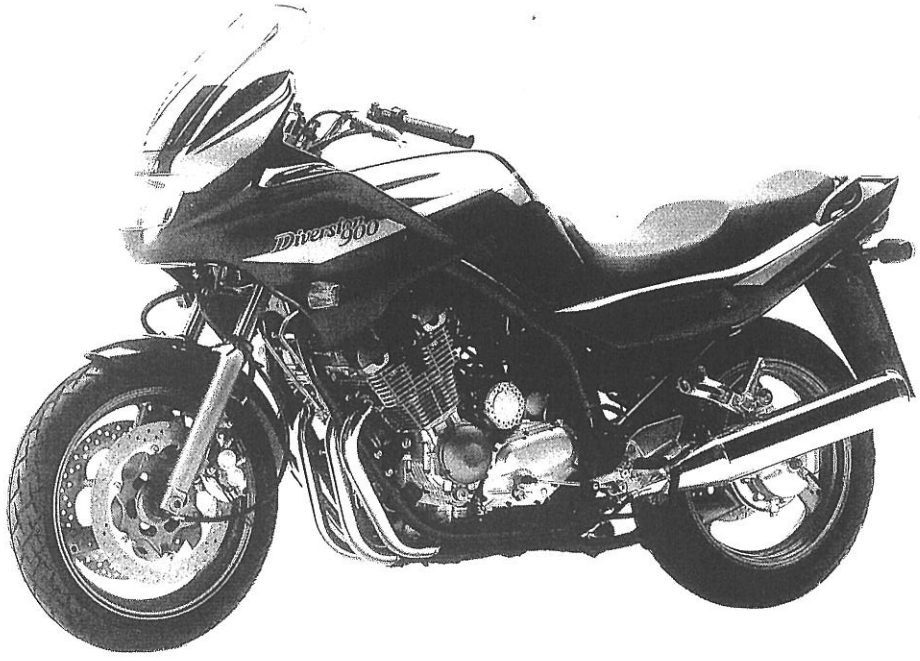
YAMAHA

XJ900S(G) '95

SERVICE MANUAL



4KM-28197-20

NOTICE

This manual was written by the Yamaha Motor Company primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha motorcycles have a basic understanding of the mechanical concepts and procedures inherent in motorcycle repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit to use and/or unsafe.

Yamaha Motor Company, Ltd. is continually striving to improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

PARTICULARY IMPORTANT INFORMATION

This material is distinguished by the following notation.

⚠ — The Safety Alert Symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

⚠ WARNING — Failure to follow WARNING instructions could result in severe injury or death to the motorcycle operator, a bystander, or a person inspecting or repairing the motorcycle.

CAUTION: — A CAUTION indicates special precautions that must be taken to avoid damage to the motorcycle.

NOTE: — A NOTE provides key information to make procedures easier or clearer.

HOW TO USE THIS MANUAL

CONSTRUCTION OF THIS MANUAL

This manual consists of chapters for the main categories of subjects. (See "Illustrated symbols")

1st title ①: This is a chapter with its symbol on the upper right of each page.

2nd title ②: This title appears on the upper of each page on the left of the chapter symbol. (For the chapter "Periodic inspection and adjustment" the 3rd title appears.)

3rd title ③: This is a final title.

MANUAL FORMAT

All of the procedures in this manual are organized in a sequential, step-by-step format. The information has been compiled to provide the mechanic with an easy to read, handy reference that contains comprehensive explanations of all disassembly, repair, assembly, and inspections.

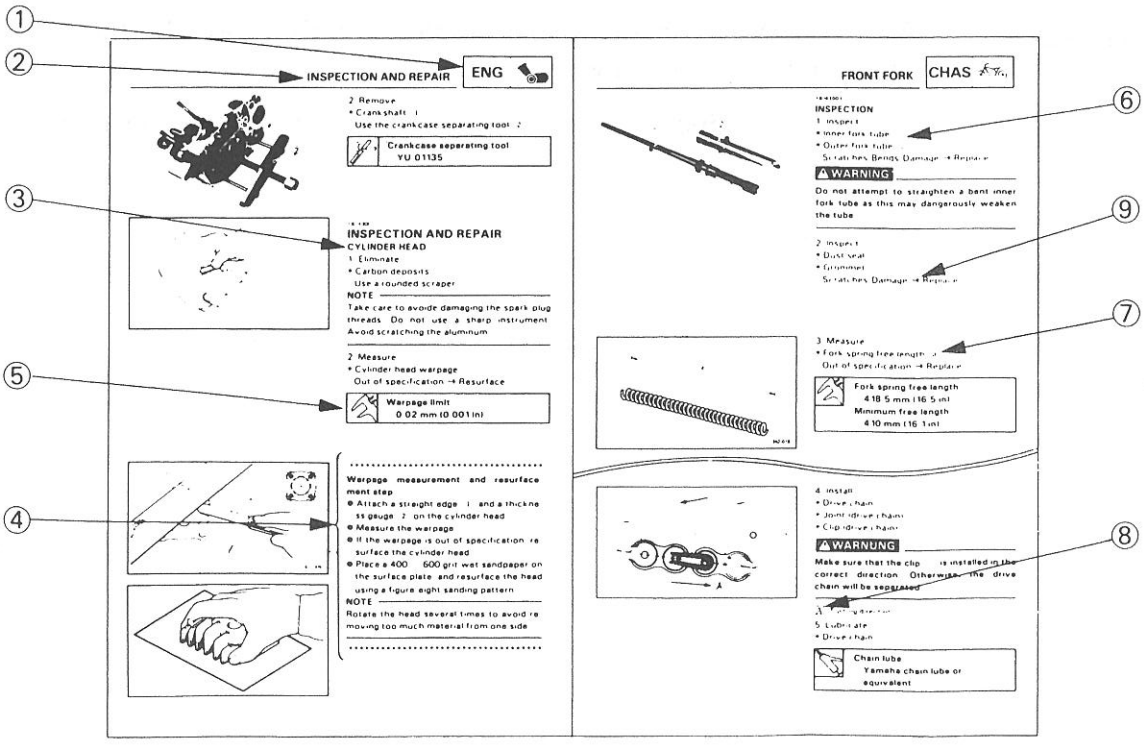
A set of particularly important procedure ④ is placed between a line of asterisks "✻"with each procedure preceded by "●".

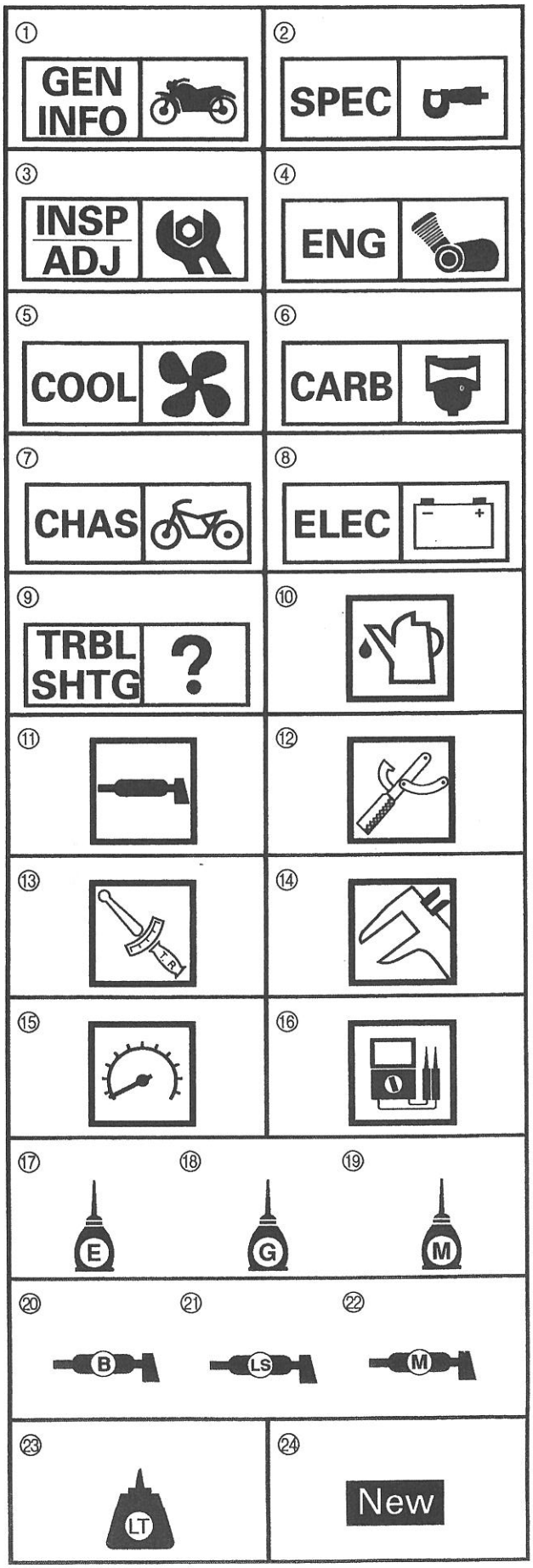
IMPORTANT FEATURES

- Data and a special tool are framed in a box preceded by a relevant symbol ⑤.
- An encircled numeral ⑥ indicates a part name, and an encircled alphabetical letter data or an alignment mark ⑦, the others being indicated by an alphabetical letter in a box ⑧.
- A condition of a faulty component will precede an arrow symbol and the course of action required the symbol ⑨.

EXPLODED DIAGRAM

Each chapter provides exploded diagrams before each disassembly section for ease in identifying correct disassembly and assembly procedures.





ILLUSTRATED SYMBOLS
(Refer to the illustration)

Illustrated symbols ① to ⑨ are designed as thumb tabs to indicate the chapter's number and content.

① General information
② Specifications
③ Periodic inspection and adjustment
④ Engine
⑤ Cooling system
⑥ Carburetion
⑦ Chassis
⑧ Electrical
⑨ Troubleshooting

Illustrated symbols ⑩ to ⑯ are used to identify the specifications appearing in the text.

⑩ Filling fluid
⑪ Lubricant
⑫ Special tool
⑬ Tightening
⑭ Wear limit, clearance
⑮ Engine speed
⑯ Ω,V,A

Illustrated symbols ⑰ to ㉔ in the exploded diagram indicate grade of lubricant and location of lubrication point.

⑰ Apply engine oil
⑱ Apply gear oil
⑲ Apply molybdenum disulfide oil
⑳ Apply wheel bearing grease
㉑ Apply lightweight lithium-soap base grease
㉒ Apply molybdenum disulfide grease
㉓ Apply locking agent (LOCTITE®)
㉔ Use new one

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GENERAL INFORMATION

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CHAPTER 4.
ENGINE OVERHAUL

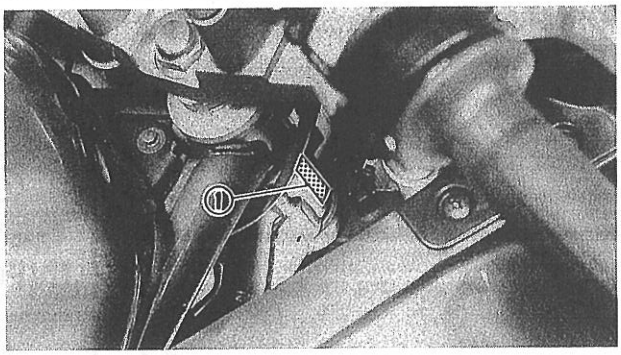
CHAPTER 5.
CARBURETION

CHAPTER 6.
CHASSIS

CHAPTER 7. ELECTRICAL

CHAPTER 8.
TROUBLESHOOTING

1



GENERAL INFORMATION

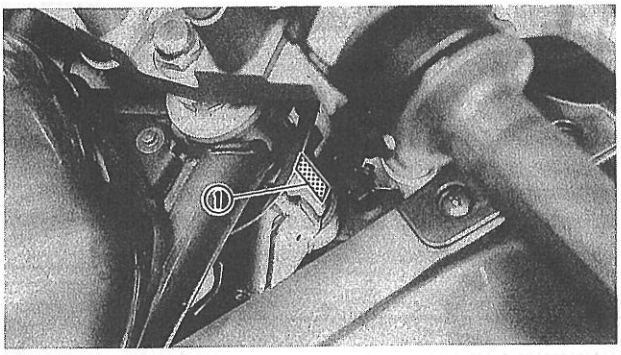
MOTORCYCLE IDENTIFICATION

VEHICLE IDENTIFICATION NUMBER
(For E, AUS and NZ)

The vehicle identification number ① is stamped into the right side of the steering head.

Starting serial number:
JYA4KMS0*SA023101 (E)
JYA4PST0*SA000101 (AUS, NZ)

NOTE:
The vehicle identification number is used to identify your motorcycle and may be used to register your motorcycle with the licensing authority in your state.

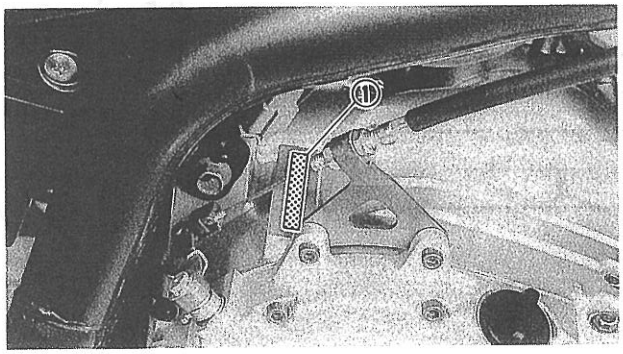


FRAME SERIAL NUMBER
(Except for E, AUS and NZ)

The frame serial number ① is stamped into the right side of the steering head.

Starting serial number:
4KM-000101
4PR-000101 (CH, A)

NOTE:
The first three digits of these numbers are for model identifications; the remaining digits are the unit production number.

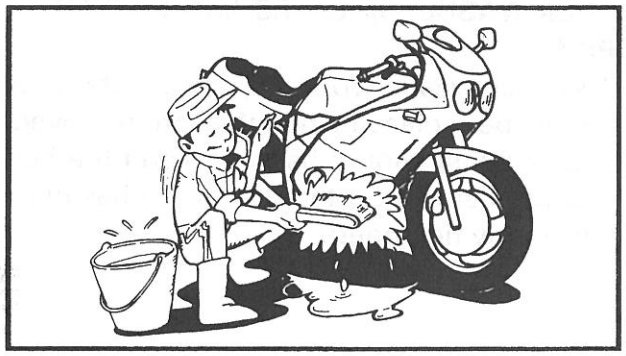


ENGINE SERIAL NUMBER

The engine serial number ① is stamped into crankcase.

Starting serial number:
4KM-000101
4KM-023101 (E)
4PR-000101 (CH, A)
4PS-000101 (AUS, NZ)

NOTE:
- The first three digits of these numbers are for model identification; the remaining digits are the unit production number.
- Designs and specifications are subject to change without notice.

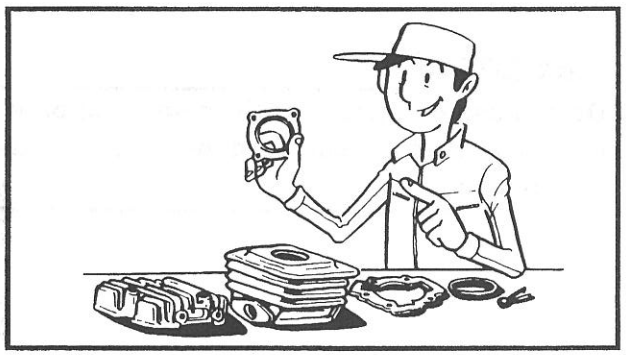


IMPORTANT INFORMATION

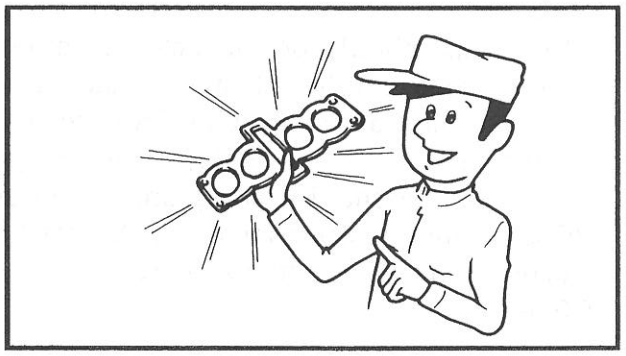
PREPARATION FOR REMOVAL

1. Remove all dirt, mud dust, and foreign material before removal and disassembly.

2. Use proper tools and cleaning equipment. Refer to "SPECIAL TOOLS".
3. When disassembling the machine keep mated parts together. This includes gears, cylinders, pistons, and other mated parts that have been "mated" through normal wear. Mated parts must be reused as an assembly or replaced.



4. During the machine disassembly, clean all parts and place them in trays in the order of disassembly. This will speed up assembly time and help assure that all parts are correctly reinstalled.
5. Keep away from fire.

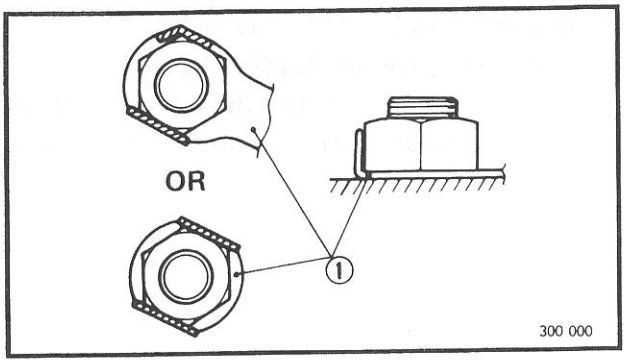


ALL REPLACEMENT PARTS

1. Use only genuine Yamaha parts for all replacements. Use oil and/or grease recommended by Yamaha for assembly and adjustment. Other brands may be similar in function and appearance, but inferior in quality.

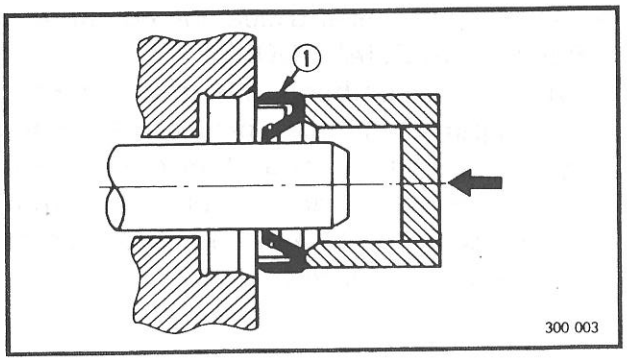
GASKETS, OIL SEALS, AND O-RINGS

1. All gaskets, seals and O-rings should be replaced when an engine is overhauled. All gaskets surfaces, oil seal lips and O-rings must be cleaned.
2. Properly oil all mating parts and bearing during reassembly. Apply grease to the oil seal lips.



LOCK WASHERS/PLATES AND COTTER PINS

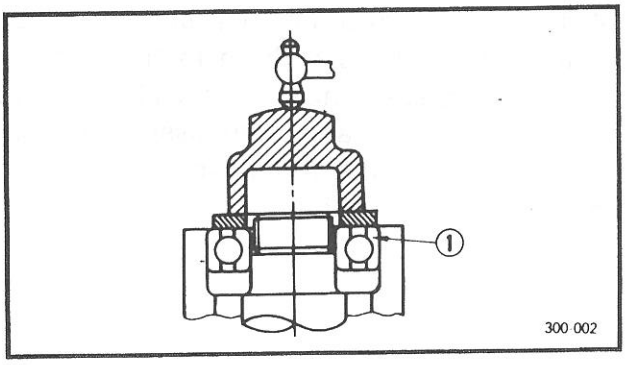
1. All lock washers/plates ① and cotter pins must be replaced when they are removed. Lock tab(s) should be bent along the bolt or nut flat(s) after the bolt or nut has been properly tightened.



BEARINGS AND OIL SEALS

1. Install the bearing(s) and oil seal(s) with their manufacturer's marks or numbers facing outward. (In other words, the stamped letters must be on the side exposed to view.) When installing oil seal(s), apply a light coating of lightweight lithium base grease to the seal lip(s). Oil the bearings liberally when installing.

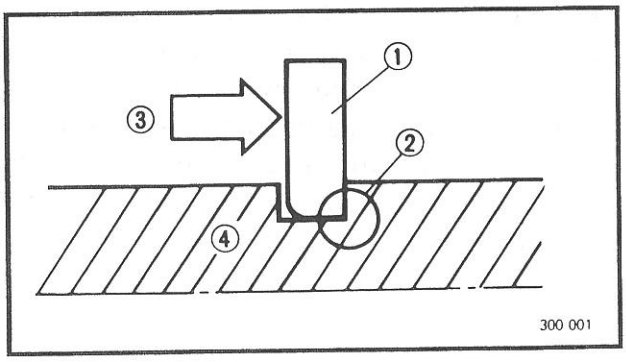
① Oil seal



CAUTION:

Do not use compressed air to spin the bearings dry. This causes damage to the bearing surfaces.

① Bearing



CIRCLIPS

1. All circlips should be inspected carefully before reassembly. Always replace piston pin clips after one use. Replace distorted circlips. When installing a circlips ①, make sure that the sharp edged corner ② is positioned opposite to the thrust ③ it receives. See the sectional view.

④ Shaft

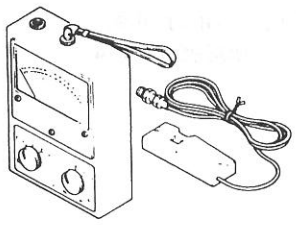
SPECIAL TOOLS

The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help prevent damage caused by the use of improper tools or improvised techniques. The shape and part number used for the special tool differ by country, so two types are provided.

Refer to the list provided to avoid errors when placing an order.

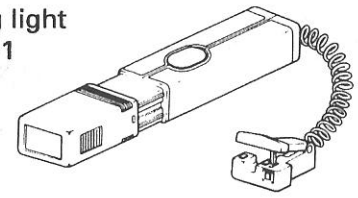
FOR TUNE UP

1
Inductive tachometer
P/N. 90890-03113



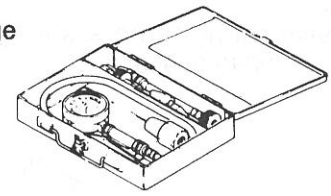
This tool is needed for detecting engine rpm.

2
Inductive timing light
P/N. 90890-03141



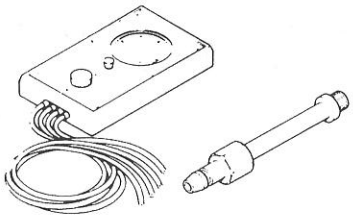
This tool is necessary for checking ignition timing.

3
Compression gauge
P/N. 90890-03081
Adapter
P/N. 90890-04082



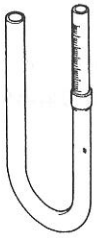
This gauge is used to measure the engine compression.

4
Vacuum gauge
P/N. 90890-03094
Adapter
P/N. 90890-03060



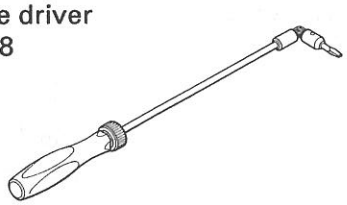
This gauge is needed for carburetor synchronization.

5
Fuel level gauge
P/N. 90890-01312



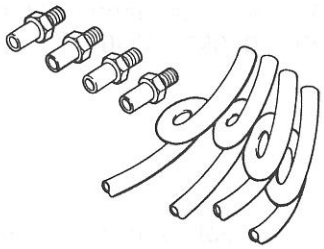
This gauge is used to measure the fuel level in the float chamber.

6
Carburetor angle driver
P/N. 90890-03158



This tool is used to adjust the pilot screw.

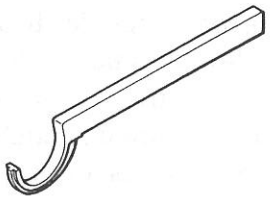
7
Exhaust attachment
P/N. 90890-03134



This tool is used to measure the exhaust gas.

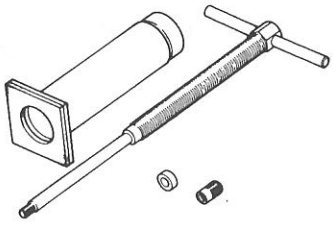
FOR ENGINE SERVICE

1
Tappet adjusting tool
P/N. 90890-04125



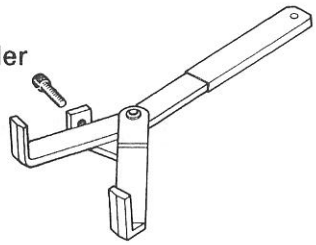
This tool is necessary to replace valve adjusting pads.

2
Piston pin puller
P/N. 90890-01304



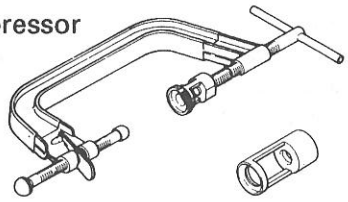
This tool is used to remove the piston pin.

3
Universal clutch holder
P/N. 90890-04086



This tool is used to hold the clutch when removing or installing the clutch boss locknut.

4
Valve spring compressor
P/N. 90890-04019

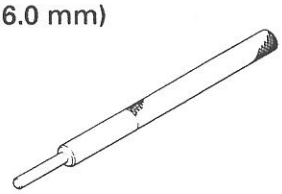


This tool is needed to remove and install the valve assemblies.

5
Attachment
P/N. 90890-01243

This tool is needed to remove and install the valve assemblies.

6
Valve guide remover (6.0 mm)
P/N. 90890-04064

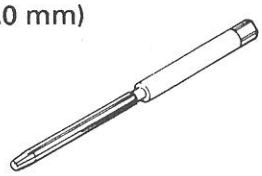


This tool is used to remove the valve guides.

7
Valve guide installer (6.0 mm)
P/N. 90890-04065

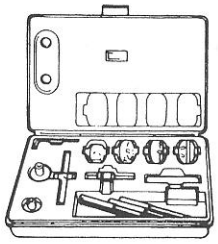
This tool is needed to install the valve guides properly.

8
Valve guide reamer (6.0 mm)
P/N. 90890-04066



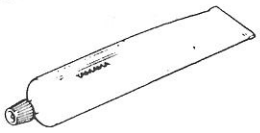
This tool is used to rebore the new valve guide.

9
Valve seat cutter
P/N. YM-91043-C



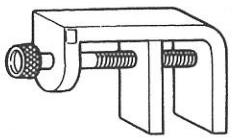
This tool is used to adjust the valve clearance.

10
YAMAHA Bond No. 1215
P/N. 90890-85505



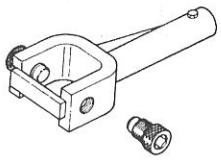
This sealant (Bond) is used for crankcase mating surfaces, etc.

11
Damper spring compressor
P/N. 90890-04090



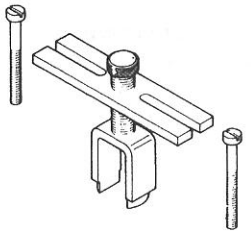
This tool is needed to disassemble and reassemble the middle gear damper.

12
Universal joint holder
P/N. 90890-04062



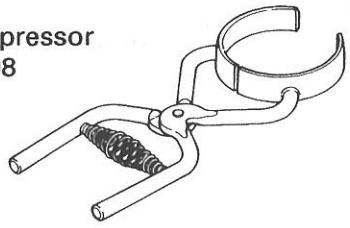
This tool is used when disassembling/assembling the U-joint and adjusting gear lash.

13
Middle gear backlash tool
P/N. 90890-04080



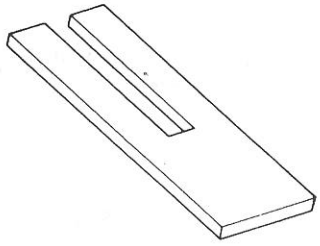
This tool is needed when measuring gear lash.

14
Piston ring compressor
P/N. 90890-04008



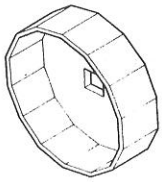
This tool is used to compress piston rings when installing the cylinder.

15
Piston base
P/N. 90890-01067



Use four pieces of these to hold the pistons during cylinder installation.

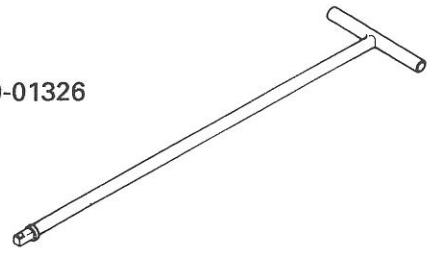
16
Oil filter wrench
P/N. 90890-01426



This tool is used to remove and install the oil filter.

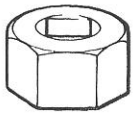
FOR CHASSIS SERVICE

1
T-handle
P/N. 90890-01326



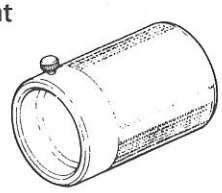
This tool is used to loosen and tighten the front fork damper rod holding bolt.

2
Front fork cylinder complete holder (27 mm)
P/N. 90890-01388



This tool is used to loosen and tighten the front fork damper rod holding bolt.

3
Fork seal driver weight
P/N. 90890-01367

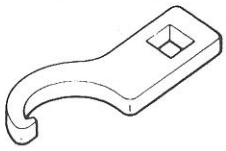


This tool is used when installing the fork seal.

4
Fork seal driver attachment (ø41)
P/N. 90890-01381

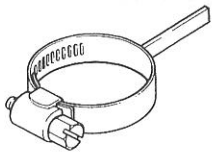
This tool is used when installing the fork seal.

5
Ring nut wrench
P/N. 90890-01403



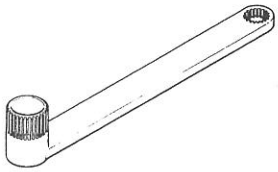
This tool is used to loosen and tighten the steering ring nut.

6
Final gear backlash band
P/N. 90890-01230



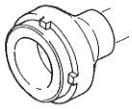
This tool is needed when measuring gear lash.

7
Middle and final gear holding tool
P/N. 90890-01229



This tool is used when measuring gear lash.

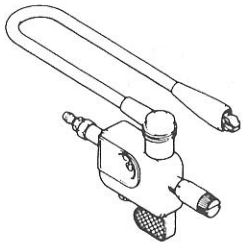
8
Final drive shaft bearing retainer wrench
P/N. 90890-04050



This tool is used to remove and install the bearing retainer.

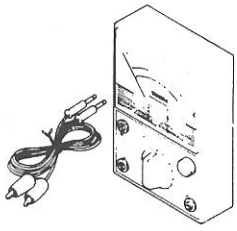
FOR ELECTRICAL COMPONENTS

1
Ignition checker
P/N. 90890-06754



This instrument is necessary for checking the ignition system components.

2
Pocket tester
P/N. 90890-03112



This instrument is invaluable for checking the electrical system.

SPECIFICATIONS

GENERAL SPECIFICATIONS

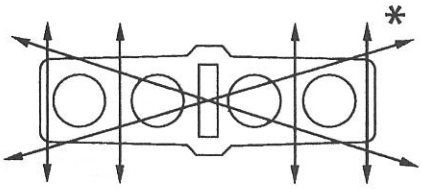
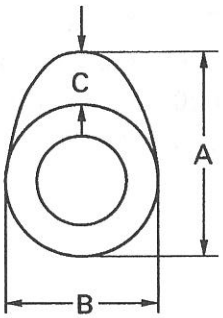
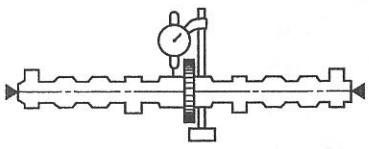
Model	XJ900S
Model code:	4KM1
Engine starting number:	4KM-000101
Frame starting number:	4KM-000101
Dimensions:	
Overall length	2,230 mm
Overall width	735 mm
Overall height	1,300 mm
Seat height	795 mm
Wheelbase	1,505 mm
Minimum ground clearance	130 mm
Minimum turning radius	3,000 mm
Basic weight:	
With oil and full fuel tank	265 kg
Engine:	
Engine type	Air-cooled 4-stroke, DOHC
Cylinder arrangement	Forward-inclined parallel 4-cylinder
Displacement	892 cm^3
Bore × stroke	68.5 × 60.5 mm
Compression ratio	10:1
Compression pressure (STD)	1,200 kPa (12 kg/cm^2, 12 bar) at 330 r/min
Starting system	Electric starter
Lubrication system:	Wet sump
Oil type or grade:	
Engine oil	SAE20W40 type SE motor oil
Final gear oil:	SAE80API "GL-4" Hypoid Gear Oil
Oil capacity:	
Engine oil	
Periodic oil change	3.2 L
With oil filter replacement	3.4 L
Total amount	4.4 L
Final gear case oil	
Total amount	0.2 L
Air filter:	Dry type element
Fuel:	
Type	Regular unleaded gasoline
Fuel tank capacity	24 L
Fuel reserve amount	5 L

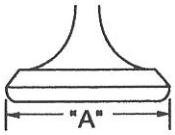
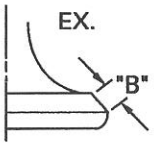
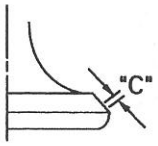
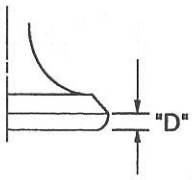
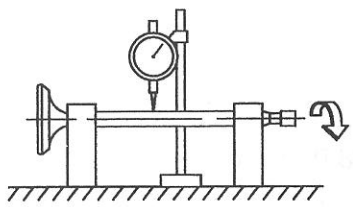
Model		XJ900S
Carburetor:		
Type / quantity		BDSR34/4
Manufacturer		MIKUNI
Spark plug:		
Type		DPR8EA-9/X24EPR-U9
Manufacturer		NGK/NIPPONDENSO
Spark plug gap		0.8 ~ 0.9 mm
Clutch type:		Wet, multiple-disc
Transmission:		
Primary reduction system		Spur gear
Primary reduction ratio		97/58 (1.672)
Secondary reduction system		Shaft drive
Secondary reduction ratio		46/38X19/18X32/11 (3.717)
Transmission type		Constant mesh 5-speed
Operation		Left foot operation
Gear ratio	1st	35/16 (2.188)
	2nd	30/20 (1.500)
	3rd	30/26 (1.154)
	4th	28/30 (0.933)
	5th	26/32 (0.813)
Chassis:		
Frame type		Double cradle
Caster angle		27°
Trail		121 mm
Tire:		
Type		Tubeless
Size	front	120/70-17 58V
	rear	150/70-17 69V
Manufacturer	front	METZLER/BRIDGESTONE/DUNLOP
	rear	METZLER/BRIDGESTONE/DUNLOP
Type	front	ME33/G601/K505F
	rear	ME55A/G602/K505
Tire pressure (cold tire):		
Maximum load-except motorcycle		205 kg
Loading condition A*		0 ~ 90 kg
	front	225 kPa (2.25 kg/cm^2, 2.25 bar)
	rear	250 kPa (2.5 kg/cm^2, 2.5 bar)
Loading condition B*		90 ~ 205 kg
	front	250 kPa (2.5 kg/cm^2, 2.5 bar)
	rear	290 kPa (2.9 kg/cm^2, 2.9 bar)
Brake:		
Front brake	type	Dual disc brake
	operation	Right hand operation
Rear brake	type	Single disc brake
	operation	Right foot operation

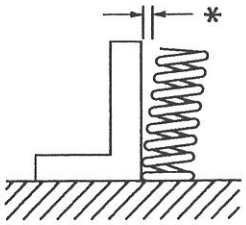
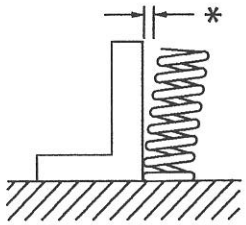
Model	XJ900S
Suspension:	
Front suspension	Telescopic fork
Rear suspension	Swingarm (link suspension)
Shock absorber:	
Front shock absorber	Coil spring / Oil damper
Rear shock absorber	Coil-gas spring / Oil damper
Wheel travel:	
Front wheel travel	140 mm
Rear wheel travel	110 mm
Electrical:	
Ignition system	T.C.I. (digital)
Generator system	A.C. generator
Battery type	YTX14-BS
Battery capacity	12 V 12 AH
Headlight type:	Quartz bulb (halogen)
Bulb wattage × quantity:	
Headlight	12 V 60 W / 55 W
Auxiliary light	12 V 4 W × 1
Tail / brake light	12 V 5 W / 21 W × 2
Flasher light	12 V 21 W × 4
Licence light	12 V 5 W × 2
Meter light	12 V 3.4 W × 4
Indicator light	
NEUTRAL	12 V 3.4 W × 1
TURN	12 V 3.4 W × 2
OIL LEVEL	12 V 3.4 W × 1
HIGH BEAM	12 V 3.4 W × 1
FUEL	12 V 3.4 W × 1

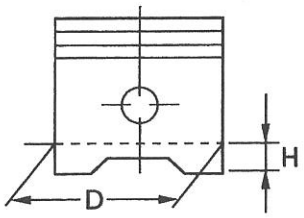
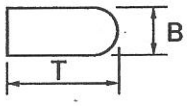
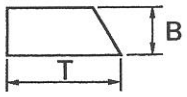
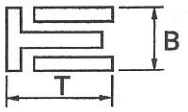
MAINTENANCE SPECIFICATIONS

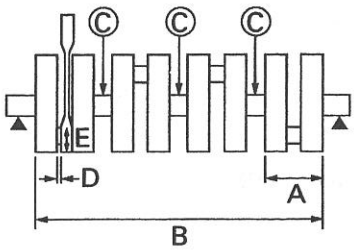
ENGINE

Model	XJ900S
Cylinder head:	
Warp limit	0.03 mm
	
Cylinder:	
Bore size	68.49 ~ 68.54 mm
Taper limit	0.05 mm
Out of round limit	0.01 mm
Camshaft:	
Drive method	Chain drive (center)
Cam cap inside diameter	25.000 ~ 25.021 mm
Camshaft outside diameter	24.967 ~ 24.980 mm
Shaft-to-cap clearance	0.020 ~ 0.054 mm
Cam dimensions	
	
Intake "A"	36.75 ~ 36.85 mm
"B"	27.975 ~ 28.075 mm
"C"	8.75 ~ 8.85 mm
Exhaust "A"	36.75 ~ 36.85 mm
"B"	27.975 ~ 28.075 mm
"C"	8.75 ~ 8.85 mm
Camshaft runout limit	0.03 mm
	

Model		XJ900S
Cam chain:		
Cam chain type / No. of links		SILENT-CHAIN/150
Cam chain adjustment method		Automatic
Valve, valve seat, valve guide:		
Valve clearance (cold)	IN	0.11 ~ 0.15 mm
	EX	0.16 ~ 0.20 mm
Valve dimensions:		
 Head Dia		
 Face Width		
 Seat Width		
 Margin Thickness		
"A" head diameter	IN	33.9 ~ 34.1 mm
	EX	27.9 ~ 28.1 mm
"B" face width	IN	2.3 mm
	EX	2.3 mm
"C" seat width	IN	0.9 ~ 1.1 mm
	EX	0.9 ~ 1.1 mm
"D" margin thickness	IN	1 mm
	EX	1 mm
Stem outside diameter	IN	5.975 ~ 5.990 mm
	EX	5.960 ~ 5.975 mm
Guide inside diameter	IN	6.000 ~ 6.012 mm
	EX	6.000 ~ 6.012 mm
Stem-to-guide clearance	IN	0.010 ~ 0.037 mm
	EX	0.025 ~ 0.052 mm
Stem runout limit		0.01 mm
		
Valve seat width	IN	0.9 ~ 1.1 mm
	EX	0.9 ~ 1.1 mm
Valve spring:		
Inner spring		
Free length	IN	37.4 mm
	EX	37.4 mm
Set length (valve closed)	IN	31.8 mm
	EX	31.8 mm
Compressed pressure (installed)	IN	6.35 ~ 7.45 kg
	EX	6.35 ~ 7.45 kg

Model		XJ900S
Tilt limit	IN	2.5°/1.6 mm
	EX	2.5°/1.6 mm
		
Direction of winding (top view)		Clockwise
	IN	
	EX	Clockwise
		
Outer spring		
Free length	IN	39.85 mm
	EX	39.85 mm
Set length (valve closed)	IN	33.8 mm
	EX	33.8 mm
Compressed pressure (installed)	IN	12.1 ~ 14.1 kg
	EX	12.1 ~ 14.1 kg
Tilt limit	IN	2.5°/1.7 mm
	EX	2.5°/1.7 mm
		
Direction of winding (top view)		Counterclockwise
	IN	
	EX	Counterclockwise
		
Piston:		
Piston to cylinder clearance		0.03 ~ 0.05 mm
<Limit>		<0.1 mm>

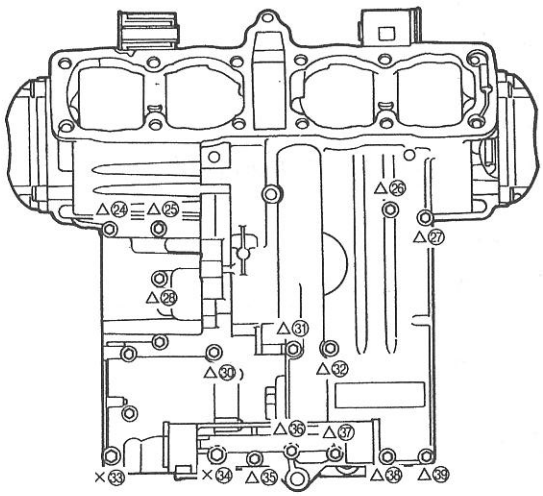
Model	XJ900S
Piston size "D"	68.45 ~ 68.50 mm
	
Measuring point "H"	5.5 mm
Oversize 2nd	69 mm
4th	69.5 mm
Piston off-set	0.5 mm
Piston off-set direction	IN side
Piston pin bore inside diameter	16.002 ~ 16.013 mm
Piston pin outside diameter	15.990 ~ 16.000 mm
Piston rings:	
Top ring:	
	
Type	Barrel
Dimensions (B × T)	1.2 × 2.5 mm
End gap (installed)	0.10 ~ 0.25 mm
Side clearance (installed)	0.025 ~ 0.080 mm
2nd ring:	
	
Type	Taper
Dimensions (B × T)	1.2 × 3.1 mm
End gap (installed)	0.30 ~ 0.45 mm
Side clearance	0.02 ~ 0.06 mm
Oil ring:	
	
Dimensions (B × T)	2.5 × 2.8 mm
End gap (installed)	0.2 ~ 0.7 mm
Connecting rod:	
Oil clearance	0.026 ~ 0.055 mm

Model		XJ900S
Crankshaft:		
		
Assembly width "B"		340.8 ~ 342.0 mm
Runout limit "C"		0.03 mm
Big end side clearance "D"		0.160 ~ 0.262 mm
Big end radial clearance "E"		0.016 ~ 0.040 mm
Journal oil clearance		0.020 ~ 0.052 mm
Color code (corresponding size)		① Blue ② Black ③ Brown ④ Green ⑤ Yellow
Clutch:		
Friction plate thickness		2.9 ~ 3.1 mm
Quantity		8
Friction plate wear limit		2.8 mm
Clutch plate thickness		1.9 ~ 2.1 mm
Quantity		7
Warp limit		0.05 mm
Clutch spring free length		51.8 mm
Quantity		6
Minimum length		50 mm
Clutch release method		Outer pull, rack & pinion pull
Transmission:		
Main axle deflection limit		0.08 mm
Drive axle deflection limit		0.08 mm
Shifter:		
Shifter type		Guide bar
Carburetor:		
I. D. mark		4KM 00
Main jet	(M.J)	#100
Main air jet	(M.A.J)	#72.5
Jet needle	(J.N)	5DT3-2
Needle jet	(N.J)	0-2
Pilot air jet	(P.A.J.1)	#120
Pilot outlet	(P.O)	1.0
Pilot jet	(P.J)	#12.5
Bypass 1	(B.P.1)	0.9
Bypass 2	(B.P.2)	0.8
Bypass 3	(B.P.3)	0.9
Pilot screw	(P.S)	1-1/2
Valve seat size	(V.S)	1.5

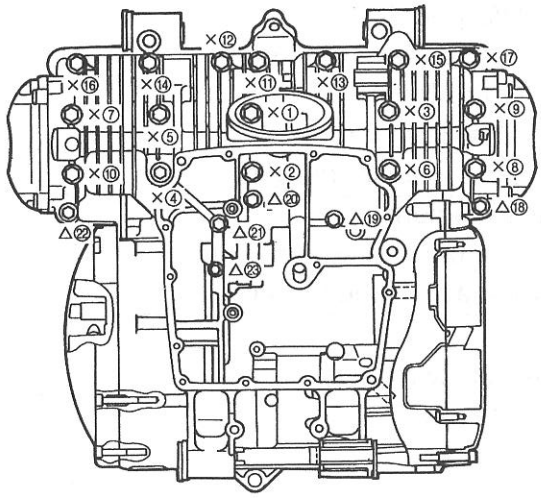
Model		XJ900S
Starter jet	(G.S.1)	#30
Throttle valve size	(Th.V)	#125
Fuel level	(F.L)	6 ~ 7 mm
Engine idle speed		950 ~ 1,050 r/min
Intake vacuum		30.3 ~ 32.9 kPa (230 ~ 250 mmHg)
Lubrication system:		
Oil filter type		Paper type
Oil pump type		Trochoid type
Tip clearance		0.03 ~ 0.09 mm
Side clearance		0.03 ~ 0.08 mm
Bypass valve setting pressure		120 ~ 160 kPa (1.2 ~ 1.6 kg/cm², 1.2 ~ 1.6 bar)
Relief valve operating pressure		540 ~ 660 kPa (5.4 ~ 6.6 kg/cm², 5.4 ~ 6.6 bar)
Oil pressure (hot)		80 kPa (0.8 kg/cm², 0.8 bar) at 1,000 r/min
Shaft drive:		
Middle gear backlash		0.1 ~ 0.2 mm
Final gear backlash		0.1 ~ 0.2 mm

Crankcase tightening sequence:

Crankcase (upper)



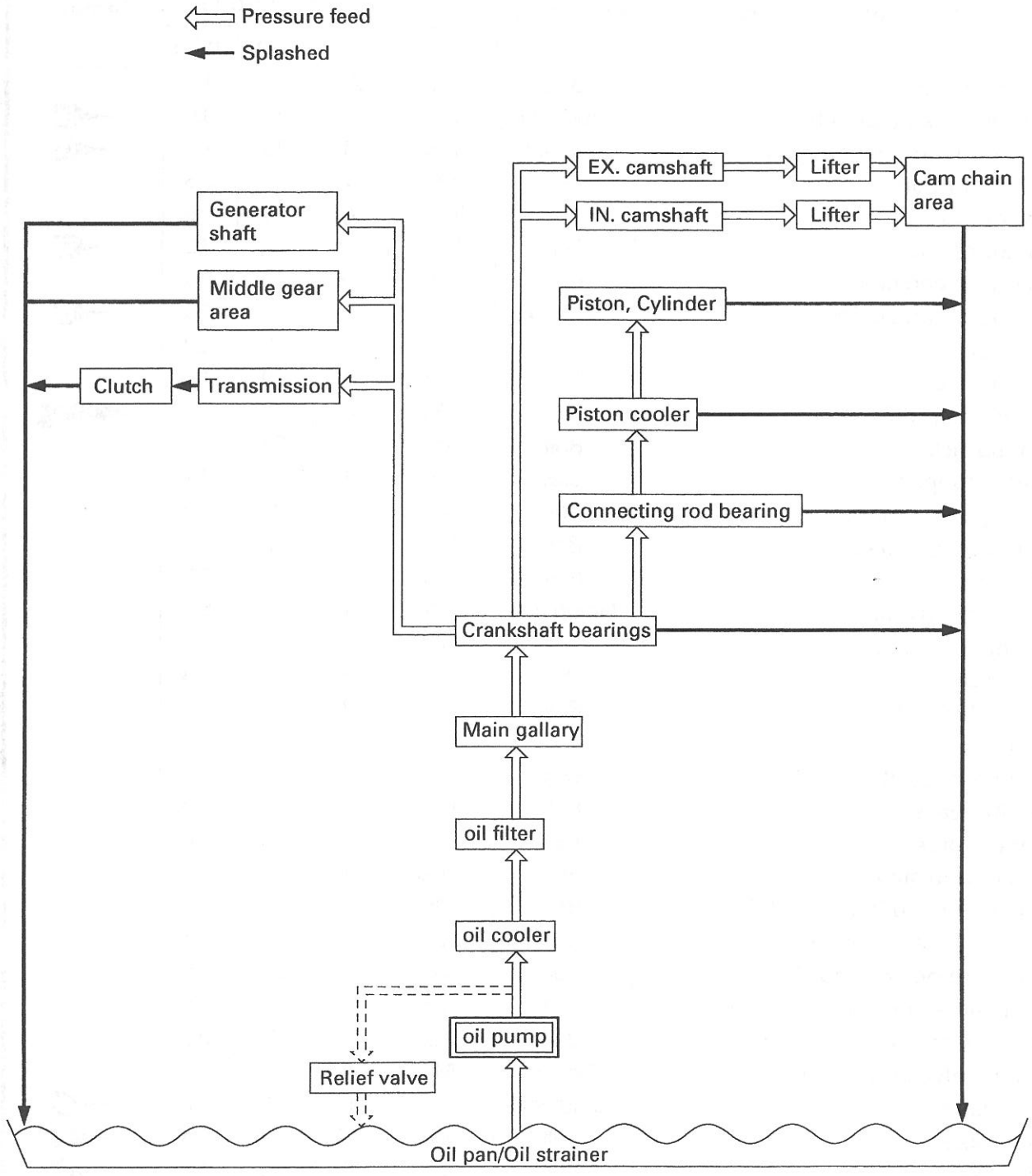
Crankcase (lower)



×: M8 bolt: 24 Nm (2.4 m • kg)
△: M6 bolt: 12 Nm (1.2 m • kg)

Model	XJ900S

Lubrication chart:



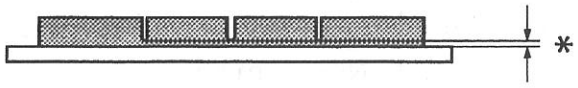
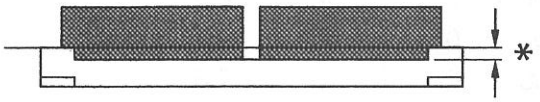
Tightening torques

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				Nm	m·kg	
Camshaft cap	Bolt	M6	24	10	1.0	
Cylinder head (cam chain)	Stud bolt	M6	4	5	0.5	E
Cylinder head (exhaust pipe)	Stud bolt	M8	8	15	1.5	E
Oil gallery bolt	—	M6	1	8	0.8	
Spark plug	—	M12	4	18	1.8	
Cylinder head	Nut	M10	12	32	3.2	E
Cylinder head cover	Bolt	M6	12	10	1.0	
Cylinder (cam chain)	Stud bolt	M8	1	8	0.8	E
Cylinder	Nut	M8	1	20	2.0	
Cylinder head	Nut	M6	4	10	1.0	
Connecting rod	Nut	M8	8	37	3.7	M
Cam sprocket	Bolt	M7	4	24	2.4	
Guide stopper	Screw	M6	1	7	0.7	
Chain guide (intake)	Bolt	M8	1	20	2.0	
Oil pump sprocket	Bolt	M6	1	12	1.2	
Oil pump	Bolt	M6	3	12	1.2	
Oil filter housing	Union bolt	M20	1	50	5.0	
Oil delivery pipe	Bolt	M12	2	32	3.2	
Drain bolt	Plug	M14	1	43	4.3	
Oil level switch	Bolt	M6	2	10	1.0	
Oil filter	—	M20	1	17	1.7	
Carburetor joint	Bolt	M6	8	12	1.2	
Air filter case	Bolt	M6	1	10	1.0	
Exhaust pipe	Nut	M8	8	20	2.0	
Muffler and stay	Bolt	M10	2	25	2.5	
Exhaust pipe blind plug (CO test)	Bolt	M6	4	7	0.7	
Exhaust pipe and stay	Bolt	M10	1	25	2.5	
Exhaust pipe and muffler	Bolt	M8	2	20	2.0	
Reed valve bracket and cowling stay	Bolt	M6	4	10	1.0	
Pipe 2, 3 and cowling stay	Bolt	M6	2	7	0.7	
Air cut valve and cowling stay	Screw	M6	2	7	0.7	
Crankcase	Stud bolt	M10	12	20	2.0	E
Crankcase	Bolt	M8	19	24	2.4	E
Crankcase	Bolt	M6	20	12	1.2	E
Bearing holder	Screw	M8	4	25	2.5	Stake
Oil baffle plate	Screw	M6	7	8	0.8	
Oil baffle plate	Screw	M6	1	8	0.8	LT
Shift shaft lever cover	Bolt	M6	10	12	1.2	
Drive axle bearing housing	Bolt	M6	3	12	1.2	
Clutch cover	Bolt	M6	10	12	1.2	

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				Nm	m·kg	
Clutch cable stay	Bolt	M6	2	12	1.2	
Generator bearing housing	Bolt	M6	3	10	1.0	
Plate stopper	Bolt	M6	1	10	1.0	Use lock washer
HY-VO chain guide	Bolt	M6	2	10	1.0	
Clutch spring	Screw	M6	6	8	0.8	
Clutch boss	Nut	M20	1	70	7.0	Use lock washer
Middle drive pinion gear	Nut	M18	1	110	11	Use lock washer
Yoke joint	Nut	M14	1	90	9.0	
Middle driven bearing housing	Bolt	M8	4	25	2.5	
Shift pedal adjuster	Nut	M6	2	10	1.0	
Shift arm	Bolt	M6	1	10	1.0	
Shift cam bearing holder	Screw	M6	2	10	1.0	
Self locking nut	—	M14	1	110	11	
Final gear bearing housing	Bolt	M10	2	23	2.3	
Final gear bearing housing	Nut	M8	6	23	2.3	
Final gear oil filler bolt	Plug	M14	1	23	2.3	
Final gear oil drain plug	Plug	M14	1	23	2.3	
Final drive bearing retainer	—	M65	1	110	11	
Final gear case	Stud bolt	M10	4	18	1.8	
Final gear case	Stud bolt	M8	6	9	0.9	
Final gear case and swingarm	Nut	M10	4	42	4.2	
A.C. generator	Bolt	M8	2	25	2.5	
A.C. generator	Bolt	M8	1	25	2.5	LT
Pickup coil base	Screw	M6	2	8	0.8	
Timing plate	Bolt	M10	1	45	4.5	
Starter motor	Bolt	M6	1	7	0.7	YAMAHA Bold No. 1215
Starter motor and crankcase	Bolt	M6	1	12	1.2	E
Neutral switch	—	M10	1	20	2.0	

CHASSIS

Model		XJ900S
Steering system:		
Steering bearing type		Ball bearing
Front suspension:		
Front fork travel		140 mm
Fork spring free length		505 mm
Spring rate	(K1)	5.0 N/mm (0.5 kg/mm)
	(K2)	9.0 N/mm (0.9 kg/mm)
Stroke	(K1)	0 ~ 80 mm
	(K2)	80 ~ 140 mm
Optional spring		No
Oil capacity		444 cm^3
Oil level		133 mm
Oil grade		Fork oil 5 W or equivalent
Rear suspension:		
Shock absorber travel		50 mm
Spring free length		177 mm
Fitting length		161.5 mm (157.5 ~ 165.5 mm)
Spring rate	(K1)	155.0 N/mm (15.5 kg/mm)
Stroke	(K1)	0 ~ 50 mm
Optional spring		No
Swingarm:		
Free play limit	end	1 mm
	side	1 mm
Front wheel:		
Type		Cast wheel
Rim size		17 X MT3.00
Rim material		Aluminum
Rim runout limit	radial	1 mm
	lateral	0.5 mm
Rear wheel:		
Type		Cast wheel
Rim size		17 X MT4.00
Rim material		Aluminum
Rim runout limit	radial	1 mm
	lateral	0.5 mm
Front disc brake:		
Type		Dual
Disc outside diameter × thickness		320 × 4 mm
Disc deflection limit		0.15 mm
Pad thickness	inner	6.1 mm
<Limit>		<0.8 mm>
Pad thickness	outer	6.1 mm

Model	XJ900S
<Limit>	<0.8 mm>
	
Master cylinder inside diameter	15.87 mm
Caliper cylinder inside diameter	30.2 mm
Caliper cylinder inside diameter	33.3 mm
Brake fluid type	DOT #4
Rear disc brake:	
Type	Single
Disc outside diameter × thickness	267 × 5 mm
Disc deflection limit	0.15 mm
Pad thickness inner	5.5 mm
<Limit>	<0.5 mm>
Pad thickness outer	5.5 mm
<Limit>	<0.5 mm>
	
Master cylinder inside diameter	14 mm
Caliper cylinder inside diameter	42.85 mm
Brake fluid type	DOT #4
Brake lever & brake pedal:	
Brake lever free play (at lever pivot)	0 mm
Brake pedal position	30 mm
Brake pedal free play	0 mm
Clutch lever free play (at lever end)	10 ~ 15 mm
Throttle cable free play	3 ~ 5 mm

Tightening torques

Part to be tightened	Thread size	Tightening torque		Remarks
		Nm	m·kg	
Chassis:				
Handle crown and inner tube	M8× 1.25	30	3.0	
Handle crown and steering stem	M14× 1.25	110	11.0	
Handle crown and handlebar (upper)	M8× 1.25	23	2.3	
Steering stem and ring nut	M25× 1.0	18	1.8	
		See "NOTE"		
Front master cylinder and cap	M4× 0.7	2	0.2	
Front master cylinder and bracket	M6× 1.0	9	0.9	
Front brake hose and union bolt	M10× 1.25	30	3.0	
Cowling and cowling stay	M5× 0.8	0.7	0.07	
Cowling and frame	M5×0.8	0.7	0.07	
Cowling and windscreen	M5× 0.8	0.7	0.07	
Cowling and inner panel	M5× 0.8	4	0.4	
Cowling and headlight	M6× 1.0	7	0.7	
Cowling stay and frame	M8× 1.25	16	1.6	
	M6× 1.0	7	0.7	
Cowling stay and meter	M6× 1.0	7	0.7	
Cowling stay and front flasher light	M12× 1.25	13	1.3	
Meter and meter cable	M12× 1.0	3	0.3	
Brake hose holder and front fork	M6× 1.0	7	0.7	
Engine mount (front-upper/lower)	M10× 1.25	48	4.8	
(rear-upper/lower)	M10× 1.25	48	4.8	
Down tube and frame	M10× 1.25	89	8.9	
Engine stay (front) and frame	M8× 1.25	30	3.0	
Engine stay (rear) and frame	M8× 1.25	30	3.0	
Pivot shaft (left) and frame	M22× 1.5	100	10.0	
Pivot shaft (right) and frame	M22× 1.5	7	0.7	
Pivot shaft (right) and locknut	M22× 1.5	100	10.0	
Relay arm and frame	M10× 1.25	48	4.8	
Relay arm and connecting rod	M12× 1.25	48	4.8	
Connecting rod and rear arm	M12× 1.25	48	4.8	
Rear shock absorber and frame	M10× 1.25	40	4.0	
Rear shock absorber and relay arm	M10× 1.25	48	4.8	
Fuel cock and fuel tank	M6× 1.0	7	0.7	
Fuel sender and fuel tank	M5× 0.8	4	0.4	
Rear fender and frame	M6× 1.0	7	0.7	
Taillight	M6× 1.0	7	0.7	
Rear fender cover and side cover	M5× 0.8	4	0.4	
Side cover and frame	M5× 0.8	4	0.4	
Rear fender stay and frame	M6× 1.0	10	1.0	

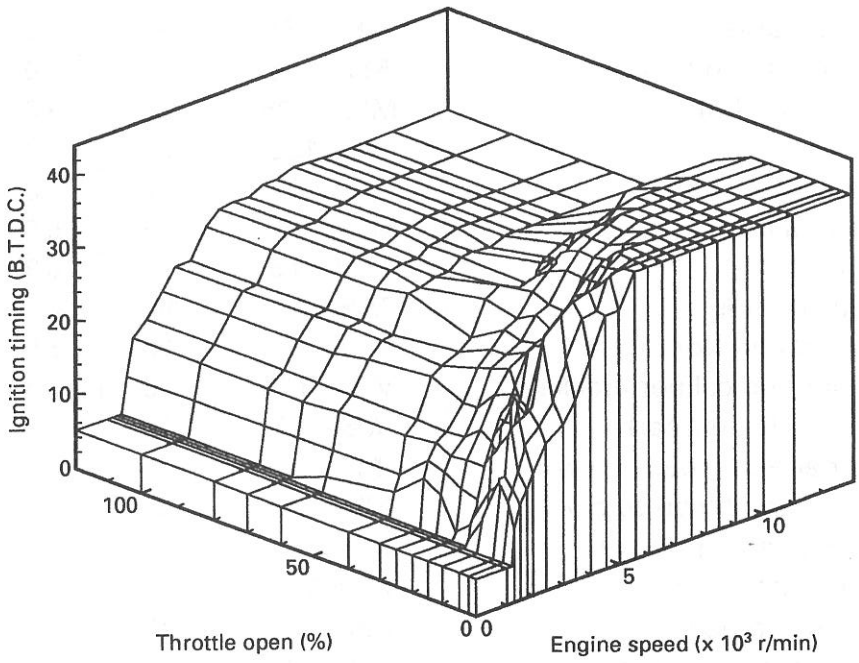
Part to be tightened	Thread size	Tightening torque		Remarks
		Nm	m·kg	
Rear brake reservoir tank and rear fender	M6× 1.0	7	0.7	
Rear flasher light and rear fender	M12× 1.25	4	0.4	
Reflector bracket and rear fender	M4× 0.7	3	0.3	
Rear fender and flap	M4× 0.7	3	0.3	
Battery cover and frame	M6× 1.0	7	0.7	
Footrest bracket and frame	M8× 1.25	30	3.0	
Rear footrest and frame	M8× 1.25	30	3.0	
Rear master cylinder and bracket	M8× 1.25	30	3.0	
Brake hose and union bolt	M10× 1.25	30	3.0	
Shift pedal	M8× 1.25	30	3.0	
Brake pedal and brake shaft	M6× 1.0	8	0.8	
Mainstand bolt and nut	M10× 1.25	56	5.6	
Front wheel axle	M14× 1.5	59	5.9	
Rear wheel axle and nut	M16× 1.5	105	10.5	
Front brake caliper and front fork	M10× 1.25	35	3.5	
Rear brake caliper and caliper bracket	M10× 1.25	35	3.5	
Disc brake and hub (front/rear)	M6× 1.0	20	2.0	L
Front brake caliper and bleed screw	M7× 1.0	6	0.6	
Rear brake caliper and bleed screw	M8× 1.25	6	0.6	
Speedometer cable and gear unit	M12× 1.0	3	0.3	
Front wheel axle pinch bolt	M8× 1.25	19	1.9	
Rear wheel axle pinch bolt	M8× 1.25	16	1.6	
Front brake caliper retaining bolt	M8× 1.25	22	2.2	
Front fender and front fork	M6× 1.0	9	0.9	
Rear brake hose and hose joint	M10× 1.0	16	1.6	
Rear brake caliper and hose joint	M10× 1.0	30	3.0	

NOTE:

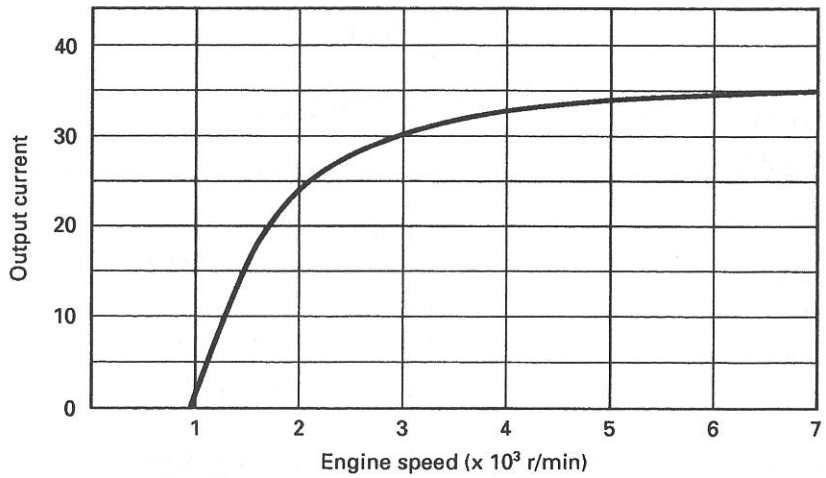
1. First, tighten the ring nut approximately 52 Nm (5.2 m • kg) by using the torque wrench, then loosen the ring nut one turn.
2. Retighten the ring nut to specification.

ELECTRICAL

Model	XJ900S
Voltage:	12 V
Ignition system:	
Ignition timing (B.T.D.C.)	5° at 1,000 r/min
Advanced timing (B.T.D.C.)	40° at 5,000 r/min
Advancer type	Electrical type



T.C.I.:	
Pickup coil resistance / color	446 ~ 545 Ω at 20°C / White/Red – White/Green
T.C.I. unit model / manufacturer	J4T051/MITSUBISHI
Ignition coil:	
Model / manufacturer	JO312,JO313/NIPPONDENSO
Minimum spark gap	6 mm
Primary winding resistance	1.87 ~ 2.53 Ω at 20°C
Secondary winding resistance	12 ~ 18 kΩ at 20°C
Spark plug cap:	
Type	Resin type
Resistance	10 kΩ
Charging system:	
Type	A.C. generator
Model / manufacturer	B3G/NIPPONDENSO
Nominal output	14 V 33 A at 5,000 r/min

Model	XJ900S
	
Rotor coil resistance	2.76 ~ 3.05 Ω at 20°C
Stator coil resistance	0.19 ~ 0.21 Ω at 20°C
Brush overall length	13.7 mm
<Wear limit>	<4.7 mm>
Spring force	520 ~ 580 g
Voltage regulator:	
Type	Semi-conductor, field control type
Model / manufacturer	B3G/NIPPONDENSO
No load regulated voltage	14.2 ~ 14.8 V
Rectifier:	
Model / manufacturer	B3G/NIPPONDENSO
Withstand voltage	200 V
Battery:	
Specific gravity	1.320
Electric starter system:	
Type	Constant mesh type
Starter motor:	
Model / manufacturer	DB4DT/NIPPONDENSO
Output	0.6 kW
Armature coil resistance	0.013 ~ 0.015 Ω at 20°C
Brush overall length	12 mm
<Limit>	<8.5 mm>
Spring force	650 ~ 950 g
Commutator diameter	28 mm
<Wear limit>	<27 mm>
Mica undercut	0.6 mm
Starter switch:	
Model / manufacturer	MS5F/JIDECO
Amperage rating	100 A
Coil winding resistance	4.18 ~ 4.62 Ω at 20°C

Model		XJ900S
Horn:		
Type		Plane type
Quantity		1
Model / manufacturer		YF-12/NIKKO
Maximum amperage		2.5 A
Flasher relay:		
Type		Full transistor type
Model / manufacturer		FE246BH/NIPPONDENSO
Self cancelling device		No
Flasher frequency		75 ~ 95 cycle/min
Wattage		21 W × 2 + 3.4 W
Oil level switch:		
Model / manufacturer		4H7/NIPPONDENSO
Fuel gauge:		
Model / manufacturer		4KM/NIPPONDENSO
Sender unit resistance	full	4 ~ 10 Ω at 20°C
	empty	90 ~ 100 Ω at 20°C
Starting circuit cut off relay:		
Model / manufacturer		3EN/OMRON
Coil winding resistance		202.5 ~ 247.5 Ω at 20°C
Diode		Yes
Circuit breaker:		
Type		Fuse
Amperage for individual circuit		
MAIN		30 A × 1
HEAD		15 A × 1
SIGNAL		20 A × 1
IGNITION		10 A × 1
CLOCK		10 A × 1
Reserve		20 A × 1
Reserve		10 A × 1

EXCLUSIVE SPECIFICATION

The following specifications are exclusive for the below listed countries.

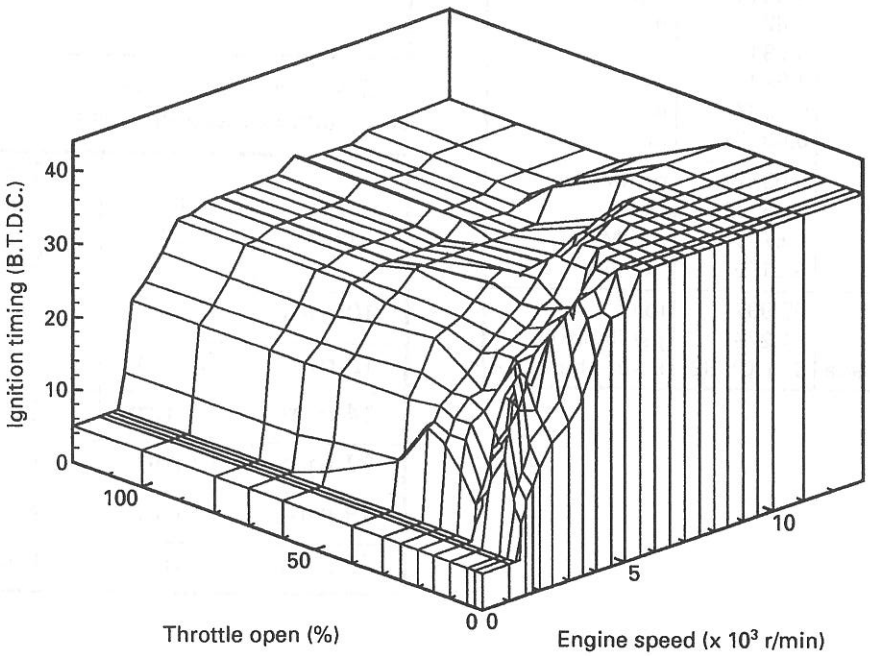
For specifications other than below, please refer to the General and maintenance specifications.

For Spain

Model code:	4KM2
Engine starting number:	4KM-023101
Vehicle identification number:	JYA4KMS0*SA023101

For Switzerland, Austria

Model code:	4PR1
Engine starting number:	4PR-000101
Frame starting number:	4PR-000101
Carburetor: I.D. mark	4PR00
Ignition system: Advancer type	



T.C.I.: T.C.I. unit model/manufacturer	J4T052/MITSUBISHI

For Australia

Model code:	4PS1
Engine starting number:	4PS-000101
Vehicle identification number:	JYA4PST0*SA000101
Fuel: Type	Unleaded fuel only

HOW TO USE THE CONVERSION TABLE

All specification data in this manual is listed in SI and METRIC UNITS.
Use this table to convert METRIC unit data to IMP unit data.

Ex.

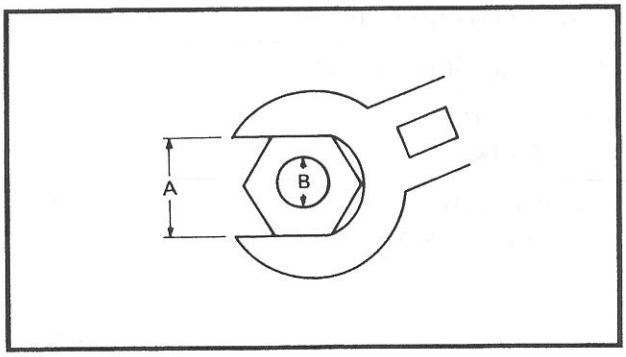
METRIC		MULTIPLIER		IMP
** mm	×	0.03937	=	** in
2 mm	×	0.03937	=	0.08 in

CONVERSION TABLE

METRIC TO IMP			
	Known	Multiplier	Result
Torque	m·kg	7.233	ft·lb
	m·kg	86.794	in·lb
	cm·kg	0.0723	ft·lb
	cm·kg	0.8679	in·lb
Weight	kg	2.205	lb
	g	0.03527	oz
Distance	km/hr	0.6214	mph
	km	0.6214	mi
	m	3.281	ft
	m	1.094	yd
	cm	0.3937	in
	mm	0.03937	in
Volume/ Capacity	cc (cm^3)	0.03527	oz (IMP liq.)
	cc (cm^3)	0.06102	cu·in
	lit (liter)	0.8799	qt (IMP liq.)
	lit (liter)	0.2199	gal (IMP liq.)
Miscella-neous	kg/mm	55.997	lb/in
	kg/cm^2	14.2234	psi (lb/in^2)
	Centigrade	9/5(°C)+32	Fahrenheit (°F)

GENERAL TORQUE SPECIFICATIONS

This chart specifies torque for standard fasteners with standard I.S.O. pitch threads. Torque specifications for special components or assemblies are included in the applicable sections of this book. To avoid warpage, tighten multi-fastener assemblies in a crisscross fashion, in progressive stages, until full torque is reached. Unless otherwise specified, torque specifications call for clean, dry threads. Components should be at room temperature.



A: Distance across flats
B: Outside thread diameter

A (Nut)	B (Bolt)	General torque specifications	
		Nm	m•kg
10 mm	6 mm	6	0.6
12 mm	8 mm	15	1.5
14 mm	10 mm	30	3.0
17 mm	12 mm	55	5.5
19 mm	14 mm	85	8.5
22 mm	16 mm	130	13.0

LUBRICATION POINT AND GRADE OF LUBRICANT

ENGINE

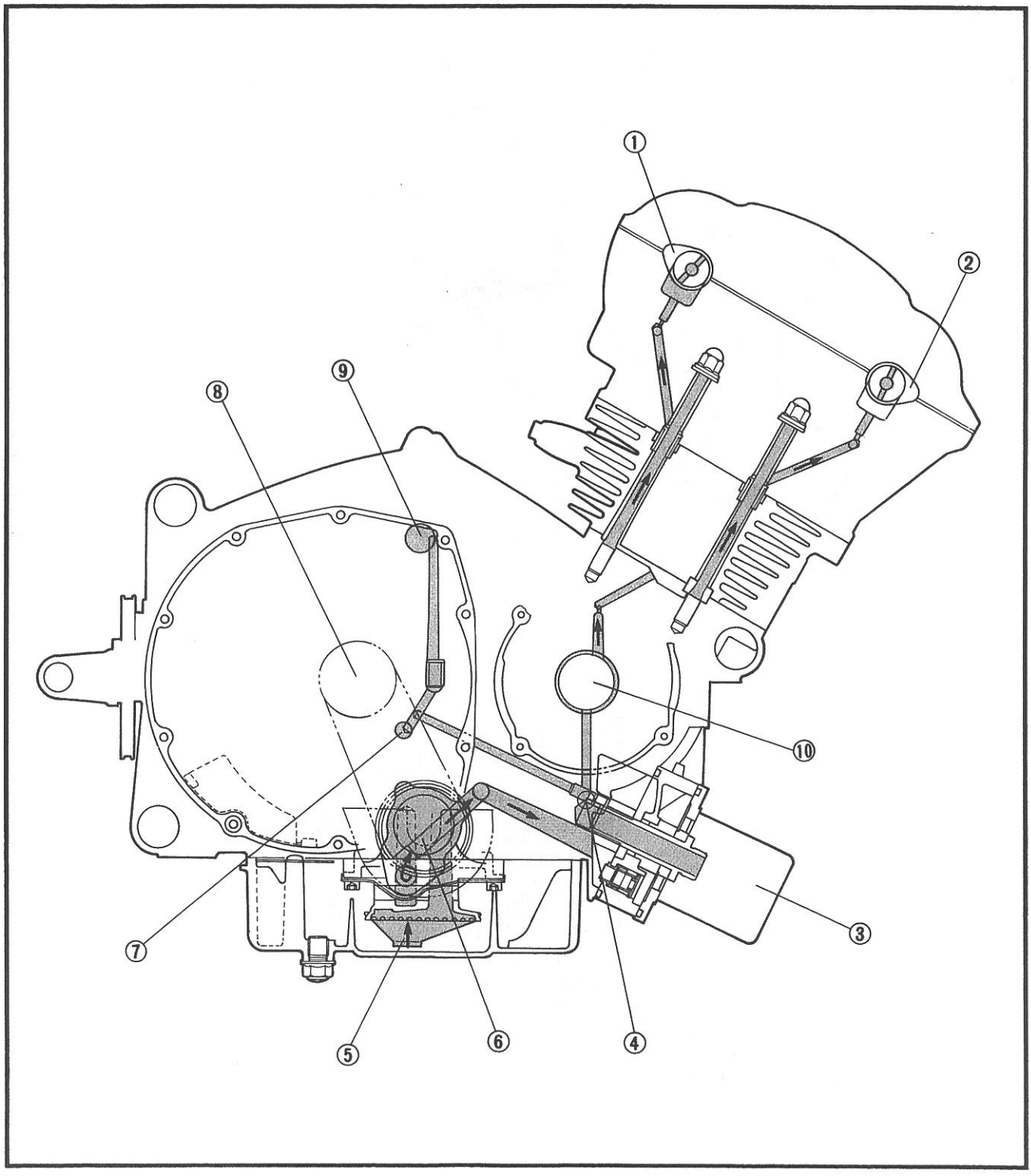
Lubrication Point	Symbol
Oil seal lips	LS
O-ring	LS
Bearing	E
Piston surface	E
Piston pin	E
Crankshaft pin	E
Crankshaft journal/big end	E
Connecting rod bolt/nut	M
Connecting rod small end	M
Middle drive shaft (drive damper cam/driven damper cam)	M
Middle drive gear	E
Middle driven gear	E
Camshaft cam lobe/journal	M
Valve stem (IN, EX)	M
Valve stem end (IN, EX)	E
Valve lifter	E
Oil pump rotor (inner/outer), housing	E
Oil strainer assembly	E
Idle gear surface	E
Starter idle gear	E
Starter idle gear shaft	E
Starter clutch (outer/roller)	E
Crankcase cover (pull rod hole)	M
Primary drive gear/damper	E
Transmission gear (wheel/pinion)	M
Axle (main/drive)	M
Pull rod (bearing/washer)	LS
Shift cam	E
Shift fork/guide bar	E
Shift shaft assembly	E

CHASSIS

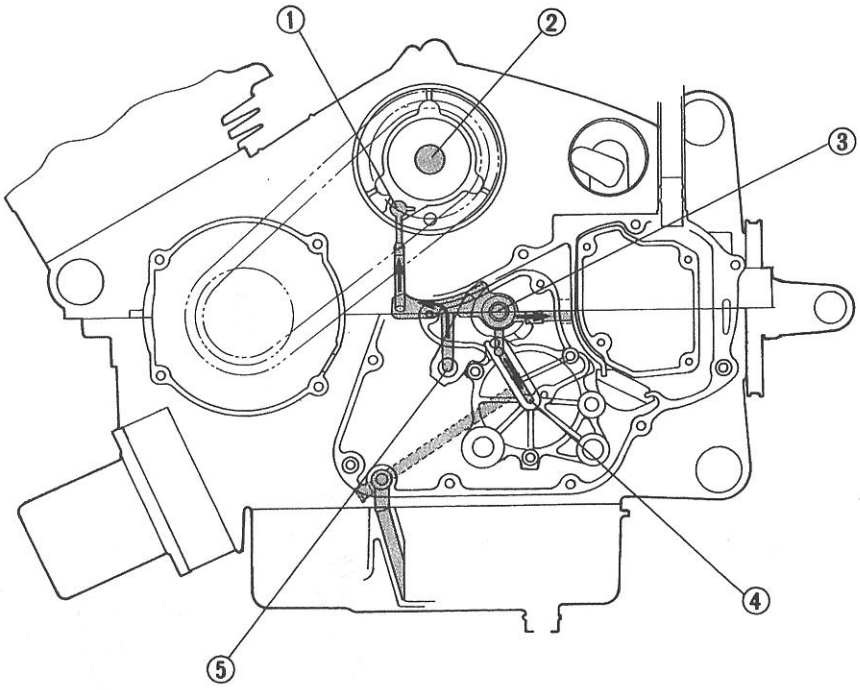
Lubrication Point	Symbol
Steering bearing (upper/lower)	LS
Front wheel oil seal (right/left)	LS
Rear wheel oil seal	LS
Clutch hub oil seal	LS
Clutch hub fitting area	LS
Rear brake pedal shaft	LS
Shift pedal	LS
Center stand sliding surface	LS
Side stand sliding surface	LS
Tube guide (throttle grip) inner surface	LS
Clutch cable end (lever side)	LS
Brake lever bolt, sliding surface	LS
Clutch lever bolt, sliding surface	LS
Rear footrest pivot	LS
Rear shock absorber (upper)	M
Rear shock absorber (lower - oil seal)	M
Connecting rod bearing (on the swingarm)	M
Swingarm pivot bearing	M
Swingarm pivot oil seal	M
Relay arm bearing (inner)	M
Final drive gear/ring gear	G
Drive shaft (final gear side)	LS
Drive shaft (middle gear side)	LS

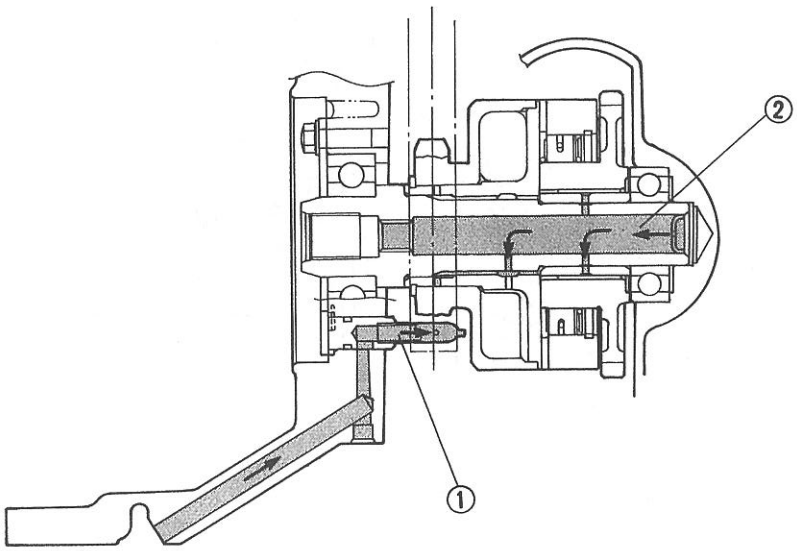
LUBRICATION DIAGRAMS

① Camshaft (intake)
② Camshaft (exhaust)
③ Oil filter
④ Main gallery
⑤ Oil strainer
⑥ Oil pump
⑦ Shift guide bar
⑧ Main axle
⑨ Starter clutch
⑩ Crankshaft

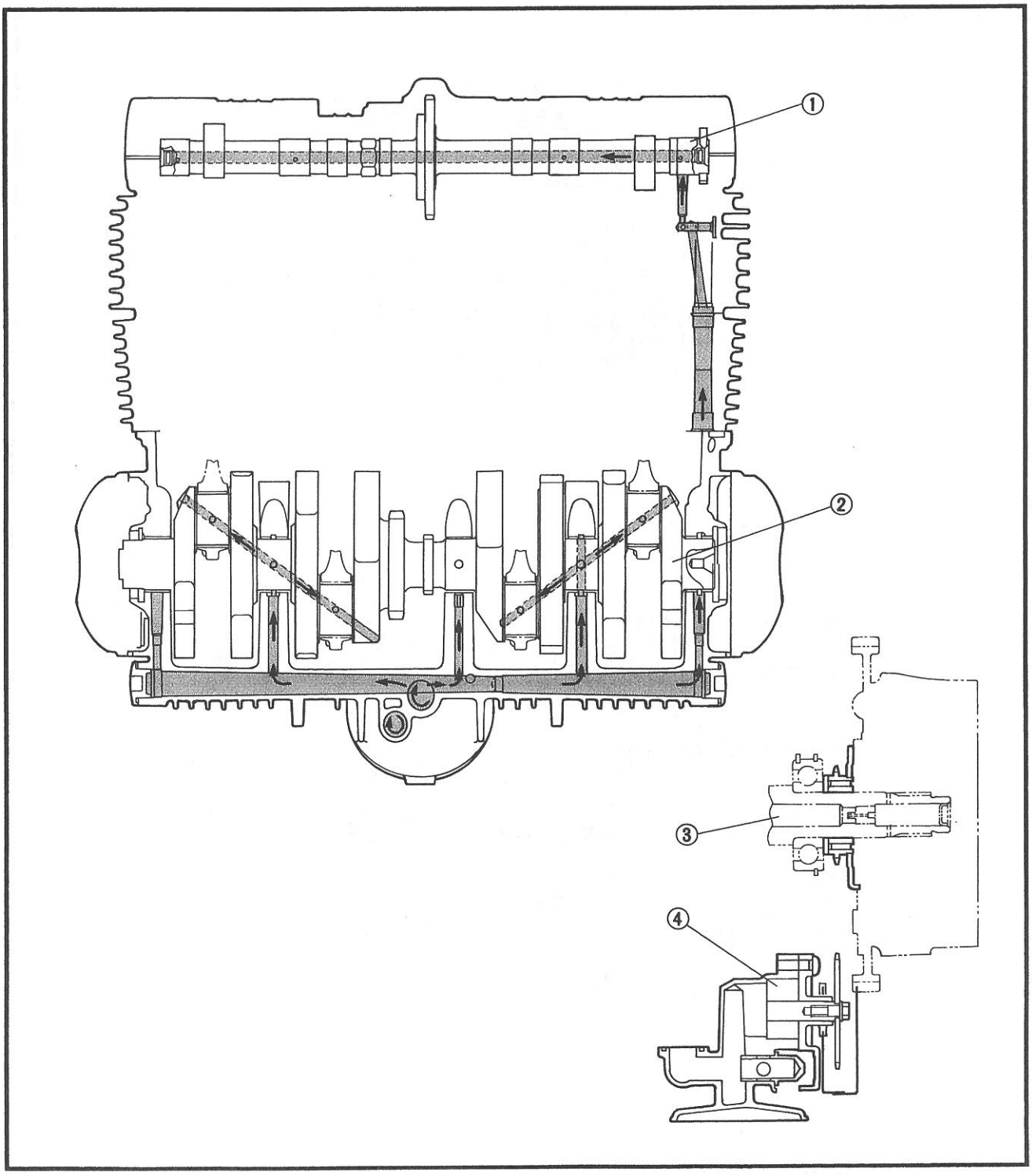


① Oil nozzle
② Starter clutch
③ Main axle
④ Drive axle
⑤ Shift guide bar

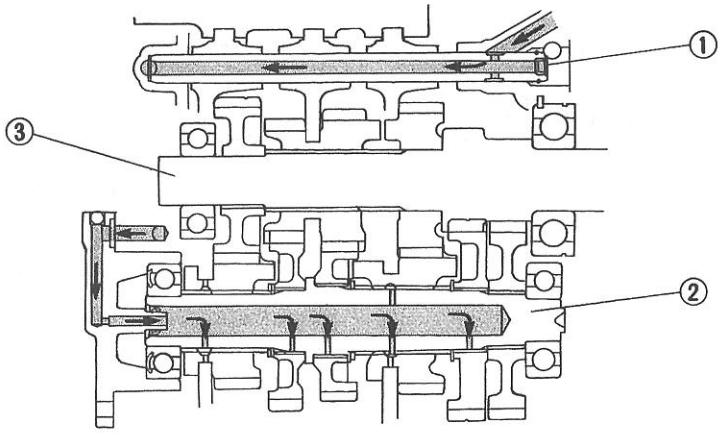


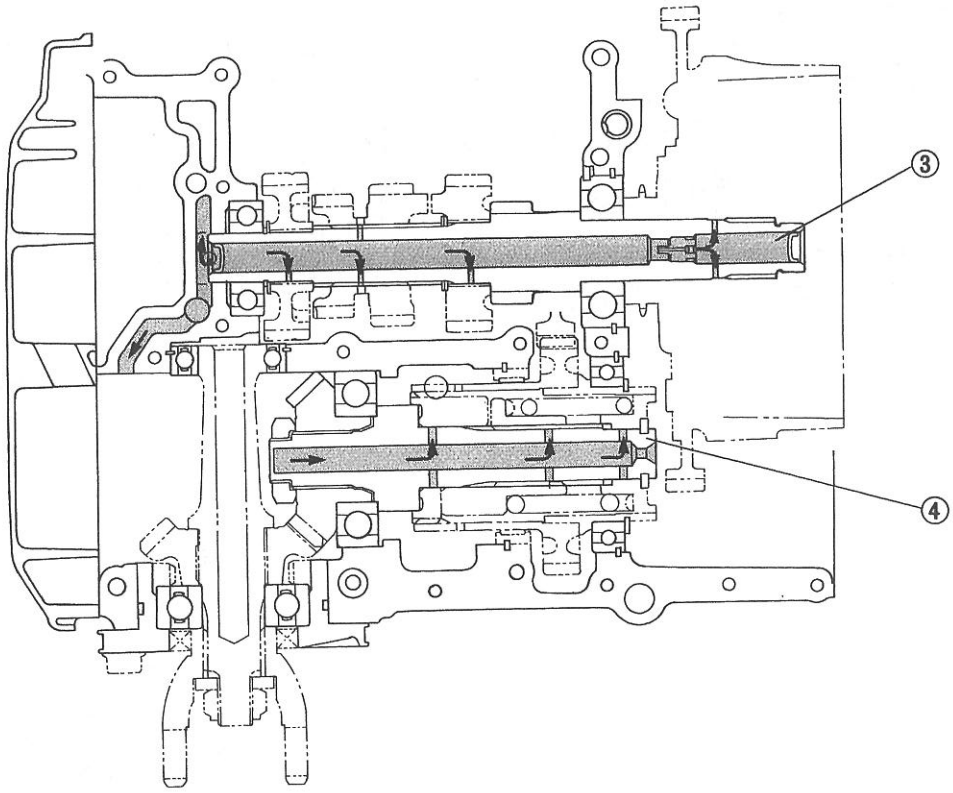


① Camshaft
② Crankshaft
③ Main axle
④ Oil pump



① Shift guide bar
② Drive axle
③ Main axle
④ Middle drive shaft

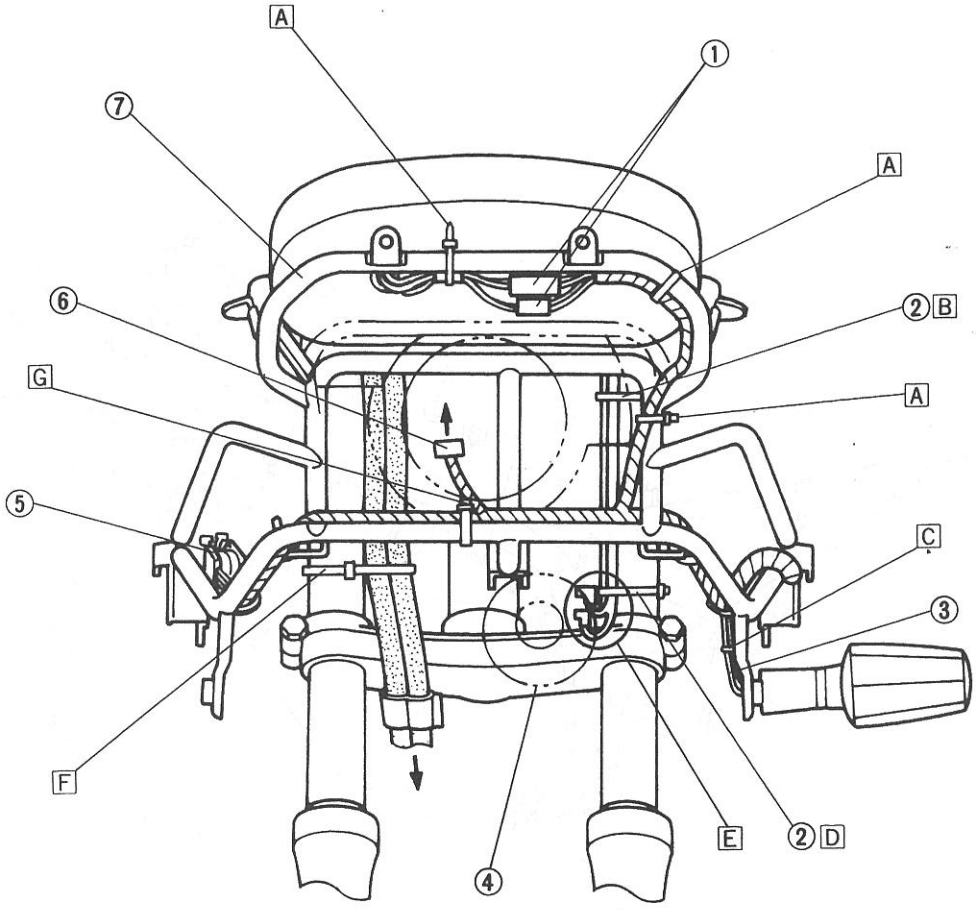




CABLE ROUTING

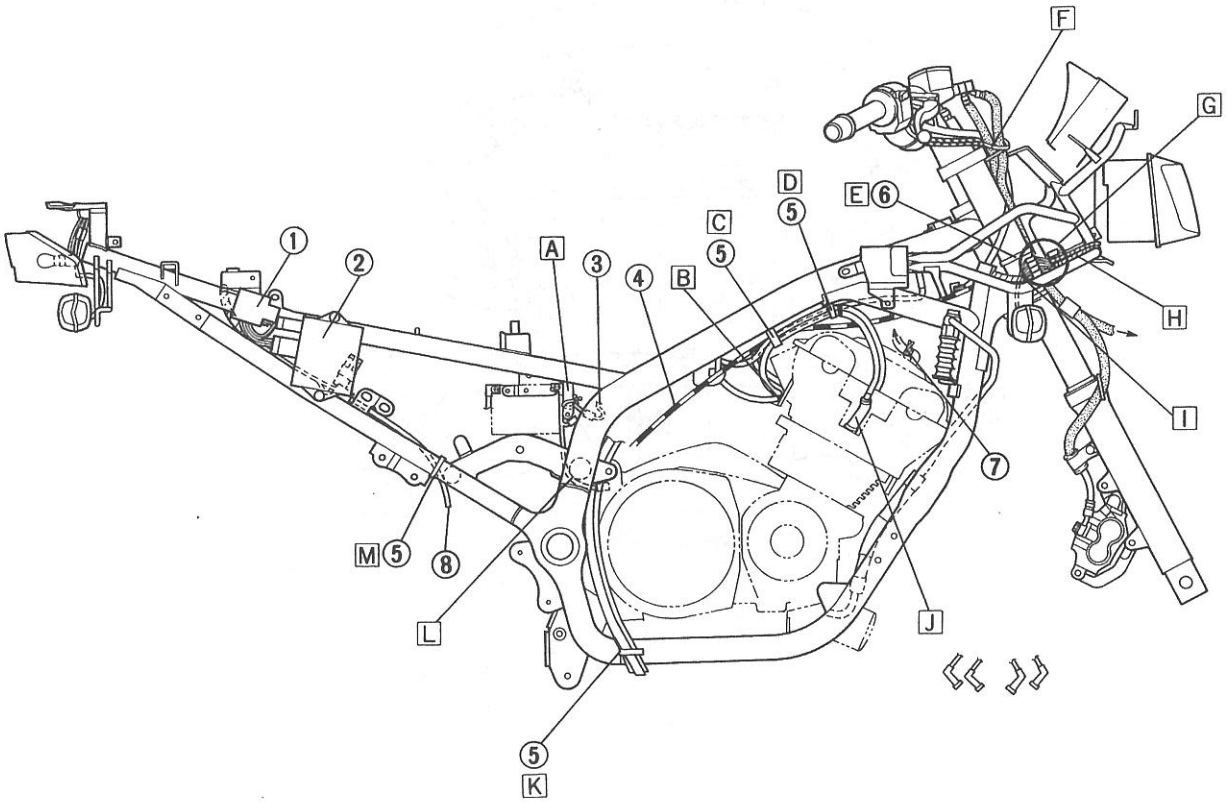
① Meter assembly coupler
② Band
③ Flasher lead
④ Horn
⑤ Thermo switch
⑥ Headlight coupler
⑦ Cowling stay

[A] Clamp the meter lead to the cowling stay.
[B] Clamp the horn lead to the inner fork tube 60 mm from the handle crown.
[C] Pass the left and right flasher leads through the cowling stay guide wire.
[D] Clamp the horn lead to the inner fork tube 20 mm from the under bracket.
[E] When connecting the horn lead, make sure that the lead points downwards from the connector so that water cannot get inside when it rains.
[F] Clamp the brake hoses to the inner fork tube.
[G] Clamp the wire harness to the cowling stay.

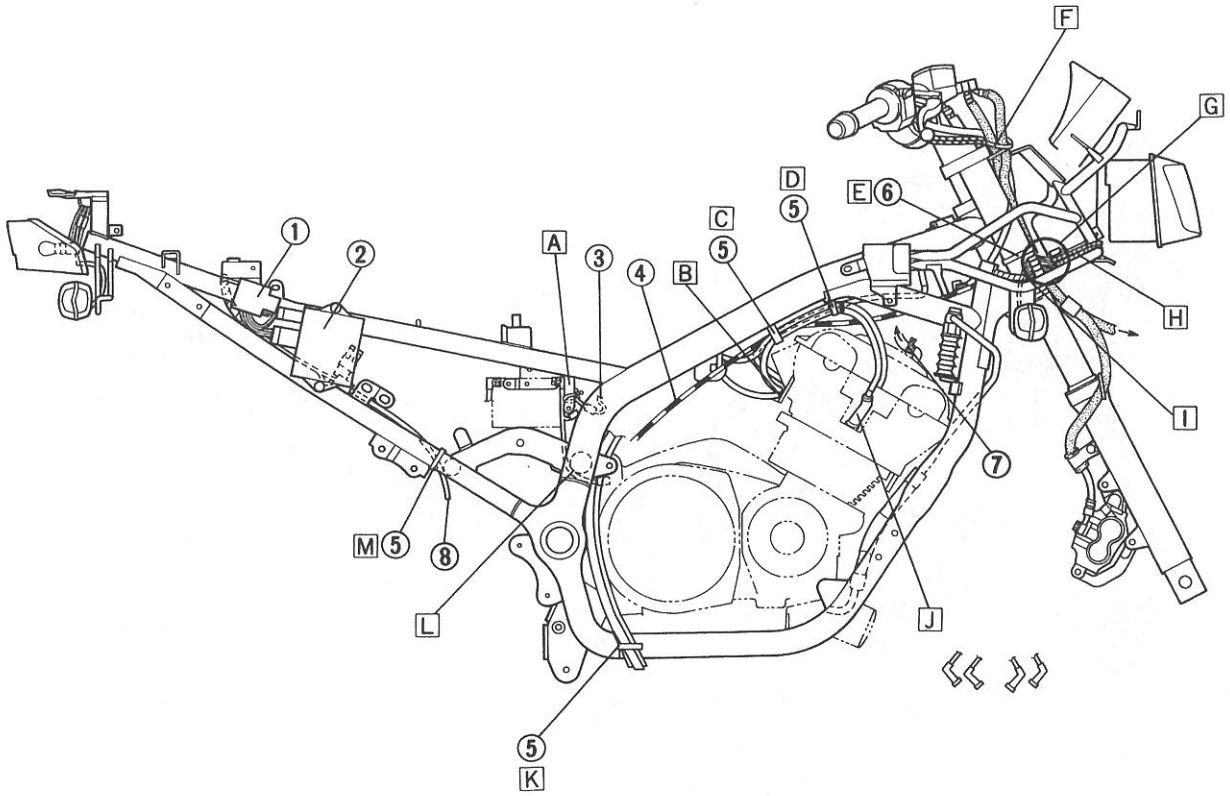


① Fuse box
② Ignitor unit
③ Fuel sender lead
④ Clutch cable
⑤ Clamp
⑥ Band
⑦ Clip
⑧ Rear brake switch lead

[A] Clamp the fuel sender wire harness to the side cover stay.
[B] Clamp the high tension cord, #4, to the upper part, and the #2 cord to the lower part at the marked position.
[C] Clamp the high tension cords and clutch cable and sensing hose.
[D] Clamp the high tension cords, #1, #2, #3 and #4 to the clamp on the frame at the marked positions accordingly.

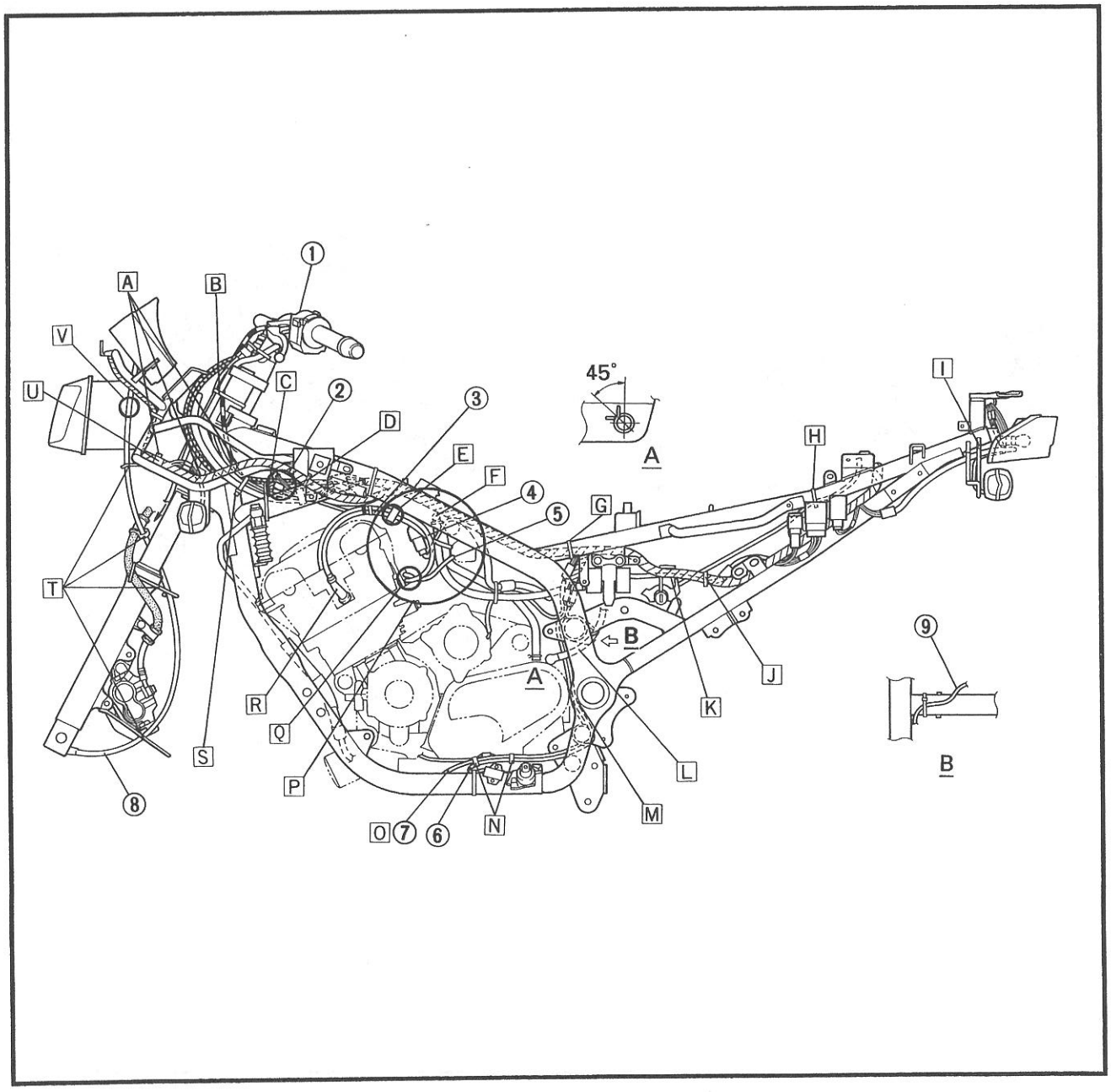


[E] Clamp the brake hoses to the inner tube.
[F] Clamp the brake hoses to the guide wire.
[G] After connecting the left and right flasher leads, clamp them to the cowling stay. Connect the thermo switch lead to the plug with white tape affixed to it.
[H] Clamp the auxiliary light lead and wire harness to the cowling stay.
[I] Clamp the flasher lead and thermo switch lead to the cowling stay.
[J] Position the spark plug cap so that it is facing inwards.
[K] Pass the drain hoses for the tank and the drain hose for the air filter case through the clamp.
[L] Pass the battery ⊖ lead under the cross pipe and secure it to the side of the battery ⊖ terminal.
[M] Clamp the rear brake switch lead to the back stay.

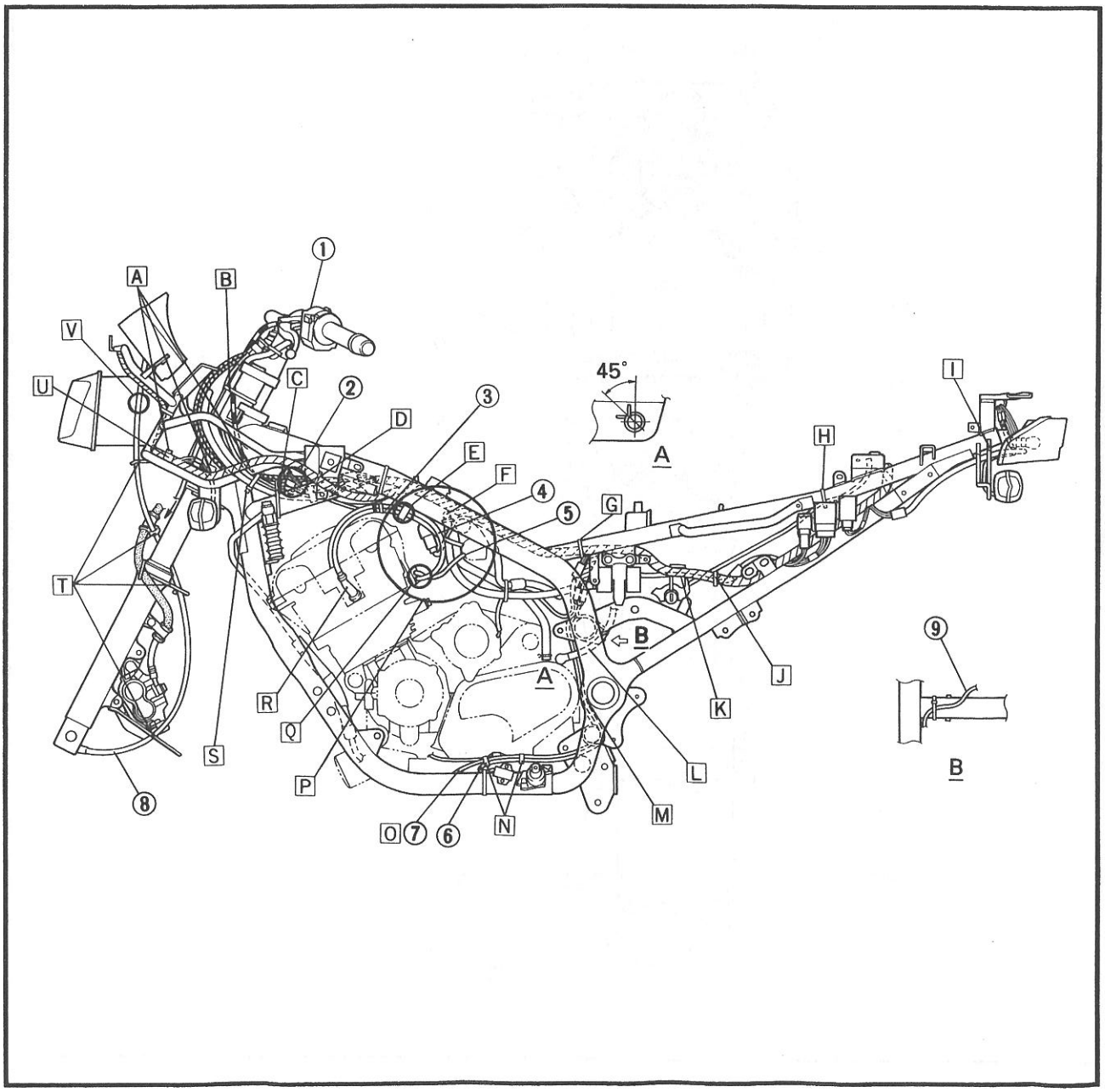


① Handlebar switch (left)
② Main switch coupler
③ High tension cord (#1)
④ High tension cord (#2)
⑤ High tension cord (#4)
⑥ Sidestand switch lead
⑦ Oil level switch lead
⑧ Speed meter cable
⑨ Starter motor lead

[A] Clamp the wire harness to the cowling stay.
[B] Clamp the left handlebar switch lead to the inner tube.
[C] Clamp the left handlebar switch lead, the main switch lead and the starter cable to the tension pipe.
[D] Clamp the wire harness at the point where the white tape is affixed to it.
[E] Clamp the high tension cords (#1 and #2).
[F] Clip both ends of the fuel hose.
[G] Clamp the wire harness inside the seat rail.
[H] Point the clamp end so that it is facing downwards.
[I] Pass the flasher lead inside the protruding tab on the rear fender.
[J] Clamp the wire harness and the fuel pump lead. Position the fuel pump lead behind the wire harness.
[K] Pass the wire harness and the fuel pump lead through the guide wire on the stay lock. Position the fuel pump lead behind the wire harness.
[L] Pass the starter motor lead under the cross pipe, then clamp it to the cross pipe. Pass the starter motor lead inside the tab on the rear fender and then inside the bracket on the rear shock absorber.

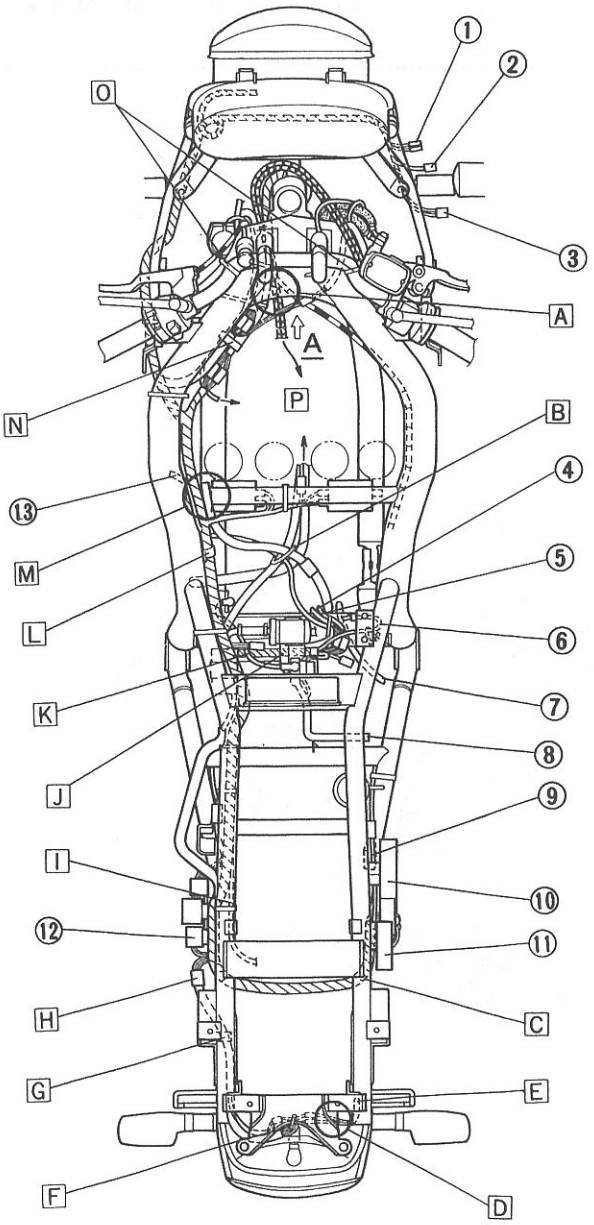


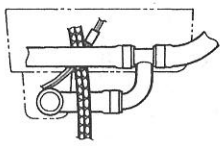
[M] Pass the side stand switch lead through the inner part of the rear arm.
[N] Clamp the side stand switch lead and the oil level switch lead with the engine clamp.
[O] Pull the oil level switch lead backwards slightly so that it is not slack.
[P] • Pass the throttle position sensor lead inside the high tension cords (#1 and #2).
• Either one of the high tension cords (#1) and (#2) can be uppermost.
• Pass the cord (#4) outside the fuel hose and breather hose.
• Pass the cord (#1) outside the fuel hose, breather hose and throttle position sensor lead.
[Q] Clamp the high tension cord, #4, to the upper part at the marked position, and the high tension cord #2 to the lower part.
[R] Position the spark plug cap so that it is facing inwards.
[S] Clamp the left handlebar switch lead, main switch lead, starter cable and throttle cables.
[T] Pass the speedometer cable to the left of the headlight and pass it through the guide wire which secures the cowling stay guide wire, brake hose holder, fender bracket guide wire and caliper.
[U] Clamp the part of the wire harness which has white tape affixed to it onto the cowling stay.
[V] When installing the cowling, make sure that the speedometer cable is not pinched between the headlight and the cowling.



① Front flasher light (right) lead
② Auxiliary light lead
③ Thermo switch lead
④ Oil level switch lead
⑤ Side stand switch lead
⑥ Fuel sender lead
⑦ Battery ⊖ lead
⑧ Battery ⊕ lead
⑨ Main fuse
⑩ Ignitor unit
⑪ Fuse box
⑫ Flasher relay
⑬ Throttle position sensor lead

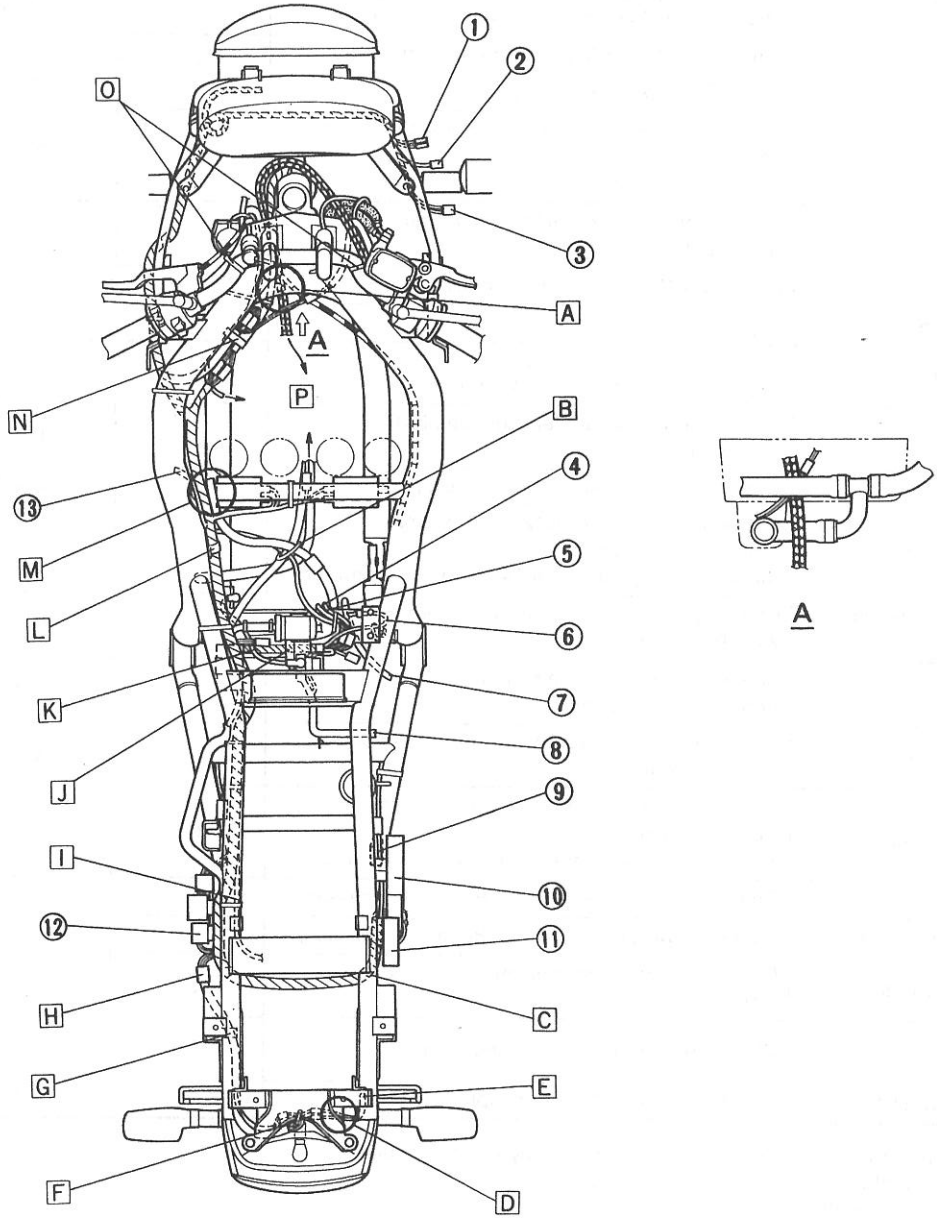
[A] The wire harness must be uppermost, followed by the clutch wire, with the throttle wire underneath.
[B] Clamp the AC generator lead, fuel hose and air filter case drain hose.
[C] Pass the wire harness through the guide on the rear fender, then pass it around to the left side of the motorcycle.
[D] Pass the rear flasher leads underneath the point where the tail light is installed.
[E] Pass the left and right rear flasher leads through the guide hole in the rear fender.
[F] Connect the leads and clamp them to the frame at the guide hole.





