

ENGINE

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COMPRESSION CHECK

The compression of a cylinder is good indicator of its internal condition. The decision to overhaul the cylinders is often based on the results of a compression test. Periodic maintenance records kept at your dealership should include compression readings for each maintenance service.

COMPRESSION

Standard	Limit	Difference in cylinders
1 000 – 1 400 kPa (10 – 14 kg/cm ²) (142 – 200 psi)	800 kPa (8 kg/cm ²) (114 psi)	200 kPa (2 kg/cm ²) (28 psi)

Low compression pressure can indicate any of the following conditions:

- * Excessively worn cylinder wall
- * Worn-down piston or piston rings
- * Piston rings stuck in the grooves
- * Poor seating of valves
- * Ruptured or otherwise defective cylinder head gasket
- * Damaged lash adjusters

Overhaul the engine in the following cases:

- * Compression pressure in one of the cylinders is less than 800 kPa (8 kg/cm², 114 psi).
- * Difference in compression pressure between any two cylinders is more than 200 kPa (2 kg/cm², 28 psi).
- * All compression pressure are below 1 000 kPa (10 kg/cm², 142 psi) (standard) even when they measure more than 800 kPa (8 kg/cm², 114 psi).

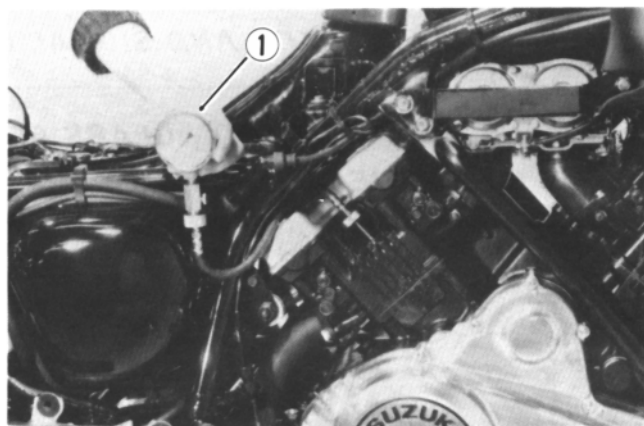
COMPRESSION TEST PROCEDURE

NOTE:

- * Before testing the compression of the engine, make sure that the cylinder head bolts and nuts are tightened to specified torque values.
- * Warm up the engine before testing.

- Remove the frame covers. (Refer to chassis section).
- Remove all the spark plugs.
- Fit the compression gauge ① in one of the plug holes, while taking care that the connection is tight.
- Twist the throttle grip full open.
- Crank the engine a few seconds with the starter, and record the maximum gauge reading as the compression of the cylinder.
- Repeat this procedure with the other cylinders.

09915-64510	Compression gauge
09918-02410	Adapter



ENGINE COMPONENTS REMOVABLE WITH THE ENGINE IN PLACE

The parts listed below can be removed and reinstalled without removing the engine from the frame. Refer to the page listed in this section for removal and reinstallation instructions.

ENGINE LEFT SIDE	ENGINE CENTER	ENGINE RIGHT SIDE
Secondary bevel gear case cover	Oil filter	Clutch cover
Gearshift lever	Radiator and cooling fan	Clutch pressure, drive and driven plates
Secondary bevel gear case	Throttle cable and choke cable	Oil pressure switch
Generator cover	Front exhaust pipe and muffler	Oil pump drive gear
Starter pinion assembly	Carburetor	Water pump drive chain
Clutch cylinder	Cylinder head breather cover	Primary driven gear
Generator rotor	Thermostat	Water pump assembly
Gear position indicator switch body	Water temp. switch	Oil pump assembly
Generator stator	Fan relay switch	Gearshift shaft
Signal generator	Oil pan	
	Starter motor	
	Oil pump filter	

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ENGINE REMOVAL AND REINSTALLATION

ENGINE REMOVAL

Before taking the engine out of the frame, wash the engine, remove the following parts from the chassis and drain engine oil and cooling solution etc. (Refer to the chassis section.)

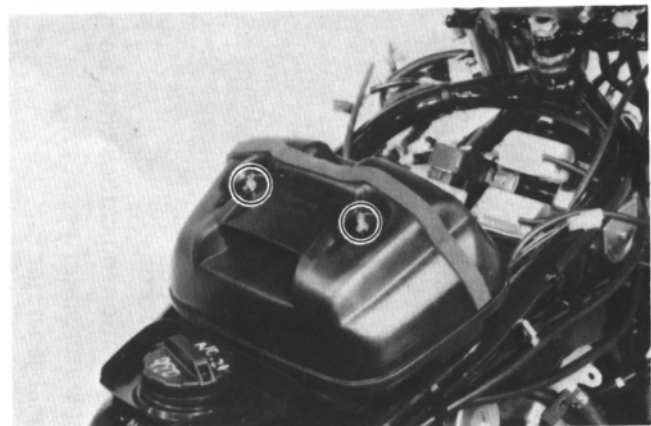
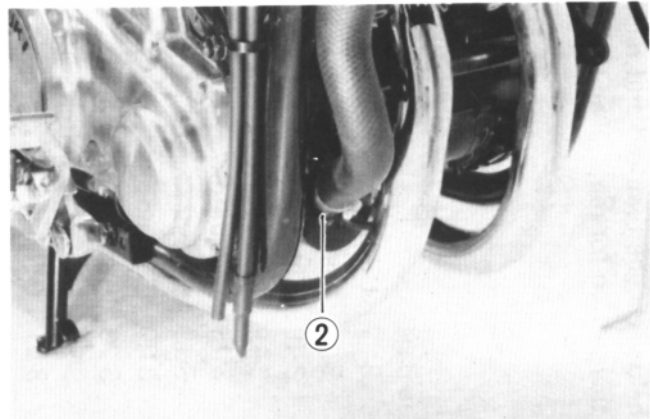
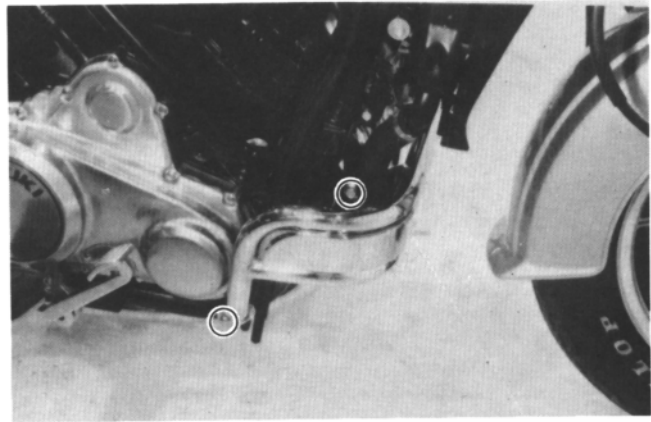
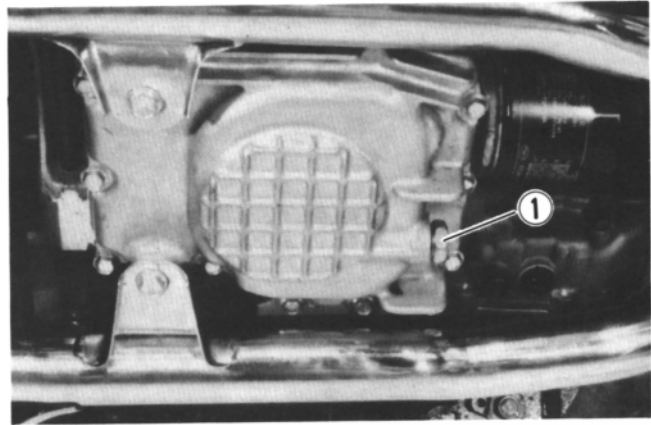
- * Seat
- * Right and left frame covers
- * Handlebar cover
- * Battery and fuel tank cover
- * Lower fairing
- * Ornament, window screen cover and headlight grill
- * Window screen
- * Headlight aiming knob and speaker cover
- * Rear view mirrors, fairing and speakers
- * Screen bracket
- * Audio box
- * Ventilator cases
- * Battery holder and coolant reservoir tank
- * Air compressor unit
- * Cruise control unit and monitor unit
- * Headlight assembly
- * Meter assembly
- * Auto cruise actuator
- * Electrical parts mounting brackets

The procedure of engine removal is sequentially explained in the following steps, and engine installation is effected by reversing the removal procedure.

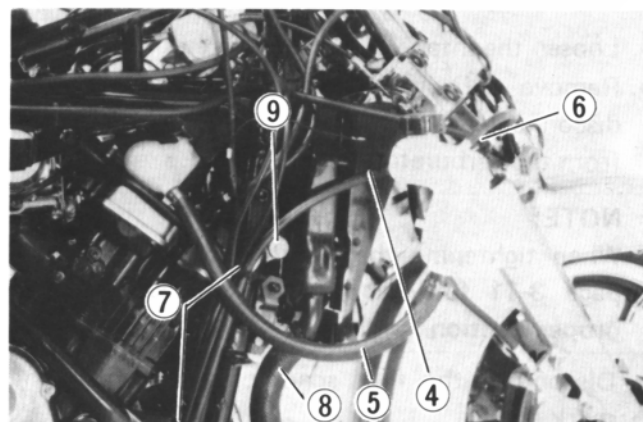
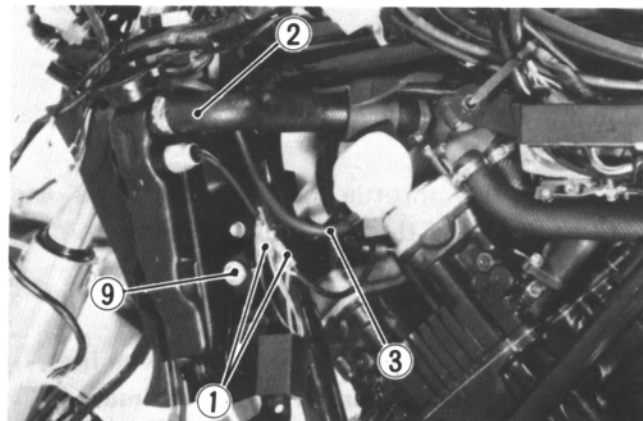
- Place an oil pan under the engine and remove the oil drain plug ① and filler plug to drain out engine oil.
- Remove the engine guard.
- Remove the radiator cap and drain plug ②, and drain cooling solution completely.
- Remove air cleaner case cover and air cleaner.
- Loosen the air inlet pipe clamp screws and remove the cleaner lower case.

