



**YAMAHA**

**TTR230T**

**SERVICE MANUAL**

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# **TTR 230(T)**

## **SERVICE MANUAL**

Feb/2005 - Yamaha Motor da Amazônia Ltda  
Post-Sales Service Department

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## PREFACE

This manual has been prepared by YAMAHA MOTOR DA AMAZÔNIA LTDA. for the exclusive use by the Yamaha Authorized Dealer and its qualified mechanics. Since all mechanics information cannot be included in a single manual, it is assumed that the people reading this manual, to execute maintenance and repair services on the Yamaha motorcycles, have a basic knowledge of the mechanical conceptions and procedures, inherent to the motorcycle repair technology. Without these knowledge, any repair or service attempt on this model could cause difficulties for its utilization and/or safety.

YAMAHA MOTOR DA AMAZÔNIA LTDA. will make its best efforts to enhance continuously all products in its line. The significant changes and modifications in the specifications or procedures will be informed to all YAMAHA Dealers, and will be included in the proper places in future editions of this manual.

### NOTE:

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This model design and specifications are subject to changes with no previous notice.

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## IMPORTANT INFORMATION

The especially important information will be marked in this manual with the notations below.



The alert sign means ATTENTION! ALERT! YOUR SAFETY IS INVOLVED!



### WARNING

The failure in fulfilling a WARNING instruction may cause serious accident and even the death of the vehicle driver, an observer, or someone examining or repairing the vehicle.

### CAUTION:

A CAUTION instruction indicates special precautions to be taken to prevent damages in the vehicle.

### NOTE:

A NOTE provides information in order to clarify or facilitate the procedures.

# HOW TO USE THIS MANUAL

## MANUAL FORMAT

This manual is constituted by chapters for the major subject categories. (See "Illustrative Symbols")

1st title ①: This is the chapter title with the symbol in the upper right corner in each page.

2nd title ②: This title indicates the section in each chapter and only appears on the first page of each section. It is located in the upper left corner of the page.

3rd title ③: This title indicates a subsection followed by step-by-step instructions and with the corresponding illustrations.

## EXPLODED VIEW DIAGRAMS

In order to identify parts and procedure steps, there are exploded view diagrams in the beginning of each dismounting and mounting section.

1. An exploded view diagram ④ is supplied to enable easy view of the mounting and dismounting services.
2. Numbers ⑤ indicate the service order in the exploded view diagrams. A number surrounded by a circle indicates a dismounting step.
3. A service and note explanation is provided in an easy reading way by using symbols ⑥. The meaning of each symbol is provided in the next page.
4. An instruction chart ⑦ is supplied with the exploded view diagram, and provides the services order, part names, notes, etc.
5. For services requiring more information, a step-by-step supplement is provided ⑧ in addition to the exploded view diagram and instruction chart.

② CILINDRO E PISTÃO

① MOTOR

CILINDRO E PISTÃO

⑤

⑥

⑦

| Ordem | Nome do serviço / Nome da peça      | Qtd. | Observações   |
|-------|-------------------------------------|------|---|
|       | <b>Remoção do cilindro e pistão</b> |      | Remove as peças pela ordem. Ver seção "CABEÇOTE".       |
| 1     | Cabeçote                            | 1    |   |
| 2     | Guia da corrente (lado do escape)   | 1    | Ver seção "INSTALAÇÃO DE ANÉIS, PISTÃO E CILINDRO".     |
| 3     | Cilindro                            | 1    |   |
| 4     | Pino guia                           | 2    |   |
| 5     | Gaxeta do cilindro                  | 1    |   |
| 6     | Trava do pino do pistão             | 2    |   |
| 7     | Pino do pistão                      | 1    | Ver seção "INSTALAÇÃO DE ANÉIS E PISTÃO".               |
| 8     | Anel (superior)                     | 1    | Ver seção "INSTALAÇÃO DE ANÉIS, PISTÃO E CILINDRO".     |
| 9     | Anel (secundário)                   | 1    |   |
| 10    | Anéis de óleo / expansor            | 2/1  | Para a instalação, reverta os procedimentos de remoção. |

③ CILINDRO E PISTÃO

MOTOR

**REMOÇÃO DE PISTÃO E ANÉIS**

1. Remova:

- Trava do pino do pistão ①
- Pino do pistão ②
- Pistão ③

**NOTA:**  
Antes de remover a trava do pino do pistão, cubra a entrada do cárter com um pano limpo para prevenir que a trava caia para dentro do motor.

2. Remova:

- Anel superior
- Anel secundário
- Anel de óleo

**NOTA:**  
Ao remover um anel do pistão, abra os anéis com os dedos e empurre para cima o outro lado do anel.

**INSPEÇÃO DO CILINDRO**

1. Meça:

- Diâmetro do cilindro

Fora de especificação => Faça um brunimento ou troque.

**NOTA:**

- Meça o diâmetro do cilindro com um súbito.
- Meça o diâmetro do cilindro em várias alturas (A,B,C) e de forma cruzada fazendo ângulos retos com o virabrequim. Então, calcule a média das medidas.







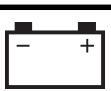














Diâmetro do cilindro:  
49,000 ~ 49,018 mm  
-Limite: 49,1 mm-  
-Limite de diferença entre A, B e C: 0,03 mm-

2. Meça:

- Empenamento

Fora de especificação => Troque.

Limite de empenamento do cilindro:  
0,03 mm

|  |   |   |
|--|---|---|
| ①<br>INFO<br>GEN    | ②<br>SPEC    |   |
| ③<br>INSP<br>ADJUS  | ④<br>ENGINE  |   |
| ⑤<br>CARB           | ⑥<br>CHAS    |   |
| ⑦<br>ELECT          | ⑧<br>PROB ?   |   |
| ⑨                  | ⑩           |   |
| ⑪                 | ⑫          |   |
| ⑬                 | ⑭          |   |
| ⑮                 | ⑯          |   |
| ⑰                 | ⑱          | ⑲  |
| ⑳                 | ㉑          | ㉒  |

## ILLUSTRATIVE SYMBOLS

The illustrative symbols from ① to ⑧ are assigned as per the table aside, in order to indicate the chapter numbers and contents.

- ① General information
- ② Specifications
- ③ Periodic inspection and adjustments
- ④ Engine
- ⑤ Carburation
- ⑥ Frame
- ⑦ Electric system
- ⑧ Troubleshooting

The illustrative symbols from ⑨ to ⑮ are used to identify the specifications appearing in the text.







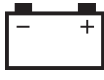
- ⑨ Replenish with fluid
- ⑩ Lubricant
- ⑪ Special tool
- ⑫ Tighten with torque wrench
- ⑬ Wear limit, clearance
- ⑭ Engine speed
- ⑮ Ω, V, A

The illustrative symbols from ⑰ to ㉒, in the exploded view diagrams, indicate the lubricant types and the lubrication points to be applied.

- F Apply locking agent (LOCTITE®)
- ⑰ Apply engine oil
- ⑱ Apply gear oil
- ⑲ Apply molybdenum disulfide oil
- ⑳ Apply grease for wheel roller bearing
- ㉑ Apply lithium-based grease
- ㉒ Apply molybdenum disulfide-based grease

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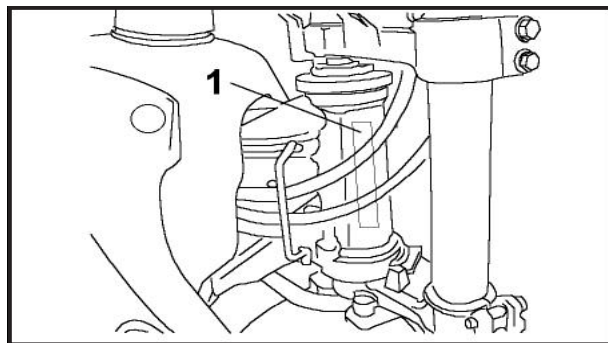
|  |   |
|--|---|
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|  | SPEC <b>2</b>   |
| <b>PERIODIC INSPECTION AND ADJUSTMENTS</b> |    |
|  | INSP ADJUS <b>3</b>   |
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|  | ENGINE <b>4</b>   |
| <b>CARBURATION</b>                         |  |
|  | CARB <b>5</b>   |
| <b>FRAME</b>                               |  |
|  | CHAS <b>6</b>   |
| <b>ELECTRIC SYSTEM</b>                     |  |
|  | ELECT <b>7</b>  |
| <b>TROUBLESHOOTING</b>                     | <b>?</b>  |
|  | PROB <b>8</b>   |

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| MODEL IDENTIFICATION .....                   | 1-1        |
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| FOR FRAME SERVICES .....                     | 1-8        |
| FOR ELECTRIC COMPONENTS .....                | 1-9        |



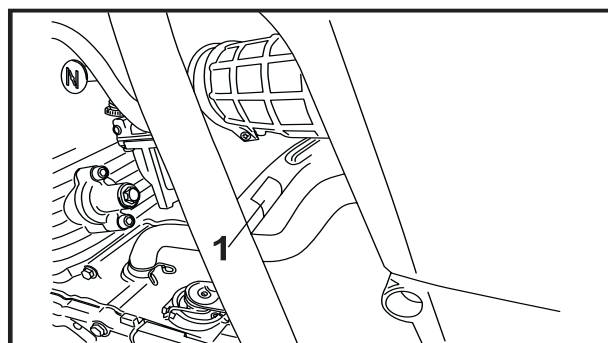
## GENERAL INFORMATION MOTORCYCLE IDENTIFICATION

### FRAME NUMBER

The serial number of the frame ① is engraved on the tube of the steering column.

### NOTE:

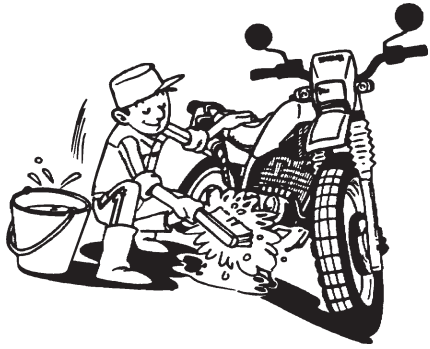
The vehicle's ID number is used to identify the motorcycle, when registering and licensing it with the local traffic authority.



### MODEL IDENTIFICATION

The model ID label ① is stuck on the frame. This information will be required for replacement part orders.

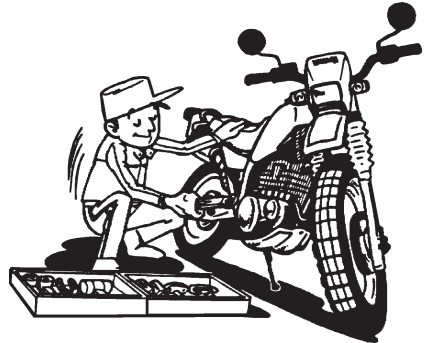




## IMPORTANT INFORMATION

### PREPARING FOR REMOVING AND DISMOUNTING

1. Clean all dirty, mud, dust and other materials before removing and dismantling.

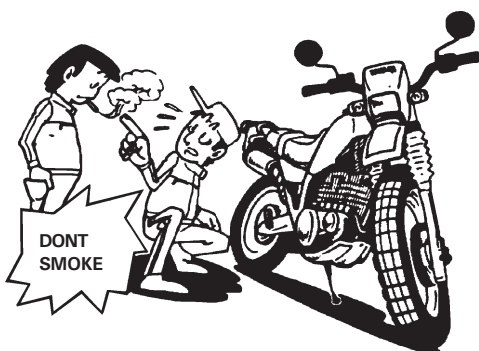


2. Use the proper tools and cleaning equipment.  
See the "SPECIAL TOOLS" section.

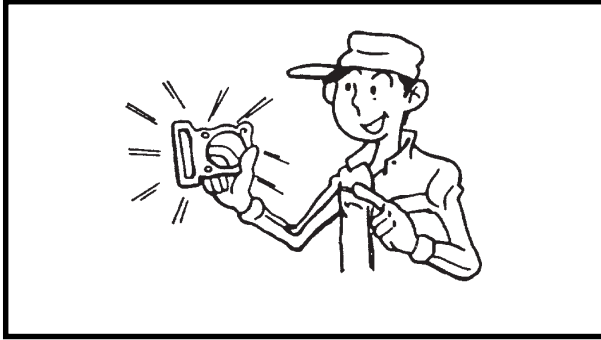


3. When dismantling the motorcycle, keep the matching parts together. This includes gears, cylinders, pistons and other matching parts that suffered natural wear together. The matching parts must be remounted as an assembly or replaced.

4. When dismantling the motorcycle, clean all parts and put them on trays by keeping the dismantling order. This will speed the mounting and will assure the correct part installation.



5. Keep fire sources away.

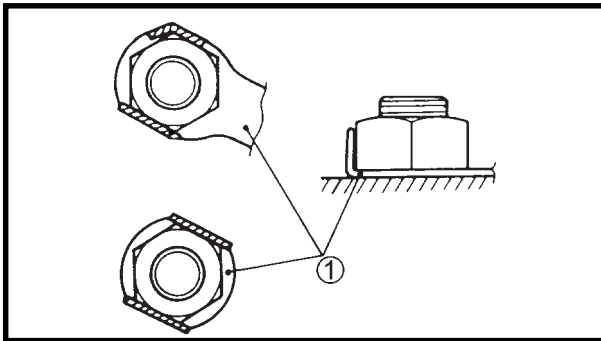


**REPLACEMENT PARTS**

1. Use only YAMAHA genuine parts for replacement. Use oils/greases recommended by YAMAHA for mounting and adjusting. Other brands may seem similar in terms of function and appearance, but have lower quality.

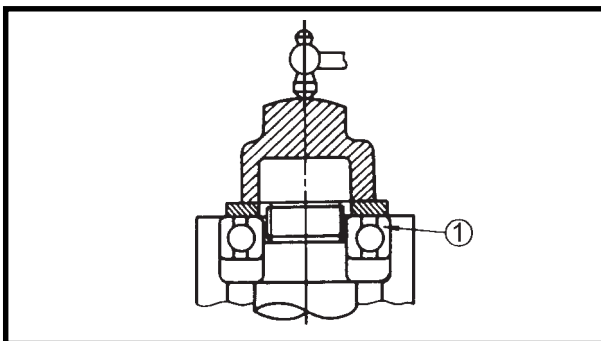
**GASKETS, RETAINERS AND O-RINGS**

1. All gaskets, retainers and O-rings must be replaced when overhauling the engine. All gasket surfaces, retainer lips and O-rings must be clean.
2. Apply oil on all points and roller bearings when mounting. Apply grease on the retainers' lips.



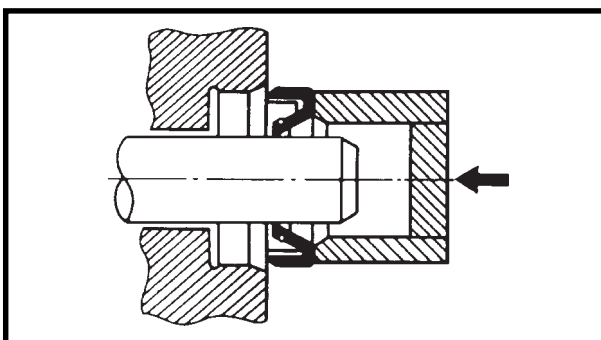
**LOCK WASHERS/SPACERS AND COTTER PINS**

1. All lockwashers/cotter pins ① must be replaced when removed. The cotter pin legs must be folded around the bolts or nuts after applying the specific torque.



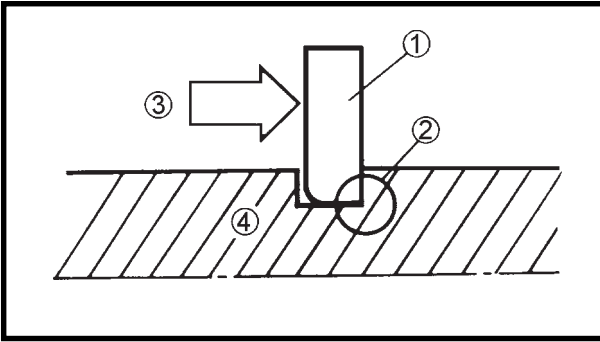
**ROLLER BEARINGS AND RETAINERS**

1. Install the roller bearings ① and retainers ②, with the manufacturer's marks facing out. (In other words, the stamped letters must be exposed for facilitating the identification). When installing the retainers, apply a thin lithium-based grease layer on the retainer's lips. Apply oil when installing the roller bearing.



**CAUTION:** \_\_\_\_\_

Do not use compressed air for drying the roller bearings. This will cause damages to the roller bearing surfaces.



## LOCK RINGS

1. All lock rings must be carefully checked before remounting. Always replace the piston pin locks after every use. Replace warped locks. When installing a lock ①, make sure that the side with sharp corner ② is positioned opposingly to the force ③ applied on it. See the aside figure.
  - ④ Shaft

## SPECIAL TOOLS

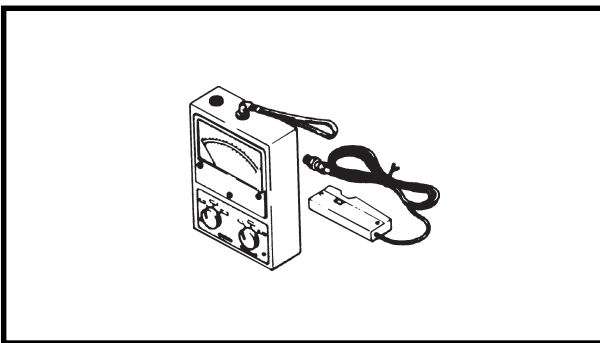
The special tools are required for complete and accurate adjustment and mounting. By using the proper special tool, you will prevent damages caused by the improper use of impromptu tools or techniques.



## FOR ADJUSTING

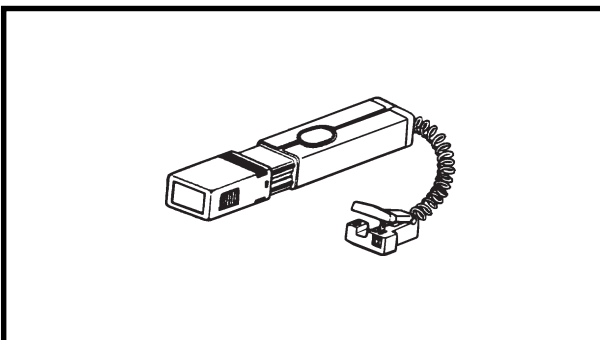
1. Valve clearance adjuster  
90890 - 01311 -09

This tool is required for adjusting valve clearances.



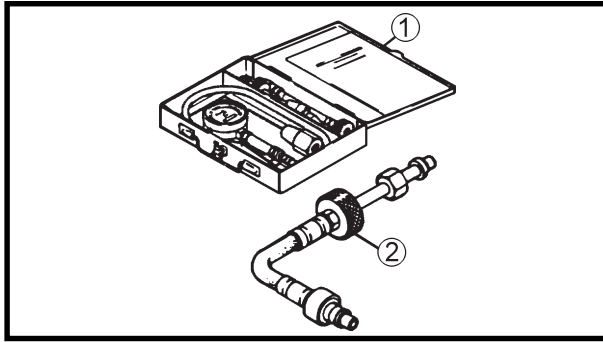
2. Digital inductive tachometer  
90890-06760

This tool is required for detecting the engine speed.



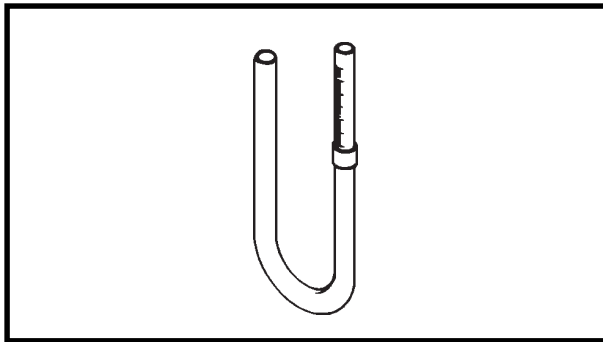
3. Strobe light  
90890-03141

This tool is used for checking the ignition point.



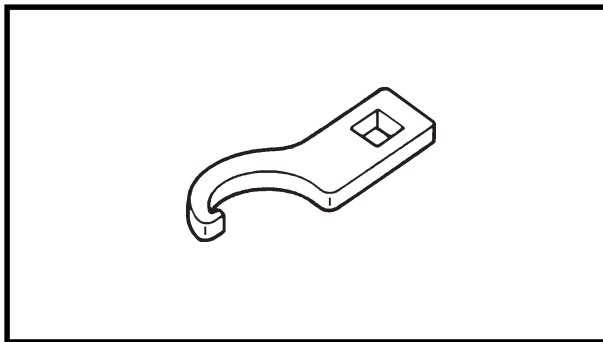
4. Compression meter  
90890-03081 - ①  
Adapter:  
90890-04082 - ②

This meter is used for measuring the engine compression.



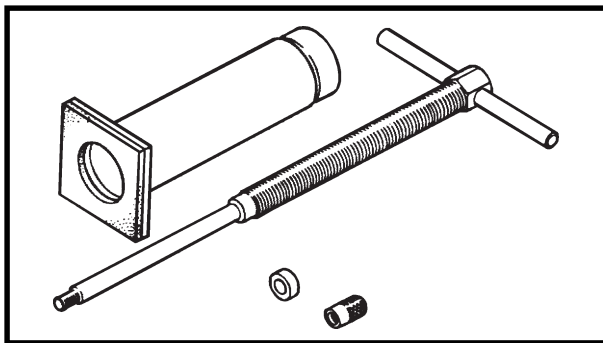
5. Fuel level meter  
90890-01312

This meter is used to measure the fuel level in the carburetor bowl.



6. Castellated nut wrench  
90890-01403

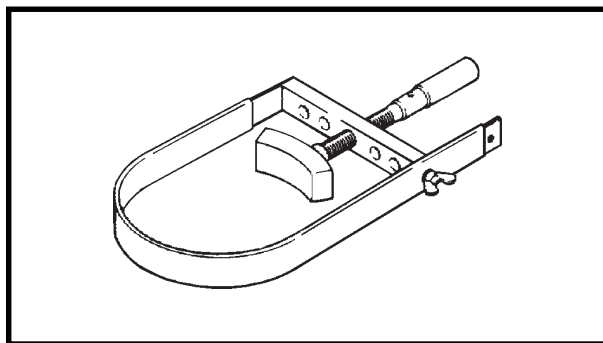
This tool is used for removing the handle bar nut.



**FOR ENGINE SERVICES**

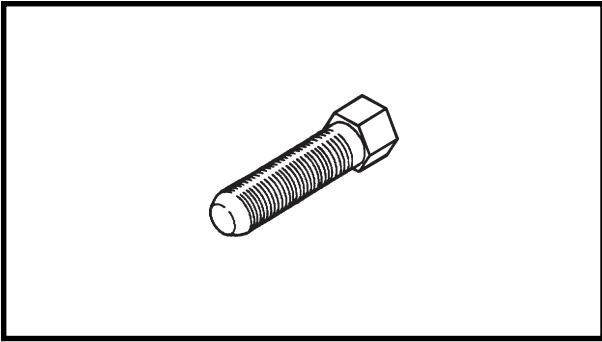
1. Piston pin puller  
90890-01304

This tool is used for removing the piston pin.



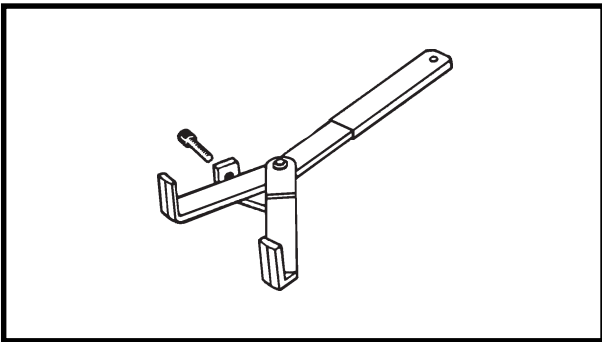
2. Rotor fastener  
90890-01701

This tool is used to fasten the rotor when removing or installing the rotor fastening nut.



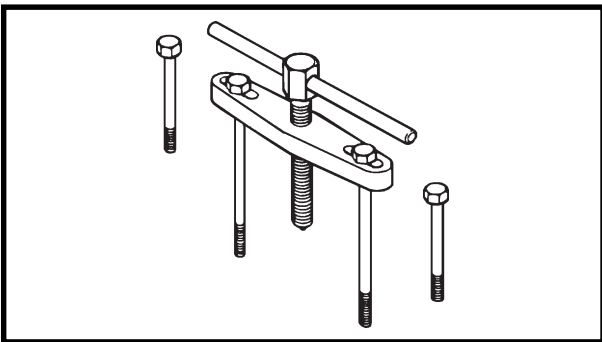
3. Rotor puller  
90890-01080

This tool is used for removing the magnet rotor.



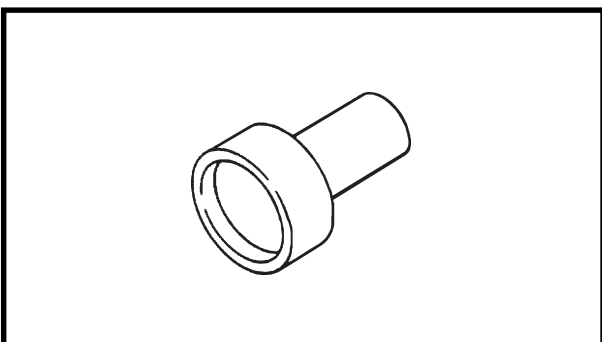
4. Universal clutch fastener  
90890-04086

This tool is used to hold the clutch when removing or installing the clutch hub fastening nut.



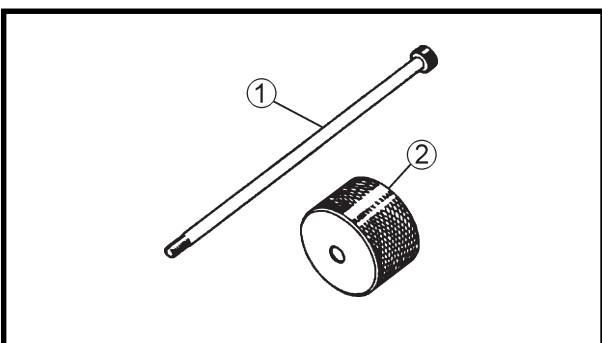
5. Crankcase separator  
90890-01135

This tool is required for separating the crankcases.



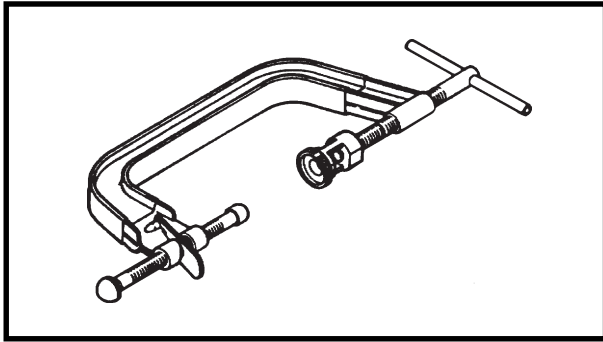
6. Crankshaft protector  
90890-01382

This tool is used for removing the crankshaft.



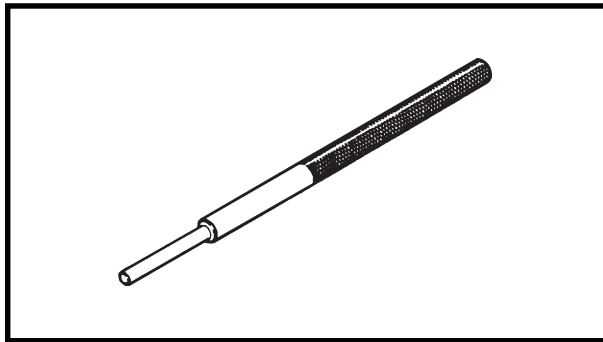
7. Sliding hammer set  
Sliding hammer bolt  
90890-01083 - ①  
Weight  
90890-01084 - ②

These tools are used for removing the rockers' shaft.



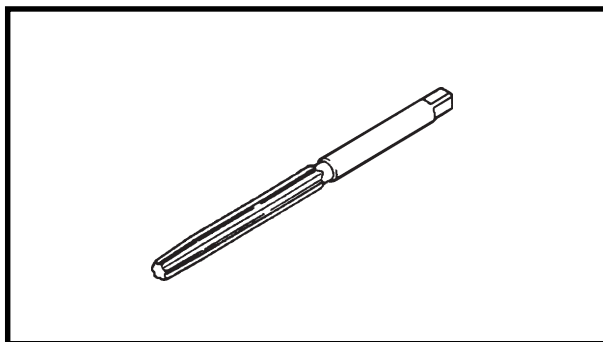
8. Valve spring clamp  
90890-04019

This tool is required for removing and installing valves.



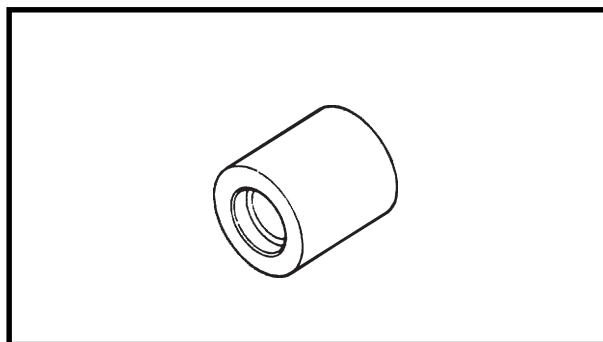
9. Guide remover for 6-mm valve  
90890-04064

This tool is required to remove the valve guides.



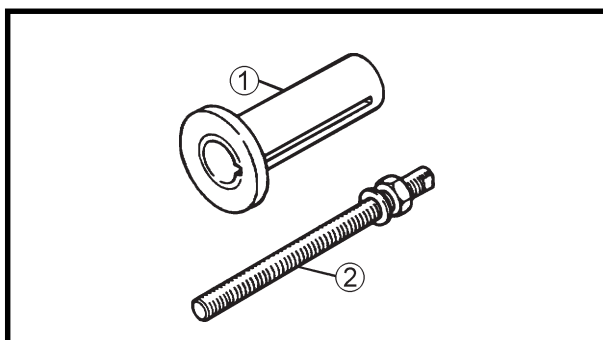
10. Guide expander for 6-mm valve  
90890-04066

This tool is used for grinding the new valve guides.

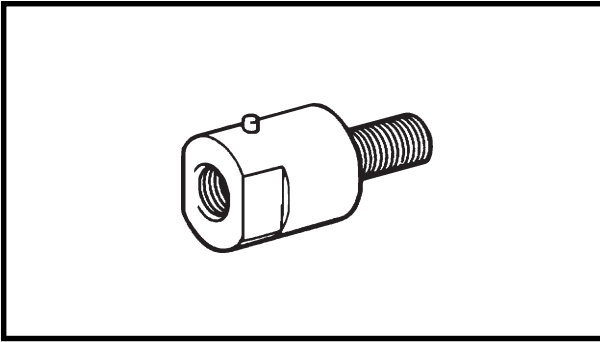


11. Guide installer for 6-mm valve  
90890-04065

This tool is required for installing the valve guides in a proper way.

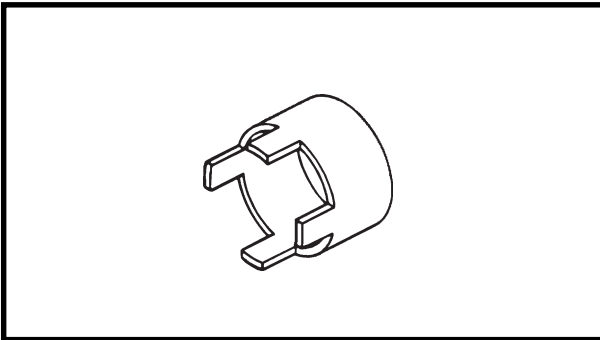


12. Crankshaft puller  
90890-01274 - ①  
Bolt  
90890-01275 - ②



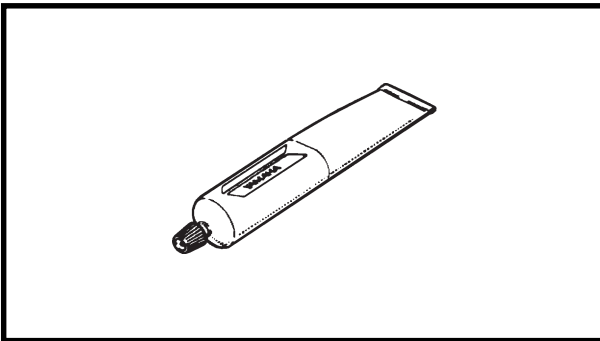
13. Adapter  
90890-01383

This tool is used for installing the crankshaft.



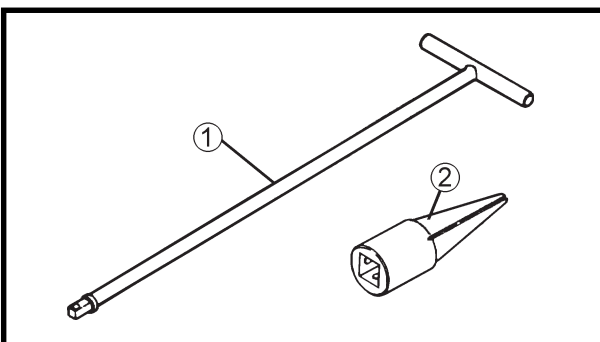
14. Crankshaft spacer  
90890-04081

This tool is used for installing the crankshaft.



15. Glue  
Yamaha Bond n°1215®  
90890-85505

This glue is used for gluing the crankcases.

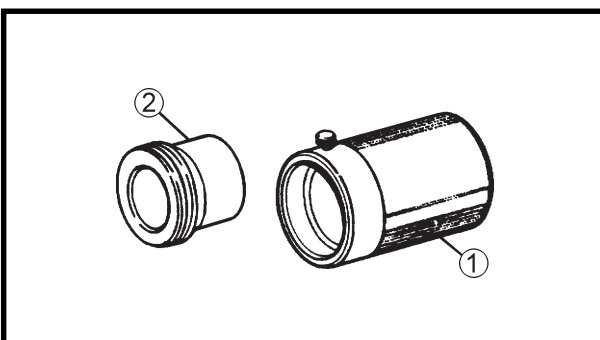


**FOR FRAME SERVICES**

1. Internal tube cylinder fastener  
90890-01326 - ①

Fastener  
90890-01294 - ②

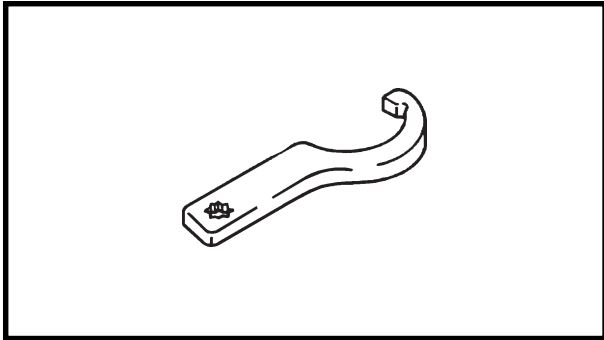
This tool is used for loosening and tightening the front fork bar fastening bolt.



2. Sliding hammer for the fork retaining installer  
90890-01367 - ①

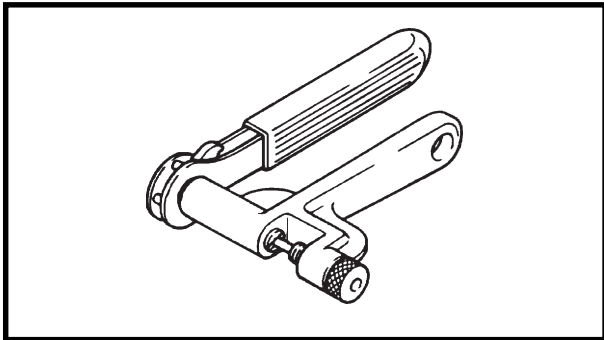
Adapter 36mm  
90890-01370 - ②

These tools are used when installing the fork retainer.



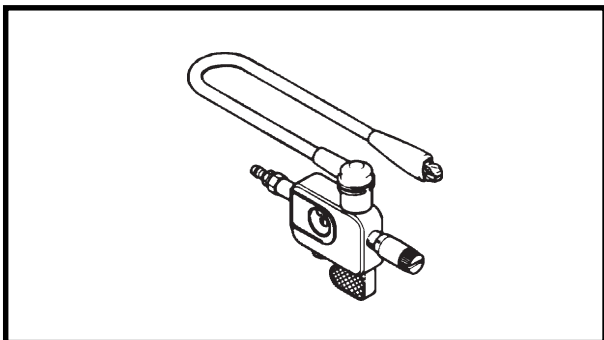
3. Adjustment nut wrench  
90890-1403

This tool is used for loosening or tightening the handle bar adjusting nut.



4. Transmission chain pin puller  
90890-01286

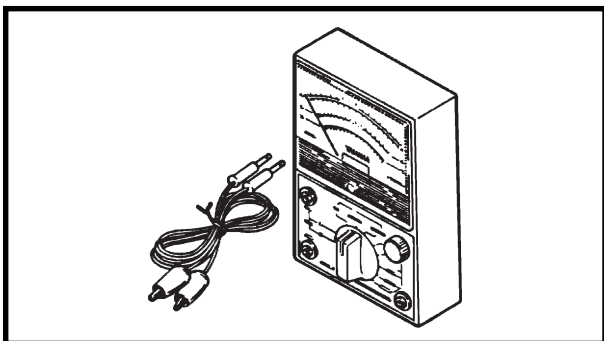
This tool is used for mounting and dismounting the transmission chain.



**FOR ELECTRIC COMPONENTS**

1. Dynamic spark tester  
90890-06754

This equipment is used for checking ignition system components.



2. Multi-tester  
90890-03112

This equipment is used for testing the electric system.





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**SPECIFICATIONS**

**GENERAL SPECIFICATIONS**

|   |   |
|---|---|
| Model name:   | TTR230T   |
| Model code:   | TT-R230<br>1C61 USA<br>1C63 CDN<br>1C64 AUS   |
| Dimensions:<br>Total length<br>Total width<br>Total height<br>Seat height<br>Wheel base:<br>Minimum height from ground                              | 2,065 mm (81.30 in)<br>800 mm (31.50 in)<br>1,180 mm (46.46 in)<br>870 mm (34.25 in)<br>1,385 mm (54.53)<br>295 mm (11.61)  |
| Minimum turning radius:   | 2,100 mm  |
| Basic weight:<br>Basic weight<br>With oil and full fuel tank  | 110 Kg<br>116 Kg  |
| Engine:<br>Type<br>Cylinder arrangement<br>Displacement<br>Diameter vs. stroke<br>Compression rate<br>Compression pressure (STD)<br>Starting system | Air cooled, 4-stroke, SOHC<br>Single cylinder, front inclined<br>223cm <sup>3</sup><br>70x58mm<br>9,5:1<br>1.200 kPa (12kg/cm <sup>2</sup> at 1000 rpm)<br>Electric start |
| Lubrication system:<br>Type<br>Oil type:<br>Engine oil<br><br>Periodic oil change<br>With filter replacement<br>Total capacity                      | Wet crankcase<br><br>YAMALUBE4, SAE10W30 or SAE20W40<br>(for USA/ CAN)<br>SAE10W30 or SAE10W40 or SAE20W40<br>or SAE20W50 (for AUS)<br><br>1.0 L<br>1.1 L<br>1.3 L        |

# GENERAL SPECIFICATIONS

**SPEC**



|   |  |  |
|---|--|--|
| <b>Fuel:</b><br>Type<br>Fuel tank capacity<br>Reserve volume  | Gasoline with additive<br>8 L<br>1.8L  |  |
| <b>Carburetor:</b><br>Type<br>Manufacturer  | Y26P x 1<br>TEIKEI   |  |
| <b>Spark plug:</b><br>Type<br>Manufacturer<br>Electrode gap   | DR8EA<br>NGK<br>0.6 ~ 0.7 mm   |  |
| <b>Clutch type:</b>   | wet, multiple discs  |  |
| <b>Transmission:</b><br>Type<br>Command<br>Primary reduction system<br>Primary reduction ratio<br>Secondary reduction system<br>Secondary reduction ratio<br>Gear ratio            1st<br>2nd<br>3rd<br>4th<br>5th<br>6th | 6-gera constant mesh<br>Left foot drive<br>Square teeth gears<br>73/22 (3,318)<br>Transmission chain<br>49/13 (3,769)<br>38/13 (2,923)<br>34/18 (1,889 )<br>30/21 (1,428 )<br>27/24 (1,125 )<br>25/27 (0,925 )<br>23/29 (0,793 ) |  |
| <b>Frame:</b><br>Frame type<br>Caster angle<br>Trail  | Diamond<br>27°<br>111 mm   |  |
| <b>Tires:</b><br>Manufacturer<br>Type<br>Size<br>Pressure   | <b>FRONT</b><br>MT320H/Pirelli<br>With tube<br>80/100 - 21 NHS<br>100KPa(1.00Kgf/cm <sup>2</sup> .15 psi)  | <b>REAR</b><br>MT320/Pirelli<br>With tube<br>110/100 - 18 NHS<br>100KPa(1.00Kgf/cm <sup>2</sup> .15 psi) |

## GENERAL SPECIFICATIONS

**SPEC**

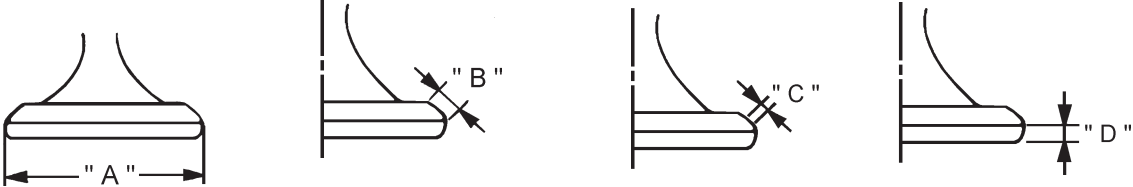
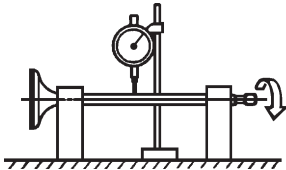
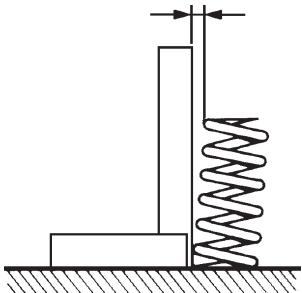

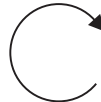
|   |   |
|---|---|
| Air filter:   | Wet-type element  |
| Wheels:<br>Front    type<br>size<br>Rear     type<br>size                                   | Spoked<br>21 x 1.60<br>Spoked<br>18 x 1.85  |
| Brakes:<br>Front    type<br>operation<br>Rear     type<br>operation                         | Disc brake (single)<br>Right-hand drive<br>Drum brake<br>Right foot drive                       |
| Suspension:<br>Front<br>Rear  | Telescopic fork<br>Swing arm (monocross)  |
| Suspension travel:<br>Front<br>Rear   | 240 mm<br>220 mm  |
| Shock absorber:<br>Front<br>Rear  | Helical spring / Hydraulic shock absorber<br>Helical spring / Hydraulic shock absorber with gas |
| Electric:<br>Ignition system<br>Charging system<br>Battery type<br>Battery capacity<br>Fuse | C.D.I.<br>Magneto A.C.<br>YTX5L-B5<br>12V, 4AH<br>10.0 A  |



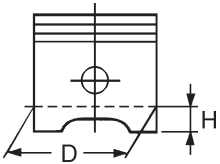



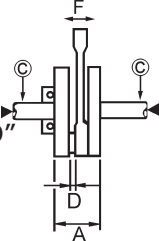
**MAINTENANCE SPECIFICATIONS  
ENGINE**

| Model   | TTR 230T   |  |
|---|--|--|
| Head:<br>Warping threshold  |  | <0.03 mm><br>*The lines indicate measurement in right angle  |
| Cylinder:<br>Diameter<br><Wear threshold><br>Measuring point(a)   |  | 69.970~70.020 mm<br><70.100 mm><br>40 mm   |
| Camshaft:<br>Transmission<br>External shaft diameter<br>Shaft clearance - bearing<br>Cam measures<br>Intake<br>"A"<br>"B"<br>"C"<br>Exhaust<br>"A"<br>"B"<br>"C"<br><Shaft warping limit> |  | By link(LE)<br>24.960~24.980 mm<br>0.020~0.061 mm<br>36.510~36.610 mm<br>30.100~30.200 mm<br>6.500~6.620 mm<br>36.510~36.610 mm<br>30.150~30.250 mm<br>6.500~6.620 mm<br><0.03 mm> |
| Command chain:<br>Command chain type<br># of links<br>Chain adjustment method   | DID25SH<br>104 links<br>Automatic                      |  |
| Rocker / Rocker shaft:<br>Internal diameter of the rocker hole<br>External diameter of the rocker shaft<br>Clearance between the rocker and rocker shaft                                  | 12.000~12.018 mm<br>11.981~11.991 mm<br>0.009~0.037 mm |  |
| Valve, valve seat, valve guide:<br>Valve clearance (cold)<br>INTAKE<br>EXHAUST<br>Valve measures<br>Intake<br>Head diameter<br>Face width<br>Seat width<br>Edge thickness                 | "A"<br>"B"<br>"C"<br>"D"                               | 0.05~0.09 mm<br>0.15~0.19 mm<br>33.9~34.1 mm<br>2.260 mm<br>0.9~1.1 mm<br>0.8~1.2 mm   |



| Model   | TTR230T  |  |
|---|--|--|
| <p>Exhaust</p> <p>Head diameter "A"</p> <p>Face width "B"</p> <p>Seat width "C"</p> <p>Edge thickness "D"</p>   | <p>28.4~28.6 mm</p> <p>2.260 mm</p> <p>0.9~1.1 mm</p> <p>0.8~1.2 mm</p>  |  |
| <p>External stem diameter</p> <p>INTAKE</p> <p>EXHAUST</p> <p>Internal guide diameter</p> <p>INTAKE</p> <p>EXHAUST</p> <p>Stem – guide clearance</p> <p>INTAKE</p> <p>EXHAUST</p> <p>&lt;Stem warping threshold&gt;</p> <p>Valve seat width</p> <p>INTAKE</p> <p>EXHAUST</p>  | <p>5.975~5.990 mm</p> <p>5.960~5.975 mm</p> <p>6.000~6.012 mm</p> <p>6.000~6.012 mm</p> <p>0.010~0.037 mm</p> <p>0.025~0.052 mm</p> <p>0.010 mm</p> <p>0.9~1.1 mm</p> <p>0.9~1.1 mm</p>  |  |
| <p>Valve springs:</p> <p>Free length</p> <p>INTAKE</p> <p>EXHAUST</p> <p>Length (valve closed)</p> <p>INTAKE</p> <p>EXHAUST</p> <p>Directions of the turns<br/>(top view)</p> <p>&lt;Inclination limit&gt;</p> <p>INTAKE</p> <p>EXHAUST</p>                                  | <p>Internal spring</p> <p>36.17 mm</p> <p>36.17 mm</p> <p>30.5 mm</p> <p>30.5 mm</p> <p>Counterclockwise</p>  <p>&lt;2,5°/1.6 mm&gt;</p> <p>&lt;2,5°/1.6 mm&gt;</p> | <p>External springs</p> <p>36.63 mm</p> <p>36.63 mm</p> <p>32.0 mm</p> <p>32.0 mm</p> <p>Clockwise</p>  <p>&lt;2,5°/1.6 mm&gt;</p> <p>&lt;2,5°/1.6 mm&gt;</p> |



| Model  | TTR230T  |
|--|--|
| <p>Piston:</p> <p>Piston diameter "D"</p> <p>Measuring point "H"</p>  <p>Piston offset</p> <p>Piston offset position</p> <p>Cylinder – piston clearance</p> <p>&lt;Clearance limit&gt;</p>  | <p>69.925~69.975 mm</p> <p>4.0 mm</p> <p>0.5 mm</p> <p>Intake side</p> <p>0.035~0.055 mm</p> <p>&lt;0.15 mm&gt;</p>  |
| <p>Piston rings:</p> <p>Type:</p> <p>Top ring</p> <p>Secondary ring</p> <p>Dimensions (BXT)</p> <p>Compression ring</p>  <p>Scraper ring</p>  <p>Oil ring</p>  <p>Inter-tip gap (installed):</p> <p>Compression ring</p> <p>Scraper ring</p> <p>Oil ring</p> <p>Side clearance (installed):</p> <p>Top ring</p> <p>Secondary ring</p> | <p>Round</p> <p>Flat</p> <p>B = 1.2 mm</p> <p>T = 2.8 mm</p> <p>B = 1.2 mm</p> <p>T = 2.8 mm</p> <p>B = 2.5 mm</p> <p>T = 2.8 mm</p> <p>0.15~0.30 mm</p> <p>0.15~0.30 mm</p> <p>0.30~0.90 mm</p> <p>0.03~0.07 mm</p> <p>0.02~0.06 mm</p> |
| <p>Crankshaft:</p> <p>Width "A"</p> <p>&lt;Misalignment threshold "C"&gt;</p> <p>Connecting rod lower clearance "D"</p> <p>&lt;Upper clearance limit "F"&gt;</p>    | <p>55.95~56.00 mm</p> <p>&lt;0.03 mm&gt;</p> <p>0.35~0.65 mm</p> <p>&lt;0.8 mm&gt;</p>   |
| <p>Balancer:</p> <p>Balancing method</p>   | <p>Gear</p>  |
| <p>Transmission:</p> <p>&lt;Main shaft warping limit&gt;</p> <p>&lt;Secondary shaft warping limit&gt;</p>  | <p>&lt;0.08 mm&gt;</p> <p>&lt;0.08 mm&gt;</p>  |
| <p>Shifting fork:</p> <p>Type</p>  | <p>Shifting fork and guide bar</p>   |










**TIGHTENING TORQUE  
ENGINE**

| Part to be tightened                        | Description        | Qty | Tightening torque |       |       | Note                    |
|---|--------------------|-----|-------------------|-------|-------|-------------------------|
|   |                    |     | N.m               | Kgf.m | ft.lb |                         |
| Spark plug                                  | --                 | 1   | 17.5              | 1.75  | 12.9  |                         |
| Oil flow bolt                               | Hexagonal bolt     | 7   | 7                 | 0.7   | 5.1   |                         |
| Head and cylinder                           | Bolt               | 4   | 22                | 2.2   | 17    | Apply oil on the washer |
| Head  | Bolt               | 1   | 20                | 2.0   | 14    | Oil inspection          |
| Cylinder head cover                         | Bolt               | 2   | 10                | 1.0   | 7.2   |                         |
| Valve cover                                 | Bolt               | 2   | 10                | 1.0   | 7.2   |                         |
| Camshaft                                    | Bolt               | 2   | 8                 | 0.8   | 5.8   |                         |
| Oil pump                                    | Bolt               | 3   | 7                 | 0.70  | 5.1   |                         |
| Draining plug                               | --                 | 1   | 43                | 4.30  | 31.7  |                         |
| Oil element cover                           | Bolts              | 2   | 10                | 1.00  | 7.2   |                         |
| Draining plug, oil element                  | Bolts              | 1   | 10                | 1.00  | 7.2   |                         |
| Carburetor manifold                         | Bolt               | 2   | 10                | 1     | 7.2   |                         |
| Air filter case cover                       | Self-tapping screw | 4   | 25                | 2.5   | 18    |                         |
| Air filter case                             | Self-tapping screw | 3   | 7                 | 0.70  | 5.1   |                         |
| Exhaust tube core                           | Bolt               | 3   | 10                | 1.00  | 7.2   |                         |
| Muffler (exhaust tube end) and frame        | Bolt               | 2   | 40                | 4.00  | 29.5  | Use lock washer         |
| Muffler (exhaust tube end) and exhaust tube | Bolt               | 1   | 16                | 1.60  | 11.8  |                         |
|   | Bolt               | 3   | 7                 | 0.70  | 5.1   |                         |
| Exhaust tube guard                          | Bolt               | 2   | 10                | 1.00  | 7.2   |                         |
| Exhaust tube and head                       | Nut                | 1   | 70                | 7.00  | 5.1   |                         |
| Main clutch                                 | Nut                | 1   | 8                 | 0.80  | 5.8   |                         |
| Disc, pressure                              | Bolt               | 4   | 6                 | 0.60  | 4.3   |                         |
| Disc, pressure                              | Nut                | 1   | 60                | 6.00  | 43    |                         |
| Primary gear                                | Bolt               | 1   | 12                | 1.2   | 8.7   |                         |
| Segment                                     | Nut                | 1   | 50                | 5.0   | 36    | Use lock washer         |
| Balancer                                    | Bolt               | 1   | 50                | 5.0   | 36    |                         |
| Crankshaft                                  | Bolt               | 1   | 10                | 1.0   | 7.2   |                         |
| Shift lever                                 | Bolt               | 2   | 10                | 1.00  | 7.2   |                         |
| Pinion                                      | Bolt               | 3   | 30                | 3.00  | 22    |                         |
| Clutch stator                               | Bolt               | 1   | 10                | 1.00  | 7.2   |                         |
| Tensioner                                   | Bolt               | 1   | 8                 | 0.80  | 5.8   |                         |
| Chain guide                                 | Bolt               | 1   | 60                | 6.00  | 43    |                         |
| Camshaft chain                              |                    |     |                   |       |       |                         |

# MAINTENANCE SPECIFICATIONS

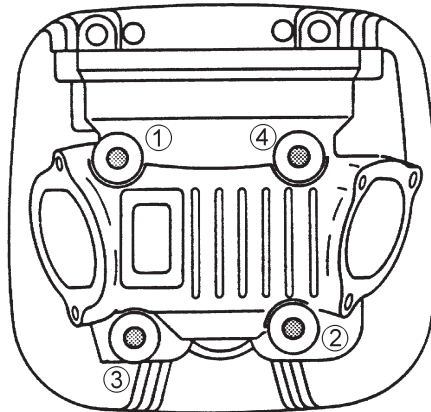
|             |   |
|-------------|---|
| <b>SPEC</b> |  |
|-------------|---|

| <i>Part to be tightened</i> | <i>Description</i> | <i>Qty</i> | <i>Tightening torque</i> |              |              | <i>Note</i>   |
|-----------------------------|--------------------|------------|--------------------------|--------------|--------------|---|
|                             |                    |            | <i>N.m</i>               | <i>Kgf.m</i> | <i>ft.lb</i> |   |
| Side cover - right          | Bolt               | 2          | 7                        | 0.70         | 5.1          | <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="text-align: left;">  </div> <div style="text-align: center;"> <p>Tighten with starting motor</p> </div> <div style="text-align: right;"> <br/>  </div> </div> |
| Side cover - right          | Bolt               | 1          | 23                       | 2.30         | 16           |   |
| Side cover - left           | Bolt               | 1          | 23                       | 2.30         | 16           |   |
| Side cover - left           | Bolt               | 1          | 7                        | 0.70         | 5.1          |   |
| Battery case                | Bolt               | 2          | 7                        | 0.70         | 5.1          |   |
| Crankcase                   | Flange bolt        | 6          | 10                       | 1.0          | 7.2          |   |
| Crankcase                   | Flange bolt        | 1          | 10                       | 1.0          | 7.2          |   |
| Crankcase                   | Flange bolt        | 2          | 10                       | 1.0          | 7.2          |   |
| Crankcase                   | Flange bolt        | 1          | 10                       | 1.0          | 7.2          |   |
| Left crankcase cover        | Flange bolt        | 5          | 10                       | 1.0          | 7.2          |   |
| Left crankcase cover        | Flange bolt        | 3          | 10                       | 1.0          | 7.2          |   |
| Coil cable guide            | Flange bolt        | 1          | 10                       | 1.0          | 7.2          |   |
| Driving gear cover          | Flange bolt        | 2          | 10                       | 1.0          | 7.2          |   |
| Right crankcase cover       | Flange bolt        | 5          | 10                       | 1.0          | 7.2          |   |
| Right crankcase cover       | Flange bolt        | 3          | 10                       | 1.0          | 7.2          |   |
| Right crankcase cover       | Flange bolt        | 2          | 10                       | 1.0          | 7.2          |   |
| Stator assembly             | Flange bolt        | 5          | 10                       | 1.00         | 7.2          |   |
| Pulse coil                  | Flange bolt        | 2          | 10                       | 1.00         | 7.2          |   |



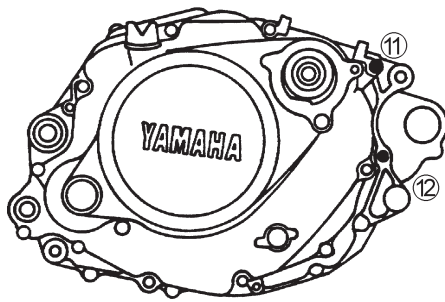
Tightening sequence:

Head

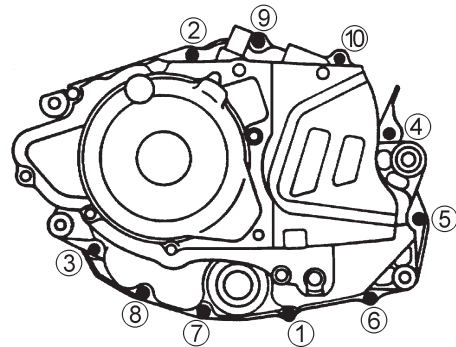


Crankcase

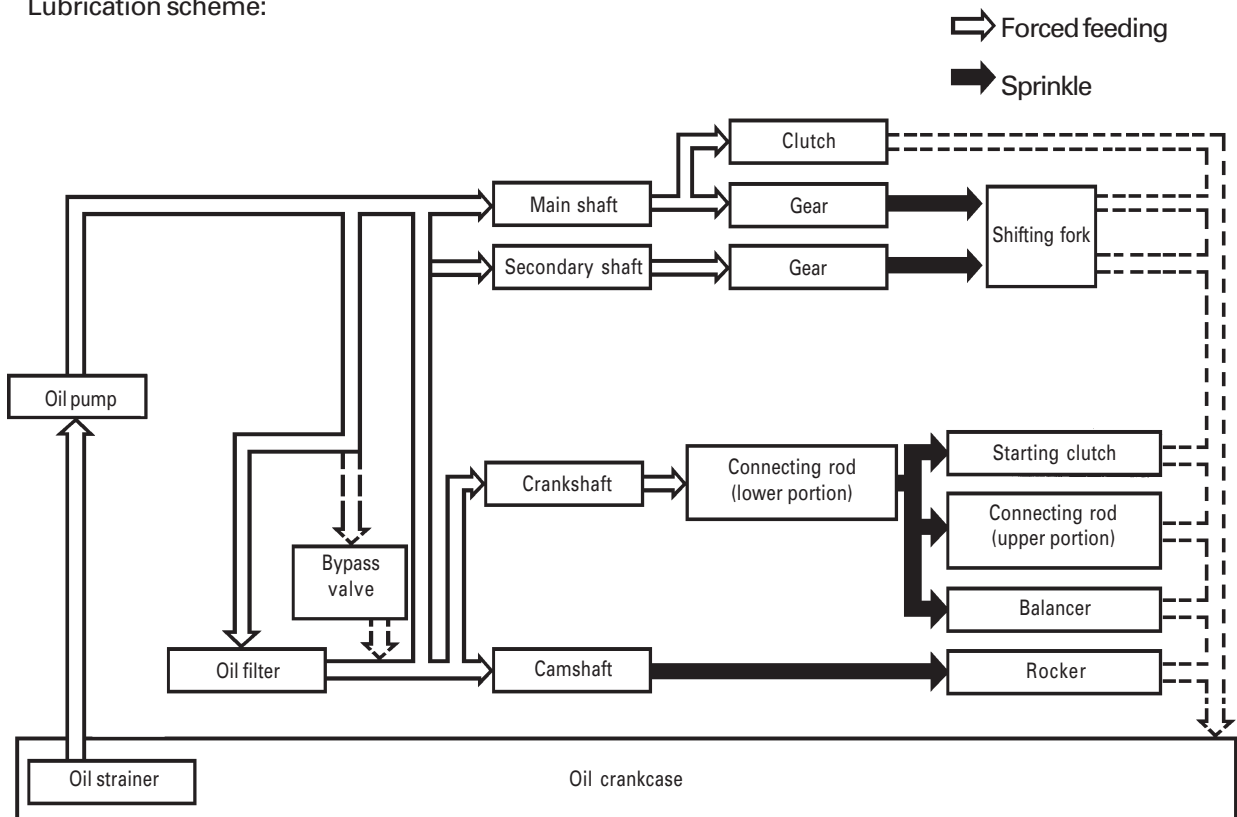
Right side



Left side



Lubrication scheme:





**FRAME**

|   |   |
|---|---|
| Steering system:<br>Roller bearing type   | conical top and bottom  |
| Front suspension:<br>Suspension travel<br>Free suspension spring length<br>Spring force/travel<br><br>Oil level<br>Oil capacity<br>Oil type | 240 mm<br>614.2 mm<br>(k1) 3.43 N/mm (0.34 Kg/m)<br>(k2) 4.80 N/mm (0.48 Kg/m)<br><br>161 mm<br>352 cm <sup>3</sup><br>suspension oil 10W or equivalent |
| Rear suspension:<br>Shock absorber travel<br>Free spring length<br>Installed length<br>Spring force/travel<br>Gas pressure                  | 81 mm<br>210 mm<br>204 mm<br>83.40 N/mm<br>2.0 MPa  |
| Front wheel:<br>Type<br>Wheel ring dimensions<br>Ring material<br><Ring warping limit><br>Vertical<br>Side                                  | Spoked<br>1.60 x 21<br>Aluminum<br><br><2.0 mm><br><2.0 mm>   |
| Rear wheel:<br>Type<br>Wheel ring dimensions<br>Ring material<br><Ring warping limit><br>Vertical<br>Side                                   | Spoked<br>1.85 x 18<br>Aluminum<br><br><2.0 mm><br><2.0 mm>   |
| Transmission chain:<br>Type/Manufacturer<br># of links<br>Clearance   | 520 V2/DAIDO<br>106<br>45~60 mm   |



|   |   |
|---|---|
| <p>Front disc brake:</p> <p>Type</p> <p>Disc external diameter</p> <p>Disc thickness</p> <p>Disc pad thickness</p> <p>&lt;Wear threshold&gt;</p> <p>Master cylinder internal diameter</p> <p>Disc brake caliper internal diameter</p> <p>Brake fluid type</p> | <p>single</p> <p>220 mm</p> <p>3.5 mm</p> <p>5.2 mm</p> <p>&lt;0.8 mm&gt;</p> <p>11 mm</p> <p>25.4 x 2 mm</p> <p>DOT N° 4</p> |
| <p>Rear drum brake:</p> <p>Type</p> <p>Drum's internal diameter</p> <p>&lt;Limit&gt;</p> <p>Brake lining thickness</p> <p>&lt;Limit&gt;</p> <p>Free shoe spring length</p>  | <p>Drum</p> <p>130 mm</p> <p>&lt;131 mm&gt;</p> <p>4.0 mm</p> <p>&lt;2 mm&gt;</p> <p>50.5 mm</p>                              |
| <p>Brake lever and pedal:</p> <p>Pedal position</p> <p>Pedal clearance</p>  | <p>3 mm below the footboard top</p> <p>20~30 mm</p>   |
| <p>Clutch and accelerator lever:</p> <p>Lever clearance</p> <p>Accelerator grip clearance</p>   | <p>10~15 mm in the lever end</p> <p>3 ~ 5 mm</p>  |



**TIGHTENING TORQUE**

| Part to be tightened                         | Description      | Qty | Tightening torque |       |       | Note |
|--|------------------|-----|-------------------|-------|-------|------|
|  |                  |     | N.m               | Kgf.m | ft.lb |      |
| Engine support (front and bottom) and frame  | Self-locking nut | 2   | 46                | 4.6   | 33.9  |      |
| Engine support (front and bottom) and engine | Self-locking nut | 2   | 46                | 4.6   | 33.9  |      |
| Engine support (front and top) and frame     | Bolt             | 2   | 38                | 37.5  | 27.7  |      |
| Engine support (front and top) and engine    | Self-locking nut | 1   | 33                | 3.25  | 24    |      |
| Engine (rear and bottom) and frame           | Self-locking nut | 1   | 46                | 4.6   | 33.9  |      |
| Engine guard                                 | Flange bolt      | 3   | 55                | 5.45  | 40.2  |      |
| Chain tensioner - bottom                     | Threaded bolt    | 1   | 7                 | 0.7   | 5.1   |      |
| Tensioner - rear                             | Flange bolt      | 1   | 23                | 2.3   | 16.9  |      |
| Connecting rod and frame                     | Nut              | 1   | 53                | 5.25  | 38.7  |      |
| Connecting rod and relay arm                 | Nut              | 1   | 53                | 5.25  | 38.7  |      |
| Rear fork and relay arm                      | Bolt             | 1   | 52                | 5.25  | 38.3  |      |
| Chain guide and rear fork                    | Bolt             | 2   | 7                 | 0.7   | 5.1   |      |
| Chain guard and rear fork                    | Bolt             | 2   | 7                 | 0.7   | 5.1   |      |
| Engine and rear fork                         | Nut              | 1   | 80                | 8     | 59    |      |
| Spoke fastener                               | Nipple           | 2   | 4                 | 0.4   | 2.9   |      |
| Relay arm and rear suspension                | Nut              | 1   | 35                | 3.45  | 25.5  |      |
| Rear suspension and frame                    | Nut              | 1   | 35                | 3.45  | 25.5  |      |
| Bottom support and top base                  | Nut              | 1   | 110               | 11    | 81.1  |      |
| Top base and ring                            | Nut              | 1   | see note          |       |       |      |
| Top support and top base                     | Flange bolt      | 2   | 23                | 2.3   | 16.9  |      |
| Top base and internal tube                   | Flange bolt      | 2   | 20                | 2     | 14.7  |      |
| Number plate                                 | Flange bolt      | 1   | 7                 | 0.7   | 5.1   |      |
| Support and top base                         | Flange bolt      | 2   | 7                 | 0.7   | 5.1   |      |
| Brake hose clamp                             | Bolt             | 2   | 7                 | 0.7   | 5.1   |      |
| Cable guide (top)                            | Bolt             | 2   | 20                | 2     | 14.7  |      |
| Bottom support and internal tube             | Flange bolt      | 2   | 20                | 2     | 14.7  |      |
| Valve base and external tube                 | Bolt             | 1   | 20                | 2     | 14.7  |      |

**NOTE:**

1. First, tighten the castellated nut by approximately 43 N.m (4.3 kg.m, 31.7 ft.lb) with the torque wrench, and then loosen the castellated nut 1/4 turn.
2. Re-tighten the castellated nut by 6.5 N.m (0.65 kg.m, 4.8 ft.lb).

