YAMAHA

# GTS1000AE
# GTS1000AEC

## Service Manual

LIT-11616-09-22

YAMAHA

# GTS1000AE
# GTS1000AEC

# SERVICE MANUAL

LIT-11616-09-22

4HH-28197-21

The service information for this motorcycle has been split into two manuals.
For service information on the following components, please refer to the "SERVICE MANUAL - NEW FEATURES":

- EFI (Electronic Fuel Injection) system
- Single-sided swingarm front suspension
- ABS (Anti-lock Brake System)

## 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 pepairs 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.

**for USA, California**
This model has been designed and manufactured to perform within certain specifications in regard to performance and emissions. proper service with correct tools in necessary to ensure that the motorcycle will operate as designed. If there is any question about a service procedure, it is imperative that you contact a Yamaha dealer for any service information changes that apply to this model. This policy is intended to provide the customer with the most satisfaction from his motorcycle and to conform with federal environmental quality objectives.

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.

**NOTE:**
For USA, California:
This Service Manual contains information regarding peroodic maintenance to the emission control system. Please read this material carefully.

## 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

## CONSTRACTION 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.

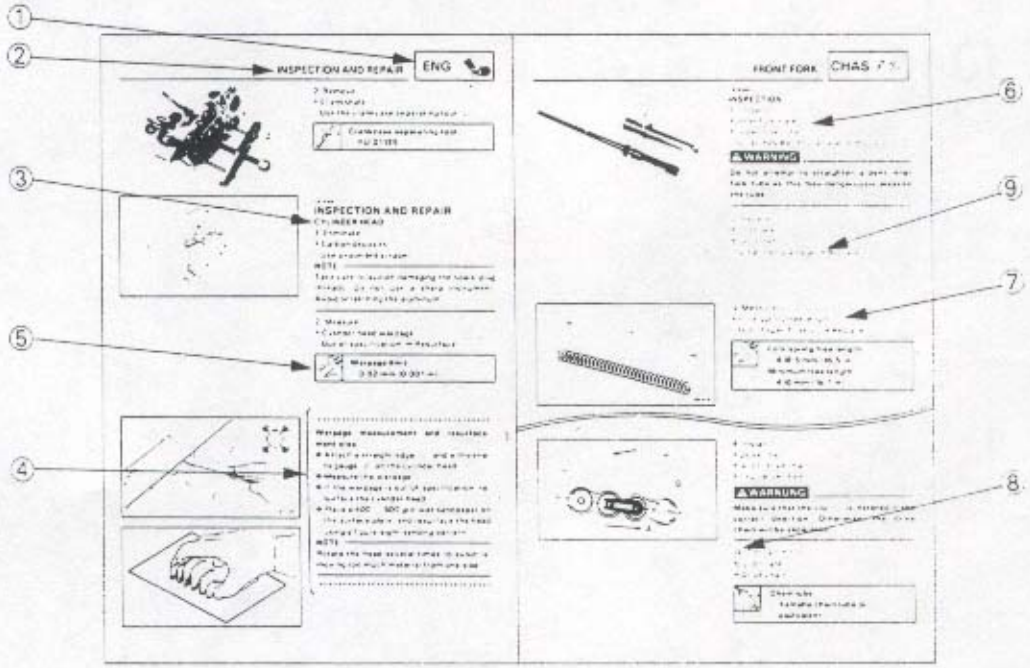
A set of particularly important procedure ④ is placed between a line of asterisks "*"with each procedure preceded by "●".

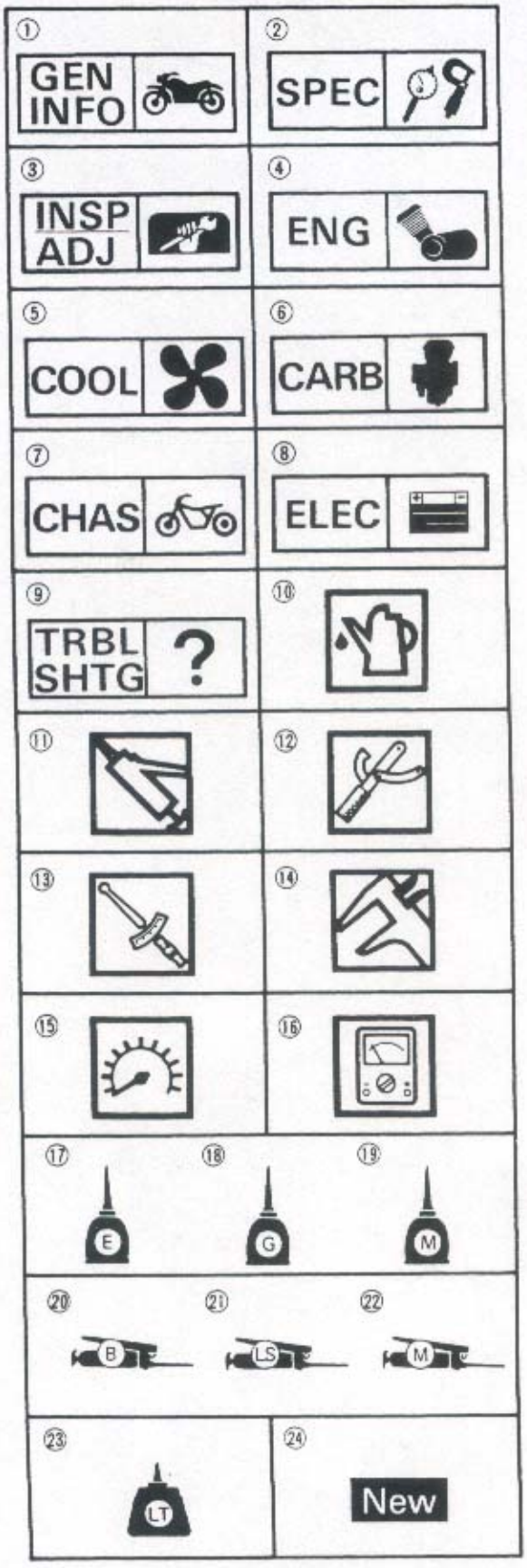
## IMPORTANT FEATURES

- 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.

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

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

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

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

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

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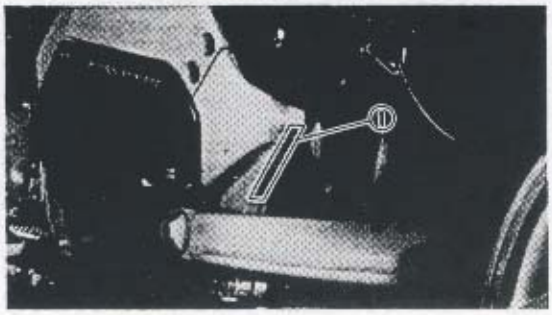


# GENERAL INFORMATION

## MOTORCYCLE IDENTIFICATION

### VEHICLE IDENTIFICATION NUMBER

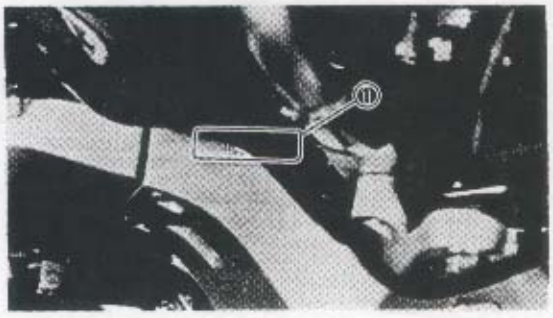
The vehicle identification number ① is stamped into the frame.

**Starting serial number:**
**JYA4HHEO * PA000101 (USA)**
**JYA4HHCO * PA001101 (California)**
**JYA4HHNO * PA002101 (CDN)**
**JYA4HJTO * PA000101 (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.

### ENGINE SERIAL NUMBER

The engine serial number ① is stamped into crankcase.



**Starting serial number:**
**4HH-000101 (USA)**
**4HH-001101 (California)**
**4HH-002101 (CDN)**
**4HJ -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 INFORMATAION

### PREPARATION FOR REMOVAL

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

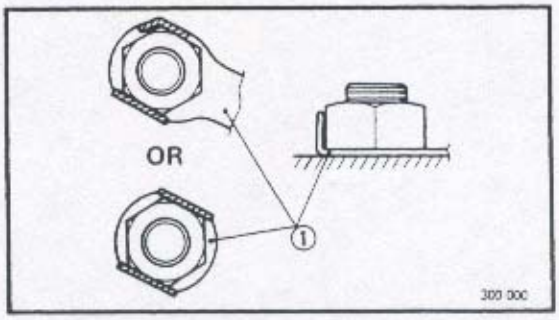
2. Use proper tools and cleaning equipment. Refer to "SPECIAL TOOL".
3. When disassembling the machine keep mated parts together. This includes gears, cylinders, pistons, and other mated parts that have been "mated" through normal wear. Mated parts must be reused as an assembly or replaced.
4. During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

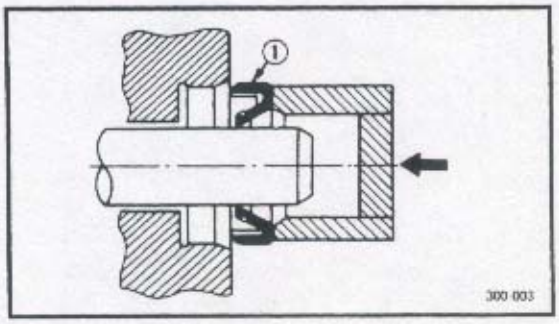
### GASKETS, OIL SEALS, AND O-RINGS

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

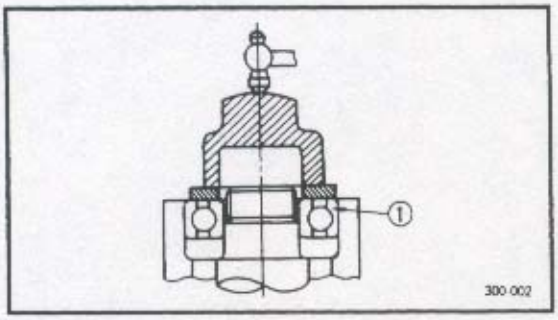
1. All lock washers/plates ① and cotter pins must be replaced when they are removed. Lock tab(s) should be bent along the bolt or nut flat(s) after the bolt or nut has been properly tightened.




### 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 light-weight lithium base grease to the seal lip(s). Oil the bearings liberally when installing.

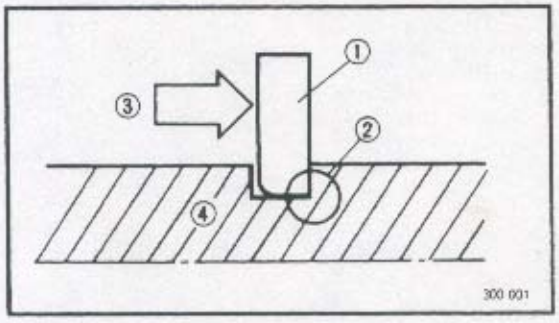
①Oil seal




**CAUTION:**

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

①Bearing




### 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.

④Shaft

1

## 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.

PN. YM- □□□□□ , YU-□□□□□
YS- □□□□□ , YK-□□□□□
ACC-□□□□□
For US, CDN

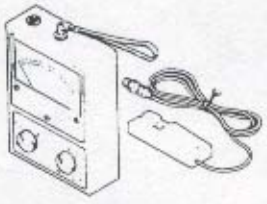
P/N. 90890-□□□□□
Except for US, CDN

### FOR TUNE UP

1-A
Inductive tachometer
P/N. YU-08036-A

This tool is needed for detecting engine rpm.

1-B
Inductive tachometer
P/N. 90890-03113

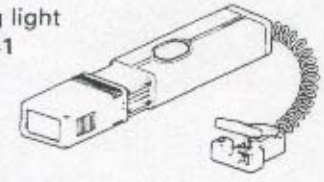


This tool is needed for detecting engine rpm.

2-A
Inductive timing light
P/N. YM-33277-A

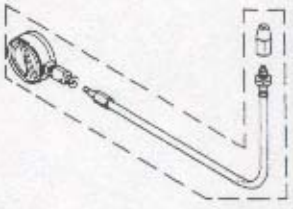
This tool is necessary for checking ignition timing.

2-B
Inductive timing light
P/N. 90890-03141



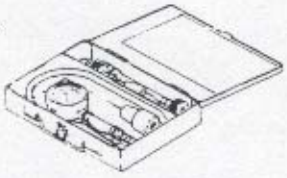
This tool is necessary for checking ignition timing.

3-A
Compression gauge
P/N. YU-33223



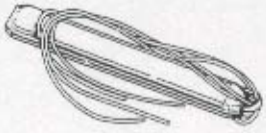
This gauge are used to measure the engine compression.

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



This gauge is used to measure the engine compression.

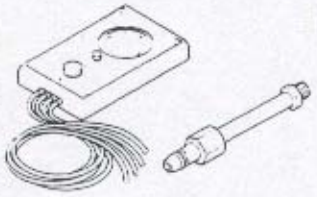
4-A
Vacuum gauge
P/N. YU-08030



This gauge is needed for carburetor synchronization.

4-B

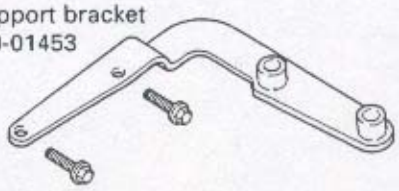
Vacuum gauge
P/N. YU-08030
90890-03094
Adapter
P/N. YM-03060
90890-03060



This gauge is needed for carburetor synchronization.

5

Caliper support bracket
P/N. 90890-01453

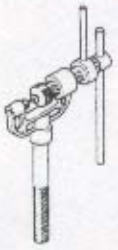


This tool is used for front brake system air bleeding.

## FOR ENGINE SERVICE

1

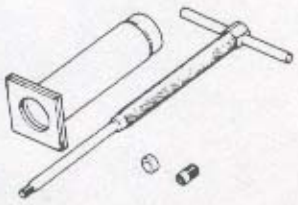
Cam chain cutter
P/N. YM-01112
90890-01112



This tool is used when cutting the cam chain.

2

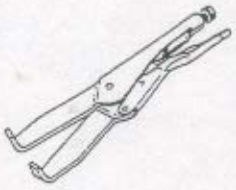
Piston pin puller
P/N. YU-01304
90890-01304



This tool is used to remove the piston pin.

3-A

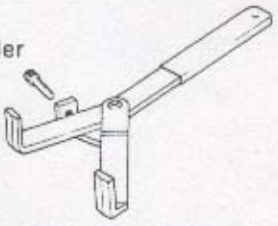
Universal clutch holder
P/N. YM-91042



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

3-B

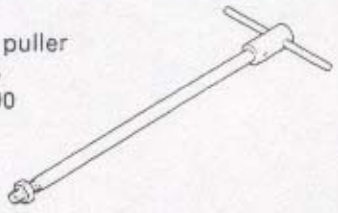
Universal clutch holder
P/N. 90890-04086



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

4-A

Armature shock puller
P/N. YU-01047-3
90890-01290



These tools are used to remove the generator armature.

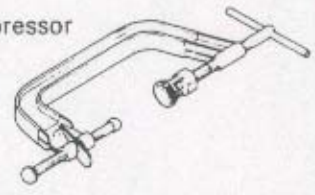
4-B

Weight
P/N. YU-01047-2
90890-01291

These tools are used to remove the generator armature.

5-A

Valve spring compressor
P/N. YM-04019
90890-04019

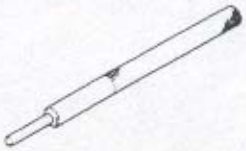


These tools are needed to remove and install the valve assemblies.

1

5-B
Attachment
(For exhaust valve)
P/N. YM-04108
90890-04108
(For intake valve)
P/N. YM-04114
90890-04114

These tools are needed to remove and install the valve assemblies.

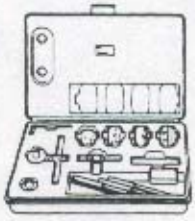
6
Valve guide remover (4.5 mm)
P/N. YM-04116
90890-04116

This tool is used to remove the valve guides.

7
Valve guide installer
P/N. YM-04117
90890-04117

This tool is needed to install the valve guides properly.

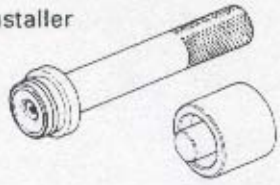
8
Valve guide reamer (4.5 mm)
P/N. YM-04118
90890-04118

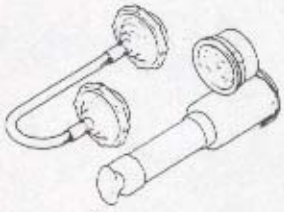
This tool is used to rebore the new valve guide.

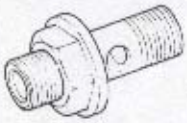
9
Valve seat cutter
P/N. YM-91043-C

This tool is used to adjust the valve clearance.

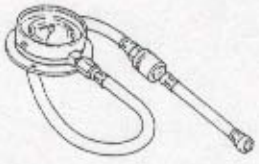
10
Quick gasket®
P/N. ACC-11001-15-01
YAMAHA Bond No. 1215
P/N. 90890-85505

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

11
Water pump seal installer
P/N. YU-04051-1
90890-04058
Adapter
P/N. YM-33221
90890-04078

These tools are used for installing the seal of the water pump housing.

12
Radiator cap tester
P/N. YU-24460-01
90890-01325
Adaptor
P/N. YU-33984
90890-01352

This tester is needed for checking the cooling system.

13
Adapter
P/N. 90890-03151

This adapter is to be used for measure the fuel pressure.

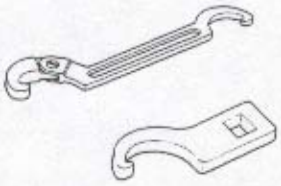
14
Pressure gauge
P/N. 90890-03153

This measuring equipments to measure the fuel pressure.

## FOR CHASSIS SERVICE

15
Oil filter wrench
P/N. YU-38411
90890-01426

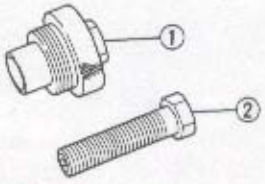
This tool is used to remove and install the oil filter.

1
Ring nut wrench
P/N. YU-01268
90890-01268
P/N. YU-33975
90890-01403



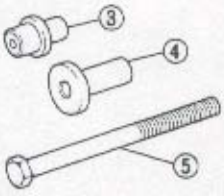
This tool is used to loosen and tighten the steering ring nut.

2-A
Bearing puller kit
P/N. 90890-04127
Bearing puller – ①
Bolt - ②



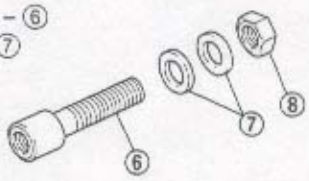

This bearing puller kit is to remove and install the front wheel bearing.

2-B
Spacer – ③
Bearing spacer – ④
Puller bolt – ⑤



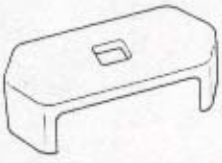

This bearing puller kit is to remove and install the front wheel bearing.

2-C
Connecting bolt – ⑥
Plane washer – ⑦
Nut – ⑧



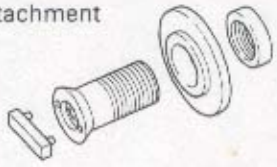

This bearing puller kit is to remove and install the front wheel bearing.

3
Cap wrench
P/N. 90890-01451



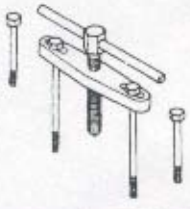
This tool is to remove and install the hub cap nut.

4
Wheel balancer attachment
P/N. 90890-01452



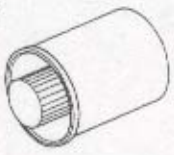
This attachment is to be used to fix the front wheel to the wheel balance.

5
Crankcase separating tool
P/N. YU-01135-A
90890-01135



This tool is necessary to remove the ABS sensor rotor.

6
Water pump seal installer
P/N. YM-33221
90890-04078



This tool is used to remove the ABS sensor rotor.

1

7
Front fork seal adapter
P/N. YM-1368
90890-01186

This tool is used to remove the ABS sensor rotor.

8
Spacer
P/N. YM-01309
90890-01309

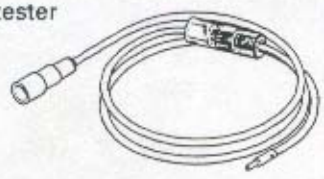
This tool is used to remove the ABS sensor rotor.

9
Sensor rotor installation pot
P/N. YM-04124
90890-04124

This tool is used to install the ABS sensor rotor.

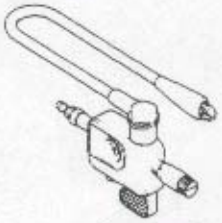
## FOR ELECTRICAL COMPONENTS

1-A
Dynamic spark tester
P/N. YM-34487



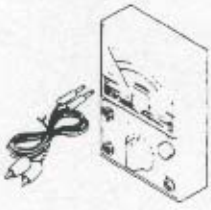
This instrument is necessary for checking the ignition system components.

1-B
Ignition checker
P/N. 90890-06754



This instrument is necessary for checking the ignition system components.

2
Pocket tester
P/N. YU-03112
90890-03112

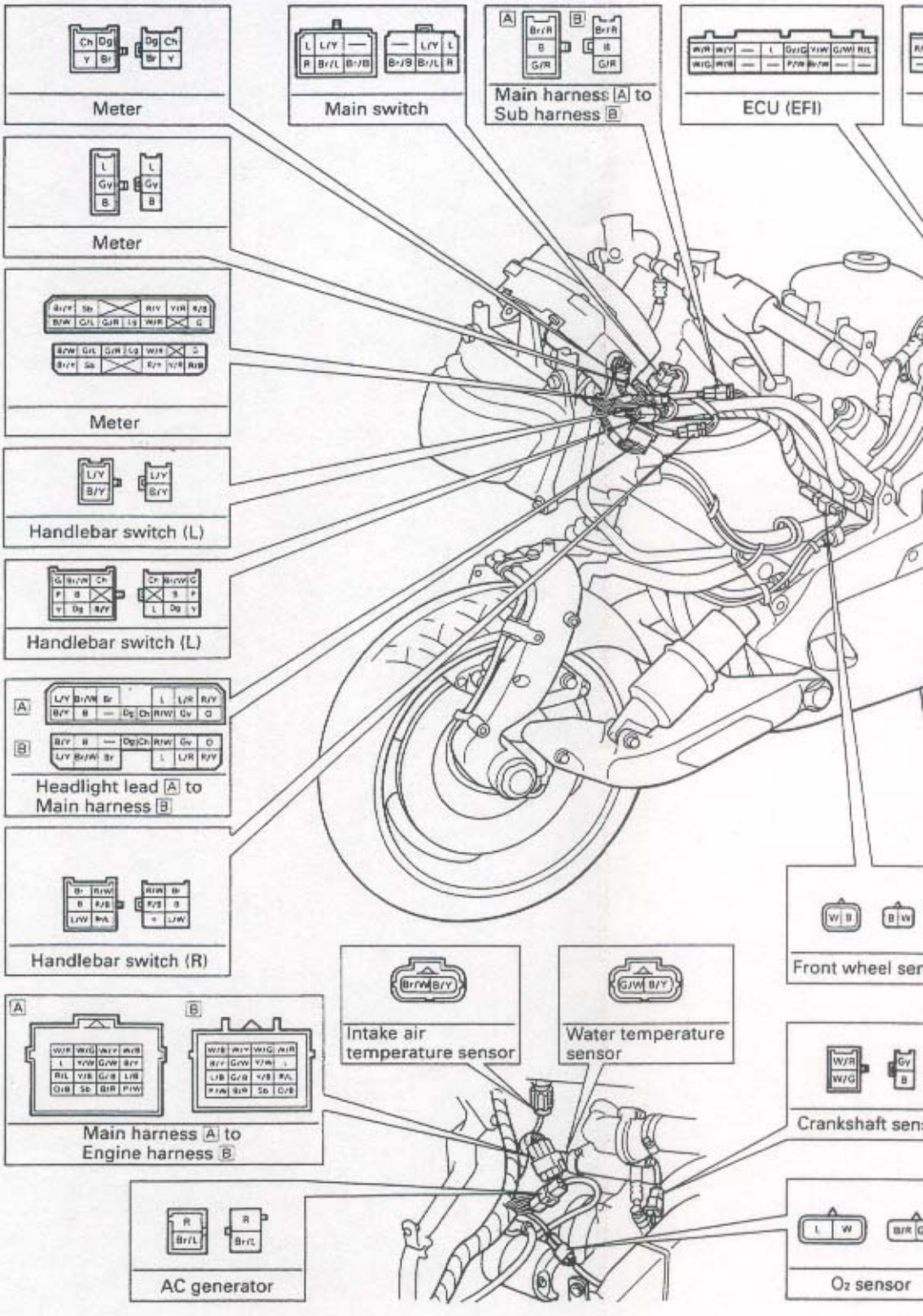


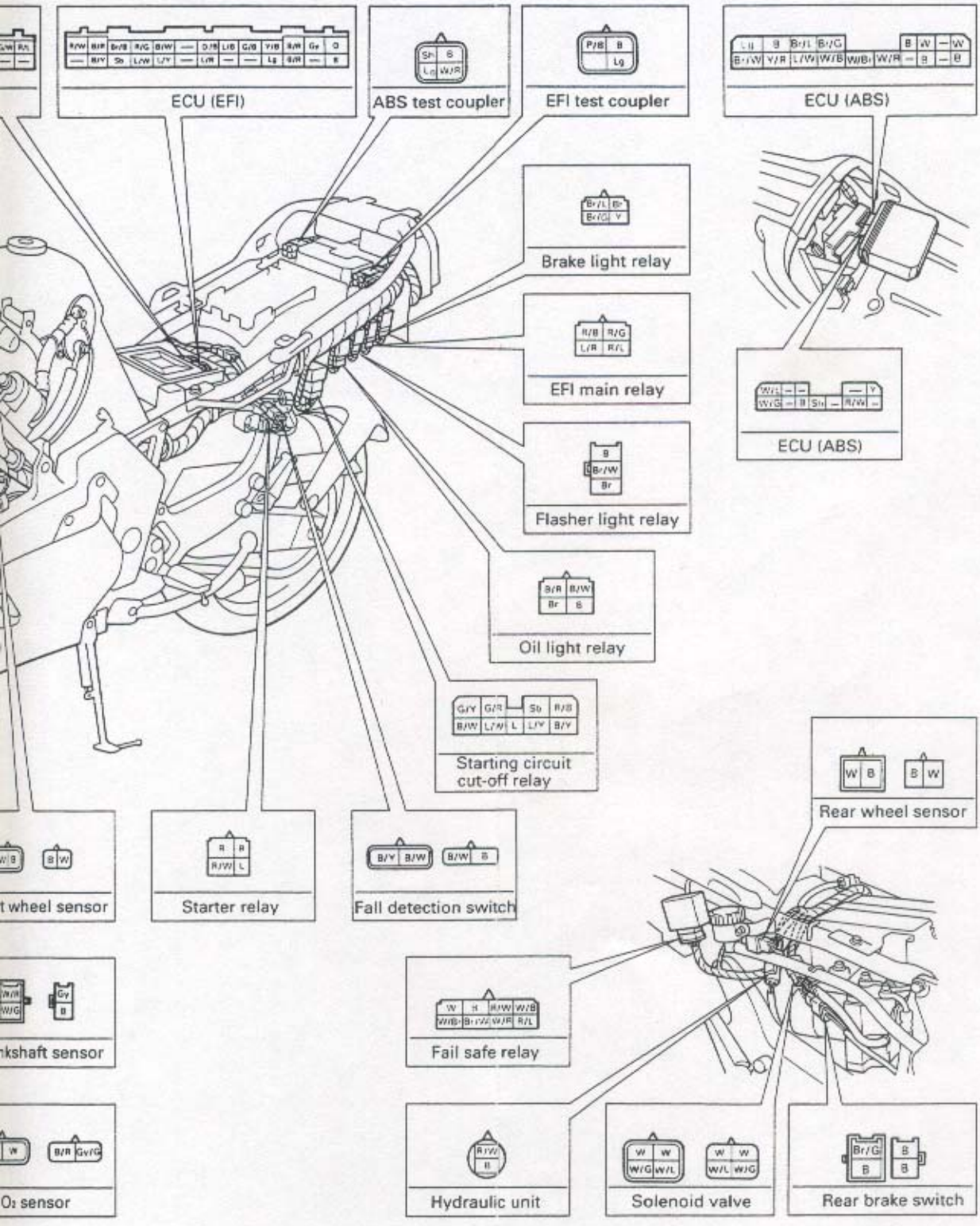
This instrument is invaluable for checking the electrical system.

3
Test coupler adapter
P/N. YM-3149
90890-03149

This instrument is necessary for self diagnosis of the EFI and ABS system.

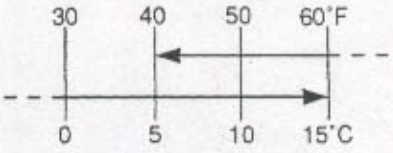
# COUPLER LAYOUT DRAWING




ECU (EFI)
ABS test coupler
EFI test coupler
ECU (ABS)
Brake light relay
EFI main relay
ECU (ABS)
Flasher light relay
Oil light relay
Starting circuit cut-off relay
Rear wheel sensor
t wheel sensor
Starter relay
Fail detection switch
nkshaft sensor
Fail safe relay
O2 sensor
Hydraulic unit
Solenoid valve
Rear brake switch

# SPECIFICATIONS

## GENERAL SPECIFICATIONS

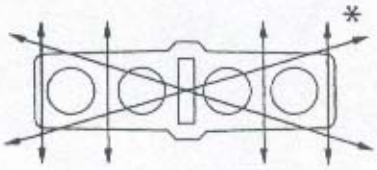
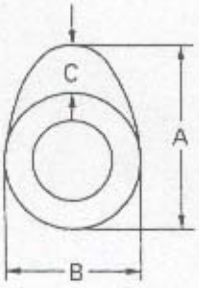
| Model | GTS1000AE |
|---|---|
| Model code: | 4HH1 |
| Engine starting number: | 4HH-000101 |
| Vehicle identification number: | JYA4HHE0*PA000101 |
| Dimensions: | |
| Overall length | 2,165 mm ( 85.2 in) |
| Overall width | 700 mm ( 27.6 in) |
| Overall height | 1,255 mm ( 49.4 in): Low screen |
| Overall height | 1,320 mm ( 52.0 in): High screen |
| Seat height | 790 mm ( 31.1 in) |
| Wheelbase | 1,495 mm ( 58.9 in) |
| Minimum ground clearance | 135 mm ( 5.31 in) |
| Minimum turning radius | 3,400 mm (133.9 in) |
| Basic weight: | |
| With oil and full fuel tank | 279 kg (615 lb) |
| Engine: | |
| Engine type | Liquid-cooled 4-stroke, DOHC |
| Cylinder arrangement | Forward-inclined parallel 4-cylinder |
| Displacement | 1,003 $cm^3$ |
| Bore × stroke | 75.5 × 56.0 mm (2.97 × 2.20 in) |
| Compression ratio | 10.8:1 |
| Compression pressure (STD) | 1,350 kPa (13.5 $kg/cm^2$, 192 psi) at 400 r/min |
| Starting system | Electric starter |
| Lubrication system: | Wet sump |
| Oil type or grade: | |
| Engine oil |  Yamalube 4 (20W40) or SAE20W40 type SE motor oil<br>Yamalube 4 (10W30) or SAE10W30 type SE motor oil |
| Oil capacity: | |
| Engine oil | |
| Periodic oil change | 2.5 L (2.2 Imp qt, 2.6 US qt) |
| With oil filter replacement | 2.7 L (2.4 Imp qt, 2.9 US qt) |
| Total amount | 3.2 L (2.8 Imp qt, 3.4 US qt) |
| Oil cooler capacity (including all routes) | 0.1 L (0.1 Imp qt, 0.1 US qt) |
| Radiator capacity (including all routes): | 2.65 L (2.33 Imp qt, 2.80 US qt) |
| Air filter: | Dry type element |

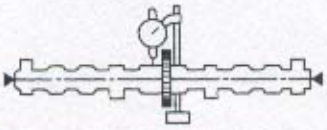
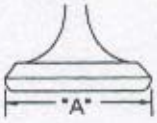
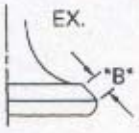
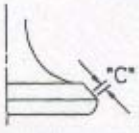
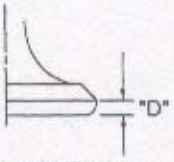
| Model | | GTS1000AE |
|---|---|---|
| Fuel: | | |
| Type | | Unleaded fuel only |
| Fuel tank capacity | | 20 L (4.40 Imp gal, 5.28 US gal) |
| Fuel reserve amount | | 3.5 L (0.77 Imp gal, 0.92 US gal) |
| Throttle body: | | |
| Type / quantity | | AC34/4 |
| Manufacturer | | MIKUNI |
| EFI: | | |
| Type | | 195500-2680 |
| Manufacturer | | NIPPONDENSO |
| Spark plug: | | |
| Type | | DPR8EA-9/X24EPR-U9 |
| Manufacturer | | NGK/NIPPONDENSO |
| Spark plug gap | | 0.8 ~ 0.9 mm (0.031 ~ 0.035 in) |
| Clutch type: | | Wet, multiple-disc |
| Transmission: | | |
| Primary reduction system | | Spur gear |
| Primary reduction ratio | | 68/41(1.658) |
| Secondary reduction system | | Chain drive |
| Secondary reduction ratio | | 47/17(2.764) |
| Transmission type | | Constant mesh 5-speed |
| Operation | | Left foot operation |
| Gear ratio | 1st | 36/14(2.571) |
| | 2nd | 32/18(1.777) |
| | 3rd | 29/21(1.380) |
| | 4th | 27/23(1.173) |
| | 5th | 28/27(1.037) |
| Chassis: | | |
| Frame type | | Double cradle |
| Caster angle | | 24° |
| Camber angle | | 0° |
| Trail | | 100 mm (3.94 in) |
| Tire: | | |
| Type | | Tubeless |
| Size | front | 130/60 ZR17 |
| | rear | 170/60 ZR17 |
| Manufacturer | front | DUNLOP |
| | rear | DUNLOP |
| Type | front | D202F |
| | rear | D202 |
| Tire pressure (cold tire): | | |
| Maximum load-except motorcycle | | 221 kg (487 lb) |
| Loading condition A * | | 0 ~ 90 kg (0 ~ 198 lb) |
| | front | 250 kPa (2.5 kg/cm², 36 psi) |
| | rear | 250 kPa (2.5 kg/cm², 36 psi) |

| Model | | GTS1000AE |
|---|---|---|
| Loading condition B * | | 90 ~ 221 kg (198 ~ 487 lb) |
| | front | 250 kPa (2.5 kg/cm², 36 psi) |
| | rear | 290 kPa (2.9 kg/cm², 41 psi) |
| | | * Load is the total weight of cargo, rider, passenger and accessories. |
| High-speed riding | | |
| | front | 250 kPa (2.5 kg/cm², 36 psi) |
| | rear | 290 kPa (2.9 kg/cm², 41 psi) |
| Brake: | | |
| Front brake | type | Single disc brake |
| | operation | Right hand operation |
| Rear brake | type | Single disc brake |
| | operation | Right foot operation |
| Suspension: | | |
| Front suspension | | Swingarm |
| Rear suspension | | Swingarm (new monocross) |
| Shock absorber: | | |
| Front shock absorber | | Coil spring / Gas-oil damper |
| Rear shock absorber | | Coil spring / Gas-oil damper |
| Wheel travel: | | |
| Front wheel travel | | 116 mm (4.6 in) |
| Rear wheel travel | | 130 mm (5.1 in) |
| 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 × 1 |
| Auxiliary light | | 12 V 5 W × 1 |
| Tail / brake light | | 12 V 5 W / 21 W × 2 |
| Flasher light | | 12 V 21 W / 5 W × 4 |
| Meter light | | 12 V 3.4 W × 5 |
| Indicator light | | |
| NEUTRAL | | 12 V 1.7 W × 1 |
| TURN | | 12 V 3.4 W × 2 |
| OIL LEVEL | | 12 V 1.7 W × 1 |
| HIGH BEAM | | 12 V 1.7 W × 1 |
| FUEL | | 12 V 3.4 W × 1 |
| ABS | | 12 V 1.7 W × 1 |
| EFI | | 12 V 1.7 W × 1 |

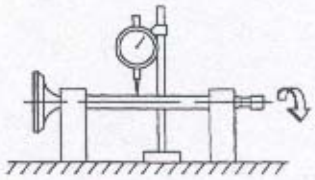
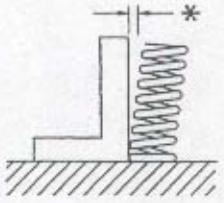
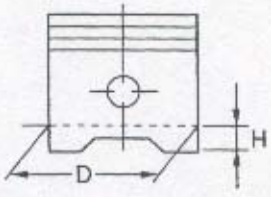
# MAINTENANCE SPECIFICATIONS

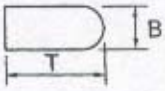
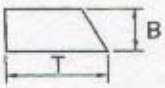
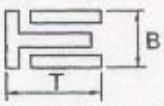
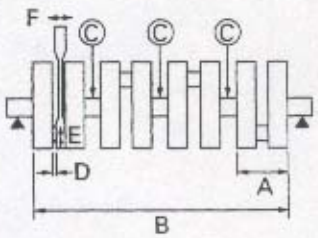
## ENGINE

| Model | GTS1000AE |
|---|---|
| Cylinder head: | |
| Warp limit | 0.03 mm (0.0012 in) |
|  | * Lines indicate straightedge measurement. |
| Cylinder: | |
| Bore size | 75.500 ~ 75.505 mm (2.9724 ~ 2.9726 in) |
| Taper limit | 0.05 mm (0.002 in) |
| Out of round limit | 0.05 mm (0.0020 in) |
| Camshaft: | |
| Drive method | Chain drive (Center) |
| Cam cap inside diameter (I-1, I-4, E-1, E-4) | 24.470 ~ 24.491 mm (0.9634 ~ 0.9642 in) |
| Cam cap inside diameter (I-2, I-3, E-2, E-3) | 24.500 ~ 24.521 mm (0.9646 ~ 0.9654 in) |
| Camshaft outside diameter | 24.437 ~ 24.450 mm (0.9621 ~ 0.9626 in) |
| Shaft-to-cap clearance (I-1, I-4, E-1, E-4) | 0.020 ~ 0.054 mm (0.0008 ~ 0.0021 in) |
| Shaft-to-cap clearance (I-2, I-3, E-2, E-3) | 0.050 ~ 0.084 mm (0.0020 ~ 0.0033 in) |
| Cam dimensions | |
|  | |
| Intake "A" | 31.8 ~ 31.9 mm (1.252 ~ 1.256 in) |
| <limit> | <31.7mm (1.248 in)> |
| "B" | 24.95 ~ 25.05 mm (0.982 ~ 0.986 in) |
| <limit> | <24.85 mm (0.978 in)> |
| "C" | 6.75 ~ 6.95 mm (0.266 ~ 0.274 in) |
| Exhaust "A" | 31.75 ~ 31.85 mm (1.250 ~ 1.254 in) |
| <limit> | <31.65 mm (1.246 in)> |
| "B" | 24.95 ~ 25.05 mm (0.982 ~ 0.986 in) |
| <limit> | <24.85 mm (0.978 in)> |
| "C" | 6.7 ~ 6.9 mm (0.264 ~ 0.272 in) |

| Model | | GTS1000AE |
|---|---|---|
| Camshaft runout limit | | 0.03 mm (0.0012 in) |
|  | | |
| Cam chain: | | |
| Cam chain type / No. of links | | 219FS/108 |
| Cam chain adjustment method | | Automatic |
| Valve, valve seat, valve guide: | | |
| Valve clearance (cold) | IN | 0.11 ~ 0.20 mm (0.004 ~ 0.008 in) |
| | EX | 0.21 ~ 0.30 mm (0.008 ~ 0.012 in) |
| Valve dimensions: | | |
|   Head Dia | | |
|   Face Width | | |
|   Seat Width | | |
|   Margin Thickness | | |
| "A" head diameter | IN | 23.4 ~ 23.6 mm (0.921 ~ 0.929 in) |
| | EX | 24.9 ~ 25.1 mm (0.980 ~ 0.988 in) |
| "B" face width | IN | 1.63 ~ 2.90 mm (0.064 ~ 0.114 in) |
| | EX | 1.63 ~ 2.90 mm (0.064 ~ 0.114 in) |
| "C" seat width | IN | 0.9 ~ 1.1 mm (0.035 ~ 0.043 in) |
| | EX | 0.9 ~ 1.1 mm (0.035 ~ 0.043 in) |
| "D" margin thickness | IN | 0.45 ~ 0.95 mm (0.018 ~ 0.037 in) |
| | EX | 0.75 ~ 1.25 mm (0.030 ~ 0.049 in) |
| Stem outside diameter | IN | 4.475 ~ 4.490 mm (0.1762 ~ 0.1768 in) |
| | EX | 4.460 ~ 4.475 mm (0.1756 ~ 0.1762 in) |
| <Limit> | IN | <4.445 mm (0.175 in)> |
| | EX | <4.43 mm (0.174 in)> |
| Guide inside diameter | IN | 4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in) |
| | EX | 4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in) |
| <Limit> | IN | <4.55 mm (0.179 in)> |
| | EX | <4.55 mm (0.179 in)> |
| Stem-to-guide clearance | IN | 0.010 ~ 0.037 mm (0.0004 ~ 0.0015 in) |
| | EX | 0.025 ~ 0.052 mm (0.0010 ~ 0.0020 in) |
| <Limit> | IN | <0.08 mm (0.003 in)> |
| | EX | <0.1 mm (0.004 in)> |

2

| Model | | GTS1000AE |
|---|---|---|
| Stem runout limit | | 0.01 mm (0.0004 in) |
|  | | |
| Valve seat width | IN | 0.9 ~ 1.1 mm (0.0354 ~ 0.0433in) |
| | EX | 0.9 ~ 1.1 mm (0.0354 ~ 0.0433 in) |
| Valve spring: | | |
| Inner spring | | |
| Free length | IN | 40.73 mm (1.60 in) |
| | EX | 45.44 mm (1.79 in) |
| Set length (valve closed) | IN | 36.5 mm (1.4 in) |
| | EX | 38.5 mm (1.5 in) |
| Compressed pressure (installed) | IN | 8.1 ~ 9.3 kg (17.86 ~ 20.50 lb) |
| | EX | 13.53 ~ 15.53 kg (29.83 ~ 34.24 lb) |
| Tilt limit | IN | 2.5°/1.7 mm (2.5°/0.067 in) |
| | EX | 2.5°/1.7 mm (2.5°/0.067 in) |
|  | | |
| Direction of winding (top view) | IN | Clockwise |
| | EX | Clockwise |
| | | |
| Piston: | | |
| Piston to cylinder clearance | | 0.06 ~ 0.08 mm (0.0024 ~ 0.0031 in) |
| <Limit> | | <0.15 mm (0.0059 in)> |
| Piston size "D" | | 75.425 ~ 75.440 mm (2.969 ~ 2.970 in) |
|  | | |
| Measuring point "H" | | 3 mm (0.118 in) |

| Model | GTS1000AE |
|---|---|
| Piston off-set | 0.5 mm (0.02 in) |
| Piston off-set direction | IN side |
| Piston pin bore inside diameter | 19.004 ~ 19.015 mm (0.7482 ~ 0.7486 in) |
| Piston pin outside diameter | 18.991 ~ 19.000 mm (0.7477 ~ 0.7480 in) |
| Piston rings: | |
| Top ring:   | |
| Type | Barrel |
| Dimensions (B × T) | 0.8 × 2.8 mm (0.031 × 0.110 in) |
| End gap (installed) | 0.3 ~ 0.5 mm (0.012 ~ 0.020 in) |
| Side clearance (installed) | 0.03 ~ 0.07 mm (0.001 ~ 0.003 in) |
| 2nd ring:   | |
| Type | Taper |
| Dimensions (B × T) | 0.8 × 2.8 mm (0.031 × 0.110 in) |
| End gap (installed) | 0.3 ~ 0.5 mm (0.012 ~ 0.020 in) |
| Side clearance | 0.02 ~ 0.06 mm (0.001 ~ 0.002 in) |
| Oil ring:   | |
| Dimensions (B × T) | 1.5 × 2.5 mm (0.059 × 0.098 in) |
| End gap (installed) | 0.2 ~ 0.8 mm (0.008 ~ 0.031 in) |
| Connecting rod: | |
| Oil clearance | 0.032 ~ 0.056 mm (0.001 ~ 0.002 in) |
| Color code (corresponding size) | ① Blue ② Black ③ Brown ④ Green |
| Crankshaft:   | |
| Crank width "A" | 55.7 ~ 59.5 mm (2.193 ~ 2.343 in) |
| Assembly width "B" | 339.8 ~ 340.2 mm (13.378 ~ 13.394 in) |
| Runout limit "C" | 0.03 mm (0.0012 in) |
| Big end side clearance "D" | 0.160 ~ 0.262 mm (0.006 ~ 0.010 in) |

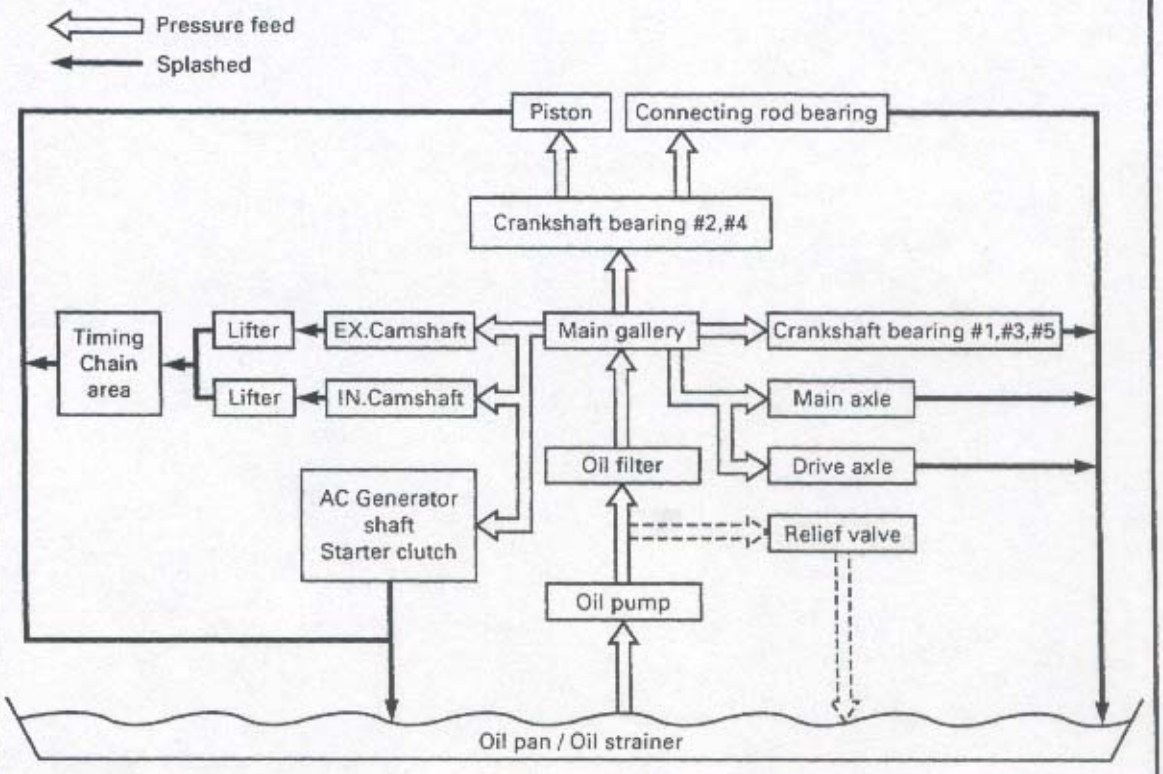
| Model | | GTS1000AE |
|---|---|---|
| Big end radial clearance "E" | | 0:042 ~ 0.066 mm (0.0017 ~ 0.0026 in) |
| Journal oil clearance | | 0.040 ~ 0.064 mm (0.0016 ~ 0.0025 in) |
| Color code (corresponding size) | | ① Blue ② Black ③ Brown ④ Green ⑤ Yellow |
| Clutch: | | |
| Friction plate thickness | | 2.9 ~ 3.1 mm (0.114 ~ 0.122 in) |
| Quantity | | 8 |
| Friction plate wear limit | | 2.8 mm (0.11 in) |
| Friction plate thickness | | 3.4 ~ 3.6 mm (0.134 ~ 0.142 in) |
| Quantity | | 1 |
| Friction plate wear limit | | 3.3 mm (0.13 in) |
| Clutch plate thickness | | 1.9 ~ 2.1 mm (0.075 ~ 0.083 in) |
| Quantity | | 8 |
| Warp limit | | 0.1 mm (0.004 in) |
| Clutch spring free length | | 50 mm (1.97 in) |
| Quantity | | 6 |
| Minimum length | | 48 mm (1.89 in) |
| Clutch release method | | Hydraulic inner push |
| Transmission: | | |
| Main axle deflection limit | | 0.08 mm (0.003 in) |
| Drive axle deflection limit | | 0.08 mm (0.003 in) |
| Shifter: | | |
| Shifter type | | Guide bar |
| Guide bar bending limit | | 0.1 mm (0.004 in) |
| Throttle body: | | |
| I. D. mark | | 4BH 00 |
| Throttle valve size | (Th.V) | #125 |
| Engine idle speed | | 950 ~ 1,050 r/min |
| Intake vacuum | | 32.9 kPa (250 mmHg, 9.843 inHg) |
| Fuel pump: | | |
| Type | | Electrical type |
| Model / manufacturer | | 4BH/NIPPONDENSO |
| Consumption amperage | <max> | 5.3 A |
| Output pressure | | 350 kPa (3.5 kg/cm², 50 psi) |
| Lubrication system: | | |
| Oil filter type | | Paper type |
| Oil pump type | | Trochoid type |
| Tip clearance "A" or "B" | | 0.09 ~ 0.15 mm (0.004 ~ 0.006 in) |
| <Limit> | | <0.2 mm (0.008 in)> |
| Side clearance | | 0.03 ~ 0.08 mm (0.001 ~ 0.003 in) |
| <Limit> | | <0.15 mm (0.006 in)> |
| Bypass valve setting pressure | | 180 ~ 220 kPa (1.8 ~ 2.2 kg/cm², 25.60 ~ 31.29 psi) |
| Relief valve operating pressure | | 390 ~ 470 kPa (3.9 ~ 4.7 kg/cm², 55.47 ~ 66.85 psi) |
| Oil pressure (hot) | | 70 kPa (0.7 kg/cm², 9.96 psi) at 1,000 r/min |

| Model | GTS1000AE |
|---|---|
| Cooling system: | |
| Radiator core size | |
| Width | 340 mm (13.4 in) |
| Height | 218 mm (8.58 in) |
| Thickness | 24 mm (0.94 in) |
| Radiator cap opening pressure | 95 ~ 125 kPa (0.95 ~ 1.25 kg/cm², 13.51 ~ 17.78 psi) |
| Radiator capacity | 2.3 L (2.02 Imp qt, 2.43 US qt) |
| Reservoir tank capacity | 0.25 L (0.22 Imp qt, 0.26 US qt) |
| <From low to full level> | <0.2 L (0.18 Imp qt, 0.21 US qt)> |
| Water pump | |
| Type | Single suction centrifugal pump |
| Reduction ratio | 68/41X41/43(1.581) |

2

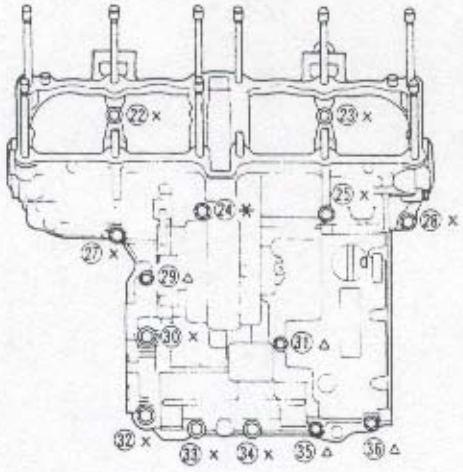
| Model | GTS1000AE |
|---|---|

Lubrication chart:

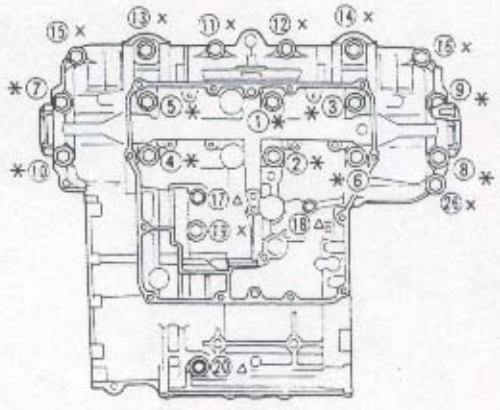



Crankcase tightening sequence:

Crancase (upper)



Crankcase (lower)



✱: M9 Bolt: 32 Nm (3.2 m • kg, 23 ft • lb)
×: M8 Bolt: 24 Nm (2.4 m • kg, 17 ft • lb)
△: M6 Bolt: 12 Nm (1.2 m • kg, 8.7 ft • lb)

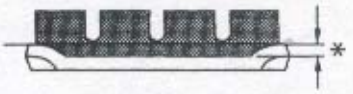
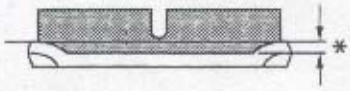
## Tightening torques

| Part to be tightened | Part name | Thread size | Q'ty | Tightening torque | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | Nm | m·kg | ft·lb | |
| Camshaft case | Flange bolt | M6 | 11 | 10 | 1.0 | 7.2 | M |
| Camshaft cap | Bolt | M6 | 40 | 10 | 1.0 | 7.2 | E |
| Cylinder head (exhaust pipe) | Stud bolt | M8 | 8 | 15 | 1.5 | 11 | |
| Cylinder head | Nut | M10 | 8 | 41 | 4.1 | 30 | E |
| Cylinder head | Cap nut | M10 | 4 | 41 | 4.1 | 30 | E |
| Spark plug | – | M12 | 4 | 17.5 | 1.75 | 12.5 | |
| Cylinder head cover | Bolt | M6 | 8 | 10 | 1.0 | 7.2 | |
| Connecting rod | Nut | M8 | 8 | 36 | 3.6 | 25 | M |
| Timing chain sprocket | Flange bolt | M7 | 4 | 24 | 2.4 | 17 | |
| Timing chain tensioner | Bolt | M6 | 2 | 10 | 1.0 | 7.2 | |
| Timing chain tensioner end | Cap bolt | M11 | 1 | 20 | 2.0 | 14 | |
| Chain guide (intake side) | Bolt | M6 | 2 | 10 | 1.0 | 7.2 | |
| Oil pump housing | Screw | M6 | 1 | 7 | 0.7 | 5.1 | |
| Oil pump mount | Bolt | M6 | 3 | 10 | 1.0 | 7.2 | |
| Oil filter | – | M20 | – | 17 | 1.7 | 12 | E |
| Oil cooler | – | M20 | – | 63 | 6.3 | 45 | E |
| Oil pan | Bolt | M6 | 12 | 10 | 1.0 | 7.2 | |
| Drain bolt | – | M14 | 1 | 43 | 4.3 | 31 | |
| Oil baffle plate (lower) | Flange bolt | M6 | 4 | 10 | 1.0 | 7.2 | G |
| Oil baffle plate (upper) | Flange bolt | M6 | 10 | 10 | 1.0 | 7.2 | G |
| Oil level switch | Bolt | M6 | 2 | 10 | 1.0 | 7.2 | |
| Exhaust pipe | Nut | M8 | 8 | 20 | 2.0 | 14 | |
| Exhaust chamber and muffler | Flange bolt | M8 | 1 | 20 | 2.0 | 14 | |
| Exhaust chamber | Flange bolt | M8 | 2 | 18 | 1.8 | 13 | |
| Exhaust pipe and exhaust chamber | Bolt | M6 | 4 | 20 | 2.0 | 14 | |
| Muffler and stay | Flange bolt | M8 | 1 | 20 | 2.0 | 14 | |
| Exhaust pipe blind plug (CO test) | Bolt | M6 | 4 | 10 | 1.0 | 7.2 | |
| Crankcase | Stud bolt | M10 | 12 | 10 | 1.0 | 7.2 | |
| Main axle bearing retainer | Torx | M6 | 3 | 10 | 1.0 | 7.2 | LT |
| Crankshaft end cover | Screw | M6 | 6 | 7 | 0.7 | 5.1 | |
| Crankcase cover (right) | Bolt | M6 | 11 | 10 | 1.0 | 7.2 | |
| Crankcase | Flange bolt | M6 | 7 | 12 | 1.2 | 8.7 | E |
| Crankcase | Flange bolt | M8 | 17 | 24 | 2.4 | 17 | E |
| Crankcase | Flange bolt | M9 | 11 | 32 | 3.2 | 23 | E |
| Oil delivery hose | Union bolt | M10 | 3 | 20 | 2.0 | 14 | |
| Starter wheel | Bolt | M8 | 3 | 25 | 2.5 | 18 | LT |
| HY-VO chain guide | Bolt | M6 | 2 | 10 | 1.0 | 7.2 | LT |
| Clutch boss | Nut | M20 | 1 | 70 | 7.0 | 50 | Use lock washer |
| Clutch spring | Bolt | M6 | 6 | 8 | 0.8 | 5.8 | |

| Part to be tightened | Part name | Thread size | Q'ty | Tightening torque | | | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | Nm | m·kg | ft·lb | |
| Drive sprocket | Nut | M18 | 1 | 70 | 7.0 | 50 | Use lock washer |
| Shift cam stopper lever | Bolt | M6 | 1 | 10 | 1.0 | 7.2 | |
| Shift cam bearing stopper | Bolt | M6 | 1 | 10 | 1.0 | 7.2 | |
| Guide bar stopper (shift fork) | Bolt | M6 | 1 | 10 | 1.0 | 7.2 | |
| Neutral switch | Screw | M6 | 2 | 4 | 0.4 | 2.9 | |
| AC generator | Flange bolt | M8 | 3 | 25 | 2.5 | 18 | |
| Starter motor | Flange bolt | M6 | 2 | 10 | 1.0 | 7.2 | |
| Fuel hose | Union bolt | M12 | 4 | 30 | 3.0 | 22 | |

## CHASSIS

| Model | | GTS1000AE |
|---|---|---|
| Steering system: | | |
| Steering bearing type | | Ball bearing |
| No. / size of steel balls | | |
| | upper | 16 pcs. / 0.2343 in |
| | lower | 16 pcs. / 0.2343 in |
| Front suspension: | | |
| Shock absorber travel | | 57.5 mm (2.26 in) |
| Fork spring free length | | 186.5 mm (7.3 in) |
| Spring rate | (K1) | 65.0 N/mm (6.5 kg/mm 364.0 lb/in) |
| | (K2) | 90.0 N/mm (9 kg/mm 504.0 lb/in) |
| | (K3) | 190.0 N/mm (19 kg/mm 1,063.9 lb/in) |
| Stroke | (K1) | 0 ~ 30 mm (0.00 ~ 1.18 in) |
| | (K2) | 30 ~ 50 mm (1.18 ~ 1.97 in) |
| | (K3) | 50.0 ~ 57.5 mm (1.97 ~ 2.26 in) |
| Optional spring | | No |
| Oil grade | | Suspension oil "01" or equivalent |
| Enclosed gas / air pressure (STD) | | 1,000 kPa (10 kg/cm², 142 psi) |
| Rear suspension: | | |
| Shock absorber travel | | 60 mm (2.36 in) |
| Spring free length | | 204 mm (8.03 in) |
| Fitting length | | 188 mm (7.40 in) |
| Spring rate | (K1) | 105.0 N/mm (10.5 kg/mm 588.0 lb/in) |
| Stroke | (K1) | 0 ~ 60 mm (0.00 ~ 2.36 in) |
| Optional spring | | No |
| Enclosed gas / air pressure (STD) | | 1,200 kPa (12 kg/cm², 171 psi) |
| Swingarm: | | |
| Free play limit | end | 1 mm (0.04 in) |
| | side | 1 mm (0.04 in) |
| Front wheel: | | |
| Type | | Cast wheel |
| Rim size | | 17 X MT3.50 |
| Rim material | | Aluminum |
| Rim runout limit | radial | 0.7 mm (0.03 in) |
| | lateral | 0.5 mm (0.02 in) |
| Rear wheel: | | |
| Type | | Cast wheel |
| Rim size | | 17 X MT5.50 |
| Rim material | | Aluminum |
| Rim runout limit | radial | 1 mm (0.04 in) |
| | lateral | 0.5 mm (0.02 in) |
| Drive chain: | | |
| Type / manufacturer | | RK532GSV2/RK EXCEL<br>DID532ZLV KAI/DAIDO |

| Model | GTS1000AE |
|---|---|
| No. of links | 118 |
| Chain free play | 10 ~ 20 mm (0.4 ~ 0.8 in) |
| Front disc brake: | |
| Type | Single |
| Disc outside diameter × thickness | 330 × 14 mm (13.0 × 0.55 in) |
| Pad thickness inner | 5 mm (0.20 in) |
| <Limit> | <0.5 mm (0.02 in)> |
| Pad thickness outer | 5 mm (0.20 in) |
| <Limit> | <0.5 mm (0.02 in)> |
|  | |
| Master cylinder inside diameter | 15.87 mm (0.62 in) |
| Caliper cylinder inside diameter | 33.96 mm (1.34 in) + 38.18 mm (1.50 in) + 38.18 mm (1.50 in) |
| Brake fluid type | DOT #4 |
| Rear disc brake: | |
| Type | Single |
| Disc outside diameter × thickness | 282.0 × 8.5 mm (11.1 × 0.33 in) |
| Pad thickness inner | 5.5 mm (0.22 in) |
| <Limit> | <0.5 mm (0.02 in)> |
| Pad thickness outer | 5.5 mm (0.22 in) |
| <Limit> | <0.5 mm (0.02 in)> |
|  | |
| Master cylinder inside diameter | 14 mm (0.55 in) |
| Caliper cylinder inside diameter | 42.85 mm (1.69 in) |
| Brake fluid type | DOT #4 |
| Clutch: | |
| Master cylinder inside diameter | 15.87 mm (0.62 in) |
| Release cylinder inside diameter | 38.1 mm (1.50 in) |
| Brake fluid type | DOT #4 |
| Brake lever & brake pedal: | |
| Brake pedal position | 25 mm (0.98 in) |

## Tightening torques

| Part to be tightened | Thread size | Tightening torque | | | Remarks |
|---|---|---|---|---|---|
| | | Nm | m·kg | ft·lb | |
| Lower arm and frame (L) | M18 | 105 | 10.5 | 75 | |
| Lower arm and frame (R) | M16 | 105 | 10.5 | 75 | |
| Camber adjuster locknut | M18 | 23 | 2.3 | 17 | Use lock washer |
| Upper arm and frame | M10 | 40 | 4.0 | 29 | |
| Front shock absorber and lower arm | M10 | 40 | 4.0 | 29 | |
| Front shock absorber and frame | M16 | 105 | 10.5 | 75 | |
| Ball joint #1 and knuckle arm | M12 | 53 | 5.3 | 38 | |
| Ball joint #1 and upper arm | M10 | 40 | 4.0 | 29 | |
| Ball joint #2 and knuckle arm | M12 | 78 | 7.8 | 56 | |
| Ball joint #2 and lower arm | M12 | 78 | 7.8 | 56 | |
| Ball joint #2 stopper bolt | M6 | 65 | 6.5 | 47 | |
| Steering tube connecting plate (upper and lower) | M8 | 23 | 2.3 | 17 | |
| Steering stem ring nuts | M25 | 18 | 1.8 | 13 | See NOTE |
| Handle crown and steering stem | M22 | 110 | 11.0 | 80 | |
| Handle crown and pinch bolt | M6 | 11 | 1.1 | 8.0 | |
| Handle crown and handlebar | M8 | 28 | 2.8 | 20 | |
| Master cylinder holder (brake and clutch) | M6 | 9 | 0.9 | 6.5 | |
| Engine mounting: | | | | | |
| Mounting bolt (rear lower) | M10 | 55 | 5.5 | 40 | |
| Mounting bolt (front upper) | M10 | 55 | 5.5 | 40 | |
| Bolt (mounting bracket) | M10 | 40 | 4.0 | 29 | |
| Mounting bolt (rear upper) | M10 | 55 | 5.5 | 40 | |
| Bolt (main frame center beam) | M10 | 40 | 4.0 | 29 | |
| Bolt (main frame center beam-steering frame) | M10 | 55 | 5.5 | 40 | |
| Bolt (reinforcement tube-front) | M10 | 55 | 5.5 | 40 | |
| Bolt (reinforcement tube-rear) | M10 | 40 | 4.0 | 29 | |
| Mounting bolt (center) | M10 | 40 | 4.0 | 29 | |
| Mounting bolt (front lower) | M10 | 55 | 5.5 | 40 | |
| Pinch bolt (rear upper) | M8 | 15 | 1.5 | 11 | |
| Pinch bolt (center) | M8 | 15 | 1.5 | 11 | |
| Cover (main frame) | M8 | 10 | 1.0 | 7.2 | |
| Front frame and frame | M10 | 55 | 5.5 | 40 | |
| Rear frame and frame | M10 | 55 | 5.5 | 40 | |
| Pivot shaft (swingarm) | M18 | 130 | 13.0 | 94 | |
| Relay arm and frame | M10 | 47 | 4.7 | 34 | |
| Relay arm and connecting arm | M12 | 73 | 7.3 | 53 | |
| Swingarm and connecting arm | M12 | 73 | 7.3 | 53 | |
| Rear shock absorber and swingarm | M10 | 40 | 4.0 | 29 | |
| Rear shock absorber and frame | M10 | 40 | 4.0 | 29 | |

| Part to be tightened | Thread size | Tightening torque | | | Remarks |
|---|---|---|---|---|---|
| | | Nm | m-kg | ft-lb | |
| Chain case and swingarm | M6 | 7 | 0.7 | 5.1 | |
| Chain case and rear fender | M6 | 7 | 0.7 | 5.1 | |
| Rear fender and swingarm (front) | M6 | 7 | 0.7 | 5.1 | |
| Rear fender and swingarm (rear) | M8 | 19 | 1.9 | 13 | |
| Fuel tank (front) | M8 | 23 | 2.3 | 17 | |
| Fuel tank (rear) | M8 | 16 | 1.6 | 11 | |
| Fuel pump and fuel tank | M5 | 4 | 0.4 | 2.9 | |
| Fuel sender and fuel tank | M5 | 4 | 0.4 | 2.9 | |
| Drain bolt (fuel tank) | M8 | 16 | 1.6 | 11 | |
| Front foot rest and frame | M8 | 28 | 2.8 | 20 | |
| Rear foot rest and bracket (foot rest) | M8 | 28 | 2.8 | 20 | |
| Bracket (foot rest) and frame | M10 | 40 | 4.0 | 29 | |
| Bracket (foot rest) and rear frame | M10 | 54 | 5.4 | 39 | |
| Rear master cylinder and bracket | M8 | 23 | 2.3 | 17 | |
| Rear brake pedal and brake shaft | M6 | 8 | 0.8 | 5.8 | |
| Shift pedal link and shift shaft | M10 | 40 | 4.0 | 29 | |
| Side stand | M10 | 43 | 4.3 | 31 | |
| Front wheel axle | M24 | 90 | 9.0 | 65 | |
| Front wheel | M12 | 95 | 9.5 | 68 | |
| Rear wheel axle | M18 | 150 | 15.0 | 110 | |
| Front brake caliper | M12 | 67 | 6.7 | 48 | |
| Rear brake caliper | M10 | 35 | 3.5 | 25 | |
| Brake disc (front) | M8 | 22 | 2.2 | 16 | |
| Brake disc (rear) | M8 | 22 | 2.2 | 16 | |
| Rear wheel sprocket and hub | M10 | 60 | 6.0 | 43 | |
| Brake hose union bolt | M10 | 25 | 2.5 | 18 | |
| Chain puller locknut | M8 | 16 | 1.6 | 11 | |
| Rear brake caliper bracket and swingarm | M8 | 49 | 4.9 | 35 | |
| Front fender (upper and lower) | M6 | 6 | 0.6 | 4.3 | |
| Front fender bracket and knuckle arm | M6 | 8 | 0.8 | 5.8 | |

**NOTE:**
1. First, tighten the ring nut approximately 47 Nm (4.7 m • kg, 34 ft • lb) by using the torque wrench, then loosen the ring nut one turn.
2. Retighten the ring nut to specification.

## ELECTRICAL

| Model | GTS1000AE |
|---|---|
| Voltage: | 12 V |
| Ignition system: | |
| Ignition timing (B.T.D.C.) | 5° at 1,000 r/min |
| T.C.I.: | |
| Pickup coil resistance / color | 120 ~ 180 Ω at 20°C (68°F) / Black – Gray |
| T.C.I. unit model / manufacturer | TBDF01/NIPPONDENSO |
| Ignition coil: | |
| Model / manufacturer | J0303.J0304/NIPPONDENSO |
| Primary winding resistance | 1.87 ~ 2.53 Ω at 20°C (68°F) |
| Secondary winding resistance | 12 ~ 18 kΩ at 20°C (68°F) |
| Spark plug cap: | |
| Type | Resin type |
| Resistance | 10 kΩ |
| Charging system: | |
| Type | A.C. generator |
| Model / manufacturer | B3GB/NIPPONDENSO |
| Nominal output | 12 V 34 A at 3,000 r/min |
| Battery: | |
| Specific gravity | 1.320 |
| Electric starter system: | |
| Type | Constant mesh type |
| Starter motor: | |
| Model / manufacturer | SM-13/MITSUBA |
| Output | 0.7 kW |
| Brush overall length | 12.5 mm (0.49 in) |
| <Limit> | <4 mm (0.16 in)> |
| Commutator diameter | 28 mm (1.10 in) |
| <Wear limit> | <27 mm (1.06 in)> |
| Mica undercut | 0.7 mm (0.03 in) |
| Starter relay: | |
| Model / manufacturer | MS5F-441/HITACHI |
| Amperage rating | 100 A |
| Coil winding resistance | 4.2 ~ 4.6 Ω at 20°C (68°F) |
| Horn: | |
| Type | Plane type |
| Quantity | 1 |
| Model / manufacturer | YF-12/NIKKO |
| Maximum amperage | 2.5 A |
| Flasher relay: | |
| Type | Semi-transistor type |
| Model / manufacturer | G18A-101/OMRON |
| Self cancelling device | No |

| Model | GTS1000AE |
|---|---|
| Flasher frequency | 60 ~ 120 cycle/min |
| Wattage | 21 W × 2 + 3.4 W |
| Oil level switch: | |
| Model / manufacturer | 3GM/NIPPONDENSO |
| Fuel gauge: | |
| Model / manufacturer | 4BH/NIPPON SEIKI |
| Sender unit resistance / color full | 10 Ω at 20°C (68°F) / Pink |
| empty | 90 Ω at 20°C (68°F) / Black – Green |
| Fuel pump relay: | |
| Model / manufacturer | 25G/OMRON |
| Coil winding resistance / color | 135 ~ 165 Ω at 20°C (68°F) / White |
| Color code | WHITE |
| Electric fan: | |
| Model / manufacturer | 4BH/NIPPONDENSO |
| Running r/min | 3,450 r/min |
| Thermostatic switch: | |
| Model / manufacturer | 2EL/NIHON THERMOSTAT |
| Thermo unit: | |
| Model / manufacturer | 4BH/NIPPONDENSO |
| Circuit breaker: | |
| Type | Fuse |
| Amperage for individual circuit | |
| MAIN | 30 A × 1 |
| HEAD | 20 A × 1 |
| TAIL | 5 A × 1 |
| SIGNAL | 10 A × 1 |
| IGNITION | 10 A × 1 |
| FAN | 10 A × 1 |
| ABS PUMP | 30 A × 1 |
| EFI | 10 A × 1 |
| CLOCK | 5 A × 1 |
| INDICATOR | 5 A × 1 |
| ABS (Anti-lock Brake System) | 5 A × 1 |
| Reserve | 30 A × 2 |
| Reserve | 20 A × 1 |
| Reserve | 10 A × 2 |
| Reserve | 5 A × 2 |

## 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 California (GTS1000AEC)

| | |
|---|---|
| Model code: | 4HH2 |
| Engine starting number: | 4HH-001101 |
| Vehicle identification number: | JYA4HHCO * PA001101 |
| Basic weight: | |
| With oil and full fuel tank | 280 kg (617 lb) |
| Tire pressure (cold tire): | |
| Maximum load-except motorcycle | 220 kg (485 lb) |
| Throttle body: | |
| I.D. mark | 4HH00 |

For Canada

| | |
|---|---|
| Model code: | 4HH3 |
| Engine starting number: | 4HH-002101 |
| Vehicle identification number: | JYA4HHNO * PA002101 |

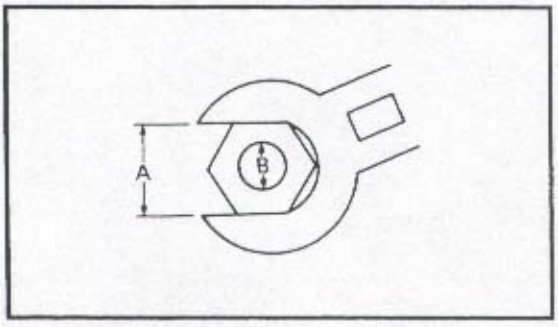
For Australia, New zealand

| | | |
|---|---|---|
| Model code: | | 4HJ1 |
| Engine start number: | | 4HJ-000101 |
| Vehicle identification number: | | JYA4HJTO * PA000101 |
| Transmission: | | |
| Primary reduction ratio | | 68/41 (1.659) |
| Secondary reduction ratio | | 47/17 (2.765) |
| Gear ratio | 1st | 36/14 (2.571) |
| | 2nd | 32/18 (1.778) |
| | 3rd | 29/21 (1.381) |
| | 4th | 27/23 (1.174) |
| | 5th | 28/27 (1.037) |

## 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 | ft•lb |
| 10 mm | 6 mm | 6 | 0.6 | 4.3 |
| 12 mm | 8 mm | 15 | 1.5 | 11 |
| 14 mm | 10 mm | 30 | 3.0 | 22 |
| 17 mm | 12 mm | 55 | 5.5 | 40 |
| 19 mm | 14 mm | 85 | 8.5 | 61 |
| 22 mm | 16 mm | 130 | 13.0 | 94 |

# LUBRICATION POINT AND GRADE OF LUBRICANT

## ENGINE

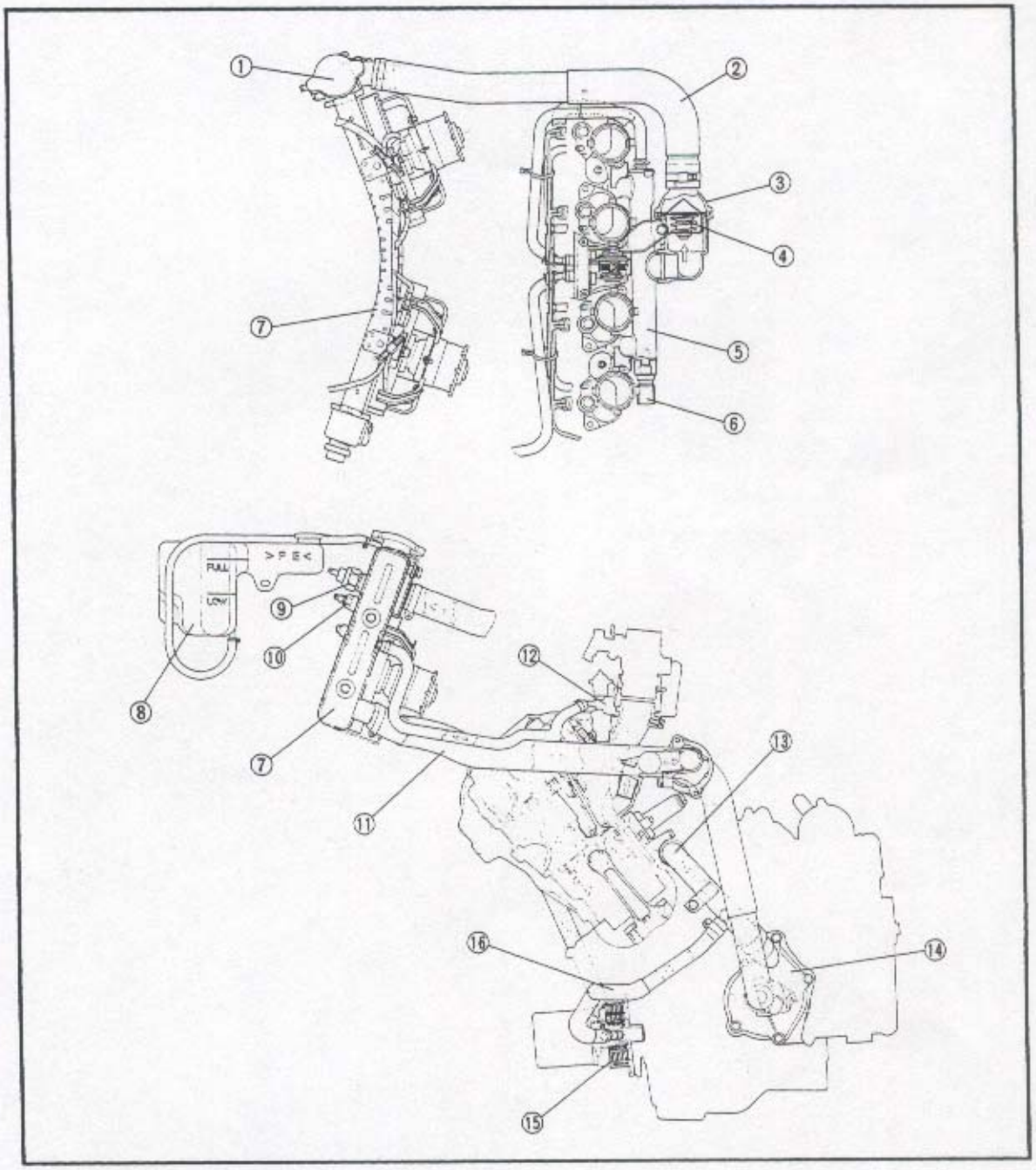
| Lubrication Point | Symbol |
|---|---|
| Oil seal lips | LS |
| O-ring | LS |
| Bearing | E |
| Piston surface | E |
| Piston pin | E |
| Crankshaft pin | E |
| Crankshaft journal | E |
| Connecting rod bolt/nut | M |
| Camshaft cam lobe | M |
| Valve stem (IN, EX) | M |
| Valve stem end (IN, EX) | E |
| Oil pump rotor (inner/outer), housing | E |
| Oil strainer assembly | E |
| Idle gear #1 and #2 surfaces | E |
| Starter idle gear | E |
| Clutch release mechanism | LS |
| Primary driver gear | E |
| Transmission gear(wheel/pinion) | M |
| Axle (main/drive) | M |
| Push rod (bearing/washer) | LS |
| Shift cam | E |
| Shift fork/guide bar | E |
| Shift shaft assembly | E |

## CHASSIS

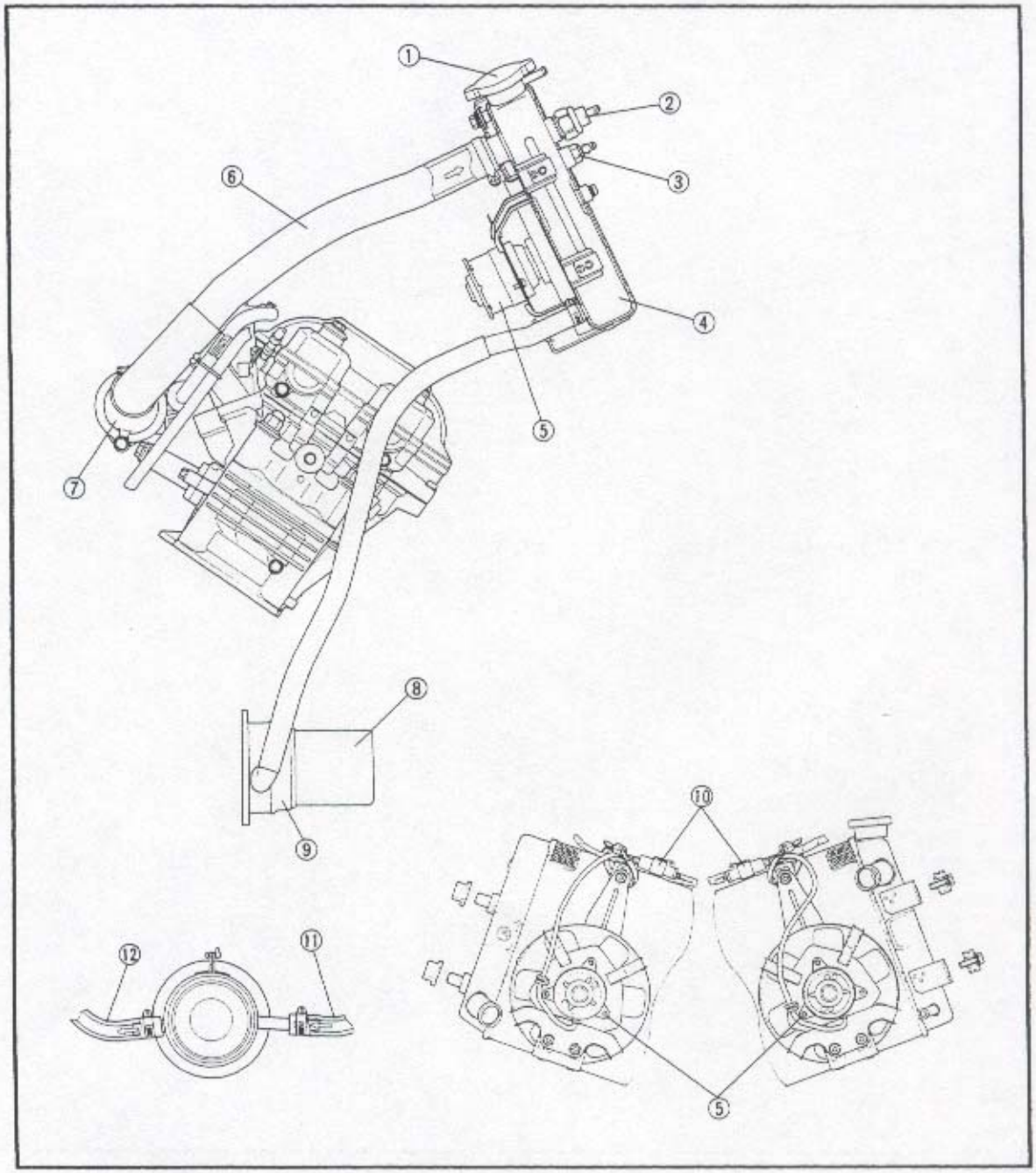
| Lubrication Point | Symbol |
|---|---|
| Rear shock absorber bushing | M |
| Rear swingarm pivot shaft | M |
| Rear swingarm oil seal lips | M |
| Rear swingarm all pivoting points | M |
| Relay arm bearing | M |
| Relay arm oil seal | M |
| Steering bearing (upper/lower) | LS |
| Connecting plate rubber washer (inner) | LS |
| Upper arm bearing and oil seal lips | LS |
| Lower arm dust seal lips | LS |
| Front shock absorber bushing (upper) | M |
| Front shock absorber oil seal lips (lower) | M |
| Hub cap O-ring | LS |
| Front wheel sensor O-ring | LS |
| Front wheel axle bearing | LS |
| Throttle grip inner surfaces | LS |
| Brake lever bolt, sliding surface | LS |
| Clutch lever bolt, sliding surface | LS |
| Rear brake pedal shaft | LS |
| Shift pedal shaft | LS |
| Rear wheel oil seal lips | LS |
| Rear sprocket hub oil seal lips | LS |

# COOLANT DIAGRAMS

①Radiator cap
②Inlet hose (radiator)
③Thermostatic valve housing
④Thermostatic valve
⑤Coolant collector (outlet)
⑥Water temperature sensor
⑦Radiator
⑧Reservoir tank (coolant)
⑨Thermo switch
⑩Thermo unit
⑪Outlet hose (radiator)
⑫Fast idle unit
⑬Outlet pipe (water pump)
⑭Water pump
⑮Oil cooler
⑯Inlet hose (oil cooler)



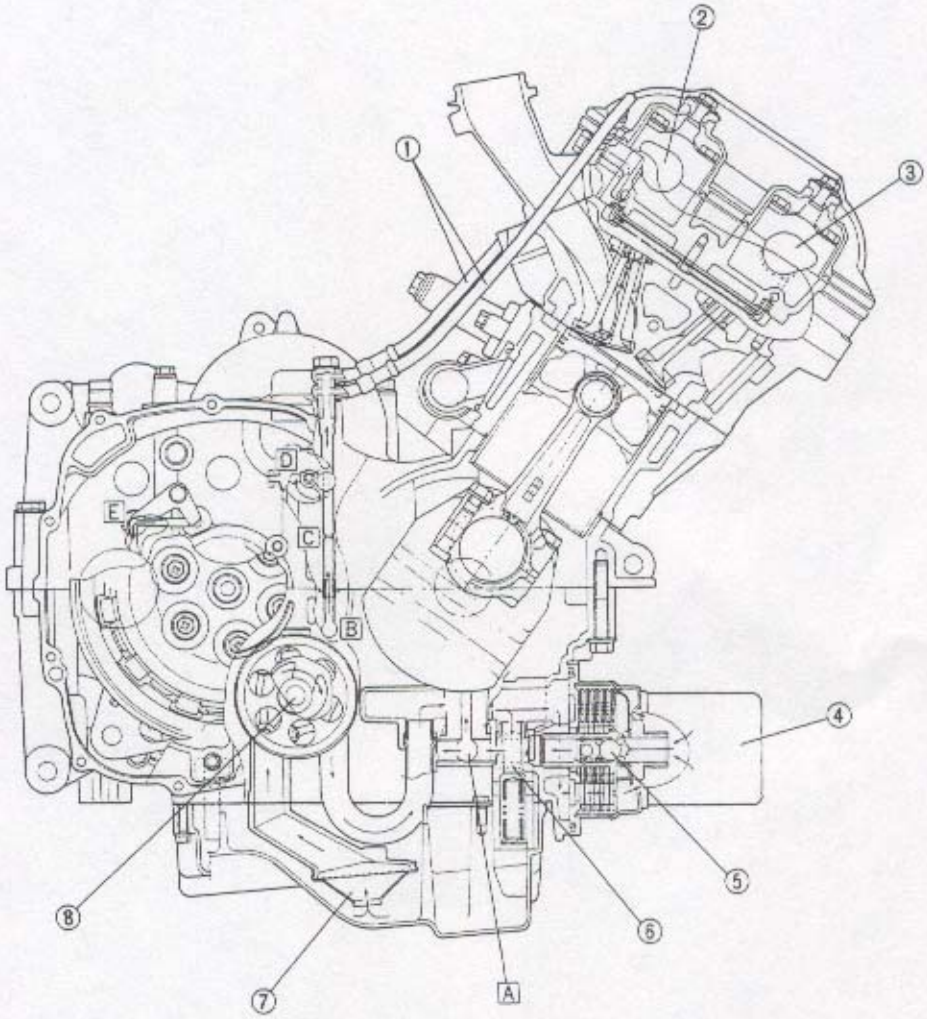
①Radiator cap
②Thermo switch
③Thermo unit
④Radiator
⑤Fan motor
⑥Inlet hose (radiator)
⑦Thermostatic valve housing
⑧Oil filter
⑨Oil cooler
⑩Fan motor coupler
⑪Inlet hose (oil cooler)
⑫Outlet hose (oil cooler)



## LUBRICATION DIAGRAMS

①Oil delivery hose
②Camshaft (intake)
③Camshaft (exhaust)
④Oil filter
⑤Bypass valve
⑥Relief valve
⑦Oil strainer
⑧Oil pump

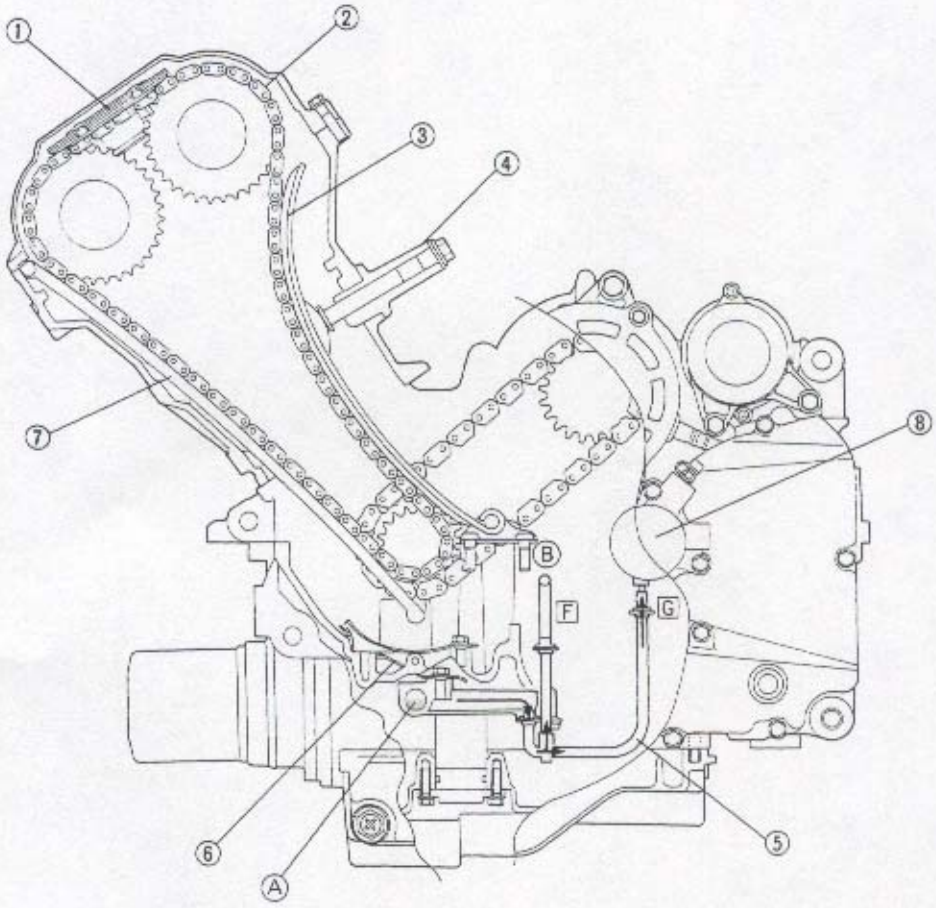
[A] To Ⓐ (see p2-26)
[B] To Ⓑ (see p2-26)
[C] To Ⓒ (see p2-28)
[D] To Ⓓ (see p2-28)
[E] To Ⓔ (see p2-27)



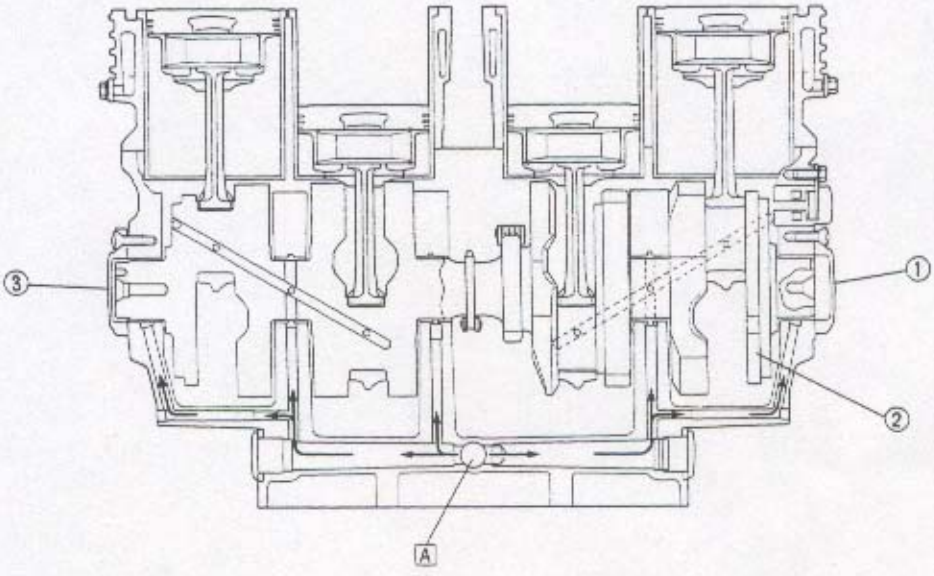
①Timing chain guide (upper)
②Timing chain
③Timing chain guide (intake side)
④Timing chain tensioner
⑤Oil pipe #1
⑥Baffle plate
⑦Timing chain guide (exhaust side)
⑧Main axle

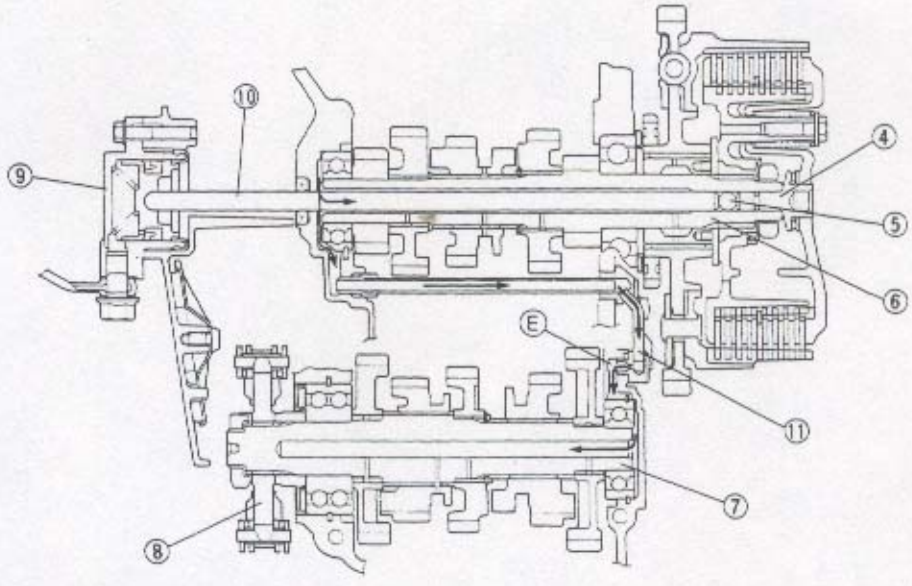
F To Ⓕ (see p2-28)
G To Ⓖ (see p2-28)

2



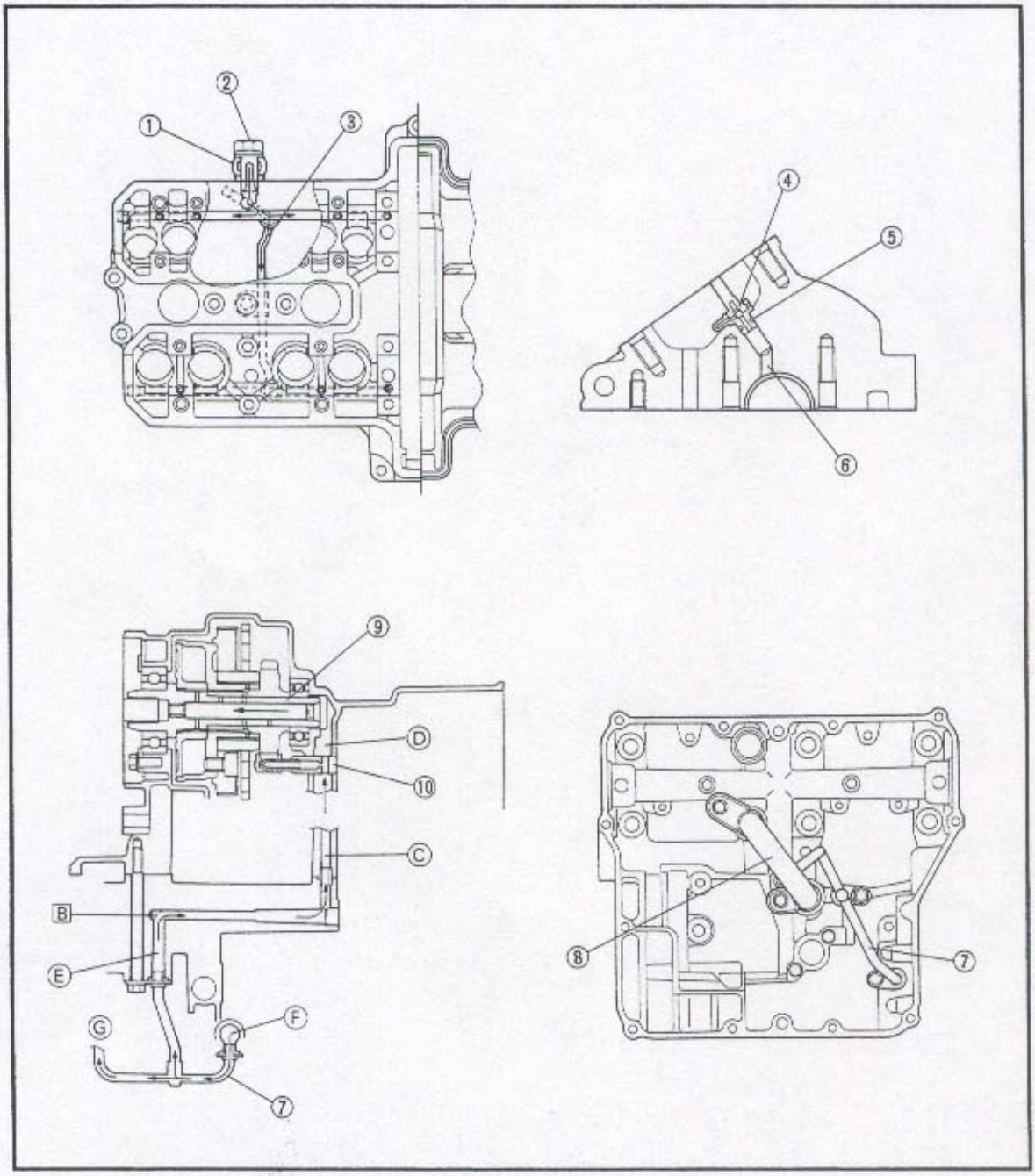
①Crankshaft end cover (right)
②Crankshaft
③Crankshaft end cover (left)
④Push rod #1
⑤Ball
⑥Main axle
⑦Drive axle
⑧Drive sprocket
⑨Clutch release cylinder
⑩Push rod #2
⑪Oil delivery pipe #5



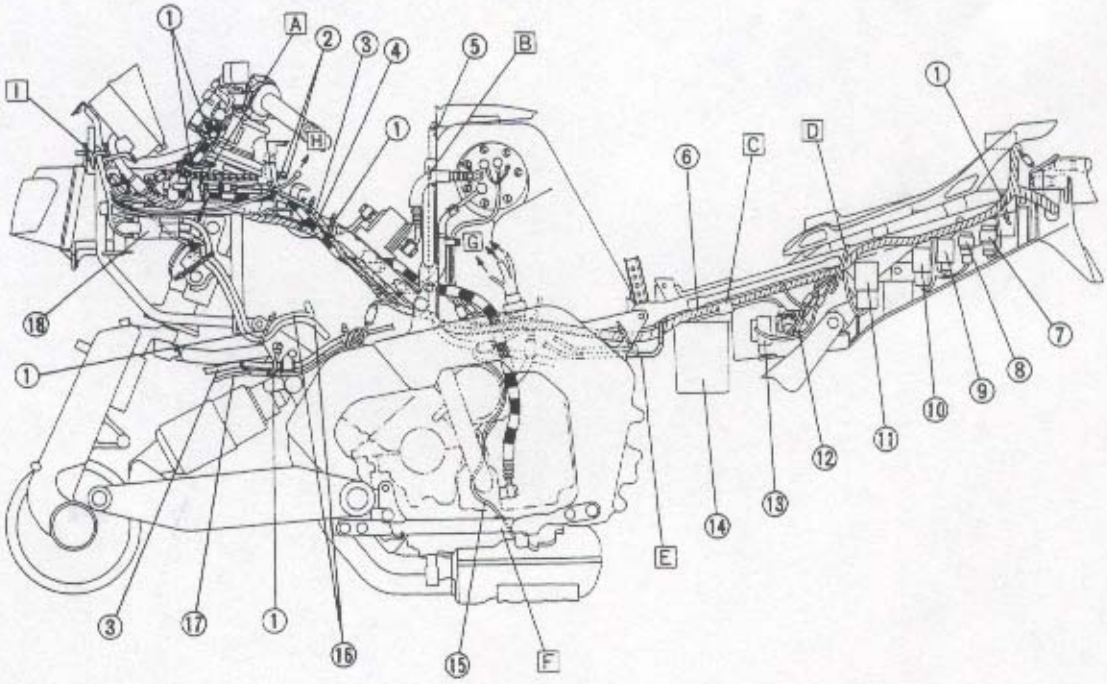
①Oil delivery pipe #2
②Union bolt
③Oil delivery pipe #3
④Oil jet nozzle
⑤O-ring
⑥Plain bearing (crankshaft)
⑦Oil delivery pipe #1
⑧Oil pipe #2
⑨AC generator shaft
⑩Oil spray nozzle

2



## CABLE ROUTING

① Band
② Throttle cables
③ Brake hose
④ Clutch hose
⑤ Drain hose (overflow plate)
⑥ Wire harness
⑦ EFI main relay/oil light relay coupler
⑧ Oil light relay stop switch relay coupler
⑨ Flasher light relay
⑩ EFI main relay stop switch relay coupler
⑪ Starting circuit cut-off relay
⑫ Starter relay
⑬ Fall detection switch
⑭ Battery
⑮ Side stand switch lead
⑯ Ignition coil lead
⑰ Front wheel sensor lead
⑱ Ignition coil
[A] Clamp the clutch hose (below) and brake hose (above).
[B] Attach the fuel delivery hose with the hose holder.
[C] Clamp the stater motor lead (lower) and wire harness (upper).
[D] Clamp the wire harness and leads.
[E] Clamp the wire harness and starter motor lead to the fuel tank stay.
[F] Clamp the side stand switch lead with the down tube clamp.
[G] To engine wire harness.
[H] To flasher.
[I] Clamp the wire harness to the meter bracket.



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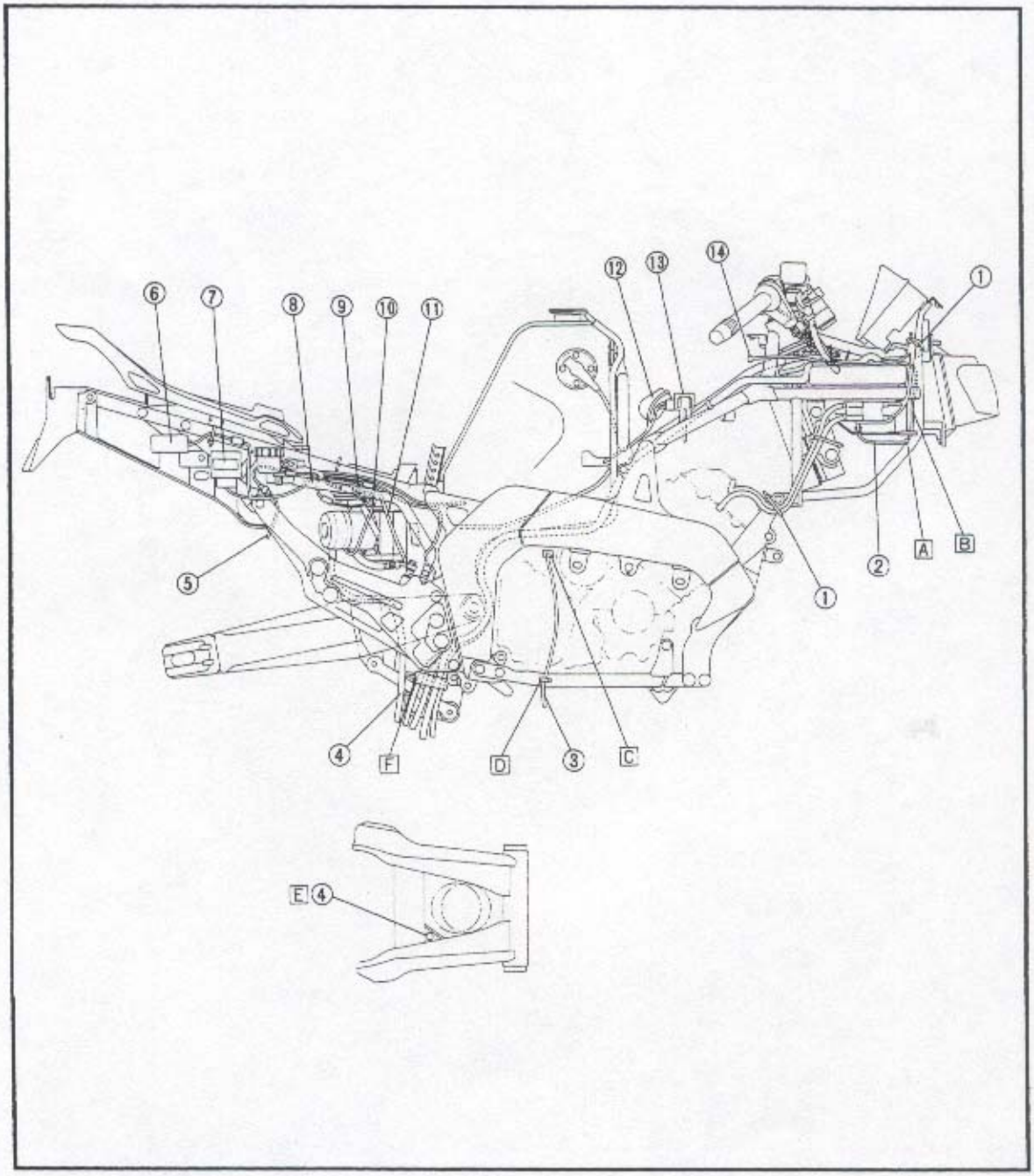
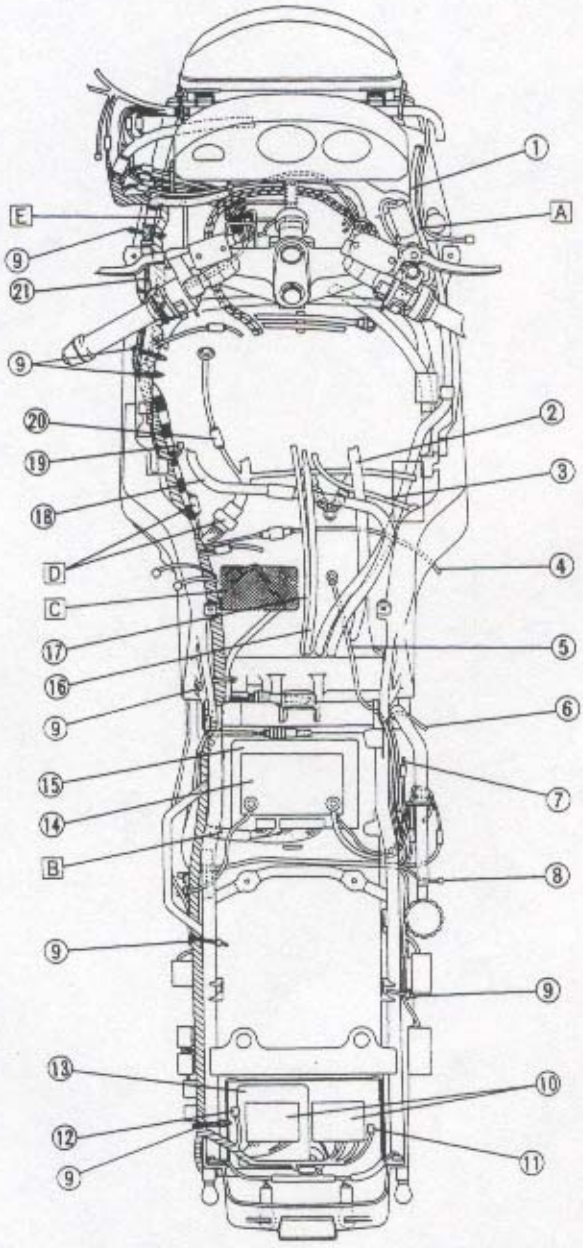
①Band
②Reservoir tank hose (coolant)
③$O_2$ sensor lead
④Hydraulic unit (HU) breather hose
⑤Rear wheel sensor lead
⑥Condenser
⑦ABS relay
⑧Reservoir tank hose (rear brake)
⑨Clamp (reservoir tank hose)
⑩Motor lead (hydraulic unit)
⑪Solenoid lead (hydraulic unit)
⑫Throttle sensor
⑬Pressure sensor
⑭Flasher light coupler (right)
[A] Hold the reservoir tank hose with the clamp of the frame.
[B] Pass the reservoir tank hose between the bracket and the head light unit.
[C] Hold the $O_2$ sensor lead with the engine clamp.
[D] Pass the $O_2$ sensor lead into the frame clamp.
[E] Pass the hydraulic unit breather hose through the swingarm guide.
[F] Clamp the drain hose (overflow plate), overflow hose (fuel tank), reservoir tank (coolant) breather hose and air filter case breather hose and route them between the swingarm and muffler.



①Reservoir tank (coolant) breather hose
②Crankcase ventilation hose
③Idle speed adjuster cable
④$O_2$ sensor lead
⑤Ground lead
⑥Rear brake switch
⑦Solenoid lead (hydraulic unit)
⑧Rear wheel sensor
⑨Band
⑩Fuse box
⑪"ABS" test coupler
⑫"EFI" test coupler
⑬ECU (for ABS)
⑭Battery
⑮ECU (for EFI)
⑯Fuel tank breather hose
⑰Drain hose (overflow plate)
⑱Air filter case drain hose
⑲Intake air temperature sensor lead
⑳Camshaft sensor lead
㉑Brake hose
[A] Pass the reservoir tank breather hose between the reservoir tank cap and radiator tank cap.
[B] Pass the EFI harness below the battery positive (+) lead.
[C] Do not touch the hose and lead on the starter motor ( ).
[D] Locate the engine harness coupler and side stand switch coupler inside of the frame.
[E] Pass the wire harness through inside of the brake hose clamp.

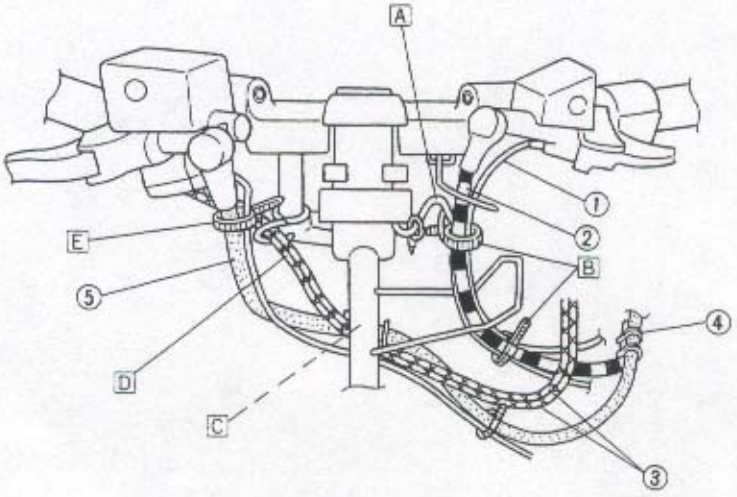


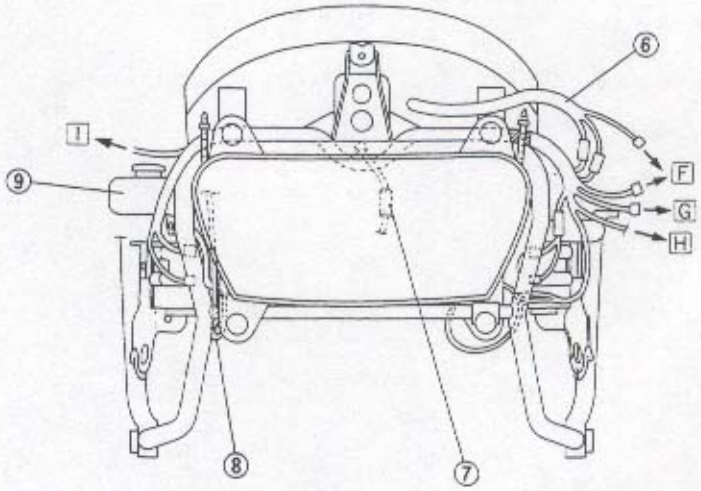
2

①Front brake switch lead
②Clutch hose
③Throttle cable
④Grommet
⑤Brake hose
⑥Meter harness
⑦Headlight lead
⑧Reservoir tank (coolant) breather hose
⑨Reservoir tank (coolant)

[A] Pass the main switch lead through the wire bracket.
[B] Clamp the main switch, handlebar switch(L) lead and clutch hose below the wire bracket.
[C] Attach the brake hose grommet to the frame clamp.
[D] Pass the throttle cable through the wire clamp.
[E] Clamp the brake hose and handlebar switch(R).

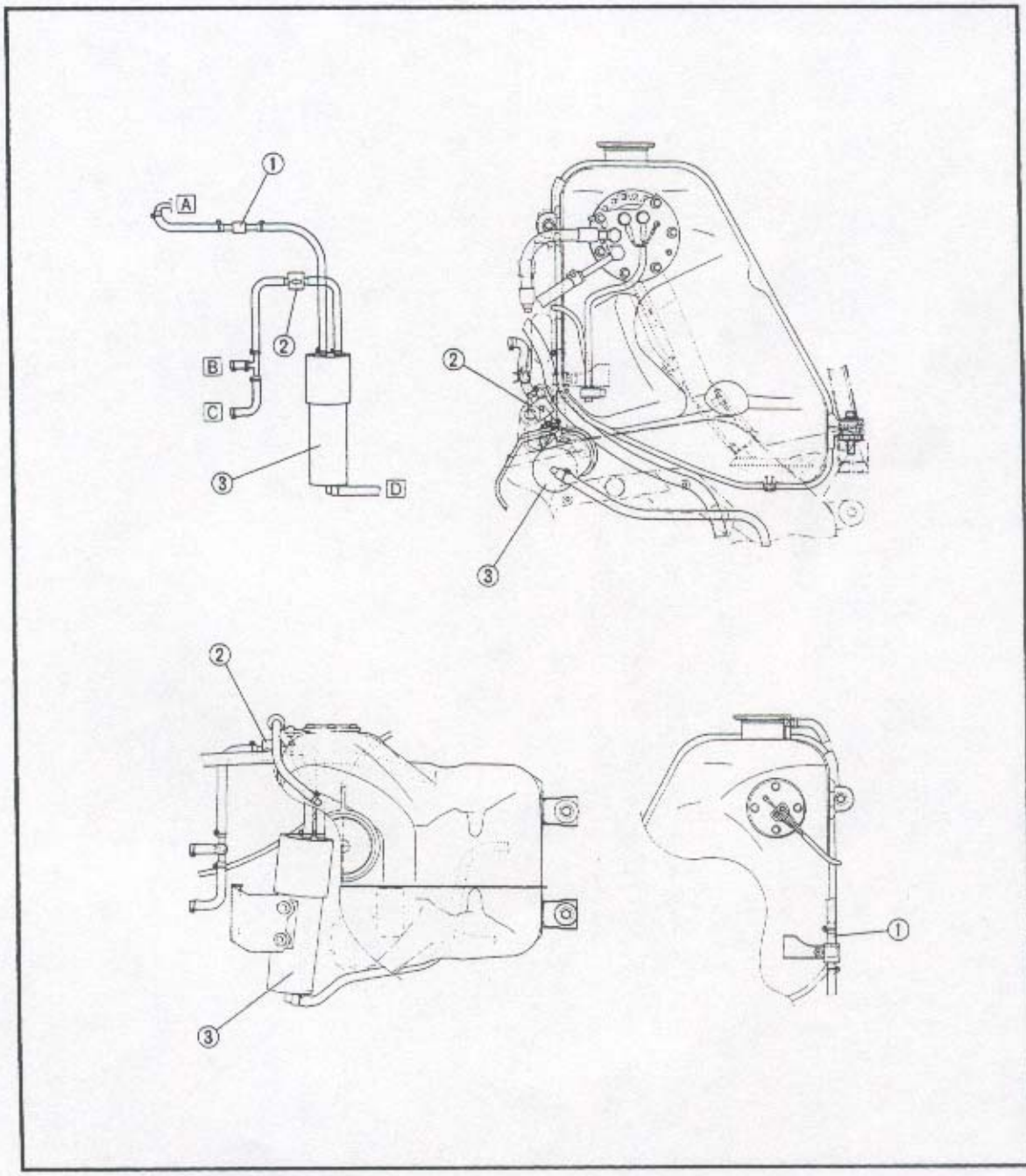
[F] To wire harness
[G] To handlebar switch(L)
[H] To front flasher light(L)
[I] To front flasher light(R)



**For California only**
①P.C.V.
②Roll over valve
③Canister ass'y
[A] To fuel tank
[B] To #3 port
[C] To #2 port
[D] To atmosphere





# 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.

## MAINTENANCE INTERVALS CHARTS (for USA, California)

Proper periodic maintenance is important. Especially important are the maintenance service related to emissions control. These controls not only function to ensure cleaner air but are also vital to proper engine operation and maximum performance. In the following maintenance tables, the services related to emissions control are grouped separatery.

**PERIODIC MAINTENANCE/EMISSION CONTROL SYSTEM**

| No. | ITEM | REMARKS | INITIAL | Odometer readings | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1,000 km or 1 month (600 mi) | **1 7,000 km or 7 month (4,400 mi) | **2 13,000 km or 13 month (8,200 mi) | **3 19,000 km or 19 month (12,000 mi) | 25,000 km or 25 month (15,800 mi) | 31,000 km or 31 month (19,600 mi) |
| 1* | Valve clearance | Check and adjust valve clearance when engine is cold. | Every 42,000 km (26,600 mi) | | | | | |
| 2 | Spark plugs | Check condition. Adjust gap and clean. Replace at 13,000 km (or 13 months) and thereafter every 12,000 km (or 12 months). | | ○ | Replace | ○ | Replace | ○ |
| 3* | Crankcase breather system | Check breather hose for cracks or damage. Replace if necessary. | | ○ | ○ | ○ | ○ | ○ |
| 4* | Fuel line | Check fuel hose and vacuum pipe for cracks or damage. Replace every 60 months. | | ○ | ○ | ○ | ○ | ○ |
| 5* | Fuel filter | Replace. | Every 50,000 km (31,000 mi) | | | | | |
| 6* | Exhaust system | Check for leakage. Retighten if necessary. Replace gasket(s) if necessary. | | ○ | ○ | ○ | ○ | ○ |
| 7* | Intake air pressure synchromization | Adjust synchronization of intake air pressure synchronization. | ○ | ○ | ○ | ○ | ○ | ○ |
| 8* | Idle speed | Check and adjust engine idle speed. Adjust cable free play. | | ○ | ○ | ○ | ○ | ○ |
| 9* | Evaporative emission control system** | Check control system for damage. Replace if necessary. | | | | ○ | | ○ |

* It is recommended that these items be serviced by a Yamaha dealer or other qualified mechanic.
** For California type only.

**NOTE:**
For farther odometer reading, repeat the above maintenance at the period established; **1: Every 6,000 km (3,800 mi), **2: Every 12,000 km (7,600 mi) and **3: Every 18,000 km (11,000 mi) intervals.

## GENERAL MAINTENANCE/LUBRICATION

| No. | ITEM | REMARKS | TYPE | INITIAL | Odometer readings | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1,000 km or 1 month (600 mi) | **1 7,000 km or 7 month (4,400 mi) | **2 13,000 km or 13 month (8,200 mi) | 19,000 km or 19 month (12,000 mi) | **3 25,000 km or 25 month (15,800 mi) | 31,000 km or 31 month (19,600 mi) |
| 1 | Engine oil | Warm-up engine before draining. | *1)Yamalube 4 (20W40) or SAE20W40 type "SE" motor oil<br>*2)Yamalube 4 (10W30) or SAE10W30 type "SE" motor oil | ○ | ○ | ○ | ○ | ○ | ○ |
| 2 | Oil filter | Replace. | - | ○ | | ○ | | ○ | |
| 3* | Air filter | Clean with compressed air. Replace if necessary. | - | | ○ | ○ | ○ | ○ | ○ |
| 4* | Cooling system | Check hose for cracks or damage. Replace if necessary. | - | | ○ | ○ | ○ | ○ | ○ |
| | | Replace coolant every 24 months | Ethylene glycol anti-freeze coolant | | | | | Replace | |
| 5* | Brake system | Check brake system. Replace pads if necessary. | - | ○ | ○ | ○ | ○ | ○ | ○ |
| 6 | Clutch | Check operation and fluid leakage. Correct if necessary. | - | ○ | ○ | ○ | ○ | ○ | ○ |
| 7 | Drive chain | Check chain condition. Adjust and lubricate chain thoroughly. | SAE 30W-50W motor oil | Every 500 km (300 mi) | | | | | |
| 8* | Control cable | Lubricate. Apply chain lube thoroughly. | Yamaha chain and cable lube or SAE 10W30 motor oil | ○ | ○ | ○ | ○ | ○ | ○ |

| No. | ITEM | REMARKS | TYPE | INITIAL | Odometer readings | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1,000 km or 1 month (600 mi) | **1 7,000 km or 7 month (4,400 mi) | **2 13,000 km or 13 month (8,200 mi) | 19,000 km or 19 month (12,000 mi) | **3 25,000 km or 25 month (15,800 mi) | 31,000 km or 31 month (19,600 mi) |
| 9* | Rear arm pivot shaft and suspension link pivots | Lubricate. Apply grease lightly. | Molybdenum disulfide grease | | | | | ○ | |
| 10 | Brake/ Clutch lever pivot shaft | Lubricate. Apply chain lube lightly. | Yamaha chain and cable lube or SAE 10W30 motor oil | | ○ | ○ | ○ | ○ | ○ |
| 11 | Brake pedal and shift pedal shaft | Lubricate. Apply chain lube lightly. | Yamaha chain and cable lube or SAE 10W30 motor oil | | ○ | ○ | ○ | ○ | ○ |
| 12* | Center and sidestand pivot | Check operation and lubricate. Apply chain lube lightly. | Yamaha chain and cable lube or SAE 10W30 motor oil | | ○ | ○ | ○ | ○ | ○ |
| 13* | Front and rear shock absorber | Check operation and oil leakage. Replace if necessary. | - | | ○ | ○ | ○ | ○ | ○ |
| 14* | Front swingarm pivot. (upper and lower) | Check front swingarm for looseness. Correct if necessary. | | | | ○ | | ○ | |
| 15* | Knuckle arm ball joint (upper and lower) | Check for smooth operation. Correct if necessary. | | | | ○ | | ○ | |
| 16* | Steering bearings | Check bearings assembly for looseness. Moderately repack every 24,000 km (15,200 mi). | Medium weight wheel bearing grease. | | ○ | ○ | ○ | ○ | ○ |
| 17* | Steering tube | Check dust boot and joint ring seal for cracks and damage. Replace if necessary. | - | | ○ | ○ | ○ | ○ | ○ |
| | | Check for smooth rotation. Correct if necessary. | - | | | ○ | | ○ | |
| 18* | Wheel bearings | Check bearings for smooth rotation. | - | | ○ | ○ | ○ | ○ | ○ |

| No. | ITEM | REMARKS | TYPE | INITIAL | Odometer readings | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1,000 km or 1 month (600 mi) | **1 7,000 km or 7 month (4,400 mi) | **2 13,000 km or 13 month (8,200 mi) | 19,000 km or 19 month (12,000 mi) | **3 25,000 km or 25 month (15,800 mi) | 31,000 km or 31 month (19,600 mi) |
| 19* | A.C. generator | Replace generator brushes. | – | Every 100,000 km (62,000 mi) | | | | | |
| 20* | Sidestand switch | Check and clean. Replace if necessary. | – | ○ | ○ | ○ | ○ | ○ | ○ |

*1) If ambient temperature does not go below 5°C.
**2) If ambient temperature does not go above 15°C.
* It is recommended that these items be serviced by a Yamaha dealer or other qualified mechanic.

**NOTE:**
For farther odometer reading, repeat the above maintenance at the period established; **1: Every 6,000 km (3,800 mi), **2: Every 12,000 km (7,600 mi) and **3: Every 24,000 km (15,200 mi) intervals.

