaft journal oil clearance (IN & EX)
Service Limit: 0.150 mm (0.0059 in)

- Tighten the camshaft journal holder bolts evenly and in diagonal stages to the specified torque.

Camshaft journal holder bolt:
10 N·m (1.0 kgf-m, 7.0 lb-ft)

NOTE:

Do not rotate the camshaft with the plastigauge in place.

Remove the journal holders and read the width of the compressed plastigauge with the envelope scale. This measurement should be taken at the widest part of the compressed plastigauge.

If the camshaft journal oil clearance exceeds the service limit, measure the inside diameter of the camshaft journal holder and outside diameter of the camshaft journal. Replace the camshaft or the cylinder head and camshaft holder depending upon which one exceeds the specification.

TOOL 09900-22403: Small bore gauge

DATA Camshaft journal holder I.D. (IN & EX)
Standard: 22.012 – 22.025 mm (0.8666 – 0.8671 in)

TOOL 09900-20205: Micrometer (0 – 25 mm)

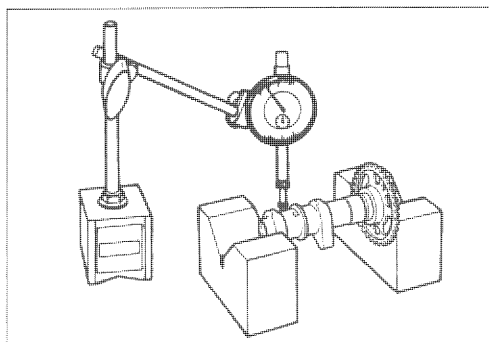
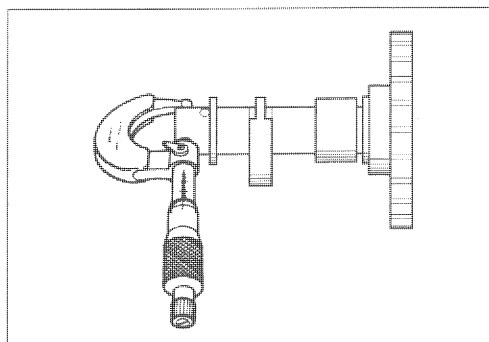
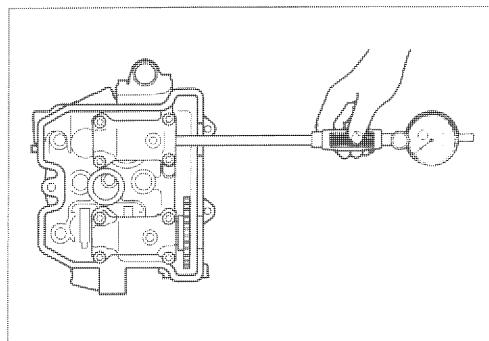
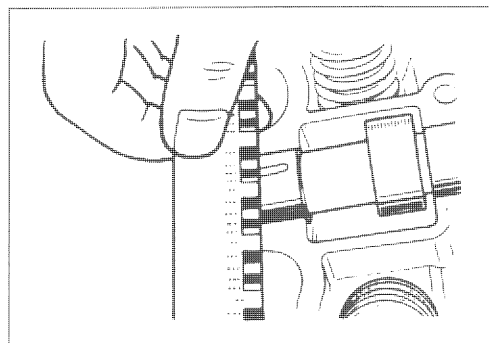
DATA Camshaft journal O.D. (IN & EX)
Standard: 21.972 – 21.993 mm (0.8653 – 0.8659 in)

CAMSHAFT RUNOUT

Support the valve using V-blocks and measure the camshaft runout using the dial gauge. If the runout exceeds the service limit, replace the camshaft with a new one.

TOOL 09900-20606: Dial gauge (1/100 mm)
09900-20701: Magnetic stand
09900-21304: V-block set (100 mm)

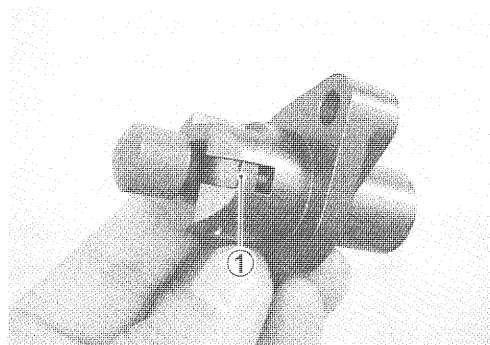
DATA Camshaft runout
Service Limit: 0.10 mm (0.004 in)



CAM CHAIN TENSION ADJUSTER AND TENSIONER

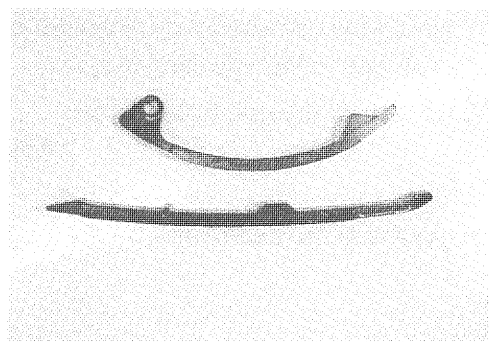
Check that the push rod slides smoothly when unlocking the ratchet mechanism ①.

If push rod does not slide smoothly, replace the cam chain tension adjuster with a new one.



Check the contacting surface of the cam chain tensioner and cam chain guide.

If it is found to be damaged, replace it with a new one.



CYLINDER

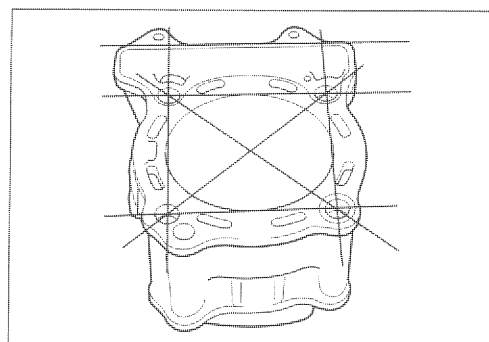
CYLINDER DISTORTION

Check the gasket surface of the cylinder block for distortion using a straightedge and thickness gauge. Take clearance readings at several places. If any clearance reading exceeds the service limit, replace the cylinder block with a new one.

TOOL 09900-20803: Thickness gauge

DATA Cylinder distortion

Service Limit: 0.05 mm (0.002 in)



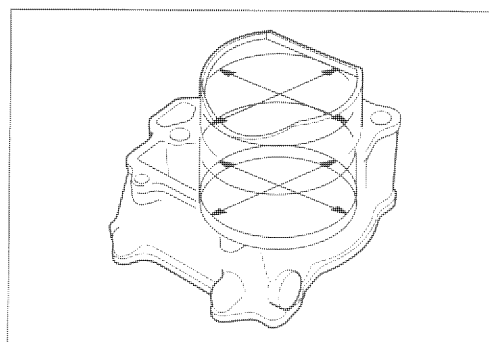
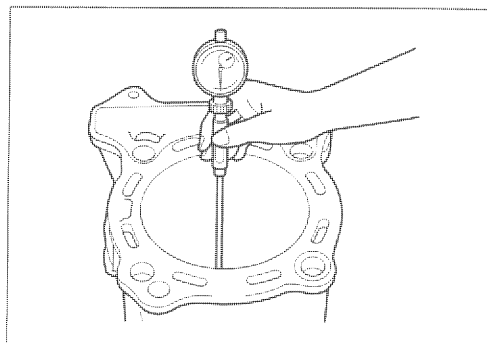
CYLINDER BORE

Inspect the cylinder wall for any scratches, nicks or other damage. Measure the cylinder bore diameter at six places.

TOOL 09900-20508: Cylinder gauge set

DATA Cylinder bore

Standard: 90.000 – 90.015 mm (3.5433 – 3.5439 in)



PISTON AND PISTON RING

PISTON DIAMETER

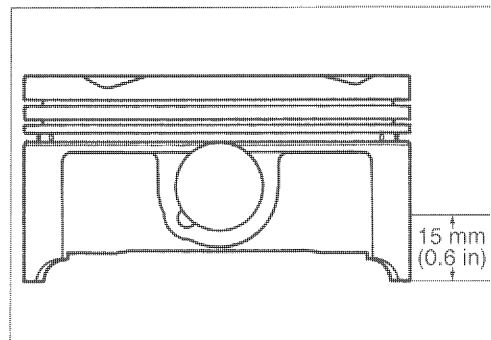
Measure the piston diameter using the micrometer at 15 mm (0.6 in) from the skirt end.

If the piston diameter is less than the service limit, replace the piston with a new one.

TOOL 09900-20204: Micrometer (75 – 100 mm)

DATA Piston diameter

Service Limit: 89.880 mm (3.5386 in)



PISTON-RING-TO-GROOVE CLEARANCE

Measure the side clearances of the 1st and 2nd piston rings using the thickness gauge. If any clearance reading exceeds the service limit, replace both the piston and piston rings.

TOOL 09900-20803: Thickness gauge

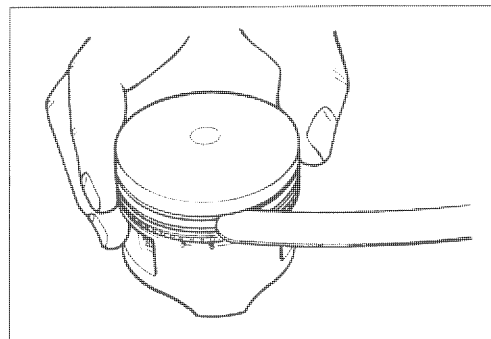
09900-20205: Micrometer (0 – 25 mm)

DATA Piston-ring-to-groove clearance

Service Limit:

1st: 0.180 mm (0.007 in)

2nd: 0.150 mm (0.006 in)



DATA Piston ring groove width

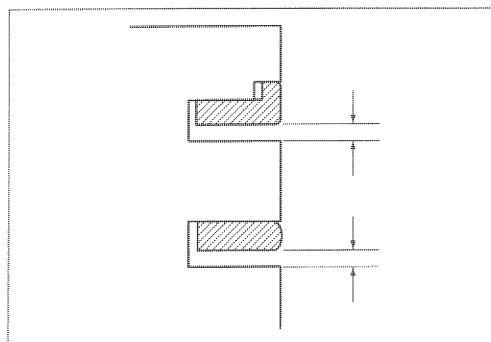
Standard:

1st: 0.78 – 0.80 mm (0.0307 – 0.0315 in)

1.30 – 1.32 mm (0.0512 – 0.0520 in)

2nd: 0.81 – 0.83 mm (0.0319 – 0.0327 in)

Oil: 2.01 – 2.03 mm (0.0791 – 0.0799 in)



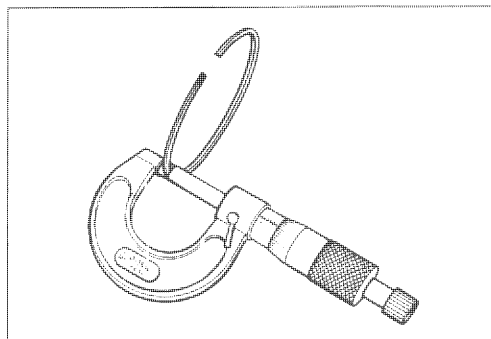
DATA Piston ring thickness

Standard:

1st: 0.71 – 0.76 mm (0.0280 – 0.0299 in)

1.08 – 1.10 mm (0.0425 – 0.0433 in)

2nd: 0.77 – 0.79 mm (0.0303 – 0.0311 in)



PISTON RING FREE END GAP AND PISTON RING END GAP

Measure the piston ring free end gap using the vernier calipers, first, and then fit the piston ring squarely into the cylinder and measure the piston ring end gap using the thickness gauge.

If any measurement exceeds the service limit, replace the piston ring with a new one.

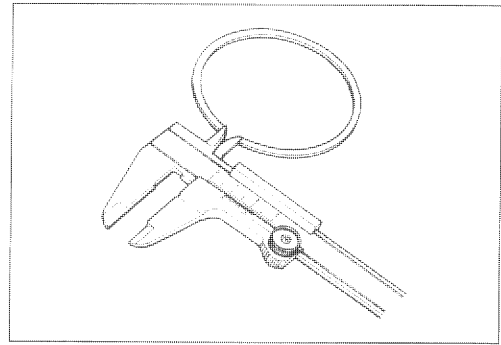
TOOL 09900-20101: Vernier calipers

DATA Piston ring free end gap

Service Limit:

1st: 5.5 mm (0.22 in)

2nd: 9.2 mm (0.36 in)



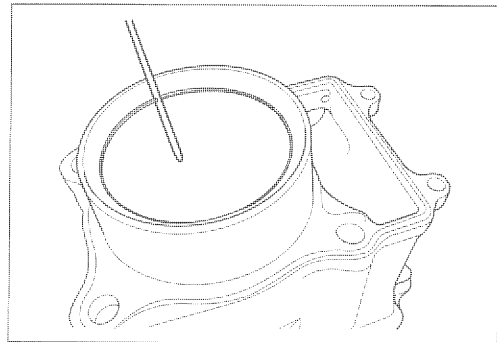
TOOL 09900-20803: Thickness gauge

DATA Piston ring end gap

Service Limit:

1st: 0.50 mm (0.020 in)

2nd: 0.50 mm (0.020 in)

**PISTON PIN AND PIN BORE**

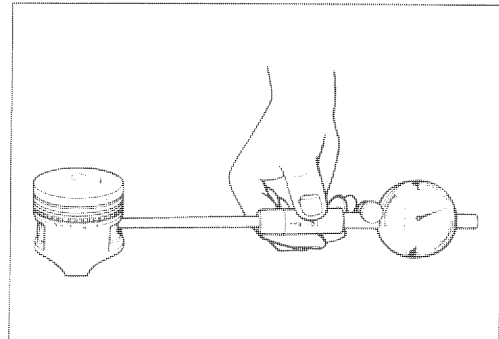
Measure the piston pin bore diameter using the small bore gauge. If the diameter exceeds the service limit, replace the piston with a new one.

TOOL 09900-20602: Dial gauge (1/1000 mm)

09900-22403: Small bore gauge (18 – 35 mm)

DATA Piston pin bore

Service Limit: 20.030 mm (0.7886 in)

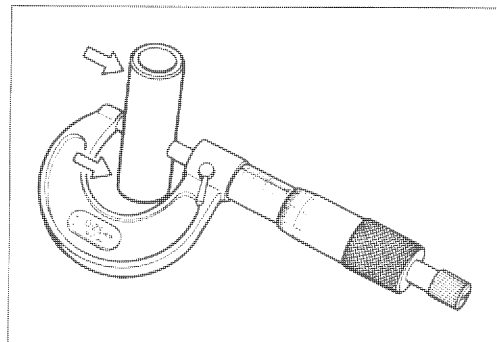


Measure the piston pin outside diameter at three positions using the micrometer. If any measurement exceeds the service limit, replace the piston pin with a new one.

TOOL 09900-20205: Micrometer (0 – 25 mm)

DATA Piston pin O.D.

Service Limit: 19.980 mm (0.7866 in)



CONROD

CONROD SMALL END I.D.