# MAINTENANCE SPECIFICATIONS

SPEC



| <i>Part to be tightened</i>       | <i>Description</i> | <i>Qty</i> | <i>Tightening torque</i> |              |              | <i>Note</i> |
|-----------------------------------|--------------------|------------|--------------------------|--------------|--------------|-------------|
|                                   |                    |            | <i>N.m</i>               | <i>Kgf.m</i> | <i>ft.lb</i> |             |
| Front wheel axle                  | Nut                | 1          | 80                       | 8            | 59           |             |
| Brake pedal                       | Shaft              | 1          | 30                       | 3            | 22.1         |             |
| Shift lever                       | Bolt               | 1          | 7                        | 0.7          | 5.1          |             |
| Side stand                        | Self-locking nut   | 1          | 44                       | 4.35         | 32           |             |
| Footboard                         | Flange bolt        | 2          | 48                       | 4.75         | 35           |             |
| Brake cylinder                    | Bolt               | 2          | 7                        | 0.7          | 5.1          |             |
| Bleeding bolt                     | Bolt               | 1          | 6                        | 0.4          | 4.4          |             |
| Dowel pin, Disc brake caliper     | Pin                | 2          | 18                       | 1.8          | 13.2         |             |
| Front disc brake                  | Flange bolt        | 6          | 13                       | 1.3          | 9.5          |             |
| Disc brake caliper and front fork | Flange bolt        | 2          | 40                       | 4            | 29.5         |             |
| Front fender                      | Bolt               | 4          | 7                        | 0.7          | 5.1          |             |
| Rear fender                       | Bolt               | 4          | 7                        | 0.7          | 5.1          |             |
| Edge                              | Bolt               | 2          | 3                        | 0.3          | 2.2          |             |
| Rear wheel                        | Self-locking nut   | 1          | 80                       | 8            | 59           |             |
| Wheel sprocket                    | Bolt               | 6          | 35                       | 3.45         | 25.5         |             |
| Carburetor manifold               | Bolt               | 2          | 10                       | 1            | 7.2          |             |
| Air filter case cover             | Self-tapping screw | 4          | 25                       | 2.5          | 18.4         |             |
| Air filter case                   | Threaded bolt      | 3          | 7                        | 0.7          | 5.1          |             |
| Seat support                      | Bolt               | 1          | 7                        | 0.70         | 5.1          |             |
| Tank strap fastener               | Bolt               | 1          | 7                        | 0.70         | 5.1          |             |
| Fuel cock, assembly               | Bolt               | 2          | 7                        | 0.70         | 5.1          |             |
| Fuel tank and frame               | Bolt               | 2          | 10                       | 1.00         | 7.2          |             |
| Air intake                        | Bolt               | 2          | 7                        | 0.70         | 5.1          |             |
| Battery case                      | Bolt               | 2          | 7                        | 0.70         | 5.1          |             |
| Starting relay                    | Flange bolt        | 2          | 7                        | 0.70         | 5.1          |             |
| Ignition coil                     | Flange bolt        | 2          | 98                       | 9.75         | 71.9         |             |
| Rectifier and regulator           | Flange bolt        | 1          | 7                        | 0.70         | 5.1          |             |
| Neutral switch                    | --                 | 1          | 20                       | 2.00         | 14           |             |



**ELECTRIC**

| Model   | TTR230T  |
|---|--|
| Voltage:  | 12V  |
| Ignition system:<br>Ignition point (A.P.M.S.)<br>Ignition advance (A.P.M.S.)<br>Advance type                                | 9° at 1,500 rpm<br>29.5° at 7,500 rpm<br>Electric                          |
| C.D.I.:<br>Model/Manufacturer<br>Pulse coil resistance (COR)  | AZ071000-2680/DENSO<br>192~288 ohm at 20°C (Blue/yellow-green)             |
| Ignition coil:<br>Model/Manufacturer<br>Primary winding resistance<br>Secondary winding resistance<br>Minimum gap for spark | 2JN/YAMAHA<br>0.18~0.28 ohm at 20°C<br>6.3~9.5 K ohm at 20°C<br>6.0 mm     |
| Charging system:<br>Type  | Magnet flywheel  |
| Spark plug cap :<br>Type<br>Resistance  | Resin<br>10K at 20°C   |
| A.C. Generator:<br>Model/Manufacturer<br>Output current<br>Coil resistance  | 1C6/DENSO<br>10A,14V at 5,000 rpm<br>0.72~1.08 ohm at 20°C (White - Black) |
| Rectifier/voltage regulator:<br>Model/Manufacturer<br>Voltage regulator:<br>Type  | TWBAlI/DENSO<br>Semiconductor – short-circuit type                         |
| Battery:<br>Specific density  | 1320 g/dm <sup>3</sup> at 27°C   |





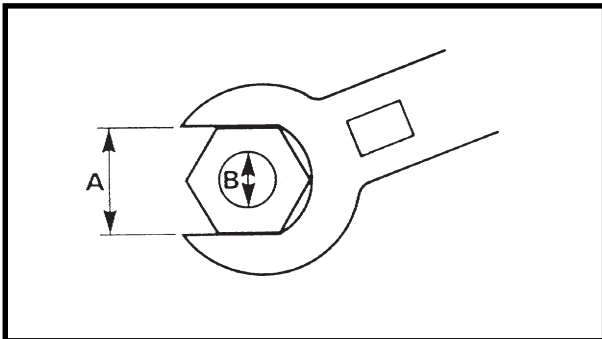
| Model   | TTR230T   |
|---|---|
| Electric starting system:<br>Type   | Constant mesh   |
| Starting motor:<br>Model/Manufacturer<br>Output power:<br>Brush length<br><Limit><br>Switch diameter<br><Limit><br>Mica depth | 1C6/YAMAHA<br>0.4 KW<br>10.0 mm<br><3.5 mm><br>22.0 mm<br><21.0 mm><br>1.5 mm |
| Starting relay:<br>Model/Manufacturer<br>Current rate   | MS5F - 751/JIDECO<br>180 A  |
| Protection circuit:<br>Type   | Fuse  |
| Fuse:<br>Main fuse<br>Reserve fuse  | 10 A<br>10 A  |



**GENERAL TORQUE SPECIFICATIONS**

This attachment specifies the tightening torque for ISO Standard threads. The torque specifications for components or special assemblies are included in the respective sections of this manual. To prevent warping, tighten the assembly bolts in a cross pattern and progressive stages up to the specified torque. When not otherwise specified, the torque specifications are for clean and dry threads. The components shall be at room temperature.

















| A<br>(Nut) | B<br>(Bolt) | General torque specifications |      |       |
|------------|-------------|-------------------------------|------|-------|
|            |             | N.m                           | Kg.m | 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    |

























- A: Distance between plans
- B: External thread diameter

| Units              | Reading                        | Definition  | Measure                        |
|--------------------|--------------------------------|---|--------------------------------|
| mm<br>cm           | millimeter<br>centimeter       | $10^{-3}$ meters<br>$10^{-2}$ meters                          | Length<br>Length               |
| kg                 | Kilogram                       | $10^3$ grams  | Weight                         |
| N                  | Newton                         | $\text{Kg} \times \text{m}/\text{sec}^2$                      | Force                          |
| Nm<br>Kgm          | Newton Meter<br>Kilogram Meter | $\text{N} \times \text{Meter}$<br>$\text{kg} \times \text{m}$ | Torque<br>Torque               |
| Pa<br>N/mm         | Pascal<br>Newton/millimeter    | $\text{N}/\text{m}^2$<br>N/mm                                 | Pressure<br>Spring coefficient |
| L<br>$\text{cm}^3$ | Liter<br>cubic centimeter      | —<br>—  | Volume<br>or capacity          |
| r.p.m.             | Revolutions per minute         | —   | Engine speed                   |

**LUBRICATION POINTS AND LUBRICANT TYPES  
ENGINE**

| <i>Lubrication points</i>          | Symbol  |
|------------------------------------|---|
| Retainer lips (all)                |    |
| Roller bearings (all)              |    |
| Bolts (head)                       |    |
| Crankshaft pin                     |    |
| Connecting rod (lower portion)     |    |
| Piston and piston rings            |    |
| Piston pin                         |    |
| Valve stem and guides              |    |
| Retainer (valve stem)              |    |
| Rocker shaft and rocker            |    |
| Cams and roller bearing (Camshaft) |    |
| O-ring (Drain plug)                |    |
| Clutch bar                         |  |
| Primary gear and main shaft        |  |
| Gearbox                            |  |
| Shift lever                        |  |
| Crankcase surfaces                 | Yamaha Bond n°1215 Glue   |

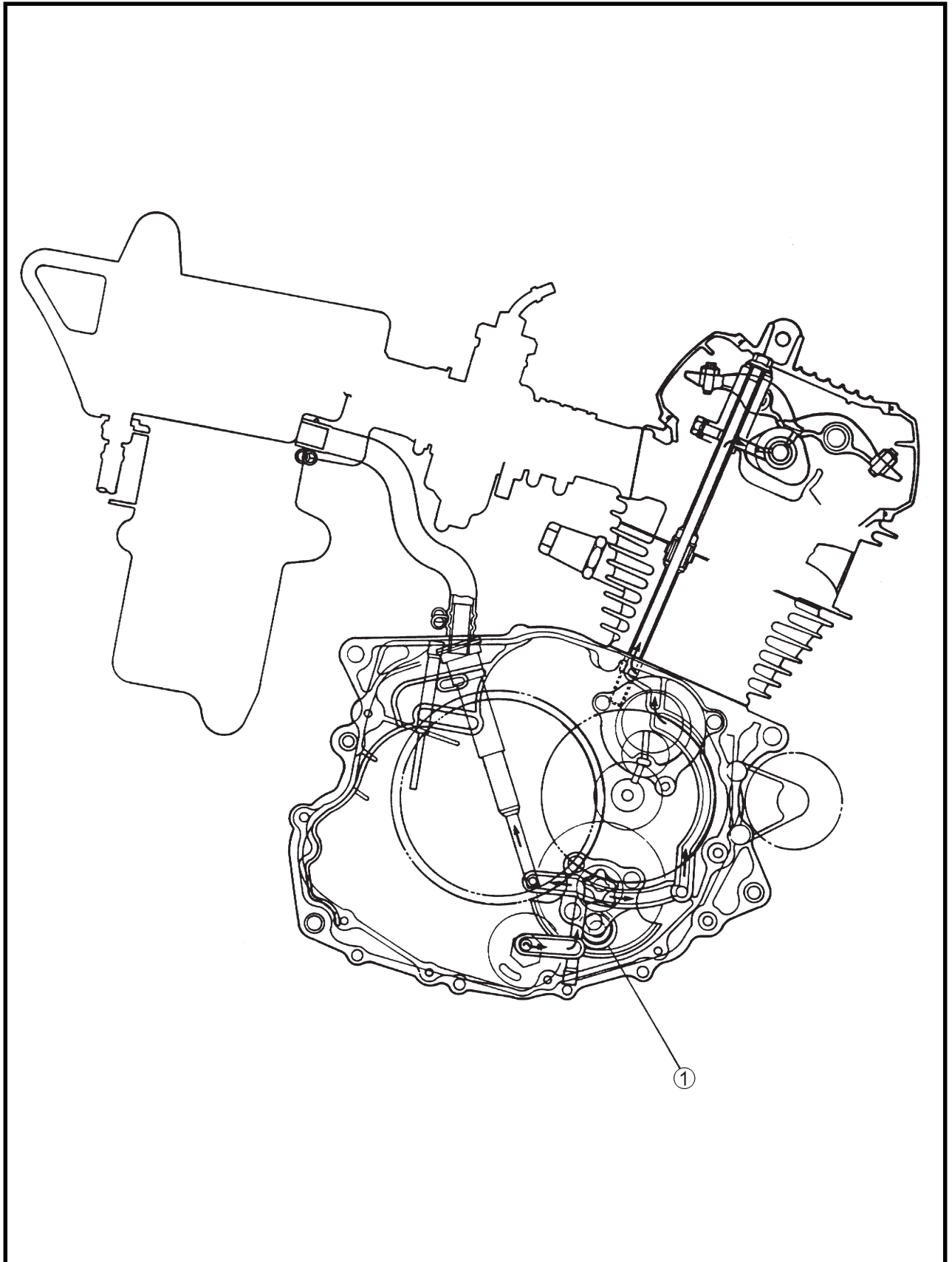
**FRAME**

| <i>Lubrication points</i>                        | Symbol  |
|--|---|
| Speedometer                                      |    |
| Retainer lips (all)                              |    |
| Wheel axle (front and rear)                      |    |
| Rear wheel hub                                   |    |
| Brake shoe plate, shaft and pin                  |    |
| Bushes (balance) and covers                      |    |
| Spacer (balance)                                 |    |
| Pivot shaft (balance)                            |    |
| Bush (shock absorber)                            |    |
| Cap (Shock absorber and relay arm)               |    |
| Bush (relay arm and union arm)                   |    |
| Bush (relay arm and union arm)                   |  |
| Bush (union arm and frame)                       |  |
| Spacer (union arm and frame)                     |  |
| Bushes (relay arm and frame) and cover           |  |
| Spacers (relay arm and balance)                  |  |
| Articulated points (brake pedal shaft and frame) |  |
| Balls and raceways (steering bearing)            |  |
| Guide tube (accelerator grip)                    |  |
| Articulated points (brake and clutch levers)     |  |
| Articulated points (side stand)                  |  |
| Bushes (chain tensioner)                         |  |



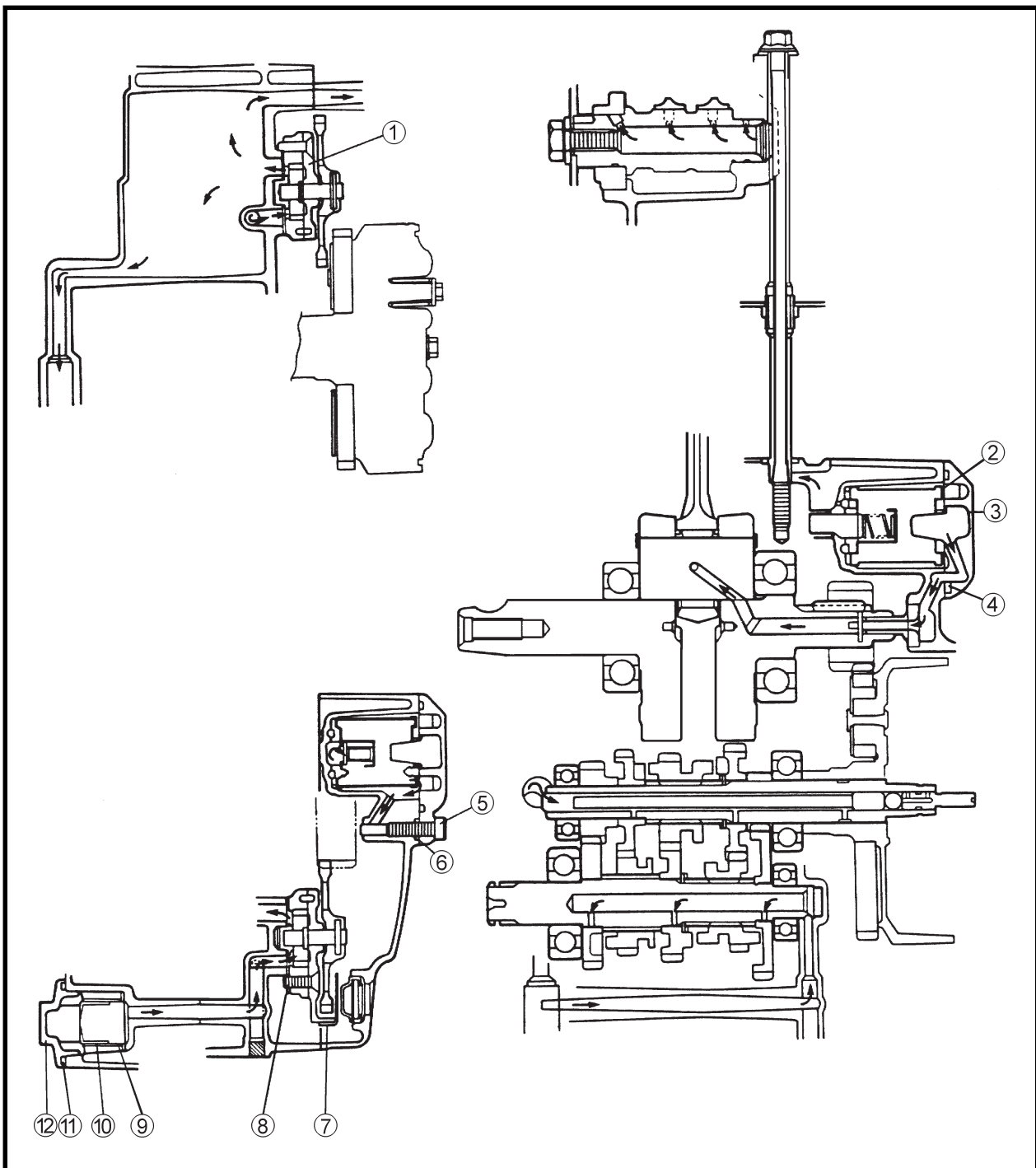
LUBRICATION DIAGRAM

- ① Oil pump





- ① Oil pump
- ② Oil filter
- ③ Filter cover
- ④ O-ring
- ⑤ Bolt
- ⑥ O-ring
- ⑦ Gear cover
- ⑧ Pump cover gasket
- ⑨ Oil strainer
- ⑩ Spring
- ⑪ O-ring
- ⑫ Drain plug



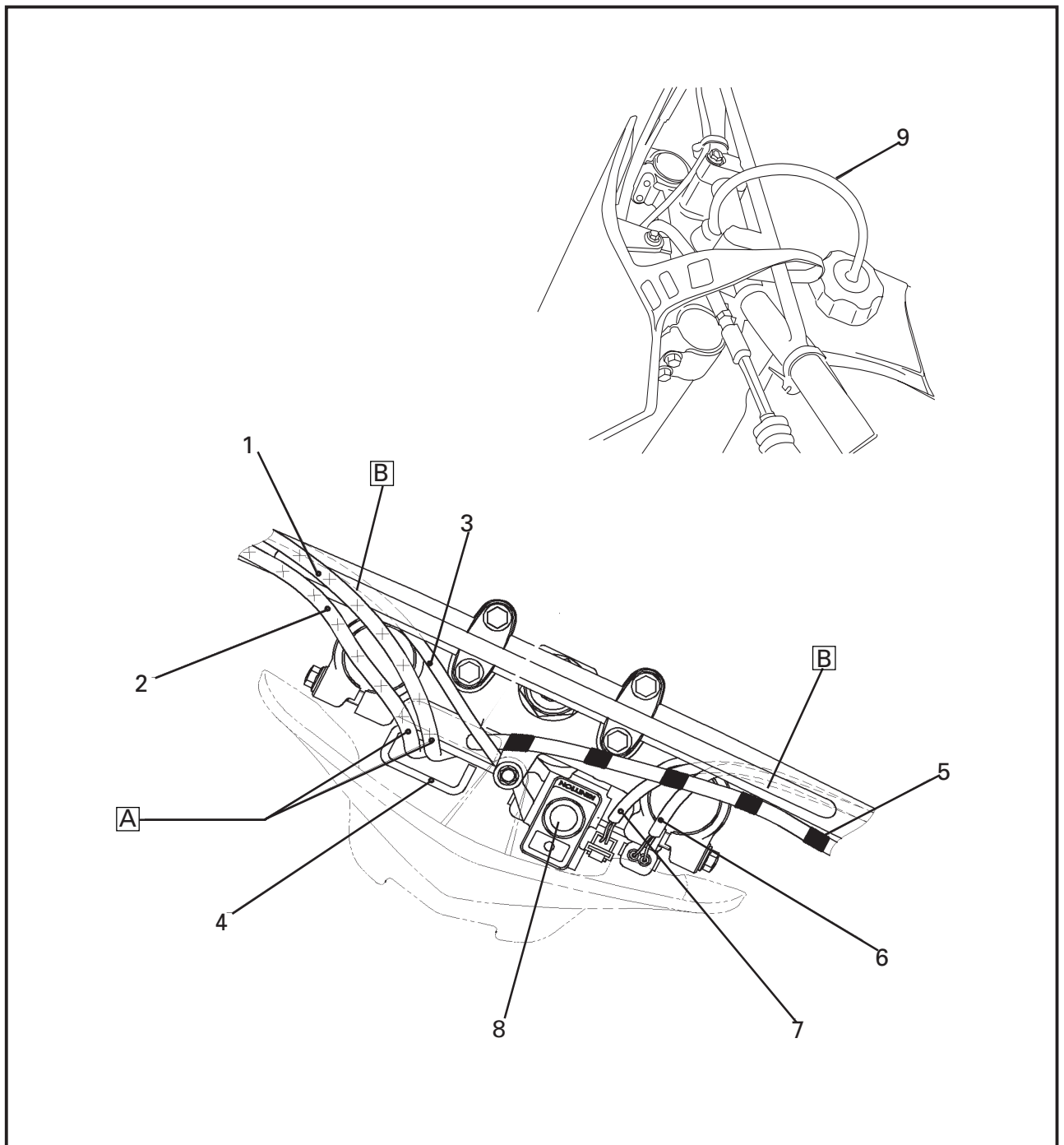


## HANDLE BAR

- ① Accelerator cable - Main
- ② Accelerator cable - Return
- ③ Starting switch harness
- ④ Cable routing slot
- ⑤ Clutch cable
- ⑥ Engine stop harness
- ⑦ Clutch switch harness
- ⑧ Ignition switch
- ⑨ Breather hose

**A** Route the cables into the slot.

**B** Fasten the harnesses with the tie wrap.

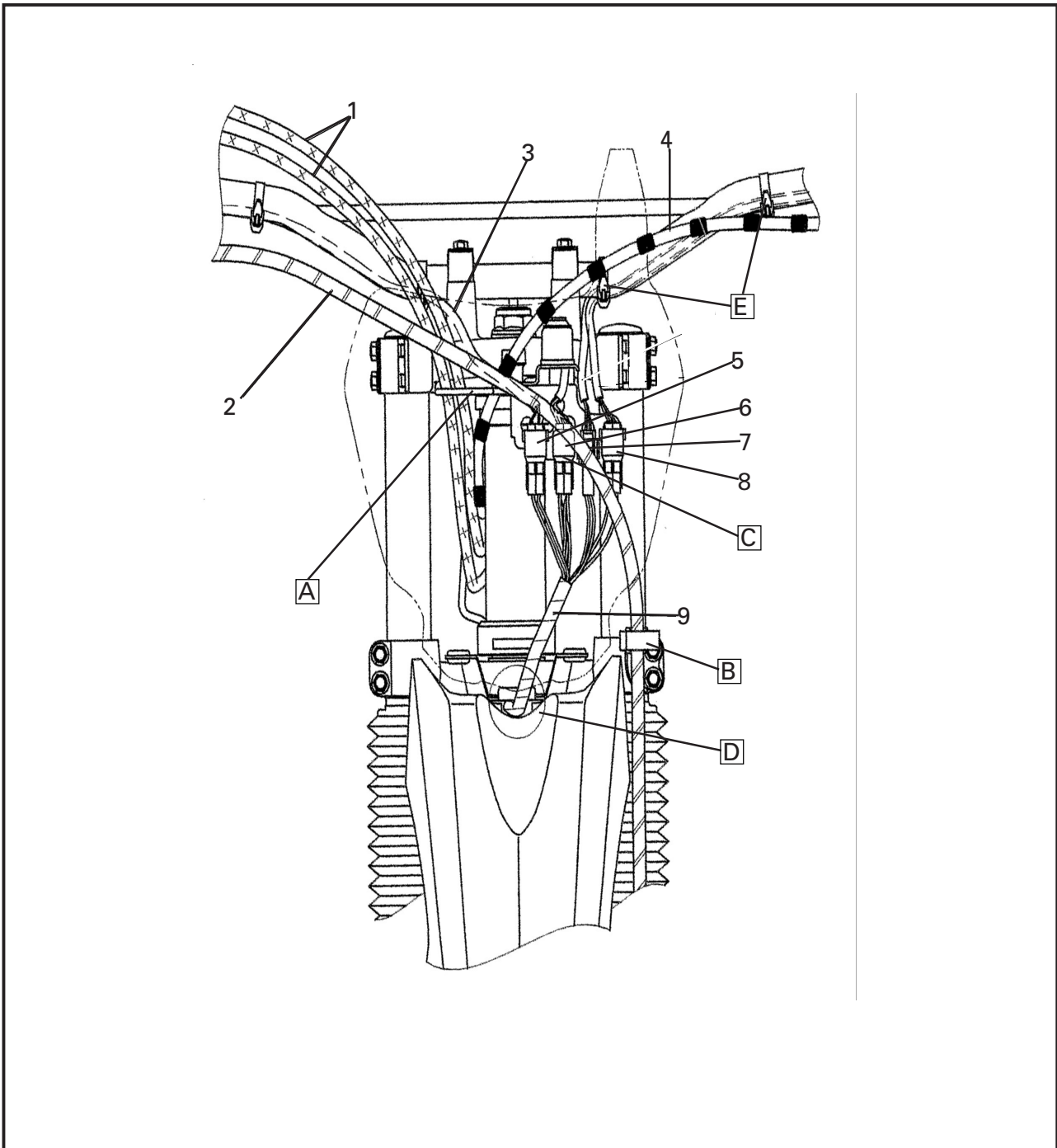




FRONT

- ① Accelerator cable
- ② Brake hose
- ③ Starting switch harness
- ④ Clutch cable
- ⑤ Starting switch connector
- ⑥ Ignition switch connector
- ⑦ Clutch switch connector
- ⑧ Engine stop switch connector
- ⑨ Main harness

- A Route the cables into the slot
- B Route the hose into the support
- C Fasten the connectors in the support
- D Route the harness through the opening
- E Mount with tie wraps (both sides)



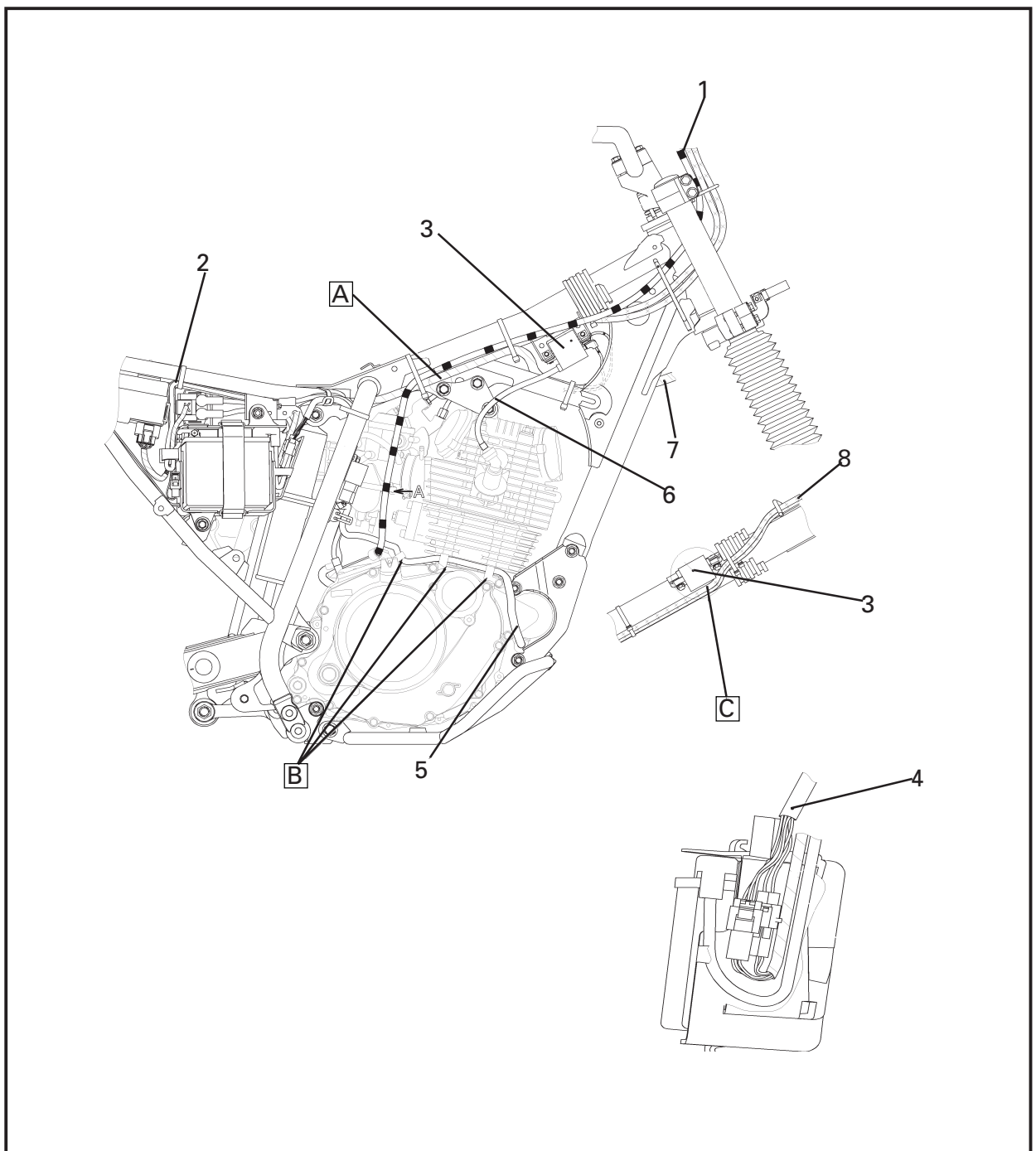




**MOTORCYCLE (RIGHT SIDE)**

- ① Clutch cable
- ② Negative cable (ground)
- ③ Ignition coil
- ④ AC magnet harness
- ⑤ Starting motor cable
- ⑥ High voltage cable
- ⑦ Main harness

- A** The harness should not touch the bolt
- B** Fasten the cables by using the clamps
- C** The accelerator cable should not touch the ignition coil

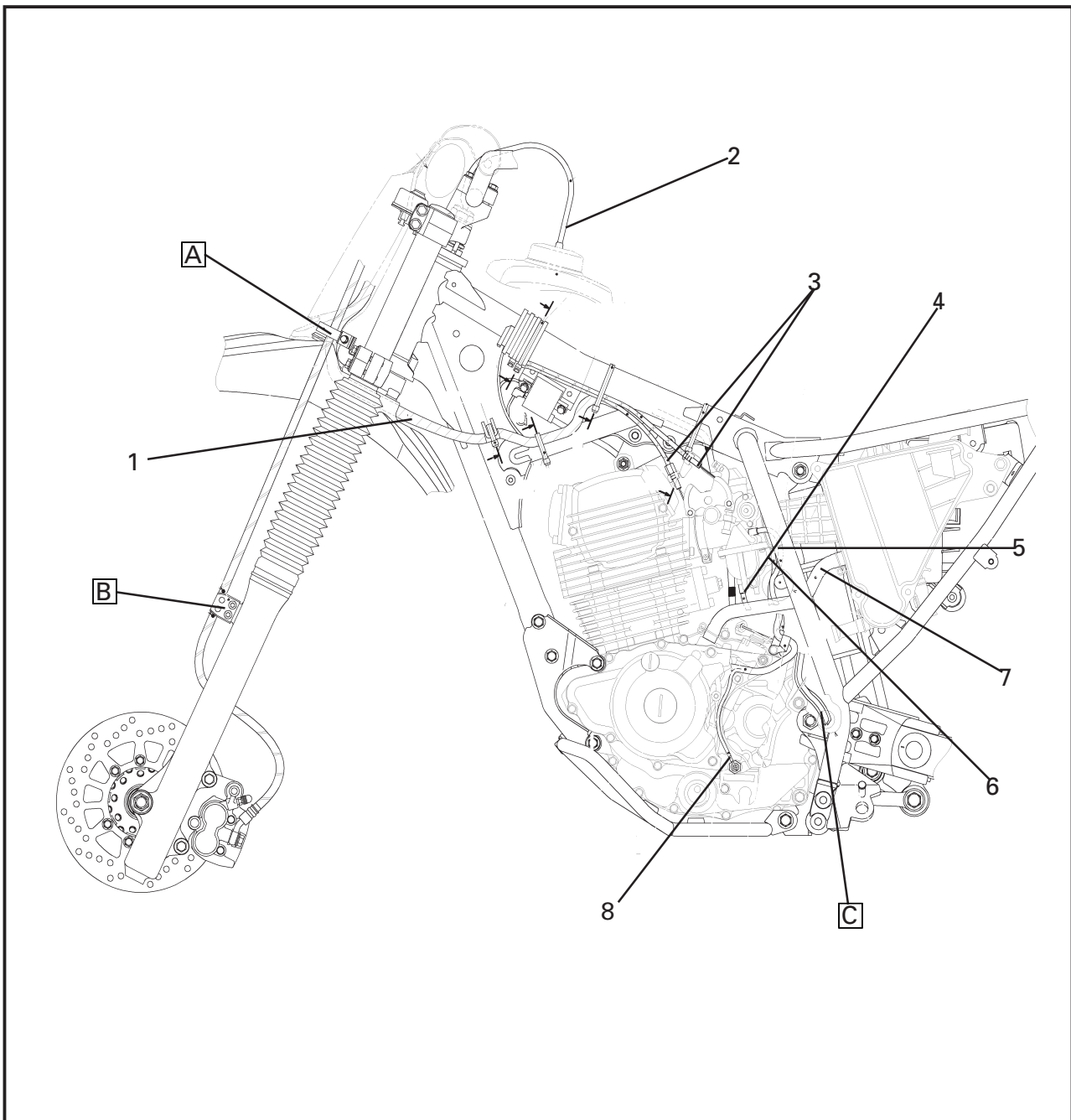




## MOTORCYCLE (LEFT SIDE)

- ① Main harness
- ② Tank breather hose
- ③ Accelerator cables (main and return)
- ④ Carburetor draining hose
- ⑤ Carburetor draining hose (right side)
- ⑥ Carburetor draining hose (left side)
- ⑦ Engine breather hose
- ⑧ Dead point switch wire

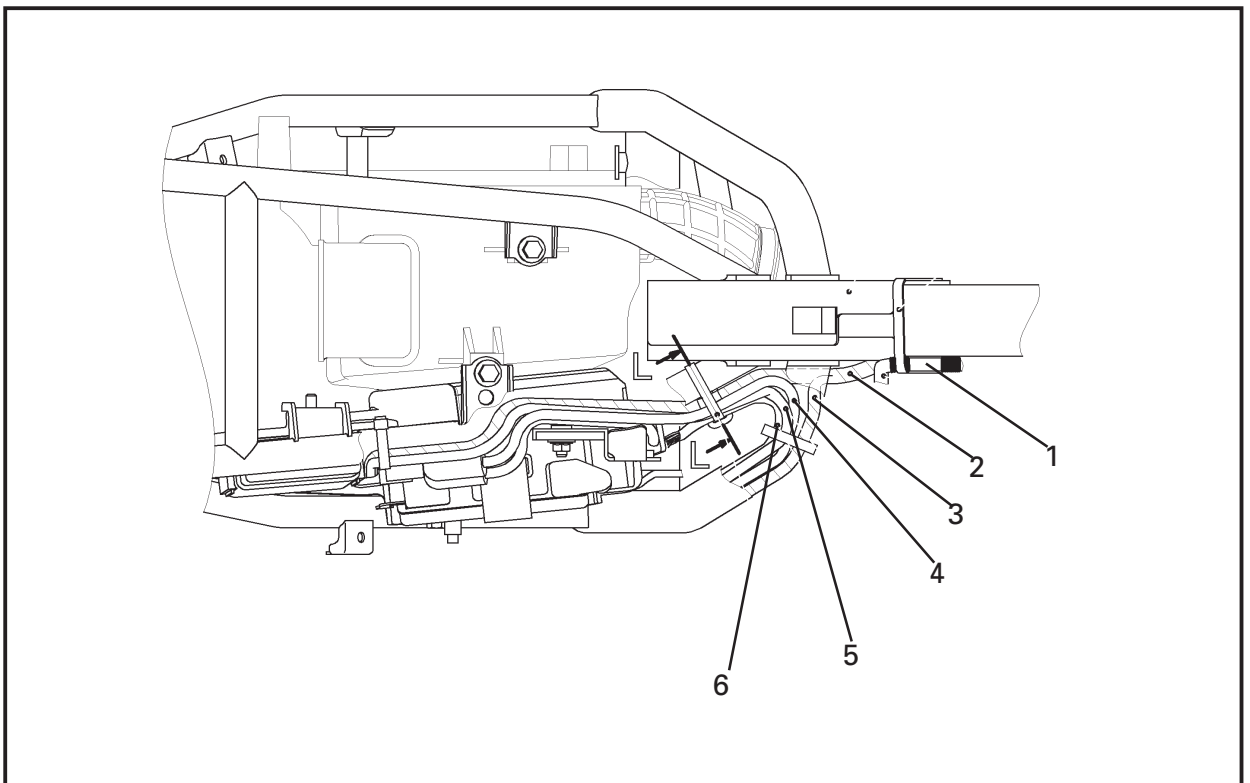
- A** Route the brake hose through the guide.
- B** Fasten the brake hose as per the figure.
- C** The final draining hose cutting shall face the motorcycle rear side.





## INTERNAL OPENING

- ① Clutch cable
- ② Main harness
- ③ Regulating rectifier harness
- ④ Starting motor cable
- ⑤ Negative cable (ground)
- ⑥ AC magnet harness

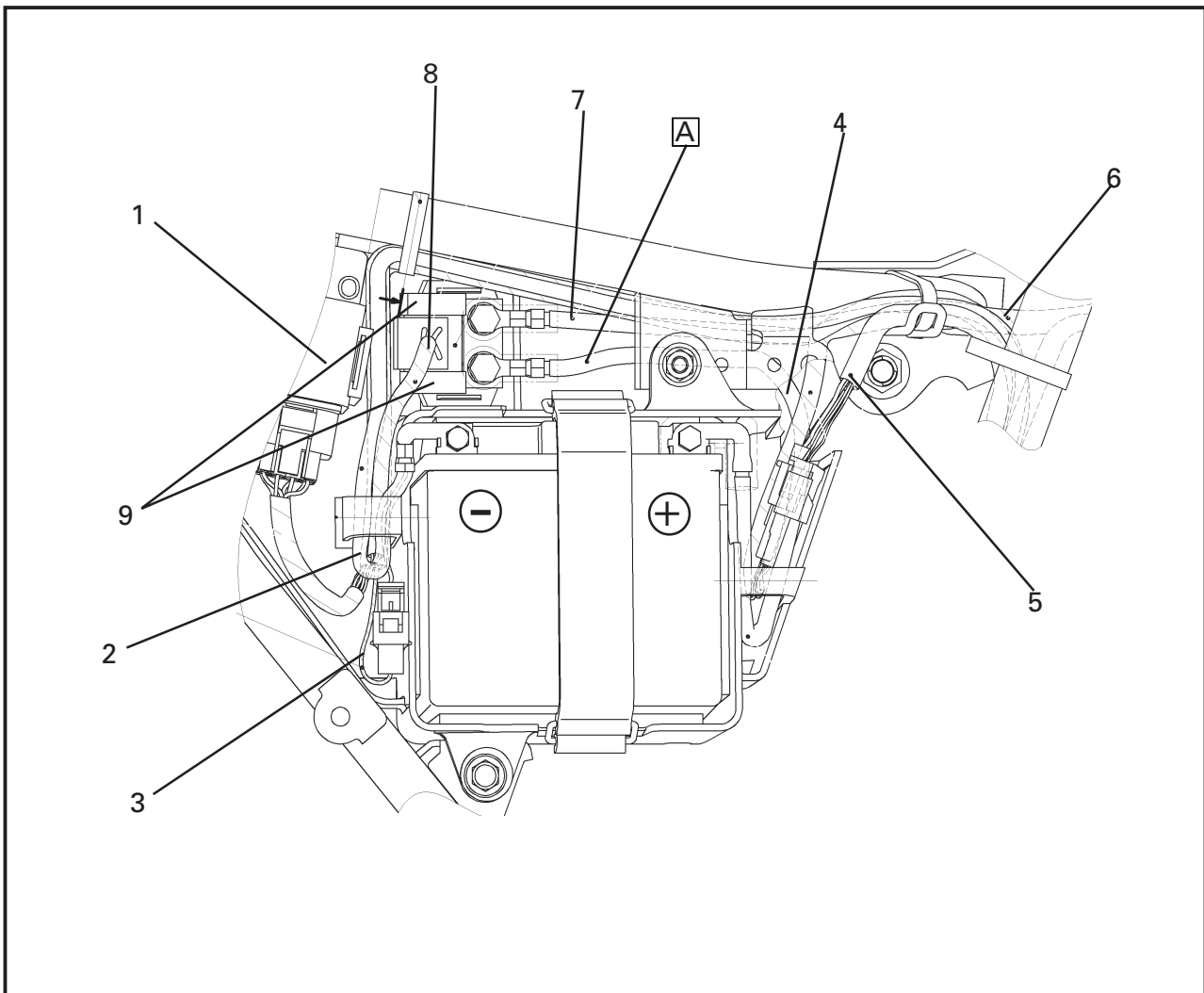




## BATTERY AND COMPONENTS

- ① CDI Unit
- ② Negative cable (ground)
- ③ Harness negative wire
- ④ Positive cable
- ⑤ AC magnet harness
- ⑥ Main harness
- ⑦ Starting motor cable
- ⑧ Starting relay harness
- ⑨ Safety fuses

**A** Starting relay connection with the battery positive pole.



## **CHAPTER 3.**

### **PERIODIC INSPECTION AND ADJUSTMENTS**

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## **PERIODIC INSPECTION AND ADJUSTMENTS**

### **INTRODUCTION**

This chapter includes all information required for carrying out the recommended preventive inspection and adjustment procedures that, when observed, ensure a reliable operation and longer service life of the vehicle. The need for an expensive overhaul service will be substantially reduced. This information applies to vehicles in service, as well as new vehicles being prepared for sale. All technicians engaged on services should be familiarized with this whole chapter.

### **MAINTENANCE SCHEDULE TABLE**

Carrying out an appropriate periodic maintenance is essential. Maintenance services concerning pollutant emission control are specially important. These services not only ensure a cleaner air but are also essential for achieving better engine operation and maximum efficiency. The pollutant emission control services are listed in a single table as follows.

### **PERIODIC MAINTENANCE / POLLUTANT EMISSION CONTROL**

NOTE:

- From 4,200 mi. (7,000 km) or 9 months, repeat the maintenance intervals at each 1,800 mi (300 km) or 3 months.
- We recommend that items marked with an (\*) be overhauled at a Yamaha authorized dealer shop.

| No. | ITEM                  | SERVICE   | INITIAL                            | EACH                                  |                                       |
|-----|-----------------------|---|------------------------------------|---------------------------------------|---------------------------------------|
|     |                       |   | 600 mi<br>(1,000 km)<br>or 1 month | 1,800 mi<br>(3,000 km)<br>or 3 months | 3,000 mi<br>(5,000 km)<br>or 6 months |
| 1.  | Fuel line*            | Inspect the fuel hoses for cracks or damage. If necessary, replace.                 | ○                                  | ○                                     | ○                                     |
| 2.  | Spark plug            | Check the conditions.<br>Adjust the clearance and clean                             | ○                                  | ○                                     | ○                                     |
| 3.  | Valve clearance*      | Check and adjust the valve clearance with the engine cold.                          | ○                                  | ○                                     | ○                                     |
| 4.  | Air filter*           | Clean with solvent.<br>If necessary, replace.                                       | ○                                  | ○                                     | ○                                     |
| 5.  | Case breather system* | Inspect ducts for cracks and damage and remove any deposits. If necessary, replace. | ○                                  | ○                                     | ○                                     |
| 6.  | Carburetor*           | Check the idle speed and the choke operation. If necessary, adjust.                 | ○                                  | ○                                     | ○                                     |
| 7.  | Exhaust system        | Check for leakage. If necessary, tighten or replace the gaskets.                    | ○                                  | ○                                     | ○                                     |
| 8.  | Engine oil            | Replace. (Warm the engine up before draining the oil.)                              | ○                                  | ○                                     | ○                                     |
| 9.  | Oil filter            | Clean.  | ○                                  | ○                                     | ○                                     |

**GENERAL MAINTENANCE / LUBRICATION**

| N°  | ITEM                         | SERVICE   | INITIAL                            | EACH                                  |                                       |
|-----|------------------------------|---|------------------------------------|---------------------------------------|---------------------------------------|
|     |                              |   | 600 mi<br>(1,000 km)<br>or 1 month | 1,800 mi<br>(3,000 km)<br>or 3 months | 3,000 mi<br>(5,000 km)<br>or 6 months |
| 1.  | Clutch                       | Check the operation. Adjust or replace the cable.   | ○                                  | ○                                     | ○                                     |
| 2.  | Front Brake*                 | Check the operation, fluid level and leakage. If necessary, replace the pads.   | ○                                  | ○                                     | ○                                     |
| 3.  | Rear Brake*                  | Check the operation. If necessary, replace the lining.  | ○                                  | ○                                     | ○                                     |
| 4.  | Brake hose*                  | Check for cracks or damage.   | ○                                  | ○                                     | ○                                     |
|     |                              | Replace   | each 4 years                       |                                       |                                       |
| 5.  | Wheels*                      | Check the alignment, swinging, and spoke fastening. If necessary, replace.  | ○                                  | ○                                     | ○                                     |
| 6.  | Tires*                       | Check for wear, air pressure and damage. If necessary, fix or replace.  | ○                                  | ○                                     | ○                                     |
| 7.  | Wheel roller bearings*       | Check the clearance/free play and damage. If necessary, replace.  | ○                                  | ○                                     | ○                                     |
| 8.  | Pivot roller bearing*        | Check the clearance/free play and apply a moderate quantity of lithium-based grease.  | ○                                  | ○                                     | ○                                     |
| 9.  | Transmission chain           | Check the clearance/free play and wear. Adjust and apply the specified lubricant.   | for each riding                    |                                       |                                       |
| 10. | Steering roller bearing*     | Check clearance/free play and damage. Apply lithium-based grease after each 1,200 mi (2,000 km) or 12 months (the first to expire). | ○                                  | ○                                     | ○                                     |
| 11. | Clamps and fasteners*        | Check bolts and nuts. If necessary, tighten.  | ○                                  | ○                                     | ○                                     |
| 12. | Clutch lever and front brake | Apply lithium-based grease.   | ○                                  | ○                                     | ○                                     |
| 13. | Shift lever and rear brake   | Apply lithium-based grease.   | ○                                  | ○                                     | ○                                     |
| 14. | Side stand                   | Check the operation and apply lithium-based grease.   | ○                                  | ○                                     | ○                                     |
| 15. | Exhaust core*                | Clean.  |                                    | ○                                     | ○                                     |
| 16. | Front suspension*            | Check the operation and leakage. If necessary, replace.   |                                    | ○                                     | ○                                     |
| 17. | Shock absorber*              | Check the operation and leakage. If necessary, replace.   |                                    | ○                                     | ○                                     |
| 18. | Rear suspension*             | Apply molybdenum disulfide-based grease.  |                                    | ○                                     | ○                                     |
| 19. | Camshaft cables*             | Apply Yamaha cable lubricant or engine oil 10W-30.  | ○                                  | ○                                     | ○                                     |
| 20. | Throttle lever and cable*    | Check the operation and free play. If necessary, adjust the cable free play. Lubricate the lever and the cable.                     | ○                                  | ○                                     | ○                                     |

\*: We recommend that these items be overhauled at a Yamaha authorized dealer shop.

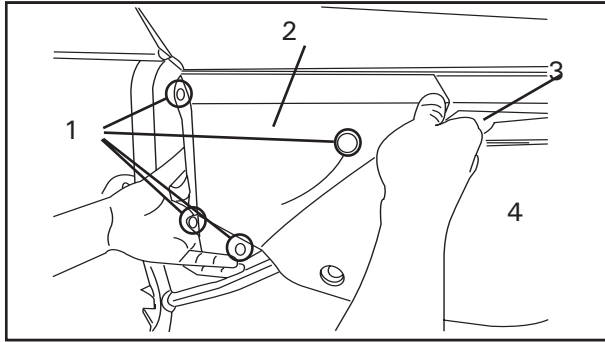
**NOTE:**

Increase the frequency of air filter maintenance when it is used in dust or mud.

Brake fluid change:

1. When dismounting the master brake cylinder, change the fluid. Verify the reservoir level regularly according to requirements.
2. Replace the master cylinder and brake caliper retainers every 2 years.
3. Replace the brake hoses every 4 years or if cracked or damaged.





## SEAT, FUEL TANK AND COVERS

### REMOVAL

#### WARNING

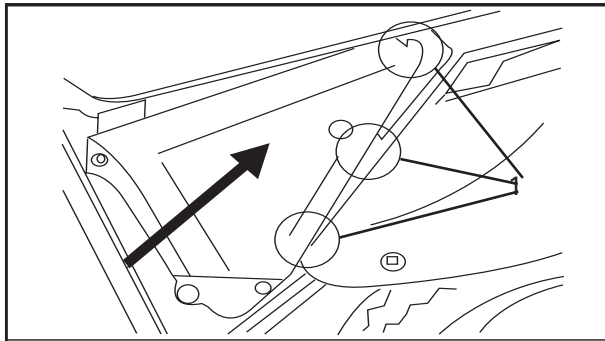
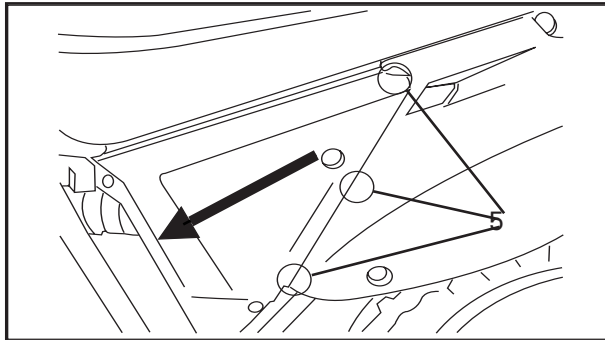
Support the motorcycle firmly preventing it from falling.

#### 1. Remove:

- Side cover (LH)  
Remove the bolts ①

#### NOTE:

Pull the cover towards you. To simplify, use the opening ③ on the side cover ④. Push the cover in the direction indicated to release the tongues ⑤.

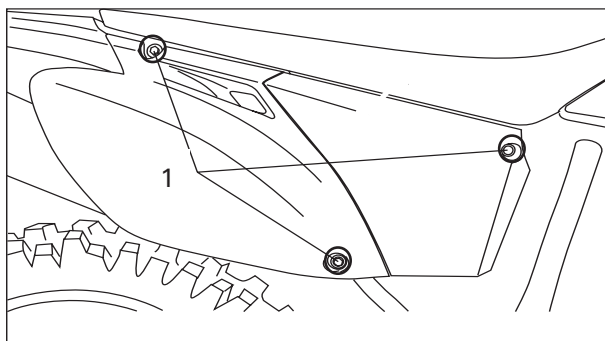


#### Installation:

- Install the cover under the seat.
- Place the cover, fastening the tongues ① as shown.
- Install the cover under the seat.

#### WARNING

Verify that the air filter cover is firmly installed, otherwise dust can enter the filter resulting in engine damage.



#### 2. Remove:

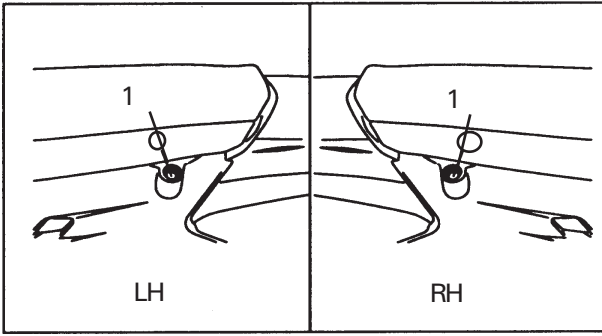
- Side cover (RH)  
remove the bolts ①.

#### NOTE:

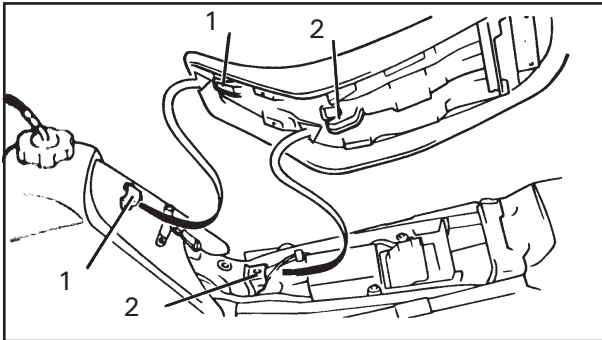
Remove the 3 bolts ①. Pull the side cover towards you

#### Installation:

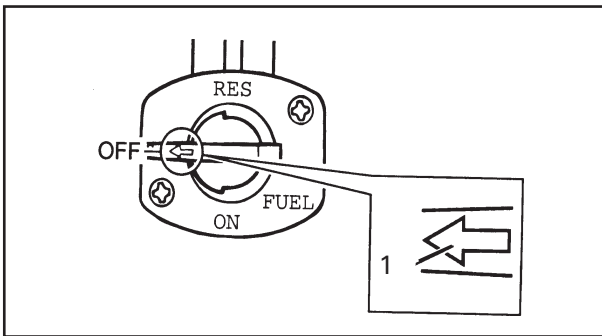
- Place the cover in the original position and install the bolts



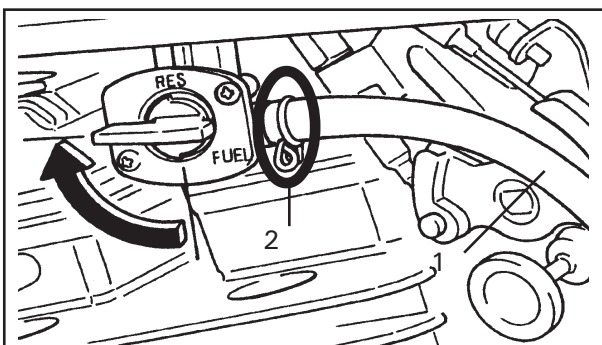
3. Remove:
- Seat  
Loosen the setscrews on both sides ① . Remove the seat, pulling it towards the rear of the motorcycle.



**NOTE:** \_\_\_\_\_  
Observe the fittings on the tank ① and frame ②, indicated in the figure.  
\_\_\_\_\_

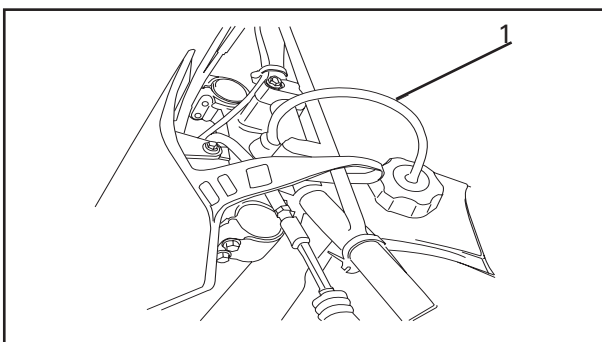


4. Remove:
- Fuel tank  
Adjust the fuel cock to "OFF" ①.



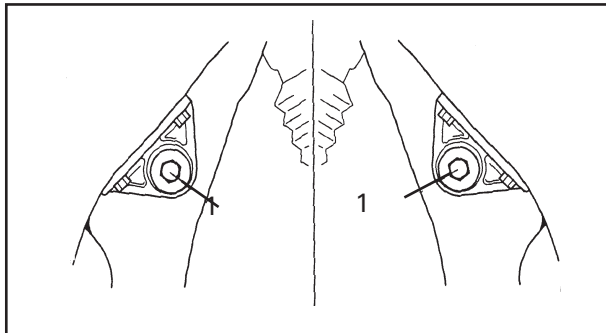
5. Disconnect:
- Fuel hose ①, pressing the clip ②

**NOTE:** \_\_\_\_\_  
Place a dry cloth on the engine in order to absorb the splattered fuel.  
\_\_\_\_\_



**WARNING** \_\_\_\_\_  
**Gasoline is highly inflammable. Prevent the fuel from being poured on the hot engine.**  
\_\_\_\_\_

6. Disconnect:
- Fuel tank breather hose ①



7. Remove:

- Setscrews on both sides ①
- Rubber belt. Remove the fuel tank.


## INSTALLATION

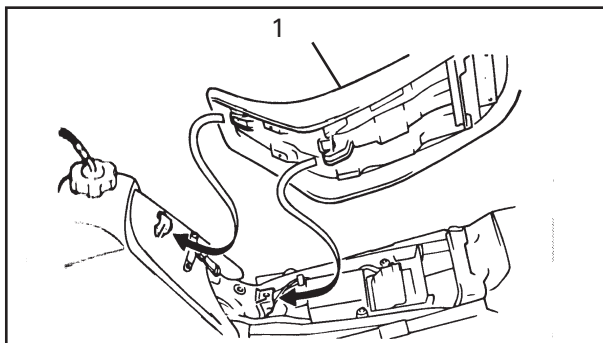
Reverse the "REMOVAL" procedures.

Check the following items:

1. Install:


- Fuel tank

|   |  |
|---|--|
|  | <b>Fuel tank bolt</b><br>10 N.m (1.0 Kg.m ; 7.2 ft.lb) |
|---|--|



2. Install:

- Seat ①
- Side covers

|   |   |
|---|---|
|  | <b>Seat and side cover bolts</b><br>7N.m (0.7 Kg.m ; 5.1 ft.lb) |
|---|---|

## ENGINE VALVE CLEARANCE ADJUSTMENT

### NOTE:

- The valve clearance should be measured with the engine cold.
- Adjust the valve clearance with the piston at the top dead center (TDC) at the compression stroke.

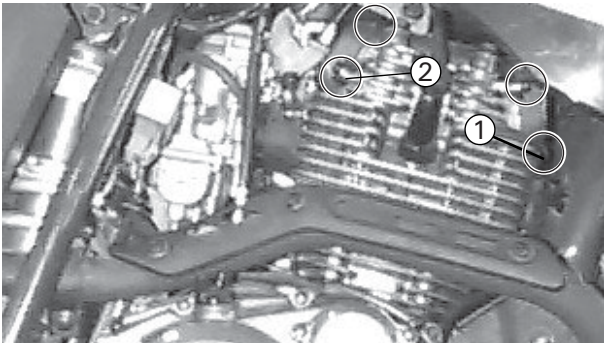
### WARNING

**Support the motorcycle firmly preventing it from falling.**

#### 1. Remove:

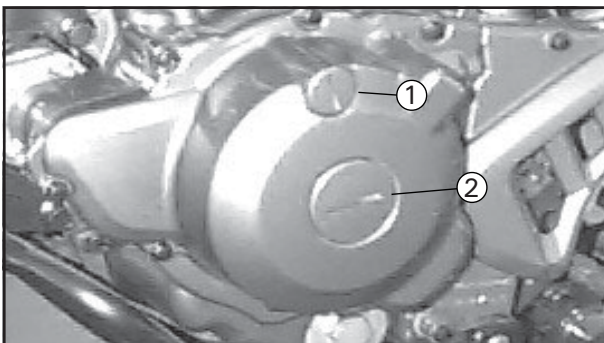
- Side covers
- Seat
- Fuel tank

See Section "SEAT, FUEL TANK AND COVERS."



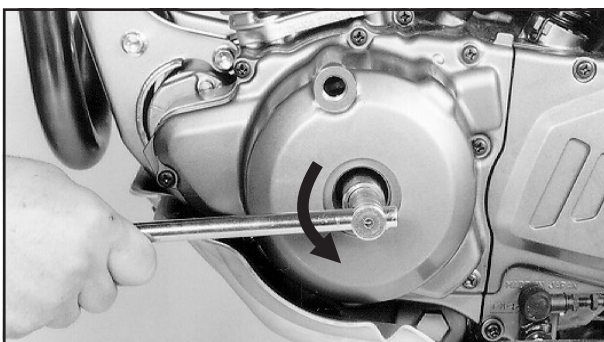
#### 2. Remove:

- Valve cover ① (Exhaust)
- Valve cover ② (Intake)



#### 3. Remove:

- Cover ① (with O-ring)
- Cover ② (with O-ring)



#### 4. Align:

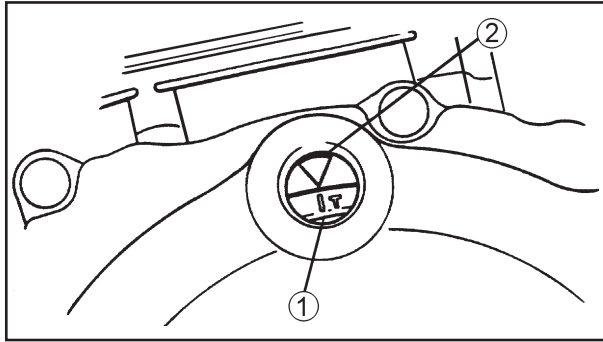
- "T" mark on the rotor with the stationary mark on the case cover.

\*\*\*\*\*

#### TDC - Alignment steps:

- Using a screwdriver, turn the crankshaft counterclockwise.

# VALVE CLEARANCE ADJUSTMENT



- Align the "T" mark ① on the rotor with the stationary mark ② on the case cover. With the "T" mark aligned with the stationary mark, the piston is at the top dead center (TDC).

**NOTE:**

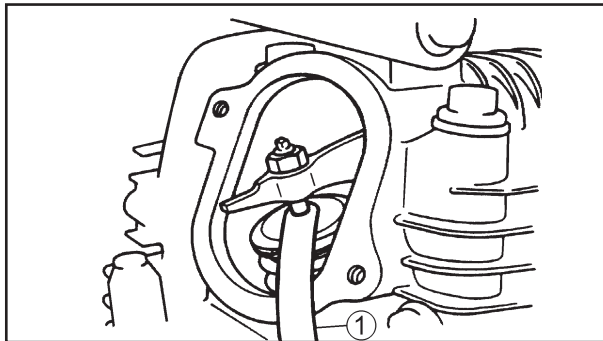
TDC checking at the compression stroke:

- Both rockers should allow for a clearance when the "T" mark is aligned with the stationary mark.
- Otherwise, rotate the crankshaft one turn counterclockwise in order to establish the condition above.

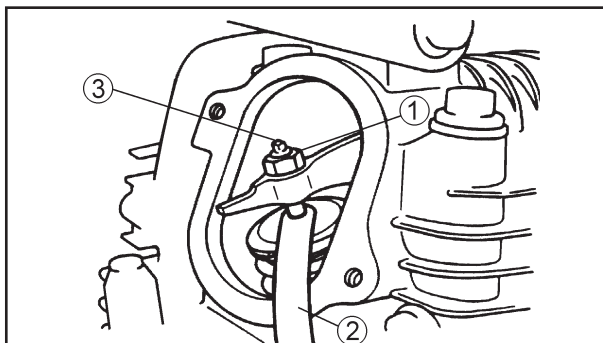
\*\*\*\*\*

5. Check:

- Valve clearance  
For clearance measurement use a sheet gage ① .  
Out of specification => Adjust.



|  |                        |
|--|------------------------|
|  | <b>Valve Clearance</b> |
|  | Intake: 0.05 ~ 0.09mm  |
|  | Exhaust: 0.15 ~ 0.19mm |



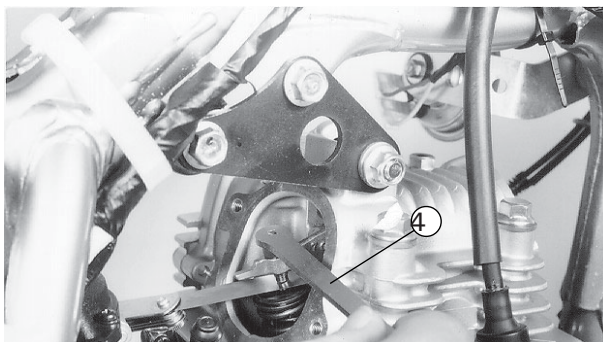
6. Adjust:

- Valve clearance

\*\*\*\*\*

**Adjustment steps:**

- Loosen the lock-nut ① .
- Insert a sheet gage ② between the adjuster tip and the valve end.
- Turn the adjuster ③ clockwise or counterclockwise, using the clearance adjusting tool ④, until the specified clearance is established.



|  |                              |
|--|------------------------------|
|  | <b>Valve adjusting tool:</b> |
|  | 90890-01311                  |

Hold the adjuster preventing it from moving and tighten the lock-nut firmly.

|   |  |
|---|--|
|  | <b>Lock-nut:</b><br><b>13.5 N.m (1.35 Kg.m; 7.2 ft.lb)</b> |
|---|--|

- Measure the valve clearance.
- If the clearance is incorrect, repeat the steps above until the specified clearance is established.

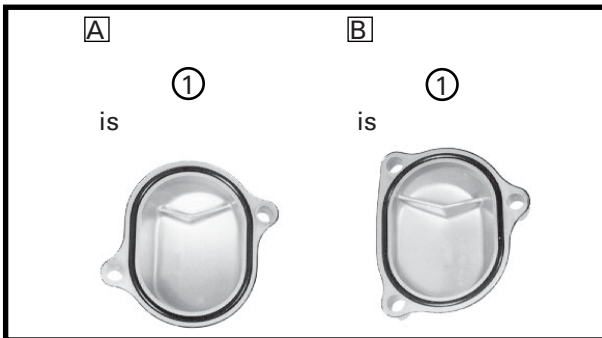
\*\*\*\*\*

7. Install:

Reverse the removal steps:

- Case cover covers
- Head covers

|   |  |
|---|--|
|  | <b>Head cover bolts:</b><br><b>10N.m (1,0 Kg.m; 7,2 ft.lb)</b> |
|---|--|



**NOTE:**


Install the head covers with the cams up ①.

- A** Intake
- B** Exhaust

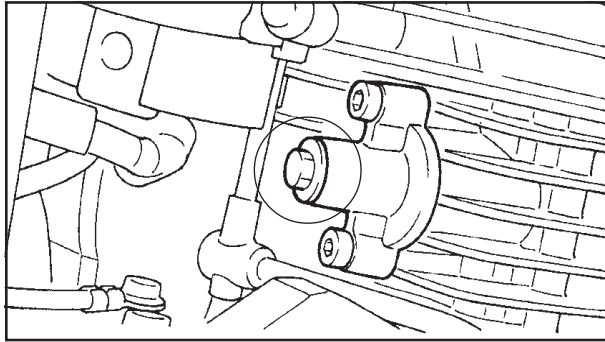
8. Install:

- Fuel tank
- Seat
- Side covers.

See Section "SEAT, FUEL TANK AND COVERS."

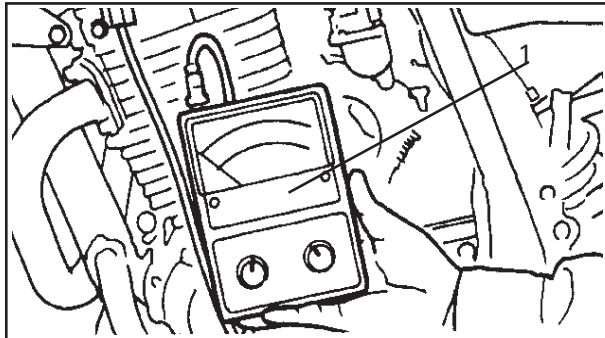
|   |   |
|---|---|
|  | <b>Bolts (tank, seat and side covers)</b><br><b>7N.m (0,7 Kg.m ; 5,1 ft.lb)</b> |
|---|---|

# CAMSHAFT CHAIN ADJUSTMENT / IDLE SPEED



## CAMSHAFT CHAIN ADJUSTMENT

Automatic adjustment.




## IDLE SPEED ADJUSTMENT

Let the engine run for some minutes for warming up.

1. Connect:

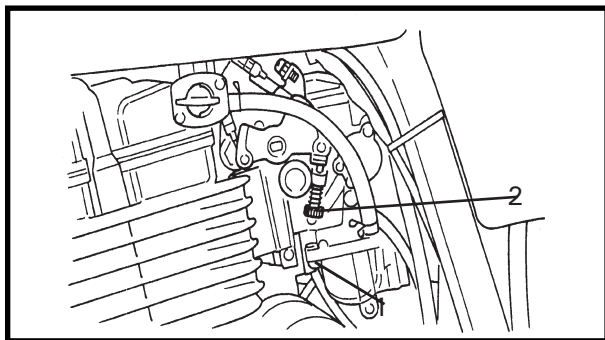
- Tachometer ① to spark plug cable

|   |                                   |
|---|-----------------------------------|
|  | <b>Tachometer:</b><br>90890-03113 |
|---|-----------------------------------|

2. Check:

- Idle speed  
Out of specification => Adjust.

|   |  |
|---|--|
|  | <b>Idle speed:</b><br>1,400 ~ 1,600rpm |
|---|--|



3. Adjust:

- Idle speed

\*\*\*\*\*

### Adjustment steps:

- Close the pilot screw ① until it touches its seat.
- Open the pilot screw up to the specified value.

|  |
|--|
| <b>Pilot screw:</b><br>2.0 turns outward |
|--|

- Turn the idle speed screw ② inward or outward until establish the specified idle speed.

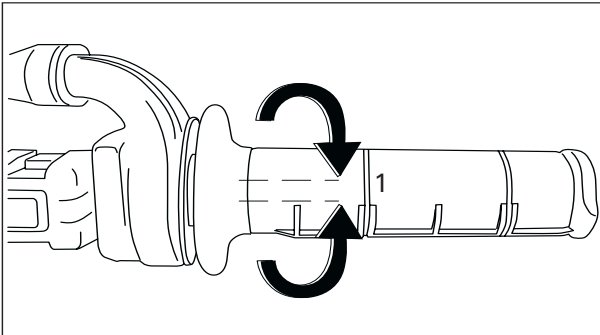
|  |
|--|
| <b>Turning inward =&gt; Increases the idle speed.</b>  |
| <b>Turning outward =&gt; Decreases the idle speed.</b> |

\*\*\*\*\*


4. Remove:
  - Tachometer
5. Adjust:
  - Throttle cable free playSee Section "THROTTLE CABLE FREE PLAY ADJUSTMENT."

## THROTTLE CABLE FREE PLAY ADJUSTMENT

**NOTE:** \_\_\_\_\_  
Before adjusting the throttle cable free play, adjust the idle speed.  
\_\_\_\_\_



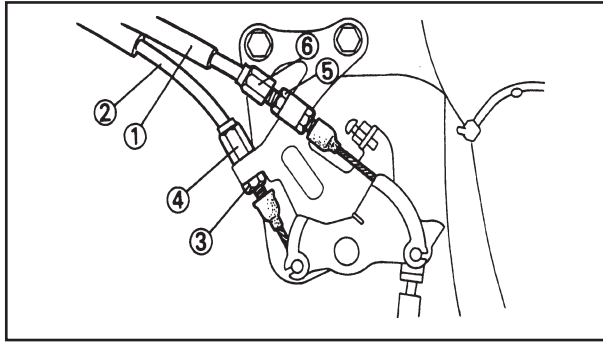
1. Check:
  - Throttle cable free play ① Out of specification => Adjust.

|   |  |
|---|--|
|  | Throttle cable free play:<br>3-5 mm (0.12 ~ 0.20 in) |
|---|--|

2. Adjust:
  - Throttle cable free play



# THROTTLE CABLE FREE PLAY ADJUSTMENT



\*\*\*\*\*  
**Adjustment steps:**

**NOTE:** Resting the throttle cable # 1 ① is extended and cable # 2 ② is retracted relative to the driving support.

**1st step:**

- Loosen the lock-nut ③ of cable #2.
- Turn the adjuster ④ and completely eliminate the cable #2 free play.

**2nd step:**

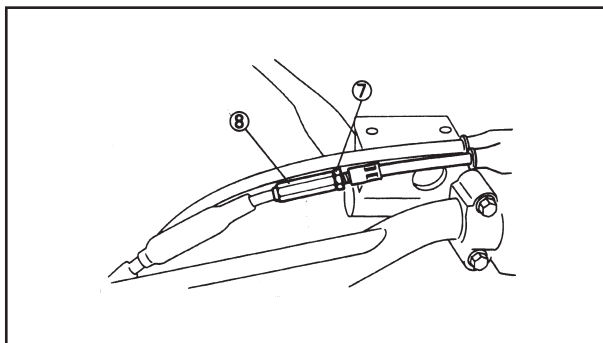
- Loosen the lock-nut ⑤ of cable #1.
- Turn the adjuster ⑥ and establish the specified throttle cable free play.

To turn inward => Increases the free play

To turn outward => Reduces the free play.

- Tighten the lock-nuts

**NOTE:** If the free play is incorrect, adjust the cable free play using the adjuster (above on the handle-bars).



**Final steps:**

- Loosen the lock-nut ⑦.
- Turn the adjuster ⑧ and establish the specified free play.

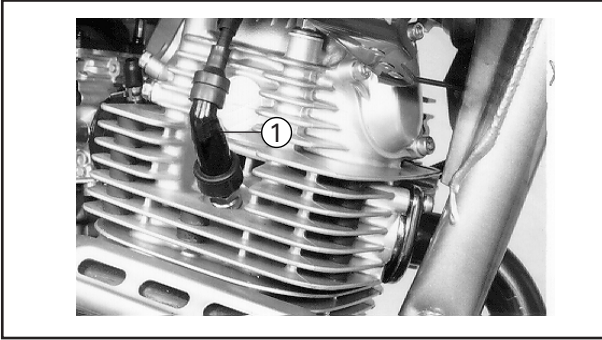
To turn inward => Increases the free play.

To turn outward => Reduces the free play.

- Tighten the lock-nut.

**WARNING**

After adjusting the free play, turn the handle-bars to the right and the left, making sure the idle speed does not vary.



## SPARK PLUG INSPECTION

1. Disconnect:
  - Spark plug cap ①

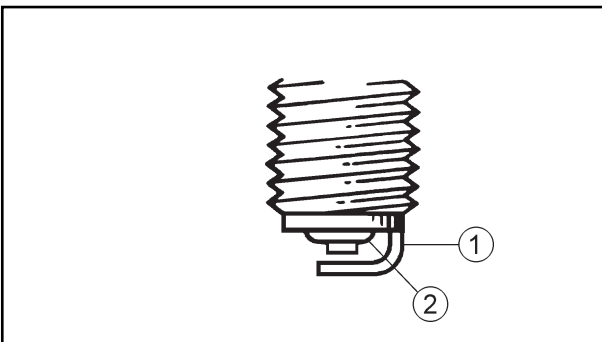
2. Remove:
  - Spark plug

**CAUTION:** \_\_\_\_\_

When removing the spark plug, take care to prevent objects from falling into the engine.

3. Inspect:
  - Spark plug - Type
  - Incorrect => Change.

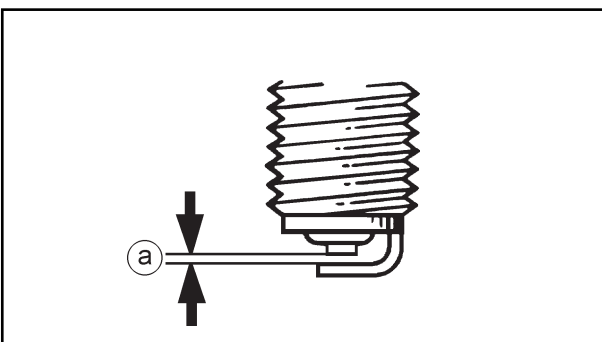
**Standard spark plug:  
DR8EA / NGK**



4. Inspect:
  - Electrodes ①
  - Wear/damage => Replace.
  - Insulator ②
  - Abnormal color => Replace.
  - Normal color: Brown, clear to medium shade.

5. Clean the spark plug using a plug cleaner or a wire brush.

6. Measure:
  - Electrode clearance @
  - Use a sheet gage or a cylindrical tip gage.
  - Out of specification => Adjust.



**Electrode clearance:  
0.6 ~ 0.7mm**

7. Tighten:
- Spark plug

|   |   |
|---|---|
|  | <b>Spark plug</b><br>17.5N.m (1.75Kg.m) |
|---|---|


- NOTE:** \_\_\_\_\_
- Before installing the spark plug, clean the spark plug thread and gasket surfaces.
  - If no torquemeter is available, a good estimate for the correct torque is as follows: Tighten from  $\frac{1}{4}$  to  $\frac{1}{2}$  turn after tightening the spark plug manually.

8. Connect:
- Spark plug cap

## IGNITION POINT INSPECTION

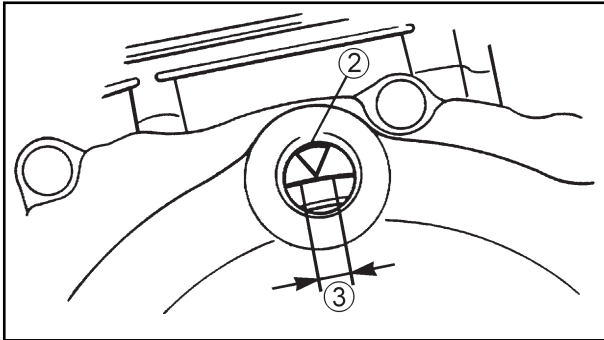
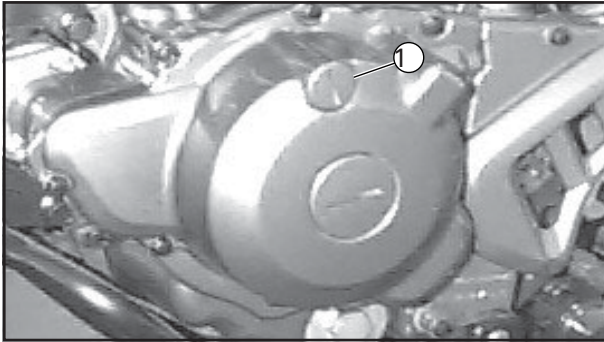
- NOTE:** \_\_\_\_\_
- Before checking the ignition point, adjust the idle speed and the throttle cable free play.

1. Let the engine run for some minutes for warming up and, then, turn it off.
2. Connect:
  - Tachometer
  - Spark plug cable strobe light

|   |                                     |
|---|-------------------------------------|
|  | <b>Tachometer:</b><br>90890-06760   |
|   | <b>Strobe Light:</b><br>90890-03109 |

3. Check:
  - Ignition point

# IGNITION PRESSURE CHECK/COMPRESSION PRESSURE MEASUREMENT



\*\*\*\*\*

## Checking steps:

- Remove the cover ①
- Start the engine.

|  |                               |
|--|-------------------------------|
|  | Engine rotation:<br>1,400 rpm |
|--|-------------------------------|

## CAUTION:

Under severe conditions, oil may be sprayed while the engine is running. Therefore, take care when carrying out this check.

- Using the strobe light check if the stationary point ② stays within the ignition range ③ indicated in the magnet wheel.

Incorrect => Check the pulse coil.

## NOTE:

The ignition point cannot be adjusted.

\*\*\*\*\*

## 4. Install:

- Cover

## 5. Disconnect:

- Strobe light
- Tachometer

## COMPRESSION PRESSURE MEASUREMENT

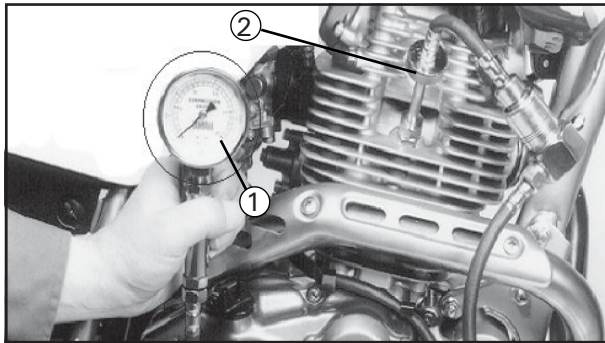
## NOTE:

Insufficient compression will result in performance loss.

## 1. Check:

- Valve clearance  
Out of specification => Adjust.  
See Section "VALVE CLEARANCE ADJUSTMENT".

2. Let the engine run for some minutes for warming up.
3. Turn the engine off.
4. Disconnect:
  - Spark plug cap
5. Remove:
  - Spark plugSee Section "SPARK PLUG INSPECTION".



6. Connect:
  - Compression meter ①
  - Adapter ②

|   |  |
|---|--|
|  | <b>Compression meter:</b><br>90890-03081 |
|   | <b>Adapter</b><br>90890-04082            |

7. Check:
  - Compression

\*\*\*\*\*

### Checking steps:

- Start the engine using the start button (make sure the battery is totally charged) and with the throttle completely open, until the meter stabilizes.

### WARNING

**When starting the engine, ground the spark plug cable in order to prevent sparks.**

- Compare the readings with the specified levels (see tables).

