GS650E

SUZUKI

GS650E

SERVICE MANUAL

99500-36011-03E
(英)

SUZUKI MOTOR CORPORATION PRINTED IN JAPAN OCTOBER, '90 (TK)

FOREWORD

The Suzuki GS650E has been developed as a companion motorcycle to the GS models. It features highly advanced design concepts including a twin dome type combustion chamber and a fully transistorized ignition system. The GS650E provides excellent performance, precise control and handling plus outstanding riding comfort.

This service manual has been produced primarily for experienced Suzuki mechanics. Apprentice and do-it-yourself mechanics will also find this manual to be an extremely useful repair guide. This manual contains the most up-to-date information at the time of publication. The rights are reserved to update or make corrections to this manual at any time.

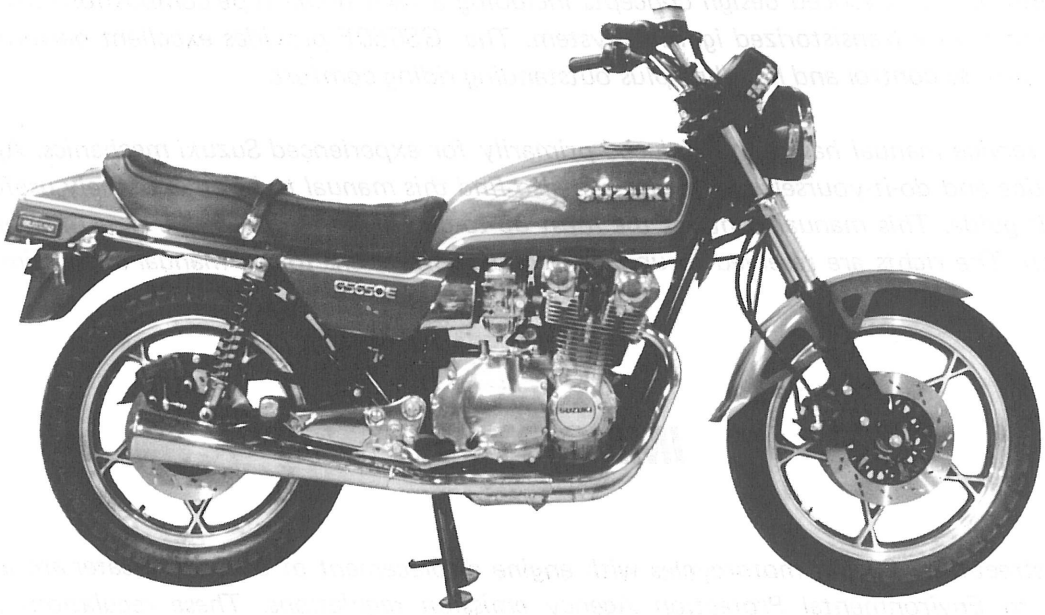
IMPORTANT

All street-legal Suzuki motorcycles with engine displacement of 50 cc or greater are subject to Environmental Protection Agency emission regulations. These regulations set specific standards for exhaust emission output levels as well as particular servicing requirements. This manual includes specific information required to properly inspect and service the GS650E in accordance with all EPA regulations. It is strongly recommended that the chapter on Emission Control, Periodic Servicing and Carburetion be thoroughly reviewed before any type of service work is performed.

Further information concerning the EPA emission regulations and U.S. Suzuki's emission control program can be found in the U.S. SUZUKI EMISSION CONTROL PROGRAM MANUAL/SERVICE BULLETIN.

SUZUKI MOTOR CORPORATION
Motorcycle Service Department

VIEW OF SUZUKI GS650E



RIGHT SIDE

LEFT SIDE

GROUP INDEX

GENERAL INFORMATION

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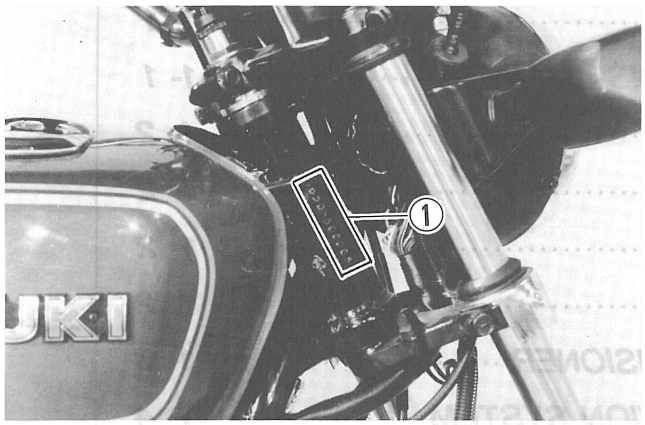
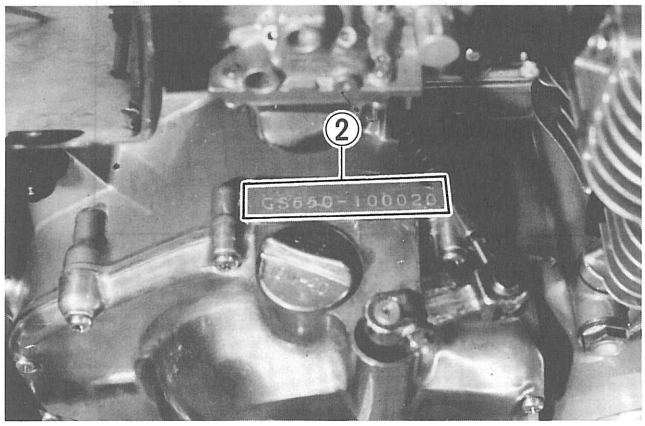
SERIAL NUMBER LOCATIONS

The VIN number ① is stamped on the steering head stem. The engine serial number ② is located on the right side of the crankcase. These numbers are required especially for registering the machine and ordering spare parts.





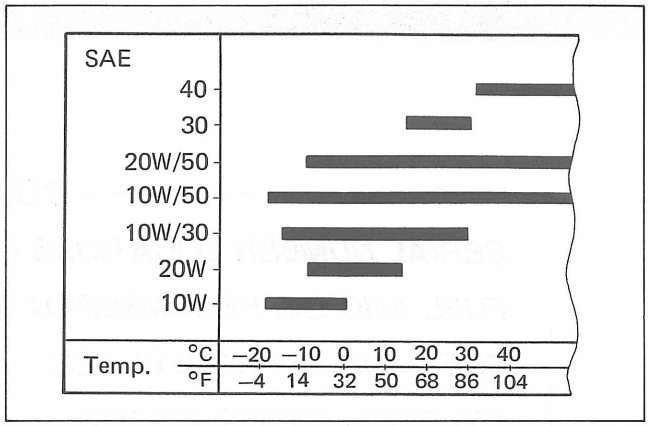
FUEL AND OIL RECOMMENDATIONS

FUEL

Use only unleaded or low-lead type gasoline of at least 85 – 95 pump octane ($\frac{R + M}{2}$ mothod) or 89 octane or higher rated by the Research method.

ENGINE OIL

Be sure that the engine oil you use comes under API classification of SE or SF and that its viscosity rating is SAE 10W/40. If SAE 10W/40 oil is not available, select the oil viscosity according to the following chart:



BRAKE FLUID

Specification and classification:	DOT3 or DOT4

WARNING:

* Since the brake system of this motorcycle is filled with a glycol-based brake fluid by the manufacturer, do not use or mix different types of fluid such as silicone-based and petroleum-based fluid for refilling the system, otherwise serious damage will result.
* Do not use any brake fluid taken from old or used or unsealed containers.
* Never re-use brake fluid left over from the previous servicing and stored for a long period.

FRONT FORK OIL

Use FORK OIL SAE # 15.

BREAKING-IN PROCEDURES

During manufacture only the best possible materials are used and all machined parts are finished to a very high standard but it is still necessary to allow the moving parts to "BREAK-IN" before subjecting the engine to maximum stresses. The future performance and reliability of the engine depends on the care and restraint exercised during its early life. The general rules are as follows:

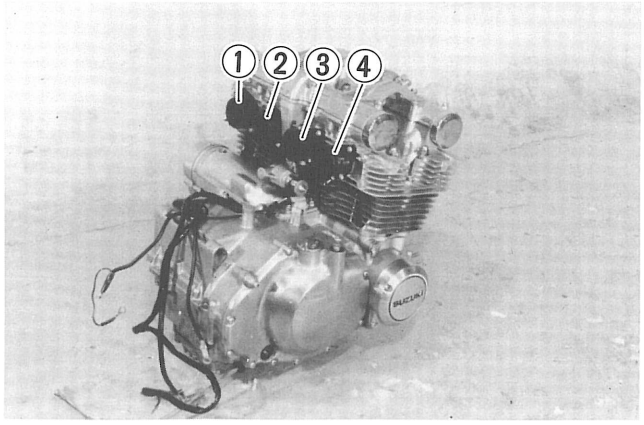
- Keep to these breaking-in engine speed limits:

Initial 800 km (500 mi)	Below 4,000 r/min
Up to 1,600 km (1000 mi)	Below 6,000 r/min
Over 1,600 km (1000 mi)	Below 9,500 r/min

- Upon reaching an odometer reading of 1,600 km you can subject the motorcycle to brief full throttle operation.
  However, do not exceed 9,500 r/min at any time.
- Do not maintain constant engine speed for an extended time period during any portion of the break-in. Try to vary the throttle position.

CYLINDER IDENTIFICATION

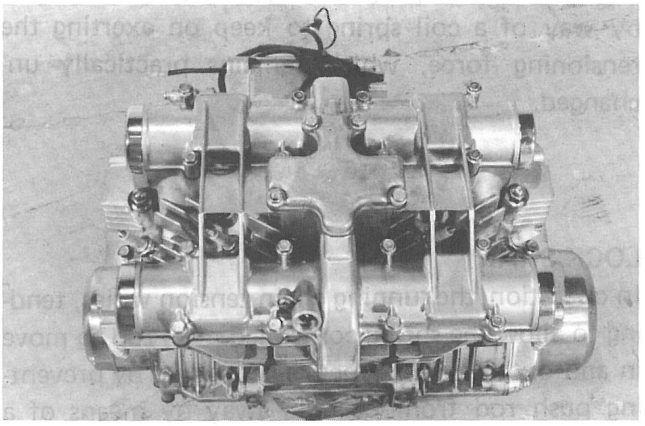
The four cylinders of this engine are identified as No. 1, No. 2, No. 3 and No. 4 cylinder, as counted from left to right (as viewed by the rider on the seat).

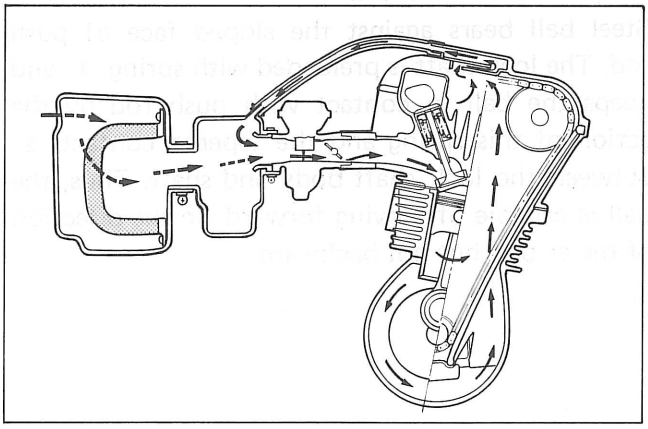


SPECIAL FEATURES

BLOWBY GAS RECYCLING

Blowby gases in the crankcase are constantly drawn into the chain chamber provided in the middle section of the cylinder block. The top section of this chamber is connected with the air chamber body through a rubber tube. In the air chamber, the gases merge with incoming air and thus are recycled to the engine through the normal intake system.



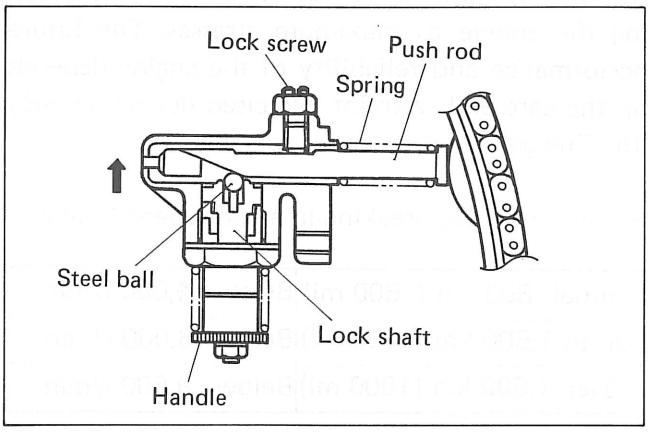


CAMSHAFT DRIVE CHAIN TENSIONER

The chain tensioner used in the Model GS650E is of self-adjusting type in that it adjusts itself to apply a constant tensioning force to the chain by compensating for the stretch of the chain.

PUSH ROD AND LOCK SCREW

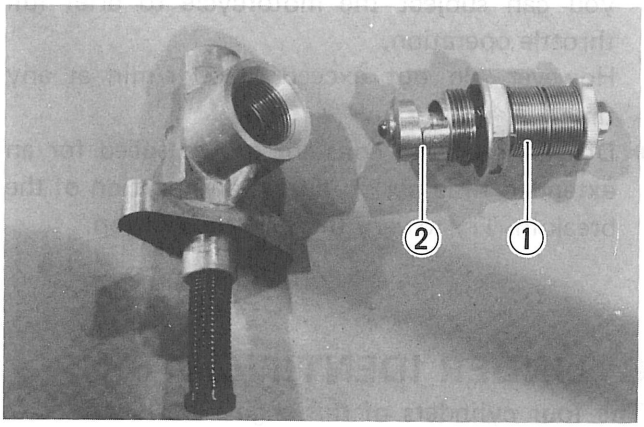
The lock screw is for locking the push rod only when removing or installing the tensioner. It is normally positioned away from the push rod to allow the push rod to move freely. As the chain in service stretches progressively, the push rod shifts by way of a coil spring to keep on exerting the tensioning force, which remains practically unchanged.



LOCK SHAFT

In operation, the running chain tension varies, tending to allow the spring controlled push rod to move in and out. This tendency is countered by preventing push rod from backing away by means of a steel ball and lock shaft.

Steel ball bears against the sloped face of push rod. The lock shaft is preloaded with spring ① and keeps the ball in contact with push rod by the action of this spring and the tapered contact ② between the lock shaft body and shaft. Thus, the ball is capable of moving forward (in the direction of the arrow) but not backward.



FULL-TRANSISTORIZED IGNITION SYSTEM

DESCRIPTION

A fully transistorized ignition system is now employed on the GS650E. Its primary advantages are:

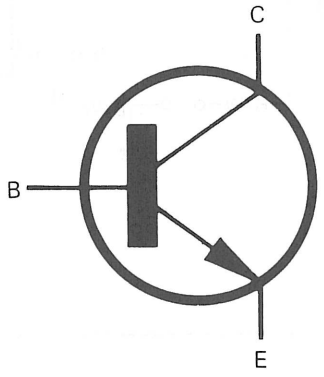
* Trouble free operation due to elimination of contact breaker points which can become contaminated.
* Ignition timing is precisely controlled at all times and requires no maintenance.
* Provides the ignition coil with stable primary voltage.
* Excellent vibration and moisture resistance.

TRANSISTOR

Transistor functions can be divided into four main functions:

1. amplification
2. switching
3. oscillation
4. modulation

These functions are utilized in the ignition system employed on the GS650E.
Transistors are divided into two groups, NPN and PNP types. The transistors used in the GS650E model are of the NPN type only, which work as an amplifier and switching device.



B : BASE
C : COLLECTOR
E : EMITTER

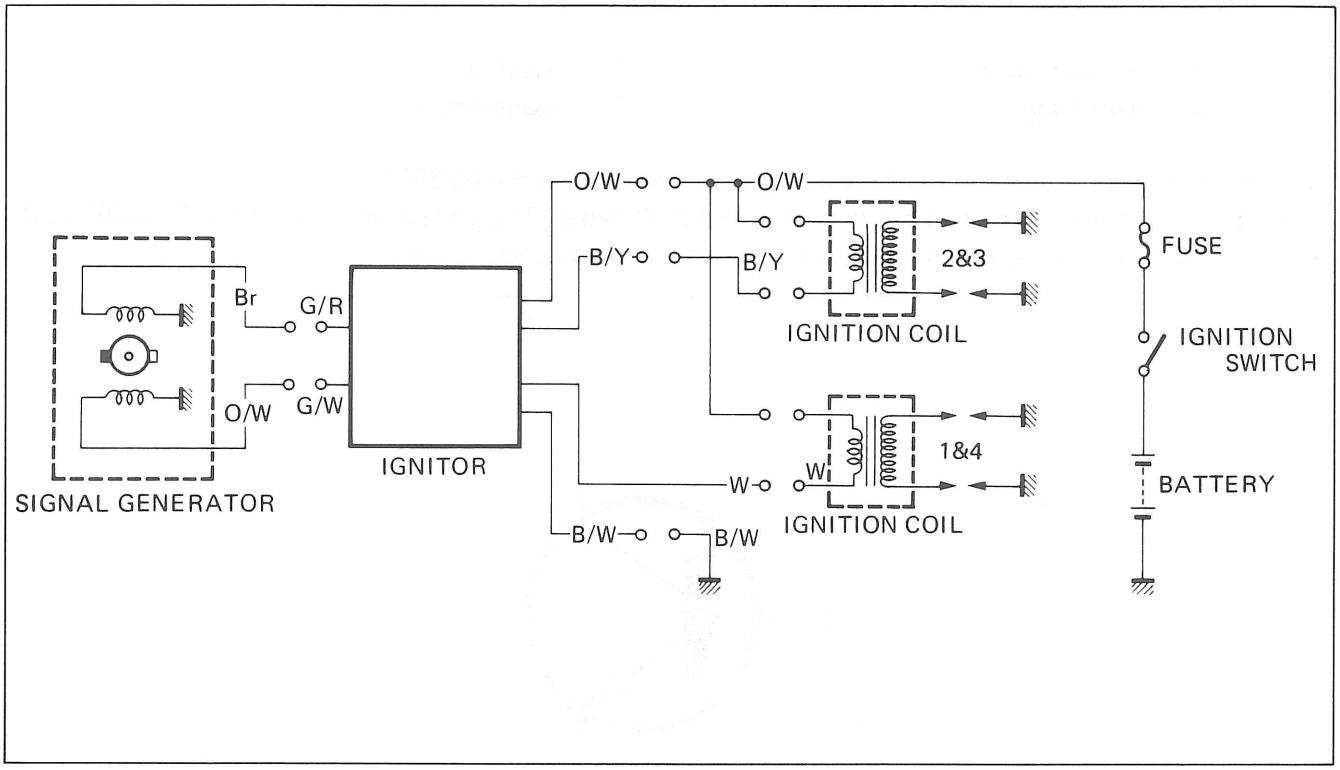
Each transistor has three terminals identified as the Base (B), Collector (C), and Emitter (E), and operation is as follows:
On a NPN type the base is the controlling terminal of the transistor operation. On this type, the base utilizes only a positive or incoming signal to do the "ON", or "OFF" switching. The collector is the terminal where voltage is supplied to the transistor and the emitter is the terminal for passing this current on when the base has the proper "signal". Usually the voltage applied across the collector to the emitter is much larger than that needed at the base. This allows a relatively low voltage at the base to control large working voltages across the collector to the emitter.
The transistor ignition system used on the GS650E is the KOKUSAN brand and consists of a signal generator, which employs a rotor and two pick-up coils, the transistor unit, ignition coils, and spark plugs.

SIGNAL GENERATOR

The signal generator is mounted on the right hand side of the engine in the area commonly used for the contact breaker points. It is comprised of a magnet embedded rotor attached to a mechanical advance mechanism and two pick-up coils, with iron plates at their bases, affixed to a plate. Each pick-up coil consists of a coil of wire and a yoke or coil and is mounted, 180° apart on the plate.

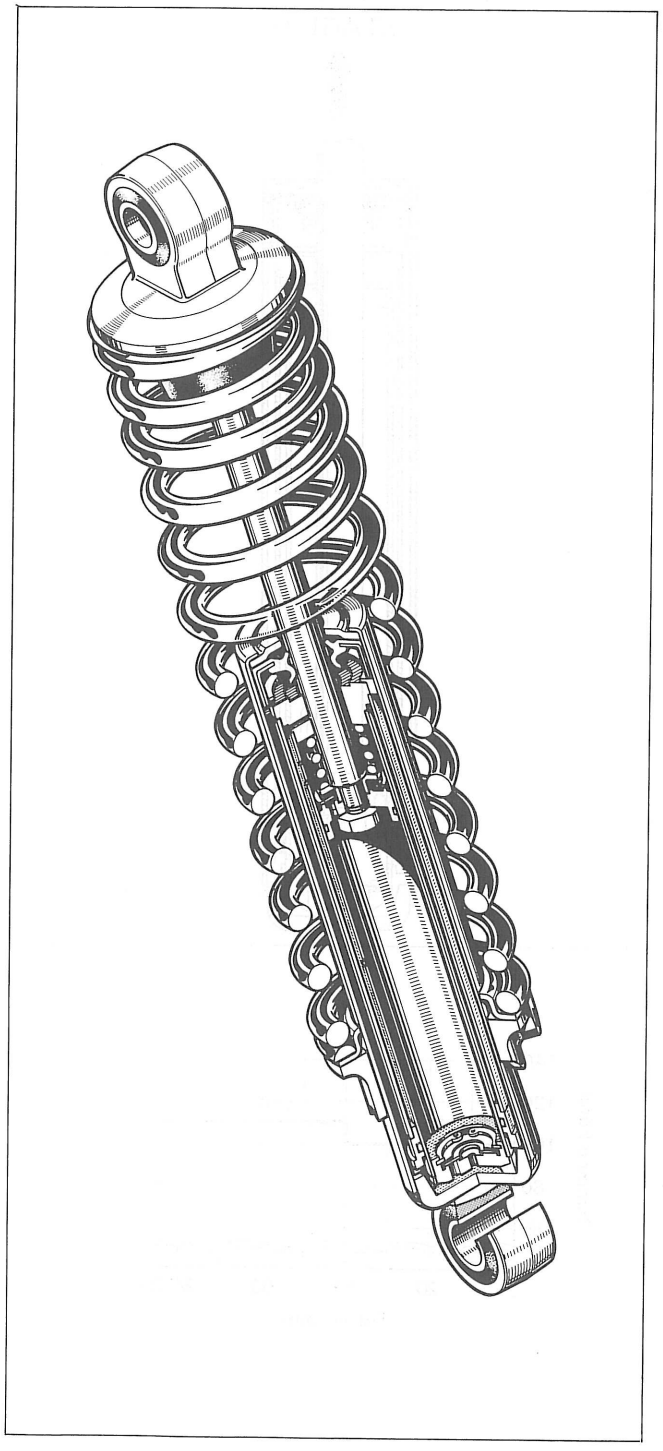
As the rotor magnet is turned past the coils, AC current is produced and used for switching within the transistor unit.

The transistor unit controls power to the ignition coils and causes the spark plugs to fire at the proper time.

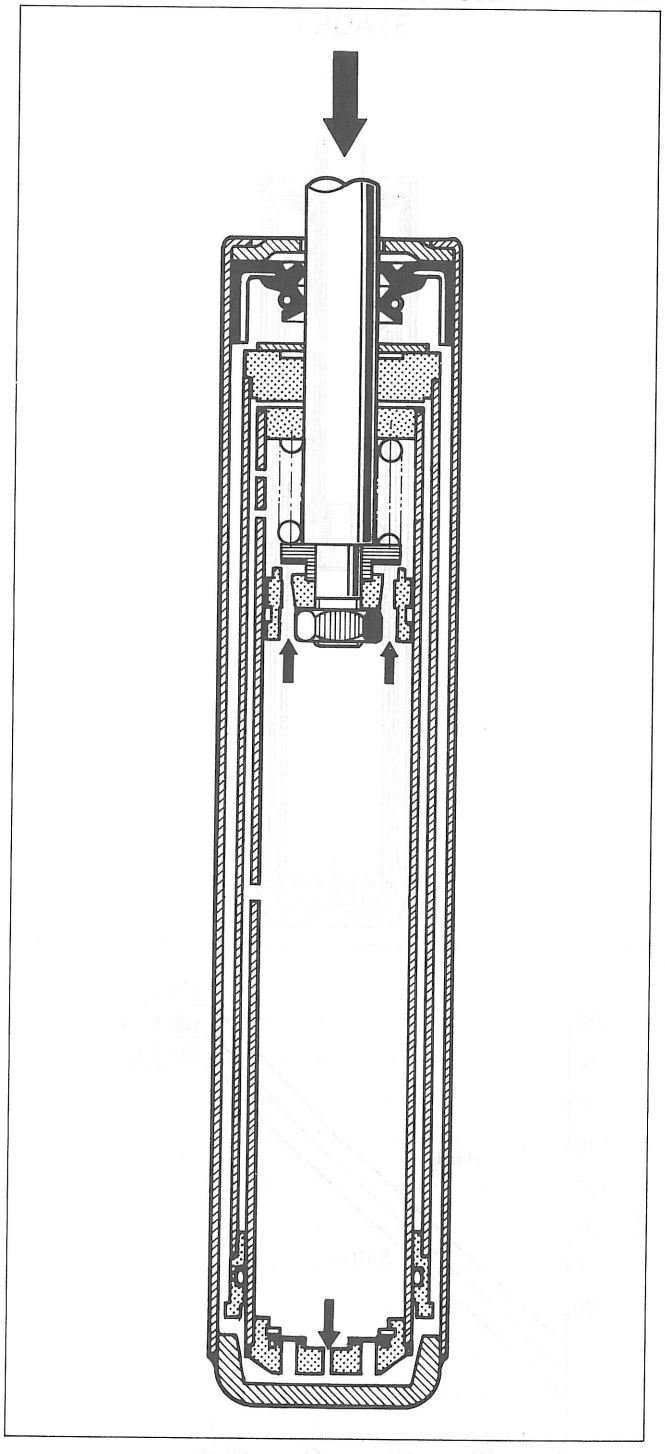


AUTOMATIC DUAL DAMPING REAR SHOCK

GS650E type adopts a rear shock absorber with the special two stage damping force setting. Whenever the shock bears the force to expand after a stroke, and then the longer is the stroke, the larger gets the damping force. And the shorter the stroke, the smaller the force. Also oil flows only through a specially provided orifice besides a valve when the stroke is short, and along the same line only through a valve when the stroke long. This automatic adjusting mechanism enables a soft, comfortable riding on the regular highways, and firm, stable riding on the high-speed freeways.



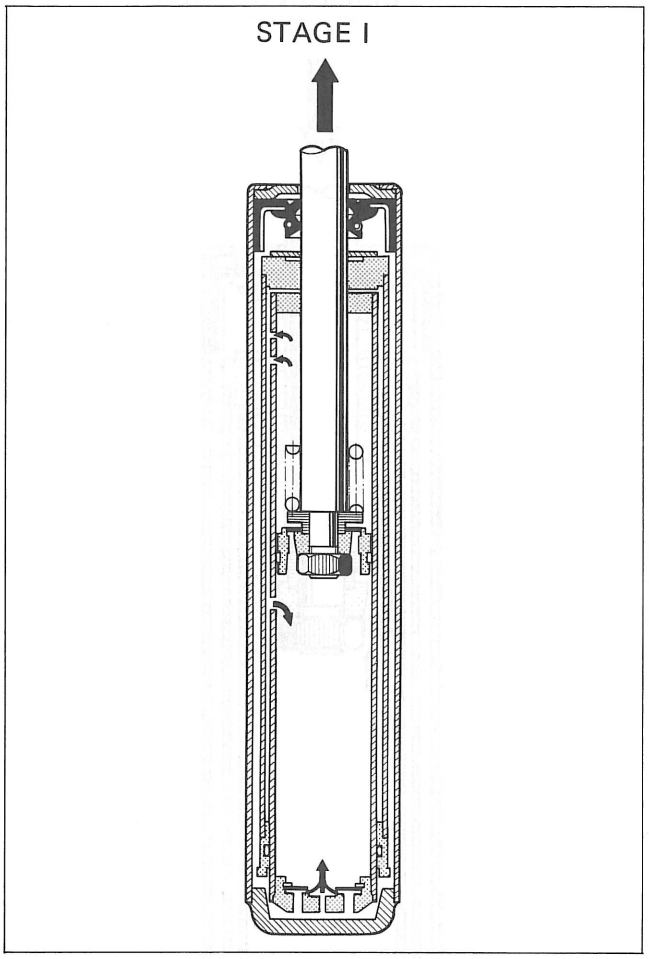
COMPRESSION STROKE



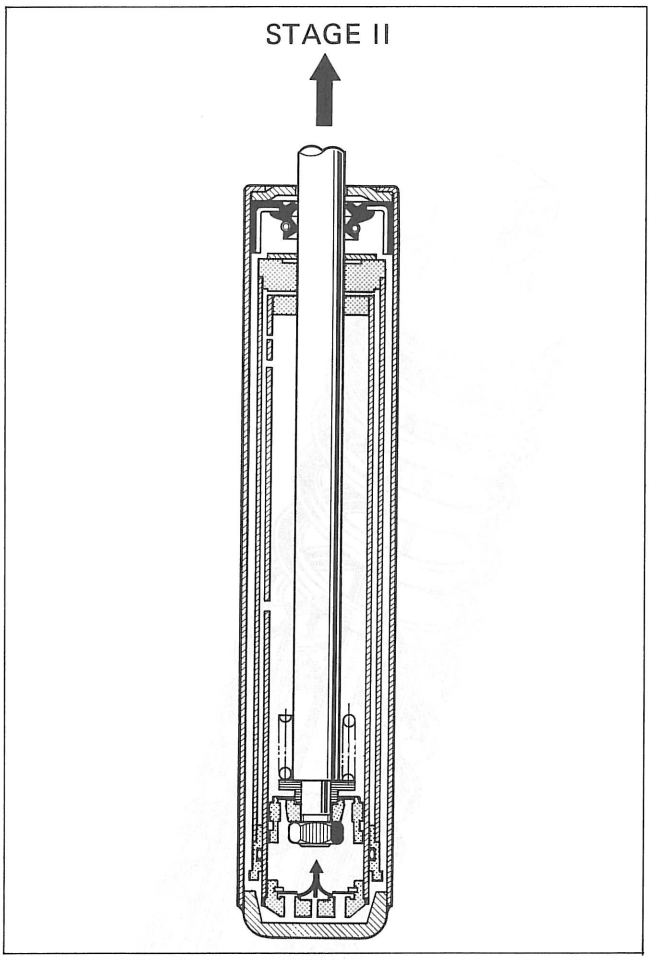
Under the following conditions the rear shock absorber takes the operation of large damping force at extension stroke; that is, oil flows through valve, or the stroke gets longer.

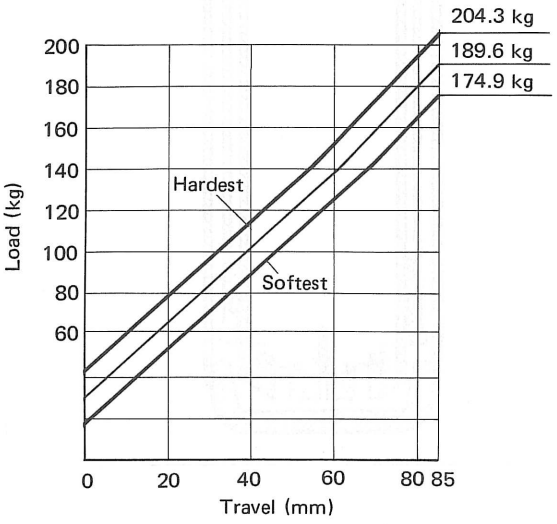
1. Over 120 km/h (75 miles/hour)
2. Cornering 90R . . . . . Over 90 km/h (55 miles/hour)
   200R . . . . . Over 160 km/h (100 miles/hour)
3. Dual riding

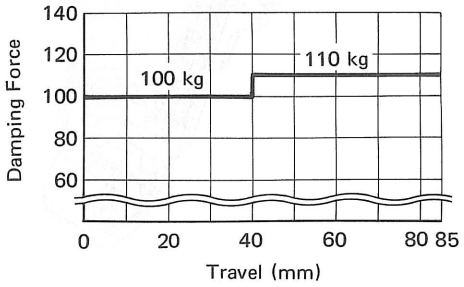
EXTENSION STROKE



EXTENSION STROKE

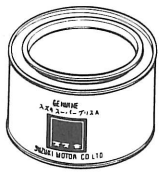
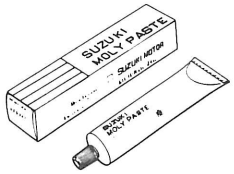






SPECIAL MATERIALS

The materials listed below are needed for maintenance work on the GS650E, and should be kept on hand for ready use. They supplement such standard materials as cleaning fluids, lubricants, emery cloth and the like. How to use them and where to use them are described in the text of this manual.

Material	Part	Page	Part	Page
 SUZUKI SUPER GREASE "A" 99000-25030	• Oil seals • Throttle grip • Cables (speedometer and tachometer) • Gearshift lever linkage and shaft • Carburetor starter shaft • Side stand		• Wheel bearings • Sprocket mounting drum bearing and oil seal • Swinging arm bearing and dust seal • Rear brake cam • Brake pedal shaft • Governor link • Centerstand spacer • Steering stem bearings	7- 3 7-25 7-34 7-20
 SUZUKI SILICONE GREASE 99000-25100	• Caliper axle shaft	7- 8		
 SUZUKI MOLY PASTE 99000-25140	• Valve stem • Cam shaft journal • Chain tensioner push rod	3-27 3-61 3-32		
 SUZUKI BOND No. 1207B 99104-31140	• Mating surfaces of upper and lower crankcase • Front fork damper rod bolt	3-48 7-15		

Material	Part	Page	Part	Page
 THREAD LOCK SUPER "1333B" 99000-32020	• Gearshift cam retainer screw • Cam chain guide screw • Cam chain guide holder screw • Cam chain guide bolt	3-52 3-34 3-46 3-51		
 THREAD LOCK SUPER "1303" 99000-32030	• Gearshift arm return spring stopper • Cam sprocket allen bolt • 2nd drive gear inner surface • Starter clutch allen bolt • Generator rotor bolt	 3-30 3-42 3-41 3-49		
 THREAD LOCK CEMENT 99000-32040	• Carburetor set screw • Camshaft end cap screw • Front fork damper rod bolt	 7-15		
 THREAD LOCK "1342" 99000-32050	• Generator stator securing screw • Generator lead wire guide screw • Gearshift cam stopper bolt • Countershaft bearing retainer screw • Oil pump fitting screw	3-40 3-40 3-52 3-51 3-53	• Starter motor securing bolt • Gearshift fork shaft stopper screw • Gearshift cam guide bolt • Oil separator plate screw	3-50 3-47 3-46 3-46

PRECAUTIONS AND GENERAL INSTRUCTIONS

Observe the following items without fail when disassembling and reassembling motorcycles.

□ Be sure to replace packings, gaskets, circlips, O rings and cotter pins with new ones.

CAUTION:
Never reuse a circlip after a circlip has been removed from a shaft, it should be discarded and a new circlip must be installed.
When installing a new circlip, care must be taken not to expand the end gap larger than required to slip the circlip over the shaft.
After installing a circlip, always insure that it is completely seated in its groove and securely fitted.

□ Tighten cylinder head and case bolts and nuts beginning with larger diameter and ending with smaller diameter, and from inside to out-side diagonally, to the specified tightening torque.

□ Use special tools where specified.

□ Use genuine parts and recommended oils.

□ When 2 or more persons work together, pay attention to the safety of each other.

□ After the reassembly, check parts for tightness and operation.

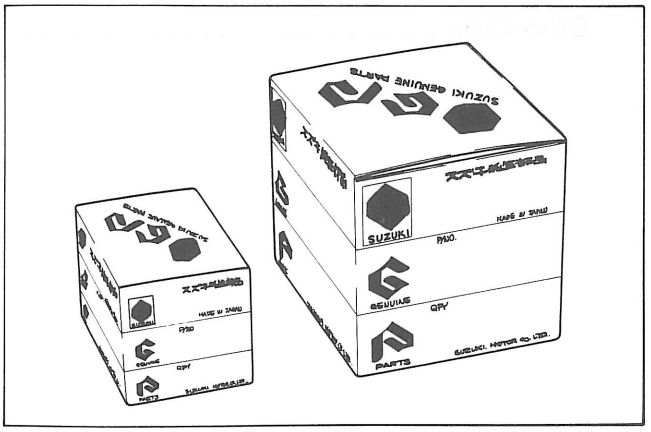
□ Treat gasoline, which is extremely flammable and highly explosive, with greatest care. Never use gasoline as cleaning solvent.

Warning, Caution and Note are included in this manual occasionally, describing the following contents.

WARNING . . . . . When personal safety of the rider is involved, disregard of the information could result in injury.
CAUTION . . . . . For the protection of the motorcycle, the instruction or rule must be strictly adhered to.
NOTE . . . . . Advice calculated to facilitate the use of the motorcycle is given under this heading.

USE OF GENUINE SUZUKI PARTS

To replace any part of the machine, use a genuine SUZUKI replacement part. Imitation parts or parts supplied from any other source than SUZUKI, if used to replace SUZUKI parts can reduce the machine's performance and, even worse, could induce costly mechanical troubles.



SPECIFICATIONS

DIMENSIONS AND DRY MASS

Overall length	2 155 mm (84.8 in)
Overall width	830 mm (32.7 in)
Overall height	1 160 mm (45.7 in)
Wheelbase	1 435 mm (56.5 in)
Ground clearance	160 mm (6.3 in)
Dry mass	203 kg (448 lbs)

ENGINE

Type	Four-stroke, air-cooled, DOHC
Number of cylinders	4
Bore	62.0 mm (2.441 in)
Stroke	55.8 mm (2.197 in)
Piston displacement	* 673 cm^3 (41.1 cu. in)
Compression ratio	9.4 : 1
Carburetor	MIKUNI BS32SS, Four
Air cleaner	Polyurethane foam element
Starter system	Electric
Lubrication system	Wet sump

TRANSMISSION

Clutch		Wet multi-plate type
Transmission		5-speed constant mesh
Gearshift pattern		1-down, 4-up
Primary reduction		1.977 (87/44)
Final reduction		3.000 (45/15)
Gear ratios,	Low	2.750 (33/12)
	2nd	1.812 (29/16)
	3rd	1.368 (26/19)
	4th	1.142 (24/21)
	Top	1.000 (22/22)
Drive chain		TAKASAGO RK520GO, 106 links

CHASSIS

Front suspension	Telescopic, oil dampened
Rear suspension	Swinging arm, automatic dual damping, spring 5-way adjustable
Steering angle	40° (right & left)
Caster	61° 50′
Trail	115 mm (4.53 in)
Turning radius	2.5 m (8.2 ft)
Front brake	Disc brake, twin
Rear brake	Disc brake
Front tire size	3.25H19 4PR
Rear tire size	3.75H18 4PR

ELECTRICAL

Ignition type	Transistorized
Ignition timing	10° B.T.D.C. below 1 650 r/min and 40° B.T.D.C. above 3 500 r/min
Spark plug	NGK D8EA or NIPPON DENSO X24ES-U
Battery	12V 43.2 kC (12Ah)/10 HR
Generator	Three-phase A.C. generator
Fuse	10/10/10/15A
Headlight	12V 60/55W
Tail/Brake light	12V 8/23W (3/32 cp)
Turn signal light	12V 23W (32 cp)
License light	12V 8W (4 cp)
Speedometer light	12V 3.4W
Tachometer light	12V 3.4W
High beam indicator light	12V 3.4W
Turn signal indicator light	12V 3.4W
Oil pressure indicator light	12V 3.4W

CAPACITIES

Fuel tank including reserve	16 L (4.2 US gal)
reserve	4.5 L (4.8 US qt)
Engine oil	2.4 L (2.5 US qt)
Front fork oil	190 ml (6.42 US oz)

* The engine displacement value listed here may differ slightly from the vehicle emission control information label because a different method of rouding off the displacement value was used.

** These specifications are subject to change without notice.

PERIODIC MAINTENANCE AND TUNE-UP PROCEDURES

CONTENTS

PERIODIC MAINTENANCE SCHEDULE

IMPORTANT: The periodic maintenance intervals and service requirements have been established in accordance with EPA regulations. Following these instructions will ensure that the motorcycle will not exceed emission standards and it will also ensure the reliability and performance of the motorcycle.

NOTE:
More frequent servicing may be performed on motorcycles that are used under severe conditions, however, it is not necessary for ensuring emission level compliance.

The chart below lists the recommended intervals for all the required periodic service work necessary to keep the motorcycle operating at peak performance and to maintain proper emission levels. Mileages are expressed in terms of kilometers, miles and time for your convenience.

PERIODIC MAINTENANCE CHART

INTERVAL: THIS INTERVAL SHOULD BE JUDGED BY ODOMETER READING OR MONTHS WHICHEVER COMES FIRST	mile	600	4 000	7 500	11 000	15 000
	km	1 000	6 000	12 000	18 000	24 000
	month	2	12	24	36	48
Battery (Specific gravity of electrolyte)		–	I	I	I	I
Cylinder head nuts & exhaust pipe bolts		T	T	T	T	T
Air cleaner element		–	C	C	C	C
Tappet clearance		I	I	I	I	I
Spark plugs		–	C	R	C	R
Fuel line		Replace every two years.				
Engine oil & oil filter		R	R	R	R	R
Carburetor idle rpm*		I	I	I	I	I
Clutch		I	I	I	I	I
Drive chain		I	I	I	I	I
		Clean and lubricate every 600 mile (1 000 km)				
Brake hose		Replace every two years.				
Brakes		I	I	I	I	I
Tires		I	I	I	I	I
Steering stem		I	I	I	I	I
Chassis bolt and nut		T	T	T	T	T

NOTE: T = Tighten, I = Inspect, R = Replace, C = Clean

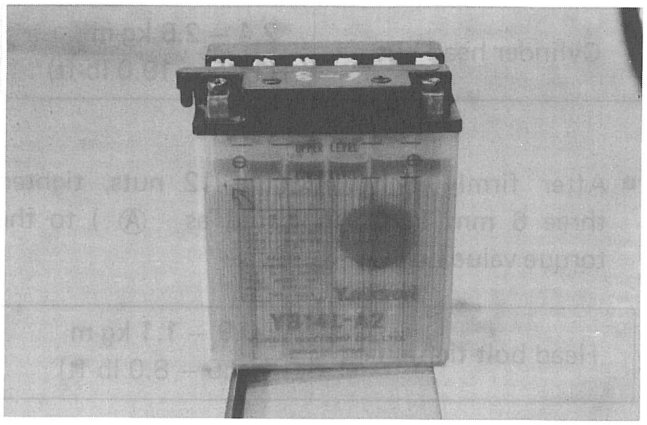
** = The specified idle rpm appears on the vehicle emission control information label.*

MAINTENANCE AND TUNE-UP PROCEDURES

BATTERY

6 000, 12 000, 18 000, 24 000 km 4 000, 7 500, 11 000, 15 000 mi

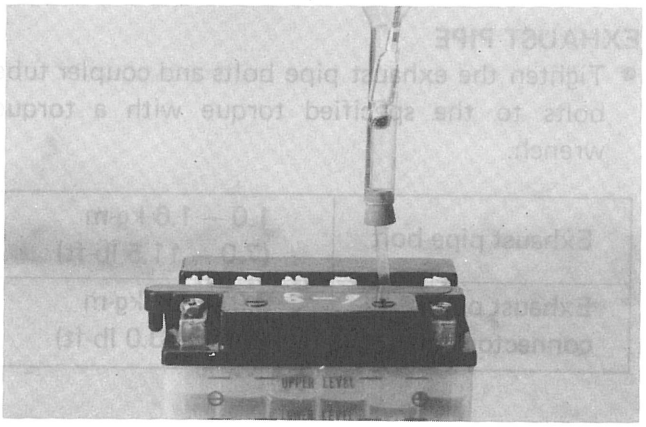
- The battery must be removed to check the electrolyte level and specific gravity.
- Remove left frame cover.
- Remove battery ⊖ and ⊕ leads at the battery terminal.
- Remove battery from the frame.
- Check electrolyte for level and specific gravity. Add distilled water, as necessary, to keep the surface of the electrolyte above the LOWER level line but not above the UPPER level line.



For checking specific gravity, use a hydrometer to determine the charged condition.

09900 - 28403	Hydrometer

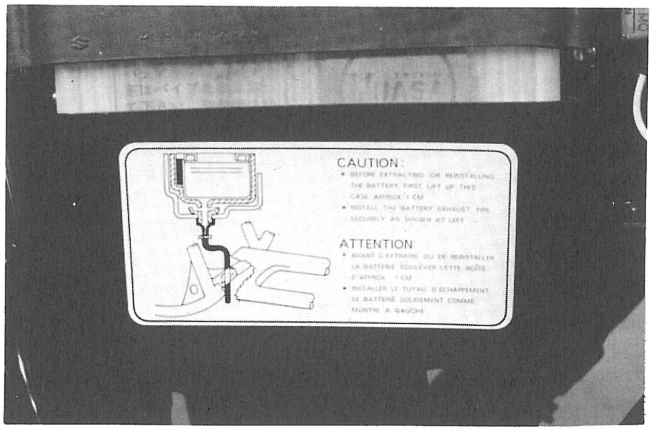
Standard specific gravity	1.28 at 20°C (68°F)



An S.G. reading of 1.22 (at 20°C) or under means that the battery needs recharging off the machine: take it off and charge it from a recharger. Charging the battery in place can lead to failure of the regulator/rectifier.

- To install the battery, reverse the procedure described above.

WARNING:
When installing the battery lead wires, fix the ⊕ lead first and ⊖ lead last.



- Make sure that the breather pipe is tightly secured and undamaged, and is routed as shown in the figure.

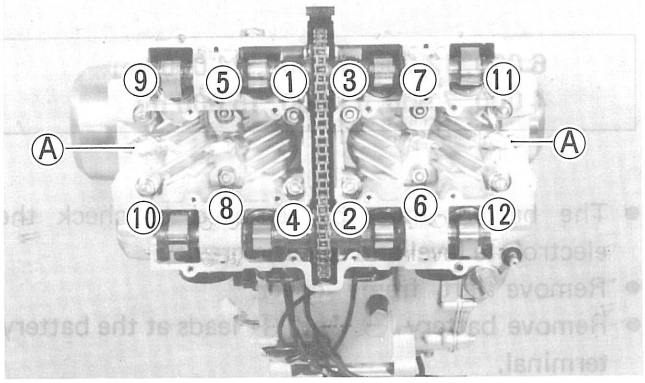
CYLINDER HEAD NUTS AND EXHAUST PIPE BOLTS

1 000, 6 000, 12 000, 18 000, 24 000 km 600, 4 000, 7 500, 11 000, 15 000 mi

CYLINDER HEAD

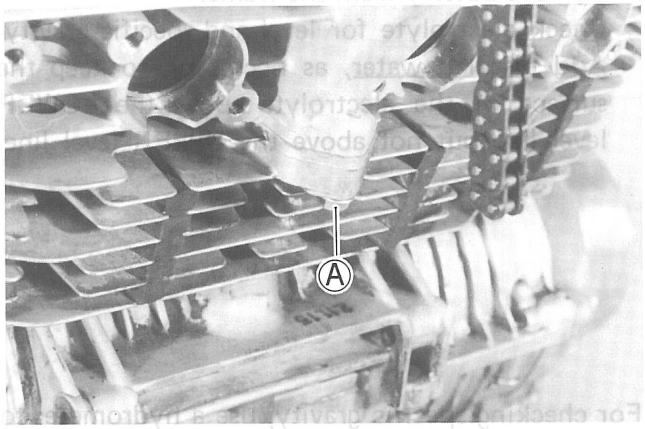
- Remove the fuel tank.
- Tighten the twelve 8 mm nuts (12 mm wrench) to the specified torque with a torque wrench sequentially in ascending numerical order with the engine cold.

Cylinder head nut	2.4 – 2.6 kg-m (17.5 – 19.0 lb-ft)



- After firmly tightening the 12 nuts, tighten three 6 mm bolts (indicated as Ⓐ) to the torque value below:

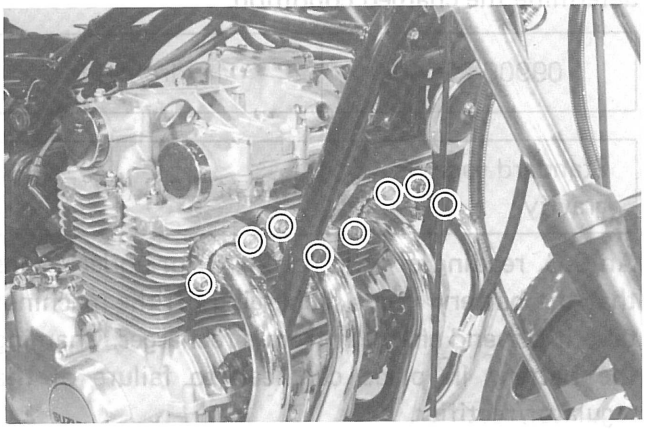
Head bolt tightening	0.9 – 1.1 kg-m (6.5 – 8.0 lb-ft)

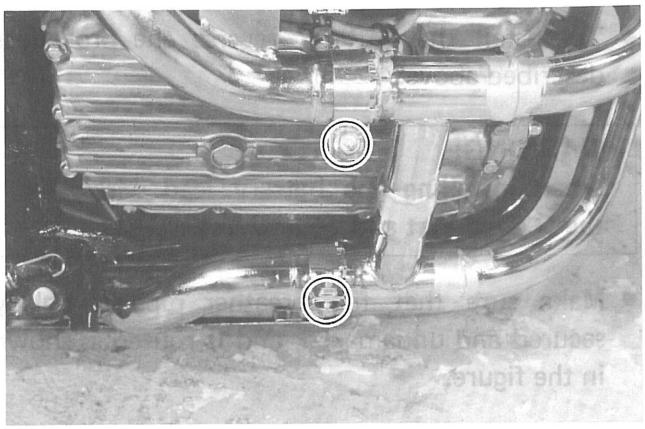


EXHAUST PIPE

- Tighten the exhaust pipe bolts and coupler tube bolts to the specified torque with a torque wrench.

Exhaust pipe bolt	1.0 – 1.6 kg-m (7.0 – 11.5 lb-ft)
Exhaust pipe connector bolt	0.9 – 1.4 kg-m (6.5 – 10.0 lb-ft)





AIR CLEANER ELEMENT

6 000, 12 000, 18 000, 24 000 km
4 000, 7 500, 11 000, 15 000 mi

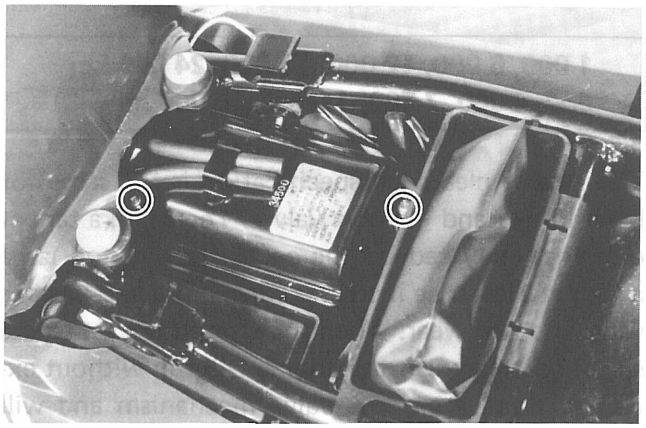
If the air cleaner is clogged with dust, intake resistance will be increased with a resultant decrease in output and an increase in fuel consumption. Check and clean the element in the following manner.

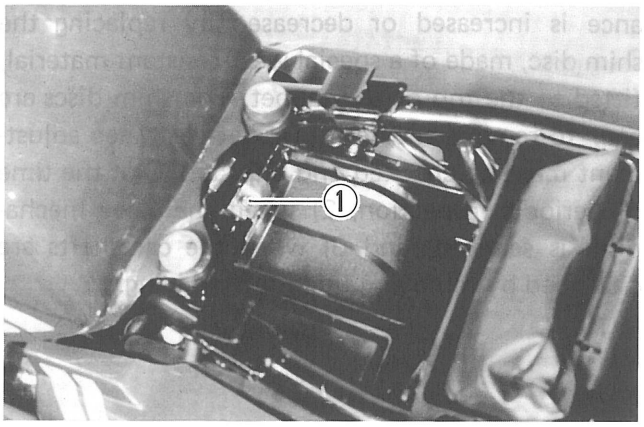
- Remove the seat and remove the two air cleaner case cap screws.
- Remove the screw ① and take out the air cleaner element.
- Remove the screw of the element band.
- Fill a washing pan of a proper size with non-flammable cleaning solvent. Immerse the element in the cleaning solvent and wash it clean.
- Squeeze the cleaning solvent out of the washed element by pressing it between the palms of both hands: do not twist or wring the element or it will develop tears.
- Immerse the element in motor oil, and squeeze the oil out of the element leaving it slightly wet with oil.
- Fit the cleaner element to element frame body properly by using band.

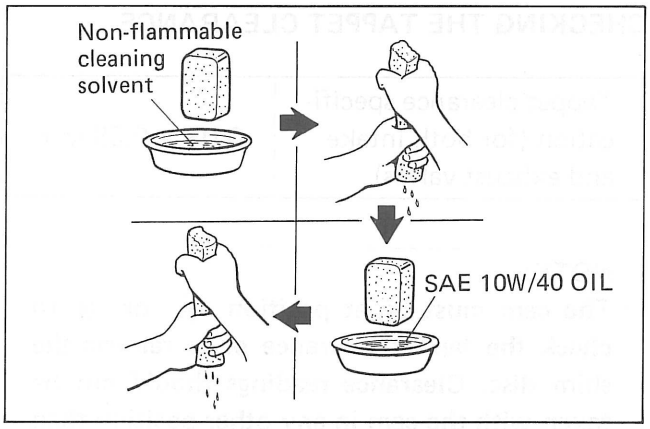
CAUTION:

*** Before and during the cleaning operation, inspect the element for tears. A torn element must be replaced.**

*** Be sure to position the element snugly and correctly, so that no incoming air will bypass it. Remember, rapid wear of piston rings and cylinder bore is often caused by a defective or poorly fitted element.**



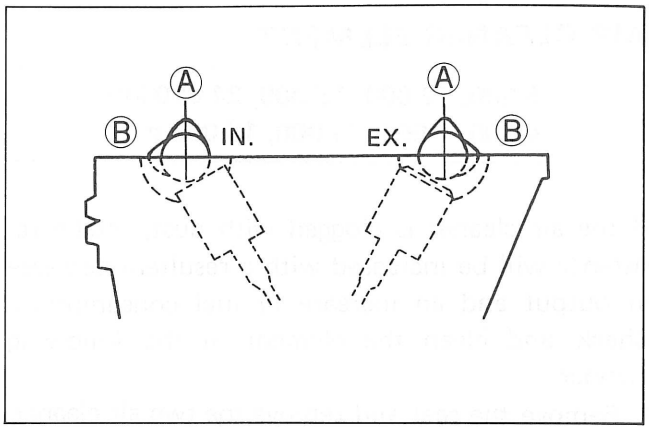


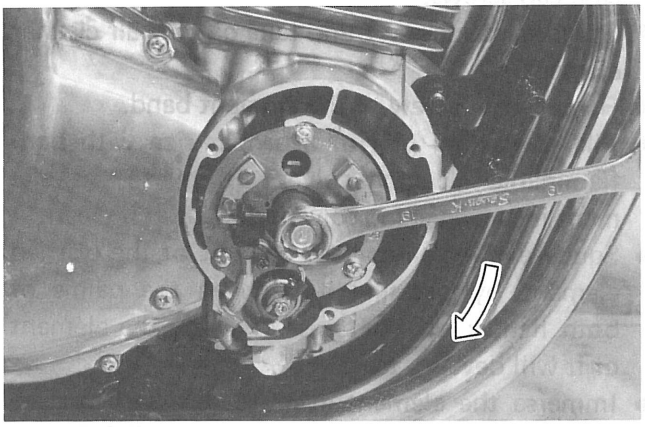


TAPPET CLEARANCE

1 000, 6 000, 12 000, 18 000, 24 000 km
600, 4 000, 7 500, 11 000, 15 000 mi

The tappet clearance specification is the same for both intake and exhaust valves. Too small a tappet clearance may reduce the engine power; too large a tappet clearance increases valve noise and hastens valve and seat wear. When the tappets are set to the specified clearance, the engine will run without excessive noise from the valve mechanism and will deliver full power. In this engine, the tappet clearance is increased or decreased by replacing the shim disc, made of a special wear-resistant material, fitted to the top of the tappet. The shim discs are easy to remove and refit. Tappet clearance adjustment must be checked and adjusted 1) at the time of periodic inspection, 2) when the valve mechanism is serviced, and 3) when the camshafts are disturbed by removing them for servicing.





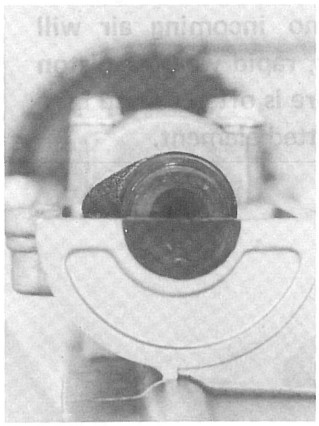
CHECKING THE TAPPET CLEARANCE

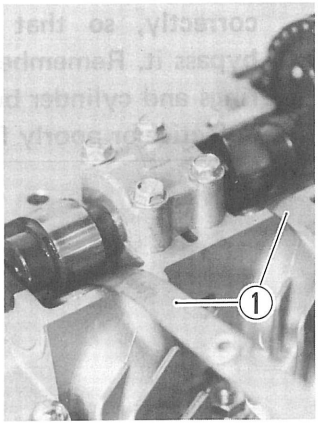
Tappet clearance specification (for both intake and exhaust valves)	0.03 – 0.08 mm

NOTE:
- *** The cam must be at position Ⓐ or Ⓑ to check the tappet clearance or to remove the shim disc. Clearance readings should not be taken with the cam in any other position than these two positions.**
- *** The clearance specification is for COLD state. Check it when engine is cold.**
- *** To turn the crankshaft for clearance checking, be sure to use a 19 mm wrench and to rotate in the normal running direction. All spark plugs should be removed.**

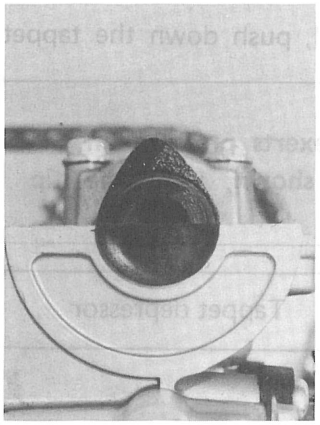
1. Turn crankshaft to bring the exhaust cam of No. 1 cylinder to this position. In this condition, read the clearance at the exhaust tappets of Nos. 1 and 2 cylinders. Use special tool ① on all tappets.

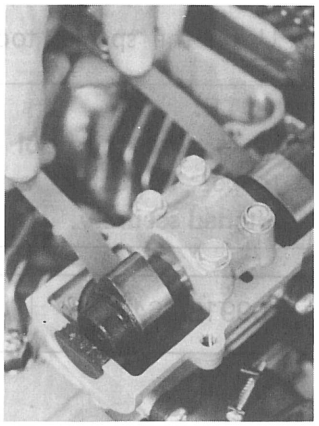
09900 - 20806	Thickness gauge



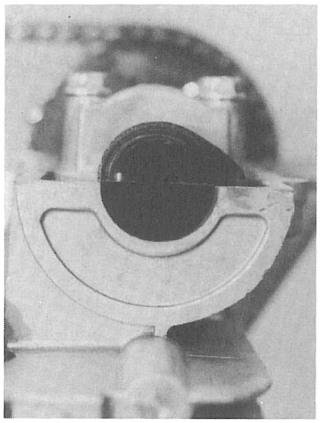


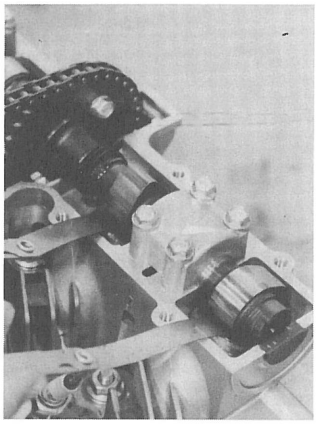
2. After setting the clearance to the specification at the exhaust tappets of Nos. 1 and 2 cylinders, turn the crankshaft 180° (half rotation) to bring the intake cam of No. 1 cylinder to the position indicated. Read the clearance at the intake tappets of Nos. 1 and 2 cylinders and, if necessary, adjust the clearance to each specification.



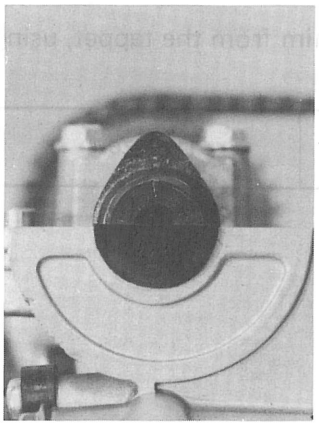


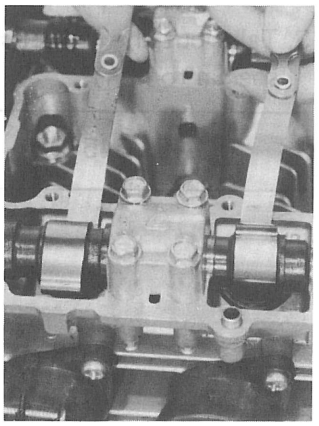
3. Turn the crankshaft a further 180°, bringing the exhaust cam of No. 4 cylinder to the position indicated. Under this condition, repeat the checking and adjusting process outlined in step "1" at the exhaust tappets of Nos. 3 and 4 cylinders.





4. Again turn the crankshaft a further 180°, bringing the intake cam of No. 4 cylinder to the position indicated. Similarly check and adjust the clearance at the intake tappets of Nos. 3 and 4 cylinders.

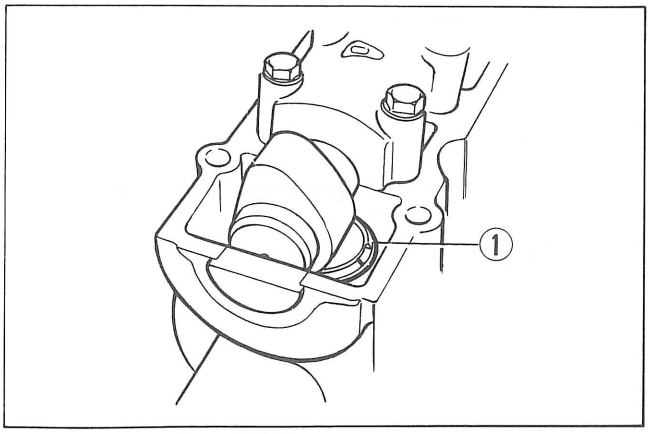


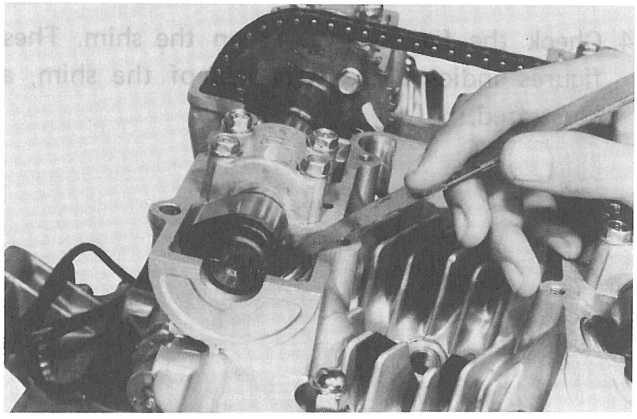


TAPPET CLEARANCE ADJUSTMENT

The clearance is adjusted by replacing the existing tappet shim by a thicker or thinner disc.

1. Place a fingertip on the tappet, and turn it in place to bring notch ① to the position indicated.

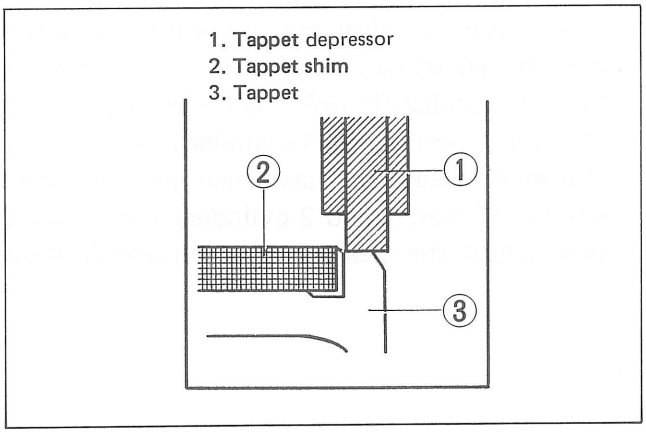


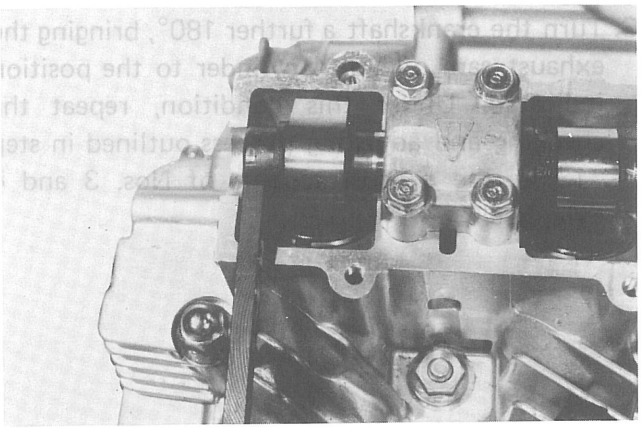


2. Using the special tool, push down the tappet.

NOTE:
Make sure the tool exerts pressure on the tappet correctly, as shown, with the tip hitched securely.

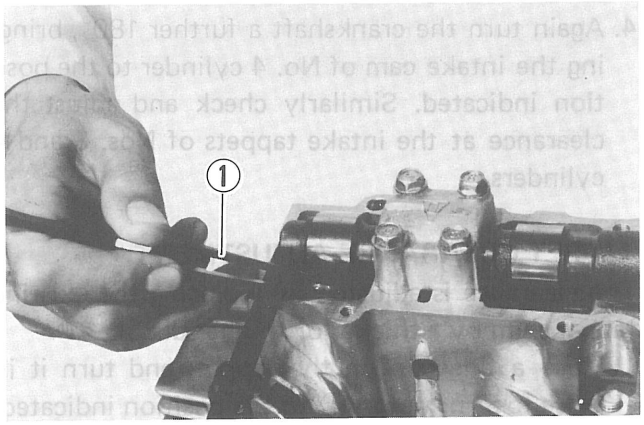
09916 - 64510	Tappet depressor



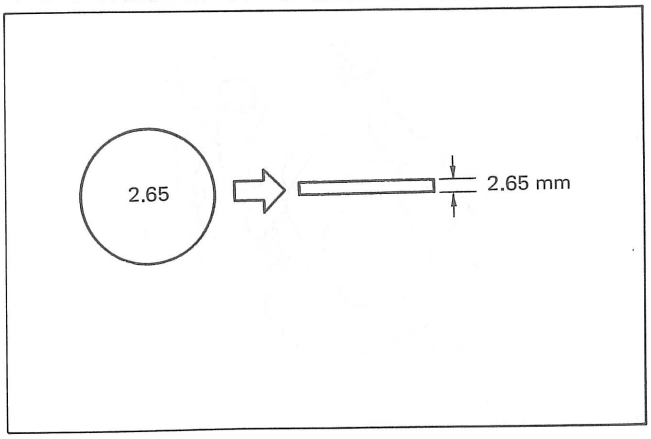


3. Take out the tappet shim from the tappet, using special tool ①.

09916 - 84510	Tweezers



4. Check the figures printed on the shim. These figures indicate the thickness of the shim, as illustrated.



5. Select a replacement shim that will provide a clearance within the specified range (0.03 – 0.08 mm). For the purpose of this adjustment, a total of 20 sizes of tappet shim are available ranging from 2.15 to 3.10 mm in steps of 0.05 mm. Fit the selected shim to the tappet, with numbers toward tappet. Be sure to check shim size with micrometer to insure its size.

> NOTE:
> **Before fitting the tappet shim to the tappet, be sure to apply engine oil to its top and bottom faces.**

6. After replacing the tappet shim, rotate the engine so that the tappet is depressed fully. This will squeeze out oil trapped between the shim and the tappet that could cause an incorrect measurement, then check the clearance again to confirm that it is within the specified range.

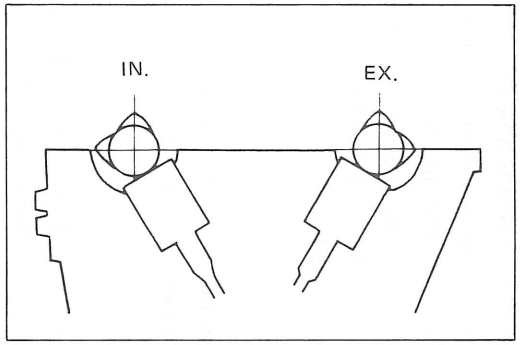
Tappet shim size chart

No.	Thickness (mm)	Part No.
1	2.15	12892-45000-215
2	2.20	12892-45000-220
3	2.25	12892-45000-225
4	2.30	12892-45000-230
5	2.35	12892-45000-235
6	2.40	12892-45000-240
7	2.45	12892-45000-245
8	2.50	12892-45000-250
9	2.55	12892-45000-255
10	2.60	12892-45000-260
11	2.65	12892-45000-265
12	2.70	12892-45000-270
13	2.75	12892-45000-275
14	2.80	12892-45000-280
15	2.85	12892-45000-285
16	2.90	12892-45000-290
17	2.95	12892-45000-295
18	3.00	12892-45000-300
19	3.05	12892-45000-305
20	3.10	12892-45000-310

SHIM SELECTION CHART

PART NUMBER – PREFIX 12892-45000

P/NO. SUFFIX	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310
Tappet Clearance (mm)	PRESENT SHIM SIZE – mm																			
	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10
0.00 – 0.02		2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05
0.03 – 0.08	SPECIFIED CLEARANCE/NO. ADJUSTMENT REQUIRED																			
0.09 – 0.13	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	
0.14 – 0.18	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10		
0.19 – 0.23	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10			
0.24 – 0.28	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10				
0.29 – 0.33	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10					
0.34 – 0.38	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10						
0.39 – 0.43	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10							
0.44 – 0.48	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10								
0.49 – 0.53	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10									
0.54 – 0.58	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10										
0.59 – 0.63	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10											
0.64 – 0.68	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10												
0.69 – 0.73	2.80	2.85	2.90	2.95	3.00	3.05	3.10													
0.74 – 0.78	2.85	2.90	2.95	3.00	3.05	3.10														
0.79 – 0.83	2.90	2.95	3.00	3.05	3.10															
0.84 – 0.88	2.95	3.00	3.05	3.10																
0.89 – 0.93	3.00	3.05	3.10																	
0.94 – 0.98	3.05	3.10																		
0.99 – 1.03	3.10																			



I. Measure tappet clearance. "ENGINE IS COLD"

II. Measure present shim size.

III. Match clearance in vertical column with present shim size in horizontal column.

EXAMPLE

Tappet clearance is – 0.55 mm

Present shim size – 2.40 mm

Shim size to be used – 2.90 mm

SPARK PLUG

6 000, 12 000, 18 000, 24 000 km
4 000, 7 500, 11 000, 15 000 mi

The plug gap is adjusted to 0.6 – 0.7 mm. The gap is correctly adjusted using a thickness gauge (special tool). When carbon is deposited on the spark plug, remove the carbon with a tool with a pointed end. If electrodes are extremely worn or burnt, replace the plug. Also replace the plug if it has a broken insulator, damaged thread, etc.

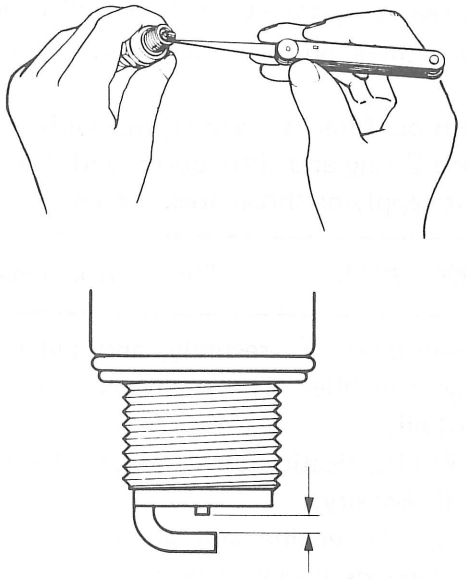
09930 - 13210	Socket wrench
09930 - 14530	Universal joint
09914 - 24510	T handle
09900 - 20803	Thickness gauge

NGK D8EA or NIPPON DENSO X24ES-U listed in the table should be used as the standard plug. However, the heat range of the plug should be selected to meet the requirements of speed, actual load, fuel, etc. If the plugs need to be replaced, it is recommended that the standard plugs listed in the table be selected. Remove the plugs and inspect the insulators. Proper heat range would be indicated if both insulators were light brown in color. If they are blackened by carbon, they should be replaced by a hot type NGK D7EA or NIPPON DENSO X22ES-U and if baked white, by NGK D9EA or NIPPON DENSO X27ES-U.

Plugs with high heat range number are used for high speed running. These plugs are designed to be sufficiently cooled to prevent overheating and are called cold type plugs.

NOTE:
To check the spark plugs, first make sure that the fuel tank contains unleaded gasoline, and after test ride if the plugs are either sooty with carbon or burnt white, replace them altogether.

NOTE:
Confirm the thread size and reach when replacing the plug. If the reach is too short, carbon will be deposited on the screw portion of the plug hole and engine damage may result.



Gap 0.6 – 0.7 mm
(0.024 – 0.028 in)

NGK	NIPPON DENSO	REMARKS
D7EA	X22ES-U	If the standard plug is apt to get wet, replace with this plug. Hot type.
D8EA	X24ES-U	**Standard**
D9EA	X27ES-U	If the standard plug is apt to overheat, replace with this plug. Cold type.

FUEL LINE

Replace every 2 years

ENGINE OIL AND OIL FILTER

1 000, 6 000, 12 000, 18 000, 24 000 km 600, 4 000, 7 500, 11 000, 15 000 mi

The oil should be changed while the engine is hot. Oil filter replacement at the above intervals should be done together with engine oil change.

- Keep the motorcycle upright, supported on the center stand.
- Place an oil pan below the engine and drain the oil by removing drain plug ① and filler cap ② .
- Remove three nuts ③ and remove the filter cover.
- Pull out old filter ④ , and replace with new one.
- Replace O-ring and filter cover, and secure nuts ③ with applying thread lock cement.

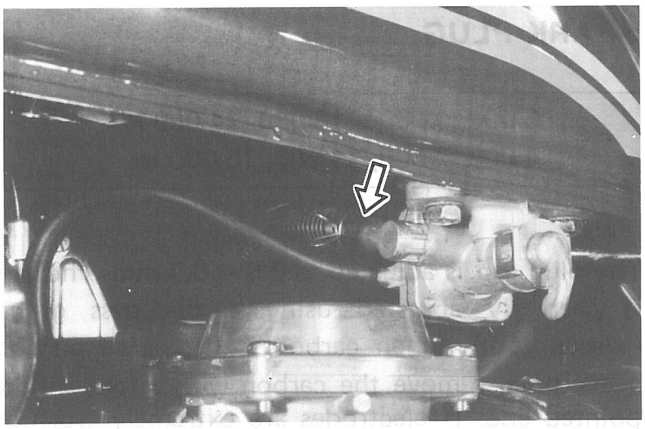
99000 - 32040	Thread lock cement

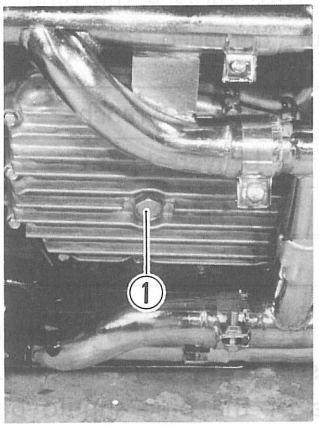
- Fit drain plug ① securely, and add fresh oil through the filler. The engine will hold about 2.6L of oil.
  Use API classification of SE or SF oil with SAE 10W/40 viscosity.
- Start up the engine and allow it to run for several seconds at idling speed.
- Turn off the engine and wait about one minute, then check the oil level through the inspection window ⑤ . If the level is below mark "F", supply oil to that level.

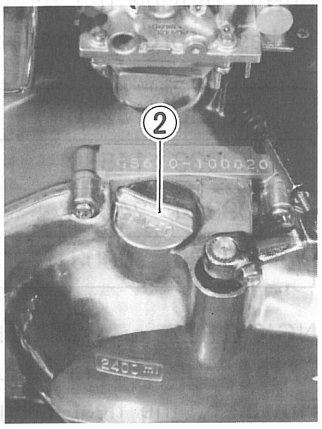
NECESSARY AMOUNT OF ENGINE OIL

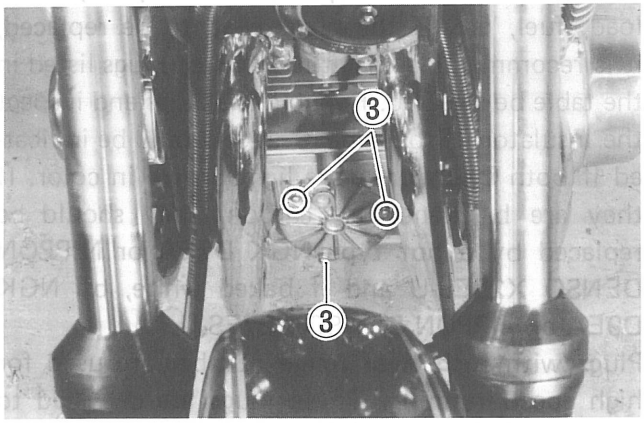
Oil change	2.4 L (2.5 US qt)
Filter change	2.6 L (2.7 US qt)
Overhaul engine	2.7 L (2.9 US qt)

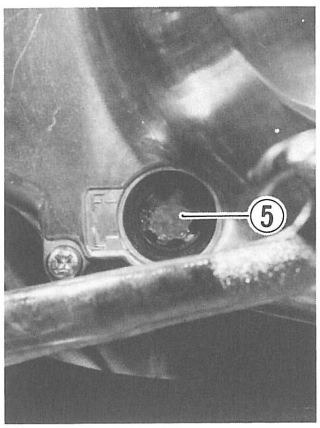
NOTE:
Be sure to take care of O-ring ⑥ to prevent any damage and be sure that filter spring ⑦ is properly in place.

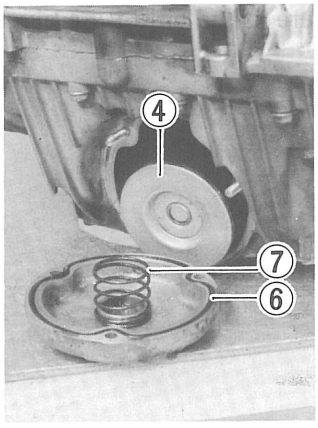












CARBURETOR IDLE RPM

1 000, 6 000, 12 000, 18 000, 24 000 km 600, 4 000, 7 500, 11 000, 15 000 mi

THROTTLE CABLE PLAY

There should be 0.5 mm play Ⓐ on the throttle cable. To adjust the throttle cable play:

- Tug on the throttle cable to check the amount of play.
- Loosen the two lock nuts ① and turn the adjuster ② in or out until the specified play is obtained.
- Secure the lock nut while holding the adjuster in place.

Throttle cable play Ⓐ	0.5 mm (0.02 in)

NOTE:
Make this adjustment when the engine is hot.

- Start up the engine and set its speed at anywhere between 1 000 and 1 200 r/min by turning throttle stop screw ③.

Engine idle speed	1 100 ± 100 r/min

CAUTION:
No adjustment except the procedure mentioned above is necessary because calibration is performed by carburetor manufacturer.

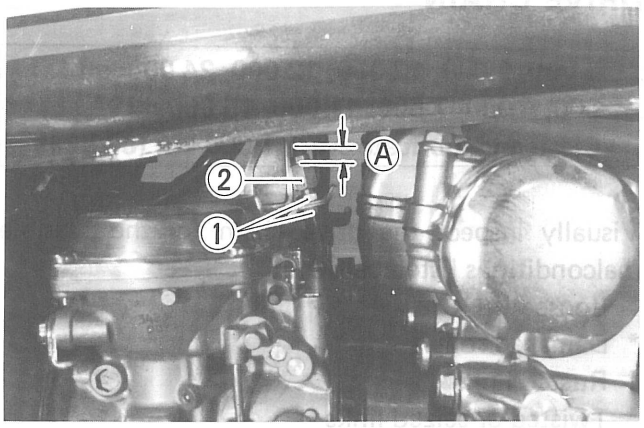
CLUTCH

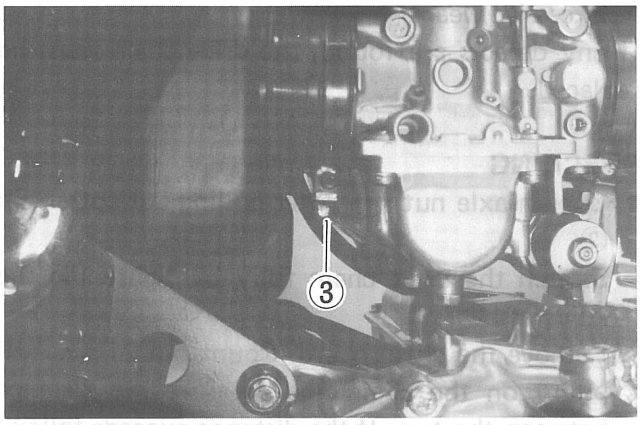
1 000, 6 000, 12 000, 18 000, 24 000 km 600, 4 000, 7 500, 11 000, 15 000 mi

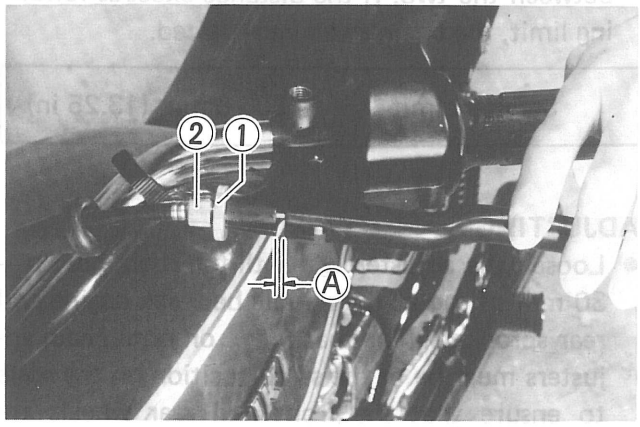
- Loosen lock nut ① on the lever side of the clutch cable and screw adjust nut ② fully in on the clutch lever side.
- Loosen the cable lock nut, tighten the adjusting screw to provide play in the outer cable. Adjust the play of the cable with adjuster ③ until play Ⓐ of the clutch lever is 2 – 3 mm. Next firmly secure lock nut.

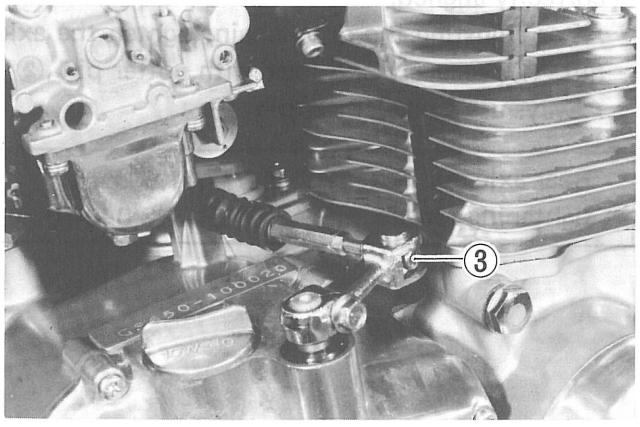
Cable play Ⓐ	2 – 3 mm (0.08 – 0.12 in)

- If the specified play can not be obtained with adjuster ③, carry out the adjustment using the adjusting nut ② on the clutch lever side.









DRIVE CHAIN

1 000, 6 000, 12 000, 12 000, 24 000 km 600, 4 000, 7 500, 11 000, 15 000 mi Clean and lubricate every 1 000 km (600 mi)

Visually inspect the drive chain for the possible malconditions listed below.

* Loose pins
* Damaged rollers
* Rusted links
* Twisted or seized links
* Excessive wear

If any defects are found, the drive chain must be replaced.

CHECKING

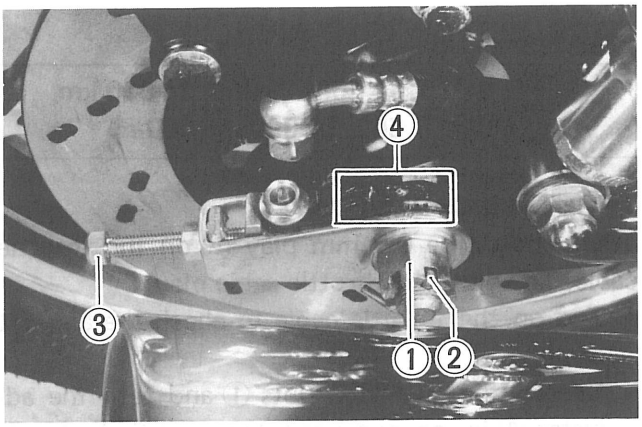
- Loosen axle nut ① after pulling out cotter pin ② .
- Stretch the drive chain fully by tightening the adjusters ③ .
- Remove the chain guard. Count out 21 pins (20 pitch) on the chain and measure the distance between the two. If the distance exceeds following limit, the chain must be replaced.

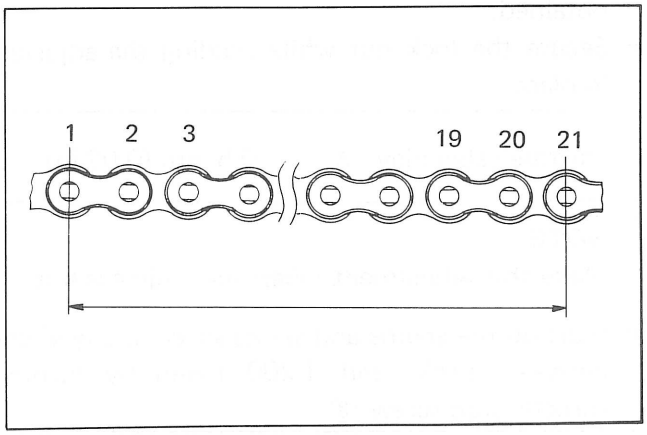
Service Limit	336.5 mm (13.25 in)

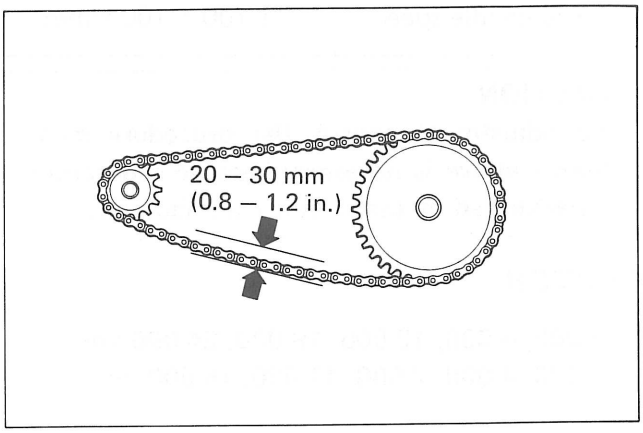
ADJUSTING

- Loosen the adjuster ③ until the chain has 20 – 30 mm of sag at the middle between engine and rear sprockets. The mark ④ on both chain adjusters must be at the same position on the scale to ensure that the front and rear wheels are correctly aligned.
- After adjusting the drive chain, tighten the axle nut ① securely and lock with cotter pin ② . Always use a new cotter pin

Rear axle nut tightening torque	8.5 – 11.5 kg-m (61.5 – 83.0 lb-ft)







CLEANING AND LUBRICATING

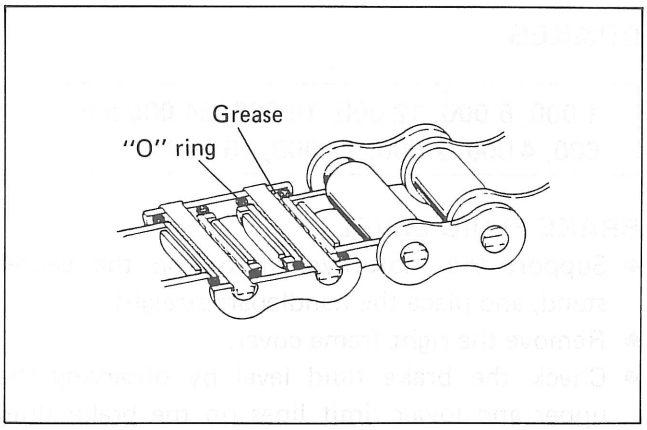
Wash the chain with kerosene. If the chain tends to rust faster, the intervals must be shortened.

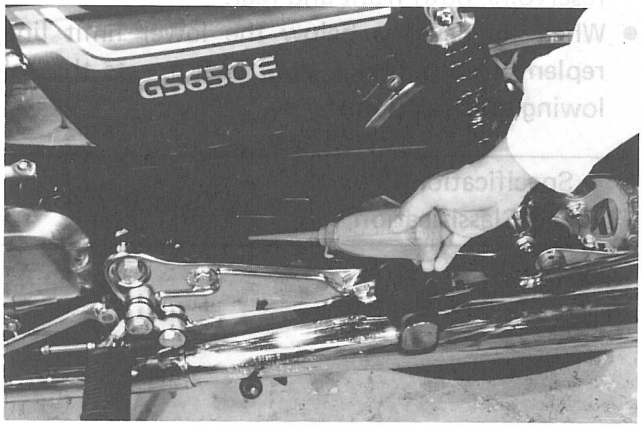
CAUTION:
Do not use trichlene, gasoline or any similar fluids: These fluids have too great a dissolving power for this chain and, what is more important, can spoil the "O" rings confining the grease in the bush-to-pin clearance. Remember, high durability comes from the presence of grease in that clearance.

After washing and drying the chain, oil it with a heavy-weight motor oil.

CAUTION:
Do not use any oil sold commercially as "drive chain oil". Such oil too can spoil the "O" rings.

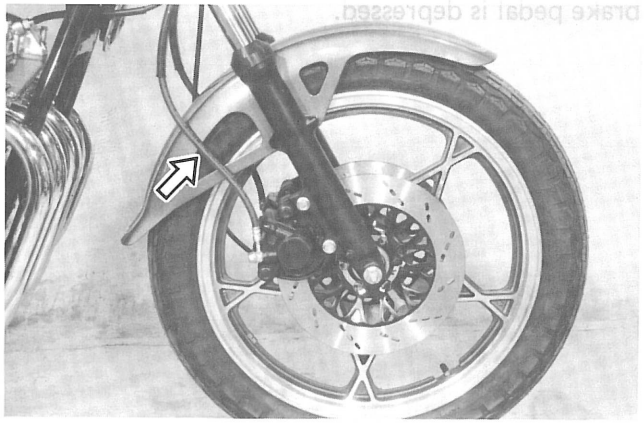
CAUTION:
The standard drive chain is TAKASAGO RK520GO. SUZUKI recommends that the above-mentioned standard drive chain be used for the replacement.





BRAKE HOSE

Replace every 2 years



BRAKES

1 000, 6 000, 12 000, 18 000, 24 000 km 600, 4 000, 7 500, 11 000, 15 000 mi

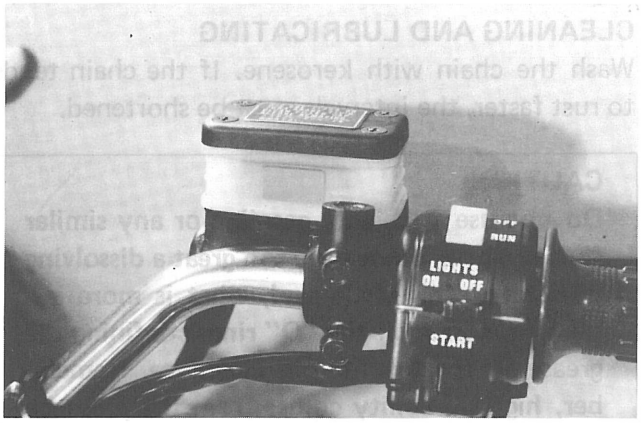
BRAKE FLUID LEVEL

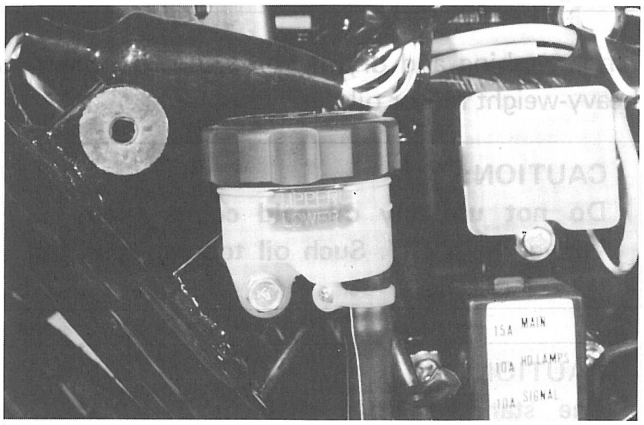
- Support the motorcycle body on the center stand, and place the handlebars straight.
- Remove the right frame cover.
- Check the brake fluid level by observing the upper and lower limit lines on the brake fluid reservoirs, both front and rear.
- When the level is below the lower limit line, replenish with brake fluid that meets the following specification.

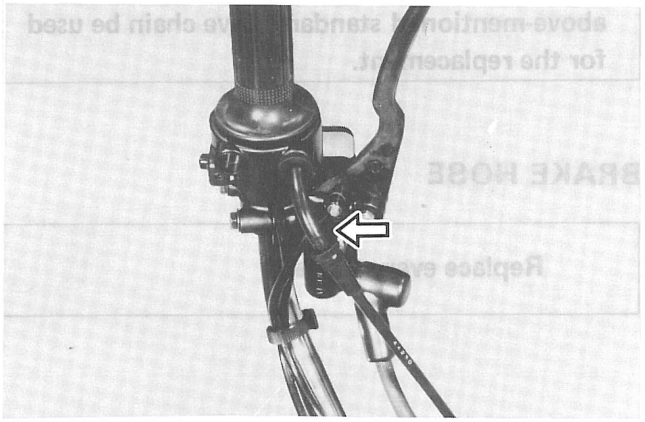
Specification and Classification	DOT3 or DOT4

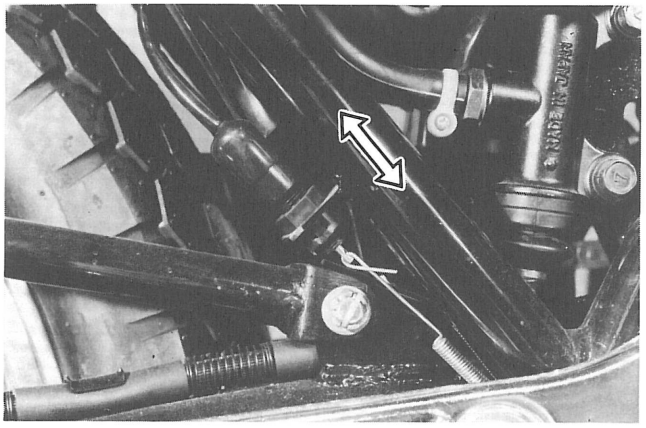
BRAKE LIGHT SWITCHES

Adjust both brake light switches, front and rear, so that brake light will come on just before a pressure is felt when the brake lever is squeezed, or the brake pedal is depressed.







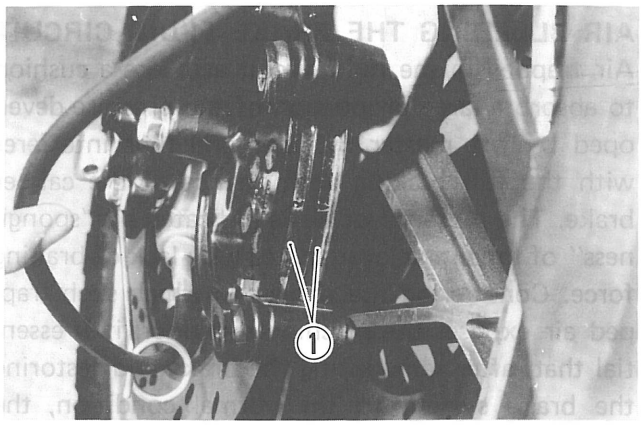


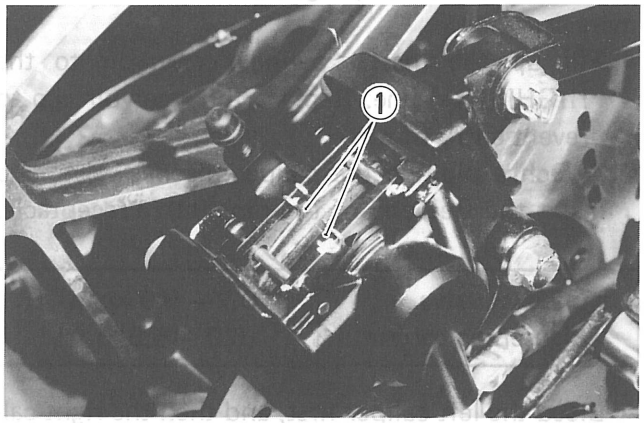
WARNING:
The brake system of this motorcycle is filled with a glycol-based brake fluid. Do not use or mix different types of fluid such as silicone-based and petroleum-based fluid for refilling the system, otherwise serious damage will be caused. Do not use any brake fluid taken from old or used or unsealed containers. Never re-use the brake fluid left over from the last servicing and stored for long periods.

WARNING:
Brake fluid, if it leaks, will interfere with safe running and immediately discolor painted surfaces.
Check the brake hoses for cracks and hose joint for leakage before riding.

BRAKE PADS

Wearing condition of brake pads can be checked by observing the red limit line ① marked on the pad. When the wear exceeds the limit line, replace the pads with new ones. (see pages 7-5 and 7-26)

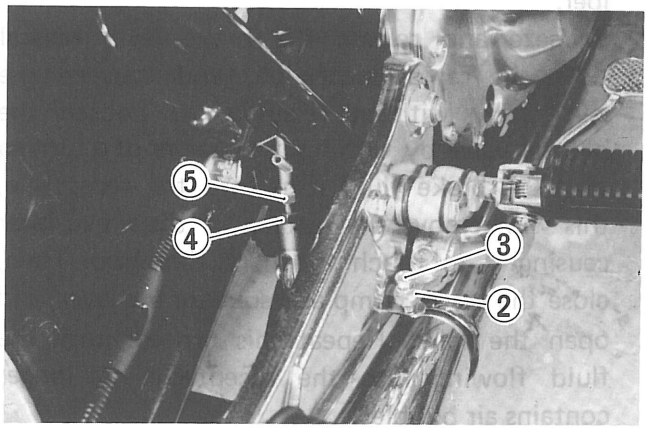


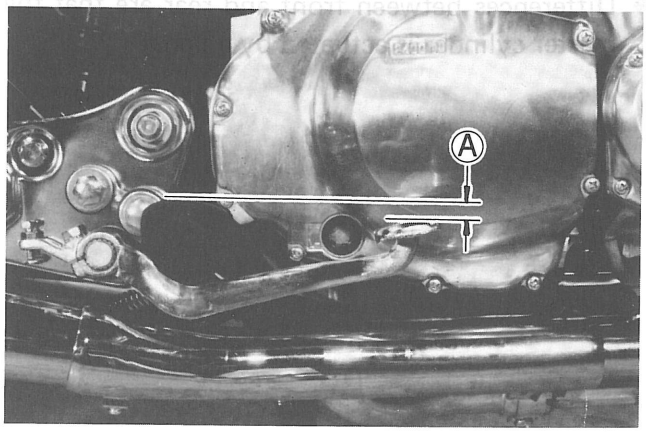


BRAKE PEDAL HEIGHT

- Loosen lock nut ② , and turn stopper bolt ③ away from the stopper.
- Loosen lock nut ④ , and rotate push rod ⑤ to locate brake pedal 20 mm Ⓐ below the top face of the footrest.
- Turn the stopper bolt ③ in so that the clearance between the stopper bolt and stopper is zero.
- Retighten both lock nuts ② and ④.

Brake pedal height Ⓐ	20 mm (0.8 in)





AIR BLEEDING THE BRAKE FLUID CIRCUIT

Air trapped in the fluid circuit acts like a cushion to absorb a large proportion of the pressure developed by the master cylinder and thus interferes with the full braking performance of the caliper brake. The presence of air is indicated by "sponginess" of the brake lever and also by lack of braking force. Considering the danger to which such trapped air exposes the machine and rider, it is essential that, after remounting the brake and restoring the brake system to the normal condition, the brake fluid circuit be purged of air in the following manner:

- Fill up the master cylinder reservoir to the "HIGH" level line. Replace the reservoir cap to prevent entry of dirt.
- Attach a pipe to the caliper bleeder valve, and insert the free end of the pipe into a receptacle.