3

## 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 (for CDN, AUS, NZ)

Unit: Km (mi)

| ITEM | REMARKS | BREAK-IN 1,000 (600) | EVERY 6,000 (4,000) or 6 months | EVERY 12,000 (8,000) or 12 months |
|---|---|---|---|---|
| Valve(s)* | Check valve clearance. Adjust if necessary. | EVERY 42,000 (28,000) | | |
| Spark plug(s) | Check condition. Clean or replace if necessary. | ○ | ○ | ○ |
| Air filter | Clean. Replace if necessary. | | ○ | ○ |
| Electronic fuel injection system* | Check idle speed/synchronization/starter operation/throttle position. Adjust if necessary. | ○ | ○ | ○ |
| Fuel line* | Check fuel hose for cracks or damage. Replace every 60 months. | | ○ | ○ |
| Fuel filter* | Replace. | EVERY 50,000 (31,000) | | |
| Engine oil | Replace (warm engine before draining). | ○ | ○ | ○ |
| Engine oil filter* | Replace. | ○ | | ○ |
| Brake* | Check operation/fluid leakage (see NOTE). Correct if necessary. | | ○ | ○ |
| Clutch* | Check operation/fluid leakage (see NOTE). Correct if necessary. | | ○ | ○ |
| Rear arm pivot* | Check rear arm assembly for looseness. Correct if necessary. Moderately repack every 24,000 (16,000) or 24 months.*** | | | ○ |
| Rear suspension link pivots* | Check operation. Apply grease lightly every 24,000 (16,000) or 24 months. *** | | | ○ |
| Wheels* | Check balance/damage/runout. Repair if necessary. | | ○ | ○ |
| Wheel bearings* | Check front axle for smooth revolution. Replace if damaged. | | ○ | ○ |
| Steering bearings* | Check bearings assembly for looseness. Correct if necessary. Moderately repack every 24,000 (16,000) or 24 months.** | ○ | | ○ |
| Steering tube* | Check dust boot and joint ring seal for cracks or damage. Replace if necessary. | | ○ | ○ |
| | Check for smooth operation. Correct if necessary. | | | ○ |
| Front swingarm pivot* (upper and lower) | Check front swingarm for looseness. Correct if necessary. | | | ○ |
| Knuckle arm ball joint* (upper and lower) | Check for smooth operation. Correct if necessary. | | | ○ |
| Front shock absorber* | Check operation/oil leakage. Repair if necessary. | | ○ | ○ |
| Rear shock absorber* | Check operation/oil leakage. Repair if necessary. | | ○ | ○ |

Unit: Km (mi)

| ITEM | REMARKS | BREAK-IN 1,000 (600) | EVERY | |
|---|---|---|---|---|
| | | | 6,000 (4,000) or 6 months | 12,000 (8,000) or 12 months |
| Cooling system | Check coolant leakage. Repair if necessary. Replace coolant every 24,000 (16,000) or 24 months. | | ○ | ○ |
| Drive chain | Check chain slack/alignment. Adjust if necessary. Clean and lube. | EVERY 500 (300) | | |
| Fittings/Fasteners* | Check all chassis fittings and fasteners. Correct if necessary. | ○ | ○ | ○ |
| Center and sidestand* | Check operation. Repair if necessary. | ○ | ○ | ○ |
| Sidestand switch* | Check operation. Clean or replace if necessary. | ○ | ○ | ○ |
| A.C. Generator* | Replace generator brushes. | EVERY 100,000 (62,000) | | |

3

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

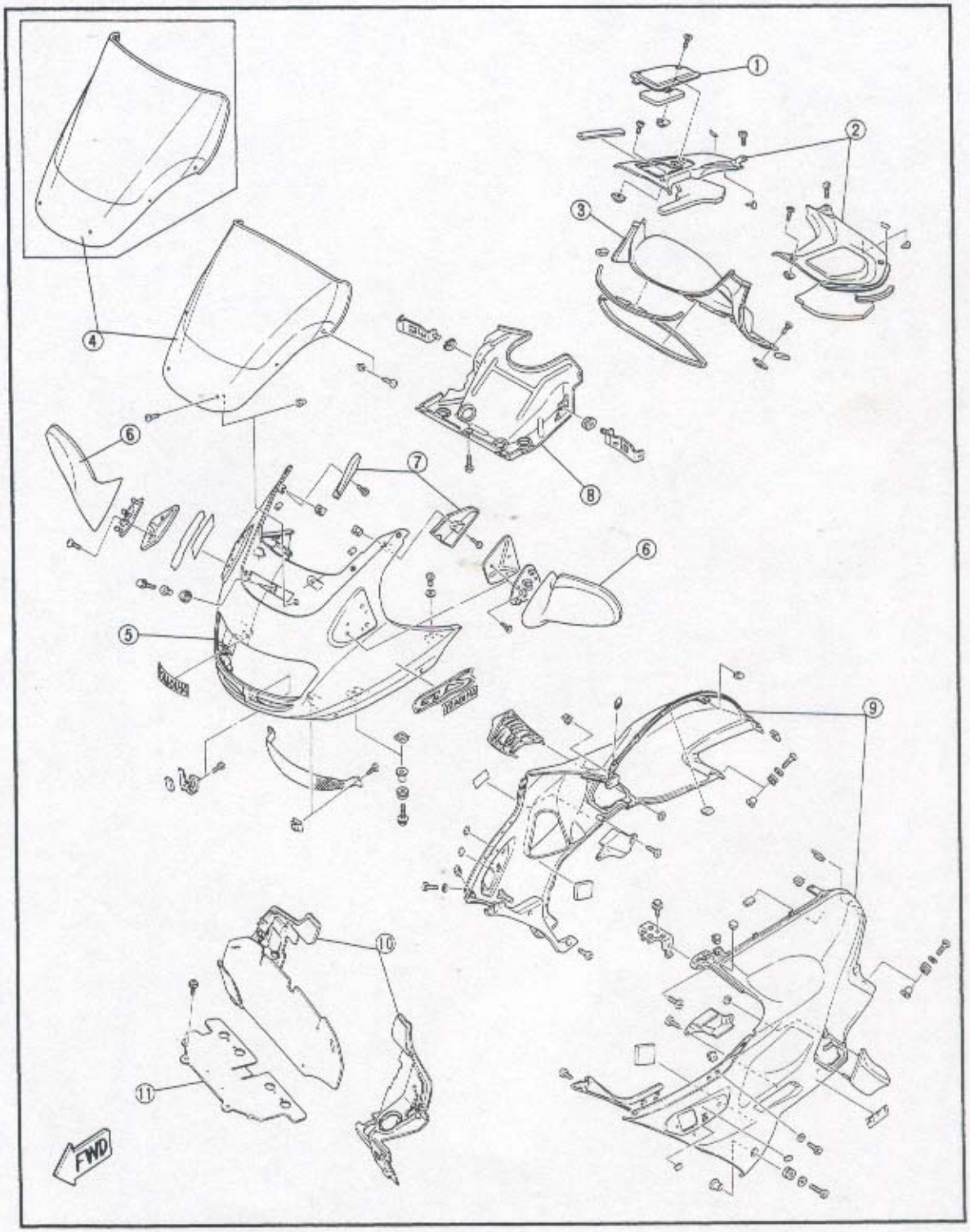
**NOTE:**

Brake fluid replacement:

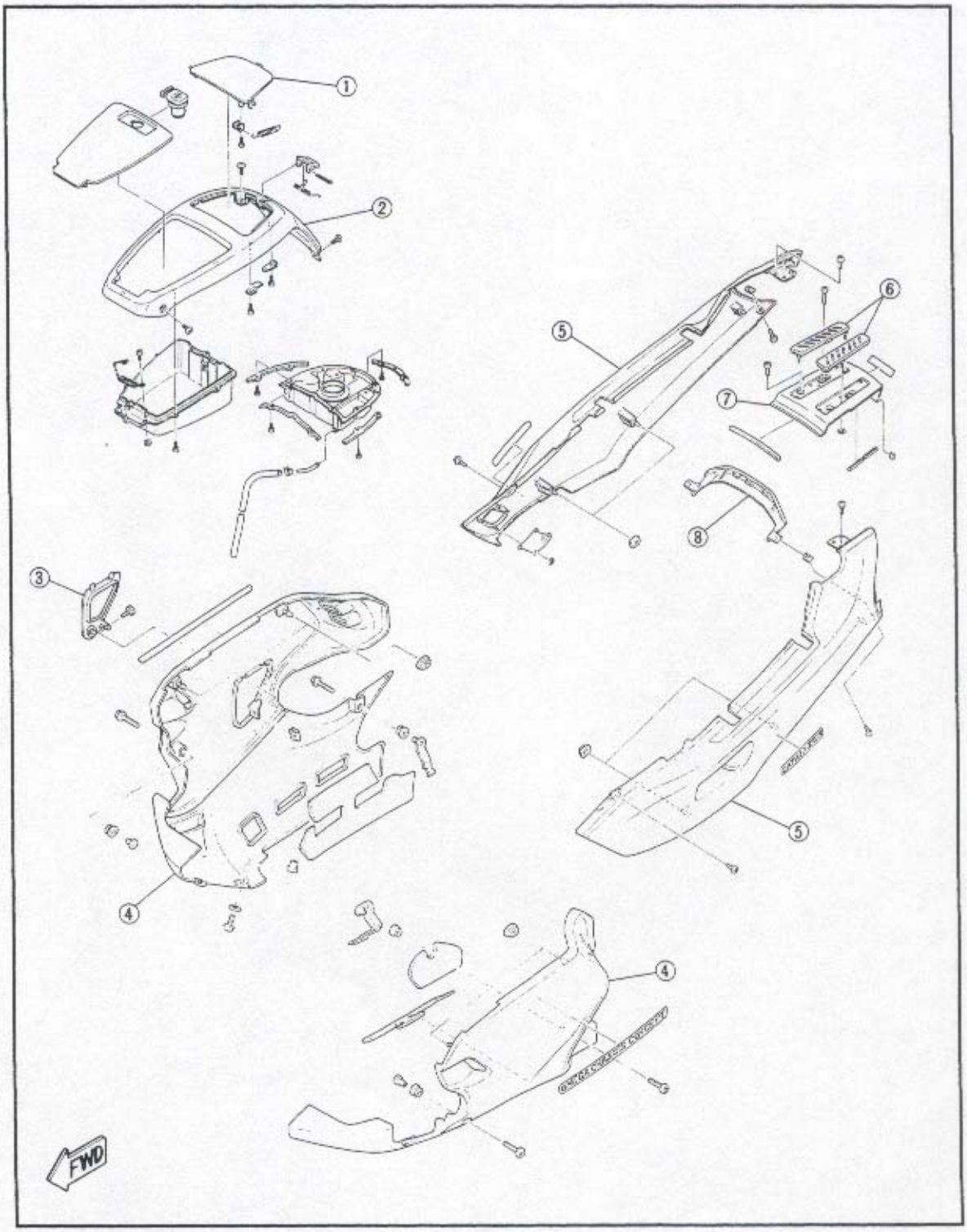
1. When disassembling the master cylinder or caliper cylinder (clutch release cylinder), replace the brake fluid. Normally check the brake fluid level and add fluid as required.
2. On the inner parts of the master cylinder and caliper cylinder (clutch release cylinder), replace the oil seals every two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

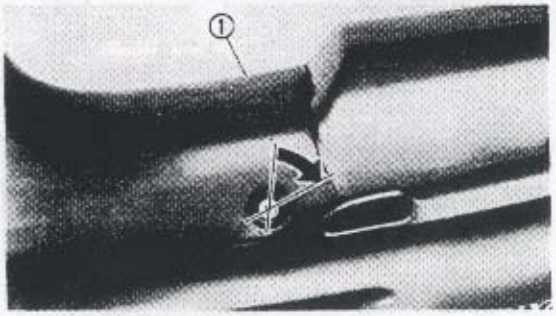
## COWLINGS

①Reservoir tank lid
②Inner panel
③Meter cover
④Windshield
⑤Front cowling
⑥Rear view mirror
⑦Meter cover extension
⑧Bottom cover
⑨Side cowling
⑩Rubber baffles (side)
⑪Rubber baffles (lower)



①Fuel filler lid
②Top cover
③Filler cap cover
④Lower cowling
⑤Side cover
⑥Tail cover protector
⑦Tail cover
⑧Side cover bridge





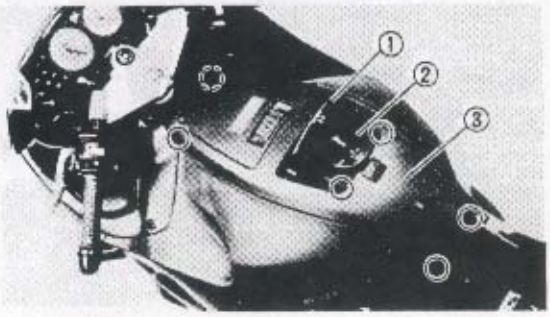

## COWLINGS

### REMOVAL

**Top cover and cowling**

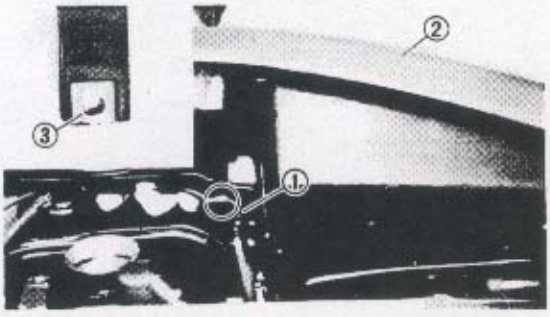
1.Remove:
- Seat ①

**NOTE:**
Insert the key into the seat lock and turn it clockwise to release the seat lock.




2.Open:
- Fuel filler lid ①

3.Remove:
- Fuel tank cap ②
- Screws (top cover ③)

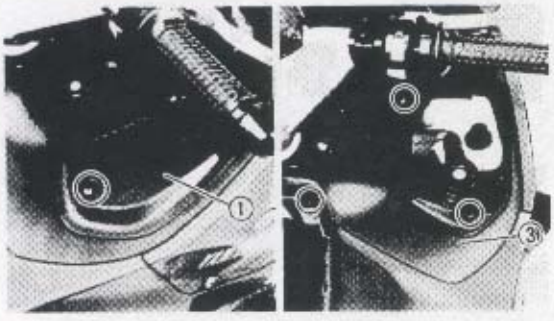



4.Disconnect:
- Drain hose ① (over flow plate)

**NOTE:**
Pull up the top cover ② and disconnect the drain hose.

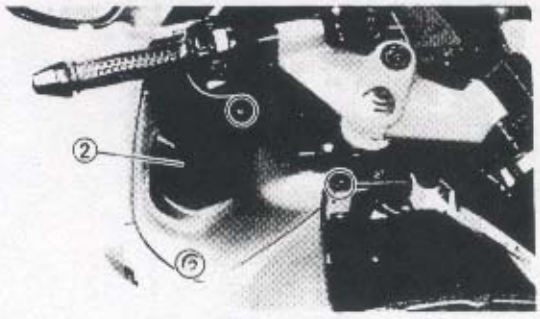
5.Remove:
- Top cover ②

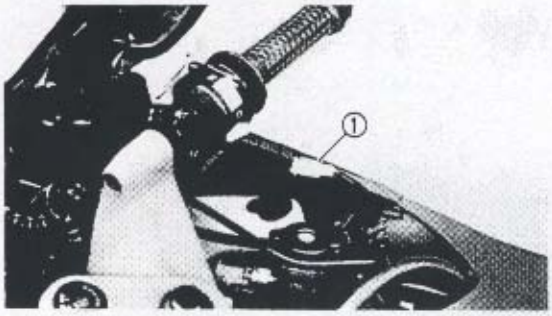
**NOTE:**
Be careful not to loose the spring nuts ③.



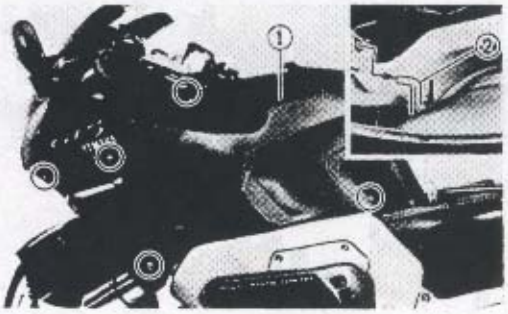

6.Install:
- Fuel tank cap

7.Remove:
- Reservoir tank lid ①
- Inner panel (left ② and right ③)



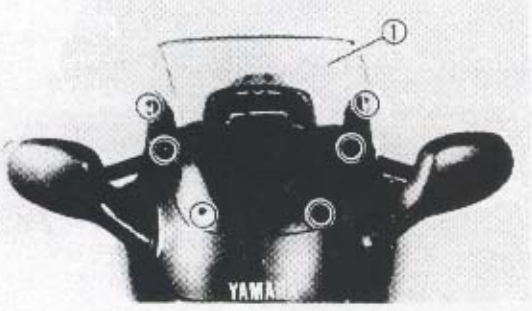



8.Disconnect:
- Flasher couplers ① (left and right)

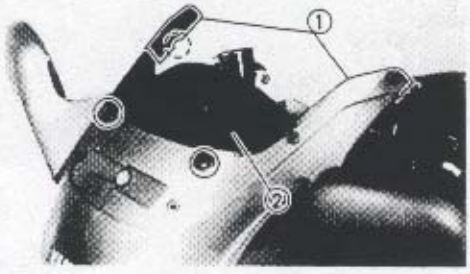



9.Remove:
- Side cowlings ① (left and right)

**NOTE:**
When removing the side cowlings, be careful not to break off the mounting hook ②.

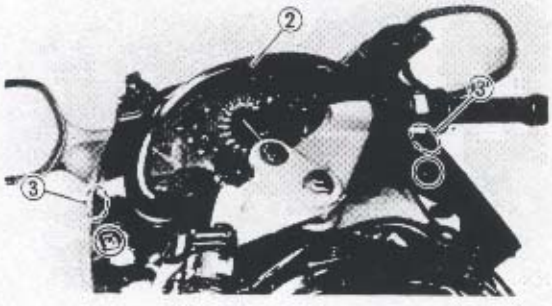


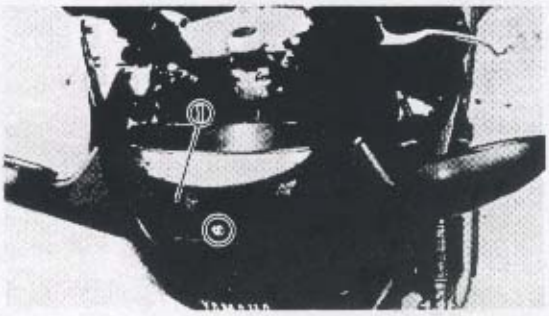

10.Remove:
- Windshield ①



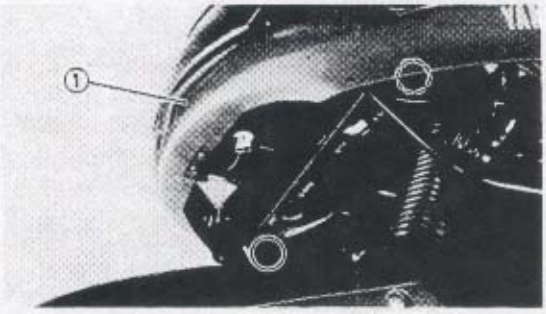

11.Remove:
- Meter cover extensions ①
- Meter cover ②

**NOTE:**
Be careful not to loose the two rubber dampers ③ on the meter cover.

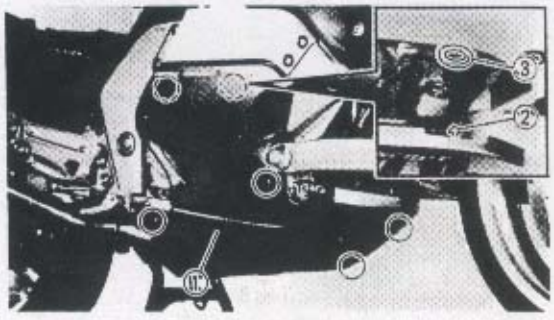




12.Remove:
- Front cowling ①



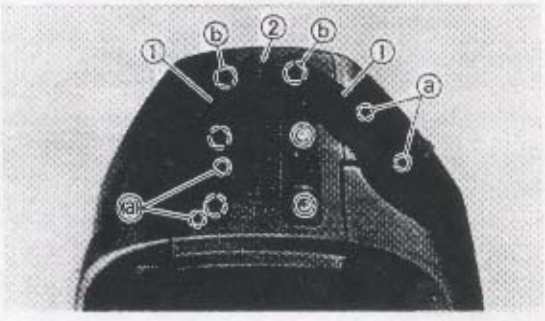




**Side cover and lower cowling**

1.Remove:
- Lower cowlings ① (left and right)

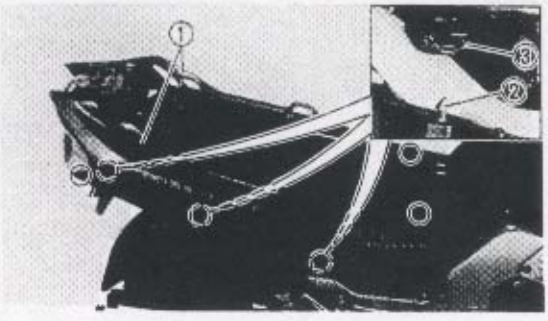
**NOTE:**
Unhook the projections ② on the inside of the lower cowling from the grommets ③ on the frame.



2.Remove:
- Tail cover protectors ①
- Tail cover ②

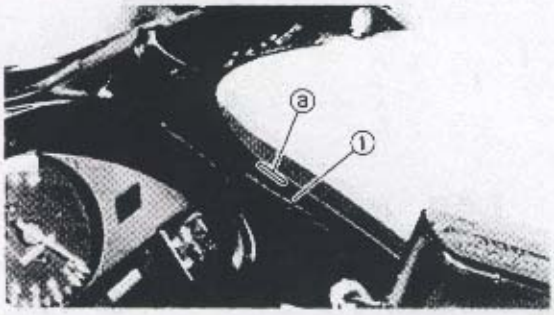
**NOTE:**
Disconnect knobs ⓐ and turn the tail cover protectors ①.

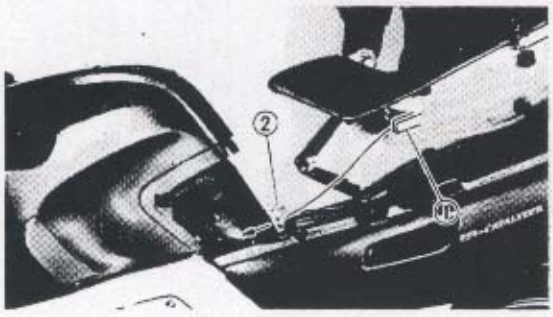
**CAUTION:**
**This knob (rear end) ⓑ can not disconnect.**



3.Remove:
- Side cover ① (left and right)

**NOTE:**
Unhook the projections ② on the inside of the side cover from the grommets ③ on the frame.






## INSTALLATION

Reverse the REMOVAL procedure.
Note the following points.

**Top cover and cowling**

1.Install:
- Meter cover

**NOTE:**
When installing the meter cover, fit the rubber dampers ① into the channels ⓐ on the inside of the front cowling.

2.Install:
- Side cowlings (left and right)

**NOTE:**
Make sure the hook ① on the inside of the side cover sits correctly behind the frame bracket ②.

3.Install:
- Seat

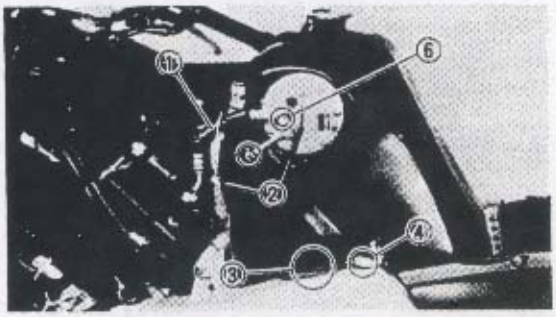
**NOTE:**
Insert the lobe ① on the front of the seat into the bracket ② on the frame, then push down the seat end.

## FUEL TANK

### REMOVAL

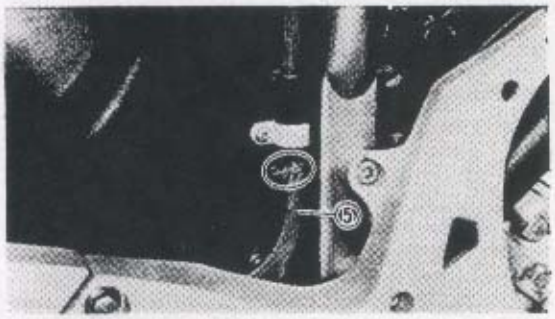
1. Place the motorcycle on the centerstand.
2. Remove:
   - Seat
   - Top cover
   - Inner panels
   - Side cowlings

   Refer to "COWLINGS".
3. Disconnect:
   - Fuel delivery hose ①
   - Fuel return hose ②
   - Fuel sender coupler ③
   - Fuel pump coupler ④
   - Fuel breather hose ⑤



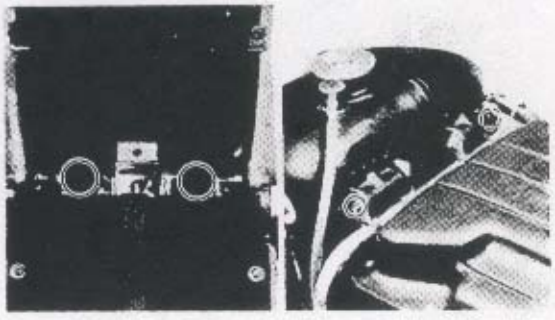

**⚠ WARNING**

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




**NOTE:**

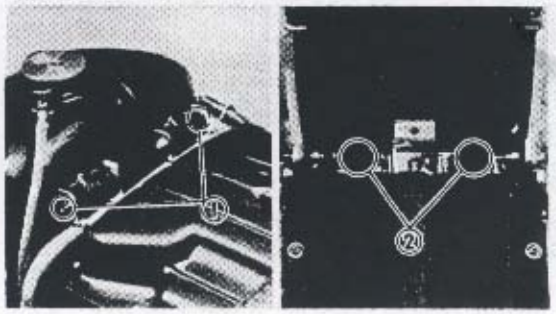
Place a rag under the return hose ② and the union bolt ⑥ of the fuel delivery hose to avoid spilling fuel.



4. Remove:
   - Fuel tank

### INSTALLATION

Reverse the removal procedure.
Note the following points.



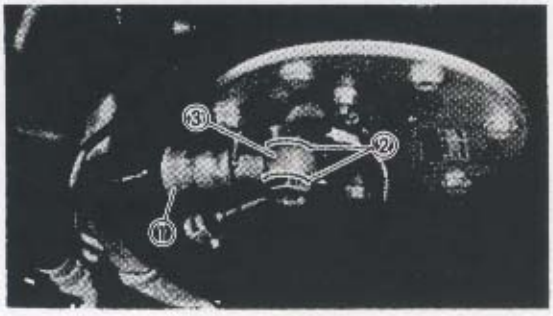
1.Install:
- Fuel tank

| | |
|---|---|
| | **Bolt ① (front):**<br>**23 Nm (2.3 m • kg, 17 ft • lb)**<br>**Bolt ② (rear):**<br>**16 Nm (1.6 m • kg, 11 ft • lb)** |

**CAUTION:**

**Be sure the fuel tank breather hose and the tank cap compartment drain hose are correctly routed. Refer to "CABLE ROUTING" in CHAPTER 2.**





2.Connect:
- Fuel delivery hose ①

**NOTE:**

Be sure to place one copper washer ② on each side of the hose fitting ③.

| | |
|---|---|
| | **Union bolt:**<br>**30 Nm (3.0 m • kg, 22 ft• lb)** |

**⚠ WARNING**

**Always use new copper washers.**

3.Check:
- Fuel leakage
  Leak → Repair.

**NOTE:**

Turn the main switch "ON" to operate the fuel pump and check for fuel leakage.

# 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.

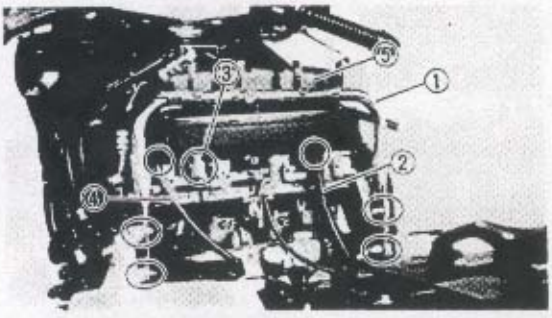
**Removal**

1.Remove:
- Seat
- Top cover
- Inner panels
- Side cowlings
- Lower cowlings

Refer to "COWLINGS".

2.Remove:
- Fuel tank

Refer to "FUEL TANK".



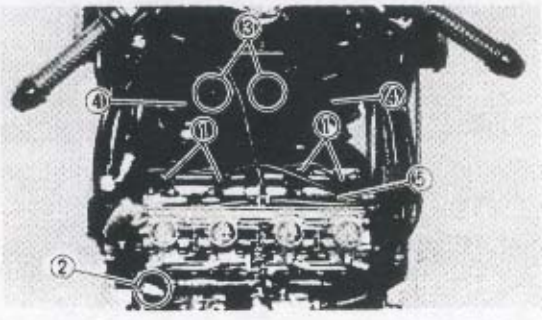
3.Remove:
- Rubber plate
- Fuel tank stay ①

4.Disconnect:
- Crankcase ventilation hose ②
- Coupler ③ (intake air temperature sensor)
- Drain hose ④ (air filter case)

5.Remove:
- Rubber cover
- Air filter case ⑤

6.Remove:
- Rubber baffles ① (left and right)
- Rubber baffle ② (lower)

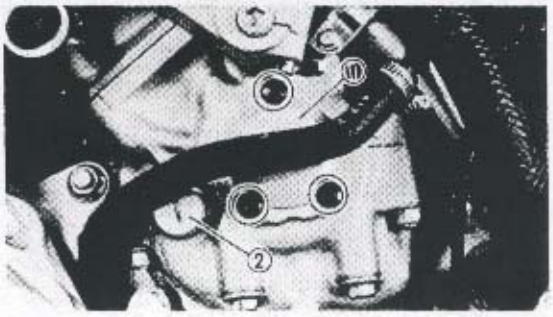
**NOTE:**
Carefully pull out the retainers ⓐ with long nose pliers.



7.Disconnect:
- Spark plug caps ①
- Coupler ② (crankshaft sensor)
- Coupler ③ (radiator fan)

8.Loosen:
- Spark plugs

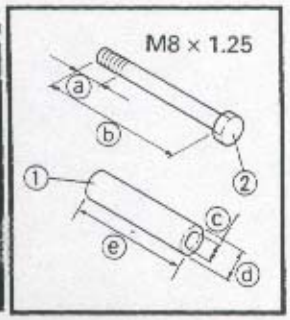
9.Remove:
- Radiator fans ④ (left and right)
- Cylinder head cover ⑤ (with gasket)




10.Remove:
- Crankshaft end cover ① (left) (with O-ring)
- Timing plug ② (with O-ring)

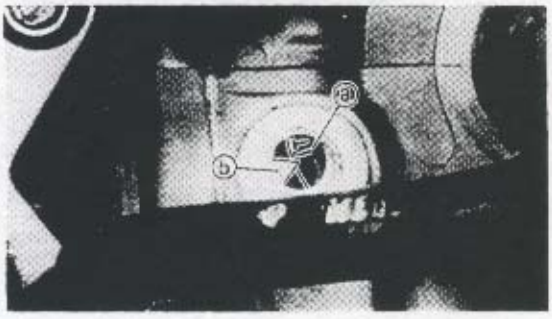
11.Check:
- Valve clearance
  Out of specification → Adjust.

**Valve clearance (cold):**
**Intake valve:**
**0.11 ~ 0.20 mm**
**(0.004 ~ 0.008 in)**
**Exhaust valve:**
**0.21 ~ 0.30 mm**
**(0.008 ~ 0.012 in)**

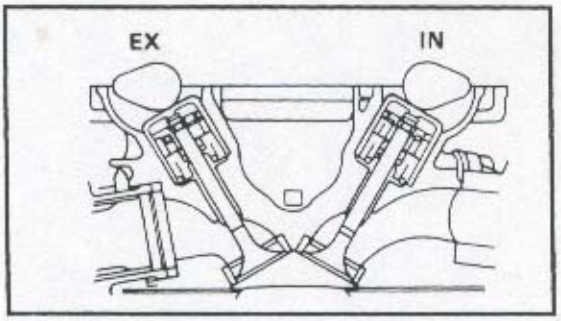



**********

**Checking steps:**
- Install a suitable collar ① and a bolt ② as shown and tighten the bolt.
  ⓐ 15 mm (0.6 in)
  ⓑ 75 mm (3.0 in)
  ⓒ 8 mm (0.3 in)
  ⓓ 12 mm (0.5 in)
  ⓔ 60 mm (2.4 in)
- Turn the crankshaft counterclockwise.

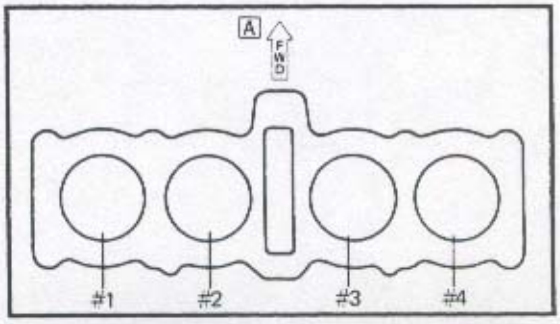


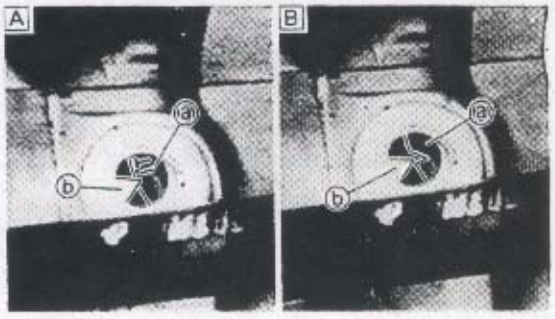

- Align the TDC mark ⓐ with the stationary pointer ⓑ.




- Check if the piston #1 is in compression stroke TDC. If not, turn the crankshaft one full turn.

**NOTE:**
The piston is in compression stroke TDC when the cam lobes are turned away from each other, as shown.




● Measure the valve clearance using a feeler gauge ③.

**NOTE:**
- Record the measured reading if the clearance is incorrect.
- Measure the valve clearance for the other cylinders in the following order:

**Measuring sequence:**
**#1 → #2 → #4 → #3**

● Turn the crankshaft by the following numbers of degrees from the compression stroke TDC of piston #1 to find the compression stroke TDC of the other pistons:

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

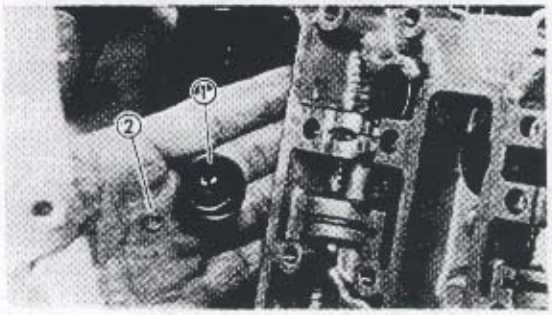
● Align the corresponding TDC mark ⓐ with the stationary pointer ⓑ :
A For cylinder #1 and #4
B For cylinder #2 and #3

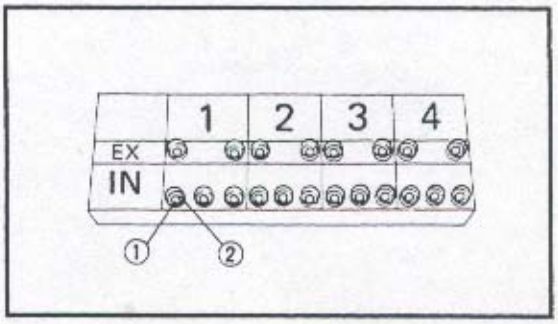
**********

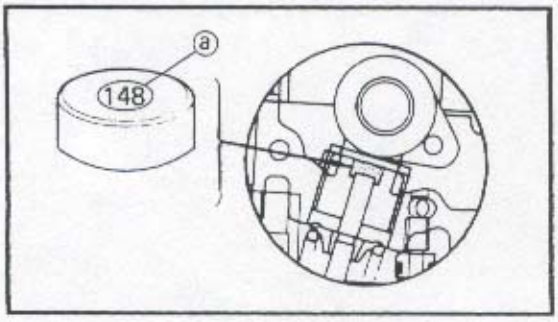
12. Remove:
- Timing chain tensioner
- Chain guide (upper)
- Chain guide (exhaust)
- Camshaft caps
- Timing chain
- Camshaft (intake and exhaust)

**NOTE:**
- Refer to "ENGINE DISASSEMBLY - CAMSHAFT AND CYLINDER HEAD" in CHAPTER 4.
- When removing the timing chain or camshafts fasten a wire to the timing chain to prevent it from falling into the crankcase.

13. Adjust:
- Valve clearance




**********

**Adjustment steps:**

- Remove the valve lifters ① and the pads ②.

**NOTE:**

- Place a rag in the timing chain space to prevent pads from falling into the crankcase
- Identify each valve lifter ① and pad ② position very carefully so that they can be reinstalled in their original place.

- Select the proper pad using the pad selecting table:

| Pad range | | Pad Availability: 25 increments |
|---|---|---|
| No. 120 ~ No. 240 | 1.20 mm (0.047 in) ~ 2.40 mm (0.094 in) | Pads are available in 0.05 mm (0.002 in) increments |

**NOTE:**

The thickness ⓐ of each pad is indicated in hundreths of millimeters on the pad upper surface.

- Round off the last digit of the installed pad number to the nearest increment.

| Last digit of pad number | Rounded value |
|---|---|
| 0 or 2 | 0 |
| 5 | (NOT ROUNDED OFF) |
| 8 | 10 |

**EXAMPLE:**

Installed pad number = 148 (1.48 mm)
Rounded off value = 150

**NOTE:**

Pads can only be selected in 0.05 mm (0.002 in) increments.

# PAD SELECTION TABLE

## INTAKE

| B MEASURED CLEARANCE | A INSTALLED PAD NUMBER | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 |
| 0.00 ~ 0.02 | | | | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 |
| 0.03 ~ 0.07 | | | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 |
| 0.08 ~ 0.10 | | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 |
| 0.11 ~ 0.20 | C RECOMMENDED CLEARANCE | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.21 ~ 0.22 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | |
| 0.23 ~ 0.27 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | |
| 0.28 ~ 0.32 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | |
| 0.33 ~ 0.37 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | |
| 0.38 ~ 0.42 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | |
| 0.43 ~ 0.47 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | |
| 0.48 ~ 0.52 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | |
| 0.53 ~ 0.57 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | |
| 0.58 ~ 0.62 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | |
| 0.63 ~ 0.67 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | |
| 0.68 ~ 0.72 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | |
| 0.73 ~ 0.77 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | |
| 0.78 ~ 0.82 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | |
| 0.83 ~ 0.87 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | |
| 0.88 ~ 0.92 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | |
| 0.93 ~ 0.97 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | |
| 0.98 ~ 1.02 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | |
| 1.03 ~ 1.07 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | |
| 1.08 ~ 1.12 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | | |
| 1.13 ~ 1.17 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | | | |
| 1.18 ~ 1.22 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | | | | |
| 1.23 ~ 1.27 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | | | | | |
| 1.28 ~ 1.32 | 235 | 240 | | | | | | | | | | | | | | | | | | | | | | | |
| 1.33 ~ 1.37 | 240 | | | | | | | | | | | | | | | | | | | | | | | | |

**EXAMPLE:**

VALVE CLEARANCE (cold):

0.11 ~ 0.20 mm (0.004 ~ 0.008 in)

Installed is 148 (Rounded off number is 150)

Measured clearance is 0.24 mm (0.009 in)

Replace 148 pad with 160 pad

## EXHAUST

| B MEASURED CLEARANCE | A INSTALLED PAD NUMBER | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 |
| 0.00 ~ 0.02 | | | | | | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 |
| 0.03 ~ 0.07 | | | | | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 |
| 0.08 ~ 0.12 | | | | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 |
| 0.13 ~ 0.17 | | | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 |
| 0.18 ~ 0.20 | | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 |
| 0.21 ~ 0.30 | C RECOMMENDED CLEARANCE | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.31 ~ 0.32 | 125 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | |
| 0.33 ~ 0.37 | 130 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | |
| 0.38 ~ 0.42 | 135 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | |
| 0.43 ~ 0.47 | 140 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | |
| 0.48 ~ 0.52 | 145 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | |
| 0.53 ~ 0.57 | 150 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | |
| 0.58 ~ 0.62 | 155 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | |
| 0.63 ~ 0.67 | 160 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | |
| 0.68 ~ 0.72 | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | |
| 0.73 ~ 0.77 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | |
| 0.78 ~ 0.82 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | |
| 0.83 ~ 0.87 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | |
| 0.88 ~ 0.92 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | |
| 0.93 ~ 0.97 | 190 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | |
| 0.98 ~ 1.02 | 195 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | |
| 1.03 ~ 1.07 | 200 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | |
| 1.08 ~ 1.12 | 205 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | |
| 1.13 ~ 1.17 | 210 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | |
| 1.18 ~ 1.22 | 215 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | | |
| 1.23 ~ 1.27 | 220 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | | | |
| 1.28 ~ 1.32 | 225 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | | | | |
| 1.33 ~ 1.37 | 230 | 235 | 240 | | | | | | | | | | | | | | | | | | | | | | |
| 1.38 ~ 1.42 | 235 | 240 | | | | | | | | | | | | | | | | | | | | | | | |
| 1.43 ~ 1.47 | 240 | | | | | | | | | | | | | | | | | | | | | | | | |

**EXAMPLE:**

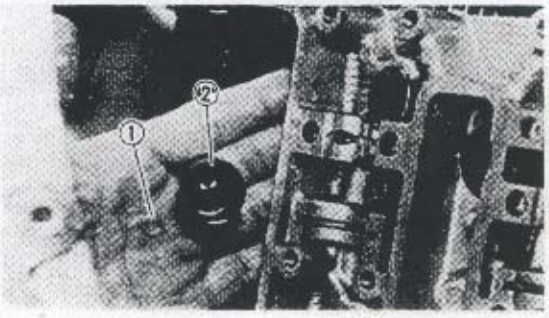
VALVE CLEARANCE (cold):

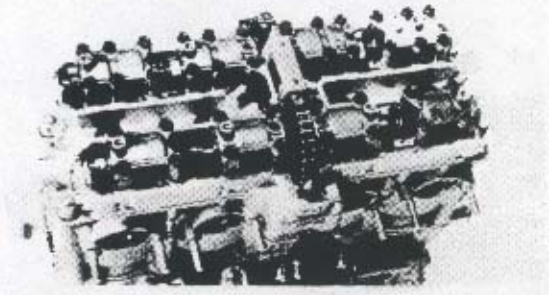
0.21 ~ 0.30 mm (0.008 ~ 0.012 in)

Installed is 175

Measured clearance is 0.35 mm (0.014 in)

Replace 175 pad with 185 pad



- Locate the rounded-off value and the measured valve clearance in the chart "PAD SELECTION TABLE". The field where these two coordinates intersect shows the new pad number to use.

**NOTE:**
Use the new pad number only as a guide when verifying the valve clearance adjustment.

- Install the new pads ① and the valve lifters ②.

**NOTE:**
- Apply molybdenum disulfide grease to the pad.
- Lubricate the valve lifter with molybdenum disulfide oil.
- Valve lifter must turn smoothly when rotated with a finger.
- Be careful to reinstall valve lifters and old pads in their original place.

- Install the camshafts (exhaust and intake), the timing chain and the camshaft caps.

| | |
|---|---|
| | **Bolt (camshaft cap):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
- Refer to "ENGINE ASSEMBLY AND ADJUSTMENT – CYLINDER HEAD AND CAMSHAFT" in CHAPTER 4.
- Lubricate the camshaft bearings, cam lobes and camshaft journals.
- Install the exhaust camshaft first.
- Align the matching marks.
- Turn the crankshaft counterclockwise several turns so that the installed parts settle into the right position.

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

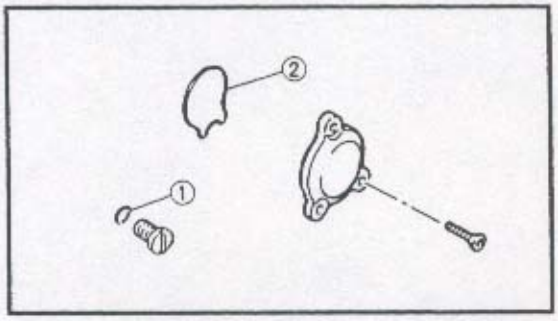
**********

14.Install:
- All removed parts

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

15.Install:
- Chain guide (exhaust)
- Chain guide (upper)
- Timing chain tensioner ①

| | |
|---|---|
| | **Bolt (chain guide – upper):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)**<br>**Bolt (timing chain tensioner):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

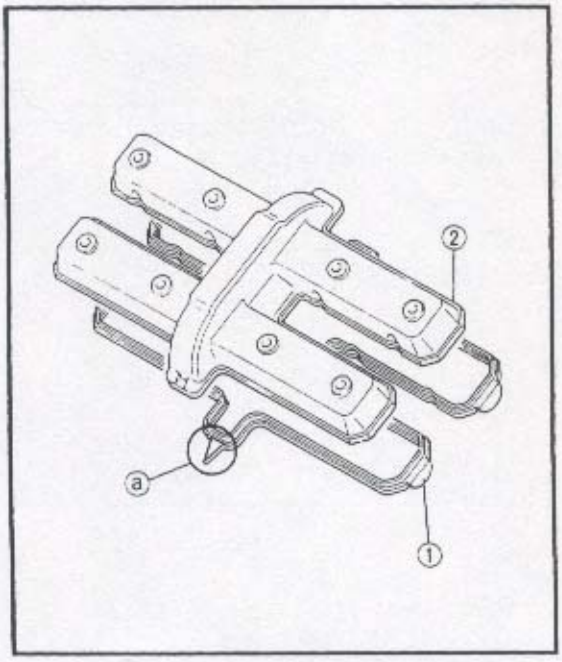



**NOTE:**
Install the tensioner body with the "UP" mark facing upward.

16.Inspect:
- O-ring ① (timing plug)
- Gasket ② (crankshaft end cover)
  Wear/Damage → Replace.

17.Tighten:
- Screws (crankshaft end cover)

| | |
|---|---|
| | **Screw (crankshaft end cover):**<br>**7 Nm (0.7 m • kg, 5.1 ft • lb)** |

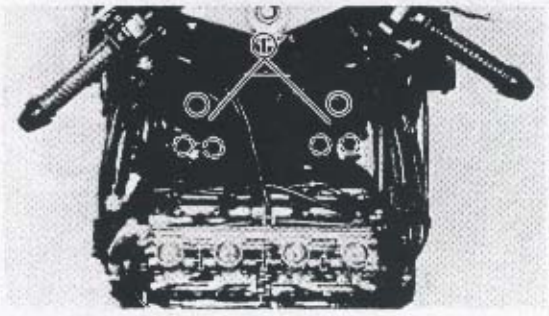



18.Inspect:
- Gasket ① (cylinder head cover)
  Wear/Damage →Replace.

19.Install:
- Gasket (cylinder head cover)
- Cylinder head cover ②
- Spark plugs

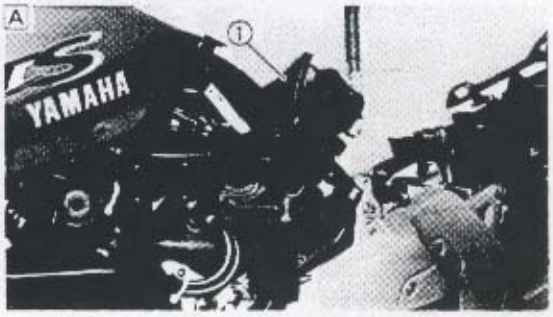
**NOTE:**
Be sure the cylinder head gasket mark ⓐ points to the front.

| | |
|---|---|
| | **Bolt (cylinder head cover):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)**<br>**Spark plug:**<br>**17.5 Nm (1.75 m • kg, 12.5 ft • lb)** |



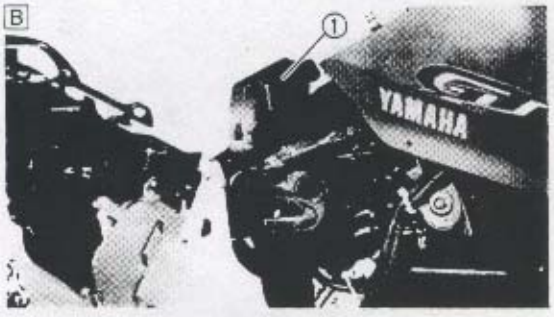
20.Install:
- Radiator fan ① (left and right)

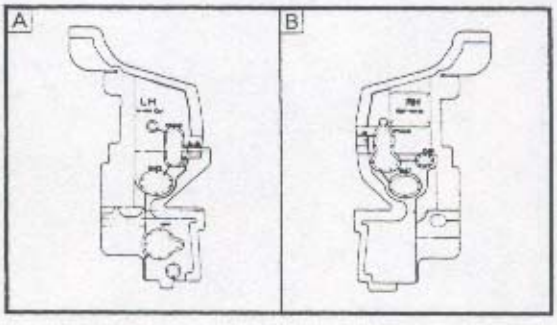
| | |
|---|---|
| | **Bolt (radiator fan):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

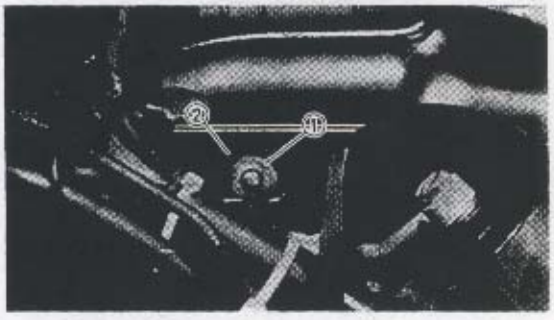



21.Install:
- Rubber baffles ① (left Ⓐ and right Ⓑ)

**NOTE:**
Holes are marked to help determine witch hose, cable or pipe must be passed, through them.

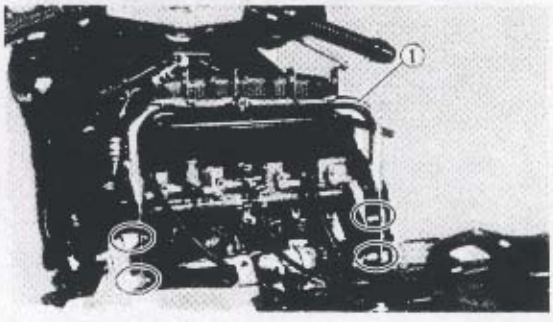



22.Install:
- Air filter case

**NOTE:**
- Set the heat protect rubber of the air filter case in front of the injector.
- Join the air filter case knob ① on the left side into the slot ② on the frame.




22.Install:
- Fuel tank stay ①

| | |
|---|---|
| | **Bolt/Nut (fuel tank stay):**<br>**20 Nm (2.0 m • kg, 14 ft • lb)** |

**INTAKE AIR PRESSURE SYNCHRONIZATION**

The air screws must be adjusted to provide uniform air pressure in all air intake ducts.

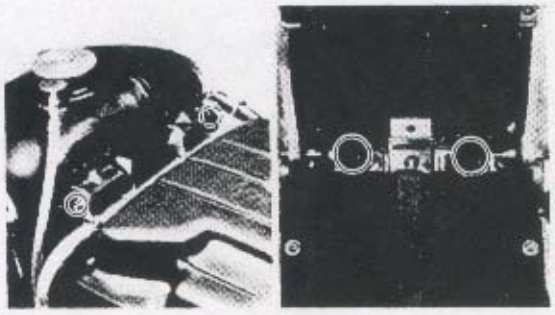
**NOTE:**

Valve clearance should be adjusted properly before synchronizing the intake air pressure.

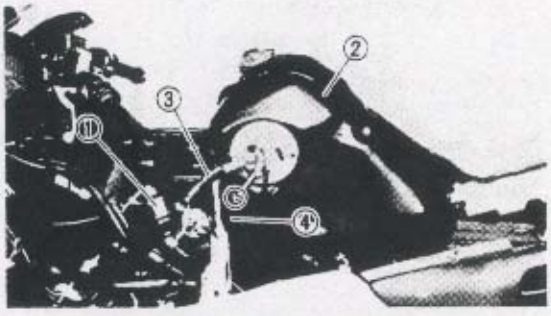
1. Place the motorcycle on its centerstand.
2. Remove:
   - Seat
   - Top cover
   - Side cowlings (left and right)

   Refer to "COWLINGS".





3. Remove:
   - Fuel tank mounting bolts



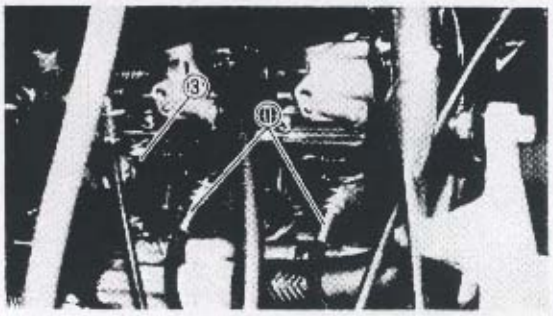

4. Detach the fuel filter ① from the frame, then lift the fuel tank ② up and place it on the left side of the frame without disconnecting the delivery ③ and fuel return hose ④.

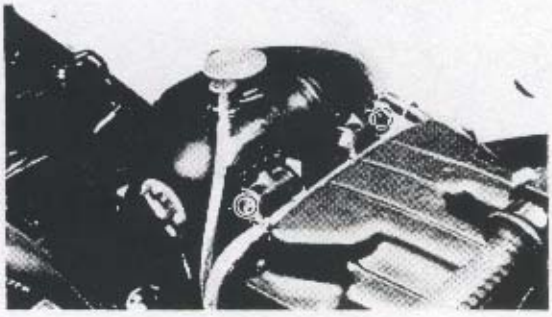
**CAUTION:**

**Be careful not to push down the fuel tank while connecting the vacuum gauge.**

5. Remove:
   - Vacuum check bolts ①

   (with gasket)





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

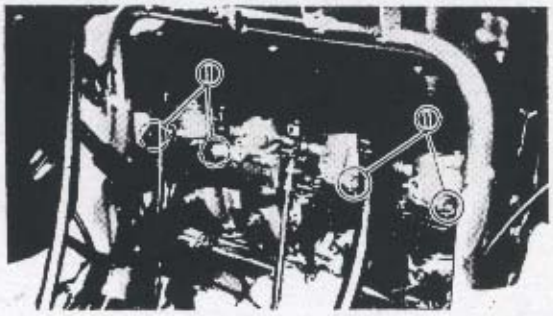
**Inductive tachometer:**
**YU-08036-A/90890-03113**
**Adapter:**
**YM-03060/90890-03060**
**Vacuum gauge:**
**YU-08030/90890-03094**

7.Reinstall the fuel tank and secure it provisionally with one of the fuel tank stay bolts.
Refer to the "FUEL TANK" section.

8.Start the engine and let it warm up for several minutes until the fast idling system ③ cuts out.

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

**Engine idle speed:**
**950 ~ 1,050 r/min**



10.Adjust:
- Intake air pressure synchronization

**********

**Adjustment steps:**
- Turn the air screws ① in or out until the gauge shows the specified vacuum reading for all four intake ducts.

● Race the engine for less than a second, two or three times, and check the synchronization again.

**Vacuum pressure at idle speed:**
**26.32 ~ 32.90 kPa**
**(200 ~ 250 mm Hg, 7.87 ~ 9.84 in Hg)**

NOTE:
The difference between the highest and lowest simultaneous reading should not exceed 1.33 kPa (10 mm.Hg, 0.4 in Hg).

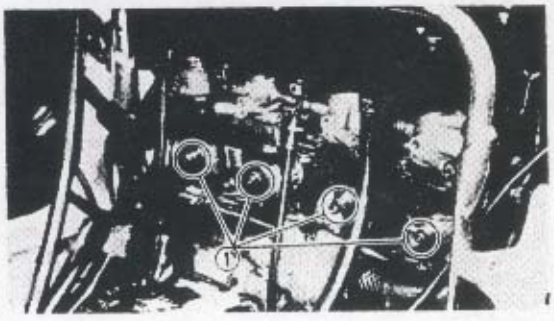
**********

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

12. Stop the engine and remove the measuring equipment.

13. Adjust:
- Throttle cable free play
  Refer to "THROTTLE CABLE FREE PLAY ADJUSTMENT".

**Throttle cable free play:**
**3 ~ 5 mm (0.1 ~ 0.2 in)**




14. Install:
- Vacuum check bolts ①
  (with gasket)

**CAUTION:**
**Always use new gaskets.**

15. Install:
- Fuel tank
  Refer to "FUEL TANK".
- Side cowlings
- Top cover
  Refer to "COWLINGS".

3

## IDLE SPEED ADJUSTMENT

**NOTE:**
The intake air pressure synchronization should be adjusted properly before adjusting the idle speed.

1. Start the engine and let it warm up until the fast idle system cuts out.

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

| | |
|---|---|
| | **Inductive tachometer:**<br>**YU-08036-A/90890-03113** |

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

| | |
|---|---|
| | **Engine idle speed:**<br>**950 ~ 1,050 r/min** |

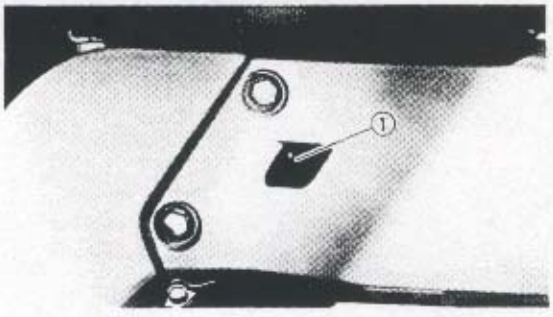
4. Adjust:
- Engine idle speed

************************************

**Adjustment steps:**
- Turn the idle speed adjusting screw ① in or out until specified idle speed is obtained.

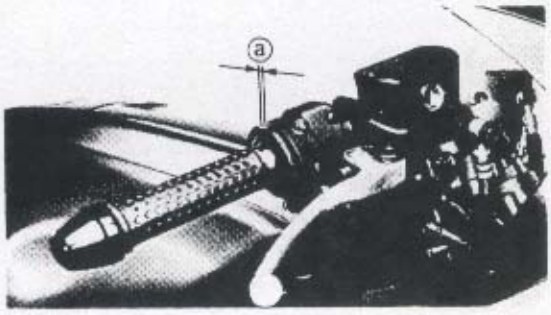
| | |
|---|---|
| **Turning in** | **Idle speed becomes higher.** |
| **Turning out** | **Idle speed becomes lower.** |

************************************




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

| | |
|---|---|
| | **Throttle cable free play:**<br>**3 ~ 5 mm (0.1 ~ 0.2 in)** |



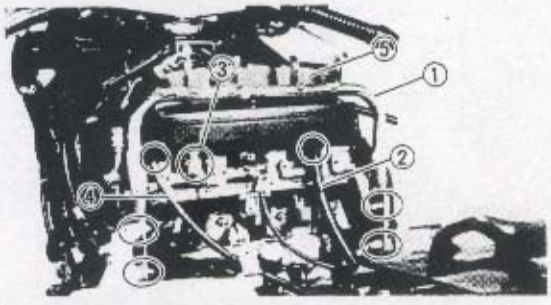

THROTTLE CABLE FREE PLAY ADJUSTMENT

**NOTE:**
Engine idling speed and intake air pressure synchronization should be adjusted properly before adjusting the throttle cable free play.

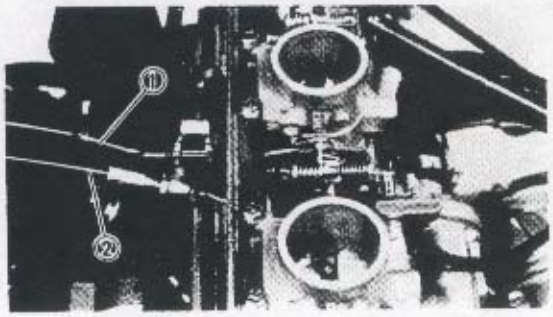
1. Start the engine and let it warm up until the fast idle system cuts out. Then stop the engine.
2. Check:
   - Throttle cable free play ⓐ
     Out of specification → Adjust.

**Throttle cable free play:**
**3 ~ 5 mm (0.1 ~ 0.2 in)**

3. Remove:
   - Seat
   - Top cover
   - Side cowlings
     Refer to "COWLINGS".
4. Remove:
   - Fuel tank
     Refer to "FUEL TANK – REMOVAL".




5. Fuel tank mounting stay ①
6. Disconnect:
   - Crankcase ventilation hose ②
   - Coupler ③ (intake air temperature sensor)
   - Drain hose ④
     (air filter case)
7. Remove:
   - Air filter case ⑤

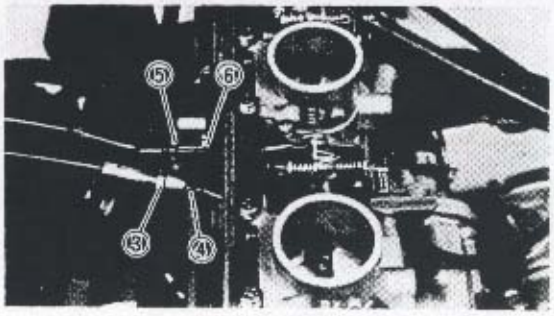



8. Adjust:
   - Throttle cable free play

**********

**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:**

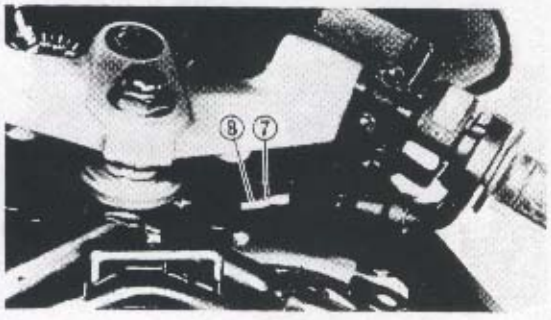
- Loosen the locknut ⑤ on throttle cable #1.
- Turn the adjuster ⑥ in or out until the specified free play is obtained.

| |
|---|
| **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.**

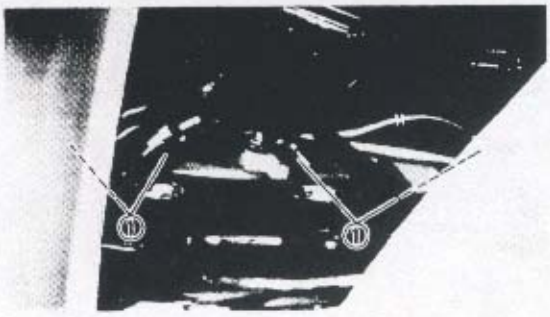
**************************************

9.Install:

- Air filter case
- Fuel tank
  Refer to "FUEL TANK".
- Side cowlings
- Top cover
- Seat
  Refer to "COWLINGS".

**NOTE:**

Make sure the air filter case breather hose is properly routed.
Refer to "CABLE ROUTING" in CHAPTER 2.



**SPARK PLUG INSPECTION**

1.Remove:
- Spark plug caps ①
- Spark plugs

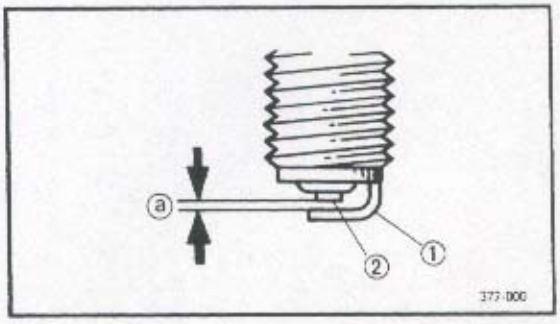
**CAUTION:**

**Before completely removing the spark plug caps, 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 sparkplug:** |
|---|
| **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 (0.031 ~ 0.035 in)** |

6.Install:
- Spark plug

| | |
|---|---|
| | **Spark plug:** **17.5 Nm (1.75 m • kg, 12.5 ft • lb)** |

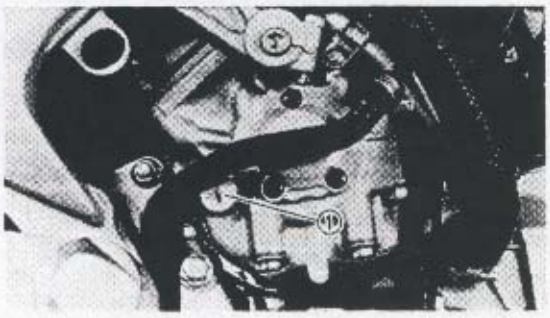
**NOTE:**
Before installing a spark plug, clean the gasket surface and plug surface.

## IGNITION TIMING CHECK

**NOTE:**
Intake air pressure synchronization, engine idle speed and throttle cable free play should be adjusted properly before adjusting the ignition timing.

1. Remove:
- Lower cowling
  Refer to "COWLINGS".

2. Remove:
- Timing plug ①
  (with O-ring)



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

| | |
|---|---|
| | **Timing light:**<br>**YM-33223/90890-03141**<br>**Inductive tachometer:**<br>**YU-08036-A/90890-03113** |

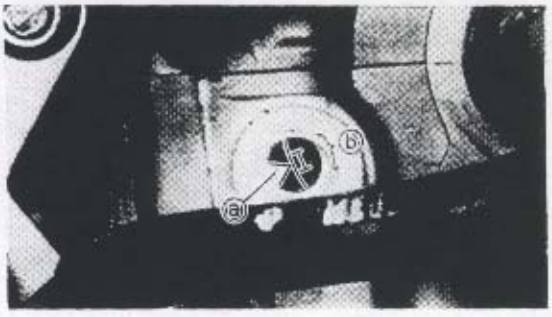
4. Check:
- Ignition timing

**********

**Checking steps:**

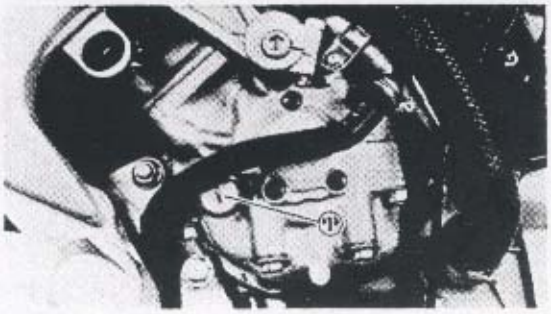
- Start the engine and let it warm up until the fast idle system cuts out. Let the engine run at the specified speed.

| | |
|---|---|
| | **Engine speed:**<br>**950 ~ 1,050 r/min** |



- Visually check the stationary pointer ⓐ is within the firing range ⓑ on the crankshaft web.
  Incorrect firing range → Check rotor and pickup assembly.

**********



**NOTE:**
The ignition timing is not adjustable.

5.Install:
- Timing plug ①
  (with O-ring)
- Lower cowling (left)
  Refer to "COWLINGS".

## COMPRESSION PRESSURE MEASUREMENT

**NOTE:**
Insufficient compression pressure will result in performance loss.

1.Remove:
- Seat
- Top cover
- Side cowlings
  Refer to "COWLINGS".
- Rubber baffle (left and right)

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

3.Start the engine and let it warm up until the fast idle system cuts out. Then stop the engine.

4.Remove:
- Spark plug caps
- Spark plugs

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

5.Attach:
- Compression gauge ①
- Adapter ②

**Compression gauge:**
**YU-33223/90890-03081**
**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:**
**1,350 kPa (13.5 kg/cm², 192 psi)**
**Minimum:**
**1,300 kPa (13.0 kg/cm², 185 psi)**
**Maximum:**
**1,450 kPa (14.5 kg/cm², 206 psi)**

**********

**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, 14 psi) or less.

**********

7. Install:
- Spark plugs
- Spark plug caps

| | |
|---|---|
| | **Spark plug:**<br>**17.5 Nm (1.75 m • kg, 12.5 ft • lb)** |

8. Install:
- Rubber baffle (left and right)
- Side cowlings
- Top cover
- Seat

Refer to "COWLINGS".

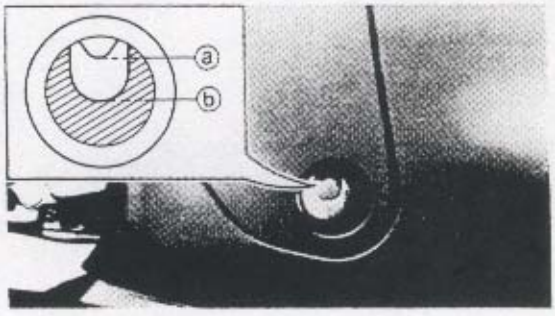


### ENGINE OIL INSPECTION

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

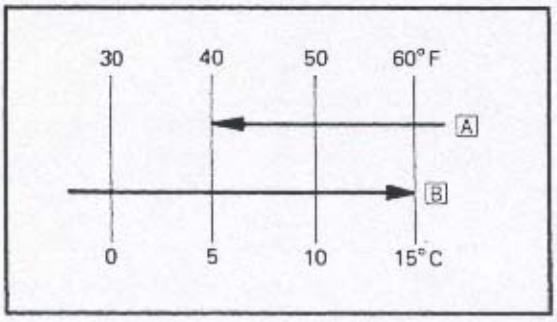
1. Place the motorcycle on a level surface.

**NOTE:**
Place the motorcycle on its centerstand.




2. Inspect:
- Oil level

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




**Recommended oil:**
**At 5°C (40°F) or higher A :**
**Yamalube 4 (20W40) or**
**SAE 20W40 type SE motor oil**
**At 15°C (60°F) or lower B :**
**Yamalube 4 (10W30) or**
**SAW 10W30 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 no allow foreign material to enter the crankcase.**

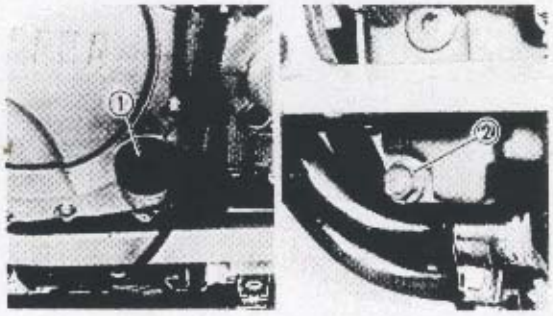
3.Start the engine and let it warm up for several minutes.
4.Stop the engine and inspect the oil level once again.

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

### ENGINE OIL REPLACEMENT

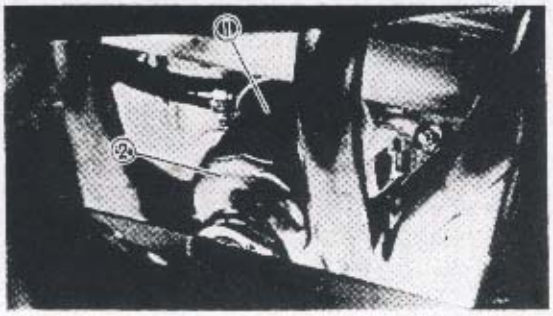
1.Remove:
- Lower cowlings
  Refer to "COWLINGS".

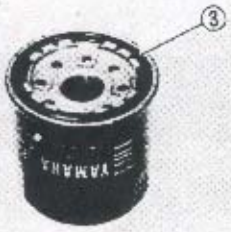
2.Start the engine and let it warm up for several minutes.
3.Stop the engine and place an oil pan under the drain bolt.

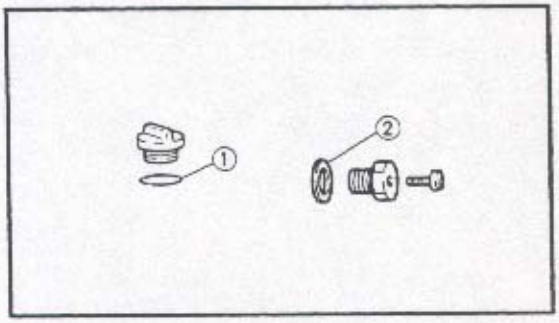



4.Remove:
- Oil filler plug ①
- Drain bolt ②
  (with gasket)
  Drain the crankcase of its oil.

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







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**Replacement steps:**

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

| | |
|---|---|
| | **Oil filter wrench:**<br>**YU-38411/90890-01426** |

- 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:**<br>**17 Nm (1.7 m • kg, 12 ft • lb)** |

**********

6. Check:
   - O-ring ① (oil filler cap)
   - Gasket ② (drain bolt)
   Damage → Replace.
7. Install:
   - Drain bolt

| | |
|---|---|
| | **Drain bolt:**<br>**43 Nm (4.3 m • kg, 31 ft • lb)** |

8. Fill:
   - Crankcase
   Refer to "ENGINE OIL LEVEL INSPECTION".

**NOTE:**

Be careful not to spill any oil on the $O_2$ sensor when filling in engine oil.

| | |
|---|---|
| | **Oil quantity:**<br>**Total amount:**<br>**3.2 L (2.8 Imp qt, 3.4 US qt)**<br>**Periodic oil change:**<br>**2.5 L (2.2 Imp qt, 2.6 US qt)**<br>**With oil filter replacement:**<br>**2.5 L (2.4 imp qt, 2.9 US qt)** |

9. Install:
   - Oil filler plug
10. Warm up the engine for a few minutes, then stop the engine.

11.Remove:
- Seat
- Top cover
- Side cowling (right)
  Refer to "COWLINGS".

12.Inspect:
- Engine
  (for oil leaks)
- Oil level

13.Inspect:
- Oil flow

**********

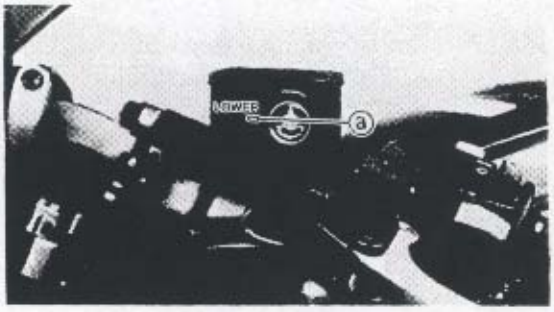
**Inspection steps:**

- Slightly loosen the oil gallery bolt ① in the camshaft case.
- Start the engine and keep it idling until oil begins to seep from the oil gallery hole. If no oil comes out after one minute, stop the engine immediately so the it will not seize.
- Check oil passages, oil filter, and oil pump for damage or leakage. Refer to "INSPECTION AND REPAIR" in CHAPTER 4.
- Restart the engine after solving the problem(s), and recheck the oil pressure.
- Stop the engine and tighten the oil gallery bolt (with gasket) to specification.

| | |
|---|---|
| | **Bolt (oil gallery):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**********

14.Install:
- Lower cowlings
- Side cowling (right)
- Top cover
- Seat
  Refer to "COWLINGS".




**CLUTCH FLUID LEVEL INSPECTION**

1.Place the motorcycle on a level surface.

**NOTE:**
Place the motorcycle on the centerstand.

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

**Recommended fluid:**
**DOT #4 only**

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

**CAUTION:**
**The fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.**

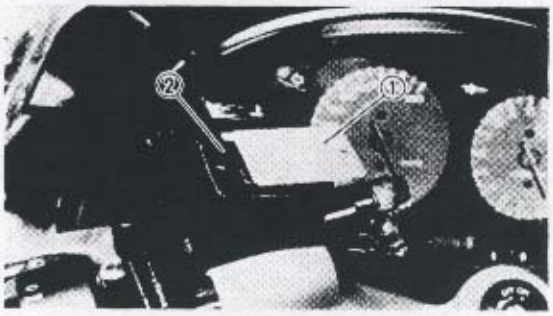
**⚠ WARNING**
- **Use only the designated quality fluid: otherwise, the rubber seals may deteriorate, causing leakage and poor performance.**
- **Refill with the same type of fluid: mixing fluids may result in a harmful chemical reaction and lead to poor performance.**
- **Be careful that water does not enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and may result in vapor lock.**

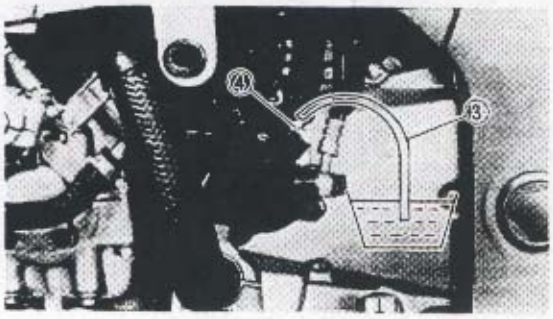


AIR BLEEDING (HYDRAULIC CLUTCH SYSTEM)

**⚠ WARNING**
**Bleed the clutch system every time:**
- **The system has been disassembled.**
- **A clutch hose has been loosened or removed.**
- **The clutch fluid has been very low.**
- **The clutch operation is faulty.**

1.Remove:
- Lower cowling (left)
  Refer to "COWLINGS".




2.Bleed:
• Clutch system

**********

**Air bleeding steps:**

a.Remove clutch master cylinder cover, diaphragm holder ① and the diaphragm ② from the reservoir. Add proper fluid to the reservoir.

**CAUTION:**

**Be careful not to spill any fluid or allow the reservoir to overflow.**

b.Install the diaphragm and diaphragm holder.

c.Connect a clear plastic hose ③ to the bleed screw.

d.Place the other end of the hose into a container.

e.Slowly apply the clutch lever several times.

f. Pull in the lever and hold it in position.

g.Loosen the bleed screw ④ and allow the lever to travel slowly towards the handlebar.

h.Tighten the bleed screw when the lever has touched the handlebar grip, then release the lever.

i. Repeat steps (e) to (h) until all air bubbles have been removed from the system.

j. Tighten the bleed screw.

| | |
|---|---|
| | **Bleed screw:**<br>**6 Nm (0.6 m • kg, 4.3 ft • lb)** |

**NOTE:**

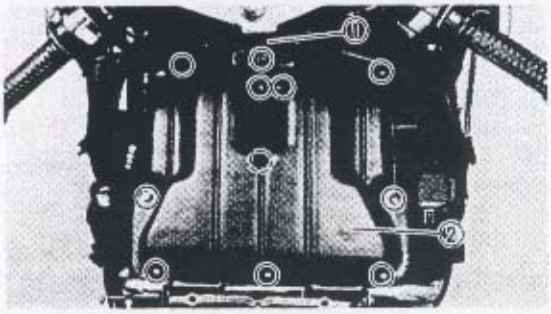
If bleeding is difficult, it may be necessary to let the clutch fluid system stabilize for a few hours. Repeat the bleeding procedure when the tiny bubbles in the fluid have disappeared.

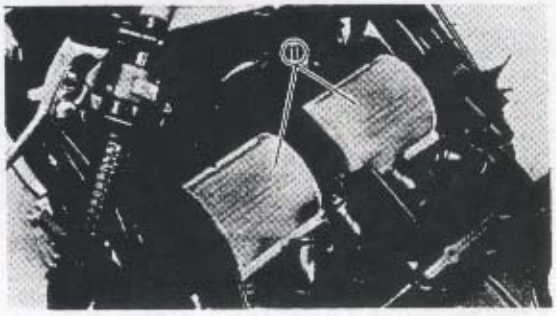
k.Add fluid to the proper level.
Refer to "CLUTCH FLUID LEVEL INSPECTION".

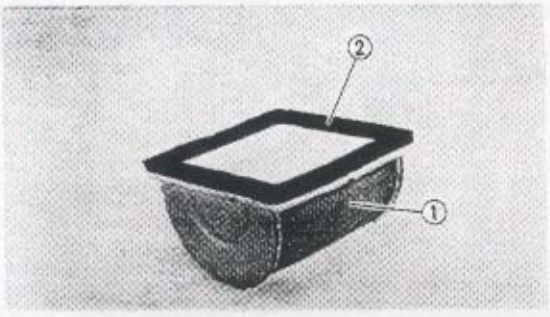
**⚠ WARNING**

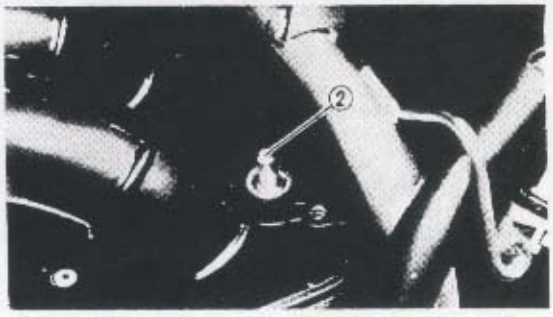
**Check the operation of the clutch after bleeding the clutch system.**

**********









### AIR FILTER CLEANING

1.Remove:
- Seat
- Top cover
- Side cowlings
  Refer to "COWLINGS".
- Bracket ① (side cowling)
- Rubber plate
- Air filter case cover ②
  (with gasket)

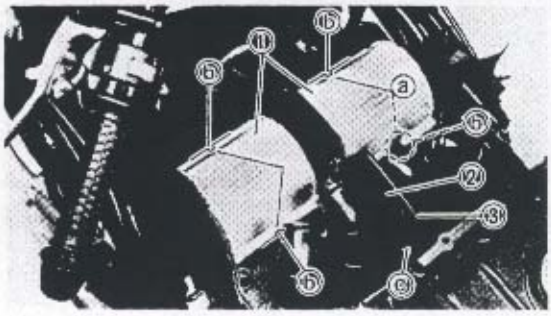
2.Remove:
- Air filter elements ①

**CAUTION:**

**The engine should never be run without the air filter element, otherwise excessive piston and/or cylinder wear may result.**

3.Inspect:
- Air filter elements ①
- Filter element seats ②
  Damage → Replace.

4.Clean:
- Air filter elements ①
  Blow off dust from the outer surface of the element with compressed air.
- Air filter case
- Case cover
  (inner surfaces)
- Intake air temperature sensor ②
  Using a cloth dampened with solvent.



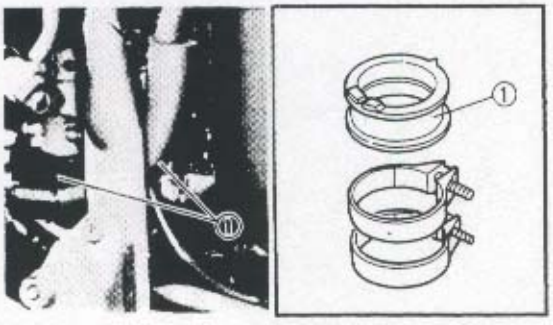
5.Install:
- Air filter elements ①
- Air filter case cover (with gasket)

**NOTE:**
- Make sure the slot ⓐ in the base of the air filters fits correctly with the projection ⓑ on the air filter case.
- Make sure the air baffle plate ② with the rubber gasket ③ is correctly fitted into the channels ⓒ in the middle of the air filter case and case cover.

6.Install:
- Side cowlings
- Top cover
- Seat

Refer to "COWLINGS".





**INTAKE DUCT JOINT INSPECTION**

1.Remove:
- Seat
- Top cover
- Side cowlings

Refer to "COWLINGS".

2.Inspect:
- Intake duct joints ①

Cracks/Damage→ Replace.
Loose → Tighten.
Refer to "ELECTRONIC FUEL INJECTION (EFI) – CHAPTER II" in Service Manual – New Features.

| | |
|---|---|
| | **Clamp screw:** **7 Nm (0.7 m • kg, 5.1 ft • lb)** |

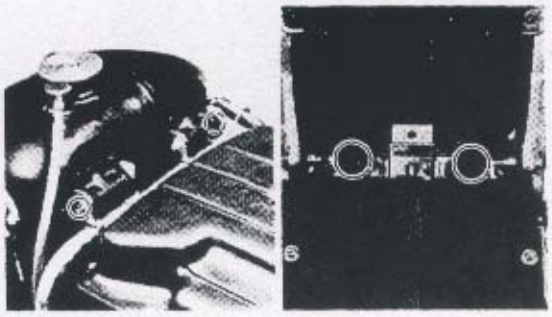
3.Install:
- Side cowlings
- Top cover
- Seat

Refer to "COWLINGS".

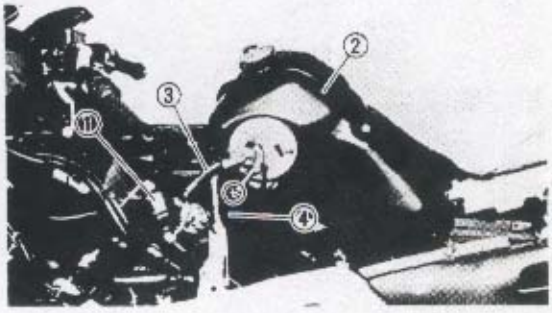
**FUEL LINE INSPECTION**

1.Remove:
- Seat
- Top cover
- Side cowlings

Refer to "COWLINGS".



2.Remove:
- Fuel tank mounting bolts



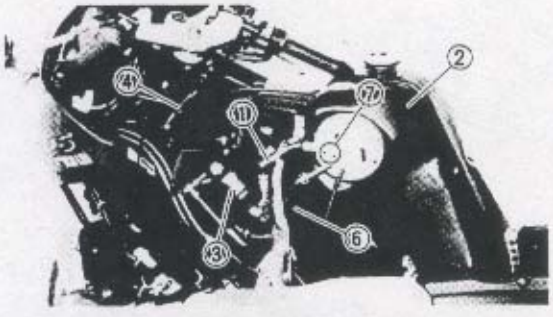
3.Detach the fuel filter ① from the frame, then lift the fuel tank ② up and place it on the left side of the frame without disconnecting the delivery ③ and fuel return hose ④.

**CAUTION:**

**Be careful not to push down the fuel tank while removing the air filter case.**

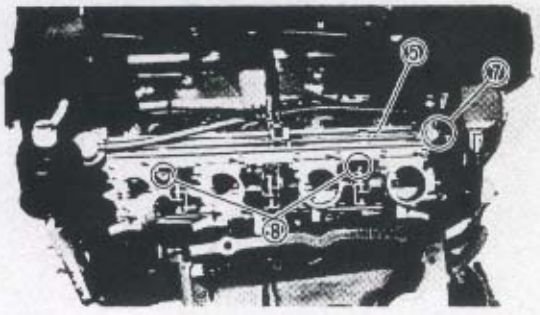
4.Remove:
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT".

5.Reinstall the fuel tank and secure it provisionally with one of the fuel tank stay bolts.
Refer to the "FUEL TANK" section.



6.Inspect:
- Fuel delivery hose #1 ①
  (fuel tank ② to filter ③)
- Fuel delivery hose #2 ④
  (filter ③ to distributor pipe ⑤)
- Fuel return hose ⑥

7.Check:
- Union bolts ⑦
- Holding bolts ⑧ (fuel distribution pipe)
  Loose → Tighten.



**Union bolt:**
**30 Nm (3.0 kg · m, 22 ft · lb)**
**Holding bolt**
**(fuel distribution pipe):**
**10 Nm (1.0 kg · m, 7.2 ft · lb)**

8.Inspect:
- Fuel filter ③
  Replace the fuel filter every 50,000 km (30,000 mi).

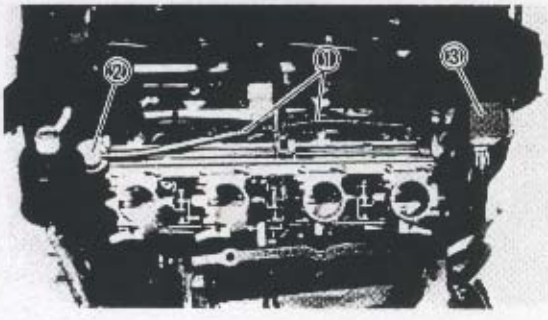
9.Install:
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT".

10.Install:
- Fuel tank
  Refer to the "FUEL TANK".
- Side cowlings
- Top cover
- Seat
  Refer to "COWLINGS".

3

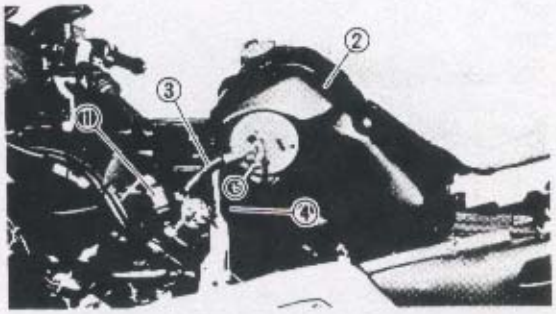
**PULSOR HOSE (PRESSURE REGULATOR) INSPECTION**

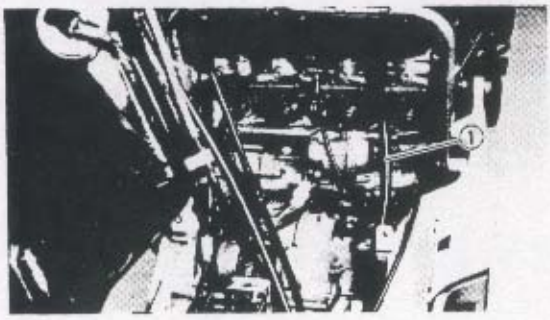
1.Remove:
- Seat
- Top cover
- Side cowlings
  Refer to "COWLINGS".
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT".




2.Inspect:
- Pulsor hoses ① (for pressure regulator ②)
- Pulsor hoses ① (for pressure sensor ③)
  Cracks/Damage → Replace.
  Loose connection → Connect properly.

3.Install:
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT".
- Side cowlings
- Top cover
- Seat
  Refer to "COWLINGS".




**CRANKCASE VENTILATION HOSE INSPECTION**

1. Remove:
   - Seat
   - Top cover
   - Side cowlings

   Refer to "COWLINGS".

2. Remove:
   - Fuel tank mounting bolts
3. Detach the fuel filter ① from the frame, then lift the fuel tank ② up and place it on the left side of the frame without disconnecting the delivery ③ and fuel return hose ④.

**CAUTION:**

**Be careful not to push down the fuel tank.**

4. Inspect:
   - Crankcase ventilation hose ①

   Cracks/Damage → Replace.
   Loose connection → Connect properly.

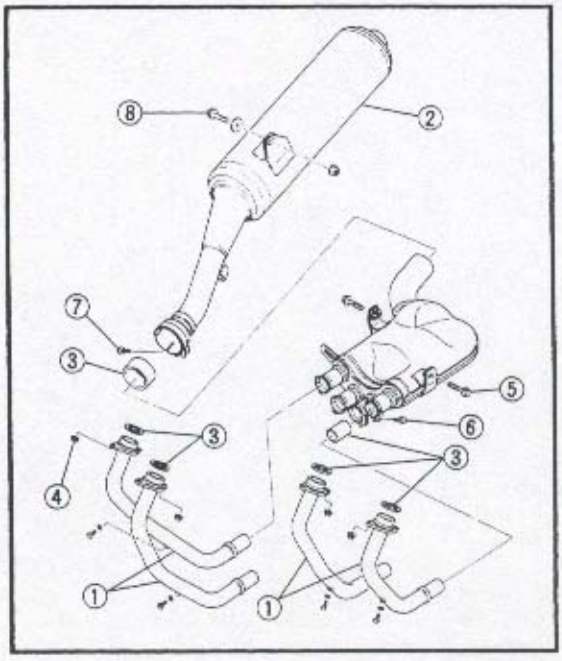
**CAUTION:**

**Make sure that the crankcase ventilation hose is routed correctly.**

5. Install:
   - Fuel tank

   Refer to "FUEL TANK".
   - Side cowlings
   - Top cover
   - Seat

   Refer to "COWLINGS".



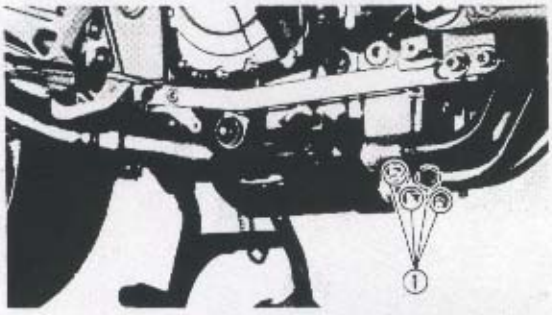

3

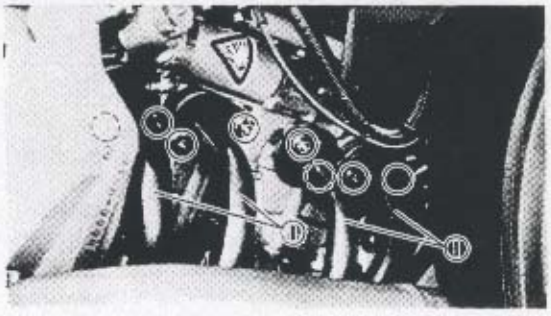
## EXHAUST SYSTEM INSPECTION

1. Place the motorcycle on the centerstand.
2. Remove:
   - Lower cowlings
     Refer to "COWLINGS".
3. Inspect:
   - Exhaust pipes ①
   - Muffler ②
     Cracks/Damage → Replace.
   - Gaskets ③
     Exhaust gas leaks → Replace.
4. Inspect:
   - Tightening torque

**Nut ④ (exhaust pipe):**
**20 Nm (2.0 m • kg, 14 ft • lb)**
**Bolt ⑤ (exhaust chamber):**
**18 Nm (1.8 m • kg, 13 ft • lb)**
**Bolt ⑥**
**(exhaust pipe-exhaust chamber):**
**20 Nm (2.0 m • kg, 14 ft • lb)**
**Bolt ⑦**
**(exhaust chamber-muffler):**
**20 Nm (2.0 m • kg, 14 ft • lb)**
**Bolt ⑧ (muffler-stay):**
**25 Nm (2.5 m • kg, 18 ft • lb)**

5. Install:
   - Lower cowlings
     Refer to "COWLINGS".

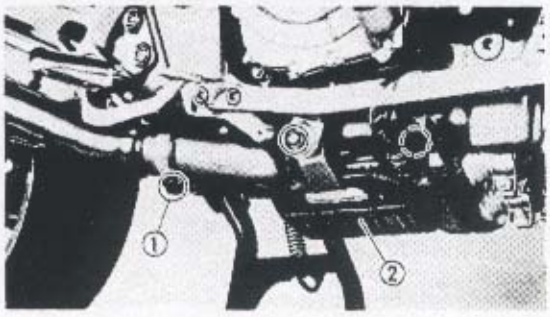



## CATALYZER CONVERTOR UNIT INSPECTION

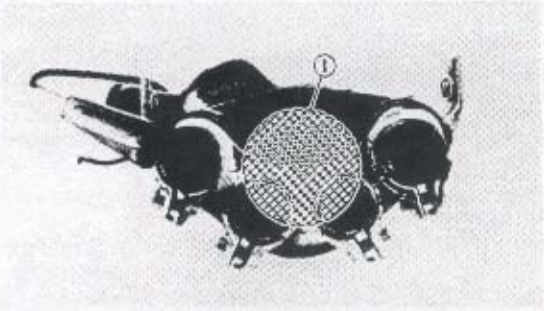
1. Remove:
   - Lower cowlings
     Refer to "COWLINGS".
2. Disconnect:
   - Coupler ($O_2$ sensor)
3. Loosen:
   - Bolt ① (exhaust pipe-exhaust chamber)
4. Remove:
   - Exhaust pipes ①

**NOTE:**
Put marks on the exhaust pipes so that they can be reinstalled in their original place.




5.Loosen:
- Bolt ① (exhaust chamber-muffler)

6.Remove:
- Exhaust chamber ②

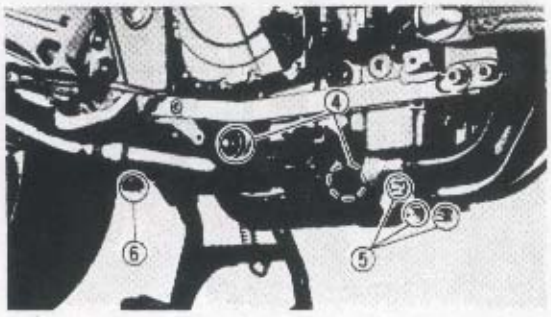



7.Inspect:
- Visually check the condition of the catalyzer convertor unit ① from the exhaust pipe side.
  Dense carbon deposit / melted cells → Replace.

8.Install:
- Exhaust chamber (temporarily)

9.Install:
- Exhaust pipes

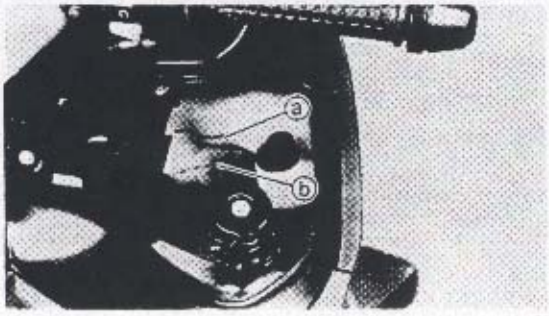
**NOTE:**
Insert the exhaust pipe into the exhaust chamber until the exhaust pipe flange ① touches the gasket ②.




**Nut ③ (exhaust pipe):**
**20 Nm (2.0 m • kg, 14 ft • lb)**
**Bolt ④ (exhaust chamber):**
**18 Nm (1.8 m • kg, 13 ft • lb)**
**Bolt ⑤**
**(exhaust pipe – exhaust chamber):**
**20 Nm (2.0 m • kg, 14 ft • lb)**
**Bolt ⑥**
**(exhaust chamber - muffler):**
**20 Nm (2.0 m • kg, 14 ft • lb)**

10.Connect:
- Copler ($O_2$ sensor)

11.Install:
- Lower cowlings
  Refer to "COWLINGS".




3

**COOLANT LEVEL INSPECTION**

1. Place the motorcycle on a level surface.

**NOTE:**
Place the motorcycle on the centerstand.

2. Remove:
- Reservoir tank lid ①

3. Inspect:
- Coolant level
  Coolant level should be between maximum ⓐ and minimum ⓑ marks.
  Coolant level low → Add soft water (tap water) to proper level.

**⚠ WARNING**

**Do not remove the radiator cap when the engine is hot.**

**CAUTION:**

**Hard water or salt water is harmful to the engine parts; use boiled or distilled water if you can't get soft water.**

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

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

6. Install:
- Reservoir tank lid

**COOLANT REPLACEMENT**

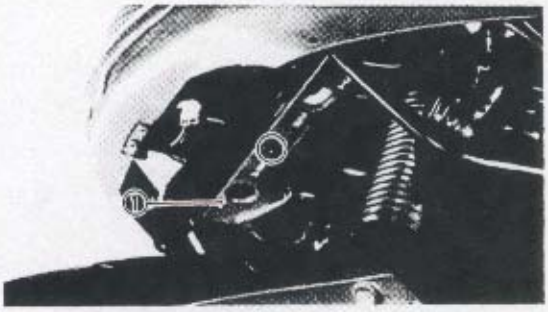
**⚠ WARNING**

**Do not remove the radiator cap when the engine and radiator are hot. Scalding hot fluid and steam may be blown out under pressure, which could cause serious injury. When the engine has cooled, open the radiator cap by following this procedure:**
**Place a thick rag or a towel over the radiator cap. Slowly rotate the cap counterclockwise to the detent. This allows any residual pressure to escape. When the hissing sound has stopped, press down on the cap while turning counterclockwise and remove it.**

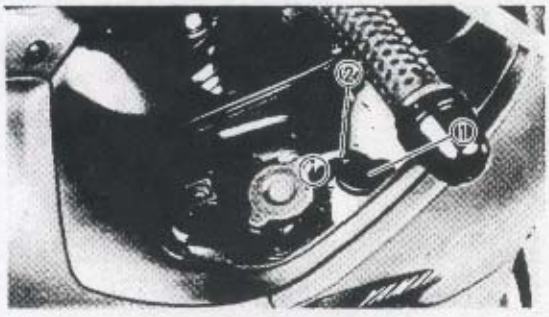
1.Place the motorcycle on a level surface.

**NOTE:**
Place the motorcycle on the centerstand.

2.Remove:
- Lower cowlings
- Reservoir tank lid
  Refer to "COWLINGS".



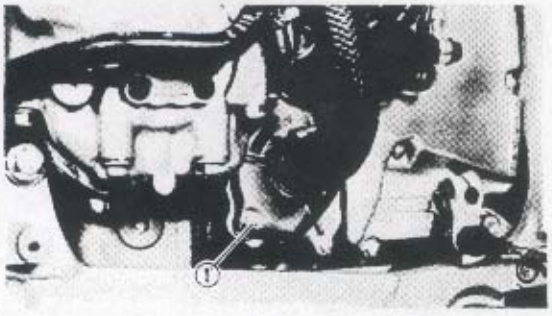
3.Remove:
- Bottom cover ①



4.Remove:
- Coolant reservoir tank cap ①

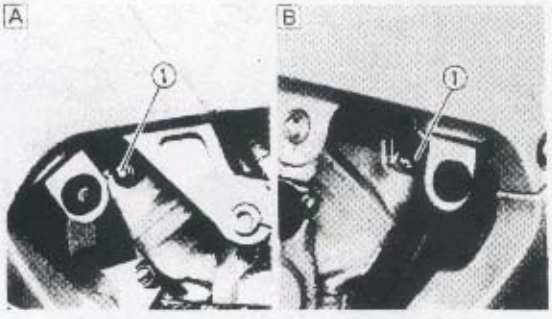
5.Disconnect:
- Hose ② (reservoir tank)
  (at the radiator cap side)

6.Hold the end of the hose into a container and drain the reservoir tank.



7.Place an open container under the drain bolts.

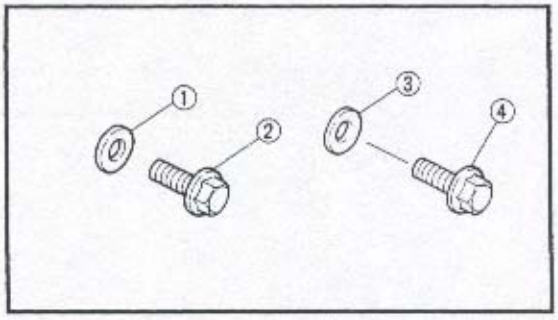
8.Remove:
- Drain bolt ① (water pump)
  (with gasket)




9.Remove:
- Drain bolts ① (cylinder)
  (with gasket)
- Radiator cap
  Drain the coolant.

**NOTE:**
Remove the drain bolts first, then remove the radiator cap to prevent the coolant from spilling out.

A Left B Right




10.Inspect:
- Gaskets ① (cylinder drain bolt ②)
- Gasket ③ (water pump drain bolt ④)
  Damage →Replace.

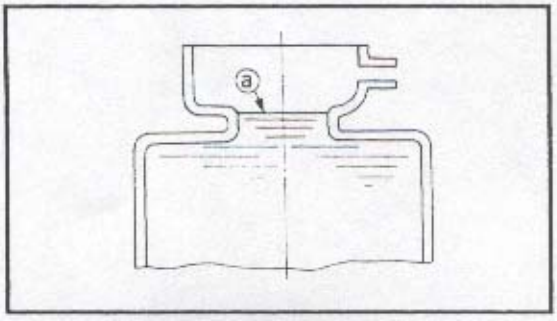
11.Install:
- Drain bolts

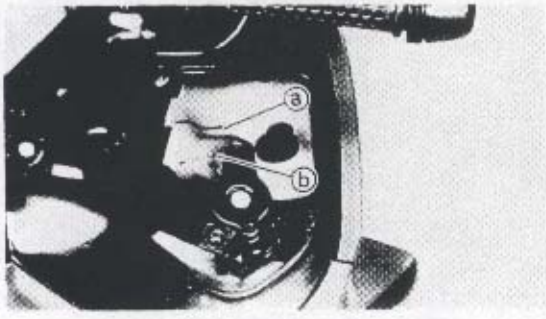
| | |
|---|---|
| | **Drain bolt:**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |



12.Connect:
- Coolant reservoir tank hose

13.Fill:
- Cooling system (radiator and engine)
  (to specified level ⓐ)




**Recommended coolant:**
**High quality ethylene glycol anti-freeze containing corrosion inhibitors for aluminum engines**
**Coolant and water mix ratio:**
**50% - 50%**
**Total amount:**
**2.3 L (2.0 Imp qt, 2.4 US qt)**
**Reservoir tank capacity:**
**0.35 L (0.31 Imp qt, 0.38 US qt)**
**From lower ⓑ to upper ⓐ level:**
**0.2 L (0.18 Imp qt, 0.21 US qt)**

**********

**Handling notes for coolant:**
Coolant is harmful and should be handled with special care.

**⚠ WARNING**

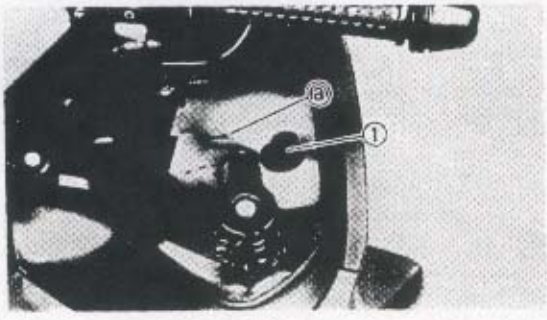
- **If coolant splashes in your eyes:**
  **Thoroughly wash your eyes with water and see a doctor.**
- **If coolant splashes on your clothes.**
  **Quickly wash it away with water and then with soap.**
- **If coolant is swallowed.**
  **Quickly make the patient vomit and take him to a doctor.**

**********

**CAUTION:**

- **Hard water or salt water is harmful to the engine parts. Use boiled or distilled water if you can't get soft water.**
- **Do no use water containing impurities or oil.**
- **Take care that no coolant splashes onto painted surfaces. If it does, wash it away with water immediately.**
- **Do not mix different types of ethylene glycol antifreeze containing corrosion inhibitors for aluminium engines.**

14. Install:
- Radiator cap




15. Fill:
- Reservoir tank
  (to upper level mark ⓐ)

16. Install:
- Reservoir tank cap ①

17. Start the engine and let it warm up for several minutes.
18. Stop the engine and inspect the level.
    Refer to "COOLANT LEVEL INSPECTION".

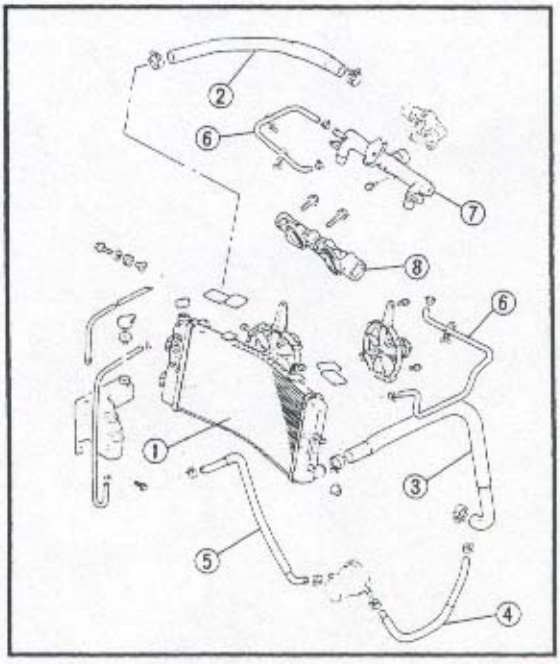
**NOTE:**
Wait a few minutes until the coolant settles before inspecting the coolant level.

19. Install:
- Bottom cover
- Reservoir tank lid
- Lower cowlings
  Refer to "COWLINGS".

## COOLING SYSTEM INSPECTION

1.Remove:
- Seat
- Top cover
- Side cowlings
- Lower cowlings

Refer to "COWLINGS".

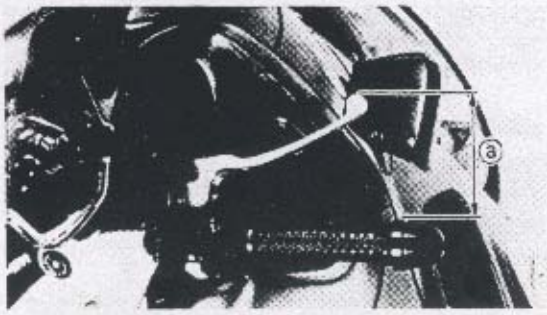



2.Inspect:
- Radiator ①
- Radiator hose ② (inlet)
- Radiator hose ③ (outlet)
- Inlet hose ④ (oil cooler)
- Outlet hose ⑤ (oil cooler)
- Hoses ⑥ (fast idle unit)
- Water jacket joint ⑦ (outlet)
- Water jacket joint ⑧ (inlet)

Cracks/Damage → Replace.
Refer to "COOLING SYSTEM" in CHAPTER 5.

3.Install:
- Lower cowlings
- Side cowlings
- Top cover
- Seat

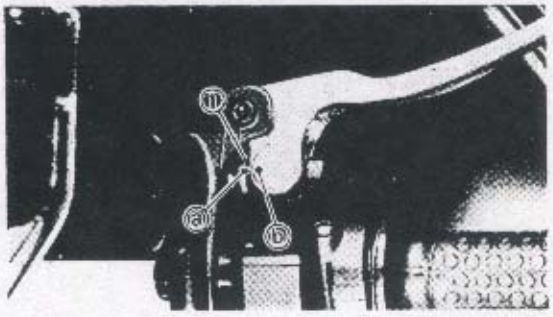
Refer to "COWLINGS".




## CHASSIS

### FRONT BRAKE 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 decreases.** |
| **Turning out → Distance increases.** |

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

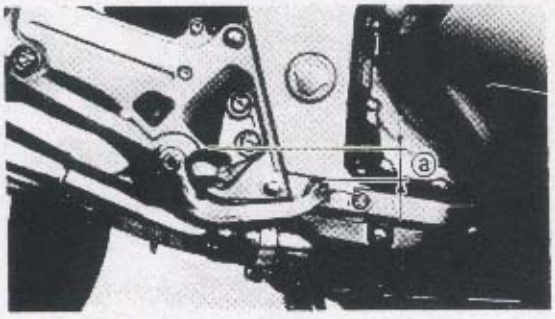
**CAUTION:**

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

**⚠ WARNING**

**A soft or 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 capability and can result in loss of control and an accident. Inspect and bleed the system if necessary.**

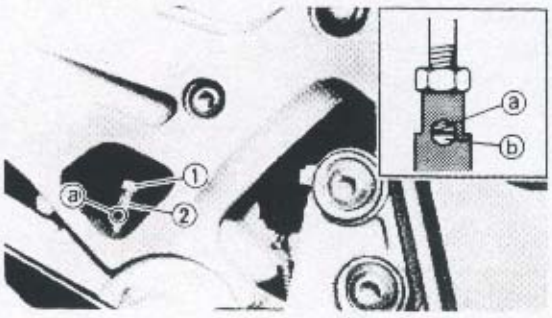
**********




### REAR BRAKE ADJUSTMENT

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

**Brake pedal height:**
**25 mm (0.98 in)**
**Below top of footrest.**




2. Adjust:
- Brake pedal height

**************************************

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

| | |
|---|---|
| **Turning in** | **Height decreased.** |
| **Turning out** | **Height increased.** |

**⚠ 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.

| | |
|---|---|
| | **Locknut: 26 Nm (2.6 m • kg, 19 ft • lb)** |

**CAUTION:**

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

**⚠ WARNING**

**A soft or 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 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".

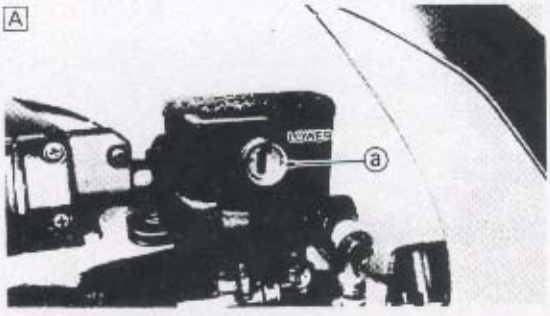
### BRAKE FLUID LEVEL INSPECTION

**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.

A

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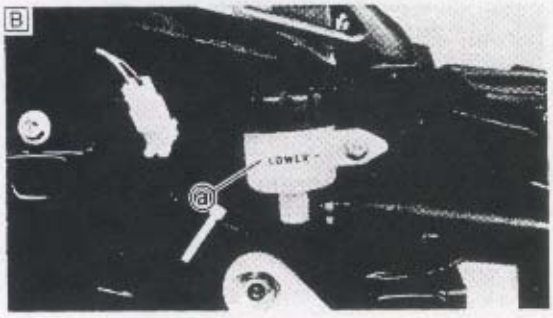



2.Remove:
- Seat
- Side cover (right)
  Refer to "COWLINGS".

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

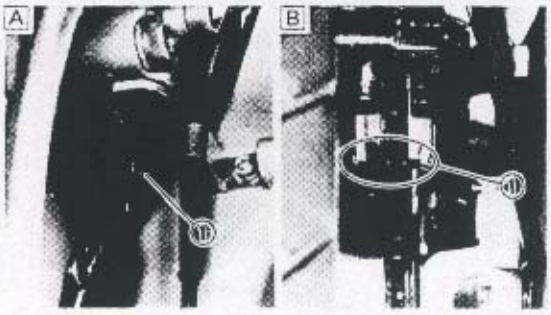
**Recommended fluid:**
**Front brake fluid: DOT #4 only**
**Rear brake fluid: DOT #4**

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
  Wear indicator ① almost contacting the brake disc → Replace brake pad as a set.
  Refer to "BRAKE PAD REPLACEMENT" in CHAPTER 7.

A Front brake B Rear brake

### 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
  Incorrect → Adjust.
2. Adjust:
- Brake light operating timing

************************************

**Adjustment steps:**

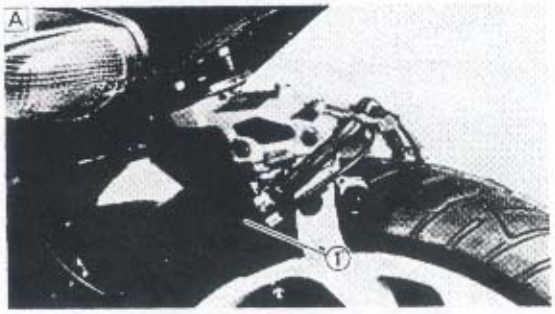
- Hold the main body ① of the switch with your hand so that it does not rotate, and turn the adjuster ② in or out until the operating timing is correct.

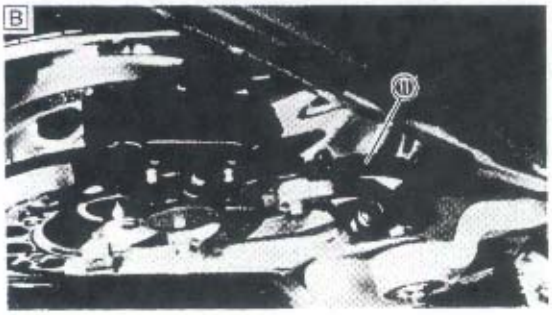
| | |
|---|---|
| **Turning in** | **Brake light on later.** |
| **Turning out** | **Brake light on sooner.** |

************************************

### BRAKE HOSE INSPECTION

1. Place the motorcycle on the centerstand.
2. Remove:
- Front fender
  Refer to "FRONT WHEEL" in CHAPTER 6.




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

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

5.Check:
- Brake hose/Wheel sensor lead routing
  Incorrect → Repair.
  Refer to "CABLE ROUTING" in CHAPTER2.

A Front B Rear

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

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

8.Install:
- Front fender
  Refer to "FRONT WHEEL" in CHAPTER 6.

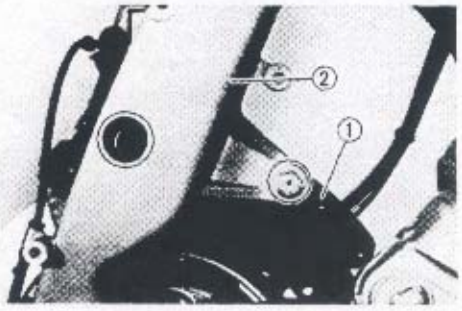
3

## 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.**

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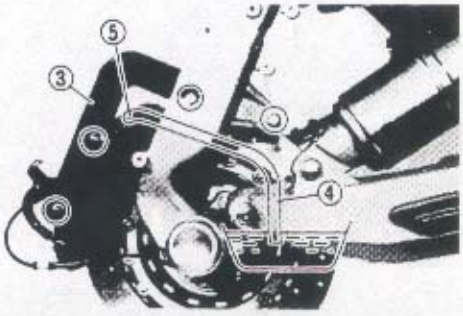


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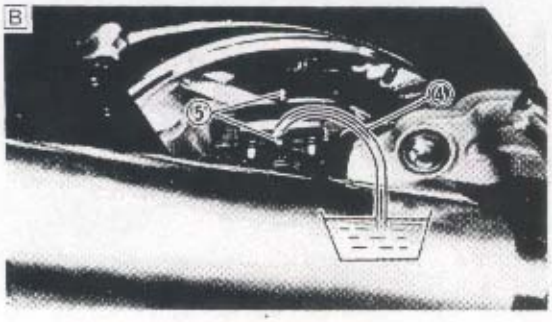



1. Bleed:
- Brake system

**********

**Air bleeding steps:**

a. Remove the front wheel.
   Refer to "FRONT WHEEL" in CHAPTER 6.
b. Remove the front brake caliper assembly ① from the knuckle arm ②.
c. Install the caliper support bracket ③, then install the front caliper assembly to the caliper support bracket.

| | |
|---|---|
| | **Caliper support bracket:**<br>**90890-01453** |

d. Add proper brake fluid to the reservoir.
e. Install the diaphragm. Be careful not to spill any fluid or allow the reservoir to overflow.
f. Connect a clear plastic hose ④ tightly to the caliper bleed screw ⑤.

A Front B Rear

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

| | |
|---|---|
| | **Bleed screw:**<br>**6 Nm (0.6 m · kg, 4.3 ft · lb)** |

**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.

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

o. Remove the front brake caliper and caliper support bracket, then install the caliper assembly to the knuckle arm.

| | |
|---|---|
| | **Bolt (brake caliper):**<br>**Front**<br>**67 Nm (6.7 m • kg, 48 ft • lb)** |

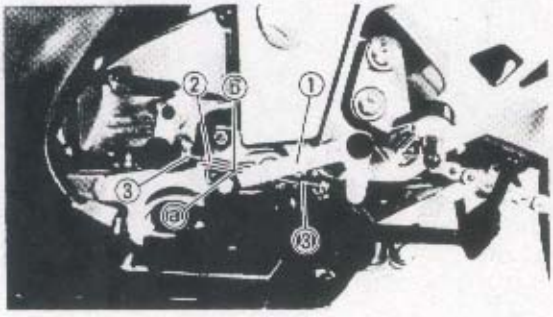
p. Install the front wheel.
Refer to "FRONT WHEEL" in CHAPTER 6.

**⚠ WARNING**

**Check the operation of the brake after bleeding the brake system.**

**********






**CHANGE PEDAL ADJUSTMENT**

1. Place the motorcycle on the centerstand.
2. Check:
- Change pedal position
When looking from the side, the top ⓐ of the change pedal ① should be level with the lower side ⓑ of the change pedal rod ②.
Not level → Adjust.

3. Adjust:
- Change pedal position

**********

**Adjustment steps:**

- Loosen both locknuts ③.
- Turn the change pedal rod ② in or out to set the correct pedal height.

| | |
|---|---|
| **Turning in** | **Pedal raised.** |
| **Turning out** | **Pedal lowered.** |

- Tighten both locknuts.

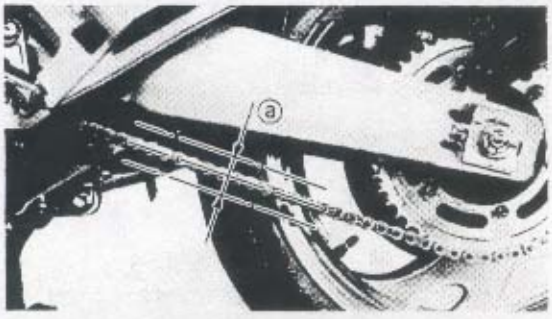
**********

## DRIVE CHAIN SLACK ADJUSTMENT

**NOTE:**
Before checking and/or adjusting, rotate the rear wheel several revolutions and check slack at several points to find the tightest point. Check and/or adjust the chain slack with the rear wheel is in this "tightest" position.

**CAUTION:**
**Too little chain slack will overload the engine and other vital parts; keep the slack within the specified limits.**

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



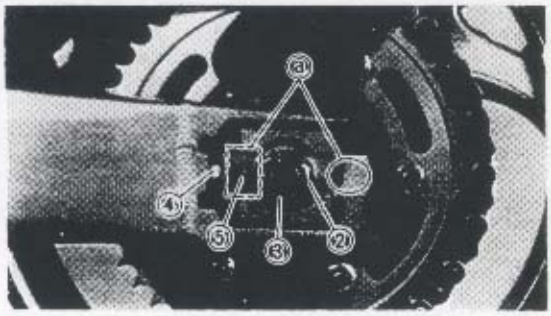

1. Place the motorcycle on the centerstand.
2. Check:
- Drive chain slack ⓐ
  Out of specification → Adjust.

| | |
|---|---|
| | **Drive Chain slack:**<br>**10 ~ 20 mm (0.4 ~ 0.8 in)** |

3. Adjust:
- Drive chain slack

**********

**Adjustment steps:**
- Loosen the caliper bracket bolt ①.
- Remove the cotter pin ②.
- Loosen the axle nut ③.
- Loosen both locknuts ④.
- Turn the adjuster ⑤ in or out until the specified slack is obtained.




| | |
|---|---|
| **Turn in** | **Slack increases.** |
| **Turn out** | **Slack decreases.** |

**NOTE:**
Turn each adjuster exactly the same amount to maintain correct axle alignment. (There are marks ⓐ on each side of the swingarm. Use them to check for proper alignment.)

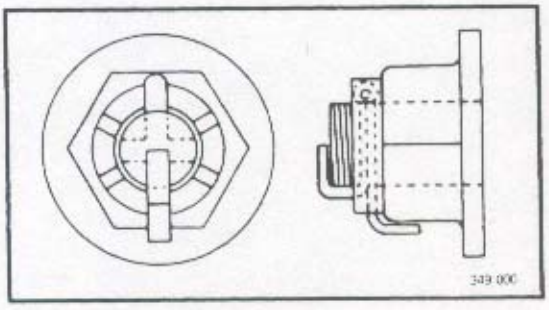
- Tighten the adjuster locknuts.

| | |
|---|---|
| | **Locknut:**<br>**16 Nm (1.6 m • kg, 11 ft • lb)** |

- Tighten the axle nut to specification, while pushing the chain tight.

| | |
|---|---|
| | **Axle nut:**<br>**150 Nm (15 m • kg, 110 ft • lb)** |





- Install the cotter pin.

**⚠ WARNING**

**Always use a new cotter pin.**

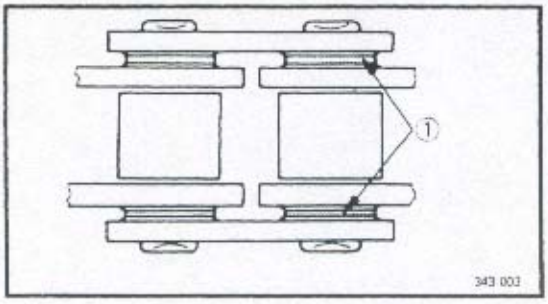
**CAUTION:**

**Do not loosen the axle nut after torque tightening. If the axle nut groove is not aligned with the cotter pin hole, align the groove with the hole by tightening the axle nut a little further.**

- Tighten the caliper bracket bolt.

| | |
|---|---|
| | **Bolt (caliper bracket):**<br>**49 Nm (4.9 m • kg, 35 ft • lb)** |

**********




### DRIVE CHAIN LUBRICATION

The chain consists of many parts that work with each other. If the chain is not maintained properly, it will wear out rapidly. Therefore, form the habit of periodically servicing the chain. This service is especially necessary when riding in dusty conditions.

This motorcycle has a drive chain with small rubber O-rings between the chain plates. Steam cleaning, high-pressure washes, and certain solvents can damage these O-rings. Use only kerosene to clean the drive chain. Wipe dry, and thoroughly lubricate it with SAE 30 ~ 50W motor oil. Do not use any other lubricants on the drive chain. They may contain solvents that could damage the O-rings.

**Recommended lubricant:**
**SAE 30 ~ 50W motor oil or chain lubricant suitable for O-ring chains.**

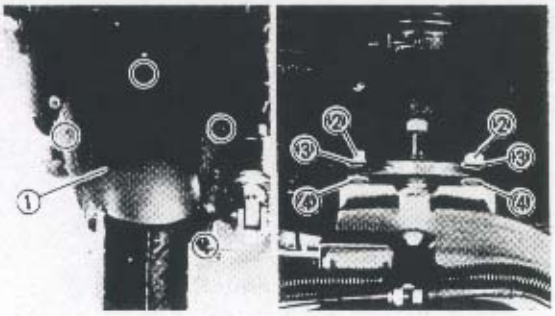
①O-ring

### STEERING HEAD INSPECTION

**⚠ WARNING**

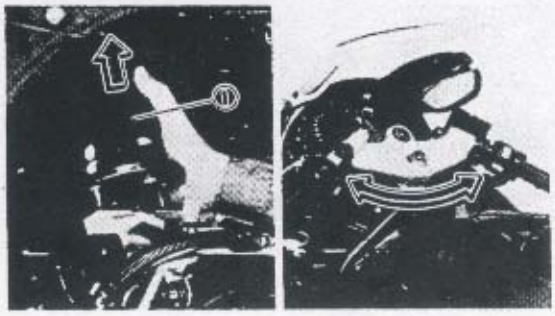
**Securely support the motorcycle so there is no danger of it falling over.**

1.Place the motorcycle on the centerstand.