**Compression pressure (at sea level)**  
**Standard:**  
                   1,200 KPa (12 kg/cm<sup>2</sup>, 171 psi)  
**Minimum:**  
                   960 KPa (9.6 kg/cm<sup>2</sup>, 128 psi)  
**Maximum:**  
                   1,300 KPa (13 kg/cm<sup>2</sup>, 185 psi)

- If the pressure is below the minimum level:
  - 1) Pour some drops of oil into the affected cylinder.
  - 2) Measure the compression again.

| <b>Compression pressure<br/>(with oil poured into the cylinder)</b> |   |
|---|---|
| <b>Reading</b>  | <b>Diagnostic</b>   |
| <b>Higher than without oil</b>                                      | <b>Worn or damaged piston</b>   |
| <b>Same as without oil</b>  | <b>Ring, valve, head or piston gasket worn or damaged</b>                   |
| <b>Above the maximum level</b>                                      | <b>Inspect head and valve surfaces or carbon fouling on the piston head</b> |

\*\*\*\*\*

8. Install:
- Spark plug

|   |  |
|---|--|
|  | <b>Spark plug</b><br>17,5N.m (1.75Kg.m ; 12.5 ft.lb) |
|---|--|

See Section "SPARK PLUG INSPECTION."

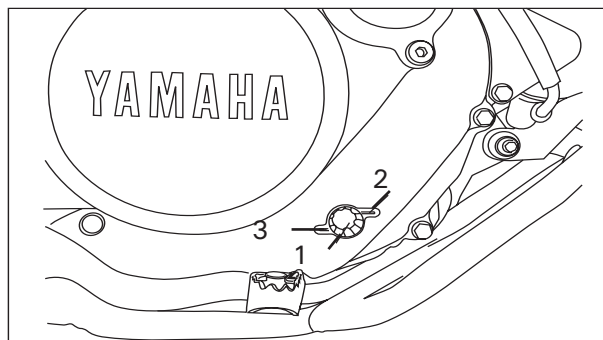
9. Connect:
- Spark plug cap

## ENGINE OIL LEVEL CHECK

### CAUTION:

- Do not apply additives. The engine oil also lubricates the clutch and additives can cause the clutch to slip.
- Prevent dust from entering the engine.

1. Place the motorcycle on a flat area.
2. Warm up the engine for some minutes.
3. Stop the engine and check the oil level through the visor ①.



### NOTE:

Place the motorcycle upright when checking the oil level, since a slight inclination can result in incorrect reading.

### 4. Inspect:

- Oil level

The oil level should be between the maximum ② and minimum ③ marks.  
Low oil level => Add oil.

### NOTE:

Wait some minutes until the oil settle, before checking the level.



Recommended engine oil:  
YAMALUBE4, SAE10W30 or  
SAE20W40 (for USA/CAN)  
SAE10W30 or SAE10W40 or  
SAE20W40 or SAE20W50 (for  
AUS)


5. Let the engine run for some minutes for warming up.

**CAUTION:** \_\_\_\_\_

Do not start the engine if the oil reservoir is empty.

---

6. Stop the engine and check the oil level again.

|   |   |
|---|---|
|  | Amount of oil:<br>Periodic change = > 1.0 l<br>Change with filter = > 1,1 l<br>Total capacity = > 1.3 l |
|---|---|

## ENGINE OIL CHANGE

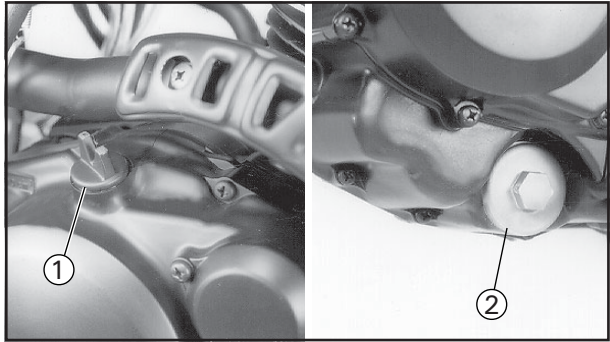
**CAUTION:** \_\_\_\_\_

- Do not apply additives. The engine oil also lubricates the clutch and additives can cause the clutch to slip.
  - Prevent dust from entering the engine.
- 

### Engine oil change (without filter replacement)

1. Place the motorcycle on a flat area.
2. Warm up the engine for some minutes and, then, stop the engine. Place a tray under the drain plug.

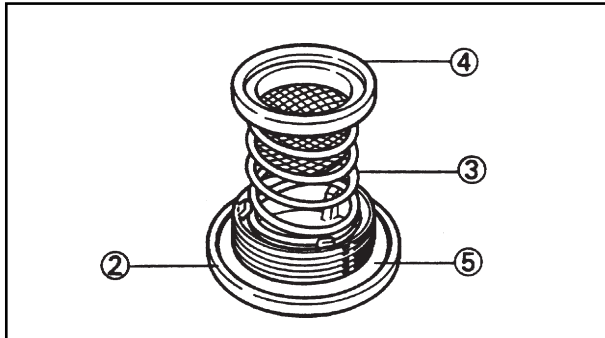




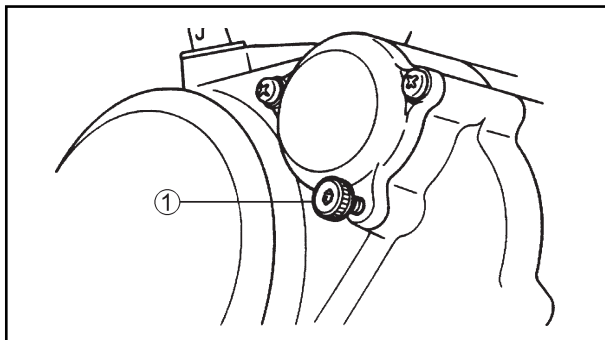
3. Remove:
- Oil filling screw ①
  - Drain plug ②

**NOTE:**

When removing the drain plug ②, the spring ③, oil strainer ④, and O-ring ⑤ will come out. Take care not to lose these parts.



4. Drain:
- Engine oil



5. Remove:
- Bolt ① (oil filter cover)

**NOTE:**

The oil filter cover is fastened by 3 bolts. The bolt ① should be removed in order to drain the oil filter cavity.

6. Inspect:
- O-ring (Drain plug)
  - Damages => Replace.

7. Clean:
- Oil strainer
  - Clean using kerosene.
  - Clogging/damage => Replace.

8. Install:
- Bolt ① (oil filter cover)
  - Drain plug

**CAUTION:**

Before reinstalling the drain plug, install the O-ring, spring and oil strainer.



**Bolts (oil filter cover)**  
**10N.m (1.0 Kg.m ; 7.2 ft.lb)**  
**Drain plug:**  
**43N.m (4.3 Kg.m ; 31ft.lb)**

9. Replenish with oil.



**Recommended engine oil:**  
**YAMALUBE4, SAE10W30 or**  
**SAE20W40 (for USA/CAN)**  
**SAE10W30 or SAE10W40 or**  
**SAE20W40 or SAE20W50 (for**  
**AUS)**

**CAUTION:** \_\_\_\_\_

- Do not apply additives. The engine oil also lubricates the clutch and additives can cause the clutch to slip.
- Prevent dust from entering the engine.

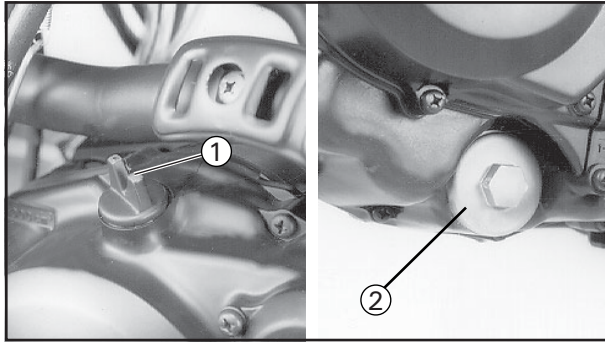
---

10. Install:

- Oil filling screw

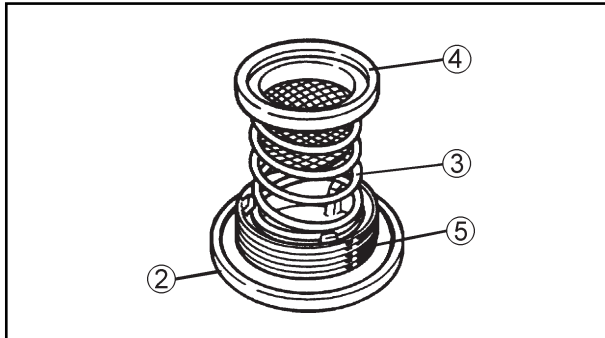
11. Check:

- Oil level  
See Section "ENGINE OIL LEVEL CHECK."
- Oil pressure
- See Section "OIL PRESSURE CHECK."
- Oil leakage



### Engine oil change (with filter replacement)

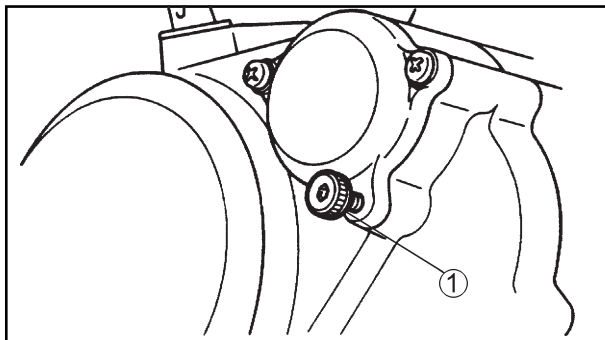
1. Place the motorcycle on a flat area.
2. Warm up the engine for some minutes and, then, stop the engine. Place a tray under the drain plug.
3. Remove:
  - Oil filling screw ①
  - Drain plug ②



**NOTE:**

When removing the drain plug ②, the spring ③, oil strainer ④, and O-ring ⑤ will fall. Take care not to lose these parts.

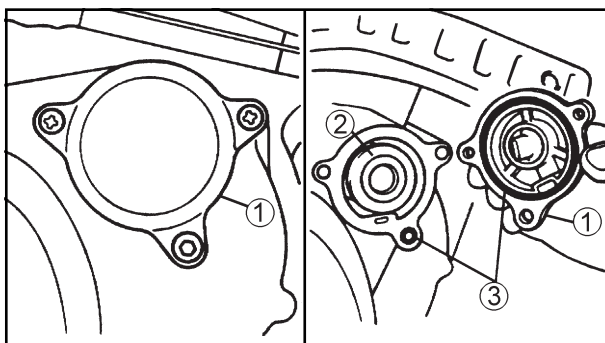
4. Drain:
  - Engine oil



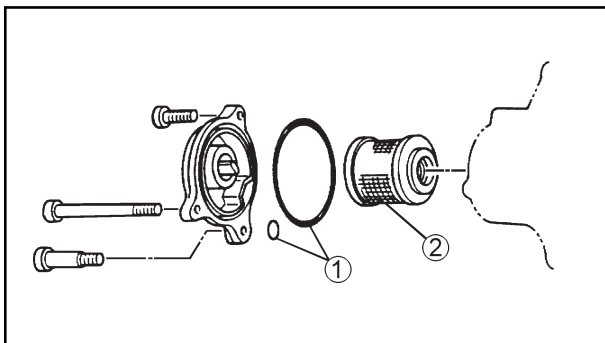
5. Remove:
  - Bolt ① (oil filter cover)

**NOTE:**

The oil filter cover is fastened by 3 bolts. The bolt ① should be removed in order to drain the oil filter cavity.

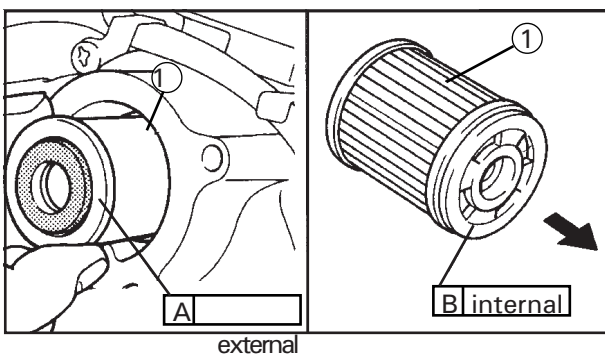


6. Remove:
  - Oil filter cover ①
  - Oil filter ②
  - O-ring ③



7. Check:
- O-rings ①
  - Damage => Replace.

8. Clean:
- Oil filter ②
- Clean using kerosene  
Clogging/damages => Replace.

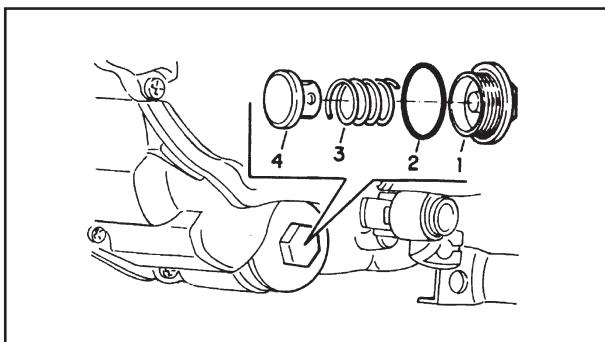


9. Install:
- Oil filter ①

**CAUTION:** \_\_\_\_\_

Install the oil filter as shown.

- Oil filter cover
- Drain plug



**CAUTION:** \_\_\_\_\_

Before reinstalling the drain plug ①, install the O-ring ②, spring ③, and oil strainer ④.



**Bolt (filter cover - lower):**  
10N.m (1.0 Kg.m ; 7.2 ft.lb)  
**Bolt (filter cover - other):**  
10N.m (1.0 Kg.m ; 7.2 ft.lb)  
**Drain plug:**  
43N.m (4.3 Kg.m ; 31 ft.lb)

10. Replenish with oil.



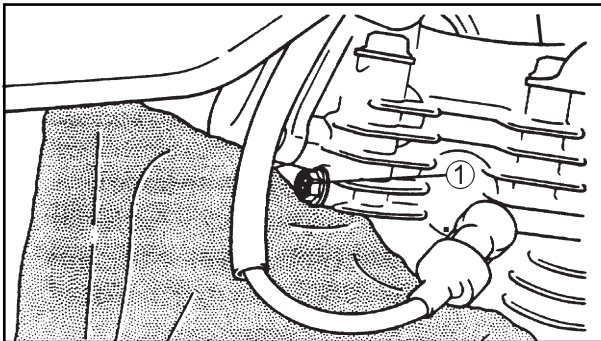
**Recommended engine oil:**  
YAMALUBE4, SAE10W30 or  
SAE20W40 (for USA/CAN)  
SAE10W30 or SAE10W40 or  
SAE20W40 or SAE20W50 (for  
AUS)

**CAUTION:** \_\_\_\_\_

- Do not apply additives. The engine oil also lubricates the clutch and additives can cause the clutch to slip.
- Prevent dust from entering the engine.



11. Install:
  - Oil filling screw
12. Check:
  - Oil level  
See Section "ENGINE OIL LEVEL CHECK."
  - Oil pressure  
See Section "OIL PRESSURE CHECK."
  - Oil leakage



## OIL PRESSURE CHECK

1. Remove:
  - Oil check screw ①
2. Start the engine and let it at idle speed for several minutes.
3. Check:
  - Oil condition at the inspection hole  
Oil flowing => Oil pressure correct.  
Oil does not flow => Oil pressure incorrect

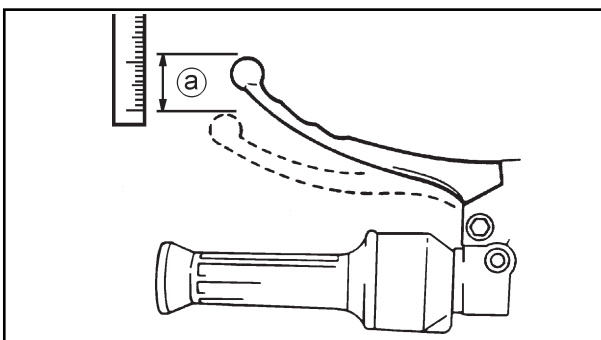
### CAUTION:

If no oil flows after 1 minute, turn off the engine immediately.

4. Tighten:
  - Oil check screw



**Oil check screw:**  
7N.m (0.7 Kg.m ; 5.1 ft.lb)

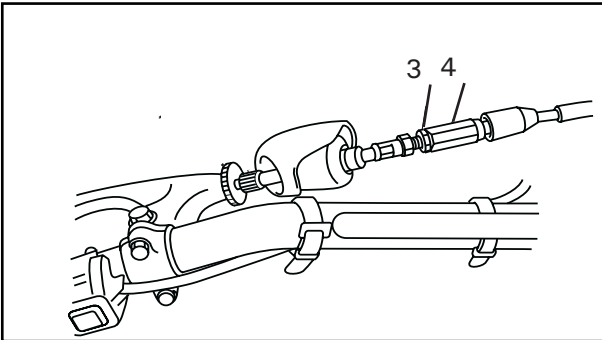
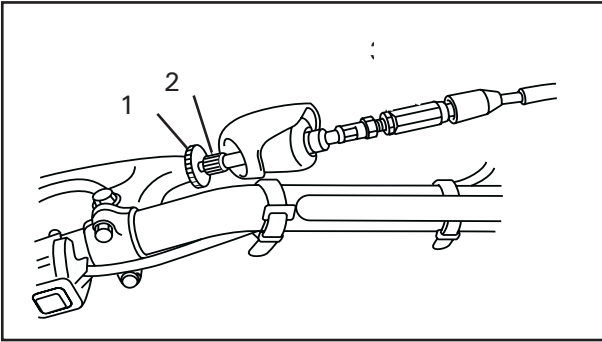


## CLUTCH ADJUSTMENT

1. Check:
  - Clutch cable free play ②  
Out of specification => Adjust.



**Free play:**  
10 ~ 15mm at the lever end



**NOTE:**  
If the clutch cable free play is incorrect, adjust it using the adjuster (close to the clutch lever).

2. Adjust:

- Clutch cable free play

\*\*\*\*\*

**Main lever adjuster:**

- Loosen the lock-nut ①
- Turn the adjuster ② inward or outward until establish the specified free play.

To turn inward => Increases the free play.

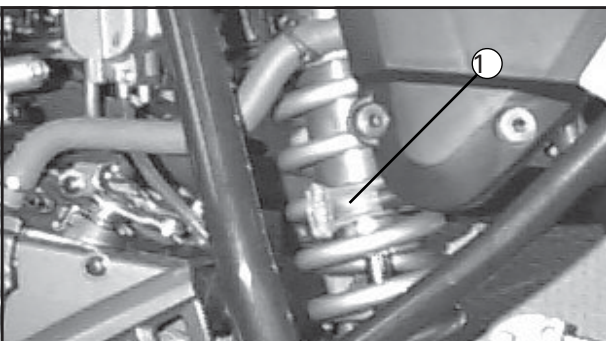
To turn outward => Reduces the free play.

- Tighten the lock-nut ①.

**Secondary lever adjuster:**

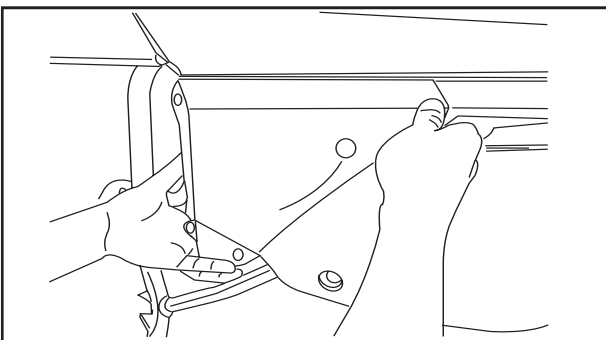
- Loosen the lock-nut ③
- Turn the adjuster ④ inward or outward until establish the specified free play.
- Tighten the lock-nut ③.

\*\*\*\*\*



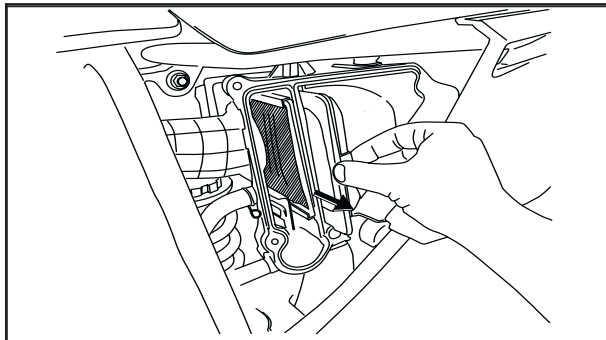
AIR FILTER CLEANING

**NOTE:**  
In addition to the maintenance specified in the periodic revision table, check the checking hose ① under the air filter box. If dust and/or water settle in the hose, clean the air filter element and box.



1. Remove:

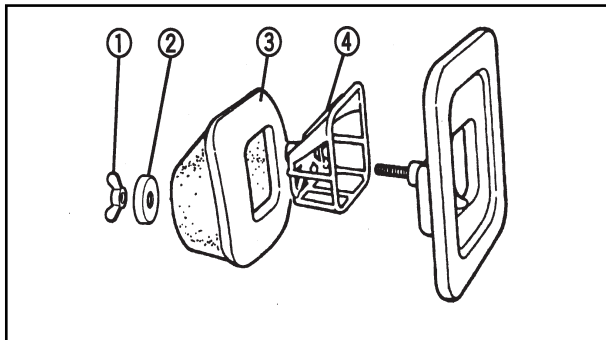
- Air filter box cover.



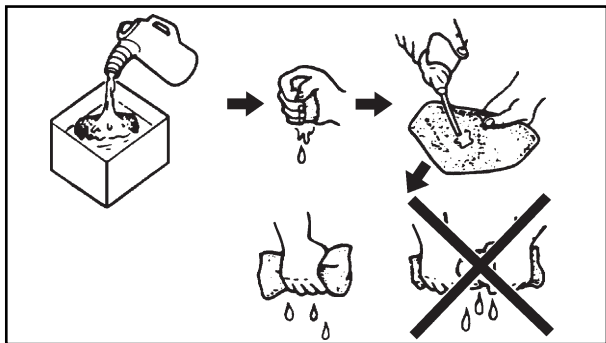
2. Remove:
- Thumb nut ①
  - Washer ②
  - Air filter element ③
  - Air filter guide ④

**CAUTION:** \_\_\_\_\_

Do not start the engine without the air filter element, since this allows non-filtered air to enter, resulting in wear and potential damage to the engine. In addition, if the engine rotates without the filter element the carburetion will be affected, resulting in efficiency loss and overheating.



3. Check:
- Air filter element ③
- Damages => Replace.



4. Clean:
- Air filter element
- Wash with kerosene.

**NOTE:** \_\_\_\_\_  
After cleaning remove the kerosene compressing the element.


**CAUTION:** \_\_\_\_\_

Do not twist the element.

**WARNING** \_\_\_\_\_

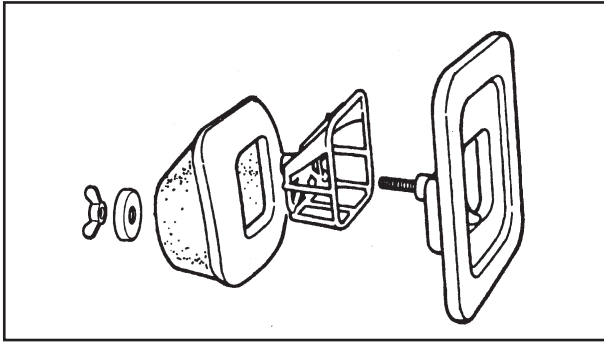
Do not use gasoline to clean the air filter element. Gasoline may cause fire or explosion.

5. Apply the recommended oil to the air filter element surface and remove the oil excess compressing the element. The element should be damp but not dripping.

|   |                               |
|---|-------------------------------|
|  | Recommended oil:<br>SAE 20W40 |
|---|-------------------------------|

## CARBURETOR CONNECTION CHECK / FUEL HOSE / BREATHER HOSE

**INSP  
ADJUS**



6. Install:
- Air filter element, reverse the procedures in "Remove."

**NOTE:**

- When installing the element in the filter box, fasten it firmly in the seat.

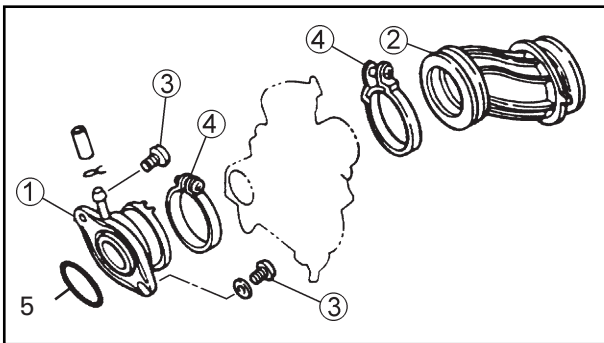
7. Install:

- Air filter box cover  
See Section "SEAT, FUEL TANK AND COVERS."



**Bolt (side cover):**  
**7N.m (0.7 Kg.m ; 5.1 ft.lb)**

## CARBURETOR CONNECTION CHECK



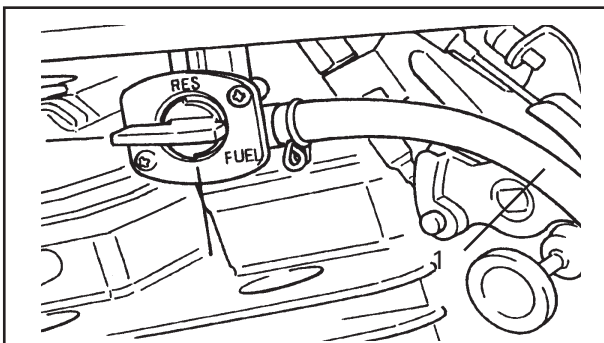
1. Check:

- Carburetor connection ①, ②
- O-Ring ⑤

Damage/cuts => Replace.



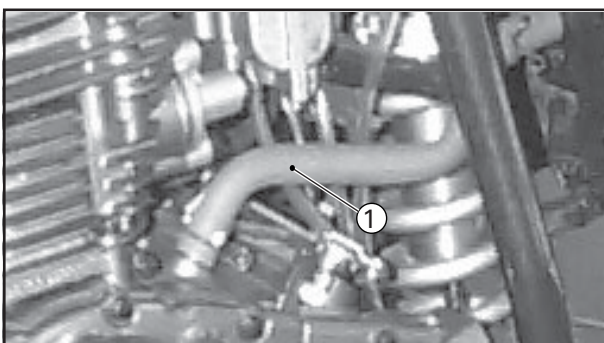
**Bolt ③:**  
**10N.m (1.0 Kg.m ; 7.2 ft.lb)**  
**Tie wrap bolt ④ :**  
**2N.m (0.2 Kg.m ; 1.4 ft.lb)**



## FUEL HOSE CHECK

1. Check:

- Fuel hose ①  
Cracks/damage => Replace.

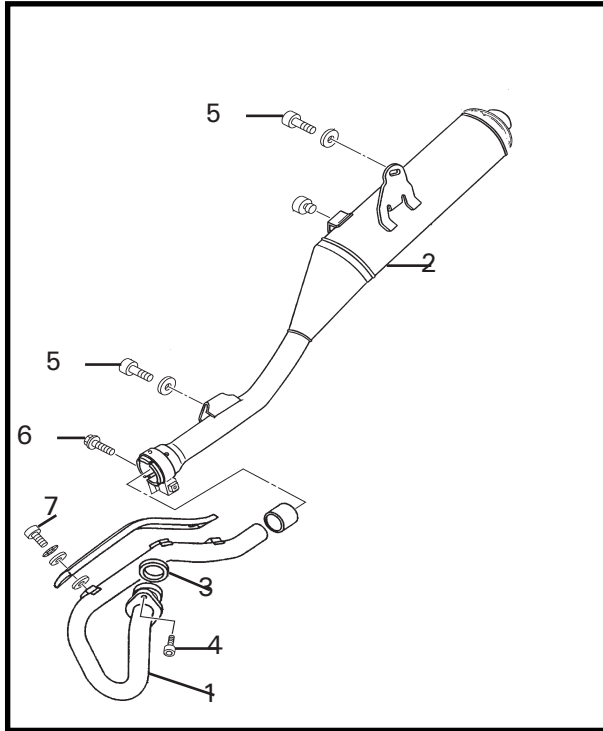


## BREATHER HOSE CHECK

1. Check:


- Engine breather hose ①  
Cracks/damage => Replace.

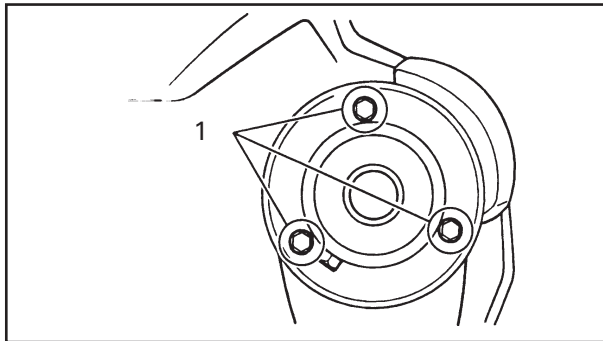




## EXHAUST SYSTEM CHECK

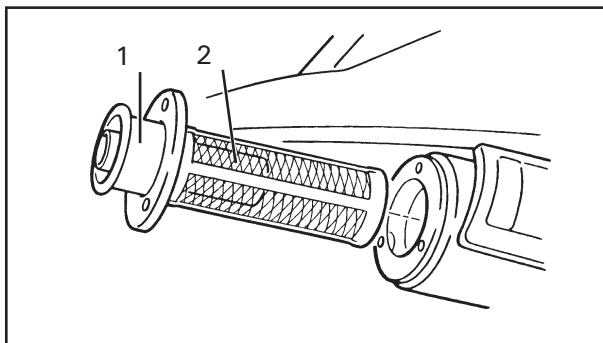
1. Check:
  - Exhaust tube ①
  - Muffler ②
  - Damage/breakage => Replace.
  - Gasket ③
  - Gas leakage => Replace.

|   |   |
|---|---|
|  | <b>Bolt ④ (exhaust tube and cylinder):</b><br>10N.m (1.0 Kg.m; 7.2 ft.lb)<br><b>Bolt ⑤ (muffler and frame):</b><br>40N.m (4.0 Kg.m; 29 ft.lb)<br><b>Bolt ⑥ (exhaust tube and muffler):</b><br>16N.m (1,6 Kg.m; 11,6 ft.lb)<br><b>Bolt ⑦ (guard):</b><br>7N.m (0.7 Kg.m ; 5.1 ft.lb)<br><b>Core bolt:</b><br>10N.M (1.0 Kg.m; 7.2 ft.lb) |
|---|---|

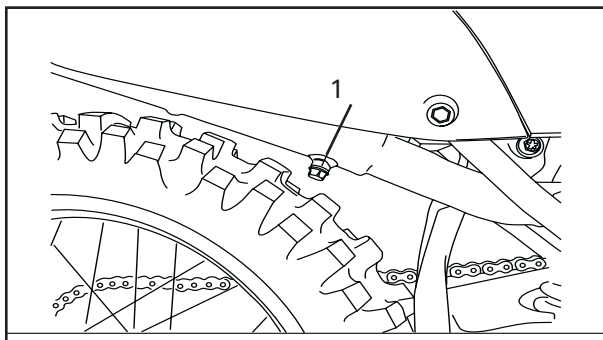


## CORE CLEARING

1. Verify that the exhaust is cold.
2. Remove:
  - Exhaust core, loosening the 3 bolts ①
3. Clean:
  - Exhaust core ②, using a wire brush.
4. Install:
  - Exhaust cover ①
  - Exhaust core ②



|   |   |
|---|---|
|  | <b>Exhaust core bolt</b><br>7N.m (0.7 Kg.m ; 5.1 ft.lb) |
|---|---|



5. Remove:
  - Cleaning bolt ①
6. Close the outlet using a rag, start the engine and increase the rotation twenty times generating a temporary pressure in the muffler.
7. Stop the operation and wait until the exhaust cools down.
8. Install:
  - Cleaning bolt ①

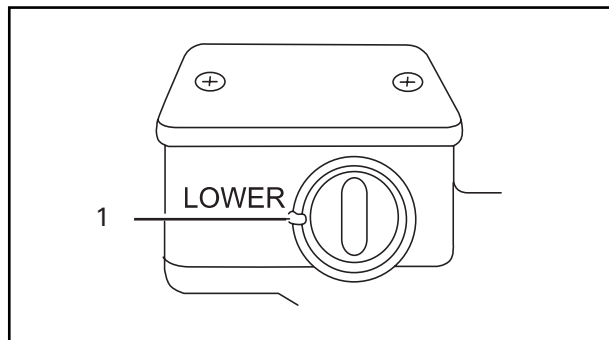
|   |   |
|---|---|
|  | <b>Cleaning bolt ①</b><br>7N.m (0.7 Kg.m ; 5.1 ft.lb) |
|---|---|

## FRONT BRAKE FLUID LEVEL CHECK

1. Place the motorcycle on a flat area.

### NOTE:

- Place the motorcycle upright when checking the brake fluid level.
- When checking the brake fluid level, make sure the top of the master cylinder is in the horizontal.



2. Check:

- Brake fluid level
- Brake fluid level below the "LOWER" mark ① - replenish



**Recommended brake fluid:  
DOT # 4**

### CAUTION:

The brake fluid may damage painted or plastic surfaces. Remove the splattered brake fluid immediately.

### WARNING

- Use the recommended brake fluid only. Otherwise, the rubber retainers may deteriorate, resulting in leakage and brake efficiency loss.
- Replenish with the same type of brake fluid. Mixing fluids may result in chemical reaction on the components and brake efficiency loss.
- Make sure to prevent water from entering the master cylinder when replenishing it. Water decreases the fluid boiling point and may result in accidents.

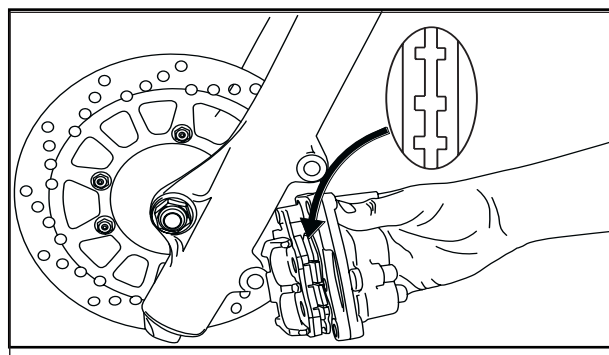
## FRONT BRAKE PAD CHECK

1. Actuate the brake lever

2. Check:

- Brake pads

The wear indicator is almost touching the disc – Replace pads.



**Wear limit:  
0.8 mm (0.76 mm)**

See Section "BRAKE PAD REPLACEMENT" CHAPTER 6.

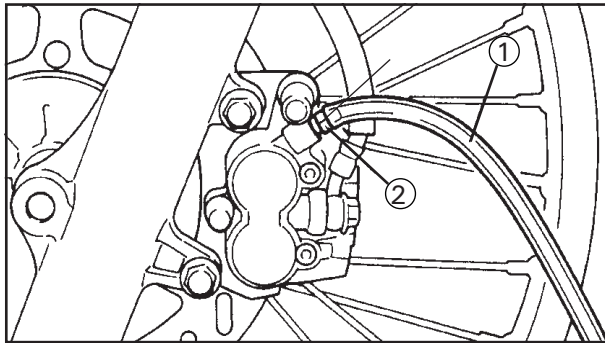
**AIR BLEEDING (FRONT BRAKE SYSTEM)**

**WARNING**

Bleed the brake system if:

- The is dismantled.
- The brake hose is loose or replaced.
- The brake fluid level is too low.
- The brake is malfunctioning.

A hazardous efficiency loss may occur if the system does not bleed properly.



1. Bleed:
  - Brake system

\*\*\*\*\*

**Air bleeding steps:**

- a. Add appropriate brake fluid to the reservoir.
- b. Install the diaphragm. Take care to prevent fluid from splattering or reservoir from overflowing.
- c. Connect a clear hose ① to the caliper bleeding screw ②.
- d. Place the other end of the hose in a container.
- e. Apply a moderate pressure to the brake lever.
- f. Pull and hold the lever.
- g. Loosen the bleeding screw and let the lever reach its limit.
- h. When the lever reaches its limit, tighten the bleeding screw. Then, loosen the lever.

|   |   |
|---|---|
|  | <p><b>Bleeding screw ②:</b><br/> <b>6N.m (0.6 Kg.m ; 4.3 ft.lb)</b></p> |
|---|---|

- i. Repeat steps "e" to "h" until all air bobbles are removed from the system.

**NOTE:**  
If the bleeding is difficult, it may be necessary to let the brake system stabilize for some hours. Repeat the bleeding procedure when the small bobbles have vanished from the system.

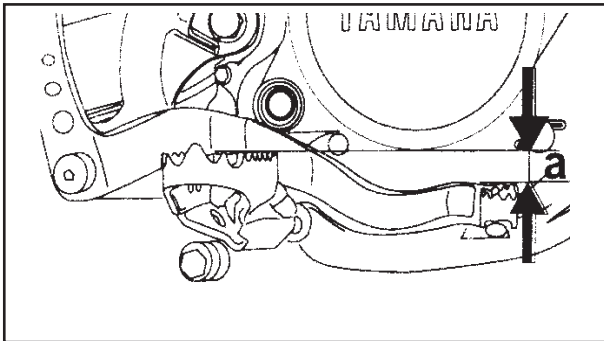
j. Replenish the brake fluid up to the level.

 **Recommended brake fluid:**  
DOT #4

**WARNING**


Check the brake system operation after the bleeding.

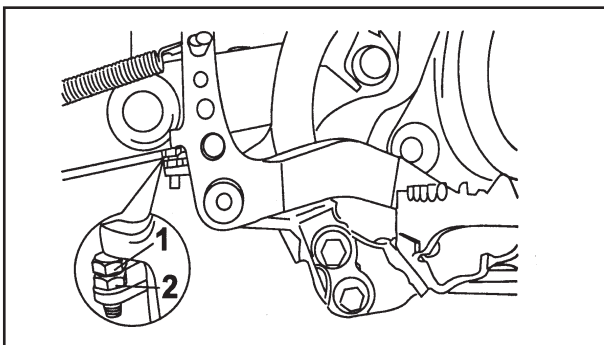
\*\*\*\*\*



**REAR BRAKE ADJUSTMENT**

1. Check:
  - Brake pedal height @  
Out of specification => Adjust.

 **Brake pedal height:**  
3 mm (0.12 in) below the top of the footboard.



2. Adjust:
  - Brake pedal height

\*\*\*\*\*

**Adjustment steps:**

- Loosen the lock-nut ②.
- Turn the adjuster ① inward or outward until establish the specified height.

**To turn inward => Increases the pedal height.**

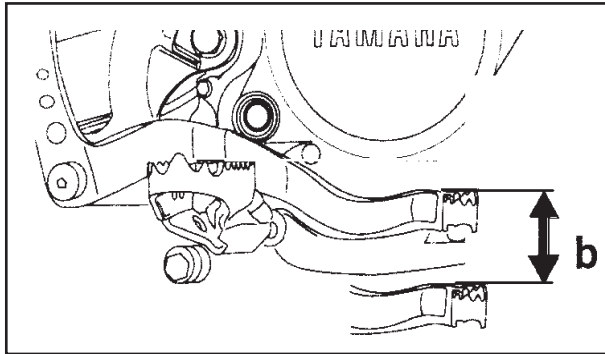
**To turn outward => Reduces the pedal height.**

- Tighten the lock-nut.

|   |   |
|---|---|
|  | <b>Lock-nut:</b><br>7N.m (0.7 Kg.m ; 5.1 ft.lb) |
|---|---|

**WARNING**


After adjusting the height, adjust the free play of the brake pedal.



\*\*\*\*\*

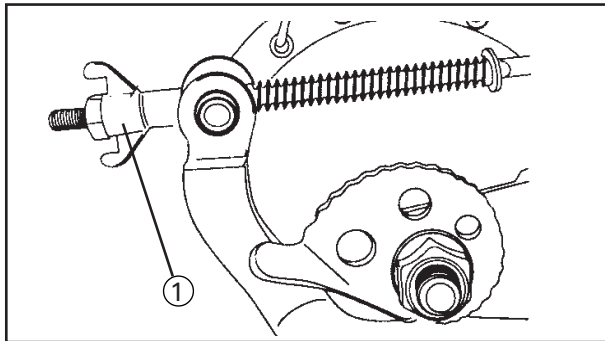
3. Check:

- Brake pedal free play ⑥  
Out of specification => Adjust.

|   |   |
|---|---|
|  | <b>Brake pedal height:</b><br>20 ~ 30 mm (0.8 ~ 1.2 in) |
|---|---|

**NOTE:**

Before adjusting the free play, adjust the height of the brake pedal.



4. Adjust:

- Brake pedal free play

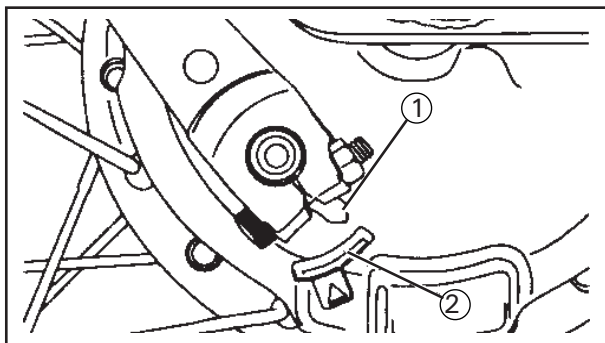
\*\*\*\*\*

**Brake pedal free play adjustment steps:**

- Turn the adjuster ① until the free play is within the specification.

\*\*\*\*\*

See Section "BRAKE SHOE CHECK."



**BRAKE LINING CHECK**

1. Press the brake pedal

2. Check:

- Wear indicator ①  
Indicator at the wear limit mark ② => Replace brake linings. See Section "REAR WHEEL" CHAPTER 6.

## TRANSMISSION CHAIN FREE PLAY ADJUSTMENT

### NOTE:

The transmission chain should be inspected before each trip and, if necessary, adjusted. Before checking and/or adjusting, place the transmission at the dead center, rotate the rear wheel some turns and check the free play at various points until find the tightest point. Check and/or adjust the chain free play with the rear wheel at its tightest position.

### CAUTION:

A too small chain free play may overcharge the engine and other critical parts. Keep the free play within the specified limits.

### WARNING

Support the motorcycle firmly preventing it from falling.

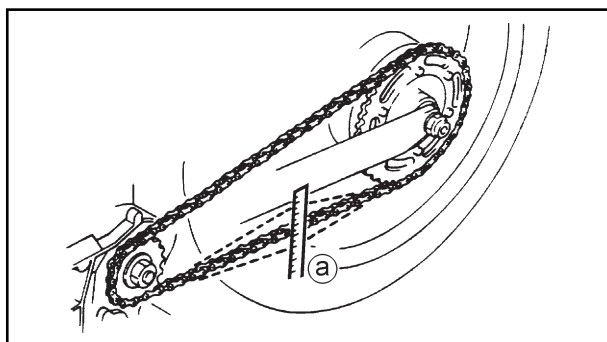
1. Place the motorcycle upright on a flat area.


### NOTE:

During the transmission chain free play adjustment, the motorcycle should be positioned upright and with no weight on it.

2. Move the rear wheel pushing the motorcycle and find the point with the highest tension. Then, measure the free play as shown.

- Transmission chain free play @  
Out of specification => Adjust.



 Transmission chain free play 45 ~ 60 mm (1.77 ~ 2.36 in)  
With both wheels on the floor and with no driver

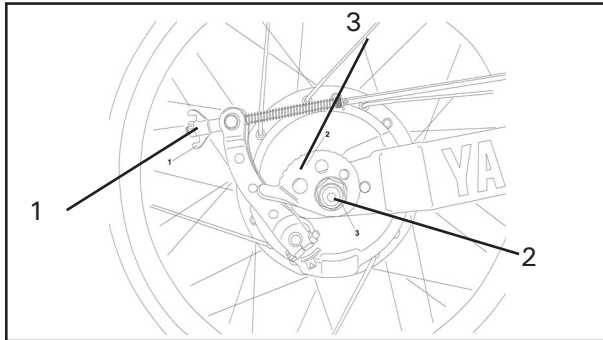
3. Adjust:

- Transmission chain free play

\*\*\*\*\*

**Adjustment steps:**

- Loosen the rear brake adjuster ① and the shaft nut ②.
- Turn the tighteners ③ clockwise or counterclockwise until establish the specified free play.



To turn clockwise => Reducers the free play.

To turn counterclockwise => Increases the free play.

**NOTE:**

Turn the chain tighteners equally in order to preserve the shaft alignment. The marks on the tighteners are intended for alignment checking.

- Tighten the shaft nut according to the specification.

|  |   |
|--|---|
|  | <b>Shaft castellated nut:</b><br>80 N.m (8.0 Kg.m ; 58 ft.lb) |
|--|---|

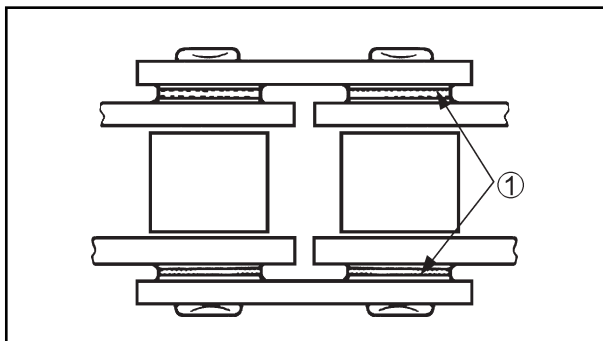
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**TRANSMISSION CHAIN LUBRICATION**

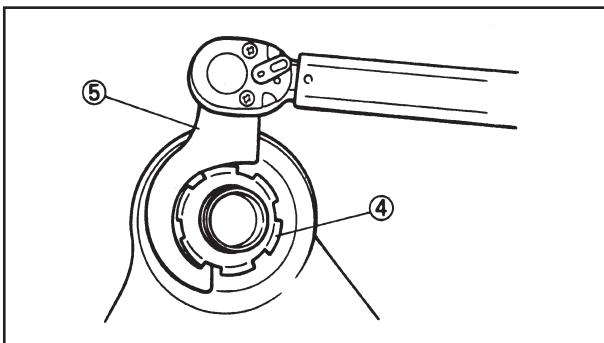
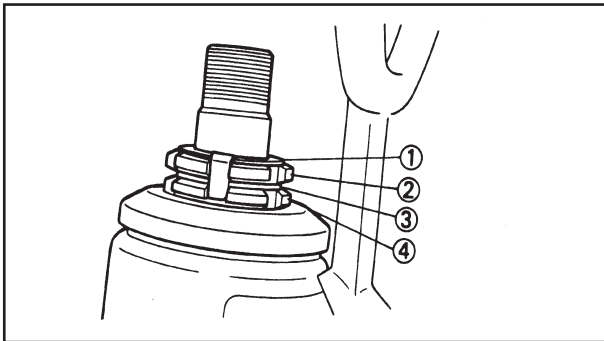
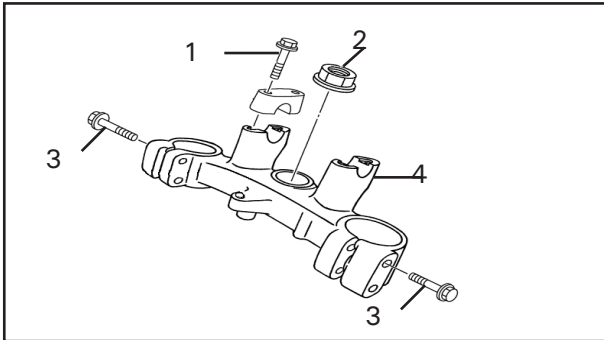
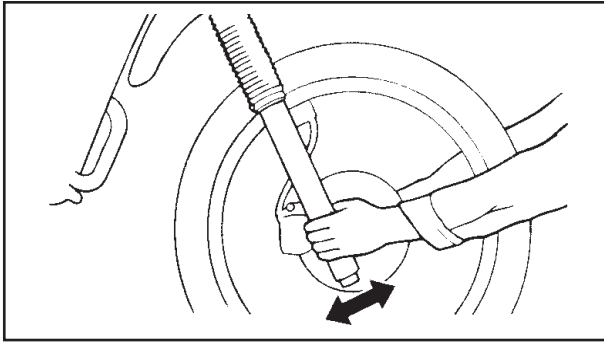
The chain consists of many parts that operate together. If not properly maintained, the chain wears quickly. Therefore, it should be periodically lubricated. This service is specially necessary when riding through uneven ground (dust, mud, stones, etc.).

The motorcycle has a transmission chain equipped with small rubber O-rings between its plates.

Steam and high pressure jet cleaning and some solvents may damage the rings. For cleaning the chain use kerosene only. Dry and lubricate the chain using oil SAE 20W40. Do not use any other lubricant. Other lubricants may contain solvents that can damage the rings ① .



|   |   |
|---|---|
|  | <b>Recommended lubricant:</b><br>SAE 20W40 or chain lubricants appropriated for chains equipped with rings. |
|---|---|



## STEERING COLUMN ADJUSTMENT

### WARNING

Support the motorcycle firmly preventing it from falling.

1. Place the motorcycle on a flat area.
2. Lift the front wheel placing a support under the engine.
3. Check:
  - Steering column roller bearing
 Hold the front fork and move it gently to and fro.  
 Free play => Adjust.
4. Adjust:
  - Steering column
5. Remove:
  - Seat and fuel tank
  - Bolts (handle-bars) ①
  - Nut (handle-bars board) ②
  - Bolts (suspension) ③
  - Handle-bars board ④

\*\*\*\*\*

### Adjustment steps:


- Remove the lock washer ①
- Remove the ring nut (upper) ② and the spacer ③, then, loosen the ring nut (lower) ④
- Tighten the ring nut (lower) using the special tool ⑤

\*\*\*\*\*

### NOTE:

Fit the torquemeter on the ring nut at a right angle.

|   |  |
|---|--|
|  | <b>Adjustment tool:</b><br>90890-01403 |
|---|--|

|   |  |
|---|--|
|  | Lower ring nut 4 (initial torque):<br>43N.m (4.3 Kg.m; 31 ft.lb) |
|---|--|

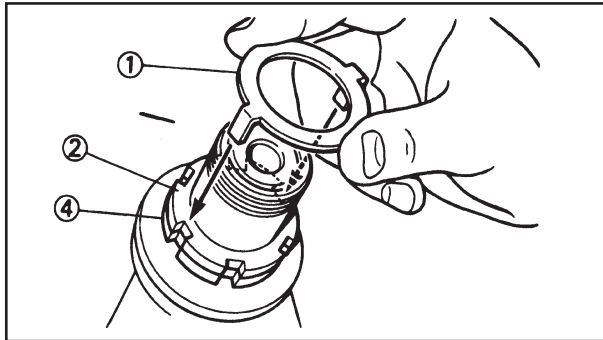


- Loosen the ring nut (lower) one turn.
- Tighten the ring nut (lower) again using the special tool.

**WARNING**

**Avoid excessive torque.**

|   |   |
|---|---|
|  | Ring nut (lower) (final torque):<br>6.5N.m (0.65 Kg.m; 4.7 ft.lb) |
|---|---|




- Check the steering column turning the front tire from side to side, after the adjustment above.

If the movement is difficult, dismount the fastening assembly (upper and lower ring nuts) and check roller bearings and tracks. If the movement is too free, repeat the adjustment steps.

- Install the spacer and upper ring nut ②.
- Tightening the lower ring nut ④, tighten the upper ring nut ② until they are fasten and aligned.
- Install the lock washer ①.

**NOTE:**

Make sure the lock washer flanges are positioned in the slots of the ring nuts.

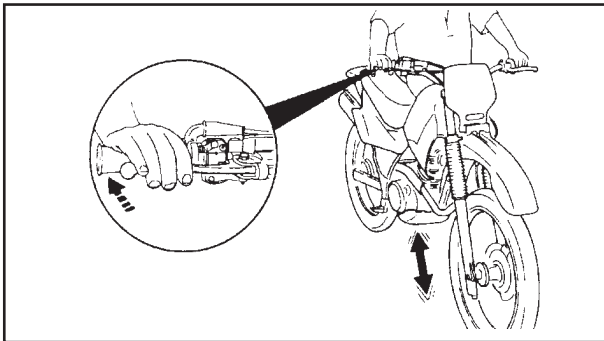
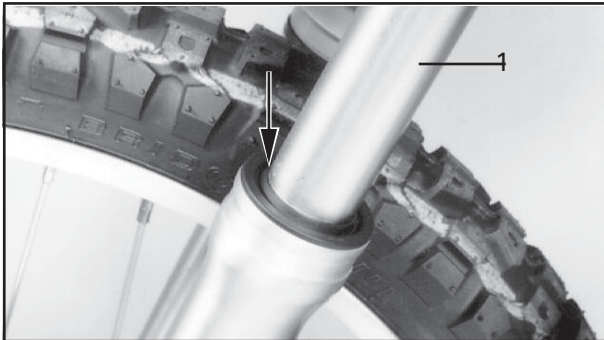
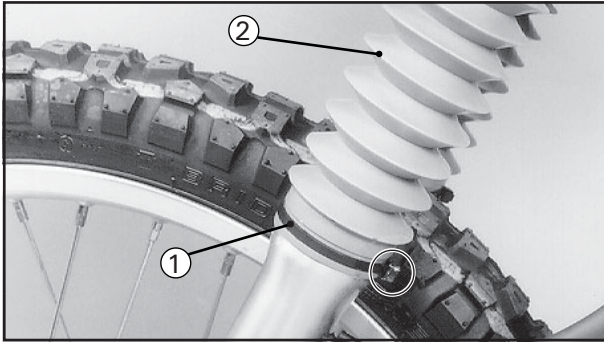
|   |   |
|---|---|
|  | <b>Nut (handle-bars board):</b><br>110 N.m (11.0 Kg.m; 79.7 ft.lb)<br><b>Bolt (handle-bars):</b><br>23 N.m (2.3 Kg.m; 16.6 ft.lb)<br><b>Bolt (suspension):</b><br>20 N.m (2.0 Kg.m; 14.7 ft.lb) |
|---|---|

\*\*\*\*\*

**6. Install:**

- Reverse the removal steps
- Fuel tank
- Seat

See Section "SEAT, FUEL TANK AND COVERS."



## FRONT SUSPENSION INSPECTION

### WARNING

The motorcycle should be firmly supported in order to prevent falls.

1. Place the motorcycle on a flat area.
  2. Remove:
    - Clamp ①
    - Dust cover ②
  3. Check:
    - Internal tube ①  
Scratches/damage => Replace.
    - Oil retainers  
Excessive leakage => Replace.
  4. Hold the motorcycle upright and actuate the front brake.
  5. Check:
    - Operation  
Force the suspension downwards repeatedly.  
Irregular operation => Repair.
- See Section "FRONTSUSPENSION" CHAPTER 6.
6. Install:
    - Dust cover
    - Clamps

See Section "FRONT SUSPENSION INSTALLATION," CHAPTER 6.

### CAUTION:

Always use new clamps.

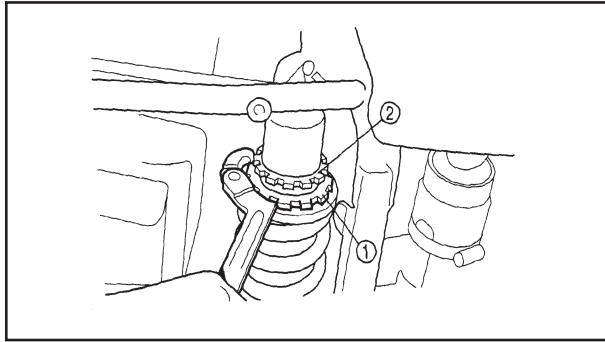
## REAR SHOCK ABSORBER ADJUSTMENT

### WARNING

The motorcycle should be firmly supported in order to prevent falls.

1. Adjust:
  - Spring preload
  - Shock absorbing

# REAR SHOCK ABSORBER ADJUSTMENT



\*\*\*\*\*

### Adjustment steps:

Spring preload

- Loosen the lock-nut ② using the tool: 90890-01443.
- Turn the adjuster ① inward or outward.



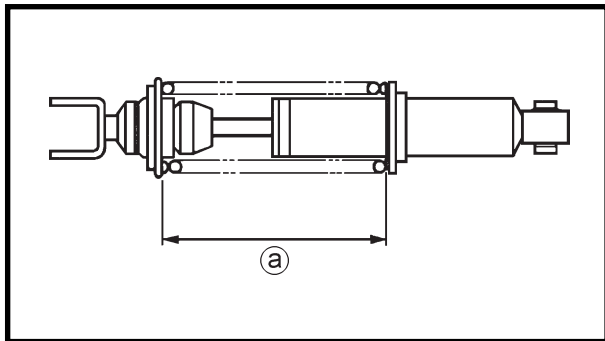
**Adjustment tool:**  
90890-01443

To turn inward => Increases the spring preload.

To turn outward => Reduces the spring preload.

### NOTE:

The spring (installed) length varies 1.0mm for each turn of the adjuster.



**Measurement length ①:**  
Standard:  
204 mm (8.0 in)  
Minimum:  
194 mm (7.6 in)  
Maximum:  
206 mm (8.1 in)

### CAUTION:

Never try to turn the adjuster more and less than the maximum and minimum adjustments, respectively.

- Tighten the lock-nut.

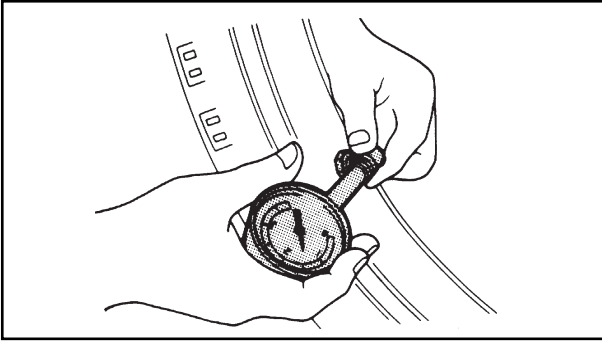


**Lock-nut:**  
43 N.m (4.3 Kg.m; 31.7 ft.lb)

### CAUTION:

Always tighten the lock-nut against the spring adjuster. Apply torque to the lock-nut according to the specification.

\*\*\*\*\*



## TIRE INSPECTION

### 1. Measure:

- Tire pressure  
Out of specification => Adjust.

### CAUTION:

The pressure should be checked and corrected when the tire temperature equals to the room temperature. The pressure should be compatible with the total weight of load, driver, passenger, and accessories (fairing, side bags, etc., when approved for this model) and the speed of the vehicle.

The appropriate load is important for driving, braking and other characteristics of performance and safety of your motorcycle. Do not carry objects not packed properly that may be displaced. Fasten your heavier load firmly, close to the center of the motorcycle, distributing the weight uniformly on both sides. Adjust the suspension according to the load and check the conditions and pressure of the tires. **NEVER OVERLOAD YOUR MOTORCYCLE.** Make sure that the total weight of load, driver, passenger, and accessories (fairing, side bags, etc., when approved for this model) does not exceed the maximum load for the motorcycle. Riding an overloaded motorcycle may result in tire damage, accidents and injuries.

### Off-road riding:

#### Front:

15 psi (100 kPa) (1.00 kgf/cm<sup>2</sup>)

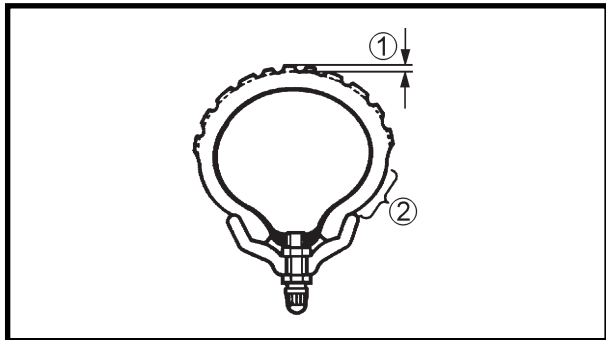
#### Rear:

15 psi (100 kPa) (1.00 kgf/cm<sup>2</sup>)


#### Maximum load\*:

90.0 kg (198 lb)

\* total weight with driver, load and accessories



2. Inspect
  - Tire surfaces
 Wear/damages => Replace.

|   |  |
|---|--|
|  | <b>Minimum groove depth</b><br>(front and rear):<br>0.4 mm (0.16 in) |
|---|--|

- ① Groove depth
- ② Side cover

**WARNING**

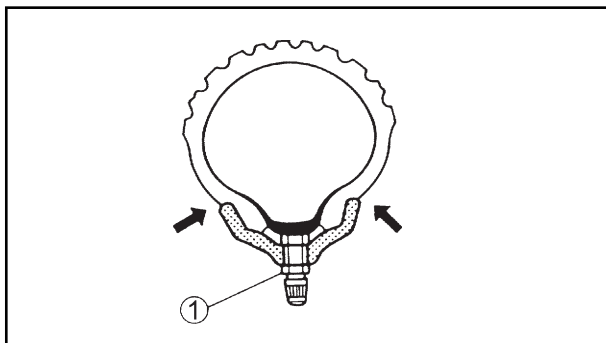
1. Riding with worn tires is dangerous. When the tire grooves show lines, replace the tire immediately.
2. Perforated tire tubes should not be patched. If it is absolutely necessary to use a patch, take care and replace the tire tube with a new high quality tire tube as soon as possible.

Front:

| Manufacturer | Measure       | Type         |
|--------------|---------------|--------------|
| PIRELLI      | 80/100 -21NHS | w/ tire tube |


Rear:

| Manufacturer | Measure       | Type         |
|--------------|---------------|--------------|
| PIRELLI      | 110/100-18NHS | w/ tire tube |



**WARNING**

- Ride with care after installing a tire allowing it to lay properly on the rim. Otherwise, an accident may occur resulting in damage to the motorcycle and injuries to the driver.
- After repairing or replacing a tire, make sure to apply the proper torque to the valve stem lock-nut ①.

|   |   |
|---|---|
|  | <b>Valve stem lock-nut:</b><br>1.5 N.m (0.15 Kg.m; 1.1 ft.lb) |
|---|---|

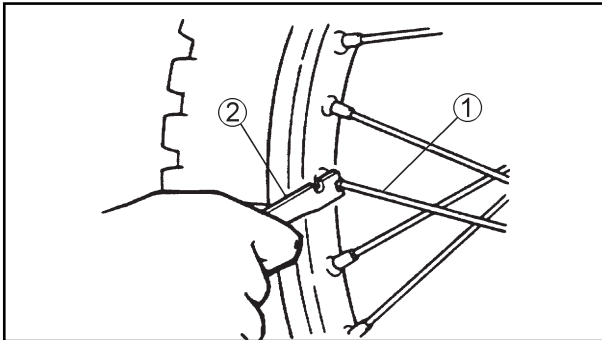
**WHEEL INSPECTION**

1. Check:
  - Wheels  
Damage/warping => Replace.

**NOTE:** \_\_\_\_\_  
Carry out the wheel swinging after each tire replacement.

**WARNING** \_\_\_\_\_

Do not try to carry out repairs to the wheels, even small repairs.



**WHEEL SPOKE INSPECTION AND TIGHTENING**

1. Check:
  - Spokes ①  
Bent/damaged => Replace.  
Loose => Tighten.
2. Tighten:
  - Spokes  
Spoke driver②

**NOTE:** \_\_\_\_\_  
Tighten the spokes before and after the laying.



**Nipple:**  
3.25 N.m (0.32 Kg.m; 2.35 ft.lb)

**CABLE INSPECTION AND LUBRICATION**

**WARNING** \_\_\_\_\_

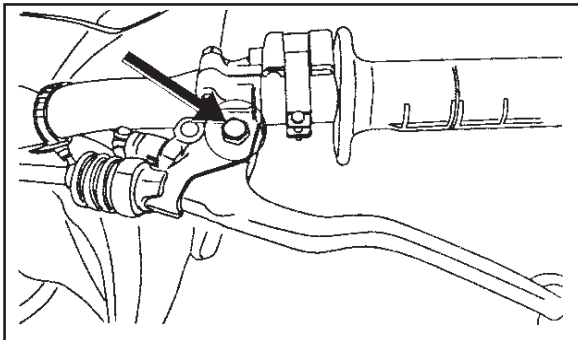
Damaged cable caps may result in corrosion, obstruction to movement of cables and, consequently, hazardous conditions. Replace the cables as soon as possible.

1. Check:
  - Cable cap  
Damages => Replace.
2. Check:
  - Cable operation  
Irregular operation => Lubricate.




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

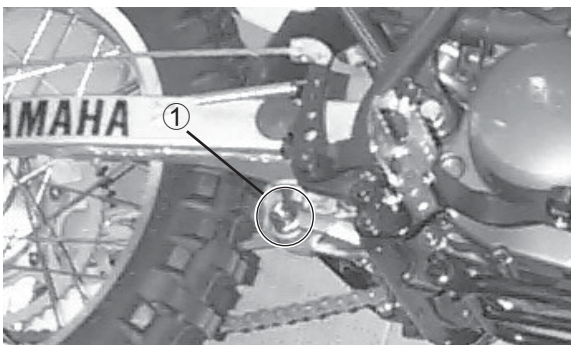
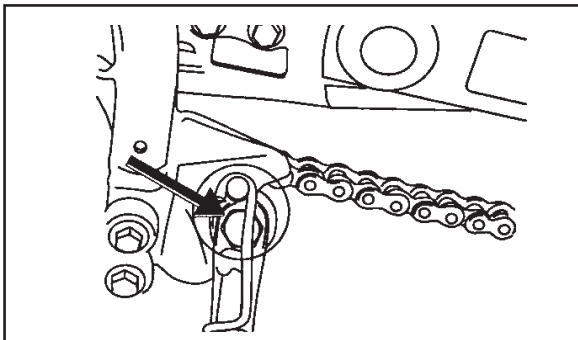
**NOTE:** \_\_\_\_\_  
Hold the cable end and apply some lubricant drops.



**PEDAL, LEVER AND SIDE SUPPORT  
LUBRICATION**


Lubricate hinges

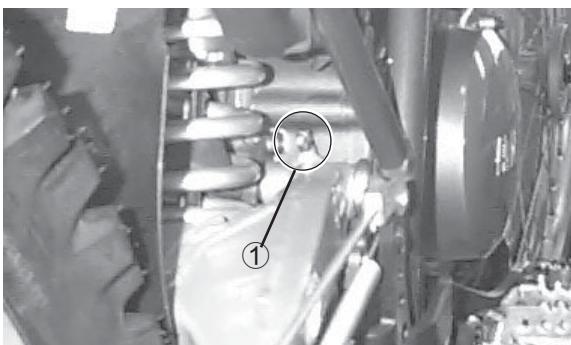
|   |  |
|---|--|
|  | Recommended lubricant:<br>Lithium-based grease |
|---|--|



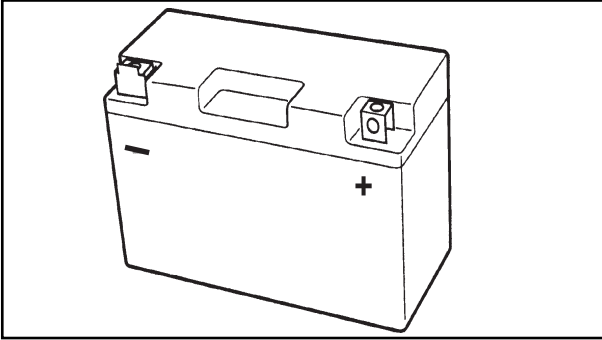
**REAR SUSPENSION LUBRICATION**

Lubricate the rear balance ①

|   |  |
|---|--|
|  | Recommended lubricant:<br>Lithium-based grease |
|---|--|



Grease fitting ①

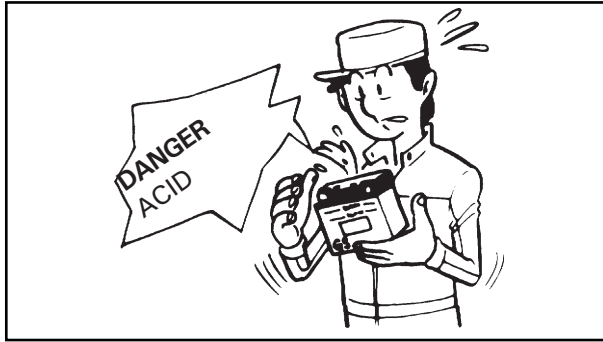
**ELECTRIC SYSTEM  
BATTERY INSPECTION****NOTE:**

The battery is a sealed MF type battery. Therefore, it is possible to measure the specific gravity of the electrolyte in a testing sequence. Then, in order to check the conditions of the battery, measure the voltage at the terminals.

**CAUTION:****RECHARGING THE BATTERY**

- The battery is a sealed type battery. During the recharging of the battery the seals should never be removed.
  - With the seals removed the electrolyte chemical proportion will be affected and the battery performance will decrease gradually.
  - Do not add water. If distilled water is added, the chemical reaction in the battery will divert from the ideal, impairing the efficiency.
  - The MF battery charging time, current and voltage are different from those of a conventional battery. The MF battery should be charged as described in "Charging the Battery." If the electrolyte level is too low, the battery may be overcharged. Therefore, take special care when charging the battery.
  - The use of any electrolyte other than that specified is forbidden. The MF battery electrolyte specific gravity is 1.32 at 20°C (68°F). (The conventional battery electrolyte specific gravity is 1.28.) If the electrolyte specific gravity is less than 1.32, the hydrogen sulfate will lose power, resulting in low battery performance, plate corrosion and reduced service life.
-





## WARNING

The battery solution is a hazardous substance, containing hydrogen sulfate. It is highly toxic and caustic. Observe the following preventive measures:

- Avoid the contact of body parts with the electrolyte, since burning or permanent damage to the eyes may result.
- Use goggles when working with batteries or close to them.

Remedy (EXTERNAL):

- Skin (wash with water).
- Eyes (wash with water for 15 minutes and look for medical help).

Remedy (INTERNAL):

- Drink great quantities of water or milk followed by milk of magnesia mixed with egg white or vegetable oil. Look for medical help immediately.
- Batteries also generate explosive hydrogen gas. Therefore, observe the following preventive measures:
  - Charge the battery in a ventilated area.
  - Keep batteries away from fire, sparks and flames.
  - DO NOT SMOKE while charging or handling batteries.

## KEEP AWAY FROM CHILDREN.

1. Remove:

- Right side cover

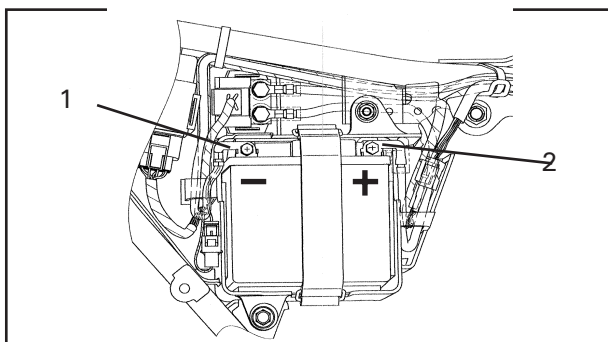
See Section "SEAT, FUEL TANK AND COVERS."

2. Disconnect:

- Battery terminals

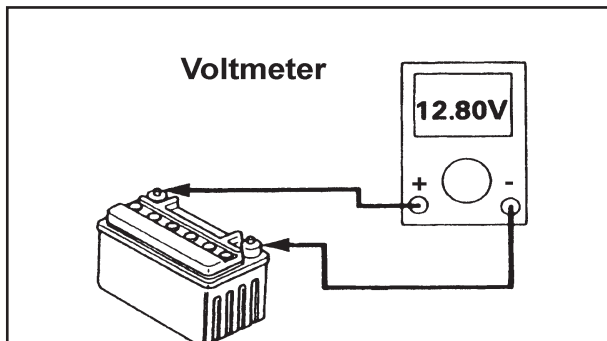
## CAUTION:

Disconnect the negative terminal ① first and, then, the positive terminal ②.



3. Remove:

- Battery



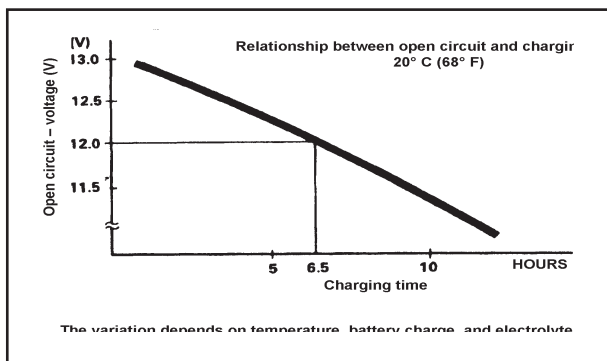
#### 4. Check:

- The battery conditions

\*\*\*\*\*

#### Check steps:

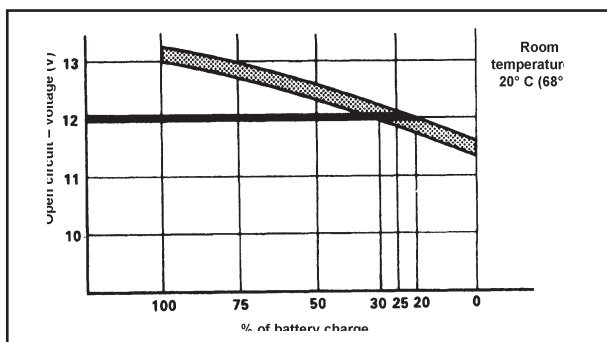
- Connect the voltmeter to the battery terminals.



|  |
|--|
| Testing terminal (+) => Battery terminal (+) |
| Testing terminal (-) => Battery terminal (-) |

#### NOTE:

The conditions of a discharged MF battery can be checked through the measurement of the voltage in the open circuit (voltage measured with the positive terminal disconnected).



| Open circuit voltage | Charging time         |
|----------------------|-----------------------|
| 12.8 V or more       | Charging not required |

- Check the battery conditions according to the instructions in the figures.