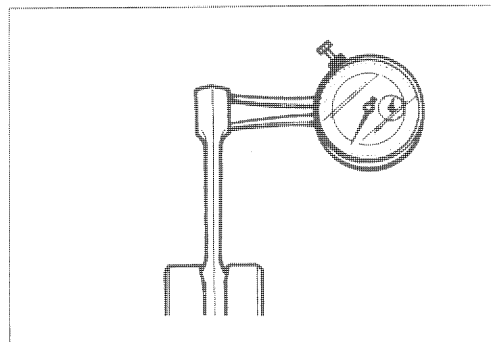
Measure the conrod small end inside diameter using the small bore gauge.

If the conrod small end inside diameter exceeds the service limit, replace the conrod with a new one.

 **09900-20605: Dial calipers**

 **Conrod small end I.D.**

Service Limit: 20.040 mm (0.7890 in)



CONROD DEFLECTION AND BIG END SIDE CLEARANCE

Wear on the big end of the conrod can be estimated by checking the movement of the small end of the rod. This method can also be used to check the extent of wear on the parts of the conrod's big end.

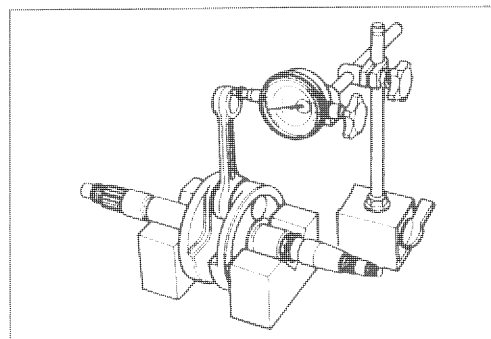
 **09900-20701: Magnetic stand**

09900-20606: Dial gauge (1/100 mm)

09900-21304: V-block set (100 mm)

 **Conrod deflection**

Service Limit: 3.0 mm (0.12 in)

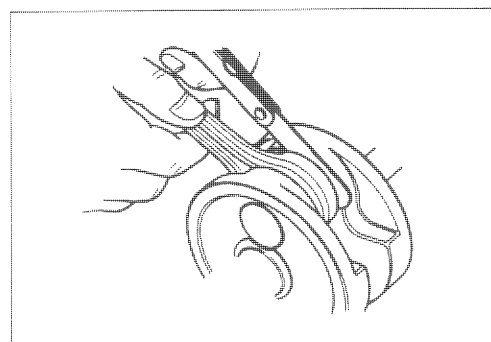


Push the big end of the conrod to one side and measure the side clearance using a thickness gauge. If the clearance exceeds the service limit, replace the crankshaft assembly with a new one or bring the deflection and the side clearance within the service limit by replacing the worn parts (conrod, big end bearing, crank pin, etc.) with new ones.

 **09900-20803: Thickness gauge**

 **Big end side clearance**

Service Limit: 1.0 mm (0.04 in)



CRANKSHAFT

CRANKSHAFT RUNOUT

Support the crankshaft using V-blocks and measure the crankshaft runout using the dial gauge, as shown. If the runout exceeds the service limit, replace the crankshaft with a new one.

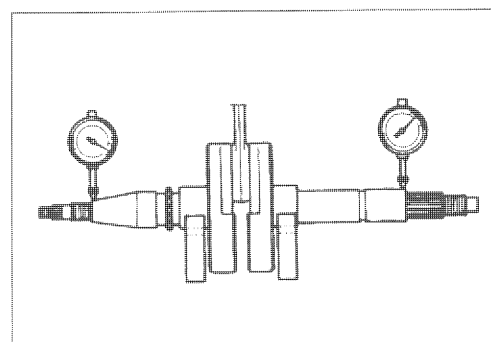
 **09900-20606: Dial gauge (1/100 mm)**

09900-20701: Magnetic stand

09910-21304: V-block set (100 mm)

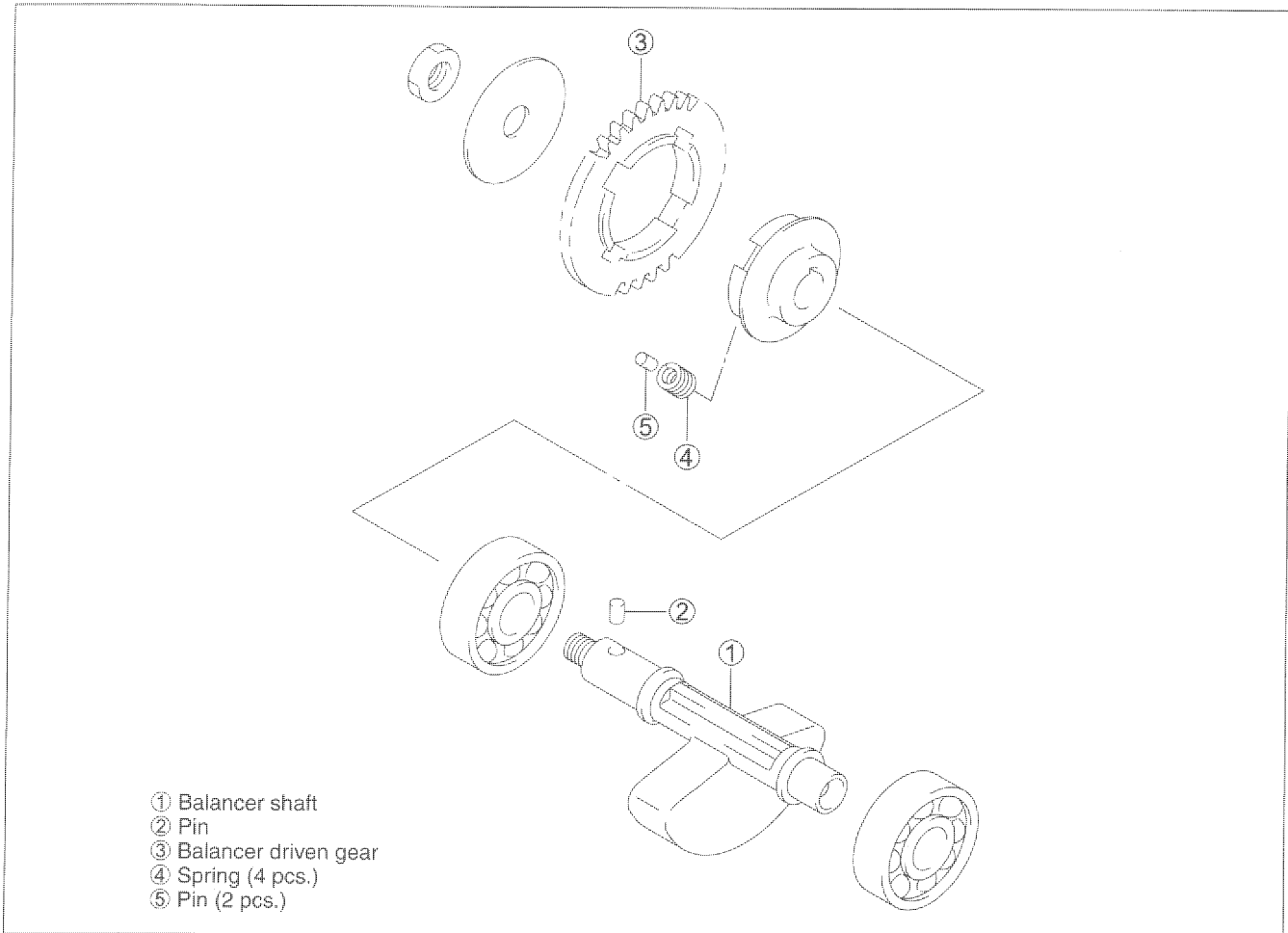
 **Crankshaft runout**

Service Limit: 0.08 mm (0.003 in)



BALANCER SHAFT AND BALANCER DRIVEN GEAR DISASSEMBLY

- Disassemble the balancer shaft as shown in the illustration.



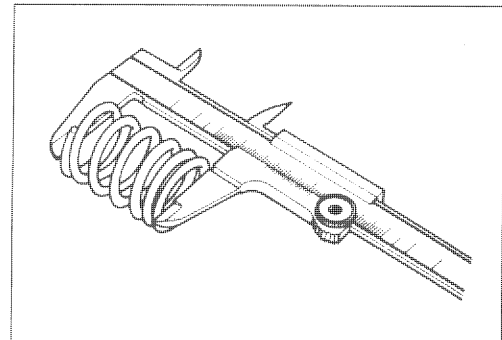
INSPECTION

Inspect the balancer shaft and balancer driven gear for wear or damage. If any wear or damage is found, replace the defective part.

Measure the free length of each balancer spring. If any spring length is less than the service limit, replace all of the spring.

TOOL 09900-20101: Vernier calipers

Service Limit: 10.3 mm (0.41 in)

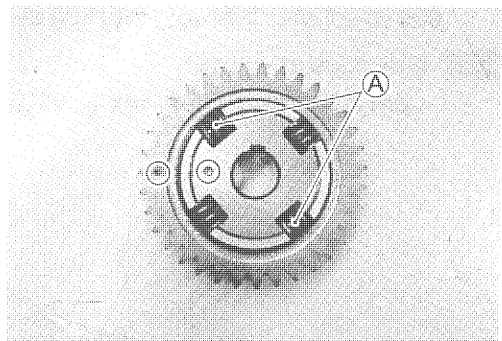


REASSEMBLY

Reassemble the balancer driven gear in the reverse order of disassembly.

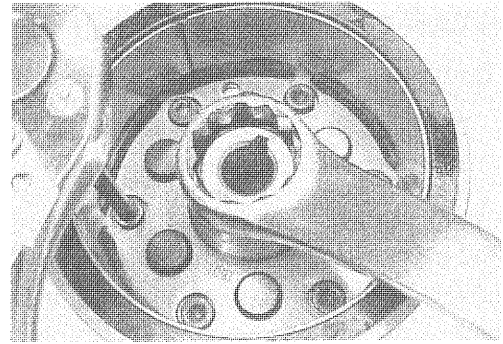
- Install the balancer driven gear by aligning the matching marks.

Ⓐ: Pin



STARTER CLUTCH

- Hold the rotor using a 27-mm offset wrench and remove the bolts.

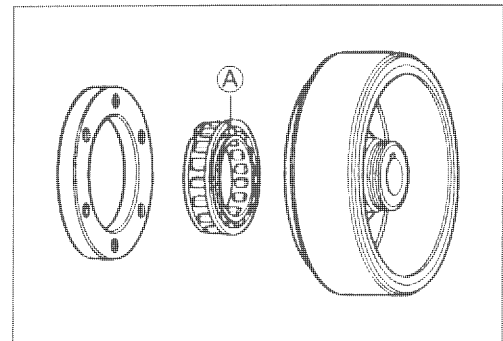


- Install the starter clutch in the proper direction as shown.

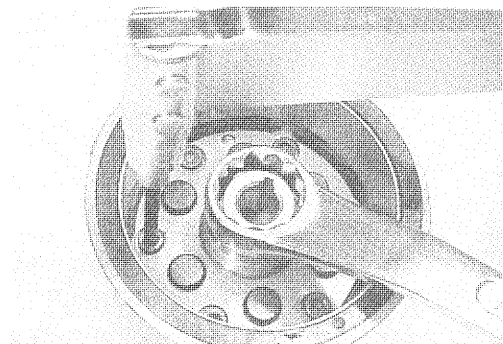
NOTE:

When installing the starter clutch onto the rotor, make sure that the flange side ① in the bearing faces to the rotor.

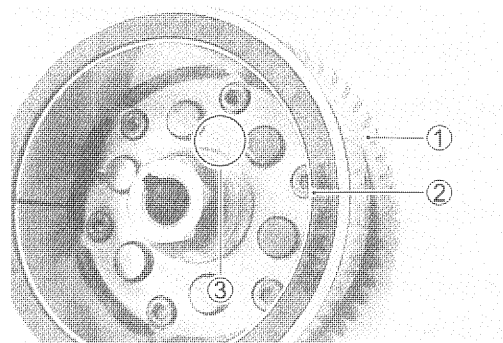
- Apply engine oil to the starter clutch.



- Tighten the bolts while holding the rotor using a 27-mm offset wrench.



- Install the starter gear ① to the starter clutch.
- Check that the rotor ② turns in the direction of the arrow ③ on the rotor while holding the starter gear, and that the rotor never turns in the opposite direction of the arrow.



STARTER TORQUE LIMITER

CAUTION

Do not attempt to disassemble the starter torque limiter. It is unserviceable.

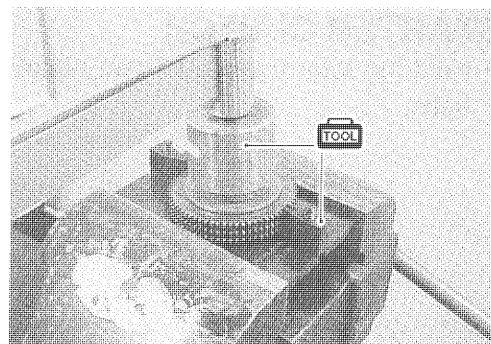
Check the slip torque of the starter torque limiter using the special tools and vise as shown, if the slip torque is not within the specified torque, replace the starter torque limiter with a new one.

 **09930-73170: Starter torque limiter holder**

09930-73180: Starter torque limiter socket

 **Slip torque:**

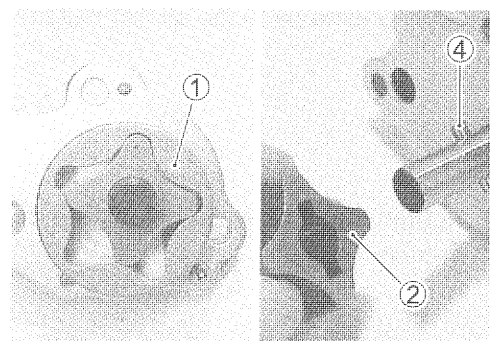
30 – 55 N·m (3.0 – 5.5 kgf-m, 21.5 – 40.0 lb-ft)



OIL PUMP

- Remove the outer rotor ①, inner rotor ② and pin ④.

Inspect the outer rotor ① and inner rotor ② for any scratches or other damage. If any damages are found, replace them with new ones.

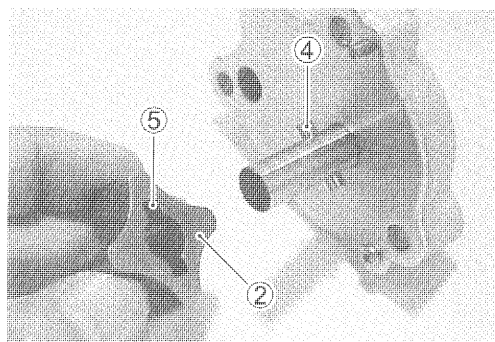
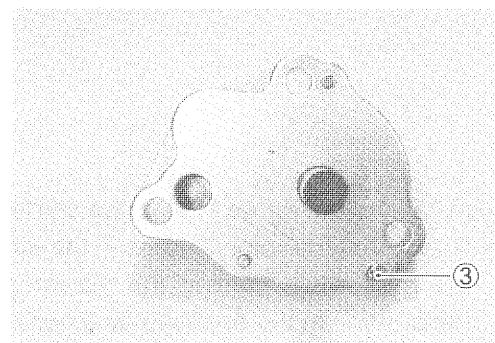


CAUTION

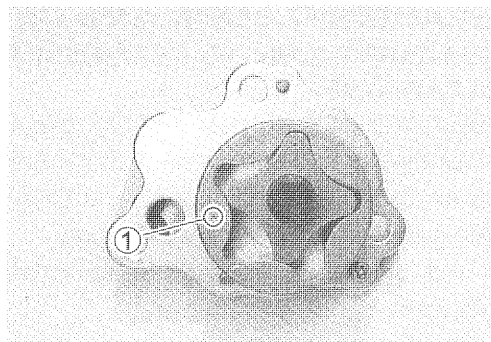
The oil pump case securing screw ③ is applied with **SUZUKI THREAD LOCK SUPER "1303"**. If an attempt is made to overhaul the oil pump assembly, the screw may be damaged. Only the oil pump unit is available as a replacement.