2.Remove:
- Front fender ①

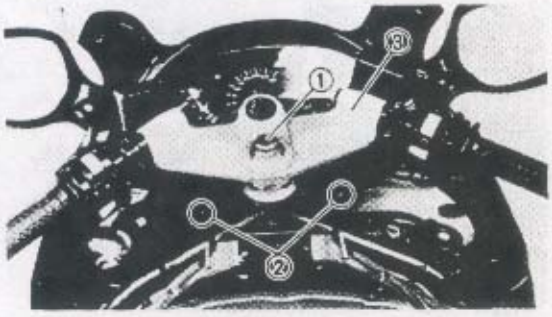
3.Remove:
- Nuts ② (steering tube)
- Special washers ③
- Plain washers ④

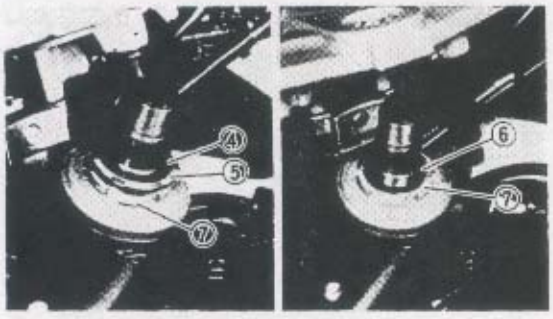


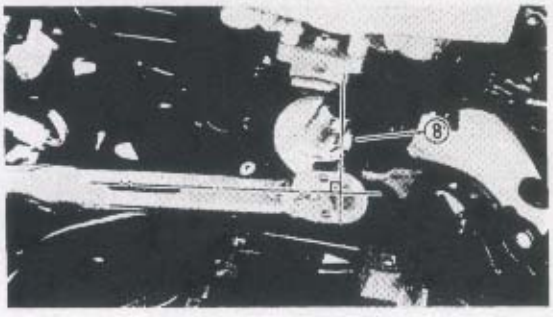
4.Check:
- Steering assembly bearings
  Lift the steering tube ① up and while holding it, turn the handlebar from side to side. Rock up and down on the handlebar. Looseness/Free play → Adjust the steering head.

5.Remove:
- Seat
- Top cover
- Inner panels
  Refer to "COWLINGS".









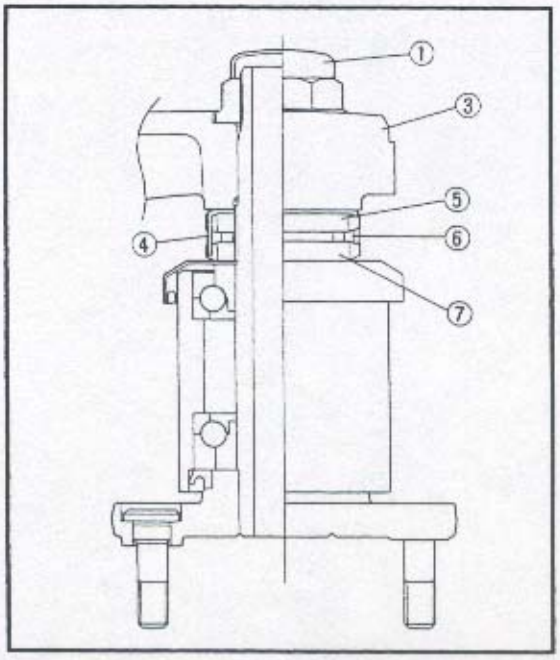
6.Adjust:
- Steering head

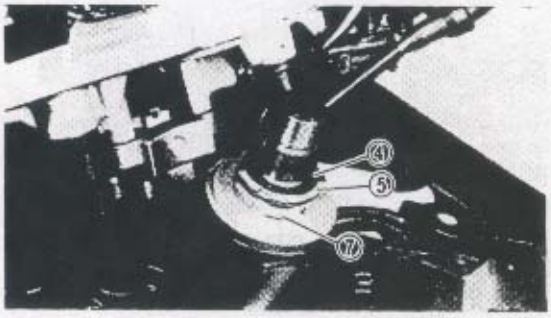
**********

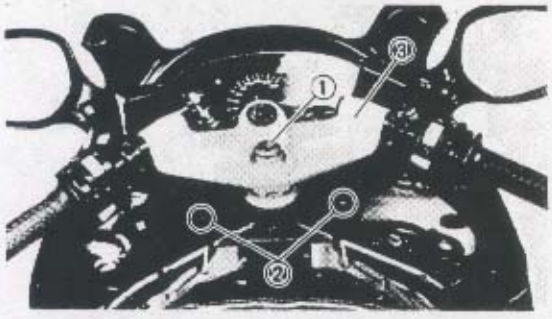
**Adjustment steps:**
- Remove the steering stem nut ① and the pinch bolts ②.
- Remove the handle crown ③.
- Remove the lock washer ④, ring nut ⑤ (upper), and rubber washer ⑥.
- Loosen the ring nut ⑦ (lower).
- Tighten the ring nut (lower) using the ring nut wrench ⑧.

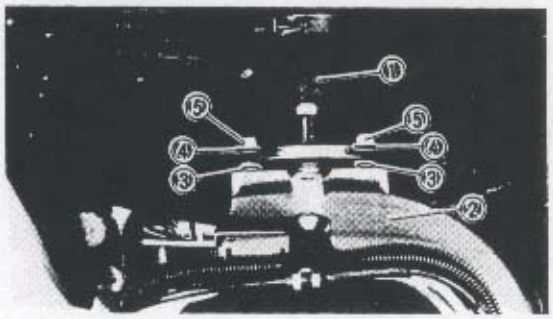
**NOTE:**
Set the torque wrench to the ring nut wrench so that they form a right angle.

| | |
|---|---|
| | **Ring nut wrench:**<br>**YU-33975/90890-01403** |
| | **Ring nut (lower):**<br>**(initial tightening):**<br>**47 Nm (4.7 m • kg, 34 ft • lb)** |




- Loosen the ring nut ⑦ (lower) completely, then retighten it to specification.

**⚠ WARNING**

**Do not overtighten.**

**Ring nut (lower):**
**(final tightening):**
**18 Nm (1.8 m • kg, 13 ft • lb)**

- 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" – CHAPTER IV." in Service Manual – New Features.
- Install the rubber washer ⑥.
- Install the ring nut ⑤ (upper).
- Finger tighten the ring nut ⑤ (upper), then align the slots of both ring nuts. If necessary, hold the ring nut ⑦ (lower) and tighten the ring nut (upper) until their slots are aligned.
- Install the lock washer ④.

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

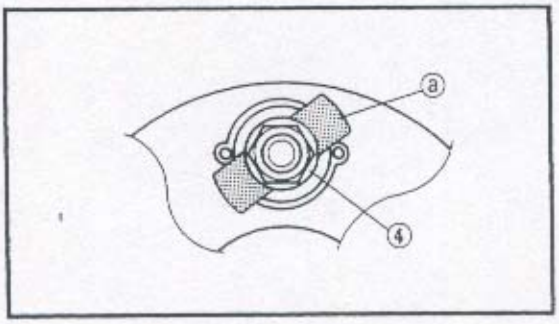
- Install the handle crown ③.
- Tighten the steering stem nut ① and pinch bolts ② to specification.

**Pinch bolt (handle crown):**
**11 Nm (1.1 m • kg, 8.0 ft • lb)**
**Nut (steering stem):**
**110 Nm (11.0 m • kg, 80 ft • lb)**

************************************

7. Install:
- Steering tube ①
  (onto knuckle arm ②)
- Plain washers ③
- Special washers ④
- Nuts ⑤ (steering tube)

**Nut (steering tube):**
**23 Nm (2.3 m • kg, 17 ft • lb)**




**CAUTION:**

- **Always use a new special washer ④.**
- **After tightening the nut (steering tube), cut off the torque stoppers ⓐ.**

8.Install:
- Front fender
- Inner panels
- Top cover
- Seat

Refer to "COWLINGS".



### STEERING TUBE INSPECTION

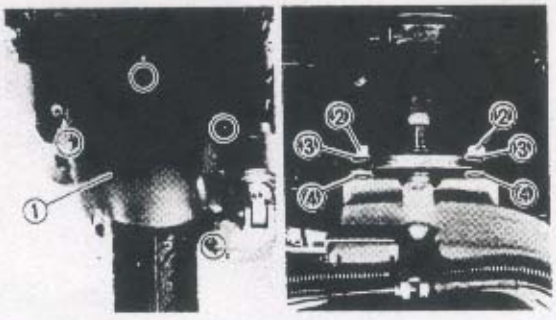
**⚠ WARNING**

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

1.Place the motorcycle on the centerstand.

2.Remove:
- Seat
- Top cover
- Inner panels

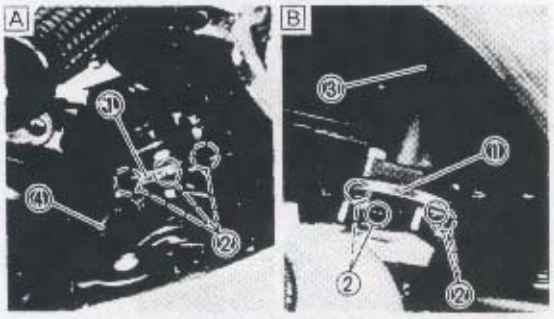
Refer to "COWLINGS".




3.Remove:
- Front fender ①

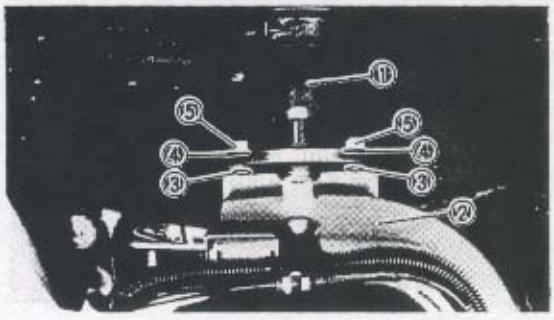
4.Remove:
- Nuts ② (steering tube)
- Special washers ③
- Plain washers ④

5.Inspect:
- Steering tube ①
  Pump several times on the steering tube.
  Looseness/Binding → Replace.
  Turn the steering tube left and right.
  Loosenes/Free play → Replace.
  Refer to "STEERING SYSTEM AND HANDLEBAR – CHAPTER IV" in Service Manual – New Features.



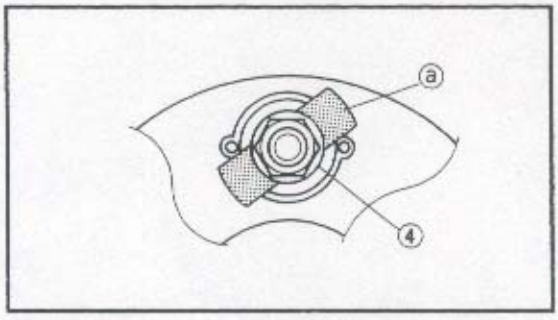

6.Inspect:
- Steering tube joint ring ① and ball joints ②
  Damage → Replace the assembly.
- Rubber boot ③
- Breather hose ④
  Damage → Replace.

A Upper
B Lower



7.Install:
- Steering tube ①
  (onto knuckle arm ②)
- Plain washers ③
- Special washers ④
- Nuts ⑤ (steering tube)

| | |
|---|---|
| | **Nut (steering tube):**<br>**23 Nm (2.3 m • kg, 17 ft • lb)** |

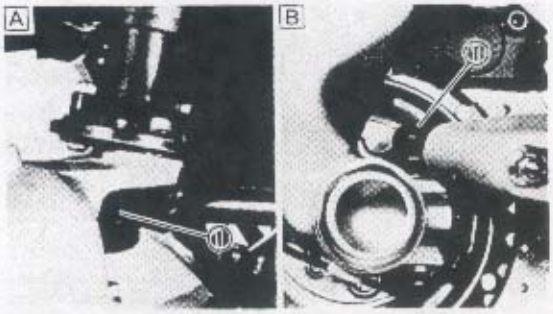


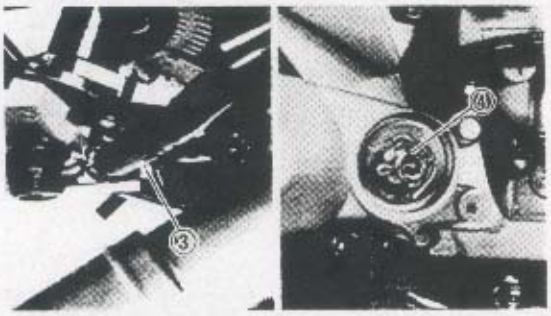
**CAUTION:**
- **Always use a new special washer ④.**
- **After tightening the nut (steering tube), cut off the torque stoppers ⓐ.**

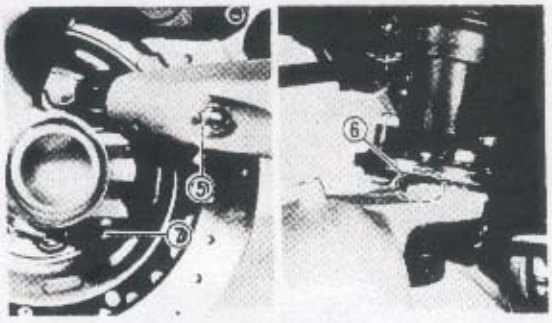
8.Install:
- Front fender
- Inner panels
- Top cover
- Seat

  Refer to "COWLINGS".

## FRONT SWING ARM INSPECTION






**⚠ WARNING**

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

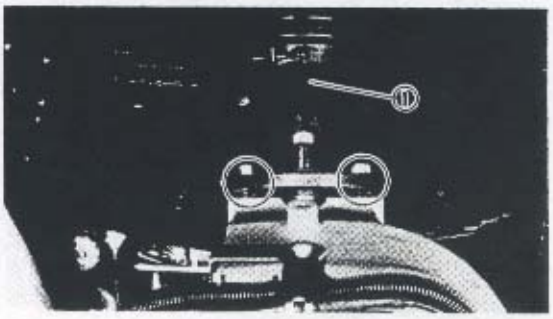
1. Place the motorcycle on the centerstand.
2. Remove:
   - Seat
   - Tap cover
   - Side cowlings
     Refer to "COWLINGS".
   - Front wheel
     Refer to "FRONT WHEEL" in CHAPTER 6.
3. Check:
   - Rubber boots ① (ball joint)
     Cracks/Damage → Replace.

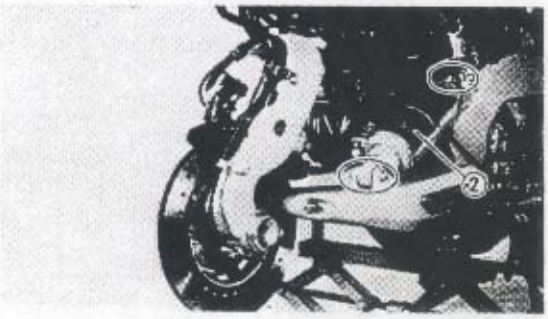
   Ⓐ Upper
   Ⓑ Lower
4. Check:
   - Bolts and nuts (front swingarm)
     If necessary, tighten to specification.

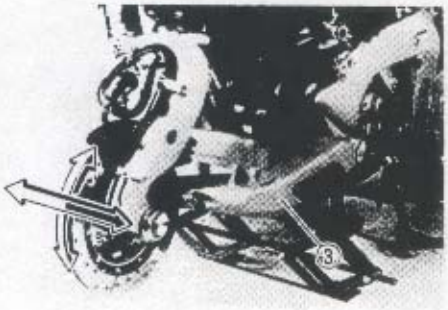
**Nut ① (upper arm - frame):**
**40 Nm (4.0 m • kg, 29 ft • lb)**
**Lock nut ② (camber adjuster):**
**23 Nm (2.3 m • kg, 17 ft • lb)**
**Nut ③ (upper arm - ball joint):**
**40 Nm (4.0 m • kg, 29 ft • lb)**
**Nut ④ (lower arm - frame):**
**Left:**
**105 Nm (10.5 m • kg, 75 ft • lb)**
**Right:**
**105 Nm (10.5 m • kg, 75 ft • lb)**
**Nut ⑤ (lower arm - ball joint):**
**78 Nm (7.8 m • kg, 56 ft • lb)**
**Nut ⑥**
**(knuckle arm - upper ball joint):**
**53 Nm (5.3 m • kg, 38 ft • lb)**
**Nut ⑦**
**(knuckle arm - lower ball joint):**
**78 Nm (7.8 m • kg, 56 ft • lb)**

**CAUTION:**

**Always use a new cotter pin.**







5.Check:
- Front swingarm free play.

**********

**Checking steps:**
- Remove the steering tube ① from the knuckle arm.
- Remove the front shock absorber ②.

**CAUTION:**

**When removing the shock absorber ② and during the swingarm free play check, securely support the swingarm to prevent it from dropping down. The ball joints of the knuckle arm would be damaged, if the lower swingarm was allowed to lower completely.**

- Rock the swingarm ③ up and down and left to right. If there is any free play or binding, check the upper and lower arm bearings.
  Refer to "FRONT SWINGARM – CHAPTER IV" in Service Manual – New Features.
- Install the shock absorber and steering tube.

**Nut (shock absorber):**
**Upper:**
**105 Nm (10.5 m • kg, 75 ft • lb)**
**Lower:**
**40 Nm (4.0 m • kg, 29 ft • lb)**
**Nut (steering tube):**
**23 Nm (2.3 m • kg, 17 ft • lb)**

**********

6.Install:
- Front wheel
  Refer to "FRONT WHEEL" in CHAPTER 6.
- Seat
- Top cover
- Side cowlings
  Refer to "COWLINGS".

### FRONT WHEEL ALIGNMENT

1.Place the motorcycle on the centerstand.

**CAUTION:**

**Be sure to place the motorcycle on an even surface.**

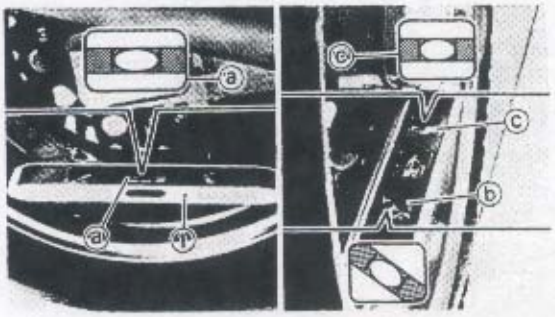
2.Check:

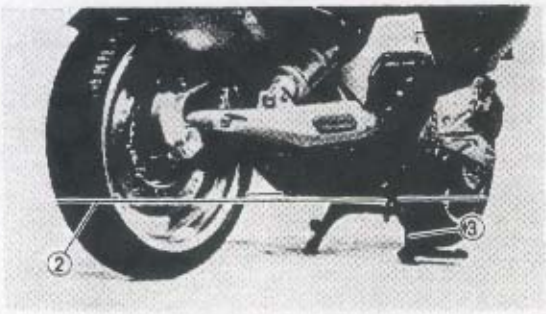
- Font wheel alignment
  Out of alignment → Adjust.

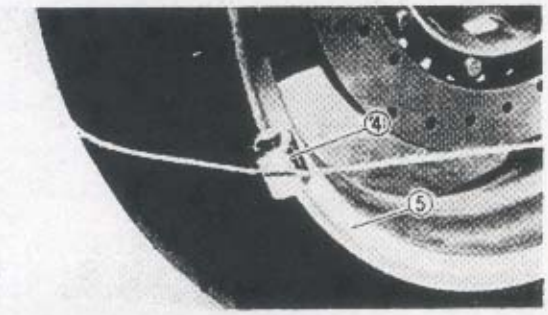
**********

**Checking and adjustment steps:**

- Check the chain slack.
  Refer to "CHAIN SLACK ADJUSTMENT".
- Clean the surface of the front and rear brake discs.
- Attach the spirit level ① to the rear brake disc and adjust the position of the level to make the middle gauge ⓐ level.
- Make the other two gauges ⓑ and ⓒ level by placing suitable shims under the centerstand.
- Attach a string ② around the rear and the front wheel at about 180 mm (7.1 in) from the ground as shown. Pass the string through the centerstand ③ on the left side.
- Place two identical spacers ④ (collar, tube, or similar) between the rim ⑤ and the string on the front side of the front wheel.



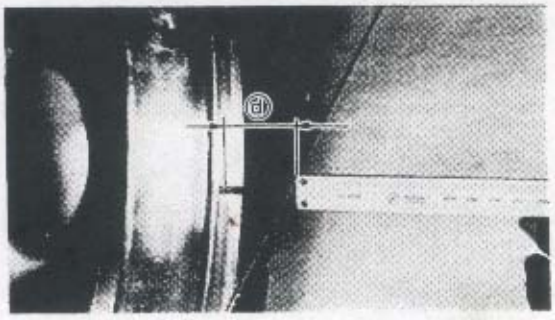



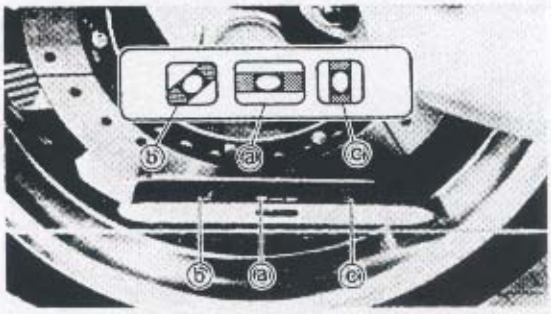



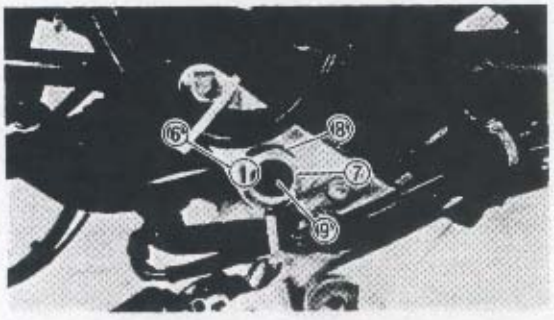

**NOTE:**

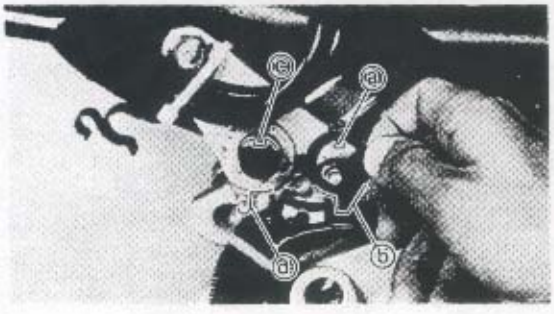
Make sure the string touches only the wheels, not the frame, centerstand or exhaust pipe.

- Measure with vernier calipers the distance ⓓ between the string and the rim edge on the rear side of the front wheel.
- Turn the handlebar until the distance to the rim is identical on both sides (i.e. the front wheel is pointing exactly straight ahead).






- Attach the spirit level to the front brake disc and make the middle gauge ⓐ level.
- If the other two gauges ⓑ, ⓒ have not become level too, the front wheel is out of alignment and the wheel camber needs adjustment.
- Remove the seat, top cover, inner panels and left side cowling.
  Refer to "COWLINGS".
- Straighten the lock washer tab ⑥ and remove the locknut ⑦ and lock washer ⑧. Turn the adjuster ⑨ in or out until the wheel camber is correct and the spirit level gauges are all level.

**Adjuster position:**
**Standard: 2 turn in**
**Adjusting range: 0 ~ 4 turn in**

**CAUTION:**

**Never turn the adjuster beyond the adjusting range.**

**********

**Standard position setting steps:**

a. Turn out (counterclockwise) the adjuster ⑨ until the upper arm touches the frame on the left.
b. Turn the adjuster clockwise until the lock washer projections ⓐ and ⓑ match the groove ⓒ and the projection ⓓ as shown.
c. Turn the adjuster two complete turns in (clockwise) to bring the upper arm into standard position.

**********

- Install the lock washer and locknut.

**⚠ WARNING**

**Always use a new lock washer.**

**NOTE:**

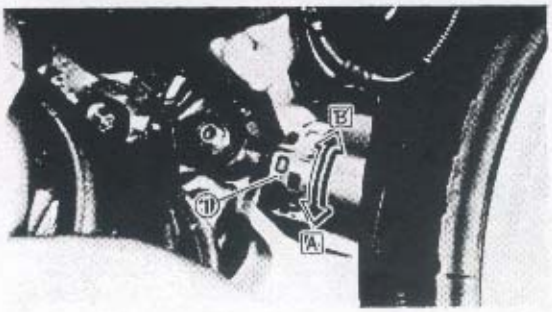
The lock washer projections ⓐ and ⓑ must match the groove ⓒ and the projection ⓓ as shown.

- Tighten the locknut ⑦ to specification while holding the adjuster ⑨.

**Locknut (camber adjuster):**
**23 Nm (2.3 m • kg, 17 ft • lb)**

- Check the alignment again. If all the spirit level gauges are not level, repeat the adjustment steps.
- Bend the lockwasher tab against the flat side of the nut.
- Install the left side cowling, inner panels, top cover and seat.
  Refer to "COWLINGS".

**********




## FRONT SHOCK ABSORBER ADJUSTMENT

**⚠ WARNING**

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

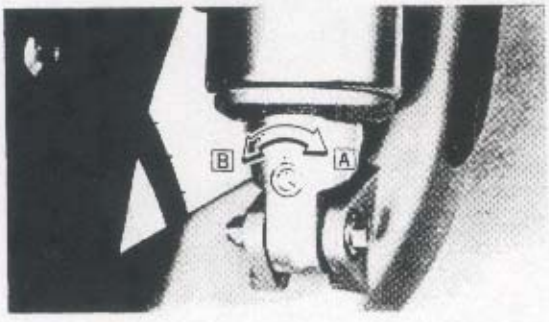
1. Place the motorcycle on the centerstand.
2. Adjust:
   - Spring preload
     Turn the adjuster ① in or out.

| | |
|---|---|
| **Turning in A** | **Preload increases.** |
| **Turning out B** | **Preload decreases.** |

**Adjuster position:**
**Standard = 3**
**Minimum = 1**
**Maximum = 9**

**CAUTION:**

**Never turn the adjuster beyond the maximum or minimum setting.**




3. Adjust:
   - Rebound damping force
     Click the adjuster ① in or out.

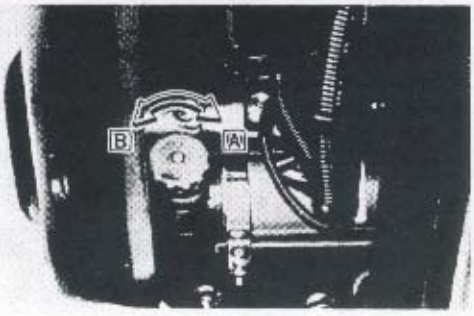
| | |
|---|---|
| **Click in A** | **Damping force increases.** |
| **Click out B** | **Damping force decreases.** |

**Adjuster position:**
**Standard = 10 clicks out***
**Minimum = 12 clicks out***
**Maximum = 3 clicks out***

*: from the fully turned in position

**CAUTION:**

**Never turn the adjuster beyond the maximum or minimum setting.**




4.Adjust:
• Compression damping force
. Click the adjuster ① in or out.

| | |
|---|---|
| Click in A | Damping force increases. |
| Click out B | Damping force decreases. |

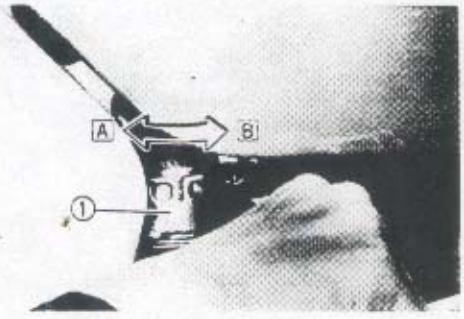
**Adjuster position:**
**Standard = 10 clicks out***
**Minimum = 12 clicks out***
**Maximum = 3 clicks out***

*: from the fully turned in position

**CAUTION:**

**Never turn the adjuster beyond the maximum or minimum setting.**






REAR SHOCK ABSORBER ADJUSTMENT

**⚠ WARNING**

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

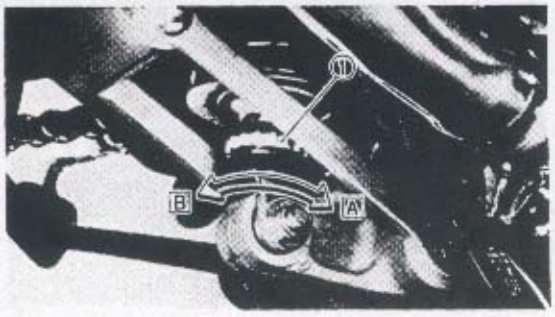
1.Place the motorcycle on the centerstand.
2.Adjust:
• Spring preload
Turn the adjuster ① in or out.

| | |
|---|---|
| Turning in A | Preload increases. |
| Turning out B | Preload decreases. |

**Adjuster position:**
**Standard = 3**
**Minimum = 1**
**Maximum = 9**

**CAUTION:**

**Never turn the adjuster beyond the maximum or minimum setting.**




3.Adjust:
- Rebound damping force

, Click the adjuster ① in or out.

| | |
|---|---|
| Click in A | Damping force increases. |
| Click out B | Damping force decreases. |

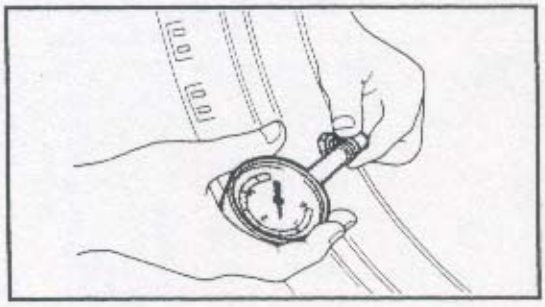
**Adjuster position:**
**Standard = 7 clicks out***
**Minimum = 12 clicks out***
**Maximum = 3 clicks out***

*: from the fully turned in position

**CAUTION:**

**Never turn the adjuster beyond the maximum or minimum setting.**





**TIRE INSPECTION**

1.Measure:
- Tire pressure

Out of specification → Adjust.

**⚠ WARNING**

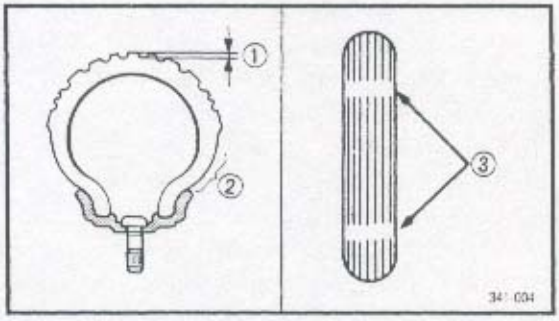
- **Tire inflation pressure should be checked and adjusted when the temperature of the tire equals the ambient air temperature. Tire inflation pressure must be adjusted according to total weight of cargo, rider, passenger, and accessories (fairing, saddlebags, etc. if approved for this model), and vehicle 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.**

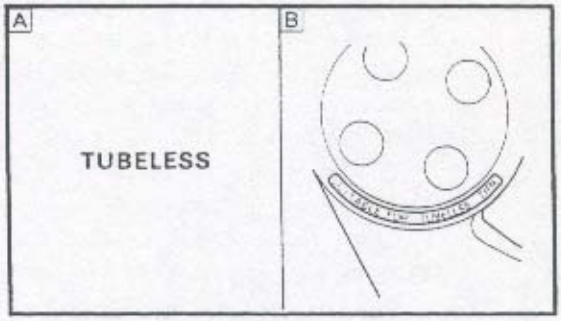
**NEVER OVERLOAD YOUR MOTORCYCLE. Make sure the total weight of the cargo, rider, passenger, and accessories (fairing, saddlebags, etc. if approved for this model) does not exceed the maximum load of the motorcycle.**

**Operation of an overloaded motorcycle could cause tire damage, an accident, or even injury.**

| | | |
|---|---|---|
| **Basic weight: With oil and full fuel tank** | Except for California 279 kg (615 lbs) | For California 280 kg (617 lbs) |
| **Maximum load*:** | Except for California 221 kg (487 lbs) | For California 220 kg (485lbs) |
| **Cold tire pressure:** | **Front** | **Rear** |
| **Up to 90 kg (198 lbs) load*** | **250 kPa (2.5 kgf/cm², 36 psi)** | **250 kPa (2.5 kgf/cm², 36 psi)** |
| **90 Kg (198 lbs) ~ Maximum load*** | **250 kPa (2.5 kgf/cm², 36 psi)** | **290 kPa (2.9 kgf/cm², 42 psi)** |
| **High speed riding** | **250 kPa (2.5 kgf/cm², 36 psi)** | **290 kPa (2.9 kgf/cm², 42 psi)** |

*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 (0.04 in)**

①Tread depth
②Side wall
③Wear 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:

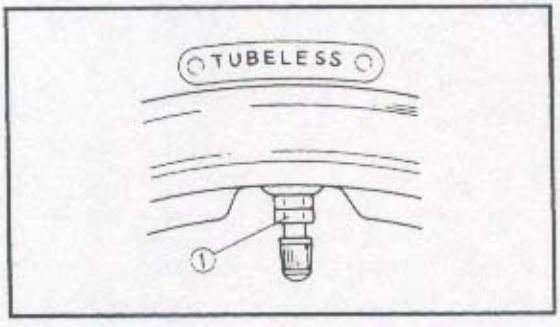
| Manufacture | Size | Type |
|---|---|---|
| DUNLOP | 130/60 ZR17 | D202F |

REAR:

| Manufacture | Size | Type |
|---|---|---|
| DUNLOP | 170/60 ZR17 | D202 |

**⚠ 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.
- After a tire repair or replacement, be sure to tighten the valve stem locknut ① to specification.



Valve stem locknut
(front wheel only):
Lower:
1 Nm (0.1 m • kg, 0.7 ft • lb)
Upper:
2 Nm (0.2 m • kg, 1.4 ft • lb)

### 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.**

3

### 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 10W30 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 10W30 motor oil**

### SIDESTAND AND CENTERSTAND LUBRICATION

Lubricate the sidestand and centerstand at pivoting points.

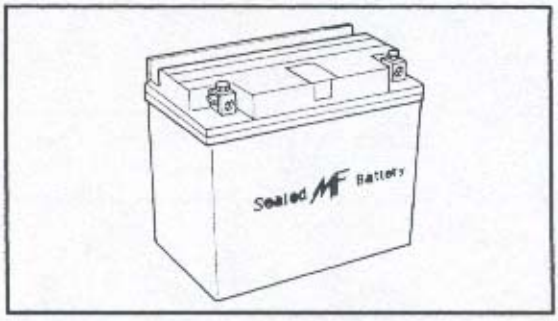
**Recommended lubricant:**
**SAE 10W30 motor oil**



### FRONT AND REAR SUSPENSION LUBRICATION

Lubricate the front shock absorber and 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 (68°F), 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.**

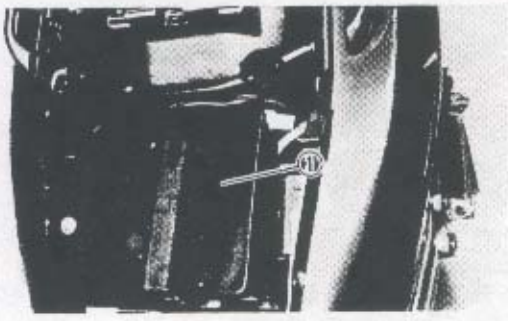
**Antidote (INTERNAL):**

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

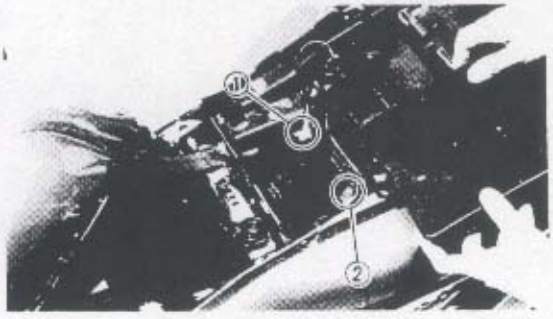
**Batteries generate explosive hydrogen gas. Always follow the following preventive measures:**

- **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:
- Seat
  Refer to "COWLINGS".
- ECU ①

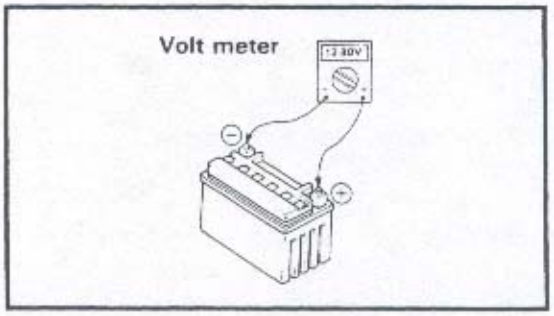


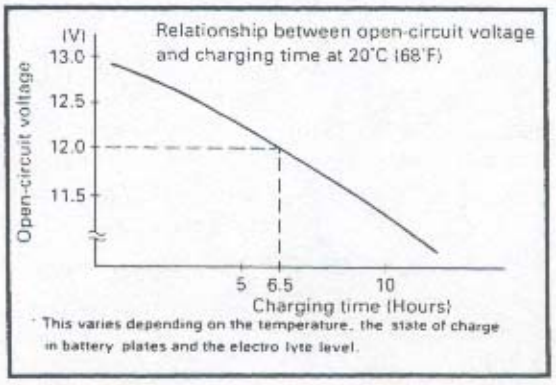
2. Disconnect:
- Battery leads

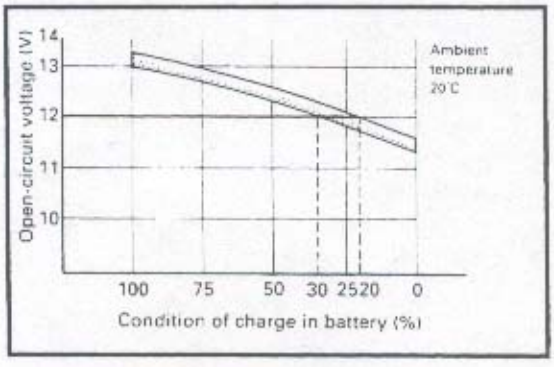
**CAUTION:**

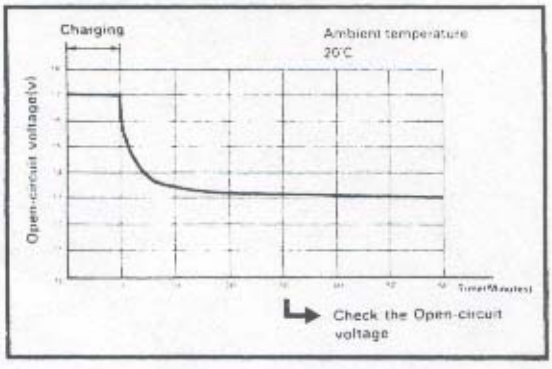
**Disconnect the negative lead ① first, then the positive lead ②.**

3. Remove:
- Battery




4.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 |
|---|---|
| 12.8 v 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%

5.Charging method of MF batteries

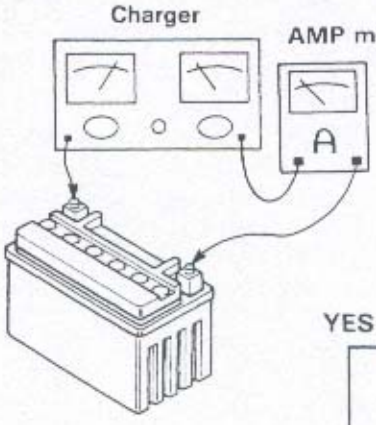
**CAUTION:**

- **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

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

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

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

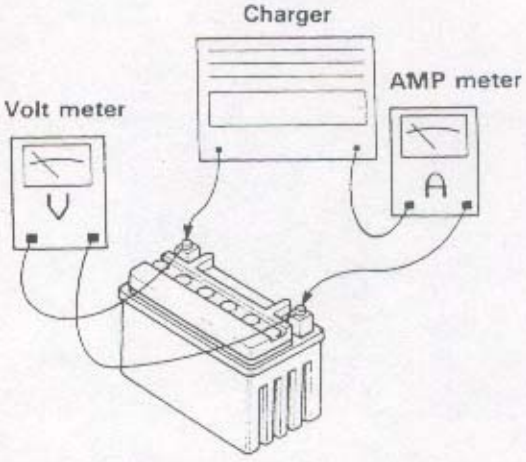
Charge the battery until the battery's charging voltage is 15 volts.

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

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.

NO

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




**Charging method using a constant current type charger**
This type of battery charger cannot charge the MF battery.

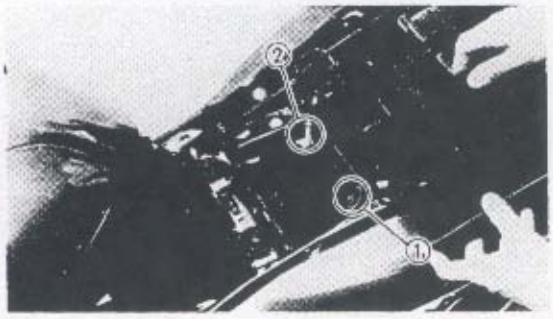
6.Inspect:
- Battery terminal
  Dirty → Clean with a wire brush.
  Poor connection → Correct.

**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.**



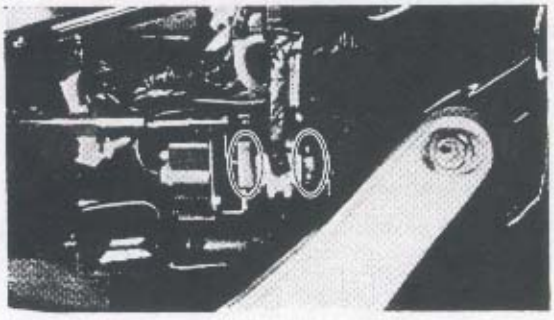
9.Install:
- ECU
- Seat
  Refer to "COWLINGS".

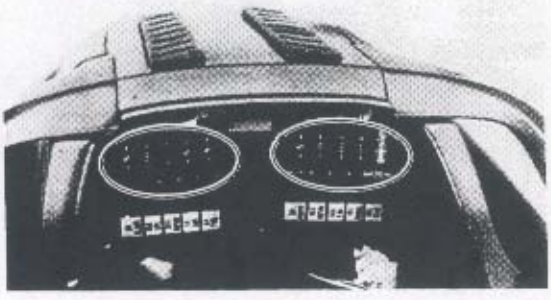
**FUSE INSPECTION**

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

1.Remove:
- Seat
- Side cover (left)
  Refer to "COWLINGS".

2.Inspect:
- Fuses





**********

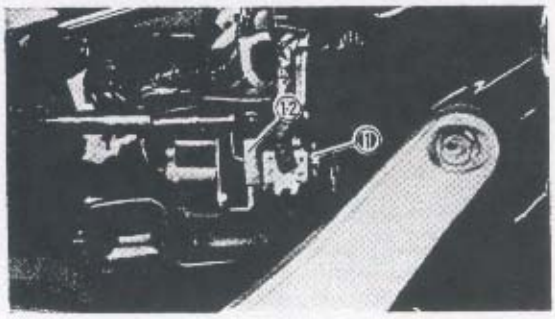
**Inspection steps:**
- Connect the pocket tester to the fuse and check it for continuity.

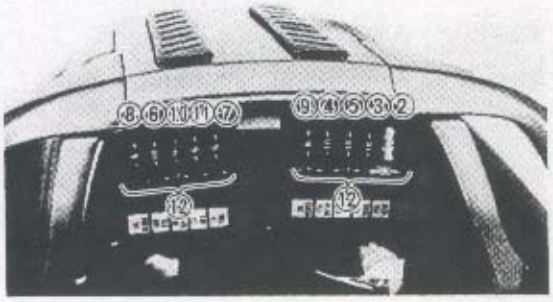
**NOTE:**
Set the tester selector to "Ω x 1".

| | |
|---|---|
| | **Pocket tester:** YU-03112/90890-03112 |

- 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 immediatly blows again, check the electrical circuit.

**********

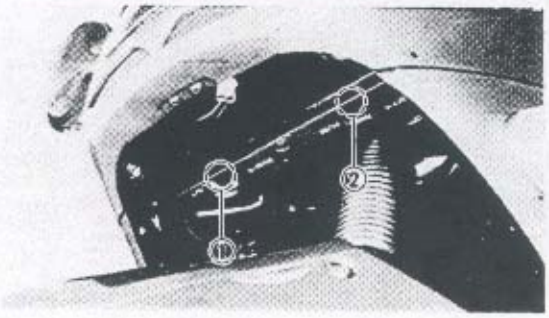
| Description | Amperage | Quantity |
|---|---|---|
| ① Main | 30A | 1 |
| ② Head | 20A | 1 |
| ③ Signal | 10A | 1 |
| ④ Ignition | 10A | 1 |
| ⑤ Fan | 10A | 1 |
| ⑥ EFI | 10A | 1 |
| ⑦ Tail | 5A | 1 |
| ⑧ Clock | 5A | 1 |
| ⑨ Indicator | 5A | 1 |
| ⑩ ABS pump | 30A | 1 |
| ⑪ ABS | 5A | 1 |
| ⑫ Reserve | – | |

**⚠ 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 (left)
- Seat

Refer to "COWLINGS".



## HEADLIGHT BEAM ADJUSTMENT

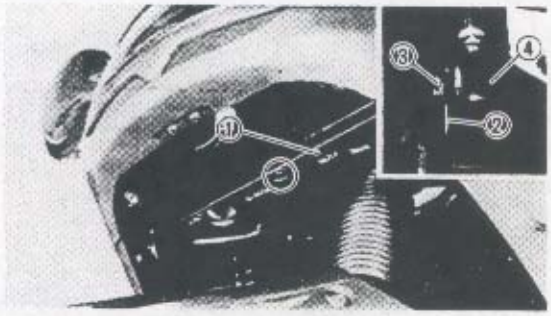
1. Adjust:
- Headlight beam (vertically)
  Turn the adjuster ① in or out.

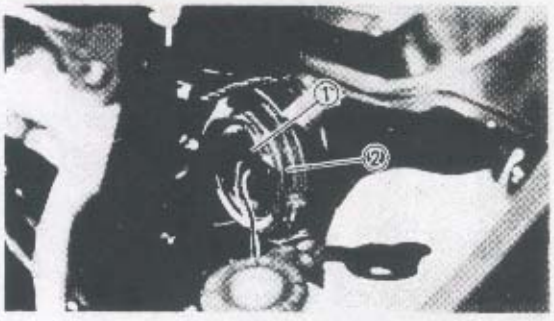
| |
|---|
| **Turning in → Headlight beam lower** |
| **Turning out → Headlight beam higher** |

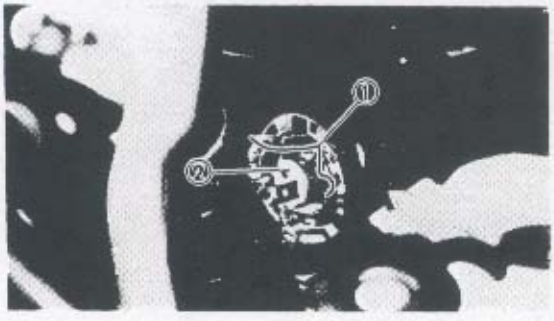
2. Adjust:
- Headlight beam (horizontally)
  Turn the adjuster ② in or out.

| |
|---|
| **Turning in → Headlight beam to the left** |
| **Turning out → Headlight beam to the right** |









## HEADLIGHT BULB REPLACEMENT

**Removal**

1. Remove:
- Seat
- Top cover
- Inner panels
  Refer to "COWLINGS".
- Bottom cover ①

**NOTE:**
Unhook the snaps ② on the cover from the grommets ③ on the ignition coil ④.

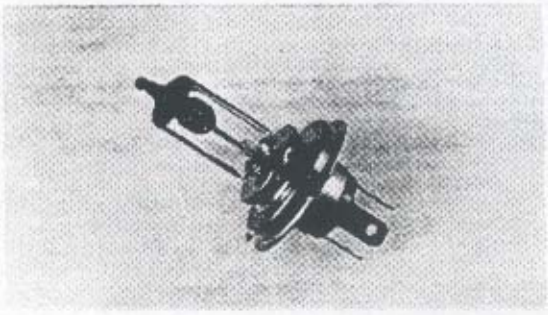
2. Disconnect:
- Headlight coupler ①
- Headlight bulb covers ②

3. Unhook:
- Bulb holding spring ①

4. Remove:
- Bulb ② (defective)

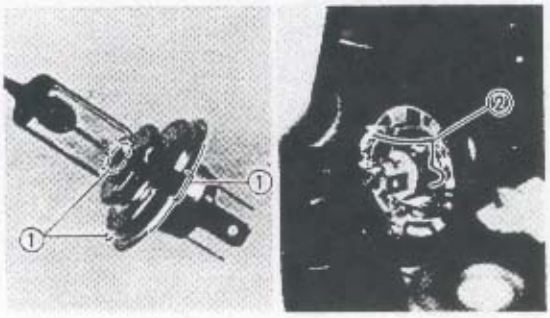
**⚠ WARNING**

**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.**



**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.**




**Installation**

1.Install:
- Bulb (new)

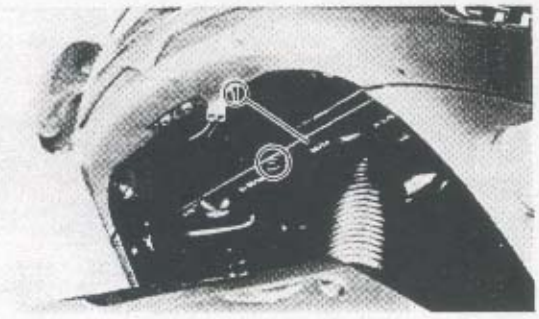
**NOTE:**
Make sure that the projection ① on the bulb are meshed with the slot in the bulb case.

2.Hook:
- Bulb holding spring ②

3.Install:
- Headlight bulb cover ①

**NOTE:**
Install the bulb covers so that the "TOP" mark faces upward.

4.Connect:
- Headlight coupler



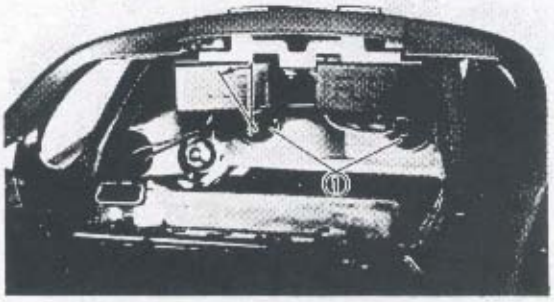

5.Install:
- Bottom cover ①

6.Install:
- Inner panels
- Top cover
- Seat

Refer to "COWLINGS".

**TAIL/BRAKE LIGHT BULB REPLACEMENT**

1.Remove:
- Seat



2.Remove:
- Bulb socket(s) ①

**NOTE:**
Turn the socket approximately 30° counterclockwise to remove it.

3.Remove:
- Bulb(s) (defective)

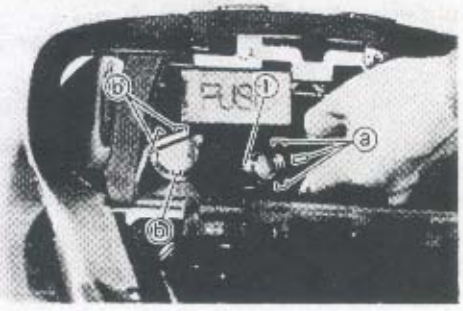
**NOTE:**
Turn the bulb ① counterclockwise while pushing.

**⚠ 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.**

4.Install:
- Bulb(s) (new)

**NOTE:**
Turn the bulb ① clockwise while pushing.



5.Install:
- Bulb socket(s) ①

**NOTE:**
Make sure that the projections ⓐ on the socket are meshed with slots ⓑ on the tail light case.

6.Install:
- Seat
  Refer to "COWLINGS".

# ENGINE OVERHAUL

## ENGINE REMOVAL

**⚠ WARNING**

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

1.Place the motorcycle on the centerstand.

**NOTE:**

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

- Camshaft case
- Cylinder head
- Cylinder
- Piston
- Clutch
- Water pump
- Oil cooler
- Starter motor
- AC generator
- Oil pan



**COWLINGS AND FUEL TANK**

1.Remove:

- Seat
- Top cover
- Inner panels
- Side cowlings
- Lower cowlings
- Side covers

  Refer to "COWLINGS" in CHAPTER 3.
- Fuel tank

  Refer to "FUEL TANK" in CHAPTER 3.

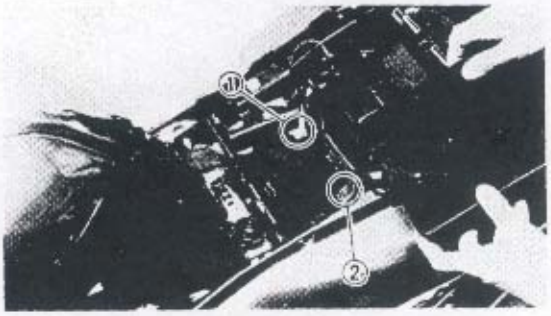
**ENGINE OIL AND COOLANT**

1.Drain:

- Engine oil

  Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.
- Coolant

  Refer to "COOLANT REPLACEMENT" in CHAPTER 3.



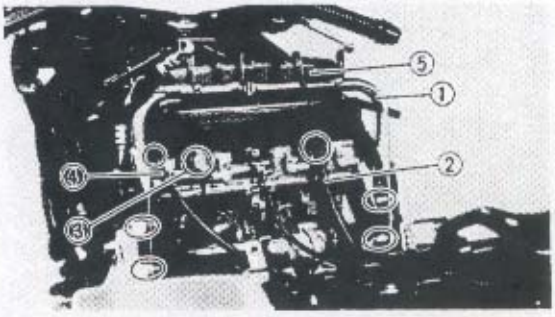
**BATTERY LEADS**

1.Disconnect:

- Battery leads

**CAUTION:**

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



**AIR FILTER CASE**

1.Remove:

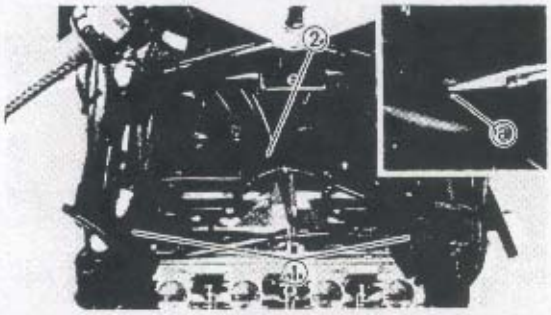
- Fuel tank stay ①

2.Disconnect:

- Crankcase ventilation hose ②
- Coupler ③ (intake air temperature sensor)
- Drain hose ④ (air filter case)

3.Remove:

- Rubber plate
- Air filter case ⑤



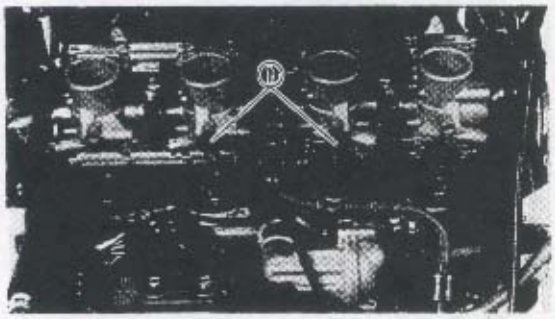
**RUBBER BAFFLE**

1.Remove:

- Rubber baffle ① (left and right)
- Rubber baffle ② (lower)

**NOTE:**

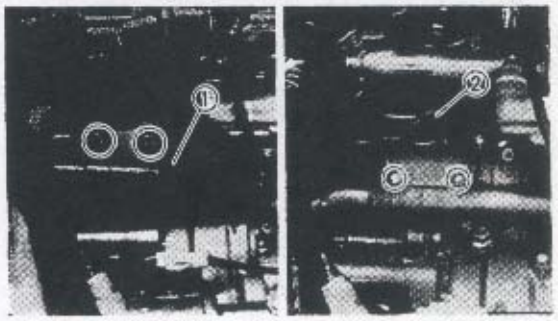
Carefully pull out the retainers ⓐ with long nose pliers.



**CANISTER (for California only)**

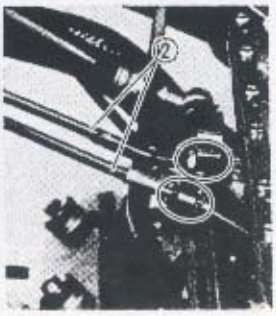
1.Disconnect:

- Hose ① (canister - carbureter)



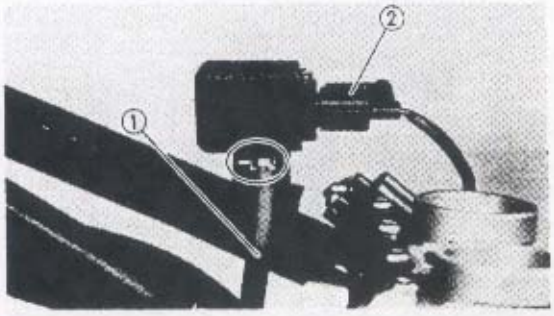
2.Remove:

- Canister ①
- Bracket ② (canister)

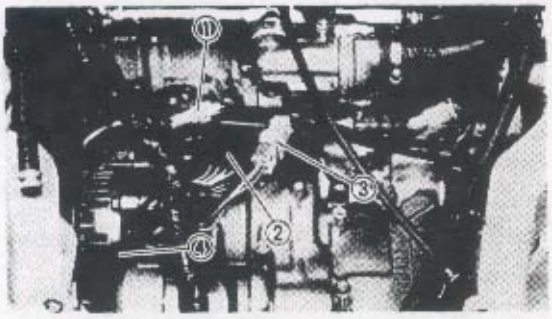


### CABLES, HOSES AND OIL FILTER

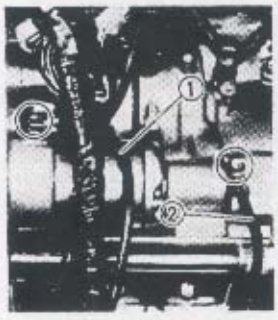
1.Disconnect:
- Spark plug caps
- Idle speed adjuster cable ①
- Throttle cables ②



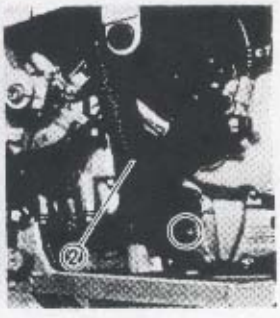
2.Disconnect:
- Pulsor hose ① (pressure sensor)
- Coupler ② (pressure sensor)



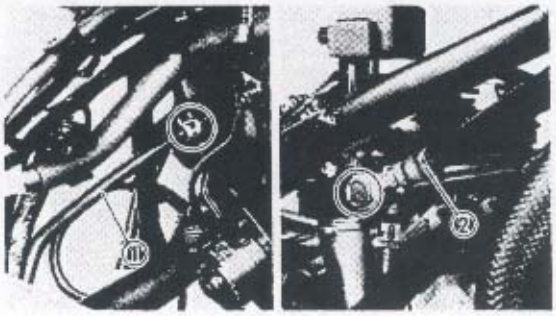
3.Disconnect:
- Coupler ① ($O_2$ sensor)
- Coupler ② (main harness)
- Coupler ③ (AC generator)
- Coupler ④ (side stand switch)



4.Disconnect:
- Starter motor lead ①
- Ground (earth) lead ②
- Coupler ③ (front wheel sensor)



5.Disconnect:
- Radiator hose ①
  (from thermostatic valve housing)
- Radiator hose ②
  (from water pump housing)



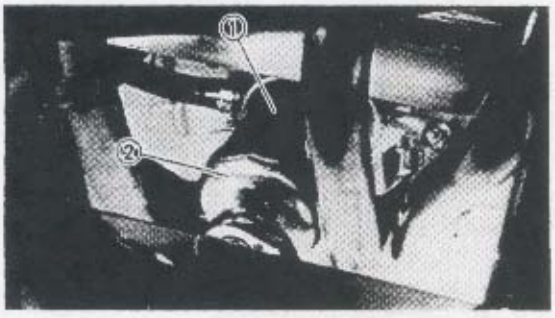
6.Disconnect:
- Hose ① (fast idle unit - radiator)
- Fuel delivery hose ② (from fuel distributor)

**⚠ WARNING**

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

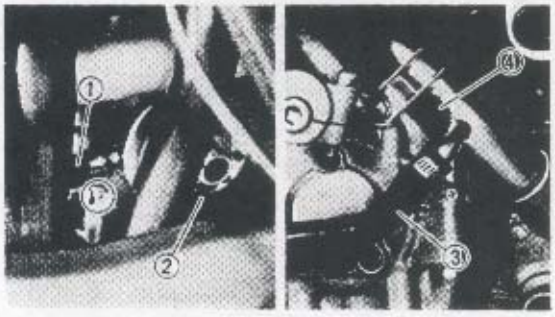
**NOTE:**
Place a rag under the fuel delivery hose ② to avoid spilling fuel.

4

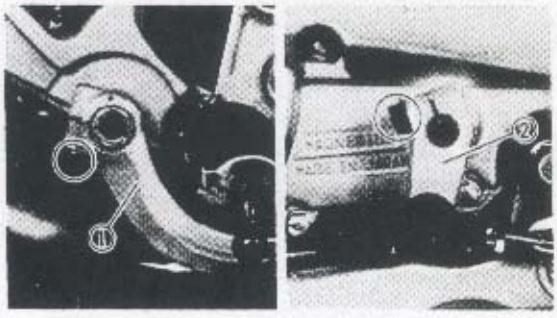


7.Remove:
- Oil filter ①
  Use oil filter wrench ②.

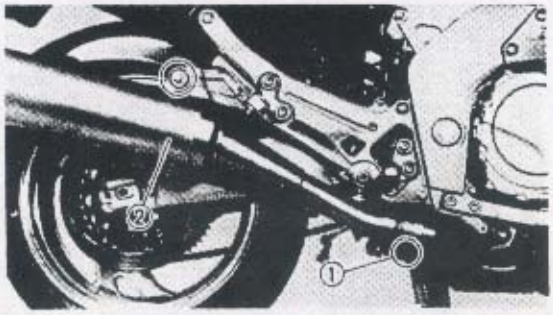
| | |
|---|---|
| | **Oil filter wrench:**<br>**YU-38411/90890-01426** |



8.Disconnect:
- Outlet hose ① (oil cooler)
  (from oil cooler ②)
- Inlet hose ③ (oil cooler)
  (from water pump outlet pipe ④)



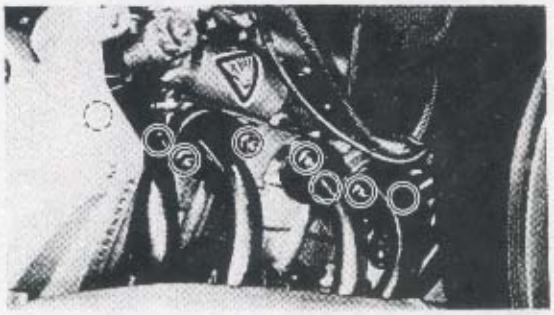
9.Remove:
- Brake pedal ①
- Shift pedal link ②



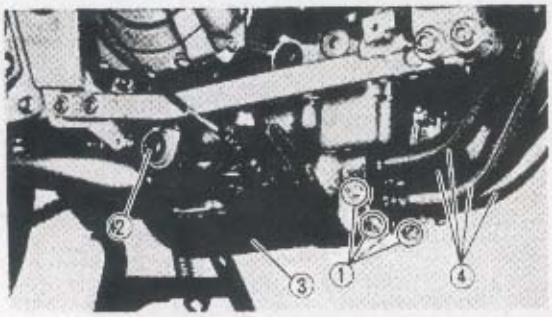
**MUFFLER ASSEMBLY**

1.Loosen:
- Clamp ①
  (muffler - exhaust chamber joint)

2.Remove:
- Muffler ②



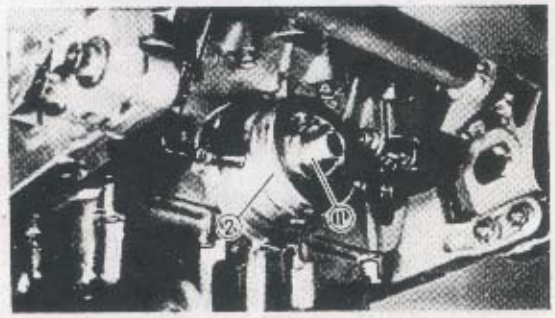
3.Remove:
- Nuts (exhaust pipe)



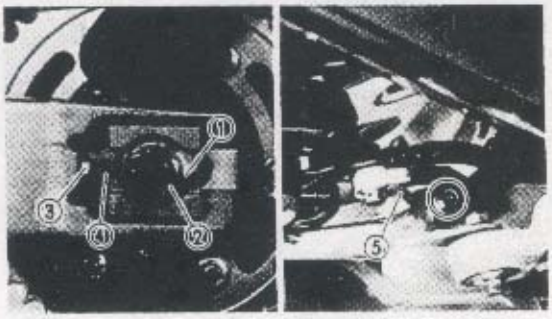
4.Loosen:
- Clamp ①
  (exhaust pipe - exhaust chamber)
- Mounting bolt ②
  (exhaust chamber - left and right)

5.Remove:
- Exhaust chamber ③
- Exhaust pipes ④
- Gaskets (exhaust pipe)

**NOTE:**
Put marks on the exhaust pipes so that they can be reinstalled in their original place.



6.Remove:
- Bolt ①
  (including bypass valve)
- Oil cooler ②
  (with O-ring)

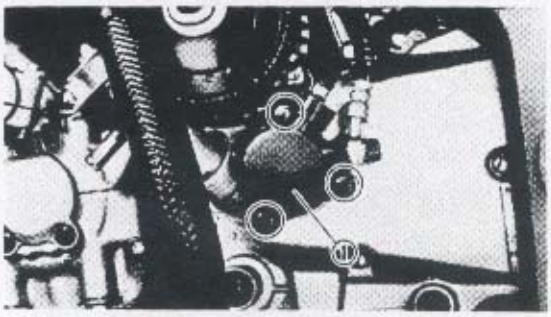


**DRIVE SPROCKET**

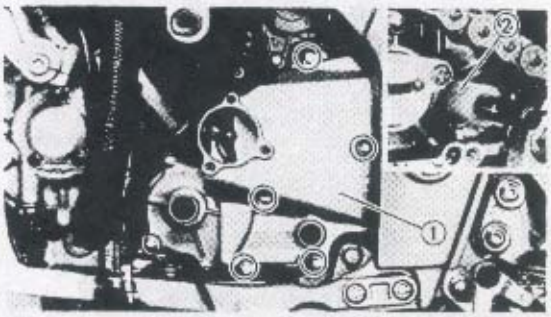
1.Remove:
- Cotter pin ① (rear axle nut ②)

2.Loosen:
- Rear axle nut ②
- Locknut ③/Adjuster ④ (chain tensionner)
- Bolt (brake caliper bracket ⑤)

3.Push the rear wheel forward to give maximum slack to the chain.

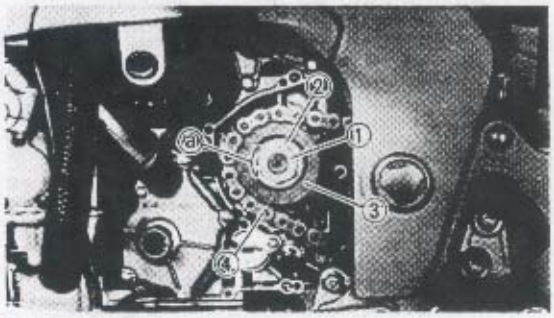


4.Remove:
- Clutch release cylinder ①
- Dowel pins



5.Remove:
- Crankcase cover ① (left)
- Dowel pins
- Gasket
- Spacer collar ② (shift shaft)

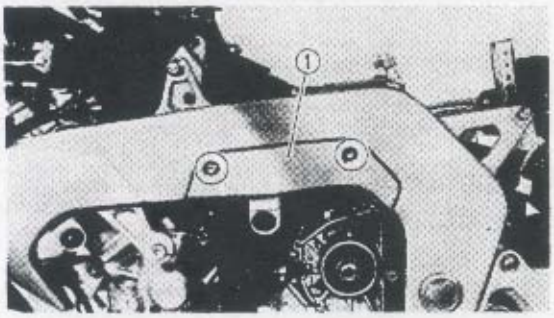
4



6.Straighten:
- Lockwasher tab ⓐ

7.Remove:
- Nut ① (drive sprocket)
- Lock washer ②
- Drive sprocket ③ (with drive chain ④)

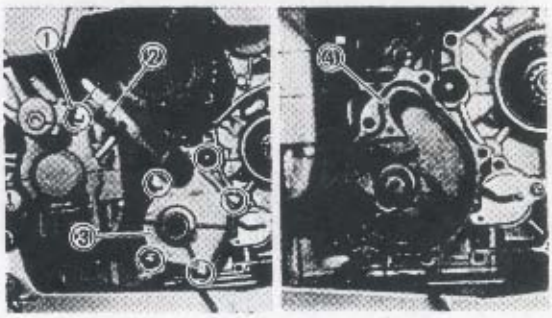
**NOTE:**
Loosen the nut (drive sprocket) while applying the rear brake.



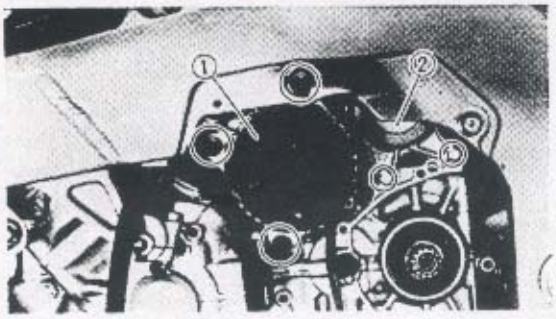
**ENGINE REMOVAL**

**CAUTION:**
**Cover the frame with rags to prevent scratches during engine removal.**

1.Remove:
- Cover ① (main frame)

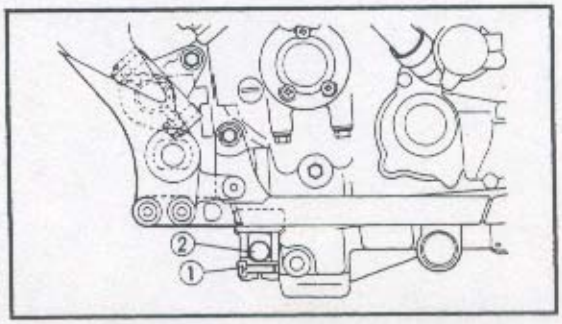


2.Remove:
- Bolt ① (outlet pipe ②)
- Water pump cover ③ (with outlet pipe and O-rings)
- Water pump housing ④



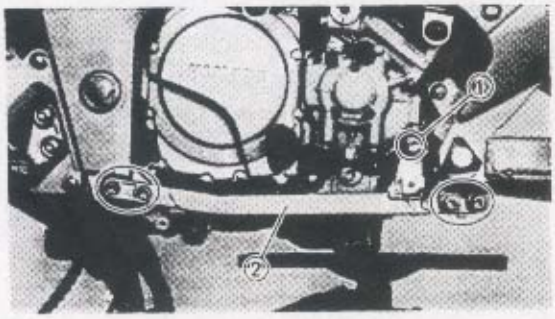

3.Remove:
- AC generator ①
- Starter motor ②

4.Place a jack under the engine.

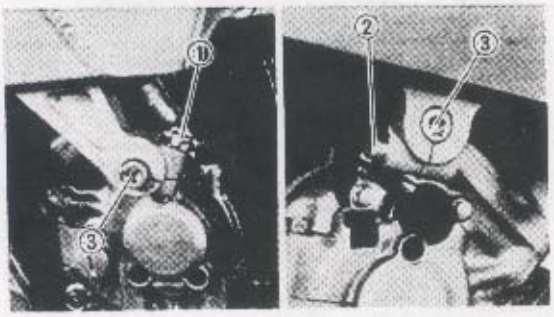



5.Loosen:
- Pinch bolt ① (cross tube)

6.Remove:
- Cross tube ②

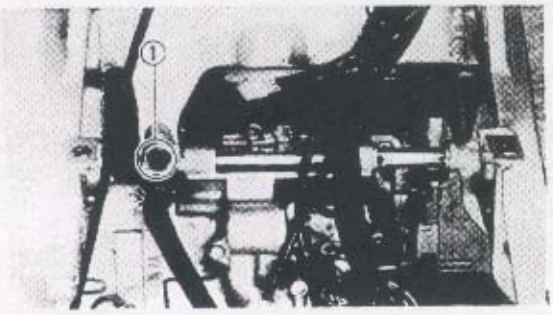



7.Remove:
- Mounting bolts ① (front lower)
- Reinforcement tube ② (right)

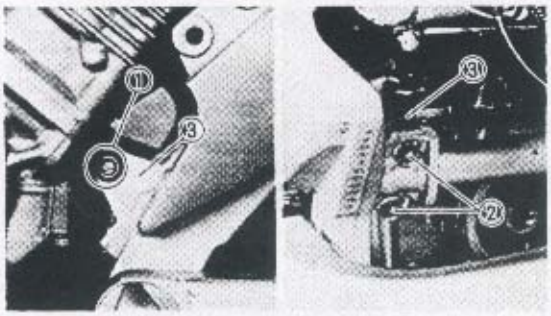



8.Loosen:
- Pinch bolt ① (center left)
- Pinch bolt ② (center right)

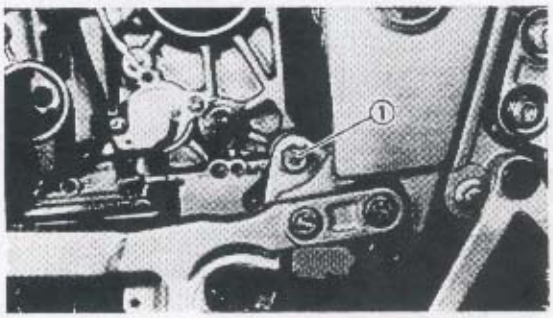
9.Remove:
- Mounting bolts ③ (center)




10.Loosen:
- Pinch bolt ① (rear upper)

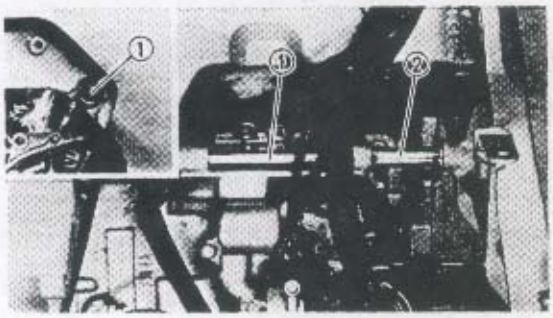


11.Remove:
- Mounting bolts ① (front upper)
- Bolts ② (mounting bracket ③)

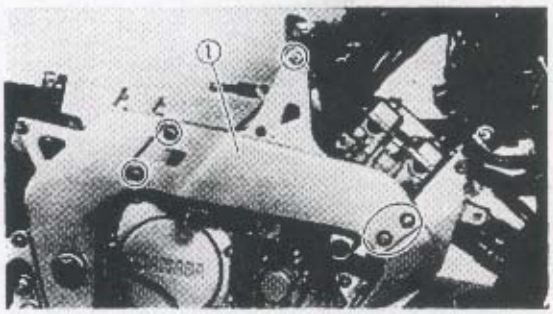


12.Remove:
- Mounting bolt ① (rear lower)

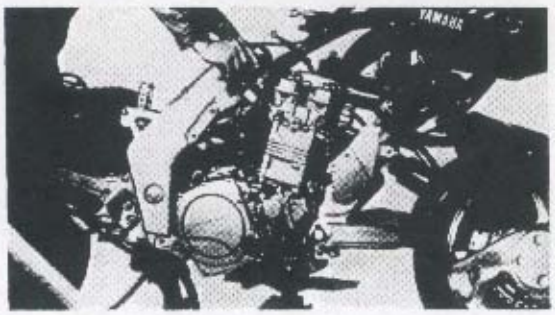
4



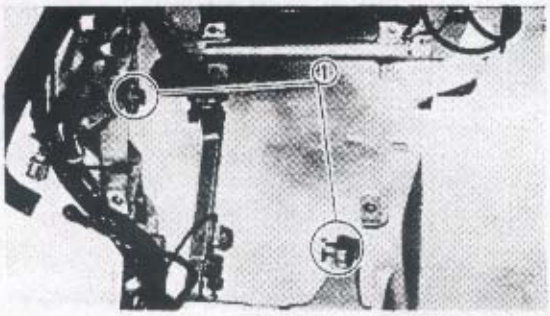
13.Remove:
- Mounting bolt ① (rear upper)
- Spacer collar ②



14.Remove:
- Main frame center beam ① (right)

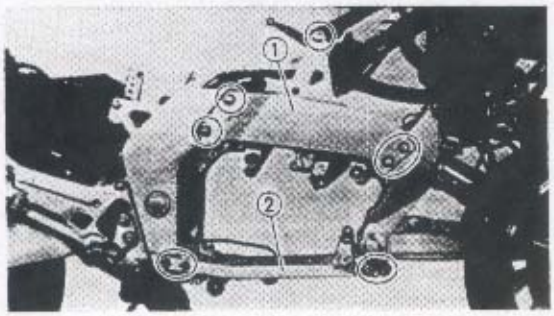


15.Remove:
- Engine assembly
  (from the right side of the motorcycle)




16.Remove:
- Collars ①

, (from mounting boss)




**CAUTION:**

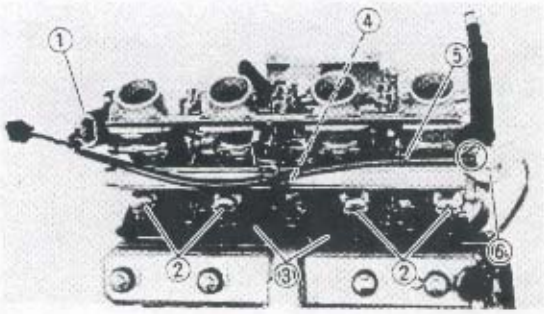
**After removing the engine, reinstall temporarily the upper beam ① (right side of the frame) and the reinforcement tube ② to prevent an accidental distortion of the frame or other damage.**

4

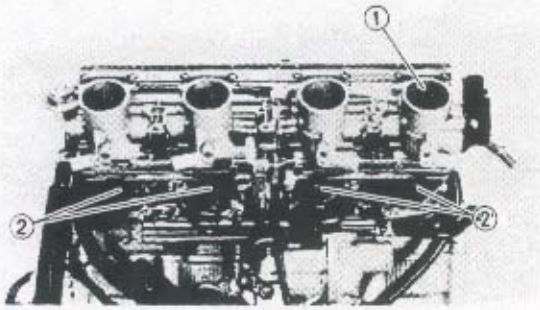
## ENGINE DISASSEMBLY

### INJECTOR ASSEMBLY

**NOTE:**
With the engine mounted, the injector assembly can be maintained when the following parts are removed:
- Side cowlings
- Air filter case

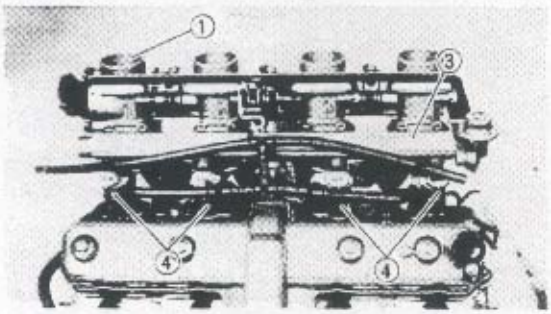


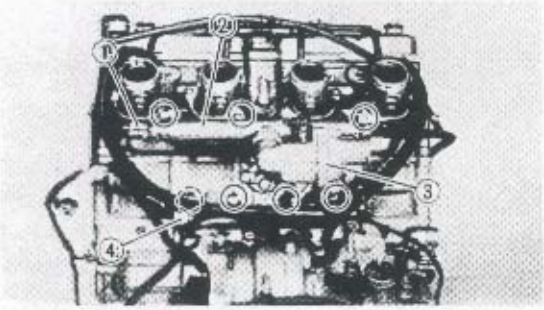

1. Disconnect:
- Coupler ① (throttle sensor)
- Couplers ② (injector)
- Hoses ③ (from fast idle unit ④)
- Pulsor hose ⑤ (from pressure regulator ⑥)




2. Remove:
- Throttle body assembly ①
- Air intake joints ②
- Fuel distributor ③ (with dowel pins)
- Fuel injectors ④ (with seals)

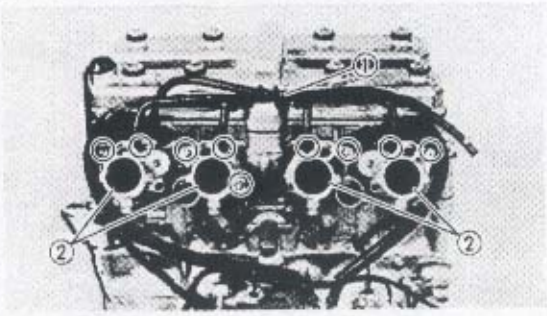
**NOTE:**
Identify each injector position carefully so that it can be reinstalled in the original place.



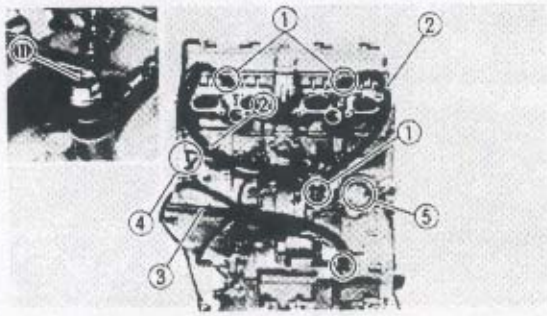

3. Disconnect:
- Coupler ① (water temperature sensor)

4. Remove:
- Coolant collector ② (outlet) (with thermostatic valve housing ③ and O-rings)
- Coolant collector ④ (inlet) (with O-rings)



5.Disconnect:
- Pulsor hoses ① (from intake ducts)

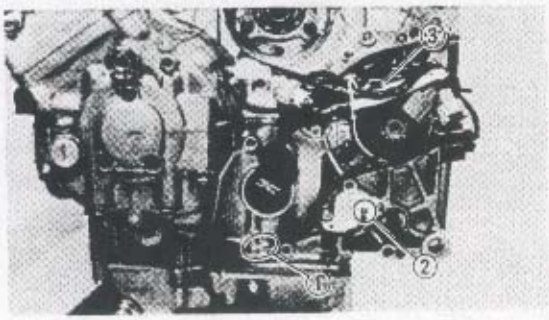
6.Remove:
- Intake ducts ②
- Dowel pins
- Gaskets (intake duct)



**HOSE AND LEADS**

1.Remove:
- Union bolts ①
  (with gaskets)
- Oil delivery hoses ②

2.Disconnect:
- Crankcase ventilation hose ③
- Coupler ④ (camshaft sensor)
- Coupler ⑤ (crankshaft sensor)

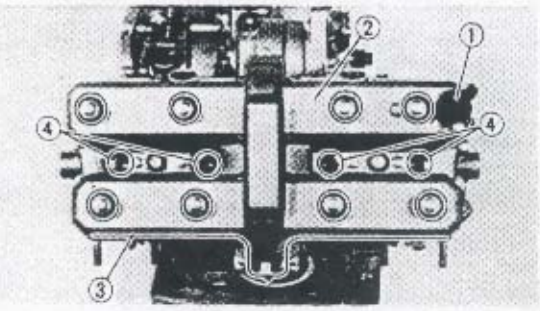


3.Disconnect:
- Oil level switch lead ①
- Neutral switch lead ②

4.Remove:
- Engine wire harness ③

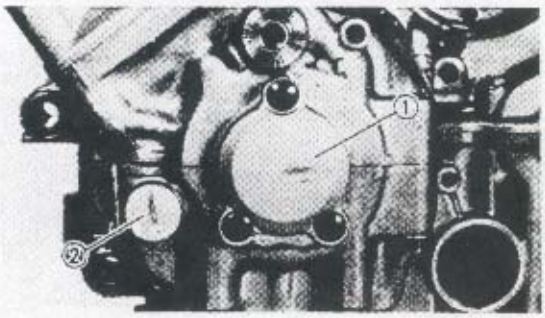
**CYLINDER HEAD COVER, CAMSHAFT, CAMSHAFT CASE AND CYLINDER HEAD**

**NOTE:**
With the engine mounted, the cylinder head cover, camshafts, camshaft case and cylinder head can be maintained by removing the following parts.
- Side cowlings
- Air filter case
- Fuel injector assembly



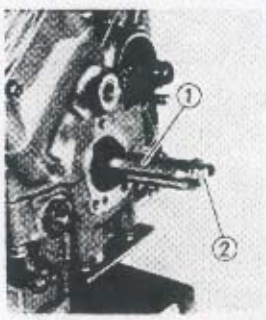

1.Remove:
- Camshaft sensor ①
- Cylinder head cover ②
- Gasket ③ (cylinder head cover)
- Spark plugs ④

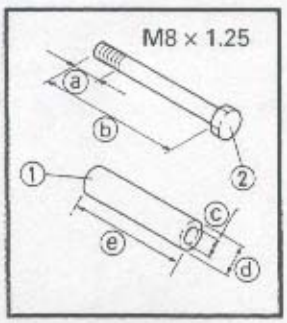
**NOTE:**
Loosen the bolts in a crisscross pattern 1/4 turn each. Remove them after all are loosened.




2.Remove:
- Crankshaft end cover ① (left) (with O-ring)
- Timing plug ② (with O-ring)

4

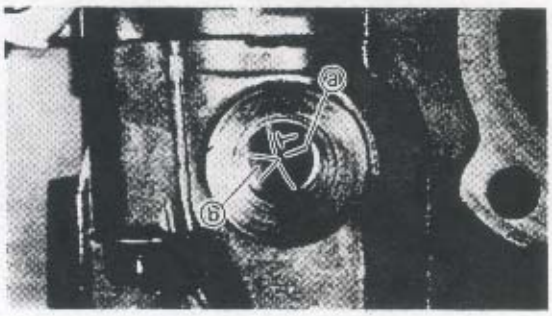



3.Install:
- Suitable collar ①
- Bolt ②

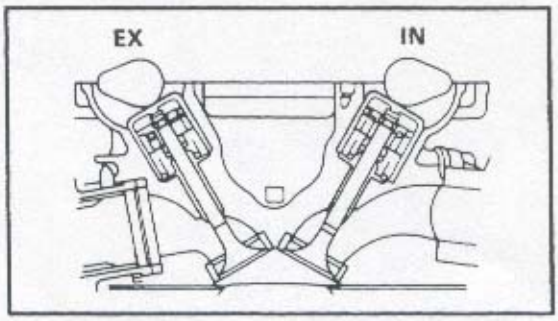
as shown in the illustration.

ⓐ 15 mm (0.6 in) ⓓ 12 mm (0.5 in)
ⓑ 75 mm (3.0 in) ⓔ 60 mm (2.4 in)
ⓒ 8 mm (0.3 in)

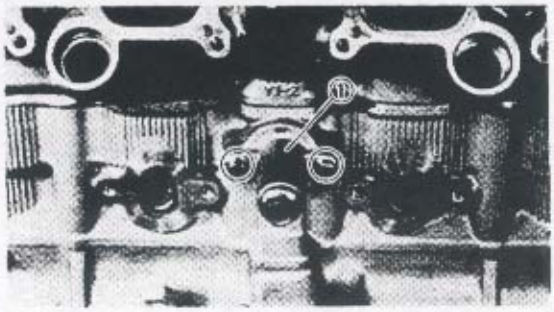



4.Align:
- "T" mark (with stationary pointer)

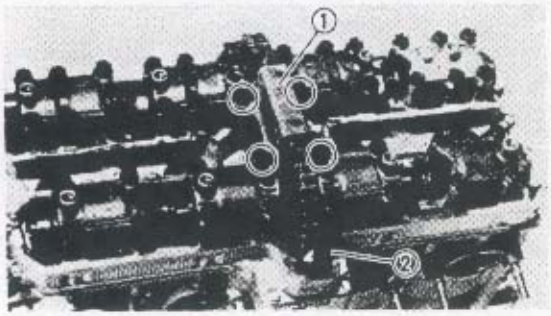
**NOTE:**
- Turn the crankshaft counterclockwise and align the "T" mark ⓐ with the stationary pointer ⓑ when #1 piston is at TDC on compression stroke.




- The #1 piston is in compression stroke TDC when the cam lobes are turned away from each other, as shown.



5.Remove:
- Timing chain tensioner ①
- Gasket



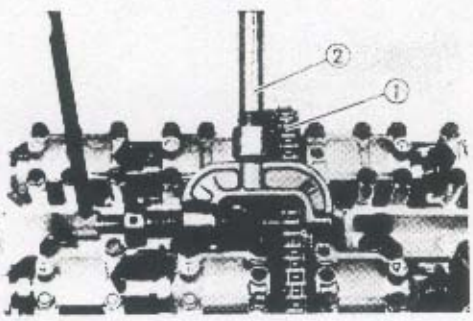
6.Remove:
- Timing chain guide ① (upper)
- Timing chain guide ② (exhaust side)



**NOTE:**
Select one of the following procedures explained hereafter:

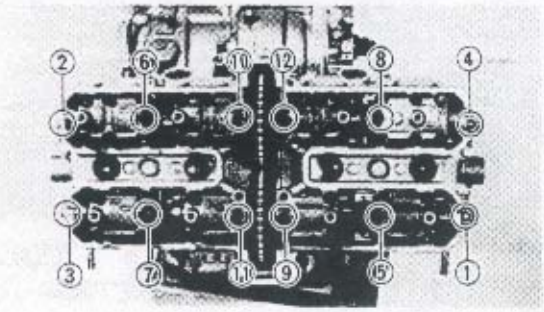
**Procedure 1.**
For engine service without cylinder head disassembly.
→ Disconnect the timing chain.
The pistons and cylinders can be removed without removing the camshafts.

**Procedure 2.**
For engine service including cylinder head disassembly.
→ Remove the camshaft caps and camshafts.
The camshafts can be removed without disconnecting the timing chain.



**Procedure 1.**
1.Disconnect:
- Timing chain ①
  Use the timing chain cutter ②.

| | |
|---|---|
| | **Timing chain cutter:**<br>**YM-01112/90890-01112** |

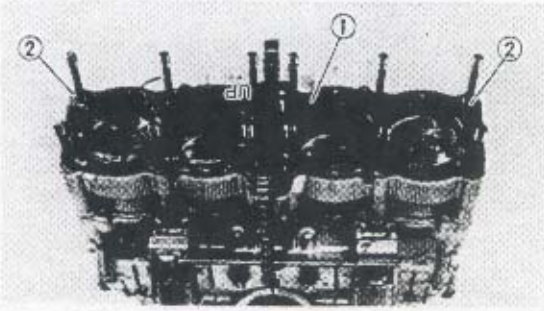


2.Remove:
- Nuts (cylinder head)

**NOTE:**
- Loosen the nuts in the proper sequence.
- Follow the numerical order shown in the photo. Start with loosening each nut 1/2 turn until all are loose.

3.Remove:
- Cylinder head (with camshaft case)
- Gasket ① (cylinder head)
- Dowel pins ②

**NOTE:**
Remove the cylinder head (with camshaft case) as a whole to prevent the valve lifters and adjusting pads from falling into the crankcase.

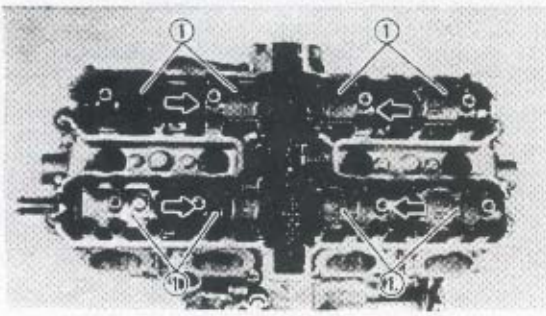


4.Next step, see "CYLINDER AND PISTON".

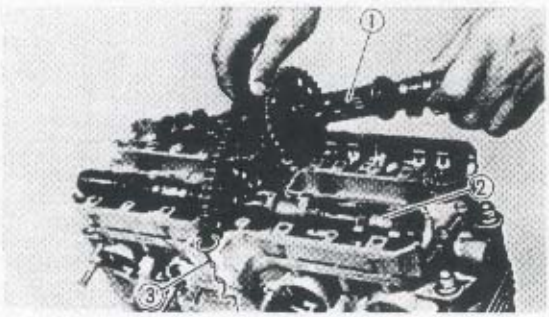
**Procedure 2.**

1.Remove:
- Camshaft caps ①
- Dowel pins

**NOTE:**
Remove the camshaft cap bolts in a criss-cross pattern from the outside to inside.

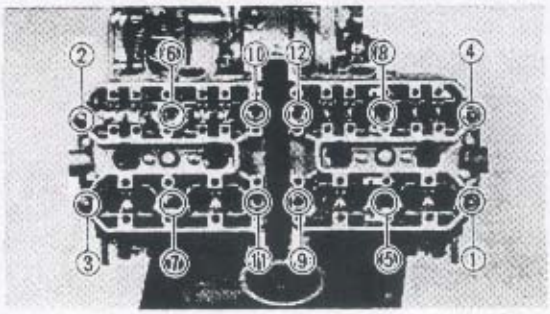


**CAUTION:**
**The bolts (camshaft caps) must be removed evenly to prevent damage to the cylinder head, camshaft or camshaft caps.**



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

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

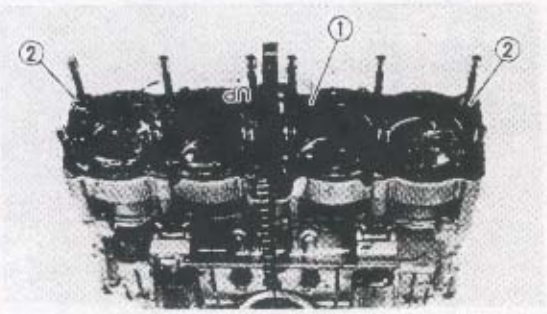



3.Remove:
- Nuts (cylinder head)

**NOTE:**
- Loosen the nuts in the proper sequence.
- Follow the numerical order shown in the photo. Start with loosening each nut 1/2 turn until all are loose.

4.Remove:
- Cylinder head
  (with camshaft case)

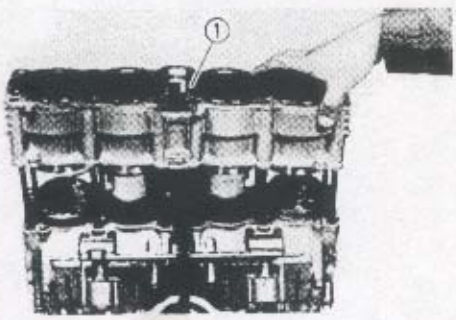
**NOTE:**
Remove the cylinder head (with camshaft case) as a whole to prevent the valve lifters and adjusting pads from falling into the crankcase.



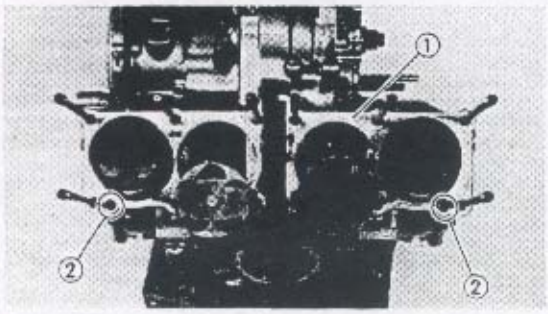

5.Remove:
- Gasket ① (cylinder head)
- Dowel pins ②

## CYLINDER AND PISTON

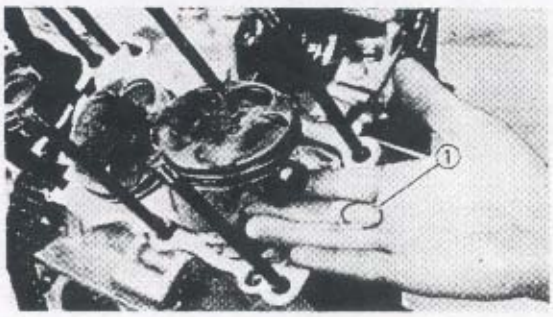
**NOTE:**
With the engine mounted, the cylinder and piston can be maintained by removing the following parts.
- Side cowlings
- Air filter case
- Fuel injector assembly
- Cylinder head assembly




1.Remove:
- Cylinder ①



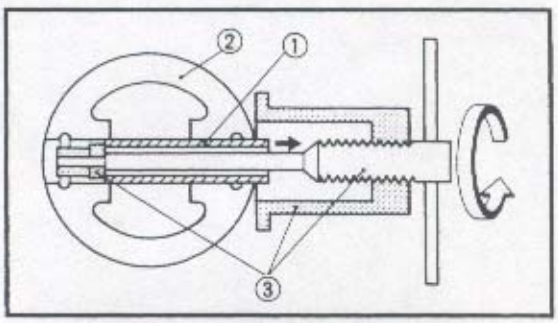

2.Remove:
- Gasket ① (cylinder)
- Dowel pins ②




3.Remove:
- Circlips ① (piston pin)

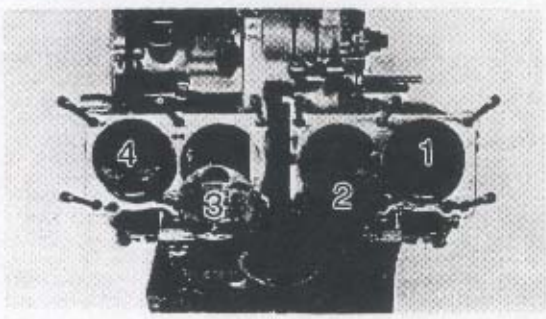
**NOTE:**
Before removing the piston pin circlip, cover the crankcase with a clean rag to prevent the circlip from falling into the crankcase cavity.

4



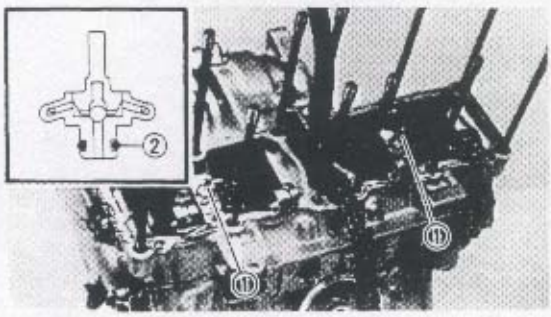

4.Remove:
- Piston pins ①
- Pistons ②

**NOTE:**
- Put identification marks on the 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 ③.




| | |
|---|---|
| | **Piston pin puller :**<br>**YU-01304/90890-01304** |

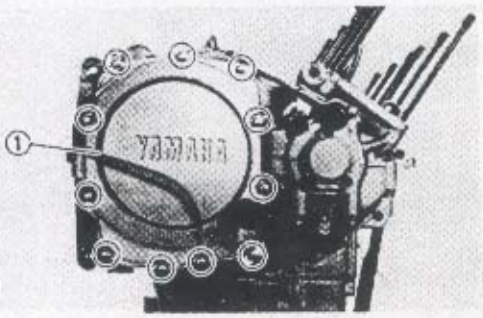
**CAUTION:**
**Do not use a hammer to drive the piston pin out.**




5.Remove:
- Oil-Jet nozzles ①
  (with O-ring ②)

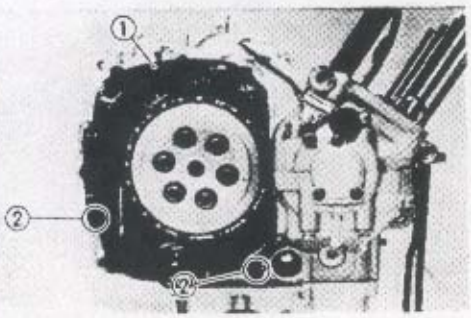
## CLUTCH

**NOTE:**
With the engine mounted, the clutch assembly can be maintained by removing the following parts.
- Lower cowling (right)

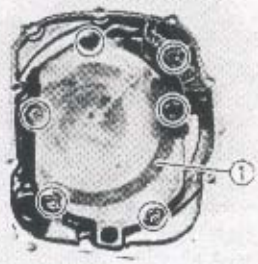



1. Remove:
- Crankcase cover ① (right)

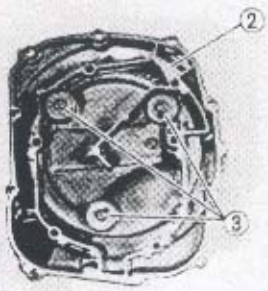
**NOTE:**
Loosen the bolts in a crisscross pattern.

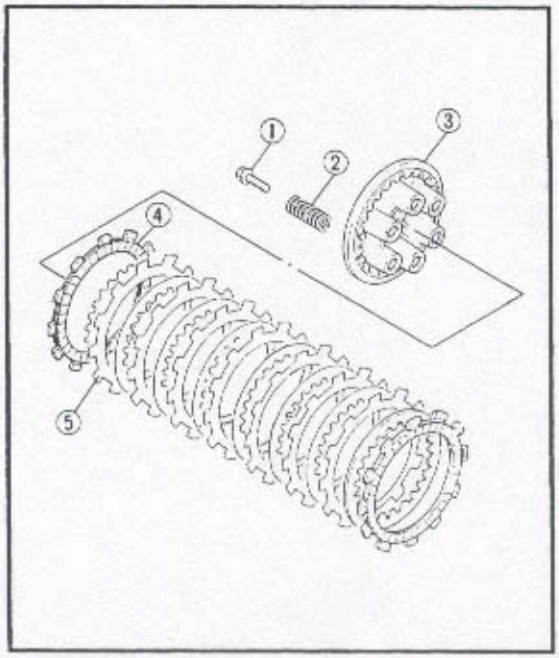



2. Remove:
- Gasket ①
- Dowel pins ②




3. Remove:
- Cover ① (breather)
- Gasket ②
- Washer ③
- Rubber ring
- Cover (outer)

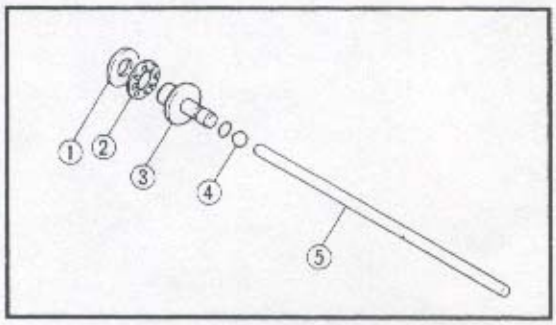




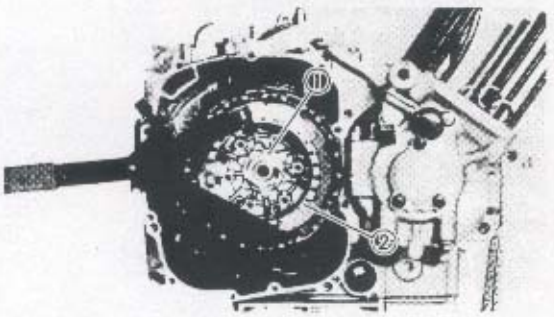

4.Remove:
- Bolts ① (pressure plate)
- Clutch springs ②
- Pressure plate ③
- Friction plates ④
- Clutch plates ⑤

**NOTE:**
Loosen the bolts (pressure plate) in a criss-cross pattern.





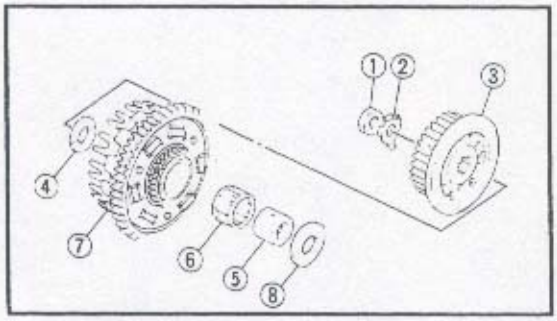

5.Remove:
- Washer ①
- Bearing ②
- Push rod #1 ③ (with O-ring)
- Ball ④
- Push rod #2 ⑤



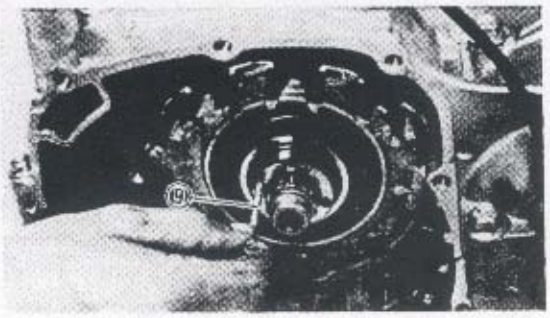

6.Straighten the lock washer tabs.
7.Loosen:
- Nut ① (clutch boss)

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

| | |
|---|---|
| | **Universal clutch holder: YM-91042/90890-04086** |



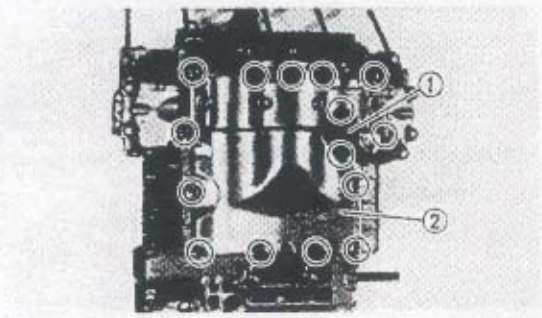

8.Remove:
- Nut ① (clutch boss)
- Lock washer ②
- Clutch boss ③
- Thrust washer ④
- Spacer ⑤
- Bearing ⑥
- Clutch housing ⑦
- Thrust washer ⑧




**NOTE:**
Install a 5 mm (0.2 in) screw ⑨ onto the spacer. Then remove the spacer by pulling on the screw.

### OIL PAN AND OIL STRAINER

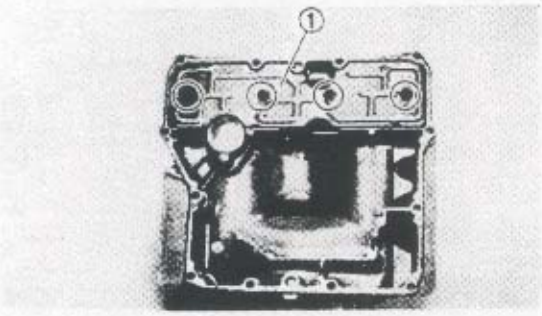
**NOTE:**
With the engine mounted, the oil pan and oil strainer can be maintained by removing the following parts.
- Lower cowling
- Exhaust pipes
- Exhaust chamber



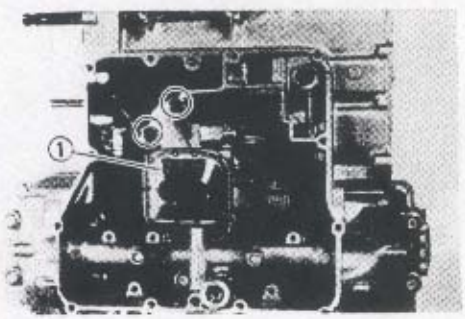

1.Remove:
- Oil level switch ①
- Oil pan ②

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

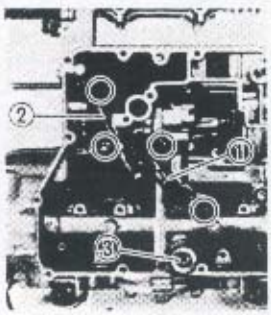
- Gasket (oil pan)
- Dowel pins

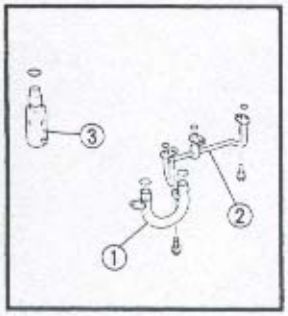



2.Remove:
- Baffle plate ① (oil pan)

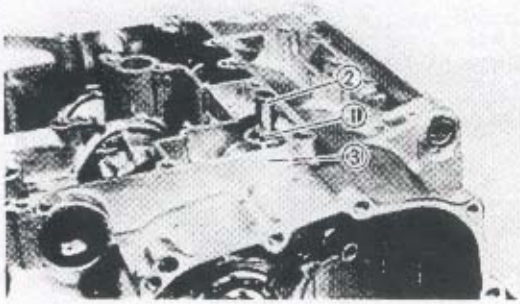



3.Remove:
- Oil strainer assembly ①





4.Remove:
- Oil delivery pipe #2 ①
  (with O-rings)
- Oil delivery pipe #1 ②
  (with O-rings)
- Relief valve ③
  (with O-ring)

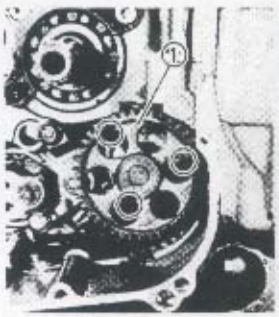


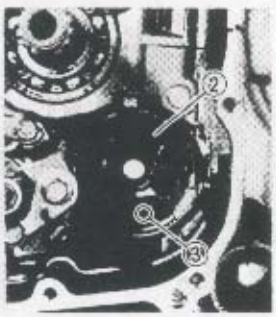
5.Remove:
- Circlip ①
- Oil pipe ②
- Mounting rubber ③

4

## OIL PUMP AND SHIFT SHAFT

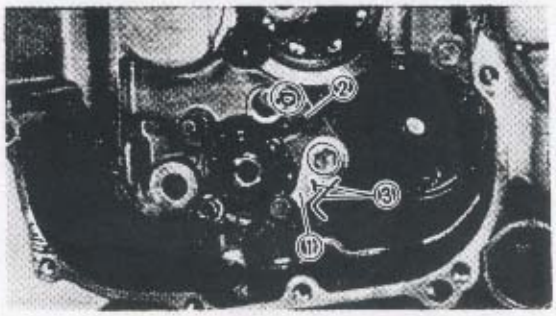
**NOTE:**
With the engine mounted, the oil pump and shift shaft can be maintained when the following parts are removed:
- Side cowlings
- Crankcase cover (left and right)
- Clutch housing



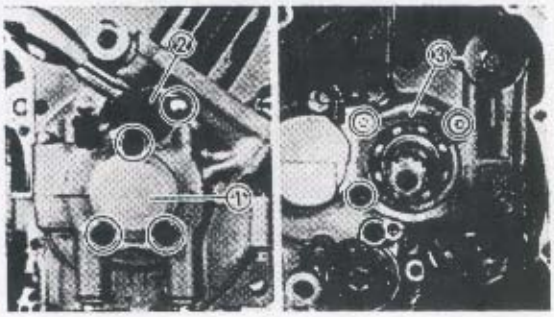


1.Remove:
- Oil pump assembly ①
- Gasket ②
- Dowel pin ③

2.Remove:
- Circlip ①
- Washer ②
- Shift shaft assembly ③



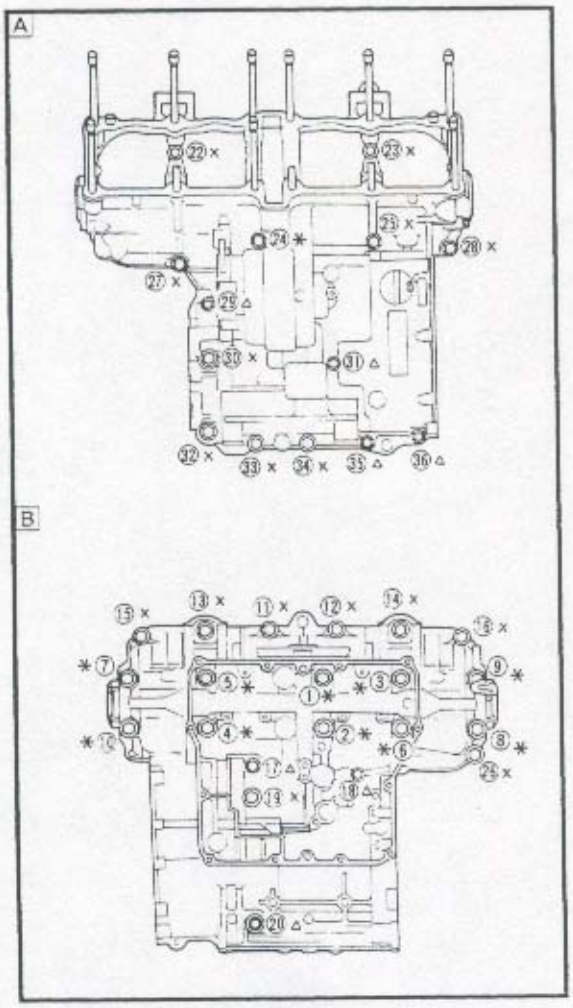
3.Remove:
- Stopper lever ①
- Stopper plate ②
  (shift fork guide bar and bearing)
- Return spring ③



**CRANKCASE DISASSEMBLY**

1.Remove:
- Crankshaft end cover ① (right)
  (with O-ring)
- Crankshaft sensor ②
  (with O-ring)

2.Remove:
- Bearing retainer ③ (main axle)
  Use the torx wrench (T30).




3.Remove:
- Bolts (crankcase)

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

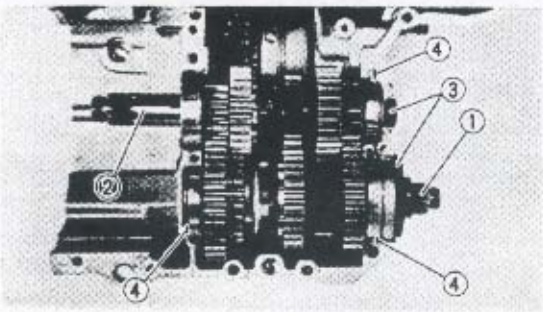
4.Place the engine upside down.

5.Remove:
- Crankcase (lower)

**CAUTION:**

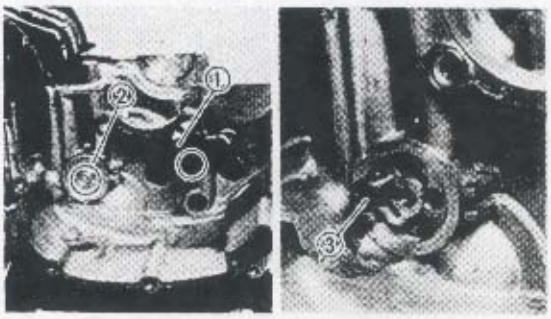
**Use a soft hammer to tap on the case half. Tap only on reinforced portions of the case. Do not tap on the gasket mating surface. Work slowly and carefully. Make sure that the case halves separate evenly.**

Ⓐ Upper case
Ⓑ Lower case
△: M6 bolts
×: M8 bolts
✳: M9 bolts




**TRANSMISSION**

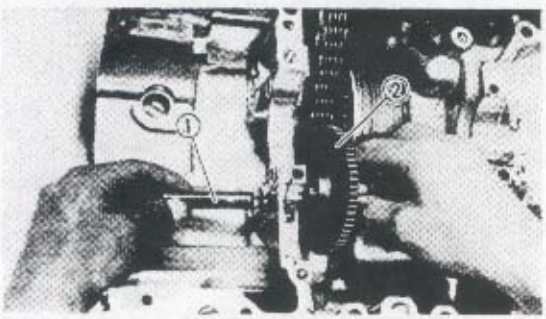
1.Remove:
- Drive axle assembly ①
- Main axle assembly ②
- Oil seals ③
- Circlips ④



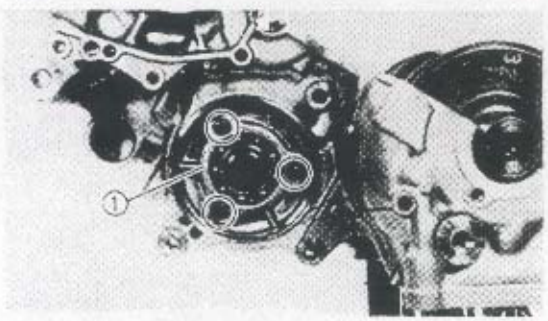

**STARTER CLUTCH AND CRANKSHAFT**

1.Remove:
- Oil delivery pipe #5 ① (with O-rings)
- Oil plug plate ②
- Gasket
- Oil spray nozzle ③

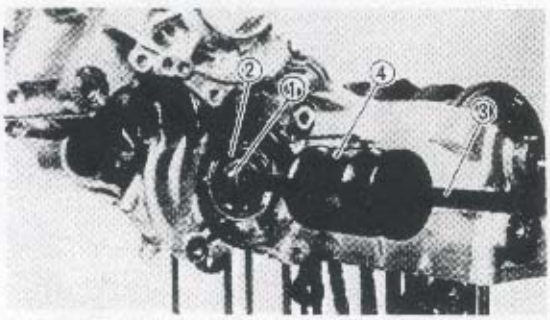





2.Remove:
- Shaft ①
- Starter idle gear ②

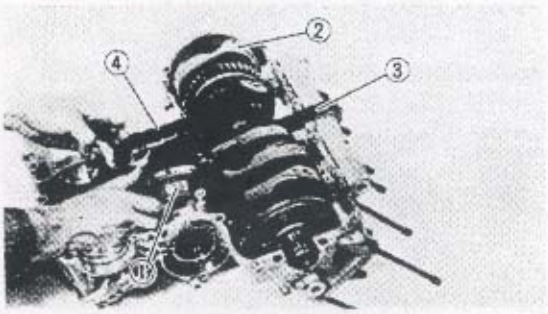



3.Remove:
- Bearing retainer ①

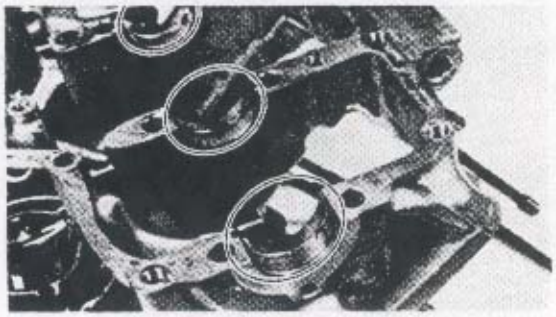



4.Remove:
- Shaft ① (AC generator) (with bearing ②)
  Use the armature shock puller ③ and weight ④.

**Armature shock puller:**
**YU-01047 – 3/90890-01290**
**Weight:**
**YU-01047 – 2/90890-01291**

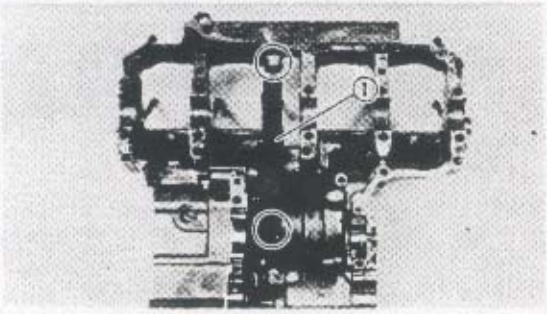


5.Remove:
- Starter clutch assembly ①
- Crankshaft assembly ②
- Timing chain ③
- HY-VO chain ④

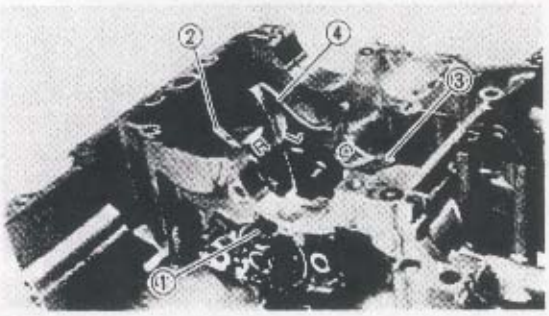


6.Remove:
- Main journal bearings (crankshaft)

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

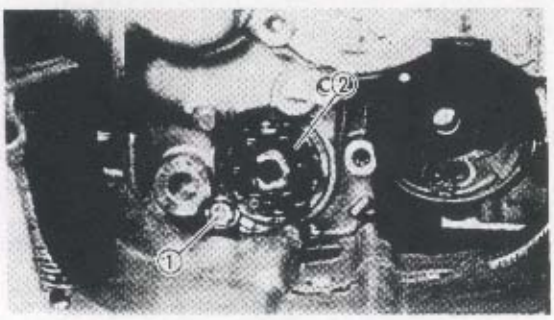


7.Remove:
- HY-VO chain guide ①

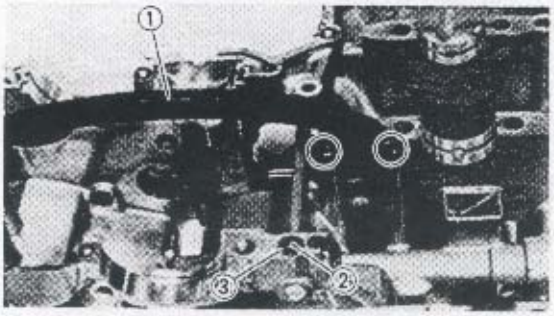


**SHIFT FORK AND SHIFT CAM**

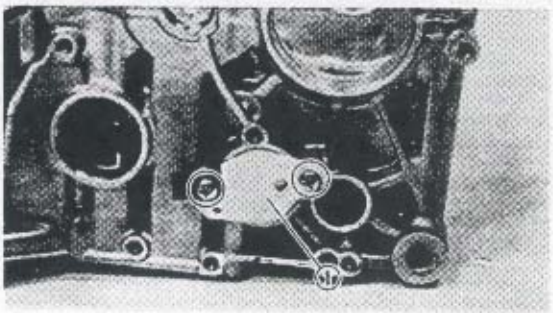
1.Remove:
- Guide bar ① (shift fork)
- Shift fork "R" ②
- Shift fork "C" ③
- Shift fork "L" ④



2.Remove:
- Bolt ① (bearing stopper)
- Shift cam assembly ②

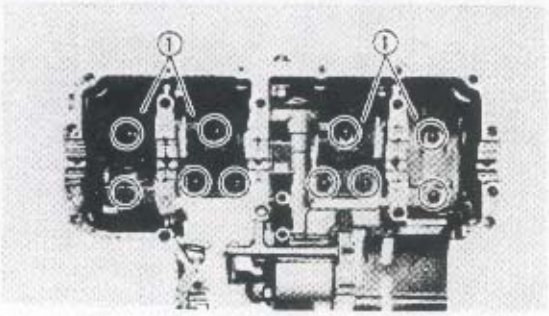



3.Remove:
- Timing chain guide ① (intake side)
- Dowel pin ②
- O-ring ③




4.Remove:
- Neutral switch ①

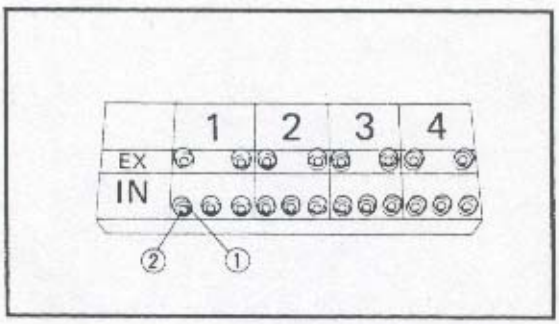





5.Remove:
- Baffle plates ①

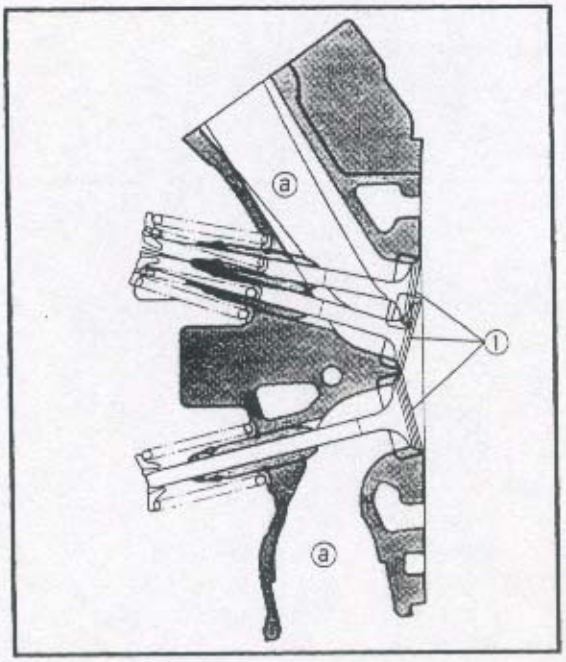
## VALVE AND CAMSHAFT CASE

**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

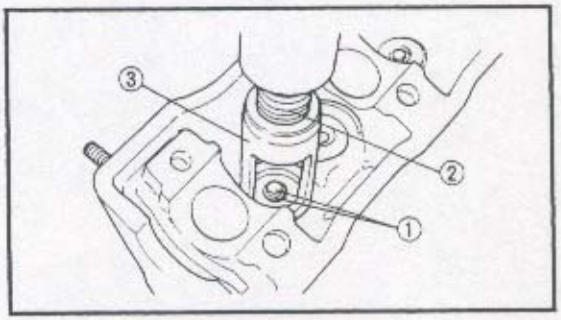
Leakage at valve seat → Inspect the valve face, valve seat and the valve seat width. Refer to "INSPECTION AND REPAIR – VALVE SEAT".