NOTE:

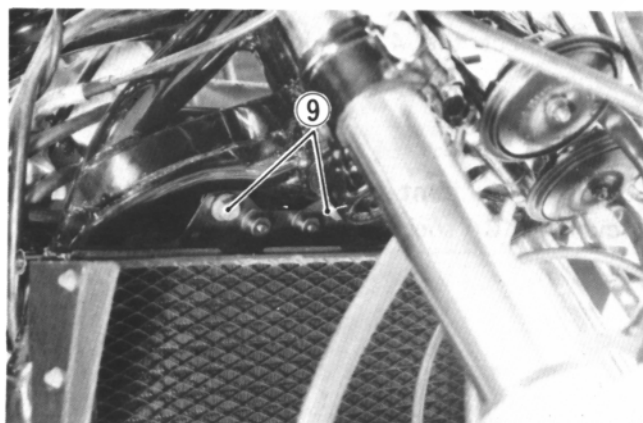
When reinstalling the air inlet pipe clamps, refer to page 3-11 for securing clamps properly.



- Disconnect the electric fan lead wire ①.
- Loosen the clamps and disconnect the following hoses.
 - ② Cylinder head to radiator hose
 - ③ Radiator to reservoir hose
- Remove the reservoir tank.
 - ④ Breather hose
 - ⑤ Reservoir tank to reservoir tank hose
 - ⑥ Reservoir tank to reservoir tank hose
- Disconnect the breather hose clamps ⑦.
- Loosen the clamps and disconnect the radiator to water pump hose ⑧.



- Remove the radiator mounting bolts ⑨ and remove the radiator with electric fan.



- Remove the radiator reservoir ⑩.



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- Remove the right frame side member ①.
- Remove the breather hose ② from the cylinder head cover cap.
- Loosen the throttle cable holder nuts and disconnect the throttle cable from the throttle lever.

NOTE:

After all cables, hoses and clamps have been removed, the carburetor assembly may be removed with the engine still in place.

- Loosen the intake pipe clamp screws.
- Remove the choke cable holder screws ③ and disconnect the two choke cables, right and left, from the carburetors.

NOTE:

When tightening the clamp screws, refer to page 3-11 for securing the clamps in the proper position.

- Disconnect the four spark plug caps from the spark plugs.
- Disconnect the 4-way joint pipe ④ from the canister.

NOTE:

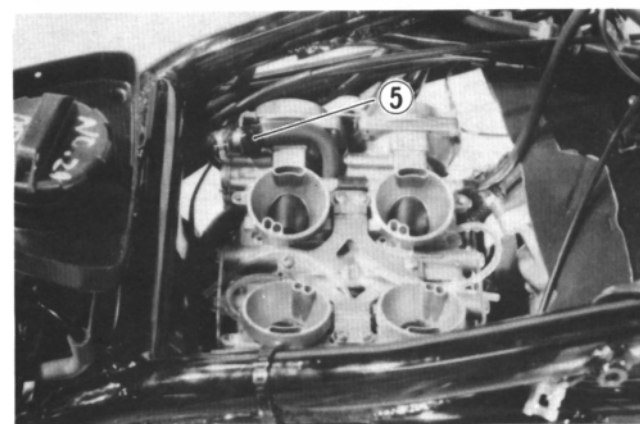
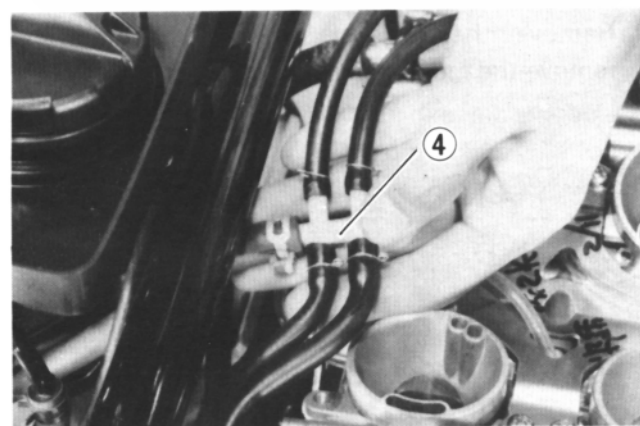
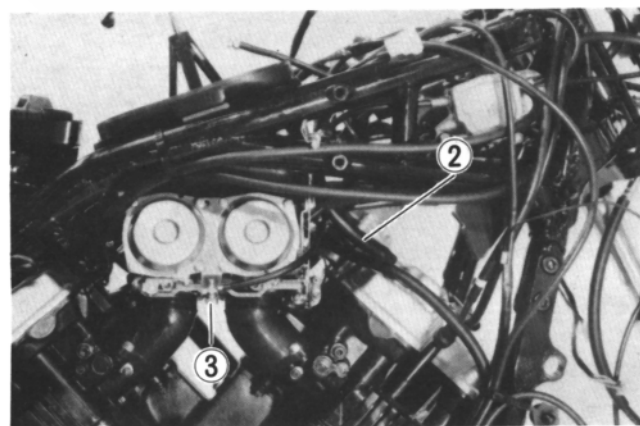
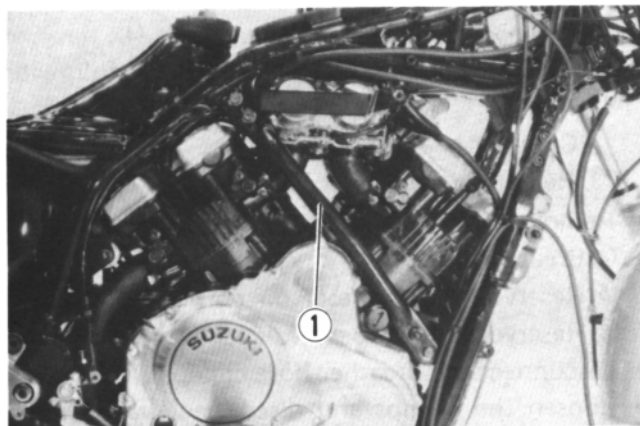
This 4-way joint is provided on the motorcycle for CA specification.

- Disconnect the fuel hose ⑤ from the fuel pump.

CAUTION:

When disconnecting the fuel hose, fuel in the hose may drain out.

Treat the gasoline with extreme care as gasoline is very explosive.



- Remove the rear brake pedal and right footrest.

NOTE:

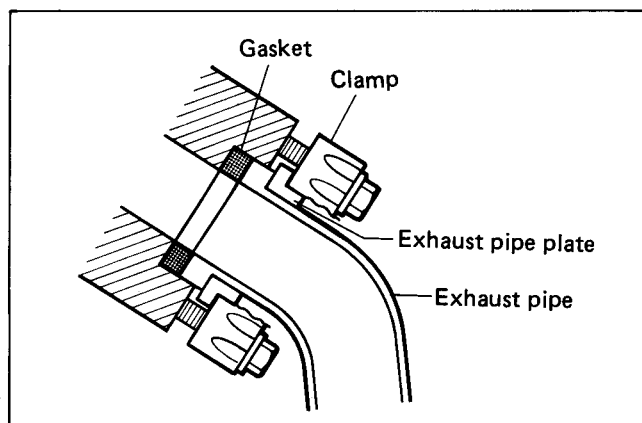
When removing the brake pedal, apply the rear brake and remove the bolt ①.

- Remove the exhaust pipe clamp bolts for Nos. 2 and 4 cylinders.

NOTE:

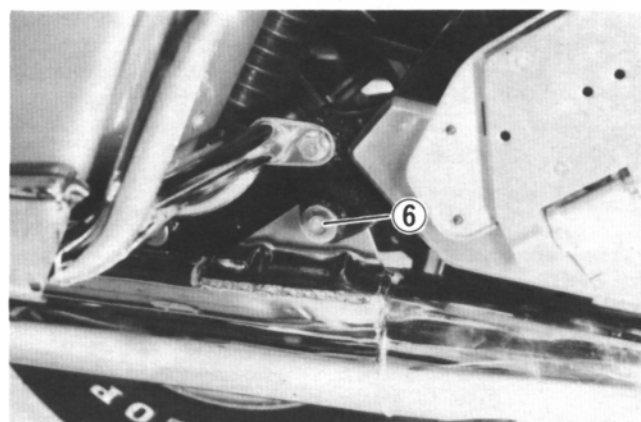
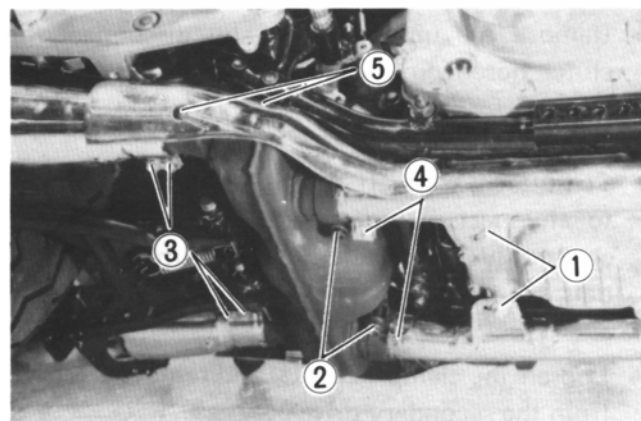
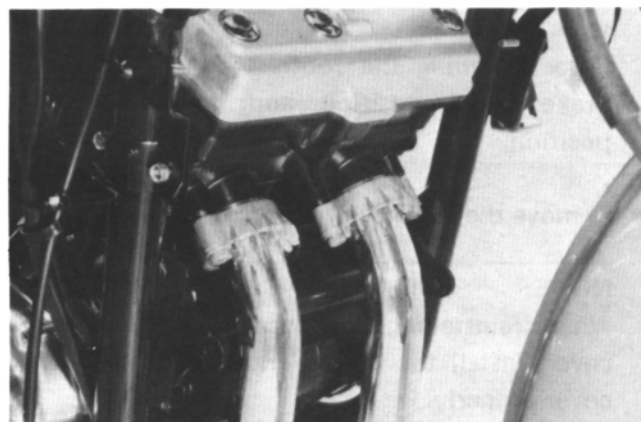
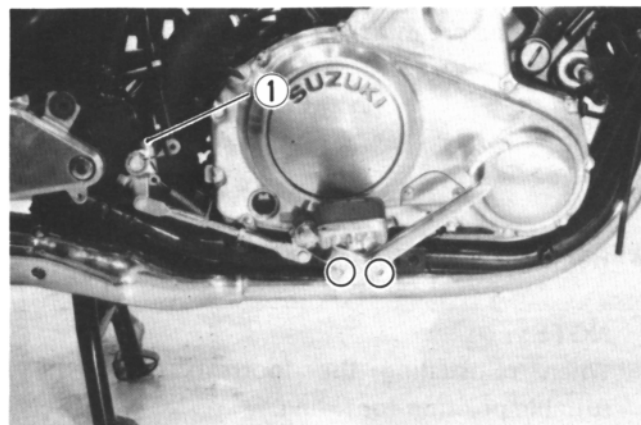
When reinstalling the front exhaust pipes, install the two exhaust pipe plates to the each clamps.