 **99000-32030: THREAD LOCK SUPER "1303"**

- Apply engine oil to the sliding surfaces of the oil pump inner rotor, outer rotor and shaft.
- When installing the inner rotor ②, align the pin ④ with the groove ⑤.



- When installing the outer rotor, face the punched mark ① on the outer rotor to the outside.



CLUTCH

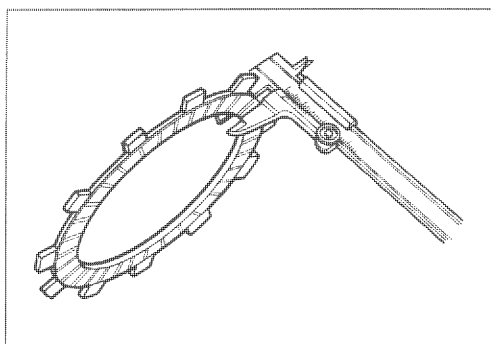
CLUTCH DRIVE PLATES

Measure the thickness of the clutch drive plates using vernier calipers. If a clutch drive plate is not within the service limit, replace the clutch plates as a set.

TOOL 09900-20101: Vernier calipers

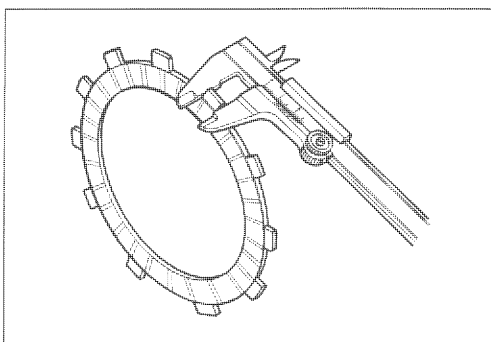
DATA Drive plate thickness (No.1 & No.2)

Service Limit: 2.62 mm (0.103 in)



DATA Drive plate claw width (No.1 & No.2)

Service Limit: 13.2 mm (0.520 in)



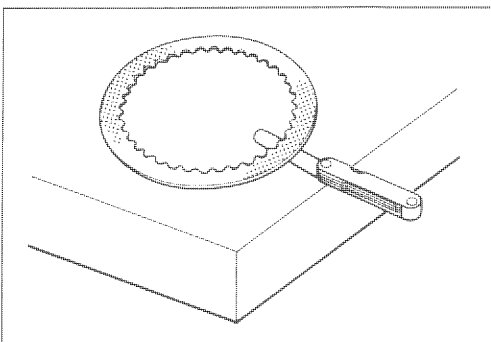
CLUTCH DRIVEN PLATES

Measure each clutch driven plate for distortion using the thickness gauge. If a clutch driven plate is not within the service limit, replace the clutch plates as a set.

TOOL 09900-20803: Thickness gauge

DATA Driven plate distortion

Service Limit: 0.10 mm (0.004 in)



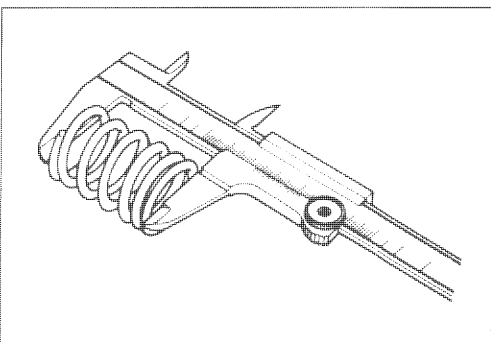
CLUTCH SPRING FREE LENGTH

Measure the free length of each clutch spring using vernier calipers. If any spring length is less than the service limit, replace all of the springs with new ones.

TOOL 09900-20101: Vernier calipers

DATA Clutch spring free length

Service Limit: 49.9 mm (1.96 in)



GEARSHIFT FORK AND GEAR

GEARSHIFT-FORK-TO-GEARSHIFT-FORK GROOVE CLEARANCE

Clearance for each gearshift fork plays an important role in the smoothness and positiveness of the shifting process.

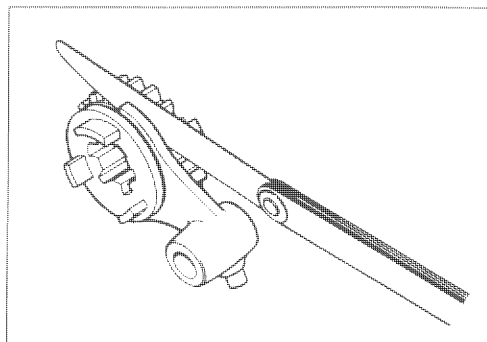
Measure the gearshift fork clearance in the groove of its respective gear using the thickness gauge.

If the clearance exceeds specification, replace the fork, its respective gear, or both.

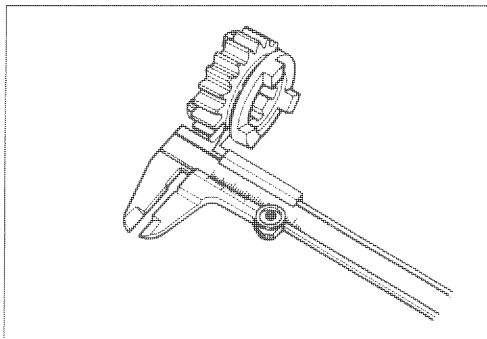
TOOL 09900-20803: Thickness gauge

09900-20101: Vernier calipers

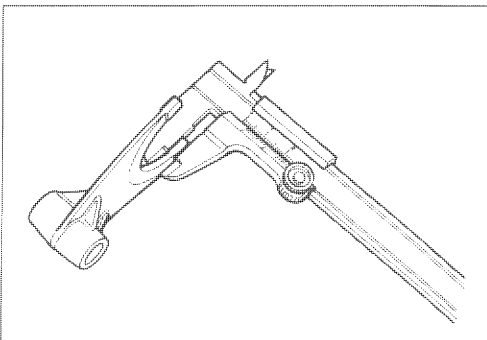
DATA Gearshift-fork-to-gearshift-fork-groove clearance
Service Limit: 0.50 mm (0.020 in)



DATA Shift fork groove width
Standard: 5.0 – 5.1 mm (0.197 – 0.201 in)



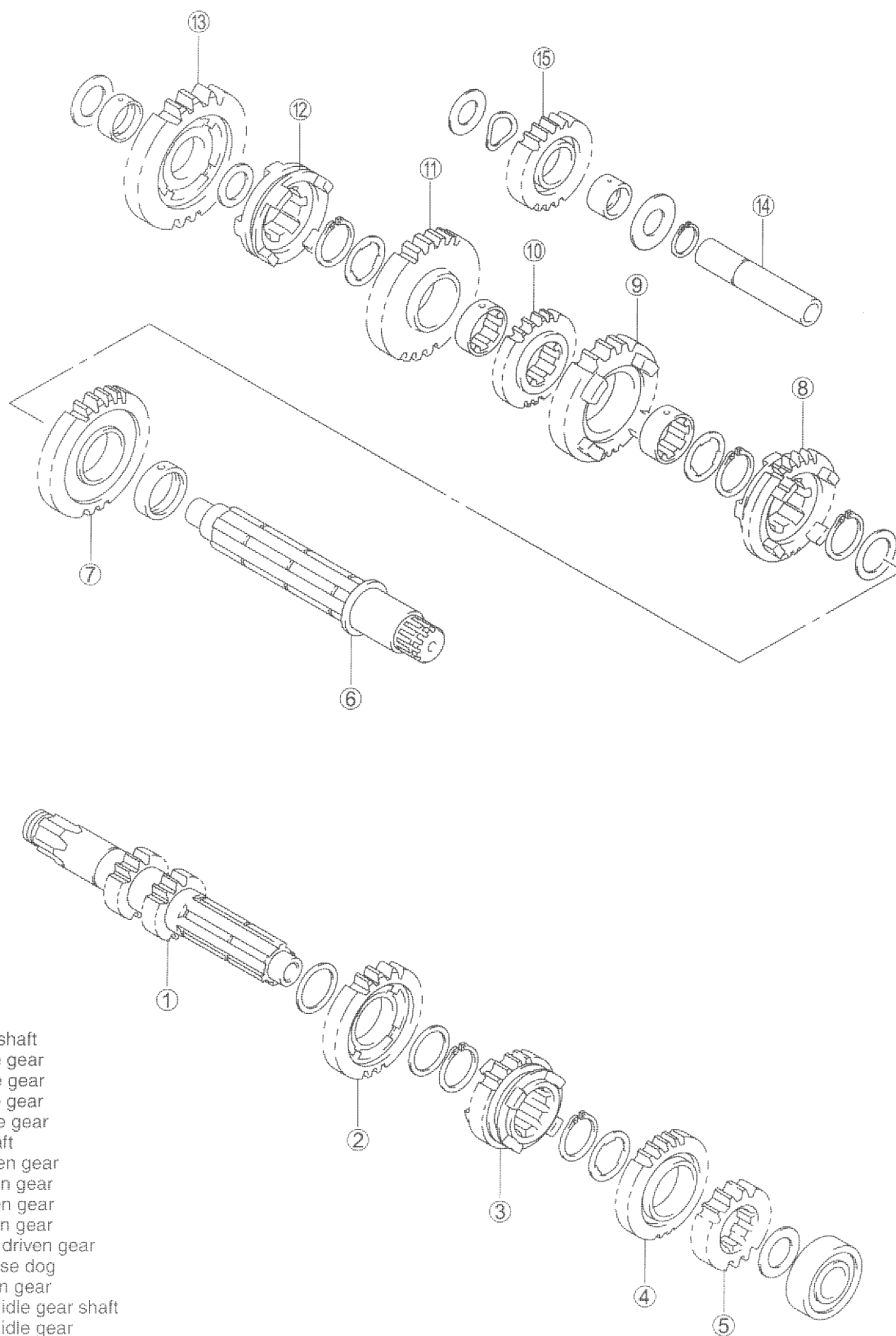
DATA Shift fork thickness
Standard: 4.8 – 4.9 mm (0.189 – 0.193 in)



TRANSMISSION

DISASSEMBLY

Disassemble the transmission gears as shown.



REASSEMBLY

Reassemble the transmission in the reverse order of disassembly. Pay special attention to the following points:

NOTE:

Before installing the gears, apply engine oil to the inner surface of each gear and bushing.

CAUTION

- * **Never reuse a snap ring. After a snap ring has been removed from a shaft, it should be discarded and a new snap ring must be installed.**
- * **When installing a new snap ring, do not expand the end gap larger than required to slip the snap ring over the shaft.**
- * **After installing a new snap ring, make sure that it is completely seated in its groove and securely fitted.**

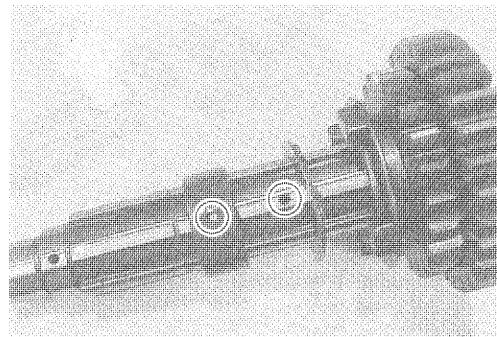
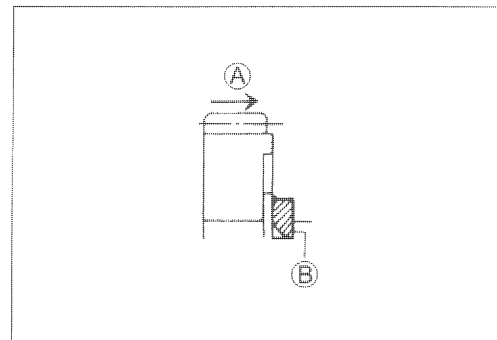
NOTE:

When reassembling the transmission, attention must be given to the locations and positions of the washers and snap rings. The cross sectional view shows the correct position of the gears, washers, and snap rings. (☞ 3-40)

- When installing a new snap ring, pay attention to the direction of the snap ring. Fit it to the side where the thrust is, as shown. The rounded side should be against the gear surface.

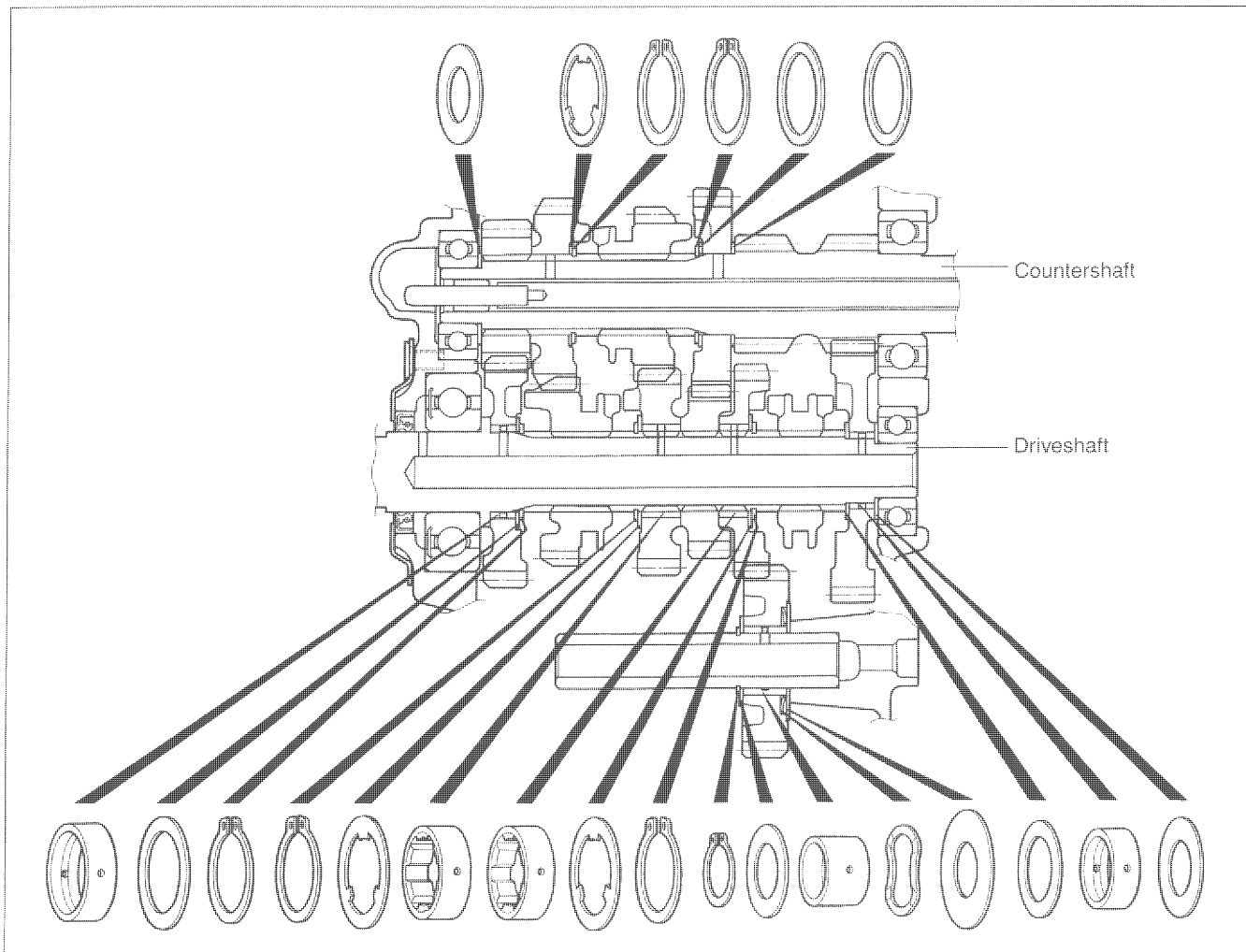
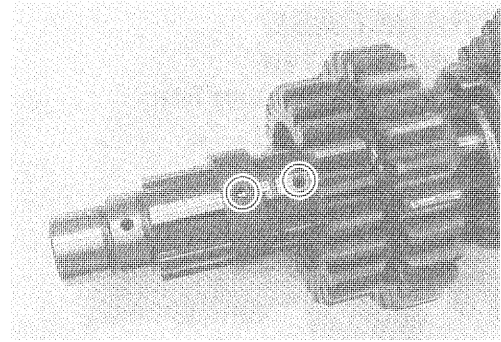
Ⓐ Thrust

Ⓑ Sharp edge



- When installing the third driven gear bushing, align the its oil hole with the driveshaft oil hole.