**********

**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.

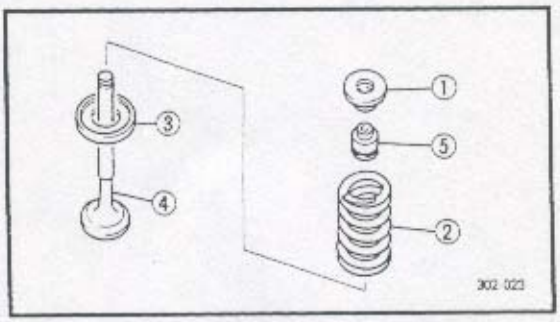
**********




3.Remove:
- Valve cotters ①

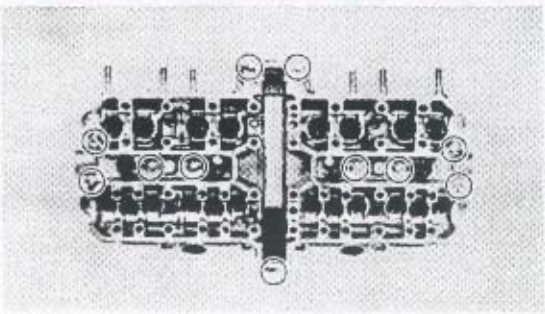
**NOTE:**
Attach the valve spring compressor ② and attachment ③ between the valve spring retainer and cylinder head to remove the valve cotters.

**Valve spring compressor:**
**YM-04019/90890-04019**
**Attachment:**
**(For exhaust valve)**
**YM-04108/90890-04108**
**(For intake valve)**
**YM-04114/90890-04114**



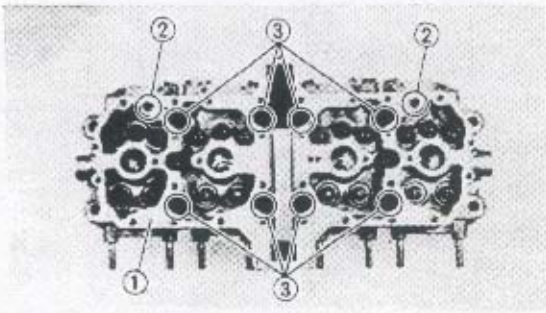

4.Remove:
- Valve spring retainer ①
- Valve spring ②
- Spring seat ③
- Valve ④
- Oil seal ⑤

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



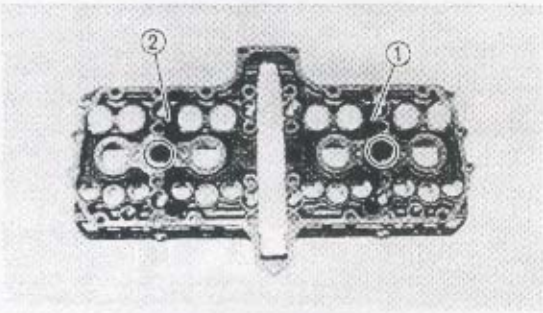
5.Remove:
- Camshaft case

**NOTE:**
Remove the bolts from the outside to inside.

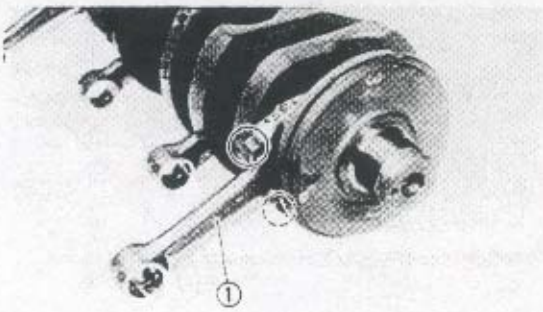



6.Remove:
- Gasket ① (camshaft case)
- Dowel pins ②
- Nuts ③ (cylinder head)
- Washers





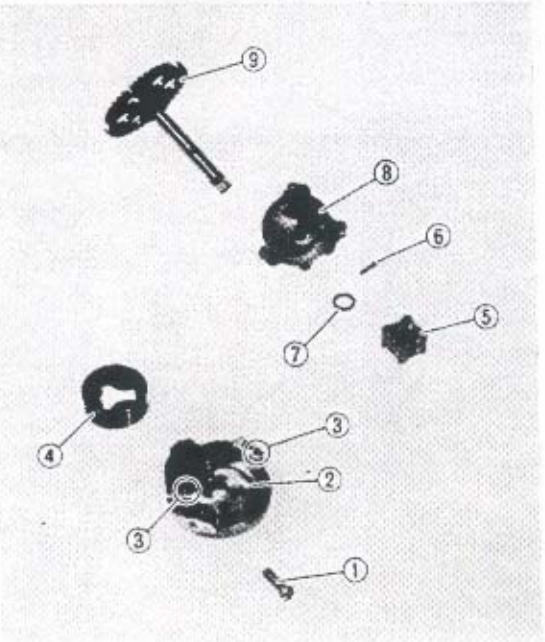

7.Remove:
- Oil delivery pipe #3 ① (with O-rings)
- Oil deliver pipe #4 ② (with O-rings)




**CONNECTING ROD**

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

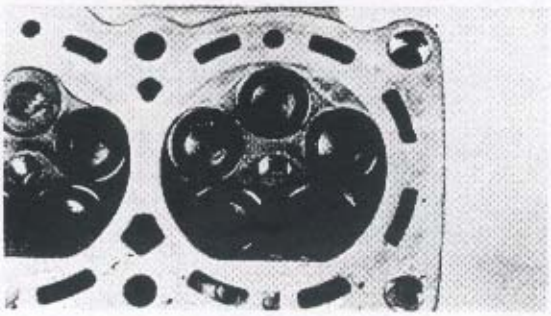
**NOTE:**
Identify each bearing position very careful so that it can be reinstalled in its original place.




**OIL PUMP**

1.Remove:

- Screw ①
- Pump housing ②
- Dowel pins ③
- Outer rotor ④
- Inner rotor ⑤
- Pin ⑥
- Washer ⑦
- Pump cover ⑧
- Pump shaft ⑨



## INSPECTION AND REPAIR

### CYLINDER HEAD

1.Eliminate:

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

**NOTE:**

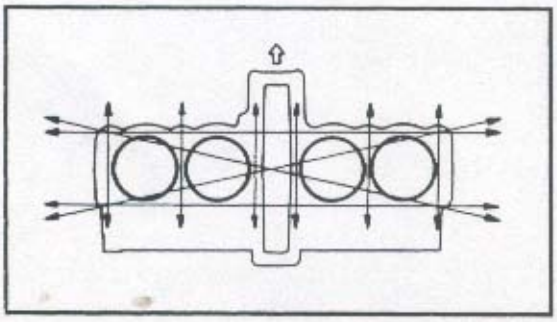
Do not use a sharp instrument to avoid damaging or scratching:

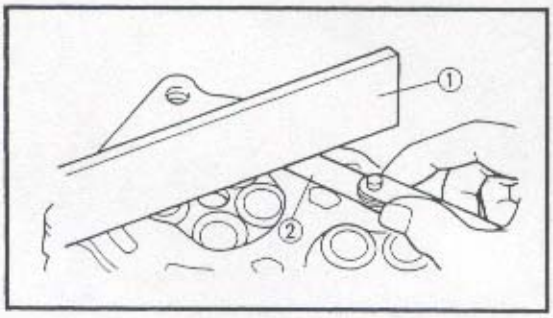
- Spark plug threads
- Valve seat

2.Inspect:

- Cylinder head
  Scratches/Damage → Replace.
- Water jacket
  Crust of minerals/Rust → Eliminate.

4






3.Measure:

- Cylinder head warpage
  Out of specification →Resurface.

| | |
|---|---|
| | **Cylinder head warpage:**<br>**Less than 0.03 mm (0.0012 in)** |

**********

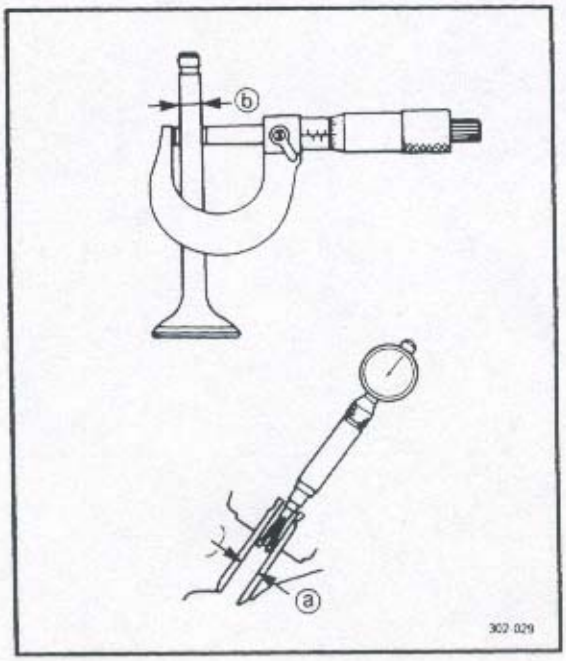
**Warpage measurement and resurfacement steps:**

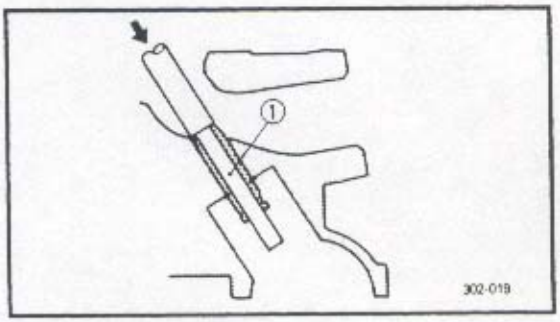
- Hold a straight edge ① and a thickness gauge ② to the cylinder head.
- Measure the warpage.
- If the warpage is out of specification, resurface the cylinder head.
- Place a 400 ~ 600 grit wet sandpaper on the surface plate, and resurface the head using a figure-eight sanding pattern.

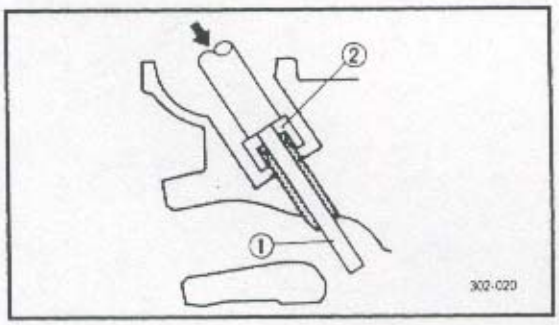
**NOTE:**

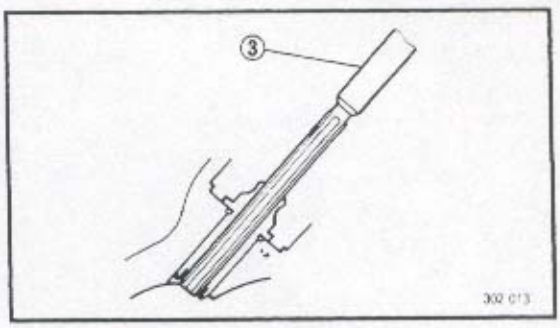
Rotate the head several times to avoid removing too much material from one side.

**********




### 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**
**(0.0004 ~ 0.0015 in)**
**< Limit > : 0.08 mm (0.003 in)**
**Exhaust:**
**0.025 ~ 0.052 mm**
**(0.0010 ~ 0.0020 in)**
**< Limit > : 0.10 mm (0.004 in)**

2.Replace:

• Valve guide

************************************

**Replacement steps:**

**NOTE:**
Heat the cylinder head in an oven to 100°C (212°F) 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.

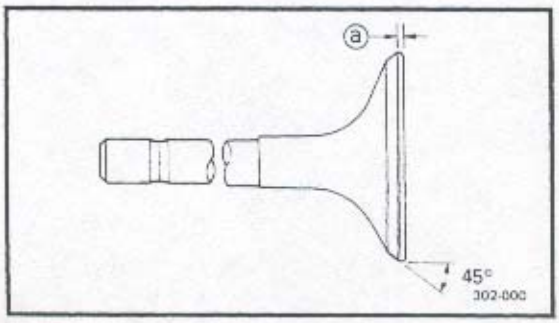
**Valve guide remover (4.5 mm):**
**YM-04116/90890-04116**
**Valve guide installer (4.5 mm):**
**YM-04117/90890-04117**
**Valve guide reamer (4.5 mm):**
**YM-04118/90890-04118**

************************************

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

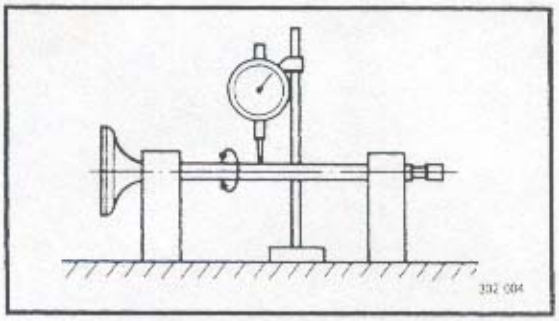
3.Eliminate:
- Carbon deposit
- (from valve face)

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:**
**IN: 0.45 ~ 0.95 mm**
**(0.018 ~ 0.037 in)**
**EX: 0.75 ~ 1.25 mm**
**(0.030 ~ 0.049 in)**




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

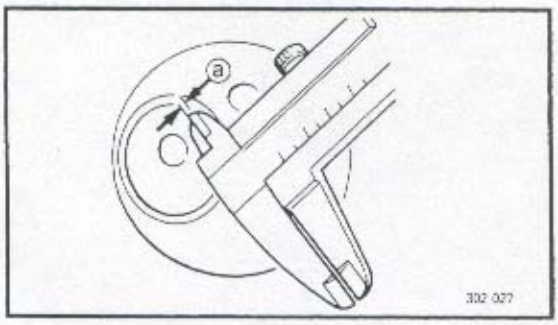
**Runout limit:**
**0.01 mm (0.0004 in)**

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

**VALVE SEAT**

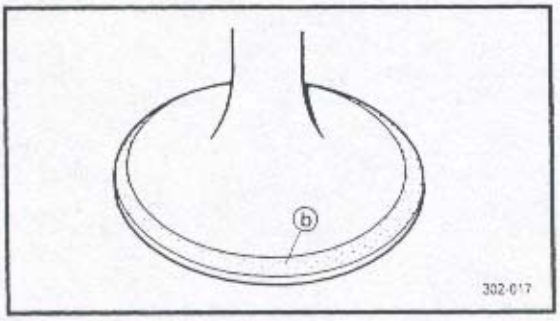
1.Eliminate:
- Carbon deposit
  (from valve face and valve seat)

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**
**(0.035 ~ 0.043 in)**
**Exhaust 0.9 ~ 1.1 mm**
**(0.035 ~ 0.043 in)**

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**Measurement steps:**

- Apply the Mechanic's bluing 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, bluing 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.

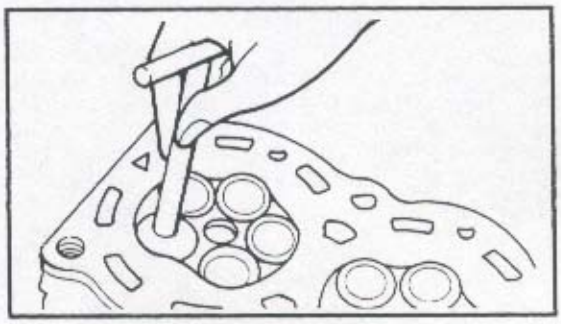
**********

4.Reface:

- Valve seat

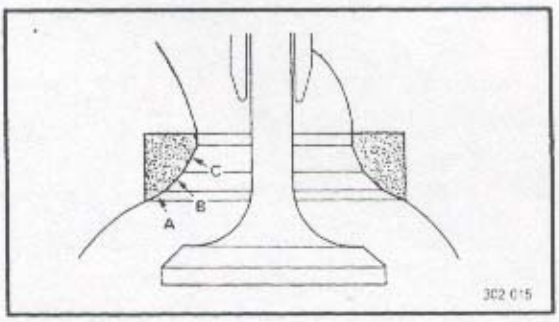
Use 20°, 45°, 60° and 75° valve seat cutter.

| | |
|---|---|
| | **Valve seat cutter: YM-91043-C** |

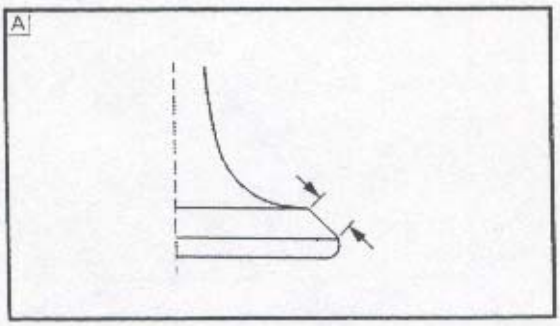


**CAUTION:**

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




| Cut sections as follows: | |
|---|---|
| **Section** | **Cutter** |
| A | 20° |
| B | 45° |
| C | IN: 75° EX: 60° |

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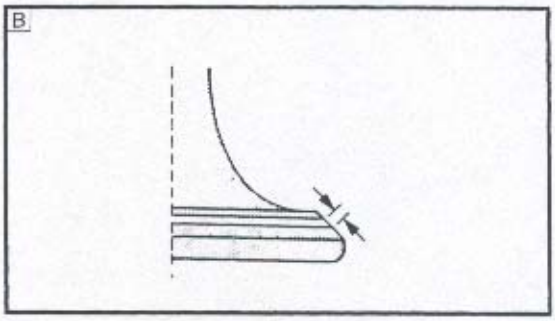
**Refacing steps:**

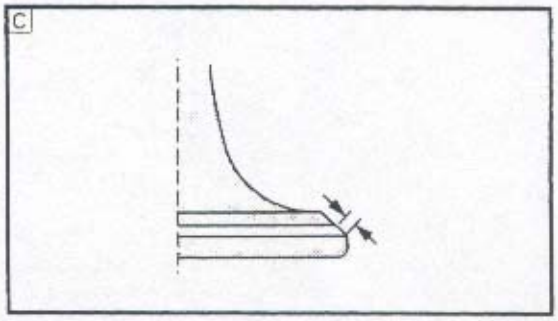
A Valve seat is centered on valve face but it is too wide.

| Valve seat cutter set | | Desired result |
|---|---|---|
| Use lightly | First: 20° cutter<br>Second: 75°/60° cutter | To reduce valve seat width to 1.0 mm (0.039 in) |



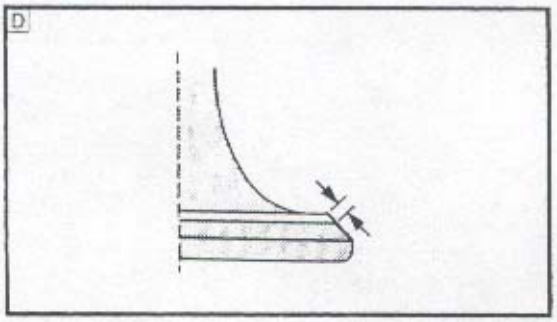

B Valve seat is in the middle of the valve face but it is too narrow.

| Valve seat cutter set | | Desired result |
|---|---|---|
| Use | 45° cutter | To achieve a uniform valve seat width of 1.0 mm (0.039 in) |




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

| Valve seat cutter set | | Desired result |
|---|---|---|
| Use | First: 20° cutter<br>Second: 45° cutter | To center the seat and to achieve its width of 1.0 mm (0.04 in) |



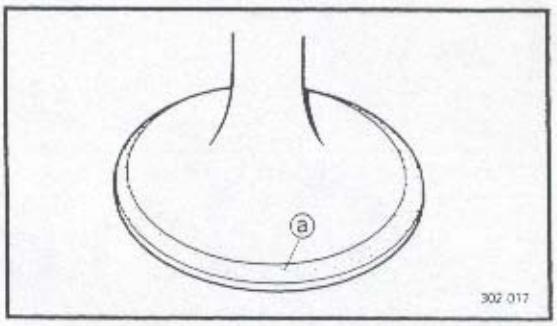

D Valve seat is too narrow and it is located near the bottom edge of the valve face.

| Valve seat cutter set | | Desired result |
|---|---|---|
| Use | First: 75°/60° cutter<br>Second: 45° cutter | To center the seat and increase its width. |

**********

5.Lap:
- Valve face
- Valve seat

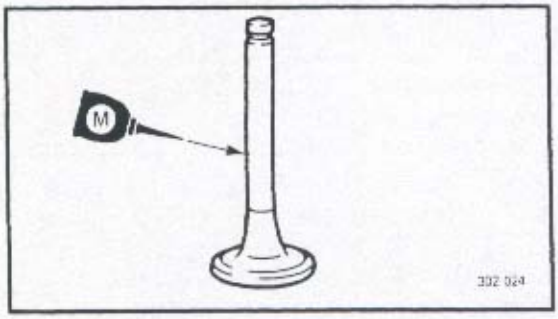
**NOTE:**
After refacing the valve seat or replacing the valve and valve guide, the valve seat and valve face should be lapped.



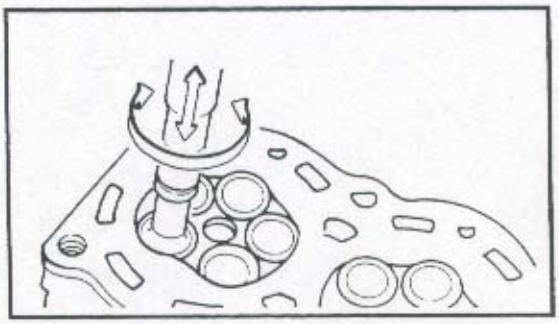

**********

**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.**



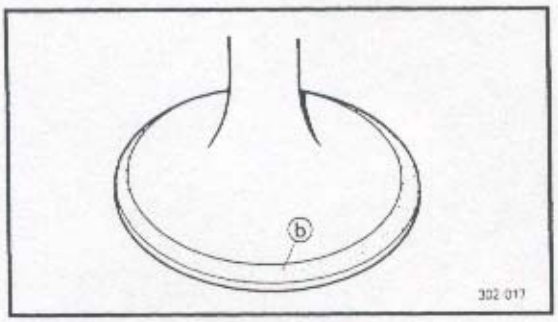

- Apply molybdenum disulfide oil to the valve stem.
- Install the valve into the cylinder head.
- Turn the valve until the valve face and valve seat are evenly polished, then clean off all compound.



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

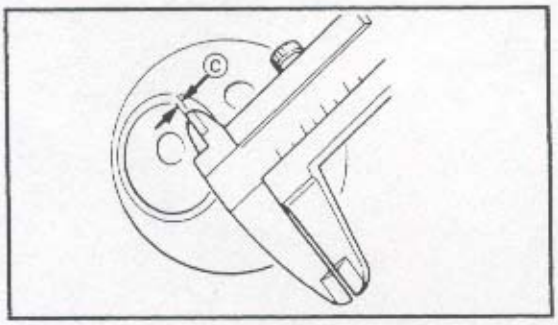
- Apply a fine lapping compound to the valve face and repeat the above steps.

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



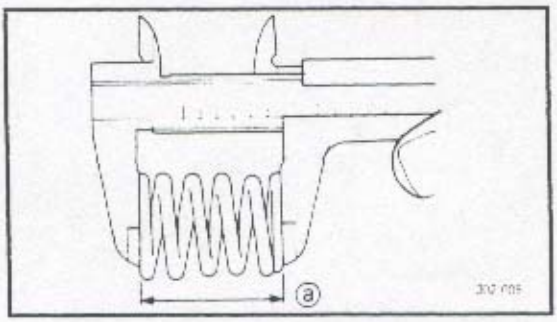

- Apply the Mechanic's bluing dye (Dykem) ⓑ to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width ⓒ again. If the valve seat width is out of specification, reface and lap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

**********

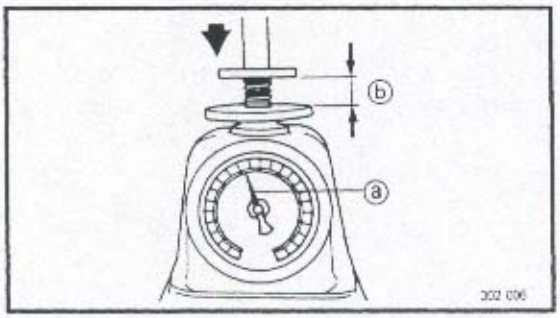



**VALVE SPRING**

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



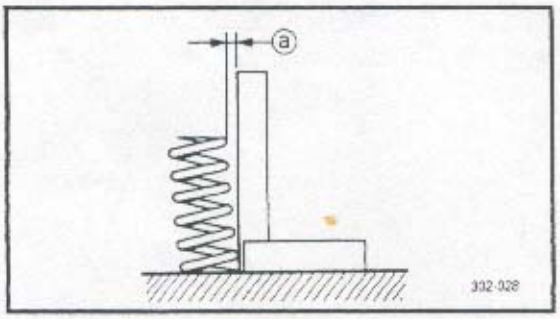

**Free lenght (valve spring):**
**Intake spring:**
**40.73 mm (1.60 in)**
**Exhaust spring:**
**45.44 mm (1.79 in)**




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

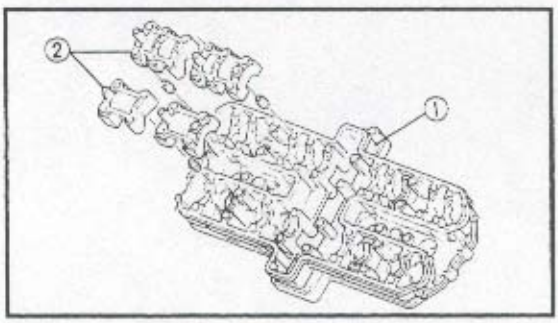
**Compressed force:**
**Intake spring:**
**8.1 ~ 9.3 kg (17.9 ~ 20.5 lb)**
**at 36.5 mm (1.4 in)**
**Exhaust spring:**
**13.5 ~ 15.5 kg (29.8 ~ 34.2 lb)**
**at 38.5 mm (1.5 in)**

4



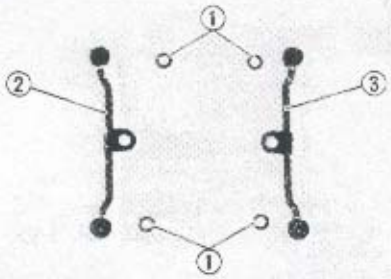

3.Measure:
- Spring tilt ⓐ
  Out of specification → Replace.

**Spring tilt limit:**
**intake:**
**1.7 mm (0.07 in)**
**exhaust:**
**1.7 mm (0.07 in)**

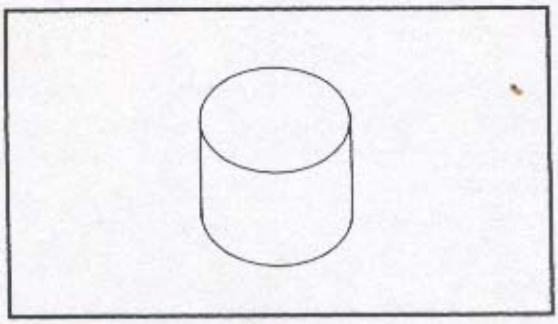



CAMSHAFT CASE

1.Inspect:
- Camshaft case ①
- Camshaft caps ②
  Cracks/Damage → Replace the camshaft case and camshaft caps as a set, and inspect the camshaft.
- Camshaft bearing surfaces
  Pitting/Scratches/Damage → Replace the camshaft case and camshaft caps as a set, and inspect the camshaft.



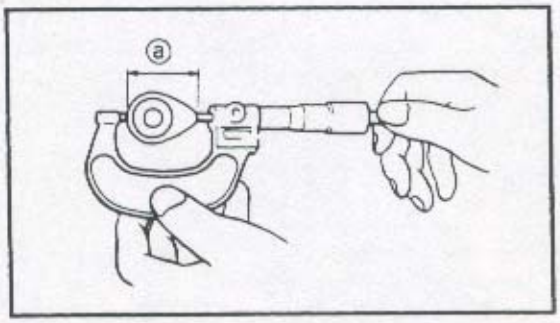

2.Inspect:
- O-rings ①
- Oil delivery pipe #3 ②
- Oil delivery pipe #4 ③
  Damage → Replace.
  Contamination → Wash and blow out the passage.

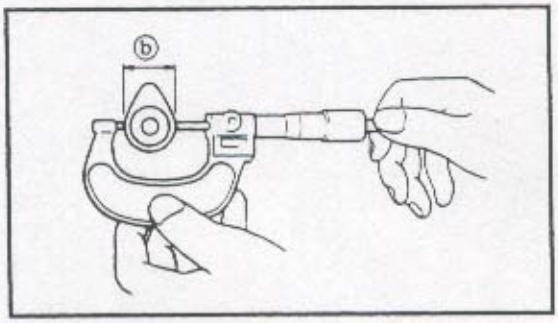


**VALVE LIFTER**

1.Inspect:

- Valve lifters
  Scratches/Damage → Replace both lifters and camshaft case.




**CAMSHAFT**

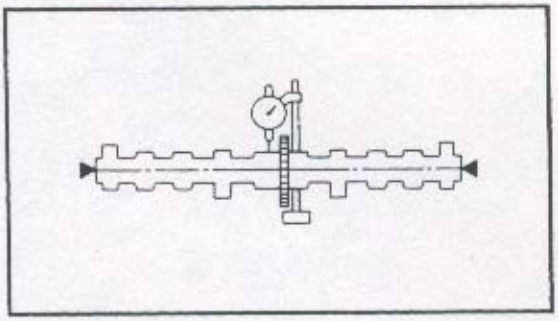
1.Inspect:

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

2.Measure:

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

**Cam lobes lenght limit:**
**Intake:**
**ⓐ 31.7 mm (1.248 in)**
**ⓑ 24.85 mm (0.978 in)**
**Exhaust:**
**ⓐ 31.65 mm (1.246 in)**
**ⓑ 24.85 mm (0.978 in)**



3.Measure:

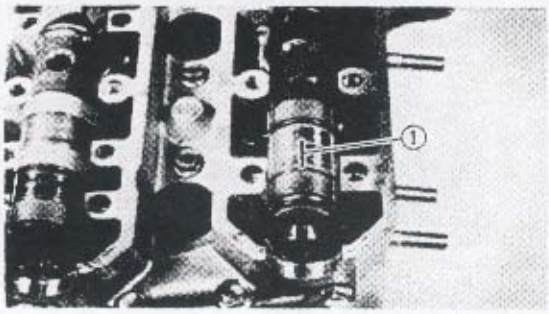
- Runout (camshaft)
  Out of specification → Replace.

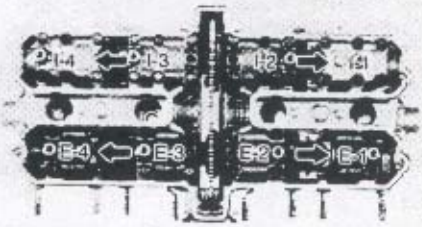
**Runout (camshaft):**
**Less than 0.03 mm (0.0012 in)**

4.Measure:

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

**Camshaft-to-cap clearance:**
**I-1, I-4, E-1, E-4:**
**0.020 ~ 0.054 mm**
**(0.0008 ~ 0.0021 in)**
**I-2, I-3, E-2, E-3:**
**0.050 ~ 0.084 mm**
**(0.0020 ~ 0.0033 in)**




**********

**Measurement steps:**

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

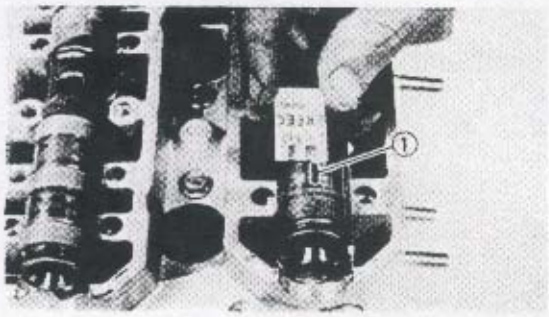
| | |
|---|---|
| | **Bolts (camshaft cap)**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

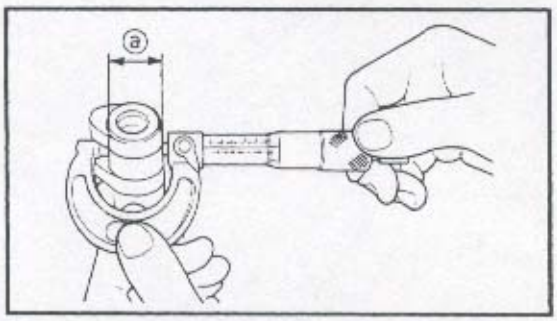
**NOTE:**

- 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 Plastigage®.

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

**********




5. Measure:

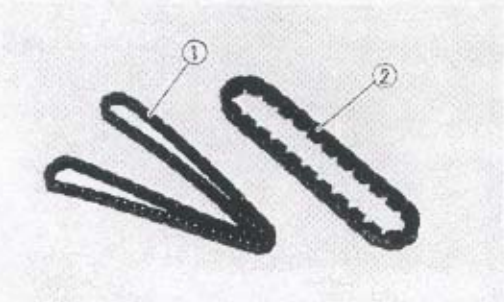
- Bearing diameter ⓐ (camshaft)
  Out of specification → Replace the camshaft.
  Within specification → Replace camshaft case and camshaft caps as a set.

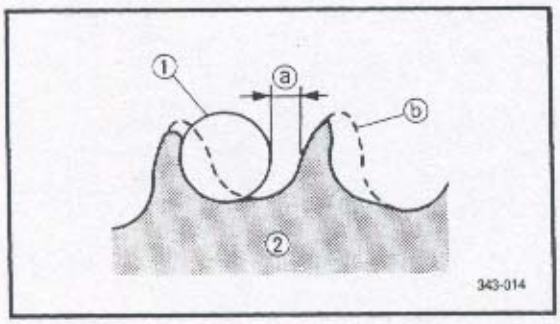
| | |
|---|---|
| | **Bearing diameter (camshaft):**<br>**24.437 ~ 24.450 mm**<br>**(0.9621 ~ 0.9626 in)** |

**TIMING CHAIN, HY-VO CHAIN, SPROCKET AND CHAIN GUIDE**

1. Inspect:

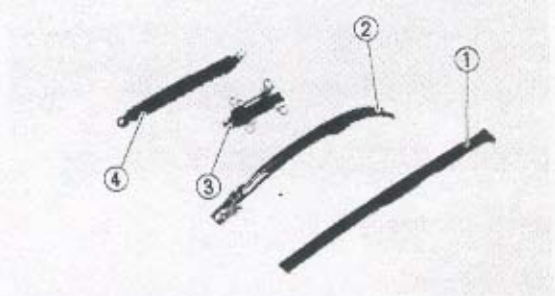
- Timing chain ①
- HY-VO chain ②
  Stiff/Cracks → Replace chain and sprocket as a set.



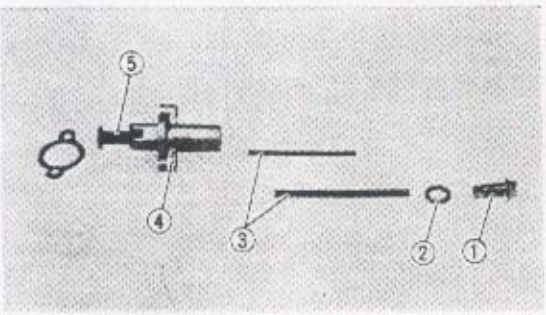



2.Inspect:
- Cam sprockets
  Wear/Damage → Replace cam sprocket and timing chain as a set.

ⓐ 1/4 tooth
ⓑ Correct
①Roller
②Sprocket




3.Inspect:
- Timing chain guide ① (exhaust)
- Timing chain guide ② (intake)
- Timing chain guide ③ (upper)
- HY-VO chain guides ④
  Wear/Damage → Replace.




**TIMING CHAIN TENSIONER**

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

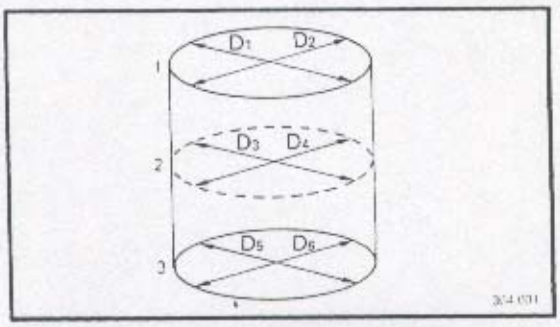
2.Inspect:
- All parts
  Damage/Wear → Replace.

① End plug
② Washer
③ Springs
④ Tensioner body
⑤ Tensioner rod

**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:**

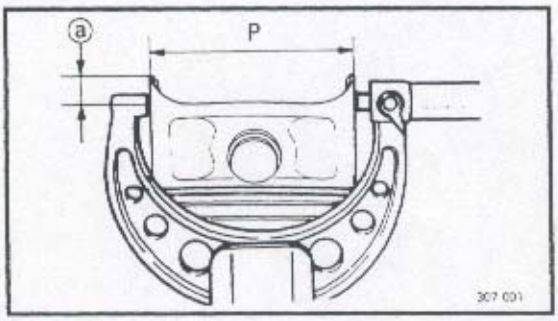
- Measure the cylinder bore "C" with a cylinder bore gauge.

**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" | 75.500 ~ 75.505 mm (2.9724 ~ 2.9726 in) |
| Taper limit "T" | 0.05 mm (0.002 in) |
| Out of round "R" | 0.05 mm (0.002 in) |

| |
|---|
| "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.

ⓐ 3.0 mm (0.118 in) from the piston bottom edge.

| | Piston size P |
|---|---|
| Standard | 75.425 ~ 75.440 mm (2.969 ~ 2.970 in) |
| Oversize 2 | 76.0 mm (2.99 in) |

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

**3rd step:**

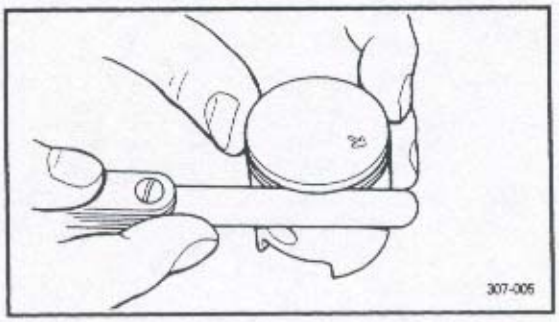
- Calculate the piston-to-cylinder clearance with following formula:

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

**Piston-to-cylinder clearance:**
**0.06 ~ 0.08 mm**
**(0.0024 ~ 0.0031 in)**
**Limit: 0.15 mm (0.0059 in)**

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

**********




**PISTON RING**

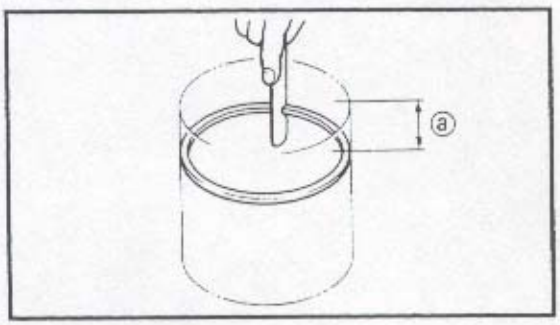
1.Measure:

- 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:**
**0.03 ~ 0.07 mm (0.001 ~ 0.003 in)**
**Limit <0.15 mm (0.0059 in)>**
**2nd ring:**
**0.02 ~ 0.06 mm (0.001 ~ 0.002 in)**
**Limit <0.15 mm (0.0059 in)>**




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 (0.8 in)

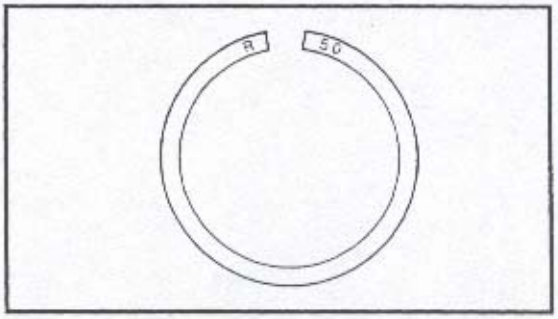
3.Measure:

- 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.

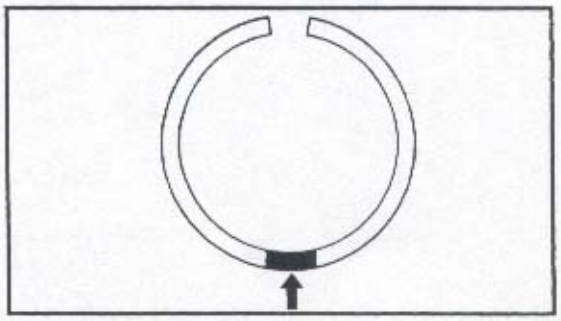
**End gap:**
**Top ring:**
**0.3 ~ 0.5 mm (0.012 ~ 0.020 in)**
**Limit <0.7 mm (0.0276 in)>**
**2nd ring:**
**0.3 ~ 0.5 mm (0.012 ~ 0.020 in)**
**Limit <0.7 mm (0.0276 in)>**
**Oil ring:**
**0.2 ~ 0.8 mm (0.008 ~ 0.031 in)**




**Piston Ring Oversize**

- Top and 2nd piston ring
  Oversize top and 2nd rings size is stamped on the top of ring.

| | |
|---|---|
| Oversize 2 | 0.50 mm (0.0197 in) |



- Oil control ring
  Expander spacer of oil control ring is color-coded to identify sizes.

| Size | Color |
|---|---|
| Oversize 2 | Red |

4

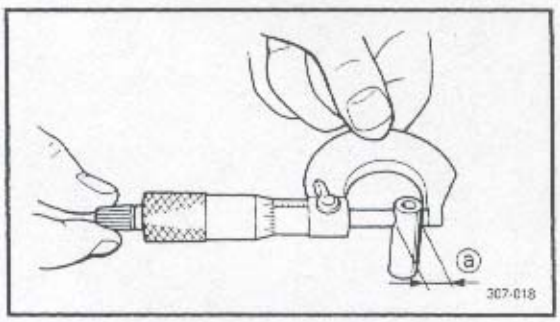
**PISTON PIN**

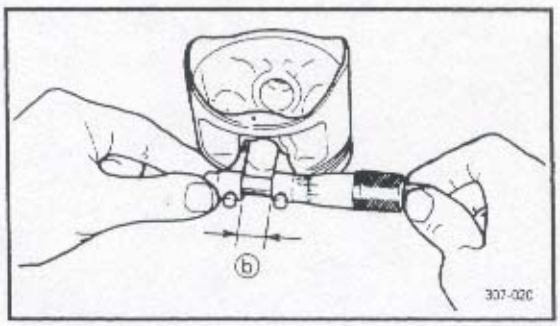
1.Inspect:

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

2.Measure:

- Piston pin-to-piston clearance




**********

**Measurement steps:**

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

**Outside diameter (piston pin):**
**18.991 ~ 19.000 mm**
**(0.7477 ~ 0.7480 in)**

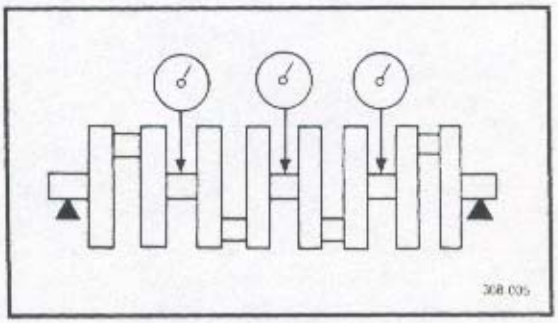
- Measure the piston inside diameter ⓑ.
- Calculate the piston pin-to-piston clearance with following formula:

**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 =**
**0.004 ~ 0.024 mm**
**(0.00016 ~ 0.00094 in)**
**< Limit: 0.07 mm (0.003 in) >**

**********



### CRANKSHAFT AND CONNECTING ROD

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

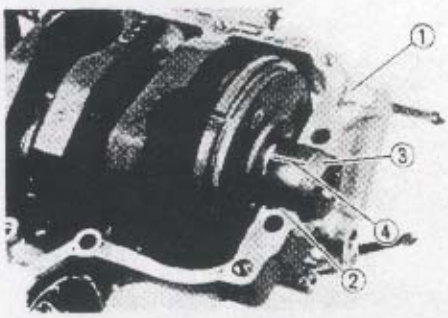
**Runout:**
**Less than 0.03 mm (0.0012 in)**

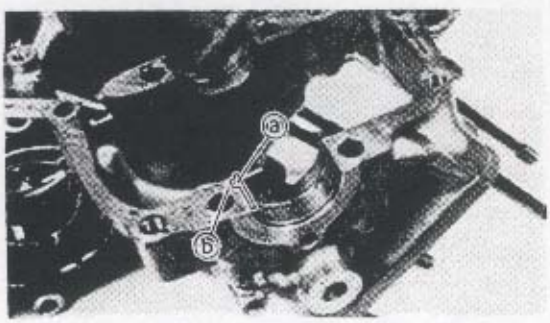
2. Inspect:
- Main journal surfaces
- Crank pin surfaces
- Bearing surfaces
  Wear/Scratches → Replace.

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

**Oil clearance:**
**0.040 ~ 0.064 mm**
**(0.0016 ~ 0.0025 in)**

**********



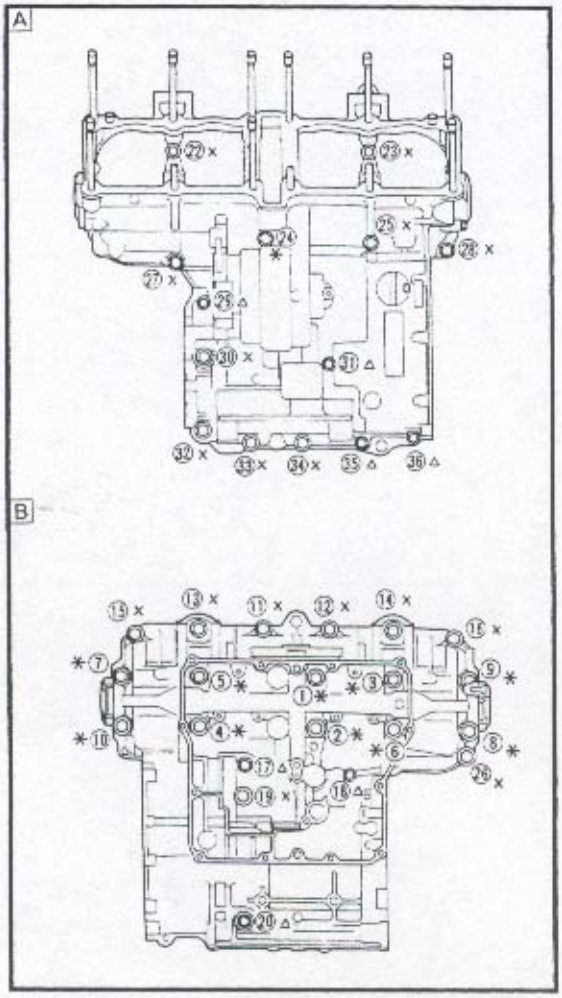

**Measurement steps:**

**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 ① (upper) on a bench in an upside down position.
- Install the upper half of the bearings ② and the crankshaft ③ into the crankcase (upper).

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



- Put a piece of Plastigauge® ④ 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.

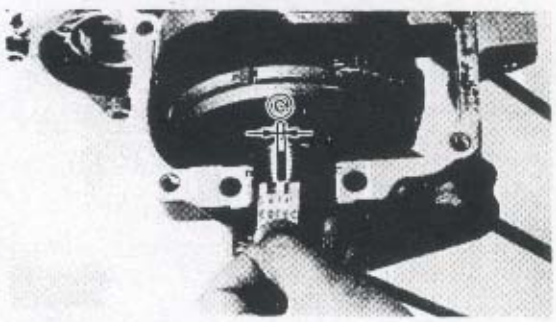
- Tighten the bolt to specification in the tightening sequence cast on the crankcase.

**Bolt (crankcase):**
*** M9 (① ~ ⑩, ㉔) :**
**32 Nm (3.2 m • kg, 23 ft • lb)**
**× M8 (⑪ ~ ⑯, ⑲, ㉒, ㉓ ㉕ ~ ㉘, ㉚ and ㉜ ~ ㉞):**
**24 Nm (2.4 m • kg, 17 ft • lb)**
**△ M6 (⑰, ⑱, ⑳, ㉙, ㉛, ㉟, ㊱):**
**12 Nm (1.2 m • kg, 8.7 ft • lb)**

A Upper case
B Lower case

**NOTE:**
- Lubricate the threads of bolts (M9) with molybdenum disulfide motor oil.
- Lubricate the threads of bolts (M8 and M6) with engine oil.

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



- Measure the compressed Plastigage® 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.

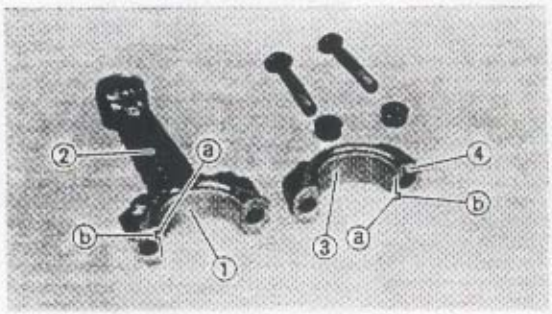
**Oil clearance:**
**0.032 ~ 0.056 mm**
**(0.001 ~ 0.002 in)**

**********

**Measurement steps:**

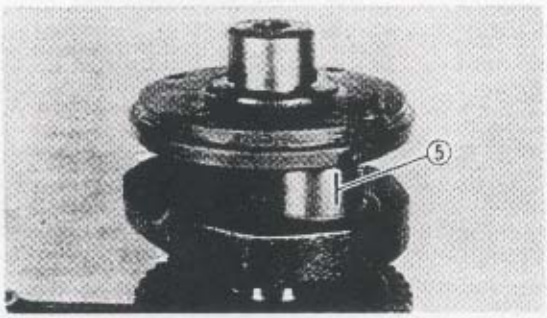
**CAUTION:**

**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.**



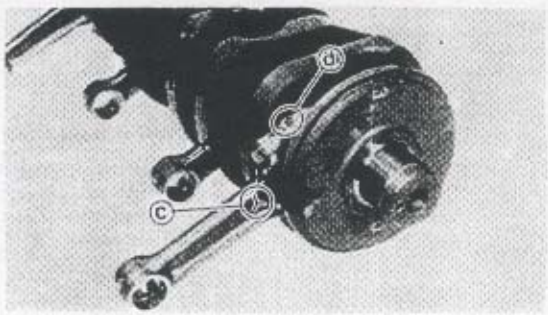

- Clean the bearings, crank pins and bearing portions of the connecting rods.
- Install the upper half of the bearing ① into the connecting rod ② and lower half of the bearing ③ into the connecting rod cap ④.

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




- Put a piece of Plastigauge® ⑤ 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 from a perfect character.




- Tighten the nuts in 2 ~ 3 steps.

**Nut:**
**36 Nm (3.6 m · kg, 25 ft · lb)**

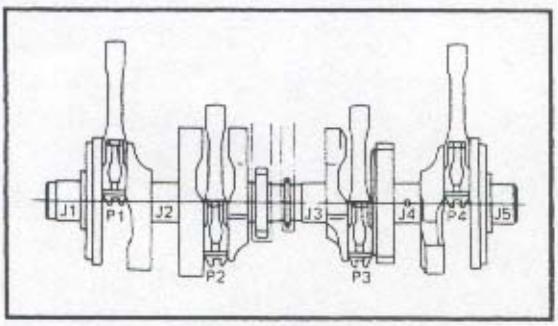
**CAUTION:**

**Tighten to full torque specification without pausing. Apply continuous torque between and 2.0 and 3.6 m • kg. Once you reach 2.0 m • kg DO NOT STOP TIGHTENING until final torque is reached. If the tightening is interrupted between 2.0 and 3.6 m • kg, loosen the nut to less than 2.0 m • kg and start again.**

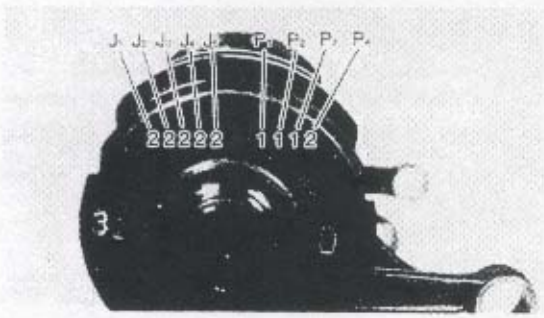
- Remove the connecting rods and bearings.
- Measure the compressed Plastigauge® width ⓔ on each crank pin.
  If oil clearance is out of specification, select a replacement bearing.

**********

4




5.Select:
- Main journal bearing ($J_1$ ~ $J_5$)
- Crank pin bearing ($P_1$ ~ $P_4$)



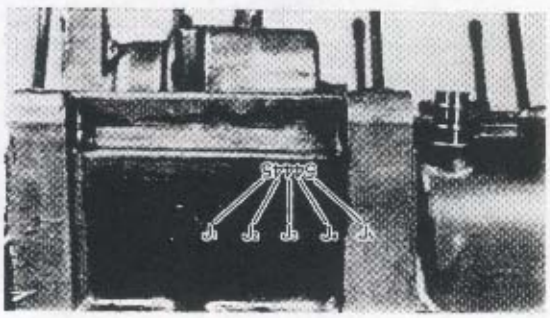

**********

**Selection of bearings:**

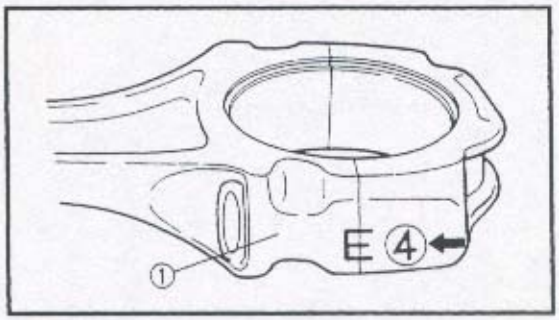
**Example 1: Main journal bearing**

- If "$J_1$" on the crankcase is "5" and "2" on the crankweb, then the bearing size for "$J_1$" is:

**Bearing size of $J_1$:**
**Crankcase $J_1$ – Crankweb $J_1$ =**
**5 – 2 = 3 (Brown)**



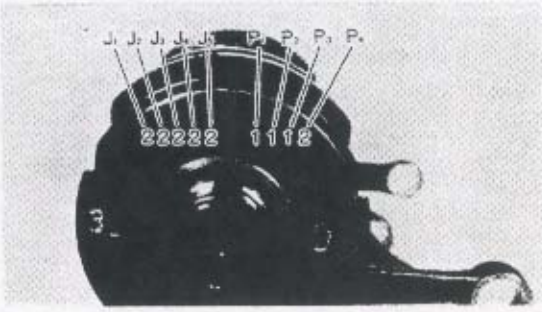
| BEARING COLOR CODE | |
|---|---|
| 1 | Blue |
| 2 | Black |
| 3 | Brown |
| 4 | Green |
| 5 | Yellow |




**Example 2: Crank pin bearing**

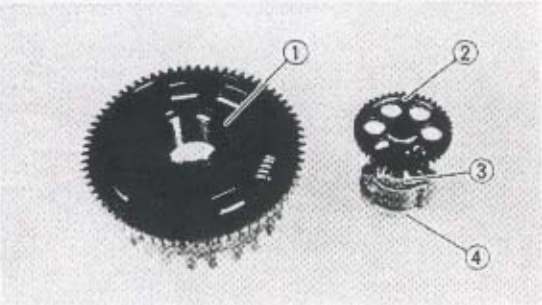
- If "$P_1$" on the connecting rod is "4" and "1" on the crankweb, then the bearing size for "$P_1$" is:

**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 |

**********

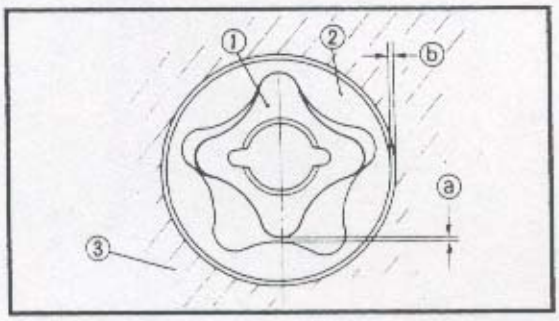



## OIL PUMP

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:

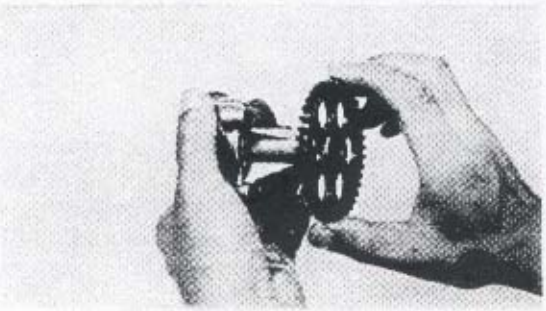
- Tip clearance ⓐ
  (between the inner rotor ① and the outer rotor ②)
- Side clearance ⓑ
  (between the outer rotor ② and the pump housing ③)

Out of specification → Replace the oil pump assembly.

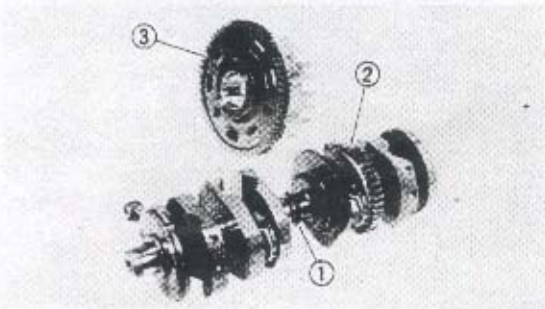
**Tip clearance:**
**0.20 mm**
**(0.008 in)**
**Side clearance:**
**0.15 mm**
**(0.006 in)**

3.Assemble:

- Oil pump
  Refer to "ENGINE ASSEMBLY - OIL PUMP".



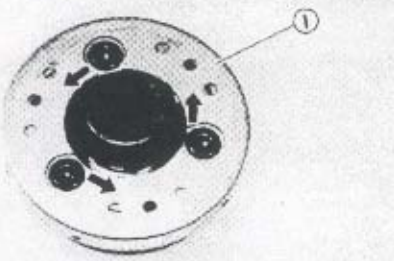
4.Check:
- Oil pump operation
  Unsmooth → Repeat steps 1 and 2 or replace defective parts.




**PRIMARY DRIVE**

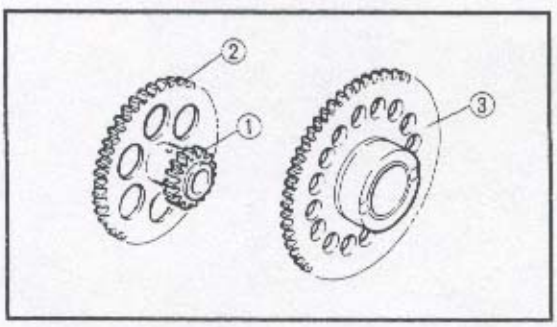
1.Inspect:
- Sprocket teeth (camshaft drive ①)
- Gear teeth (primary drive ②)
- Gear teeth (primary driven ③)
  Wear/Damage → Replace both gears.
  Excessive noises during operation
  Replace both gears.

| Primary reduction ratio: | | |
|---|---|---|
| No. of teeth | | Ratio |
| Drive | Driven | |
| 41 | 68 | 1.658 |

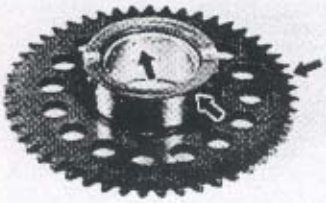



**STARTER DRIVES**

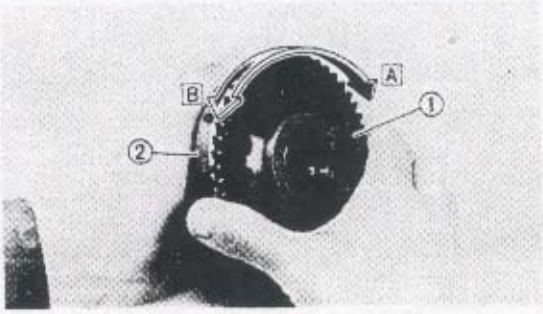
1.Check:
- Starter clutch rollers ①
  Wear/Damage → Replace.




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



3.Inspect:
- Starter wheel gear (contacting surfaces)
  Putting/Wear/Damage → Replace.



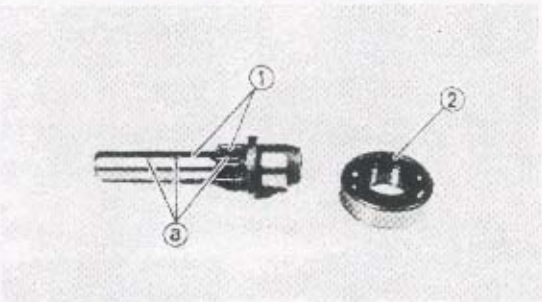

4.Check:
- Starter clutch operation

**********

**Clutch operation checking steps:**

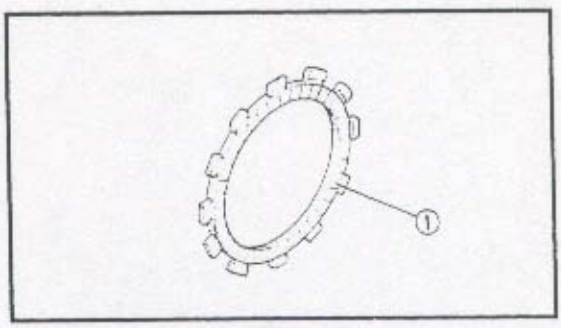
- Install the starter wheel gear ① to the starter clutch ②, and hold the starter clutch.
- When turning the starter wheel gear clockwise [A], the starter clutch and the wheel gear should be engaged.
  If not, the starter clutch is faulty. Replace it.
- When turning the starter wheel gear counterclockwise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

**********



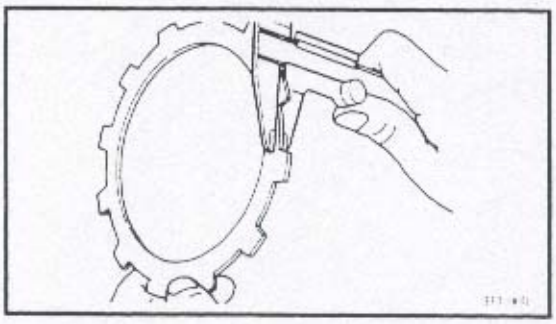

**AC GENERATOR SHAFT**

1.Check:
- Shaft and spline ①
  Wear/Damage → Replace.
- Oil passages ⓐ
  Contamination → Wash and blow out oil passages
- Bearing ②
  Unsmooth operation → Replace.




**CLUTCH**

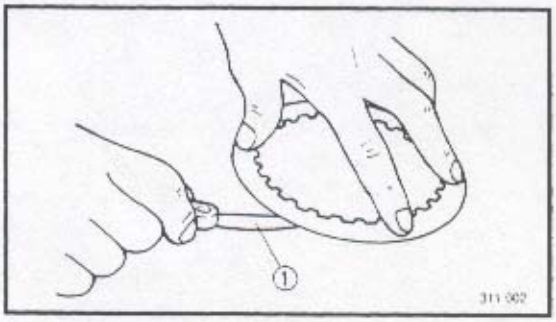
1.Inspect:
- Friction plate ①
  Damage/Wear → Replace friction plates as a set.



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

**Thickness:**
**Inner friction plate:**
**3.4 ~ 3.6 mm (0.134 ~ 0.142 in)**
**<Limit: 3.3 mm (0.13 in)>**
**Other friction plates:**
**2.9 ~ 3.1 mm (0.114 ~ 0.122 in)**
**<Limit: 2.8 mm (0.11 in)>**

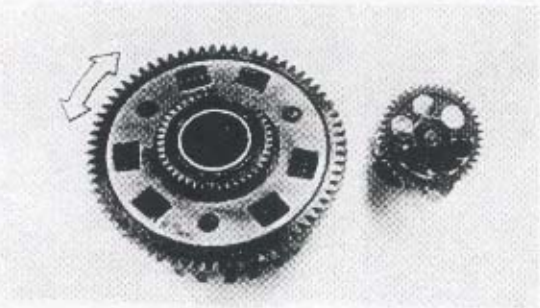
4



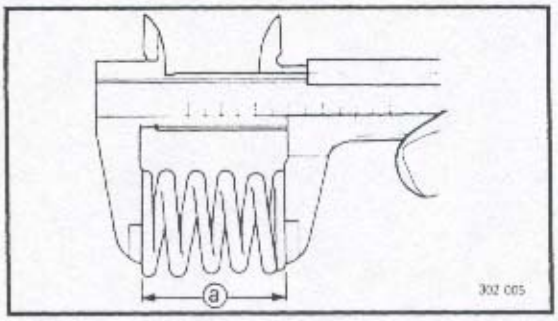

3.Inspect:
- Clutch plate
  Damage → Replace clutch plates as a set.

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 0.1 mm (0.004 in)**



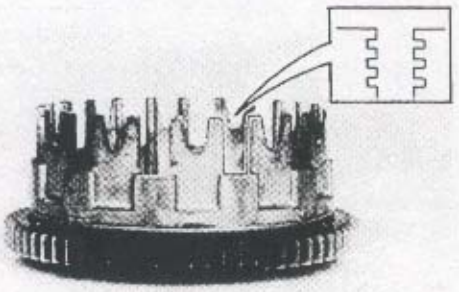
5.Check:
- Circumferential play
  Free play exists → Replace.




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

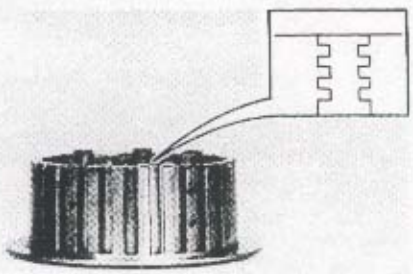
7.Measure:
- Free length ⓐ (clutch spring)
  Out of specification → Replace spring as a set.

**Free length (clutch spring):**
**50 mm (1.97 in)**
**<Limit: 48 mm (1.89 in)>**



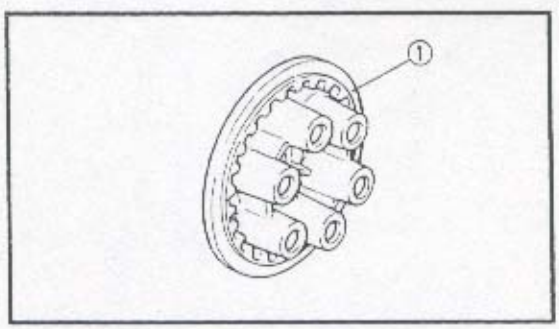
8.Inspect:
- Dogs
  (on the clutch housing)
  Pitting/Wear/Damage → Deburr or replace.
- Clutch housing bearing
  Wear/Damage → Replace clutch housing.

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

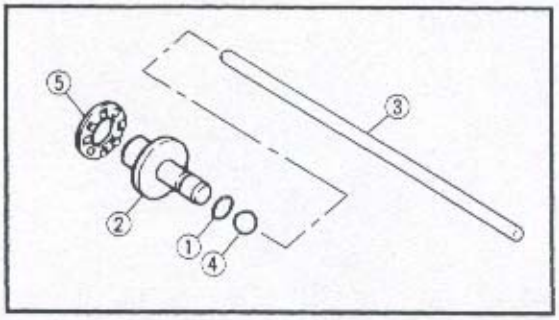


9.Inspect:
- Clutch boss splines
  Pitting/Wear/Damage → Replace clutch boss.

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

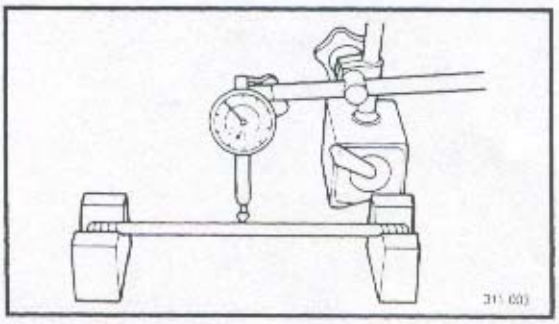



10.Inspect:
- Pressure plate ①
  Cracks/Damage → Replace.




11.Inspect:
- O-ring ①
- Push rod #1 ②
- Push rod #2 ③
- Ball ④
- Bearing ⑤

Wear/Crack/Damage → Replace.

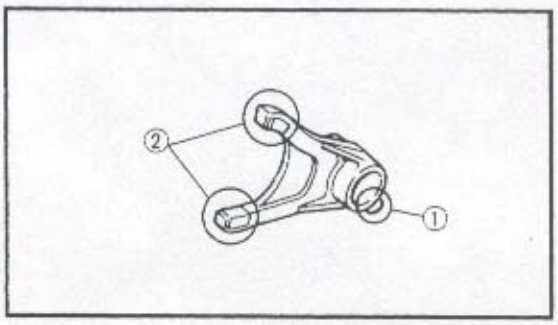


12.Measure:
- Push rod #2

Out of specification → Replace.

**Bending limit:**
**0.5 mm (0.02 in)**

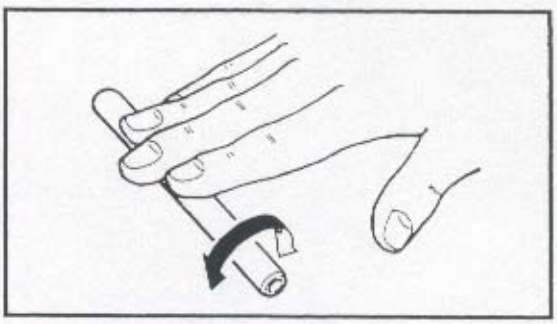
4




**TRANSMISSION AND SHIFTER**

1.Inspect:
- Shift fork cam follower ①
- Shift fork pawl ②

Scoring/Bends/Wear/Damage → Replace.

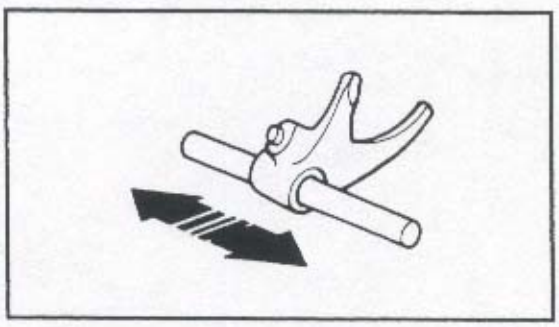


2.Inspect:
- Guide bar

Roll the guide bar on a flat surface.
Bends → Replace.

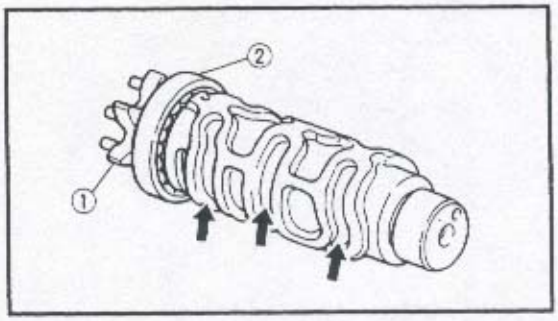
**⚠ WARNING**

**Do not attempt to straighten a bent guide bar.**

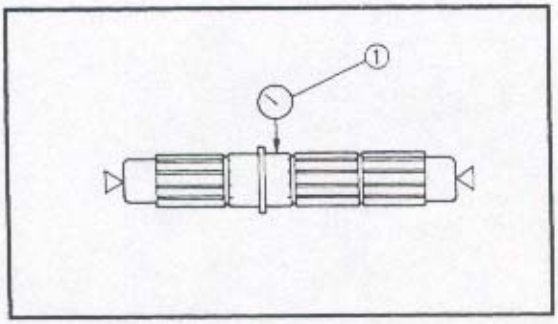


3.Check:
- Shift fork movement (on its guide bar)

Unsmooth operation → Replace the fork and guide bar.

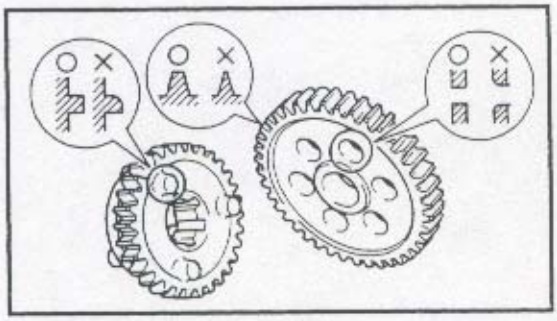



4.Inspect:
- Shift cam grooves
  Wear/Damage/Scratches → Replace.
- Shift cam segment ①
  Damage/Wear → Replace.
- Shift cam bearing ②
  Pitting/Damage → Replace.

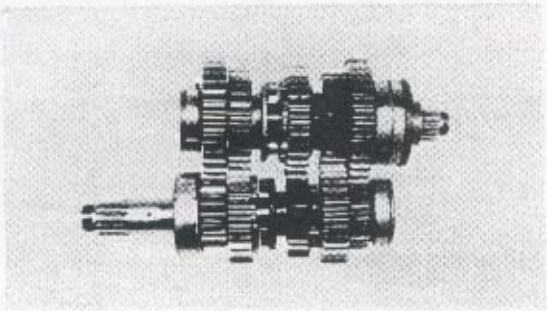



5.Measure:
- Axle runout (main and drive)
  Use a centering device and dial gauge ①.
  Out of specification → Replace.

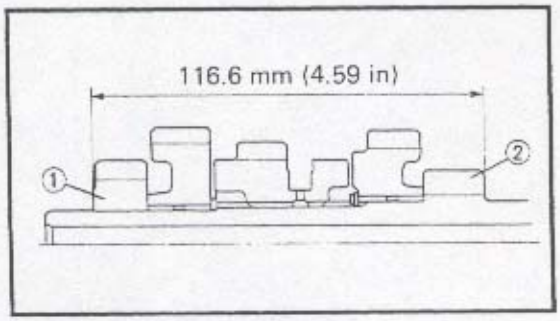
| | |
|---|---|
| | **Runout limit:**<br>**0.08 mm (0.003 in)** |



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.

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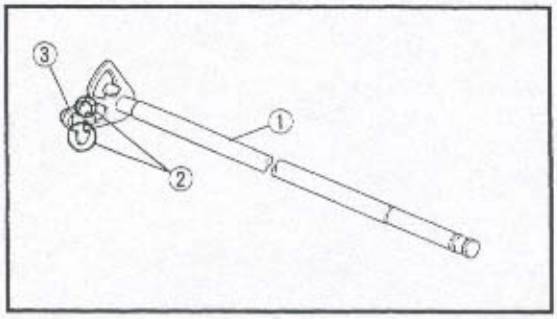
**Transmission gear reassembling point:**
Press the 2nd pinion gear ① in the main axle ② as shown.

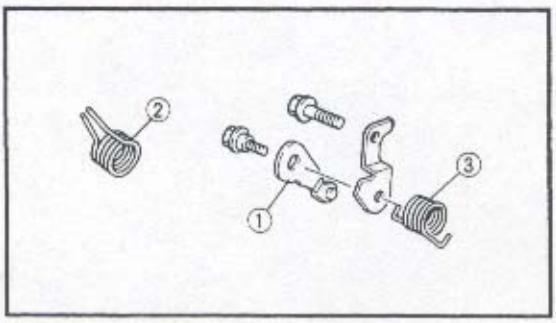
**********

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




### SHIFT SHAFT AND STOPPER LEVER

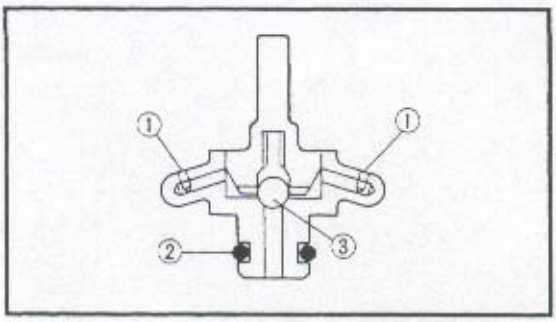
1.Inspect:
- Shift shaft ①
- Shift pawls ②
- Return spring ③ (shift pawls)
  Bends/Wear/Damage → Replace.




2.Inspect:
- Stopper lever ①
  Roller turns roughly → Replace.
  Bends/Damage → Replace.

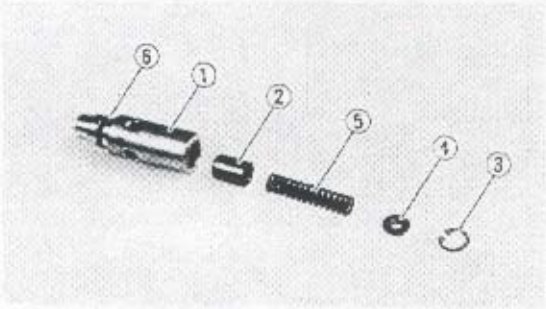
3.Inspect:
- Return spring ② (shift shaft)
- Return spring ③ (stopper lever)
  Wear/Damage → Replace.

4



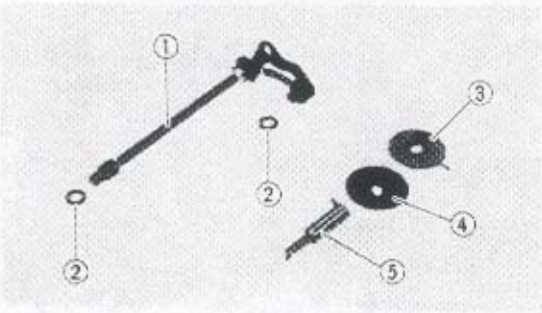

### OIL-JET NOZZLE

1.Check:
- Oil-jet nozzles ①
- O-ring ②
- Check ball ③
  Damage/Wear → Replace.
- Oil jet passage
  Clogged → Blow out with compressed air.

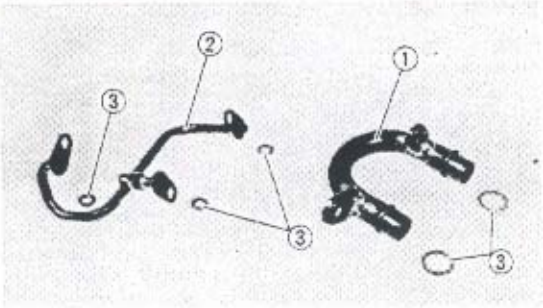



### RELIEF VALVE, OIL PIPE AND STRAINER

1.Check:
- Relief valve body ①
- Valve ②
- Circlip ③
- Spring seat ④
- Spring ⑤
- O-ring ⑥
  Damage/Wear → Replace.

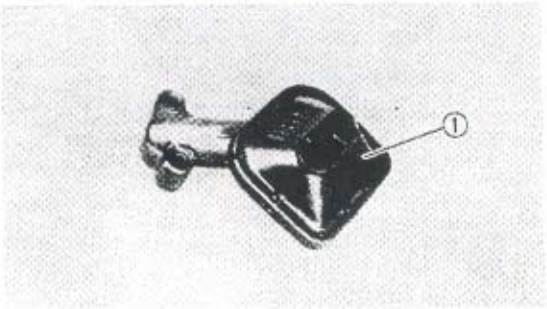



2.Check:
- Oil delivery pipe #5 ①
- O-rings ②
- Oil plug plate ③
- Gasket ④
- Oil splay nozzle ⑤
  Damage → Replace.
  Contamination → Wash and blow out the passage.



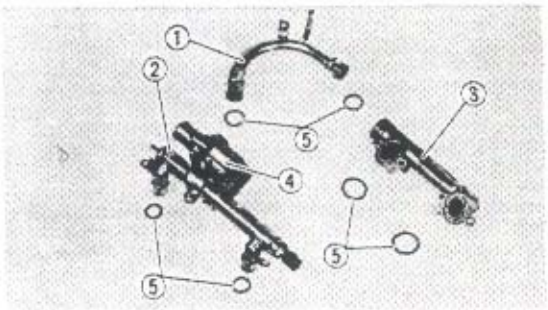
3.Check:
- Oil pipe #2 ①
- Oil delivery pipe #1 ②
- O-rings ③

  Damage → Replace.
  Contamination → Wash and blow out the passage.



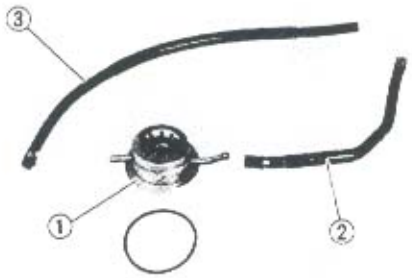
4.Inspect:
- Oil strainer ①.

  Damage → Replace.



5.Check:
- Coolant pipe ①
- Coolant collector (outlet ② and inlet ③)
- Thermostat housing ④
- O-rings ⑤

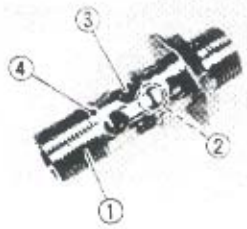
  Damage → Replace.
  Refer to "COOLING SYSTEM" in CHAPTER 5.



**OIL COOLER AND RELIEF VALVE**

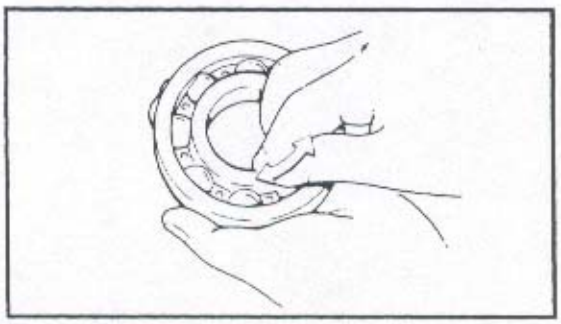
1.Check:
- Oil cooler ①
- Inlet hose ② (oil cooler)
- Outlet hose ③ (oil cooler)

  Cracks/Wear/Damage → Replace.



2.Check:
- By-pass valve body ① (oil cooler)
- Check ball ②
- Spring ③
- Stopper pin ④

  Damage/Wear → Replace.



4

**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:

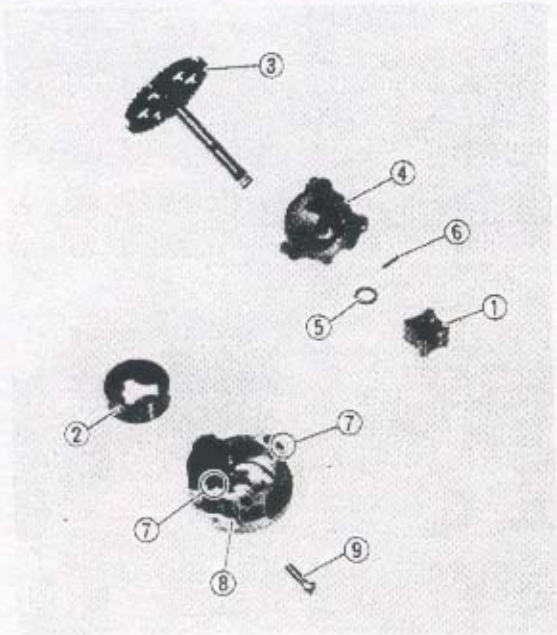
- Circlips
- Washers
  Damage/Looseness/Bends → Replace.

# 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**

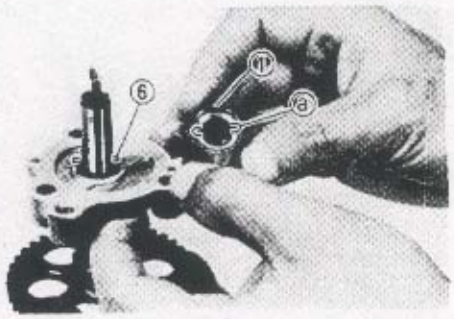
1.Lubricate:

- Inner rotor ①
- Outer rotor ②
- Pump shaft ③

**Recommended lubricant:**
**SAE 10W30 motor oil**

2.Install:

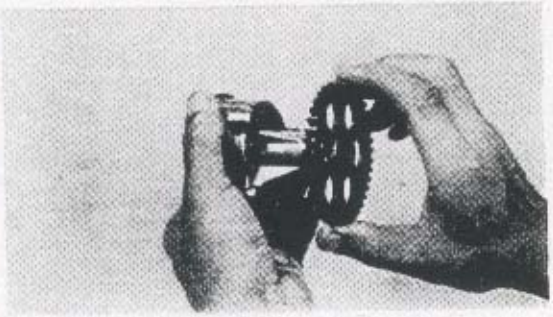
- Pump shaft ③
  (to pump cover ④)
- Washer ⑤
- Pin ⑥
- Inner rotor ①
- Outer rotor ②
- Dowel pins ⑦
- Pump housing ⑧
- Screw ⑨




**Screw (pump housing):**
**7 Nm (0.7 m · kg, 5.1 ft · lb)**

**NOTE:**

When installing the inner rotor, align the pin ⑥ in the pump shaft with the groove ⓐ on the inner rotor ①.



3.Check:

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

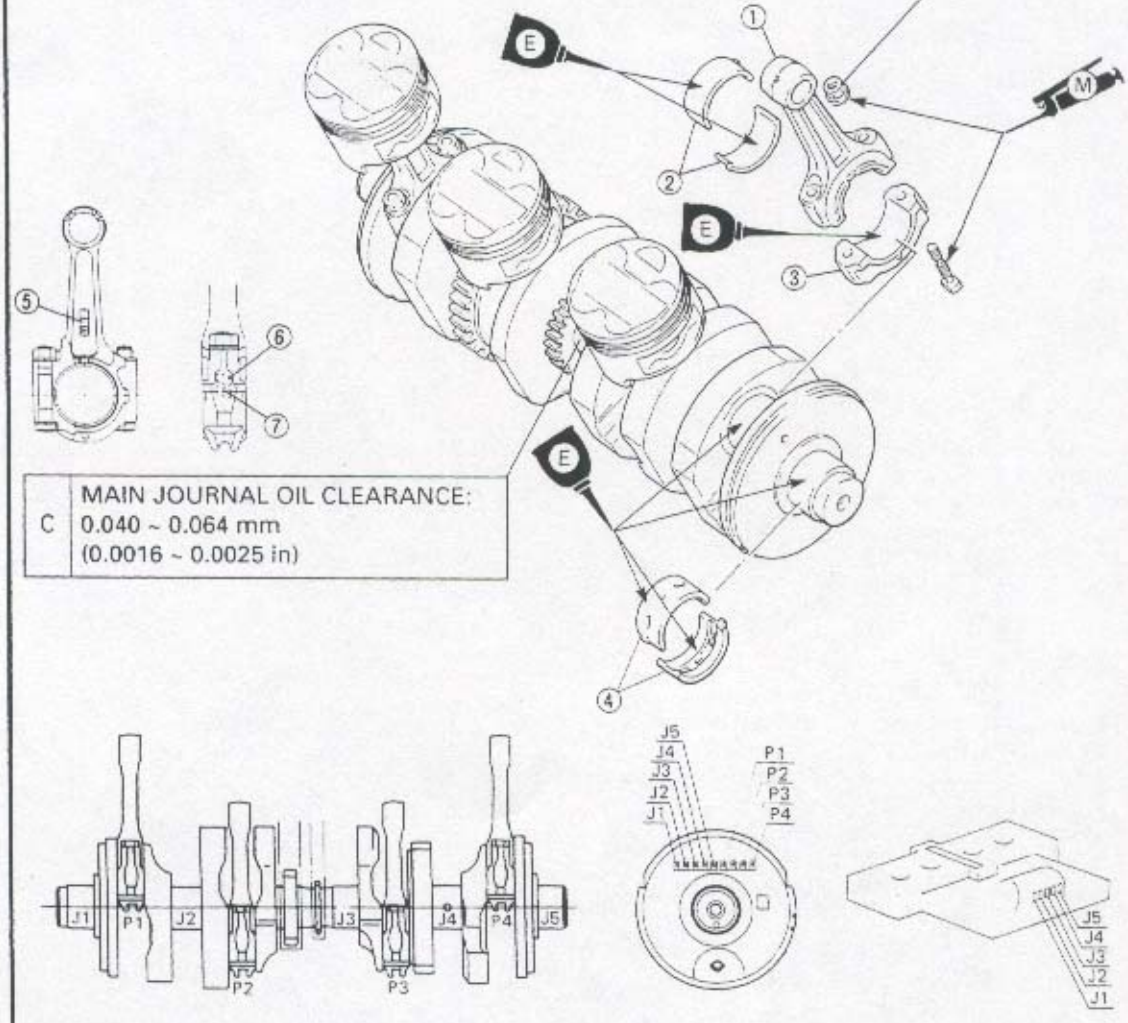
## CONNECTING ROD AND CRANKSHAFT

①Connecting rod
②Plane bearing (connecting rod)
③Connecting rod cap
④Plain bearing (crankshaft-main journal)
⑤Projection mark
⑥Crank pin bearing size
⑦Connecting rod weight number

| | |
|---|---|
| A | CRANKSHAFT RUNOUT LIMIT:<br>0.03 mm (0.0012 in) |
| B | CRANK PIN OIL CLEARANCE:<br>0.032 ~ 0.056 mm<br>(0.001 ~ 0.002 in) |

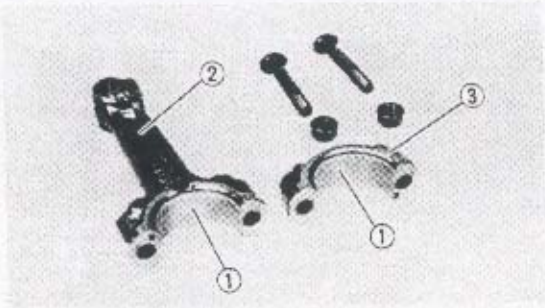
36 Nm (3.6 m • kg, 25 ft • lb)

| | |
|---|---|
| C | MAIN JOURNAL OIL CLEARANCE:<br>0.040 ~ 0.064 mm<br>(0.0016 ~ 0.0025 in) |



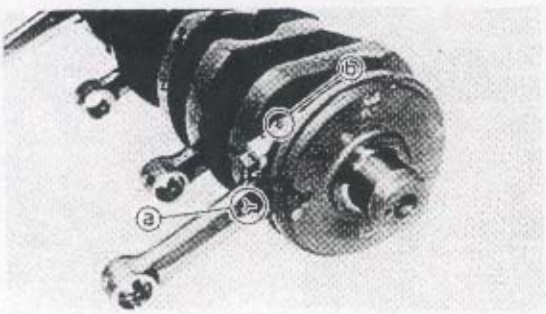
**CONNECTING ROD**

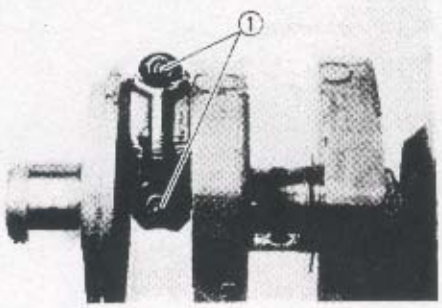
1.Apply:
- Molybdenum disulfide grease (onto threads of bolts and nut seats)
- Engine oil (onto crank pins, crank pin bearings and inner surfaces of connecting rods)




2.Install:
- Bearings ① (crank pin)
- 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 reinstalle 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 from a perfect character.




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

4.Tighten:
- Nuts (connecting rods)

**CAUTION:**

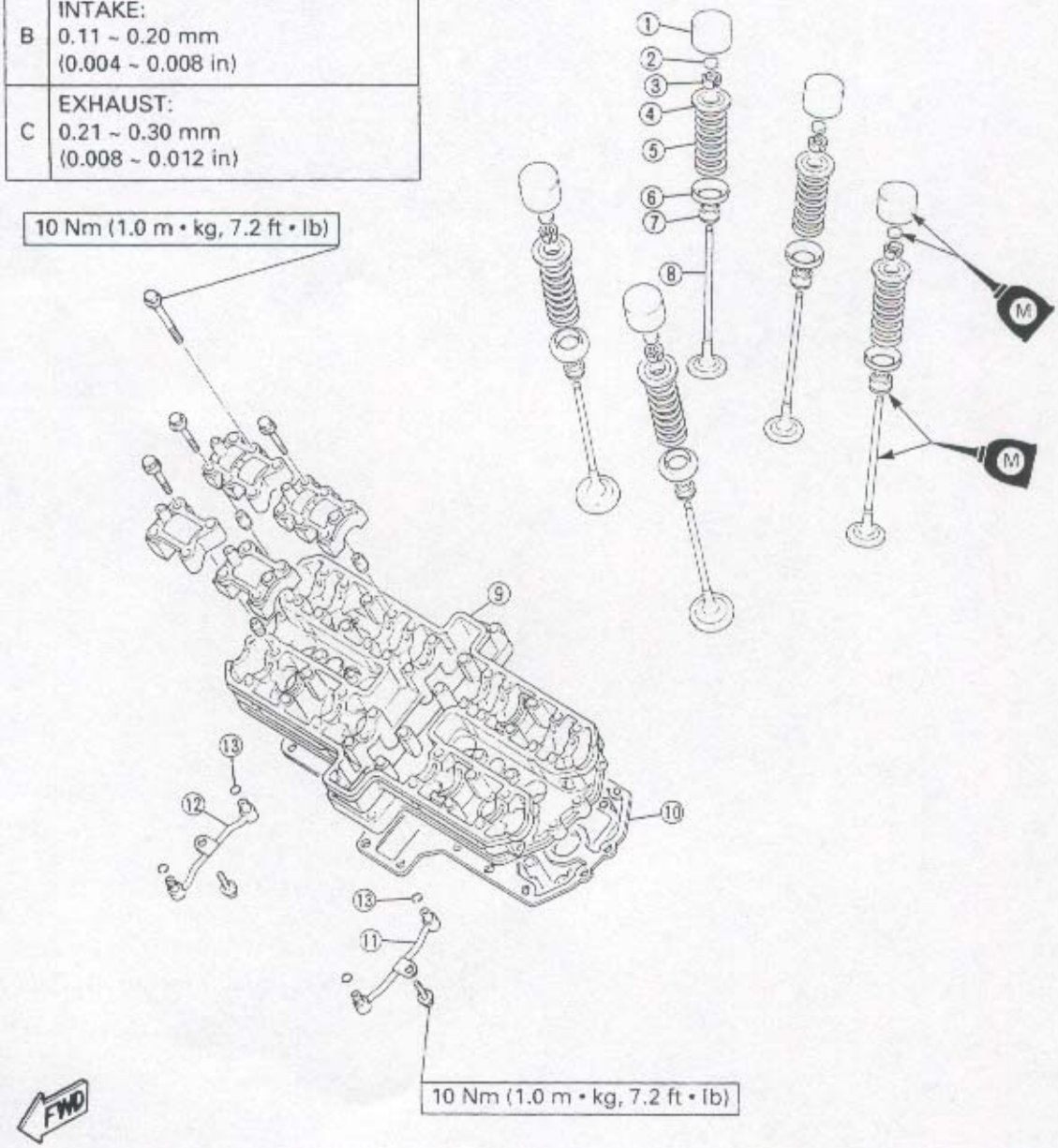
**Tighten to full torque specification without pausing. Apply continuous torque between 2.0 and 3.6 m • kg. Once you reach 2.0 m • kg DO NOT STOP TIGHTENING until final torque is reached. If the tightening is interrupted between 2.0 and 3.6 m • kg, loosen the nut to less than 2.0 m • kg and start again.**

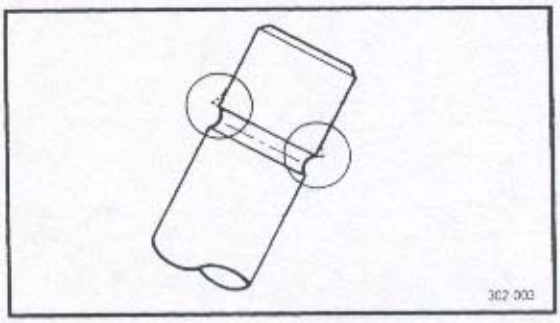
| | |
|---|---|
| | Nut (connecting rod): 36 Nm (3.6 m • kg, 25 ft • lb) |

## VALVE AND CAMSHAFT CASE

①Valve lifter
②Pad
③Valve cotter
④Valve spring retainer
⑤Valve spring
⑥Spring seat
⑦Oil seal
⑧Valve
⑨Camshaft case
⑩Gasket (camshaft case)
⑪Oil delivery pipe #3
⑫Oil delivery pipe #4
⑬O-ring

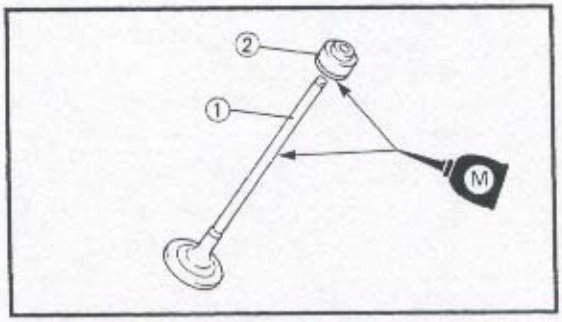
| | |
|---|---|
| A | VALVE CLEARANCE (COLD): |
| B | INTAKE:<br>0.11 ~ 0.20 mm<br>(0.004 ~ 0.008 in) |
| C | EXHAUST:<br>0.21 ~ 0.30 mm<br>(0.008 ~ 0.012 in) |



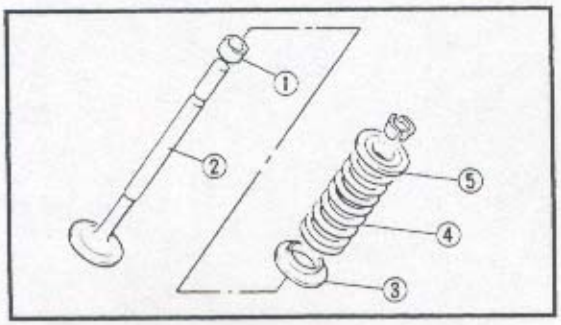


### VALVE AND CAMSHAFT CASE

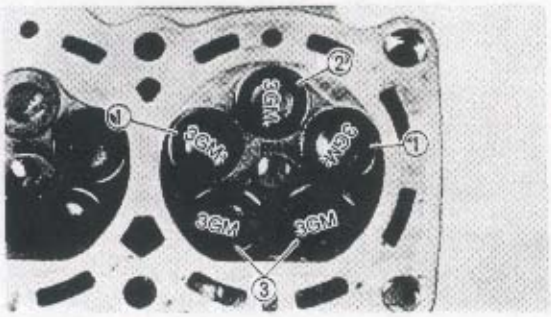
1.Deburr:
- Valve stem end
  Use an oil stone to smooth the stem end.



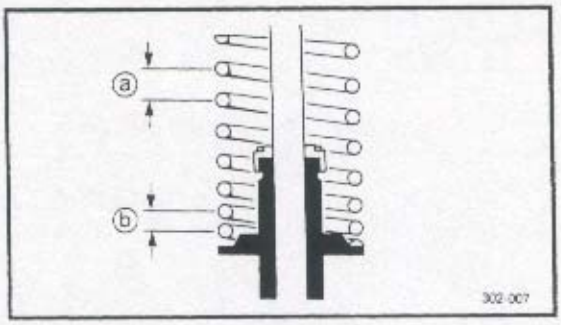

2.Apply:
- Molybdenum disulfide oil
  (onto valve stem ① and oil seal ②)




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

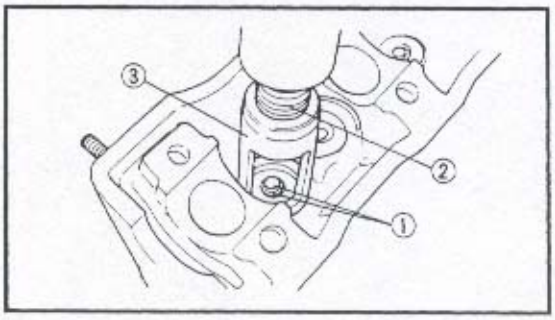



**NOTE:**
- Make sure that each valve is installed in its original place, also refering to the embossed mark as follows:
  Intake (right/left): "3GM:" ①
  Intake (middle): "3GM." ②
  Exhaust "3GM" ③




- Install the valve spring with the larger pitch ⓐ facing upwards.

ⓑ Smaller pitch



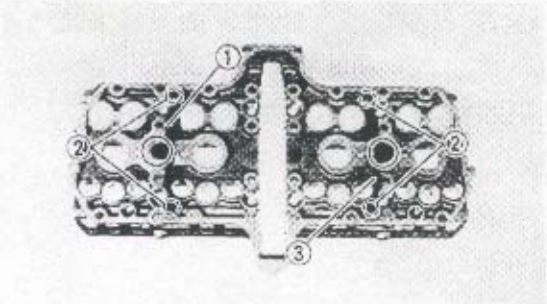

4.Install:
- Valve cotters ①

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

**Valve spring compressor ② :**
**YM-04019/90890-04019**
**Attachment ③ :**
**(For exhaust valve)**
**YM-04108/90890-04108**
**(For intake valve)**
**YM-04114/90890-04114**

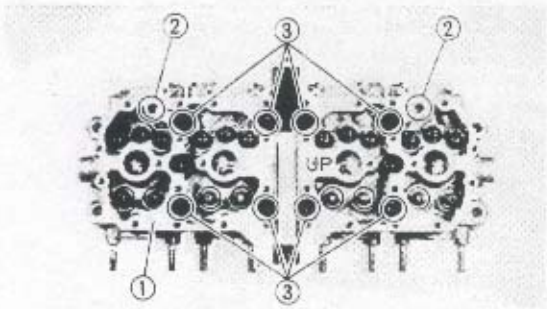
5.Secure the valve cotters ① onto the valve stem by tapping lightly with a piece of wood.

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




6.Install:
- Oil delivery pipe #4 ①
  (with O-rings ②)
- Oil delivery pipe #3 ③
  (with O-rings ②)
  (onto camshaft case)

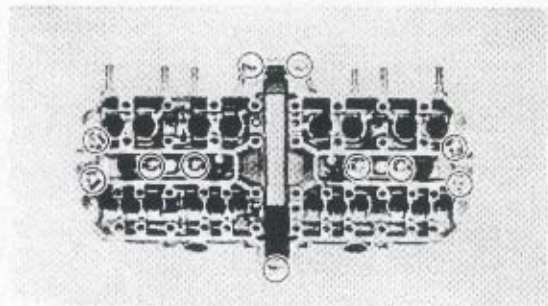
**Bolt (oil delivery pipe #3/#4):**
**10 Nm (1.0 m · kg, 7.2 ft · lb)**




7.Install:
- Gasket ① (camshaft case)
- Dowel pins ②
- Nut ③

**NOTE:**
Be sure the "UP" mark is correctly readable.

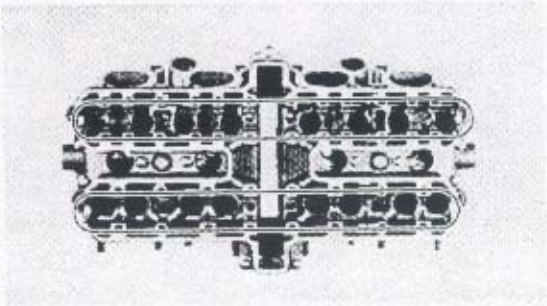
**⚠ WARNING**
**Always use a new gasket (camshaft case).**



8.Install:
- Camshaft case

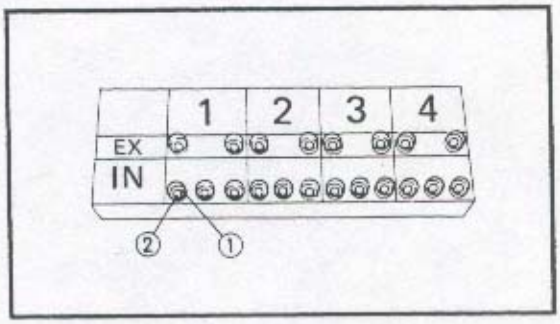
**Bolt (camshaft case):**
**10 Nm (1.0 m · kg, 7.2 ft · lb)**

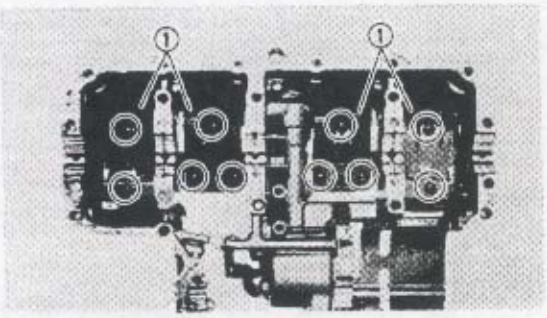
**NOTE:**
- Apply molybdenum disalfide oil to the bolt threads.
- Tighten the bolts in a crisscross pattern starting from the center.



9.Install:
- Pads ①
- Valve lifters ②

**NOTE:**
- Apply molybdenums disulfide oil to the valve lifters and pads.
- The valve lifters must move smoothly when rotated with the finger.
- Each valve lifter and pad must be reinstalled in its original position.

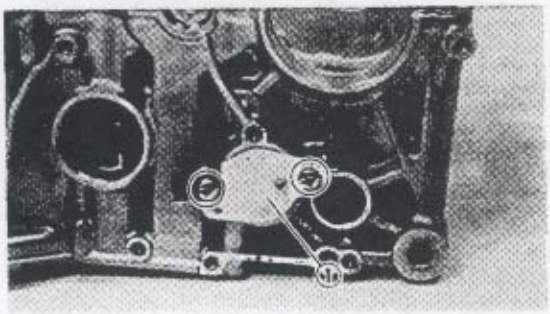



**SHIFT FORK AND SHIFT CAM**

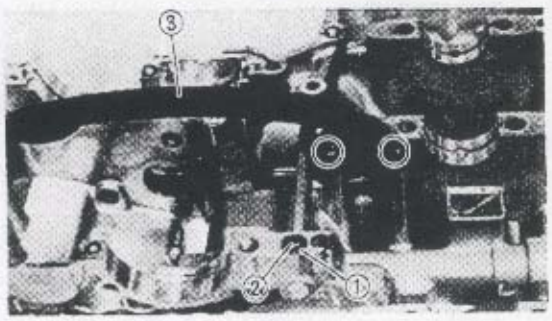
1.Install:
- Baffle plates ①

| | |
|---|---|
| | **Bolts (baffle plate):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)**<br>**LOCTITE®** |



2.Install:
- Neutral switch ①

**NOTE:**
Apply engine oil to the O-ring on the neutral switch body.




3.Install:
- O-ring ①
- Dowel pin ②
- Timing chain guide ③ (intake side)

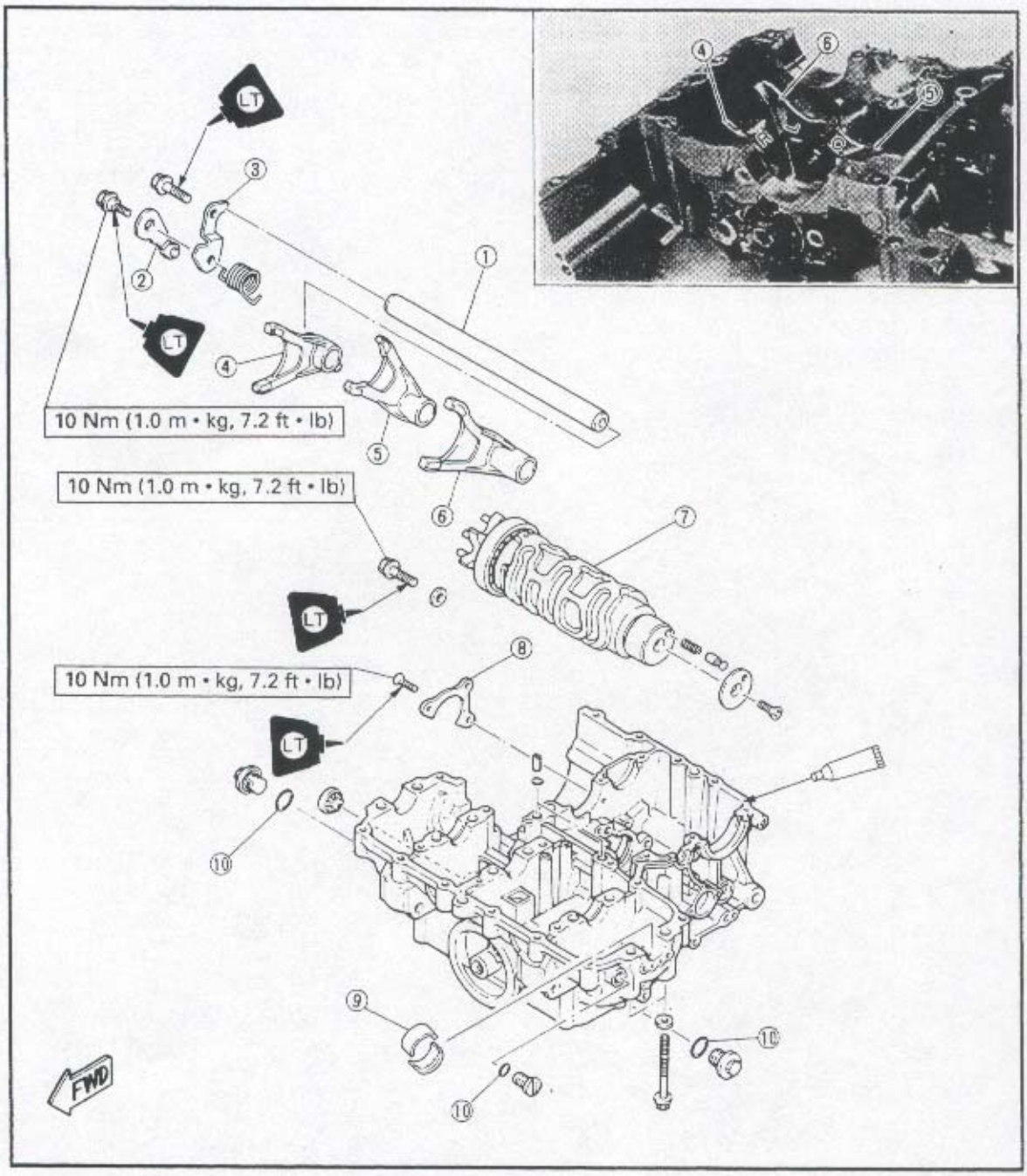
| | |
|---|---|
| | **Bolt (chain guide):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

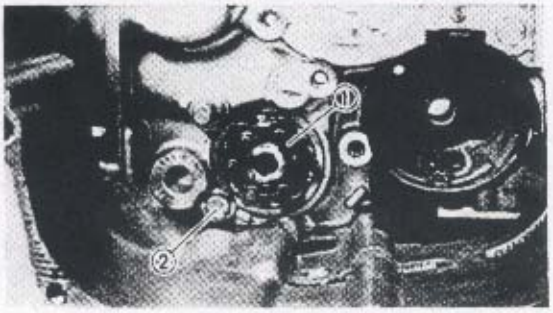
**⚠ WARNING**

**Always use a new O-ring.**

## LOWER CRANKCASE

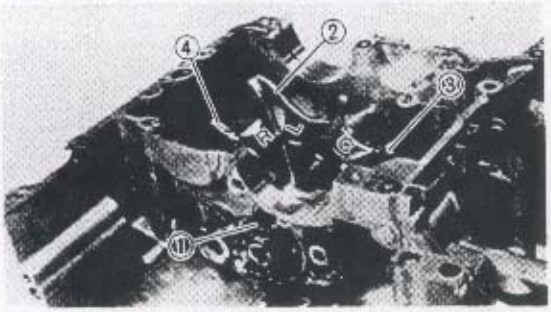
①Guide bar
②Stopper lever
③Guide bar stopper
④Shift fork (R)
⑤Shift fork (C)
⑥Shift fork (L)
⑦Shift cam
⑧Bearing retainer (main axle)
⑨Bearing (main journal)
⑩O-ring





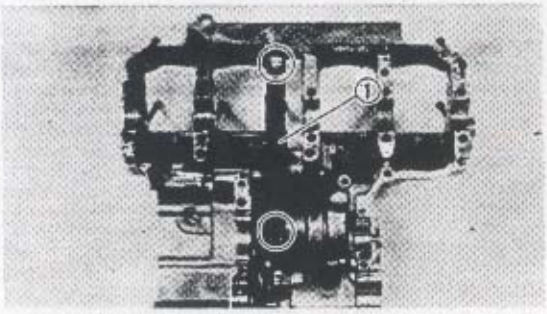

4.Install:
- Shift cam assembly ①
- Bolt ② (bearing stopper) (with washer)

**Bolt (bearing stopper):**
**10 Nm (1.0 m • kg, 7.2 ft • lb)**
**LOCTITE®**




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

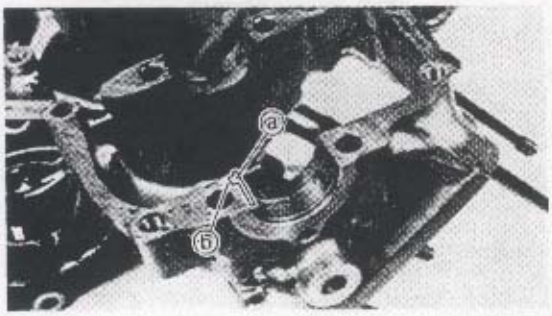
**NOTE:**
Install the shift forks with the embossed mark to the right and in sequence (R, C, L) beginning from the right.




**STARTER CLUTCH AND CRANKSHAFT**

1.Install:
- HY-VO chain guide ①

**Bolt (HY-VO chain guide):**
**10 Nm (1.0 m • kg, 7.2 ft • lb)**
**LOCTITE®**



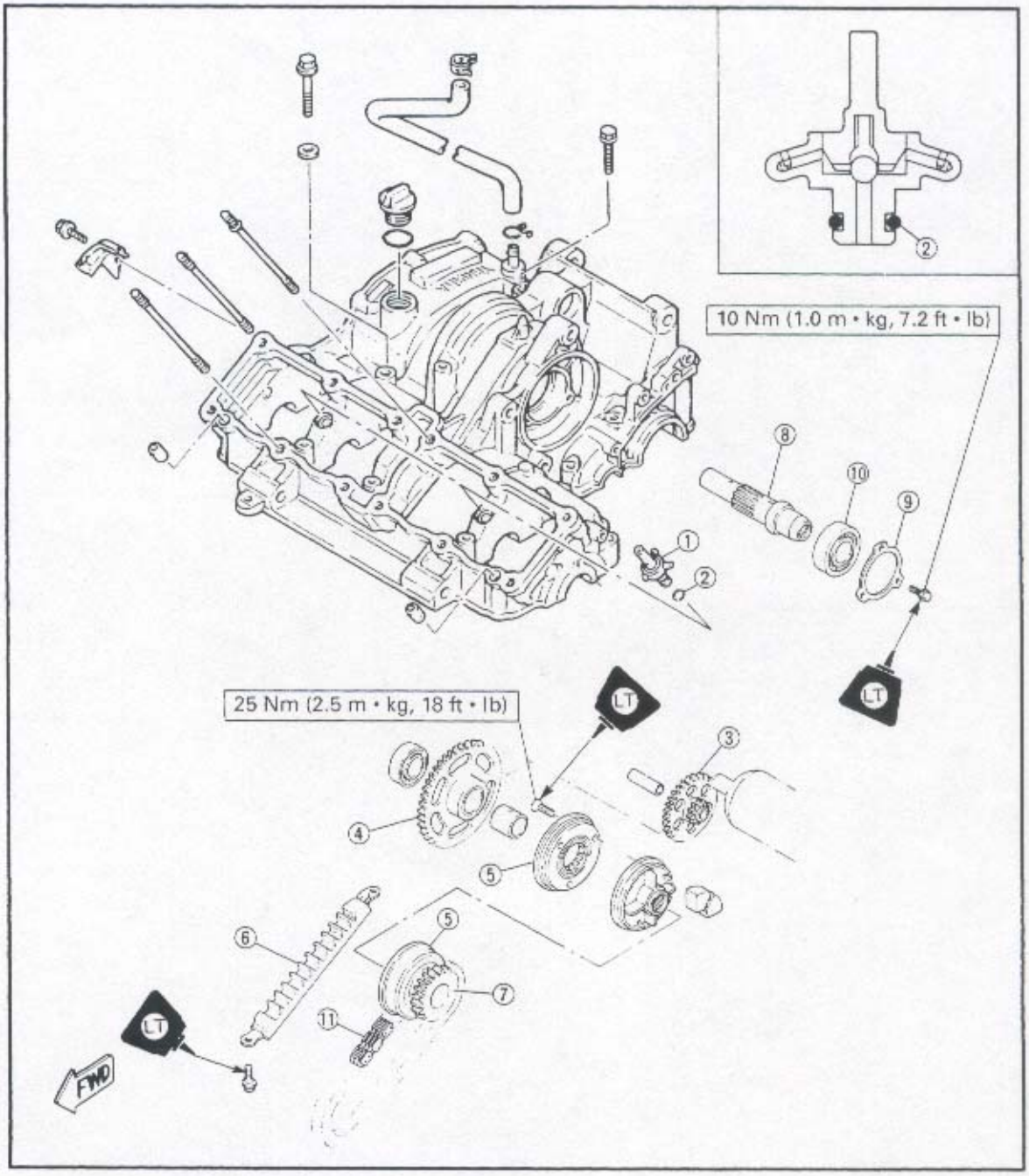

2.Install:
- Main journal bearings (onto upper crankcase crankshaft)

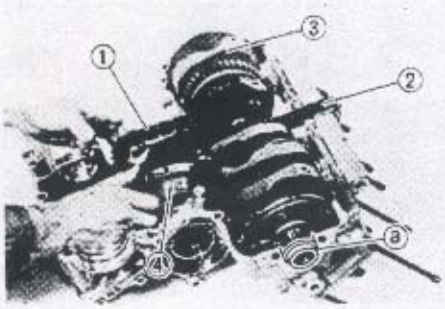
**NOTE:**
- Align the projection ⓐ of the bearing with the notch ⓑ in the case.
- Be sure to install each bearing (crankshaft) in its original place.

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

## UPPER CRANKCASE

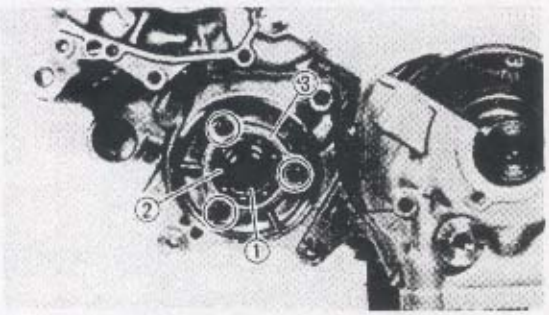
①Oil-Jet nozzle
②O-ring
③Starter idle gear
④Starter clutch gear
⑤Starter clutch
⑥HY-VO chain guide
⑦Drive gear (AC generator)
⑧AC generator shaft
⑨Bearing retainer
⑩Bearing
⑪HY-VO chain





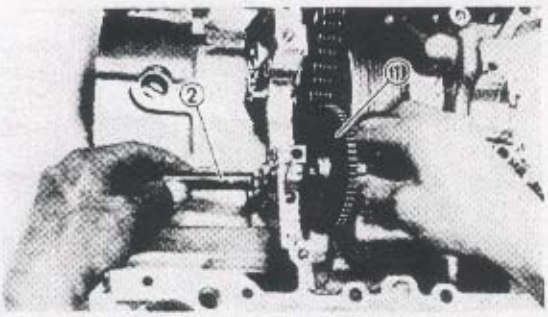

4.Install:
- HY-VO chain ①
- Timing chain ②
  (onto crankshaft)
- Crankshaft assembly ③
- Starter clutch assembly ④

**NOTE:**
- The stepped crankshaft end ⓐ should point to the left.
- Pass the timing chain through the timing chain cavity and attach a retaining wire to it.

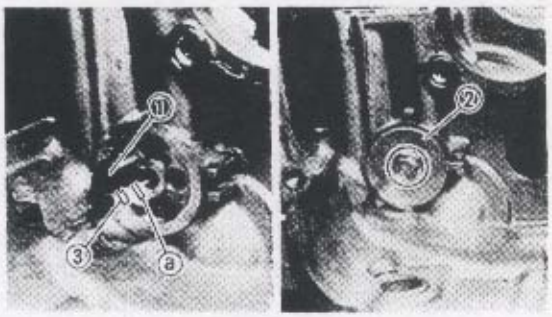



5.Install:
- AC generator shaft ①
- Bearing ②
- Bearing retainer ③
- Bolts

| | |
|---|---|
| | **Bolt (bearing retainer):**<br>**10 Nm (1.0 m · kg, 7.2 ft · lb)**<br>**LOCTITE®** |




6.Install:
- Starter idle gear ①
- Shaft ②

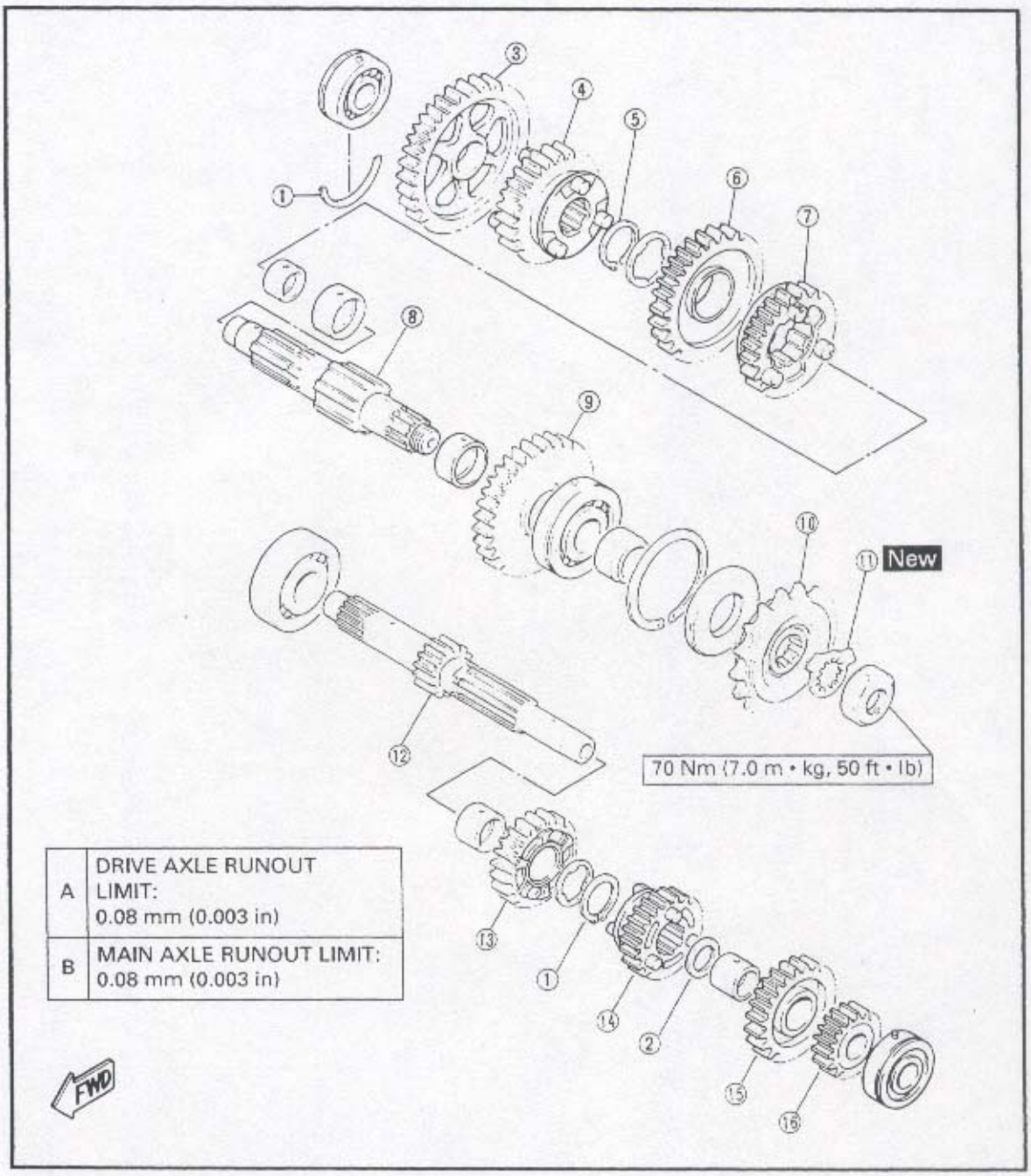


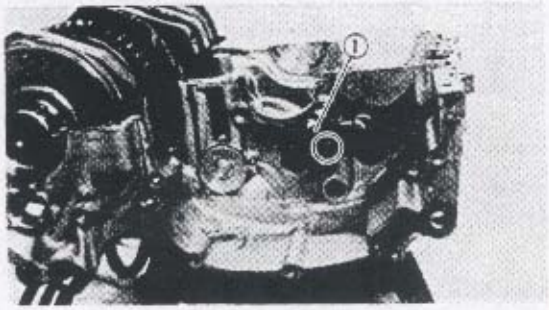

7.Install:
- Oil spray nozzle ①
- Gasket
- Oil plug plate ②

**NOTE:**
When installing the oil spray nozzles, align the pin ③ with the slot ⓐ in the crankcase.

## TRANSMISSION

①Circlip
②Plain washer
③1st wheel gear (36T)
④4th wheel gear (27T)
⑤Circlip
⑥3rd wheel gear (29T)
⑦5th wheel gear (28T)
⑧Drive axle
⑨2nd wheel gear (32T)
⑩Drive sprocket
⑪Lock washer
⑫Main axle (14T)
⑬4th pinion gear (23T)
⑭3rd pinion gear (21T)
⑮5th pinion gear (27T)
⑯2nd pinion gear (18T)





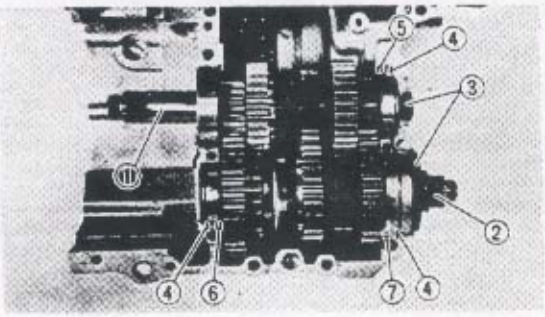

8.Install:
- Oil delivery pipe #5 ①
  (with O-rings)

| | |
|---|---|
| | **Bolt (oil plug plate):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Lubricate the O-rings with lithium soap base grease.