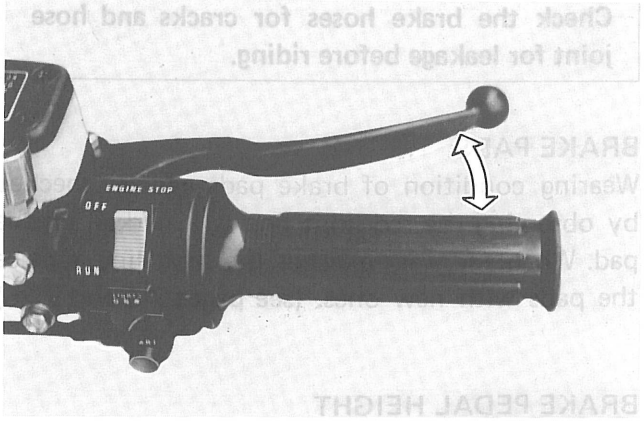
Bleeder valve tightening torque	0.7 – 0.9 kg-m (5.0 – 6.5 lb-ft)

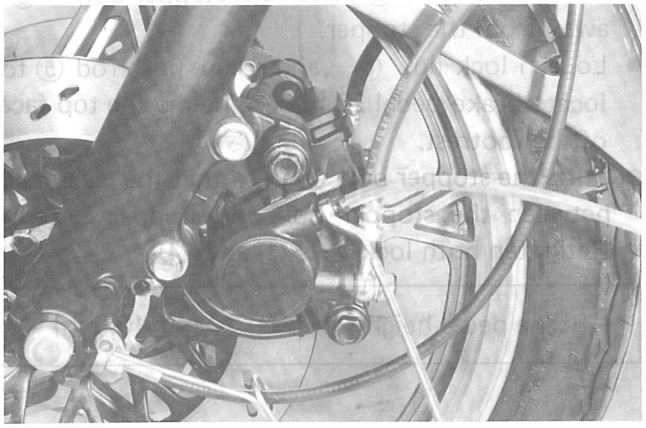
- Bleed the left caliper first, and then the right caliper.
- Squeeze and release the brake lever several times in rapid succession, and squeeze the lever fully without releasing it. Loosen the bleeder valve by turning it a quarter of a turn so that the brake fluid runs into the receptacle, this will remove the tension of the brake lever causing it to touch the handlebar grip. Then, close the valve, pump and squeeze the lever, and open the valve. Repeat this process until the fluid flowing into the receptacle no longer contains air bubbles.
- Differences between front and rear are that the master cylinder is actuated by a pedal.

NOTE:
Replenish the brake fluid reservoir as necessary while bleeding the brake system.
Make sure that there is always some fluid visible in the reservoir.

- Close the bleeder valve, and disconnect the pipe. Fill the reservoir to the "HIGH" level line.

CAUTION:
Handle the brake fluid with care: the fluid reacts chemically with paint, plastics, rubber materials, etc.



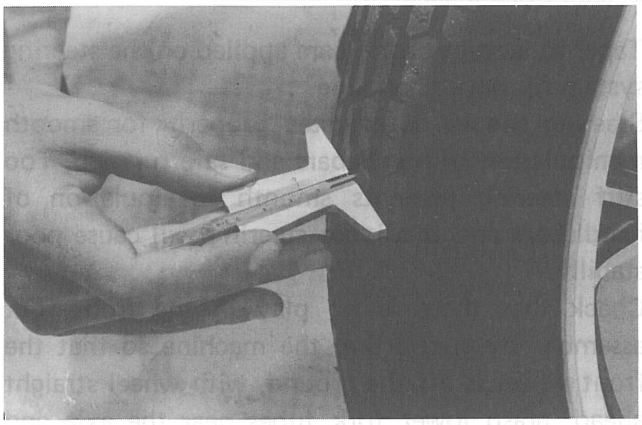


TIRES

1 000, 6 000, 12 000, 18 000, 24 000 km
600, 4 000, 7 500, 11 000, 15 000 mi

TIRE TREAD CONDITION

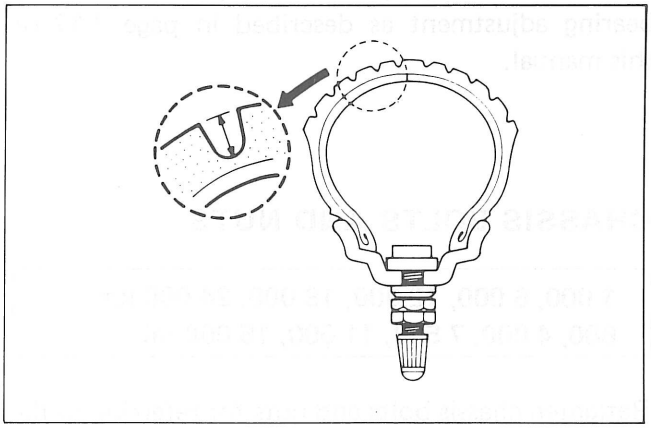
Operating the motorcycle with the excessively worn tires will decrease riding stability and consequently invite a dangerous situation. It is highly recommended to replace the tire when the remaining depth of tire tread reaches the following specifications.



FRONT	REAR
1.6 mm (0.06 in)	2.0 mm (0.08 in)

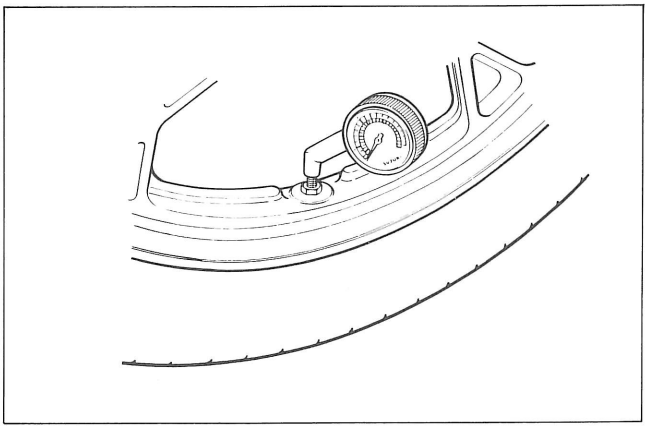
TIRE PRESSURE

If the tire pressure is too high or too low, steering will be adversely affected and tire wear increased. Therefore, maintain the correct tire pressure for good roadability or shorter tire life will result. Cold inflation tire pressure is as follows.



	Normal riding				High speed riding			
	Solo		Dual		Solo		Dual	
	kg/cm²	psi	kg/cm²	psi	kg/cm²	psi	kg/cm²	psi
FRONT	1.75	24	1.75	24	2.00	28	2.00	28
REAR	2.00	28	2.50	36	2.25	32	2.80	40

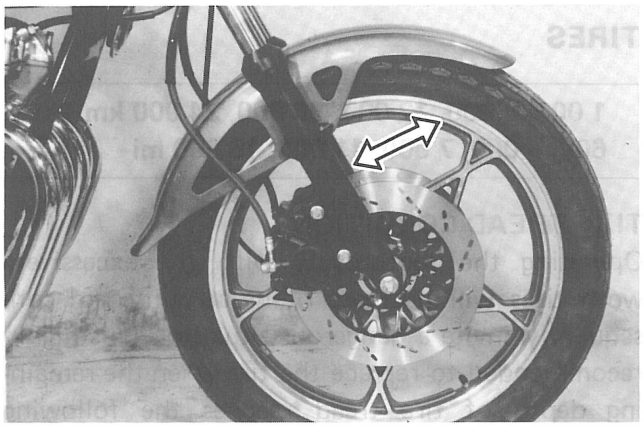
CAUTION:
The standard tire fitted on this motorcycle is 3.25H19 4PR for front and 3.75H18 4PR for rear. The use of a tire other than the standard may cause instability. It is highly recommended to use a SUZUKI Genuine Tire.



STEERING

1 000, 6 000, 12 000, 18 000, 24 000 km 600, 4 000, 7 500, 11 000, 15 000 mi

Taper roller type bearing are applied on the steering system for better handling.
Steering should be adjusted properly for smooth manipulation of handlebars and safe running. Too stiff steering prevents smooth manipulation of handlebars and too loose steering will cause poor stability.
Check that there is no play in the front fork assembly by supporting the machine so that the front wheel is off the ground, with wheel straight ahead, grasp lower fork tubes near the axle and pull forward. If play is found, perform steering bearing adjustment as described in page 7-17 of this manual.



CHASSIS BOLTS AND NUTS

1 000, 6 000, 12 000, 18 000, 24 000 km 600, 4 000, 7 500, 11 000, 15 000 mi

Retighten chassis bolts and nuts for referring to the page (8-15).

SERVICING ENGINE

CONTENTS

ENGINE COMPONENTS REMOVABLE WITH 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

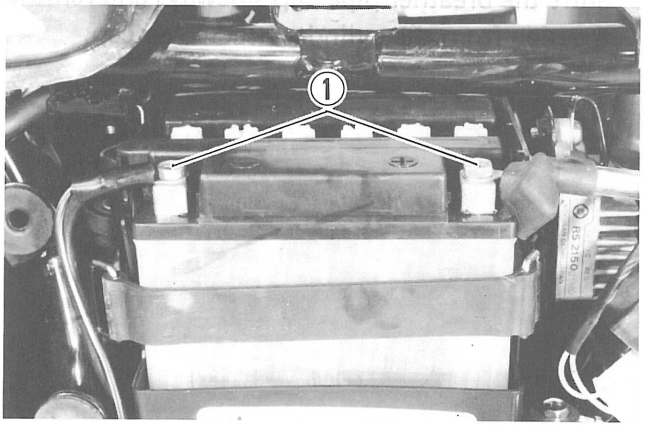
- Starter motor lead wire should be removed from the starting motor relay side.

ENGINE RIGHT SIDE

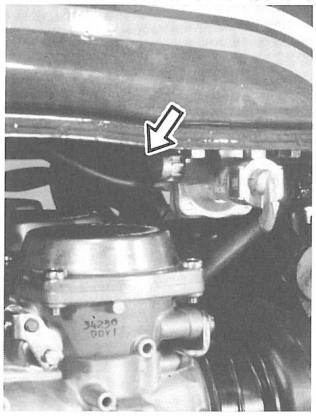
ENGINE REMOVAL AND REINSTALLATION

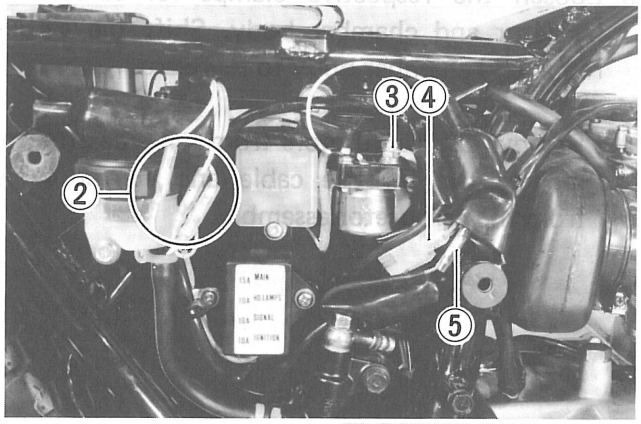
ENGINE REMOVAL

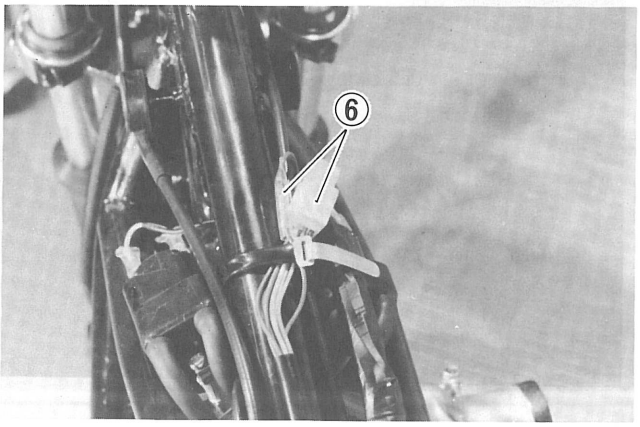
Before taking the engine out of the frame, wash the engine with a steam cleaner and drain engine oil etc. The procedure of engine removal is sequentially explained in the following steps, and engine installation is effected by reversing the removal procedure.

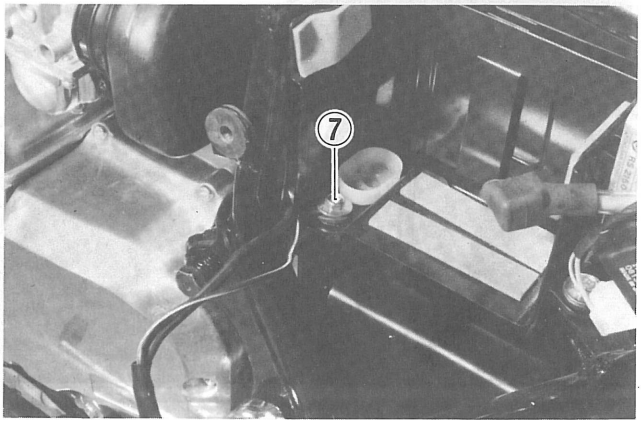


1. Place an oil pan under the engine and remove the oil filter cap and the oil drain plug to drain out engine oil.
2. Take off the seat.
3. Remove the left and right frame covers and disconnect the battery ⊖ and ⊕ lead wires ①.
4. Set the fuel cock in the "ON" position and shift the fuel hose clip sideways to remove the two hoses (fuel and vacuum) from the fuel cock.
5. Remove the two bolts at the rear of the fuel tank and remove the tank by moving it rearwards.
6. Disconnect various lead wires.
   * Generator lead ②.
   * Starter relay ⊖ lead ③.
   * Signal generator lead ④.
   * Oil pressure switch lead ⑤.
   * Gear position indicator and neutral indicator lead ⑥.
   * Engine ground wire from the battery holder ⑦.

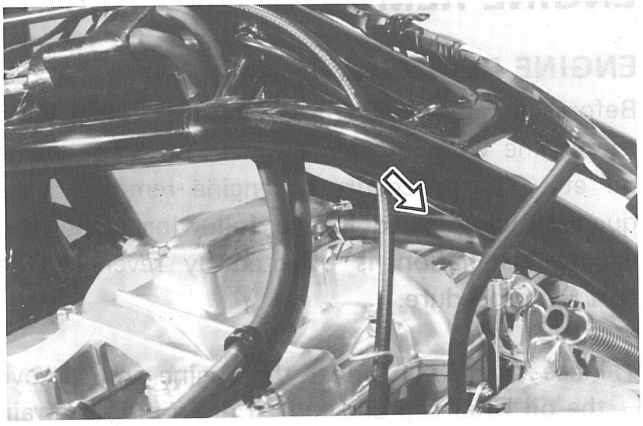




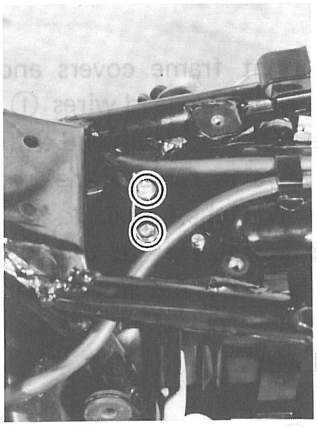


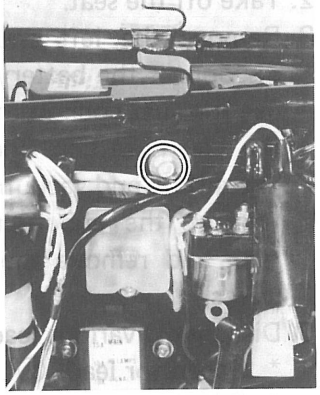


7. Shift the breather pipe clip sideways and remove the pipe from the cylinder head cover cap.



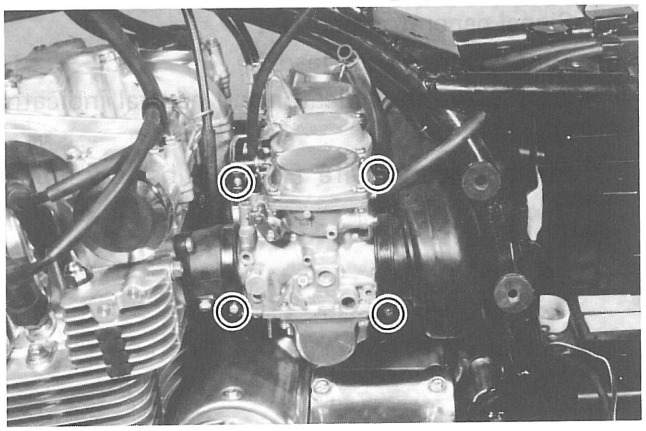
8. Remove the two screws and one bolt for securing air cleaner case.

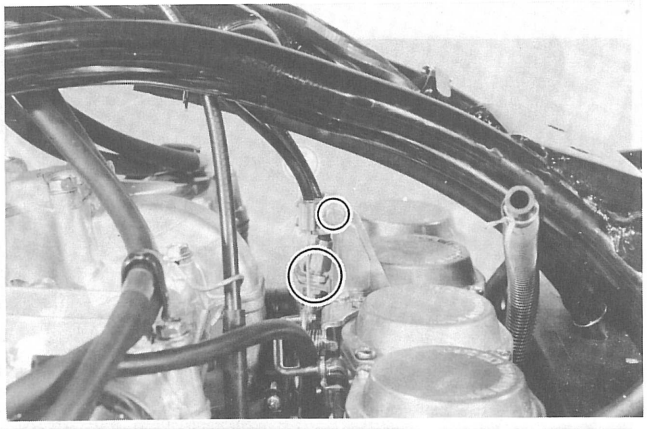


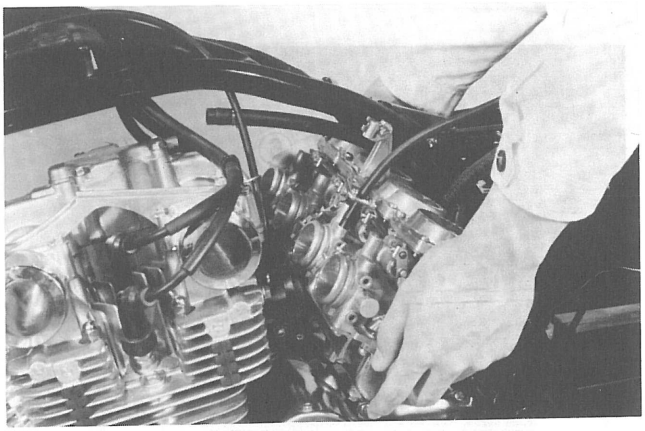


9. Loosen the respective clamps for carburetor insulator and chamber body. Shift the carburetors and chamber body to rearward.

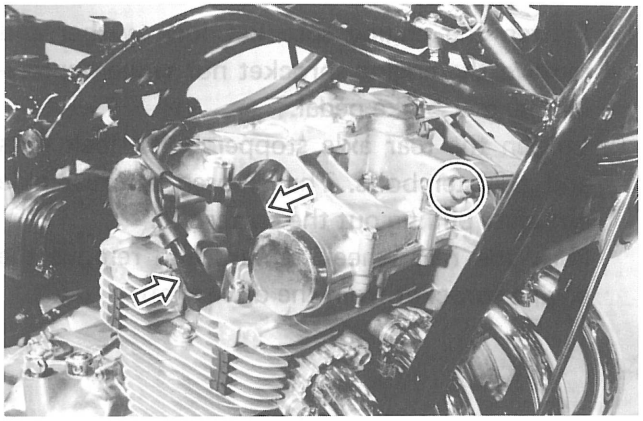
10. Remove the carburetors from left side after removing the throttle cable and starter cable from the carburetor assembly.



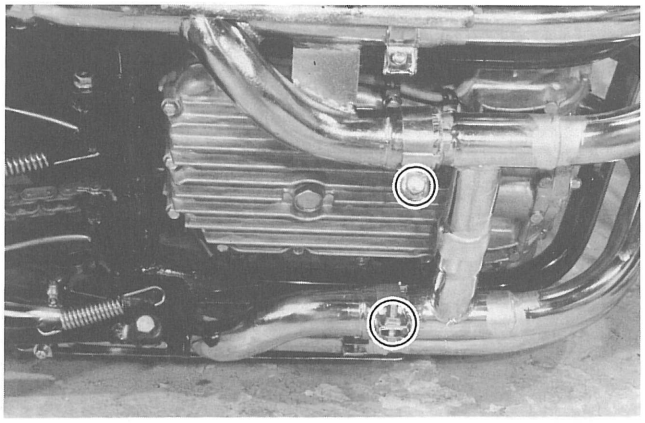


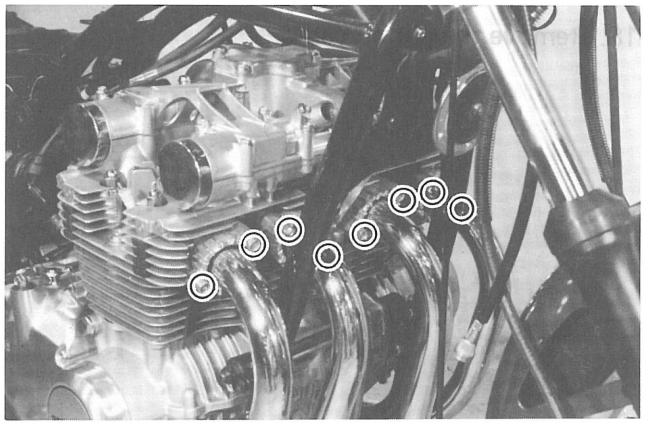


11. Pull out the spark plug caps from spark plugs.
12. Remove the tachometer cable from the cylinder head cover.

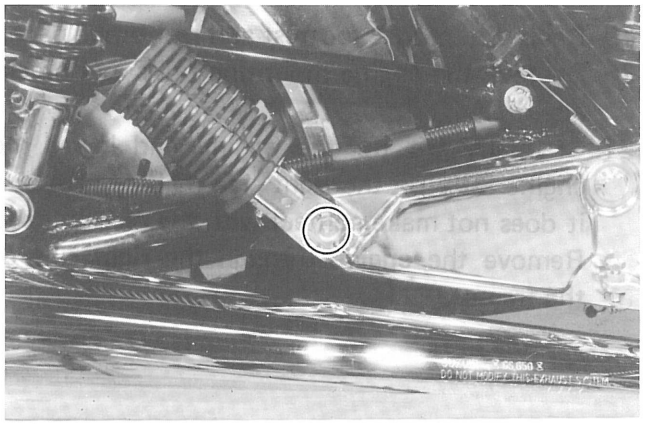


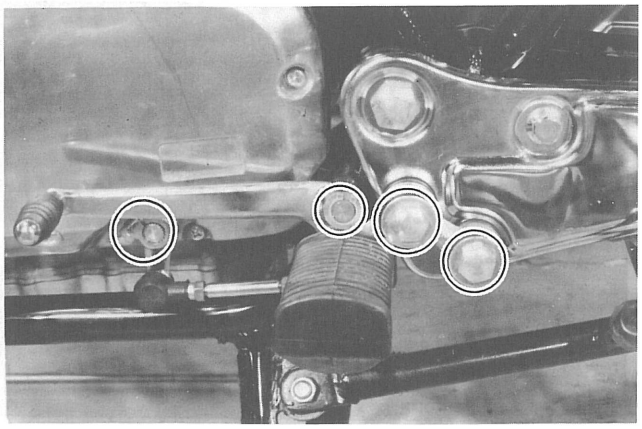
13. Remove the exhaust pipe coupler tube bolts. Remove the exhaust pipes of the Nos. 2 and 3 cylinders by unscrewing exhaust pipe clamp bolts.

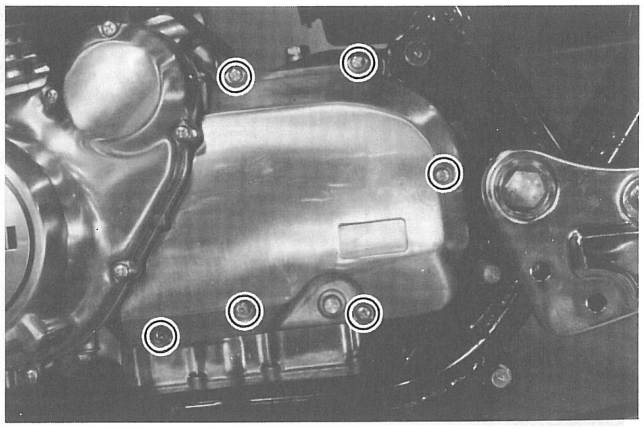




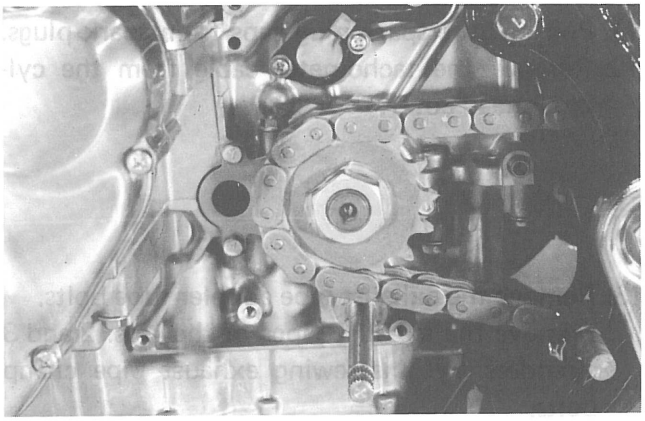
14. Remove the both mufflers by unscrewing muffler mounting bolts.
15. Remove the left footrest and gearshift lever.
16. Remove the engine sprocket cover.



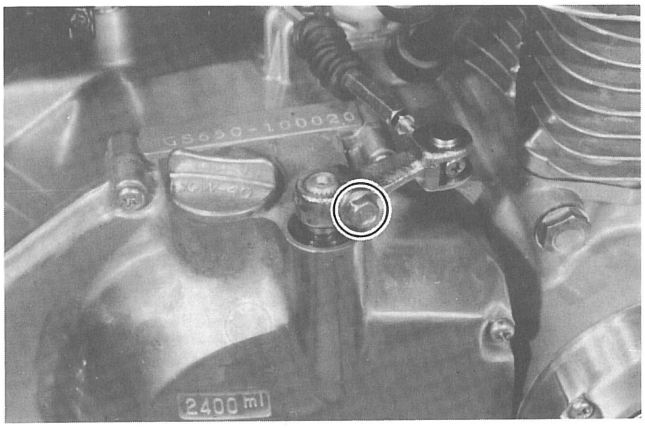




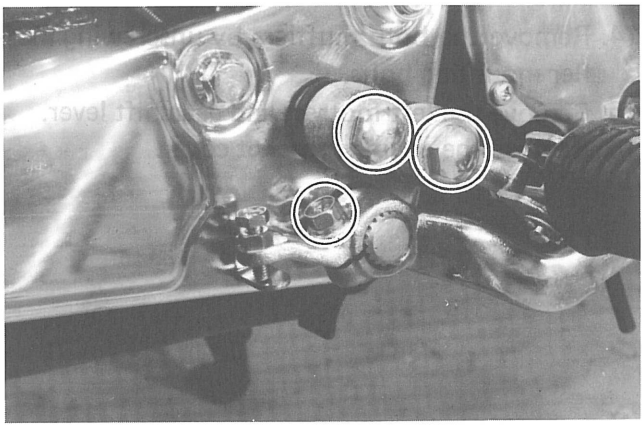
17. Flatten the engine sprocket lock washer and remove the engine sprocket nut while depressing the rear brake pedal.
    Loosen the rear axle stopper bolts, lock nuts and adjuster bolts. Then loosen the rear axle nut after pulling out the cotter pin.
    Push the rear wheel forward and remove the engine sprocket from the drive shaft.

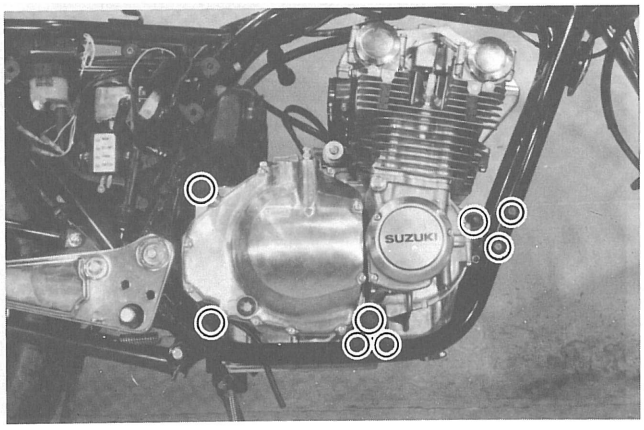


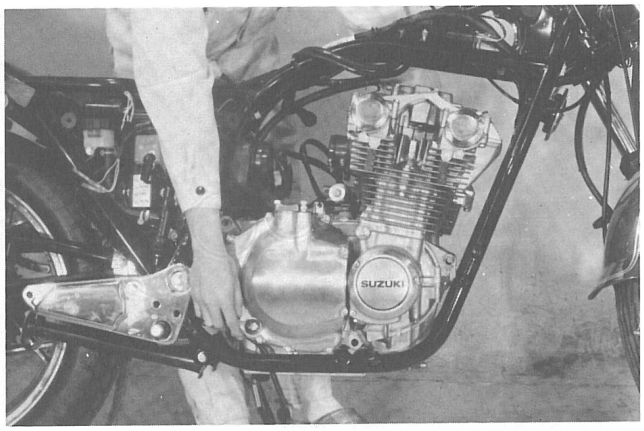
18. Remove the clutch cable.



19. Remove the right footrest and rear brake pedal.
20. Remove the engine mounting bolts and brackets.
21. Gradually lift up the engine and lower the engine ass'y on the right side making sure that it does not make contact with the rear bracket. Remove the engine through the right side of the frame.



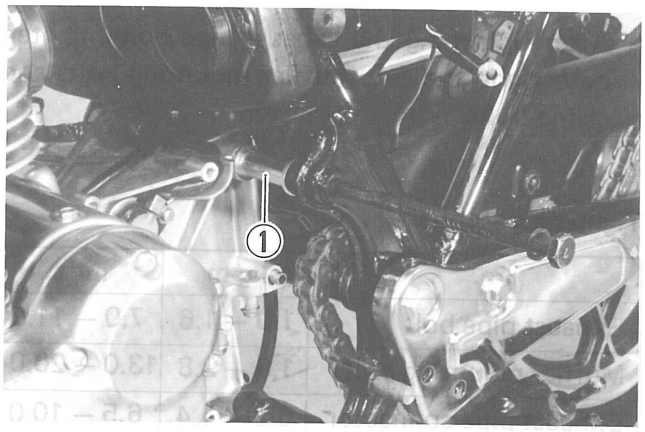




ENGINE REINSTALLATION

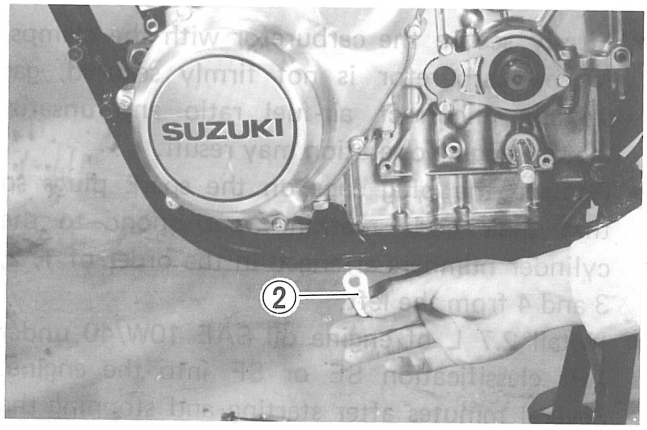
For remounting, reverse the order of engine removal.

- Temporarily fasten the engine mounting bracket before inserting the engine mounting bolts.
- After inserting the engine mounting bolts, tighten engine mounting bracket bolts and engine mounting bolts. Insert all three long bolts from the left side and insert the rear upper bolt through the spacer ① on the left side of the engine.

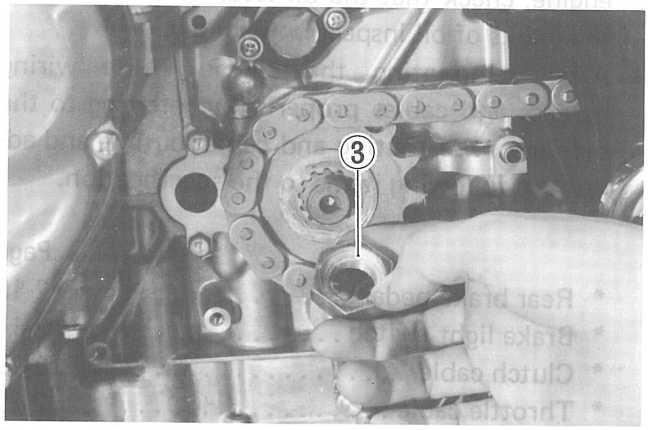


Tightening torque for engine mounting bolts

	kg-m	lb-ft
10 mm Diam.	3.5	25.5
8 mm Diam.	2.5	18.0



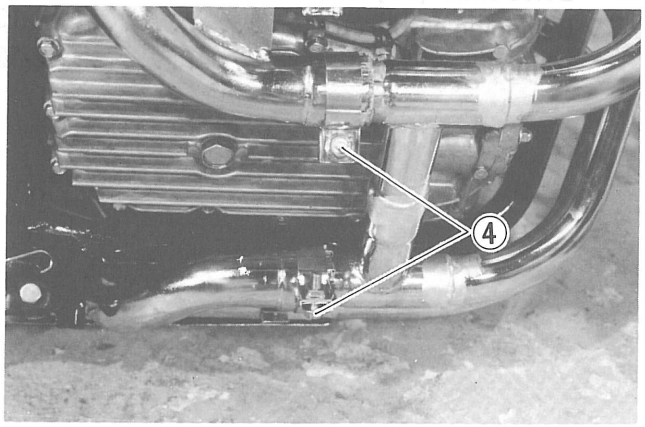
- The nut ② takes its position in the place indicated.
- The engine sprocket should be installed on the drive shaft beforehand as shown in figure, at the same time as installing the drive chain.
  If it is difficult to assemble the engine sprocket, remove the rear axle cotter pin and loosen the axle nut and chain adjuster bolt to push the wheel forward and give the drive chain some play. When replacing the engine sprocket nut, stepped side ③ should be faced inside. After complete tightening of the engine mounting bolts, adjust the drive chain play (see page 2-13).



Tightening torque

	kg-m	lb-ft
Engine sprocket nut	9.0 – 11.0	65.0 – 79.5
Rear axle nut	8.5 – 11.5	61.5 – 83.0

- Securely tighten bolts ④ connecting exhausts and muffler of No. 2 and 3 to prevent gas leakage.



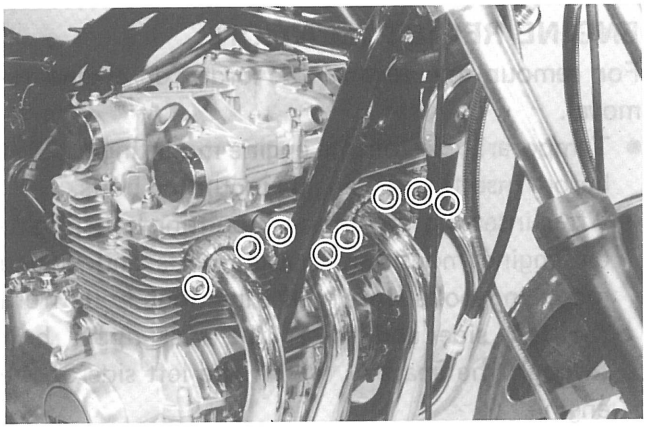
Tightening torque	0.9 – 1.4 kg-m (6.5 – 10.0 lb-ft)

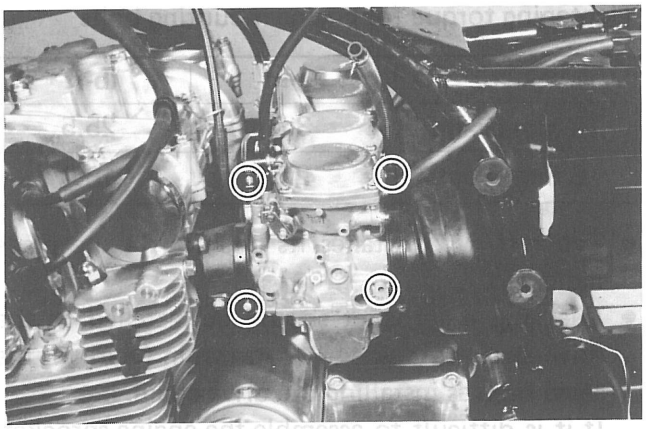
- After tightening the exhaust pipe bolts, tighten both right and left muffler mounting bolts and clamp bolts.

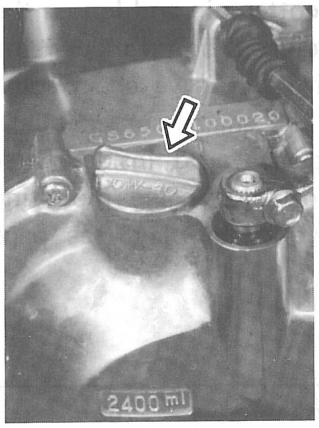
Tightening torque

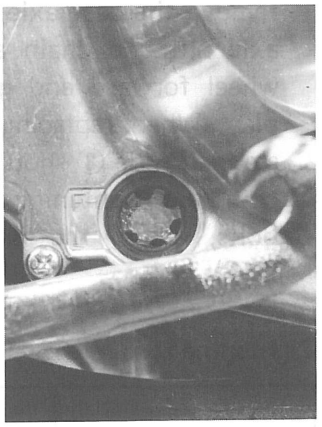
	kg-m	lb-ft
Exhaust pipe bolt	1.0 – 1.6	7.0 – 11.5
Muffler mounting bolt	1.8 – 2.8	13.0 – 20.0
Exhaust pipe connector	0.9 – 1.4	6.5 – 10.0

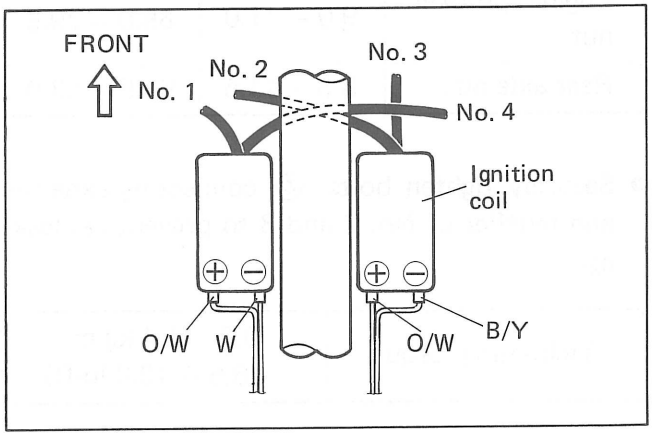
- Firmly secure the carburetor with the clamps. If the carburetor is not firmly secured, gas leakage, incorrect air-fuel ratio and unsatisfactory engine operation may result.
- Replace the plug caps on the spark plugs so that their code markings correspond to the cylinder numbers arranged in the order of 1, 2, 3 and 4 from the left.
- Install 2.7 L 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 of oil inspection window.
- After remounting the engine, route wiring harness and cables properly by referring to the sections, wire routing and cable routing, and adjust the following items to the specification.











COMPRESSION CHECK

The compression of a cylinder is a 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
10 – 14 kg/cm^2 (142 – 199 psi)	7 kg/cm^2 (100 psi)	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 sealing of valves
* Ruptured or otherwise defective cylinder head gasket

Overhaul the engine in the following cases:

* Compression pressure in one of the cylinders is less than 7 kg/cm^2 (100 psi).
* Difference in compression pressure between the two is more than 2 kg/cm^2 (28 psi).
* All compression pressure are below 10 kg/cm^2 (142 psi) (standard) even when they measure more than 7 kg/cm^2 (100 psi).

COMPRESSION TEST PROCEDURE

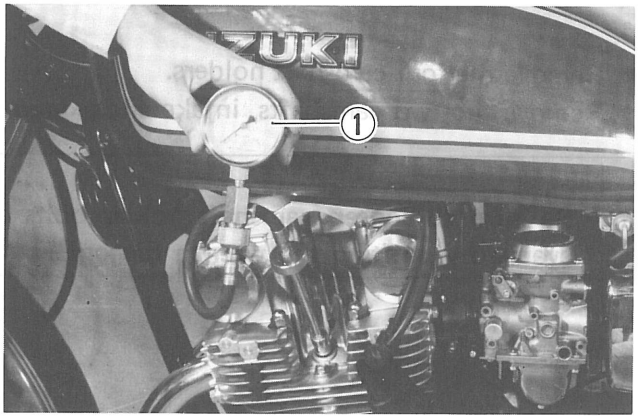
NOTE:

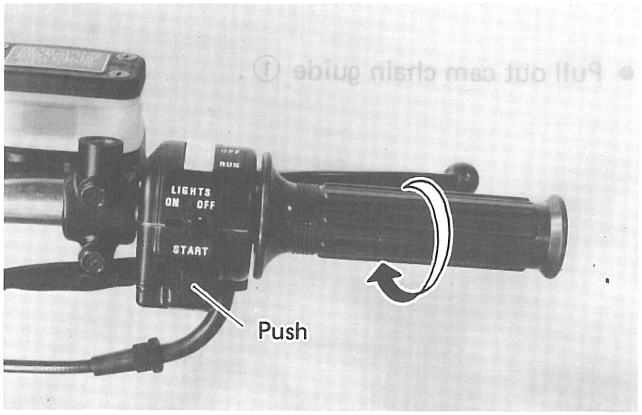
*** Before testing the compression of the engine, make sure that the cylinder head nuts and bolts are tightened to specification.**

*** Warm up the engine before testing.**

- Remove all 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 that cylinder.
- Repeat this procedure with the other cylinder.

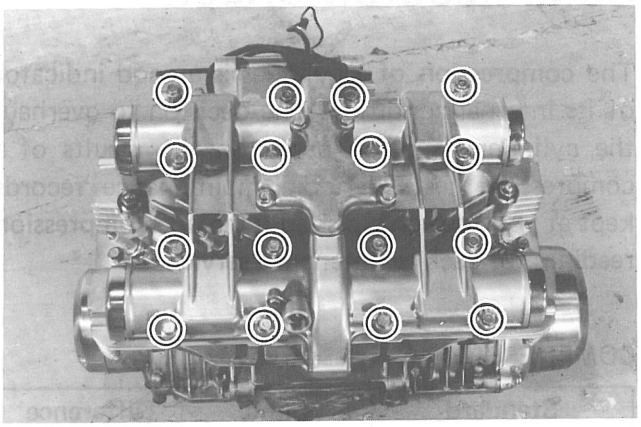
09915 - 64510	Compression gauge
09915 - 63210	Adapter





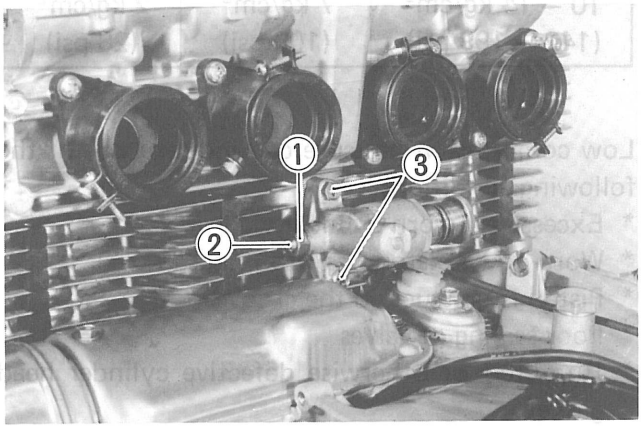
ENGINE DISASSEMBLY

- Remove cylinder head cover and its gasket.



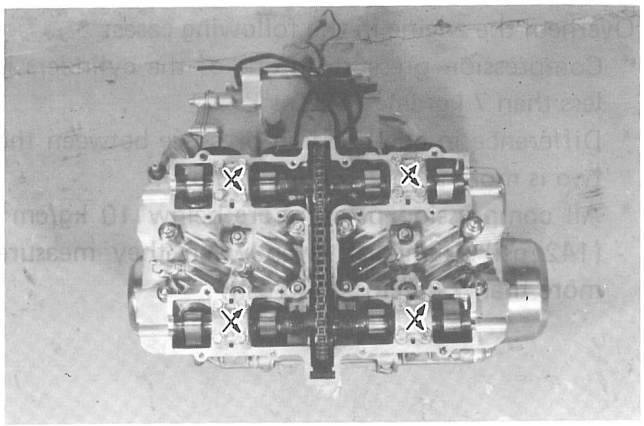
- Loosen the lock nut ① and tighten the stop screw ② and then remove two cam chain tensioner mounting bolts ③.

NOTE:
Screw ② locks the spring loaded tensioner push rod inside.

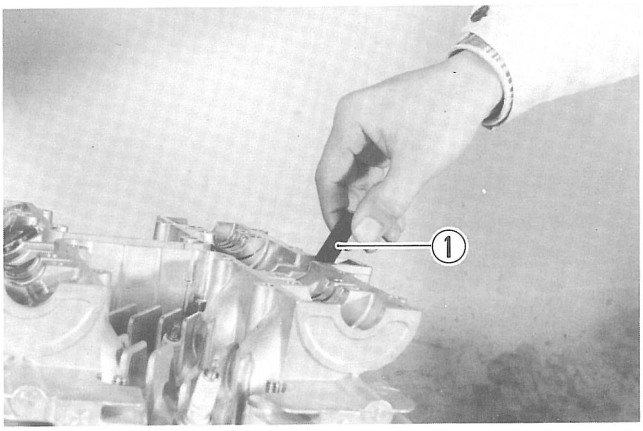


- Remove the four camshaft holders.
- Remove the two camshafts, intake and exhaust.

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

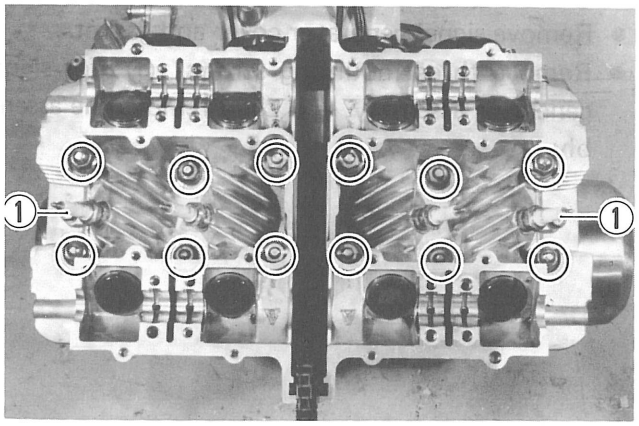


- Pull out cam chain guide ①.

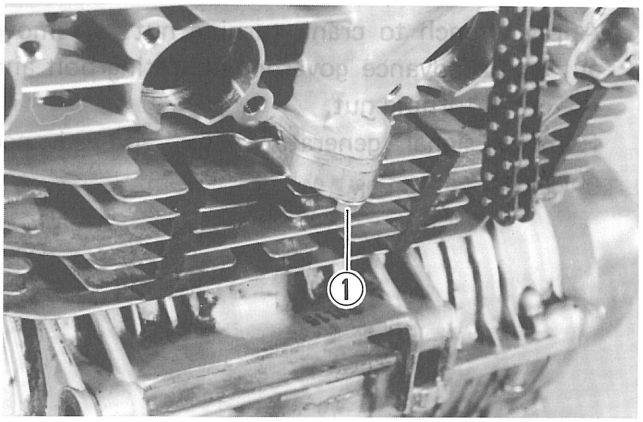


- The cylinder head becomes free for removal when its three 6-mm bolts ① and twelve 10-mm nuts are removed.

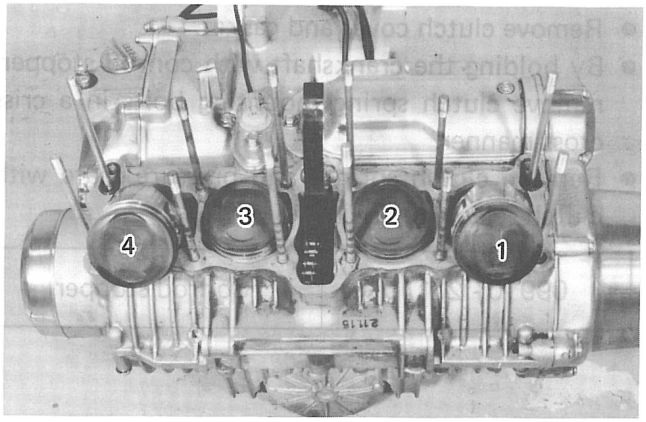
09911 - 74510	Long socket 14 mm
09914 - 24510	T handle



NOTE:
Be sure to use the special tool ("T" wrench) designed to enter the pockets formed in the head and reach the nuts down below to loosen the 10-mm nuts, and to shift the tool sequentially in the nuts descending order of numbers in order to reduce the pressure equally and evenly.

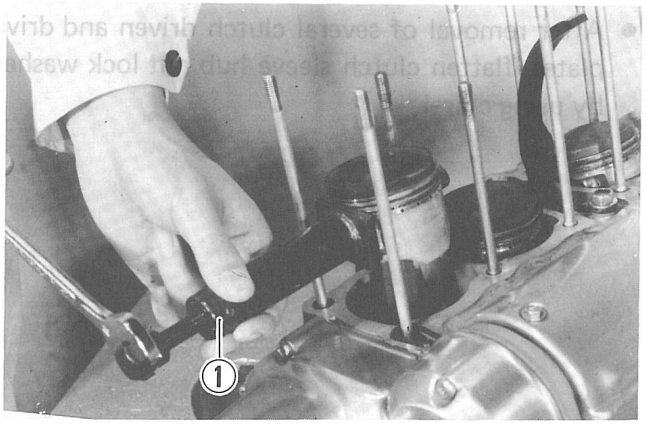


- Firmly grip the cylinder block at both ends, and lift it straight up. If the block does not come off, lightly tap on the finless portions of the block with a plastic mallet to shake the gasketed joint loose.
- Place a cloth beneath the piston so as not to drop the parts in the crankcase, and remove the circlip with pliers.

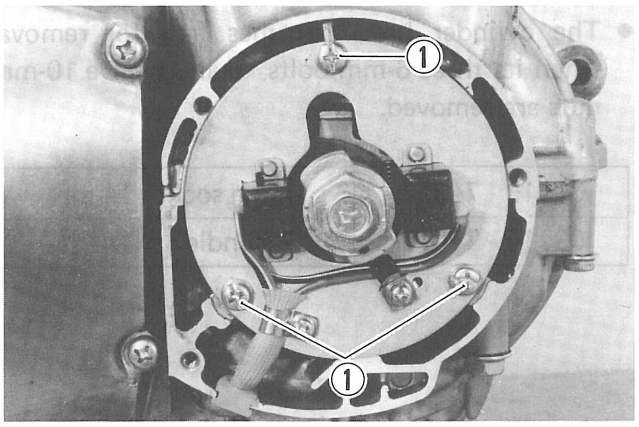


- Scribe the cylinder No. on the head of the piston, and draw out the piston pin with the special tool ① . Place the drawn-out piston pin in the same place as that given the cylinder No. on the head of the piston.

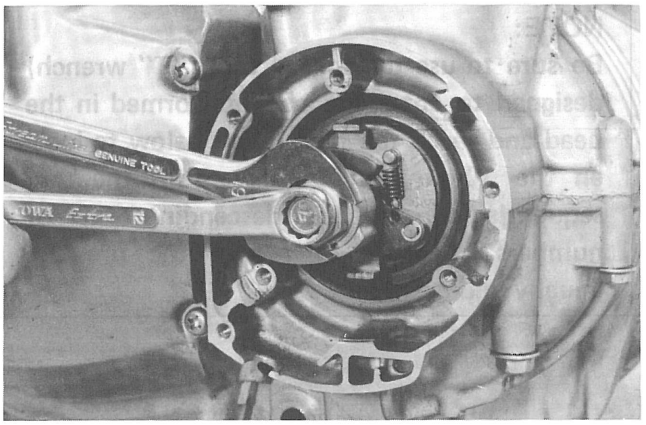
09910 - 34510	Piston pin puller
09910 - 33210	Attachment



- Remove signal generator cover and gasket.
- Remove three mounting screws ① for signal generator assembly, and then remove the assembly.

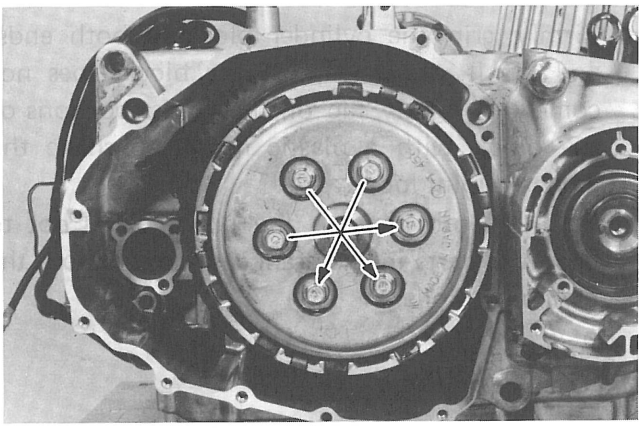


- Apply wrench to crank turning nut to remove automatic advance governor mounting bolt and the crank turning nut.
  Remove signal generator rotor and advance governor.

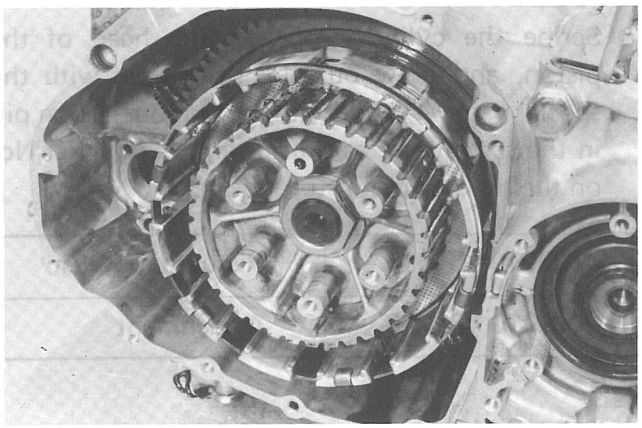


- Remove clutch cover and gasket.
- By holding the crankshaft with conrod stopper, remove clutch spring mounting bolts in a criss cross manner.
- Remove clutch springs and pressure plate with clutch release rack.

09910 - 20115	Conrod stopper

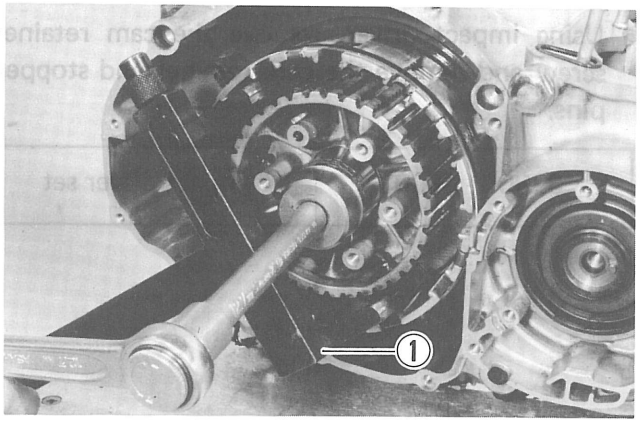


- After removal of several clutch driven and drive plates, flatten clutch sleeve hub nut lock washer by using chisel.

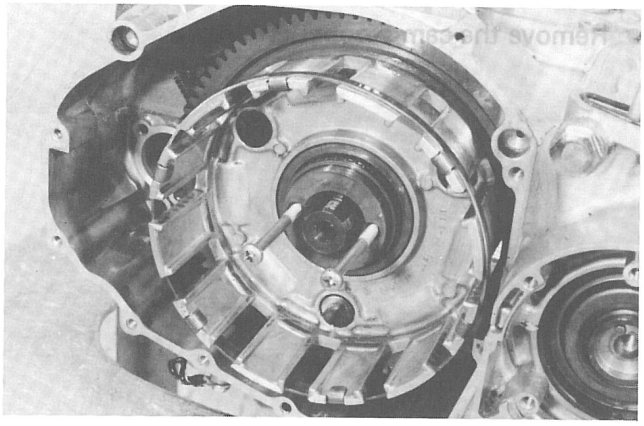


- Firmly secure clutch sleeve hub to remove mounting nut with clutch sleeve hub holder ① .

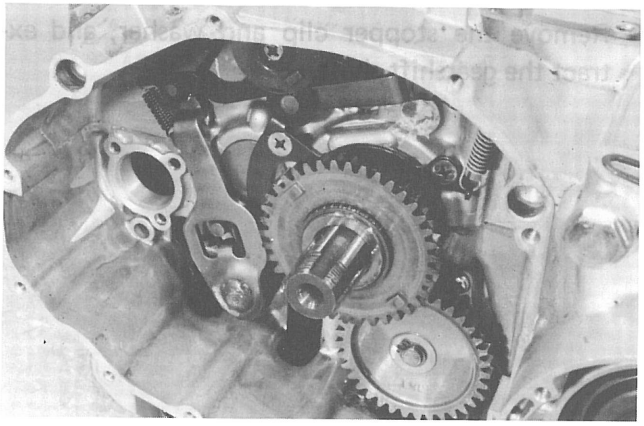
09920 - 53710	Clutch sleeve hub holder



- Remove washer, clutch hub, and the remaining plates.
- Run two 6-mm screws into the primary driven gear spacer to ease out the spacer by pulling. With the spacer removed, the primary driven gear (integral with the clutch housing) is free to disengage from the primary drive gear.

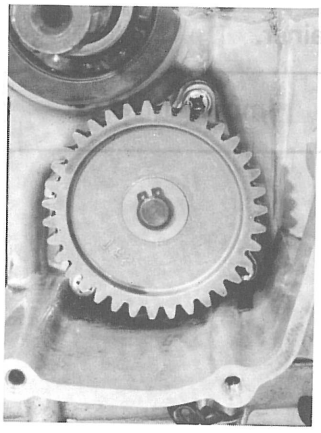


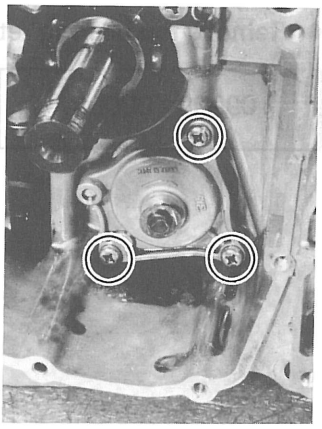
- Pull out oil pump drive gear, its spacer, bearing and thrust washer.



- Using circlip remover, remove oil pump driven gear, drive pin and washer. Then remove oil pump with two O-rings by removing three oil pump securing screws.

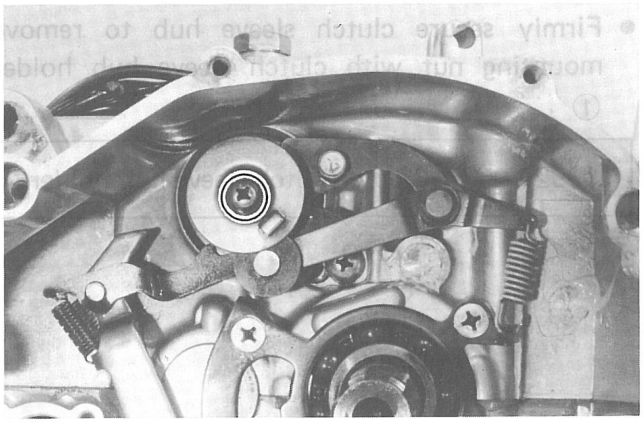
09900 - 06107	Circlip remover



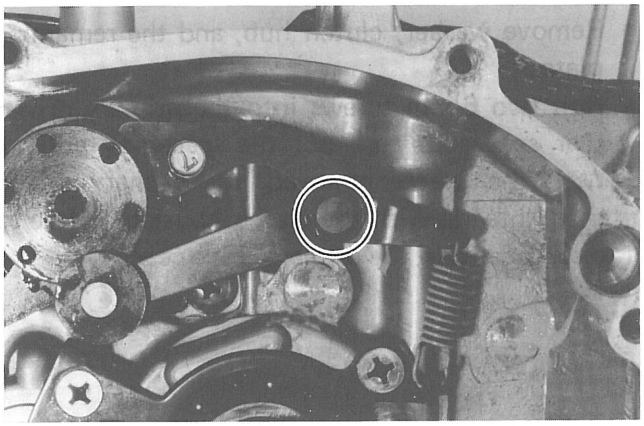


- Using impact driver, remove the cam retainer screw and remove the cam retainer and stopper pins.

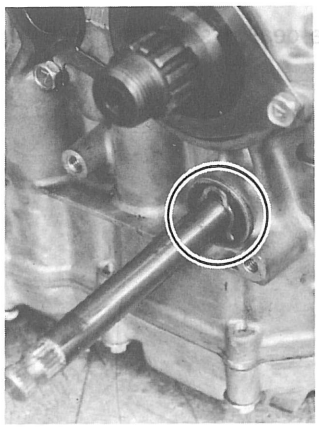
09900 - 09003	Impact driver set

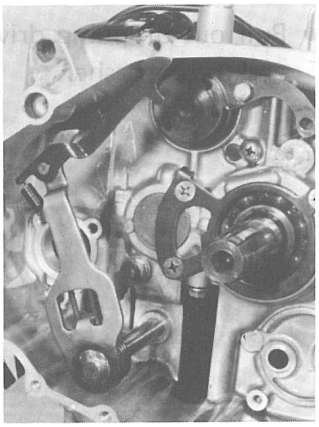


- Remove the cam stopper.



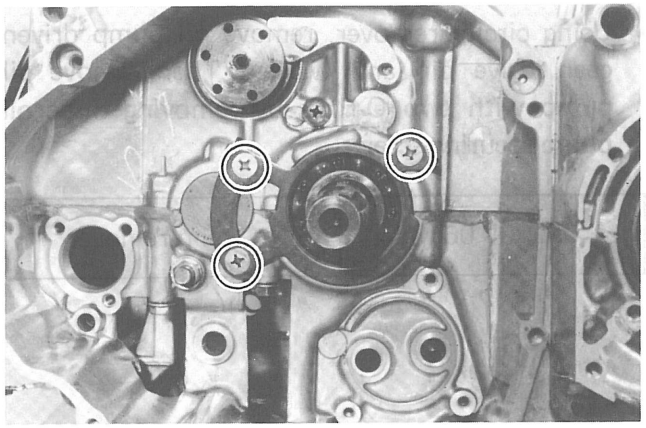
- Remove the stopper clip and washer, and extract the gearshift shaft.



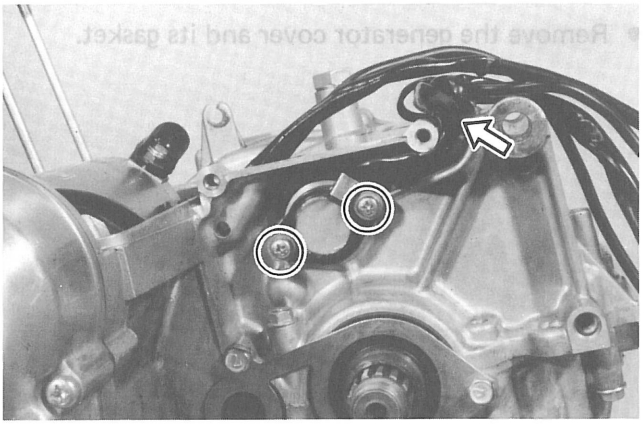


- Remove the bearing retainer.

09900 - 09003	Impact driver set

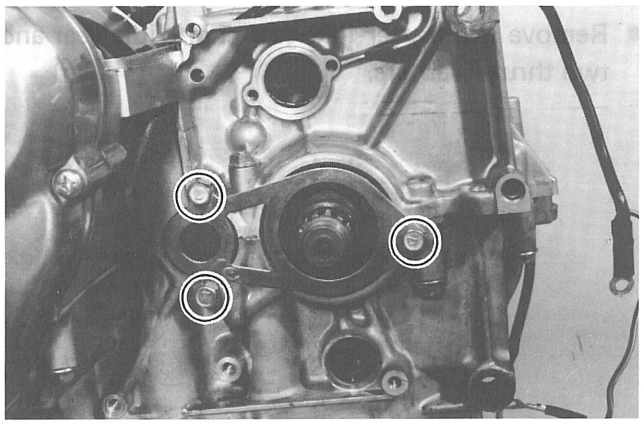


- Unclamp the lead wire and remove the gear position indicator switch body.

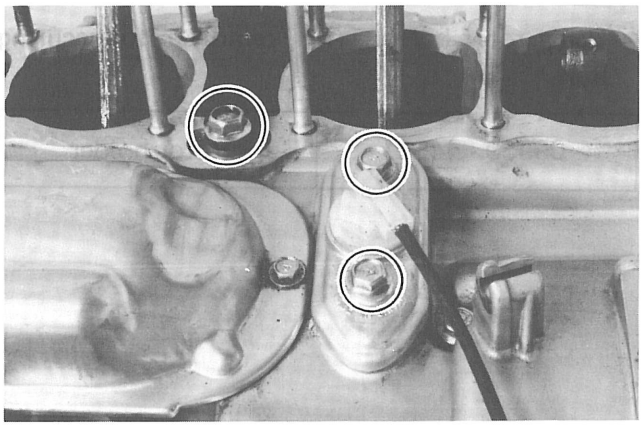


NOTE:
Do not miss the O-ring, switch contact and its spring.

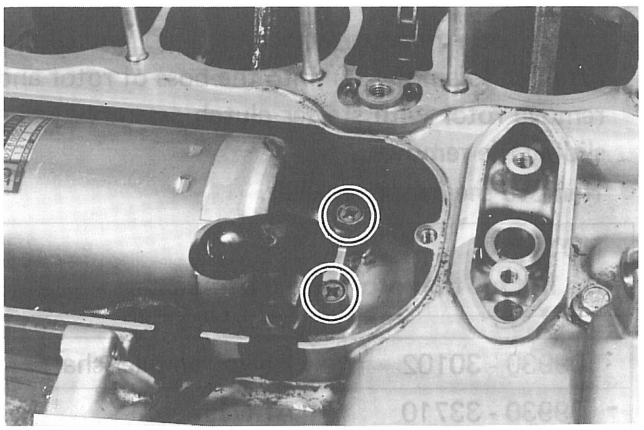
- Flatten the lock portion of the oil seal stopper and remove the oil seal stopper securing bolts.



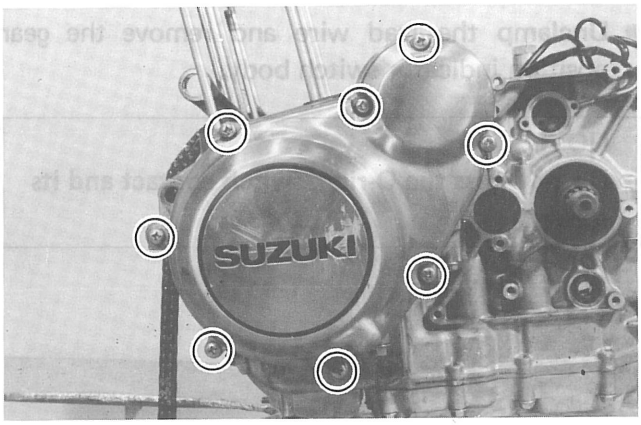
- Remove the cam chain guide securing bolt and oil pressure switch housing bolts.



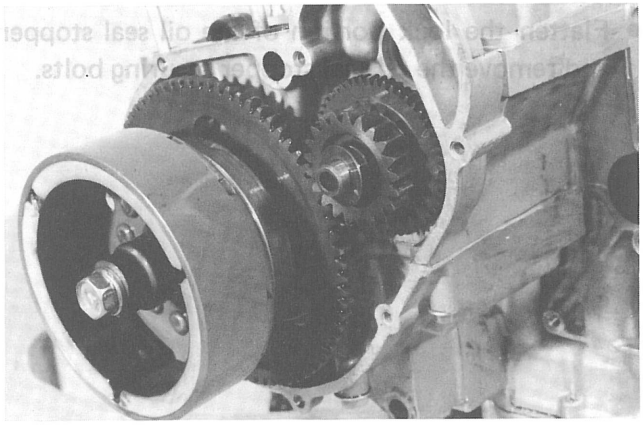
- Remove the starter motor.



- Remove the generator cover and its gasket.

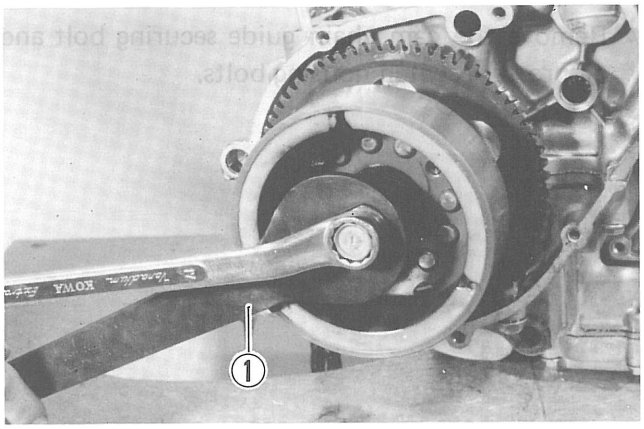


- Remove the starter idle gear shaft, idle gear and two thrust washers.



- Using rotor holder ① , remove rotor securing bolt.

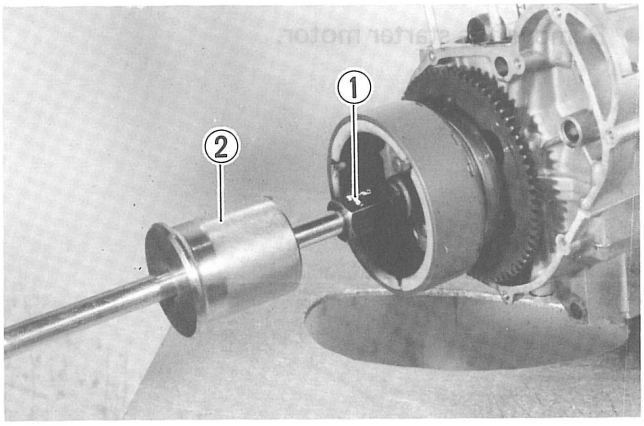
09930 - 44511	Rotor holder



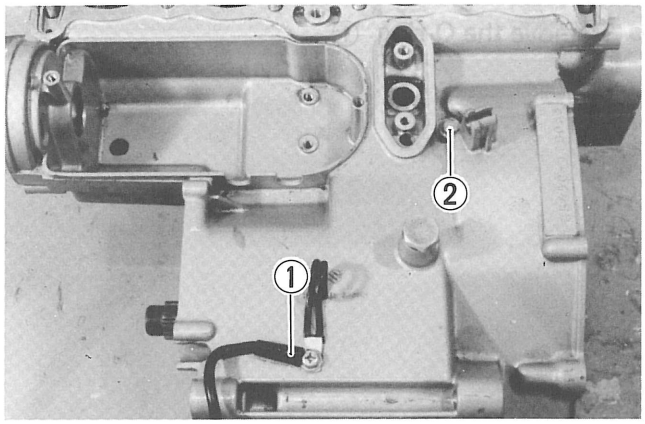
- Install rotor remover attachment ① and sliding hammer assembly ② into the boss of rotor and remove rotor with starter clutch assembly while sliding the remover.
- Remove the copper washer.

NOTE:
Do not hit the rotor with a hammer.

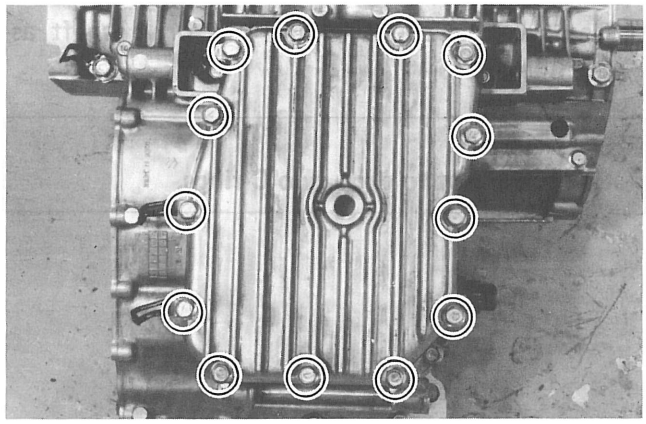
09930 - 30102	Rotor remover shaft
09930 - 33710	Attachment



- Remove the engine ground wire ① and remove the crankcase securing bolt ② from the upper crankcase.

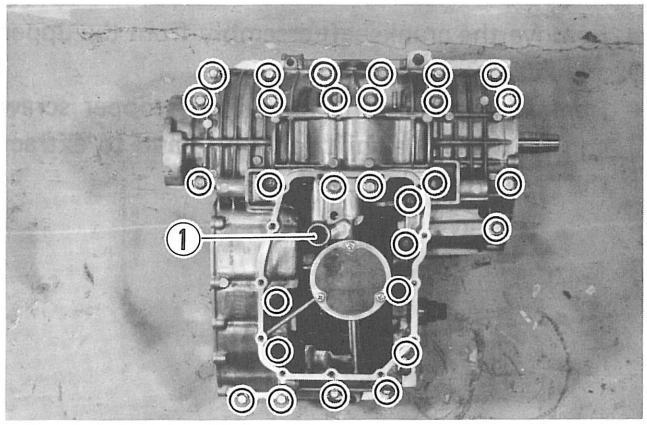


- Turn engine up side down and remove oil pan.



- Remove the O-ring ① .
- Remove crankcase tightening bolts.

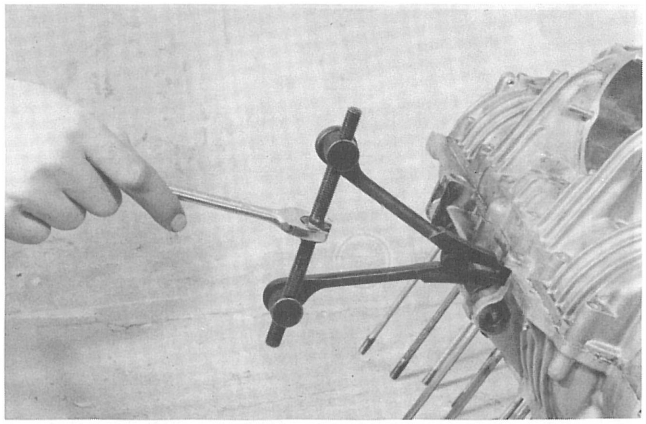
NOTE:
At this stage, it is not necessary to remove the oil sump filter.



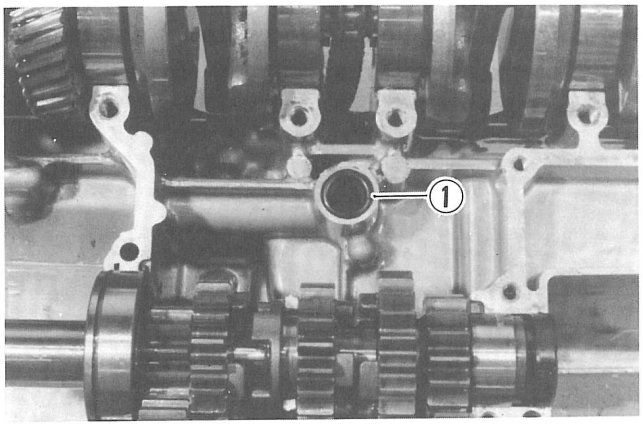
- Make sure that all bolts are removed without fail. Hammer lightly the lower crankcase side with a plastic hammer to separate the upper and lower crankcase halves and then lift the latter.

NOTE:
To separate the crankcases is made easier by the use of the cylinder disassembling tool.

09912 - 34510	Cylinder disassembling tool

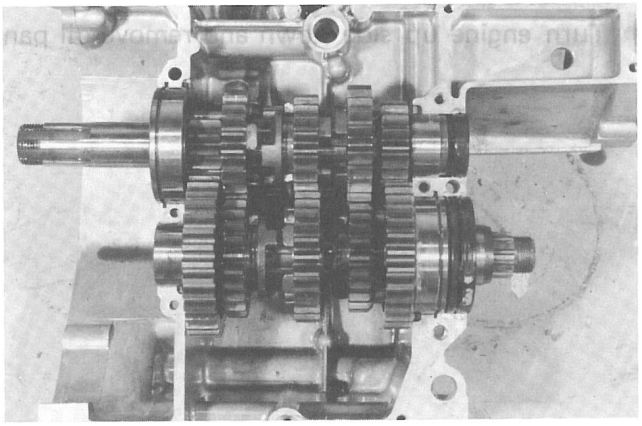


- Remove the O-ring ① .

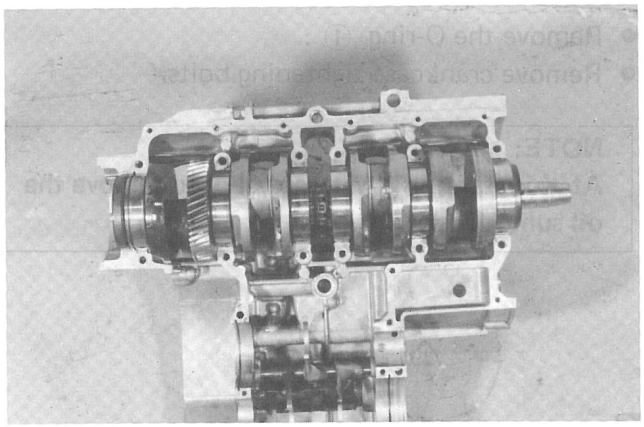


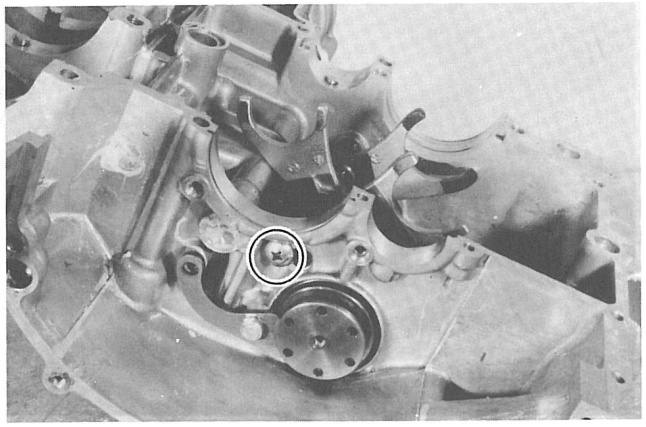
- Remove the countershaft and drive shaft assemblies.

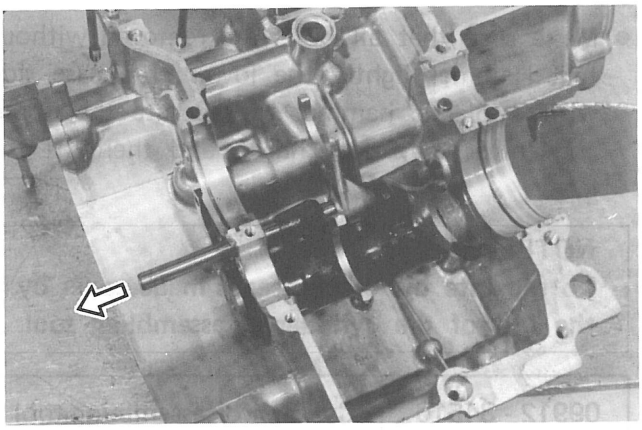
NOTE:
Be careful not to drop two C-rings.



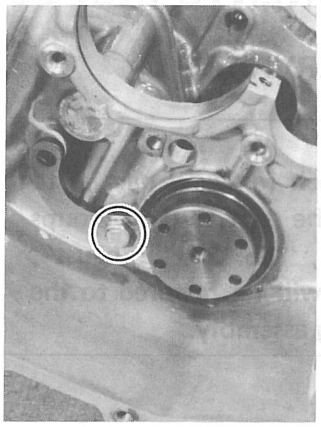
- Remove the crankshaft assembly from the upper crankcase.
- Remove the gearshift fork shaft stopper screw and hold the gearshift forks by hand to extract the gearshift fork shaft.

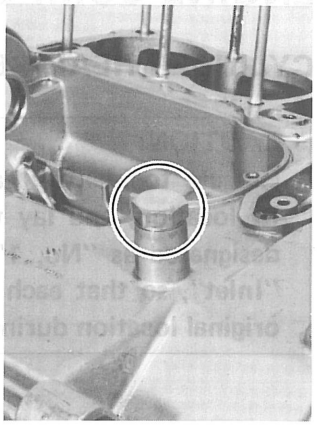




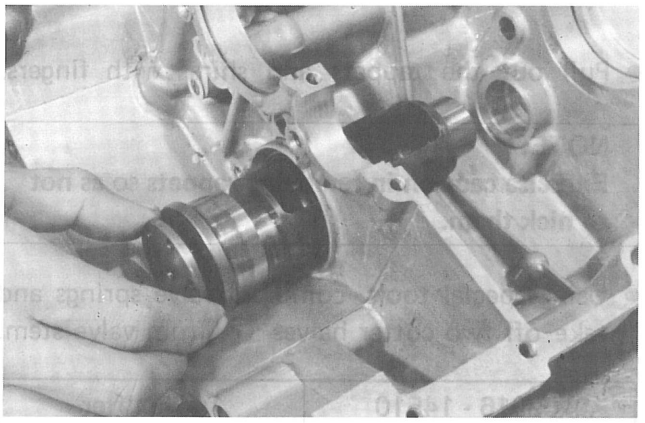


- Remove the neutral stopper housing and gearshift cam guide bolt.

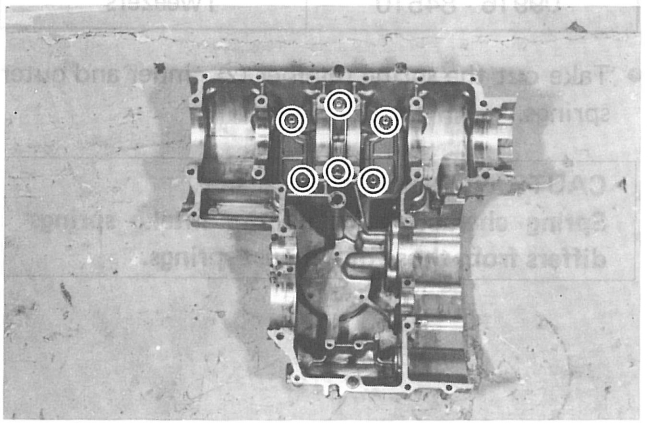




- Extract the gearshift cam from the right side.



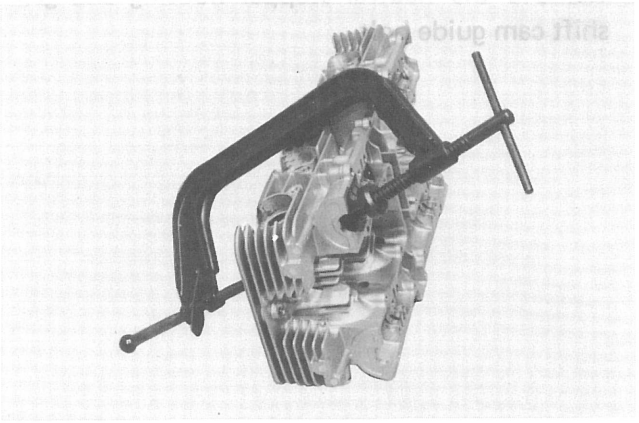
- Remove the oil separators and cam chain guide holder.



ENGINE COMPONENTS INSPECTION AND SERVICING

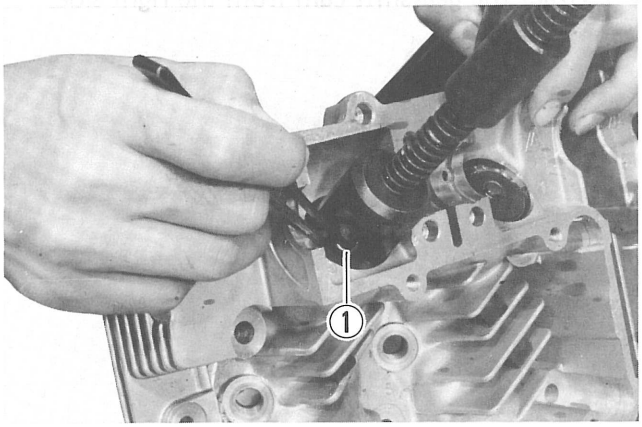
CYLINDER HEAD SERVICING

CAUTION:
Be sure to identify each removed part as to its location, and lay the parts out in groups designated as "No. 1", "No. 2", "Exhaust", "Inlet", so that each will be restored to the original location during assembly.



- Pull out the tappets and shims with fingers.

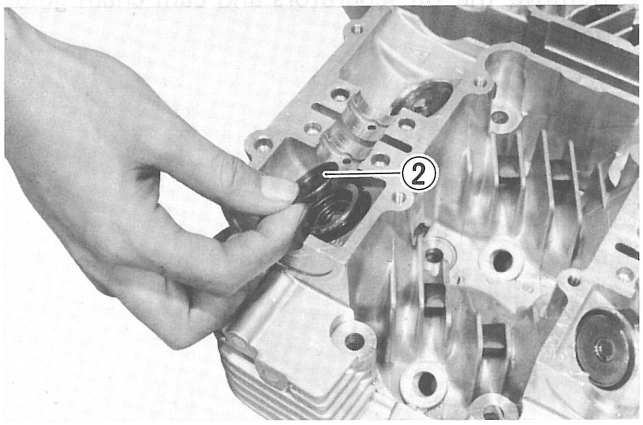
NOTE:
Exercise caution in removing tappets so as not to nick them.



- Using special tools, compress valve springs and take off two cotter halves ① from valve stem.

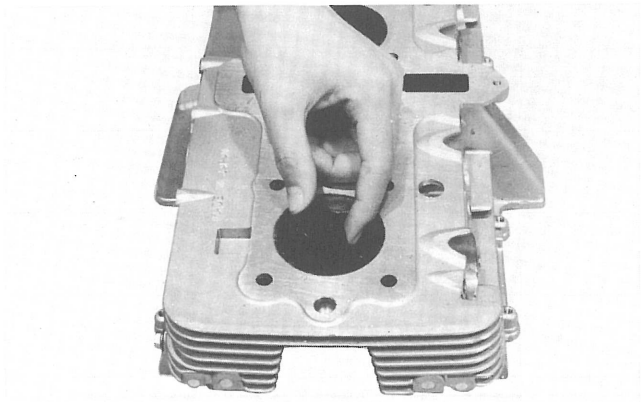
09916 - 14510	Valve lifter
09916 - 84510	Tweezers

- Take out the spring retainer ② , inner and outer springs.



CAUTION:
Spring characteristics of the intake springs differs from those of exhaust springs.

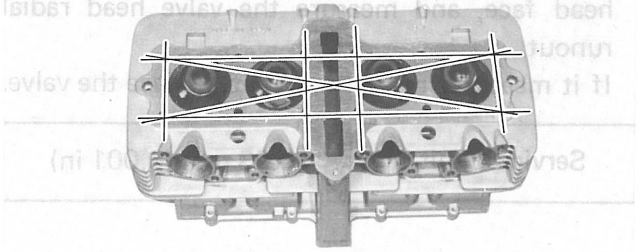
- From the other side, pull out the valve.



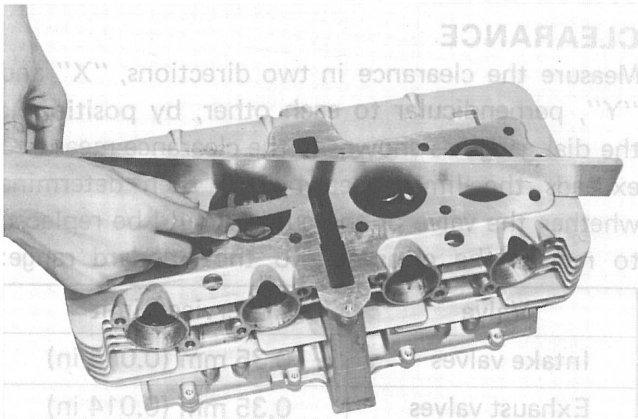
NOTE:
Removal of valves completes ordinary disassembling work. If valve guides have to be removed for replacement after inspecting related parts, carry out the steps shown in valve guide servicing.

CYLINDER HEAD DISTORTION

- Decarbonize the combustion chambers.
- Check the gasketed surface of the cylinder head for distortion with a straightedge and thickness gauge, taking a clearance reading at several places indicated. If the largest reading at any position of the straightedge exceeds the limit, replace the cylinder head.



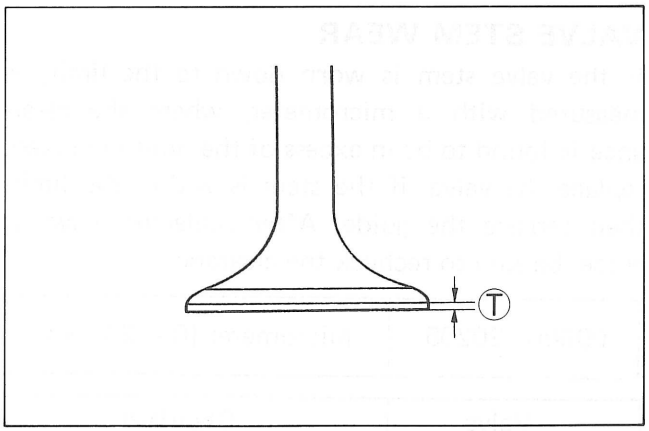
09900 - 20803	Thickness gauge



Service Limit	0.2 mm (0.008 in)

VALVE FACE WEAR

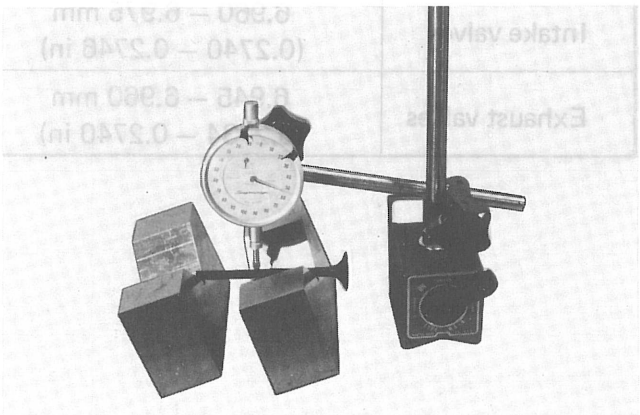
- Visually inspect each valve for wear of its seating face. Replace any valve with an abnormally worn face.
- The thickness Ⓣ decreases as the wear of the face advances. Measure the thickness and, if the thickness is found to have been reduced to the limit, replace it.



Service Limit	0.5 mm (0.02 in)

VALVE STEM RUNOUT

- Support the valve with "V" blocks, as shown, and check its runout with a dial gauge.
  The valve must be replaced if the runout exceeds the limit.

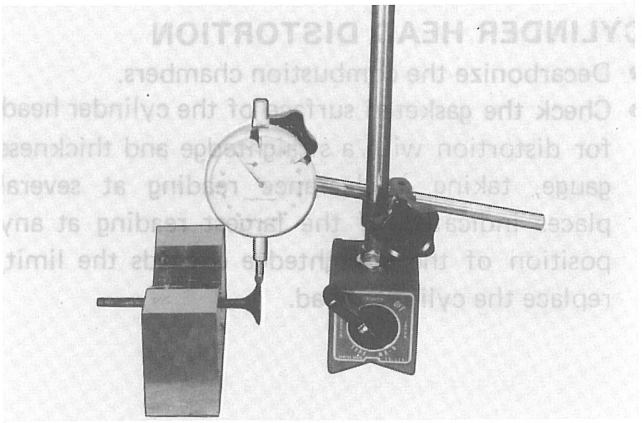


Service Limit	0.05 mm (0.002 in)

VALVE HEAD RADIAL RUNOUT

- Place the dial gauge at right angles to the valve head face, and measure the valve head radial runout.
  If it measures more than limit, replace the valve.

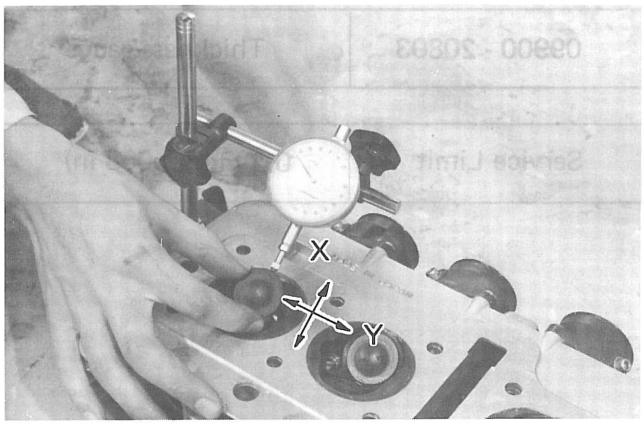
Service Limit	0.03 mm (0.001 in)



VALVE GUIDE-VALVE STEM CLEARANCE

Measure the clearance in two directions, "X" and "Y", perpendicular to each other, by positioning the dial gauge as shown. If the clearance measured exceeds the limit, (see below) then determine whether the valve or the guide should be replaced to reduce the clearance to the standard range:

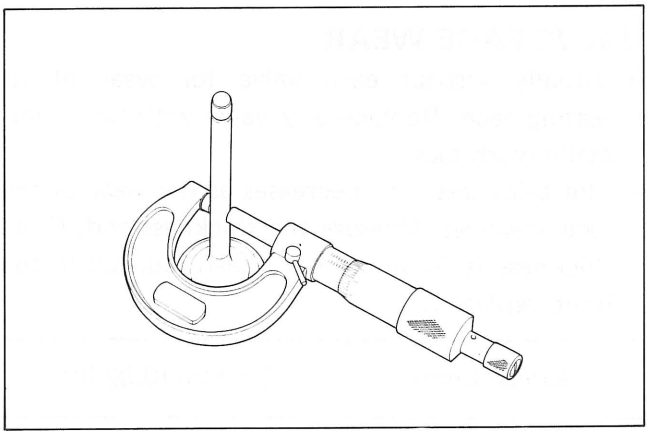
Valve	Service Limit
Intake valves	0.35 mm (0.014 in)
Exhaust valves	0.35 mm (0.014 in)



VALVE STEM WEAR

If the valve stem is worn down to the limit, as measured with a micrometer, where the clearance is found to be in excess of the limit indicated, replace the valve; if the stem is within the limit, then replace the guide. After replacing valve or guide, be sure to recheck the clearance.

09900 - 20205	Micrometer (0 – 25 mm)



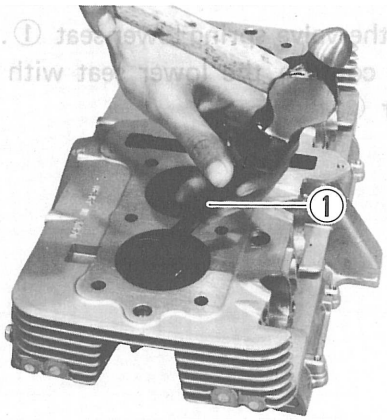
Valve	Standard
Intake valves	6.960 – 6.975 mm (0.2740 – 0.2746 in)
Exhaust valves	6.945 – 6.960 mm (0.2734 – 0.2740 in)

VALVE GUIDE SERVICING

- Using valve guide remover ① , drive the valve guide out toward intake or exhaust port side.

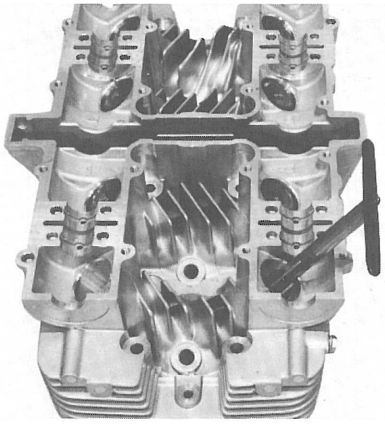
09916 - 44511	Valve guide remover

NOTE:
*** Discard the removed valve guide subassemblies.**
*** Only oversized valve guide is available.**



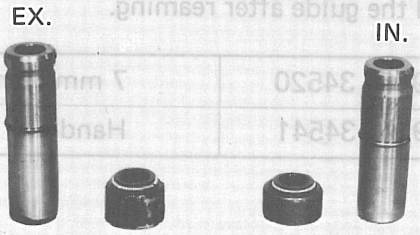
- Re-finish the valve guide holes in cylinder head with a 12.3 mm reamer and handle.

09916 - 34531	12.2 mm reamer
09916 - 34541	Reamer handle



- Fit a ring to each valve guide. Be sure to use new rings and valve guides. Reuse of rings and valve guides removed during disassembly is prohibited. Remember that the guide and oil seal for intake valve differs in shape from those of the exhaust valve in production, however, the replacements of oil seal are identical in shape.

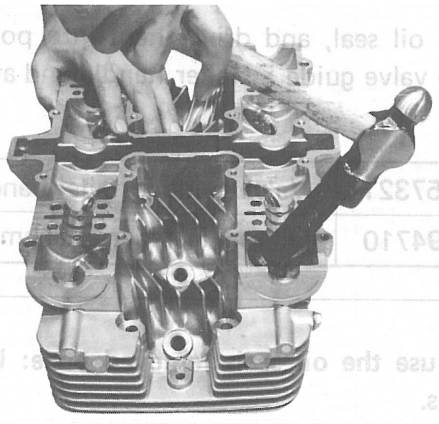
11115 - 34270	Intake valve guide
11116 - 47740	Exhaust valve guide
09289 - 07002	Valve guide oil seal



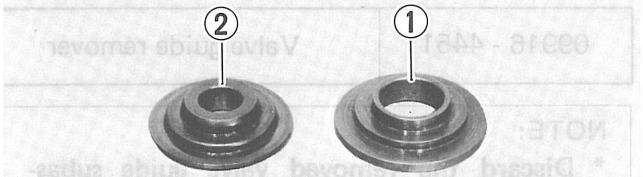
- Oil the stem hole, too, of each valve guide and drive the guide into the guide hole with the valve guide installer handle and attachment.

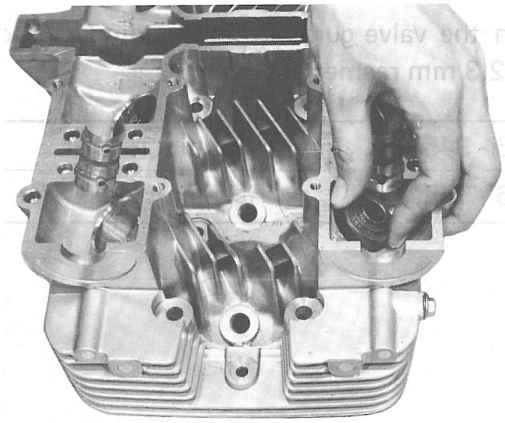
09916 - 57321	Valve guide installer handle
09916 - 54530	Valve guide installer attachment

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



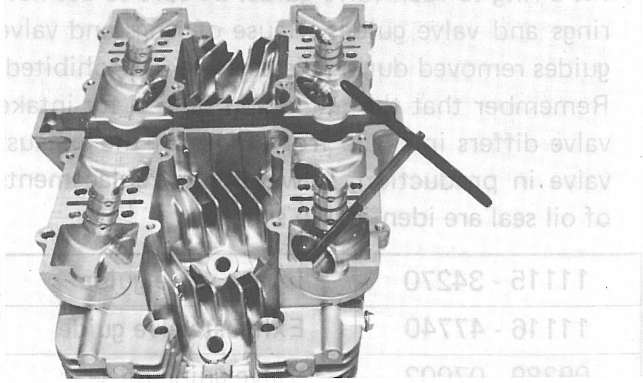
- Install the valve spring lower seat ①. Be careful not to confuse the lower seat with the spring retainer ②.





- After fitting all valve guides refinish their guiding bores with a 7 mm reamer. Be sure to clean and oil the guide after reaming.

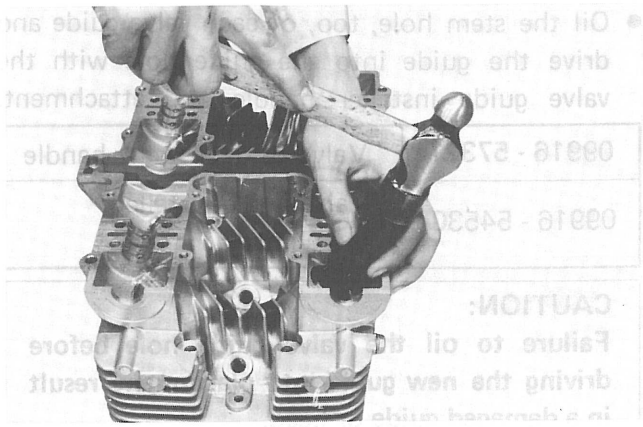
09916 - 34520	7 mm reamer
09916 - 34541	Handle



- Oil each oil seal, and drive them into position with the valve guide installer handle and attachment.

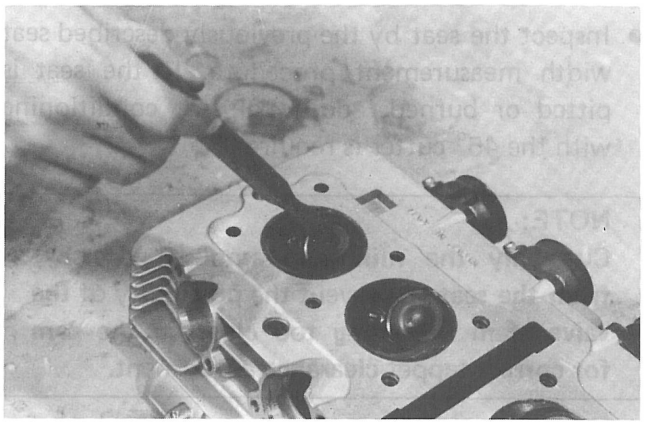
09916 - 57321	Valve guide installer handle
09911 - 94710	Oil seal installer attachment

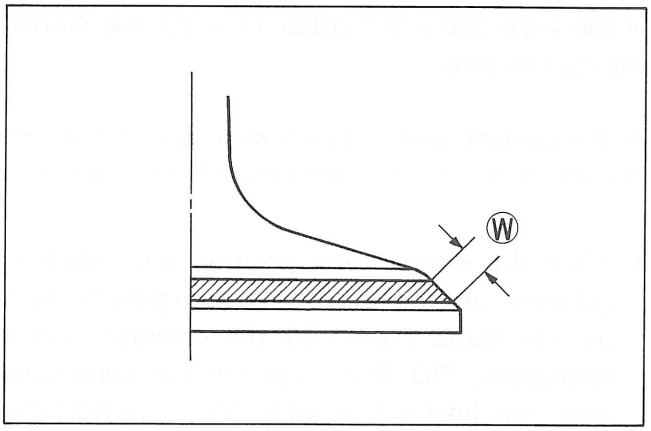
NOTE:
Do not use the oil seals removed once: Use new seals.