Replace exhaust pipe gaskets with new ones.



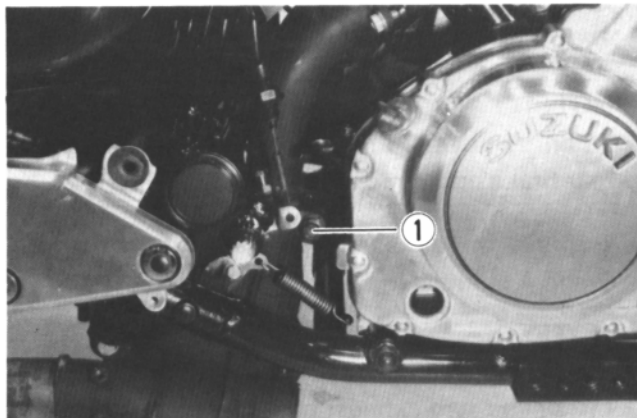
- Remove the exhaust pipe mounting bolts ①.
- Loosen the exhaust pipe — pre-muffler clamp bolts ② and pre-muffler — muffler clamp bolts ③.
- Loosen the muffler cover clamp bolts ④ and muffler cover screws ⑤.
- Remove the exhaust pipes.

- Remove the muffler mounting bolts ⑥ and remove the right and left mufflers.



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- Loosen the rear exhaust clamp bolts ① and remove the pre-muffler.



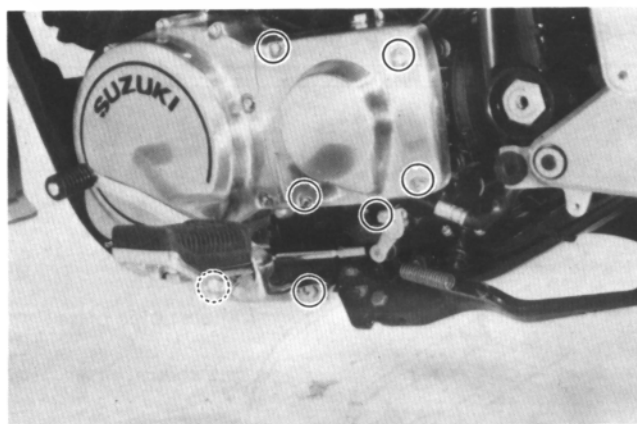
- Remove the left footrest and gearshift lever.

NOTE:

When reinstalling the footrest, select the suitable position for riding.

Install the both right and left footrests at the same position.

After installing the footrest adjust the rear brake pedal position and gearshift lever position.



- Remove the secondary gear case cover.

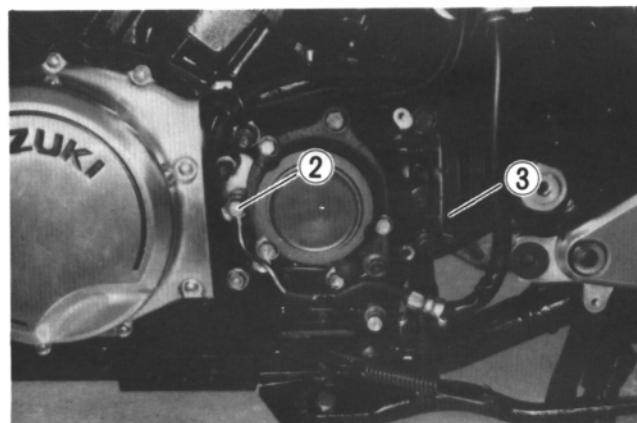
NOTE:

When reinstalling the secondary gear case cover, install the rubber insulator behind the cover properly.

- Remove the union bolt ② and disconnect the clutch hose from the clutch cylinder.

CAUTION:

Completely wipe off any clutch fluid adhering to any part of motorcycle. The fluid reacts chemically with paint, plastics, rubber materials, etc.



- Loosen the clamp screw ③ and remove the boot from the secondary drive gear case.
- Remove the left frame side member.

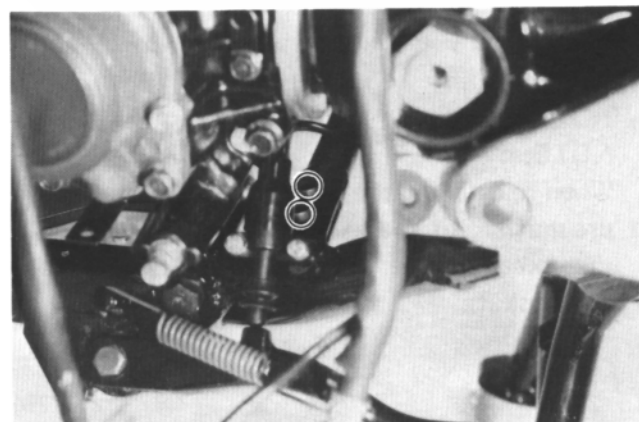
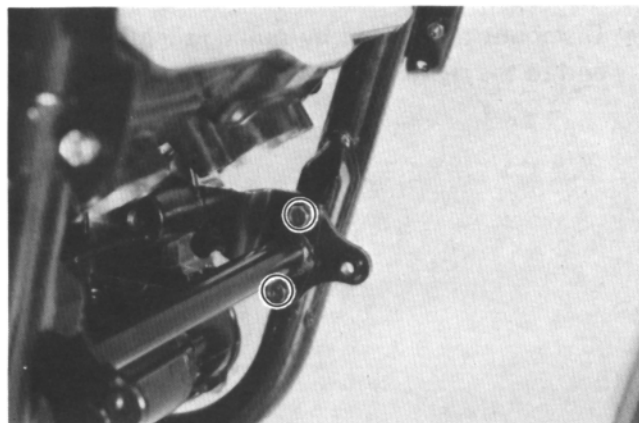


- Use a jack and wooden block, and hold the engine assembly.

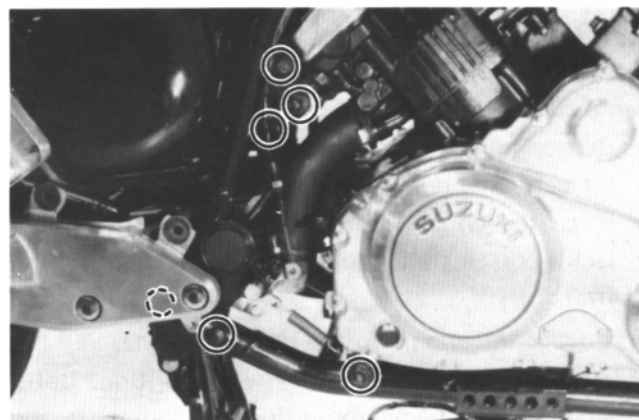
CAUTION:

When holding the engine with jack, place a piece of wood on the jack, or the oil pan may be damaged.

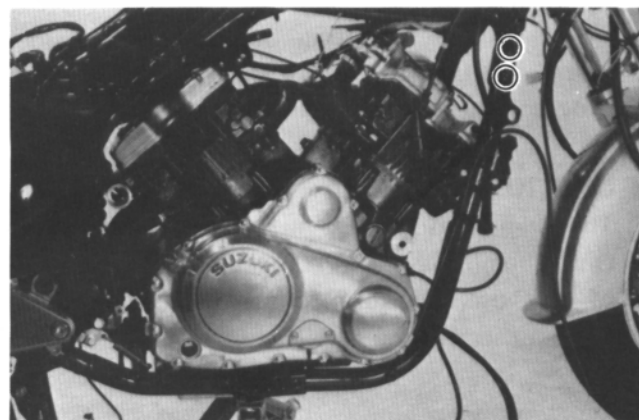
- Loosen the engine mounting bolts and bracket bolts.
- Remove the right frame down tube securing bolts.



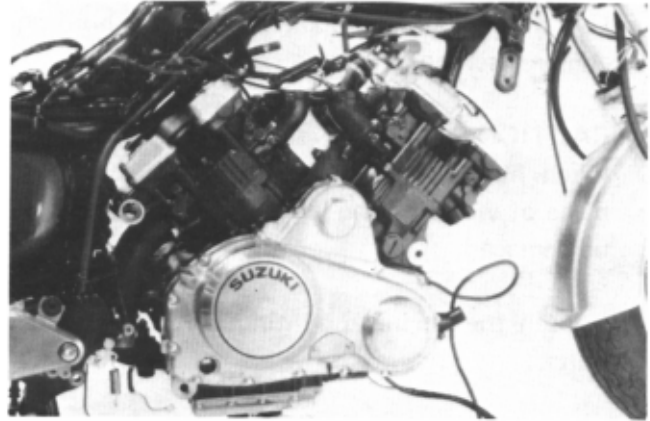
- Remove all the engine mounting bolts and remove the down tube bolts.