Example:

Open circuit voltage = 12.0 V

Charging time = 6.5 hours

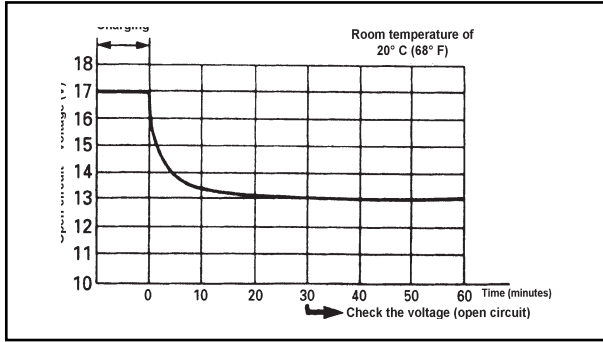
Charge conditions of the battery = 20 ~ 30%

\*\*\*\*\*

#### 5. Charging method for the MF battery:

#### CAUTION:

- If the standard current charge cannot be stabilized, make sure not to exceed it.
- Remove the battery from the motorcycle before charging it. (If, for any reason, it is necessary to charge the battery on the motorcycle, disconnect the negative terminal.)
- The seal cap of MF batteries should never be removed.



- Take special care to make sure the jaws contact efficiently the battery terminals and do not short. (A corroded jaw may cause the battery terminal to overheat. A weak jaw spring may generate sparks.)
- Before removing the jaws from the battery terminals, turn off the charger switch.
- The changes to the open voltage circuit of the MF battery after charging are shown in the figure. The open voltage circuit will be stabilized 30 minutes after the conclusion of the charging process. Therefore, in order to check the conditions of the battery, carry out the measurement in the circuit after this period.

6. Check:

- Battery terminals  
Dust/dirt => clean using a wire brush  
Poor contact => fix

**NOTE:** \_\_\_\_\_

After cleaning, apply conventional grease to the terminals.

7. Install:

- Battery

8. Connect:

- Battery terminals

**CAUTION:** \_\_\_\_\_

Connect the positive terminal first, then, the negative terminal.

9. Install:

- Right side cover

## FUSE INSPECTION

**CAUTION:** \_\_\_\_\_

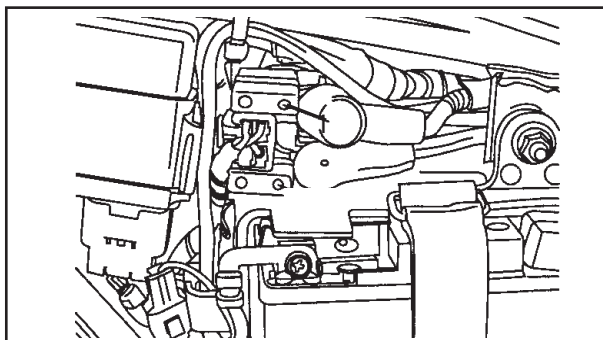
The main switch should be at OFF position while the fuse is checked or replaced. Otherwise, a short-circuit may occur.

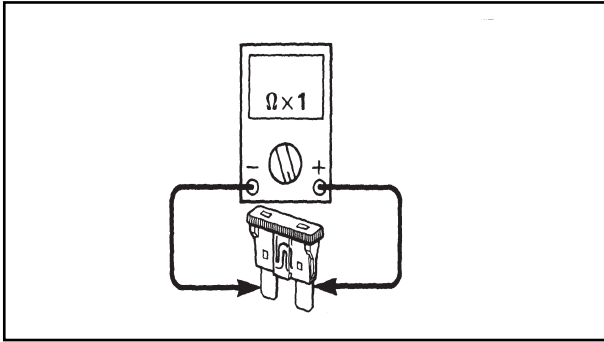
1. Remove:

- Side cover (RH)  
See Section "SEAT, FUEL TANK AND COVERS."

2. Remove:

- Main fuse ①






3. Inspect:
- Fuse

\*\*\*\*\*

**Inspection steps:**

- Connect a multimeter to the fuse and check the continuity.

**NOTE:** \_\_\_\_\_  
Adjust the switch to " Wx1".

|   |                                   |
|---|-----------------------------------|
|  | <b>Multimeter:</b><br>90890-01312 |
|---|-----------------------------------|

If the device indicates ~~∞~~, the fuse is burnt. Replace.

\*\*\*\*\*

4. Replace:
- Burnt fuse

\*\*\*\*\*

**Replacement steps:**

- Keep the main switch OFF.
- Install a new fuse with appropriate amperage.

|   |                               |
|---|-------------------------------|
|  | <b>Fuse:</b><br>10 A X 1 part |
|---|-------------------------------|

- Turn on the main switch and check the operation of the electric system.
- If the fuse burns, verify the circuit.

\*\*\*\*\*

**WARNING**

**Do not use a fuse with higher amperage or any other material. Using an improper fuse may result in damage to the electric system, including fire.**

5. Install:
- Side cover (RH)

---

## CHAPTER 4. ENGINE INSPECTION

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## ENGINE INSPECTION

### ENGINE REMOVAL

**NOTE:** \_\_\_\_\_

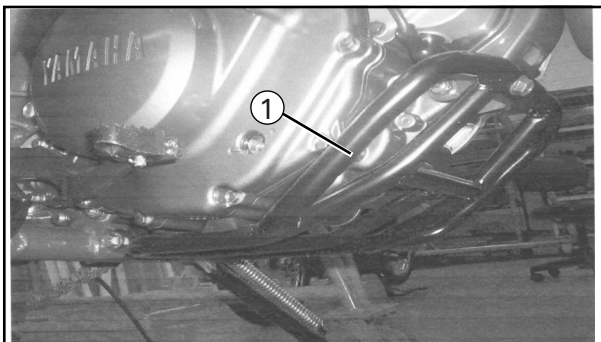
It is not necessary to remove the engine in order to remove the following components:

- Head
- Cylinder
- Piston
- Clutch
- Oil pump
- Magnet rotor

### SEAT, FUEL TANK AND COVERS

1. Remove:

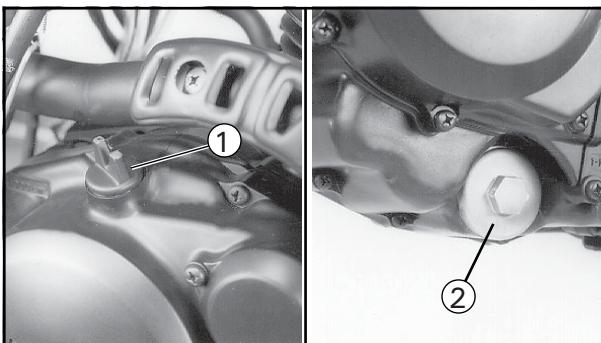
- Side covers
- Seat
- Fuel tank



### CRANKCASE GUARD

1. Remove:

- Crankcase guard ①

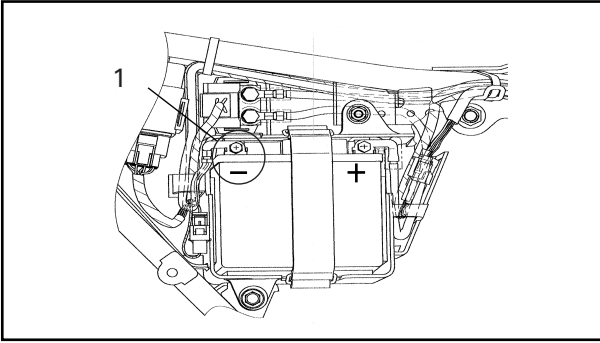


### ENGINE OIL

1. Remove:

- Oil filling screw ①
- Drain plug ②

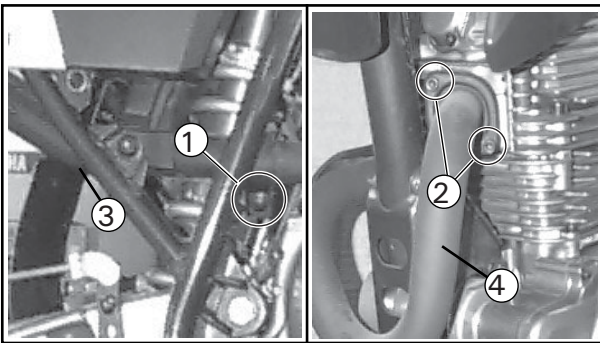
See Section "ENGINE OIL CHANGE", CHAPTER 3.



### BATTERY CABLES

1. Disconnect:

- Battery negative cable ①

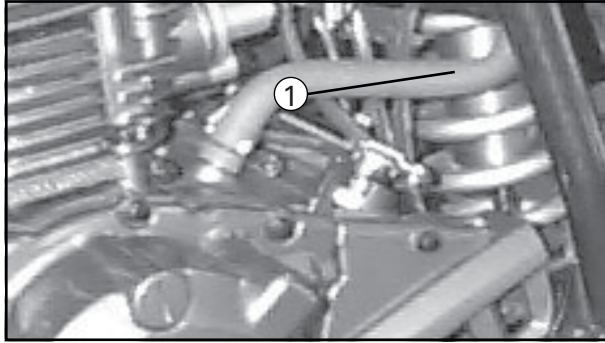


### EXHAUST TUBE AND MUFFLER

1. Remove:

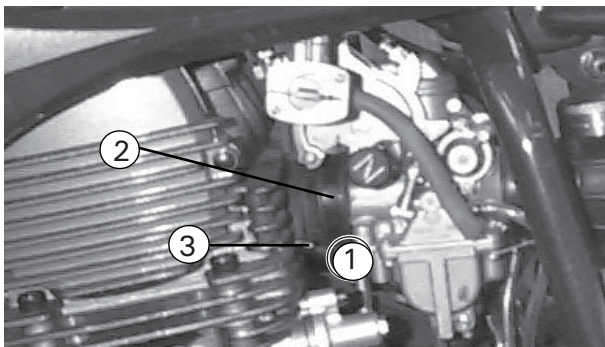
- Bolt ① (tie wrap)
- Bolt ② (exhaust tube)
- Muffler ③
- Exhaust tube ④





## BREATHER HOSE AND CARBURETOR

1. Disconnect:
  - Engine breather hose ①
  
2. Drain:
  - Fuel (bowl chamber)



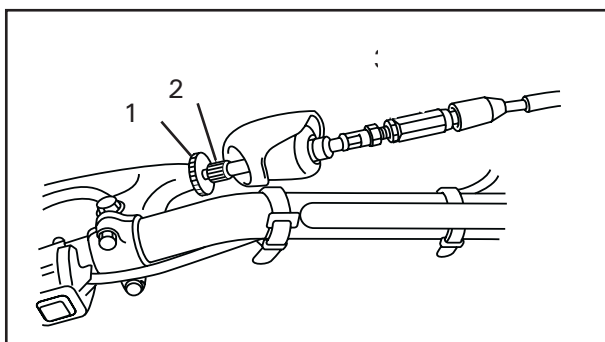
3. Loosen:
  - Bolts ① (carburetor connections)

**NOTE:** \_\_\_\_\_  
 Move the carburetor tie wrap ② back.  
 \_\_\_\_\_

4. Loosen:
  - Bolts ③ (intake manifold)

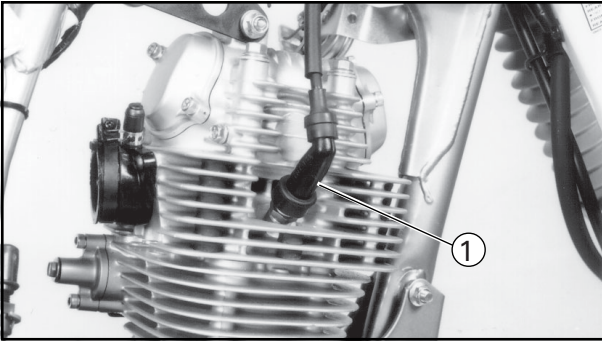
5. Disconnect:
  - Carburetor (through the left side of the motorcycle)

**NOTE:** \_\_\_\_\_  
 Cover the carburetor with a clean cloth in order to prevent dirt from entering the carburetor.  
 \_\_\_\_\_



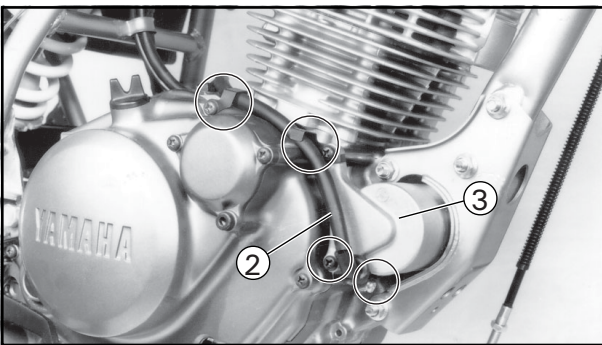
## CABLES AND WIRING

1. Loosen:
  - Nut ①
  - Adjuster ② (cable adjusting screw)
2. Disconnect:
  - Clutch cable (clutch lever and cable fastener)



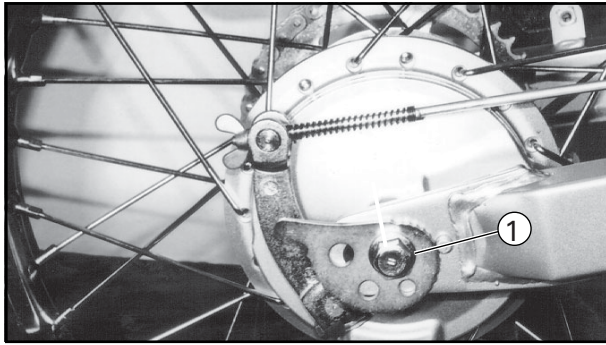
3. Disconnect:
  - Spark plug cap ①

4. Disconnect:
  - Magnet connectors ①



5. Remove:
  - Starter motor wire ②
  - Starter motor ③

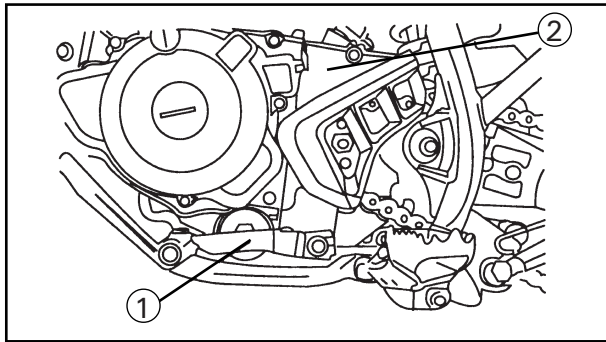
6. Disconnect:
  - Ground wire
  - Starter motor wire



## TRANSMISSION CHAIN

### 1. Loosen:

- Shaft castellated nut ①

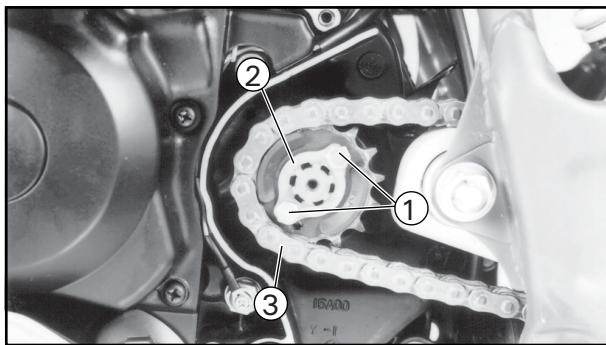


### 2. Remove:

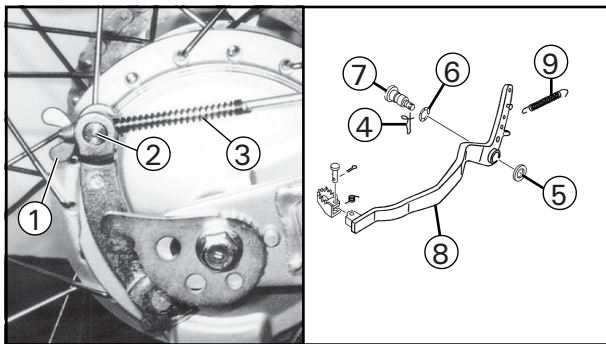
- Shift lever ①
- Case cover ②

### 3. Remove:

- Bolts ①
- Pinion gear fastener ②
- Transmission chain ③



**NOTE:** Loosen the bolt while engaging the rear brake.



### 4. Remove:

- Adjuster ①
- Pin ②
- Spring ③

### 5. Remove:

- Cotter pin ④
- Corrugated washer ⑤
- Flat washer ⑥
- Brake pedal shaft ⑦
- Rear brake pedal ⑧

### 6. Disconnect:

- Spring ⑨

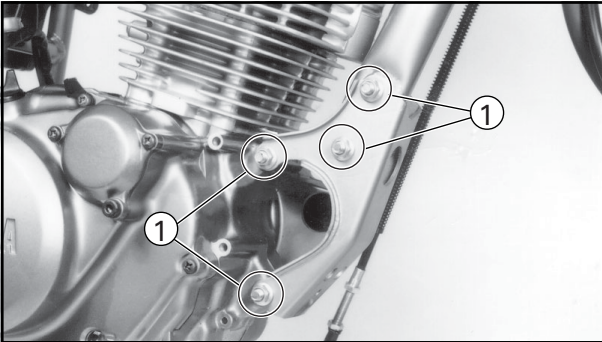


## ENGINE REMOVAL

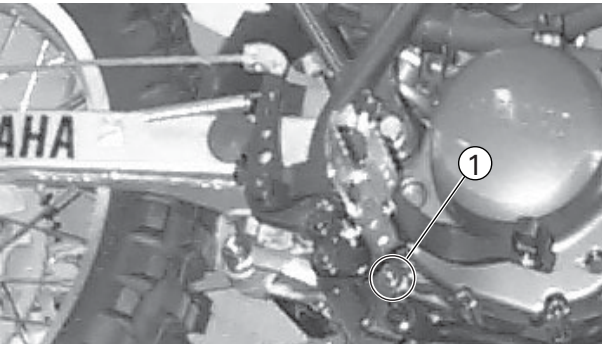
1. Place a suitable support under the engine.

**WARNING**

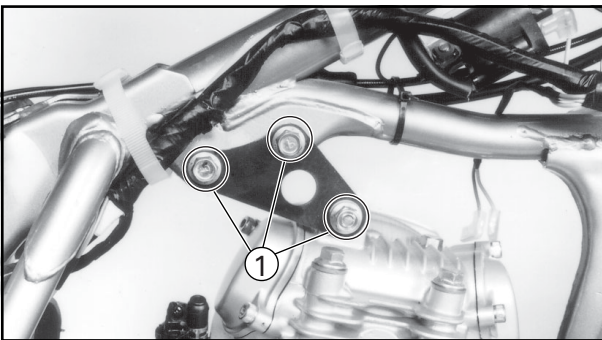
The motorcycle should be firmly supported in order to prevent falls.



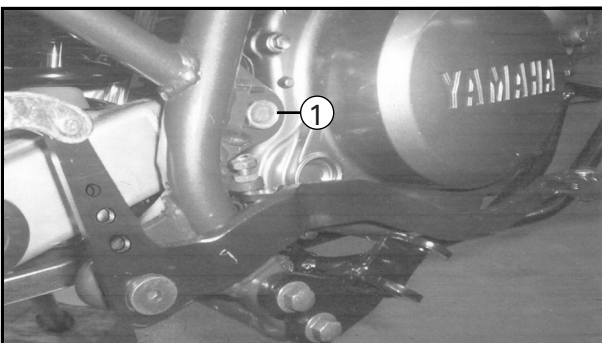
2. Remove:
  - Setscrews ① (front lower)



3. Remove:
  - Setscrews ① (rear lower)



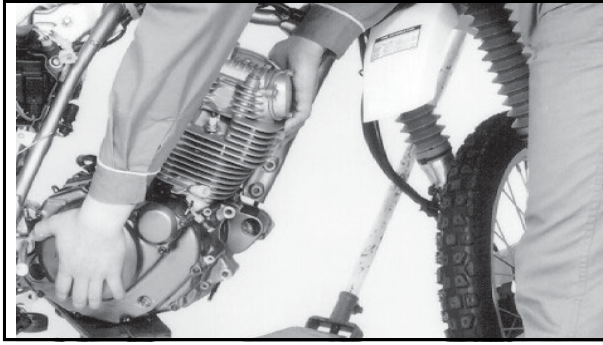
4. Remove:
  - Setscrews ① (front upper)



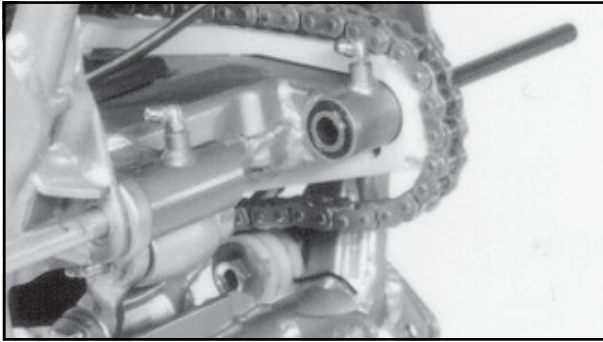
5. Remove:
  - Shaft ①

**NOTE:**

The engine and the rear balance are installed on the same shaft. Therefore, the shaft should be carefully displaced just enough to remove the engine.



6. Remove:
  - Engine  
(through the right side of the motorcycle)



**NOTE:** \_\_\_\_\_  
After the engine has been removed, place the other side of the balance properly using a suitable shaft.  
\_\_\_\_\_



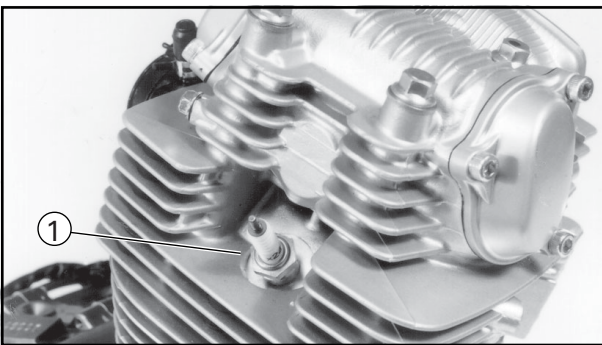
## ENGINE DISMOUNTING

### HEAD, CYLINDER, AND PISTON

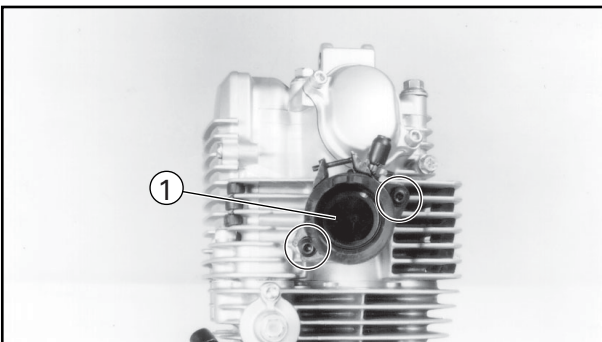
**NOTE:**

With the engine mounted, the head, camshaft, and cylinder overhauling is possible, removing the following parts:

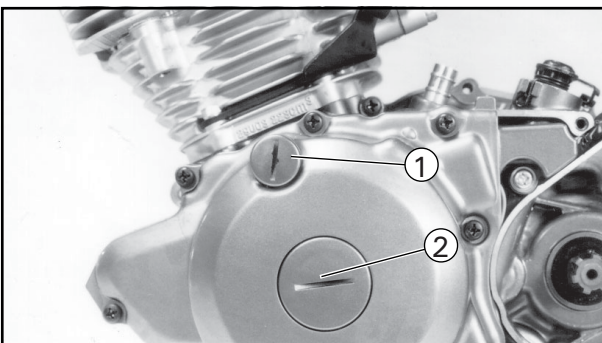
- Side covers
- Seat
- Fuel tank
- Exhaust tube
- Carburetor
- Clutch cable
- Spark plug cable
- Engine support

**1. Remove:**

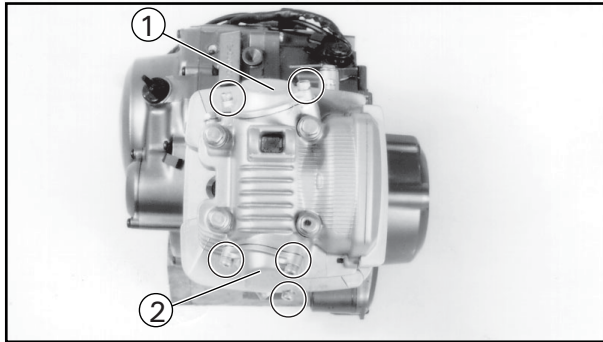
- Spark plug ①

**2. Remove:**

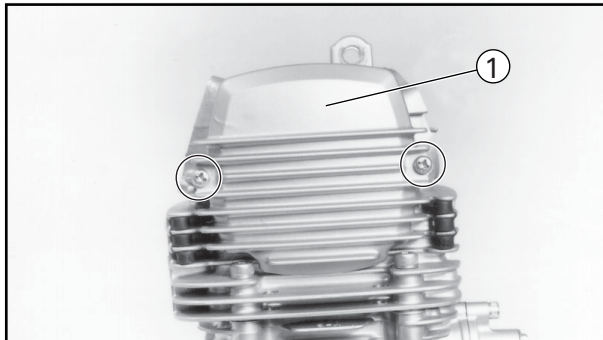
- Intake manifold ①

**3. Remove:**

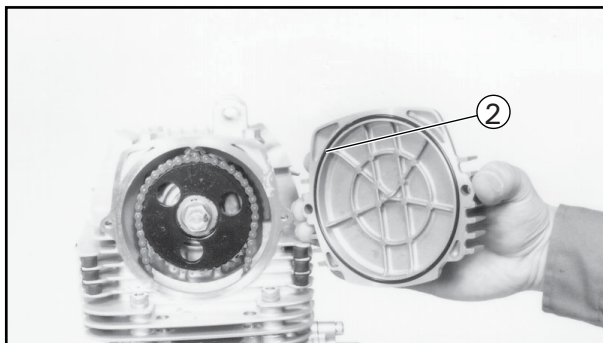
- Covers ① and ②



4. Remove:
- Valve cover (Intake) ①
  - Valve cover (Exhaust) ②



5. Remove:
- Head cover ①
  - O-ring ②

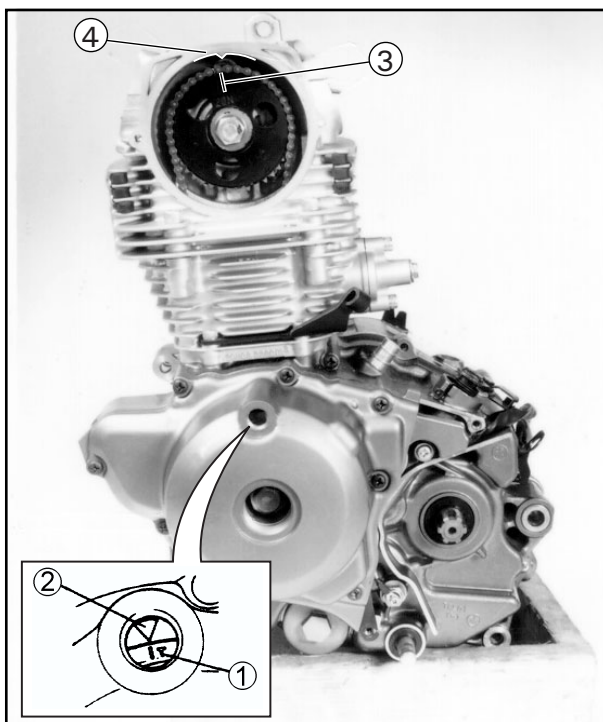


6. Align:
- "T" mark on the rotor with the stationary mark on the case cover.

\*\*\*\*\*

**Steps for PMS alignment:**

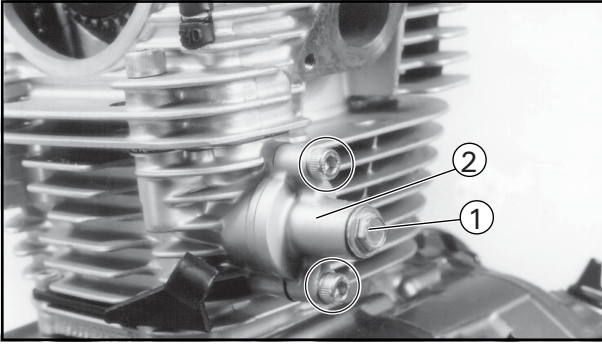
- Turn the crankshaft counterclockwise.
- Align the "T" mark ① on the rotor with the stationary mark ② on the case cover. With the "T" mark aligned, the piston is at the top dead center (TDC).



**NOTE:** \_\_\_\_\_

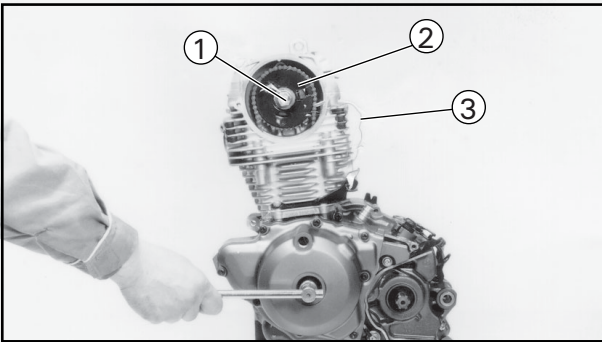
- Check the compression stroke at the TDC.
- Both rockers should allow for clearance when the camshaft gear mark ③ is aligned with the head mark ④.
  - Otherwise, rotate the crankshaft one more turn in order to establish the condition above.

\*\*\*\*\*



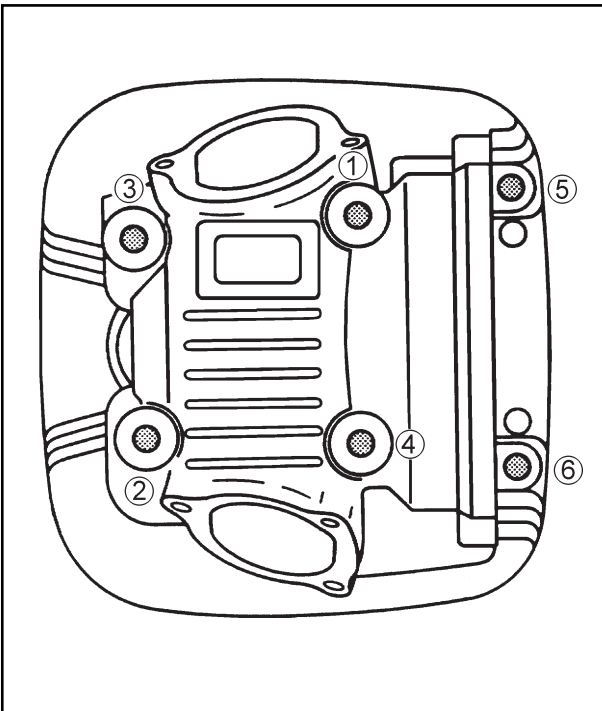
7. Loosen:
- Tensioner cover bolt ①

8. Remove:
- Chain tensioner ②



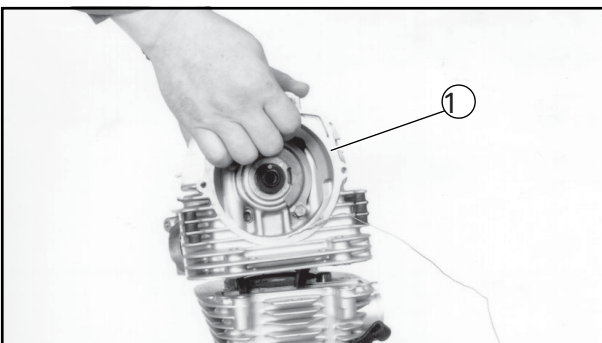
9. Remove:
- Bolt ①
  - Camshaft gear ②

**NOTE:** \_\_\_\_\_  
 Fasten to the camshaft chain ③ using a wire in order to prevent it from falling into the case.  
 \_\_\_\_\_



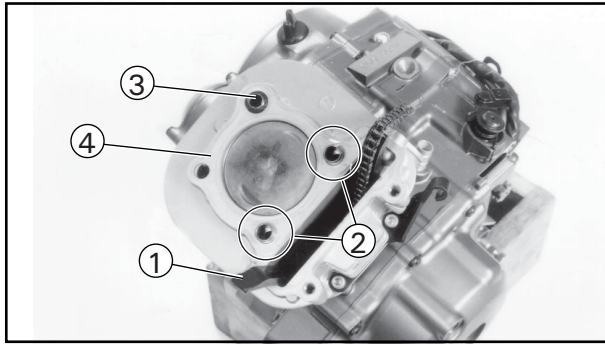
10. Remove:
- Bolts

**NOTE:** \_\_\_\_\_  
 ● Loosen the bolts  $\frac{1}{4}$  turn, then, remove the bolts.  
 ● Loosen the bolts with higher numbers first.  
 ● The numbers on the head indicate the tightening order.  
 \_\_\_\_\_

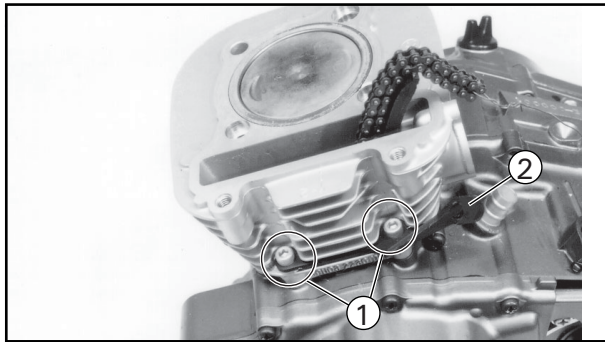


11. Remove:
- Head ①

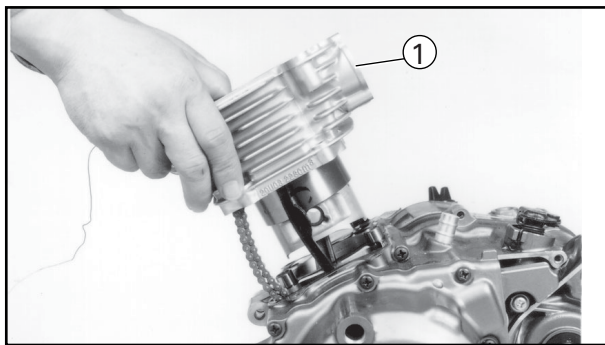




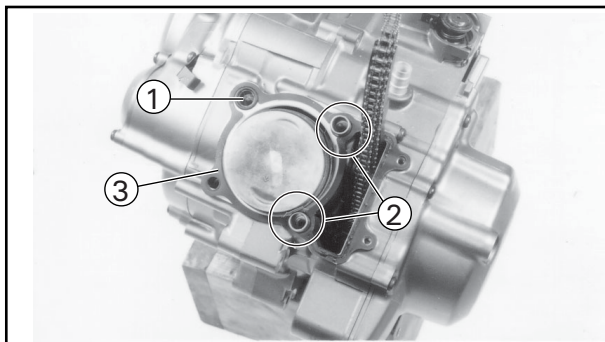
12. Remove:
- Camshaft chain guide (Exhaust) ①
  - Dowel pins ②
  - Seal ③
  - Head gasket ④



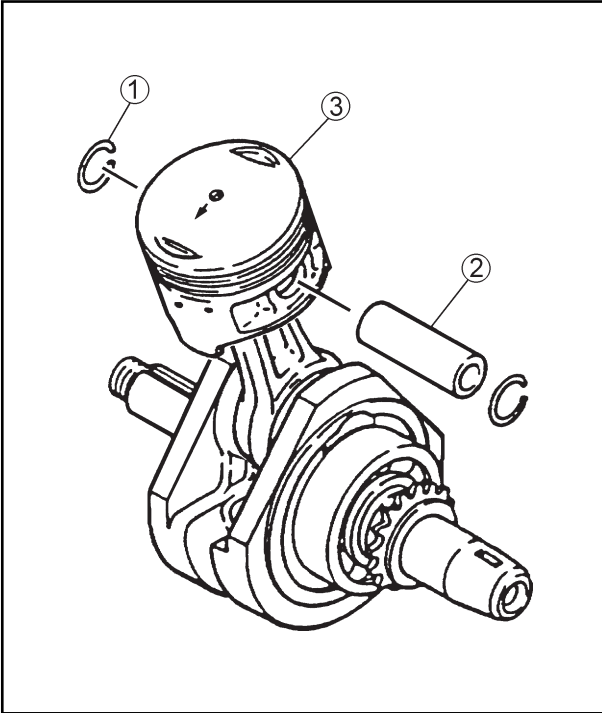
13. Remove:
- Bolts ①
  - Clutch cable fastener ②



14. Remove:
- Cylinder ①



15. Remove:
- O-ring ①
  - Dowel pins ②
  - Cylinder gasket ③



16. Remove:

- Piston pin lock ①
- Piston pin ②
- Piston ③

**NOTE:**

- Before removing the piston pin lock, cover the case using a cloth in order to prevent the lock from falling into the case.
- Use an appropriate puller to remove the piston pin.



Piston pin puller.  
90890-01304

**CAUTION:**

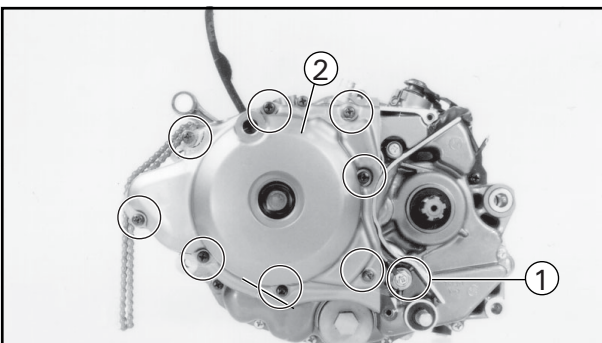
Do not use a hammer to remove the piston pin.

## MAGNET ROTOR AND STARTING GEARS

**NOTE:**

With the engine installed on the frame, the magnet rotor and starting gear overhauling is possible, removing the following parts:

- Side cover (RH)
- Seat
- Crankcase guard



1. Disconnect:

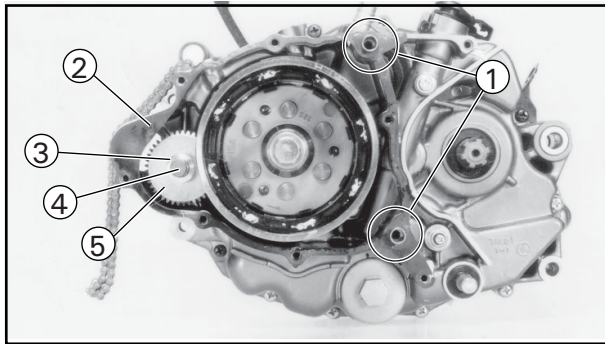
- Neutral switch wire ①

2. Remove:

- Case cover ② (LH)

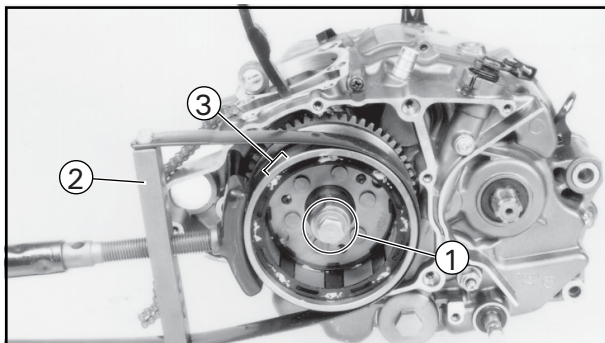
**NOTE:**

Loosen the bolts  $\frac{1}{4}$  turn in a cross pattern, then, remove the bolts.



3. Remove:

- Dowel pins ①
- Gasket ② (case cover)
- Spacer ③
- Shaft ④
- Starting gear ⑤



4. Remove:

- Bolt 1 (rotor)

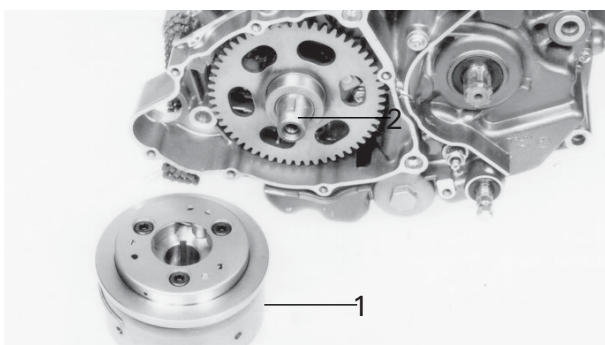
**NOTE:**

Loosen the rotor bolt holding the rotor with the fastener ②.

|   |                                       |
|---|---------------------------------------|
|  | <b>Rotor fastener:</b><br>90890-01701 |
|---|---------------------------------------|

**CAUTION:**


Prevent the rotor fastener from touching the cam ③ on the rotor.

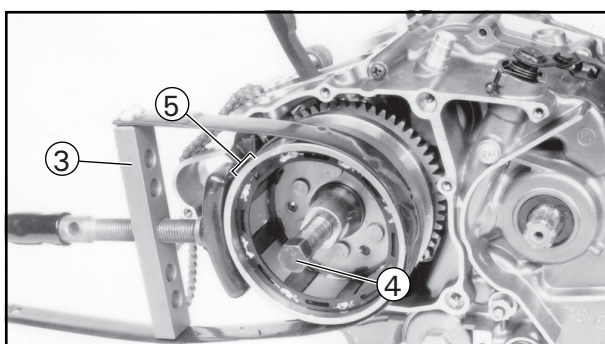


5. Remove:

- Rotor ①
- Key ②

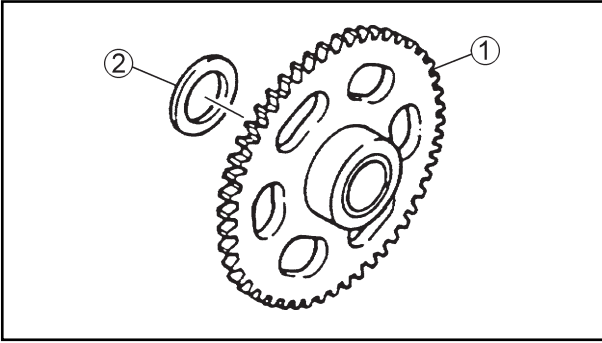
Use the rotor fastener ③ and the rotor puller ④.

|   |                                     |
|---|-------------------------------------|
|  | <b>Rotor puller:</b><br>90890-01080 |
|---|-------------------------------------|

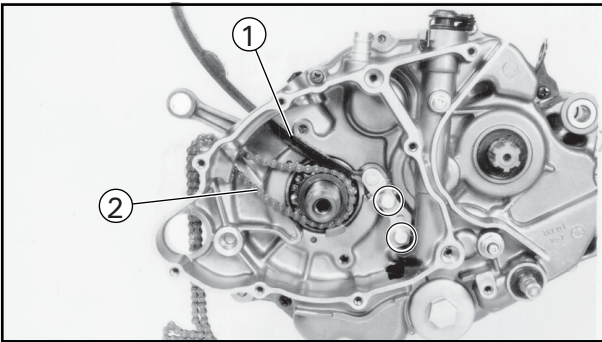


**CAUTION:**

Prevent the rotor fastener from touching the cam ⑤.

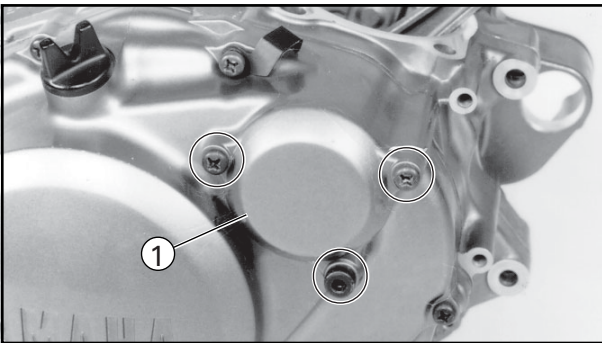


6. Remove:
- Gear ①
  - Washer ②

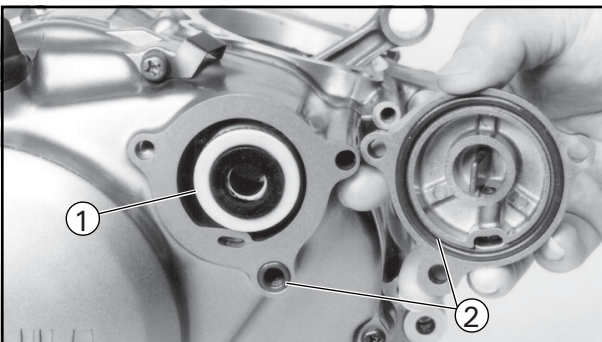


7. Remove:
- Chain guide ① (Intake)
  - Camshaft chain ②

## OIL FILTER



1. Remove:
- Oil filter cover ①



2. Remove:
- Oil filter ①
  - O-rings ②

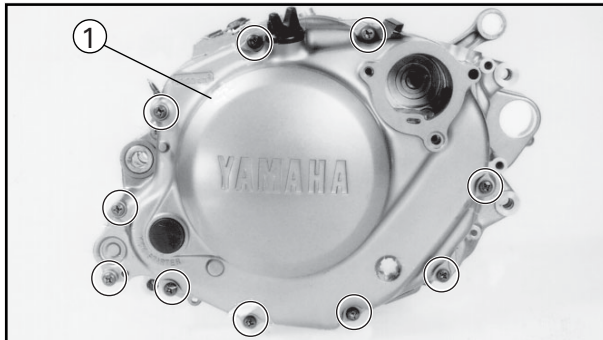


## CLUTCH, OIL PUMP AND BALANCER GEAR

### NOTE:

With the engine installed on the frame, the clutch and oil pump overhauling is possible, removing the following parts:

- Crankcase guard
- Brake pedal

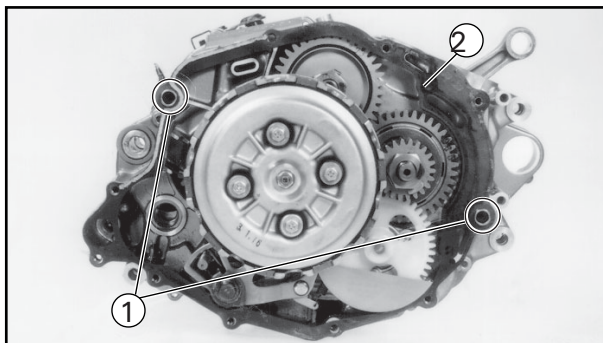


### 1. Remove:

- Case cover ① (RH)

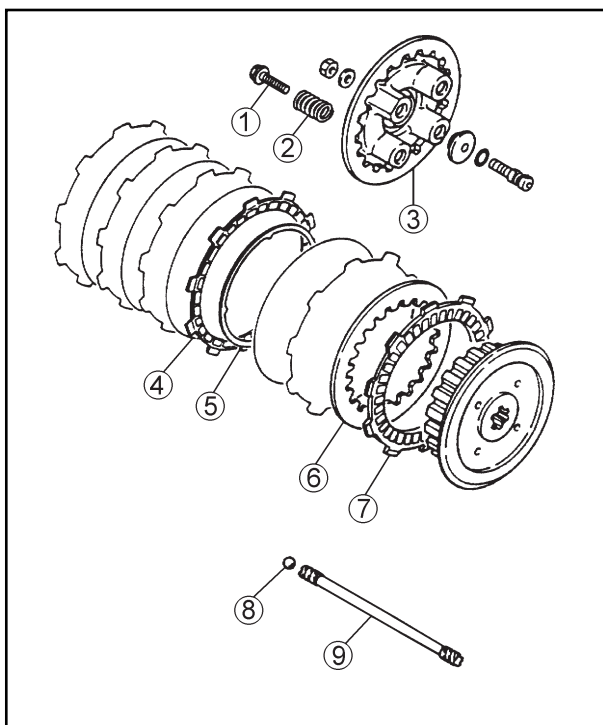
### NOTE:

Loosen the bolts  $\frac{1}{4}$  turn in a cross pattern, then, remove the bolts.



### 2. Remove:

- Dowel pins ①
- Gaskets ② (case cover)

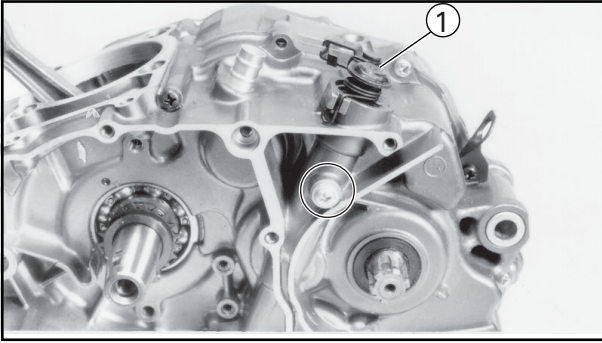


### 3. Remove:

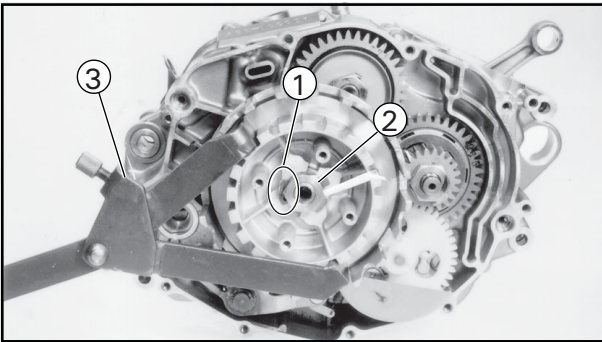
- Bolts ①
- Springs ②
- Pressure plate ③
- Friction discs ④ (type A)
- Pressure spring ⑤
- Separators ⑥
- Friction disc ⑦ (type B)
- Ball ⑧
- Stem ⑨

### NOTE:

Loosen the bolts  $\frac{1}{4}$  turn in a cross pattern, then, remove the bolts.



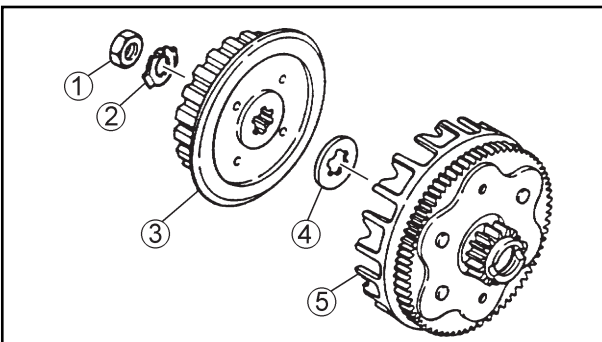
4. Remove:
- Clutch drive stem ①



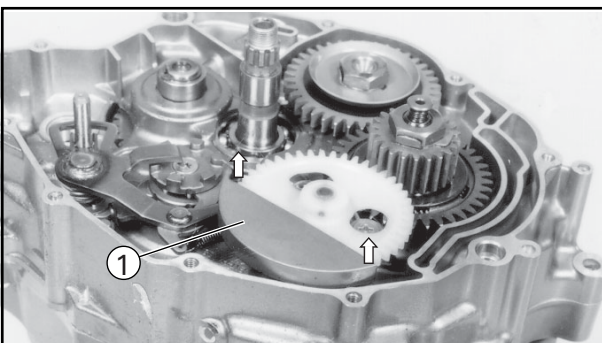
5. Straighten out:
- Lock washer flange ①
6. Loosen:
- Nut ② (clutch hub)

**NOTE:** \_\_\_\_\_  
 Loosen the nut (from the clutch hub) holding the clutch hub with the universal clutch fastener ③.

|   |  |
|---|--|
|  | <b>Universal clutch fastener:</b><br>90890-04086 |
|---|--|

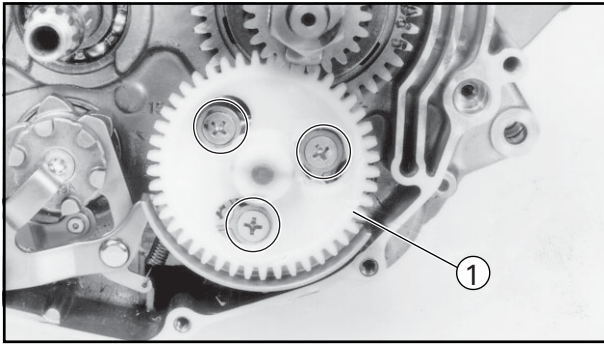


7. Remove:
- Nut ① (clutch hub)
  - Lock washer ②
  - Clutch hub ③
  - Spacer ④
  - Driven gear ⑤ (sleeve)

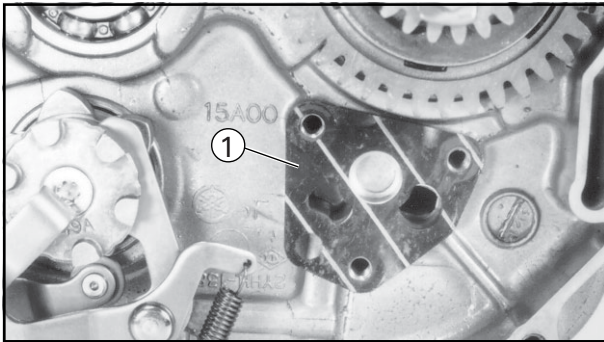


8. Remove:
- Oil pump gear cover ①

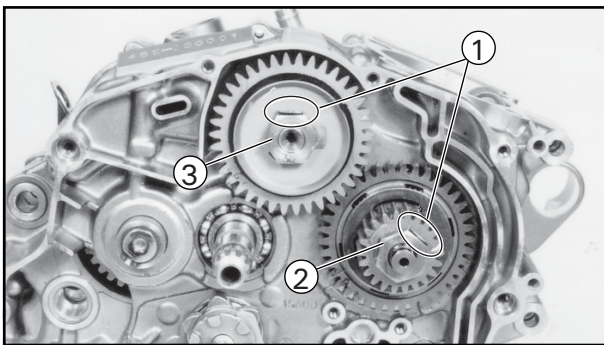
**NOTE:** \_\_\_\_\_  
 Lift and remove the cover.



9. Remove:
- Oil pump assembly ①

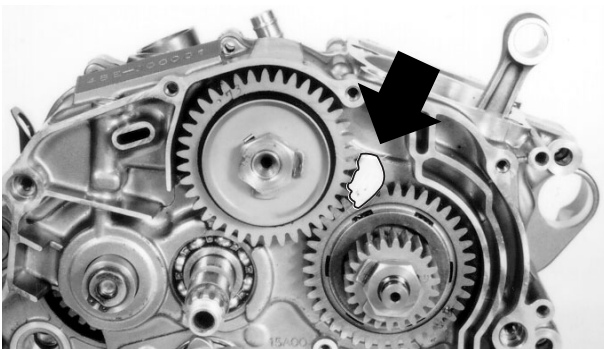


10. Remove:
- Gasket ① (oil pump)

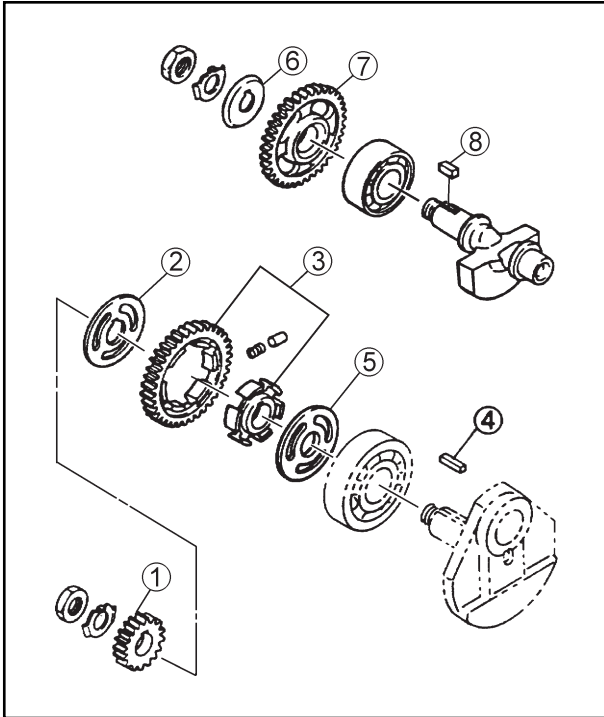


11. Straighten out:
- Lock washer flange ①

12. Loosen:
- Nut ② (Crankshaft)
  - Nut ③ (Balancer shaft)



- NOTE:**
- Place a cloth or an aluminum plate between the teeth of the primary and balancer shaft gears.
  - Take care not to damage the teeth of the gears.



13. Remove:

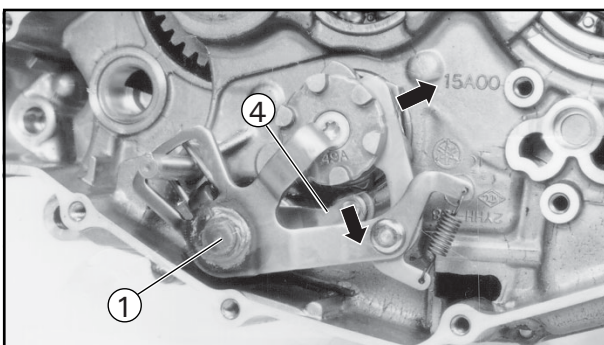
- Primary gear ①
- Special washer ②
- Balancer gear and impact hub ③
- Key ④
- Special washer ⑤
- Plate ⑥
- Balancer gear ⑦
- Key ⑧

## SHIFT SHAFT

### NOTE:

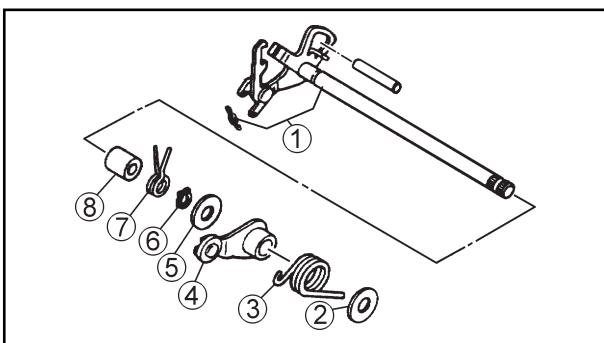
With the engine installed on the frame, the shift shaft overhauling is possible, removing the following parts:

- Crankcase guard
- Brake pedal
- Clutch
- Oil pump



1. Remove:

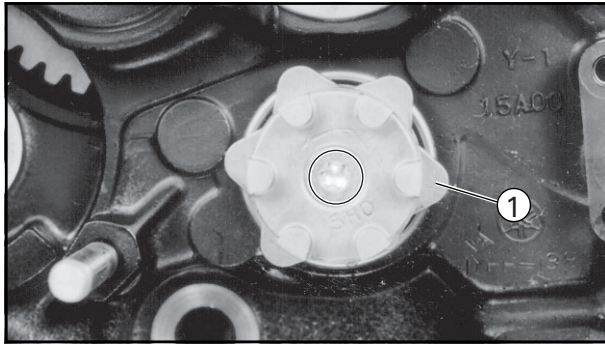
- Shift shaft ①
- Washer ②
- Spring ③
- Stop ④
- Washer ⑤
- Lock ⑥
- Torsion spring ⑦
- Spacer ⑧



### NOTE:

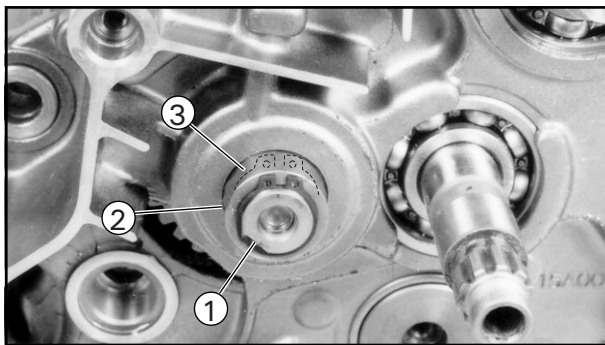
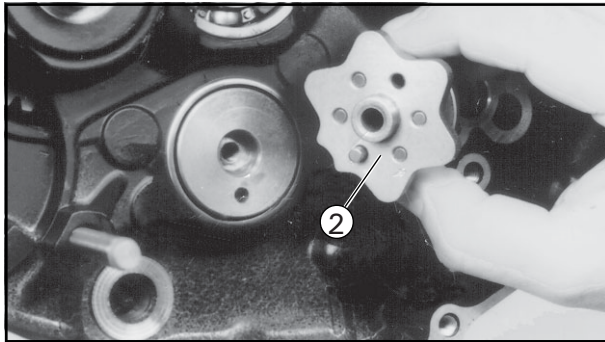
Push the shift shaft arm and the stop in the arrow direction and remove it.



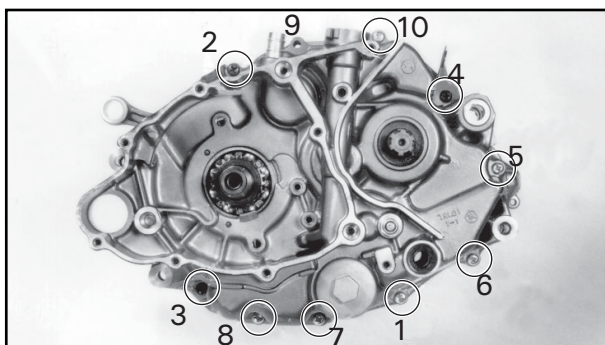


2. Remove:
- Section ①
- Use a wrench.

**NOTE:** \_\_\_\_\_  
 When removing the section, the dowel pin ② may fall. Take care not to lose it.



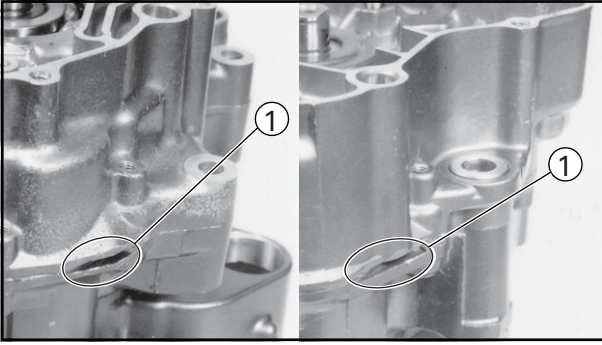
3. Remove:
- Lock ①
  - Spacer ② (Driving shaft)
  - Lock ③



## CASE (RIGHT)

1. Remove:
- Bolts (case)

**NOTE:** \_\_\_\_\_  
 ● Loosen the bolts  $\frac{1}{4}$  turn, then, remove the bolts.  
 ● Loosen the bolts with higher numbers first.  
 ● The numbers on the case indicate the tightening order.



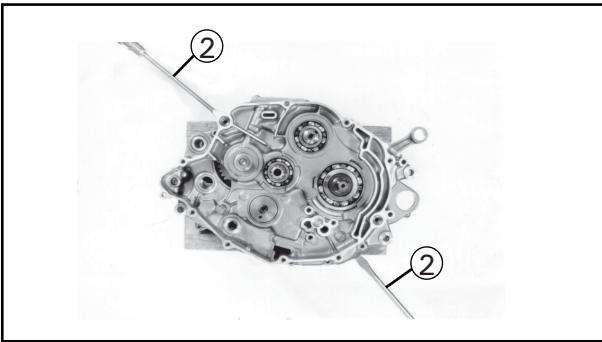
2. Remove:

- Case:

The slots ① are specific for separating the cases. Use a screwdriver ②, applying the same force on both sides in order to separate the cases.

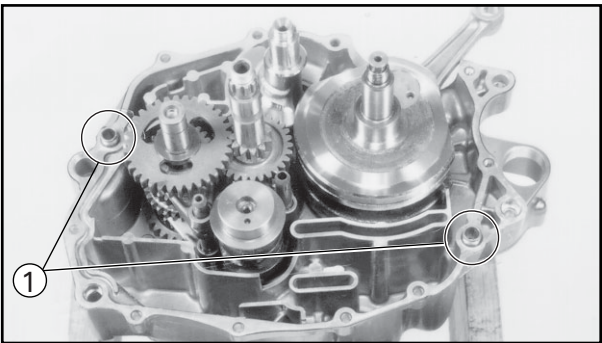
**CAUTION:**

- The cases should be separated by removing the right case.
- Separate the cases after verifying that the main shaft lock and the shifting fork section have been removed.
- Use the screwdriver only in the slots ① shown in the figure above.
- Prevent the case surfaces from being damaged.



3. Remove:

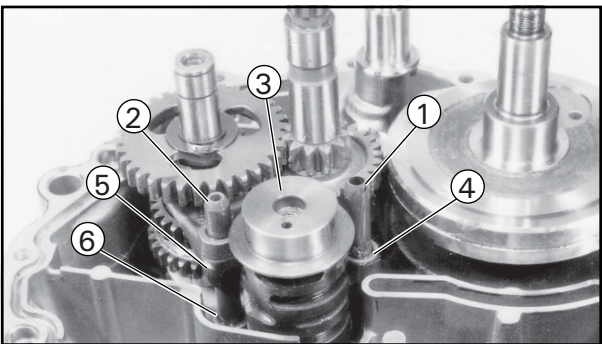
- Dowel pins ①



## BALANCER, TRANSMISSION AND SHIFTING FORK

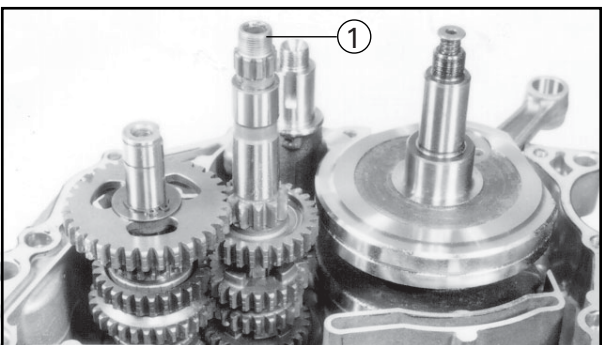
1. Remove:

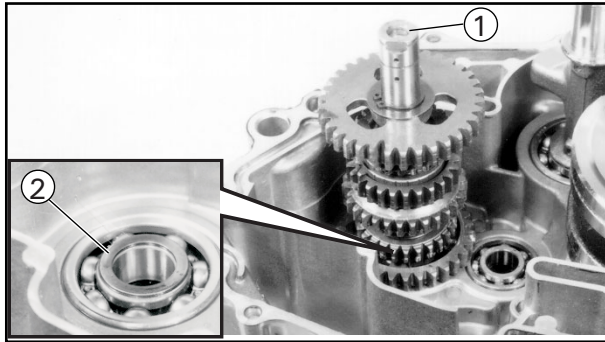
- Shifting fork guide bar ① (short)
- Shifting fork guide bar ② (long)
- Shifting fork ③
- Shifting fork 1 ④
- Shifting fork 2 ⑤
- Shifting fork 3 ⑥



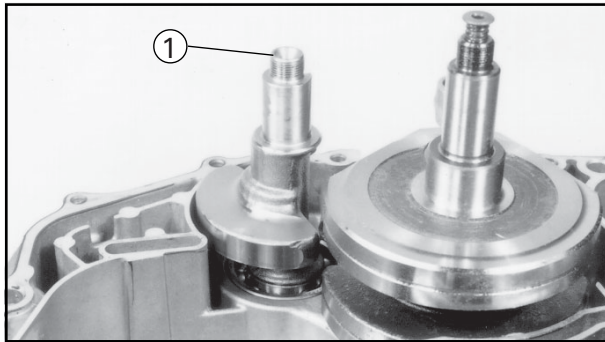
2. Remove:

- Main shaft assembly ①

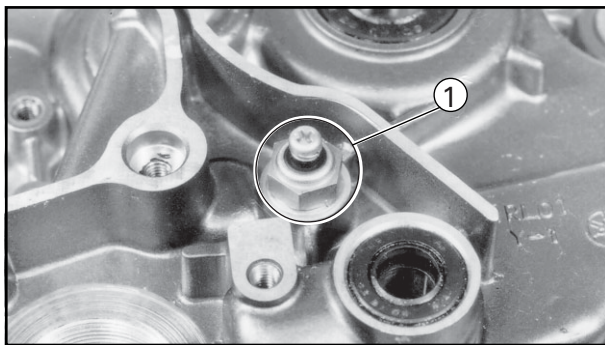




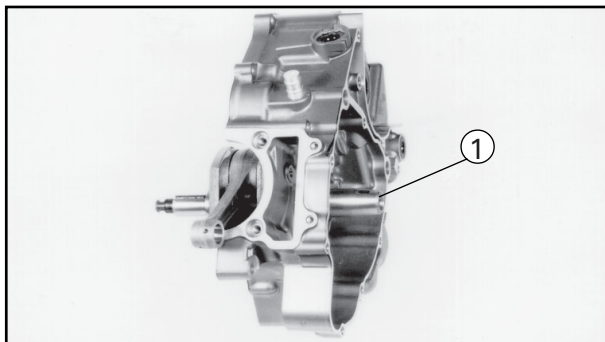
3. Remove:
- Secondary shaft assembly ①
  - Washer ②



4. Remove:
- Balancer shaft ①



5. Remove:
- Dead center switch ①



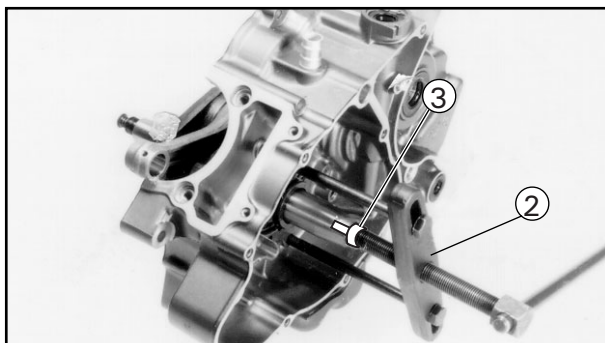
## CRANKSHAFT

1. Remove:
- Crankshaft assembly ①
- Use the case separator ② and the adapter ③.

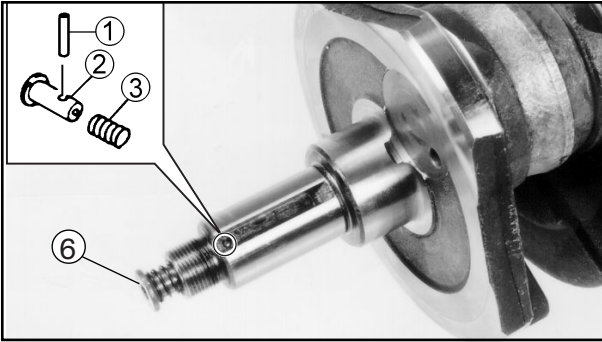


**Case separator:**  
90890-03081

**Adapter:**  
90890-01382



**NOTE:** \_\_\_\_\_  
Verify that the tool spindle is aligned with the crankshaft center line.  
\_\_\_\_\_



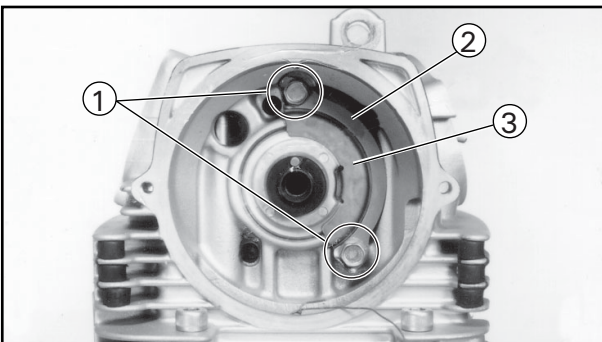
2. Remove:
  - Elastic pin ①
  - Pin with hole ②
  - Spring ③

## ROCKER AND CAMSHAFT

### NOTE:

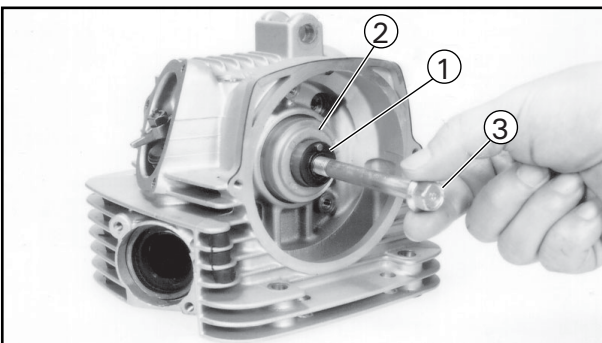
With the engine installed on the frame, the camshaft and rocker overhauling is possible, removing the following parts:

- Side covers
- Seat
- Fuel tank
- Valve covers
- Side head cover



1. Straighten out:
  - Lock washer flange

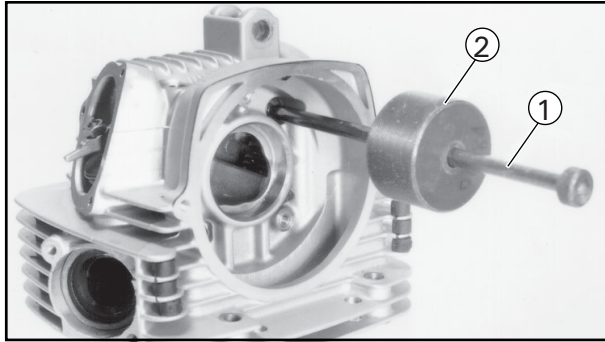
2. Remove:
  - Bolts ①
  - Lock washer ②
  - Plate ③



3. Remove:
  - Camshaft ①
  - Spacer ②

### NOTE:

Remove the camshaft and the spacer, using a 10 mm bolt ③.