**TRANSMISSION**

1.Install:
- Main axle assembly ①
- Drive axle assembly ②
- Oil seals ③
- Circlips ④



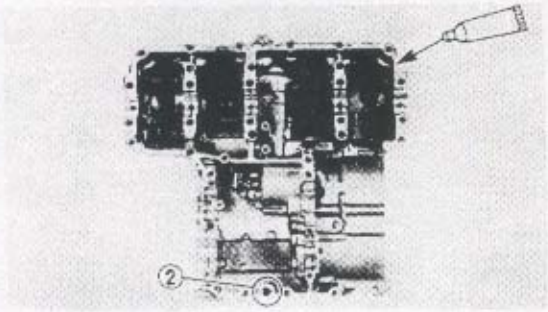

**NOTE:**
- Be sure that the drive axle bearing circlips ④ are inserted into the upper crankcase positioning grooves.
- The main axle bearing pin ⑤ must point to the front of the crankcase, the drive axle bearing pin ⑥ and ⑦ to the rear side.

2.Check:
- Transmission
  Unsmooth rotation → Repair.

**NOTE:**
Oil each gear and bearing thoroughly.

**CRANKCASE ASSEMBLY**

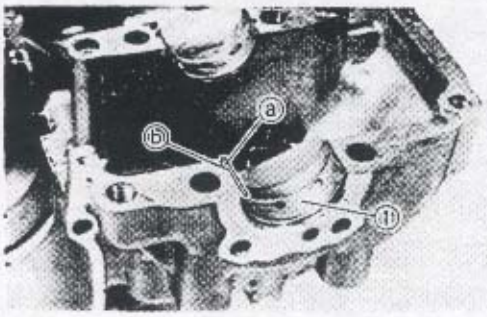
1.Apply:
- Engine oil
  (onto main journal bearings)
- Sealant
  (onto crankcase mating surfaces)




| | |
|---|---|
| | **Yamaha bond No. 1215:**<br>**90890-85505**<br>**Quick gasket®:**<br>**ACC-11001-15-01** |

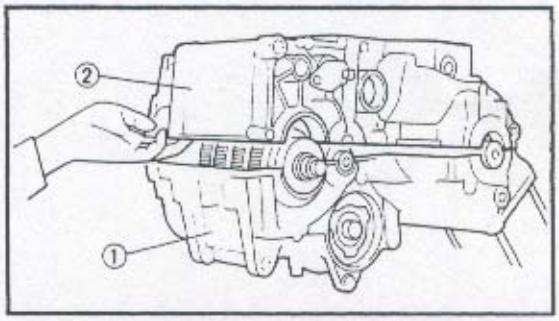
**NOTE:**
DO NOT ALLOW any sealant to come in contact with the oil gallery or crankshaft bearings. Do not apply sealant to within 2 ~ 3 mm (0.08 ~ 0.12 in) of the bearings.

2.Install:
- Dowel pin ②

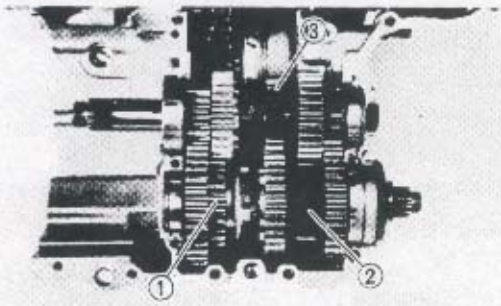



3.Install:
- Main journal bearings ①
  (onto lower crankcase)

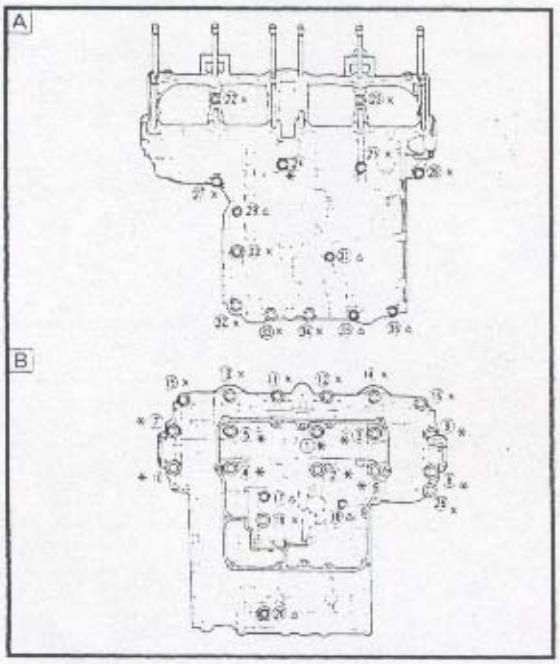
**NOTE:**
- Align the projection ⓐ of the bearing with the notch ⓑ in the crankcase.
- Install each bearing in its original place.




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 "L" with the 4th wheel gear ① and "R" with the 5th wheel gear ② on the drive axle.
- Mesh the shift fork "C" with the 3rd pinion gear ③ on the main axle.

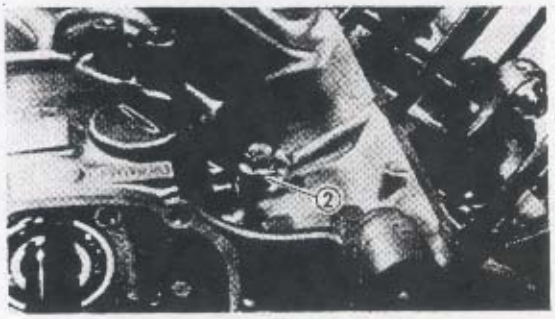



**CAUTION:**
**Before tightening the crankcase bolts, check the following points:**
- **Be sure the gears shift correctly when the shift cam is turned by hand.**

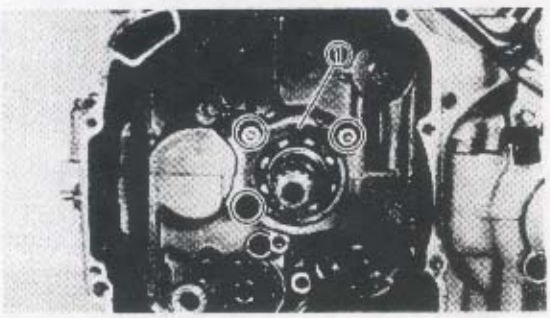
6.Tighten:
- Upper crankcase bolt
- Lower crankcase bolt
  (follow the proper tightening sequence)

**△ M6 bolt:**
**12 Nm (1.2 m • kg, 8.7 ft • lb)**
**× M8 bolt:**
**24 Nm (2.4 m • kg, 17 ft • lb)**
**✳ M9 bolt:**
**32 Nm (3.2 m • kg, 23 ft • lb)**

A Upper crankcase
B Lower crankcase

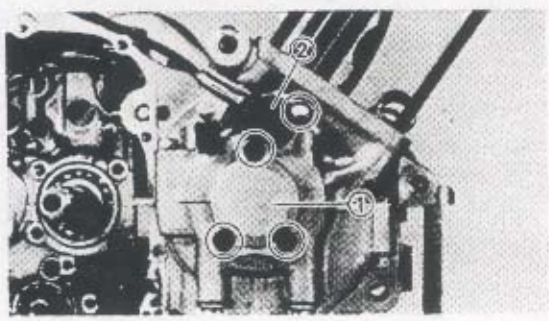


**NOTE:**
- Lubricate the threads of bolts with engine oil.
- Tighten the bolts in the tightening sequence cast on the crankcase.
- Install a washer ① on bolt No. 7, 8, 9 and 10.
- Install a copper washer ② on bolt No. 24 .



7.Install:
- Bearing retainer ① (main axle)
  Use torx wrench (T30).

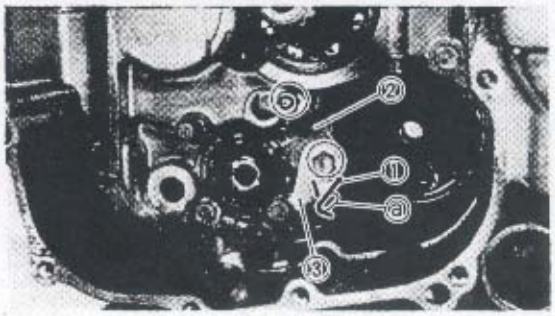
| | |
|---|---|
| | **Screw (bearing retainer):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)**<br>**LOCTITE®** |



8.Install:
- Crankshaft end cover ① (right)
  (with O-ring)
- Crankshaft sensor ②
  (with O-ring)

| | |
|---|---|
| | **Screw (crankshaft end cover):**<br>**7 Nm (0.7 m • kg, 5.1 ft • lb)**<br>**Bolt (crankshaft sensor):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Apply engine oil to the O-ring of the crankshaft sensor.



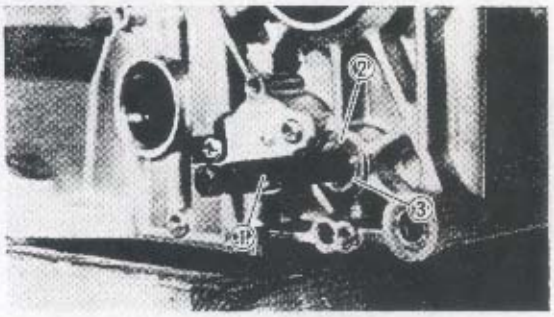
**SHIFT SHAFT AND OIL PUMP**

1.Install:
- Return spring ①
- Stopper plate ② (guide bar and bearing)
- Stopper lever ③

| | |
|---|---|
| | **Bolt (stopper plate/stopper lever): 10 Nm (1.0 m • kg, 7.2 ft • lb) LOCTITE®** |

**NOTE:**
- Hook the spring ends on the stopper lever ③ and crankcase boss ⓐ.
- Mesh the stopper lever ③ with the shift cam stopper.



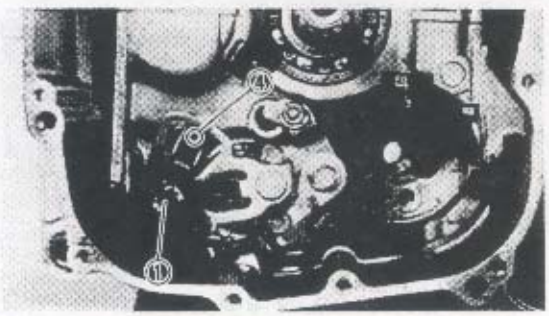


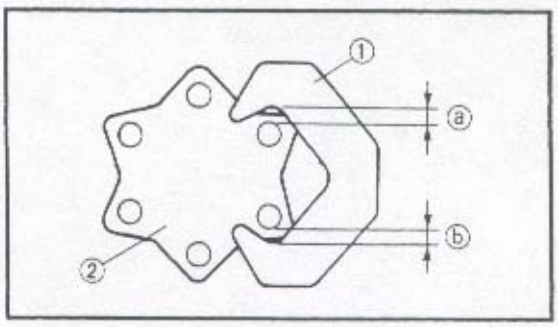
2.Install:
- Shift shaft ①
- Washer ②
- Circlip ③

**NOTE:**
- Apply grease to the oil seal lips.
- Hook the spring ends onto the stopper ④.

**⚠ WARNING**

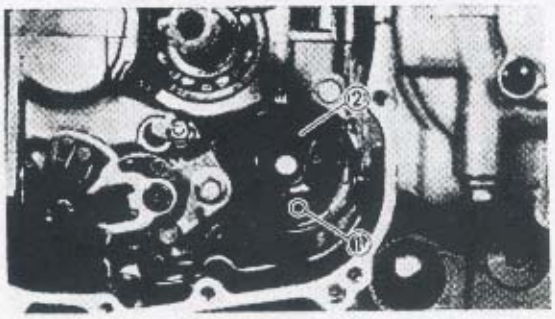
**Always use a new circlip.**



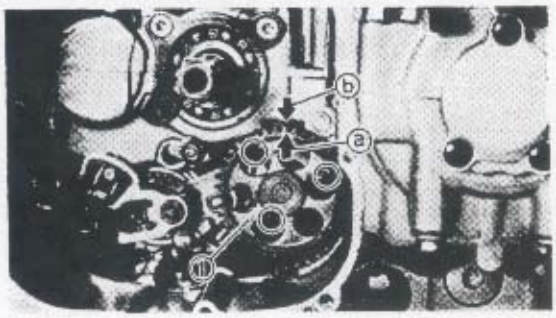


3.Check:
- Shift pawl ① position
  Gaps ⓐ and ⓑ are not equal → Replace defective parts.

②Shift cam




4.Install:
- Dowel pin ①
- Gasket ②



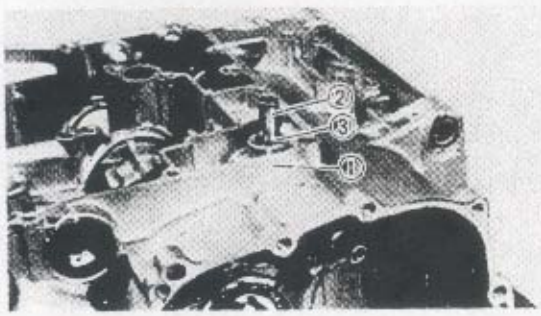

5.Install:
- Oil pump assembly ①

| | |
|---|---|
| | **Bolt (oil pump assembly): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Align the arrow mark ⓐ on the oil pump with the arrow mark ⓑ on the crankcase.

**CAUTION:**
**Be sure that the oil pump turns smoothly after tightening the bolts.**

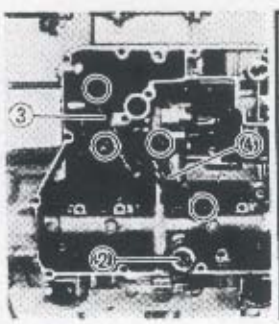


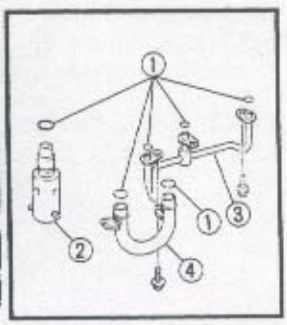



**OIL PAN AND OIL STRAINER**

1.Install:
- Mounting rubber ①
- Oil pipe ②
- Circlip ③

**NOTE:**
Fit the mounting rubber correctly onto the crankcase.



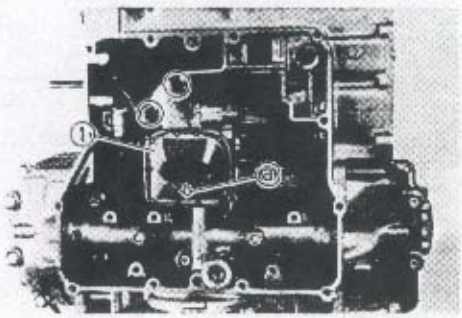

2.Install:
- O-rings ①
- Relief valve ②
- Oil delivery pipe #1 ③
- Oil pipe #2 ④

**NOTE:**
Apply engine oil to the O-rings.

**⚠ WARNING**

**Always use new O-rings.**

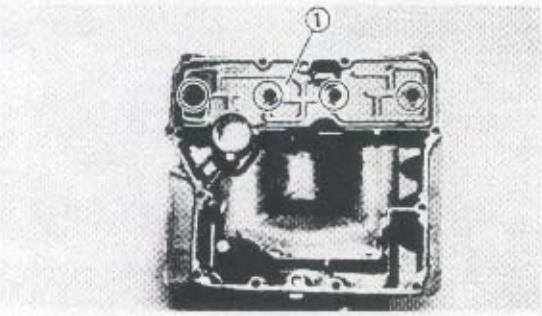
| | |
|---|---|
| | **Bolt (oil delivery pipe #1 / oil pipe #2): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |



3.Install:
- Oil strainer assembly ①.

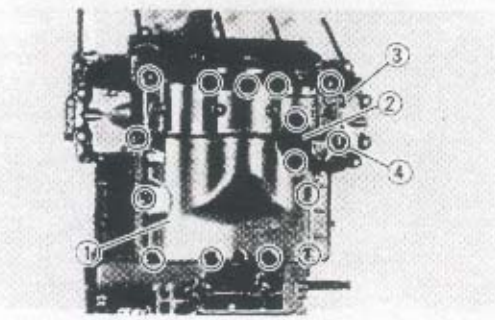
| | |
|---|---|
| | **Bolt (oil strainer): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
The arrow mark ⓐ on the strainer cover must point to the front of the engine.



4.Install:
- Baffle plate ① (oil pan)

| | |
|---|---|
| | **Bolt (baffle plate): 10 Nm (1.0 m • kg, 7.2 ft • lb) LOCTITE®** |



5.Install:
- Dowel pins
- Gasket (oil pan)
- Oil pan ①
- Oil level switch ②
  (with O-ring)
- Drain bolt ③
  (with copper washer)

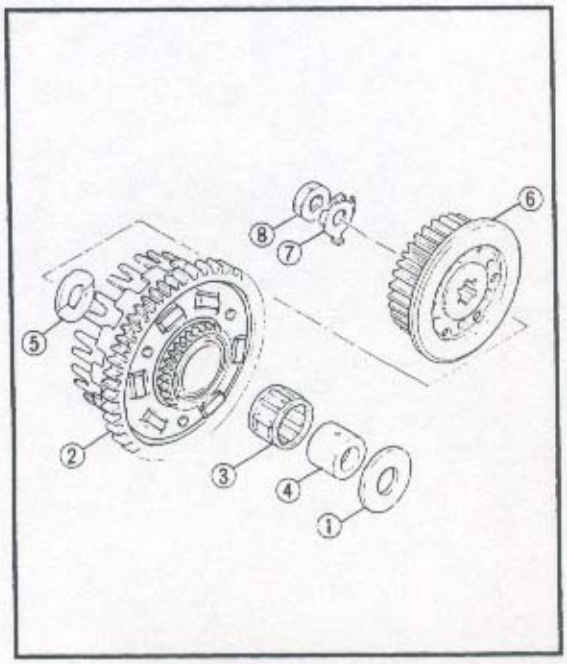
②Clamp (oil level switch lead)

**⚠ 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.

| | |
|---|---|
| | **Bolt (oil pan):** **10 Nm (1.0 m • kg, 7.2 ft • lb)** **Bolt (oil level switch):** **10 Nm (1.0 m • kg, 7.2 ft • lb)** **Drain bolt:** **43 Nm (4.3 m • kg, 31 ft • lb)** |

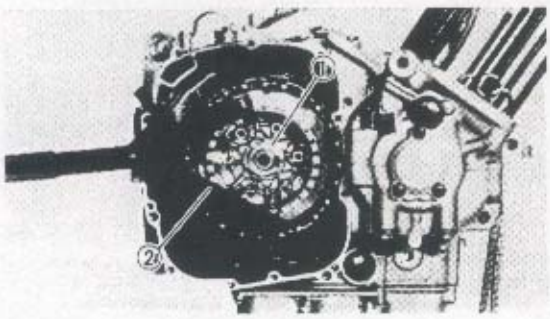



**CLUTCH**

1.Install:
- Thrust washer ①
- Clutch housing ②
- Bearing ③
- Spacer ④
- Thrust washer ⑤
- Clutch boss ⑥
- Lock washer ⑦
- Nut ⑧ (clutch boss)

**NOTE:**
Install the spacer ④ with the two screw holes towards the clutch boss.

**⚠ WARNING**
**Always use a new lock washer.**




2.Tighten:
- Nut ① (clutch boss)

| | |
|---|---|
| | **Nut (clutch boss):** **70 Nm (7.0 m • kg, 50 ft • lb)** |

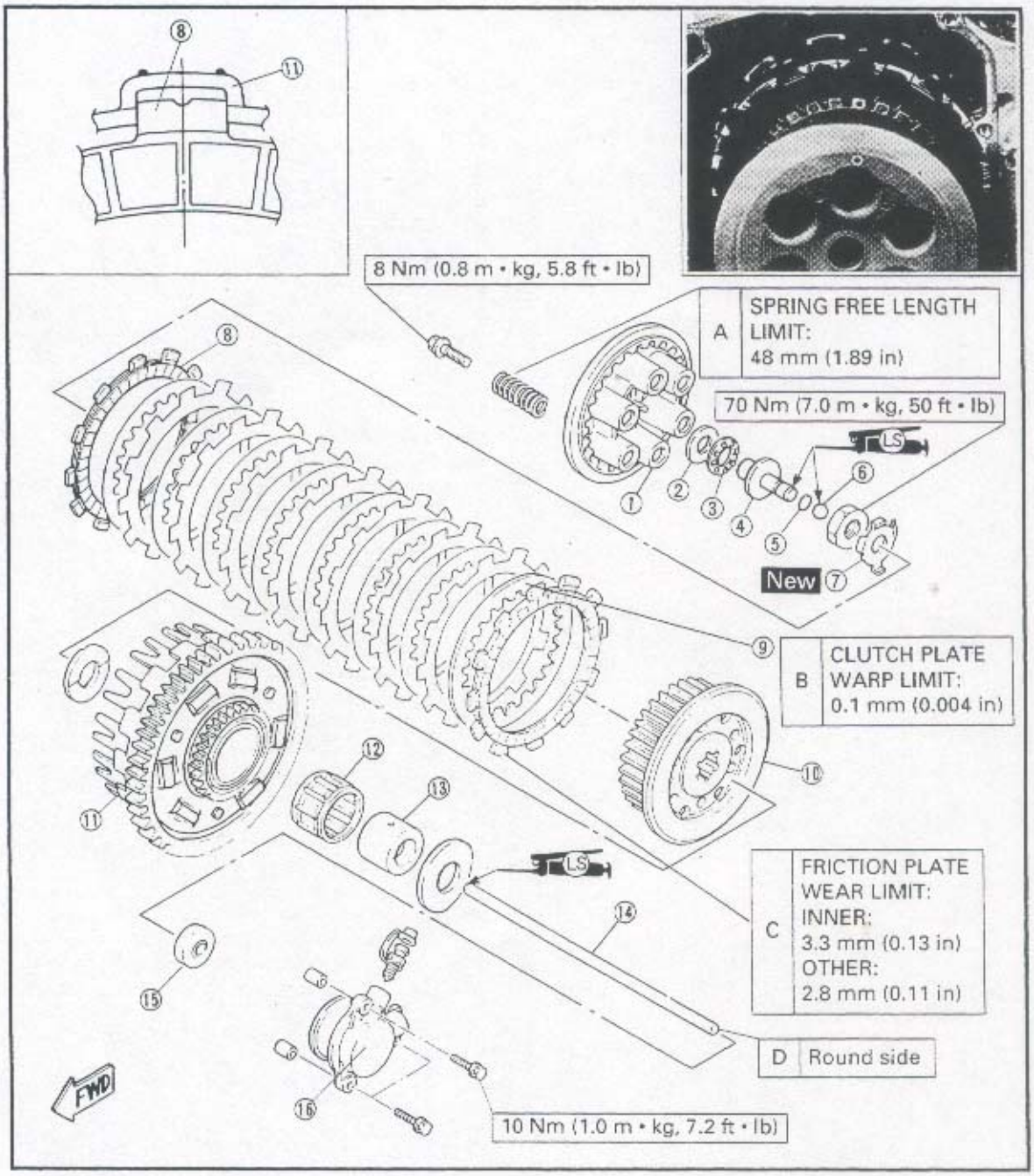
**NOTE:**
Tighten the nut ① (clutch boss) while holding the clutch boss with the universal clutch holder ②.

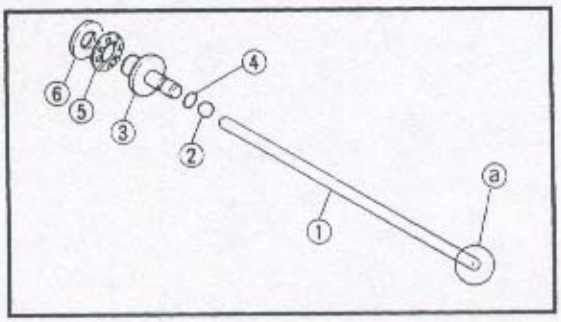
| | |
|---|---|
| | **Universal clutch holder:** **YM-91042/90890-04086** |

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

## CLUTCH

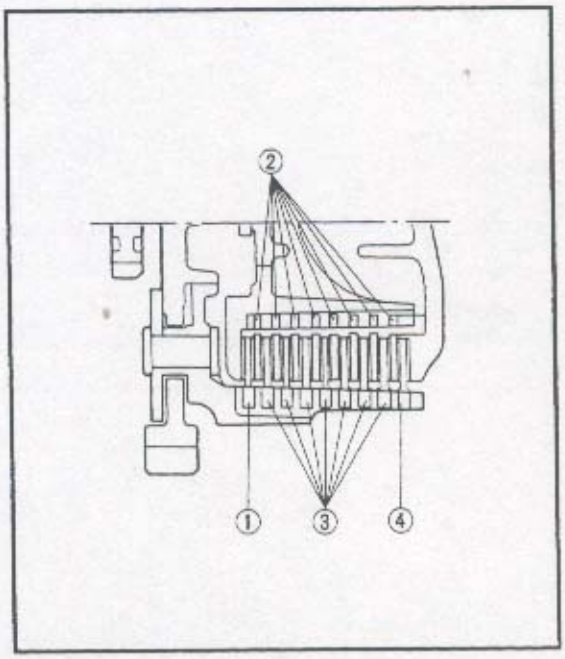
①Pressure plate
②Washer
③Bearing
④Push rod #1
⑤O-ring
⑥Ball
⑦Lock washer
⑧Friction plate
⑨Clutch plate
⑩Clutch boss
⑪Clutch housing
⑫Bearing
⑬Spacer
⑭Push rod #2
⑮Oil seal
⑯Clutch release cylinder






4.Install:
- Push rod #2 ①
- Ball ②
- Push rod #1 ③ (with O-ring ④)
- Bearing ⑤
- Washer ⑥

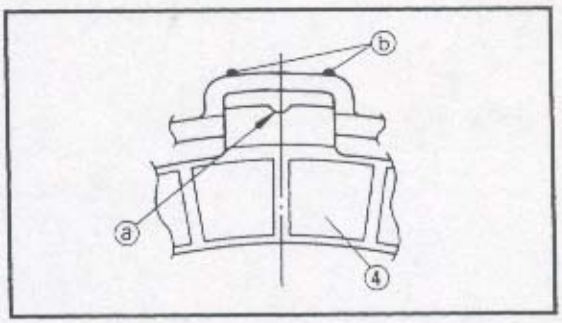
**NOTE:**
- Insert the push rod #2 with the rounded end ⓐ first into the clutch boss.
- Apply lithium soap base grease to the ball and the push rods #1 and #2.




5.Install:
- Friction plates
- Clutch plates

**********

**Installation steps:**
- Install the thickest friction plate ① (3.4 ~ 3.6 mm (0.134 ~ 0.142 in) thickness as opposed to 3.0 mm for the other friction plates) first and install the clutch plate ②.
- Install friction plates (3.0 mm thickness) ③ and clutch plates ② alternately.
- Install the outer friction plate ④ (with the single semicircular slot ⓐ) last.

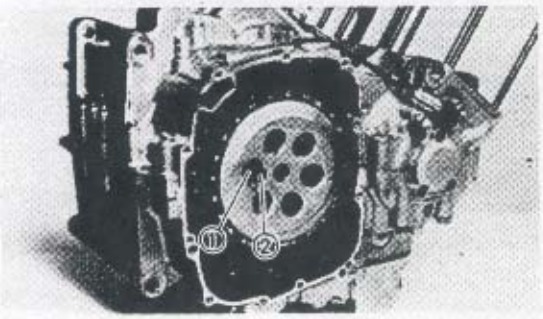



**NOTE:**
Be sure that the semicircular slot ⓐ on the friction plate is aligned with the mark ⓑ embossed in the clutch housing.

**********

6.Install:
- Pressure plate ①

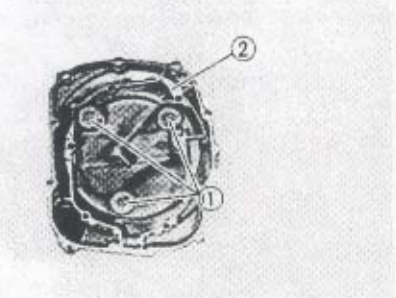
**NOTE:**
Align the punched mark ⓐ on the clutch boss with the punched mark ⓑ on the pressure plate.




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

| | |
|---|---|
| | **Bolt (clutch spring):**<br>**8 Nm (0.8 m • kg, 5.8 ft • lb)** |

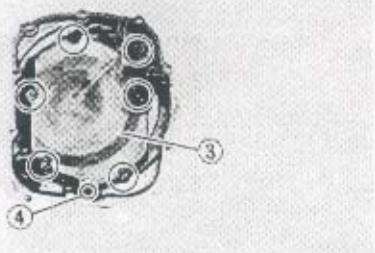
**NOTE:**
Tighten the bolts (clutch spring) is stage, using a crisscross pattern.

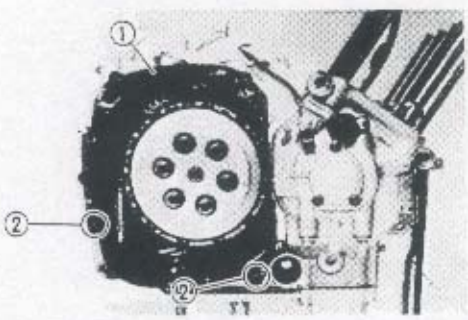



8.Install:
- Cover (outer)
- Rubber ring
- Washer ①
- Gasket ②
- Cover ③ (breather)

**NOTE:**
Apply grease to the O-ring ④.

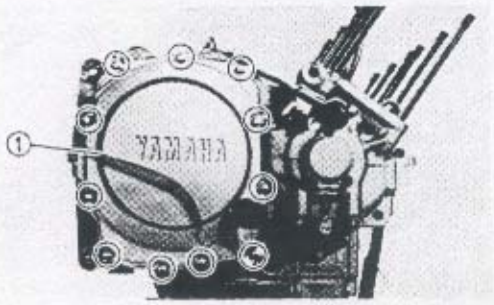
**⚠ WARNING**
**Always use a new gasket.**




9.Install:
- Gasket ①
- Dowel pins ②

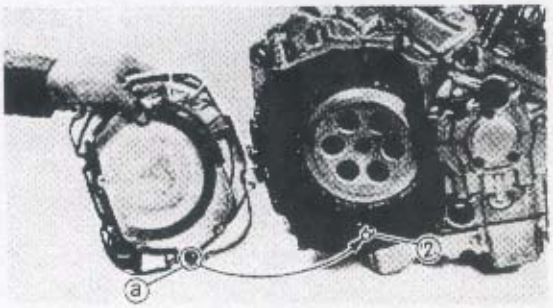
**⚠ WARNING**
**Always use a new gasket.**




10.Install:
- Crankcase cover ① (right)

| | |
|---|---|
| | **Bolt (crankcase cover): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

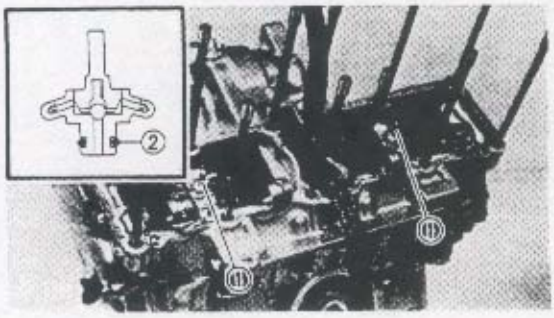
**NOTE:**
- When installing the crankcase cover, make sure that the oil pipe ② under the clutch fits correctly into the hole ⓐ on the cover
- Tighten the bolts (crankcase cover) in stage, using a crisscross pattern.

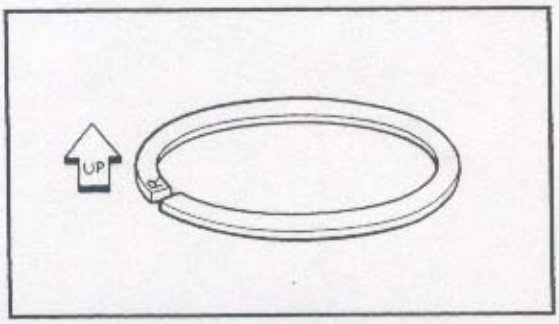



**PISTON AND CYLINDER**

1.Install:
- Oil-jet nozzles ①
  (with O-ring ②)

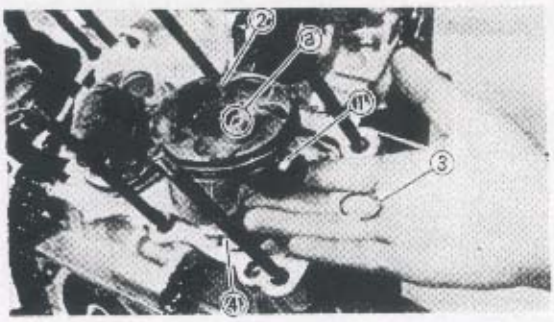
**NOTE:**
Apply engine oil to the O-rings.




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.



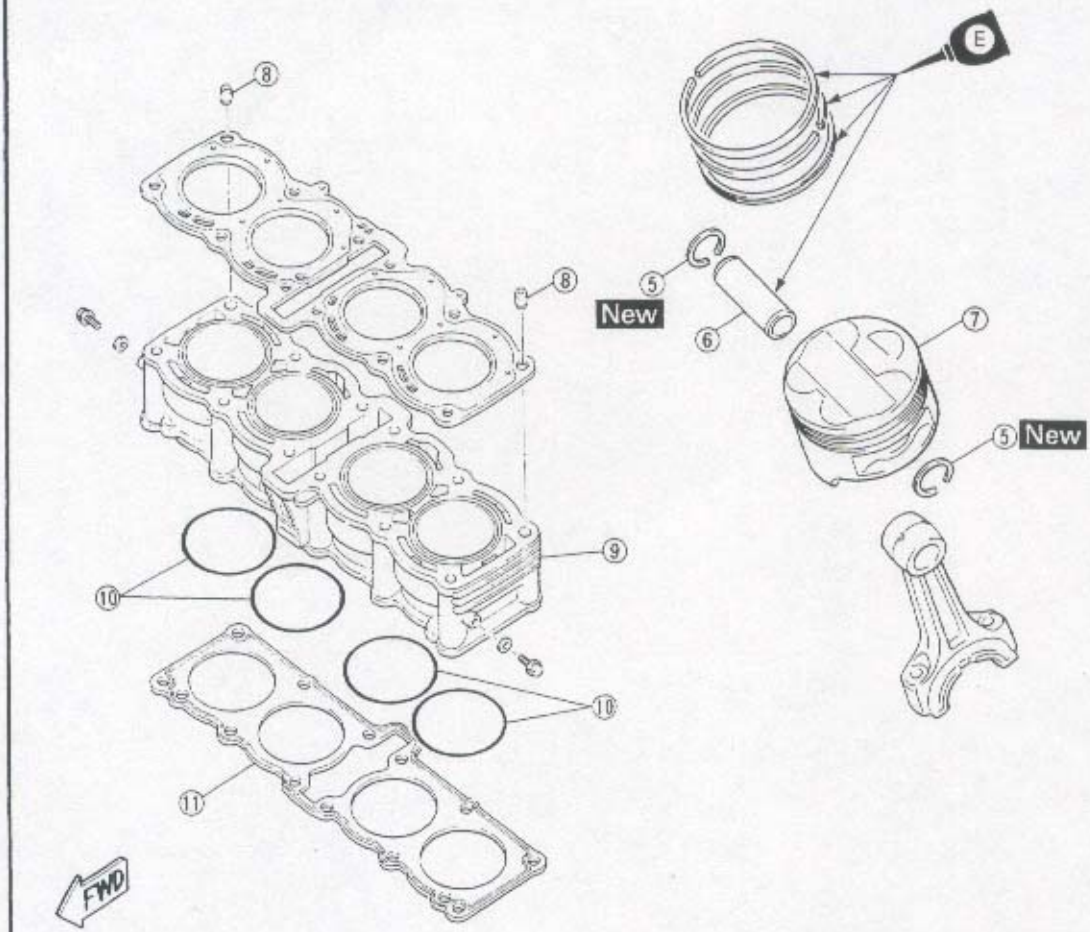

3.Install:
- Piston pins ①
- Pistons ②
- Circlips ③ (piston pin)

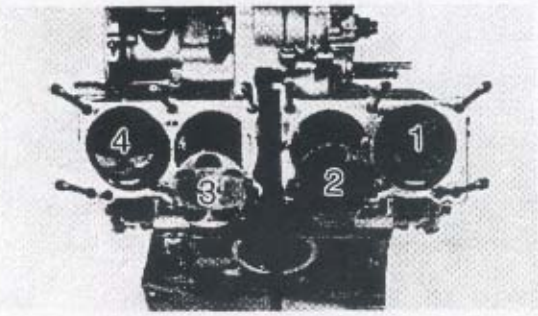
**NOTE:**
- Apply engine oil to the piston pins.
- Be sure that the arrow mark ⓐ on the piston points to the exhaust side of the engine.

## PISTON AND CYLINDER

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

| | |
|---|---|
| A | SIDE CLEARANCE LIMIT:<br>Top: 0.15 mm (0.0059 in)<br>2nd: 0.15 mm (0.0059 in) |
| B | END GAP LIMIT:<br>Top: 0.7 mm (0.0276 in)<br>2nd: 0.7 mm (0.0276 in) |
| C | PISTON TO CYLINDER CLEARANCE LIMIT:<br>0.15 mm (0.0059 in) |






- Before installing the piston pin circlip, cover the crankcase with a clean rag ④ to prevent the circlip from falling into the crankcase.
- Reinstall each piston into the cylinder it came from (numbering order 1 to 4 from the left).

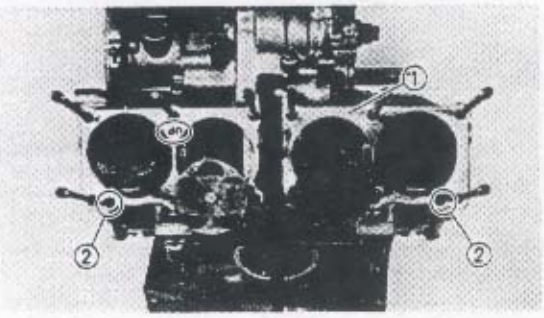
**⚠ WARNING**

**Always use new circlips (piston pin).**

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

**NOTE:**

The gasket mark "UP" must be correctly readable from above.



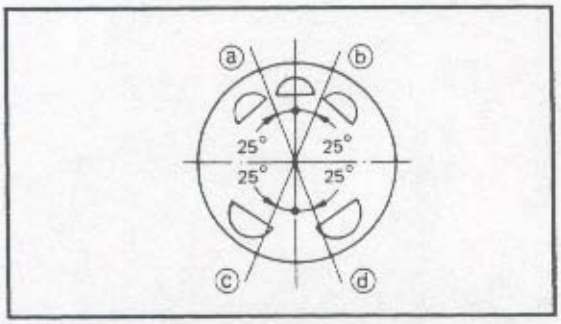

**⚠ WARNING**

**Always use a new gasket (cylinder).**

5.Lubricate:
- Pistons
- Piston rings
- Cylinder

**NOTE:**

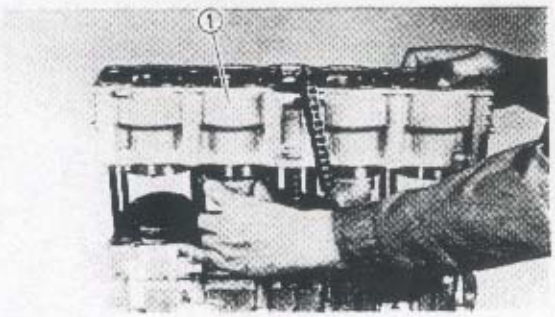
Apply a liberal coating of engine oil.




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

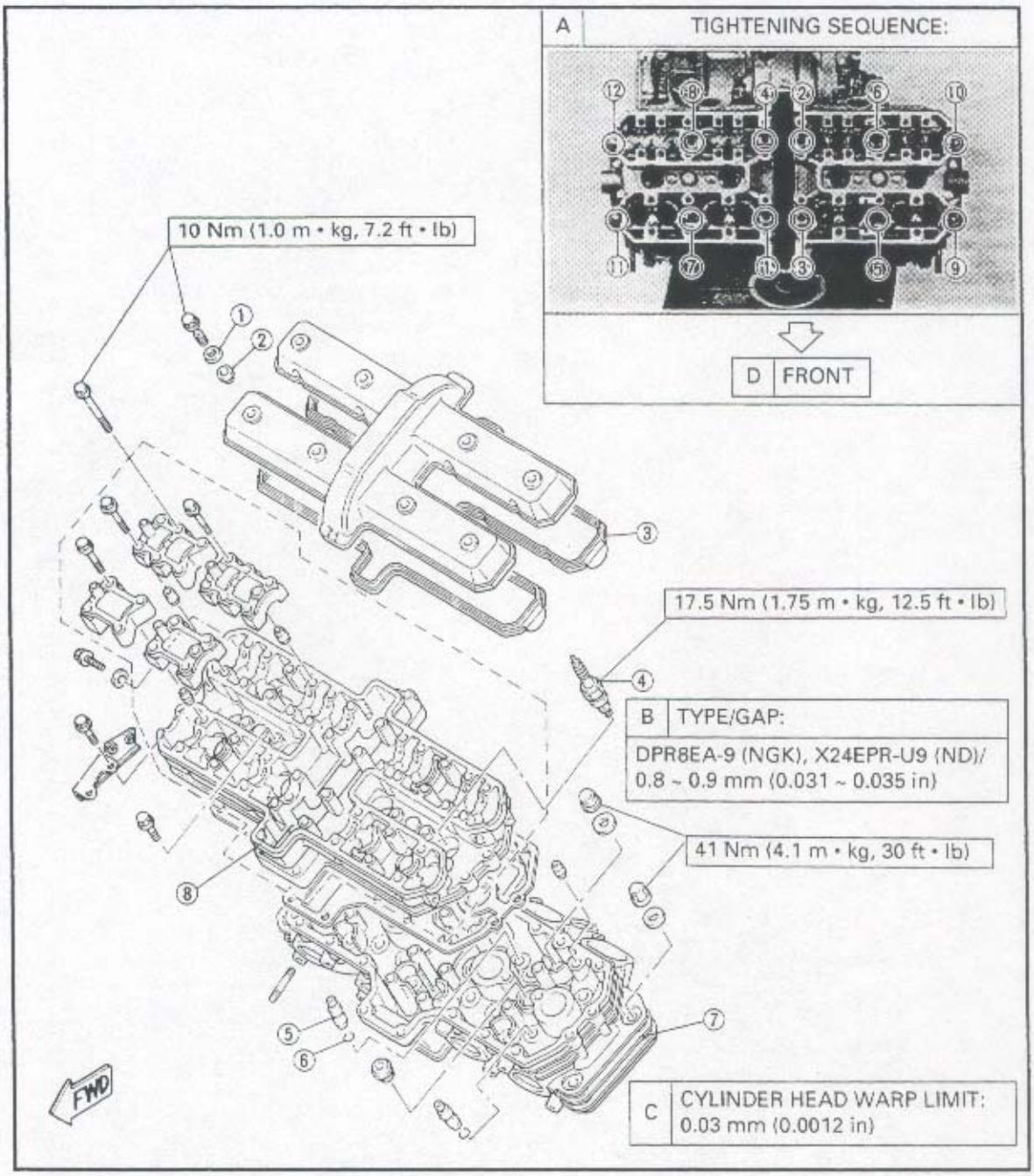



7.Install:
- Cylinder ①

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

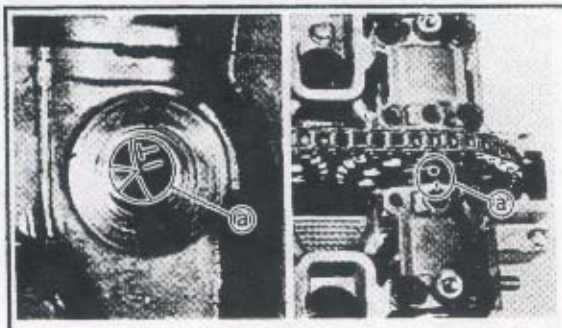
## CYLINDER HEAD

①Washer
②Rubber washer
③Gasket
④Spark plug
⑤Valve guide
⑥Circlip
⑦Cylinder head
⑧Camshaft case

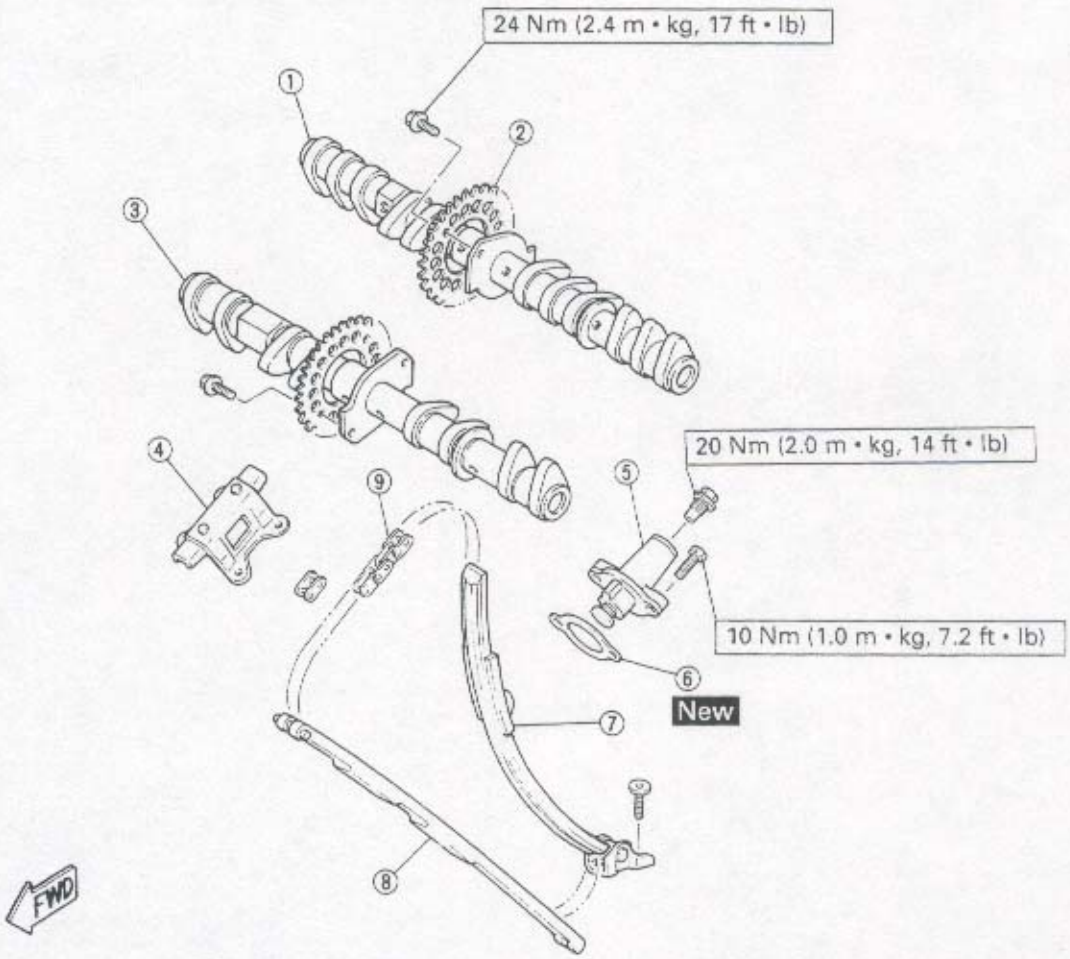


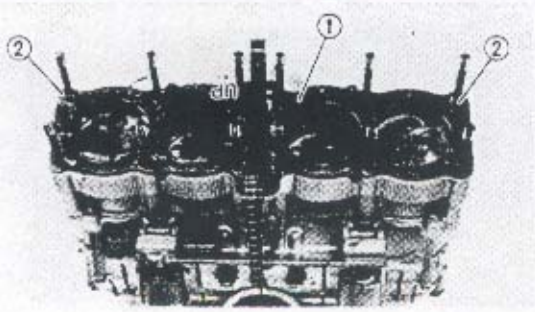
## CAMSHAFT

①Camshaft (intake)
②Timing chain sprocket
③Camshaft (exhaust)
④Chain guide (upper)
⑤Timing chain tensioner
⑥Gasket
⑦Timing chain guide (intake side)
⑧Timing chain guide (exhaust side)
⑨Timing chain
ⓐMatch mark



| | |
|---|---|
| A | VALVE CLEARANCE (COLD): |
| B | INTAKE:<br>0.11 ~ 0.20 mm<br>(0.004 ~ 0.008 in) |
| C | EXHAUST:<br>0.21 ~ 0.30 mm<br>(0.008 ~ 0.012 in) |






### CYLINDER HEAD AND CAMSHAFT

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

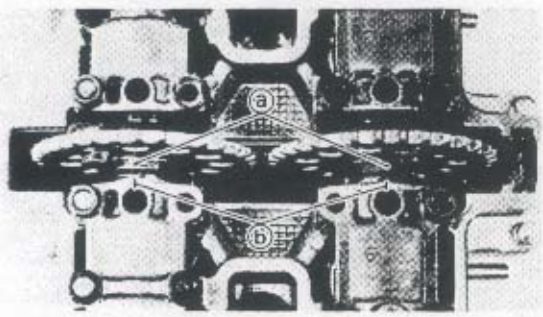
**NOTE:**
The mark "UP" on the gasket must be readable correctly from above.

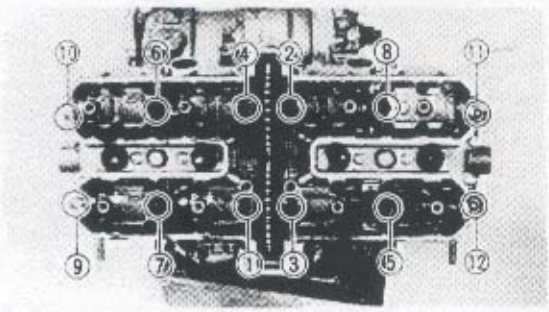
**⚠ WARNING**

**Always use a new gasket (cylinder head).**

**NOTE:**
- Select either of the two procedures explained in this manual, as follows:
- Procedure 1:
  The timing chain is disconnected → Connect.
- Procedure 2:
  The camshafts are removed → Install.

4




**Procedure 1**

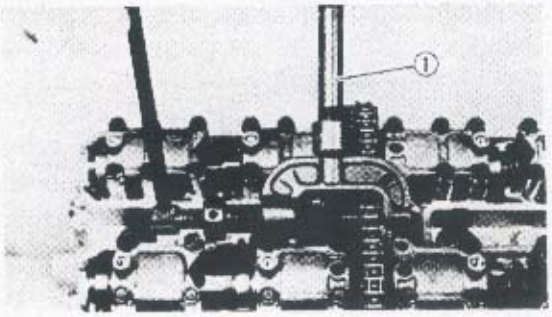
1.Install:
- Cylinder head assembly
  (with camshafts and camshaft case)

**NOTE:**
- Be sure that the camshaft timing marks ⓐ align with the camshaft cap marks ⓑ.
- Be sure that the "T" mark on the crankshaft web is aligned with the stationary pointer when #1 piston is at TDC.

2.Tighten:
- Nuts (cylinder head)

**NOTE:**
- Apply engine oil onto the nut threads.
- Tighten the nuts in the proper tightening sequence and torque them in two stages.

| | |
|---|---|
| | **Nut (cylinder head):**<br>**41 Nm (4.1 m • kg, 30 ft • lb)** |




3.Connect:
- Timing chain
  (with the chain joint)
  Use the timing chain cutter ①.

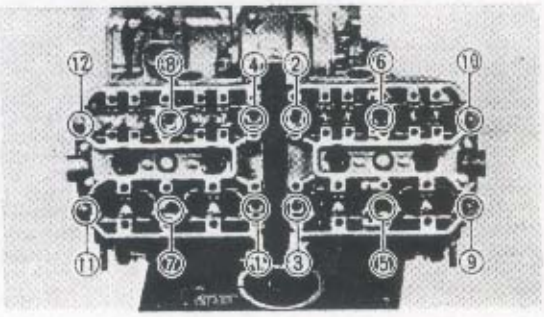
| | |
|---|---|
| | **Timing chain cutter:**<br>**YM-01112/90890-01112** |

**NOTE:**
Keep the timing chain as tense as possible on the exhaust side.

**⚠ WARNING**

**Always use a new chain joint.**

4.Next installation step, see "TIMING CHAIN TENSIONER".

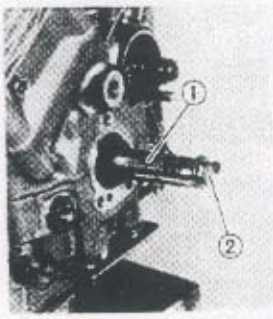


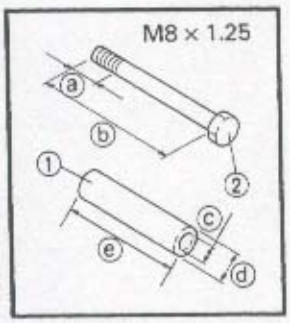

**Procedure 2.**
1.Install:
- Cylinder head assembly
  (with camshaft and camshaft case)

2.Tighten:
- Nuts (cylinder head)

**NOTE:**
- Apply engine oil onto the nut threads.
- Tighten the nuts in their proper tightening sequence and torque them in two stages.

| | |
|---|---|
| | **Nuts (cylinder head):**<br>**41 Nm (4.1 m · kg, 30 ft · lb)** |



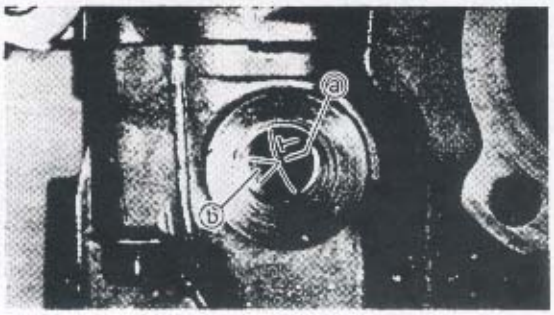




3.Install:
- Camshafts (intake and exhaust)

**********

**Installation steps;**
- Install a suitable collar ① and a bolt ② as shown and tighten the bolt.

ⓐ 15 mm (0.6 in)
ⓑ 75 mm (3.0 in)
ⓒ 8 mm (0.3 in)
ⓓ 12 mm (0.5 in)
ⓔ 60 mm (2.4 in)




- Turning counterclockwise, align the "T" mark ⓐ on the crankshaft web with the stationary pointer ⓑ when #1 piston is at TDC.

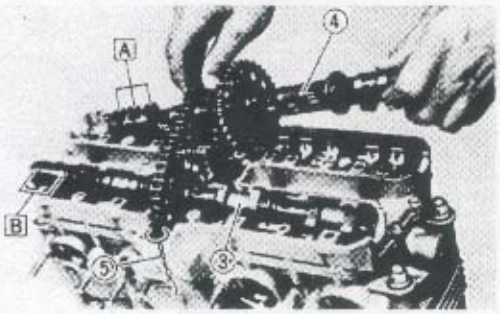
**CAUTION:**

**Do not turn the crankshaft during the camshafts installation. Damage or improper valve timing will result.**

- Lubricate the camshaft bearing surfaces, cam lobes and cam journals.

**Recommended lubricant:**
**Molybdenum disulfide oil**

4




- Install the exhaust camshaft ③ first, then install the intake camshaft ④.

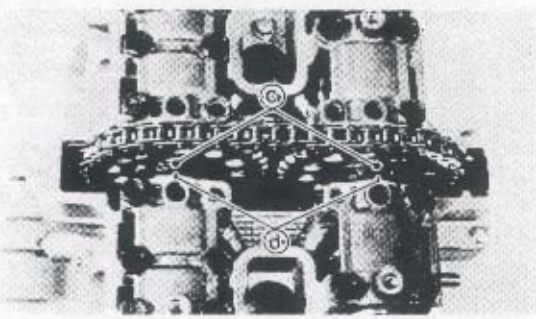
NOTE:
- Be sure to install the camshafts in the right place:
  3 lobes [A] = intake camshaft
  2 lobes [B] = exhaust camshaft
- Be sure the timing marks ⓒ on the camshaft face upward.
- Keep the timing chain as tense as possible on the exhaust side.
- Remove the retaining wire ⑤.

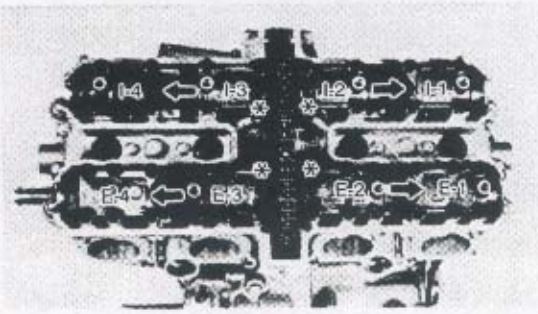
**CAUTION:**

**Do not rotate the camshaft because damage could occur to the piston and valves.**

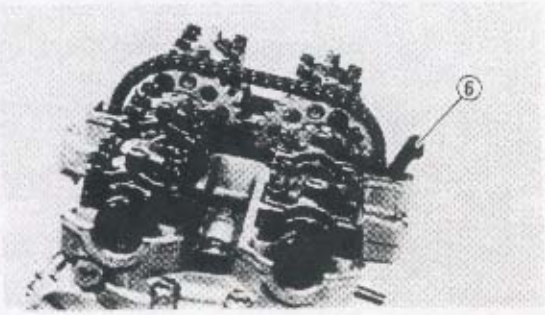
- Install the dowel pins.
- Install the camshaft caps.
- Align the camshaft timing marks ⓒ with the camshaft cap marks ⓓ.
- Tighten the bolts (camshaft caps).

**Bolts (camshaft cap):**
**10 Nm (1.0 m · kg, 7.2 ft · lb)**





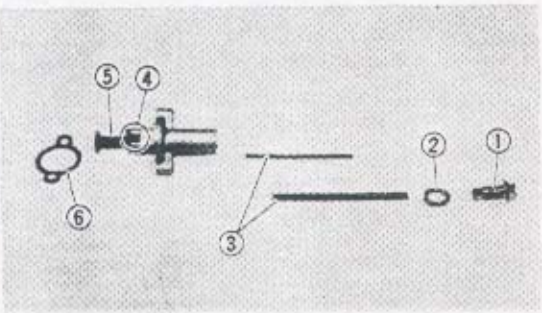

**NOTE:**
- The camshaft caps are numbered from left to right.
- Apply engine oil onto the bolt (camshaft cap) threads.
- Do not install the bolts at places marked "*" in this stage.
- Tighten the camshaft caps in a crisscross pattern starting from the center.




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

●Install the timing chain guide of the exhaust side ⑥.

**********

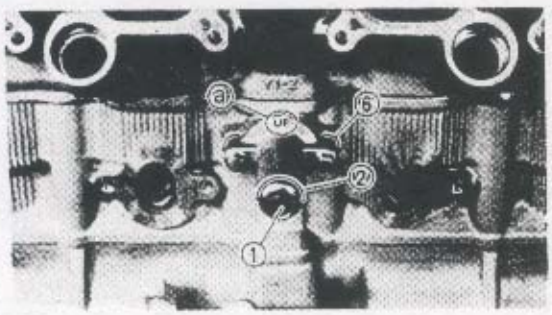



**TIMING CHAIN TENSIONER**

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.



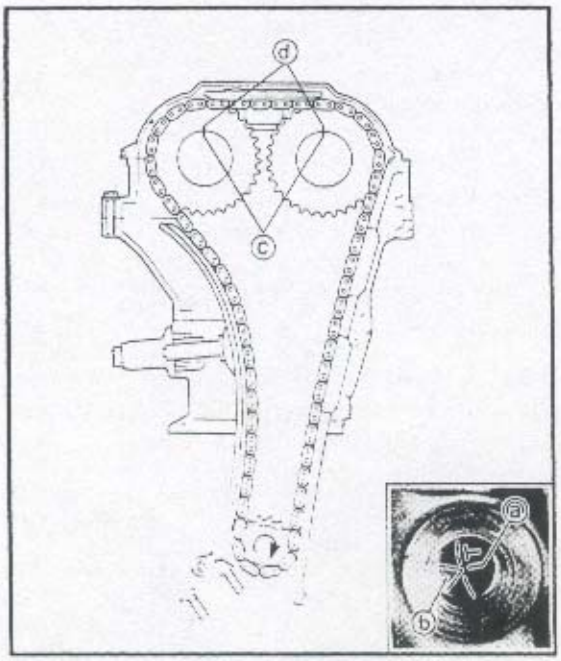

**NOTE:**
The "UP" mark ⓐ on the tensioner should face upward.

| | |
|---|---|
| | **Bolt (timing chain tensioner): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

●Install the springs ③, washer ② and cap bolt ①.

| | |
|---|---|
| | **Cap bolt (timing chain tensioner): 20 Nm (2.0 m • kg, 14 ft • lb)** |

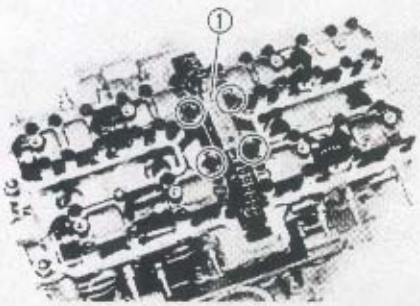
**********




2.Turn:
- Crankshaft
  Counterclockwise several turns

3.Check:
- Crankshaft "T" mark ⓐ
  Align with the stationary pointer ⓑ.
- Camshaft timing marks ⓒ
  Align with the camshaft cap marks ⓓ.
  Out of alignment → Adjust.
  Refer to "Camshaft installation steps".

4

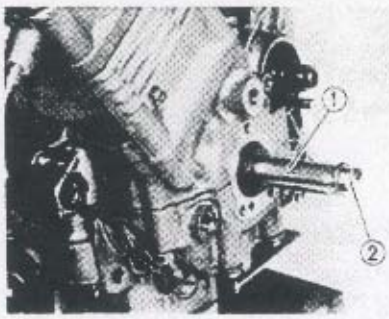



4.Install:
- Timing chain guide ① (upper)

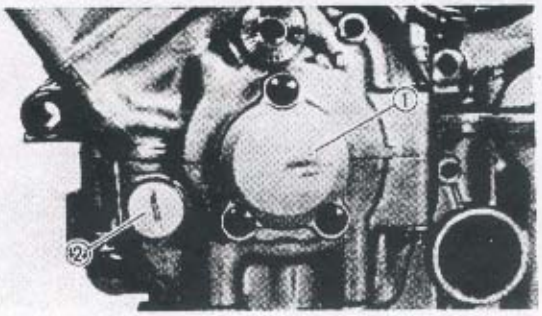
| | |
|---|---|
| | **Bolt (chain guide – upper):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

5.Measure:
- Valve clearance
  Out of specification → Adjust.
  Refer to "VALVE CLEARANCE ADJUSTMENT" in CHAPTER 3.

| | |
|---|---|
| | **Intake valve (cold):**<br>**0.11 ~ 0.20 mm**<br>**(0.004 ~ 0.008 in)**<br>**Exhaust valve (cold):**<br>**0.21 ~ 0.30 mm**<br>**(0.008 ~ 0.012 in)** |



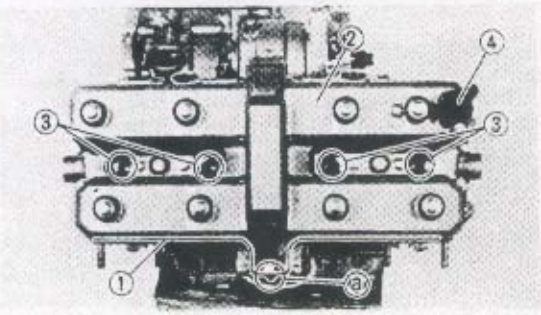

6.Remove:
- Collar ①
- Bolt ②



7.Install:
- Crankshaft end cover ① (left) (with O-ring)
- Timing plug ② (with O-ring)

**NOTE:**
Apply engine oil to the O-rings.

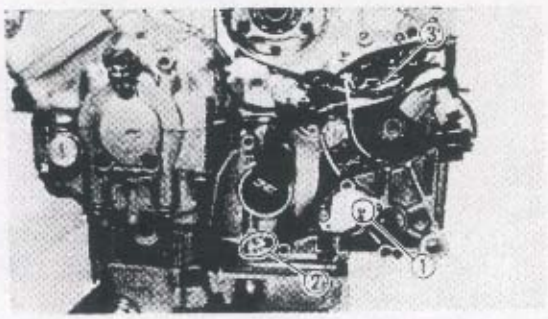
| | |
|---|---|
| | **Screws (crankshaft end cover): 7 Nm (0.7 m • kg, 5.1 ft • lb)** |



8.Install:
- Gasket ① (cylinder head cover)
- Cylinder head cover ②
- Spark plugs ③
- Camshaft sensor ④

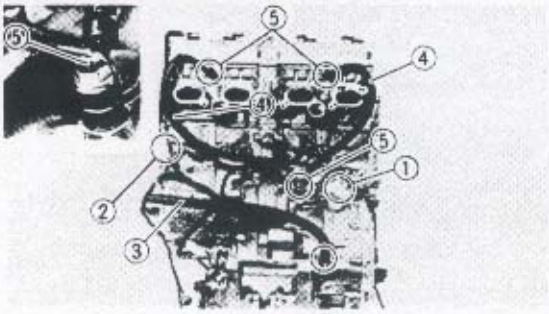
**NOTE:**
- Be sure the cylinder head gasket mark ⓐ points to the front.
- Tighten the cylinder head cover bolts in a crisscross pattern.

| | |
|---|---|
| | **Spark plug: 17.5 Nm (1.75 m • kg, 12.5 ft • lb)**<br>**Bolt (cylinder head cover): 10 Nm (1.0 m • kg, 7.2 ft • lb)**<br>**Bolt (camshaft sensor): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |



**INJECTOR ASSEMBLY**

1.Connect:
- Neutral switch lead ①
- Oil level switch lead ② (to engine wireharness ③)



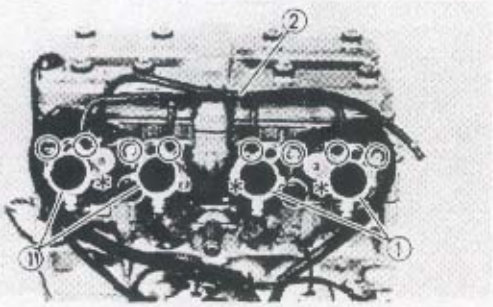
2.Connect:
- Coupler ① (crankshaft sensor)
- Coupler ② (camshaft sensor)
- Crankcase ventilation hose ③

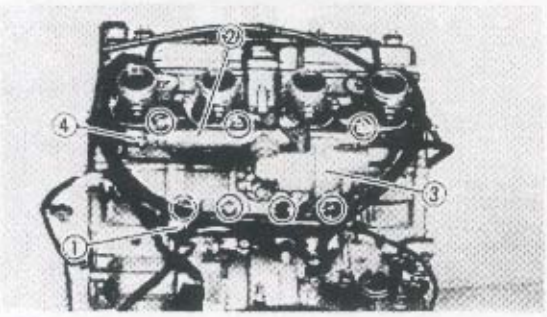
3.Install:
- Oil delivery hoses ④
- Union bolts ⑤
  (with gaskets)

**NOTE:**
Install the oil delivery hoses as shown.

| | |
|---|---|
| | **Union bolt (oil delivery hose): 20 Nm (2.0 m • kg, 14 ft • lb)** |

4





4.Install:
- Gaskets (intake duct)
- Dowel pins
- Intake ducts ①

**⚠ WARNING**
**Always use new gaskets (intake duct).**

**NOTE:**
Do not install the bolts at places marked "*" in this stage.

| | |
|---|---|
| | **Bolt (intake duct): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

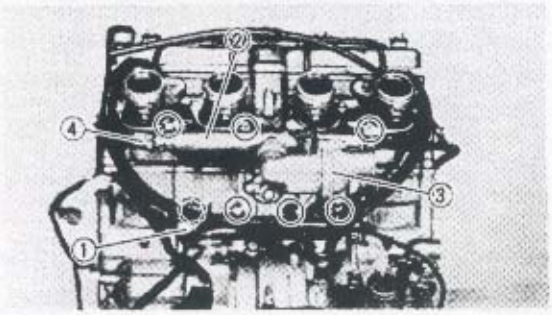
5.Connect:
- Pulsor hoses ②
  (to intake ducts)

6.Install:
- Coolant collector ① (inlet)
- Coolant collector ② (outlet)
  (with O-rings and thermostat housing ③)

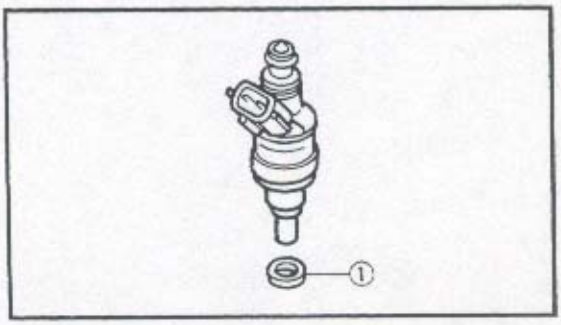
| | |
|---|---|
| | **Bolt (coolant collector): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Apply engine oil to the O-rings of the coolant collector.

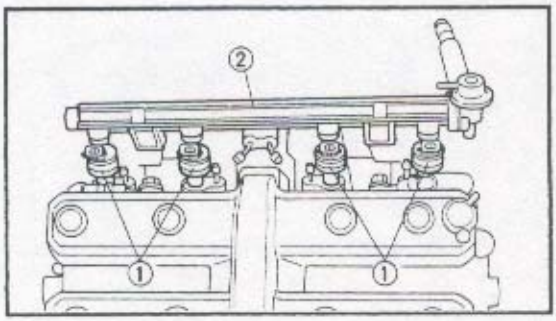
**⚠ WARNING**
**Always use a new O-ring.**




7.Connect:
- Coupler ④ (water temperature sensor)




8.Inspect:
- Fuel injector seals ①
  Wear /Damage → Replace.
  Refer to "ELECTRONI FUEL INJECTION (EFI) – CHAPTER II" in Service Manual – New Features.



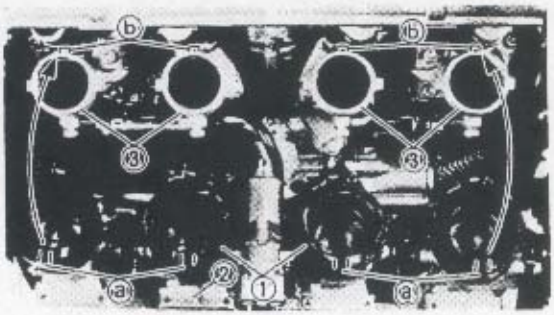

9.Install:
- Fuel injectors ①
  (with seals)
- Fuel distributor ②
  (with dowel pins)

**NOTE:**
- Apply gasoline to the O-ring and injector seals.
- Be sure to reinstall each injector in the original place.
- Make sure that the injectors can be turned smoothly back and forth. If they are tight, check the seal and the injector position.

**⚠ WARNING**

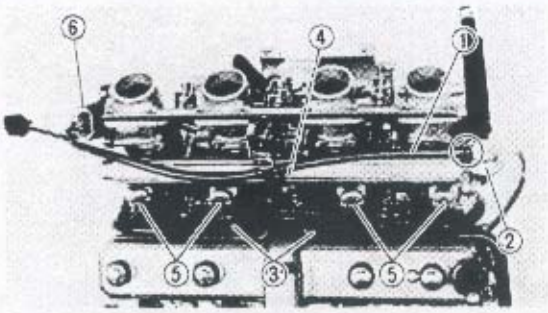
**Always use new O-ring and seal of the fuel injector.**

| | |
|---|---|
| | **Bolt (fuel distributor):**<br>**10 Nm (1.0 m · kg, 7.2 ft · lb)** |

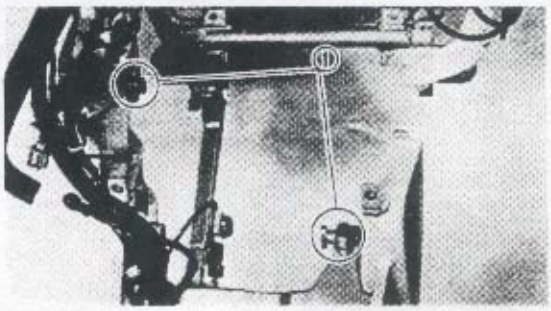



10.Install:
- Air intake joints ①
- Throttle body assembly ②

**NOTE:**
Make sure the slots ⓐ on the intake joints fit correctly over the projections ⓑ on the intake ducts ③ and on the throttle body ②.



11.Connect:
- Pulsor hose ①
  (to pressure regulator ②)
- Hoses ③
  (to fast idle unit ④)
- Couplers ⑤ (injector)
- Coupler ⑥ (throttle sensor)

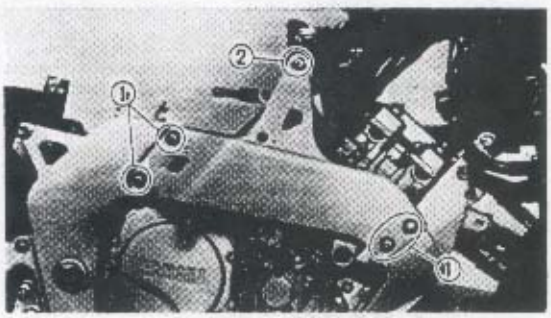


**ENGINE REMOUNTING**

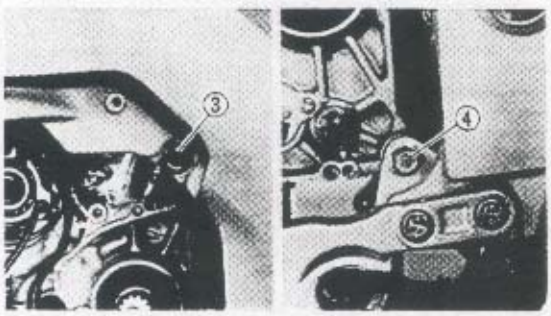
When remounting the engine, reverse the removal procedure.
Note the following points.

1.Install:
- Mounting collars ①
  (to mounting boss)
- Engine assembly
  (from right side of motorcycle)

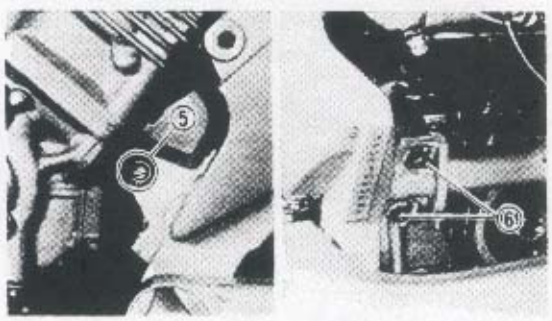
4

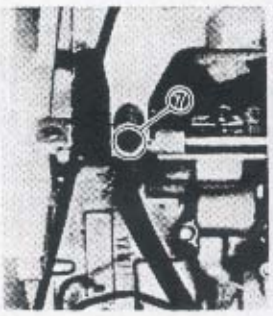


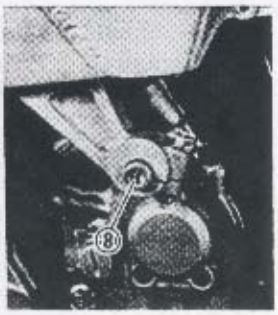
2.Install:
- Bolt ① (main frame center beam)
- Bolt ② (main frame center beam-steering frame)
- Mounting bolt ③ (rear upper)
- Mounting bolt ④ (rear lower)
- Mounting bolts ⑤ (front upper)
- Bolts ⑥ (mounting bracket)
- Pinch bolt ⑦ (rear upper)
- Mounting bolts ⑧ (center)
- Pinch bolt ⑨ (center)
- Bolts ⑩, ⑪ (reinforcement tube)
- Mounting bolt ⑫ (front lower)
- Pinch bolt ⑬ (cross tube)

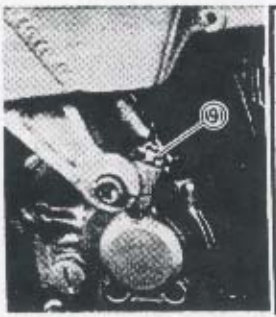


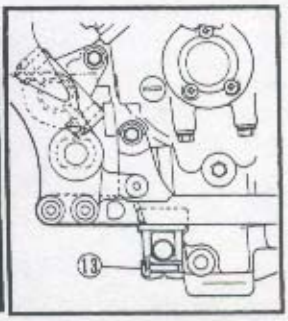
**NOTE:**
First install all the bolts and nuts, and then tighten them to specification.

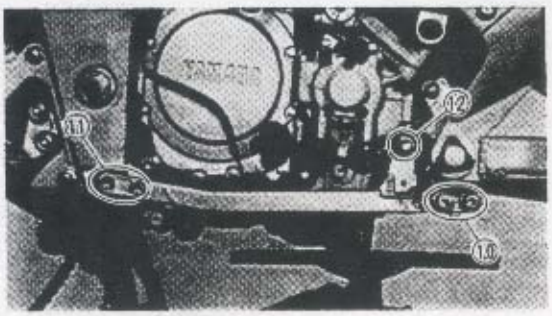




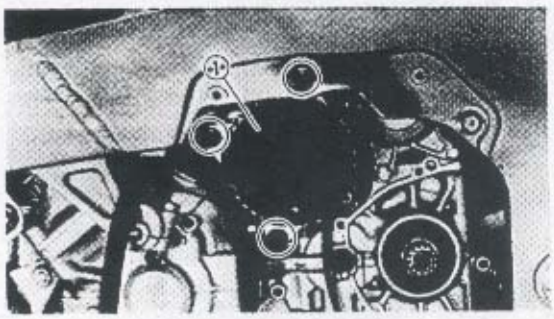
**Bolt ① (main frame center beam):**
**40 Nm (4.0 m • kg, 29 ft • lb)**
**LOCTITE®**
**Bolt ② (main frame center beam - steering frame):**
**55 Nm (5.5 m • kg, 40 ft • lb)**
**Mounting bolt ③ (rear upper):**
**55 Nm (5.5 m • kg, 40 ft • lb)**
**Mounting bolt ④ (rear lower):**
**55 Nm (5.5 m • kg, 40 ft • lb)**
**Mounting bolt ⑤ (front upper):**
**55 Nm (5.5 m • kg, 40 ft • lb)**
**Bolt ⑥ (mounting bracket):**
**40 Nm (4.0 m • kg, 29 ft • lb)**
**Pinch bolt ⑦ (rear upper):**
**15 Nm (1.5 m • kg, 11 ft • lb)**
**Mounting bolt ⑧ (center):**
**40 Nm (4.0 m • kg, 29 ft • lb)**
**Pinch bolt ⑨ (center):**
**15 Nm (1.5 m • kg, 11 ft • lb)**
**Bolt ⑩ (reinforcement tube- rear):**
**55 Nm (5.5 m • kg, 40 ft • lb)**
**Bolt ⑪ (reinforcement tube-front):**
**49 Nm (4.9 m • kg, 35 ft • lb)**
**LOCTITE®**
**Mounting bolt ⑫ (front lower):**
**55 Nm (5.5 m • kg, 40 ft • lb)**
**Pinch bolt ⑬ (cross tube):**
**28 Nm (2.8 m • kg, 20 ft • lb)**

3.Remove:
- Jack

4.Install:
- Starter motor①

**Bolt (starter motor):**
**10 Nm (1.0 m • kg, 7.2 ft • lb)**

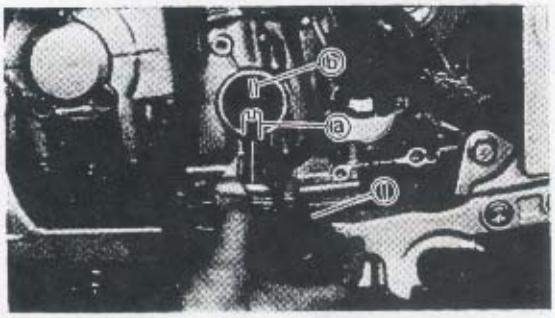
**NOTE:**
- Apply engine oil to the O-ring of the starter motor.
- Be sure to mesh correctly the splines.



5.Install:
- AC generator ①

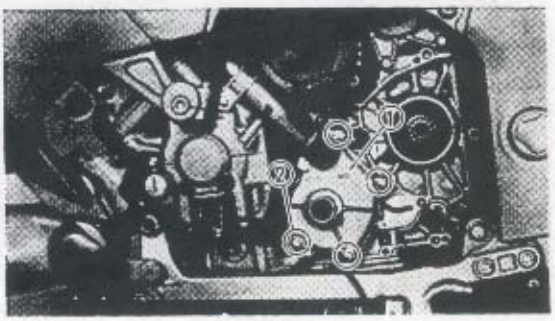
| | |
|---|---|
| | **Bolt (AC generator):**<br>**25 Nm (2.5 m • kg, 18 ft • lb)** |

**NOTE:**
- Apply engine oil to the O-ring of the AC generator.
- Be sure to mesh correctly the splines



6.Install:
- Water pump housing ①

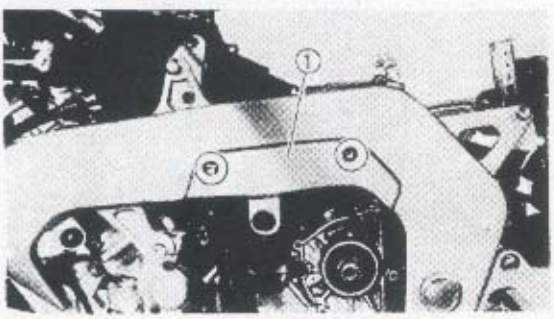
**NOTE:**
- Apply engine oil to the O-ring of the pump housing.
- Align the slot ⓐ of the water pump shaft with the projection ⓑ of the oil pump drive shaft.



7.Install:
- Water pump cover ①
  (with outlet pipe)

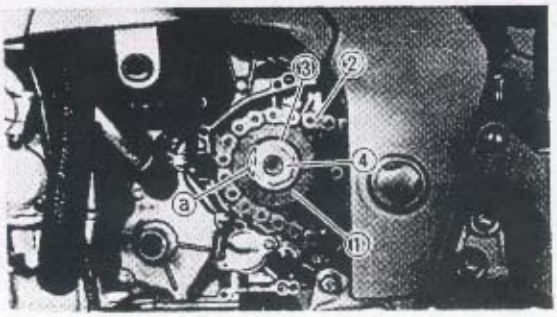
| | |
|---|---|
| | **Bolt (outlet pipe):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)**<br>**Bolt (water pump):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Use a copper washer ② for the coolant drain bolt.



8.Install:
- Cover ① (main frame)

| | |
|---|---|
| | **Bolt (cover-main frame):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |




9.Install:
- Drive sprocket ①
- (with drive chain ②)
- Lock washer ③
- Nut ④ (drive sprocket)

| | |
|---|---|
| | **Nut (drive sprocket):**<br>**70 Nm (7.0 m • kg, 50 ft • lb)** |

**⚠ WARNING**

**Always use a new lock washer.**

**NOTE:**

Tighten the nut (drive sprocket), while applying the rear brake.

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

11.Install:
- Spacer collar ① (shift shaft)
- Gasket
- Dowel pins
- Crankcase cover ② (left)

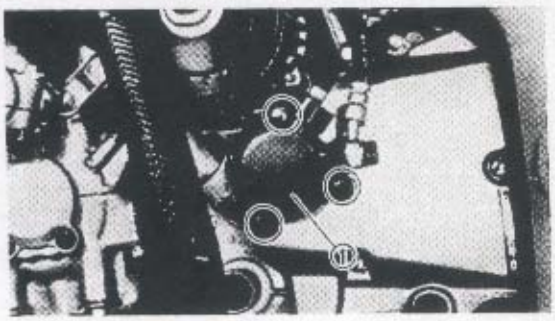
| | |
|---|---|
| | **Bolt (crankcase cover – left):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**

Tighten the bolts (crankcase cover – left) in stage, using a crisscross pattern.

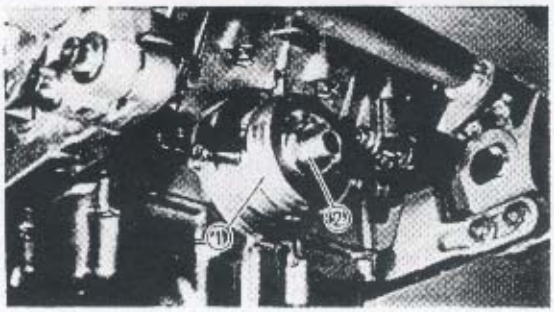
**⚠ WARNING**

**Always use a new gasket.**




12.Install:
- Dowel pins
- Clutch release cylinder ①

| | |
|---|---|
| | **Bolt (clutch release cylinder):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |



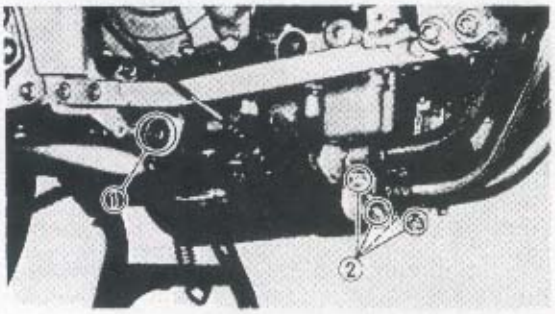
13.Install:
- Oil cooler ①
  (with O-ring)
- Bolt ②
  (including by-pass valve)

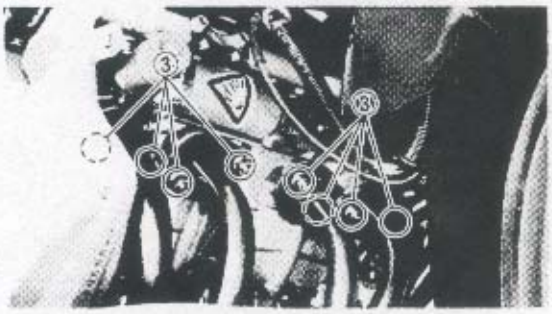
| | |
|---|---|
| | **Bolt:**<br>**63 Nm (6.3 m • kg, 45 ft • lb)** |

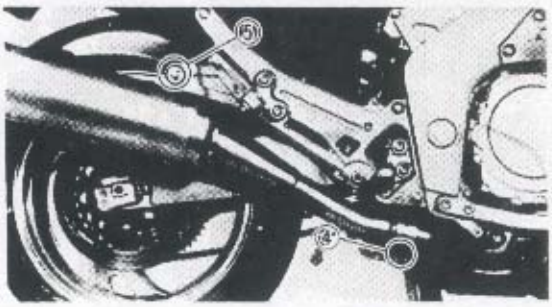
**NOTE:**
- Apply engine oil to the O-ring ③ of the oil cooler.
- Be sure that the O-ring is positioned properly.

**⚠ WARNING**
**Always use a new O-ring.**

4

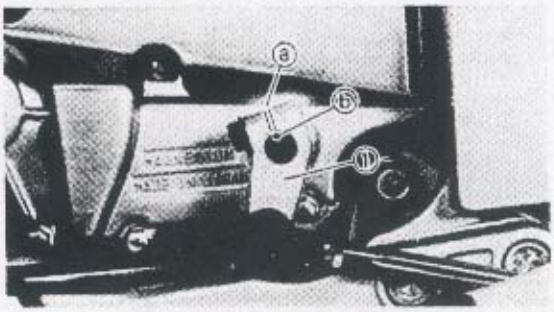






14.Tighten:
- Mounting bolts ①
  (exhaust chamber-left and right)
- Clamp ② (exhaust pipe-exhaust chamber)
- Nut ③ (exhaust pipe clamp)
- Clamp ④ (muffler-exhaust chamber joint)
- Nut ⑤ (muffler-stay)

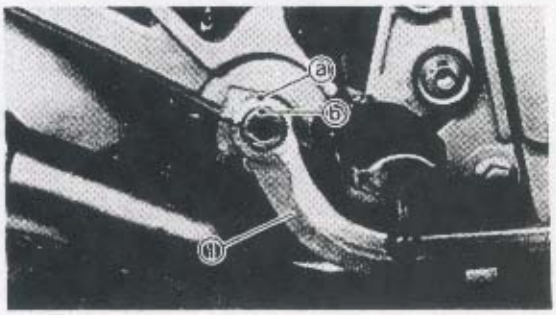
| | |
|---|---|
| | **Mounting bolt ①**<br>**(exhaust chamber):**<br>**18 Nm (1.8 m • kg, 13 ft • lb)**<br>**Clamp ② (exhaust pipe - exhaust chamber):**<br>**20 Nm (2.0 m • kg, 14 ft • lb)**<br>**Nut ③ (exhaust pipe clamp):**<br>**20 Nm (2.0 m • kg, 14 ft • lb)**<br>**Clamp ④**<br>**(muffler-exhaust chamber):**<br>**20 Nm (2.0 m • kg, 14 ft • lb)**<br>**Nut ⑤ (muffler - stay):**<br>**25 Nm (2.5 m • kg, 18 ft • lb)** |




15.Install:
• Shift pedal link ①

| | |
|---|---|
| | **Bolt (shift pedal link):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Align the slot ⓐ on the pedal link with the punched mark ⓑ on the shaft.




16.Install:
• Brake pedal ①

| | |
|---|---|
| | **Bolt (brake pedal):**<br>**8 Nm (0.8 m • kg, 5.8 ft • lb)** |

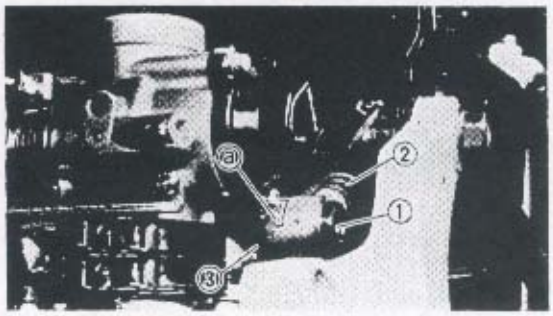
**NOTE:**
Align the punched mark ⓐ on the pedal with the punched mark ⓑ on the shaft.

17.Apply:
• Engine oil (lightly)
(to O-ring ① of new oil filter)

**NOTE:**
Make sure the O-ring ① is positioned properly.

18.Install:
• Oil filter ① (new)
19.Tighten:
• Oil filter ①
Use the oil filter wrench ②.

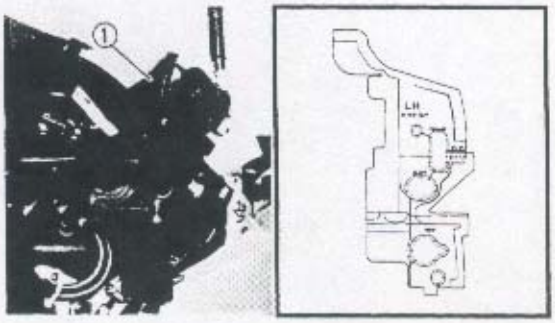
| | |
|---|---|
| | **Oil filter wrench:**<br>**YU-38411/90890-01426** |
| | **Oil filter:**<br>**17 Nm (1.7 m • kg, 12 ft • lb)** |




20.Tighten:
- Union bolt ①
, (with aluminium washer)

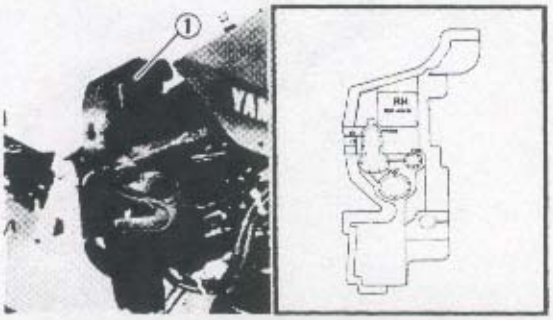
| | |
|---|---|
| | **Union bolt:** **30 Nm (3.0 m • kg, 22 ft • lb)** |

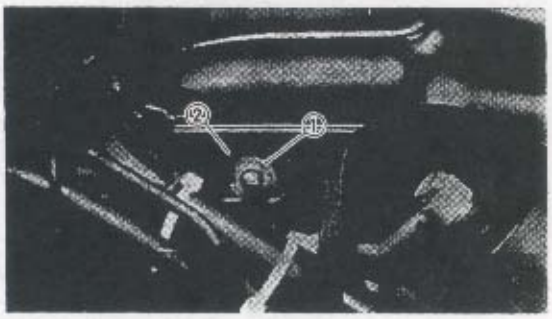
**⚠ WARNING**
- **Always use a new aluminium washer.**
- **When installing the fuel delivery hose ② on the fuel distributor ③, take care that the pipe touches the projection ⓐ as shown.**




21.Install:
- Rubber baffles ① (left Ⓐ and right Ⓑ)

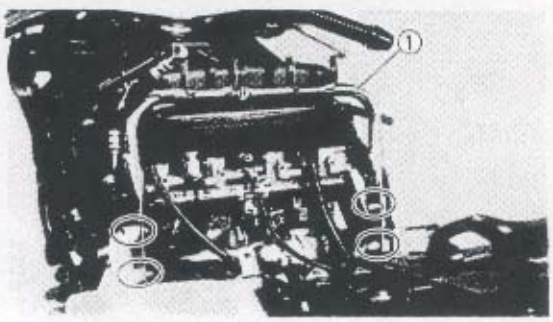
**NOTE:**
Holes are marked to help determine witch hose, cable or pipe must be passed through them.



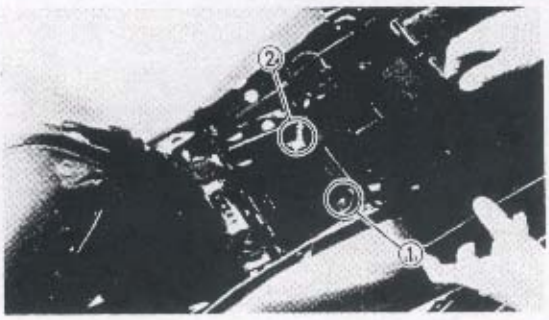

22.Install:
- Air filter case

**NOTE:**
- Set the heat protect rubber of the air filter case in front of the injector.
- Join the air filter case knob ① on the left side into the slot ② on the frame.




23.Install:
- Fuel tank stay ①

| | |
|---|---|
| | **Bolt/Nut (fuel tank stay):** **20 Nm (2.0 m • kg, 14 ft • lb)** |




24.Connect:
- Battery leads

**CAUTION:**

**Connect the positive lead ① first and then the negative lead ②.**

25.Fill:
- Crankcase

Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.

**Total amount:**
**3.2 L (2.8 Imp qt, 3.4 US qt)**

26.Fill:
- Cooling system

Refer to "COOLANT LEVEL INSPECTION" in CHAPTER 3.

**Total amount:**
**2.3 L (2.0 Imp qt, 2.4 US qt)**

27.Adjust:
- Intake air pressure synchronization

Refer to "INTAKE AIR PRESSURE SYNCHRONIZATION" in CHAPTER 3.

28.Adjust:
- Idle speed

Refer to "IDLE SPEED ADJUSTMENT" in CHAPTER 3.

**Idle speed:**
**950 ~ 1,050 r/min**

29.Adjust:
- Throttle cable free play

Refer to "THROTTLE CABLE FREE PLAY ADJUSTMENT" in CHAPTER 3.

**Throttle cable free play:**
**3 ~ 5 mm (0.1 ~ 0.2 in)**

30.Adjust:
- Drive chain slack

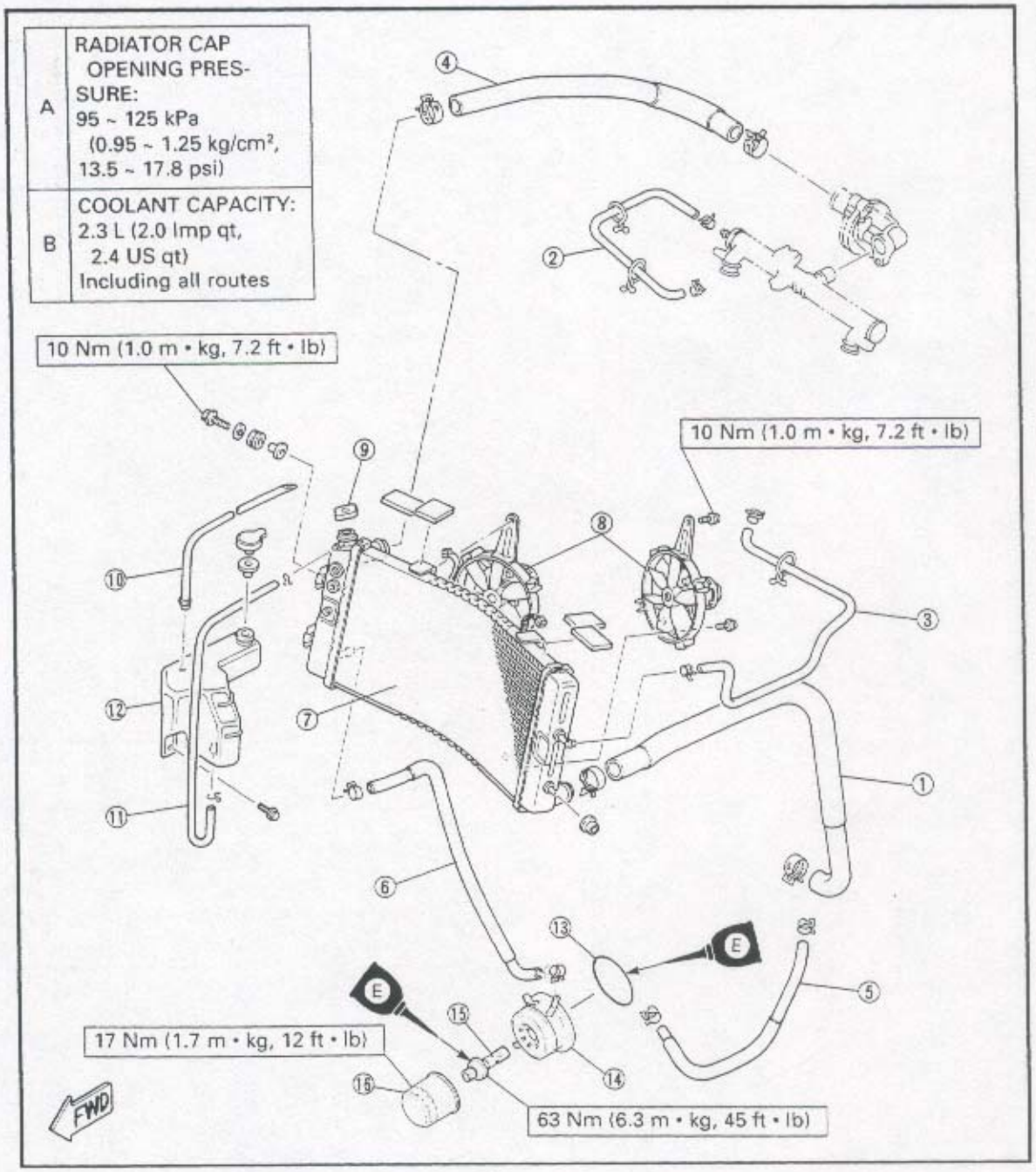
Refer to the "DRIVE CHAIN SLACK ADJUSTMENT" section.

**Drive chain slack:**
**10 ~ 20 mm (0.4 ~ 0.8 in)**

# COOLING SYSTEM

## RADIATOR/OIL COOLER

①Outlet hose (radiator)
②Hose (fast idle unit-coolant collector)
③Hose (fast idle unit-radiator)
④Inlet hose (radiator)
⑤Inlet hose (oil cooler)
⑥Outlet hose (oil cooler)
⑦Radiator
⑧Fan motor assembly
⑨Radiator cap
⑩Breather hose
⑪Reservoir tank hose
⑫Coolant reservoir tank
⑬O-ring
⑭Oil cooler
⑮Bolt (by-pass valve)
⑯Oil filter



## RADIATOR

**⚠ WARNING**

**Do not remove the radiator cap when the engine and radiator are hot. Scalding hot fluid and steam may be blown out under pressure, which could cause serious injury. When the engine has cooled, open the radiator cap by the following procedure:**
**Place a thick rag, like a towel, over the radiator cap, slowly rotate the cap counterclockwise to the detent. This procedure allows any residual pressure to escape. When the hissing sound has stopped, press down on the cap while turning counterclockwise and remove it.**

### REMOVAL

1.Remove:
- Seat
- Top cover
- Inner panels
- Side cowlings

Refer to "COWLINGS" in CHAPITER 3.

2.Drain:
- Coolant

Refer to "COOLANT REPLACEMENT" in CHAPTER 3.

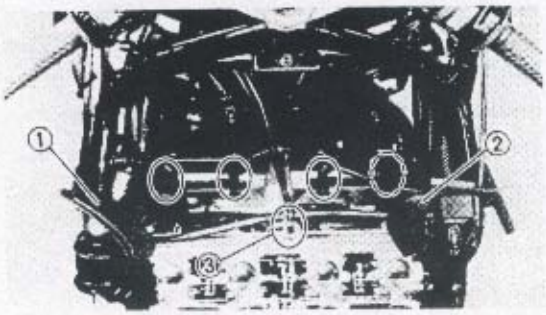
**NOTE:**
Thoroughly flush the cooling system with clean tap water.

**CAUTION:**
**Take care that no coolant splashes onto painted surfaces. If it does, wash it away with water immediately.**

3.Remove:
- Fuel tank

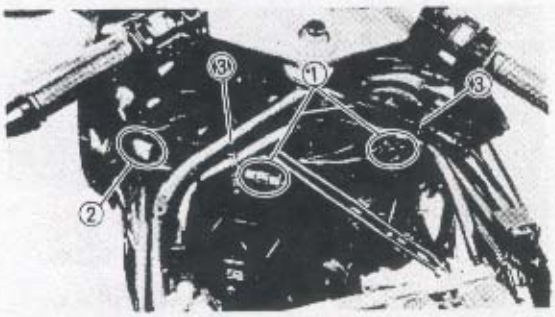
Refer to "FUEL TANK" in CHAPTER 3.
- Air filter case

Refer to "VALVE CLEARANCE ADJUSTMENT" in CHAPTER 3.



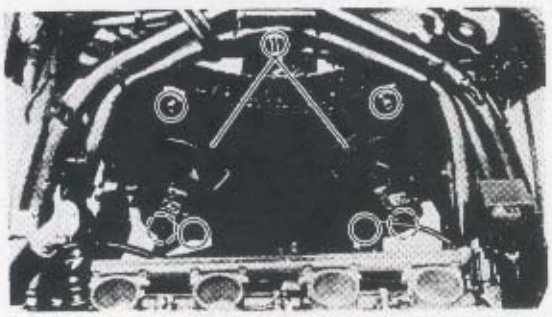
4.Remove:
- Rubber baffle (left ① and right ②)
- Spark plug caps

5.Disconnect:
- Throttle cables ③

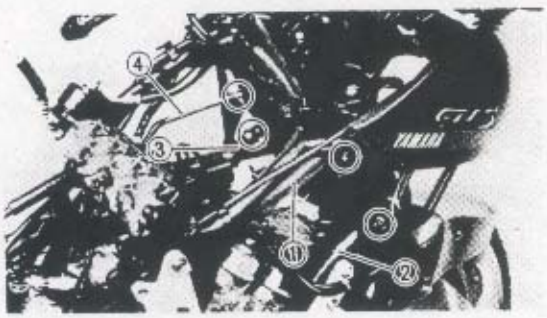


6.Disconnect:
- Couplers ① (fan motor)
- Coupler ② (fan motor harness)

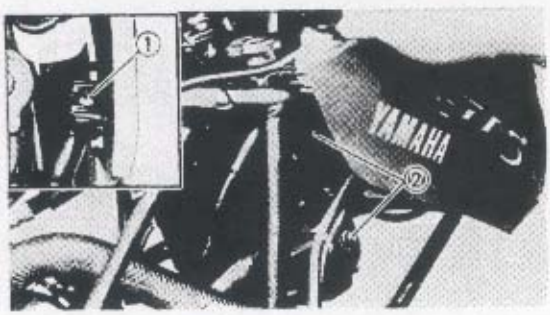
7.Remove:
- Bands ③ (fan motor harness)



8.Remove:
- Fan motors ①



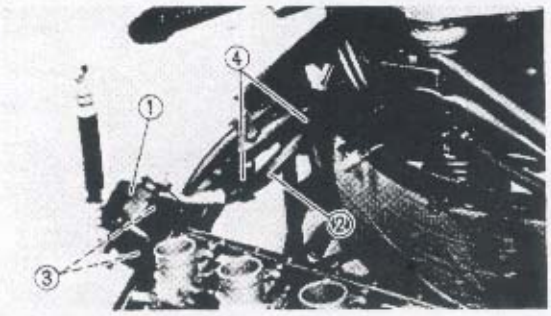
9.Disconnect:
- Inlet hose ① (radiator)
- Outlet hose ② (oil cooler)
- Outlet hose ③ (radiator)
- Hose ④ (from fast idle system)



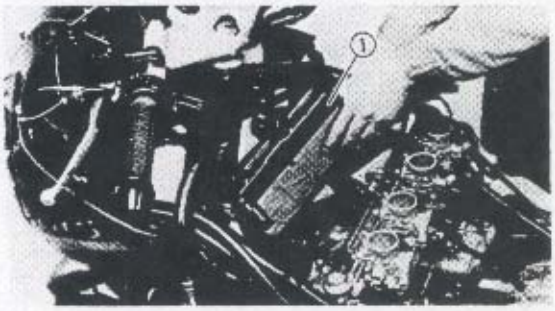

10.Loosen:
- Screw ① (front cowling - right)

11.Remove:
- Bolts ② (radiator)

**NOTE:**
Carefully lift off the front cowling to loosen the right side upper radiator mounting bolt.

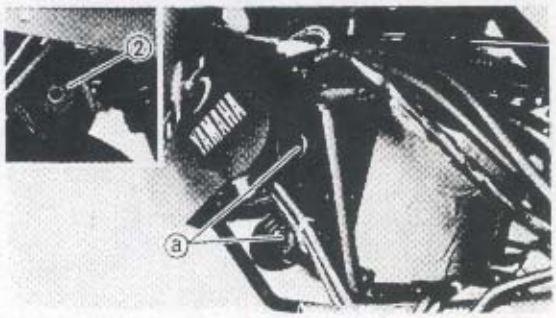



12.Disconnect:
- Fuel filter ①
- Fuel delivery hose ②
  (from bracket ③ and hose guides ④)




13.Remove:
- Radiator ①

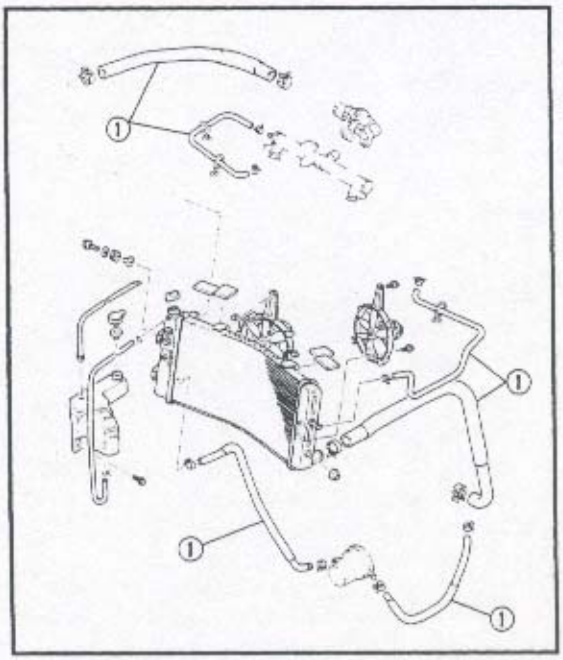
**NOTE:**
- Before removing the radiator cover the core with thick tape, cardboard or any other protection to prevent damage to the fins.
- First pull the radiator out of the grommets ⓐ on the left side, then remove the radiator left side first towards the rear.
- Take care not to loose the collars ②.




14.Disconnect:
- Fan motor harness

**INSPECTION**

1.Inspect:
- Radiator core
  Obstruction → Blow out with compressed air through rear of the radiator.
  Flattened fin → Repair/Replace radiator.




2.Inspect:
- Coolant hoses ①
  Cracks/Damage →Replace.

3.Measure:
- Radiator cap opening pressure
  Radiator cap opens at pressure below the specified pressure → Replace.

**Radiator cap opening pressure:**
**95 ~ 125 kPa**
**(0.95 ~ 1.25 kg/cm², 13.51 ~ 17.78 psi)**

**********

**Measurement steps:**

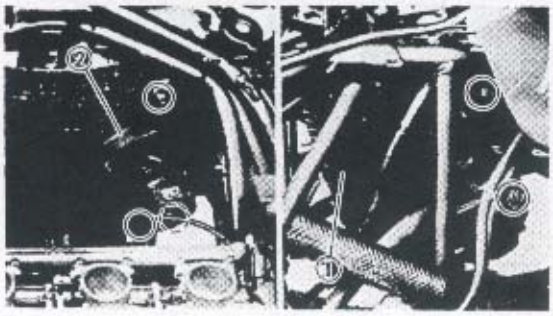
- Attach the cooling system tester ① and adapter ② to the radiator cap ③.

**Cooling system tester:**
**YU-24460-01/90890-01325**
**Adapter:**
**YU-33984/90890-01352**

- Apply the specified pressure for 10 seconds, and check that there is no pressure drop.

**********

4.Inspect:
- Fan motor assembly
  Damage → Replace.
  Does not operate → Check.
  Refer to "ELECTRICAL — COOLING SYSTEM" in CHAPTER 7.



**INSTALLATION**

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

1.Install:

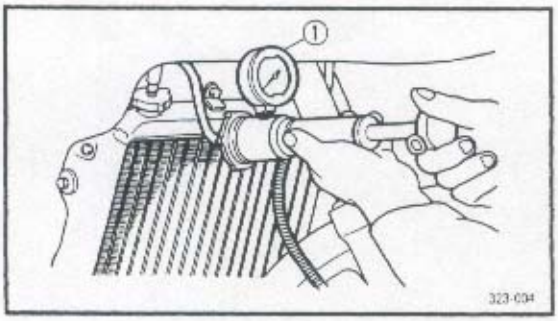
- Radiator ①
- Fan motors ②

**Bolts (radiator):**
**10 Nm (1.0 m • kg, 7.2 ft • lb)**
**Bolt (fan motor):**
**10 Nm (1.0 m • kg, 7.2 ft • lb)**

2.Fill:

- Cooling system
  Refer to "COOLANT REPLACEMENT" in CHAPTER 3.

**Total amount:**
**2.3 L (2.0 Imp qt, 2.4 US qt)**




3.Inspect:

- Cooling system
  Decrease of pressure (leaks) → Repair as required.

**********

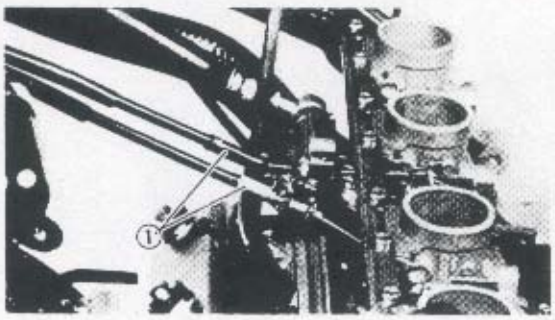
**Inspection steps:**

- Attach the cooling system tester ① to the radiator.

**Cooling system tester:**
**YU-24460-01/90890-01325**

- Apply 100 kPa (1.0 kg/cm², 14 psi) pressure.
- Measure the indicated pressure with the gauge.

**********



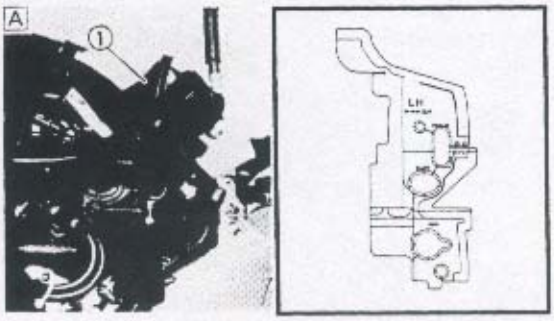
4.Connect:

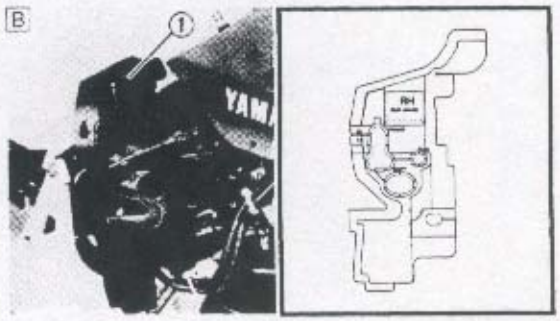
- Throttle cables ①

5.Adjust:

- Throttle cable free play
  Refer to "THROTTLE CABLE FREE PLAY ADJUSTMENT" in CHAPTER 3.

**Throttle cable free play:**
**3 ~ 5 mm ( 0.1 ~ 0.2 in)**




6.Install:
- Rubber baffles ① (left Ⓐ and right Ⓑ)

**NOTE:**
Holes are marked to help determine witch hose, cable or pipe must be passed through them.

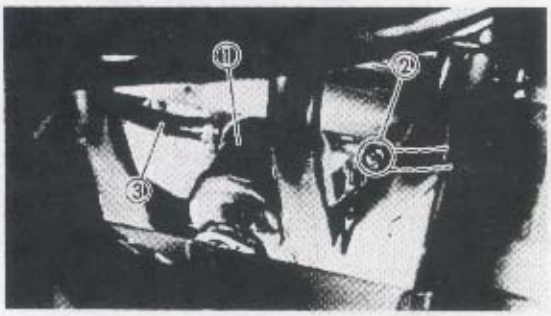
7.Install:
- Air filter case
  Refer to "VALVE CLEARANCE ADJUSTMENT" in CHAPTER 3.
- Fuel tank
  Refer to "FUEL TANK" in CHAPTER 3.

## OIL COOLER

### REMOVAL

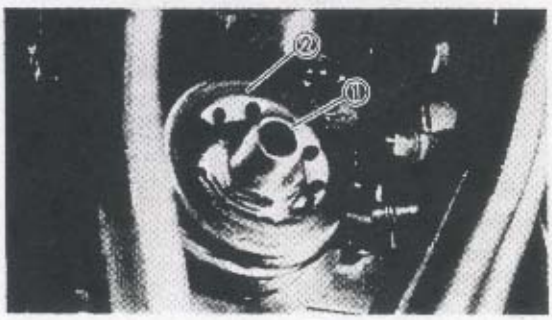
1.Remove:
- Lower cowling
  Refer to "COWLINGS" in CHAPTER 3.

2.Drain:
- Engine oil
  Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.
- Coolant
  Refer to "COOLANT REPLACEMENT" in CHAPTER 3.




3.Remove:
- Oil filter ①
  Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.

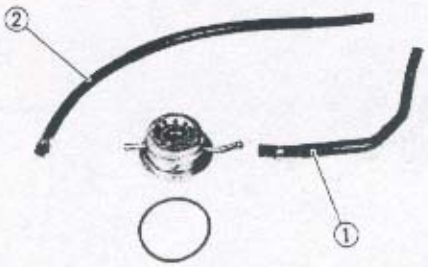
4.Disconnect:
- Inlet hose ② (oil cooler)
- Outlet hose ③ (oil cooler)



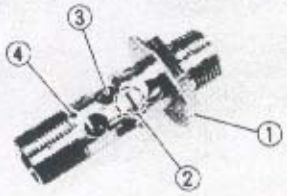

5.Remove:
- Bolt ①
  (by-pass valve included)
- Oil cooler ②
  (with O-ring)

### INSPECTION

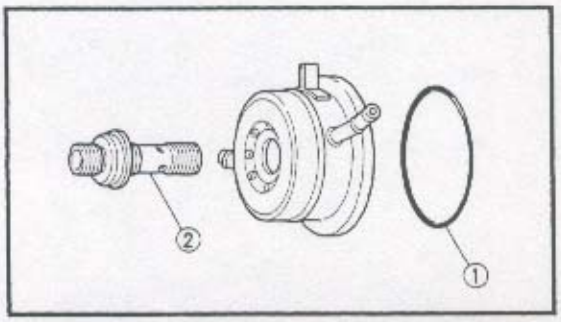
1.Inspect:
- Oil cooler
  Cracks/Damage → Replace.




2.Inspect:
- Inlet hose ① (oil cooler)
- Outlet hose ② (oil cooler)
  Cracks/Wear/Damage → Replace.




3.Check:
- By-pass valve body ① (oil cooler)
- Check ball ②
- Spring ③
- Stopper pin ④
  Damage/Wear → Replace.




**INSTALLATION**

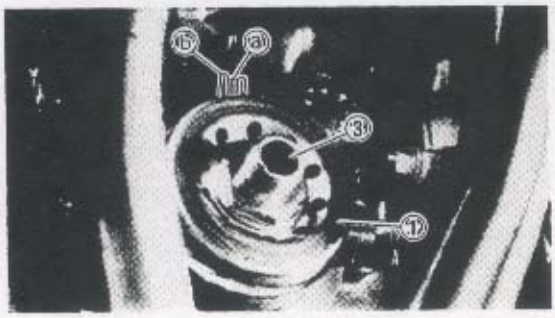
Reverse the "REMOVAL" procedure.
Note the following points.

1.Clean the mating surfaces of the oil cooler and the crankcase with a cloth dampened with thinner.

2.Apply:
- Engine oil
  (to O-ring ① and bolt ②)

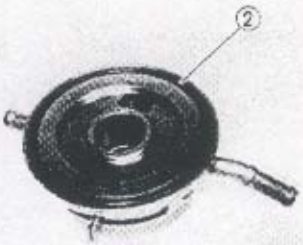
**⚠ WARNING**

**Always use a new O-ring on the oil cooler.**

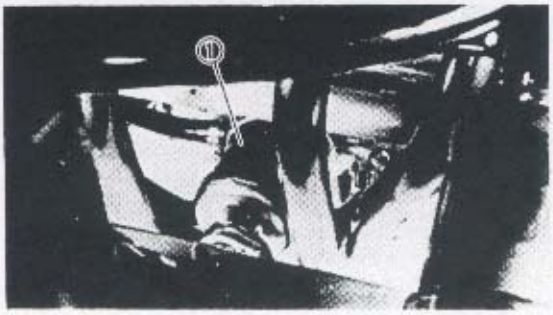



3.Install:
- Oil cooler ①
  (with O-ring ②)
- Bolt ③
  (by-pass valve included)

**NOTE:**
- Mesh the oil cooler projection ⓐ with the crankcase slot ⓑ.
- Make sure the O-ring ② is positioned properly.




| | |
|---|---|
| | **Bolt (oil cooler):**<br>**63 Nm (6.3 m · Kg, 45 ft · lb)** |



4.Install:
- Oil filter ① (new)
  Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.

| | |
|---|---|
| | **Oil filter:**<br>**17 Nm (1.7 m • kg, 12 ft • lb)** |

5.Fill:
- Cooling system
  Refer to "COOLANT REPLACEMENT" in CHAPTER 3.

| | |
|---|---|
| | **Total amount:**<br>**2.3 L (2.0 Imp qt, 2.4 US qt)** |

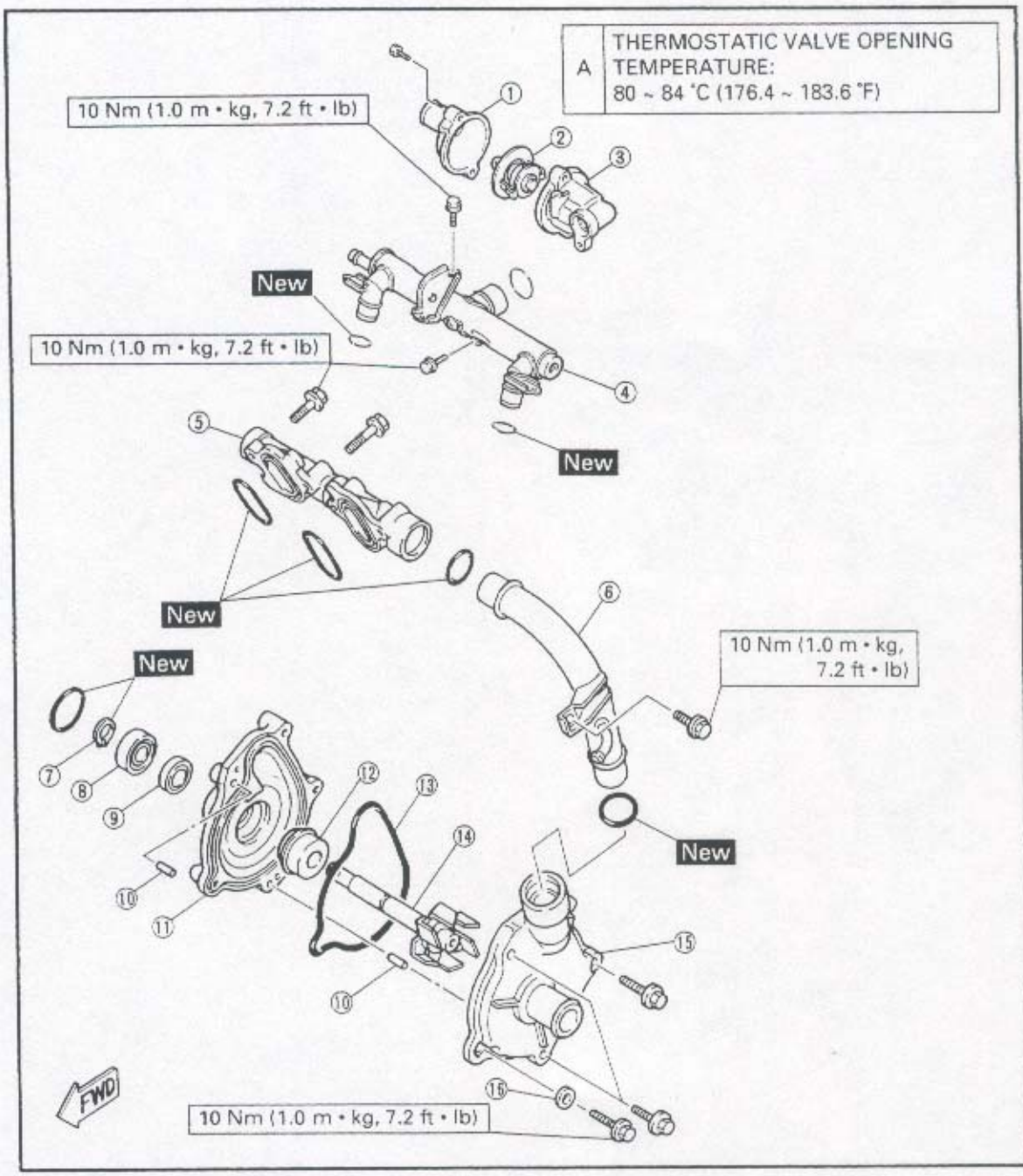
6.Inspect:
- Cooling system (oil cooler)
  Decrease of pressure (leaks) → Replace oil cooler as required.
  Refer to "step 4" in "RADIATOR — INSTALLATION".