A

[G] Clamp the wire harness to the rear fender at the tab.
[H] Pass the coupler for the wire harness outside the rear fender.
[I] Pass the seat lock wire outside the rear fender.
[J] Pass the wire harness underneath the point where the rear fender and fuel filter are installed, then pass it above the frame and the bracket of the rear shock absorber.
[K] Pass the starter motor lead under the wire harness and fuel hose.
[L] Clamp the portion of the wire harness marked with white tape.
[M] Fasten the ground terminal and the ignition coil together.
[N] Clamp the wire harness, main switch lead and starter cable.
[O] Clamp the handlebar switch lead to the handlebar.
[P] To carburetor.



PERIODIC INSPECTION AND ADJUSTMENT

INTRODUCTION

This chapter includes all information necessary to perform recommended inspections and adjustments. These preventive maintenance procedures, if followed, will ensure more reliable vehicle operation and a longer service life. The need for costly overhaul work will be greatly reduced. This information applies to vehicles already in service as well as new vehicles that are being prepared for sale. All service technicians should be familiar with this entire chapter.

PERIODIC MAINTENANCE/LUBRICATION INTERVALS

Unit: km

ITEM	REMARKS	BREAK-IN 1,000	EVERY	
			6,000 or 6 months	12,000 or 12 months
Valve	Check valve clearance. Adjust if necessary.	EVERY 24,000		
Spark plugs	Check condition. Clean or replace if necessary.	○	○	○
Air filter	Clean. Replace if necessary.		○	○
Carburetor*	Check idle speed/synchronization/starter operation. Adjust if necessary.	○	○	○
Fuel line*	Check fuel hose for cracks or damage. Replace if necessary.		○	○
Engine oil	Replace (Warm engine before draining).	○	○	○
Engine oil filter*	Replace.	○		○
Final gear oil	Check oil level/oil leakage. Replace every 24,000 or 24 months.	Replace	○	○
Brakes*	Check operation/fluid leakage (see NOTE). Correct if necessary.		○	○
Clutch	Check operation. Adjust if necessary.		○	○
Rear arm pivot*	Check rear arm assembly for looseness. Correct if necessary. Moderately repack every 24,000 or 24 months.***			○
Rear suspension link pivots	Check operation. Apply grease lightly every 24,000 or 24 months.***			○
Wheels*	Check balance/damage/runout. Replace if necessary.		○	○
Wheel bearings*	Check bearings assembly for looseness/damage. Replace if damaged.		○	○
Steering bearings*	Check bearings assembly for looseness. Correct if necessary. Moderately repack every 24,000 or 24 months.**	○		○
Front forks*	Check operation/oil leakage. Repair if necessary.		○	○
Rear shock absorber*	Check operation/oil leakage. Repair if necessary.		○	○
Fittings/Fasteners*	Check all chassis fittings and fasteners. Correct if necessary.	○	○	○
Centerstand and sidestand*	Check operation. Repair if necessary.	○	○	○
Sidestand switch*	Check operation. Clean or replace if necessary.	○	○	○

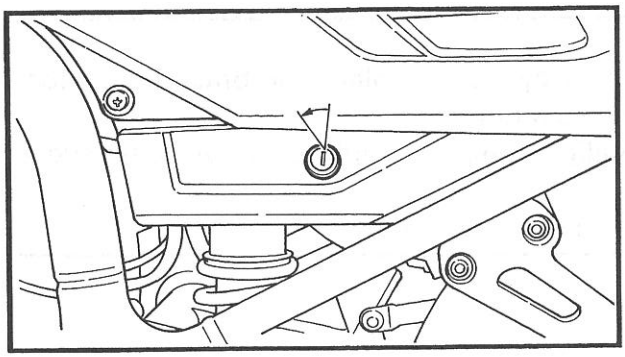
*: It is recommended that these items be serviced by a Yamaha dealer.
**: Medium weight wheel bearing grease. (bearing type)
***: Molybdenum disulfide grease.

INSP/ADJ

NOTE:

Brake fluid replacement:

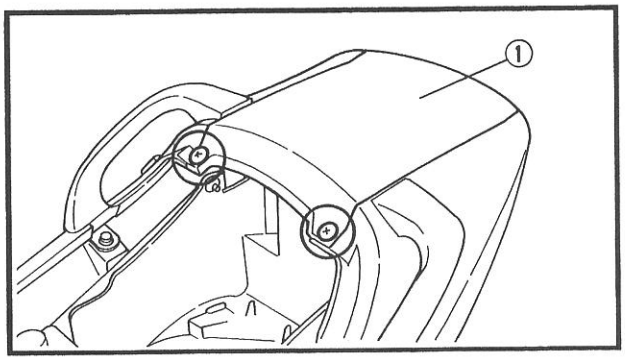
1. When disassembling the master cylinder or caliper cylinder, replace the brake fluid. Normally check the brake fluid level and add the fluid as required.
2. On the inner parts of the master cylinder and caliper cylinder, replace the oil seals every two years.
3. Replace the brake hoses every four years, or if cracked or damaged.



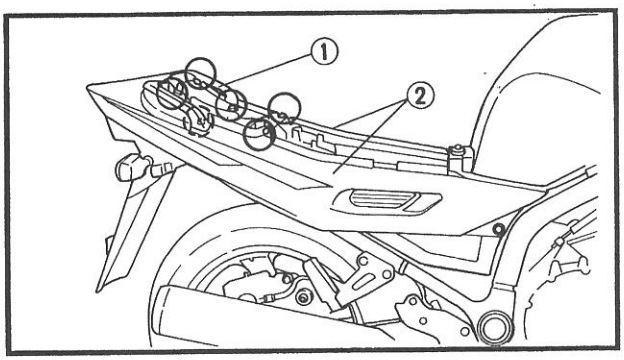
SIDE COVER, FUEL TANK AND COWLING

REMOVAL

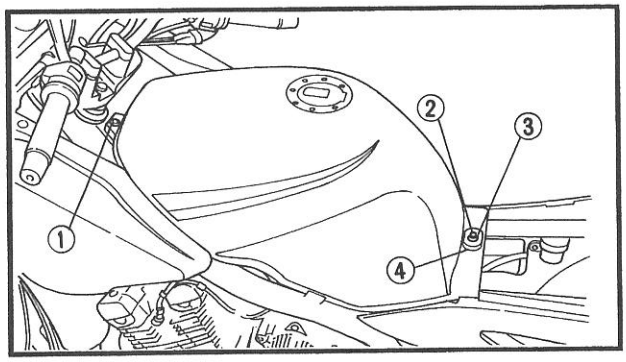
1.Remove:
- Seat



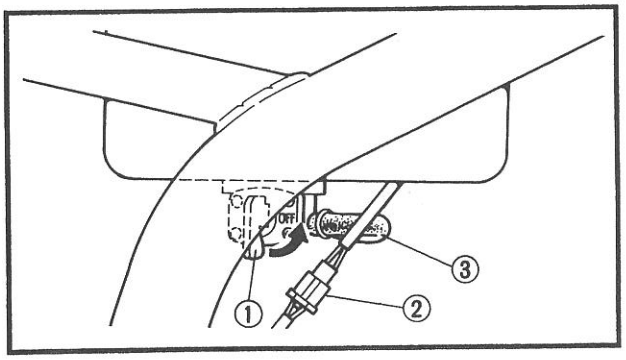
2.Remove:
- Tail cover ①



3.Remove:
- Grab bars (left and right) ①
- Side covers (left and right) ②



4.Remove:
- Bolt ①
- Bolt ②
- Plate ③
- Damper rubber ④



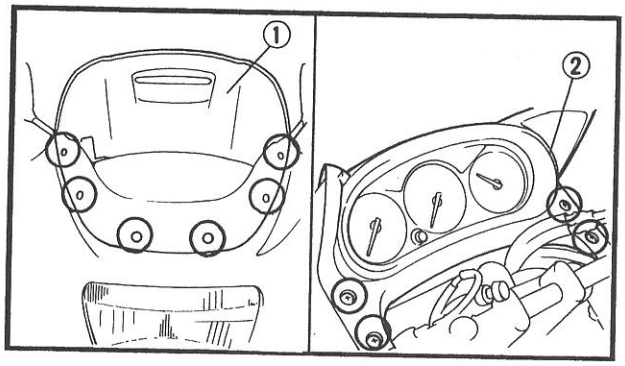
5.Turn the fuel cock ① to "OFF".
6.Disconnect:
- Fuel sender coupler ②
- Fuel hose ③

⚠ WARNING

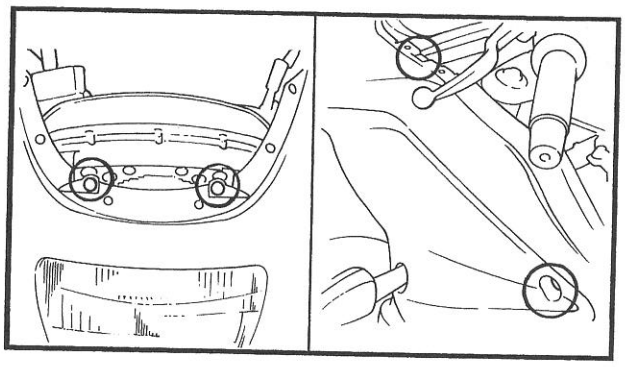
Gasoline is highly flammable.
Avoid spilling fuel on the hot engine.

NOTE:
Place a rag under the fuel hose to avoid spilling fuel.

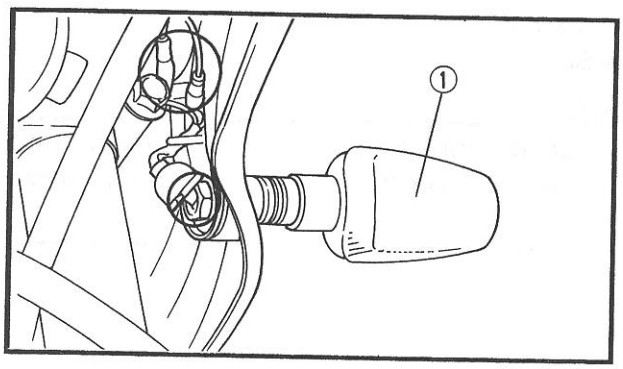
7.Remove:
- Fuel tank



8.Remove:
- Screws
- Windscreen ①
- Rubber plugs
- Inner cover ②



9.Remove:
- Bolts



10.Disconnect:
- Flasher light lead (front)

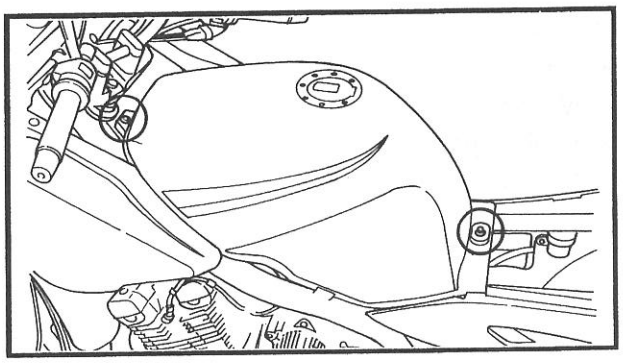
11.Remove:
- Flasher light (front) ①

12.Disconnect:
- Head light lead

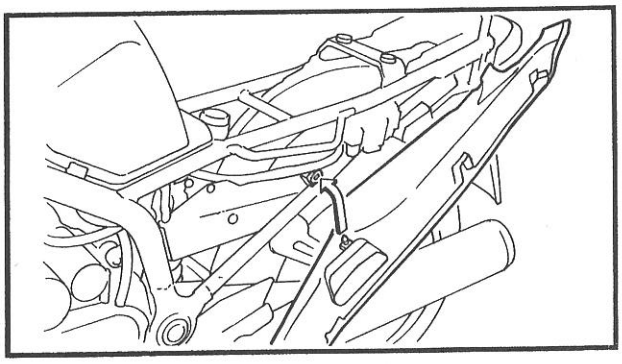
13.Remove:
- Cowling

INSTALLATION

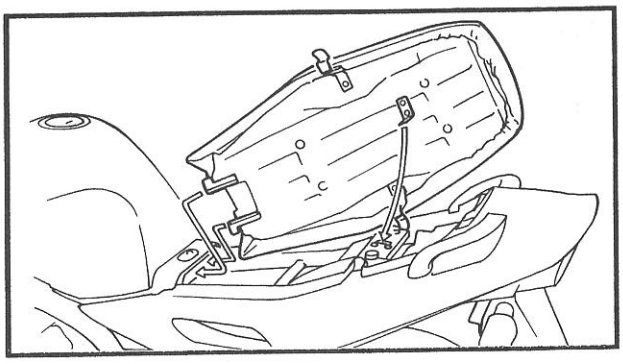
Reverse the "REMOVAL" procedure.
Note the following points.



1.Install:
- Fuel tank



2.Install:
- Side covers



3.Install:
- Seat

NOTE:
Insert the lobes on the front of the seat into the bracket on the frame, then push down the seat end.

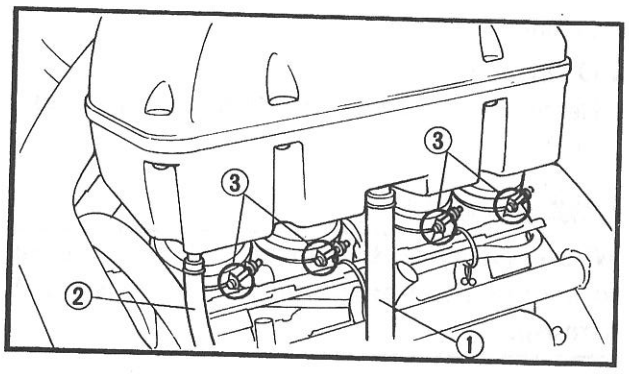
ENGINE

VALVE CLEARANCE ADJUSTMENT

NOTE:
- The valve clearance should be adjusted when the engine is cool to the touch.
- The piston must be at Top Dead Center (T.D.C.) on compression stroke to check or adjust the valve clearance.

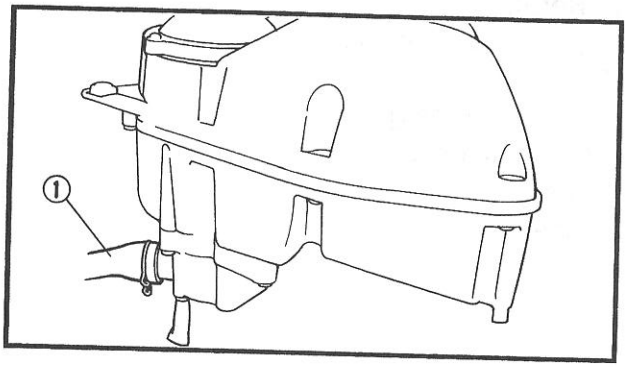
1.Remove:
- Seat
- Fuel tank
- Cowling

Refer to "SIDE COVER, FUEL TANK AND COWLING".

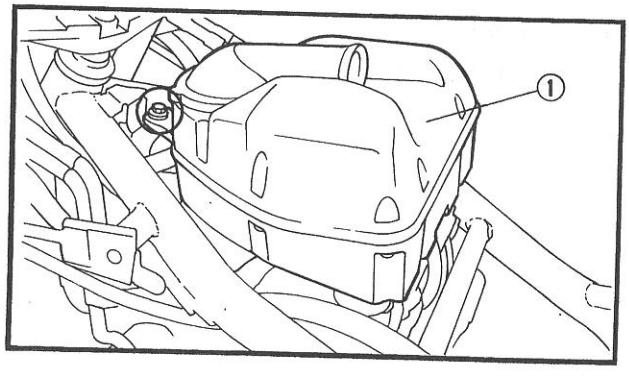


2.Disconnect:
- Breather hose ①
- Drain hose ②

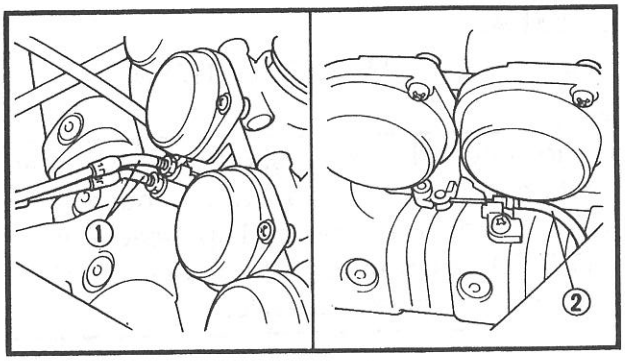
3.Loosen:
- Screws ③



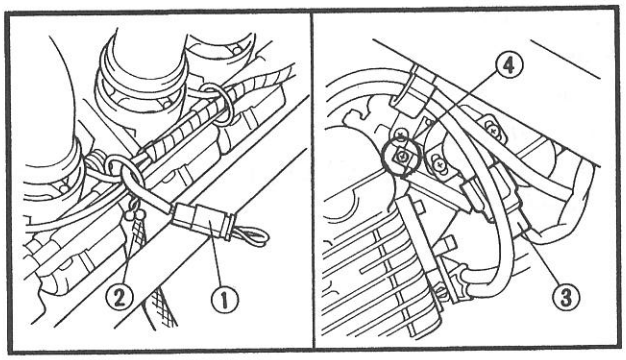
4.Disconnect:
- Hose (air filter case - air cut valve) ① (from air filter case)



5.Remove:
- Air filter case ①



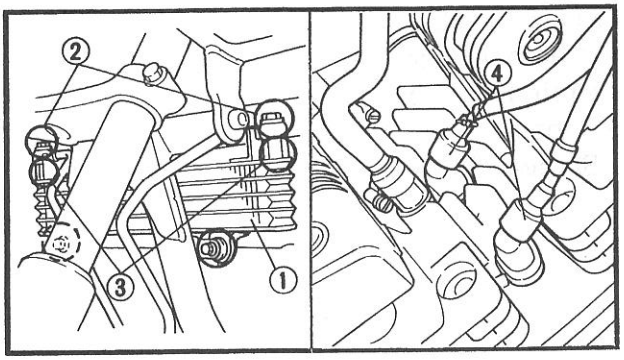
6.Disconnect:
- Throttle cables ①
- Starter choke cable ②



7.Disconnect:
- Carburetor heater coupler ①
- Fuel hose ②
- TPS (throttle position sensor) coupler ③

8.Loosen:
- Screws (carburetor - joint) ④

9.Remove:
- Carburetor assembly

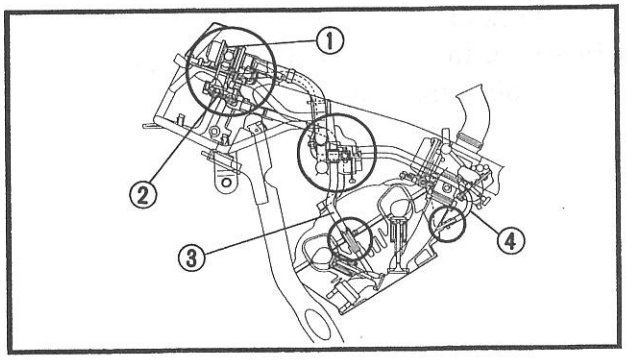


10.Remove:
- Oil cooler ①

  Refer to "ENGINE REMOVAL" in CHAPTER 4.

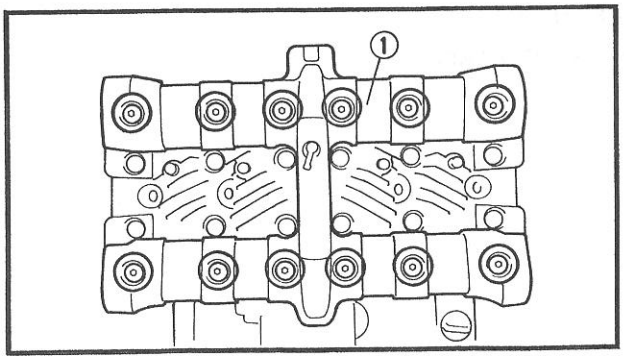
CAUTION:

When removing the union bolt ②, be sure to secure the hexagonal part ③ to stop it turning.

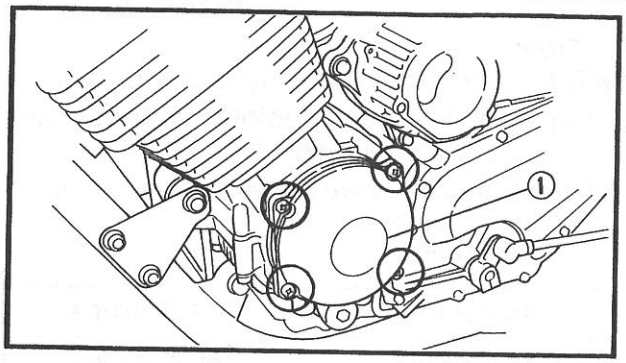


11.Remove:
- Spark plug caps ④

12.Remove:
- Air cut valves ①
- Reed valves ②
- Pipes ③
- Hose ④



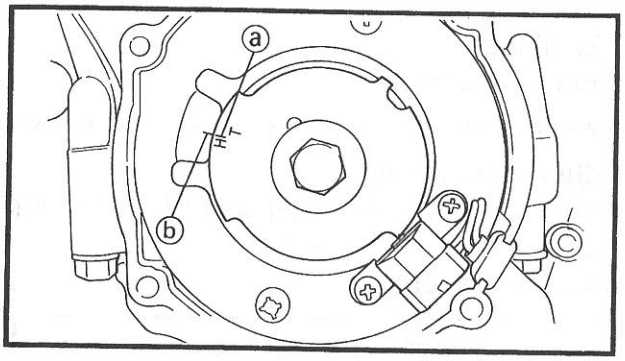
13.Remove:
- Cylinder head cover ①



14.Remove:
- Timing plate cover ①

15.Check:
- Valve clearance
  Out of specification → Adjust.

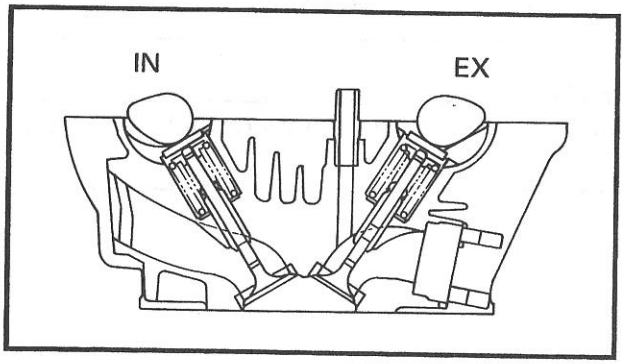
Valve clearance (cold):
Intake valve:
0.11 ~ 0.15 mm
Exhaust valve:
0.16 ~ 0.20 mm

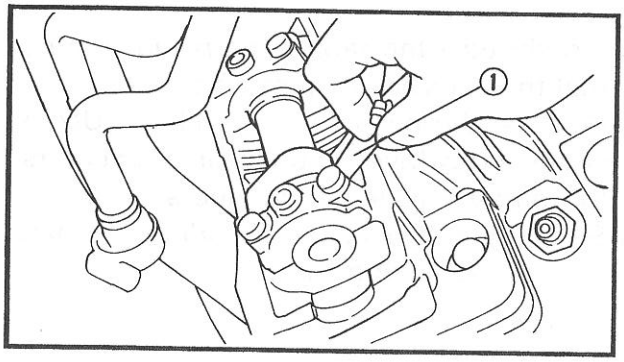


****

Checking steps:
- Turn the crankshaft counterclockwise with a wrench.
- Align the TDC mark ⓐ with the align mark ⓑ when #1 piston is at TDC on compression stroke.

NOTE:
TDC on compression stroke can be found when the cam lobes are opposite each other as shown.

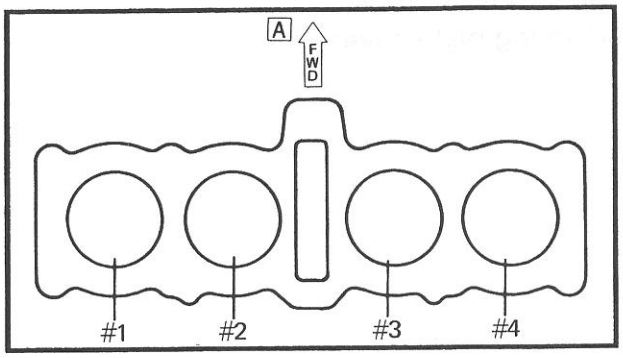


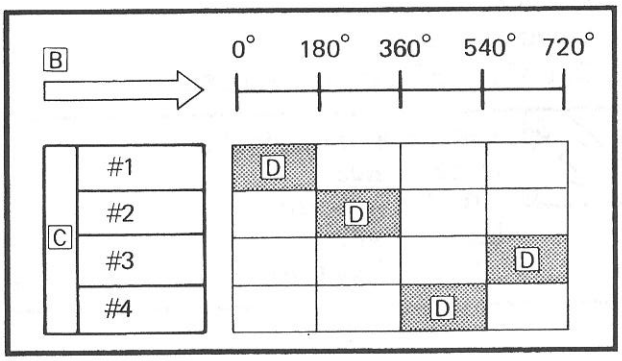


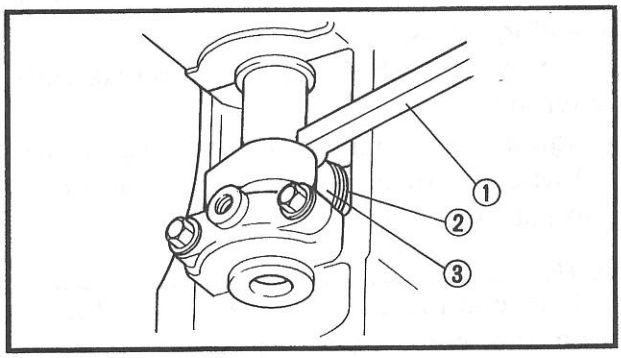
- Measure the valve clearance using a feeler gauge ①.

NOTE:
- Record the measured reading if the clearance is incorrect.
- Measure the valve clearance in the following sequence.

Measuring sequence:
#1 → #2 → #4 → #3







A Front

- Turn the crankshaft by the number of degrees indicated below counterclockwise from #1 cylinder TDC.

B Crankshaft counterclockwise turning angle
C Cylinder number
D Combustion

#2 Cylinder	**180 degrees**
#4 Cylinder	**360 degrees**
#3 Cylinder	**540 degrees**

****

16. Adjust:
- Valve clearance

****

Adjustment steps:
- Position the valve lifter slots (intake and exhaust) opposite each other.
- Attach the tappet adjusting tool ①.

	Tappet adjusting tool: P/N 90890-04125

NOTE:
Make sure the tool only contacts the lifter ②, not the pad ③.

- Slowly turn the tappet adjusting tool so that the pads can be removed.
- Remove the pads from the lifters. Use a small screwdriver and a pair of tweezers for removal. Note pad numbers.
- Select the proper valve adjusting pad from the following chart.

INTAKE

MEASURED CLEARANCE	INSTALLED PAD NUMBER
0.00 ~ 0.05	200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.06 ~ 0.10	200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310
0.11 ~ 0.15	STANDARD CLEARANCE
0.16 ~ 0.20	205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.21 ~ 0.25	210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.26 ~ 0.30	215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.31 ~ 0.35	220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.36 ~ 0.40	225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.41 ~ 0.45	230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.46 ~ 0.50	235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.51 ~ 0.55	240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.56 ~ 0.60	245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.61 ~ 0.65	250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.66 ~ 0.70	255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.71 ~ 0.75	260 265 270 275 280 285 290 295 300 305 310 315 320
0.76 ~ 0.80	265 270 275 280 285 290 295 300 305 310 315 320
0.81 ~ 0.85	270 275 280 285 290 295 300 305 310 315 320
0.86 ~ 0.90	275 280 285 290 295 300 305 310 315 320
0.91 ~ 0.95	280 285 290 295 300 305 310 315 320
0.96 ~ 1.00	285 290 295 300 305 310 315 320
1.01 ~ 1.05	290 295 300 305 310 315 320
1.06 ~ 1.10	295 300 305 310 315 320
1.11 ~ 1.15	300 305 310 315 320
1.16 ~ 1.20	305 310 315 320
1.21 ~ 1.25	310 315 320
1.26 ~ 1.30	315 320
1.31 ~ 1.35	320

VALVE CLEARANCE (cold):
0.11 ~ 0.15 mm
Example: Installed is 250
Measured clearance is 0.23 mm
Replace 250 pad with 260 pad
Pad number: (example)
Pad No. 250 = 2.50 mm
Pad No. 260 = 2.60 mm
Always install pad with number down.

EXHAUST

MEASURED CLEARANCE	INSTALLED PAD NUMBER
0.00 ~ 0.05	200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.06 ~ 0.10	200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305
0.11 ~ 0.15	200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310
0.16 ~ 0.20	STANDARD CLEARANCE
0.21 ~ 0.25	205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.26 ~ 0.30	210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.31 ~ 0.35	215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.36 ~ 0.40	220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.41 ~ 0.45	225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.46 ~ 0.50	230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.51 ~ 0.55	235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.56 ~ 0.60	240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.61 ~ 0.65	245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.66 ~ 0.70	250 255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.71 ~ 0.75	255 260 265 270 275 280 285 290 295 300 305 310 315 320
0.76 ~ 0.80	260 265 270 275 280 285 290 295 300 305 310 315 320
0.81 ~ 0.85	265 270 275 280 285 290 295 300 305 310 315 320
0.86 ~ 0.90	270 275 280 285 290 295 300 305 310 315 320
0.91 ~ 0.95	275 280 285 290 295 300 305 310 315 320
0.96 ~ 1.00	280 285 290 295 300 305 310 315 320
1.01 ~ 1.05	285 290 295 300 305 310 315 320
1.06 ~ 1.10	290 295 300 305 310 315 320
1.11 ~ 1.15	295 300 305 310 315 320
1.16 ~ 1.20	300 305 310 315 320
1.21 ~ 1.25	305 310 315 320
1.26 ~ 1.30	310 315 320
1.31 ~ 1.35	315 320
1.36 ~ 1.40	320

VALVE CLEARANCE (cold):
0.16 ~ 0.20 mm
Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 265 pad
Pad number: (example)
Pad No. 250 = 2.50 mm
Pad No. 265 = 2.65 mm
Always install pad with number down.

Pad range		Pad availability: 25 increments
No. 200 ~ No. 320	2.00 mm ~ 3.20 mm	Pads are stepped in 0.05 mm increments

NOTE:
Thickness of each pad is marked on the pad face that contacts the valve lifter (not the cam).

- Round off the hundredths digit of the original pad number to the nearest 0.05 mm increment.

Hundredths digit	Rounded value
0 or 2	0
5	(NOT ROUNDED OFF)
8	10

EXAMPLE:
Original pad number = 248 (2.48 mm)
Rounded off digit = 250

NOTE:
Pads can only be selected in 0.05 mm increments.

- Locate the previously installed pad number on the chart. Locate the measured valve clearance on the chart. The point where these coordinates intersect is the new pad number.

NOTE:
Use the new pad number as a guide only if the number must be verified.

- Install the new pad with the numbered side down.
- Remove the adjusting tool.

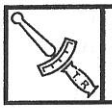
- Recheck the valve clearance.
- If the clearance is incorrect, repeat all of the clearance adjustment steps until the specified clearance is obtained.

****

17.Install:
- All removed parts

NOTE:
Install all removed parts in reversed order of their removal. Note the following points.

18.Install:
- Timing plate cover



Screw (timing plate cover):
8 Nm (0.8 m • kg)

19.Install:
- Cylinder head cover
- Spark plugs

Bolt (cylinder head cover):
10 Nm (1.0 m • kg)
Spark plug:
18 Nm (1.8 m • kg)

20.Install:
- Oil cooler

CAUTION:
When installing the union bolt, be sure to secure the hexagonal part to stop it turning.

Nut (oil cooler - frame):
10 Nm (1.0 m • kg)
Bolt (oil cooler - oil pipe):
32 Nm (3.2 m • kg)

CARBURETOR SYNCHRONIZATION

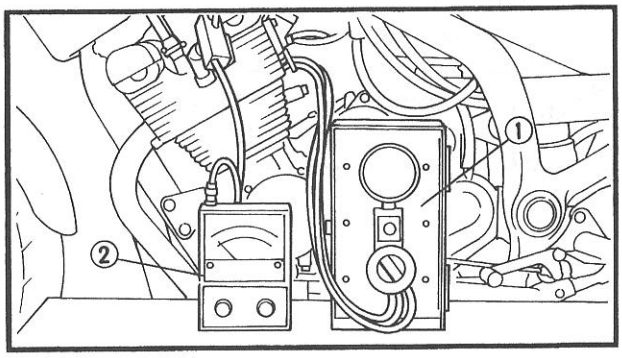
NOTE:
Valve clearance and idling speed should be adjusted properly before synchronizing the carburetors.

1.Place the motorcycle on a level surface.

NOTE:
Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.

2.Remove:
- Seat
- Fuel tank
  Refer to "SIDE COVER, FUEL TANK AND COWLING".

3.Attach:
- Adapters
- Vacuum gauge ①
- Inductive tachometer ②
  (to #1 spark plug lead)



Vacuum gauge:
90890-03094
Adapter:
90890-03060
Inductive tachometer:
90890-03113

4.Start the engine and let it warm up for several minutes.

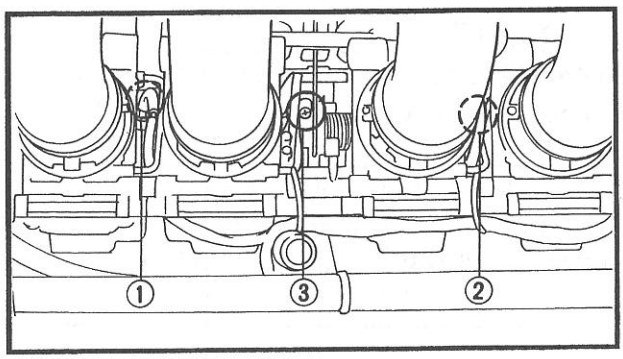
5.Check:
- Engine idling speed
  Out of specification → Adjust.
  Refer to "IDLING SPEED ADJUSTMENT".

Engine idling speed:
950 ~ 1,050 r/min

6.Adjust:
- Carburetor synchronization

****

Adjustment steps:
- Synchronize carburetor #1 to carburetor #2 by turning synchronizing screw ① until both gauges read the same.
- Race the engine for less than a second, two or three times and check the synchronization again.



- Repeat the above steps to synchronize carburetor #4 to carburetor #3 by turning synchronizing screw ② until both gauges read the same.
- Repeat the same steps to synchronize carburetor #2 to carburetor #3 by turning synchronizing screw ③ until both gauges read the same.

Vacuum pressure at idle speed:
30.3 ~ 32.9 kPa (230 ~ 250 mm Hg)

NOTE:
The difference between both carburetors should be 1.33 kPa (10 mm Hg) or less.

****

7. Check:
- Engine idling speed
  Out of specification → Adjust.

8. Stop the engine and detach the measuring equipment.

9. Adjust:
- Throttle cable free play.
  Refer to "THROTTLE CABLE ADJUSTMENT".

Free play:
3 ~ 5 mm
At throttle grip flange

10. Install:
- Fuel tank
- Seat
  Refer to "SIDE COVER, FUEL TANK AND COWLING".

IDLING SPEED ADJUSTMENT

NOTE:
The carburetor synchronization should be adjusted properly before adjusting the idling speed.

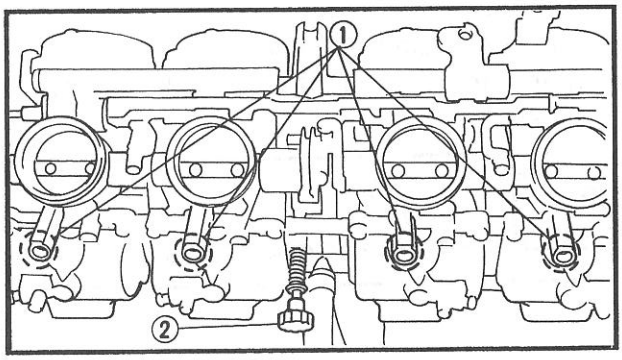
1. Start the engine and let it warm up for several minutes.

2. Attach:
- Inductive tachometer
  (to the #1 spark plug lead)

	Inductive tachometer: 90890-03113

3. Check:
- Engine idling speed
  Out of specification → Adjust.

	Engine idling speed: 950 ~ 1,050 r/min



4. Adjust:
- Engine idling speed

****

Adjustment steps:
- Turn the pilot screw ① until it is lightly seated.
- Turn out the pilot screw for the specified number of turns.

	Carburetor angle driver: 90890-03158

Pilot screw: 1-1/2 turns out

- Turn the throttle stop screw ② in or out until specified idling speed is obtained.

Turning in → Idling speed increased.
Turning out → Idling speed decreased.

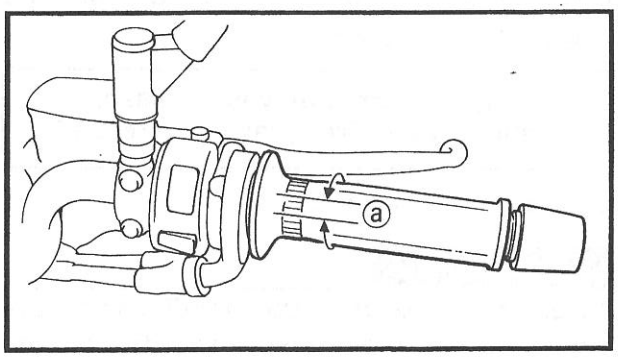
****

5.Adjust:
- Throttle cable free play
  Refer to "THROTTLE CABLE ADJUSTMENT".

Free play:
3 ~ 5 mm
At throttle grip flange

THROTTLE CABLE ADJUSTMENT

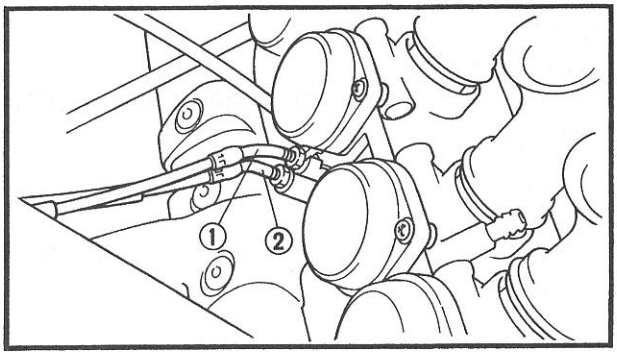
NOTE:
Engine idling speed and carburetor synchronization should be adjusted properly before adjusting the throttle cable free play.



1.Check:
- Throttle cable free play ⓐ
  Out of specification → Adjust.

Free play:
3 ~ 5 mm
At throttle grip flange

2.Remove:
- Seat
- Fuel tank
  Refer to "SIDE COVER, FUEL TANK AND COWLING".
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT".

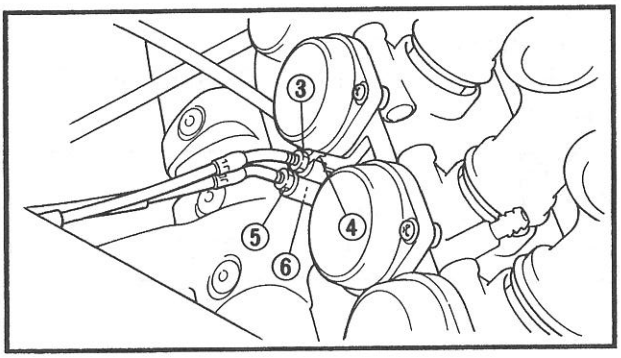


3.Adjust:
- Throttle cable free play

****

Adjustment steps:

NOTE:
When accelerating, throttle cable #1 ① is pulled and throttle cable #2 ② is pushed.



First step:
- Loosen the locknut ③ on throttle cable #2.
- Turn the adjuster ④ in or out until all slack is removed from throttle cable #2.

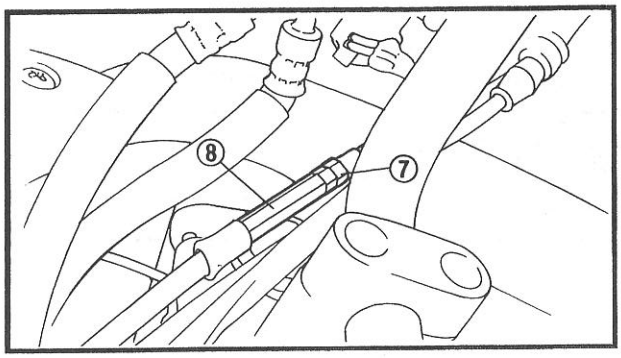
Second step:
- Loosen the locknut ⑤ on throttle cable #1.
- Turn the adjuster ⑥ in or out until the specified free play is obtained.

Turning in → Free play is increased.
Turning out → Free play is decreased.

- Tighten the locknuts.

NOTE:
If the free play can not be adjusted here, adjust it at the throttle grip side of the cable.

Final step:
- Loosen the locknut ⑦.
- Turn the adjuster ⑧ in or out until the specified free play is obtained.



Turning in → Free play is increased.
Turning out → Free play is decreased.

- Tighten the locknut.

⚠ WARNING

After adjusting, turn the handlebar to the right and left, making sure that the engine idling speed does not change.

****

4.Install:
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT".
- Fuel tank
- Seat
  Refer to "SIDE COVER, FUEL TANK AND COWLING".

SPARK PLUG INSPECTION

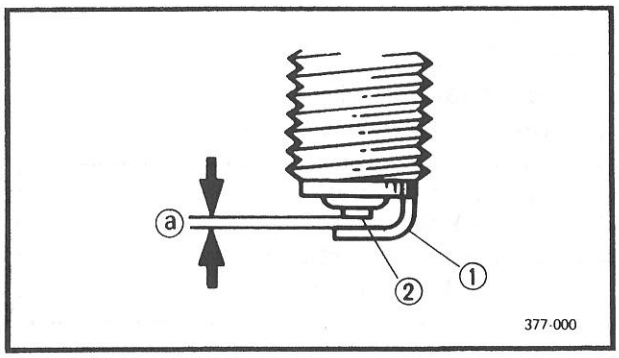
1.Remove:
- Spark plug caps
- Spark plugs

CAUTION:

Before completely removing the spark plug, use compressed air to clean the cylinder head cover areas to prevent dirt from falling into the engine.

2.Inspect:
- Spark plug type
  Incorrect → Replace.

Standard spark plug:
DPR8EA-9 (NGK)
X24EPR-U9 (NIPPONDENSO)



3.Inspect:
- Electrode ①
  Wear/Damage → Replace.
- Insulator ②
  Abnormal color → Replace.
  Normal color is a medium-to-light tan color.

4.Clean:
- Spark plug
  (with spark plug cleaner or wire brush)

5.Measure:
- Spark plug gap ⓐ
  Use a wire gauge.
  Out of specification → Re-gap.

Spark plug gap:
0.8 ~ 0.9 mm

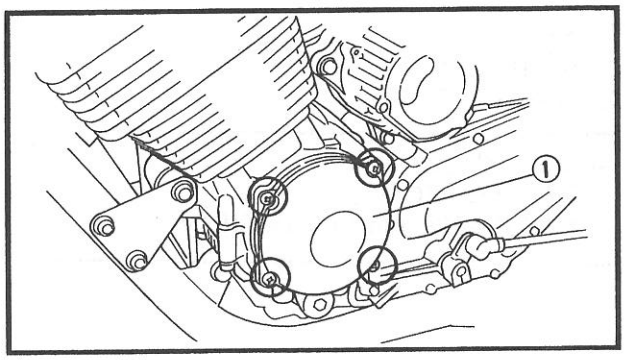
6.Install:
- Spark plug

Spark plug:
18 Nm (1.8 m • kg)

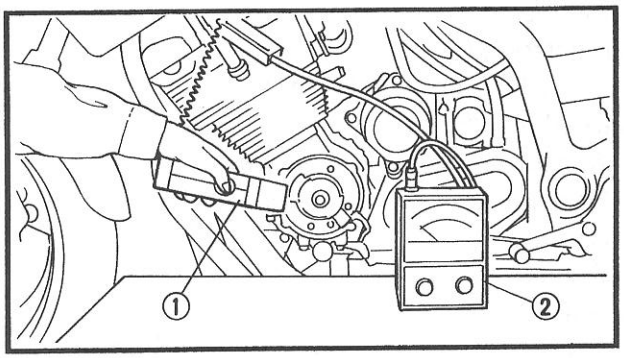
NOTE:
Before installing a spark plug, clean the gasket surface and plug surface.

IGNITION TIMING CHECK

NOTE:
Carburetor synchronization, engine idle speed and throttle cable free play should be adjusted properly before checking the ignition timing.



1.Remove:
- Timing plate cover ①



2.Attach:
- Timing light ①
- Inductive tachometer ②
  (to the #1 spark plug lead)

Timing light:
90890-03141
Inductive tachometer:
90890-03113

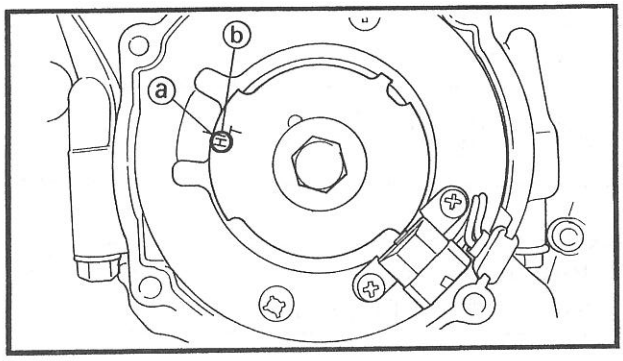
3.Check:
- Ignition timing

****

Checking steps:

- Start the engine and let it warm up for several minutes. Let the engine run at the specified speed.

Engine speed:
950 ~ 1,050 r/min



- Visually check the align mark ⓐ to verify it is within the required firing range ⓑ indicated on the timing plate.
  Incorrect firing range → Check timing plate and/or pickup assembly.

****

4.Install:
- Timing plate cover

COMPRESSION PRESSURE MEASUREMENT

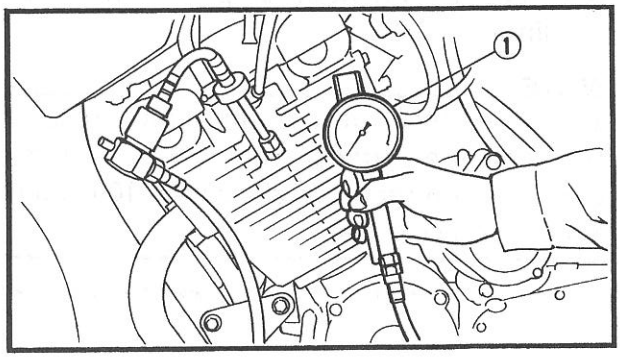
NOTE:
Insufficient compression pressure will result in performance loss.

1.Check:
- Valve clearance
  Out of specification → Adjust.
  Refer to "VALVE CLEARANCE ADJUSTMENT".

2.Start the engine and let it warm up for several minutes.
3.Stop the engine.

4.Remove:
- Spark plug caps
- Spark plugs

CAUTION:
Before completely removing the spark plug, use compressed air to clean the cylinder head cover areas to prevent dirt from falling into the engine.



5.Attach:
- Compression gauge ①

Compression gauge:
90890-03081
Adapter:
90890-04082

6. Measure:
- Compression pressure

Above the maximum pressure:
Inspect the cylinder head, valve surfaces, and piston crown for carbon deposits.

Below the minimum pressure:
Squirt a few drops of oil into the affected cylinder and measure again.

- Refer to the table below.

Compression pressure (with oil applied into cylinder)	
Reading	**Diagnosis**
Higher than without oil	**Worn or damaged pistons → Repair**
Same as without oil	**Defective ring(s), valves, cylinder head gasket or piston is possible → Repair**

Compression pressure (at sea level):
Standard:
1,200 kPa (12 kg/cm², 12 bar)
Minimum:
1,000 kPa (10 kg/cm², 10 bar)
Maximum:
1,400 kPa (14 kg/cm², 14 bar)

****

Measurement steps:
- Crank over the engine with the throttle wide-open until the reading on the compression gauge stabilizes.

⚠ WARNING

Before cranking the engine, ground all spark plug leads to prevent sparking.

- Repeat the previous steps for the other cylinders.

NOTE:
The difference of compression pressure between the highest and lowest cylinder compression readings should be 100 kPa (1 kg/cm², 1bar) or less.

****

7.Install:
- Spark plugs
- Spark plug caps

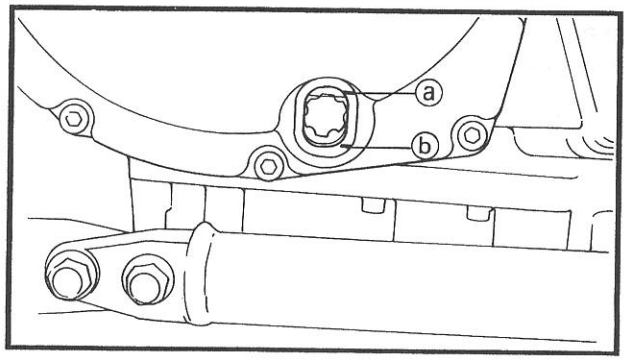
	Spark plug: **18 Nm (1.8 m • kg)**

ENGINE OIL LEVEL INSPECTION

NOTE:
Position the motorcycle straight up when inspecting the oil level.

1.Place the motorcycle on a level surface.

NOTE:
Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.



2.Inspect:
- Oil level
  Oil level should be between maximum ⓐ and minimum ⓑ marks.
  Oil level low → Add oil to proper level.

	Recommended oil: **SAE 20W40 type SE motor oil**

NOTE:
Recommended oil classification: API Service "SE", "SF" and "SG" type or equivalent (e.g. "SF-SE", "SF-SE-CC", "SF-SE-SD" etc.).

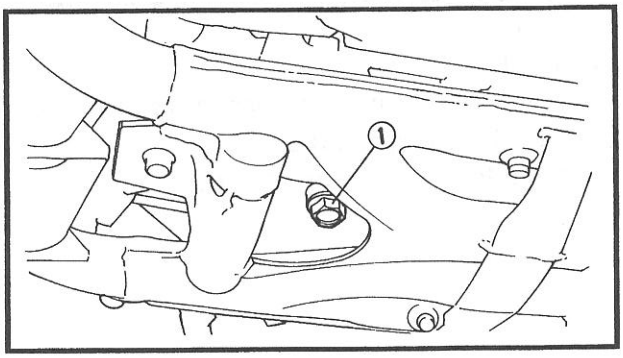
CAUTION:
- **Do not add any chemical additives. Engine oil also lubricates the clutch and additives could cause clutch slippage.**
- **Do not allow foreign material to enter the crankcase.**

3.Start the engine and let it warm up for several minutes.
4.Stop the engine and inspect the oil level once again.

NOTE:
Wait a few minutes until the oil settles before inspecting the oil level.

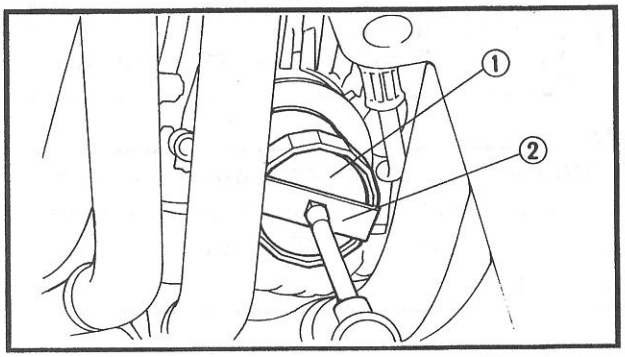
ENGINE OIL REPLACEMENT

1.Start the engine and let it warm up for several minutes.
2.Stop the engine and place an oil pan under the drain bolt.



3.Remove:
- Oil filler plug
- Drain bolt ①

Drain the crankcase of its oil.



4.If the oil filter is to be replaced during this oil change, remove the following parts and reinstall them.

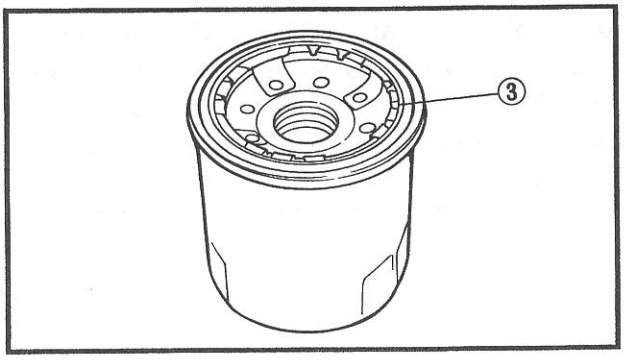
****

Replacement steps:

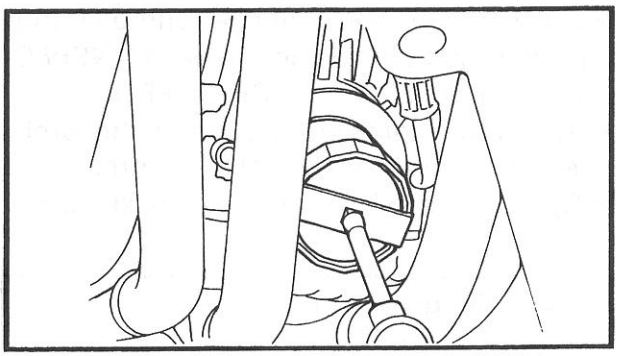
- Remove the oil filter ① using the oil filter wrench ②.

	**Oil filter wrench:** **90890-01426**

- Apply engine oil to the O-ring ③ of the new oil filter.



NOTE:
Make sure the O-ring ③ is positioned correctly.



● Tighten the oil filter using the oil filter wrench.

	Oil filter: **17 Nm (1.7 m • kg)**

****

5. Install:
• Drain bolt

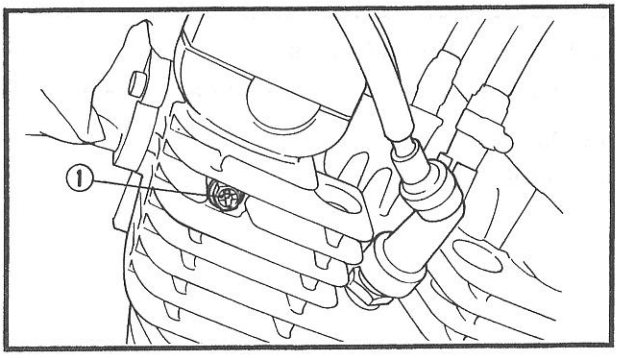
	Drain bolt: **43 Nm (4.3 m • kg)**

NOTE:
Check the gasket (drain plug). If damaged, replace it with a new one.

6. Fill:
• Crankcase
Refer to "ENGINE OIL LEVEL INSPECTION".

	Oil quantity: **Total amount:** **4.4 L** **Periodic oil change:** **3.2 L** **With oil filter replacement:** **3.4 L**

7. Install:
• Oil filler plug
8. Warm up the engine for a few minutes, then stop the engine.
9. Inspect:
• Engine (for oil leaks)
• Oil level



10. Check:
• Oil pressure

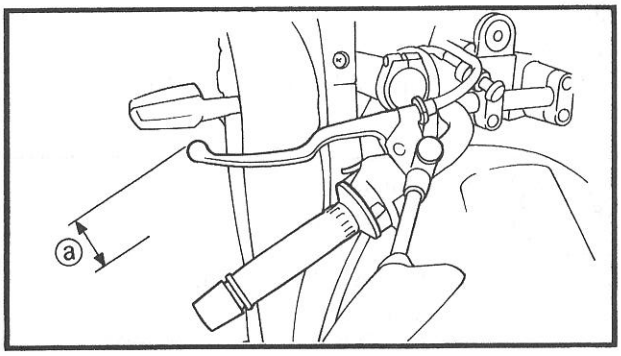
****

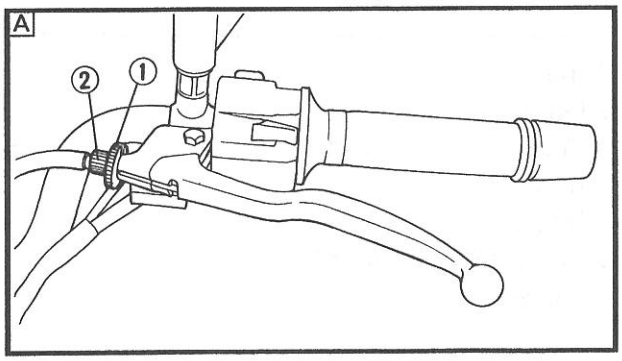
Checking steps:
● Slightly loosen the oil gallery bolt ①.
● Start the engine and keep it idling until oil starts to seep from the oil gallery bolt. If no oil comes out after one minute, turn the engine off so it will not seize.

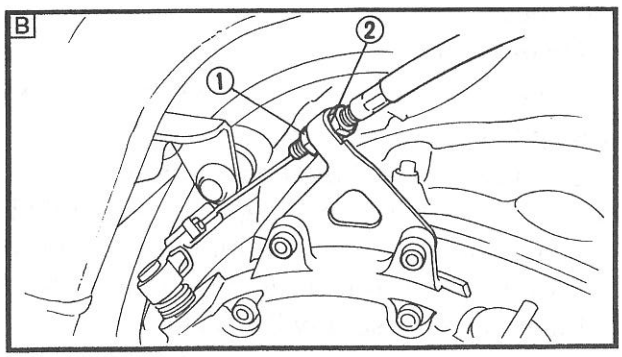
- Check oil passages, oil filter and oil pump for damage or leakage. Refer to "INSPECTION AND REPAIR" in CHAPTER 4.
- Start the engine after solving the problem(s) and recheck the oil pressure.
- Tighten the oil gallery bolt to specification.

Oil gallery bolt:
8 Nm (0.8 m • kg)

****







CLUTCH ADJUSTMENT

1. Check:
- Clutch cable free play ⓐ
  Out of specification → Adjust.

Free play:
10 ~ 15 mm
At clutch lever end

2. Adjust:
- Clutch cable free play

****

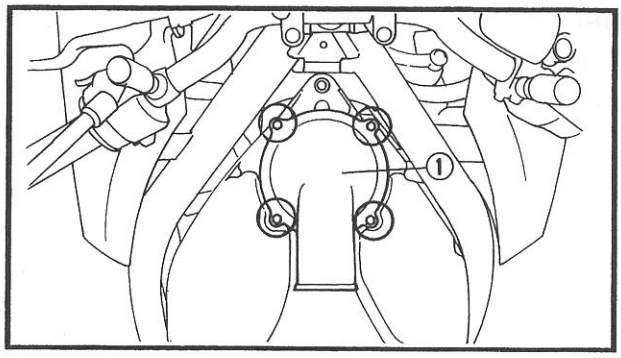
Adjustment steps:
- Loosen the locknut(s) ①.
- Turn the adjuster(s) ② in or out until the specified free play is obtained.

Turning in → Free play is increased.
Turning out → Free play is decreased.

- Tighten the locknut(s).

****

A Handlebar side
B Engine side



AIR FILTER CLEANING

1.Remove:
- Seat
- Fuel tank

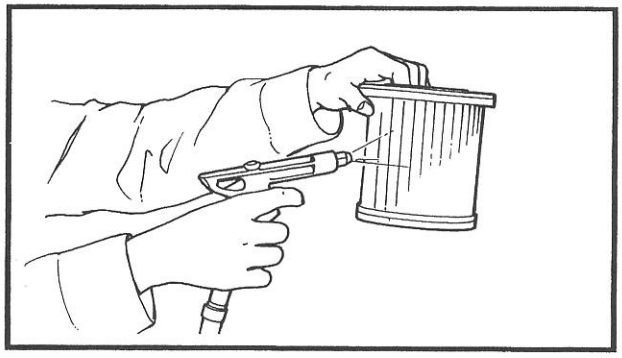
  Refer to "SIDE COVER, FUEL TANK AND COWLING".

2.Remove:
- Air filter case cover ①

3.Remove:
- Air filter element

CAUTION:

Never operate the engine with the air filter element removed. Unfiltered air will cause rapid wear of engine parts and possible engine damage. Additionally, operation without the filter element will affect carburetor tuning with subsequent poor performance and possible engine overheating.



4.Inspect:
- Air filter element

  Damage → Replace.

5.Clean:
- Air filter element

  Blow out the dust in the outer surface of the element with compressed air.

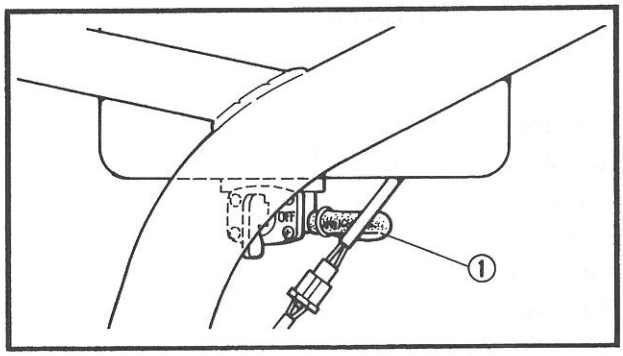
6.Install:
- Air filter element
- Air filter case cover

NOTE:

When installing the element in its case, be sure its sealing surface matches the sealing surface of the case so there is no air leak.

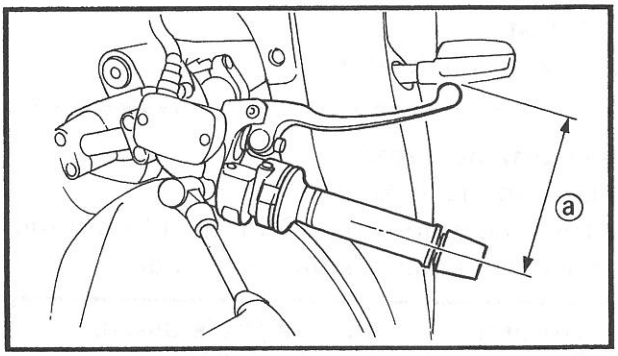
7.Install:
- Fuel tank
- Seat

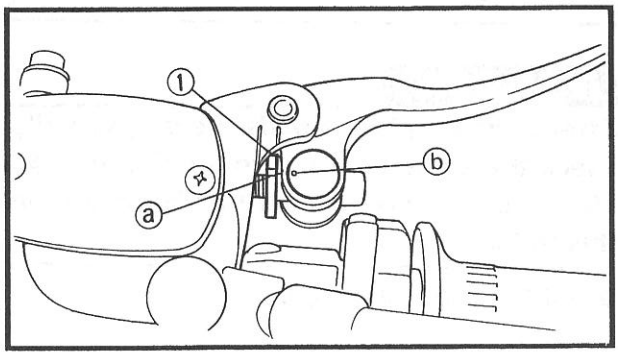
  Refer to "SIDE COVER, FUEL TANK AND COWLING".



FUEL LINE INSPECTION

1. Inspect:
   - Fuel hose ①





CHASSIS

FRONT BRAKE LEVER POSITION ADJUSTMENT

1. Adjust:
- Brake lever position
  (distance ⓐ from handle grip to front brake lever)

****

Adjustment steps:
- Push the brake lever forward.
- Turn the adjuster ① in or out.

Turning in → Distance is smaller.
Turning out → Distance is largest.

- Align the mark ⓐ on the adjuster with the mark ⓑ on the lever.

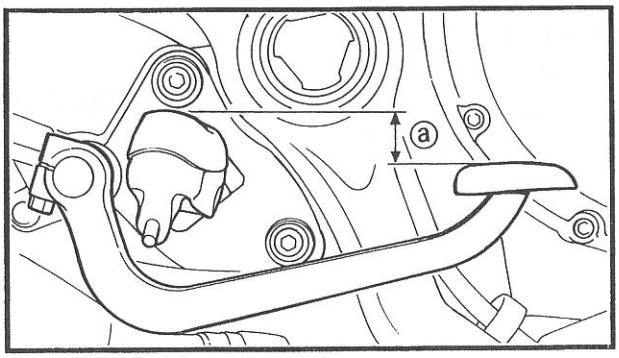
****

CAUTION:

Make sure that the brake does not drag after adjusting it.

⚠ WARNING

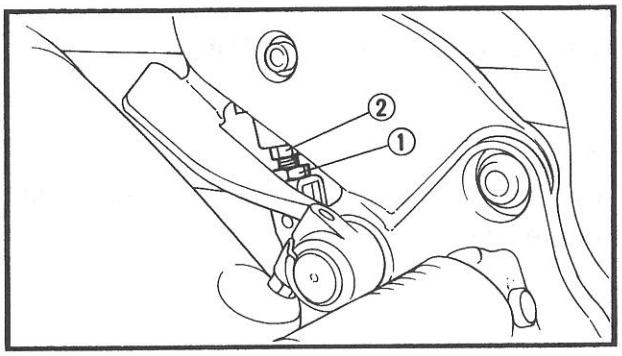
A soft spongy feeling in the brake lever can indicate the presence of air in the brake system. This air must be removed by bleeding the brake system before the motorcycle is operated. Air in the system will cause greatly diminished braking capacity and can result in loss of control and an accident. Inspect and bleed the system if necessary.

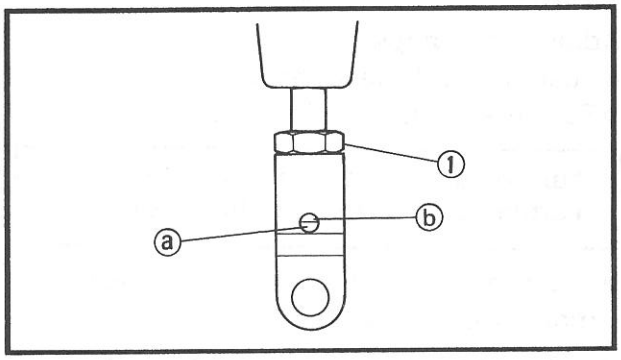


REAR BRAKE ADJUSTMENT

1. Check:
- Brake pedal height ⓐ
  Out of specification → Adjust.

Brake pedal height:
30 mm
Below top of footrest





2.Adjust:
- Brake pedal height

****

Adjustment steps:
- Loosen the locknut(s) ①.
- Turn the adjuster(s) ② in or out until the specified pedal height is obtained.

Turning in → Pedal height is down.
Turning out → Pedal height is up.

⚠ WARNING

After adjusting brake pedal height, visually check the adjuster end through the hole ⓐ. The adjuster end ⓑ must be visible within this hole.

- Tighten the locknut ①.

CAUTION:

Make sure that the brake does not drag after adjusting it.

⚠ WARNING

A soft or spongy feeling in the brake pedal can indicate the presence of air in the brake system. This air must be removed by bleeding the brake system before the motorcycle is operated. Air in the system will cause greatly diminished braking capability and can result in loss of control and an accident. Inspect and bleed the system if necessary.

****

3.Adjust:
- Brake light switch

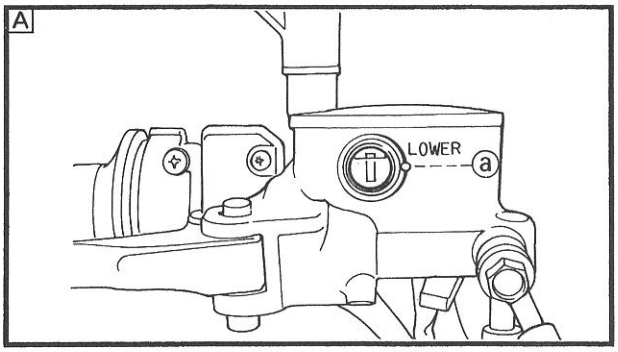
Refer to "BRAKE LIGHT SWITCH ADJUSTMENT".

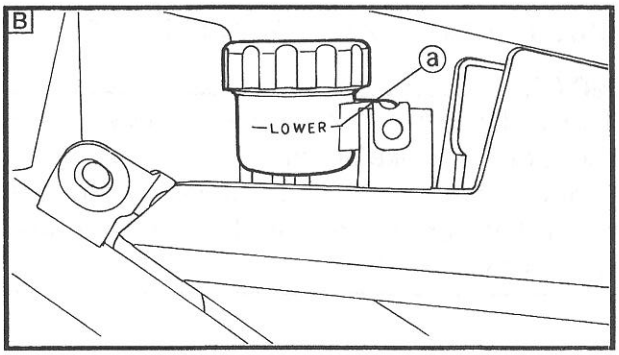
BRAKE FLUID LEVEL INSPECTION

NOTE:
Position the motorcycle straight up when inspecting the fluid level.

1. Place the motorcycle on a level surface.

NOTE:
Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.





2. Inspect:
- Fluid level
  Fluid level is under "LOWER" level line ⓐ
  → Fill to proper level.

Recommended fluid:
DOT #4

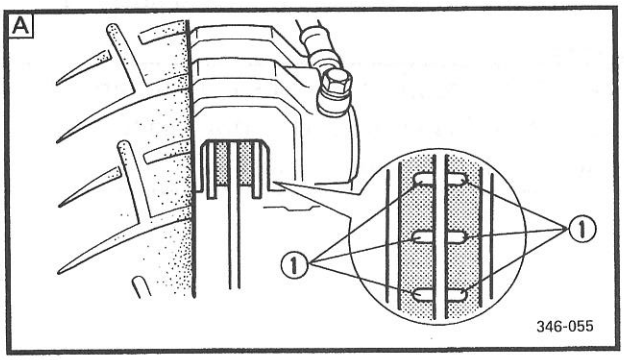
A Front brake
B Rear brake

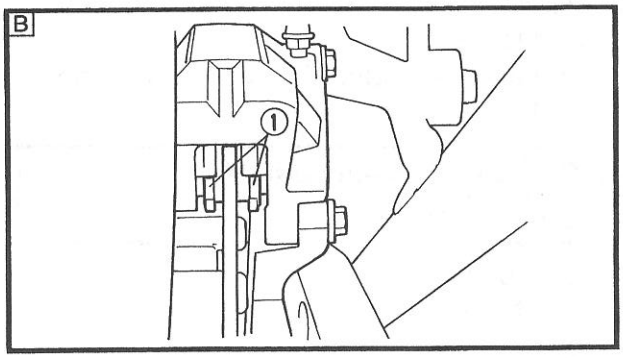
NOTE:
When inspecting the fluid level in the reservoir on the handlebar, make sure the master cylinder top is horizontal.

CAUTION:
Brake fluid may corrode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

⚠ WARNING
- **Use only the designated quality fluid. Otherwise, the rubber seals may deteriorate causing leakage and poor brake performance.**
- **Refill with the same type of fluid. Mixing fluids may result in a harmful chemical reaction leading to poor brake performance.**

- **Be careful that water does no enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and could cause vapor lock.**





BRAKE PAD INSPECTION

1. Activate the brake lever or brake pedal.
2. Inspect:
- Brake pad (front)
- Brake pad (rear)

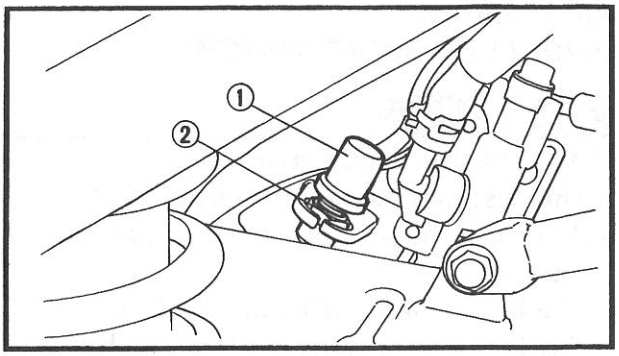
Wear indicator ① almost contacting the brake disc → Replace brake pad as a set. Refer to "FRONT AND REAR BRAKE" in CHAPTER 6.

[A] Front
[B] Rear

BRAKE LIGHT SWITCH ADJUSTMENT

NOTE:
The brake light switch is operated by movement of the brake pedal.
Proper adjustment is achieved when the brake light comes on just before the brake begins to take effect.

1. Check:
- Brake light operation timing
  Incorrect → Adjust.



2.Adjust:
- Brake light operating timing

****

Adjustment steps:

- Hold the main body ① of the switch with your hand so that it does not rotate, and turn the adjuster ② in or out until the operating timing is correct.

Turning in → Brake light on later.
Turning out → Brake light on sooner.

****

BRAKE HOSE INSPECTION

1.Inspect:
- Brake hoses
  Cracks/Wear/Damage → Replace.

2.Check:
- Brake hose clamp
  Loosen → Tighten.

3.Hold the motorcycle on upright position and apply the front or rear brake.

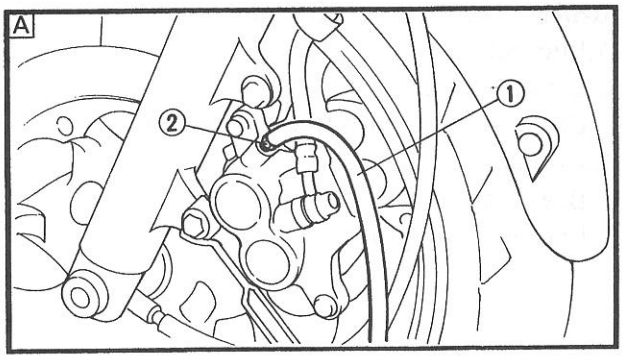
4.Check:
- Brake hoses
  Activate the brake lever or pedal several times.
  Fluid leakage → Replace the hose.
  Refer to "FRONT AND REAR BRAKE" in CHAPTER 6.

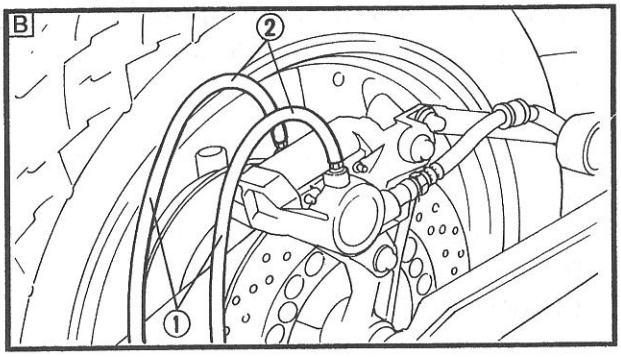
AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)

⚠ WARNING

Bleed the brake system if:
- **The system has been disassembled.**
- **A brake hose has been loosened or removed.**
- **The brake fluid has been very low.**
- **The brake operation has been faulty.**

A loss of braking performance may occur if the brake system is not properly bled.





1. Bleed:
- Brake system

****

Air bleeding steps:

a. Add proper brake fluid to the reservoir.
b. Install the diaphragm. Be careful not to spill any fluid or allow the reservoir to overflow.
c. Connect a clear plastic hose ① tightly to the caliper bleed screw ②.

[A] Front [B] Rear

d. Place the other end of the hose into a container.
e. Slowly apply the brake lever or pedal several times.
f. Pull the lever in or push down on the pedal. Hold the lever or pedal in position.
g. Loosen the bleed screw and allow the lever or pedal to travel towards its limit.
h. Tighten the bleed screw when the lever or pedal limit has been reached, then release the lever or pedal.
i. Repeat steps (e) to (h) until all air bubbles have disappeared from the fluid.
j. Tighten the bleed screw.

	Bleed screw: **6 Nm (0.6 m • kg)**

NOTE:
If bleeding is difficult, it may be necessary to let the brake fluid settle for a few hours. Repeat the bleeding procedure when the tiny bubbles in the system have disappeared.

k.Add brake fluid to proper level.
Refer to "BRAKE FLUID LEVEL INSPECTION".

⚠ WARNING
Check the operation of the brake after bleeding the brake system.

****

FINAL GEAR OIL LEVEL INSPECTION

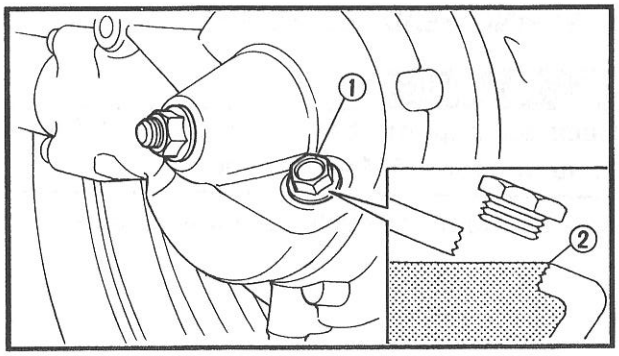
NOTE:
Position the motorcycle straight up when inspecting the oil level.

1.Place the motorcycle on a level surface.

NOTE:
Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the engine.

2.Remove:
- Oil filler bolt ①

3.Inspect:
- Oil level
  Oil level should be up to bottom brim ② of hole.
  Oil level low → Add oil to proper level.

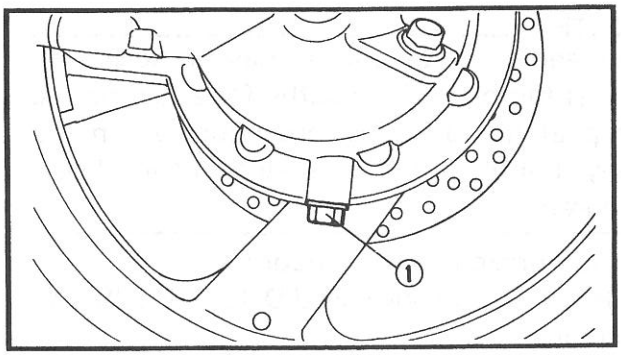


Recommended oil:
SAE 80 API "GL-4" Hypoid gear oil
If desired, an SAE 80W90 hypoid gear oil may be used for all conditions.

NOTE:
"GL-4" is a quality and additive rating. "GL-5" or "GL-6" rated hypoid gear oils may also be used.

4.Install:
- Oil filler bolt

Oil filler bolt:
23 Nm (2.3 m • kg)



FINAL GEAR OIL REPLACEMENT

1.Place an oil pan under the final gear case.
2.Remove:
- Oil filler bolt
- Drain plug ①

Drain the final gear case of its oil.

3.Install:
- Drain plug

	Drain plug: **23 Nm (2.3 m • kg)**

NOTE:
Check the gasket (drain plug). If damaged, replace it with a new one.

4.Fill:
- Final gear case

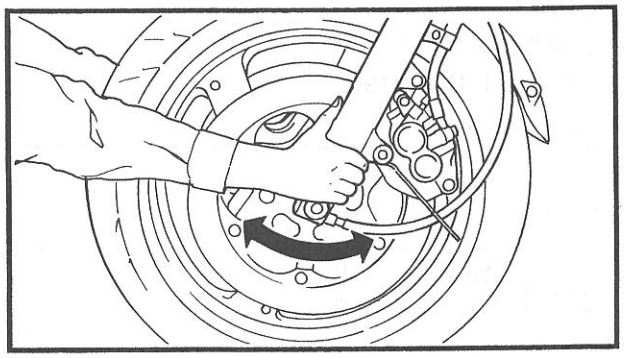
	Oil quantity: **0.2 L**

Refer to "FINAL GEAR OIL LEVEL INSPECTION".

STEERING HEAD INSPECTION

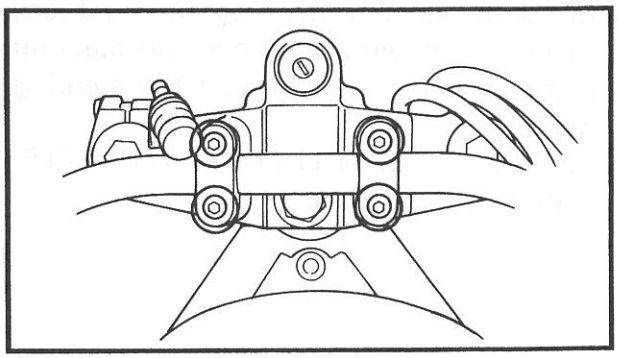
⚠ WARNING
Securely support the motorcycle so there is no danger of it falling over.

1.Place the motorcycle on a level place.

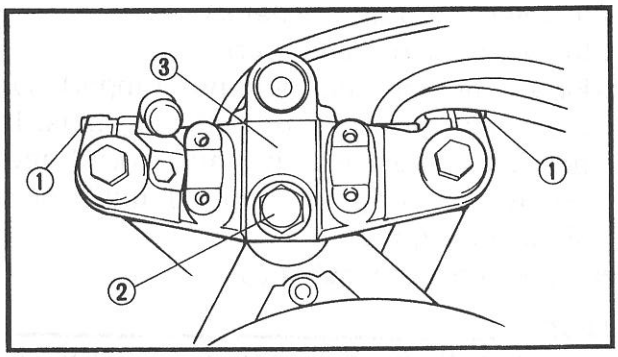


2.Elevate the front wheel by placing a suitable stand under the exhaust pipe.
3.Check:
- Steering assembly bearings

Grasp the bottom of the front forks and gently rock the fork assembly back and forth.
Looseness → Adjust the steering head.

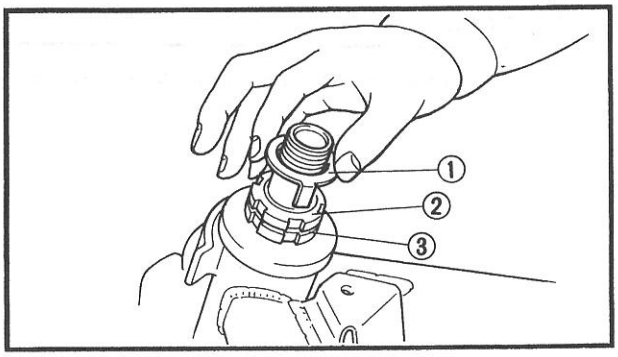


4.Remove:
- Handlebar



5.Loosen:
- Pinch bolts ①

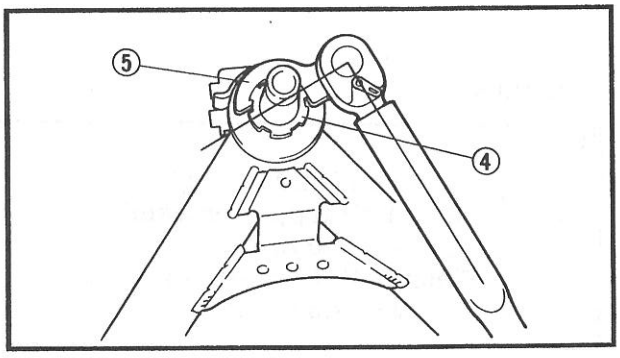
6.Remove:
- Nut ②
- Upper bracket ③



7.Adjust:
- Steering head

****

Adjustment steps:
- Remove the special washer ①, ring nut ② (upper) and rubber washer ③.
- Loosen the ring nut (lower) ④.
- Tighten the ring nut (lower) using the ring nut wrench ⑤.



NOTE:
Set the torque wrench to the ring nut wrench so that they form a right angle.

	**Ring nut wrench: 90890-01403**
	**Ring nut (lower): (initial tightening): 52 Nm (5.2 m • kg)**

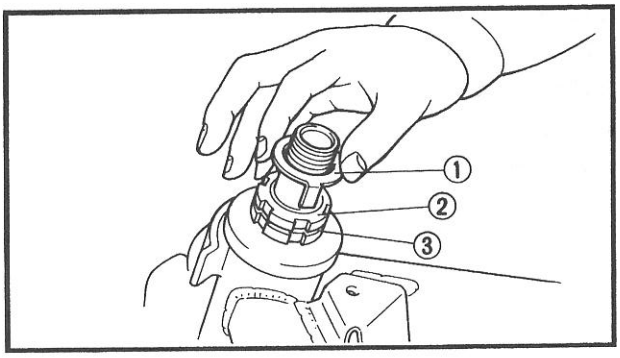
- Loosen the ring nut (lower) ④ completely, then retighten it to specification.

⚠ WARNING

Do not overtighten.

	**Ring nut (lower): (final tightening): 18 Nm (1.8 m • kg)**

- Check the steering head by turning it lock to lock. If it binds, remove the steering stem assembly and inspect the steering bearings.
  Refer to "STEERING HEAD AND HANDLEBAR" in CHAPTER 6.



- Install the rubber washer ③.
- Install the ring nut (upper) ②.
- Finger tighten the ring nut (upper) ②, then align the slots of both ring nuts. If necessary, hold the ring nut (lower) and tighten the ring nut (upper) until their slots are aligned.
- Install the lock washer ①.

NOTE:
Make sure the lock washer tabs sit correctly in the slots.

****

8.Install:
- Upper bracket
- Handlebar

Nut:
110 Nm (11.0 m • kg)
Pinch bolt (upper bracket):
30 Nm (3.0 m • kg)
Pinch bolt (handlebar holder):
23 Nm (2.3 m • kg)

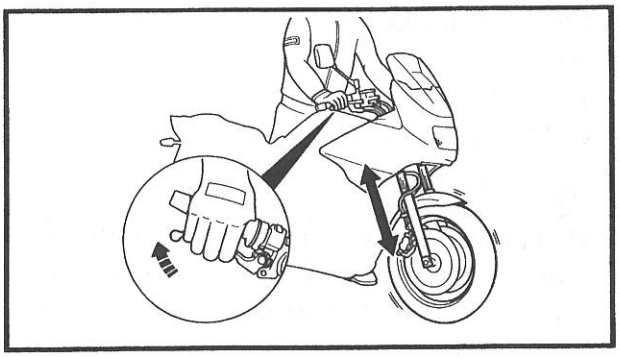
FRONT FORK INSPECTION

⚠ WARNING

Securely support the motorcycle so there is no danger of it falling over.

1. Place the motorcycle on a level place.

2. Check:
   - Inner tube
     Scratches/Damage → Replace.
   - Oil seal
     Excessive oil leakage → Replace.
3. Hold the motorcycle in an upright position and apply the front brake.



4. Check:
   - Operation
     Pump the front fork up and down for several times.
     Unsmooth operation → Repair.
     Refer to "FRONT FORK" in CHAPTER 6.

REAR SHOCK ABSORBER ADJUSTMENT

⚠ WARNING

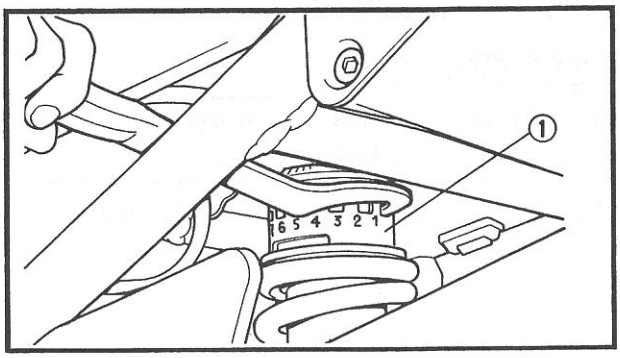
Securely support the motorcycle so there is no danger of it falling over.

Spring preload

1. Adjust:
   - Spring preload

NOTE:

Use the special wrench and extension bar included in the owner's tool kit to adjust.



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Adjustment steps:

- Turn the adjuster ① in or out.

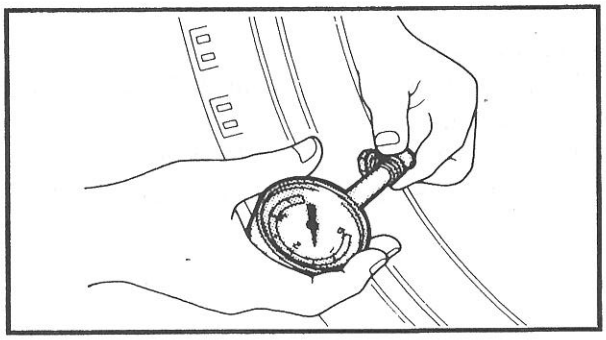
Turning lower number →
Spring preload is softer.
Turning higher number →
Spring preload is harder.

Adjuster position:
Standard: 4
Minimum: 1
Maximum: 7

CAUTION:

Never turn the adjuster beyond the maximum or minimum setting.

****



TIRE INSPECTION

1.Measure:

- Tire pressure
  Out of specification → Adjust.

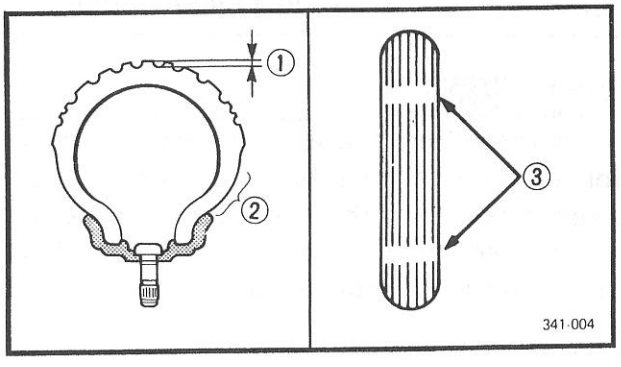
⚠ WARNING

- **Tire inflation pressure should be checked and adjusted when the temperature of the tire equals the ambient air temperature. Tire inflation pressure must be adjusted according to total weight of cargo, rider, passenger, and accessories (fairing, saddlebags, etc. if approved for this model), and vehicle speed.**
- **Proper loading of your motorcycle is important for the handling, braking, and other performance and safety characteristics of your motorcycle. Do not carry loosely packed items that can shift. Securely pack your heaviest items close to the center of the motorcycle, and distribute the weight evenly from side to side. Properly adjust the suspension for your load, and check the condition and pressure of your tires.**

NEVER OVERLOAD YOUR MOTORCYCLE
Make sure the total weight of the cargo, rider, passenger, and accessories (fairing, saddlebags, etc. if approved for this model) does not exceed the maximum load of the motorcycle.
Operation of an overloaded motorcycle could cause tire damage, an accident, or even injury.

Basic weight: With oil and full fuel tank	**265 kg**	
Maximum load*:	**205 kg**	
Cold tire pressure:	**Front**	**Rear**
Up to 90 kg load*	**225 kPa (2.25 kgf/cm², 2.25 bar)**	**250 kPa (2.5 kgf/cm², 2.5 bar)**
90 kg ~ Maximum load*	**250 kPa (2.5 kgf/cm², 2.5 bar)**	**290 kPa (2.9 kgf/cm², 2.9 bar)**
High speed riding	**250 kPa (2.5 kgf/cm², 2.5 bar)**	**290 kPa (2.9 kgf/cm², 2.9 bar)**

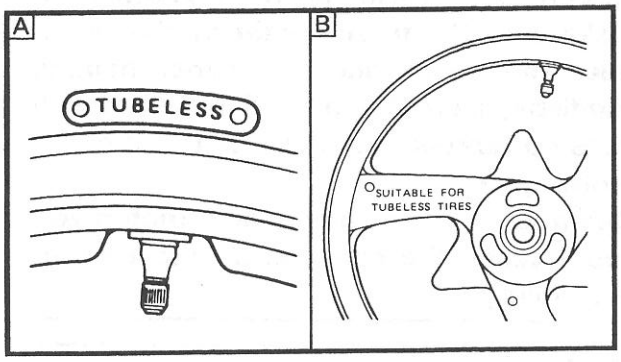
* Load is the total weight of cargo, rider, passenger, and accessories.



2.Inspect:
• Tire surfaces
Wear/Damage → Replace.

Minimum tire tread depth: (front and rear): 1.0 mm

① Tread depth
② Side wall
③ Wear indicator



⚠ WARNING

- **It is dangerous to ride with a worn–out tire. When a tire tread begins to show lines, replace the tire immediately.**
- **Do not use tubeless tires on a wheel designed for tube type tires only. Tire failure and personal injury may result from sudden deflation.**

A Tire B Wheel

Tube type wheel → Tube type tire only.
Tubeless type wheel →
Tube type or tubeless tire.

- **Be sure to install the correct tube when using tube type tires.**

⚠ WARNING

After extensive tests, the tires mentioned below have been approved by Yamaha Motor Co., Ltd. for this model. No guarantee for handling characteristics can be given if a tire combinations other than the approved is used on this motorcycle. The front and rear tires should always be of the same manufacture and design.

FRONT:

Manufacturer	Size	Type
METZELER	120/70-17 58V	ME33
BRIDGESTONE	120/70-17 58V	G601
DUNLOP	120/70-17 58V	K505F

REAR:

Manufacturer	Size	Type
METZELER	150/70-17 69V	ME55A
BRIDGESTONE	150/70-17 69V	G602
DUNLOP	150/70-17 69V	K505

⚠ WARNING

After mounting a tire, ride conservatively for a while to give the tire time to seat itself properly in the rim. Failure to do so could lead to an accident with possible injury to the rider or damage to the motorcycle.

WHEEL INSPECTION

1. Inspect:
- Wheels
  Damage/Bends → Replace.

NOTE:
Always balance the wheel when a tire or wheel has been changed or replaced.

⚠ WARNING
Never attempt to make any repairs to the wheel.

CABLE INSPECTION AND LUBRICATION

⚠ WARNING
Damaged cable sheaths may cause corrosion and interfere with the cable movement. Replace damaged cables as soon as possible.

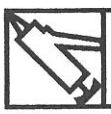
1. Inspect:
- Cable sheath
  Damage → Replace.
2. Check:
- Cable operation
  Unsmooth operation → Lubricate.

Recommended lubricant:
SAE 20W40 motor oil

NOTE:
Hold cable end up and pour a few drops of lubricant into the cable sheath.

LEVER AND PEDAL LUBRICATION

Lubricate levers and pedals at their pivoting points.



Recommended lubricant:
SAE 20W40 motor oil

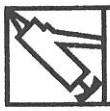
SIDESTAND LUBRICATION

Lubricate the sidestand at pivoting points.

Recommended lubricant:
Lithium soap base grease

CENTERSTAND LUBRICATION

Lubricate the centerstand at pivoting points.

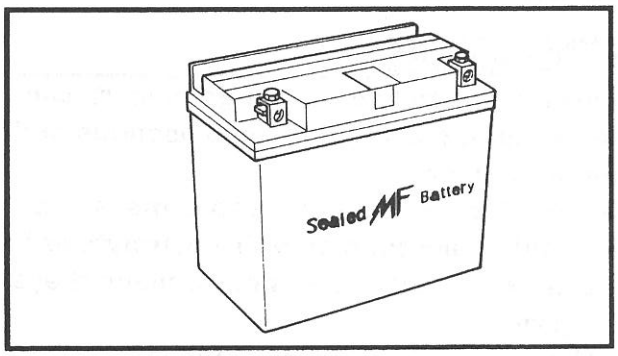


Recommended lubricant:
Lithium soap base grease

REAR SUSPENSION LUBRICATION

Lubricate the rear suspension at pivoting points.

Recommended lubricant:
Molybdenum disulfide grease



ELECTRICAL

BATTERY INSPECTION

NOTE:

Since the MF battery is a sealed type battery, it is not possible to measure the specific gravity of the electrolyte in order to check the state of charge of the battery. Therefore the charge of the battery has to be checked by measuring the voltage at the battery terminals.

CAUTION:

CHARGING METHOD

- **This is a sealed type battery. Never remove the sealing caps. If the sealing caps have been removed, the balancing will not be maintained, and battery performance will deteriorate.**
- **Never add water, as this will affect the chemical reaction in the battery and cause loss of performance.**
- **Charging time, charging current and charging voltage for the MF battery are different from general type batteries. The MF battery should be charged as explained in "CHARGING METHOD". If the battery is overcharged, the electrolyte level will drop considerably. Therefore, take special care when charging the battery.**
- **Never use an electrolyte other than specified. The specific gravity of the MF battery electrolyte is 1.32 at 20°C, whereas the specific gravity of a general type battery electrolyte is 1.28. If electrolyte with a specific gravity lower than 1.32 is used, the concentration of sulfuric acid will decrease, resulting in poor battery performance. If an electrolyte with a specific gravity higher than 1.32 is used, the battery plates will corrode and battery life will be shortened.**

⚠ WARNING

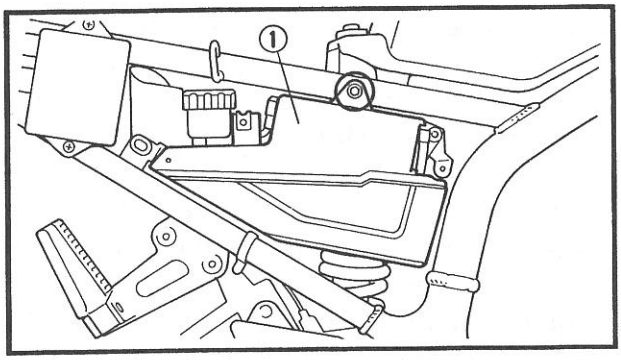
Battery electrolyte is dangerous; it contains sulfuric acid which is poisonous and highly caustic.
Always follow these preventive measures:
- **Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.**
- **Wear protective eye gear when handling or working near batteries.**

Antidote (EXTERNAL):
- **SKIN - Flush with water.**
- **EYES - Flush with water for 15 minutes and get immediate medical attention.**

Antidote (INTERNAL):
- **Drink large quantities of water or milk follow with milk of magnesia, beaten egg, or vegetable oil. Get immediate medical attention.**

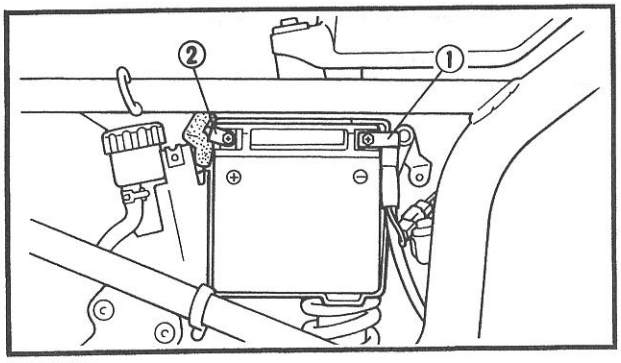
Batteries generate explosive hydrogen gas. Always follow the following preventive measures:
- **Charge batteries in a well-ventilated area.**
- **Keep batteries away from fire, sparks, or open flames (e.g., welding equipment, lighted cigarettes, etc.)**
- **DO NOT SMOKE when charging or handling batteries.**

KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.



1.Remove:
- Side cover (right)
  Refer to "SIDE COVER, FUEL TANK AND COWLING".

2.Remove:
- Cover ①

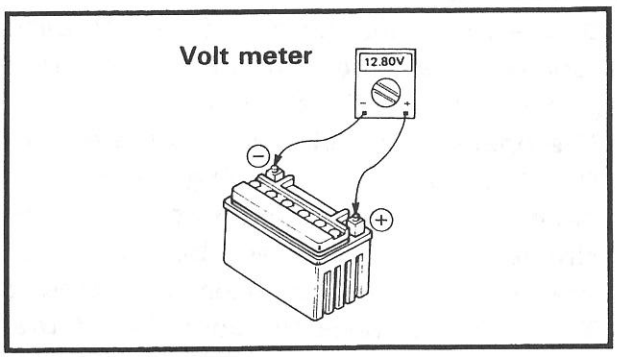


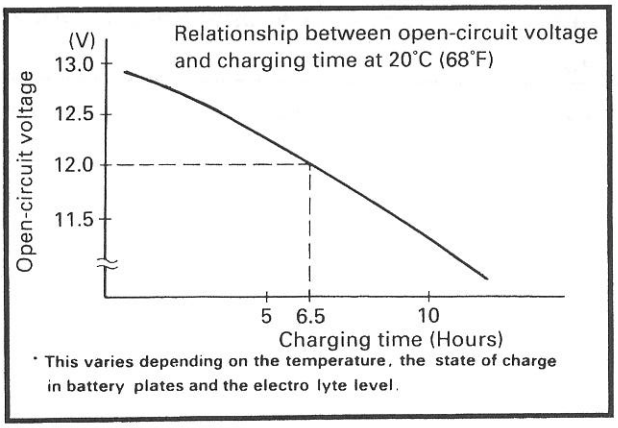
3.Disconnect:
- Battery leads

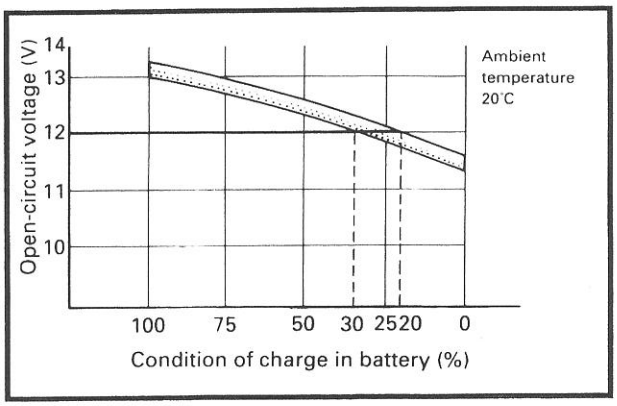
CAUTION:

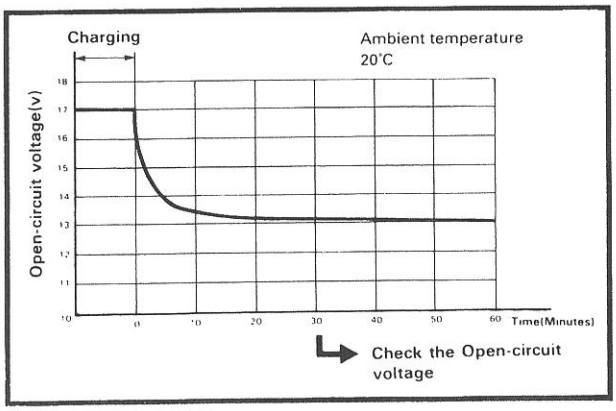
Disconnect the negative lead ① first, then the positive lead ②.

4.Remove:
- Battery









5.Check:
- Battery condition

****

Battery condition checking steps:

- Connect a digital voltmeter to the battery terminals.

Tester (+) lead → Battery (+) terminal **Tester (–) lead → Battery (–) terminal**

NOTE:

The charge state of an MF battery can be checked by measuring the open circuit voltage (i.e. when the positive terminal is disconnected).

Open-circuit voltage	Charging time
12.8V or higher	No charging is necessary.

- Check the condition of the battery using the charts.

Example:

- Open circuit voltage = 12.0V
- Charging time = 6.5 hours
- Charge condition of the battery = 20 ~ 30%
- Charging method of MF batteries

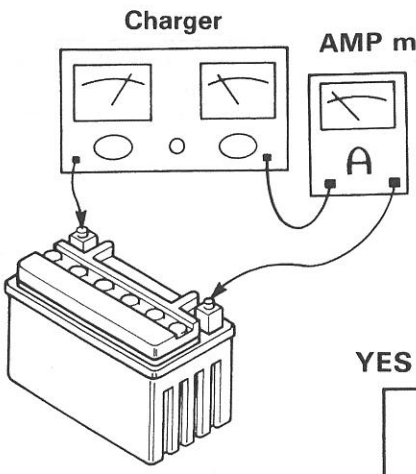
CAUTION:

- **If it is impossible to set the standard charging current, be careful not to overcharge.**
- **When charging the battery, be sure to remove it from the motorcycle. (If charging has to be done with the battery mounted on the motorcycle for some reason, be sure to disconnect the wire at the negative terminal.)**
- **Never remove the sealing caps of an MF battery.**
- **Take care that the charging clips are in a full contact with the terminal and that they are not shorted. (A corroded clip of the charger may cause the battery to generate heat at the contact area. A weak clip spring may cause sparks.)**

- Before removing the clips from the battery terminals, be sure to turn off the power switch of the charger.
- The open-circuit voltage variation of the MF battery after charging is shown below. As shown in the figure, the open-circuit voltage stabilizes about 30 minutes after charging has been completed. Therefore, to check the condition of the battery after charging, wait 30 minutes before measuring the open-circuit voltage.

****

Charging method using a variable-current (voltage) type charger



Measure the open-circuit voltage prior to charging.

NOTE:
Voltage should be measured 30 minutes after the machine is stopped.

Connect a charger and AMP meter to the battery and start charging.

NOTE:
Set the changing voltage at 16-17v. (If the setting is lower, charging will be insufficient. If too high, the battery will be over-charged.)

Make sure the current is higher than the standard charging current written on the battery.

YES

NO

By turning the charging voltage adjust dial, set the charging voltage at 20 - 25 v.

Monitor the amperage for 3-5 minutes to check if the standard charging current is reached.

YES

Adjust the voltage so that current is at standard charging level.

NO

Set the timer according to the charging time suitable for the open-circuit voltae.
Refer to "Battery condition checking steps".

If current does not exceed standard charging current after 5 minutes, replace the battery.

In case that charging requires more than 5 hours, it is advisable to check the charging current after a lapse of 5 hours. If there is any change in the amperage, readjust the voltage to obtain the standard charging current.

Measure the battery open-circuit voltage after having left the battery unused for more than 30 minutes.
12.8 v or more --- Charging is complete.
12.7 v or less --- Recharging is required.
Under 12.0 v --- Replace the battery.

Charging method using a constant-voltage type charger

Measure the open-circuit voltage prior to charging.

NOTE:
Voltage should be measured 30 minutes after the machine is stopped.

Connect a charger and AMP meter to the battery, and start charging.

Make sure the current is higher than the standard charging current written on the battery.

YES

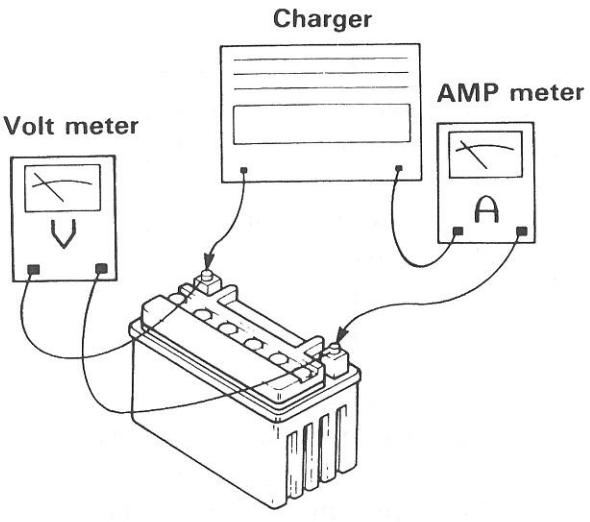
NO

Charge the battery until the battery's charging voltage is 15 volts.

NOTE:
Set the charging time at 20 hours (maximum).

This type of battery charger cannot charge the MF battery. A variable voltage charger is recommended.

Check the open-circuit voltage after having left the battery for 30 minutes after charging.
12.8 v or more---Charging is complete.
12.7 v or less---Recharging is necessary.
Under 12 v---Replace the battery.

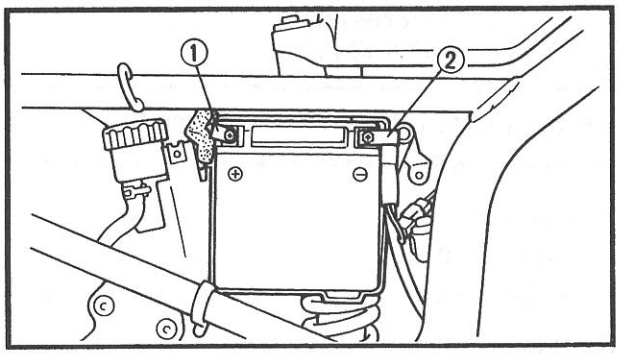


Charging method using a constant current type charger

This type of battery charger cannot charge the MF battery.

6.Inspect:
- Battery terminal
  Dirty → Clean with a wire brush.
  Poor connection → Correct.

NOTE:
After cleaning the terminals, grease them lightly.



7.Install:
- Battery

8.Connect:
- Battery leads

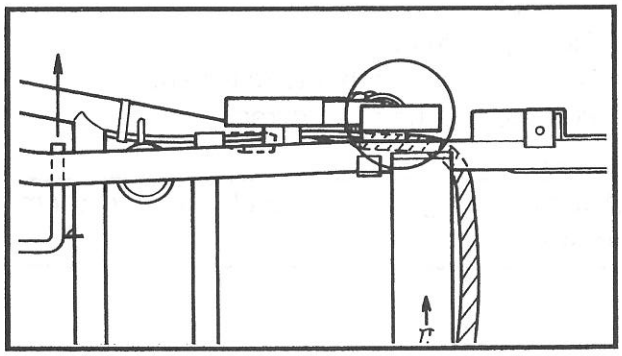
CAUTION:
Connect the positive lead ① first, then the negative lead ②.

9.Install:
- Side cover (right)
  Refer to "SIDE COVER, FUEL TANK AND COWLING".

FUSE INSPECTION

CAUTION:
Always turn off the main switch when checking or replacing the fuse. Otherwise, a short circuit may occur.

1.Remove:
- Side cover (right)
  Refer to "SIDE COVER, FUEL TANK AND COWLING".



2.Inspect:
- Fuses

****

Inspection steps:
- Connect the pocket tester to the fuse and check it for continuity.

NOTE:
Set the tester selector to "Ω × 1".

Pocket tester:
90890-03112

- If the tester indicates ∞, replace the fuse.

****

3.Replace:
- Blown fuse

****

Replacement steps:
- Turn off the ignition.
- Install a new fuse of proper amperage.
- Turn on the switches to verify operation of related electrical devices.
- If the fuse immediately blows again, check the electrical circuit.

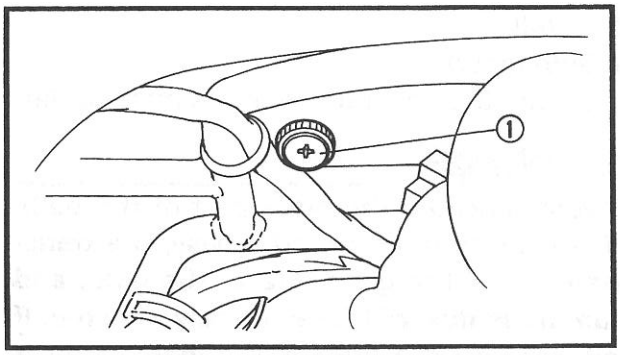
****

Description	Amperage	Quantity
Main	30A	1
Head	15A	1
Signal	20A	1
Ignition	10A	1
Clock	10A	1

⚠ WARNING

Never use a fuse with a rating other than specified. Never use other materials in place of a fuse. An improper fuse may cause extensive damage to the electrical system, malfunction of lighting and ignition and possibly cause a fire.

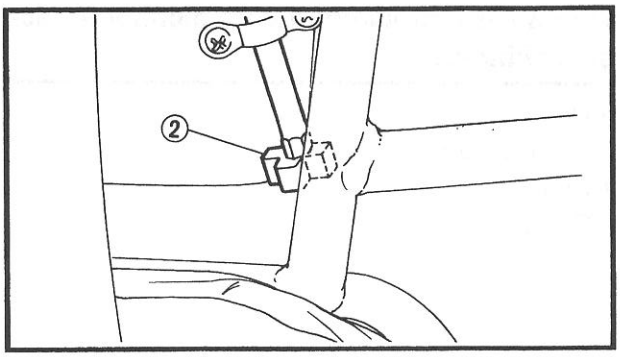
4.Install:
- Side cover (right)
  Refer to "SIDE COVER, FUEL TANK AND COWLING".



HEADLIGHT BEAM ADJUSTMENT

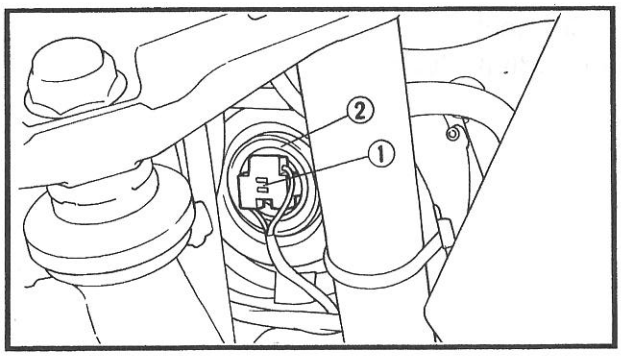
1.Adjust:
- Headlight beam (vertically)
  Turn the adjuster ① in or out.

Turning in → Headlight beam higher.
Turning out → Headlight beam lower.



2.Adjust:
- Headlight beam (horizontally)
  Turn the adjuster ② in or out.

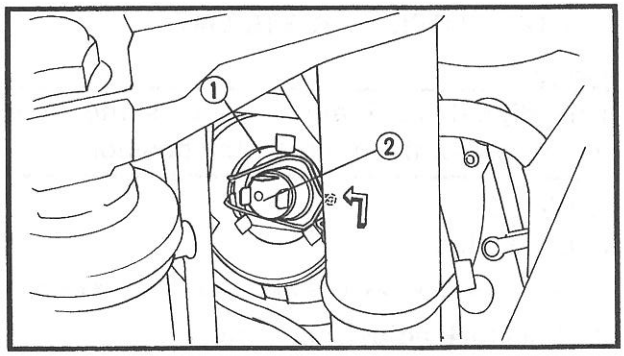
Turning in → Headlight beam to the right.
Turning out → Headlight beam to the left.



HEADLIGHT BULB REPLACEMENT

1.Disconnect:
- Headlight lead ①

2.Remove:
- Cover ②



3.Unhook:
- Bulb holder ①

4.Remove:
- Bulb ②

⚠ WARNING

Keep flammable products and your hands away from the bulb while it is on, as it will be hot. Do not touch the bulb until it has cooled down.

5.Install:
- Bulb (new)

Secure the new bulb with the bulb holder.

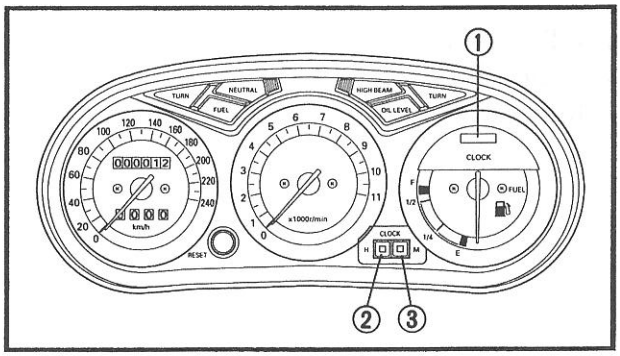
CAUTION:

Avoid touching the glass part of the bulb. Keep it free from oil; otherwise, the transparency of the glass, life of the bulb, and luminous flux will be adversely affected. If oil gets on the bulb, thoroughly clean it with a cloth moistened with alcohol or lacquer thinner.

6.Hook:
- Bulb holder

7.Install:
- Cover

8.Connect:
- Headlight lead



DIGITAL CLOCK ADJUSTMENT

NOTE:

This digital clock always shows the time regardless of the main switch position.

1.Adjust:
- Digital clock ①

****

Digital clock adjustment steps:
- Turn the main switch to "ON".
- The time (hour) setting can be made by pushing or holding the "H" switch ②.
- The time (minute) setting can be made by pushing or holding the "M" switch ③.

NOTE:

When setting the clock after is power source is cut by a removed battery, etc., first set the time for 1:00 AM, then, go on to set it for the correct time.

ENGINE OVERHAUL

ENGINE REMOVAL

⚠ WARNING

Securely support the motorcycle so there is no danger of it falling over.