4. Remove:
- Rocker shaft
  - Rocker

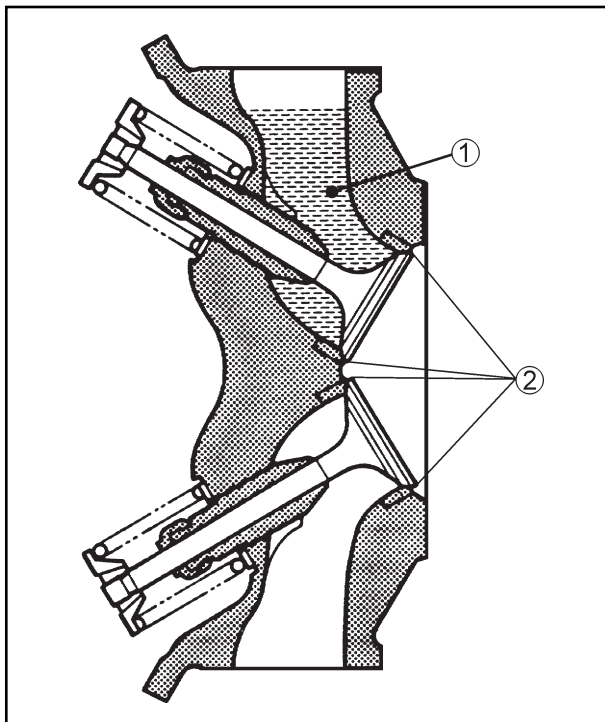
**NOTE:** \_\_\_\_\_  
 Remove the rocker shaft, using the sliding hammer ① and weight ②.



**Sliding hammer:**  
 90890-01083  
**Weight:**  
 90890-01084

**VALVES**

**NOTE:** \_\_\_\_\_  
 Before removing the internal parts (valves, springs, valve seat, etc.) from the head, check the valve seal.



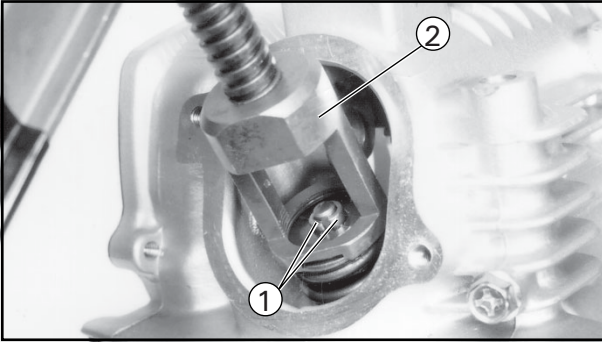
1. Check:
- Valve seal
- Leakage in valve seat => Check the valve face, seat and width.  
 See Section "INSPECTION AND REPAIR => VALVE SEAT".

\*\*\*\*\*

**Checking steps:**


- Pour gasoline ① into the intake and exhaust manifolds.
- Check the valve seal. The valve seats should be free from leakage ②.

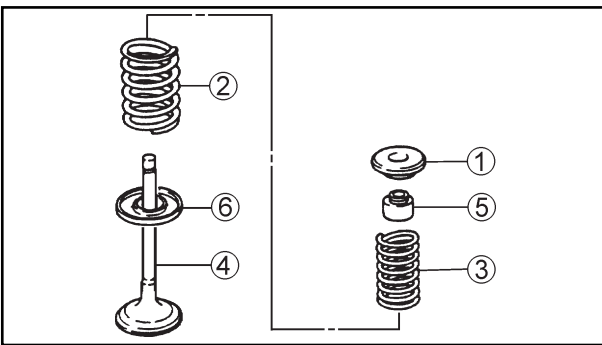
\*\*\*\*\*



2. Remove:
- Valve locks ①

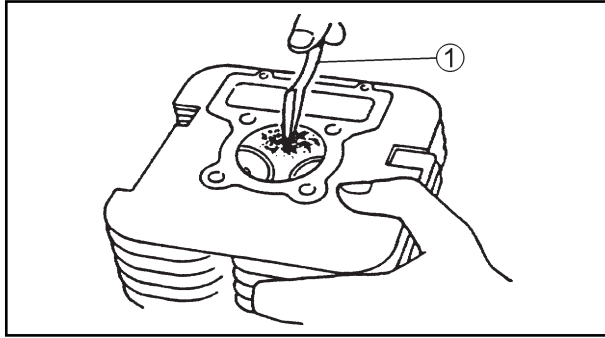
**NOTE:** \_\_\_\_\_  
 Remove the valve locks when compressing the springs using the spring clamp ②.

|   |   |
|---|---|
|  | <b>Valve spring clamp:</b><br>90890-04019 |
|---|---|



3. Remove:
- Valve retainer ①
  - Valve spring ② (External)
  - Valve spring ③ (Internal)
  - Valve ④
  - Oil retainer ⑤
  - Spring seat ⑥

**NOTE:** \_\_\_\_\_  
 Identify each part in order to reinstall it in the original place.



**INSPECTION AND REPAIR HEAD**

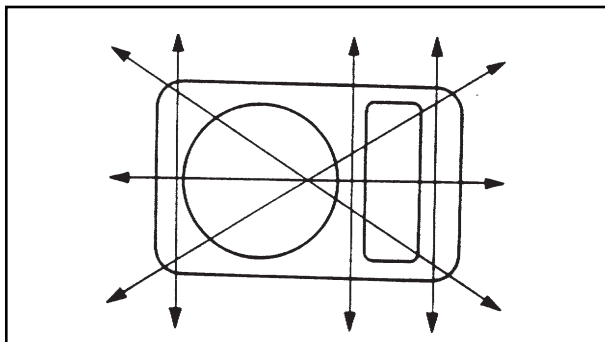
1. Remove:
  - Carbon fouling (from the combustion chamber)
 Use a round scraper ①.

**NOTE:** \_\_\_\_\_  
 Do not use pointed instruments and avoid producing scratches on:


- Spark plug thread
- Valve seat

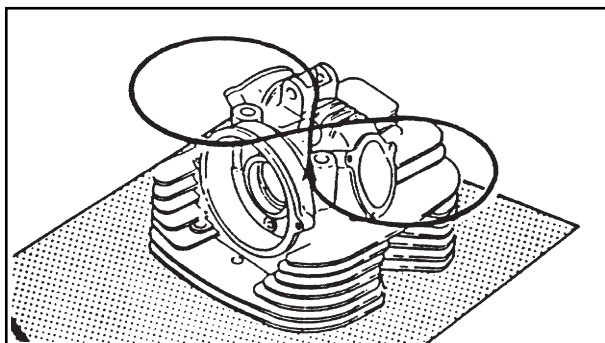
---

2. Check:
  - Head
 Damages/scratches => Replace.



3. Measure:
  - Warping.
 Out of specification => Flatten.

|   |  |
|---|--|
|  | <p><b>Head warping:</b><br/>                 Less than 0.03 mm</p> |
|---|--|



4. Flatten:
  - Head

\*\*\*\*\*

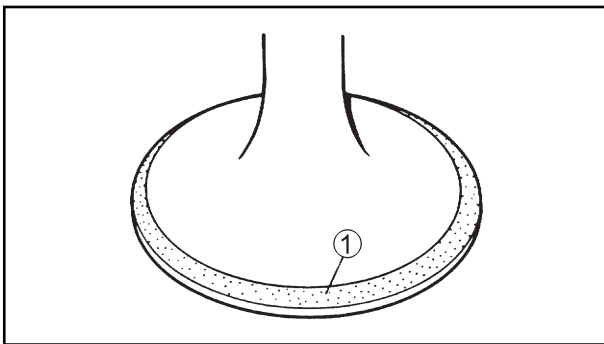
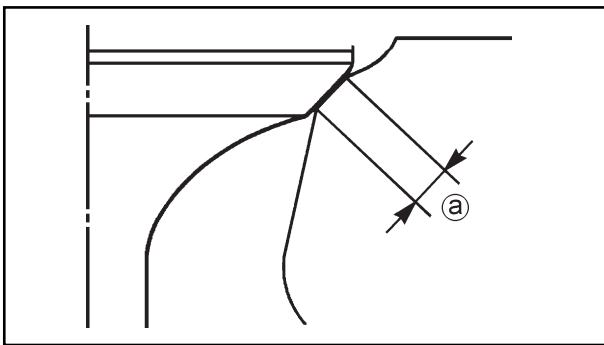
**Flattening steps:**

- Place a 400 to 600 crocus cloth on a flat surface and level the head, sanding it in an 8 pattern.

**NOTE:** \_\_\_\_\_  
 Rotate the head some turns in order to avoid excessive removal of material only on one side.

**VALVE SEAT**

1. Remove:
  - Carbon fouling  
(from the valve and seat)
  
2. Inspect:
  - Valve seat  
Wear => Grind the seat.
  
3. Measure:
  - Valve seat width (a)  
Out of specification => Grind the seat.



|   |                                 |
|---|---------------------------------|
|  | <b>Valve seat width:</b>        |
|   | <b>Intake:</b>                  |
|   | 0.9 ~ 1.1 mm (0.035 ~ 0.043 in) |
|   | <b>Exhaust:</b>                 |
|   | 0.9 ~ 1.1 mm (0.035 ~ 0.043 in) |

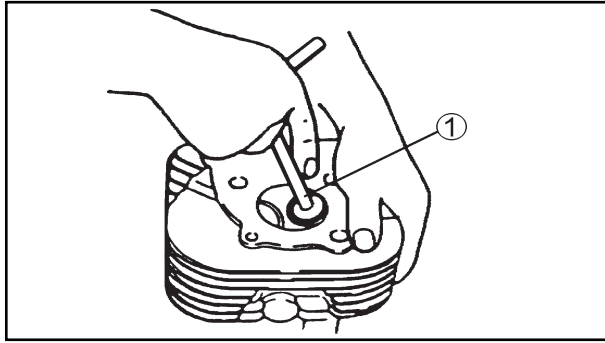
\*\*\*\*\*

**Measurement steps:**

- Apply blue mechanic paint on the valve face.
- Install the valve on the head.
- Press the valve through the guide to the valve seat.
- Measure the valve seat width.
- If the valve seat width is too thin or too thick or off-center, the valve seat should be redone.

\*\*\*\*\*





4. Grind:

- Valve seat

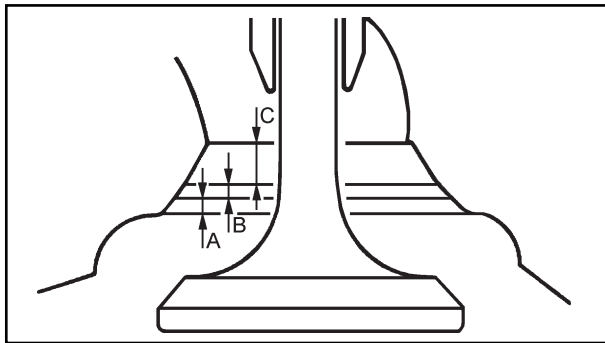
Use 30°, 45° and 60° valve grinders ①.



Valve seat milling cutter:  
YM - 91043

**CAUTION:**

When turning the milling cutter, keep a 4~5 kg pressure.



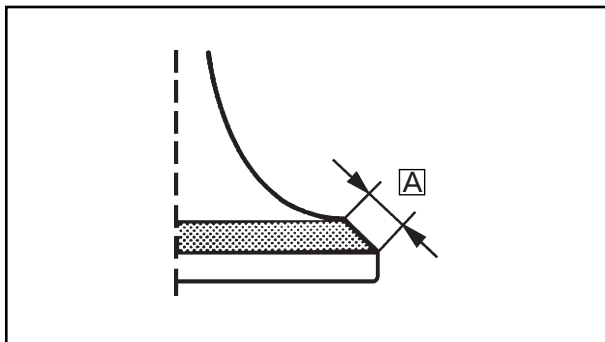
Mill the seat as follows:

| Section | Cutting |
|---------|---------|
| A       | 30°     |
| B       | 45°     |
| C       | 60°     |

\*\*\*\*\*

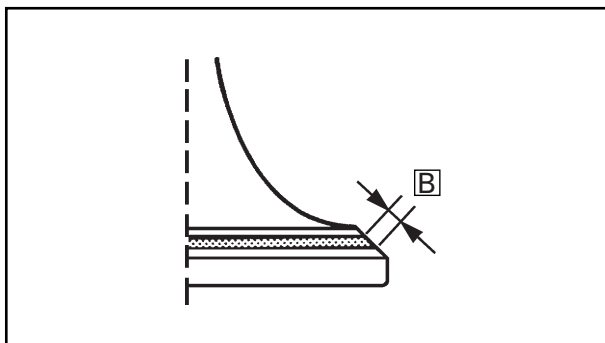
Valve seat grinding steps

- Ⓐ The valve face indicates that the seat is centered but too wide.

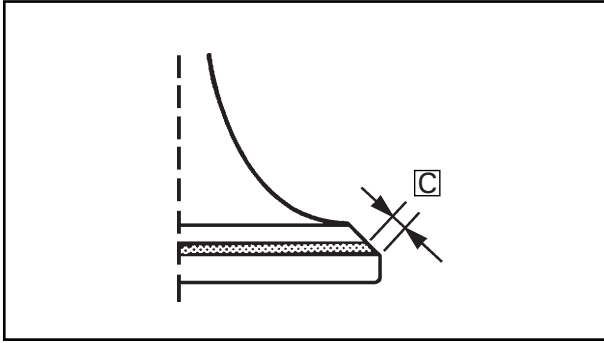


| Milling cutter | Desired result                  |
|----------------|---------------------------------|
| 30°<br>60°     | Reduce the seat width to 1.0 mm |

- Ⓑ The seat is centered but thin.

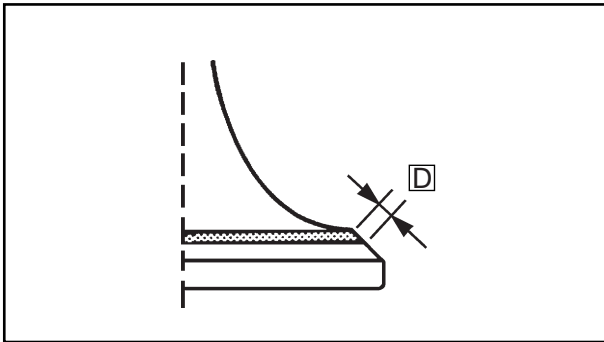


| Milling cutter | Desired result                        |
|----------------|---------------------------------------|
| 45°            | Establish an 1.0 mm wide uniform seat |



**C** The seat is thin and is resting on the external side of the valve face.

| Milling cutter | Desired result                                   |
|----------------|--|
| 30°            | To center the seat and establish an 1,0 mm width |
| 45°            |  |



**D** The seat is thin and is resting on the valve internal face.

| Milling cutter | Desired result                             |
|----------------|--|
| 60°            | To center the seat and increase the width. |
| 45°            |  |

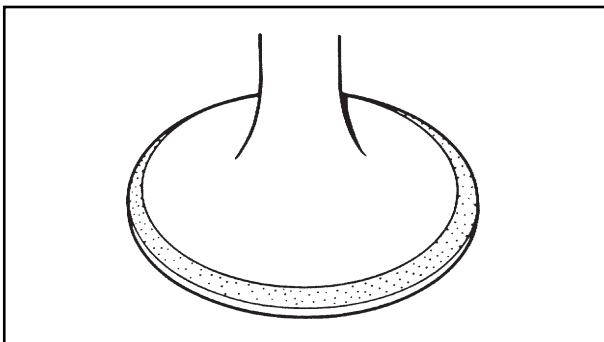
\*\*\*\*\*

5. Polish (grind):

- Valve face
- Valve seat

**NOTE:** \_\_\_\_\_

After the valve seat milling or the valve and valve guide replacement, the valve seat and face should be polished.



\*\*\*\*\*

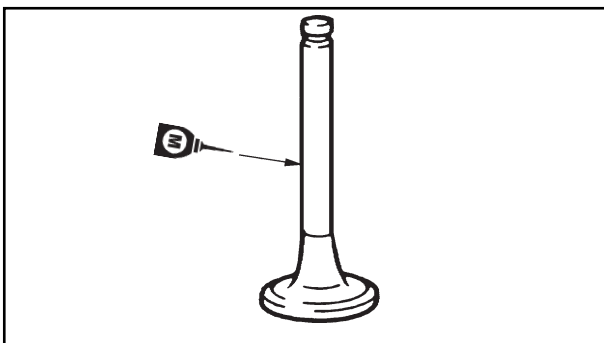
**Polishing steps (grinding):**

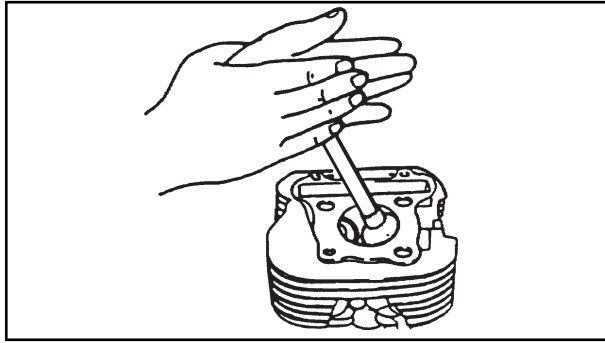
- Apply a coarse abrasive paste to the valve face.

**CAUTION:** \_\_\_\_\_

Take care to prevent the paste from entering into the gap between the valve stem and the guide.

- Apply molybdenum disulfide-based oil on the valve stem.
- Install the valve on the head.
- Turn the valve until its face and seat are polished. Then, clean it using paste.





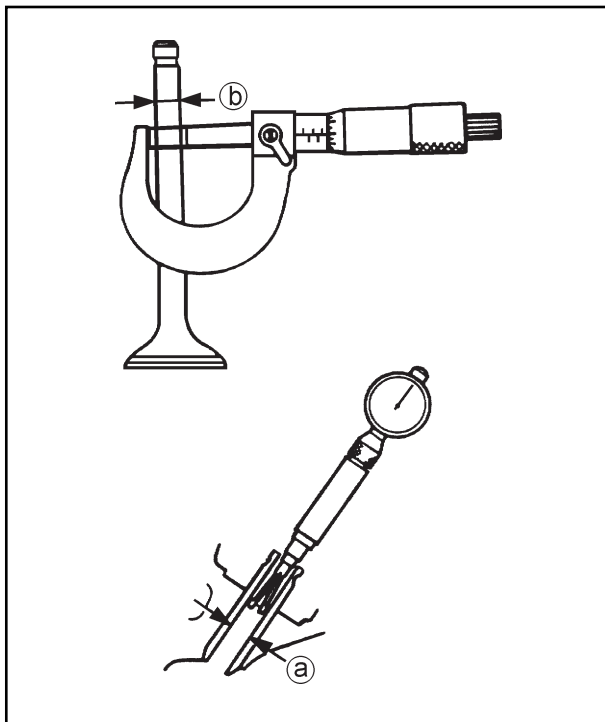
**NOTE:**  
 In order to achieve the best polishing results, occasionally and lightly, beat the valve face on the seat while turning the valve in both directions between the hands.

- Apply fine abrasive paste to the valve face and repeat the same steps.

**NOTE:**  
 Remove the paste from the valve face and seat after each polishing work.

- Apply blue mechanic paint to the valve face.
- Install the valve on the head.
- Press the valve against the seat through the valve guide.
- Measure the valve seat width again. If the seat width is out of specification, mill and polish the valve again.

\*\*\*\*\*




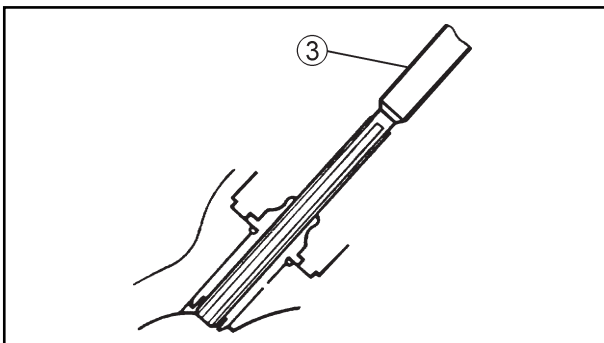
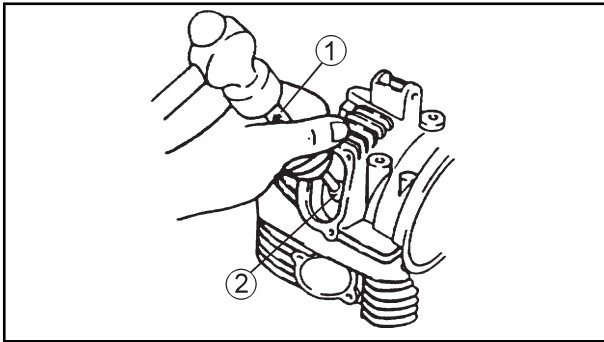
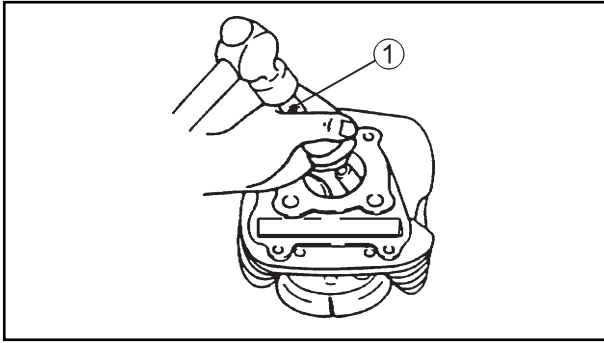
**VALVES AND VALVE GUIDES**

1. Measure:
  - Stem – guide clearance

$$\text{Stem – guide clearance} = \text{Internal guide diameter } \textcircled{a} - \text{Stem diameter } \textcircled{b}$$

Out of specification => Replace guide.

|   |                                |
|---|--------------------------------|
|  | <b>Stem – guide clearance:</b> |
|   | Intake => 0.010 ~ 0.037 mm     |
|   | < limit >: 0.08 mm             |
|   | Exhaust: => 0.025 ~ 0.52 mm    |
|   | < limit >: 0,10 mm             |



2. Replace:

- Valve guide ①

\*\*\*\*\*

Replacement steps:

NOTE:

Heat the cylinder in an oven at 100° C (212° F) in order to facilitate the removal and installation of the guide and ensure the correct relationship.

- Remove the valve guide using the valve guide puller ①.
- Install the valve guide (new) using the valve guide puller ② and remover ①.
- After installing the valve guide, buff the valve guide using the valve guide reamer ③ in order to establish the appropriate stem-guide clearance.



Valve guide puller (6mm):  
90890-04064

Valve guide reamer (6mm):  
90890-04066

Valve guide installer (6mm):  
90890-04065

\*\*\*\*\*

NOTE:

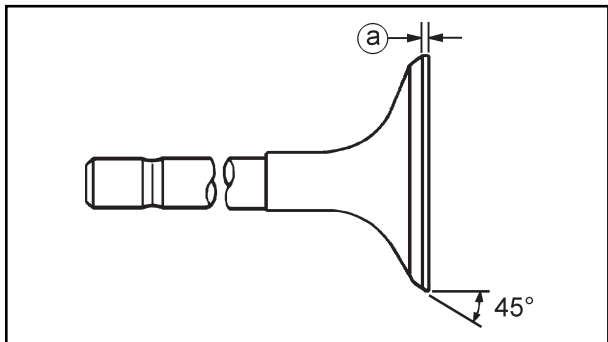
Grind the valve seat after replacing the valve guide.

3. Remove:

- Carbon fouling from the valve face

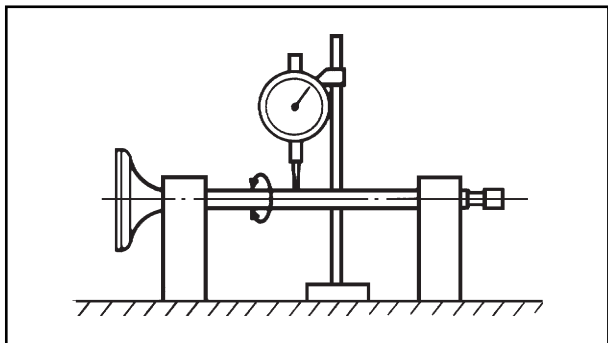
4. Inspect:

- Valve face  
Corrosion / Wear => Grind.
- Valve head:  
Wear => Replace.




5. Measure:
- Thickness @
- Out of specification => Replace.

 **Thickness:**  
0.8-1.2 mm (0.031 ~ 0.047 in)

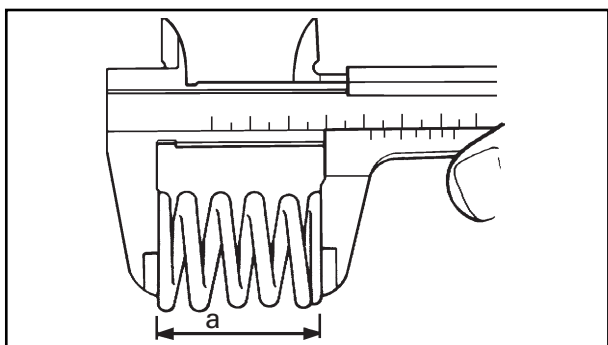


6. Measure:
- Warping (valve stem)
- Out of specification => Replace.

 **Warping:**  
Less than 0.010 mm

**NOTE:**

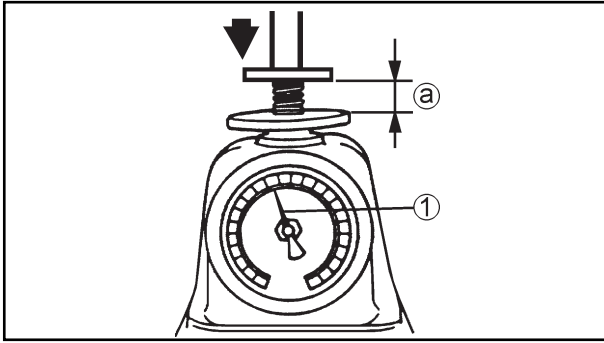
- Replace the guide and retainers whenever the valve is replaced.



**VALVE SPRING**

1. Measure:
- Free length @
- Out of specification => Replace.

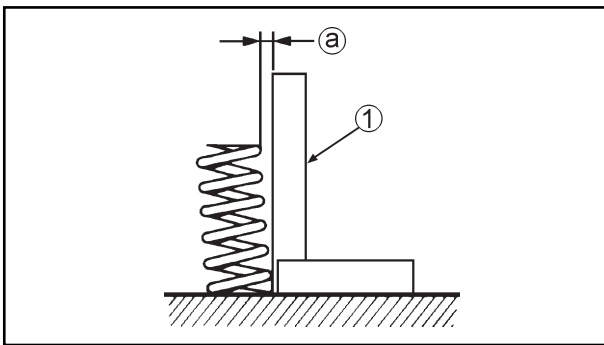
|         | Spring free length: |          |
|---------|---------------------|----------|
|         | Internal            | External |
| Intake  | 36.17 mm            | 36.63 mm |
| Exhaust | 36.17 mm            | 36.63 mm |



2. Measure:

- Spring load ①
- Out of specification => Replace.  
 ① installed spring length.

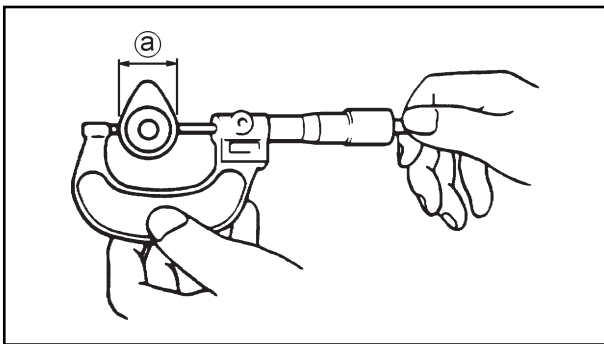
| Spring load: |                     |                     |
|--------------|---------------------|---------------------|
|              | Internal<br>30.5 mm | External<br>32.0 mm |
| Intake       | 7.7 ~ 9.4 mm        | 13.1 ~ 16.1 mm      |
| Exhaust      | 7.7 ~ 9.4 mm        | 13.1 ~ 16.1 mm      |



3. Measure:

- Spring inclination ②
  - Use 90° square ①
- Out of specification => Replace.

| Spring inclination: |                  |
|---------------------|------------------|
| Intake:             | Less than 1.6 mm |
| Exhaust:            | Less than 1.6 mm |



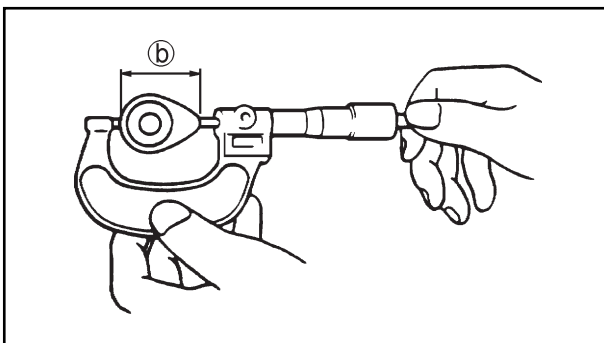
CAMSHAFT

1. Check:

- Shaft cams
- Scratches/blue color => Replace.

2. Measure:

- Cam height ② and ③
- Out of specification => Replace.



| Cam height |                  |
|------------|------------------|
| Intake:    |                  |
| ②          | 30.10 ~ 30.20 mm |
| ③          | 36.51 ~ 36.61 mm |

**Cam height****Exhaust:**

Ⓐ 30.15 ~ 30.25 mm

Ⓑ 36.51 ~ 36.61 mm

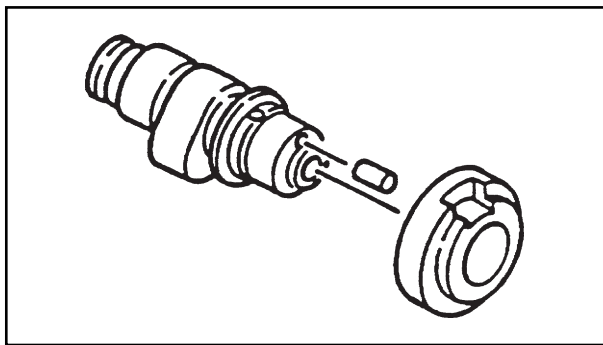
**3. Measure:**

- Warping (Camshaft)

Out of specification => Replace.

**Warping (Camshaft)**

Less than 0.03 mm

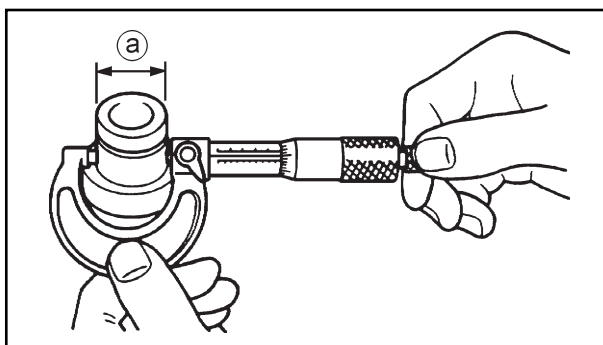
**4. Measure:**

- Clearance between camshaft and bearing

Out of specification => Measure the camshaft bearing diameter.

**Camshaft clearance – bearing:**

0.020 ~ 0.061 mm

**5. Measure:**

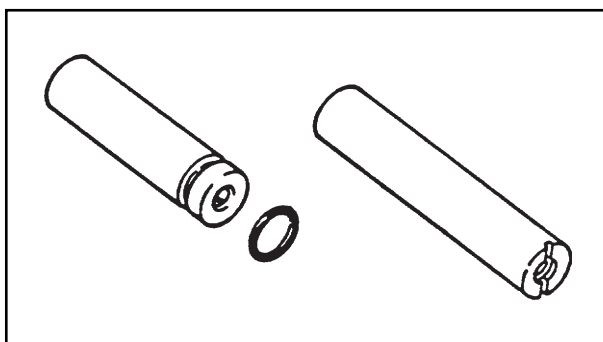
- Camshaft roller bearing diameter Ⓐ

Out of specification => Replace camshaft.

As per specification => Replace bearing (spacer).

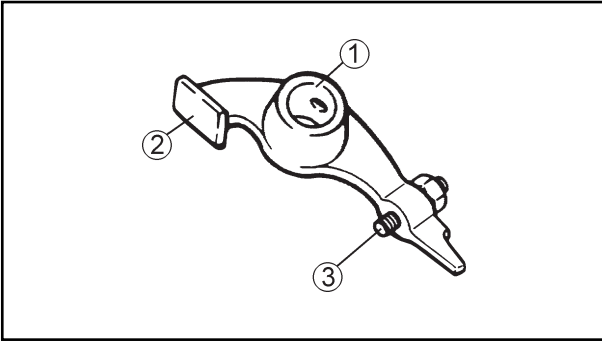
**Camshaft bearing diameter:**

24.960 ~ 24.980 mm

**ROCKER AND ROCKER SHAFT****1. Check:**

- Rocker shaft

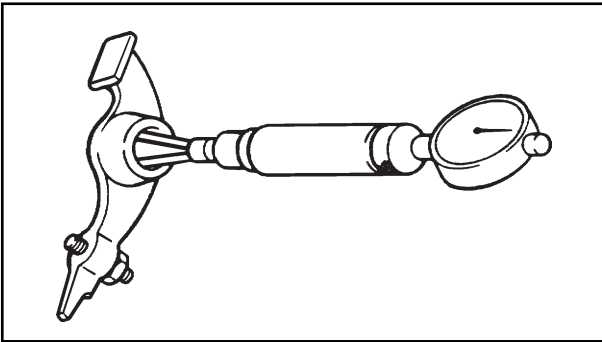
Blue color / wear => Replace, inspect the lubrication system.



2. Check:

- Rocker shaft hole ①
- Shaft contact surface ②
- Adjuster surface ③

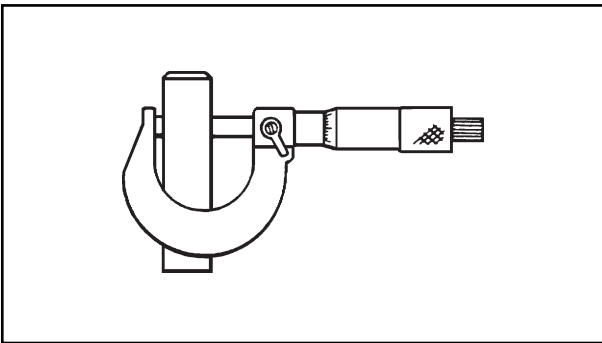
Wear/dots/scratches/blue color => Replace and inspect the lubrication system.



3. Measure:

- Shaft-rocker clearance

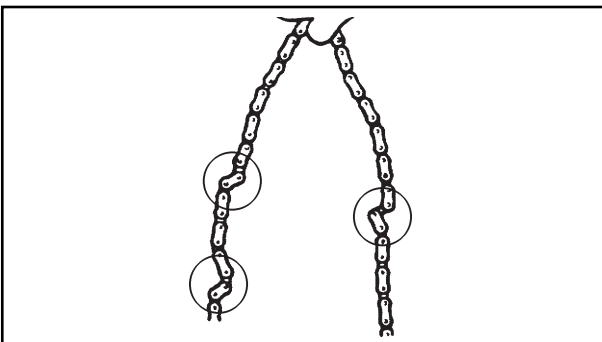
$$\text{Shaft-rocker clearance} = \text{Internal rocker diameter } \textcircled{a} - \text{External shaft diameter } \textcircled{b}$$



Out of specification => Replace assembly.



$$\text{Shaft-rocker clearance} \\ 0.009 \sim 0.037 \text{ mm}$$

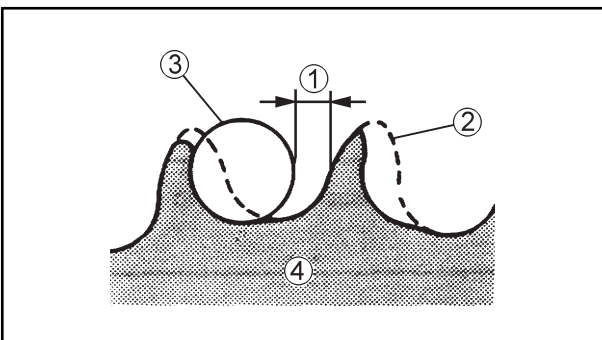


**CAMSHAFT CHAIN, GEAR, CHAIN GUIDE AND TENSIONER**

1. Check:

- Camshaft chain

Cracks/ warping => Replace chain and gear.



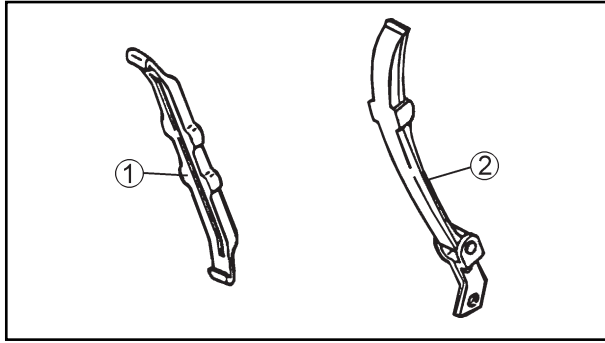
2. Check:

- Camshaft gear

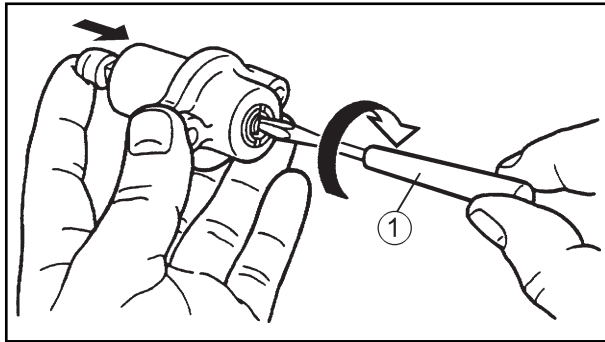
Damages/wear => Replace gear and chain.

- ① ¼ tooth
- ② Correct
- ③ Link roller
- ④ Gear





3. Check:
- Chain guide ① (Exhaust side)
  - Chain guide ② (Intake side)
- Wear/damages => Replace.



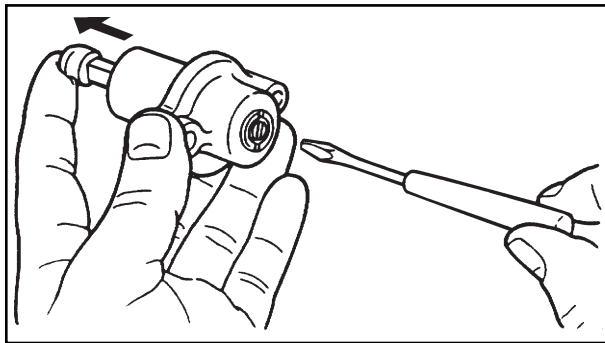
4. Check:
- Camshaft chain tensioner clearance

\*\*\*\*\*

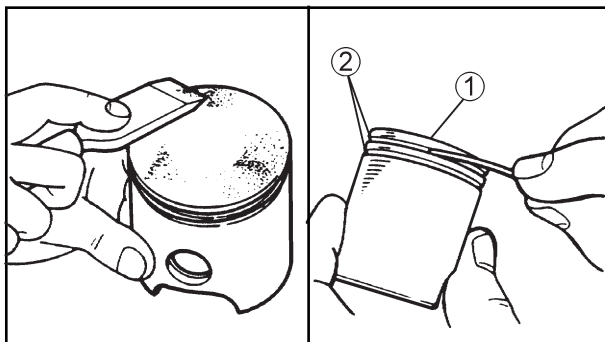
**Checking steps:**

- Use a screwdriver ①, turning clockwise, to pull and lock the tensioner system.
- Press the stem and verify the smoothness of the movement.
- If the test result is unsatisfactory, replace the assembly.

\*\*\*\*\*



**CYLINDER AND PISTON**



1. Remove:
- Carbon fouling (from piston head ① and ring grooves ②)
2. Check:
- Piston side
- Wear/scratches/damages => Replace.

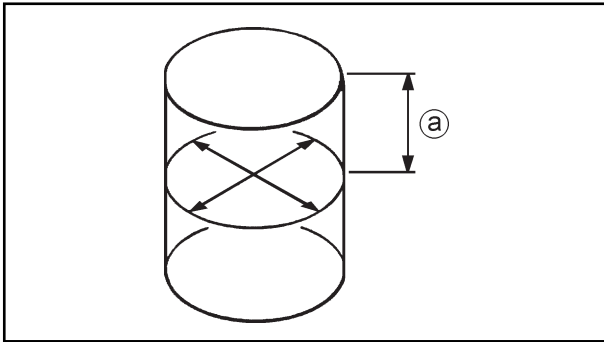
3. Check:

- Cylinder liner
- Wear/scratches => Replace or buff.

4. Measure:

- Cylinder – piston clearance

\*\*\*\*\*



**Measurement steps:**

- Measure the cylinder diameter "C" using a suitable instrument.
- ① 40 mm from the top of the cylinder.

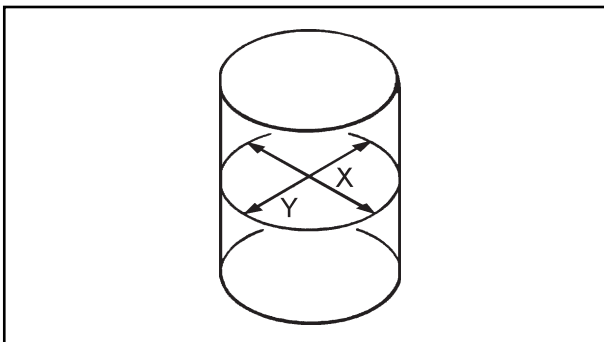
**NOTE:**

Measure the cylinder diameter "C" at various points 40 mm from the top of the cylinder and determine the measurement average.



**Cylinder diameter "C":**  
69.970 ~ 70.020 mm  
<limit>: 70.1 mm

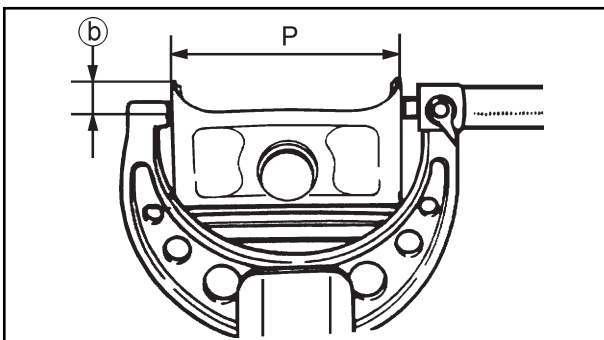
$$C = (X + Y) / 2$$



- If out of specification, grind or replace cylinder, piston, and rings.

- Measure the lower end diameter of the piston "P" using a micrometer.

② 4.0 mm.




**Piston skirt diameter "P":**  
69.925 ~ 69.975 mm

- If out of specification, replace piston and rings.

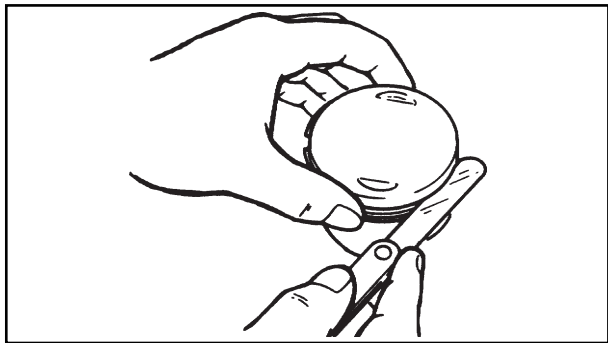
- Determine the cylinder – piston clearance using the following formula:

$$\text{Cylinder – piston clearance} = \text{Cylinder diameter "C"} - \text{Piston skirt diameter "P"}$$

 Cylinder – piston clearance:  
0.035 ~ 0.055 mm  
<limit>: 0,15 mm

- If out of specification, grind or replace cylinder, piston, and rings.


\*\*\*\*\*

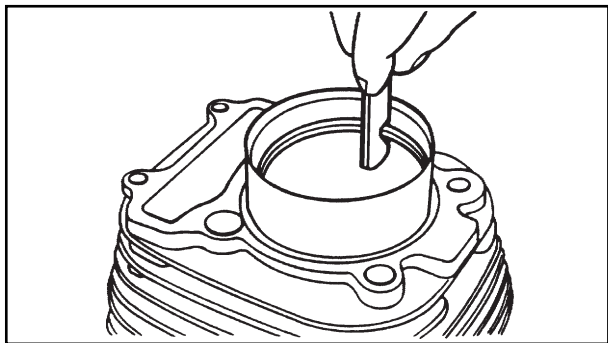


**PISTON RINGS**

1. Measure:
  - Side clearance  
Out of specification => Replace piston and rings.

**NOTE:** \_\_\_\_\_  
Remove the carbon fouling from the piston grooves and rings before measuring the clearance.  
\_\_\_\_\_

 Side clearance  
Top ring:  
0.03 ~ 0.07 mm  
Secondary ring  
0.02 ~ 0.06 mm



2. Place:
  - Cylinder ring

**NOTE:** \_\_\_\_\_  
Use the piston head and the guide to place the ring on the cylinder parallel to the base.  
\_\_\_\_\_



## 3. Measure:

- Inter-tip gap  
Out of specification => Replace.

**NOTE:**

It is not possible to measure the inter-tip gap of the oil ring expander. If the grooved rails of the oil ring have an excessive clearance, replace the 3 rings.

**Inter-tip gap:**

**Compression ring (top):**

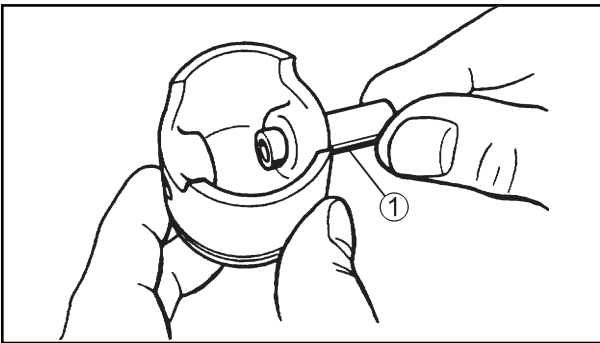
0.15 ~ 0.30 mm

**Scraper ring (secondary):**

0.15 ~ 0.30 mm

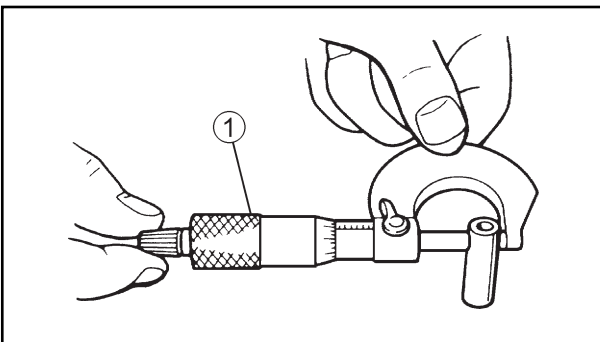
**Oil ring:**

0.30 ~ 0.90 mm

**PISTON PIN**

## 1. Check:

- Piston pin ①  
Blue color/scratches => Replace and inspect the lubrication system.



## 2. Measure:

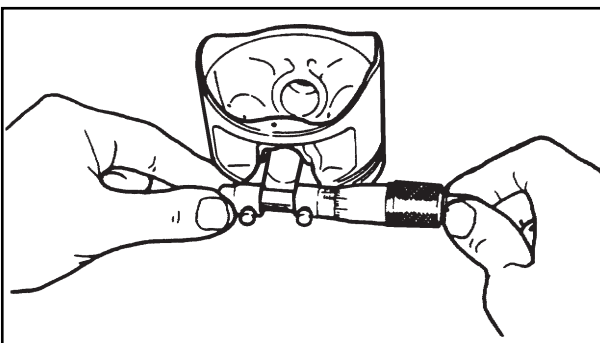
- External diameter of the piston pin  
Out of specification => Replace.



**External diameter of the piston pin**

15.991 ~ 16.000 mm

① Micrometer



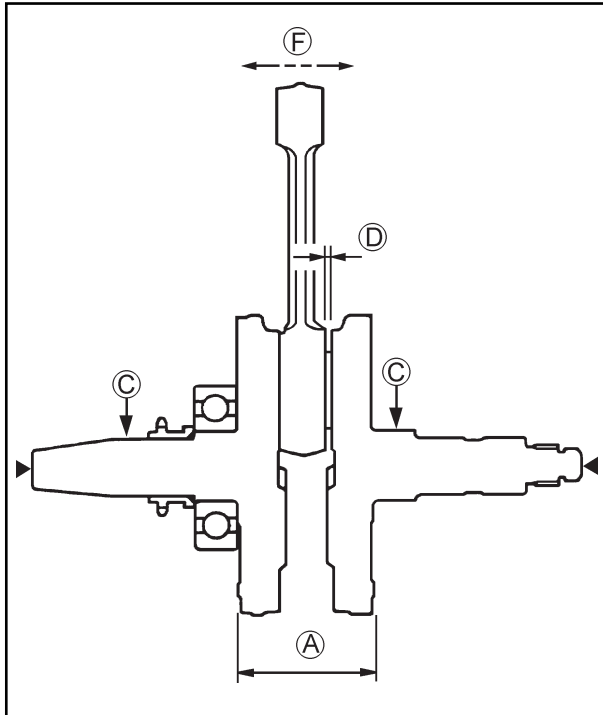
## 3. Measure:

- Internal diameter of the piston pin hole  
Out of specification => Replace.



**Internal diameter of the piston pin hole (on the piston):**

16.002 ~ 16.013 mm



## CRANKSHAFT

### 1. Measure:

- Crankshaft width (A)  
Out of specification => Replace crankshaft.



Crankshaft width:  
55.95 ~ 56.00 mm

- Warping (C)

Out of specification => Replace crankshaft and/or roller bearings.



Warping limit:  
0.03 mm

- Connecting-rod side clearance (D)

Out of specification => Replace rollers on connecting-rod, crankshaft pin and/or connecting-rod.



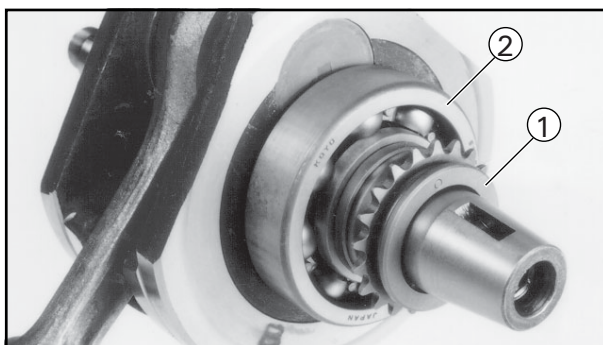
Connecting-rod side clearance:  
0.35 ~ 0.65 mm

- Connecting-rod deflection (F)

Out of specification => Replace connecting-rod.

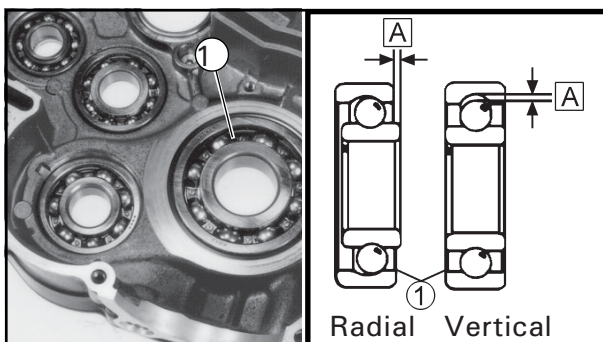


Connecting-rod deflection:  
0.8 mm



### 2. Check:

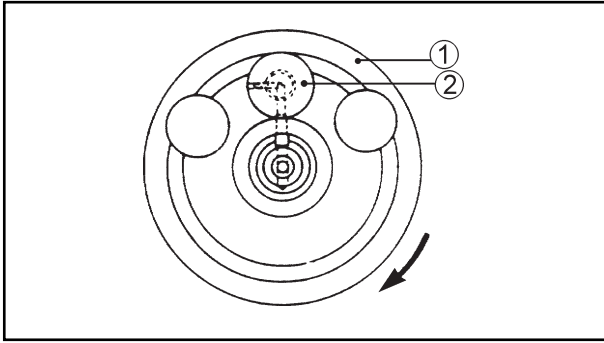
- Primary gear (1)  
Wear/damages => Replace crankshaft.
- Crankshaft roller bearing (2)  
Abnormal noise / Slow rotation / clearance => Replace crankshaft.



### 3. Check:

- Crankshaft roller bearing (1)  
Abnormal noise / Slow rotation / clearance => Replace crankshaft.

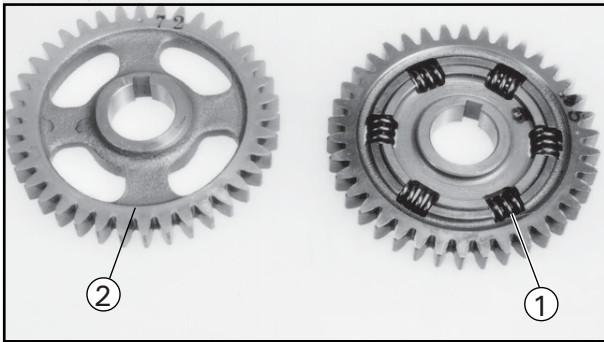
□ Clearance



\*\*\*\*\*  
**Crankshaft mounting:**

The crankshaft ① and the crankshaft pin oil passage ② should be correctly aligned with a maximum tolerance of 1 mm.

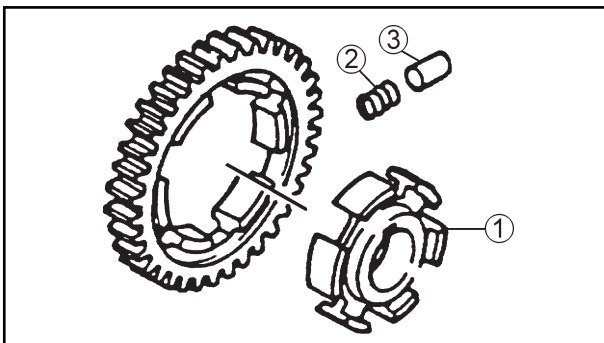
\*\*\*\*\*



**BALANCER GEARS**

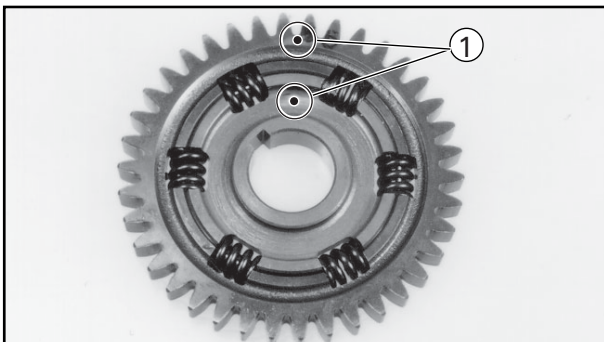
1. Check:

- Balancer driving gear teeth ①
  - Balancer gear teeth ②
- Wear/damages => Replace gears.



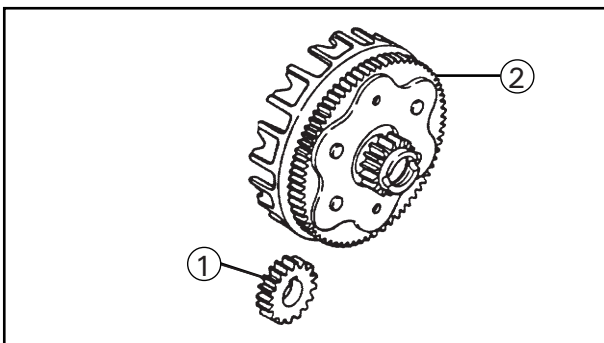
2. Check:

- Impact hub ①
  - Spring ②
  - Dowel pin ③
- Wear/breakage/damages => Replace.



3. Check:

- Dot marks ①
- Align the marks



**PRIMARY GEAR**

1. Check:

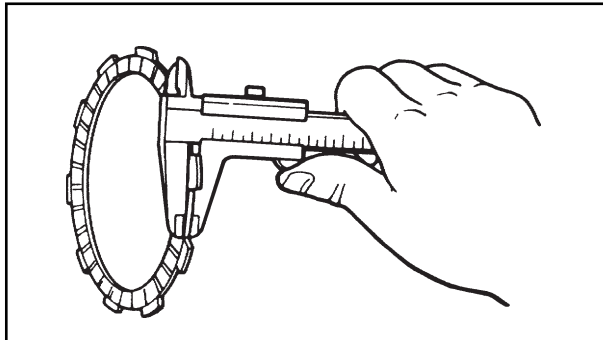
- Primary gear teeth ①
  - Driven gear teeth (sleeve) ②
- Wear/damages => Replace both gears.  
 Excessive running noise => Replace both gears.

**CLUTCH**

1. Check:

- Friction discs

Wear/damages => Replace friction disc assembly.



2. Measure:

- Friction disc thickness

Out of specification => Replace friction disc assembly.

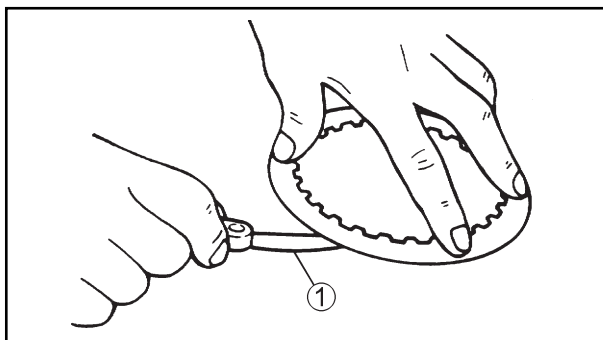
Measure at four tips.

| Spring free length: |                |            |
|---------------------|----------------|------------|
|                     | Thickness      | Wear limit |
| Type "A"            | 2.90 ~ 3.10 mm | 2.8 mm     |
| Type "B"            | 2.90 ~ 3.10 mm | 2.8 mm     |

3. Check:

- Steel discs (separators)

Damage => Replace assembly.




4. Measure:

- Steel disc warping (separators)

Out of specification => Replace assembly.

Use a sheet gage on a flat surface ①.

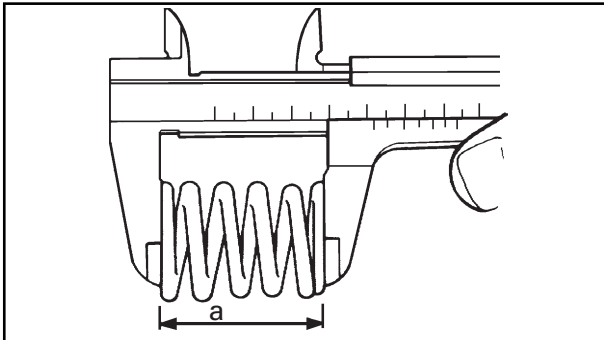
|  |
|--|
|  Warping limit:<br>Less than 0.2 mm |
|--|



## 5. Check:

- Clutch springs

Damages => Replace spring assembly.



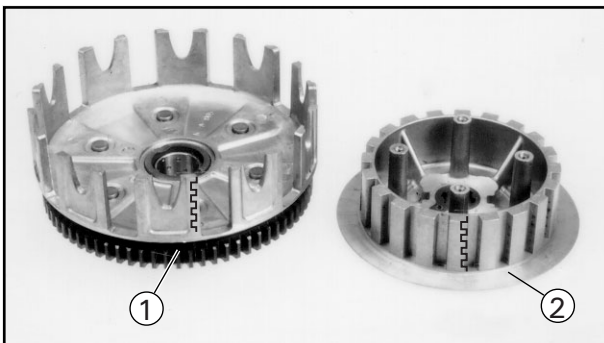
## 6. Measure:

- Spring free length @

Out of specification => Replace spring assembly.



**Free length  
(clutch springs):  
37.3 mm  
< Limit: 35.3 mm >**



## 7. Check:

- Friction disc sockets ①

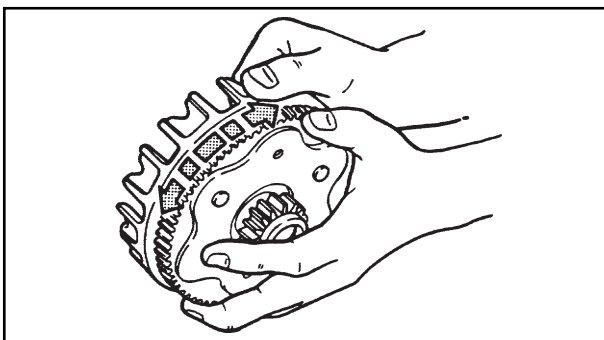
Burrs/wear/damages => Clean or replace.

- Clutch hub sockets ②

Burrs/wear/damages => Replace clutch hub.

**NOTE:**

Burrs on friction disc sockets and clutch hub will result in irregular operation.

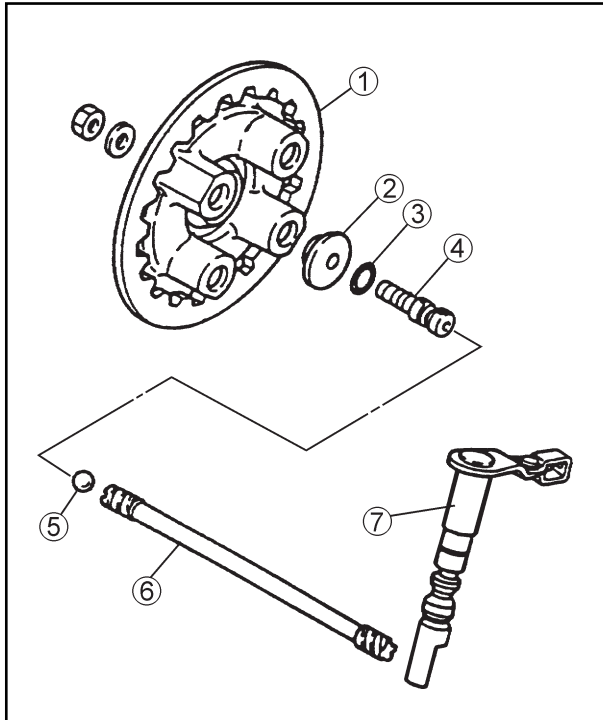


## 8. Check:

- Circumferential clearance

There is clearance => Replacement.





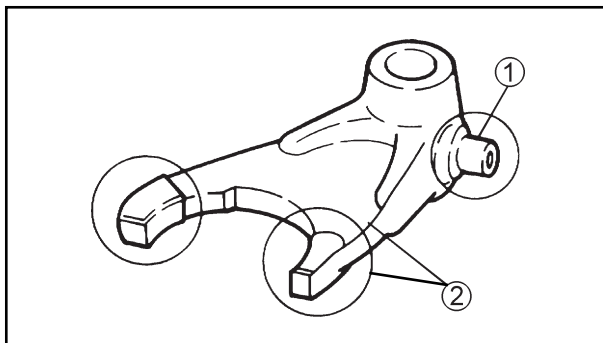
9. Check:

- Pressure plate ①
- Plate ②
- O-ring ③
- Stem 1 ④
- Ball ⑤

Wear/damages => Replace.

- Stem 2 ⑥
- Clutch stem ⑦

Wear/warping/damages => Replace.

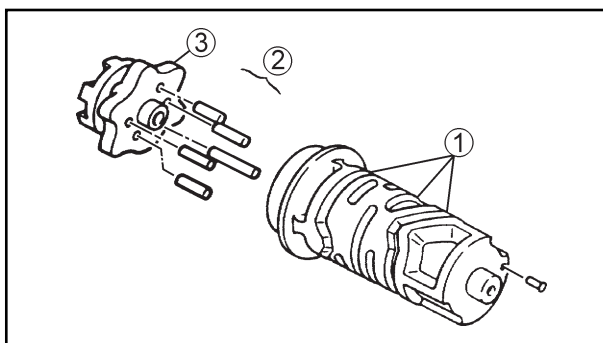


TRANSMISSION AND SHIFTING FORK

1. Check:

- Fork follower ①
- Fork tips ②

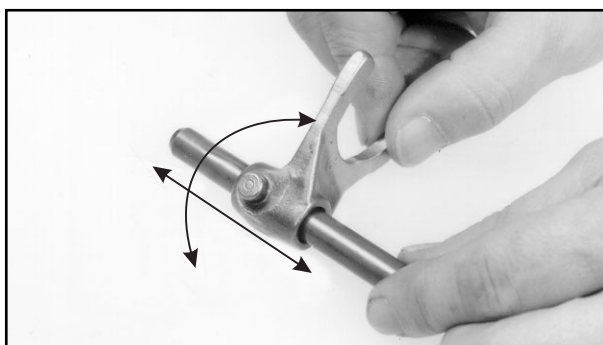
Burrs/warping/wear => Replace.



2. Check:

- Shifting fork channels ①
- Dowel pins ②
- Shifting fork section ③

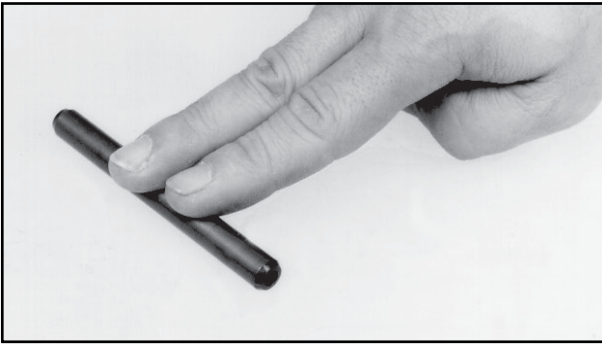
Wear/Damages => Replace.



3. Check:

- Fork movement

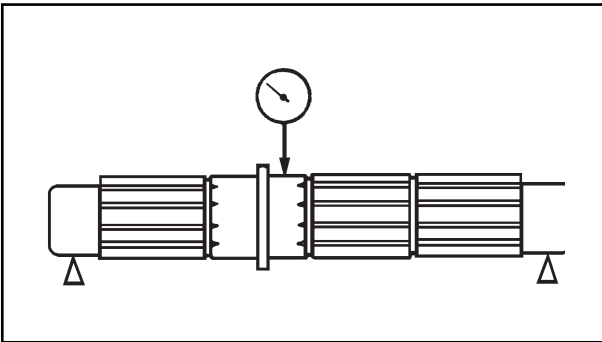
Irregular operation => Replace fork and/or guide bar.



4. Check:
- Guide bars
- Roll the bar on a flat surface  
Warping => Replace.

**WARNING**

**Do not try to straighten out the bars.**



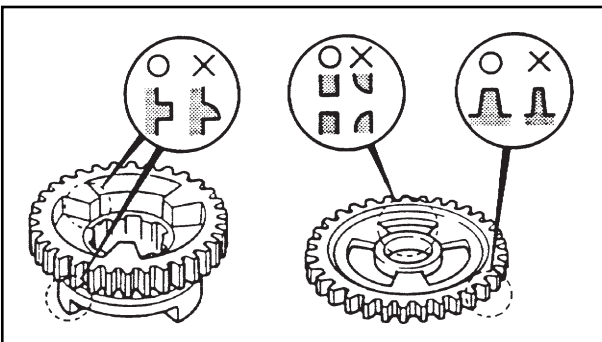
5. Measure:
- Warping (Driving and driven shaft)
- Out of specification => Replace.



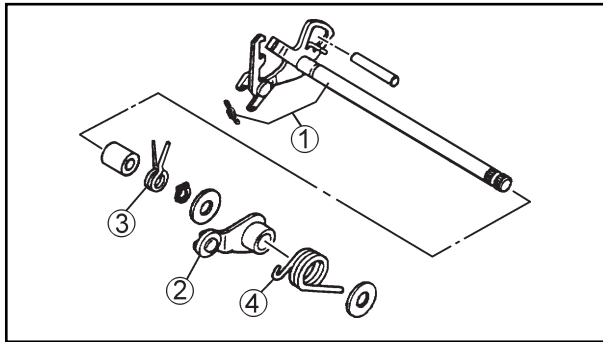
**Warping:**  
Less than 0,08 mm

**WARNING**

**Do not try to straighten out the shaft.**

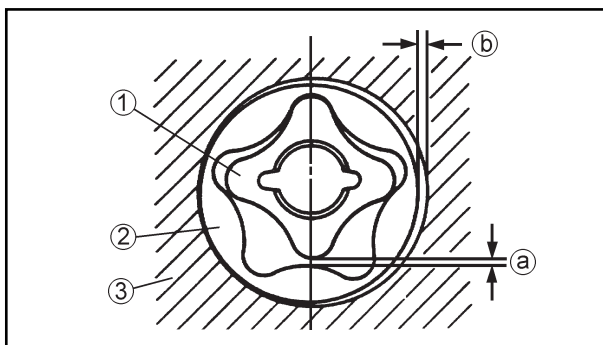


6. Check:
- Gear teeth
- Blue color/Wear => Replace.
- Sockets
- Round/broken edges => Replace.



7. Check:

- Shift shaft ①
  - Stop stem ②
- Damages/warping/wear => Replace.
- Torsion spring ③
  - Return spring ④
- Breakage/damages => Replace.

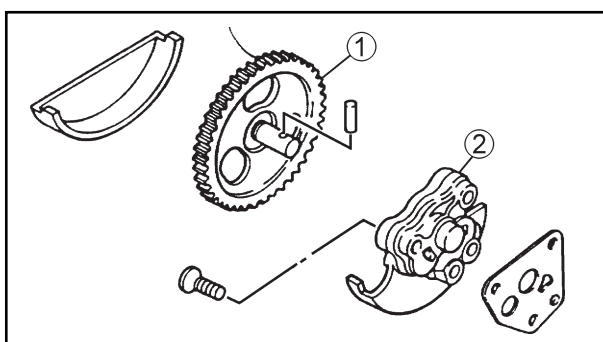


## OIL PUMP AND FILTER STRAINER

1. Measure:

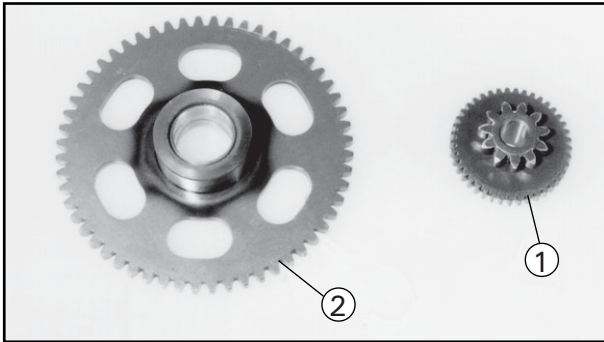
- Clearance ①
- (between the internal rotor ① and the external rotor ②)
- Side clearance ②
- (between the external rotor ② and the pump case ③)
- Out of specification => Replace oil pump.

|   |   |
|---|---|
|  | <b>Clearance ①</b><br>0.15 mm<br><b>Side clearance ②:</b><br>0.04 ~ 0.09 mm |
|---|---|



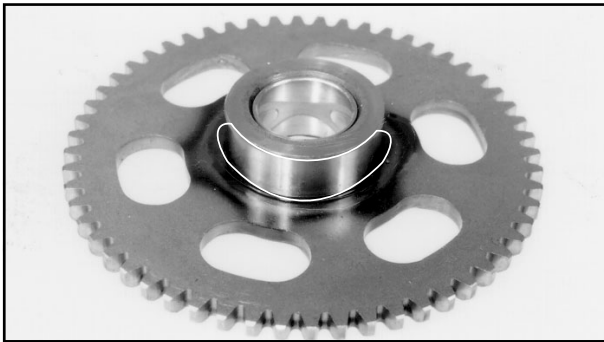
2. Check:

- Oil pump driving gear ①
  - Oil pump ②
- Wear/breakage/damages => Replace.

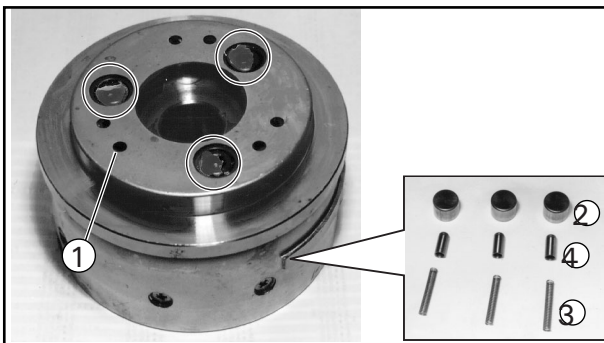


**ELECTRIC STARTING SYSTEM GEARS**

1. Check:
- Starting gear teeth ①
  - Starting gear teeth ②
- Burrs/Roughness/Wear => Replace.



2. Check:
- Starting gear (contact surface)
- Scratches/wear/damages => Replace.

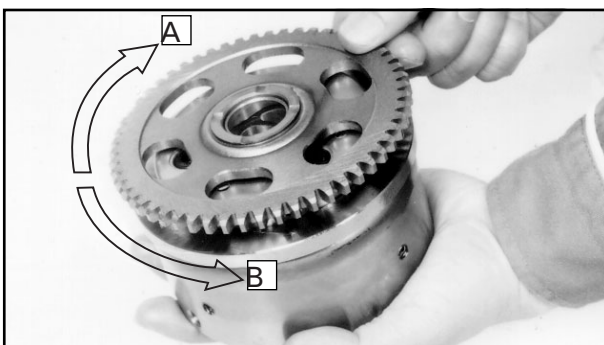


3. Check:
- Starting clutch assembly ①
  - Dowel pins ②
  - Springs ③
  - Spring covers ④
- Wear/damages => Replace.

4. Check:
- Starting clutch operation.

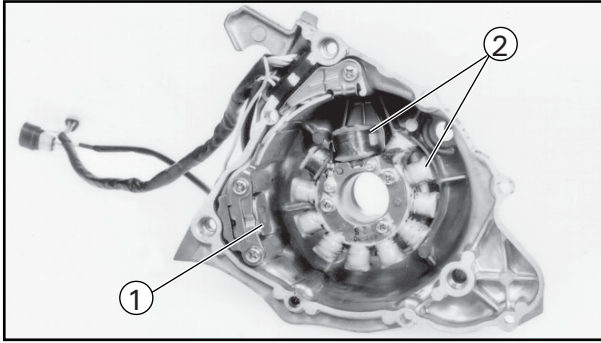
\*\*\*\*\*

**Checking steps:**



- Install the starting gear (driven) on the starting clutch. Hold the clutch.
- When turning the starting gear clockwise **A**, the clutch and the gear should be meshed. Otherwise, the clutch is damaged => Replace.
- When turning the starting gear counterclockwise **B**, the gear should turn freely. Otherwise, the clutch is damaged => Replace.

\*\*\*\*\*



## 5. Check:

- Pulse coil ①
- Charging coil/stator ②
- Damages => Replace.