7.Fill:
- Crankcase
  Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.

| | |
|---|---|
| | **With oil filter replacement:**<br>**2.7 L (2.4 Imp qt, 2.9 US qt)** |

## THERMOSTATIC VALVE/WATER PUMP

①Thermostatic valve cover
②Thermostatic valve
③Thermostatic valve housing
④Coolant collector (outlet)
⑤Coolant collector (inlet)
⑥Outlet pipe (water pump)
⑦Circlip
⑧Bearing
⑨Oil seal
⑩Dowel pin
⑪Water pump housing
⑫Damper rubber
⑬Gasket
⑭Impeller shaft
⑮Water pump cover
⑯Copper washer

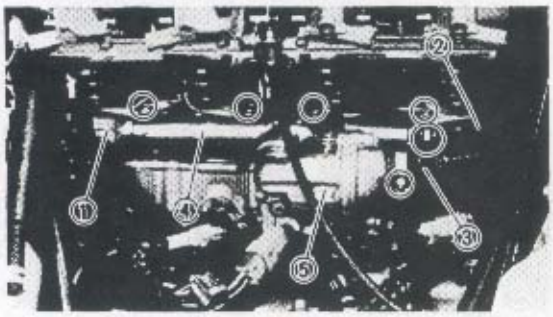


## THERMOSTATIC VALVE

### REMOVAL

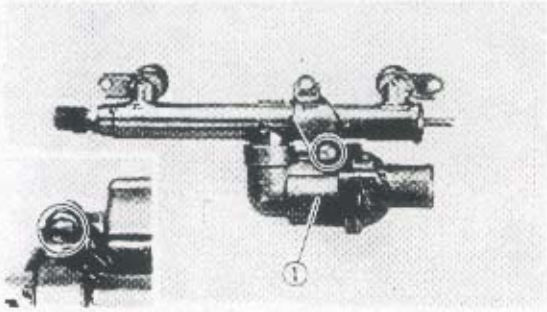
1.Remove:
- Seat
- Top cover
- Inner panels
- Side cowlings
- Lower cowling
  Refer to "COWLINGS" in CHAPTER 3.
- Fuel tank
  Refer to "FUEL TANK" in CHAPTER 3.

2.Drain:
- Coolant
  Refer to "COOLANT REPLACEMENT" in CHAPTER 3.

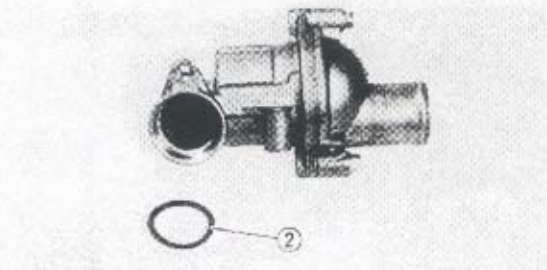


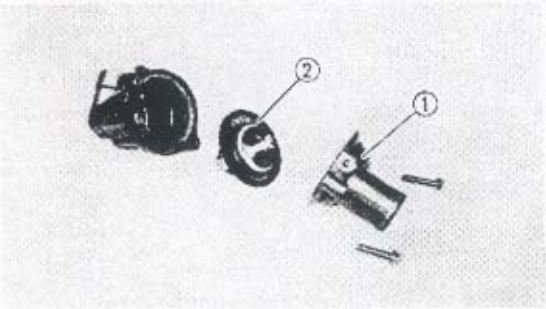
3.Disconnect:
- Coupler ① (water temperature sensor)
- Hose ② (from fast idle unit)
- Inlet hose ③ (radiator)

4.Remove:
- Coolant collector ④ (outlet)
  (with O-rings and thermostatic valve housing ⑤)

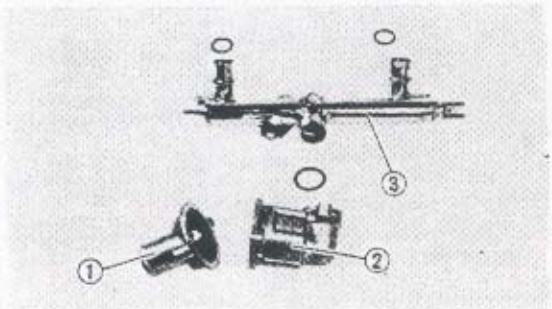


5.Remove:
- Thermostatic valve housing ①
- O-ring ②
  (from coolant collector (outlet))



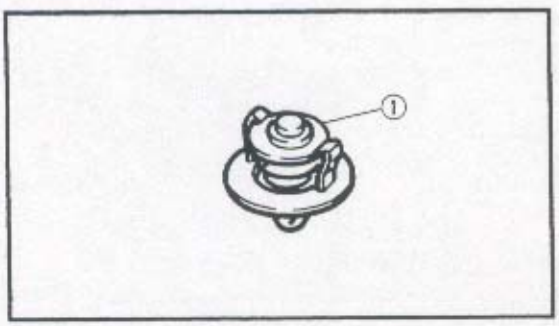



6.Remove:
- Thermostatic valve cover ①
- Thermostatic valve ②




## INSPECTION

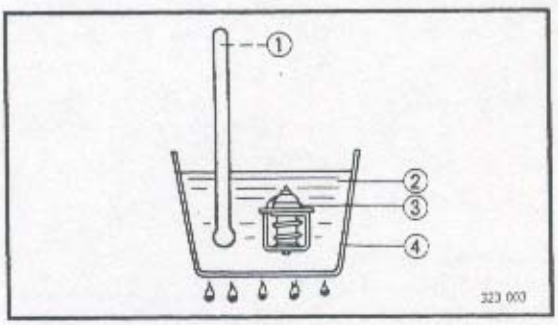
1.Inspect:
- Thermostatic valve cover ①
- Thermostatic valve housing ②
- Coolant collector ③ (outlet)
  Cracks/Damage → Replace.
- Coolant hoses
  Cracks/Wear/Damage → Replace.
  Refer to "RADIATOR/OIL COOLER – INSPECTION".




2.Inspect:
- Thermostatic valve ①
  Valve does not open at 80 ~ 84°C (176 ~ 183°F) → Replace.

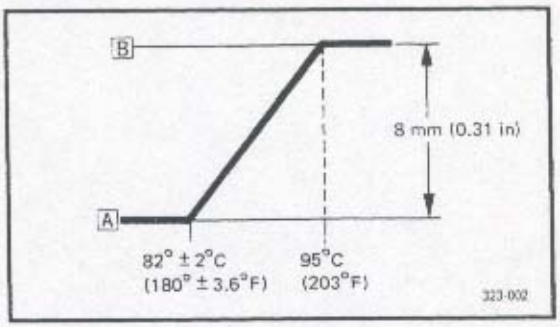
**********

**Inspection Steps:**
- Suspend thermostatic valve in a vessel with water.
- Place reliable thermometer in a water.
- Heat water slowly.
- Observe thermometer, while stirring water continually:




**Thermostatic valve Ⓐ :**
**Opening temperature:**
**80 ~ 84° C (176.4 ~ 183.6° F)**
**Full open temperature/Lift Ⓑ :**
**95° C (203° F)/8 mm (0.31 in)**

**********

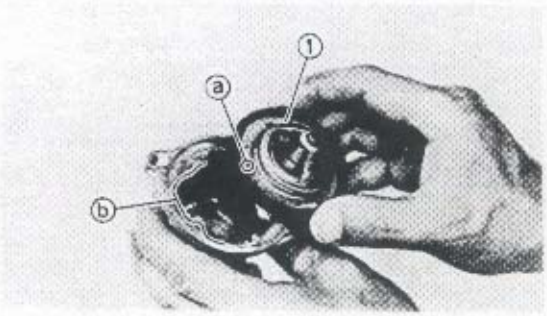



①Thermometer
②Water
③Thermostatic valve
④Vessel

**NOTE:**
The thermostatic valve is sealed and its setting is specialized work. If its accuracy is in doubt, replace it. A faulty unit could cause serious overheating or over-cooling.

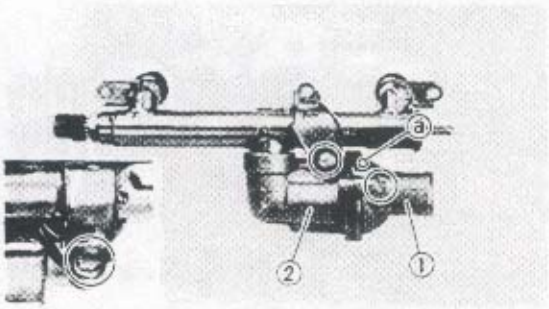
**INSTALLATION**

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




1. Install:
- Thermostatic valve ①
  (to thermostatic valve housing)

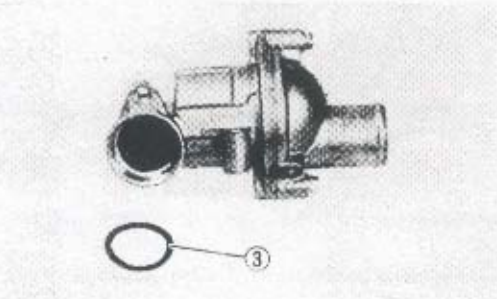
**NOTE:**
When installing the thermostatic valve, align the breather hole ⓐ with the section ⓑ of the housing.




2. Install:
- Thermostatic valve cover ①
- Thermostatic valve housing ②

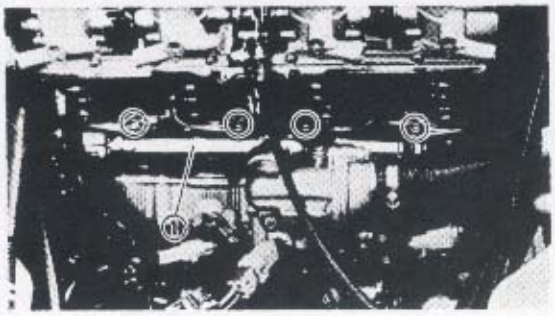
| | |
|---|---|
| | **Bolt (thermostatic valve cover): 10 Nm (1.0 m • kg, 7.2 ft • lb)**<br>**Bolt (thermostatic valve housing): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
- The groove ⓐ on the cover must face upwards.
- Before installing the ther mostatic valve housing to the coolant collector (outlet), apply a thin coating of lithium-soap base grease to the O-ring ③.




**⚠ WARNING**

**Always use a new O-ring.**



3.Install:
- Coolant collector ① (outlet)

| | |
|---|---|
| | **Bolt (coolant collector):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Before installing the coolant collector (outlet) to the cylinder head, apply a thin coating of lithium-soap base grease to the O-rings.

**⚠ WARNING**
**Always use new O-rings.**

4.Fill:
- Cooling system
  Refer to "COOLANT REPLACEMENT" in CHAPTER 3.

| | |
|---|---|
| | **Total amount:**<br>**2.3 L (2.0 Imp qt, 2.4 US qt)** |

5.Inspect:
- Cooling system
  Decrease of pressure (leaks) → Repair.
  Refer to "step 4" in the section "RADIATOR — INSTALLATION".

## WATER PUMP

### REMOVAL

1.Remove:
- Seat
- Top cover
- Inner panels
- Side cowlings
- Lower cowling (left)

Refer to "COWLINGS" in CHAPTER 3.

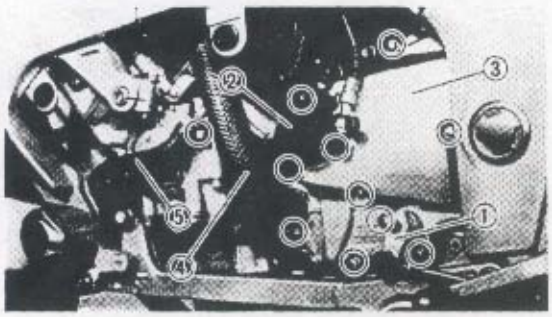
2.Remove:
- Fuel tank

Refer to "FUEL TANK" in CHAPTER 3.

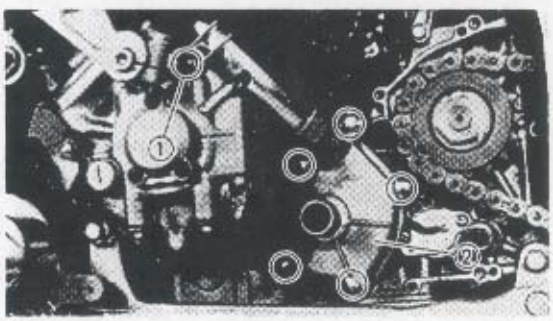
3.Drain:
- Coolant

Refer to "COOLANT REPLACEMENT" in CHAPTER 3.
- Engine oil

Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.

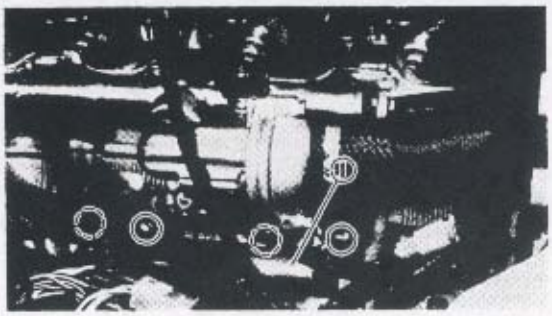


4.Remove:
- Shift pedal link ①
- Clutch release cylinder ②
- Dowel pins
- Crankcase cover ③ (left)
- Dowel pins
- Gasket
- Inlet hose ④ (water pump)
- Inlet hose ⑤ (oil cooler)



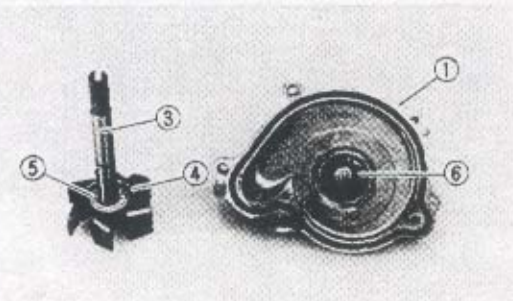
5.Remove:
- Bolt ① (outlet pipe - water pump)
- Water pump cover ② (with outlet pipe)
- Gasket
- Dowel pins

6.Remove:
- Water pump housing ①



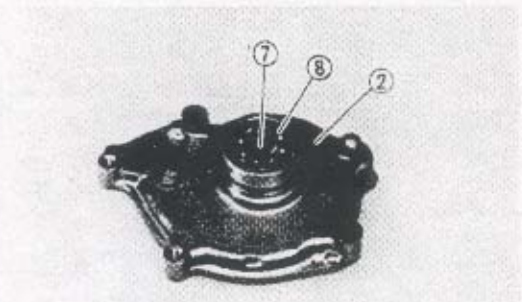
7.Remove:
- Coolant collector ① (inlet)
- (with O-rings)

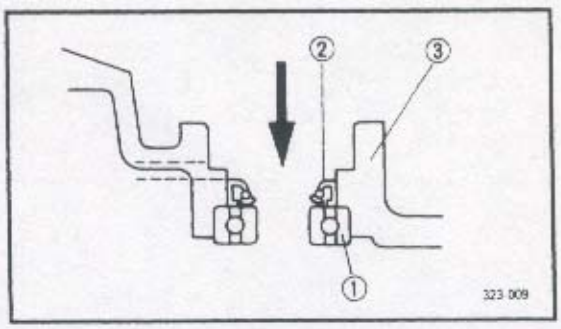
8.Remove:
- Circlip ①
- Impeller shaft ②



**INSPECTION**

1.Inspect:
- Water pump cover ①
- Water pump housing ②
- Impeller ③
- Damper rubber ④
- Rubber holder ⑤
- Water pump seals ⑥
- Oil seal ⑦
  Cracks/Wear/Damage → Replace.
- Bearing ⑧
  Roughness → Replace.
- Outlet pipe (water pump)
- Coolant hoses
  Cracks/Wear/Damage → Replace.
  Refer to "RADIATOR / OIL COOLER - INSPECTION".

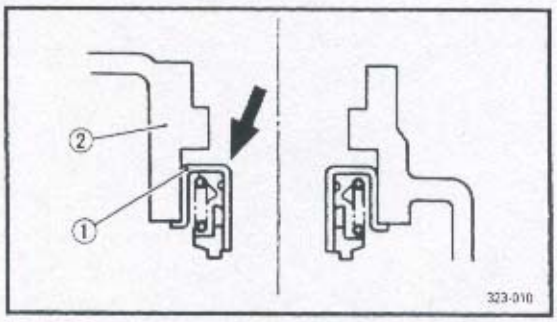




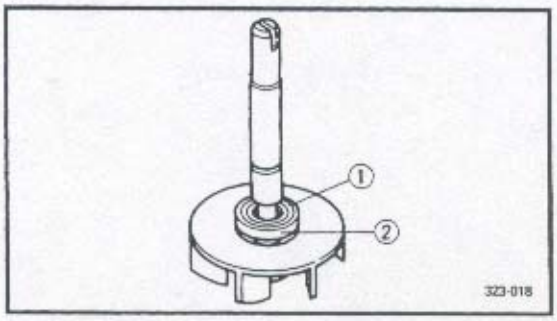

**Bearing and Seal Replacement**

1.Remove:
- Bearing ①
- Oil seal ②
  Tap off from the water pump seal side.

③Water pump housing

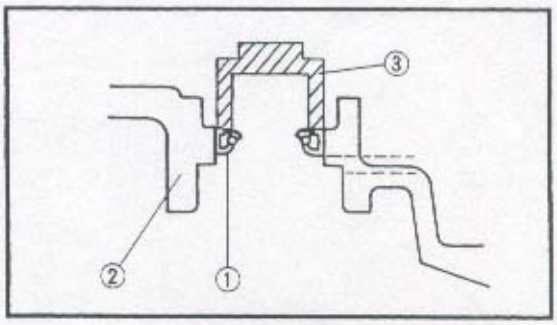



2.Remove:
- Water pump seal ①
- Tap off from the water pump housing ②.



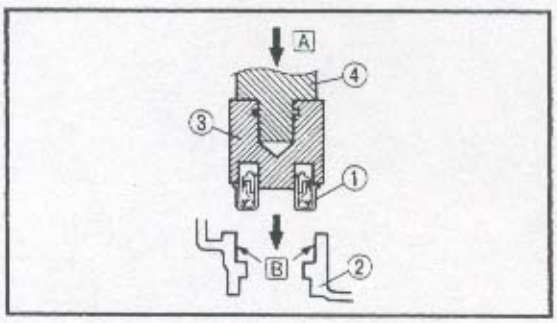

3.Remove:
- Rubber holder ①
- Damper rubber ②
  (from impeller)
  Pry out with a thin flat head screwdriver.

**NOTE:**
Be careful not to scratch the impeller shaft.




4.Install:
- Oil seal ① (new)
  (to water pump housing ②)

**NOTE:**
Use a socket ③ that matches the outside diameter of the oil seal.
Before installing the oil seal, apply tap water or coolant to the outer surface of the oil seal.

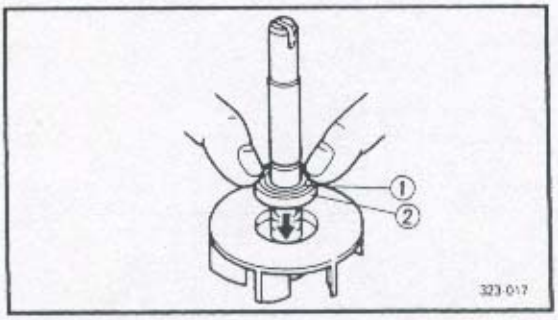


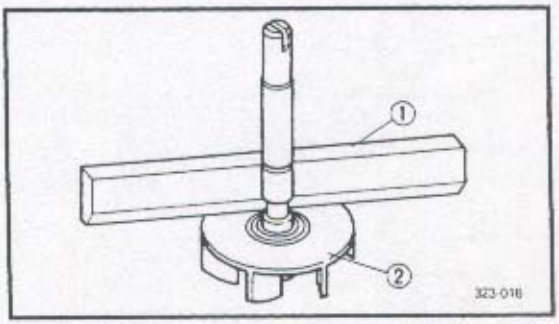

5.Install:
- Water pump seal ① (new)

**NOTE:**
- Use the water pump seal installer.
- Apply Yamaha bond No. 1215 or Quick Gasket® to the water pump housing ② before installing the seal.

**Water pump seal installer (③ and ④):**
**YU-94051-1/90890-04058**
**YM-33221/90890-04078**
**Quick Gasket®:**
**ACC-11001-15-01**
**Yamaha bond No. 1215**
**90890-85505**

A PRESS




6.Apply:
- Tap water or coolant
  (to outer surface of damper rubber ①)

**CAUTION:**

**Never apply oil or grease to water pump seal surfaces.**

7.Install:
- Dumper rubber ① (new)
- Rubber holder ② (new)

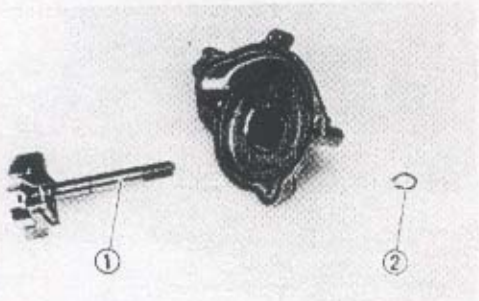
8.Measure:
- Tilt
  Out of specification → Repeat the above steps 6 and 7.

**CAUTION:**

**Be sure the dumper rubber and rubber holder fit squarely.**

**Tilt limit:**
**0.15 mm (0.006 in)**

①Straight edge
②Impeller




**INSTALLATION**

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

1.Install:
- Impeller shaft ①
- Circlip ②

**NOTE:**

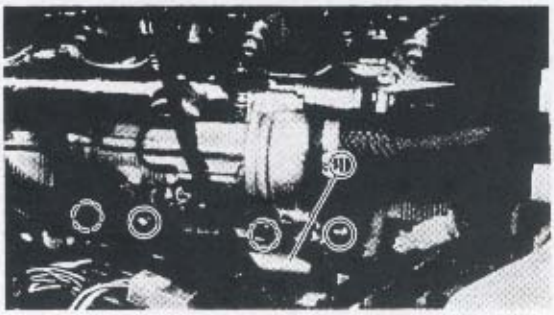
Before installing the impeller shaft, apply tap water or coolant to the water pump seal, then apply lithium soap base grease to the bearing and oil seal.

**CAUTION:**

**Be sure not to scratch the water pump seal while installing.**

**⚠ WARNING**

**Always use a new circlip.**

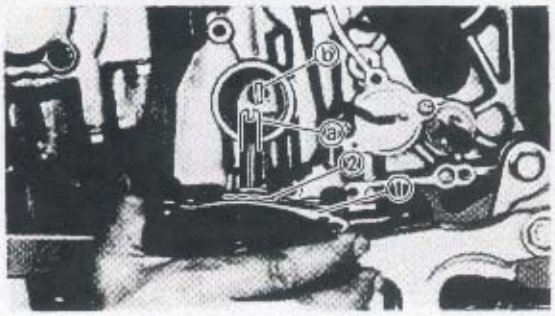


2.Install:
- Coolant collector ① (inlet)
- (with O-rings)

**⚠ WARNING**

**Always use a new O-ring.**

| | |
|---|---|
| | **Bolt (coolant collector):** **10 Nm (1.0 m • kg, 7.2 ft • lb)** |



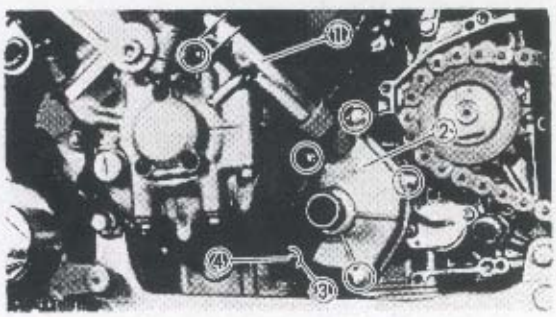
3.Install:
- Water pump housing ①

NOTE:
- Align the slot ⓐ on the impeller shaft with the projection ⓑ on the oil pump shaft.
- Apply a thin coating of grease to the O ring ②.

**⚠ WARNING**

**Always use a new O-ring on the water pump housing.**

5



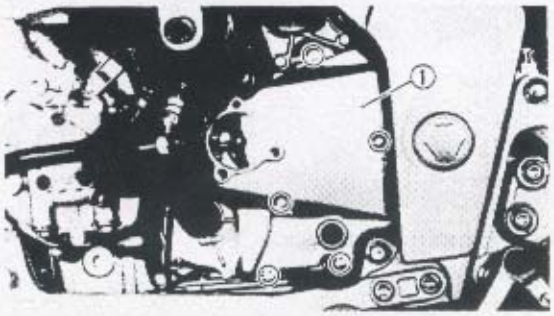
4.Install:
- Outlet pipe ① (water pump) (to water pump cover ②)
- Water pump cover ② (with outlet pipe)

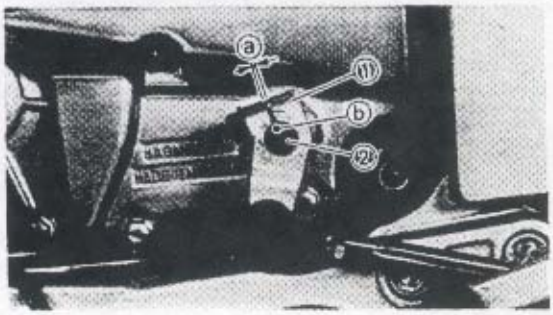
NOTE:
- Before installing the outlet pipe (water pump), apply a grease to the O-rings.
- Set the new copper washer ③ to the coolant drain bolt ④.

| | |
|---|---|
| | **Bolt (water pump cover):** **10 Nm (1.0 m • kg, 7.2 ft • lb)** **Bolt (outlet pipe)** **10 Nm ( 1.0 m • kg, 7.2 ft • lb)** |

**⚠ WARNING**

**Always use new O-rings, gasket and copper washer.**




5.Install:
- Gasket
- Dowel pins
- Crank case cover ① (left)

**⚠ WARNING**

**Always use a new gasket.**

| | |
|---|---|
| | **Bolt (crankcase cover - left): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

6.Install:
- Shift pedal link ①

**NOTE:**
Align the slot ⓐ on the shift pedal link ① with the punched mark ⓑ on the shift shaft ②.

| | |
|---|---|
| | **Bolt (shift pedal link): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

7.Fill:
- Cooling system
  Refer to "COOLANT REPLACEMENT" in CHAPTER 3.

| | |
|---|---|
| | **Total amount: 2.3 L (2.0 Imp qt, 2.4 US qt)** |

8.Inspect:
- Cooling system
  Decrease of pressure (leaks) → Repair.
  Refer to "step 3" in the section "RADIATOR — INSTALLATION".

9.Fill:
- Crankcase
  Refer to "ENGINE OIL REPLACEMENT" in CHAPTER 3.

| | |
|---|---|
| | **Periodic oil change: 2.7 L (2.4 Imp qt, 2.9 US qt)** |

# CHASSIS

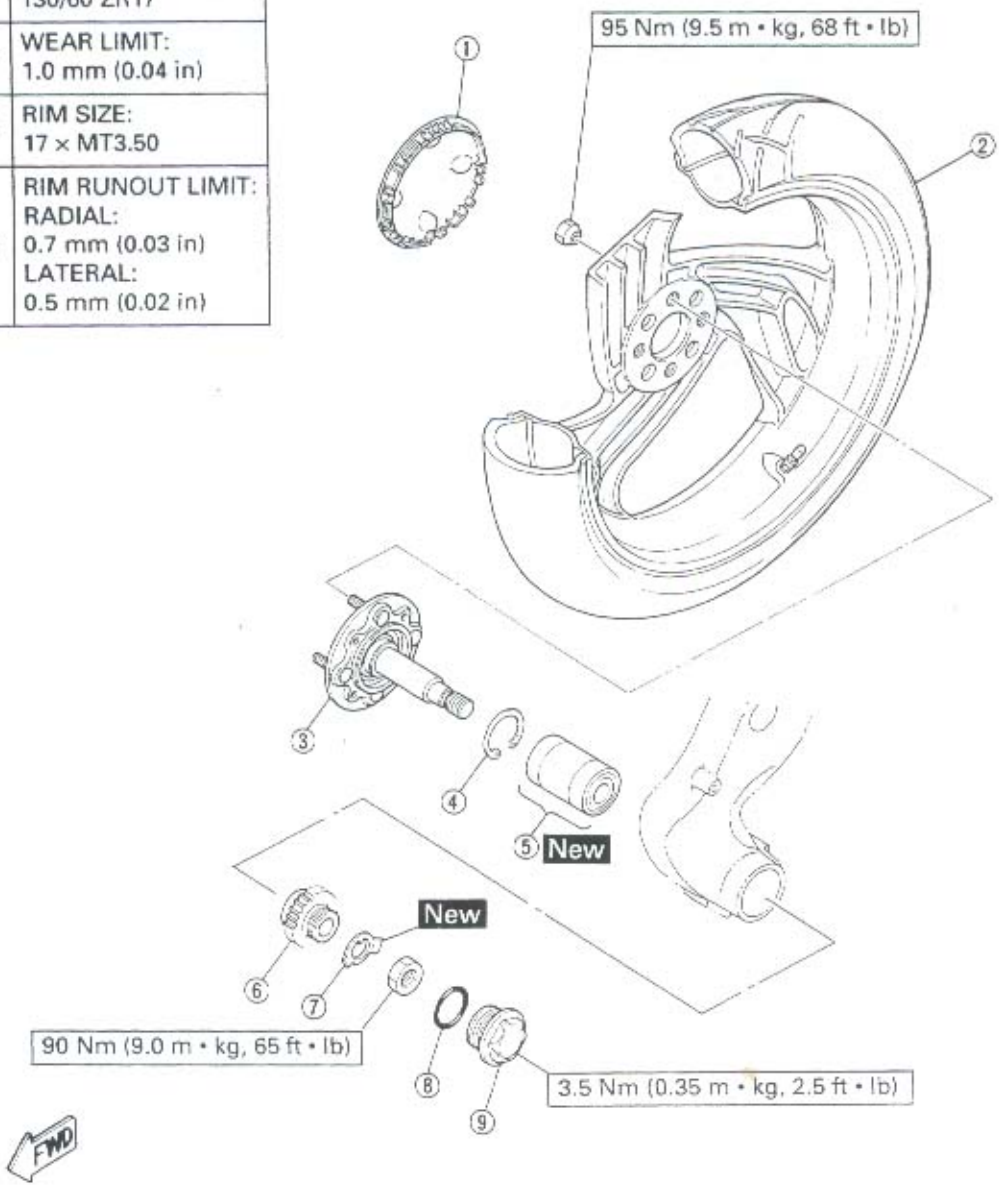
## FRONT WHEEL

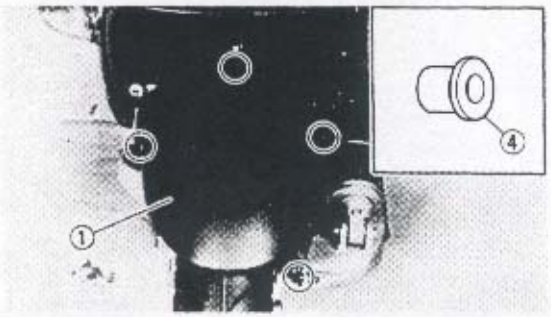
①Wheel cap
②Front wheel
③Wheel axle
④Circlip
⑤Bearing kit
⑥Sensor rotor
⑦Lock washer
⑧O-ring
⑨Hub cap

| TIRE AIR PRESSURE (COLD) | | |
|---|---|---|
| Cold tire pressure: | Front | Rear |
| Up to 90 kg (198 lbs) load* | 250 kPa (2.5 kgf/cm², 36 psi) | 250 kPa (2.5 kgf/cm², 36 psi) |
| 90 Kg (198 lbs) ~ Maximum load* | 250 kPa (2.5 kgf/cm², 36 psi) | 290 kPa (2.9 kgf/cm², 42 psi) |
| High speed riding | 250 kPa (2.5 kgf/cm², 36 psi) | 290 kPa (2.9 kgf/cm², 42 psi) |

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

| | |
|---|---|
| A | TIRE SIZE:<br>130/60 ZR17 |
| B | WEAR LIMIT:<br>1.0 mm (0.04 in) |
| C | RIM SIZE:<br>17 × MT3.50 |
| D | RIM RUNOUT LIMIT:<br>RADIAL:<br>0.7 mm (0.03 in)<br>LATERAL:<br>0.5 mm (0.02 in) |






REMOVAL

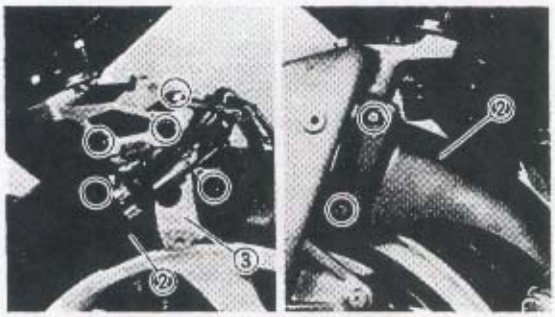
**⚠ WARNING**

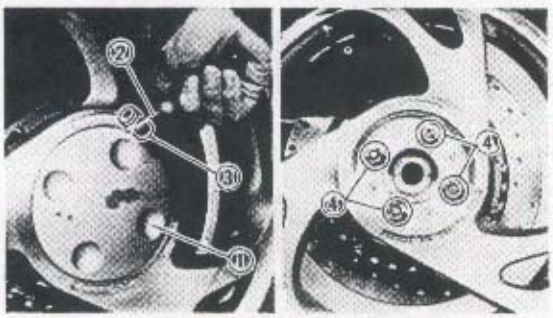
**Securely support the motorcycle so there is no danger of it falling over.**

1. Place the motorcycle on the centerstand.
2. Remove:
   - Front fenders (upper ① and lower ②)
   - Fender bracket ③

**NOTE:**

Take care not to loose the collars ④.



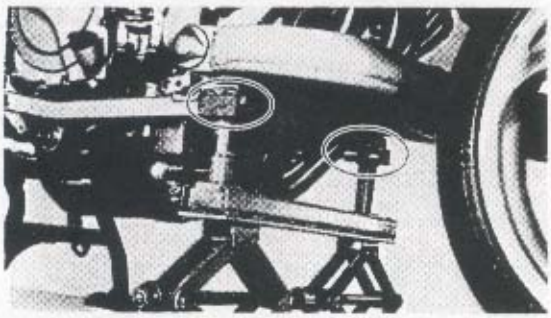




3. Remove:
   - Wheel cap ①
     Using a flat-head screw driver ②

**CAUTION:**

**Place a rag ③ between the screwdriver and the rim to avoid damaging the rim.**

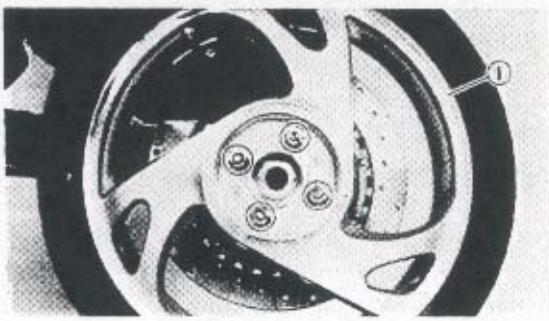
4. Loosen:
   - Nuts ④ (front wheel)



5. Elevate the front wheel by placing a suitable stand under the engine.

**CAUTION:**

**Use the front end of the main frame as jack-up point, never the reinforcement tube or exhaust pipes.**



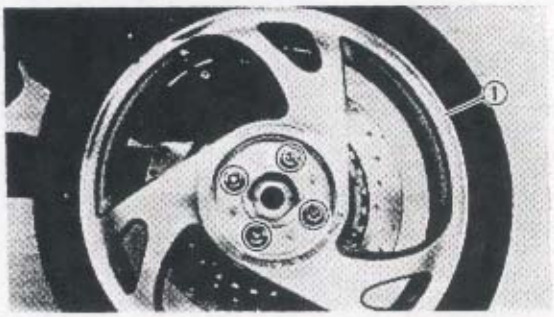

6. Remove:
   - Nuts (front wheel)
   - Front wheel ①

**CAUTION:**

**Take care not to scratch the rim against the brake caliper when removing the front wheel.**

### INSPECTION

Refer to "FRONT WHEEL AND WHEEL AXLE – CHAPTER IV " in Service Manual – New Features.

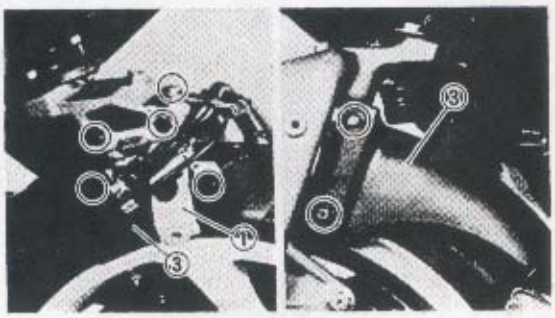



### INSTALLATION

1.Install:

- Front wheel ①

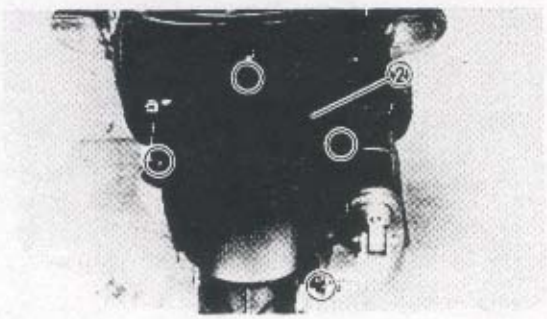
| | |
|---|---|
| | **Nut (front wheel):**<br>**95 Nm (9.5 m • kg, 68 ft • lb)** |




2.Install:

- Fender bracket ①
- Front fenders (upper ② and lower ③)

| | |
|---|---|
| | **Bolt (fender bracket):**<br>**8 Nm (0.8 m • kg, 5.8 ft • lb)**<br>**Bolt (front fender):**<br>**6 Nm (0.6 m • kg, 4.3 ft • lb)** |




**⚠ WARNING**

**Make sure that the brake hose is routed properly.**

6

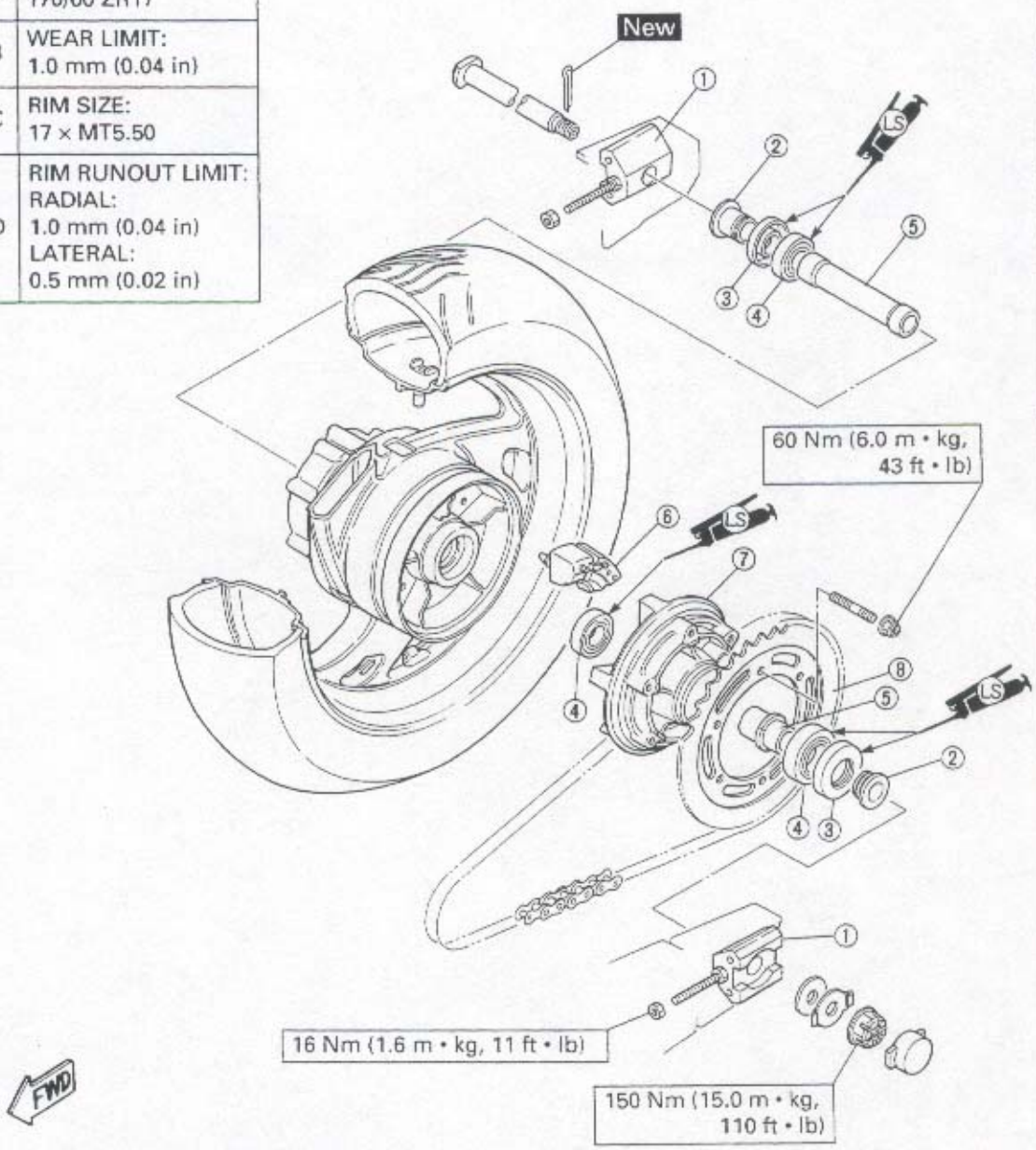
### STATIC WHEEL BALANCE ADJUSTMENT

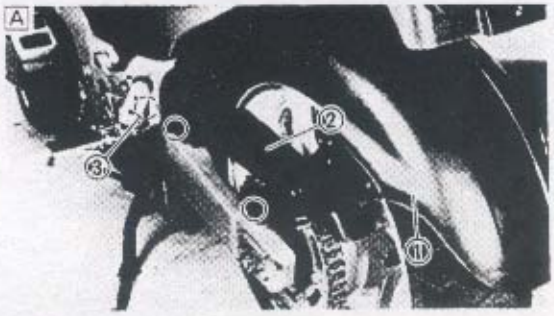
Refer to "FRONT WHEEL AND WHEELAXLE – CHAPTER IV" in Service Manual – New Features.

## REAR WHEEL

①Chain puller
②Collar
③Oil seal
④Bearing
⑤Spacer
⑥Damper rubber
⑦Sprocket hub
⑧Rear sprocket wheel

| | |
|---|---|
| A | TIRE SIZE:<br>170/60 ZR17 |
| B | WEAR LIMIT:<br>1.0 mm (0.04 in) |
| C | RIM SIZE:<br>17 × MT5.50 |
| D | RIM RUNOUT LIMIT:<br>RADIAL:<br>1.0 mm (0.04 in)<br>LATERAL:<br>0.5 mm (0.02 in) |





## REMOVAL

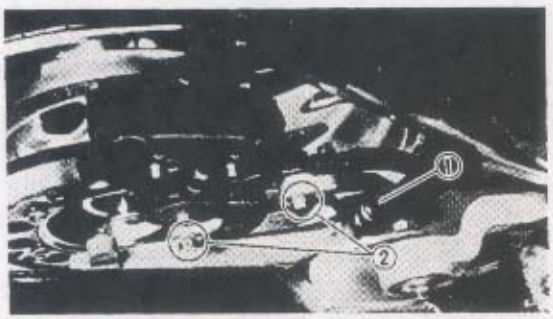
**⚠ WARNING**

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

1. Place the motorcycle on the centerstand.
2. Remove:
   - Rear fender ①
     (with chain guard ②)

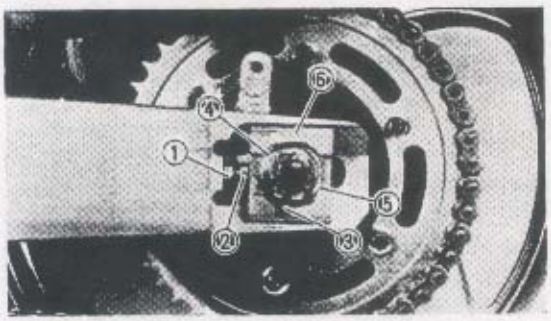
**NOTE:**
Take care not to loose the collars ③.

Ⓐ Left side
Ⓑ Right side

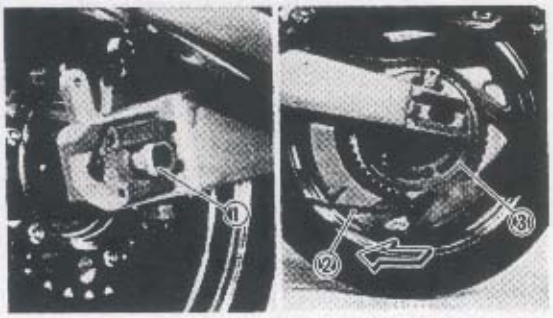



3. Loosen:
   - Bolt ① (brake caliper bracket)
4. Remove:
   - Bolts ② (brake caliper)

**NOTE:**
Do not depress the brake pedal while the caliper is removed.

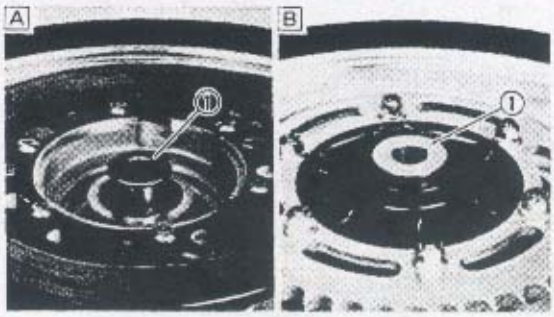



5. Loosen:
   - Locknut ①
   - Adjuster ②
6. Remove:
   - Cotter pin ③
   - Axle nut ④
   - Washer ⑤
   - Chain puller ⑥



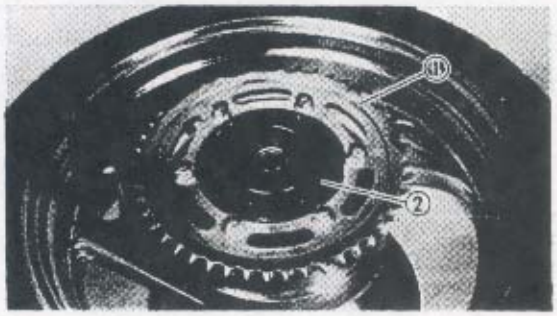

7. Remove:
   - Rear wheel axle ①
   - Rear wheel

**NOTE:**
Push the rear wheel forward and disconnect the drive chain ② from the rear sprocket wheel ③.

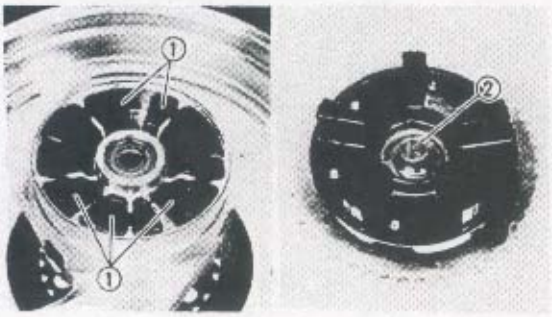



8.Remove:
- Collars ①

Ⓐ Left
Ⓑ Right

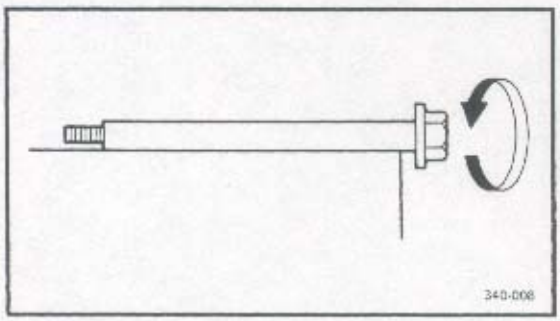



9.Remove:
- Rear sprocket wheel ①
  (with sprocket hub ② )




10.Remove:
- Damper rubbers ①
- Collar ②
  (from sprocket hub)





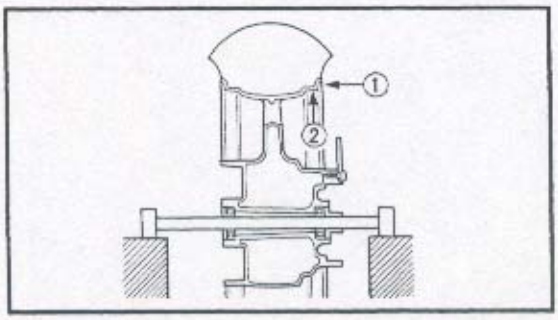

**INSPECTION**

1.Inspect:
- Rear wheel axle
  Roll the axle on a flat surface.
  Bent → Replace.

**⚠ WARNING**

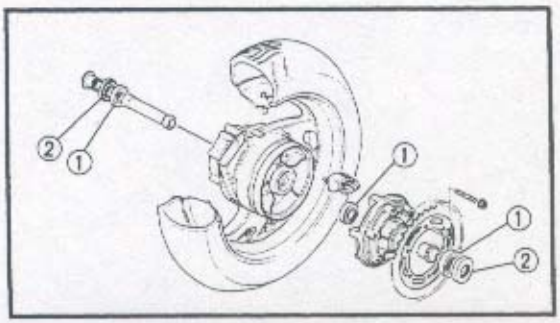
**Never attempt to straighten a bent axle.**

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 limit:**
**Radial ⓐ : 1.0 mm (0.04 in)**
**Lateral ⓑ : 0.5 mm (0.02 in)**

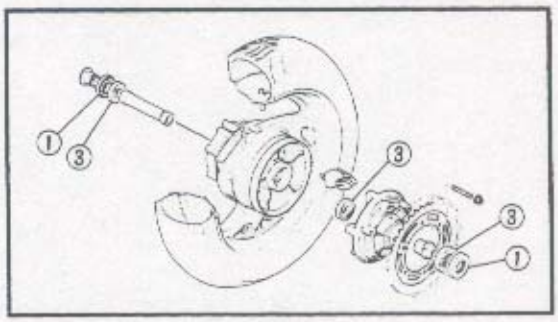



4.Inspect:
- Wheel bearings ①
  Bearings allow play in the wheel hub and sprocket hub, or wheel turns roughly → Replace.
- Oil seals ②
  Wear/Damage → Replace.

**********

**Wheel bearing and oil seal replacement steps:**
- Clean the outside of the wheel and sprocket hub .
- Remove the oil seals ① using a flat-head screw driver.

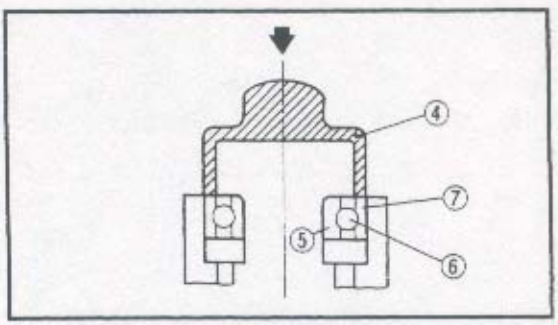
**NOTE:**
Place a rag ② on the outer edge to prevent damage.




- Remove the bearings ③ using a general bearing puller.
- Install the new bearings and oil seals.

**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.**

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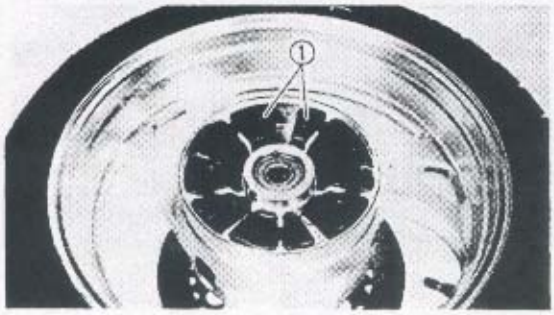



5.Inspect:
- Damper rubber ①
, Wear/Damage → Replace.

**INSTALLATION**

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

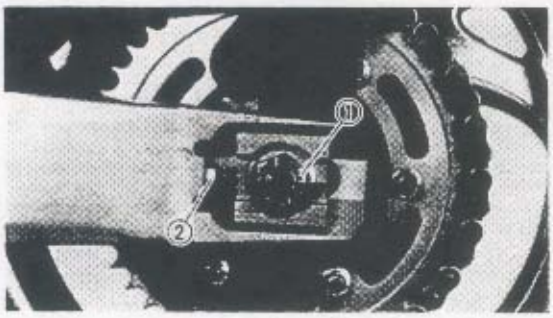
1.Lubricate:
- Rear wheel axle
- Bearings
- Oil seals

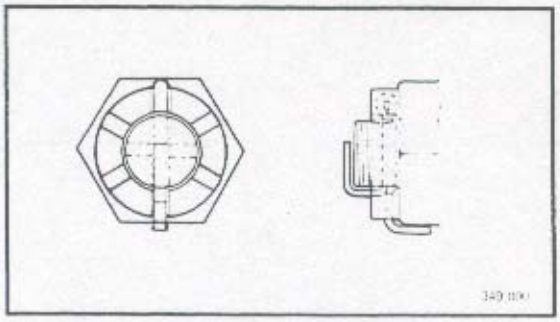
**Recommended lubricant:**
**Lithium soap base grease**

2.Adjust:
- Drive chain slack
  Refer to "DRIVE CHAIN SLACK ADJUSTMENT" in CHAPTER 3.

**Drive chain slack:**
**10 ~ 20 mm (0.4 ~ 0.8 in)**

6



3.Tighten:
- Axle nut ① (rear wheel)
- Lock nut ② (chain adjuster)

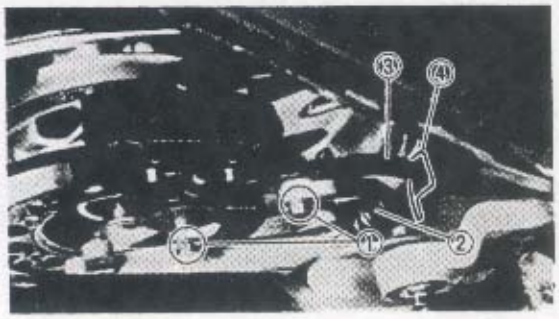
**Axle nut (rear wheel):**
**150 Nm (15.0 m • kg, 110 ft • lb)**
**Lock nut (chain adjuster):**
**16 Nm (1.6 m • kg, 11 ft • lb)**

**NOTE:**
- Do not loosen the axle nut after torque tightening.
- If the axle nut groove is not aligned with the wheel axle cotter pin hole, align the groove to the hole by tightening up on the axle nut.

4.Install:
- Cotter pin

**⚠ WARNING**

**Always use a new cotter pin on the axle nut.**




5.Tighten:
- Bolts ① (brake caliper)
- Bolt ② (caliper bracket)

**Bolt (brake caliper):**
**35 Nm (3.5 m · kg, 25 ft · lb)**
**Bolt (caliper bracket):**
**49 Nm (4.9 m · kg, 35 ft · lb)**

**⚠ WARNING**

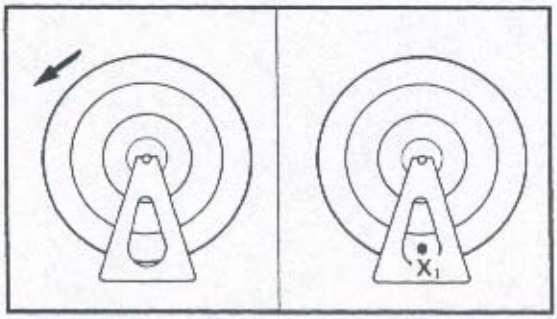
**Make sure that the brake hose is routed properly.**

③Brake hose
④Brake hose guides

## STATIC WHEEL BALANCE ADJUSTMENT

NOTE:
- After replacing the tire and/or wheel, wheel balance should be adjusted.
- Adjust the wheel balance with brake disc and sprocket hub installed.

1.Remove:
- Balancing weight
- Set the wheel on a suitable stand




2.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.

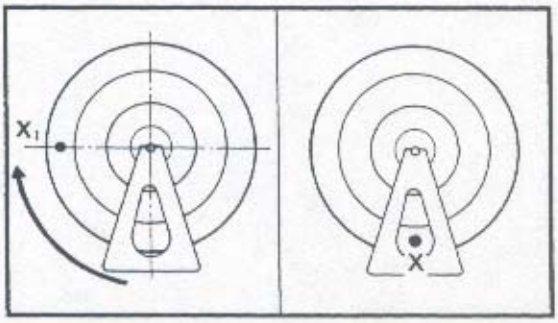
c.Turn the wheel so that the "$X_1$" mark is 90° up.

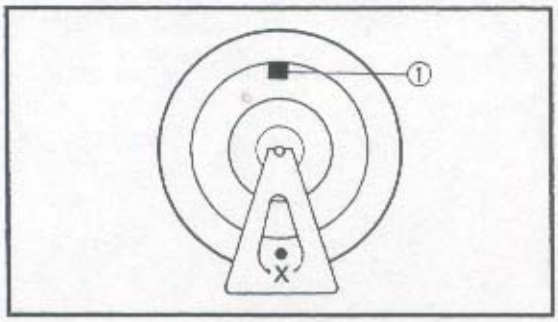
d.Let the wheel fall and wait for it to rest. Put an "$X_2$" mark on the wheel bottom spot.

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".

**********




3.Adjust:
- Wheel balance

**********

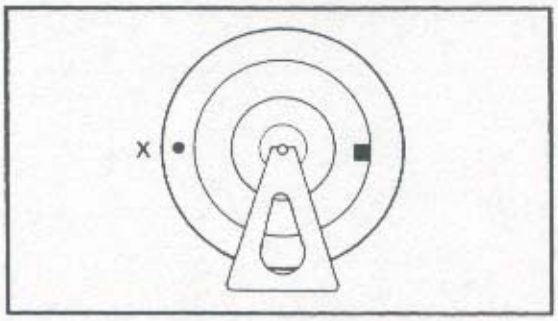
**Adjusting steps:**

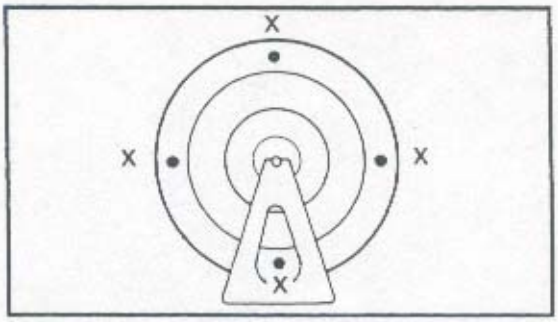
- Install a balancing weight ① on the rim exactly opposite to the heavy spot "X".

**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.

**********




4.Check:
- Wheel balance

**********

**Checking steps:**

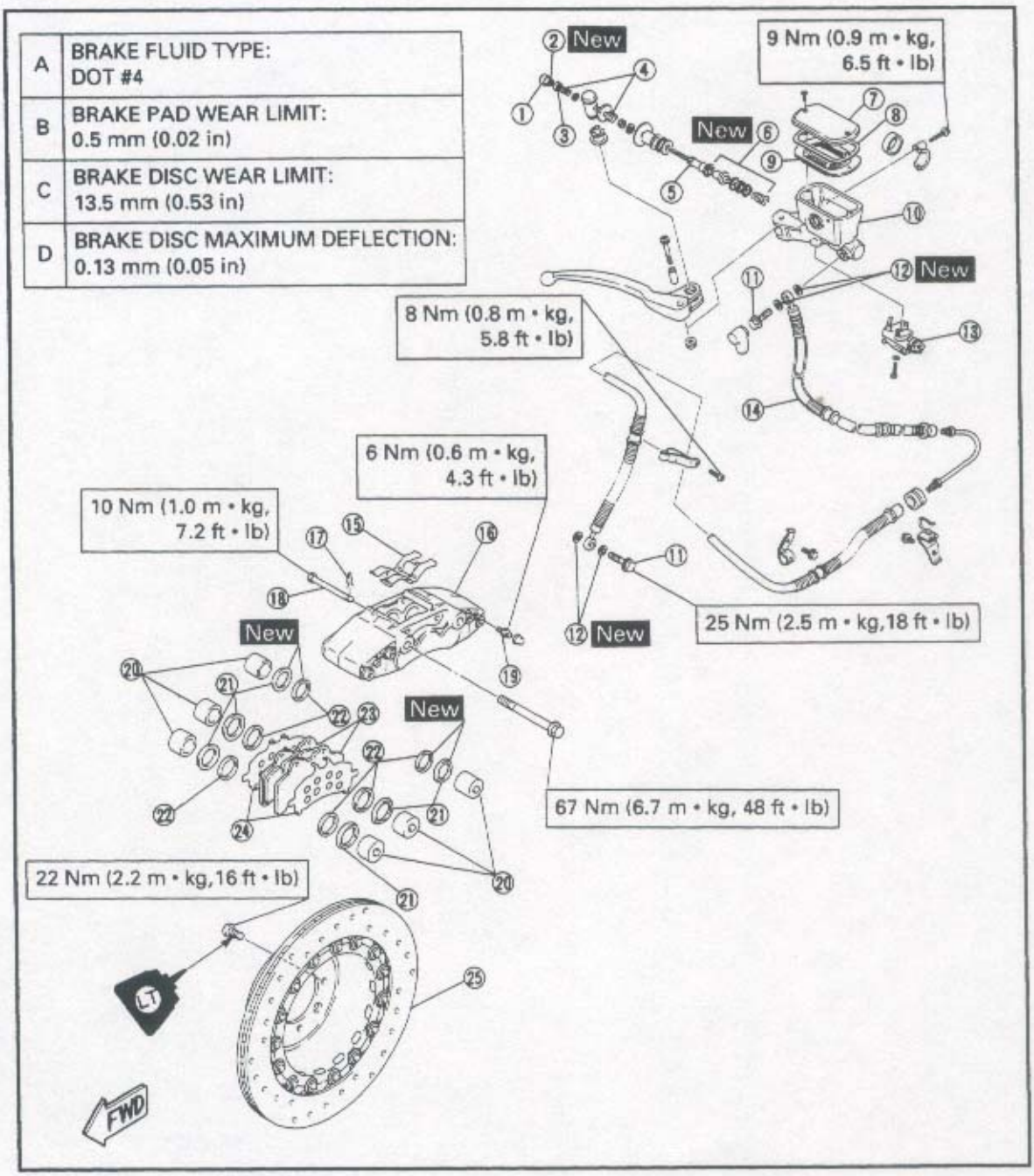
- Turn the wheel so that it comes to each point as shown.
- Check that the wheel is at rest at each point. If not, readjust the wheel balance.

**********

## FRONT AND REAR BRAKE

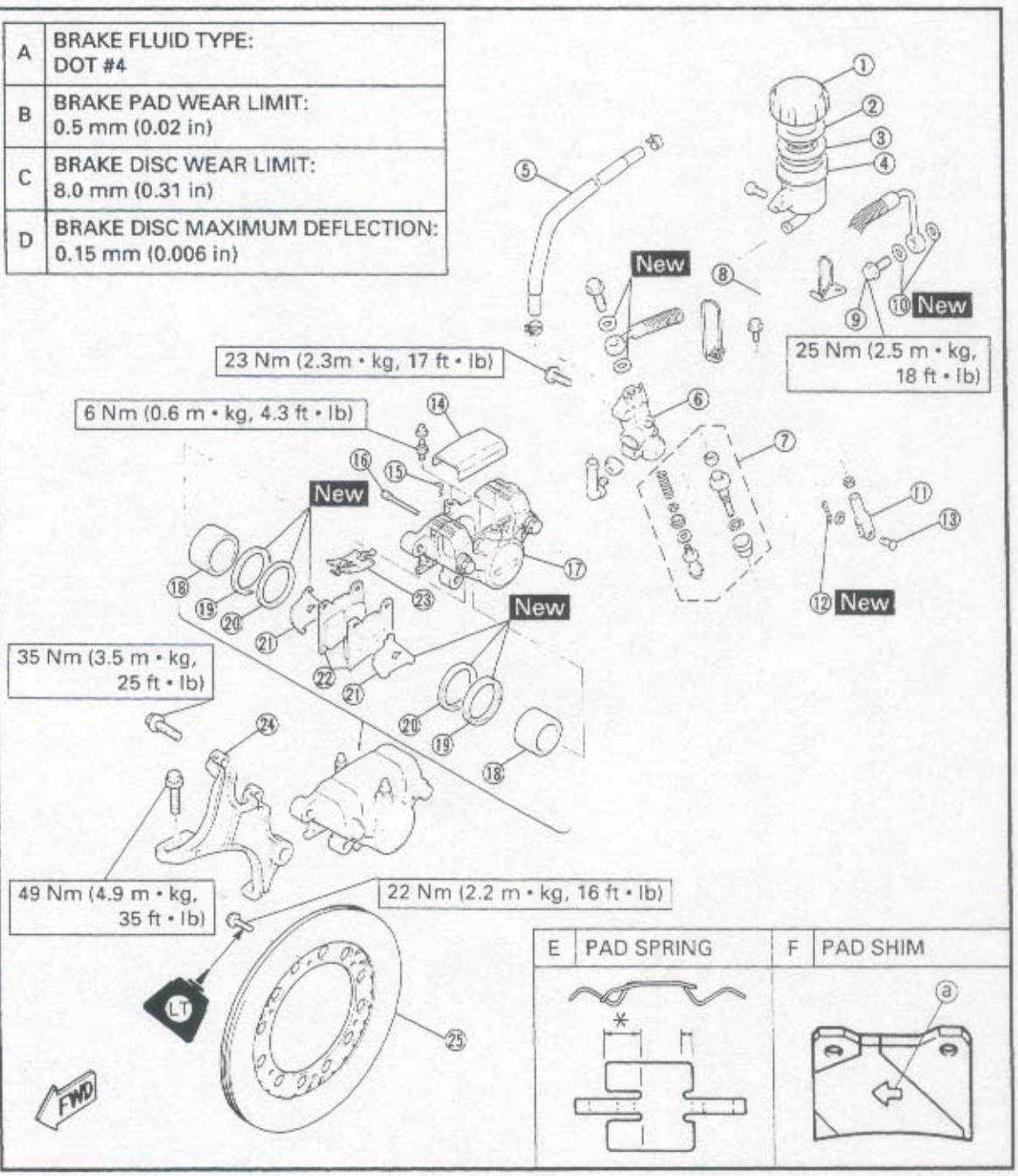
①Rubber cap
②Circlip
③Spring retainer
④Spring
⑤Push rod
⑥Master cylinder kit
⑦Reservoir tank cap
⑧Holder (diaphragm)
⑨Diaphragm
⑩Master cylinder
⑪Union bolt
⑫Copper washer
⑬Brake switch
⑭Brake hose
⑮Pad spring
⑯Brake caliper
⑰Retaining clips
⑱Retaining bolt
⑲Bleed screw
⑳Piston
㉑Piston seal
㉒Dust seal
㉓Brake pad
㉔Pad shim
㉕Brake disc

| | |
|---|---|
| A | BRAKE FLUID TYPE: DOT #4 |
| B | BRAKE PAD WEAR LIMIT: 0.5 mm (0.02 in) |
| C | BRAKE DISC WEAR LIMIT: 13.5 mm (0.53 in) |
| D | BRAKE DISC MAXIMUM DEFLECTION: 0.13 mm (0.05 in) |



①Reservoir tank cap
②Holder (diaphragm)
③Diaphragm
④Reservoir tank
⑤Reservoir hose
⑥Master cylinder
⑦Master cylinder kit
⑧Brake hose
⑨Union bolt
⑩Copper washer
⑪Adjuster
⑫Cotter pin
⑬Clevis pin
⑭pad cover
⑮Retaining clips
⑯Retaining pin
⑰Brake caliper
⑱Piston
⑲Piston seal
⑳Dust seal
㉑Pad shim
㉒Brake pad
㉓Pad spring
㉔Caliper bracket
㉕Brake disc
E The longer tangs (*) of the pad spring must point in the direction of the disc rotation.
F The arrow mark ⓐ on the pad shim must point in the direction of the disc rotation.

| | |
|---|---|
| A | BRAKE FLUID TYPE: DOT #4 |
| B | BRAKE PAD WEAR LIMIT: 0.5 mm (0.02 in) |
| C | BRAKE DISC WEAR LIMIT: 8.0 mm (0.31 in) |
| D | BRAKE DISC MAXIMUM DEFLECTION: 0.15 mm (0.006 in) |



**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.**

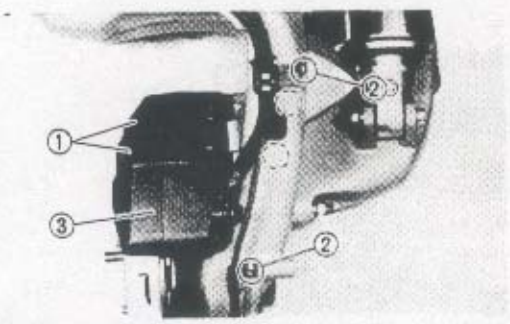
## BRAKE PAD REPLACEMENT

**NOTE:**

It is not necessary to disassemble the brake caliper and brake hose to replace the brake pads.

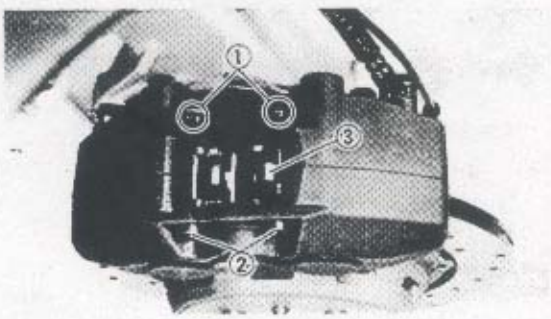
**Front brake**

1.Remove:
- Front wheel
  Refer to "FRONT WHEEL".




2.Loosen:
- Retaining bolt ①

3.Remove:
- Screws ② (hose and lead holders)
- Brake caliper ③

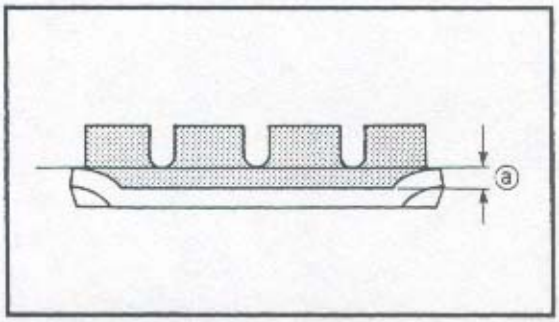


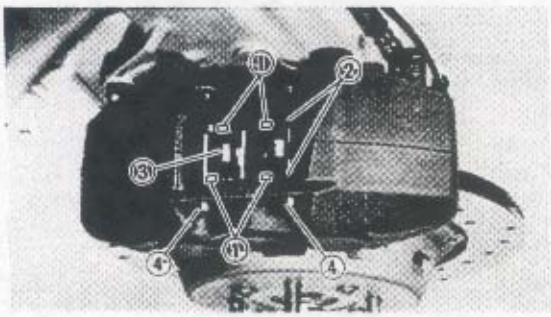

4.Remove:
- Retaining clips ①
- Retaining bolts ②
- Pad spring ③

5.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 (0.02 in)**



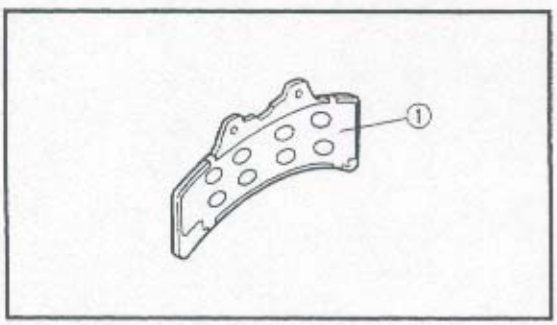

6.Install:
- Pad shims ①
  (onto brake pads ②)
- Brake pads ②
- Pad spring ③
- Retaining bolts ④

6

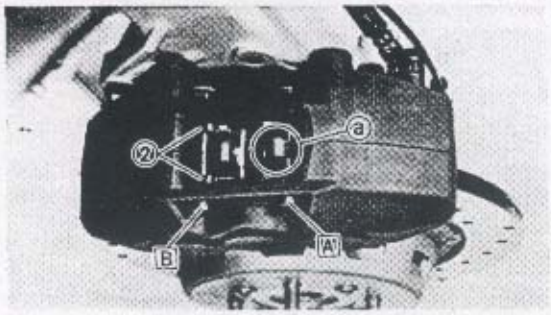
**********

**Installation steps:**
- Connect a suitable hose ⑤ tightly to the caliper bleed screw ⑥ . 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 ⑥.

**Caliper bleed screw:**
**6 Nm (0.6 m • kg, 4.3 ft • lb)**




- Install the pad shims ① (new) onto the new brake pads.

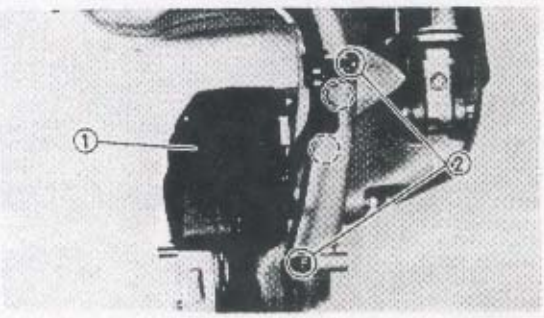



- Install the brake pads ② (new) and the retaining bolt (front).
- Hook the pad spring (new) ⓐ on the retaining bolt (front Ⓐ), then install the retaining bolt (rear Ⓑ), while pressing down the pad spring.

| | |
|---|---|
| | **Retaining bolt :**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

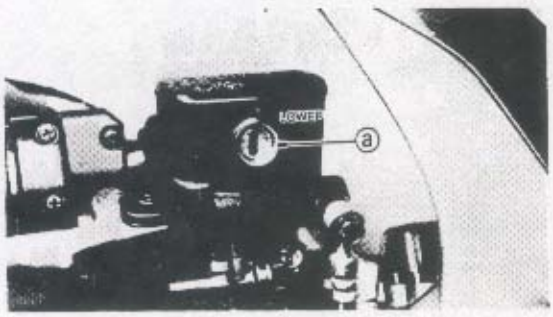
**********

7.Install:
- Retaining clips
- Brake caliper ①
- Screws ② (hose and lead holder)



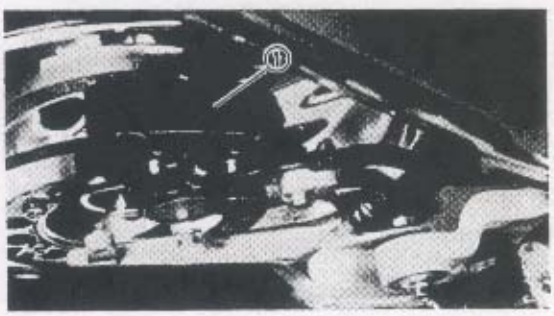

| | |
|---|---|
| | **Bolt (brake caliper):**<br>**67 Nm (6.7 m • kg, 48 ft • lb)**<br>**Screw (hose and lead holder):**<br>**8 Nm (0.8 m • kg, 5.8 ft • lb)** |

8.Inspect:
- Brake fluid level
  Refer to "BRAKE FLUID INSPECTION" in CHAPTER 3.



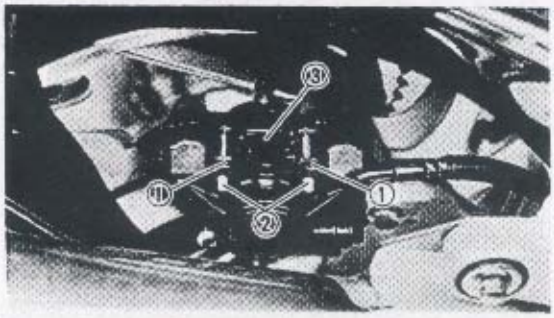

ⓐ "LOWER" level line

9.Check:
- Brake lever operation
  A soft or spongy feeling → Bleed brake system.
  Refer to "AIR BLEEDING" in CHAPTER 3.

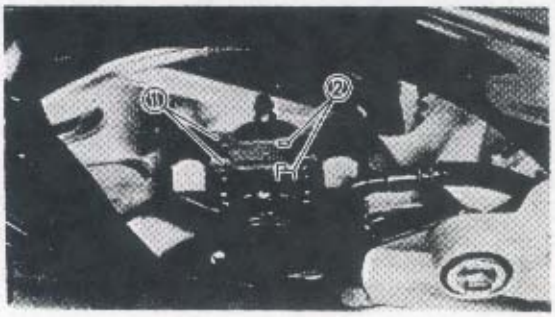



**Rear brake**

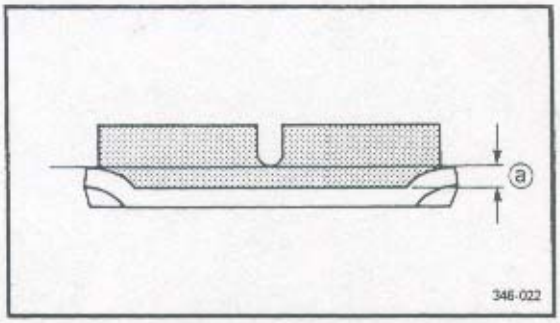
1.Remove:
- Pad cover ①




2.Remove:
- Retaining clips ①
- Retaining pins ②
- Pad spring ③

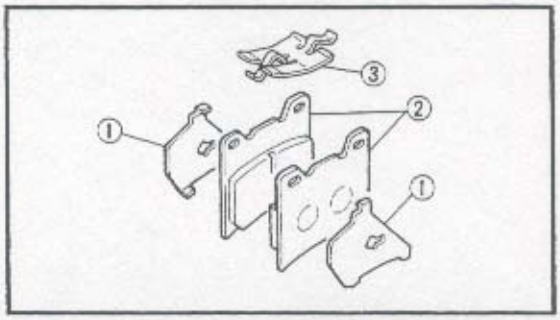



3.Remove:
- Brake pads ①
  (with pad shims ②)

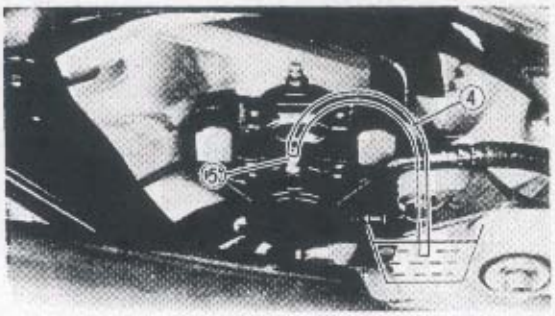



**NOTE:**
- When pad replacement is required, also replace the pad spring and shims.
- Replace the pads as a set if either is found to be worn to the wear limit ⓐ.

**Wear limit ⓐ :**
**0.5 mm (0.02 in)**



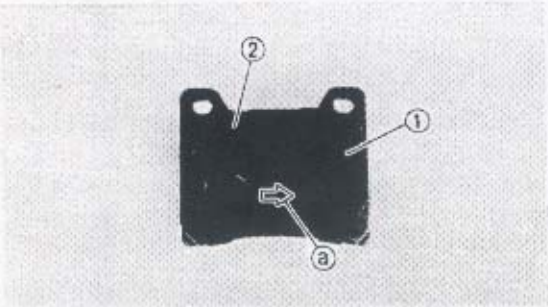

4.Install:
- Pad shims ①
  (onto brake pads ②)
- Brake pads ②
- Pad spring ③




**********

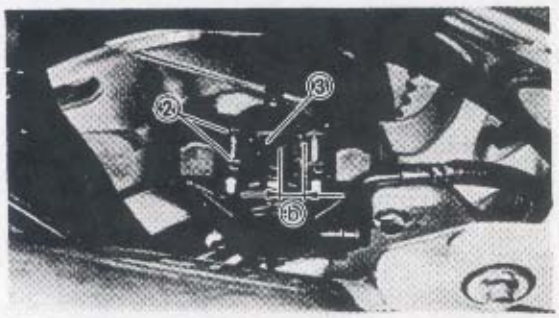
**Installation steps:**
- Connect a suitable hose ④ tightly to the caliper bleed screw ⑤. Then, place the other end of this hose into an open container.
- Loosen the caliper bleed screw and push the pistons into the caliper with the finger.
- Tighten the caliper bleed screw ⑤.

**Caliper bleed screw:**
**6 Nm (0.6 m · kg, 4.3 ft · lb)**




● Install the pad shim ① (new) on the brake pad ② (new).

**NOTE:**
The arrow mark ⓐ on the pad shim must point in the direction of the disc rotation.

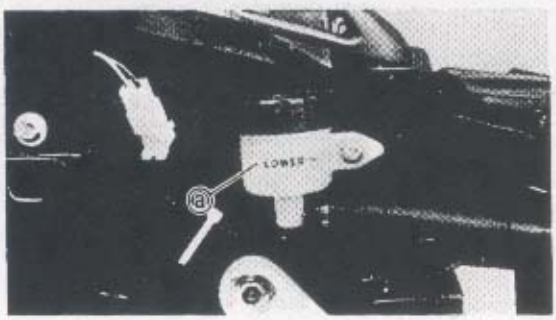



● Install the brake pads ② (new) and pad spring ③ (new).

**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 ①




6. Inspect:
- Brake fluid level
  Refer to "BRAKE FLUID INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

7. Check:
- Brake pedal operation
  A soft or spongy feeling → Bleed brake system.
  Refer to "AIR BLEEDING" in CHAPTER 3.

8. Install:
- Side cover (right)
- Seat
  Refer to "COWLINGS" in CHAPTER 3.

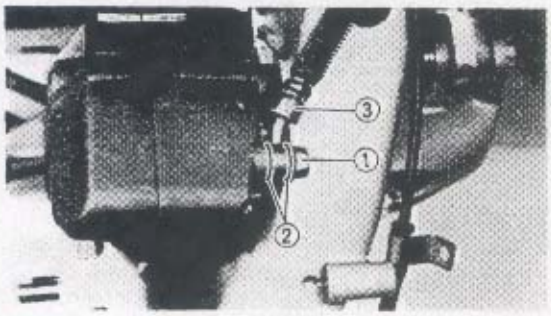
### CALIPER DISASSEMBLY

**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:
- Front wheel
  Refer to "FRONT WHEEL".

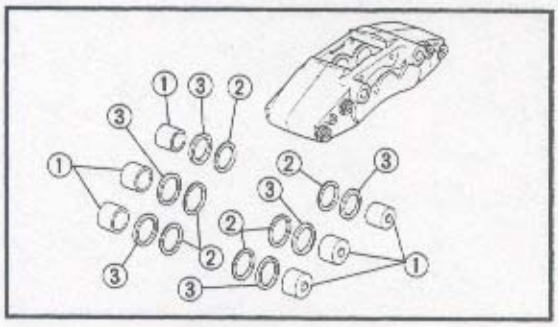
2.Remove:
- Brake caliper
- Pad cover
- Retaining clips
- Retaining bolts
- Pad spring
- Brake pads
  (with pad shims)
  Refer to "BRAKE PAD REPLACEMENT".



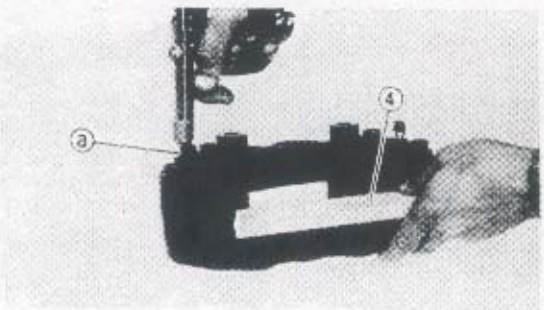

3.Remove:
- Union bolt ①
- Copper washers ②
- Brake hose ③

**NOTE:**
Place the open end of the hose into a container and pump the oil fluid out carefully.



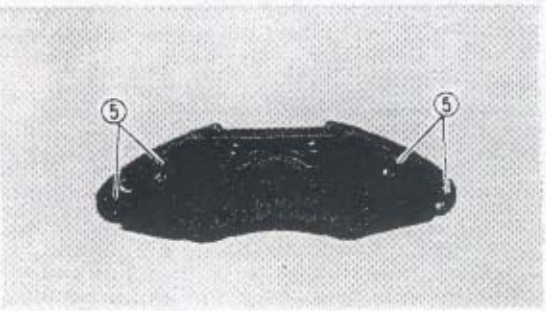


4.Remove:
- Pistons ①
- Dust seals ②
- Piston seals ③




**********

**Removal steps:**
- Using a wood piece ④, 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.

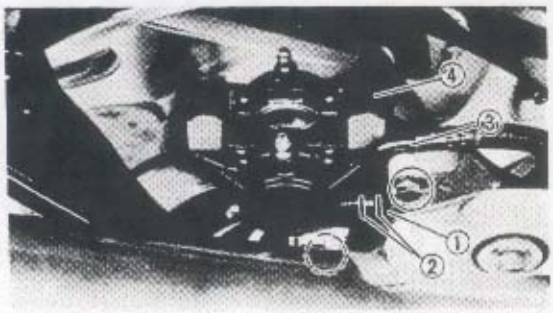
**⚠ WARNING**

- **Never try to pry out the piston.**
- **Do not loosen the bolts ⑤.**

**********

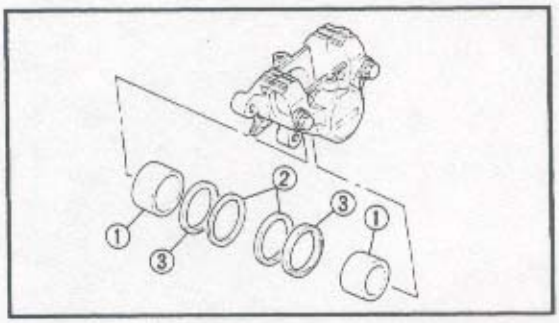
**Rear brake**

1.Remove:
- Pad cover
- Retaining clips
- Retaining pins
- Pad spring
- Brake pads
  (with pad shims)
  Refer to "BRAKE PAD REPLACEMENT".

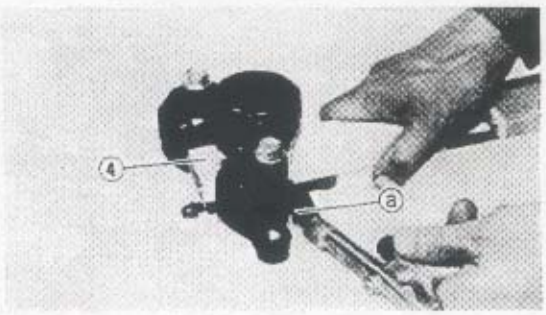



2.Remove:
- Union bolts ①
- Copper washers ②
- Brake hose ③
- Brake caliper ④

**NOTE:**
Place the open end of the hose into a container and pump the oil fluid out carefully.

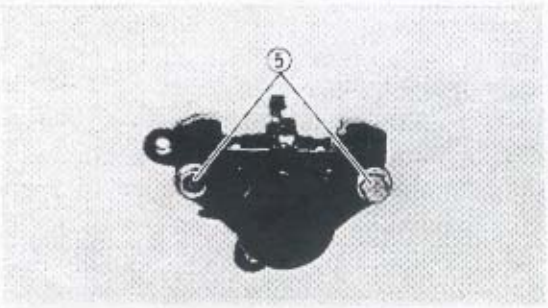



3.Remove:
- Pistons ①
- Dust seals ②
- Piston seals ③




**********

**Removal steps:**
- Using a wood piece ④, 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.

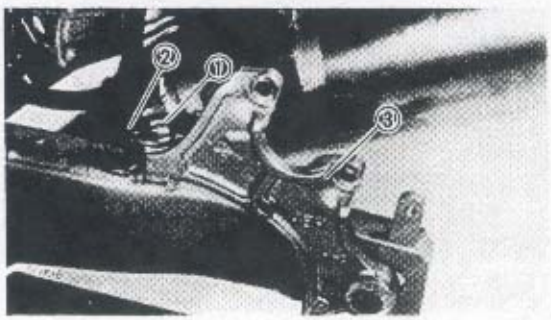



- Repeat previous step to force out the right side piston from the caliper body.

**⚠ WARNING**

- **Never try to pry out the piston.**
- **Do not loosen the bolts ⑤.**

**********

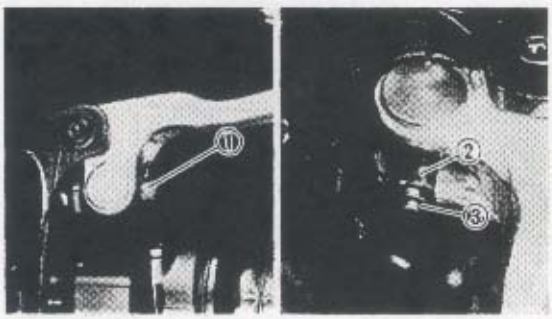



4.Remove:
- Rear wheel
  Refer to "REAR WHEEL".
- Bolt ① (caliper bracket)
- Brake hose guide ②
- Caliper bracket ③

### 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.

6

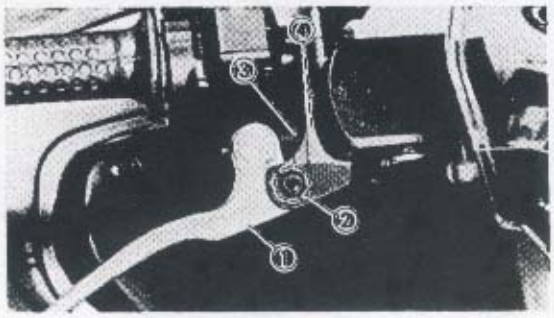



**Front brake**

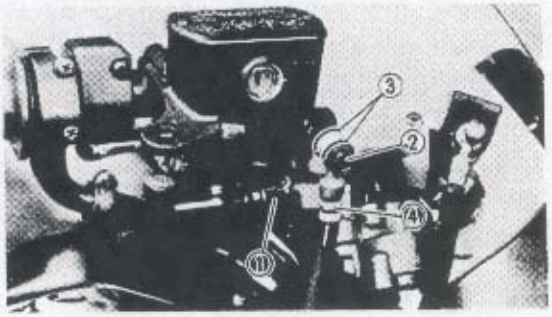
1.Remove:
- Rubber cap ①

2.Turn in the spring retainer ② as far as possible and remove the circlip ③ with a thin screw driver.

3.Remove:
- Spring retainer ①
- Spring ②
- Square washer ③



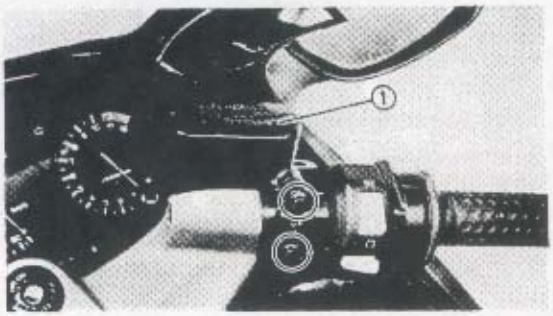
4.Remove:
- Brake lever ①
- Collar ②
- Adjuster ③
- Spring ④



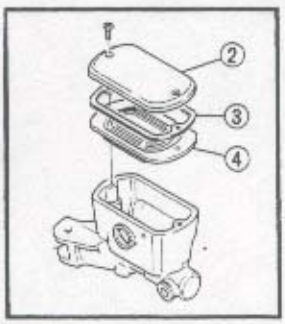
5.Disconnect:
- Coupler ① (brake switch)

6.Remove:
- Union bolt ②
- Copper washers ③
- Brake hose ④

**NOTE:**
Hold a container under the master cylinder and under the hose end to collect remaining brake fluid.

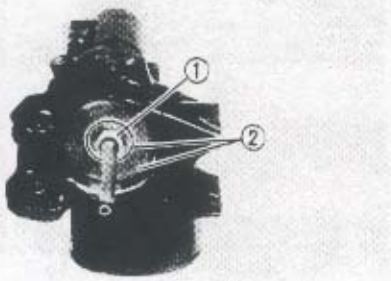


7.Remove:
- Master cylinder ①

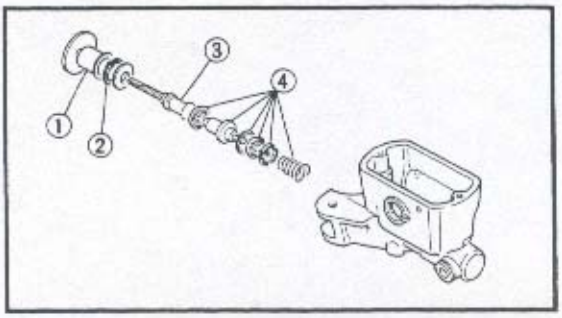


8.Remove:
- Brake switch ①

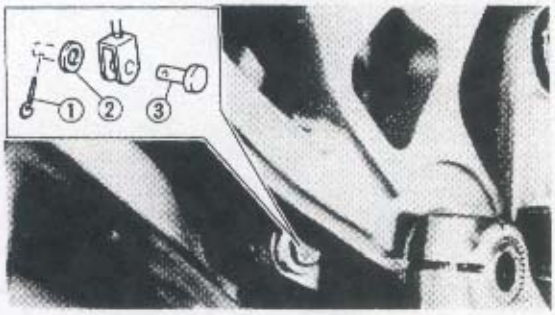
9.Remove:
- Cap ② (master cylinder)
- Holder ③ (diaphragm)
- Diaphragm ④



10.Remove:
- Locknut ①
- Washers ②



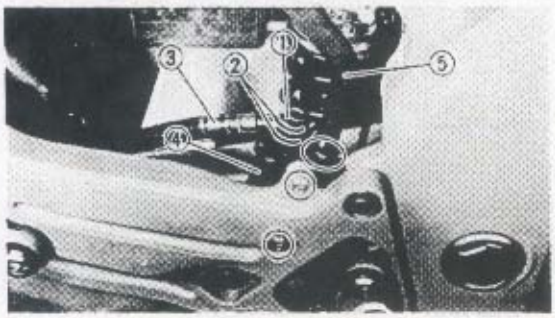
11.Remove:
- Dust boot ①
- Criclip ②
- Push rod ③
- Master cylinder kit ④



**Rear brake**

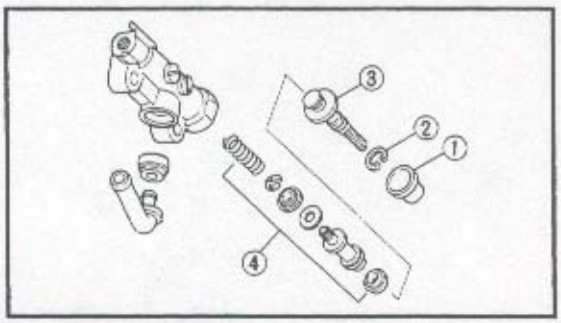
1.Remove:
- Side cover (right)
  Refer to "COWLINGS" in CHAPTER 3.

2.Remove:
- Cotter pin ①
- Washer ②
- Clevis pin ③

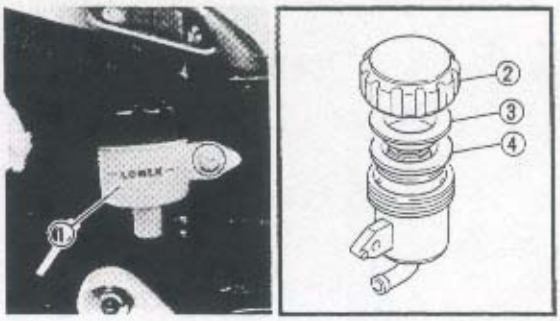


3.Remove:
- Union bolt ①
- Copper washers ②
- Brake hose ③
- Master cylinder ④
- Brake hose ⑤ (reservoir tank - master cylinder)

**NOTE:**
Hold a container under the master cylinder and under the hose ends to collect remaining brake fluid.



4.Remove:
- Dust boot ①
- Circlip ②
- Push rod ③
- Master cylinder kit ④



5.Remove:
- Reservoir tank ①
  (from frame)
- Cap ② (reservoir tank)
- Holder ③ (diaphragm)
- Diaphragm ④

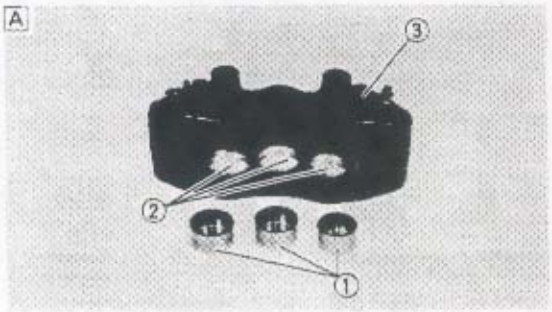
## INSPECTION AND REPAIR

| 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. |

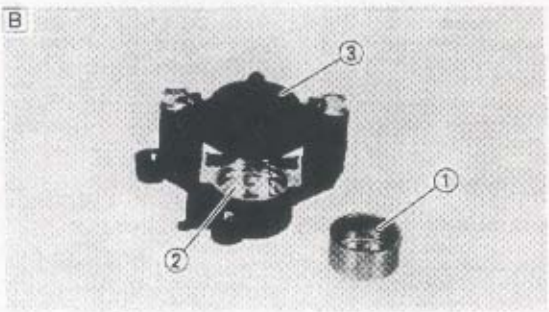
**⚠ WARNING**

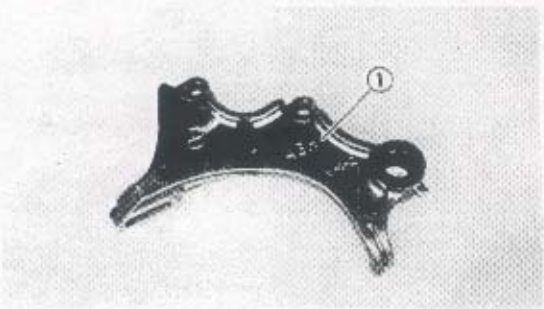
**All internal parts should be cleaned in new brake fluid only. Do not use solvents as they will cause seals to swell and distort.**

A




B




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.

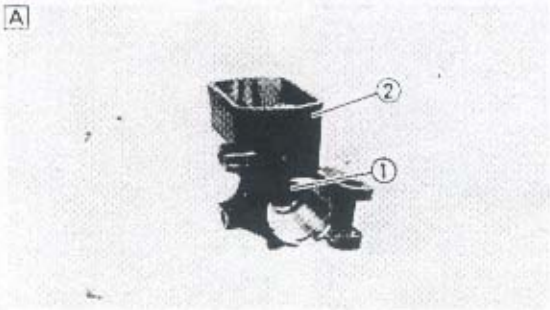
**⚠ WARNING**

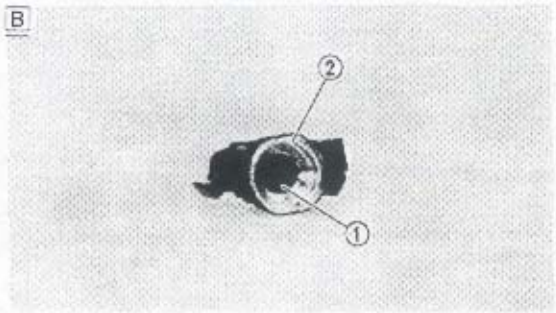
**Replace the piston seal and dust seal whenever the caliper is disassembled.**

A Front
B Rear

2.Inspect:
- Caliper bracket ①
  Cracks/Damage → Replace.

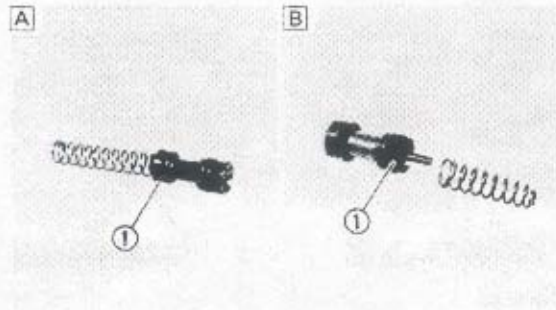
6




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.

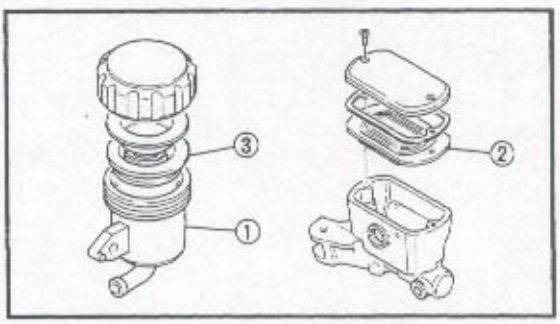
A Front
B Rear



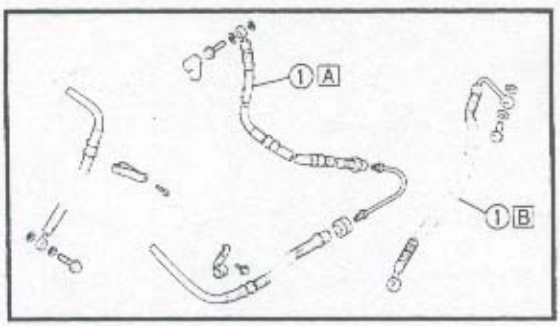

4.Inspect:
- Master cylinder kit ①
  Scratches/Wear/Damage → Replace as a set.

A Front
B Rear

6

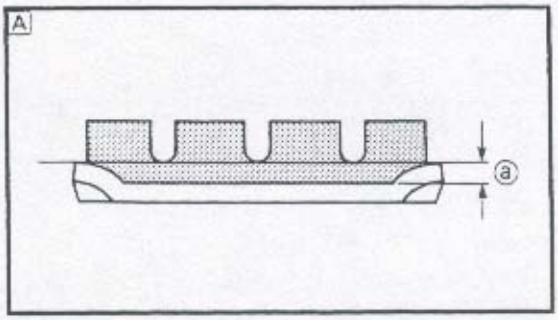


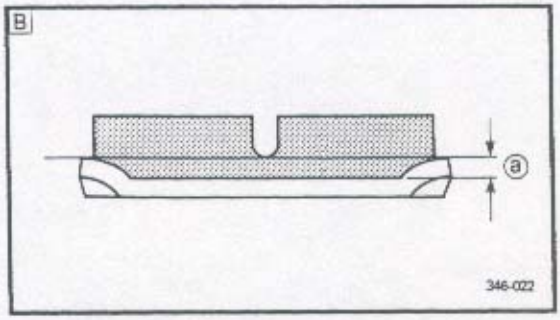

5.Inspect:
- Reservoir tank ①
  Cracks/Damage →Replace.
- Diaphragm ② (front)
- Diaphragm ③ (rear)
  Wear/Damage → Replace.




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

A Front
B Rear



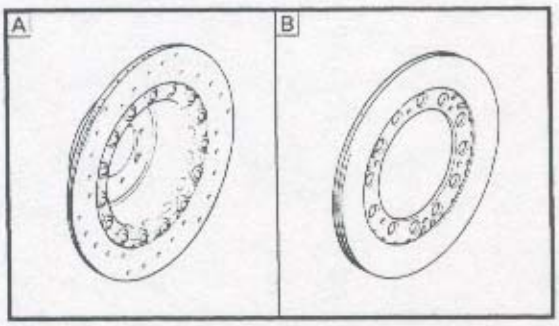




7. Measure:
- Brake pads (thickness) ⓐ
- Out of specification → Replace.

**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 ⓐ.

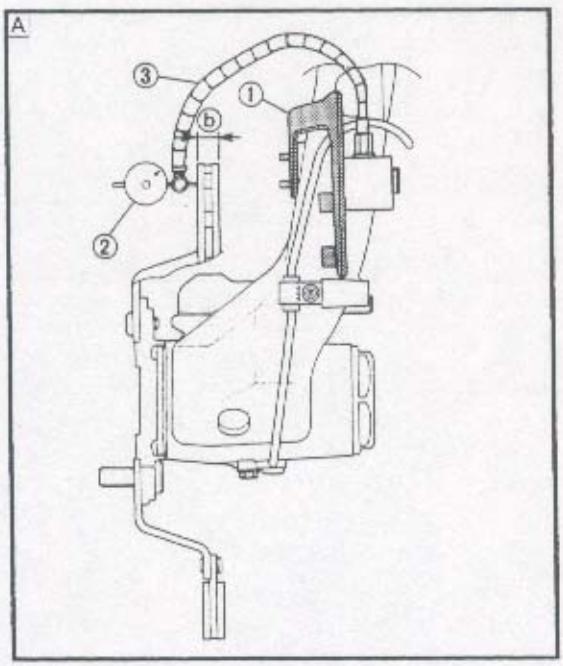
**Wear limit ⓐ (front and rear):**
**0.5 mm (0.02 in)**

A Front
B Rear




8. Inspect:
- Brake discs (front and rear)
  Galling/Damage → Replace.

A Front
B Rear



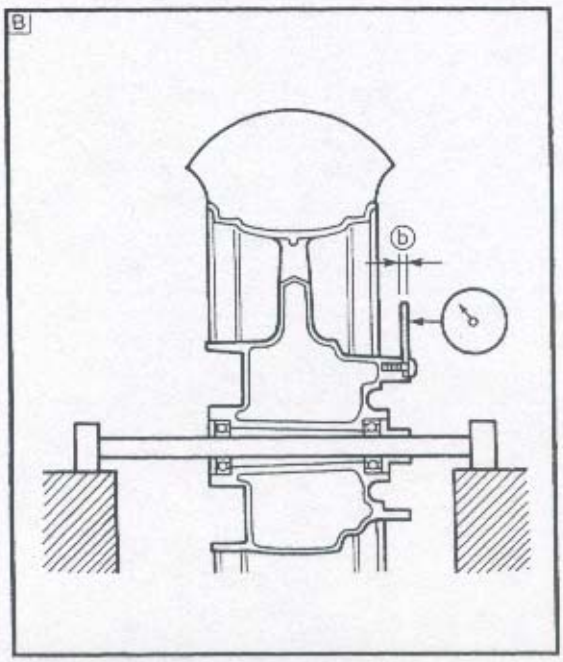

9. Measure:
- Brake disc deflection

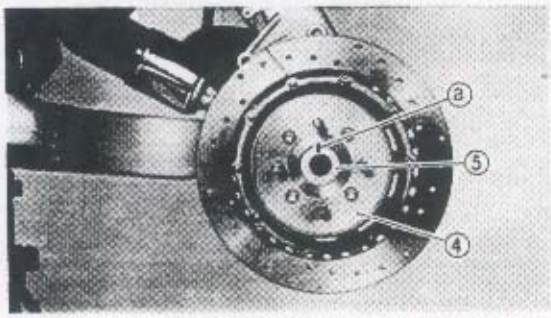
**********

**Measurement steps:**
- Install the caliper support bracket ① to the brake caliper boss (front brake only).

**Caliper support bracket:**
**90890-01453**

- Set the dial gauge ② and magneto stand ③ on the caliper support bracket (front brake only).






● Measure the brake disc deflection.
Out of specification → Adjust or replace the brake disc.

**Maximum deflection:**
**Front disc: 0.13 mm (0.005 in)**
**Rear disc: 0.15 mm (0.006 in)**

A Front B Rear

**********

10.Adjust:
• Brake disc deflection

**********

**Adjustment steps:**

a.Make an alignment mark ⓐ on the brake disc ④ and wheel axle (front) ⑤ or wheel hub (rear).
b.Remove the brake disc.
c.Check the condition of the brake disc and wheel axle (front) or wheel hub (rear). Clean if necessary.If the brake disc or wheel axle (front) or wheel hub (rear) are damaged (wear, cracks, etc.) replace it.
d.Rotate the brake disc 90° (front) or 60° (rear) and reinstall it.
e.Tighten the bolts (brake disc) to specifications.

**NOTE:**
Tighten the bolts (brake disk) in two stage using a crisscross pattern.

**Bolt (brake disc):**
**22 Nm (2.2 m • kg, 16 ft • lb)**

f. Measure the brake disc deflection again.
g.If brake disc deflection is out of specification, repeat (a.) to (f.).
h.If the maximum deflection is exceeded in every position, replace the brake disc.

**********

11.Measure:
- Brake disc thickness ⓑ
- Out of specification → Replace.

**Minimum thickness:**
**Front: 13.5 mm (0.53 in)**
**Rear: 8.0 mm (0.31 in)**

**NOTE:**
Tighten the bolts (brake disk) in two stage using a crisscross pattern.

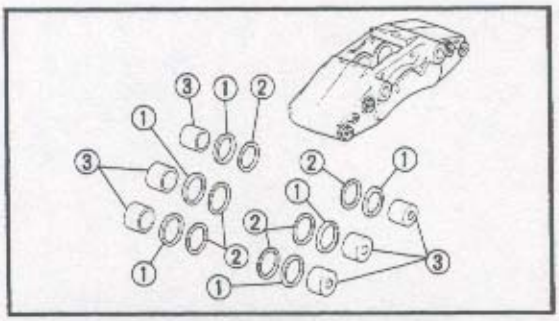
**Bolt (brake disk):**
**Front:**
**22 Nm (2.2 m · kg, 16 ft · lb)**
**Rear:**
**22 Nm (2.2 m · kg, 16 ft · lb)**
**LOCTITE®**

CALIPER ASSEMBLY

**⚠ WARNING**
- **All internal parts should be cleaned in new brake fluid only.**
- **Internal parts should be lubricated with brake fluid when installed.**

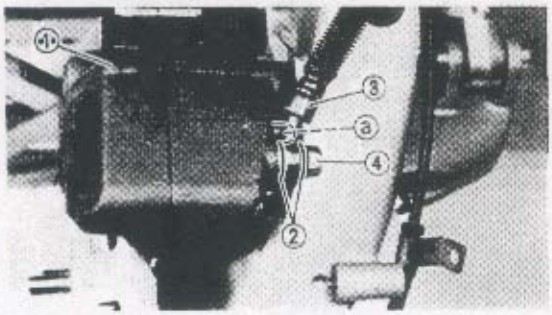
**Recommended brake fluid:**
**DOT #4**

- **Replace the piston seals and dust seals whenever a caliper is disassembled.**



Front brake
1.Install:
- Piston seals ①
- Dust seals ②
- Pistons ③

**⚠ WARNING**
**Always use new piston seals and dust seals.**



2.Install:
- Brake caliper ①
  (temporarily)
- Copper washers ②
- Brake hose ③
- Union bolt ④

**Union bolt:**
**25 Nm (2.5 m · kg, 18 ft · lb)**

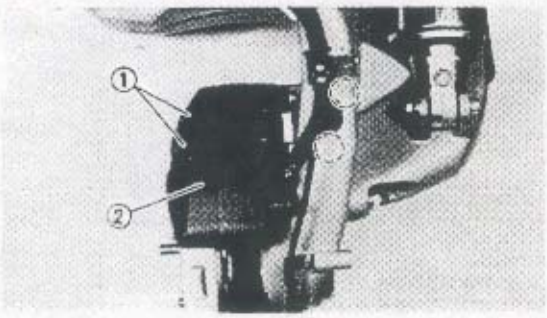
**CAUTION:**

**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 (with pad shims)
- Pad spring
- Retaining bolts ①
- Retaining clips
- Brake caliper ②

Refer to "BRAKE PAD REPLACEMENT".

**Retaining bolt:**
**10 Nm (1.0 m • kg, 7.2 ft • lb)**
**Bolt (brake caliper):**
**67 Nm (6.7 m • kg, 48 ft • lb)**

5.Fill:
- Reservoir tank

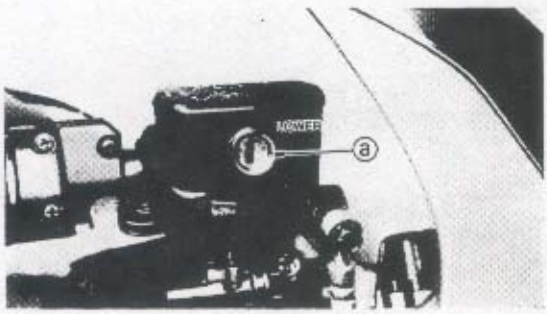
**Recommended brake fluid:**
**DOT #4**

**CAUTION:**

**Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.**

**⚠ WARNING**

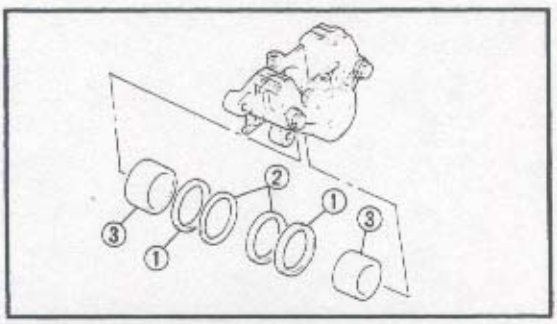
- **Use only the designated quality brake fluid: otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.**
- **Refill with the same type of brake fluid: mixing fluids may result in a harmful chemical reaction and lead to poor performance.**
- **Be careful that water does 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" in CHAPTER 3.

7.Inspect:
- Brake fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "BRAKE FLUID INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

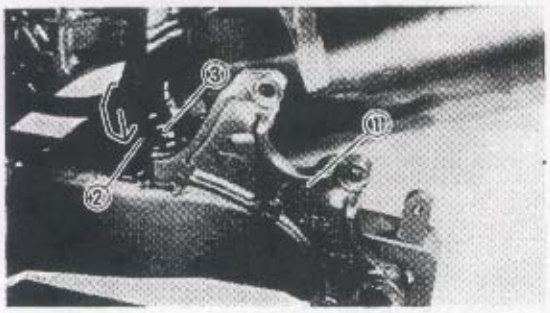



**Rear brake**

1.Install:
- Piston seals ①
- Dust seals ②
- Pistons ③

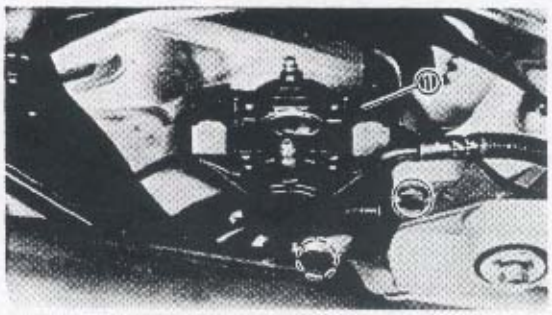
**⚠ WARNING**

**Always use new piston seals and dust seals.**



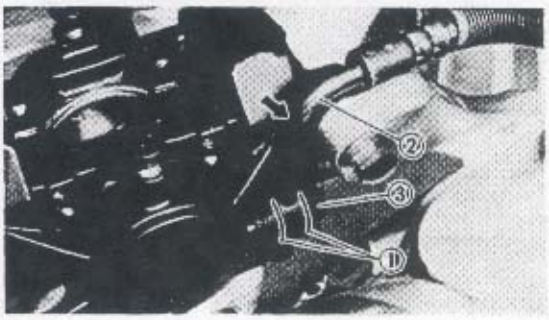

2.Install:
- Caliper bracket ①
- Brake hose guide ②
- Bolt ③ (caliper bracket) (temporarily)
- Rear wheel
  Refer to "REAR WHEEL".

6



3.Install:
- Brake caliper ①

| | |
|---|---|
| | **Bolt (brake caliper):**<br>**35 Nm (3.5 m • kg, 25 ft • lb)** |



4.Install:
- Copper washers①
- Brake hose ②
- Union bolt ③

| | |
|---|---|
| | **Union bolt:**<br>**25 Nm (2.5 m • kg, 18 ft • lb)** |

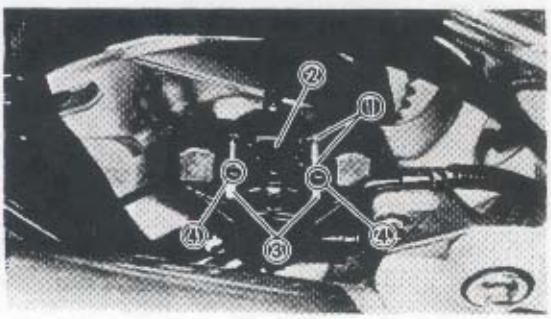
**CAUTION:**

**When installing the brake hose on the caliper, take care that the pipe touches the caliper body as shown.**

**⚠ WARNING**

- **Proper hose routing is essential to insure safe motorcycle operation. Refer to "CABLE ROUTING".**
- **Always use new copper washers.**

6



5.Install:
- Brake pads ①
  (with pad shims)
- Pad spring ②
- Retaining pins ③
- Retaining clips ④
- Pad cover
  Refer to "BRAKE PAD REPLACEMENT".

6.Fill:
- Reservoir tank

| | |
|---|---|
| | **Recommended brake fluid:**<br>**DOT #4** |

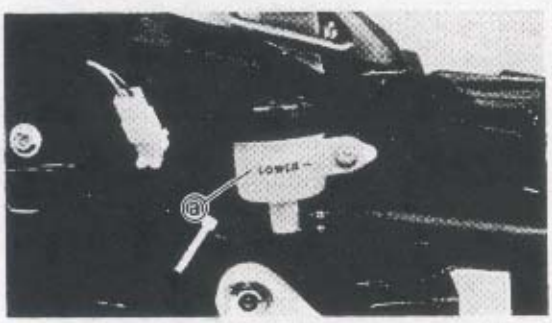
**CAUTION:**

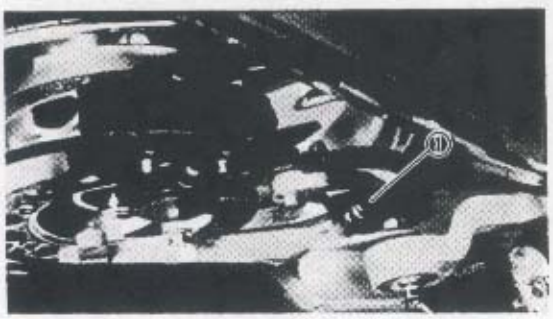
**Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.**

**⚠ 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" in CHAPTER 3.




8.Inspect:
- Brake fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "BRAKE FLUID INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

9.Adjust:
- Drive chain slack
  Refer to "DRIVE CHAIN SLACK ADJUSTMENT" in CHAPTER 3.

| | |
|---|---|
| | **Drive chain slack:**<br>**10 ~ 20 mm (0.4 ~ 0.8 in)** |
| | **Bolt ① (caliper bracket):**<br>**49 Nm (4.9 m · kg, 35 ft · lb)** |

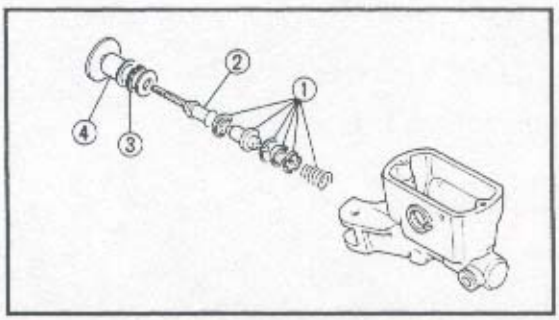
## MASTER CYLINDER ASSEMBLY

**⚠ 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**

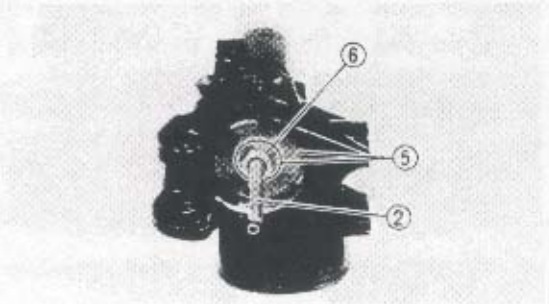
1.Install:

- Master cylinder kit ①
- Push rod ②
- Cir clip ③
- Dust boot ④
- Washers ⑤
- Locknut ⑥

**CAUTION:**

**To prevent damage to the dust boot ④, hold the push rod ② with a wrench while tightening the locknut ⑥ .**

**Locknut:**
**4 Nm (0.4 m · kg, 2.9 ft · lb)**

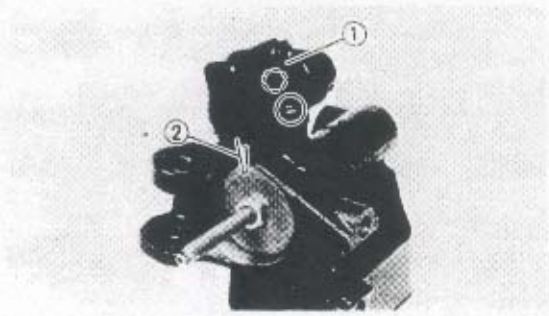


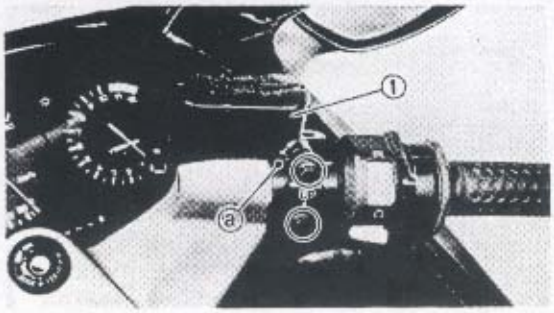

2.Install:

- Brake switch ①

**NOTE:**

The brake switch lever ② must be in front of the washer

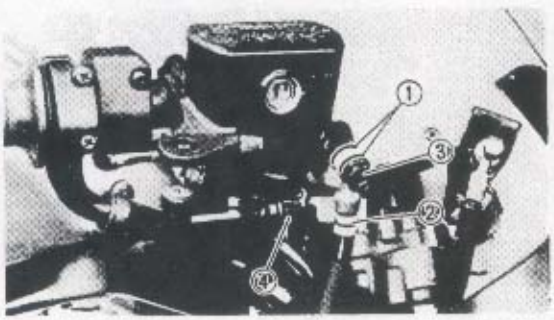





3.Install:
- Master cylinder ①

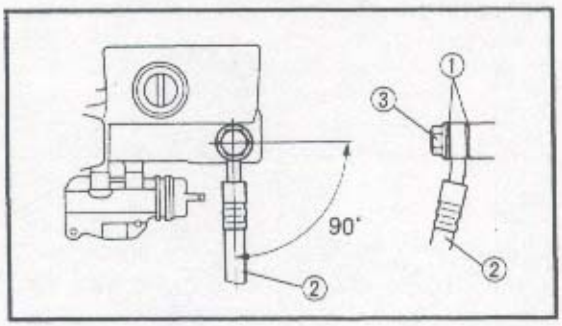
**CAUTION:**
- **Install the master cylinder holder with the "UP" mark facing upward.**
- **Align the end of the holder with the punch mark ⓐ on the handlebar.**
- **Tighten first the upper bolt, then the lower bolt.**

| | |
|---|---|
| | **Bolt (master cylinder holder): 9 Nm (0.9 m • kg, 6.5 ft • lb)** |




4.Install:
- Copper washers ①
- Brake hose ②
- Union bolt ③

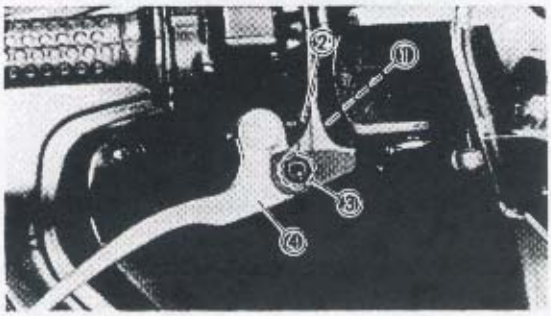
| | |
|---|---|
| | **Union bolt: 25 Nm (2.5 m • kg, 18 ft • lb)** |



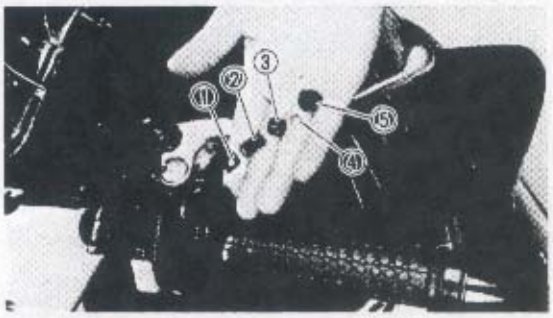

**NOTE:**
- Tighten the union bolt while holding the brake hose ② as shown.
- Check that the brake hose does not touch other parts (throttle cable, wire harness, leads, etc.) by turning the handlebar left and right, and correct if necessary.

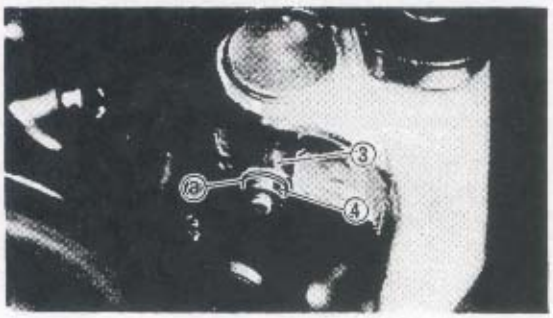
**⚠ WARNING**
- **Proper hose routing is essential to insure safe motorcycle operation. Refer to "CABLE ROUTING".**
- **Always use new copper washers.**

5.Connect:
- Coupler ④ (brake switch)




6.Install:
- Spring ①
- Adjuster ②
- Collar ③
- Brake lever ④




7.Install:
- Square washer ①
- Spring ②
- Spring retainer ③
- Circlip ④
- Rubber cap ⑤

**NOTE:**
- The grooved side ⓐ of the spring retainer must face outward.
- After installing the circlip, turn the spring retainer counter-clockwise against the circlip.