NOTE:

It is not necessary to remove the engine in order to remove the following components:

- Cylinder head
- Cylinder
- Piston
- Clutch
- Oil cooler
- Starter motor
- A.C. generator
- Oil pan

4

FUEL TANK AND COWLINGS

1.Remove:

- Seat
- Fuel tank
- Cowling
- Side cover

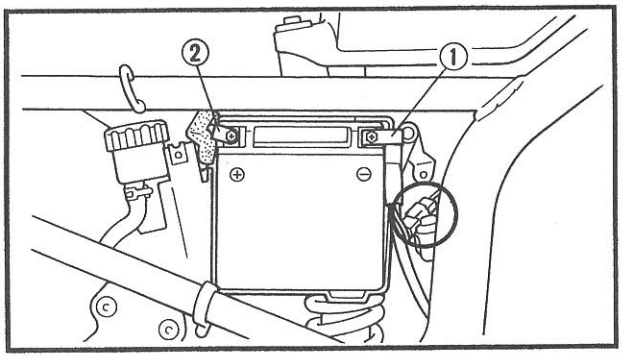
Refer to "SIDE COVER, FUEL TANK AND COWLING" in CHAPTER 3.

ENGINE OIL

1.Drain:

- Engine oil

Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.



BATTERY LEADS

1.Disconnect:

- Battery leads

CAUTION:

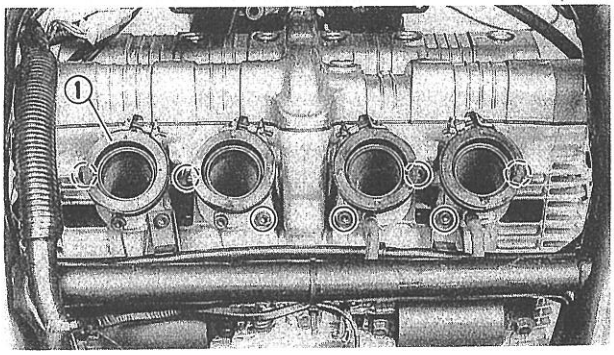
Disconnect the negative lead ① first and then disconnect the positive lead ②.

AIR FILTER CASE

1.Remove:
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT" in CHAPTER 3.

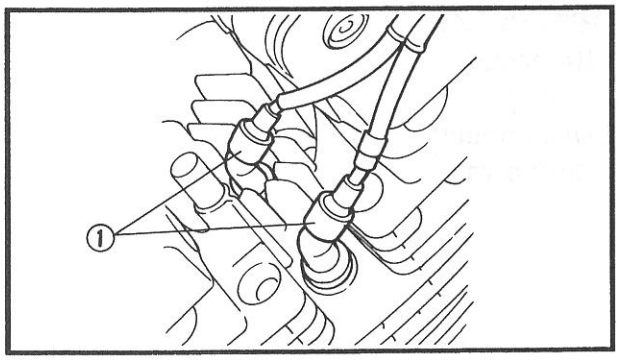
A.I.S. (AIR INDUCTION SYSTEM)

1.Remove:
- A.I.S. (AIR INDUCTION SYSTEM)
  Refer to "VALVE CLEARANCE ADJUSTMENT" in CHAPTER 3.



CARBURETOR

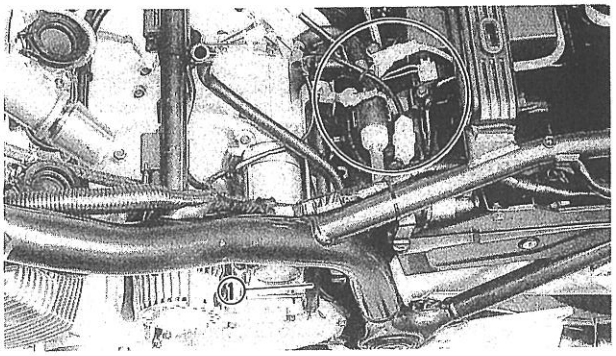
1.Remove:
- Carburetor
  Refer to "CARBURETOR" in CHAPTER 5.
- Carburetor joint ①



HOSES AND LEADS

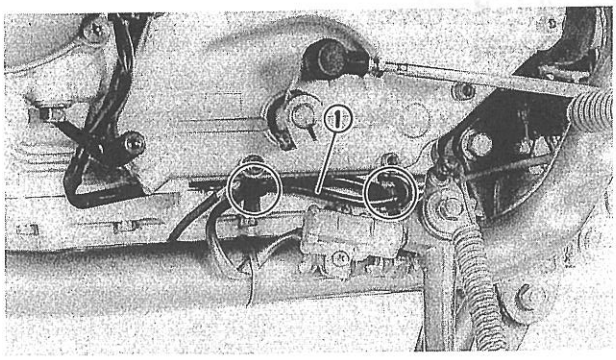
1.Disconnect:
- Spark plug caps ①

2.Remove:
- Spark plug

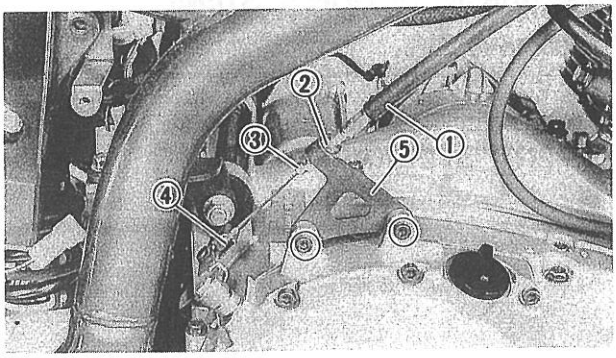


3.Disconnect:
- Breather hose ①
- A.C. generator coupler
- Pickup coil coupler

4.Remove:
- Bands



5.Remove:
• Side stand switch lead ①
from the clamp.



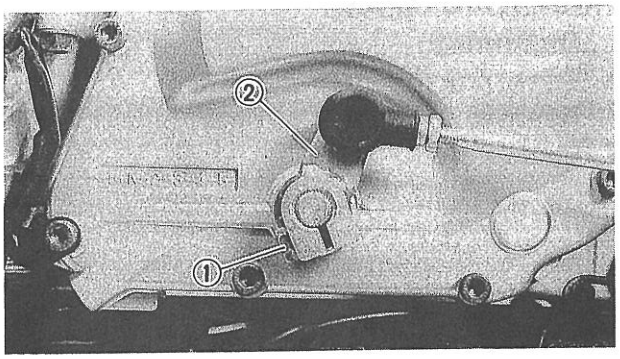
CLUTCH CABLE
1.Remove:
• Clutch cable ①

****

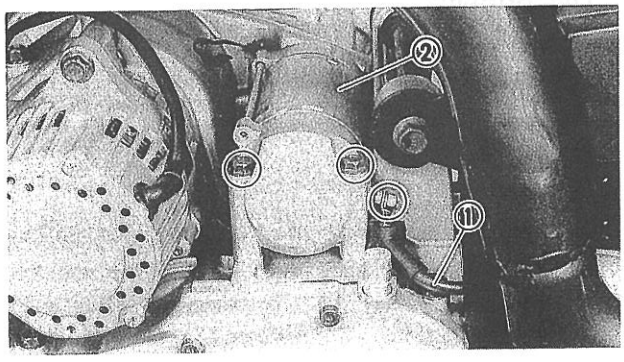
Removal steps:
● Loosen the locknut ②.
● Turn the adjuster ③ enough to free the clutch cable.
● Unhook the cable end ④.

****

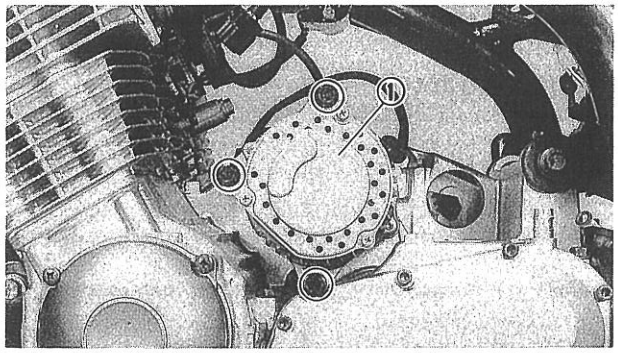
• Cable stay ⑤



SHIFT PEDAL
1.Remove:
• Bolt ①
2.Disconnect:
• Shift arm ②

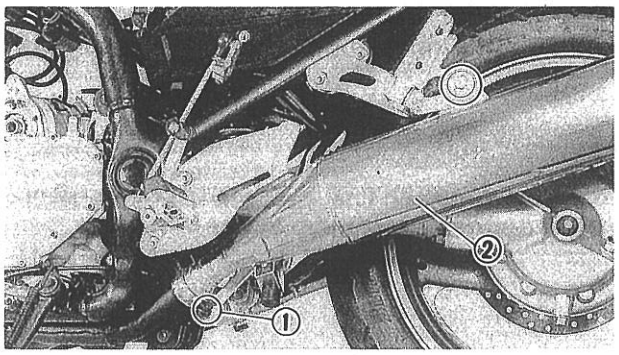


STARTER MOTOR
1.Disconnect:
• Starter motor lead ①
2.Remove:
• Starter motor ②



A.C. GENERATOR

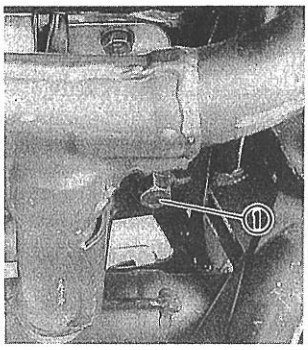
1.Remove:
- A.C. generator ①

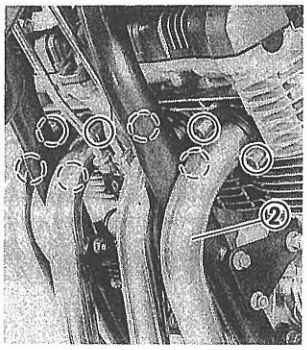


EXHAUST PIPE

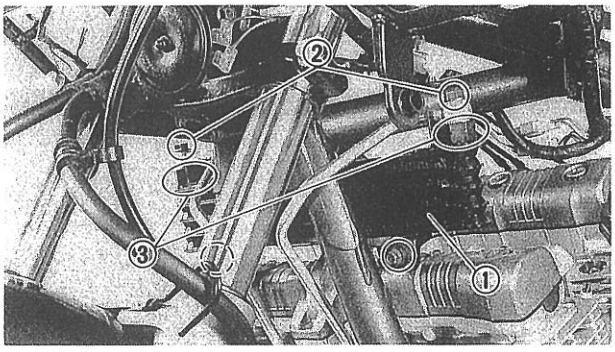
1.Loosen:
- Bolt ①

2.Remove:
- Muffler ②





3.Remove:
- Bolt ①
- Nuts
- Exhaust pipe ②
- Gasket

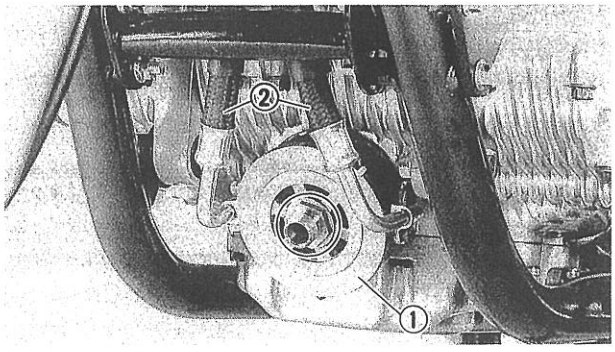


OIL COOLER

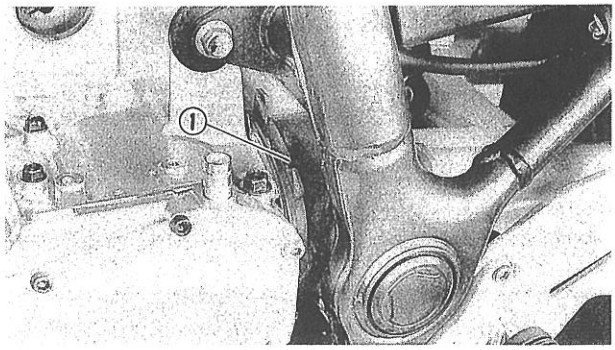
1.Remove:
- Oil cooler ①

CAUTION:

When removing the union bolt ②, be sure to secure the hexagonal part ③ to stop it turning.



2.Remove:
- Oil filter housing ①
- Oil pipe ②



DRIVE SHAFT RUBBER BOOT

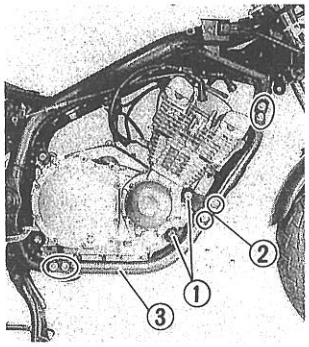
1.Peel back:
- Rubber boot ①

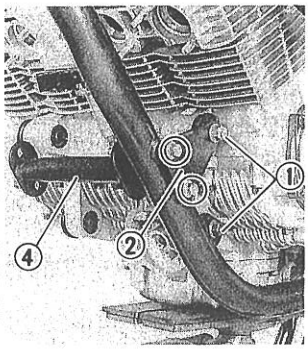
ENGINE REMOVAL

1.Place suitable stand under the frame and engine.

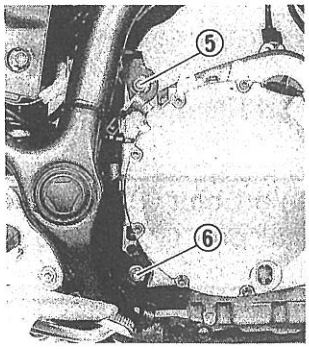
⚠ WARNING

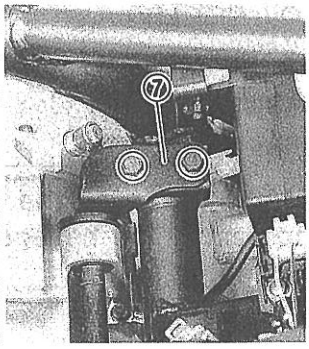
Securely support the motorcycle so there is no danger of it falling over.





2.Remove:
- Mounting bolt (front) ①
- Engine stay (front) ②
- Down tube (right) ③
- Cross tube (front) ④
- Mounting bolt (rear - upper) ⑤
- Mounting bolt (rear - lower) ⑥
- Engine stay (rear) ⑦





3.Remove:
- Engine assembly
  (from the right side of the motorcycle)

CAUTION:

Cover the front fender with a rug to prevent scratching.

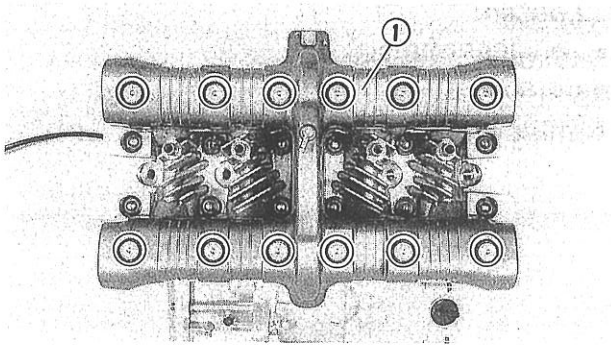
ENGINE DISASSEMBLY

CYLINDER HEAD COVER, CAMSHAFT AND CYLINDER HEAD

NOTE:

With the engine mounted, the cylinder head cover, camshaft and cylinder head can be maintained by removing the following parts:

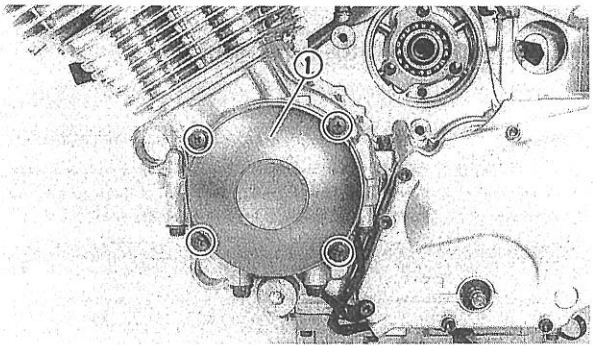
- Fuel tank
- Cowling
- Air filter case
- Carburetor
- A.I.S. assembly
- Oil cooler



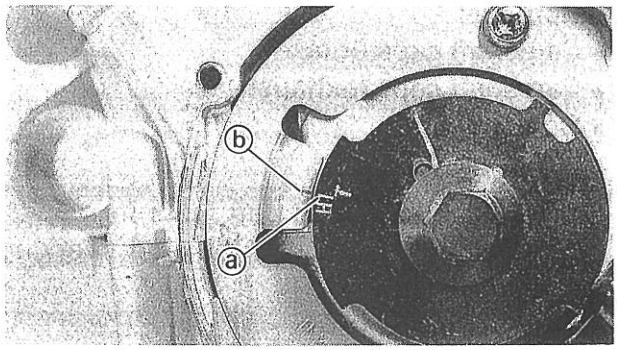
1. Remove:
- Cylinder head cover ①

NOTE:

Loosen the bolts in a crisscross pattern 1/4 turn each. Remove them after all are loosened.



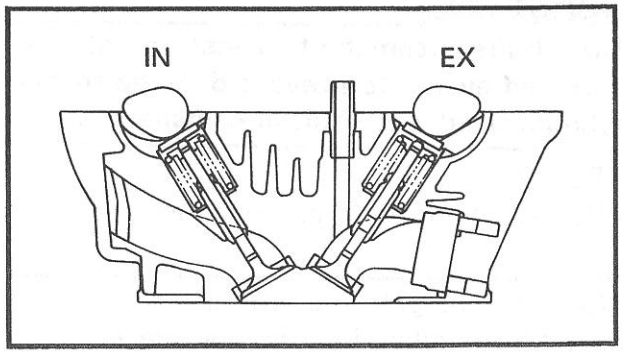
2. Remove:
- Timing plate cover ①

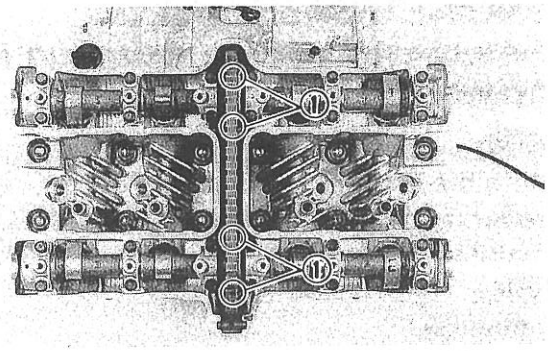


3. Align:
- "TDC" mark (with stationary pointer)

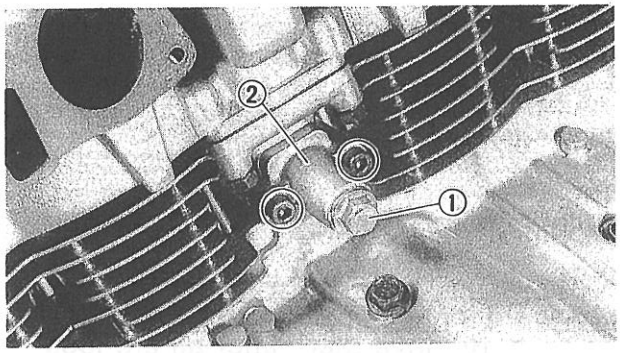
NOTE:

- Turn the crankshaft counterclockwise and align the "TDC" mark ⓐ with the align mark ⓑ when #1 piston is at TDC on compression stroke.
- The #1 piston is in compression stroke TDC when the cam lobes are turned away from each other, as shown.



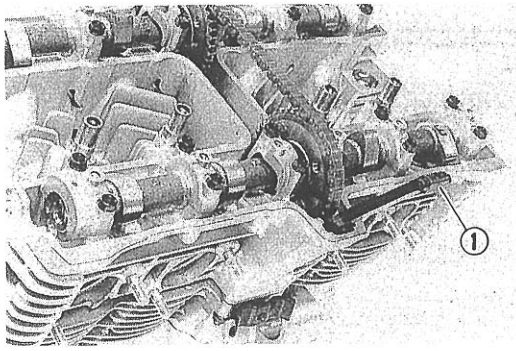


4.Loosen:
- Bolts (cam sprockets) ①

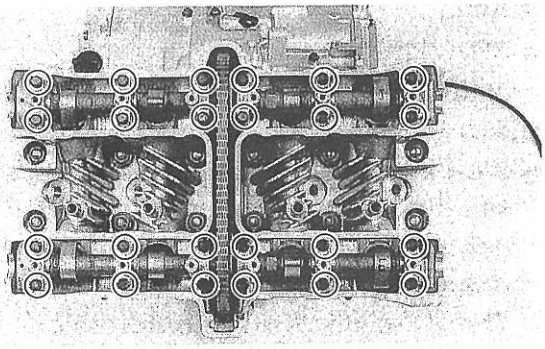


5.Loosen:
- Tensioner bolt ①

6.Remove:
- Timing chain tensioner ②

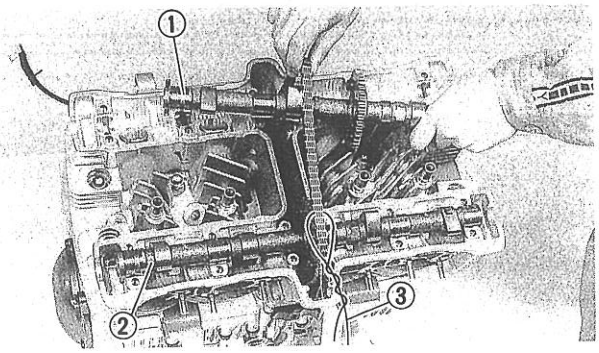


7.Remove:
- Chain guide (exhaust side) ①



8.Remove:
- Camshaft caps (intake)
- Camshaft caps (exhaust)
- Dowel pins

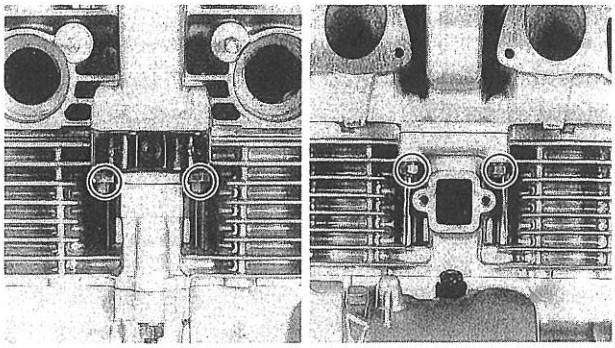
NOTE:
Remove the camshaft cap bolts in a criss-cross pattern from the outside working inwards.



CAUTION:
The bolts (camshaft caps) must be removed evenly to prevent damage to the cylinder head, camshaft or camshaft caps.

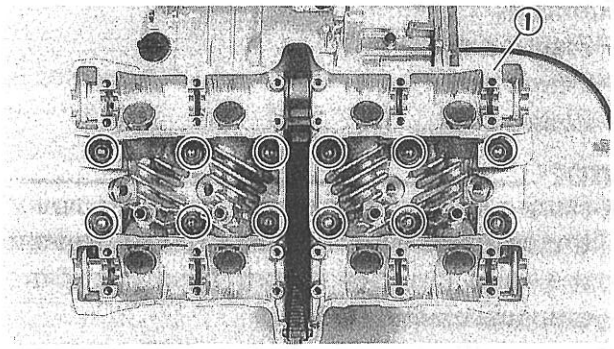
9.Remove:
- Camshaft (intake ① and exhaust ②)

NOTE:
Attach a wire ③ to the timing chain to prevent it from falling into the crankcase.

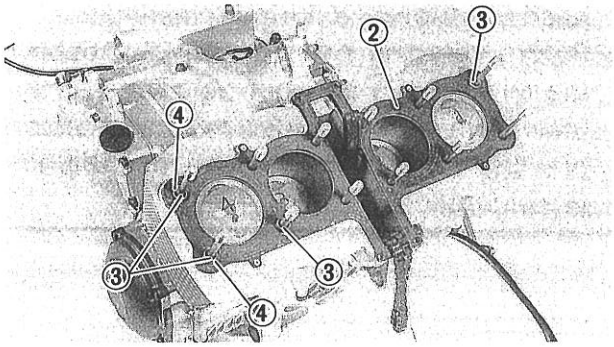


10.Remove:
- Nuts (cylinder head)

NOTE:
- Loosen the bolts in their proper loosening sequence.
- Start by loosening each nut 1/2 turn until all are loose.

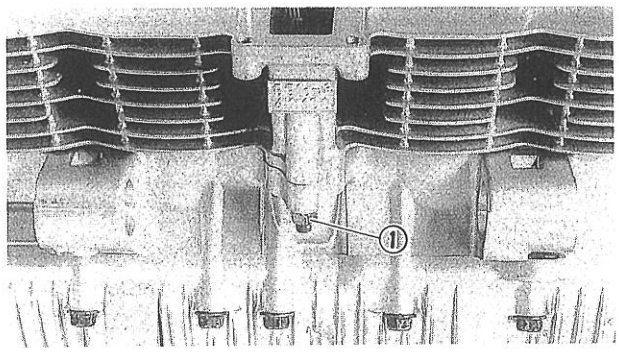


11.Remove:
- Cylinder head ①
- Gasket (cylinder head) ②
- Dowel pins ③
- O-rings ④

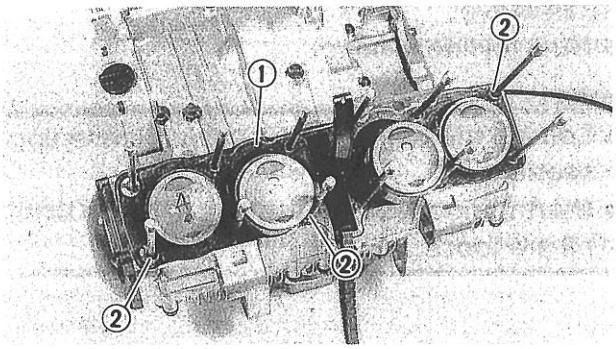


CYLINDER AND PISTON

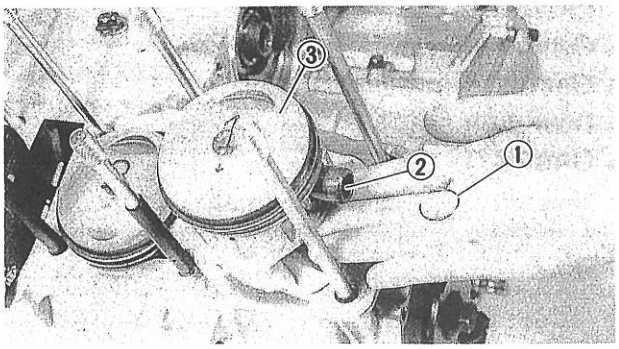
NOTE:
With the engine mounted, the cylinder and piston can be maintained by removing the following parts:
- Fuel tank
- Cowling
- Air filter case
- Carburetor
- A.I.S. assmbly
- Oil cooler
- Cylinder head



1.Remove:
- Nut ①
- Washer

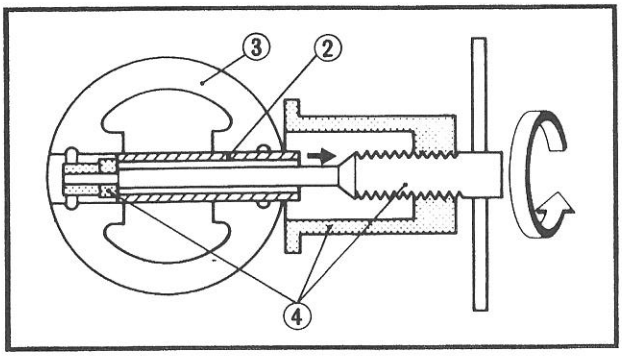


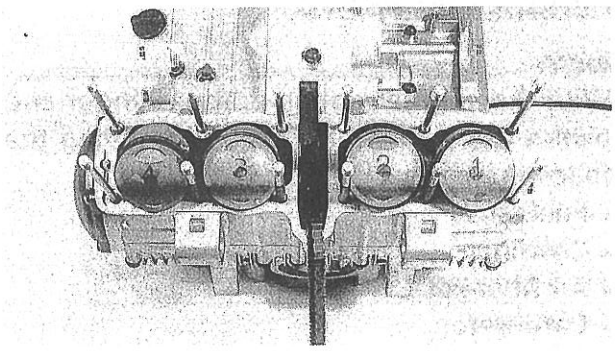
2.Remove:
- Cylinder
- Gasket (cylinder) ①
- Dowel pins ②

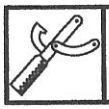


3.Remove:
- Piston pin clips ①
- Piston pins ②
- Pistons ③

NOTE:
- Before removing the piston pin clip, cover the crankcase with a clean rag to prevent the piston pin clip from falling into the crankcase cavity.
- Put identification marks on each piston head for reference during reinstallation.
- Before removing the piston pin, deburr the clip groove and pin hole area. If the piston pin groove is deburred and piston pin is still difficult to remove, use the piston pin puller ④.

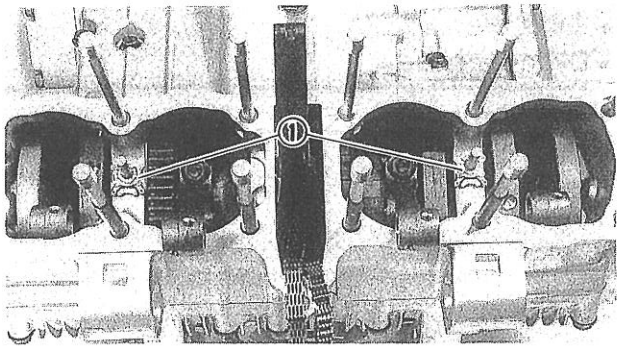




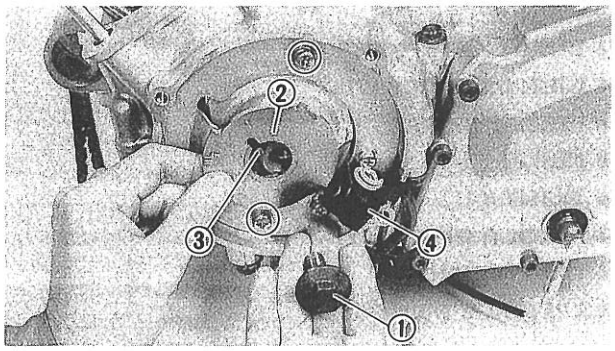


Piston pin puller:
90890-01304

CAUTION:
Do not use a hammer to drive the piston pin out.



4.Remove:
- Oil-Jet nozzles ①
  (with O-ring)

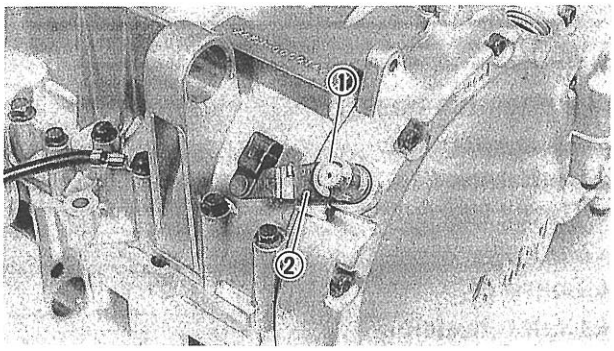


PICKUP COIL

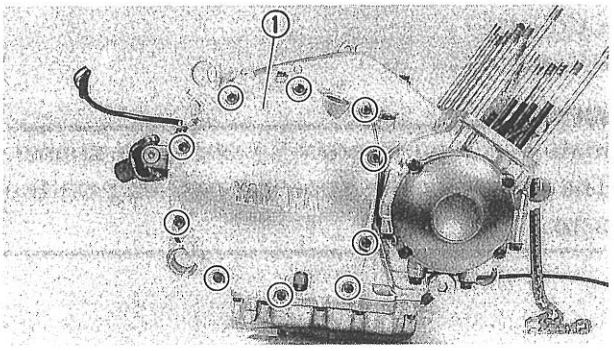
1.Remove:
- Bolt (timing plate) ①
- Timing plate ②
- Pin ③
- Pickup coil base ④

CLUTCH

NOTE:
With the engine mounted, the clutch assembly can be maintained by removing the following part:
- Clutch cover

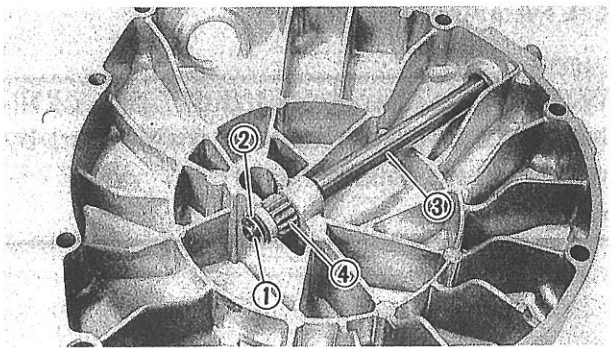


1.Remove:
- Circlip ①
- Washer
- Pull lever ②
- Return spring
- Plate washer

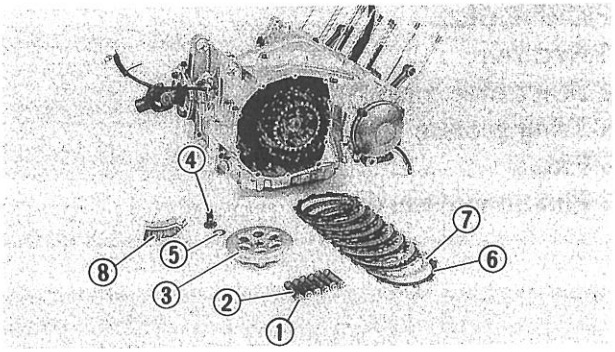


2.Remove:
- Clutch cable bracket
- Clutch cover ①
- Gasket
- Dowel pins

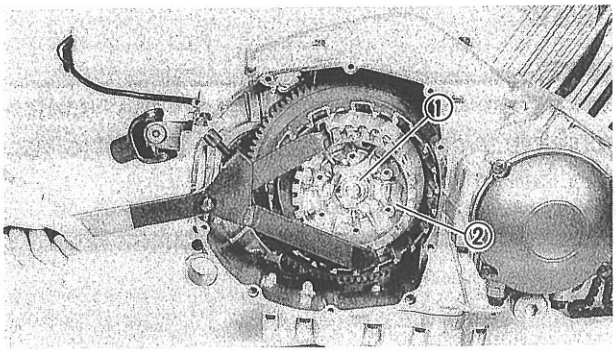
NOTE:
Working in a crisscross pattern, loosen the bolts 1/4 turn each. Remove them after all are loosened.



3.Remove:
- Circlip ①
- Washer ②
- Clutch pull lever shaft ③
- Gear ④



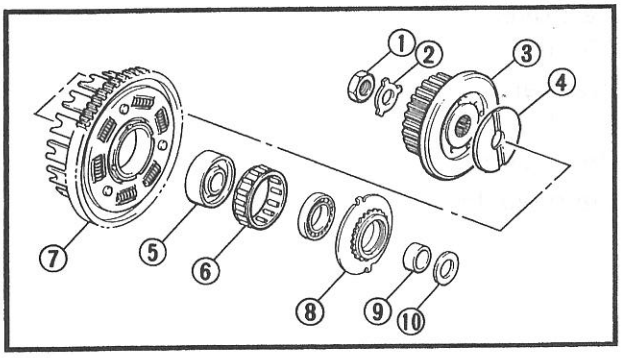
4.Remove:
- Bolts (clutch spring) ①
- Clutch springs ②
- Pressure plate ③
- Pull rod ④
- Washer ⑤
- Friction plates ⑥
- Clutch plates ⑦
- Oil guide plates ⑧



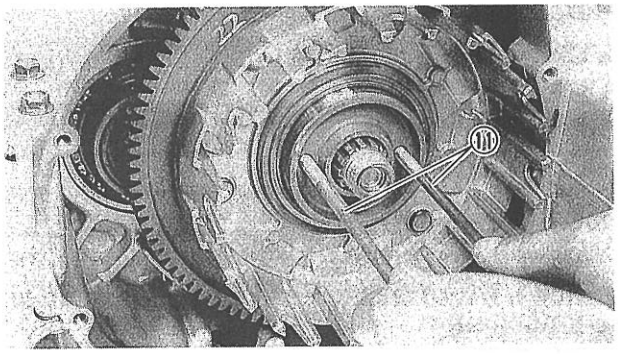
5.Straighten the lock washer tabs.
6.Loosen:
- Nut (clutch boss) ①

NOTE:
Loosen the nut (clutch boss) ① while holding the clutch boss ② with the universal clutch holder.

	**Universal clutch holder: 90890-04086**



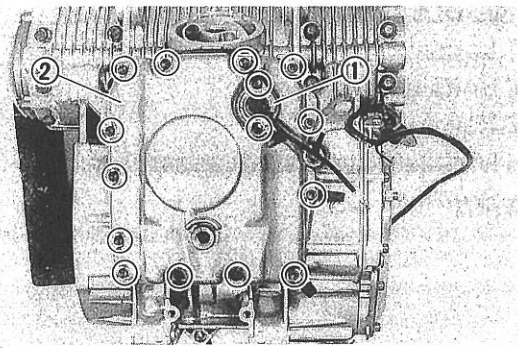
7.Remove:
- Nut (clutch boss) ①
- Lock washer ②
- Clutch boss ③
- Thrust plate ④
- Spacer ⑤
- Bearing ⑥
- Clutch housing ⑦
- Oil pump drive sprocket ⑧
- Collar ⑨
- Washer ⑩



NOTE:
Install a 6 mm screw ⑪ onto the spacer. Then remove the spacer by pulling on the screw.

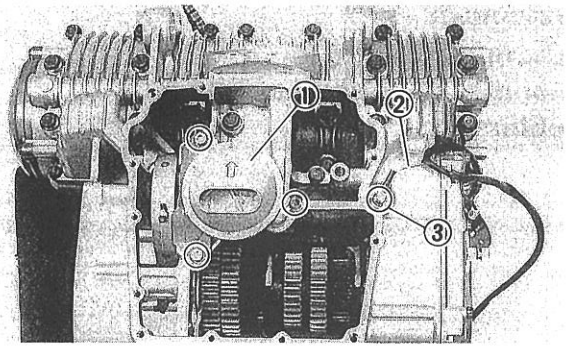
OIL PAN AND OIL PUMP

NOTE:
With the engine mounted, the oil pan, oil filter and oil strainer can be maintained by removing the following part:
- Exhaust pipe



1.Remove:
- Oil level switch ①
- Oil pan ②
- Gasket
- Dowel pins

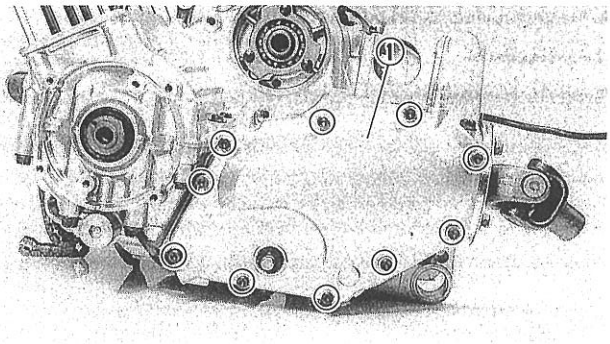
NOTE:
Loosen the bolts in a crisscross pattern 1/4 turn each. Remove them after all are loosened.



2.Remove:
- Oil pump assembly ①

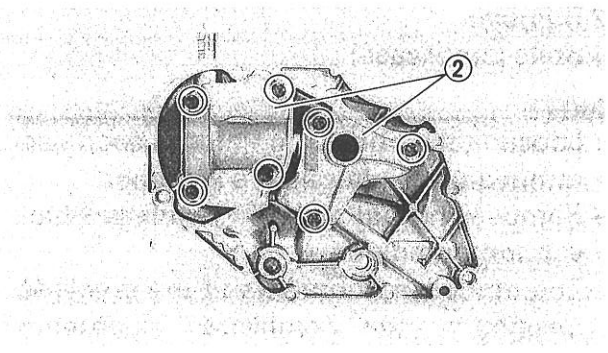
3.Disconnect:
- Neutral switch lead ②

4.Remove:
- Neutral switch ③

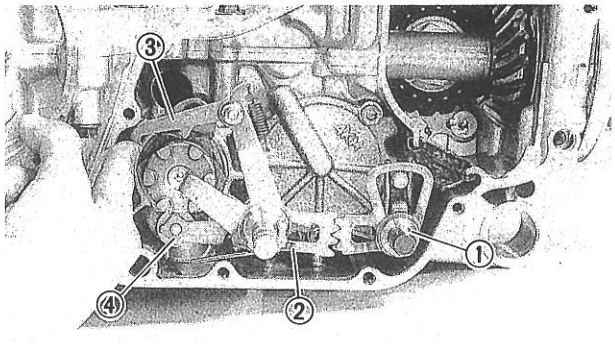


SHIFT SHAFT

1.Remove:
- Shift shaft lever cover ①
- Gasket
- Dowel pins

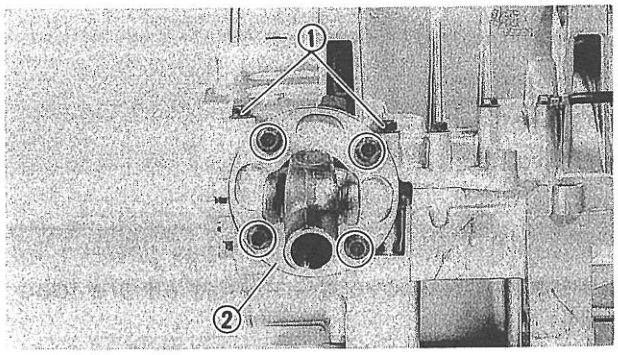


2.Remove:
- Covers ②
- Gaskets



3.Remove:
- Shift shaft ①
- Washer
- Shift lever ②
- Spring
- Stopper lever ④

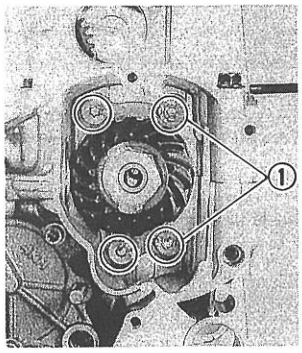
NOTE:
Release the shift arm ③ from the drum pins while pulling out the shift shaft assembly.

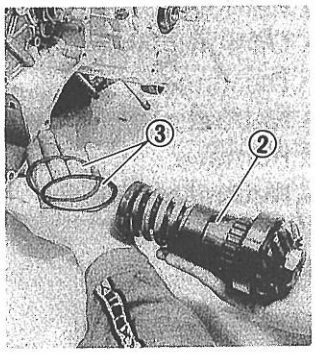


MIDDLE GEAR

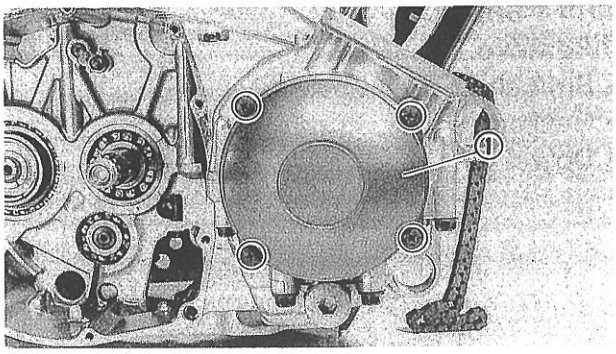
1.Loosen:
- Bolts (crankcase) ①

2.Remove:
- Middle driven shaft assembly ②
- Shim



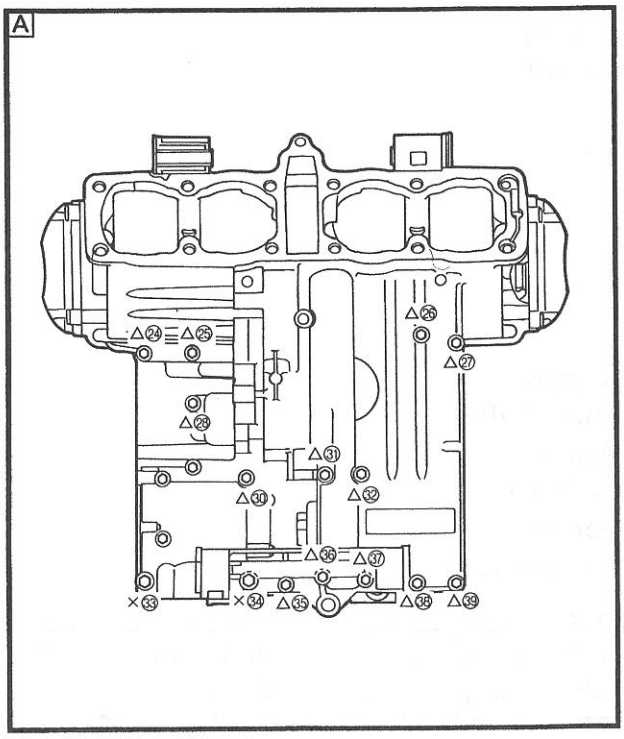


3.Remove:
- Bearing holder ①
- Middle drive shaft assembly ②
- Shim ③



CRANKCASE DISASSEMBLY

1.Remove:
- Crankcase cover (right) ①



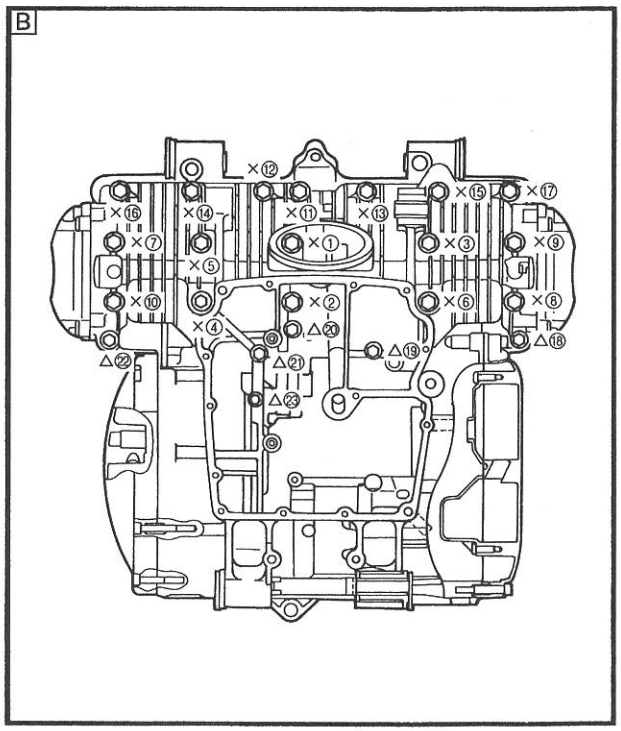
2.Remove:
- Bolts (crankcase)

NOTE:
- Loosen the bolts 1/4 turn each and remove them after all are loosened.
- Remove the bolts starting with the highest numbered one.
- The embossed numbers in the crankcase designate the crankcase tightening sequence.

3.Place the engine upside down.

4.Remove:
- Crankcase (lower)

A Upper case

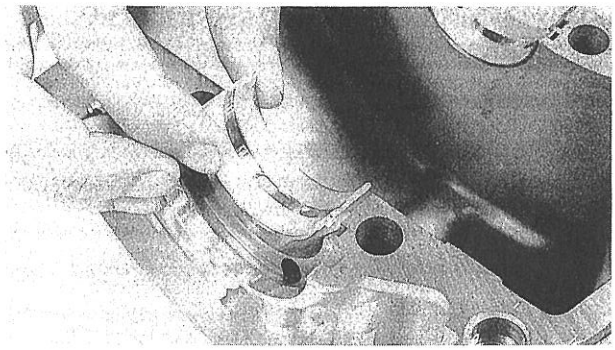


CAUTION:

Use a soft hammer to tap on the case half. Tap only on reinforced portions of the case. Do not tap on the gasket mating surface. Work slowly and carefully. Make sure that the case halves separate evenly.

- Dowel pins
- O-ring

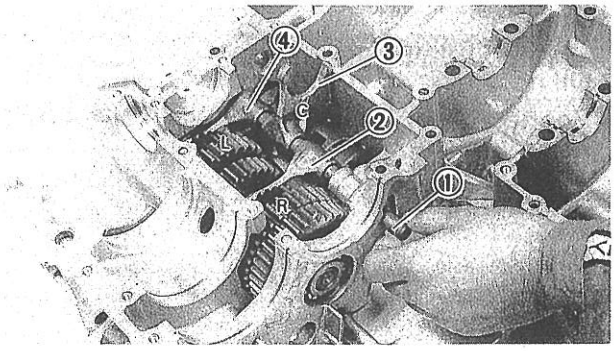
B Lower case
△:M6 bolts
×:M8 bolts



5.Remove:
- Main journal bearing (from lower crankcase)

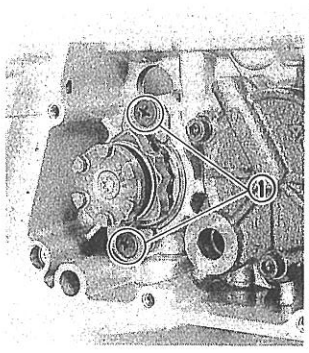
NOTE:

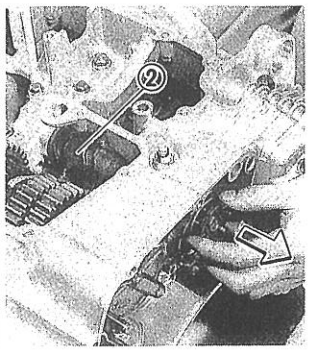
Identify each plain bearing position very carefully so that it can be reinstalled in its original place.



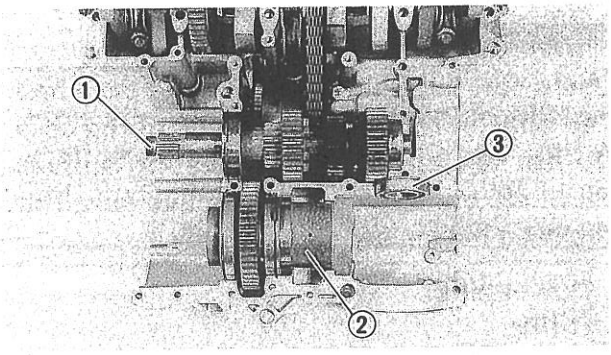
SHIFT FORK AND SHIFT CAM

1.Remove:
- Guide bars (shift fork) ①
- Shift fork "R" ②
- Shift fork "C" ③
- Shift fork "L" ④



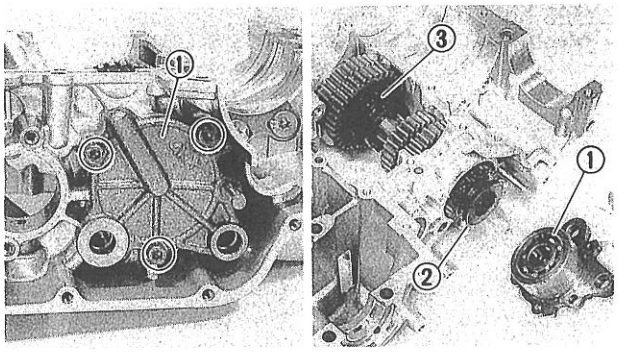


2.Remove:
- Bearing holder ①
- Shift cam assembly ②

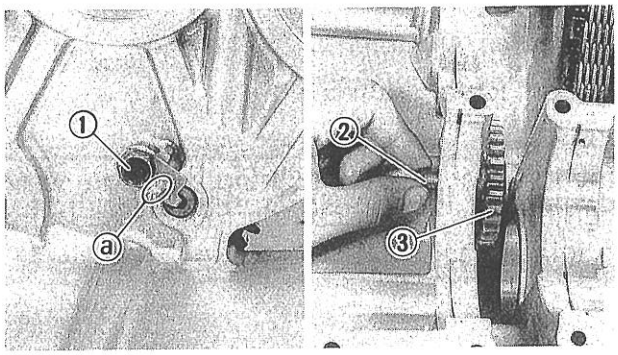


TRANSMISSION

1.Remove:
- Main axle assembly ①
- Middle drive shaft assembly holder ②
- Bearing ③



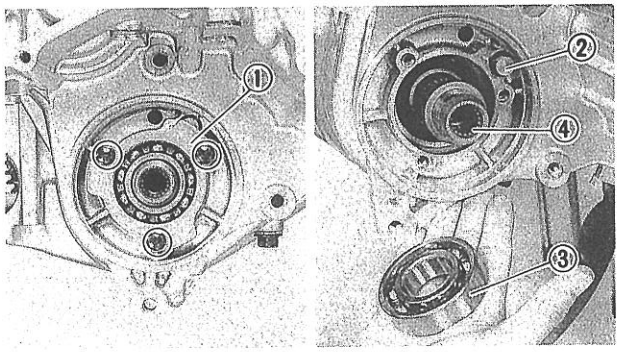
2.Remove:
- Bearing housing ①
- Drive axle gear (5TH) ②
- Drive axle assembly ③



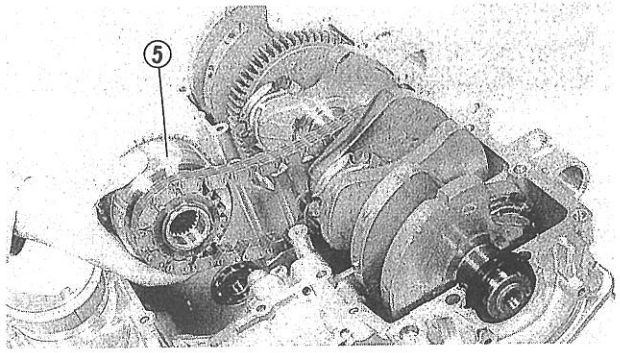
CRANKSHAFT AND STARTER CLUTCH

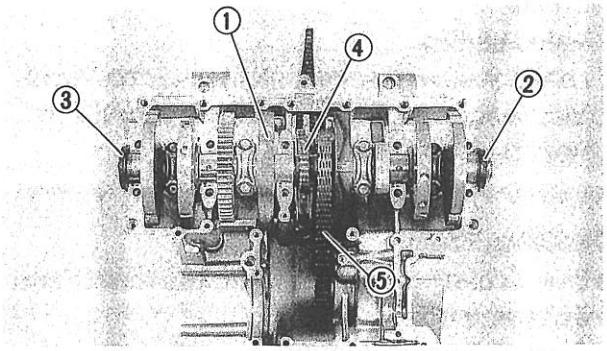
1.Straighten:
- Lockwasher tab ⓐ

2.Remove:
- Bolt ①
- Shaft (idle gear) ②
- Idle gear ③

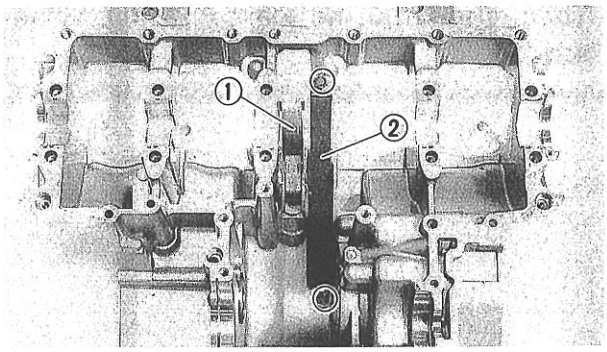


3.Remove:
- Bearing holder ①
- Oil nozzle ②
- Bearing ③
- Starter clutch shaft ④
- Starter clutch ⑤





4.Remove:
- Crankshaft assembly ①
- Oil seal ②
- Plug ③
- Timing chain ④
- HY-VO chain ⑤

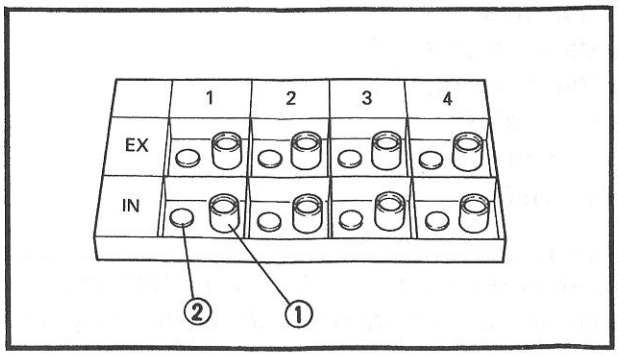


5.Remove:
- Timing chain guide (intake side) ①
- Chain guide (HY-VO chain) ②

VALVE

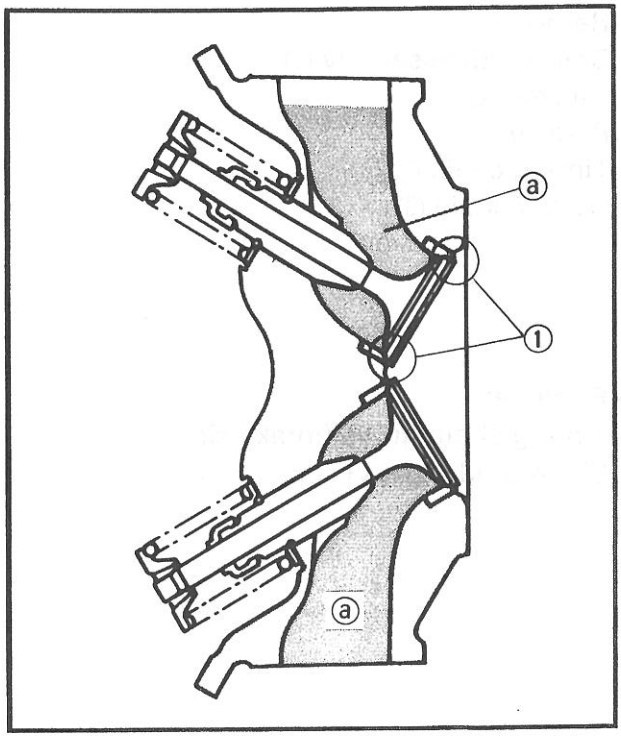
NOTE:
With the engine mounted, the valve and camshaft can be maintained by removing the following parts:
- Fuel tank
- Center cowlings
- Air filter case
- Carburetor
- A.I.S. assembly
- Oil cooler
- Cylinder head

NOTE:
The valve sealing should be checked before removing the internal parts (valve, valve spring, valve seat etc.) of the cylinder head.



1.Remove:
- Lifters ①
- Pads ②

NOTE:
Identify each lifter ① and pad ② position very carefully so that they can be reinstalled in their original place.

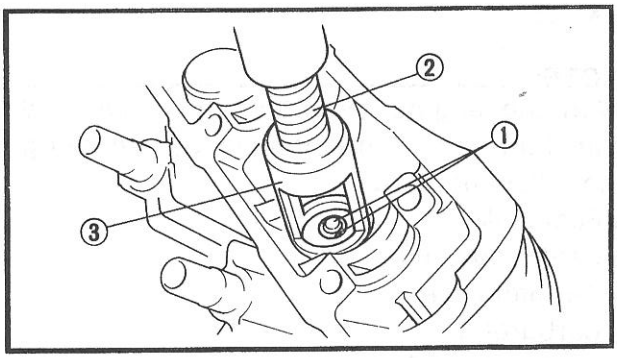


2.Check:
- Valve sealing
  Leakage at valve seat → Inspect the valve face, valve seat and the valve seat width. Refer to "VALVE SEAT".

****

Checking steps:
- Pour a clean solvent ⓐ into the intake and exhaust ports.
- Check the valve seating.
  There should be no leakage at the valve seat ①.

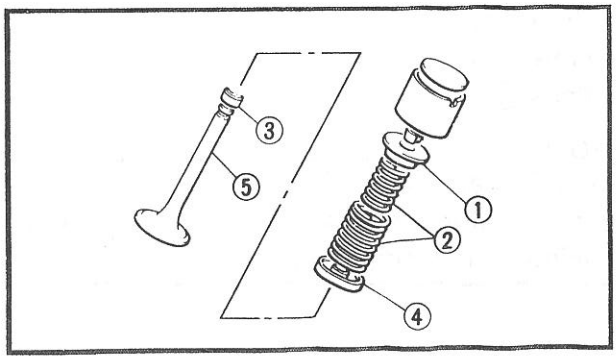
****



3.Remove:
- Valve cotters ①

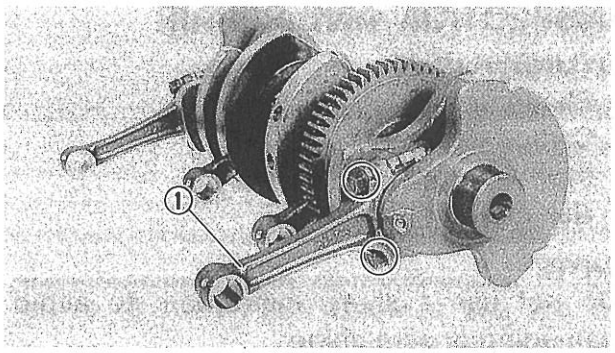
NOTE:
Attach the valve spring compressor ② and attachment ③ between the valve spring retainer and cylinder head to remove the valve cotters.

Valve spring compressor:
90890-04019
Attachment:
90890-01243



4.Remove:
- Valve retainer ①
- Valve springs ②
- Oil seal ③
- Spring seat ④
- Valve ⑤

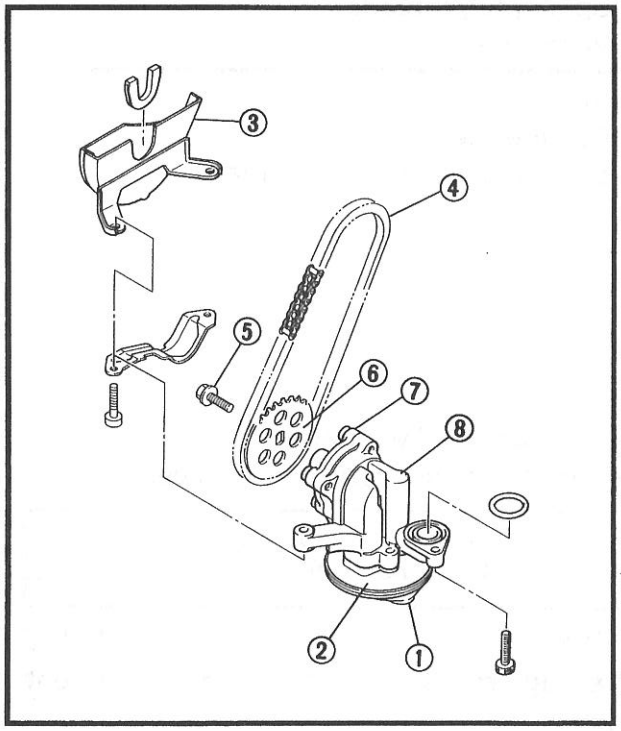
NOTE:
Identify each part position very carefully so that it can be reinstalled in its original place.



CONNECTING ROD

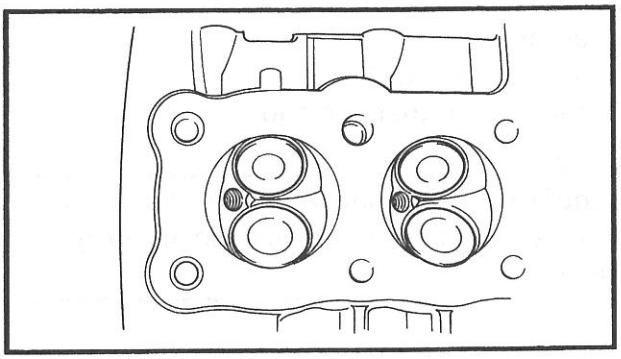
1.Remove:
- Connecting rod ①
- Bearings (connecting rod)

NOTE:
Identify each bearing position very careful so that it can be reinstalled in its original place.



OIL PUMP

1.Remove:
- Oil strainer ①
- Oil strainer cover ②
- Chain cover ③
- Chain ④
- Bolt ⑤
- Sprocket ⑥
- Pump cover ⑦
- Inner rotor
- Pump shaft
- Pin
- Outer rotor
- Spring
- Relief valve
- Oil pump housing ⑧



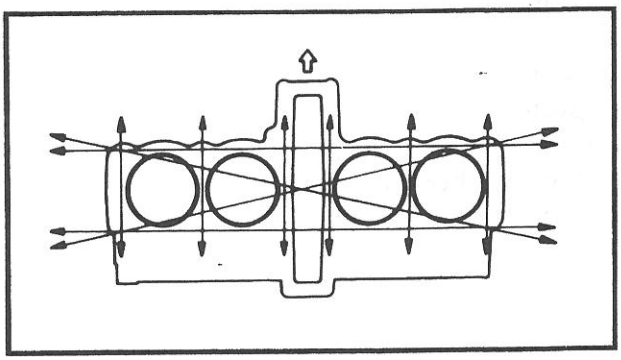
INSPECTION AND REPAIR

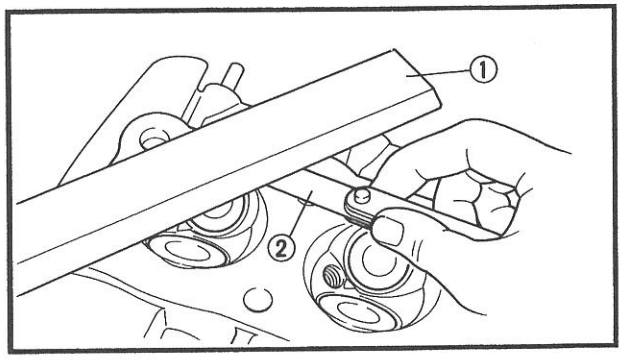
CYLINDER HEAD

1.Eliminate:
- Carbon deposit
  (from combustion chamber)
  Use rounded scraper.

NOTE:
Do not use a sharp instrument to avoid damaging or scratching:
- Spark plug threads
- Valve seat

2.Inspect:
- Cylinder head
  Scratches/Damage → Replace.





3.Measure:
- Cylinder head warpage
  Out of specification → Resurface.

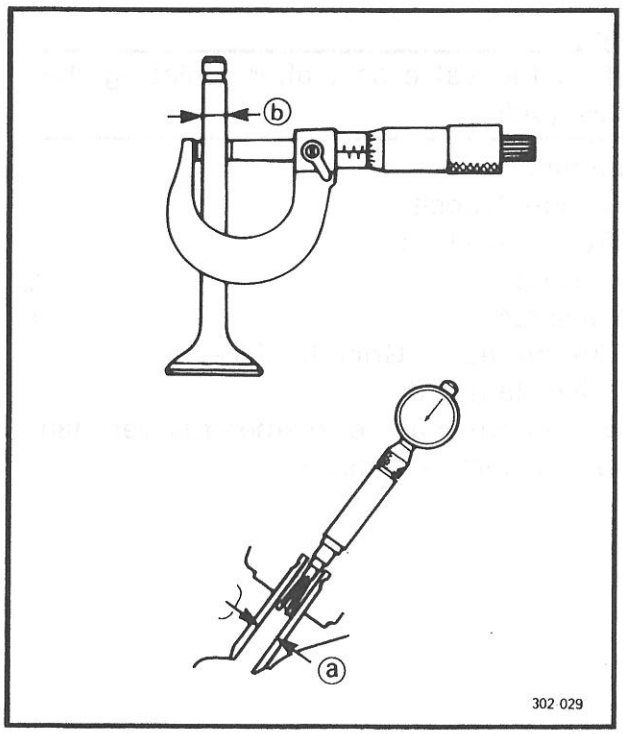
Cylinder head warpage:
Less than 0.03 mm

****

Warpage measurement and resurfacement steps:
- Hold a straight edge ① and a thickness gauge ② to the cylinder head.
- Measure the warpage.
- If the warpage is out of specification, resurface the cylinder head.
- Place a 400 ~ 600 grit wet sandpaper on the surface plate, and resurface the head using a figure-eight sanding pattern.

NOTE:
Rotate the head several times to avoid removing too much material from one side.

****



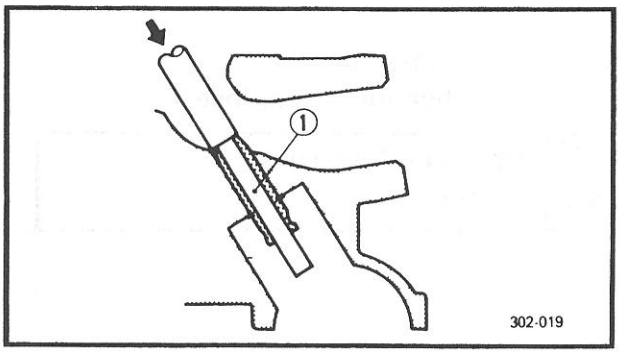
VALVE AND VALVE GUIDE

1.Measure:
- Stem-to-guide clearance

Stem-to-guide clearance =
Valve guide inside diameter ⓐ –
Valve stem diameter ⓑ

Out of specification → Replace valve guide.

Stem-to-guide clearance:
Intake:
0.010 ~ 0.037 mm
<Limit>: 0.08 mm
Exhaust:
0.025 ~ 0.052 mm
<Limit>: 0.10 mm



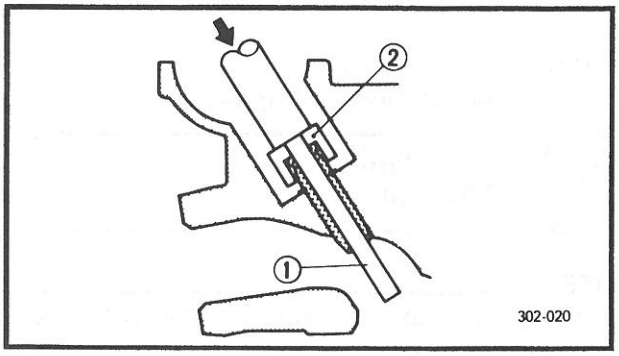
2.Replace:
- Valve guide

****

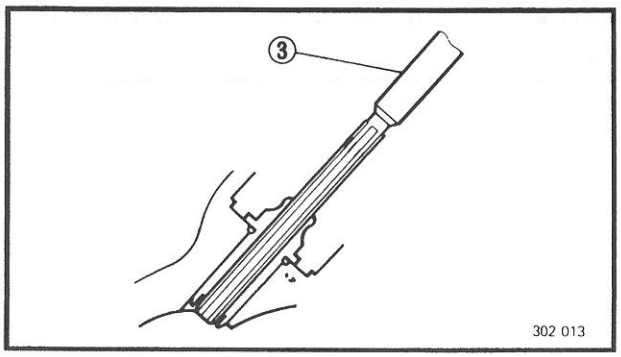
Replacement steps:

NOTE:
Heat the cylinder head in an oven to 100°C to ease guide removal and installation and to maintain correct interference fit.

- Remove the valve guide using the valve guide remover ①.
- Install the valve guide (new) using the valve guide installer ② and valve guide remover ①.
- After installing the valve guide, bore the valve guide using the valve guide reamer ③ to obtain proper stem-to-guide clearance.



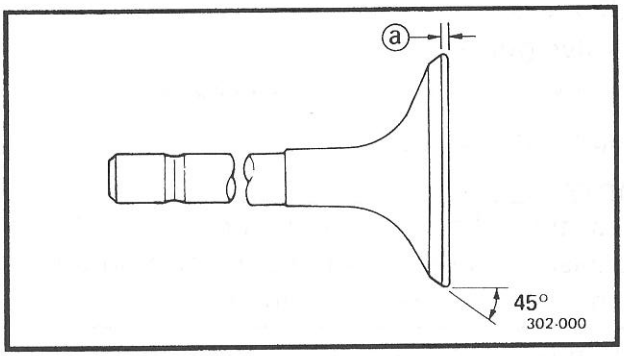
Valve guide remover (6.0 mm):
90890-04064
Valve guide installer (6.0 mm):
90890-04065
Valve guide reamer (6.0 mm):
90890-04066



NOTE:
Reface the valve seat after replacing the valve guide.

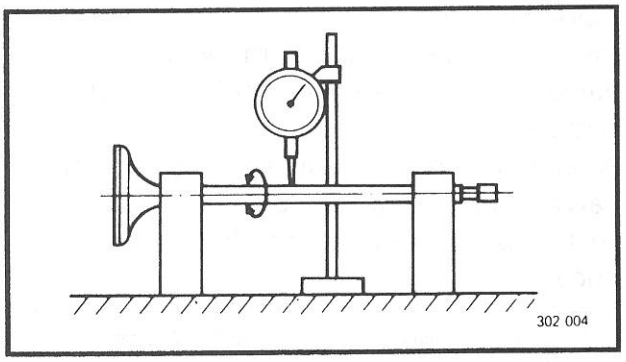
3.Eliminate:
- Carbon deposit
  (from valve face)

4.Inspect:
- Valve face
  Pitting/Wear → Grind the face.
- Valve stem end
  Mushroom shape or diameter larger than rest of stem → Replace.



5.Measure:
- Margin thickness ⓐ
  Out of specification → Replace.

Margin thickness:
1 mm



6.Measure:
- Runout (valve stem)
  Out of specification → Replace.

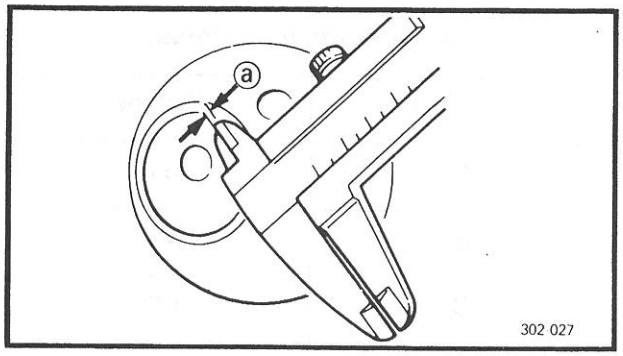
Runout limit:
0.01 mm

NOTE:
- Always replace the guide if the valve is replaced.
- Always replace the oil seal if the valve is removed.

VALVE SEAT

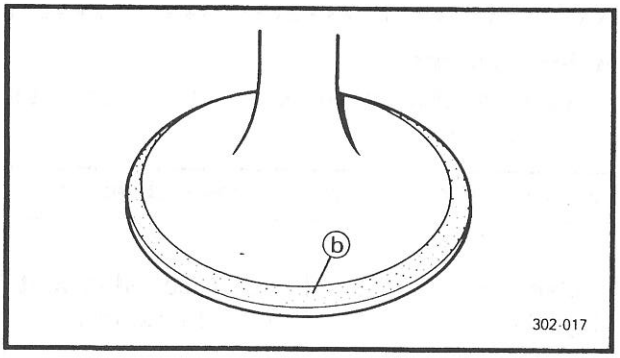
1.Eliminate:
- Carbon deposit
  (from valve face and valve seat)

2.Inspect:
- Valve seat
  Pitting/Wear → Reface valve seat.



3.Measure:
- Valve seat width ⓐ
  Out of specification → Reface valve seat.

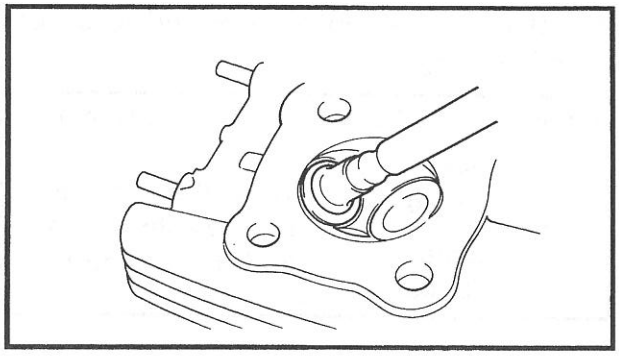
Valve seat width:
Intake: 0.9 ~ 1.1 mm
Exhaust: 0.9 ~ 1.1 mm



****

Measurement steps:
- Apply the Mechanic's blueing dye (Dykem) ⓑ to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width. Where the valve seat and valve face made contact, blueing will have been removed.
- If the valve seat is too wide, too narrow, or the seat is not centered, the valve seat must be refaced.

****

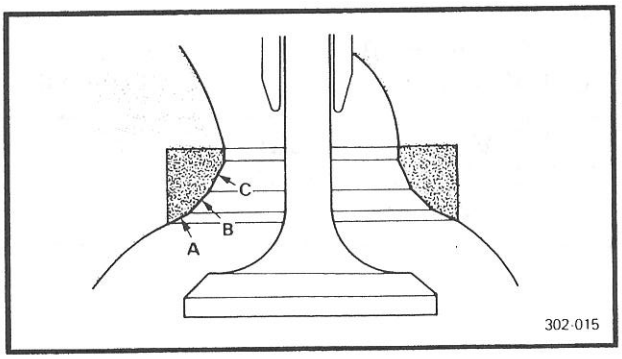


4.Reface:
- Valve seat
  Use 31°, 45° and 60° valve seat cutter.

Valve seat cutter:
YM-91043-C

CAUTION:

When twisting the cutter, keep an even downward pressure (4 ~ 5 kg) to prevent chatter marks.

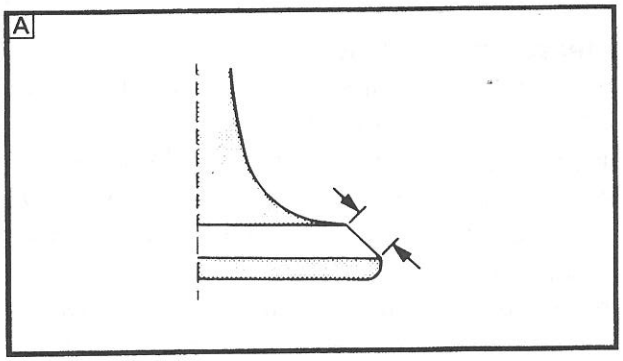


Cut sections as follows:	
Section	**Cutter**
A	31°
B	45°
C	60°

****

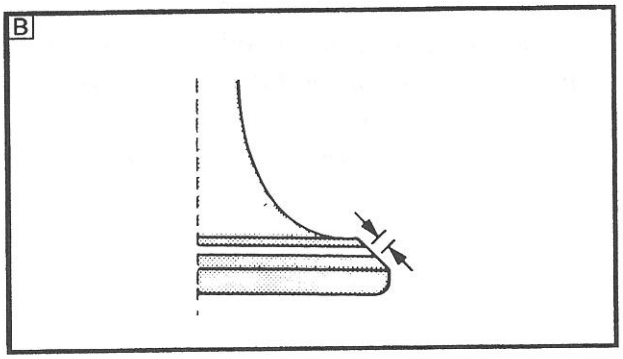
Refacing steps:

A Valve seat is centered on valve face but it is too wide.



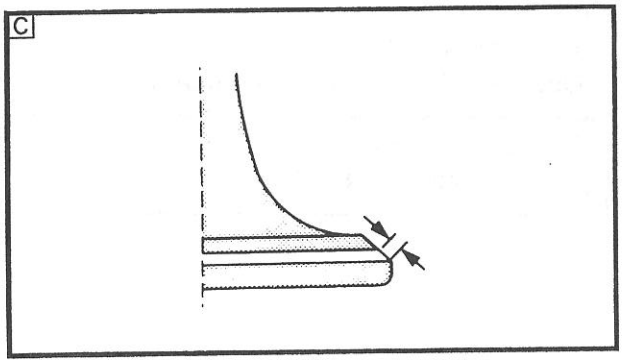
Valve seat cutter set		Desired result
Use lightly	First: 31° cutter Second: 60° cutter	To reduce valve seat width to 1.0 mm

B Valve seat is in the middle of the valve face but it is too narrow.

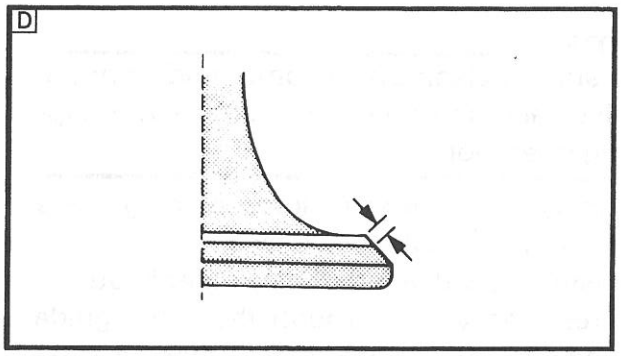


Valve seat cutter set		Desired result
Use	45° cutter	To achieve a uniform valve seat width of 1.0 mm

C Valve seat is too narrow and it is near valve margin.



Valve seat cutter set		Desired result
Use	First: 31° cutter Second: 45° cutter	To center the seat and to achieve its width of 1.0 mm



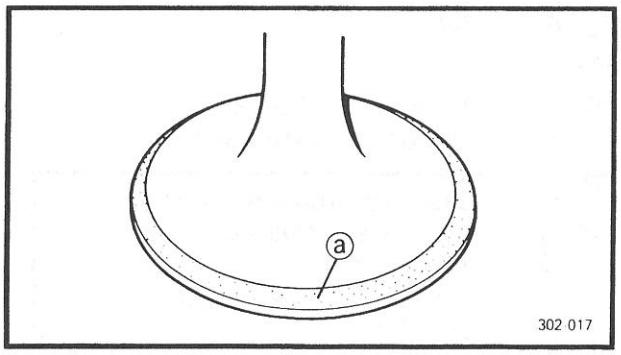
D Valve seat is too narrow and it is located near the bottom edge of the valve face.

Valve seat cutter set		Desired result
Use	First: 60° cutter Second: 45° cutter	To center the seat and increase its width.

****

5.Lap:
- Valve face
- Valve seat

NOTE:
After refacing the valve seat or replacing the valve and valve guide, the valve seat and valve face should be lapped.



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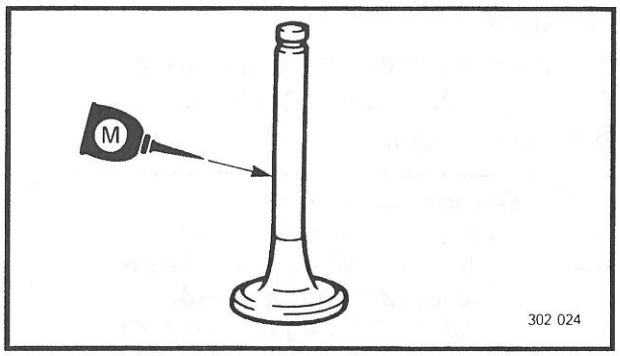
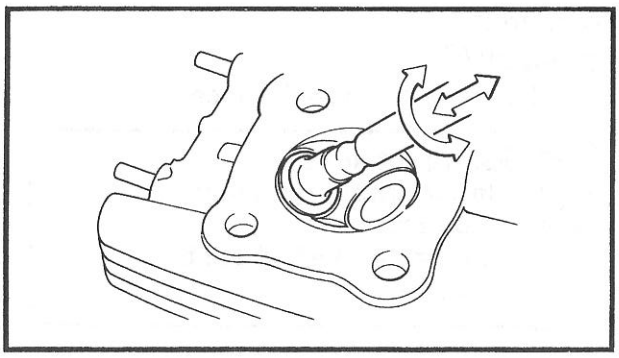
Lapping steps:
- Apply a coarse lapping compound ⓐ to the valve face.

CAUTION:
Be sure no compound enters the gap between the valve stem and guide.

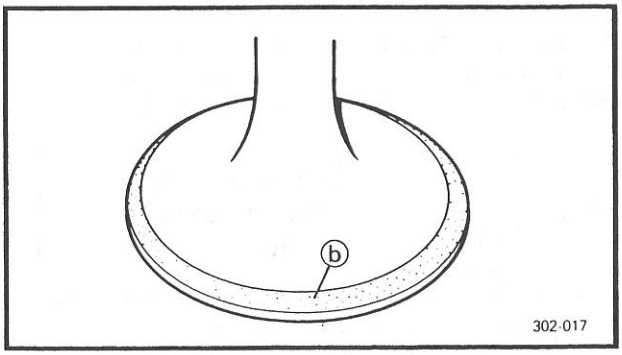


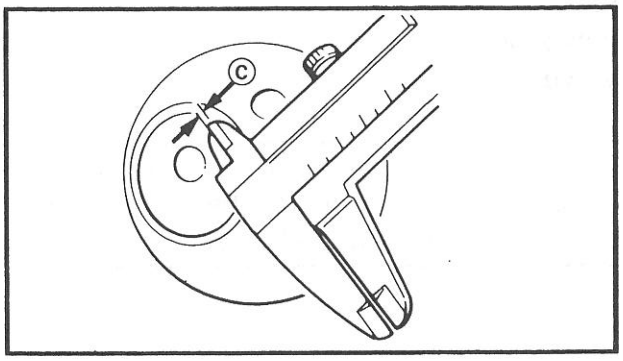
- Apply molybdenum disulfide oil to the valve stem.
- Install the valve into the cylinder head.
- Turn the valve until the valve face and valve seat are evenly polished, then clean off all compound.

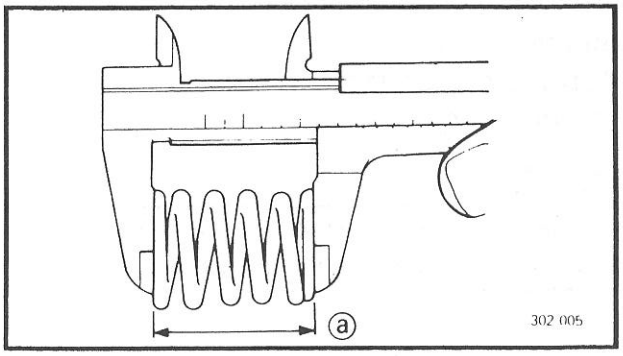


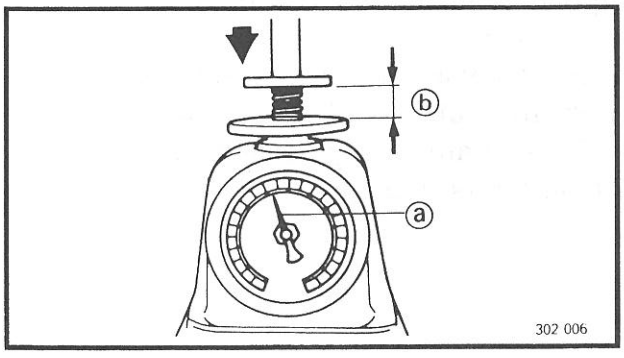
NOTE:
To obtain the best lapping result, lightly tap the valve seat while rotating the valve back and forth between your hand.

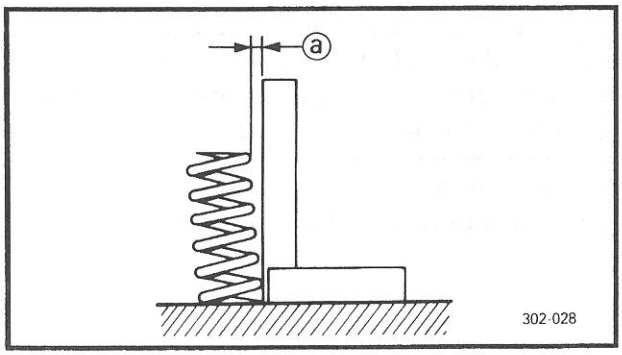
- Apply a fine lapping compound to the valve face and repeat the above steps.











NOTE:
Be sure to clean off all compound from the valve face and valve seat after every lapping operation.

- Apply the Mechanic's blueing dye (Dykem) ⓑ to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width ⓒ again. If the valve seat width is out of specification, reface and lap the valve seat.

****

VALVE SPRING

1. Measure:
- Free length (valve spring) ⓐ
  Out of specification → Replace.

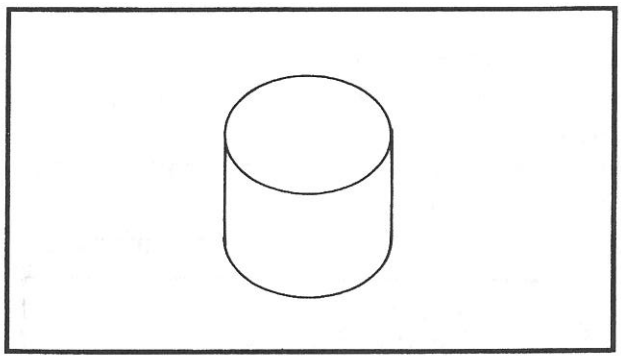
Free length (valve spring):
Inner (intake/exhaust):
37.40 mm
Outer (intake/exhaust):
39.85 mm

2. Measure:
- Compressed force (valve spring) ⓐ
  Out of specification → Replace.
  ⓑ Installed length

Compressed force:
Inner (intake/exhaust):
6.35 ~ 7.45 kg at 31.8 mm
Outer (intake/exhaust):
12.1 ~ 14.1 kg at 33.8 mm

3. Measure:
- Spring tilt ⓐ
  Out of specification → Replace.

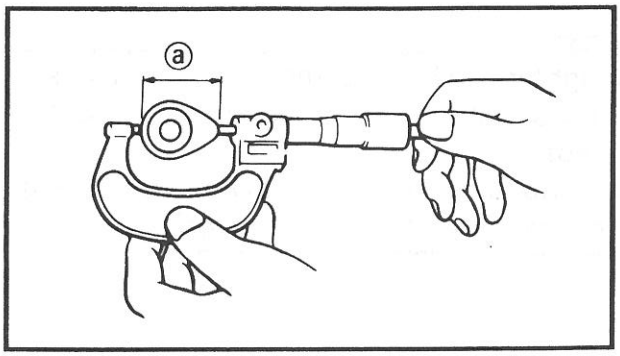
Spring tilt limit:
Inner (intake/exhaust):
1.6 mm
Outer (intake/exhaust):
1.7 mm

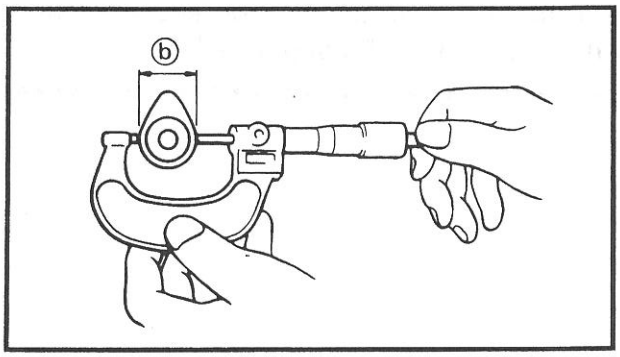


VALVE LIFTER

1.Inspect:

- Valve lifters
  Scratches/Damage → Replace both lifters and cylinder head.





CAMSHAFT

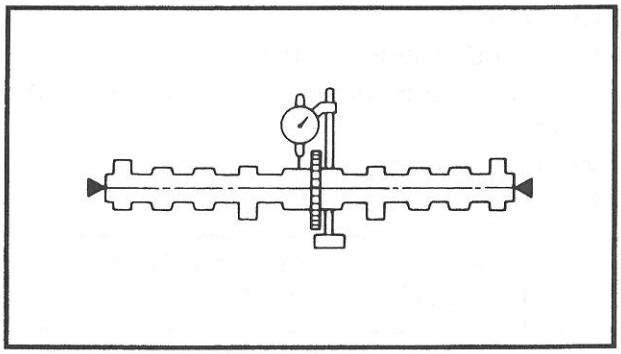
1.Inspect:

- Cam lobes
  Pitting/Scratches/Blue discoloration → Replace.

2.Measure:

- Cam lobes length ⓐ and ⓑ
  Out of specification → Replace.

Cam lobes length limit:
Intake:
ⓐ 36.75 mm
ⓑ 27.975 mm
Exhaust:
ⓐ 36.75 mm
ⓑ 27.975 mm



3.Measure:

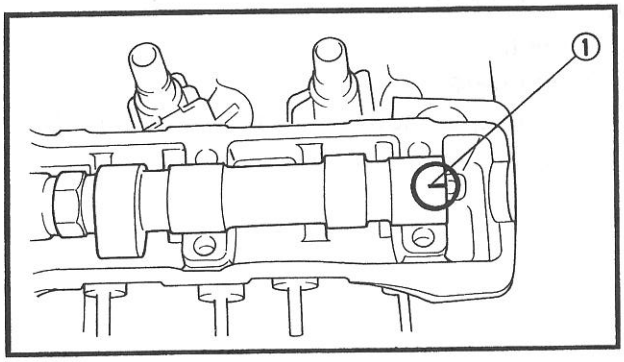
- Runout (camshaft)
  Out of specification → Replace.

Runout (camshaft):
Less than 0.03 mm

4.Measure:

- Camshaft-to-cap clearance
  Out of specification → Measure bearing diameter (camshaft)

Camshaft-to-cap clearance:
0.020 ~ 0.054 mm



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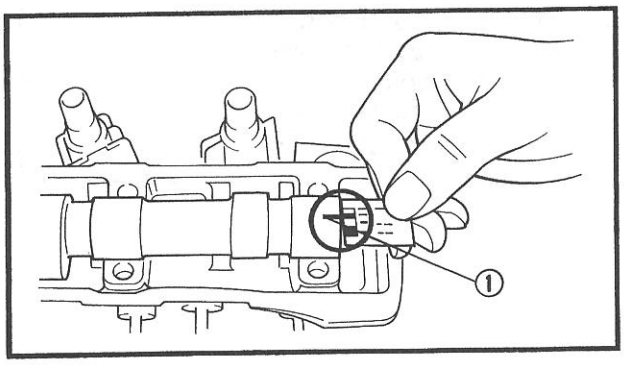
Measurement steps:

- Install the camshaft onto the cylinder head.
- Position a strip of Plastigauge® ① onto the camshaft.
- Install the dowel pins and camshaft caps.

	Bolts (camshaft cap) **10 Nm (1.0 m • kg)**

NOTE:

- Tighten the bolts (camshaft cap) in a criss-cross pattern from innermost to outer caps.
- Do not turn the camshaft when measuring clearance with the Plastigauge®.



- Remove the camshaft caps and measure the width of the Plastigauge® ①.

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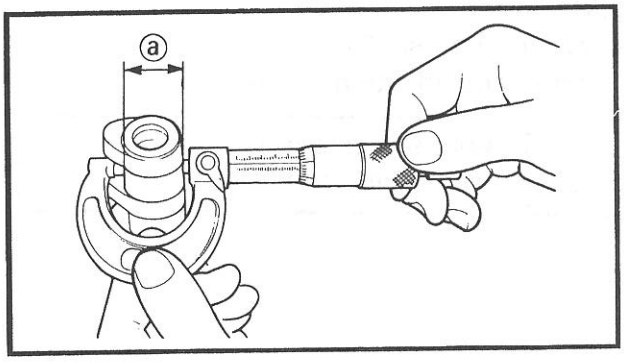
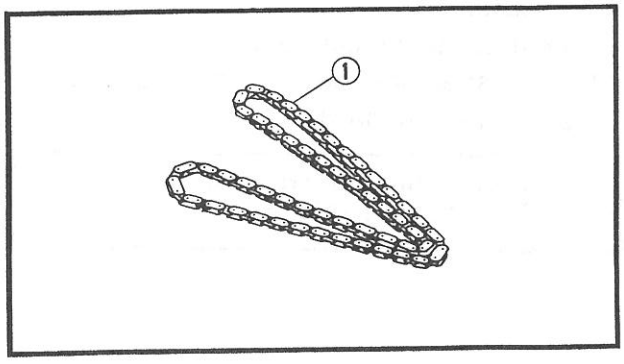


5.Measure:

- Bearing diameter (camshaft) ⓐ
  Out of specification → Replace the camshaft.
  Within specification → Replace cylinder head and camshaft caps as a set.

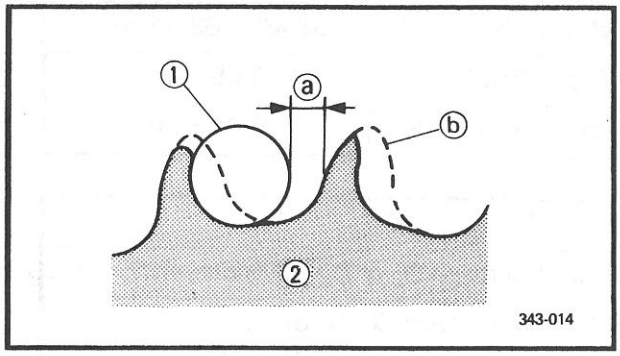
	Bearing diameter (camshaft): **24.967 ~ 24.980 mm**



TIMING CHAIN, SPROCKET AND CHAIN GUIDE

1.Inspect:

- Timing chain ①
  Stiff/Cracks → Replace chain and sprocket as a set.



2.Inspect:
- Cam sprockets
  Wear/Damage → Replace cam sprocket and timing chain as a set.

ⓐ 1/4 tooth
ⓑ Correct
① Roller
② Sprocket

3.Inspect:
- Timing chain guide (exhaust)
- Timing chain guide (intake)
- Timing chain guide (upper)
  Wear/Damage → Replace.

TIMING CHAIN TENSIONER

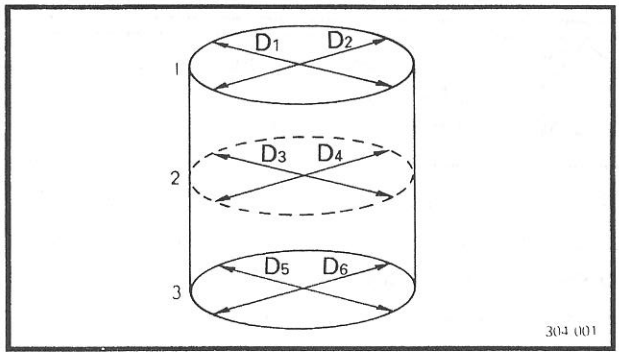
1.Check:
- One-way cam operation
  Unsmooth operation → Replace.

2.Inspect:
- All parts
  Damage/Wear → Replace.

CYLINDER AND PISTON

1.Inspect:
- Cylinder and Piston walls
  Vertical scratches → Rebore or replace cylinder and piston.

2.Measure:
- Piston-to-cylinder clearance



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Measurement steps:

First step:

- Measure the cylinder bore "C" with a cylinder bore gauge.

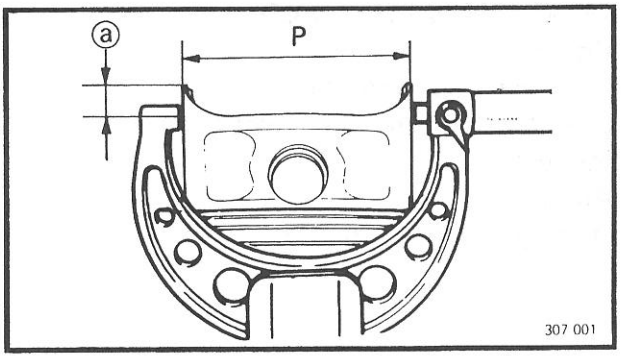
NOTE:

Measure the cylinder bore "C" in parallel to and at right angles to the crankshaft. Then, find the average of the measurements.

Cylinder bore "C"	68.49 ~ 68.54 mm
Taper limit "T"	0.05 mm
Out of round "R"	0.01 mm

"C" = Maximum D
"T" = (Maximum D_1, or D_2) – (Maximum D_5 or D_6)
"R" = (Maximum D_1, D_3 or D_5) – (Minimum D_2, D_4 or D_6)

- If out of specification, rebore or replace the cylinder, and replace the piston and piston rings as set.



2nd step:

- Measure the piston skirt diameter "P" with a micrometer.

ⓐ 5.5 mm from the piston bottom edge.

	Piston size P
Standard	68.45 ~ 68.50 mm
Oversize 2	69.0 mm
Oversize 4	69.5 mm

- If out of specification, replace the piston and piston rings as a set.

3rd step:

- Calculate the piston-to-cylinder clearance with following formula:

Piston-to-cylinder clearance = Cylinder bore "C" – Piston skirt diameter "P"

Piston-to-cylinder clearance: 0.03 ~ 0.05 mm <Limit>: 0.1 mm

- If out of specification, rebore or replace the cylinder, and replace the piston and piston rings as set.

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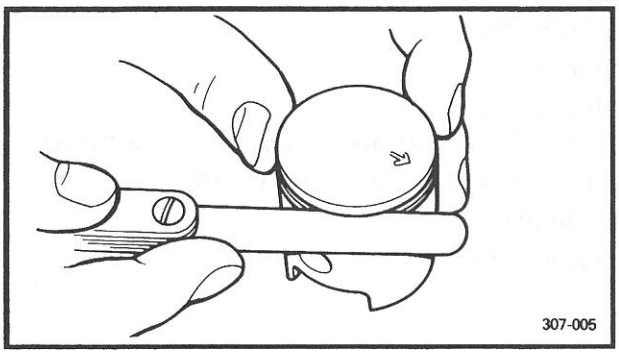


PISTON RING

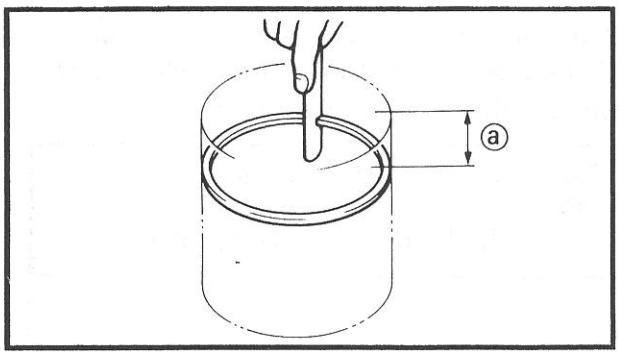
1.Measure:

- Side clearance
  Out of specification → Replace piston and rings as a set.

NOTE:

Eliminate the carbon deposits from the piston ring grooves and rings before measuring the side clearance.

Side clearance:
Top ring:
0.025 ~ 0.080 mm
2nd ring:
0.02 ~ 0.06 mm



2.Position:

- Piston ring
  (into cylinder)

NOTE:

Push the ring with the piston crown so that the ring will be at a right angle to the cylinder bore.

ⓐ 20 mm

3.Measure:

- End gap
  Out of specification → Replace.

NOTE:

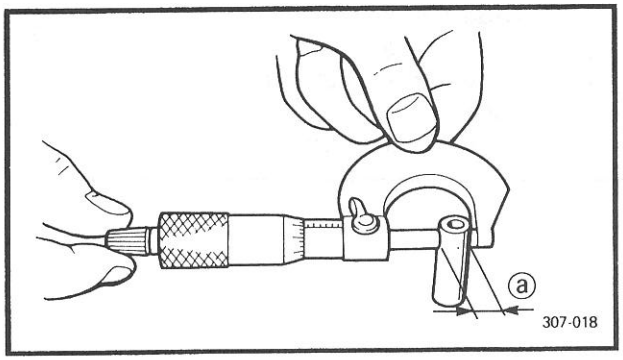
You cannot measure the end gap on the expander spacer of the oil control ring. If the oil control ring rails show excessive gap, replace all three rings.

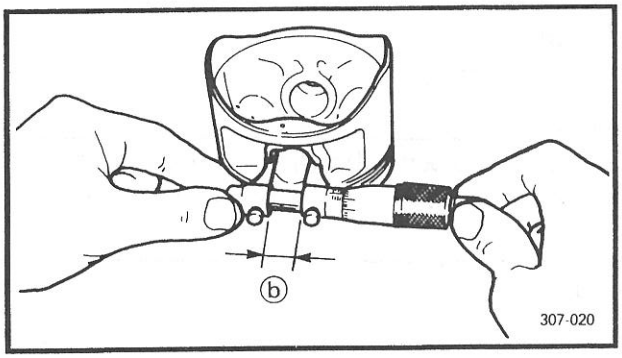
End gap:
Top ring:
0.10 ~ 0.25 mm
2nd ring:
0.30 ~ 0.45 mm
Oil ring:
0.20 ~ 0.70 mm

PISTON PIN

1.Inspect:
- Piston pin
  Blue discoloration/Grooves → Replace, then inspect lubrication system.

2.Measure:
- Piston pin-to-piston clearance





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Measurement steps:

- Measure the piston pin outside diameter ⓐ.
  If out of specification, replace the piston pin.

Outside diameter (piston pin):
15.990 ~ 16.000 mm

- Measure the piston inside diameter ⓑ.
- Calculate the piston pin-to-piston clearance with following formula:

Piston pin-to-piston clearance =
Bore size (piston pin) ⓑ –
Outside diameter (piston pin) ⓐ

- If out of specification, replace the piston.

Piston pin-to-piston clearance =
0.002 ~ 0.023 mm
<Limit>: 0.07 mm

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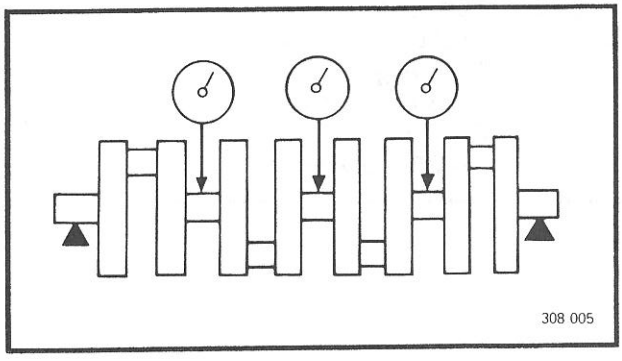


CRANKSHAFT AND CONNECTING ROD

1.Measure:
- Runout (crankshaft)
  Out of specification → Replace.

Runout:
Less than 0.03 mm

2.Inspect:
- Main journal surfaces
- Crank pin surfaces
- Bearing surfaces
  Wear/Scratches → Replace.

3.Measure:
- Oil clearance (main journal)
  Out of specification → Replace bearing.

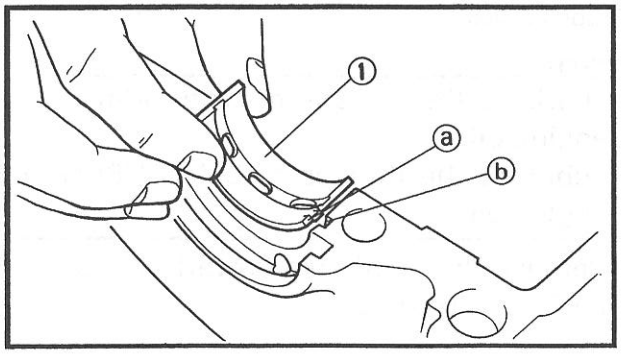
Oil clearance:
0.020 ~ 0.052 mm

****

Measurement steps:

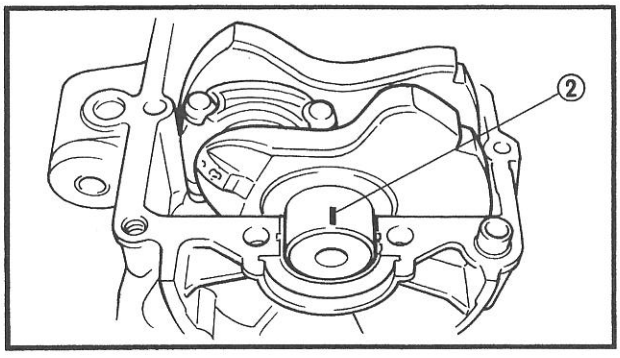
CAUTION:

Do not interchange the bearings and connecting rod. They must be installed in their original positions, or the correct oil clearance may not be obtained causing engine damage.



- Clean the bearings, main journals and bearing portions of the crankcase.
- Place the crankcase (upper) on a bench in an upside down position.
- Install the upper half of the bearings ① and the crankshaft into the crankcase (upper).

NOTE:
Align the projection ⓐ of the bearing with the notch ⓑ in the crankcase.

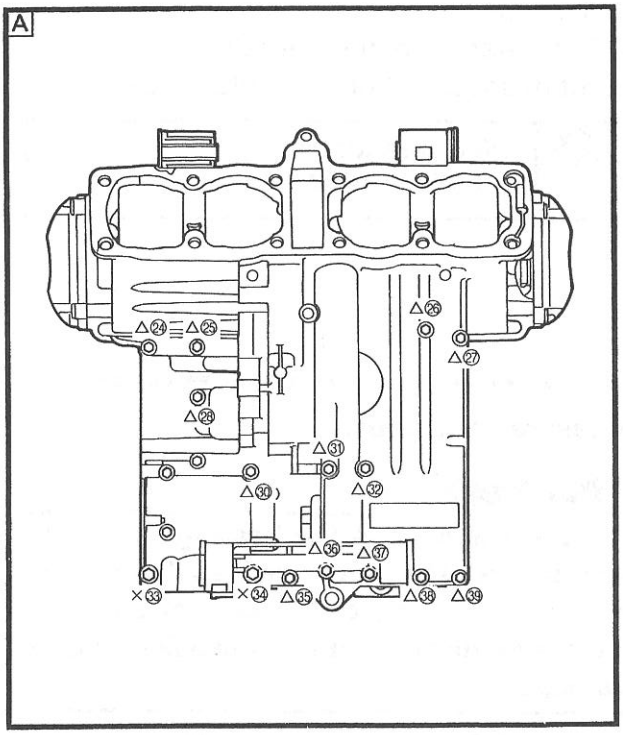


- Put a piece of Plastigauge® ② on each main journal.

NOTE:
Do not put the Plastigauge® over the oil hole in the main journal of the crankshaft.

- Install the lower half of the bearings into the crankcase (lower) and assemble the crankcase halves.

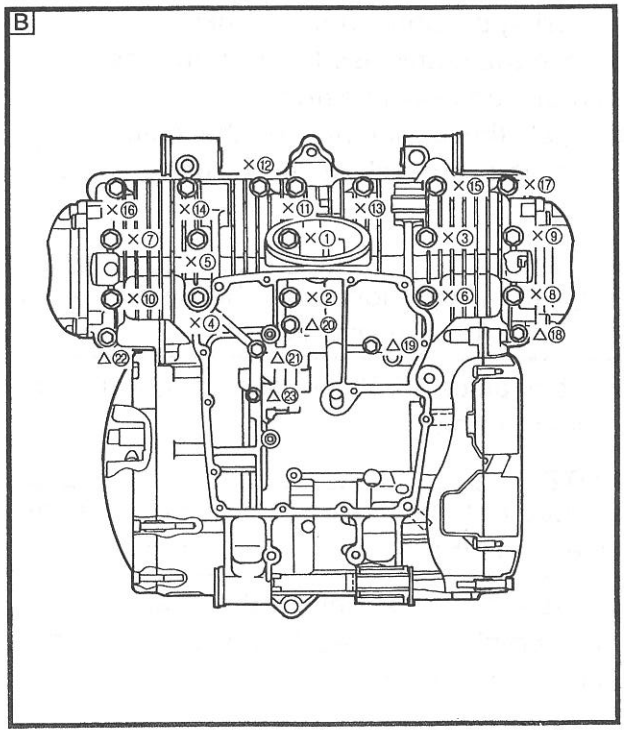
NOTE:
- Align the projection of the bearing with the notch in the crankcase.
- Do not move the crankshaft until the oil clearance has been completed.



- Tighten the bolt to specification in the tightening sequence cast on the crankcase.

	Bolt (crankcase): **× M8:** **24 Nm (2.4 m • kg)** **△M6:** **12 Nm (1.2 m • kg)**

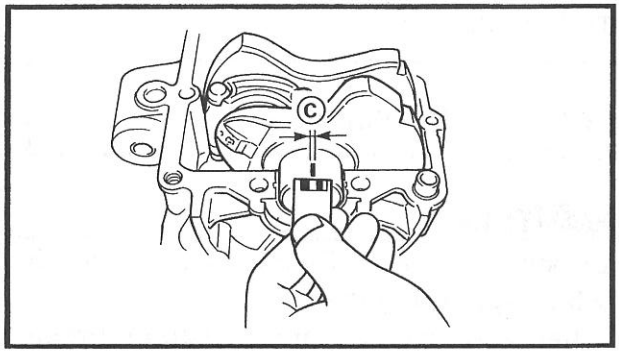
A Upper case



B Lower case

NOTE:
- Lubricate the threads of bolts (M8) with engine oil.
- Lubricate the threads of bolts (M6) with engine oil.

- Remove the crankcase (lower) and lower half of the bearing.



● Measure the compressed Plastigauge® width ⓒ on each main journal.
If oil clearance is out of specification, select a replacement bearing.

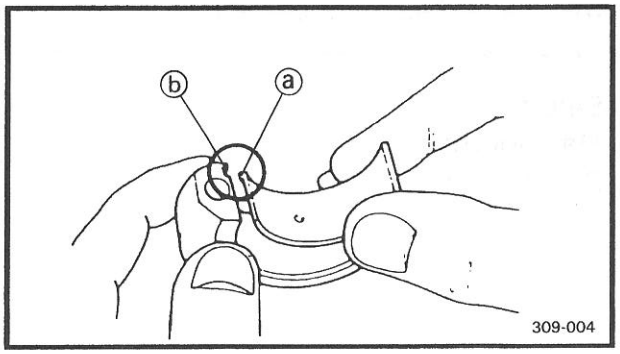
****

4. Measure:
• Oil clearance (crank pin)
Out of specification → Replace bearing.

	Oil clearance: **0.026 ~ 0.055 mm**

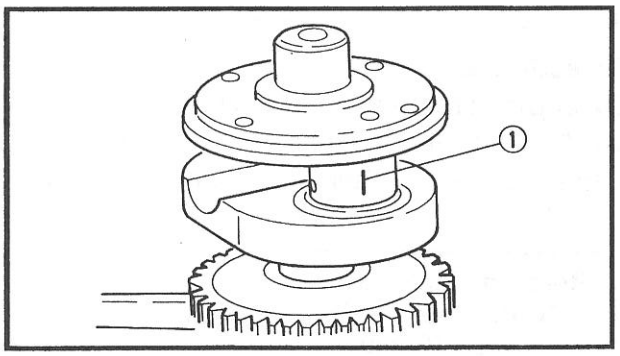
****

Measurement steps:



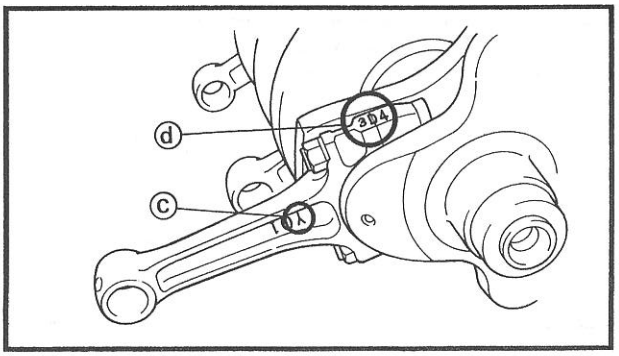
CAUTION:
Do not interchange the bearings and connecting rod. They must be installed in their original positions, or the correct oil clearance may not be obtained causing engine damage.

● Clean the bearings, crank pins and bearing portions of the connecting rods.
● Install the upper half of the bearing into the connecting rod and lower half of the bearing into the connecting rod cap.



NOTE:
Align the projection ⓐ of the bearing with the notch ⓑ of the cap and connecting rod.

● Put a piece of Plastigauge® ① on the crank pin.
● Assemble the connecting rod halves.



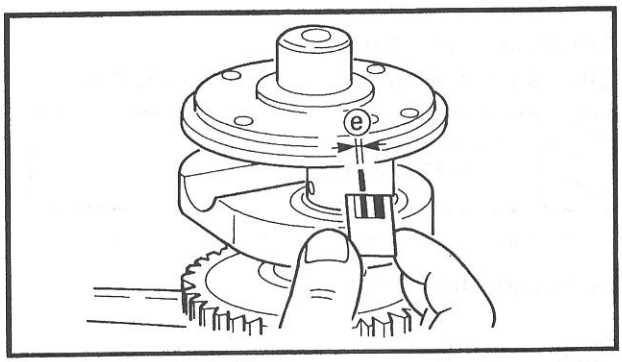
NOTE:
• Do not move the connecting rod or crankshaft until the oil clearance measurement has been completed.
• Apply molybdenum disulfide grease to the bolts, threads and nut seats.
• Make sure the "Y" marks ⓒ on the connecting rods face the left side of the crankshaft.
• Make sure that the letters ⓓ on both components align to form a perfect character.

● Tighten the nuts.

	Nut: **37 Nm (3.7 m • kg)**

CAUTION:

- **Be sure to use an F-type torque wrench when tightening the nuts.**
- **When you reach 3.0 m • kg, keep tightening until the final torque is obtained. Apply continuous torque until the specified torque is obtained.**



Refer to "ENGINE ASSEMBLY AND ADJUSTMENT" — "CONNECTING ROD".