**CASES**

1. Wash the cases thoroughly using kerosene.
2. Clean all gasket surfaces and the contact surfaces of the cases.

## 3. Check:

- Cases
- Breakage/damages => Replace.
- Oil passages
- Clogging => Blow using compressed air.

**ROLLER BEARINGS AND RETAINERS**

## 1. Check:

- Roller bearings
- Clean, lubricate and manually turn the internal raceway.
- Irregular rotation => Replace.

**CAUTION:**

Do not use compressed air for drying the roller bearings. This results in damage to the surfaces.

## 2. Check:

- Oil retainers
- Damages/wear => Replace.

**LOCKS AND WASHERS**

## 1. Check:

- Locks
- Washers
- Damages/clearances/warping => Replace.



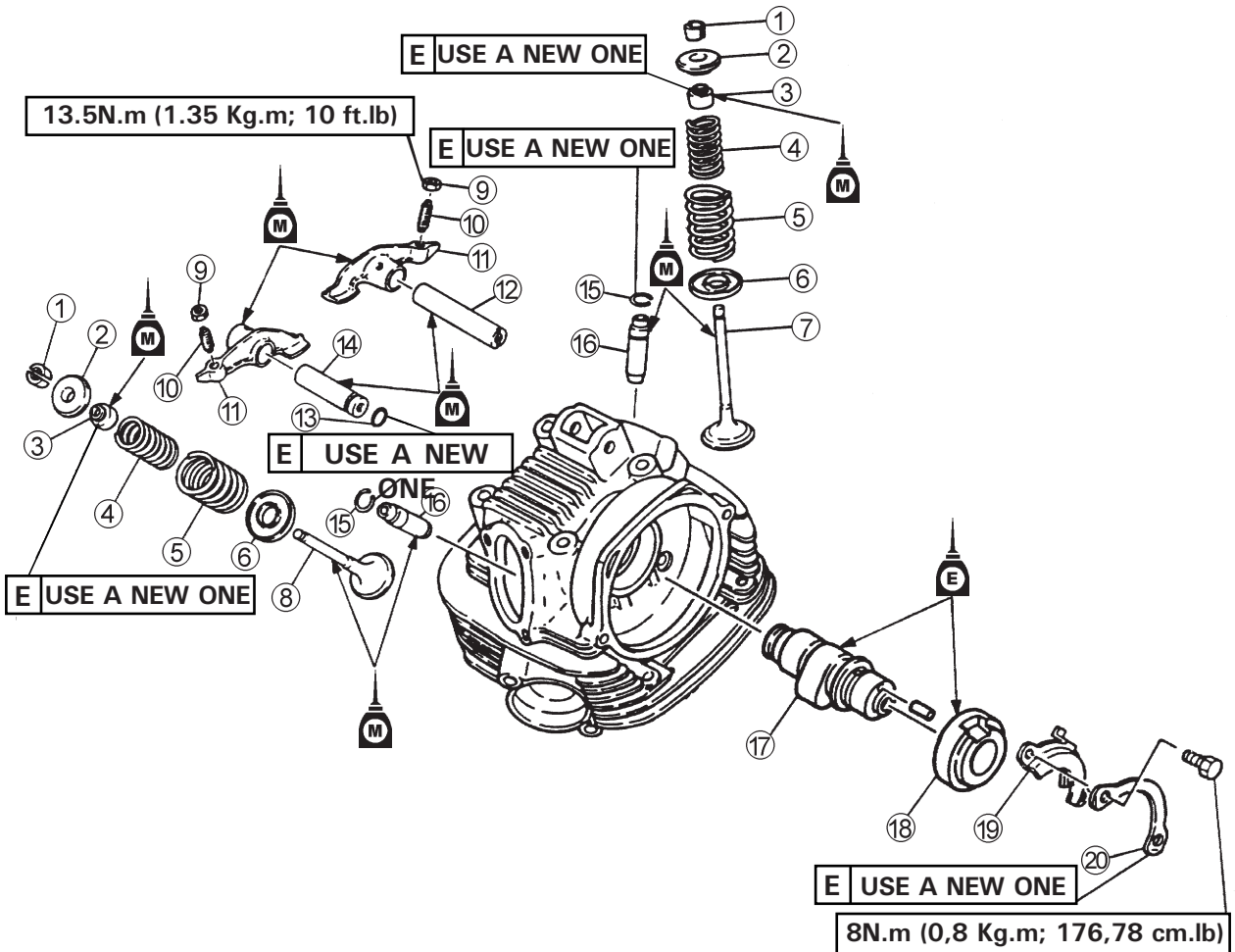
## ENGINE MOUNTING AND ADJUSTMENTS

### VALVES, ROCKER, AND CAMSHAFT

- |                         |                   |               |
|-------------------------|-------------------|---------------|
| ① Valve lock            | ⑧ Valve (exhaust) | ⑮ Lock        |
| ② Valve spring retainer | ⑨ Lock-nut        | ⑯ Valve guide |
| ③ Retainer              | ⑩ Adjuster        | ⑰ Camshaft    |
| ④ Internal spring       | ⑪ Rocker          | ⑱ Spacer      |
| ⑤ External spring       | ⑫ Rocker shaft    | ⑲ Plate       |
| ⑥ Spring seat           | ⑬ O-ring          | ⑳ Lock washer |
| ⑦ Valve (intake)        | ⑭ Rocker shaft    |               |

**B** Valve inclination limit:  
 Internal spring: 2.5° or 1.6 mm  
 External spring: 2.5° or 1.6 mm

**A** Valve clearance:  
 Intake: 0.05 ~ 0.09 mm  
 Exhaust: 0.15 ~ 0.19 mm



**C** Stem warping limit  
 0.01 mm

**D** Valve seat width:  
 0.9 ~ 1.1 mm

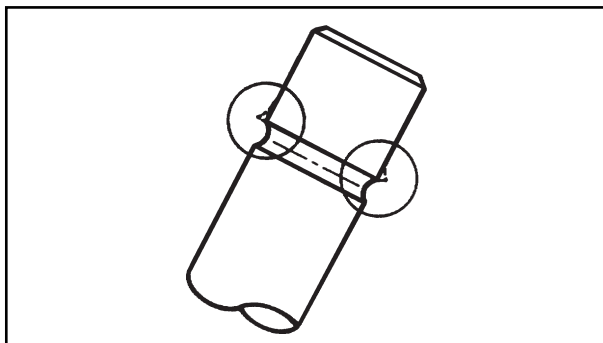


## ENGINE MOUNTING AND ADJUSTMENTS

### **⚠ WARNING**

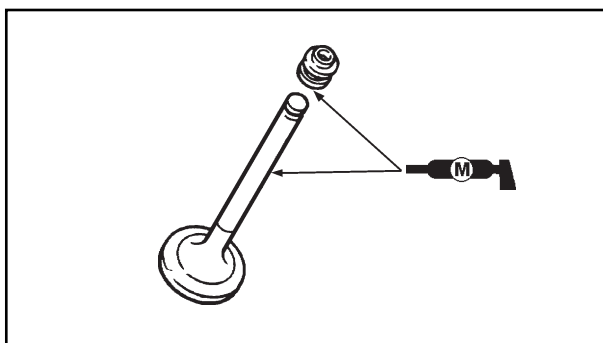
The engine mounting requires the replacement of the following parts with new ones:

- O-ring
- Gaskets
- Retainer
- Copper washers
- Lock washers
- Locks

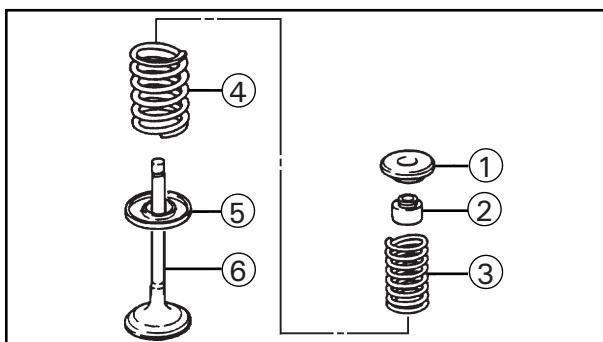


## VALVES

1. Remove burrs:
  - Valve stem head

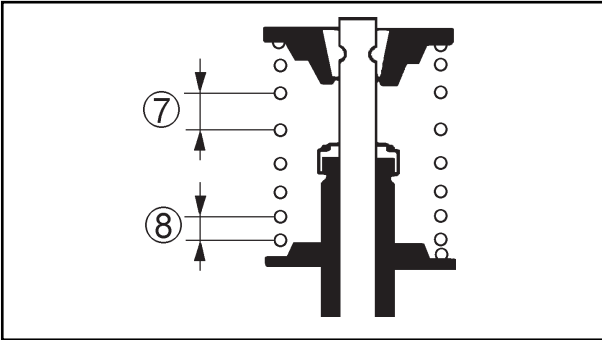


2. Apply:
  - Molybdenum disulfide-based oil (to stem and retainer)

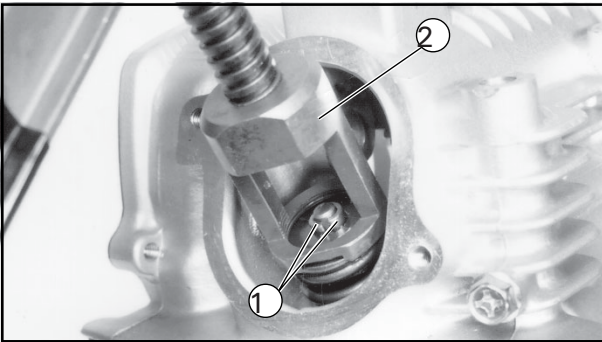


3. Install the components shown in the figure in the following sequence:

- Retainer ② on the valve guide
- Valve ⑥
- Lower spring seat ⑤
- Internal spring ③
- External spring ④
- Upper spring seat ①




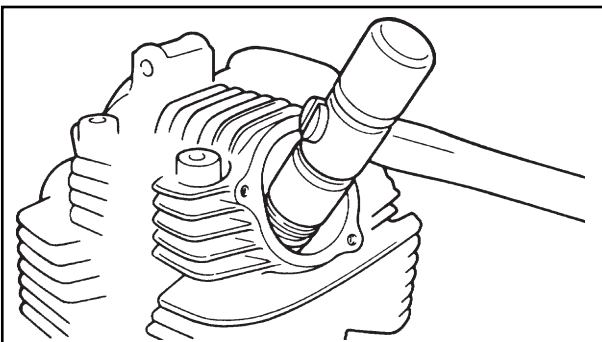
**NOTE:** \_\_\_\_\_  
 Install the valve spring with the longest pitch ⑦ up.  
 ⑧ Shorter pitch.



4. Install:  
 • Valve locks ①

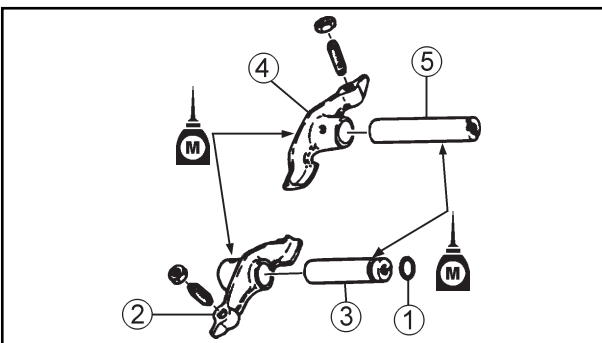
**NOTE:** \_\_\_\_\_  
 Install the valve locks while pressing the spring using the valve spring clamp ②.

|   |   |
|---|---|
|  | <p>Valve spring clamp:<br/>                 90890-04019</p> |
|---|---|



5. Fasten the valve lock beating slightly using a plastic hammer.

**NOTE:** \_\_\_\_\_  
 Avoid beating excessively in order to prevent valve damage.

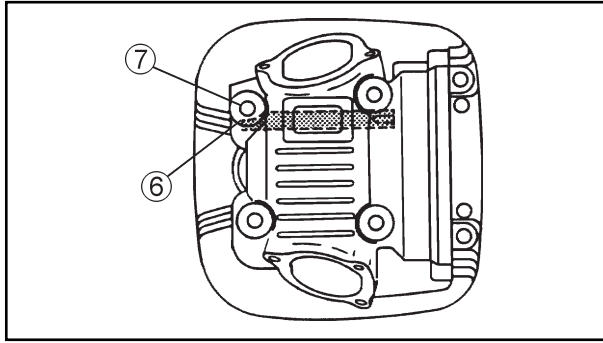


**ROCKER**

1. Lubricate:  
 • Molybdenum sulfide-based oil (to rocker, rocker shaft, and O-ring)

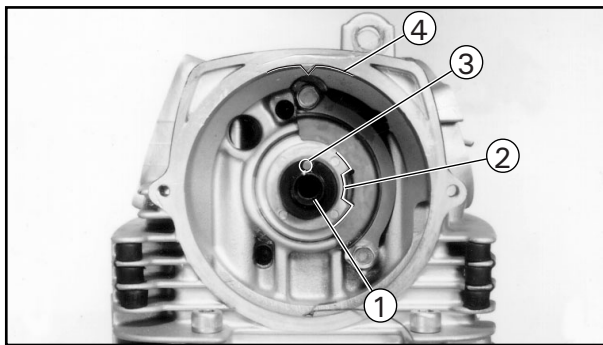
2. Install:  
 • O-ring ①  
 • Rocker ②  
 • Rocker shaft ③ (exhaust)  
 • Rocker ④  
 • Rocker shaft ⑤ Intake





**NOTE:** \_\_\_\_\_  
Align the slot ⑥ of the intake rocker shaft with the head bolt hole ⑦ and install the rocker shaft.

**CAUTION:** \_\_\_\_\_  
Do not confound the installation direction of the rocker shaft. Take care to install the threaded part facing outward.



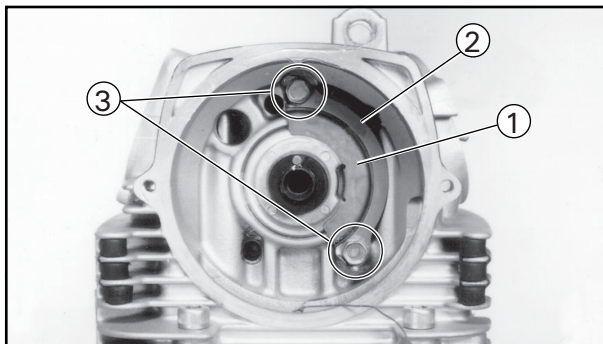
3. Lubricate:  

- Using engine oil 4T (camshaft, spacer and pin)

4. Install:  

- Camshaft ①
- Spacer ②
- Pin ③

**NOTE:** \_\_\_\_\_  
Align the camshaft pin ③ with the mark ④ on the head and install the pin.



5. Install:  

- Plate ①
- Lock washer ②

|  |   |
|--|---|
|  | Bolt 3 (camshaft):<br>8 N.m (0.8 Kg.m; 5.8 ft.lb) |
|--|---|

**WARNING**

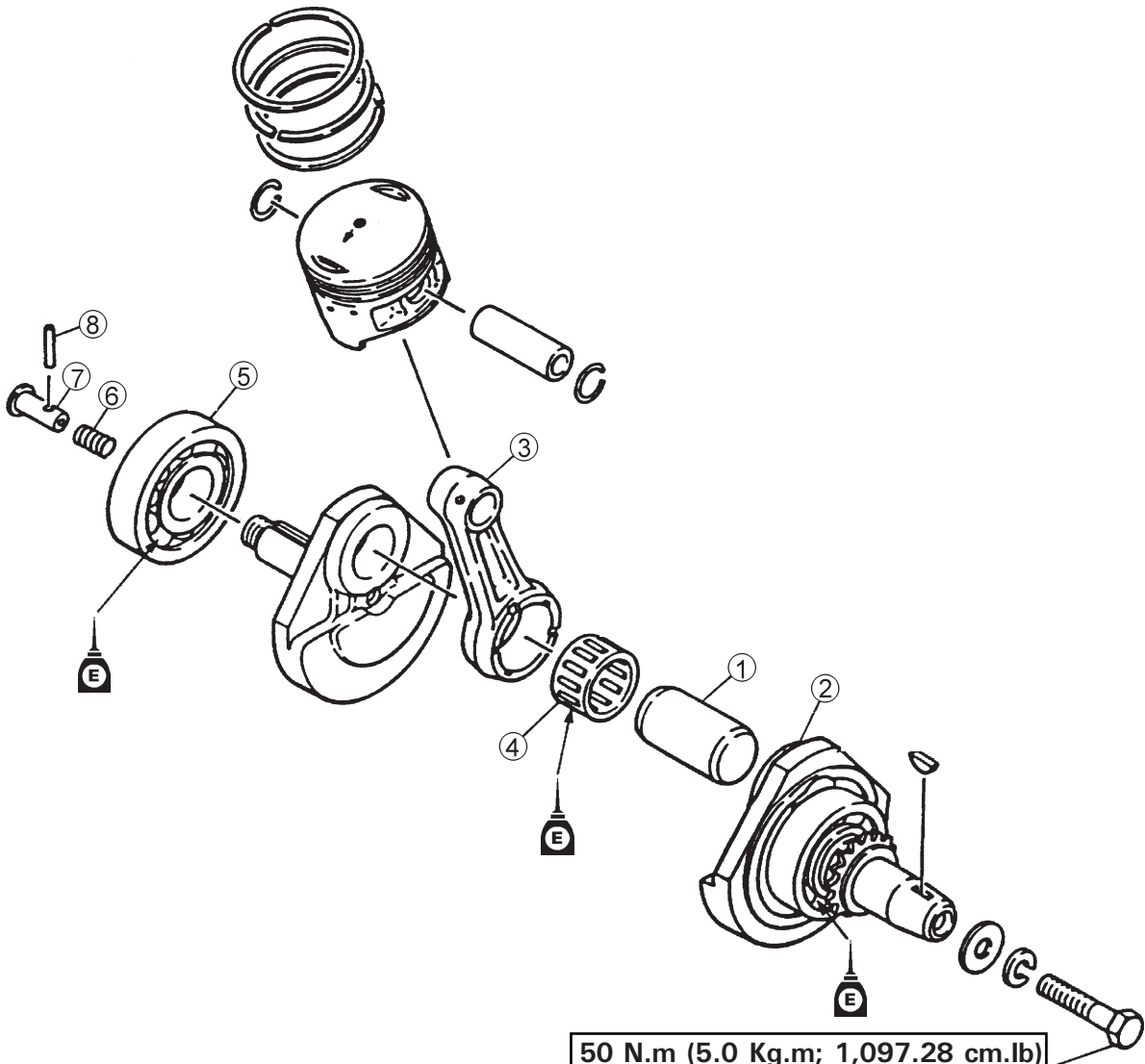
 \_\_\_\_\_  
**Always use a new lock washer.**

6. Fold the lock washer flange on the bolts.

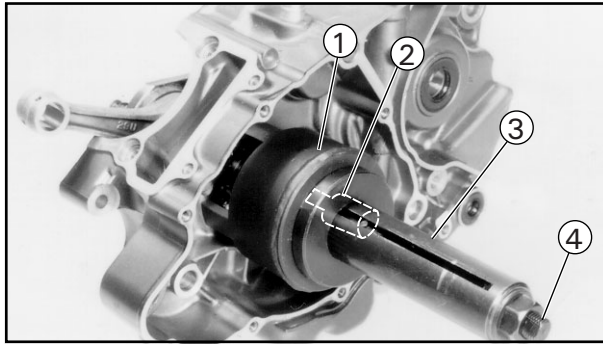
**CRANKSHAFT**

- ① Crankshaft pin
- ② Left crankshaft
- ③ Connecting-rod
- ④ Lower connecting-rod roller bearing
- ⑤ Crankshaft roller bearing
- ⑥ Spring
- ⑦ Pin with hole
- ⑧ Dowel pin

|          |   |
|----------|---|
| <b>A</b> | <b>CRANKSHAFT WIDTH:</b><br>< 55.95 ~ 56 mm >               |
| <b>B</b> | <b>WARPING LIMIT:</b><br>< 0.03 mm >                        |
| <b>C</b> | <b>CONNECTING-ROD DEFLECTION LIMIT:</b><br>< 0.08 mm >      |
| <b>D</b> | <b>CONNECTING-ROD SIDE CLEARANCE:</b><br>< 0.35 ~ 0.65 mm > |




50 N.m (5.0 Kg.m; 1,097.28 cm.lb)



## CRANKSHAFT

1. Install:
  - Crankshaft puller

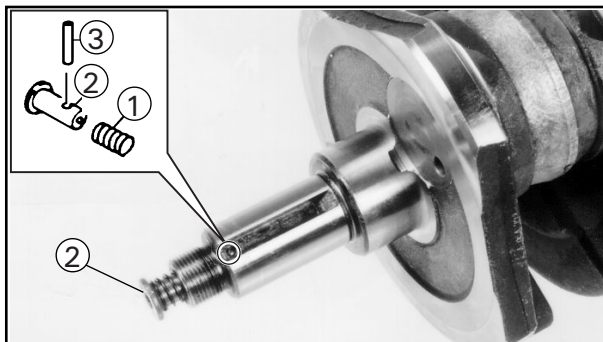


**Crankshaft puller assembly:**  
**YU-90050**  
**Spacer ①:**  
**90890-04081**  
**Adapter # 12 ②:**  
**YM-01383**  
**Adapter ③:**  
**90890-01274**  
**Bolt ④:**  
**90890-01275**

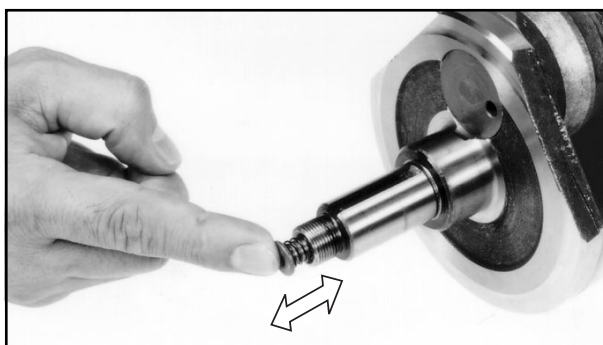
2. Install:
  - Crankshaft

**NOTE:** \_\_\_\_\_  
 Hold the connecting-rod in the top dead center using one hand while turning the tool nut with the other. Continue using the tool until the crankshaft touches the roller bearing.

**CAUTION:** \_\_\_\_\_  
 In order to protect the crankshaft against hazards or facilitate the installation operation. Apply grease to the retainer sides and engine oil in each roller bearing.



3. Install:
  - Spring ①
  - Pin with hole ②
  - Dowel pin ③



4. Check:
  - Pin with hole clearance

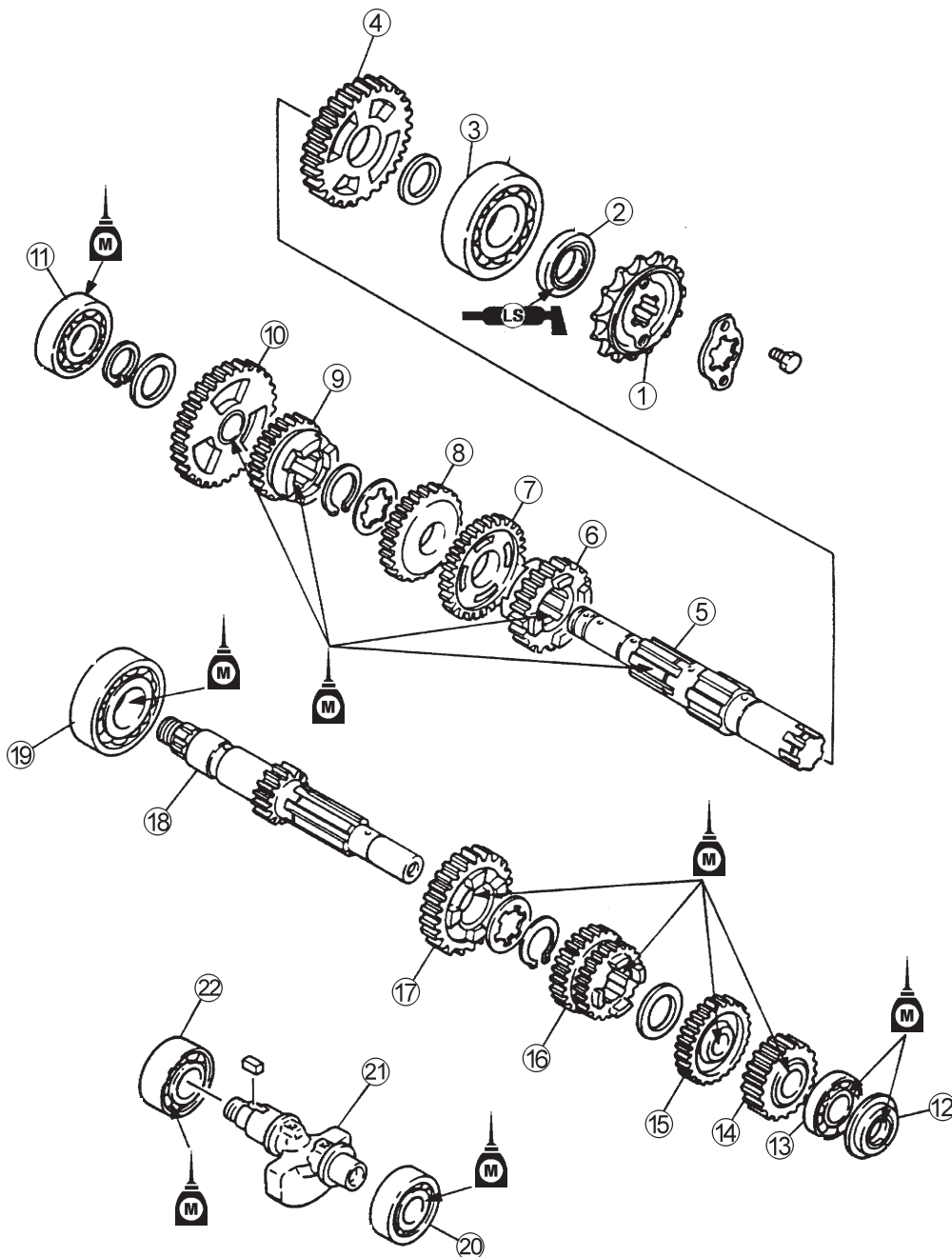
After installation, make sure that the pin operates smoothly in the arrow directions.



### BALANCER AND TRANSMISSION

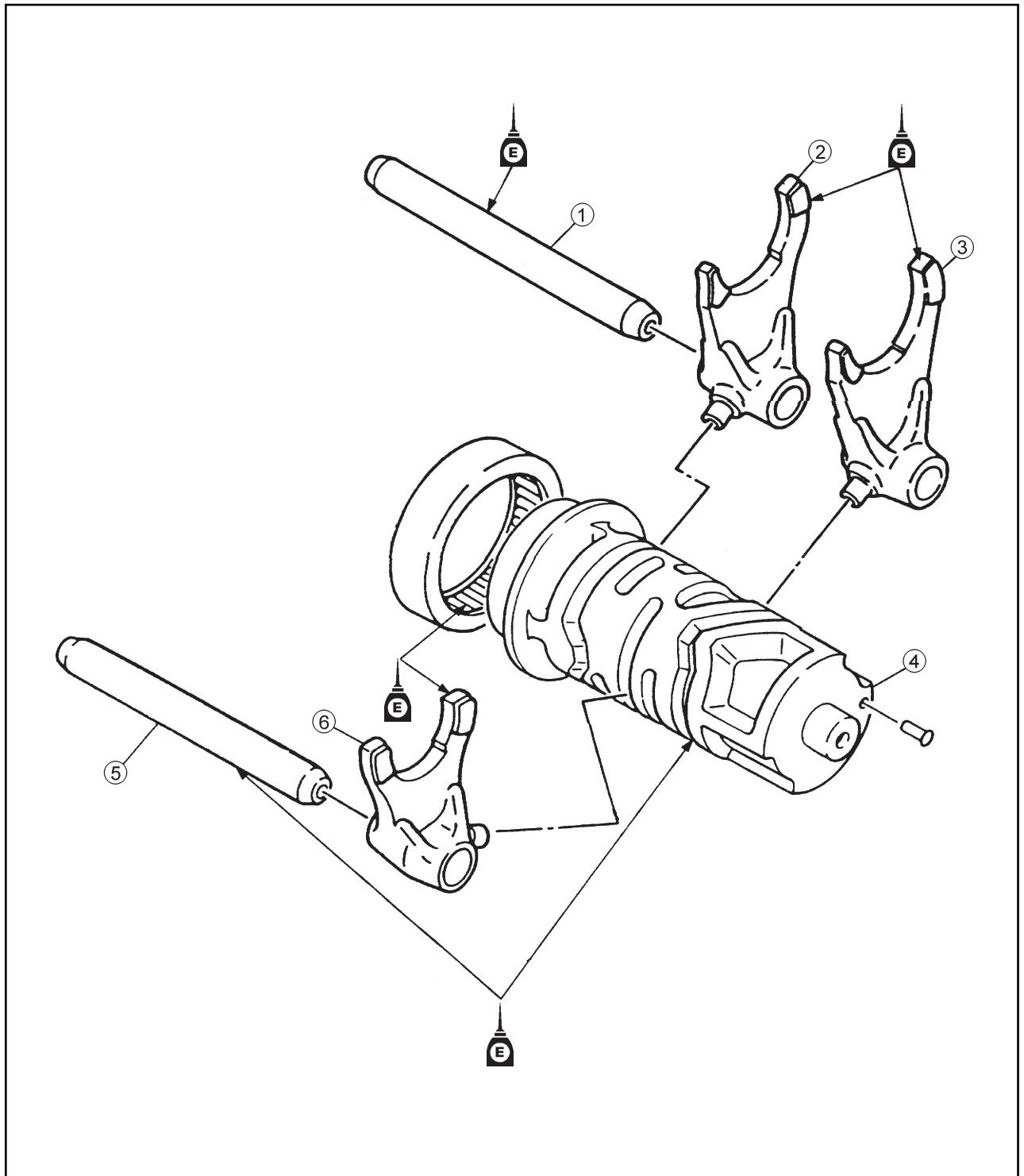
- |                   |                    |                    |
|-------------------|--------------------|--------------------|
| ① Pinion gear     | ⑧ 4th driven gear  | ⑮ 5th driving gear |
| ② Retainer        | ⑨ 6th driven gear  | ⑯ 3rd driving gear |
| ③ Roller bearing  | ⑩ 1st driven gear  | ⑰ 4th driving gear |
| ④ 2nd driven gear | ⑪ Roller bearing   | ⑱ Main shaft       |
| ⑤ Driven shaft    | ⑫ Retainer         | ⑲ Roller bearing   |
| ⑥ 5th driven gear | ⑬ Roller bearing   | ⑳ Roller bearing   |
| ⑦ 3rd driven gear | ⑭ 2nd driving gear | ㉑ Balancer         |
|                   |                    | ㉒ Roller bearing   |

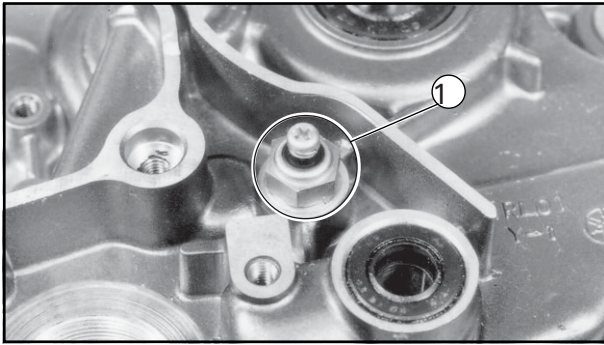
Warping limit of the main and driven shafts:  
0.08 mm



## SHIFTING FORK

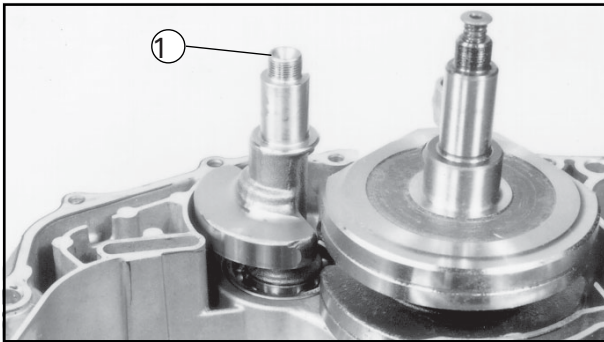
- ① Fork guide bar (long)
- ② Fork # 3
- ③ Fork # 1
- ④ Shifting fork
- ⑤ Fork guide bar (short)
- ⑥ Fork # 2



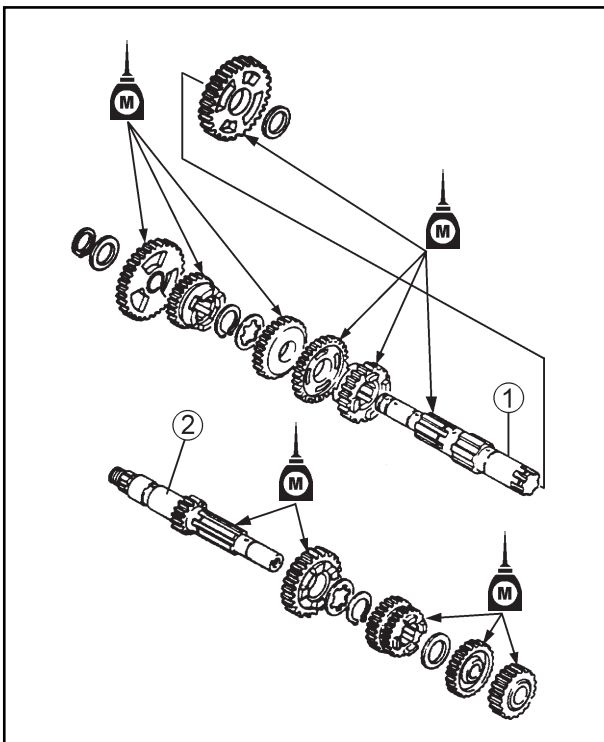


## BALANCER, TRANSMISSION AND SHIFTING FORK

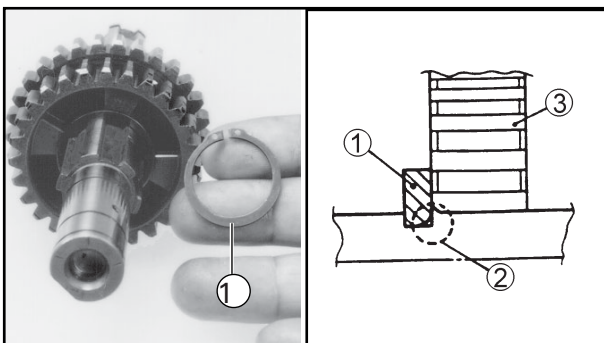
1. Install:
  - Dead center switch ①



2. Install:
  - Balancer shaft ①



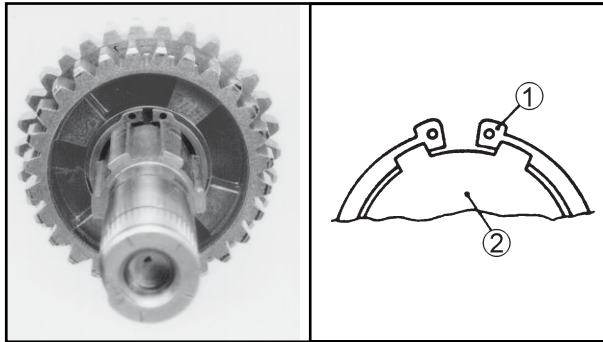
3. Apply:
  - Molybdenum disulfide-based oil (to main and driven shafts and gears)
4. Install:
  - Driven shaft assembly ①
  - Main shaft assembly ②



- Lock ①
- Install the beveled side ② facing the gear ③.

**WARNING**

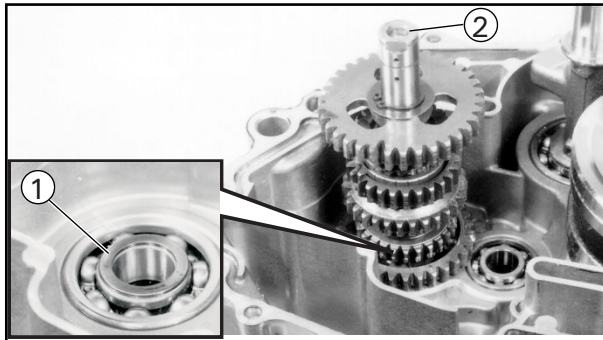
Always use a new lock.



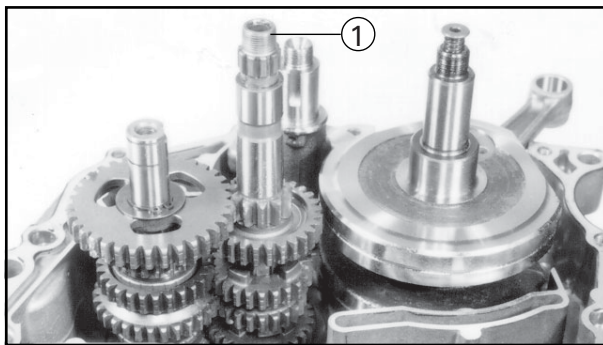
- Lock ①
  - Special washer ②
- Install the lock tip on the special washer center.

**CAUTION:** \_\_\_\_\_

Do not open the lock more than necessary.

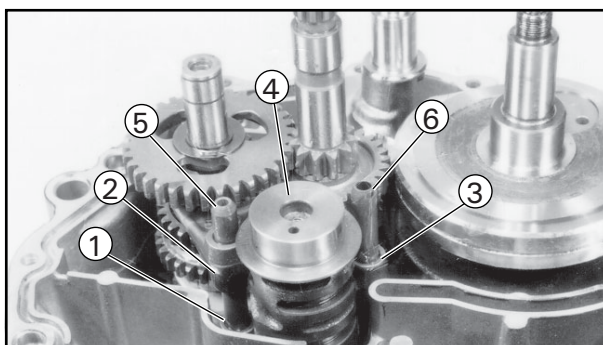


5. Install:
- Washer ①
  - Shaft assembly ②



6. Install:
- Main shaft assembly ①

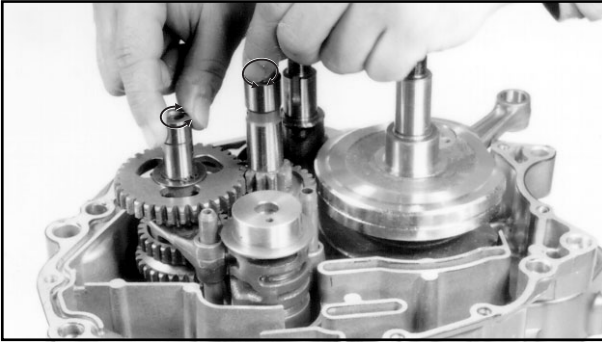
7. Apply:
- Engine oil 4 T  
(to fork guide bars)



8. Install:
- Fork # 3 ①
  - Fork # 2 ②
  - Fork # 1 ③
  - Shifting fork ④
  - Fork guide bar (long) ⑤
  - Fork guide bar (short) ⑥

**NOTE:** \_\_\_\_\_

Install the forks with their marks facing the left side of the engine.



9. Check:

- Transmission operation

Irregular operation => Repair.

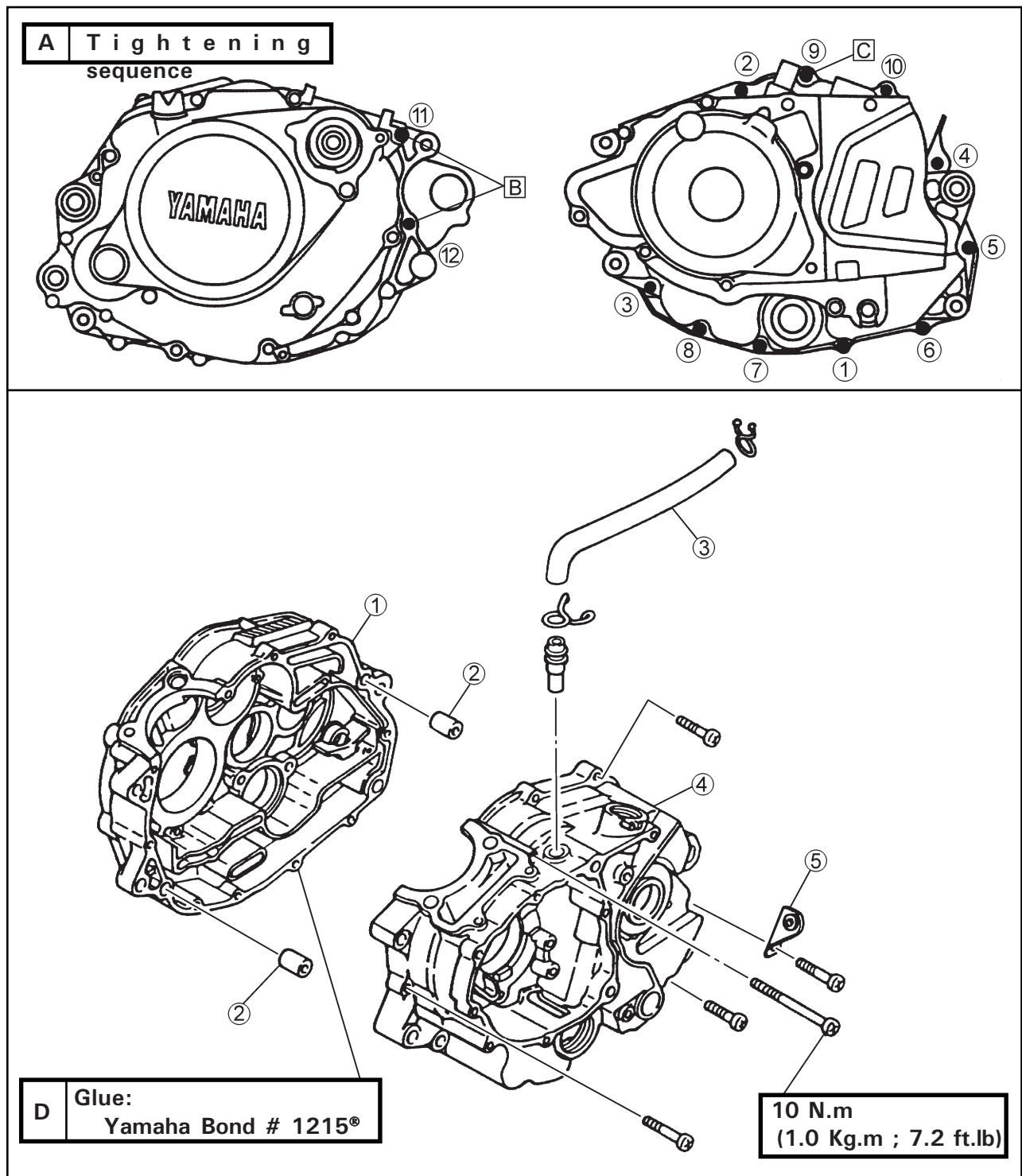


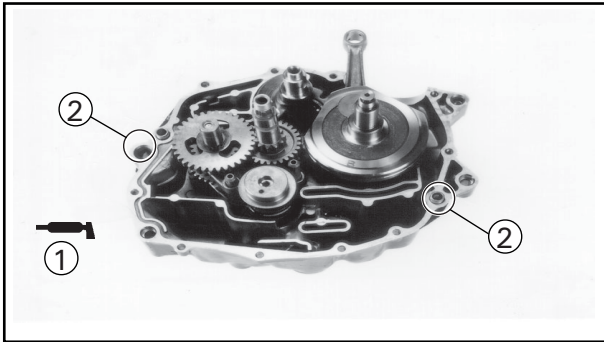
## CASES

- ① Case (R.H.)
- ② Dowel pin
- ③ Breather hose
- ④ Case (L.H.)
- ⑤ Hose fastener

**B** Tighten the bolt together with the starter motor.

**C** Tighten the bolt together with the ground wire.





### CASE (R.H.)

1. Apply:
  - Glue ①  
(to case closing surfaces)



**Glue:**  
**Yamaha Bond # 1215®**  
**90890-85505**

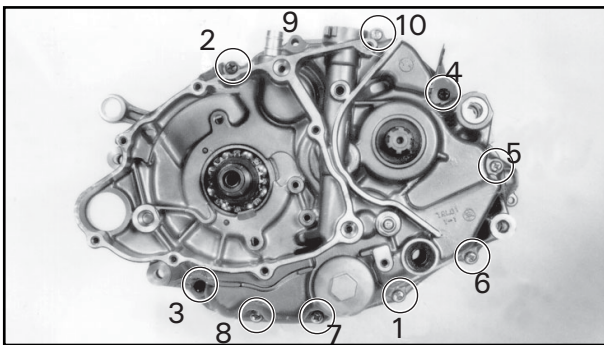
**NOTE:** \_\_\_\_\_  
 Prevent glue from touching the oil galleries.

2. Install:
  - Dowel pins ②

3. Fit the right case to the left case. Beat slightly using a plastic hammer.

4. Tighten
  - Bolts 1 ~ 10

**NOTE:** \_\_\_\_\_  
 ● Tighten the bolts with lower numbers first.  
 ● Install the clutch cable fastener on bolt # 9 and the hose fastener on bolt # 4.

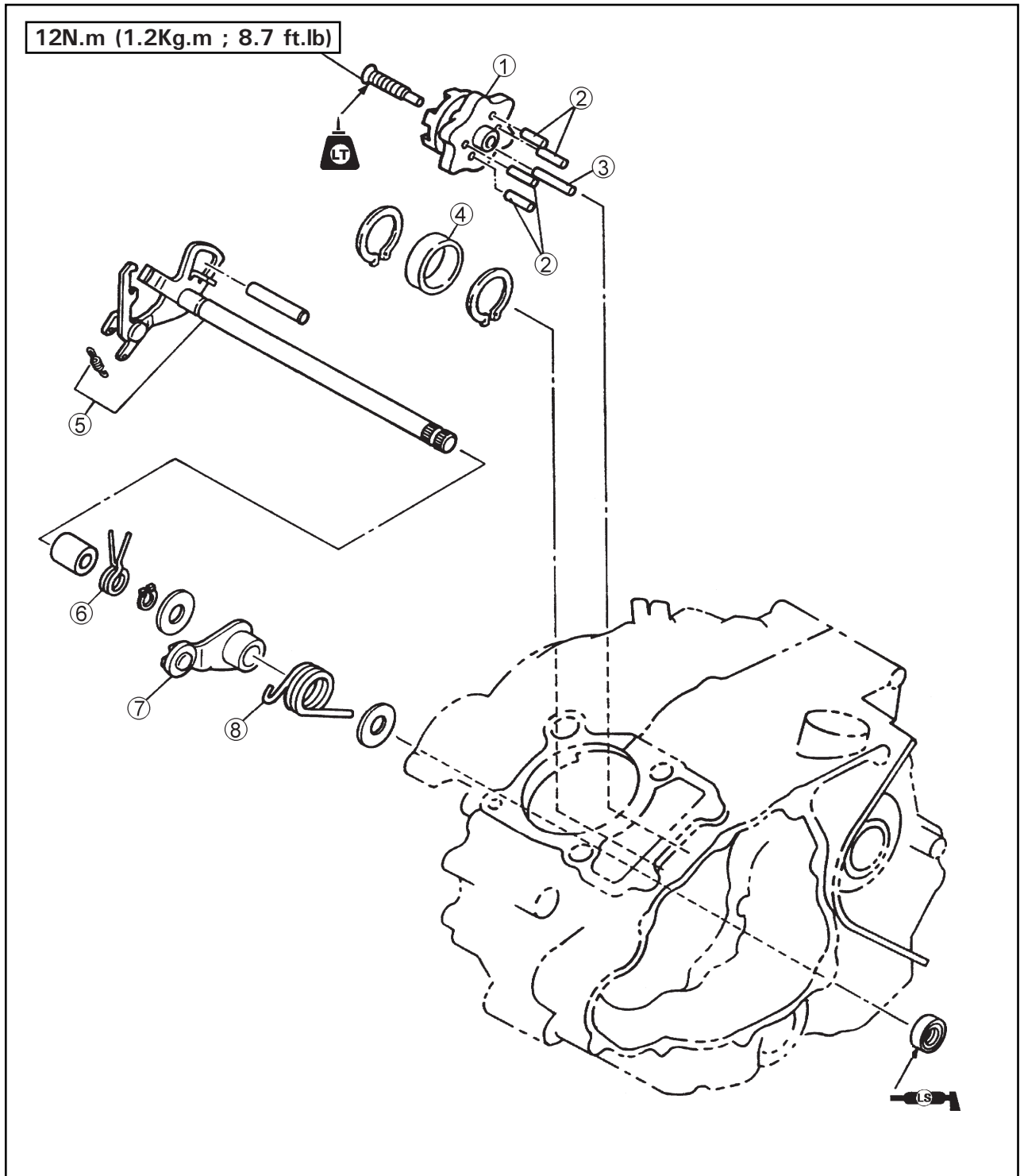


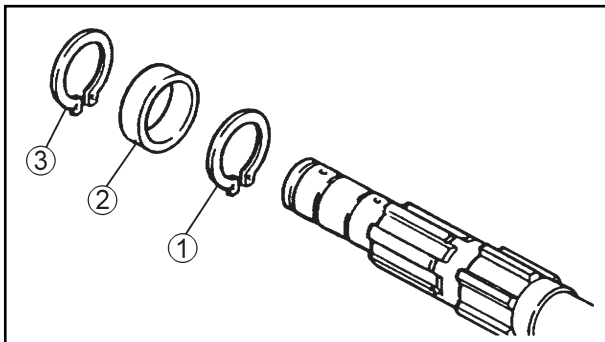
**Bolts (case):**  
**10 N.m (1.0 Kg.m; 219.46 cm.lb)**

5. Apply:
  - Engine oil 4T (to roller bearings and oil galleries)
6. Check:
  - Crankshaft operation and transmission
  - Irregular operation => Repair.

**SHIFT SHAFT**

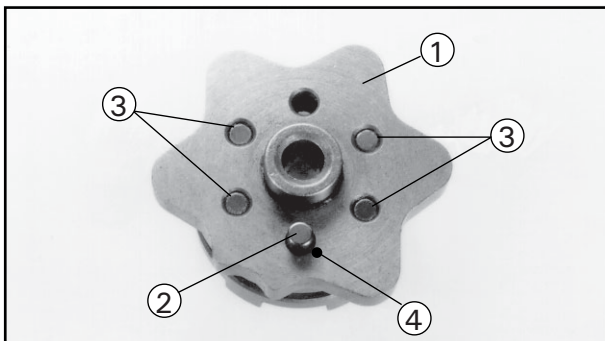
- ① Section
- ② Dowel pin (short)
- ③ Dowel pin (long)
- ④ Spacer
- ⑤ Shift shaft
- ⑥ Torsion spring
- ⑦ Stop stem
- ⑧ Return spring





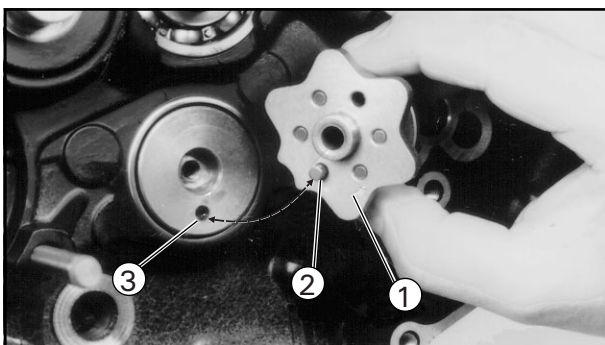
## SHIFT SHAFT

1. Install:
  - Lock ①
  - Spacer ②
  - Lock ③



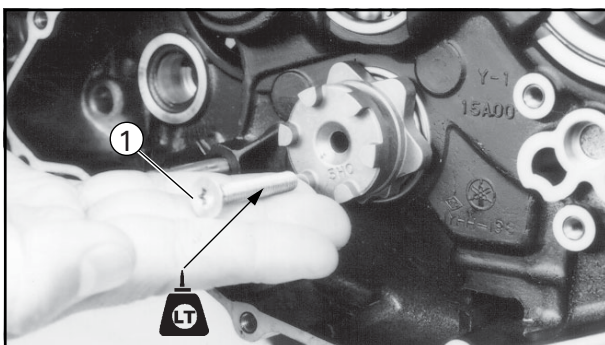
2. Install:
  - Section ①
  - Dowel pin (long) ②
  - Dowel pin (short) ③

**NOTE:** \_\_\_\_\_  
 Install the long dowel pin ② on the mark ④.




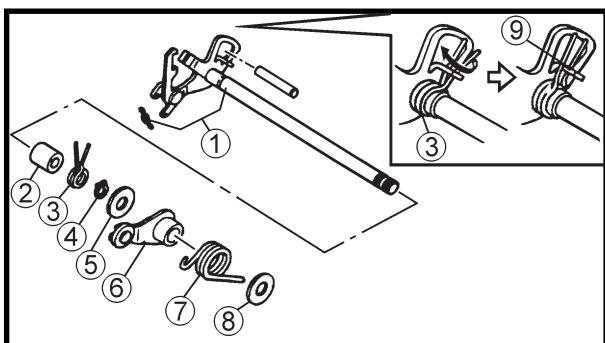
3. Install
  - Section ①

**NOTE:** \_\_\_\_\_  
 Place the dowel pin (long) ② in the installation hole ③ and install the section.



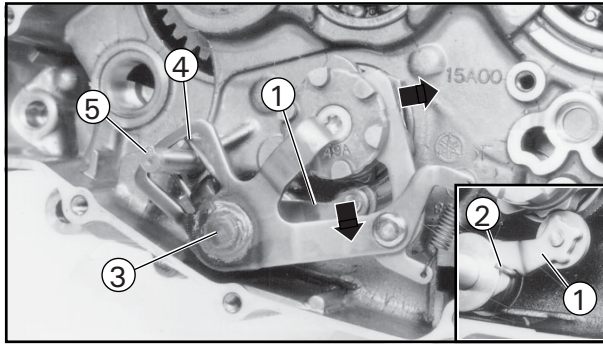
4. Tighten:
  - Bolt ①

|   |   |
|---|---|
|  | Bolt:<br>12 N.m (1.2 Kg.m; 8.7 ft.lb)<br>Use LOCTITE® |
|---|---|



5. Install:
  - Shift shaft ①
  - Spacer ②
  - Torsion spring ③
  - Lock ④
  - Washer ⑤
  - Stop stem ⑥
  - Return spring ⑦
  - Washer ⑧

**NOTE:** \_\_\_\_\_  
 Install the torsion spring ③ firmly in order to hold both sides of the guide plate ⑨.



## 6. Install

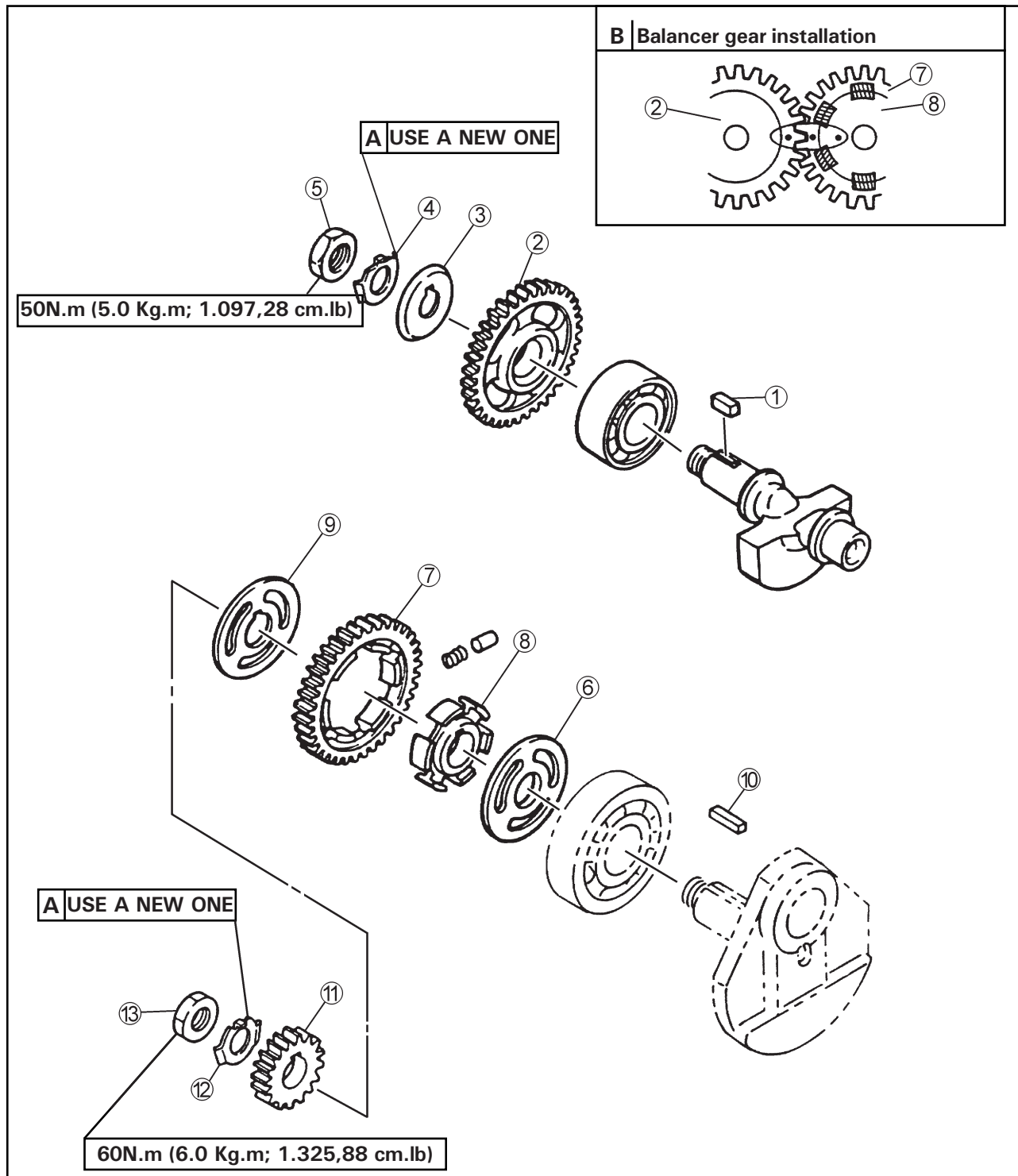
- Stop stem ①
- Return spring ②
- Shift shaft ③
- Torsion spring ④

### NOTE:

- Place the return spring ② and the stop stem ① in the correct position.
- Push the shift shaft arm and the stop stem in the arrow direction and install them on the section.
- Install the torsion spring ④ on the dowel pin ⑤.

## BALANCER GEAR

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>① Key</li> <li>② Balancer gear</li> <li>③ Plate</li> <li>④ Lock washer</li> <li>⑤ Nut</li> <li>⑥ Special washer</li> <li>⑦ Balancer driving gear</li> </ul> | <ul style="list-style-type: none"> <li>⑧ Impact hub</li> <li>⑨ Special washer</li> <li>⑩ Key</li> <li>⑪ Primary Gear</li> <li>⑫ Lock washer</li> <li>⑬ Nut</li> </ul> |
|--|---|





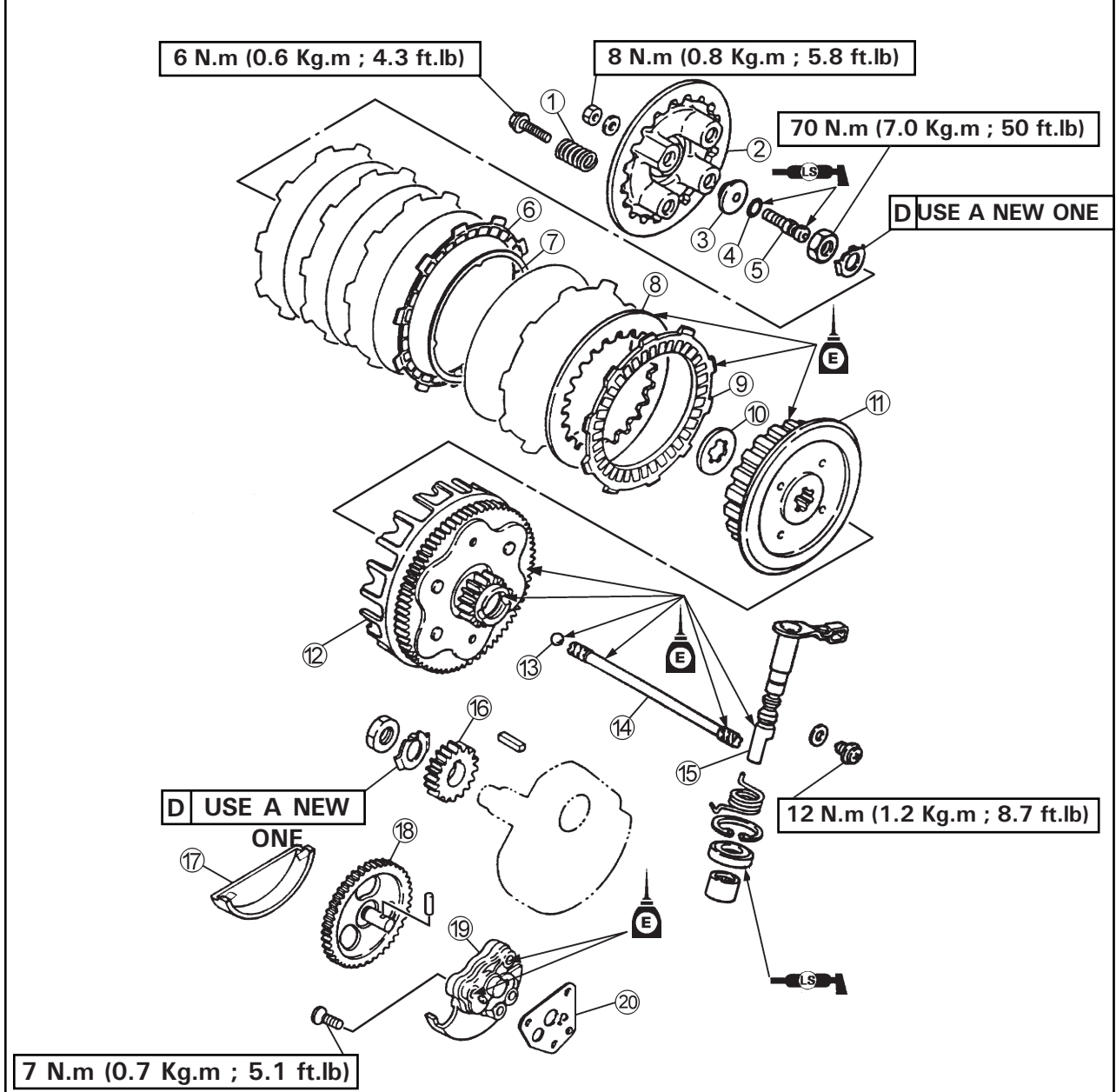
## CLUTCH AND OIL PUMP

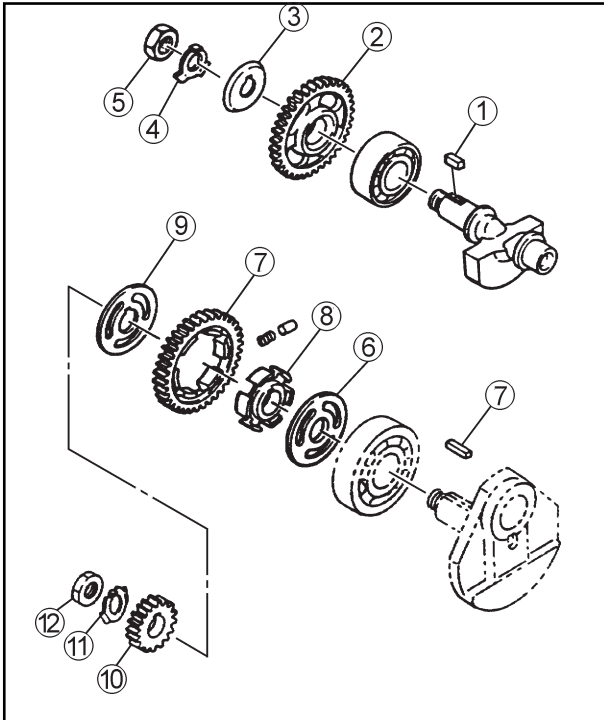
- |                          |                          |
|--------------------------|--------------------------|
| ① Spring                 | ⑪ Clutch hub             |
| ② Pressure plate         | ⑫ Driven clutch (sleeve) |
| ③ Plate                  | ⑬ Ball                   |
| ④ O-ring                 | ⑭ Stem 2                 |
| ⑤ Stem 1                 | ⑮ Clutch stem            |
| ⑥ Friction disc (type A) | ⑯ Primary gear           |
| ⑦ Expansion spring       | ⑰ Oil pump gear cover    |
| ⑧ Separator              | ⑱ Oil pump driven gear   |
| ⑨ Friction disc (type B) | ⑲ Oil pump               |
| ⑩ Washer                 | ⑳ Gaskets                |

| A FRICTION DISCS: |              |            |
|-------------------|--------------|------------|
| Type              | Thickness    | Wear limit |
| A (1 piece)       | 2.9 ~ 3.1 mm | 2.8 mm     |
| B (5 pieces)      | 2.9 ~ 3.1 mm | 2.8 mm     |

|          |  |
|----------|--|
| <b>B</b> | Spring minimum free length:<br>35.3 mm |
|----------|--|

|          |                                    |
|----------|------------------------------------|
| <b>C</b> | Separator warping limit:<br>0.2 mm |
|----------|------------------------------------|





**CLUTCH, OIL PUMP AND BALANCER GEAR**

1. Install:

- Key ①
- Balancer gear ②
- Plate ③
- Lock washer ④
- Nut ⑤ (balancer gear)
- Special washer ⑥
- Key ⑦
- Balancer driving gear and impact hub ⑧
- Special washer ⑨
- Primary gear ⑩
- Lock washer ⑪
- Nut ⑫ (primary gear)

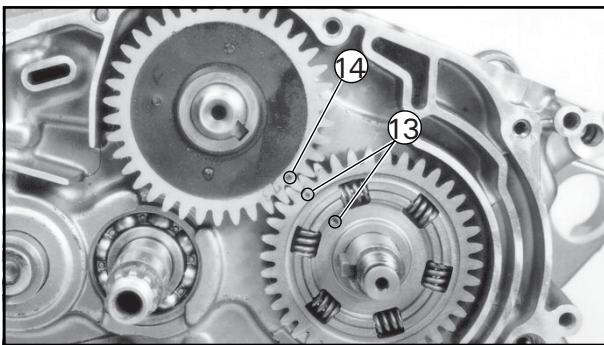


**Nut (balancer gear)**

**50N.m (5.0 Kg.m; 36 ft.lb)**

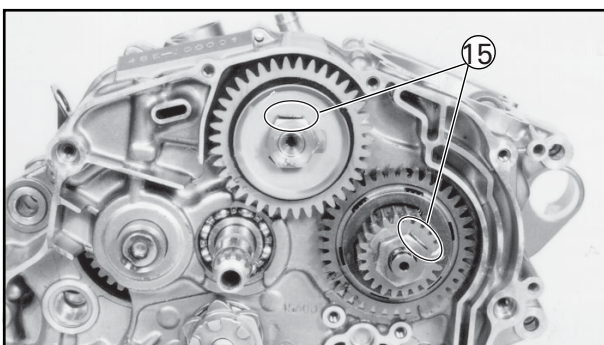
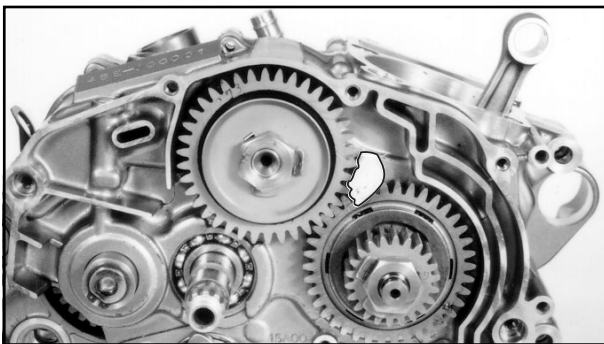
**Nut (primary gear):**

**60N.m (6.0 Kg.m; 43.5 ft.lb)**



**NOTE:**

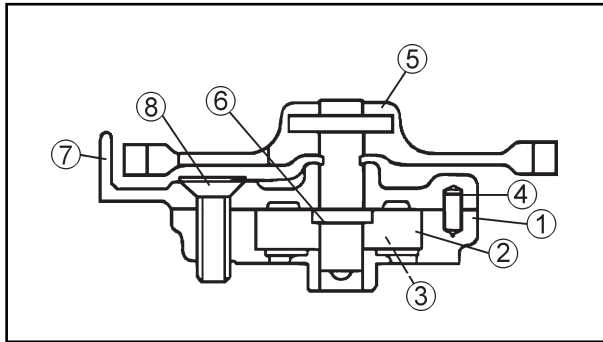
- When installing the primary gear, align the punch mark ⑬ of the driving gear with the punch mark ⑭ of the balancer gear.
- Place a cloth or an aluminum plate between the teeth of the primary and balancer shaft gears.
- Take care not to damage the teeth of the gears.



2. Fold the lock washer flanges on the nuts

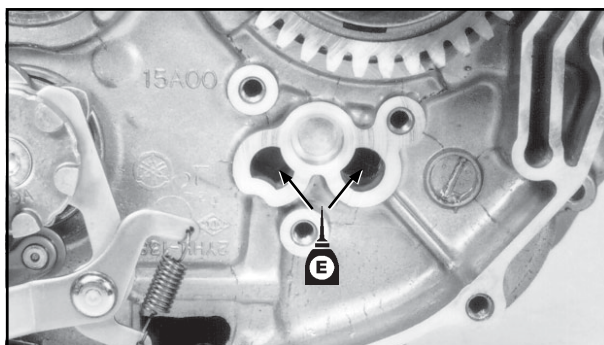
⑮





3. Apply:
  - Engine oil 4 T  
(to internal parts of the oil pump)
4. Install:
  - Rotor seat ①
  - External rotor ②
  - Internal rotor ③
  - Dowel pins ④
  - Oil pump gear ⑤
  - Dowel pin ⑥
  - Oil pump cover ⑦
  - Bolt ⑧

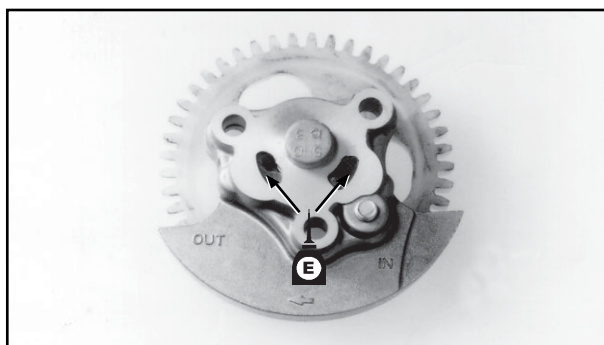
|   |   |
|---|---|
|  | <b>Bolt:</b><br><b>7N.m (0.7 Kg.m; 5.1 ft.lb)</b> |
|---|---|



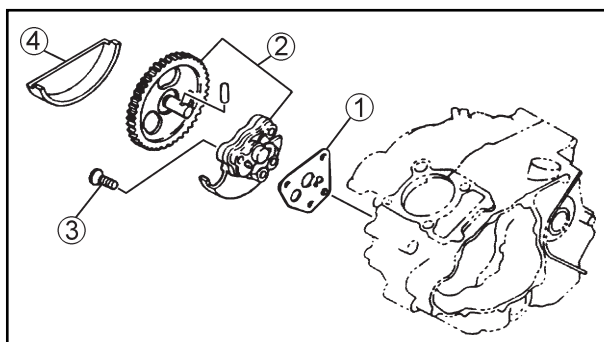
5. Apply:
  - Engine oil 4T  
(to oil passages of the case)

**CAUTION:** \_\_\_\_\_


Apply an appropriate amount of engine oil 4 T to the oil passages on the case in order to prevent the engine from being damaged.