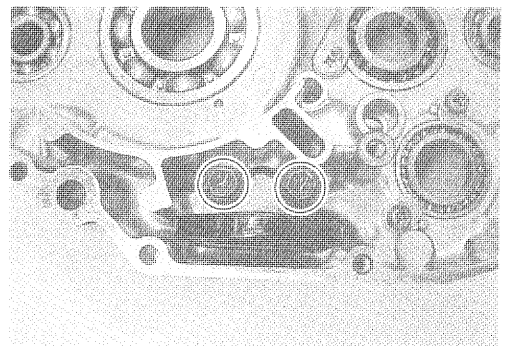
- When installing the reverse driven gear bushing, align the its oil hole with the driveshaft oil hole.



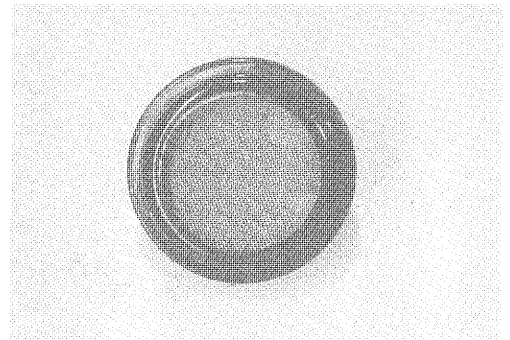
CRANKCASE

OIL SUMP FILTER

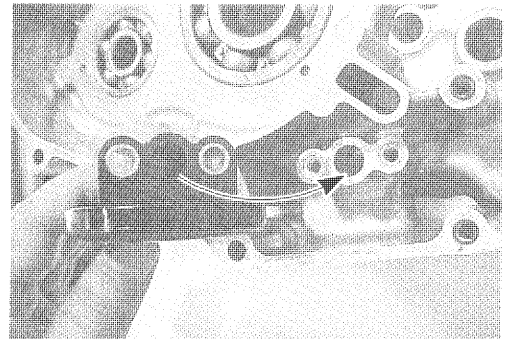
- Remove the oil sump filter.



- Clean the oil sump filter using compressed air.

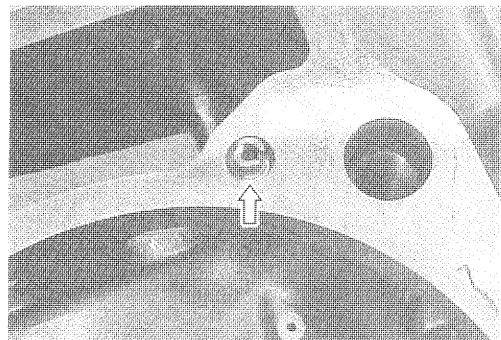


- Align the oil passage holes when installing the oil sump filter.

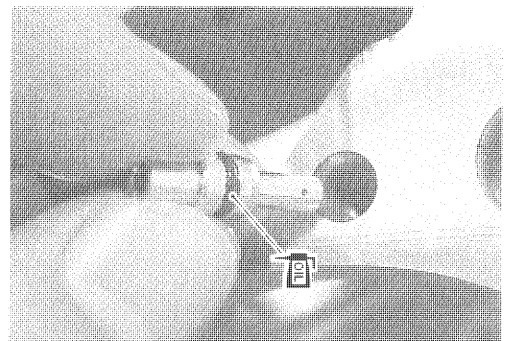


OIL JET

- Remove the oil jet.

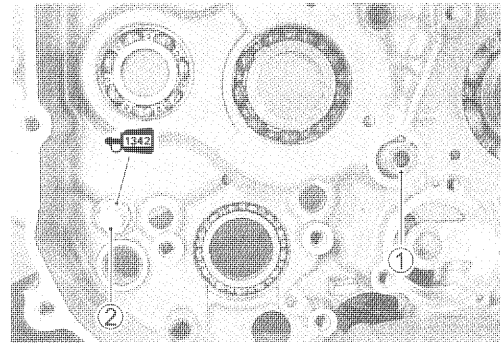


- Fit the new O-ring and apply engine oil to it.
- Install the oil jet as shown.



OIL PUMP IDLE GEAR SHAFT AND GEARSHIFT ARM STOPPER

- Remove the oil pump idle gear shaft ①.



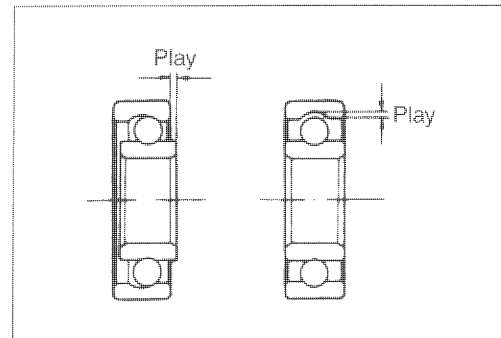
- Apply THREAD LOCK "1342" to the gearshift arm stopper.
- Tightening the gearshift arm stopper ② to the specified torque.

 **1342 99000-32050: THREAD LOCK "1342"**

 **Gearshift arm stopper: 19 N·m (1.9 kgf-m, 13.5 lb-ft)**

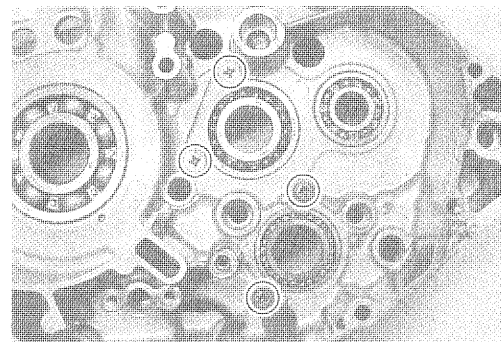
BEARING INSPECTION

Wash the bearing with a cleaning solvent and lubricate it with motor oil before inspection. Rotate the inner race and check to see that it turns smoothly. If it does not turn quietly and smoothly, or if there are signs of any abnormalities, the bearing is defective and must be replaced with a new one as follows.



BEARING REMOVAL

- Remove the bearing retainers.

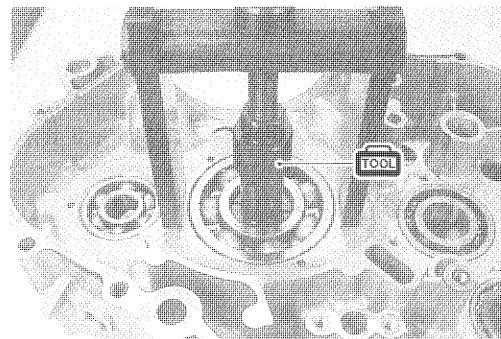


- Remove the crankcase bearings using the special tool.

 **09921-20240: Bearing remover set**

CAUTION

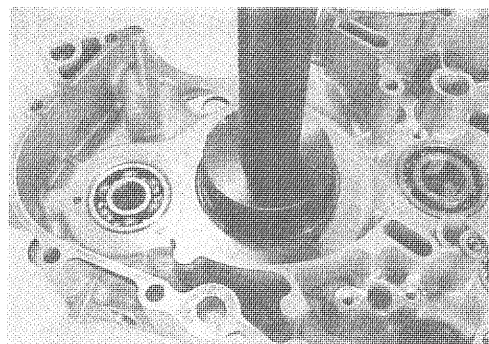
Replace the removed bearing with new ones.



BEARING INSTALLATION

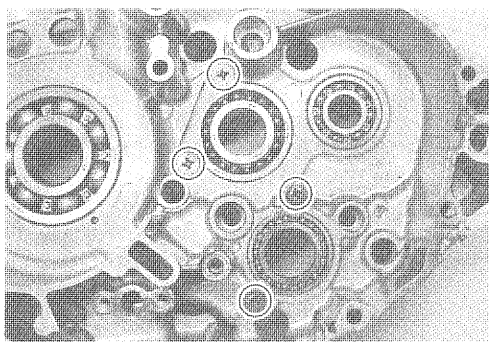
- Install the crankcase bearings using the special tool.

 **09913-70210: Bearing installer set**

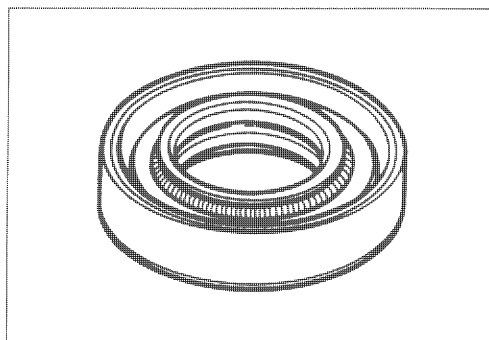


- Apply a small quantity of THREAD LOCK SUPER "1303" to the bearing retainer screws, and tighten them securely.

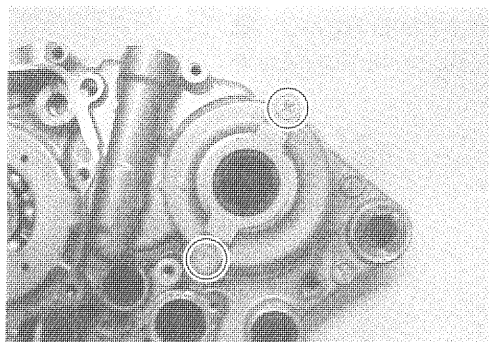
 **99000-32030: THREAD LOCK SUPER "1303"**

**OIL SEAL INSPECTION**

Damage to the lip of the oil seal may result in leakage of the engine oil. Inspect the oil seal for wear or damage. If any damages are found, replace the oil seal with a new one.

**OIL SEAL REMOVAL**

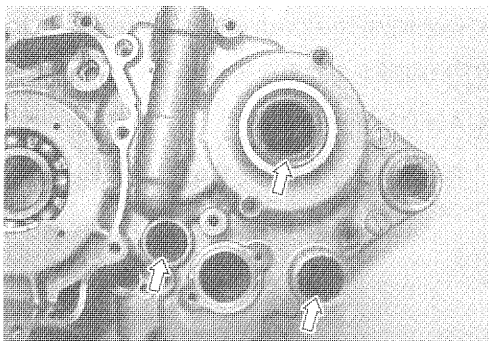
- Remove the oil seal retainer.



- Remove the oil seals.

CAUTION

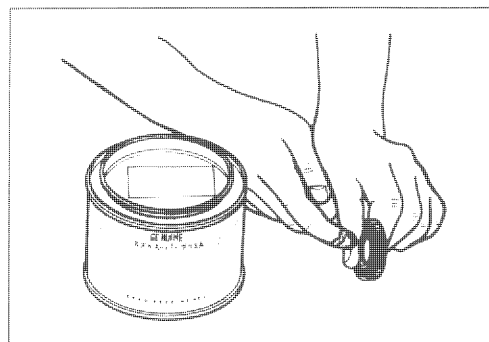
Replace the removed oil seals with new ones.



OIL SEAL INSTALLATION

- Install the oil seals into the crankcase. Pay attention to the following points:
- Apply SUZUKI SUPER GREASE "A" to the lip of the oil seals.

 **99000-25030: SUZUKI SUPER GREASE "A" (USA)**
99000-25010: SUZUKI SUPER GREASE "A" (Others)

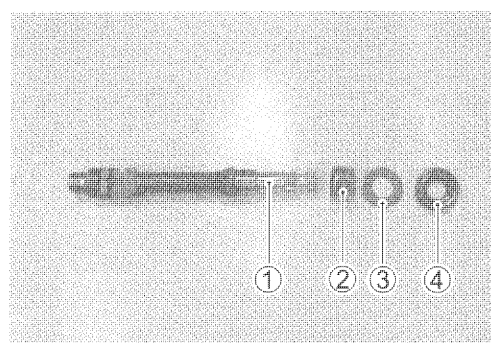
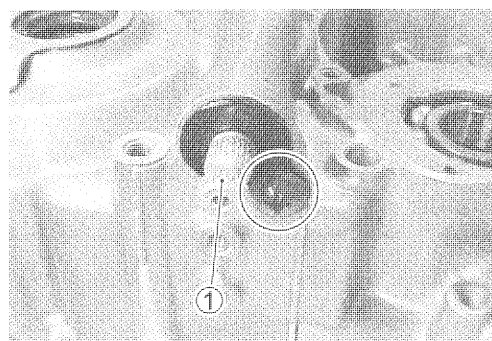


- Install the new oil seals using the special tool.

 **09913-70210: Bearing installer set**

CLUTCH RELEASE CAMSHAFT

- Remove the clutch release camshaft.
 - ① Clutch release camshaft
 - ② Bearing
 - ③ Washer
 - ④ Oil seal



- Install the clutch release camshaft correctly.

CLUTCH COVER

OIL FILTER

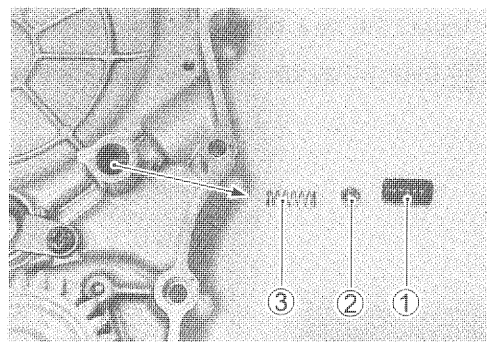
2-13

WATER PUMP

5-13

OIL CHECK VALVE

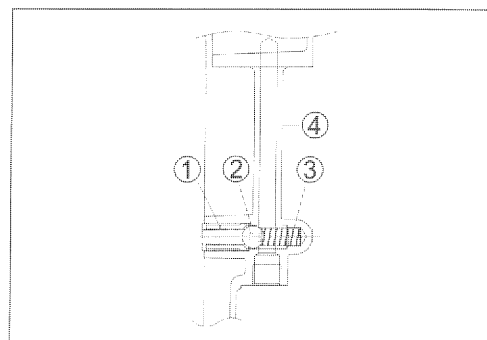
- Remove the bushing ①, oil check valve ball ② and spring ③.