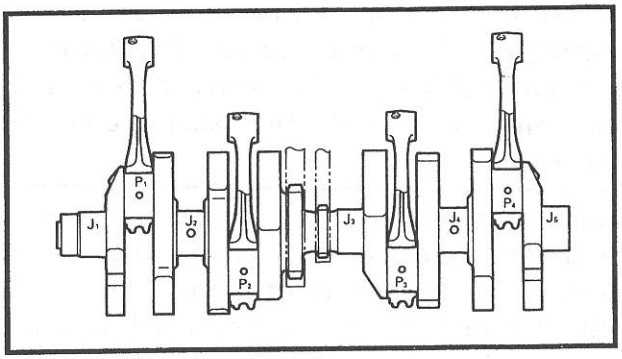
● Remove the connecting rods and bearings.

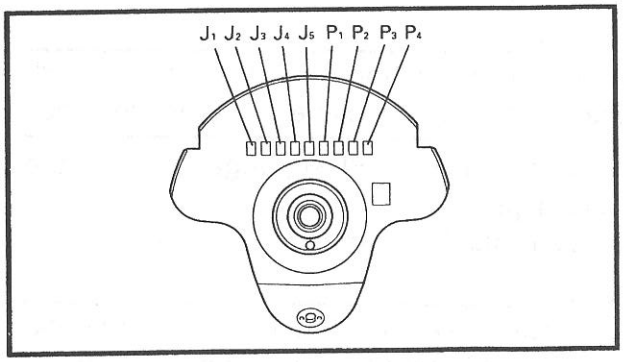
● Measure the compressed Plastigauge® width ⓔ on each crank pin.
If oil clearance is out of specification, select a replacement bearing.

****

5. Select:

- Main journal bearing ($J_1 \sim J_5$)
- Crank pin bearing ($P_1 \sim P_4$)





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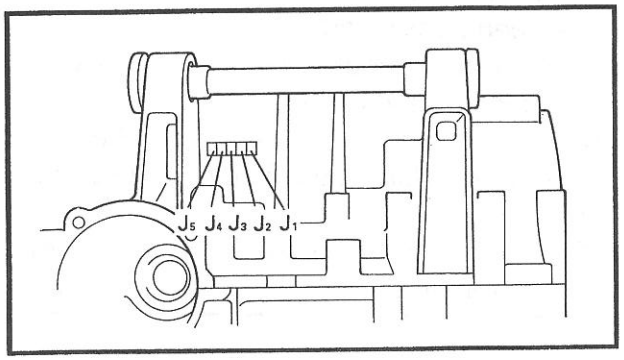
Selection of bearings:

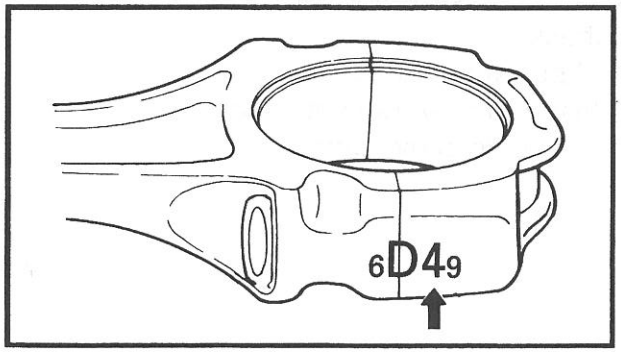
Example 1: Main journal bearing

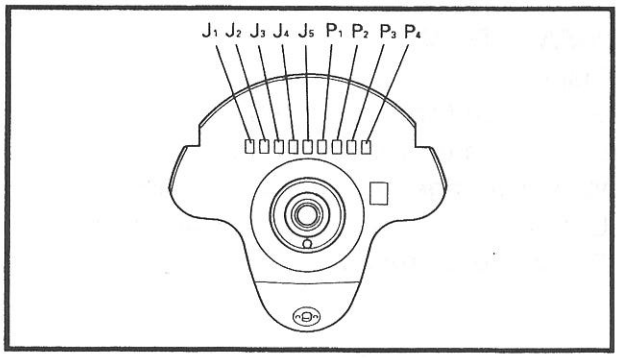
● If "J_1" on the crankcase is "6" and "2" on the crankweb, then the bearing size for "J_1" is:

Bearing size of J_1:
Crankcase J_1 – Crankweb J_1 =
6 – 2 = 4 (Green)



BEARING COLOR CODE	
1	Blue
2	Black
3	Brown
4	Green
5	Yellow





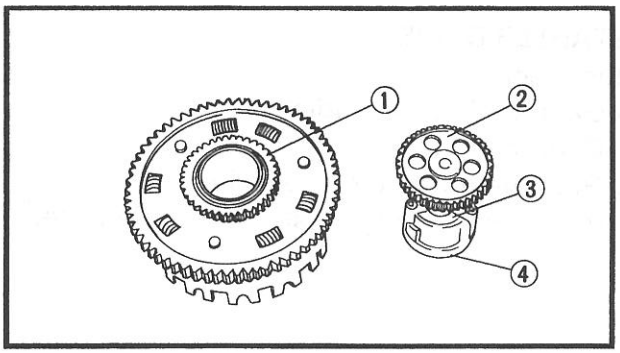
Example 2: Crank pin bearing

- If "P_1" on the connecting rod is "4" and "1" on the crankweb, then the bearing size for "P_1" is:

Bearing size of P_1:
Connecting rod P_1 – Crankweb P_1 = 4 – 1 = 3 (Brown)

BEARING COLOR CODE	
1	Blue
2	Black
3	Brown
4	Green

****

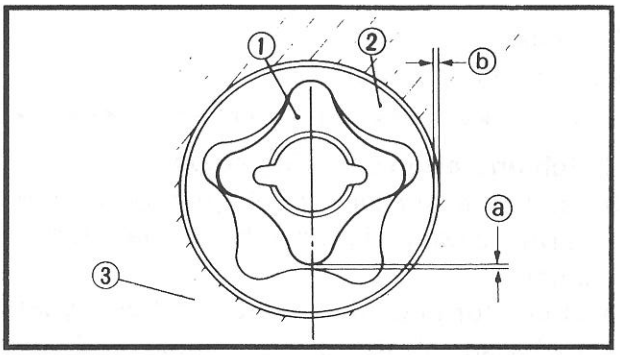


OIL PUMP

1.Inspect:

- Drive gear (oil pump ①)
- Driven gear (oil pump ②)
- Pump housing ③
- Pump housing cover ④

Wear/Cracks/Damage → Replace.

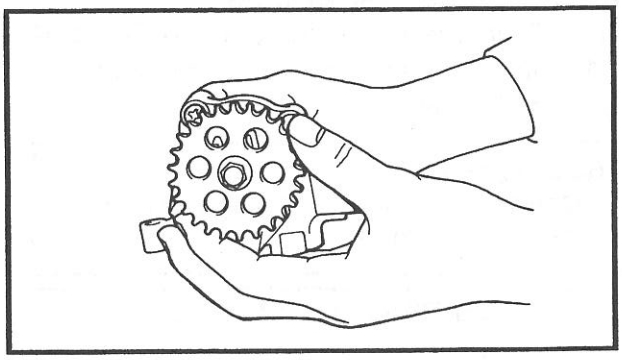


2.Measure:

- Tip clearance ⓐ
  (between the inner rotor ① and the outer rotor ②)
- Side clearance ⓑ
  (between the outer rotor ② and the pump housing ③)

Out of specification → Replace the oil pump assembly.

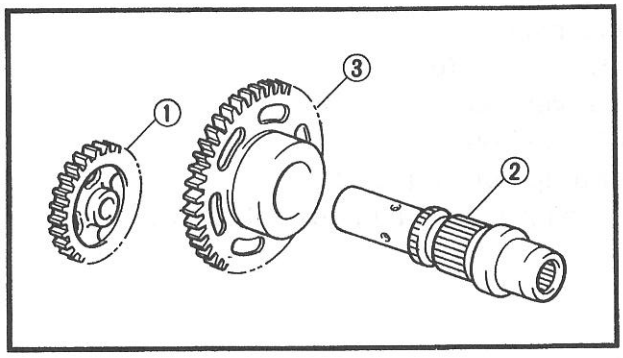
Tip clearance:
0.03 ~ 0.09 mm
Side clearance:
0.03 ~ 0.08 mm



3.Check:
- Oil pump operation
  Unsmooth → Repeat steps 1 and 2 or replace defective parts.

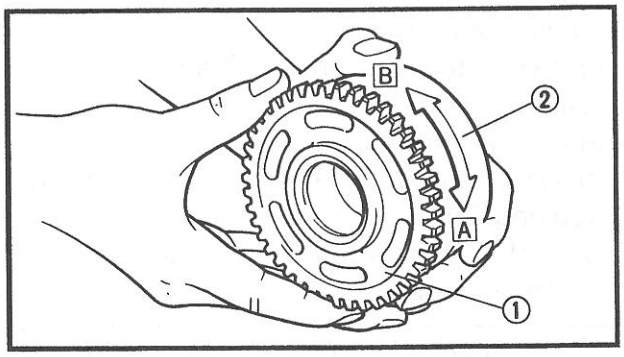
PRIMARY DRIVE

1.Inspect:
- Gear teeth (primary drive)
- Gear teeth (primary driven)
  Wear/Damage → Replace both gears.
  Excessive noises during operation → Replace both gears.



STARTER DRIVES

1.Inspect:
- Gear teeth (starter idle ①)
- Gear teeth (starter drive ②)
- Gear teeth (starter wheel ③)
  Burrs/Chips/Roughness/Wear → Replace.



2.Check:
- Starter clutch operation

****

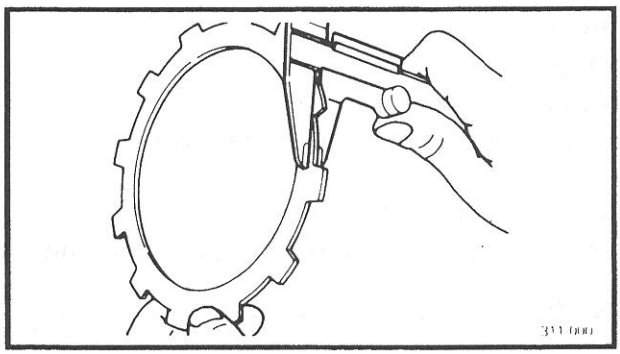
Clutch operation checking steps:

- Install the starter wheel gear ① to the starter clutch ②, and hold the starter clutch.
- When turning the starter wheel gear clockwise [A], the starter clutch and the wheel gear should be engaged.
  If not, the starter clutch is faulty. Replace it.
- When turning the starter wheel gear counterclockwise [B], the starter wheel gear should turn freely.
  If not, the starter clutch is faulty. Replace it.

****

CLUTCH

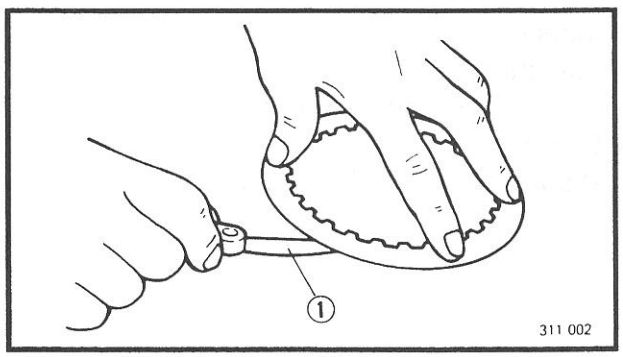
1.Inspect:
- Friction plate
  Damage/Wear → Replace friction plates as a set.



2.Measure:
- Friction plate thickness
  Out of specification → Replace friction plates as a set.
  Measure at four points.

Thickness:
2.9 ~ 3.1 mm
<Limit>: 2.8 mm

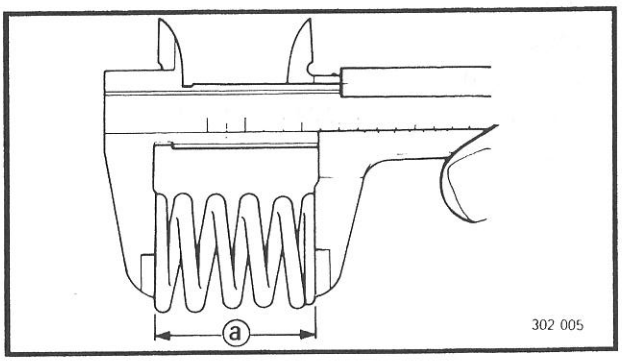
3.Inspect:
- Clutch plate
  Damage → Replace clutch plates as a set.



4.Measure:
- Clutch plate warpage
  Out of specification → Replace clutch plate as a set.
  Use a surface plate and feeler gauge ①.

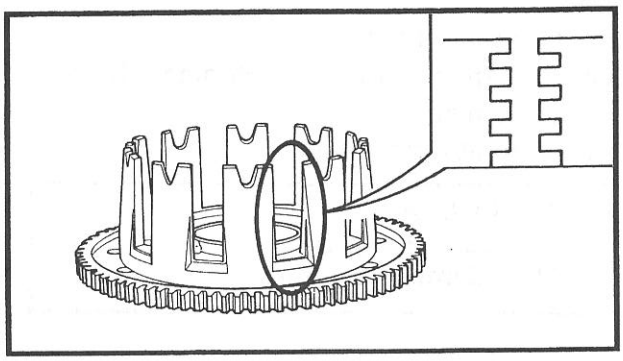
Warp limit:
Less than 0.05 mm

5.Inspect:
- Clutch spring
  Damage → Replace springs as a set.



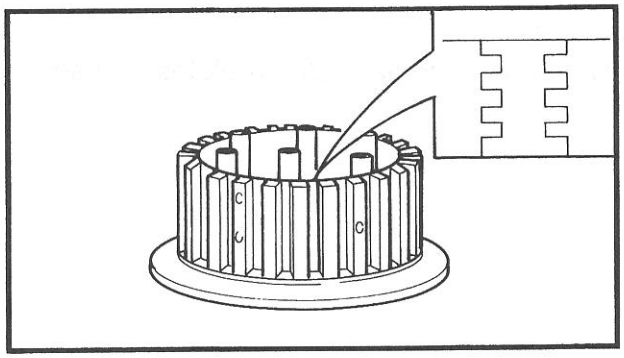
6.Measure:
- Free length (clutch spring) ⓐ
  Out of specification → Replace spring as a set.

Free length (clutch spring):
51.8 mm
<Limit>: 50.0 mm



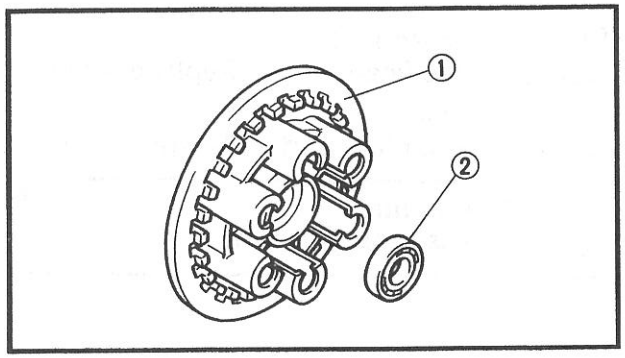
7.Inspect:
- Dogs
  (on the clutch housing)
  Pitting/Wear/Damage → Deburr or replace.
- Clutch housing bearing
  Wear/Damage → Replace clutch housing.

NOTE:
Pitting on the clutch housing dogs will cause erratic operation.



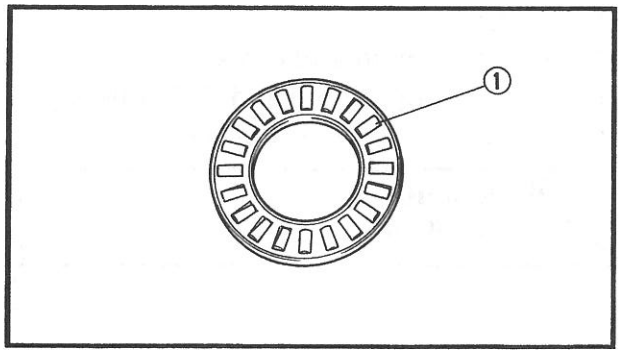
8.Inspect:
- Clutch boss splines
  Pitting/Wear/Damage → Replace clutch boss.

NOTE:
Pitting on the clutch boss splines will cause erratic operation.

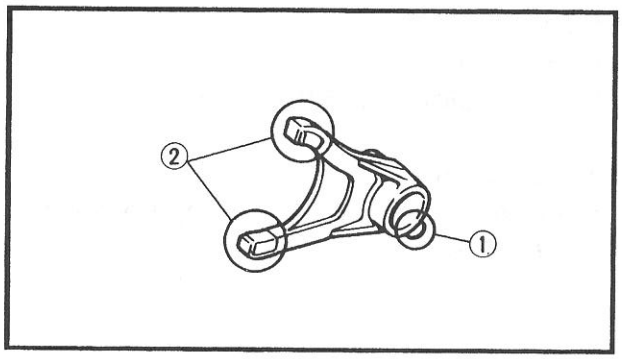


9.Inspect:
- Pressure plate ①
  Cracks/Damage → Replace.
- Bearing ②
  Wear/Damage → Replace.

10.Inspect:
- Gear teeth (pull lever pinion gear)
- Gear teeth (pull rod)
  Wear/Damage → Replace as a set.

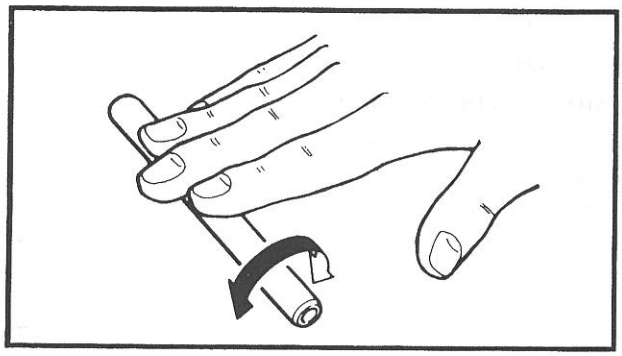


11.Inspect:
- Bearing (pull rod) ①
  Wear/Damage → Replace.



TRANSMISSION AND SHIFTER

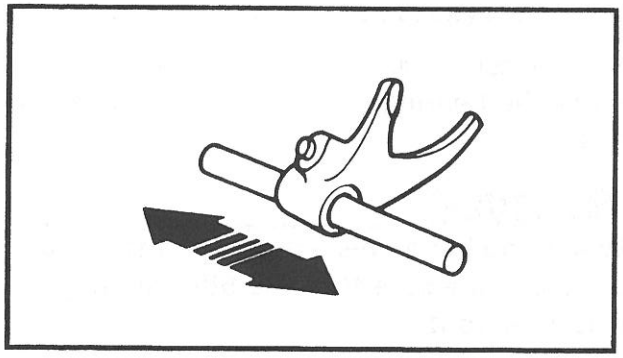
1.Inspect:
- Shift fork cam follower ①
- Shift fork pawl ②
  Scoring/Bends/Wear/Damage → Replace.



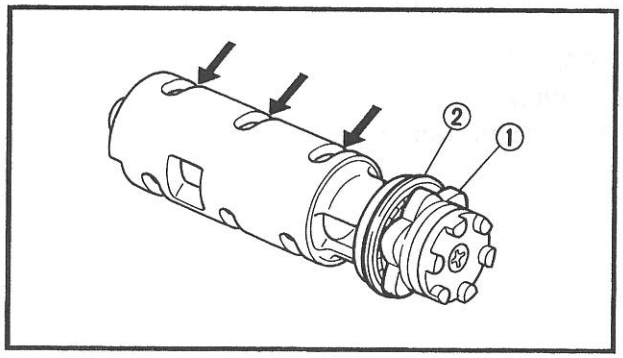
2.Inspect:
- Guide bar
  Roll the guide bar on a flat surface.
  Bends → Replace.

⚠ WARNING

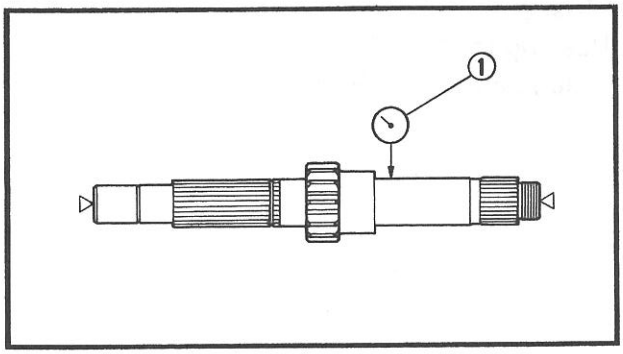
Do not attempt to straighten a bent guide bar.



3.Check:
- Shift fork movement
  (on its guide bar)
  Unsmooth operation → Replace the fork and guide bar.

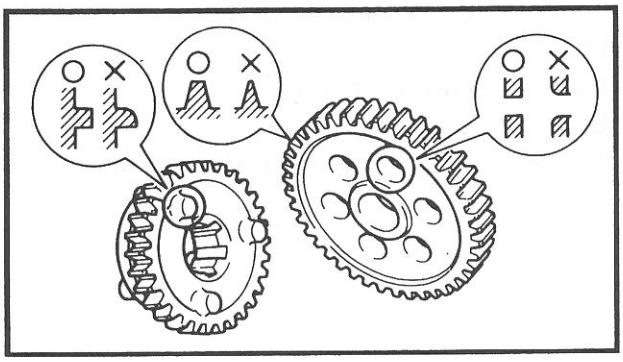


4.Inspect:
- Shift cam grooves
  Wear/Damage/Scratches → Replace.
- Shift cam segment ①
  Damage/Wear → Replace.
- Shift cam bearing ②
  Pitting/Damage → Replace.

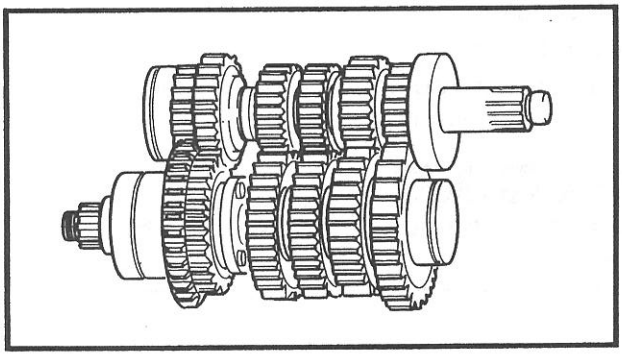


5.Measure:
- Axle runout (main and drive)
  Use a centering device and dial gauge ①.
  Out of specification → Replace.

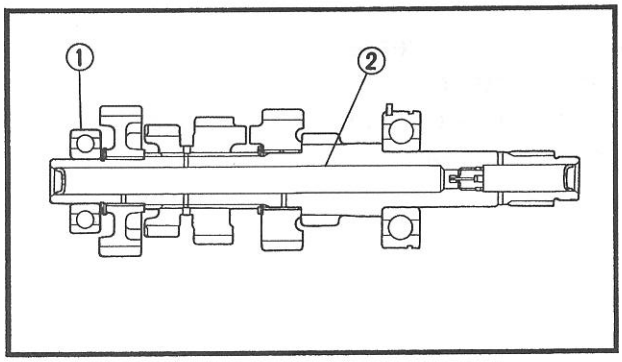
Runout limit:
0.08 mm



6.Inspect:
- Gear teeth
  Blue discoloration/Pitting/Wear → Replace.
- Mated dogs
  Rounded edges/Cracks/Missing portions → Replace.



7.Check:
- Proper gear engagement (each gear) (to its counter part)
  Incorrect → Reassemble.
- Gear movement
  Roughness → Replace.



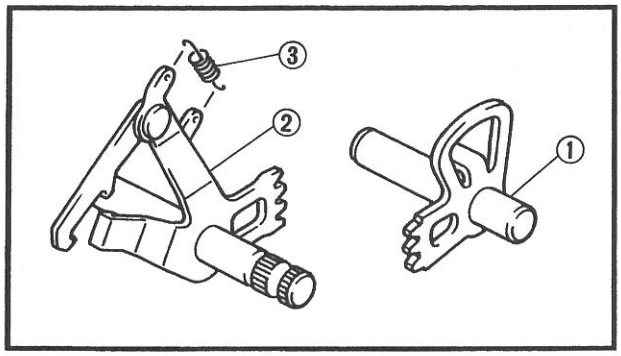
****

Transmission gear reassembling point:
Press the bearing ① in the main axle ② as shown.

CAUTION:
When you have finished pressing the bearing ①, make sure that the 5th pinion gear rotates smoothly.

****

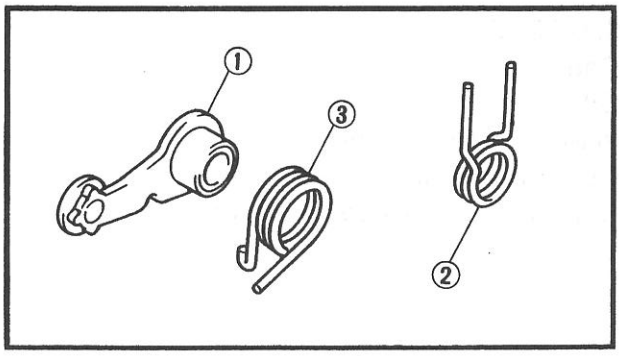
8.Inspect:
- Circlips
  Damage/Looseness/Bends → Replace.



SHIFT SHAFT AND STOPPER LEVER

1.Inspect:
- Shift shaft ①
- Shift lever ②
- Return spring (shift arm) ③

  Bends/Wear/Damage → Replace.



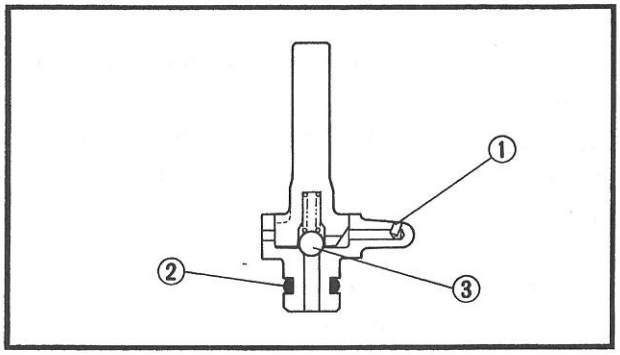
2.Inspect:
- Stopper lever ①

  Roller turns roughly → Replace.

  Bends/Damage → Replace.

3.Inspect:
- Return spring (shift shaft) ②
- Return spring (stopper lever) ③

  Wear/Damage → Replace.

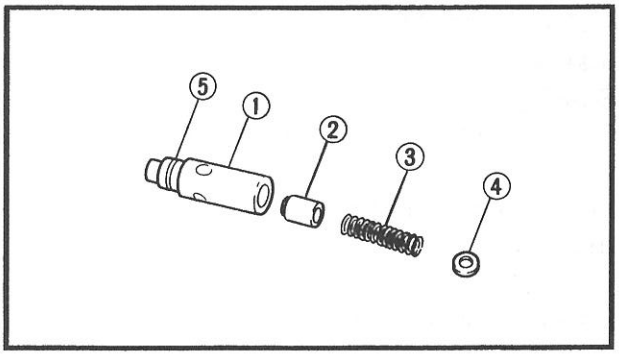


OIL-JET NOZZLE

1.Check:
- Oil-jet nozzles ①
- O-ring ②
- Check ball ③

  Damage/Wear → Replace oil - jet nozzle assembly.
- Oil jet passage

  Clogged → Blow out with compressed air.



RELIEF VALVE, OIL PIPE AND STRAINER

1.Check:
- Relief valve body ①
- Valve ②
- Spring ③
- Spring seat ④
- O-ring ⑤

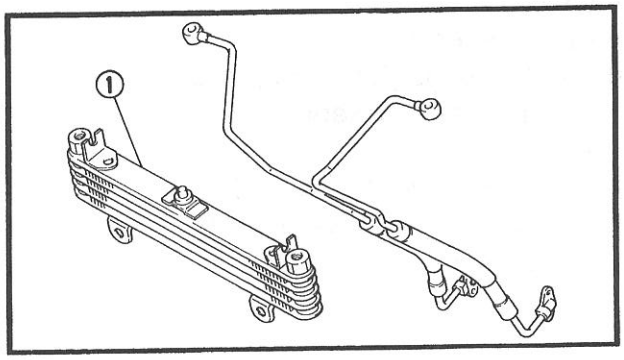
  Damage/Wear → Replace.

2.Check:
- Oil delivery pipe

  Damage → Replace.

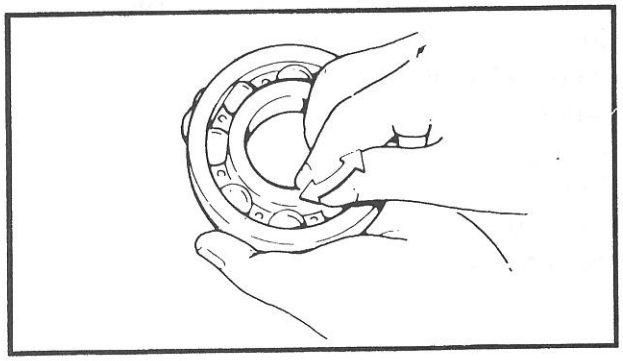
  Contamination → Wash and blow out the passage.

3.Inspect:
- Oil strainer
  Damage → Replace.



OIL COOLER
1.Check:
- Oil cooler ①
- Inlet hose (oil cooler)
- Outlet hose (oil cooler)
  Cracks/Wear/Damage → Replace.

CRANKCASE
1.Thoroughly wash the case halves in mild solvent.
2.Clean all the gasket mating surfaces and crankcase mating surfaces thoroughly.
3.Inspect:
- Crankcase
  Cracks/Damage → Replace.
- Oil delivery passages
  Clogged → Blow out with compressed air.



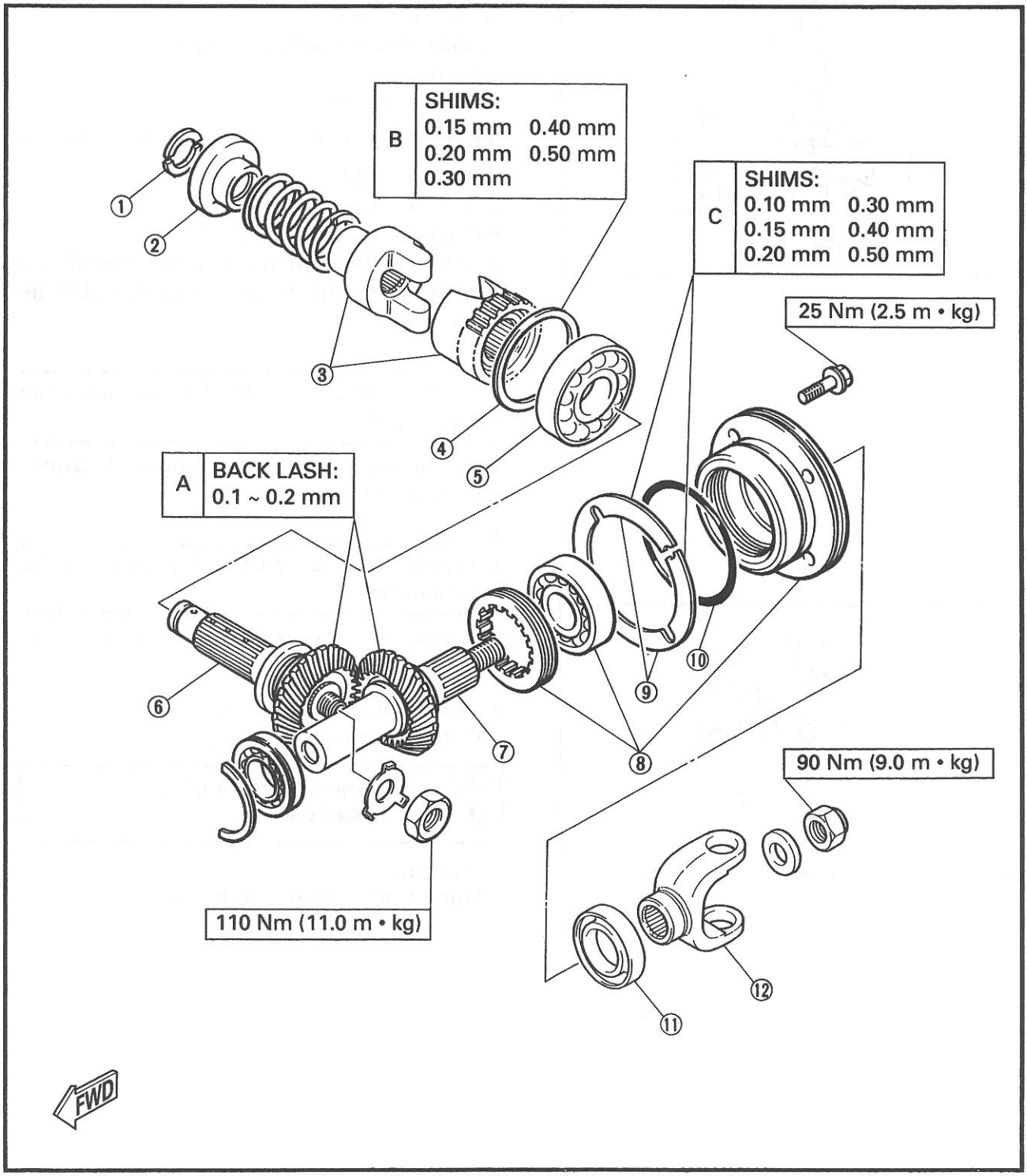
BEARING AND OIL SEAL
1.Inspect:
- Bearings
  Clean and lubricate, then rotate inner race with finger.
  Roughness → Replace.

2.Inspect:
- Oil seals
  Damage/Wear → Replace.

CIRCLIP AND WASHER
1.Inspect:
- Circlips
- Washers
  Damage/Looseness/Bends → Replace.

MIDDLE GEAR SERVICE

① Spring retainer
② Spring seat
③ Damper cam
④ Shim
⑤ Bearing
⑥ Middle drive shaft
⑦ Middle driven shaft
⑧ Bearing housing assembly
⑨ Shim
⑩ O-ring
⑪ Oil seal
⑫ Universal joint

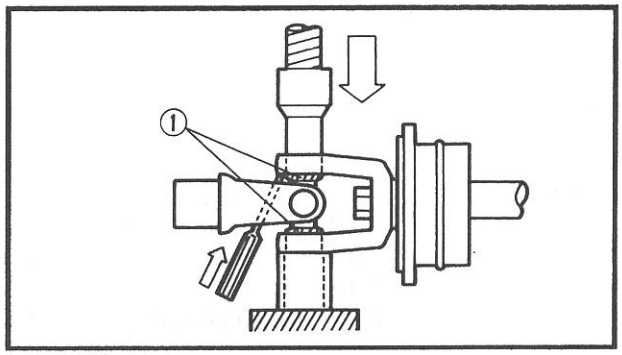


REMOVAL

1.Remove:

- Middle driven shaft assembly
- Middle drive shaft assembly

Refer to "ENGINE DISASSEMBLY".



DISASSEMBLY

Middle driven shaft assembly

1.Remove:

- Universal joint

****

Removal steps:

- Remove the circlips ①.
- Place the U-joint in a press.
- With a suitable diameter pipe beneath the yoke, press the bearing into the pipe as shown.

NOTE:

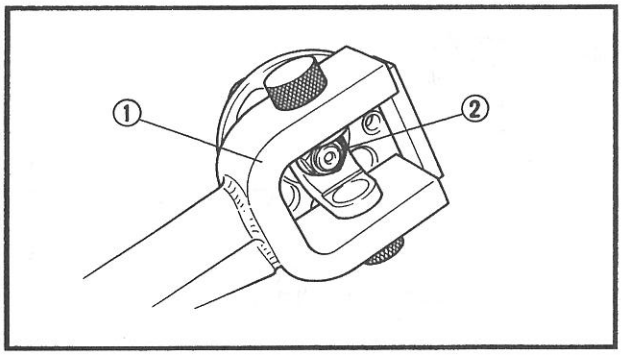
It may be necessary to lightly tap the yoke with a punch.

- Repeat the steps for the opposite bearing.
- Remove the yoke.

NOTE:

It may be necessary to lightly tap the yoke with a punch.

****



2.Attach:

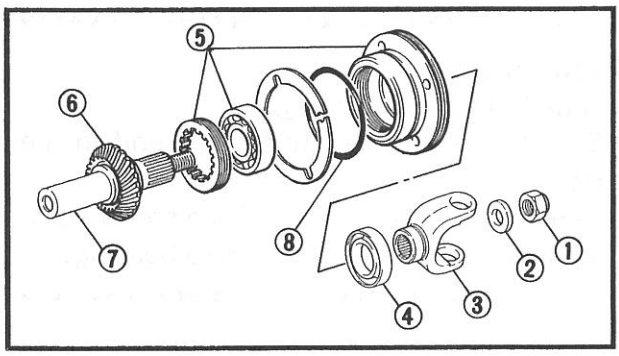
- Universal joint holder ①

Onto the universal joint yoke.

	**Universal joint holder: 90890-04062**

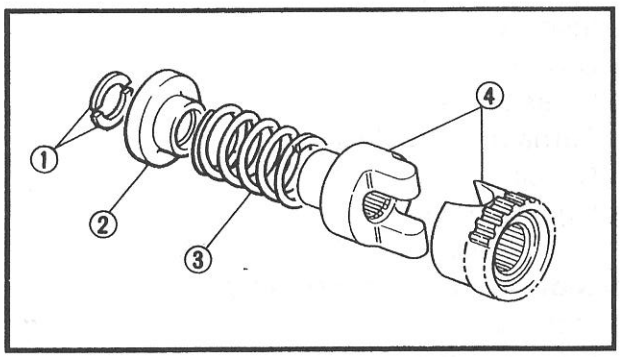
3.Loosen:

- Nut (middle driven shaft) ②



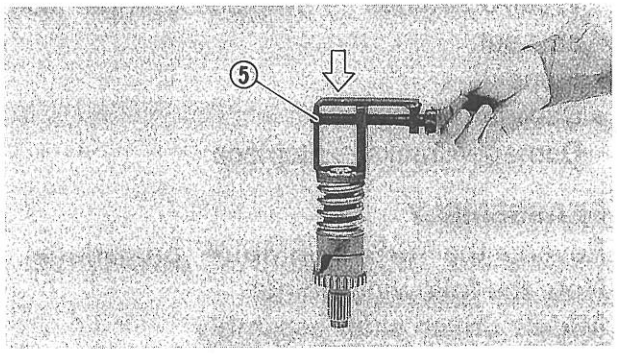
4.Remove:
- Nut (middle driven shaft) ①
- Washer ②
- Yoke ③
- Oil seal ④
- Bearing housing assembly ⑤
- Driven pinion gear ⑥
- Middle driven shaft ⑦
- O-ring ⑧

CAUTION:
Always replace the collapsible collar whenever the middle gear is disassembly.

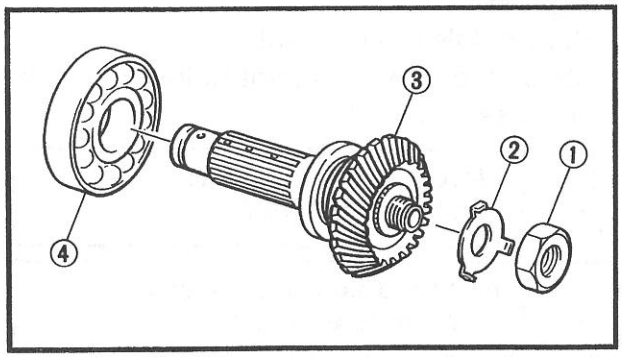


Middle drive shaft assembly
1.Remove:
- Spring retainers ①
- Spring seat ②
- Spring ③
- Damper cam ④

NOTE:
Attach the damper spring compressor ⑤ on the spring seat and compress the spring, then remove the spring retainer.

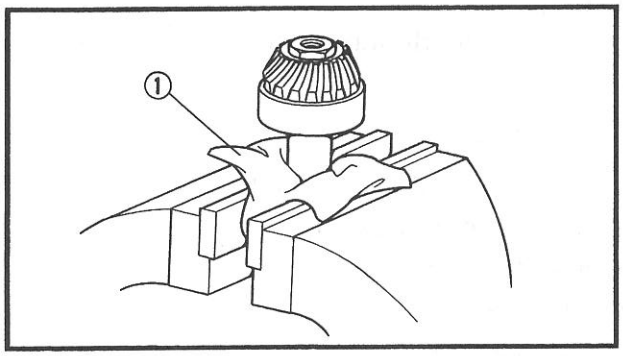


Damper spring compressor:
P/N 90890-04090



2.Straighten:
- Lock washer

3.Remove:
- Nut (middle drive shaft) ①
- Lock washer ②
- Drive pinion gear ③
- Bearing ④



****

Removal steps:

- Attach the folded rag ①.
- Secure the middle drive shaft end in the vise.
- Remove the nut (middle drive shaft), lock-washer, drive pinion gear and bearing.

****

INSPECTION

Middle driven shaft assembly

1. Inspect:
- Middle gear teeth
  Pitting/Galling/Wear → Replace middle gear as a set.
2. Inspect:
- Bearing
  Pitting/Damage → Replace bearing housing assembly.
3. Inspect:
- O-ring
- Oil seal
  Damage → Replace.
4. Check:
- U-joint movement
  Roughness → Replace U-joint.

Middle drive shaft assembly

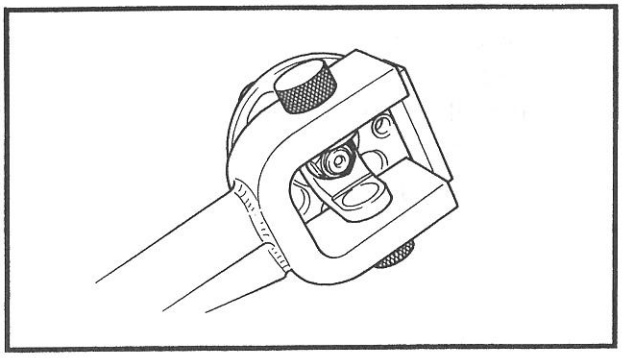
1. Inspect:
- Damper cam surface
  Wear/Scratches → Replace damper cam as a set.
2. Inspect:
- Damper spring
  Damage/Cracks → Replace.

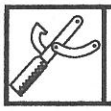
REASSEMBLY

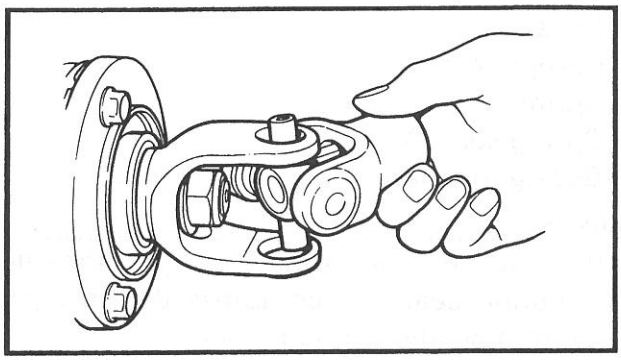
Reverse the "DISASSEMBLY" procedures.
Note the following points.

Middle driven shaft assembly

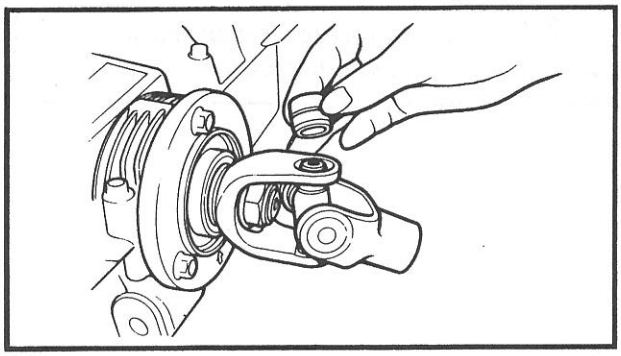
1. Tighten:
- Nut (middle driven shaft)
  Attach the universal joint holder onto the universal joint yoke.



	**Universal joint holder: P/N 90890-04062**
	**Nut (middle driven shaft): 90 Nm (9.0 m • kg)**



2.Position:
- Yoke
  into the U-joint.

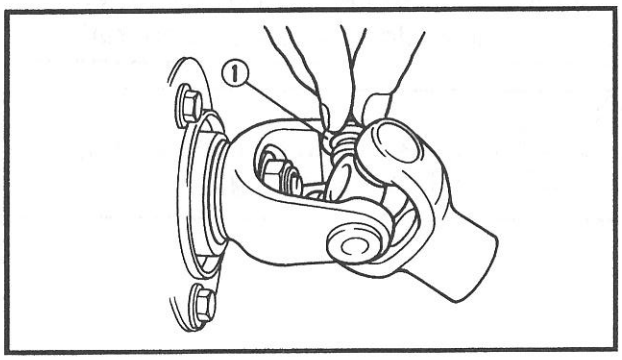


3.Install:
- Bearings
  onto the yoke.

CAUTION:
Check each bearing. The needles can easily fall out of their races. Slide the yoke back and forth on the bearings; the yoke will not go all the way onto a bearing if a needle is out of place.

4.Press each bearing into U-joint using a suitable socket.

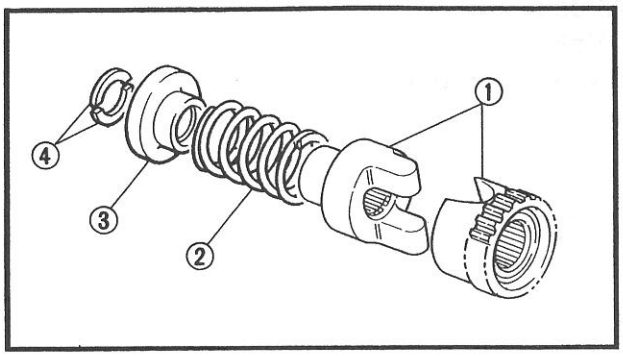
NOTE:
Bearing must be inserted far enough into U-joint so that circlip can be installed.



5.Install:
- Circlips ①
  Into groove of each bearing.

Middle drive shaft assembly
1.Tighten:
- Nut (middle drive shaft)

	Nut (middle drive shaft): 110 Nm (11 m • kg)



2.Install:
- Damper cam ①
- Spring ②
- Spring seat ③
- Spring retainers ④

NOTE:
Attach the damper spring compressor on the spring seat and compress the spring, then remove the spring retainer.

Damper spring compressor:
P/N 90890-04090

INSTALLATION

1.Install:
- Middle drive shaft assembly
- Middle driven shaft assembly
  Refer to "ENGINE ASSEMBLY AND ADJUSTMENT".

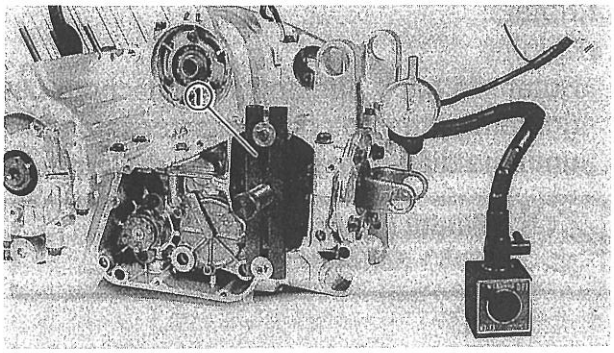
NOTE:
Before tighten the bolts
1.Adjust the gear lash of the middle gear.
  Refer to "GEAR LASH ADJUSTMENT".
2.Check the middle driven gear operation.

Bolts
(middle driven gear assembly):
25 Nm (2.5 m • kg)

GEAR LASH MEASUREMENT

1.Measure:
- Gear lash
  Out of specification → Adjust.

Gear lash:
0.1 ~ 0.2 mm



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Measurement steps:

● Install the middle gear backlash tool ①.

	Middle gear backlash tool: P/N 90890-04080

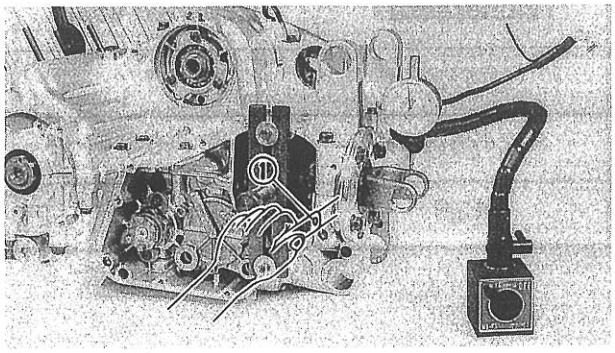
● Align the dial gauge with the yoke.
● Measure the gear lash while rotating the yoke gently back and forth.

NOTE:
Measure the gear lash at each 90° rotation to obtain four measurements.

****

GEAR LASH ADJUSTMENT

1. Loosen:
• Bolts (driven gear bearing housing)
2. Remove:
• Shims



3. Tighten:
• Bolts (driven gear bearing housing)

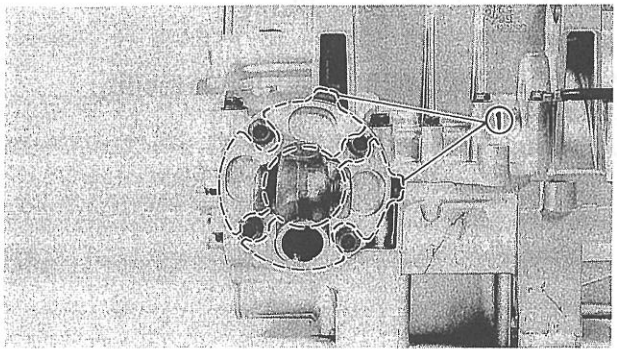
NOTE:
Clearance between the crankcase and driven gear bearing housing should be about 2 mm. Measure gap with feeler gauge ①.

CAUTION:
Do not overtighten bearing housing bolts or you may obtain too little gear lash and cause damage to gears. If over tightened, loosen the 4 bolts so that crankcase/bearing housing clearance is about 2 mm and repeat all previous steps.

4.Rotate:
- U-joint
  Rotate it back and forth, while carefully tightening the bolts in a crisscross pattern until the dial gauge reads 0.1 ~ 0.2 mm.

	Middle gear lash: **0.1 ~ 0.2 mm**

5.Measure:
- Crankcase/bearing housing clearance
  Use a feeler gauge.



6.Select:
- Shim(s) ①

****

Selection steps:
- If the clearance between crankcase and bearing housing is 0.42 mm.
- The chart instructs you to round off 2 to 0 at the hundredth place. Thus, the shim thickness is 0.40 mm.

Hundredths	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

Shim sizes are supplied in the following thickness.

	Middle drive pinion gear shim:		
Thickness (mm)	**0.10** **0.15**	**0.20** **0.30**	**0.40** **0.50**

****

7.Loosen:
- Bolts (driven gear bearing housing)

8.Install:
- Shims

9.Tighten:
- Bolts (driven gear bearing housing)

	**Bolt (driven gear bearing housing): 25 Nm (2.5 m • kg)**

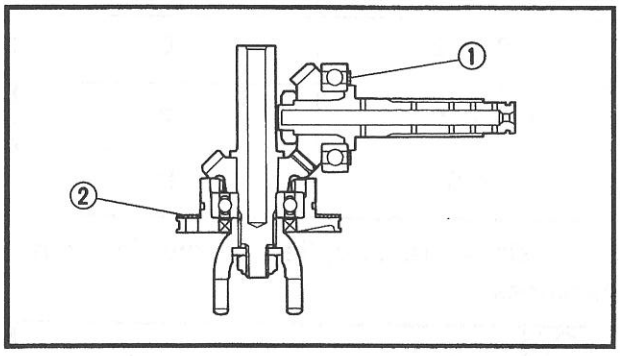
10.Measure:
- Gear lash

	**Middle gear lash: 0.1 ~ 0.2 mm**

If the gear lash is incorrect → Repeat.

MIDDLE DRIVE GEAR AND DRIVEN GEAR POSITIONING

NOTE:
Gear positioning is necessary when any of the following parts are replaced.
- Crankcase assembly
- Middle drive shaft
- Middle gear bearing housing



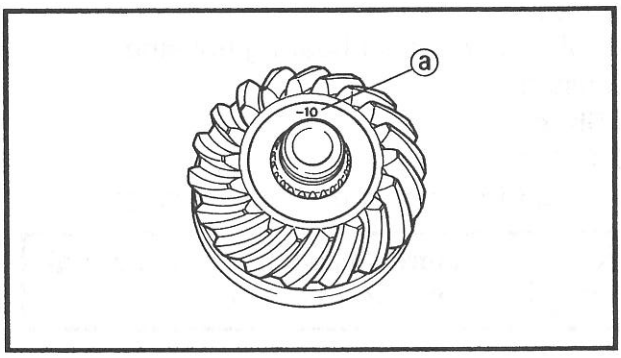
1.Select:
- Middle drive gear shim ①

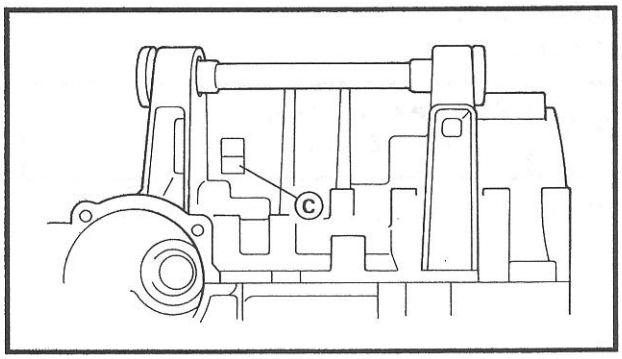
NOTE:
Select the middle driven gear shim ② by calculating out the middle drive gear shim ① and then actually measuring the gear lash.

****

Middle drive gear shim selection steps:
- Position middle drive gear by using shims ① with their respective thickness calculated from information marked on crankcase, and drive gear end.

① Shim thickness "A" (middle drive gear)





● To find shim thickness "A" use following formula.

Middle drive pinion gear shim thickness:
"A" = ⓒ – ⓐ – ⓑ

Where:

ⓐ = a numeral (usually a decimal number) on the drive pinion gear is either added to or subtracted from "43.00".

ⓑ = bearing thickness (considered constant).

ⓒ = a numeral (usually a decimal number) on the crankcase (upper) half near the main bearing selection numbers and added to the nominal size "60".

Example:

1) If the drive pinion gear is marked "–10".... ⓐ is 42.90
2) ⓑ is 16.94
3) If the crankcase (upper) is marked "48"..... ⓒ is 60.48
   "A" = 60.48 – 42.90 – 16.94 = 0.64
4) Round off hundredths digit and select appropriate shim(s).
   In the example above, the calculated number is 0.64. The chart instructs you to round off 4 to 5 at the hundredth place. Thus, the shim thickness is 0.65 mm.

Hundredths	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

Shim sizes are supplied in the following thickness.

Middle drive pinion gear shim:			
Thickness (mm)	0.15 0.20	0.30 0.40	0.50

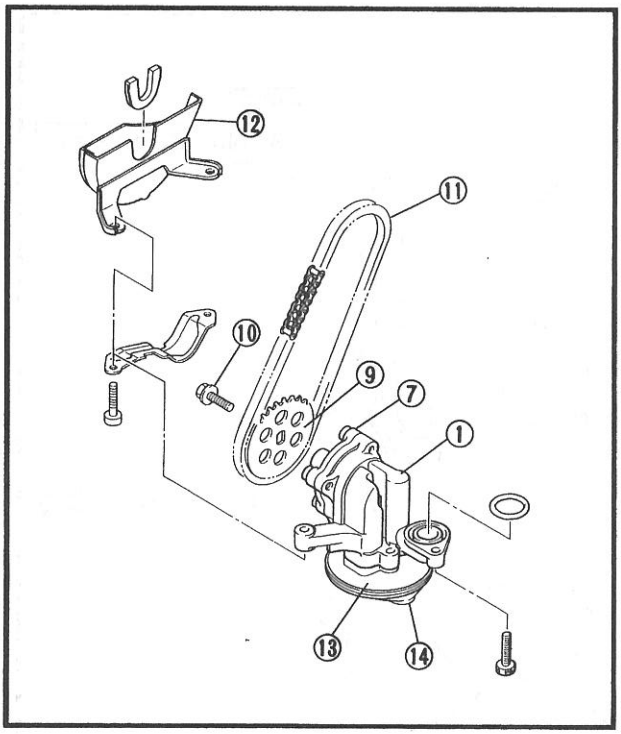
****

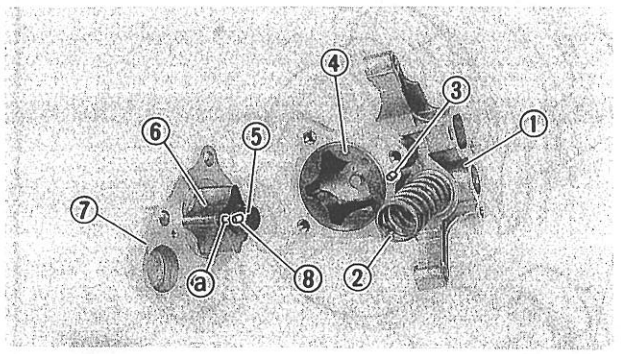
ENGINE ASSEMBLY AND ADJUSTMENT

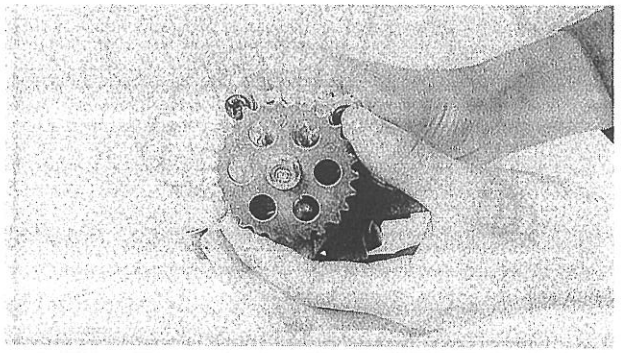
⚠ WARNING

For engine reassembly, replace the following parts with new ones:

- **O-ring**
- **Gasket**
- **Oil seal**
- **Copper washer**
- **Lock washer**
- **Circlip**







OIL PUMP

1.Lubricate:

- Inner rotor
- Outer rotor
- Pump shaft

	Recommended lubricant: SAE 20W40 motor oil

2.Install:

- Oil pump housing ①
- Relief valve
- Spring ②
- Pin ③
- Outer rotor ④
- Pump shaft ⑤
- Inner rotor ⑥
- Pump cover ⑦
- Pin ⑧
- Sprocket ⑨
- Bolt ⑩
- Chain ⑪
- Chain cover ⑫
- Oil strainer cover ⑬
- Oil strainer ⑭

	Screw (pump housing): 12 Nm (1.2 m • kg)

NOTE:

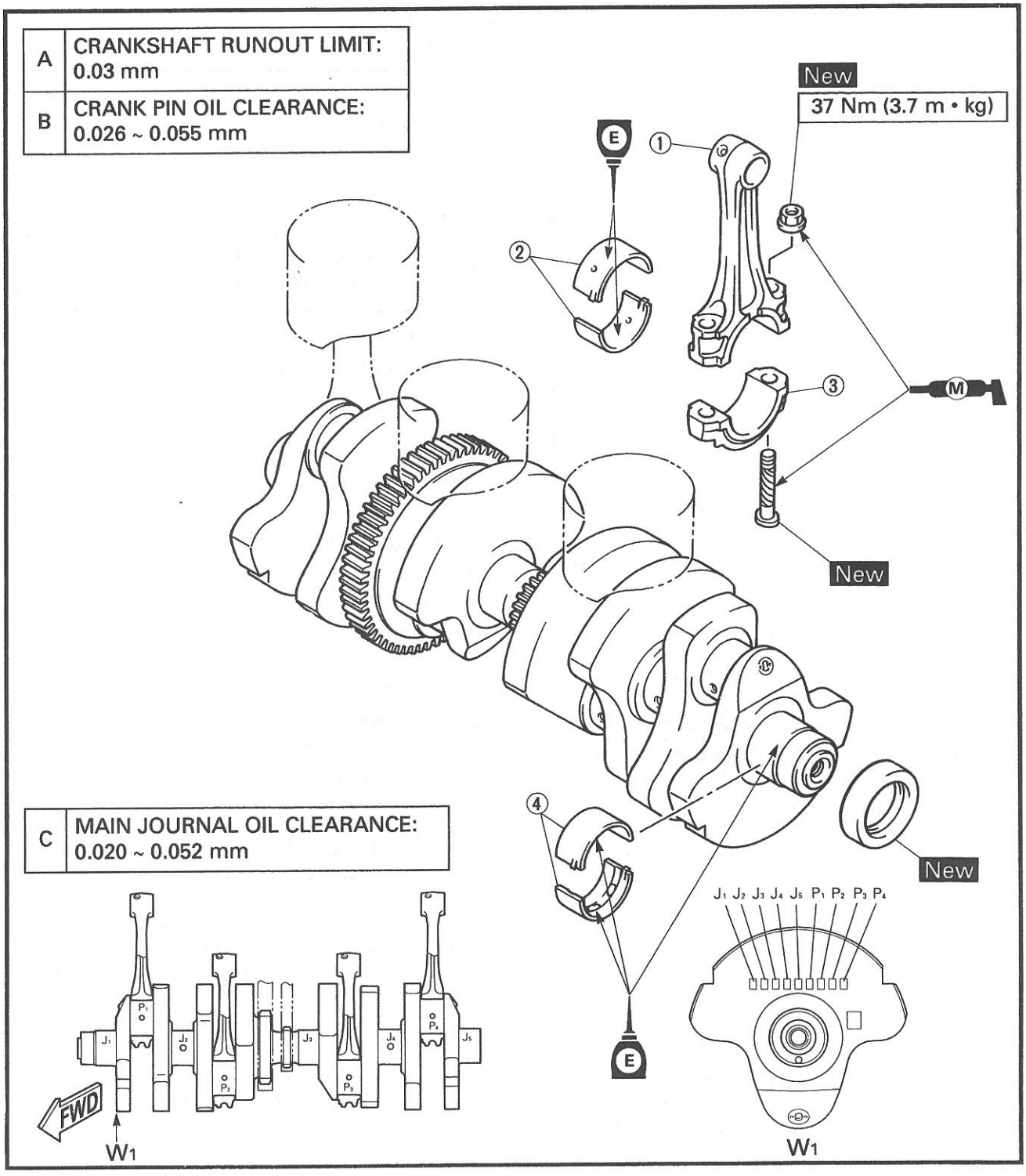
When installing the inner rotor, align the pin ⑧ in the pump shaft with the groove ⓐ on the inner rotor ⑥.

3.Check:

- Oil pump operation
  Refer to "INSPECTION AND REPAIR".

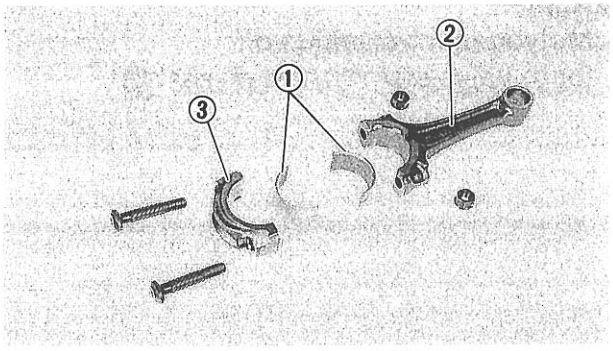
CONNECTING ROD AND CRANKSHAFT

① Connecting rod
② Plain bearing (connecting rod)
③ Connecting rod cap
④ Plain bearing (crankshaft-main journal)



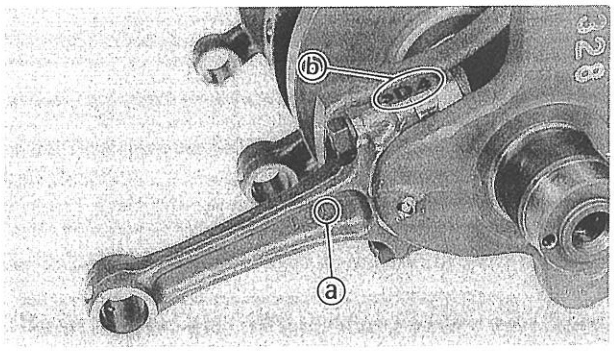
CONNECTING ROD

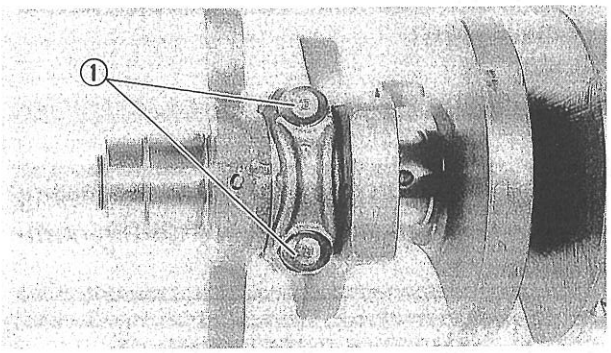
1.Apply:
- Molybdenum disulfide grease (onto threads of bolts and nut seats)
- Engine oil (onto crank pins, crank pin bearings and inner surfaces of connecting rods)



2.Install:
- Bearings (crank pin) ①
- Connecting rods ②
- Connecting rod caps ③ (onto crank pins)

NOTE:
- Align the projection of bearing with the groove of the caps and connecting rod.
- Make sure to reinstall each connecting rod bearing in its original place.
- The stamped "Y" mark ⓐ on the connecting rods should face towards the left of the crankshaft.
- Be sure that the letter ⓑ on both components align to form a perfect character.



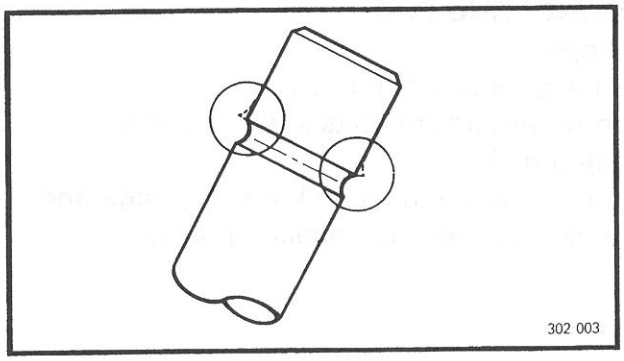


3.Align:
- Bolt head ① (with connecting rod cap)

4.Tighten:
- Nuts (connecting rods)

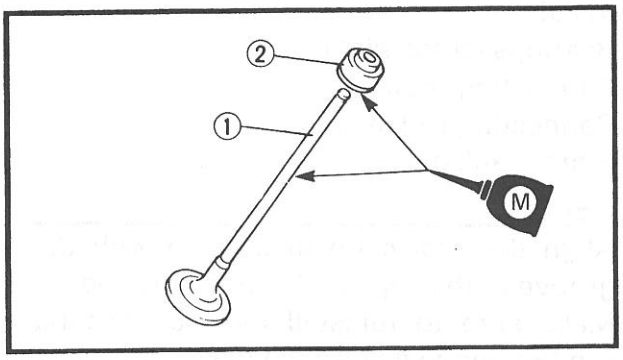
	Nut (connecting rod): 37 Nm (3.7 m • kg)

CAUTION:
- **Be sure to use an F-type torque wrench when tightening the nuts.**
- **When you reach 3.0 m • kg, keep tightening until the final torque is obtained. Apply continuous torque until the specified torque is obtained.**

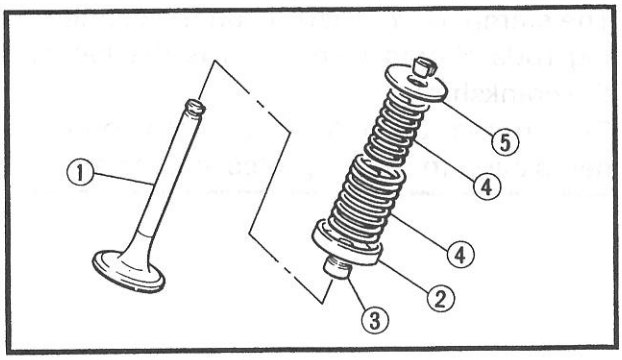


VALVE

1.Deburr:
- Valve stem end
  Use an oil stone to smooth the stem end.

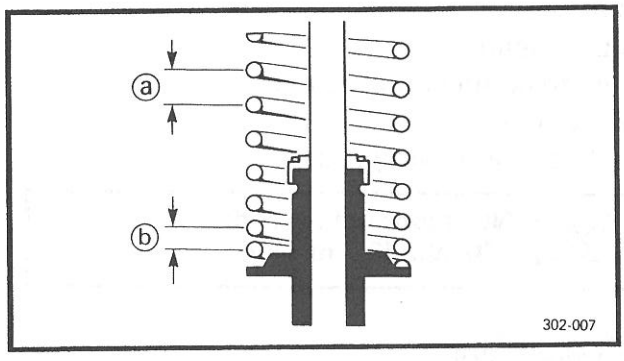


2.Apply:
- Molybdenum disulfide oil
  (onto valve stem ① and oil seal ②)



3.Install:
- Valve ①
- Spring seat ②
- Oil seal ③
- Valve spring ④
- Valve retainer ⑤
  (into cylinder head)

NOTE:
Install the valve spring with the larger pitch ⓐ facing upwards.

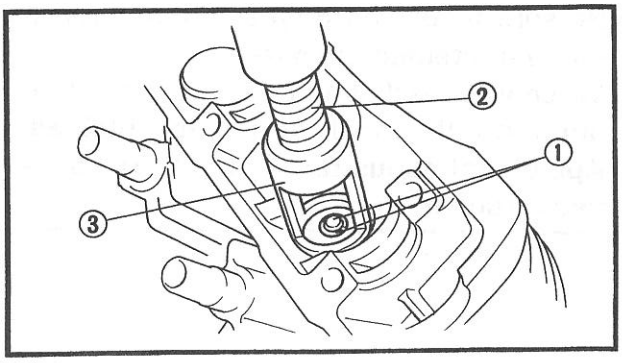


ⓑ Smaller pitch

4.Install:
- Valve cotters ①

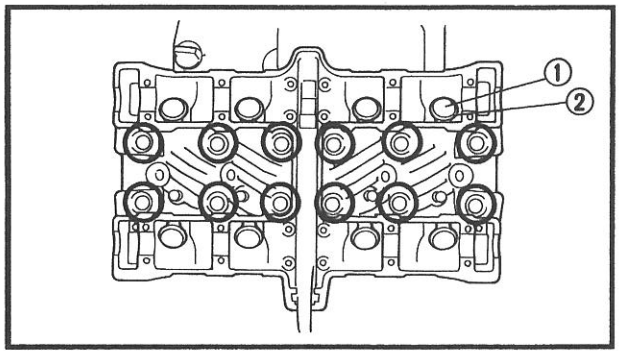
NOTE:
Install the valve cotters while compressing the valve spring with the valve spring compressor.

Valve spring compressor ②:
90890-04019
Attachment ③:
90890-01243



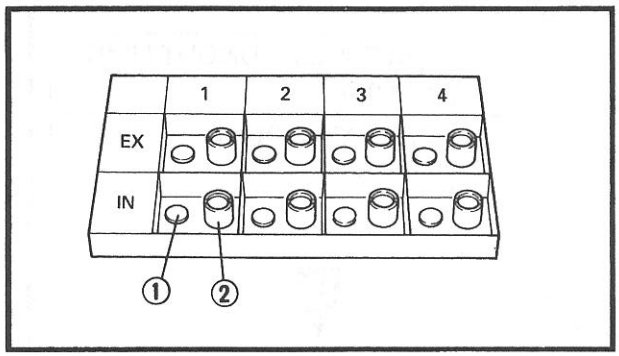
5.Secure the valve cotters ① onto the valve stem by tapping lightly with a piece of wood.

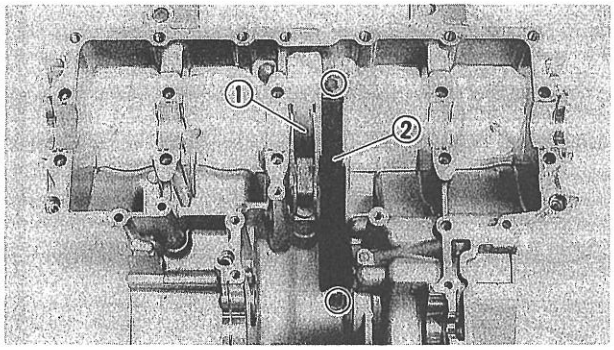
NOTE:
Do not hit so much as to damage the valve.



6.Install:
- Pads ①
- Valve lifters ②

NOTE:
- The valve lifters must move smoothly when rotated with the finger.
- Each valve lifter and pad must be reinstalled in their original position.





CRANKSHAFT AND STARTER CLUTCH

1.Install:
- Timing chain guide (intake side) ①
- Chain guide (HY-VO chain) ②

	**Bolt (timing chain guide): 20 Nm (2.0 m • kg)** **Bolt (HY-VO chain guide): 10 Nm (1.0 m • kg)**

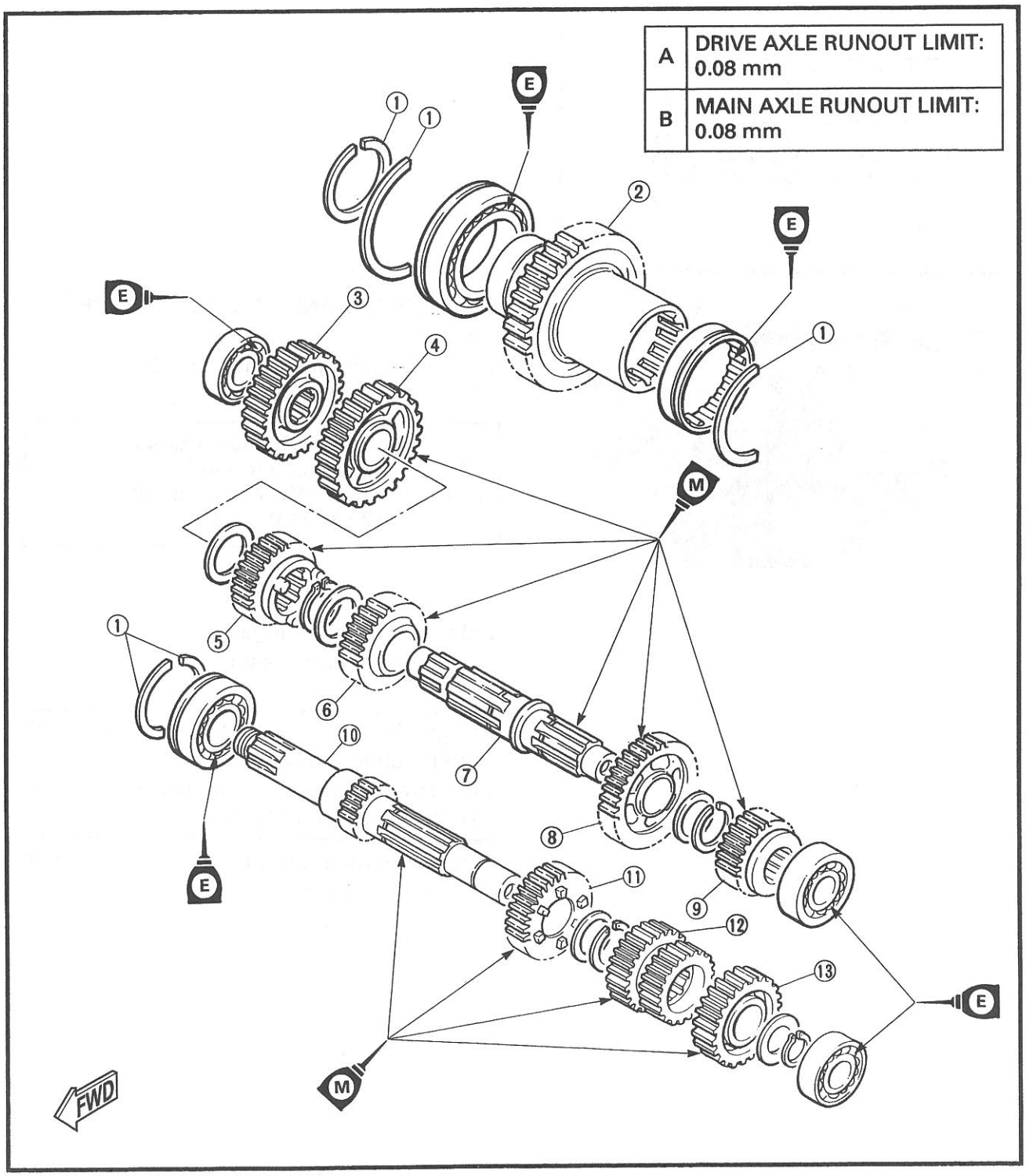
2.Install:
- Main journal bearings (onto upper crankcase)

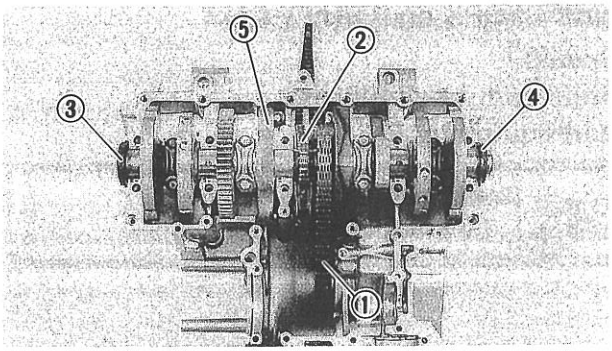
NOTE:
- Align the projection of the bearing with the notch in the case.
- Be sure to install each bearing (crankshaft) in its original place.

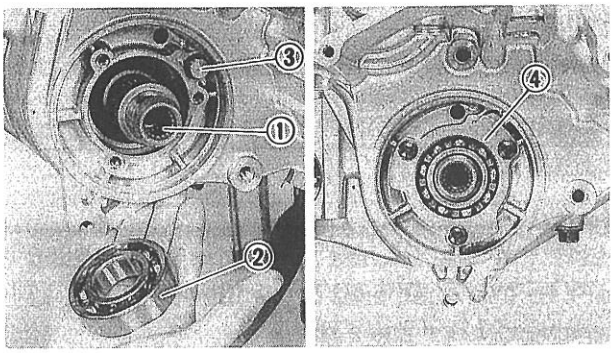
3.Apply engine oil to the bearing (main journal) surfaces.

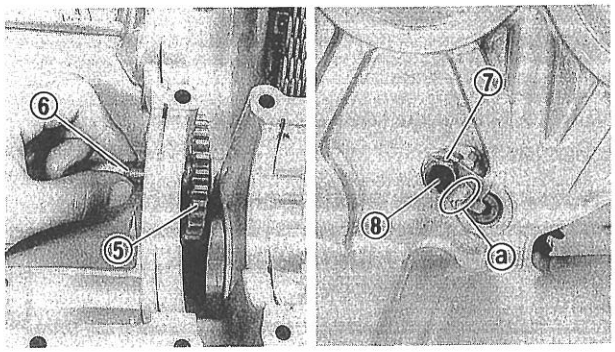
TRANSMISSION

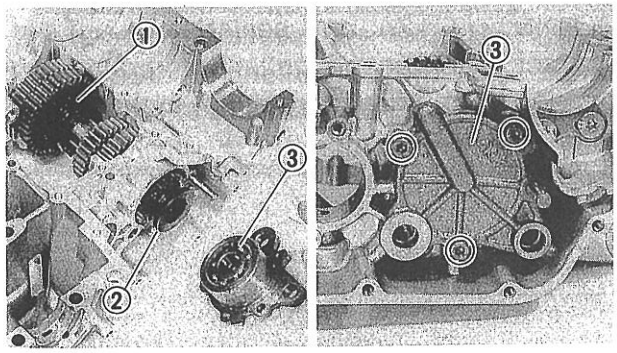
① Circlip
② Middle driven gear
③ Middle drive gear
④ 1st wheel gear
⑤ 4th wheel gear
⑥ 3rd wheel gear
⑦ Drive axle
⑧ 2nd wheel gear
⑨ 5th wheel gear
⑩ Main axle
⑪ 4th pinion gear
⑫ 2nd pinion gear
⑬ 5th pinion gear

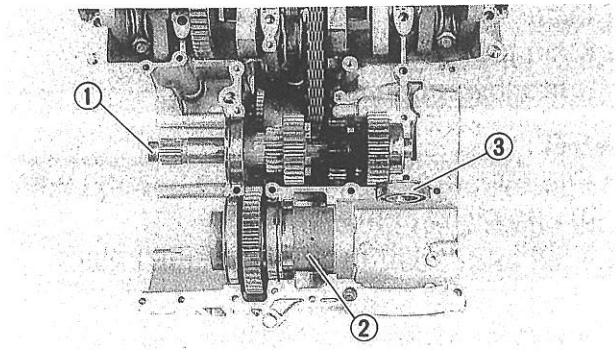












4.Install:
- HY-VO chain ①
- Timing chain ②
- Plug ③
- Oil seal ④
- Crankshaft assembly ⑤

5.Install:
- Starter clutch
- Starter clutch shaft ①
- Bearing ②
- Oil nozzle ③
- Bearing holder ④

NOTE:
Align the projection of the oil nozzle with notch in the crankcase.

	Bolt (bearing holder): 10 Nm (1.0 m • kg)

- Idle gear ⑤
- Shaft (idle gear) ⑥
- Lock washer ⑦

⚠ WARNING
Always use a new lock washer.

- Bolt ⑧

	Bolt: 10 Nm (1.0 m • kg)

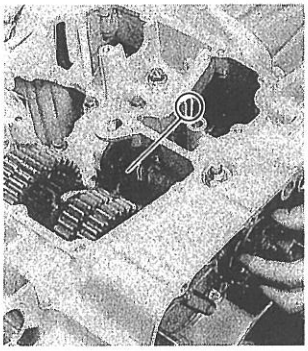
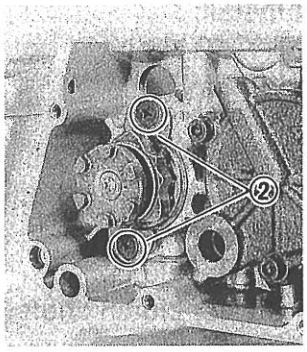
6.Bend the lock washer tab ⓐ along a flat side of the nut.

TRANSMISSION

1.Install:
- Drive axle assembly ①
- Drive axle gear (5TH) ②
- Bearing housing ③

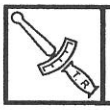
	Bolt (bearing housing): 12 Nm (1.2 m • kg)

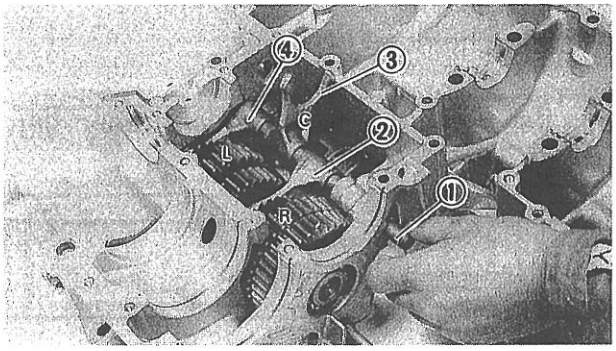
2.Install:
- Main axle assembly ①
- Middle drive shaft assembly holder ②
- Bearing ③

SHIFT FORK AND SHIFT CAM

1.Install:
- Shift cam assembly ①
- Bearing holder ②

	**Bolt (bearing holder): 10 Nm (1.0 m • kg)**



2.Install:
- Guide bars (shift fork) ①
- Shift fork "R" ②
- Shift fork "C" ③
- Shift fork "L" ④

NOTE:
Install the shift forks with the embossed mark to the right and in sequence (R, C, L) beginning from the right.

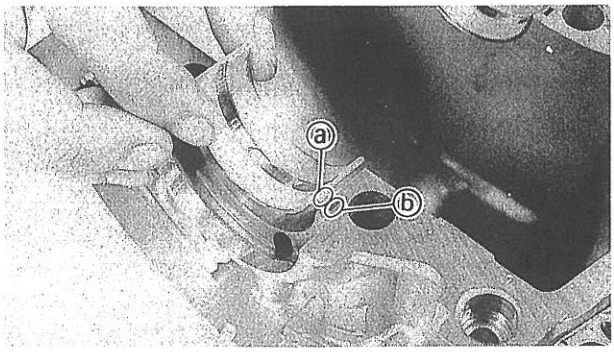
CRANKCASE ASSEMBLY

1.Apply:
- Engine oil
  (onto main journal bearings)
- Sealant
  (onto crankcase mating surfaces)

	**Yamaha bond No. 1215: 90890-85505**

NOTE:
DO NOT ALLOW any sealant to come in contact with the oil gallery or crankshaft bearings. Do not apply sealant to within 2 ~ 3 mm of the bearings.

2.Install:
- Dowel pin



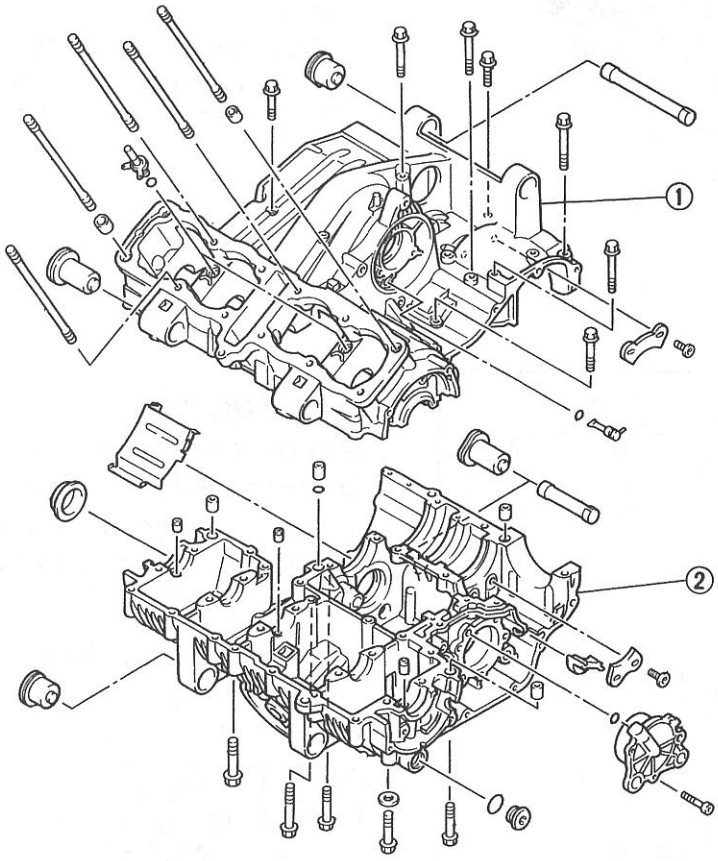
3.Install:
- Main journal bearings
  (onto lower crankcase)

NOTE:
- Align the projection ⓐ of the bearing with the notch ⓑ in the crankcase.
- Install each bearing in its original place.

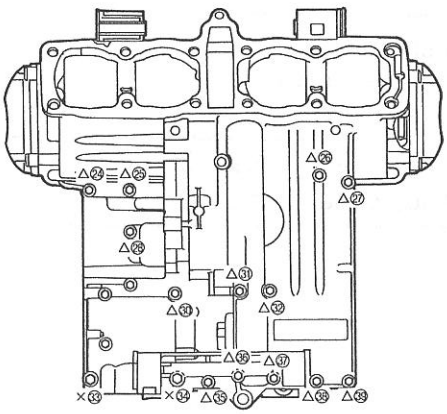
CRANKCASE

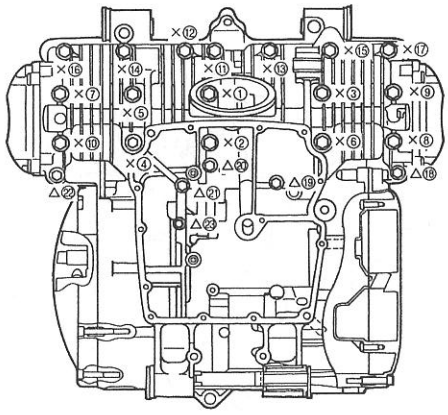
① Crankcase upper
② Crankcase lower

[A] Crankcase sequence tightening

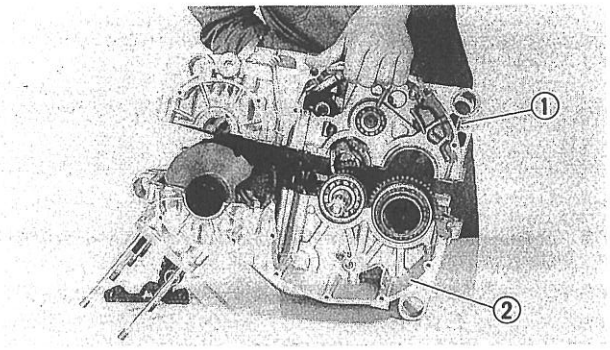


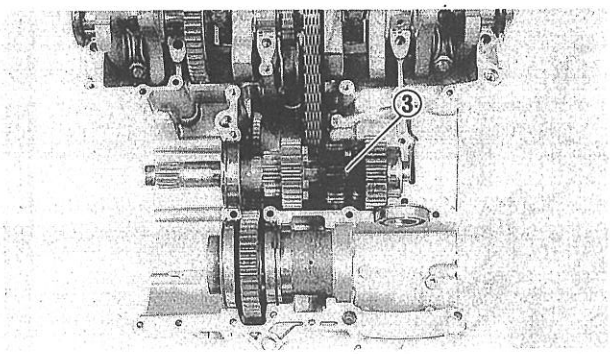
[A]





✕ M8 bolt	24 Nm (2.4 m • kg)
△ M6 bolt	12 Nm (1.2 m • kg)





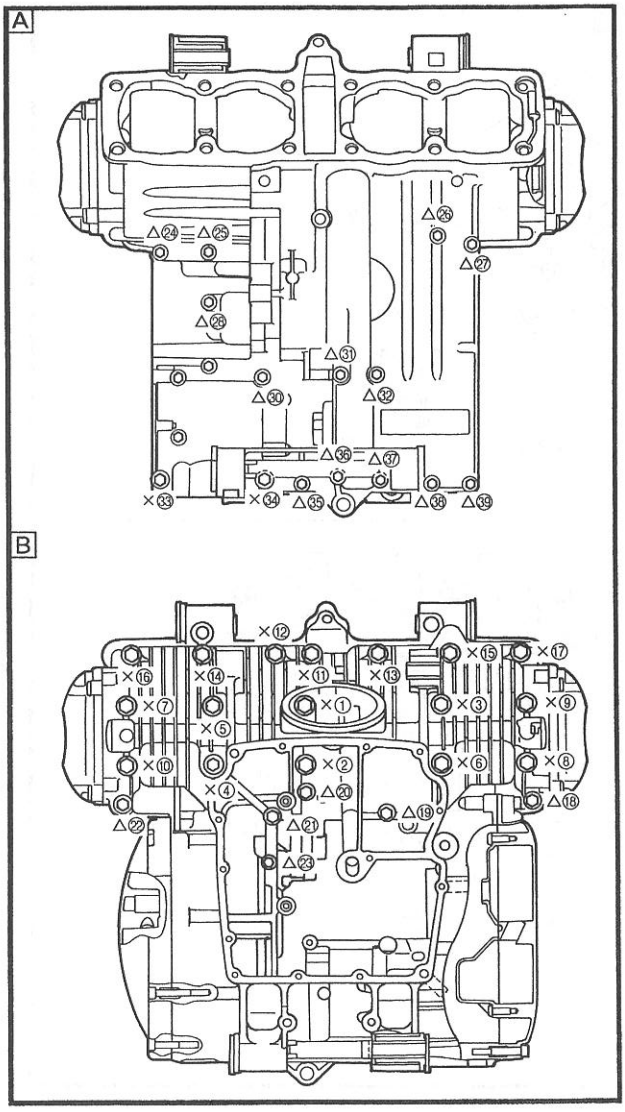
4.Set shift cam and transmission gears in "NEUTRAL" position.

5.Install:

- Lower crankcase ①
  (onto upper crankcase ②)
  Place the lower crankcase assembly onto the upper crankcase assembly.

NOTE:

- Carefully guide the shift forks so that they mesh smoothly with the transmission gears.
- Mesh the shift fork "C" with the 2nd pinion gear ③ on the main axle.



CAUTION:

Before tightening the crankcase bolts, check the following points:

- **Be sure the gears shift correctly when the shift cam is turned by hand.**

6.Tighten:

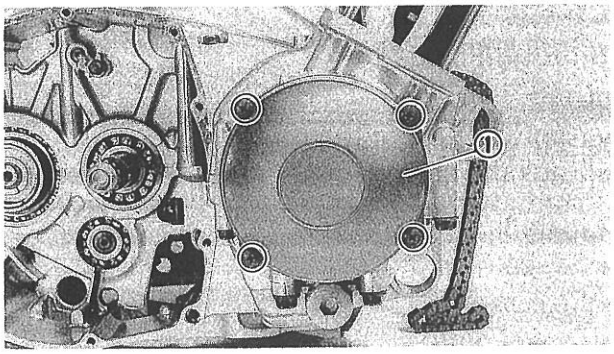
- Lower crankcase bolt
  (follow the proper tightening sequence)
- Upper crankcase bolt

△ M6 bolt:
12 Nm (1.2 m • kg)
× M8 bolt:
24 Nm (2.4 m • kg)

A Upper crankcase
B Lower crankcase

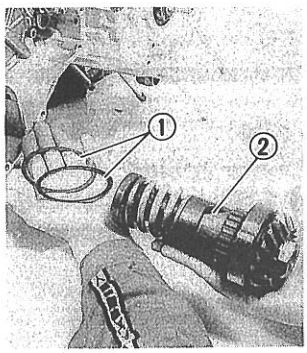
NOTE:

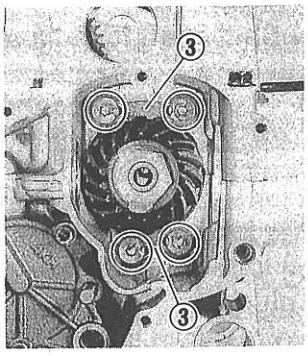
Tighten the bolts in the tightening sequence cast on the crankcase.



7.Install:
- Crankcase cover (right) ①

	Screw (crankcase cover): 8 Nm (0.8 m • kg)





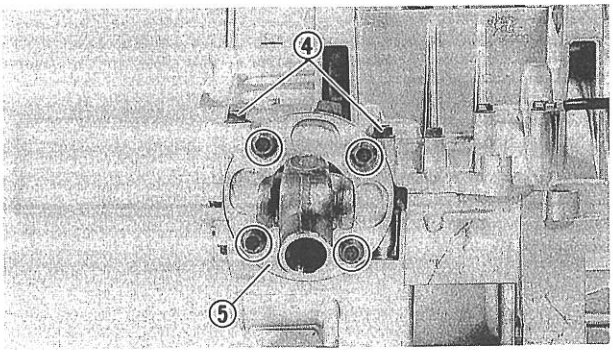
MIDDLE GEAR SHAFT

1.Install:
- Shim ①
- Middle drive shaft assembly ②
- Bearing holders ③

	Screw (bearing holder): 25 Nm (2.5 m • kg)

CAUTION:

After tightening the bearing holder with the screws, make sure that you stake them.



⚠ WARNING

Always use a new screw.

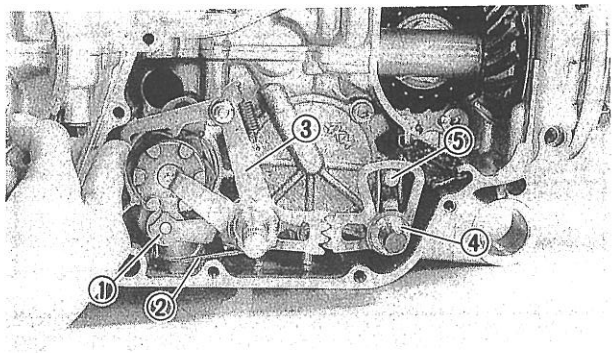
2.Loosen:
- Bolts (crankcase) ④

3.Install:
- Shim
- Middle driven shaft assembly ⑤

	Bolt (driven shaft assembly): 25 Nm (2.5 m • kg)

4.Tighten:
- Bolts (crankcase) ④

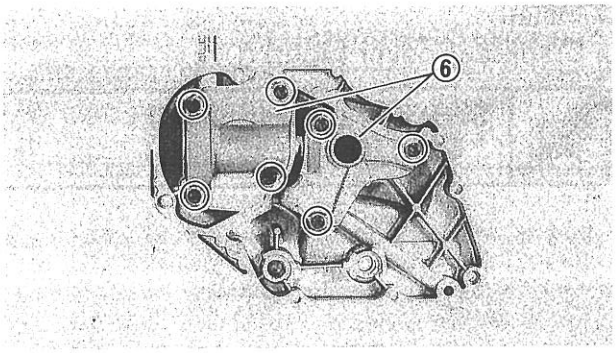
	Bolt (crankcase): 24 Nm (2.4 m • kg)

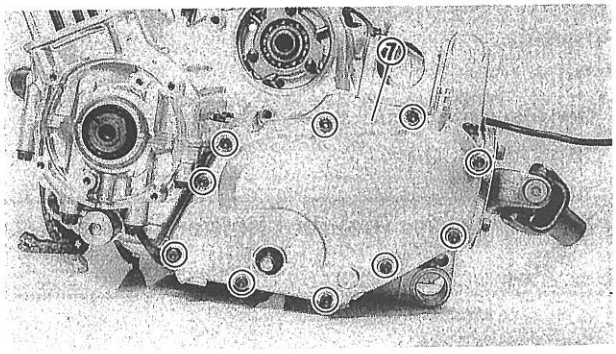


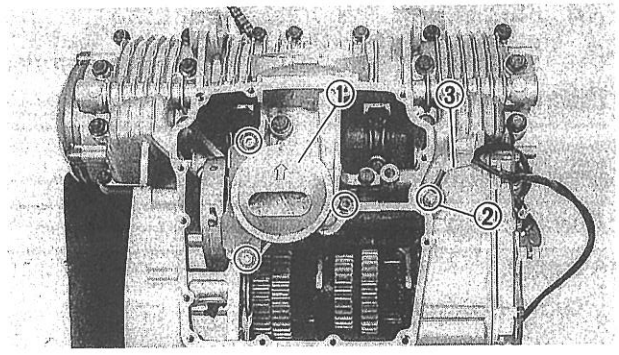
SHIFT SHAFT

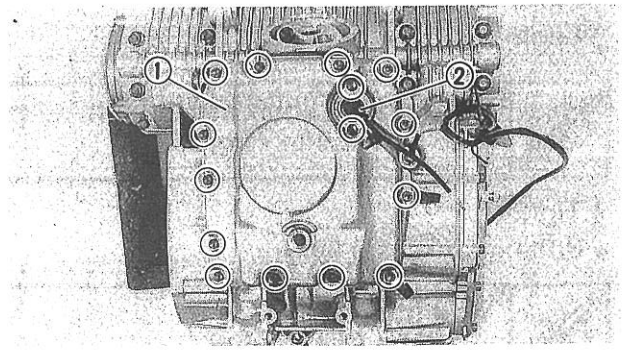
1.Install:
- Stopper lever ①
- Spring ②
- Shift lever ③

NOTE:
- Hook the spring ends on the stopper lever ① and crankcase boss.
- Mesh the stopper lever ① with the shift cam stopper.









- Washer
- Shift shaft ④

NOTE:
- Apply grease to the oil seal lips.
- Hook the spring ends onto the stopper ⑤.

2.Install:
- Gaskets
- Covers ⑥
- Dowel pins
- Gasket
- Shift shaft lever cover ⑦

Screw (cover):
8 Nm (0.8 m • kg)
Bolt (shift shaft lever cover):
12 Nm (1.2 m • kg)

OIL PAN AND OIL PUMP

1.Install:
- Oil pump assembly ①
- Neutral switch ②

2.Connect:
- Neutral switch lead ③

Bolt (oil pump):
12 Nm (1.2 m • kg)

3.Install:
- Dowel pins
- Gasket
- Oil pan ①
- Oil level switch ②

⚠ WARNING

Always use new copper washer and gasket.

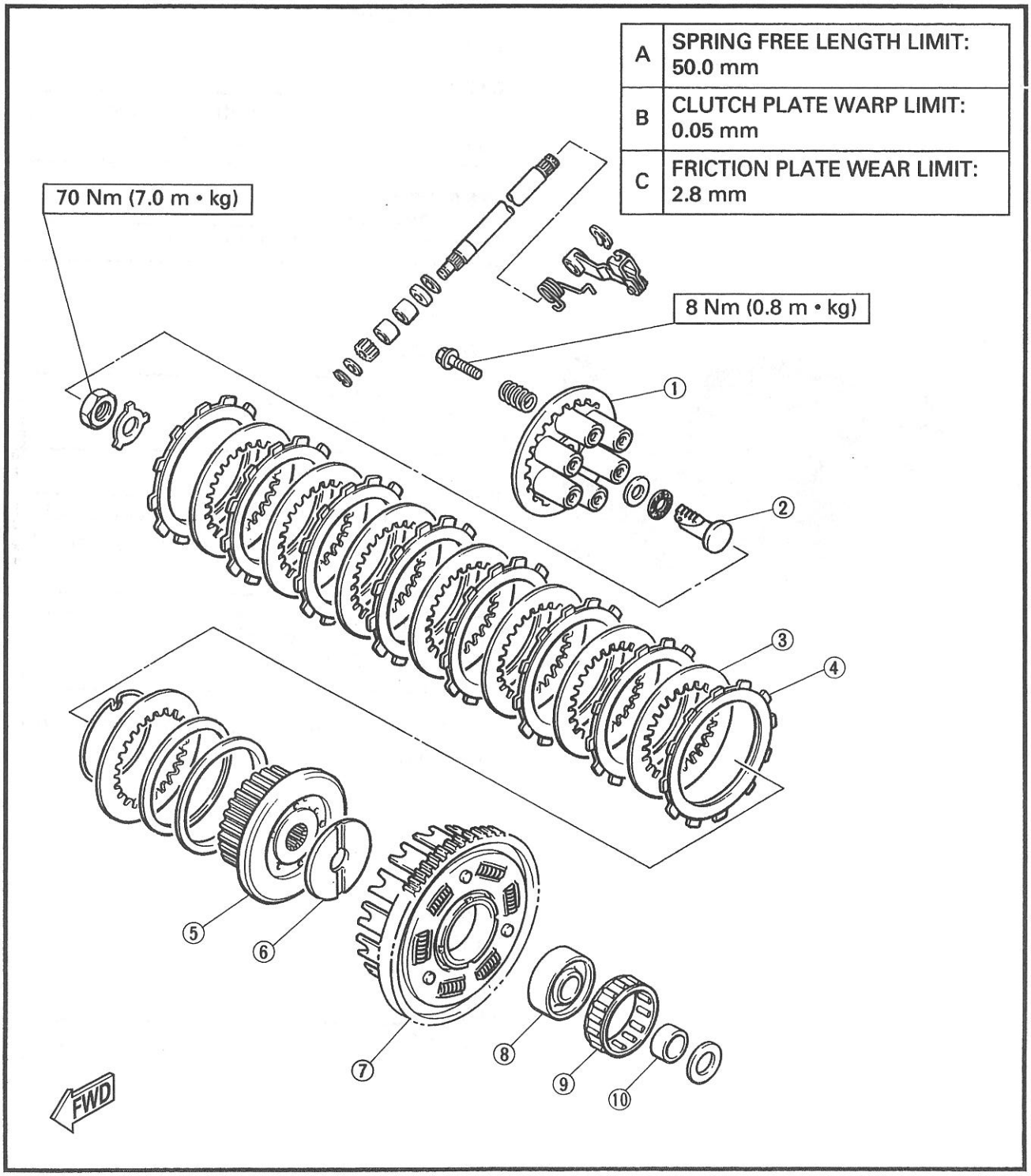
NOTE:
- Tighten the bolts (oil pan) in a crisscross pattern.
- Apply engine oil to the O-ring of the oil level switch.

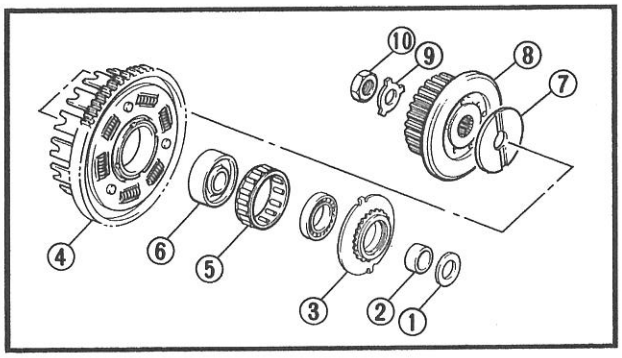
- Drain bolt

Bolt (oil pan):
12 Nm (1.2 m • kg)
Bolt (oil level switch):
10 Nm (1.0 m • kg)
Drain bolt:
43 Nm (4.3 m • kg)

CLUTCH

① Pressure plate
② Pull rod
③ Clutch plate
④ Friction plate
⑤ Clutch boss
⑥ Thrust plate
⑦ Clutch housing
⑧ Spacer
⑨ Bearing
⑩ Collar



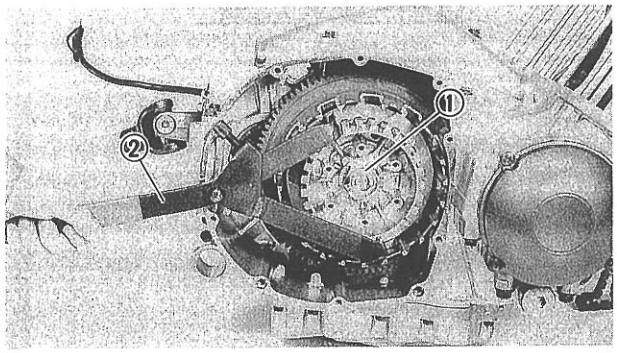


CLUTCH AND PICKUP COIL

1.Install:
- Washer ①
- Collar ②
- Oil pump drive sprocket ③
- Clutch housing ④
- Bearing ⑤
- Spacer ⑥
- Thrust plate ⑦
- Clutch boss ⑧
- Lock washer ⑨
- Nut (clutch boss) ⑩

NOTE:
Install the spacer ⑥ with the two screw holes towards the clutch boss.

⚠ WARNING
Always use a new lock washer.



2.Tighten:
- Nut (clutch boss) ①

	Nut (clutch boss): **70 Nm (7.0 m • kg)**

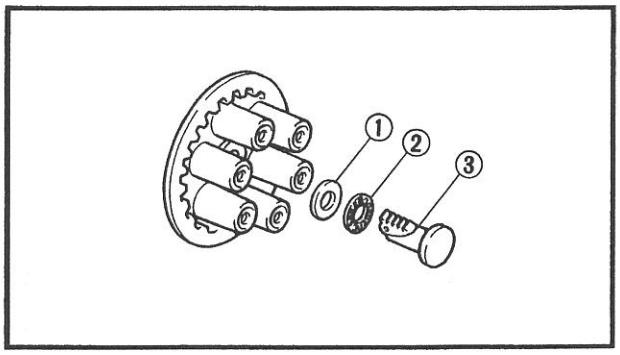
NOTE:
Tighten the nut (clutch boss) ① while holding the clutch boss with the universal clutch holder ②.

	Universal clutch holder: **90890-04086**

3.Bend the lock washer tab along a flat side of the nut.

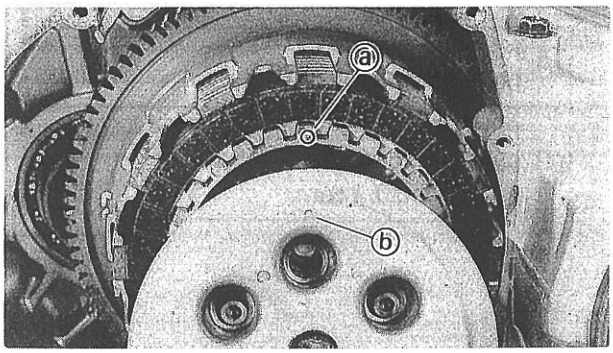
4.Install:
- Friction plates
- Clutch plates

NOTE:
Mount friction and clutch plate alternately.



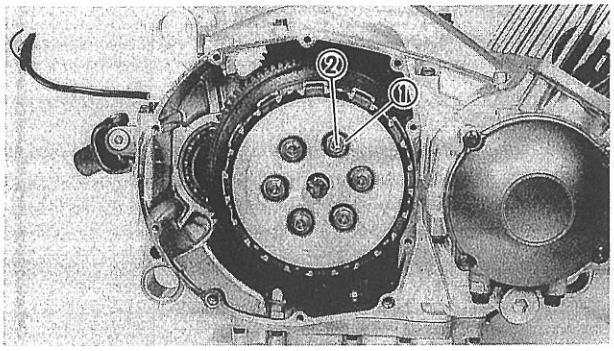
5.Install:
- Washer ①
- Bearing ②
- Pull rod ③

NOTE:
Apply molybdenum disulfide grease onto bearing/gear teeth of pull rod.



6.Install:
- Pressure plate

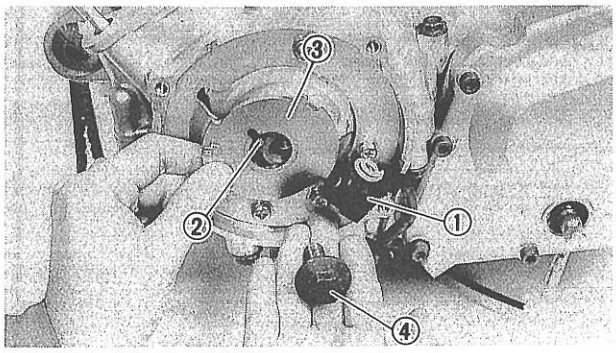
NOTE:
Align the punched mark ⓐ on the clutch boss with the punched mark ⓑ on the pressure plate.



7.Install:
- Clutch springs ①
- Bolts (clutch spring) ②

	Bolt (clutch spring): 8 Nm (0.8 m • kg)

NOTE:
Tighten the bolts (clutch spring) in stage, using a crisscross pattern.



8.Install:
- Pickup coil ①
- Pin ②
- Timing plate ③
- Bolt (timing plate) ④

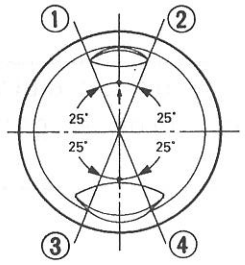
	Bolt (timing plate): 45 Nm (4.5 m • kg)

9.Install:
- Gasket
- Dowel pins

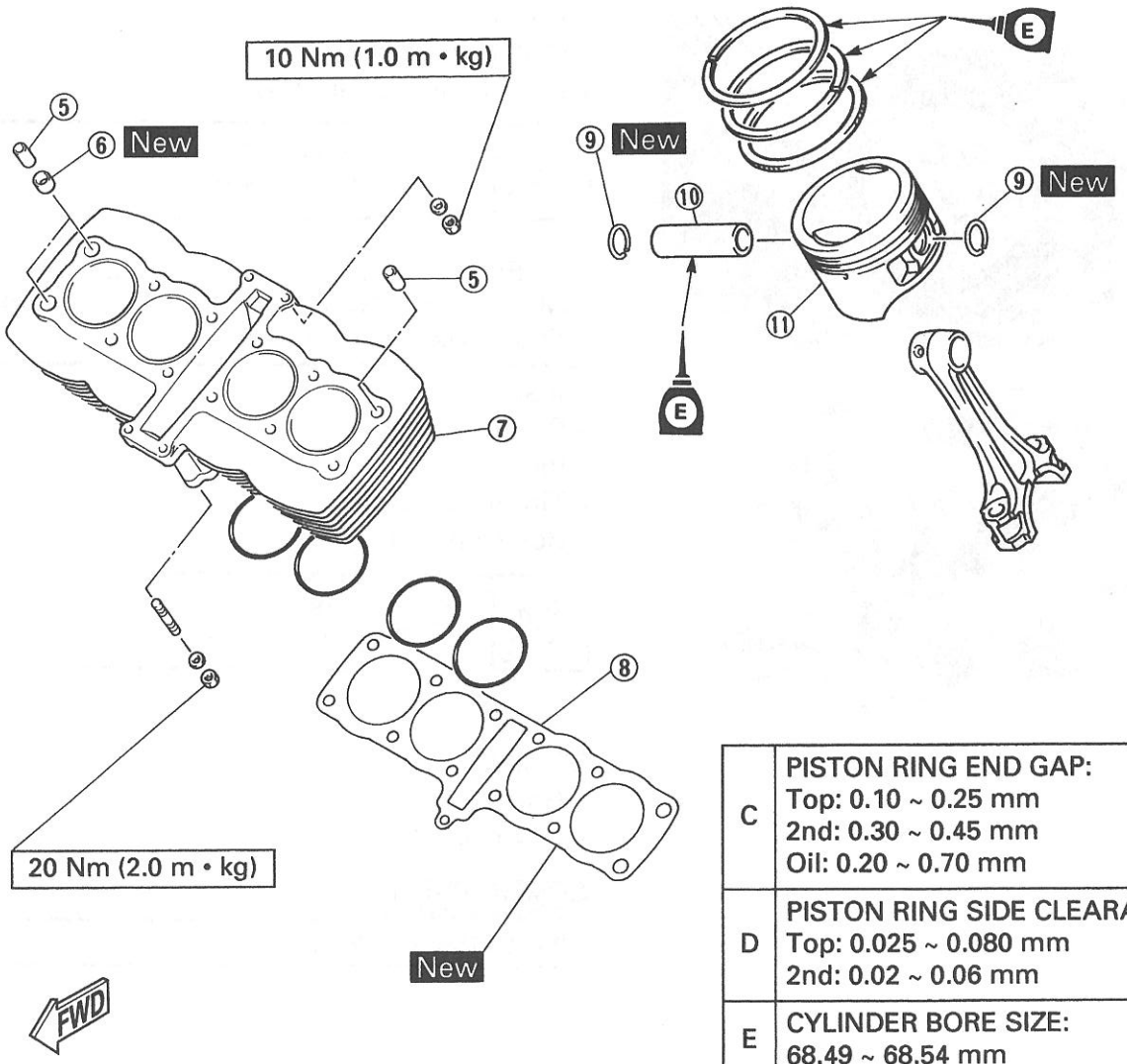
⚠ WARNING
Always use a new gasket.

PISTON AND CYLINDER

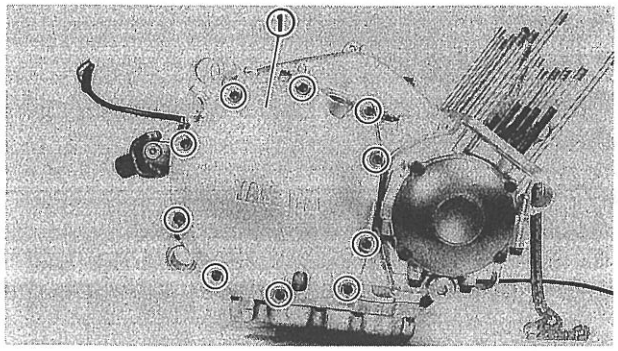
① Top ring
② Oil ring (lower)
③ Oil ring (upper)
④ Second ring
⑤ Dowel pin
⑥ O-ring
⑦ Cylinder
⑧ Gasket
⑨ Circlip
⑩ Piston pin
⑪ Piston



A	PISTON SIZE: 68.45 ~ 68.50 mm
B	PISTON-TO-CYLINDER CLEARANCE: 0.03 ~ 0.05 mm <LIMIT>: 0.1 mm



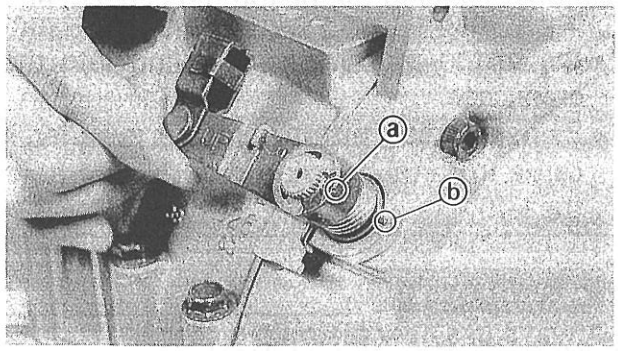
C	PISTON RING END GAP: Top: 0.10 ~ 0.25 mm 2nd: 0.30 ~ 0.45 mm Oil: 0.20 ~ 0.70 mm
D	PISTON RING SIDE CLEARANCE: Top: 0.025 ~ 0.080 mm 2nd: 0.02 ~ 0.06 mm
E	CYLINDER BORE SIZE: 68.49 ~ 68.54 mm



10.Install:
- Clutch cover ①

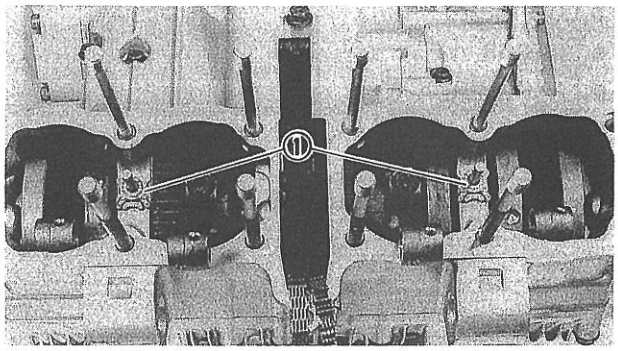
	Bolt (clutch cover): 12 Nm (1.2 m • kg)

NOTE:
Tighten the bolts (clutch cover) in stage, using a crisscross pattern.