- Remove the down tube and slowly lower the engine assembly.



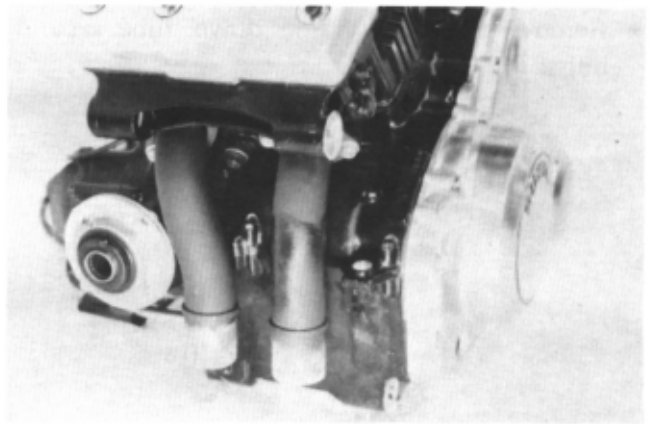
- Dismount the engine by pulling slightly forward and to the right side.



- Remove the exhaust pipes for Nos. 1 and 3 cylinders.

NOTE:

When reinstalling the exhaust pipes, install the pre-muffler to the exhaust pipes and tighten the exhaust pipe clamp bolts. Always use new gaskets.



ENGINE REINSTALLATION

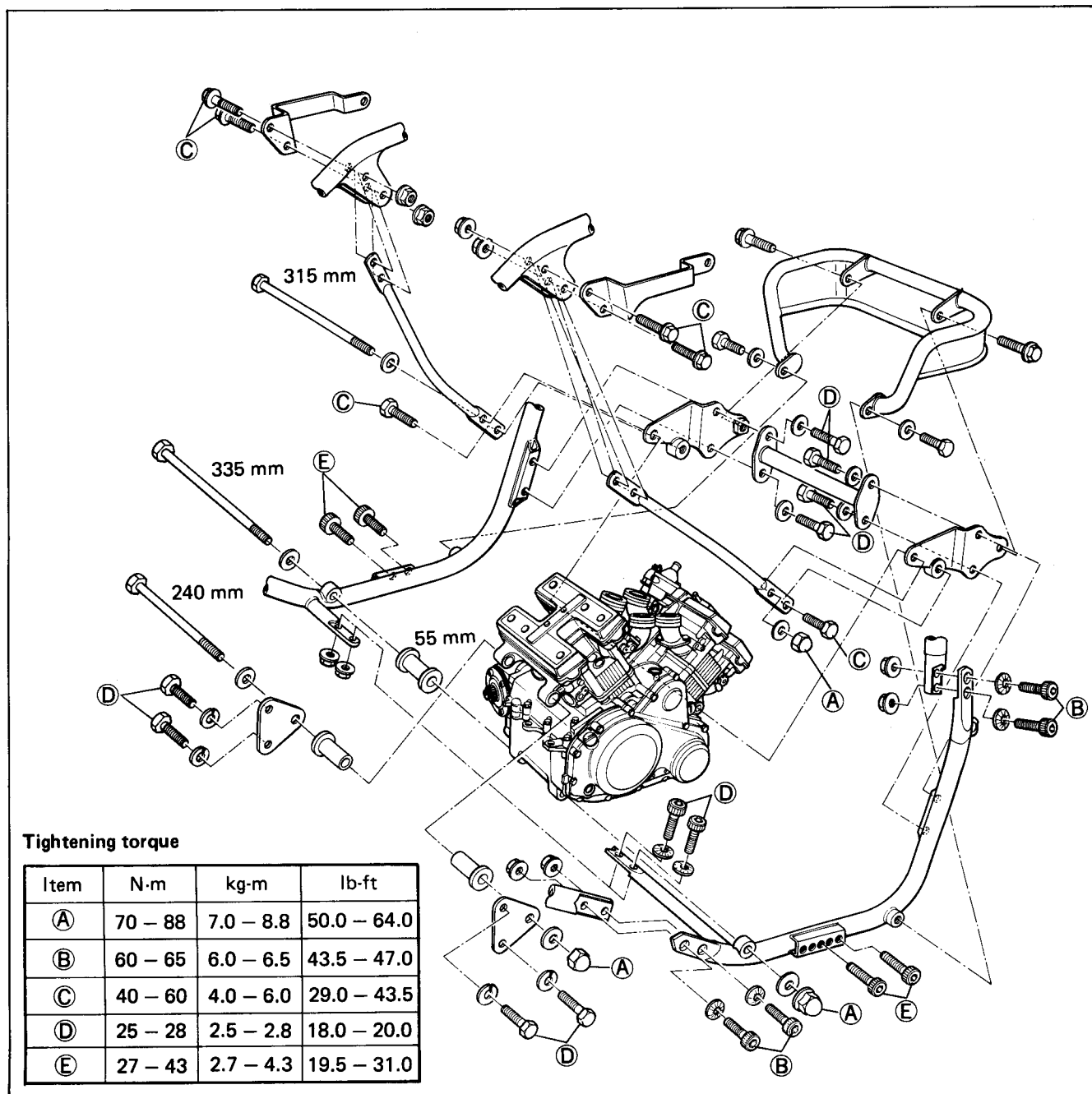
Reinstall the engine in the reverse order of engine removal.

- Before mounting the engine, install the exhaust pipes for the rear cylinders.
- Place the engine in the proper position using a jack, and install the right down tube to the frame.
- Engage the engine to the universal joint.
- After inserting the engine mounting bolts, tighten the engine mounting bracket bolts and engine mounting bolts.

Insert all the mounting bolts from left side. Install the brackets, bolts and nuts properly as shown in the following illustration.

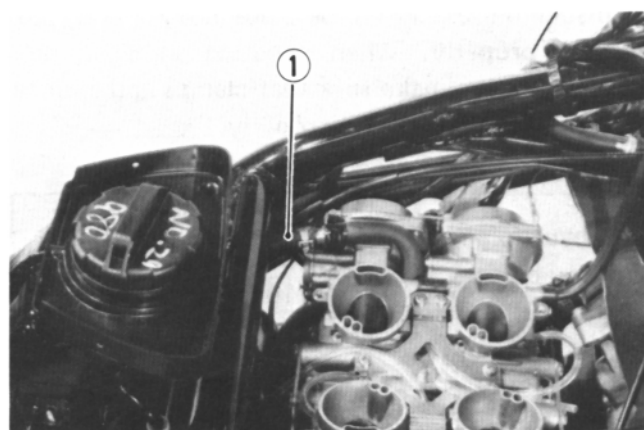
CAUTION:

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 tighten them to the specified torque.

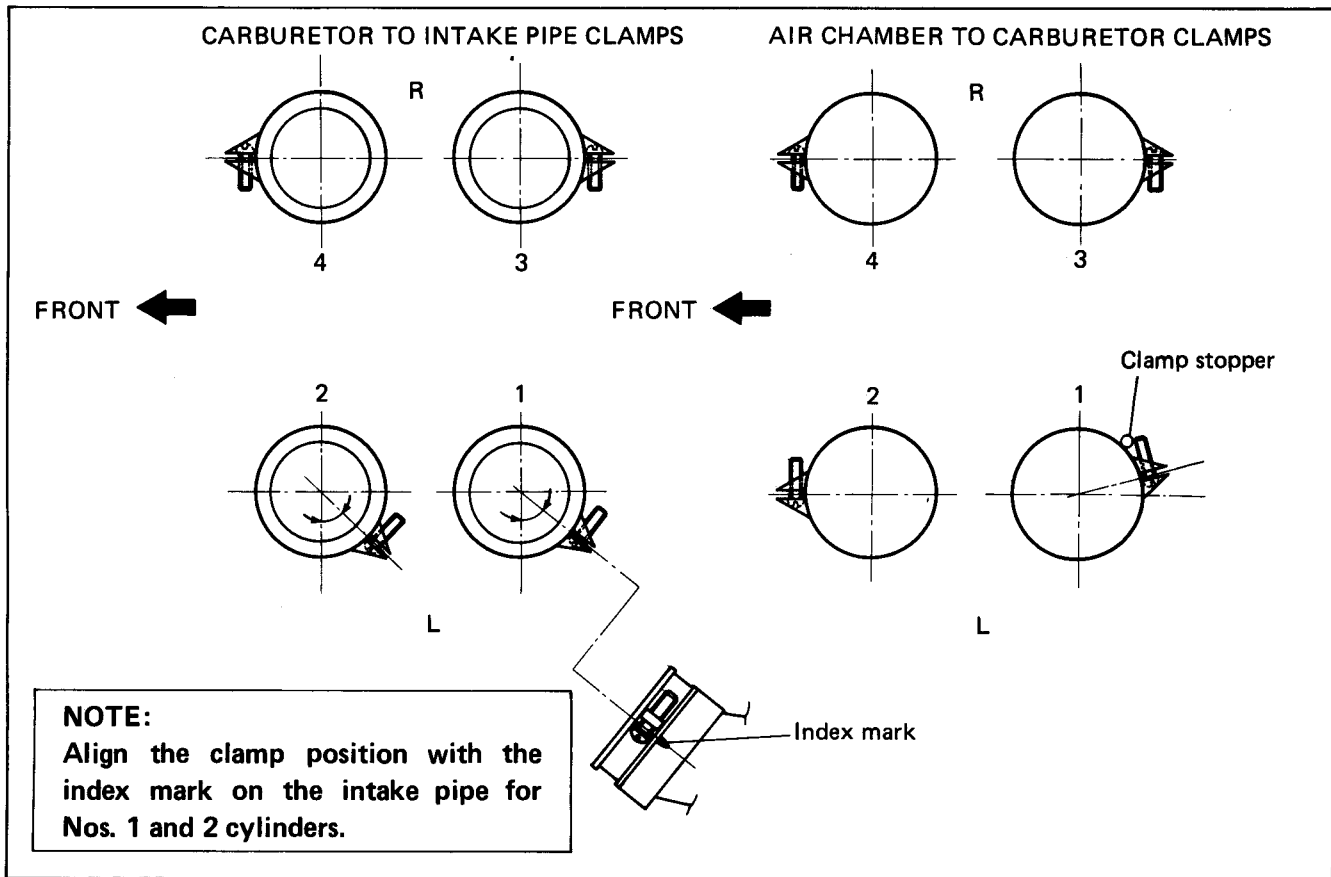
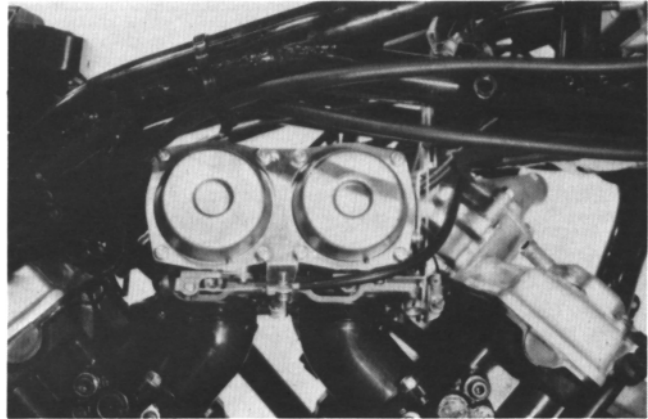