VALVE SEAT WIDTH

- Coat the valve seat with Prussian blue uniformly. Fit the valve and tap the coated seat with the valve face in a rotating manner, in order to obtain a clear impression of the seating contact. In this operation, use the valve lapper to hold the valve head.
- The ring-like dye impression left on the valve face must be continuous—without any break—and, in addition to this requirement, the width of the dye ring, which is the visualized seat "width", must be within the following specification:





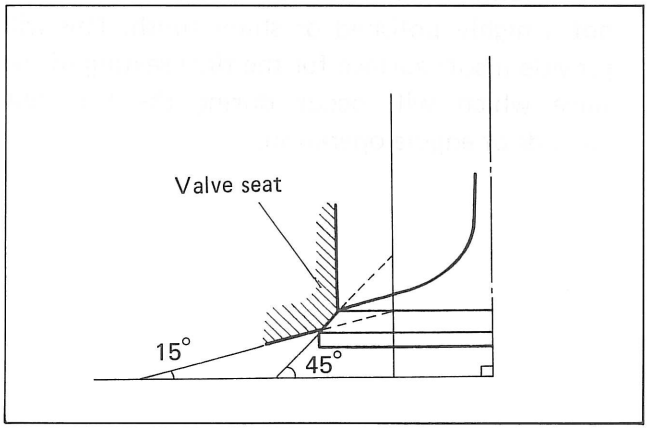
Valve seat width

Seat width	Standard
Ⓦ	0.9 – 1.1 mm (0.035 – 0.043 in)

If either requirement is not met, correct the seat by servicing it as follows:

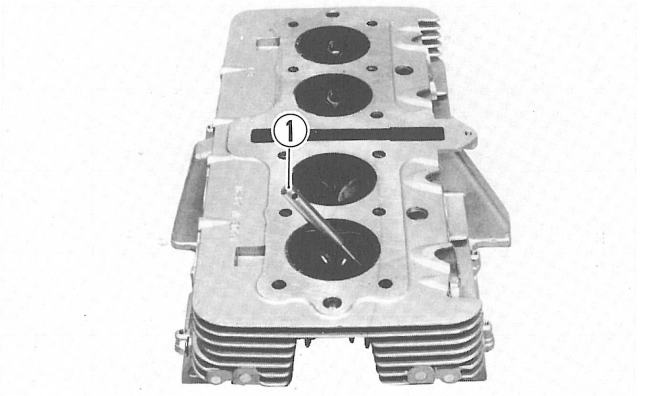
VALVE SEAT SERVICING

The valve seats for both the intake and exhaust valves are machined to two different angles. The seat contact surface is cut 45° and the area above the contact service (closest to the combustion chamber) is cut to 15°.



99103-45014-001 (N-608)	Valve seat cutter head (45°)
99103-45011-001 (N-212)	Valve seat cutter head (15°)

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



- Insert the solid pilot ① with a slight rotation. Seat the pilot snugly. Install the 45° cutter, attachment and T handle.
- Using the 45° cutter, descale and cleanup the seat with one or two turns.

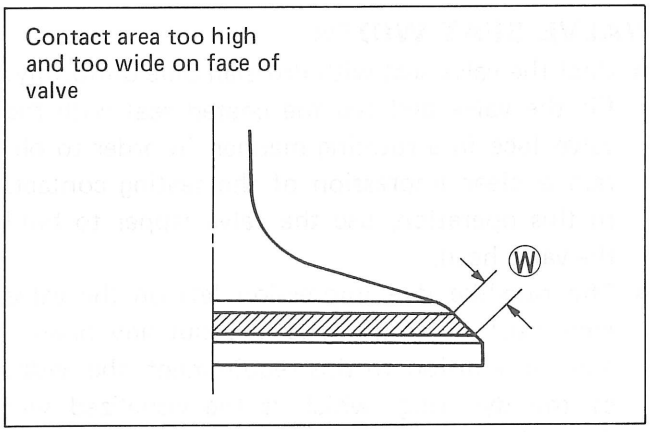
- Inspect the seat by the previously described seat width measurement procedure. If the seat is pitted or burned, additional seat conditioning with the 45° cutter is required.

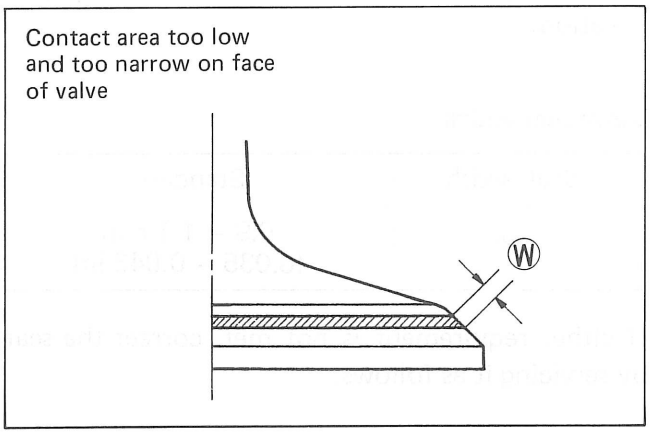
NOTE:
Cut only the minimum amount necessary from the seat to prevent the possibility of the valve stem becoming too close to the cam for correct tappet clearance adjustment.

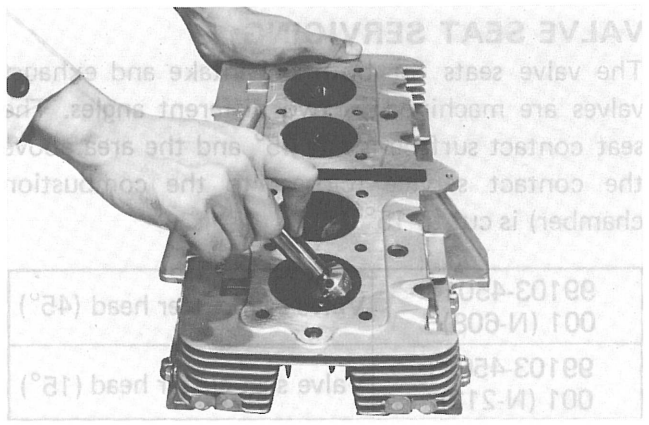
If the contact area is too high on the valve, or if it is too wide, use a 15° cutter to lower and narrow the contact area.

If the contact area is too low or too narrow, use the 45° cutter to raise and widen the contact area.

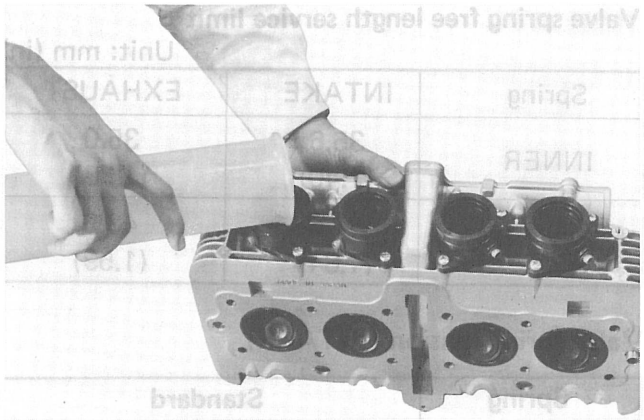
- After the desired seat position and width is achieved, use the 45° cutter very lightly to clean up any burrs caused by the previous cutting operations. DO NOT use lapping compound after the final cut is made. The finished valve seat should have a velvety smooth finish and not a highly polished or shiny finish. This will provide a soft surface for the final seating of the valve which will occur during the first few seconds of engine operation.



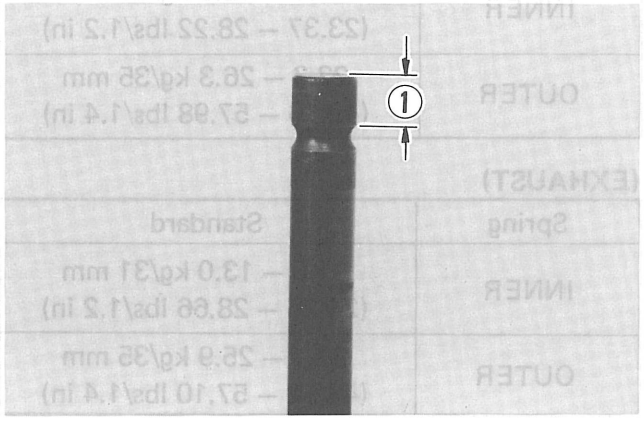




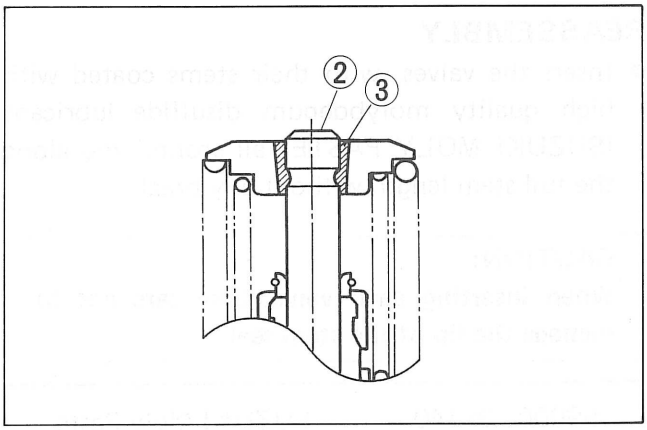
- Clean and assemble the head and valve components. Fill the intake and exhaust ports with gasoline to check for leaks. If any leaks occur, inspect the valve seat and face for burrs or other things that could prevent the valve from sealing.



NOTE:
* Always use extreme caution when handling gasoline.
* After servicing the valve seats, be sure to adjust the tappet clearance after the cylinder head has been reinstalled. (see page 2-5)

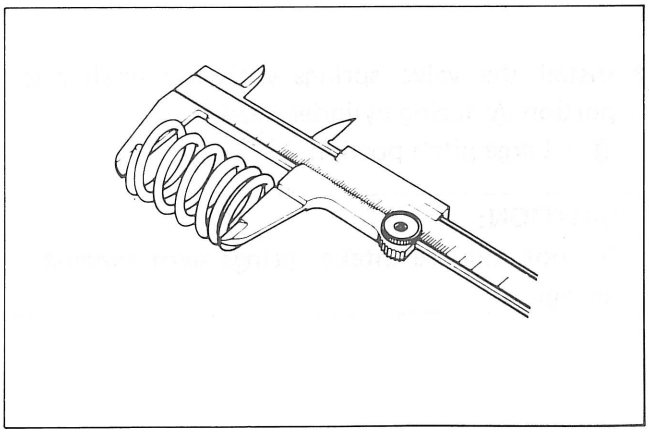


CAUTION:
* Refacing valve stem end face is permissible where the length ① will not be reduced to less than 3.6 mm. If this length becomes shorter than 3.6 mm, then the valve must be replaced.
* After installing the valve whose stem end has been ground off as above, check that the face ② of valve stem end is above the valve cotter ③.



VALVE SPRINGS

- The force of the two coil springs keeps the valve seat tight. Weakened springs result in reduced engine power output, and often account for the chattering noise coming from the valve mechanism.
- Check the springs for strength by measuring their free lengths and also the force required to compress them. If the limit indicated is exceeded by the free length reading or if the measured force does not fall within the range specified, replace with a SUZUKI spring.



CAUTION:
Replace both the valve springs, inner and outer, at a time, if any one of these is found to be beyond the limit.

Valve spring free length service limit

Unit: mm (in)

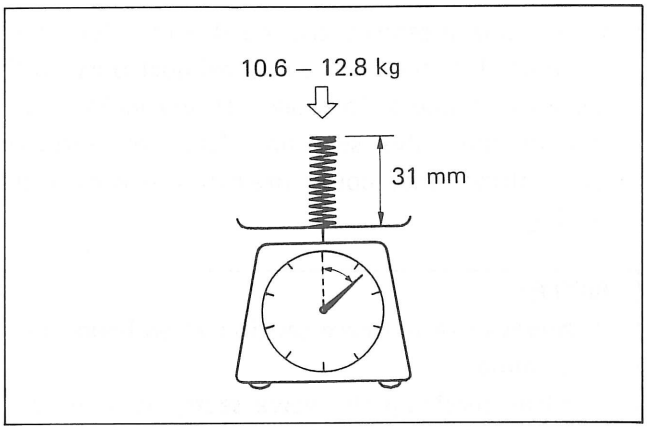
Spring	INTAKE	EXHAUST
INNER	35.6 (1.40)	35.0 (1.38)
OUTER	41.6 (1.64)	40.5 (1.59)

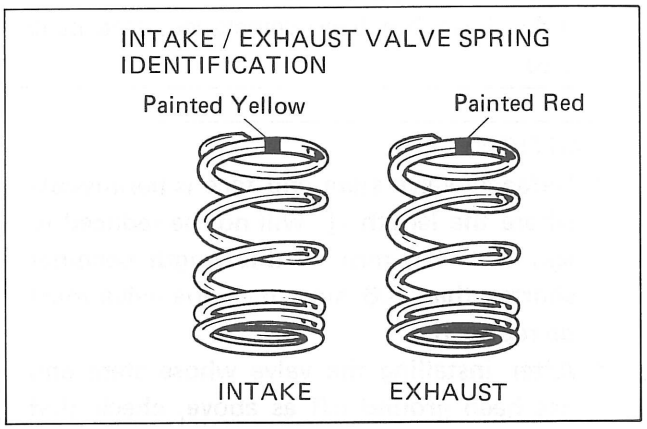
Valve spring tension (INTAKE)

Spring	Standard
INNER	10.6 – 12.8 kg/31 mm (23.37 – 28.22 lbs/1.2 in)
OUTER	22.3 – 26.3 kg/35 mm (49.16 – 57.98 lbs/1.4 in)

(EXHAUST)

Spring	Standard
INNER	11.0 – 13.0 kg/31 mm (24.25 – 28.66 lbs/1.2 in)
OUTER	22.1 – 25.9 kg/35 mm (48.72 – 57.10 lbs/1.4 in)



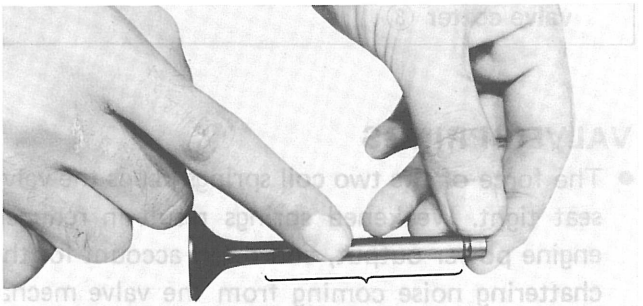


REASSEMBLY

- Insert the valves, with their stems coated with high quality molybdenum disulfide lubricant (SUZUKI MOLY PASTE) all around and along the full stem length without any break.

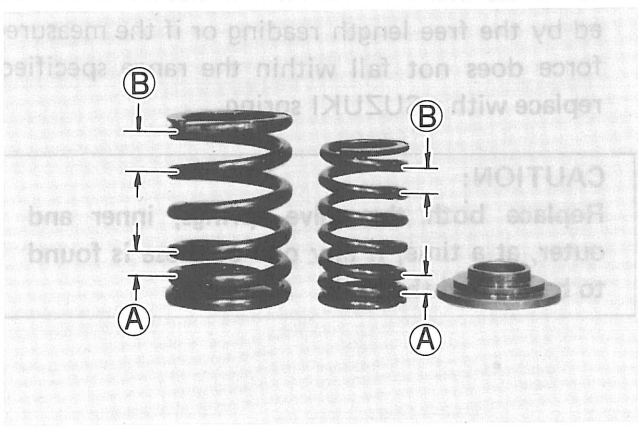
CAUTION:
When inserting each valve, take care not to damage the lip of the stem seal.

99000 - 25140	SUZUKI Moly Paste



- Install the valve springs with the small pitch portion Ⓐ facing cylinder head.
  Ⓑ : Large-pitch portion.

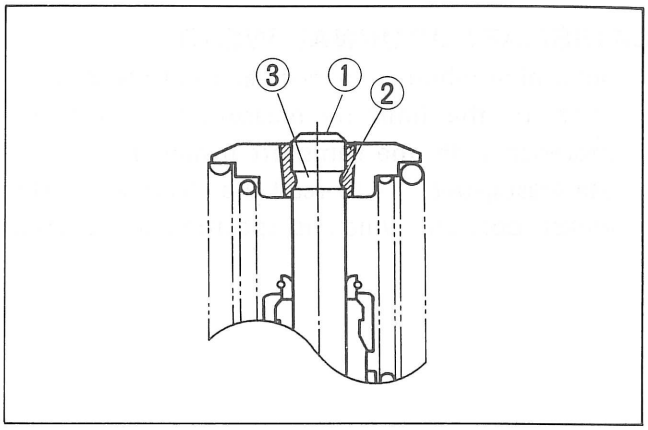
CAUTION:
Do not mix-use intake springs with exhaust springs.



- Put on the valve retainer and, using the valve lifter, press down the springs, fit the cotter halves to the stem end, and release the lifter to allow the cotter ① to wedge in between retainer and stem. Be sure that the rounded lip ② of the cotter fits snugly into the groove ③ in the stem end.

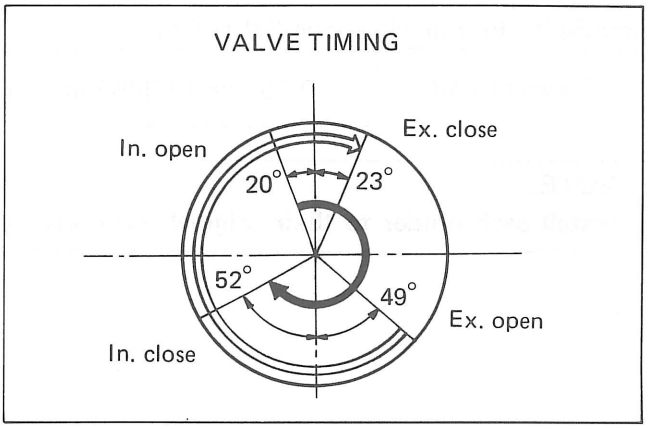
09916 - 14510	Valve lifter
09916 - 84510	Tweezers

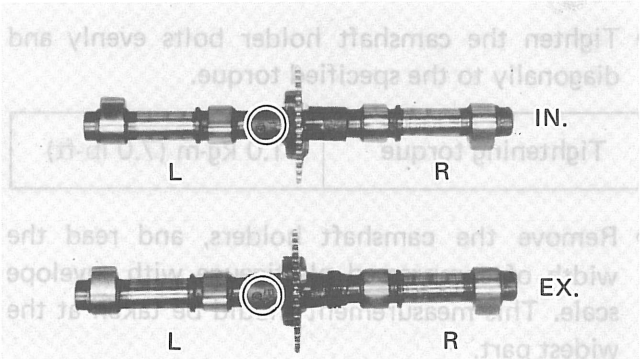
CAUTION:
Be sure to restore each spring and valve to their original positions.



CAMSHAFT

- Both camshafts should be checked for runout and also for wear of cams and journals if the engine has been noted as giving abnormal noise or vibration or lack power output. Any of these conditions may be caused by camshafts worn down or distorted to the service limit.
- The exhaust camshaft can be distinguished from that of the intake by the embossed letters "EX" (for exhaust) as against letters "IN" (for intake). Similarly, the right end can be distinguished by the notch from the left end.



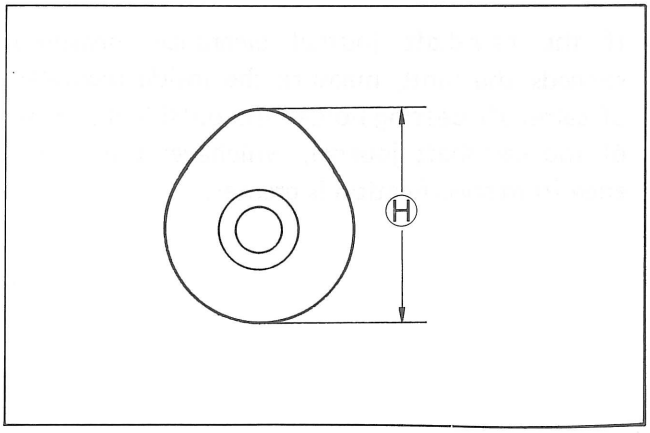


CAM WEAR

- Worn-down cams are often the cause of mistiming valve operation resulting in reduced power output. The limit of cam wear is specified for both intake and exhaust cams in terms of cam height Ⓗ, which is to be measured with a micrometer. Replace camshafts if found worn down to the limit.

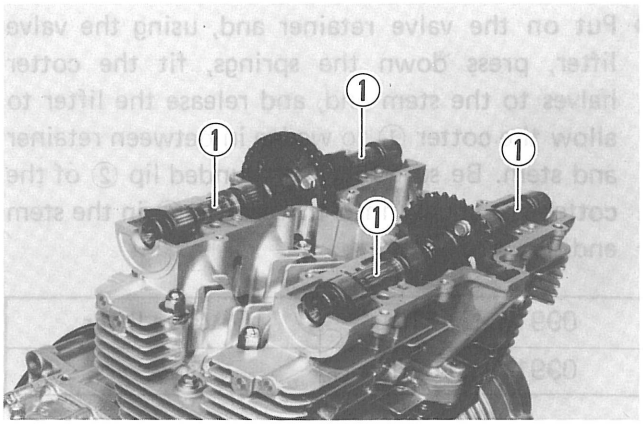
Cam height

Height Ⓗ	Service Limit
Intake cams	35.990 mm (1.4160 in)
Exhaust cams	35.490 mm (1.3972 in)



CAMSHAFT JOURNAL WEAR

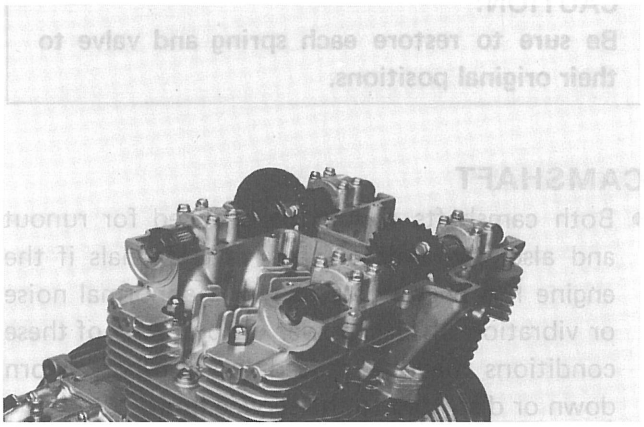
- Determine whether or not each journal is worn down to the limit by measuring the running clearance with the camshaft installed in place. Use plastigauge ① to read the clearance at the widest portion, which is specified as follows:



Camshaft–Journal clearance (IN & EX)

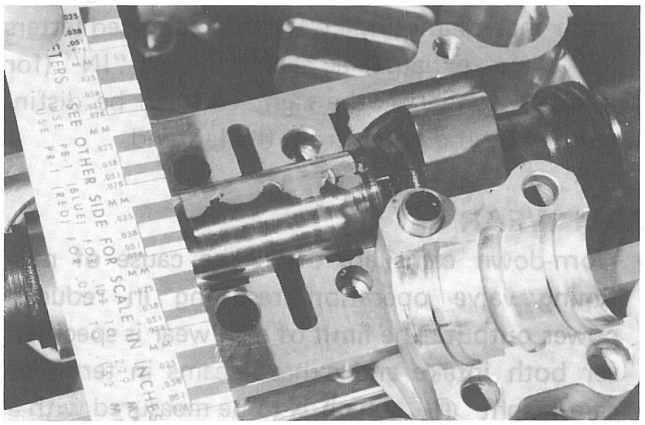
Service Limit	0.15 mm (0.0059 in)

NOTE:
Install each holder to their original positions.



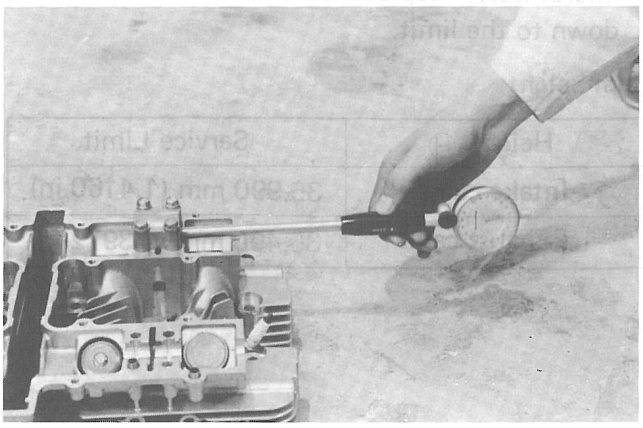
- Tighten the camshaft holder bolts evenly and diagonally to the specified torque.

Tightening torque	1.0 kg-m (7.0 lb-ft)



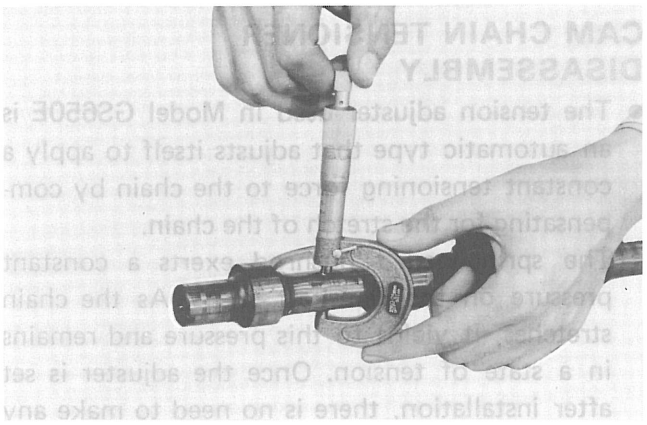
- Remove the camshaft holders, and read the width of compressed plastigauge with envelope scale. This measurement should be taken at the widest part.

- If the camshaft journal clearance measured exceeds the limit, measure the inside diameter of camshaft bearing holder and outside diameter of the camshaft journal, whichever the difference from specification is greater.



09900 - 20205	Micrometer (0 – 25 mm)

	Standard
Journal holder I.D. (In & Ex)	22.012 – 22.025 mm (0.8666 – 0.8671 in)
Camshaft journal O.D. (In & Ex)	21.959 – 21.980 mm (0.8645 – 0.8654 in)

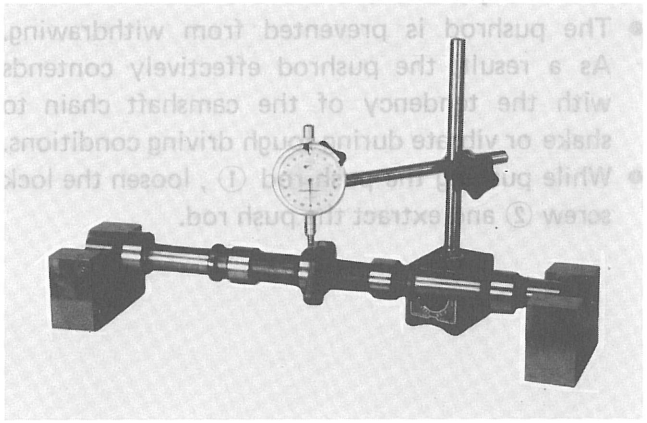


CAMSHAFT RUNOUT

- Measure the runout with a dial gauge. Replace the camshaft if the runout exceeds the limit.

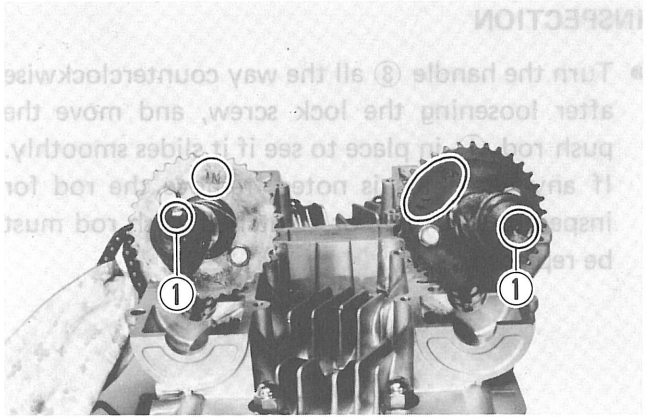
Camshaft runout (IN & EX)

Service Limit	0.1 mm (0.004 in)



CAM SPROCKET REASSEMBLY

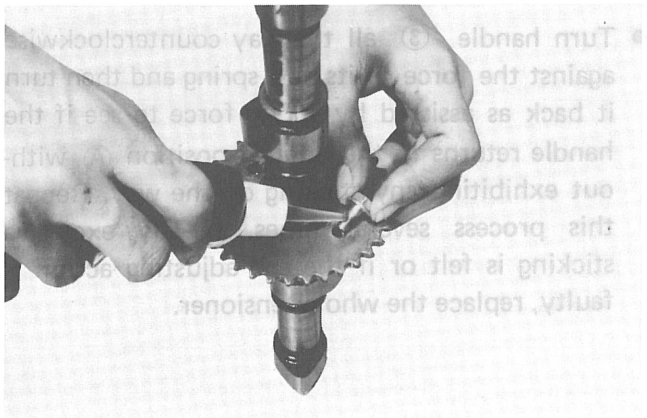
- It is very important that each sprocket be positioned angularly on its camshaft as illustrated. Its correct position is determined by arrow mark "3" (on INTAKE sprocket) or arrow marks "1" and "2" (on EXHAUST sprocket) located (as shown) in reference to the notch ① in the camshaft end.



- Apply THREAD LOCK SUPER "1303" (99000-32030) to the threads of bolts, and tighten them to the following torque value:

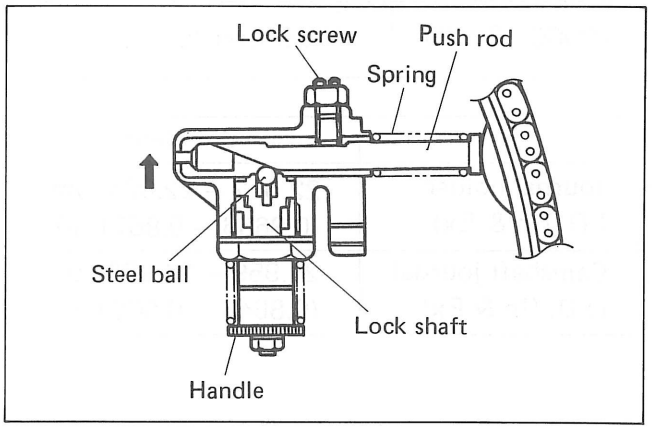
99000-32030	Thread lock super "1303"

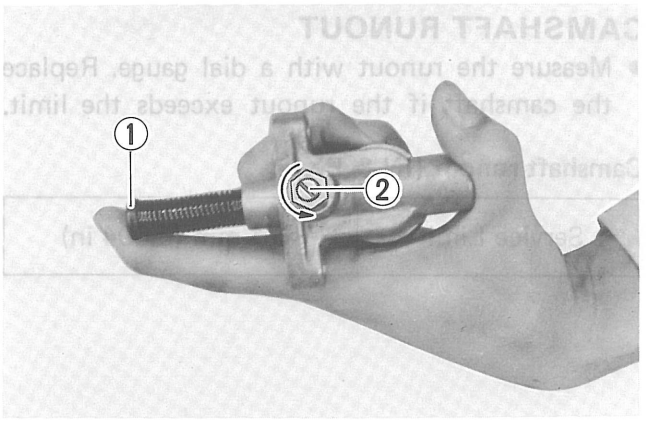
Tightening torque	2.4 – 2.6 kg-m (17.5 – 19.0 lb-ft)



CAM CHAIN TENSIONER DISASSEMBLY

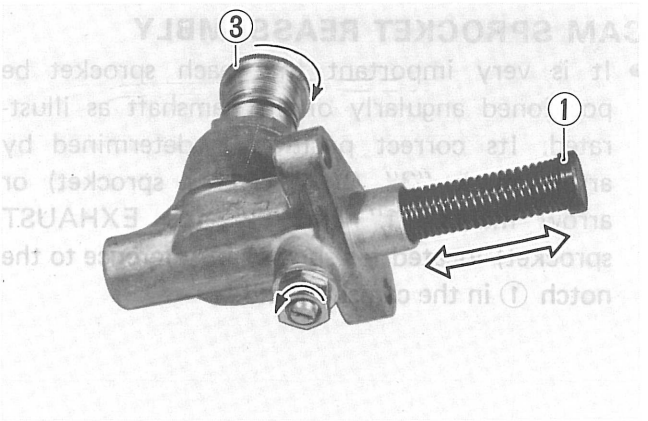
- The tension adjuster used in Model GS650E is an automatic type that adjusts itself to apply a constant tensioning force to the chain by compensating for the stretch of the chain.
- The spring-loaded pushrod exerts a constant pressure on the camshaft chain. As the chain stretches, it yields to this pressure and remains in a state of tension. Once the adjuster is set after installation, there is no need to make any further adjustment.
- The pushrod is prevented from withdrawing. As a result, the pushrod effectively contends with the tendency of the camshaft chain to shake or vibrate during rough driving conditions.
- While pushing the push rod ① , loosen the lock screw ② and extract the push rod.



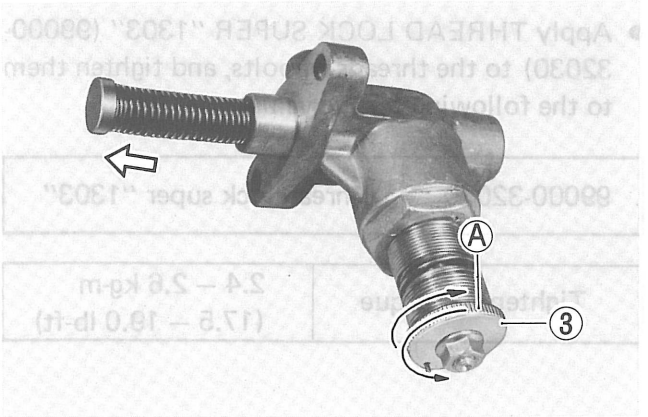


INSPECTION

- Turn the handle ③ all the way counterclockwise after loosening the lock screw, and move the push rod ① in place to see if it slides smoothly. If any stickiness is noted, remove the rod for inspection. A bent or scratched push rod must be replaced.

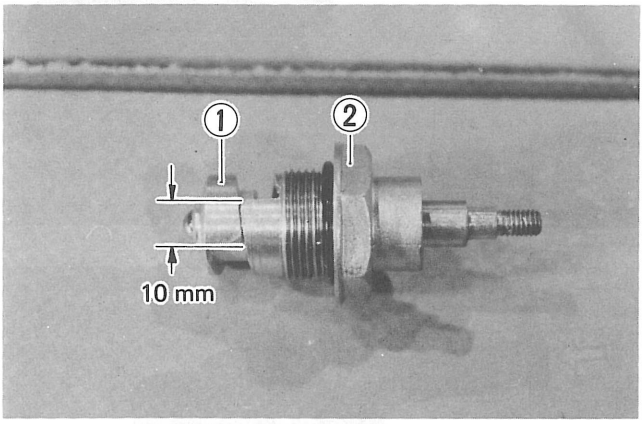


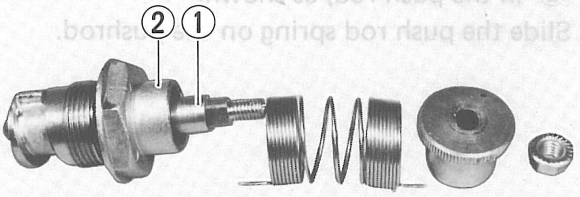
- Turn handle ③ all the way counterclockwise against the force of its coil spring and then turn it back as assisted by spring force to see if the handle returns to the original position Ⓐ without exhibiting any sticking on the way. Repeat this process several times. If any excessive sticking is felt or if the self-adjusting action is faulty, replace the whole tensioner.



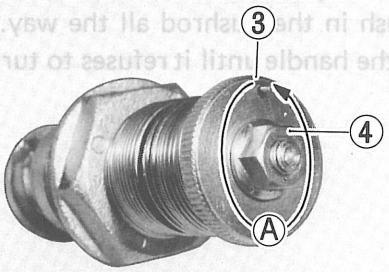
REASSEMBLING

- Apply engine oil to the lock shaft ① . Insert the shaft into the holder ② , and bring the two into the relative position indicated.

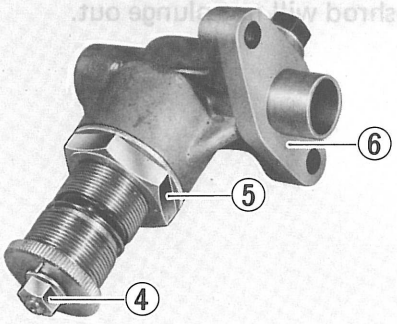




- Hook the spring onto the holder and handle ③ , twist the spring by one complete rotation counterclockwise Ⓐ , fit the handle onto the shaft, and then tighten it by nut ④ .



- After tightening the lock shaft nut ④ , install the lock shaft assembly ⑤ on the tensioner body ⑥ . Be sure to adhere to the following torque specifications:

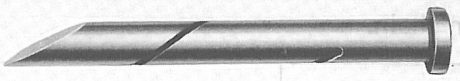


Lock shaft nut tightening torque	0.8 – 1.0 kg-m (6.0 – 7.0 lb-ft)

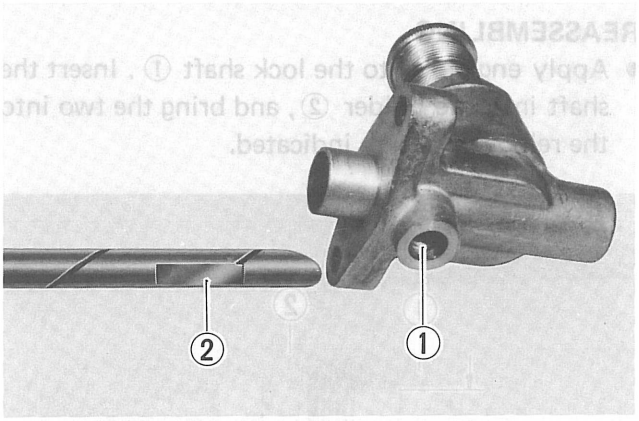
Shaft assembly tightening torque	3.1 – 3.5 kg-m (22.5 – 25.5 lb-ft)

- Apply a high quality molybdenum disulfide lubricant (SUZUKI MOLY PASTE) to the push rod and engine oil to the push rod guide hole.

99000 - 25140	SUZUKI Moly Paste

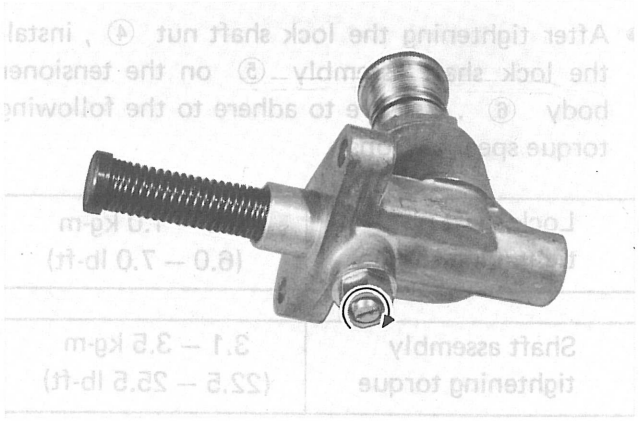


- Match the lock screw hole ① to the long groove ② in the push rod, as shown.
- Slide the push rod spring on the pushrod.



- While turning lock shaft handle counterclockwise, push in the pushrod all the way. Keep on turning the handle until it refuses to turn further.

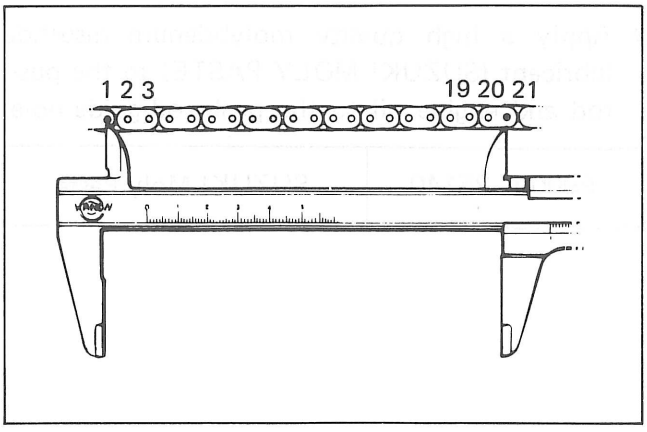
- Tighten the lock screw to lock the pushrod, so that the pushrod will not plunge out.



CAM CHAIN 20-PITCH LENGTH

Pull the chain tight to remove any slack, then using vernier calipers, measure the 20-pitch length of cam chain. If it measures more than limits, replace the cam chain.

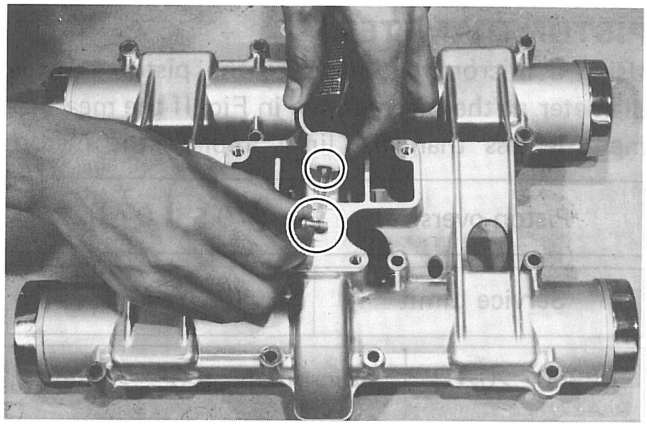
Service Limit	157.80 mm (6.213 in)



CAM CHAIN GUIDE

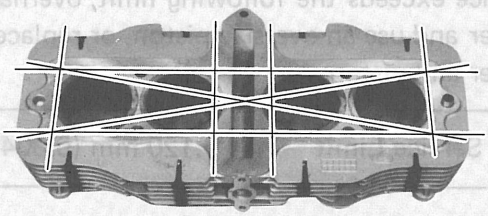
NOTE:
When replacing following chain guides, apply SUZUKI Thread lock cement "1333B" to screws thread.

99000-32020	Thread lock super "1333B"



CYLINDER DISTORTION

Check the gasketed surface of the cylinder for distortion with a straightedge and thickness gauge, taking a clearance reading at several places indicated. If the largest reading at any position of the straightedge exceeds the limit, replace the cylinder.

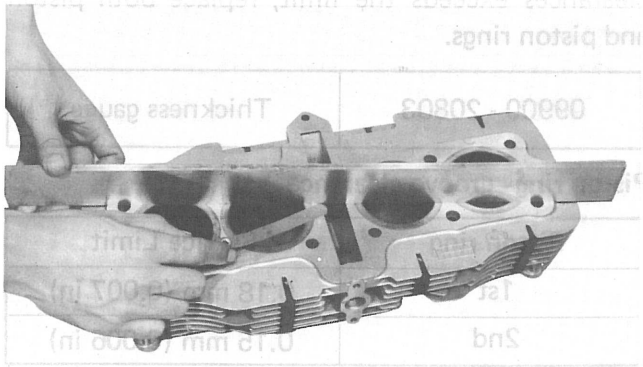


Cylinder distortion specification

Service Limit	0.2 mm (0.008 in)

CYLINDER BORE

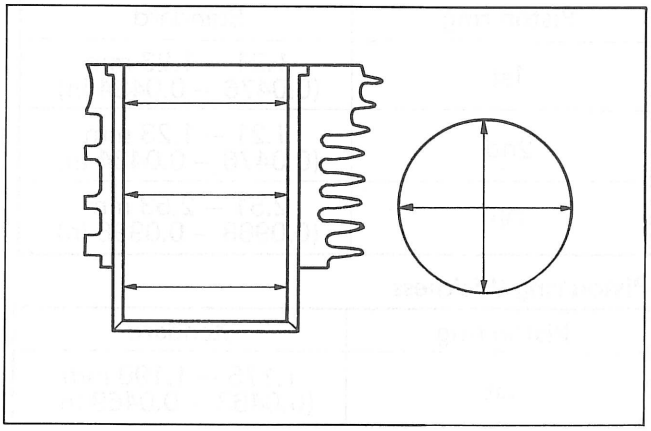
Measure the cylinder bore diameter at six places. If any one of the measurements exceeds the limit, overhaul the cylinder and replace the piston with an oversize, or replace the cylinder. Once the reboring is done on any one cylinder which measurement is beyond the limit, the remaining cylinders must be also rebored accordingly. Otherwise the imbalance might causes excess vibration.



Cylinder bore

Service Limit	62.095 mm (2.4447 in)

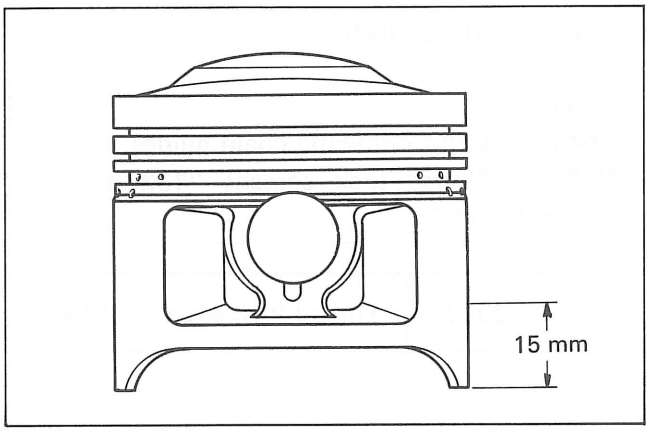
09900 - 20508	Cylinder gauge set



PISTON DIAMETER

Using a micrometer, measure the piston outside diameter at the place shown in Fig. If the measurement is less than the limit, replace the piston.

Piston oversize	0.5, 1.0 mm
Service Limit	61.880 mm (2.4362 in)
09900 - 20203	Micrometer (50 – 75 mm)



PISTON-CYLINDER CLEARANCE

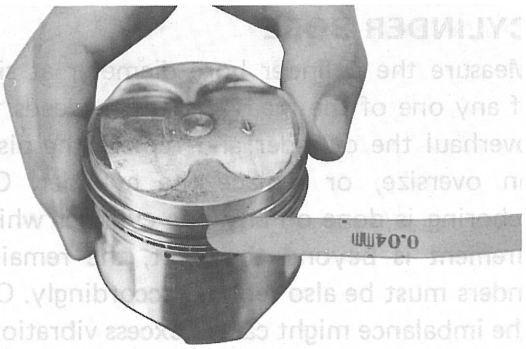
As a result of the above measurement, if the piston clearance exceeds the following limit, overhaul the cylinder and use an oversize piston, or replace both cylinder and piston.

Service Limit	0.120 mm (0.0047 in)

PISTON RING-GROOVE CLEARANCE

Using a thickness gauge, measure the side clearances of the 1st and 2nd rings. If any of the clearances exceeds the limit, replace both piston and piston rings.

09900 - 20803	Thickness gauge

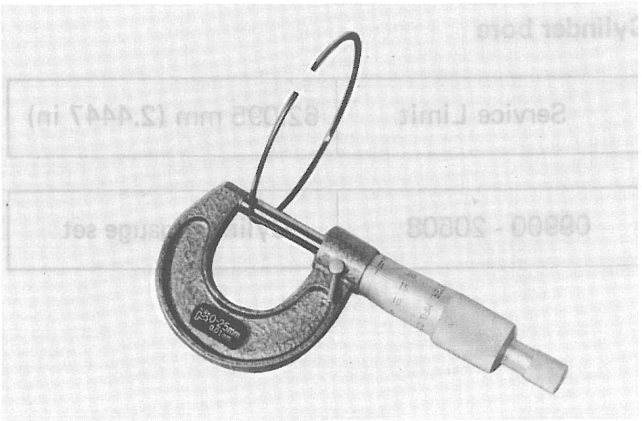


Piston ring–groove clearance

Piston ring	Service Limit
1st	0.18 mm (0.007 in)
2nd	0.15 mm (0.006 in)

Piston ring groove width

Piston ring	Standard
1st	1.21 – 1.23 mm (0.0476 – 0.0484 in)
2nd	1.21 – 1.23 mm (0.0476 – 0.0484 in)
Oil	2.51 – 2.53 mm (0.0988 – 0.0996 in)



Piston ring thickness

Piston ring	Standard
1st	1.175 – 1.190 mm (0.0463 – 0.0469 in)
2nd	1.170 – 1.190 mm (0.0461 – 0.0469 in)

PISTON RING FREE END GAP AND PISTON RING END GAP

Before installing piston rings, measure the free end gap of each ring using vernier calipers. Next, fit the ring in the cylinder, and measure each ring end gap using a thickness gauge.

If any ring has an excess end gap, replace the ring.

Piston ring free end gap

Piston ring	Service Limit
1st	6.0 mm (0.24 in)
2nd	7.6 mm (0.30 in)

Piston ring end gap

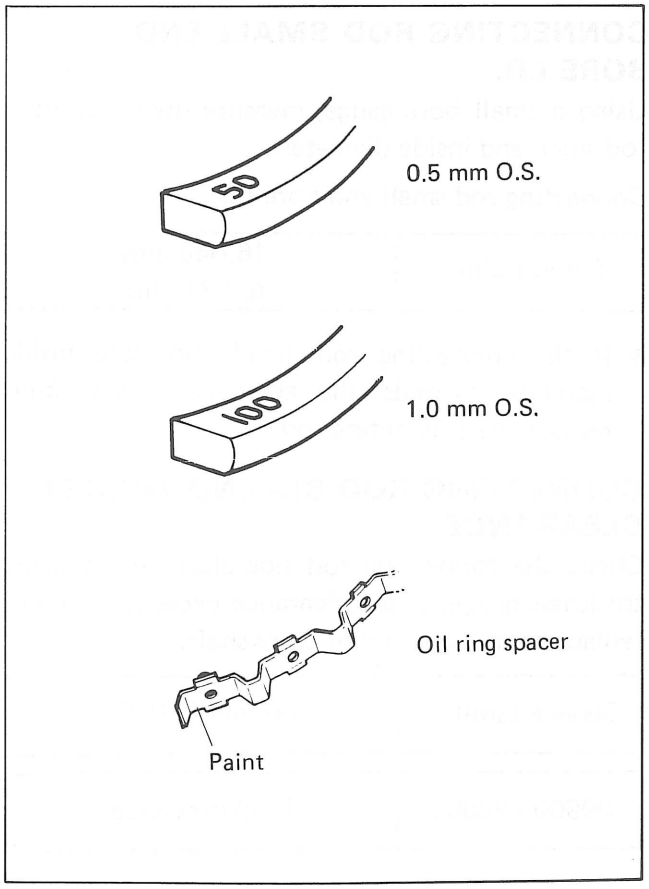
Piston ring	Service Limit
1st & 2nd	0.7 mm (0.028 in)

09900 - 20803	Thickness gauge

- **Oversize piston rings**

  The following two types of oversize piston rings are used. They bear the following identification numbers.

	1st	2nd
0.5 mm	50	50
1.0 mm	100	100



- **Oversize oil rings**

  The following two types of oversize oil rings are available. They bear the following identification marks.

SIZE	COLOR
STD	NIL
0.5 mm O.S.	Painted red
1.0 mm O.S.	Painted yellow

- **Oversize side rail**

  Just measure out side diameter.

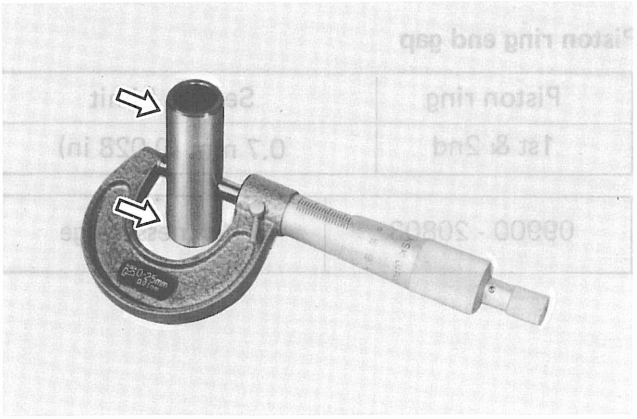
PISTON PIN AND PIN BORE

Using a small bore gauge, measure the piston pin bore inside diameter, and using a micrometer, measure the piston pin outside diameter. If the reading exceeds the following limit, replace both piston and piston pin.

Piston pin bore I.D.

Service Limit	16.030 mm (0.6311 in)

Using a micrometer, measure the piston pin outside diameter at three positions.

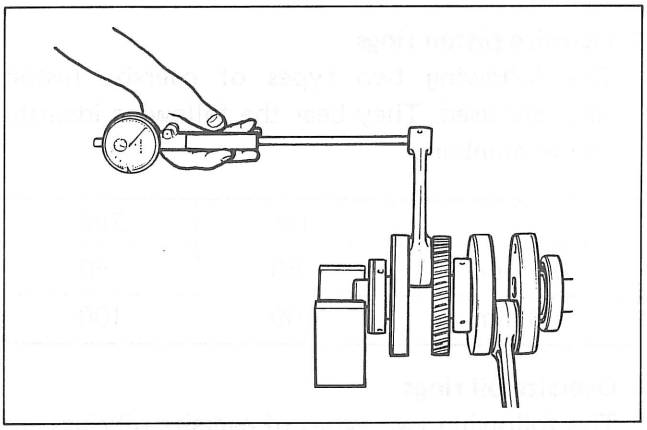


Piston pin O.D.

Service Limit	15.980 mm (0.6291 in)
09900 - 20205	Micrometer (0 – 25 mm)

CONNECTING ROD SMALL END BORE I.D.

Using a small bore gauge, measure the connecting rod small end inside diameter.



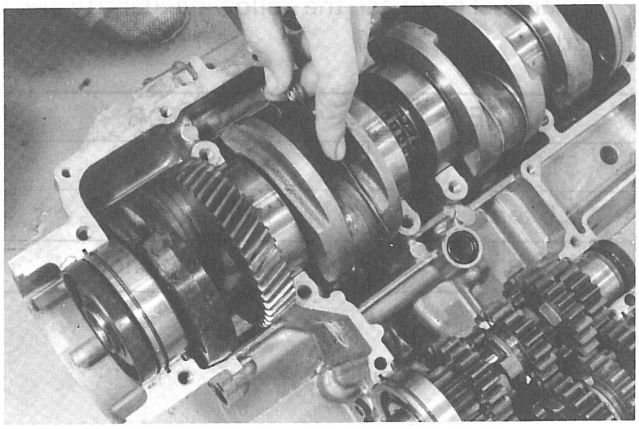
Connecting rod small end bore I.D.

Service Limit	16.040 mm (0.6315 in)

- If the connecting rod small end bore inside diameter exceeds the abovementioned limit, replace the connecting rod.

CONNECTING ROD BIG END THRUST CLEARANCE

Check the connecting rod side clearance by using thickness gauge. If the clearance exceeds the limit, replace connecting rod or crankshaft.



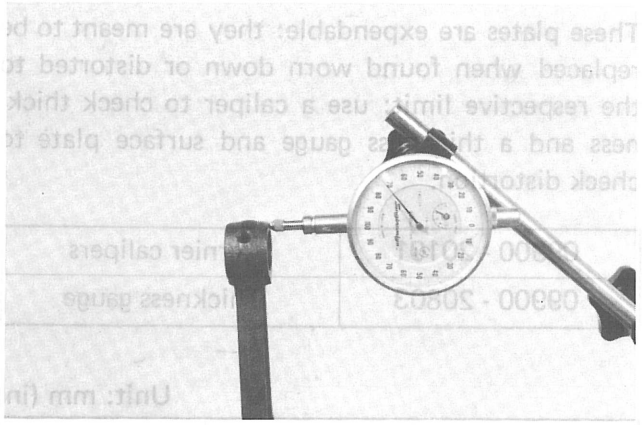
Service Limit	1.00 mm (0.039 in)
09900 - 20803	Thickness gauge

CRANK PIN WEAR AND BIG END BEARING WEAR

Check the wear of each crankpin in terms of connecting rod movement using a dial gauge as shown.

Service Limit	3.0 mm (0.12 in)

Where the limit is exceeded, replace crankshaft assembly or reduce the deflection and the side clearance within the limit by replacing the worn parts — connecting rod, big end bearing, crankpin and thrust washer etc.

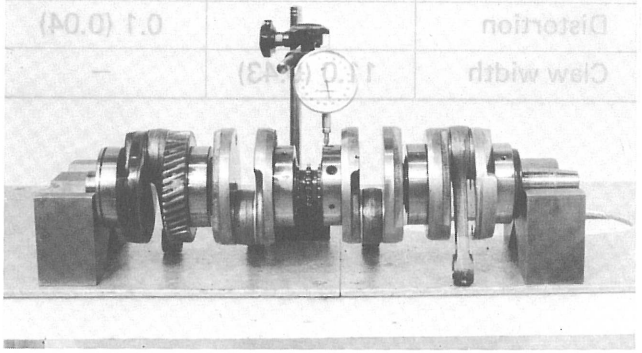


CRANKSHAFT RUNOUT

Support the crankshaft with "V" blocks as shown, with the two end journals resting on the blocks. Set up the dial gauge, as shown, and rotate the crankshaft slowly to read the runout.

Replace the crankshaft if the runout is greater than the limit.

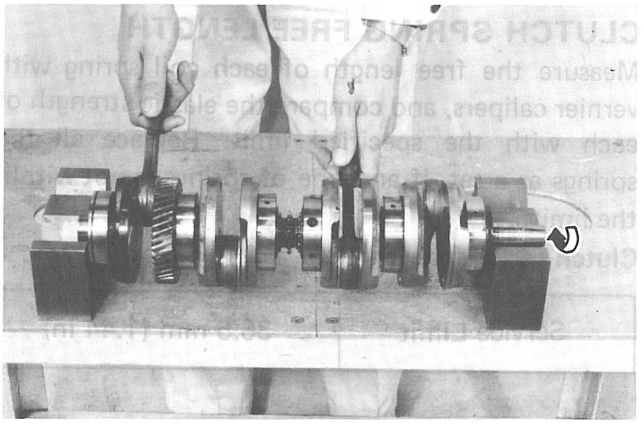
09900 - 20606	Dial gauge (1/100 mm)



Crankshaft runout

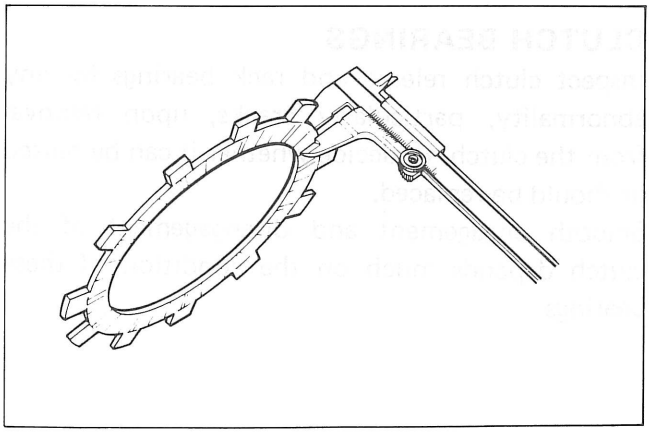
Service Limit	0.05 mm (0.004 in)

Check the connecting rod for smooth turning.



CLUTCH DRIVE PLATES AND DRIVEN PLATES

Clutch plates in service are lubricated with oil. Because of this condition, both drive and driven plates are subject to little wear. Their life depends largely on the quality of oil used in the engine and also on the way the clutch is operated.



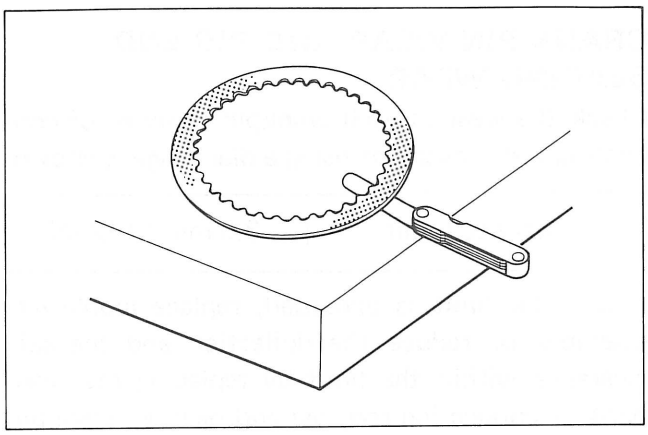
Checking thickness

These plates are expendable: they are meant to be replaced when found worn down or distorted to the respective limit: use a caliper to check thickness and a thickness gauge and surface plate to check distortion.

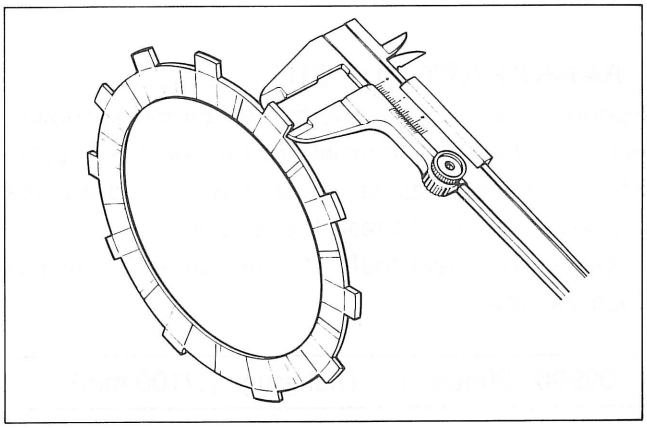
09900 - 20101	Vernier calipers
09900 - 20803	Thickness gauge

Unit: mm (in)

Service Limit	Drive plate	Driven plate
Thickness	2.4 (0.09)	–
Distortion	–	0.1 (0.04)
Claw width	11.0 (0.43)	–



Checking distortion



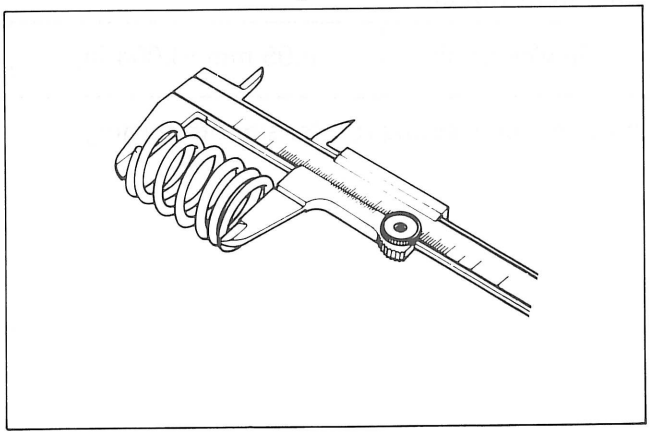
Checking claw width

CLUTCH SPRING FREE LENGTH

Measure the free length of each coil spring with vernier calipers, and compare the elastic strength of each with the specified limit. Replace all the springs as a set, if any one of springs is not within the limit.

Clutch spring free length

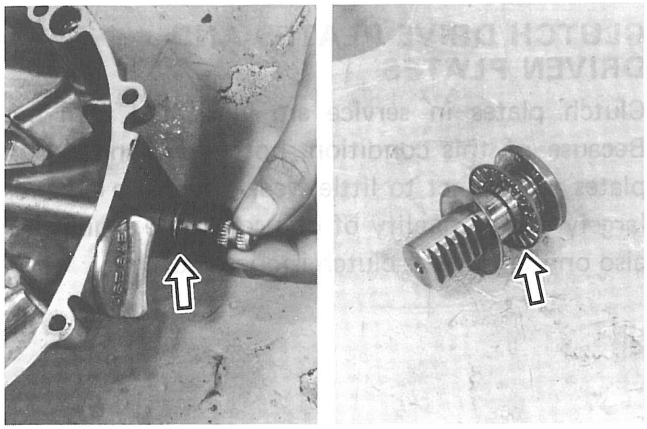
Service Limit	36.5 mm (1.44 in)



CLUTCH BEARINGS

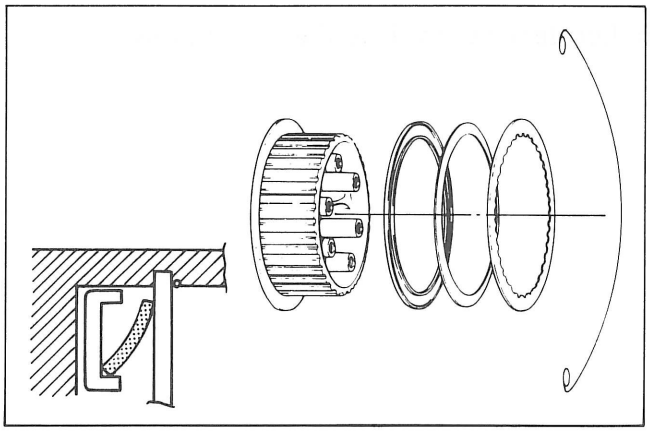
Inspect clutch release and rack bearings for any abnormality, particularly cracks, upon removal from the clutch, to decide whether it can be reused or should be replaced.

Smooth engagement and disengagement of the clutch depends much on the condition of these bearings.



SLEEVE HUB WAVE WASHER

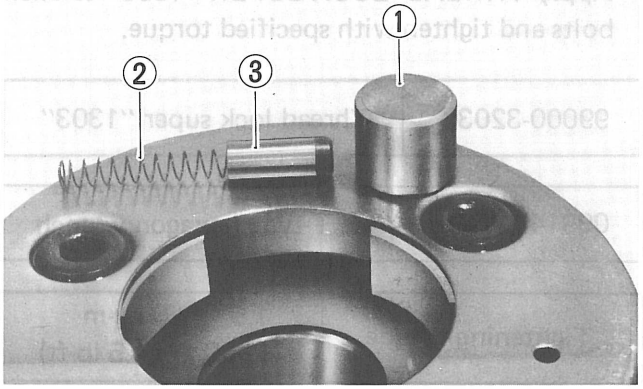
- Install the spring seat, spring, and driven plate in the clutch sleeve hub. Check that these three parts are positioned correctly as illustrated.
  While holding the driven plate with pliers, install the piano wire clip.



NOTE:
Always use a new piano wire clip.

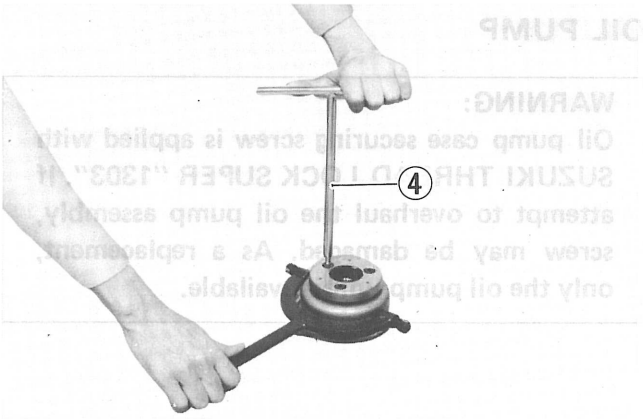
STARTER CLUTCH REMOVAL

- Remove roller ① , spring ② , and push piece ③ from starter clutch.



- Clamp the rotor with a vise taking care not to damage it and separate starter clutch from the rotor using the T type hexagon wrench ④.

09914 - 25811	"T" type hexagon wrench (6 mm)

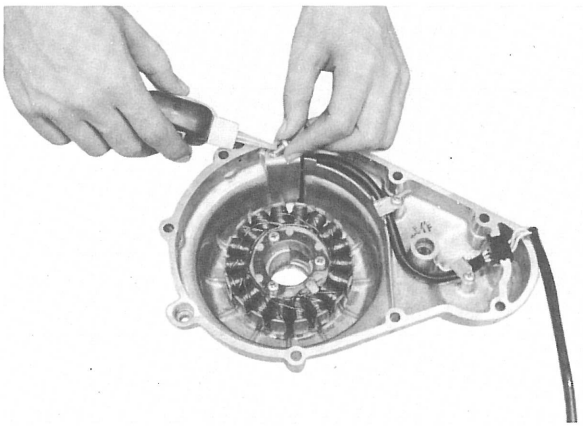


ASSEMBLY

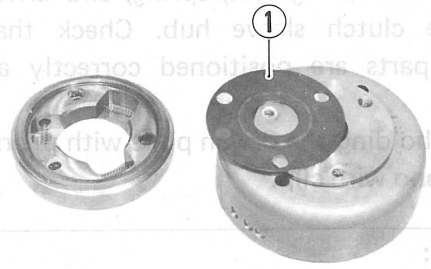
- Apply THREAD LOCK "1342" (99000-32050) to the stator set screws and its lead wire guide screws.

NOTE:
Wipe off oil and grease on screw completely, and then apply the screw lock.

- Mount the lead wire clamp as shown in the photo.



- Locate the shim ① to the proper position.



- Apply THREAD LOCK SUPER "1303" to allen bolts and tighten with specified torque.

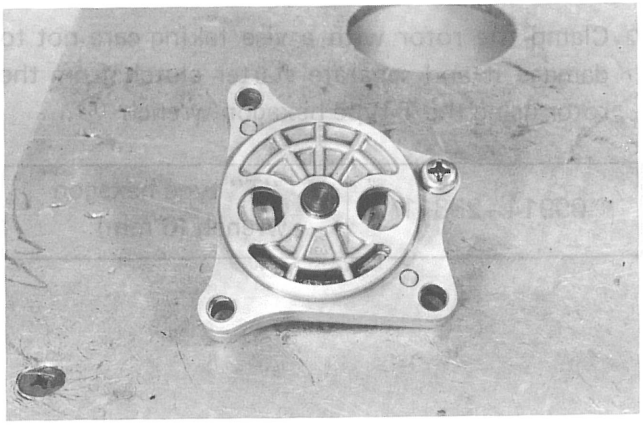
99000-32030	Thread lock super "1303"

09914 - 25811	T-type hexagon wrench

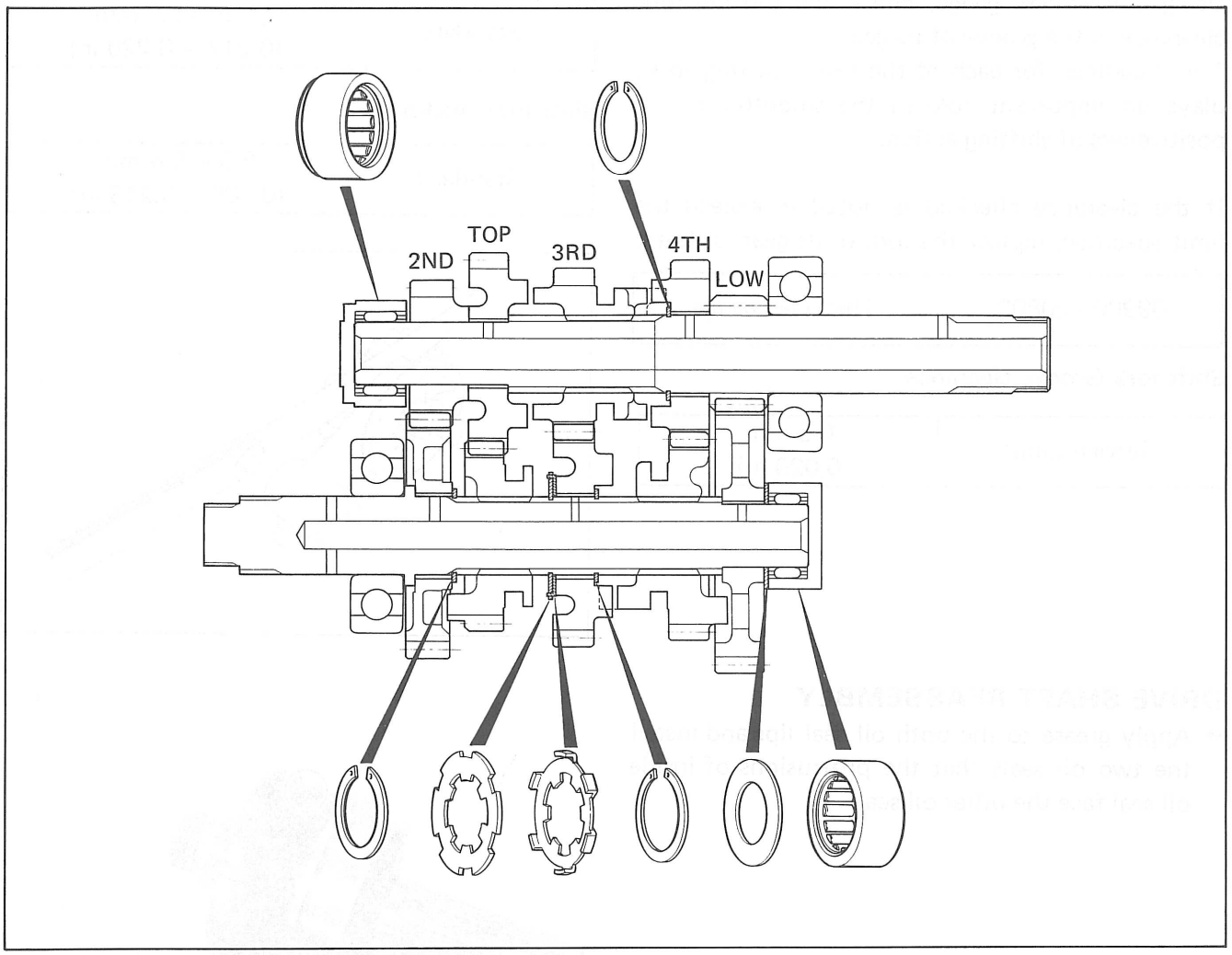
Tightening torque	1.5 – 2.0 kg-m (11.0 – 14.5 lb-ft)

OIL PUMP

WARNING:
Oil pump case securing screw is applied with SUZUKI THREAD LOCK SUPER "1303". If attempt to overhaul the oil pump assembly, screw may be damaged. As a replacement, only the oil pump unit is available.



TRANSMISSION

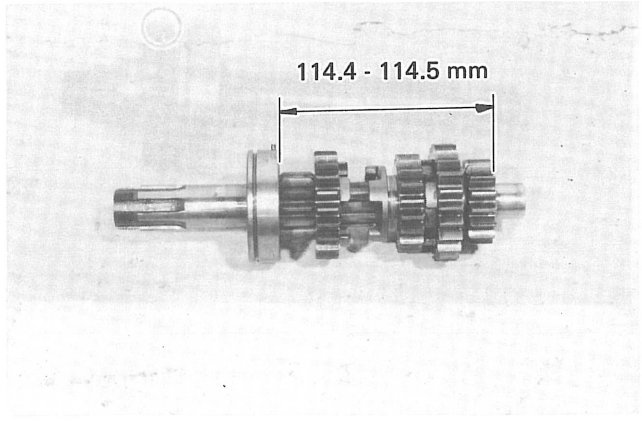


MOUNTING 2ND DRIVE GEAR

Press 2nd drive gear to a position where the distance between this drive gear and the 1st drive gear assumes the value indicated:

Countershaft length	114.4 – 114.5 mm (4.504 – 4.508 in)

99000-32030	Thread lock super "1303"



NOTE:

* **Before mounting 2nd drive gear, apply THREAD LOCK SUPER "1303" to its bore, taking care not to smear Top drive gear with "1303".**
* **After mounting the 2nd drive gear, check that Top drive gear spins smoothly, by moving it with your fingers.**
* **2nd drive gear may be replaced only twice before it becomes necessary to also replace the countershaft.**

SHIFT FORK-GROOVE CLEARANCE

Using a thickness gauge, check the shifting fork clearance in the groove of its gear.
This clearance for each of the three shifting forks plays an important role in the smoothness and positiveness of shifting action.

If the clearance checked is noted to exceed the limit specified, replace the fork or its gear, or both.

09900 - 20803	Thickness gauge

Shift fork-Groove clearance

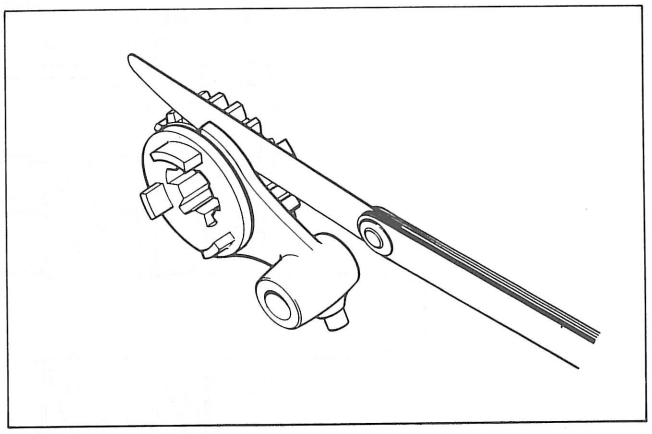
Service Limit	0.5 mm (0.020 in)

Shift fork groove width

Standard	5.5 – 5.6 mm (0.217 – 0.220 in)

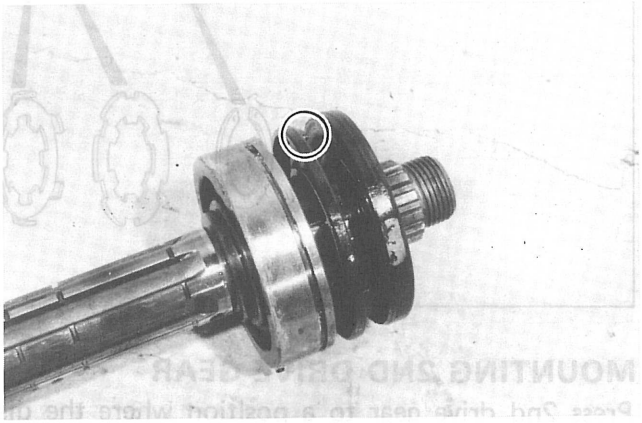
Shift fork thickness

Standard	5.3 – 5.4 mm (0.209 – 0.213 in)

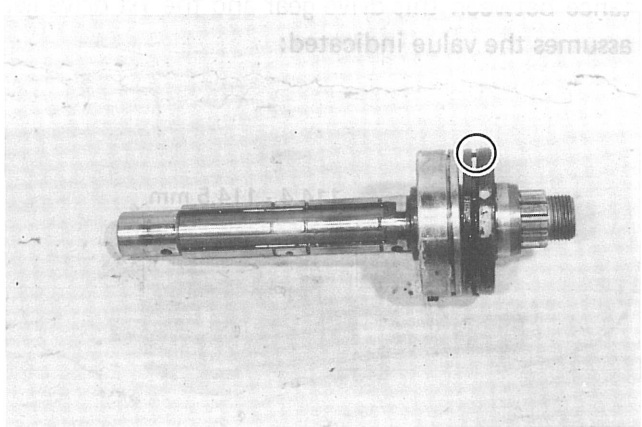


DRIVE SHAFT REASSEMBLY

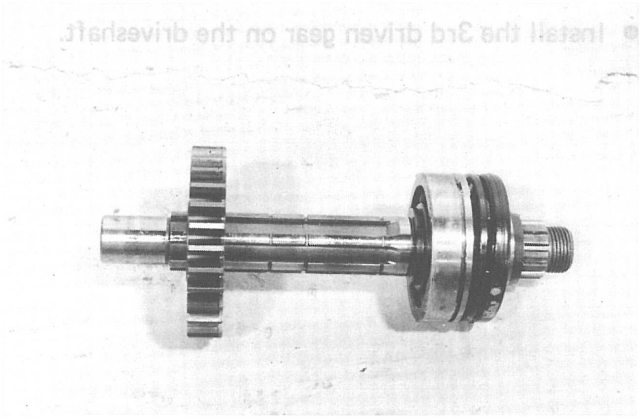
- Apply grease to the both oil seal lips and install the two oil seals that the protrusions of inside oil seal face the other oil seal.



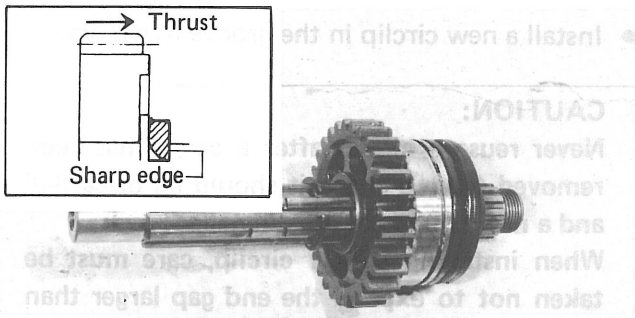
- Both oil seals position properly as shown.



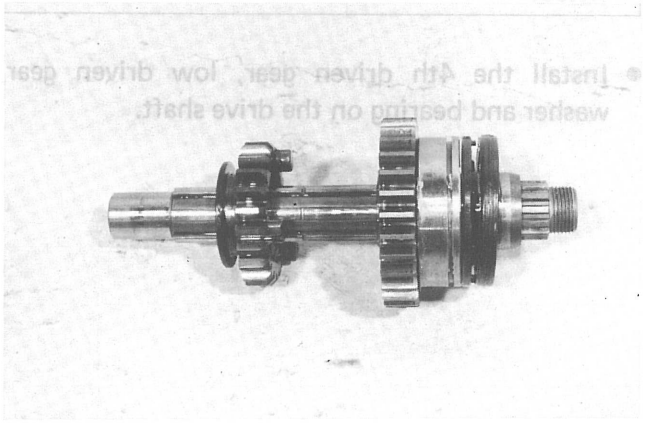
- Before installing gears, coat lightly with moly paste or engine oil on the driveshaft.
- Install the 2nd driven gear on the drive shaft.

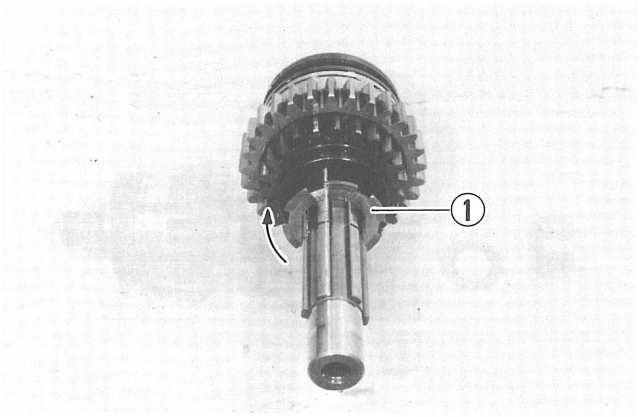


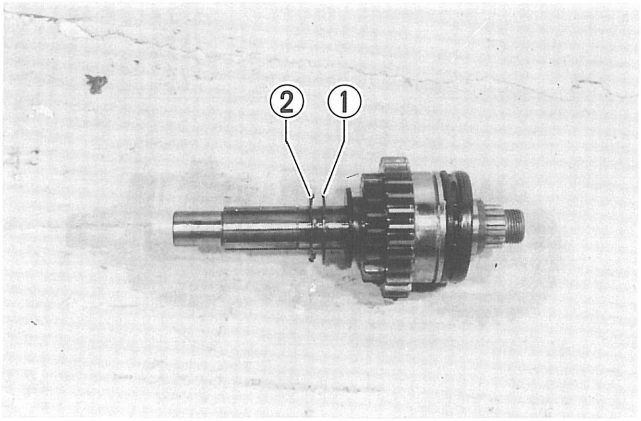
- When mounting a new circlip, pay attention to the direction of the circlip. Fit it to the side where the thrust is as shown in figure.



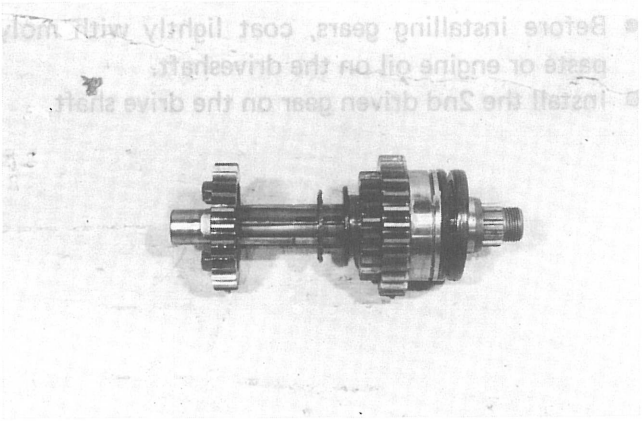
- Install the Top driven gear on the drive shaft.
- Insert the lock washer ① into the drive shaft, and turn and fit it into the groove. Then fit the lock washer ② in the lock washer ① .



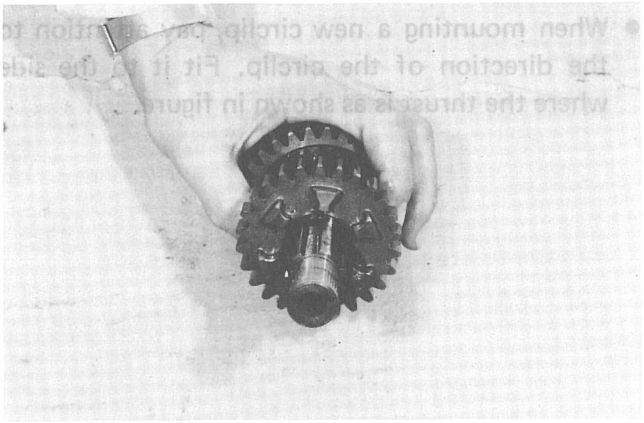




- Install the 3rd driven gear on the driveshaft.

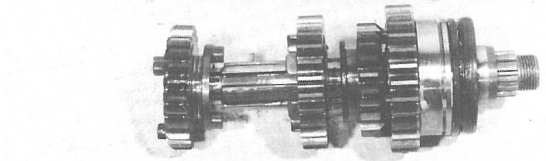


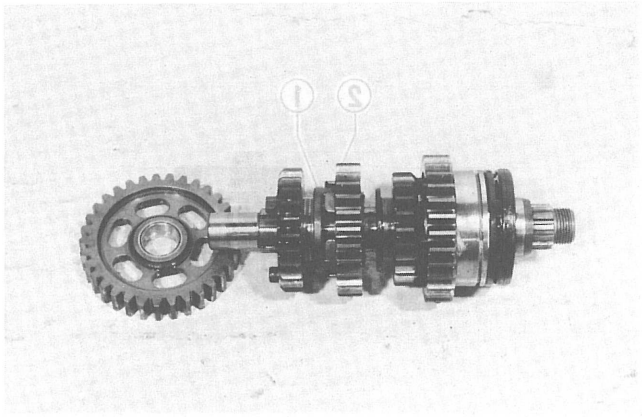
- Install a new circlip in the groove as shown.

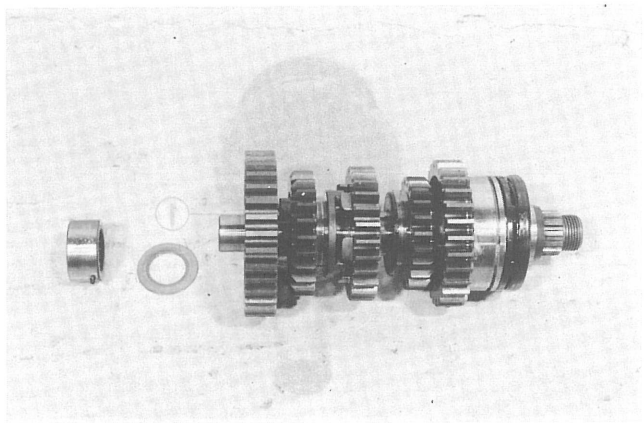


CAUTION:
Never reuse a circlip after a circlip has been removed from a shaft, it should be discarded and a new circlip must be installed.
When installing a new circlip, care must be taken not to expand the end gap larger than required to slip the circlip over the shaft.
After installing a circlip, always insure that it is completely seated in its groove and securely fitted.

- Install the 4th driven gear, low driven gear, washer and bearing on the drive shaft.







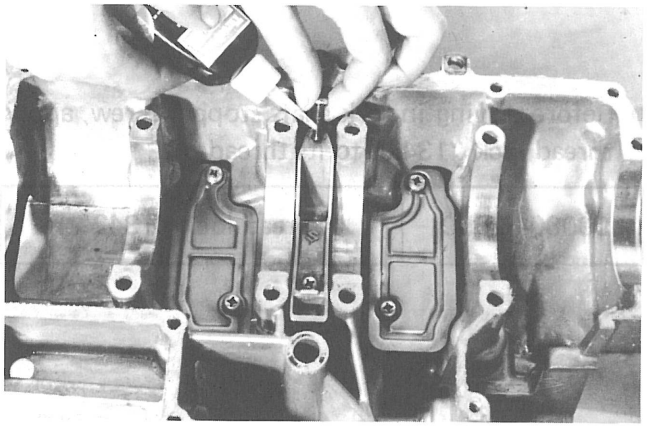
ENGINE REASSEMBLY

The engine is reassembled by carrying out the steps of disassembly in the reverse order, but there are a number of steps which demand special descriptions or precautionary measures.

> **NOTE:**
> **Apply engine oil to each running and sliding part before reinstalling.**

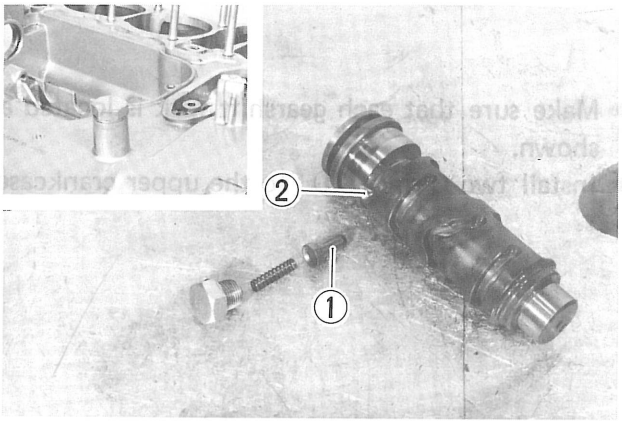
- Fix two oil separator plate with 4 screws applying thread lock "1342".
- Apply thread lock super "1333B" to the cam chain tensioner guide screws.

99000-32050	Thread lock "1342"
99000-32050	Thread lock super "1333B"



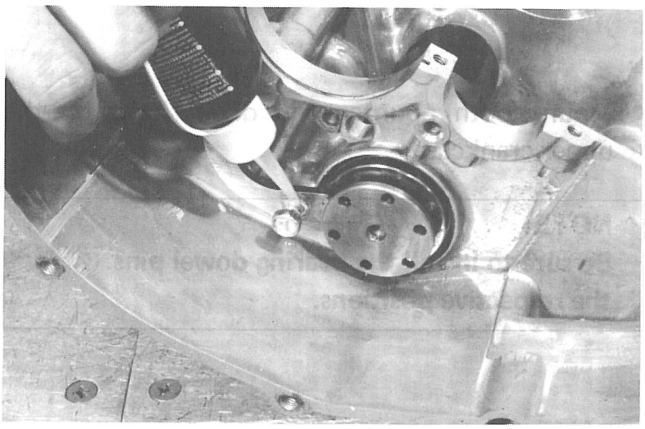
- Install the gearshifting cam with the dent for the neutral stopper directed downward, and meet the neutral stopper ① with this dent ②.
- Tighten the neutral stopper housing as the following torque value.

Tightening torque	1.8 – 2.8 kg-m (13.0 – 20.0 lb-ft)

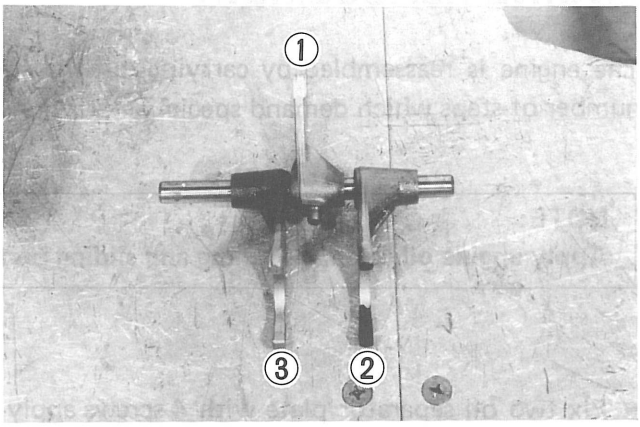


- Apply thread lock "1342" to the bolt thread and install the cam guide bolt.

99000-32050	Thread lock "1342"

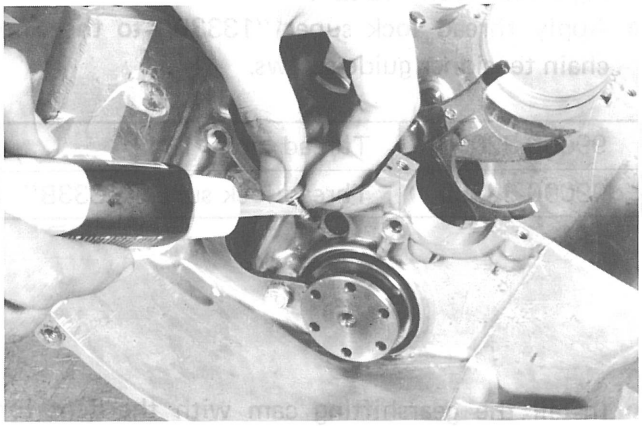


- Refer to the following figure in regard to the correct positions and orientations of the forks when installing these parts.
  ① For 3rd drive gear
  ② For Top driven gear
  ③ For 4th driven gear

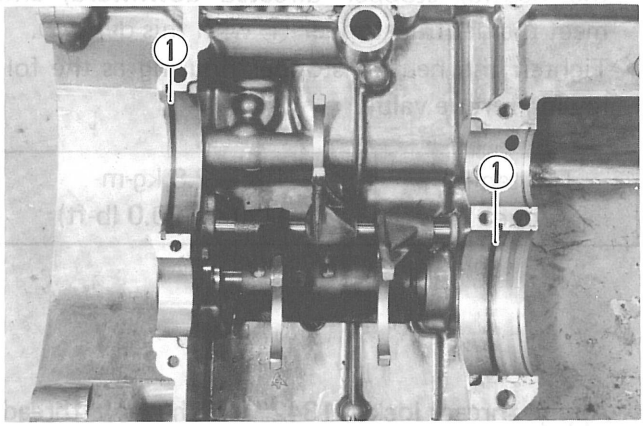


- Before driving in fork shaft stopper screw, apply thread lock "1342" to its threads.

99000-32050	Thread lock "1342"

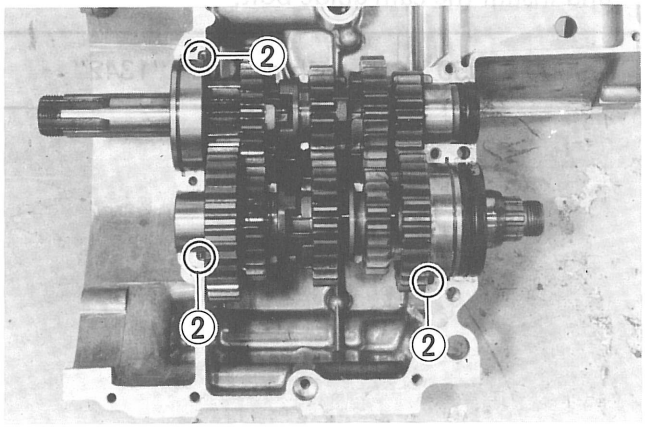


- Make sure that each gearshift fork is located as shown.
- Install two C-rings ① to the upper crankcase.

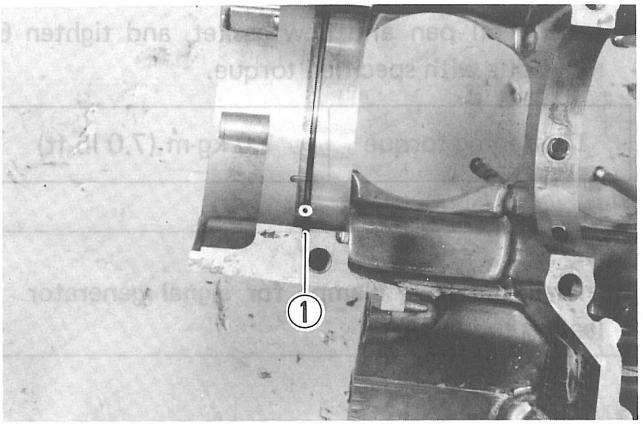


- Mount both counter and drive shafts on the upper crankcase.

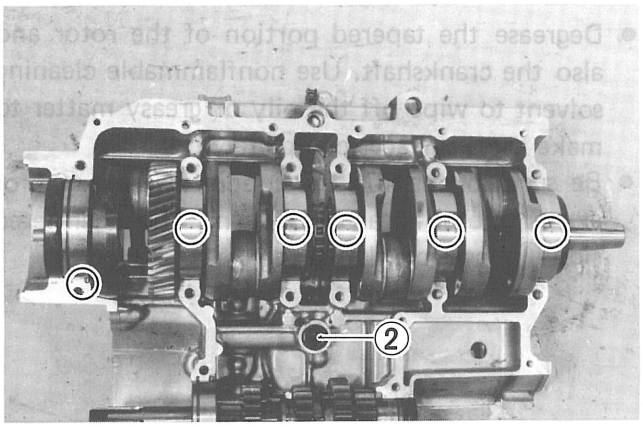
NOTE:
Be sure to install the bearing dowel pins ② in the respective positions.



- Check the oil orifice for clogging.
- Place a C-ring ① in the groove.
- Mount the crankshaft on the upper crankcase. At this time firmly fit each bearing onto the locating pin with punch mark stamped on the circumference of the bearing directed upwards.
- Bearing stopper pin should be in the position shown.
- Place a new O-ring ② .
- Clean the mating surfaces of the crankcases before matching the upper and lower ones.
- Apply 1207B to the mating surface of the lower crankcase.

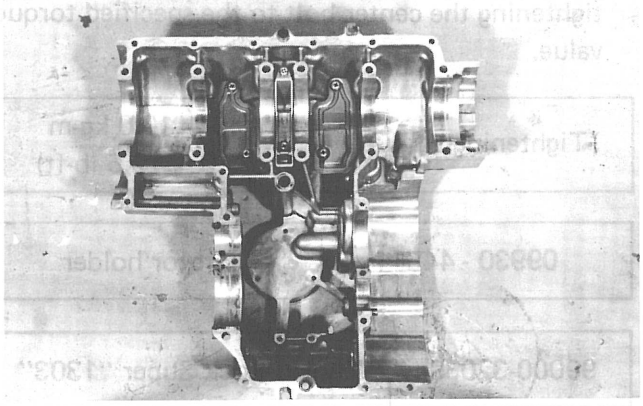


99104 - 31140	SUZUKI Bond No. 1207B

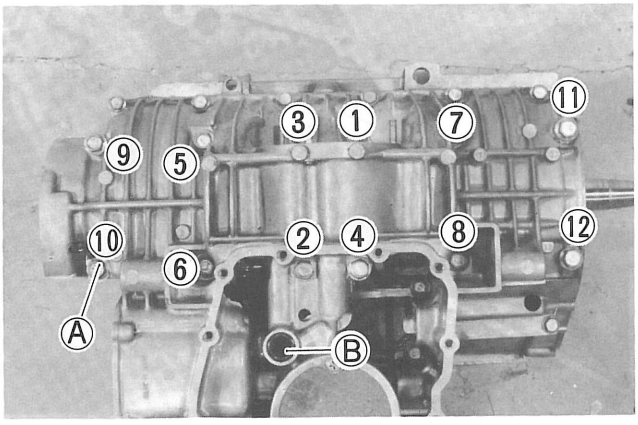


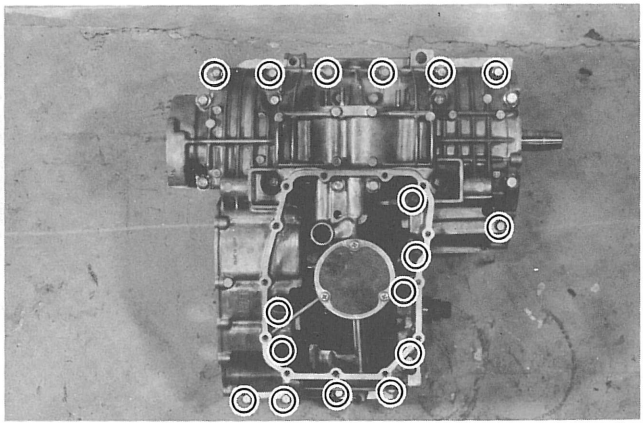
- When securing the lower crankcase, tighten the 8 mm bolts and the 6 mm bolts in the ascending order of numbers assigned to these bolts, tightening each bolt a little at a time to equalize the pressure. Tighten all the securing bolts to the specified torque values.

Tightening torque	Initial tightening		Final tightening	
	lb-ft	kg-m	lb-ft	kg-m
6 mm bolt	4.5	0.6	9.5	1.3
8 mm bolt	7.0	1.0	14.5	2.0



- Install the clamp Ⓐ for signal generator lead wire.
- Install a new O-ring Ⓑ .

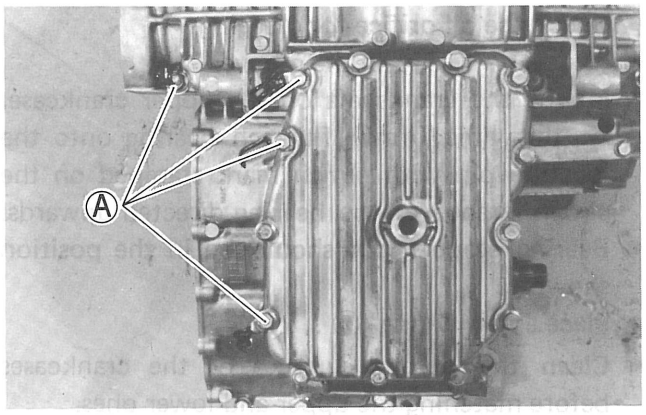




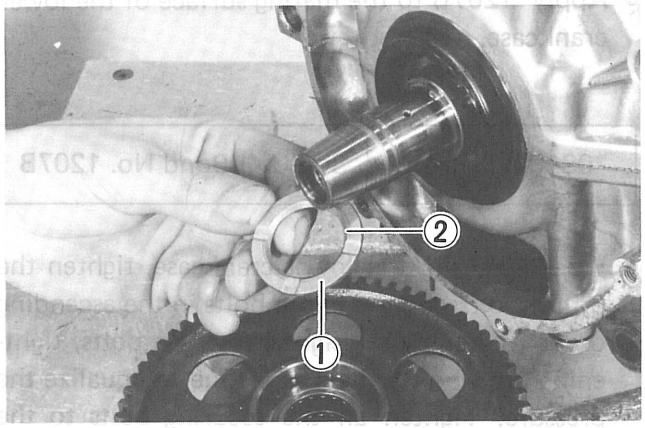
- Locate oil pan and new gasket, and tighten 6 mm bolts with specified torque.

Tightening torque	1.0 kg-m (7.0 lb-ft)

NOTE:
Install the four clamps for signal generator lead as shown Ⓐ .



- Degrease the tapered portion of the rotor and also the crankshaft. Use nonflammable cleaning solvent to wipe off the oily or greasy matter to make these surfaces completely dry.
- Be sure to position the copper washer ① for starter clutch gear as shown. The chamfered side ② faces crank bearing.