11.Install:
- Plate washer
- Return spring
- Pull lever
- Washer
- Circlip

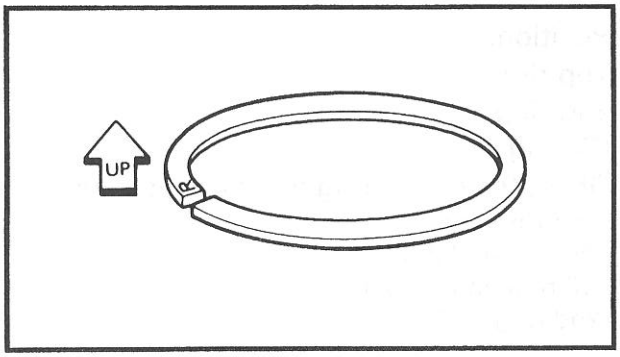
NOTE:
Align the punched mark ⓐ on the clutch pull lever shaft with the slit ⓑ on the pull lever.



PISTON AND CYLINDER

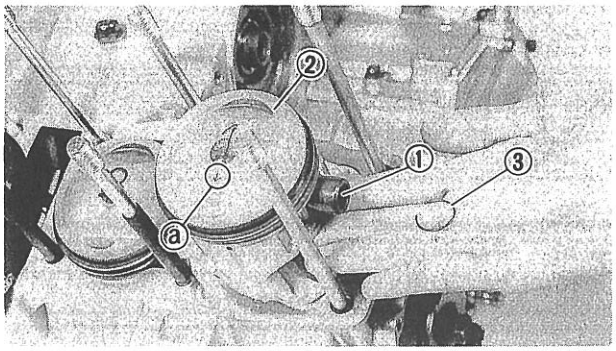
1.Install:
- Oil-jet nozzles ① (with O-ring)

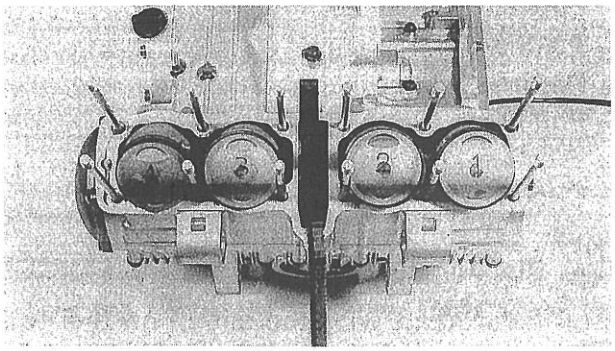
NOTE:
Apply engine oil to the O-rings.

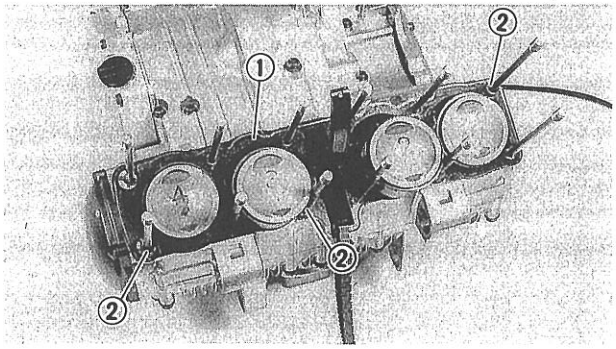


2.Install:
- Piston rings

NOTE:
Be sure to install rings so that the manufacturer's marks or numbers are located on the upper side of the rings. Oil the pistons and rings liberally.







3.Install:
- Piston pins ①
- Pistons ②
- Piston pin clips ③

NOTE:
- Apply engine oil to the piston pins.
- Be sure that the arrow mark ⓐ on the piston points to the exhaust side of the engine.
- Before installing the piston pin clip, cover the crankcase with a clean rag to prevent the piston pin clip from falling into the crankcase.
- Reinstall each piston into the cylinder it came from (numbering order 1 to 4 from the left).

⚠ WARNING

Always use new piston pin clip.

4.Install:
- Gasket (cylinder) ①
- Dowel pins ②

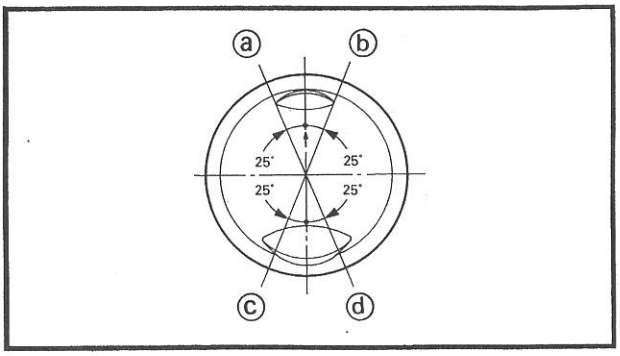
⚠ WARNING

Always use a new gasket (cylinder).

5.Lubricate:
- Pistons
- Piston rings
- Cylinder

NOTE:

Apply a liberal coating of engine oil.

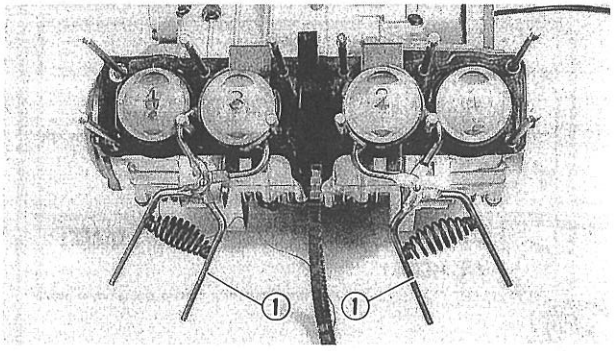


6.Position:
- Top ring
- 2nd ring
- Oil ring

Offset the piston ring end gaps as shown.
ⓐ Top ring end
ⓑ Oil ring end (lower)
ⓒ Oil ring end (upper)
ⓓ 2nd ring end

7.Install:
- Cylinder

NOTE:
- Install the #2 and #3 pistons first.
- Pass the timing chain and timing chain guide (intake side) through the timing chain cavity.



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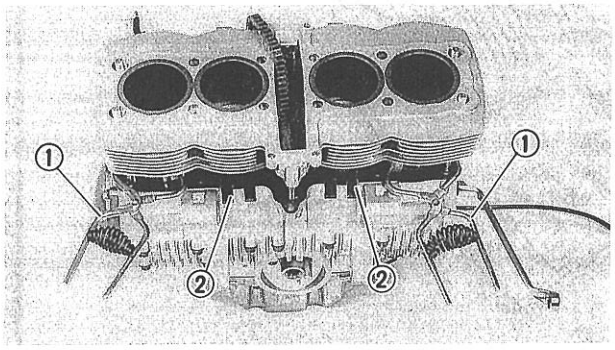
Installation steps:
- Set the piston ring compressor ① to the #2 and #3 pistons.
- Install the #2 and #3 pistons to the cylinder.
- Remove the piston ring compressors.
- Set the piston ring compressors ① and piston bases ② to the #1 and #4 pistons.
- Install the #1 and #4 pistons to the cylinder.
- Remove the piston ring compressors and piston bases.



Piston ring compressor:
90890-04008
Piston base:
90890-01067

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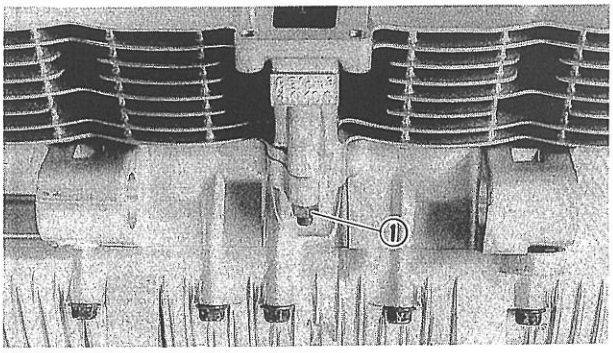
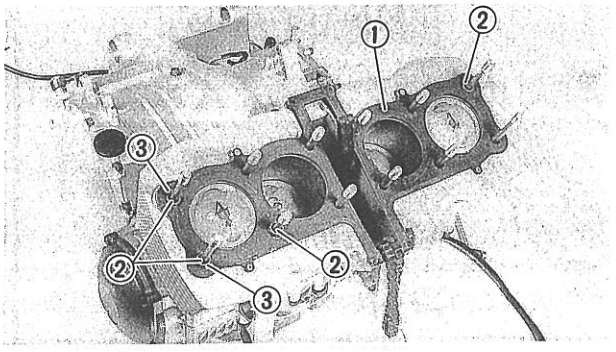


8.Install:
- Washer
- Nut (cylinder) ①

Nut (cylinder):
20 Nm (2.0 m • kg)



CYLINDER HEAD AND CAMSHAFT

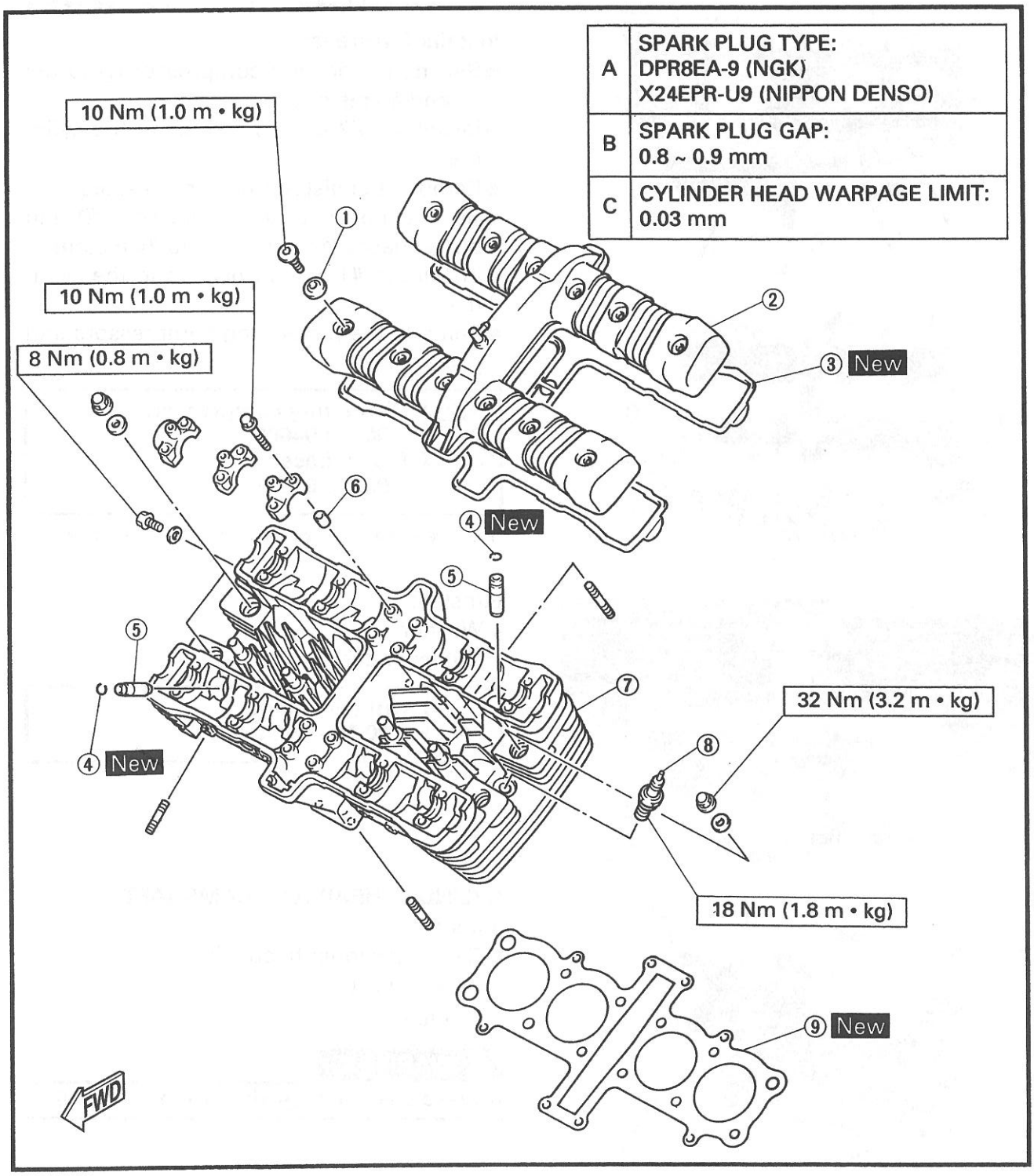
1.Install:
- Gasket (cylinder head) ①
- Dowel pins ②
- O-rings ③

⚠ WARNING

Always use a new gasket (cylinder head).

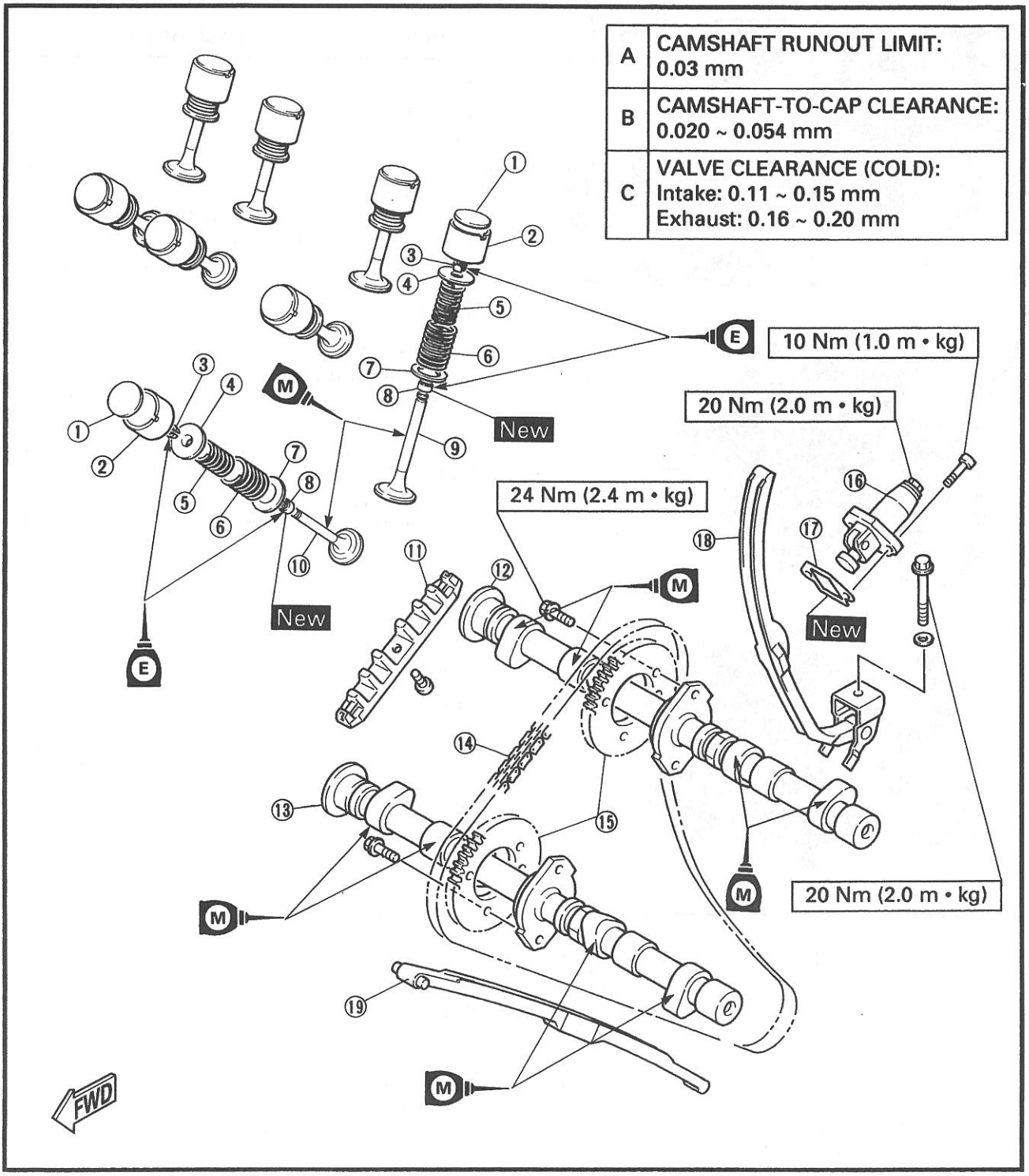
CYLINDER HEAD AND CYLINDER HEAD COVER

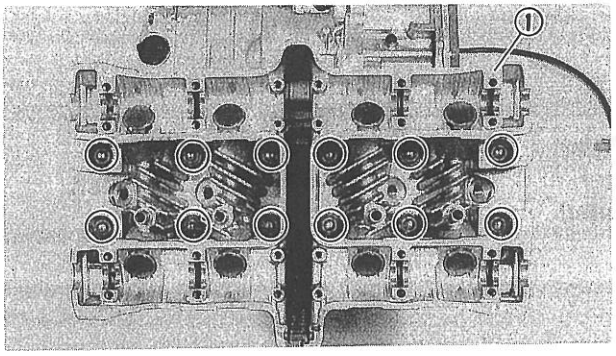
① Rubber
② Cylinder head cover
③ Cylinder head gasket
④ Circlip
⑤ Valve guide
⑥ Dowel pin
⑦ Cylinder head
⑧ Spark plug
⑨ Gasket

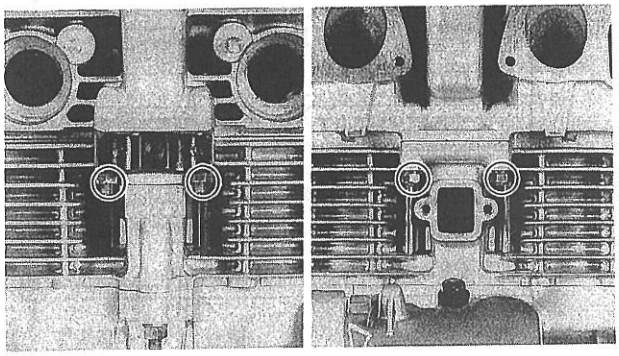


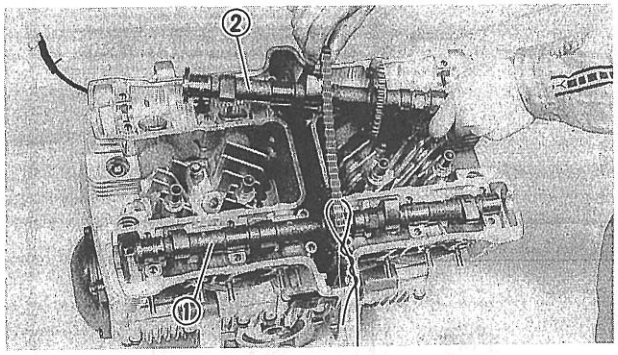
CAMSHAFT, VALVE AND TIMING CHAIN

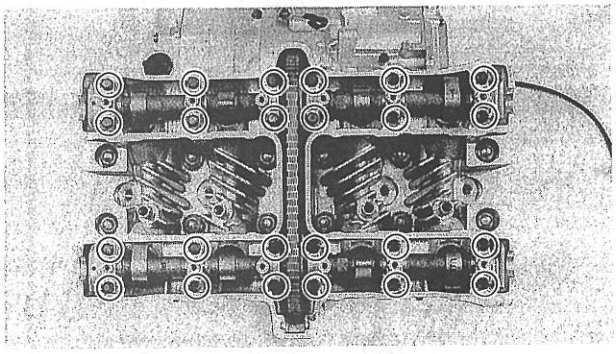
① Valve pad
② Valve lifter
③ Valve cotter
④ Valve retainer
⑤ Valve spring (inner)
⑥ Valve spring (outer)
⑦ Spring seat
⑧ Valve stem seal
⑨ Intake valve
⑩ Exhaust valve
⑪ Chain guide (upper)
⑫ Camshaft (intake)
⑬ Camshaft (exhaust)
⑭ Timing chain
⑮ Cam sprocket
⑯ Chain tensioner
⑰ Gasket
⑱ Chain guide (intake)
⑲ Chain guide (exhaust)

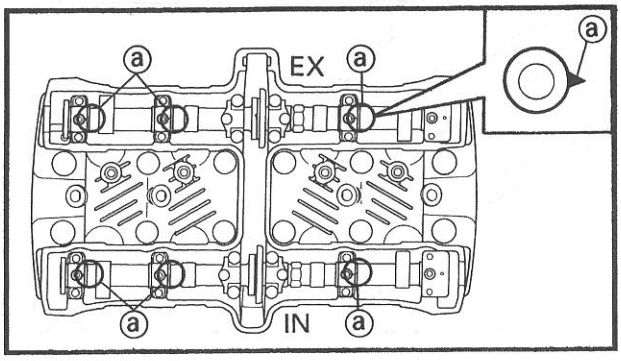












2.Install:
- Cylinder head ①
- Washers
- Copper washers
- Nuts

	Nut (cylinder head): 32 Nm (3.2 m • kg)

NOTE:
- Apply the engine oil onto the nut threads.
- Tighten the nuts in a crisscross pattern.

3.Install:
- Washers
- Nuts

	Nut (cylinder head — front/rear side): 10 Nm (1.0 m • kg)

4.Install:
- Exhaust camshaft ①
- Intake camshaft ②
  (with cam sprocket temporarily tighten)

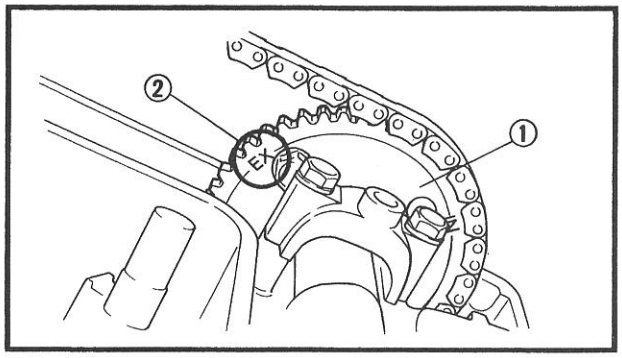
NOTE:
Install the camshaft with the punch mark facing upward.

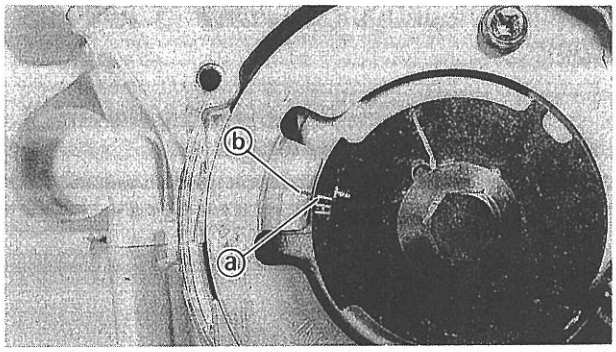
5.Install:
- Dowel pins
- Camshaft caps (intake camshaft)
- Camshaft caps (exhaust camshaft)

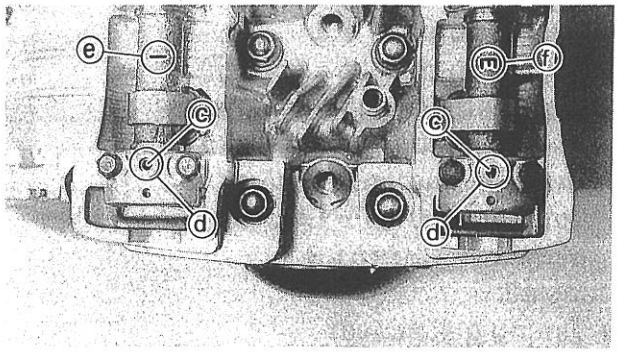
NOTE:
- Make sure that each camshaft cap is installed in its original place by reference to its embossed identification mark, as follows:
  Intake: I
  Exhaust: E
- Install the camshaft cap with the arrow mark ⓐ embossed facing right side of the engine.

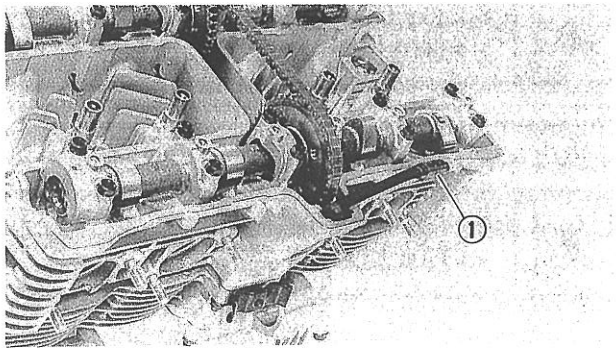
6.Install:
- Bolts (camshaft caps)

	Bolt (camshaft cap): 10 Nm (1.0 m • kg)









NOTE:
Tighten the bolts (camshaft cap) in a criss-cross pattern from the inside outwards.

CAUTION:
The bolts (camshaft caps) must be tightened evenly or damage to the cylinder head, camshaft caps and camshaft will result.

7.Install:
- Cam sprockets ①

****

Installing steps:
- Turn the crankshaft counterclockwise until the TDC mark ⓐ is aligned with the align mark ⓑ.
- Fit the timing chain onto both cam sprockets and install the cam sprockets on the camshafts.

NOTE:
When installing the cam sprockets, start with the exhaust camshaft to keep the timing chain as tense as possible on the exhaust side, and set the hole of "EX" mark side ② on the cam sprocket to the camshaft.
"IN": Intake side "EX": Exhaust side.

CAUTION:
Do not turn the crankshaft during the camshafts installation. Damage or improper valve timing will result.

- Turn both camshafts opposite to each other until the punch mark ⓒ on the camshaft is aligned with the hole ⓓ on the camshaft cap. Make sure that the "E" on the exhaust camshaft ⓔ and the "I" on the intake camshaft ⓕ are visible from the top.
- While holding the camshafts, temporarily tighten the bolts.

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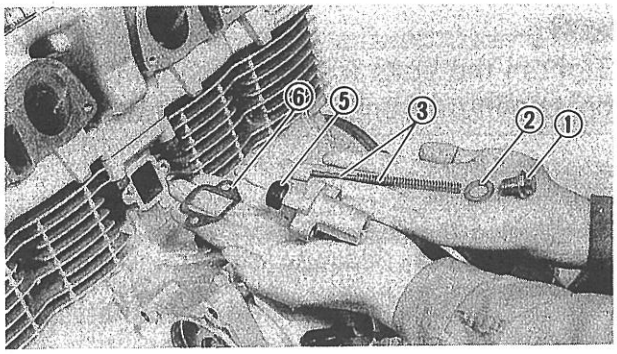
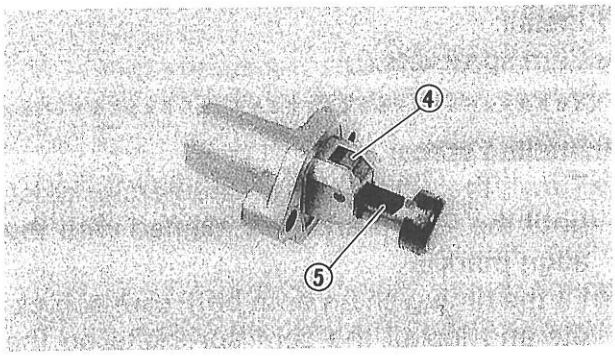
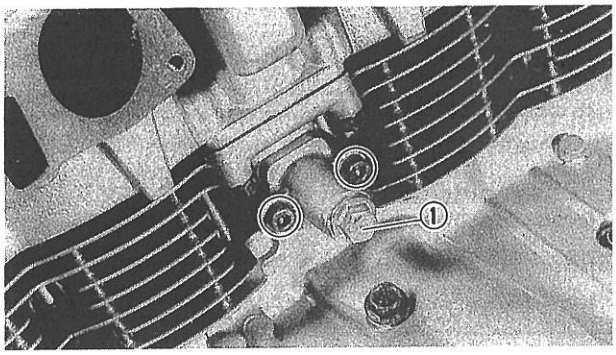
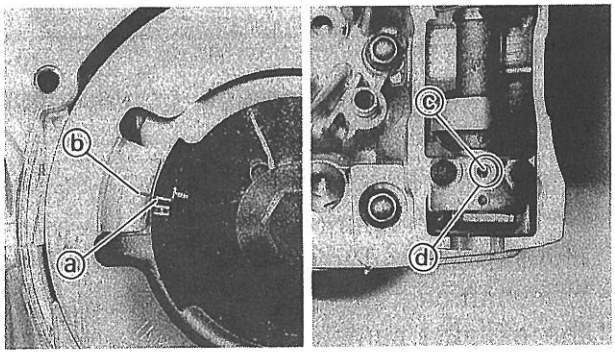
8.Install:
- Chain guide (exhaust) ①









TIMING CHAIN TENSIONER

1.Install:
- Timing chain tensioner

****

Installation steps:
- Remove the tensioner cap bolt ①, washer ② and springs ③.
- Release the timing chain tensioner one-way cam ④ and push the tensioner rod ⑤ all the way in.
- Install the tensioner with a new gasket ⑥ onto the cylinder.

	Bolt (timing chain tensioner): 10 Nm (1.0 m • kg)

- Install the springs ③, washer ② and cap bolt ①.

	Cap bolt (timing chain tensioner): 20 Nm (2.0 m • kg)

****

2.Turn:
- Crankshaft
  Counterclockwise several turns

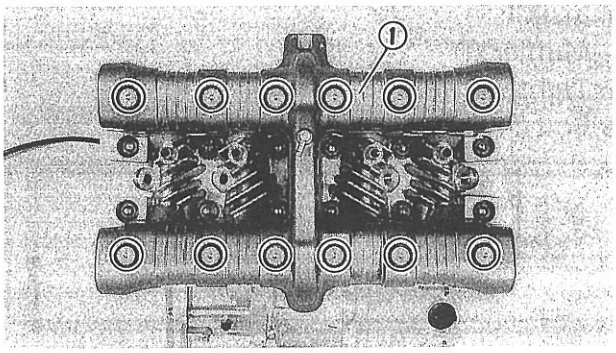
3.Check:
- TDC mark ⓐ
  Align with the align mark ⓑ.
- Camshaft timing punch mark ⓒ
  Align with the camshaft cap hole ⓓ.
  Out of alignment → Adjust.
  Refer to "VALVE CLEARANCE ADJUSTMENT" in CHAPTER 3.

4.Install:
- Timing plate cover

	Screw (timing plate cover): 8 Nm (0.8 m • kg)

5.Tighten:
- Bolt (cam sprocket)

	Bolt (cam sprocket): 24 Nm (2.4 m • kg)



CYLINDER HEAD COVER

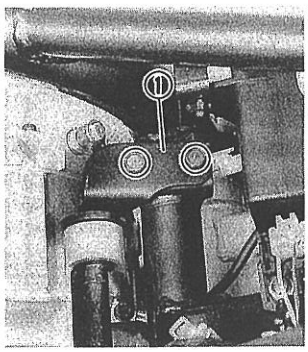
1.Install:
- Gasket (cylinder head cover)
- Cylinder head cover ①

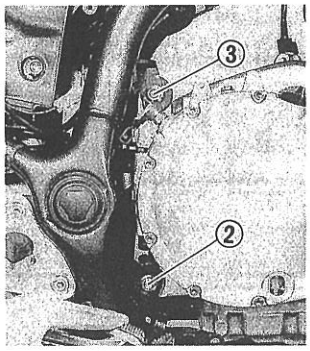
	Bolt (cylinder head cover): **10 Nm (1.0 m • kg)**

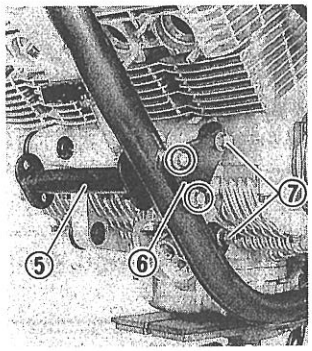
ENGINE REMOUNTING

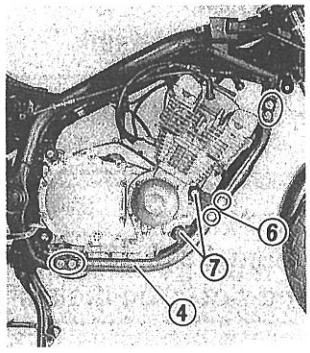
When remounting the engine, reverse the removal procedure.
Note the following points:

1.Install:
- Engine assembly
  (from the right side of the motorcycle)



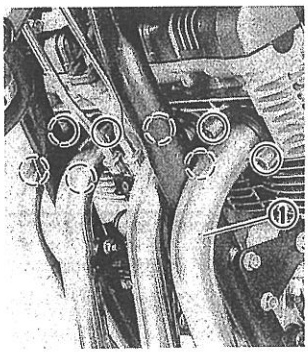


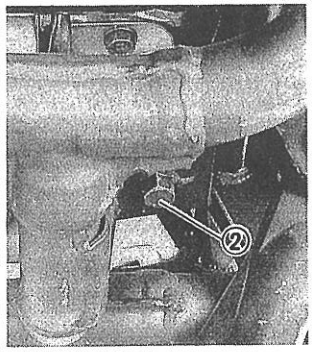




2.Install:
- Engine stay (rear) ①
- Mounting bolt (rear-lower) ②
- Mounting bolt (rear-upper) ③
- Down tube (right) ④
- Cross tube (front) ⑤
- Engine stay (front) ⑥
- Mounting bolt (front) ⑦

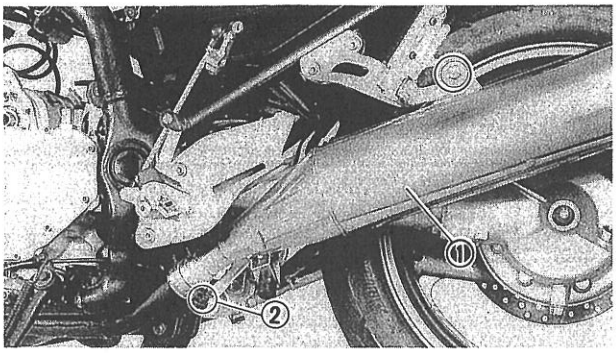
	Bolt (engine stay): **30 Nm (3.0 m • kg)** **Mounting bolt (rear-upper/lower):** **48 Nm (4.8 m • kg)** **Bolt (down tube):** **89 Nm (8.9 m • kg)** **Mounting bolt (front):** **48 Nm (4.8 m • kg)**





3.Install:
- Gaskets
- Exhaust pipe ①
- Bolt ②

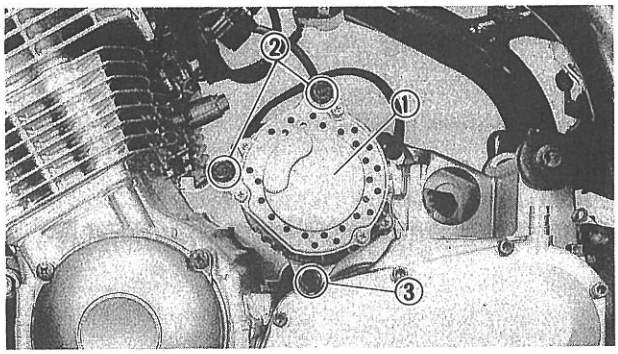
	Nut (exhaust pipe): **20 Nm (2.0 m • kg)** **Bolt:** **25 Nm (2.5 m • kg)**



4.Install:
- Muffler ①

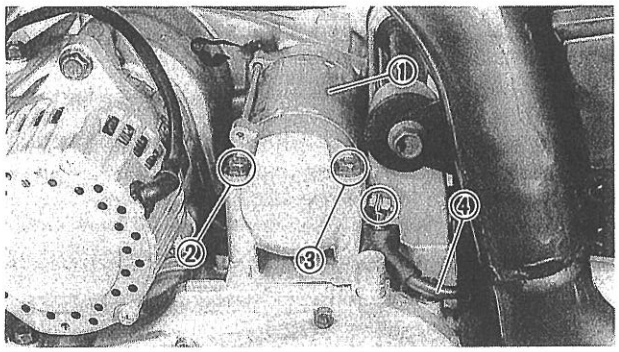
5.Tighten:
- Bolt ②

Bolt (muffler):
25 Nm (2.5 m • kg)
Bolt (exhaust pipe-muffler):
20 Nm (2.0 m • kg)



6.Install:
- A.C. generator ①

Bolt (A.C. generator) ②:
25 Nm (2.5 m • kg)
Bolt (A.C. generator) ③:
25 Nm (2.5 m • kg)
LOCTITE®

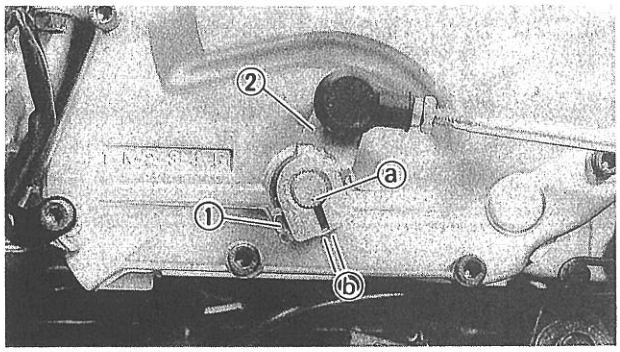


7.Install:
- Starter motor ①

Bolt (starter motor) ②:
12 Nm (1.2 m • kg)
Bolt (starter motor) ③:
7 Nm (0.7 m • kg)
YAMAHA Bond No.1215

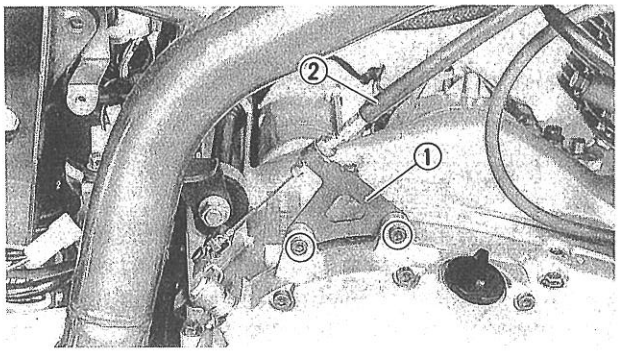
8.Connect:
- Starter motor lead ④

9.Install:
- Shift pedal link



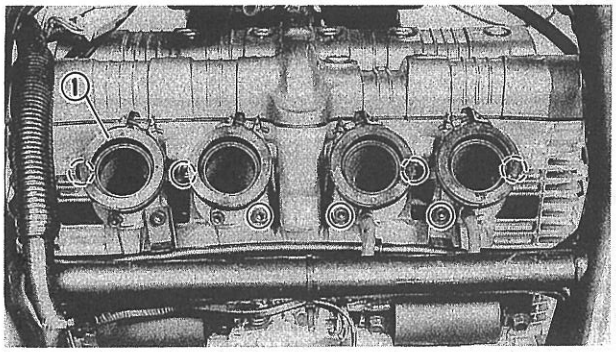
Bolt (shift pedal link) ①:
10 Nm (1.0 m • kg)

NOTE:
Align the punched mark ⓐ on the shaft with the slot ⓑ on the shift arm ②.



10.Install:
- Cable stay ①
- Clutch cable ②

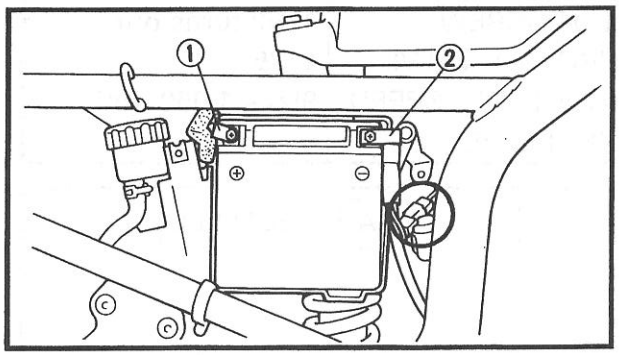
Bolt (cable stay):
12 Nm (1.2 m • kg)



11.Install:
- Carburetor joint ①

	Bolt (carburetor joint): **12 Nm (1.2 m • kg)**

- Carburetor
  Refer to "CARBURETOR" in CHAPTER 5.



12.Connect:
- Battery leads

CAUTION:
Connect the positive lead ① first and then the negative lead ②.

13.Fill:
- Crankcase
  Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.

	Total amount: **4.4 L**

14.Adjust:
- Idle speed
  Refer to "IDLING SPEED ADJUSTMENT" in CHAPTER 3.

	Idle speed: **950 ~ 1,050 r/min**

15.Adjust:
- Throttle cable free play
  Refer to "THROTTLE CABLE ADJUSTMENT" in CHAPTER 3.

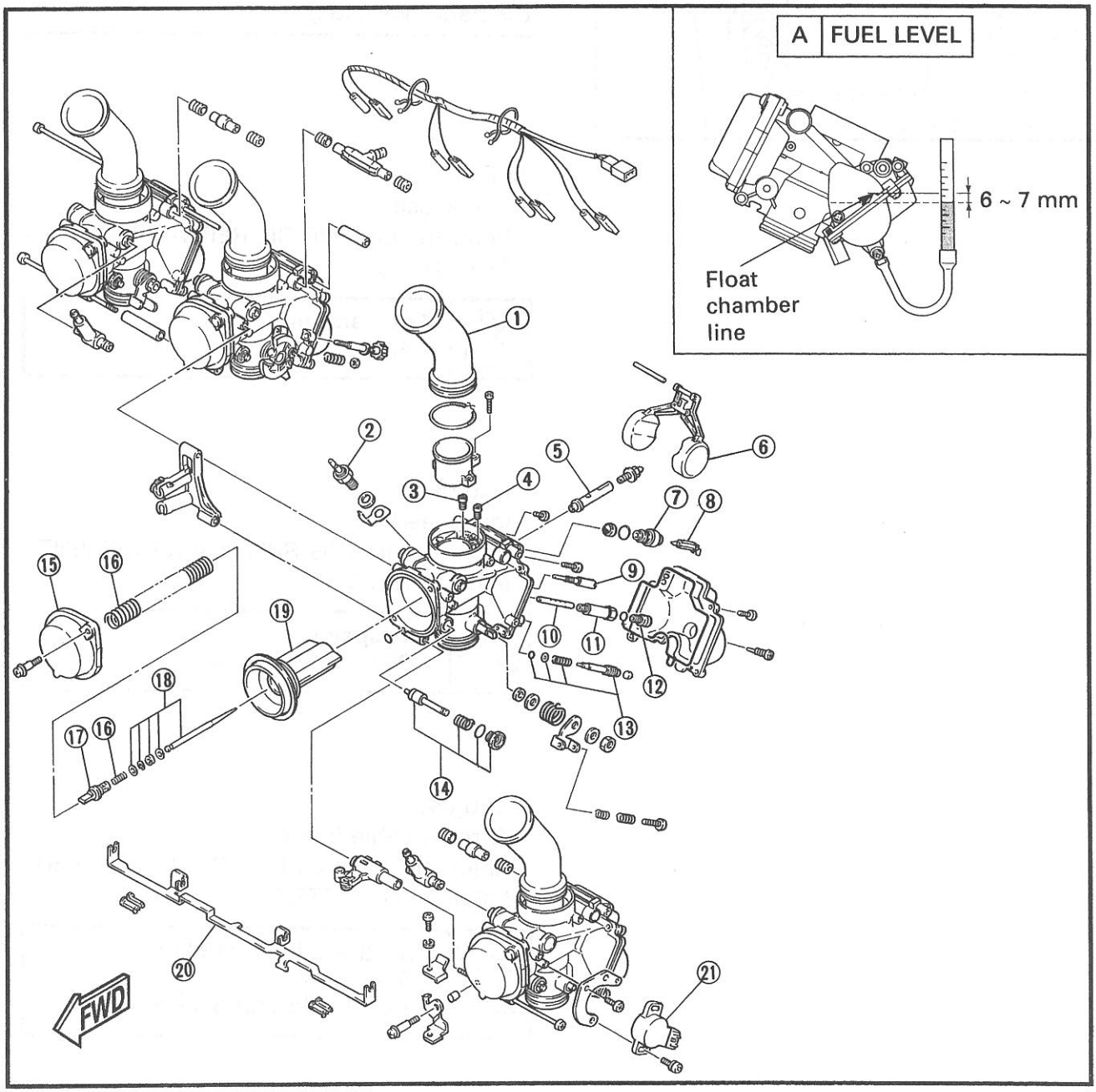
	Throttle cable free play: **3 ~ 5 mm** **At throttle grip flange**

CARBURETION

CARBURETOR

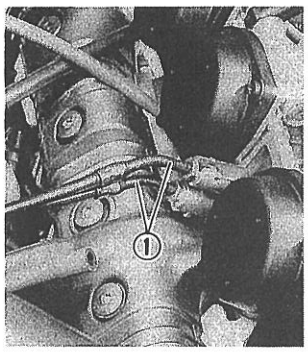
① Air funnel
② Carburetor heater
③ Pilot air jet
④ Main air jet
⑤ Needle jet
⑥ Float
⑦ Valve seat
⑧ Needle valve
⑨ Pilot jet
⑩ Main jet nozzle
⑪ Main jet holder
⑫ Main jet
⑬ Pilot screw set
⑭ Starter plunger set
⑮ Vacuum chamber cover
⑯ Spring
⑰ Jet needle holder
⑱ Jet needle set
⑲ Piston valve
⑳ Joint (starter lever)
㉑ TPS (throttle position sensor)

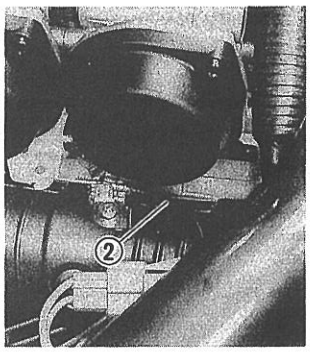
SPECIFICATIONS		
I. D. Mark	4KM00	4PR00
MAIN JET	#100	
MAIN AIR JET	#72.5	
PILOT JET	#12.5	
PILOT AIR JET 1	#120	
JET NEEDLE	5DT3-2	
PILOT SCREW	1-1/2 turns out	
THROTTLE VALVE	#125	
ENGINE IDLE SPEED	950 ~ 1,050 r/min	
FUEL LEVEL	6 ~ 7 mm	



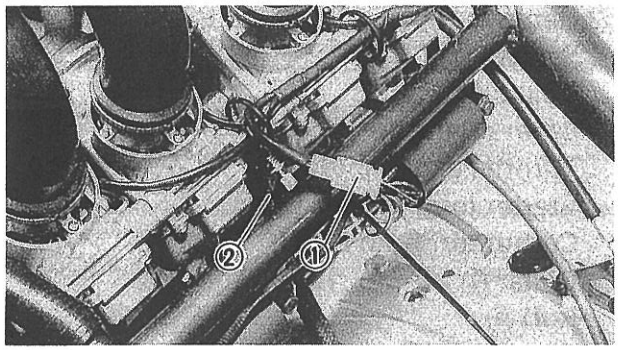
REMOVAL

1.Remove:
- Seat
- Fuel tank
  Refer to "SIDE COVER, FUEL TANK AND COWLING" in CHAPTER 3.
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT" in CHAPTER 3.



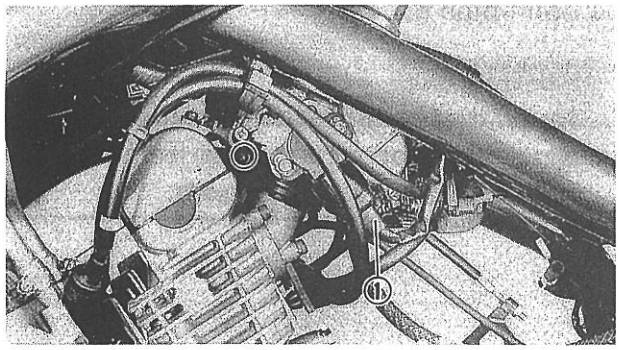


2.Disconnect:
- Throttle cables ①
- Starter cable ②



3.Disconnect:
- Carburetor heater coupler ①

4.Remove:
- Fuel hose ②



5.Disconnect:
- Throttle sensor lead ①

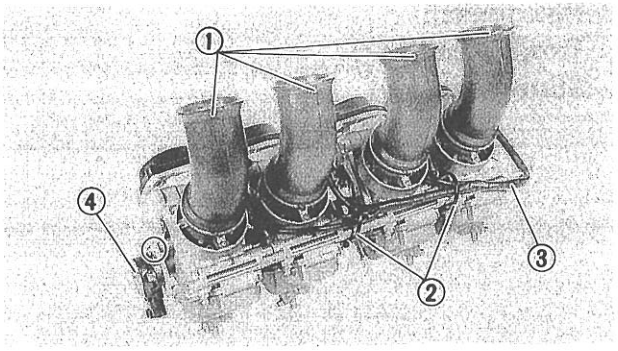
6.Loosen:
- Screws

7.Remove:
- Carburetor assembly

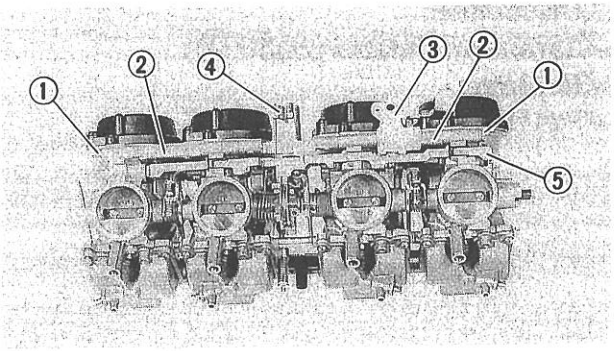
DISASSEMBLY

NOTE:
The following parts can be cleaned and inspected without carburetor separation.
(All inner parts except starter plunger can be cleaned and inspected without carburetor separation.)
- Throttle valve
- Piston valve

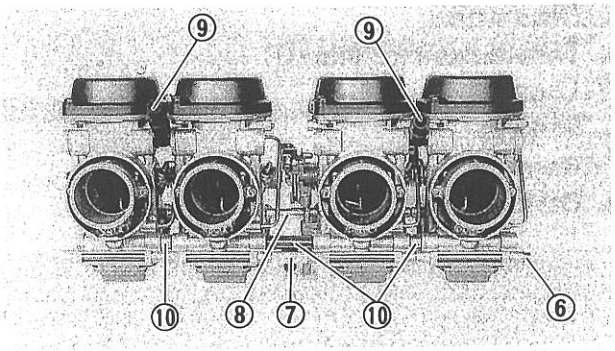
- All jets
- Float
- Needle valve
- Valve seat
- Main nozzle
- Jet needle



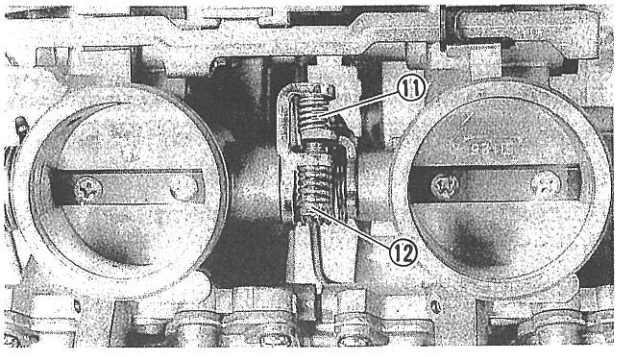
1.Remove:
- Air funnel ①
- Clamps ②
- Carburetor heater lead ③
- Throttle sensor ④
- O-ring



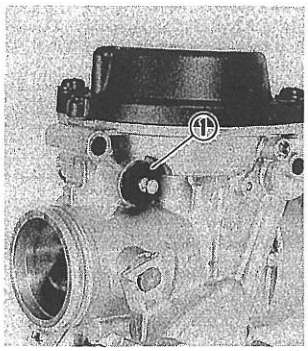
2.Remove:
- Screws ①
- Collars ②
- Lever connecter ③
- Throttle cable holder ④
- Starter joint ⑤
- Carburetor hold bolt ⑥
- Collar ⑦
- Rod ⑧
- Joint hose ⑨
- Joint pipe ⑩

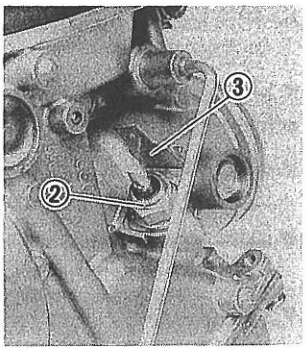


CAUTION:
- **Never disassemble the joint (fuel feed) ⑩.**
- **Since the parts that were removed are defective, do not reuse them.**



NOTE:
Be careful not to lose the return spring ⑪ under the synchronizing screw ⑫ when disassembling the carburetor.

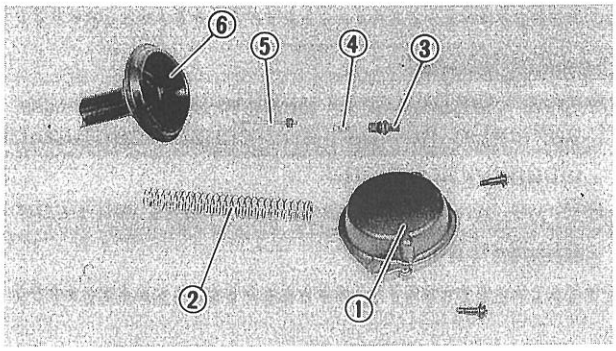




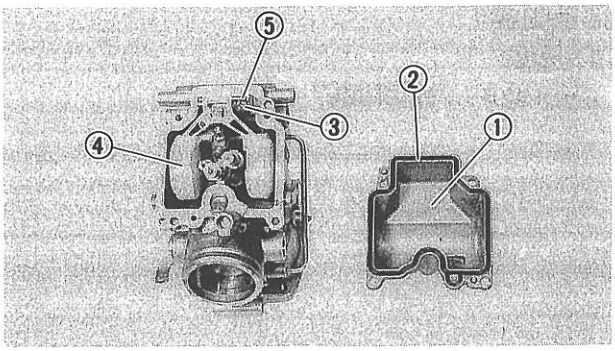
3.Remove:
- Starter plunger ①

NOTE:
Unhook the hooks from the carburetor body and then pull out the starter plunger.

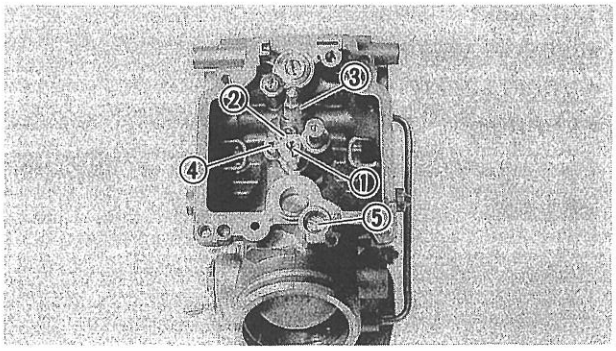
4.Remove:
- Carburetor heater ②
- Washer
- Terminal ③



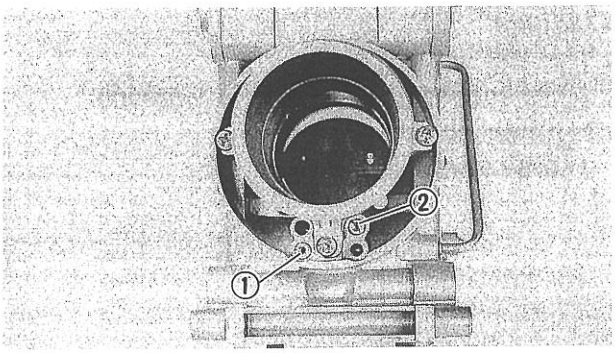
5.Remove:
- Vacuum chamber cover ①
- Spring ②
- Jet needle holder ③
- Spring ④
- Jet needle ⑤
- Piston valve ⑥



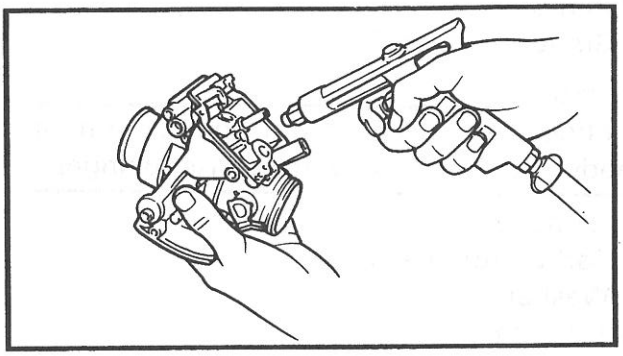
6.Remove:
- Float chamber ①
- Gasket ②
- Screw ③
- Float ④
- Float pin ⑤
- Screw
- Needle valve
- Valve seat
- O-ring



7.Remove:
- Main jet ①
- Main jet holder ②
- Main jet nozzle
- Screw ③
- Needle jet
- Pilot jet ④
- Pilot screw ⑤



8.Remove:
- Main air jet ①
- Pilot air jet ②



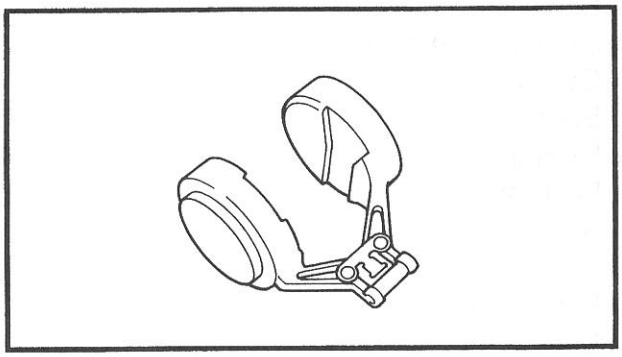
INSPECTION

1.Inspect:
- Carburetor body
- Float chamber
- Jet housing
  Cracks/Damage → Replace.
- Fuel passage
  Contamination → Clean as indicated.
- Carburetor float chamber body
  Contamination → Clean.

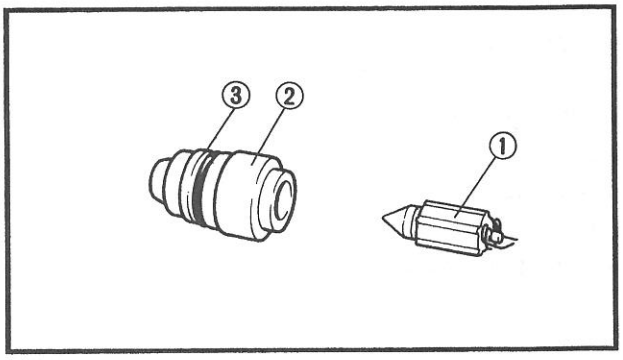
****

Cleaning steps:
- Wash carburetor in petroleum based solvent. (Do not use any caustic carburetor cleaning solution.)
- Blow out all passages and jets with compressed air.

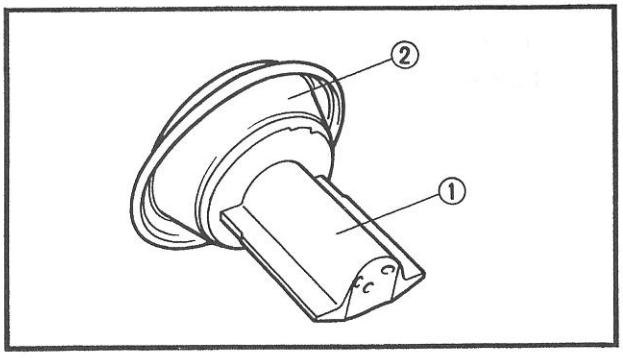
****



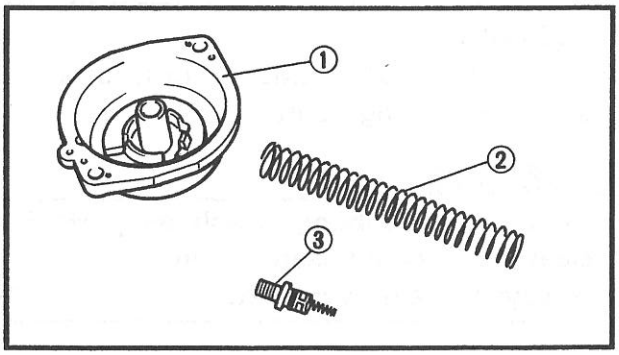
2.Inspect:
- Floats
  Damage → Replace.



3.Inspect:
- Needle valve ①
- Valve seat ②
- O-ring ③
  Damage/Wear/Contamination → Replace as a set.

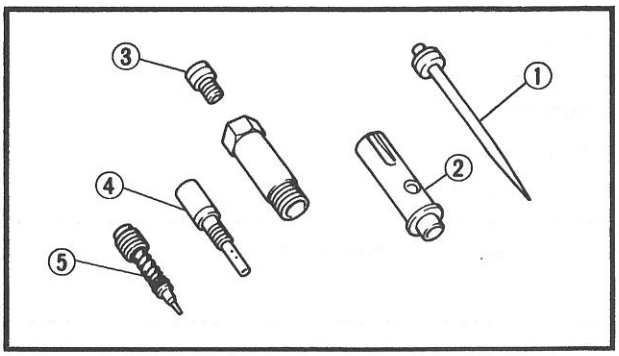


4.Inspect:
- Throttle valve ①
  Scratches/Wear/Damage → Replace.
- Rubber diaphragm ②
  Tears → Replace.



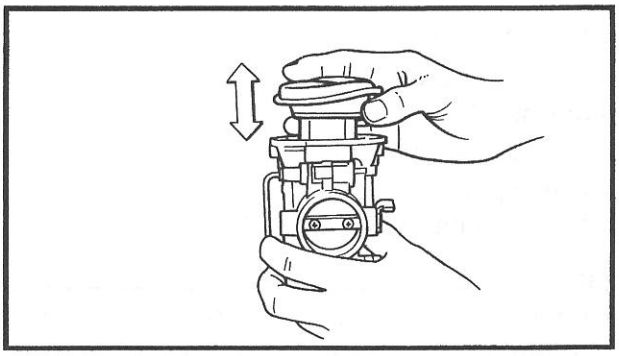
5.Inspect:
- Vacuum chamber cover ①
- Spring ②
- Jet needle holder ③

Cracks/Damage → Replace.



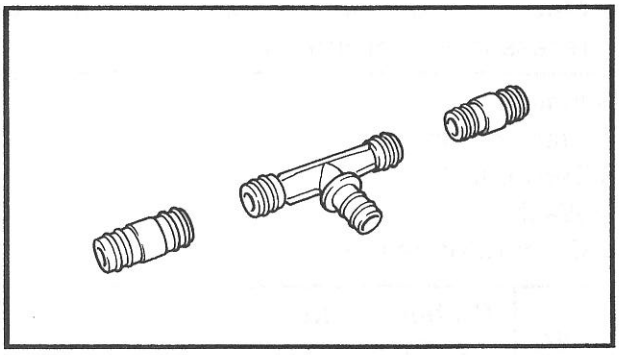
6.Inspect:
- Jet needle ①
- Needle jet ②
- Main jet ③
- Pilot jet ④
- Pilot screw ⑤

Bends/Wear/Damage → Replace.
Contamination → Blow out jets with compressed air.



7.Check:
- Free movement

Insert the throttle valve into the carburetor body, and check for free movement.
Stick → Replace.



8.Inspect:
- Joint (ventilation hose)
- Joint (fuel hose)
- Joint (fuel feed)

Cracks/Damage → Replace.

ASSEMBLY

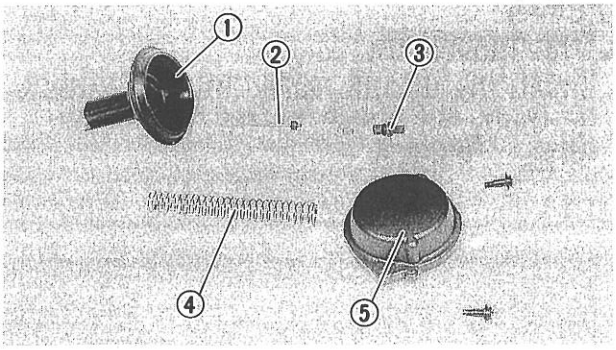
Reverse the "DISASSEMBLY" procedure.
Note the following points.

CAUTION:

- **Before reassembling, wash all parts in clean petroleum based solvent.**
- **Always use a new gasket.**

1. Install:
- O-ring
- Washer
- Spring
- Pilot screw

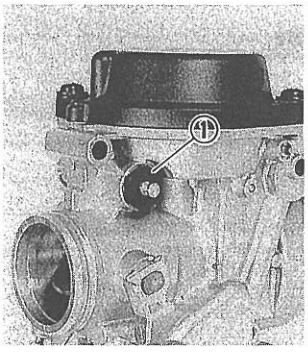
Pilot screw (turns out): **1-1/2**

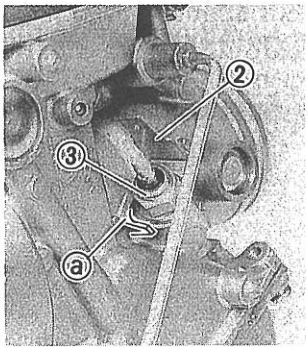


2. Install:
- Throttle valve ①
- Jet needle ②
- Jet needle holder ③
- Spring ④
- Vacuum chamber cover ⑤

NOTE:

- Insert the spring end onto the spring guide on the vacuum chamber cover.
- Match the tab on the diaphragm to the recess in the carburetor body.





3. Install:
- Starter plunger ①
- Terminal ②
- Washer
- Carburetor heater ③

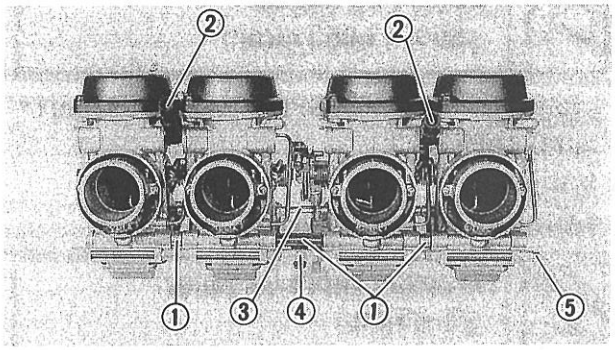
	**Carburetor heater:** **3 Nm (0.3 m • kg)**

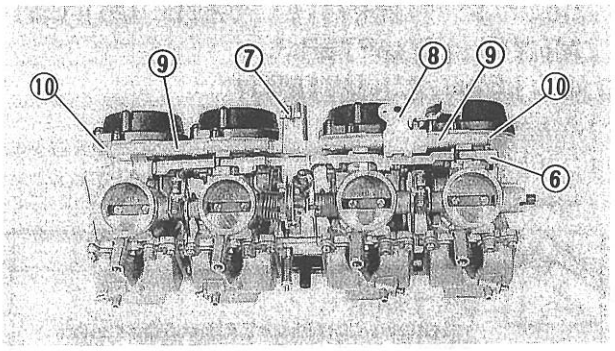
NOTE:

- Use "Heat Sinker" when installing the carburetor heater ③.
- Align the corner of terminal ② with ⓐ.

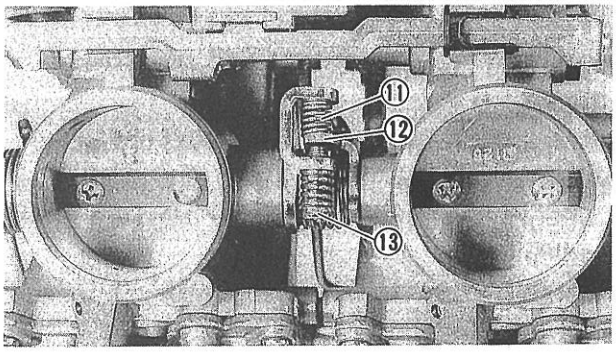
	**Heat sinker**

NOTE:
"HEAT SINKER" is the name of a product, sold at most electrical appliance dealers.



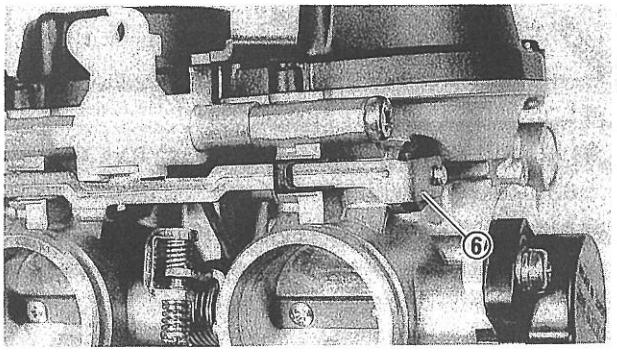


4.Install:
- Joint pipe ①
- Joint hose ②
- Rod ③
- Collar ④
- Carburetor hold bolt ⑤
- Starter joint ⑥
- Throttle cable holder ⑦
- Lever connector ⑧
- Collars ⑨
- Screws ⑩



NOTE:
- Do not tighten the connecting bolts yet.
- Insert the throttle arm ⑫ (on the #1, #2, #4 carburetors) between the spring ⑪ and synchronizing screw ⑬.

NOTE:
Hook the starter joint arm onto each starter plunger.



NOTE:
- Place the carburetor assembly on a surface plate with the intake manifold side down and then tighten the connecting bolts while pushing down the respective carburetor with an even force.
- After tightening, check the throttle lever and starter joint for smooth action.

INSTALLATION

Reverse the "REMOVAL" procedure.
Note the following points.

1.Adjust:
- Carburetor synchronization
  Refer to "CARBURETOR SYNCHRONIZATION" in CHAPTER 3.

2.Adjust:
- Idle speed

Engine idle speed:
950 ~ 1,050 r/min

Refer to "IDLING SPEED ADJUSTMENT" in CHAPTER 3.

3.Adjust:
- Throttle cable free play

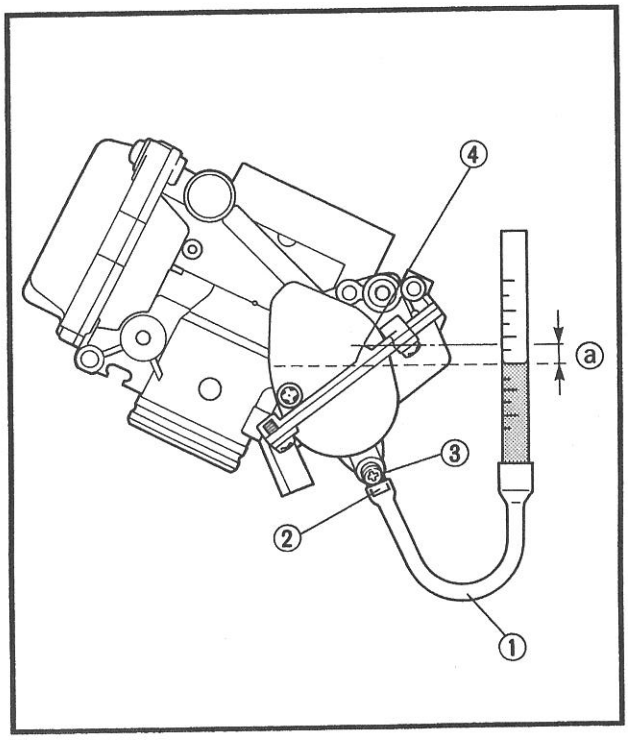
Throttle cable free play:
3 ~ 5 mm

Refer to "THROTTLE CABLE ADJUSTMENT" in CHAPTER 3.

FUEL LEVEL ADJUSTMENT

1.Measure:
- Fuel level ⓐ
  Out of specification → Adjust.

Fuel level:
6 ~ 7 mm
Below the float chamber line



****

Fuel level measurement and adjustment steps:

- Place the motorcycle on a level surface.
- Use a garage jack under the engine to ensure that the carburetor is positioned vertically.
- Connect the fuel level gauge ① to the drain pipe ②.

Fuel level gauge:
90890-01312

- Loosen the drain screw ③.
- Hold the gauge vertically next to the float chamber line ④.
- Measure the fuel level ⓐ with the gauge.

****

TPS (THROTTLE POSITION SENSOR) ADJUSTMENT AND INSPECTION

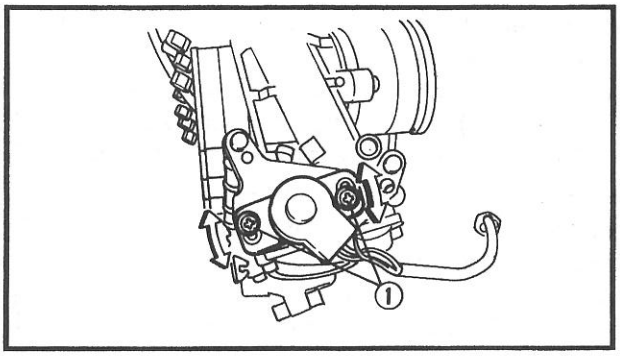
NOTE:
- Idle speed should be adjusted properly before adjusting the throttle sensor position.
- When installing the TPS, observe the display on the tachometer and adjust the angle accordingly. Refer to the adjustment procedure below.

1. Adjust:
- Throttle position sensor position

****

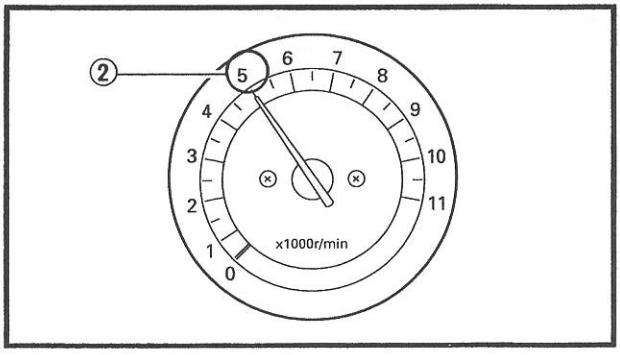
Adjustment steps:
- Turn the main switch to "ON".
- Disconnect the throttle sensor coupler.
- Reconnect the throttle sensor coupler.

NOTE:
When the above procedure is commenced, the machine switches to TPS adjustment mode.



- Loosen the throttle sensor screws ①.
- Adjust the throttle sensor position.

NOTE:
The angle of the TPS is shown on the tachometer.



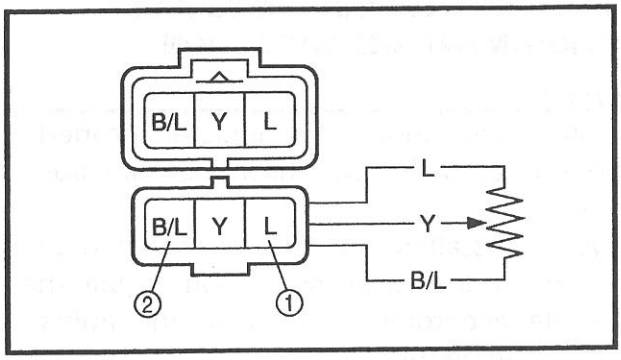
- Adjust the angle of the TPS as appropriate as shown below.

When the angle is correct, the tachometer reads 5,000 rpm. ②
When the angle is too wide, the tachometer reads 10,000 rpm.
When the angle is too narrow, the tachometer reads 0 rpm.

- After adjusting the angle, tighten the throttle sensor screws.

NOTE:
To return to normal mode, start the engine or reset the main switch.

****



2.Inspect:
- Throttle sensor

****

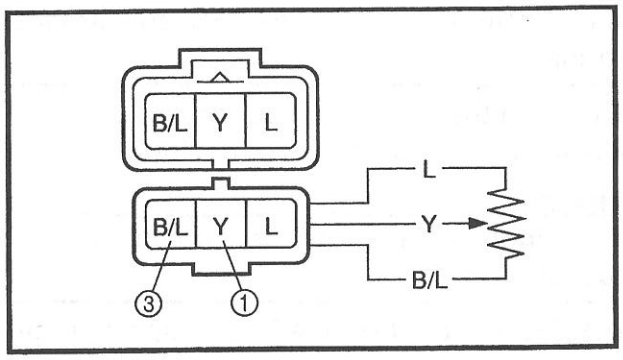
Inspection steps:
- Disconnect the throttle sensor coupler.
- Remove the throttle sensor from carburetor.
- Connect the pocket tester (Ω × 1k) to the throttle sensor couplers.

Tester (+) lead → Blue terminal ①
Tester (–) lead → Black/Blue terminal ②

- Check the throttle sensor resistance.

Throttle sensor resistance:
3.5 ~ 6.5 kΩ at 20°C
(Blue — Black/Blue)

Out of specification → Replace the throttle sensor.



- Connect the pocket tester (Ω × 1k) to throttle sensor coupler.

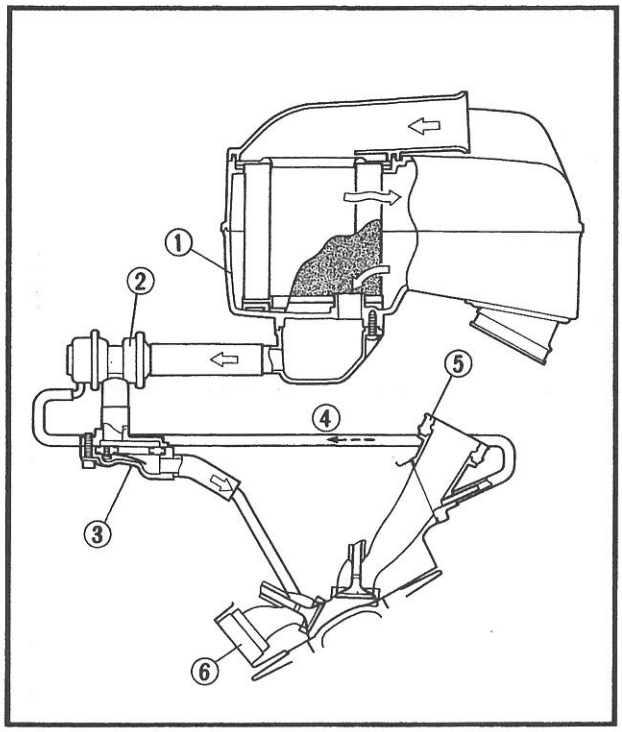
Tester (+) lead → Yellow terminal ①
Tester (–) lead → Black/Blue terminal ③

- Check the throttle sensor resistance while turning throttle slowly.

Throttle sensor resistance:
0 ~ 5 ± 1.5 kΩ at 20°C
(Yellow — Black/Blue)

Out of specification → Replace the throttle sensor.

****



A.I.S. (AIR INDUCTION SYSTEM)

AIR INJECTION

This system reburns unburned exhaust gas by mixing fresh air (secondary air) in at the exhaust port to reduce hydrocarbon.

When the pressure around the exhaust port is reversed (negative), the reed valve is opened and the secondary air flows into the exhaust port. Required temperature for reburning of unburned exhaust gas is approximately 600° to 700°C.

① Air cleaner
② Air cut valve
③ Reed valve
④ Vacuum signal
⑤ Carburetor joint
⑥ Exhaust port

AIR CUT VALVE

The air cut valve is operated by intake gas pressure through the diaphragm. Normally, this valve is opened in order to allow fresh air to flow into the exhaust port. When the throttle is closed rapidly, negative pressure is generated and this valve is closed in order to prevent after-burning.

Additionally, even if the engine is run at high RPM and the pressure decreases, the valve automatically closes in order to guard against a loss of performance due to self-E.G.R. (Exhaust Gas Recirculation).

(This "low-boost close" function is the same as the A.I.S. air cut valve function on the FZR600 (3HW), however, the XV750 models work differently.)

VIEW 1.

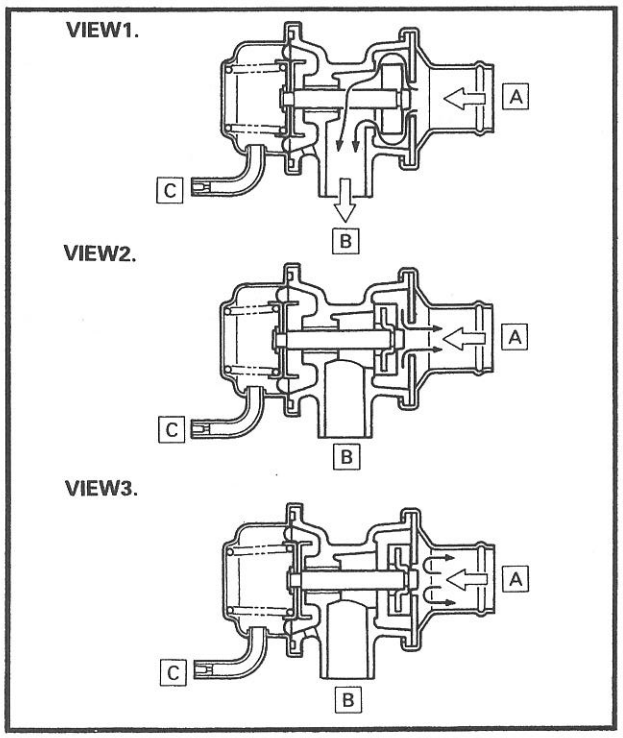
During normal operation, the valve is open.

VIEW 2.

When decelerating suddenly (throttle valve suddenly closes), the valve closes.

VIEW 3.

When running at high PRM's, the valve is closed.

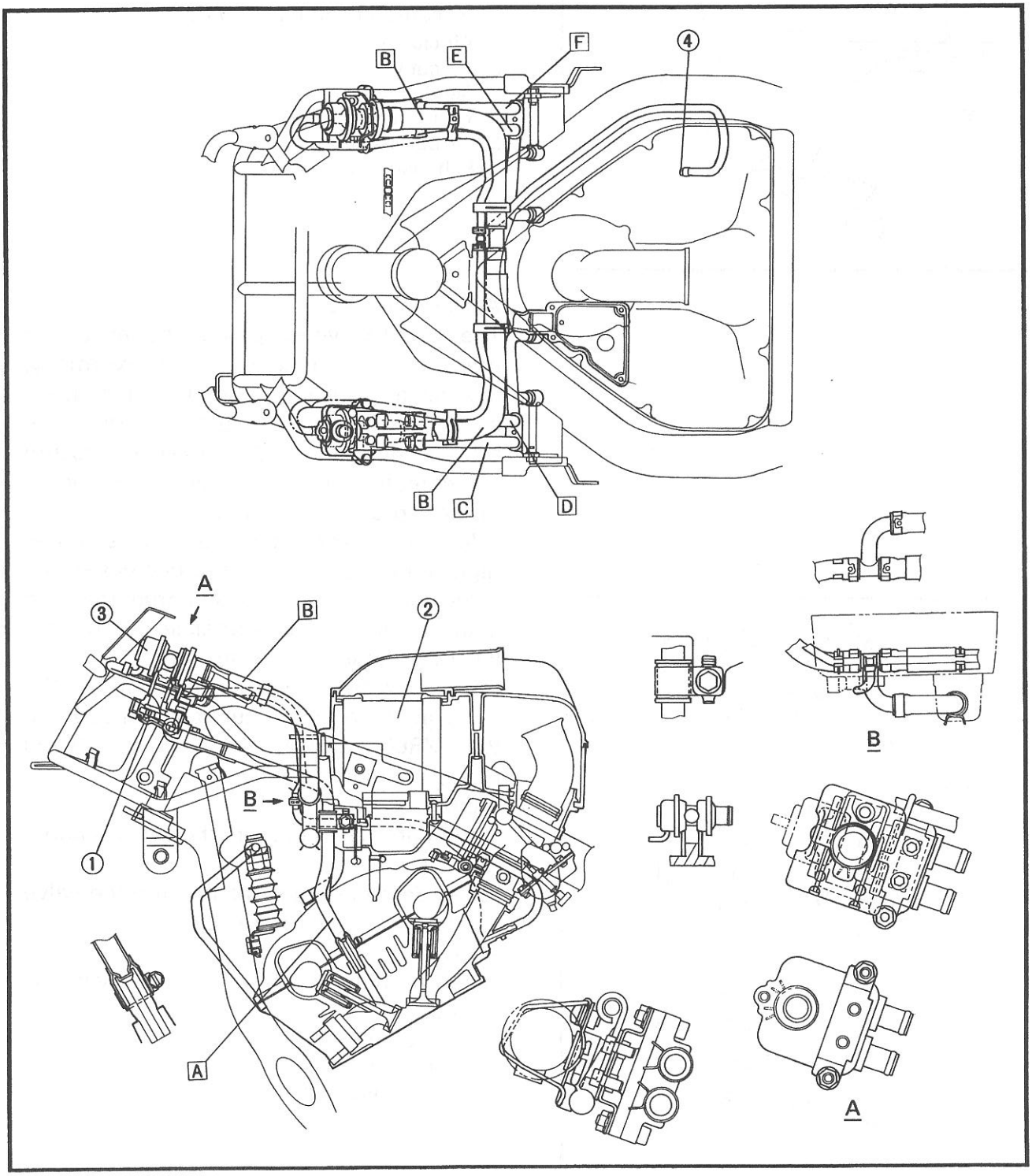


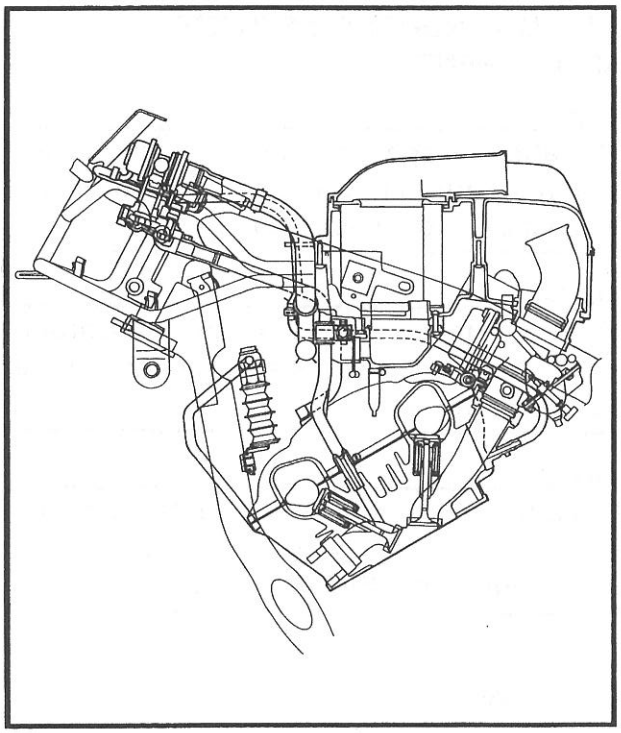
[A] From air cleaner
[B] To reed valve
[C] To carburetor joint

A.I.S. (AIR INDUCTION SYSTEM) DIAGRAMS

① Reed valve
② Air cleaner
③ Air cut valve
④ No. 4 cylinder (carburetor joint)

[A] To cylinders
[B] To air cut valve
[C] To No. 1 cylinder
[D] To No. 2 cylinder
[E] To No. 3 cylinder
[F] To No. 4 cylinder

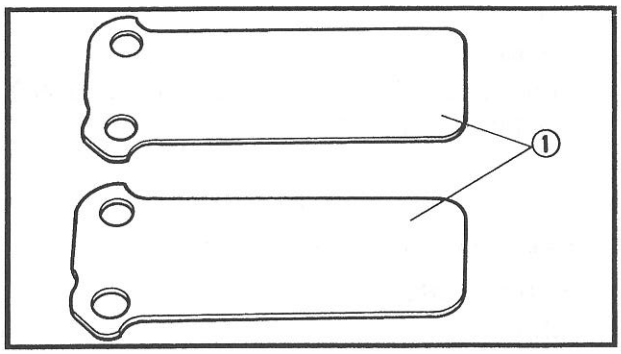




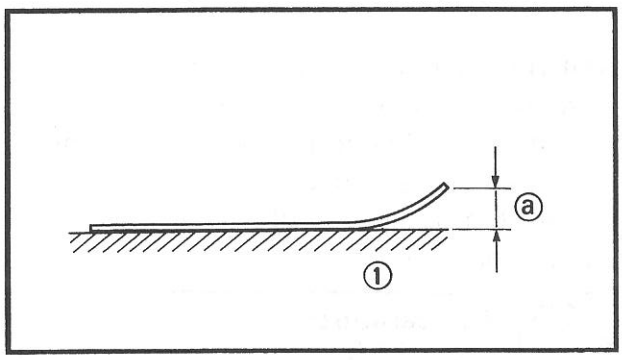
A.I.S. (AIR INDUCTION SYSTEM) INSPECTION

NOTE:
If the specified idling speed cannot be obtained, even after the adjustment procedures described in the "Inspection and adjustment" section have been carried out, follow the procedures below.

1.Inspect:
- Hose connection
  Poor connection → Correct.
  Loose connection → Correct properly.
- Hoses
  Cracks/Damage → Replace.
- Pipes
  Cracks/Damage → Replace.



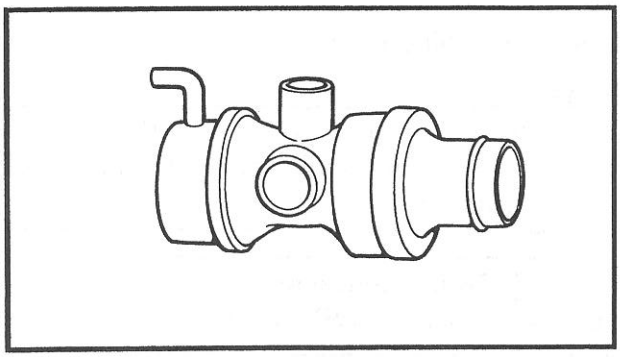
2.Inspect:
- Reed valves ①
- Reed valve stopper
  Cracks/Damage → Replace.



3.Measure:
- Reed valve bending limit ⓐ
  Out of specification → Replace.

	Reed valve bending limit: 0.4 mm

① Surface plate



4.Inspect:
- Air cut valve
  Cracks/Damage → Replace.

A.I.S. (AIR INDUCTION SYSTEM) ADJUSTMENT

NOTE:
The above inspection and adjustment procedures are unnecessary for ordinary inspection and adjustment.

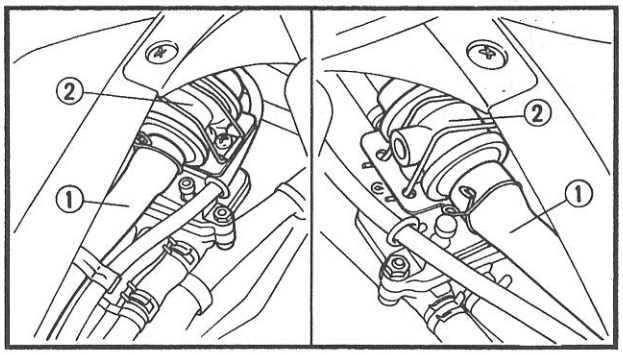
NOTE:
Valve clearance and carburetor synchronization should be adjusted properly before adjusting the A.I.S.

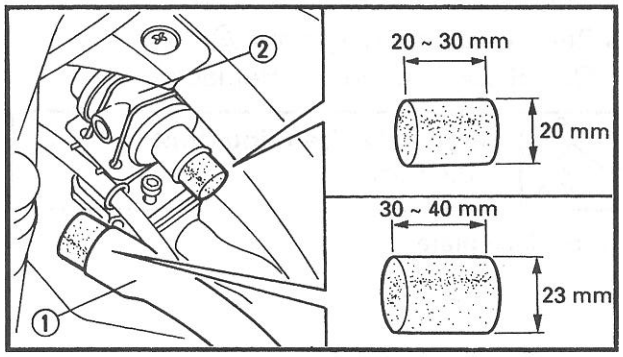
NOTE:
Place the motorcycle on its centerstand if a centerstand is equipped. If not, place a suitable stand under the motorcycle.

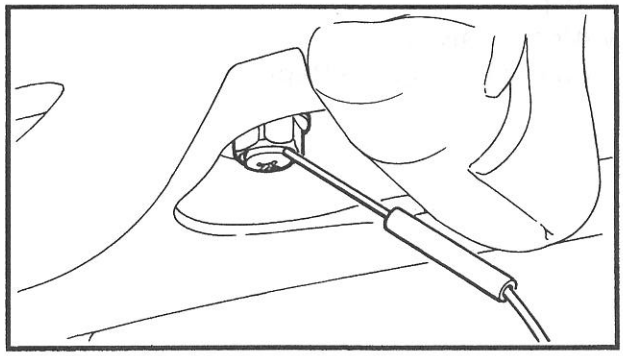
1.Remove:
- Seat
- Fuel tank
- Cowling

Refer to "SIDE COVER, FUEL TANK AND COWLING" in CHAPTER 3.

2.Adjust:
- A.I.S. (Air Induction System)







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Adjustment steps:

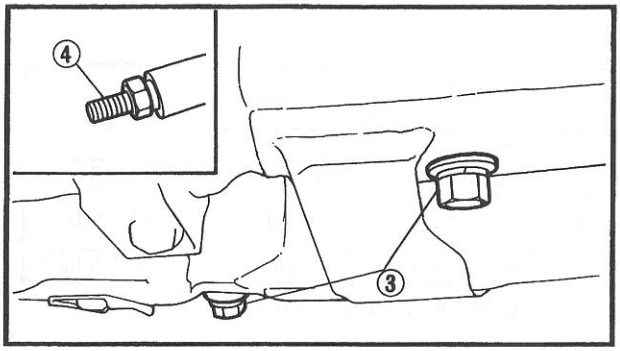
1st step:
- Remove the hose ① from the air cut valve ②.
- Fit rubber plugs into the air cut valve ② and hose ① to cut off the air.
- Start the engine and let it warm up until it reaches the specified temperature.
- Use a temperature probe tester connected to the drain bolt thread.

	Temperature: **65 ~ 75°C**

- Adjust engine idling speed.

NOTE:
Be careful not to get burned during the operation as the exhaust pipe generates considerable heat.

	Engine idling speed: **950 ~ 1,050 r/min**

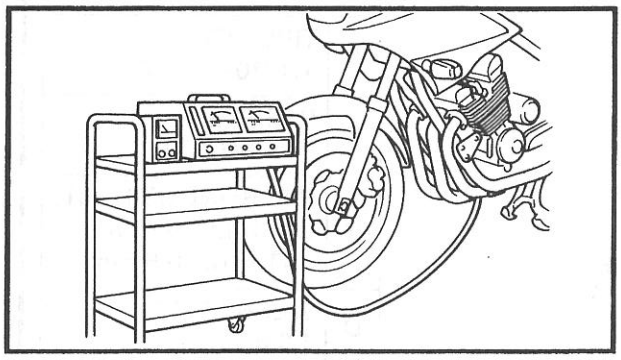


● Remove the exhaust bolt ③ and install the exhaust attachment ④.

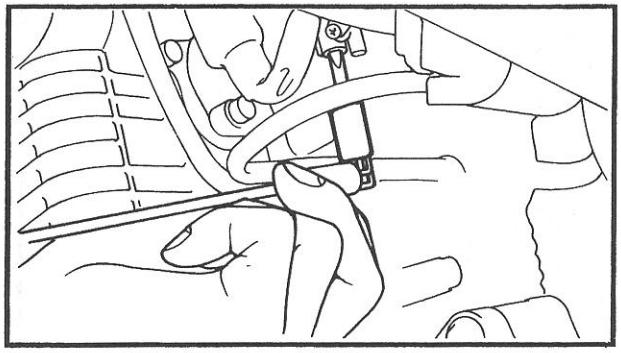
	Exhaust attachment: **90890-03134**

⚠ WARNING

Be careful not to get burned when removing or installing the exhaust bolt or exhaust attachment, as the exhaust pipe generates considerable heat.

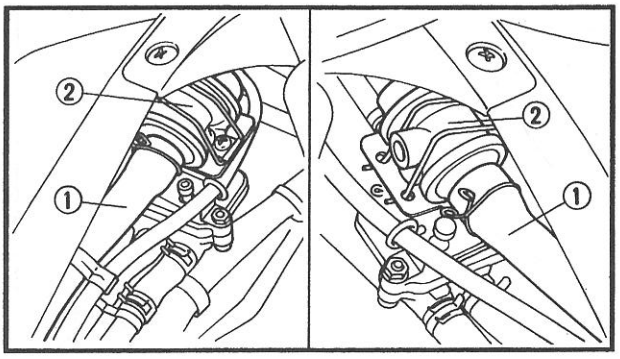


● Check the CO density by connecting a CO meter to the exhaust attachment.



● Use a carburetor angle driver to adjust the pilot screw until the specified value is obtained.

	Standard CO density: **4.5%**
	Carburetor angle driver: **90890-03158**



● Remove the exhaust attachment and install the exhaust bolt.

⚠ WARNING

Be careful not to get burned when removing or installing the exhaust bolt or exhaust attachment, as the exhaust pipe generates considerable heat.

	Exhaust bolt: **7 Nm (0.7 m • kg)**

2nd step:

● Remove the rubber plugs from the air cut valve ② and hose ①, and activate the A. I. S.

● Adjust engine idling speed once more.

	Engine idling speed: **950 ~ 1,050 r/min**

****

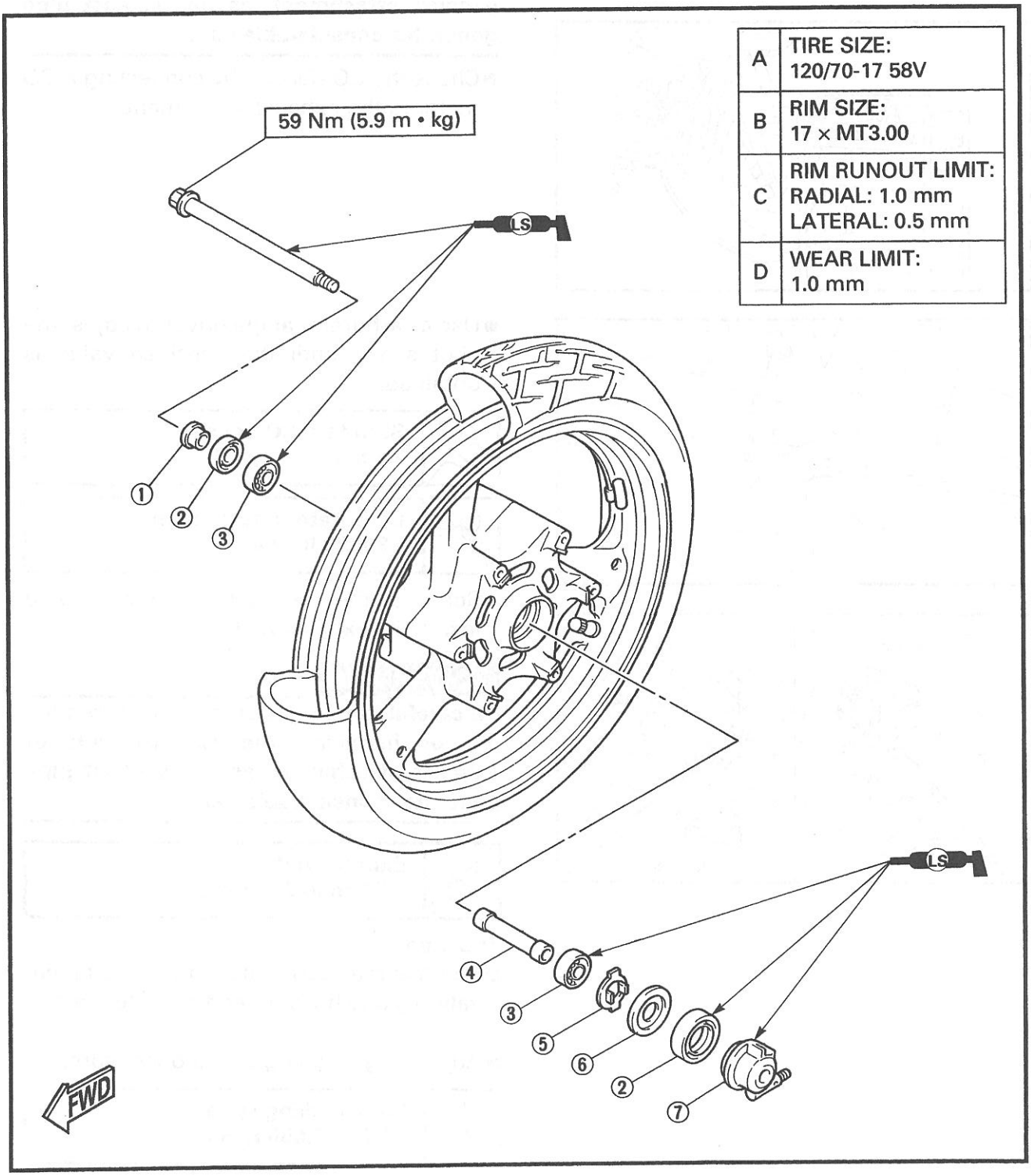
CHASSIS

FRONT WHEEL

① Collar
② Oil seal
③ Bearing
④ Spacer
⑤ Meter clutch
⑥ Clutch retainer
⑦ Speedometer gear unit

TIRE PRESSURE (COLD)		
Maximum load*	205 kg	
Cold tire pressure:	Front	Rear
Up to 90 kg load*	225 kPa (2.25 kg/cm², 2.25 bar)	250 kPa (2.5 kg/cm², 2.5 bar)
90 kg load ~ Maximum load*	250 kPa (2.5 kg/cm², 2.5 bar)	290 kPa (2.9 kg/cm², 2.9 bar)
High speed riding	250 kPa (2.5 kg/cm², 2.5 bar)	290 kPa (2.9 kg/cm², 2.9 bar)

* Load is the total weight of cargo, rider, passenger, and accessories.



A	TIRE SIZE: 120/70-17 58V
B	RIM SIZE: 17 × MT3.00
C	RIM RUNOUT LIMIT: RADIAL: 1.0 mm LATERAL: 0.5 mm
D	WEAR LIMIT: 1.0 mm

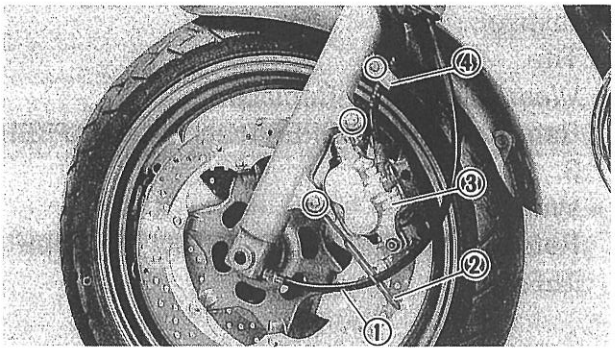
6

REMOVAL

⚠ WARNING

Securely support the motorcycle so there is no danger of it falling over.

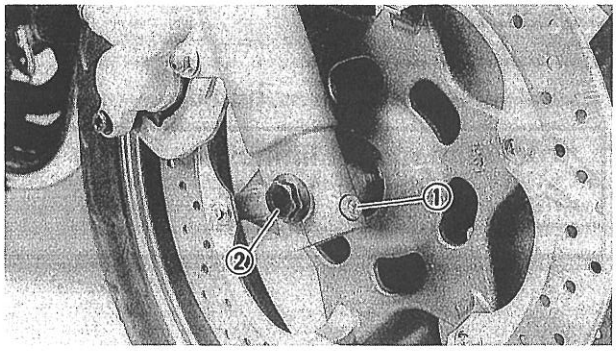
1. Place the motorcycle on a level place.



2. Disconnect:
   - Speedometer cable ①
3. Remove:
   - Speedometer cable guide ②
   - Brake calipers (left and right) ③
   - Bolt (brake hose holder) ④

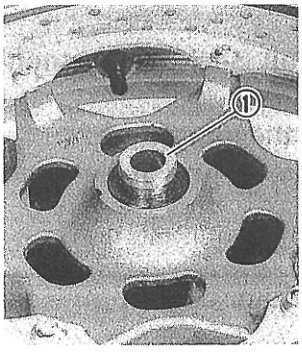
NOTE:

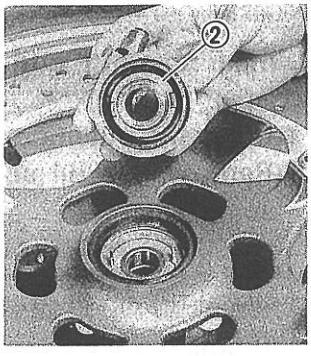
Do not depress the brake lever when the wheel is off the motorcycle otherwise the brake pads will be forced shut.



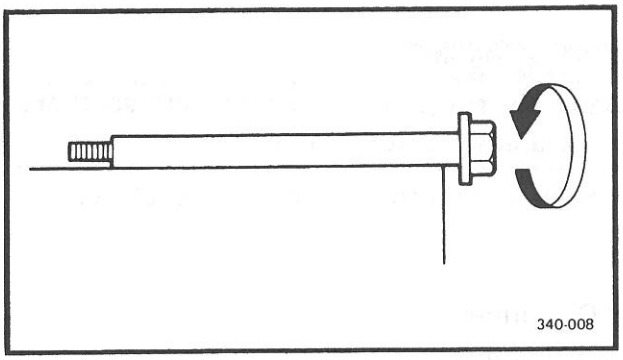
4. Loosen:
   - Pinch bolt (front wheel axle) ①
   - Front wheel axle ②

5. Elevate the front wheel by placing a suitable stand under the exhaust pipe.
6. Remove:
   - Front wheel axle
   - Front wheel





7. Remove:
   - Collar ①
   - Speedometer gear unit ②



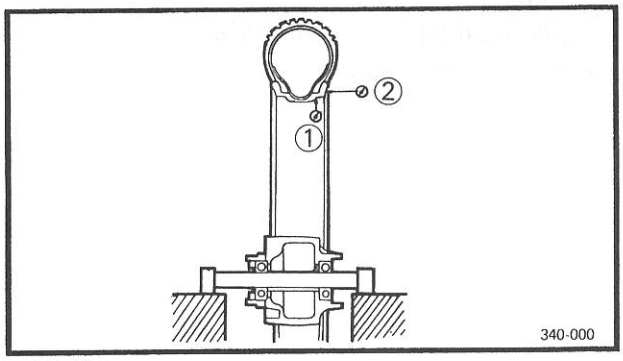
INSPECTION

1.Inspect:
- Front wheel axle
  Roll the axle on a flat surface.
  Bends → Replace.

⚠ WARNING

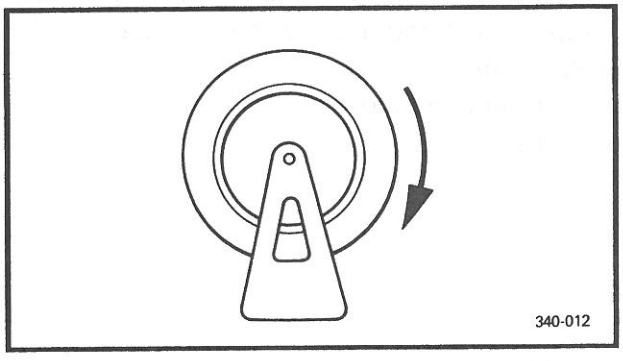
Do not attempt to straighten a bent axle.

2.Inspect:
- Tire
  Wear/Damage → Replace.
  Refer to "TIRE INSPECTION" in CHAPTER 3.
- Wheel
  Refer to "WHEEL INSPECTION" in CHAPTER 3.

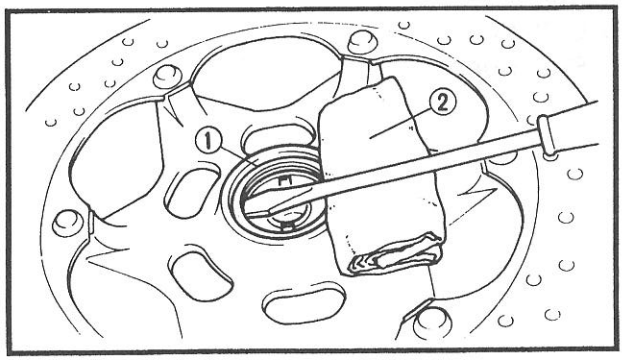


3.Measure:
- Wheel runout
  Over specified limit → Replace.

Rim runout limits:
Radial ①: 1.0 mm
Lateral ②: 0.5 mm



4.Inspect:
- Wheel bearings
  Bearings allow play in the wheel hub or wheel turns roughly → Replace.
- Oil seals
  Wear/Damage → Replace.



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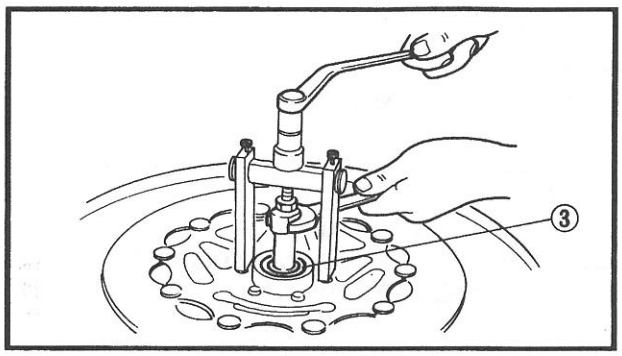
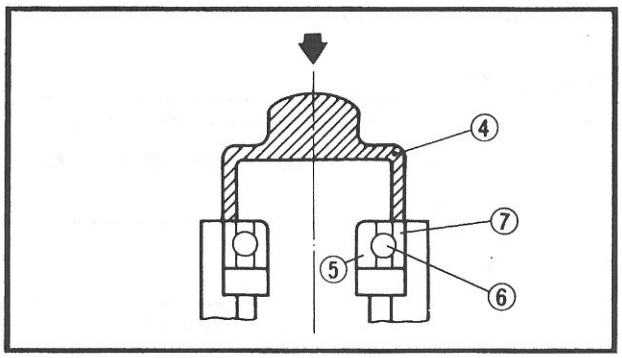
Wheel bearing and oil seal replacement steps:
- Clean the outside of the wheel hub.
- Remove the oil seals ① use a flat-head screw driver.

NOTE:
Place a rag ② on the outer edge to prevent damage.





- Remove the bearing ③ using a general bearing puller.
- Install the new bearing and oil seal by reversing the previous steps.

NOTE:
Use a socket ④ that matches the outside diameter of the race of the bearing and oil seal.

CAUTION:
Do not strike the center race ⑤ or balls ⑥ of the bearing. Contact should be made only with the outer race ⑦.

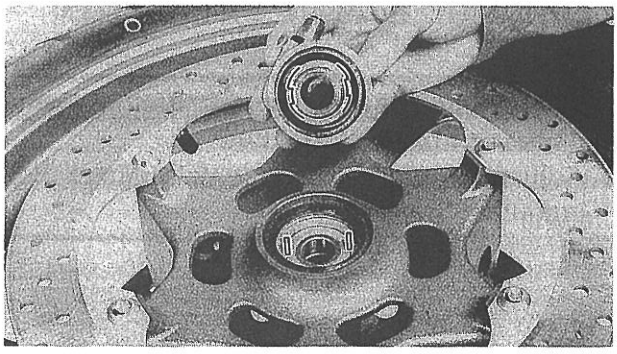
****

INSTALLATION

Reverse the "REMOVAL" procedure.
Note the following points.

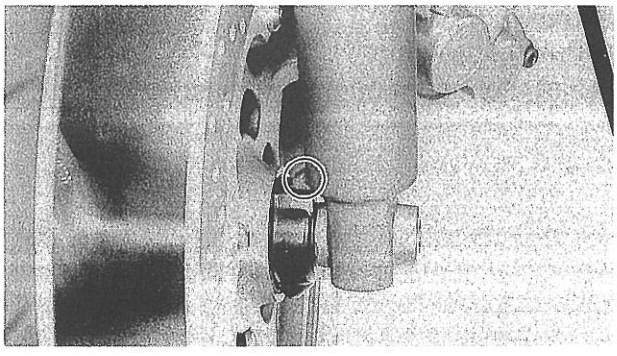
1.Lubricate:
- Front wheel axle
- Bearings
- Oil seal (lips)
- Drive/Driven gear (speedometer)

Recommended lubricant:
Lithium soap base grease



2.Install:
- Speedometer gear unit

NOTE:
Be sure that two projections inside the wheel hub mesh with the two slots in the gear unit assembly.



3.Install:
- Front wheel

NOTE:
Be sure that the projection (torque stopper) of the gear unit housing is positioned correctly.

4.Tighten:
- Front wheel axle
- Pinch bolt (front wheel axle)
- Bolt (brake caliper)

Front wheel axle:
59 Nm (5.9 m • kg)
Pinch bolt (front wheel axle):
19 Nm (1.9 m • kg)
Bolt (brake caliper):
35 Nm (3.5 m • kg)

CAUTION:
Before tightening the pinch bolt, stroke the front fork several times to check for proper fork operation.

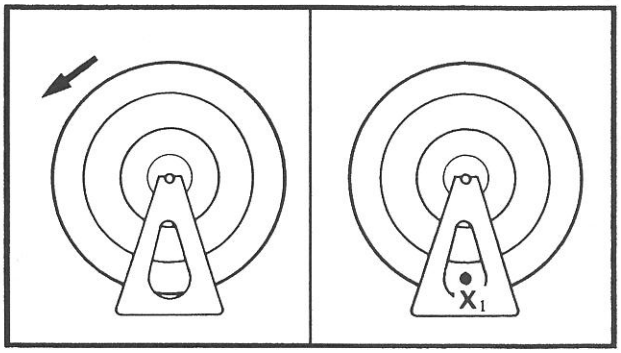
⚠ WARNING
Make sure that the brake hose is routed properly.

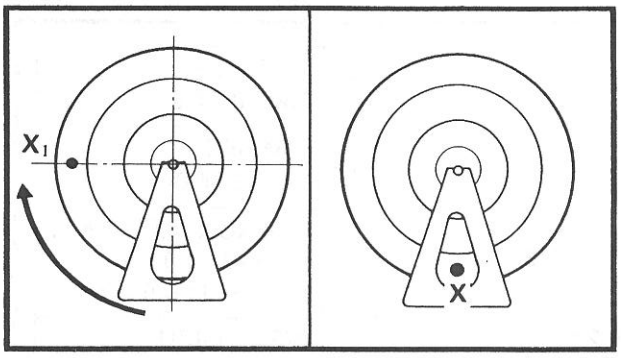
STATIC WHEEL BALANCE ADJUSTMENT

NOTE:
- After replacing the tire and/or rim, wheel balancer should be adjusted.
- Adjust the wheel balance with brake disk installed.

1.Remove:
- Balancing weight

2.Set the wheel on a suitable stand.





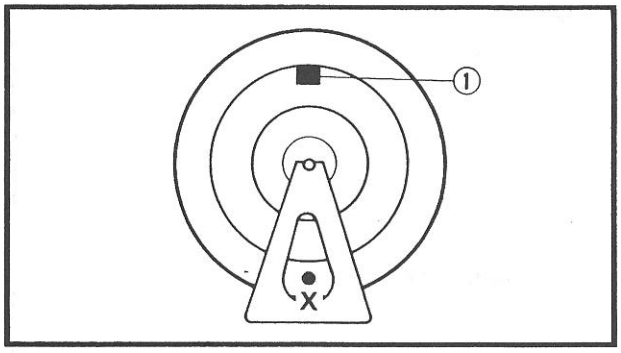
3.Find:
- Heavy spot

****

Procedure:

a.Spin the wheel and wait for it to rest.
b.Put an "X_1" mark on the wheel bottom spot.
c.Turn the wheel so that the "X_1" mark is 90° up.
d.Left the wheel fall and wait for it to rest. Put an "X_2" mark on the wheel bottom spot.
e.Repeat the above b., c., and d. several times until these marks come to the same spot.
f. This spot is the heavy spot "X".