- Route the fuel hose properly and connect the fuel hose to the fuel pump.

① Hose to the carburetor



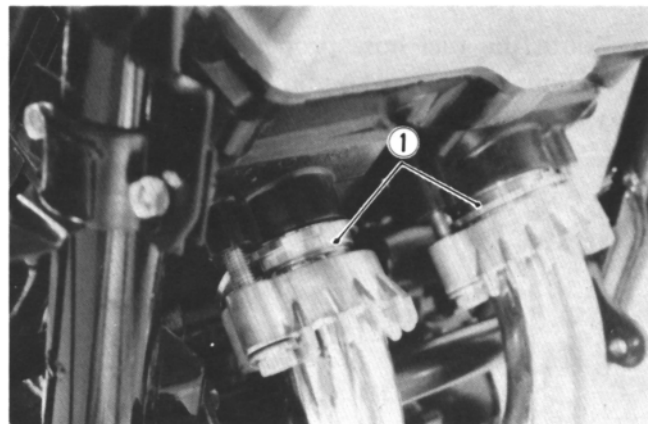
- Install the carburetor to the air chamber and tighten the intake pipe clamp screws securely.
- Firmly secure the carburetors with the clamps. If the carburetors are not firmly secured, gas leakage, incorrect air-fuel ratio and unsatisfactory engine operation may result.



- Install the exhaust pipes, pre-muffler and mufflers properly. When securing exhaust pipe clamp bolts, make sure that clamps and connectors ① are positioned properly.

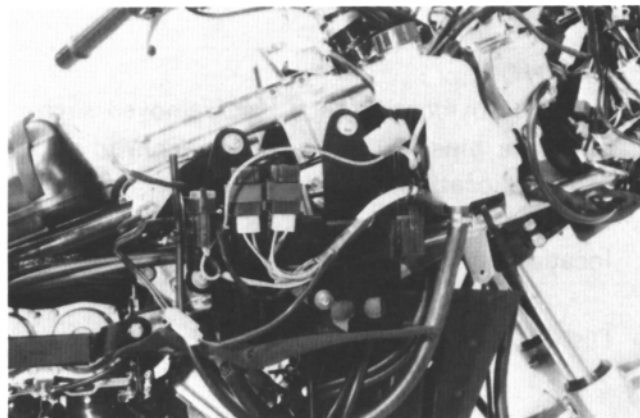
Tightening torque

Exhaust pipe clamp bolt	20 – 25 N·m (2.0 – 2.5 kg-m) (14.5 – 18.0 lb-ft)
Muffler mounting bolt	27 – 43 N·m (2.7 – 4.3 kg-m) (19.5 – 31.0 lb-ft)

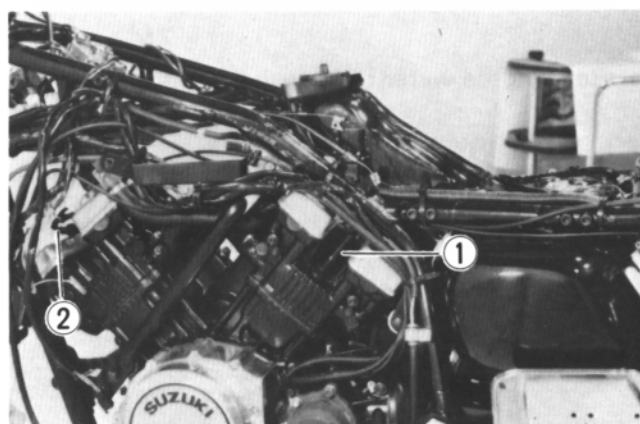


- Mount the cooling solution reservoir tank and radiator, and route and connect the hoses properly. (Refer to the section "Cooling system")

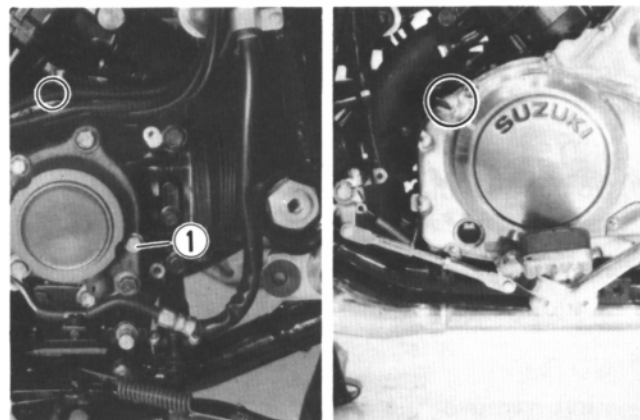
Radiator mounting bolt tightening torque	7 – 9 N·m (0.7 – 0.9 kg-m) (5.0 – 6.5 lb-ft)
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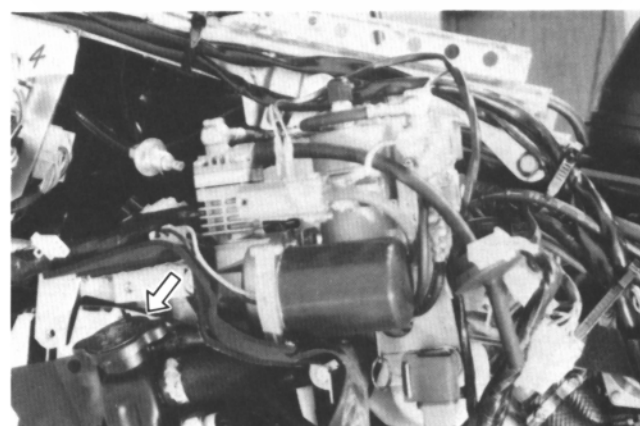
- Replace the plug caps on the spark plugs so that their code markings correspond to the cylinder numbers in the order of 1, 2, 3 and 4 from the rear left.
 - ① Rear left cylinder
 - ② Front left cylinder
 - ③ Rear right cylinder
 - ④ Front right cylinder



- Install 4.2 L (4.4 US qt.) (when overhauling engine) of engine oil SAE 10W/40 under API classification SE or SF into the engine. Several minutes after starting and stopping the engine, check that the oil level remains between the marks on the oil inspection window.
- Install 330 – 350 ml (11.2 – 11.8 US oz) of hypoid # 90 gear oil into the secondary gearcase to the level screw ①.
- Fill the proper cooling solution.
- After remounting the engine, route wiring harness, hoses and cables properly by referring to the sections, wire routing and cable routing, and adjust the following items to the specification.



	Page
* Throttle cable	2- 7
* Choke cables	2- 7
* Idling adjustment	2- 7
* Clutch air bleeding	2- 9
* Filling cooling solution	2-10
* Rear brake pedal and fluid level	2-12
* Brake light switch	2-14
* Balancing carburetor	6-26

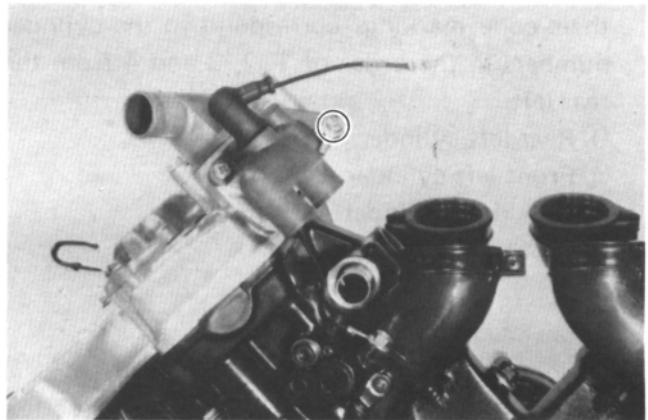
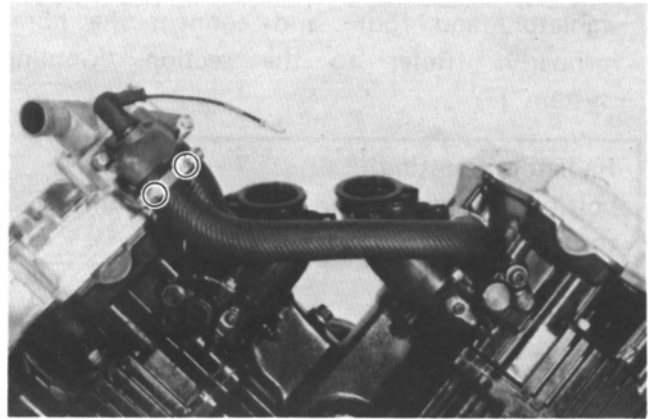


ENGINE DISASSEMBLY

CAUTION:

Be sure to identify each part removed such as intake pipe, camshaft, piston, conrod etc. as to its location. Lay the parts out in groups so that each will be restored to the original location during assembly.