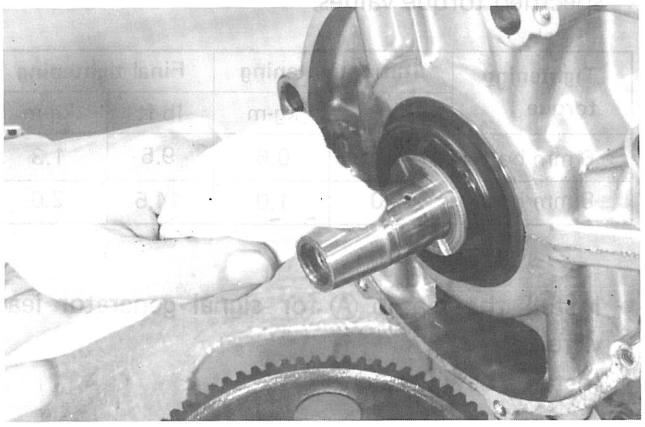


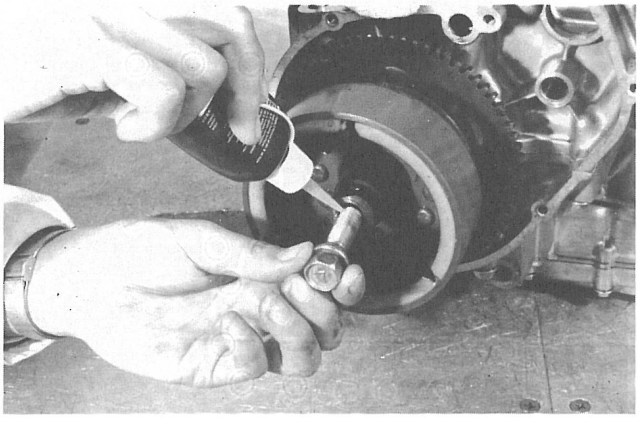
- After mounting the rotor, secure the rotor by tightening the center bolt to the specified torque value.

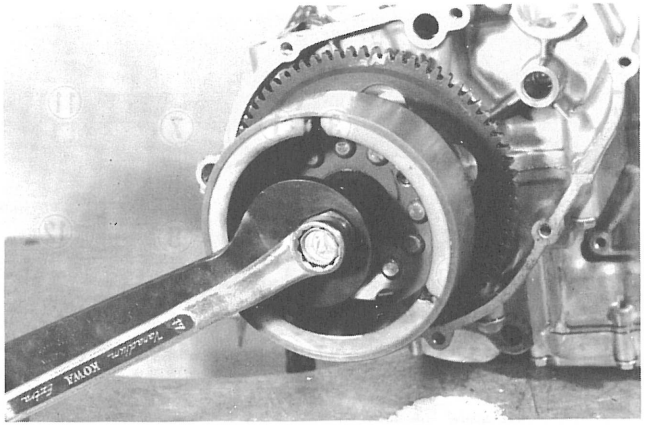
Tightening torque	9.0 – 10.0 kg-m (65.0 – 72.5 lb-ft)

09930 - 44511	Rotor holder

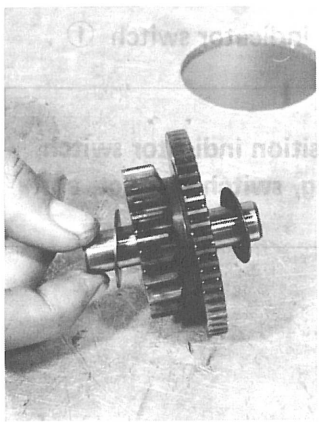
99000-32030	Thread Lock Super "1303"

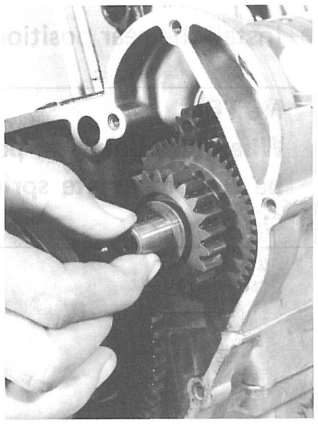






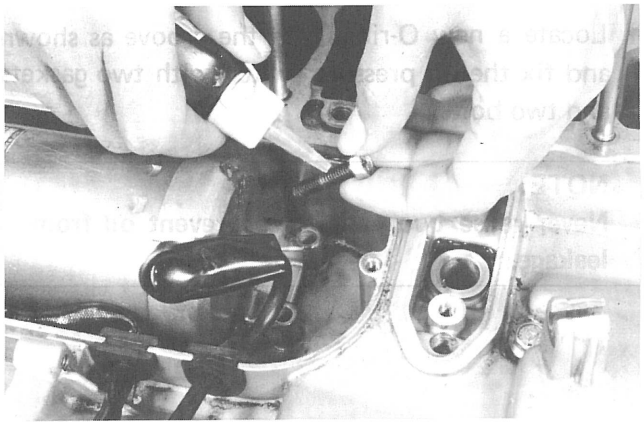
- Install the two washers at the both sides.
- Install the starter idle gear and its shaft.





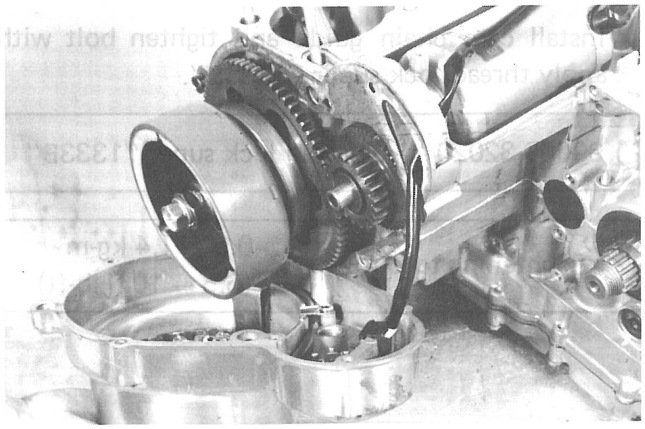
- Mount starter motor, and route the lead wire properly.

99000-32050	Thread lock "1342"

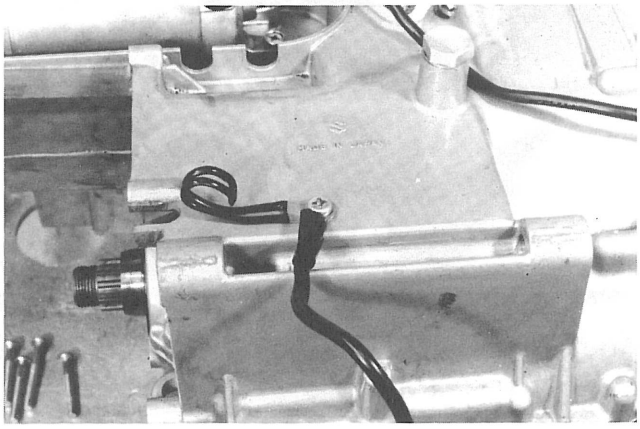


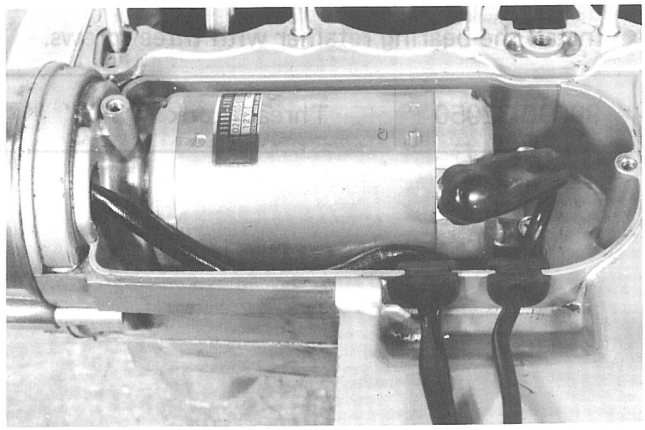
- Pass the generator stator lead wire through gasket and upper crankcase. Route its lead wire properly.

NOTE:
Always use new gasket, and install knock pin.



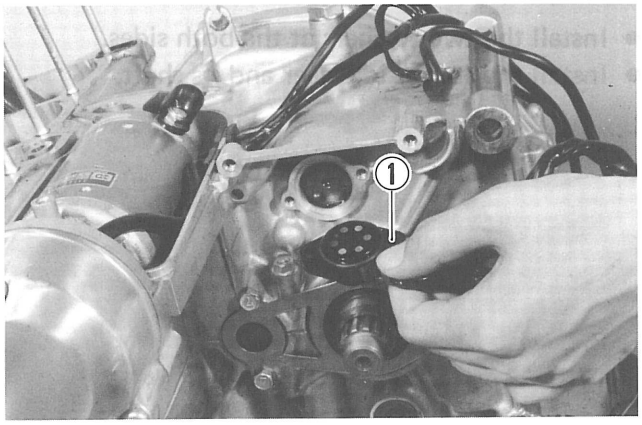
- Install the engine ground wire and clamp as shown.
- Route the both lead wires, generator and starter motor, and clamp them properly.





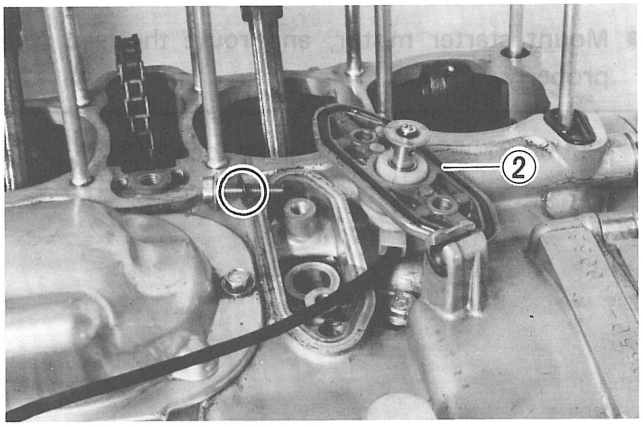
- Install the gear position indicator switch ① .

NOTE:
When installing gear position indicator switch, be sure to locate spring, switch contact, and O-ring.



- Locate a new O-ring ② in the groove as shown and fix the oil pressure switch with two gaskets and two bolts.

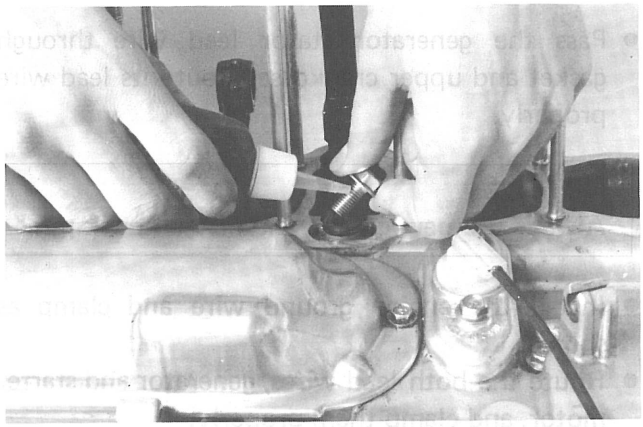
NOTE:
Never reuse two gaskets to prevent oil from leakage.



- Install cam chain guide and tighten bolt with apply thread lock super "1333B".

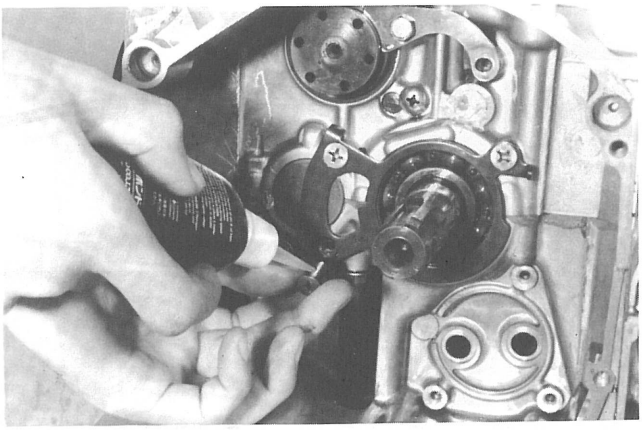
99000-32020	Thread lock super "1333B"

Tightening torque	0.9 – 1.4 kg-m (6.5 – 10.0 lb-ft)

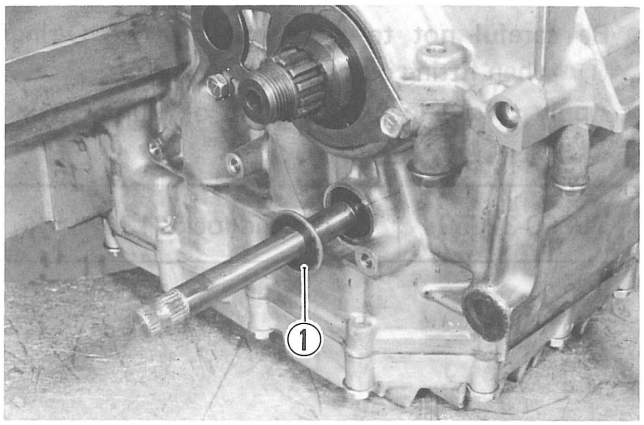


- Install the bearing retainer with three screws.

99000-32050	Thread Lock "1342"



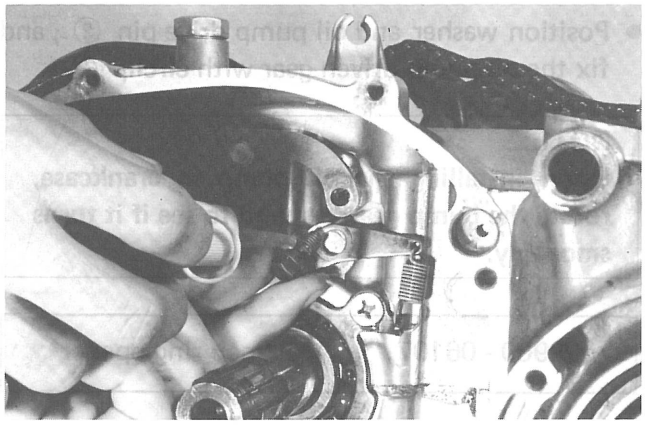
- Install the gearshift shaft.
- Fix washer ① and clip to the gearshift shaft.



- Hitch one end of the spring to the bearing holder and install the cam stopper with bolt.

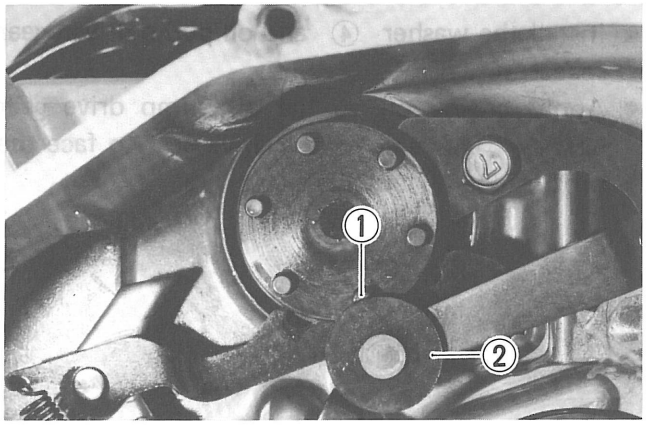
99000-32050	Thread lock "1342"

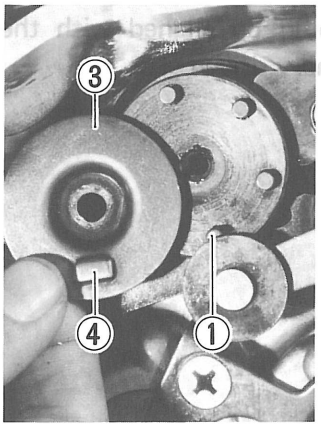
NOTE:
After tightening the cam stopper bolt, move the stopper back and forth with fingers to be sure that its movement is normal.

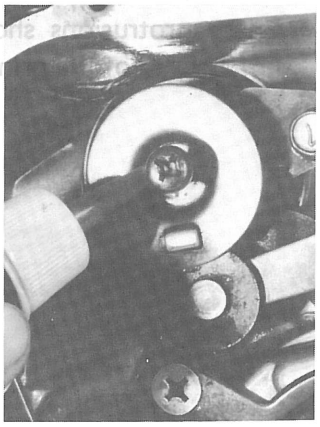


- Bring the gearshift cam to "NEUTRAL" position by inspecting neutral cam stopper hole.
- Insert the neutral cam pin ① which is half circle end into the closest pin hole to the cam stopper ② .
- Install the pin retainer ③ in such a way that the recess ④ of the pin retainer will admit the neutral pin ① .
- Tighten pin retainer securing screw with applying thread lock super "1333B".

99000-32020	Thread lock super "1333B"

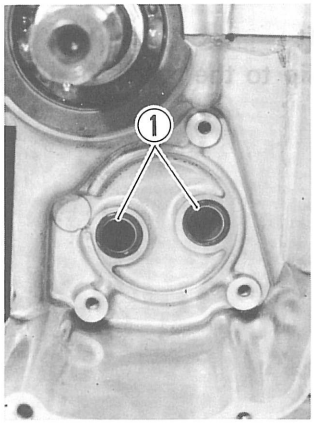


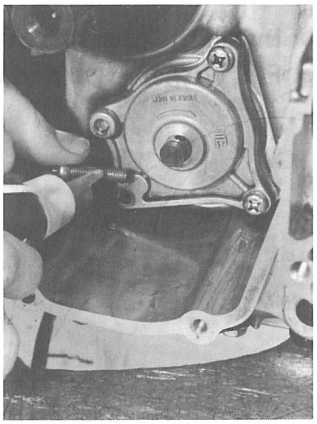




- Be careful not to leave out the two O-rings ① when fitting oil pump.
- Apply thread lock "1342" to oil pump fitting screws.

99000-32050	Thread lock "1342"

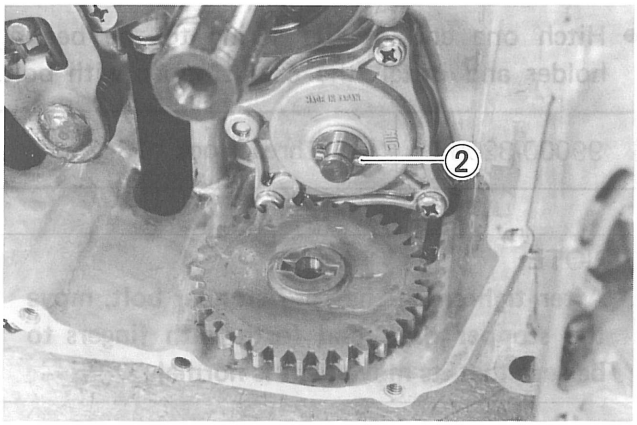




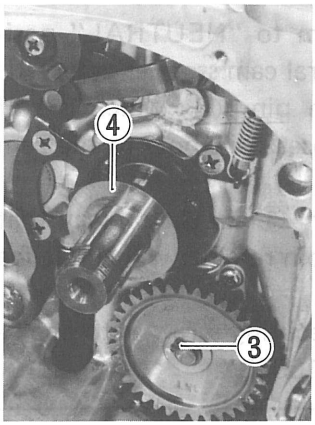
- Position washer and oil pump drive pin ② , and fix the oil pump driven gear with circlip ③ .

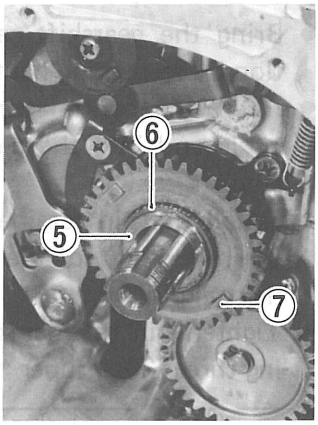
NOTE:
Upon installing the oil pump in crankcase, rotate the pump gear by hand to see if it turns smoothly.

09900 - 06107	Snap ring opener

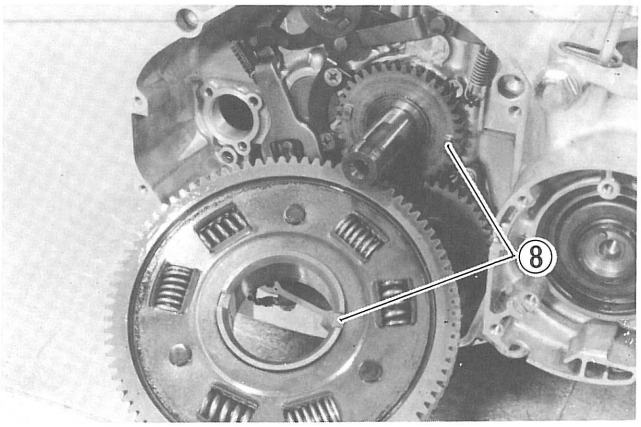


- Install the washer ④ and oil pump driven gear spacer ⑤ .
- Apply engine oil to the oil pump drive gear bearing ⑥ and fix the drive gear to face the protrusions ⑦ outside.

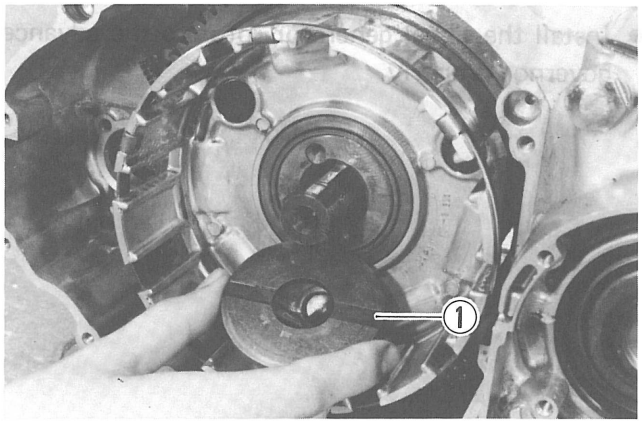




- These protrusions should be aligned with the notches ⑧ of the primary driven gear.



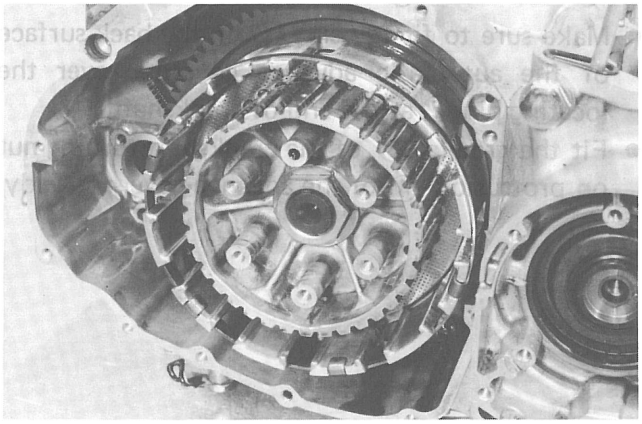
- Assemble the primary driven gear and apply engine oil to the needle bearing and its spacer with oil groove facing inside.
- Thrust washer must be installed with the oil groove side ① facing in.
- Check to be sure that the piano wire, wave washer and driven plate are properly installed.



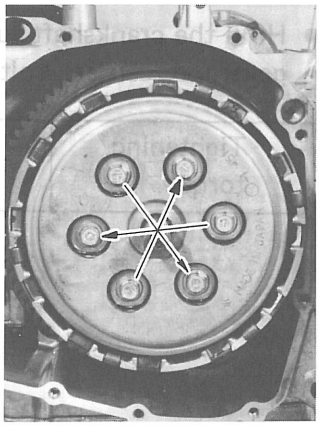
- After tightening the clutch sleeve hub nut, be sure to lock the nut by firmly bending the tongue of the washer. Tightening torque for the nut is specified.

Clutch sleeve hub nut	5.0 – 7.0 kg-m (36.0 – 50.5 lb-ft)

09920 - 53710	Clutch sleeve hub holder

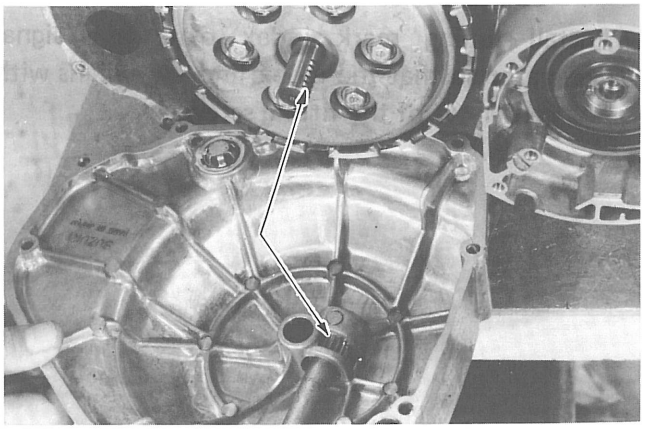


- Insert clutch driven plate and drive plate one by one into sleeve hub in the prescribed order, cork plate first. Insert clutch release rack, bearing and thrust washer into pressure plate, making sure that the thrust washer is between the bearing and the pressure plate. Then fit pressure plate into sleeve hub.
- Tighten clutch spring bolts in the order shown in the photo.



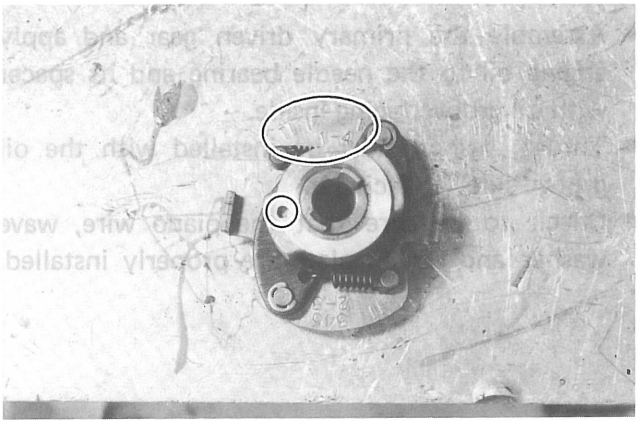
NOTE:
Tighten the clutch spring set bolts in the manner indicated, tightening them by degrees until they attain a uniform tightness.

Clutch spring bolt	1.1 – 1.3 kg-m (8.0 – 9.5 lb-ft)

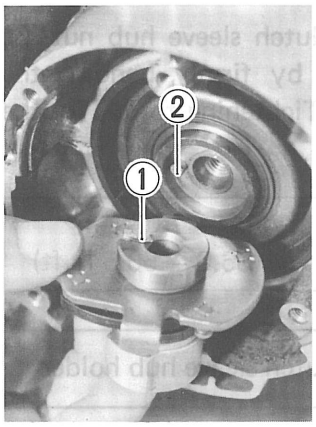


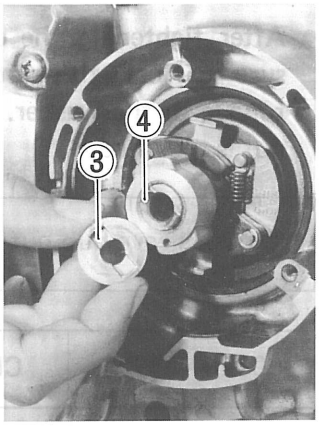
- Replace clutch cover gasket with new one to prevent oil leakage.
- Engage the teeth of clutch release rack with those of pinion gear at the clutch cover side, and replace clutch cover. Make sure that the rack and pinion gear engage positively. To install cover, tap lightly with plastic hammer, and tighten screws.

- Install the signal generator rotor to the advance governor properly.



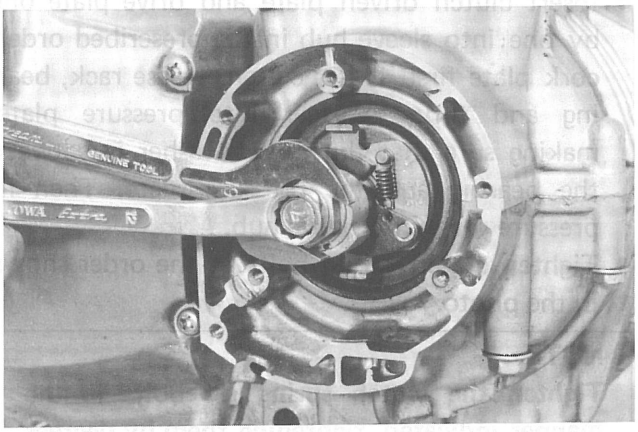
- Make sure to fit the slot ① on the back surface of the automatic advance governor over the locating pin ② at the end of crankshaft.
- Fit the groove ③ of the crankshaft turning nut on protrusion ④ of the advance governor body.



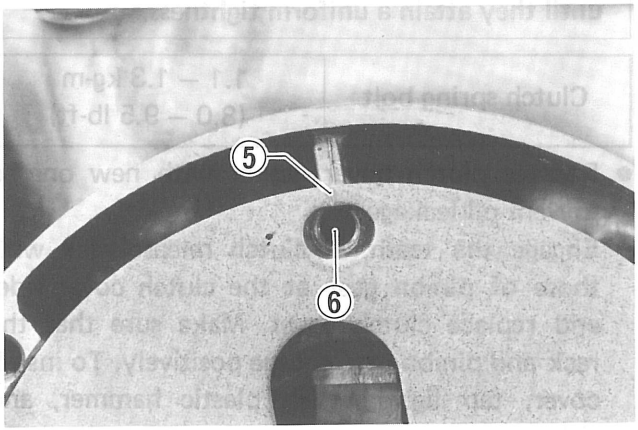


- Hold the crankshaft turning nut and tighten the governor center bolt with specified torque.

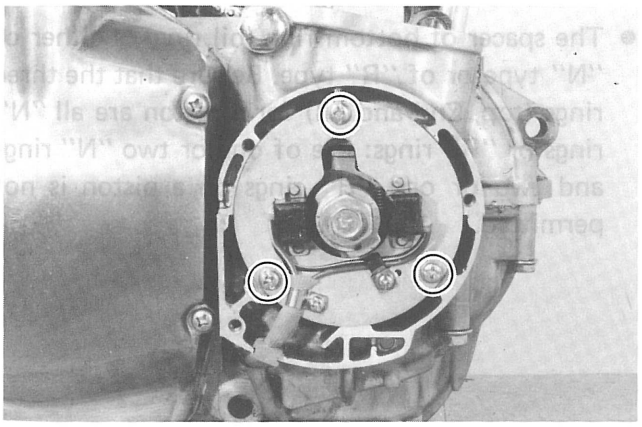
Tightening torque	1.3 – 2.3 kg-m (9.5 – 16.5 lb-ft)



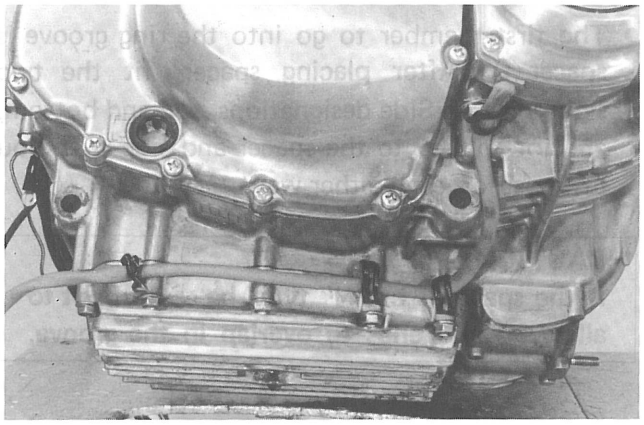
- Install timing mark index plate and signal generator so that the index line ⑤ aligns with the center ⑥ of the fitting screw.



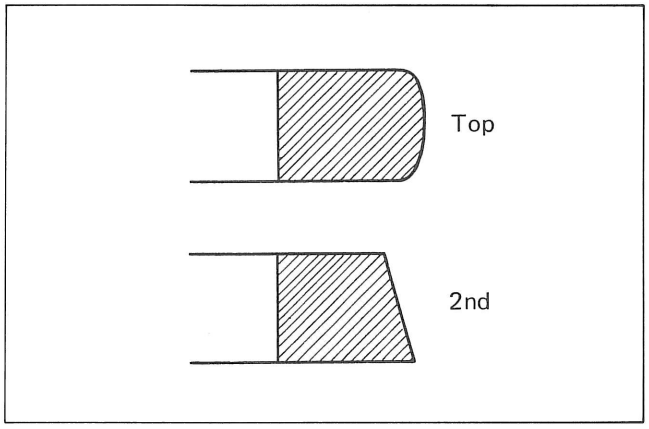
- Install the signal generator with three screws properly.



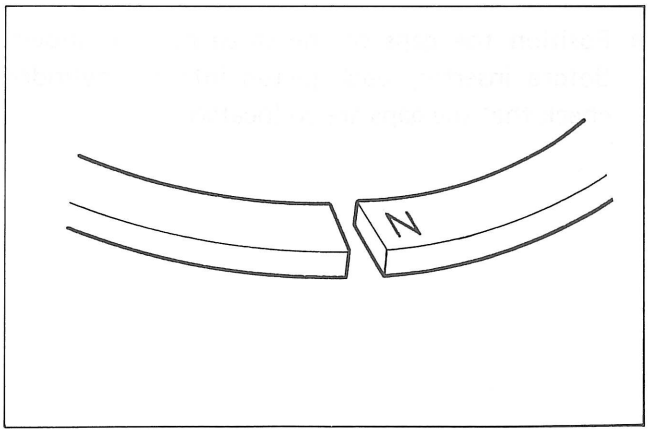
- Route the signal generator lead wire as shown.



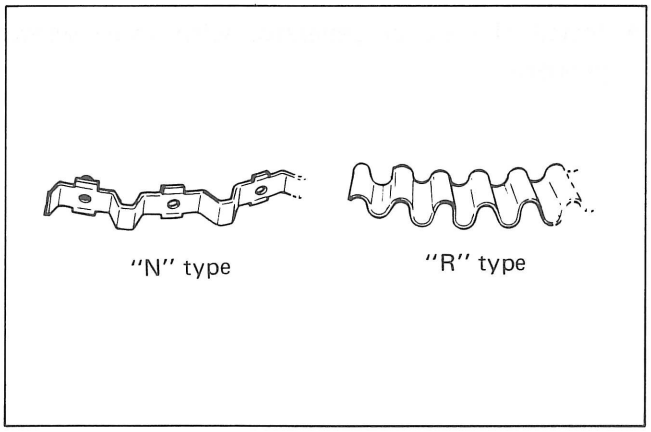
- Mount the piston ring in the order of oil ring, 2nd ring, and top ring.
- Top ring and 2nd (middle) ring differ in the shape of ring face, and the face of top ring is chrome-plated whereas that of 2nd ring is not. The color of 2nd ring appears darker than that of the top one.



- Top and 2nd (middle) rings have letter "N" or "R" marked on the side. Be sure to bring the marked side to top when fitting them to the piston.

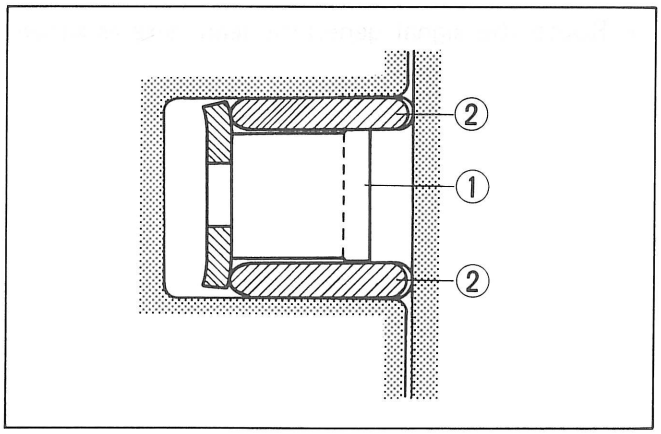


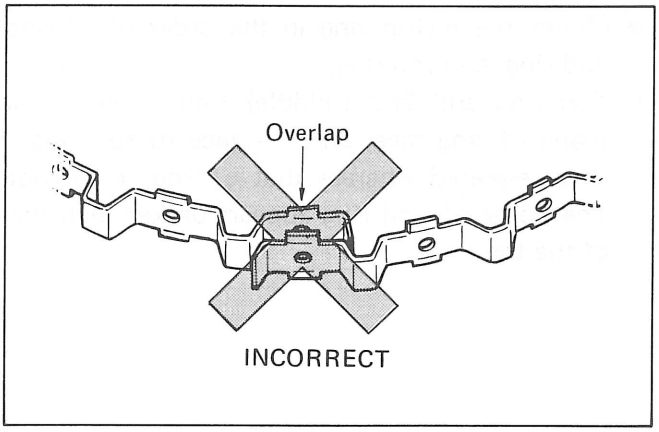
- The spacer of bottom ring (oil ring) is either of "N" type or of "R" type. Be sure that the three rings (top, 2nd and oil) for a piston are all "N" rings or "R" rings: use of one or two "N" rings and two or one "R" rings on a piston is not permitted.



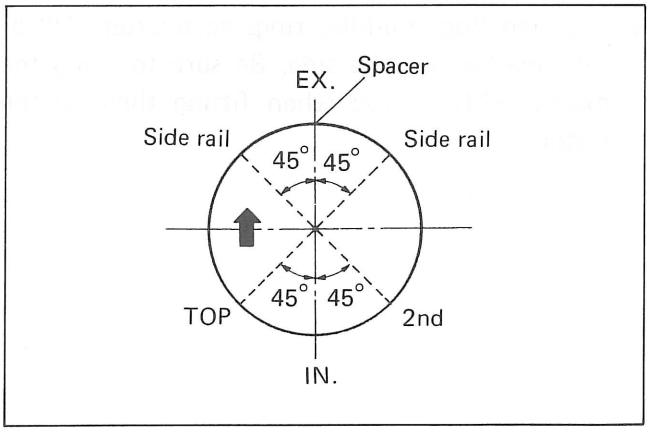
- The first member to go into the ring groove is spacer ①. After placing spacer, fit the two side rails ②. Side designations, top and bottom, are not applied to the spacer and side rails: you can position each either way.

CAUTION:
If the spacer is of "N" type, be careful not to allow its two ends to overlap in the groove.

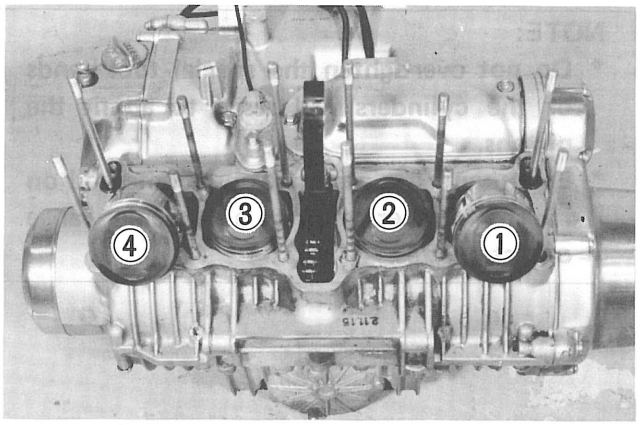




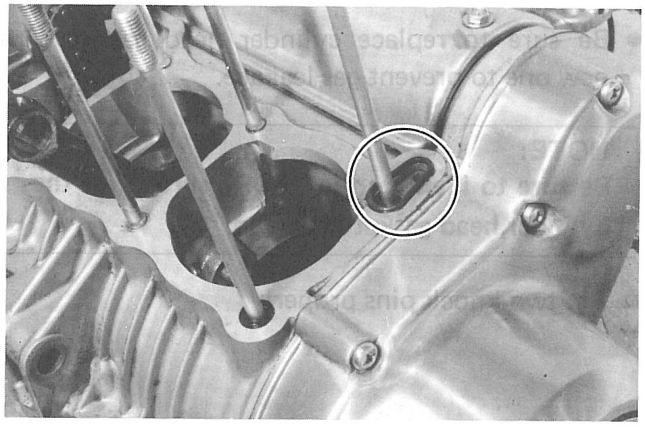
- Position the gaps of the three rings as shown. Before inserting each piston into the cylinder, check that the gaps are so located.



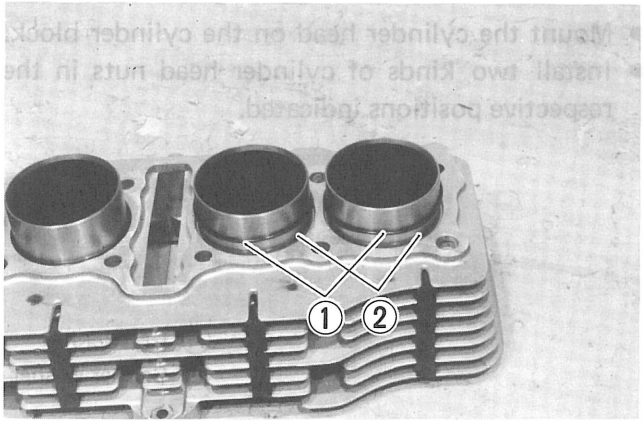
- The piston is in correct position when its arrow (on the crown) points forward.
- Be sure to install the pistons in the cylinder from which they were taken out in disassembly, refer to the letter mark, "1" through "4", scribed on the piston crown.



- Have each piston oiled lightly before installing it.
- Place a rag beneath the piston, and install the circlips.
- Be sure to use new circlips.
- Place a new O-ring as shown.
- Oil the conrod big end and primary drive gear.

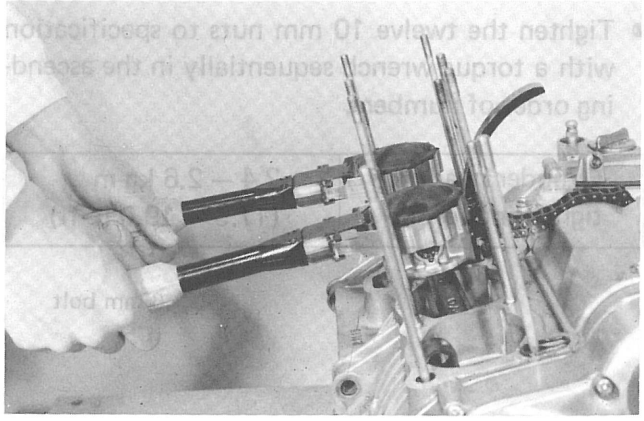


- Before putting on the cylinder block, oil the big and small ends of each connecting rod and also the sliding surface of each piston. Check to be sure that the "O" rings ① are accurately positioned in the groove ②.
- Place the new cylinder gasket on the crankcase.

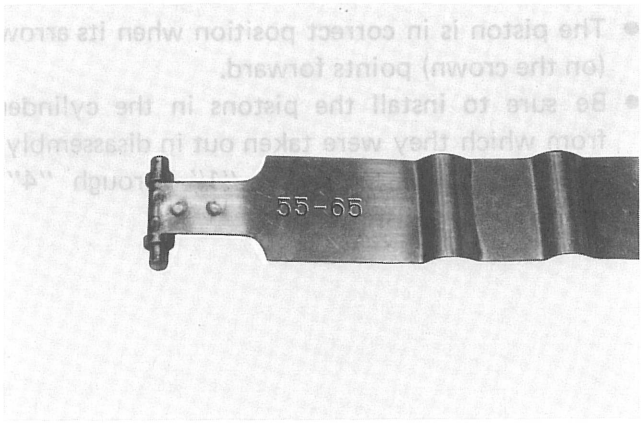


- Install piston ring holders in the indicated manner. Some light resistance must be overcome to lower the cylinder block.
- With No. 2 and No. 3 pistons in place, install No. 1 and No. 4 pistons, and insert them into the cylinder.

09916 - 74521	Holder body
09916 - 74530	Band (bore 55 – 65 mm)

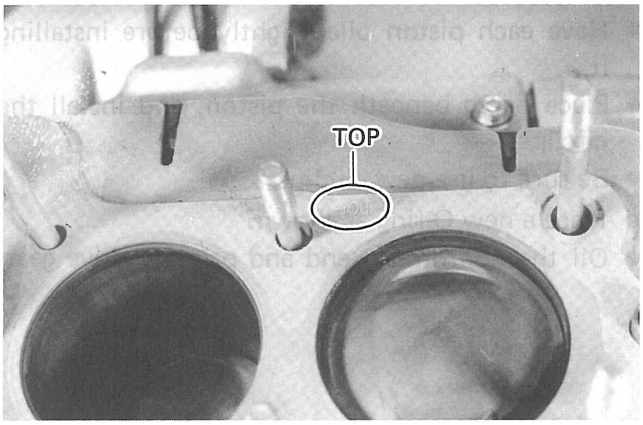


NOTE:
* **Do not overtighten the special tool bands or the cylinders will resist to admit the pistons.**
* **Each band has a number punchmarked on it. The number refers to a particular range of piston sizes.**



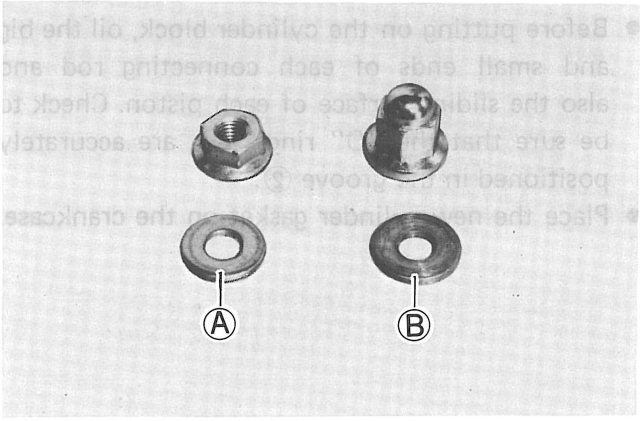
- Be sure to replace cylinder head gasket with new one to prevent gas leakage.

NOTE:
Be sure to identify the "TOP" surface of the cylinder head gasket as shown.



- Fix two knock pins properly.

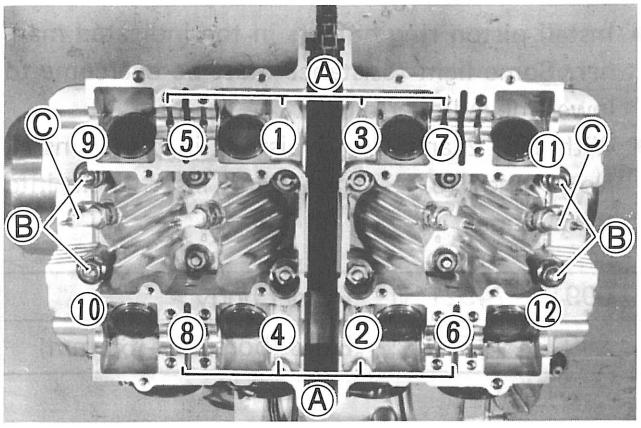
- Mount the cylinder head on the cylinder block.
- Install two kinds of cylinder head nuts in the respective positions indicated.



Ⓐ Iron washer
Ⓑ Copper washer

- Tighten the twelve 10 mm nuts to specification with a torque wrench sequentially in the ascending order of numbers.

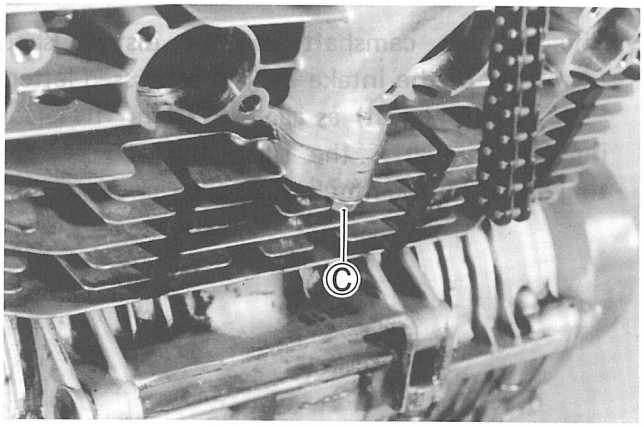
Cylinder head nut tightening torque	2.4 – 2.6 kg-m (17.5 – 19.0 lb-ft)



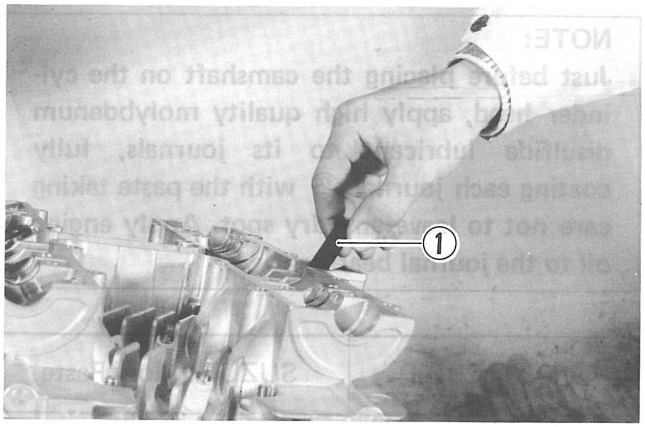
Ⓒ 6 mm bolt

- After firmly tightening the 12-nuts, insert three 6 mm bolts Ⓒ and tighten them with specified torque.

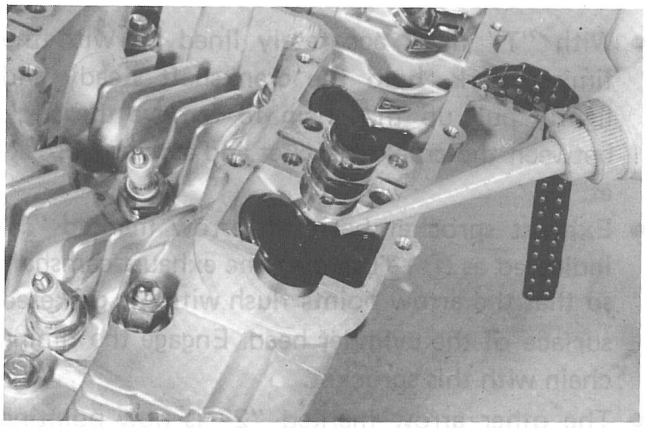
Tightening torque	0.9 – 1.1 kg-m (6.5 – 8.0 lb-ft)



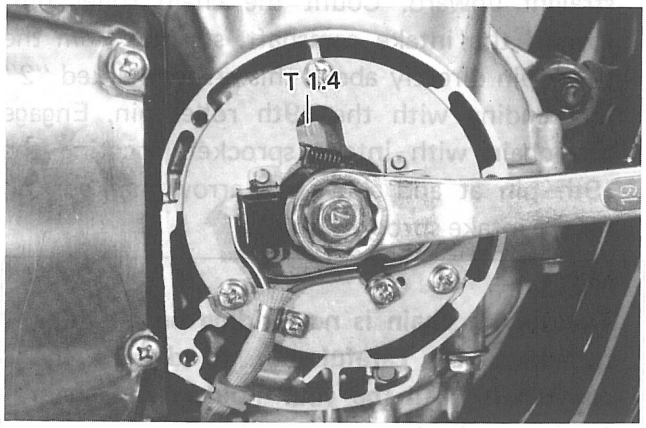
- Place chain guide ① properly.



- Install each tappet to their original positions.
- Oil each tappet.

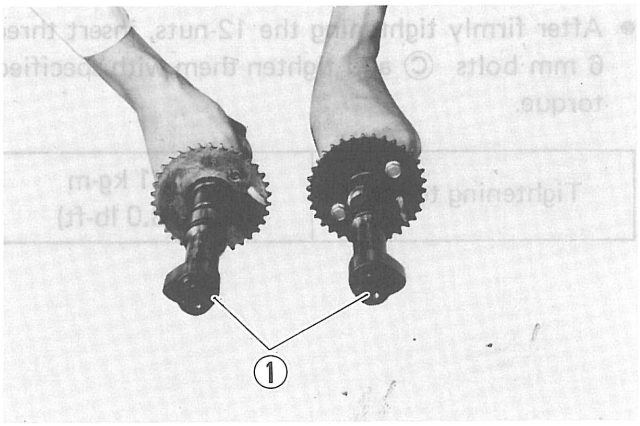


- While holding down the timing chain, rotate the crankshaft in normal direction to bring the "T" mark (on Nos. 1 and 4 cylinder side of the advance governor) to the timing mark.

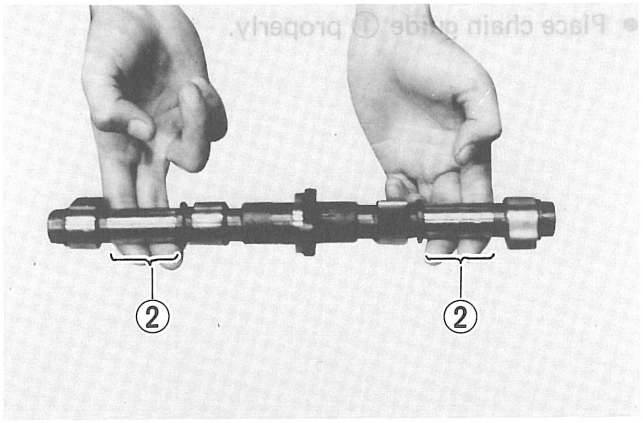


CAUTION:
To turn over crankshaft, torque nut with a 19 mm wrench. Never try to rotate crankshaft by putting a 12 mm wrench to bolt.

- The exhaust camshaft can be distinguished from that of the intake by the embossed letters "EX" (for exhaust) as against letters "IN" (for intake). Similarly, the right end can be distinguished by the notch ① at the right end.

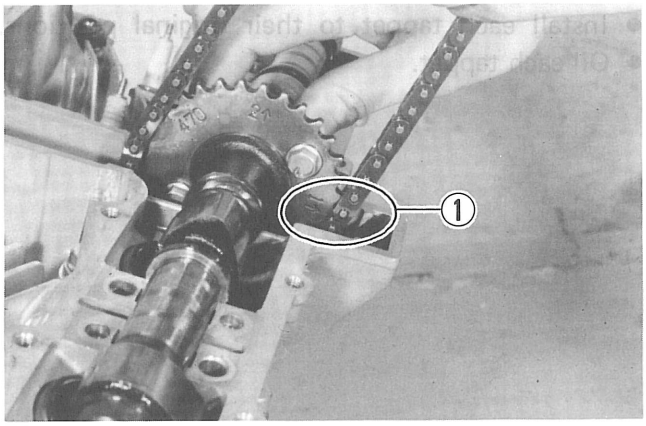


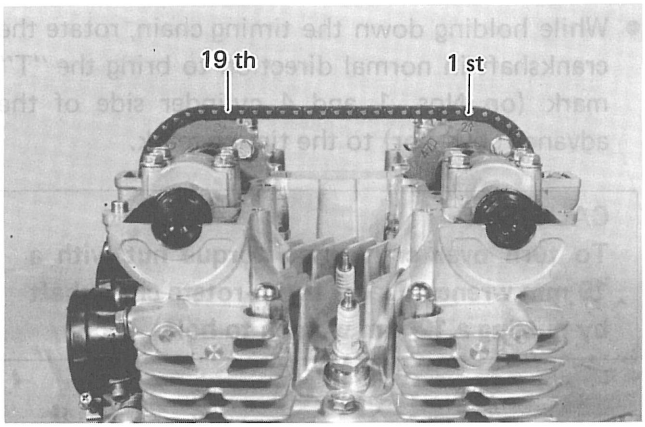
NOTE:
Just before placing the camshaft on the cylinder head, apply high quality molybdenum disulfide lubricant to its journals, fully coating each journal ② with the paste taking care not to leave any dry spot. Apply engine oil to the journal bearings.



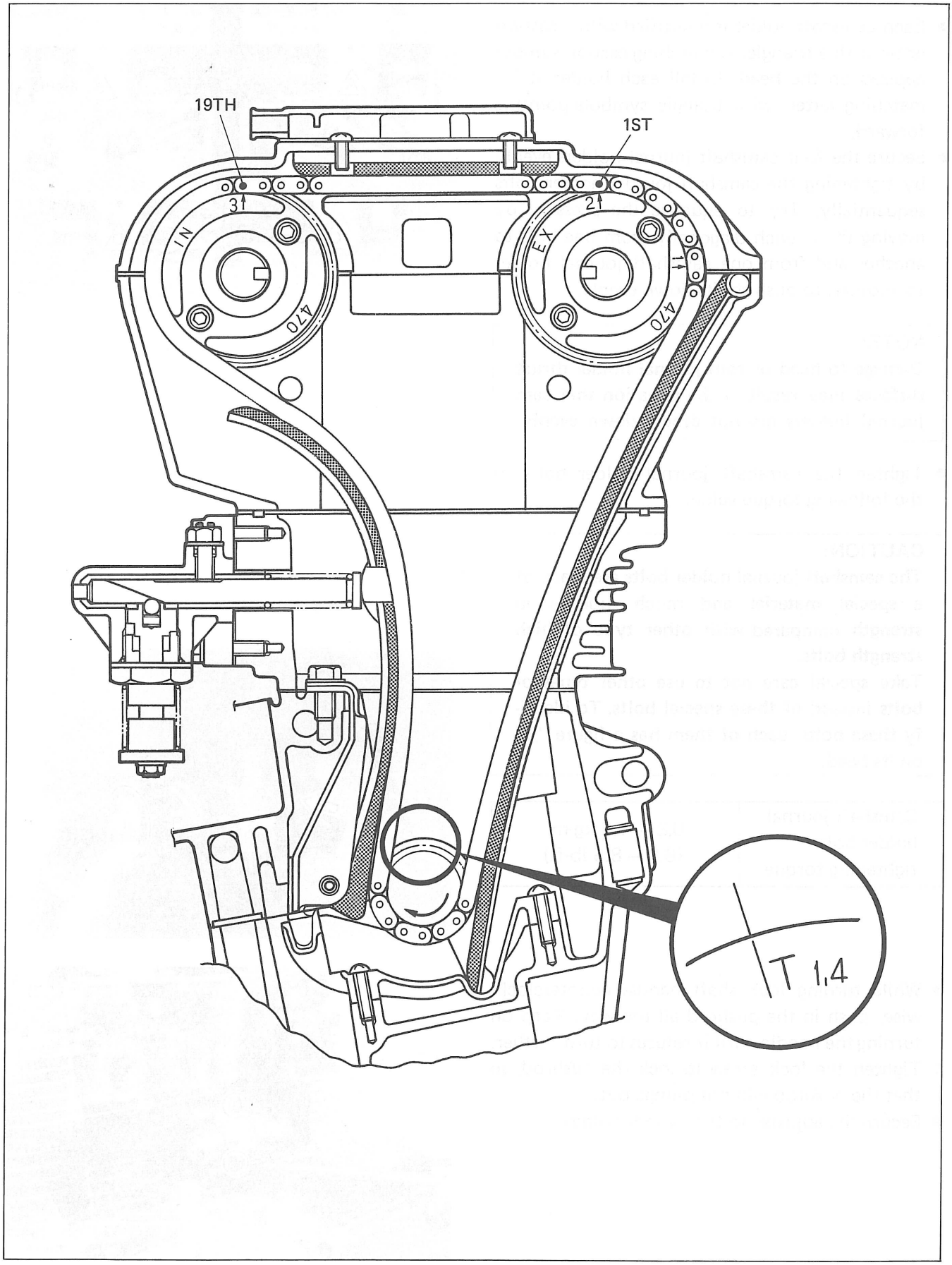
99000 - 25140	SUZUKI Moly Paste

- With "T" mark accurately lined up with the timing mark, hold the crankshaft steady and lightly pull up the chain to remove the slack between the crank sprocket and exhaust sprocket.
- Exhaust sprocket bears an arrow marked "1" indicated as ① . Turn over the exhaust camshaft so that the arrow points flush with the gasketed surface of the cylinder head. Engage the timing chain with this sprocket.
- The other arrow marked "2" is now pointing straight upward. Count the chain roller pins toward the intake camshaft, starting from the roller pin directly above this arrow marked "2" and ending with the 19th roller pin. Engage the chain with intake sprocket, locating the 19th pin at and above the arrow marked "3" on the intake sprocket.

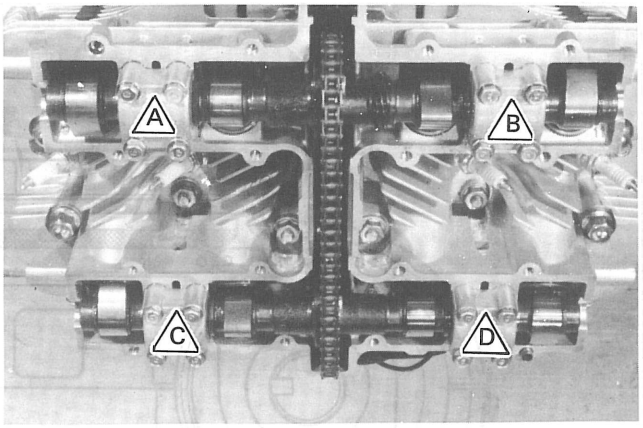




NOTE:
The timing chain is now riding on all three sprockets. Be careful not to disturb the crankshaft until the four holders and chain tensioner adjuster are secured.


19TH
1ST
3
2
IN
EX
A70
A70
T 1,4

- Each camshaft holder is identified with a cast-on letter with a triangle. A matching cast-on symbol appears on the head. Install each holder at it's matching letter, with triangle symbols pointing forward.
- Secure the four camshaft journal holders evenly by tightening the camshaft journal holder bolts sequentially. Try to equalize the pressure by moving the wrench diagonally from one bolt to another and from one camshaft journal holder to another, to push shafts down evenly.

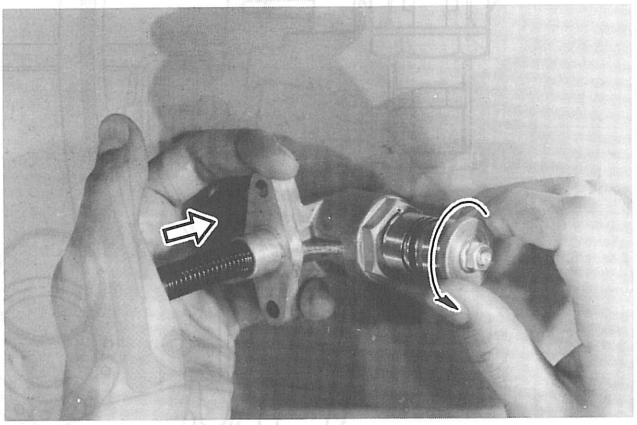


NOTE:
Damage to head or cam journal holder thrust surfaces may result in the situation that cam journal holders are not drawn down evenly.

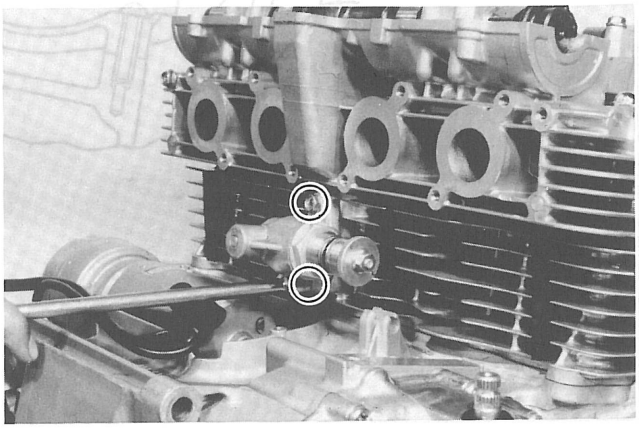
- Tighten the camshaft journal holder bolts to the following torque value:

CAUTION:
The camshaft journal holder bolts are made of a special material and much superior in strength compared with other type of high strength bolts.
Take special care not to use other types of bolts instead of these special bolts. To identify these bolts, each of them has a figure "9" on its head.

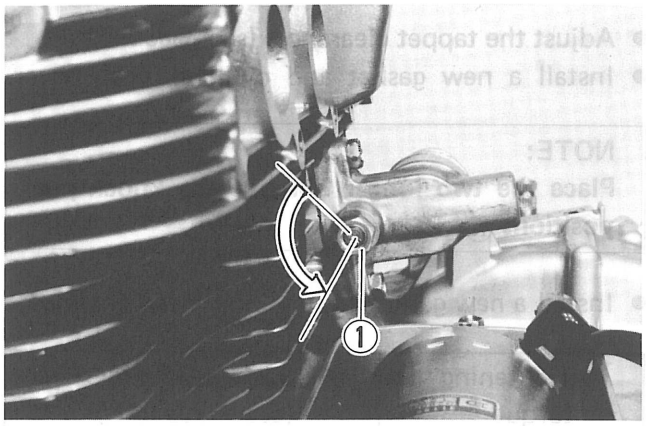
Camshaft journal holder bolt tightening torque	0.8 – 1.2 kg-m (6.0 – 8.5 lb-ft)



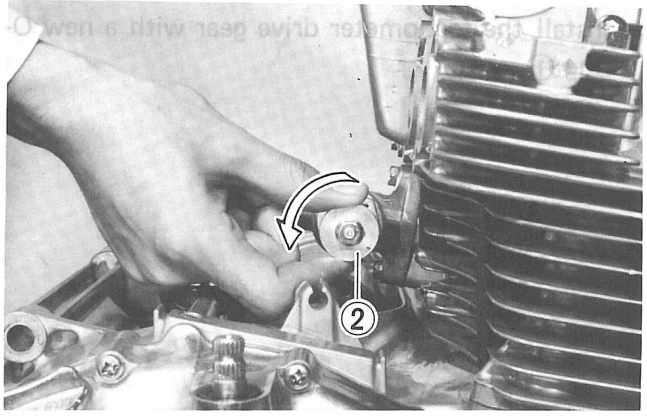
- While turning lock shaft handle counterclockwise, push in the pushrod all the way. Keep on turning the handle until it refuses to turn further.
- Tighten the lock screw to lock the pushrod, so that the pushrod will not plunge out.
- Secure the adjuster to the cylinder block.



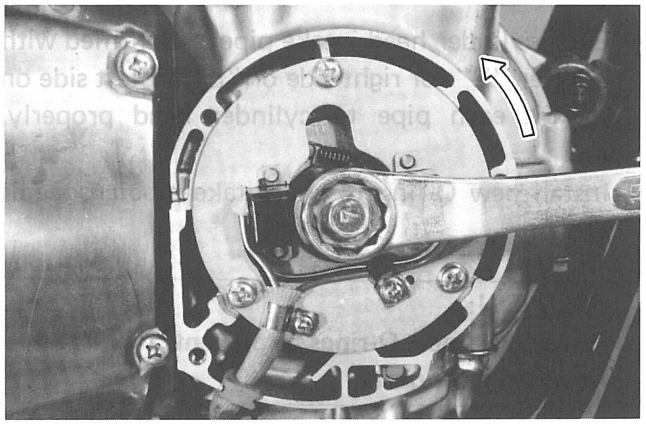
- If tensioner adjuster is not going in, turn the crankshaft slowly clockwise to get chain play at inlet side.
- Withdraw the lock screw by one-quarter to half a turn: this separates the tip of the screw from the pushrod, thereby allowing the pushrod to advance under spring force and to press the tensioner against the camshaft chain.
- Tighten the lock nut ①.

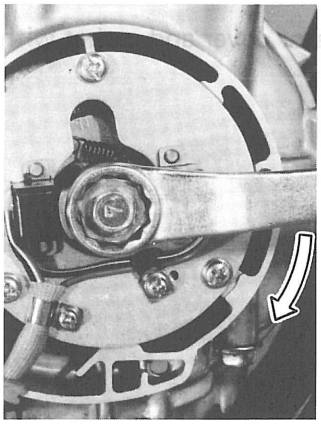


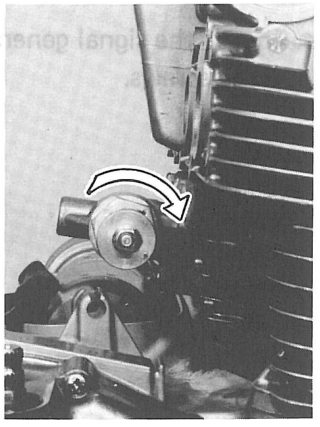
NOTE:
When tightening the lock nut, take care to prevent the lock screw from turning.



- While turning the handle ② counterclockwise, slowly rotate the crankshaft in reverse direction (thus causing the chain to push back the tensioner).
- Release the handle and slowly turn back the crankshaft in normal running direction (to slacken that portion of the chain extending along the tensioner). See if the handle rotates by itself as the chain becomes progressively slackened; if it does, then the pushrod inside is obviously moving forward under spring force as it should, thus signifying that the tensioner is in good operable condition. If the handle rotates, but sluggishly, it means that the pushrod or lock shaft is sticking and, in such a case, remove the tensioner and service the pushrod and lock shaft to make them move smoothly.



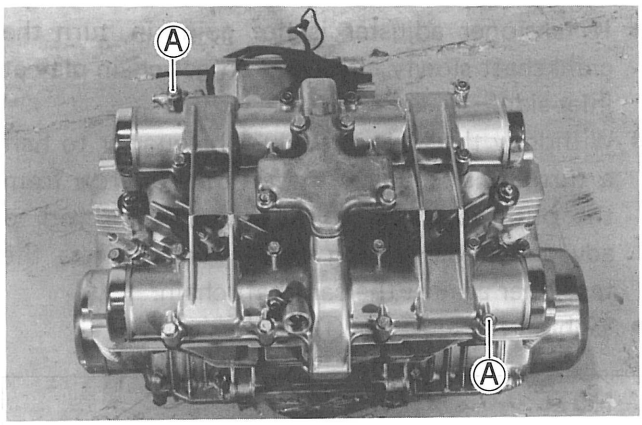




CAUTION:
After installing the tensioner and checking it in initially set condition for operation, do not attempt to turn the handle in either direction until the next overhaul.

- Adjust the tappet clearance. (see page 2-5)
- Install a new gasket and cylinder head cover.

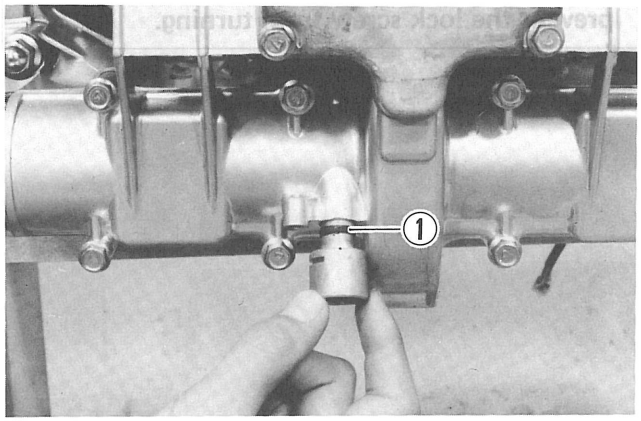
NOTE:
Place the two longer bolts at the knock pin positions Ⓐ .



- Install a new gasket and cylinder head cover cap.

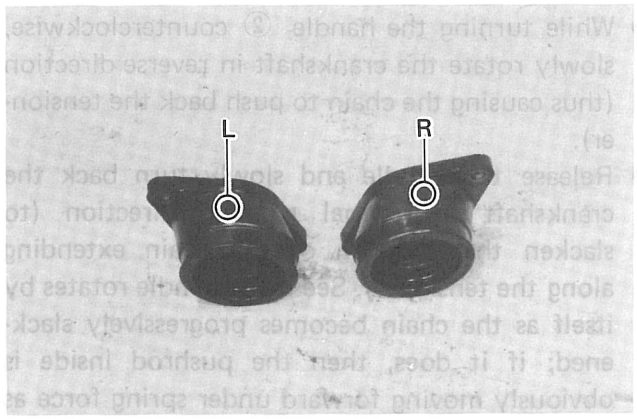
Tightening torque	0.9 – 1.0 kg-m (6.5 – 7.0 lb-ft)

- Install the tachometer drive gear with a new O-ring ① .

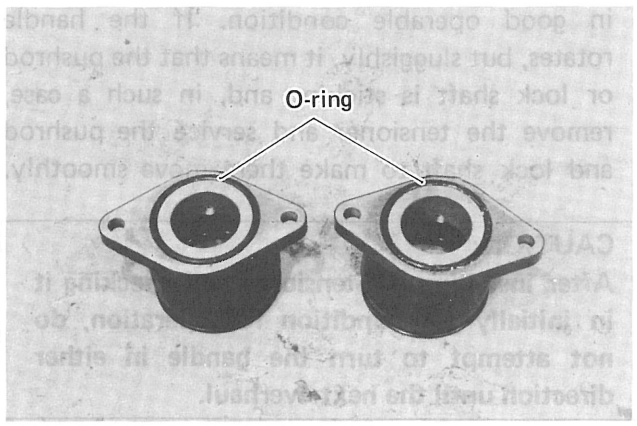


- Each cylinder head intake pipe is identified with a letter "R" for right side or "L" for left side on it. Fit each pipe to cylinder head properly.
- Install new O-ring to the intake pipe groove as shown.

CAUTION:
Always use new O-rings to prevent sucking air from the joint part.



- Install the signal generator cover and gasket with three screws.

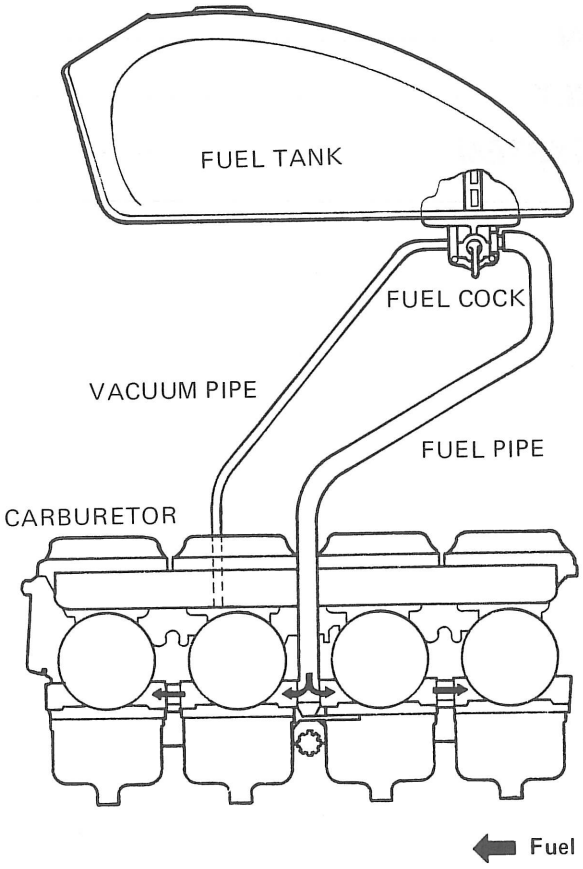


FUEL AND LUBRICATION SYSTEM

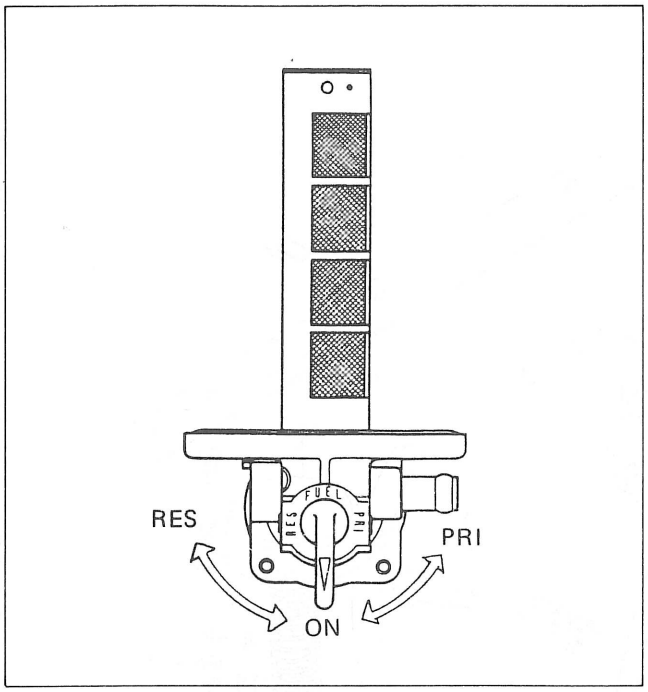
CONTENTS

FUEL SYSTEM

When engaging starter motor, negative pressure is generated in the combustion chamber. This negative pressure works on the diaphragm of fuel cock through passageway provided in the carburetor main bore and vacuum pipe, and diaphragm builds up a negative pressure which is higher than the spring pressure. Fuel valve is forced to open due to diaphragm operation, and thus allow fuel to flow into carburetor float chamber.

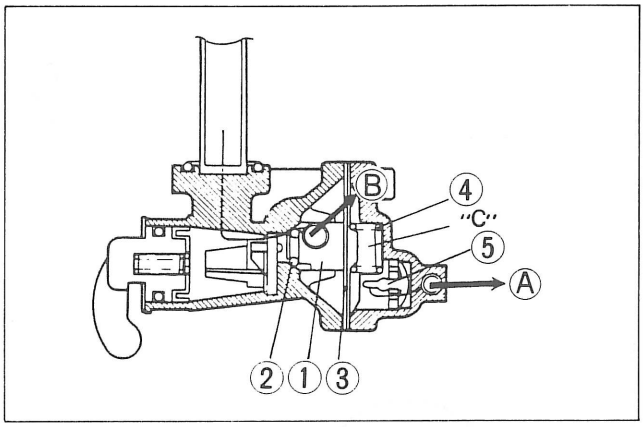


FUEL COCK



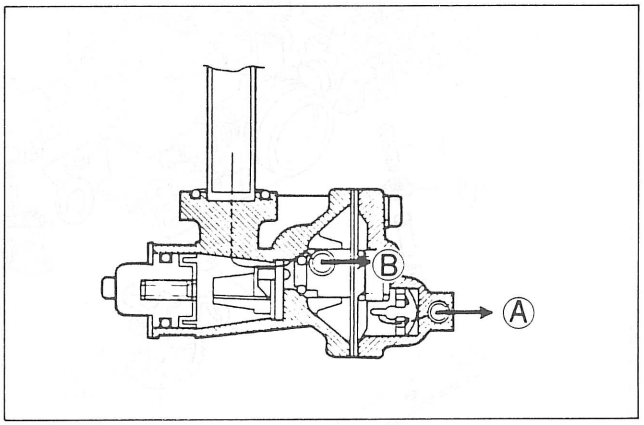
When the engine is not running and the valve in the ON or RES position, the fuel valve is kept in the closed position by applying pressure utilizing a spring so that no fuel will flow to the carburetors. When the engine is engaged, a negative pressure is generated in the diaphragm chamber "C" through the vacuum (negative pressure) pipe which is connected to the No. 2 carburetor, and builds up a negative pressure which is higher than the spring pressure so that the diaphragm is forced to open the fuel valve and thus allow the fuel to flow to the carburetors.

When the lever is set to PRI position, the protrusion ⑥ located on the lever end pushes back the fuel valve mechanically against the spring force and it allows fuel to flow to the carburetors directly, whether the engine is running or not, through the RES side fuel filter and fuel valve clearance.

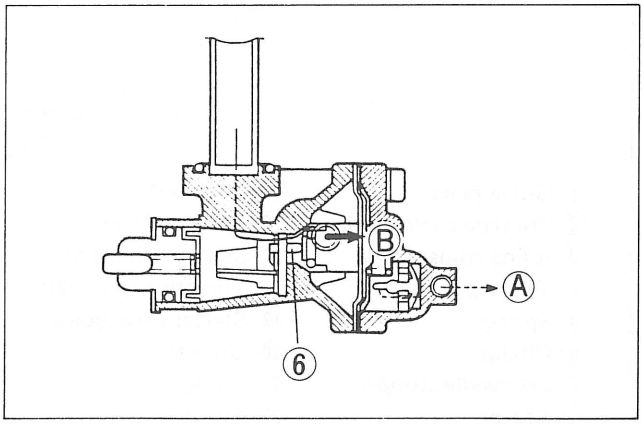


"ON"

① Fuel valve ② O-ring ③ Diaphragm
④ Spring ⑤ One way valve
Ⓐ Vacuum Ⓑ Fuel flow

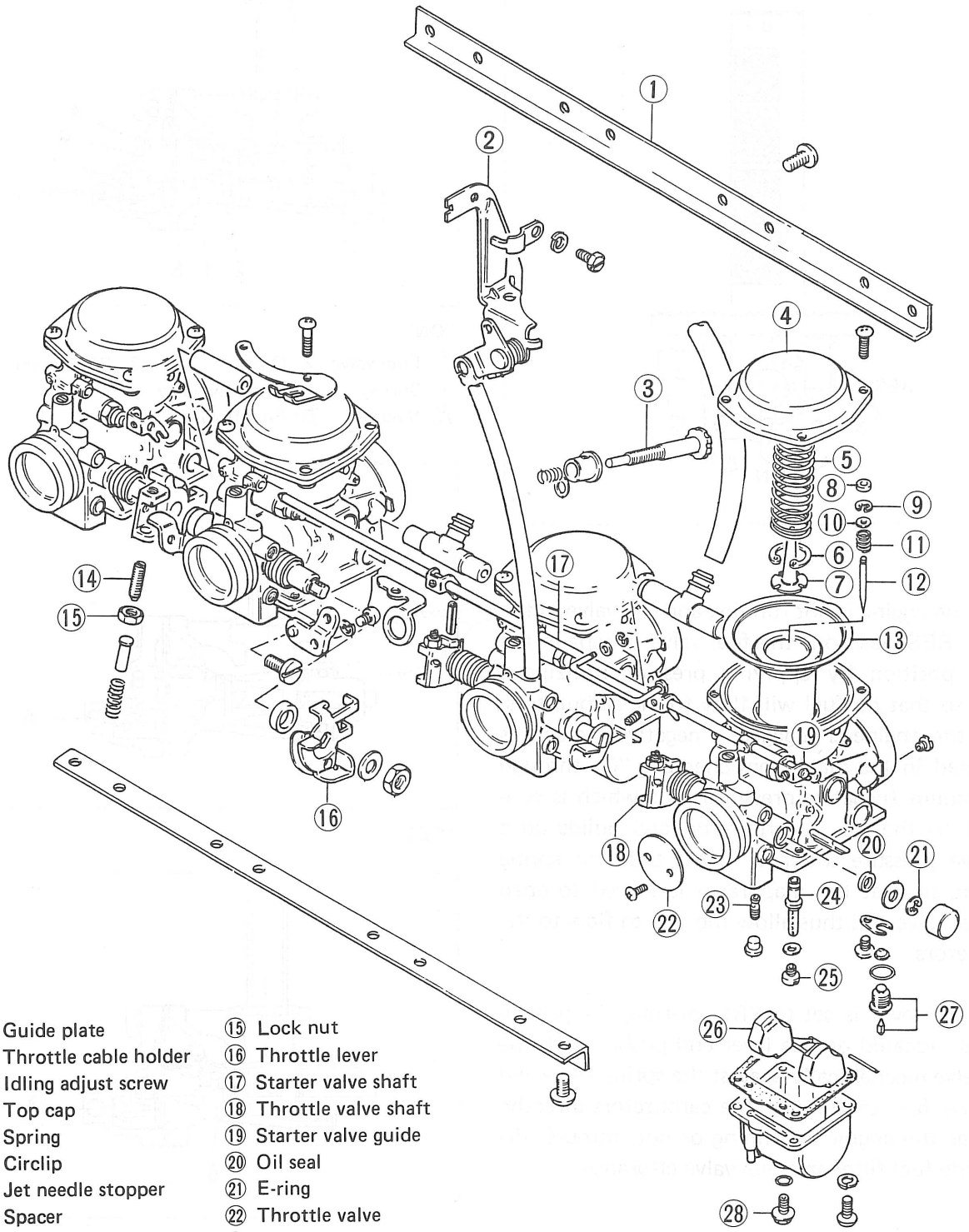


"RES"



"PRI"

CARBURETOR

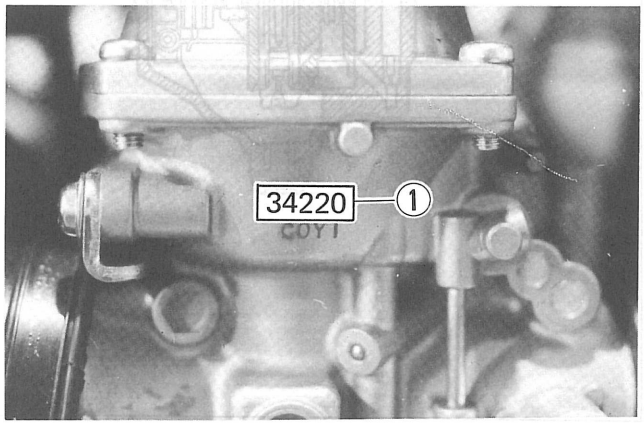


① Guide plate
② Throttle cable holder
③ Idling adjust screw
④ Top cap
⑤ Spring
⑥ Circlip
⑦ Jet needle stopper
⑧ Spacer
⑨ Clip
⑩ Washer
⑪ Spring
⑫ Jet needle
⑬ Diaphragm and piston
⑭ Synchronizer screw
⑮ Lock nut
⑯ Throttle lever
⑰ Starter valve shaft
⑱ Throttle valve shaft
⑲ Starter valve guide
⑳ Oil seal
㉑ E-ring
㉒ Throttle valve
㉓ Pilot jet
㉔ Needle jet
㉕ Main jet
㉖ Float
㉗ Needle valve
㉘ Drain plug

SPECIFICATIONS

ITEM	SPECIFICATIONS
Type	MIKUNI BS32SS
I.D. No.	34220
Bore	32 mm (1.26 in)
Idle r/min	1 100 ± 100 r/min
Fuel level	5.0 ± 0.5 mm (0.20 ± 0.02 in)
Float height	22.4 ± 1.0 mm (0.88 ± 0.04 in)
Main jet	#97.5
Main air jet	2.0 mm
Jet needle	5C45
Needle jet	Y-7
Pilot jet	#42.5
By pass	0.8, 0.7, 0.8 mm
Pilot outlet	0.7 mm
Valve seat	2.0
Starter jet	# 47.5
Pilot screw	Pre-set
Throttle cable play	0.5 – 1.0 mm (0.02 – 0.04 in)
Choke cable play	0.5 – 1.0 mm (0.02 – 0.04 in)

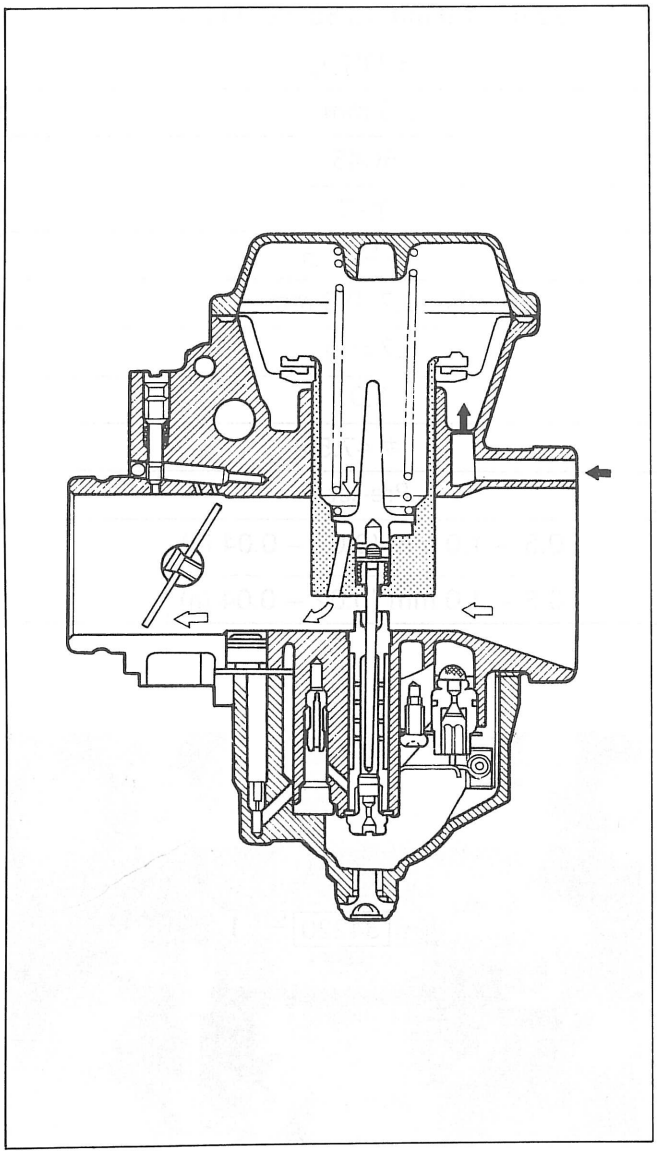
Each carburetor has I.D. Number ① printed on the carburetor body according to its specifications.

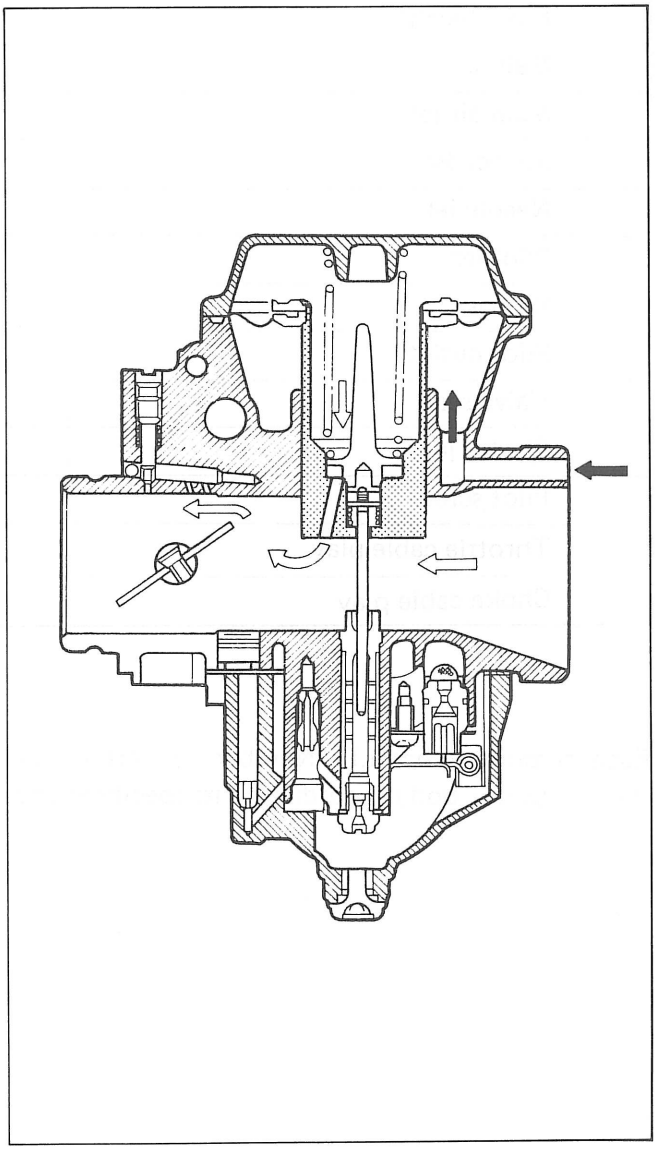


DIAPHRAGM AND PISTON OPERATION

The carburetor is of a variable-venturi type, whose venturi cross section area is increased or decreased automatically by the piston according to the vacuum present on the downstream side of the venturi. Vacuum is admitted into the diaphragm chamber through an orifice provided in the piston.

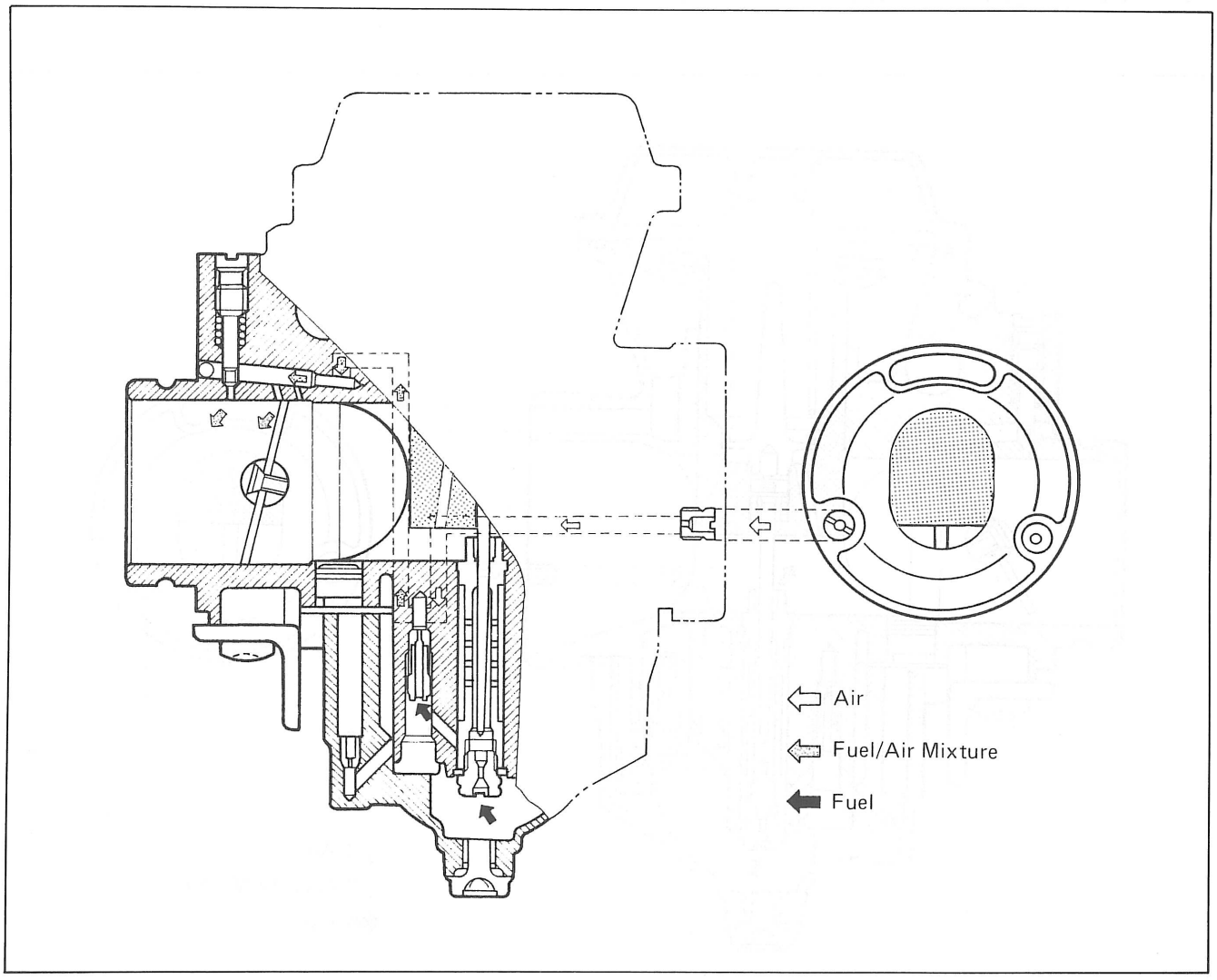
Rising vacuum overcomes the spring force, causing the piston to rise to increase the said area and thus to prevent the air velocity from increasing. Therefore, air velocity in the venturi passage is kept relatively constant for improved fuel atomization and for securing an optimum ratio of fuel to air in the mixture.





SLOW SYSTEM

This system supplies fuel during engine operation with throttle valve closed or slight opened.
The fuel from float chamber is first passed through main jet and metered by pilot jet where it mixes with air coming in through pilot air jet.
This mixture, rich with fuel, then goes up through pilot pipe to pilot screw. A part of the mixture is discharged into the main bore out of bypass ports. The remainder is then metered by pilot screw and sprayed out into the main bore through pilot outlet.



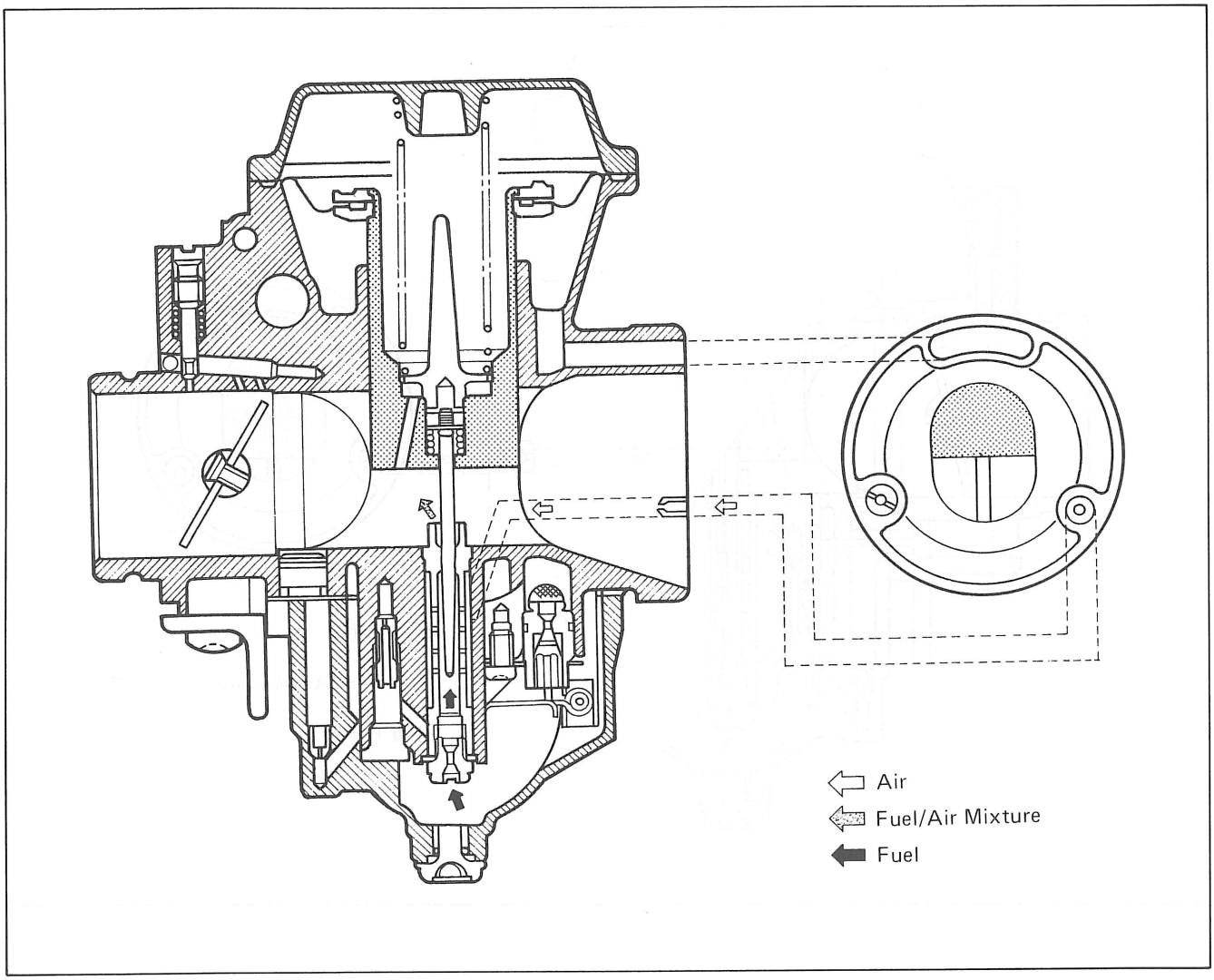
MAIN SYSTEM

As throttle valve is opened, engine speed rises, and this increases vacuum in the venturi. Consequently the piston valve moves upward.

Meanwhile, the fuel in float chamber is metered by main jet, and the metered fuel enters needle jet, in which it mixes with the air admitted through main air jet to form an emulsion.

The emulsified fuel then passes through the clearance between needle jet and jet needle, and is discharged into the venturi, in which it meets main air stream being drawn by the engine.

Mixture proportioning is accomplished in needle jet; the clearance through which the emulsified fuel must flow is either large or small, depending ultimately on throttle position.

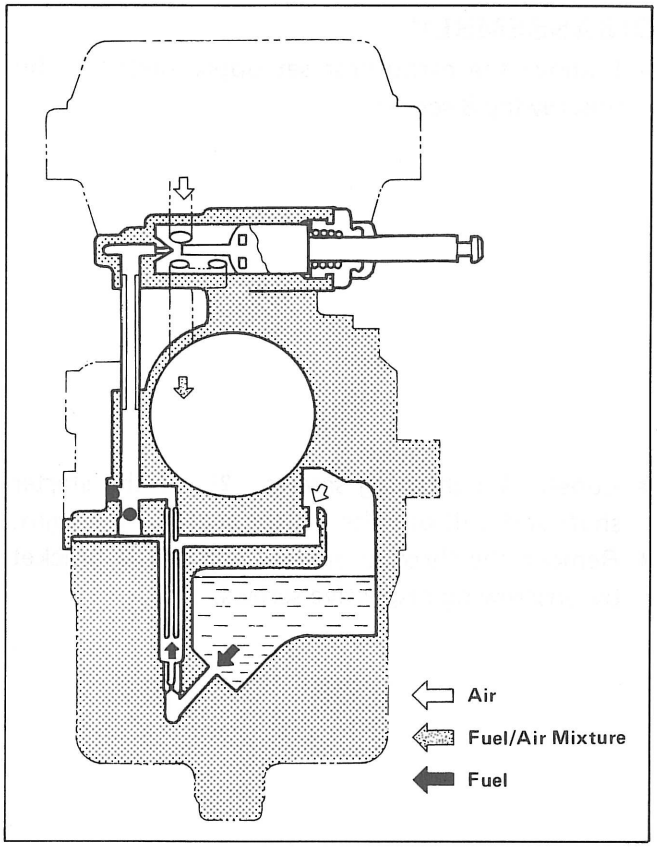


STARTER SYSTEM

Pulling up the choke knob allows the starting plunger to draw fuel into the starter circuit from the float chamber through starter jet.

Starter jet meters this fuel, which then flows into starter pipe and mixes with the air coming from the float chamber. The mixture, rich in fuel content, reaches starting plunger and mixes again with the air coming through a passage extended from behind the diaphragm.

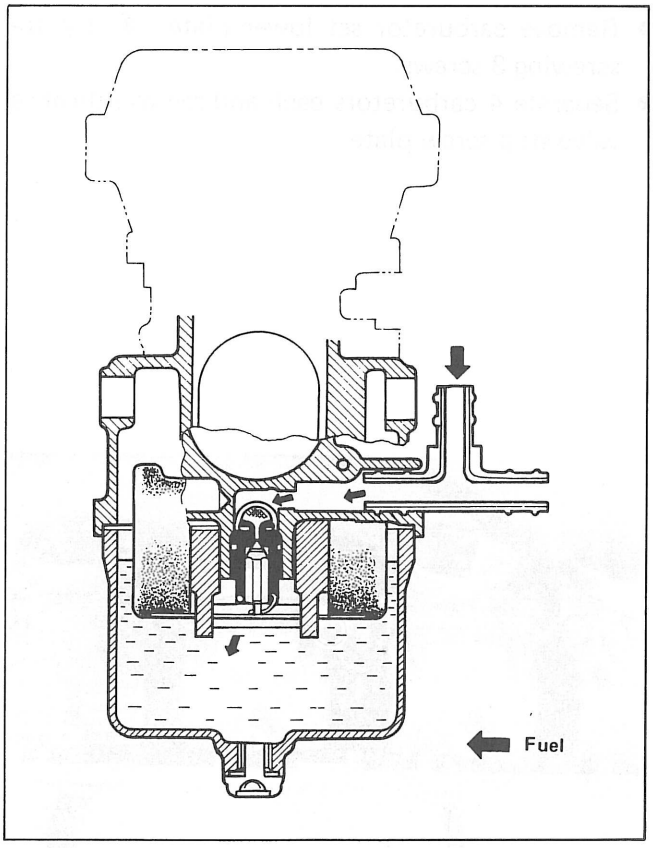
The two successive mixings of fuel with air are such that proper air/fuel mixture for starting is produced when the mixture is sprayed out through starter outlet into the main bore.