****



4.Adjust:
- Wheel balance

****

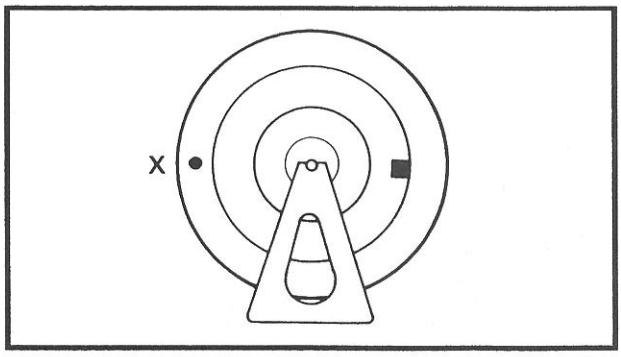
Adjusting steps:

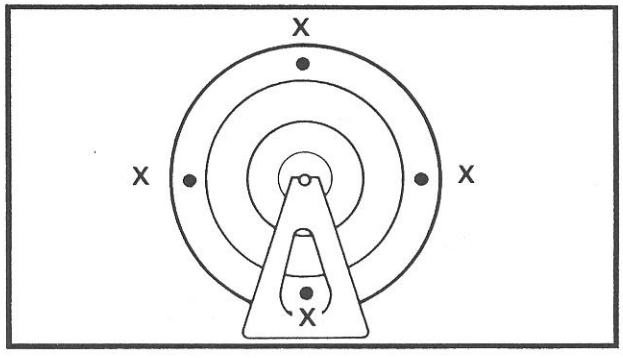
- Install a balancing weight ① on the rim exactly opposite to the heavy spot "X".

NOTE:
Start with the smallest weight.

- Turn the wheel so that the heavy spot is 90° up.
- Check that the heavy spot is at rest there. If not, try another weight until the wheel is balanced.

****





5.Check:
- Wheel balance

****

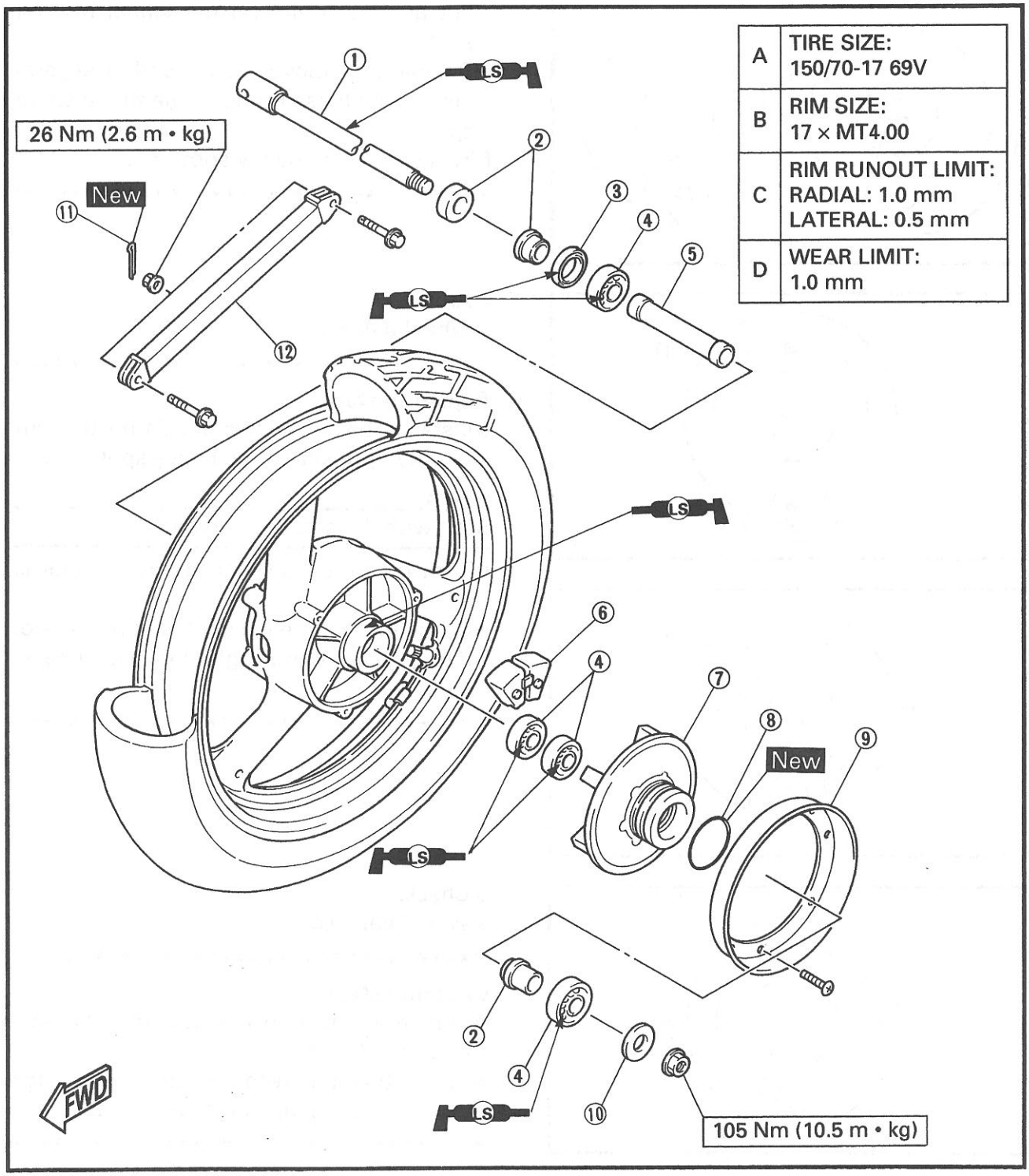
Checking steps:

- Turn the wheel so that it comes to each point as shown.
- Check that the wheel is at rest at each point. If not, readjust the wheel balance.

****

REAR WHEEL

① Wheel axle
② Collar
③ Oil seal
④ Bearing
⑤ Spacer
⑥ Clutch damper
⑦ Clutch hub
⑧ O-ring
⑨ Dust cover plate
⑩ Plate washer
⑪ Cotter pin
⑫ Tension bar

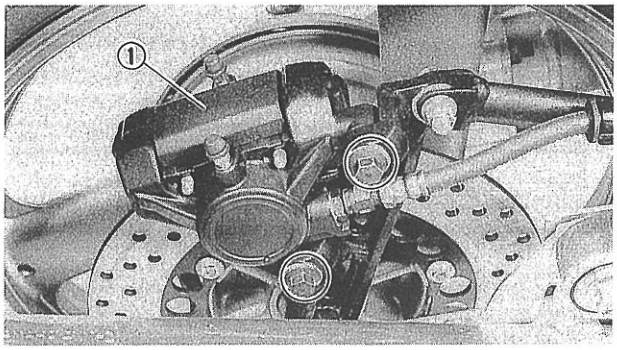


REMOVAL

⚠ WARNING

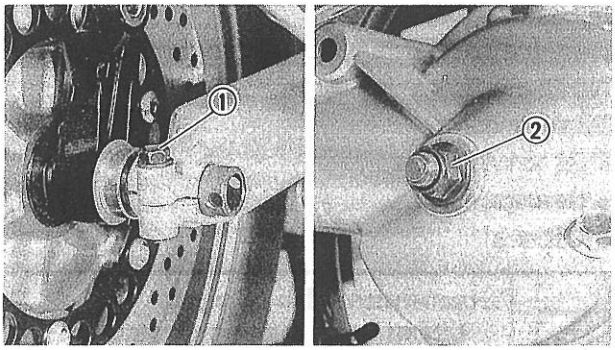
Securely support the motorcycle so there is no danger of it falling over.

1.Place the motorcycle on a level place.



2.Remove:
- Brake caliper ①

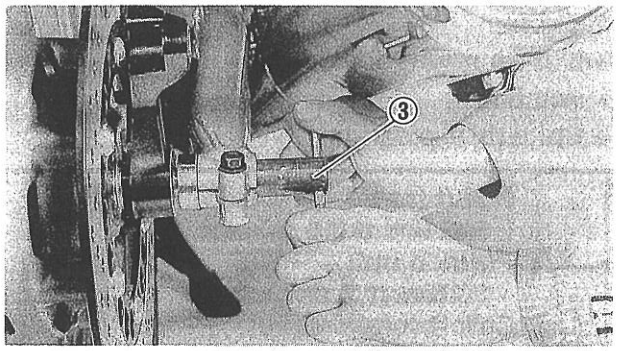
NOTE:
Do not depress the brake pedal while the caliper is removed.

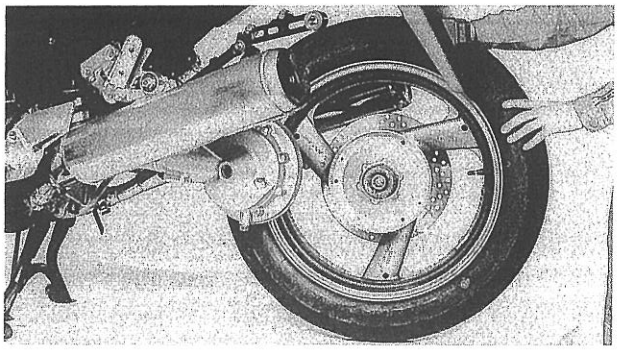


3.Loosen:
- Pinch bolt ①

4.Remove:
- Nut (rear wheel axle) ②
- Washer
- Rear wheel axle ③

  Pull the wheel to the right, to separate it from the final gear case.





5.Remove:
- Rear wheel

INSPECTION

1.Inspect:
- Rear wheel axle
- Wheel
- Wheel bearing
- Oil seals

Refer to "FRONT WHEEL".

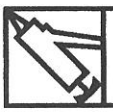
2.Measure:
- Wheel runout

Refer to "FRONT WHEEL".

INSTALLATION

Reverse the "REMOVAL" procedure.
Note the following points.

1.Lubricate:
- Rear wheel axle
- Bearings
- Oil seals



Recommended lubricant:
Lithium soap base grease

2.Tighten:
- Nut (rear wheel axle)
- Pinch bolt
- Bolts (brake caliper)

Nut (rear wheel axle):
105 Nm (10.5 m • kg)
Pinch bolt:
16 Nm (1.6 m • kg)
Bolt (brake caliper):
35 Nm (3.5 m • kg)

STATIC WHEEL BALANCE ADJUSTMENT

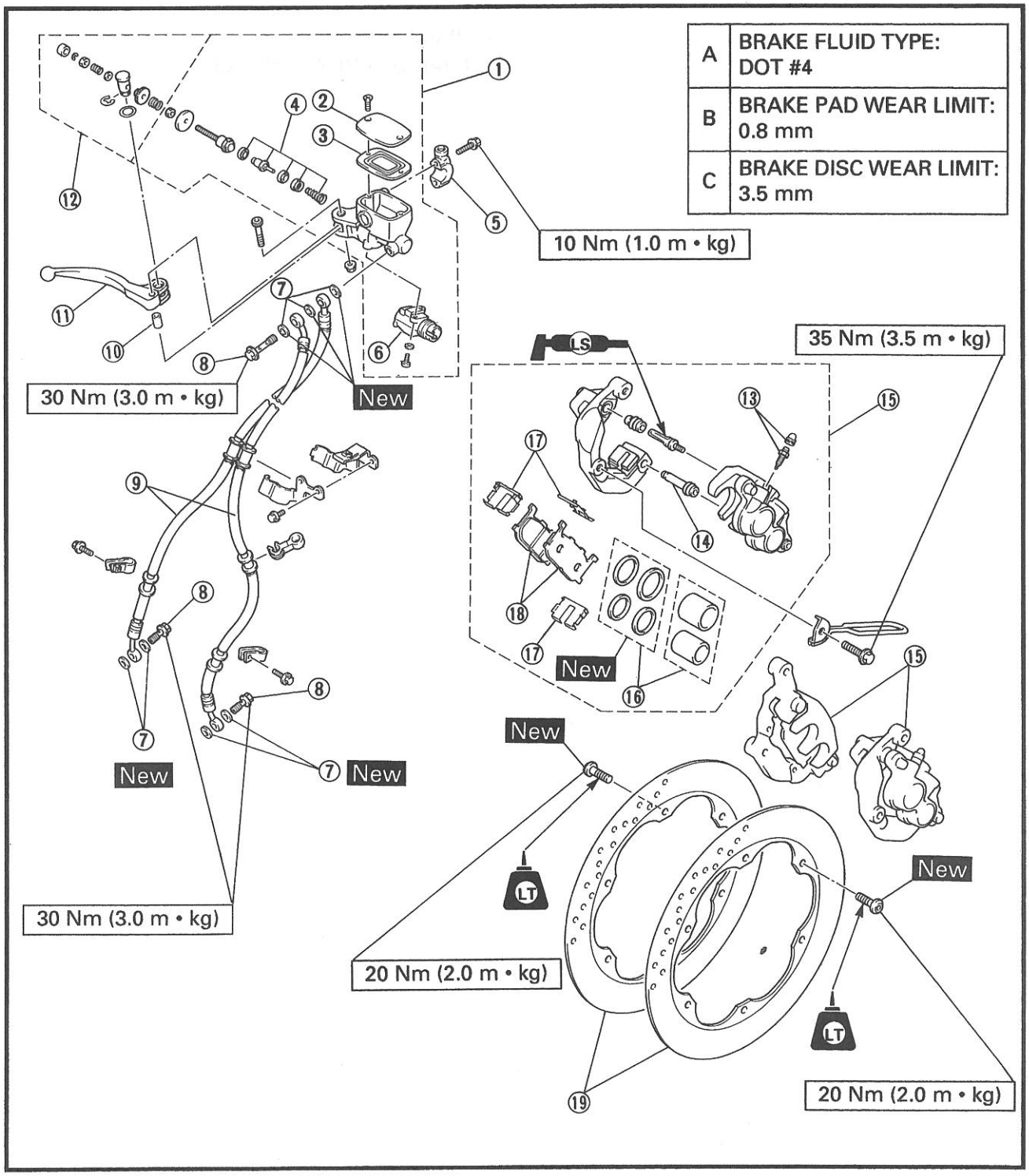
NOTE:
- After replacing the tire and/or rim, wheel balance should be adjusted.
- Adjust the wheel balance with brake disc and hub installed.

1. Adjust:
- Wheel balance
  Refer to "FRONT WHEEL".

FRONT AND REAR BRAKE

FRONT BRAKE

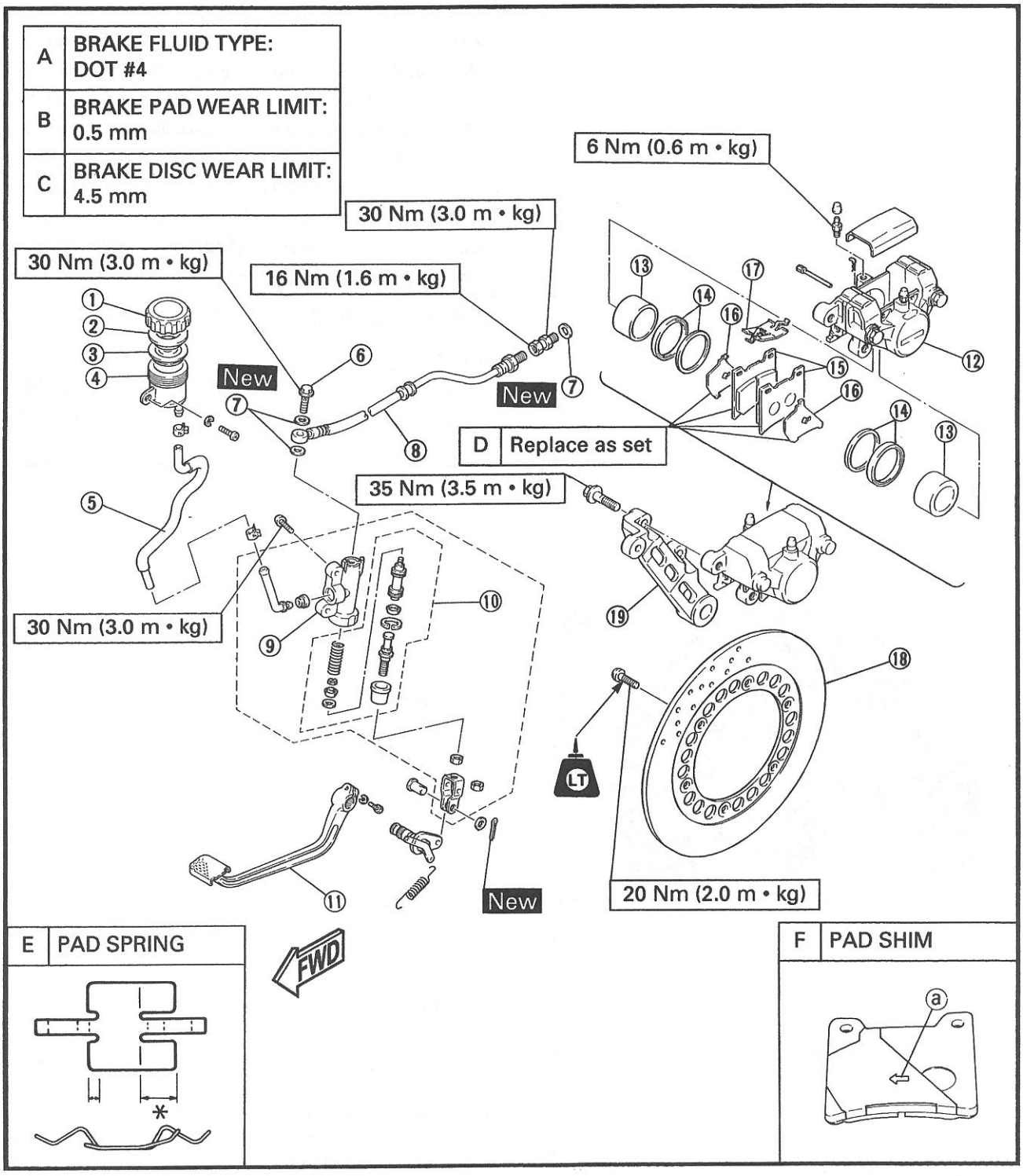
① Master cylinder assembly
② Master cylinder cap
③ Diaphragm
④ Master cylinder kit
⑤ Master cylinder bracket
⑥ Front brake switch
⑦ Copper washer
⑧ Union bolt
⑨ Brake hose
⑩ Collar
⑪ Brake lever
⑫ Master cylinder screw kit
⑬ Bleed screw
⑭ Retaining bolt
⑮ Caliper assembly
⑯ Caliper piston assembly
⑰ Pad spring
⑱ Brake pad
⑲ Brake disc



REAR BRAKE

① Reservoir tank cap
② Holder (diaphragm)
③ Diaphragm
④ Reservoir tank
⑤ Reservoir hose
⑥ Union bolt
⑦ Copper washer
⑧ Brake hose
⑨ Master cylinder
⑩ Master cylinder kit
⑪ Brake pedal
⑫ Brake caliper
⑬ Piston
⑭ Piston seal
⑮ Brake pad
⑯ Shim
⑰ Pad spring
⑱ Brake disc
⑲ Caliper bracket

E The longer tangs (*) of the pad spring must point in the disc rotating direction.
F The arrow mark ⓐ on the pad shim must point in the disc rotating direction.



CAUTION:

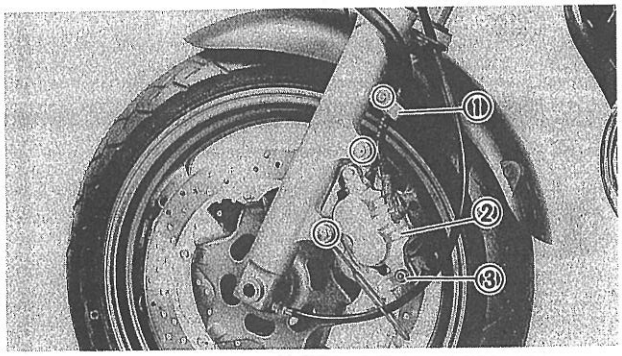
Disc brake components rarely require disassembly. DO NOT:

- **Disassemble components unless absolutely necessary.**
- **Use solvents on internal brake components.**
- **Use contaminated brake fluid for cleaning.**
  Use only clean brake fluid.
- **Allow brake fluid to come in contact with the eyes, otherwise eye injury may occur.**
- **Allow brake fluid to contact painted surfaces or plastic parts otherwise damage may occur.**
- **Disconnect any hydraulic connection otherwise the entire system must be disassembled, drained, cleaned, and then properly filled and bled after reassembly.**

BRAKE PAD REPLACEMENT

NOTE:

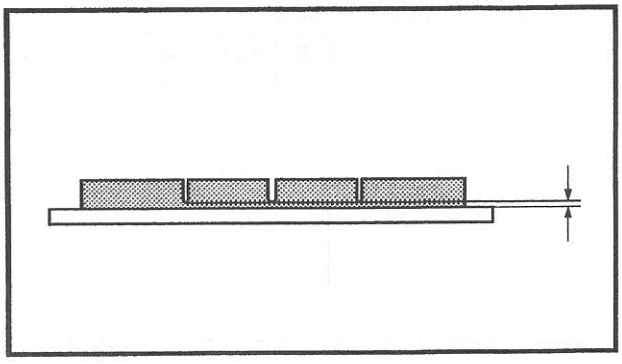
It is not necessary to disassemble the brake caliper and brake hose to replace the brake pads.



Front brake

1.Remove:

- Bolt (brake hose holder) ①
- Caliper assembly ②
- Retaining bolt ③



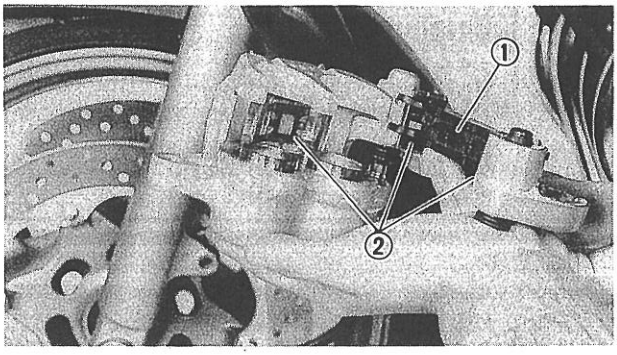
2.Remove:

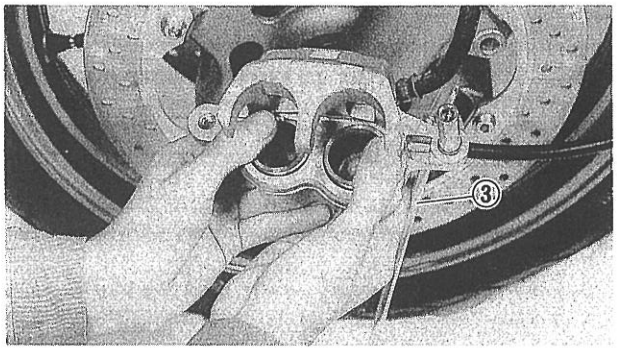
- Brake pads

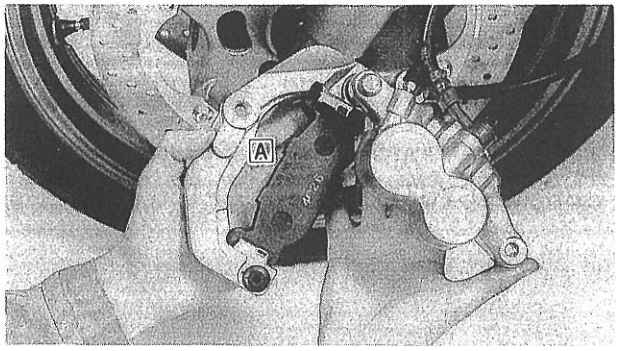
NOTE:

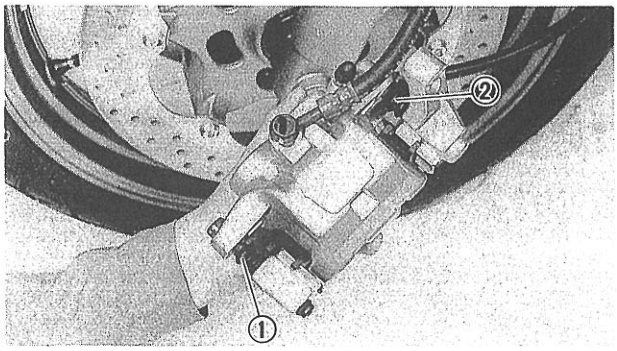
- Replace the pad spring if the pad replacement is required.
- Replace the pads as a set if either is found to be worn to the wear limit.

Wear limit:
0.8 mm









3.Install:
- Brake pads ①
- Pad springs ②

****

Installation steps:

- Connect a suitable hose ③ tightly to the caliper bleed screw. Then, place the other end of this hose into an open container.
- Loosen the caliper bleed screw and push the pistons into the caliper with the finger.
- Tighten the caliper bleed screw.

	Caliper bleed screw: 6 Nm (0.6 m • kg)

- Be careful to install the pad springs in proper position.
- Install the brake pads.

NOTE:

Be sure to position the pad so that its round side [A] is forward.

****

4.Lubricate:
- Retaining bolt (caliper body) ①
- Caliper guide shaft ②

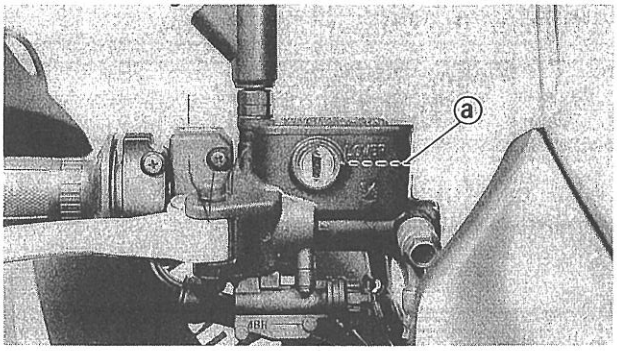
	Recommended lubricant: Lithium soap base grease

CAUTION:

- **Take care not to allow the brake pads to be smeared by grease.**
- **Wipe off any unnecessary grease that comes out of place.**

5.Install:
- Retaining bolt
- Caliper assembly
- Brake hose holder

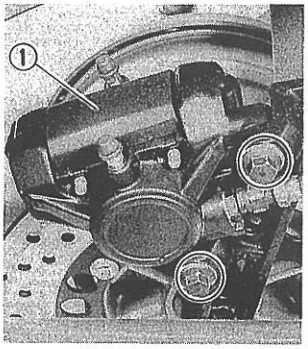
Retaining bolt:
22 Nm (2.2 m • kg)
Bolt (caliper bracket):
35 Nm (3.5 m • kg)
Bolt (brake hose holder):
7 Nm (0.7 m • kg)

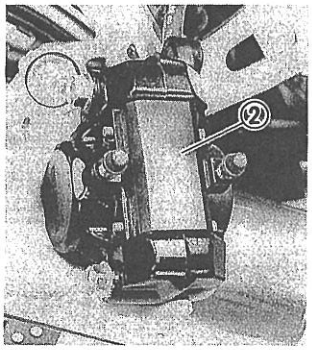


6.Inspect:
- Brake fluid level
  Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

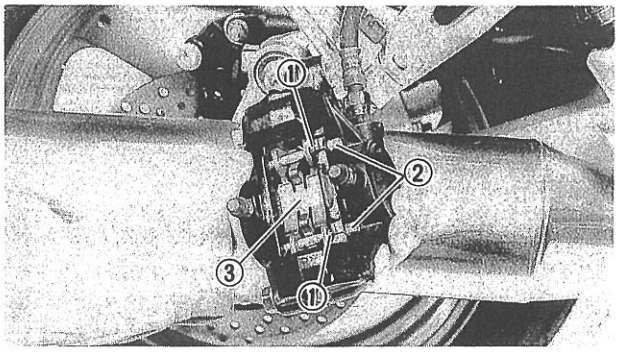
7.Check:
- Brake lever operation
  A soft spongy feeling → Bleed brake system.
  Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.



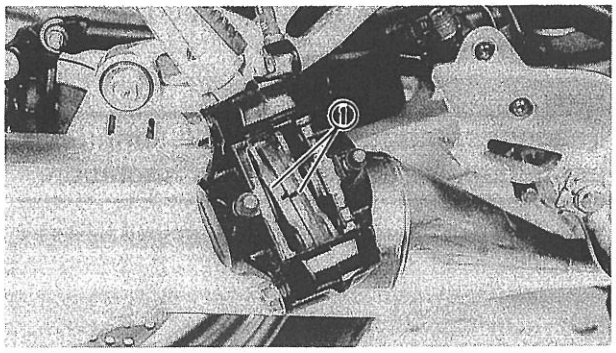


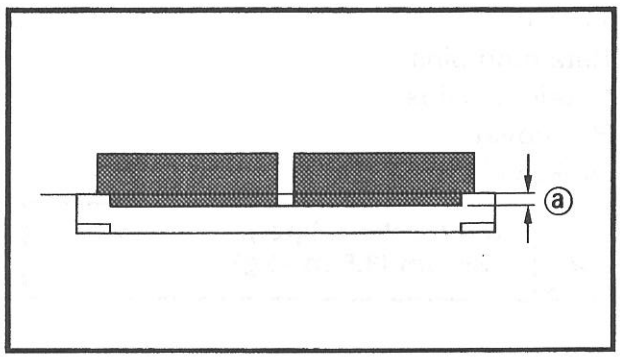
Rear brake

1.Remove:
- Brake caliper ①
- Pad cover ②



2.Remove:
- Retaining clips ①
- Retaining pins ②
- Pad spring ③



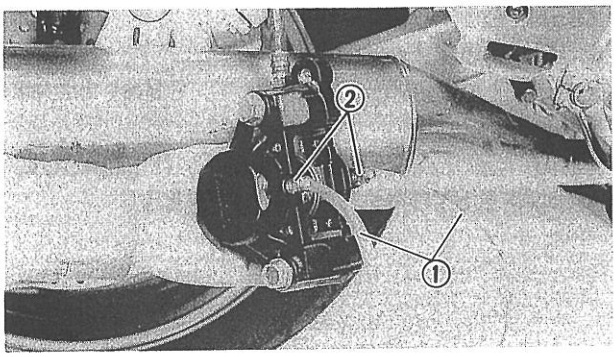


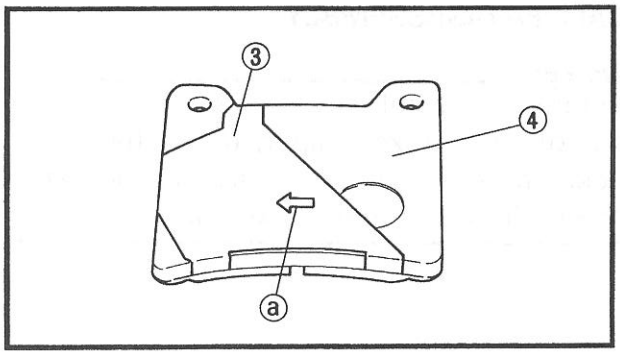
3.Remove:
- Brake pads ①
  (with pad shims)

NOTE:
- When pad replacement is required, also replace the pad spring and shims.
- Replace the pads as a set if either is found to be worn to the wear limit ⓐ.

Wear limit ⓐ:
0.5 mm

4.Install:
- Pad shims
  (onto brake pads)
- Brake pads
- Pad spring





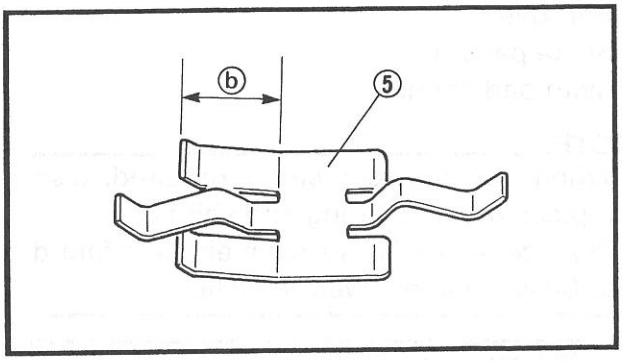
****

Installation steps:
- Connect a suitable hose ① tightly to the caliper bleed screw ②. Then, place the other end of this hose into an open container.
- Loosen the caliper bleed screw and push the pistons into the caliper with the finger.
- Tighten the caliper bleed screw ②.

Caliper bleed screw:
6 Nm (0.6 m • kg)

- Install the pad shim (new) ③ on the brake pad (new) ④.

NOTE:
The arrow mark ⓐ on the pad shim must point in the direction of the disc rotation.



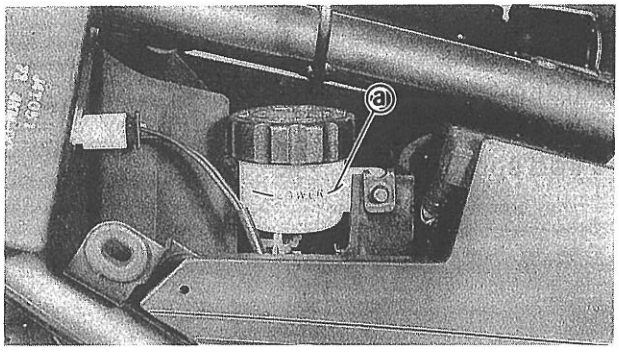
● Install the brake pads (new) and pad spring (new) ⑤.

NOTE:
The longer tangs ⓑ of the pad spring must point in the direction of the disc rotation.

****

5. Install:
- Retaining pins
- Retaining clips
- Pad cover
- Brake caliper

T.R.	**Bolt (brake caliper): 35 Nm (3.5 m • kg)**



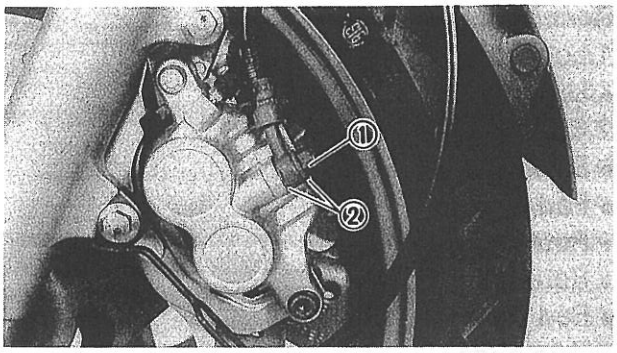
6. Inspect:
- Brake fluid level
  Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

7. Check:
- Brake pedal operation
  A soft or spongy feeling → Bleed brake system.
  Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.

CALIPER DISASSEMBLY

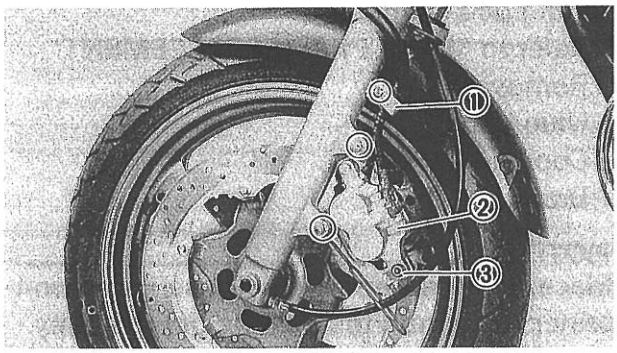
NOTE:
Before disassembling the front brake caliper or rear brake caliper, drain the brake hose, master cylinder, brake caliper and reservoir tank of their brake fluid.



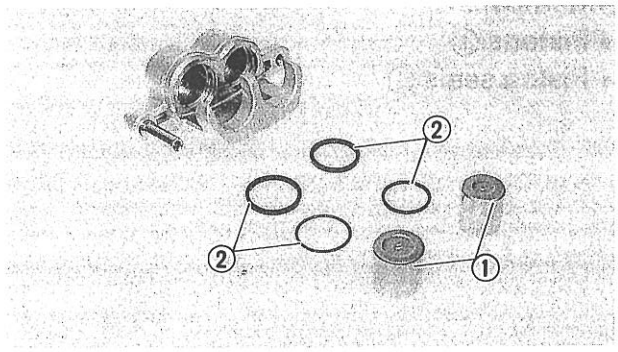
Front brake

1.Remove:
- Union bolt ①
- Copper washers ②
- Brake hose

NOTE:
Place the open end hose into a container and pump the oil fluid out carefully.



2.Remove:
- Bolt (brake hose holder) ①
- Caliper assembly ②
- Retaining bolt ③
- Brake pads
- Pad springs

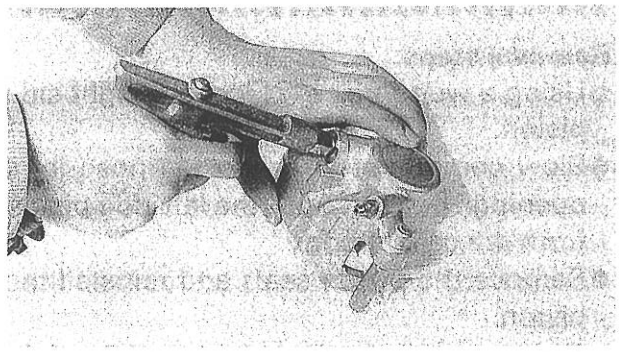


3.Remove:
- Pistons ①
- Piston seals ②

****

Removal steps:
- Blow compressed air into the hose joint opening to force out the caliper piston from the caliper body.

⚠ WARNING
- **Never try to pry out the piston.**
- **Cover the piston with a rag. Use care so that piston does not cause injury as it is expelled from the cylinder.**



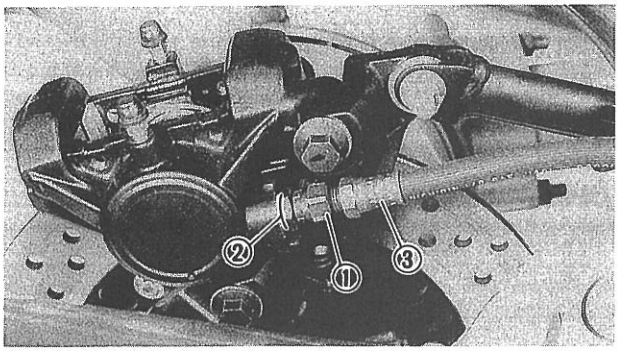
- Remove the piston seals.

****

Rear brake

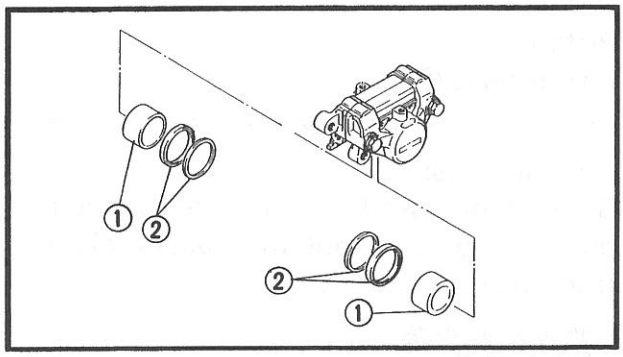
1.Loosen:
- Union bolt

2.Remove:
- Brake caliper
- Pad cover
- Retaining clips
- Retaining pins
- Pad spring
- Brake pads
  (with pad shims)
  Refer to "BRAKE PAD REPLACEMENT".



3.Remove:
- Union bolt ①
- Copper washer ②
- Brake hose ③

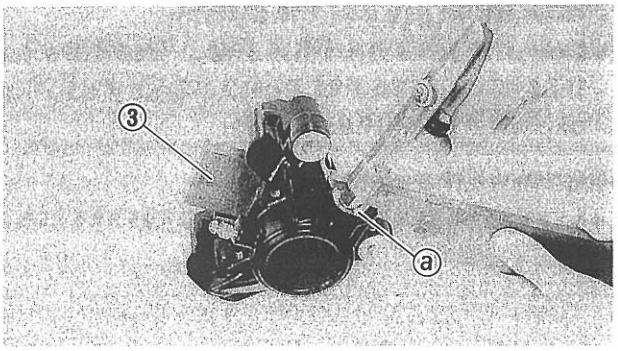
NOTE:
Place the open end of the hose into a container and pump the oil fluid out carefully.



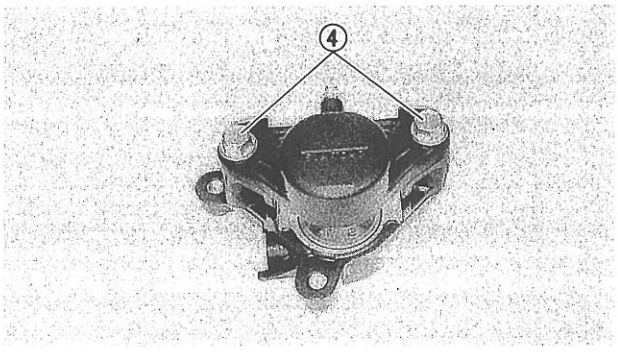
4.Remove:
- Pistons ①
- Piston seals ②

****

Removal steps:
- Using a wood piece ③, lock the right side piston.
- Blow compressed air into the hose joint opening ⓐ to force out the left side piston from the caliper body.
- Remove the piston seals and reinstall the piston.
- Repeat previous step to force out the right side piston from the caliper body.



⚠ WARNING
- **Never try to pry out the piston.**
- **Do not loosen the bolts ④.**



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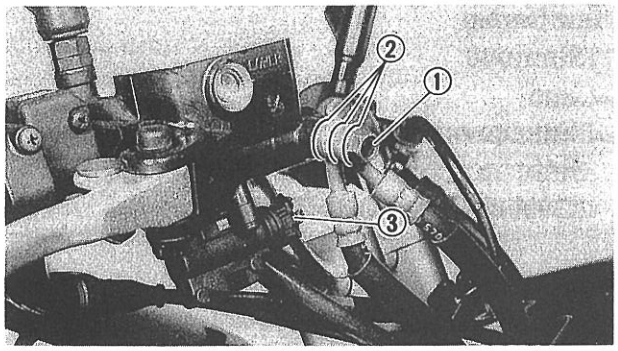
MASTER CYLINDER DISASSEMBLY

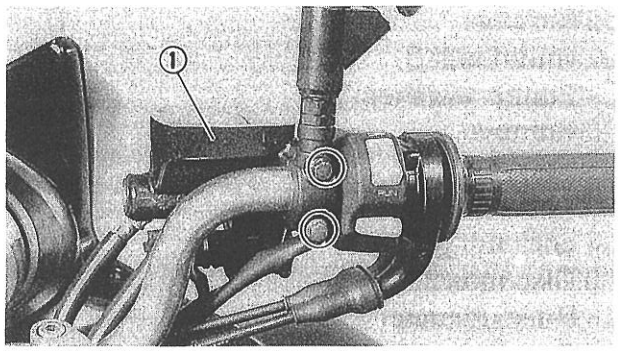
NOTE:
Before disassembling the front or rear brake master cylinders, drain the brake hose, master cylinder, brake caliper and reservoir tank of their brake fluid.



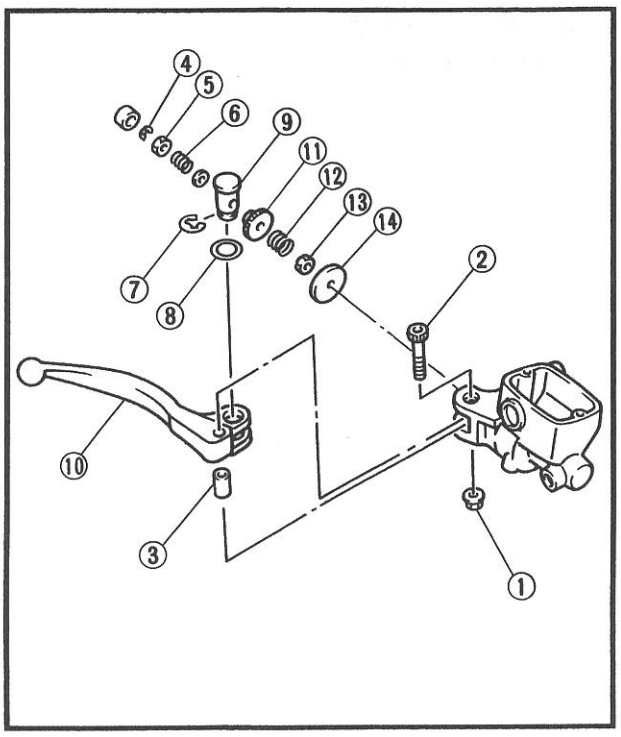
Front brake

1.Remove:
- Union bolt ①
- Copper washers ②
- Brake switch lead ③

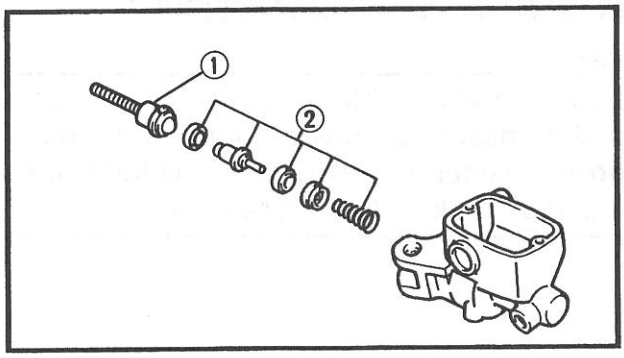
NOTE:
Disconnect the brake switch coupler from the brake lever while the hook of the brake switch is pushed by suitable rod.



2.Remove:
- Master cylinder ①



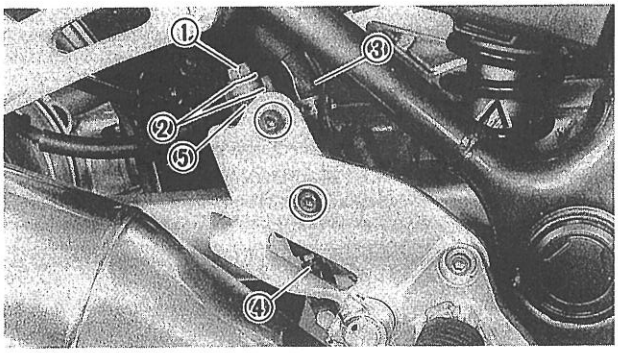
3.Remove:
- Nut ①
- Bolt ②
- Collar ③
- Circlip ④
- Nut ⑤
- Spring ⑥
- Plate
- Circlip ⑦
- Washer ⑧
- Retaining pin ⑨
- Brake lever ⑩
- Adjuster ⑪
- Spring ⑫
- Nut ⑬
- Plate ⑭



4.Remove:
- Rod ①
- Master cylinder kit ②

Rear brake

1.Remove:
- Seat
- Side cover (right)
  Refer to "SIDE COVER, FUEL TANK AND COWLING" in CHAPTER 3.



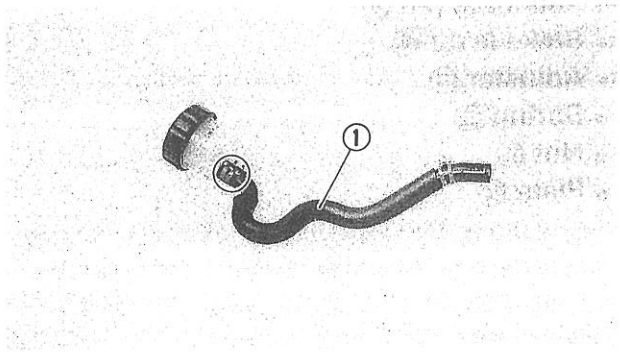
2.Remove:
- Union bolt ①
- Copper washers ②

3.Remove:
- Hose ③

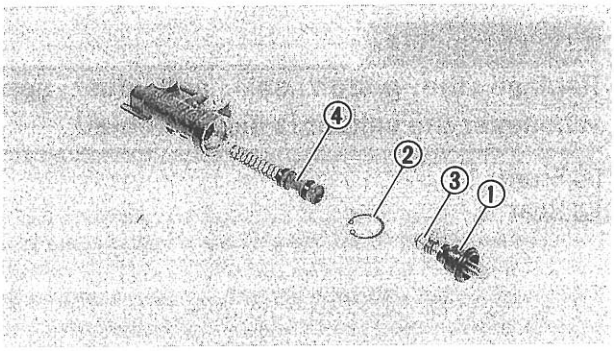
4.Loosen:
- Lock nut ④

5.Disconnect:
- Brake adjuster

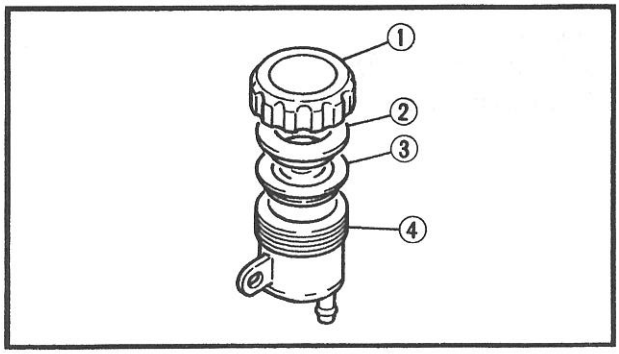
6.Remove:
- Master cylinder ⑤
- Reservoir tank



7.Remove:
- Hose (reservoir tank) ①



8.Remove:
- Dust cover ①
- Circlip ②
- Rod ③
- Master cylinder kit ④



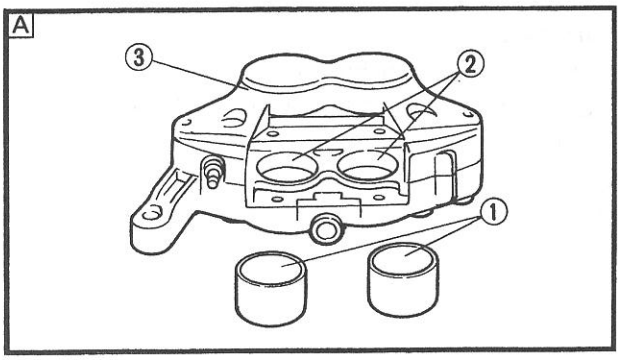
9.Remove:
- Cap (reservoir tank) ①
- Holder (diaphragm) ②
- Diaphragm ③
- Reservoir tank ④

INSPECTION AND REPAIR

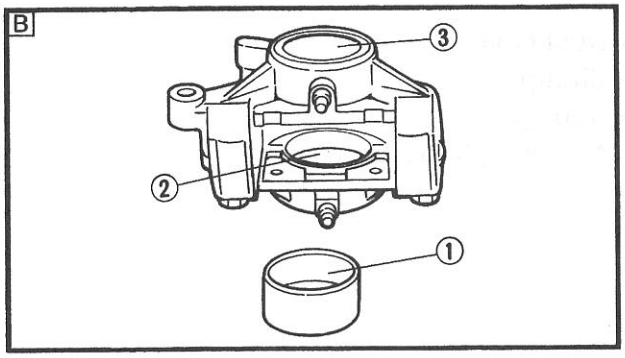
Recommended brake component replacement schedule:	
Brake pads	**As required**
Piston seal, dust seal	**Every two years**
Brake hoses	**Every two years**
Brake fluid	**Replace only when brakes are disassembled.**

⚠ WARNING

All internal parts should be cleaned in new brake fluid only. Do not use solvents as they will cause seals to swell and distort.



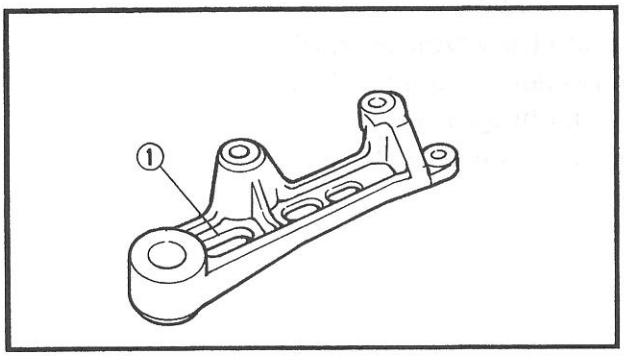
1.Inspect:
- Caliper piston ①
  Scratches/Rust/Wear → Replace caliper assembly.
- Caliper cylinder ②
  Wear/Scratches → Replace caliper assembly.
- Caliper body ③
  Cracks/Damage → Replace.
- Oil delivery passage (caliper body)
  Blow out with compressed air.



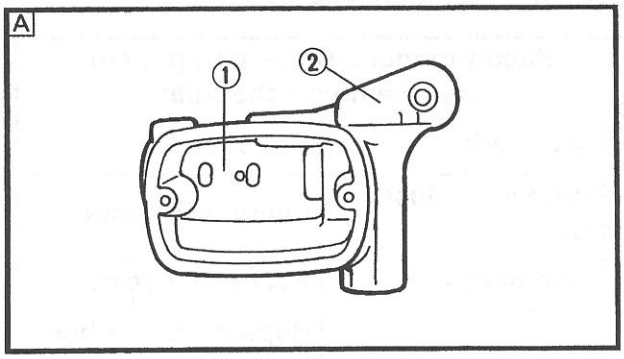
⚠ WARNING

Replace the piston seal and dust seal whenever the caliper is disassembled.

A Front
B Rear

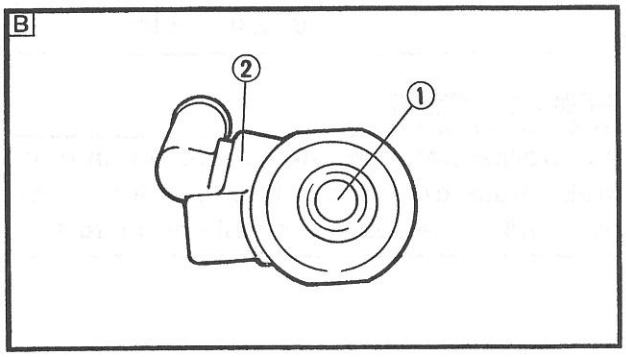


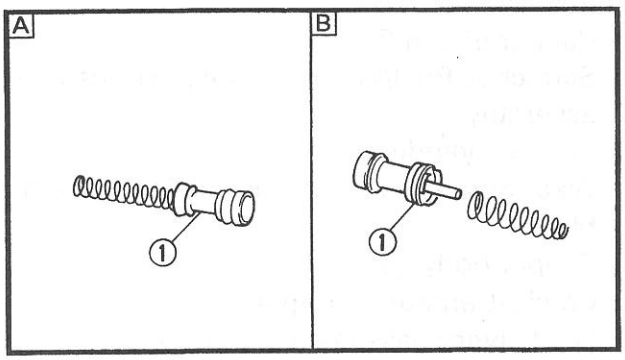
2.Inspect:
- Caliper bracket ①
  Cracks/Damage → Replace.



3.Inspect:
- Master cylinder ①
  Wear/Scratches → Replace the master cylinder assembly.
- Master cylinder body ②
  Cracks/Damage → Replace.
- Oil delivery passage
  (master cylinder body)
  Blow out with compressed air.

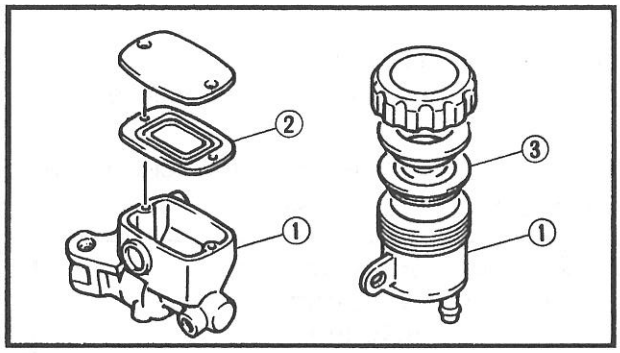
A Front
B Rear



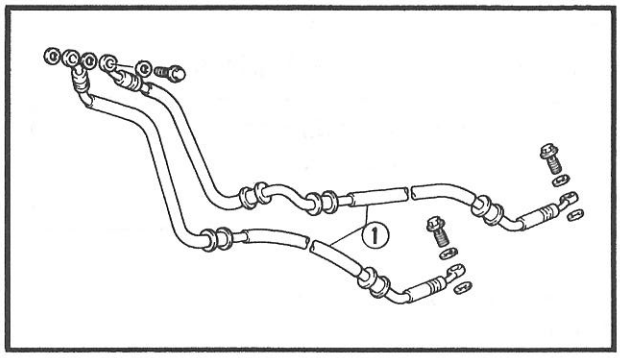


4.Inspect:
- Master cylinder kit ①
  Scratches/Wear/Damage → Replace as a set.

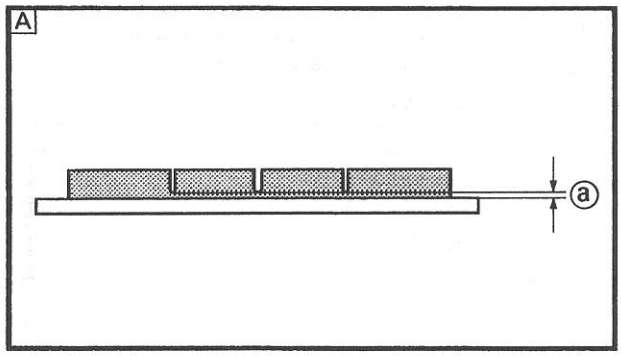
A Front
B Rear

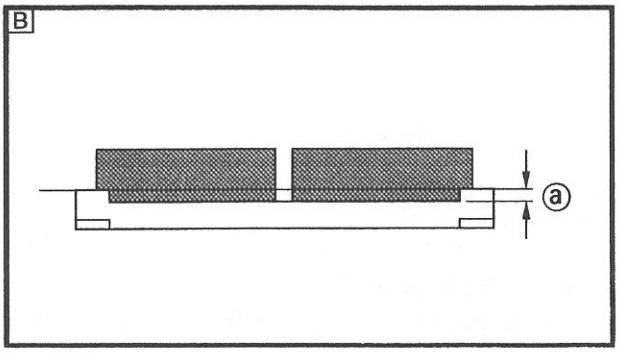


5.Inspect:
- Reservoir tank ①
  Cracks/Damage → Replace.
- Diaphragm (front) ②
- Diaphragm (rear) ③
  Wear/Damage → Replace.



6.Inspect:
- Brake hoses ①
  Cracks/Wear/Damage → Replace.



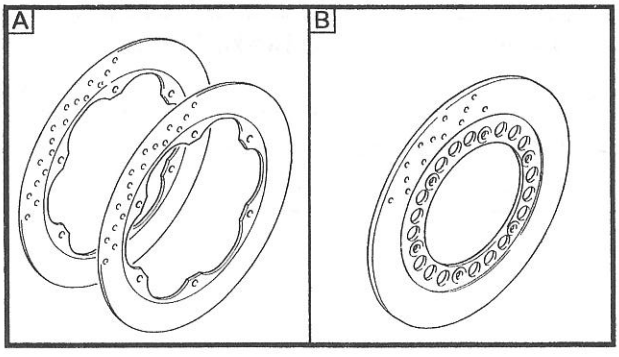


7.Measure:
- Brake pads (thickness) ⓐ
  Out of specification → Replace.

NOTE:
- When pad replacement is required, also replace the pad spring and shims.
- Replace the pads as a set if either is found to be worn to the wear limit ⓐ.

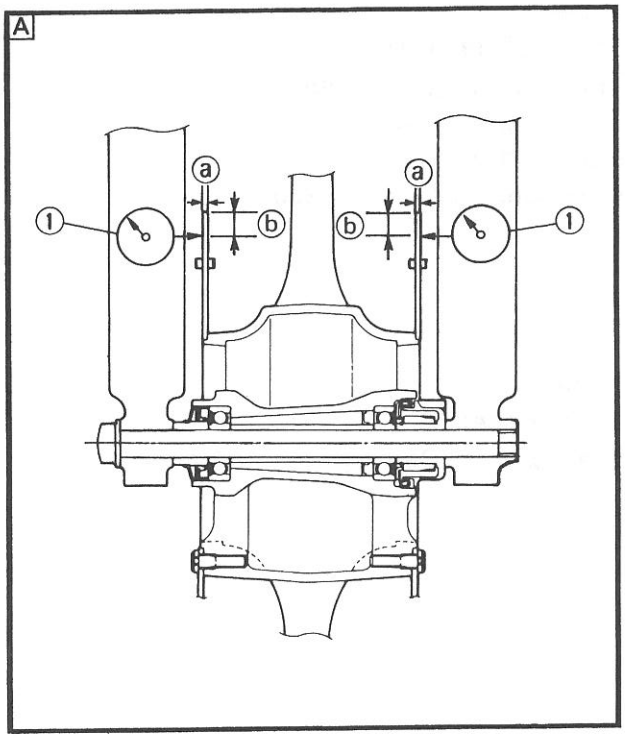
Wear limit ⓐ:
Front: 0.8 mm
Rear: 0.5 mm

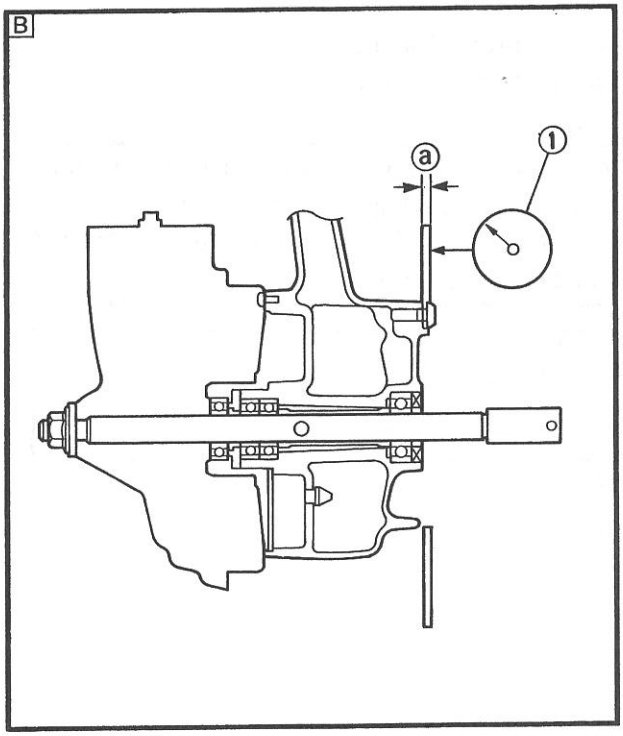
A Front
B Rear



8.Inspect:
- Brake discs (front and rear)
  Galling/Damage → Replace.

A Front
B Rear





9. Measure:
- Brake disc deflection
  Out of specification → Inspect wheel runout.
  If wheel runout is in good condition, replace the brake disc(s).

Maximum deflection:
Front: 0.15 mm
Rear: 0.15 mm

- Brake disc thickness ⓐ
  Out of specification → Replace.

Minimum thickness:
Front: 3.5 mm
Rear: 4.5 mm

① Dial gauge
ⓑ Measuring point 1 ~ 3 mm
A Front
B Rear

NOTE:
Tighten the bolts (brake disc) in stage using a crisscross pattern.

Bolt (brake disc):
20 Nm (2.0 m • kg)
LOCTITE®

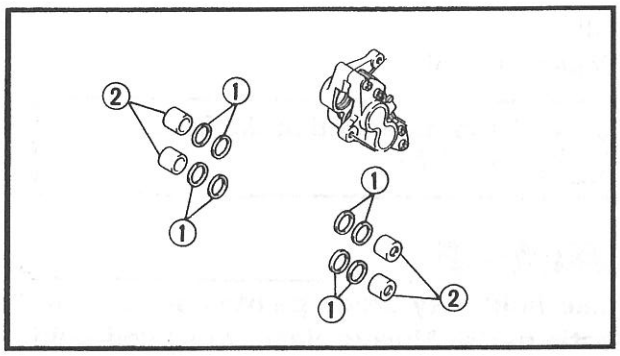
CALIPER ASSEMBLY

⚠ WARNING

- **All internal parts should be cleaned in new brake fluid only.**
- **Internal parts should be lubricated with brake fluid when installed.**

Recommended brake fluid:
DOT #4

- **Replace the piston seals and dust seals whenever a caliper is disassembled.**

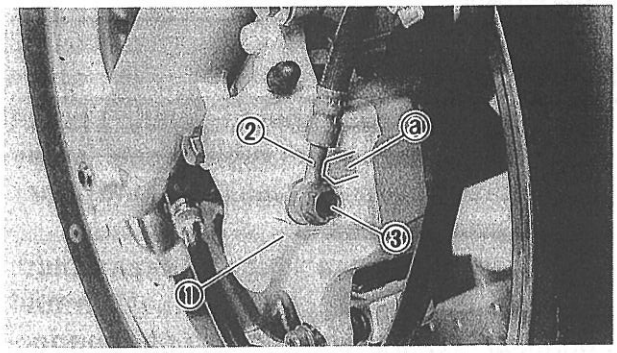


Front brake

1.Install:
- Piston seals ①
- Pistons ②

⚠ WARNING

Always use new piston seals.



2.Install:
- Brake caliper (temporarily) ①
- Copper washers
- Brake hose ②
- Union bolt ③

Union bolt:
30 Nm (3.0 m • kg)

CAUTION:

When installing the brake hose on the caliper ①, take care that the pipe touches the projection ⓐ on the brake caliper.

⚠ WARNING

- **Proper hose routing is essential to insure safe motorcycle operation. Refer to "CABLE ROUTING".**
- **Always use new copper washers.**

3.Remove:
- Brake caliper

4.Install:
- Brake pads
- Pad springs
- Retaining bolt
- Brake caliper
- Brake hose holder

Refer to "BRAKE PAD REPLACEMENT".

Retaining bolt:
22 Nm (2.2 m • kg)
Bolt (brake caliper):
35 Nm (3.5 m • kg)
Bolt (brake hose holder):
7 Nm (0.7 m • kg)

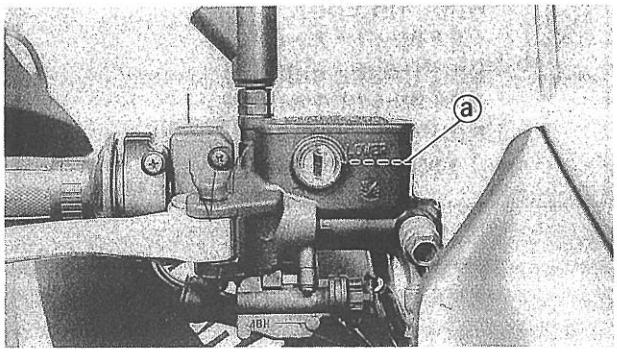
5.Fill:
- Reservoir tank

	Recommended brake fluid: DOT #4

CAUTION:
Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

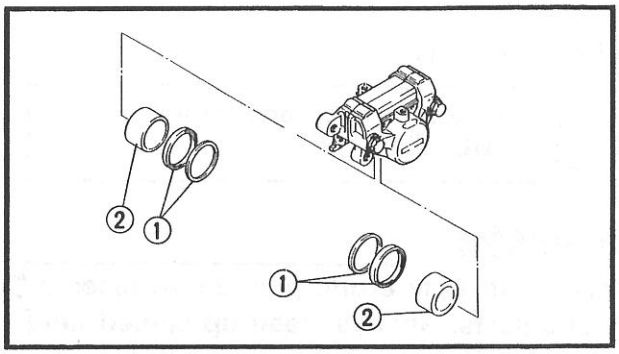
⚠ WARNING
- **Use only the designated quality brake fluid: otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid: mixing fluids may result in a harmful chemical reaction and lead to poor performance.**
- **Be careful that water does not enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and may result in vapor lock.**

6.Air bleed:
- Brake system
  Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.



7.Inspect:
- Brake fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

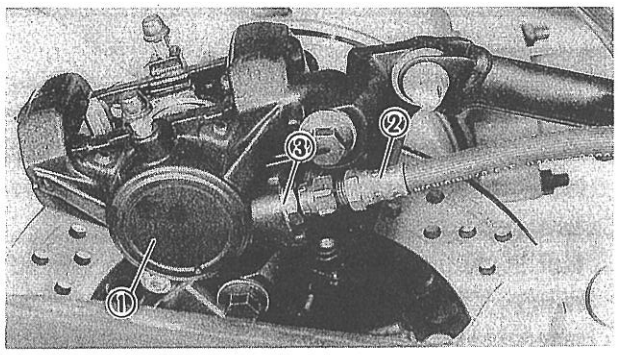


Rear brake

1.Install:
- Piston seals ①
- Pistons ②

⚠ WARNING

Always use new piston seals.



2.Install:
- Brake caliper (temporarily) ①
- Copper washer
- Brake hose ②
- Union bolt ③

	Union bolt: **30 Nm (3.0 m • kg)**

⚠ WARNING

- **Proper hose routing is essential to insure safe motorcycle operation. Refer to "CABLE ROUTING".**
- **Always use new copper washers.**

3.Remove:
- Brake caliper

4.Install:
- Brake pads (with pad shims)
- Pad spring
- Retaining pins
- Retaining clips
- Pad cover
- Brake caliper

Refer to "BRAKE PAD REPLACEMENT".

	Bolt (brake caliper): **35 Nm (3.5 m • kg)**

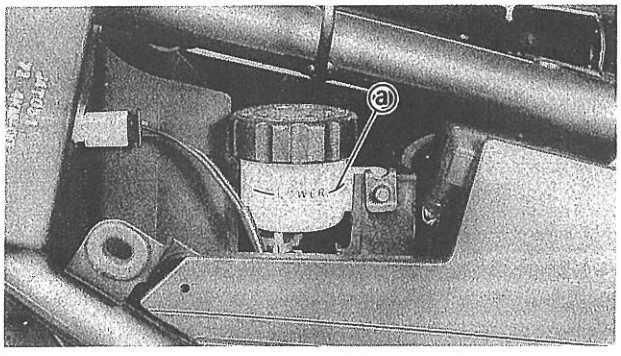
5.Fill:
- Reservoir tank

	Recommended brake fluid: DOT #4

CAUTION:
Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

⚠ WARNING
- **Use only the designated quality brake fluid: otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid: mixing fluids may result in a harmful chemical reaction and lead to poor performance.**
- **Be careful that water does not enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and may result in vapor lock.**

6.Air bleed:
- Brake system
  Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.



7.Inspect:
- Brake fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

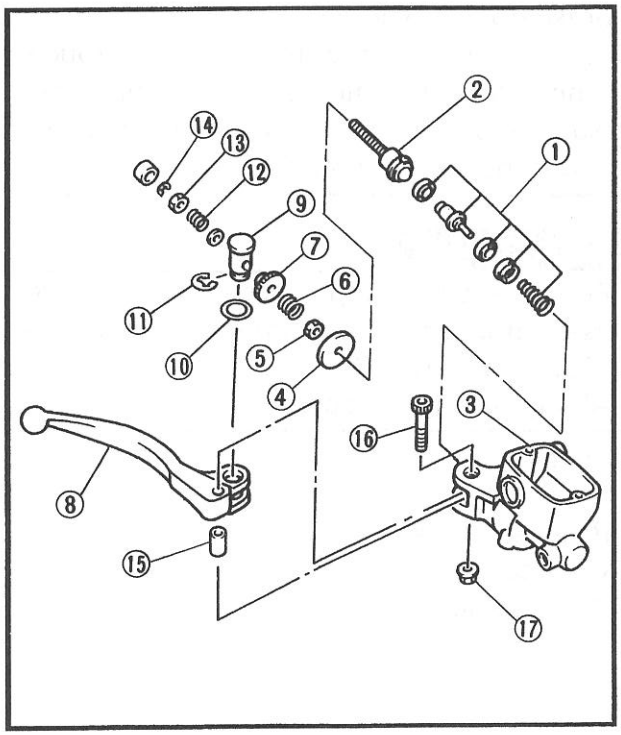
MASTER CYLINDER ASSEMBLY

⚠ WARNING

- **All internal parts should be cleaned in new brake fluid only.**
- **Internal parts should be lubricated with brake fluid when installed.**

Recommended brake fluid:
DOT #4

- **Replace the piston seals and dust seals whenever a caliper is disassembled.**



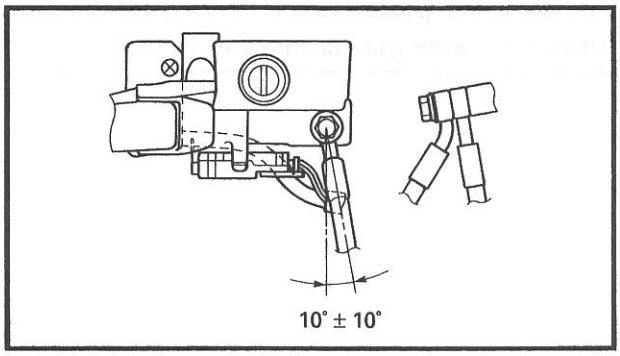
Front brake

1.Install:

- Master cylinder kit ①
- Rod ②
- Master cylinder ③
- Plate ④
- Nut ⑤
- Spring ⑥
- Adjuster ⑦
- Brake lever ⑧
- Retaining pin ⑨
- Washer ⑩
- Circlip ⑪
- Plate
- Spring ⑫
- Nut ⑬
- Circlip ⑭
- Collar ⑮
- Bolt ⑯
- Nut ⑰

2.Install:
- Master cylinder

	Bolt (master cylinder): 9 Nm (0.9 m • kg)



3.Install:
- Copper washers
- Brake hose
- Union bolt

	Union bolt: 30 Nm (3.0 m • kg)

NOTE:
- Tighten the union bolt while holding the brake hose as shown.
- Check that the brake hose does not touch other parts (throttle cable, wire harness, leads, etc.) by turning the handlebar left and right, and correct if necessary.

⚠ WARNING
- **Proper hose routing is essential to insure safe motorcycle operation. Refer to "CABLE ROUTING".**
- **Always use new copper washers.**

4.Install:
- Brake lever
- Reservoir tank

5.Connect:
- Brake switch leads

6.Fill:
- Reservoir tank

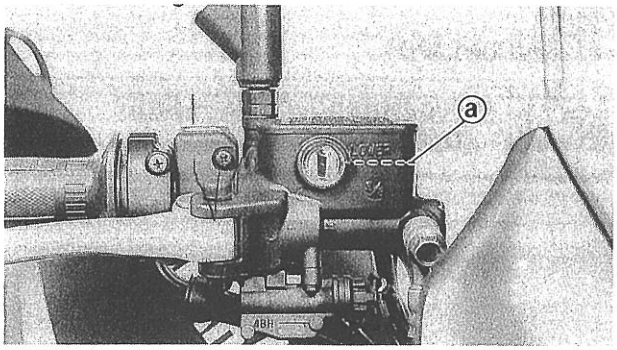
	Recommended brake fluid: DOT #4

CAUTION:
Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

⚠ WARNING

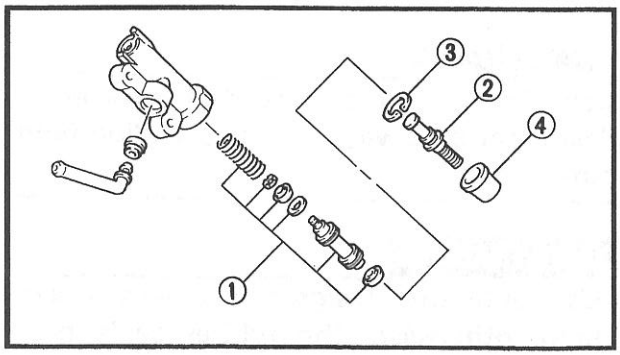
- **Use only the designated quality brake fluid: otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid: mixing fluids may result in a harmful chemical reaction and lead to poor performance.**
- **Be careful that water does not enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and may result in vapor lock.**

7.Air bleed:
- Brake system
  Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.



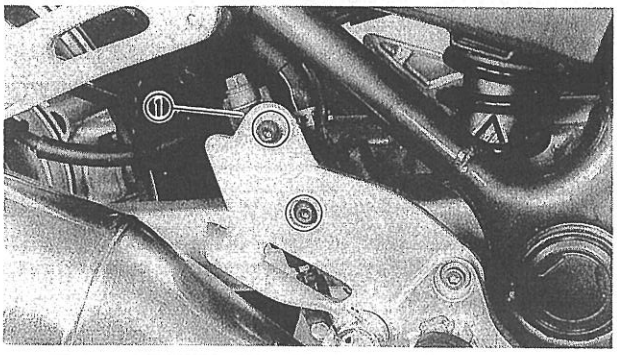
8.Inspect:
- Brake fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line



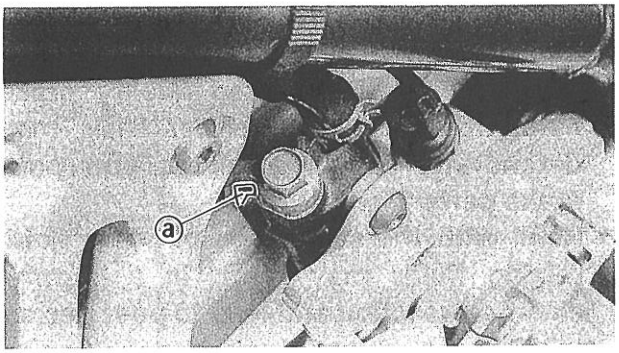
Rear brake

1.Install:
- Reservoir tank
  (onto frame)
- Master cylinder kit ①
- Push rod ②
- Circlip ③
- Dust boot ④



2.Install:
- Master cylinder ①

	**Bolt (master cylinder): 30 Nm (3.0 m • kg)**



3.Install:
- Copper washers
- Brake hoses
- Union bolt

Union bolt:
30 Nm (3.0 m • kg)

CAUTION:
When installing the brake hose on the master cylinder, take care that the pipe touches the projection ⓐ as shown.

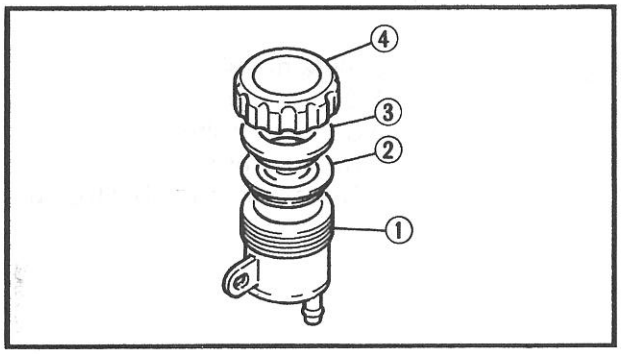
⚠ WARNING
- **Proper hose routing is essential to insure safe motorcycle operation. Refer to "CABLE ROUTING".**
- **Always use new copper washers.**

4.Fill:
- Reservoir tank

Recommended brake fluid:
DOT #4

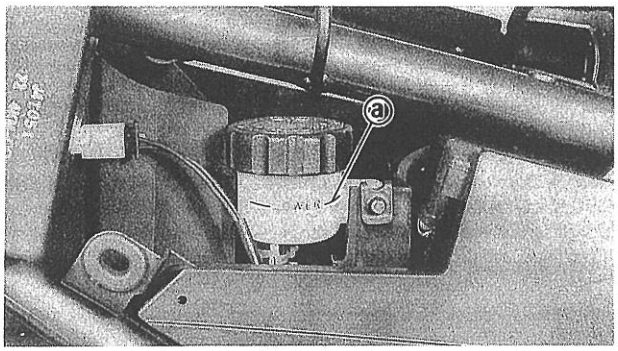
CAUTION:
Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

⚠ WARNING
- **Use only the designated quality brake fluid: otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid: mixing fluids may result in a harmful chemical reaction and lead to poor performance.**
- **Be careful that water does not enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and may result in vapor lock.**



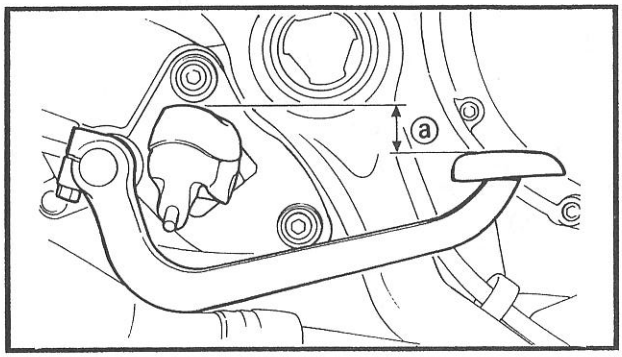
5.Install:
- Reservoir tank ①
- Diaphragm ②
- Holder (diaphragm) ③
- Cap (reservoir tank) ④

6.Air bleed:
- Brake system
  Refer to "AIR BLEEDING (HYDRAULIC BRAKE SYSTEM)" in CHAPTER 3.



7.Inspect:
- Brake fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "BRAKE FLUID LEVEL INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line



8.Adjust:
- Brake pedal height ⓐ
  Refer to "REAR BRAKE ADJUSTMENT" in CHAPTER 3.

Brake pedal height:
30 mm
Below top of footrest.

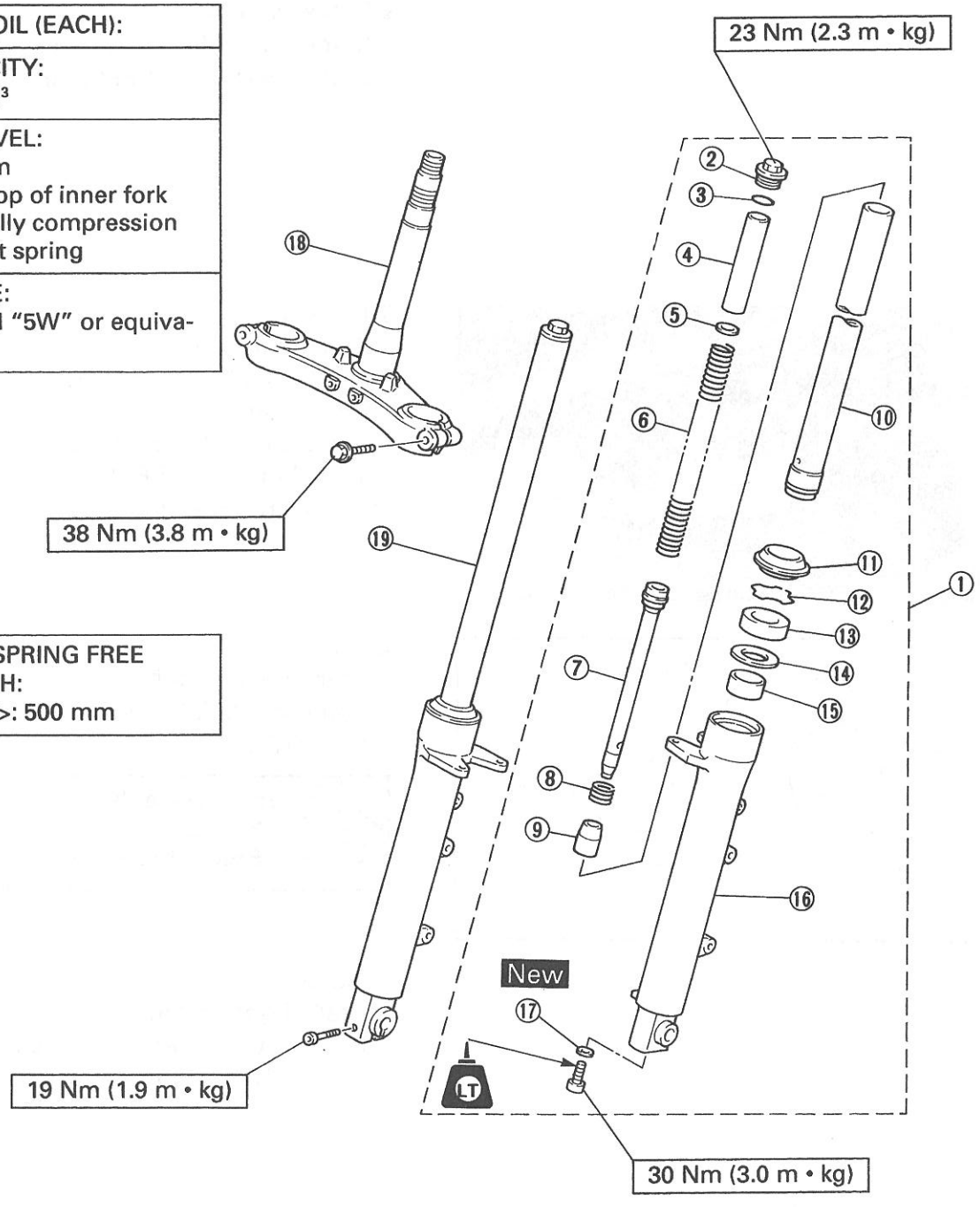
9.Adjust:
- Brake light switch
  Refer to "BRAKE LIGHT SWITCH ADJUSTMENT" in CHAPTER 3.

FRONT FORK

① Front fork assembly (left)
② Cap bolt
③ O-ring
④ Spacer
⑤ Spring seat
⑥ Fork spring
⑦ Damper rod
⑧ Damper rod spring
⑨ Oil lock piece
⑩ Inner tube
⑪ Dust seal
⑫ Retaining clip
⑬ Oil seal
⑭ Seal spacer
⑮ Slide metal
⑯ Outer tube
⑰ Copper washer
⑱ Under bracket
⑲ Front fork assembly (right)

A	FORK OIL (EACH):
B	CAPACITY: 444 cm³
C	OIL LEVEL: 133 mm From top of inner fork tube fully compression without spring
D	GRADE: Fork oil "5W" or equivalent

E	FORK SPRING FREE LENGTH: <LIMIT>: 500 mm



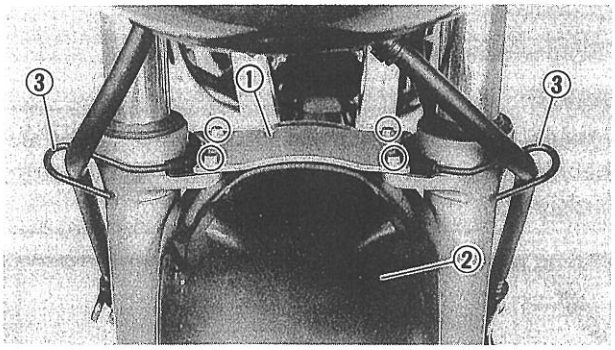
REMOVAL

⚠ WARNING

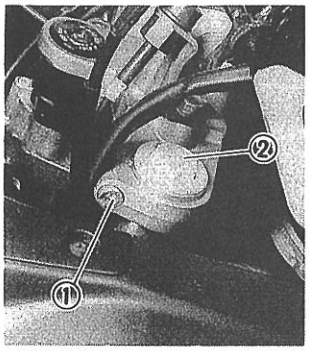
Securely support the motorcycle so there is no danger of it falling over.

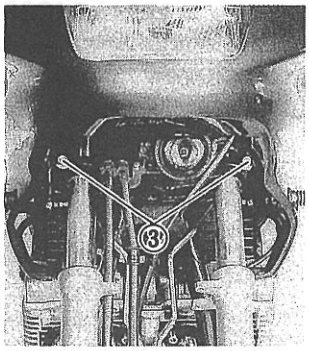
1. Place the motorcycle on a level place.

2. Elevate the front wheel by placing suitable stand under the engine.
3. Remove:
- Front wheel
  Refer to "FRONT WHEEL".



4. Remove:
- Fork brace ①
- Front fender ②
- Brake hose holder ③



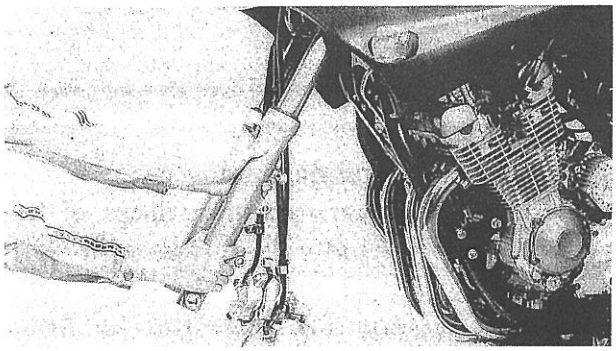


5. Remove:
- Bands

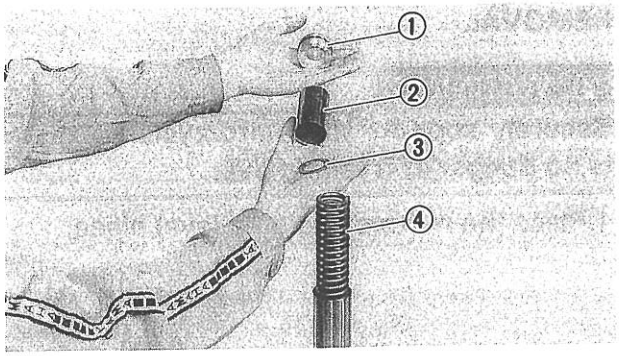
6. Loosen:
- Pinch bolts (upper bracket) ①
- Cap bolts ②
- Pinch bolts (lower bracket) ③

⚠ WARNING

Support the fork before loosening the pinch bolts.



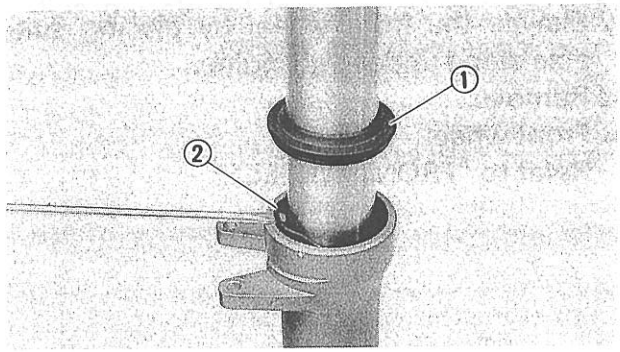
7. Remove:
- Front fork(s)



DISASSEMBLY

1.Remove:
- Cap bolt ①
- Spacer ②
- Spring seat ③
- Spring ④

2.Drain:
- Fork oil

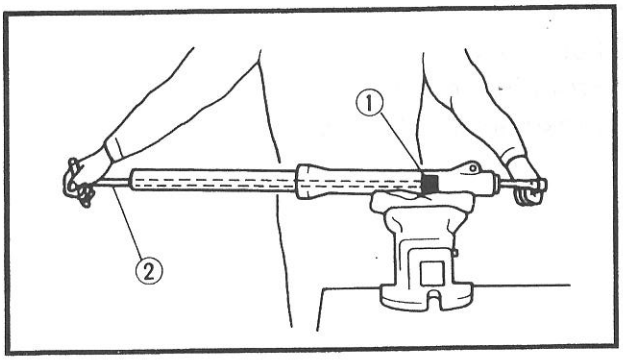


3.Remove:
- Dust seal ①
- Retaining clip ②

  Use a slotted-head screwdriver.

CAUTION:

Take care not to scratch the inner tube.

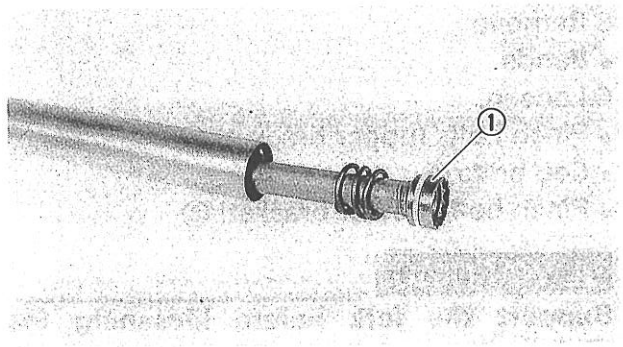


4.Remove:
- Bolt (damper rod)

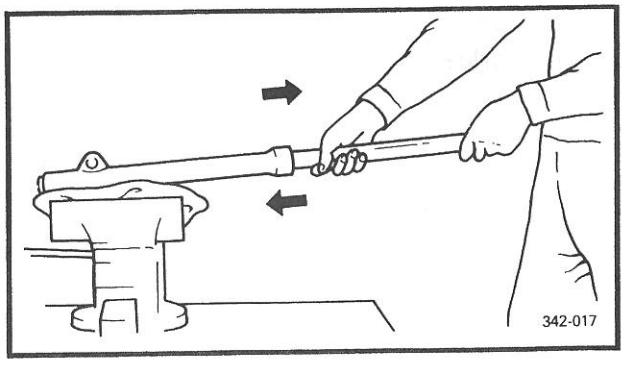
NOTE:

Loosen the bolt (damper rod) while holding the damper rod with the T-handle ② and holder ①.

Damper rod holder:
90890-01388
T-Handle:
90890-01326



5.Remove:
- Damper rod ①



6.Remove:
- Inner fork tube

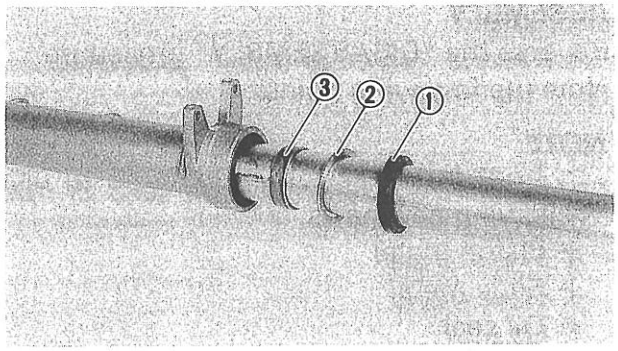
****

Removal steps:
- Hold the fork leg holizontally.
- Clamp the caliper mounting boss of the outer tube securely in a vise with soft jaws.
- Pull out the inner fork tube from the outer tube by forcefully, but carefully, with drawing the inner tube.

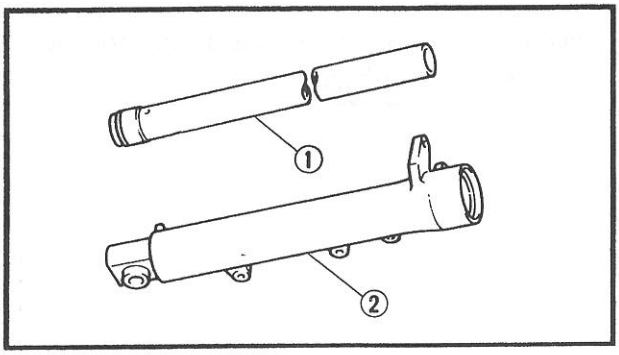
CAUTION:

- **Excessive force will damage the oil seal and/or the bushes. Damage oil seal and busing must be replaced.**
- **Avoid bottoming the inner tube in the outer tube during the above procedure, as the oil lock piece will be damaged.**

****



7.Remove:
- Oil seal ①
- Seal spacer ②
- Slide metal ③
- Piston metal
- Oil lock piece



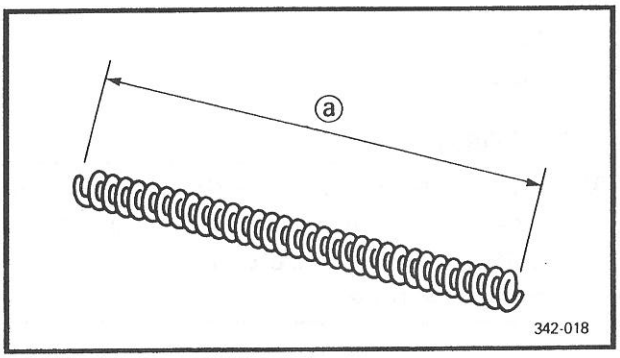
INSPECTION

1.Inspect:
- Inner fork tube ①
- Outer fork tube ②

  Scratches/Bends/Damage → Replace.

⚠ WARNING

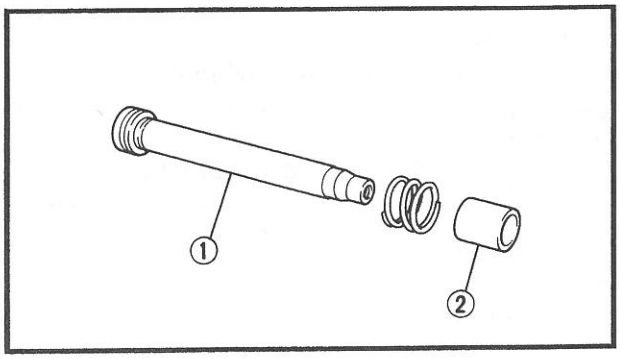
Do not attempt to straighten a bent inner fork tube as this may dangerously weaken the tube.



2.Measure:
- Fork spring ⓐ

  Over specified limit → Replace.

Fork spring free length (limit): 500 mm

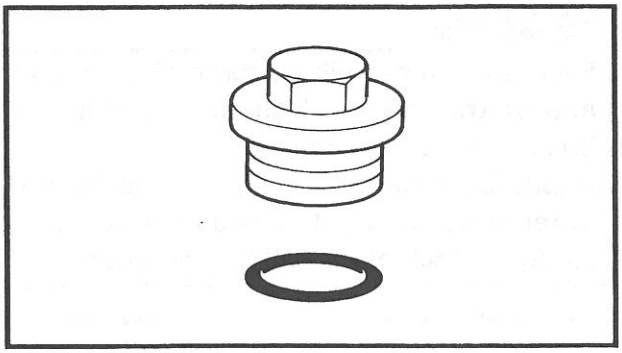


3.Inspect:
- Damper rod ①

  Wear/Damage → Replace.

  Contamination → Blow out all oil passages with compressed air.
- Oil lock piece ②

  Damage → Replace.



4.Inspect:
- O-ring (cap bolt)
  Wear/Damage → Replace.

ASSEMBLY

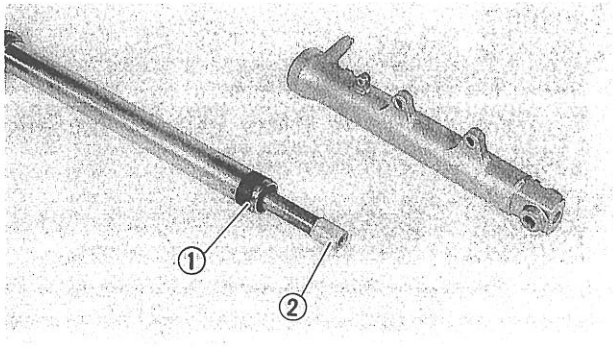
Reverse the "DISASSEMBLY" procedure.
Note the following points.

NOTE:
- In front fork reassembly, be sure to use following new parts.
  - * Piston metal
  - * Slide metal
  - * Oil seal
  - * Dust seal
- Make sure that all components are clean before reassembly.

1.Install:
- Damper rod ①

CAUTION:

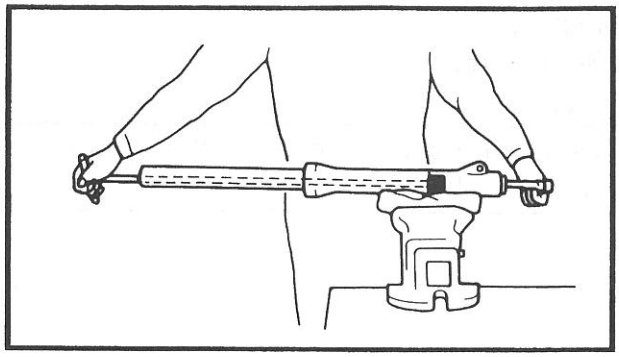
Allow the damper rod to slide slowly down the inner fork tube until it protrudes from the bottom, being careful not to damage the inner fork tube.



2.Lubricate:
- Inner fork tube (outer surface)

Recommended lubricant:
Fork oil 5W or equivalent

3.Install:
- Piston metal ①
- Oil lock piece ②

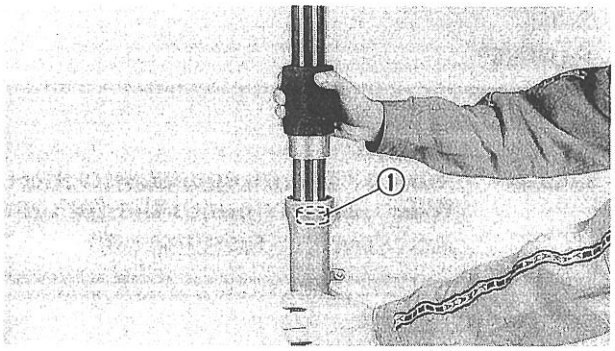


4.Tighten:
- Bolt (damper rod)

Bolt (damper rod):
30 Nm (3.0 m • kg)
LOCTITE®

NOTE:
Tighten the bolt (damper rod) while holding the damper rod with the T-handle and holder.

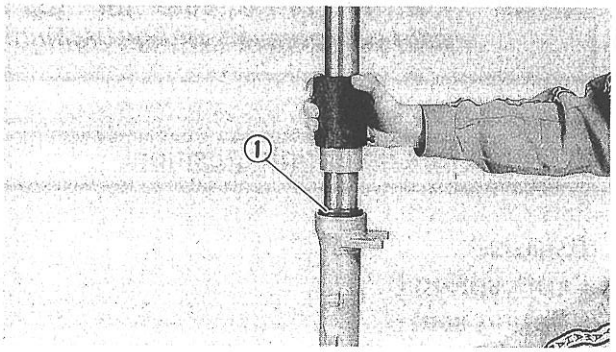
T-handle:
90890-01326
Damper rod holder:
90890-01388



5.Install:
- Slide metal ①

Use the fork seal driver weight and adapter.

Fork seal driver weight:
90890-01367
Adapter:
90890-01381



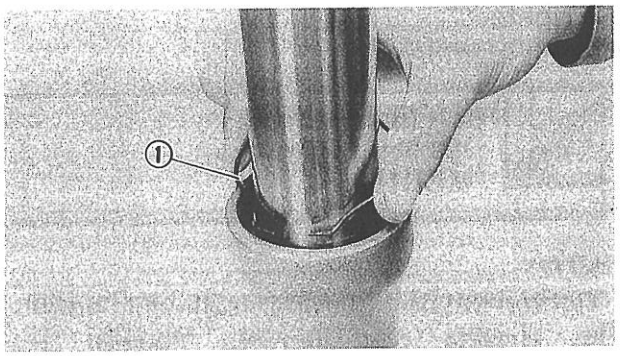
6.Install:
- Seal spacer
- Oil seal ①

Use the fork seal driver weight and adapter.

Fork seal driver weight:
90890-01367
Adapter:
90890-01381

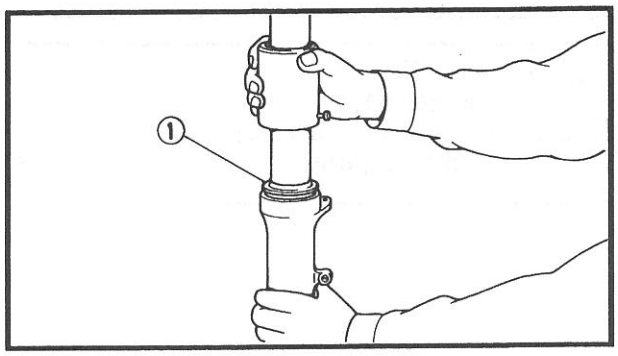
NOTE:
Before installing the oil seal, apply the lithium soap base grease onto the oil seal lips.

CAUTION:
Be sure that the oil seal numbered side face upward.



7.Install:
- Retaining clip ①

NOTE:
Fit retaining clip correctly in the groove in the outer tube.



8.Install:
- Dust seal ①

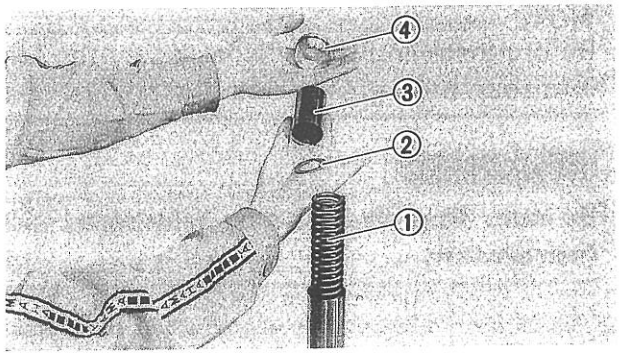
  Use the fork seal driver weight.

	Fork seal driver weight: **90890-01367**

9.Fill:
- Fork oil

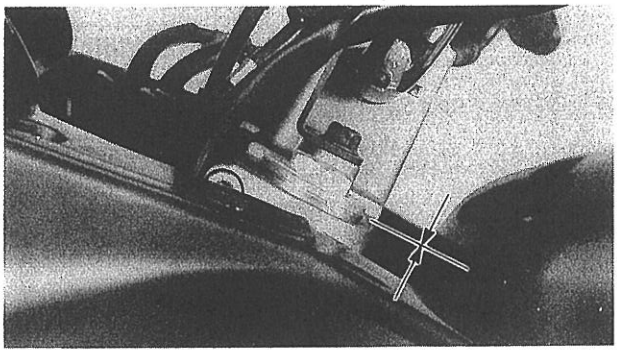
	Each fork: **444 cm³** **Fork oil 5W or equivalent. After filling, slowly pump the fork up and down to distribute oil.**
	Oil level: **133 mm** **from the top of inner fork tube fully compressed without spring**

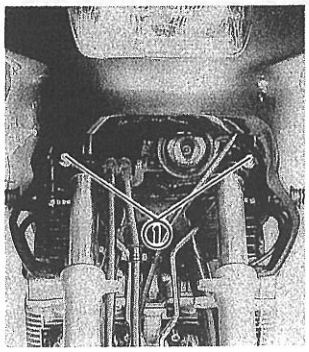
NOTE:
Place the fork on upright position.

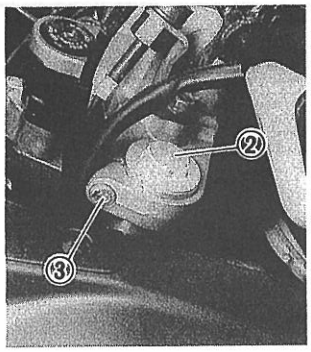


10.Install:
- Fork spring ①
- Spring seat ②
- Spacer collar ③
- Cap bolt ④

NOTE:
- Fork spring must be installed with the smaller pitch upward.
- Before installing the cap bolt, apply the grease to the O-ring.
- Temporarily tighten the cap bolt.







INSTALLATION

Reverse the "REMOVAL" procedure.
Note the following points.

1.Install:
- Front fork(s)
  Temporary tighten the pinch bolts.

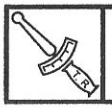
NOTE:
Be sure the inner fork tube end is flush with the top of the handle crown.

2.Tighten:
- Pinch bolts (lower bracket) ①
- Cap bolts ②
- Pinch bolts (upper bracket) ③

	**Pinch bolt (lower bracket):** **38 Nm (3.8 m • kg)** **Cap bolt:** **23 Nm (2.3 m • kg)** **Pinch bolt (upper bracket):** **30 Nm (3.0 m • kg)**

3.Install:
- Bands

4.Install:
- Front fender
- Fender bracket
- Brake hose holder

	**Bolt (front fender):** **9 Nm (0.9 m • kg)**

5.Install:
- Front wheel
- Brake caliper
  Refer to "FRONT WHEEL".

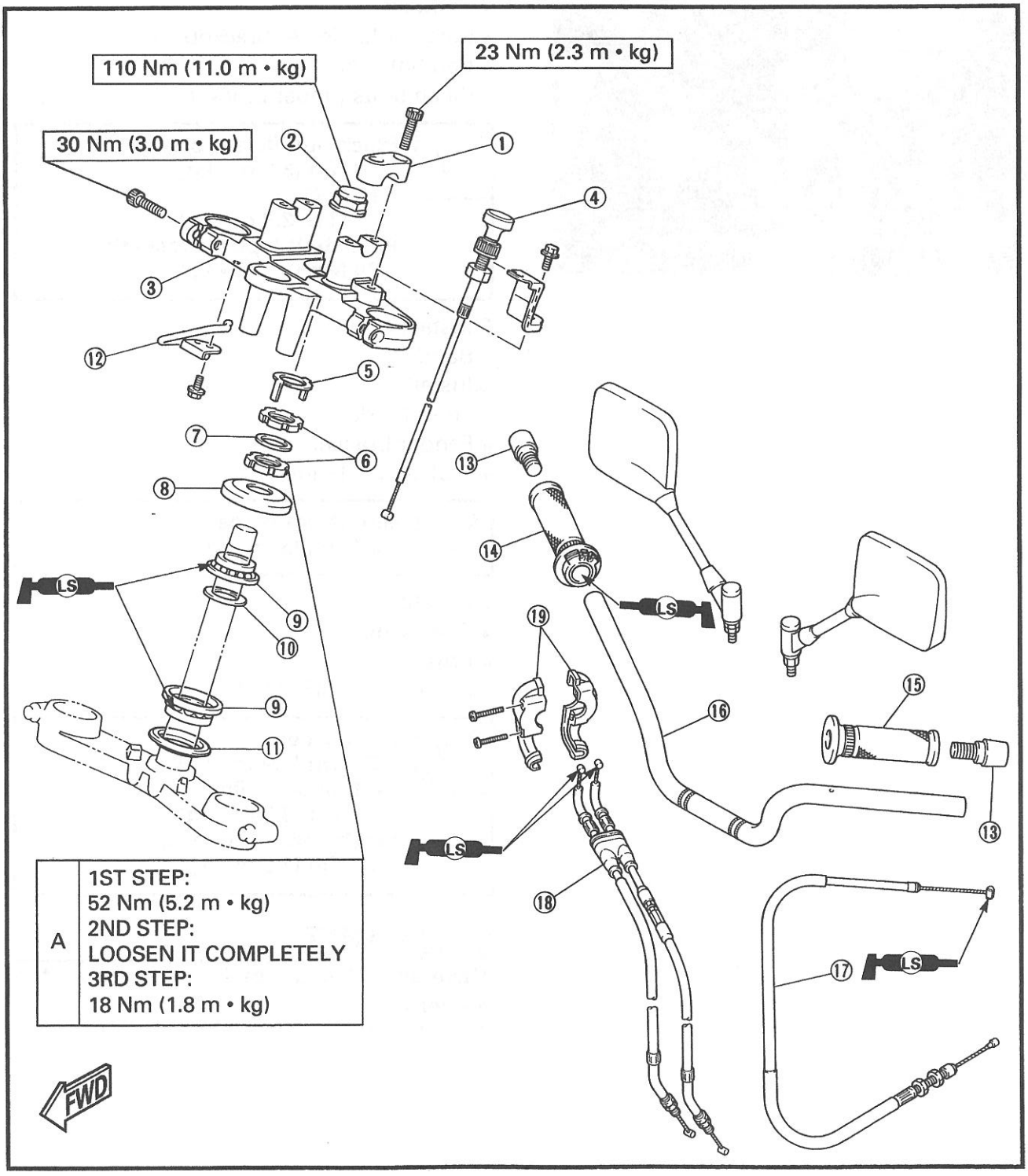
	**Front axle:** **59 Nm (5.9 m • kg)** **Bolt (brake caliper):** **35 Nm (3.5 m • kg)** **Pinch bolt (front axle):** **19 Nm (1.9 m • kg)**

⚠ WARNING

Make sure that the brake hose are routed properly.

STEERING HEAD AND HANDLEBAR

① Handlebar holder
② Steering stem nut
③ Upper bracket
④ Starter cable
⑤ Lock washer
⑥ Ring nut
⑦ Rubber washer
⑧ Bearing cover
⑨ Bearing
⑩ Rubber seal
⑪ Bearing race
⑫ Cable holder
⑬ Grip end
⑭ Handlebar grip (right)
⑮ Handlebar grip (left)
⑯ Handlebar
⑰ Clutch cable
⑱ Throttle cable
⑲ Throttle cable housing

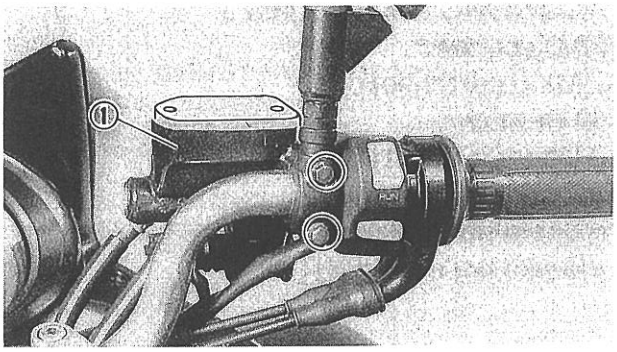


REMOVAL

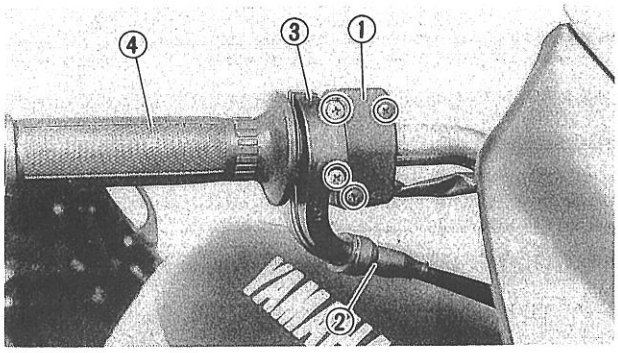
⚠ WARNING

Securely support the motorcycle so there is no danger of it falling over.

1.Place the motorcycle on a level place.



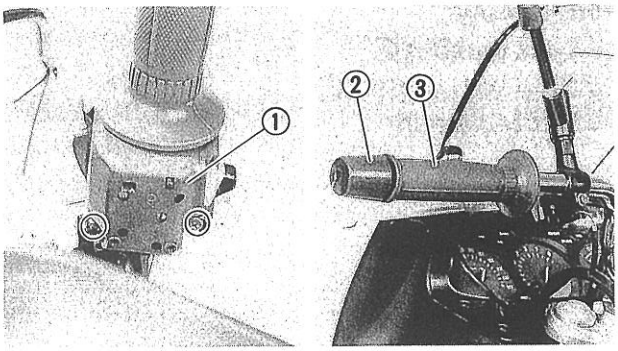
2.Remove:
- Master cylinder ①



3.Remove:
- Handlebar switches (right) ①

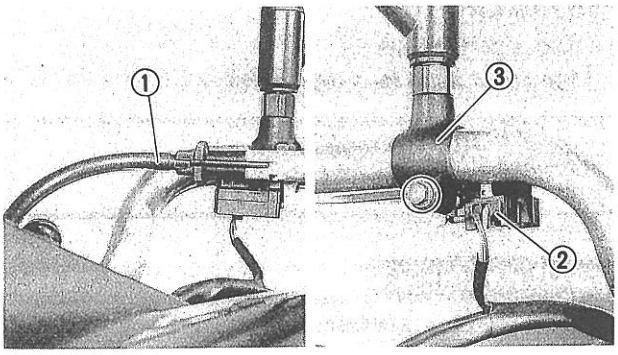
4.Disconnect:
- Rubber cover ②

5.Remove:
- Throttle cable housing ③
- Grip end (right)
- Grip (right) ④



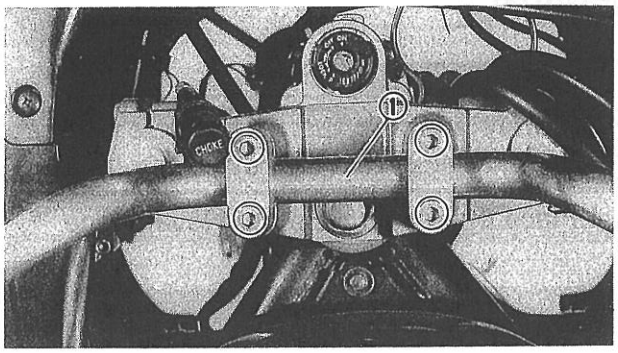
6.Remove:
- Handlebar switches (left) ①

7.Remove:
- Grip end (left) ②
- Grip (left) ③



8.Disconnect:
- Clutch cable ①
- Clutch switch lead ②

9.Remove:
- Clutch lever holder ③



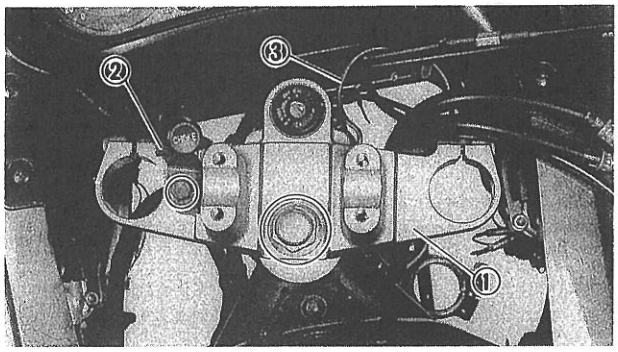
10.Remove:
- Handlebar ①

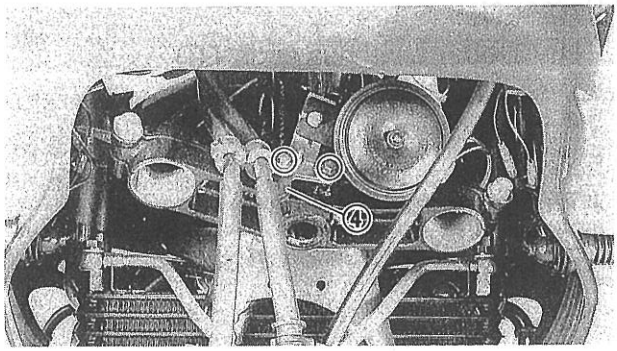
11.Remove:
- Front wheel
  Refer to "FRONT WHEEL".
- Front fork
  Refer to "FRONT FORK".