- Install the spring ③, oil check valve ball ② and bushing ① to the clutch cover ④ as shown.

CAUTION

The rubber part of bushing ① must face to the outside.



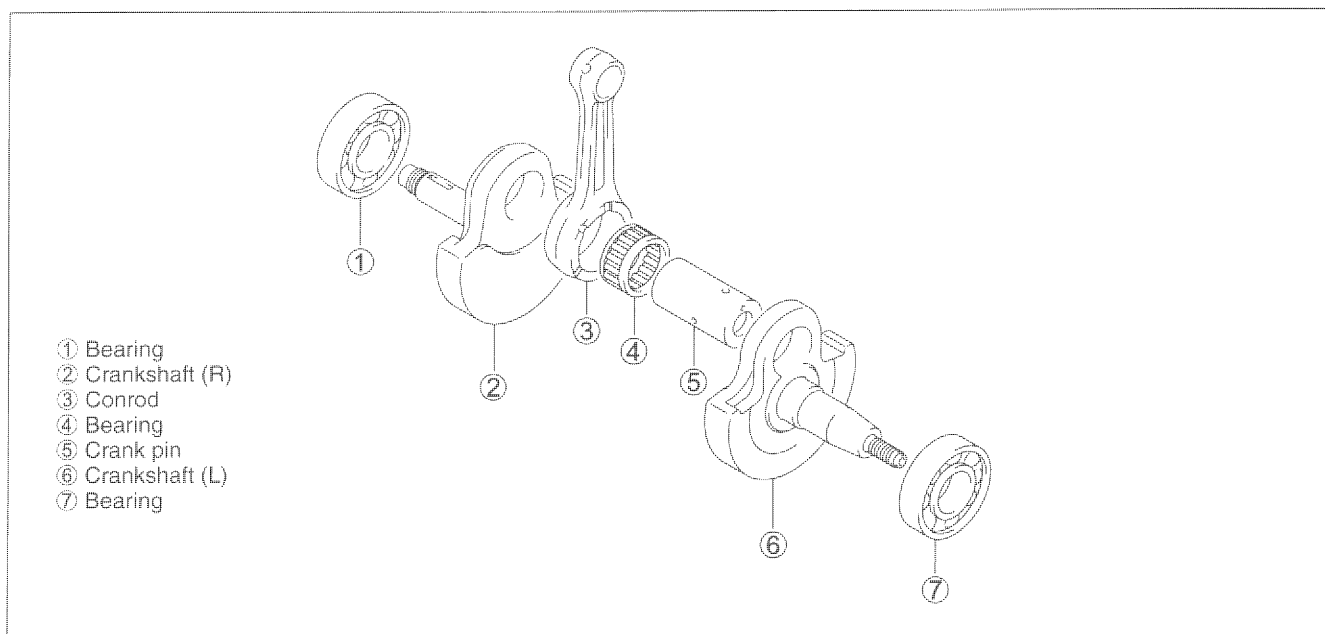
ENGINE REASSEMBLY

Reassemble the engine in the reverse order of disassembly.
Pay special attention to the following points:

NOTE:

Apply engine oil to each running and sliding part before reassembling the engine.

CRANKSHAFT



- Determine the width between the webs referring to the figure when rebuilding the crankshaft.

DATA Crank-web-to-web-width

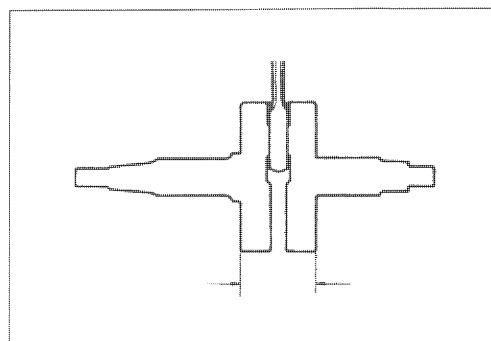
Standard: $62.0 \pm 0.1 \text{ mm}$ ($2.441 \pm 0.004 \text{ in}$)

- When mounting the crankshaft in the crankcase, it is necessary to pull its left end into the crankcase by using the special tools.

TOOL 09910-32812: Crankshaft installer

09910-32820: Spacer

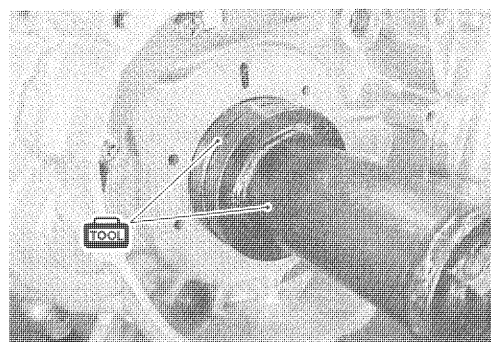
09911-11310: Attachment



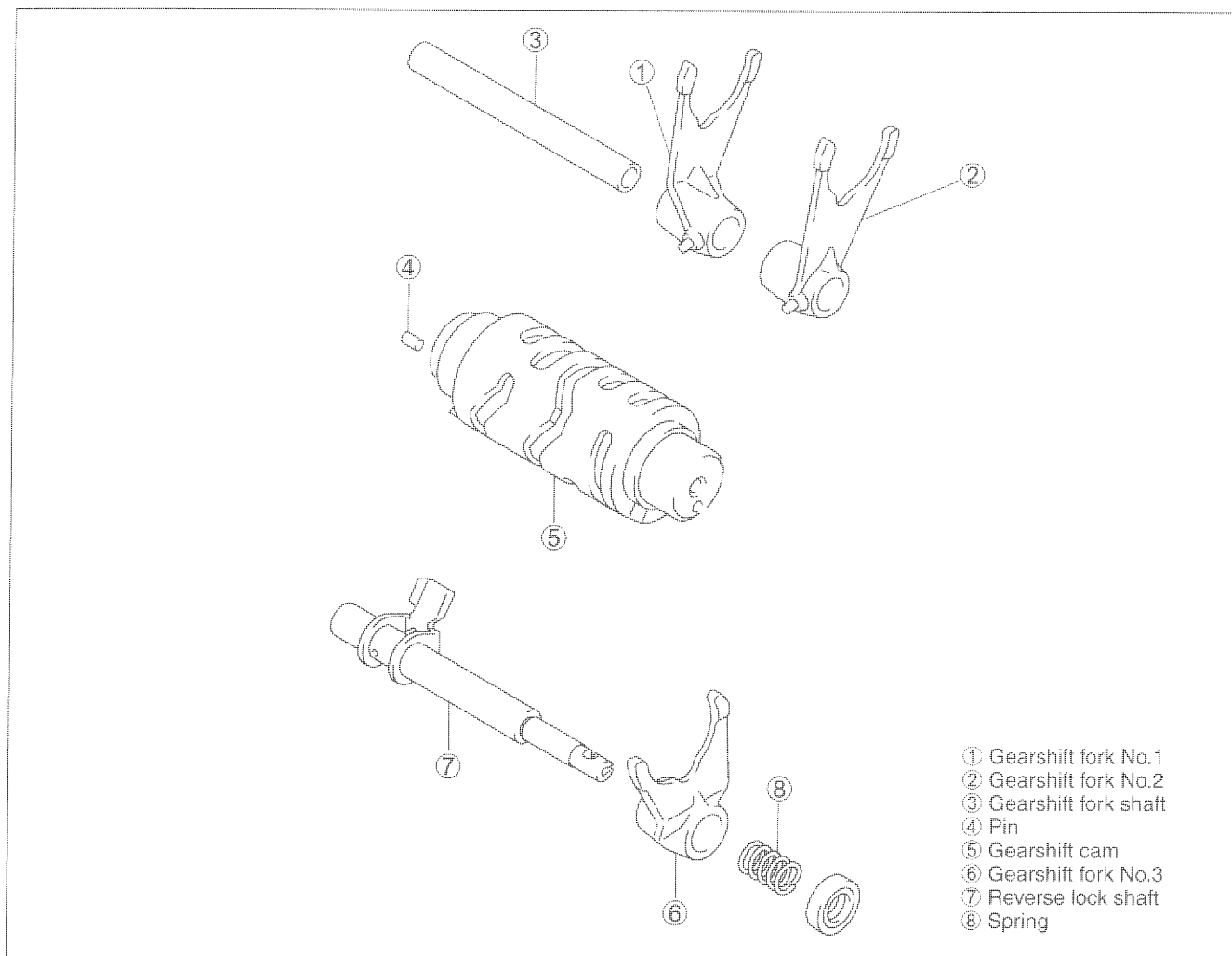
CAUTION

Never fit the crankshaft into the crankcase by striking it with a plastic hammer.

Always use the special tool, otherwise the accuracy of the crankshaft alignment will be affected.

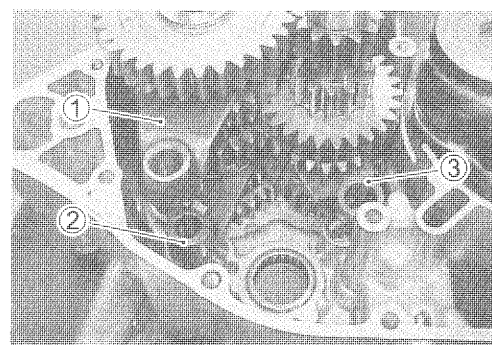


GEARSHIFT CAM, FORK AND REVERSE LOCK SHAFT



- Install the gearshift forks into the gearshifting grooves in the correct position and direction.

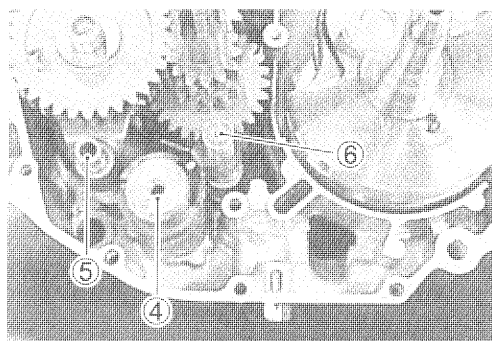
- ① Gearshift fork No.1
- ② Gearshift fork No.2
- ③ Gearshift fork No.3



- Install the gearshift cam ④.
- Install the gearshift fork shaft ⑤ and reverse lock shaft ⑥.

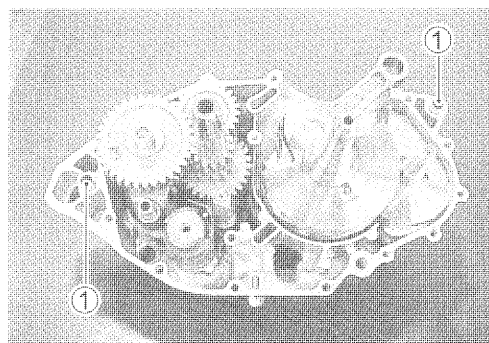
NOTE:

- * After the gearshift fork shaft and gearshift forks have been fitted, make sure that the gears engage normally.
- * Set the transmission gears to the neutral position.



CRANKCASE

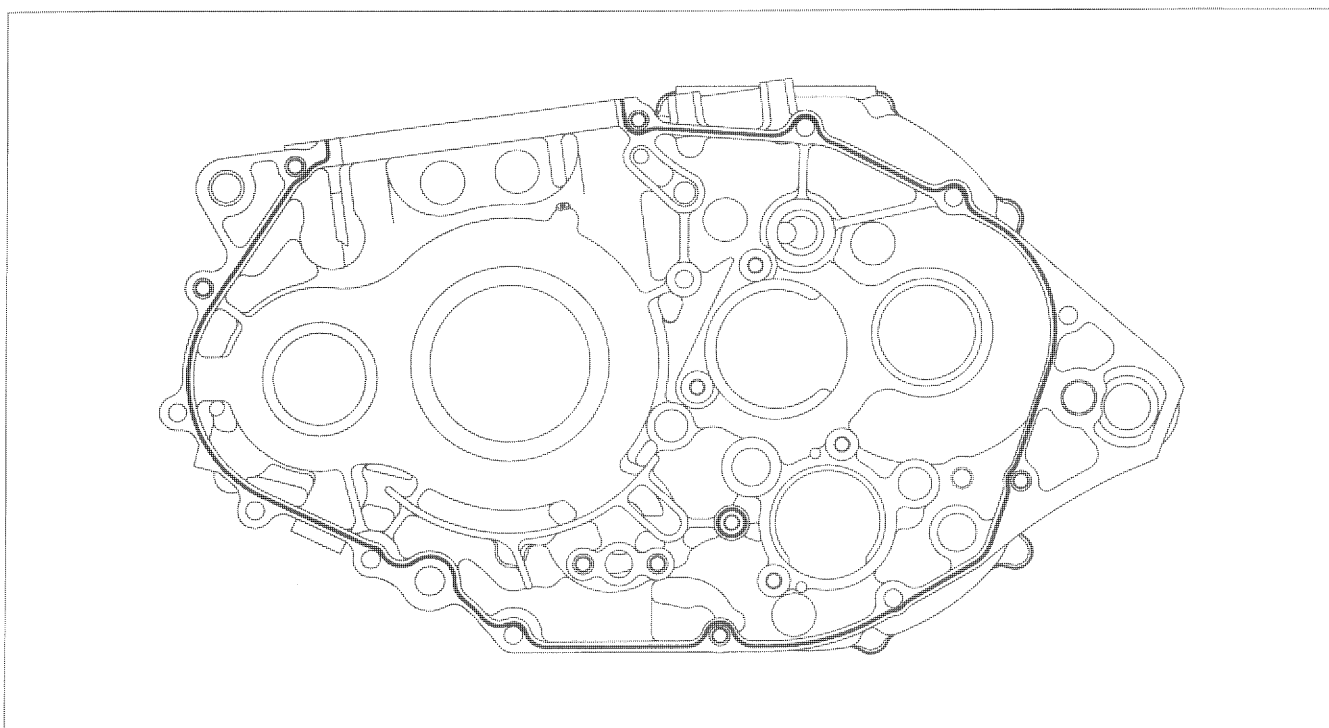
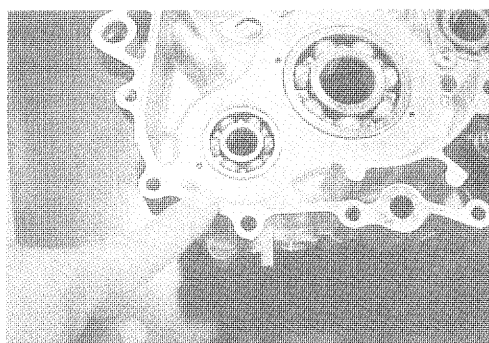
- Thoroughly remove the sealant material and oil stains on the mating surface of the right and left crankcases.
- Install the dowel pins ① to the left crankcase.
- Apply engine oil to the conrod big end and to the transmission gears.



- Apply SUZUKI BOND "1207B" or "1215" to the mating surface of the right crankcase as shown.