FLOAT SYSTEM

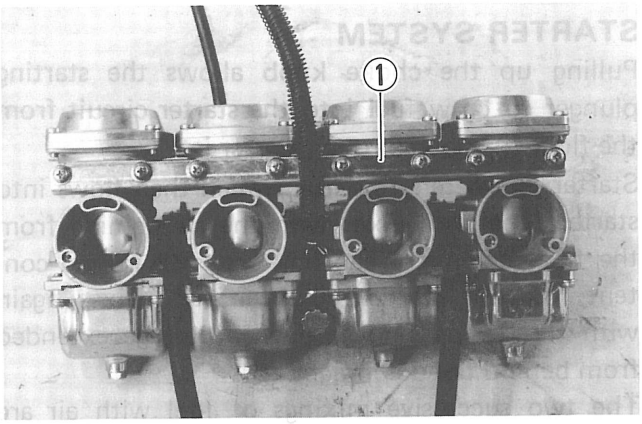
Floats and needle valve are associated with the same mechanism, so that, as the floats move up and down, the needle valve too moves likewise. When fuel level is up in float chamber, floats are up and needle valve remains pushed up against valve seat. Under this condition, no fuel enters the float chamber.

As the fuel level falls, floats go down and needle valve unseats itself to admit fuel into the chamber. In this manner, needle valve admits and shuts off fuel alternately to maintain a practically constant fuel level inside the float chamber.

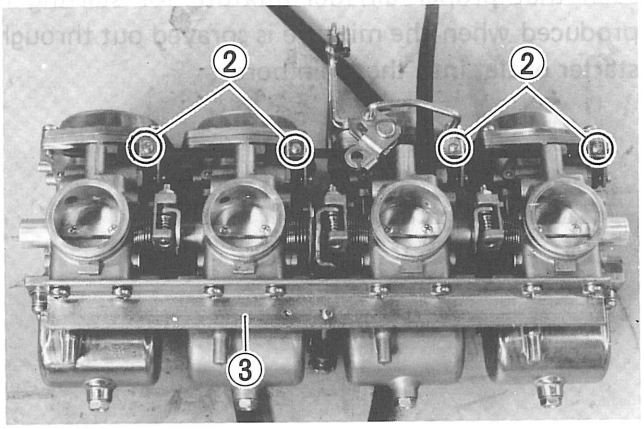


DISASSEMBLY

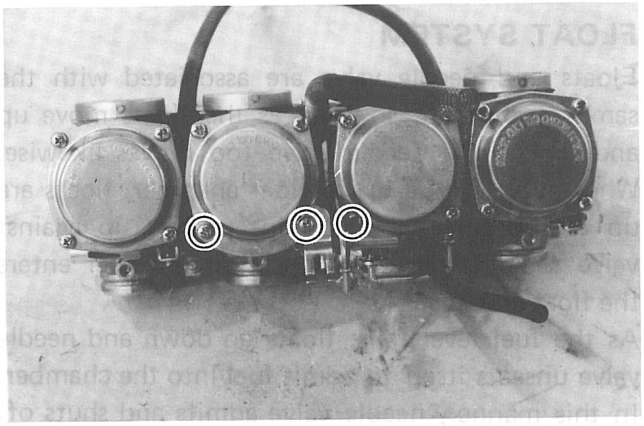
- Remove the carburetor set upper plate ① by unscrewing 8 screws.

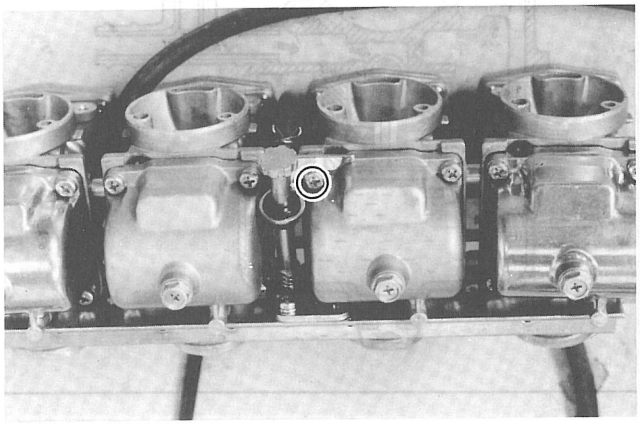


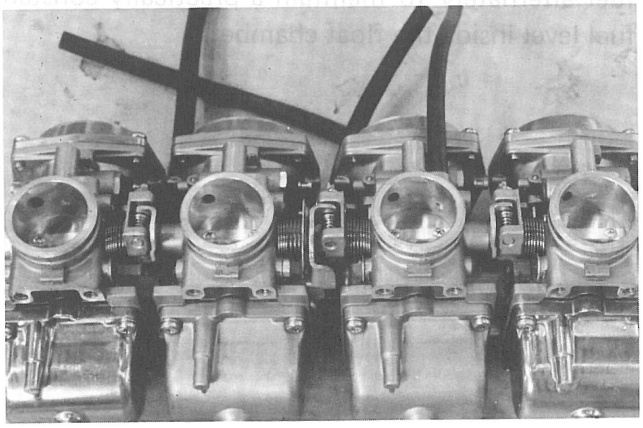
- Loosen 4 tightening screws ② of the starter shaft and pull out the starter shaft to the right.
- Remove the throttle bracket and starter bracket by unscrewing respective screws.



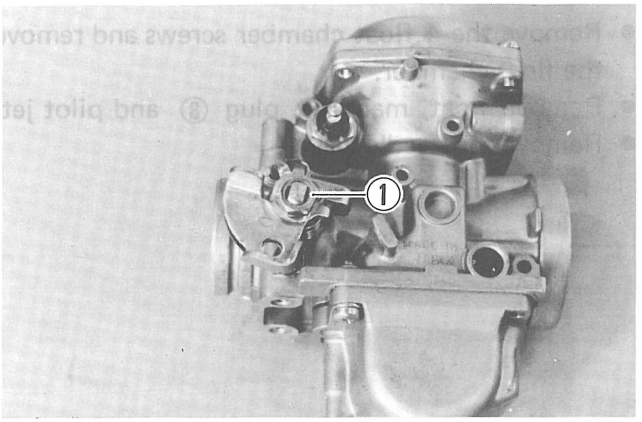
- Remove carburetor set lower plate ③ by unscrewing 8 screws.
- Separate 4 carburetors each and remove throttle valve stop screw plate.





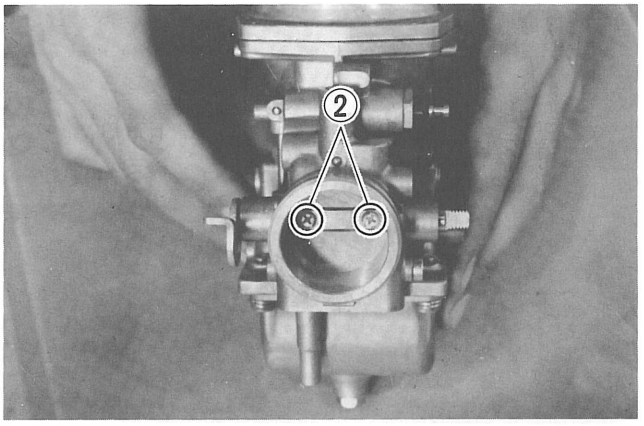


- Take off the adjuster lever by removing nut ① .

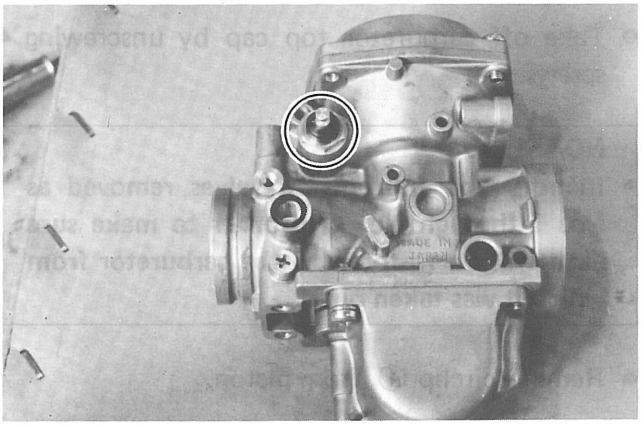


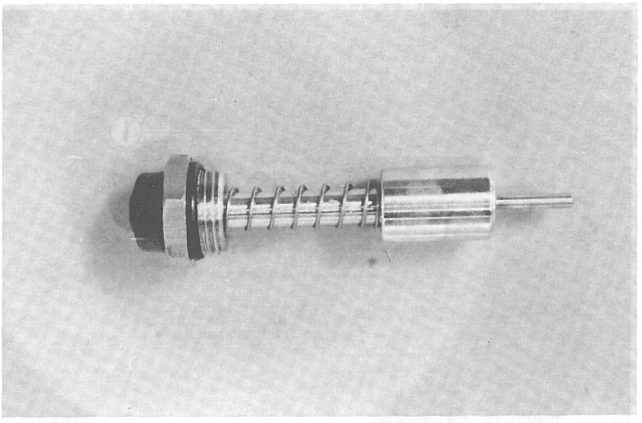
- Remove two throttle valve screws ② , and pull out the valve by turning throttle valve shaft.

CAUTION:
These two screws are locked by punching its end. Once removing the screws, they will be damaged.

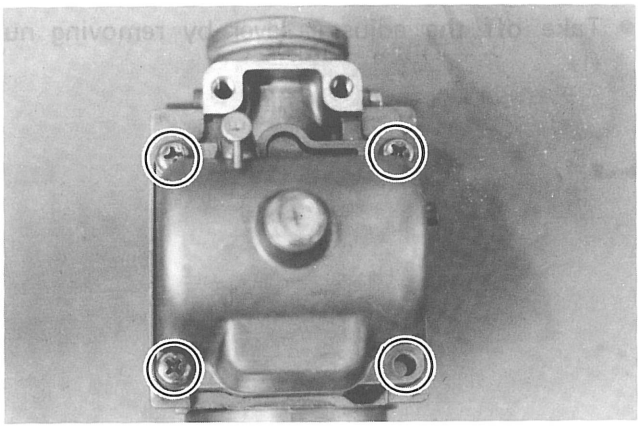


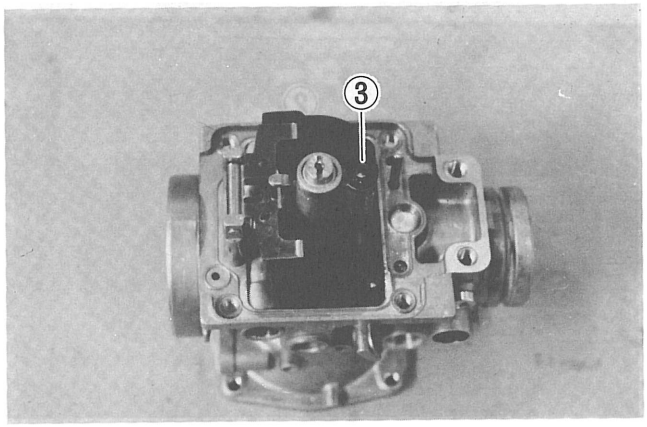
- Remove the starter valve from the carburetor body.

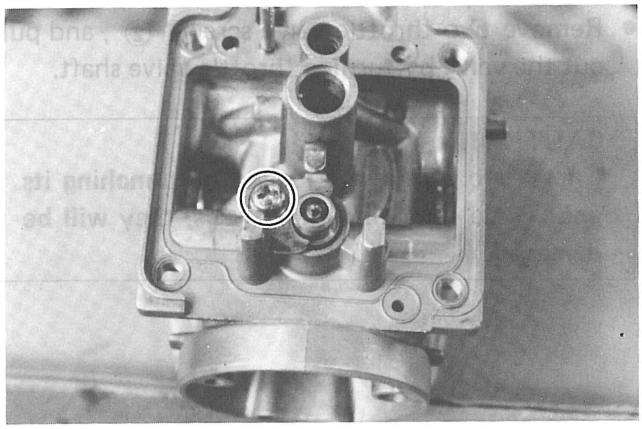




- Remove the 4 float chamber screws and remove the float chamber.
- Remove float, main jet, plug ③ and pilot jet.
- Remove the needle valve.

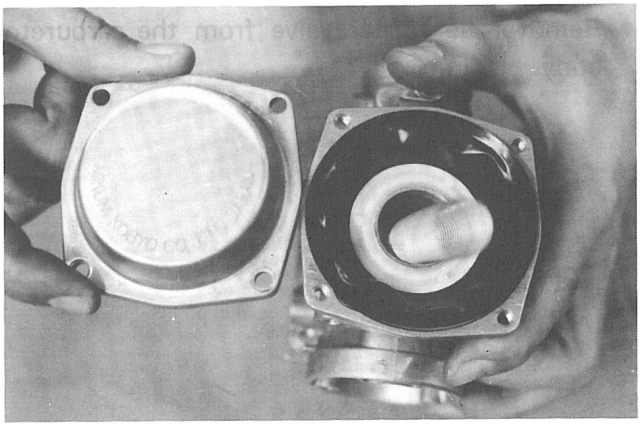




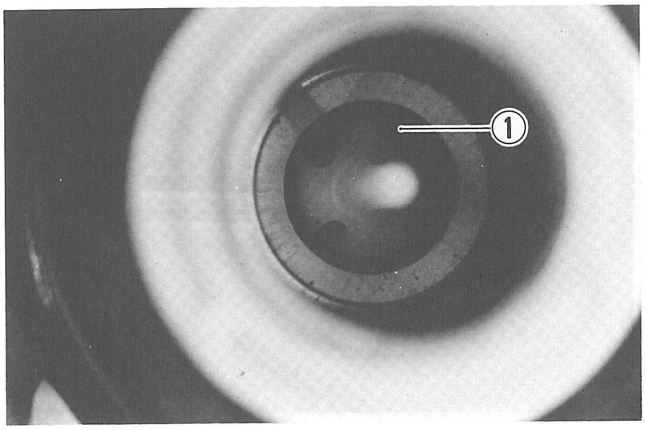


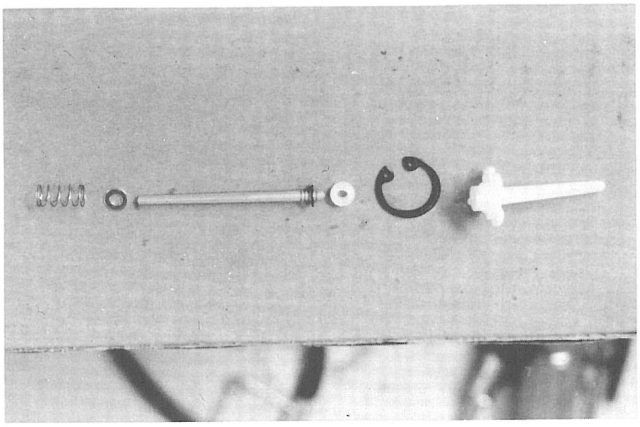
- Take off carburetor top cap by unscrewing 4 screws.

NOTE:
Identify the four piston valves removed as No. 1 through No. 4 in order to make sure each will be restored to the carburetor from which it was taken out.



- Remove circlip ① from piston.

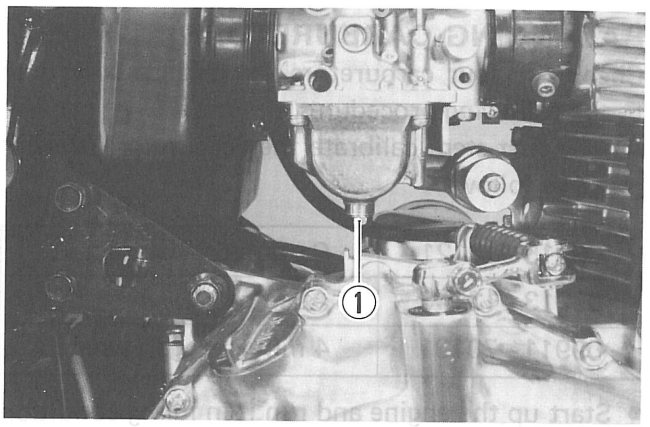




FUEL LEVEL INSPECTION

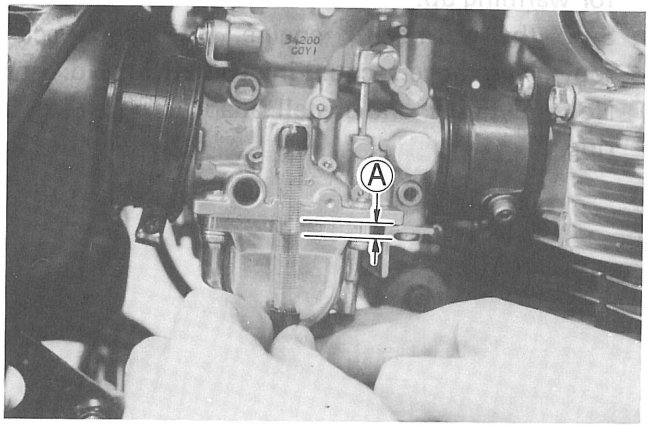
- Place machine on center stand.
- Remove carburetor drain plug and install the fuel level gauge ① .

09913 - 14511	Fuel gauge set



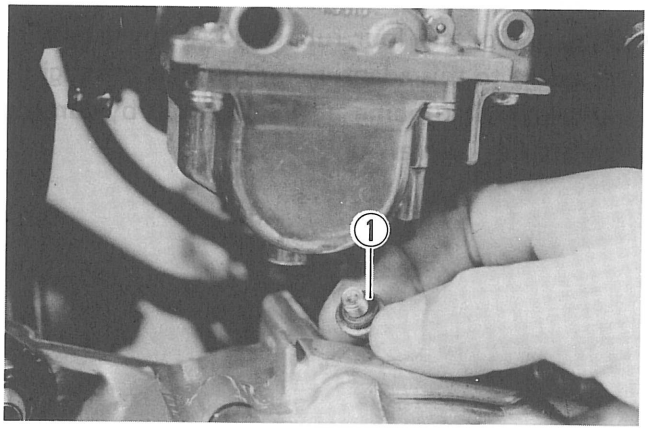
- Run the engine at the idling speed (1 000 – 1 200 r/min), and measure the distance with the middle line of the level gauge aligned with the lower surface of carburetor body as shown in photo. Ⓐ should be within the specified range.

Distance Ⓐ	5.0 ± 1.0 mm (0.20 ± 0.04 in)



- Repeat the procedure on each carburetor.

NOTE:
When refitting the screw, be sure to use the "O" ring ① .



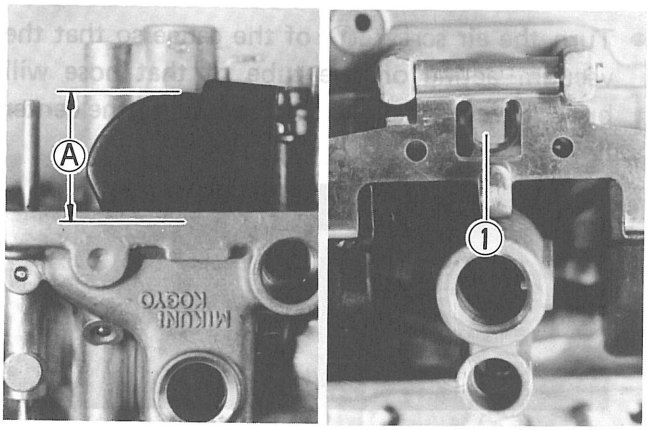
- If fuel level readjustment is necessary, see the following procedure to adjust the float height.

FLOAT HEIGHT ADJUSTMENT

To check the float height, invert the carburetor body holding the float arm pin so that the pin will not slip off. With the float arm kept free, measure the height Ⓐ while float arm is just in contact with needle valve by using the calipers. Bend the tongue ① as necessary to bring the height Ⓐ to this value.

NOTE:
Be sure to have the gasket removed before measuring the height.

Float height	22.4 ± 1.0 mm (0.88 ± 0.04 in)

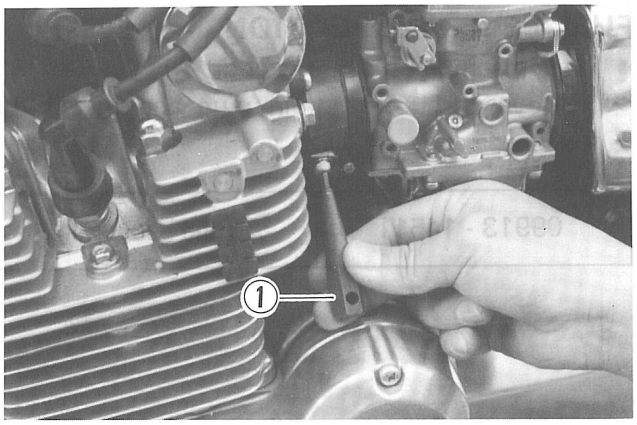


BALANCING CARBURETORS

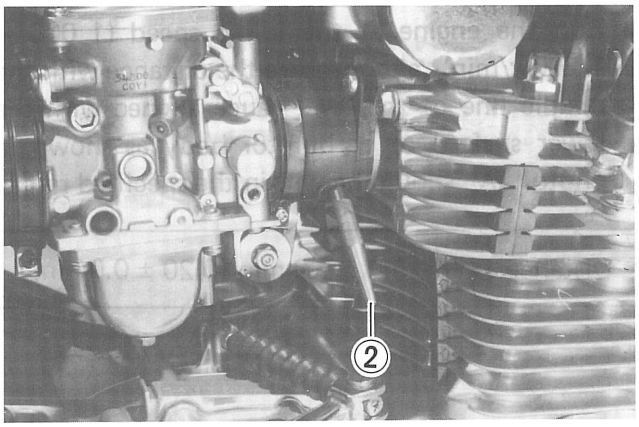
Check the four carburetors for balance according to the following procedures.

As the first step, calibrate the carburetor balancer gauge as follows:

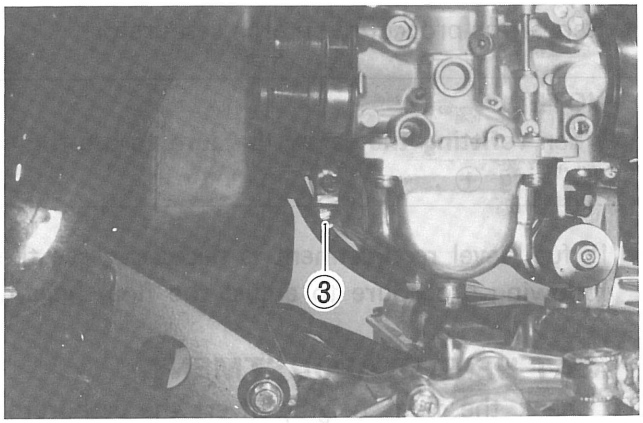
09913 - 13121	Carburetor balancer
09913 - 13140	Adaptor
09911 - 70131	4 mm Hexagon wrench



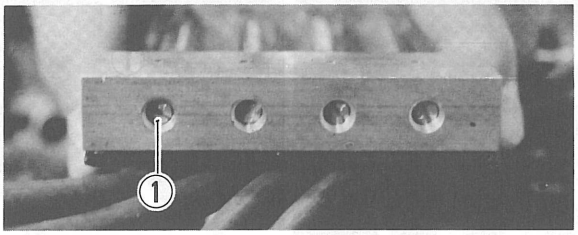
- Start up the engine and run it in idling condition for warming up.
- Stop the warmed-up engine. By using special tool ① , remove vacuum inlet screw for No. 1 or No. 4 cylinder and install adaptor ② with O ring.

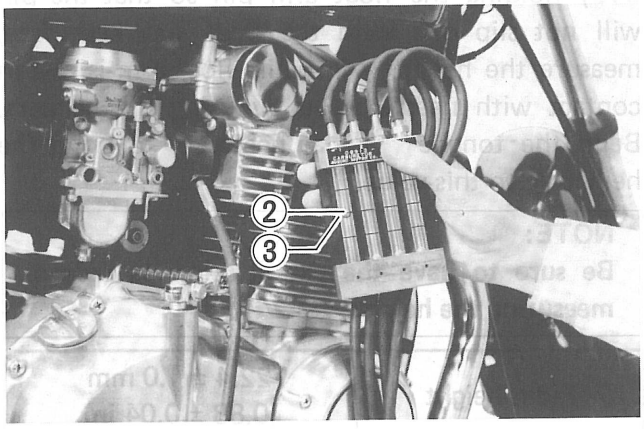


- Plug one of the four rubber hoses of the balancer gauge to this adaptor, and start up the engine, and keep it running at 1 750 r/min by turning throttle stop screw ③ .

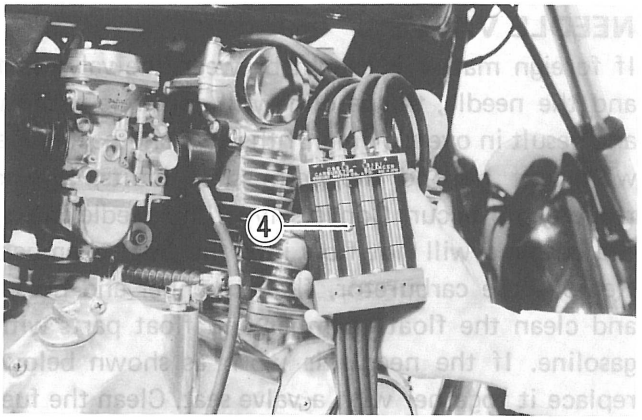


- Turn the air screw ① of the gauge so that the vacuum acting on the tube of that hose will bring the steel ball ② in the tube to the center line ③ .



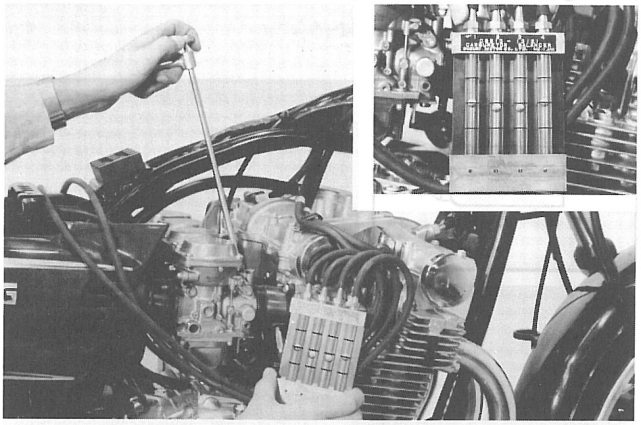


- After making sure that the steel ball stays steady at the center line, disconnect the hose from the adaptor and connect the next hose to the adaptor. Turn air screw to bring the other steel ball ④ to the center line.
- Repeat the process on the third and fourth tubes. The balancer gauge is now ready for use in balancing the carburetors.



Remove the respective vacuum inlet screws and insert the adaptors in the holes. Connect the balancer gauge hoses to these adaptors, one hose to one adaptor, and balance the four carburetors as follows:

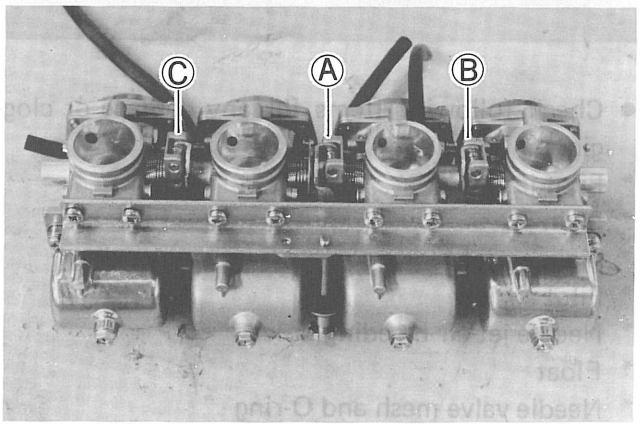
- Start up the engine, and keep it running at 1 750 r/min.
- A correctly adjusted carburetor has the steel balls in the Nos. 1 and 4 tubes at the same level, and those in the Nos. 2 and 3 tubes also at the same level, but lower by one half of the ball diameter than the Nos. 1 and 4 tubes as shown.
- If the steel balls are not in line positions, adjust the throttle valve adjusting screw correctly by using throttle valve adjust wrench.



09913 - 14911	Throttle valve adjust wrench

Adjusting order:

Ⓐ (for No. 2 Carb) → Ⓑ (for No. 1) → Ⓒ (for No. 4)

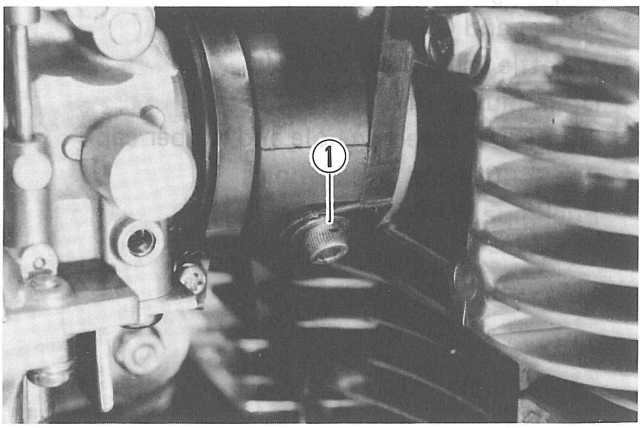


NOTE:

*** If an adjustment is required, it is suggested that the fuel tank is removed, and fuel should be supplied by a separate fuel tank.**

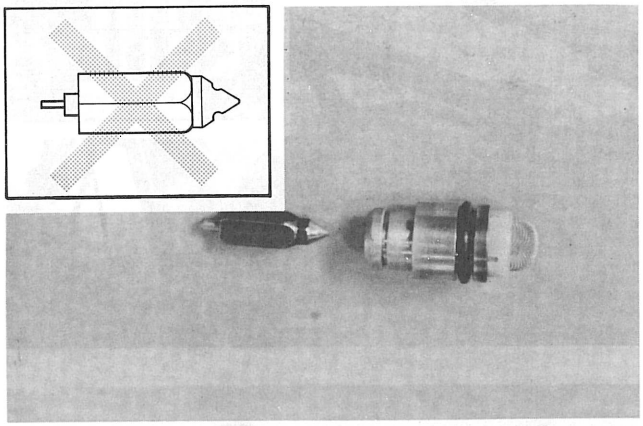
*** Be sure to plug the fuel cock vacuum line.**

*** Each vacuum inlet screw has a gasket. Be careful not to leave out this gasket ① .**



NEEDLE VALVE

If foreign matter is caught between the valve seat and the needle, the gasoline will continue to flow and result in overflowing. If the seat and needle are worn out beyond the permissible limits, similar trouble will occur. Conversely, if the needle sticks, the gasoline will not flow into the float chamber. Remove the carburetor, float chamber and floats, and clean the float chamber and float parts with gasoline. If the needle is worn as shown below, replace it together with a valve seat. Clean the fuel passage of the mixing chamber with compressed air.

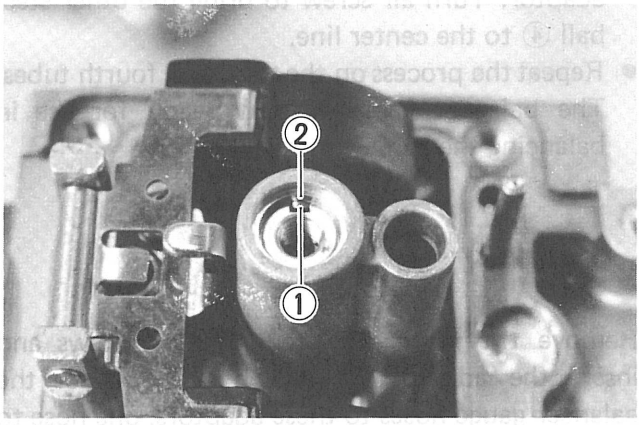


- Check following items for any damage or clogging.

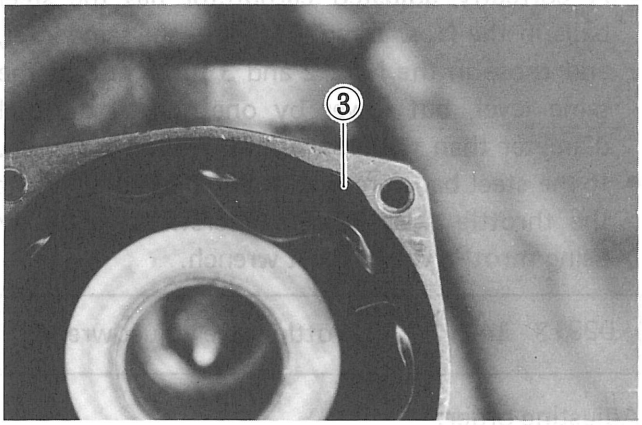
* Pilot jet
* Main jet
* Main air jet
* Pilot air jet
* Needle jet air bleeding holes
* Float
* Needle valve mesh and O-ring
* Diaphragm
* Gasket and O-ring
* Throttle valve shaft oil seals
* Drain plug O-ring
* Pilot screw bleeding hole and rubber cap
* Pilot outlet and bypass holes
* Fuel pipe O-rings

REASSEMBLY

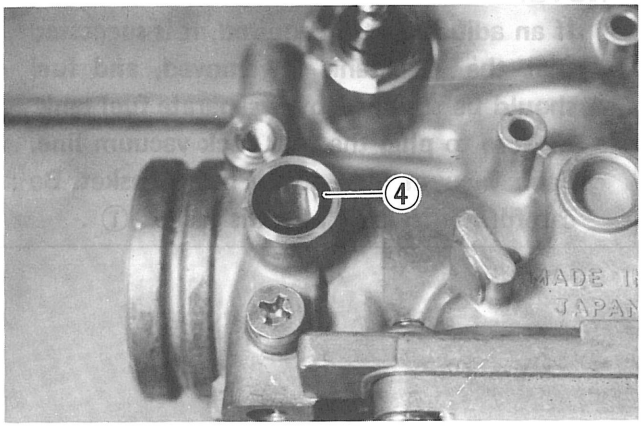
- Align the groove ① of the needle jet with the pin ② and replace it.



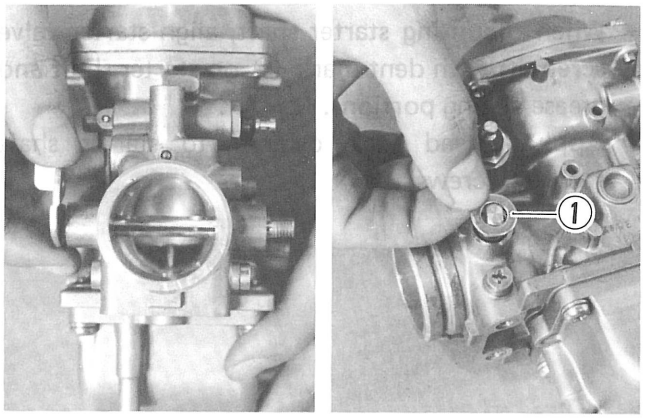
- Place tongue ③ of diaphragm to carburetor body properly.



- When fitting throttle valve shaft oil seals, groove should be faced outside ④ .

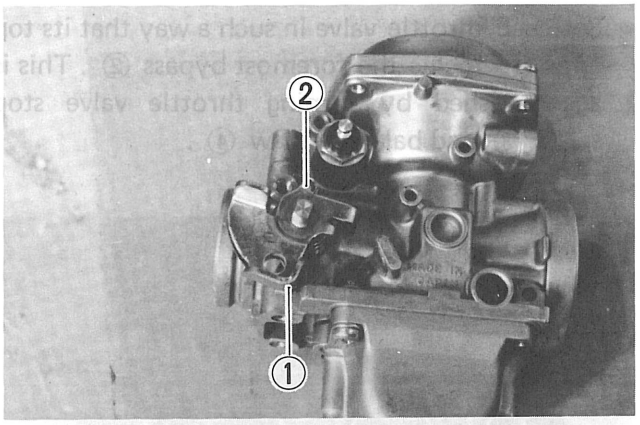


- Set the throttle valve shaft and install the washer ① as shown.

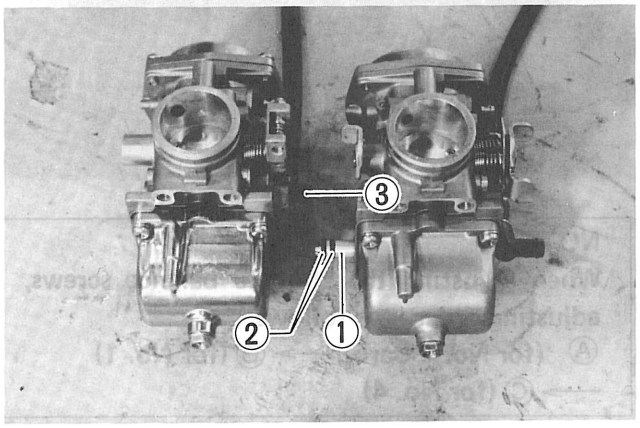


- Hook one end of spring to the boss ① , turn the other end ② clockwise by one turn, and hook it to the cable guide properly.
  Tighten lock nut and bend up lock washer.
- Apply thread lock "1342" to two screws for securing throttle valve.

99000-32050	Thread lock "1342"

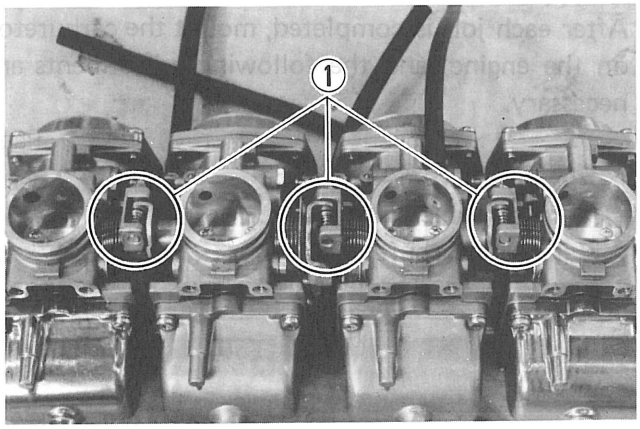


- When engaging four carburetors, be sure to fix fuel pipe ① with four O-rings ② and breather connector ③ properly.

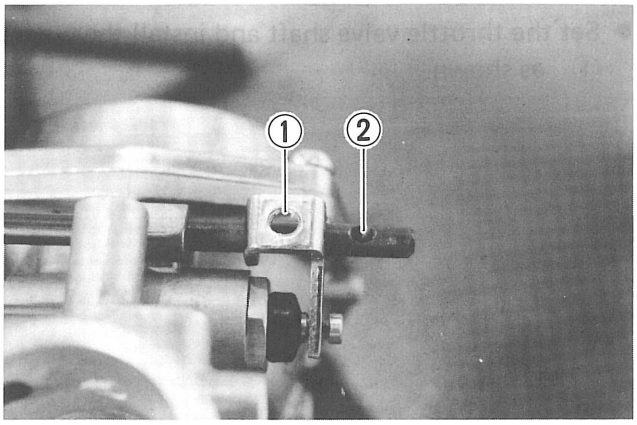


- Position throttle valve control lever ① correctly.
- Apply thread lock cement to lower bracket screws.
- Apply thread lock cement to the upper bracket screws.

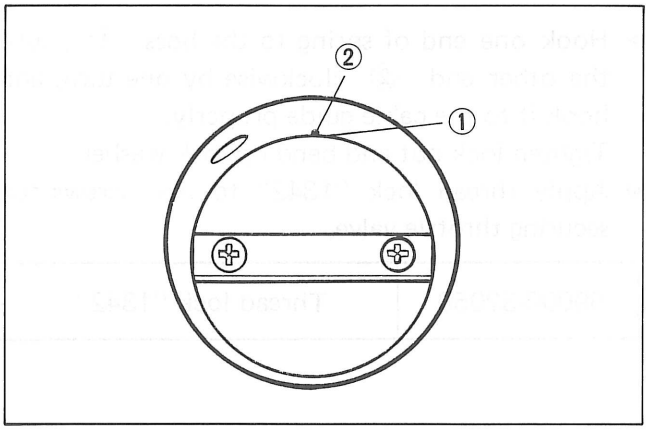
99000 - 32040	Thread lock cement

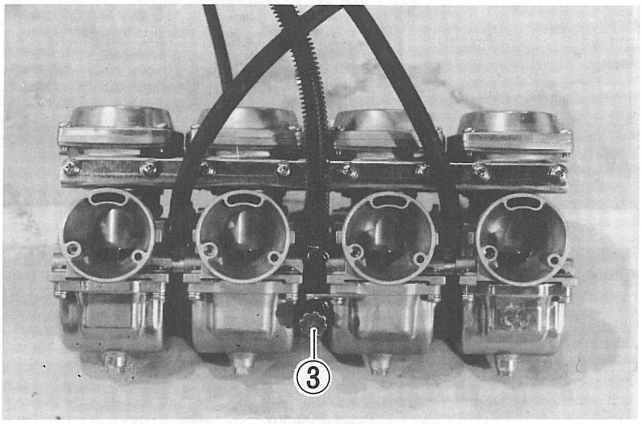


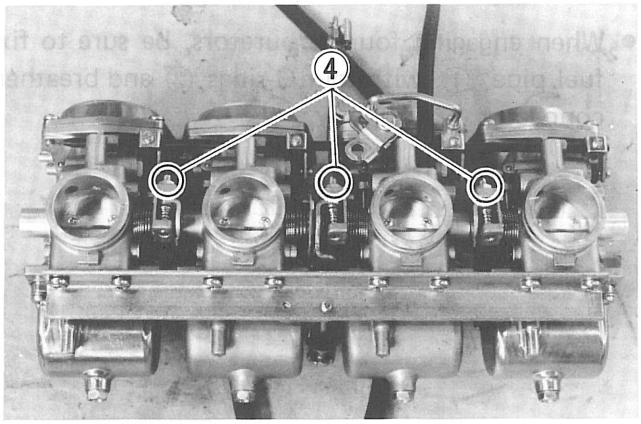
- When mounting starter shaft, align starter valve screw ① with dent mark ② on starter shaft and grease sliding portions.
- Apply thread lock cement to starter shaft securing screws.



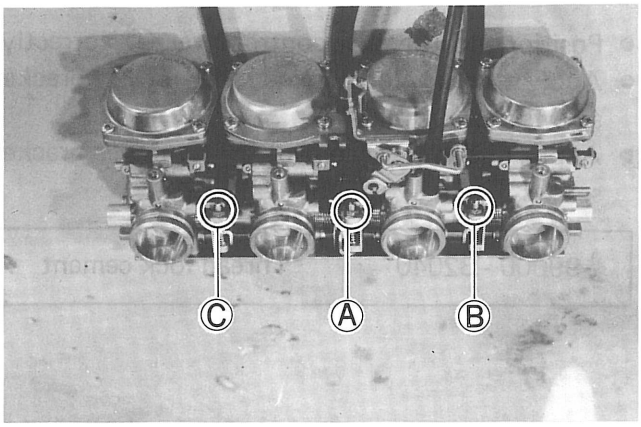
- Set each throttle valve in such a way that its top end ① meets the foremost bypass ② . This is accomplished by turning throttle valve stop screw ③ and balance screw ④ .







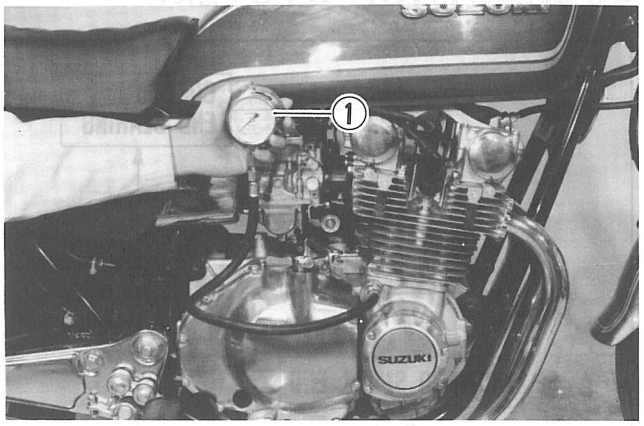
NOTE:
When adjusting the throttle balance screws, adjusting order is as follows:
Ⓐ (for No. 2 Carb.) ⟶ Ⓑ (for No. 1) ⟶ Ⓒ (for No. 4)



After each job is completed, mount the carburetor on the engine, and the following adjustments are necessary.

LUBRICATION SYSTEM

OIL PRESSURE



Start the engine and check if the oil pump pressure indicator light is turned on. If it keeps on lighting, check the oil pump pressure indicator light circuit. If it is in good condition, check the oil pump pressure in the following manner:

- Remove the oil pressure inspection plug from right side of the engine.
- Install the oil pressure gauge ① in the position shown in the figure.
- Warm up the engine as follows:
  Summer 10 min. or so at 2 000 r/min
  Winter 20 min. or so at 2 000 r/min
- After warming up operation, increase the engine speed to 3 000 r/min, and read the oil pressure gauge.

Oil pump pressure specification

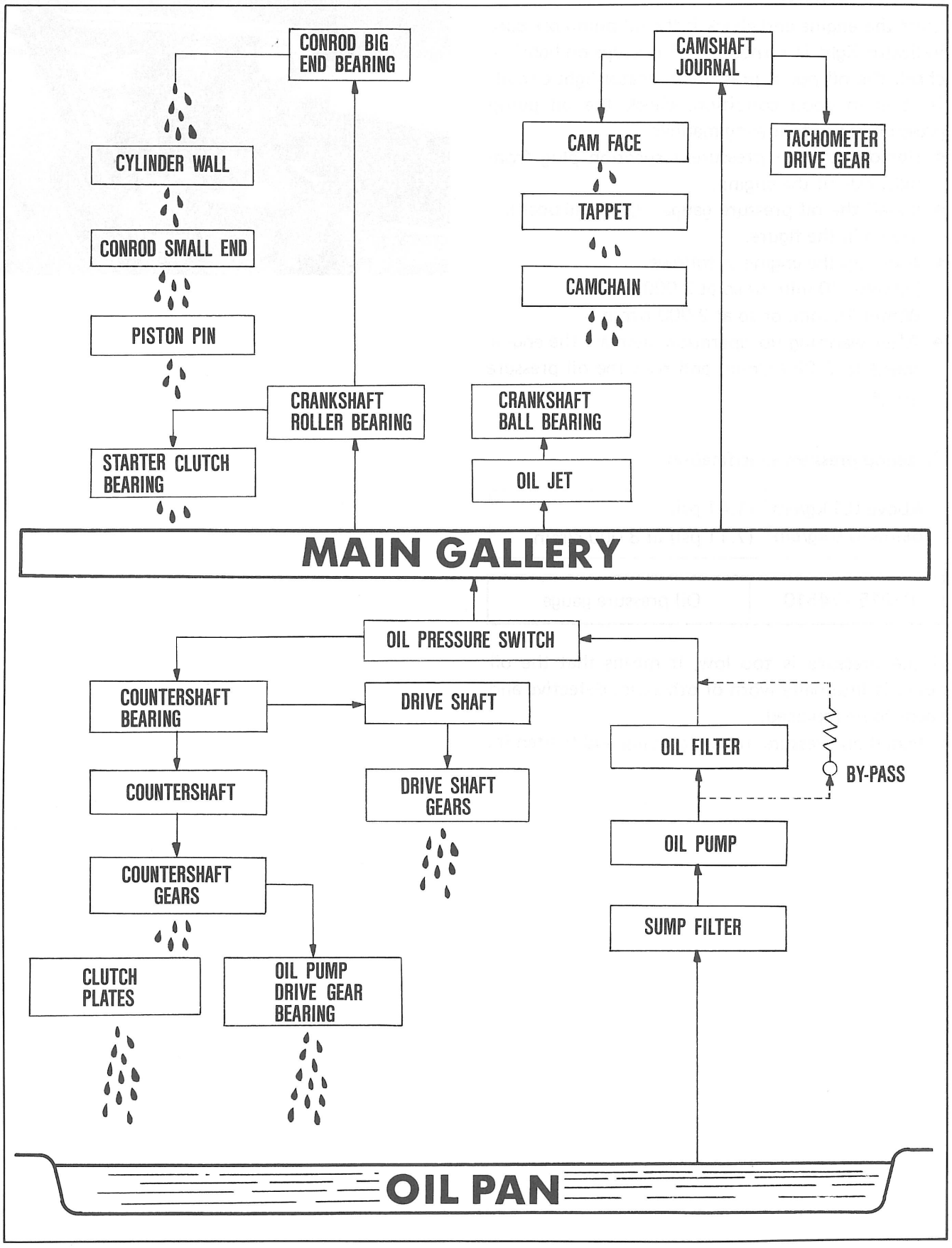
Above 0.1 kg/cm^2 (1.41 psi) Below 0.5 kg/cm^2 (7.11 psi) at 3 000 r/min

09915 - 74510	Oil pressure gauge

If the pressure is too low, it means that the oil pump is internally worn or otherwise defective and needs to be replaced.

- Install oil pressure inspection plug and tighten it.

LUBRICATION SYSTEM



EMISSION CONTROL & REGULATIONS

CONTENTS

EMISSION REGULATIONS

On February 4, 1977, Federal Emission Regulations for motorcycles that may be licensable took effect. The regulations provided for a gradual, multi-step application of stricter emission limits beginning with all effected motorcycles manufactured after January 1, 1978, culminating with the present 1980 emission level restrictions. For the 1980 and succeeding years one set of emission limits will be in effect. They are as follows:

1980 EMISSION LIMITS

CATEGORIES	HYDROCARBONS (HC)	CARBON MONOXIDE
All motorcycles 50 cc — Larger	5.0 Grams/Kilometer (8.0 Grams/Mile)	12 Grams/Kilometer (19.3 Grams/Mile)

Emission-controlled motorcycles which are subject to the emission regulations are those motorcycles which are equipped with a headlight, taillight, stop light and which have an engine displacement larger than 50 cc.

Suzuki Motor Company performed all the necessary testing and certification of emission-controlled models in strict compliance with the E.P.A. testing regulations. Suzuki motorcycle dealers are not required to either test or certify emission levels on any motorcycles as Suzuki Motor Company is legally responsible for the entire certification procedure.

E.P.A. regulations also provide fines for individuals who alter, render inoperative or improperly service emission-controlled motorcycles ranging up to $10,000.00 per motorcycle. It is essential that the individual servicing this emission-controlled motorcycle review thoroughly all the service procedures presented in this manual. Under no circumstances should the recommended service procedures be deviated from nor adjustments made which are not in accordance with the factory specifications or service procedures.

EMISSION CONTROL CARBURETOR COMPONENTS

GS650E motorcycles are equipped with precision, manufactured carburetors for emission level control. These carburetors require special mixture control components and other precision adjustments to function properly.

There are several carburetor mixture control components in each carburetor assembly. Three (3) of these components are machined to much closer tolerances than standard machined carburetor jets. These three (3) particular jets – MAIN JET, NEEDLE JET, PILOT JET – must not be replaced by standard jets. To aid in identifying these three (3) jets a different design of letter and number are used. If replacement of these close tolerance jets becomes necessary, be sure to replace them with the same type close tolerance jets marked as in the examples shown below.

The jet needle is also of special manufacture. Only one clip position is provided on the jet needle. If replacement becomes necessary the jet needle may only be replaced with an equivalent performing replacement component. Suzuki recommends that Genuine Suzuki Parts be utilized whenever possible for the best possible performance and durability.

Conventional Figures Used on Standard Tolerance Jet Components	1 2 3 4 5 6 7 8 9 0
Emission Type Figures Used On Close Tolerance Jet Components	1 2 3 4 5 6 7 8 9 0

The carburetor specification for the emission-controlled GS650E are as follows.

Carburetor I.D. No.	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Pilot Screw
34220	#97.5	Y-7	5C45	#42.5	PRE-SET DO NOT ADJUST

The pilot screw is pre-set by the factory utilizing specialized testing and adjusting procedures. The pilot screw is not adjustable as the idle circuit is "sealed" after factory adjustment. Adjusting, interferring with, improper replacement, or resetting of any of the carburetor components may adversely affect carburetor performance and cause the motorcycle to exceed the exhaust emission level limits. If persons, who are unaware of these special carburetor servicing requirements tamper with the carburetors the Suzuki dealer should restore the carburetors to their original condition or if unable to effect repairs, contact the distributors representative for further technical information and assistance.

GENERAL EMISSION INFORMATION

There are three different types of regulated exhaust emissions. They are:

Hydrocarbons (HC)
Carbon Monoxide (CO)
Oxides of Nitrogen (NOx)

Automobiles must meet specific emission standards for all three of these pollutants. Motorcycles must only meet the requirements for the following:

Hydrocarbons (HC)
Carbon Monoxide (CO)

HC exhaust emissions are basically unburned fuel vapors which have passed through the engine and escaped the combustion process.

CO exhaust emissions are formed during an incomplete combustion cycle as a result of a rich air/fuel mixture. The only way that CO can be produced is by the combustion cycle.

Total NOx emissions from all motorcycles is considered negligible. The EPA states that total NOx emission from motorcycles by 1990 will only amount to approximately 0.5%. NOx is formed during the combustion process at high combustion chamber temperatures.

CARBON MONOXIDE

Carbon monoxide is a product of an incomplete combustion cycle. CO is measured in grams per mile or kilometer and also in percentage (%).

The most common cause of CO is rich carburetion. As the mixture is richened excessively, the CO amount increases proportionately. Engine oil is also a hydrocarbon, so engine problesm which lead to oil burning increase carbon monoxide.

CARBURETION MALFUNCTION

1. Air Cleaner – Dirty or over oiled.
2. Idle Mixture – Adjusted incorrectly.
3. Idle Speed – Too high or low.
4. Fuel Level – Sticking float, leaking needle, incorrect setting.
5. Choke – Leaking or linkage sticking.
6. Synchronization – Improper balance on multi cylinders.

ENGINE MALFUNCTION

1. Valve Seals – Leaking or torn.
2. Valve Guide – Worn and leaking excess oil.
3. Gaskets – Leaking oil into combustion chamber.

HYDROCARBONS

Hydrocarbons are unburnt gasoline vapors and can be measured in two different ways. The first is to measure the weight of the pollutants over a specific distance such as grams per mile or grams per kilometer. The second method is to measure the concentration of HC in the exhaust gas in parts per million (PPM).

The most common cause of high HC emissions are ignition system problems. If the ignition system fails to ignite the fuel mixture properly, then raw gasoline vapors will pass through the engine into the exhaust system. Listed are the most common ignition problems which occur and which can affect HC emission output.

IGNITION SYSTEM MALFUNCTIONS

1. Spark Plugs – Fouled, dirty, improper type or improperly gapped.
2. Ignition Timing – Advanced or Retarded.
3. Timing Advance – Too fast or too slow an advance rate.
4. Battery – Low charge or faulty.

Carburetion can also lead to high HC emissions if the mixture is either excessively rich or excessively lean.

MIXTURE-RELATED MALFUNCTIONS

1. Air Cleaner – Dirty, over oiled or torn.
2. Jets – Clogged, restricted or incorrect size.
3. Float Level – Level too low (lean) or too high (rich).
4. Choke – Leaking choke plunger or sticking linkage.
5. Air Leaks – Intake manifolds, engine gaskets and other sealing surfaces.
6. Synchronization – Unbalanced on multi-cylinder machines.
7. Exhaust System – Restricted flow or improper exhaust system.

Engine wear or damage can also cause high HC emissions.

1. Rings – Low compression, leakage into crankcase.
2. Valves – Improper adjustment, bent stem or burnt.
3. Gaskets – Leaking, loss of compression.
4. Crank Seals – Leaking.
5. Oil Consumption – Worn valve guides, worn rings, clogged crankcase breather.
6. Oil – Improper engine oil.

ELECTRICAL SYSTEM

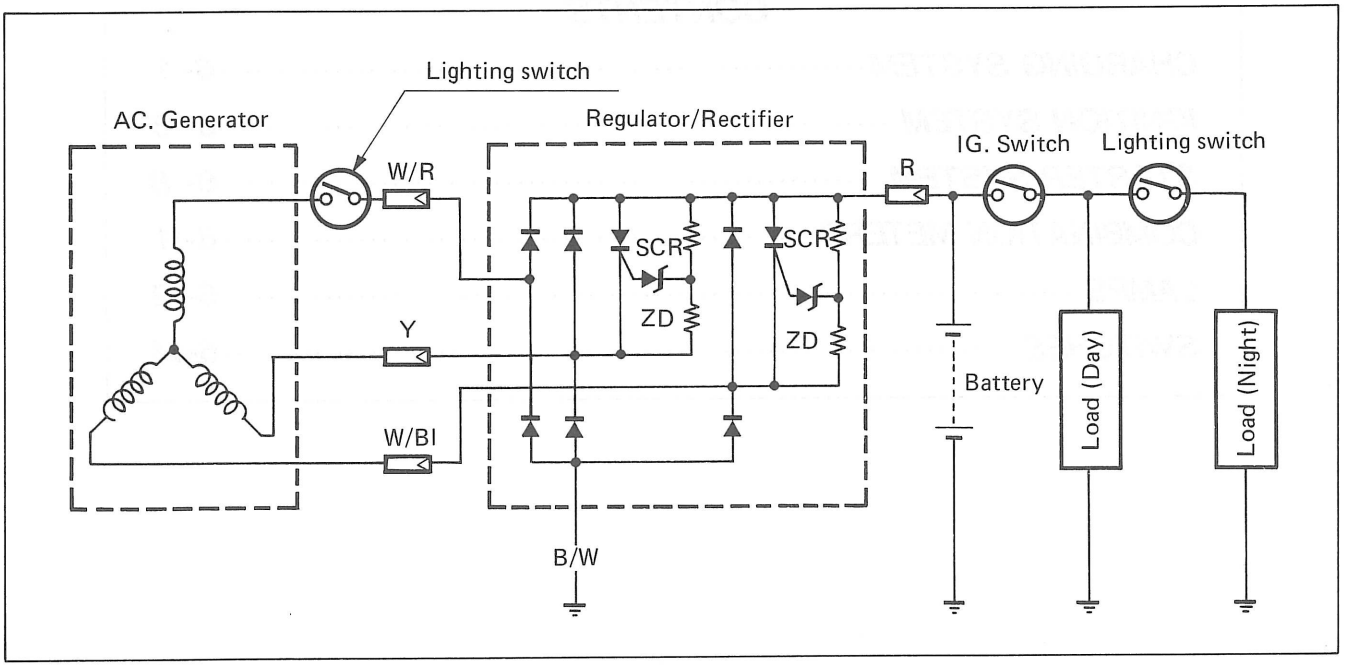
CONTENTS

CHARGING SYSTEM

DESCRIPTION

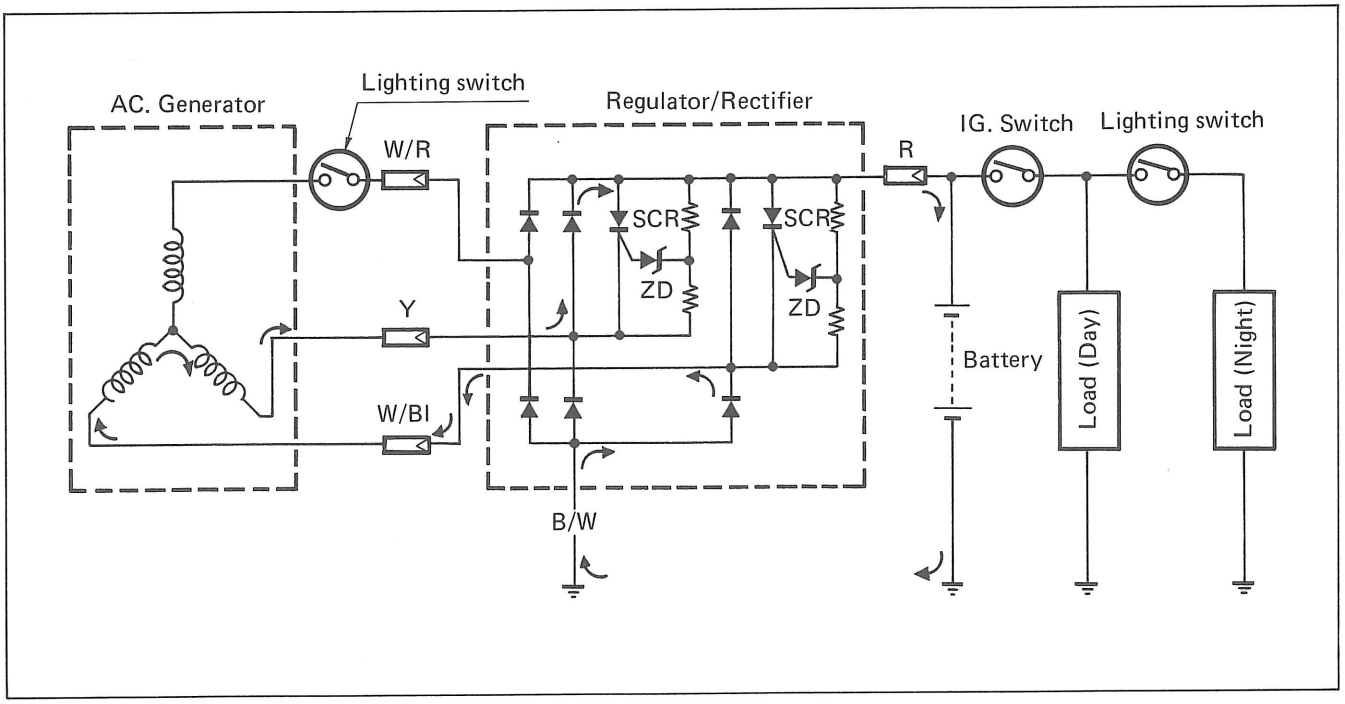
This motorcycle, the circuit of its charging system is indicated in the figure, is composed of AC generator, rectifier/regulator unit and battery.

The AC current generated from AC generator is converted by rectifier and is turned into DC current, then it charges the battery.

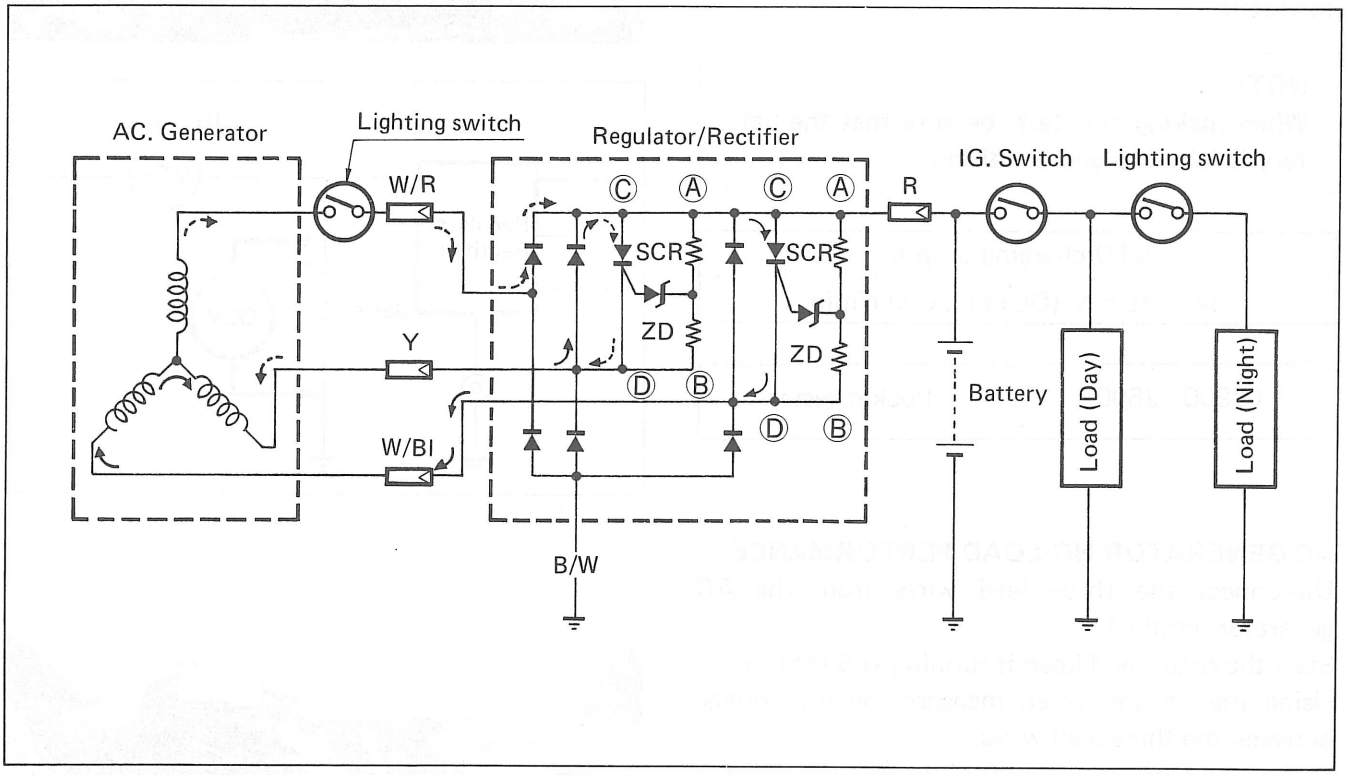


Function of Regulator

While the engine r/min is low and the generated voltage of AC generator is lower than the adjusted voltage of Regulator, the regulator does not function, incidentally the generated current charges the battery directly.



When the engine r/min becomes higher, the generated voltage of AC generator also becomes higher and the voltage between points Ⓐ and Ⓑ of regulator becomes high accordingly, and when it reaches the adjusted voltage of regulator, ZD (Zener diode) sends signal to the gate of SCR (Thyristor). Then the SCR becomes conductive to the direction from point Ⓒ to point Ⓓ. Namely at the state of this the current generated from the AC generator get through SCR without charging the battery and returns to AC generator again. At the end of this state, since the AC current generated from AC generator flows into the point Ⓓ, reverse current tends to flow to SCR, then the circuit of SCR turns to OFF mode and begins to charge the battery again. Thus these repetitions maintain charging voltage to the battery constant and protect it from overcharging.



INSPECTION

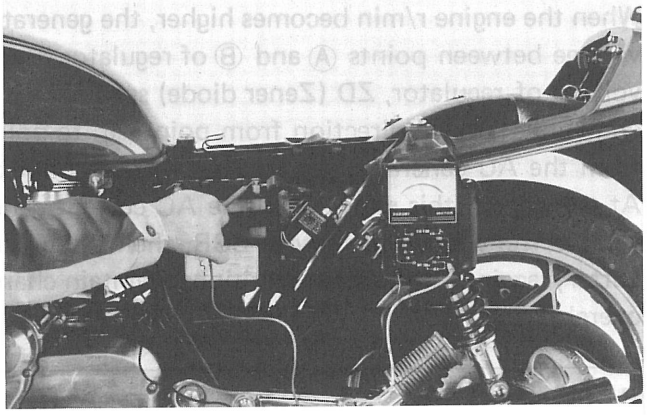
CHARGING OUTPUT CHECK

Remove the left frame cover.

Start the engine and keep it running at 5 000 r/min with dimmer switch turned HI position.

Using pocket tester, measure the DC voltage between the battery terminal ⊕ and ⊖ .

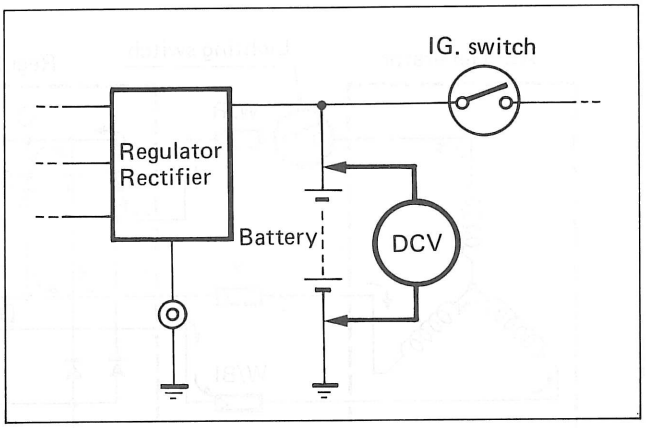
If the tester reads under 14V or over 15.5V, check the AC generator no-load performance and regulator/rectifier.



NOTE:
When making this test, be sure that the battery is fully-charged condition.

STD charging output
14 – 15.5 V (DC) at 5 000 r/min

09900 - 25002	Pocket tester



AC GENERATOR NO-LOAD PERFORMANCE

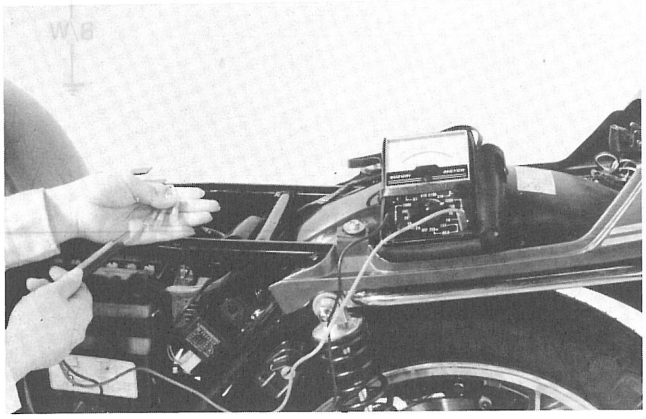
Disconnect the three lead wires from the AC generator terminal.

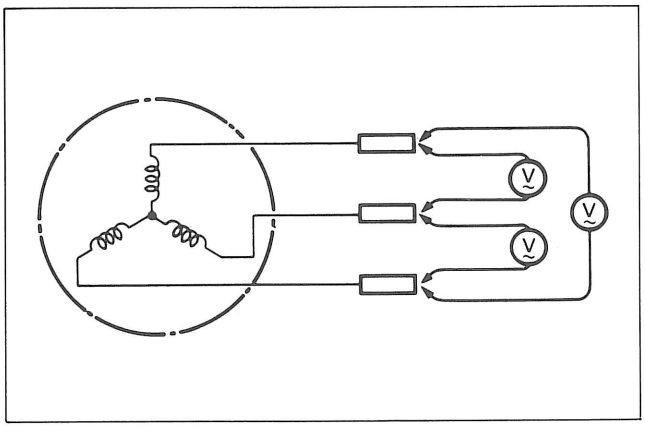
Start the engine and keep it running at 5 000 r/min.

Using the pocket tester, measure the AC voltage between the three lead wires.

If the tester reads under 80V, the AC generator is faulty.

STD No-load performance
80V (AC) or Over at 5 000 r/min



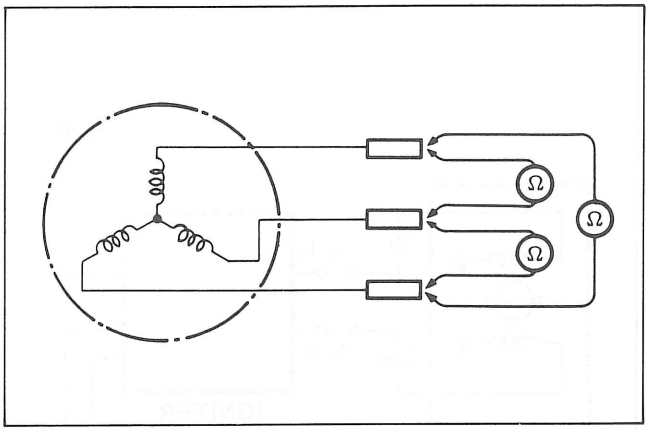


AC GENERATOR CONTINUITY CHECK

Using the pocket tester, check the continuity between the lead wires of the stator.
Also check that the stator core is insulated.

NOTE:
When making this test, it is not necessary to remove the AC generator.

09900 - 25002	Pocket tester

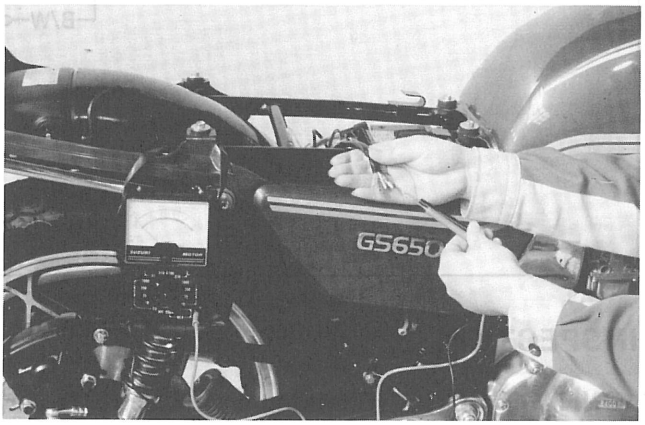


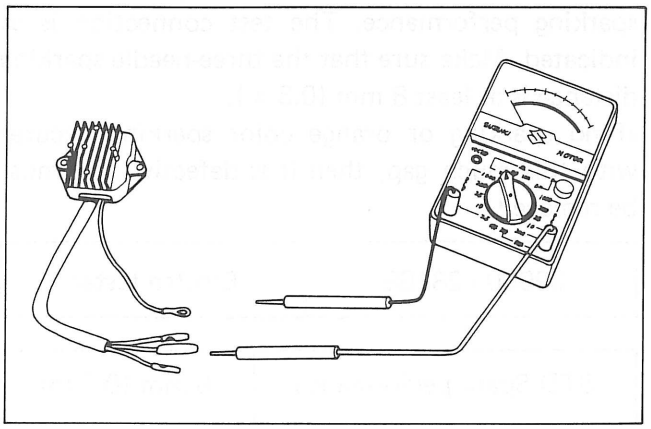
REGULATOR/RECTIFIER

Using the pocket tester (X1Ω range), measure the resistance between the lead wires in the following table.
If the resistance checked is incorrect, replace the regulator/rectifier.

09900 - 25002	Pocket tester

⊖ probe of tester	⊕ probe of tester					
		R	W/Bl	W/R	Y	B/W
R			∞	OFF	∞	OFF
W/Bl	5-6Ω			OFF	∞	OFF
W/R	5-6Ω	∞			∞	OFF
Y	5-6Ω	∞	OFF			OFF
B/W	30-40Ω	5-6Ω	5-6Ω	5-6Ω		



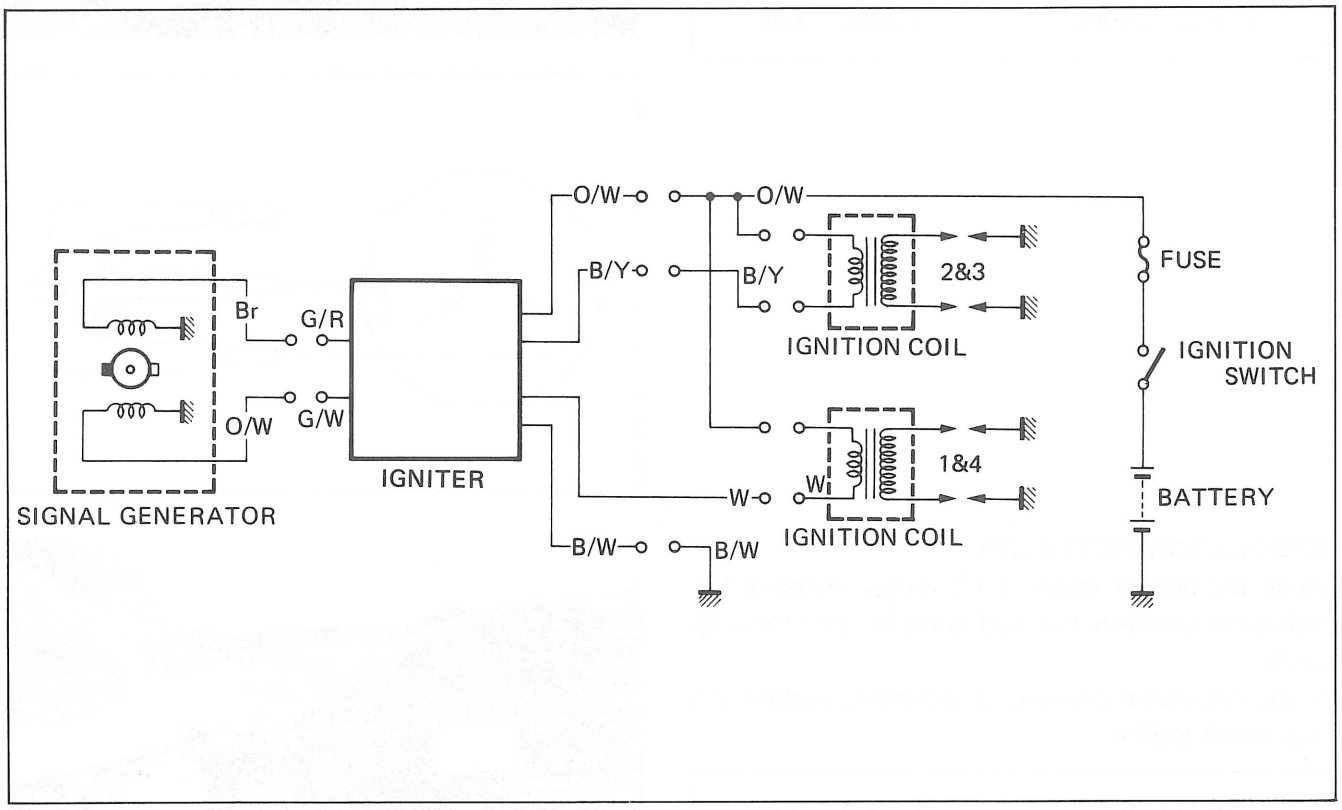


IGNITION SYSTEM

DESCRIPTION

The fully transistorized ignition system consists of a signal generator, transistor igniter, ignition coils, and spark plugs. The signal generator comprises one rotor and two pickup coils.

The signal generator is mounted at the right end of the crankshaft. The output of the signal generator goes to the transistor Igniter unit, where it turns ON and OFF the transistor alternately. As the transistor is turned ON and OFF, the current passing through the primary winding of the ignition coil is also turned OFF and ON accordingly, thus it induces the secondary current on the ignition coil secondary windings and produces the spark between spark plug gaps.



INSPECTION

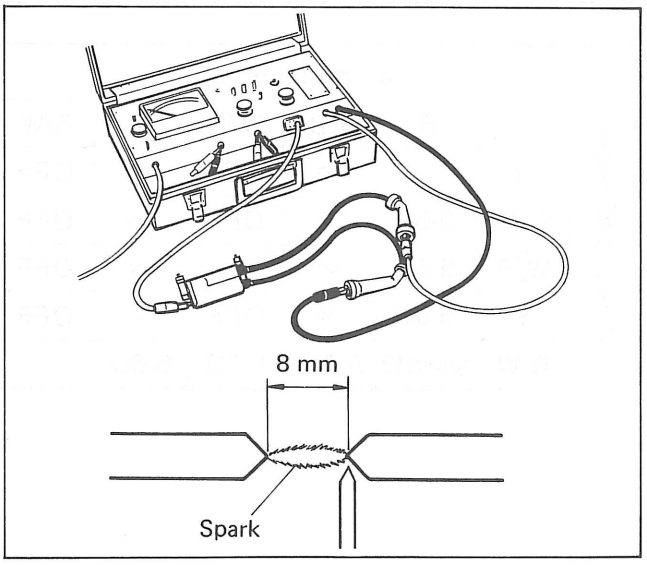
IGNITION COILS (Checking with Electro Tester)

Using the electro tester, test each ignition coil for sparking performance. The test connection is as indicated. Make sure that the three-needle sparking distance is at least 8 mm (0.3 in).

If no sparking or orange color sparking occures with this much gap, then it is defective and must be replaced.

09900 - 28106	Electro tester

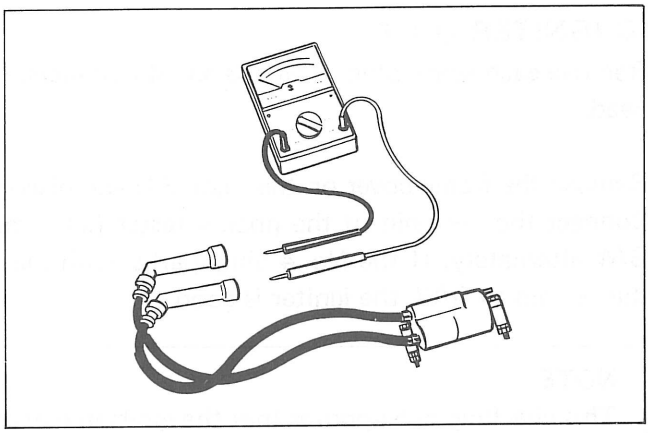
STD Spark performance	8 mm (0.3 in)

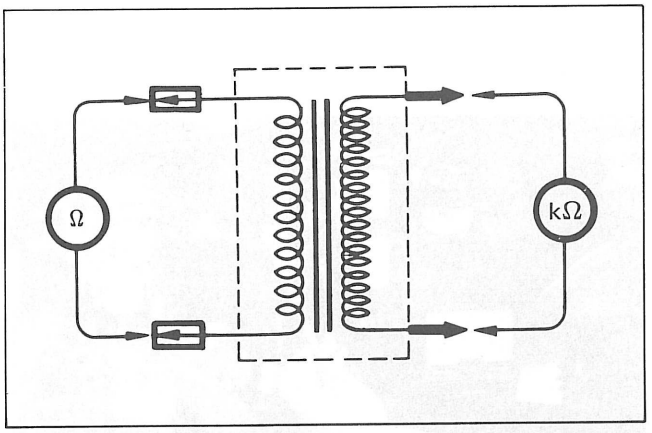


IGNITION COILS (Checking with Pocket Tester)
A SUZUKI pocket tester or an ohm meter may be used, instead of the electro tester. In either case, the ignition coil is to be checked for continuity in both primary and secondary windings. Exact ohmic readings are not necessary, but, if the windings are in sound condition, their continuity will be noted with these approximate ohmic values.

09900 - 25002	Pocket tester

Ignition coil resistance	
Primary	Approx. 3 – 5Ω
Secondary	Approx. 30 – 35kΩ

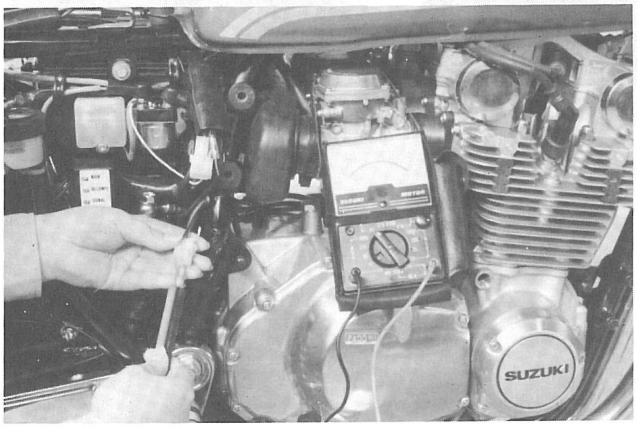


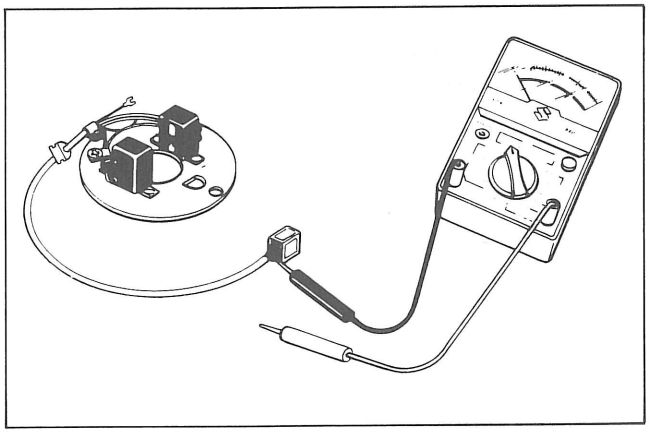


SIGNAL GENERATOR
Measure the resistance between lead wires.
If the resistance noted to show infinity or too low a resistance value must be replaced.

09900 - 25002	Pocket tester

STD resistance	
Br – B/W G/W – B/W	60 – 80 Ω



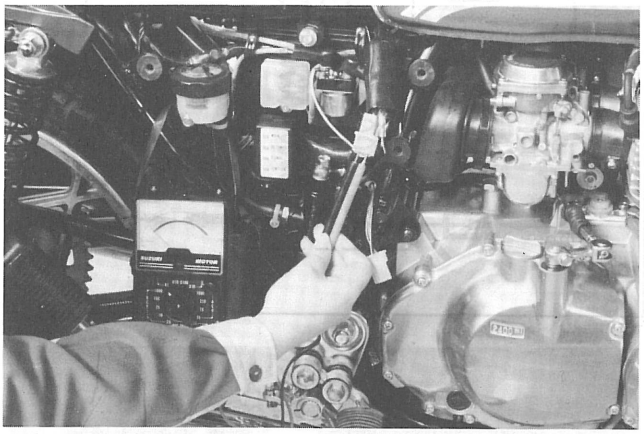


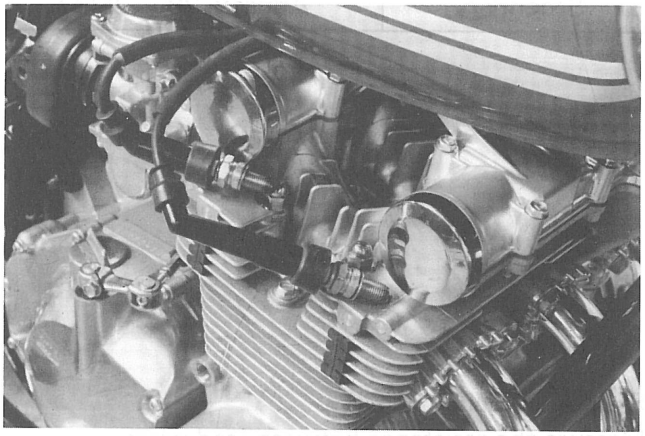
IC IGNITER UNIT

Remove each spark plug of Nos. 3 and 4 cylinders, fit it to respective plug cap and place it on the cylinder head.

Remove the frame cover on the right side and disconnect the lead wire from the signal generator. Connect the ⊖ pin of the pocket tester (x1Ω range) to B/W, and then connect the ⊕ pin to Br and G/W alternately. If the No. 4 plug sparks, with the ⊕ pin connected to Br, and if the No. 3 sparks, with the ⊕ pin to G/W, the igniter is good.

NOTE:
This checking presupposes that the ignition coil used for checking is a good one.

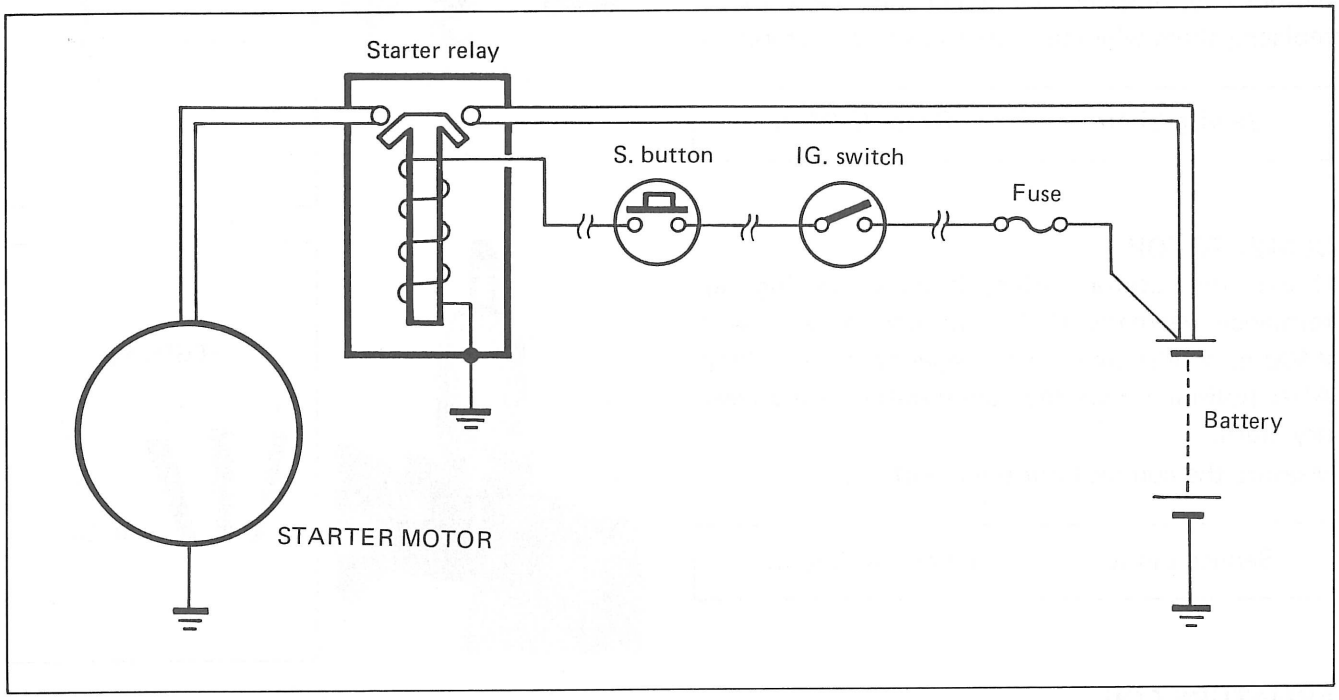




STARTER SYSTEM

DESCRIPTION

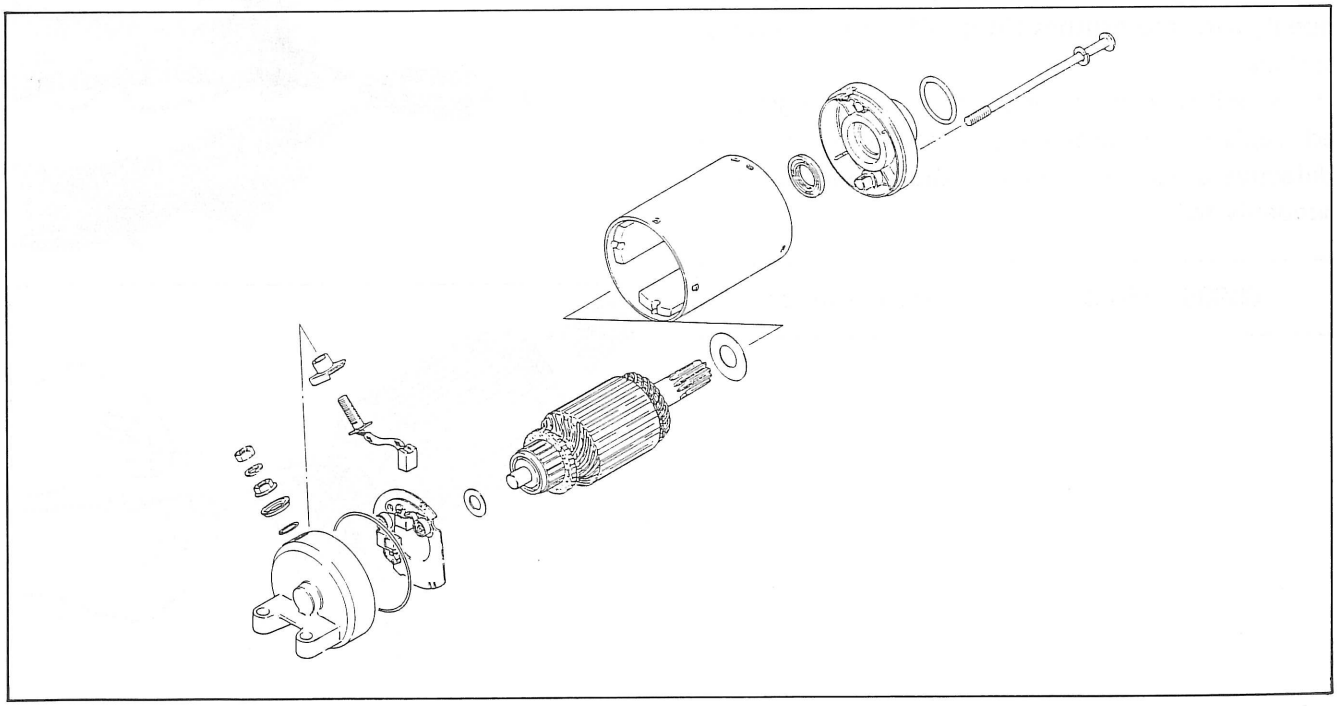
The starter system is shown in the diagram below: namely, the starter motor, relay, starter switch and battery. Depressing the starter button (on the right handlebar switch box) energizes the relay, causing the contact points to close which connects the starter motor to the battery. The motor draws about 80 amperes to start the engine.



STARTER MOTOR REMOVAL AND DISASSEMBLY

Remove the starter motor (See page 3-14).

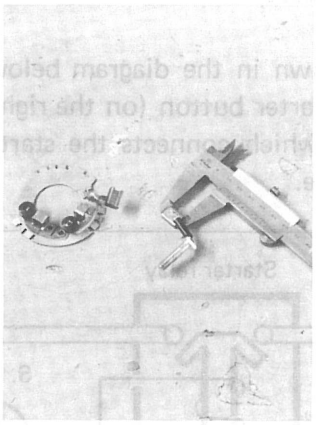
Disassemble the starter motor as follows.

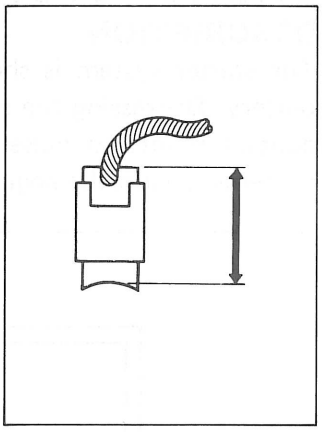


STARTER MOTOR INSPECTION

CARBON BRUSHES

When the brushes are worn, the motor will be unable to produce sufficient torque, and the engine will be difficult to turn over. To prevent this, periodically, inspect the length of the brushes, replacing them when they are too short or chipping.



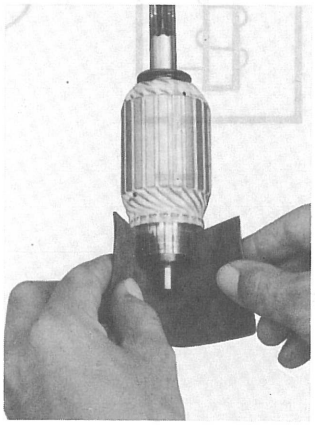


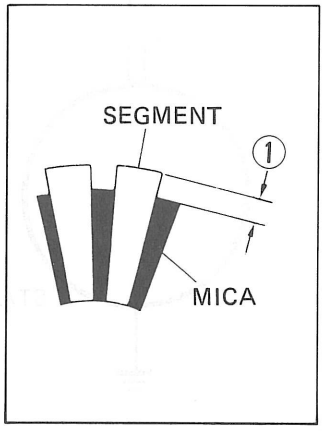
Service Limit	6 mm (0.24 in)

COMMUTATOR

If the commutator surface is dirty, starting performance decrease. Polish the commutator with #400 or similar fine emery paper when it is dirty. After polishing wipe the commutator with a clean dry cloth.

Measure the commutator under cut ①.



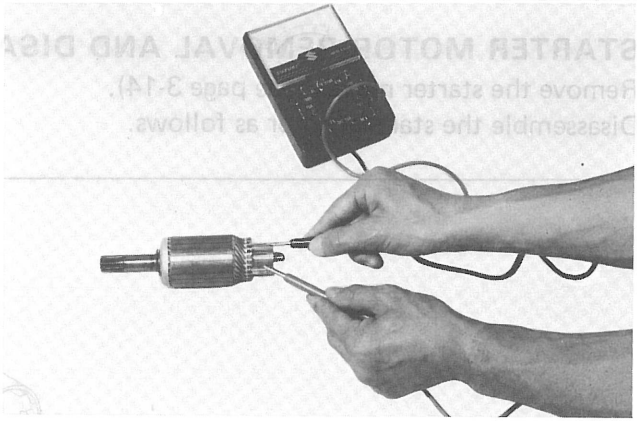


Service Limit	0.2 mm (0.008 in)

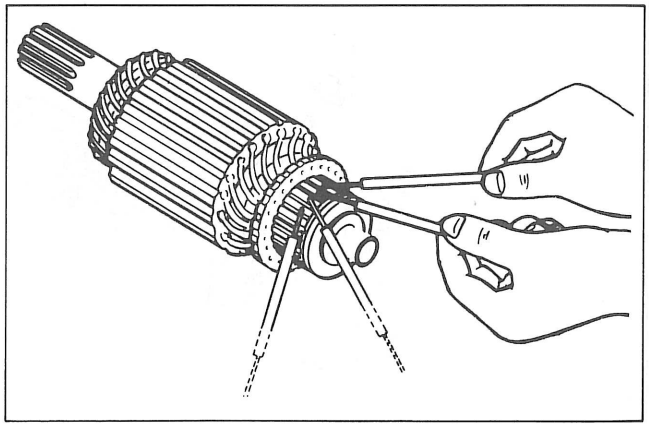
ARMATURE COIL

Using a pocket tester, check the coil for open and ground by placing probe pins on each commutator segment and rotor core (to test for ground) and on any two segments at various places (to test for open), with the brushes lifted off the commutator surface.

If the coil is found to be open-circuited or grounded replace the armature. Continuous use of a defective armature will cause the starter motor to suddenly fail.



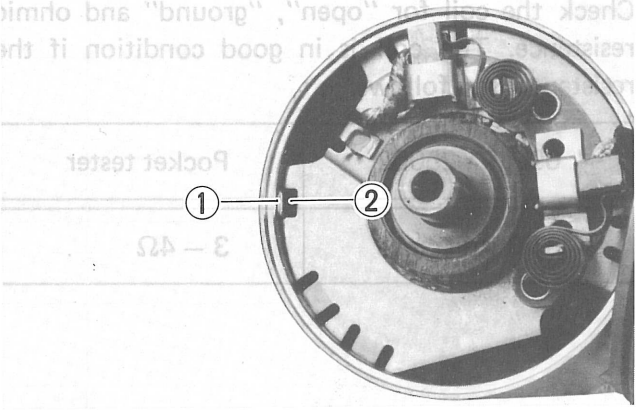
09900 - 25002	Pocket tester



STARTER MOTOR REASSEMBLY

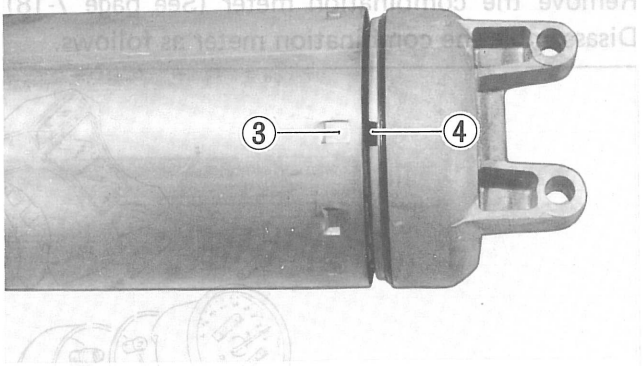
BRUSH HOLDER

When fixing brush holder to starter motor case, align the protrusion ① of the starter motor case with the notch ② of the brush holder.



HOUSING END

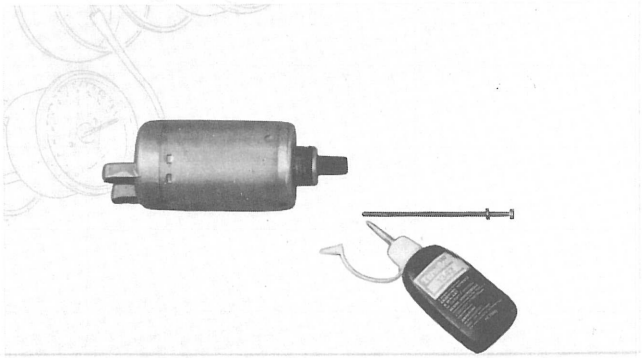
When installing housing end, fix the protrusion ③ of the starter motor case to the notch ④ on the housing end.



SECURING SCREWS

Apply Thread Lock "1363C" to starter motor securing screws.

99100-32050	Thread Lock "1342"



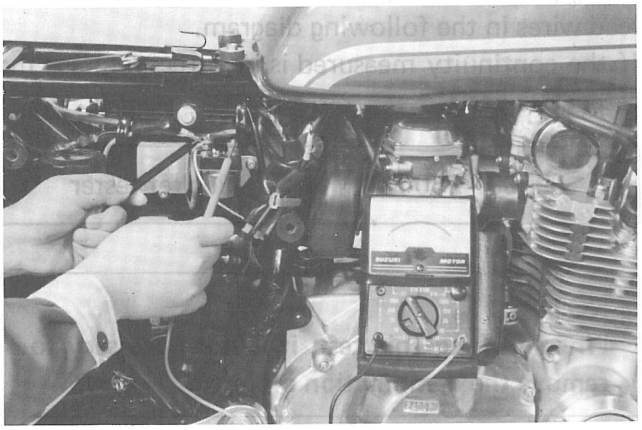
STARTER RELAY INSPECTION

Disconnect lead wire of the starter motor at starter relay.

Turn on the ignition switch, inspect the continuity between the terminals, positive and negative, when pushing the starter button.

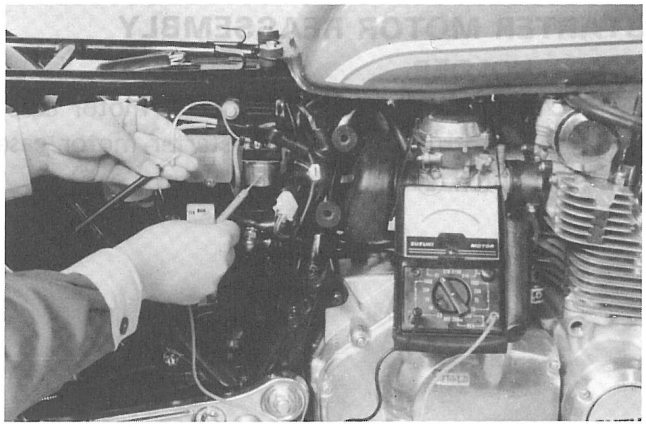
If the starter relay is in sound condition, continuity is found.