- Disconnect the water hose from the union.
- Remove the water temp. gauge ground lead wire.



- Remove cylinder head covers and their gaskets.

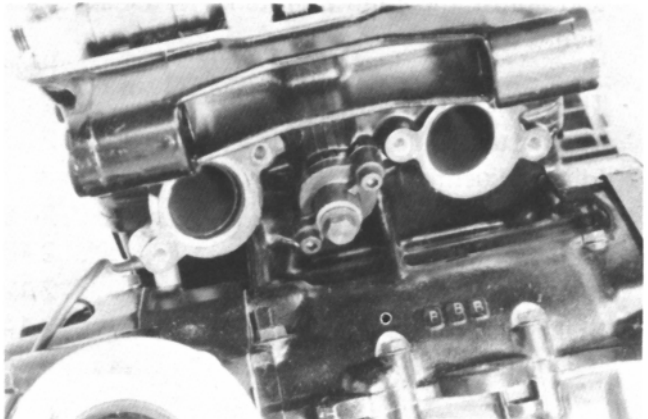
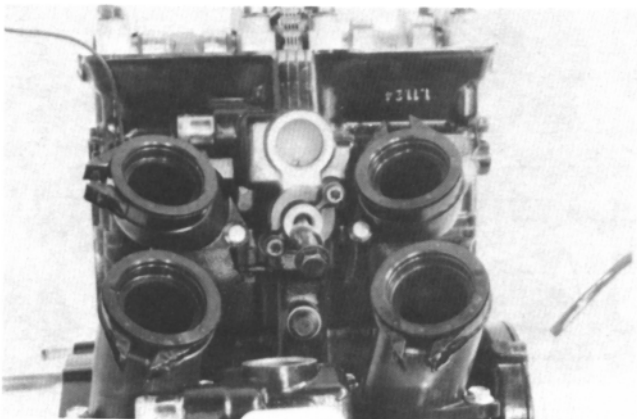
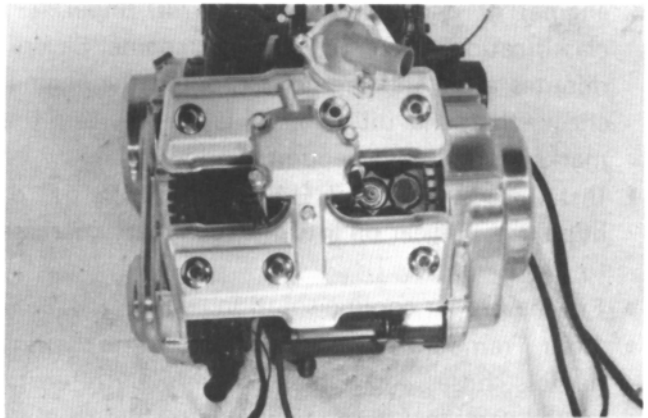
NOTE:

Do not miss the gasket located with screw.

- Remove the cam drive chain tensioners by using 5-mm hexagon wrench.

NOTE:

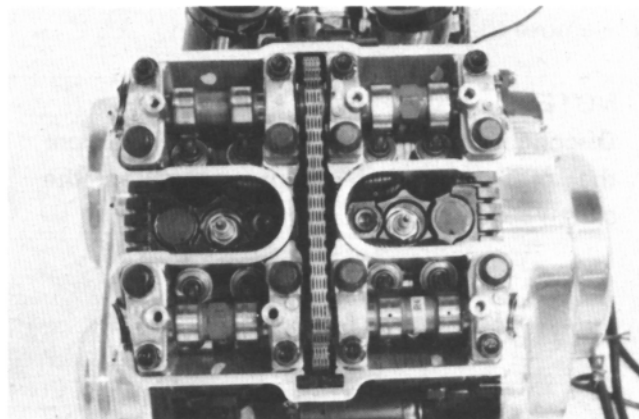
First remove the center cap of the chain tensioners.



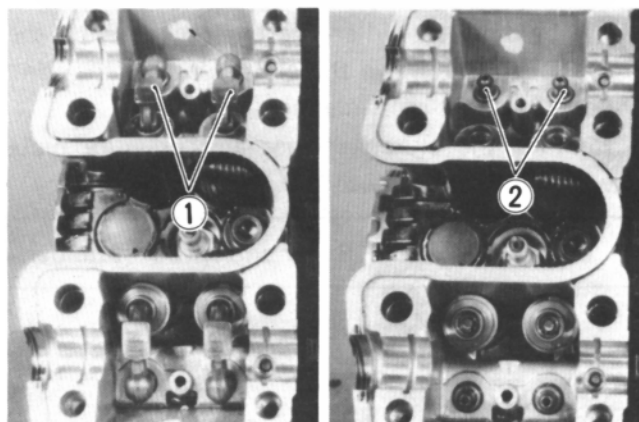
- Remove the sixteen camshaft holders.
- Remove the four camshafts.

NOTE:

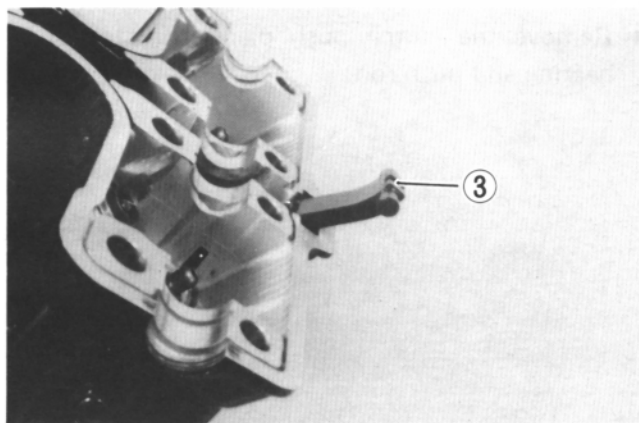
Be sure to loosen camshaft holder bolts evenly by shifting the wrench diagonally.



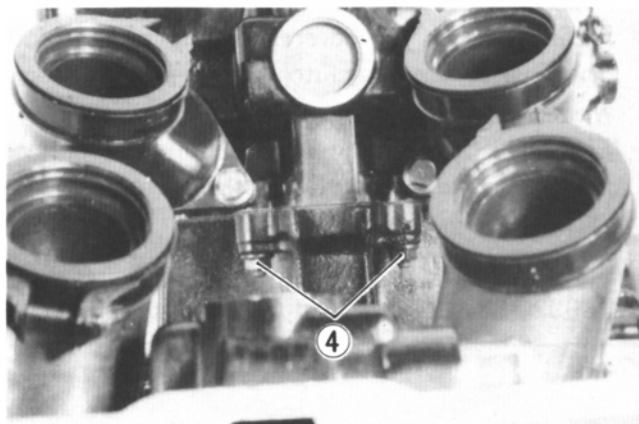
- Remove the cam follower pivots ① and lash-adjusters ②.



- Pull out cam chain guide ③.



- The cylinder head becomes free for removal when its two nuts ④ are removed.

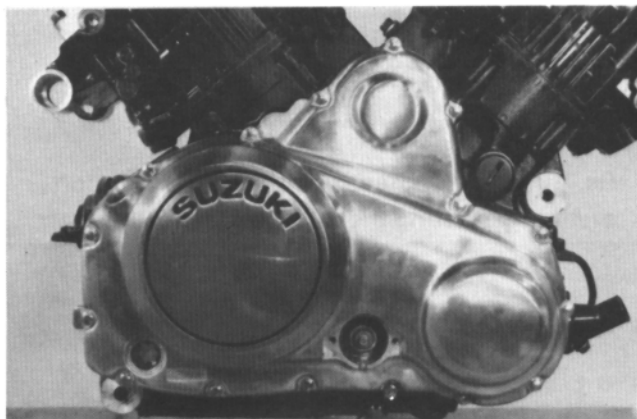


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- Remove the clutch cover and gasket.

NOTE:

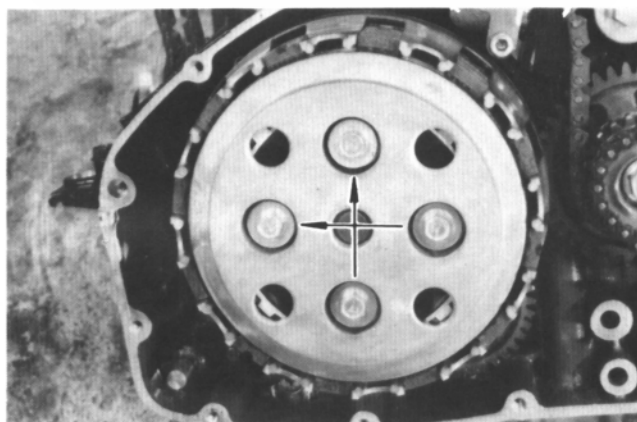
Disconnect the oil pressure switch lead from the pressure switch before removing the clutch cover.



- By holding the idler shaft sprocket with the special tool, remove the clutch spring mounting bolts in a criss-cross manner.
- Remove the clutch springs and pressure plate with clutch push piece.

09930-40113

Rotor and sprocket holder



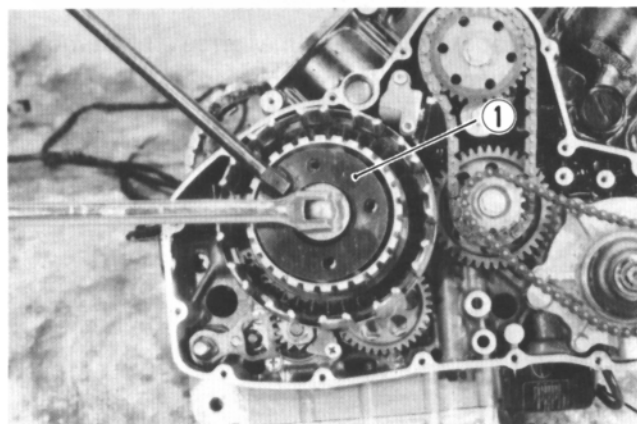
- Remove the clutch push piece, thrust washer, bearing and push rod.