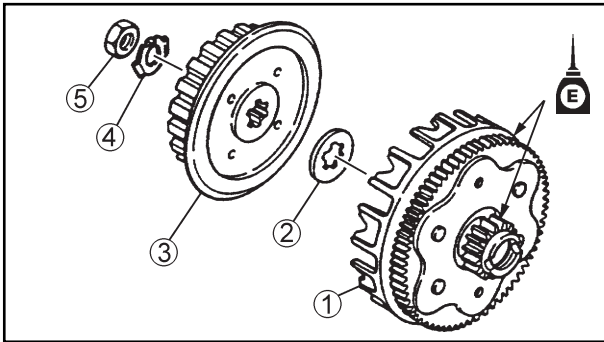


6. Apply:
  - Engine oil 4 T  
(to oil passages of the oil pump)

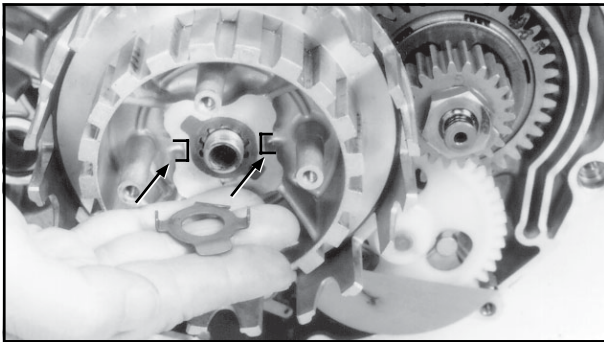


7. Install:
  - Gasket ①
  - Oil pump assembly ②
  - Bolts ③
  - Oil pump cover ④

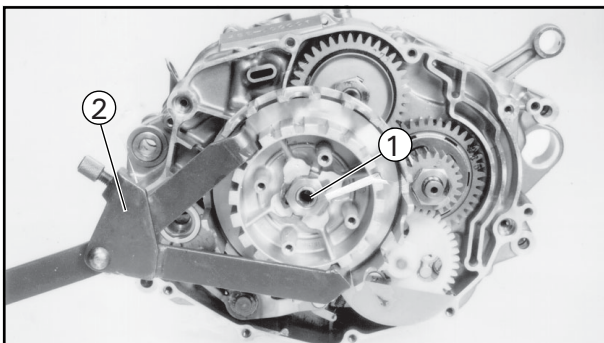
|   |  |
|---|--|
|  | <b>Bolt (oil pump):</b><br><b>7N.m (0.7 Kg.m; 5.1 ft.lb)</b> |
|---|--|



8. Apply:
  - Engine oil 4T (to gear teeth)
9. Install:
  - Driven gear (sleeve) ①
  - Washer ②
  - Clutch hub ③
  - Lock washer ④
  - Nut ⑤ (clutch hub)



**NOTE:** \_\_\_\_\_  
 Fold the lock washer flanges on the clutch hub channel.  
 \_\_\_\_\_



10. Tighten:
  - Nut ① (clutch hub)

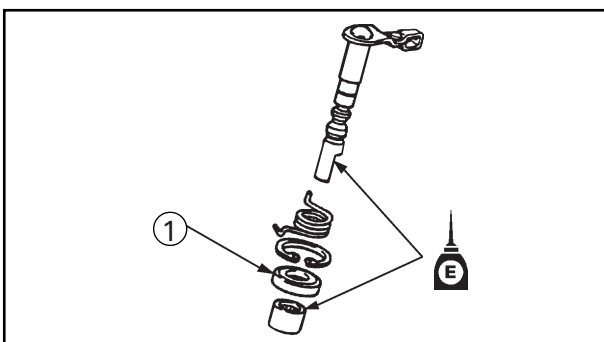
**NOTE:** \_\_\_\_\_  
 Tighten the nut (clutch hub) holding the clutch hub with the universal clutch fastener ②.  
 \_\_\_\_\_



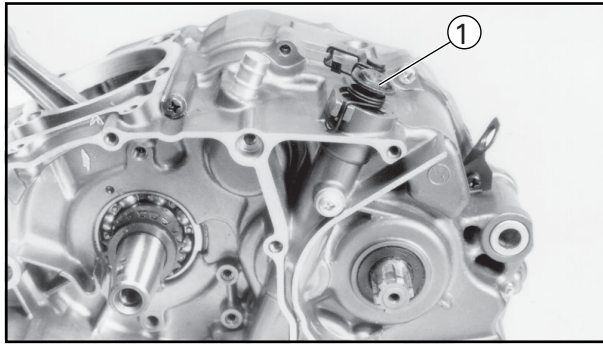
**Universal clutch fastener:**  
 90890-04086



**Nut (clutch hub)**  
 70N.m (7.0 Kg.m; 50 ft.lb)

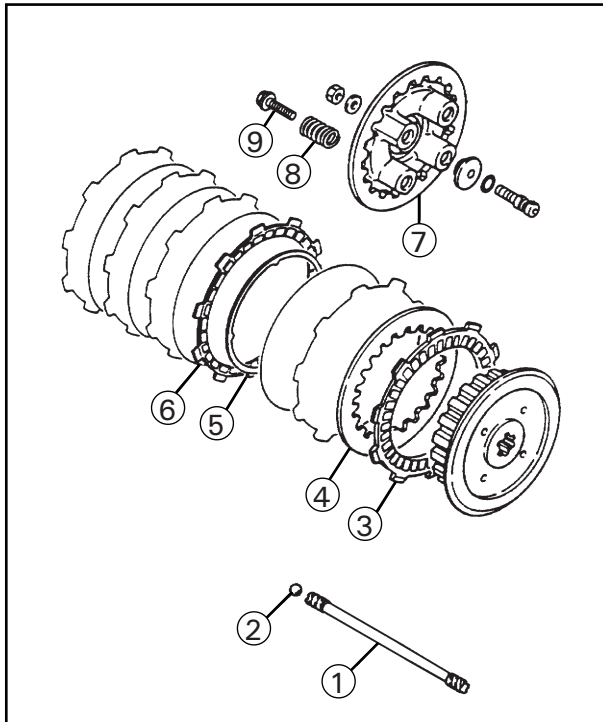


11. Fold:
  - Lock washer flange
12. Apply:
  - Engine oil 4T (to roller bearing ① and stem)
  - Lithium-based grease (to stem retainer)



13. Install:
- Clutch stem ①

**Bolt (clutch stem):**  
12N.m (1.2 Kg.m; 8.7 ft.lb)



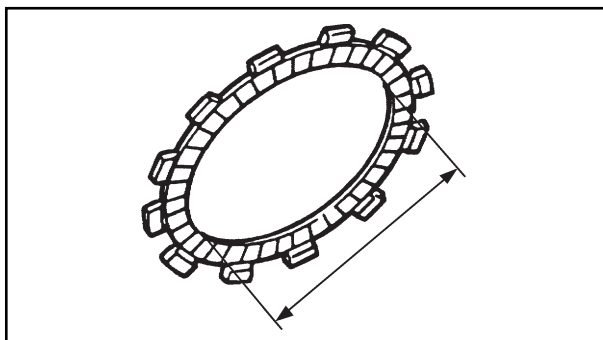
14. Install:
- Stem 2 ①
  - Ball ②
  - Friction disc ③ (type b)
  - Separators ④
  - Expansion spring ⑤
  - Friction disc ⑥ (type a)
  - Pressure plate ⑦
  - Springs ⑧
  - Bolts ⑨

**NOTE:**

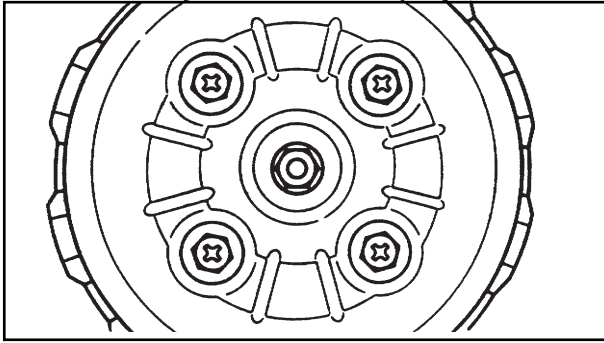
- Apply engine oil 4T to the separators.
- Install the separators and friction discs alternately on the clutch hub, starting and finishing with a friction disc.

**CAUTION:**

The friction disc (type A) ⑥ with the wider internal diameter should be installed in the 3rd position.  
The expansion spring ⑤ should be placed inside the 3rd friction disc.

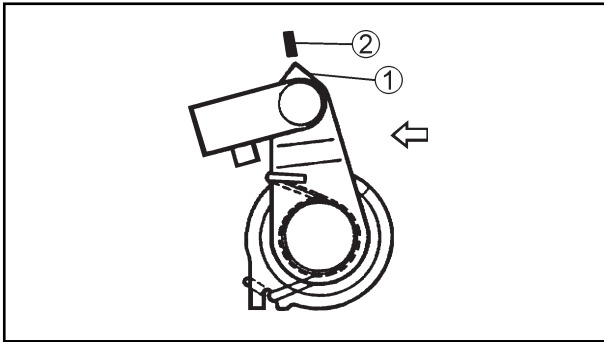


|                       | Friction disc |          |
|-----------------------|---------------|----------|
|                       | Type "A"      | Type "B" |
| <b>Quantity</b>       | 1 piece       | 5 pieces |
| <b>Int. diam. "D"</b> | 107 mm        | 99 mm    |



**NOTE:** \_\_\_\_\_  
Tighten the bolts in a cross pattern.

|   |  |
|---|--|
|  | <b>Screws (pressure plate):</b><br><b>6N.m (0.6 Kg.m; 4.3 ft.lb)</b> |
|---|--|



15. Check:
- Clutch stem position
  - Push the clutch stem assembly in the arrow direction. Make sure the adjusting marks are aligned.
- Out of line => Adjust.
- ① Clutch stem assembly indicator.
  - ② Case mark.


16. Adjust:
- Clutch stem position.

\*\*\*\*\*

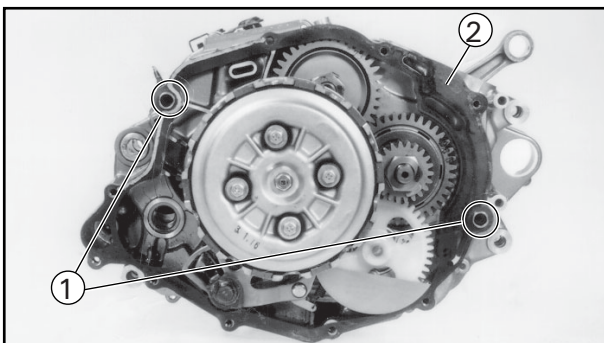
**Adjustment steps:**

- Loosen the lock-nut ①.
- Turn the adjuster ② clockwise or counterclockwise until the marks are aligned.
- Use a tool to fasten the adjuster in order to prevent its displacement. Then, tighten the lock-nut firmly.

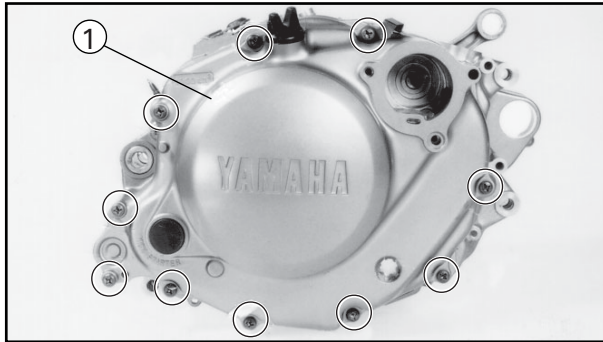
**CAUTION:** \_\_\_\_\_  
Do not overtighten the adjuster ② and eliminate the clearance between the stems.

|   |  |
|---|--|
|  | <b>Lock-nut (stem 1):</b><br><b>8N.m (0.8 Kg.m; 5.8 ft.lb)</b> |
|---|--|

\*\*\*\*\*



17. Install:
- Dowel pins ①
  - Gasket ② (case cover)



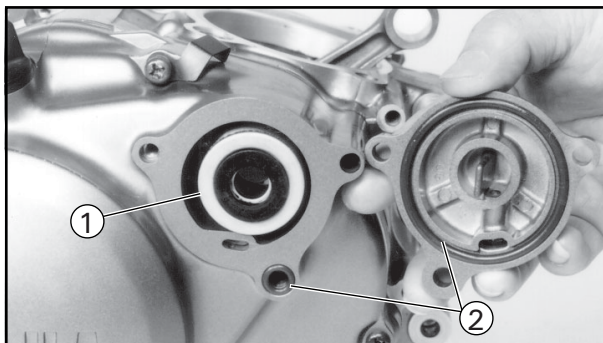
18. Install:
- Case cover (RH) ①

|   |  |
|---|--|
|  | <b>Bolt (case cover):</b><br>10N.m (1.0 Kg.m; 7.2 ft.lb) |
|---|--|

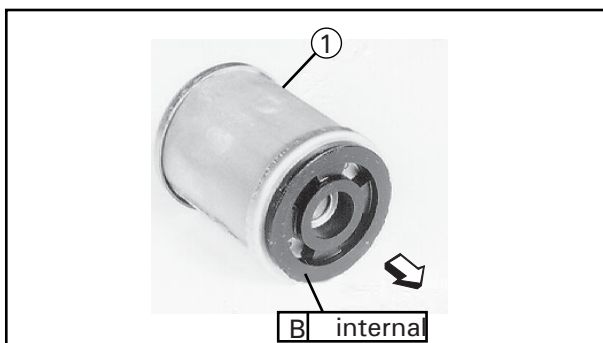
**NOTE:** \_\_\_\_\_  
 Tighten the bolts (case cover) in a cross pattern.

## OIL FILTER

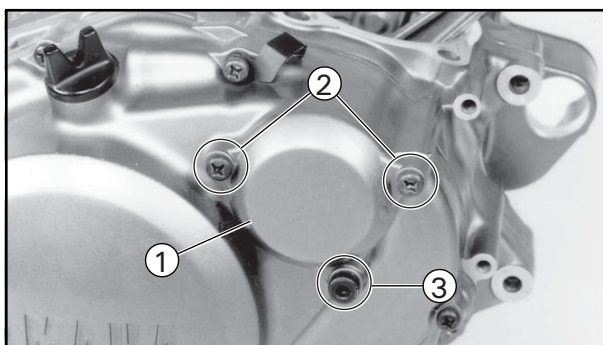
1. Apply:
- Engine oil 4T  
 (to oil filter and oil passage)




2. Install:
- Oil filter ①
  - O-rings ②



**CAUTION:** \_\_\_\_\_  
 Install the oil filter as shown in the figure.

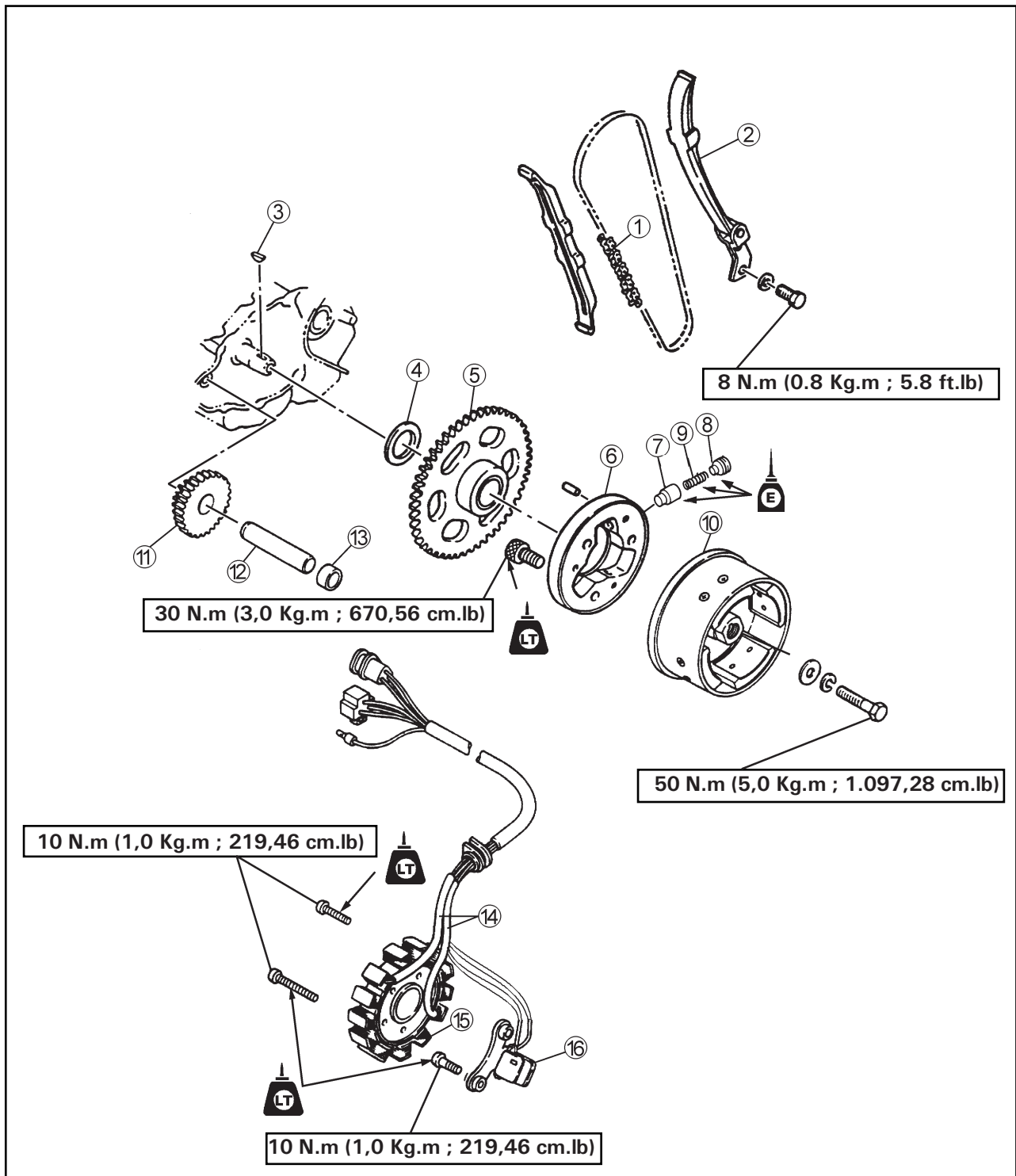


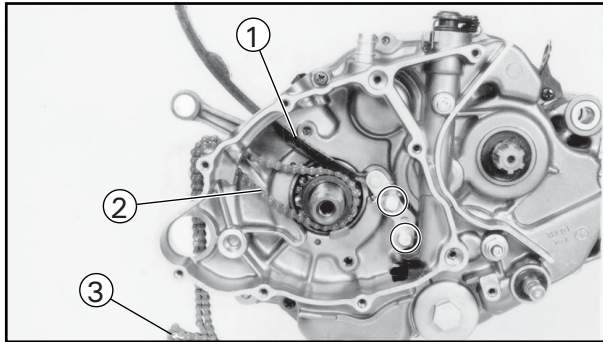
3. Install:
- Oil filter cover ①

|   |  |
|---|--|
|  | <b>Bolt 2:</b><br>10N.m (1,0 Kg.m; 219,46 cm.lb) |
|   | <b>Bolt 3:</b><br>10N.m (1,0 Kg.m; 219,46 cm.lb) |

## MAGNET ROTOR AND STARTING GEARS

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>① Camshaft chain</li> <li>② Belt guide (intake)</li> <li>③ Key</li> <li>④ Washer</li> <li>⑤ Starting gear 2</li> <li>⑥ One-way gear</li> <li>⑦ Dowel pin</li> <li>⑧ Spring cover</li> </ul> | <ul style="list-style-type: none"> <li>⑨ Spring</li> <li>⑩ Magnet rotor</li> <li>⑪ Starting gear 1</li> <li>⑫ Shaft</li> <li>⑬ Spacer</li> <li>⑭ Loading coil</li> <li>⑮ Stator</li> <li>⑯ Pulse coil</li> </ul> |
|--|--|





## MAGNET ROTOR AND STARTING GEARS

1. Install:

- Chain guide ①
- Camshaft chain ②



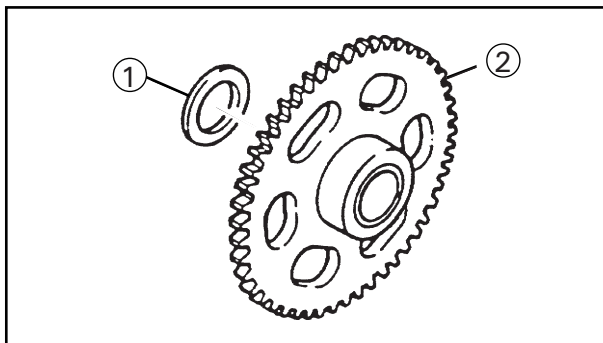
**Bolt (chain guide):**  
8N.m (0,8 Kg.m; 5,8 ft.lb)

**NOTE:**

Fasten to the camshaft chain ③ using a wire in order to prevent it from falling into the case.

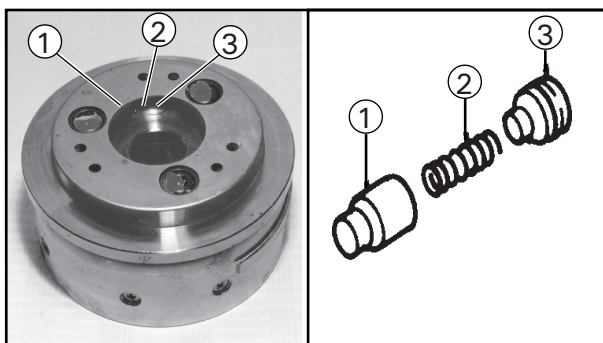
2. Apply:

- Engine oil 4T  
(to starting gears)



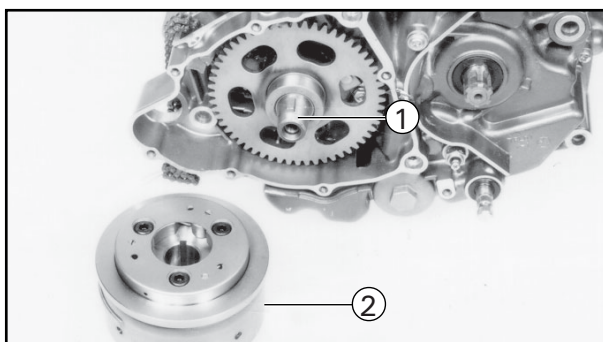
3. Install:

- Washer ①
- Starting gear 2 ②



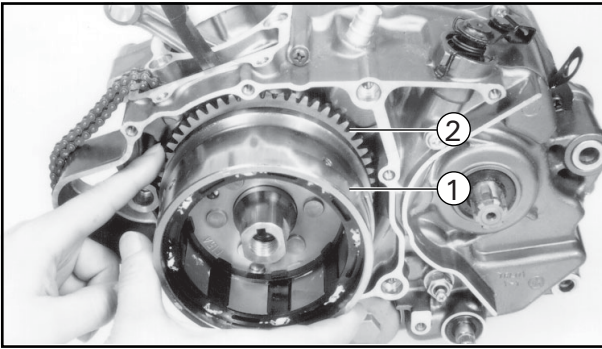
4. Install:

- Driving pin ①
- Spring ②
- Fastener ③

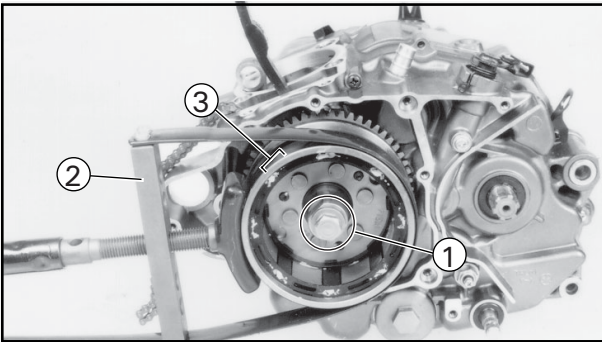


5. Install:


- Key ①
- Magnet rotor ②




**NOTE:** \_\_\_\_\_  
 Install rotor 1 aligning the slot and the key.  
 Turn starting gear 2 ② clockwise and install rotor and starting gear.



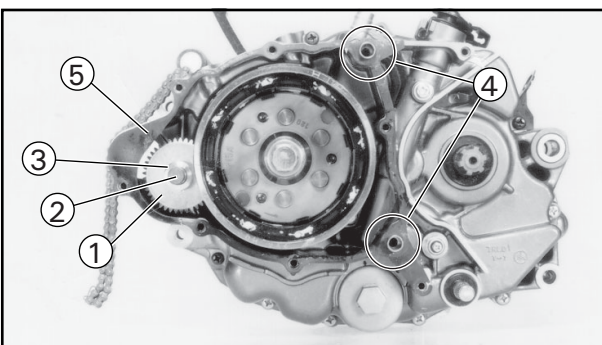
6. Install:  
 ● Bolt ① (rotor)

|   |   |
|---|---|
|  | <b>Bolt (rotor):</b><br>50 N.m (5.0 Kg.m; 36 ft.lb) |
|---|---|

**NOTE:** \_\_\_\_\_  
 Tighten the bolt (rotor) holding the rotor with the fastener ②⑭


|  |                                       |
|--|---------------------------------------|
|  | <b>Rotor fastener:</b><br>90890-01701 |
|--|---------------------------------------|

**CAUTION:** \_\_\_\_\_  
 Prevent the rotor fastener from touching the cams ③ on the rotor.

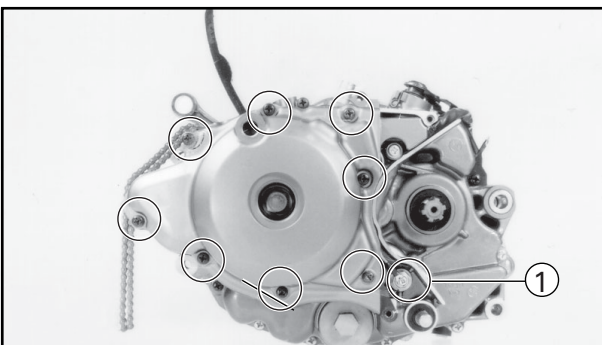


7. Install:  
 ● Starting gear 1 ①  
 ● Shaft ②  
 ● Spacer ③  
 ● Dowel pins ④  
 ● Gasket ⑤ (case cover)

8. Install:  
 ● Case cover (LH)

|   |   |
|---|---|
|  | <b>Bolt (case cover):</b><br>10N.m (1,0 Kg.m; 219,46 cm.lb) |
|---|---|

**NOTE:** \_\_\_\_\_  
 Tighten the bolts (case cover) in a cross pattern.

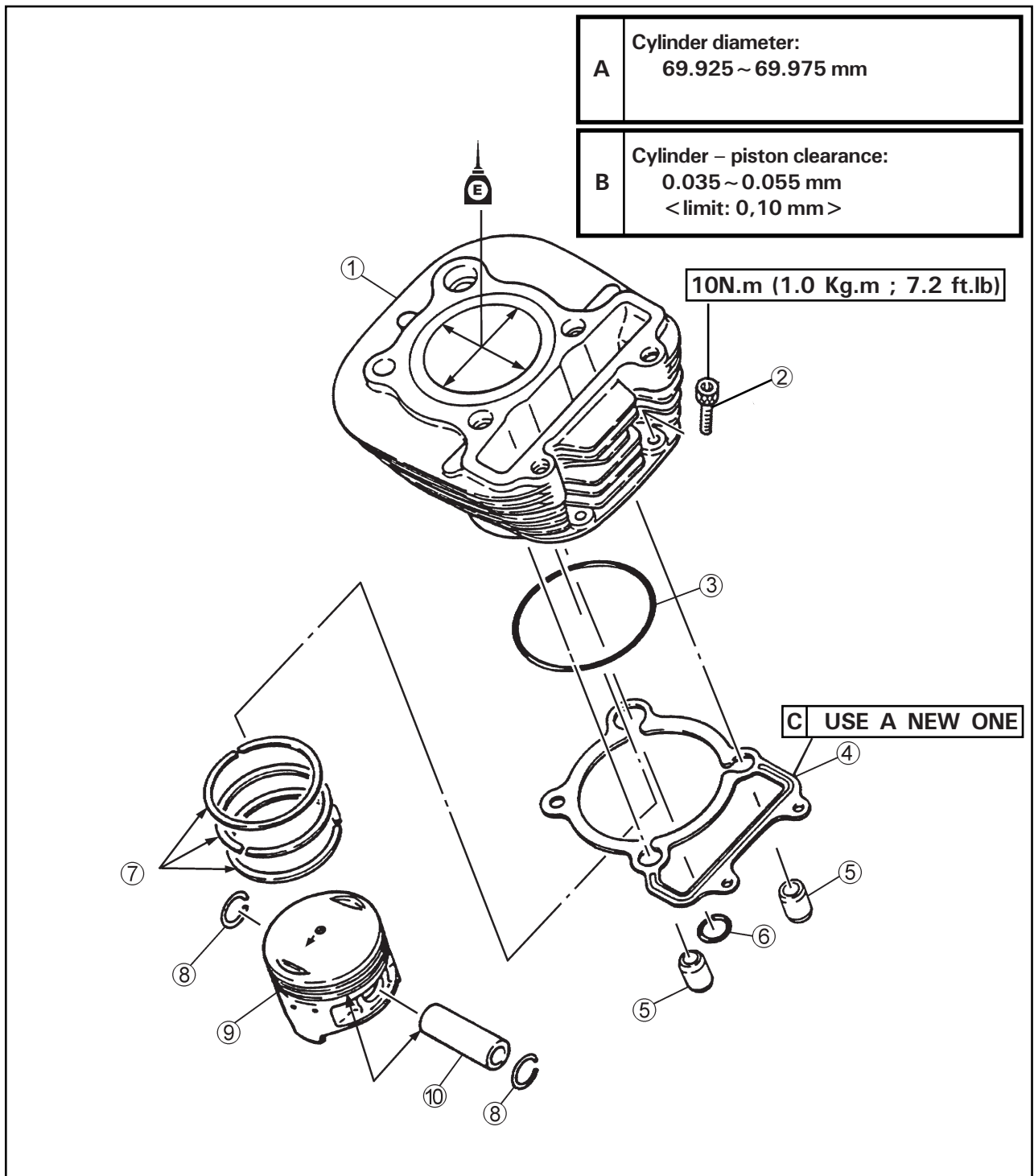


9. Connect:  
 ● Dead center switch wire ①



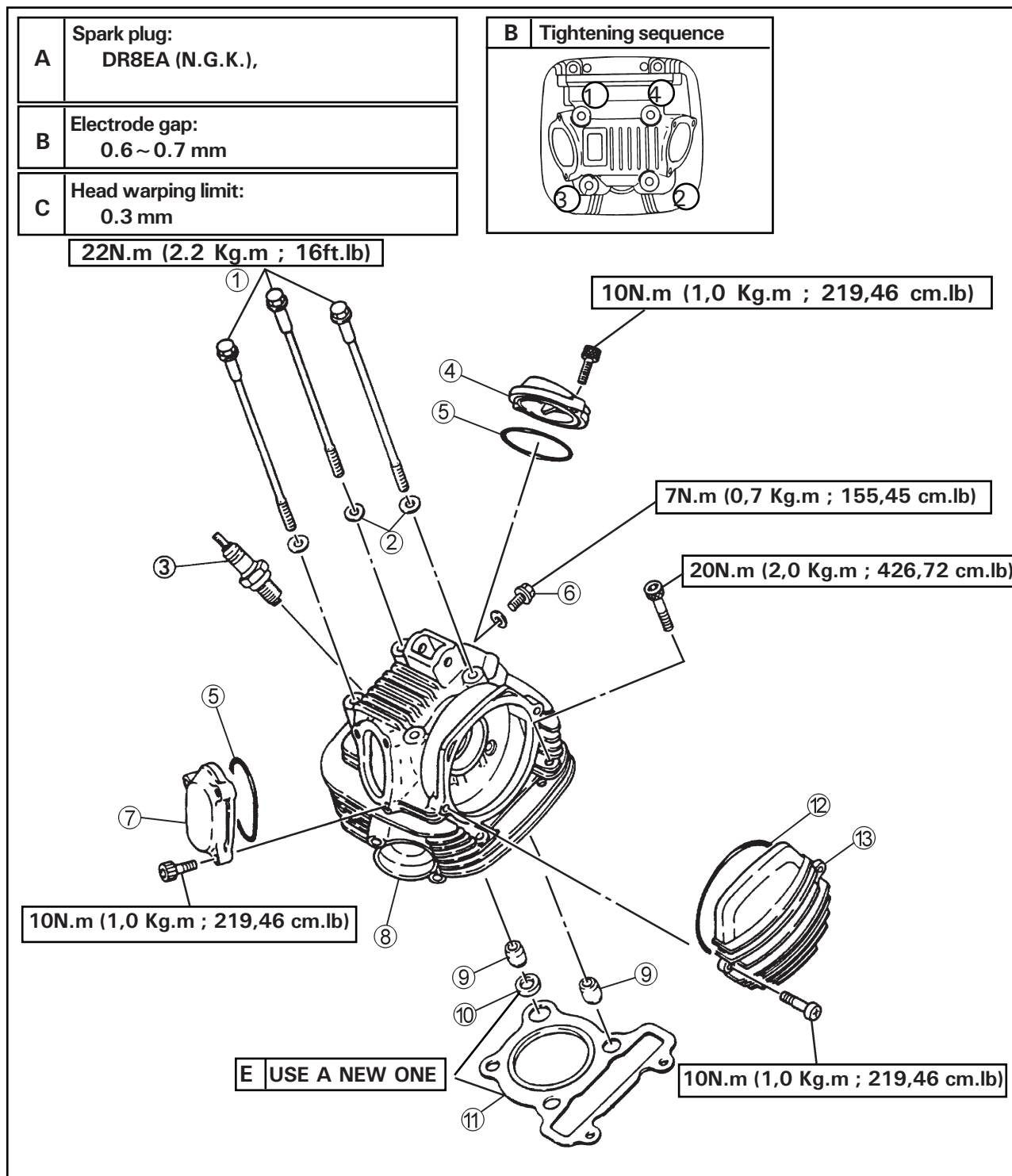
## CYLINDER AND PISTON

- ① Cylinder
- ② Cylinder bolt
- ③ O-ring
- ④ Cylinder gasket
- ⑤ Dowel pins
- ⑥ O-ring
- ⑦ Piston rings
- ⑧ Piston pin locks
- ⑨ Piston
- ⑩ Piston pin



## HEAD

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>① Bolts</li> <li>② Washer</li> <li>③ Spark plug</li> <li>④ Cover (intake)</li> <li>⑤ O-ring</li> <li>⑥ Oil check bolt</li> <li>⑦ Cover (exhaust)</li> </ul> | <ul style="list-style-type: none"> <li>⑧ Head</li> <li>⑨ Dowel pin</li> <li>⑩ Grommet</li> <li>⑪ Head gasket</li> <li>⑫ O-ring</li> <li>⑬ Side head cover</li> </ul> |
|--|--|

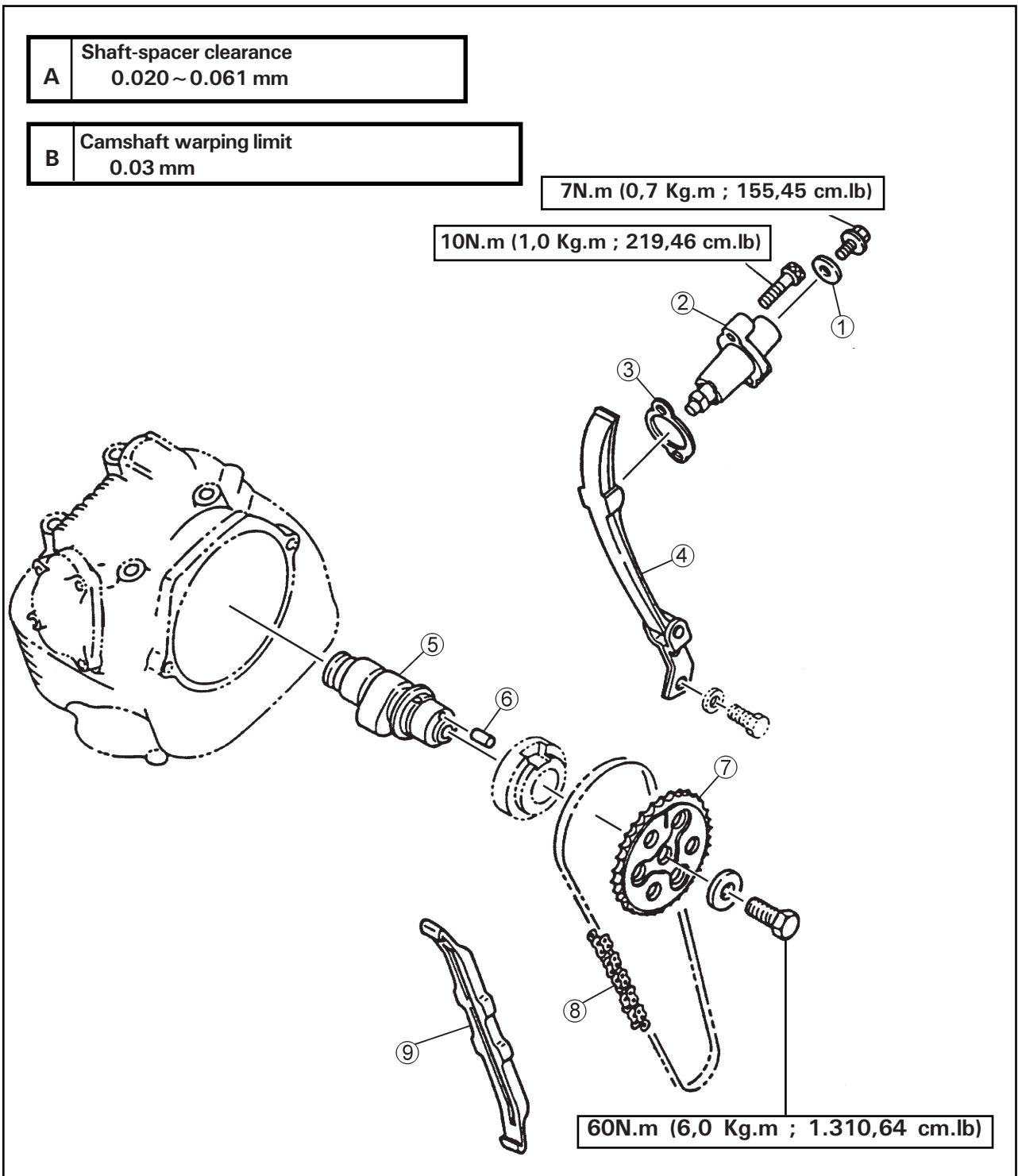


## CAMSHAFT AND CAMSHAFT CHAIN

- ① Gasket
- ② Chain tensioner
- ③ Gasket
- ④ Chain guide (intake)
- ⑤ Camshaft
- ⑥ Pin
- ⑦ Gear
- ⑧ Camshaft chain
- ⑨ Chain guide (exhaust)

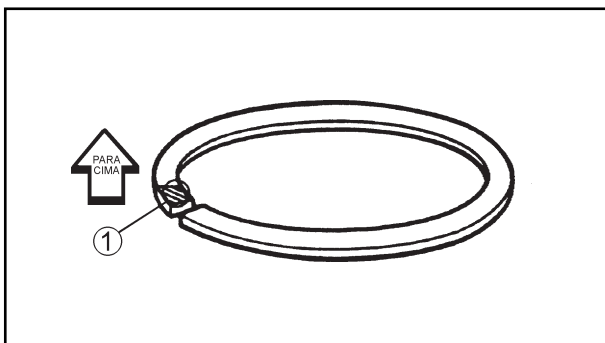
|          |  |
|----------|--|
| <b>A</b> | Shaft-spacer clearance<br>0.020 ~ 0.061 mm |
|----------|--|

|          |                                   |
|----------|-----------------------------------|
| <b>B</b> | Camshaft warping limit<br>0.03 mm |
|----------|-----------------------------------|



## HEAD, CYLINDER, AND PISTON

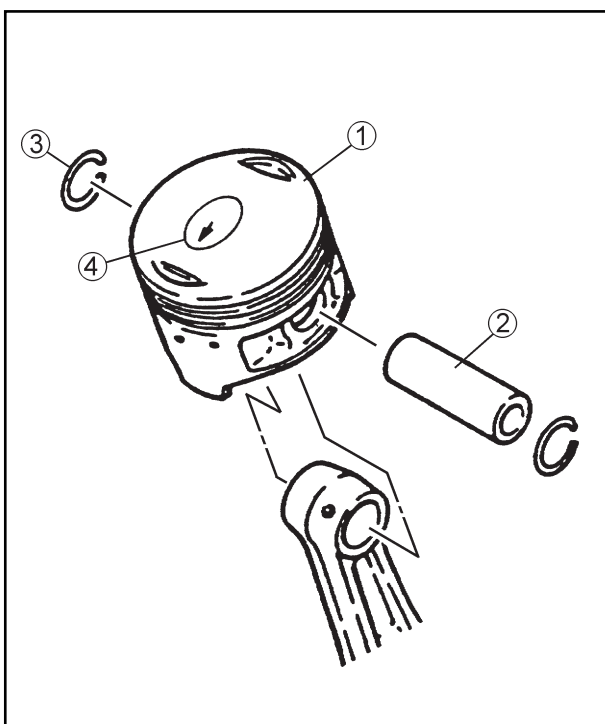
1. Apply:
  - Engine oil 4T  
(Piston rings and pin)



2. Install:
  - Piston rings

**NOTE:** \_\_\_\_\_  
Install the rings with the brand mark up.

\_\_\_\_\_

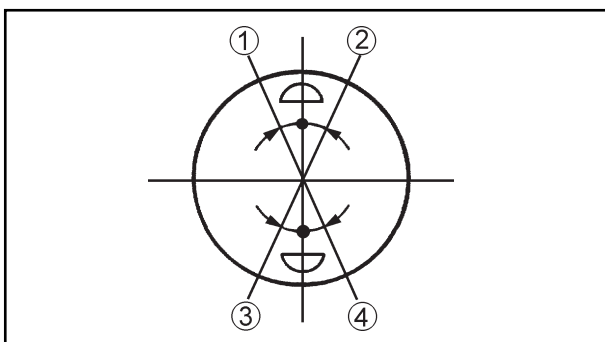


3. Install:
  - Piston ①
  - Piston pin ②
  - Piston pin locks ③

**NOTE:** \_\_\_\_\_

- The piston arrow ④ should be facing the front part of the engine.
- Before installing the piston pin locks, cover the engine case using a cloth in order to prevent the locks from falling into the engine.

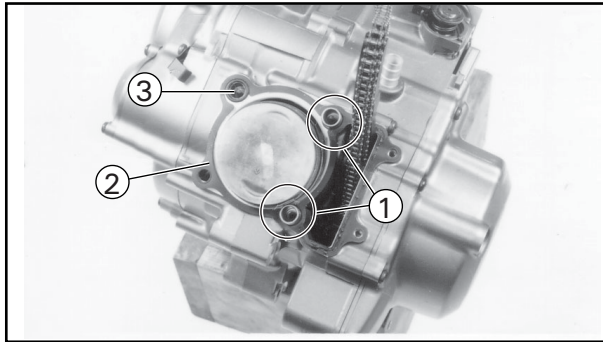
\_\_\_\_\_



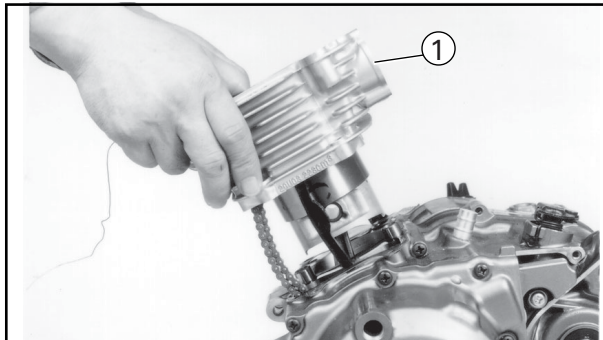
4. Ring opening positions:
  - Top ring
  - Bottom rings

As the arrangement shown in the figure:

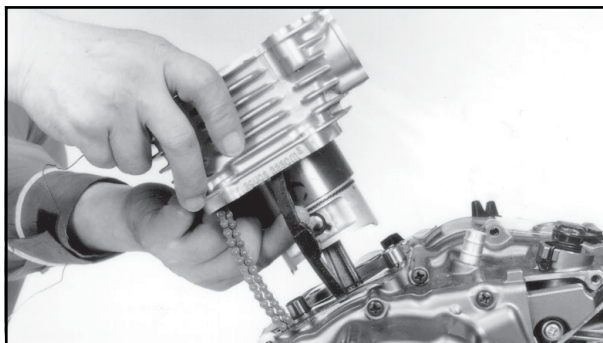
  - Compression ring ①
  - Oil ring (bottom) ②
  - Oil ring (top) ③
  - Scraper ring ④



5. Install:
- Dowel pins ①
  - Gasket ② (cylinder)
  - O-ring ③



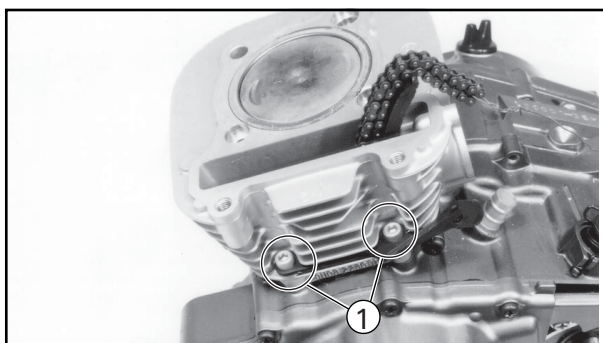
6. Install:
- Cylinder ①



**NOTE:** \_\_\_\_\_  
 Pressing the piston rings manually, install the cylinder.

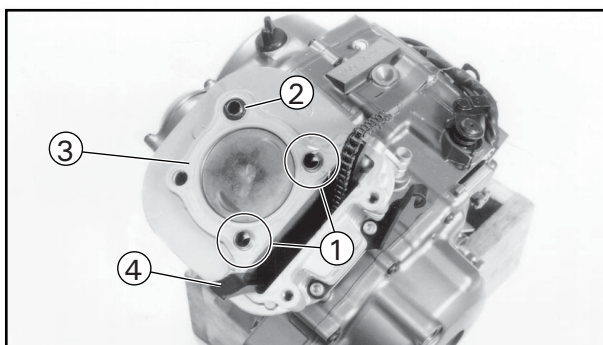
**WARNING** \_\_\_\_\_

During this operation, take care not to hurt your hands.

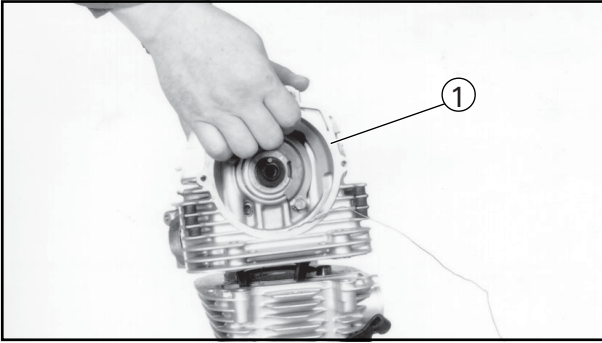


7. Install:
- Bolts ①

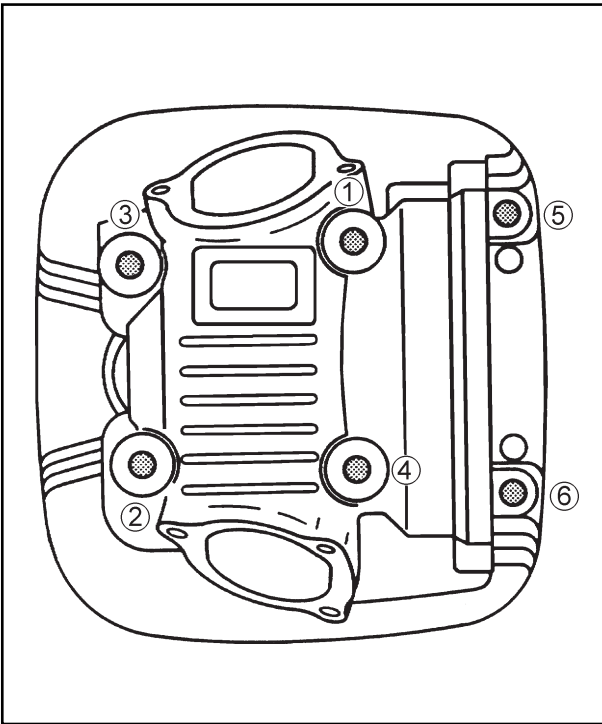
|  |   |
|--|---|
|  | Bolts 1:<br>10N.m (1.0 Kg.m; 7.2 ft.lb) |
|--|---|



8. Install:
- Dowel pins ①
  - Grommet ②
  - Gasket ③ (head)
  - Chain guide ④ (exhaust)



9. Install:
- Head ①

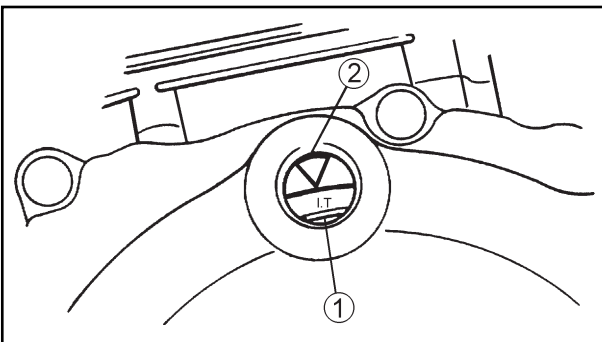


10. Install:
- Bolts

**Bolt ① ~ ④:**  
22N.m (2.2 Kg.m; 16 ft.lb)

**Bolt ⑤ ~ ⑥:**  
20N.m (2,0 Kg.m; 426,72 cm.lb)

- NOTE:**
- Apply engine oil 4T to the washers.
  - Tighten the bolts with lower numbers first.
  - The numbers on the head indicate the tightening order.

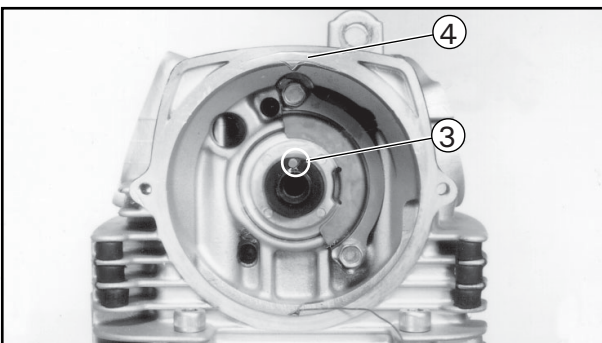


11. Install:
- Camshaft gear

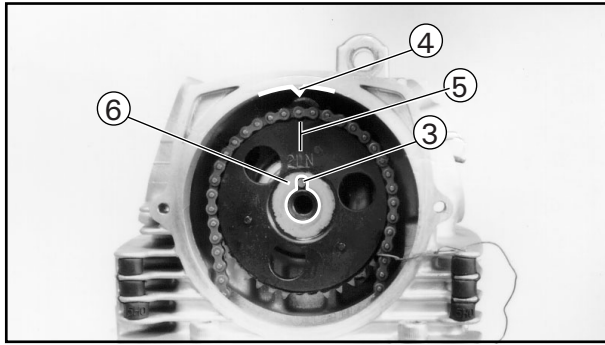
\*\*\*\*\*

**Installation steps:**

- Turn the crankshaft counterclockwise until mark PMS ① aligns with the stationary mark on the case ②.
- Align the camshaft pin ③ with the stationary mark ④ on the head.
- Place the camshaft chain on the camshaft gear and install the gear on the camshaft.



- NOTE:**
- When installing the camshaft gear, keep pulling the chain to the maximum on the exhaust side.
  - Align the camshaft gear mark ⑤ with the stationary mark ④ on the head.
  - Align the camshaft pin ③ with the slot ⑥ on the gear.

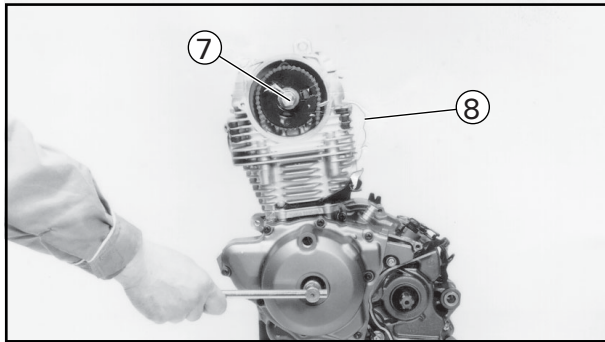


**CAUTION:**

Do not turn the crankshaft while installing the camshaft, otherwise, damage or incorrect valve timing can result.

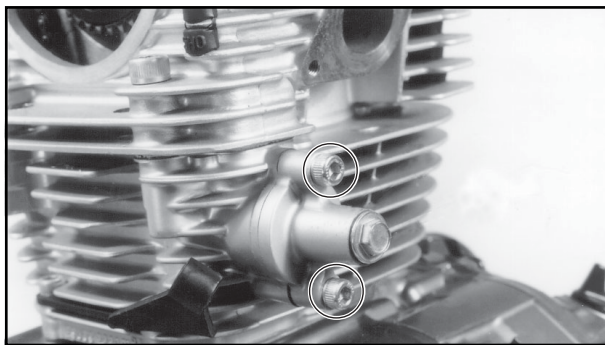
- Tighten the bolt 7.

|  |  |
|--|--|
|  | <p><b>Bolt (camshaft gear):</b><br/>60N.m (6.0 Kg.m; 43 ft.lb)</p> |
|--|--|



- Remove the safety wire ⑧ from the camshaft chain.

\*\*\*\*\*



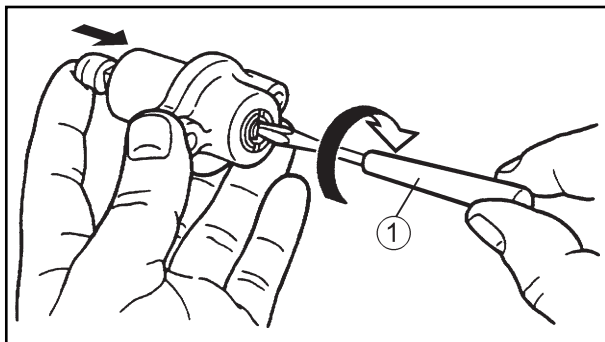
12. Install:

- Camshaft chain tensioner

\*\*\*\*\*

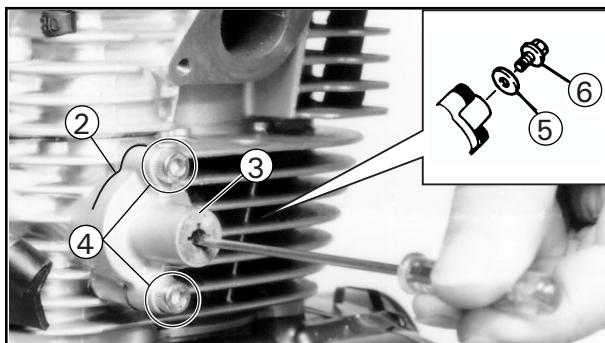
Installation steps:

- Use a screwdriver ①, turning clockwise, to pull and lock the tensioner system.
- With the stem totally retracted, lock the system, install the gasket ② and the chain tensioner ③, and tighten the bolt ④, applying the specified torque.



|  |   |
|--|---|
|  | <p><b>Bolt (chain tensioner):</b><br/>10N.m (1.0 Kg.m; 7.2 ft.lb)</p> |
|--|---|

- Using the screwdriver, unlock the system, install the gasket ⑤ and tighten the bolt ⑥, applying the specified torque.

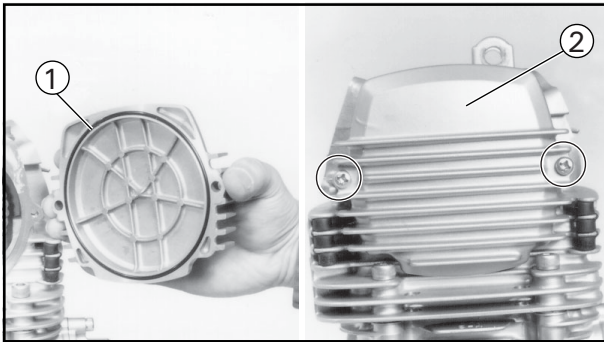



|  |  |
|--|--|
|  | <p><b>Cover bolt (chain tensioner):</b><br/>7N.m (0.7 Kg.m; 5.1 ft.lb)</p> |
|--|--|

\*\*\*\*\*

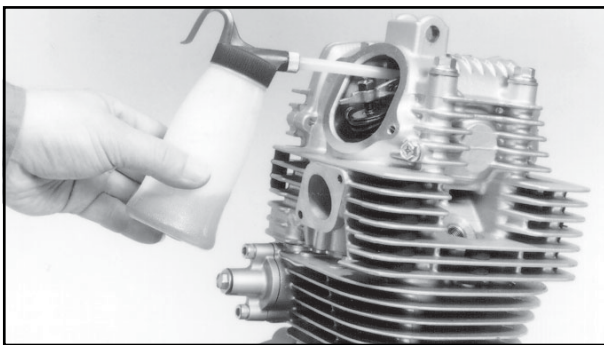
13. Check:
- Camshaft point  
Out of line => Adjust.  
Repeat Items 11 and 12.


14. Check:
- Valve clearance  
Out of specification => Adjust.  
See Section "VALVE CLEARANCE ADJUSTMENT" CHAPTER 3.



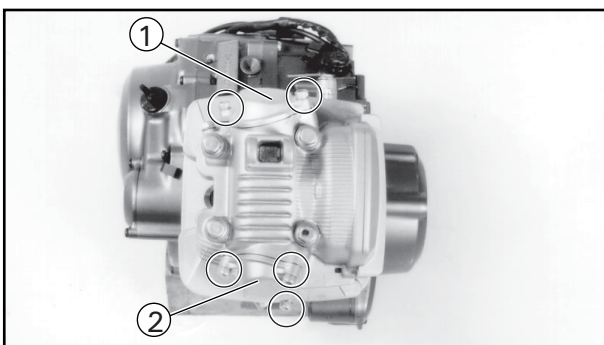
|   |                              |
|---|------------------------------|
|  | <b>Intake valve (cold):</b>  |
|   | 0.05 ~ 0.09 mm               |
|   | <b>Exhaust valve (cold):</b> |
|   | 0.15 ~ 0.19 mm               |


15. Install:
- O-ring ①
  - Side head cover ②




|   |                                |
|---|--------------------------------|
|  | <b>Bolt (side head cover):</b> |
|   | 10N.m (1.0 Kg.m; 72 ft.lb)     |

16. Apply:
- Engine oil 4T  
(to camshaft)

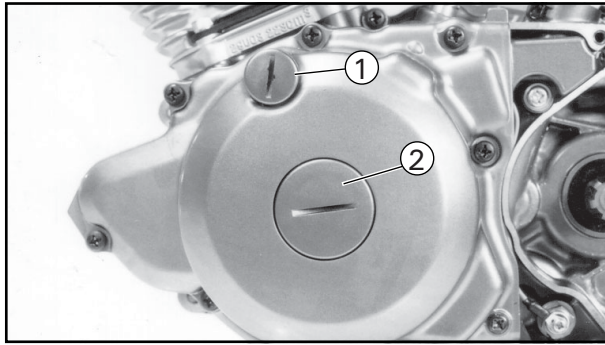


|   |                       |
|---|-----------------------|
|  | <b>Amount of oil:</b> |
|   | 0.5 l                 |

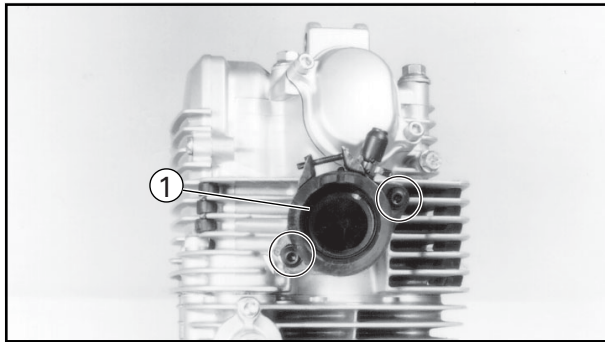
17. Install:
- Valve covers ① and ②

|   |                             |
|---|-----------------------------|
|  | <b>Bolt (covers):</b>       |
|   | 10N.m (1.0 Kg.m; 7.2 ft.lb) |




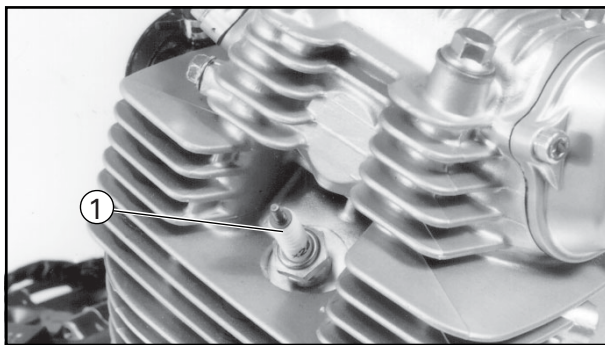


18. Install:
- Cover ①
  - Cover ②




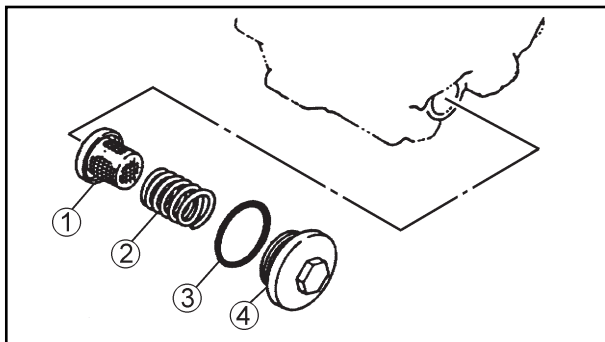
19. Install:
- Intake manifold ①

|   |  |
|---|--|
|  | <b>Bolt (intake manifold)</b><br>10N.m (1.0 Kg.m; 7.2 ft.lb) |
|---|--|




20. Install:
- Spark plug ①

|   |   |
|---|---|
|  | <b>Spark plug:</b><br>17,5N.m (1,75 Kg.m; 381,00 cm.lb) |
|---|---|

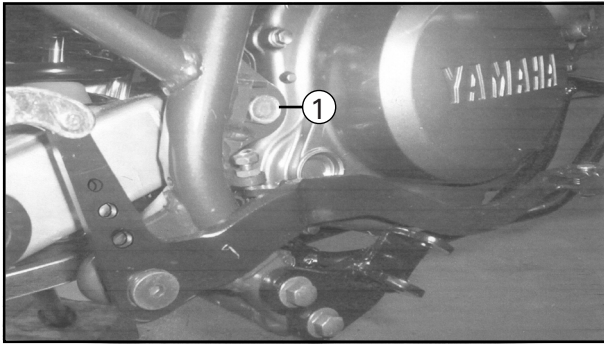


21. Install:
- Oil strainer ①
  - Spring ②
  - O-ring ③
  - Drain plug ④

|   |  |
|---|--|
|  | <b>Drain plug:</b><br>43N.m (4.3 Kg.m; 31 ft.lb) |
|---|--|

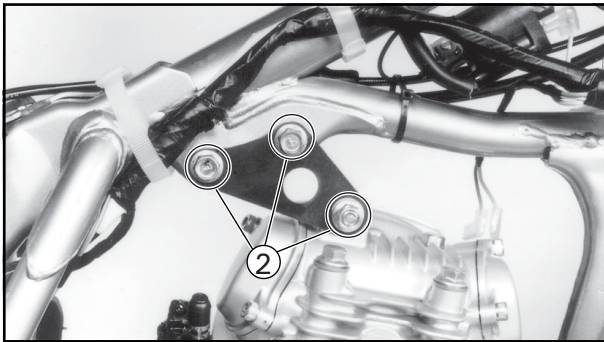
## REINSTALLING THE ENGINE

Reverse the removal process. Observe the following:



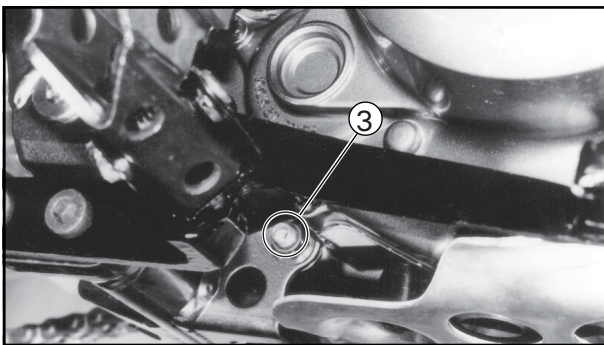
### 1. Install:

- Hinge shafts ①
- Setscrews ② (front upper)
- Setscrews ③ (rear lower)
- Setscrews ④ (front lower)



### NOTE:

Install all bolts and nuts and, then, apply the specified torque.