09900 - 25002	Pocket tester



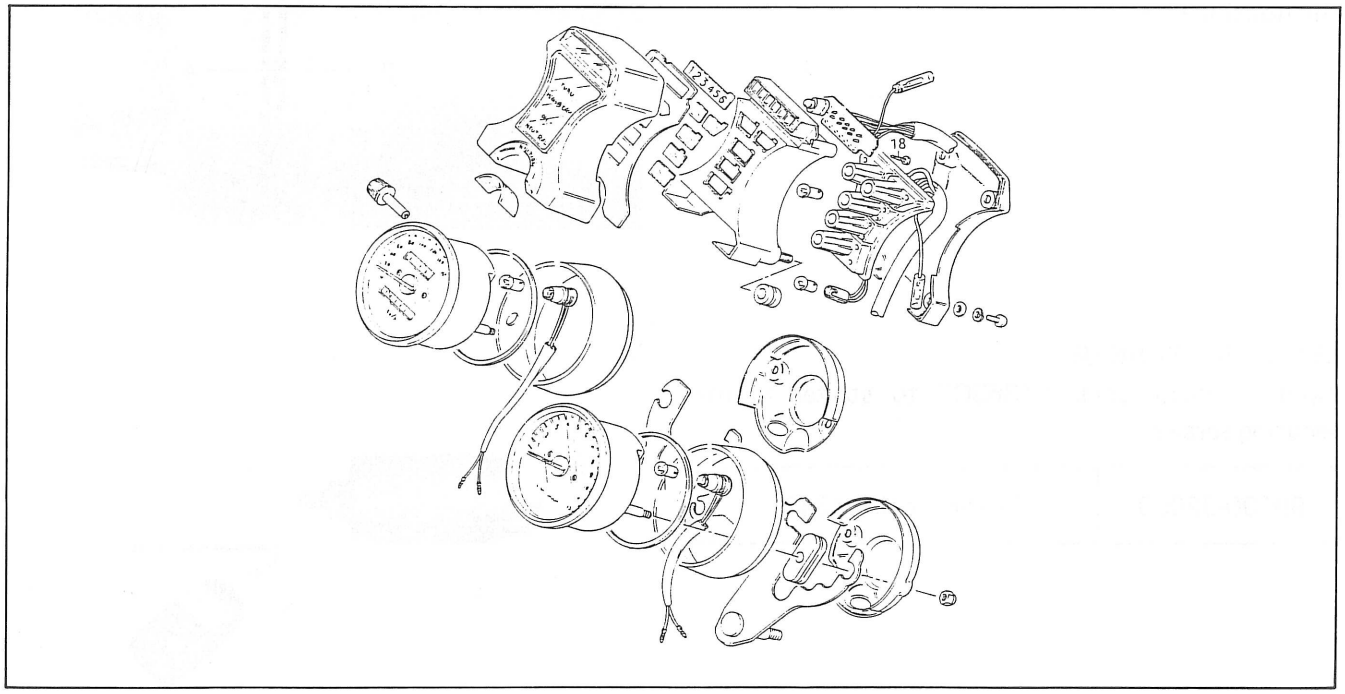
Check the coil for "open", "ground" and ohmic resistance. The coil is in good condition if the resistance is as follows.

09900 - 25002	Pocket tester
STD resistance	3 – 4Ω



COMBINATION METER

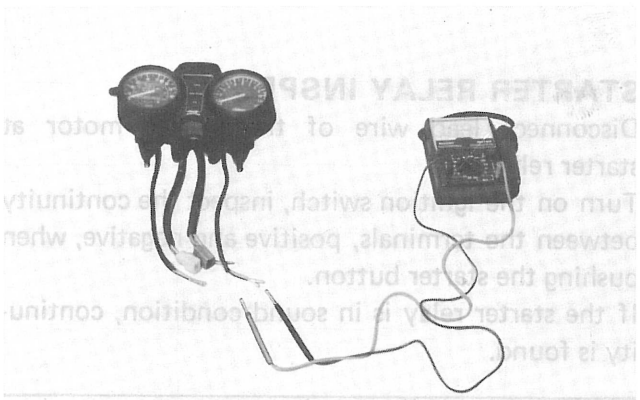
Remove the combination meter (See page 7-18).
Disassemble the combination meter as follows.



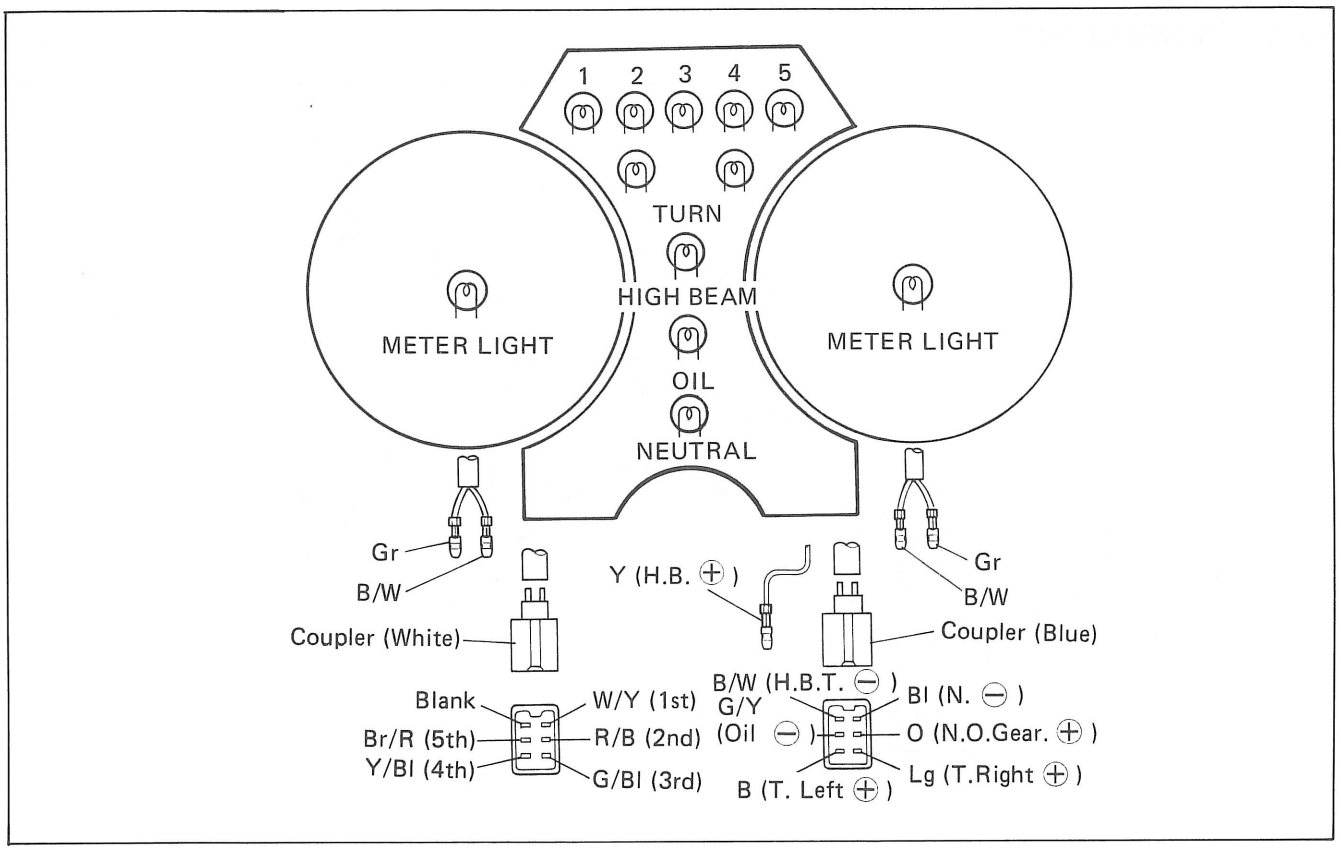
INSPECTION

Using pocket tester, check the continuity between lead wires in the following diagram.
If the continuity measured is incorrect, replace the respective parts.

09900 - 25002	Pocket tester

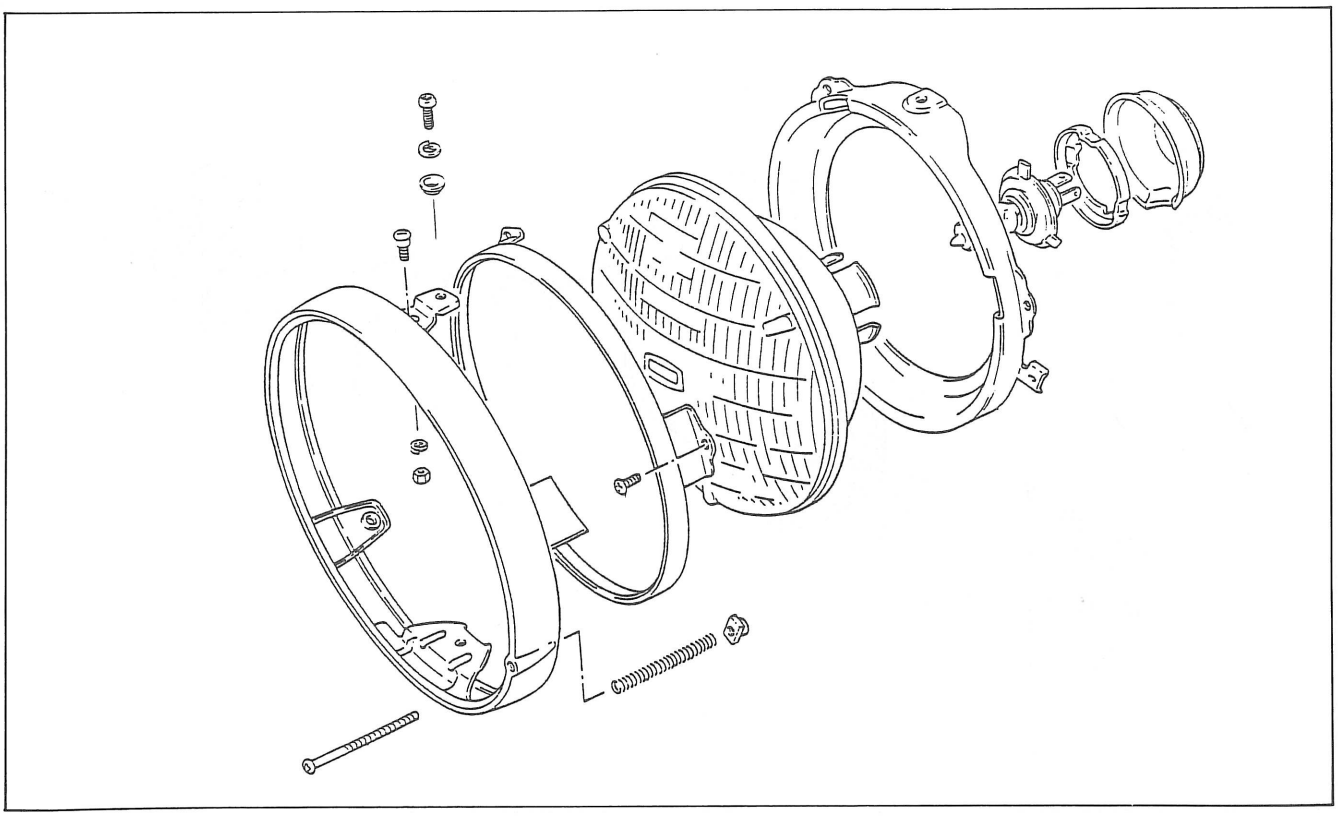


NOTE:
When making this test, it is not necessary to remove the combination meter.

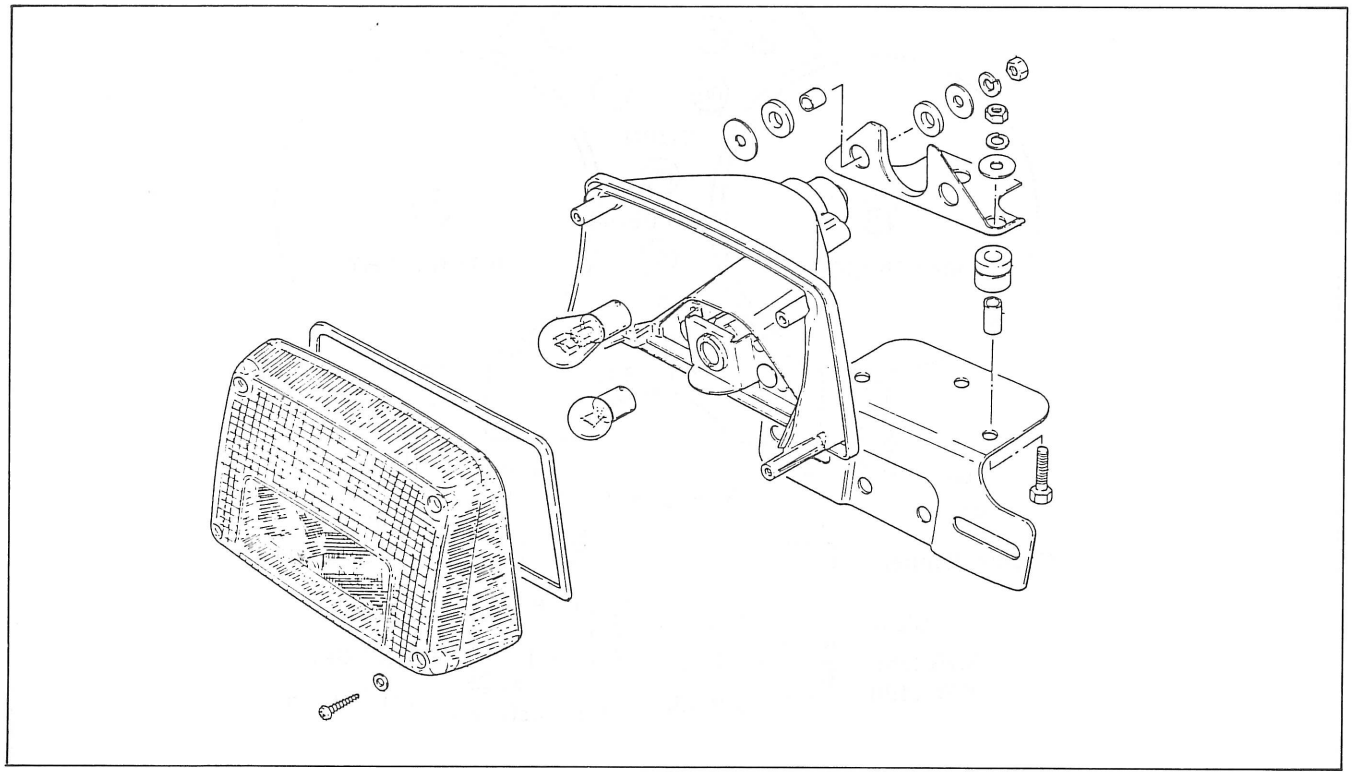


LAMPS

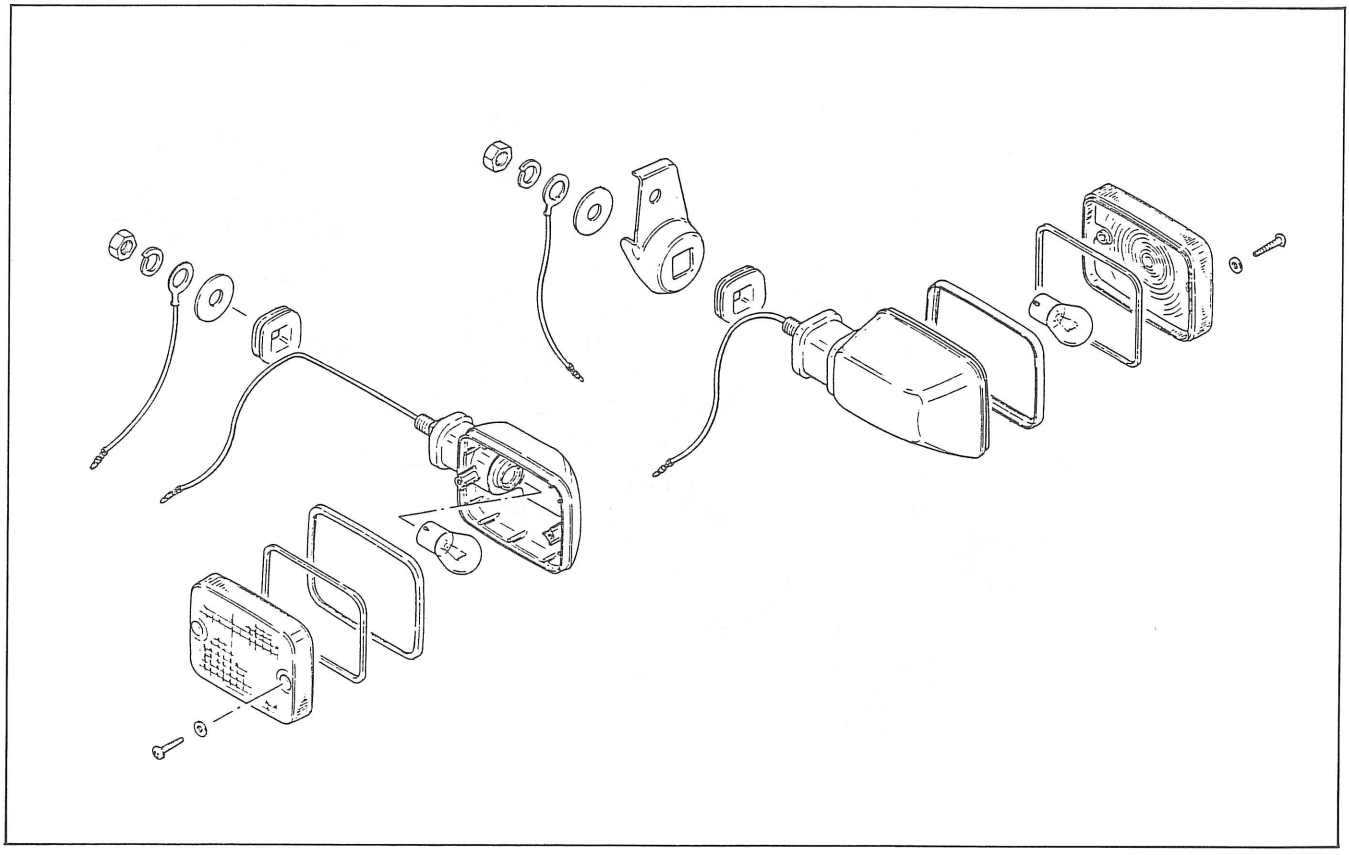
HEADLIGHT



TAIL/BRAKE LIGHT



TURN SIGNAL LIGHT



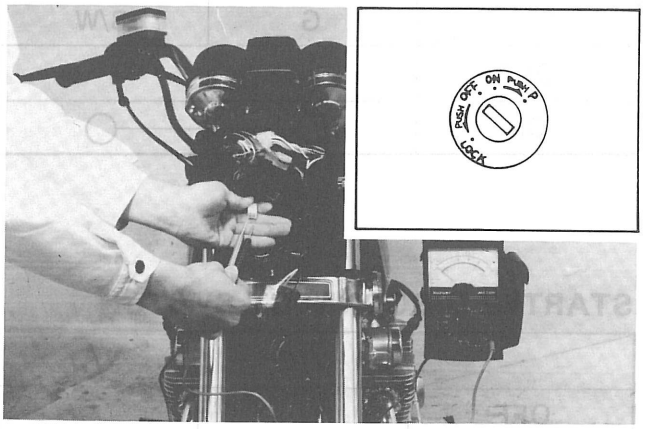
SWITCHES

Inspect each switch for continuity with the pocket tester referring to the chart.
If it is found any abnormality, replace the respective switch assemblies with new ones.

09900 - 25002	Pocket tester

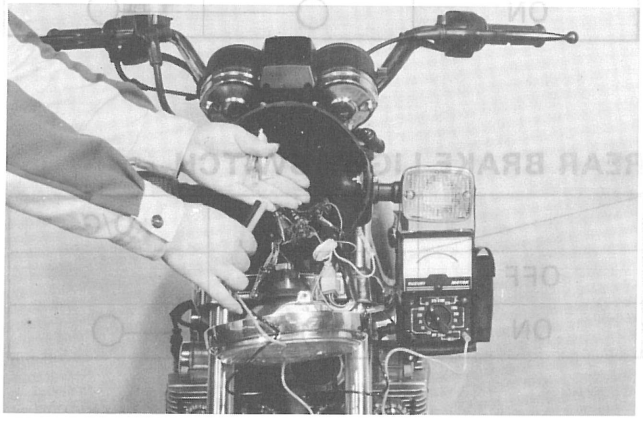
IGNITION SWITCH

	R	O	Gr	Br
OFF				
ON	○	○	○	○
P	○			○



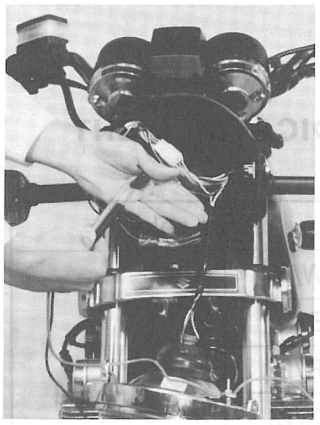
ENGINE STOP AND START SWITCH

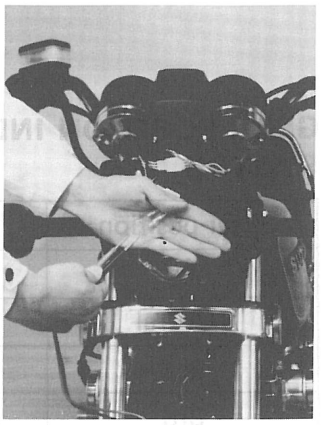
	O	O/W	Y/G
OFF			
RUN	○	○	
START		○	○



FRONT BRAKE RIGHT SWITCH

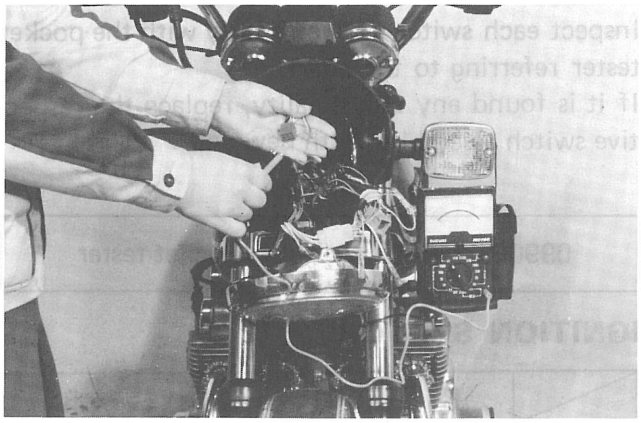
	O	W
OFF		
ON	○	○





DIMMER SWITCH

	W	Y	Y/W
HI		○	○
LO	○		○



HORN SWITCH

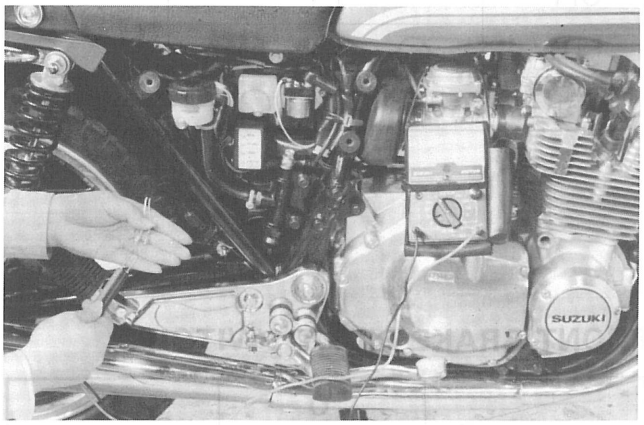
	G	B/W
OFF		
ON	○	○

STARTER DISCONNECT SWITCH

	Y/G	Y/G
OFF		
ON	○	○

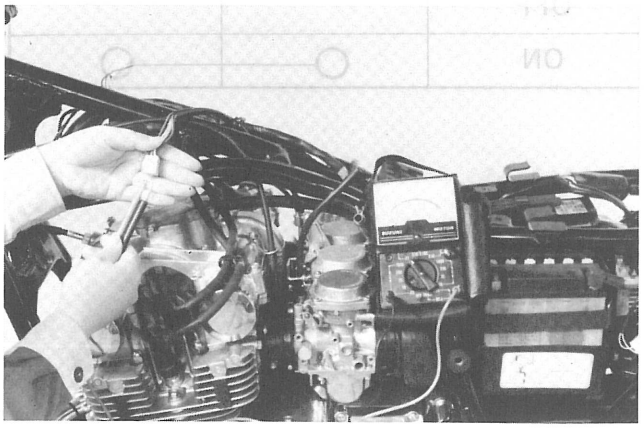
REAR BRAKE LIGHT SWITCH

	W	O/G
OFF		
ON	○	○



GEAR POSITION INDICATOR LIGHT SWITCH

Gear position	Wire color	
1st	W/Y	Ground
Neutral	Bl	
2nd	R/B	
3rd	G/Bl	
4th	Y/Bl	
Top	Br/R	



BATTERY

Specifications

Type designation	YB10L-A2
Capacity	43.2 kC (12 Ah)
Standard electrolyte S.G.	1.28 at 20°C (68°F)

In fitting the battery to the motorcycle, connect the breather tube to the battery vent.

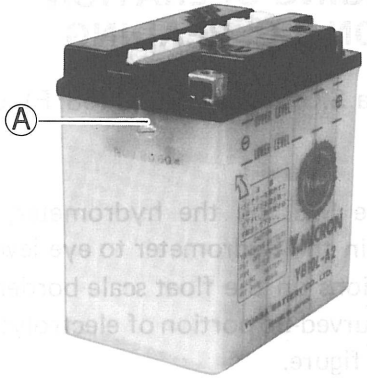
INITIAL CHARGING

Filling electrolyte

Remove short sealed tube before filling electrolyte. Fill battery with electrolyte (dilute sulfuric acid solution with acid concentration of 35.0% by weight, having a specific gravity of 1.28 at 20°C (68°F)) up to indicated UPPER LEVEL. Filling electrolyte should be always cooled below 30°C (86°F) before filling into battery. Leave battery standing for half an hour after filling. Add additional electrolyte if necessary.

Charge battery with current as described in the tables shown below.

Maximum charging current	1.2A



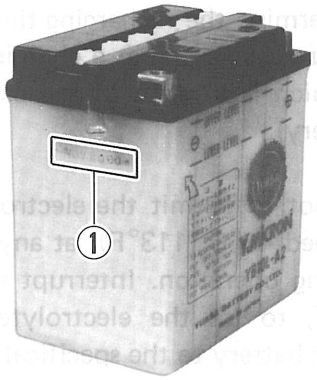
Ⓐ Sealed tube

Charging time

The charging time for a new battery is determined by the number of months that have elapsed since the date of manufacture.

Confirmation for date of manufacture:

Date of manufacture is indicated by a three-part number ① , as follows, each indicating month, date and year.



Near the end of charging period, adjust the specific gravity of electrolyte to value specified. After charging, adjust the electrolyte level to the UPPER LEVEL with DISTILLED WATER.

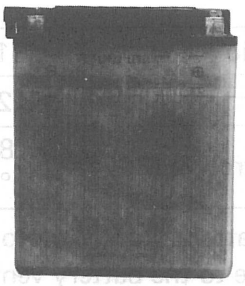
Months after manufacturing	Within 6	Within 9	Within 12	Over 12
Necessary charging hours	20	30	40	60

SERVICING

Visually inspect the surface of the battery container. If any signs of cracking or electrolyte leakage from the sides of the battery have occurred, replace the battery with a new one.

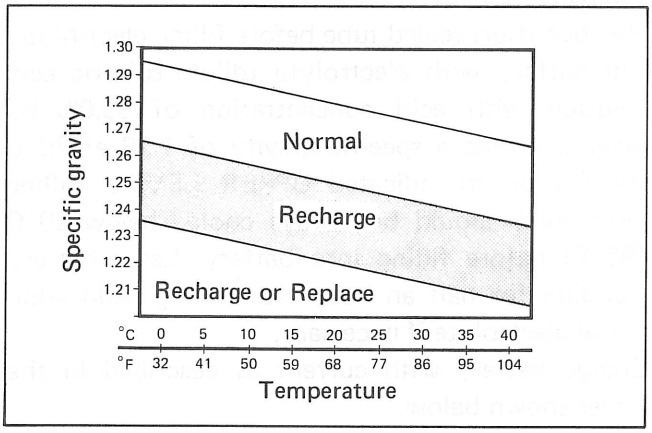
If the battery terminals are found to be coated with rust or an acidic white powdery substance, then this can be cleaned away with sandpaper.

Check the electrolyte level and add distilled water, as necessary, to raise the electrolyte to each cell's upper level.
Check the battery for proper charge by taking an electrolyte S.G. reading. If the reading is 1.22 or less, as corrected to 20°C (68°F), it means that the battery is still in a run-down condition and needs recharging.



RECHARGING OPERATION BASED ON S.G. READING

To correct a S.G. reading 20°C (68°F), use following table.

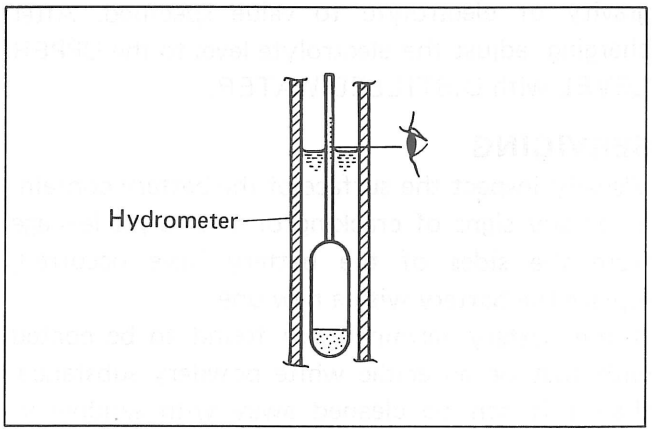


To read the S.G. on the hydrometer, bring the electrolyte in the hydrometer to eye level and read the graduations on the float scale bordering on the meniscus (curved-up portion of electrolyte surface), as shown in figure.

Check the reading (as corrected to 20°C) with chart to determine the recharging time in hours by constant-current charging at a charging rate of 1.2 amperes (which is a tenth of the capacity of the present battery).

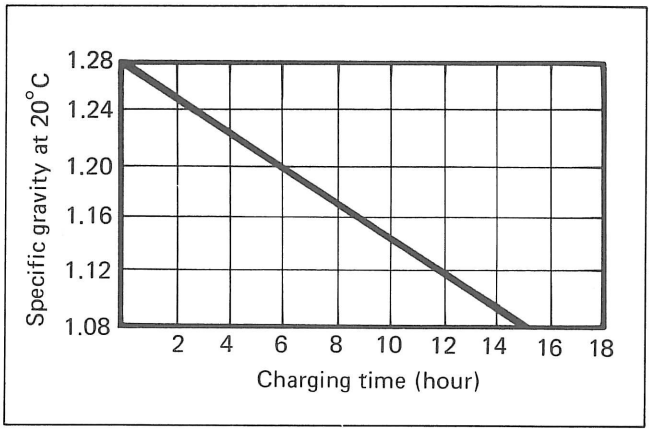
Be careful not to permit the electrolyte temperature to exceed 45°C (113°F), at any time, during the recharging operation. Interrupt the operation, as necessary, to let the electrolyte cool down. Recharge the battery to the specification.

Electrolyte specific gravity	1.28 at 20°C (68°F)



CAUTION:
Constant-voltage charging, otherwise called "quick" charging, is not recommendable for it could shorten the life of the battery.

09900 - 28403	Hydrometer



SERVICE LIFE

Lead oxide is applied to the pole plate of the battery which will come off gradually during the service. When the bottom of the battery case becomes full of the sediment, the battery cannot be used any more. If the battery is not charged for a long time, lead sulfate is generated on the surface of the pole plate and will deteriorate the performance (sulfation). Replace the battery with new one in such a case.

When a battery is left for a long term without using, it is apt to subject to sulfation. When the motorcycle is not used for more than 1 month (especially during the winter season), recharge the battery once a month at least.

WARNING:

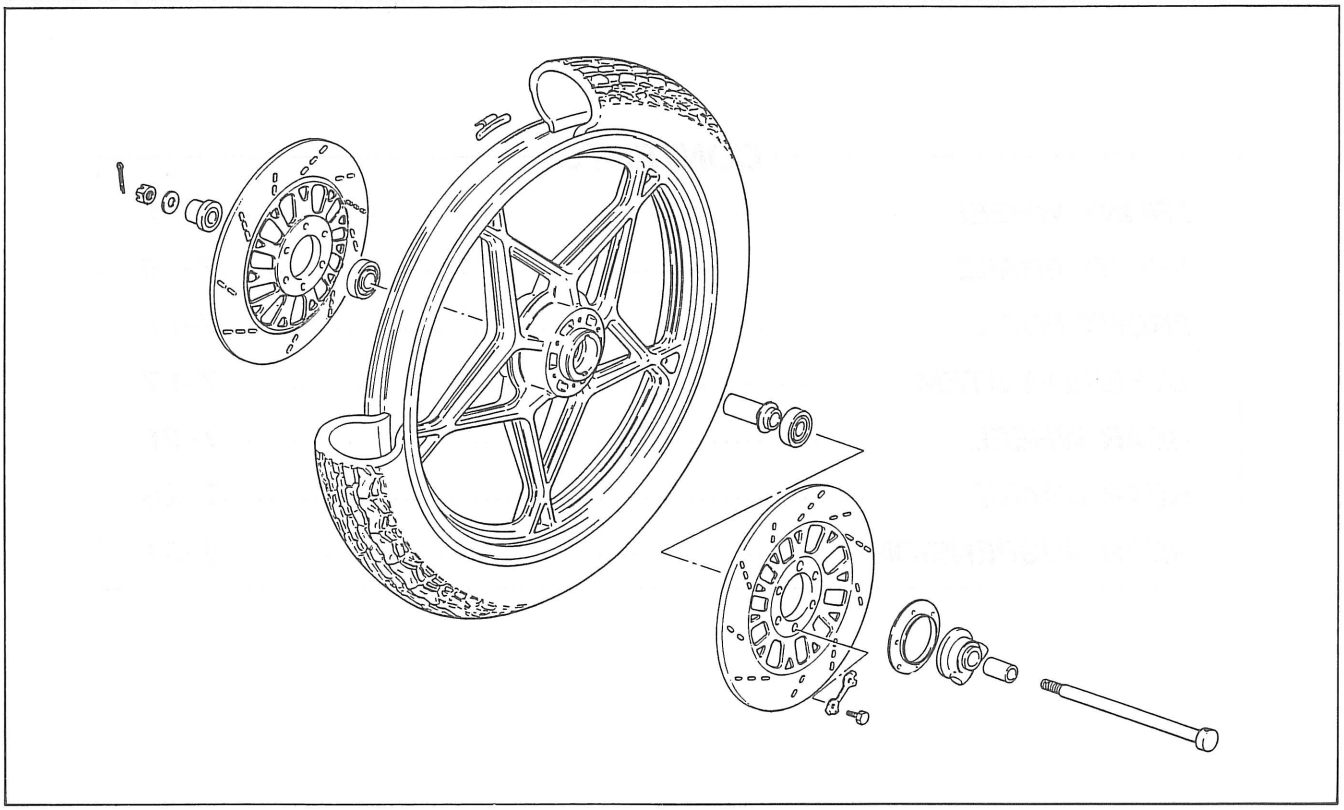
- **Before charging a battery, remove the seal cap from each cell.**
- **Keep fire and sparks away from a battery being charged.**
- **When removing a battery from the motorcycle, be sure to remove the (–) terminal first.**

CHASSIS

CONTENTS

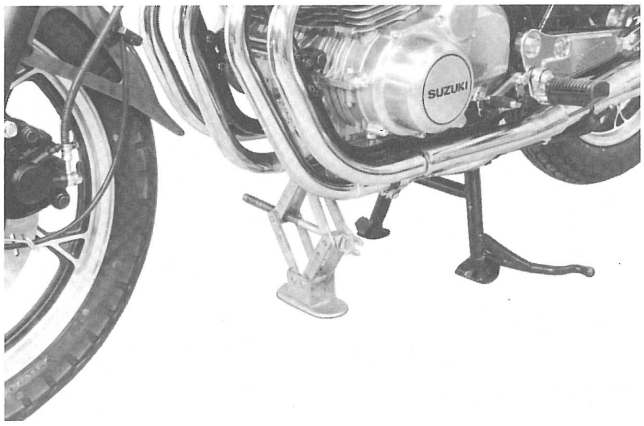
FRONT WHEEL

CONSTRUCTION



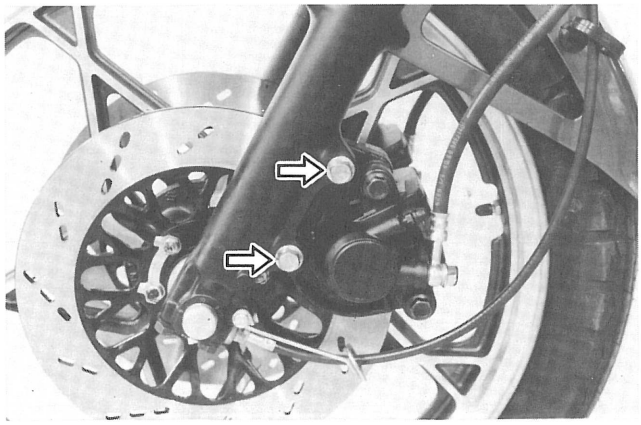
REMOVAL AND DISASSEMBLY

Support the machine by centerstand and jack.

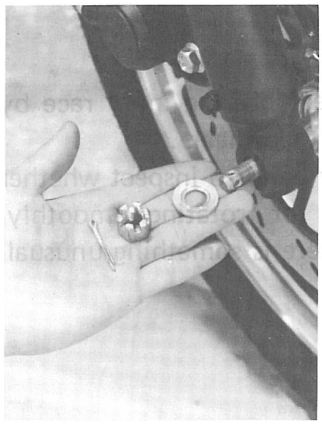


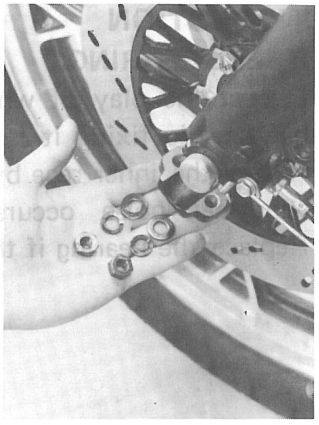
Remove caliper mounting bolts and dismount the caliper.

NOTE:
Do not operate the brake lever while dismounting the caliper.



Pull off cotter pin and remove axle nut.
Remove axle holder.

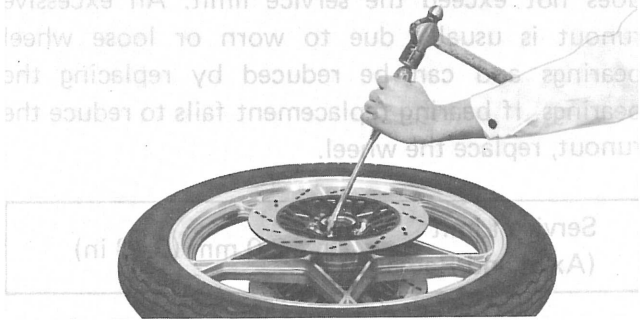




Draw out axle shaft and take off front wheel.

Unlock the lock washer.
Remove the securing bolts and separate the disc from wheel (Right and Left).

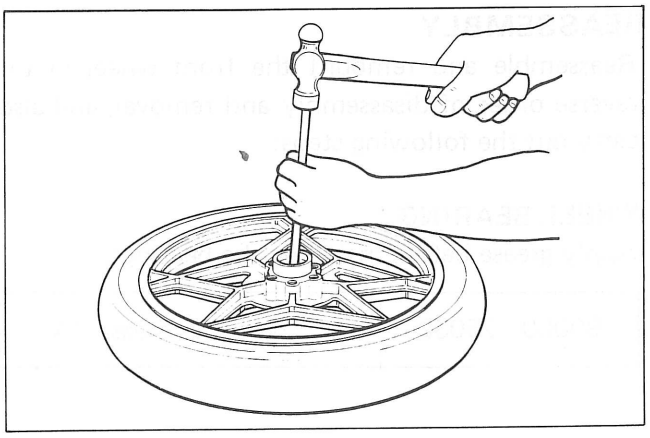
CAUTION:
Do not reuse the lock washer.



Draw out the right and left wheel bearings.

NOTE:
If drawing out the left side bearing first, it makes the job easier.

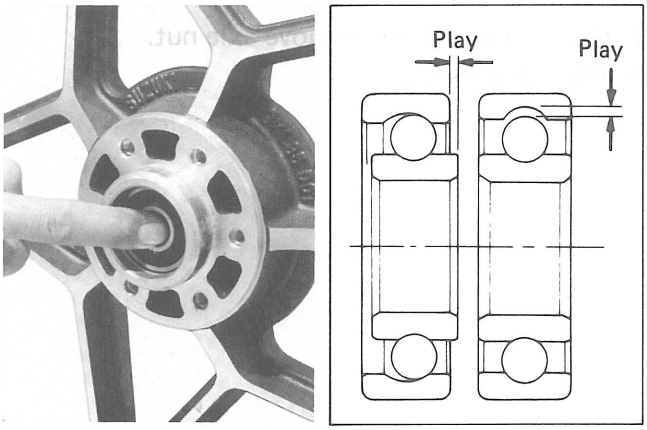
CAUTION:
The removed bearing should be replaced.



INSPECTION

WHEEL BEARINGS

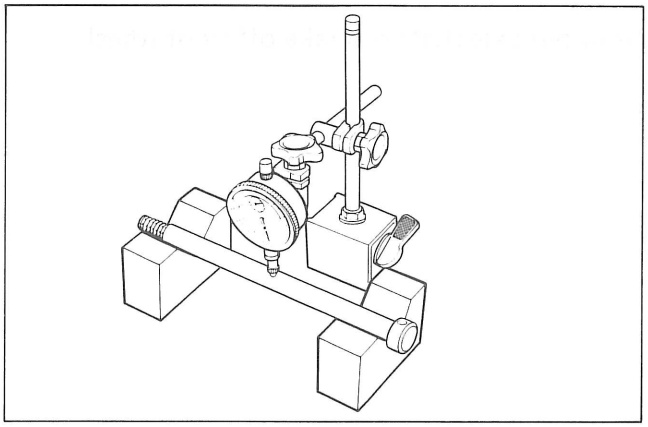
Inspect the play of wheel bearing inner race by hand while fixing it in the wheel.
Rotate the inner race by hand to inspect whether abnormal noise occurs or rotating smoothly. Replace the bearing if there is something unusual.



AXLE SHAFT

Using a dial gauge, check the axle shaft for runout and replace it if the runout exceeds the limit.

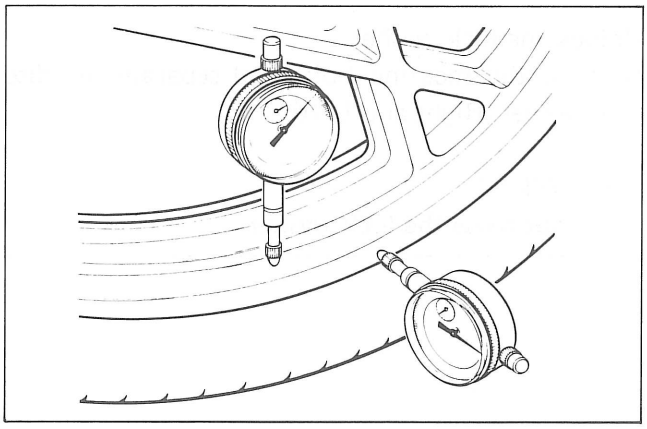
Service Limit	0.25 mm (0.010 in)



WHEEL AND WHEEL RIM

Make sure that the wheel runout checked as shown, does not exceed the service limit. An excessive runout is usually due to worn or loose wheel bearings and can be reduced by replacing the bearings. If bearing replacement fails to reduce the runout, replace the wheel.

Service Limit (Axial and Radial)	2.0 mm (0.08 in)



REASSEMBLY

Reassemble and remount the front wheel in the reverse order of disassembly and removal, and also carry out the following steps:

WHEEL BEARING

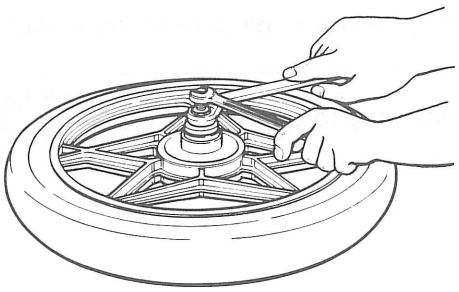
Apply grease before installing the bearings.

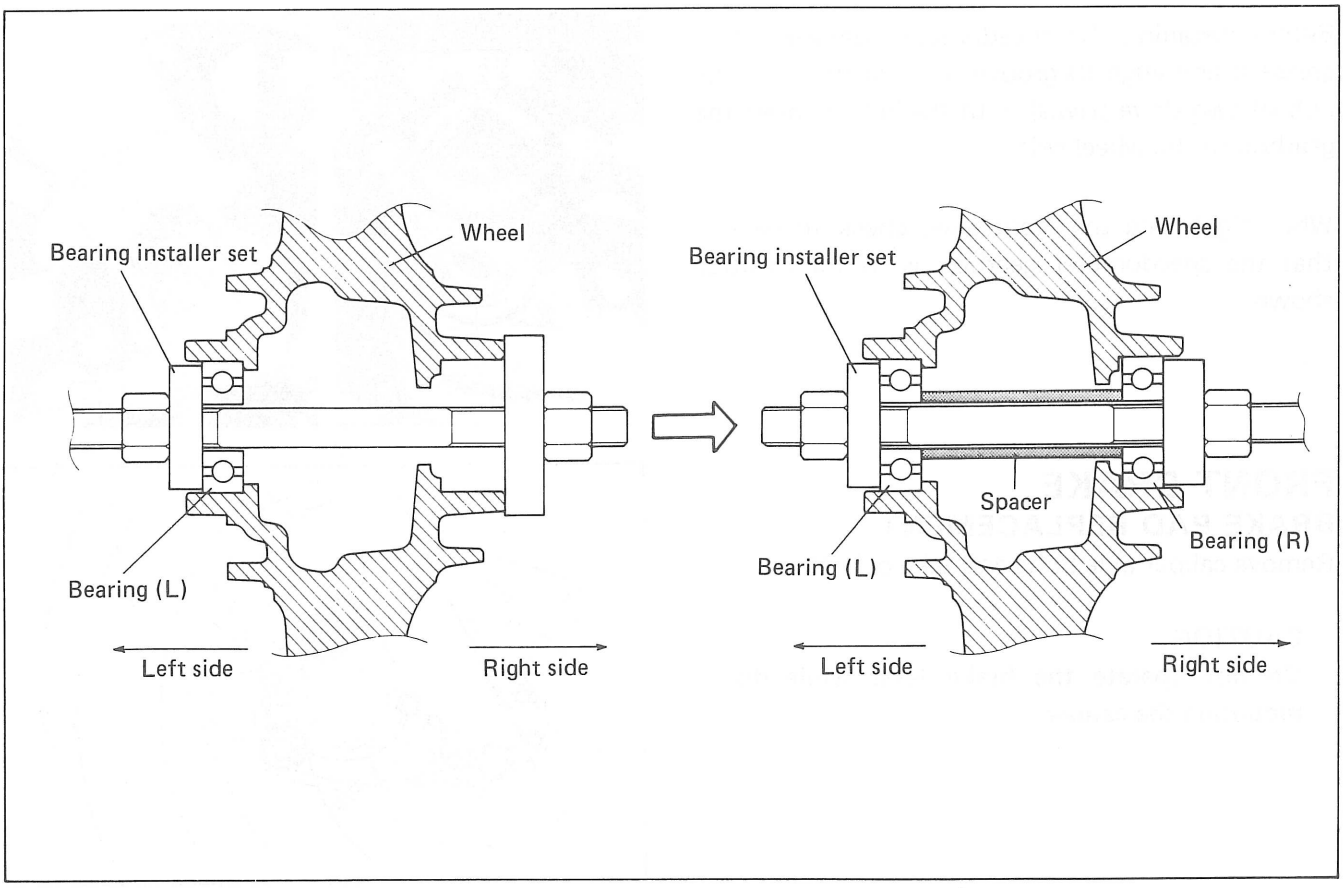
99000 - 25030	Suzuki super grease "A"

Install the wheel bearings as follows by using the special tool.

CAUTION:
First install the wheel bearing for left side.

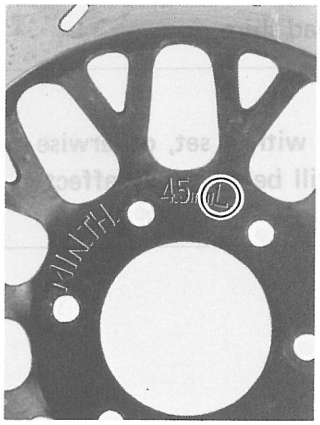
09924 - 84510	Bearing installer set

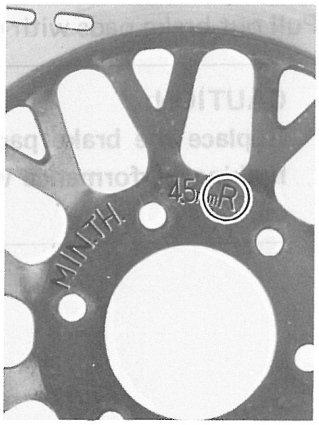




Mount each brake disc properly according to the stamped marks, "R" or "L", on the respective disc plates.

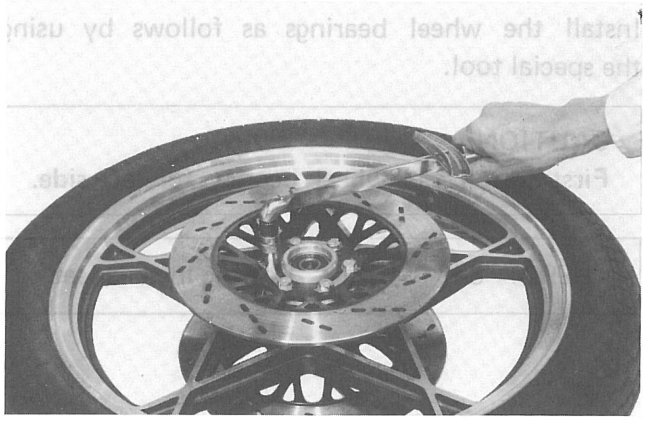
"R"	Right side
"L"	Left side





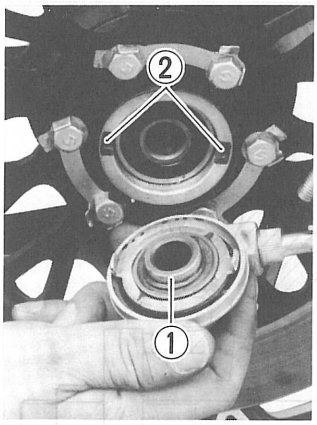
Make sure that the brake disc is clean and free of any greasy matter. After securing it in place by tightening its bolts, be sure to lock each tongue.

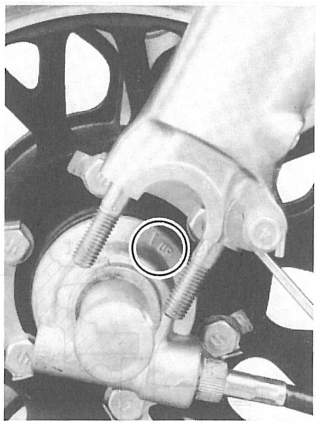
Tightening torque	1.5 – 2.5 kg-m (11.0 – 18.0 lb-ft)



Before installing the speedometer gearbox ① , grease it and align its groove ② , (for fitting to the hub of two drive pawls) with the hub to insert the gearbox to the wheel side.

When tightening the front axle, check to be sure that the speedometer gearbox is in the position shown.



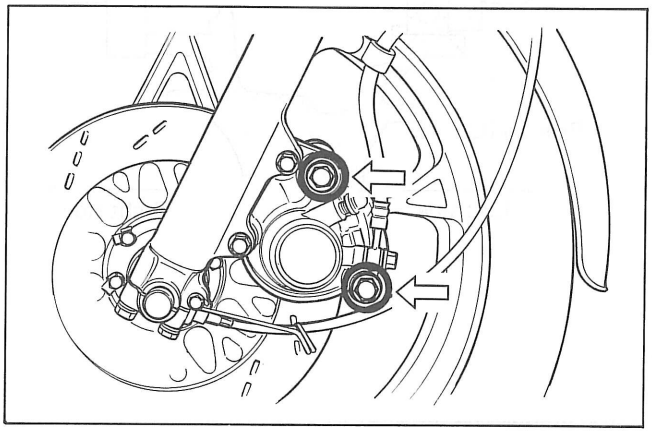


FRONT BRAKE

BRAKE PAD REPLACEMENT

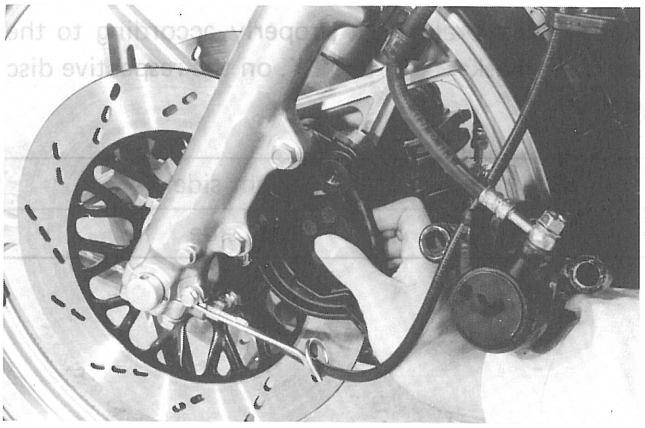
Remove caliper axle bolts and take off caliper.

CAUTION:
Do not operate the brake lever while dismounting the caliper.



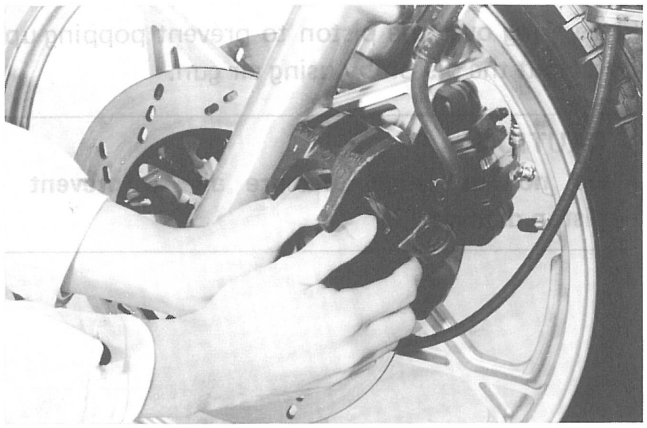
Pull out brake pads with pad shim.

CAUTION:
Replace the brake pad with a set, otherwise braking performance will be adversely affected.



NOTE:
Push in the piston all the way to the caliper when remounting the caliper.

Tightening torque	4.0 – 5.5 kg-m (29.0 – 40.0 lb-ft)

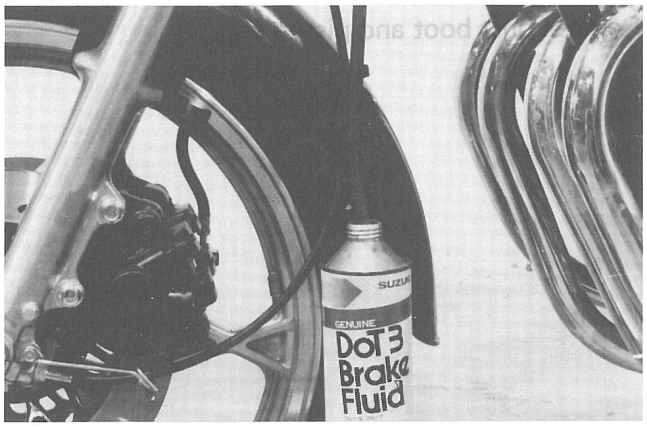


CALIPER REMOVAL AND DISASSEMBLY

Disconnect brake hose and catch the brake fluid in a suitable receptacle.

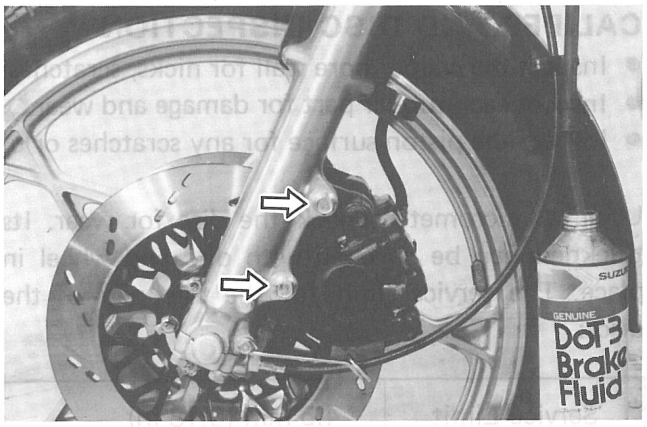
CAUTION:
Never re-use the brake fluid left over from the last servicing and stored for long periods.

WARNING:
Brake fluid, if it leaks, will interfere with safe running and immediately discolor painted surfaces. Check the brake hose for cracks and hose joint for leakage before riding.

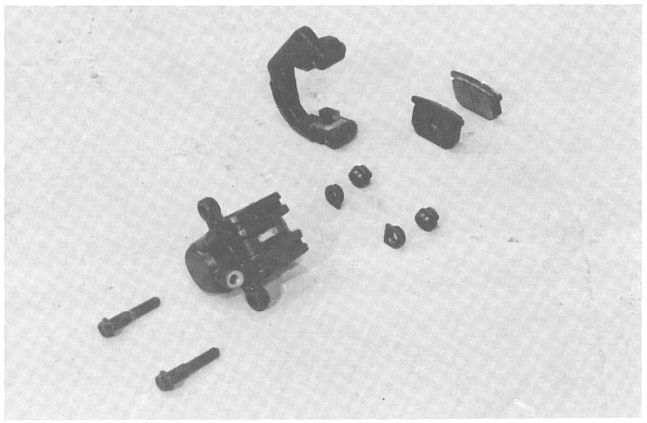


Remove caliper mounting bolts and take off caliper.

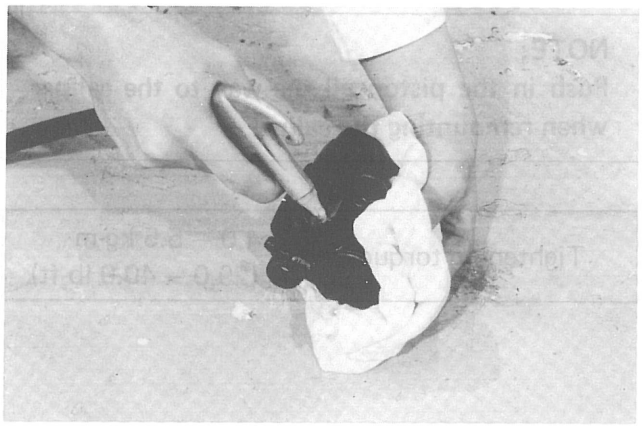
NOTE:
Slightly loosen the caliper axle bolts to facilitate later disassembly.



Remove caliper axle bolts, separate the caliper and caliper holder.



Place a rag over the piston to prevent popping up. Force out the piston by using air gun.



> **CAUTION:**
> **Do not use high pressure air to prevent piston damage.**

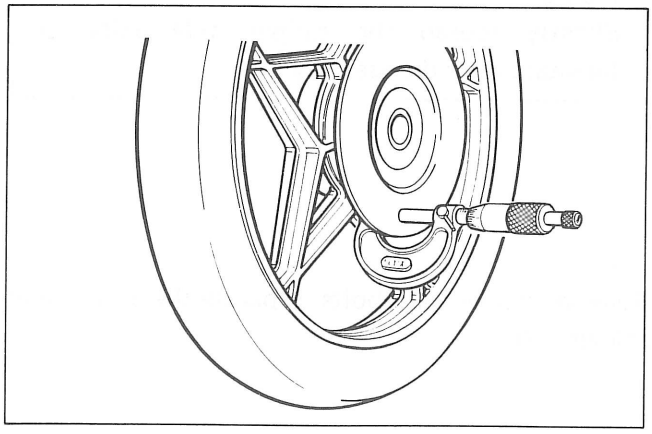
Remove dust boot and piston seal.

CALIPER AND DISC INSPECTION

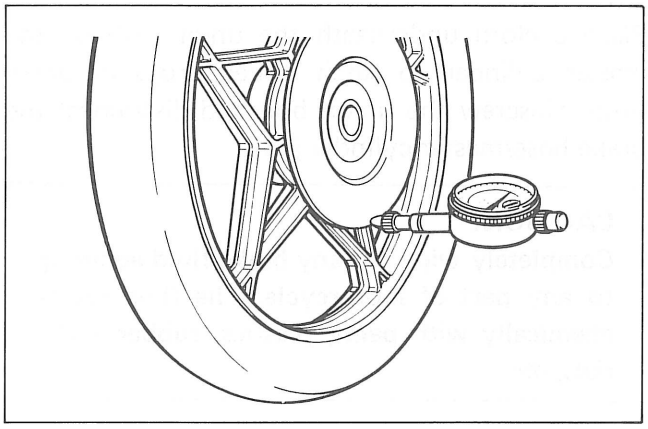
- Inspect the caliper bore wall for nicks, scratches or other damage.
- Inspect each rubber part for damage and wear.
- Inspect the piston surface for any scratches or other damage.

Using a micrometer check the disc for wear. Its thickness can be checked with disc and wheel in place. The service limit for the thickness of the discs:

Service Limit	4.5 mm (0.18 in)



With the disc mounted on the wheel, check the disc for face runout with a dial gauge, as shown.



Service Limit	0.30 mm (0.012 in)

CALIPER REASSEMBLY

Reassemble the caliper in the reverse orders of disassembly and by taking the following steps:

CAUTION:
Wash the caliper components only with fresh brake fluid before reassembly.
Never use cleaning solvent or gasoline to wash them.
Apply brake fluid to the caliper bore and piston to be inserted into the bore.

Apply SUZUKI silicone grease to the caliper axles.

99000 - 25100	SUZUKI silicone grease

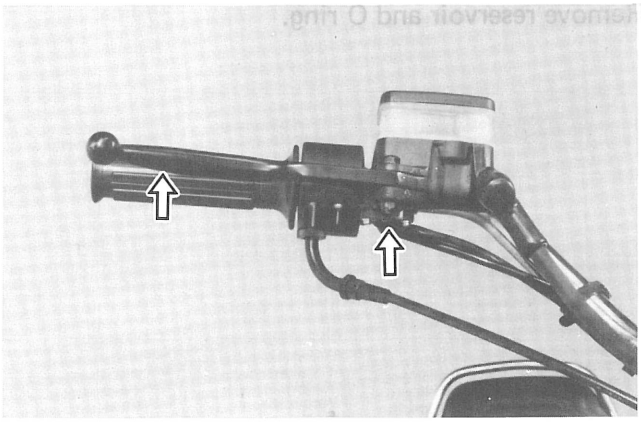
WARNING:
Bleed the air after reassembling caliper (See page 2-17).

Tightening torque:

	kg-m	lb-ft
Union bolt	2.0 – 2.5	14.5 – 18.0
Caliper mounting bolt	2.5 – 4.0	18.0 – 29.0
Caliper axle bolt	4.0 – 5.5	29.0 – 40.0

MASTER CYLINDER REMOVAL AND DISASSEMBLY

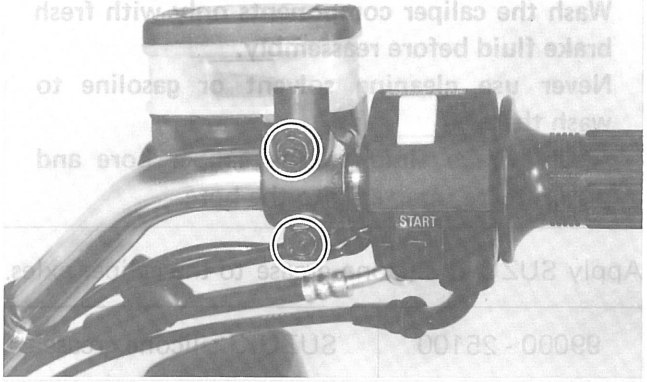
Take off front brake light switch and remove front brake lever.



Place a cloth underneath the union bolt on the master cylinder to catch spilled drops of brake fluid. Unscrew the union bolt and disconnect the brake hose/master cylinder joint.

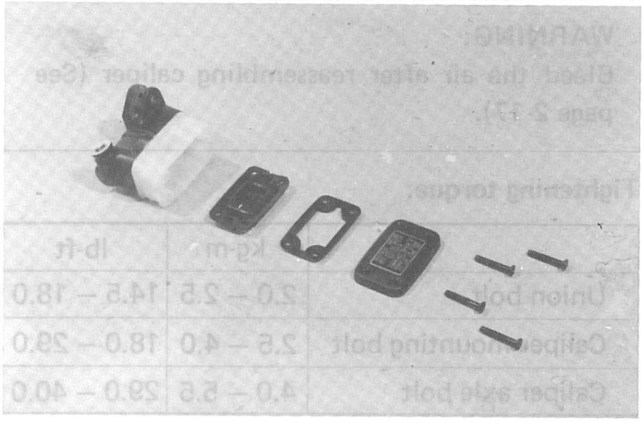
CAUTION:
Completely wipe off any brake fluid adhering to any part of motorcycle. The fluid reacts chemically with paint, plastics, rubber materials, etc.

Remove two clamp bolts and take off master cylinder ass'y.

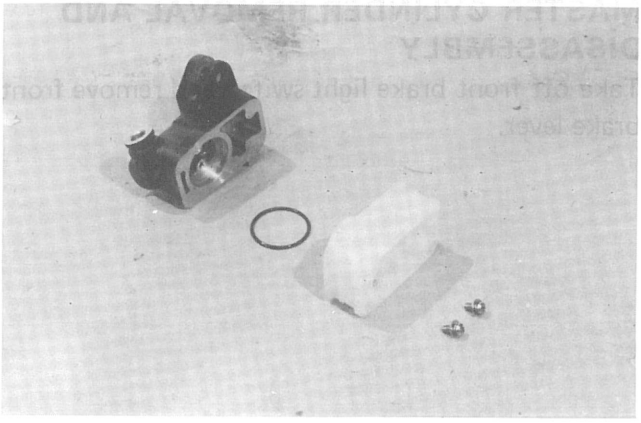


Remove reservoir cap, diaphragm plate and diaphragm.

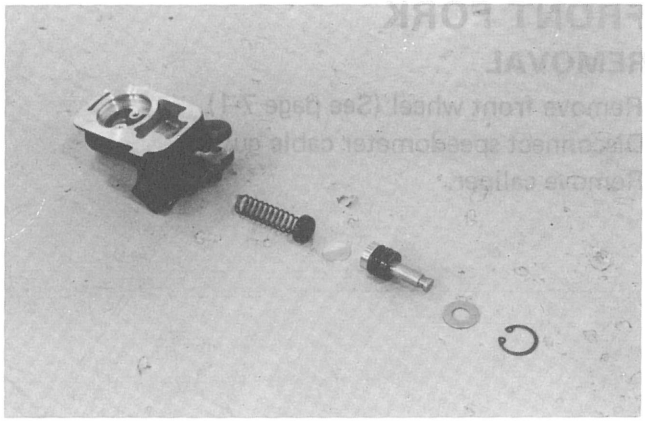
Drain brake fluid.



Remove reservoir and O ring.



Pull off dust boot.
Remove circlip by using the special tool.
Remove piston, primary cup and spring.



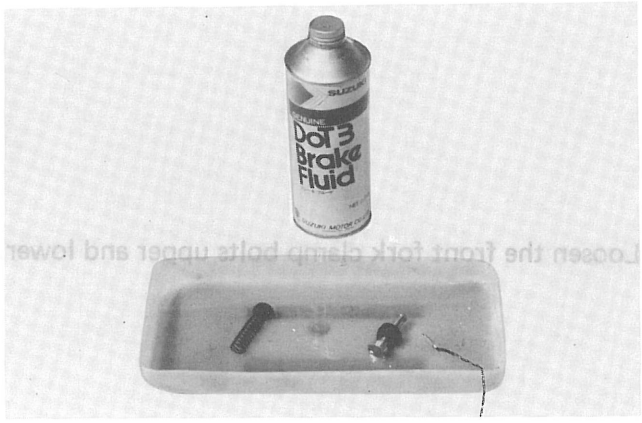
MASTER CYLINDER INSPECTION

- Inspect the master cylinder bore for any scratches or other damage.
- Inspect the piston surface for scratches or other damage.
- Inspect the primary cup, secondary cup and dust boot for wear or damage.

MASTER CYLINDER REASSEMBLY

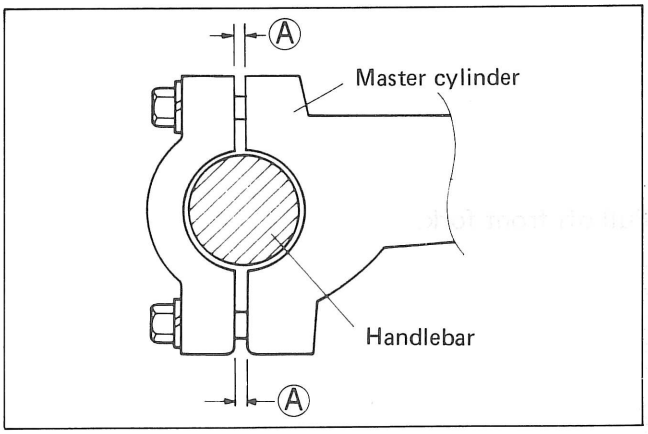
Reassemble the master cylinder in the reverse orders of disassembly and by taking the following steps:

CAUTION:
Wash the master cylinder components only with fresh brake fluid before reassembly. Never use cleaning solvent or gasoline to wash them. Apply brake fluid to the cylinder bore and all the internals to be inserted into the bore.



When remounting the master cylinder on the handlebars, secure the clamp so that the clearances Ⓐ of both upside and downside of the handlebars stay equally.

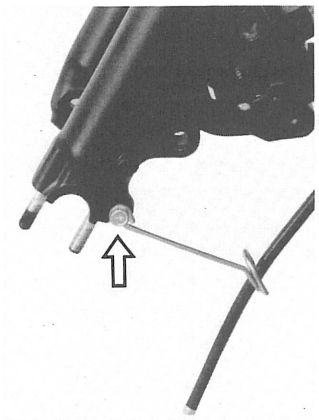
CAUTION:
Bleed the air after reassembling master cylinder. (See page 2-17).
Adjust the front brake light switch after installation.



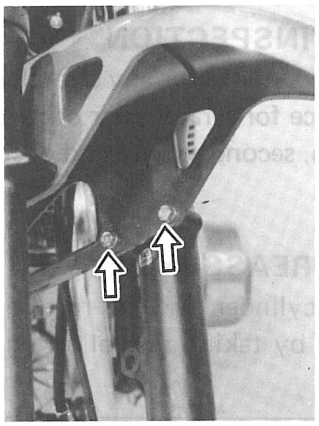
FRONT FORK

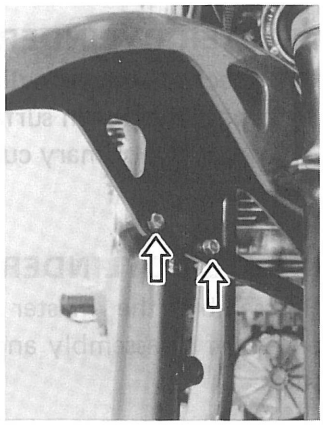
REMOVAL

Remove front wheel (See page 7-1).
Disconnect speedometer cable guide.
Remove caliper.

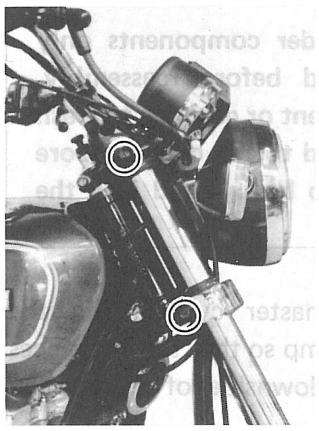


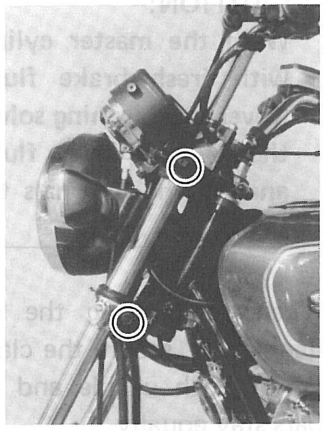
Remove fender.



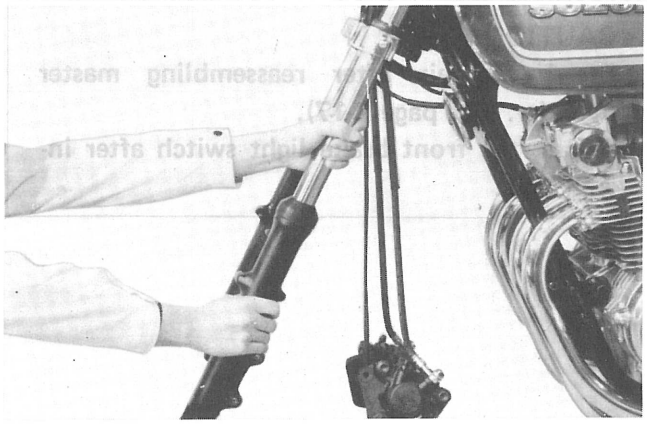


Loosen the front fork clamp bolts upper and lower.

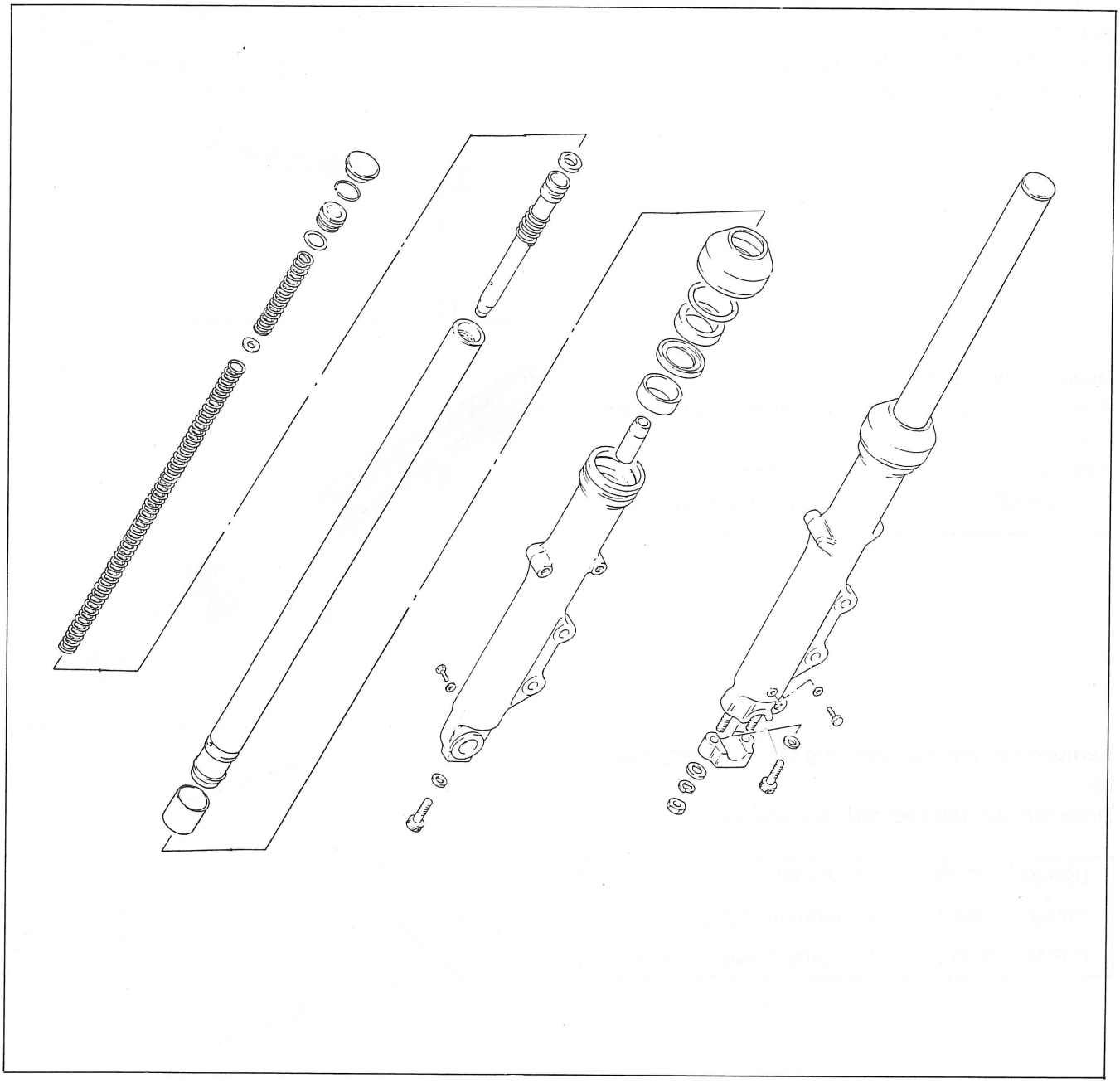




Pull off front fork.

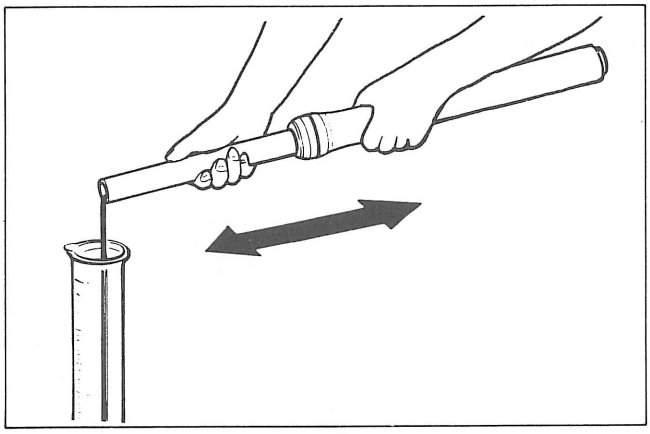


DISASSEMBLY



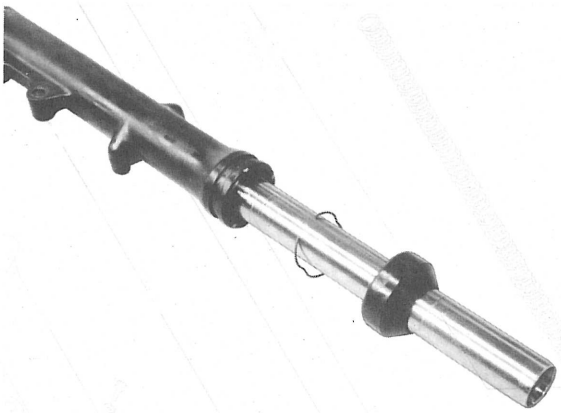
Remove rubber cap and take off spring stopper by removing clip.
Draw out fork spring.

Invert the fork and stroke it several times to let out the oil inside.
Under the condition (inverted condition), hold the fork for a few minutes.



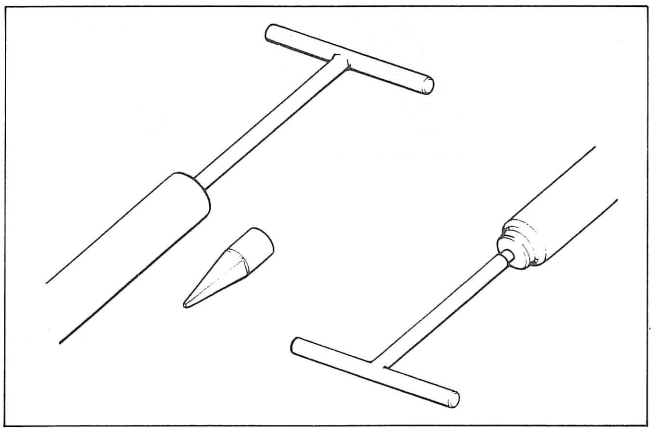
Draw out dust seal.
Remove circlip by using special tool and stopper ring.

09900 - 06105	Snap ring pliers



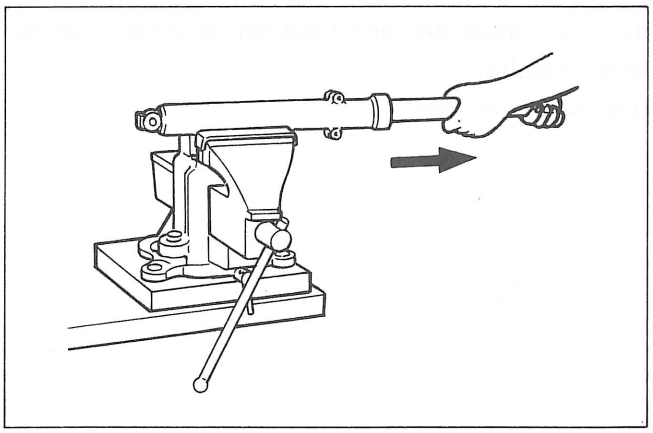
Remove damper rod securing bolt by using special tools.
Draw out damper rod and rebound spring.

09940 - 34520	"T" handle
09940 - 34561	Attachment "D"
09914 - 25811	"T" type hexagon wrench



While holding the caliper mounting portion of the outer tube by vise, separate the inner tube from the outer tube as shown.

CAUTION:
The outer tube and inner tube "anti-friction" rings or metal slide rings must be replaced along with the oil seal any time the fork is disassembled.



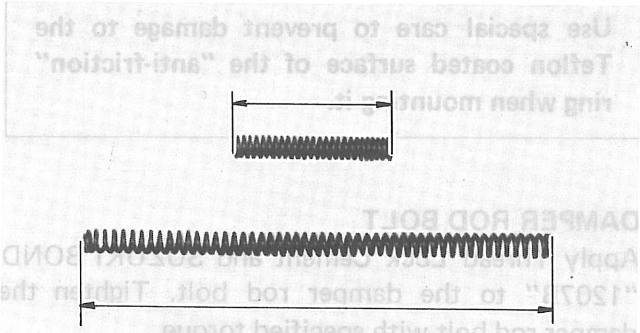
Remove inner tube anti-friction ring.

INSPECTION

FORK SPRING

Measure the fork spring free length. If it is shorter than service limit, replace it.

Service Limit	S	93 mm (3.6 in)
	L	397 mm (15.6 in)



INNER TUBE AND OUTER TUBE

Inspect inner tube sliding surface for any scuffing and check the bend.

Inspect outer tube sliding surface for any scuffing.

DAMPER ROD RING

Inspect damper rod ring for wear and damage.

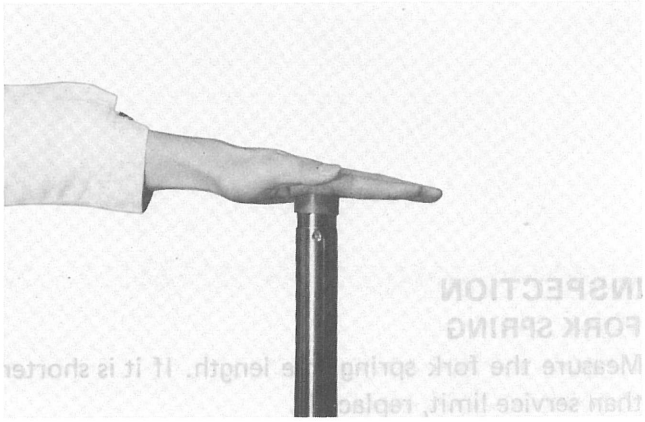
REASSEMBLY

Reassemble and remount the front fork in the reverse order of disassembly and removal and also carry out the following steps:

INNER TUBE METAL

Hold the inner tube vertically and clean the metal groove.

Clean the new metal inner surface and install it to the metal groove of the inner tube as shown.



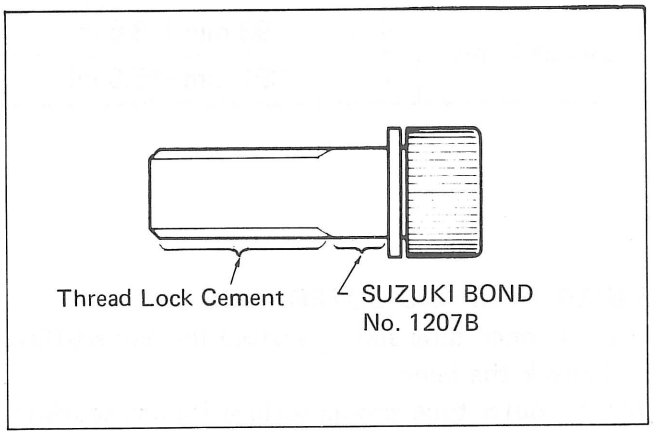
CAUTION.
Use special care to prevent damage to the Teflon coated surface of the "anti-friction" ring when mounting it.

DAMPER ROD BOLT

Apply Thread Lock Cement and SUZUKI BOND "1207B" to the damper rod bolt. Tighten the damper rod bolt with specified torque.

99000 - 32040	Thread Lock Cement
99104 - 31140	SUZUKI BOND "1207B"

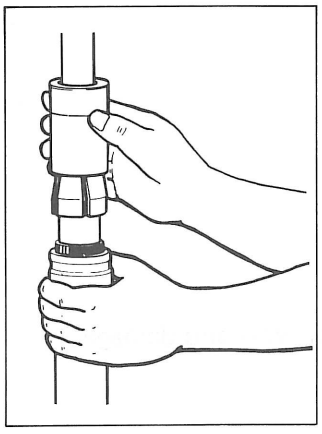
Tightening torque	1.5 – 2.5 kg-m (11.0 – 18.0 lb-ft)

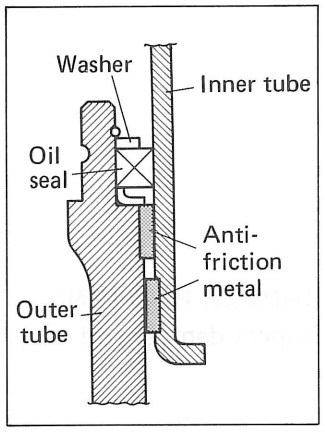


OUTER TUBE METAL, SPACER AND OIL SEAL

Clean the metal groove of the outer tube. Clean the new metal outer surface and install it to the metal groove of the outer tube as shown.

CAUTION:
Use special care to prevent damage to the Teflon coated surface of the "anti-friction" ring when mounting it.



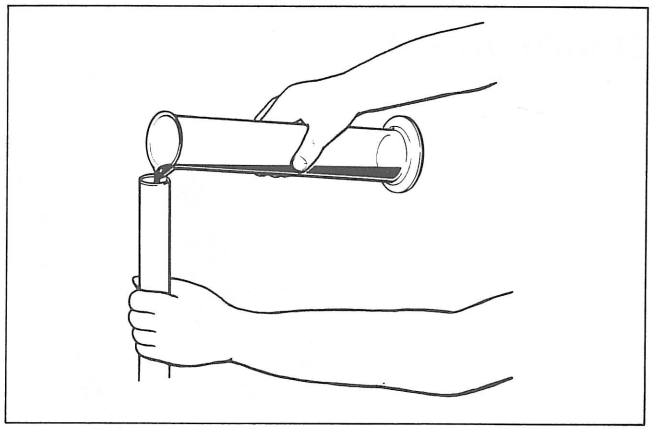


FORK OIL

For the fork oil, be sure to use a fork oil whose viscocity rating meets specifications below.

Fork oil	Fork oil # 15

Fork oil capacity	190 ml (6.42/6.69 US/Imp oz)

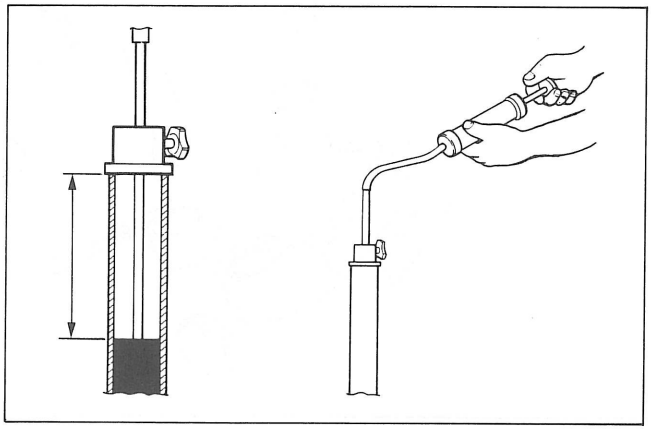


Hold the front fork vertical and adjust the fork oil level with the special tool.

NOTE:
When adjusting oil level, remove the fork spring and compress the inner tube fully.

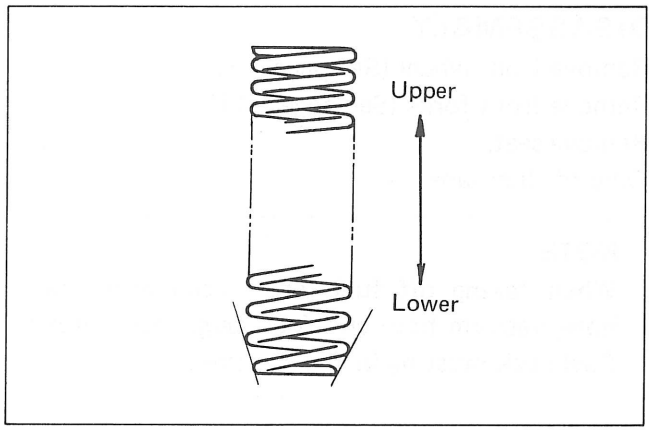
09943 - 74111	Fork oil level gauge

Fork oil level	201 mm (7.91 in)



FORK SPRING

When installing the upper fork spring, small diameter end should be positioned in bottom.

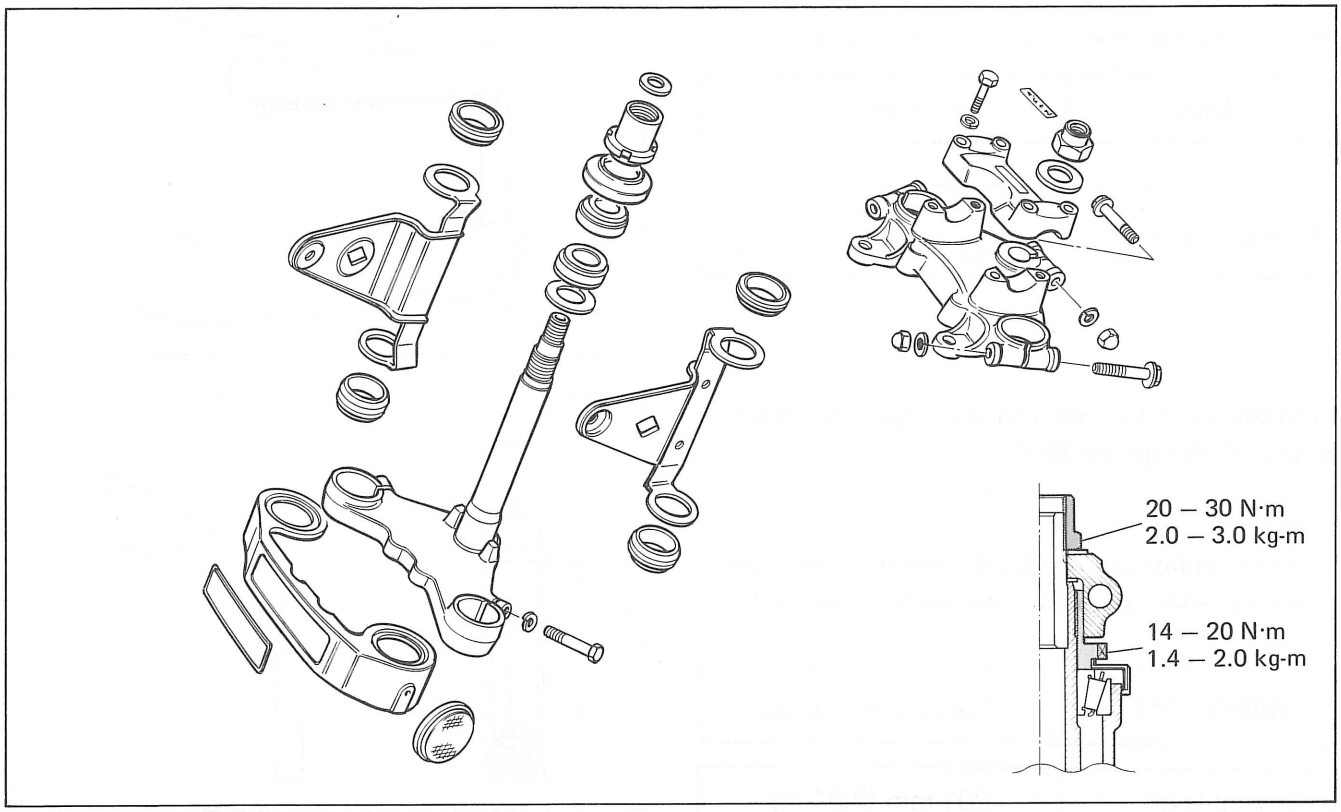


Tightening torque:

	kg-m	lb-ft
Front fork clamp bolt (U)	2.0 – 3.0	14.5 – 21.5
Front fork clamp bolt (L)	1.5 – 2.5	11.0 – 18.0
Damper rod bolt	1.5 – 2.5	11.0 – 18.0

STEERING STEM

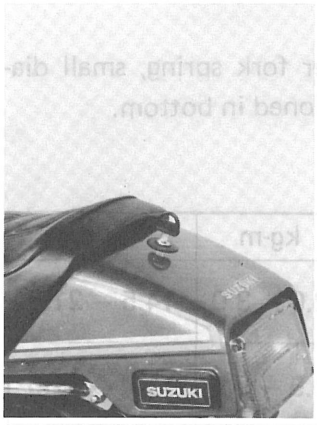
CONSTRUCTION

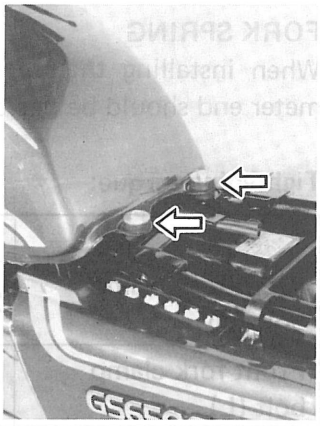


DISASSEMBLY

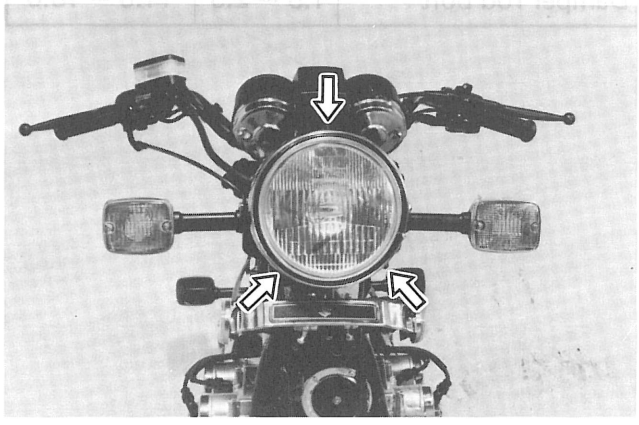
Remove front wheel (See page 7-1).
Remove front forks (See page 7-11).
Remove seat.
Take off fuel tank.

NOTE:
When taking off fuel tank, disconnect fuel hose, vacuum hose and fuel gauge lead wires. Fuel cock must be in ON position.

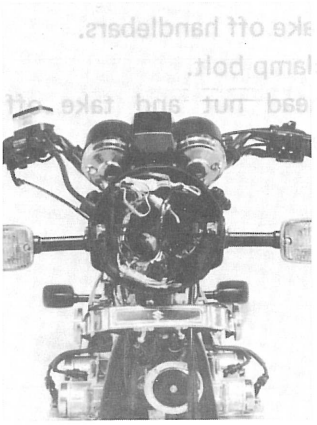


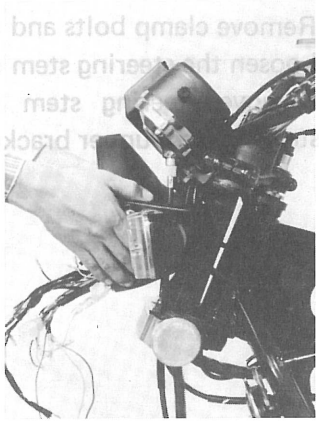


Remove headlight by removing three fitting screws.

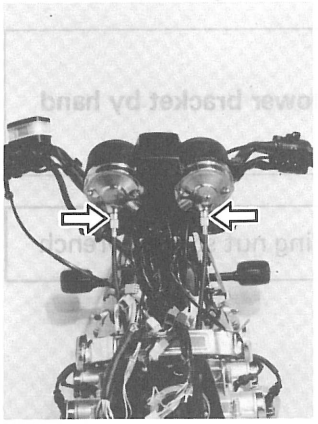


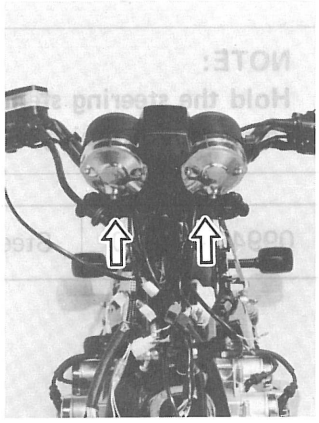
Disconnect lead wires.
Dismount the headlight housing, turn signal lights and headlight bracket at same time.





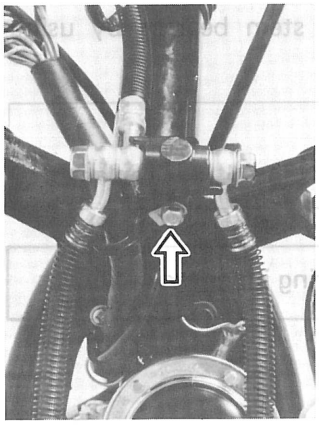
Disconnect speedometer and tachometer cables.
Remove meter mounting nuts and take off meter.

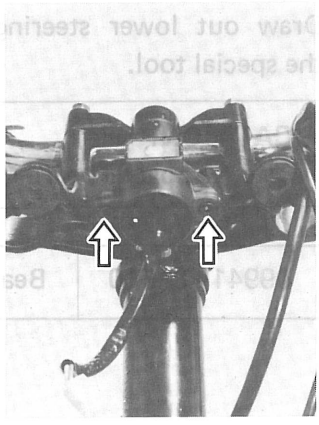




Disconnect brake hose joint.
Remove ignition switch by using the special tool.

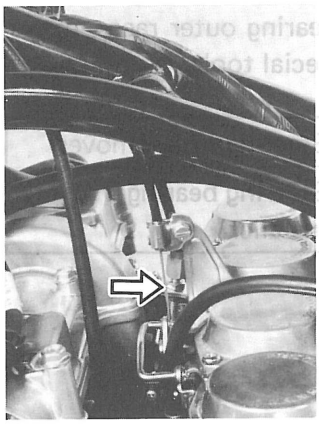
09911 - 73730	T type hexagon wrench

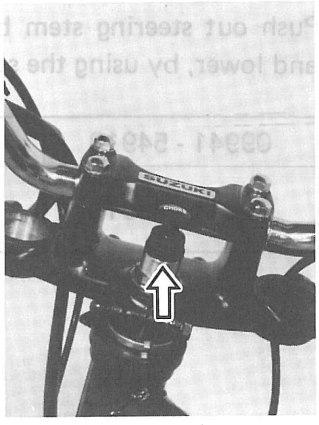




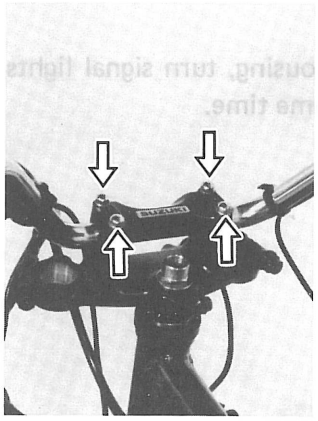
Disconnect choke cable at carburetor side.

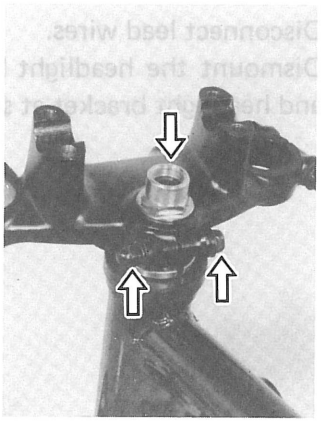
Loosen the lock nut and remove choke cable.





Remove clamp bolts and take off handlebars.
Loosen the steering stem clamp bolt.
Remove steering stem head nut and take off steering stem upper bracket.

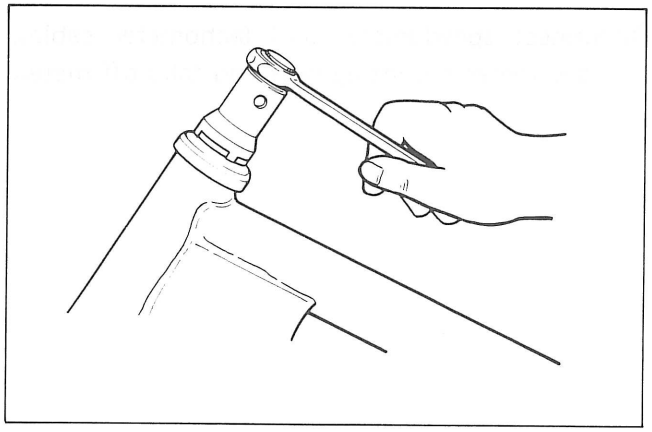




Remove steering stem nut by using the special tool.

NOTE:
Hold the steering stem lower bracket by hand to prevent dropping.