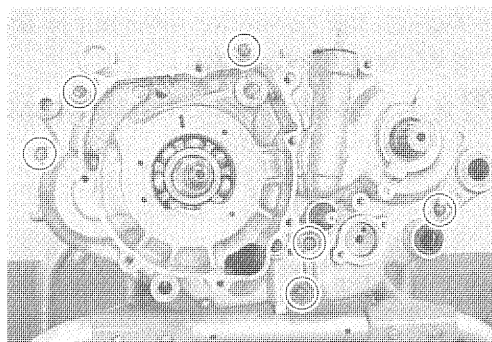
1207B 99104-31140: SUZUKI BOND "1207B" (USA)

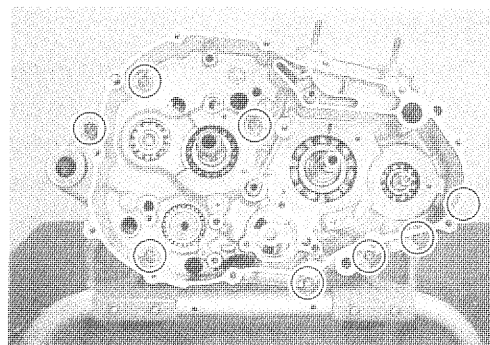
1215 99000-31110: SUZUKI BOND "1215" (Others)



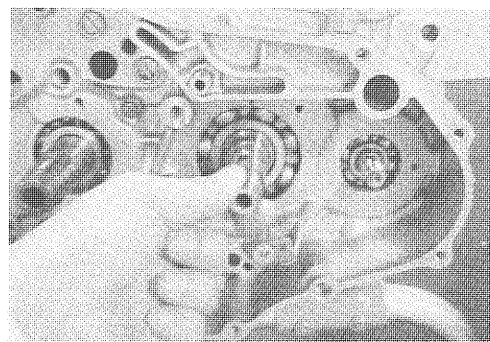
- Tighten the crankcase bolts to the specified torque.

 **Crankcase bolt: 11 N·m (1.1 kgf·m, 8.0 lb·ft)**



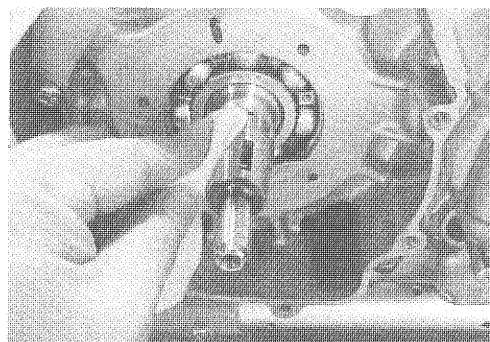


- After the crankcase bolts have been tightened, check if the crankshaft, countershaft, and driveshaft rotate smoothly. If a large resistance is felt to rotation, try to free the shafts by tapping them with a plastic mallet.

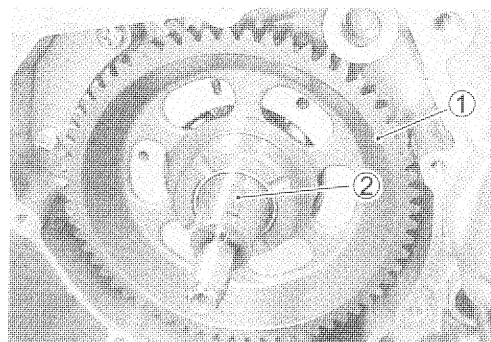


STARTER CLUTCH AND GENERATOR ROTOR

- Remove the grease from the tapered portion of the crankshaft and the generator rotor.

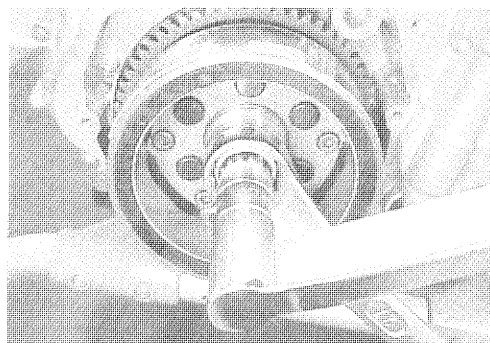


- Install the starter driven gear ① and key ②.



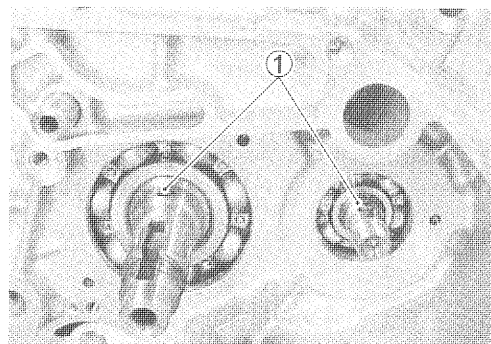
- Tighten the generator rotor nut to the specified torque using a 27-mm offset wrench.

 **Generator rotor nut: 120 N·m (12.0 kgf-m, 87.0 lb-ft)**

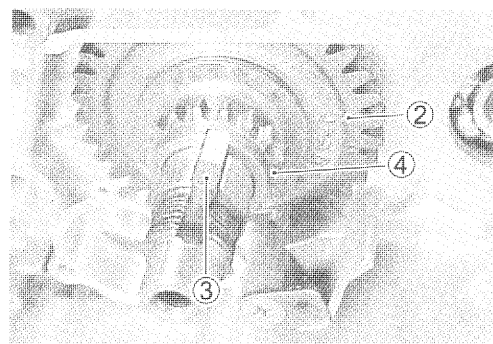


PRIMARY DRIVE GEAR AND BALANCER GEAR

- Install the pins ①.



- Install the balancer drive gear ②.
- Install the key ③ and cam chain drive sprocket ④.



- Apply engine oil to the thread and inside surface of the nut.
- Hold the generator rotor using a 27-mm offset wrench, and then tighten the primary drive gear nut to the specified torque.

Primary drive gear nut: 140 N·m (14.0 kgf-m, 101.5 lb-ft)

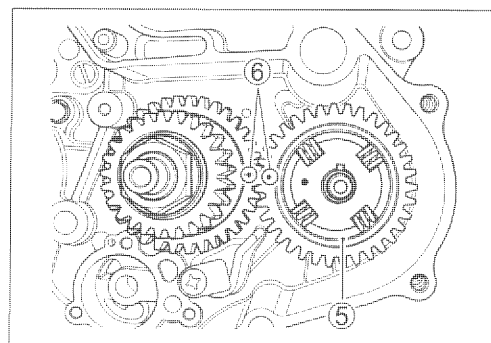
NOTE:

This nut has left-hand thread.

CAUTION

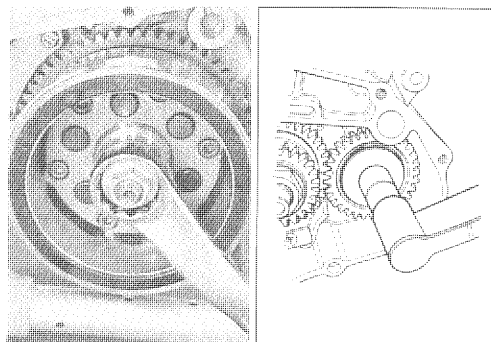
Apply engine oil to the primary drive gear nut.

- Install the balancer driven gear ⑤ by aligning the matching marks ⑥.



- Hold the generator rotor using a 27-mm offset wrench, and then tighten the balancer driven gear nut to the specified torque.

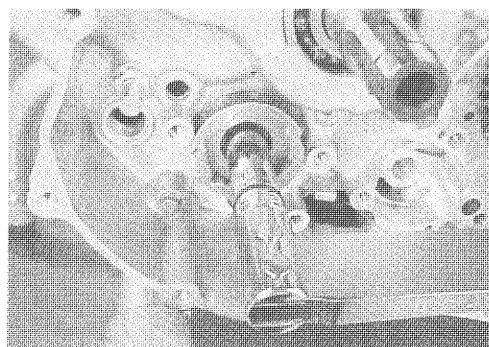
Balancer driven gear nut: 50 N·m (5.0 kgf-m, 36.0 lb-ft)



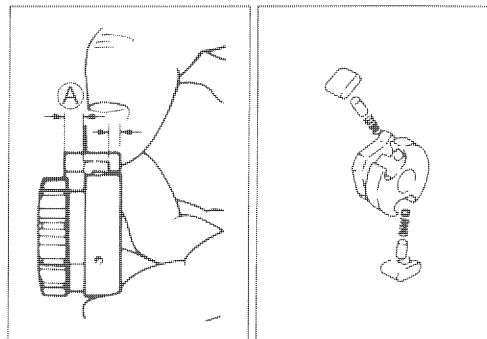
GEARSHIFT CAM DRIVEN GEAR

- Tighten the gearshift cam driven gear bolt to the specified torque.

 **Gearshift cam driven gear bolt:**
24 N·m (2.4 kgf-m, 17.5 lb-ft)



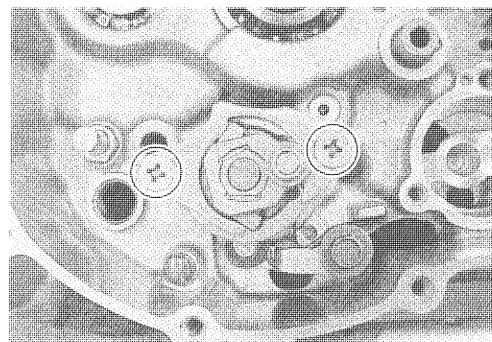
- Install each pawl lifter into the gearshift cam driven gear. The large shoulder (A) must face to the outside.



- Apply a small quantity of THREAD LOCK “1342” or THREAD LOCK SUPER “1322” to the pawl lifter screws, and then tighten them securely.

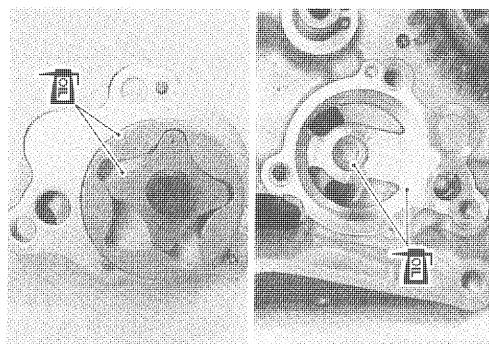
 **1342 99000-32050: THREAD LOCK “1342” (USA)**

 **1322 99000-32110: THREAD LOCK SUPER “1322” (Others)**



OIL PUMP

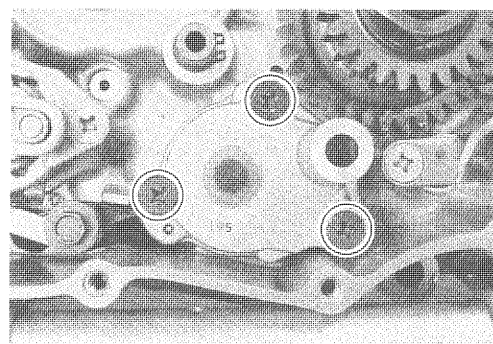
- Before mounting the oil pump, apply engine oil to the sliding surfaces of the oil pump case, outer rotor, inner rotor, and crankcase.



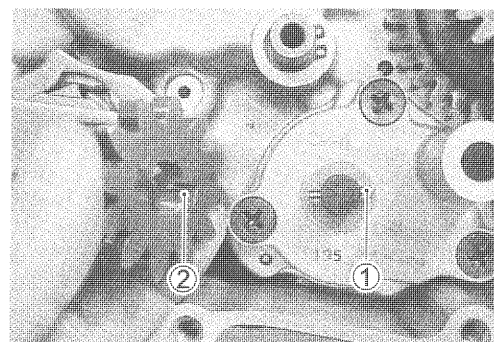
- Apply a small quantity of THREAD LOCK “1342” or THREAD LOCK SUPER “1322” to the oil pump mounting screws, and then tighten them securely.

 **99000-32050: THREAD LOCK “1342” (USA)**

 **99000-32110: THREAD LOCK SUPER “1322” (Others)**



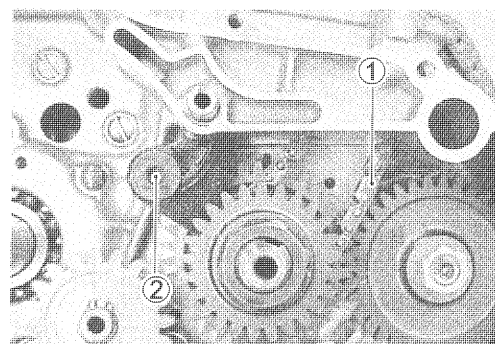
- When installing the oil pump driven gear, align the pin ① with the groove ②.



CAM CHAIN

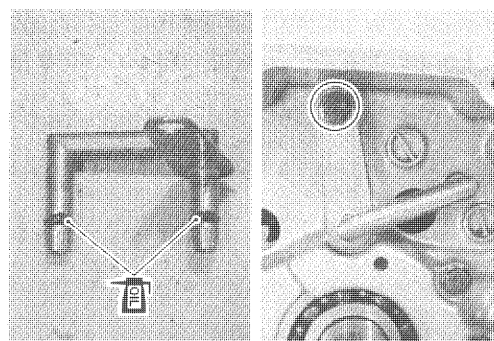
- Install the cam chain ① onto the sprocket.
- Tighten the cam chain tensioner mounting bolt ② to the specified torque.

 **Cam chain tensioner mounting bolt:**
10 N·m (1.0 kgf-m, 7.0 lb-ft)

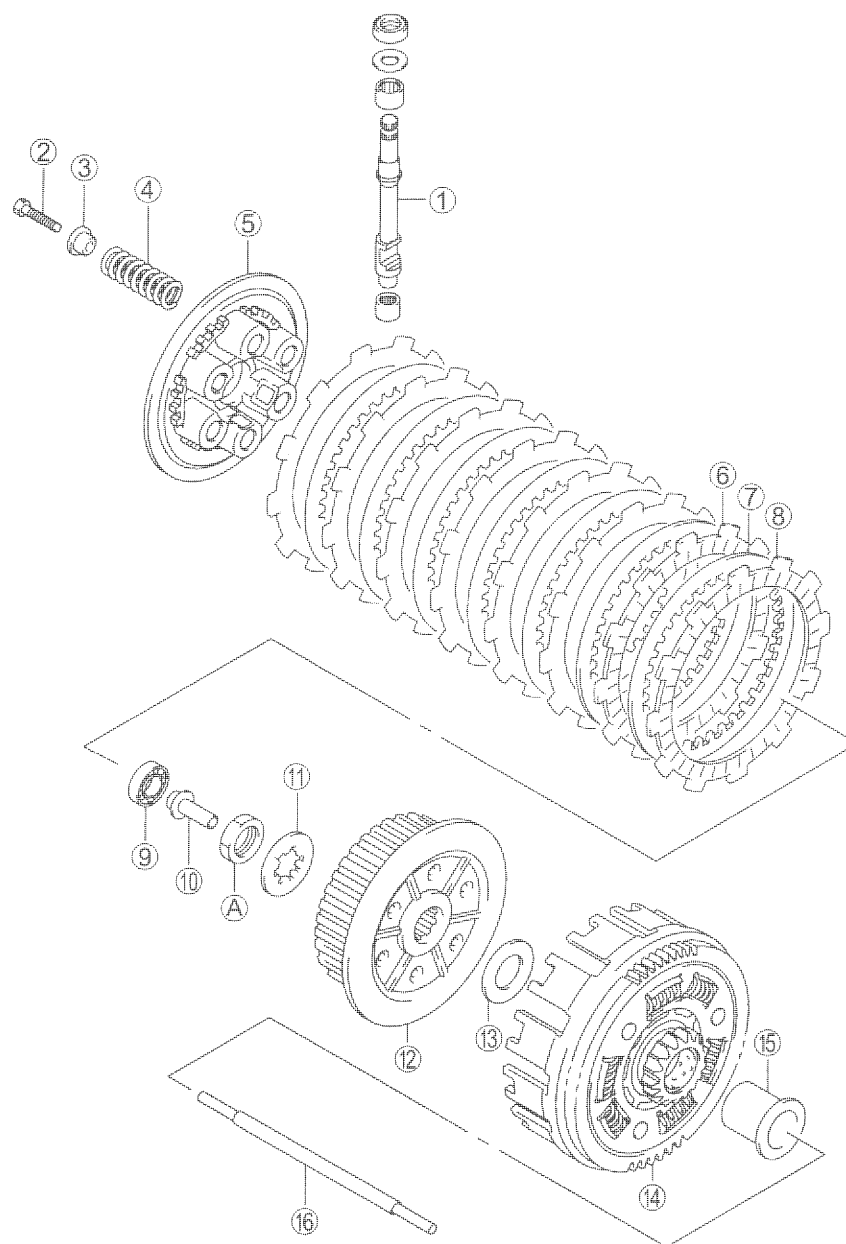


OIL PIPE

- Apply engine oil to the O-rings.
- Tighten the oil pipe bolt securely.