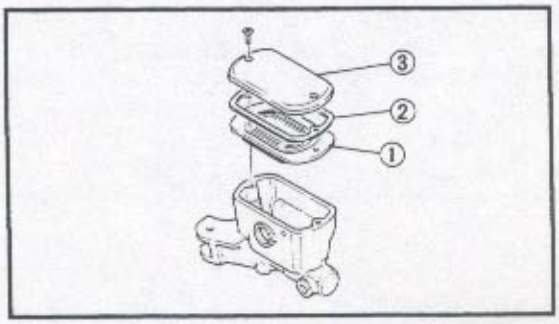
8.Fill:
- Reservoir tank

**Recommended brake fluid:**
**DOT #4**

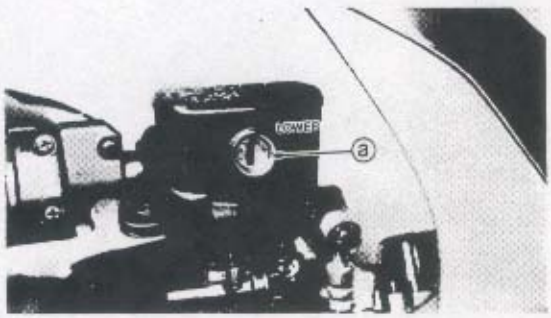
**CAUTION:**
**Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.**

**⚠ 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.**




9.Install:
- Diaphragm ①
- Holder ② (diaphragm)
- Cap ③ (master cylinder)

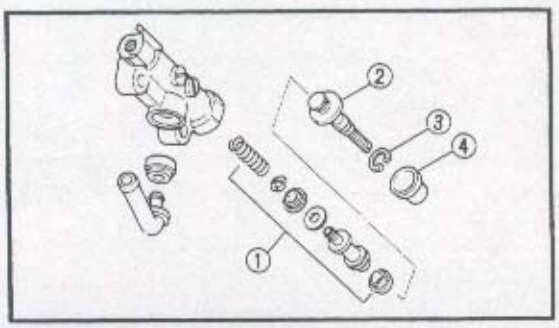



10.Air bleed
- Brake system
  Refer to "AIR BLEEDING" in CHAPTER 3.

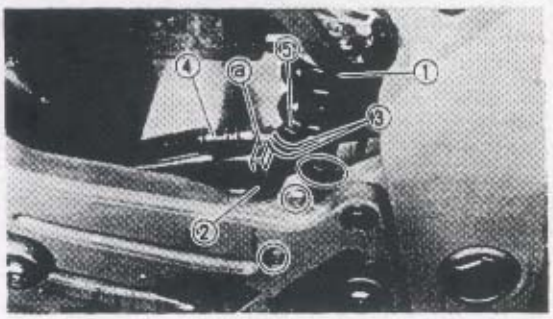
11.Inspect:
- Brake fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "BRAKE FLUID INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

**Rear brake**




1.Install:
- Reservoir tank
  (onto frame)
- Master cylinder kit ①
- Push rod ②
- Circlip ③
- Dust boot ④

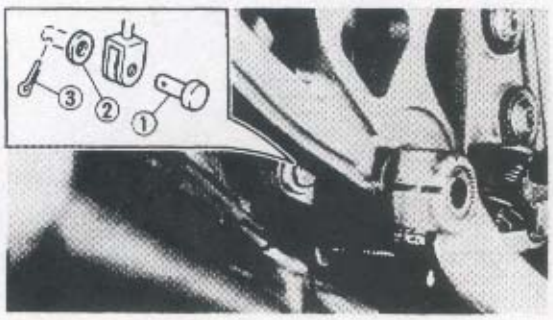



2.Install:
- Brake hose ①
  (reservoir tank - master cylinder)
- Master cylinder ②
- Copper washers ③
- Brake hose ④
- Union bolt ⑤

Bolt (master cylinder):
23 Nm (2.3 m • kg, 17 ft • lb)
Union bolt:
25 Nm (2.5 m • kg, 18 ft • lb)

**CAUTION:**
When installing the brake hose on the master cylinder ②, 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.




3.Install:
- Clevis pin ①
- Washer ②
- Cotter pin ③

**⚠ WARNING**
Always use a new cotter pin.

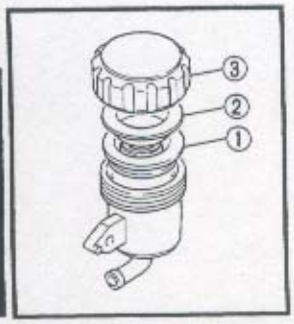
4.Fill:
- Reservoir tank

Recommended brake fluid:
DOT #4

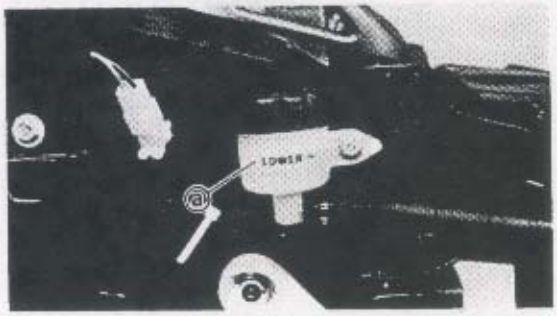
**CAUTION:**
Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

**⚠ 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:
- Diaphragm ①
- Holder ② (diaphragm)
- Cap ③ (reservoir tank)




6.Air bleed
- Brake system
  Refer to "AIR BLEEDING" in CHAPTER 3.

7.Inspect:
- Brake fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "BRAKE FLUID INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line

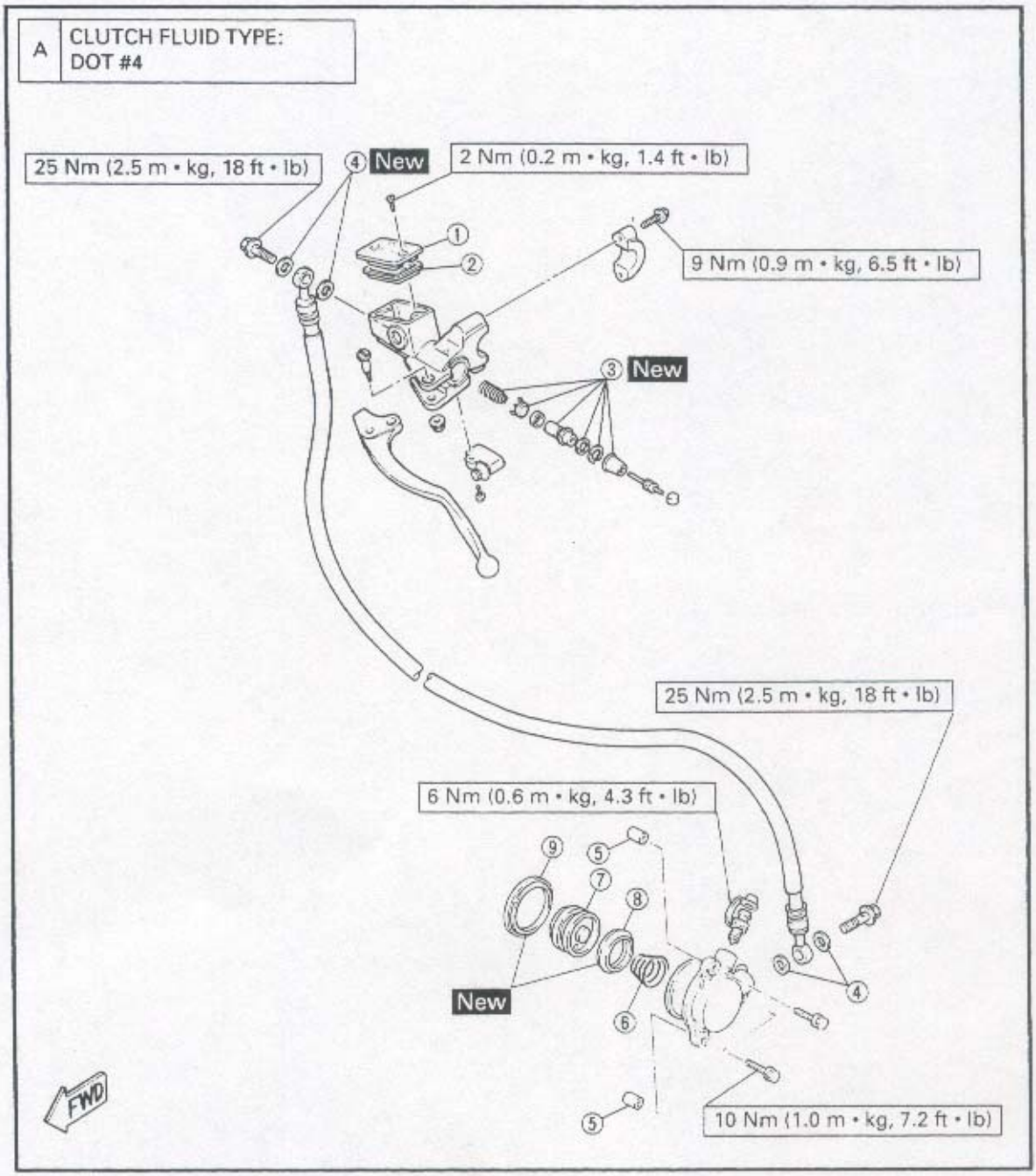
8.Adjust:
- Brake pedal height ⓐ
  Refer to "REAR BRAKE ADJUSTMENT" in CHAPTER 3.

**Brake pedal height:**
**37 mm (1.5 in)**
**Below top of footrest.**

9.Adjust:
- Brake light switch
  Refer to "BRAKE LIGHT SWITCH ADJUSTMENT" in CHAPTER 3.

## HYDRAULIC CLUTCH

①Master cylinder cap
②Diaphragm
③Master cylinder kit
④Copper washer
⑤Dowel pin
⑥Spring
⑦Piston
⑧Piston seal
⑨Dust seal



**CAUTION:**

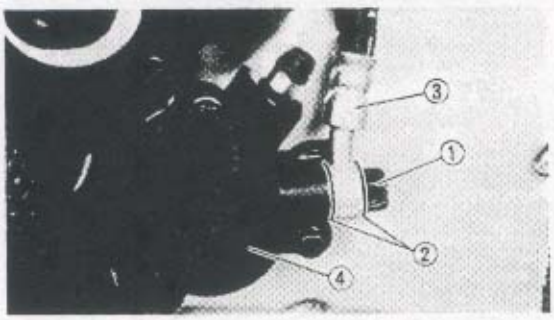
**Hydraulic clutch components rarely require disassembly. DO NOT:**

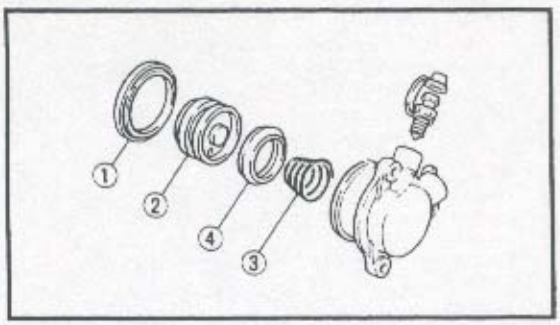
- **Disassemble components unless absolutely necessary.**
- **Use solvents on internal clutch components.**
- **Use contaminated brake fluid for cleaning.**
  **Use only clean brake fluid.**
- **Allow brake fluid to come in contact with the eyes, otherwise eye injury may occur.**
- **Allow brake fluid 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.**

## DISASSEMBLY

**NOTE:**
Before disassembling the clutch release cylinder or master cylinder drain the master cylinder and clutch hose of their fluid.





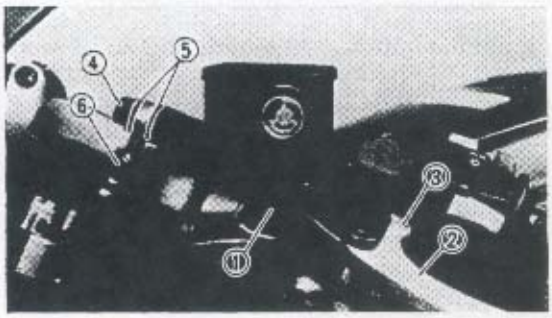

**Clutch release cylinder**

1. Remove:
   - Lower cowling (left)
     Refer to "COWLINGS".
2. Remove:
   - Union bolt ①
   - Copper washers ②
   - Clutch hose ③
   - Clutch release cylinder ④
   - Dowel pins
3. Remove:
   - Dust seal ①
   - Piston ② (release cylinder)
   - Spring ③
   - Piston seal ④

**NOTE:**
Blow compressed air into the hose joint opening to force out the piston from the release cylinder body.

**⚠ WARNING**

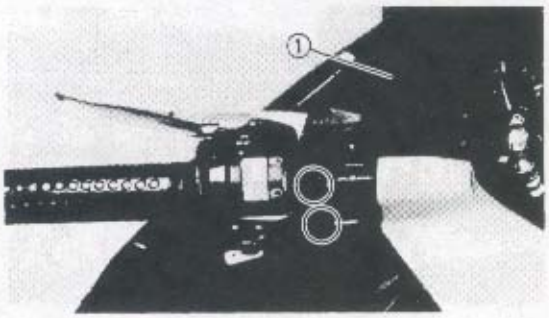
- **Cover the piston with rags and use extreme caution when expelling the piston from the cylinder.**
- **Never attempt to pry out the piston.**




**Master cylinder**

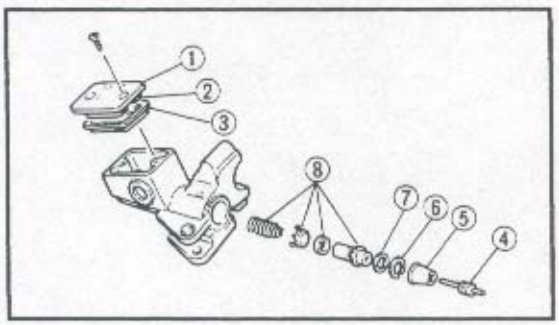
1.Disconnect:
- Coupler ① (clutch switch)

2.Remove:
- Clutch lever ②
- Holder ③ (push rod)
- Union bolt ④
- Coper washers ⑤
- Clutch hose ⑥




3.Remove:
- Master cylinder ①

6



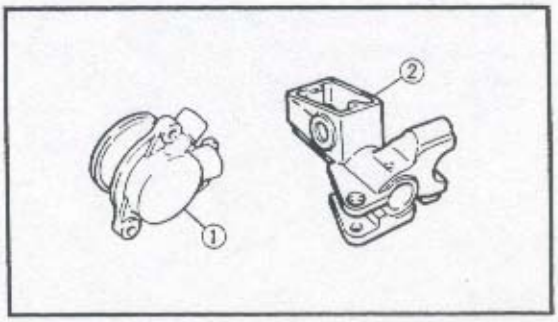

4.Remove:
- Master cylinder cap ①
- Holder ② (diaphragm)
- Diaphragm ③
- Push rod ④
- Dust boot ⑤
- Circlip ⑥
- Washer ⑦
- Master cylinder kit ⑧

**INSPECTION AND REPAIR**

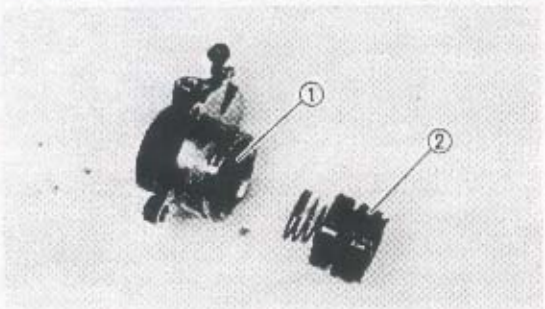
| Recommended clutch component replacement schedule: | |
|---|---|
| Piston seal, dust seal | Every two years |
| Clutch hose | Every four years |
| Clutch fluid (brake fluid) | Replace only when clutch is disassembled. |

**⚠ WARNING**

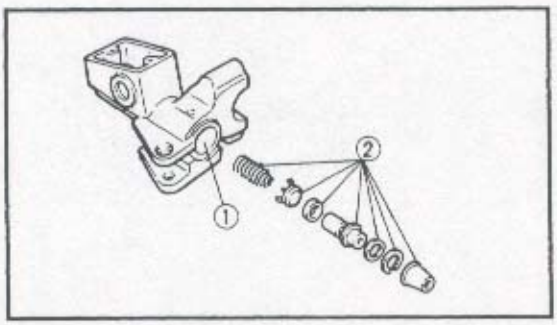
**All internal parts should be cleaned in new brake fluid only. Do not use solvents as they will cause seals to swell and distort.**



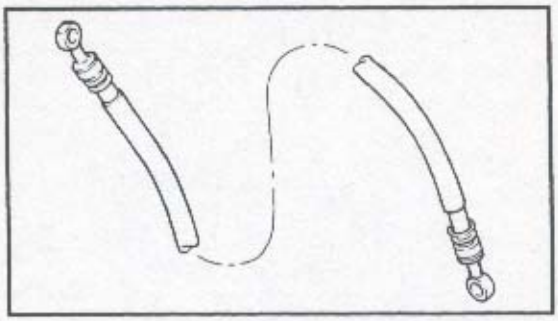

1.Inspect:
- Release cylinder body ①
- Master cylinder body ②
  Cracks/Damage → Replace.
- Oil delivery passage
  Blow out with compressed air.




2.Inspect:
- Release cylinder ①
- Piston ② (release cylinder)
  Scratches/Wear/Rust → Replace as a set.




3.Inspect:
- Master cylinder ①
- Master cylinder kit ②
  Scratches/Wear/Rust → Replace as a set.



4.Inspect:
- Clutch hose
  Cracks/Wear/Damage → Replace.

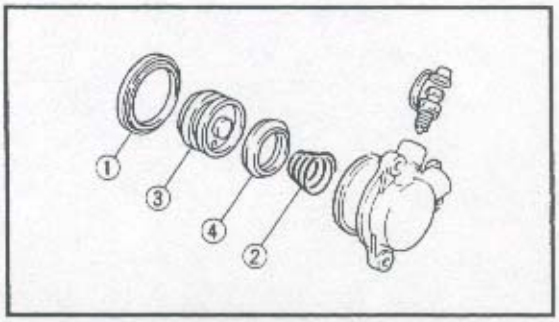
### ASSEMBLY

**⚠ 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 seal and dust seal whenever the clutch release and master cylinder are disassembled.**

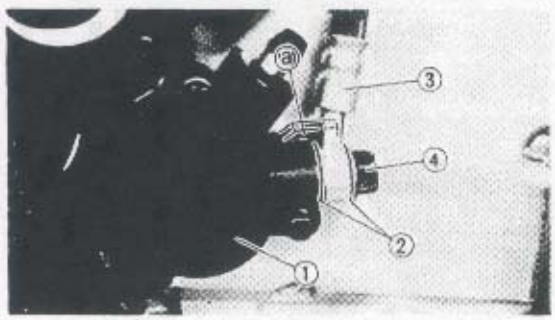



**Clutch release cylinder**

1.Install:
- Piston seal ①
- Spring ②
- Piston ③ (release cylinder)
- Dust seal ④

**⚠ WARNING**

**Always use new piston and dust seals.**




2.Install:
- Dowel pins
- Clutch release cylinder ①

| | |
|---|---|
| | **Bolt (clutch release cylinder): 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

3.Install:
- Copper washers ②
- Clutch hose ③
- Union bolt ④

| | |
|---|---|
| | **Union bolt: 25 Nm (2.5 m • kg, 18 ft • lb)** |

**CAUTION:**

**When installing the clutch hose on the release cylinder ①, 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:
- Master cylinder tank

**Recommended fluid:**
**DOT #4**

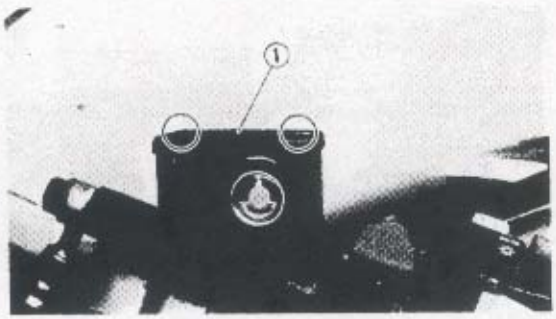
**CAUTION:**

**Clutch fluid may erode 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 clutch performance.**
- **Refill with the same type of fluid: mixing fluids may result in a harmful chemical reaction and lead to poor clutch 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.**



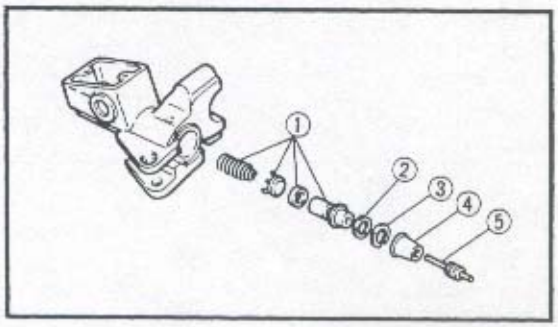



5.Install:
- Diaphragm
- Holder (diaphragm)
- Cap ① (master cylinder)

6.Air bleed
- Clutch system
  - Refer to "AIR BLEEDING" in CHAPTER 3.

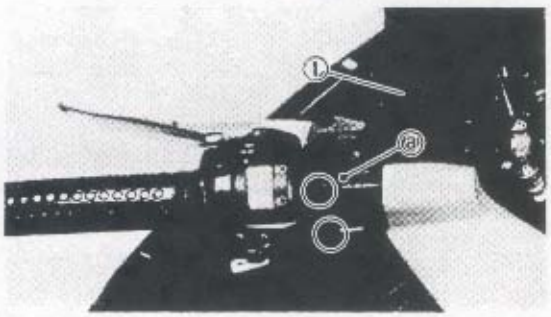
7.Inspect:
- Clutch fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "CLUTCH FLUID LEVEL INSPECTION" in CHAPTER 3.

ⓐ "LOWER" level line




**Master cylinder**

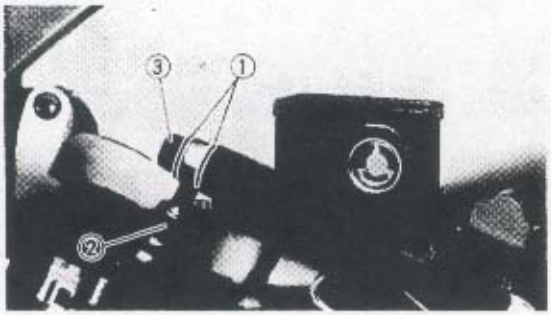
1.Install:
- Master cylinder kit ①
- Washer ②
- Circlip ③
- Dust boot ④
- Push rod ⑤




2.Install:
- Master cylinder ①

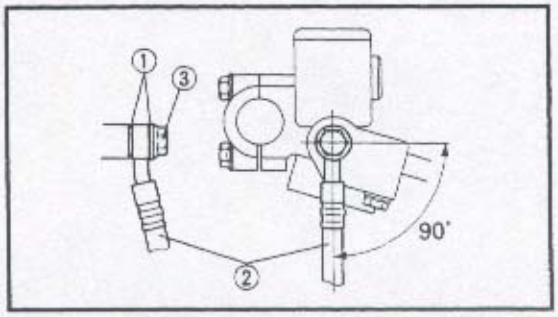
**CAUTION:**
- **Install the master cylinder holder with the "UP" mark facing upward.**
- **Align the end of the holder with the punch mark ⓐ on the handlebar.**
- **Tighten first the upper bolt, then the lower bolt.**

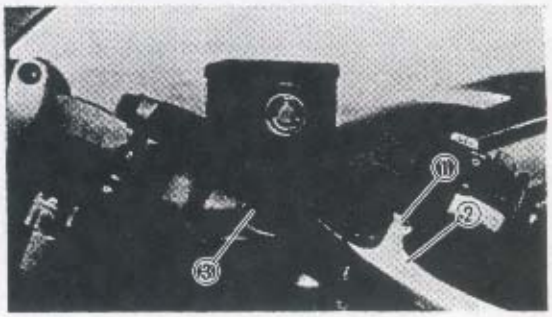
| | |
|---|---|
| | **Bolt (master cylinder holder): 9 Nm (0.9 m • kg, 6.5 ft • lb)** |




3.Install:
- Copper washers ①
- Clutch hose ②
- Union bolt ③

| | |
|---|---|
| | **Union bolt: 25 Nm (2.5 m • kg, 18 ft • lb)** |




**NOTE:**
Tighten the union bolt while holding the clutch hose ② as shown.

**⚠ WARNING**
- **Proper hose routing is essential to insure safe motorcycle operation. Refer to "CABLE ROUTING".**
- **Always use new copper washers.**

4.Install:
- Holder ① (push rod)
- Clutch lever ②

**NOTE:**
Apply litium soap base grease to the clutch lever pivot.

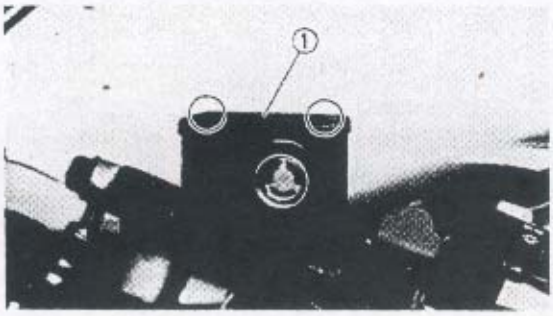
5.Connect:
- Coupler ③ (clutch switch)

6.Fill:
- Master cylinder tank.

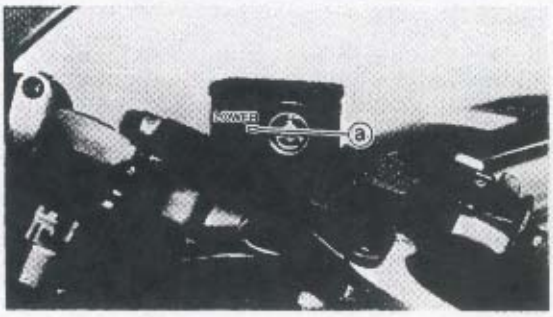
**Recommended fluid:**
**DOT #4**

**CAUTION:**
**Clutch fluid may erode 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 clutch performance.**
- **Refill with the same type of fluid: mixing fluids may result in a harmful chemical reaction and lead to poor clutch 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.Install:
- Diaphragm
- Holder (diaphragm)
- Cap ① (master cylinder)




8.Air bleed
- Clutch system
  Refer to "AIR BLEEDING" in CHAPTER 3.

9.Inspect:
- Clutch fluid level
  Fluid level is under "LOWER" level line → Replenish.
  Refer to "CLUTCH FLUID LEVEL INSPECTION" in CHAPTER 3.

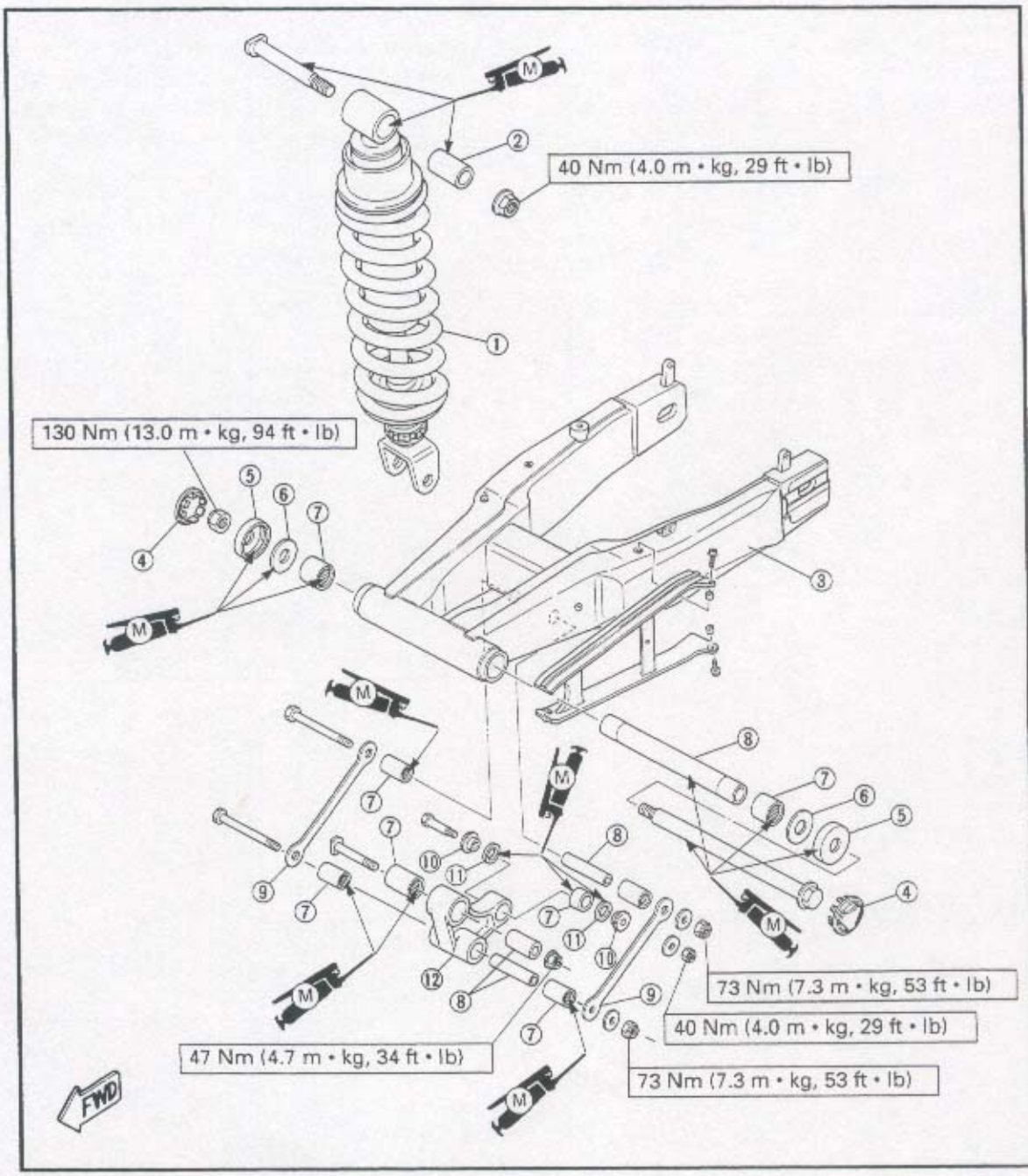
ⓐ "LOWER" level line

6

## REAR SHOCK ABSORBER AND SWINGARM

①Shock absorber
②Collar
③Swingarm
④Pivot shaft cover
⑤Thrust cover
⑥Washer
⑦Bearing
⑧Collar
⑨Connecting arm
⑩Collar
⑪Oil seal
⑫Relay arm

**NOTE:**
Coat the bearings, bushings, thrust covers, 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.**

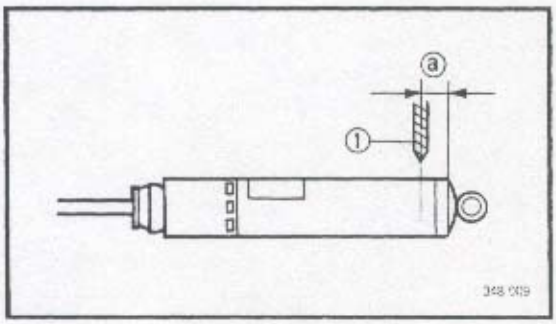
1. **Do not tamper or attempt to open the cylinder assembly.**
2. **Do not subject shock absorber to an open flame or other high heat. This may cause the unit to explode due to excessive gas pressure.**
3. **Do not deform or damage the cylinder in any way. Cylinder damage will result in poor damping performance.**

### NOTES ON DISPOSAL

**********

**Shock absorber disposal steps:**

Gas pressure must be released before disposing of the shock absorber. To do so, drill ① a 2 ~ 3 mm (0.08 ~ 0.12 in) hole through the cylinder wall at a point ⓐ 30 ~ 35 mm (1.2 ~ 1.4 in) from the end of the gas chamber.




**⚠ WARNING**

**Wear eye protection to prevent eye damage from escaping gas and/or metal chips.**

**********

### REMOVAL

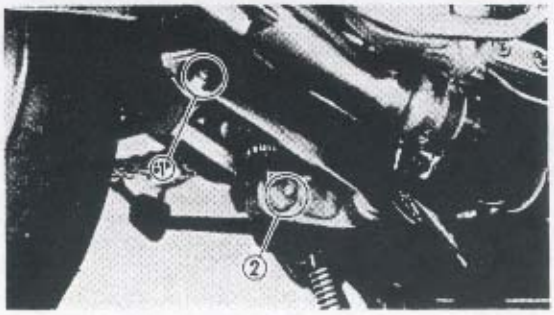
**Rear shock absorber**

**⚠ WARNING**

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

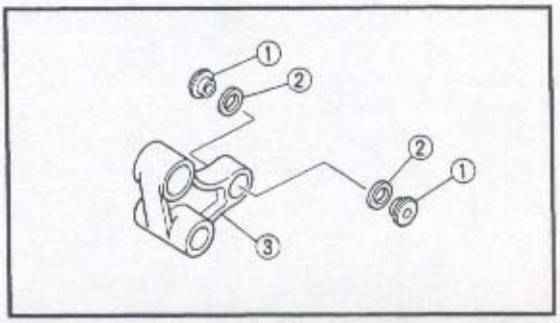
1. Place the motorcycle on the centerstand.
2. Remove:
   - Seat
   - Side covers

   Refer to "COWLINGS" in CHAPTER 3.

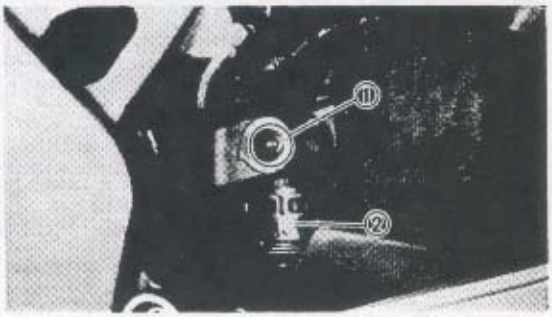


3.Remove:
- Bolt ① (connecting arm-swingarm)
- Bolt ②
  (relay arm-shock absorber (lower))

**NOTE:**
When removing the bolt ① (connecting arm -swingarm), hold the swingarm so that it does not drop downwards.



4.Remove:
- Collars ①
- Oil seals ②
  (from relay arm ③)



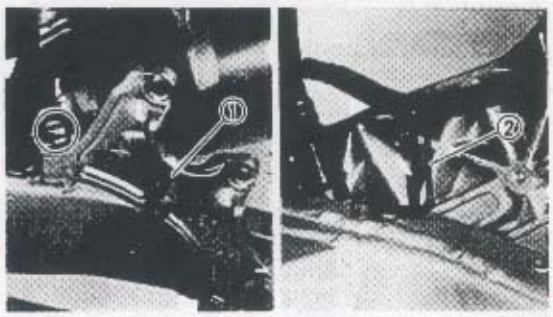
5.Remove:
- Bolt ① (shock absorber (top) -frame)
- Rear shock absorber ②
- Collars (rear shock absorber)

**Swingarm**

**⚠ WARNING**

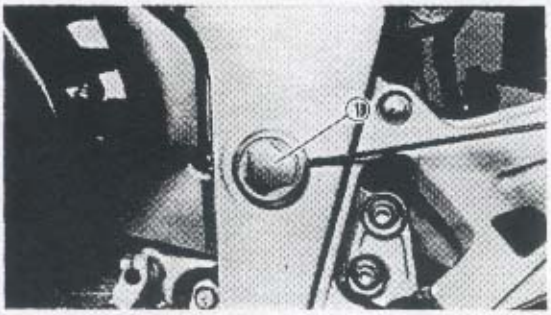
**Securely support the motorcycle so there is no danger of it falling over.**

1.Place the motorcycle on the centerstand.



2.Remove:
- Rear wheel
  Refer to "REAR WHEEL".
- Caliper bracket ①
  Refer to "FRONT AND REAR BRAKE".
- Rear shock absorber
  Refer to "Rear Shock Absorber".

3.Remove:
- Brake hose guide ②

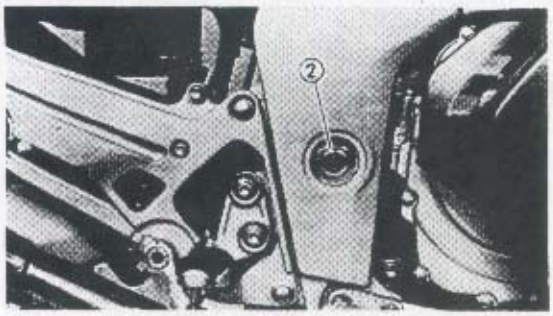



4.Check:
- Swingarm free play

**********

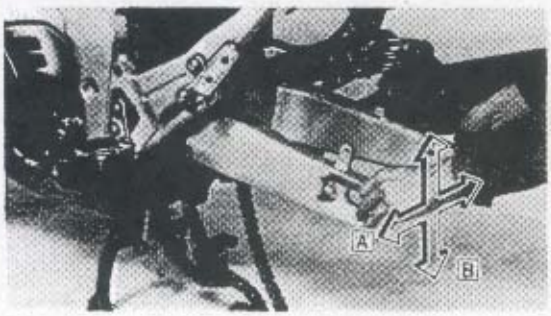
**Inspection steps:**

- Remove the pivot shaft covers ① (left and right), using a thin screw driver.




- Check the tightening torque of the pivot shaft (swingarm) securing nut ②.

| | |
|---|---|
| | **Nut (swingarm-pivot shaft): 130 Nm (13.0 m • kg, 94 ft • lb)** |



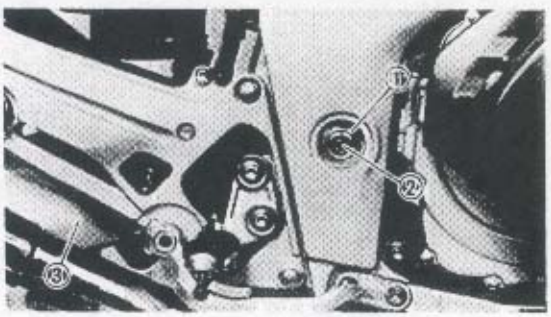

- Check the swingarm side play A by moving it from side to side.
  If side play is noticeable, check the collar, bearing, washer and thrust cover.

| | |
|---|---|
| | **Side play (at end of swingarm): 1.0 mm (0.04 in)** |

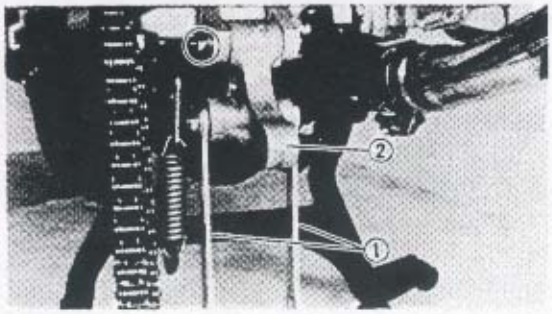
- Check the swingarm vertical movement B by moving it up and down.
  If vertical movement is tight, binding or rough, check the collar, bearing, washer and thrust cover.

**********

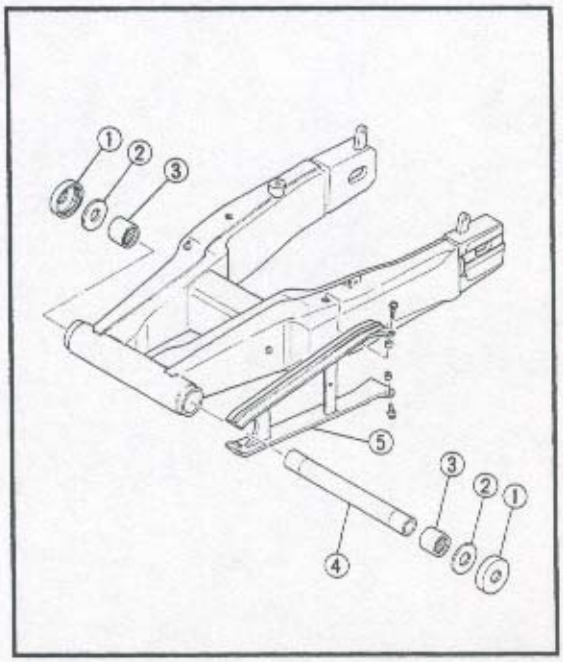
6



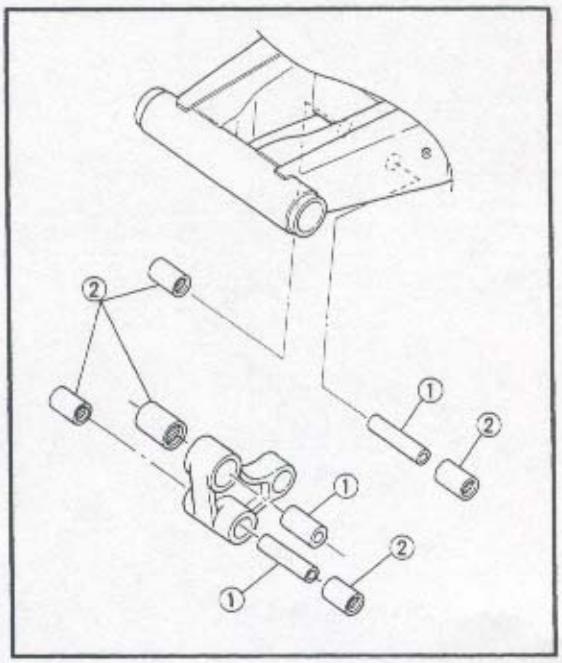

5.Remove:
- Nut ① (pivot shaft)
- Pivot shaft ②
- Swingarm ③




6.Remove:
- Connecting arms ① (left and right)
- Relay arm ②

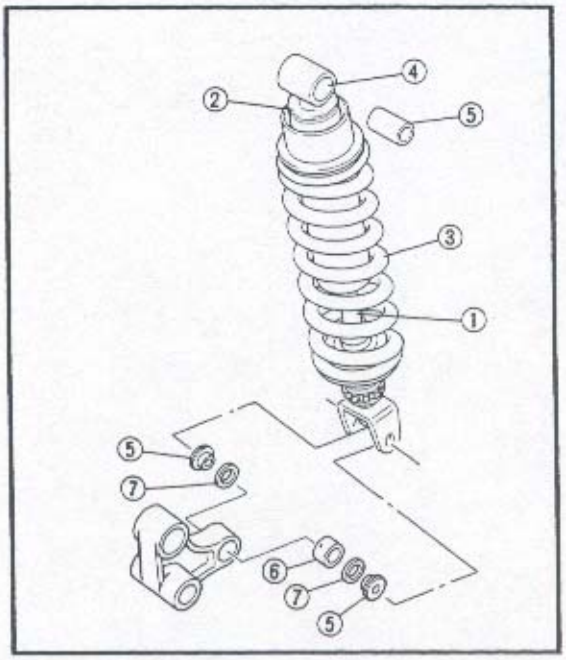



7.Remove:
- Thrust covers ①
- Washers ②
- Bearings ③
- Collar ④ (swingarm)
- Chain guide ⑤




8.Remove:
- Collars ①
- Bearings ②

6

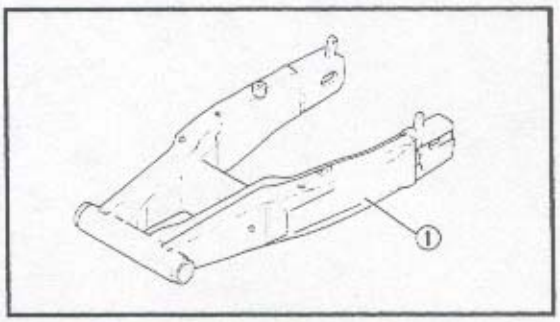



## INSPECTION

### Rear Shock Absorber

1.Inspect:

- Rear shock absorber rod ①
  Bents/Damage → Replace the rear shock absorber assembly.
- Rear shock absorber ②
  Oil leaks/Gas leaks/Damage → Replace the rear shock absorber assembly.
- Spring ③
  Wear/Damage → Replace the rear shock absorber assembly.
- Bushing ④
- Collars ⑤
- Bearing ⑥
- Oil seals ⑦
  Wear/Damage → Replace.

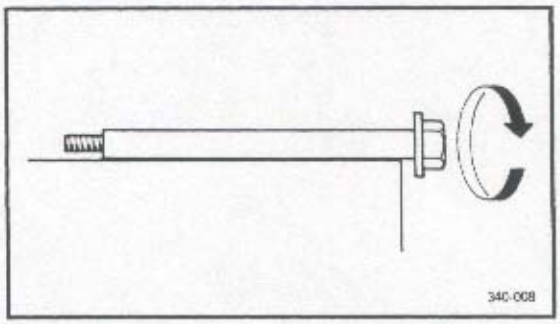



### Swingarm

1.Inspect:

- Swingarm ①
  Cracks/Bents/Damage → Replace.

6



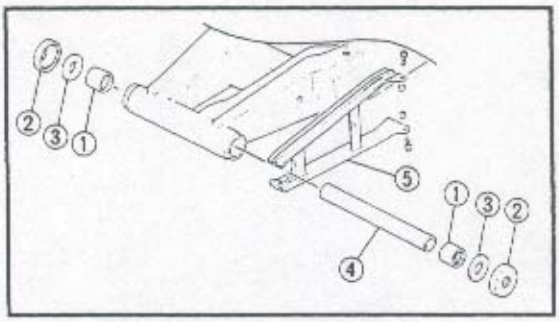

2.Inspect:

- Pivot shaft ①
  Roll the shaft on a flat surface.
  Bents → Replace.

**⚠ WARNING**

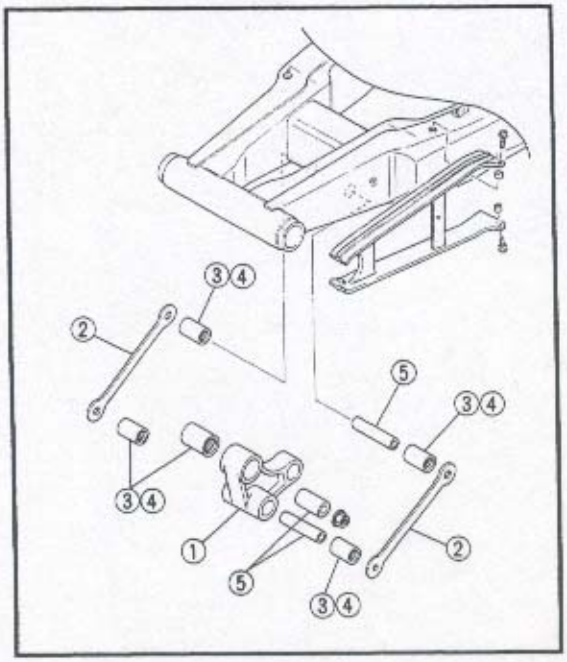
**Do not attempt to straighten a bent shaft.**

3.Wash the swingarm pivoting parts in solvent .

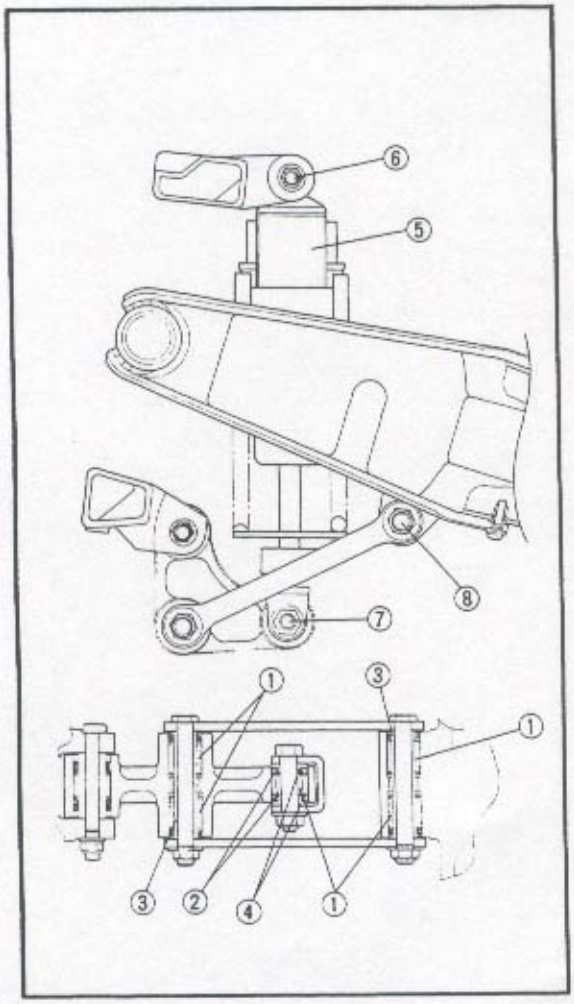



4.Inspect:

- Bearings ①
  Pitting/Damage → Replace.
- Thrust covers ②
- Washer ③
- Collar ④
- Chain guide ⑤
  Wear/Damage → Replace.




5.Inspect:
- Relay arm ①
- Connecting arms ②
  Bents/Cracks/Damage → Replace.
- Bearings ③
- Oil seals ④
  Wear/Damage → Replace.
- Collars ⑤ (relay arm and connecting arm)
  Wear/Scratches/Damage → Replace.




**INSTALLATION**

**Rear Shock Absorber**

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

1.Lubricate:
- Bearings ①
- Oil seals ②
- Collars ③
- Bushings (rear shock absorber)

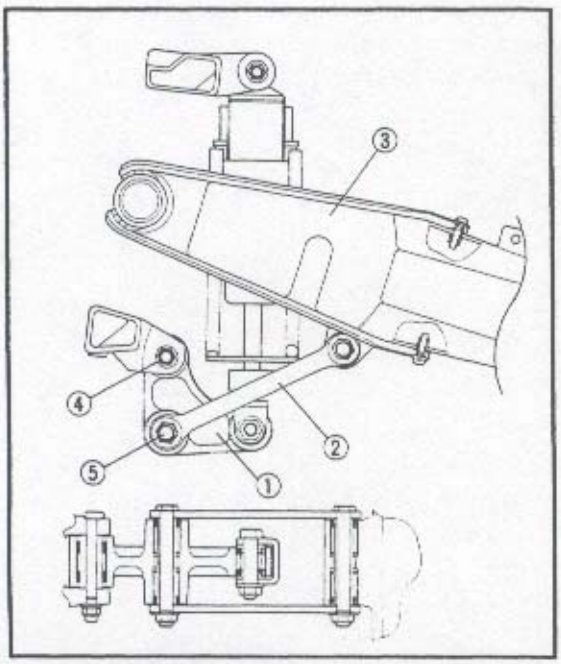
**Recommended lubricant:**
**Molybdenum disulfide grease**

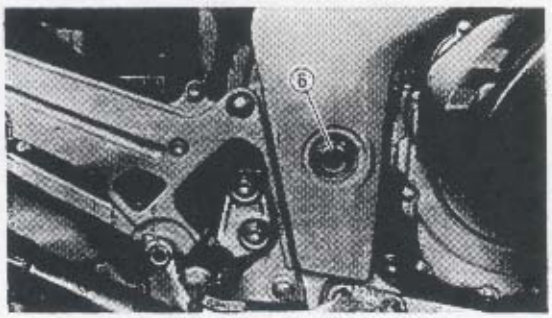
2.Install:
- Collars ④ (rear shock absorber)
- Rear shock absorber ⑤
- Nut ⑥ (shock absorber (top) -frame)
- Nut ⑦
  (relay arm-shock absorber (lower))
- Nut ⑧ (connecting arm-swingarm)

6

**Nut ⑥**
**(shock absorber (top)-frame):**
**40 Nm (4.0 m • kg, 29 ft • lb)**
**Nut ⑦ (relay arm-shock absorber (lower)):**
**40 Nm (4.0 m • kg, 29 ft • lb)**
**Nut ⑧**
**(connecting arm-swingarm):**
**73 Nm (7.3 m • kg, 53 ft • lb)**

**NOTE:**
Lift up the swingarm to install the upper mounting bolt of the rear shock absorber.




**Swingarm**
Reverse the "REMOVAL" procedure.
Note the following points.
1.Lubricate:
- Bearings
- Collars
- Thrust covers
- Washers
- Pivot shaft (swingarm)

**Recommended lubricant:**
**Molybdenum disulfide grease**

2.Install:
- Relay arm ①
- Connecting arms ②
- Swingarm ③

**Nut ④ (relay arm-frame):**
**47 Nm (4.7 m • kg, 34 ft • lb)**
**Nut ⑤**
**(connecting arm-relay arm):**
**73 Nm (7.3 m • kg, 53 ft • lb)**
**Nut ⑥ (pivot shaft):**
**130 Nm (13.0 m • kg, 94 ft • lb)**

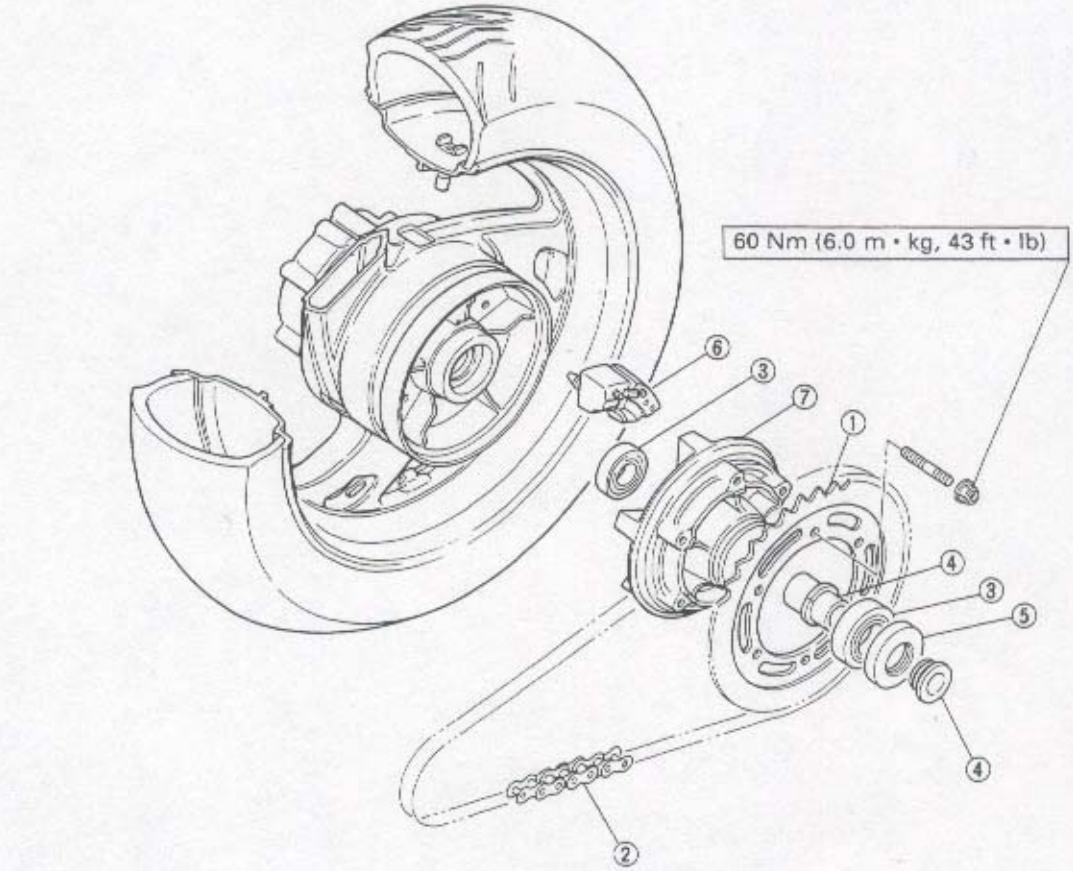
3. Adjust:
- Drive chain slack
  Refer to "DRIVE CHAIN SLACK ADJUSTMENT" in CHAPTER 3.

**Drive chain slack:**
**10 ~ 20 mm (0.4 ~ 0.8 in)**

## DRIVE CHAIN AND SPROCKETS

①Rear sprocket wheel
②Drive chain
③Bearing
④Collar
⑤Oil seal
⑥Dumper rubber
⑦Sprocket hub wheel

| | |
|---|---|
| A | DRIVE CHAIN: |
| B | TYPE/MANUFACTURER:<br>RK532GSV2/RK EXCEL<br>DID532ZLVKAI/DAIDO |
| C | NO. OF LINKS:<br>118 |
| D | DRIVE CHAIN SLACK:<br>10 ~ 20 mm (0.4 ~ 0.8 in) |



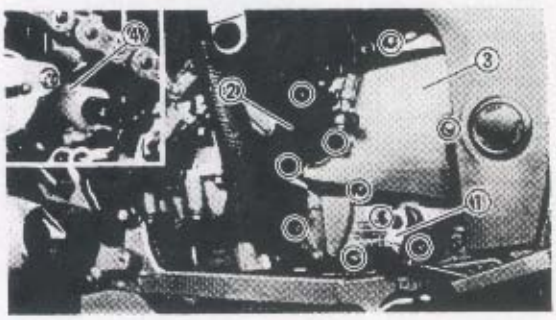
**NOTE:**
Before removing the drive chain and sprockets, drive chain slack and 10-link length of drive chain should be measured.

## REMOVAL

**⚠ WARNING**

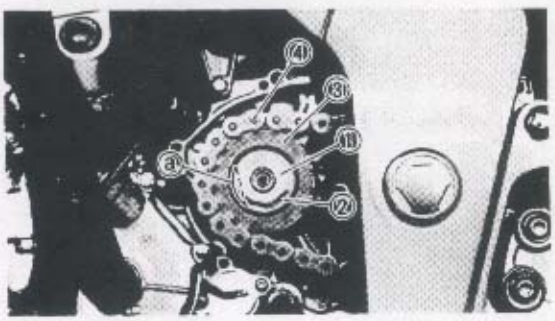
**Securely support the motorcycle so there is no danger of it falling over.**

1. Place the motorcycle on the centerstand.



2. Remove:
- Shift pedal link ①
- Clutch release cylinder ②
- Dowel pins
- Crankcase cover ③ (left)
- Dowel pins
- Gasket
- Spacer collar ④ (shift shaft)

3. Loosen:
- Drive chain
  Refer to "DRIVE CHAIN SLACK ADJUSTMENT" in CHAPTER 3.

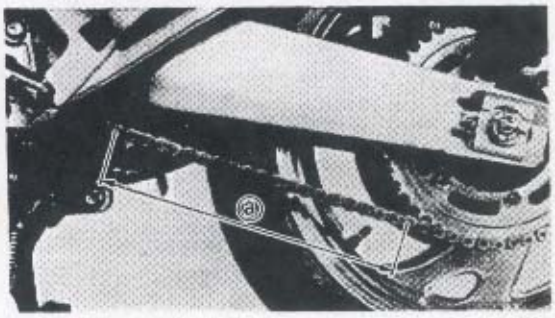


4. Straighten:
- Lock washer tab ⓐ

5. Remove:
- Nut ① (drive sprocket)
- Lock washer ②
- Drive sprocket ③
  (with drive chain ④)

**NOTE:**
Loosen the nut (drive sprocket) while applying the rear brake.

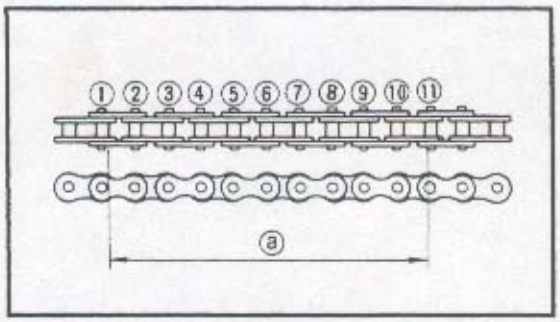
6.Remove:
- Rear wheel
  Refer to "REAR WHEEL".
- Swingarm
  Refer to "REAR SHOCK ABSORBER AND SWINGARM".
- Drive chain



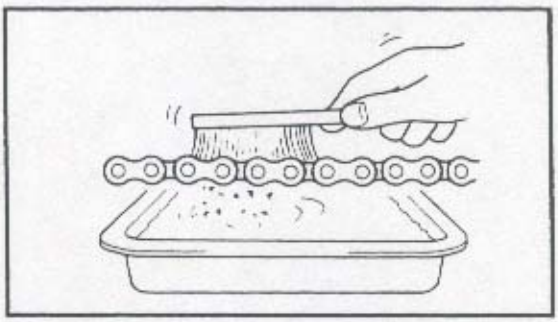

**INSPECTION**

1.Measure:
- 10-link length ⓐ (drive chain)
  Out of specification → Replace drive chain.

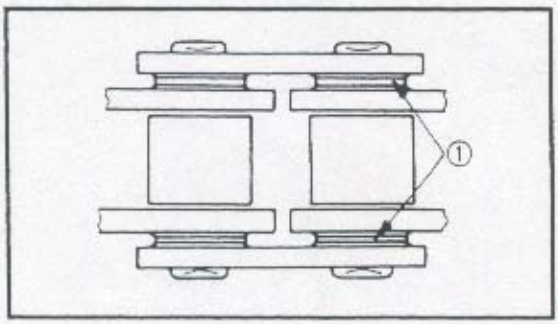
| | |
|---|---|
| | **10-link length limit:**<br>**150.1 mm (5.91 in)** |




**NOTE:**
- For measurement make the chain tense by finger.
- 10-link length is a measurement between the insides of the ① and ⑪ rollers as shown.
- Two or three different 10-link lengths should be measured.

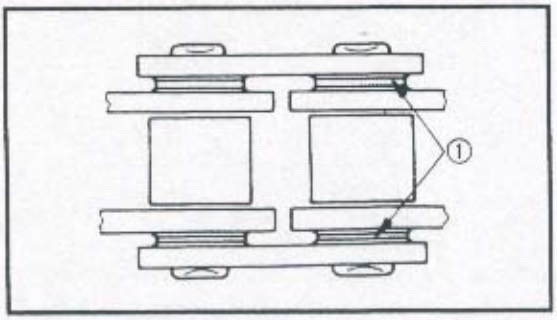


2.Clean:
- Drive chain
  Place it in kerosene, and brush off as much dirt as possible. Then remove the chain from the kerosene and dry it.




**CAUTION:**

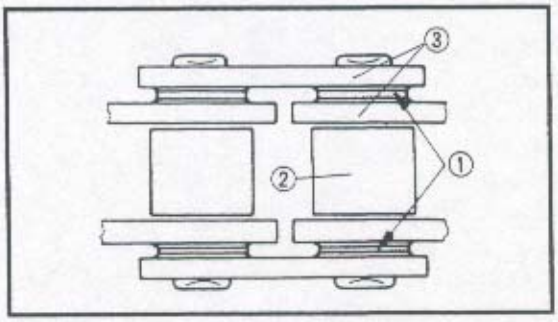
**This motorcycle has a drive chain with small rubber O-rings ① between the chain plates. Steam cleaning, high-pressure washes, and certain solvents can damage these O-rings. Use only kerosene to clean the drive chain.**

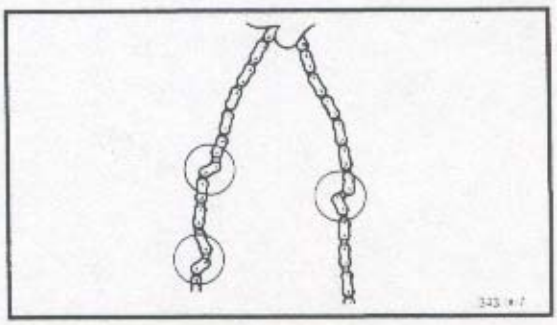



3.Inspect:
- O-rings ① (Drive chain)
  Damage → Replace drive chain.
- Rollers ②
- Side plates ③
  Damage/Wear → Replace drive chain.

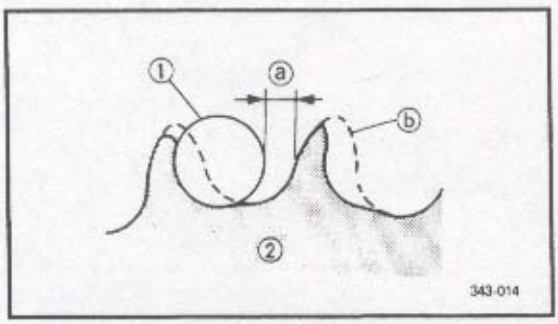
4.Lubricate:
- Drive chain

**Recommended lubricant:**
**SAE 30 ~ 50W motor oil or chain lubricants suitable for "O-ring" chains.**



5.Inspect:
- Drive chain stiffness
  Stiff → Clean and lubricate or replace.




6.Inspect:
- Drive sprocket
- Rear sprocket wheel
  More than 1/4 teeth ⓐ wear → Replace sprocket.
  Bent teeth → Replace sprocket.

ⓑCorrect
①Roller
②Sprocket

**********

**Replacement steps:**
- Remove the self-lock nuts ① and the rear sprocket wheel ②.
- Clean the hub, especially on the surfaces in contact with the sprocket, using a clean cloth.
- Install the new rear sprocket wheel.

**NOTE:**
Tighten the self-lock nuts in stage, using a crisscross pattern.

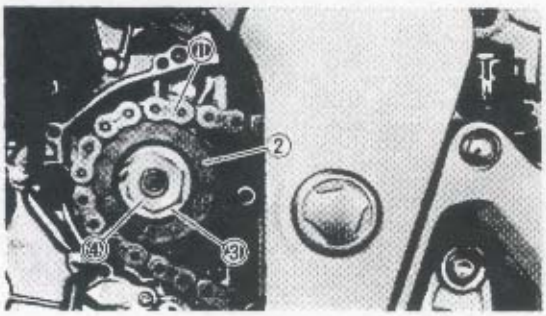
| | |
|---|---|
| | **Self-lock nut (rear sprocket wheel): 60 Nm (6.0 m • kg, 43 ft • lb)** |

**********

**INSTALLATION**

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

1.Install:
- Drive chain (over the swingarm)
- Swingarm
  Refer to "REAR SHOCK ABSORBER AND SWINGARM".
- Rear wheel
  Refer to "REAR WHEEL" section.



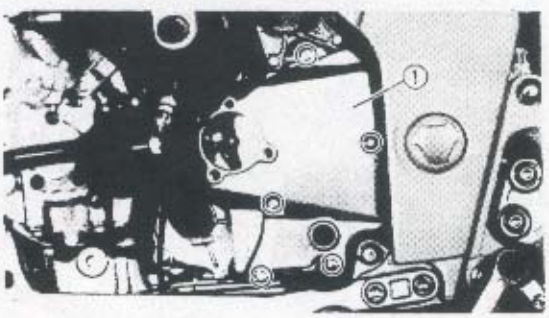

2.Install:
- Drive chain ①
  (onto drive sprocket)
- Drive sprocket ②
- Lock washer ③
- Nut ④ (drive sprocket)

| | |
|---|---|
| | **Nut (drive sprocket): 70 Nm (7.0 m • kg, 50 ft • lb)** |

**NOTE:**
Tighten the nut (drive sprocket) while applying the rear brake.

**⚠ WARNING**
**Always use a new lock washer.**

3.Bend the lockwasher tabs along the flat side of the nut.

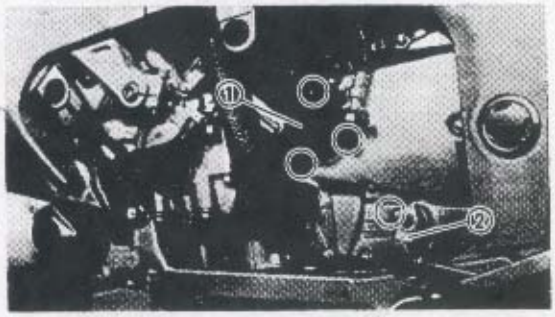


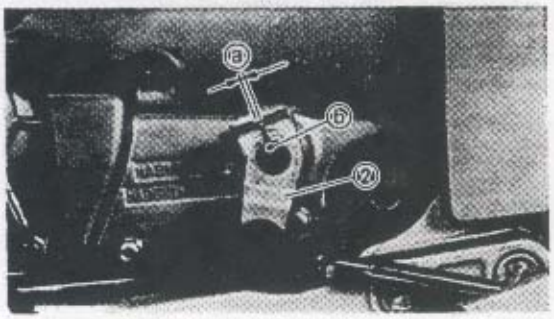

4.Install:
- Gasket
- Dowel pins
- Crankcase cover ① (left)

| | |
|---|---|
| | **Bolt (crankcase cover – left) 10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Tighten the bolts (crankcase cover – left) in stage, using a crisscross pattern.

**⚠ WARNING**
**Always use a new gasket.**




5.Install:
- Dowel pins
- Clutch release cylinder ①
- Shift pedal link ②

| | |
|---|---|
| | **Bolt (clutch release cylinder):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)**<br>**Bolt (shift pedal link):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

**NOTE:**
Align the slot ⓐ on the shift pedal link with the punched mark ⓑ on the shaft.

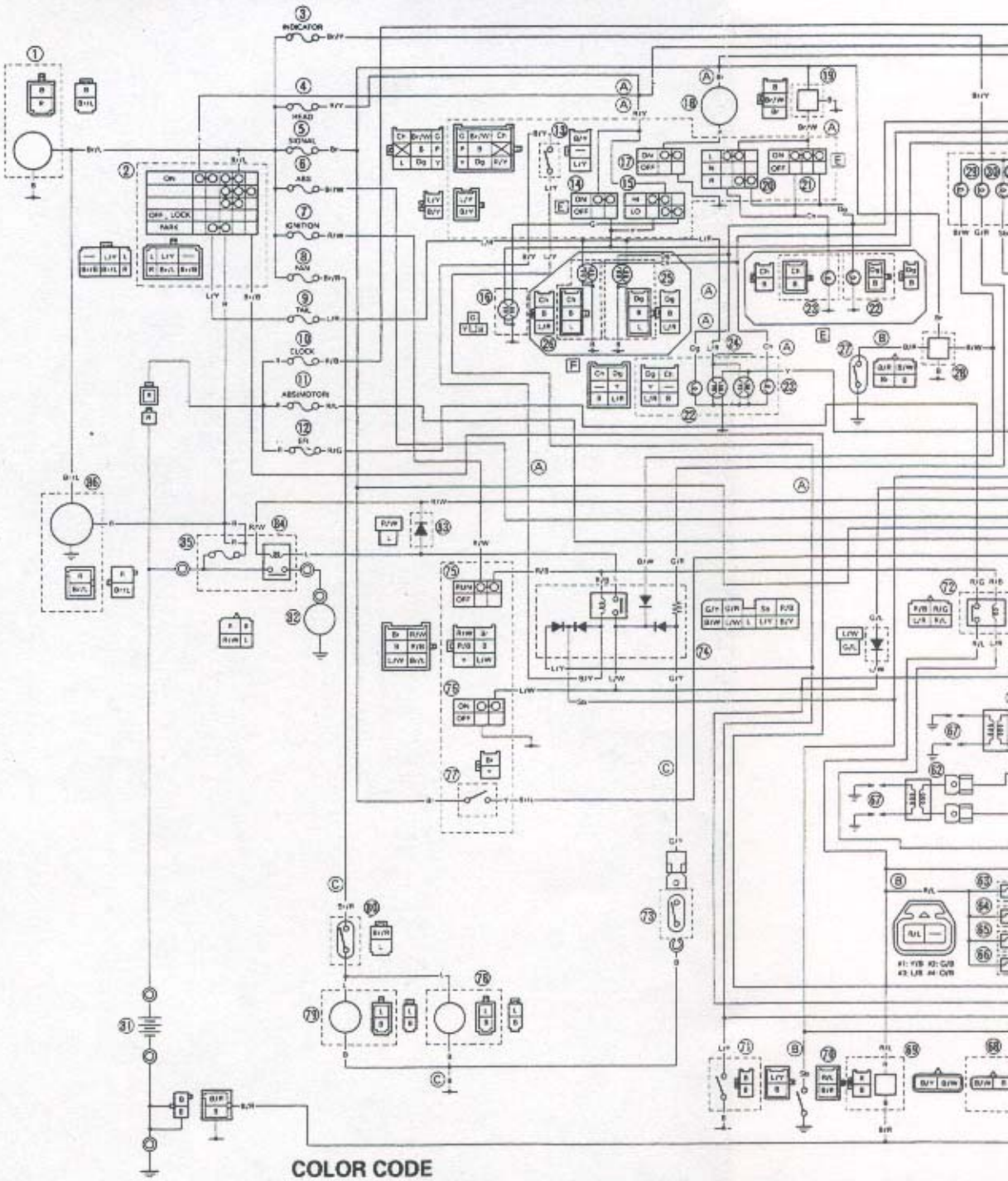
6.Adjust:
- Drive chain slack
  Refer to "DRIVE CHAIN SLACK ADJUSTMENT" in CHAPTER 3.

| | |
|---|---|
| | **Drive chain slack:**<br>**10 ~ 20 mm (0.4 ~ 0.8 in)** |

6

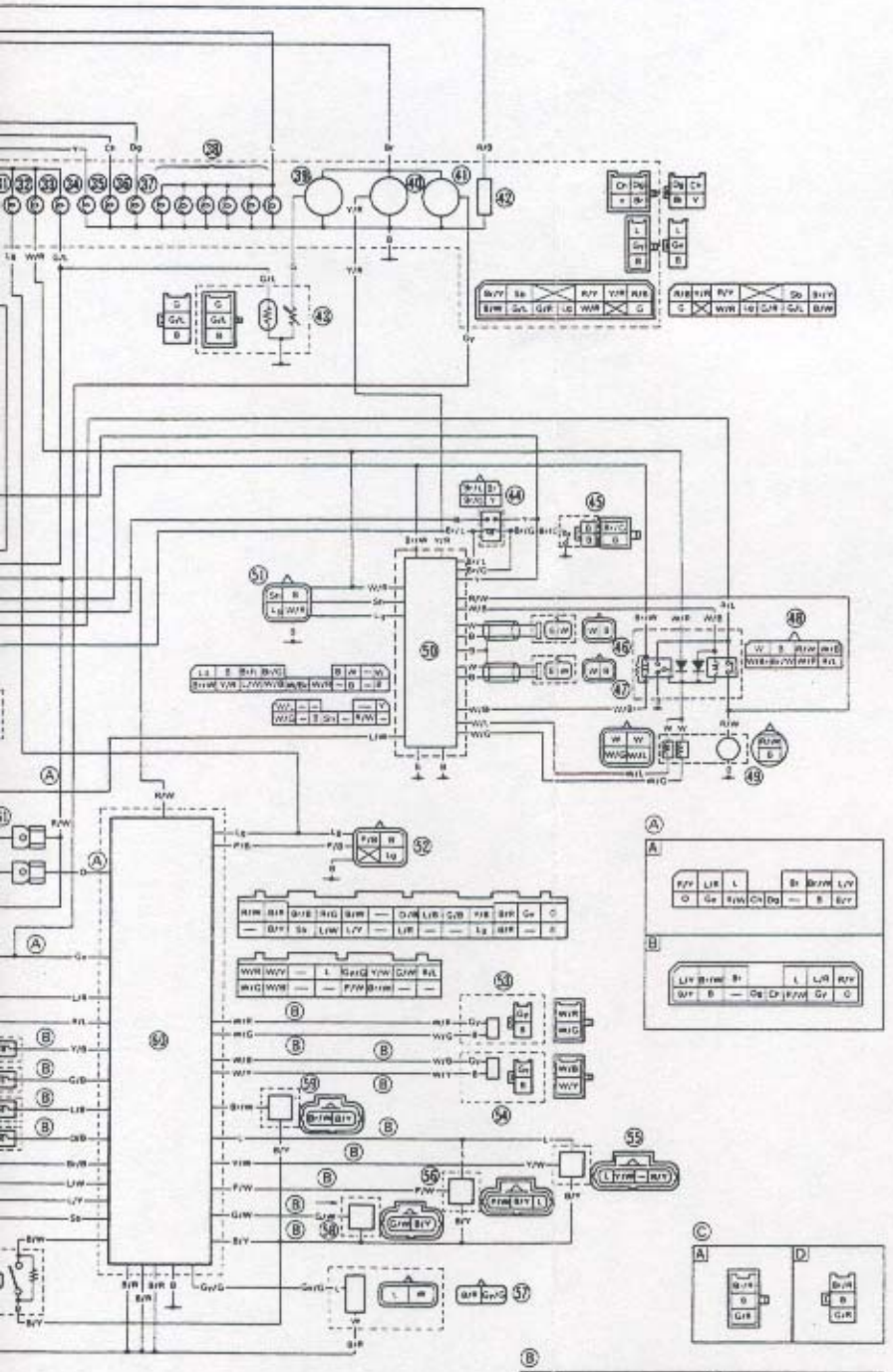
# ELECTRICAL

## GTS1000AE/GTS1000AEC CIRCUIT DIAGRAM



### COLOR CODE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| B | Black | Ch | Chocolate | B/R | Black/Red | G/Y | Gree |
| L | Blue | Gy | Gray | G/W | Green/White | G/R | Gree |
| G | Green | Sb | Sky blue | W/R | White/Red | L/Y | Blue |
| Y | Yellow | Dg | Dark green | W/Y | White/Yellow | L/R | Blue |
| R | Red | W | White | W/B | White/Black | L/B | Blue |
| P | Pink | O/B | Orange/Black | Y/W | Yellow/White | L/W | Blue |
| O | Orange | B/Y | Black/Yellow | P/W | Pink/White | R/W | Red |
| Br | Brown | B/W | Black/White | G/B | Green/Black | Br/W | Brow |



n/Yellow
n/Red
/Yellow
/Red
/Black
/White
White
vn/White

Br/L ..... Brown/Blue
Br/R ..... Brown/Red
R/Y ..... Red/Yellow
R/L ..... Red/Blue
Y/B ..... Yellow/Black

① Condensor
② Main switch
③ Fuse (INDICATOR)
④ Fuse (HEAD)
⑤ Fuse (SIGNAL)
⑥ Fuse (ABS)
⑦ Fuse (IGNITION)
⑧ Fuse (FAN)
⑨ Fuse (TAIL)
⑩ Fuse (CLOCK)
⑪ Fuse (ABS PUMP)
⑫ Fuse (EFI)
⑬ Clutch switch
⑭ "PASS" switch
⑮ "LIGHTS" (dimmer) switch
⑯ Headlight
⑰ "HORN" switch
⑱ Horn
⑲ Flasher relay
⑳ "TURN" switch
㉑ "Emergency" switch
㉒ Flasher light (right)
㉓ Flasher light (left)
㉔ Tail/brake light
㉕ Front position light (right)
㉖ Front position light (left)
㉗ Oil level switch
㉘ Oil light relay
㉙ "OIL" level indicator light
㉚ Water temperature indicator light
㉛ "NEUTRAL" indicator light
㉜ "EFI" indicator light
㉝ "ABS" indicator light
㉞ "FUEL" level indicator light
㉟ "HIGH BEAM" indicator light
㊱ "TURN" indicator light (left)
㊲ "TURN" indicator light (right)
㊳ Meter light
㊴ Fuel gauge
㊵ Speedometer
㊶ Tachometer
㊷ Clock
㊸ Fuel sender
㊹ Brake light relay
㊺ Rear brake switch
㊻ Front wheel sensor
㊼ Rear wheel sensor
㊽ Fail safe relay
㊾ Hydraulic unit
㊿ ECU (for ABS)
(51) ABS test coupler
(52) EFI test coupler
(53) Crankshaft sensor
(54) Camshaft sensor
(55) Throttle sensor
(56) Presure sensor
(57) $O_2$ sensor
(58) Water temperature sensor
(59) Intake air temperature sensor
(60) ECU (for EFI)
(61) Ignition coil #1
(62) Ignition coil #2
(63) Injector #1
(64) Injector #2
(65) Injector #3
(66) Injector #4
(67) Spark plug
(68) Fall detection switch
(69) Fuel pump
(70) Neutral switch
(71) Sidestand switch
(72) EFI main relay
(73) Thermo unit
(74) Starting circuit cut-off relay
(75) "ENGINE STOP" switch
(76) "START" switch
(77) Font brake switch
(78) Fan motor #2
(79) Fan motor #1
(80) Thermo switch
(81) Battery
(82) Starter motor
(83) Diode
(84) Starter relay
(85) Fuse (MAIN)
(86) AC genelator

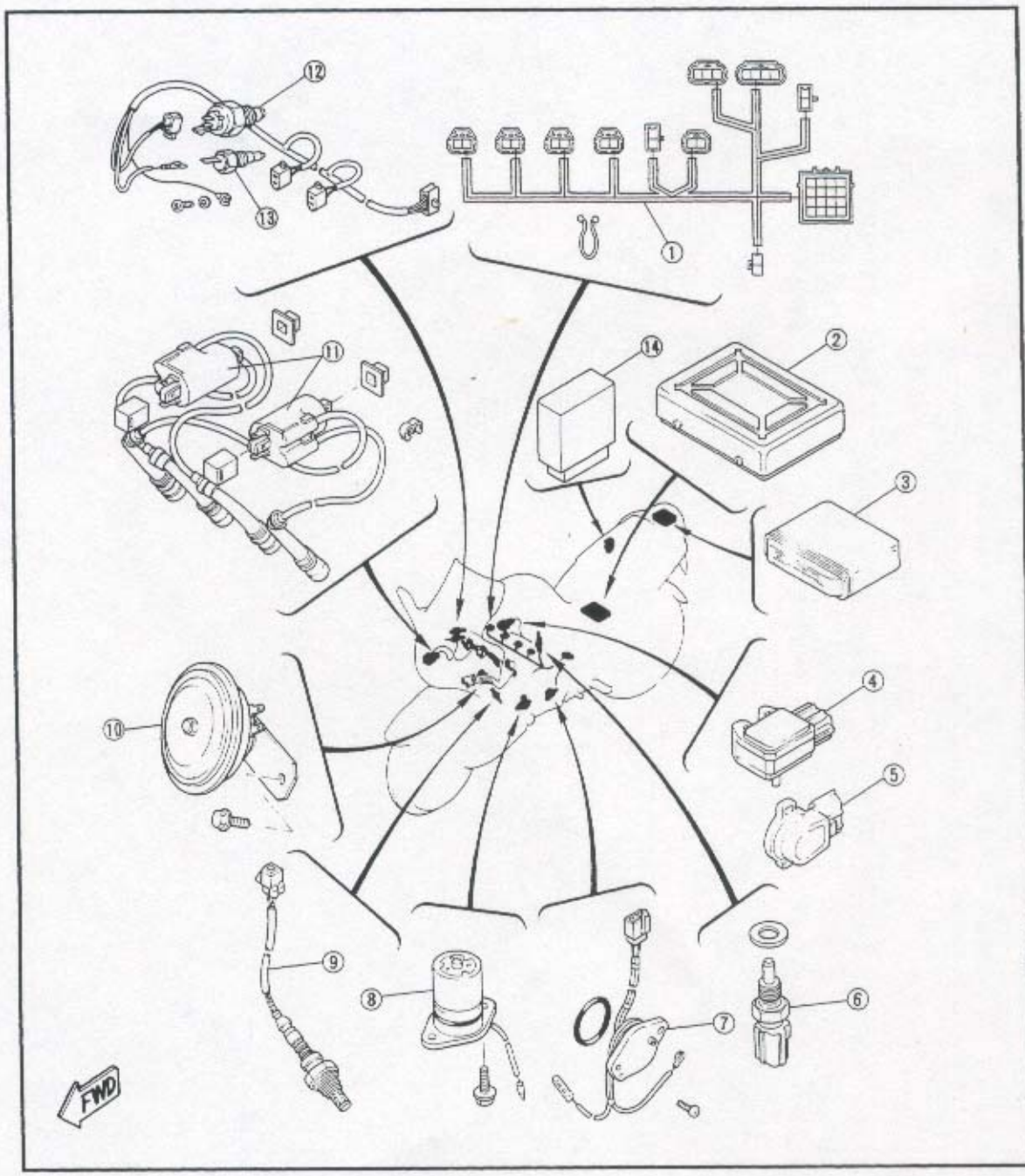
[A] Main harness
[B] Head light lead
[C] Engine harness
[D] Sub lead
[E] For AUS and NZ
[F] For US and CDN

7

## ELECTRICAL COMPONENTS

①Engine wireharness
②ECU (For EFI)
③ECU (For ABS)
④Pressure sensor
⑤Throttle sensor
⑥Intake air temperature sensor
⑦Neutral switch
⑧Oil level switch
⑨$O_2$ sensor
⑩Horn
⑪Ignition coil
⑫Thermo switch
⑬Thermo unit
⑭ABS relay

IGNITION COIL:
PRIMARY WINDING RESISTANCE:
1.87 ~ 2.53 Ω at 20°C (68°F)
SECONDARY WINDING RESISTANCE:
12 ~ 18 kΩ at 20°C (68°F)

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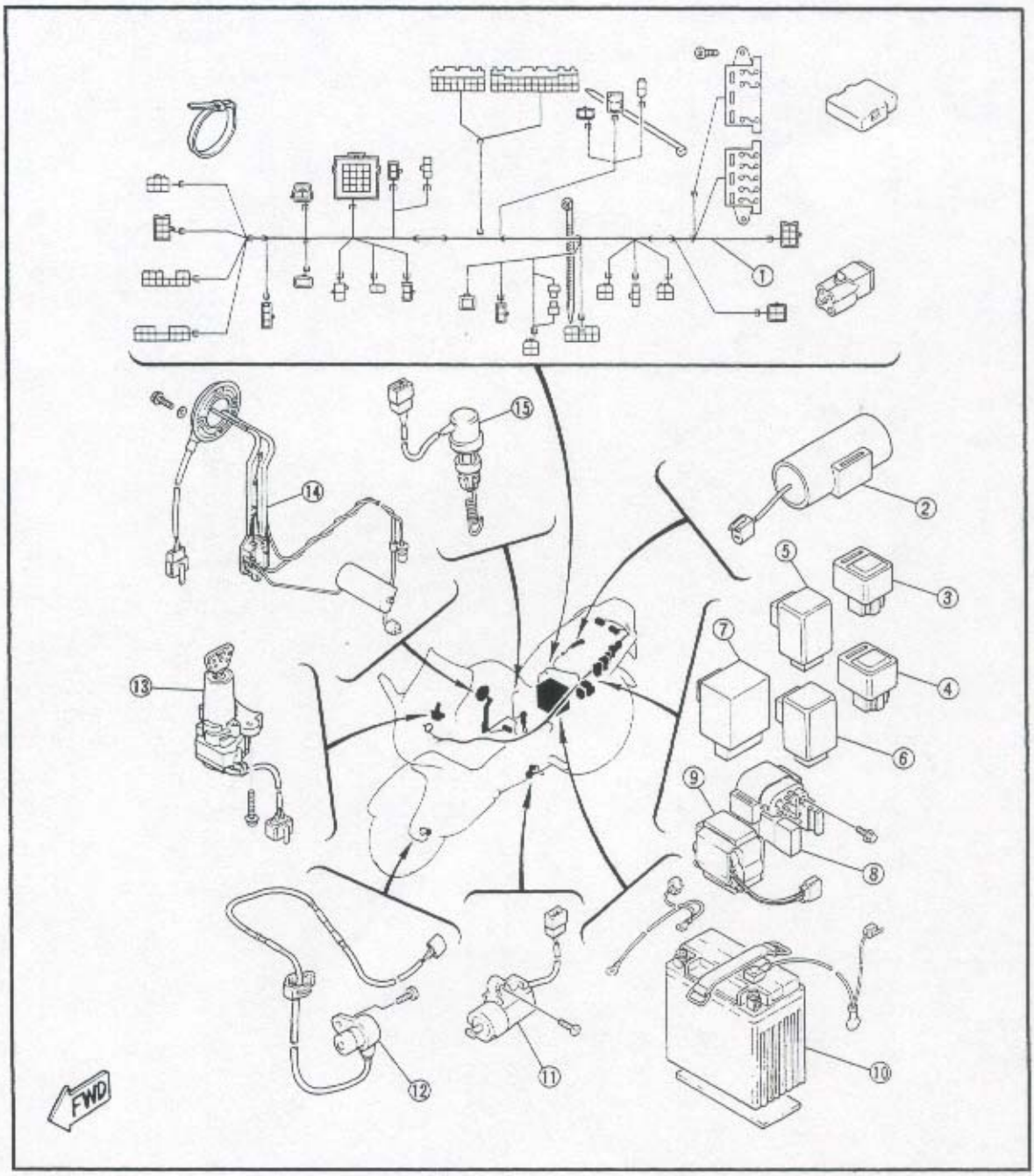
①Wire harness
②Cordensor
③Stop switch relay
④EFI main relay
⑤Flasher relay
⑥Oil light relay
⑦Starting circuit cut-off relay
⑧Starter relay
⑨Fall detection switch
⑩Battery
⑪Sidestand switch
⑫Front wheel sensor
⑬Main switch
⑭Fuel sender
⑮Brake switch

BATTERY:
CAPACITY:
12V 12AH
SPECIFIC GRAVITY:
1.320



## CHCKING OF SWITCHES

Check the switches for the continuity between the terminal to determine correct connection.

Read the following for switch inspection.

### SWITCH CONNECTION AS SHOWN IN MANUAL

The manual contains a connection chart as shown left showing the terminal connections of the switches (e.g., main switch, handlebar switch, bracket switch, lighting switch etc.)

The extreme left column indicates the switch positions and the top line indicates the colors of leads connected with the terminals in the switch component.

"○—○" indicates the terminals between which there is a continuity of electricity; i.e., a closed circuit at the respective switch positions.

In this chart:
"R and Br" and "L/W and L/R" are continuous with the "ON" switch position.

"B and B/W" is continuous with the "OFF" switch position.

"B and B/W" is continuous with the "LOCK" switch position.

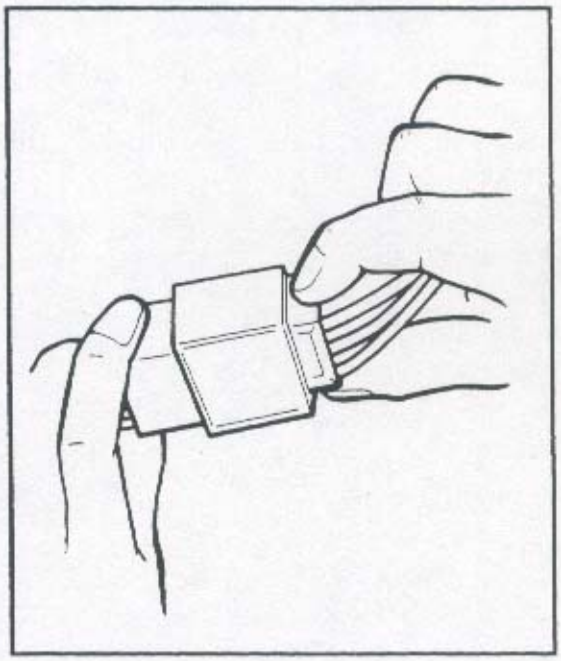
"B and B/W" and "R and L/R" are continuous with the "P" switch position.

| | B | B/W | R | Br | L/W | L/R |
|---|---|---|---|---|---|---|
| ON | | | ○ | ○ | ○ | ○ |
| OFF | ○ | ○ | | | | |
| LOCK | ○ | ○ | | | | |
| P | ○ | ○ | ○ | — | — | ○ |

**CHECKING SWITCH FOR TERMINAL CONNECTION**

Before checking the switch, refer to the connection chart as shown above and check for the correct terminal connection (closed circuit) by the color combination.

To explain how to check the switch, the main switch taken for example in the following.



1. Disconnect the main switch coupler from the wireharness.

**CAUTION:**

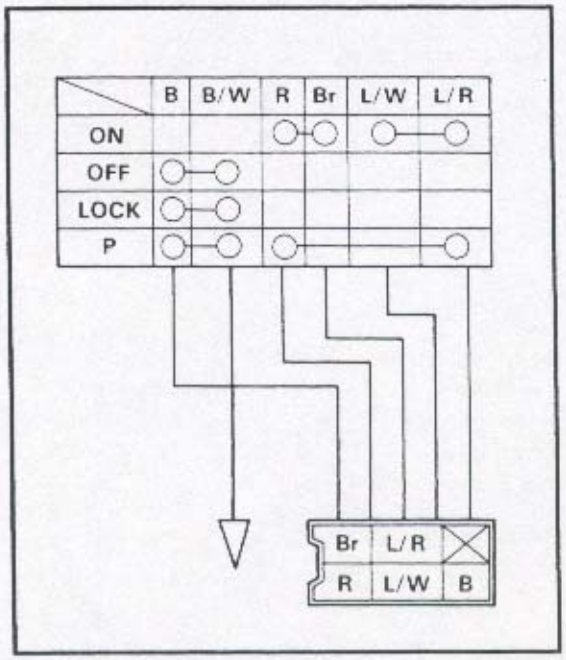
**Never disconnect the main switch coupler by pulling the leads. Otherwise, leads may be pulled off the terminals inside the coupler.**

2. Inspect whether any lead is off the terminal inside the coupler. If it is, repair it.

**NOTE:**

If the coupler is clogged with mud or dust, blow it off by compressed air.

7




3. Use the connection chart to check the color combination for continuity (a closed circuit). In this example, the continuity is as follows.

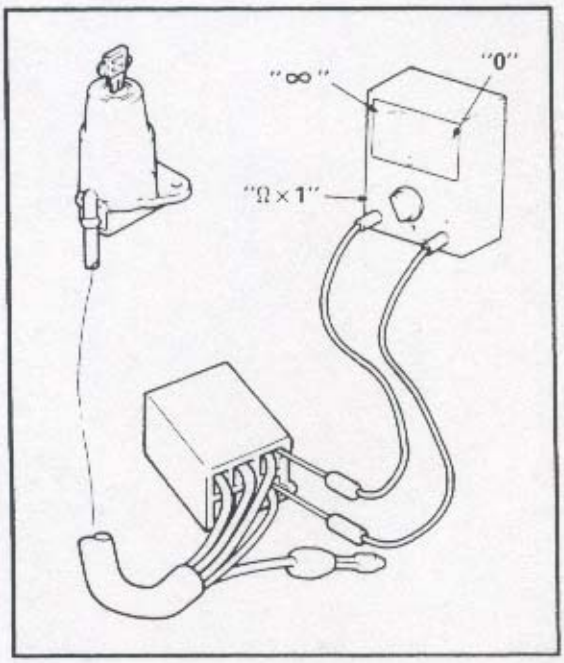
"R and Br" and "L/W and L/R" are continuous with the "ON" switch position.

"B and B/W" is continuous with the "OFF" switch position.

"B and B/W" is continuous with the "LOCK" switch position.

"B and B/W" and "R and L/R" are continuous with the "P" switch position.

Please note that these is no continuity (an open circuit) at all for the color combinations other than the above.




4. Check the switch component for the continuity between "R and Br".

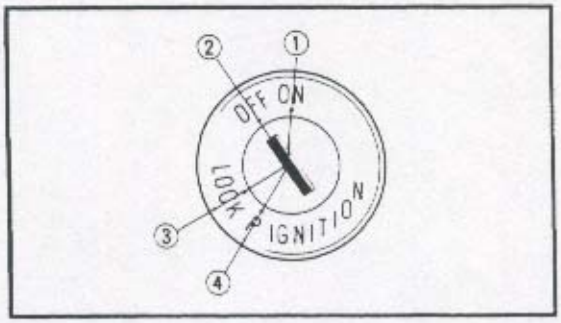
**********

**Checking step:**

- Turn the switch key to the "ON", "OFF", "LOCK" and "P" several times.
- Set the pocket tester selector to the "Ω × 1".
- Connect the tester (+) lead to the "R" lead terminal in the coupler and the (–) lead to the "Br" lead terminal.

**NOTE:**

Use thin probes for checking the continuity. Otherwise, the probes may contact other terminals inside the coupler.




- Check the continuity between "R" and "Br" at the respective switch position of "ON" ①, "OFF" ②, "LOCK" ③, and "P" ④. There must be continuity (the tester indicating "0") at the "ON" switch position, and there must be no continuity (the tester indicating "∞") at "OFF", "LOCK", or "P". There is something wrong between "R" and "Br" if there is no continuity at the "ON" position or if there is some continuity either at the "OFF" or "LOCK" or "P".

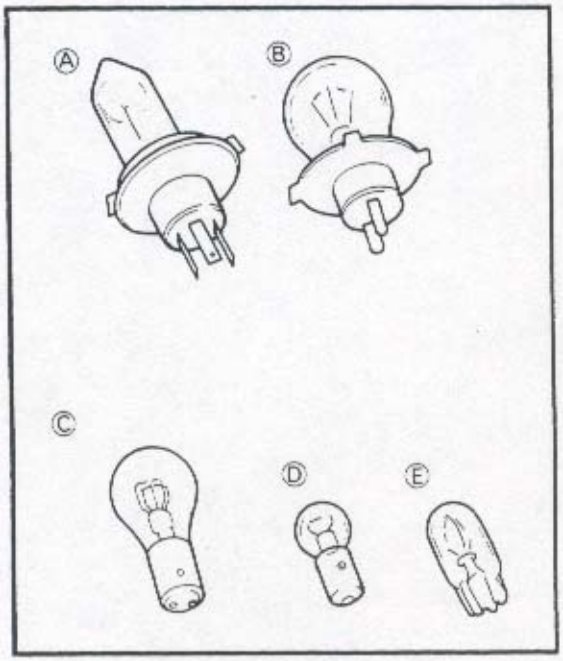
**NOTE:**
Check the switch for continuity several times.

**********

5. Next go on to checking of the continuity between "B" and "B/W", "L/W and L/R", and "R and L/R" at the respective switch positions, as in the same manner mentioned above.
6. If there is something wrong with any one of the combinations, replace the switch component.

## CHECKING OF BULBS (FOR HEADLIGHT, TAIL/BRAKE LIGHT, FLASHER LIGHT, METER LIGHT, ETC.)

Check the bulb terminal continuity for the condition of the bulb.




### KINDS OF BULBS

The bulbs used in the motorcycle are classified as shown left by the shape of the bulb socket.

Ⓐ and Ⓑ are many used for the headlight.

Ⓒ is mainly used for the flasher light and tail/brake light.

Ⓓ and Ⓔ are mainly used for the mater light and other indicator lights.

### CHECKING BULB CONDITION

1.Remove the bulb

**NOTE:**

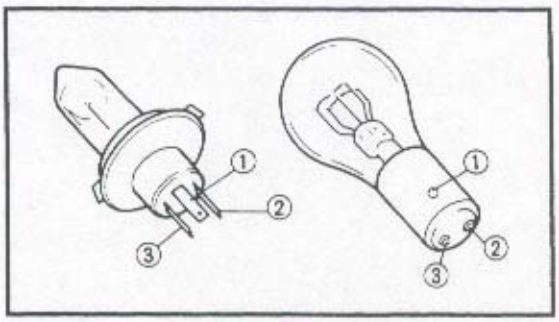
- Bulbs of the Ⓐ and Ⓑ type uses a bulb holder. Remove the bulb holder before removing the bulb itself. Most of the bulb holder for this type can be removed by turning them counterclockwise.
- Most of the bulbs of Ⓒ and Ⓓ type can be removed from the bulb sockets by pushing and turning them counterclockwise.
- Bulbs of the Ⓔ type can be removed from the bulb sockets by simply pulling them out.

**CAUTION:**

**Be sure to hold the socket firmly when removing the bulb. Never pull the lead. Otherwise, the lead may be pulled off the terminal in the coupler.**

**⚠ WARNING**

**Keep flammable products or your hands away from the headlight bulb while it is on. It will be hot. Do not touch the bulb until it cools down.**




2.Check the bulb terminals for continuity.

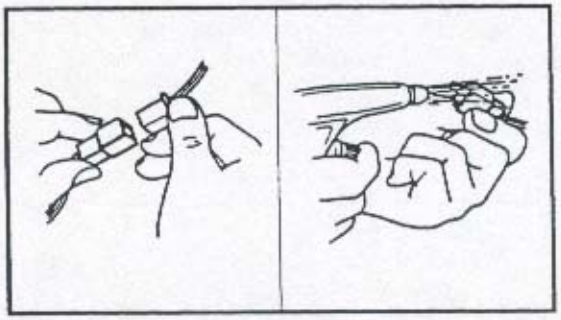
**********

**Checking steps:**

- Set the pocket tester selector to the "Ω × 1".
- Connect the tester lead to the respective bulb terminals. Take for example a 3-terminal bulb as shown left. First check the continuity between the ① and ② terminal by connecting the tester (+) lead to the ① terminal and the tester (–) lead to the ② terminal. Then check the continuity between the ① and ③ terminals by connecting the tester (+) lead still to the ① terminal and the tester (–) lead to the ③ terminal. If the tester shown "∞" in either case, replace the bulb.

**********

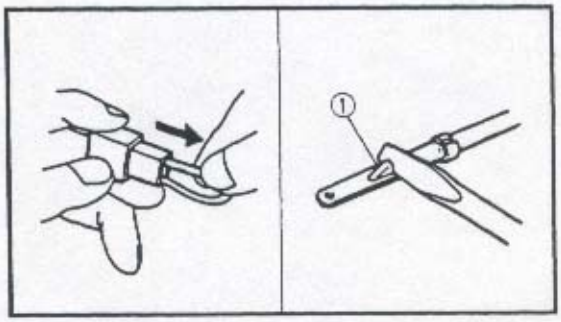
3.Check the bulb socket by installing a proven bulb to it. As in the checking of bulbs, connect the pocket tester leads to the respective leads of the socket and check for continuity in the same manner as mentioned above.



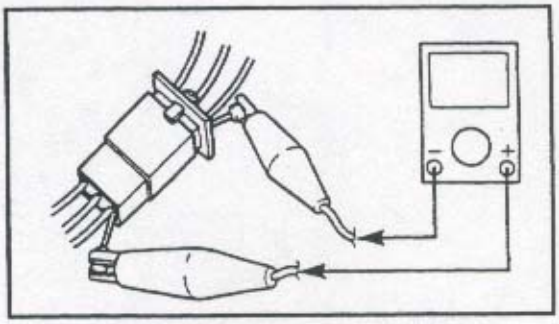
## CHECKING OF CONNECTIONS

Dealing with stains, rust, moisture, etc. on the connector.

1. Disconnect:
   - Connector
2. Dry each terminal by 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 connector.

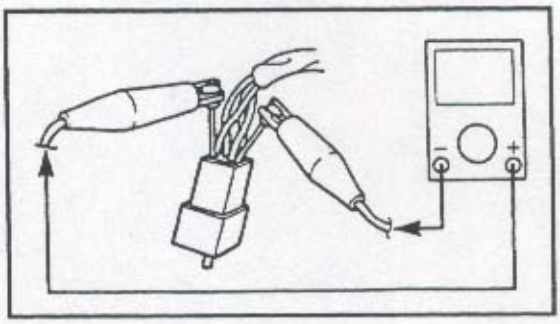


6. Connect:
   - Connector

**NOTE:**
The two connectors "click" together.

7. Check for continuity by a tester.

**NOTE:**
- If there is no continuity, clean the terminals.
- Be sure to perform the above steps 1 to 7 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.

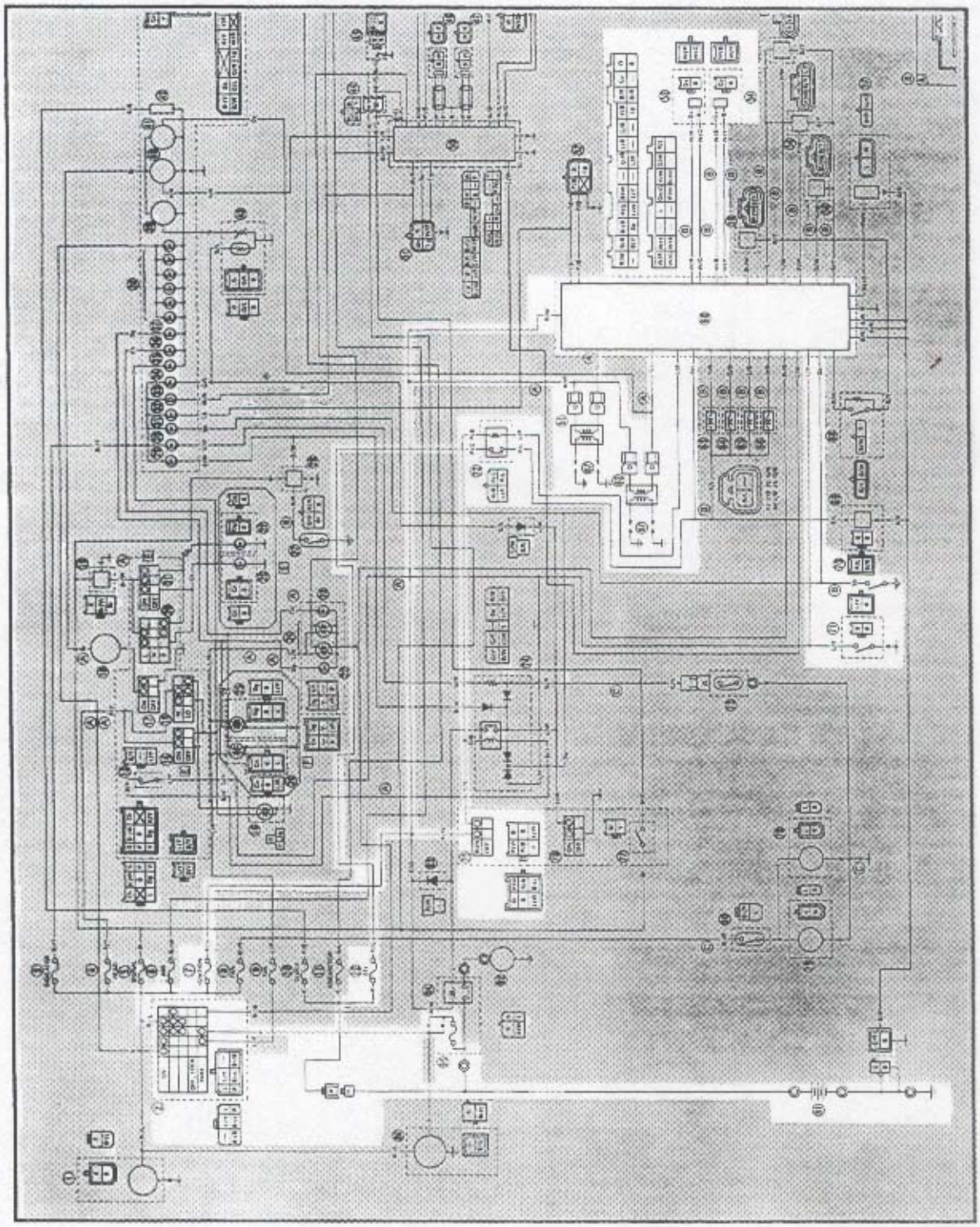


7

# IGNITION SYSTEM

## CIRCUIT DIAGRAM

② Main switch
⑦ Fuse (IGNITION)
⑫ Fuse (EFI)
㊸ Crankshaft sensor
㊹ Camshaft sensor
㊿ ECU (for EFI)
㊶ Ignition coil #1
㊷ Ignition coil #2
㊼ Spark plug
㊿ Neutral switch
㊶ Sidestand switch
㊷ EFI main relay
㊺ "ENGINE STOP" switch
㊽ Battery
㊺ Fuse (MAIN)



## TROUBLESHOOTING

**IF IGNITION SYSTEM SHOULD BECOME INOPERATIVE (NO SPARK OR INTERMITTENT SPARK)**

**Procedure**

Check;

1. Fuse (main, ignition and EFI)
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. EFI main relay
10. Neutral switch
11. Sidestand switch
12. Crankshaft sensor resistance
13. Camshaft sensor resistance
14. Wiring connection (entire ignition system)

**NOTE:**

- Remove the following parts before troubleshooting.
  1) Seat
  2) Top cover
  3) Inner panels
  4) Side cowlings
  5) Side covers
- Use the following special tool(s) in this troubleshooting.

**Dynamic spark tester:**
**YM-34487**
**Ignition checker:**
**90890-06754**
**Pocket tester:**
**YU-03112/ 90890-03112**

**1. Fuse (main, ignition and EFI)**

- Remove the fuses.
- Connect the pocket tester (Ω x 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:**
**12.8 V or more at 20° C(68° F)**

INCORRECT →

- Clean battery terminals.
- Recharge or replace the battery.

CORRECT ↓

*

*

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:**
**DPR 8EA-9/X24EPR-U9**
**NGK/NIPPONDENSO**

**Spark plug gap:**
**0.8 ~ 0.9 mm (0.031 ~ 0.035 in)**

INCORRECT

Repair or replace spark plug.

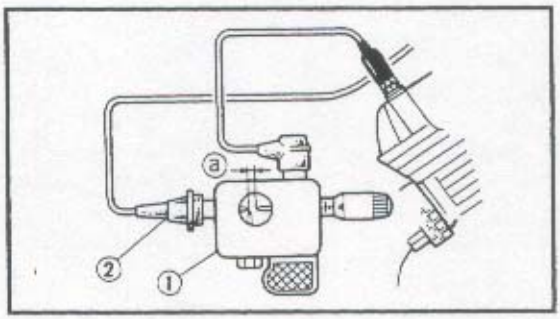
CORRECT

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 ⓐ.
- Start engine, and increase spark gap until misfire occurs.

**Minimum spark gap:**
**6.0 mm (0.24 in)**

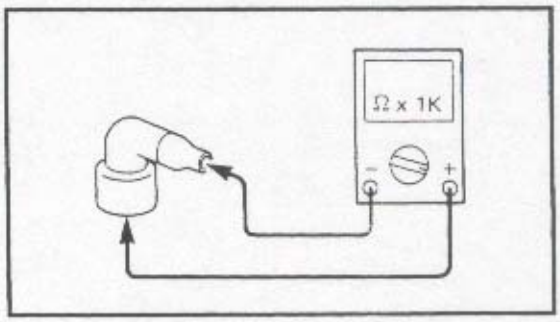
MEETS SPECIFICATION

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 x 1k) to the spark plug cap.

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- Check the spark plug cap for specificated resistance.

**Spark plug cap resistance:**
**10 kΩ at 20° C (68° F)**

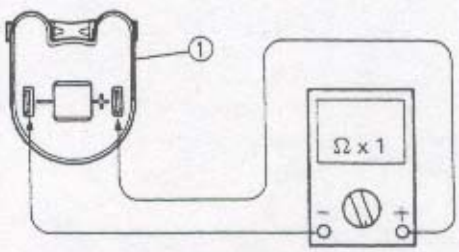
OUT OF SPECIFICATION → Replace spark plug cap.

MEETS SPECIFICATION

6.Ignition coil resistance

- Disconnect the ignition coil leads from the ignition coil.
- Connect the pocket tester (Ω × 1) to the ignition coil.

**Tester (+) lead → Terminal**
**Tester (–) lead → Terminal**

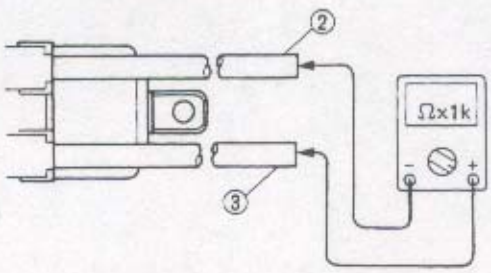



- Check the primary coil for specificated resistance.

**Primary coil resistance:**
**1.87 ~ 2.53 Ω at 20° C (68° F)**

- Connect the pocket tester (Ω × 1k) to the ignition coil.

**Tester (+) lead → Spark plug lead ②**
**Tester (–) lead → Spark plug lead ③**




①#1 and #2 ignition coils

- Check the secondary coil for specificated resistance.

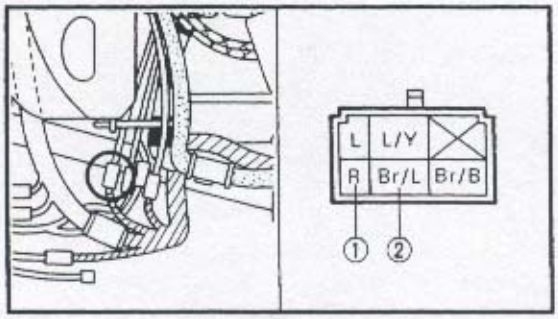
**Secondary coil resistance:**
**12 ~ 18 kΩ at 20° C (68° F)**

OUT OF SPECIFICATION → Replace ignition coil.

BOTH MEET SPECIFICATION

7.Main switch

- Disconnect the main switch coupler from the wireharness.
- Check the switch component for the continuity between "Red ① and Brown/Blue ②".
  Refer to "CHECKING OF SWITCHES".



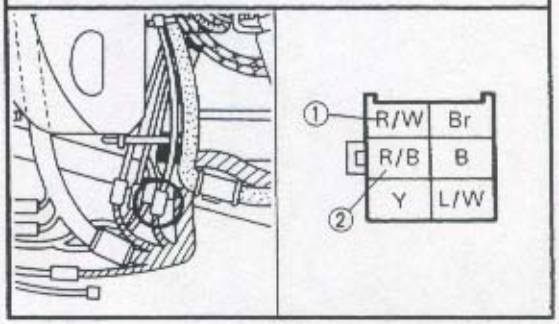

INCORRECT

Replace main switch.

CORRECT

8."ENGINE STOP" switch

- Disconnect the handlebar switch (right) coupler from the wireharness.
- Check the switch component for the continuity between "Red/White ① and Red/Black ② ".
  Refer to "CHECKING OF SWITCHES".




INCORRECT

Replace handlebar switch (right).

CORRECT

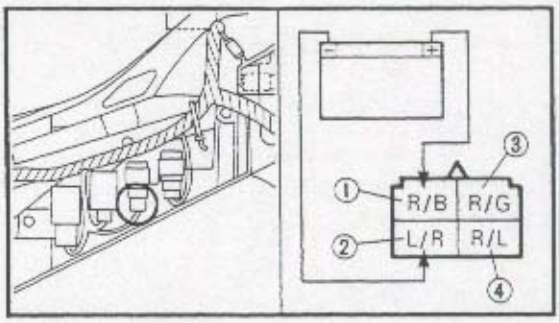
9.EFI main relay

- Disconnect the EFI main relay coupler from the EFI main relay.
- Connect the pocket tester (Ω × 1) and battery (12 V) to the EFI main relay coupler terminals.

**Battery (+) terminal → Red/Black terminal ①**
**Battery (–) terminal → Blue/Red terminal ②**

**Tester (+) terminal → Red/Green terminal ③**
**Tester (–) terminal → Red/Blue terminal ④**

- Check the EFI main relay for coutinuity.




NO CONTINUITY

Replace EFI main relay.

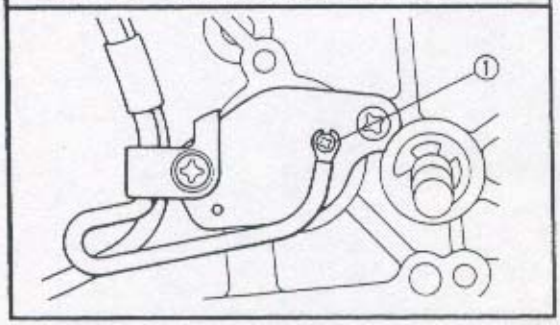
CONTINUITY

*

*

10.Neutral switch

- Check the switch component for the continuity between terminal ① and Ground.
  Refer to "CHECKING OF SWITCHES".



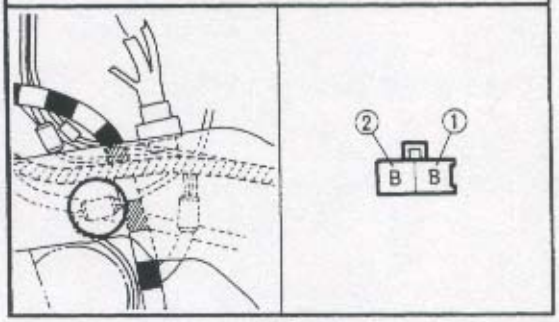

INCORRECT

Replace neutral switch.

CORRECT

11.Sidestand switch

- Disconnect the sidestand switch coupler from the wireharness.
- Check the switch component for the continuity between "Black ① and Black ②".
  Refer to "CHECKING OF SWITCHES".




INCORRECT

Replace sidestand switch.

CORRECT

*

7

*

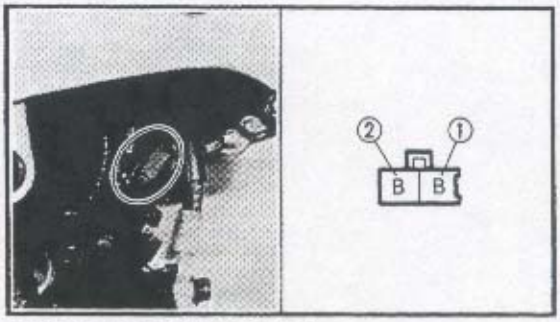
12.Crankshaft sensor resistance

- Disconnect the crankshaft sensor coupler from the wireharness.
- Connect the pocket tester (Ω × 100) to the crankshaft sensor terminal.

**Tester (+) lead → Gray terminal ①**
**Tester (–) lead → Black terminal ②**

- Check the crankshaft sensor for specificated resistance.

**Crankshaft sensor resistance:**
**120 ~ 180 Ω at 20° C (68° F)**
**(Gray - Black)**




OUT OF SPECIFICATION → Replace crankshaft sensor.

MEETS SPECIFICATION

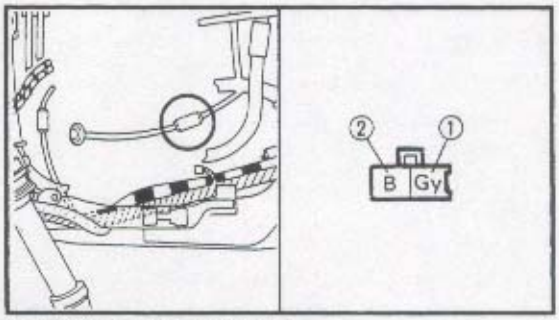
13.Camshaft sensor

- Disconnect the camshaft sensor coupler from the wireharness.
- Connect the pocket tester (Ω × 100) to the camshaft sensor terminal.

**Tester (+) lead → Gray terminal ①**
**Tester (–) lead → Black terminal ②**

- Check the camshaft sensor for specificated resistance.

**Camshaft sensor resistance:**
**120 ~ 180 Ω at 20° C (68° F)**
**(Gray - Black)**




OUT OF SPECIFICATION → Replace camshaft sensor.

MEETS SPECIFICATION

14.Wiring connection

- Check the entire ignition system for connections.
  Refer to "CIRCUIT DIAGRAM".

POOR CONNECTION → Correct.

CORRECT

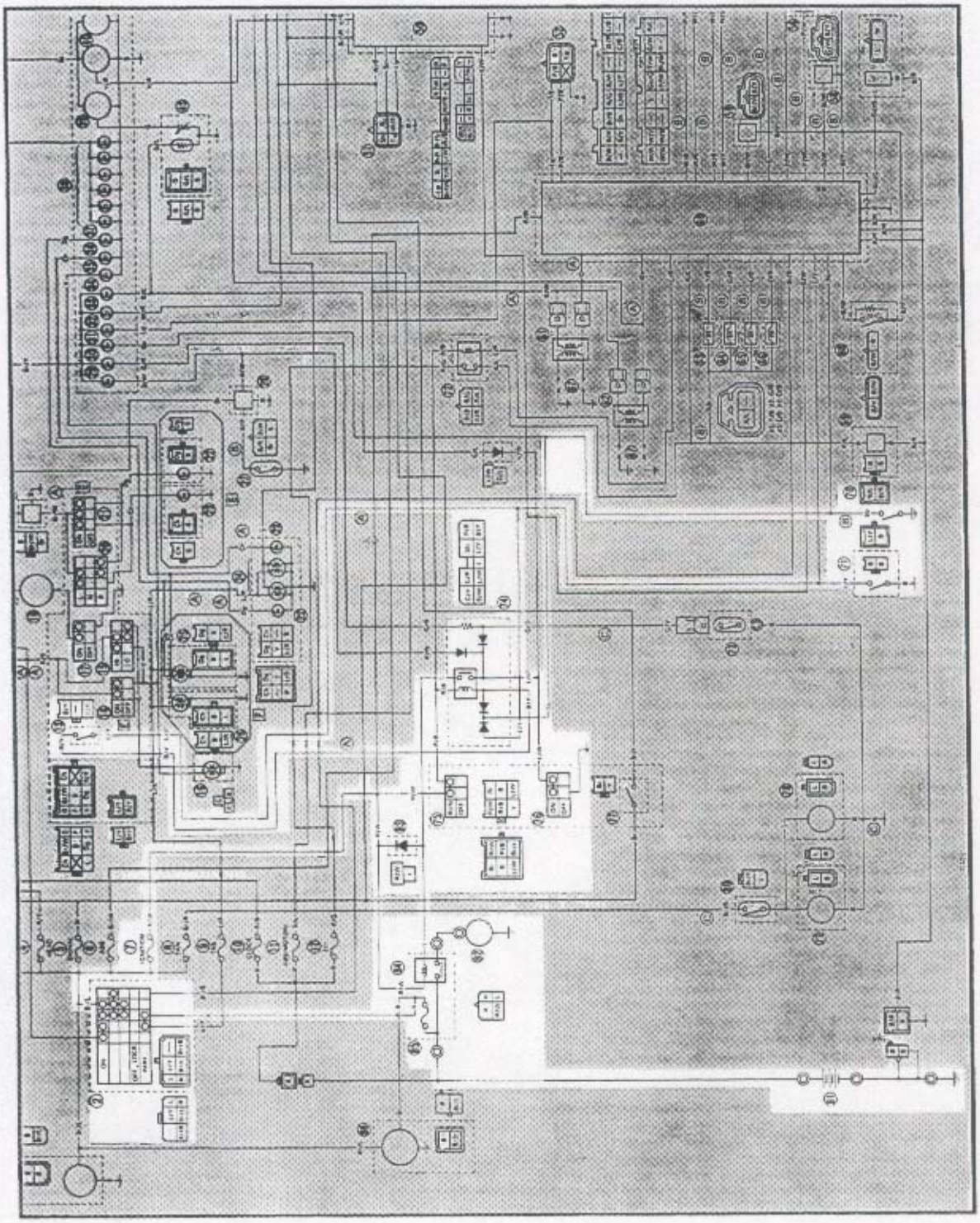
Replace ECU.

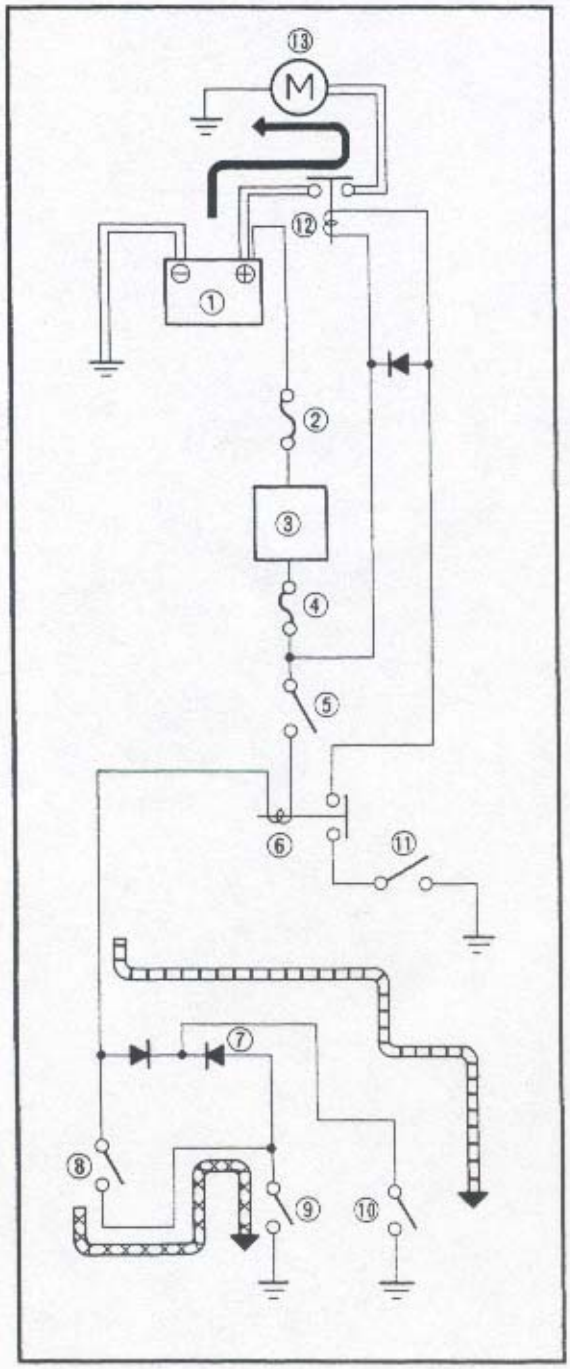
7

# ELECTRIC STARTING SYSTEM

## CIRCUIT DIAGRAM

②Main switch
⑦Fuse (IGNITION)
⑬Clutch switch
⑰Neutral switch
⑰Sidestand switch
⑭Starting circuit cut-off relay
⑮"ENGINE STOP" switch
⑯"START" switch
㉑Battery
㉒Starter motor
㉓Diode
㉔Starter relay
㉕Fuse (MAIN)






### STARTING CIRCUIT OPERATION

The starting circuit on this model consist 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 bees 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 have 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

①Battery
②Fuse (main)
③Main switch
④Fuse (ignition)
⑤"ENGINE STOP" switch
⑥Starting circuit cut-off relay
⑦Diode
⑧Clutch switch
⑨Sidestand switch
⑩Neutral switch
⑪"START" switch
⑫Starter relay
⑬Starter motor

7

## 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. Diode
12. "START" switch
13. Wiring connection (entire starting system)

**NOTE:**

- Remove the following parts before troubleshooting.

1) Seat
2) Top cover
3) Inner panels
4) Side cowlings
5) Side covers

- Use the following special tool(s) in this troubleshooting.