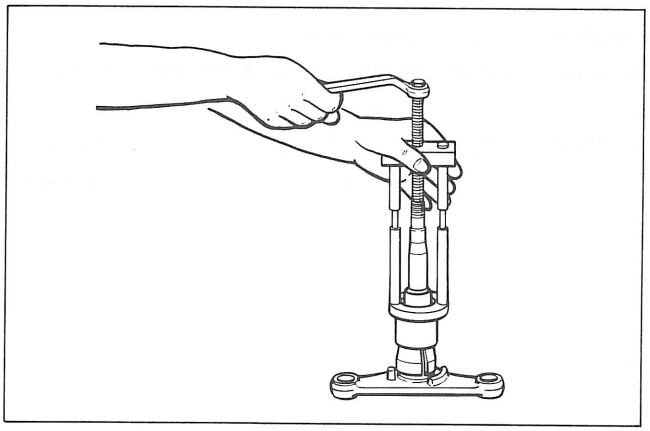
09940 - 14910	Steering nut socket wrench



Draw out lower steering stem bearing by using the special tool.

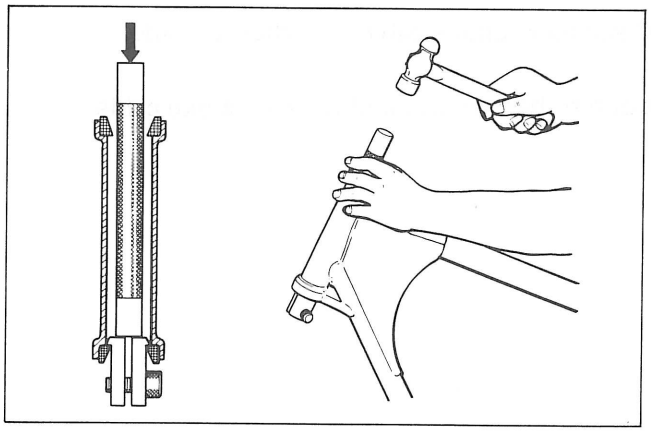
CAUTION.
The removed bearing should be replaced.

09941 - 84510	Bearing inner race remover



Push out steering stem bearing outer races, upper and lower, by using the special tools.

09941 - 54910	Steering race remover
09941 - 74910	Steering bearing installer



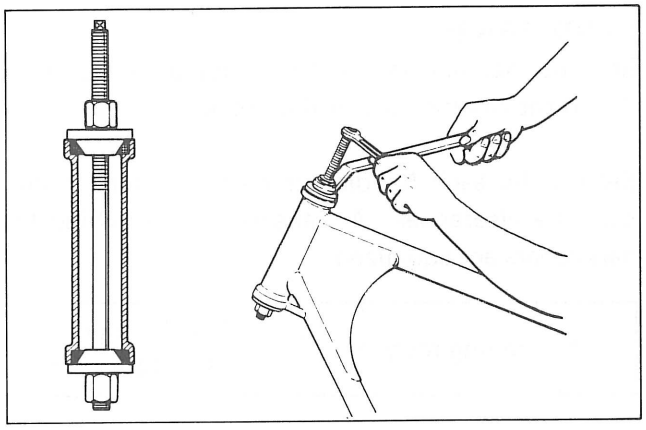
REASSEMBLY

Reassemble and remount the steering stem in the reverse order of disassembly and removal and also carry out the following steps:

OUTER RACES

Press in the upper and lower outer races using the special tool.

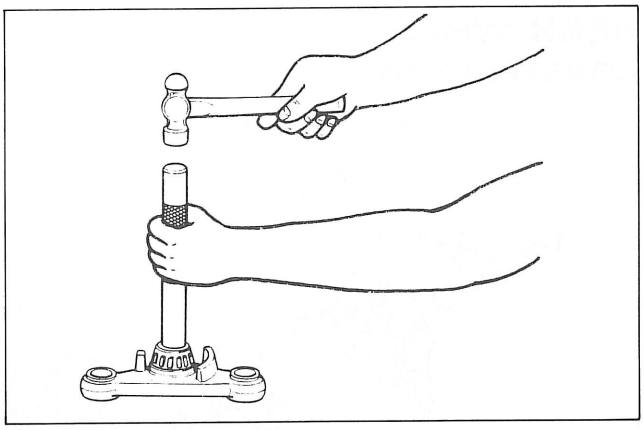
09941 - 34511	Steering outer race installer



BEARING

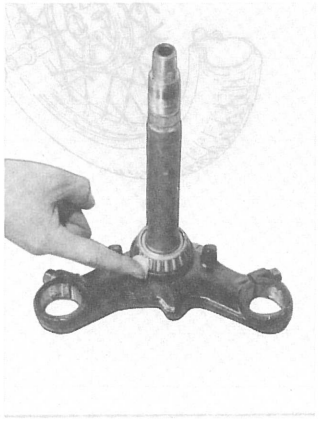
Press in the lower bearing by using special tool.

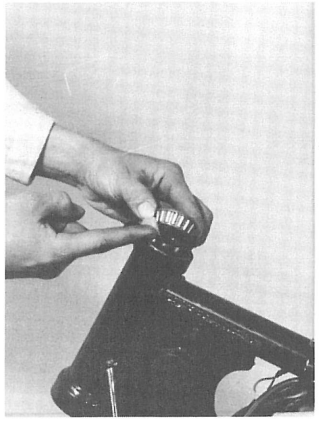
09941 - 74910	Steering bearing installer



Apply grease upper and lower bearing before remounting the steering stem.

99000 - 25030	Suzuki super grease "A"





STEM NUT

Tighten the steering stem nut by using the special tool with specified torque.

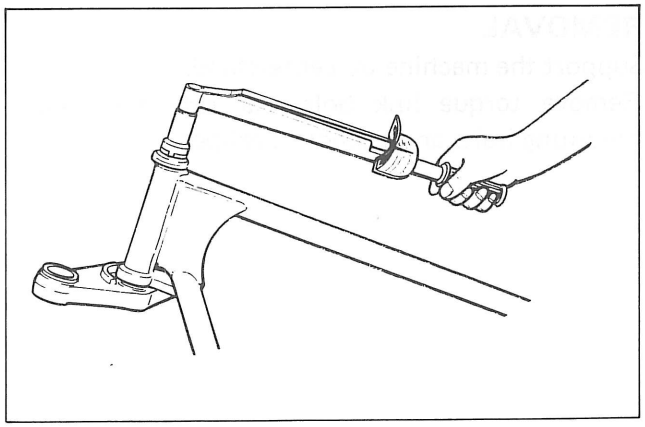
Turn the front fork right and left 5 or 6 times to seat the bearings.

Turn out the steering stem nut 1/4 turn.

Then retighten very lightly so that no play can be detected in the stem.

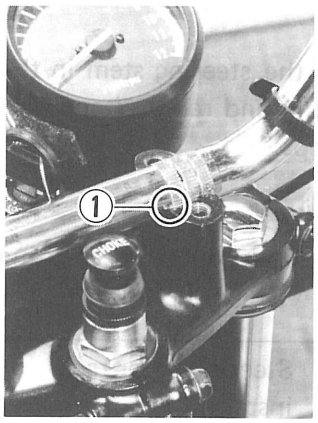
09940 - 14911	Stem nut socket wrench

Tightening torque	1.4 – 2.0 kg-m (10.0 – 14.5 lb-ft)

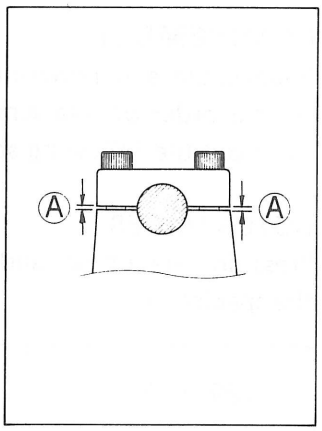


HANDLEBARS

Set the handlebars to match its punched mark ① to the mating face of the holder.



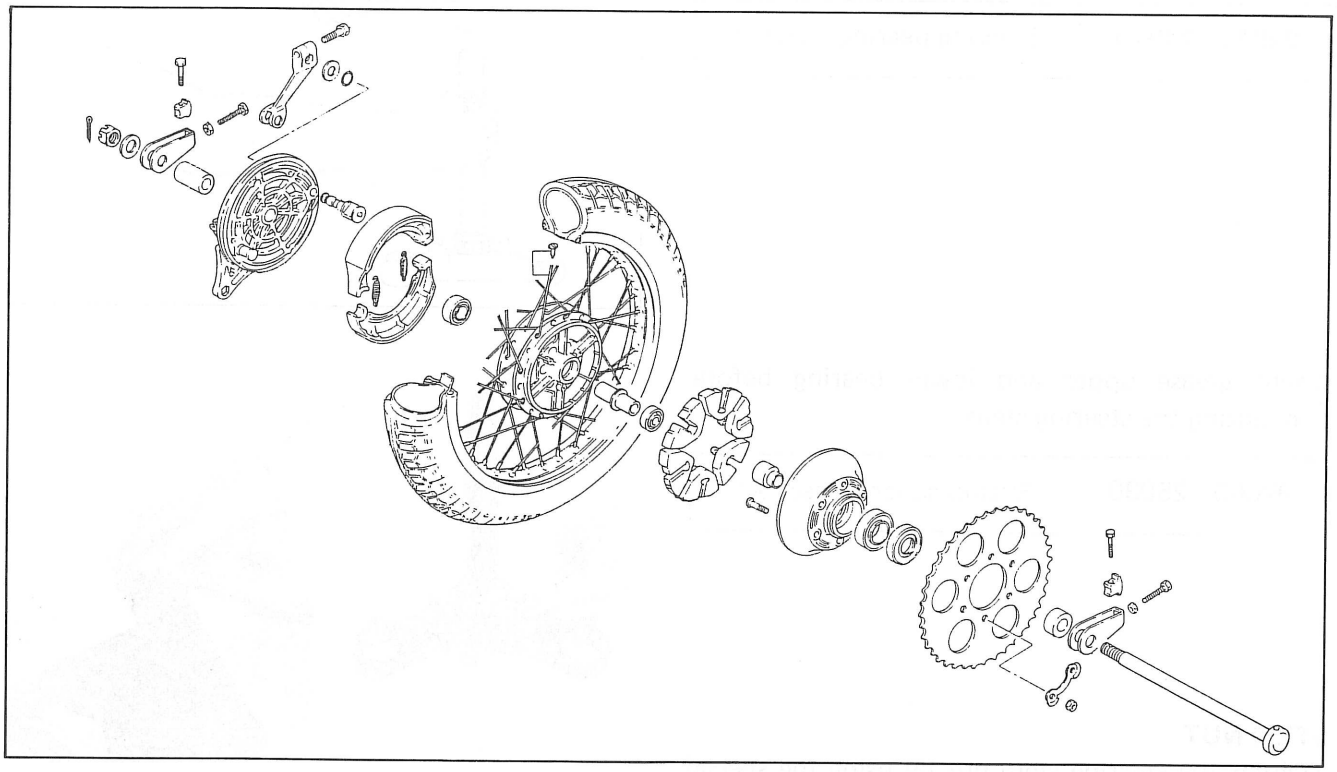
Secure the each handlebars clamp in such a way that the clearances Ⓐ ahead of and behind the handlebars are equalized.



Tightening torque	1.2 – 2.0 kg-m (8.5 – 14.5 lb-ft)

REAR WHEEL

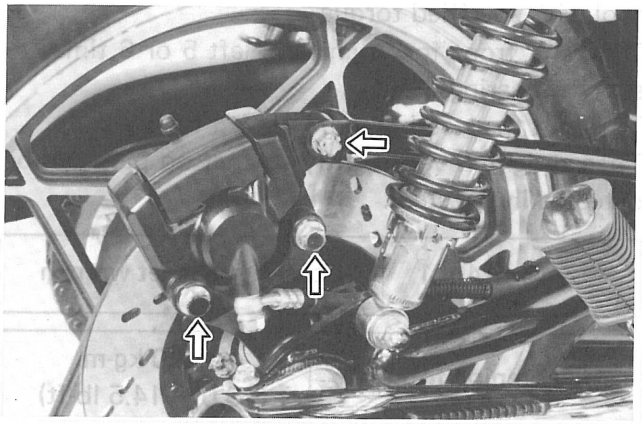
CONSTRUCTION



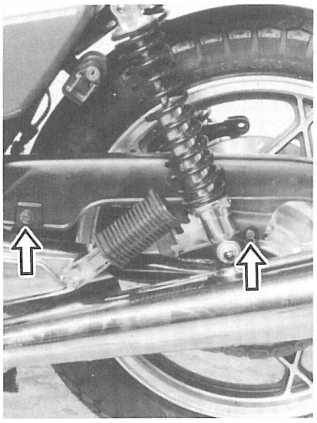
REMOVAL

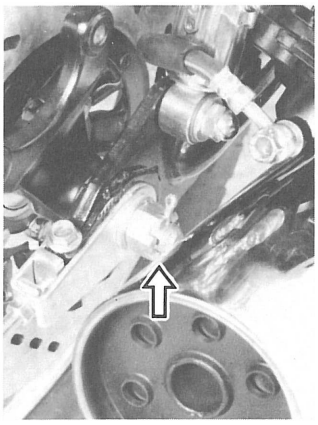
Support the machine by centerstand.

Remove torque link bolt rear side and caliper mounting bolts and dismount caliper.

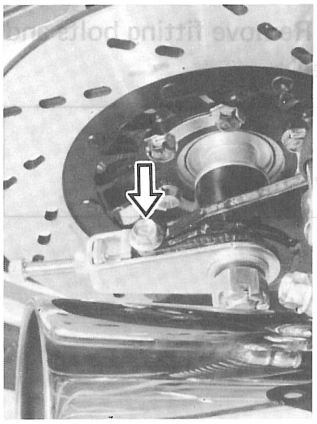


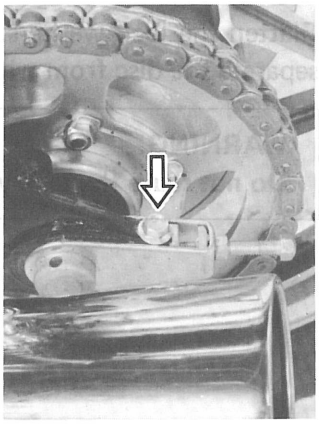
Remove chain case.



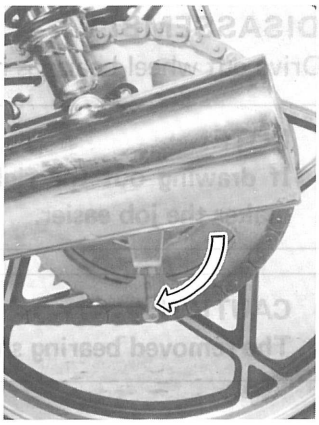


Remove chain adjuster supporter bolts.



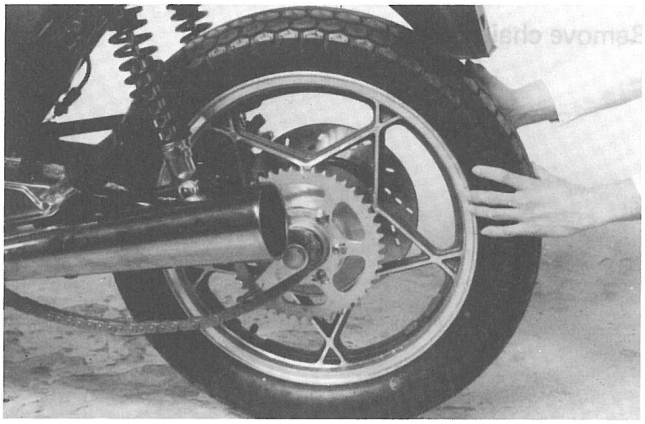


Pull the wheel rearward and push down the chain adjusters.



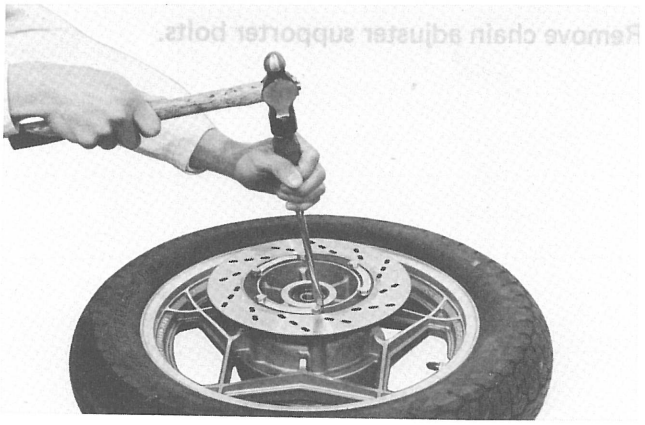
Push the wheel forward and dismount drive chain from sprocket.

Pull off wheel rearward.



Flatten the lock washers. Remove fitting bolts and separate the disc from wheel.

WARNING:
Do not reuse the lock washers.

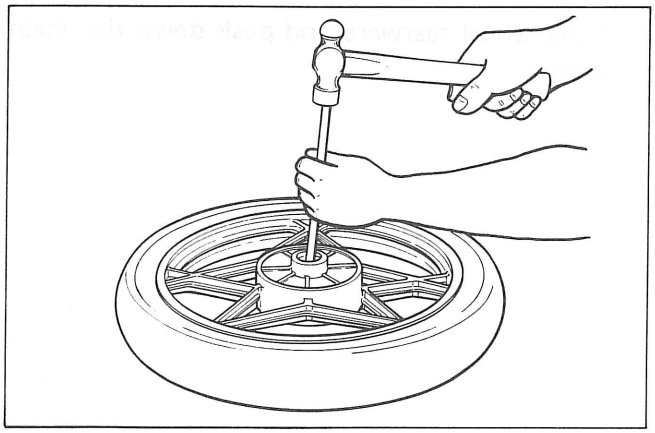


DISASSEMBLY

Drive out wheel bearings right and left.

NOTE:
If drawing out the right side bearing first, it makes the job easier.

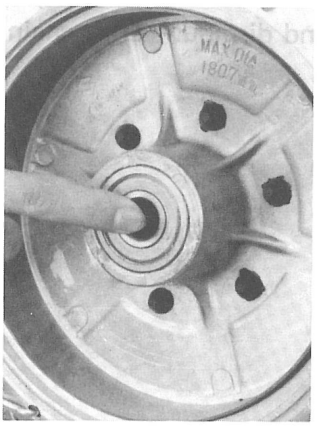
CAUTION:
The removed bearing should be replaced.

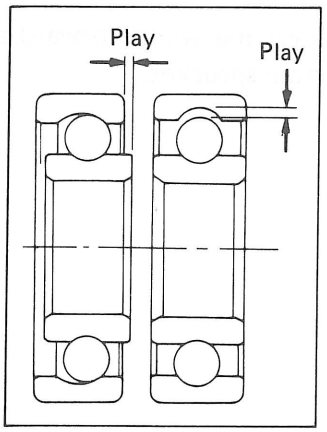


INSPECTION

WHEEL BEARINGS

Inspect the play of wheel bearing inner race by hand while fixing it in the wheel. Rotate the inner race by hands to inspect whether abnormal noise occurs or is rotates smoothly. Replace the bearing if there is something unusual.

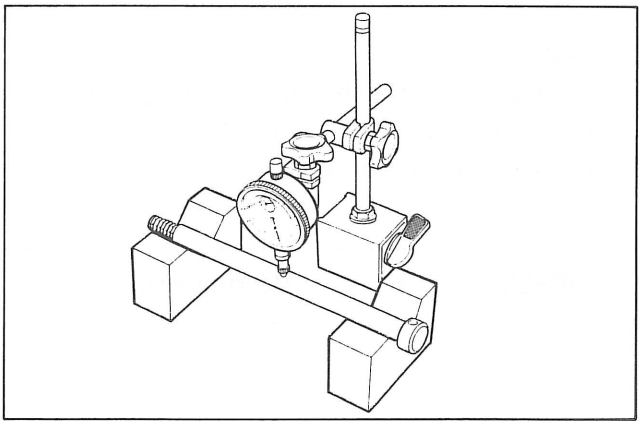




AXLE SHAFT

Using a dial gauge, check the axle shaft for runout and replace it if the runout exceeds the limit.

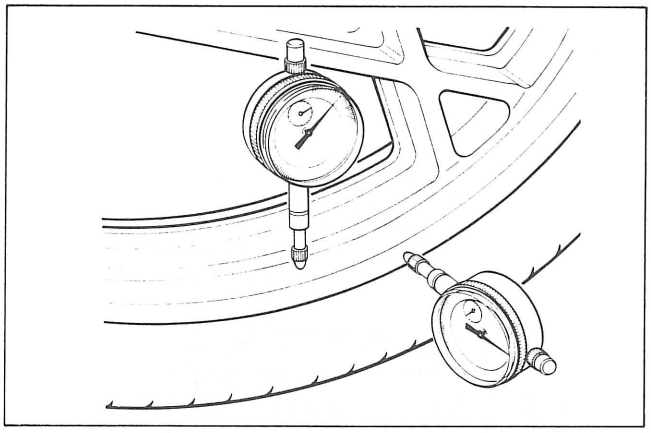
Service Limit	0.25 mm (0.010 in)



WHEEL

Make sure that the wheel runout checked as shown does not exceed the service limit. An excessive runout is usually due to worn or loose wheel bearings and can be reduced by replacing the bearings. If bearing replacement fails to reduce the runout replace the wheel.

Service Limit (Axial and Radial)	2.0 mm (0.08 in)



WHEEL DAMPER

Inspect the wheel dampers for damage or wear.

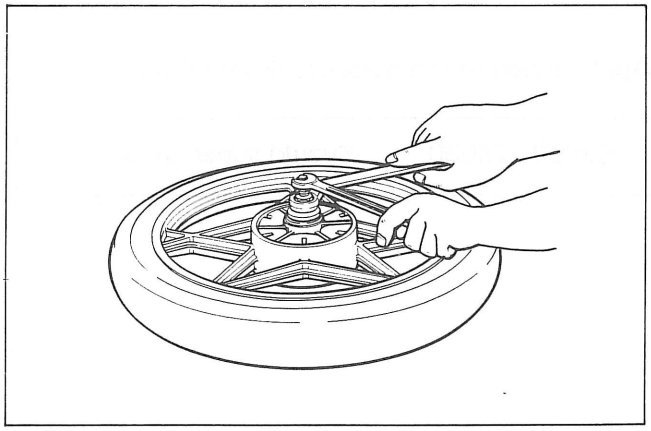
REASSEMBLY

Reassemble and remount the rear wheel in the reverse order of disassembly and removal and also carry out the following steps:

WHEEL BEARINGS

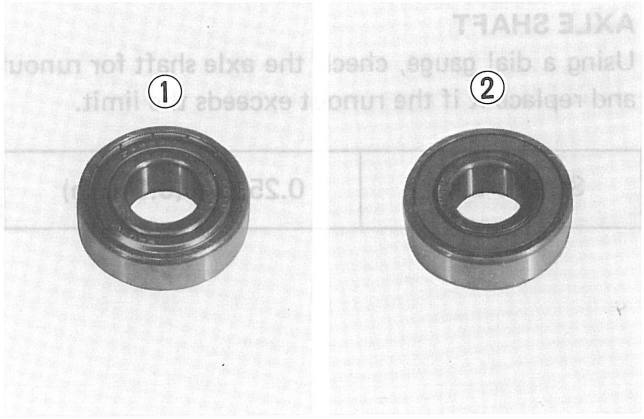
Install the wheel bearings by using the special tool as shown.

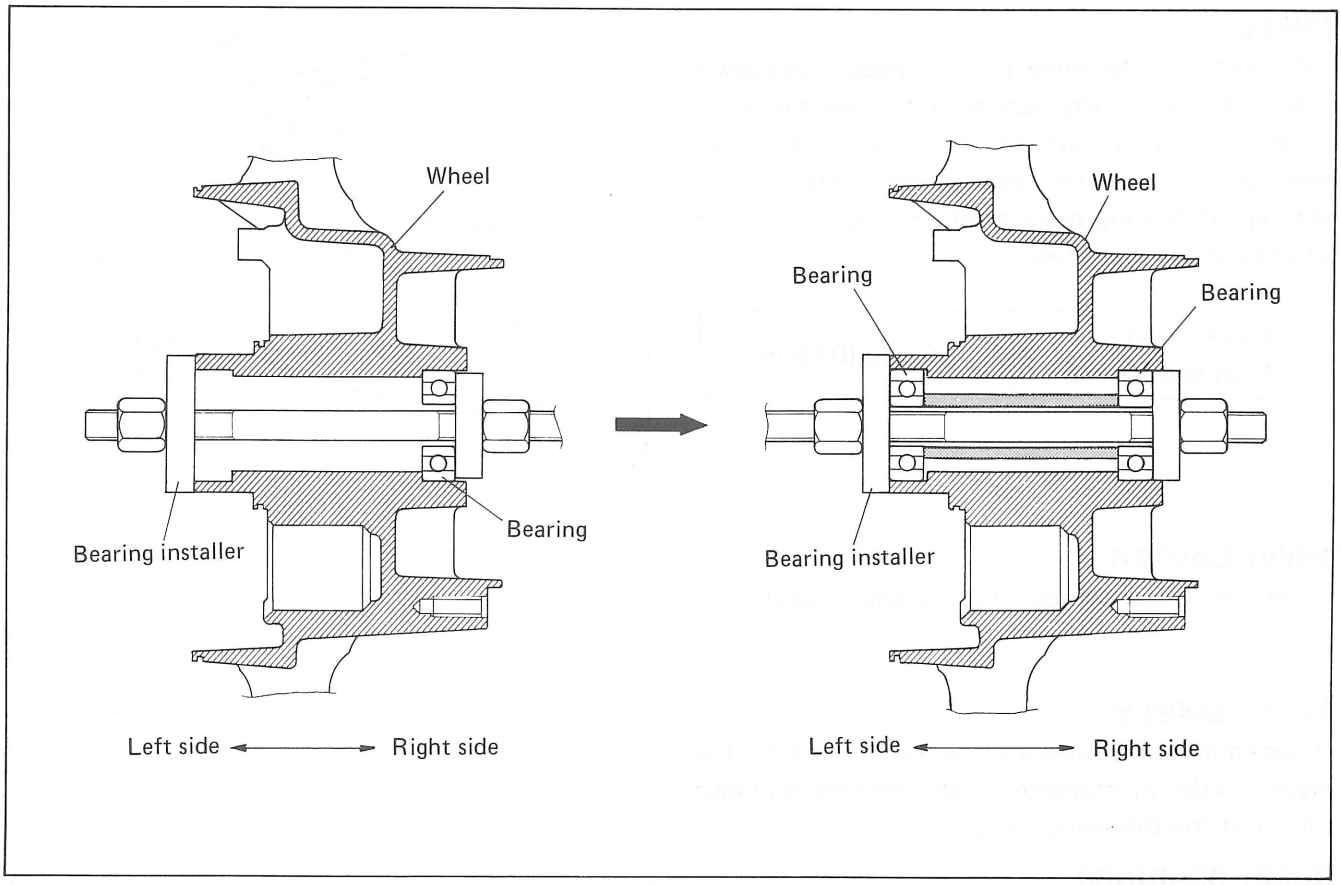
CAUTION:
First install the wheel bearing for right side.



CAUTION:
Make sure to identify each bearing, the left side (iron plate sealed type) ① and right side (rubber sealed type) ② .

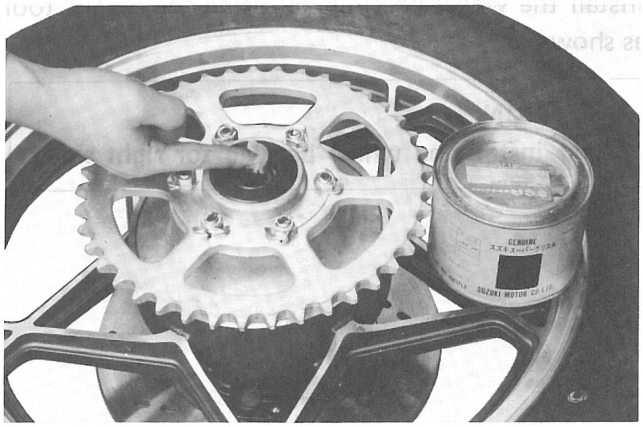
09924 - 84510	Bearing installer set





Apply grease to the sprocket drum oil seal.

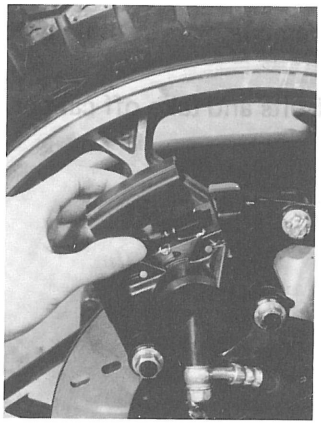
99000 - 25030	Suzuki super grease "A"

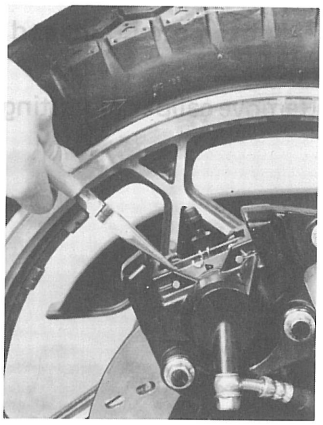


REAR BRAKE

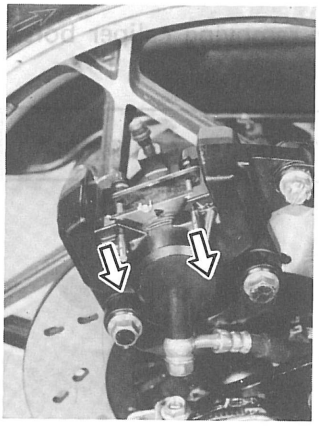
BRAKE PAD REPLACEMENT

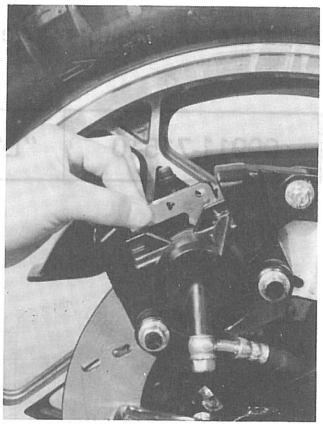
Remove dust cover.
Pull off clips.





Pull off brake pad hold pins.
Take off brake pads with pad shims.

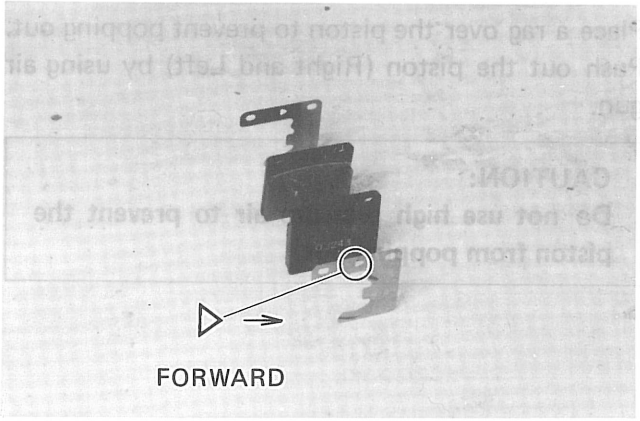




NOTE:
Do not operate the brake pedal while taking off the brake pads.

CAUTION:
Replace the brake pad with a set, otherwise braking performance will be adversely affected.

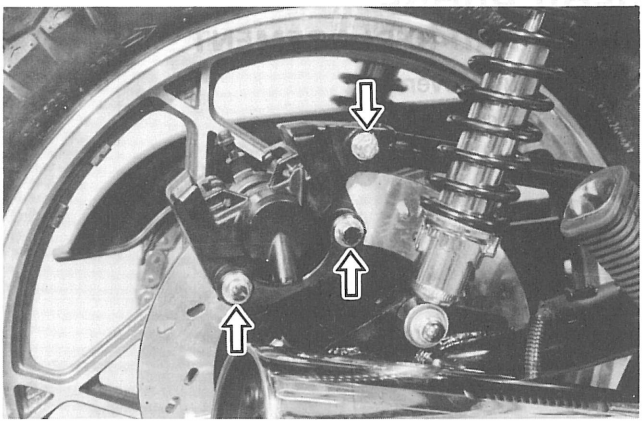
Fit brake pad shim to the rear of each brake pad so that the "hole" in the shim points to the front.



CALIPER REMOVAL AND DISASSEMBLY

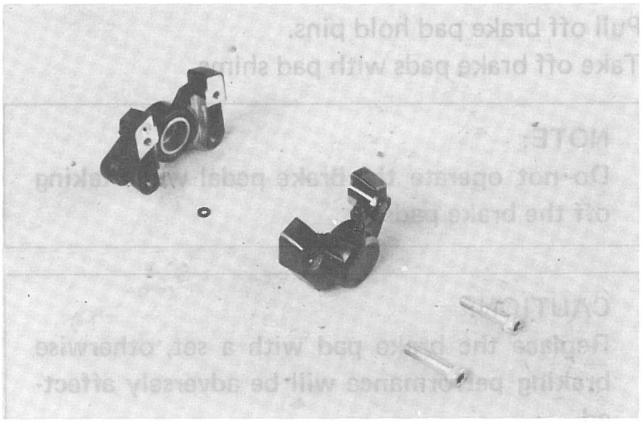
Remove brake pads.
Disconnect brake hose and catch the brake fluid in a suitable receptacle.

Pull off cotter pin and remove torque link bolt rearside.
Remove caliper mounting bolts and take off caliper.



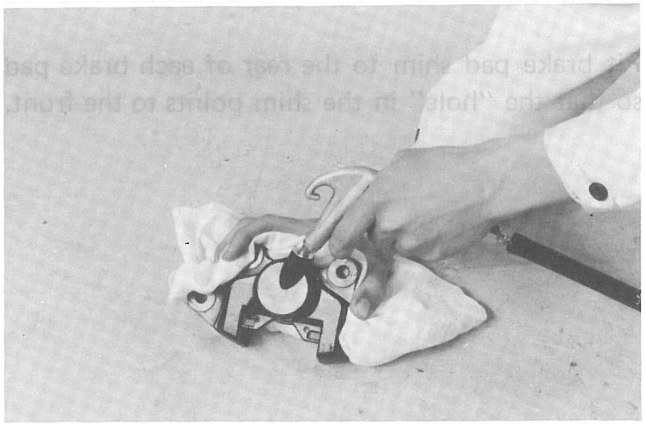
Separate the caliper after removing caliper bolts.

09911-71510	"L" type hexagon wrench

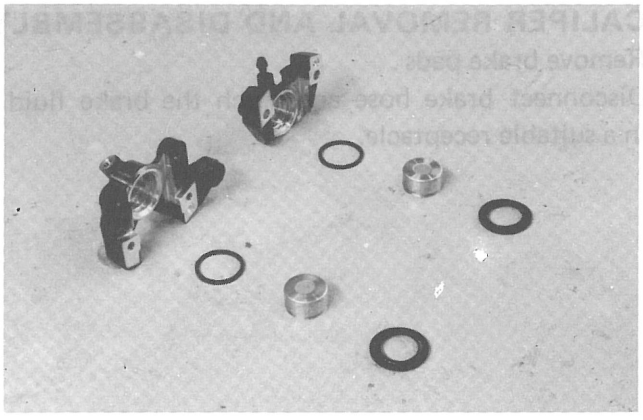


Place a rag over the piston to prevent popping out.
Push out the piston (Right and Left) by using air gun.

CAUTION:
Do not use high pressure air to prevent the piston from popping out.



Remove dust boot and piston seal.

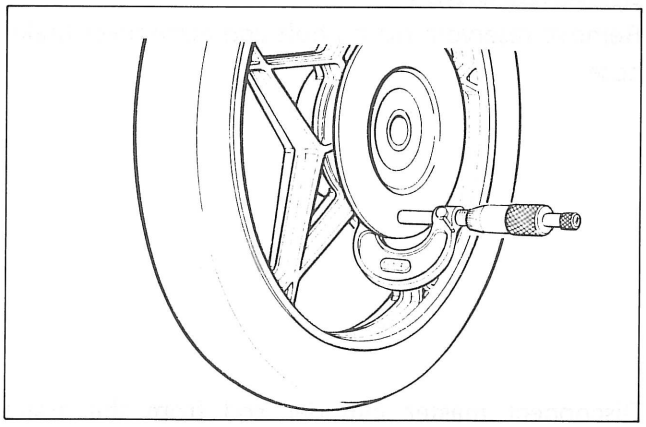


CALIPER AND DISC INSPECTION

- Inspect the cylinder bore wall for nick, scratches or other damage.
- Inspect the piston surface for any flaw or other damage.
- Inspect each rubber part for damage and wear.

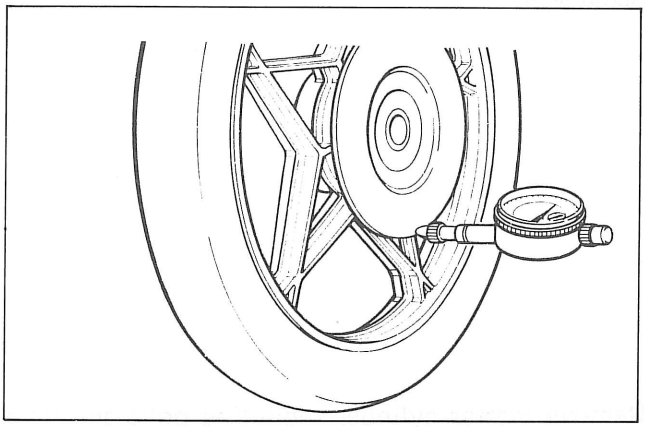
Using a micrometer check the disc for wear. Its thickness can be checked with disc and wheel in place. The service limit is specified for the thickness of the disc:

Service Limit	6.0 mm (0.24 in)



With the disc mounted on the wheel, check the disc for face runout with a dial gauge, as shown.

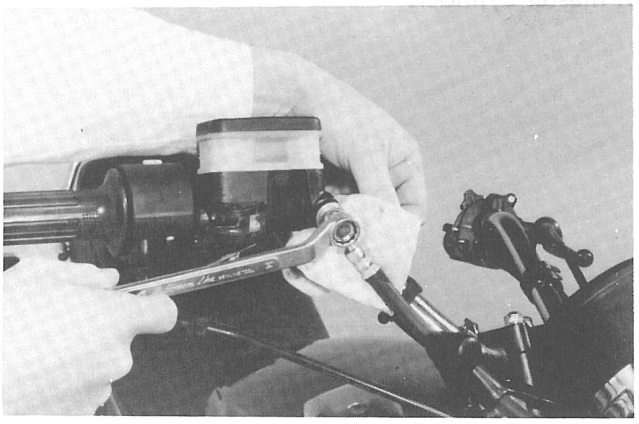
Service Limit	0.30 mm (0.012 in)



CALIPER REASSEMBLY

Reassemble the caliper in the reverse orders of disassembly and by taking the following steps:

CAUTION:
Wash the caliper components with fresh brake fluid before reassembly.
Never use cleaning solvent or gasoline to wash them.
Apply brake fluid to the caliper bore and piston to be inserted into the bore.
Bleed the air after reassembling master cylinder.

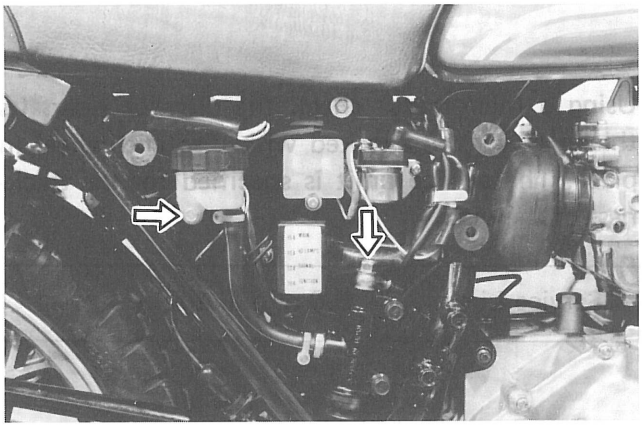


Tightening torque:

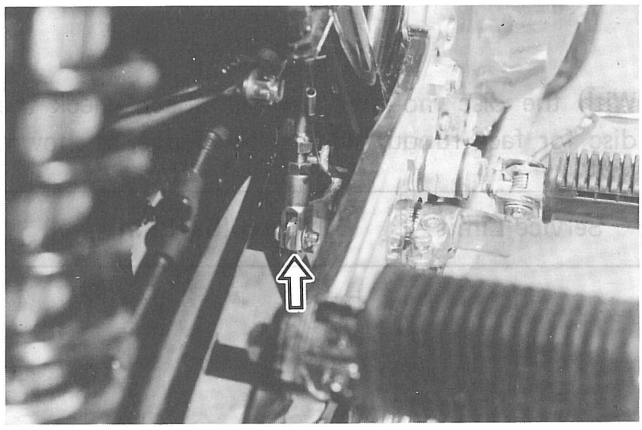
	kg-m	lb-ft
Union bolt	2.0 – 2.5	14.5 – 18.0
Torque link bolt	2.0 – 3.0	14.5 – 21.5
Caliper bolt	2.0 – 3.0	14.5 – 21.5
Caliper mounting bolt	2.5 – 4.0	18.0 – 29.0

MASTER CYLINDER REMOVAL AND DISASSEMBLY

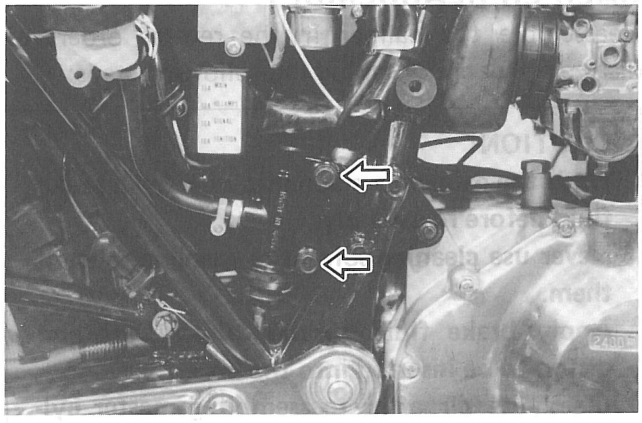
Remove reservoir fitting bolt and disconnect brake hose.



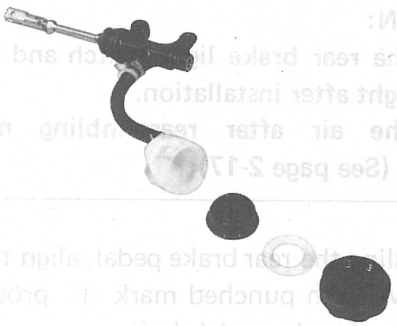
Disconnect master cylinder rod from the brake pedal arm.



Remove master cylinder mounting bolts and take off master cylinder.



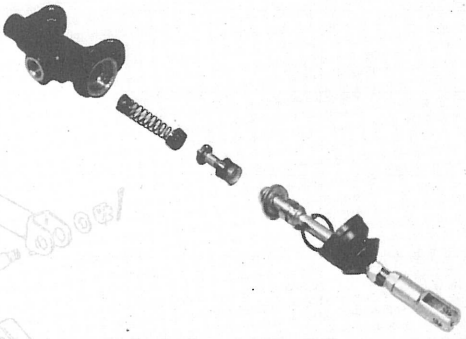
Remove reservoir cap and drain brake fluid.



Remove reservoir.

Remove rod, piston, primary cup and spring by using the special tool.

09900 - 06105	Snap ring pliers



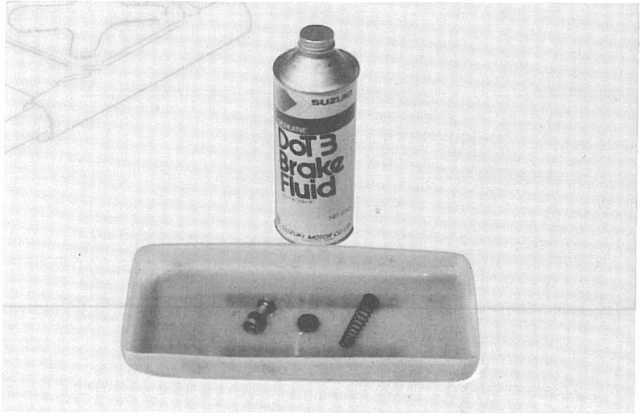
MASTER CYLINDER INSPECTION

- Inspect the cylinder bore wall for any scratches or other damage.
- Inspect the primary cup, secondary cup and each rubber parts for damage.
- Inspect the piston surface for scratches or other damage.

MASTER CYLINDER REASSEMBLY

Reassemble the master cylinder in the reverse orders of disassembly and by taking the following steps:

CAUTION:
Wash the master cylinder components only with fresh brake fluid before reassembly. Never use cleaning solvent or gasoline to wash them. Apply brake fluid to the cylinder bore and all the internals to be inserted into the bore.

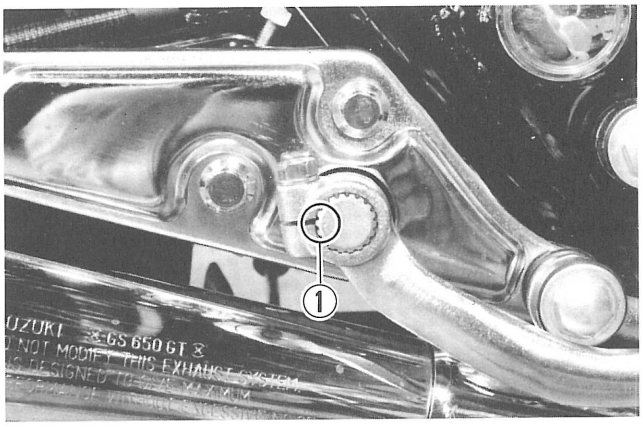


CAUTION:
Adjust the rear brake light switch and brake pedal height after installation.
Bleed the air after reassembling master cylinder. (See page 2-17)

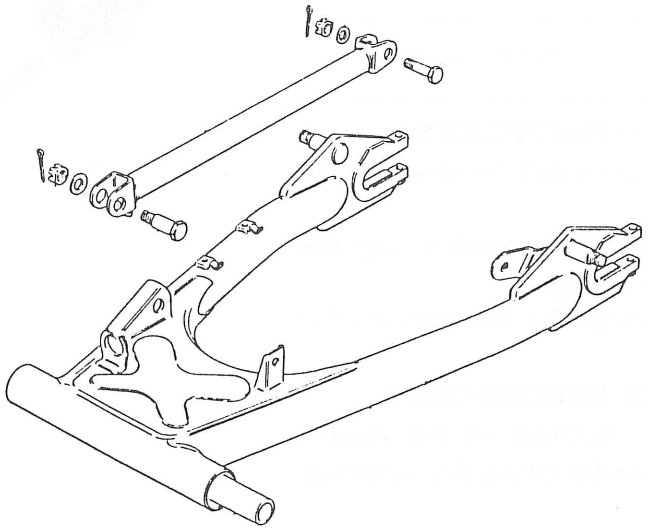
When installing the rear brake pedal, align the brake pedal groove with punched mark ① provided on the end face of brake pedal shaft.

Tightening torque:

	kg-m	lb-ft
Union bolt	2.0 – 2.5	14.5 – 18.0
Mounting bolt	1.5 – 2.5	11.0 – 18.0



REAR SUSPENSION
CONSTRUCTION

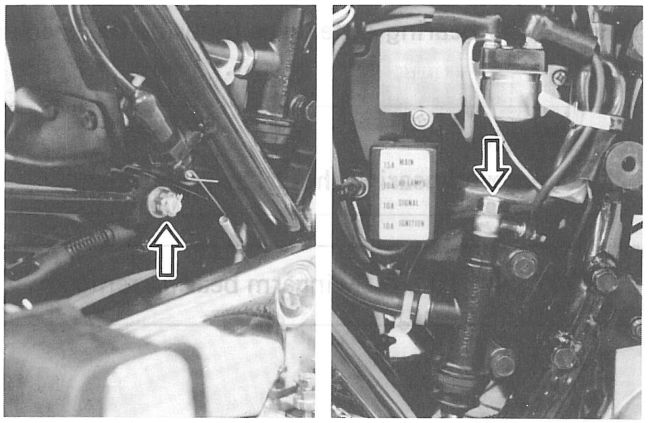


REMOVAL AND DISASSEMBLY

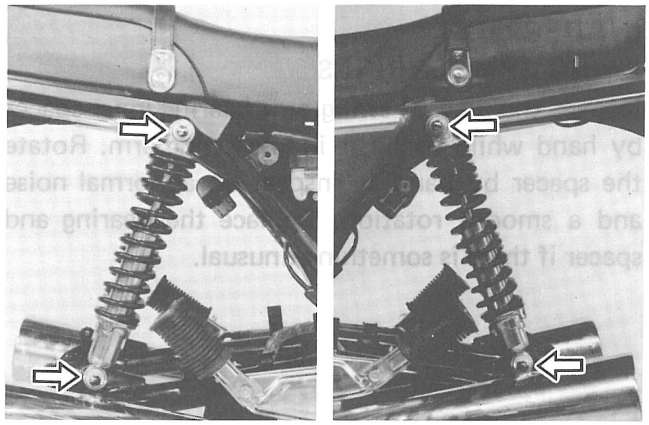
Remove rear wheel (See page 7-21).

Remove torque link bolt after pulling off cotter pin and take off torque link.

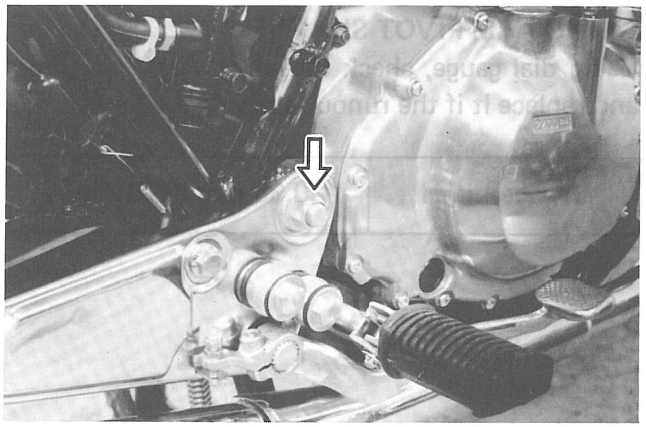
Remove brake hose union bolt and remove rear brake caliper with brake hose.



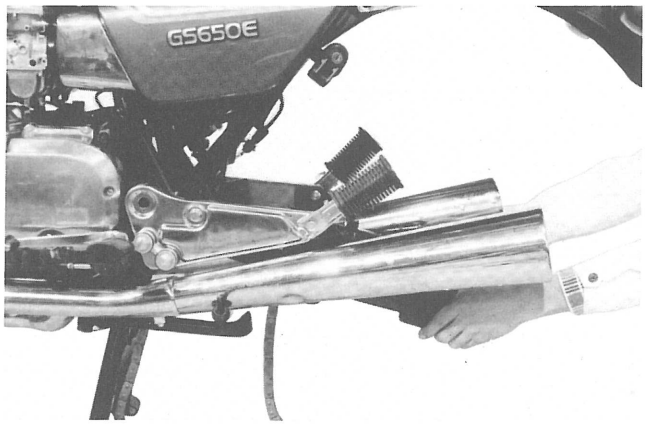
Remove rear shock absorber right and left.



Remove swing arm pivot nut



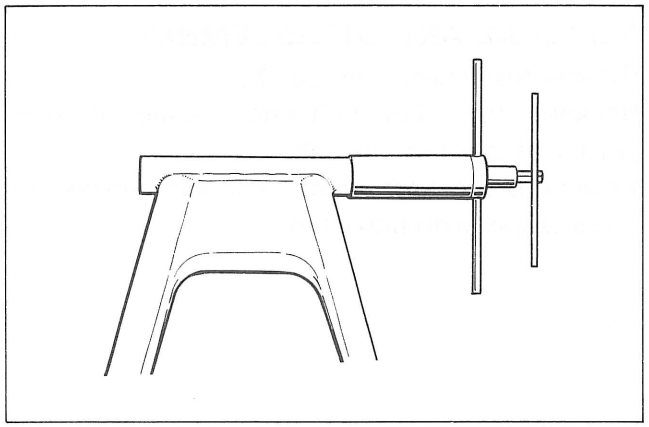
Draw out pivot shaft and take off swing arm.



Remove the bearing outer race by using the special tool.

CAUTION:
The removed bearing should be replaced.

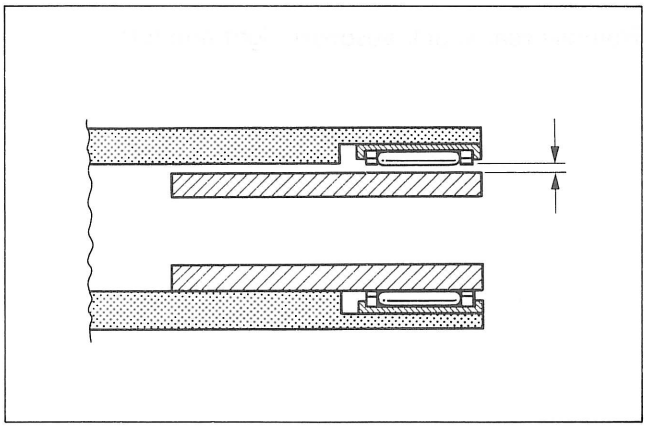
09941 - 44510	Swingarm bearing remover



INSPECTION

SWING ARM BEARINGS

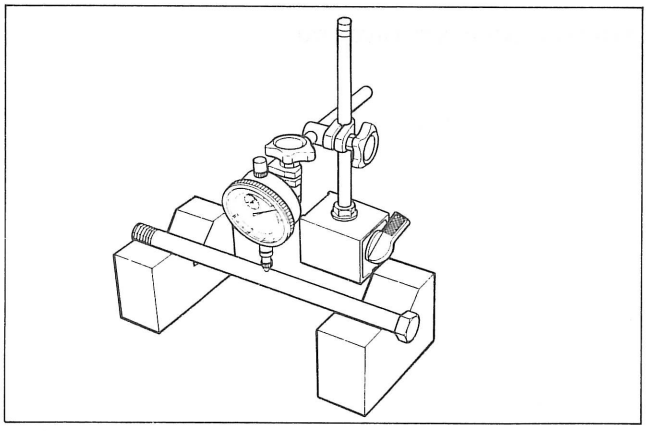
Inspect the play of swing arm bearing inner spacer by hand while fixing it in the swing arm. Rotate the spacer by hand to inspect an abnormal noise and a smooth rotation. Replace the bearing and spacer if there is something unusual.



SWING ARM PIVOT SHAFT

Using dial gauge, check the pivot shaft for runout and replace it if the runout exceeds the limit.

Service Limit	0.30 mm (0.012 in)



REASSEMBLY

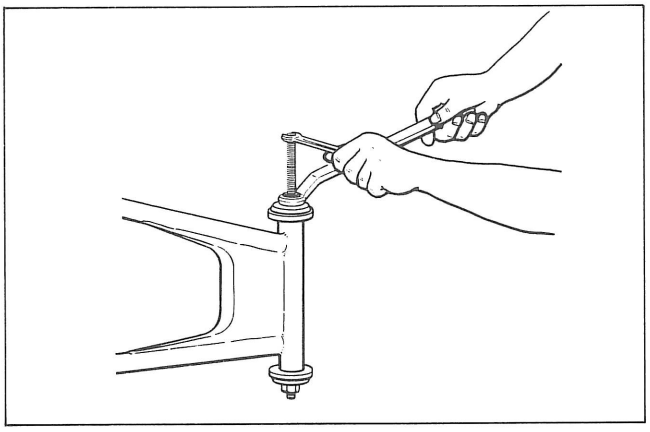
Reassemble and remount the swing arm and rear shock absorbers in the reverse order of disassembly and removal, and also carry out the following steps:

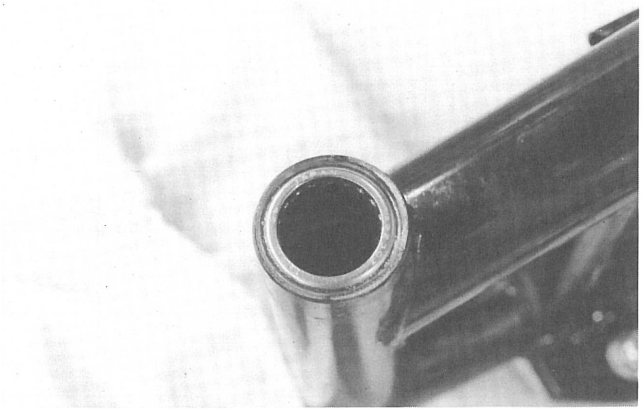
SWING ARM BEARINGS

Press in the bearings by using the special tool.

09941 - 34511	Bearing installer

CAUTION:
When installing a set of bearings, punch marked side of each bearing comes on outer side.

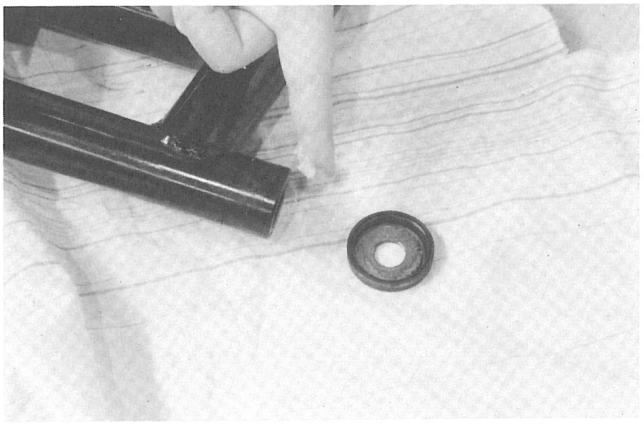




Apply grease to inside of bearing.
Apply grease to dust seal cover.

99000 - 25030	Suzuki super grease "A"

WARNING:
Bleed the air to the rear brake caliper after reassembling swingarm and rear wheel.



SERVICING INFORMATION

CONTENTS

TROUBLESHOOTING

ENGINE

Complaint	Symptom and possible causes	Remedy
Engine will not start, or is hard to start.	**Compression too low**	
	1. Tappet clearance out of adjustment.	Adjust.
	2. Worn valve guides or poor seating of valves.	Repair, or replace.
	3. Valves mistiming.	Adjust.
	4. Piston rings excessively worn.	Replace.
	5. Worn-down cylinder bores.	Replace, or rebore.
	6. Starter motor cranks but too slowly.	Consult "electrical complaints".
	Plugs not sparking	
	1. Fouled spark plugs.	Clean.
	2. Wet spark plug.	Clean and dry.
	3. Ignition timing out of adjustment.	Adjust.
	4. Defective ignition coil.	Replace.
	5. Open or short in high-tension cords.	Replace.
	6. Defective signal generator or transistor unit	Replace.
	No fuel reaching the carburetors	
	1. Clogged hole in the fuel tank cap.	Clean.
	2. Clogged or defective fuel cock.	Clean or replace.
	3. Defective carburetor float valve.	Replace.
	4. Clogged fuel pipe or suction cock pipe.	Clean.
	5. Defective fuel cock diaphragm.	Replace.
Engine stalls easily.	1. Fouled spark plugs.	Clean.
	2. Ignition timing out of adjustment.	Adjust.
	3. Defective signal generator or transistor unit.	Replace.
	4. Clogged fuel pipe.	Clean.
	5. Clogged jets in carburetors.	Clean.
	6. Tappet clearance out of adjustment.	Adjust.
Noisy engine.	**Excessive valve chatter**	
	1. Tappet clearance too large.	Adjust.
	2. Weakened or broken valve springs.	Replace.
	3. Camshaft journal worn and burnt.	Replace.
	Noise appears to come from pistons	
	1. Pistons or cylinders worn down.	Replace.
	2. Combustion chambers fouled with carbon.	Clean.
	3. Piston pins worn.	Replace.
	Noise seems to come from timing chain	
	1. Stretched chain.	Replace.
	2. Worn sprockets.	Replace.
	3. Tension adjuster not working.	Repair or replace.
	Noise seems to come from clutch	
	1. Worn splines of countershaft or hub.	Replace.
	2. Worn teeth of clutch plates.	Replace.
	3. Distorted clutch plates, driven and drive.	Repair or replace.
	Noise seems to come from crankshaft	
	1. Rattling bearings due to wear.	Replace.
	2. Big-end bearings worn and burnt.	Replace.
	3. Journal bearing worn and burnt.	Replace.

Complaint	Symptom and possible causes	Remedy
Noisy engine.	**Noise seems to come from transmission**	
	1. Gears worn or rubbing.	Replace.
	2. Badly worn splines.	Replace.
	3. Primary gears worn or rubbing.	Replace.
Slipping clutch	1. Clutch control out of adjustment or loss of play.	Adjust.
	2. Weakened clutch springs.	Replace.
	3. Worn or distorted pressure plate.	Replace.
	4. Distorted clutch plates, driven and drive.	Replace.
Dragging clutch	1. Clutch control out of adjustment or too much play.	Adjust.
	2. Some clutch springs weakened while others are not.	Replace.
	3. Distorted pressure plate or clutch plates.	Replace.
Transmission will not shift	1. Broken gearshift cam.	Replace.
	2. Distorted gearshift forks.	Replace.
Transmission will not shift back.	1. Broken return spring on shift shaft.	Replace.
	2. Shift shaft is rubbing or sticky.	Repair.
Transmission jumps out of gear.	1. Worn shifting gears on drive shaft or countershaft.	Replace.
	2. Distorted or worn gearshift forks.	Replace.
	3. Weakened stopper spring on gearshift stopper.	Replace.
Engine idles poorly.	1. Tappet clearance out of adjustment.	Adjust.
	2. Poor seating of valves.	Replace.
	3. Defective valve guides.	Replace.
	4. Ignition timing out of adjustment.	Adjust.
	5. Spark plug gaps too wide.	Adjust or replace.
	6. Defective ignition coil.	Replace.
	7. Defective signal generator or transistor unit.	Replace.
	8. Float-chamber fuel level out of adjustment in carburetors.	Adjust.
	9. Clogged jets or imbalance of carburetors.	Clean or adjust.
Engine runs poorly in high-speed range.	1. Valve springs weakened.	Replace.
	2. Valve timing out of adjustment.	Adjust.
	3. Spark plug gaps too narrow.	Adjust.
	4. Ignition not advanced sufficiently due to poorly working advancer.	Replace.
	5. Defective ignition coil.	Replace.
	6. Defective signal generator or transistor unit.	Replace.
	7. Float-chamber fuel level too low.	Adjust.
	8. Clogged air cleaner element.	Clean.
	9. Clogged fuel pipe, resulting in inadequate fuel supply to carburetors.	Clean, and prime.
	10. Clogged suction cock pipe.	Clean.
Dirty or heavy exhaust smoke	1. Too much engine oil in the engine.	Check with level window drain out excess oil.
	2. Worn piston rings or cylinders.	Replace.
	3. Worn valve guides.	Replace.
	4. Cylinder walls scored or scuffed.	Rebore or replace.
	5. Worn valves stems.	Replace.
	6. Defective stem seal.	Replace.

Complaint	Symptom and possible causes	Remedy
Engine lacks power	1. Loss of tappet clearance.	Adjust.
	2. Weakened valve springs.	Replace.
	3. Valve timing out of adjustment.	Adjust.
	4. Worn piston rings or cylinders.	Replace.
	5. Poor seating of valves.	Repair.
	6. Ignition timing out of adjustment.	Adjust.
	7. Spark plug gaps incorrect.	Adjust or replace.
	8. Clogged jets in carburetors.	Clean.
	9. Float-chamber fuel level out of adjustment.	Adjust.
	10. Clogged air cleaner element.	Clean.
	11. Carburetor balancing screw loose.	Retighten.
	12. Sucking air from intake pipe.	Retighten or replace.
	13. Too much engine oil in the engine.	Drain out excess oil.
Engine overheats.	1. Heavy carbon deposit on piston crowns.	Clean.
	2. Not enough oil in the engine.	Add oil.
	3. Defective oil pump or clogged oil circuit.	Replace or clean.
	4. Fuel level too low in float chambers.	Adjust.
	5. Suck air from intake pipes.	Retighten or replace.
	6. Use incorrect engine oil.	Change.

CARBURETOR

Complaint	Symptom and possible causes	Remedy
Trouble with starting	1. Starter jet is clogged.	Clean.
	2. Starter pipe is clogged.	Clean.
	3. Air leaking from a joint between starter body and carburetor.	Check starter body and carburetor for tightness, adjust and replace gasket.
	4. Air leaking from carburetor's joint or vacuum gauge joint.	Check and adjust.
	5. Starter plunger is not operating properly.	Check and adjust.
Idling or low-speed trouble	1. Pilot jet, pilot air jet are clogged or loose.	Check and clean.
	2. Air leaking from carburetor's joint, vacuum gauge joint, or starter.	Check and adjust.
	3. Pilot outlet or bypass is clogged.	Check and clean.
	4. Starter plunger is not fully closed.	Check and adjust.
Medium- or high-speed trouble	1. Main jet or main air jet is clogged.	Check and clean.
	2. Needle jet is clogged.	Check and clean.
	3. Fuel leaking due to a broken O-ring in needle jet.	Replace O-ring.
	4. Throttle valve is not operating properly.	Check throttle valve for operation.
	5. Filter is clogged.	Check and clean.
Overflow and fuel level fluctuations	1. Needle valve is worn or damaged.	Replace.
	2. Spring in needle valve is broken.	Replace.
	3. Float is not working properly.	Check and adjust.
	4. Foreign matter has adhered to needle valve.	Clean.
	5. Fuel level is too high or low.	Adjust float height

ELECTRICAL

Complaint	Symptom and possible causes	Remedy
No sparking or poor sparking	1. Defective ignition coil. 2. Defective spark plugs. 3. Defective signal generator or transistor unit.	Replace. Replace. Replace.
Spark plugs soon become fouled with carbon.	1. Mixture too rich. 2. Idling speed set too high. 3. Incorrect gasoline. 4. Dirty element in air cleaner. 5. Spark plugs too cold.	Adjust carburetors. Adjust carburetors. Change. Clean. Replace by hot type plugs.
Spark plugs become fouled too soon.	1. Worn piston rings. 2. Pistons or cylinders worn. 3. Excessive clearance of valve stems in valve guides. 4. Worn stem oil seal.	Replace. Replace. Replace. Replace.
Spark plug electrodes overheat or burn.	1. Spark plugs too hot. 2. The engine overheats. 3. Ignition timing out of adjustment. 4. Spark plugs loose. 5. Mixture too lean.	Replace by cold type plugs. Tune up. Adjust. Retighten. Adjust carburetors.
Generator does not charge.	1. Open or short in lead wires, or loose lead connections. 2. Shorted, grounded or open generator coils. 3. Shorted or open regulator/rectifier.	Repair or replace or retighten. Replace. Replace.
Generator does charge, but charging rate is below the specification.	1. Lead wires tend to get shorted or open-circuited or loosely connected at terminals. 2. Grounded or open-circuited stator coils of generator. 3. Defective regulator/rectifier. 4. Not enough electrolyte in the battery. 5. Defective cell plates in the battery.	Repair, or retighten. Replace. Replace. Add distilled water to the upper level. Replace the battery.
Generator Overcharges.	1. Internal short-circuit in the battery. 2. Resistor element in the regulator/rectifier damaged or defective. 3. Regulator/rectifier poorly grounded.	Replace the battery. Replace. Clean and tighten ground connection.
Unstable charging	1. Lead wire insulation frayed due to vibration, resulting in intermittent shorting. 2. Generator internally shorted. 3. Defective regulator/rectifier.	Repair or replace. Replace. Replace.
Starter button is not effective.	1. Battery run down. 2. Defective switch contacts. 3. Brushes not seating properly on commutator in starter motor. 4. Defective starter relay.	Recharge or replace. Replace. Repair or replace. Replace.

BATTERY

Symptom	Probable cause	Remedy
"Sulfation", acidic white powdery substance or spots on surfaces of cell plates.	1. Not enough electrolyte	Add distilled water, if the battery has not been damaged and "sulfation" has not advanced too far, and recharge.
	2. Battery case is cracked.	Replace the battery.
	3. Battery has been left in a run-down condition for a long time.	Replace the battery.
	4. Comtaminated electrolyte (Foreign matter has enteres the battery and become mixed with the electrolyte.	If "sulfation" has not advanced too far, try to restore the battery by replacing the electrolyte, recharging it fully with the battery detached from the motorcycle and then adjusting electrolyte S.G.
Battery runs down quickly.	1. The charging method is not correct.	Check the generator, regulator/rectifier and circuit connections, and make necessary adjustments to obtain specified charging operation.
	2. Cell plates have lost much of their active material as a result of over-charging.	Replace the battery, and correct the charging system.
	3. A short-circuit condition exists within the battery due to excessive accumulation of sediments caused by the high electrolyte S.G.	Replace the battery.
	4. Electrolyte S.G. is too low.	Recharge the battery fully and adjust electrolyte S.G.
	5. Contaminated electrolyte.	Replace the electrolyte, recharge the battery and then adjust S.G.
	6. Battery is too old.	Replace the battery.
Reversed battery polarity.	The battery has been connected the wrong way round in the system, so that it is being charged in the reverse direction.	Replace the battery and be sure to connect the battery properly.
Battery "sulfation"	1. Charging rate too low or too high. (When not in use batteries should be recharged at least once a month to avoid sulfation.)	Replace the battery.
	2. Battery electrolyte excessive or insufficient, or its specific gravity too high or too low.	Keep the electrolyte up to the prescribed level, or adjust the S.G. by consulting the battery maker's directions.
	3. The battery left unused for too long in cold climate.	Replace the battery, if badly sulfated.
Battery discharges too rapidly.	1. Dirty container top and sides.	Clean.
	2. Impurities in the electrolyte or electrolyte S.G. is too high.	Change the electrolyte by consulting the battery maker's directions.

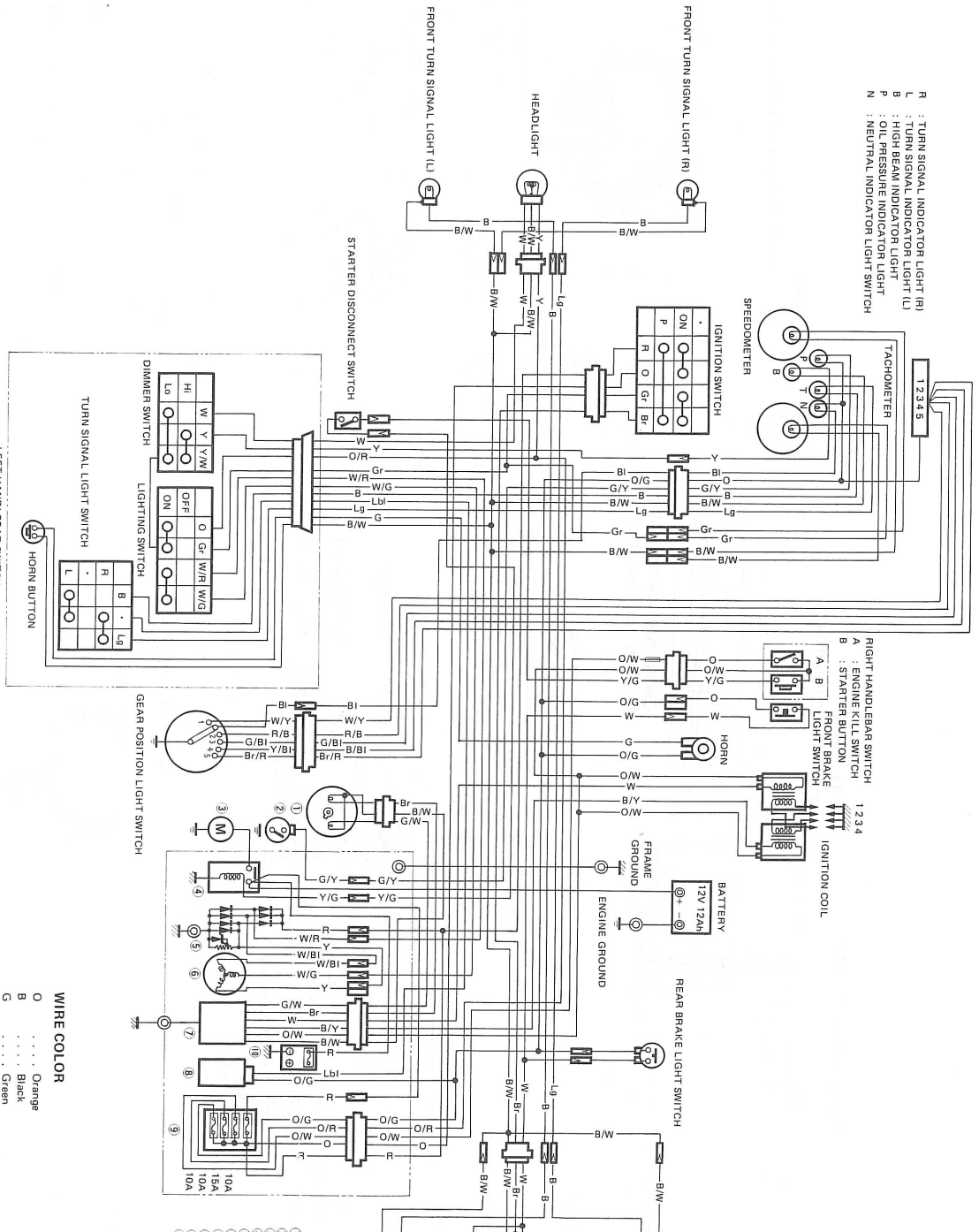
CHASSIS

Complaint	Symptom and possible causes	Remedy
Heavy steering	1. Steering stem nut overtightened. 2. Broken bearing in steering stem. 3. Distorted steering stem. 4. Not enough pressure in tires.	Adjust. Replace. Replace. Adjust.
Wobbly handle	1. Loss of balance between right and left suspensions. 2. Distorted front fork. 3. Distorted front axle or crooked tire.	Adjust or replace. Repair or replace. Replace.
Wobbly front wheel	1. Distorted wheel rim. 2. Worn-down front wheel bearings. 3. Defective or incorrect tire. 4. Loose nut on axle. 5. Loose wheel spokes	Replace. Replace. Replace. Retighten. Retighten.
Front suspension too soft	1. Weakened springs. 2. Not enough fork oil.	Replace. Refill
Front suspension too stiff	1. Fork oil too viscous. 2. Too much fork oil.	Replace. Drain excess oil.
Noisy front suspension	1. Not enough fork oil. 2. Loose nuts on suspension.	Refill. Retighten.
Wobbly rear wheel	1. Distorted wheel rim. 2. Worn-down rear wheel bearings. 3. Defective or incorrect tire. 4. Loose wheel sprkes	Replace. Replace. Replace. Retighten.
Rear suspension too soft	1. Weakened springs. 2. Rear suspension adjusters improperly set.	Replace. Adjust.
Rear suspension too stiff	Rear suspension adjusters improperly set.	Adjust.
Noisy rear suspension	Loose nuts on suspension.	Retighten.
Poor braking (FRONT and REAR)	1. Not enough brake fluid in the reservoir. 2. Air trapped in brake fluid circuit. 3. Pads or linings worn down. 4. Too much play on brake pedal.	Refill to level mark. Bleed air out. Replace. Adjust.

BRAKES

Complaint	Symptom and possible causes	Remedy
Insufficient brake power	1. Leakage of brake fluid from hydraulic system. 2. Worn pads. 3. Oil adhesion on engaging surface of pads. 4. Worn disc. 5. Air in hydraulic system.	Repair or replace. Replace. Clean disc and pads. Replace. Bleed air.
Brake squeaking	1. Carbon adhesion on pad surface. 2. Tilted pad. 3. Damaged wheel bearing. 4. Loose front-wheel axle or rear-wheel axle. 5. Worn pads. 6. Foreign material in brake fluid. 7. Clogged return port of master cylinder	Repair surface with sand-paper. Modify pad fitting. Replace. Tighten to specified torque. Replace. Replace brake fluid Disassemble and clean master cylinder.
Excessive brake lever stroke	1. Air in hydraulic system. 2. Worn brake lever cam. 3. Insufficient brake fluid. 4. Improper quality of brake fluid.	Bleed air. Replace brake lever. Replenish fluid to specified level; bleed air. Replace with correct fluid.
Leakage of brake fluid	1. Insufficient tightening of connection joints. 2. Cracked hose. 3. Worn piston and/or cup.	Tighten to specified torque. Replace. Replace piston and/or cup.

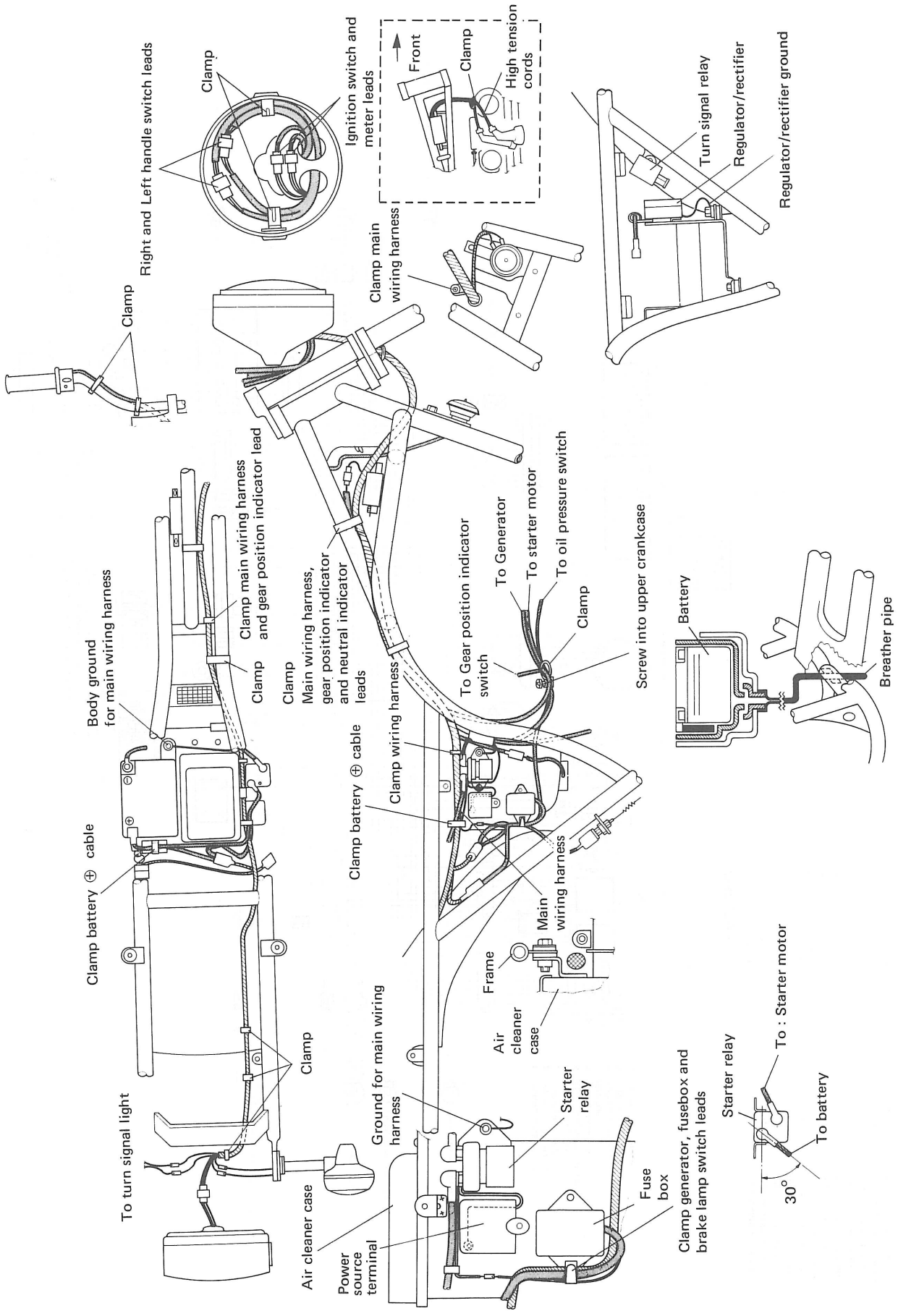
WIRING DIAGRAM

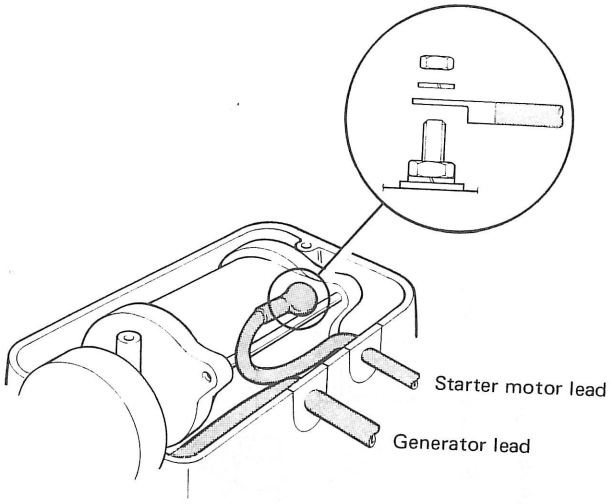


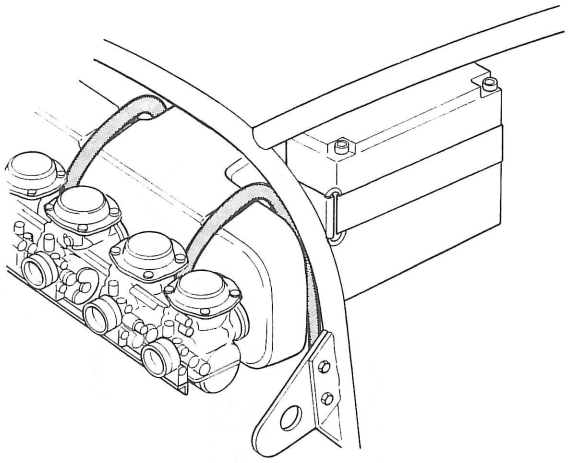
WIRE COLOR

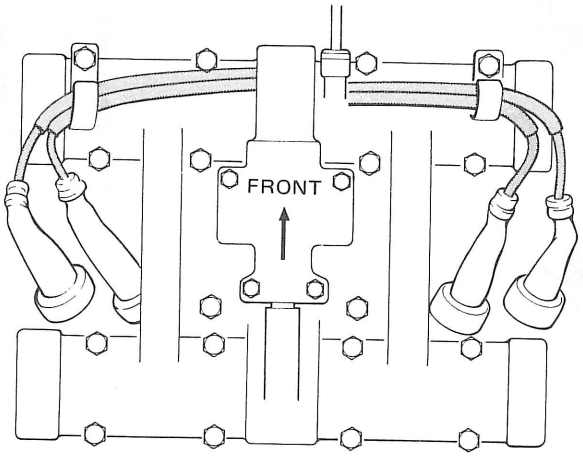
O	Orange
B	Black
G	Green
Y	Yellow
W	White
R	Red
Br	Brown
Bl	Blue
Gr	Grey
Lg	Light green
Lbl	Light blue
O/R	Orange with Red tracer
G/Y	Green with Red tracer
Y/W	Yellow with White tracer
Bl/W	Blue with White tracer
W/R	White with Red tracer
W/G	White with Green tracer
B/W	Black with White tracer
W/Y	White with Yellow tracer
R/B	Red with Black tracer
Y/B	Yellow with Black tracer
G/Bl	Green with blue tracer
Br/R	Brown with Red tracer
O/G	Orange with Green tracer
W/Bl	White with Blue tracer
G/W	Green with White tracer

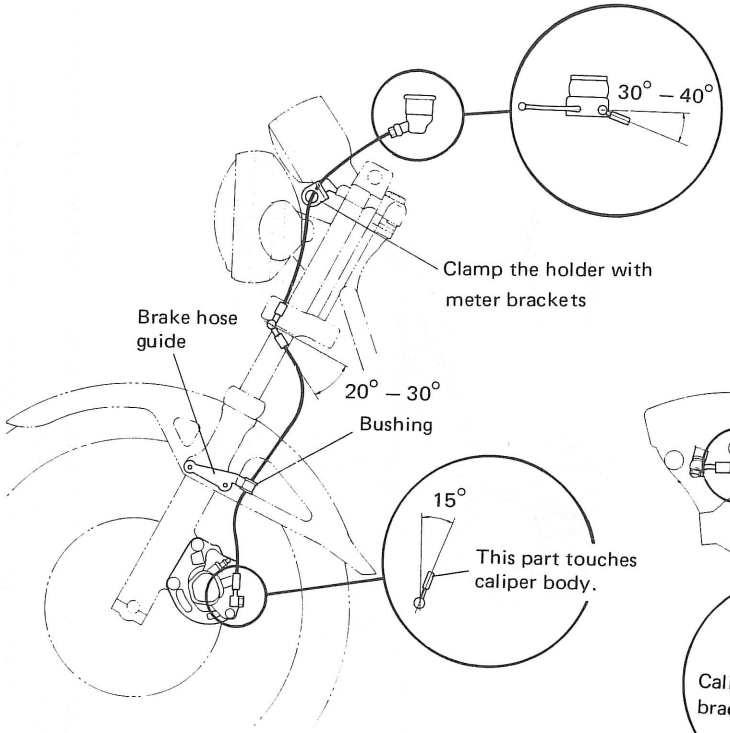
WIRE ROUTING

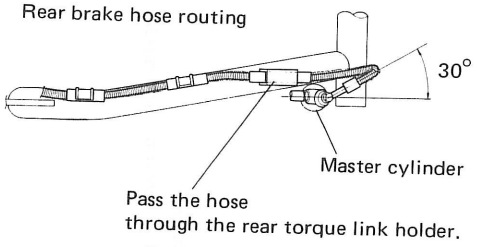


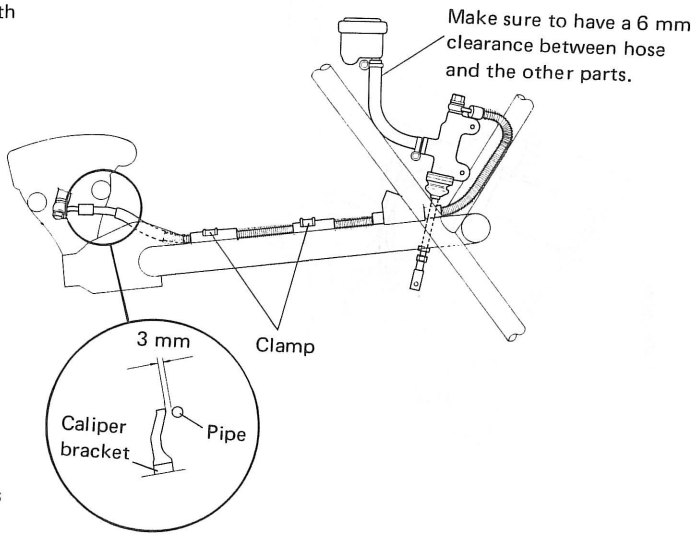






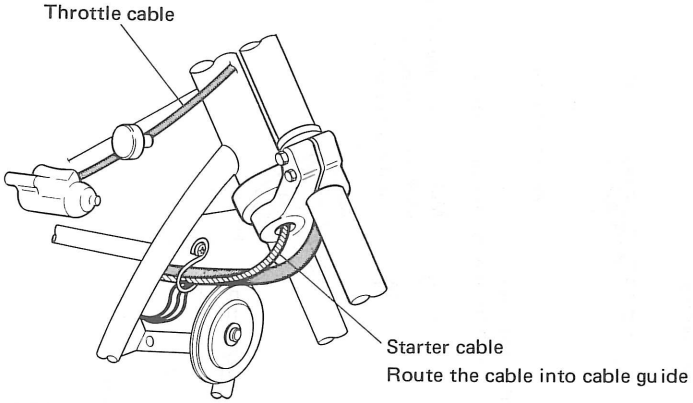


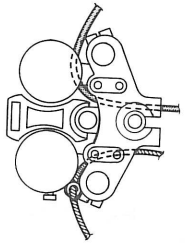


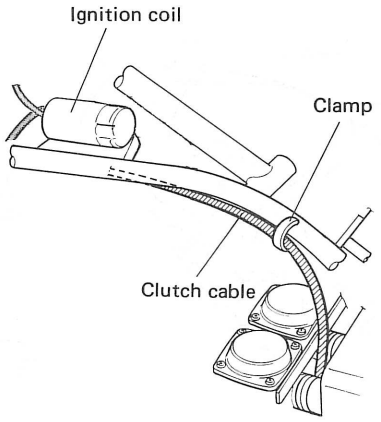


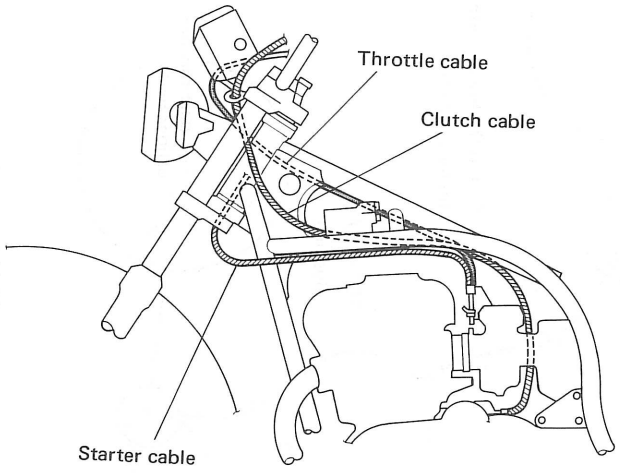
** Make sure that brake hose is free from the other parts.

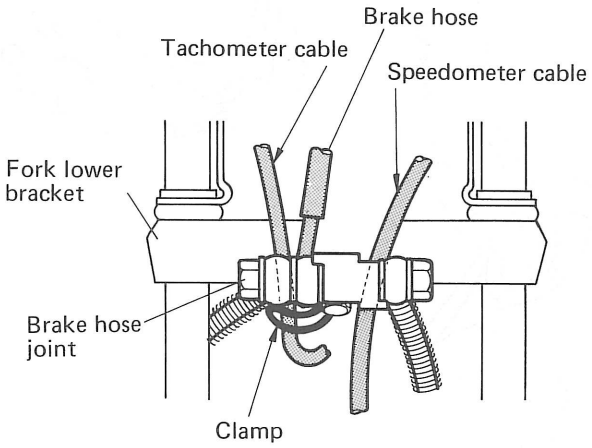
CABLE ROUTING











1. Speedo and tachometer cables should be route between the brake hose joint and front fork lower bracket.
2. Route the tachometer cable inside the clamp for wiring harness.

SPECIAL TOOLS

Item	Part No.	Part Name
1	09900 - 06104	Snap ring pliers (Opening type)
2	09900 - 06105	Snap ring pliers (Closing type)
3	09900 - 06107	Snap ring pliers (Opening type)
4	09900 - 06108	Snap ring pliers (Closing type)
5	09900 - 09003	Impact driver set
6	09900 - 20101	Vernier calipers (150 mm)
7	09900 - 20205	Micrometer (0 – 25 mm)
	- 20202	" (25 – 50 mm)
	- 20203	" (50 – 75 mm)
8	09900 - 20508	Cylinder gauge set
9	09900 - 20606	Dial gauge (1/100 mm)
10	09900 - 20803	Thickness gauge
11	09900 - 21102	Torque wrench (0 – 1.2 kg-m)
	- 21103	" (1.0 – 9.0 kg-m)
12	09900 - 25002	Pocket tester
13	09900 - 28106	Electrotester
14	09900 - 28403	Hydrometer
15	09910 - 10710	Stud bolt installer
16	09910 - 20115	Conrod stopper
17	09910 - 34510	Piston pin puller
18	09911 - 70131	4 mm Hexagon wrench
19	09911 - 73730	"T" type hexagon wrench '5 mm)
	- 25811	"T" type hexagon wrench (6 mm)
20	09911 - 94710	Oil seal installer attachment
21	09912 - 34510	Cylinder disassembling tool
22	09913 - 13121	Carburetor balancer gauge set
23	09913 - 14511	Gauge body (6 mm x P 0.75)
24	09913 - 14911	Throttle valve adjust wrench
25	09913 - 50121	Oil seal remover
26	09913 - 80112	Drive pinion race installer (34 mm)
27	09913 - 84510	Bearing installer (38 mm)
28	09915 - 64510	Compression gauge
29	09915 - 63210	Adapter
30	09915 - 74510	Oil pressure gauge
31	09916 - 14510	Valve lifter

Item	Part No.	Part Name
32	09916 - 34531	Valve guide reamer (12.3 mm)
	- 34541	Reamer handle
	- 34520	Valve guide reamer (7 mm)
33	09916 - 44511	Valve guide remover
34	09916 - 57321	Valve guide installer handle
35	09916 - 54530	Valve guide installer attachment
36	09916 - 64510	Tappet depressor
37	09916 - 74521	Piston ring holder body
	- 74530	Band (Bore : 55 – 65 mm)
38	09916 - 84510	Tweezers
39	09920 - 53710	Clutch sleeve hub holder
40	09923 - 73210	Bearing puller (17 – 20 mm)
41	09930 - 14511	Cylinder head nut and spark plug wrench set
		09914 - 24510 "T" handle
		09911 - 74510 Long socket (14 mm)
		09911 - 74520 " (12 mm)
		09930 - 14530 Universal joint
		09930 - 14520 Spark plug wrench (21 mm)
42	09930 - 13210	Spark plug socket wrench (19 mm)
43	09930 - 30102	Rotor remover sliding shaft
44	09930 - 33710	Attachment (14 mm screw)
45	09930 - 40113	Rotor and engine sprocket holder
46	09930 - 44510	Rotor holder
47	* 09940 - 14911	Steering nut socket wrench
48	09940 - 34520	Front fork assembling "T" handle
	- 34561	Attachment "D"
49	09940 - 50111	Front fork oil seal installer
50	09941 - 34511	Steering race installer
51	09941 - 54911	Bearing outer race remover
52	09941 - 64510	Bearing and oil seal remover
53	09941 - 74910	Steering bearing installer
54	09941 - 84510	Bearing inner race remover
55	09943 - 74111	Front fork oil level gauge
56	* 99103 - 45014-001	Valve seat cutter head (45°) (N-608)
	- 45011-001	" (15°) (N-212)

NOTE: (*) mark shows newly applied for GS650E

TIGHTENING TORQUE

ENGINE

ITEM	kg-m	lb-ft
Cylinder head cover bolt	0.9 – 1.0	6.5 – 7.0
Cylinder head bolt	0.9 – 1.1	6.5 – 8.0
Cylinder head nut	2.4 – 2.6	17.5 – 19.0
Camshaft holder bolt	0.8 – 1.2	6.0 – 8.5
Cam sprocket bolt	2.4 – 2.6	17.5 – 19.0
Cam chain tensioner fitting bolt	0.6 – 0.8	4.5 – 6.0
Cam chain tensioner shaft assy	3.1 – 3.5	22.5 – 25.5
Cam chain tensioner lock shaft nut	0.8 – 1.0	6.0 – 7.0
Cam chain tensioner adjuster lock nut	0.9 – 1.4	6.5 – 10.0
Generator rotor bolt	9.0 – 10.0	65.0 – 72.5
Starter clutch allen bolt	1.5 – 2.0	11.0 – 14.5
Governer center bolt	1.3 – 2.3	9.5 – 16.5
Crankcase bolt (6 mm)	1.3	9.5
(8 mm)	2.0	14.5
Starter motor bolt	0.4 – 0.7	3.0 – 5.0
Oil pan bolt	1.0	7.0
Oil filter cover nut	0.6 – 0.8	4.5 – 6.0
Neutral stopper housing	1.8 – 2.8	13.0 – 20.0
Gearshift arm stopper	1.5 – 2.3	11.0 – 16.5
Clutch sleeve hub nut	5.0 – 7.0	36.0 – 50.5
Clutch spring bolt	1.1 – 1.3	8.0 – 9.5
Engine mounting bolt (8 mm)	2.0 – 3.0	14.5 – 21.5
(10 mm)	3.0 – 3.7	21.5 – 27.0
Gearshift lever bolt	1.3 – 2.3	9.5 – 16.5
Clutch release arm bolt	0.6 – 0.8	4.5 – 6.0
Engine sprocket nut	9.0 – 11.0	65.0 – 79.5

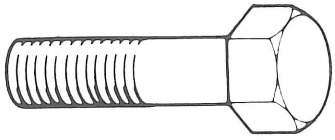
CHASSIS

ITEM	kg-m	lb-ft
Spoke nipple	0.4 – 0.5	3.0 – 3.5
Disc bolt	1.5 – 2.5	11.0 – 18.0
Front axle nut	3.6 – 5.2	26.0 – 37.5
Front axle holder bolt	1.5 – 2.5	11.0 – 18.0
Front caliper mounting bolt	2.5 – 4.0	18.0 – 29.0
Front caliper axle bolt	4.0 – 5.5	29.0 – 40.0
Brake hose union bolt	2.0 – 2.5	14.5 – 18.0
Caliper bleeder	0.7 – 0.9	5.0 – 6.5
Front fork damper rod bolt	1.5 – 2.5	11.0 – 18.0
Front fork lower clamp bolt	1.5 – 2.5	11.0 – 18.0
Front fork upper clamp bolt	2.0 – 3.0	14.5 – 21.5
Steering stem nut	1.4 – 2.0	10.0 – 14.5
Steering stem clamp bolt	1.5 – 2.5	11.0 – 18.0
Steering stem head nut	2.0 – 3.0	14.5 – 21.5
Handlebar clamp bolt	1.2 – 2.0	8.5 – 14.5
Front master cylinder clamp bolt	0.5 – 0.8	3.5 – 6.0
Front footrest bolt	2.7 – 4.3	19.5 – 31.0
Swing arm pivot nut	5.0 – 8.0	36.0 – 58.0
Brake pedal arm bolt	1.0 – 1.5	7.0 – 11.0
Rear master cylinder mounting bolt	1.5 – 2.5	11.0 – 18.0
Rear torque link bolt and nut	2.0 – 3.0	14.5 – 21.5
Rear caliper mounting bolt	2.5 – 4.0	18.0 – 29.0
Rear caliper bolt	2.0 – 3.0	14.5 – 21.5
Muffler bracket nut	1.5 – 2.0	11.0 – 14.5
Rear shock absorber fitting nut	2.0 – 3.0	14.5 – 21.5
Rear footrest bolt	2.7 – 4.3	19.5 – 31.0
Rear sprocket nut	2.5 – 4.0	18.0 – 29.0
Rear brake cam lever bolt	0.5 – 0.8	3.5 – 6.0
Rear axle nut	8.5 – 11.5	61.5 – 83.0
Chain adjuster support bolt	1.5 – 2.0	11.0 – 14.5

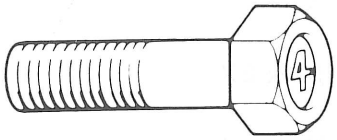
TIGHTENING TORQUE CHART

For other bolts and nuts not listed above, refer to this chart:
Tightening torque

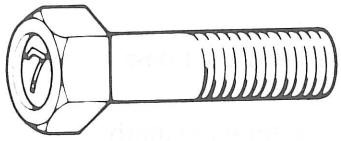
Bolt Diameter (mm)	Conventional or "4" marked bolt			"7" marked bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1 – 2	0.1 – 0.2	0.7 – 1.5	1.5 – 3	0.15 – 0.3	1.0 – 2.0
5	2 – 4	0.2 – 0.4	1.5 – 3.0	3 – 6	0.3 – 0.6	2.0 – 4.5
6	4 – 7	0.4 – 0.7	3.0 – 5.0	8 – 12	1.8 – 1.2	6.0 – 8.5
8	10 – 16	1.0 – 1.6	7.0 – 11.5	18 – 28	1.8 – 2.8	13.0 – 20.0
10	22 – 35	2.2 – 3.5	16.0 – 25.5	40 – 60	4.0 – 6.0	29.0 – 43.5
12	35 – 55	3.5 – 5.5	25.5 – 40.0	70 – 100	7.0 – 10.0	50.5 – 72.5
14	50 – 80	5.0 – 8.0	36.0 – 58.0	110 – 160	11.0 – 16.0	79.5 – 115.5
16	80 – 130	8.0 – 13.0	58.0 – 94.0	170 – 250	17.0 – 25.0	123.0 – 181.0
18	130 – 190	13.0 – 19.0	94.0 – 137.5	200 – 280	20.0 – 28.0	144.5 – 202.5



Conventional Bolt



"4" Marked Bolt



"7" Marked Bolt

SERVICE DATA

VALVE + GUIDE

Unit: mm (in)

ITEM	STANDARD		LIMIT
Valve diam.	IN.	32.0 (1.26)	———
	EX.	27.0 (1.06)	———
Valve lift	IN.	8.0 (0.31)	———
	EX.	7.5 (0.30)	———
Tappet clearance (when cold)	IN. & EX.	0.03 – 0.08 (0.001 – 0.003)	———
Valve guide to valve stem clearance	IN.	0.025 – 0.055 (0.0010 – 0.0022)	0.35 (0.0138)
	EX.	0.040 – 0.070 (0.0016 – 0.0028)	0.35 (0.0138)
Valve guide I.D.	IN. & EX.	7.000 – 7.015 (0.2756 – 0.2762)	———
Valve stem O.D.	IN.	6.960 – 6.975 (0.2740 – 0.2746)	———
	EX.	6.945 – 6.960 (0.2734 – 0.2740)	———
Valve stem runout	IN. & EX.	———	0.05 (0.002)
Valve head thickness	IN. & EX.	———	0.5 (0.02)
Valve stem end length	IN. & EX.	———	4.0 (0.16)
Valve seat width	IN. & EX.	0.9 – 1.1 (0.035 – 0.043)	———
Valve head radial runout	IN. & EX.	———	0.03 (0.001)
Valve spring free length (INTAKE)	INNER	———	35.6 (1.40)
	OUTER	———	41.6 (1.64)
(EXHAUST)	INNER	———	35.0 (1.38)
	OUTER	———	40.5 (1.59)
Valve spring tension (INTAKE)	INNER	10.6 – 12.8 kg (23.37 – 28.22 lbs) at length 31 mm (1.2 in)	———
	OUTER	22.3 – 26.3 kg (49.16 – 57.98 lbs) at length 35 mm (1.4 in)	———

Unit: mm (in)

ITEM	STANDARD		LIMIT
Valve sprint tension (EXHAUST)	INNER	11.0 – 13.0 kg (24.25 – 28.66 lbs) at length 31 mm (1.2 in)	———
	OUTER	22.1 – 25.9 kg (48.72 – 57.10 lbs) at length 35 mm (1.4 in)	———

CAMSHAFT + CYLINDER HEAD

Unit: mm (in)

ITEM	STANDARD		LIMIT
Cam height	IN.	36.285 – 36.315 (1.4285 – 1.4297)	35.990 (1.4169)
	EX.	35.785 – 35.815 (1.4089 – 1.4100)	35.490 (1.3972)
Camshaft journal oil clearance	IN. & EX.	0.032 – 0.066 (0.0013 – 0.0026)	0.150 (0.0059)
Camshaft journal holder I.D.	IN. & EX.	22.012 – 22.025 (0.8666 – 0.8671)	———
Camshaft journal O.D.	IN. & EX.	21.959 – 21.980 (0.8645 – 0.8654)	———
Camshaft runout	IN. & EX.	———	0.10 (0.004)
Cam chain 20 pitch length		———	157.80 (6.213)
Cam chain pin (at arrow "3")		19th pin	
Cylinder head distortion		———	0.2 (0.008)

CYLINDER + PISTON + PISTON RING

Unit: mm (in)

ITEM	STANDARD	LIMIT
Compression pressure	10 – 14 kg/cm^2 (142 – 199 psi)	7 kg/cm^2 (100 psi)
Compression pressure difference	———	2 kg/cm^2 (28 psi)
Piston to cylinder clearance	0.035 – 0.045 (0.0014 – 0.0018)	0.120 (0.0047)
Cylinder bore	62.000 – 62.015 (2.4409 – 2.4415)	62.095 (2.4447)
Piston diam.	61.960 – 61.975 (2.4394 – 2.4400) Measure at the 15 (0.6) from skirt end.	61.880 (2.4362)
Cylinder distortion	———	0.2 (0.008)

Unit: mm (in)

ITEM	STANDARD			LIMIT
Piston ring free end gap	1st	N	Approx. 7.5 (0.30)	6.0 (0.24)
		R	Approx. 7.5 (0.30)	6.0 (0.24)
	2nd	N	Approx. 9.5 (0.37)	7.6 (0.30)
		R	Approx. 9.5 (0.37)	7.6 (0.30)
Piston ring end gap	1st		0.10 – 0.30 (0.004 – 0.012)	0.70 (0.028)
	2nd		0.10 – 0.30 (0.004 – 0.012)	0.70 (0.028)
Piston ring to groove clearance	1st		———	0.18 (0.007)
	2nd		———	0.15 (0.006)
Piston ring groove width	1st		1.210 – 1.230 (0.0476 – 0.0484)	———
	2nd		1.210 – 1.230 (0.0476 – 0.0484)	———
	Oil		2.510 – 2.530 (0.0988 – 0.0996)	———
Piston ring thickness	1st		1.175 – 1.190 (0.0463 – 0.0469)	———
	2nd		1.170 – 1.190 (0.0461 – 0.0469)	———
Piston pin bore	16.002 – 16.008 (0.6300 – 0.6302)			16.030 (0.6311)
Piston pin O.D.	15.995 – 16.000 (0.6297 – 0.6300)			15.980 (0.6291)

CONROD + CRANKSHAFT

Unit: mm (in)

ITEM	STANDARD	LIMIT
Conrod small end I.D.	16.010 – 16.018 (0.6303 – 0.6306)	16.040 (0.6315)
Conrod deflection	———	3.0 (0.12)
Conrod big end side clearance	0.10 – 0.65 (0.004 – 0.026)	1.0 (0.039)
Crankshaft runout	———	0.10 (0.004)

OIL PUMP

Unit: mm (in)

ITEM	STANDARD	LIMIT
Oil pump reduction ratio	1.508 (87/44 x 29/38)	———
Oil pressure (at 60°C, 140°F)	Above 0.1 kg/cm² (1.42 psi) Below 0.5 kg/cm² (7.11 psi) at 3 000 r/min	———

CLUTCH

Unit: mm (in)

ITEM	STANDARD	LIMIT
Clutch cable play	2 – 3 (0.08 – 0.12)	———
Drive plate thickness	2.7 – 2.9 (0.10 – 0.11)	2.4 (0.09)
Drive plate claw width	11.8 – 12.0 (0.46 – 0.47)	11.0 (0.43)
Driven plate thickness	2.00 ± 0.06 (0.079 ± 0.002)	———
Driven plate distortion	———	0.1 (0.004)
Clutch spring free length	———	36.5 (1.44)

TRANSMISSION + DRIVE CHAIN

Unit: mm (in)

ITEM	STANDARD		LIMIT
Primary reduction ratio	1.977 (87/44)		———
Final reduction ratio	3.000 (45/15)		———
Gear ratios	Low	2.750 (33/12)	———
	2nd	1.812 (29/16)	———
	3rd	1.368 (26/19)	———
	4th	1.142 (24/21)	———
	Top	1.000 (22/22)	———
Shift fork to groove clearance	0.10 – 0.30 (0.004 – 0.012)		0.50 (0.020)
Shift fork groove width	5.50 – 5.60 (0.217 – 0.220)		———
Shift fork thickness	5.30 – 5.40 (0.209 – 0.213)		———
Counter shaft length	114.4 – 114.5 (4.504 – 4.508)		———
Drive chain	Type	TAKASAGO: RK50GO	———
	Links	106	———
	20 pitch length	———	336.5 (13.25)
Drive chain slack	20 – 30 (0.8 – 1.2)		———

CARBURETOR

Unit: mm (in)

ITEM		SPECIFICATION
Carburetor type		MIKUNI BS32, Four
Bore size		32
I.D. No.		34220
Idle r/min.		1 100 ± 100 r/min.
Fuel level		5.0 ± 1.0 (0.20 ± 0.04)
Float height		22.4 ± 1.0 (0.88 ± 0.04)
Main jet	(M. J.)	#97.5
Main air jet	(M. A. J.)	2.0
Jet needle	(J. N.)	5C45
Needle jet	(N. J.)	Y–7
Pilot jet	(P. J.)	#42.5
By pass	(B. P.)	0.8, 0.7, 0.8
Pilot outlet	(P. O.)	0.7
Valve seat	(V. S.)	2.0
Starter jet	(G. S.)	# 47.5
Pilot screw	(P. S.)	PRE–SET
Pilot air jet	(P. A. J.)	# 175
Throttle cable play		0.5 – 1.0 (0.02 – 0.04)
Choke cable play		0.5 – 1.0 (0.02 – 0.04)

ELECTRICAL

Unit: mm (in)

ITEM	SPECIFICATION		
Ignition timing	10° B.T.D.C. Below 1 650 ± 100 r/min and 40° B.T.D.C. Above 3 500 ± 100 r/min.		
Firing order	1. 2. 4. 3.		
Spark plug	Type	NGK : D8EA ND : X24ES-U	
	Gap	0.6 – 0.7 (0.24 – 0.028)	
Spark performance	Over 8 (0.3) at 1 atm		
Signal coil resistance	Approx. 60 – 80 Ω		
Ignition coil resistance	Primary	O/W – W or B/Y Approx. 3 – 5 Ω	
	Secondary	Plug cap – Plug cap Approx. 30 – 35 k Ω	
Generator no-load voltage	More than 80V (AC) at 5 000 r/min.		
Regulated voltage	14 – 15.5 V at 5 000 r/min.		
Starter motor	Brush length	N. D.	Limit: 6 (0.24)
	Commutator under cut		Limit : 0.2 (0.008)
Starter relay resistance	Approx. 3 – 4 Ω		
Battery	Type designation		YB10L – A2
	Capacity		42.3 kC (12 Ah)
	Standard electrolyte S. G.		1.28 at 20°C (68°F)
Fuse size	Main		15 A
	Headlight		10 A
	Signal		10 A
	Ignition		10 A

BRAKE + WHEEL

Unit: mm (in)

ITEM		STANDARD	LIMIT
Rear brake pedal height		20 (0.8)	———
Brake disc thickness	Front	5.0 ± 0.2 (0.20 ± 0.008)	4.5 (0.18)
	Rear	6.7 ± 0.2 (0.26 ± 0.008)	6.0 (0.24)
Brake disc runout		———	0.30 (0.012)
Master cylinder bore	Front	15.870 – 15.913 (0.6248 – 0.6265)	———
	Rear	14.000 – 14.043 (0.5512 – 0.5529)	———
Master cylinder piston diam.	Front	15.827 – 15.854 (0.6231 – 0.6242)	———
	Rear	13.957 – 13.984 (0.5495 – 0.5506)	———
Brake caliper cylinder bore	Front	38.180 – 38.256 (1.5031 – 1.5061)	———
	Rear	38.180 – 38.256 (1.5031 – 1.5061)	———
Brake caliper piston diam.	Front	38.098 – 38.148 (1.4999 – 1.5019)	———
	Rear	38.098 – 38.148 (1.4999 – 1.5019)	———
Wheel rim runout	Axial	———	2.0 (0.08)
	Radial	———	2.0 (0.08)
Wheel axle runout	Front	———	0.25 (0.010)
	Rear	———	0.25 (0.010)
Tire size	Front	3.25H19 4PR	———
	Rear	3.75H18 4PR	———
Tire tread depth	Front	———	1.6 (0.06)
	Rear	———	2.0 (0.08)

SUSPENSION

Unit: mm (in)

ITEM	STANDARD		LIMIT
Front fork stroke	150 (5.9)		———
Front fork spring free length	Short	———	93.0 (3.7)
	Long	———	397.0 (15.6)
Front fork oil level	201 (7.9)		———
Rear wheel travel	100 (3.9)		———
Swing arm pivot shaft runout	———		0.3 (0.012)

FUEL + OIL

ITEM	SPECIFICATION	
Fuel type	Use only unleaded or low-lead type gasoline of at least 85 – 95 pump octane ($\frac{R+M}{2}$ method) or 89 octane or higher rated by the Research Method.	
Fuel tank including reserve	16 L (4.2/3.5 US/Imp gal)	
reserve	4.5 L (4.8/4.0 US/Imp qt)	
Engine oil type	SAE 10W/40, API SE or SF	
Engine oil capacity	Change	2 400 ml (2.5/2.1 US/Imp qt)
	Filter change	2 600 ml (2.7/2.3 US/Imp qt)
	Overhaul	2 700 ml (2.9/2.4 US/Imp qt)
Front fork oil type	Fork oil # 15	
Front fork oil capacity (each leg)	190 ml (6.42/6.69 US/Imp oz)	
Brake fluid type	DOT3 or DOT4	

TIRE PRESSURE

COLD INFLATION TIRE PRESSURE	NORMAL RIDING						CONTINUOUS HIGH SPEED RIDING					
	SOLO RIDING			DUAL RIDING			SOLO RIDING			DUAL RIDING		
	kPa	kg/cm²	psi	kPa	kg/cm²	psi	kPa	kg/cm²	psi	kPa	kg/cm²	psi
FRONT	175	1.75	24	175	1.75	24	200	2.00	28	200	2.00	28
REAR	200	2.00	28	250	2.50	36	225	2.25	32	280	2.80	40

WATTAGE

(W)

	SPECIFICATION
Headlight HI/LO	60/55
Tail/Brake light	8/23
Turn signal light	23
Speedometer light	3.4
Tachometer light	3.4
Turn signal indicator light	3.4
High beam indicator light	3.4
Neutral indicator light	3.4
Oil pressure indicator light	3.4
Gear position indicator light	1.4

GS650EZ ('82-MODEL)

This supplementary section has been produced to aid Suzuki mechanics in properly maintaining and repairing the 1982 "Z" model.
This section has been written primarily for the experienced Suzuki mechanic but will also be very useful even for the apprentice mechanic and do-it-yourself mechanic. The entire manual should be thoroughly reviewed before any servicing is performed.