CLUTCH



- ① Clutch release camshaft
- ② Bolt
- ③ Spring retainer
- ④ Spring
- ⑤ Pressure plate
- ⑥ Drive plate (7 pcs)
- ⑦ Driven plate (7 pcs)
- ⑧ Drive plate (1 pc)
- ⑨ Bearing
- ⑩ Push piece
- ⑪ Washer
- ⑫ Clutch sleeve hub
- ⑬ Washer
- ⑭ Primary driven gear assembly
- ⑮ Spacer
- ⑯ Push rod

A Clutch sleeve hub nut

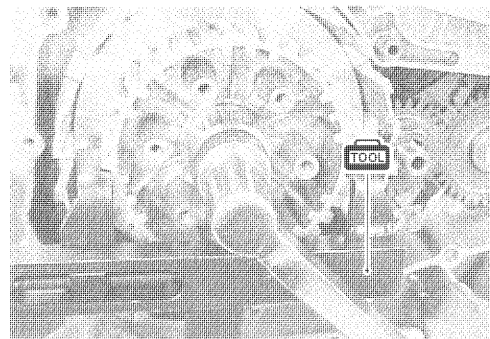


ITEM	N-m	kgf-m	lb-ft
A	70	7.0	50.5

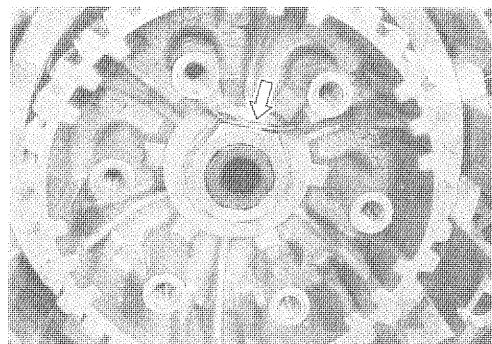
- Hold the clutch sleeve hub using the special tool, and then tighten the clutch sleeve hub nut to the specified torque.

TOOL 09920-53740: Clutch sleeve hub holder

Clutch sleeve hub nut: 70 N-m (7.0 kgf-m, 50.5 lb-ft)



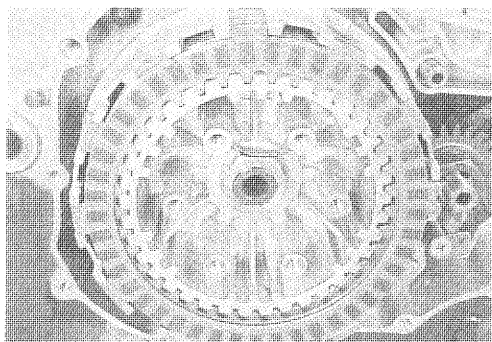
- Bend the tongue of the washer securely.



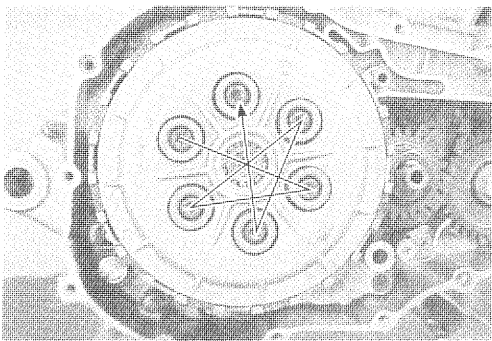
- Insert the clutch drive plates and driven plates one by one into the clutch sleeve hub in the prescribed order.

NOTE:

- * Be sure to install the drive plate with an inside diameter of 122.5 mm (4.82 in), first.
- * Two different types of drive plates are used: one with an inside diameter of 122.5 mm (4.82 in) and seven with an inside diameter of 116 mm (4.5 in). For further information refer to page 3-54.



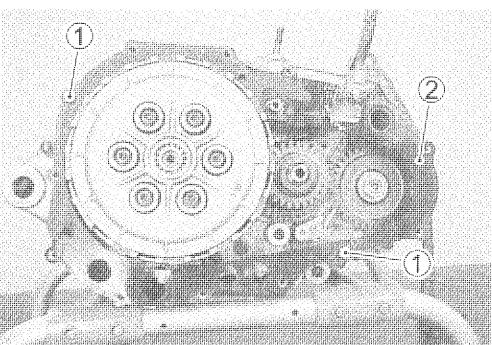
- Tighten the clutch spring set bolts securely in diagonal stages.



- Install the dowel pins ① and new gasket ②.

CAUTION

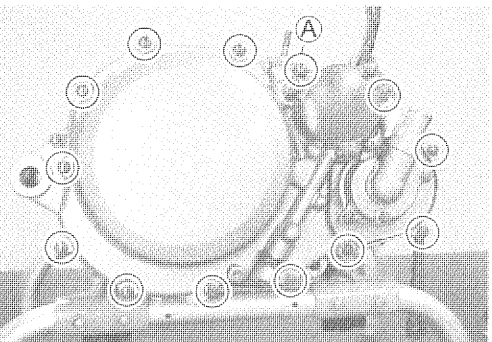
Use a new gasket to prevent oil leakage.



- Tighten the clutch cover bolts securely.

NOTE:

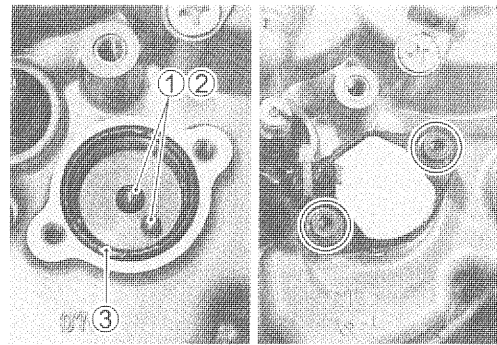
Install the new gasket onto the clutch cover bolt ① as shown.



NEUTRAL SWITCH

- Install the springs ①, contacts ② and new O-ring ③.
- Install the neutral switch and tighten the bolts to the specified torque.

 Neutral switch bolt: 6.5 N·m (0.65 kgf-m, 4.7 lb-ft)

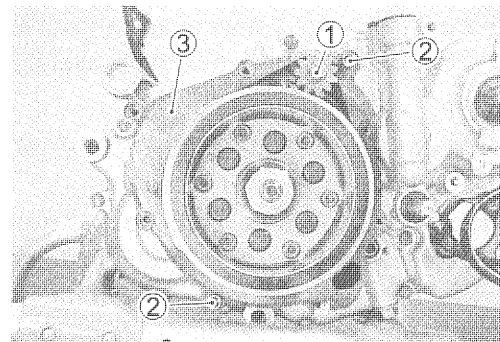


GENERATOR ROTOR COVER

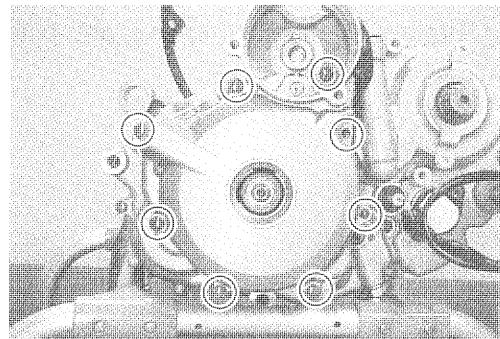
- Install the starter driven gear ①, dowel pins ②, and new gasket ③.

CAUTION

Use a new gasket to prevent oil leakage.



- Tighten the generator rotor cover bolts securely.

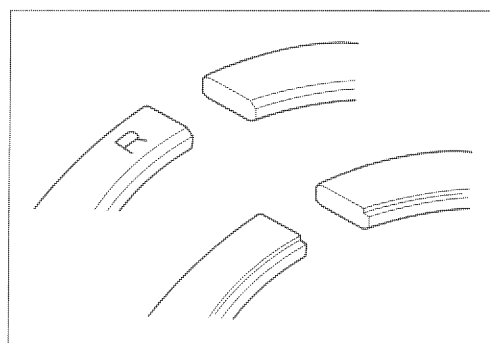
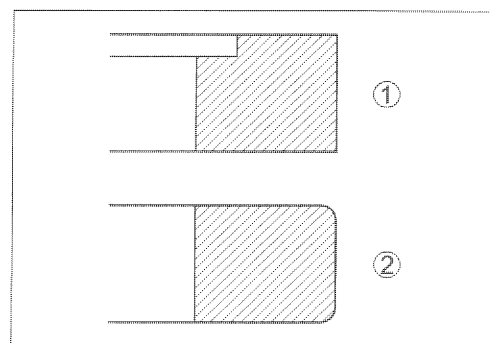


PISTON RING

- Install the oil ring first, the 2nd ring second, and the 1st ring last.

NOTE:

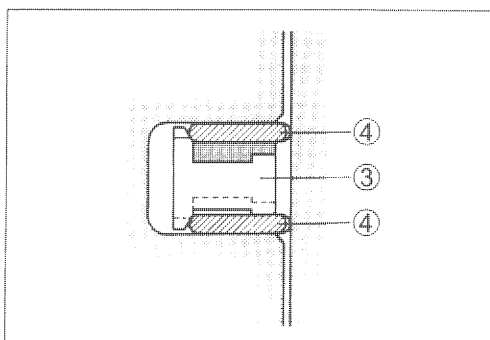
- * The 1st ① and 2nd ② piston rings differ in shape.
- * The 1st and 2nd piston rings should be installed with the mark facing up.



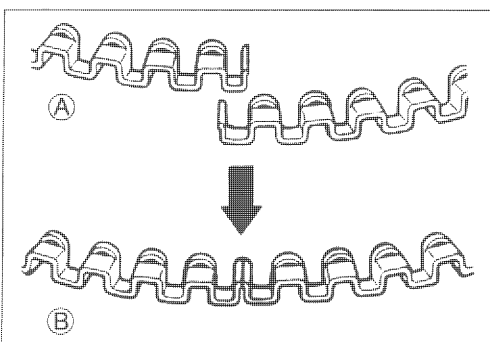
- First, install a spacer ③ into the oil ring groove, and then install the two side rails ④. The spacer and side rails do not have a designated top and bottom. They can be installed in any position.

CAUTION

When installing the spacer, be careful not to allow its two ends to overlap in the groove.

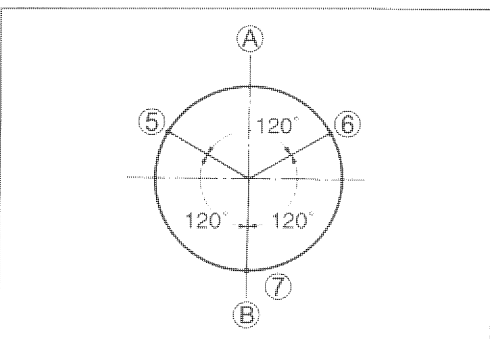


- Ⓐ INCORRECT
- Ⓑ CORRECT



- Position the piston ring gaps as shown. Before inserting the piston into its cylinder, check that the gaps are properly positioned.

- Ⓐ Exhaust side
- Ⓑ Intake side
- ⑤ 2nd ring and lower side rail
- ⑥ Upper side rail
- ⑦ 1st ring and spacer

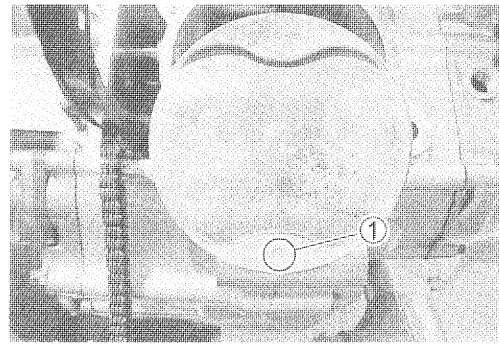


PISTON AND CYLINDER

- Apply molybdenum oil solution onto the piston pin and small end of the conrod.

NOTE:

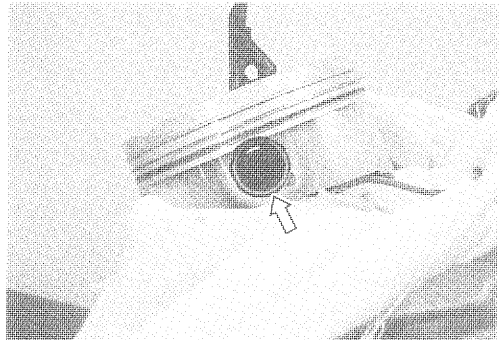
Install the piston with the punch mark ① on the piston head facing toward the exhaust side.



- Place a clean rag over the cylinder base to prevent the piston pin circlip from dropping into the crankcase, and then fit the piston pin circlip with long-nose pliers.

CAUTION

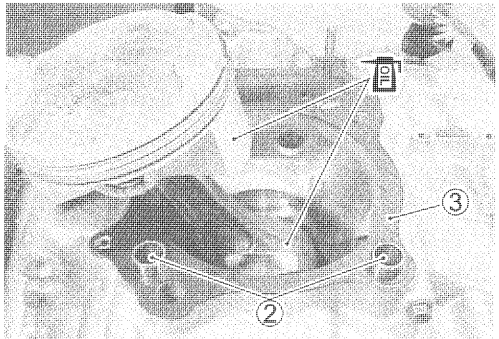
Use a new piston pin circlip to prevent circlip failure with a bent one.



- Apply engine oil to the sliding surface of the piston and big end of the conrod.
- Install the dowel pins ② and new gasket ③ onto the crankcase.

CAUTION

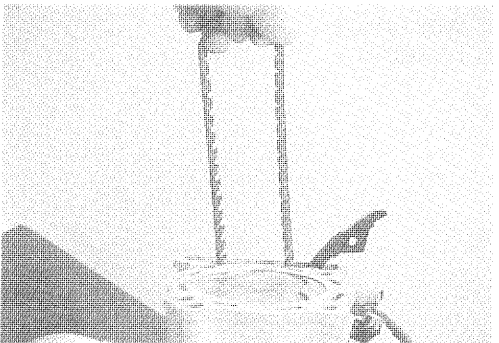
Use a new gasket to prevent oil leakage.