**Pocket tester:**
**YU-03112/90890-03112**

**1. Fuse (main and ignition)**

- Remove the fuses.
- Connect the pocket tester (Ω x 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 ↓

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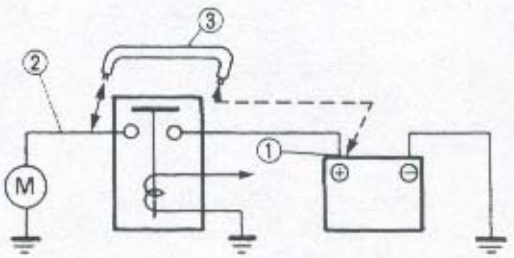
3.Starter motor

- Connect the battery positive terminal ① and starter motor cable ② using a jumper lead ③ * .
- Check the starter motor for operation.

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**⚠ 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.

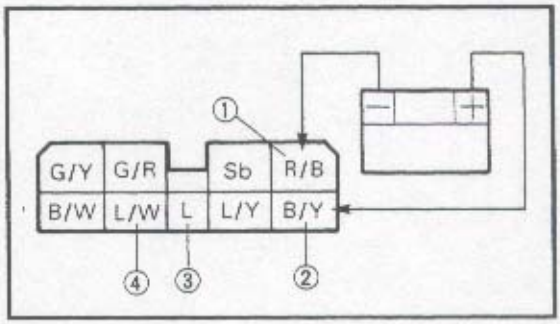
MOVES

4.Starting circuit cut-off relay

- Disconnect the starting circuit cut-off relay coupler from the wireharness.
- Connect the pocket tester (Ω x 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 ④**




- Check the starting circuit cut-off relay for continuity.

NO CONTINUITY

Replace starting circuit cut-off relay.

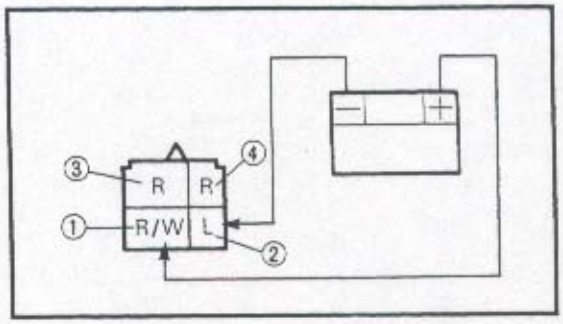
CONTINUITY

*

*

5.Starter relay

- Disconnect the relay unit coupler from the wireharness.
- Connect the pocket tester (Ω × 1) and battery (12V) to the relay unit coupler terminals.

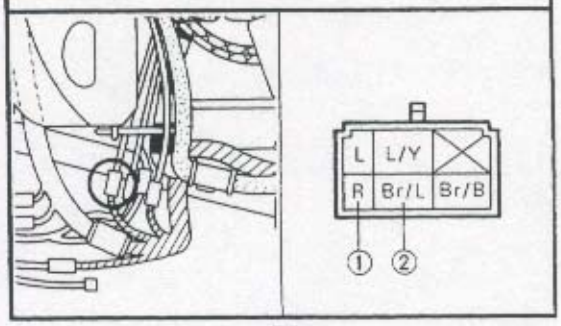



| | |
|---|---|
| **Battery (+) terminal → Red/White terminal ①**<br>**Battery (–) terminal → Blue terminal ②** | |
| **Tester (+) lead → Red terminal ③**<br>**Tester (–) lead → Red terminal ④** | |
| • Check the starter relay for continuity. | NO CONTINUITY → Replace starter relay. |

CONTINUITY

6.Main switch

- Disconnect the main switch coupler from the wireharness.
- Check the switch component for the continuity between "Red ① and Brown/Blue ②".
  Refer to "CHECKING OF SWITCHES".




INCORRECT → Replace main switch.

CORRECT

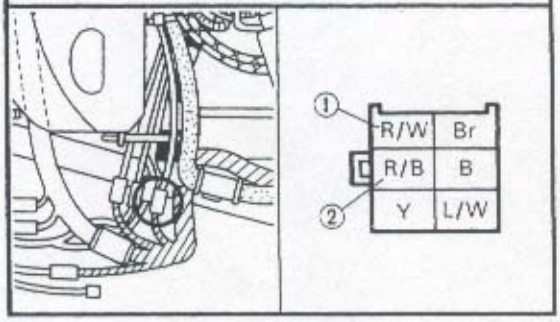
*

7

*

7."ENGINE STOP" switch

- Disconnect the handlebar switch (right) coupler from the wireharness.
- Check the switch component for the continuity between "Red/White ① and Red/Black ② ".
  Refer to "CHECKING OF SWITCHES" .



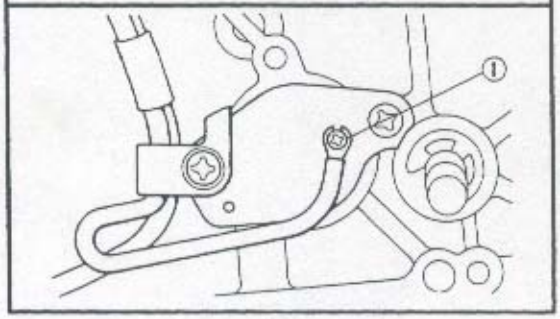

INCORRECT

Replace handlebar switch (right).

CORRECT

8.Neutral switch

- Check the switch component for the continuity between terminal ① and Ground.
  Refer to "CHECKING OF SWITCHES".




INCORRECT

Replace neutral switch.

CORRECT

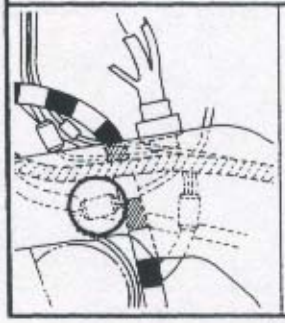
*

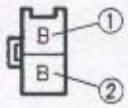
7

*

9.Sidestand switch

- Disconnect the sidestand switch coupler from the wireharness.
- Check the switch component for the continuity between "Black ① and Black ②".
  Refer to "CHECKING OF SWITCHES".





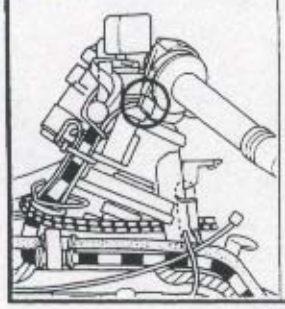

INCORRECT

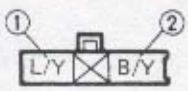
Replace sidestand switch.

CORRECT

10.Clutch switch

- Disconnect the clutch switch coupler from wireharness.
- Check the clutch switch component for the continuity between "Blue/Yellow ① and Black/Yellow ②".
  Refer to "CHECKING OF SWITCHES".






INCORRECT

Replace clutch switch.

CORRECT

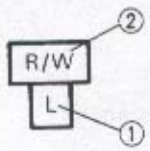
*

7

*

**11.Diode**

- Disconnect the diode coupler from the wireharness.
- Connect the pocket tester (Ω × 1) to the diode terminal.
- Check the relay unit for continuity.




NO CONTINUITY

**Tester (+) lead → Blue terminal ①**
**Tester (–) lead → Red/White terminal ②**

CONTINUITY

**Tester (+) lead → Red/White terminal ②**
**Tester (–) lead → Blue terminal ①**

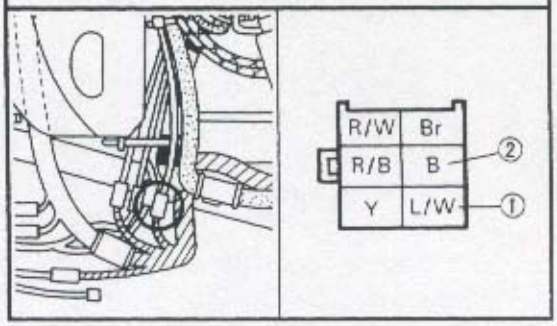
IN CORRECT

Replace diode unit.

CORRECT

**12."START" switch**

- Disconnect handlebar switch (right) coupler from wireharness.
- Check the "START" switch component for the continuity between "Blue/White ① and Black ② ".
  Refer to "CHECKING OF SWITCHES".




INCORRECT

Replace handlebar switch (right).

CORRECT

**13.Wiring connection**

- Check the entire starting system for connections.
  Refer to "CIRCUIT DIAGRAM".

POOR CONNECTION

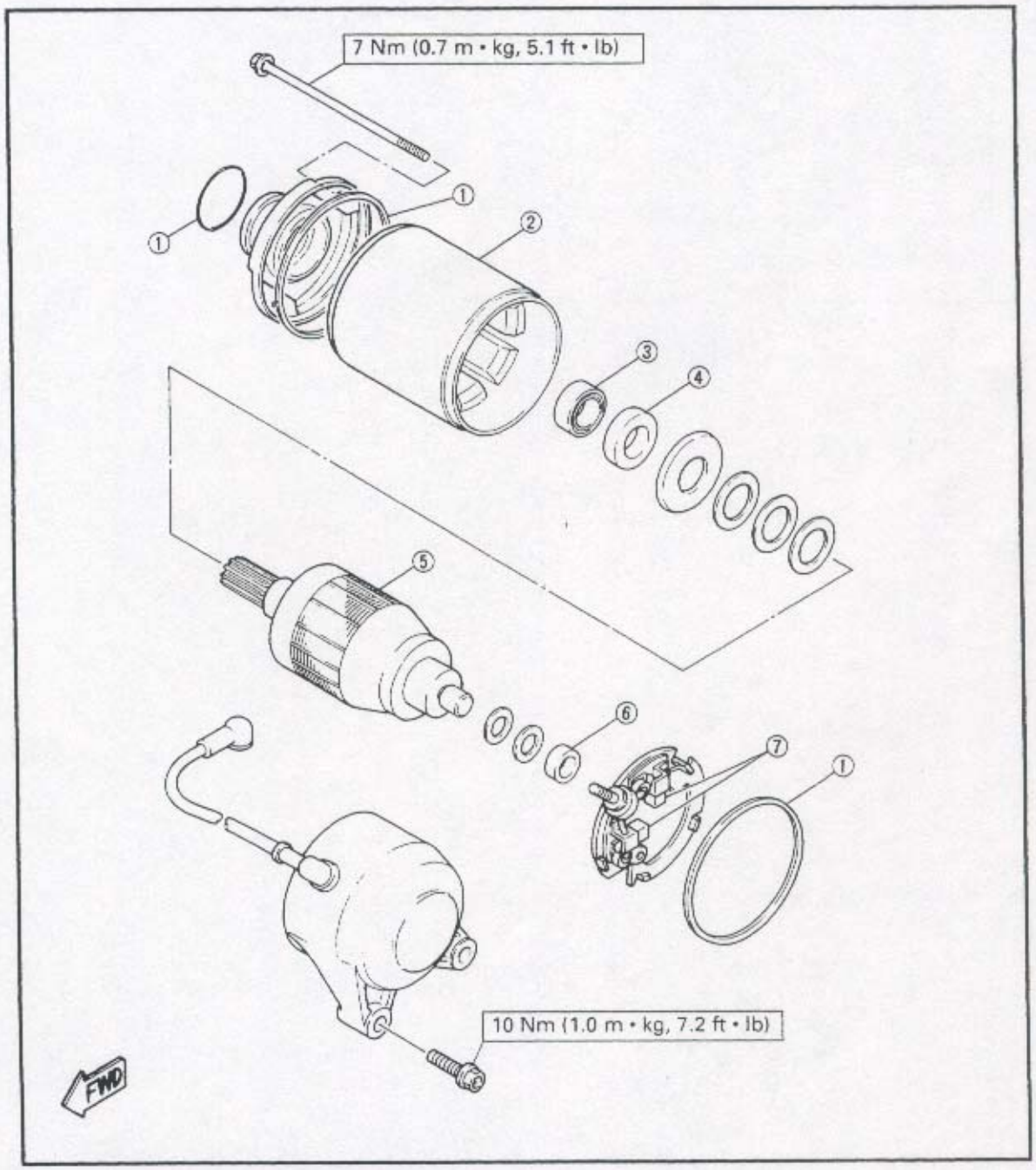
Correct.

7

## STARTER MOTOR

①O-ring
②Yoke
③Bearing
④Oil seal
⑤Armature
⑥Bushing
⑦Brush

| | |
|---|---|
| A | ARMATURE COIL RESISTANCE:<br>0.0018 ~ 0.0022 Ω at 20° C (68° F) |
| B | BRUSH WEAR LIMIT:<br>4 mm (0.16 in) |
| C | COMMUTATOR WEAR LIMIT:<br>27 mm (1.06 in) |
| D | MICA UNDERCUT:<br>0.7 mm (0.03 in) |



**Removal**

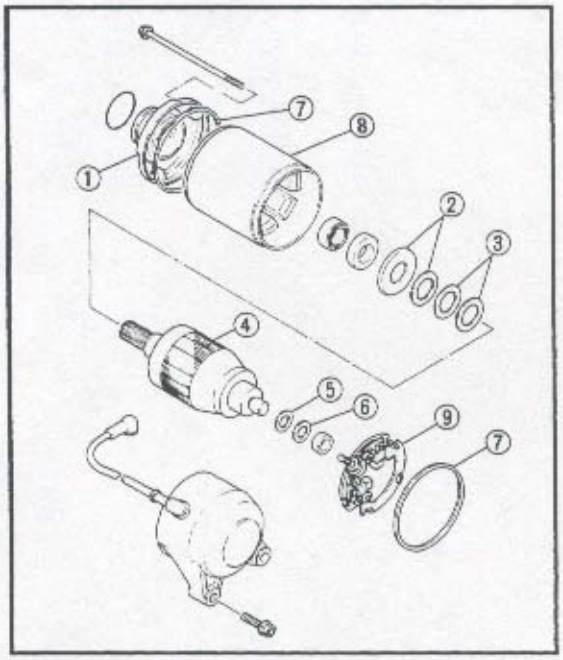
1.Remove:

- Starter motor
  Refer to "ENGINE OVERHAUL-ENGINE REMOVAL" in CHAPTER 4.

**Disassembly**

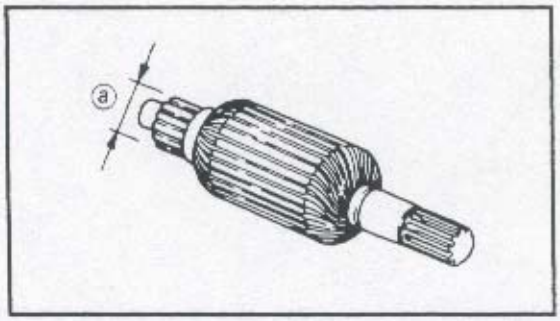
1.Remove:

- Bolts ①
  (with washer and O-ring)




2.Remove:

- Bracket ①
- Washers ②
- Shims ③
- Armature ④
- Washer ⑤
- Shims ⑥
- O-rings ⑦
- Yoke ⑧
- Brushes ⑨



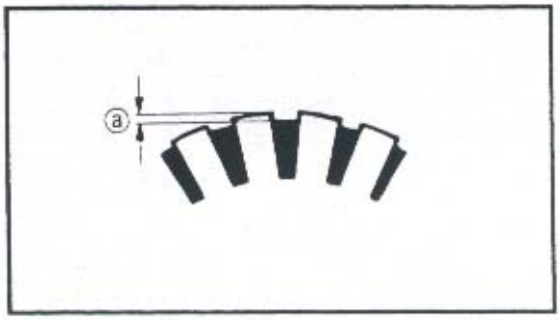

**Inspection and repair**

1.Inspect:

- Commutator
  Dirty → Clean it with #600 grit sandpaper.

2.Measure:

- Commutator diameter ⓐ
  Out of specification → Replace starter motor.

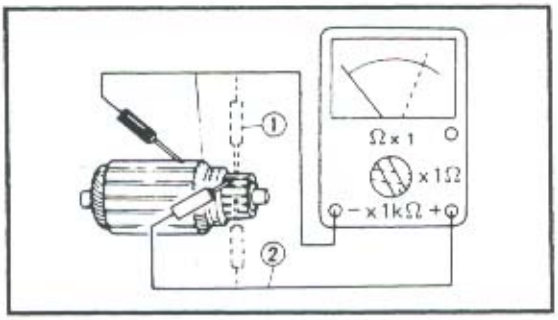



**Commutator wear limit:**
**27 mm (1.06 in)**

3.Measure:
- Mica undercut ⓐ
  Out of specification → Scrape the mica to proper value use a hacksaw blade can be ground to fit.

**Mica undercut:**
**0.7 mm (0.03 in)**

**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.

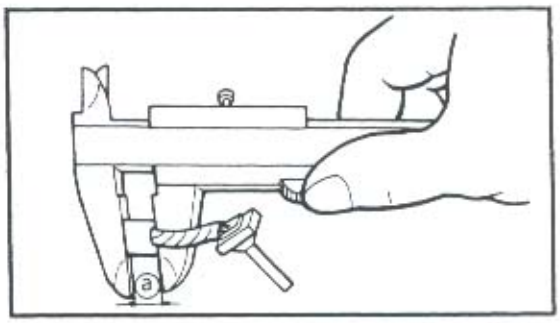
**********

**Inspecting steps:**
- Connect the pocket tester for continuity check ① and insulation check ②.
- Measure the armature resistances.

**Armature coil resistance:**
**Continuity check ①:**
**0.0018 ~ 0.002Ω at 20° C (68° F)**
**Insulation check ②:**
**More than 1MΩ at 20° C (68° F)**

- If the resistance is incorrect, replace the starter motor.

**********

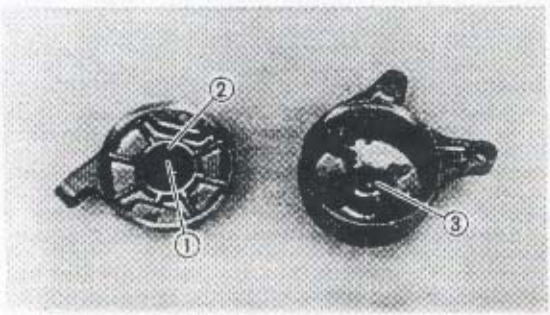



5.Measure:
- Brush length ⓐ
  Out of specification → Replace.

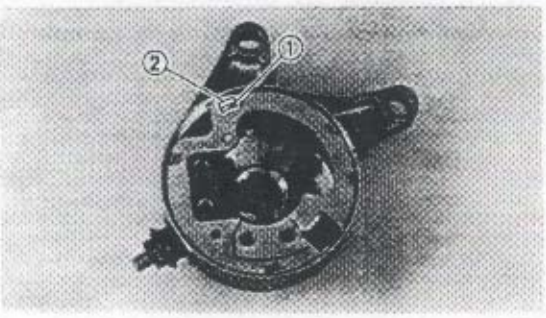
**Brush length limit:**
**4 mm (0.16 in)**

6.Measure:
- Brush spring force
  Fatigue/Out of specification → Replace as a set.

**Brush spring force:**
**570 ~ 920 g (20.1 ~ 32.5 oz)**

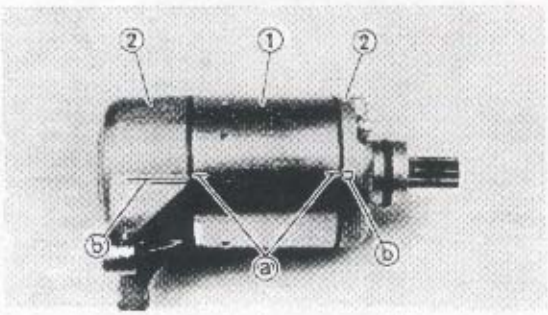



7.Inspect:
- Bearing ①
  Roughness → Replace.
- Oil seal ②
- O-rings
- Bushing ③
  Wear/Damage → Replace.



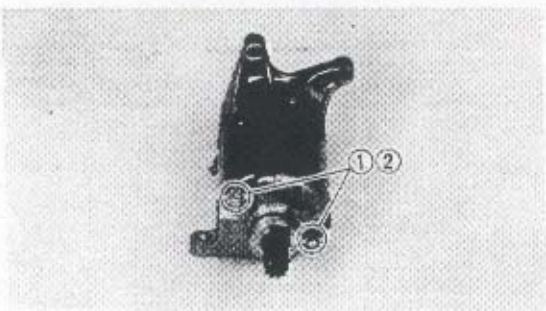

**Assembly**
Reserve the "Removal" procedure.
Note the following points.
1.Install:
- Brush seat ①

**NOTE:**
Align the projection ① on the brush seat with the slot ② on the housing.




2.Install:
- Yoke ①
- Brackets ②

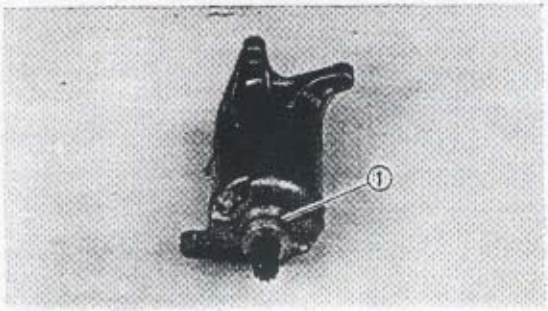
**NOTE:**
Align the match marks ⓐ on the yoke with the match marks ⓑ on the brackets.




3.Install:
- O-rings ①
- Washer
- Bolts ②

**⚠ WARNING**
**Always use new O-rings.**

**Bolt (yoke assembly):**
**7 Nm (0.7 m · kg, 5.1 ft · lb)**




**Installation**

1.Install:

- Starter motor

**NOTE:**

Apply a grease lightly to the O-ring ①.

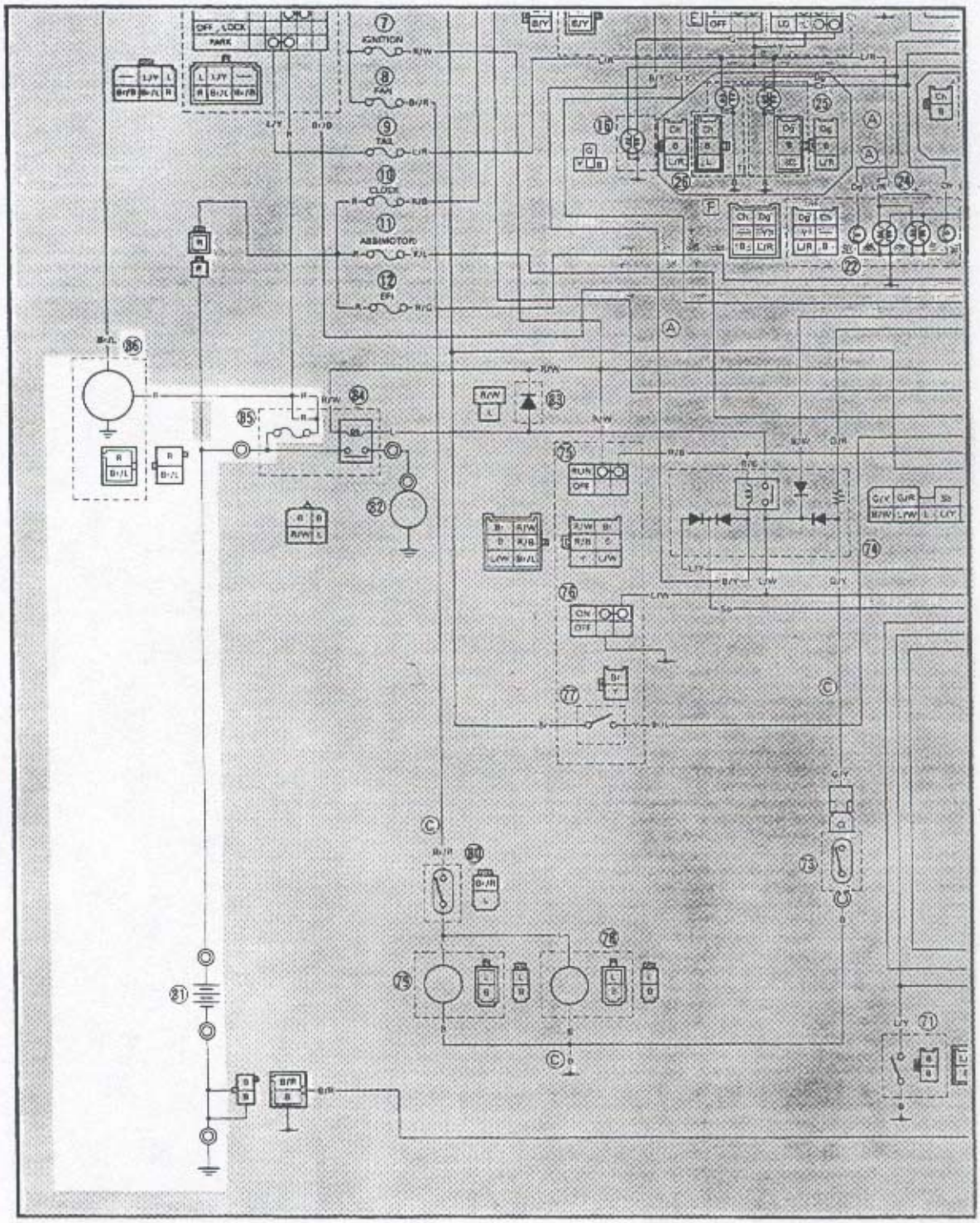
| | |
|---|---|
| | **Bolt (starter motor):**<br>**10 Nm (1.0 m • kg, 7.2 ft • lb)** |

Refer to "ENGINE OVERHAUL-ENGINE REMOUNTING" in CHAPTER 4.

# CHARGING SYSTEM

## CIRCUIT DIAGRAM

㉑Battery
㉟Fuse (MAIN)
㊱AC genelator



## 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) Top cover
3) Inner panels
4) Side cowlings
5) Side covers

- Use the following special tool(s) in this troubleshooting.

**Inductive tachometer:**
**YU-08036/ 90890-03113**
**Pocket tester:**
**YU-63112/90890-03112**

**1. Fuse (main)**

- Remove the fuses.
- Connect the pocket tester (Ω x 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:**
**12.8 V or more at 20° C(68° F)**

INCORRECT → • Clean battery terminals. • Recharge or replace the battery.

CORRECT ↓

*

*

3.Charging voltage

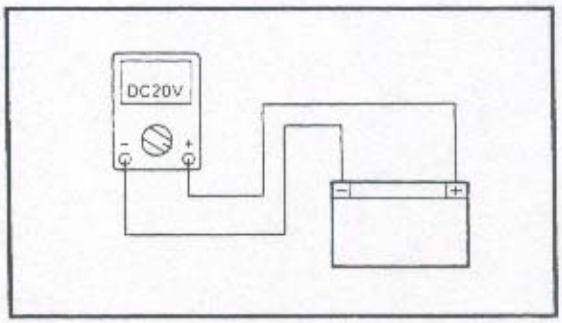
- Connect the inductive tachometer to spark plug lead.
- Connect the pocket tester (DC 20V) to the battery.

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

- Start the engine and accelerate to about, 5,000 r/min.
- Check charging voltage.

**Charging voltage:**
**14 V at 3,000 r/min**

**NOTE:**
Use a full charged battery.




MEETS SPECIFICATION

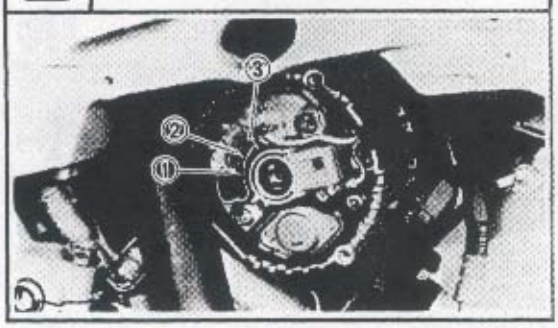
Charging circuit is good.

OUT OF SPECIFICATION

4.Stator coil resistance

- Remove the generator cover.
- Connect the pocket tester "Ω × 1" to the starter coils.
- Measure the starter coil resistance.

**Stator coil resistance:**
**0.13 ~ 0.15 Ω at 20° C (68° F)**




**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

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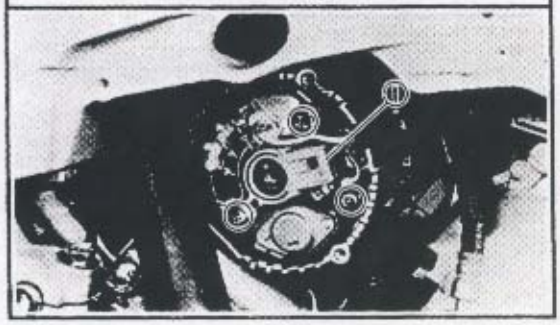
5.Brush inspection

- Remove the brush holder ①.
- Inspect the brush spring.
- Measure the brush length.



**Brush length limit:**
**4.7 mm (0.19 in)**
**Brush spring force:**
**550 g (19.3 oz)**

OUT OF SPECIFICATION

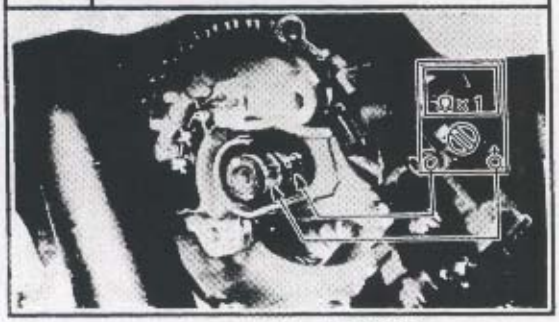
Replace the brush and/or spring.

BOTH MEET SPECIFICATION

6.Field coil (rotor) resistance

- Connect the pocket tester "Ω × 1" to the rotor.
- Measure the resistance.

**Field coil (rotor) resistance:**
**2.7 ~ 3.1 Ω at 20° C (68° F)**




OUT OF SECIFICATION

Replace field coil (rotor).

MEETS SPECIFICATION

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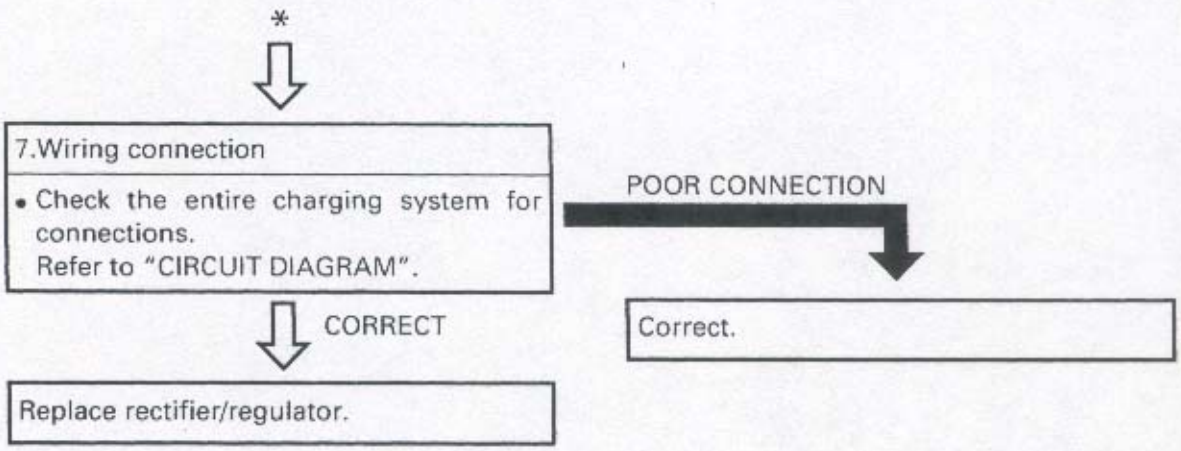
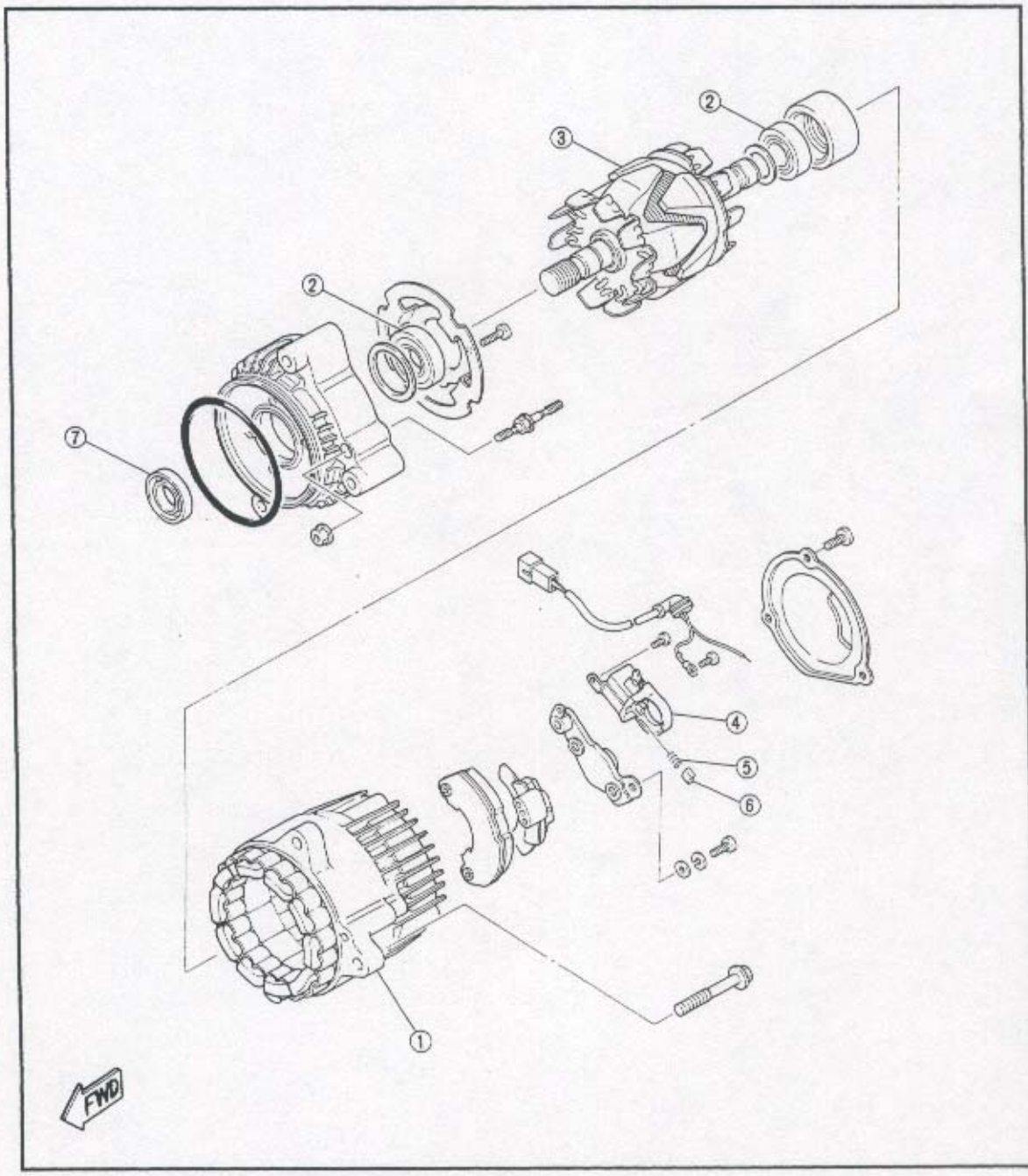

*
7.Wiring connection
• Check the entire charging system for connections.
Refer to "CIRCUIT DIAGRAM".
POOR CONNECTION
Correct.
CORRECT
Replace rectifier/regulator.

## AC GENERATOR

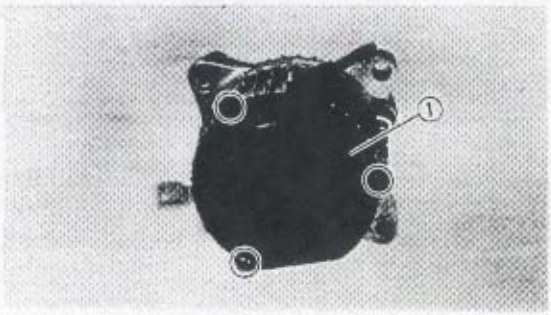
①Stator coil
②Bearing
③Field coil
④Brush holder
⑤Brush spring
⑥Brush
⑦Oil seal



**Removal**

1.Remove:

- AC generator
  Refer to "ENGINE OVERHAUL – ENGINE REMOVAL" in CHAPTER 4.




**Disassembly**

1.Remove:

- Cover ①

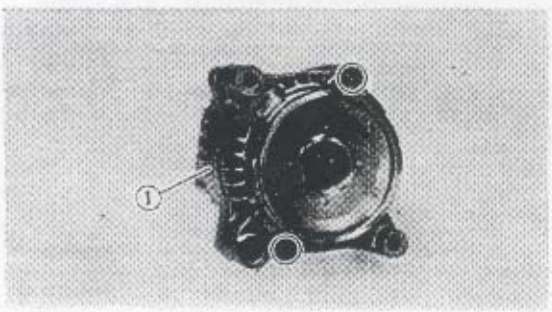
2.Remove:

- Brush holder ①
- Regulator ②

3.Remove:

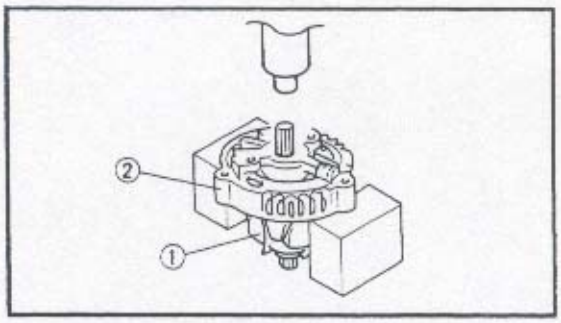
- Rectifier ③

**NOTE:**
Use a soldering iron to disconnect the stator coil leads.




4.Remove:

- Stator coil housing ①




5.Remove:

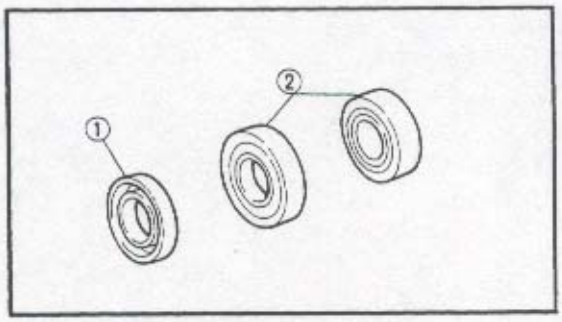
- Field coil ①
  Press out field coil ① from end frame ② using a press machine and V-brock.

**Inspection and repair**

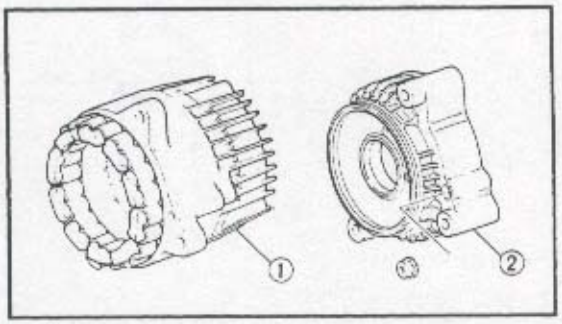
1.Inspect:
- Stator coil resistance
  Refer to "TROUBLESHOOTING – 4. Stator coil resistance".

2.Inspect:
- Brush
  Refer to "TROUBLE SHOOTING – 5. Brush inspection".

3.Inspect:
- Field coil (rotor) resistance
  Refer to "TROUBLE SHOOTING – 6. Field coil (rotor) resistance".



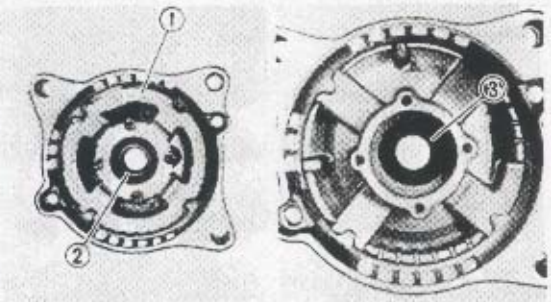

4.Inspect:
- Stator coil housing ①
- End frame ②
  Cracks/Damage → Replace.

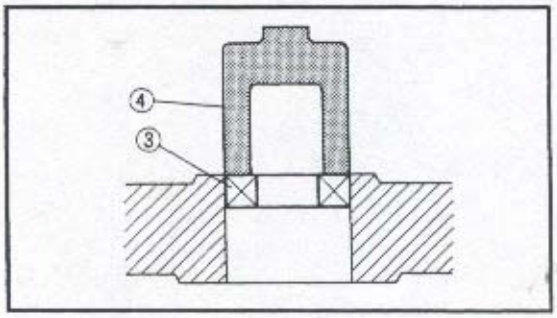



5.Inspect:
- Oil seal ①
  Wear/Damage → Replace.
- Bearings ②
  Roughness/Damage → Replace.

**********

**Replacement steps (on end frame):**
- Clean the end frame assembly using clean solvent.
- Remove the bearing retainer ① and bearing ②.
- Remove the oil seal ③.
- Install the oil seal (new).



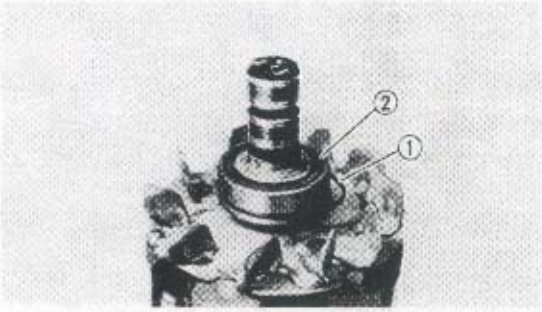


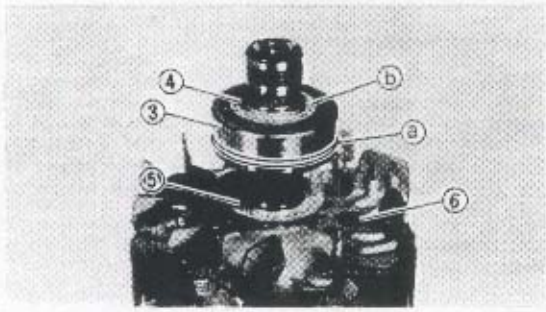

**NOTE:**
When removing and installing the oil seal ③, using a socket ④ that matches the outside diameter of the oil seal.

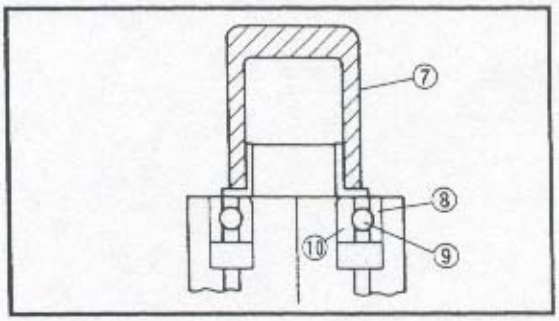
- Install the bearing (new) ② and bearing retainer ①.

| | |
|---|---|
| | **Screw (bearing retainer): 6 Nm (0.6 m • kg, 4.3 ft • lb)** |

**********




**********

**Replacement steps (on rotor shaft):**

- Remove the stopper ring ① from bearing ②.
- Remove the bearing ③ together with the flange washer ④ using a general bearing puller.
- Remove the washer ⑤.
- Clean the rotor shaft and install the washer.
- Install the bearing ③ (new) and flange washer ④.

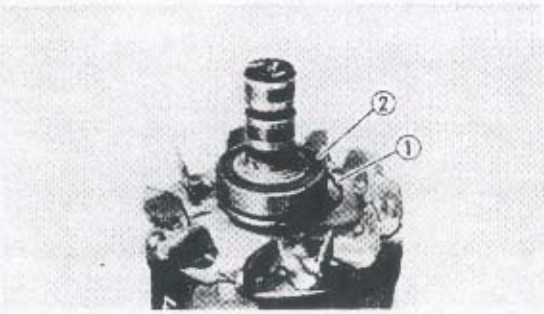
**NOTE:**

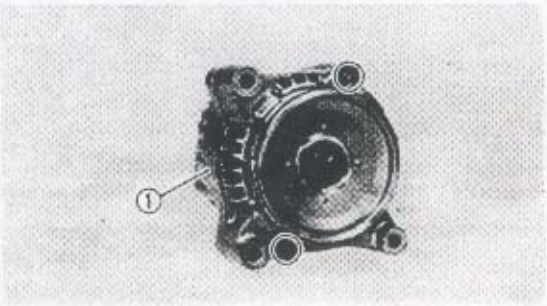
- Install the bearing with the groove ⓐ side facing the field coil ⑥ and the flange ⓑ of the washer facing away from the bearing.
- Use a socket ⑦ that matches the inside diameter of the race of the bearing.

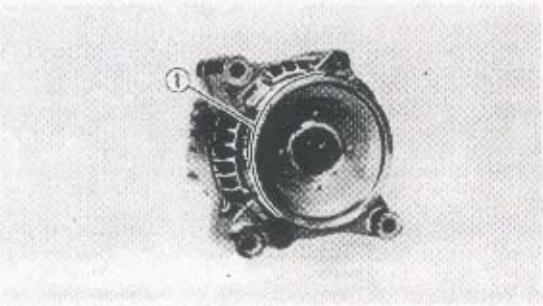
**CAUTION:**

**Do not strike the outer race ⑧ or balls ⑨ of the bearing. Contact should be made only with the center race ⑩.**

**********




**Assembly**

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

1.Install:
- Stopper ring ①
  (onto bearing ②)

**⚠ WARNING**

**Always use a new stopper ring.**

2.Install:
- Stator coil housing ①

| | |
|---|---|
| | **Nut (stator coil housing)**<br>**7 Nm (0.7 m • kg, 5.1 ft • lb)** |

**Installation**

1.Install:
- AC generator

**NOTE:**

Apply grease lightly to the O-ring ①.

| | |
|---|---|
| | **Bolt (AC generator):**<br>**25 Nm (2.5 m • kg, 18 ft • lb)** |

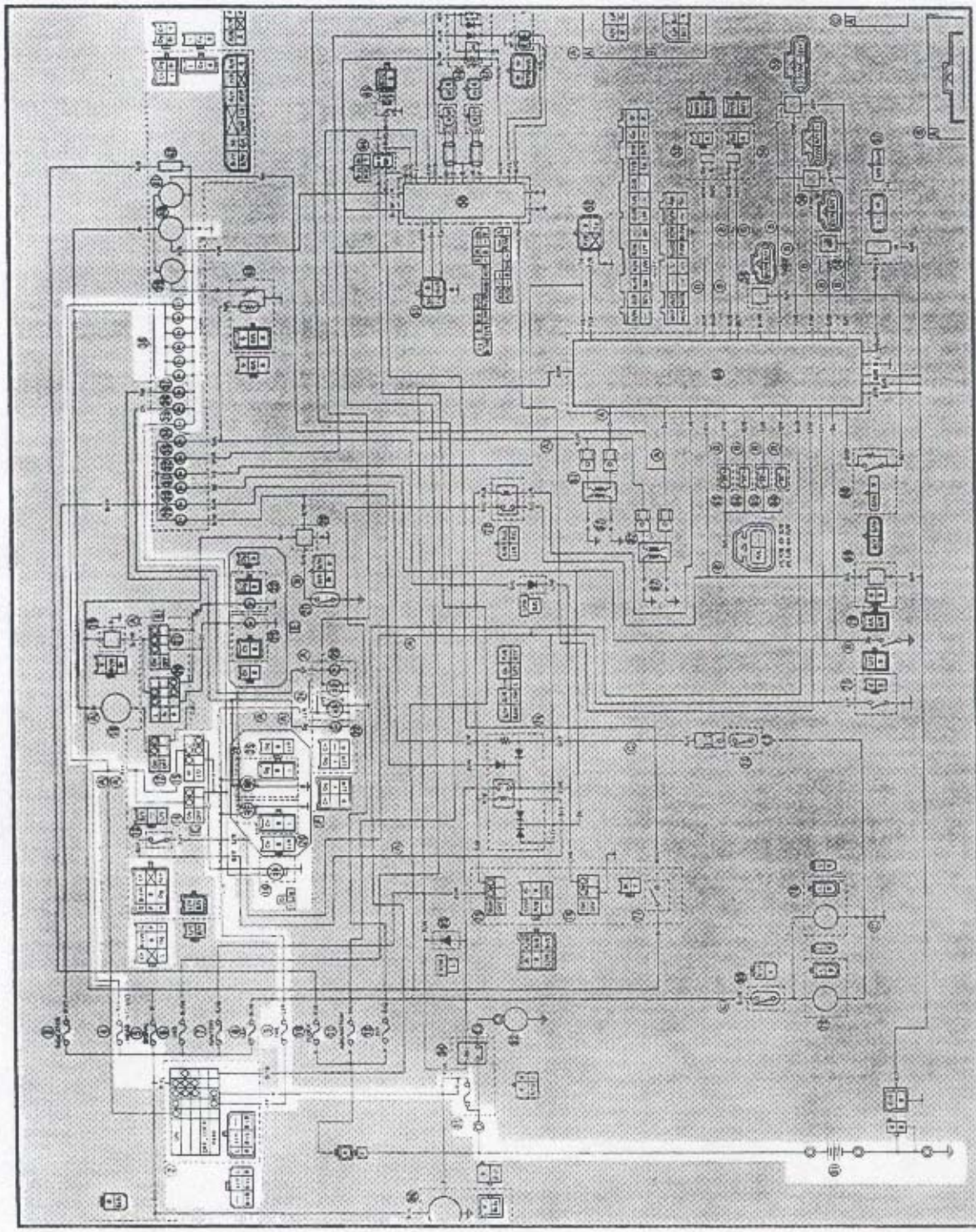
Refer to "ENGINE OVERHAUL – ENGINE INSTALLATION" in CHAPTER 4.

7

# LIGHTING SYSTEM

## CIRCUIT DIAGRAM

②Main switch
④Fuse (HEAD)
⑤Fuse (TAIL)
⑭"PASS" switch
⑮"LIGHTS" (dimmer) switch
⑯Headlight
㉔Tail/brake light
㉕Front position light (right)
㉖Front position light (left)
㉟"HIGH BEAM" indicator light
㊳Meter light
㊶Battery
㊺Fuse (MAIN)



7

## TROUBLESHOOTING

**HEADLIGHT "HIGH BEAM" INDICATOR LIGHT, TAILLIGHTY, AND/OR METER LIGHT DO NOT COME ON.**

**Procedure**

Check;

1. Fuse (main, head and tail)
2. Battery
3. Main switch
4. "LIGHTS" (dimmer) switch
5. "PASS" switch
6. Wiring connection (entire lighting system)

**NOTE:**

- Remove the following parts before troubleshooting.

1) Seat
2) Top cover
3) Inner panels
4) Side cowlings
5) Side covers

- Use the following special tool(s) in this troubleshooting.

**Pocket tester:**
**YU-03112/90890-03112**

**1. Fuse (main, head and tail)**

- Remove the fuses.
- Connect the pocket tester (Ω x 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:**
**12.8 V or more at 20° C(68° F)**

INCORRECT →

- Clean battery terminals.
- Recharge or replace the battery.

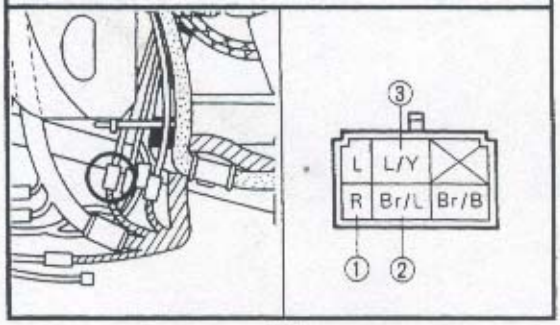
CORRECT ↓

*

*

3.Main switch

- Disconnect the main switch coupler from the wireharness.
- Check the switch component for the continuity between "Red ① and Brown/Blue ②", "Red ① and Blue/Yellow ③". Refer to "CHECKING OF SWITCHES".



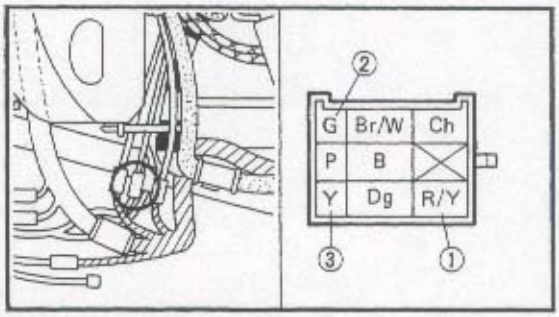

INCORRECT

Replace main switch.

CORRECT

4."LIGHTS" (dimmer) switch

- Disconnect the handlebar switch (left) coupler from the wireharness.
- Turn the "LIGHTS" (dimmer) switch to the "LO".
- Check the switch component for the continuity between "Red/Yellow ① and Green ②".
- Set the position of the "LIGHTS" (dimmer) switch to the "HI".
- Check the switch component for the continuity between "Red/Yellow ① and Yellow ③". Refer to "CHECKING OF SWITCHES".




INCORRECT

"LIGHTS" (dimmer) switch are faulty, replace handlebar switch (left).

CORRECT

*

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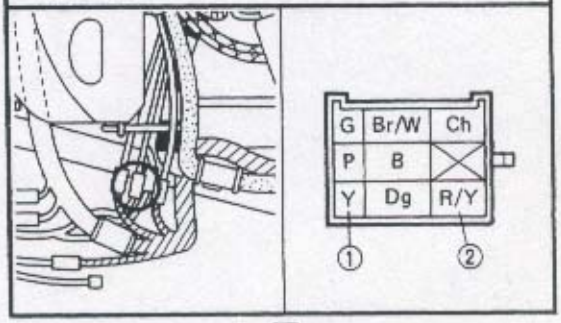
*

5."PASS" switch (for AUS, NZ)

- Disconnect the handlebar switch (left) coupler from the wireharness.
- Check the switch component for the continuity between "Yellow ① and Red/Yellow ②".
  Refer to "CHECKING OF SWITCHES".




INCORRECT

"PASS" switch is faulty, replace handlebar switch (left).

CORRECT

6.Wiring connection

- Check the entire lighting system for connections.
  Refer to "WIRING DIAGTAM".

POOR CONNECTION

Correct.

CORRECT

Check condition of each circuit for lighting system.
Refer to "LIGHTING SYSTEM CHCEKING" section.

7

## 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.
  Refer to "CHECKING OF BULBS".

NO CONTINUITY → Replace bulb and/or bulb socket.

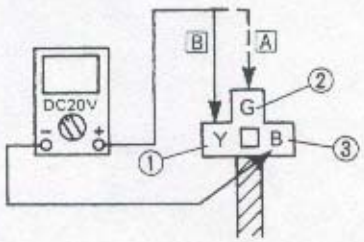
CONTINUITY ↓

**2. Voltage**

- Connect the pocket tester (DC 20V) to the headlight and "HIGH BEAM" indicator light couplers.

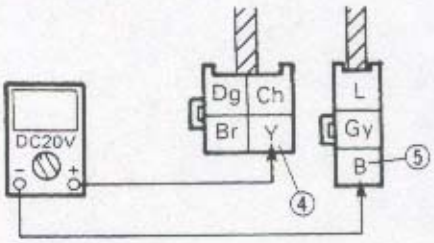
[A] When "LIGHTS" (dimmer) switch is "LO" position.
[B] When "LIGHTS" (dimmer) switch is "HI" position.

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" (dimmer) switch to "LO" or "HI" position.
- Check for voltage (12 V) 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.

2.Meter light does not come on.

1.Bulb and bulb socket

- Check the bulb and bulb socket for continuity.
  Refer to "CHECKING OF BULBS".

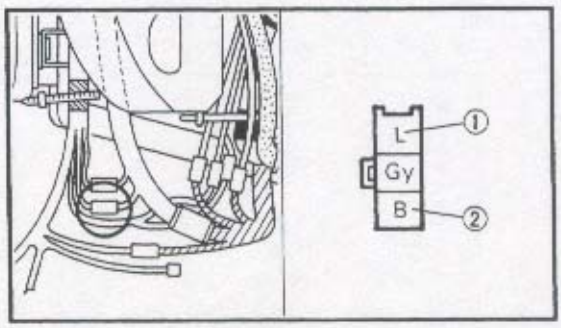
NO CONTINUITY → Replace bulb and/or bulb socket.

CONTINUITY ↓

2.Voltage

- Connect the pocket tester (20 V) to the bulb socket coupler.

**Tester (+) lead → Blue terminal ①**
**Tester (–) lead → Black terminal ②**




- Turn the main switch to "ON".
- Check for voltage (12 V) 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.
  Refer to "CHECKING OF BULBS".

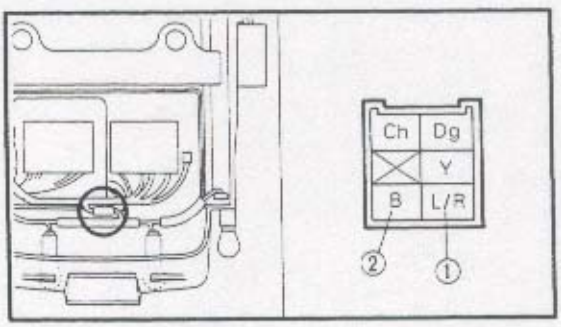
NO CONTINUITY → Replace bulb and/or bulb socket.

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**

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- Turn the main switch to "ON".
- Check for voltage (12 V) 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.

4.Front position light does not come on.

1.Bulb and bulb socket

- Check the bulb and bulb socket for continuity.
  Refer to "CHECKING OF BULBS".

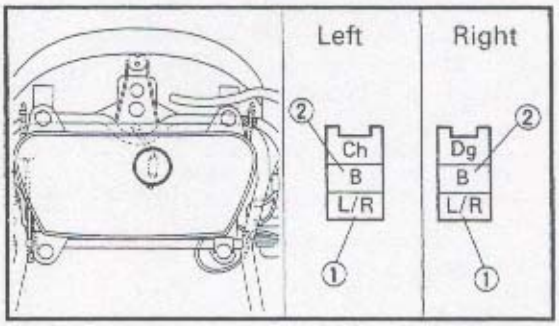
NO CONTINUITY → Bulb and/or socket are faulty, replace.

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".
- Check for voltage (12 V) 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 ↓

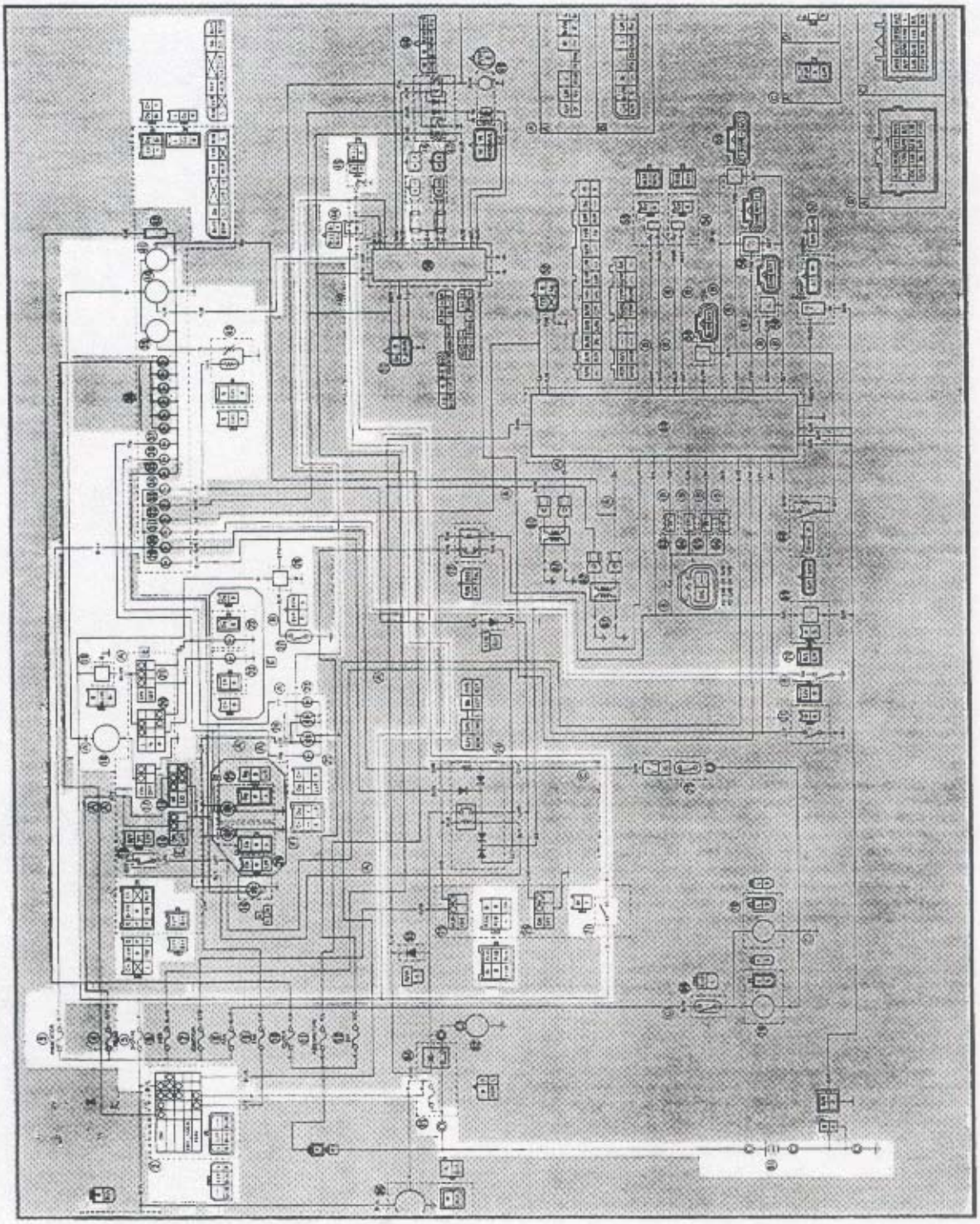
This circuit is good.

7

# SIGNAL SYSTEM

## CIRCUIT DIAGRAM

②Main switch
③Fuse (INDICATOR)
⑤Fuse (SIGNAL)
⑰"HORN" switch
⑱Horn
⑲Flasher relay
⑳"TURN" switch
㉑"Emergency" switch
㉒Flasher light (right)
㉓Flasher light (left)
㉔Tail/brake light
㉗Oil level switch
㉘Oil light relay
㉙"OIL" level indicator light
㉛"NEUTRAL" indicator light
㉞"FUEL" level indicator light
㉟"TURN" indicator light (left)
㊲"TURN" indicator light (right)
㊳Fuel gauge
㊵Speedometer
㊶Tachometer
㊸Fuel sender
㊹Brake light relay
㊺Rear brake switch
㊻Front wheel sensor
㊼Neutral switch
㊽Front brake switch
㊾Battery
㊿Fuse (MAIN)



7

## TROUBLESHOOTING

**• FLASHER LIGHT, BRAKE LIGHT AND/OR INDICATOR LIGHT DO NOT COME ON.**
**• HORN DOES NOT SOUND.**

**Procedure**
Check;
1.Fuse (main, signal and indicator)
2.Battery
3.Main switch
4.Wiring connection
(entire signal system)

**NOTE:**
- Remove the following parts before troubleshooting.

1)Seat
2)Top cover
3)Inner panels
4)Side cowlings
5)Front cowling
6)Side cover (left)

- Use the following special tool in this troubleshooting.

**Pocket tester:**
**YU-03112/ 90890-03112**

1.Fuse (main, signal and indicator)

- 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:**
**12.8 V or more at 20° C (68° F)**

INCORRECT →
- Clean battery terminals.
- Recharge or replace the battery.

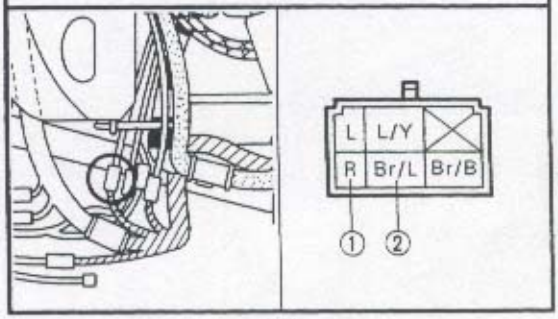
CORRECT ↓

*

*

3.Main switch

- Disconnect the main switch coupler from the wireharness.
- Check the switch component for the continuity between "Red ① and Brown/Blue ②".
  Refer to "CHECKING OF SWITCHES".




INCORRECT

Replace main switch.

CORRECT

4.Wiring connection

- Check the entire signal system for connections.
  Refer to "WIRING DIAGRAM".

POOR CONNECTION

Correct.

CORRECT

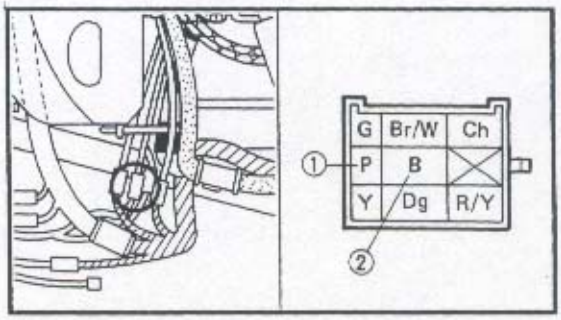
Check condition of each circuit for signal system. Refer to "SIGNAL SYSTEM CHECK".

7

**SIGNAL SYSTEM CHECK**

1.Horn does not sound.

1."HORN" switch.




- Disconnect the handlebar switch (left) coupler from wireharness.
- Check the switch component for the continuity between "Pink ① and Black ② ".
  Refer to "CHECKING OF SWITCHES".

INCORRECT

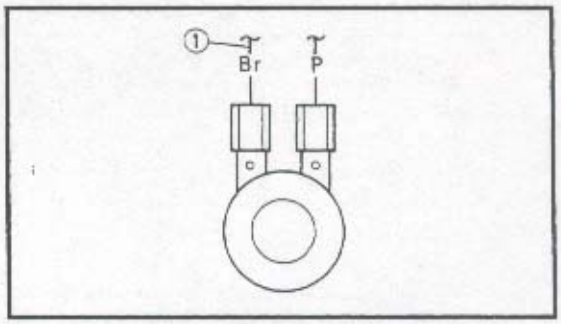
Replace handlebar switch (left).

CORRECT

2.Voltage

- Connect the pocket tester (DC 20V) to the horn lead.

**Tester (+) lead→ Brown lead ①**
**Tester (–) lead → Frame ground**

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- Turn the main switch to "ON".
- Check for voltage (12 V) on the "Brown" lead at the horn terminal.

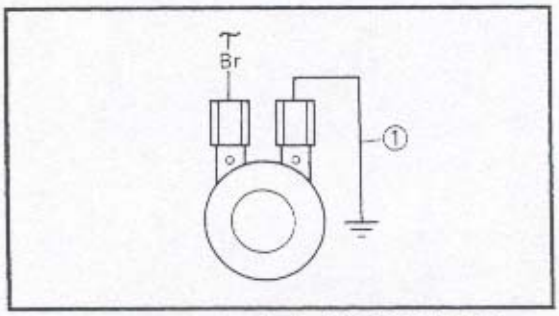
OUT OF SPECIFICATION

Wiring circuit from main switch to horn terminal is faulty, repair.

MEETS SPECIFICATION

3.Horn

- Disconnect the "Pink" 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".




HORN IS SOUNDED

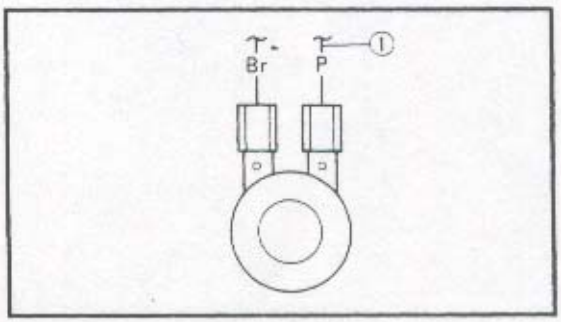
Horn is good.

HORN IS NOT SOUNDED

4.Voltage

- Connect the pocket tester (DC 20V) to the horn at the "Pink" terminal.

**Tester (+) lead → Pink lead ①**
**Tester (–) lead → Frame ground**




- Turn the main switch to "ON".
- Check for voltage (12 V) on the "Pink" 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.
  Refer to "CHECKING OF BULBS".

NO CONTINUITY

Replace bulb and/or bulb socket.

CONTINUITY

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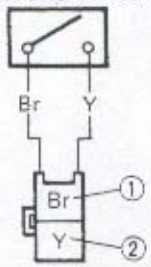
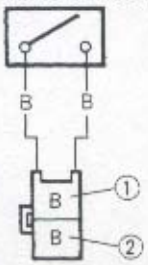
2.Brake switch

- Disconnect the brake switch coupler from the wireharness.
- Check the switch components for the continuity between "Brown (Black) ① and Yellow (Black) ②".
  Refer to "CHECKING OF SWITCHES".

Front brake switch




Rear brake switch




IN CORRECT

Replace brake switch.

CORRECT

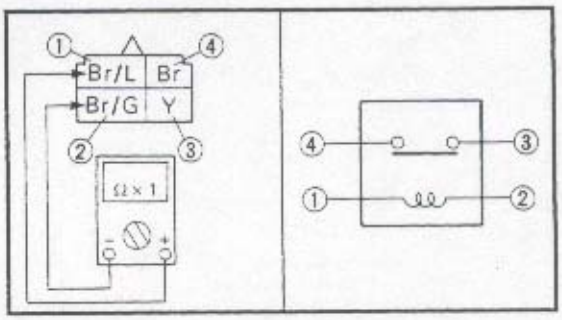
3.Brake light relay

- Disconnect the brake light relay coupler from the wireharness.
- Connect the pocket tester (Ω × 1) and battery (12 V) to the brake light relay terminal.

**Battery (+) terminal → Brown/Blue ① terminal**
**Battery (–) terminal → Brown/Green ② terminal**

**Tester (+) lead → Yellow terminal ③**
**Tester (–) lead → Brown terminal ④**

- Check relay for continuity.




CONTINUITY

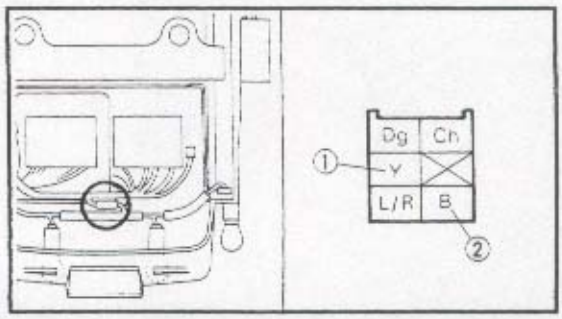
Replace brake light relay.

NO CONTINUITY

4.Voltage

- Connect the pocket tester (DC 20V) to the bulb socket connector.

**Tester (+) lead → Yellow lead ①**
**Tester (–) lead → Black lead ②**



- Turn the switch to "ON".
- The brake lever is pulled in or brake pedal is stepped down.
- Check for voltage (12 V) on the "Yellow" 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.Flasher light and/or "TURN" indicator light does not blink.

1.Bulb and bulb socket

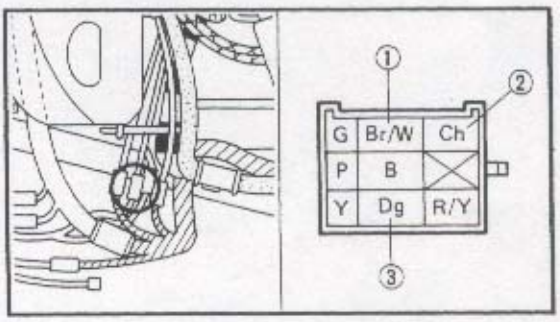
- Check the bulb and bulb socket for continuity.
  Refer to "CHECKING OF BULBS".

NO CONTINUITY

Replace bulb and/or bulb socket.

CONTINUITY

2."TURN" switch.




- Disconnect the handlebar switch (left) coupler from the wireharness.
- Check the switch component for the continuity between "Brown/White ① and Chocolate ②"and "Brown/White ① and Dark green ③".
  Refer to "CHECKING OF SWITCHES".

IN CORRECT

Replace handlebar switch (left).

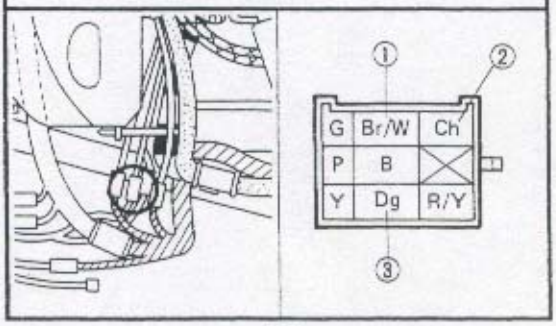
CORRECT

*

*

3.Emergency switch (for US, CDN)

- Disconnect the handlebar switch (left) coupler from the wireharness.
- Check the switch component for the continuity between "Brown/White ① and Chocolate ② and "Brown/White ① and Dark green ③".
  Refer to "CHECKING OF SWITCHES".




IN CORRECT

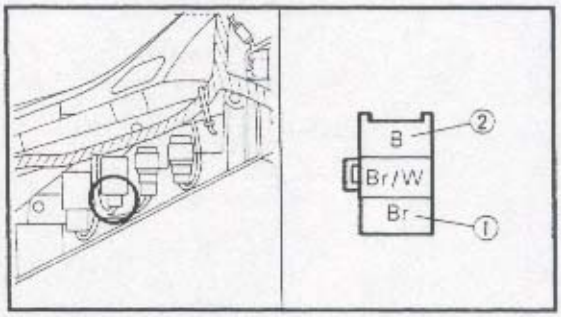
Replace handlebar switch (left).

CORRECT

4.Voltage

- Connect the pocket tester (DC 20V) to the flasher relay coupler.

**Tester (+) lead → Brown terminal ①**
**Tester (–) lead → Black terminal ②**




7

- Turn the main switch to "ON".
- Check for voltage (12 V) on the "Brown" lead at the flasher relay terminal.

OUT OF SPECIFICATION

Wiring circuit from main switch to flasher relay connector is faulty, repair.

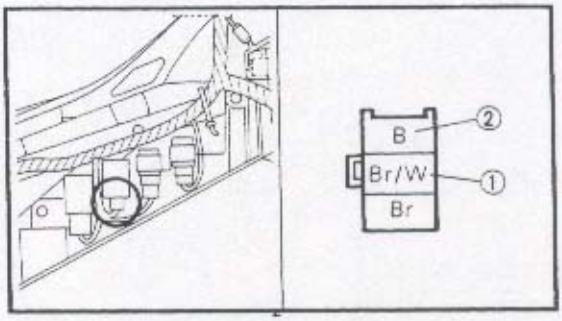
MEETS SPECIFICATION

*

5.Voltage

- Connect the pocket tester (DC 20V) to the flasher relay lead.

**Tester (+) lead → Brown/White terminal ①**
**Tester (–) lead → Black terminal ②**




- Turn the main switch to "ON".
- Check for voltage (12 V) on the "Brown/White" lead at the flasher relay terminal.

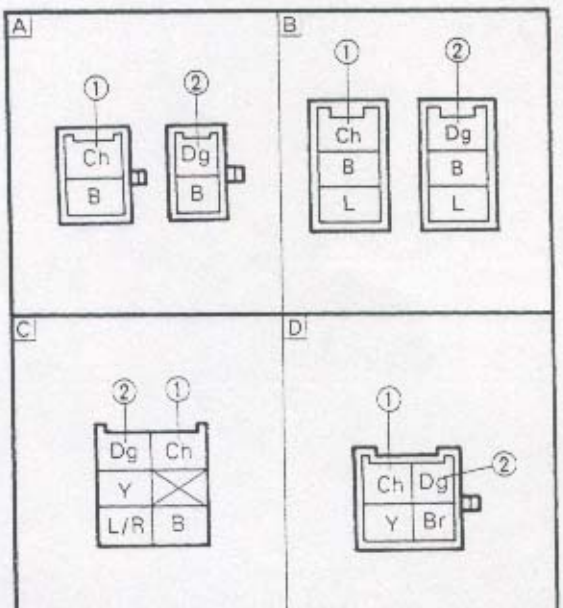
OUT OF SPECIFICATION

Replace flasher relay.

MEETS SPECIFICATION

6.Voltage

- Connect the pocket tester (DC 20V) to the bulb socket connector.




A Front flasher light (without position light)
B Front flasher light (with position light)
C Rear flasher light
D "TURN" indicator

**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**

7

- Turn the main switch to "ON".
- Turn the "TURN" switch to "L" or "R".
- Check for voltage (12 V) on the "Chocolate" lead or "Dark green" lead at the bulb socket connector.

OUT OF SPECIFIACATION

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. Refer to the "CHCEKING OF BULBS" section.

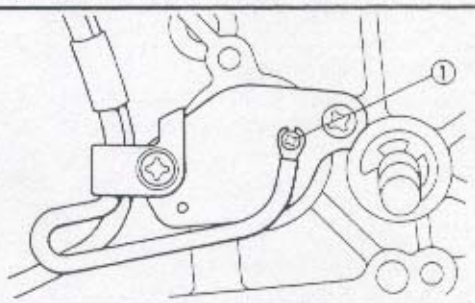
NO CONTINUITY

Replace bulb and/or bulb socket.

CONTINUITY

2.Neutral switch

- Disconnect the neutral switch coupler from the wireharness.
- Check the switch component for the continuity between "Sky blue ① and Ground".
  Refer to "CHECKING OF SWITCHES".




NO CONTINUITY

Replace neutral switch.

CONTINUITY

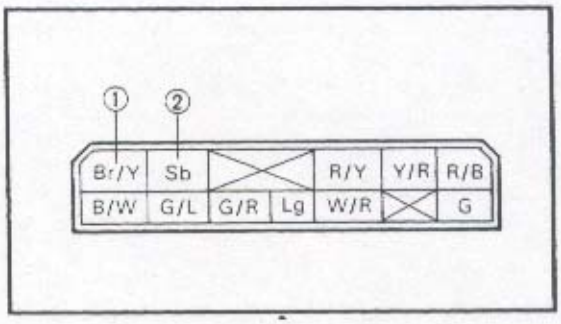
*

*

3.Voltage

- Connect the pocket tester (DC 20 V) to the bulb socket coupler.

**Tester (+) lead → Brown/Yellow terminal ①**
**Tester (–) lead → Sky blue terminal ②**




- Turn the main switch to "ON".
- Check for voltage (12 V).

OUT OF SPECIFICATION → Wiring circuit from main switch to bulb socket connector is faulty, repair.

MEETS SPECIFICATION

This circuit is good.

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.
  Refer to "CHECKING OF BULBS".

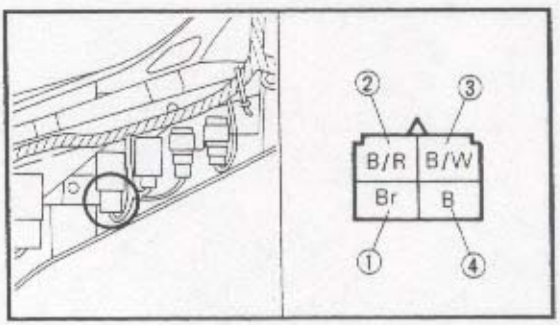
NO CONTINUITY → Replace bulb and/or bulb socket.

CONTINUITY

2.Oil light relay

- Remove the oil light relay coupler from the wireharness.
- Connect the pocket tester (Ω × 1) and battery (12V) to the oil light relay terminal.

**Battery (+) terminal → Brown ① terminal**
**Battery (–) terminal → Black/Red ② terminal**




7

**Tester (+) lead → Black/White terminal ③**
**Tester (–) lead → Black terminal ④**

- Check resistor for continuity.

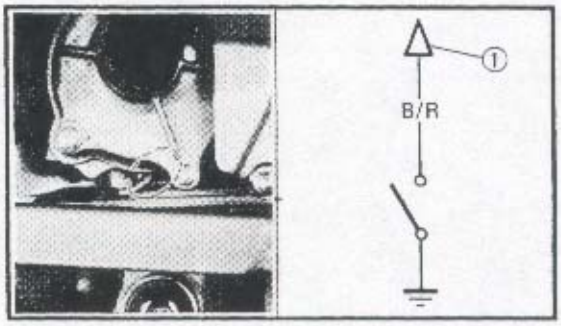
NO CONTINUITY → Replace oil light relay.

CONTINUITY ↓

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 gauge.

**Tester (+) lead → Black/Red terminal ①**
**Tester (–) lead → Frame ground**




- Check the oil level switch for continuity.

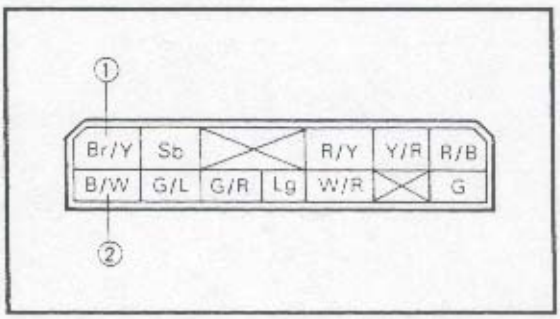
BAD CONDITION → Replace oil level switch.

GOOD CONDITION ↓

4.Voltage

- Connect the pocket tester (DC 20 V) to the bulb socket connector.

**Tester (+) lead → Brown/Yellow lead ①**
**Tester (–) lead → Black/White lead ②**




- Turn the main switch to "ON".
- Check for voltage (12 V).

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.
  Refer to "CHECKING OF BULBS".

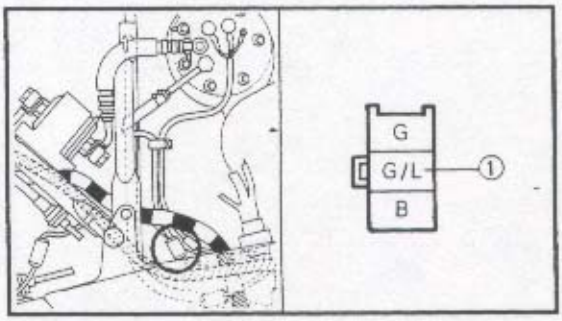
NO CONTINUITY → Replace bulb and/or bulb socket.

CONTINUITY ↓

2.Fuel sender

- Drain the fuel and remove the fuel sender from the fuel tank.
- Connect the pocket tester (Ω × 1) to the fuel sender.

**Tester (+) lead → Green/Blue terminal ①**
**Tester (–) lead → Frame ground**




- Check the fuel sender for continuity.

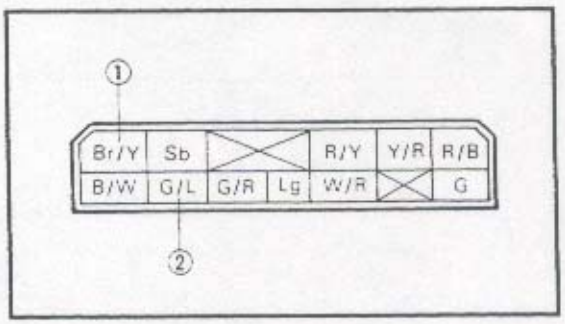
BAD CONDITION → Replace fuel sender.

GOOD CONDITION ↓

3.Voltage

- Connect the pocket tester (DC 20V) to the bulb socket connector.

**Tester (+) lead → Brown/Yellow lead ①**
**Tester (–) lead → Green/Blue lead ②**




- Turn the main switch to "ON".
- Check for voltage (12 V).

OUT OF SPECIFICATION → Wiring circuit from main switch to bulb socket connector is faulty, repair.

MEETS SPECIFICATION ↓

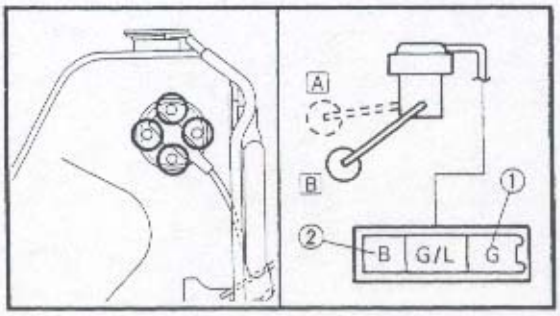
This circuit is good.

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 ① terminal**
**Tester (–) lead → Black ② terminal**




- Check the fuel sender for specificated resistance.

**Fuel sender resistance (up A):**
**(Ω × 1)**
**10 Ω at 20° C (68° F)**
**Fuel sender resistance (down B):**
**(Ω × 10)**
**90 Ω at 20° C (68° F)**

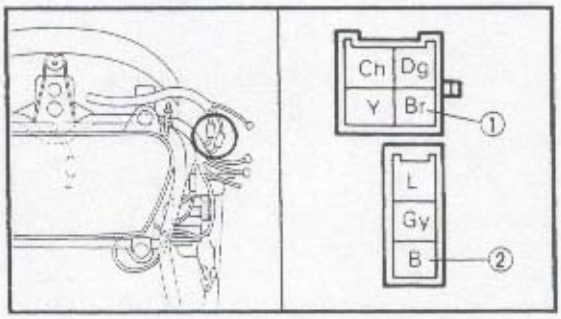
OUT OF SPECIFICATION → Replace bulb and/or bulb socket.

BOTH MEET SPECIFICATION

2.Voltage

- Connect the pocket tester (DC 20 V) to the fuel gauge coupler.

**Tester (+) lead → Brown ① terminal**
**Tester (–) lead → Black ② terminal**




- 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.

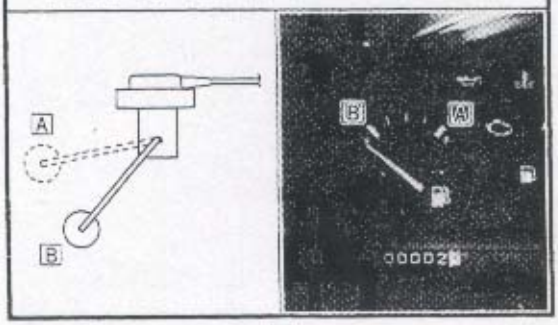
MEETS SPECIFICATION

*

*

3.Fuel gauge

- Turn the main switch to "ON".
- Move the float to "UP [A]" or "DOWN [B]".
- Check the fuel gauge needle moves "FUEL" 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.
  Refer to the "CIRCUIT DIAGRAM" section.

8.Speedometer does not operate.

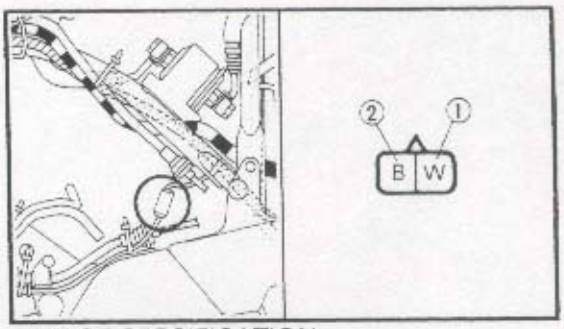
1.Front wheel sensor

- Remove the front sensor coupler from the wireharness.
- Connect the pocket tester (kΩ × 1) to the front sensor coupler.

**Tester (+) lead → White ① terminal**
**Tester (–) lead → Black ② terminal**

- Check the front wheel senser for specificated resistance.

**Front wheel senser resistance:**
**1.19 ~ 2.21 kΩ at 20° C (68° F)**




OUT OF SPECIFICATION

Replace front wheel sensor.

MEETS SPECIFICATION

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7

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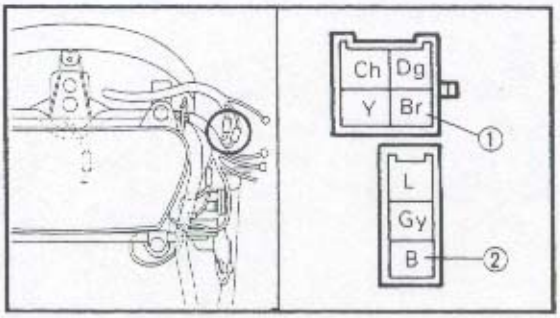
2.Voltage

- Connect the pocket tester (DC 20V) to the speedometer coupler.

**Tester (+) lead → Brown ① terminal**
**Tester (–) lead → Black ② terminal**




- Turn the main switch to "ON".
- Check for voltage (12V) on the "Brown" lead at the speedometer coupler.

OUT OF SPECIFICATION → Check the entire signal system for connections.

MEETS SPECIFICATION

3.Wiring connection

- Check the entire signal system for connections.
  Refer to the "CIRCUIT DIAGRAM" section.

POOR CONNECTION → Correct.

CORRECT

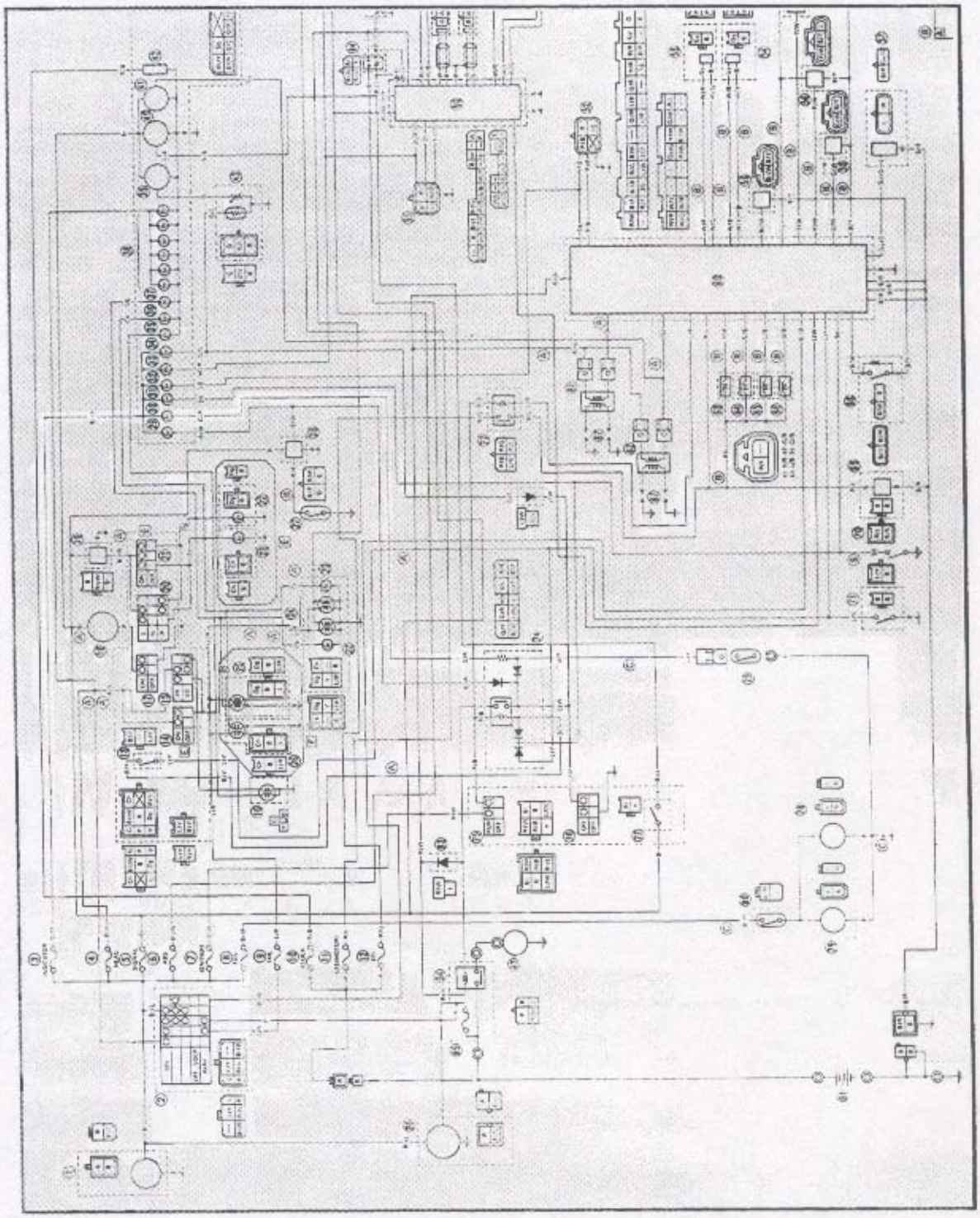
Replace speedometer assembly.

7

# COOLING SYSTEM

## CIRCUIT DIAGRAM

②Main switch
③Fuse (INDICATOR)
⑧Fuse (FAN)
㉜Water temperature indicator light
㉝Thermo unit
㉞Starting circuit cut-off relay
㉟Fan motor #2
㊴Fan motor #1
㊵Thermo switch
㊶Battery
㊺Fuse (MAIN)



## TROUBLESHOOTING

- **FAN MOTOR DOES NOT MOVE.**
- **WATER TEMPERATURE INDICATER LIGHT COME ON, WHEN ENGINE IS COOL.**

**Procedure**

Check;

1. Fuse (main and fan)
2. Battery
3. Main switch
4. Fan motor (Test 1)
5. Fan motor (Test 2)
6. Thermo switch
7. Wiring connection (entire cooling system)

**NOTE:**

- Remove the following parts before troubleshooting.
  1) Seat
  2) Top cover
  3) Inner panels
  4) Side cowlings
  5) Side cover (left)
  6) Fuel tank
  7) Air filter case
- Use the following special tool in this troubleshooting.

**Pocket tester:**
**YU-03112/90890-03112**

1. Fuse (main, indicator and fan)
   - Remove the fuses.
   - Connect the pocket tester (Ω x 1) to the fuses.
   - Check the fuses for continuity. Refer to "FUSE INSPECTION" in CHAPTER 3.

NO CONTINUITY → Fuse is faulty, replace it.

CONTINUITY ↓

2. Battery
   - Check the battery condition. Refer to "BATTERY INSPECTION" in CHAPTER 3.

   **Open circuit voltage:**
   **12.8 V or more at 20° C(68° F)**

INCORRECT →
- Clean battery terminals.
- Recharge or replace the battery.

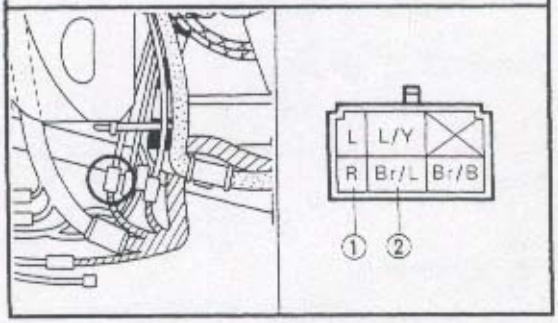
CORRECT ↓

*

*

3.Main switch

- Disconnect the main switch coupler from the wireharness.
- Check the switch component for the continuity between "Red ① and Brown/Blue ②".
  Refer to "CHECKING OF SWITCHES".




INCORRECT

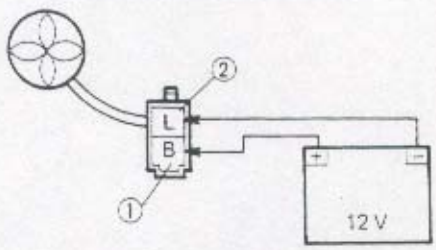
Main switch is faulty, replace it.

CORRECT

4.Fan motors (test 1)

- Disconnect the fan motor couplers.
- Connect the battery (12V) as shown.

**Battery (+) lead → Blue lead ①**
**Battery (–) lead → Black lead ②**




- Check the fan motors for operation.

DOES NOT MOVES

Fan motor(s) in faulty, replace it(s).

MOVES

*

7

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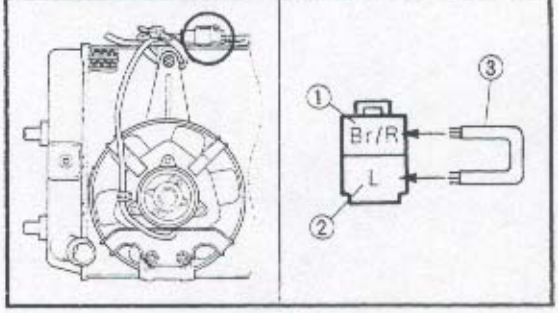
5.Fan motor (test 2)

- Disconnect the thermo switch coupler.
- Turn the main switch to "ON".
- Connect the Brown/Red ① and Blue ② leads using a jumper lead ③.




DOES NOT MOVE

Wiring circuit from main switch to fan motor leads is faulty, repair.

MOVES

6.Thermo switch, Thermo unit

- Remove the thermo switch/thermo unit from the radiator.
- Connect the pocket tester (Ω x 1) to the thermo switch (or thermo unit) ①.
- Immerse the thermo switch in the water.
- Check the thermo switch (or thermo unit) for continuity.
  Note temperatures while heating the water with the temperature gauge ③.

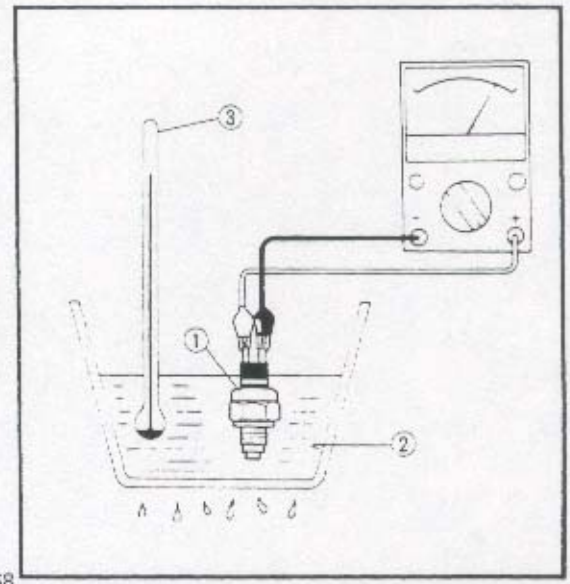
| Test step | Water temperature | | Good condition |
|---|---|---|---|
| | Thermo switch | Thermo unit | |
| 1 | 0 - 98°C (32 - 208.4°F) | 0 - 113°C (32 - 235.4°F) | × |
| 2 | More than 105 ± 3°C (221.0 ± 5.4°F) | More than 120 ± 3°C (248 ± 5.4°F) | ○ |
| 3* | 105 to 98°C (221.0 to 208.4°F) | 120 to 113°C (248 to 235.4°F) | ○ |
| 4* | Less than 98°C 208.4°F) | Less than 113°C 235.4°F) | × |

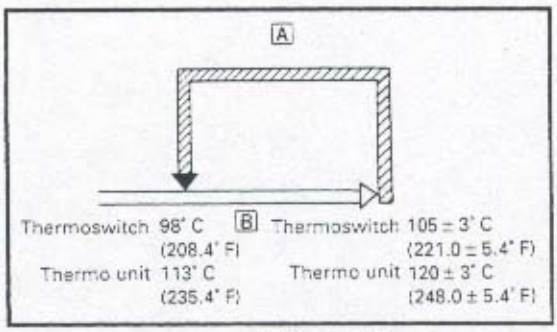
Test 1 & 2; Heat-up tests
Test 3* & 4*; Cool-down tests
○ : Continuity × : No continuity

**⚠ WARNING**

**Handle the thermo switch (or thermo unit) with special care.**
**Never subject it to strong shock or allow it to be dropped. Should it be dropped, it must be replaced.**

**Thermo switch:**
**28 Nm (2.8 m · kg, 20 ft · lb)**
**Three bond sealock® #10**
**Thermo unit:**
**8 Nm (0.8 m · kg, 5.8 ft · lb)**
**Three bond sealock® #10**






[A] THERMO SWITCH "ON", FAN "ON"
THERMO UNIT "ON", WATER TEMPERATURE LIGHT "ON"
[B] COOLANT TEMPERATURE

BAD CONDITION

Replace thermo switch/thermo unit.

GOOD CONDITION

7.Wiring connection

Check the entire cooling system for connections. Refer to "CIRCUIT DIAGRAM".

POOR CONNECTION

Correct.

CORRECT

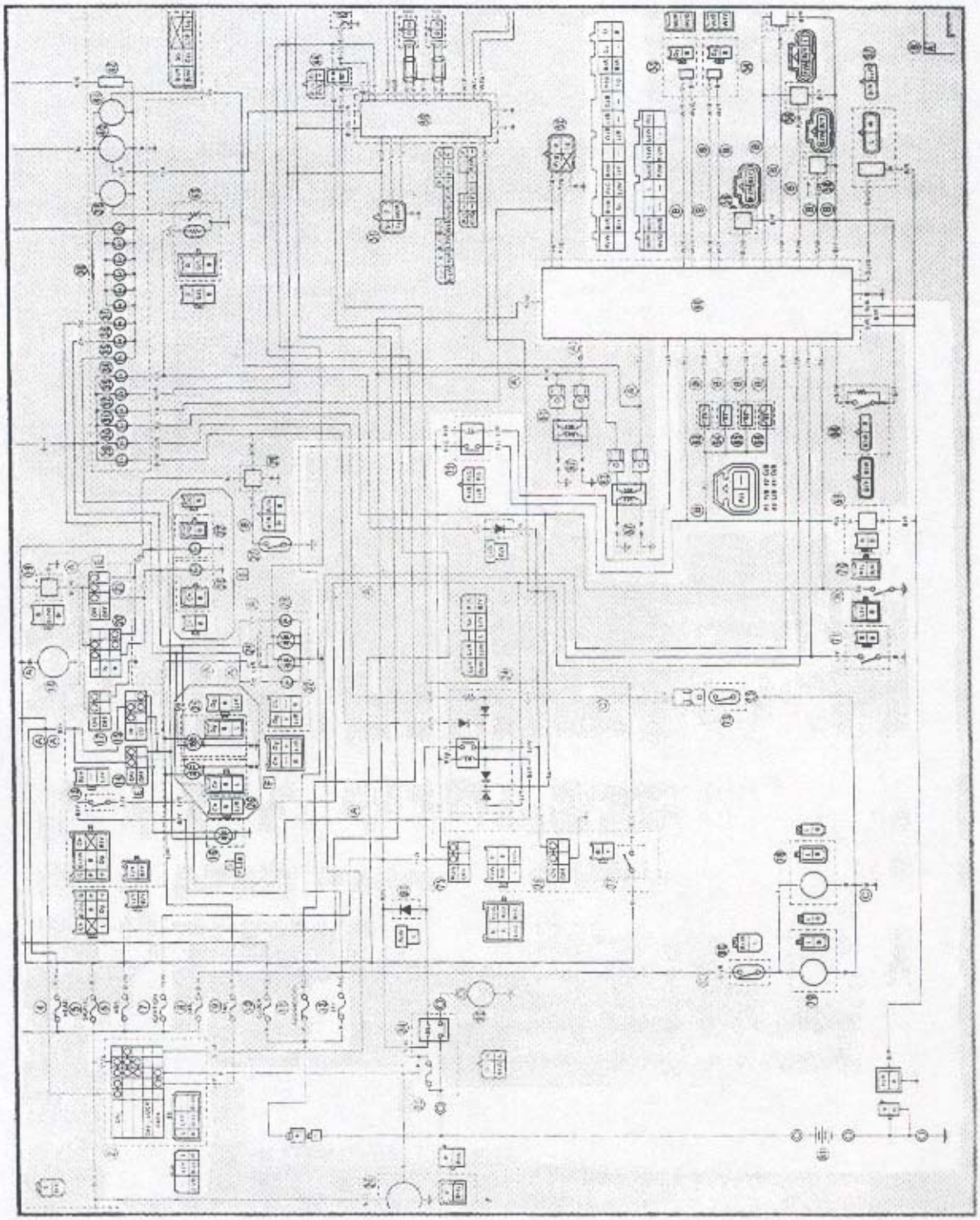
This circuit is good.

7

# FUEL PUMP SYSTEM

## CIRCUIT DIAGRAM

②Main switch
⑦Fuse (IGNITION)
⑫Fuse (EFI)
⑯ECU (for EFI)
⑲Fuel pump
㉒EFI main relay
㉕"ENGINE STOP" switch
㉛Battery
㉟Fuse (MAIN)

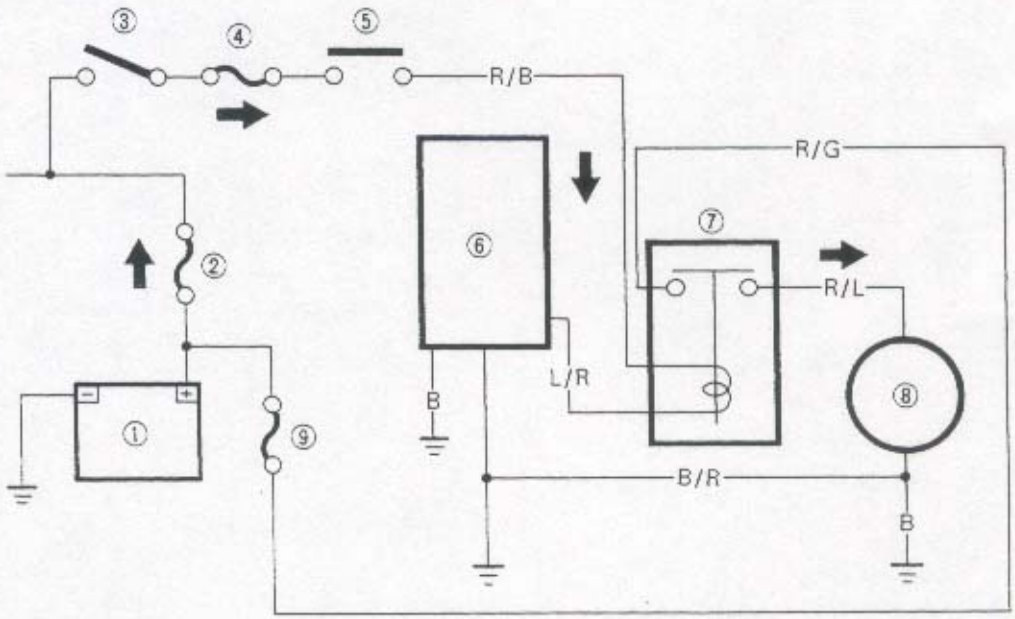


7

## FUEL PUMP CIRCUIT OPERATION

The fuel pump circuit consists of the EFI main relay, fuel pump, "ENGINE STOP" switch and ECU.
The ECU includes the control unit for the fuel pump.

①Battery
②Fuse (MAIN)
③Main switch
④Fuse (IGNITION)
⑤"ENGINE STOP" switch
⑥ECU
⑦EFI main relay
⑧Fuel pump
⑨Fuse (EFI)



## TROUBLESHOOTING

**FUEL PUMP FAILS TO OPERATE.**

**Procedure**

Check;

1. Fuse (main, ignition and EFI)
2. Battery
3. Main switch
4. "ENGINE STOP" switch
5. EFI main relay
6. Fuel pump
7. Wiring connection (entire fuel system)

**NOTE:**

- Remove the following parts before troubleshooting.

1) Seat
2) Top cover
3) Inner panel (left)
4) Side cowling (left)
5) Side cover (left)

- Use the following special tool(s) in this troubleshooting.

**Pocket tester:**
**YU-03112/90890-03112**

1. Fuse (main, ignition and EFI)

- Remove the fuses.
- Connect the pocket tester (Ω x 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:**
**12.8 V or more at 20° C (68° F)**

INCORRECT →

- Clean battery terminals.
- Recharge or replace the battery.

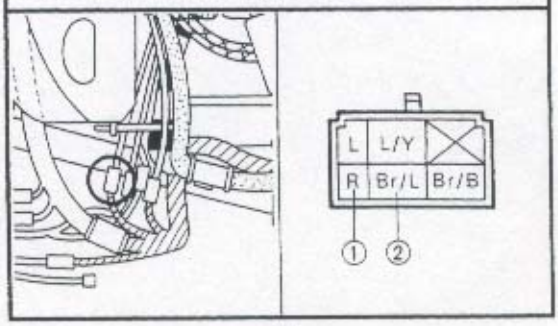
CORRECT ↓

*

*

3.Main switch

- Disconnect the main switch coupler from the wireharness.
- Check the switch component for the continuity between "Red ① and Brown/Blue ②".
  Refer to "CHECKING OF SWITCHES".



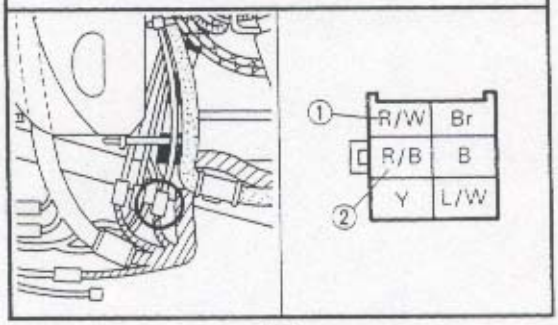

INCORRECT

Replace main switch.

CORRECT

4."ENGINE STOP" switch

- Disconnect the handlebar switch (right) coupler from the wireharness.
- Check the switch component for the continuity between "Red/White ① and Red/Black ② ".
  Refer to "CHECKING OF SWITCHES" .



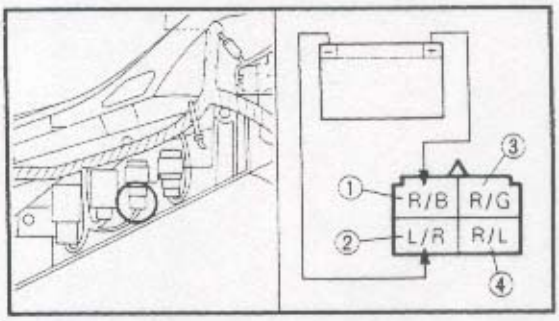

INCORRECT

Replace handlebar switch (right).

CORRECT

5.EFI main relay

- Disconnect the relay unit coupler from the wireharness.
- Connect the pocket tester (Ω × 1) and battery (12V) to the relay unit coupler terminals.




7

**Battery (+) terminal → Red/Black terminal ①**
**Battery (–) terminal → Blue/Red terminal ②**

**Tester (+) lead → Red/Green terminal ③**
**Tester (–) lead →Red/Blue terminal ④**

- Check the EFI main relay for continuity.

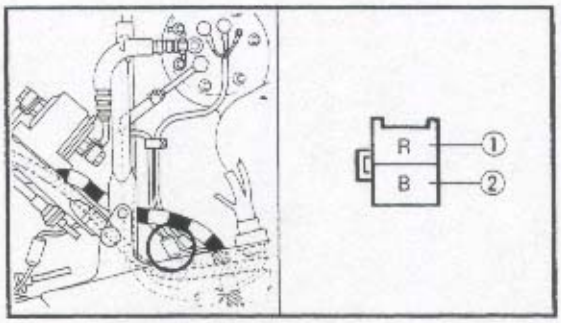
NO CONTINUITY → Replace EFI main relay.

CONTINUITY ⇩

6.Fuel pump resistance

- Disconnect the fuel pump coupler from the wireharness.
- Connect the pocket tester (Ω × 1) to the fuel pump coupler terminals.

**Tester (+) lead → Red terminal ①**
**Tester (–) lead → Black terminal ②**




- Check the fuel pump for specificated resistance.

**Fuel pump resistance:**
**2 ~ 4 Ω at 20° C (68° F)**

OUT OF SPECIFICATION → Replace fuel pump.

BOTH MEET SPECIFICATION ⇩

7.Wiring connection

- Check the entire starting system for connections.
  Refer to "CIRCUIT DIAGRAM".

POOR CONNECTION → Correct.

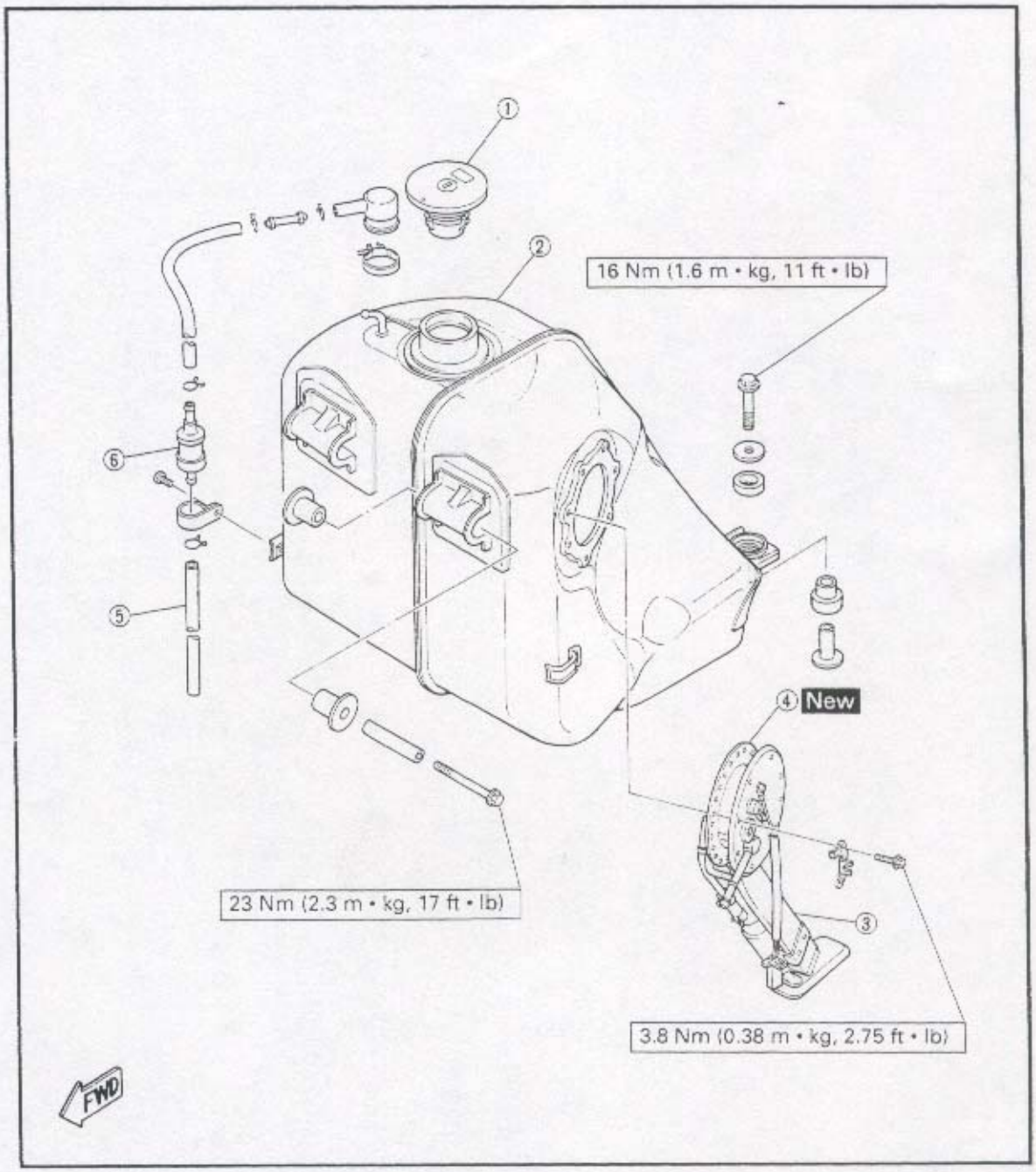
CORRECT ⇩

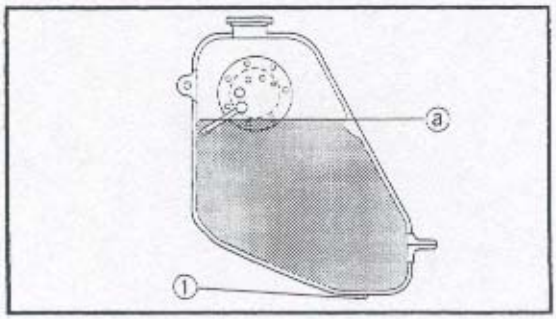
Replace ECU.

7

## FUEL PUMP AND FILTER

①Fuel tank cap
②Fuel tank
③Fuel pump assembly
④Gasket
⑤Breather
⑥Roll-over valve

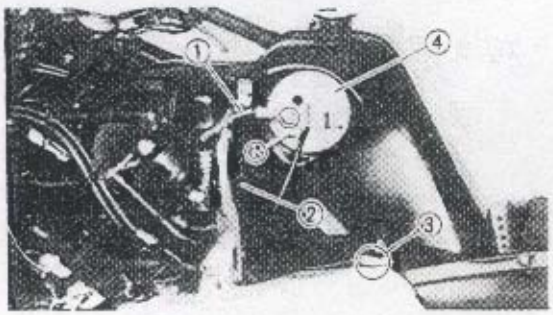





**REMOVAL**

1.Check:
- Fuel level
  Above level ⓐ → Remove fuel tank and drain fuel at drain bolt ①.
  Refer to "FUEL TANK" in CHAPTER 3.

2.Remove:
- Top cover
- Side cowlings (left and right)
  Refer to "COWLINGS" in CHAPTER 3.




3.Disconnect:
- Fuel delivery hose ①
- Fuel return hose ②
- Fuel pump coupler ③

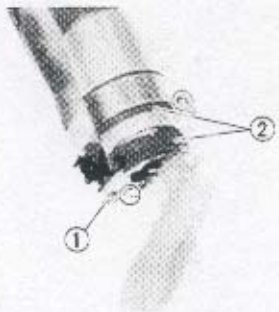
**⚠ WARNING**

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

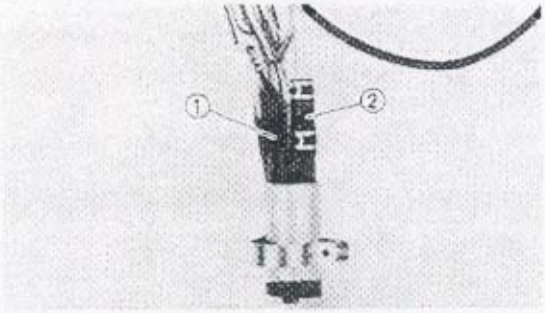
**NOTE:**

Place a rag under the return hose ② and the union bolt of the fuel delivery hose ① to avoid spilling fuel.

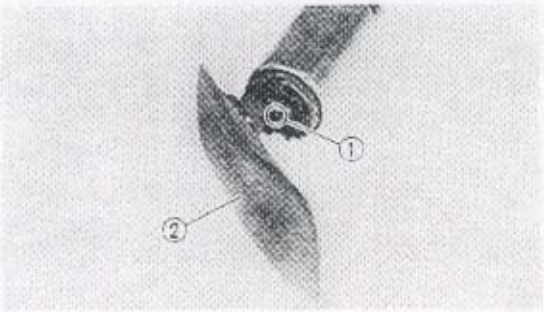
4.Remove:
- Fuel pump assembly ④




5.Remove:
- Bracket ①
- Damper ②



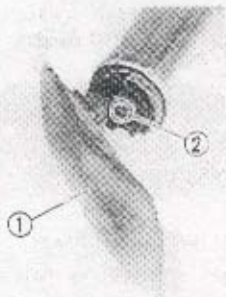

6.Disconnect:
- Coupler ①
- Hose ②




7.Remove:
- Clip ①
- Filter ②

**INSPECTION**

1.Inspect:
- Filter
  Damage/Clogged → Replace.

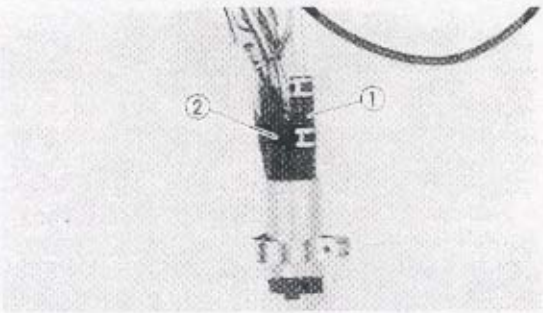



**INSTALLATION**

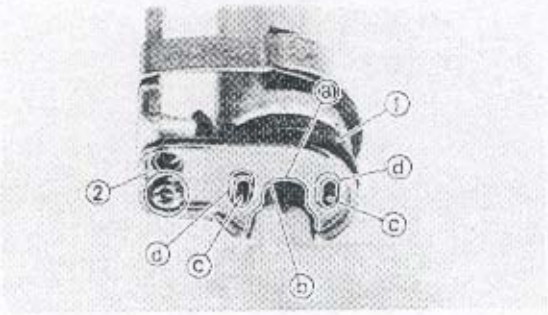
1.Install:
- Filter ①
- Clip ②

**CAUTION:**

- **Always use a new clip ②.**
- **Be sure the clip sits tightly against the filter.**



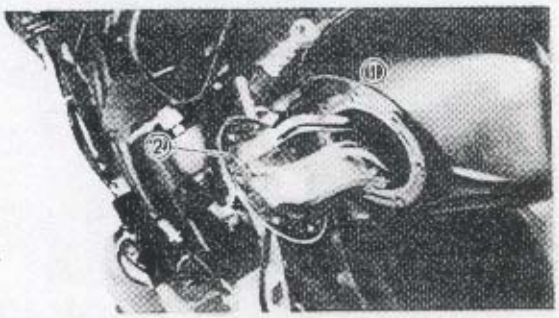

2.Connect:
- Hose ①
- Coupler ②



3.Install:
- Damper ①
- Bracket ②

**NOTE:**
- Be sure the flange ⓐ on the damper ② fits correctly in the groove ⓑ on the bracket ①.
- Be sure the projection ⓒ of the damper ① fits correctly in the hole ⓓ on the bracket.

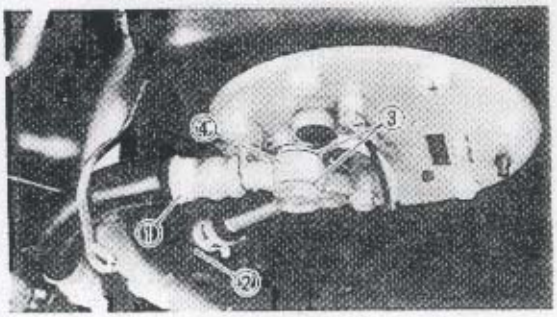
| | |
|---|---|
| | **Screw (bracket):**<br>**3.5 Nm (0.35 m · kg, 2.5 ft · lb)** |



4.Install:
- Fuel pump assembly ①

**CAUTION:**
**Always use a new gasket ②.**

| | |
|---|---|
| | **Bolt (fuel pump assembly):**<br>**3.8 Nm (0.38 m · kg, 2.75 ft · lb)** |



5.Connect:
- Fuel delivery hose ①
- Fuel return hose ②

**NOTE:**
Be sure to place one copper washer ③ on each side of the hose fitting ④.

| | |
|---|---|
| | **Union bolt:**<br>**30 Nm (3.0 m · kg, 22 ft · lb)** |

**⚠ WARNING**
**Always use new copper washers.**

6.Install:
- Side cowlings (left and right)
- Top cover
  Refer to "COWLINGS" in CHAPTER 3.

# TROBLESHOOTING

**ANMERKUNG:**
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 breather hose
- Deteriorated fuel or fuel containing water or foreign material

**Air cleaner**
- Clogged air filter

**Fuel pump**
- Faulty fuel pump
- Faulty EFI main relay
- Pinched fuel delivery hoses
- Pinched fuel return hose
- Clogged fuel distributor pipe

**Throttle body**
- Improperly adjusted air screws
- Sucked-in air
- Fast idle system malfunction

**Injector**
- Clogged injector
- Faulty injector
- Sucked-in air
- Faulty ECU
- Faulty pressure regulater
- Cracked or clogged pulsor hoses

### 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 ECU
- Faulty crankshaft sensor
- Faulty camshaft sensor

**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

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

**Throttle body**
- Improperly synchronized intake air pressure.
- Improperly adjusted idle speed (idle speed adjusting screw)
- Improper throttle cable play
- Improperly fast idle system

**Injector**
- Clogged injector
- Faulty injector

**Electrical system**
- Faulty battery
- Faulty spark plug
- Faulty ECU
- Faulty crankshaft sensor
- Faulty camshaft sensor
- 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.)

**Throttle body**
- Sucked-in air

**Injector**
- Clogged injector
- Faulty injector
- Faulty pressure regulater

**Air cleaner**
- Clogged air filter

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# 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
- 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**
- Air in clutch fluid
- 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
- Match marks not aligned
- Bent push rod
- Broken clutch boss
- Burnt primary driven gear bushing
- Bent clutch plate
- Swollen friction plate

**Engine oil**
- Improper oil level
- Improper quality/(high viscosity)
- Deterioration

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## OVERHEATING

### OVERHEATING

**Ignition system**
- Improper spark plug gap
- Improper spark plug heat range
- Faulty ECU

**Fuel system**
- Clogged injector
- Faulty injector
- Faulty pressure regulater
- Clogged air filter

**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

## 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
- Improperly installed steering tube
- Damaged steering tube
- Damaged ball on the joint ring
- Bent or damaged knuckle arm
- Damaged ball joint of knuckls arm
- Improperly adjusted front wheel camber

**Front swingarm**
- Worn bearing or inner race
- Bent or damage

**Front shock absorber**
- Fatigued spring
- Oil and gas leakage

**Rear 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 case 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

### 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 KEEPS ON
- Faulty flasher relay
- Bulb burnt out

### FLASHER WINKS QUICKER
- Improper bulb
- Faulty flasher relay
- Bulb burnt out

### BULB BURNT OUT
- Improper bulb
- Faulty battery
- Faulty rectifier/regulator
- Improperly grounded
- Faulty main and/or light switch
- Bulb life expires

### FLASHER WINKS SLOWER
- Faulty flasher relay
- Faulty main and/or turn switch

### HORN IS INOPERATIVE
- Faulty battery
- Faulty fuse
- Faulty main and/or horn switch
- Improperly adjusted horn
- Faulty horn
- Broken wireharness