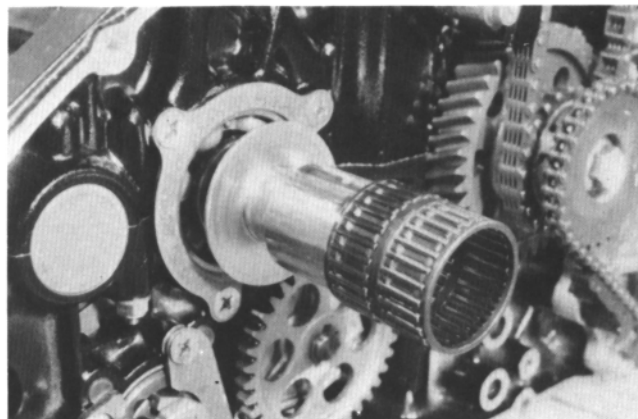
- After removal of several clutch driven and drive plates, flatten clutch sleeve hub nut lock washer using a chisel.
- Firmly secure clutch sleeve hub to remove mounting nut with clutch sleeve hub holder ①.

09920-53722

Clutch sleeve hub holder



- Remove washer, clutch hub, the remaining plates, wave washer and seat.
- Remove the primary driven gear assembly, spacer, bearing and washer.

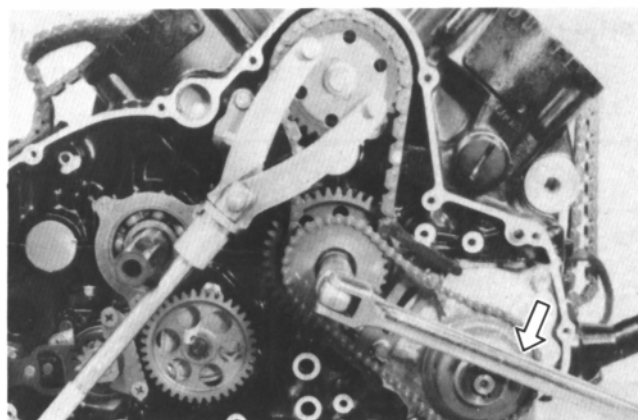


- Hold the idler sprocket with the special tool and remove the water pump drive sprocket bolt by turning the bolt clockwise.

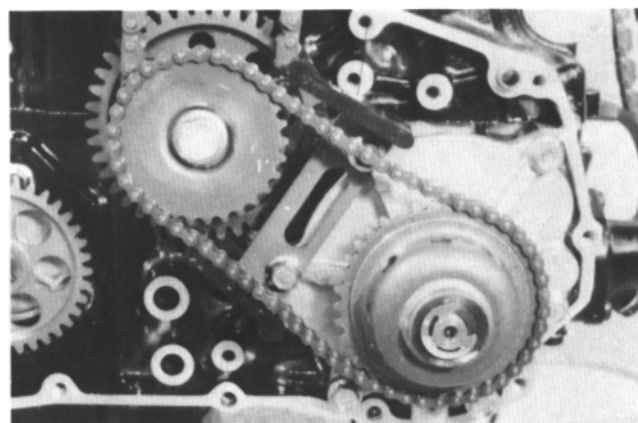
09930-40113	Rotor and sprocket holder
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CAUTION:

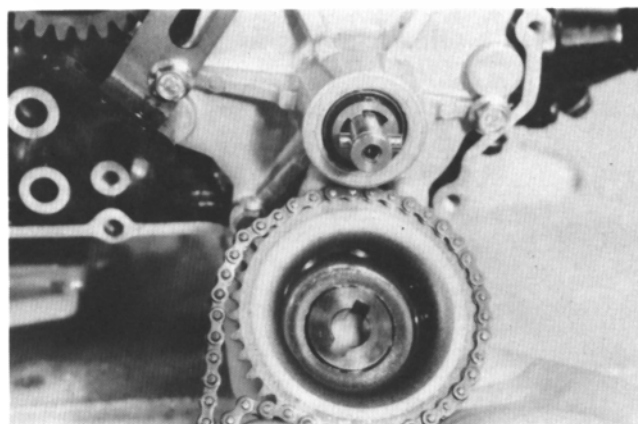
This bolt has left-hand thread. Turning it counter-clockwise, may cause damage to the threads.



- Remove water pump driven sprocket E-ring.

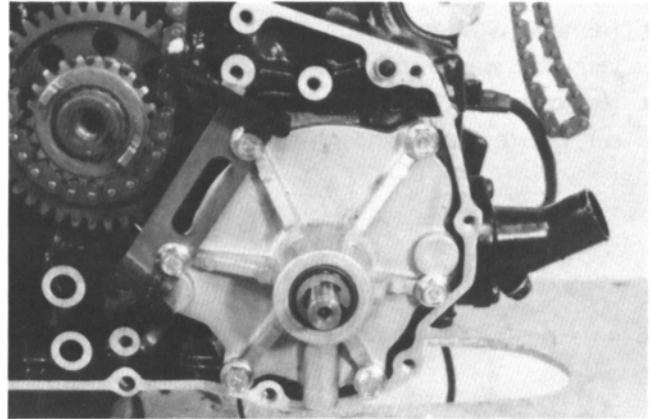


- Remove water pump drive and driven sprockets with drive chain.



3-17 ENGINE

- Remove the water pump drive chain guide and water pump assembly.



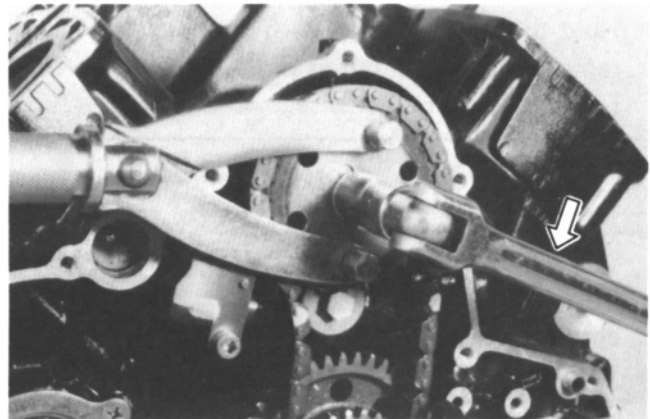
- Hold the idler shaft sprocket with the special tool and remove the sprocket bolt by turning it clockwise.

09930-40113

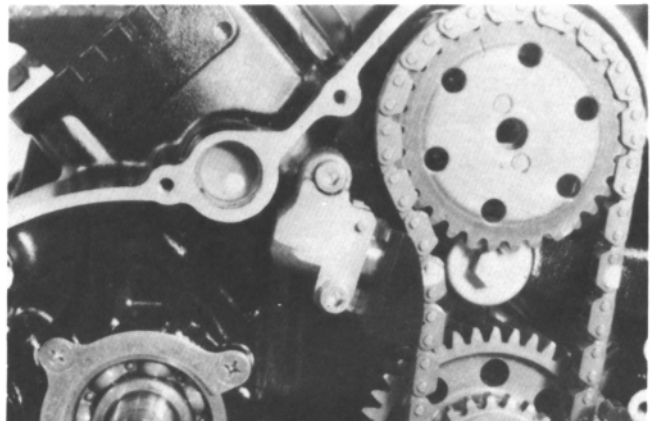
Rotor and sprocket holder

CAUTION:

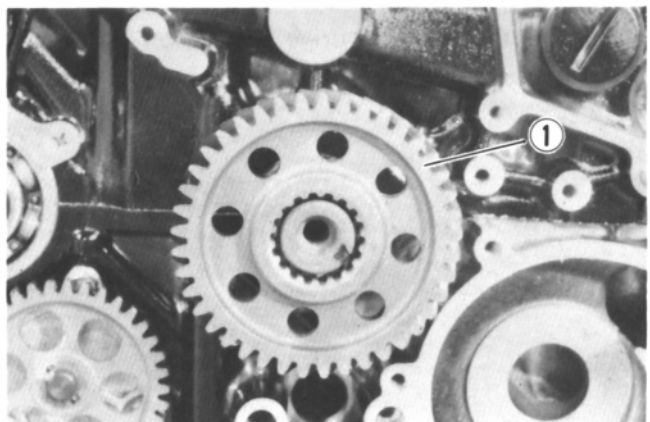
This bolt has a left-hand thread. When loosening it, turn it clockwise.



- Remove the idler shaft drive chain tensioner.
- Remove the idler shaft drive and driven sprockets with the drive chain.

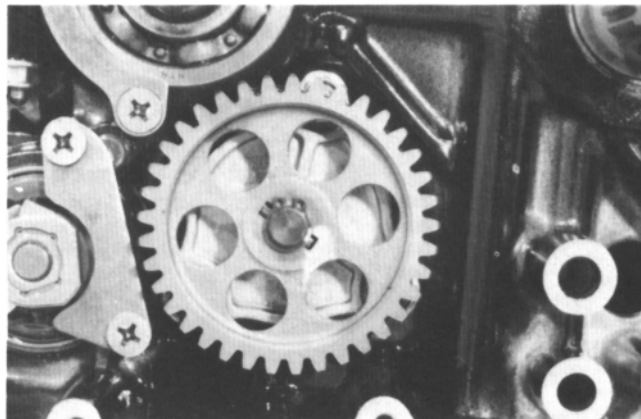


- Remove the primary drive gear ①.