Please also refer to the sections, 1 through 8, for GS650E "X" MODEL (1981 MODEL) for all other areas of information not covered in this section.

IMPORTANT

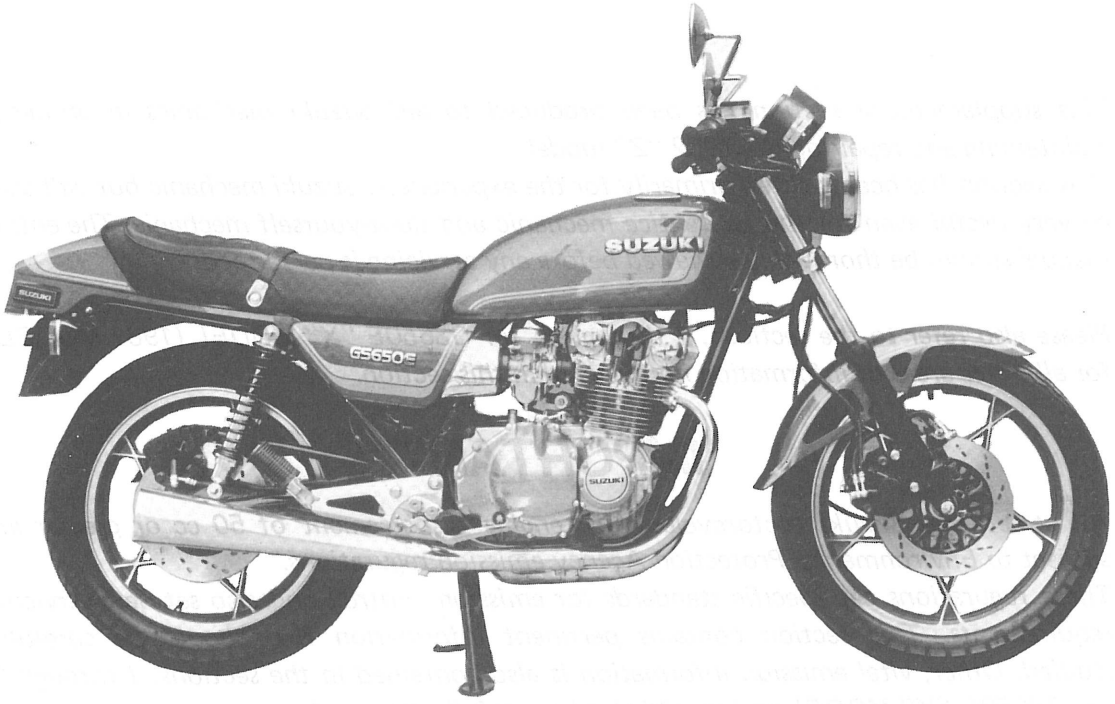
All street-legal Suzuki motorcycles with engine displacement of 50 cc or greater are subject to Environmental Protection Agency emission regurations.
These regurations set specific standards for emission control, and also set new servicing requirements. This section contains pertinent information that should be carefully studied. Other, vital emission information is also contained in the sections, 1 through 8, for GS650E "X" MODEL and should also be carefully reviewed.

Complete information concerning the EPA emission reguration and U.S. Suzuki's emission control program can be found in the U.S. SUZUKI EMISSION CONTROL PROGRAM MANUAL.

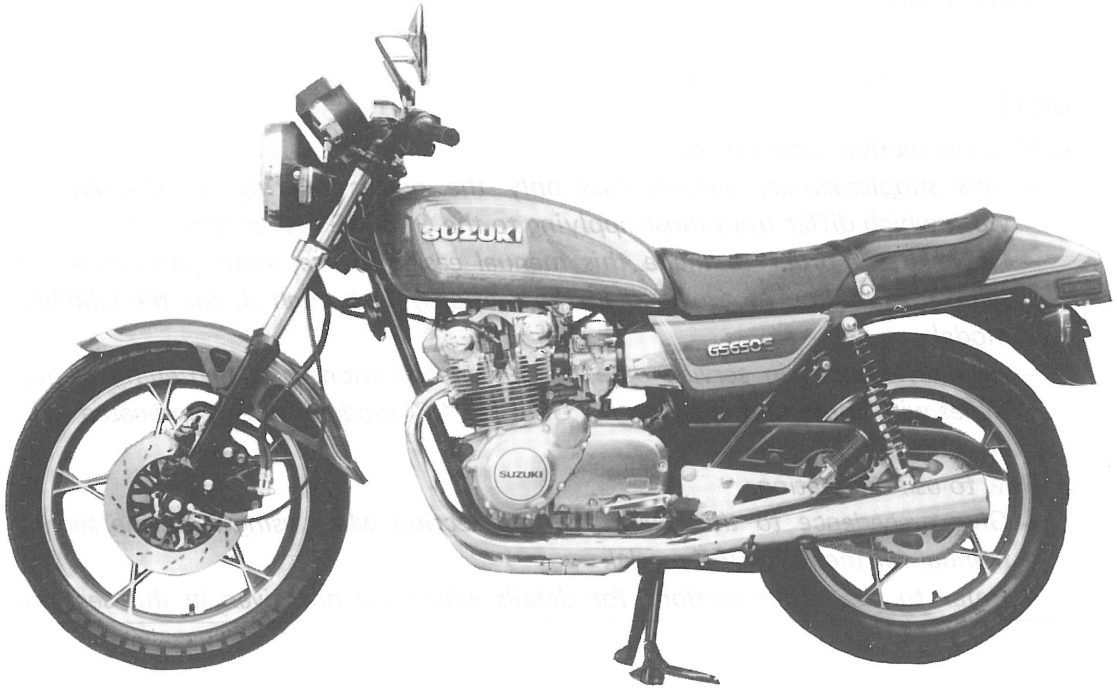
NOTE:
1. How the section is compiled.
- *This supplementary section lists only the points relating to maintenance work which differ from those applying to the GS650E "X" model.*
- *However, in order to make this manual easier to use, some parts have the same information as provided in the sections, 1 through 8, for the GS650E model.*
- *Any differences in service data, service specifications and tightening torque tables with those that apply to the GS650E "X" model is clearly indicated with an asterisk (*).*

2. How to use the section.
- *Give precedence to this supplementary section when using it as the service manual for the GS650EZ model.*
- *Refer to the other sections for details which are not given in this section.*

VIEW OF SUZUKI GS650EZ



RIGHT SIDE



LEFT SIDE

CONTENTS

SPECIFICATIONS

DIMENSIONS AND DRY MASS

Overall length	2 155 mm
Overall width	830 mm
Overall height	1 160 mm
Wheelbase	1 435 mm
Ground clearance	160 mm
Dry mass	203 kg

ENGINE

Type	Four-stroke, air-cooled, DOHC
Number of cylinders	4
Bore	62.0 mm
Stroke	55.8 mm
Piston displacement	673 cm^3
Compression ratio	9.4 : 1
Carburetor	MIKUNI BS32SS, four
Air cleaner	Polyurethane foam element
Starter system	Electric
Lubrication system	Wet sump

TRANSMISSION

Clutch	Wet multi-plate type
Transmission	5-speed constant mesh
Gearshift pattern	1-down, 4-up
Primary reduction	1.977 (87/44)
Final reduction	3.000 (45/15)
Gear ratios, Low	2.750 (33/12)
2nd	1.812 (29/16)
3rd	1.368 (26/19)
4th	1.142 (24/21)
Top	1.000 (22/22)
Drive chain	TAKASAGO RK50GO, 106 links

CHASSIS

Front suspension	* Telescopic, pneumatic/coil spring, oil dampened
Rear suspension	* Swing arm, oil dampened, damper 4-way, spring 5-way adjustable
Steering angle	40° (right & left)
Caster	61° 50′
Trail	115 mm
Turning radius	2.5 m
Front brake	Disc brake, twin
Rear brake	Disc brake
Front tire size	3.25H19 4PR
Rear tire size	3.75H18 4PR

ELECTRICAL

Ignition type	Transistorized
Ignition timing	10° B.T.D.C. below 1 650 r/min and 40° B.T.D.C. above 3 500 r/min
Spark plug	NGK D8EA or NIPPON DENSO X24ES-U
Battery	12V 43.2 kC (12 Ah)/10 HR
Generator	Three-phase A.C. generator
Fuse	10/10/10/15A

CAPACITIES

Fuel tank including reserve	16 L
reserve	4.5 L
Engine oil when changing	2.4 L
Front fork oil	*223 ml

** These specifications are subject to change without notice.
* The asterisk mark indicates new Z model specifications.

SERVICE DATA

VALVE + GUIDE

Unit: mm

ITEM	STANDARD		LIMIT
Valve diam.	IN.	32.0	—
	EX.	27.0	—
Valve lift	IN.	7.2	—
	EX.	7.0	—
Tappet clearance (when cold)	IN. & EX.	0.03 – 0.08	—
Valve guide to valve stem clearance	IN.	0.025 – 0.055	0.35
	EX.	0.040 – 0.070	0.35
Valve guide I.D.	IN. & EX.	7.000 – 7.015	—
Valve stem O.D.	IN.	6.960 – 6.975	—
	EX.	6.945 – 6.960	—
Valve stem runout	IN. & EX.	—	0.05
Valve head thickness	IN. & EX.	—	0.5
Valve stem end length	IN. & EX.	—	4.0
Valve seat width	IN. & EX.	0.9 – 1.1	—
Valve head radial runout	IN. & EX.	—	0.03
Valve spring free length INTAKE	INNER	—	35.6
	OUTER	—	41.6
EXHAUST	INNER	—	35.0
	OUTER	—	40.5
Valve spring tension INTAKE	INNER	10.6 – 12.8 kg at length 31 mm	—
	OUTER	22.3 – 26.3 kg at length 35 mm	—
EXHAUST	INNER	11.0 – 13.0 kg at length 31 mm	—
	OUTER	22.1 – 25.9 kg at length 35 mm	—

CAMSHAFT + CYLINDER HEAD

Unit: mm

ITEM	STANDARD		LIMIT
Cam height	IN.	35.485 – 35.515	35.190
	EX.	35.285 – 35.315	34.990
Camshaft journal oil clearance	IN. & EX.	0.032 – 0.066	0.150
Camshaft journal holder I.D.	IN. & EX.	22.012 – 22.025	———
Camshaft journal O.D.	IN. & EX.	21.959 – 21.980	———
Camshaft runout	IN. & EX.	———	0.10
Cam chain 20-pitch length		———	157.80
Cam chain (at arrow "3")		19th pin	———
Cylinder head distortion		———	0.2

CYLINDER + PISTON + PISTON RING

Unit: mm

ITEM	STANDARD	LIMIT
Compression pressure	10 – 14 kg/cm^2	7 kg/cm^2
Compression pressure difference	———	2 kg/cm^2
Piston to cylinder clearance	0.035 – 0.045	0.120
Cylinder bore	62.000 – 62.015	62.095
Piston diam.	61.960 – 61.975 Measure at the 15 from skirt end.	61.880
Cylinder distortion	———	0.2

Unit: mm

ITEM	STANDARD			LIMIT
Piston ring free end gap	1st	N	Approx. 7.5	6.0
		R	Approx. 7.5	6.0
	2nd	N	Approx. 9.5	7.6
		R	Approx. 9.5	7.6
Piston ring end gap	1st		0.10 – 0.30	0.70
	2nd		0.10 – 0.30	0.70
Piston ring to groove clearance	1st		———	0.18
	2nd		———	0.15
Piston ring groove width	1st		1.210 – 1.230	———
	2nd		1.210 – 1.230	———
	Oil		2.510 – 2.530	———
Piston ring thickness	1st		1.175 – 1.190	———
	2nd		1.170 – 1.190	———
Piston pin bore	16.002 – 16.008			16.030
Piston pin O.D.	15.995 – 16.000			15.980

CONROD + CRANKSHAFT

Unit: mm

ITEM	STANDARD	LIMIT
Conrod small end I.D.	16.010 – 16.018	16.040
Conrod deflection	———	3.0
Conrod big end side clearance	0.10 – 0.65	1.0
Crankshaft runout	———	0.10

OIL PUMP

Unit: mm

ITEM	STANDARD	LIMIT
Oil pump reduction ratio	1.821 (87/44 x 35/38)	———
Oil pressure (at 60°C, 140°F)	Above 0.1 kg/cm^2 Below 0.5 kg/cm^2 at 3 000 r/min.	———

CLUTCH

Unit: mm

ITEM	STANDARD	LIMIT
Clutch cable play	2 – 3	———
Drive plate thickness	2.7 – 2.9	2.4
Drive plate claw width	11.8 – 12.0	11.0
Driven plate thickness	2.00 ± 0.06	———
Driven plate distortion	———	0.1
Clutch spring free length	———	36.5

TRANSMISSION + DRIVE CHAIN

Unit: mm

ITEM	STANDARD		LIMIT
Primary reduction	1.977 (87/44)		———
Final reduction ratio	3.000 (45/15)		———
Gear ratios	Low	2.750 (33/12)	———
	2nd	1.812 (29/16)	———
	3rd	1.368 (26/19)	———
	4th	1.142 (24/21)	———
	Top	1.000 (22/22)	———
Shift fork to groove clearance	0.10 – 0.30		0.50
Shift fork groove width	5.50 – 5.60		———
Shift fork thickness	5.30 – 5.40		———
Countershaft length (Low to 2nd)	114.4 – 114.5		———
Drive chain	Type	TAKASAGO: RK50GO	———
	Links	106	———
	20 pitch length	———	336.5
Drive chain slack	20 – 30		———

CARBURETOR

Unit: mm

ITEM		SPECIFICATION
Carburetor type		MIKUNI BS32SS
Bore size		32
I.D. No.		* 34260
Idle r/min.		1 100 ± 50 r/min.
Fuel level		5.0 ± 1.0
Float height		22.4 ± 1.0
Main jet	(M.J.)	#97.5
Main air jet	(M.A.J.)	2.0
Jet needle	(J.N.)	5C45
Needle jet	(N.J.)	Y-7
Throttle valve	(T.V.)	# 125
Pilot jet	(P.J.)	#42.5
By pass	(B.P.)	0.8, 0.7, 0.8
Pilot outlet	(P.O.)	0.7
Valve seat	(V.S.)	2.0
Starter jet	(G.S.)	# 47.5
Pilot screw	(P.S.)	PRE-SET
Pilot air jet	(P.A.J.)	# 175
Throttle cable play		0.5 – 1.0
Choke cable play		0.5 – 1.0

* The asterisk mark indicates new Z model specifications.

ELECTRICAL

Unit: mm

ITEM	SPECIFICATION		
Ignition timing	10° B.T.D.C. Below 1 650 ± 100 r/min. and 40° B.T.D.C. Above 3 500 ± 100 r/min.		
Firing order	1. 2. 4. 3		
Spark plug	Type	NGK: D8EA or N.D.: X24ESU	
	Gap	0.6 – 0.7	
Spark performance	Over 8 at 1 atm		
Signal coil resistance	G/W – B/Bl Br – B/Bl	Approx. 60 – 80 Ω	
Ignition coil resistance	Primary	O/W – W or B/Y Approx. 3 – 5 Ω	
	Secondary	Plug cap – Plug cap Approx. 30 – 35 kΩ	
Generator no-load voltage	More than 80V (AC) at 5 000 r/min.		
Regulated voltage	14 – 15.5V at 5 000 r/min.		
Starter motor	Brush length	N.D.	Limit: 6
	Commutator under cut		Limit: 0.2
Starter relay resistance	Approx. 3 – 4 Ω		
Battery	Type designation	YB10L-A2	
	Capacity	43.2 kC (12 Ah)	
	Standard electrolyte S.G.	1.28 at 20°C (68°F)	
Fuse size	Main	15 A	
	Headlight	10 A	
	Signal	10 A	
	Ignition	10 A	

BRAKE + WHEEL

Unit: mm

ITEM	STANDARD		LIMIT
Rear brake pedal height	20		———
Brake disc thickness	Front	5.0 ± 0.2	4.5
	Rear	6.7 ± 0.2	6.0
Brake disc runout	———		0.3
Master cylinder bore	Front	15.870 – 15.913	———
	Rear	14.000 – 14.043	———
Master cylinder piston diam.	Front	* 15.811 – 15.838	———
	Rear	13.957 – 13.984	———
Brake caliper cylinder bore	Front	38.180 – 38.256	———
	Rear	38.180 – 38.256	———
Brake caliper piston diam.	Front	38.098 – 38.148	———
	Rear	38.098 – 38.148	———
Wheel rim runout	Axial	———	2.0
	Radial	———	2.0
Wheel axle runout	Front	———	0.25
	Rear	———	0.25
Tire size	Front	3.25H19 4PR	———
	Rear	3.75H18 4PR	———
Tire tread depth	Front	———	1.6
	Rear	———	2.0

SUSPENSION

Unit: mm

ITEM	STANDARD	LIMIT
Front fork stroke	150	———
Front fork spring free length	———	* 494
Front fork oil level	* 140	———
Front fork air pressure	* 50 kPa 0.5 kg/cm^2	———
Rear wheel travel	100	———
Swing arm pivot shaft runout	———	0.3

FUEL + OIL

ITEM	SPECIFICATION	
Fuel type	Use only unleaded or low-lead type gasoline of at least 85-95 pump octane ($\frac{R+M}{2}$ Method) or 89 octane or higher rated by the Research Method.	
Fuel tank including reserve	16 L	
reserve	4.5 L	
Engine oil type	SAE 10W/40	
Engine oil capacity	Change	2 400 ml
	Filter change	2 600 ml
	Overhaul	2 700 ml
Front fork oil type	Fork oil SAE # 15	
Front fork oil capacity (each leg)	* 223 ml	
Brake fluid type	DOT3 or DOT4	

* The asterisk mark indicates new Z model specifications.

TIRE PRESSURE

COLD INFLATION TIRE PRESSURE	NORMAL RIDING						CONTINUOUS HIGH SPEED RIDING					
	SOLO RIDING			DUAL RIDING			SOLO RIDING			DUAL RIDING		
	kPa	kg/cm^2	psi	kPa	kg/cm^2	psi	kPa	kg/cm^2	psi	kPa	kg/cm^2	psi
FRONT	175	1.75	24	175	1.75	24	200	2.00	28	200	2.00	28
REAR	200	2.00	28	250	2.50	36	225	2.25	32	280	2.80	40

WATTAGE

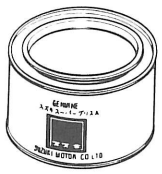
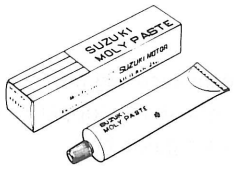
(W)

ITEM		SPECIFICATION
Headlight	HI	60
	LO	55
Tail/Brake light		8/23
Turn signal light		23
Speedometer light		3.4
Tachometer light		3.4
Turn signal indicator light		3.4
High beam indicator light		3.4
Neutral indicator light		3.4
Oil pressure indicator light		3.4
License light		* 8
Gear position indicator light		1.4
Fuel meter light		* 1.7

* The asterisk mark indicates new Z model specifications.

SPECIAL MATERIALS

The materials listed below are needed for maintenance work on the GS650E, and should be kept on hand for ready use. They supplement such standard materials as cleaning fluids, lubricants, emery cloth and the like. How to use them and where to use them are described in the text of this manual.

Material	Part	Part
 SUZUKI SUPER GREASE "A" 99000-25030	• Oil seals • Throttle grip • Cables (speedometer and tachometer) • Gearshift lever linkage and shaft • Carburetor starter shaft • Side stand	• Wheel bearings • Sprocket mounting drum bearing and oil seal • Swinging arm bearing and dust seal • Rear brake cam • Brake pedal shaft • Governor link • Centerstand spacer • Steering stem bearings
 SUZUKI SILICONE GREASE 99000-25100	• Caliper axle shaft	
 SUZUKI MOLY PASTE 99000-25140	• Valve stem • Cam shaft journal • Chain tensioner push rod	
 SUZUKI BOND NO. 1207B 99104-31140	• Mating surfaces of upper and lower crankcase • Front fork damper rod bolt	

Material	Part	Part
 THREAD LOCK SUPER "1333B" 99000-32020	• Gearshift cam retainer screw • Cam chain guide screw • Cam chain guide holder screw • Cam chain guide bolt	
 THREAD LOCK SUPER "1303" 99000-32030	• Gearshift arm return spring stopper • Cam sprocket allen bolt • 2nd drive gear inner surface • Generator rotor bolt • Starter clutch allen bolt	
 THREAD LOCK CEMENT 99000-32040	• Carburetor set screw • Camshaft end cap screw • Front fork damper rod bolt	
 THREAD LOCK "1342" 99000-32050	• Generator stator securing screw • Generator lead wire guide screw • Gearshift cam stopper bolt • Countershaft bearing retainer screw • Oil pump fitting screw	• Starter motor securing bolt • Gearshift fork shaft stopper screw • Gearshift cam guide bolt • Oil separator plate screw

PERIODIC MAINTENANCE SCHEDULE

IMPORTANT: The periodic maintenance intervals and service requirements have been established in accordance with EPA regulations. Following these instructions will ensure that the motorcycle will not exceed emission standards and it will also ensure the reliability and performance of the motorcycle.

NOTE:
Vehicles operated under severe conditions may require more frequent servicing.

The chart below lists the recommended intervals for all the required periodic service work necessary to keep the motorcycle operating at peak performance and to maintain proper emission levels. Mileages are expressed in terms of kilometers, miles and time for your convenience.

PERIODIC MAINTENANCE CHART

INTERVAL: THIS INTERVAL SHOULD BE JUDGED BY ODOMETER READING OR MONTHS WHICHEVER COMES FIRST	mile	600	4 000	7 500	11 000	15 000
	km	1 000	6 000	12 000	18 000	24 000
	month	2	12	24	36	48
Battery (Specific gravity of electrolyte)		–	I	I	I	I
Cylinder head nuts & exhaust pipe bolts		T	T	T	T	T
Air cleaner element		–	C	C	C	C
Tappet clearance		I	I	I	I	I
Spark plugs		–	C	R	C	R
Fuel line		Replace every two years.				
Engine oil & oil filter		R	R	R	R	R
Carburetor idle rpm*		I	I	I	I	I
Clutch		I	I	I	I	I
Drive chain		I	I	I	I	I
		Clean and lubricate every 600 mile (1 000 km)				
Brake hose		Replace every two years.				
Brakes		I	I	I	I	I
Tires		I	I	I	I	I
Steering stem		I	I	I	I	I
Chassis bolt and nut		T	T	T	T	T

NOTE: T = Tighten, I = Inspect, R = Replace, C = Clean

** = The specified idle rpm appears on the vehicle emission control information label.*

EMISSION REGULATIONS

On February 4, 1977, Federal Emission Regulations for motorcycles that may be licensable took effect. The regulations provided for a gradual, multi-step application of stricter emission limits beginning with all effected motorcycles manufactured after January 1, 1978, culminating with the present 1980 emission level restrictions. For the 1980 and succeeding years one set of emission limits will be in effect. They are as follows:

1980 EMISSION LIMITS

CATEGORIES	HYDROCARBONS (HC)	CARBON MONOXIDE
All motorcycles 50 cc — Larger	5.0 Grams/Kilometer (8.0 Grams/Mile)	12 Grams/Kilometer (19.3 Grams/Mile)

Emission-controlled motorcycles which are subject to the emission regulations are those motorcycles which are equipped with a headlight, taillight, stop light and which have an engine displacement larger than 50 cc.

Suzuki Motor Company performed all the necessary testing and certification of emission-controlled models in strict compliance with the E.P.A. testing regulations. Suzuki motorcycle dealers are not required to either test or certify emission levels on any motorcycles as Suzuki Motor Company is legally responsible for the entire certification procedure.

E.P.A. regulations also provide fines for individuals who alter, render inoperative or improperly service emission-controlled motorcycles ranging up to $10,000.00 per motorcycle. It is essential that the individual servicing this emission-controlled motorcycle review thoroughly all the service procedures presented in this manual. Under no circumstances should the recommended service procedures be deviated from nor adjustments made which are not in accordance with the factory specifications or service procedures.

EMISSION CONTROL CARBURETOR COMPONENTS

GS650E motorcycles are equipped with precision, manufactured carburetors for emission level control. These carburetors require special mixture control components and other precision adjustments to function properly.

There are several carburetor mixture control components in each carburetor assembly. Three (3) of these components are machined to much closer tolerances than standard machined carburetor jets. These three (3) particular jets – MAIN JET, NEEDLE JET, PILOT JET – must not be replaced by standard jets. To aid in identifying these three (3) jets a different design of letter and number are used. If replacement of these close tolerance jets becomes necessary, be sure to replace them with the same type close tolerance jets marked as in the examples shown below.

The jet needle is also of special manufacture. Only one clip position is provided on the jet needle. If replacement becomes necessary the jet needle may only be replaced with an equivalent performing replacement component. Suzuki recommends that Genuine Suzuki Parts be utilized whenever possible for the best possible performance and durability.

Conventional Figures Used on Standard Tolerance Jet Components	1 2 3 4 5 6 7 8 9 0
Emission Type Figures Used On Close Tolerance Jet Components	1 2 3 4 5 6 7 8 9 0

The carburetor specification for the emission-controlled GS650E are as follows.

Carburetor I.D. No.	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Pilot Screw
34260	#97.5	Y-7	5C45	#42.5	PRE-SET DO NOT ADJUST

The pilot screw is pre-set by the factory utilizing specialized testing and adjusting procedures. The pilot screw is not adjustable as the idle circuit is "sealed" after factory adjustment. Adjusting, interferring with, improper replacement, or resetting of any of the carburetor components may adversely affect carburetor performance and cause the motorcycle to exceed the exhaust emission level limits. If persons, who are unaware of these special carburetor servicing requirements tamper with the carburetors the Suzuki dealer should restore the carburetors to their original condition or if unable to effect repairs, contact the distributors representative for further technical information and assistance.

GENERAL EMISSION INFORMATION

There are three different types of regulated exhaust emissions. They are:

Hydrocarbons (HC)
Carbon Monoxide (CO)
Oxides of Nitrogen (NOx)

Automobiles must meet specific emission standards for all three of these pollutants. Motorcycles must only meet the requirements for the following:

Hydrocarbons (HC)
Carbon Monoxide (CO)

HC exhaust emissions are basically unburned fuel vapors which have passed through the engine and escaped the combustion process.

CO exhaust emissions are formed during an incomplete combustion cycle as a result of a rich air/fuel mixture. The only way that CO can be produced is by the combustion cycle.

Total NOx emissions from all motorcycles is considered negligible. The EPA states that total NOx emission from motorcycles by 1990 will only amount to approximately 0.5%. NOx is formed during the combustion process at high combustion chamber temperatures.

CARBON MONOXIDE

Carbon monoxide is a product of an incomplete combustion cycle. CO is measured in grams per mile or kilometer and also in percentage (%).

The most common cause of CO is rich carburetion. As the mixture is richened excessively, the CO amount increases proportionately. Engine oil is also a hydrocarbon, so engine problesm which lead to oil burning increase carbon monoxide.

CARBURETION MALFUNCTION

1. Air Cleaner – Dirty or over oiled.
2. Idle Mixture – Adjusted incorrectly.
3. Idle Speed – Too high or low.
4. Fuel Level – Sticking float, leaking needle, incorrect setting.
5. Choke – Leaking or linkage sticking.
6. Synchronization – Improper balance on multi cylinders.

ENGINE MALFUNCTION

1. Valve Seals – Leaking or torn.
2. Valve Guide – Worn and leaking excess oil.
3. Gaskets – Leaking oil into combustion chamber.

HYDROCARBONS

Hydrocarbons are unburnt gasoline vapors and can be measured in two different ways. The first is to measure the weight of the pollutants over a specific distance such as grams per mile or grams per kilometer. The second method is to measure the concentration of HC in the exhaust gas in parts per million (PPM).

The most common cause of high HC emissions are ignition system problems. If the ignition system fails to ignite the fuel mixture properly, then raw gasoline vapors will pass through the engine into the exhaust system. Listed are the most common ignition problems which occur and which can affect HC emission output.

IGNITION SYSTEM MALFUNCTIONS

1. Spark Plugs – Fouled, dirty, improper type or improperly gapped.
2. Ignition Timing – Advanced or Retarded.
3. Timing Advance – Too fast or too slow an advance rate.
4. Battery – Low charge or faulty.

Carburetion can also lead to high HC emissions if the mixture is either excessively rich or excessively lean.

MIXTURE-RELATED MALFUNCTIONS

1. Air Cleaner – Dirty, over oiled or torn.
2. Jets – Clogged, restricted or incorrect size.
3. Float Level – Level too low (lean) or too high (rich).
4. Choke – Leaking choke plunger or sticking linkage.
5. Air Leaks – Intake manifolds, engine gaskets and other sealing surfaces.
6. Synchronization – Unbalanced on multi-cylinder machines.
7. Exhaust System – Restricted flow or improper exhaust system.

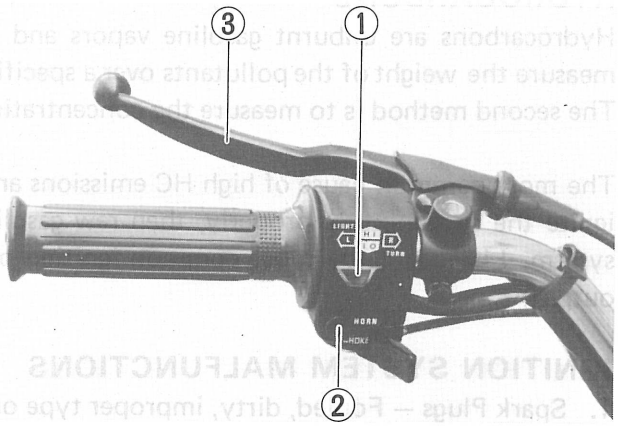
Engine wear or damage can also cause high HC emissions.

1. Rings – Low compression, leakage into crankcase.
2. Valves – Improper adjustment, bent stem or burnt.
3. Gaskets – Leaking, loss of compression.
4. Crank Seals – Leaking.
5. Oil Consumption – Worn valve guides, worn rings, clogged crankcase breather.
6. Oil – Improper engine oil.

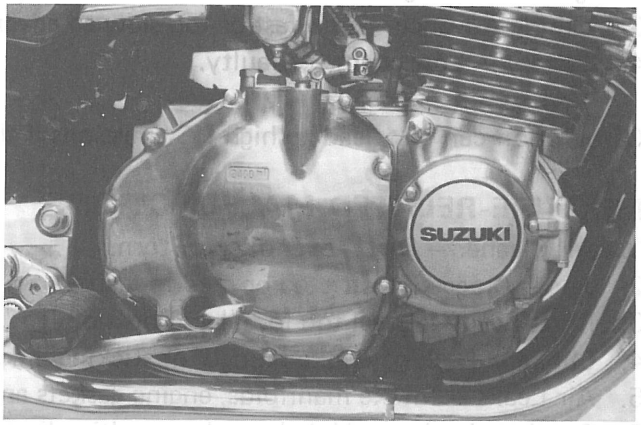
MODIFICATIONS

The following number of refinements have been carried out on the GS650EZ (1982 model) and new mechanisms adopted.

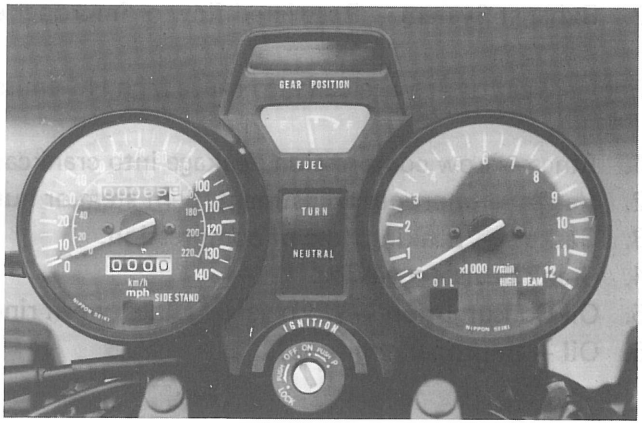
1. Handling ease has been improved by moving the choke lever position from its location on the steering stem head to the left handlebar. The carburetor has been slightly modified.



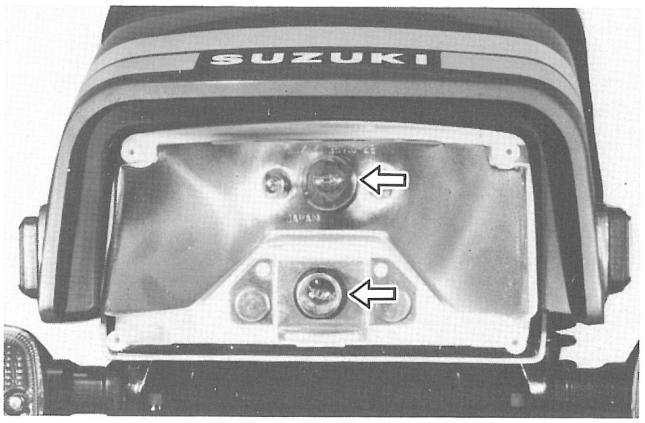
2. The engine cover screws have been replaced with bolts.



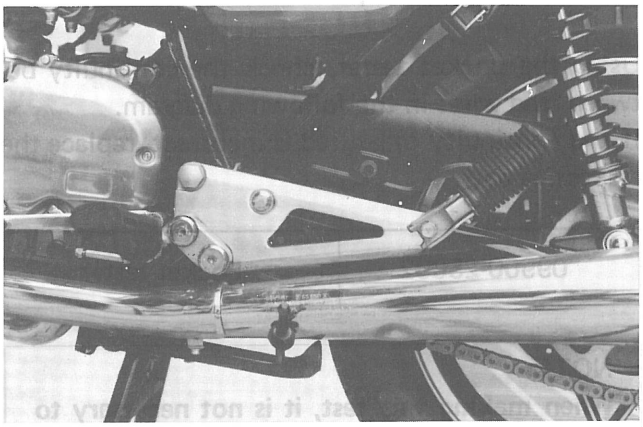
3. A fuel level gauge has been adopted and a fuel meter added so that the remaining amount of fuel can be seen at a glance. Along with the adoption of the fuel level gauge, the position of the fuel cock has been moved to the front.



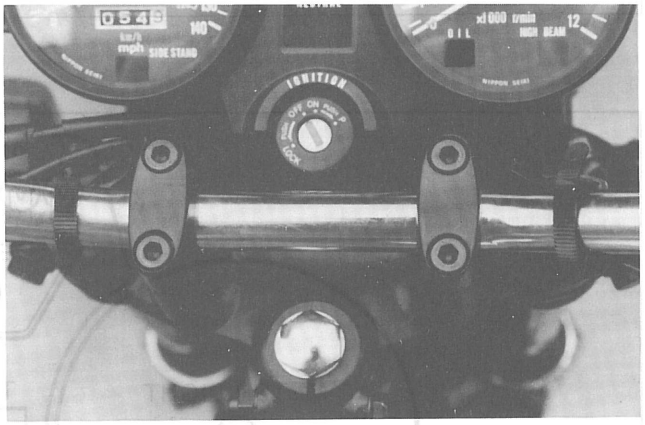
4. The tail/brake light has been made separate from the license light.



5. The iron chrome plating which was used as the material for the muffler mounting bracket has been replaced with aluminum.

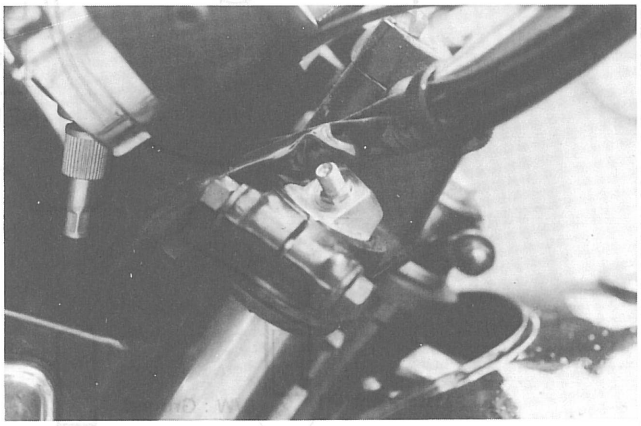


6. Allen bolts have been adopted for the handlebar securing bolts.



7. An air-assisted fork has been adopted for the front fork.

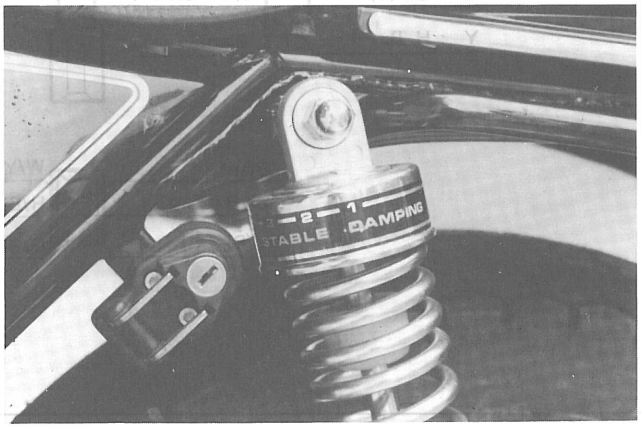
Air pressure	0.5 kg/cm^2 (7.1 psi)



8. A 4-way damping force/5-way spring adjustable rear shock absorber has been adopted.

STANDARD SETTING

Spring	"1" (Softest)
Damping force	"1" (Softest)

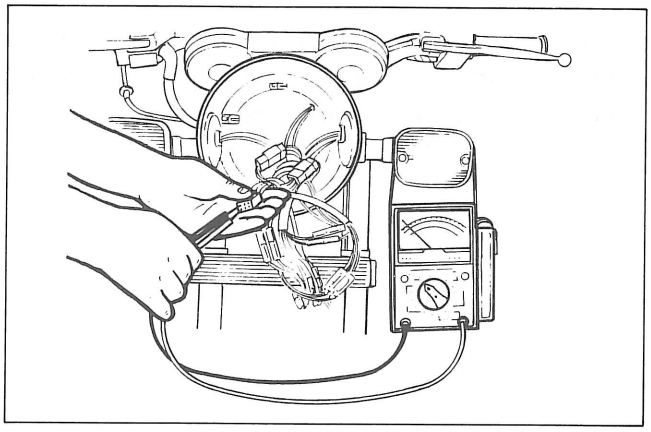


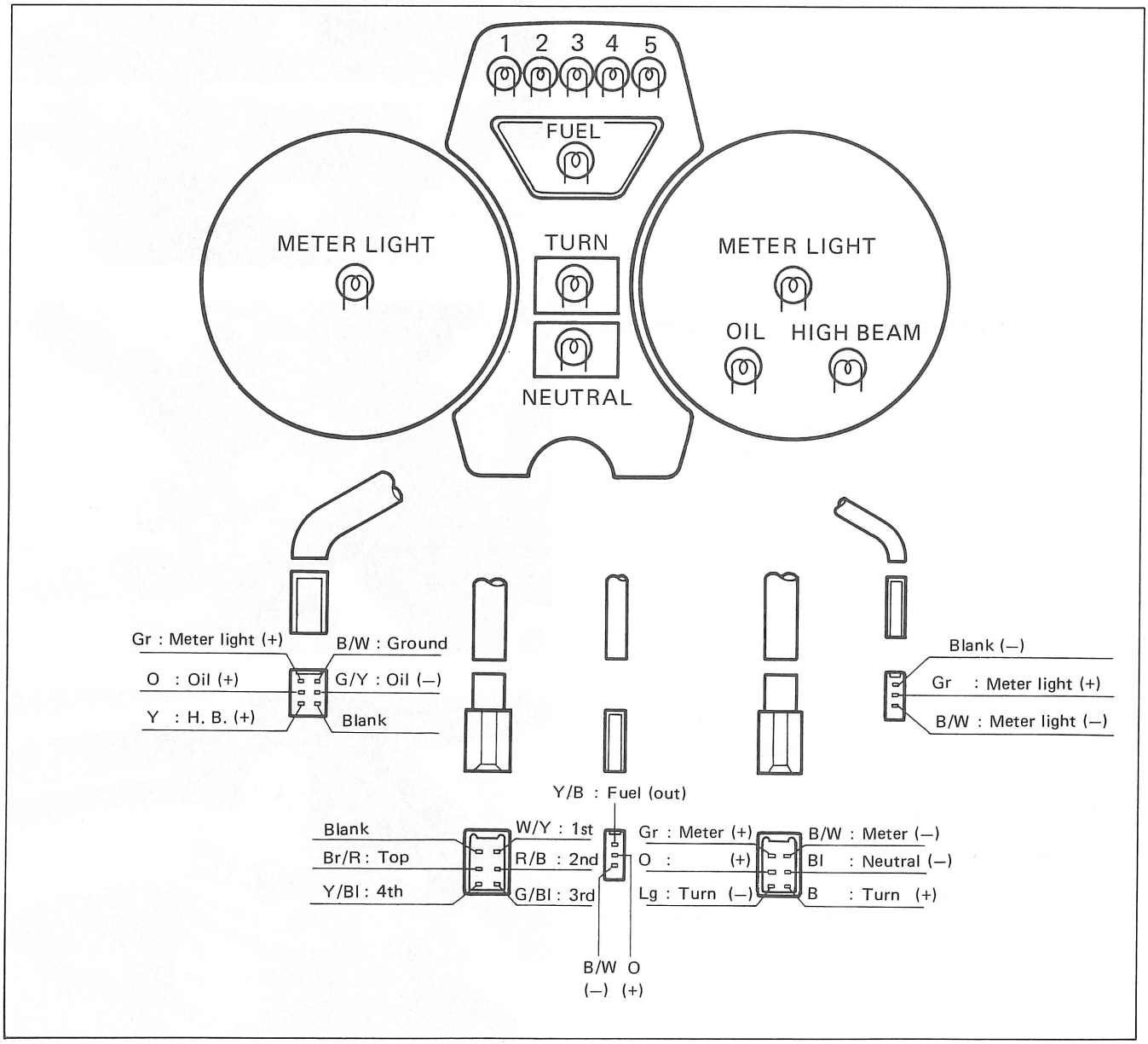
INSTRUMENT/METER LIGHTS

Using the pocket tester, check the continuity between lead wires in the following diagram.
If the continuity measured is incorrect, replace the respective part.

09900-25002	Pocket tester

NOTE:
When making this test, it is not necessary to remove the combination meter.





COIL TYPE FUEL GAUGE

As shown in Fig.1, coils N_1, N_2, N_3 and N_4 are set in the fuel gauge. When the ignition switch is ON, the float in the tank is displaced in proportion to the change in the amount of gasoline, the resistance of the fuel gauge sending unit varies, currents I_1 and I_2 vary, strength of the magnetic field generated by the coils vary, compound vector H (Fig.2) varies, and the magnet of the fuel gauge rotates to deflect the pointer.

Even when the ignition is turned off, the pointer remains in the position where it was when the switch was ON. This function is displayed by using high-viscosity oil and a balanced magnet.

FUEL LEVEL SYSTEM

The Fuel Level System can be divided into two sections:

(1) The Fuel Meter : Located in the instrument cluster

(2) The Fuel Tank Float Assembly (Fuel gauge sending unit)

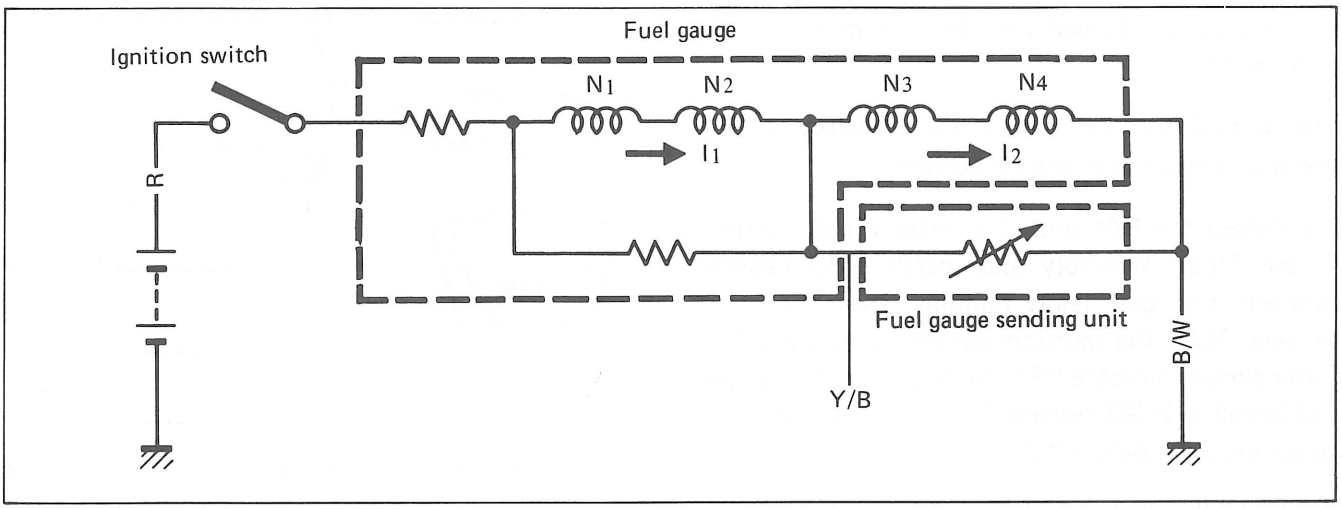
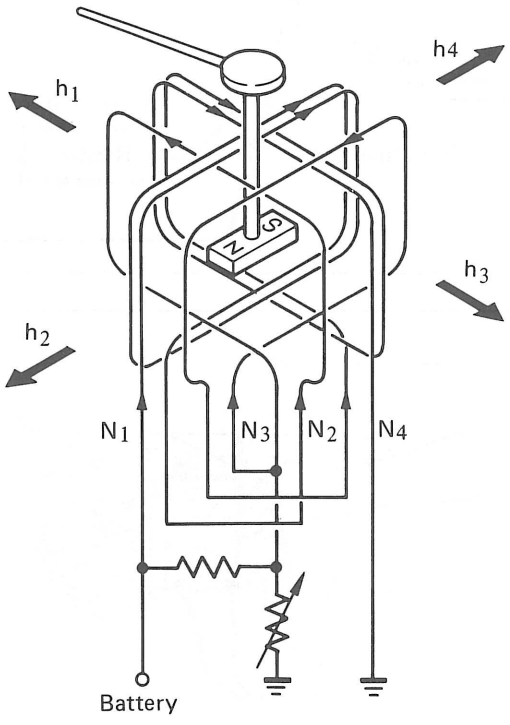


Fig 1



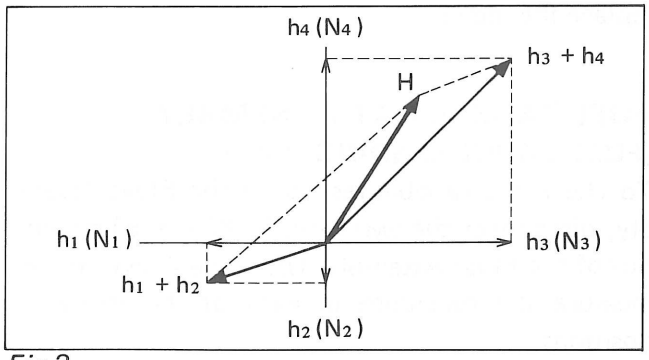


Fig 2

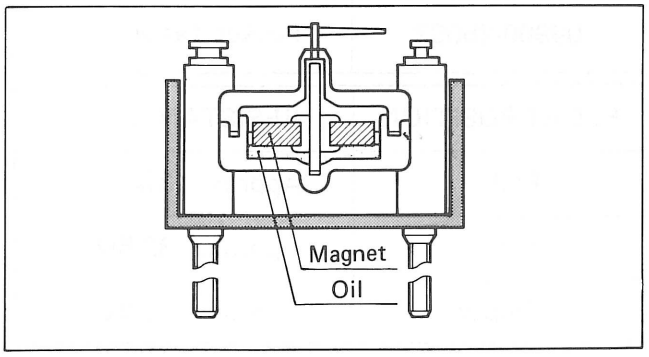


Fig 3

NOTE:
Prior to testing the Fuel Level System, verify that the battery is in a fully charged condition.

FUEL METER

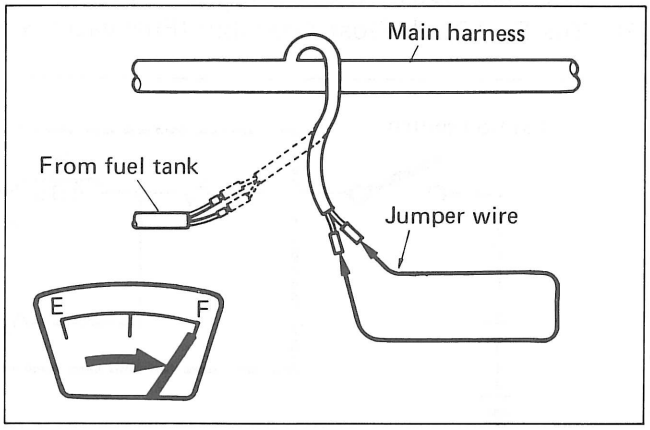
To test the Fuel Meter two different checks may be used. The first, and simplest test will tell if the meter is operating but will not indicate the meters accuracy throughout the range.

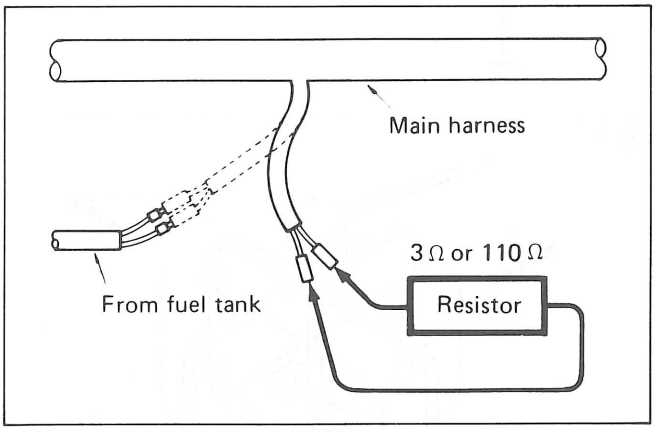
To perform this test, disconnect the B/W and Y/B wires going to the Fuel Tank Float Assembly. Connect a jumper wire between the B/W and Y/B wires coming from the main harness. With the ignition switch turned on, the fuel meter should indicate "F".

The second test will check the accuracy of the meter in the full and empty positions.

Disconnect the B/W and Y/B wires which connect to the Float Assembly and install a 3Ω resistor between the two leads coming from the main harness. Turn the ignition switch on and the fuel meter should indicate "F". Remove the 3Ω resistor and install a 110Ω resistor in its place and the fuel meter should indicate "E".

If the fuel meter does not read as perscribed above, replace the meter.



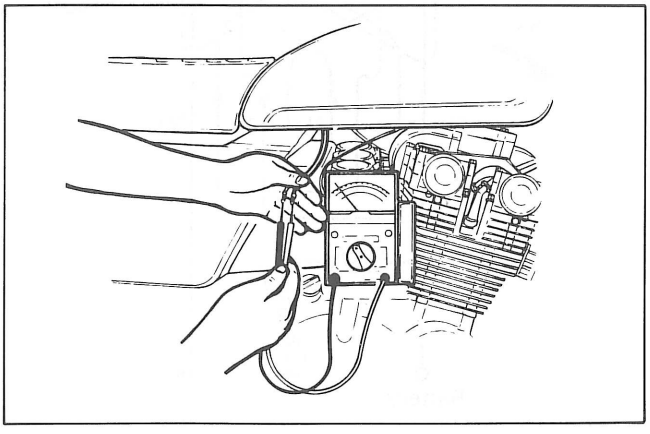


FUEL TANK FLOAT ASSEMBLY
(FUEL GAUGE SENDING UNIT)

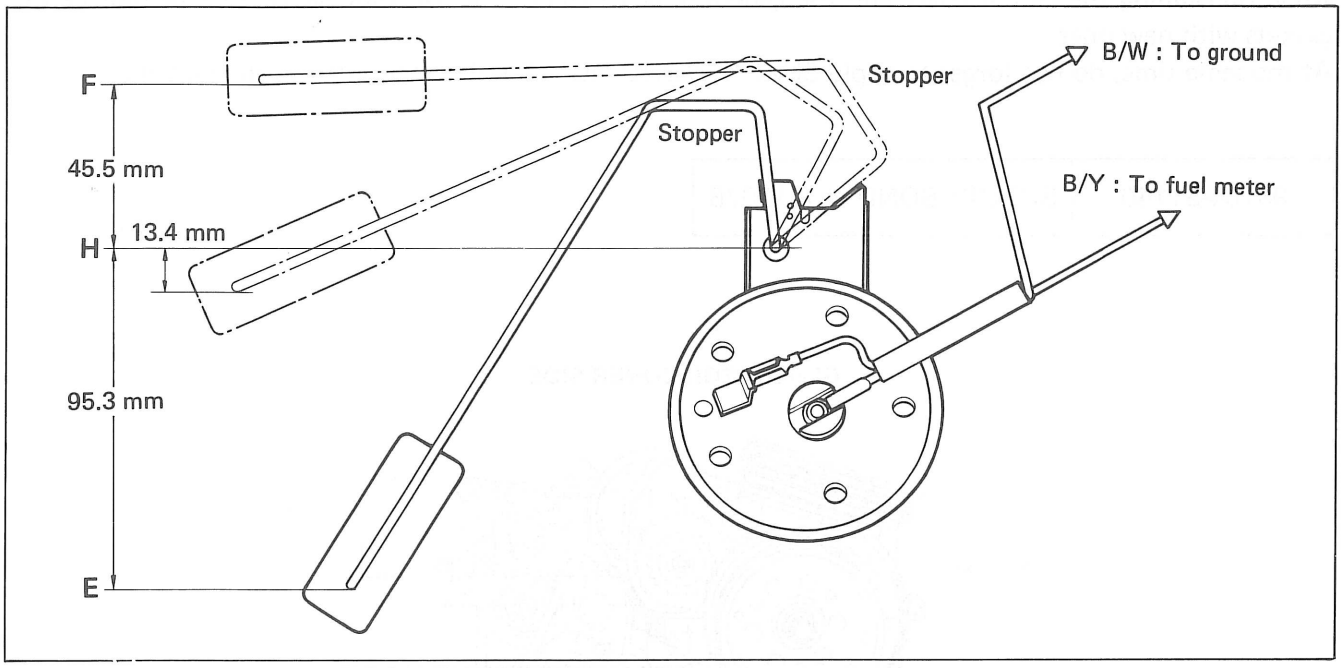
To check the variable resistor in the Float Assembly, disconnect the two wires (B/W – Y/B) coming out of the Float Assembly. Using the Pocket tester, measure the resistance in each of the following positions:

09900-25002	Pocket Tester

FLOAT POSITION	RESISTANCE
Full	Approx. 3Ω
1/2	Approx. 32.5Ω
Empty	Approx. 110Ω



If the resistance measured is incorrect, replace the Float Assembly.



OIL PUMP

The three screws used to secure the oil pump to the crankcase have been replaced with three bolts. In addition, the three screws that were utilized to secure the oil pump cover to the housing have been eliminated and the three bolts now retain the entire assembly. The tightening torque for the oil retaining bolts is as follows:

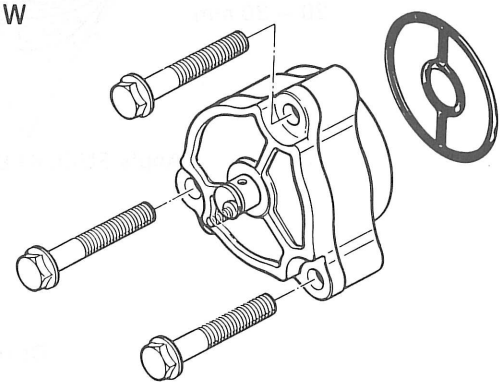
Tightening torque	7 – 9 N·m (0.7 – 0.9 kg-m)

CAUTION:

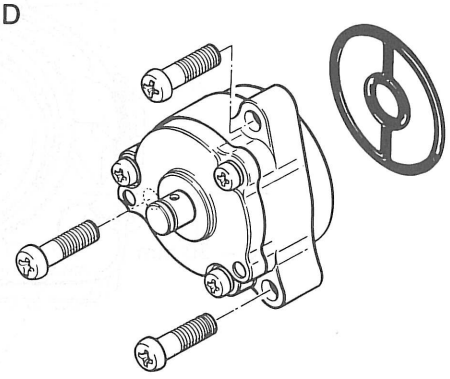
- *** Never disassemble the oil pump. No replacement parts are available for the oil pump. It is available only as an assembled unit for replacement.**
- *** When replacing the oil pump with a new unit, be sure to replace the O-ring also.**
- *** Performance for both oil pumps is not changed.**

	NEW P/NO.	OLD P/NO.
Oil pump assy	16400-34310	16400-34300
Oil pump screw		02112-06258
Oil pump bolt	01517-06408	

NEW



OLD

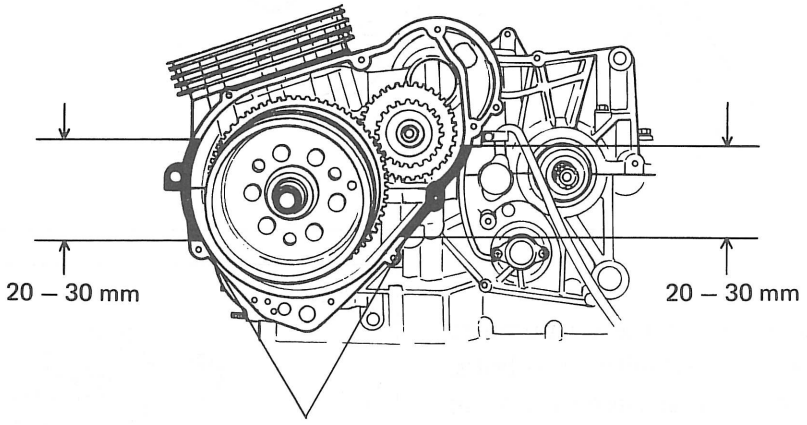


CLUTCH COVER AND GENERATOR COVER

When reinstalling the clutch cover and the generator cover of all GS650E models, be sure to replace the gaskets with new ones.
At the same time, do not forget to apply SUZUKI BOND NO. 1207B on the surfaces shown below.

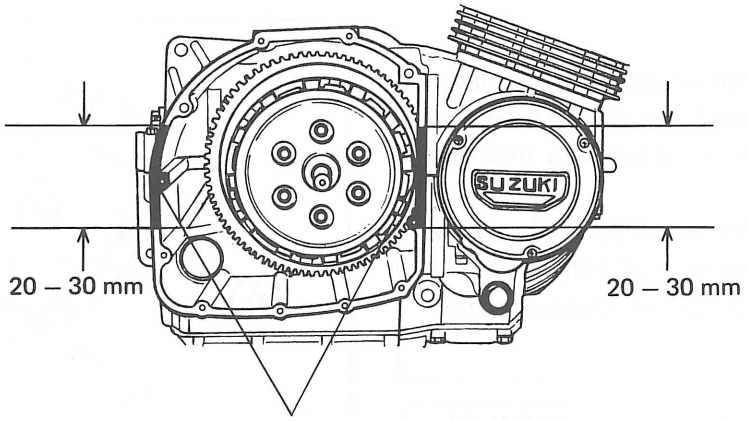
99104-31140	SUZUKI BOND NO. 1207B

GENERATOR COVER SIDE



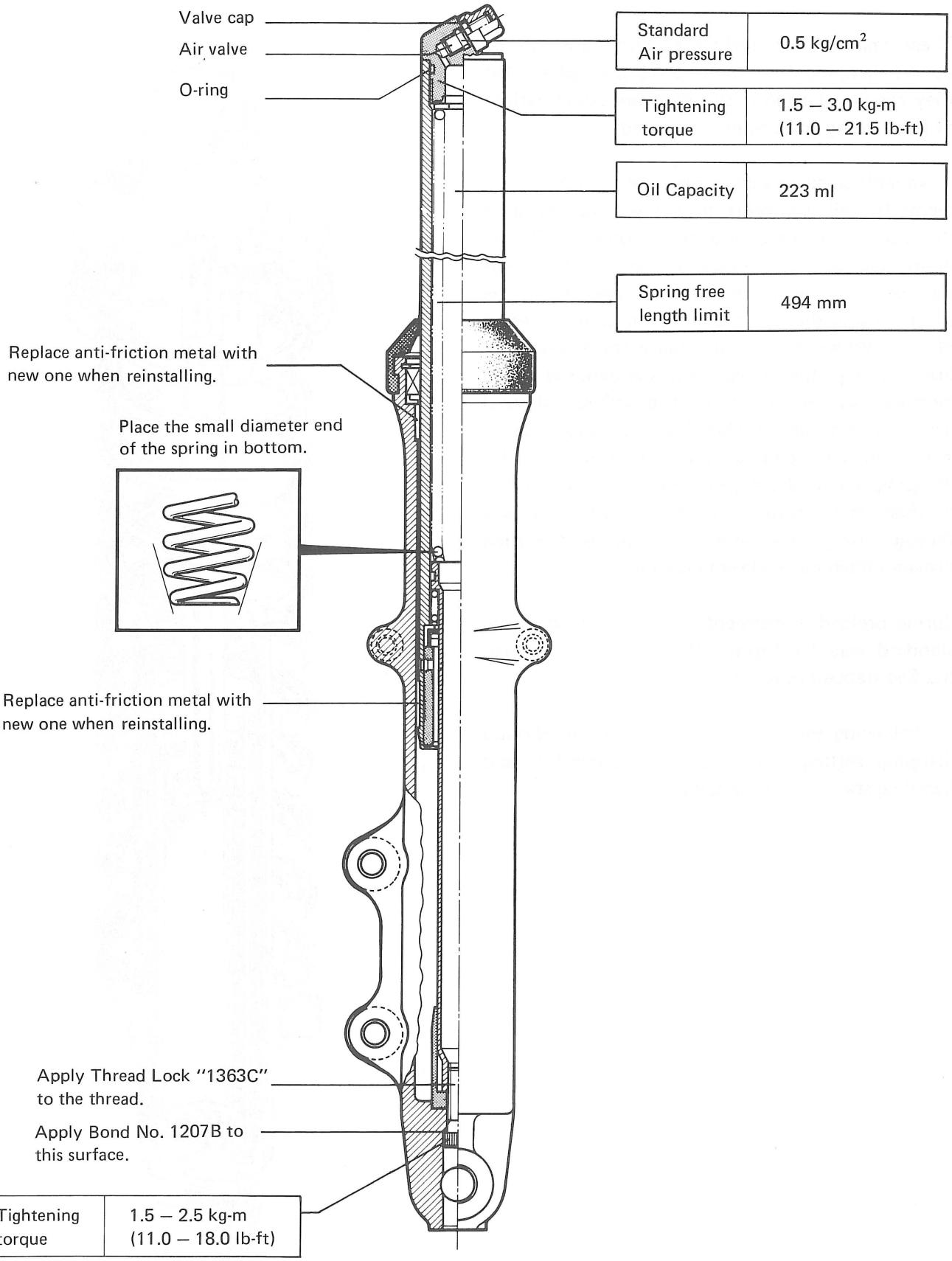
Apply SUZUKI BOND NO. 1207B

CLUTCH COVER SIDE



Apply SUZUKI BOND NO. 1207B

FRONT FORK


Valve cap
Air valve
O-ring
Standard Air pressure
0.5 kg/cm²
Tightening torque
1.5 – 3.0 kg-m (11.0 – 21.5 lb-ft)
Oil Capacity
223 ml
Spring free length limit
494 mm
Replace anti-friction metal with new one when reinstalling.
Place the small diameter end of the spring in bottom.
Replace anti-friction metal with new one when reinstalling.
Apply Thread Lock "1363C" to the thread.
Apply Bond No. 1207B to this surface.
Tightening torque
1.5 – 2.5 kg-m (11.0 – 18.0 lb-ft)

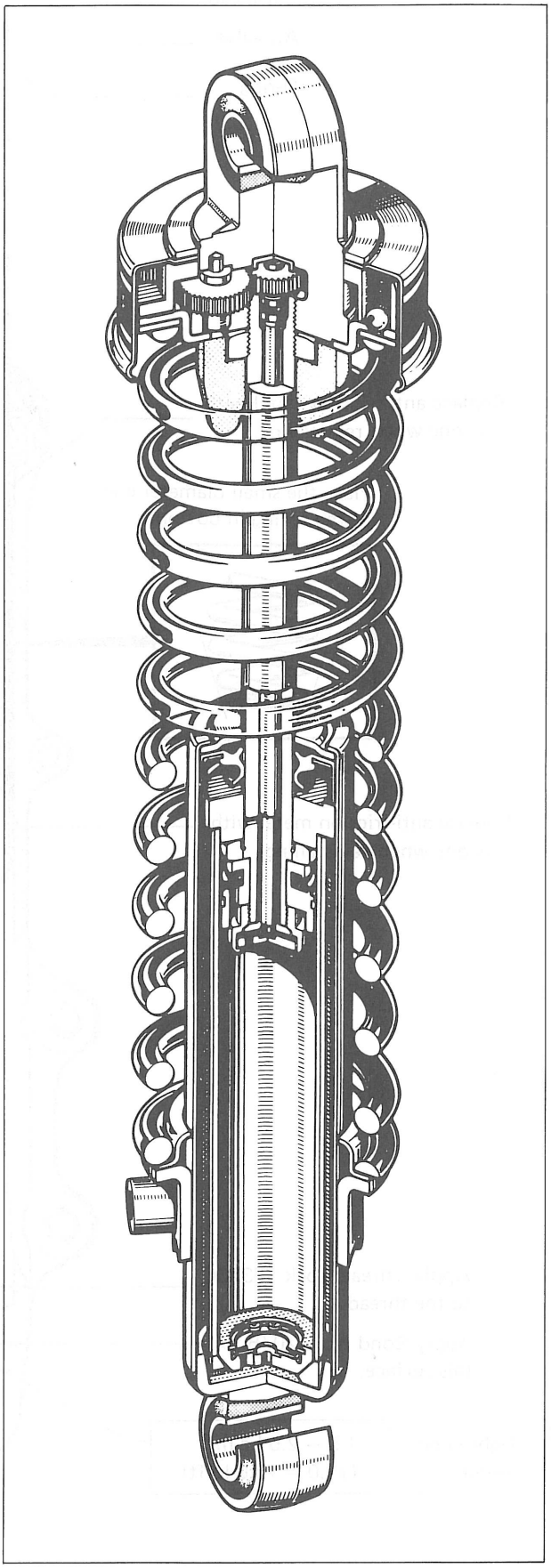
REAR SHOCK ABSORBER

These rear shock absorbers feature adjustable rebound damping force and spring preload so that they can be adjusted to suit different combinations of load, riding conditions, and speed.

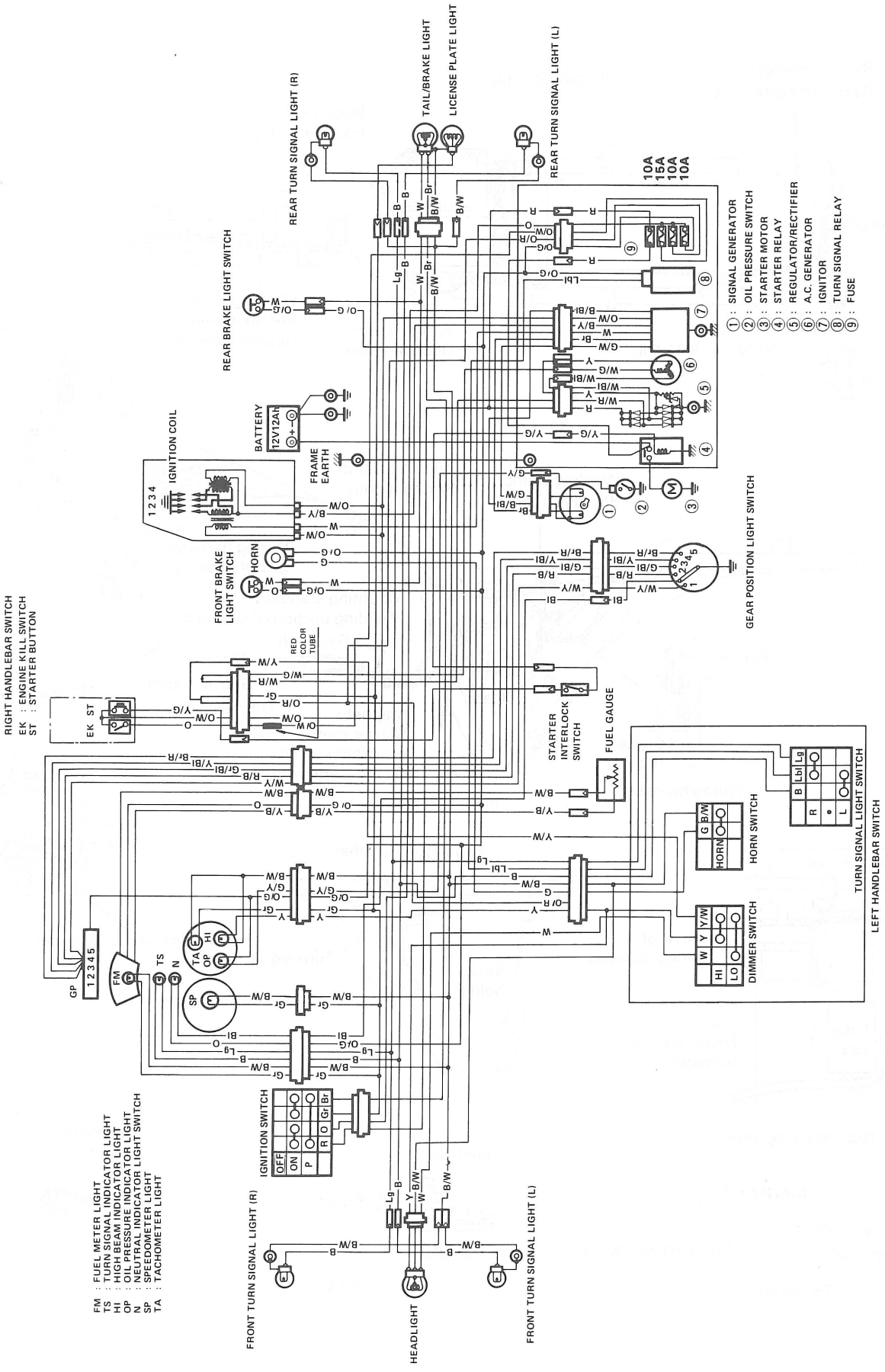
A variable-sized orifice is provided which supplements the oil flowing through the piston valve on the rebound stroke of the shock absorber. The rebound damping is changed by varying the size of the piston orifice which directly varies the volume of oil passing through the orifice in a given period of time. When the adjuster ring is set to the number 1 setting, the largest orifice is exposed which increases the oil flow for the softest rebound damping. Settings number 2 and 3 have progressively smaller openings and respectively stiffer damping. When the adjuster ring is set to number 4, there is no orifice and all the oil must pass through the piston valve. The number 4 setting provides maximum rebound damping.

Spring preload adjustment is accomplished in the standard way by turning the spring collar which has five stepped notches.

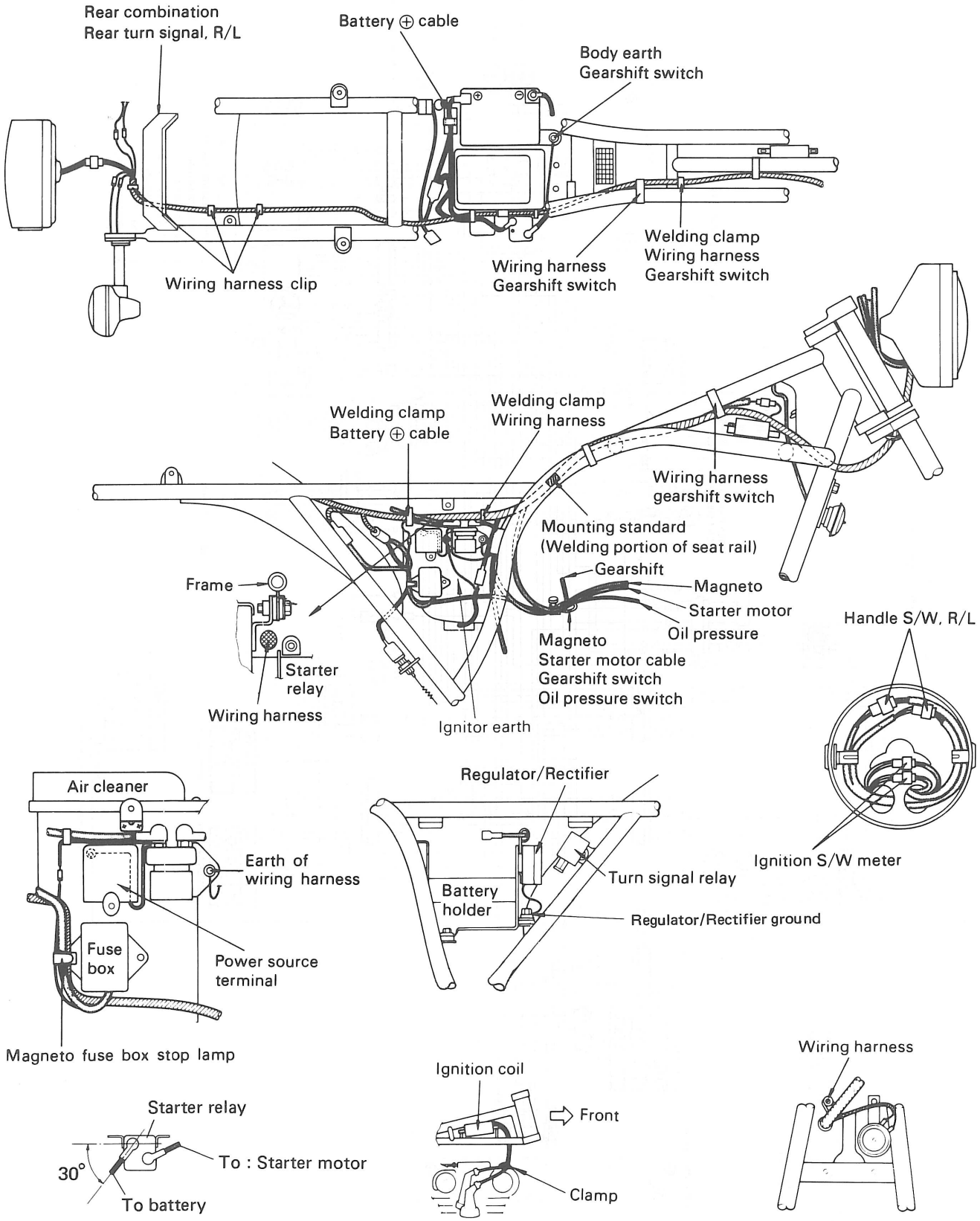
By balancing the spring preload and the rebound damping settings, maximum riding comfort and handling stability can be achieved.

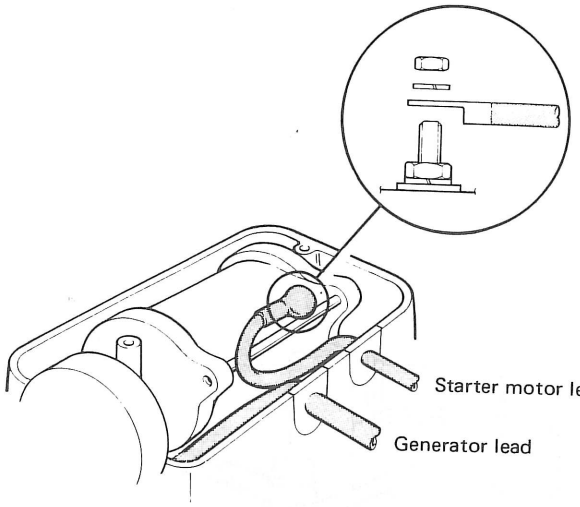


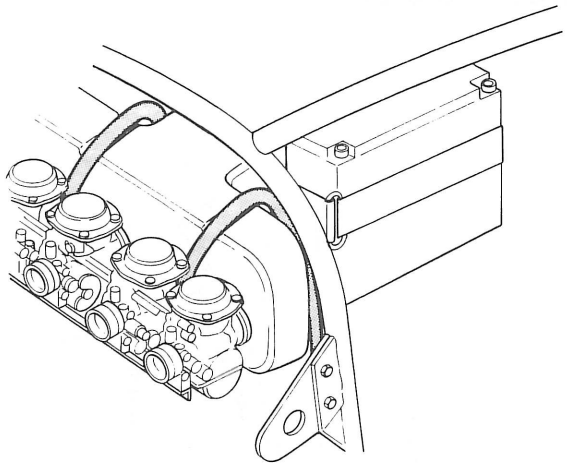
WIRING DIAGRAM

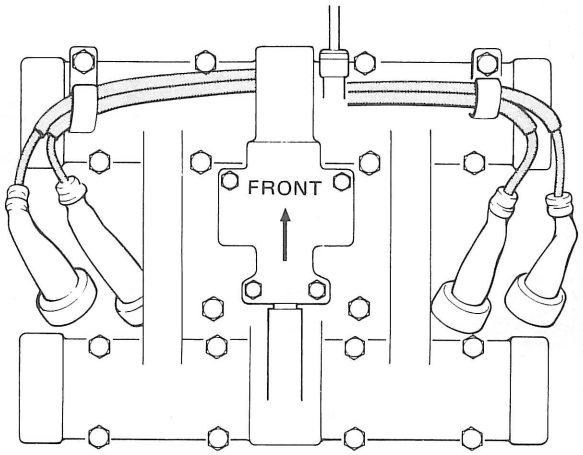


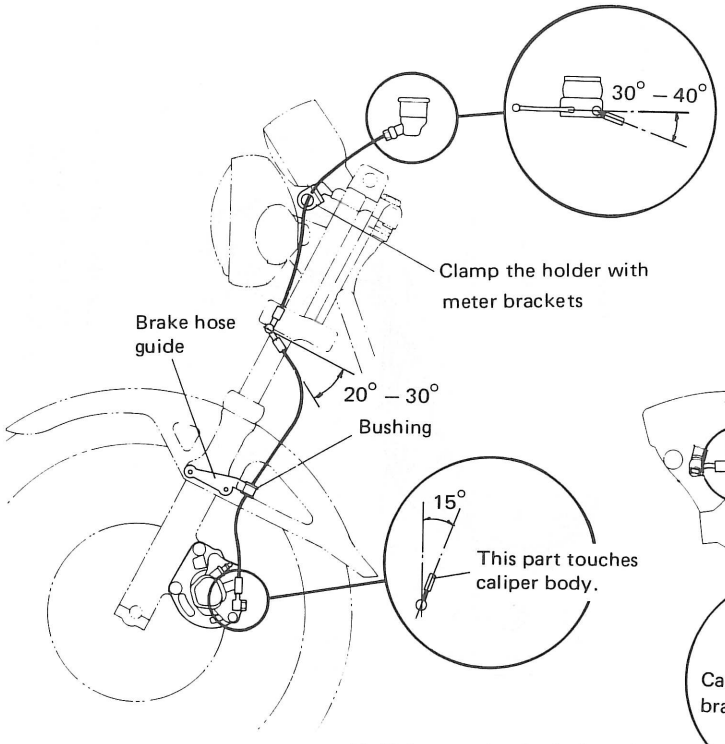
WIRE ROUTING



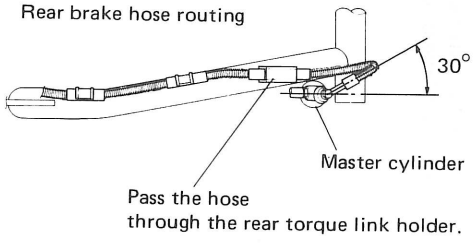


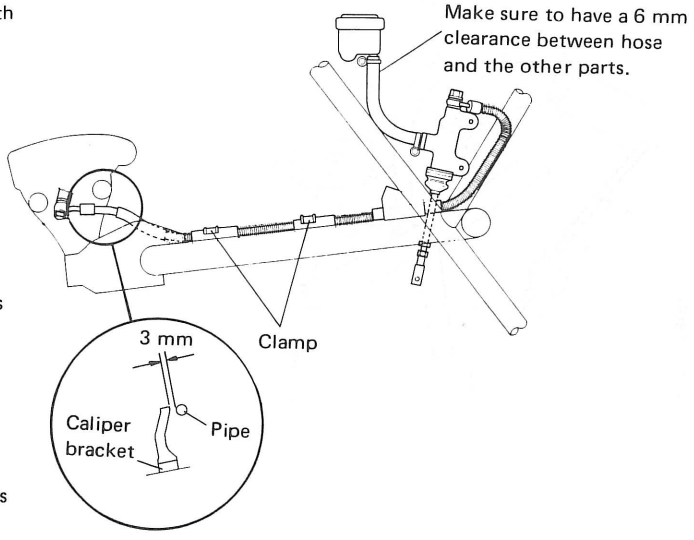




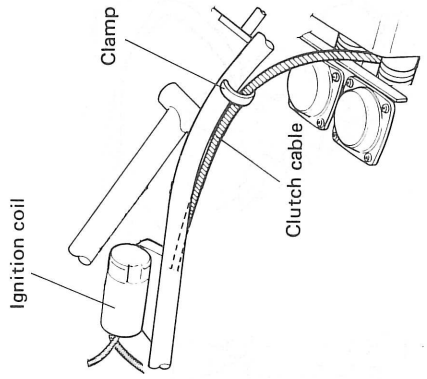


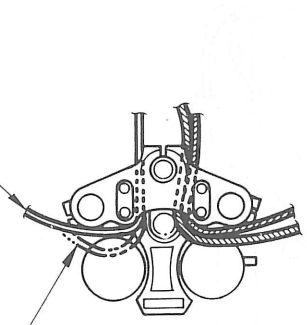
** Make sure that brake hose is free from the other parts.

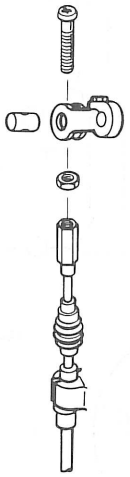




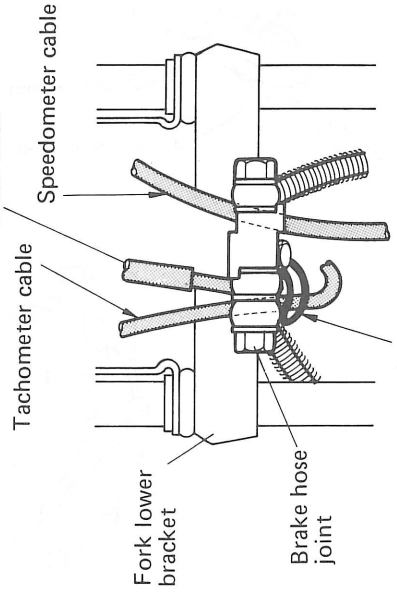
CABLE ROUTING

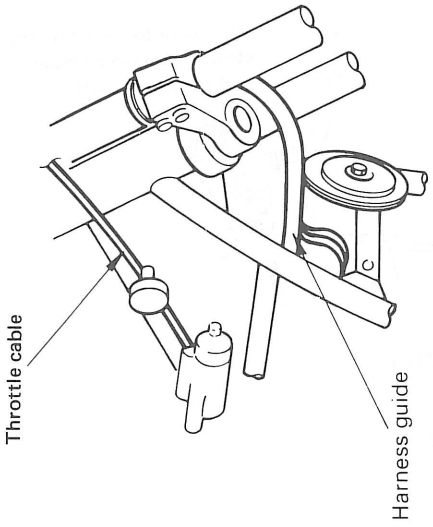


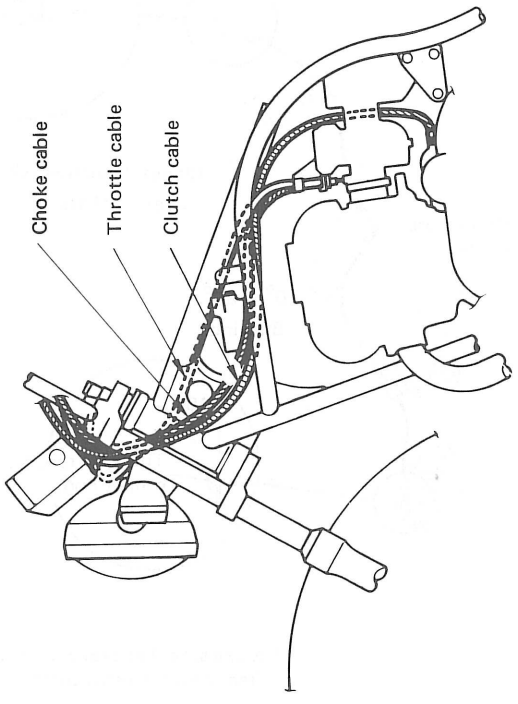




Clutch cable assembling order







1. Speedo and tachometer cables should be route between the brake hose joint and front fork lower bracket.
2. Route the tachometer cable inside the clamp for wiring harness.

TIGHTENING TORQUE

ENGINE

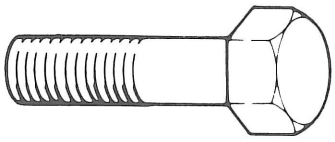
ITEM	kg-m	lb-ft
Cylinder head cover bolt	0.9 – 1.0	6.5 – 7.0
Cylinder head bolt	0.9 – 1.1	6.5 – 8.0
Cylinder head nut	2.4 – 2.6	17.5 – 19.0
Camshaft holder bolt	0.8 – 1.2	6.0 – 8.5
Cam sprocket bolt	2.4 – 2.6	17.5 – 19.0
Cam chain tensioner fitting bolt	0.6 – 0.8	4.5 – 6.0
Cam chain tensioner shaft assy	3.1 – 3.5	22.5 – 25.5
Cam chain tensioner lock shaft nut	0.8 – 1.0	6.0 – 7.0
Cam chain tensioner adjuster lock nut	0.9 – 1.4	6.5 – 10.0
Generator rotor bolt	9.0 – 10.0	65.0 – 72.5
Starter clutch allen bolt	1.5 – 2.0	11.0 – 14.5
Governer center bolt	1.3 – 2.3	9.5 – 16.5
Crankcase bolt (6 mm)	1.3	9.5
(8 mm)	2.0	14.5
Starter motor bolt	0.4 – 0.7	3.0 – 5.0
Oil pan bolt	1.0	7.0
Oil filter cover nut	0.6 – 0.8	4.5 – 6.0
Neutral stopper housing	1.8 – 2.8	13.0 – 20.0
Gearshift arm stopper	1.5 – 2.3	11.0 – 16.5
Clutch sleeve hub nut	5.0 – 7.0	36.0 – 50.5
Clutch spring bolt	1.1 – 1.3	8.0 – 9.5
Engine mounting bolt (8 mm)	2.0 – 3.0	14.5 – 21.5
(10 mm)	3.0 – 3.7	21.5 – 27.0
Gearshift lever bolt	1.3 – 2.3	9.5 – 16.5
Clutch release arm bolt	0.6 – 0.8	4.5 – 6.0
Engine sprocket nut	9.0 – 11.0	65.0 – 79.5

ITEM	kg-m	lb-ft
Spoke nipple	0.4 – 0.5	3.0 – 3.5
Disc bolt	1.5 – 2.5	11.0 – 18.0
Front axle nut	3.6 – 5.2	26.0 – 37.5
Front axle holder bolt	1.5 – 2.5	11.0 – 18.0
Front caliper mounting bolt	2.5 – 4.0	18.0 – 29.0
Front caliper axle bolt	4.0 – 5.5	29.0 – 40.0
Brake hose union bolt	2.0 – 2.5	14.5 – 18.0
Caliper bleeder	0.7 – 0.9	5.0 – 6.5
Front fork damper rod bolt	1.5 – 2.5	11.0 – 18.0
Front fork lower clamp bolt	1.5 – 2.5	11.0 – 18.0
Front fork upper clamp bolt	2.0 – 3.0	14.5 – 21.5
Steering stem nut	1.4 – 2.0	10.0 – 14.5
Steering stem clamp bolt	1.5 – 2.5	11.0 – 18.0
Steering stem head nut	2.0 – 3.0	14.5 – 21.5
Handlebar clamp bolt	1.2 – 2.0	8.5 – 14.5
Front master cylinder clamp bolt	0.5 – 0.8	3.5 – 6.0
Front footrest bolt	2.7 – 4.3	19.5 – 31.0
Swing arm pivot nut	5.0 – 8.0	36.0 – 58.0
Brake pedal arm bolt	1.0 – 1.5	7.0 – 11.0
Rear master cylinder mounting bolt	1.5 – 2.5	11.0 – 18.0
Rear torque link bolt and nut	2.0 – 3.0	14.5 – 21.5
Rear caliper mounting bolt	2.5 – 4.0	18.0 – 29.0
Rear caliper bolt	2.0 – 3.0	14.5 – 21.5
Muffler bracket nut	1.5 – 2.0	11.0 – 14.5
Rear shock absorber fitting nut	2.0 – 3.0	14.5 – 21.5
Rear footrest bolt	2.7 – 4.3	19.5 – 31.0
Rear sprocket nut	2.5 – 4.0	18.0 – 29.0
Rear brake cam lever bolt	0.5 – 0.8	3.5 – 6.0
Rear axle nut	8.5 – 11.5	61.5 – 83.0
Chain adjuster support bolt	1.5 – 2.0	11.0 – 14.5

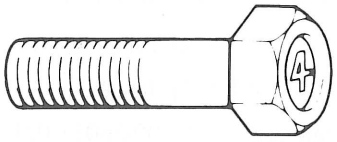
TIGHTENING TORQUE CHART

For other bolts and nuts not listed above, refer to this chart:
Tightening torque

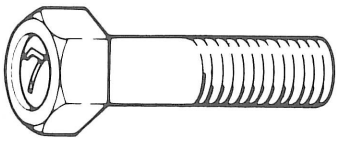
Bolt Diameter (mm)	Conventional or "4" marked bolt			"7" marked bolt		
	N·m	kg-m	lb-ft	N·m	kg-m	lb-ft
4	1 – 2	0.1 – 0.2	0.7 – 1.5	1.5 – 3	0.15 – 0.3	1.0 – 2.0
5	2 – 4	0.2 – 0.4	1.5 – 3.0	3 – 6	0.3 – 0.6	2.0 – 4.5
6	4 – 7	0.4 – 0.7	3.0 – 5.0	8 – 12	1.8 – 1.2	6.0 – 8.5
8	10 – 16	1.0 – 1.6	7.0 – 11.5	18 – 28	1.8 – 2.8	13.0 – 20.0
10	22 – 35	2.2 – 3.5	16.0 – 25.5	40 – 60	4.0 – 6.0	29.0 – 43.5
12	35 – 55	3.5 – 5.5	25.5 – 40.0	70 – 100	7.0 – 10.0	50.5 – 72.5
14	50 – 80	5.0 – 8.0	36.0 – 58.0	110 – 160	11.0 – 16.0	79.5 – 115.5
16	80 – 130	8.0 – 13.0	58.0 – 94.0	170 – 250	17.0 – 25.0	123.0 – 181.0
18	130 – 190	13.0 – 19.0	94.0 – 137.5	200 – 280	20.0 – 28.0	144.5 – 202.5



Conventional bolt



"4" marked bolt



"7" marked bolt

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