- Hold each piston ring with the piston ring sections positioned correctly and put it into the cylinder. Make sure that the piston rings are caught by the cylinder skirt.

NOTE:

* When mounting the cylinder, after attaching the camshaft drive chain, keep the camshaft drive chain taut. The camshaft drive chain must not be caught between the cam drive chain sprocket and crankcase when the crankshaft is rotated.



- Install the cam chain guide ①.

NOTE:

Make sure that the guide ① is inserted properly or binding of the cam chain and guide may result.

- Install the dowel pins ② and new gasket ③.

CAUTION

Use a new cylinder head gasket to prevent gas leakage.

CYLINDER HEAD

- With the head snugly seated on the cylinder, secure it by tightening the bolts in diagonal stages. Tighten the cylinder head bolts diagonally to the specified torque.

Cylinder head bolt

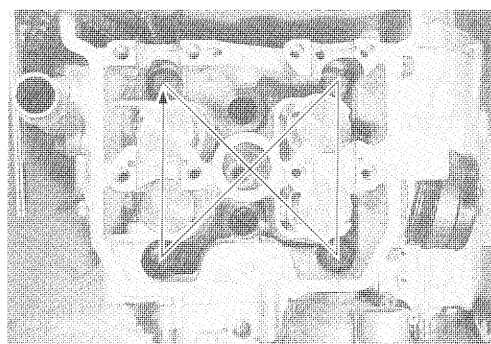
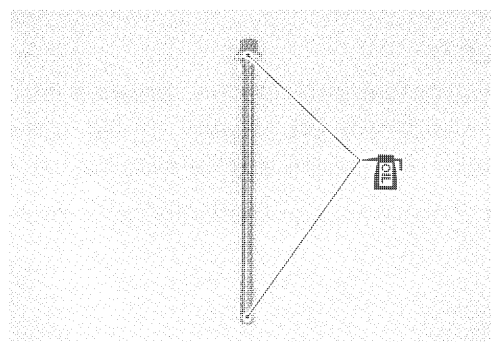
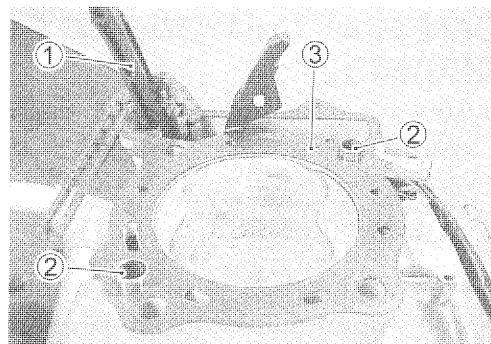
Initial: 25 N·m (2.5 kgf-m, 18.0 lb-ft)

Final: 46 N·m (4.6 kgf-m, 33.5 lb-ft)

NOTE:

* Apply engine oil to the threaded parts of the cylinder head bolts and its washers.

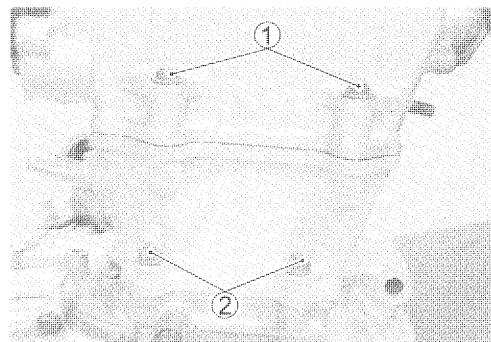
* Be sure to install the washer with rounded side facing up.



- After tightening the cylinder head bolts to specification, tighten the cylinder head bolts ① and cylinder nuts ② to the specified torque.

Cylinder head bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

Cylinder nut: 10 N·m (1.0 kgf-m, 7.0 lb-ft)



CAMSHAFT/AUTOMATIC DECOMPRESSION ASSEMBLY

- Turn the generator rotor until the "T" line on the generator rotor is aligned with the center of the hole in the generator cover.

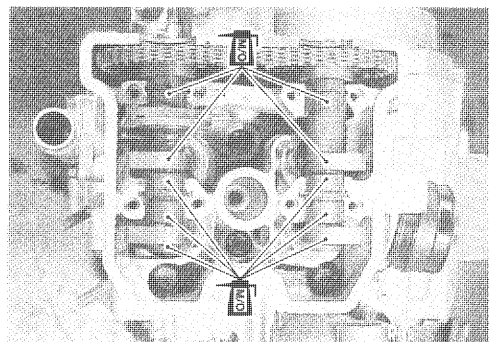
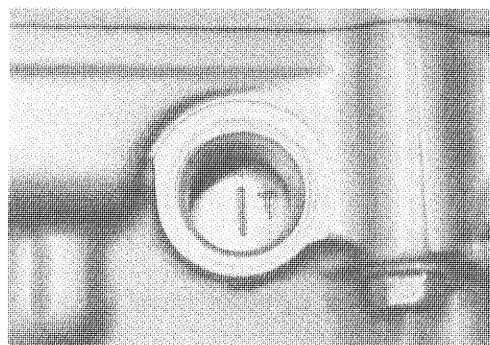
CAUTION

If the crankshaft is turned without drawing the cam chain upward, the cam chain will catch between crankcase and cam chain drive sprocket.

NOTE:

Just before installing the camshaft into the cylinder head, apply molybdenum oil solution to the camshaft journals and cam faces. Also, apply engine oil to the camshaft journal holders.

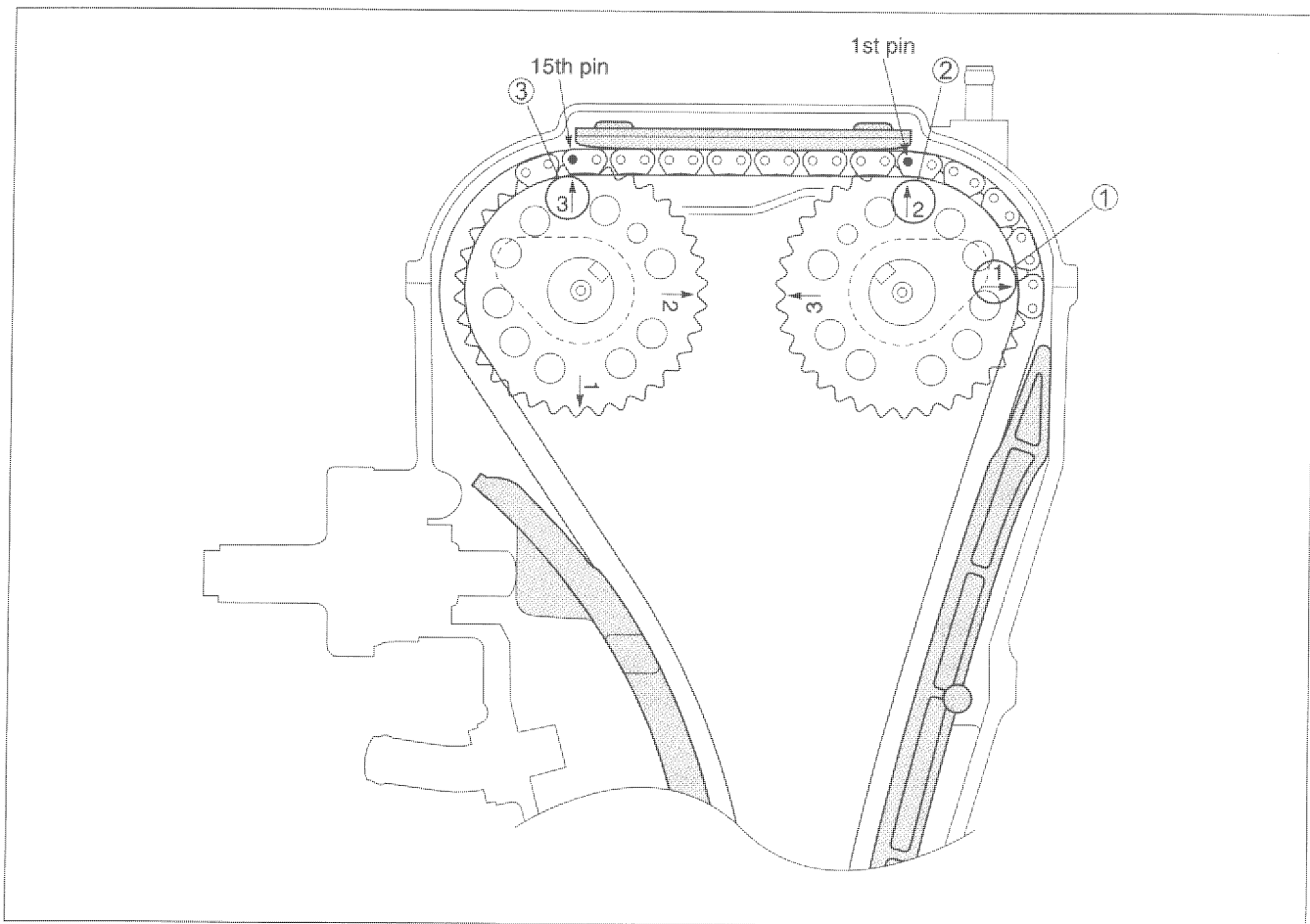
- Place each camshaft into the correct position.



- With the "T" line aligned with the center of the hole, hold the camshaft steady and lightly pull up the cam chain to remove any slack between the cam chain drive sprocket and exhaust camshaft sprocket.
- The exhaust camshaft sprocket has an arrow marked "1" ①. Turn the exhaust camshaft so that the arrow is aligned with the gasket surface of the cylinder head. Engage the cam chain with the exhaust camshaft sprocket.
- The other arrow marked "2" ② should now be pointing straight up. Starting from the roller pin that is directly above the arrow marked "2" ②, count out 15 roller pins (from the exhaust camshaft side going towards the intake camshaft side). Engage the 15th roller pin on the cam chain with the arrow marked "3" ③ on the intake sprocket. Refer to the following illustrations.

NOTE:

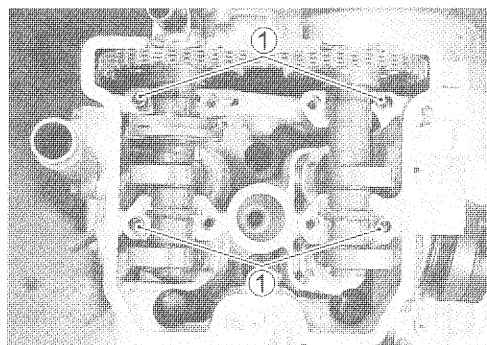
The cam chain should now be on all three sprockets. Be careful not to move the crankshaft until the camshaft journal holders and cam chain tensioner are secured.



- Install the dowel pins ①.
- Place each camshaft journal holders and cam chain guide into the correct position.

NOTE:

Camshaft journal holders marked "EX" are for the exhaust side and those marked "IN" are for the intake side.

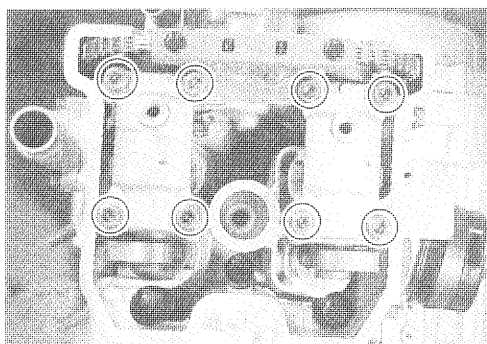


- Tighten the camshaft journal holder bolts to the specified torque.

 **Camshaft journal holder bolt: 10 N·m (1.0 kgf-m, 7.0 lb-ft)**

NOTE:

When tightening the camshaft journal holder bolts, the piston position must be at TDC on the compression stroke.

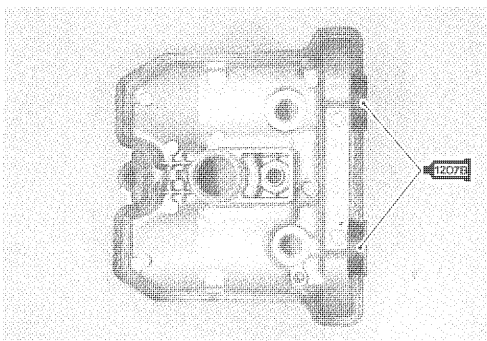


CYLINDER HEAD COVER

- Thoroughly wipe off oil from the fitting surfaces of the cylinder head and cover.
- Apply SUZUKI BOND "1207B" to the end caps of the cylinder head cover gasket as shown.

 **99104-31140: SUZUKI BOND "1207B" (USA)**

 **99000-31140: SUZUKI BOND "1207B" (Others)**



- Apply engine oil to both sides of the washer ①.
- Lightly tighten the cylinder head cover bolts in diagonal stages, and then tighten them to the specified torque.

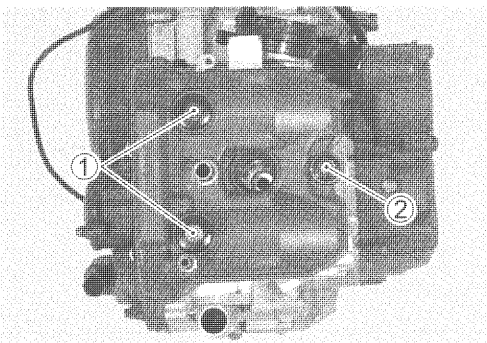
 **Cylinder head cover bolt**

Initial: 10 N·m (1.0 kgf-m, 7.0 lb-ft)

Final: 14 N·m (1.4 kgf-m, 10.0 lb-ft)

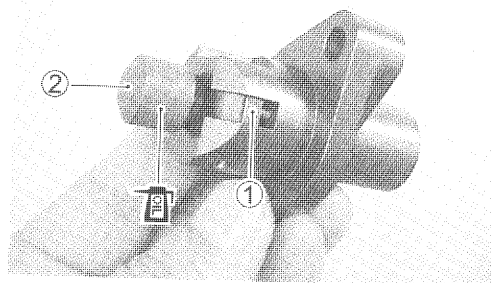
CAUTION

Use a new washers ① and cushion ②.



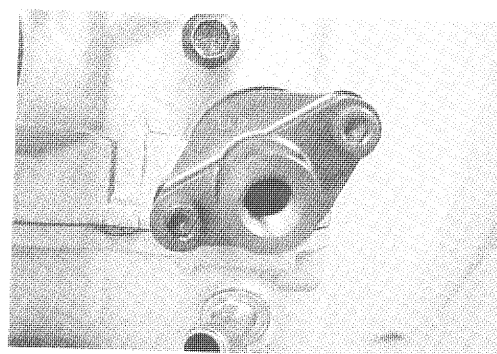
CAM CHAIN TENSION ADJUSTER

- Apply engine oil to the push rod.
- Unlock the ratchet mechanism ① and push the push rod ② all the way.



- Install the new gasket and cam chain tension adjuster to the cylinder.
- Tighten the cam chain tension adjuster mounting bolts to the specified torque.

 **Cam chain tension adjuster mounting bolt:**
10 N·m (1.0 kgf-m, 7.0 lb-ft)



- Install the spring ③.
- Tighten the spring holder bolt to the specified torque.

 **Cam chain tension spring holder bolt:**
30 N·m (3.0 kgf-m, 21.5 lb-ft)