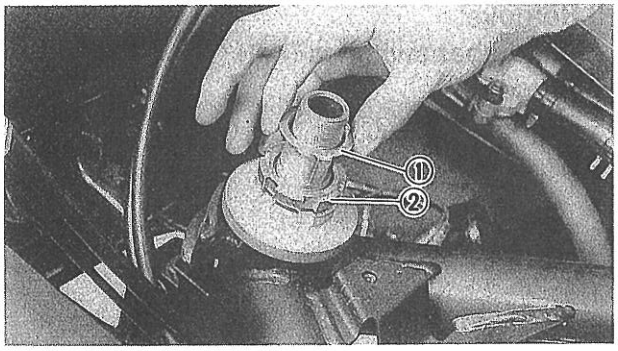
12.Remove:
- Fuel tank
  Refer to "SIDE COVER, FUEL TANK AND COWLING" in CHAPTER 3.

13.Disconnect:
- Main switch lead

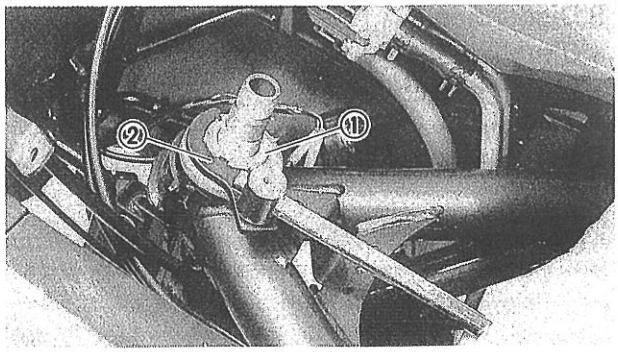
14.Remove:
- Upper bracket ①
- Choke knob holder ②
- Cable holder ③
- Brake hose holder ④







15.Remove:
- Lock washer ①
- Ring nut (upper) ②
- Rubber washer

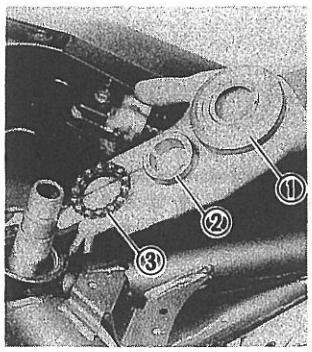


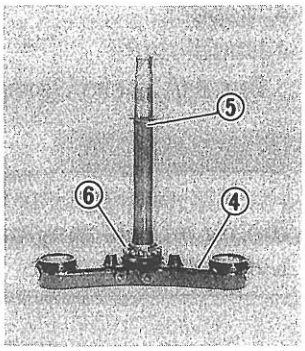
16.Remove:
- Ring nut (lower) ①
  Use the ring nut wrench ②.

	Ring nut wrench: 90890-01403

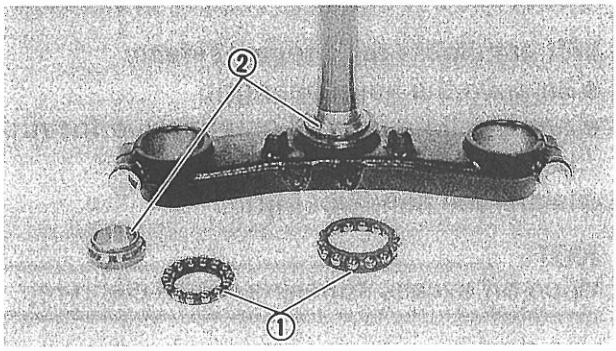
⚠ WARNING

Support the steering shaft so that it may not fall down.





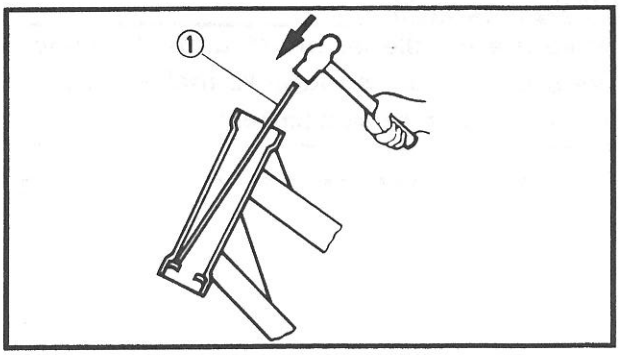
17.Remove:
- Bearing cover ①
- Bearing race ②
- Bearing (upper) ③
- Lower bracket ④
- Rubber seal ⑤
- Bearing (lower) ⑥



INSPECTION

1.Wash the bearing and bearing races with a solvent.

2.Inspect:
- Bearings ①
- Bearing races ②
  Pitting/Damage → Replace.



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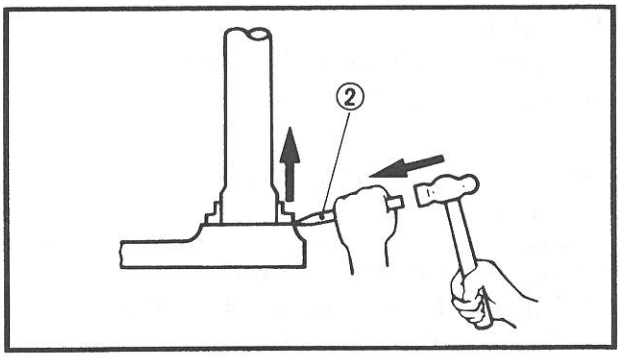
Bearing race replacement steps:

- Remove the bearing races on the head pipe using long rod ① and the hammer as shown.
- Remove the bearing race on the under bracket using the floor chisel ② and the hammer as shown.
- Install the new dust seal and races.

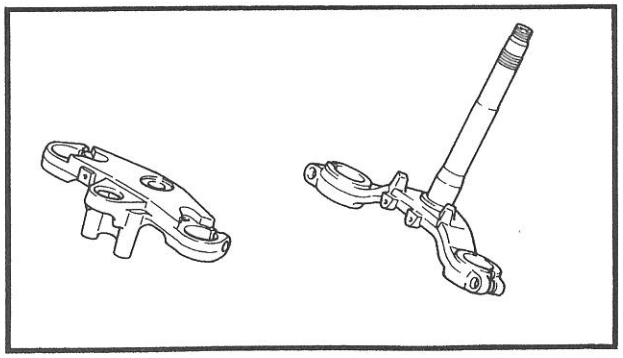
****



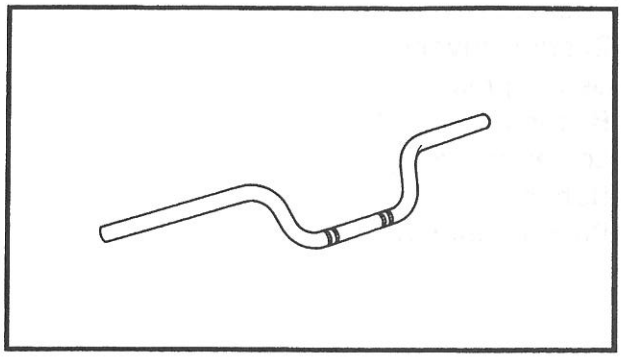
NOTE:
- Always replace bearings and races as a set.
- Replace the dust seal whenever a steering head is disassembled.

CAUTION:

If the bearing race is not fitted squarely, the head pipe could be damaged.



3.Inspect:
- Upper bracket
- Under bracket
  (with steering stem)
  Cracks/Bends/Damage → Replace.



4.Inspect:
- Handlebars
  Bends/Cracks/Damage → Replace.

⚠ WARNING

Do not attempt to straighten a bent handlebar as this may dangerously weaken the handlebar.

****

Left handlebar replacement steps:
- Remove the handlebar grip.
- Apply a light coat of an adhesive for rubber on the handlebar end.
- Install the handlebar grip.

NOTE:
Wipe off excess adhesive with a clean rag.

⚠ WARNING

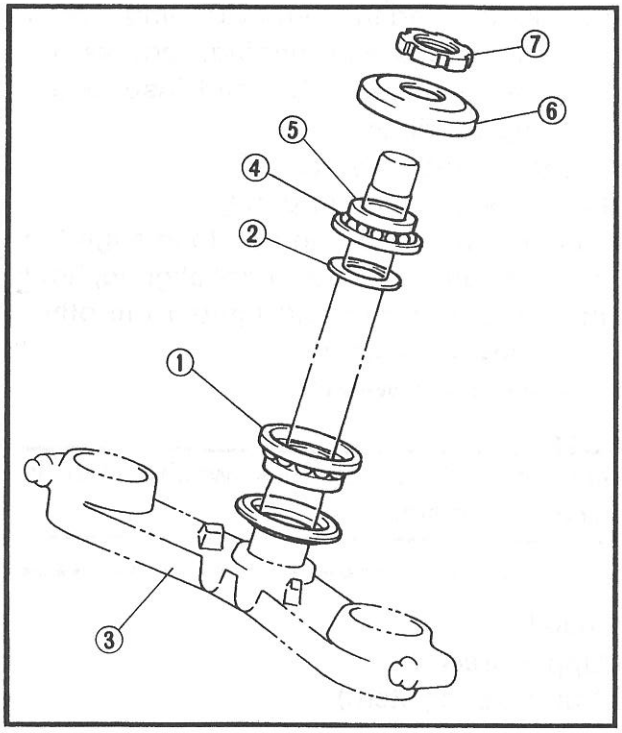
Leave the handlebar intact until the adhesive becomes dry enough to make the grip and handlebar stuck securely.

****

INSTALLATION

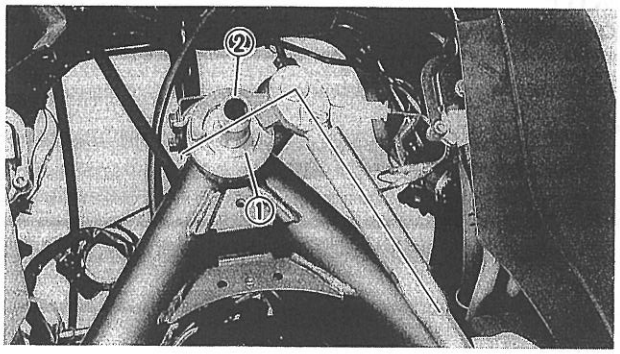
Reverse the "REMOVAL" procedure.
Note the following points.
1.Lubricate:
- Bearings (upper and lower)
- Bearing races

Recommended lubricant:
Lithium-soap base grease



2.Install:
- Bearing (lower) ①
- Rubber washer ②
- Lower bracket ③
- Bearing (upper) ④
- Bearing race ⑤
- Bearing cover ⑥
- Ring nut (lower) ⑦

CAUTION:
Hold the steering stem until it is secured.



3.Tighten:
- Ring nuts (lower and upper)

****

Tightening steps:
- Tighten the ring nut (lower) ① using the ring nut wrench ②.

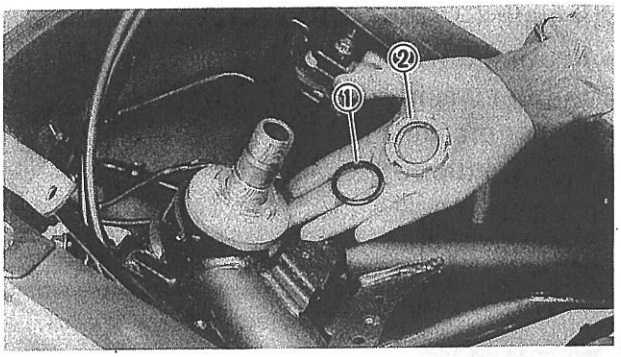
NOTE:
Set the torque wrench to the ring nut wrench so that they form a right angle.

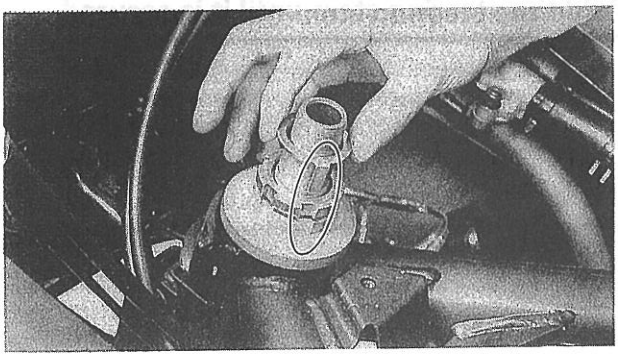
	**Ring nut wrench: 90890-01403**
	**Ring nut (initial tightening): 52 Nm (5.2 m • kg)**

- Turn the steering stem left and right for several times.
- Loosen the ring nut completely and retighten it to specification.

⚠ WARNING
Do not over tighten.

	**Ring nut (final tightening): 18 Nm (1.8 m • kg)**





- Check the steering stem by turning lock to lock. If there is any binding, remove the steering stem assembly and inspect the steering bearings.
- Install the rubber washer ①.
- Install the ring nut (upper) ②.
- Finger tighten the ring nut, then align the slots of both ring nuts. If not aligned, hold the lower ring nut and tighten the other until they are aligned.
- Install the lock washer.

NOTE:
Make sure that the lock washer tab is placed in the slots.

****

4.Install:
- Upper bracket
- Nut (steering stem)

NOTE:
Temporarily tighten the steering stem nut.

5.Install:
- Front forks
  Refer to "FRONT FORK".

NOTE:
In this stage, temporarily tighten the pinch bolt.

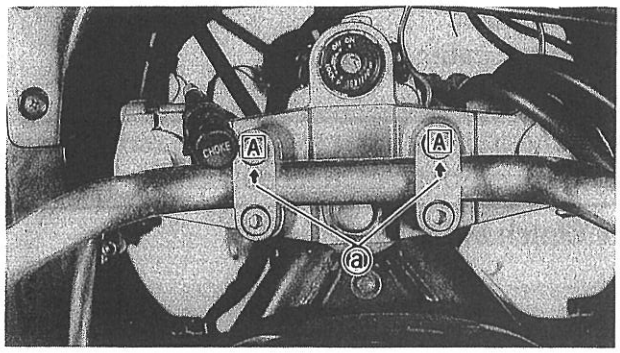
6.Tighten:
- Nut (steering stem)
- Pinch bolt (lower bracket)
- Pinch bolt (upper bracket)

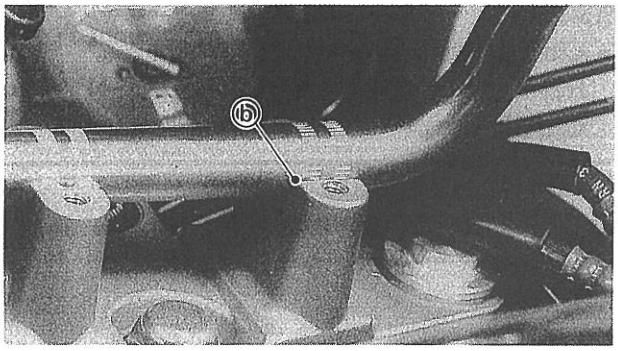
Nut (steering stem):
110 Nm (11.0 m • kg)
Pinch bolt (lower bracket):
38 Nm (3.8 m • kg)
Pinch bolt (upper bracket):
30 Nm (3.0 m • kg)

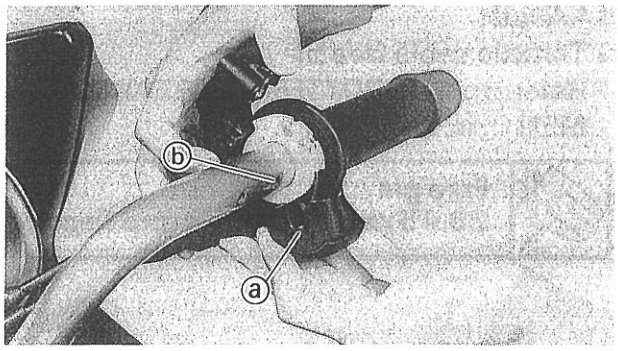
7.Install:
- Front wheel
  Refer to "FRONT WHEEL".

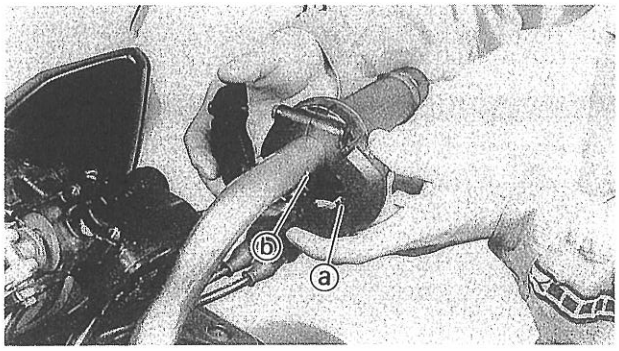
8.Install:
- Handlebar
- Handlebar holders

Bolt (handlebar holder):
23 Nm (2.3 m • kg)









NOTE:
- Before installing the handlebar onto the handle crown, apply a light coat of lithium soap base grease onto the handlebar end and install the throttle housing to the handlebar.
- The upper handlebar holder should be installed with the arrow mark ⓐ forward [A].
- Align the match mark ⓑ on the handlebar with the top of handlebar holder (lower).

CAUTION:
- **First tighten the bolts on the front side of the handlebar holder, and then tighten the bolts on the rear side.**
- **Check the handlebar by turning from lock to lock. If there is any contact to the fuel tank, adjust the handlebar position.**

9.Connect:
- Throttle cable

⚠ WARNING

Make sure that projection ⓐ on the throttle housing is aligned with the hole ⓑ on the handlebar.

10.Install:
- Handlebar switches (left and right)

NOTE:
Align the projection ⓐ on the handlebar switch with the hole ⓑ on the handlebar.

11.Install:
- Master cylinder (front brake)

	**Bolt (master cylinder bracket): 9 Nm (0.9 m • kg)**

12.Connect:
- Clutch cable

NOTE:
Apply a light coat of lithium soap base grease onto the clutch cable end.

- Clutch switch lead

13.Adjust:
- Clutch cable free play
  Refer to "CLUTCH ADJUSTMENT" in CHAPTER 3.

Free play:
10 ~ 15 mm at lever end

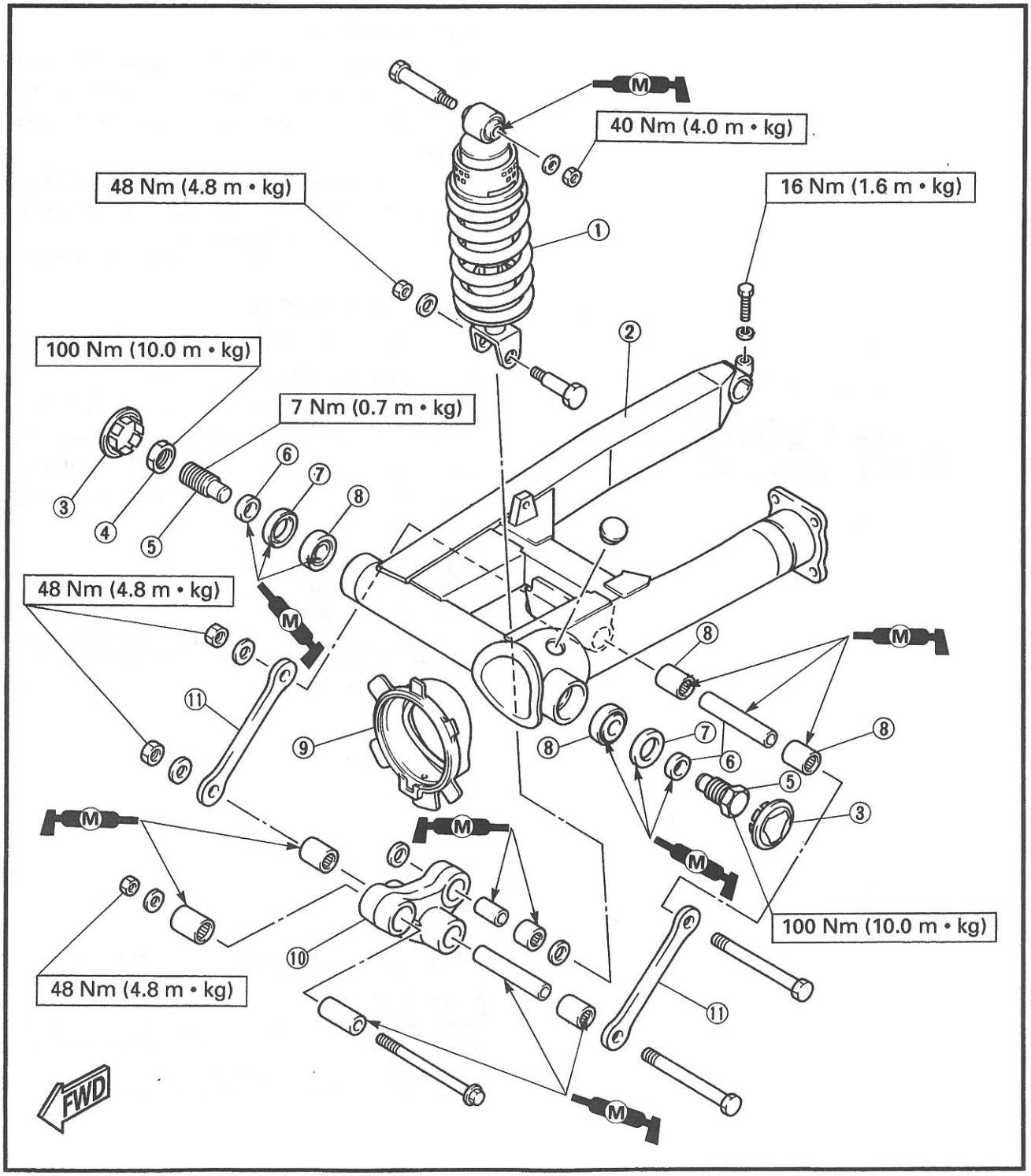
14.Adjust:
- Throttle cable free play
  Refer to "THROTTLE CABLE ADJUSTMENT" in CHAPTER 3.

Free play:
3 ~ 5 mm at throttle grip flange

REAR SHOCK ABSORBER AND SWINGARM

① Shock absorber
② Swingarm
③ Cover
④ Pivot shaft nut
⑤ Pivot shaft
⑥ Collar
⑦ Oil seal
⑧ Bearing
⑨ Rubber boot
⑩ Relay arm
⑪ Connecting rod

NOTE:
Coat the bearings, oil seals, and collars with a liberal amount of molybdenum disulfide grease before installing. After installing, thoroughly wipe off excess grease.



HANDLING NOTES

⚠ WARNING

This shock absorber contains highly compressed nitrogen gas. Read and understand the following information before handling the shock absorber. The manufacturer cannot be held responsible for property damage or personal injury that may result from improper handling.

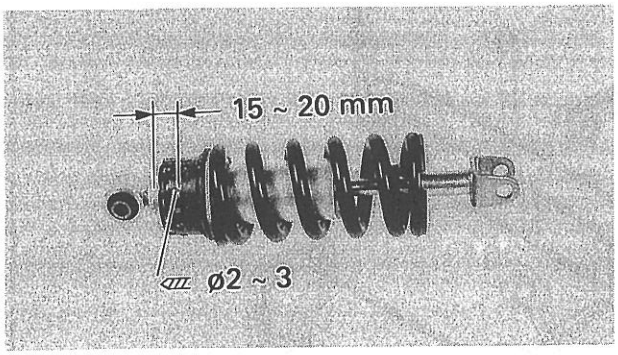
- **Do not tamper or attempt to open the cylinder assembly.**
- **Do not subject shock absorber to an open flame or other high heat. This may cause the unit to explode due to excessive gas pressure.**
- **Do not deform or damage the cylinder in any way. Cylinder damage will result in poor damping performance.**

NOTES ON DISPOSAL

****

Shock absorber disposal steps:

- Gas pressure must be released before disposing of the shock absorber. To do so, drill a 2 ~ 3 mm hole through the cylinder wall at a point 15 ~ 20 mm from the end of the gas chamber.



⚠ WARNING

Wear eye protection to prevent eye damage from escaping gas and/or metal chips.

****

REMOVAL

Rear shock absorber

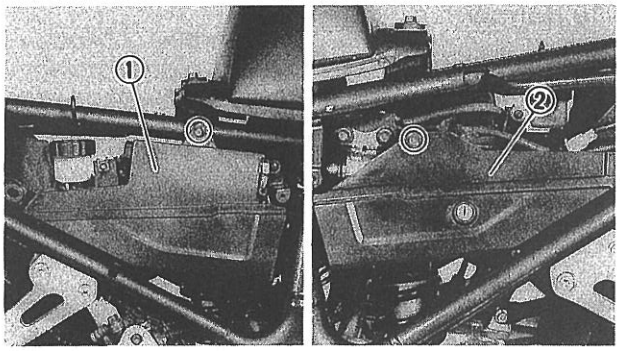
1.Place the motorcycle on the level place.

⚠ WARNING

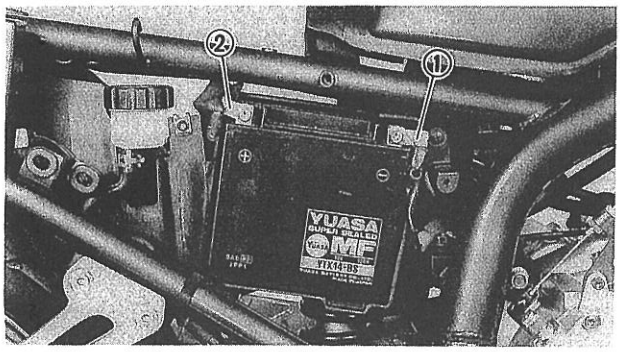
Securely support the motorcycle so there is no danger of it falling over.

2.Remove:
- Side cover
- Fuel tank

Refer to "SIDE COVER, FUEL TANK AND COWLING" in CHAPTER 3.



3.Remove:
- Cover (right) ①
- Cover (left) ②

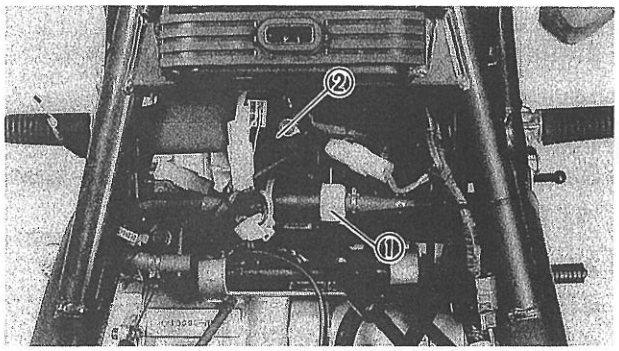


4.Disconnect:
- Battery leads

CAUTION:

Disconnect the negative lead ① first, than the positive lead ②.

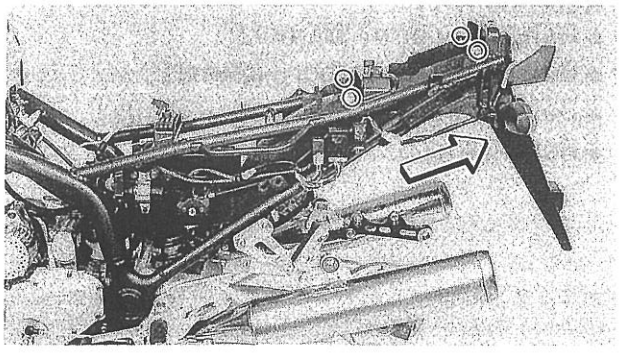
5.Remove:
- Battery



6.Remove:
- Fuel filter ①
- Starter relay ②

7.Remove:
- Rear wheel

Refer to "REAR WHEEL".

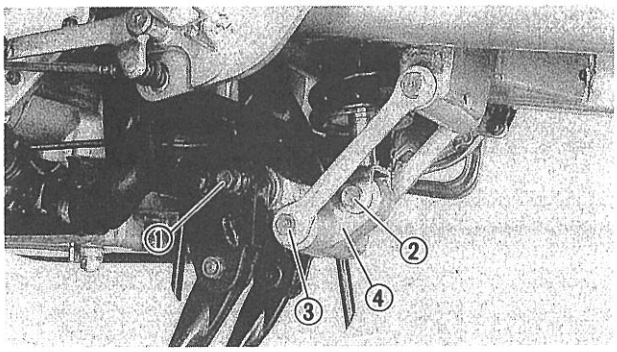


8.Remove:
- Bolts
- Rear fender

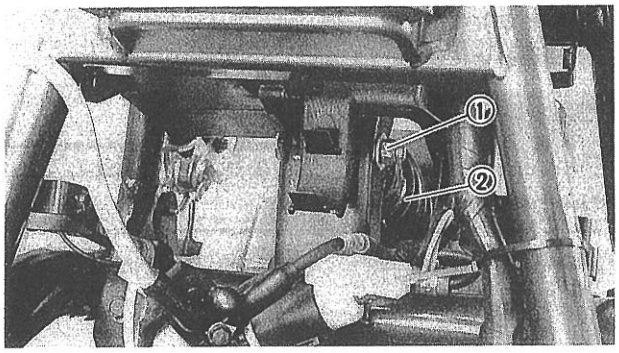
move the rear fender a little to the back.

9.Remove:
- Muffler
- Exhaust pipe

Refer to "ENGINE REMOVAL" in CHAPTER 4.



10.Remove:
- Bolt (relay arm - frame) ①
- Bolt (shock absorber - lower) ②
- Bolt (connecting rod - relay arm) ③
- Relay arm ④



11.Remove:
- Bolt (shock absorber - upper) ①
- Rear shock absorber ②

Swingarm

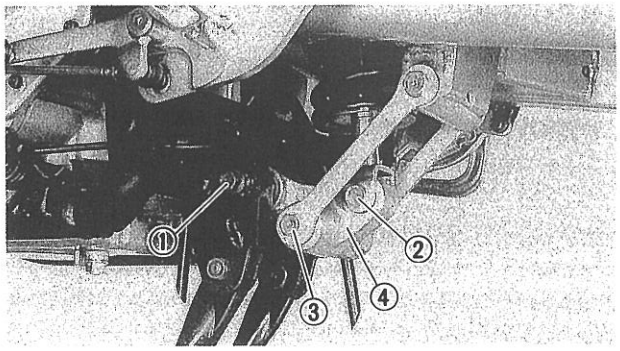
1.Place the motorcycle on a level place.

⚠ WARNING

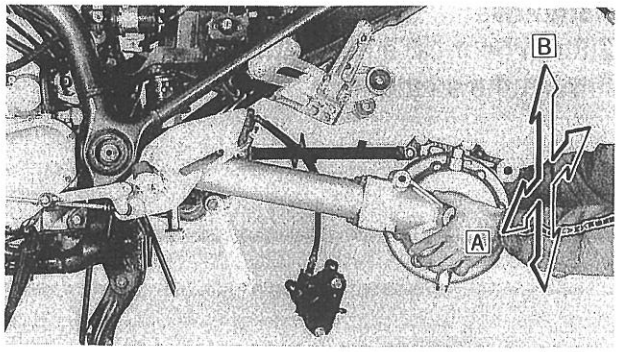
Securely support the motorcycle so there is no danger of it falling over.

2.Remove:
- Rear wheel

Refer to "REAR WHEEL".



3.Remove:
- Bolt (relay arm - frame) ①
- Bolt (shock absorber - lower) ②
- Bolt (connecting rod - relay arm) ③
- Relay arm ④



4.Check:
- Swingarm free play

****

Inspection steps:

- Check the tightening torque of the pivot shaft (swingarm) securing nut.

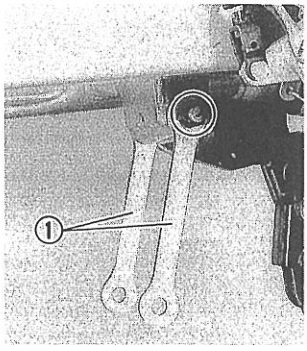
Nut (swingarm pivot shaft):
Left: 100 Nm (10.0 m • kg)
Right: 7 Nm (0.7 m • kg)
Right - lock nut:
100 Nm (10.0 m • kg)

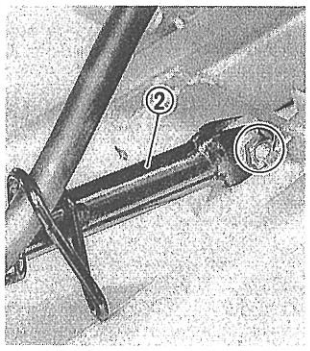
- Check the swingarm side play [A] by moving it from side to side.
  If side play is noticeable, check the inner collar, bearing, washer and thrust cover.

Side play (at end of swingarm):
1.0 mm

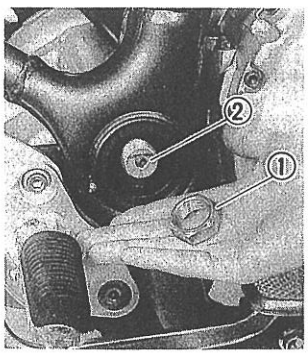
- Check the swingarm vertical movement [B] by moving it up and down.
  If vertical movement is tight, binding or rough, check the inner collar, bearing, washer and thrust cover.

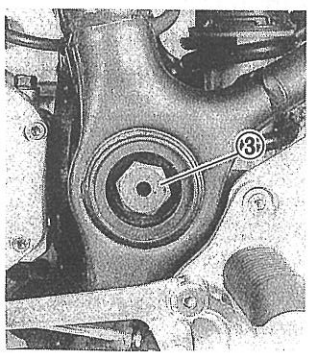
****



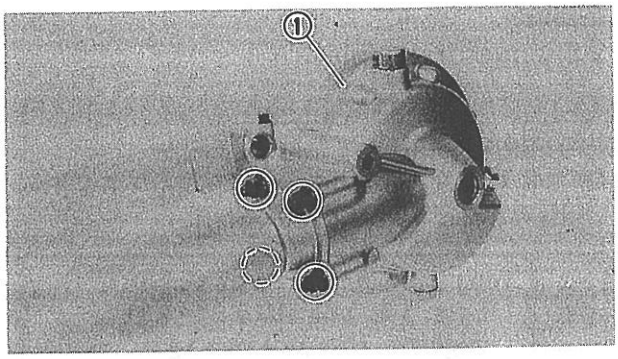


5.Remove:
- Connecting rod (left and right) ①
- Tension bar ②

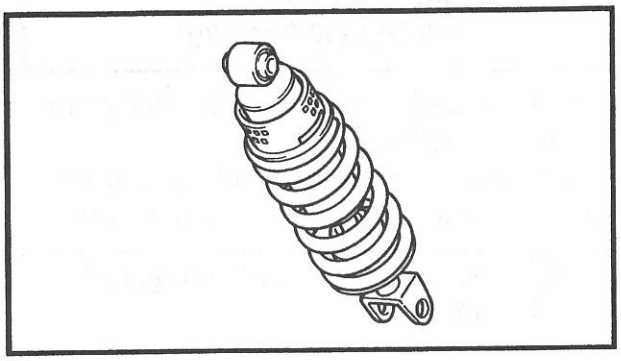




6.Remove:
- Covers (left and right)
- Pivot shaft nut ①
- Pivot shaft (right) ②
- Pivot shaft (left) ③
- Swingarm



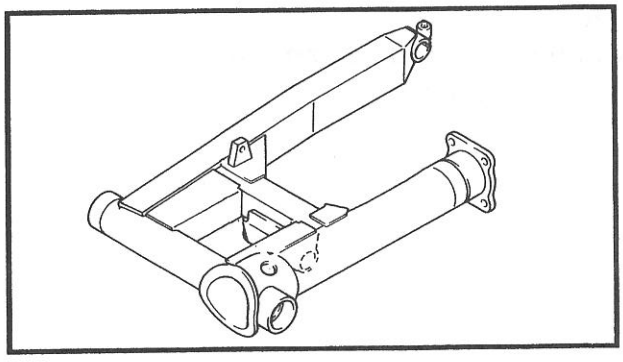
7.Remove:
- Final gear case assembly ①
  from the swingarm



INSPECTION

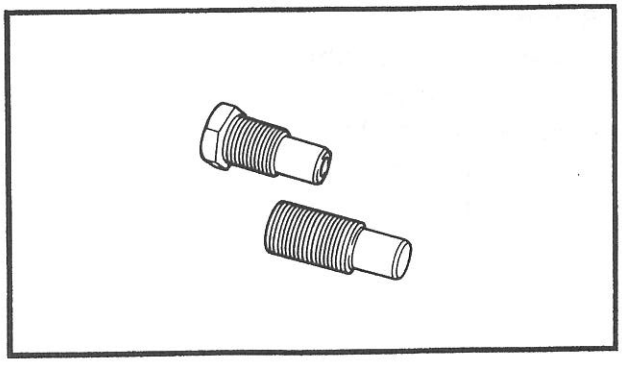
Rear shock absorber

1.Inspect:
- Rear shock absorber rod
  Bents/Damage → Replace the rear shock absorber assembly.
- Rear shock absorber
  Oil leaks/Gas leaks → Replace the rear shock absorber assembly.
- Spring
  Wear/Damage → Replace the rear shock absorber assembly.
- Bushings
- Dust seals
  Wear/Damage → Replace.
- Bolts
  Wear/Bends/Damage → Replace.

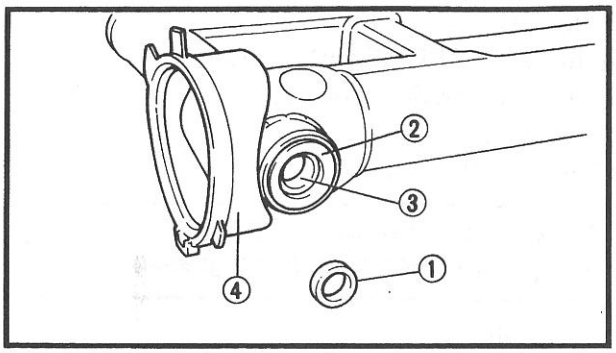


Swingarm

1.Inspect:
- Swingarm
  Crack/Bents/Damage → Replace.



2.Inspect:
- Pivot shaft
  Damage/Wear → Replace.



3.Inspect:
- Collar ①
- Oil seal ②
- Bearing ③
- Rubber boot ④

INSTALLATION

Rear shock absorber

Reverse the "REMOVAL" procedure.
Note the following points.
1.Lubricate:
- Collars
- Bearings

Recommended lubricant:
Molybdenum disulfide grease

2.Install:
- Rear shock absorber

Nut (shock absorber - upper):
40 Nm (4.0 m • kg)
Nut (shock absorber - lower):
48 Nm (4.8 m • kg)
Nut (relay arm - frame):
48 Nm (4.8 m • kg)

NOTE:
Lift up the swingarm to install rear shock absorber.

3.Connect:
- Battery leads

CAUTION:
Connect the positive lead first and then connect the negative lead.

Swingarm

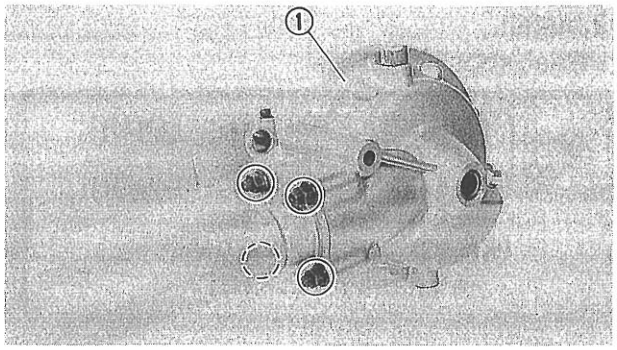
Reverse the "REMOVAL" procedure.
Note the following points.

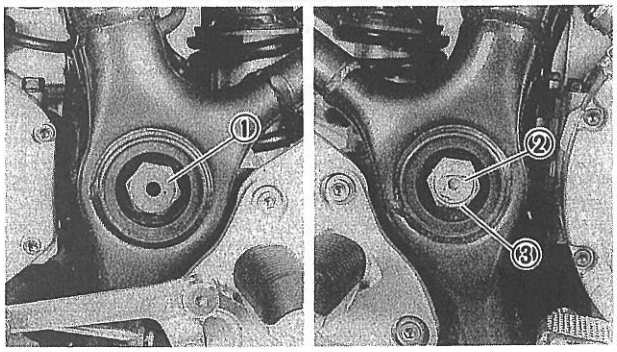
1.Lubricate:
- Drive shaft spline

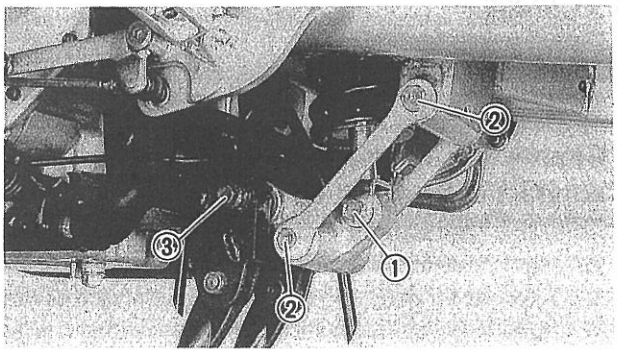
Recommended lubricant:
Lithium soap base grease

2.Lubricate:
- Bearings
- Collars
- Oil seals

Recommended lubricant:
Molybdenum disulfide grease







3.Install:
- Final gear case assembly ①

Nut:
42 Nm (4.2 m • kg)

4.Install:
- Swingarm

Pivot shaft (left) ①:
100 Nm (10 m • kg)
Pivot shaft (right) ②:
7 Nm (0.7 m • kg)
Pivot shaft nut ③:
100 Nm (10 m • kg)

5.Install:
- Relay arm
- Connecting rod (left and right)

Nut (shock absorber - lower) ①:
48 Nm (4.8 m • kg)
Nut (connecting rod) ②:
48 Nm (4.8 m • kg)
Nut (relay arm - frame) ③:
48 Nm (4.8 m • kg)

CAUTION:
Insert the bolt (connecting rod) ② from the left.

6.Install:
- Tension bar

	**Nut (tension bar):** **26 Nm (2.6 m • kg)**

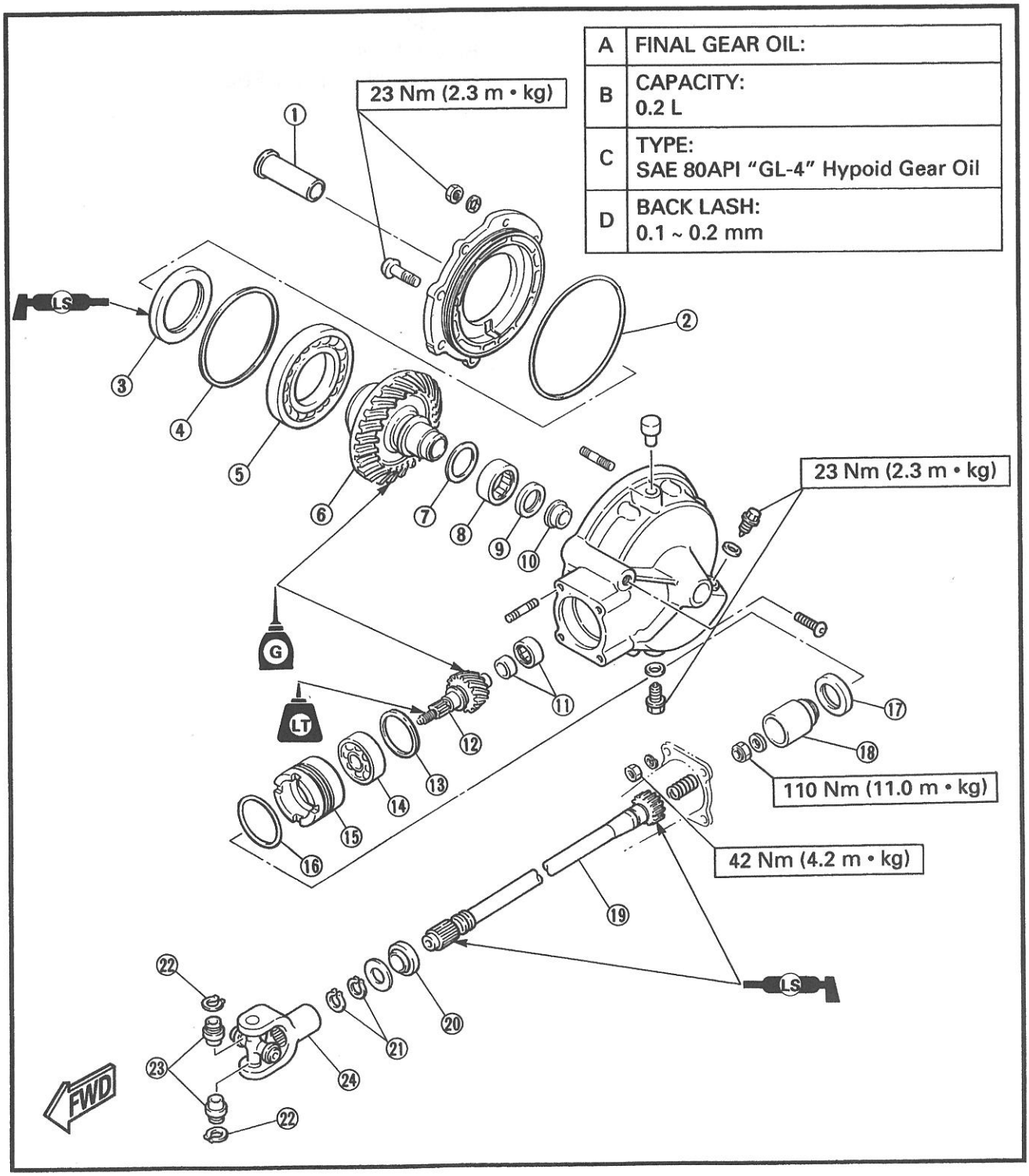
⚠ WARNING

Always use a new cotter pin.

7.Install:
- Rear wheel
  Refer to "REAR WHEEL".

SHAFT DRIVE

① Collar
② O-ring
③ Oil seal
④ Shim(s)
⑤ Bearing
⑥ Ring gear
⑦ Thrust washer
⑧ Bearing
⑨ Oil seal
⑩ Guide collar
⑪ Bearing
⑫ Final drive shaft
⑬ Shim(s)
⑭ Bearing
⑮ Bearing retainer
⑯ O-ring
⑰ Oil seal
⑱ Gear coupling
⑲ Drive shaft
⑳ Oil seal
㉑ Circlip
㉒ Circlip
㉓ Bearing
㉔ Universal joint



TROUBLESHOOTING

The following conditions may indicate damaged shaft drive components:

A	Symptoms	B	Possible Causes
1.A pronounced hesitation or "jerky" movement during acceleration, deceleration, or sustained speed. (This must not be confused with engine surging or transmission characteristics.) 2.A "rolling rumble" noticeable at low speed; a high-pitched whine; a "clunk" from a shaft drive component or area. 3.A locked-up condition of the shaft drive mechanism; no power transmitted from engine to rear wheel.		A. Bearing damage. B. Improper gear lash. C. Gear tooth damage. D. Broken drive shaft. E. Broken gear teeth. F. Seizure due to lack of lubrication. G. Small foreign object lodged between moving parts.	

NOTE:

Areas A, B and C above may be extremely difficult to diagnose. The symptoms are quite subtle and difficult to distinguish from normal motorcycle operating noise. If there is reason to believe these components are damaged, remove the components for specific inspection.

Inspection notes

1.Investigate any unusual noises.

****

The following "noises" may indicate a mechanical defect:

a.A "rolling rumble" noise during coasting, acceleration, or deceleration. The noise increase with rear wheel speed, but it does not increase with higher engine or transmission speeds.
Diagnosis: Possible wheel bearing damage.

b.A "whining" noise that varies with acceleration and deceleration.
Diagnosis: Possible incorrect reassembly, too-little gear lash.

CAUTION:

Too-little gear lash is extremely destructive to the gear teeth. If a test ride following reassembly indicates this condition, stop riding immediately to minimize gear damage.

c.A slight "thunk" evident at low speed operation. This noise must be distinguished from normal motorcycle operation.
Diagnosis: Possible broken gear teeth.

⚠ WARNING

Stop riding immediately if broken gear teeth are suspected. This condition could result in a locking loss of control of the shaft drive assembly, causing loss of control of the dike and possible injury to the rider.

****

2.Inspect:

- Drained oil
  Drain plug shows large amount of metal particles → Check bearing for seizure.

NOTE:

A small amount of metal particles in the oil is normal.

Swingarm
- Worn bearing or bush
- Bent or damaged

Rear shock absorber
- Fatigued spring
- Oil and gas leakage

Tires
- Uneven tire pressures on both sides
- Incorrect tire pressure
- Unevenly worn tires

Wheels
- Incorrect wheel balance
- Deformed cast wheel
- Damaged bearing
- Bent or loose wheel axle
- Excessive wheel run-out

Frame
- Twisted
- Damaged head pipe
- Improperly installed bearing race

FAULTY LIGHTING AND SIGNAL SYSTEM

HEADLIGHT DARK
- Improper bulb
- Too many electric accessories
- Hard charging (broken stator coil wire, faulty rectifier/regulator)
- Incorrect connection
- Improperly grounded
- Poor contacts (main or light switch)
- Bulb life expires

BULB BURNT OUT
- Improper bulb
- Faulty battery
- Faulty rectifier/regulator
- Improperly grounded
- Faulty main and/or light switch
- Bulb life expires

FLASHER DOES NOT LIGHT
- Improperly grounded
- Discharged battery
- Faulty turn switch
- Faulty flasher relay
- Broken wireharness
- Loosely connected coupler
- Bulb burnt out
- Faulty fuse

FLASHER WINKS SLOWER
- Faulty flasher relay
- Faulty main and/or turn switch
- Improper bulb

FLASHER KEEPS ON
- Faulty flasher relay
- Bulb burnt out

HORN IS INOPERATIVE
- Faulty battery
- Faulty fuse
- Faulty main and/or horn switch
- Improperly adjusted horn
- Faulty horn
- Broken wireharness

FLASHER WINKS QUICKER
- Improper bulb
- Faulty flasher relay
- Bulb burnt out

OVERHEATING

OVERHEATING

Ignition system
- Improper spark plug gap
- Improper spark plug heat range
- Faulty ignitor unit

Fuel system
- Improper carburetor main jet (improper setting)
- Improperly adjusted fuel level
- Clogged air filter element

Compression system
- Heavy carbon build-up

Engine oil
- Incorrect oil level
- Improper oil viscosity
- Inferior oil quality

Brake
- Dragging brake

FAULTY BRAKE

POOR BRAKING EFFECT

Disc brake
- Worn brake pads
- Worn disc
- Air in brake fluid
- Leaking brake fluid
- Faulty cylinder kit cup
- Faulty caliper kit seal
- Loose union bolt
- Broken brake hose
- Oily or greasy disc/brake pads
- Improper brake fluid level

FRONT FORK OIL LEAKAGE AND FRONT FORK MALFUNCTION

OIL LEAKAGE
- Bent, damaged or rusty inner tube
- Damaged or cracked outer tube
- Damaged oil seal lip
- Improperly installed oil seal
- Improper oil level (too much)
- Loose damper rod holding bolt
- Broken cap bolt O-ring
- Loose drain bolt
- Damaged drain bolt gasket

MALFUNCTION
- Bent, deformed or damaged inner tube
- Bent or deformed outer tube
- Damaged fork spring
- Worn or damaged slide metal
- Bent or damaged damper rod
- Improper oil viscosity
- Improper oil level

INSTABLE HANDLING

INSTABLE HANDLING

Handlebar
- Improperly installed or bent

Steering
- Improperly installed handlebar crown
- Bent steering stem
- Improperly installed steering shaft (improperly tightened ring nut)
- Damaged ball bearing or bearing race

Front forks
- Uneven oil levels on both sides
- Uneven spring tension (uneven damping force adjuster position)
- Broken spring
- Twisted front forks

FAULTY GEAR SHIFTING

HARD SHIFTING

Refer to "CLUTCH DRAGGING".

SHIFT PEDAL DOES NOT MOVE

Shift shaft
- Improperly adjusted shift rod
- Bent shift shaft

Shift cam, shift fork
- Groove jammed with impurities
- Seized shift fork
- Bent shift fork guide bar

Transmission
- Seized transmission gear
- Jammed impurities
- Incorrectly assembled transmission

JUMP-OUT GEAR

Shift shaft
- Improperly adjusted shift lever position
- Improperly returned stopper lever

Shift fork
- Worn shift fork

Shift cam
- Improper thrust play
- Worn shift cam groove

Transmission
- Worn gear dog

CLUTCH SLIPPING/DRAGGING

CLUTCH SLIPPING

Clutch
- Improperly adjusted clutch cable
- Loose clutch spring
- Fatigued clutch spring
- Worn, friction plate/clutch plate
- Incorrectly assembled clutch

Engine oil
- Low oil level
- Improper quality/(low viscosity)
- Deterioration

CLUTCH DRAGGING

Clutch
- Warped pressure plate
- Unevenly tensioned clutch springs
- Bent push rod
- Broken clutch boss
- Burnt primary driven gear bushing
- Bent clutch plate
- Swollen friction plate
- Match marks not aligned

Engine oil
- Improper oil level
- Improper quality/(high viscosity)
- Deterioration

COMPRESSION SYSTEM

Cylinder and cylinder head
- Loose spark plug
- Loose cylinder head or cylinder
- Broken cylinder head gasket
- Worn, damaged or seized cylinder
- Improperly sealed valve
- Improperly contacted valve and valve seat
- Improper valve timing
- Broken valve spring

Piston and piston rings
- Improperly installed piston ring
- Worn, fatigued or broken piston ring
- Seized piston ring
- Seized or damaged piston

Crankcase and crankshaft
- Improperly seated crankcase
- Seized crankshaft

POOR IDLE SPEED PERFORMANCE

POOR IDLE SPEED PERFORMANCE

Carburetor
- Improperly returned starter plunger
- Loose pilot jet
- Clogged pilot air jet
- Improperly synchronized carburetors
- Improperly adjusted idle speed (throttle stop screw)
- Improper throttle cable free play
- Flooded carburetor
- Faulty A.I.S. (AIR INDUCTION SYSTEM)

Electrical system
- Faulty battery
- Faulty spark plug
- Faulty ignitor unit
- Faulty pickup coil
- Faulty ignition coil

Valve train
- Improperly adjusted valve clearance

Air cleaner
- Clogged air filter

POOR MEDIUM AND HIGH SPEED PERFORMANCE

POOR MEDIUM AND HIGH SPEED PERFORMANCE

Refer to "STARTING FAILURE/HARD STARTING". (Fuel system, electrical system, compression system and valve train)

Carburetor
- Diaphragm malfunction
- Improperly adjusted fuel level
- Clogged or loose main jet

Air cleaner
- Clogged air filter element

Fuel pump
- Faulty fuel pump

8

TROUBLESHOOTING

NOTE:
The following troubleshooting does not cover all the possible causes of trouble. If should be helpful, however, as a guide to troubleshooting. Refer to the relative procedure in this manual for inspection, adjustment and replacement of parts.

STARTING FAILURE/HARD STARTING

FUEL SYSTEM

Fuel tank
- Empty
- Clogged fuel filter
- Clogged fuel strainer
- Clogged fuel tank drain hose
- Clogged roll over valve
- Clogged roll over valve breather hose
- Deteriorated fuel or fuel containing water or foreign material

Fuel cock
- Clogged fuel hose

Carburetor
- Deteriorated fuel, fuel containing water or foreign material
- Clogged pilot jet
- Clogged pilot air passage
- Sucked-in air
- Deformed float
- Groove-worn needle valve
- Improperly sealed valve seat
- Improperly adjusted fuel level
- Improperly set pilot jet
- Clogged starter jet
- Starter plunger malfunction
- Improperly adjusted starter cable

Air cleaner
- Clogged air filter

Fuel pump
- Faulty fuel pump
- Faulty fuel pump relay

ELECTRICAL SYSTEM

Spark plug
- Improper plug gap
- Worn electrodes
- Wire between terminals broken
- Improper heat range
- Faulty spark plug cap

Ignition coil
- Broken or shorted primary/secondary
- Faulty spark plug lead
- Broken body

Full-transistor system
- Faulty ignitor unit
- Faulty pick up coil

Switches and wiring
- Faulty main switch
- Faulty "ENGINE STOP" switch
- Broken or shorted wiring
- Faulty neutral switch
- Faulty "START" switch
- Faulty sidestand switch
- Faulty clutch switch

Starter motor
- Faulty starter motor
- Faulty starter relay
- Faulty circuit cut-off relay
- Faulty starter clutch

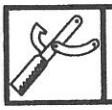
TPS (THROTTLE POSITION SENSOR) SELF DIAGNOSIS

TROUBLESHOOTING

WHEN THE TPS SELF-DIAGNOSIS DEVICE DETECTS A DEFECT IN THE CIRCUIT

Procedure
Check:
1.TPS (throttle position sensor)
2.Wire harness

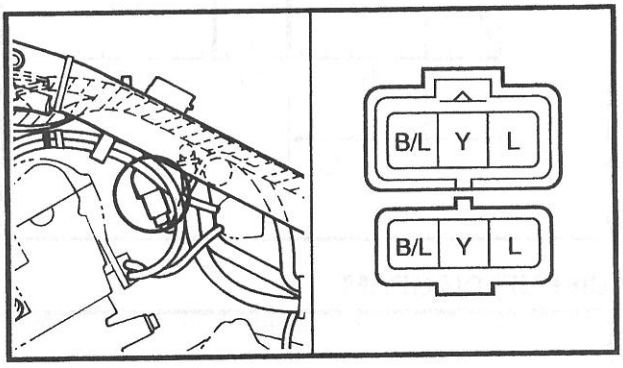
NOTE:
Use the following special tool in this troubleshooting.



Pocket tester:
90890-03112

1.TPS (throttle position sensor)

- Disconnect the throttle sensor coupler from the wire harness.
- Connect the pocket tester (Ω × 1) to the throttle sensor.
  Refer to "TPS (THROTTLE POSITION SENSOR) ADJUSTMENT AND INSPECTION" in CHAPTER 5.



- Check the TPS (throttle position sensor) for continuity.

BAD CONDITION → Replace TPS (throttle position sensor).

GOOD CONDITION ↓

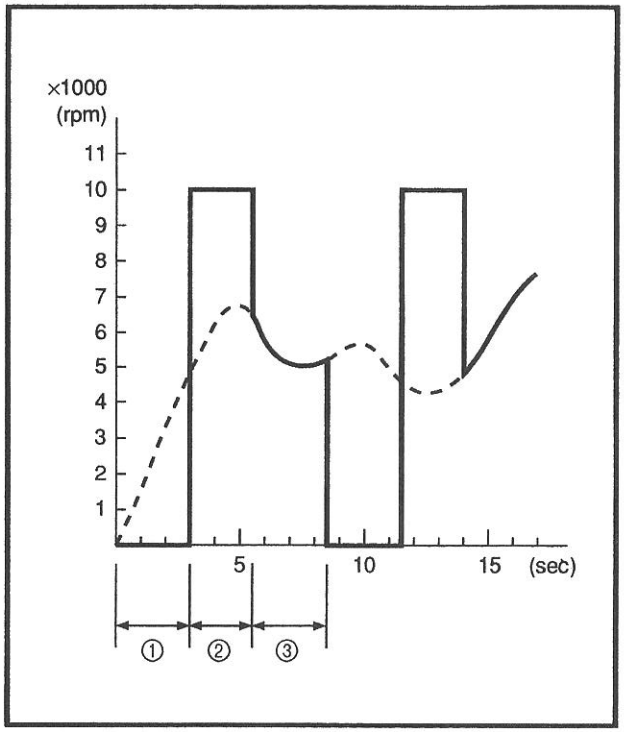
2.Wire harness

- Check the wire harness for continuity.
  Refer to "CIRCUIT DIAGRAM".

NO CONTINUITY → Repair or replace wire harness.

CONTINUITY ↓

This circuit is good.



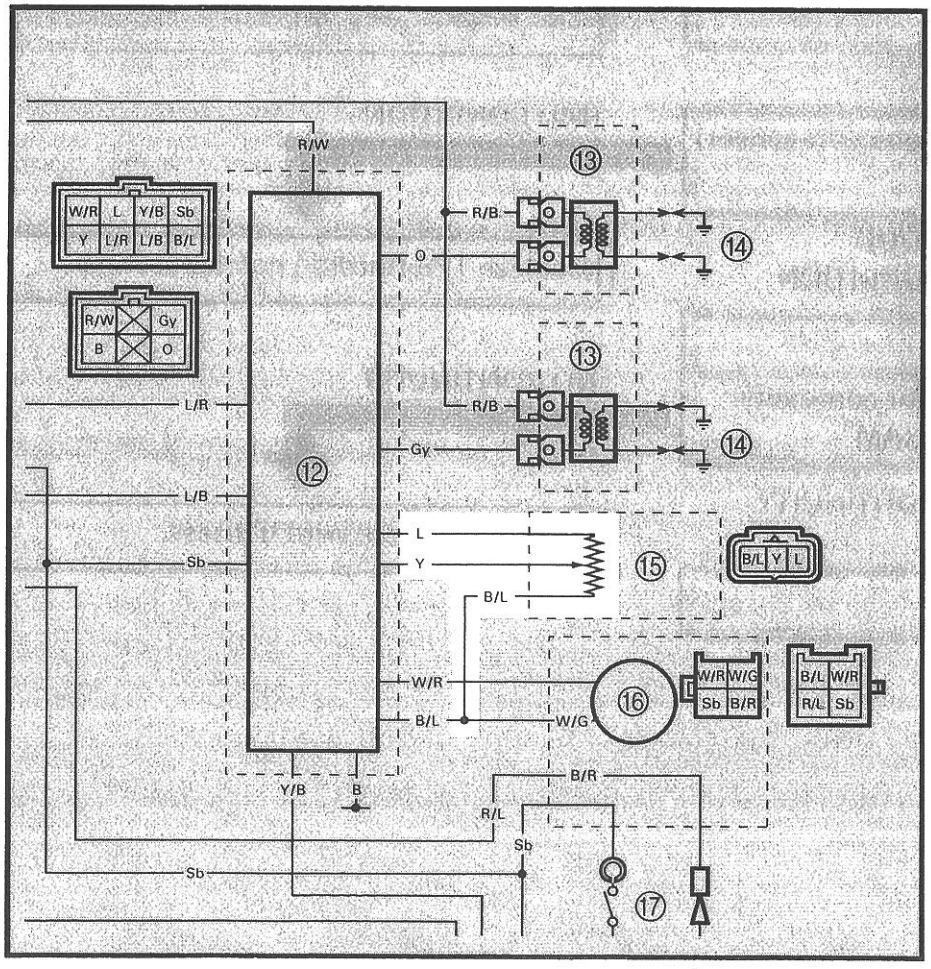
TPS (THROTTLE POSITION SENSOR) SELF-DIAGNOSIS

When the needle of the tachometer shows the following pattern while either running or stopped when the main switch is on, the throttle position sensor circuit is broken, shorted, or the TPS (throttle position sensor) is locked. In that case, it would be best to inspect it.

① 0 rpm - 3 seconds
② 10,000 rpm - 2.5 seconds
③ present engine revolutions - 3 seconds
The above pattern is repeated.

NOTE:
The ignition timing is determined by the characteristics of the throttle when fully open.

CIRCUIT DIAGRAM



When the wiring is broken or shortened, or when the TPS (throttle position sensor) is locked as shown in the figure to the left, the tachometer pattern above is shown.

⑮ TPS (throttle position sensor)

*

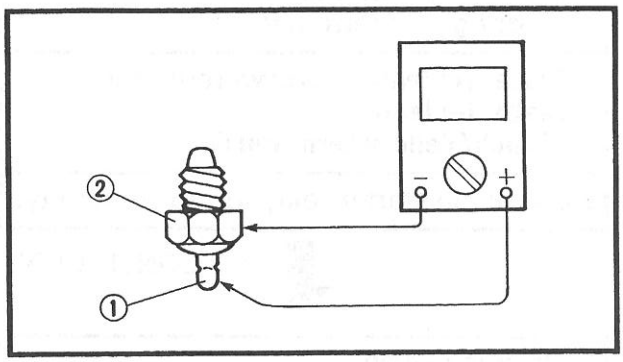
7.Carburetor heater

- Remove the carburetor heater from the carburetor body.
- Connect the pocket tester to the carburetor heater.

Tester (+) lead → Heater terminal ①
Tester (–) lead → Heater body ②

- Measure the heater resistance.

Carburetor heater resistance:
6 ~ 10 Ω at 20°C



IN CORRECT

Replace carburetor heater.

CORRECT

8.Wiring connection

- Check the entire carburetor heater system for connections.
  Refer to "CIRCUIT DIAGRAM".

POOR CONNECTION

Correct.

Battery (+) terminal →
Brown terminal ①
Battery (–) terminal →
Light green terminal ②

Tester (+) lead → Brown terminal ③
Tester (–) lead →
Black/Yellow terminal ④

- Check the starter relay for no continuity.

CONTINUITY →

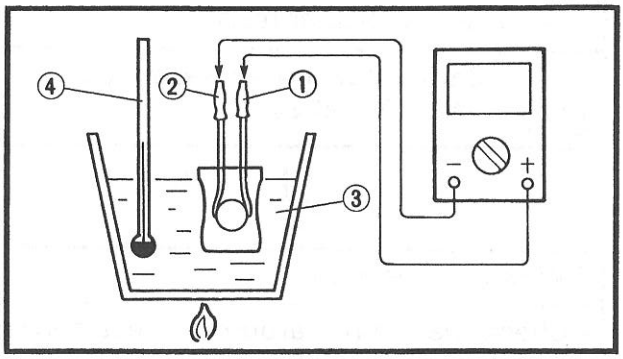
Replace starter relay.

NO CONTINUITY ↓

6. Thermo switch

- Remove the thermo switch from the thermo switch plate.
- Connect the pocket tester to the thermo switch lead.

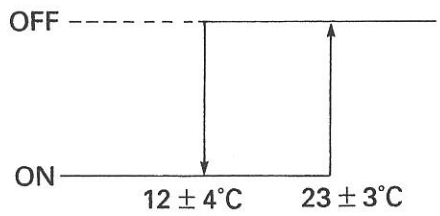
Tester (+) lead → Black lead ①
Tester (–) lead → Black lead ②



- Immerse the thermo switch in the water ③.
- Check the thermo switch for continuity. Note the temperatures while heating the water with the temperature gauge ④.

Test step	Water temperature	Good condition
1	Less than 23 ± 3°C	○
2	More than 23 ± 3°C	×
3	More than 12 ± 4°C	×
4	Less than 12 ± 4°C	○

Test 1 & 2: Heat-up test
Test 3 & 4: Cool-down test
○: Continuity **×: No continuity**



- If condition is not good, replace the thermo switch.

NO CONTINUITY →

Replace thermo switch.

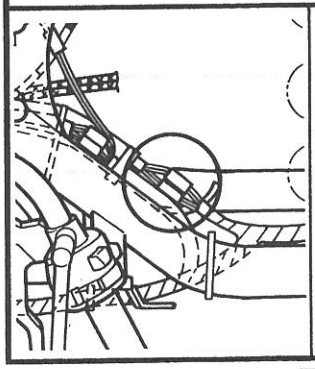
CONTINUITY ↓

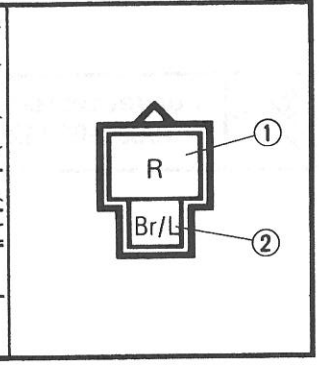
*

*

3.Main switch

- Disconnect the main switch coupler from the wire harness.
- Check the switch component for continuity between "Red ① and Brown/Blue ②".





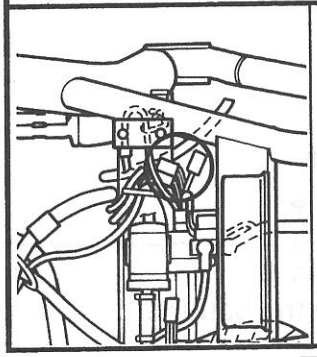
INCORRECT

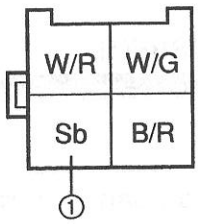
Replace main switch.

CORRECT

4.Neutral switch

- Disconnect the neutral switch coupler from the wire harness.
- Check the switch component for continuity between "Sky blue ①" and Ground.





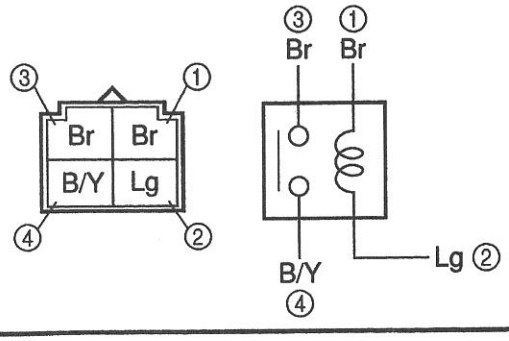
INCORRECT

Replace neutral switch.

CORRECT

5.Heater relay

- Disconnect the relay unit coupler from the wire harness.
- Connect the pocket tester (Ω × 1) and battery (12V) to the relay unit coupler terminals.



TROUBLESHOOTING

CARBURETOR HEATER SYSTEM DOES NOT OPERATE

Procedure

Check:

1. Fuse (main and signal)
2. Battery
3. Main switch
4. Neutral switch
5. Heater relay
6. Thermo switch
7. Carburetor heater
8. Wiring connection

NOTE:

- Remove the following parts before troubleshooting.
  1) Seat
  2) Side cover
  3) Cowling
- Use the following special tool(s) in this troubleshooting.

Pocket tester:
90890-03112

1. Fuse (main and ignition)

- Remove the fuses.
- Connect the pocket tester (Ω × 1) to the fuses.
- Check the fuses for continuity.

NO CONTINUITY → Replace fuse(s).

CONTINUITY ↓

2. Battery

- Check the battery condition.
  Refer to "BATTERY INSPECTION" in CHAPTER 3.

Open circuit voltage:
12.8V or more at 20°C

INCORRECT →

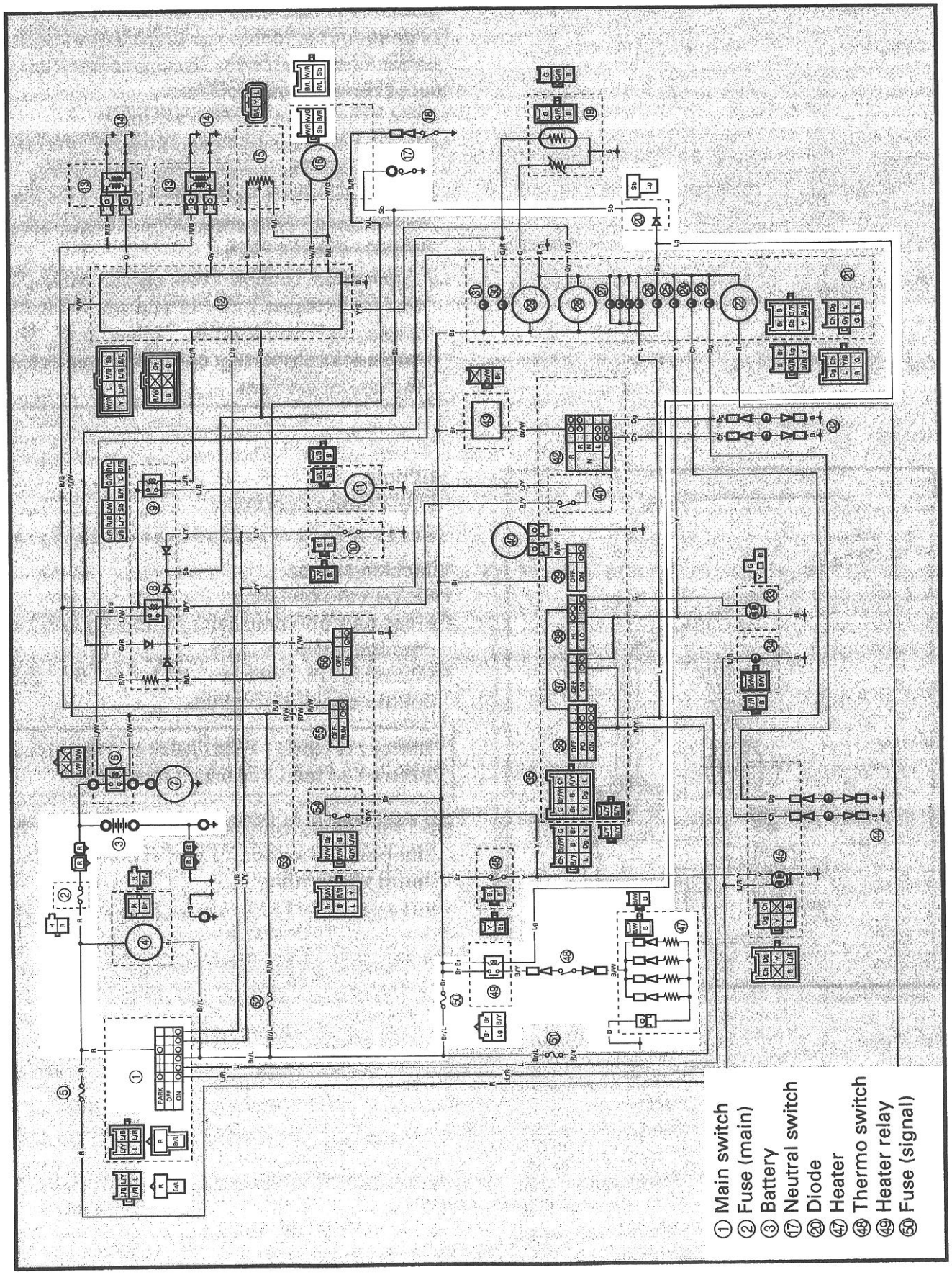
- Clean battery terminals.
- Recharge or replace the battery.

CORRECT ↓

*

CARBURETOR HEATER SYSTEM

CIRCUIT DIAGRAM

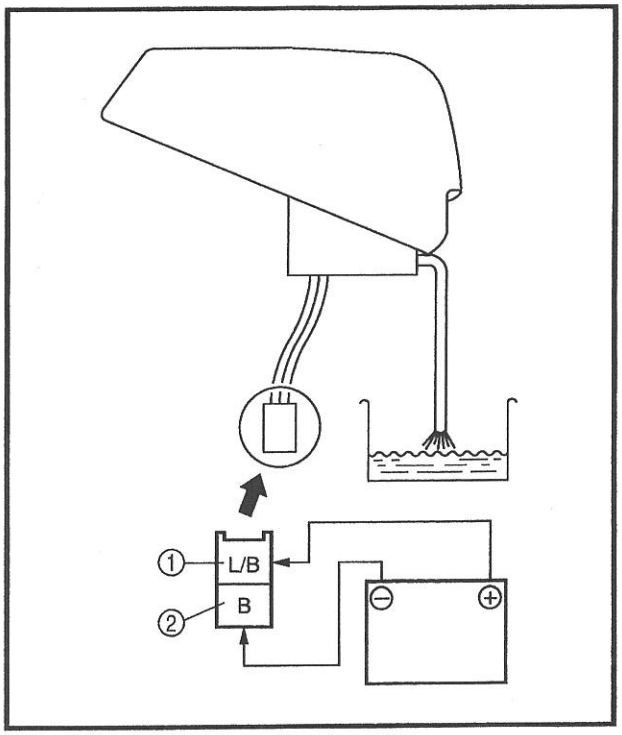


FUEL PUMP TEST

⚠ WARNING

Gasoline is extremely flammable and there is danger of explosion or combustion under certain circumstances. Be extremely careful of the following points:

- **Stop the engine before refuelling.**
- **Do not smoke, and keep away from open flames, sparks, or any other kind of fire.**
- **Take care not to spill gasoline. If you do accidentally spill some, wipe it up immediately with dry rags.**
- **If gasoline touches the engine when it has just stopped and is still hot, there is danger of combustion. Make sure the engine is completely cool before performing any operations.**



1.Check:
- Fuel pump operation

****

Checking steps:
- Fill up the fuel tank.
- Place an open container under the end of the fuel hose.
- Connect the battery (12V) to the fuel pump coupler terminals.

Battery (+) lead → Blue/Black ① terminal
Battery (–) lead → Black ② terminal

- If fuel flows out from the fuel hose, the fuel pump is good. If not, replace the fuel pump assembly.

****

Battery (+) terminal →
Red/Black terminal ①
Battery (–) terminal →
Blue/Red terminal ②

Tester (+) lead → Red/Black terminal ①
Tester (–) lead → Blue/Black terminal ③

- Check the starting circuit cut-off relay for continuity.

NO CONTINUITY

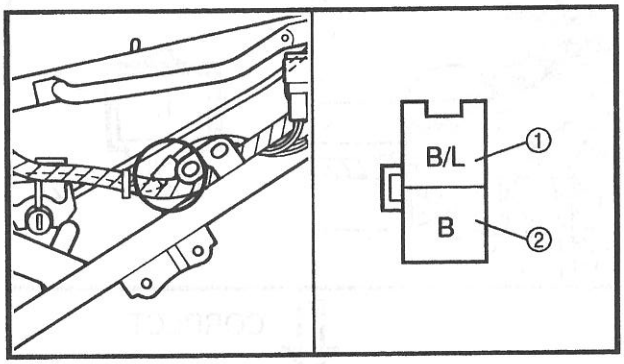
Replace starting circuit cut-off relay.

CONTINUITY

6.Fuel pump resistance

- Disconnect the fuel pump coupler from the wire harness.
- Connect the pocket tester (Ω × 1) to the fuel pump coupler terminals.

Tester (+) lead → Black/Blue terminal ①
Tester (–) lead → Black terminal ②



- Check the fuel pump for specified resistance.

Fuel pump resistance:
4 ~ 10 Ω at 20°C

OUT OF SPECIFICATION

Replace fuel pump.

MEETS SPECIFICATION

7.Wiring connection

- Check the entire fuel pump system for connections.
  Refer to "CIRCUIT DIAGRAM".

POOR CONNECTION

Correct.

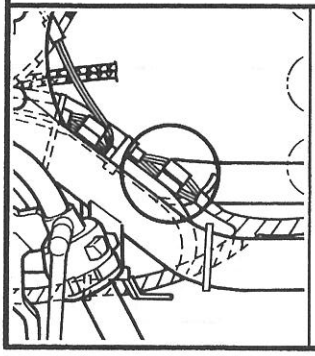
CORRECT

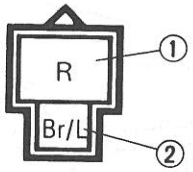
Replace ignitor unit.

*

3.Main switch

- Disconnect the main switch coupler from the wire harness.
- Check the switch component for continuity between "Red ① and Brown/Blue ②".





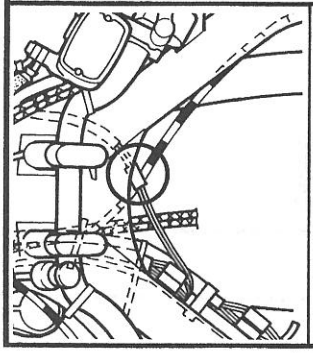
INCORRECT

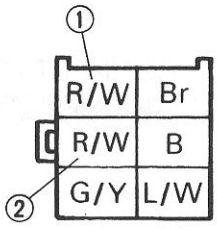
Replace main switch.

CORRECT

4."ENGINE STOP" switch

- Disconnect the handlebar switch (right) coupler from the wire harness.
- Check the switch component for continuity between "Red/White ① and Red/White ②".





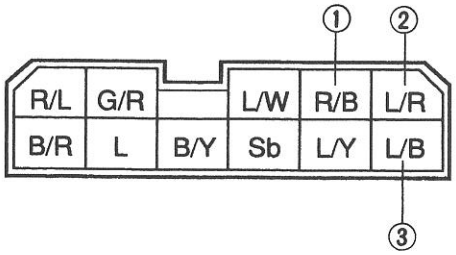
INCORRECT

Replace handlebar switch (right).

CORRECT

5.Starting circuit cut-off relay (fuel pump relay)

- Disconnect the starting circuit cut-off relay coupler from the wire harness.
- Connect the pocket tester (Ω × 1) and battery (12V) to the starting circuit cut-off relay coupler terminals.



TROUBLESHOOTING

FUEL PUMP FAILS TO OPERATE.

Procedure

Check:

1. Fuse (main and ignition)
2. Battery
3. Main switch
4. "ENGINE STOP" switch
5. Starting circuit cut-off relay (fuel pump relay)
6. Fuel pump
7. Wiring connection (entire fuel system)

NOTE:

- Remove the following parts before troubleshooting.
  1) Seat
  2) Side cover
  3) Fuel tank
  4) Air filter case
- Use the following special tool(s) in this troubleshooting.

Pocket tester:
90890-03112

1. Fuse (main and ignition)

- Remove the fuses.
- Connect the pocket tester (Ω × 1) to the fuses.
- Check the fuses for continuity.

NO CONTINUITY → Replace fuse(s).

CONTINUITY ↓

2. Battery

- Check the battery condition. Refer to "BATTERY INSPECTION" in CHAPTER 3.

Open circuit voltage:
12.8V or more at 20° C (68° F)

INCORRECT → • Clean battery terminals. • Recharge or replace the battery.

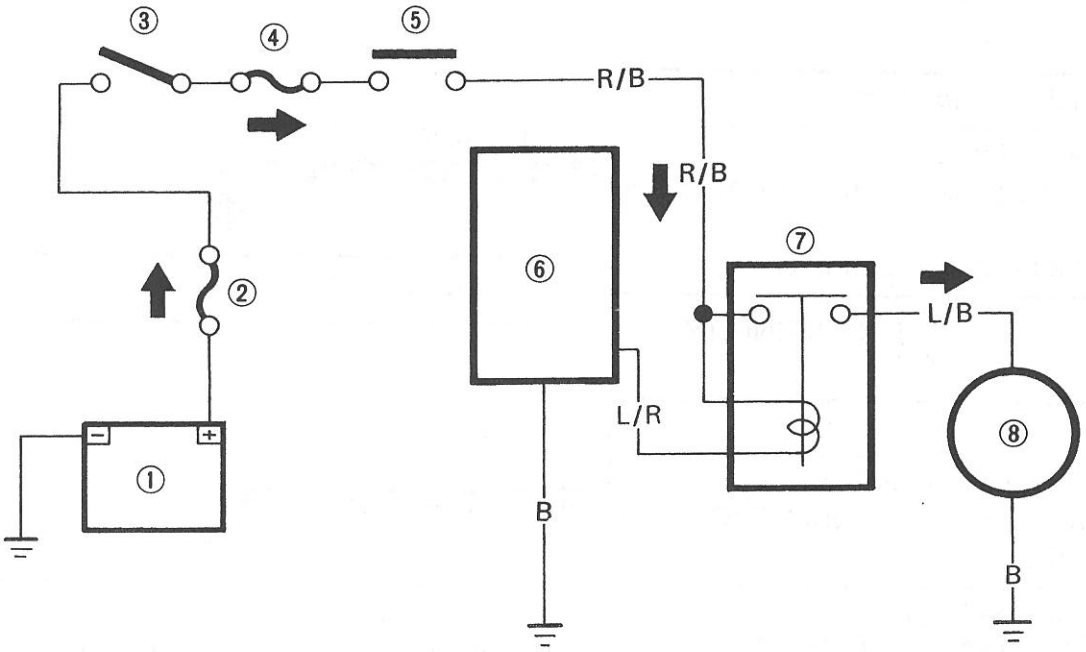
CORRECT ↓

*

FUEL PUMP CIRCUIT OPERATION

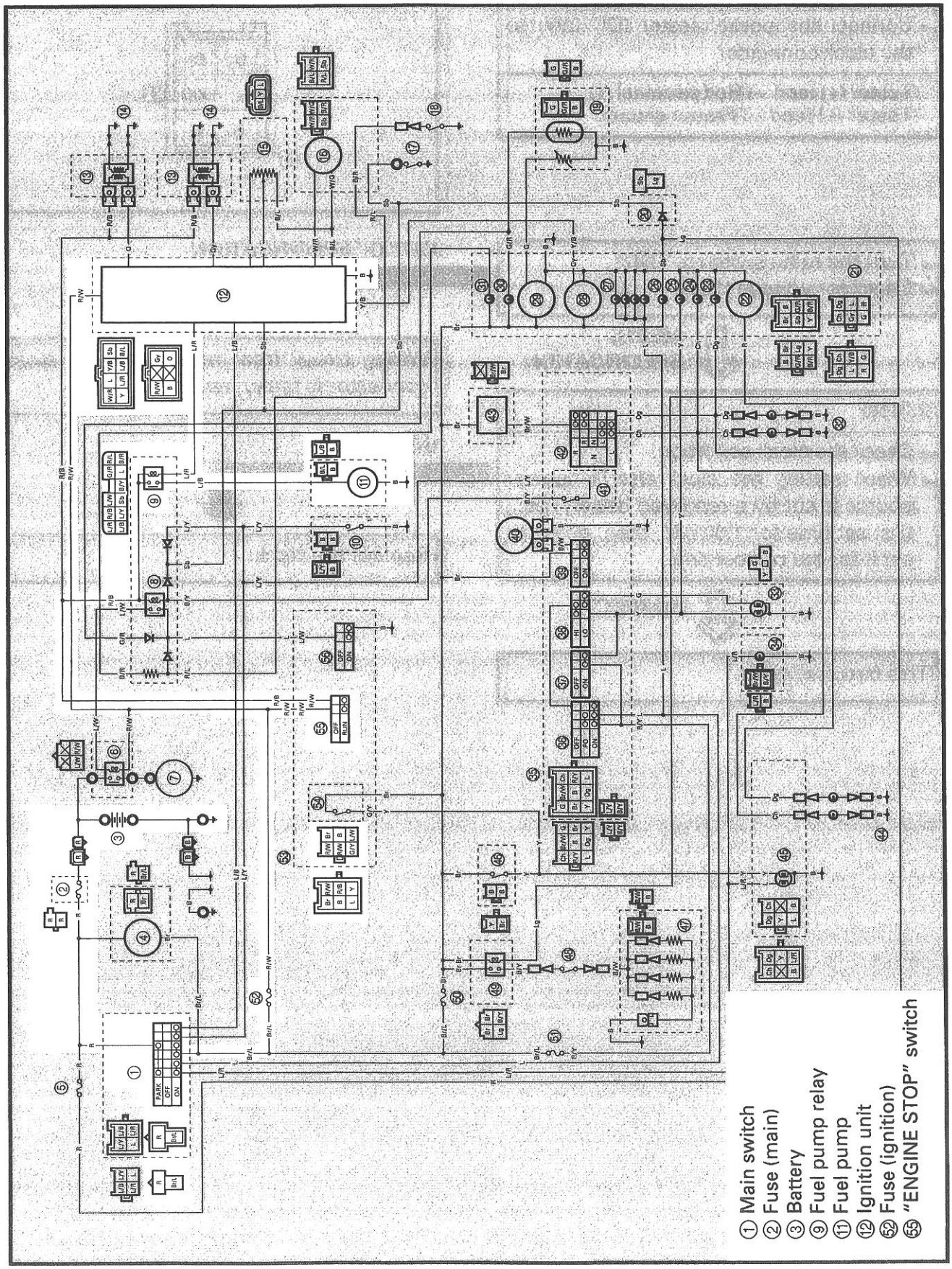
The fuel pump circuit consists of the fuel pump relay, fuel pump, "ENGINE STOP" switch and ignitor unit.
The ignitor unit includes the control unit for the fuel pump.

① Battery
② Fuse (MAIN)
③ Main switch
④ Fuse (IGNITION)
⑤ "ENGINE STOP" switch
⑥ Ignitor unit
⑦ Fuel pump relay
⑧ Fuel pump



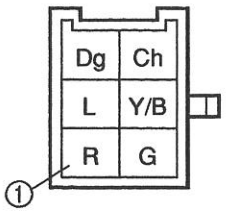
FUEL PUMP SYSTEM

CIRCUIT DIAGRAM



8.Clock does not come on.

1.Voltage
• Connect the pocket tester (DC 20V) to the clock connector.
Tester (+) lead → Red terminal ① **Tester (–) lead → Frame ground**



- Turn the main switch to "ON".
- Check for voltage (12V).

OUT OF SPECIFICATION

Wiring circuit from main switch to clock connector is faulty, repair.

MEETS SPECIFICATION

2.Clock
• Check the clock condition. • When setting the clock after is power source is cut by a removed battery, etc., first set time for 1:00 AM, then, go on to set it for the correct time.

INCORRECT

Replace the clock.

CORRECT

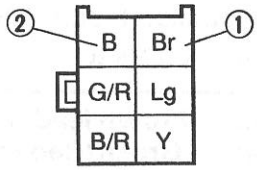
This circuit is good.

*

2.Voltage

- Connect the pocket tester (DC 20V) to the fuel gauge coupler.

Tester (+) lead → Brown terminal ①
Tester (–) lead → Black terminal ②



- Turn the main switch to "ON".
- Check for voltage (12V) on the "Brown" lead at the fuel meter coupler.

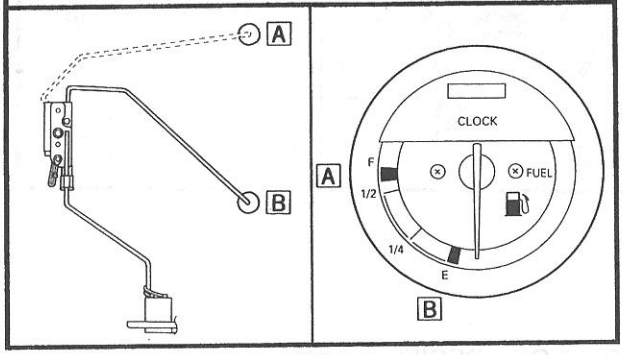
OUT OF SPECIFICATION

Check the entire signal system for connections.

MEET SPECIFICATION

3.Fuel gauge

- Turn the main switch to "ON".
- Move the float to "UP A" or "DOWN B".
- Check the fuel gauge needle moves "FULL" or "EMPTY".



NOTE:
Before reading the meter, stay put the float for more than three minutes respectively at "UP" or "DOWN".

DOES NOT MOVE

Replace fuel gauge.

MOVES

4.Wiring connection

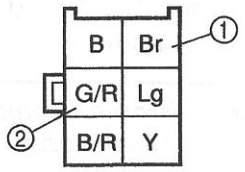
- Check the entire signal system for connections.

*

3.Voltage

- Connect the pocket tester (DC 20V) to the bulb socket connector.

Tester (+) lead → Brown lead ①
Tester (–) lead → Green/Red lead ②



- Turn the main switch to "ON".
- Check for voltage (12V).

OUT OF SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

MEETS SPECIFICATION

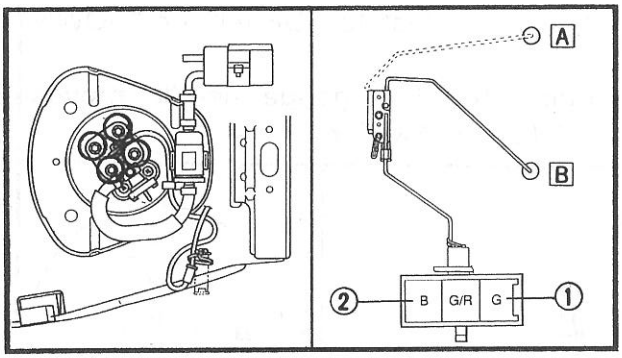
This circuit is good.

7.Fuel gauge does not operate.

1.Fuel sender

- Remove the fuel sender from the fuel tank.
- Connect the pocket tester to the fuel sender coupler.

Tester (+) lead → Green terminal ①
Tester (–) lead → Black terminal ②



- Check the fuel sender for specificated resistance.

Fuel sender resistance (up A):
(Ω × 1)
10 Ω at 20°C
Fuel sender resistance (down B):
(Ω × 10)
90 Ω at 20°C

OUT OF SPECIFICATION

Replace fuel sender.

BOTH MEET SPECIFICATION

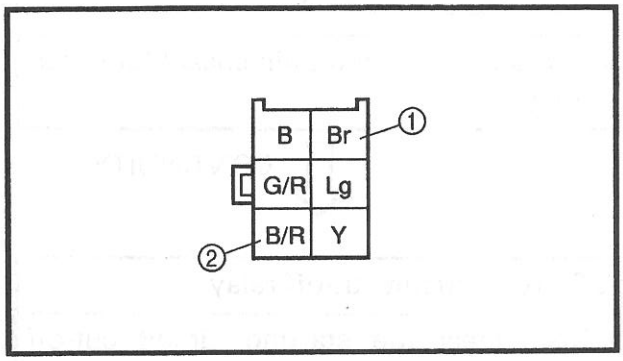
*

*

4.Voltage

- Connect the pocket tester (DC 20V) to the bulb socket connector.

Tester (+) lead → Brown lead ①
Tester (–) lead → Black/Red lead ②



- Turn the main switch to "ON".
- Check for voltage (12V).

OUT OF SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

MEETS SPECIFICATION

This circuit is good.

6."FUEL" level indicator light does not come on, when fuel level is low.

1.Bulb and bulb socket

- Check the bulb and bulb socket for continuity.

NO CONTINUITY

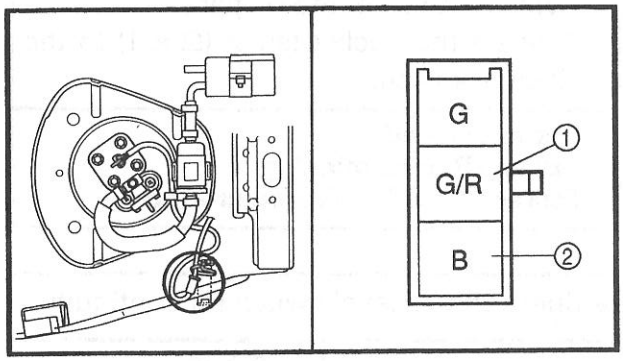
Replace bulb and/or bulb socket.

CONTINUITY

2.Fuel sender

- Drain the fuel and remove the fuel sender from the fuel tank.
- Disconnect the fuel sender coupler from the wire harness.
- Connect the pocket tester (Ω × 1) to the fuel sender.

Tester (+) lead → Green/Red terminal ①
Tester (–) lead → Black terminal ②



- Check the fuel sender for continuty.

BAD CONDITION

Replace fuel sender.

GOOD CONDITION

*

5."OIL LEVEL" indicator light does not come on, when engine oil level is low.

1.Bulb and bulb socket

- Check the bulb and bulb socket for continuity.

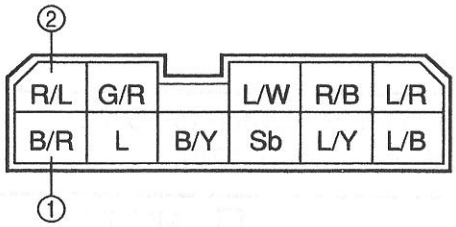
NO CONTINUITY → Replace bulb and/or bulb socket.

CONTINUITY ↓

2.Starting circuit cut-off relay

- Disconnect the starting circuit cut-off relay coupler from the wire harness.
- Connect the pocket tester (Ω × 100) to the starting circuit cut-off relay coupler terminals.
- Check the resistor for specification resistance.

Tester (+) terminal → Black/Red terminal ①
Tester (–) terminal → Red/Blue ②



OUT OF SPECIFICATION → Replace starting circuit cut-off relay.

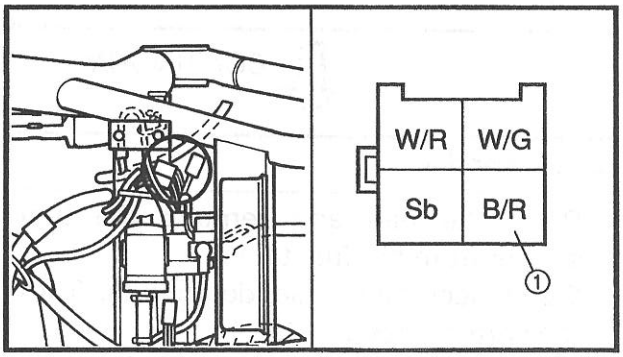
202.5 ~ 247.5 Ω at 20°C

MEETS SPECIFICATION ↓

3.Oil level switch

- Drain the engine oil and remove the oil level switch from the oil pan.
- Connect the pocket tester (Ω × 1) to the oil level switch.

Tester (+) lead → Black/Red terminal ①
Tester (–) lead → Frame ground



- Check the oil level switch for continuity.

BAD CONDITION → Replace oil level switch.

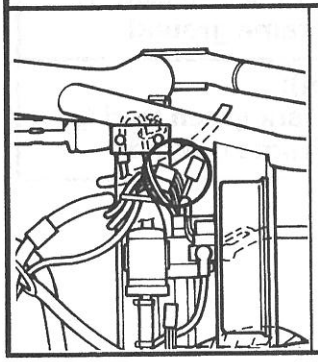
GOOD CONDITION ↓

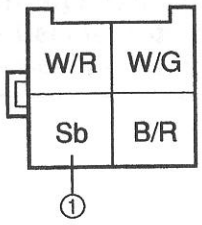
*

*

2.Neutral switch

- Disconnect the neutral switch coupler from the wire harness.
- Check the switch component for continuity between "Sky blue ①" and Ground.





NO CONTINUITY

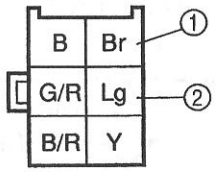
Replace neutral switch.

CONTINUITY

3.Voltage

- Connect the pocket tester (DC 20V) to the bulb socket coupler.

Tester (+) lead → Brown terminal ①
Tester (–) lead → Light green terminal ②



- Turn the main switch to "ON".
- Check for voltage (12V).

OUT OF SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

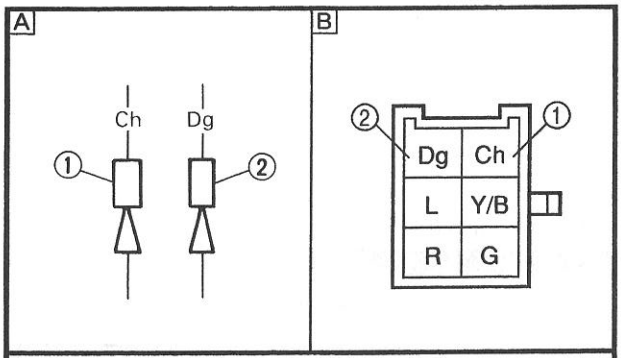
MEETS SPECIFICATION

This circuit is good.

*

5.Voltage

- Connect the pocket tester (DC 20V) to the bulb socket connector.



A Flasher light
B "TURN" indicator light

At flasher light (left):
Tester (+) lead → Chocolate lead ①
Tester (–) lead → Frame ground

At flasher light (right):
Tester (+) lead → Dark green lead ②
Tester (–) lead → Frame ground

- Turn the switch to "ON".
- Turn the "TURN" switch to "L" or "R".
- Check for voltage (12V) on the "Chocolate" lead or "Dark green" lead at the bulb socket connector.

OUT OF SPECIFICATION

Wiring circuit from "TURN" switch to bulb socket connector is faulty, repair.

MEETS SPECIFICATION

This circuit is good.

4."NEUTRAL" indicator light does not come on.

1.Bulb and bulb socket

- Check the bulb and bulb socket for continuity.

NO CONTINUITY

Replace bulb and/or bulb socket.

CONTINUITY

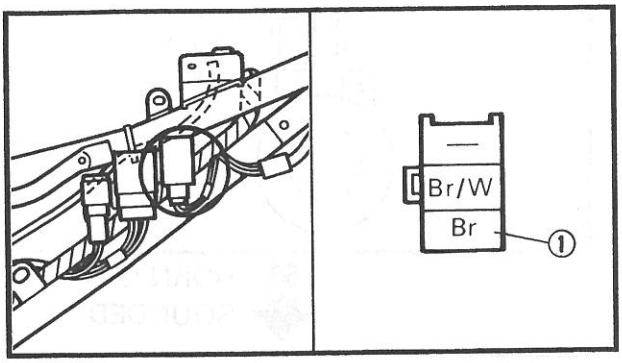
*

*

3.Voltage

- Connect the pocket tester (DC 20V) to the flasher relay coupler.

Tester (+) lead → Brown terminal ①
Tester (–) lead → Frame ground



- Turn the main switch to "ON".
- Check for voltage (12V) on the "Brown" ① lead at the flasher relay terminal.

OUT OF SPECIFICATION

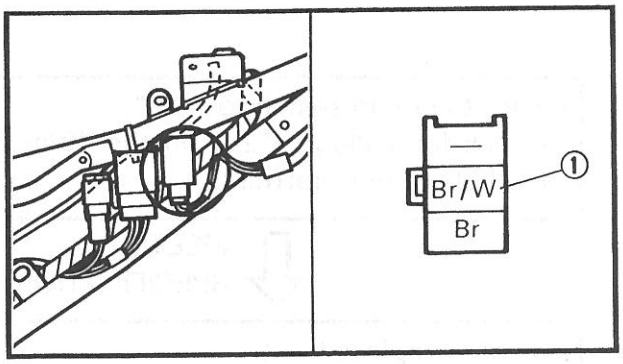
Wiring circuit from main switch to flasher relay connector is faulty, repair.

MEETS SPECIFICATION

4.Voltage

- Connect the pocket tester (DC 20V) to the flasher relay coupler.

Tester (+) lead →
Brown/White terminal ①
Tester (–) lead → Frame ground



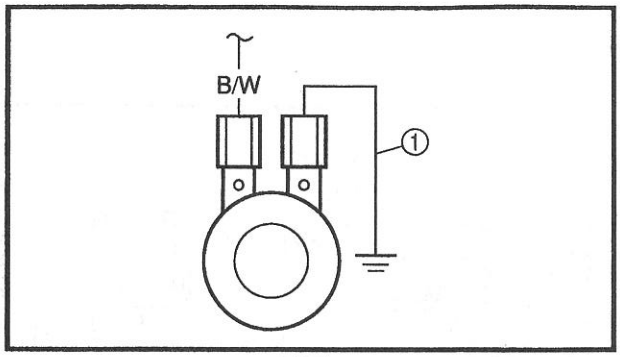
- Turn the main switch to "ON".
- Turn the "TURN" switch to "L" or "R".
- Check for voltage (12V) on the "Brown/White" ① lead at the flasher relay terminal.

OUT OF SPECIFICATION

Flasher relay is faulty, replace.

MEETS SPECIFICATION

*



HORN IS SOUNDED

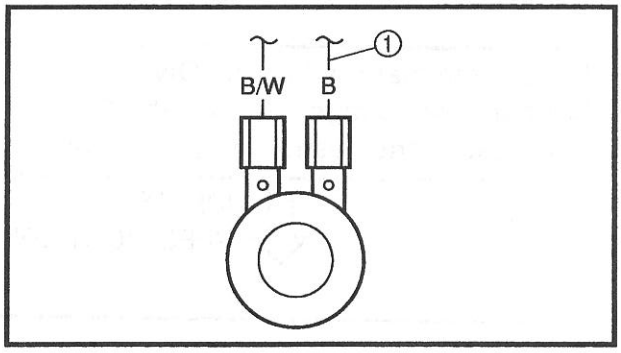
Horn is good.

HORN IS NOT SOUNDED

4.Voltage

- Connect the pocket tester (DC 20V) to the horn at the "Black" terminal.

Tester (+) lead → Black lead ①
Tester (–) lead → Frame ground



- Turn the main switch to "ON".
- Check for voltage (12V) on the "Black" lead at the horn terminal.

OUT OF SPECIFICATION

Replace horn.

MEETS SPECIFICATION

Adjust or replace horn.

2.Brake light does not come on.

1.Bulb and bulb socket

- Check the bulb and bulb socket for continuity.

NO CONTINUITY

Replace bulb and/or bulb socket.

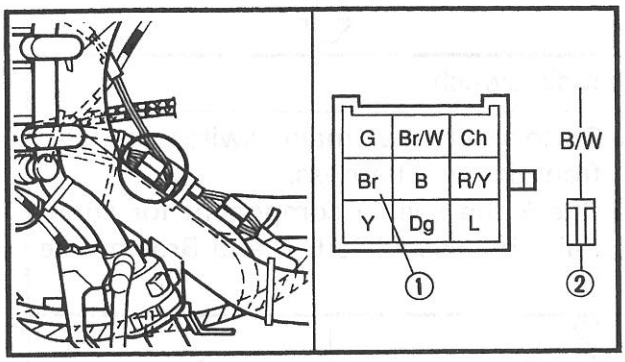
CONTINUITY

*

SIGNAL SYSTEM CHECK

1.Horn does not sound.

1."HORN" switch.



- Disconnect the handlebar switch (left) coupler from wire harness.
- Check the switch component for continuity between "Brown ① and Black/White ②".

INCORRECT

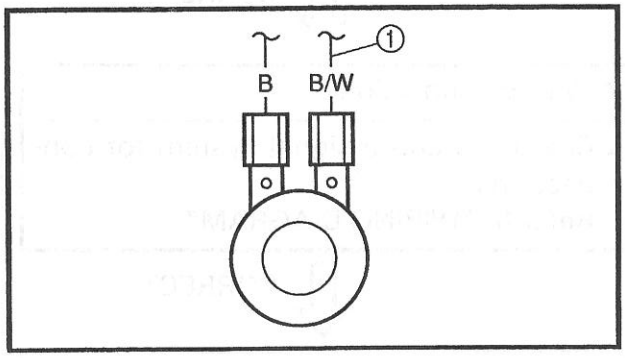
Replace handlebar switch (left).

CORRECT

2.Voltage

- Connect the pocket tester (DC 20V) to the horn lead.

Tester (+) lead→ Black/White lead ①
Tester (–) lead → Frame ground



- Turn the main switch to "ON".
- Push the "HORN" switch.
- Check for voltage (12V) on the "Black/White" lead at the horn terminal.

OUT OF SPECIFICATION

Wiring circuit from main switch to horn terminal is faulty, repair.

MEETS SPECIFICATION

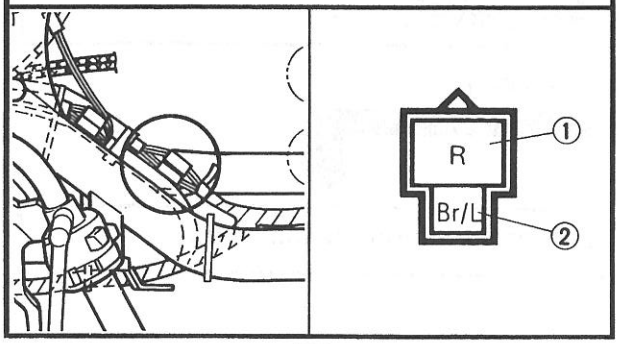
3.Horn

- Disconnect the "Black" lead at the horn terminal.
- Connect a jumper lead ① to the horn terminal and ground the jumper lead.
- Turn the main switch to "ON".

*

3.Main switch

- Disconnect the main switch coupler from the wire harness.
- Check the switch component for continuity between "Red ① and Brown/Blue ②".



INCORRECT

Replace main switch.

CORRECT

4.Wiring connection

- Check the entire signal system for connections.
  Refer to "WIRING DIAGRAM".

POOR CONNECTION

Correct.

CORRECT

Check condition of each circuit for signal system. Refer to "SIGNAL SYSTEM CHECK".

TROUBLESHOOTING

• FLASHER LIGHT, BRAKE LIGHT AND/OR INDICATOR LIGHT DO NOT COME ON.
• HORN DOES NOT SOUND.

Procedure
Check:
1.Fuse (main, signal and clock)
2.Battery
3.Main switch
4.Wiring connection (entire signal system)

NOTE:
- Remove the following parts before troubleshooting.
1)Seat
2)Side cover
3)Cowling
- Use the following special tool in this troubleshooting.

Pocket tester:
90890-03112

1.Fuse (main, signal and clock)
- Remove the fuses.
- Connect the pocket tester (Ω × 1) to the fuses.
- Check the fuses for continuity.

NO CONTINUITY → Replace fuse(s).

CONTINUITY ↓

2.Battery
- Check the battery condition. Refer to "BATTERY INSPECTION" in CHAPTER 3.

Open circuit voltage:
12.8V or more at 20°C

INCORRECT →
- Clean battery terminals.
- Recharge or replace the battery.

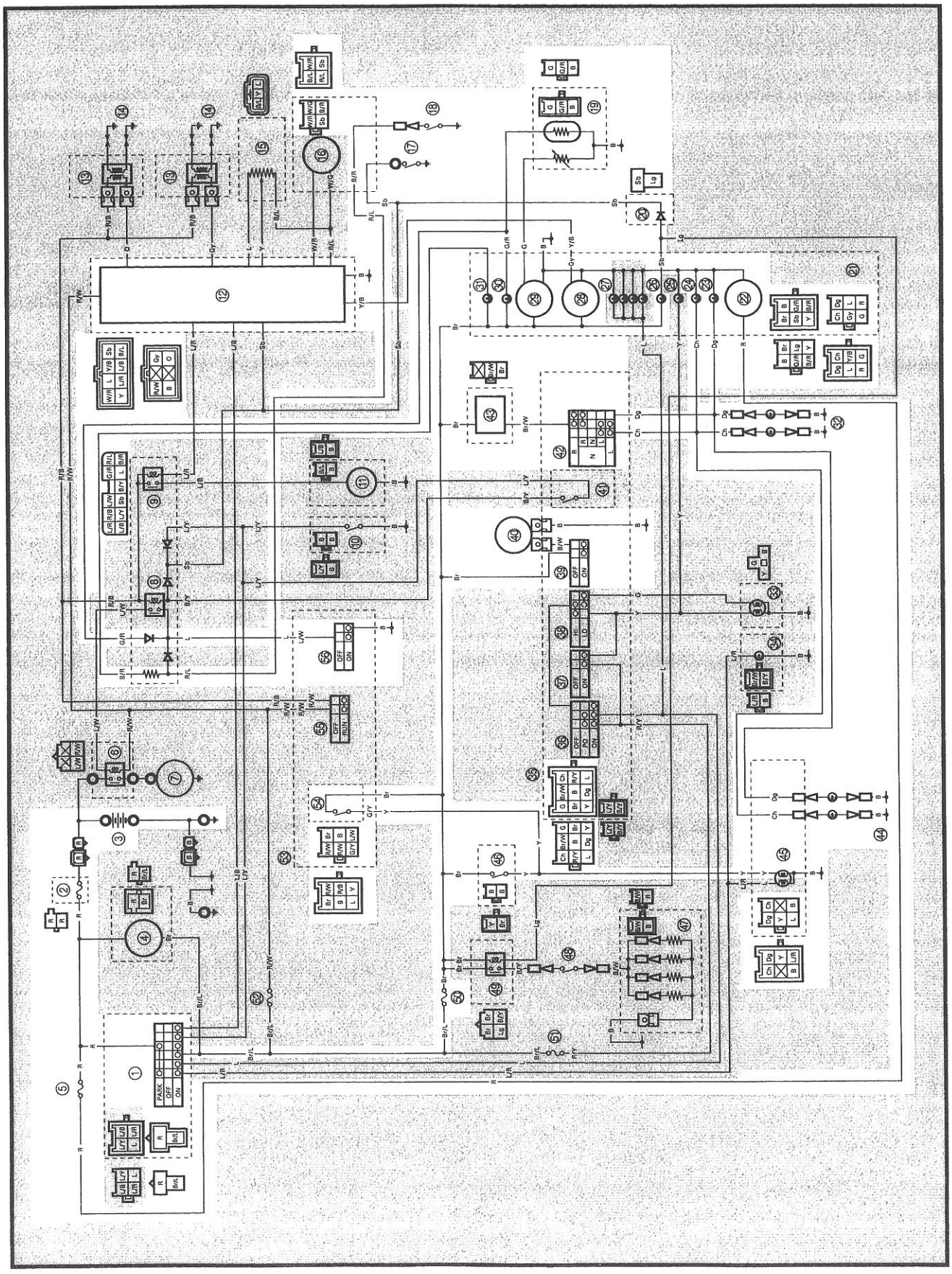
CORRECT ↓

*

① Main switch
② Fuse (main)
③ Battery
⑤ Fuse (clock)
⑫ Ignitor unit
⑰ Neutral switch
⑱ Oil level switch
⑲ Fuel sender
⑳ Diode
㉒ Clock
㉓ "TURN" indicator light (right)
㉔ "TURN" indicator light (left)
㉖ "NEUTRAL" indicator light
㉘ Tachometer
㉙ Fuel level meter
㉚ "FUEL LEVEL" indicator light
㉛ "OIL LEVEL" indicator light
㉜ Front flasher light
㉟ "HORN" switch
㊵ Horn
㊷ "TURN" switch
㊸ Flasher relay
㊹ Rear flasher light
㊺ Tail/brake light
㊻ Rear brake switch
㊿ Fuse (signal)
54 Front brake switch
56 "START" switch

SIGNAL SYSTEM

CIRCUIT DIAGRAM



- Turn the main switch to "ON".
- Turn the "LIGHTS" switch to "ON" or "PO" position.
- Check for voltage (12V) on the "Blue/Red" lead at the bulb socket connector.

OUT OF SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

MEETS SPECIFICATION

This circuit is good.

3.Auxiliary light does not come on.

1.Bulb and bulb socket

- Check the bulb and bulb socket for continuity.

NO CONTINUITY

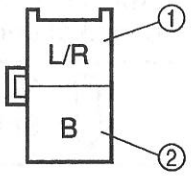
Bulb and/or socket are faulty, replace.

CONTINUITY

2.Voltage

- Connect the pocket tester (DC 20V) to the bulb socket connector.

Tester (+) lead → Blue/Red terminal ①
Tester (–) lead → Black terminal ②



- Turn the main switch to "ON".
- Turn the "LIGHTS" switch to "ON" or "PO" position.
- Check for voltage (12V) on the "Blue/Red" lead at the bulb socket connector.

OUT OF SPECIFICATION

Wiring circuit from main switch to bulb socket connector is faulty, repair.

MEETS SPECIFICATION

This circuit is good.

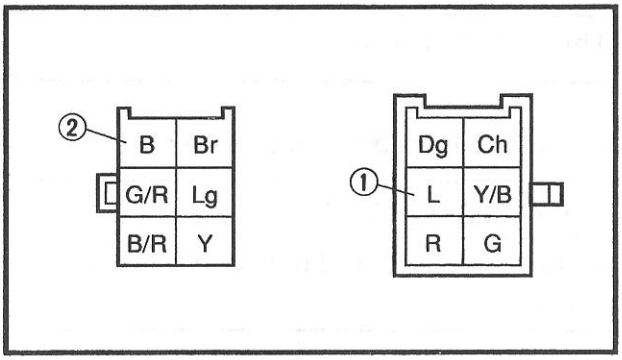
2.Meter light does not come on.

1.Bulb and bulb socket
• Check the bulb and bulb socket for continuity.

NO CONTINUITY → Replace bulb and/or bulb socket.