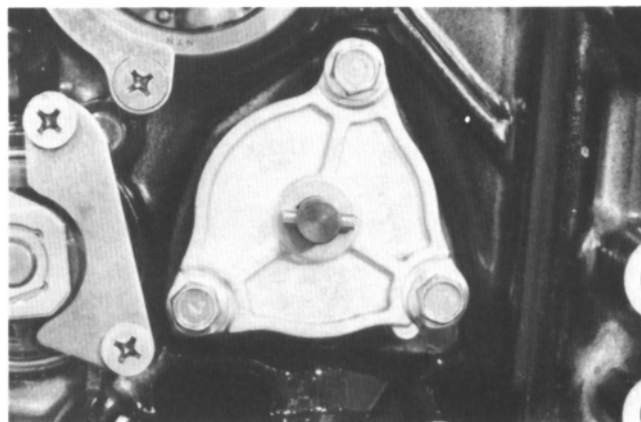


- Remove the oil pump driven gear using the snapping pliers.

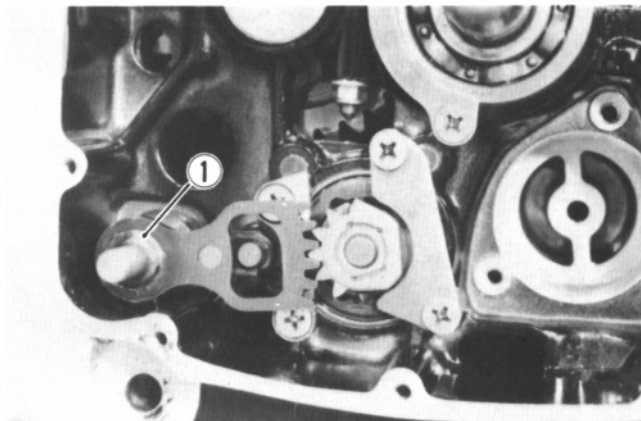
09900-06107	Snapring pliers
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- Remove the pin, washer and oil pump assembly.



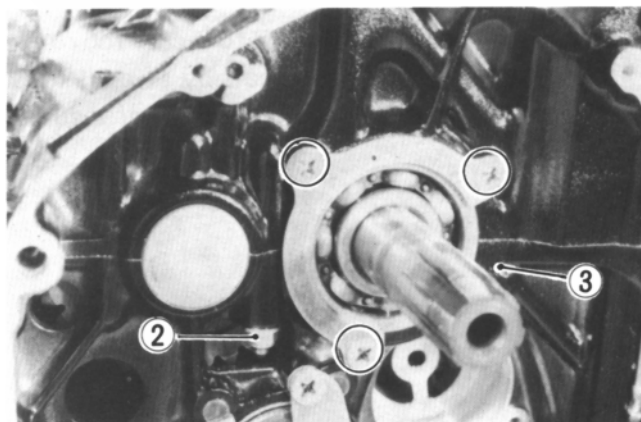
- Remove the gearshift shaft ① by pulling.



- Remove the countershaft bearing retainer by using impact driver.

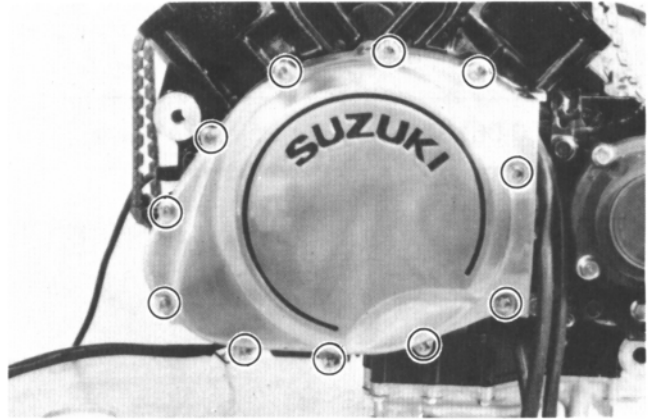
09900-09003	Impact driver set
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- Remove the crankcase securing nut ② and bolt ③.

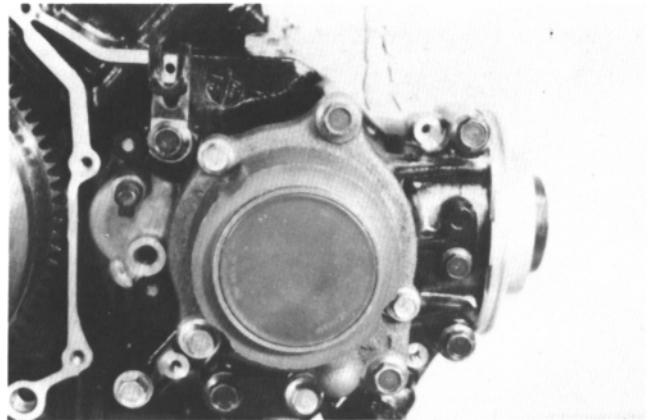


3-19 ENGINE

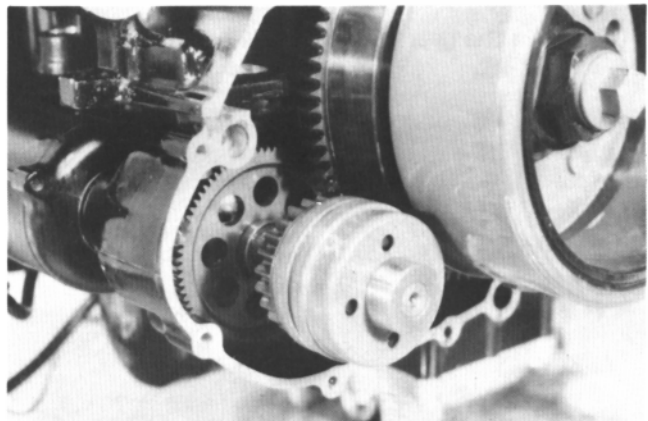
- Remove the generator cover and its gasket.



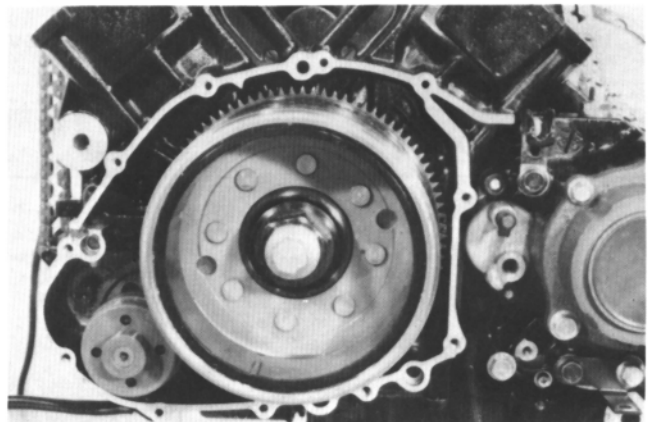
- Remove the secondary gearcase and clutch cylinder.



- Remove the starter pinion and starter drive gear.



- Using 36 mm off-set wrench to secure the rotor, loosen the rotor securing bolt by several turns. At this stage, do not remove the rotor securing bolt.



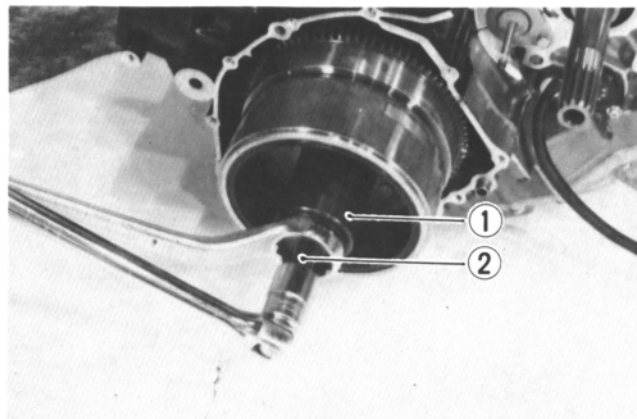
- Install the rotor remover ① into the boss of rotor and remove the rotor assembly by turning its center bolt ② while holding the remover with the 36 mm off-set wrench.
- Remove the rotor remover from the rotor and remove the rotor securing bolt.

NOTE:

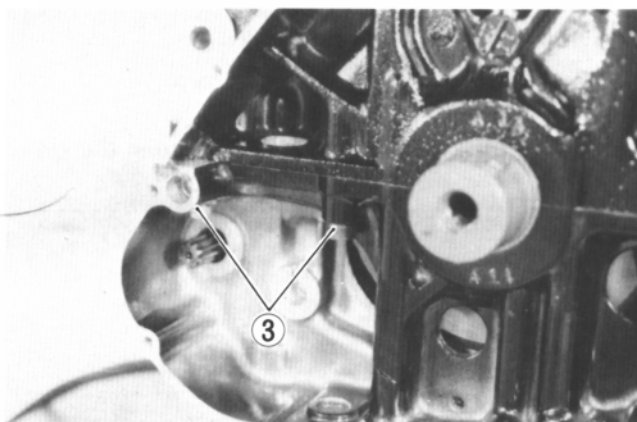
Do not hit the rotor with a hammer.

09930-30720

Rotor remover



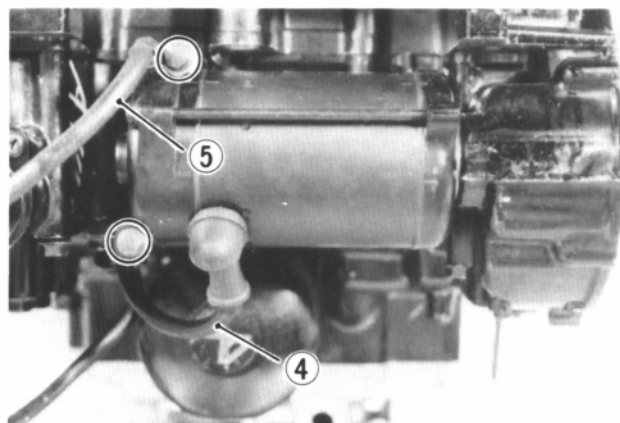
- Remove the crankcase securing bolts ③.



- Disconnect the starter motor lead wire and remove the starter motor.

④ : Starter motor lead wire

⑤ : Engine ground lead wire



- Remove the oil pan.