CONTINUITY ↓

2.Voltage
• Connect the pocket tester (20V) to the bulb socket coupler.
Tester (+) lead → Blue terminal ① **Tester (–) lead → Black terminal ②**



- Turn the main switch to "ON".
- Turn the "LIGHTS" switch to "ON" or "PO" position.
- Check for voltage (12V) on the "Blue" lead at the bulb socket connector.

OUT OF SPECIFICATION → Wiring circuit from main switch to bulb socket connector is faulty, repair.

MEETS SPECIFICATION ↓

This circuit is good.

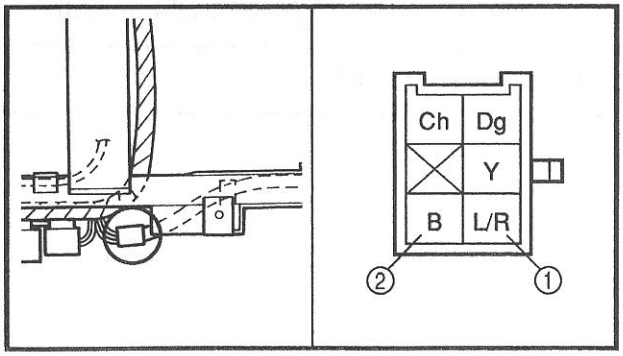
3.Taillight does not come on.

1.Bulb and bulb socket
• Check the bulb and bulb socket for continuity.

NO CONTINUITY → Replace bulb and/or bulb socket.

CONTINUITY ↓

2.Voltage
• Connect the pocket tester (DC 20V) to the bulb socket connector.
Tester (+) lead → Blue/Red terminal ① **Tester (–) lead → Black terminal ②**



LIGHTING SYSTEM CHECK

1.Headlight and "HIGH BEAM" indicator light does not come on.

1.Bulb and bulb socket

- Check the bulb and bulb socket for continuity.

NO CONTINUITY → Replace bulb and/or bulb socket.

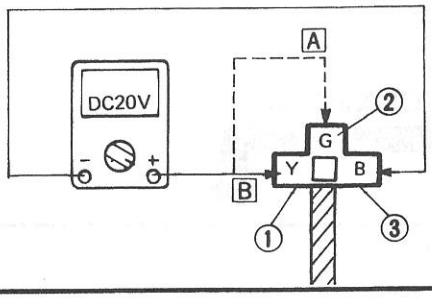
CONTINUITY ↓

2.Voltage

- Connect the pocket tester (DC 20V) to the headlight and "HIGH BEAM" indicator light couplers.

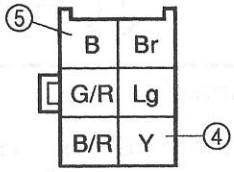
[A] When "LIGHTS" (dimmer) switch is "LO" position.
[B] When "LIGHTS" (dimmer) switch is "HI" position.

Headlight connector



Head light:
Tester (+) lead → Yellow ① or Green ② lead.
Tester (–) lead → Black ③ lead.
"HIGH BEAM" indicator light:
Tester (+) lead → Yellow ④ lead.
Tester (–) lead → Black ⑤ lead.

[B] Meter connector



- Turn the main switch to "ON".
- Turn the "LIGHTS" switch to "ON" position.
- Turn the "LIGHTS" (dimmer) switch to "LO" or "HI" position.
- Check for voltage (12V) on the "Green" and "Yellow" lead at bulb socket connectors.

OUT OF SPECIFICATION → Wiring circuit from main switch to bulb socket connector is faulty, repair.

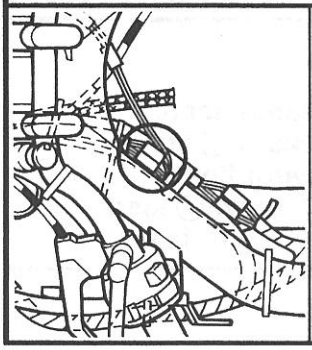
MEETS SPECIFICATION ↓

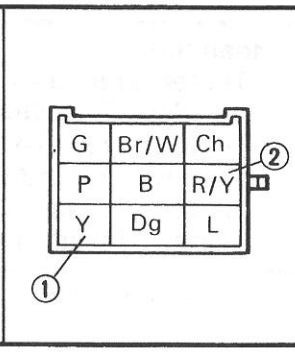
This circuit is good.

*

5."PASS" switch

- Disconnect the handlebar switch (left) coupler from the wire harness.
- Check the switch component for the continuity between "Yellow ① and Red/Yellow ②".





INCORRECT

"PASS" switch is faulty, replace handlebar switch (left).

CORRECT

6.Wiring connection

- Check the entire lighting system for connections.
  Refer to "WIRING DIAGRAM".

POOR CONNECTION

Correct.

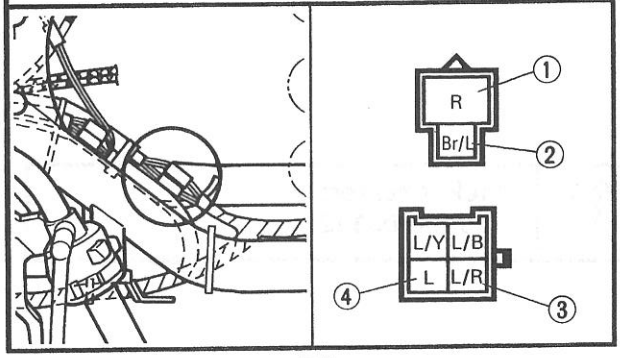
CORRECT

Check condition of each circuit for lighting system.
Refer to "LIGHTING SYSTEM CHECK".

*

3.Main switch

- Disconnect the main switch coupler from the wire harness.
- Check the switch component for continuity between "Red ① and Brown/Blue ②", "Blue/Red ③ and Blue ④", "Red ① and Blue/Red ③".



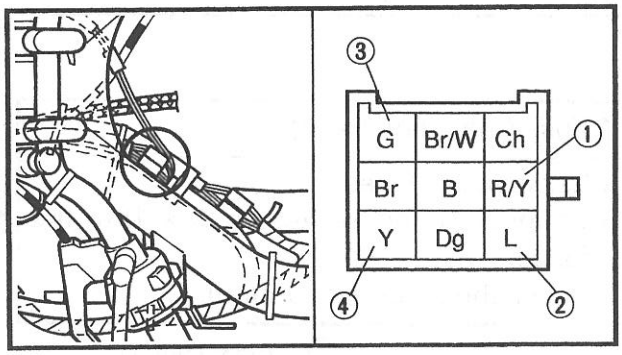
INCORRECT

Replace main switch.

CORRECT

4."LIGHTS" switch/"LIGHTS" (dimmer) switch

- Disconnect the handlebar switch (left) coupler from the wire harness.
- Turn the "LIGHTS" switch to the "ON" or "PO".
- Check the switch component for continuity between "Red/Yellow ① and Blue ②".
- Turn the "LIGHTS" (dimmer) switch to the "LO".
- Check the switch component for continuity between "Red/Yellow ① and Green ③".
- Set the position of the "LIGHTS" (dimmer) switch to the "HI".
- Check the switch component for continuity between "Red/Yellow ① and Yellow ④".



INCORRECT

"LIGHTS" switch/"LIGHTS" (dimmer) switch are faulty, replace handlebar switch (left).

CORRECT

*

TROUBLESHOOTING

HEADLIGHT "HIGH BEAM" INDICATOR LIGHT, TAILLIGHT, AUXILIARY LIGHT AND/OR METER LIGHT DO NOT COME ON.

Procedure

Check:
1. Fuse (main and head)
2. Battery
3. Main switch
4. "LIGHTS" switch/"LIGHTS" (dimmer) switch
5. "PASS" switch
6. Wiring connection (entire lighting system)

NOTE:
- Remove the following parts before troubleshooting.
  1) Seat
  2) Side cover
  3) Cowling
- Use the following special tool(s) in this troubleshooting.

Pocket tester:
90890-03112

1. Fuse (main and head)
- Remove the fuses.
- Connect the pocket tester (Ω × 1) to the fuses.
- Check the fuses for continuity.

NO CONTINUITY → Replace fuse(s).

CONTINUITY ↓

2. Battery
- Check the battery condition. Refer to "BATTERY INSPECTION" in CHAPTER 3.

Open circuit voltage:
12.8V or more at 20°C

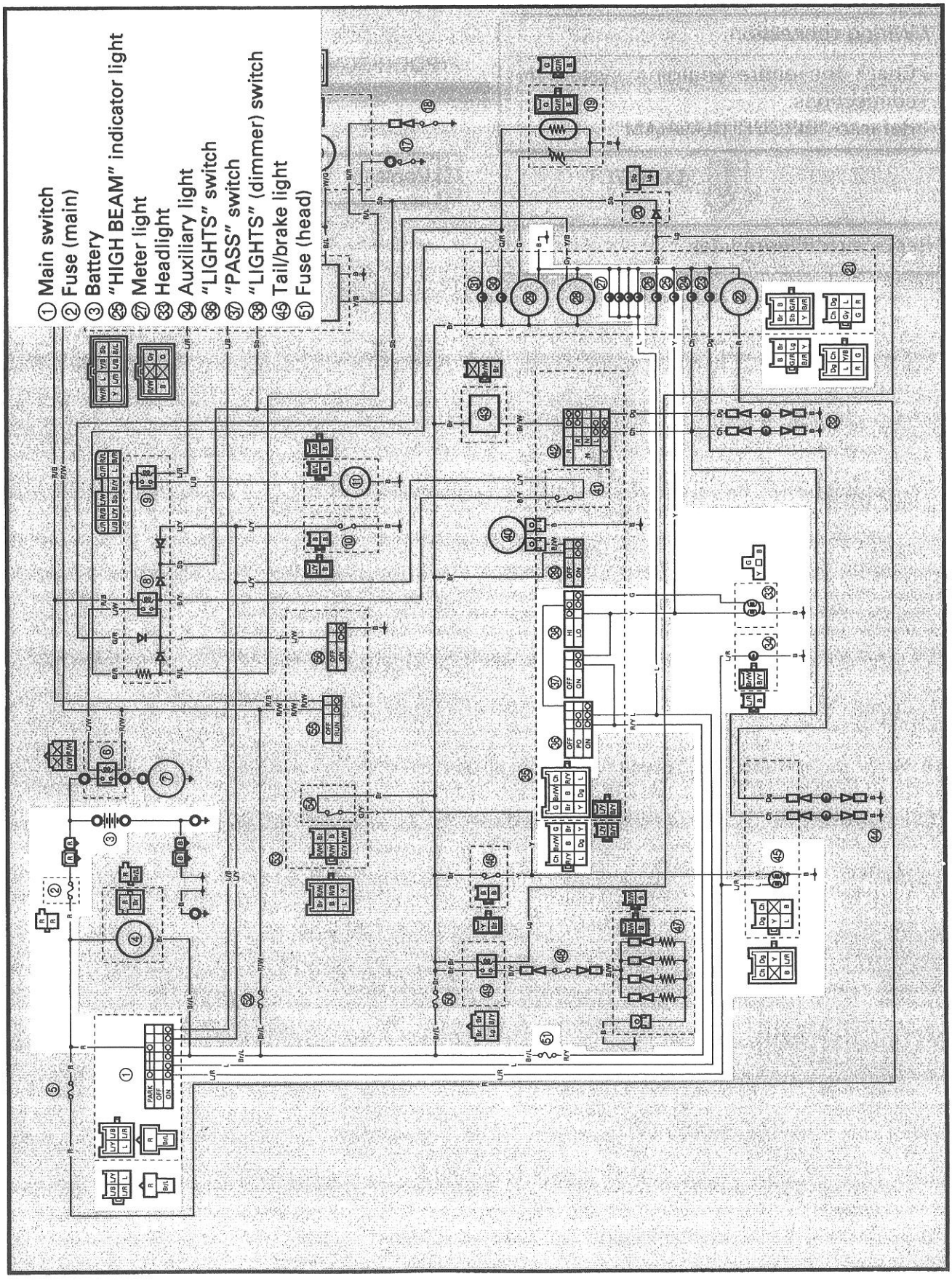
INCORRECT →
- Clean battery terminals.
- Recharge or replace the battery.

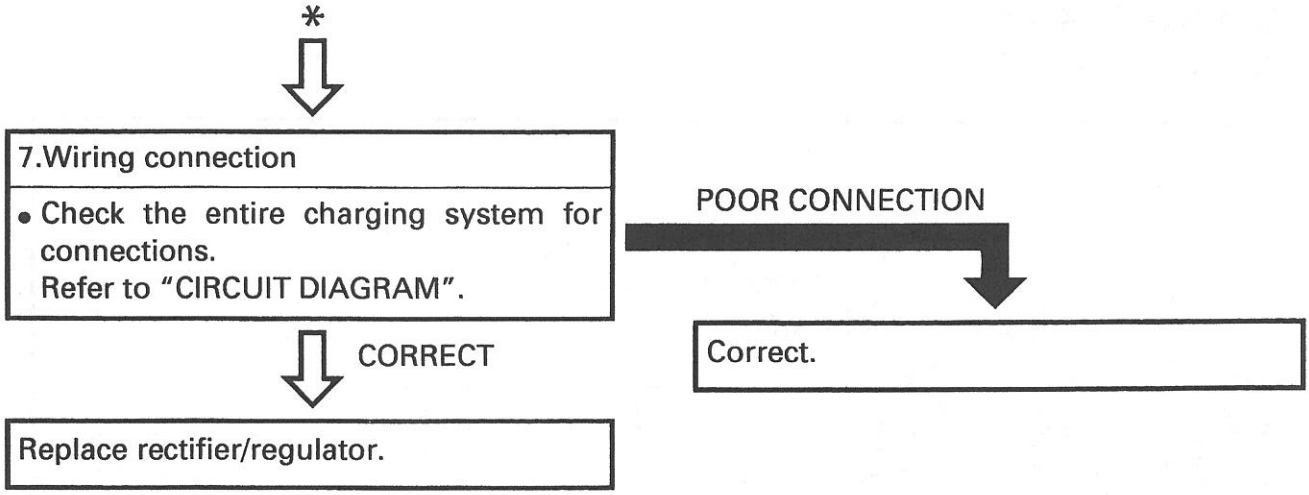
CORRECT ↓

*

LIGHTING SYSTEM

CIRCUIT DIAGRAM

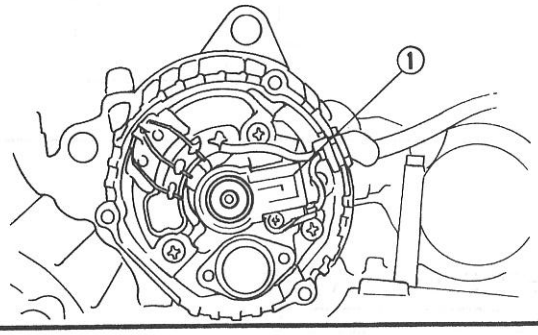



*
7.Wiring connection
• Check the entire charging system for connections.
Refer to "CIRCUIT DIAGRAM".
POOR CONNECTION
Correct.
CORRECT
Replace rectifier/regulator.

*

5.Brush inspection

- Remove the brush holder ①.
- Inspect the brush spring.
- Check the brush length.



Brush spring force:
520 ~ 580 g

INCORRECT

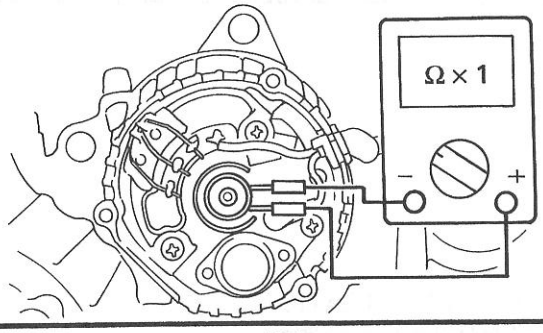
Replace the brush and spring.

CORRECT

6.Field coil (rotor) resistance

- Connect the pocket tester "Ω × 1" to the rotor.
- Measure the resistance.

Field coil (rotor) resistance:
2.76 ~ 3.05 Ω at 20°C



OUT OF SPECIFICATION

Replace field coil (rotor).

MEETS SPECIFICATION

*

*

3.Charging voltage

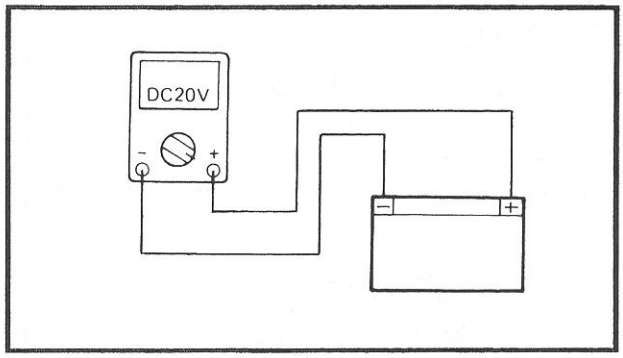
- Connect the inductive tachometer to spark plug lead.
- Connect the pocket tester (DC 20V) to the battery.

Tester (+) lead → Battery (+) terminal
Tester (–) lead → Battery (–) terminal

- Start the engine and accelerate to about, 3,000 r/min.
- Check charging voltage.

Charging voltage:
14V at 3,000 r/min

NOTE:
Use a full charged battery.



MEETS SPECIFICATION

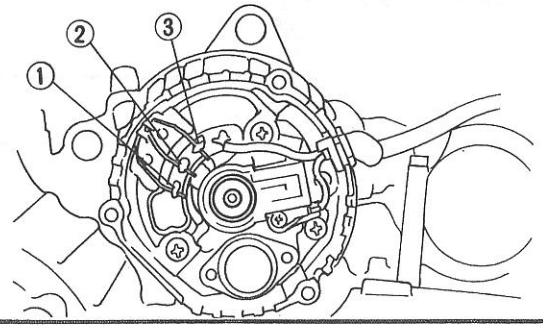
Charging circuit is good.

OUT OF SPECIFICATION

4.Stator coil resistance

- Remove the generator cover.
- Connect the pocket tester "Ω × 1" to the stator coils.
- Measure the stator coil resistance.

Stator coil resistance:
0.19 ~ 0.21 Ω at 20°C



Tester (+) lead → White lead ①
Tester (–) lead → White lead ②

Tester (+) lead → White lead ①
Tester (–) lead → White lead ③

OUT OF SPECIFICATION

Replace stator assembly.

BOTH MEET SPECIFICATION

*

TROUBLESHOOTING

THE BATTERY IS NOT CHARGED.

Procedure

Check:

1. Fuse (main)
2. Battery
3. Charging voltage
4. Stator coil resistance
5. Brush inspection
6. Field coil (rotor) resistance
7. Wiring connection (entire charging system)

NOTE:

- Remove the following parts before troubleshooting.
  1) Seat
  2) Side cover
  3) Fuel tank
  4) Air filter case
- Use the following special tool(s) in this troubleshooting.

Inductive tachometer:
90890-03113
Pocket tester:
90890-03112

1.Fuse (main)

- Remove the fuses.
- Connect the pocket tester (Ω × 1) to the fuses.
- Check the fuses for continuity.

NO CONTINUITY → Replace fuse(s).

CONTINUITY ↓

2.Battery

- Check the battery condition. Refer to "BATTERY INSPECTION" in CHAPTER 3.

Open circuit voltage:
12.8V or more at 20°C

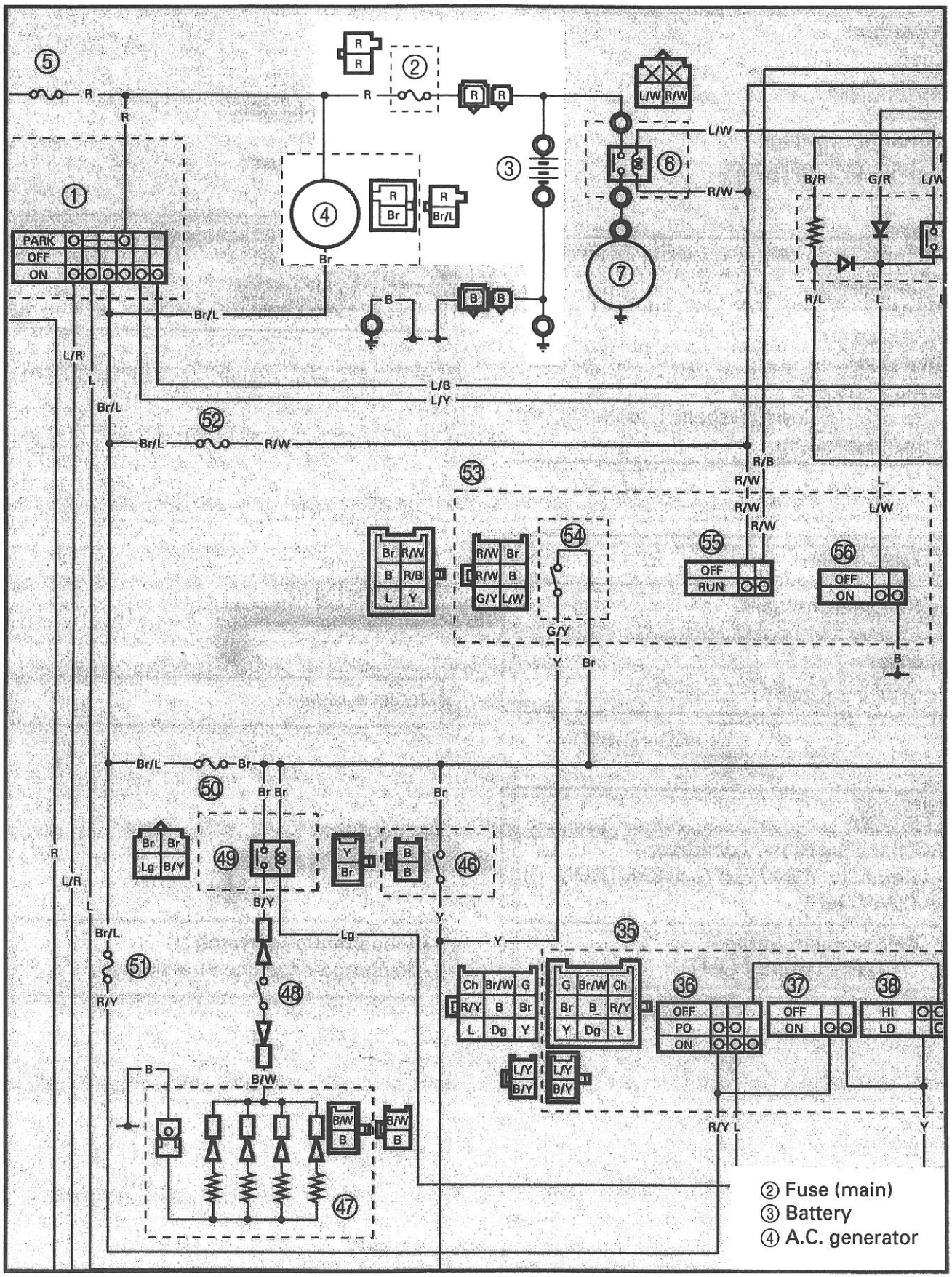
INCORRECT →
- Clean battery terminals.
- Recharge or replace the battery.

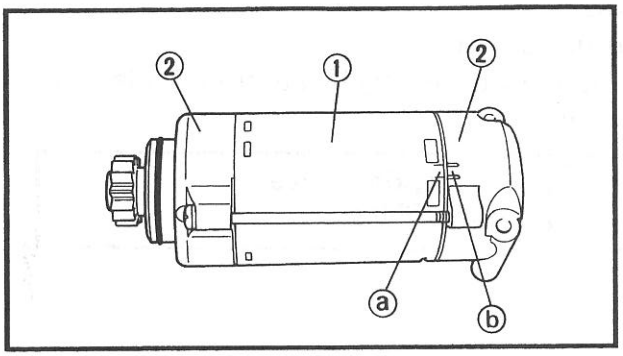
CORRECT ↓

*

CHARGING SYSTEM

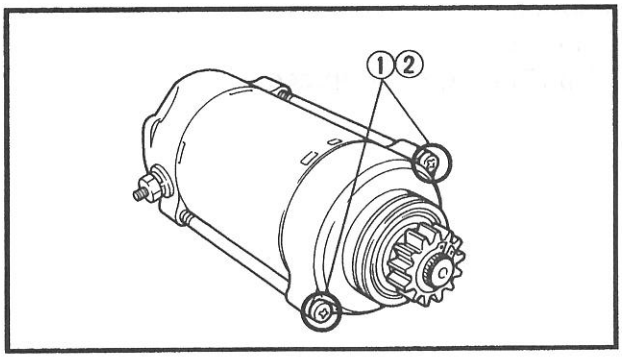
CIRCUIT DIAGRAM





3.Install:
- Yoke ①
- Brackets ②

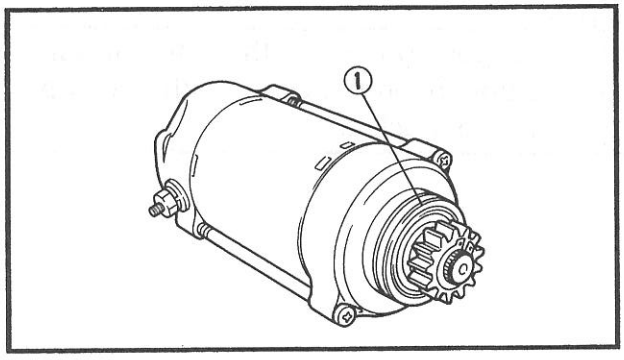
NOTE:
Align the match marks ⓐ on the yoke with the match marks ⓑ on the brackets.



4.Install:
- O-rings ①
- Washer
- Bolts ②

⚠ WARNING
Always use new O-rings.

	Bolt (yoke assembly): **7 Nm (0.7 m • kg)**



Installation

1.Install:
- Starter motor

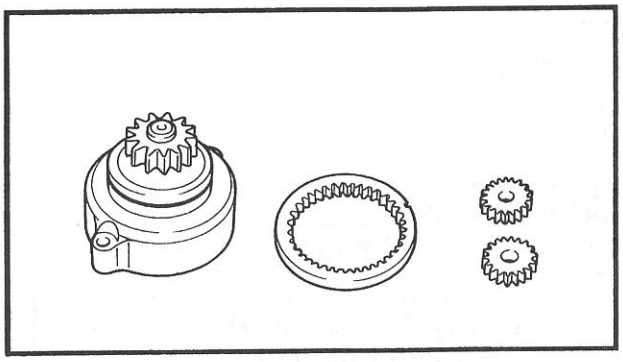
NOTE:
Apply a grease lightly to the O-ring ①.

	Bolt (starter motor): **12 Nm (1.2 m • kg)** **Bolt (starter motor):** **7 Nm (0.7 m • kg)** **YAMAHA Bond No. 1215**

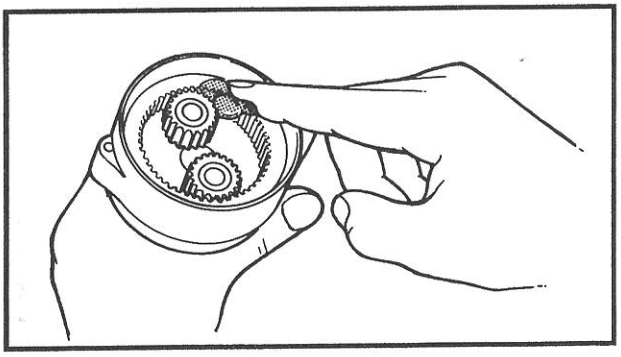
Refer to "ENGINE ASSEMBLY AND ADJUSTMENT" in CHAPTER 4.

6.Measure:
- Brush spring force
  Fatigue/Out of specification → Replace as a set.

	Brush spring force: **650 ~ 950 g**

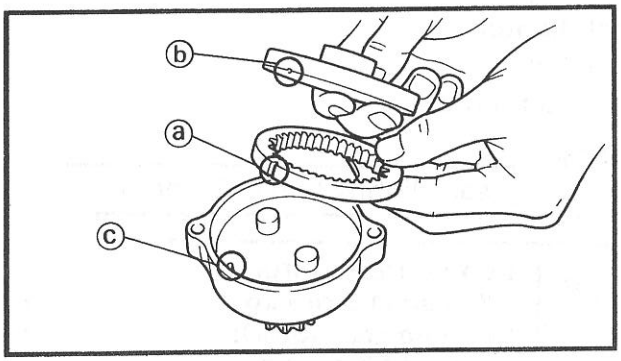


7.Inspect:
- Gear teeth
  Wear/Damage → Replace.

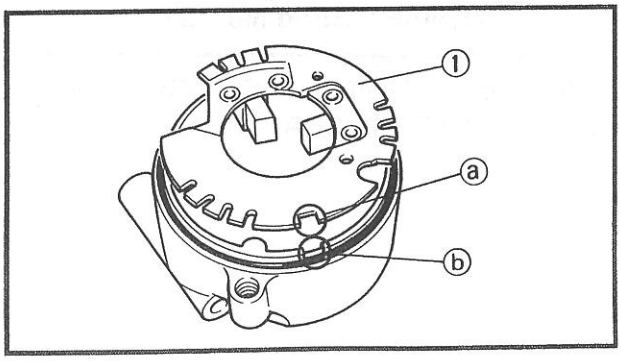


Assembly
Reserve the "Removal" procedure.
Note the following points.
1.Install:
- Gears
- Cover

NOTE:
Apply a molybdenum grease to the gears.

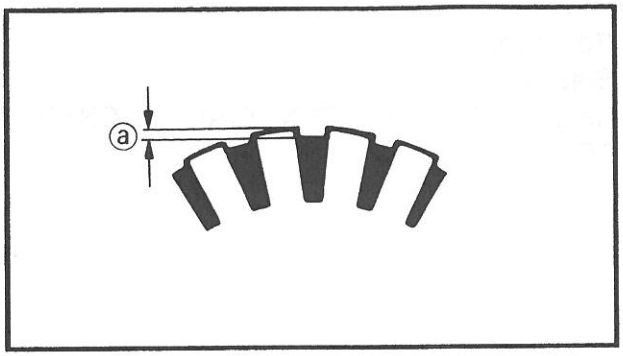


NOTE:
Align the position ⓐ on the internal gear and position ⓑ on the cover with the stopper ⓒ on the bracket.



2.Install:
- Brush seat ①

NOTE:
Align the projection ⓐ on the brush seat with the match make ⓑ on the yoke.

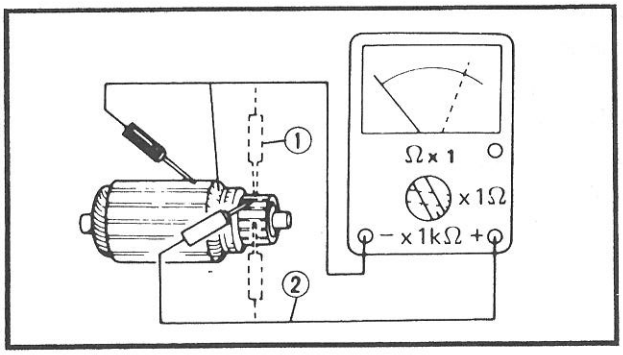


Commutator wear limit:
27 mm

3.Measure:
- Mica undercut ⓐ
  Out of specification → Scrape the mica to proper value (a hacksaw blade can be ground to fit).

Mica undercut:
0.6 mm

NOTE:
The mica insulation of the commutator must be undercut to ensure proper operation of commutator.



4.Inspect:
- Armature coil (insulation/continuity)
  Defects → Replace starter motor.

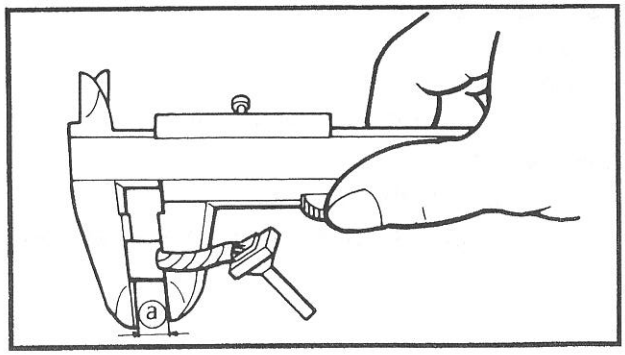
****

Inspecting steps:
- Connect the pocket tester for continuity check ① and insulation check ②.
- Measure the armature resistances.

Armature coil resistance:
Continuity check ①:
0.013 ~ 0.015 Ω at 20°C
Insulation check ②:
More than 1 MΩ at 20°C

- If the resistance is incorrect, replace the starter motor.

****



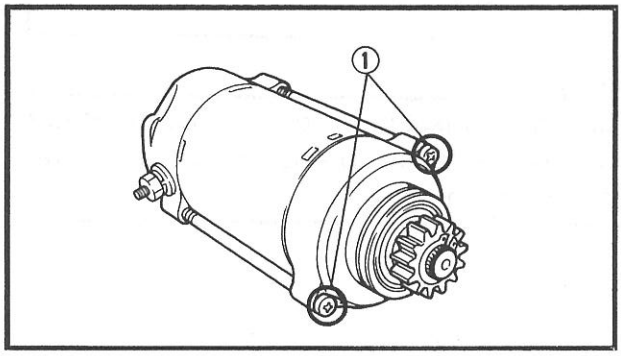
5.Measure:
- Brush length ⓐ
  Out of specification → Replace.

Brush length limit:
8.5 mm

Removal

1.Remove:

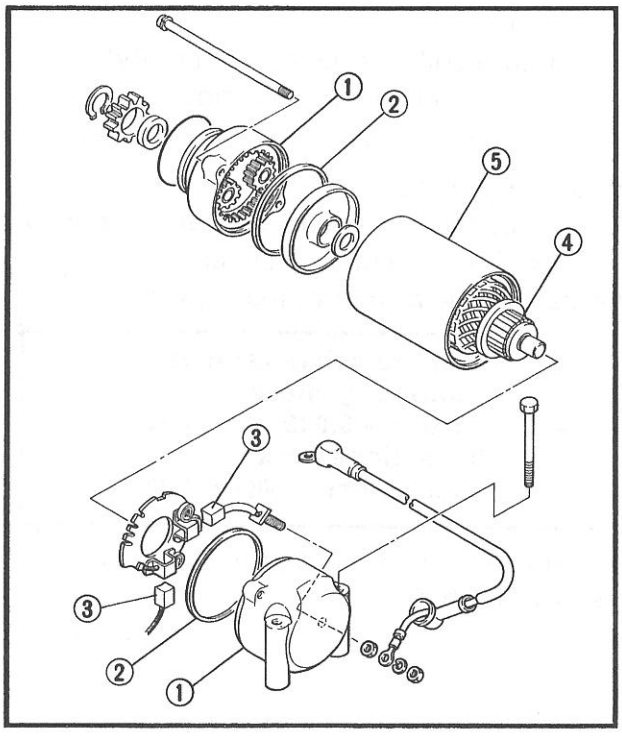
- Starter motor
  Refer to "ENGINE REMOVAL" in CHAPTER 4.



Disassembly

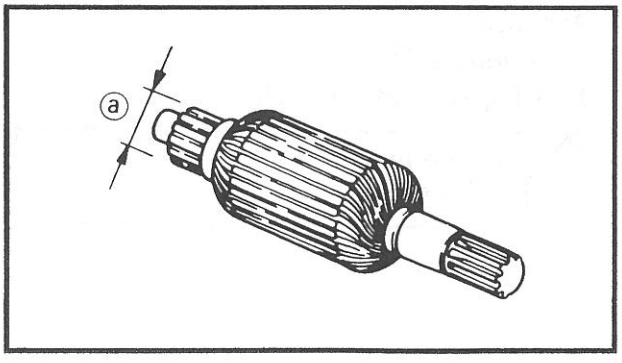
1.Remove:

- Bolts ①
  (with washer and O-ring)



2.Remove:

- Bracket ①
- O-ring ②
- Brush ③
- Armature ④
- Yoke ⑤



Inspection and repair

1.Inspect:

- Commutator
  Dirty → Clean it with #600 grit sandpaper.

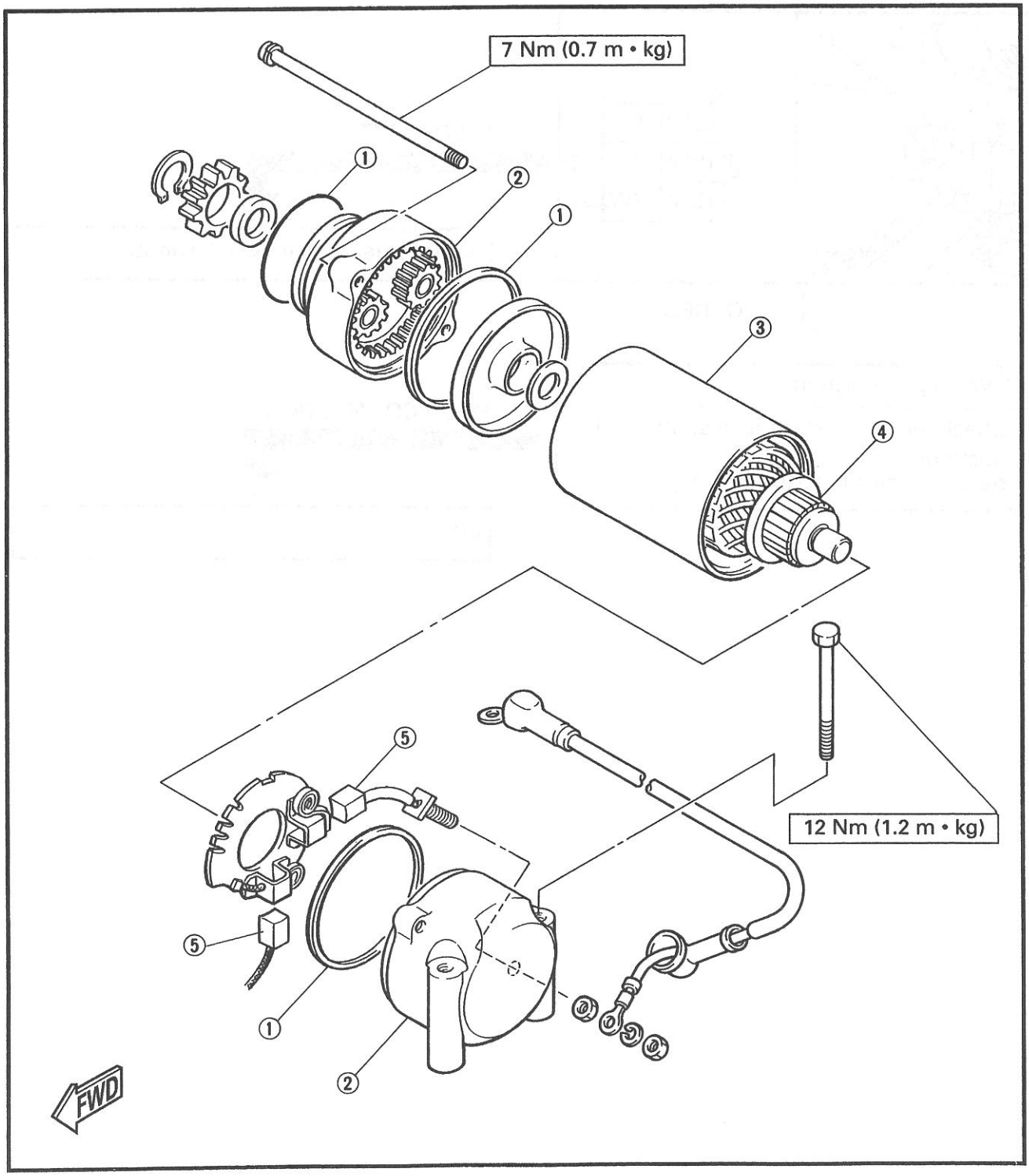
2.Measure:

- Commutator diameter ⓐ
  Out of specification → Replace starter motor.

STARTER MOTOR

① O-ring
② Bracket
③ Yoke
④ Armature
⑤ Brush

A	ARMATURE COIL RESISTANCE: 0.013 ~ 0.015 Ω at 20°C
B	BRUSH WEAR LIMIT: 8.5 mm
C	COMMUTATOR WEAR LIMIT: 27 mm
D	MICA UNDERCUT: 0.6 mm



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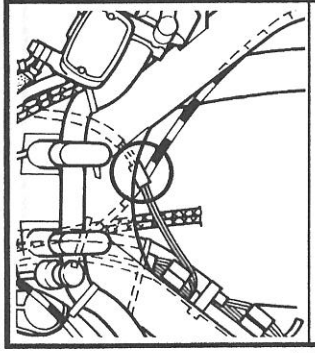
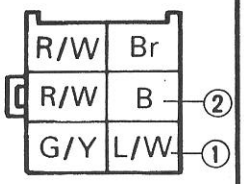
11."START" switch

- Disconnect handlebar switch (right) coupler from wire harness.
- Check the "START" switch component for continuity between "Blue/White ① and Black ② ".





INCORRECT

Replace handlebar switch (right).

CORRECT

12.Wiring connection

- Check the entire starting system for connections.
  Refer to "CIRCUIT DIAGRAM".

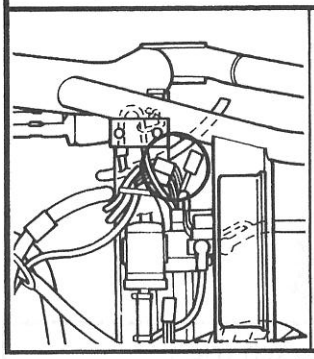
POOR CONNECTION

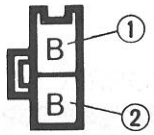
Correct.

*

9.Sidestand switch

- Disconnect the sidestand switch coupler from the wire harness.
- Check the switch component for continuity between "Black ① and Black ②".





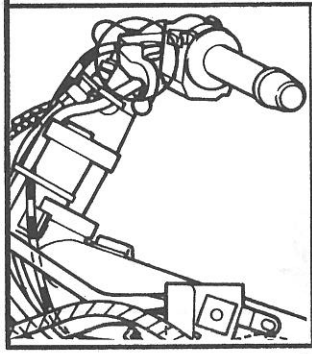
INCORRECT

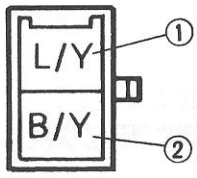
Replace sidestand switch.

CORRECT

10.Clutch switch

- Disconnect the clutch switch coupler from the wire harness.
- Check the clutch switch component for continuity between "Blue/Yellow ① and Black/Yellow ②".





INCORRECT

Replace clutch switch.

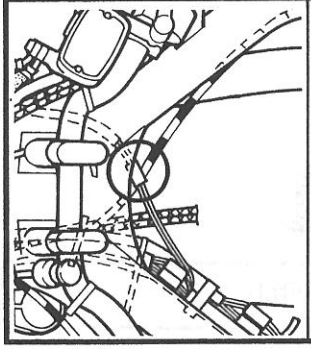
CORRECT

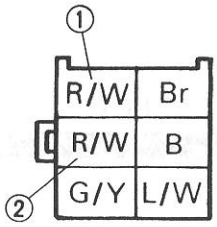
*

*

7."ENGINE STOP" switch

- Disconnect the handlebar switch (right) coupler from the wire harness.
- Check the switch component for continuity between "Red/White ① and Red/White ②".





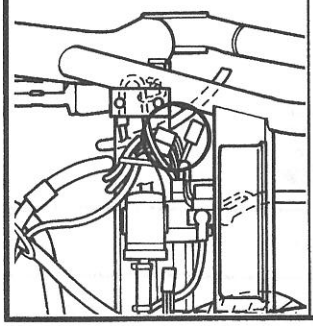
INCORRECT

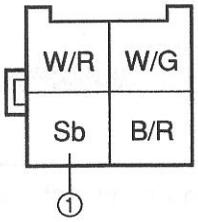
Replace handlebar switch (right).

CORRECT

8.Neutral switch

- Disconnect the neutral switch coupler from the wire harness.
- Check the switch component for continuity between "Sky blue ①" and Ground.





INCORRECT

Replace neutral switch.

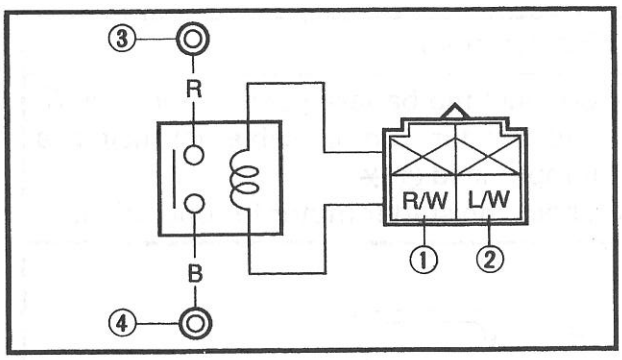
CORRECT

*

*

5.Starter relay

- Disconnect the relay unit coupler from the wire harness.
- Connect the pocket tester (Ω × 1) and battery (12V) to the relay unit coupler terminals.



Battery (+) terminal →
Red/White terminal ①
Battery (–) terminal →
Blue/White terminal ②

Tester (+) lead → Red terminal ③
Tester (–) lead → Black terminal ④

- Check the starter relay for continuity.

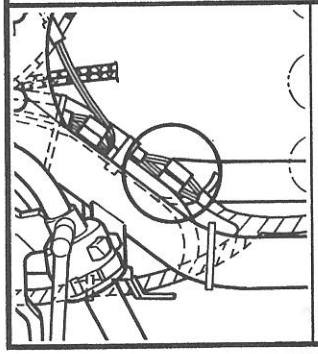
NO CONTINUITY

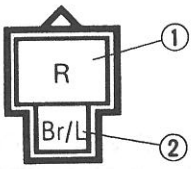
Replace starter relay.

CONTINUITY

6.Main switch

- Disconnect the main switch coupler from the wire harness.
- Check the switch component for continuity between "Red ① and Brown/Blue ②".





INCORRECT

Replace main switch.

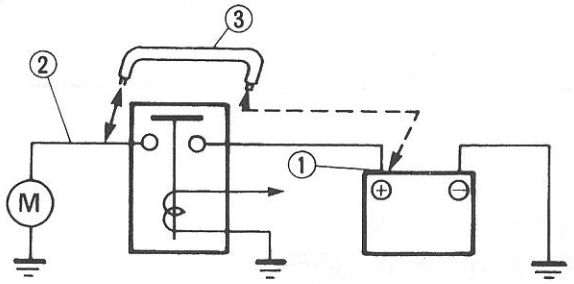
CORRECT

*

*

3.Starter motor

- Connect the battery positive terminal ① and starter motor cable ② using a jumper lead ③ *.
- Check the starter motor for operation.



*

⚠ WARNING

- **A wire for jumper lead must have the equivalent capacity as that of the battery lead or more, otherwise it may cause the jumper lead to be burned.**
- **This check is likely to produce sparks, so be sure that no flammable gas or fluid is in the vicinity.**

DOES NOT MOVE

Repair or replace starter motor.

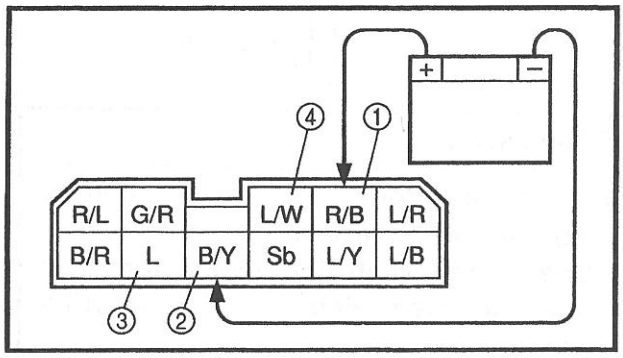
MOVES

4.Starting circuit cut-off relay

- Disconnect the starting circuit cut-off relay coupler from the wire harness.
- Connect the pocket tester (Ω × 1) and battery (12V) to the starting circuit cut-off relay coupler terminals.

Battery (+) terminal →
Red/Black terminal ①
Battery (–) terminal →
Black/Yellow terminal ②

Tester (+) terminal → Blue terminal ③
Tester (–) terminal →
Blue/White terminal ④



- Check the starting circuit cut-off relay for continuity.

NO CONTINUITY

Replace starting circuit cut-off relay.

CONTINUITY

*

TROUBLESHOOTING

STARTER MOTOR DOES NOT OPERATE.

Procedure

Check:

1. Fuse (main and ignition)
2. Battery
3. Starter motor
4. Starting circuit cut off-relay
5. Starter relay
6. Main switch
7. "ENGINE STOP" switch
8. Neutral switch
9. Sidestand switch
10. Clutch switch
11. "START" switch
12. Wiring connection (entire starting system)

NOTE:

- Remove the following parts before troubleshooting.
  1) Seat
  2) Fuel tank
  3) Air filter case
  4) Side cover
- Use the following special tool(s) in this troubleshooting.

Pocket tester:
90890-03112

1. Fuse (main and ignition)

- Remove the fuses.
- Connect the pocket tester (Ω × 1) to the fuses.
- Check the fuses for continuity.

NO CONTINUITY → Replace fuse(s).

CONTINUITY ↓

2. Battery

- Check the battery condition.
  Refer to "BATTERY INSPECTION" in CHAPTER 3.

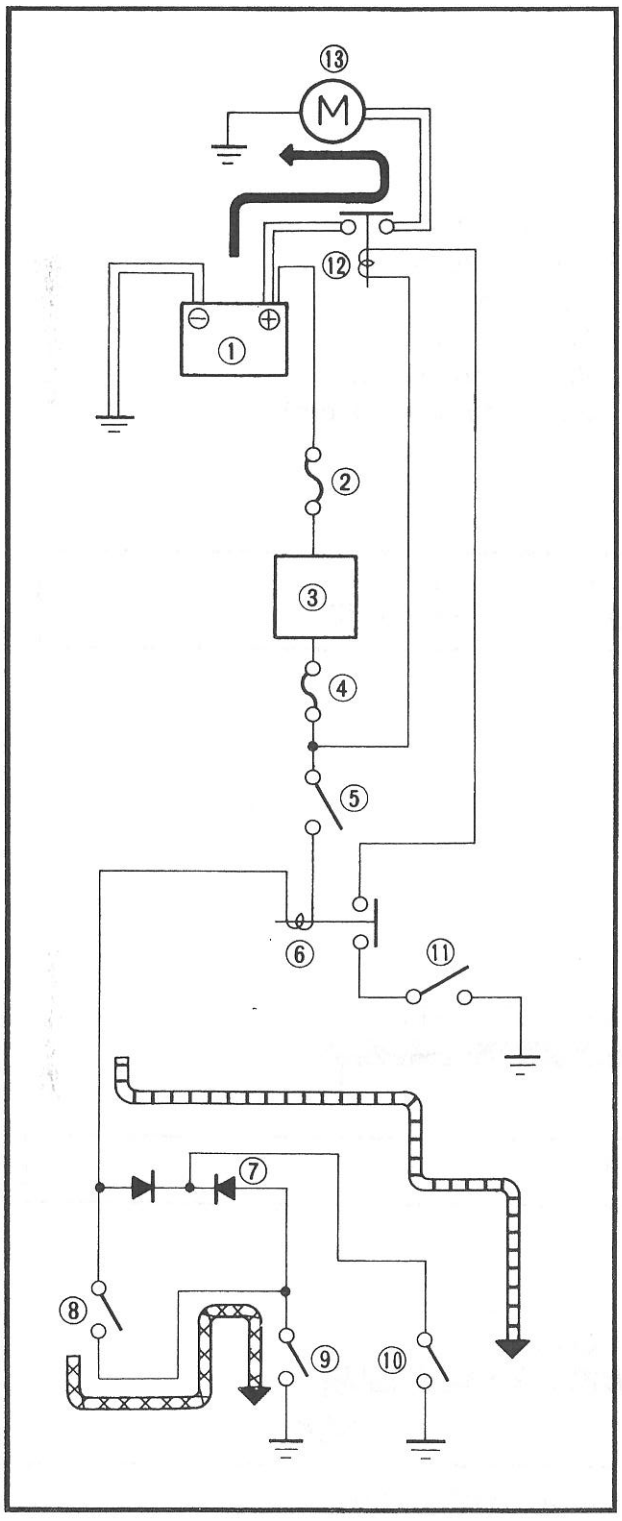
Open circuit voltage:
12.8V or more at 20°C

INCORRECT →

- Clean battery terminals.
- Recharge or replace the battery.

CORRECT ↓

*



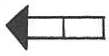
STARTING CIRCUIT OPERATION

The starting circuit on this model consists of the starter motor, starter relay, and the starting circuit cut-off relay. If the "ENGINE STOP" switch and the main switch are both closed, the starter motor can operate only if:

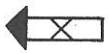
> The transmission is in neutral (the neutral switch is closed).
>
> **or if**
>
> The clutch lever is pulled to the handlebar (the clutch switch is closed) and the sidestand is up (the sidestand switch is closed).

The starting circuit cut-off relay prevents the starter from operating when neither of these conditions has been met. In this instance, the starting circuit cut-off relay is open so current cannot reach the starter motor.

When at least one of the above conditions has been met however, the starting circuit cut-off relay is closed, and the engine can be started by pressing the starter switch.



WHEN THE TRANSMISSION IS IN NEUTRAL

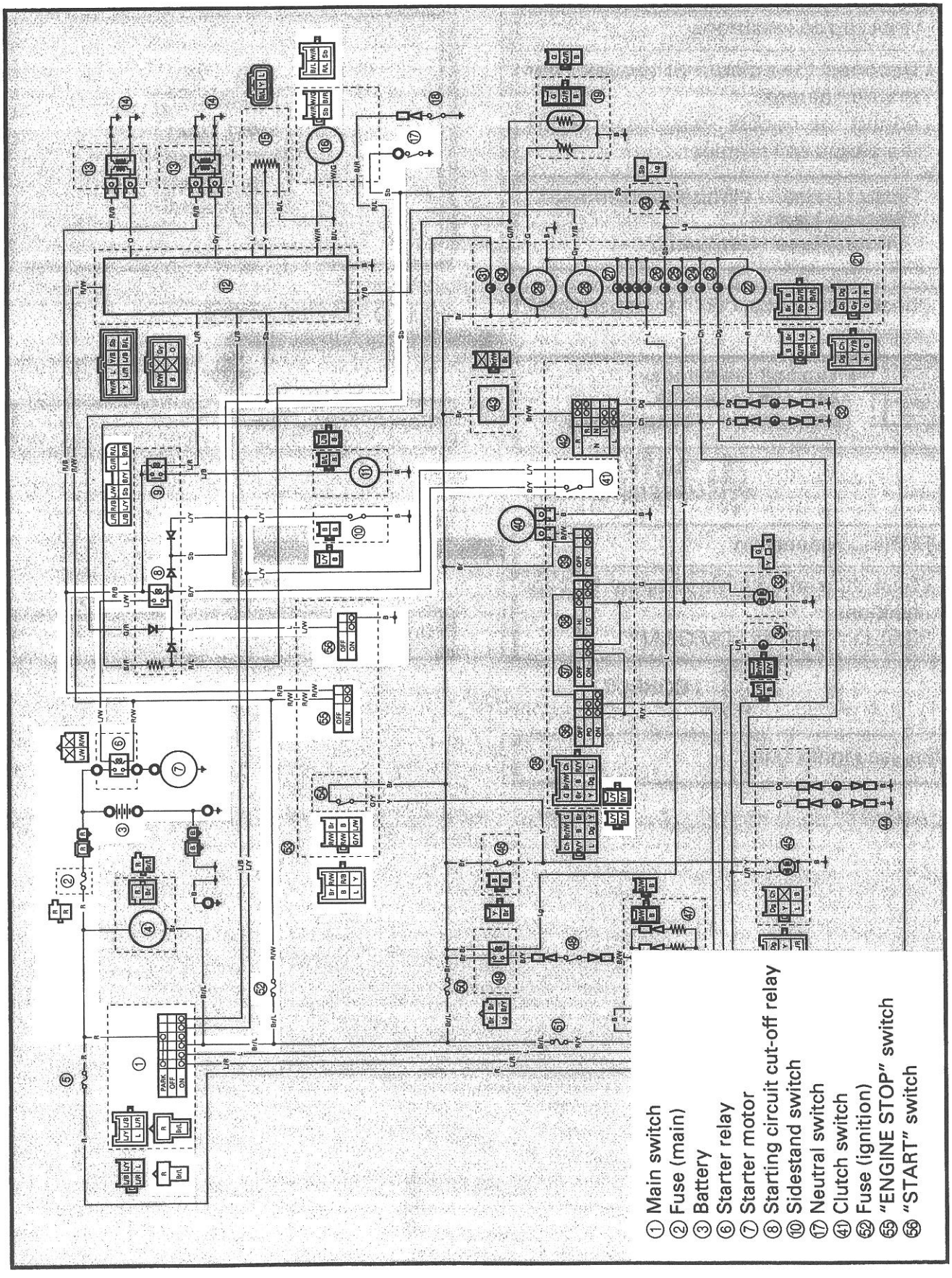


WHEN THE SIDESTAND IS UP AND THE CLUTCH LEVER IS PULLED IN

① Battery
② Fuse (main)
③ Main switch
④ Fuse (ignition)
⑤ "ENGINE STOP" switch
⑥ Starting circuit cut-off relay
⑦ Diode
⑧ Clutch switch
⑨ Sidestand switch
⑩ Neutral switch
⑪ "START" switch
⑫ Starter relay
⑬ Starter motor

ELECTRIC STARTING SYSTEM

CIRCUIT DIAGRAM

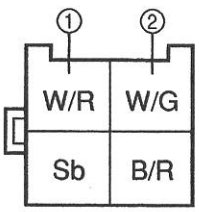


*

11.Pickup coil resistance

- Disconnect the pickup coil coupler from the wire harness.
- Connect the pocket tester (Ω × 100) to the pickup coil terminal.

Tester (+) lead → White/Red terminal ①
Tester (–) lead → White/Green terminal ②



- Check the pickup coil for specificated resistance.

Pickup coil resistance:
446 ~ 545 Ω at 20°C
(White/Red — White/Green)

OUT OF SPECIFICATION

Replace pickup coil.

MEETS SPECIFICATION

12.Wiring connection

- Check the entire ignition system for connections.
  Refer to "CIRCUIT DIAGRAM".

POOR CONNECTION

Correct.

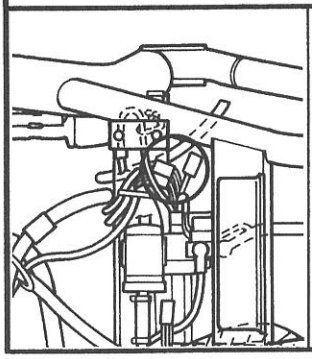
CORRECT

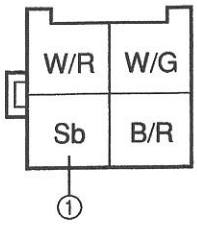
Replace ignitor unit.

*

9.Neutral switch

- Disconnect the neutral switch coupler from the wire harness.
- Check the switch component for the continuity between "Sky blue ①" and Ground.





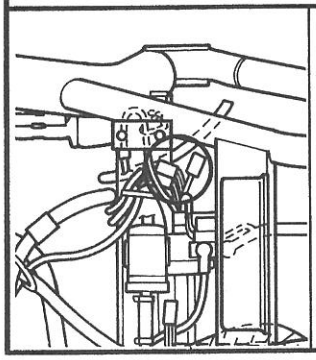
INCORRECT

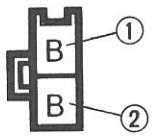
Replace neutral switch.

CORRECT

10.Sidestand switch

- Disconnect the sidestand switch coupler from the wire harness.
- Check the switch component for the continuity between "Black ① and Black ②".



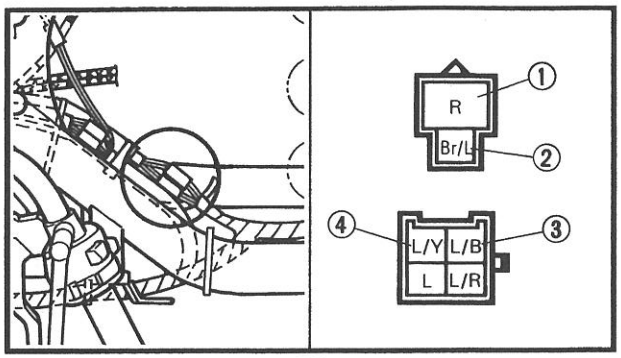


INCORRECT

Replace sidestand switch.

CORRECT

*



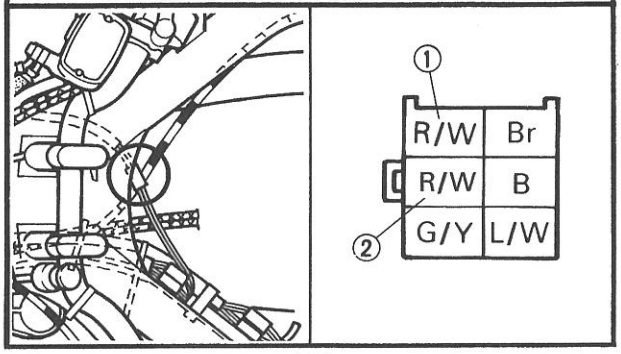
INCORRECT

Replace main switch.

CORRECT

8."ENGINE STOP" switch

- Disconnect the handlebar switch (right) coupler from the wire harness.
- Check the switch component for the continuity between "Red/White ① and Red/White ② ".



INCORRECT

Replace handlebar switch (right).

CORRECT

*

- Check the spark plug cap for specificated resistance.

Spark plug cap resistance:
10 kΩ at 20°C

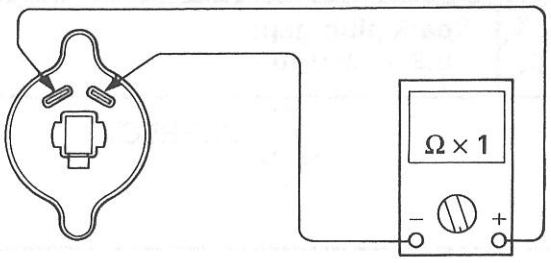
OUT OF SPECIFICATION → Replace spark plug cap.

MEETS SPECIFICATION

6.Ignition coil resistance

- Disconnect the ignition coil connector from the wire harness.
- Connect the pocket tester (Ω × 1) to the ignition coil.

Tester (+) lead → Red/Black terminal
Tester (–) lead → Orange (Gray) terminal

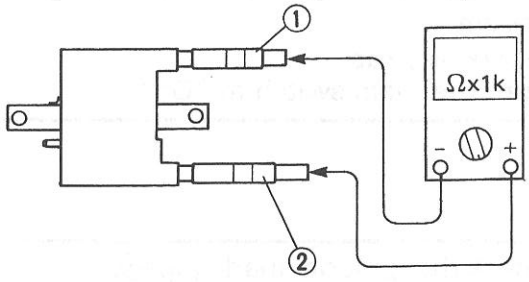


- Check the primary coil for specificated resistance.

Primary coil resistance:
1.87 ~ 2.53 Ω at 20°C

- Connect the pocket tester (Ω × 1k) to the ignition coil.

Tester (+) lead → Spark plug lead ①
Tester (–) lead → Spark plug lead ②



- Check the secondary coil for specificated resistance.

Secondary coil resistance:
12 ~ 18 kΩ at 20°C

OUT OF SPECIFICATION → Replace ignition coil.

BOTH MEET SPECIFICATION

7.Main switch

- Disconnect the main switch coupler from the wire harness.
- Check the switch component for the continuity between "Red ① and Brown/Blue ②" and "Blue/Black ③ and Blue/Yellow ④".

*

3.Spark plug

- Check the spark plug condition.
- Check the spark plug type.
- Check the spark plug gap.
  Refer to "SPARK PLUG INSPECTION" in CHAPTER 3.

Standard spark plug:
DPR8EA-9/X24EPR-U9
NGK/NIPPONDENSO

Spark plug gap:
0.8 ~ 0.9 mm

INCORRECT

CORRECT

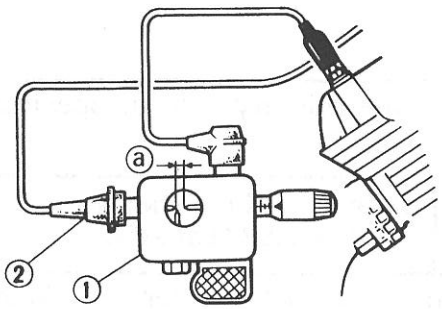
Repair or replace spark plug.

4.Ignition spark gap

- Disconnect the spark plug cap from spark plug.
- Connect the ignition checker ① as shown.

② Spark plug cap

- Turn the main switch to "ON".



- Check the ignition spark gap ⓐ.
- Crank the engine by pushing the starter switch, and increase the spark gap until a misfire occurs.

Minimum spark gap:
6.0 mm

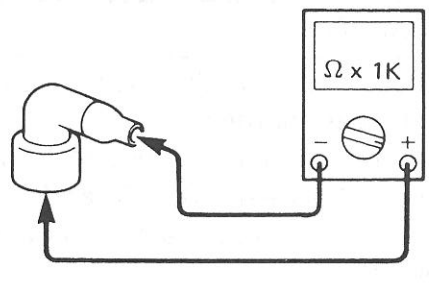
MEETS SPECIFICATION

Ignition system is good.

OUT OF SPECIFICATION OR NO SPARK

5.Spark plug cap resistance

- Remove the spark plug cap.
- Connect the pocket tester (Ω × 1k) to the spark plug cap.



TROUBLESHOOTING

IF IGNITION SYSTEM SHOULD BECOME INOPERATIVE (NO SPARK OR INTERMITTENT SPARK)

Procedure

Check:

1. Fuse (main and ignition)
2. Battery
3. Spark plug
4. Ignition spark gap
5. Spark plug cap resistance
6. Ignition coil resistance
7. Main switch
8. "ENGINE STOP" switch
9. Neutral switch
10. Sidestand switch
11. Pick up coil resistance
12. Wiring connection (entire ignition system)

NOTE:

- Remove the following parts before troubleshooting.
  1) Seat
  2) Fuel tank
  3) Air filter case
  4) Side cover
- Use the following special tool(s) in this troubleshooting.

Ignition checker:
90890-06754
Pocket tester:
90890-03112

1. Fuse (main and ignition)

- Remove the fuses.
- Connect the pocket tester (Ω × 1) to the fuses.
- Check the fuses for continuity.

NO CONTINUITY → Replace fuse(s).

CONTINUITY ↓

2. Battery

- Check the battery condition. Refer to "BATTERY INSPECTION" in CHAPTER 3.

Open circuit voltage:
12.8V or more at 20°C

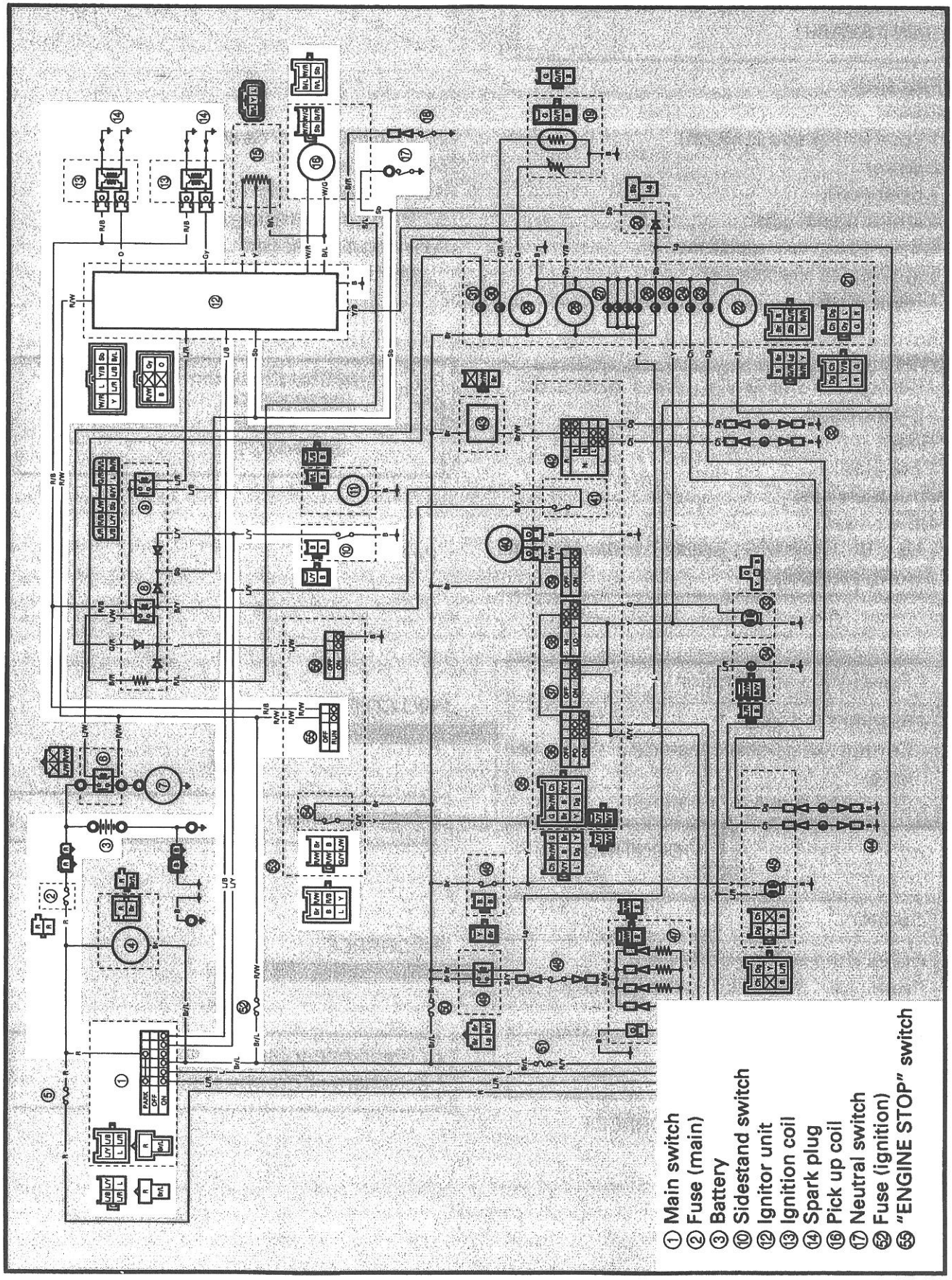
INCORRECT →
- Clean battery terminals.
- Recharge or replace the battery.

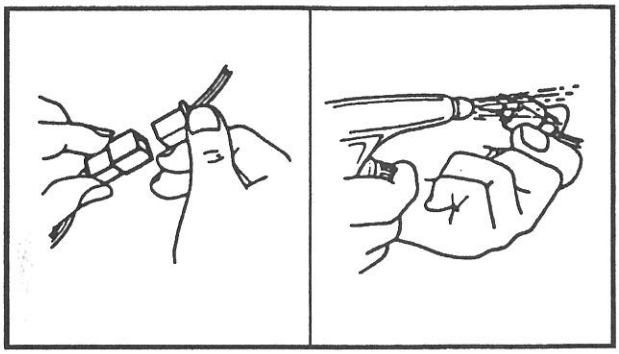
CORRECT ↓

*

IGNITION SYSTEM

CIRCUIT DIAGRAM

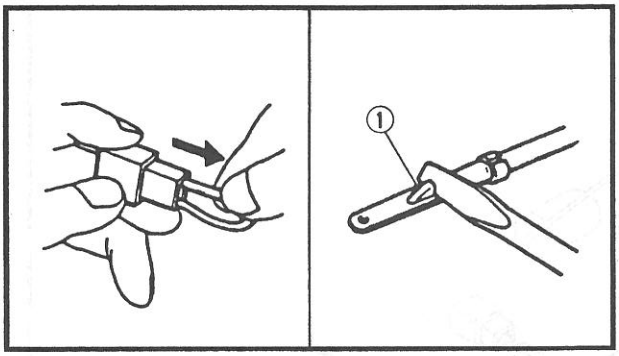




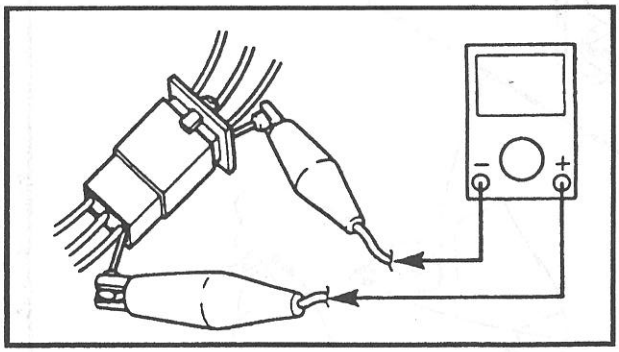
CHECKING OF CONNECTIONS

Dealing with stains, rust, moisture, etc. on the connector.

1. Disconnect:
   - Connector
2. Dry each terminal with an air blower.



3. Connect and disconnect the connector two or three times.
4. Pull the lead to check that it will not come off.
5. If the terminal comes off, bend up the pin ① and reinsert the terminal into the connector.

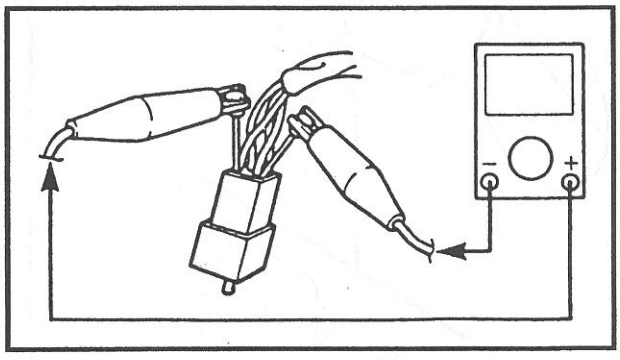


6. Connect:
   - Connector

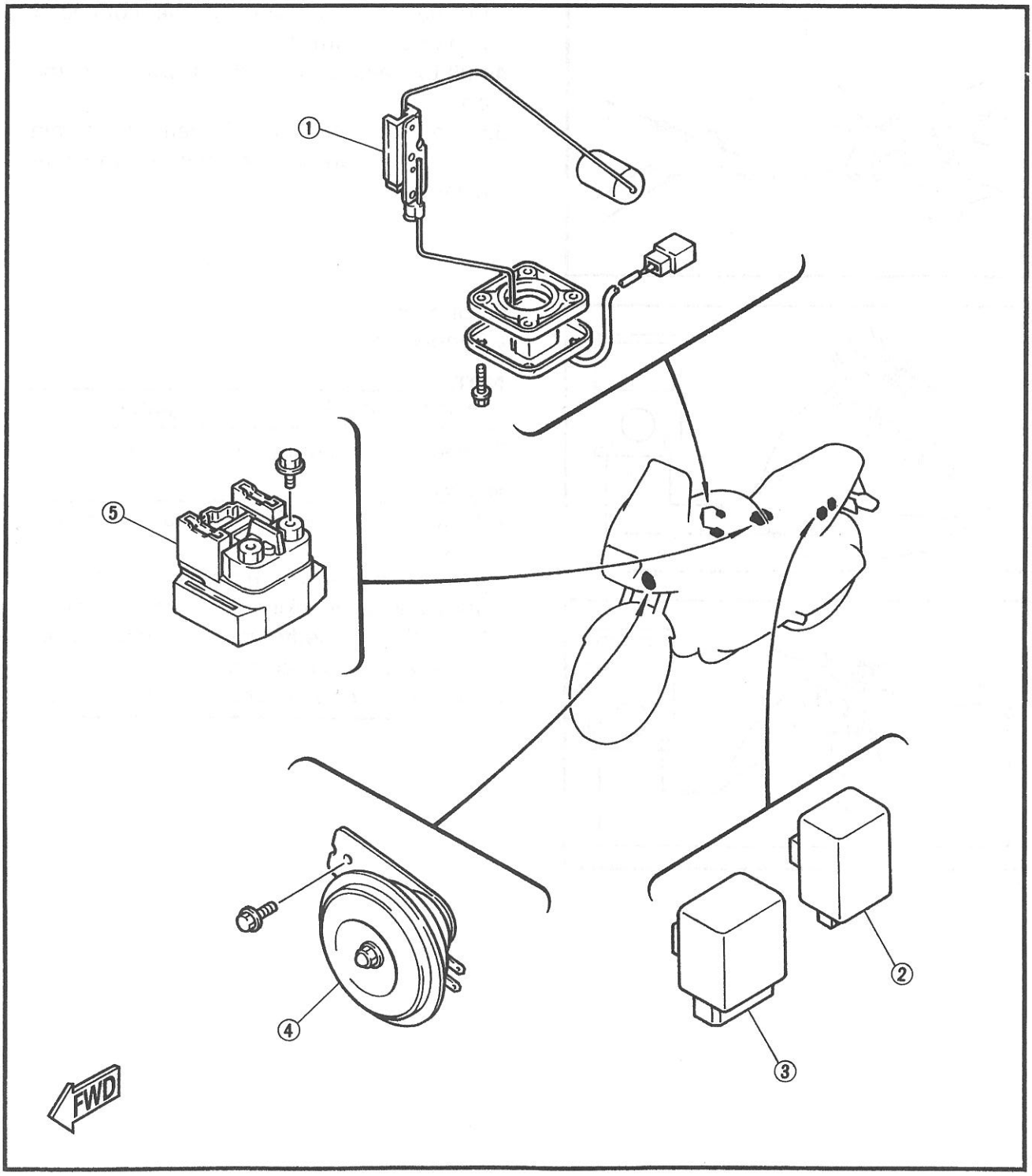
NOTE:
The two connectors "click" together.

7. Check for continuity with a tester.

NOTE:
- If there is no continuity, clean the terminals.
- Be sure to perform the steps 1 to 7 listed above when checking the wire harness.
- For a field remedy, use a contact revitalizer available on the market.
- Use the tester on the connector as shown.



① Fuel sender
② Flasher relay
③ Starting circuit cut-off relay
④ Horn
⑤ Starter relay

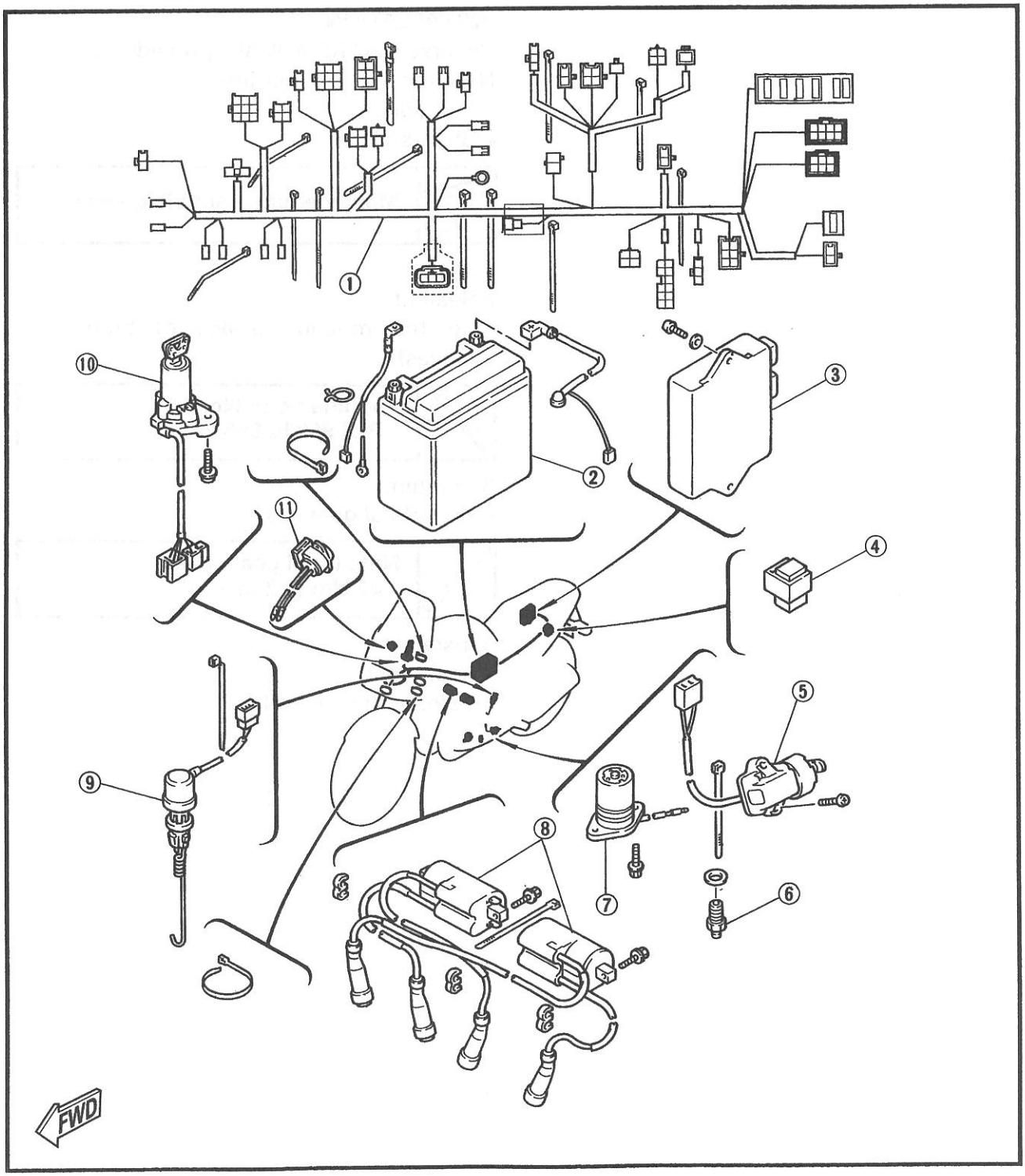


ELECTRICAL

ELECTRICAL COMPONENTS

① Wire harness
② Battery
③ Ignitor unit
④ Heater relay
⑤ Sidestand switch
⑥ Neutral switch
⑦ Oil level switch
⑧ Ignition coil
⑨ Rear brake switch
⑩ Main switch
⑪ Thermo switch

IGNITION COIL:
PRIMARY WINDING RESISTANCE:
1.87 ~ 2.53 Ω at 20°C
SECONDARY WINDING RESISTANCE:
12 ~ 18 kΩ at 20° C
BATTERY:
CAPACITY: 12V 12AH
SPECIFIC GRAVITY: 1.320



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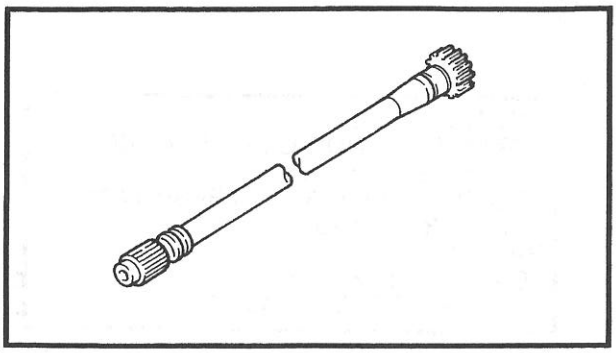


DRIVE SHAFT

Inspection

1.Inspect:
- Drive shaft splines
  Wear/Damage → Replace.

INSTALLATION

Reverse the "REMOVAL" procedure.
Note the following points.

1.Lubricate:
- Shaft splines

	Molybdenum disulfide grease

2.Apply:
- Sealant
  (to the mating surface of both case halves)

	Yamaha bond No. 1215: **P/N 90890-85505**

3.Tighten:
- Nuts (final gear case)

	Nuts (final gear case): **42 Nm (4.2 m • kg)**

4.Install:
- Rear wheel
  Refer to "REAR WHEEL".

****

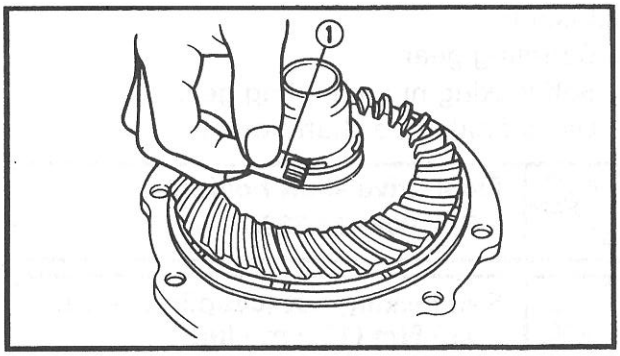
Thrust clearance measurement steps:

- Remove the ring gear assembly.
- Place four pieces of Plastigage® between originally fitted thrust washer and ring gear.
- Install the ring gear assembly and tighten the bolts and nuts to specification.

LT	**Bolts (bearing housing):** **23 Nm (2.3 m • kg)** **Nuts (bearing housing):** **23 Nm (2.3 m • kg)**

NOTE:

Do not turn the shaft drive and ring gear when measuring clearance with Plastigage®.



- Remove the ring gear assembly.
- Measure the thrust clearance. Calculate width of flattened Plastigage® ①.

	Ring gear thrust clearance: **0.1 ~ 0.2 mm**

- If the clearance is correct, install the ring gear assembly.
- If the out of specification, select the correct washer.

Thrust washer selection steps:

- Select the suitable thrust washer by the following chart.

	Trust washer	
Thickness (mm)	**1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1**	

- Repeat measurement steps until the ring gear thrust clearance is within the specified limits.

	Ring gear thrust clearance: **0.1 ~ 0.2 mm**

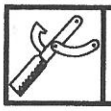
****

2.Install:
- Shims (proper size as calculated)
- Final drive shaft assembly
- Bearing retainer (final drive shaft)
  Use a final drive shaft bearing retainer wrench.

NOTE:
The bearing retainer has left-hand threads. Turn retainer counterclockwise to tighten it.

	**Bearing retainer wrench: P/N 90890-04050**
	**Bearing retainer: 110 Nm (11.0 m • kg)**

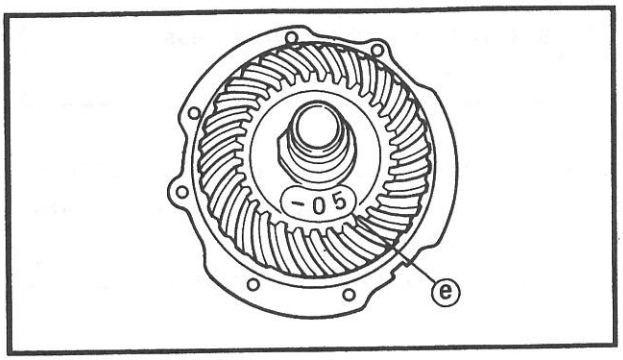
3.Install:
- Coupling gear
- Self locking nut (coupling gear)
  Use a final drive shaft holder.

	**Final drive shaft holder: P/N 90890-01229**
	**Self locking nut (coupling gear): 110 Nm (11.0 m • kg) LOCTITE®**

4.Install:
- Ring gear assembly
  (without thrust washer)

5.Adjust:
- Gear lash
  Refer to "Gear lash measurement" and "Gear lash adjustment".

6.Measure/Select:
- Ring gear thrust clearance



ⓔ =a numeral (usually a decimal number) on inside of ring gear either added to or subtracted from 35.40.

ⓕ =a bearing thickness (considered constant).

	Bearing thickness ⓕ: 13.00 mm

Example:

1)If gear case is marked "45.51".....ⓒ is 45.51

2)If ring gear bearing housing is marked "3.35".....ⓓ is 3.35.

3)If the ring gear is marked "–05".....ⓔ is 35.35

4)ⓕ is 13.00

"B" = 45.51 + 3.35 – (35.35 + 13.00)
= 48.86 – (48.35)
= 0.51

5)Therefore, shim thickness is 0.51 mm. Shim sizes are supplied in following thickness.

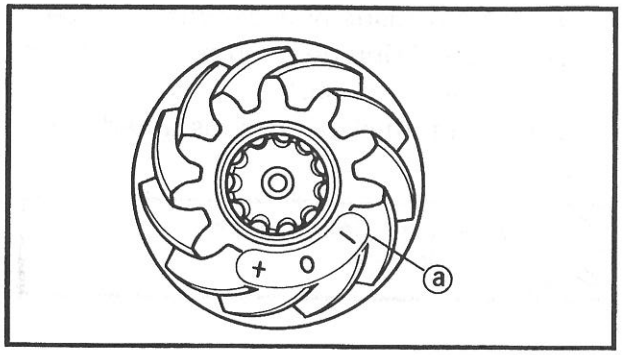
	Ring gear shim
Thickness (mm)	0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50

Because shims can only be selected in 0.05 mm increments, round off hundredths digit and select appropriate shim(s).

Hundredths	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

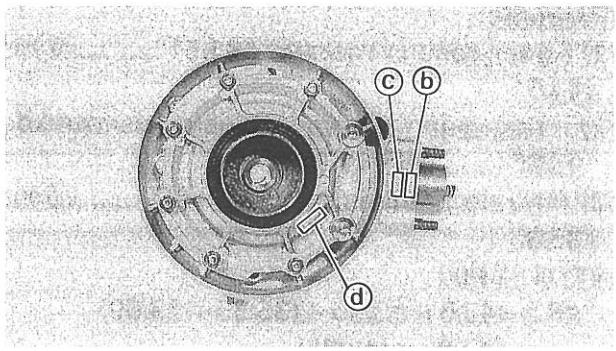
In the example above, the calculated shim thickness is 0.51 mm. The chart instructs you, however, to round off the 1 to 0. Thus you should use a 0.50 mm shim.

****



Final drive gear shim thickness:
A = ⓐ − ⓑ

Where:
ⓐ =a numeral (usually a decimal number) on the gear is either added to or subtracted from "84".
ⓑ =a numeral on the gear case (i.e. 83.50)



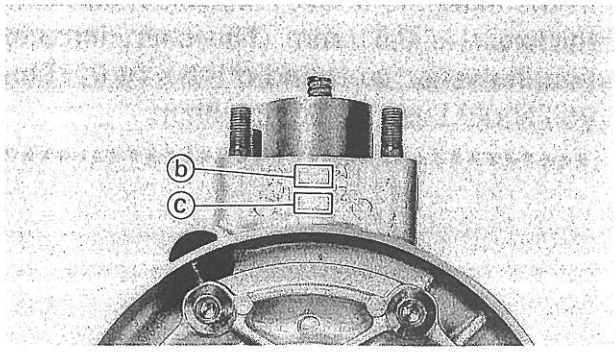
Example:
1)If final drive shaft gear is marked "+01".....ⓐ is 84.01.
2)If the gear case is marked "83.50".....ⓑ is 83.50.
"A" = 84.01 − 83.50
= 0.51
3)Therefore, shim thickness is 0.51 mm. Shim sizes are supplied in following thickness.

	Final drive gear shim
Thickness (mm)	0.15 0.30 0.40 0.45 0.50 0.60

Because shims can only be selected in 0.05 mm increments, round off hundredths digit and select appropriate shim(s).

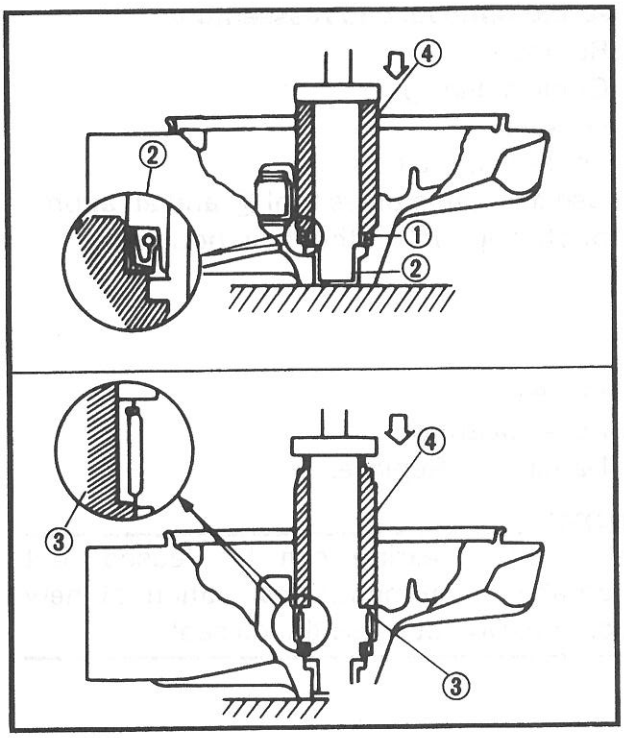
Hundredths	Rounded value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

In the example above, the calculated shim thickness is 0.51 mm. The chart instructs you, however, to round off the 1 to 0. Thus you should use a 0.50 mm shim.
● To find shim thickness "B", use following formula.



Ring gear shim thickness:
B = ⓒ + ⓓ − (ⓔ + ⓕ)

Where:
ⓒ =numeral on gear case (i.e. 45.51)
ⓓ =numeral (usually a decimal number) on outside of ring gear bearing housing (i.e. 3.35).

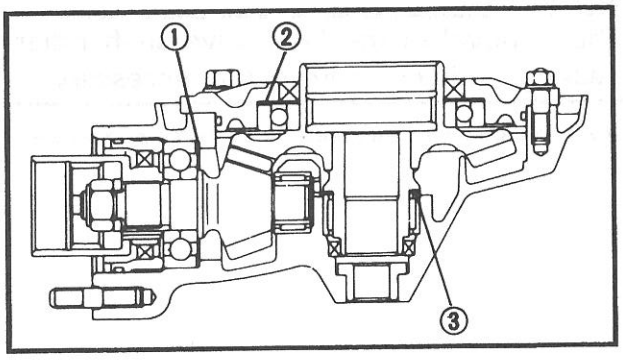


5.Install:
- Guide collar ①
- Oil seal (new) ②
- Roller bearing (outer race) ③

Use a suitable press tool ④ and a press to install the above components into the main housing.

Final drive/Ring gear positioning

NOTE:
Gear positioning is necessary when any of the following parts are replaced:
- Final gear case
- Ring gear bearing housing
- Bearing(s)



1.Select:
- Final drive gear shim ①
- Ring gear shim ②

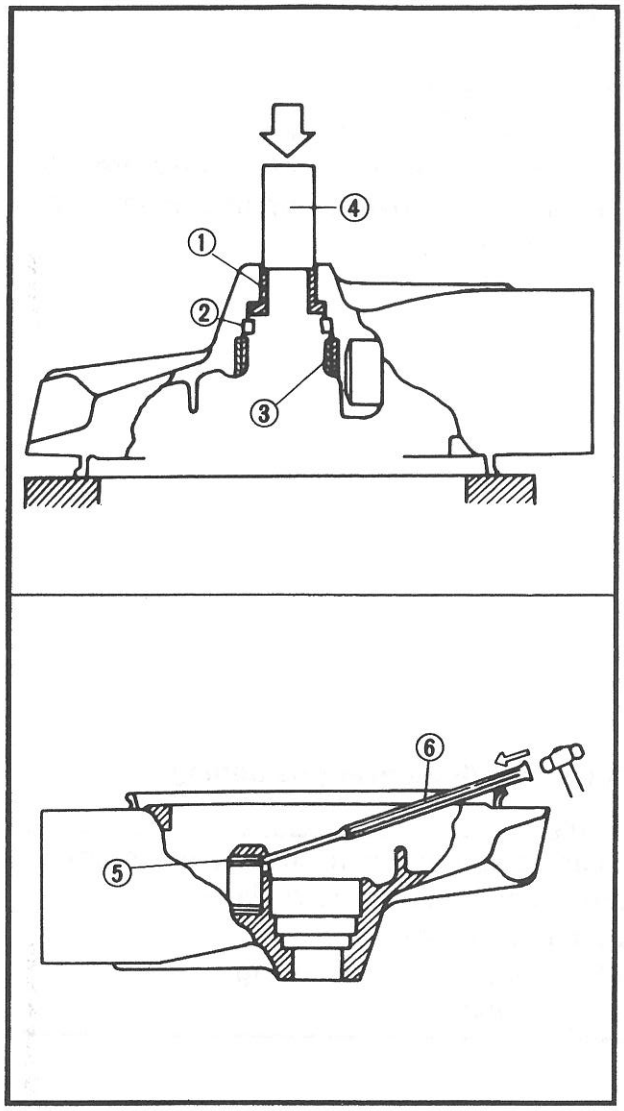
****

Selecting steps:

●Position final drive gear and ring gear by using shims ① and ② with their respective thickness calculated from information marked on final gear case and drive gear end.

① Shim thickness "A"
② Shim thickness "B"
③ Thrust washer "C"

●To find shim thickness "A" use following formula:



Bearing removal and reassembly

1.Remove:
- Guide collar ①
- Oil seal ②
- Roller bearing ③

  Use a suitable press tool ④ and an appropriate support for the main housing.

2.Inspect:
- Roller bearing

  Damage → Replace.

NOTE:

The roller bearing can be reused, but Yamaha recommends installation of new bearing. Do not reuse the oil seal.

3.Remove:
- Final drive roller bearing ⑤

****

Removing steps:
- Heat the bare housing to 150°C.
- Remove the roller bearing outer races with an appropriately shaped punch ⑥.
- Remove the inner race from the final drive shaft.

NOTE:

The removal of the final drive shaft roller bearing is difficult and seldom necessary.

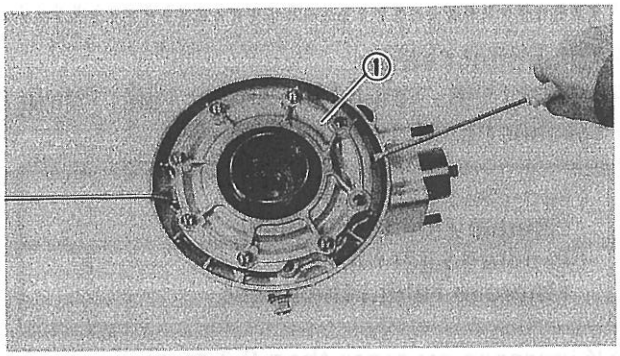
****

4.Install:
- Final drive shaft roller bearing (new)

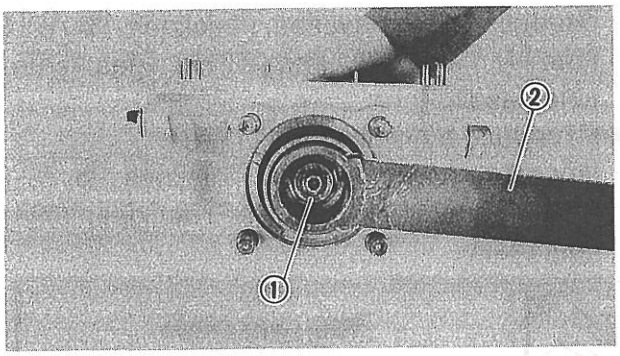
****

Installing steps:
- Heat the bare housing to 150°C.
- Install the roller bearing outer race using the proper adapter.
- Install the inner race onto the drive shaft.

****



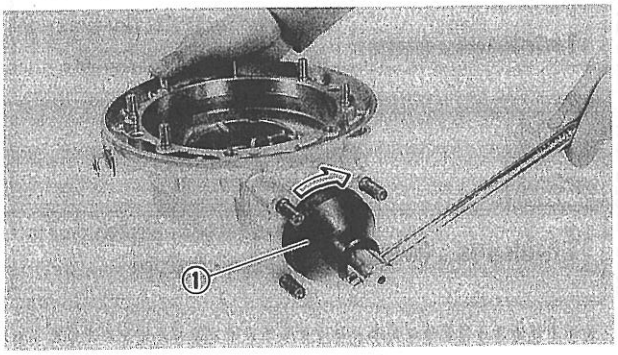
2.Remove:
- Bearing housing ①
- Shim(s)
- Thrust washer



3.Remove:
- Self-locking nut (coupling gear) ①
  Use a final drive shaft holder ②.

	Final drive shaft holder: P/N 90890-01229

- Gear coupling



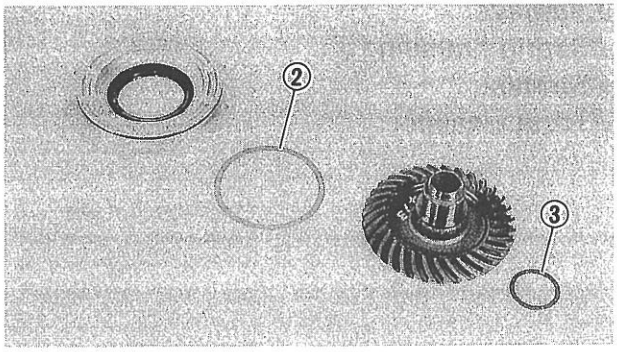
4.Remove:
- Bearing retainer (final drive shaft)
  Use a final drive shaft bearing retainer wrench ①.

	Bearing retainer wrench: P/N 90890-04050

CAUTION:
Final drive shaft bearing retainer has left-hand threads. Turn retainer clockwise to loosen it.

- Final drive shaft assembly
  Tap lightly on the final drive shaft end with a soft hammer.

CAUTION:
Final drive shaft removal should be performed only if gearing replacement is necessary. Do not reuse bearing or races after removal.



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Adjustment steps:

- Select the suitable shims and thrust washer by the following chart.

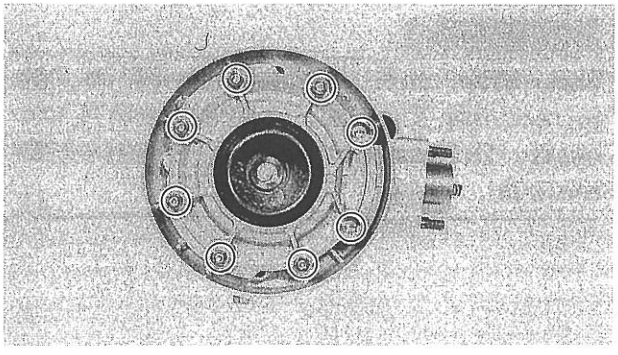
Too-little gear lash →
Reduce shim thickness.
Too-large gear lash →
Increase shim thickness.

- If increase by more than 0.1 mm:
  Reduce thrust washer thickness by 0.1 mm for every 0.1 mm of ring gear shim increase.
- If reduce by more than 0.1 mm:
  Increase thrust washer thickness by 0.1 mm for every 0.1 mm of ring gear shim decrease.

Ring gear shim	
Thickness (mm)	0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50

Thrust washer	
Thickness (mm)	1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1

****

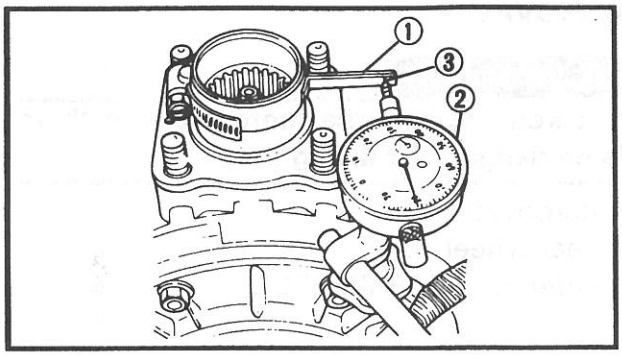


Final drive gear disassembly

1.Remove:

- Nuts (bearing housing)
- Bolts (bearing housing)

NOTE:
Working in a crisscross pattern, loosen nut 1 /4 turn each. Remove them after all loosened.



5.Attach:
- Gear lash measurement tool ①
- Dial gauge ②

Final gear back lash band:
P/N 90890-01230

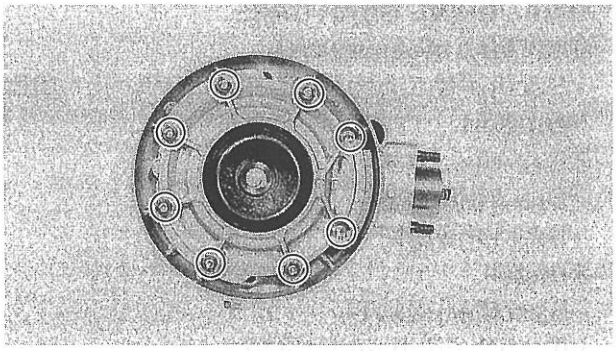
③ Position mark

6.Measure:
- Gear lash

Gently rotate the gear coupling from engagement to engagement.
Over specified limit → Adjust.

Final gear lash:
0.1 ~ 0.2 mm

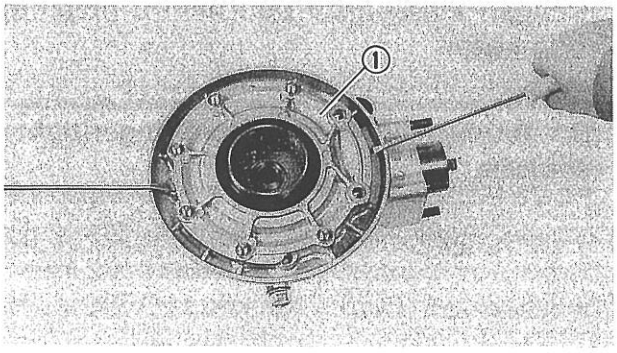
NOTE:
Measure the gear lash at 4 positions. Rotate the shaft 90° each time.



Gear lash adjustment

1.Remove:
- Nuts (bearing housing)
- Bolts (bearing housing)

NOTE:
Working in a crisscross pattern, loosen nut 1 /4 turn each. Remove them after all are loosened.



2.Remove:
- Bearing housing ①
- Ring gear
- Shim(s) ②
- Thrust washer ③

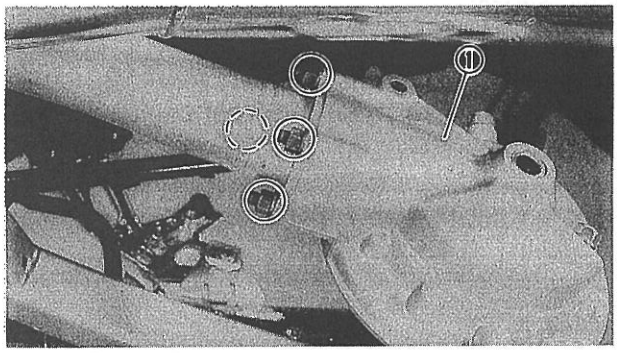
3.Adjust:
- Gear lash

REMOVAL

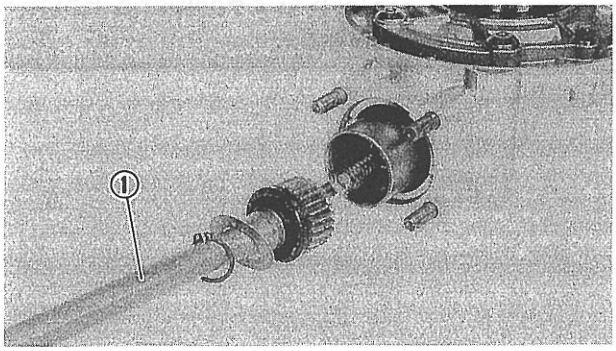
⚠ WARNING

Securely support the motorcycle so there is no danger of it falling over.

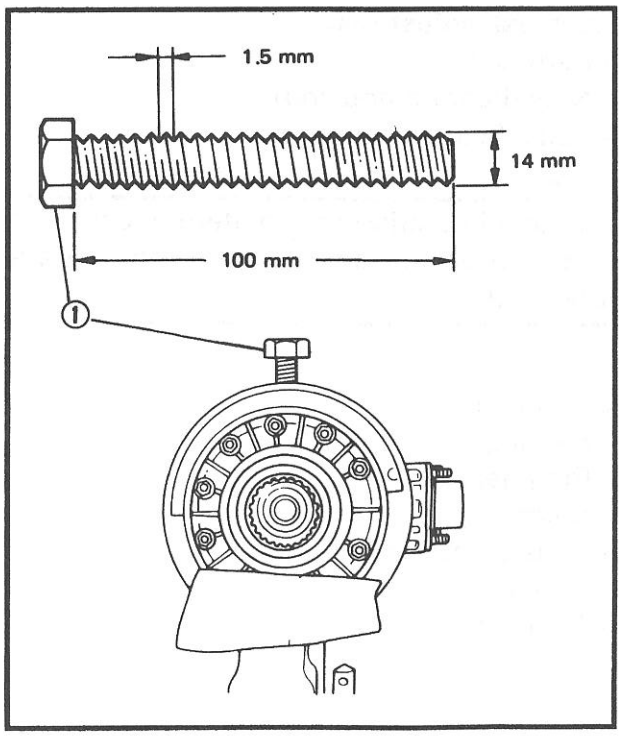
1.Remove:
- Rear wheel
  Refer to "REAR WHEEL".



2.Remove:
- Final gear assembly ①



3.Remove:
- Drive shaft ①



FINAL DRIVE GEAR CASE

Gear lash measurement

1.Secure the gear case in a vise or other support.
2.Remove:
- Drain plug
  Drain the oil.

3.Install:
- Specified bolt ①
  (into the drain plug hole)

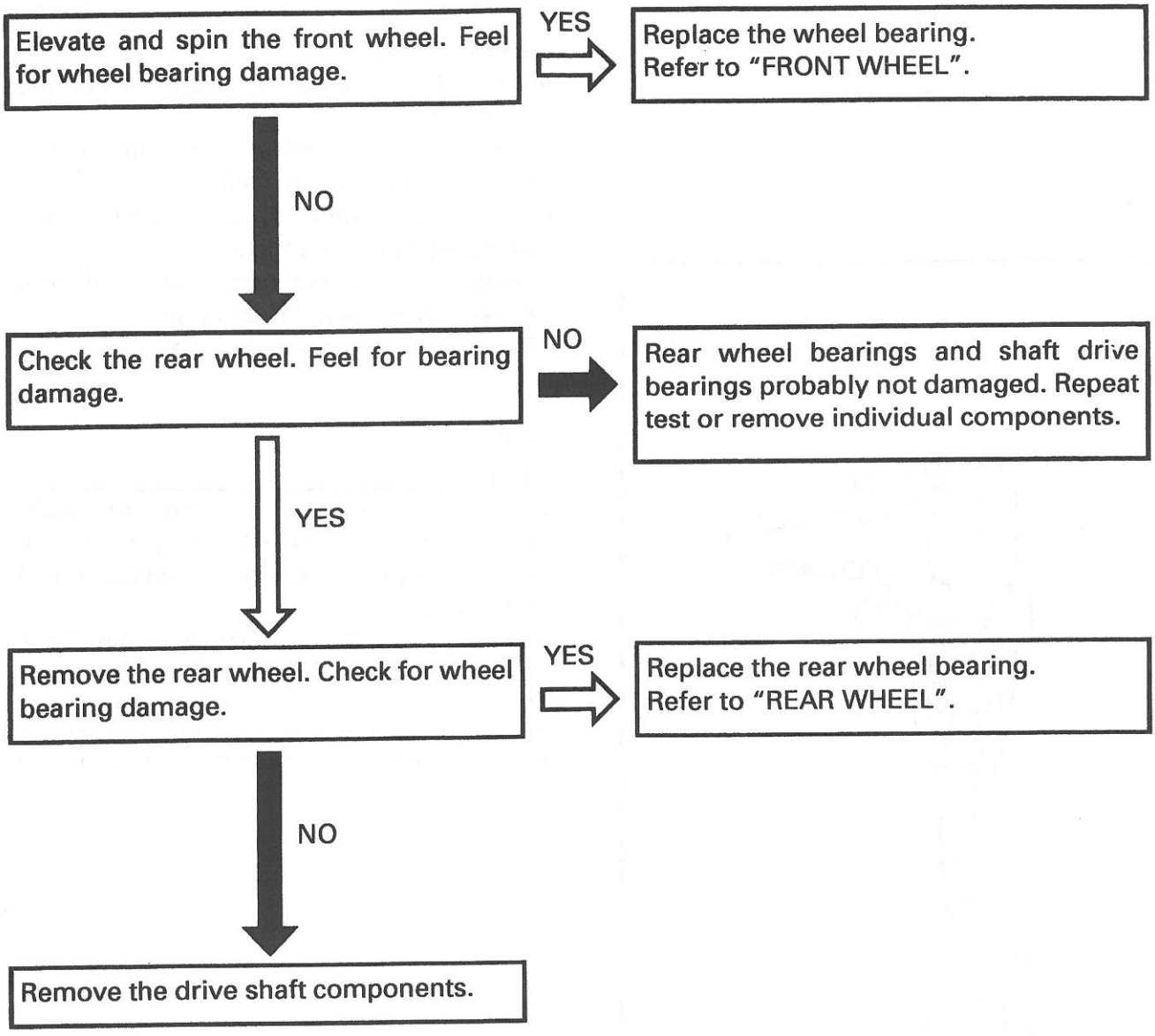
4.Finger tighten the bolt until it holds the ring gear.

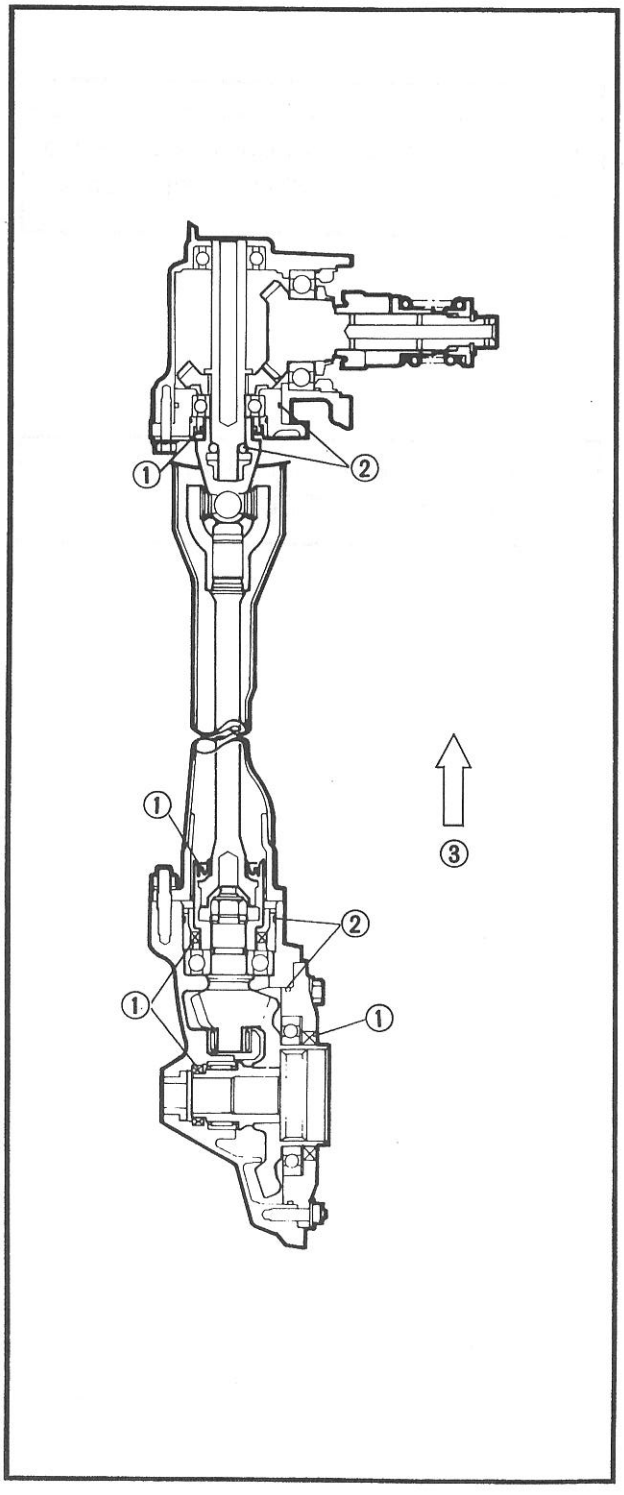
NOTE:

Do not over tighten the bolt; finger-tight is sufficient.

Troubleshooting Chart

When basic conditions "a" and "b" above exist, check the following points:





3.Inspect:
• Oil leakage

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Inspection steps:

- Clean the entire motorcycle thoroughly, then dry it.
- Apply a leak-localizing compound or dry powder spray to the shaft drive.
- Road test the motorcycle for the distance necessary to locate the leak.
  Leakage → Inspect component housing, gasket and/or seal for damage.
  Damage → Replace component.

① Oil seal
② O-ring
③ Forward

NOTE:

- An apparent oil leak on a new or nearly new motorcycle may be the result of a rust preventive coating or excessive seal lubrication.
- Always clean the motorcycle and recheck the suspected location of an apparent leakage.

****