**Nut (hinge shaft):**

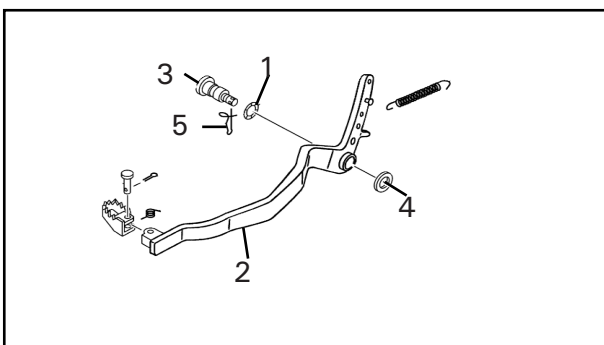
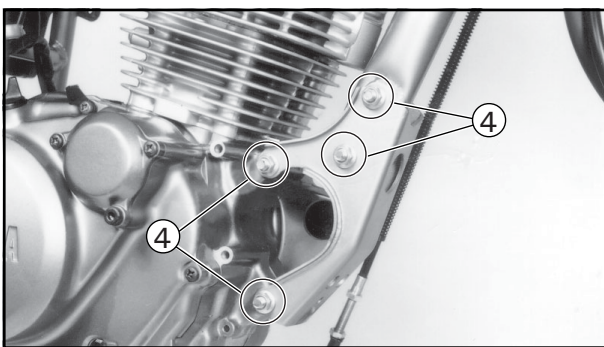
**80N.m (8.0 Kg.m; 58 ft.lb)**

**Bolt (engine support - upper):**

**38N.m (3.8 Kg.m; 27 ft.lb)**

**Nut (setscrew):**

**46N.m (3.25 Kg.m; 23.5 ft.lb)**



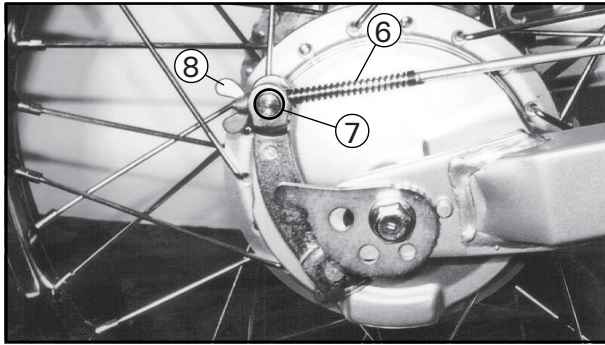
### 2. Install:

- Corrugated washer ①
- Brake pedal ②
- Brake pedal shaft ③
- Flat washer ④
- Cotter pin ⑤



**Brake pedal shaft:**

**30N.m (3.0 Kg.m; 22 ft.lb)**

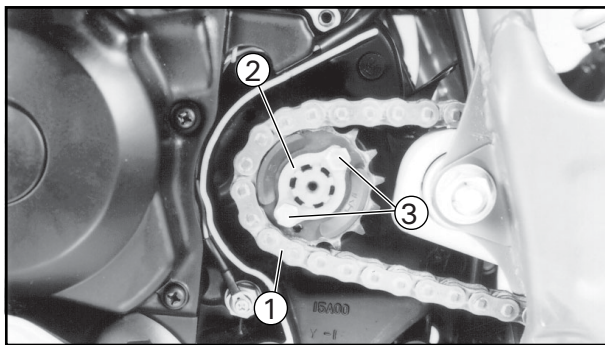


4. Install:
- Spring ⑥
  - Pin ⑦
  - Adjuster ⑧

5. Adjust:
- Brake pedal free play:

See Section "REAR BRAKE ADJUSTMENT" CHAPTER 3.

|  |                                      |
|--|--------------------------------------|
|  | Brake pedal free play:<br>20 ~ 30 mm |
|--|--------------------------------------|



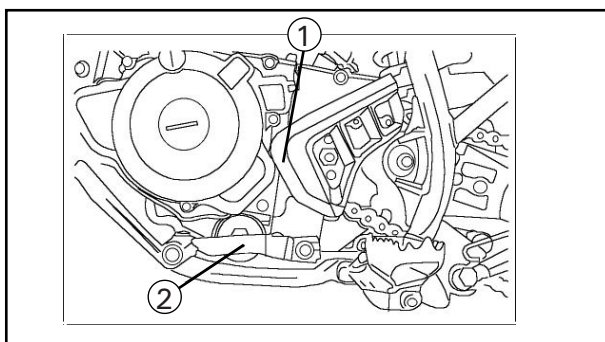
6. Install:
- Transmission chain ① (with pinion gear)
  - Pinion gear fastener ②
  - Bolts ③

|  |  |
|--|--|
|  | <b>Bolt:</b><br>10N.m (1,0 Kg.m; 219,46 cm.lb) |
|--|--|

7. Adjust:
- Transmission chain free play

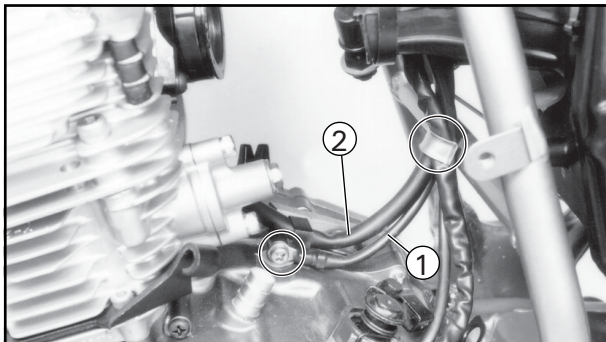
See Section "TRANSMISSION CHAIN FREE PLAY ADJUSTMENT" CHAPTER 3.

|  |  |
|--|--|
|  | Transmission chain free play<br>45 ~ 60 mm |
|--|--|



8. Install:
- Pinion gear cover ①
  - Shift lever ②

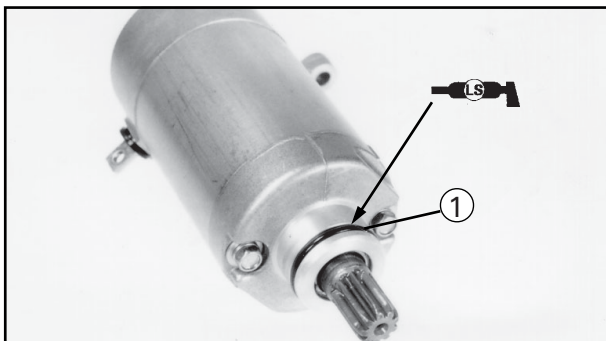
|  |   |
|--|---|
|  | <b>Bolt (pinion gear cover):</b><br>10N.m (1.0 Kg.m; 7.2 ft.lb) |
|  | <b>Bolt (shift lever):</b><br>7N.m (0.7 Kg.m; 5.1 ft.lb)        |



9. Connect:
- Ground wire ①
  - Starter motor wire ② to case



**Bolt:**  
7N.m (0,7 Kg.m; 155,45 cm.lb)

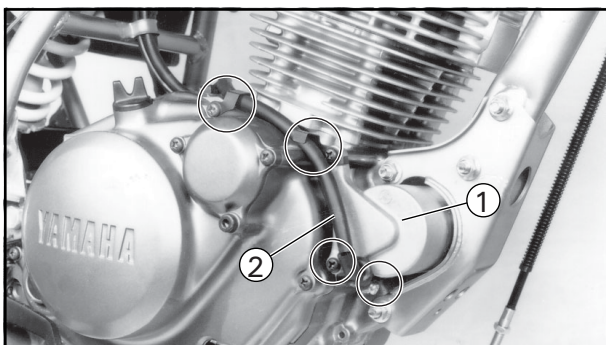


10. Apply:
- Lithium-based grease (to starter motor O-ring)

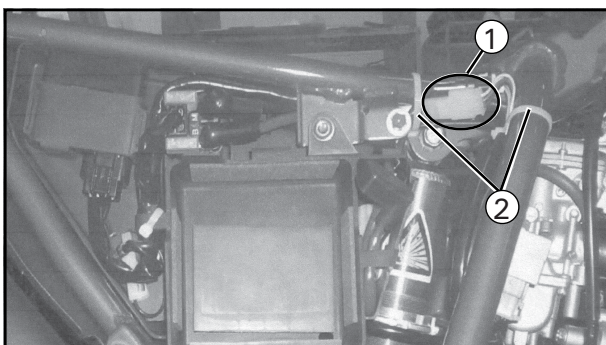
11. Install:
- Starter motor ①



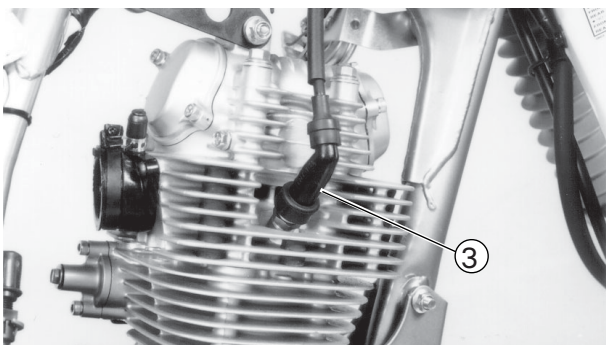
**Bolt (starter motor):**  
7N.m (0.7 Kg.m; 5.1 ft.lb)



12. Connect:
- Starter wire ② (to starter motor and fasteners)



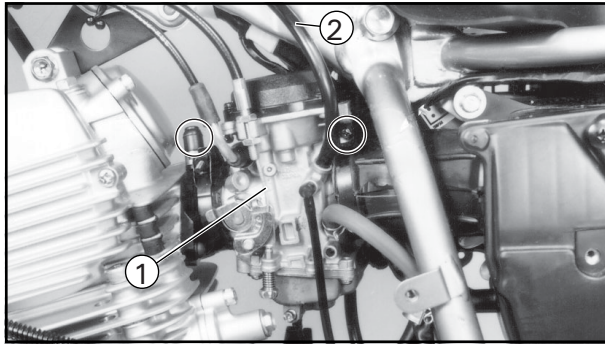
13. Connect:
- Magnet harness ①
  - Plastic belt ②
  - Spark plug cap ③



14. Install:
- Clutch cable
15. Adjust:
- Clutch cable free play
- See Section "CLUTCH ADJUSTMENT" CHAPTER 3.

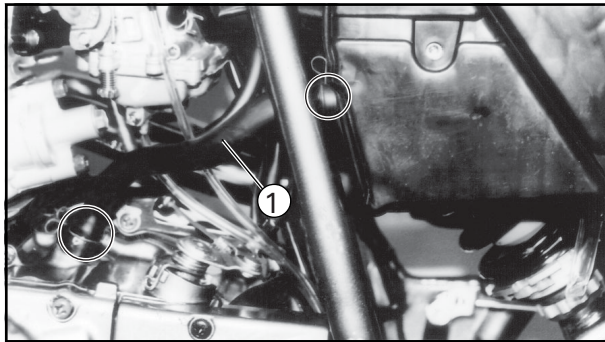


**Clutch lever end free play:**  
10 ~ 15 mm

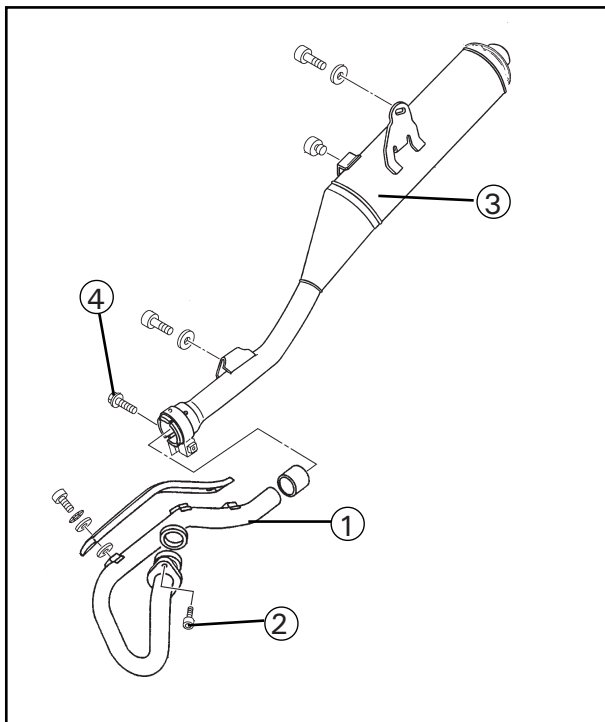


16. Install:
- Carburetor ①
  - Hose ②


 **Bolt (carburetor tie wrap):**  
2N.m (0.2 Kg.m; 1.4 ft.lb)




17. Connect:
- Breather hose ①

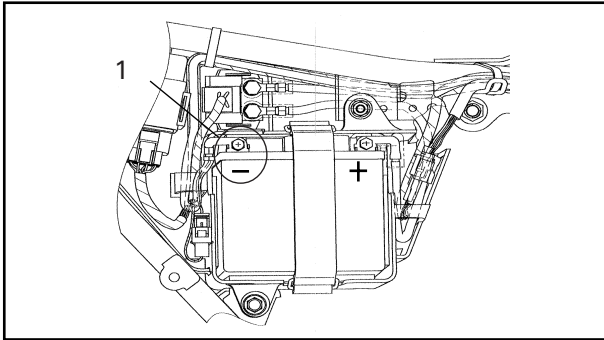


18. Install:
- Exhaust tube ①
  - Bolt ②

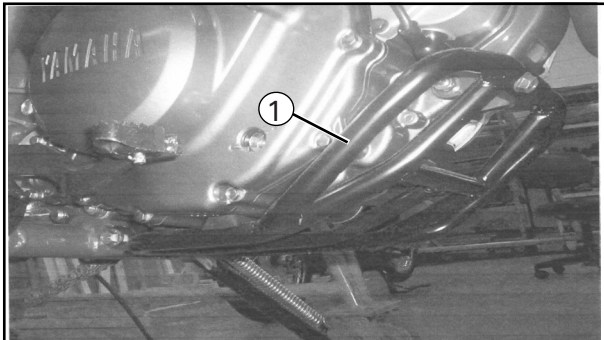
 **Bolt (exhaust tube)**  
10N.m (1.0 Kg.m; 7.2 ft.lb)

19. Install:
- Muffler ③
  - Bolt ④


 **Bolt (muffler tie wrap):**  
16N.m (1.6 Kg.m; 11.6 ft.lb)



20. Connect:
- Battery negative cable 1
- See Section "BATTERY INSPECTION" CHAPTER 3.





21. Install:
- Crankcase guard ①
- See Section "ENGINE OIL CHANGE" CHAPTER 3.

|   |   |
|---|---|
|  | <p>Bolt (crankcase guard):<br/>54.5N.m (5.45 Kg.m; 39.50 ft.lb)</p> |
|---|---|

22. Replenish:
- Engine oil 4T (on case)

See Section "ENGINE OIL CHANGE AND OIL PRESSURE INSPECTION" CHAPTER 3.

|   |  |
|---|--|
|  | <p>Amount of oil:<br/>Total capacity 1.3 l</p> |
|---|--|

|   |  |
|---|--|
|  | <p>Bolt (oil check)<br/>7N.m (0.7 Kg.m; 5.1 ft.lb)</p> |
|---|--|

**CAUTION:** \_\_\_\_\_  
Do not start the engine without oil.



23. Install:

- Fuel tank
- Seat
- Side covers

See Section "SEAT, FUEL TANK, AND COVERS" CHAPTER 3.

|   |   |
|---|---|
|  | <b>Bolts</b><br>7N.m (0.7 Kg.m ; 5.1 ft.lb) |
|---|---|

24. Check:

- Idle speed

See Section "IDLE SPEED ADJUSTMENT" CHAPTER 3.

|   |                                   |
|---|-----------------------------------|
|  | Idle speed:<br>1,300 to 1,500 rpm |
|---|-----------------------------------|



---

**CHAPTER 5.  
CARBURATION**

**CARBURETOR** ..... 5-1  
REMOVAL ..... 5-2  
DISMOUNTING ..... 5-3  
INSPECTION ..... 5-5  
MOUNTING ..... 5-7  
INSTALLATION ..... 5-9  
FUEL LEVEL ADJUSTEMENT ..... 5-10

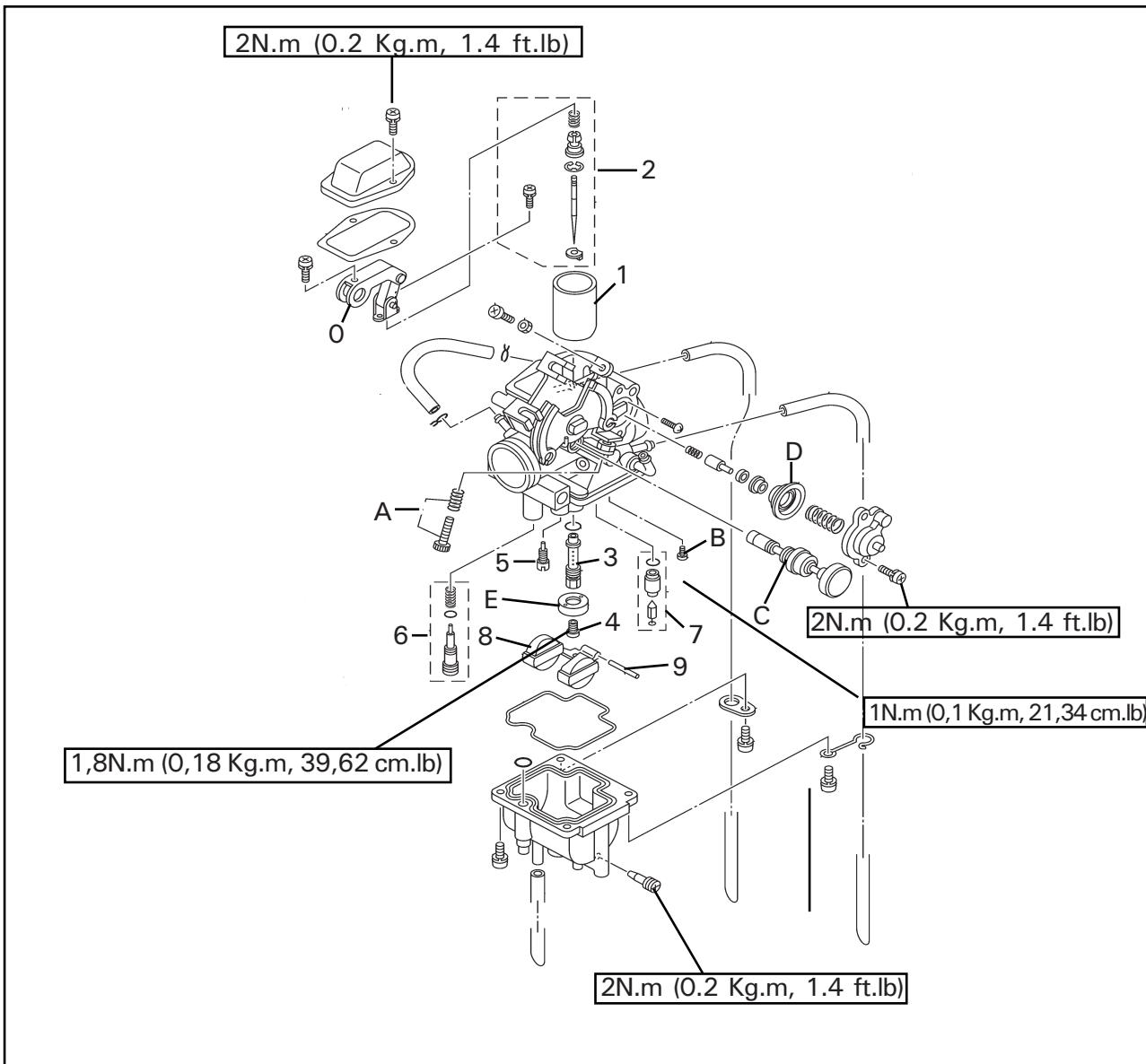




### CARBURETOR

- ① Throttle valve
- ② Needle assembly
- ③ Diffuser
- ④ Main adjusting nozzle (#125)
- ⑤ Pilot adjusting nozzle (#36)
- ⑥ Pilot screw assembly
- ⑦ Valve seat assembly
- ⑧ Float
- ⑨ Float pin
- ⑩ Drive arm
- ⑪ Idle speed screw
- ⑫ Seat bolt
- ⑬ Choke assembly
- ⑭ Diaphragm assembly
- ⑮ Main adjusting nozzle washer

| Specifications                     |                                  |
|------------------------------------|----------------------------------|
| High-speed adjusting nozzle (M.J.) | # 125,0                          |
| Low-speed adjusting nozzle (P.J.)  | # 36                             |
| Needle / lock position (J.N.)      | F-21 -3/5                        |
| Diffuser (N.J.)                    | V 95                             |
| Pilot Screw (P.S.)                 | 2,0                              |
| Fuel level (F.L.)                  | 9.0 ~ 11.0 mm                    |
|                                    | Under the float bowl front face. |
|                                    | 1.400 ~ 1.600 rpm                |
| Idle speed                         |                                  |



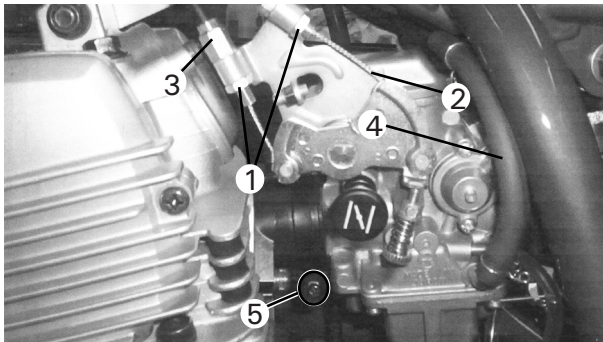


### REMOVAL

1. Drain:
  - Fuel (bowl)
 See Section "ENGINE REMOVAL," CHAPTER 4.

2. Loosen:
  - Lock-nut ① (throttle cable)

3. Disconnect:
  - Throttle main cable ②
  - Throttle return cable ③
  - Breather hose
  - Fuel hose ④
  - Drain hose



4. Loosen:
  - Connection bolts ⑤

**NOTE:** \_\_\_\_\_  
 Move the carburetor tie wrap back.  
 \_\_\_\_\_

5. Remove:
  - Carburetor

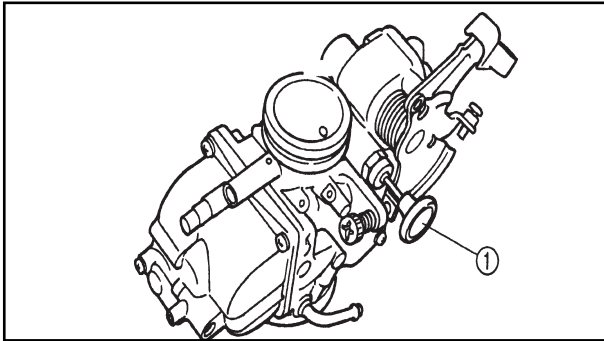


**DISMOUNTING**

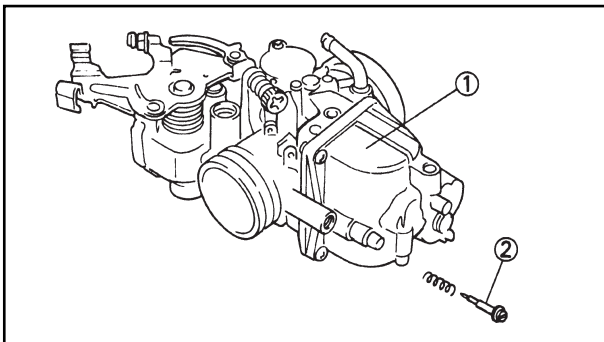
**NOTE:**

The following parts can be cleaned and checked with no need for dismounting:

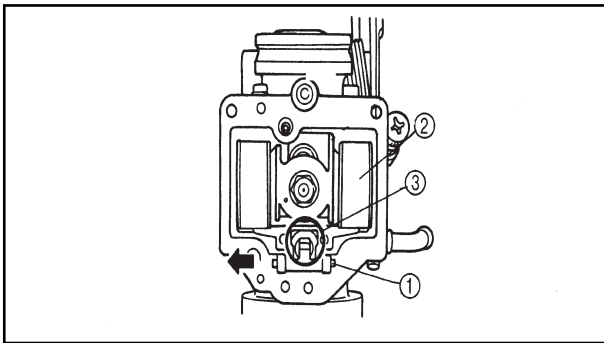
- Pilot screw
- Choke
- Idle speed screw



1. Disconnect:
- Choke assembly ①



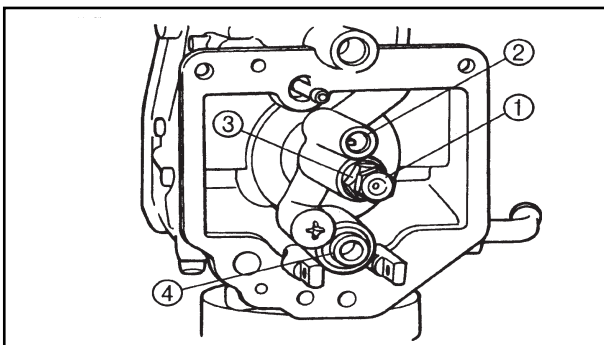
2. Remove:
- Carburetor bowl ①
  - Pilot screw ②



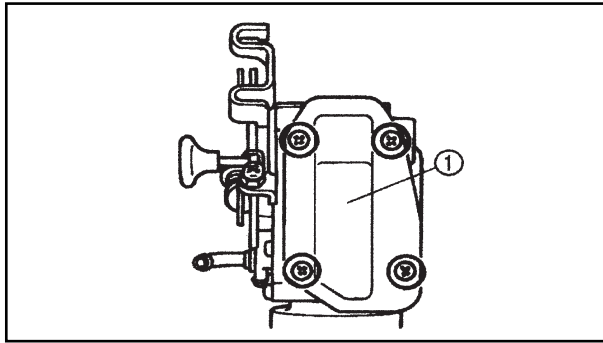
3. Remove:
- Float pin ①
  - Float ②
  - Needle valve assembly ③

**NOTE:**

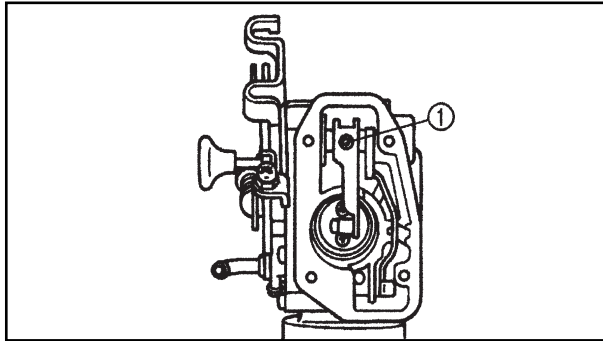
Remove the float pin in the arrow direction.



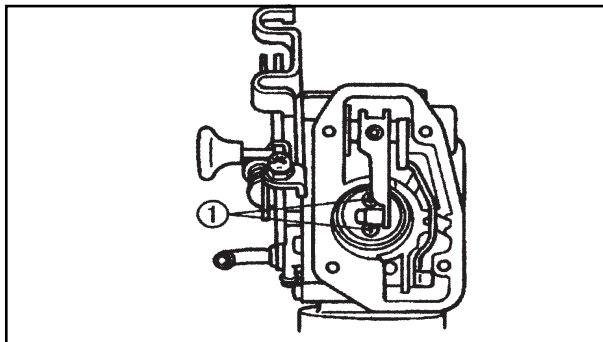
4. Remove:
- Main adjusting nozzle ①
  - Pilot adjusting nozzle ②
  - Diffuser ③
  - Needle valve seat ④



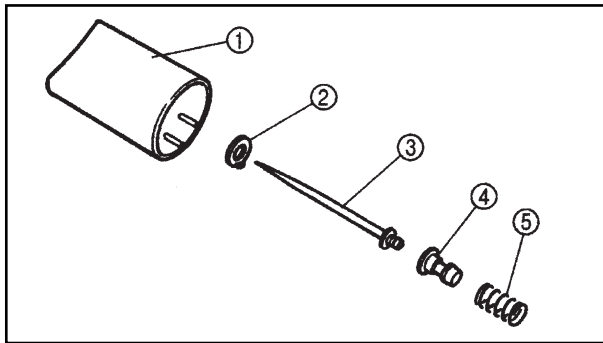
5. Remove:
- Upper cover ①



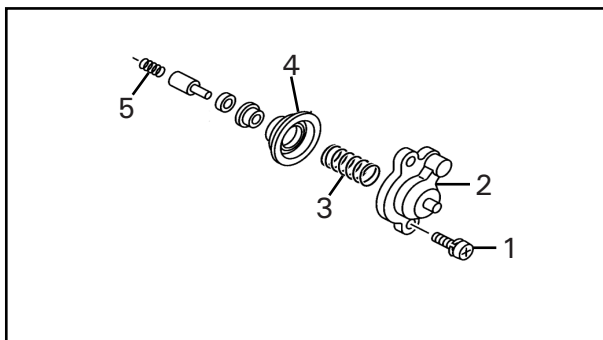
6. Remove:
- Bolt (drive arm) ①



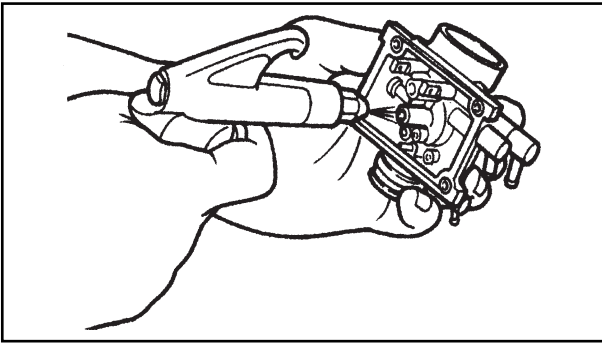
7. Remove:
- Bolts (throttle valve) ①



8. Remove:
- Throttle valve ①
  - Ring ②
  - Needle ③
  - Needle fastener ④
  - Spring ⑤



9. Remove:
- Diaphragm cover bolt ①
  - Diaphragm cover ②
  - Diaphragm spring ③
  - Diaphragm ④
  - Spring ⑤



### INSPECTION

#### 1. Check:

- Mixing chamber body
- Float chamber (Bowl)

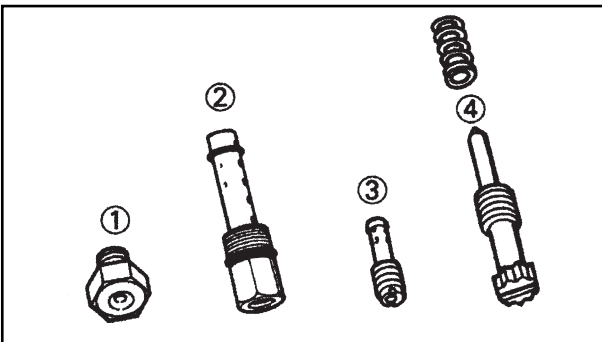
Contamination => Clean passages using compressed air.

#### NOTE:

Use kerosene for cleaning. Blow passages and adjusting nozzles using compressed air.

#### CAUTION:

- The starting adjusting nozzle is press fastened on its seat. It cannot be removed.
- Do not use wire for cleaning.

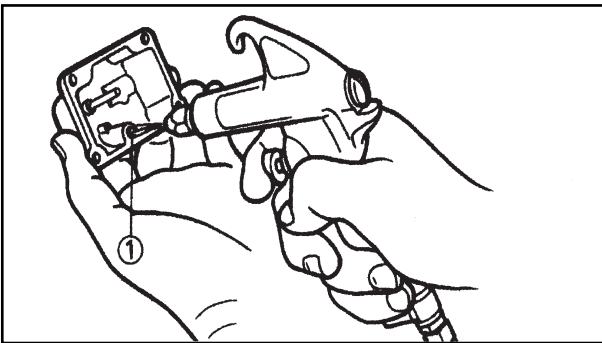


#### 2. Check:

- Main adjusting nozzle ①
- Diffuser ②
- Pilot adjusting nozzle ③
- Pilot screw ④

Damage/wear => Replace assembly.

Dust => Clean using compressed air.



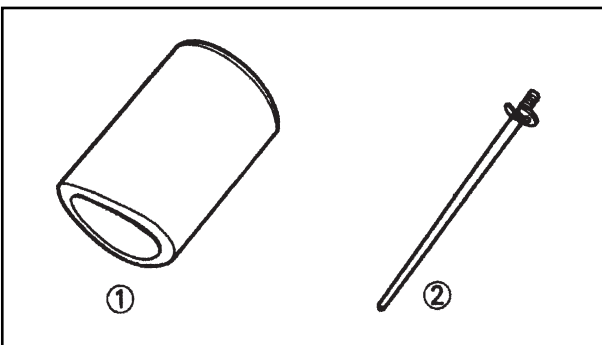
#### 3. Check:

- Starting injector ①

Contamination => clean.

#### NOTE:

The starting injector is a stationary type injector.



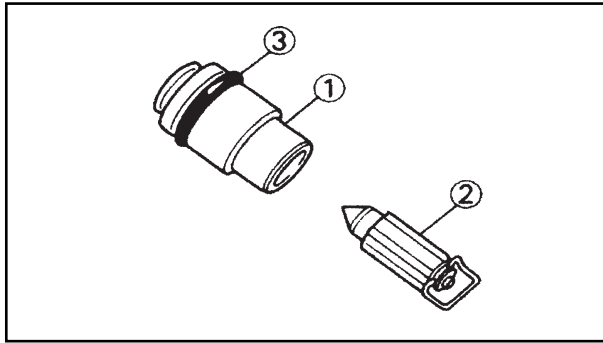
#### 4. Check:

- Throttle valve ①

Scratches/wear/damage => Replace.

- Needle ②

Wear/warping/damage => Replace.



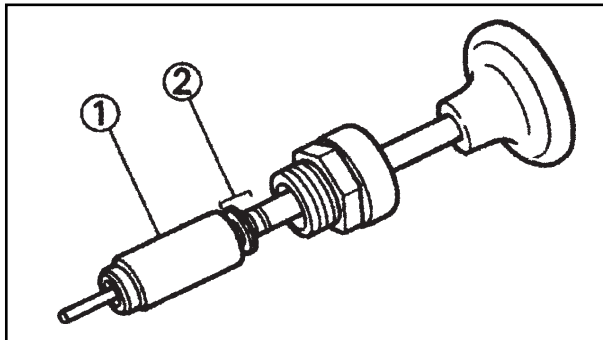
5. Check:

- Needle valve seat ①
- Needle valve ②
- O-ring ③

Damage/wear => Replace assembly.

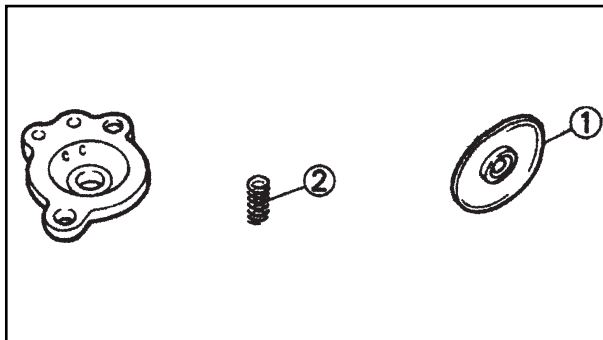
**NOTE:**

Replace the needle valve and its seat as a whole.



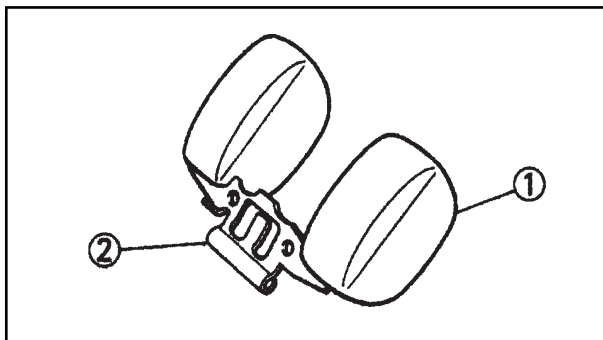
6. Check:

- Choke assembly ①  
Warping/wear/damage => Replace.
- Spring ②  
Damage => Replace.



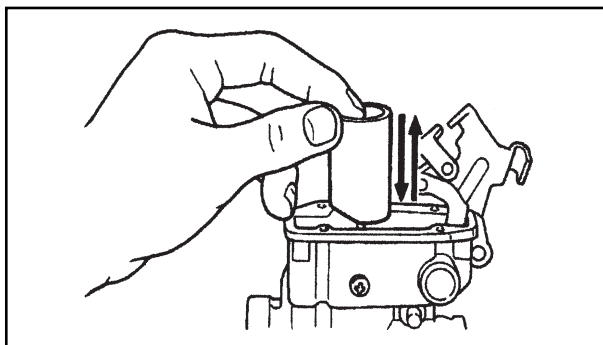
7. Check:

- Diaphragm ①  
Damage => Replace.
- Spring ②  
Damage => Replace.



8. Check:

- Float ①
- Float arm ②  
Damage => Replace.



9. Observe:

- Movement smoothness  
Irregular => Replace.  
Insert the throttle valve in the carburetor and check the movement smoothness.

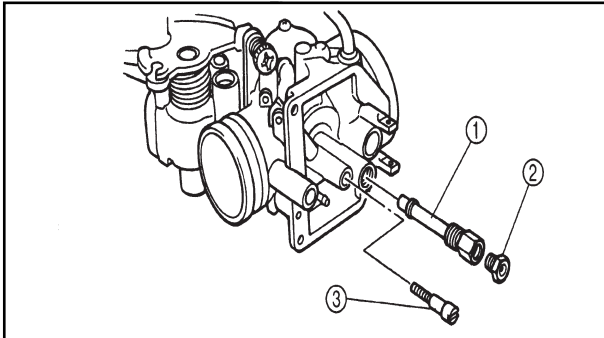


### MOUNTING

Reverse the "DISMOUNTING" procedures.  
Check the following items:

#### CAUTION:

- Wash the parts with kerosene before mounting.



#### 1. Install:

- Diffuser ①
- Main adjusting nozzle ②
- Pilot adjusting nozzle ③

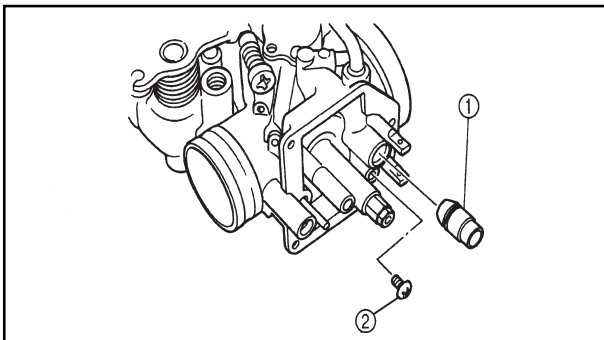


#### Pilot adjusting nozzle:

1 N.m (0.1 Kg.m; 0.7 ft.lb)

Main adjusting nozzle:

1.8 N.m (0.18 Kg.m; 1.3 ft.lb)



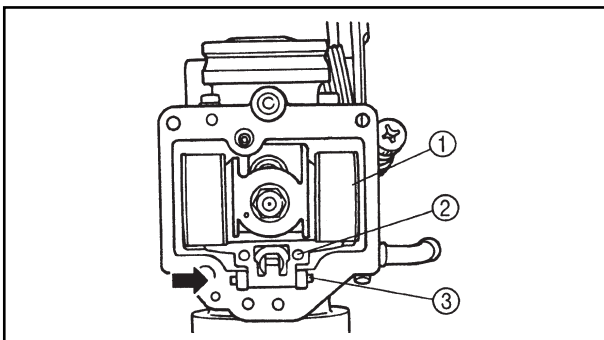
#### 2. Install:

- Needle valve seat ①
- Setscrew ②



#### Bolt (needle valve fastening):

2 N.m (0.2 Kg.m; 1.4 ft.lb)

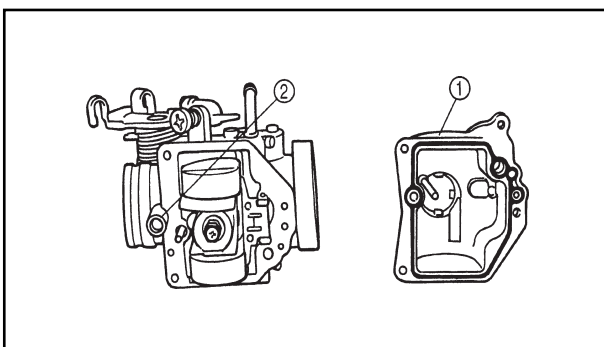


#### 3. Install:

- Float ①
- Needle valve assembly ②
- Float pin ③

#### NOTE:

Install the float pin in the direction indicated.



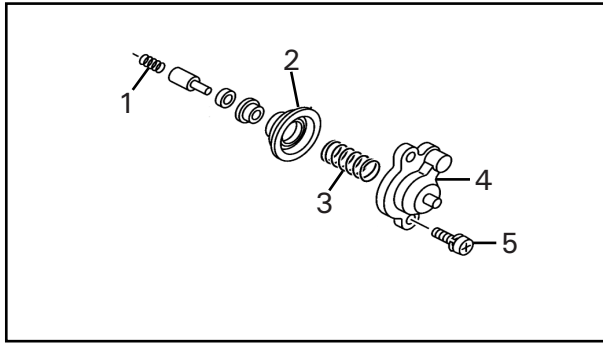
#### 4. Install:

- Float bowl ①
- Pilot screw ②



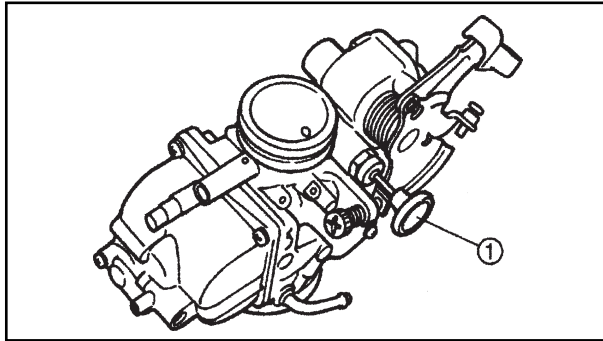
#### Bolt (float bowl):

2 N.m (0.2 Kg.m; 1.4 ft.lb)



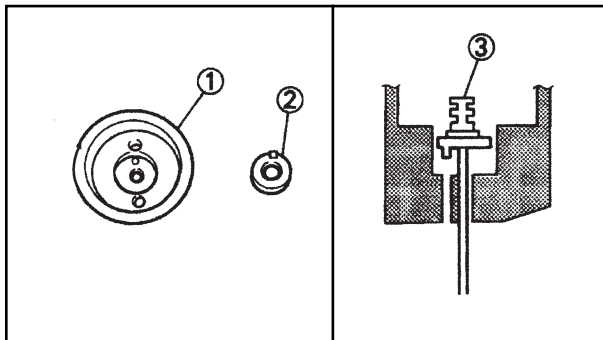
5. Install:

- Spring ①
- Diaphragm ②
- Diaphragm spring ③
- Cover ④
- Bolt ⑤



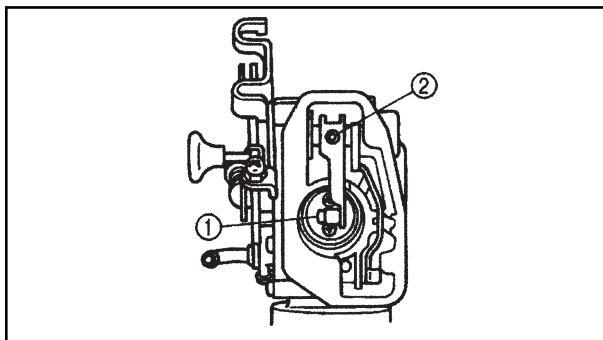
6. Install:

- Choke assembly ①



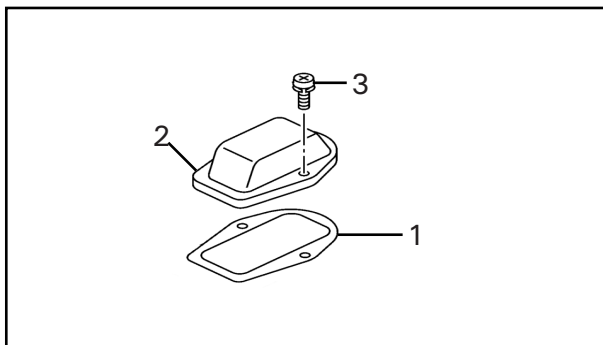
7. Install:

- Throttle valve ①
- Ring ②
- Needle ③



8. Install:

- Throttle valve ①
- Drive arm ②



9. Install:

- Gasket ①
- Upper cover ②
- Bolt ③



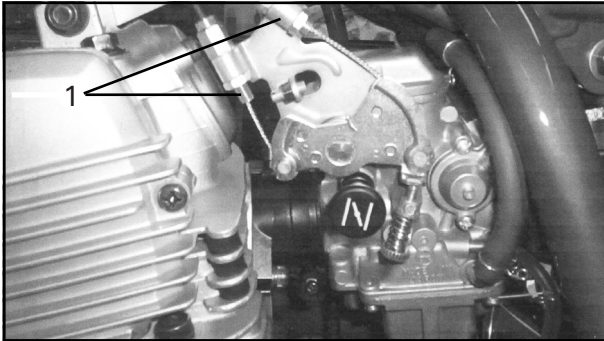
**Bolt (upper cover):**  
2 N.m (0.2 Kg.m; 1.4 ft.lb)





10. Install:
  - Breather hose
  - Fuel hose
  - Drain hose

## INSTALLATION



1. Install:
  - Carburetor assemblySee Section "ENGINE REMOVAL" Chapter 4.
2. Install:
  - Throttle cables ①See Section "CABLE ROUTING" Chapter 2.
3. Adjust:
  - Throttle cable free playSee Section "THROTTLE CABLE FREE PLAY ADJUSTMENT" Chapter 3

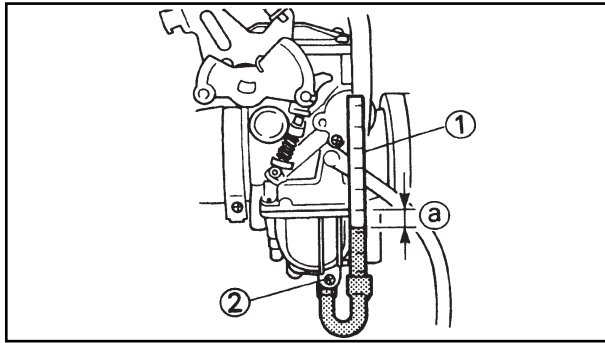


**Throttle cable free play:**  
3 ~ 5 mm (0,12 ~ 5,08 mm)

4. Adjust:
  - Idle speedSee Section "IDLE SPEED ADJUSTMENT" Chapter 3.



**Idle speed:**  
1,400 ~ 1,600 rpm



**FUEL LEVEL ADJUSTMENT**

1. Place the motorcycle on a flat area.
2. Place a support under the frame in order to maintain the carburetor upright.
3. Connect the fuel level meter ① to the drain nozzle of the float bowl.



**Fuel level meter:**  
90890-01312

4. Turn the cock to "ON" or "RES."
5. Loosen the drain bolt ②.
6. Place the level meter close to the bowl, with the graduated face pointing towards you.
7. Measure:
  - Fuel level ③
 Out of specification => Adjust.



**Fuel level:**  
9.0 ~ 11.0 mm (0.35 ~ 0.37 in)  
Under the float bowl front face.

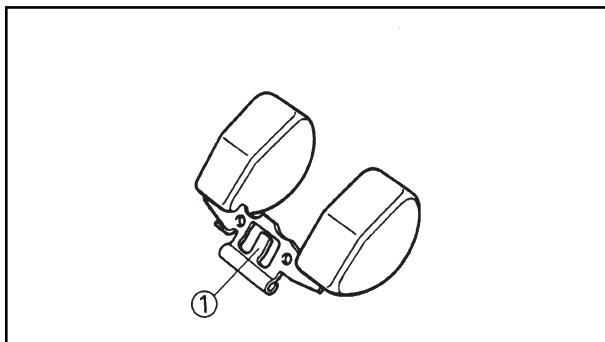
8. Adjust:
  - Fuel level

\*\*\*\*\*

**Adjustment steps:**

- Remove the carburetor.
- Check the valve seat and needle valve.
- If one is damaged, replace both.
- If in good conditions, adjust the float, bending the float arm stop ①.
- Measure the fuel level again.

\*\*\*\*\*



## CHAPTER 6 FRAME

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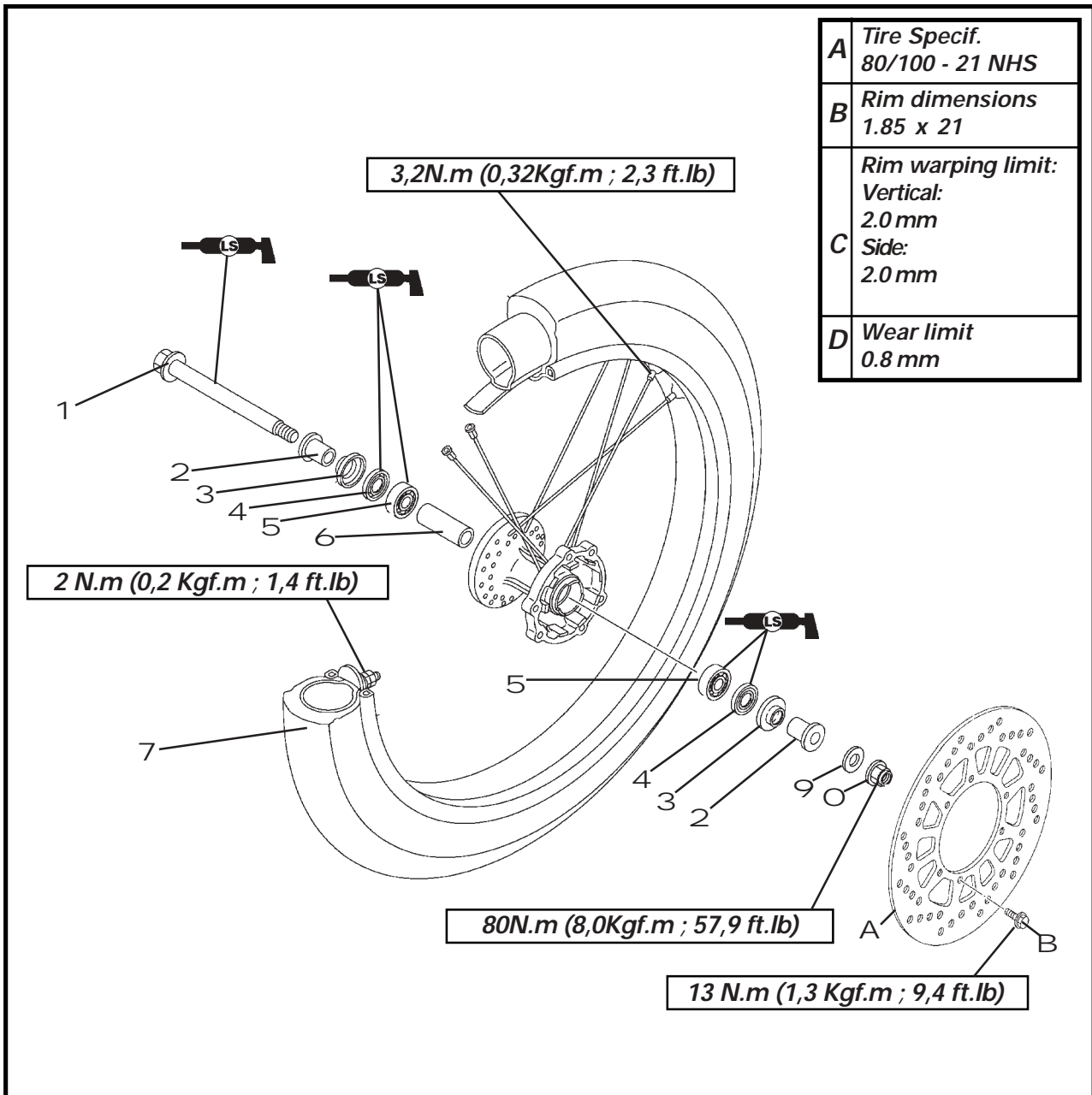
FRAME

FRONT WHEEL

- 1 Axle
- 2 Spacer
- 3 Dust protector
- 4 Retainer
- 5 Roller bearing
- 6 Spacer
- 7 Front wheel
- 8 Washer
- 9 Nut
- Disc
- A Bolt

| Tire pressure (cold)                 |  |  |
|--------------------------------------|--|--|
| Maximum load - except the motorcycle | 90kg (198 lb)                                  |  |
| Tire pressure (cold)                 | Front  | Rear   |
| Off-road riding                      | 100 kPa<br>(1 kgf/cm <sup>2</sup> ,<br>15 psi) | 100 kPa<br>(1 kgf/cm <sup>2</sup> ,<br>15 psi) |

\* Total weight of driver, passenger and accessories.





## REMOVAL

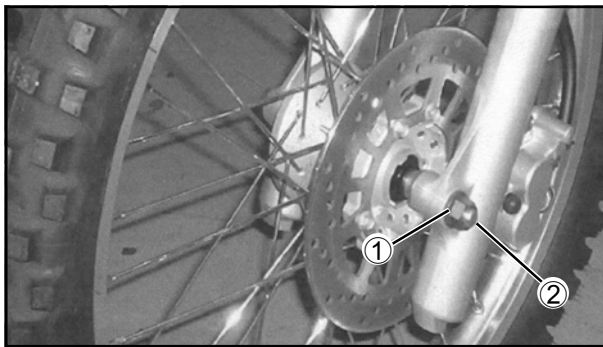
**⚠ WARNING**

Support the motorcycle firmly preventing it from falling.

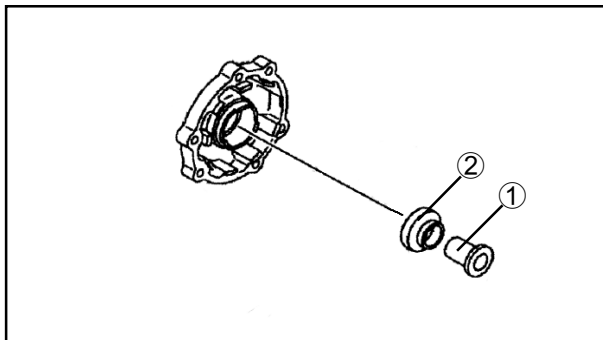
1. Place the motorcycle on a flat area
2. Lift the front wheel placing a support under the engine.

## 3. Remove

- Nut ①
- Axle ②
- Front wheel

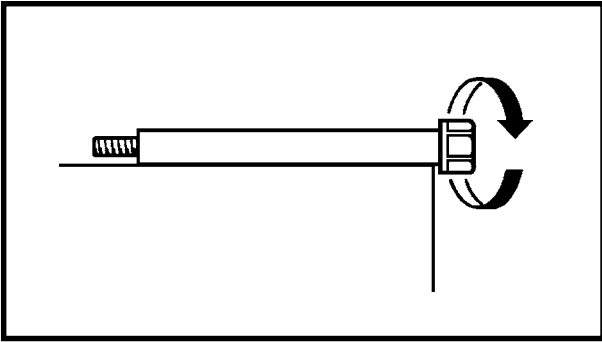
**NOTE:**

Do not press the brake stem when the wheel is out of the motorcycle. Otherwise, the brake pads will be forced.



## 4. Remove:

- Spacer ①
- Dust protector ②

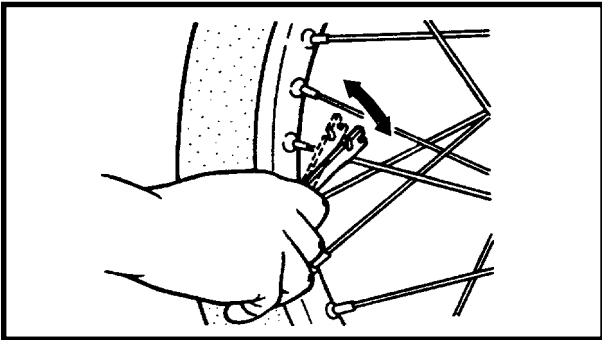


**INSPECTION**

1. Remove corrosion from parts.
2. Verify:
  - Axle  
Roll the axle on a flat surface. Warping => Replace.

**⚠ WARNING**

**Do not try to straighten out the axle.**



3. Check:
  - Tire  
Damage/wear => Replace.  
See Section "TIRE INSPECTION," CHAPTER 3.
  - Wheel  
Warping/damage => Replace.  
See Section "WHEEL INSPECTION," CHAPTER 3.

4. Check:
  - Spokes  
Warping/damage => Replace.  
Loose spokes => Tighten.  
Turn the wheel and beat the spokes using a screwdriver.

**NOTE:**

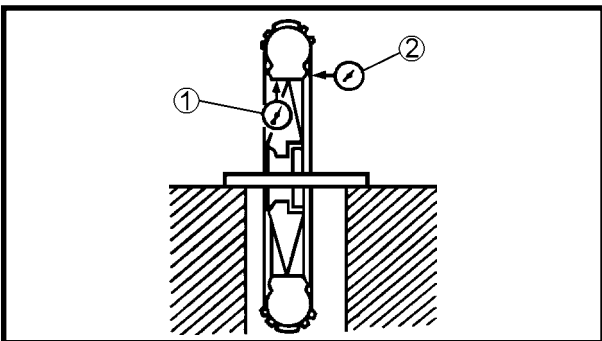
If a sharp metallic sound is heard, the spoke is tight.  
If a deep metallic sound is heard, the spoke is loose.

5. Tighten:
  - Loose spokes


|   |  |
|---|--|
|  | <b>Nipple:</b><br>2 N.m (0.2 kgf.m; 1.4 ft.lb) |
|---|--|

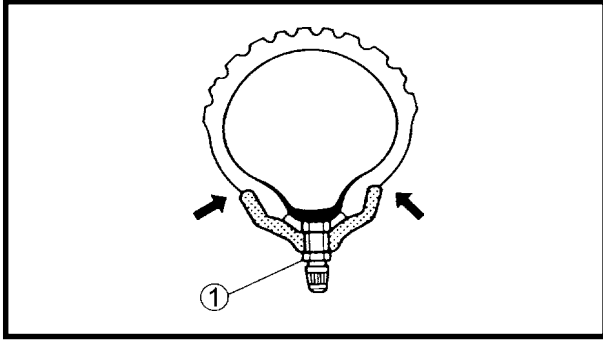
**NOTE:**

Check the wheel for warping after spoke tightening.




6. Measure:
  - Wheel warping  
Out of specification => Check the wheel and roller bearing clearance.

|   |   |
|---|---|
|  | <b>Rim warping limit:</b><br>Vertical ① : 2.0 mm<br>Side ② : 2.0 mm |
|---|---|



**⚠ WARNING**

Ride with care after installing a tire allowing it to lay properly on the rim. Otherwise, an accident may occur resulting in damage to the motorcycle and injuries to the driver. After repairing or replacing a tire, make sure to apply the proper torque to the valve stem lock-nu ① .

 **Valve stem lock-nut:**  
2.0 N.m (0.2 kgf.m; 1.4 ft.lb)

7. Check:

- Wheel roller bearing  
Abnormal noise / clearance / irregular rotation => Replace.
- Retainer  
Damage/wear => Replace.

\*\*\*\*\*

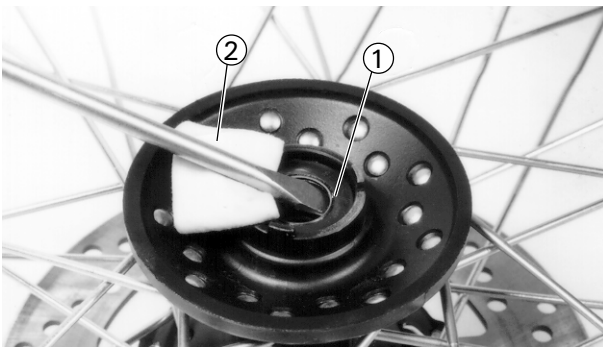
**Replacement steps:**

**Wheel retainer and roller bearing.**

- Clean the external surface of the wheel hub.
- Remove the retainer ① using a screwdriver ②.

**NOTE:**

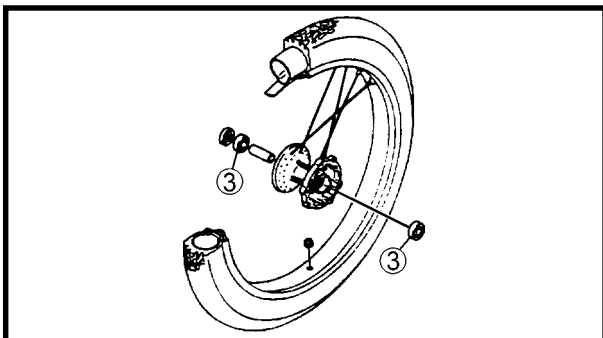
Place a cloth on the hub surface in order to prevent damage.

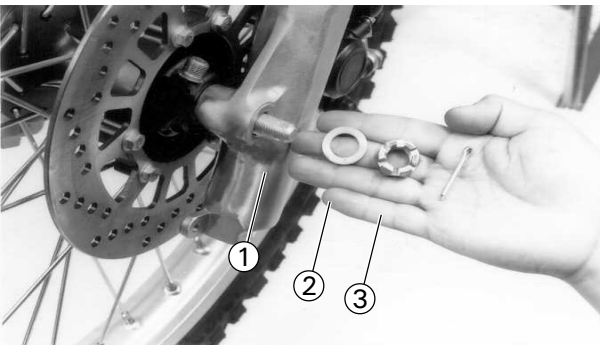
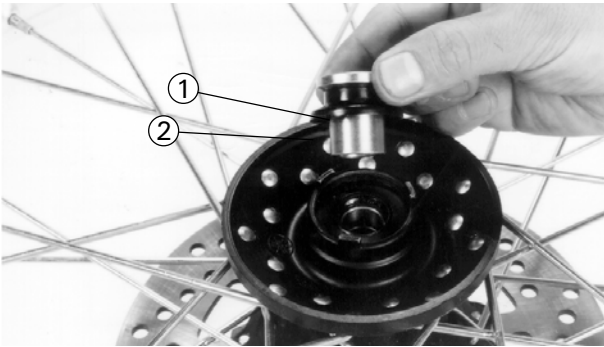
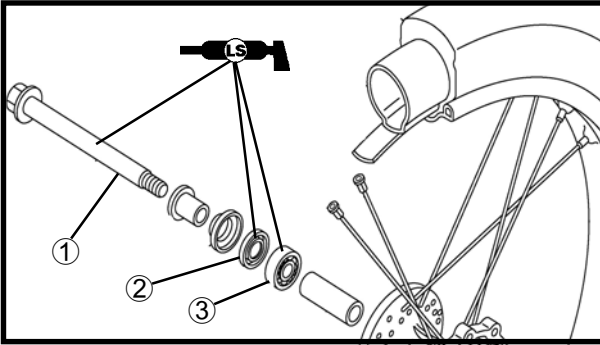
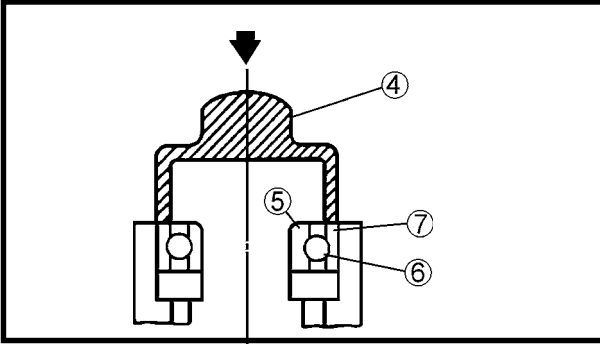


- Remove the roller bearings ③, using the roller bearing puller.
- Install the new roller bearing and the new retainer, reversing the steps above.

**NOTE:**

Use a socket wrench ④ that fits the outside diameter of the race and the retainer.





**CAUTION:**

Do not touch the internal race ⑤ or bearing balls ⑥. The contact should occur on the external race only ⑦.

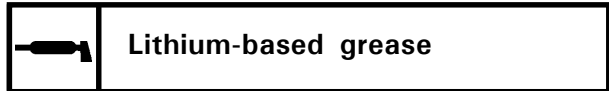
\*\*\*\*\*

**INSTALLATION**

Reverse the "REMOVAL" procedure.

1. Lubricate:

- Axle ①
- Retainer lips ②
- Bearings ③



2. Install:

- Spacer ①
- Dust protector ②

**NOTE:**

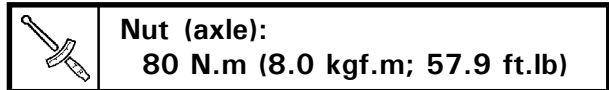
Install the oil retainer taking care not to damage or fold the lips.

3. Install:

- Axle ①
- Washer ②
- Nut ③

4. Tighten:

- Nut ③

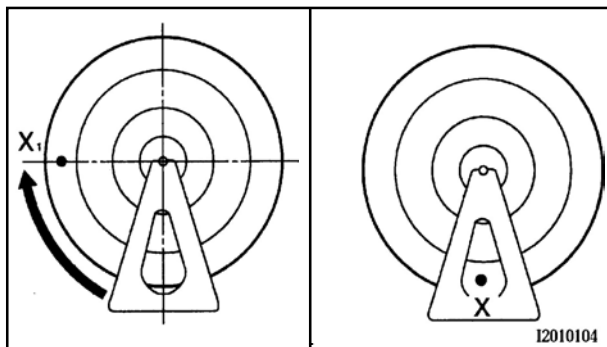
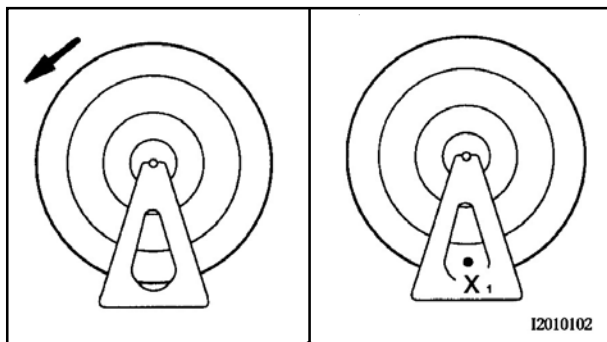




**STATIC WHEEL BALANCING**

**NOTE:** After replacing tires and rims, carry out the static wheel balancing. The brake disc should be installed.

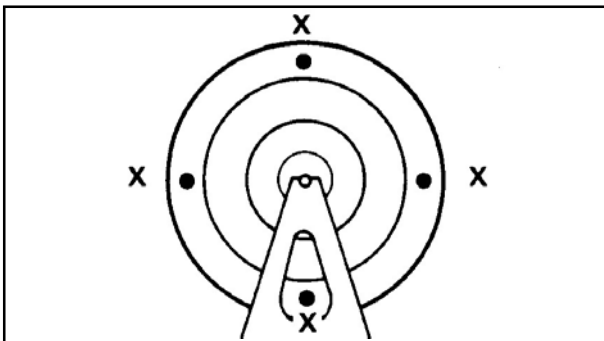
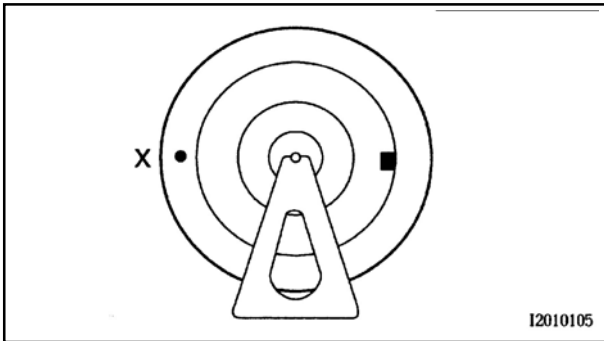
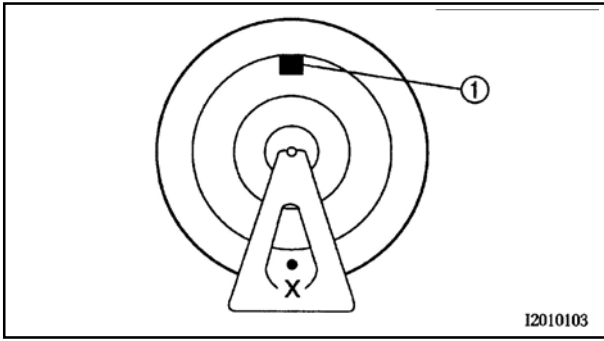
1. Remove:
  - Pesos antigos para balanceamento
2. Place the wheel on an appropriate support.
3. Find:
  - Weight point (unbalance).



\*\*\*\*\*  
**Procedure:**

- a. Turn the wheel and wait until it stops.
- b. Mark a "X1" on the lower point found.
- c. Turn the wheel placing the "X1" at 90 degrees.
- d. Free the wheel and wait until it stops. Mark a "X2" on the new point found.
- e. Repeat steps b, c and d until the marks begin coincide.
- f. The average point found is the weight point.

\*\*\*\*\*



4. Adjust:
- Static wheel balancing

\*\*\*\*\*

**Adjustment steps:**

- Install a balancing weight on the point of the rim symmetrical to the weight point found.

**NOTE:** \_\_\_\_\_  
Install the most light weight available.

- Turn the wheel and place the "X" mark at 90 degrees from its original position.
- Observe if the weight point stays on the same position. Repeat the previous steps until the weight point (unbalance) is eliminated.

**NOTE:** \_\_\_\_\_  
For the first and second measurements, install the balancing weight(s) on the opposite side of the brake disc. Use the same side for the following measurements.

**CAUTION:** \_\_\_\_\_

**Do not install more than 4 balancing weights.**

\*\*\*\*\*

5. Check:
- Static wheel balancing

\*\*\*\*\*

**Adjustment steps:**

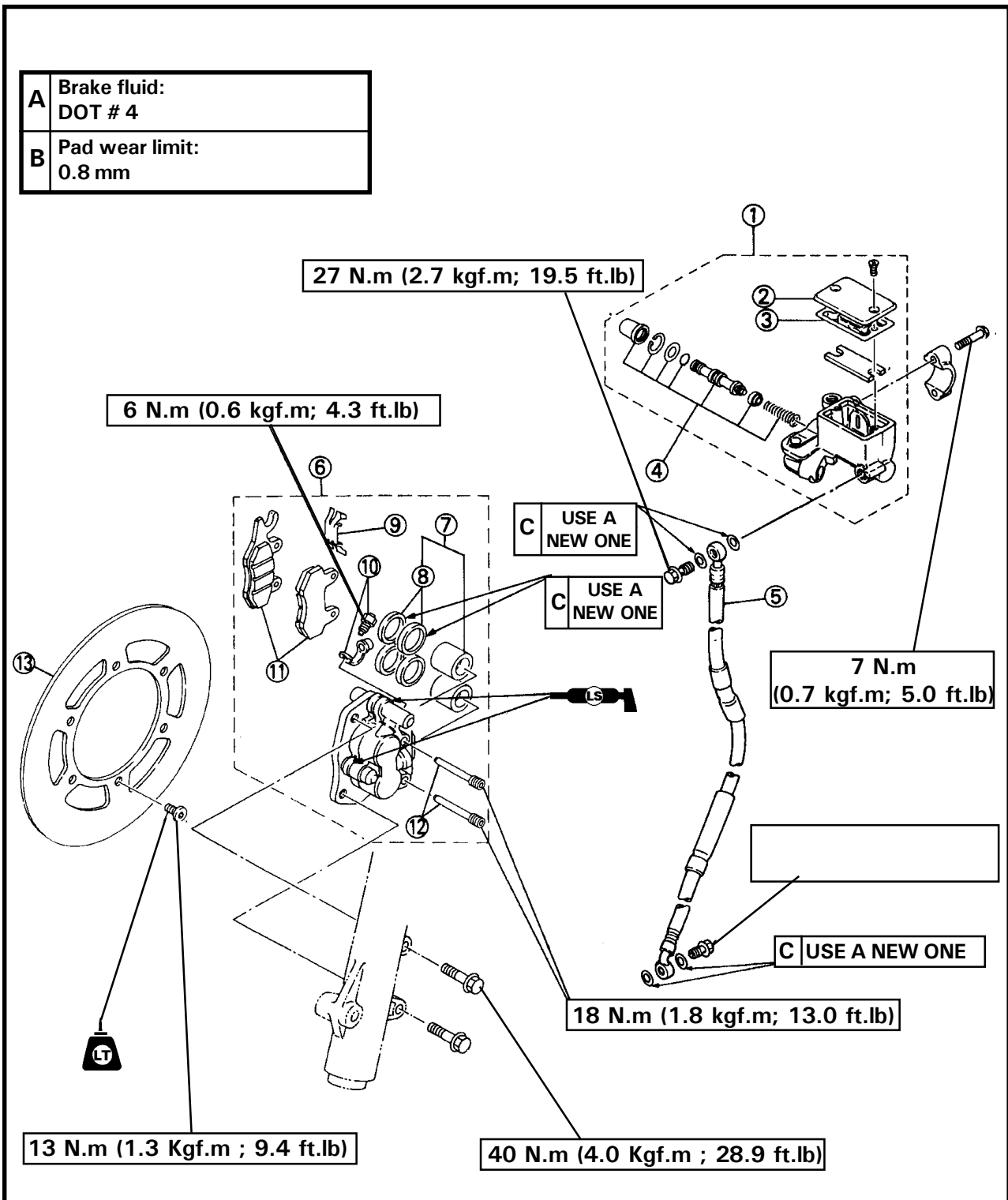
- Turn the wheel, positioning it on the points indicated in the figure.
- Observe if it stays at the predetermined points. If not, carry out the static wheel balancing again.

\*\*\*\*\*

**FRONT BRAKE**

- ① Master cylinder assembly
- ② Master cylinder cover
- ③ Diaphragm
- ④ Master cylinder kit
- ⑤ Brake hose
- ⑥ Brake caliper assembly
- ⑦ Caliper piston
- ⑧ Retainer kit
- ⑨ Pad spring
- ⑩ Bleeding screw
- ⑪ Brake pads
- ⑫ Brake pad pin
- ⑬ Brake disc

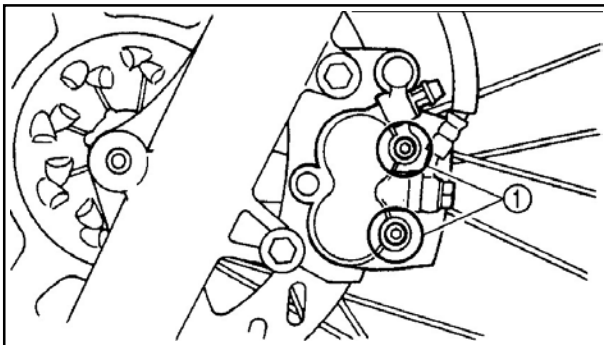
|          |                           |
|----------|---------------------------|
| <b>A</b> | Brake fluid:<br>DOT # 4   |
| <b>B</b> | Pad wear limit:<br>0.8 mm |



**CAUTION:**

Generally, the brake disc components do not need to be dismantled.

- Do not dismantle components, unless absolutely necessary.
- Do not apply solvents to the brake internal components.
- Do not use contaminated brake fluid for cleaning.
- Prevent the brake fluid from reaching the eyes.
- Prevent the brake fluid from contacting painted or plastic surfaces.
- Do not disconnect any hydraulic system component. Otherwise, it will be necessary to dismantle, drain, clean and, then, replenish with fluid and bleed properly.

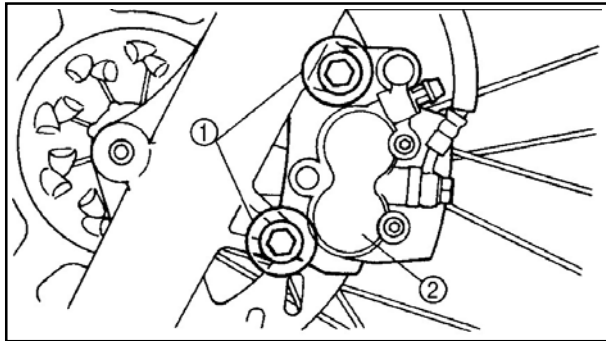
**BRAKE PAD REPLACEMENT****NOTE:**

The disconnection of the brake caliper and hose is not required for replacing pads.

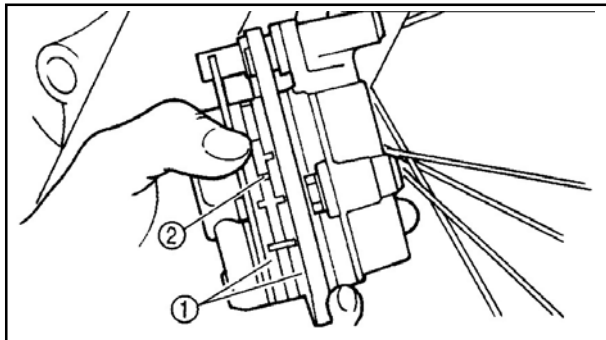
**⚠ WARNING**

Support the motorcycle firmly preventing it from falling.

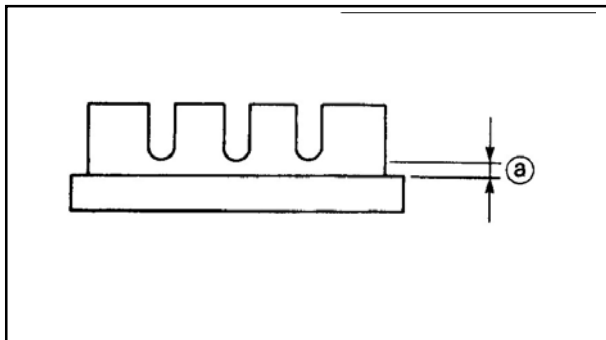
1. Loosen:
  - Pad pins ①



2. Remove:
- Bolt ①
  - Brake caliper ②

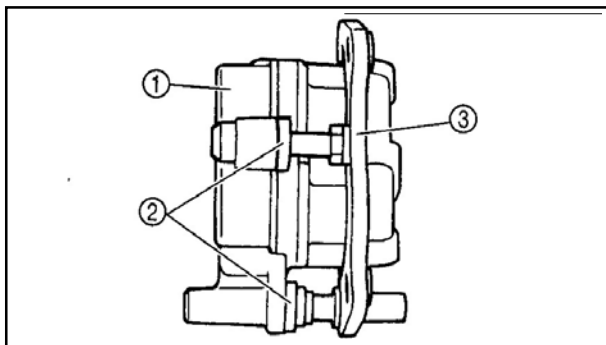


3. Remove:
- Pad pins
  - Brake pads ①
  - Brake pad spring ②




- NOTE:**
- If replacing the pads, replace the springs.
  - Replace the pads in case of wear or if the wear limit has been reached.

|   |                                 |
|---|---------------------------------|
|  | <b>Wear limit ② :</b><br>1.0 mm |
|---|---------------------------------|



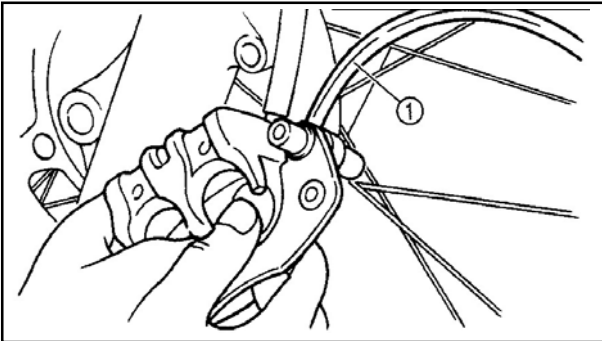
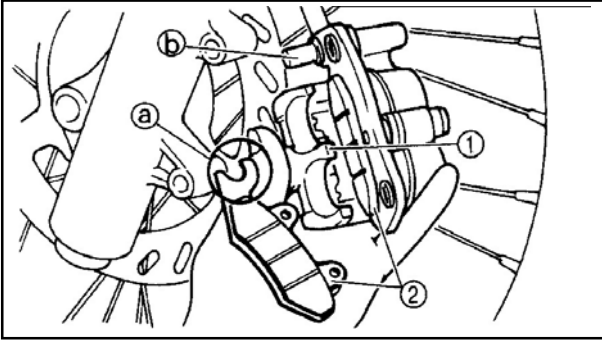
4. Check:
- Brake caliper ①  
Cracks/damage => Replace the assembly
  - Rubber protector ②  
Cracks/damage => Replace
  - Caliper support ③

5. Lubricate:
- Dowel pins

|   |                             |
|---|-----------------------------|
|  | <b>Lithium-based grease</b> |
|---|-----------------------------|

- NOTE:**
- Fasten the rubber protector ② firmly to the sliding spacer seat.

6. Install:
- Caliper support



7. Install:

- Brake pad spring ①
- Brake pads ②
- Brake pad pin



**Brake pad pins:**  
18 N.m (1.8 kgf.m; 13 ft.lb)

**NOTE:**

Install the brake pad (internal) with its fastener @ facing the support pin ⑥

\*\*\*\*\*

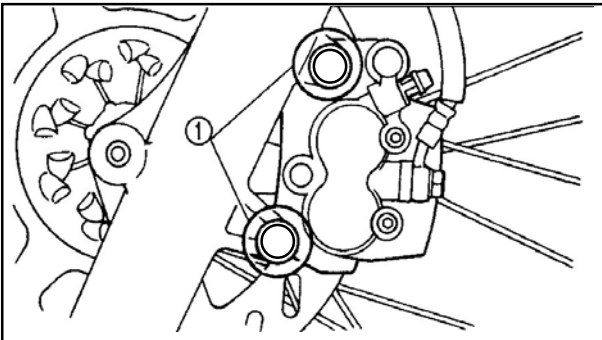
**Installation steps:**

- Connect a clear plastic tube ① firmly to the bleeding screw. Then, place the other end of the tube in a container.
- Loosen the bleeding screw and push the piston against the caliper manually.
- Tighten the bleeding screw.



**Bleeding screw:**  
6 N.m (0.6 kgf.m; 4.3 ft.lb)

\*\*\*\*\*



8. Install:

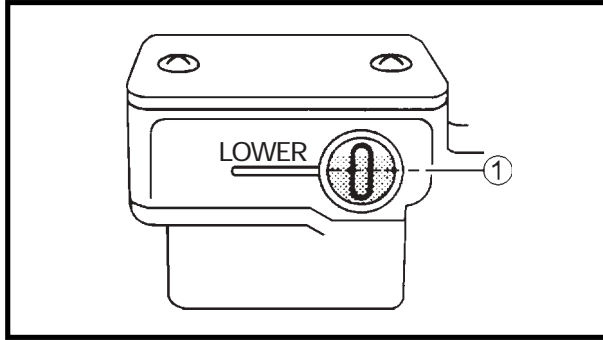
- Brake caliper assembly
- Screws ①



**Screw:**  
23 N.m (2.3 kgf.m; 17 ft.lb)

**⚠ WARNING**

Route the brake hose properly in order to ensure the safe riding.

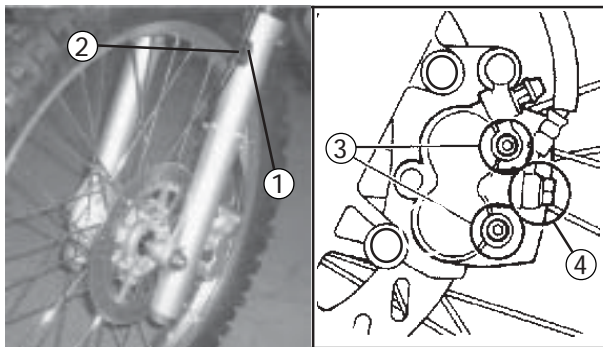


9. Check:
  - Brake fluid level.
 See Section "FRONT BRAKE FLUID LEVEL CHECK," CHAPTER 3.  
 1 Low level "LOWER."
10. Check:
  - Brake lever operation
 Soft, spongy touch => Bleed the brake  
 See Section "AIR BLEEDING," CHAPTER 3.

**BRAKE CALIPER DISMOUNTING**

**NOTE:** \_\_\_\_\_  
 Before dismantling the brake caliper, drain the brake fluid.

**⚠ WARNING** \_\_\_\_\_  
**Support the motorcycle firmly preventing it from falling.**



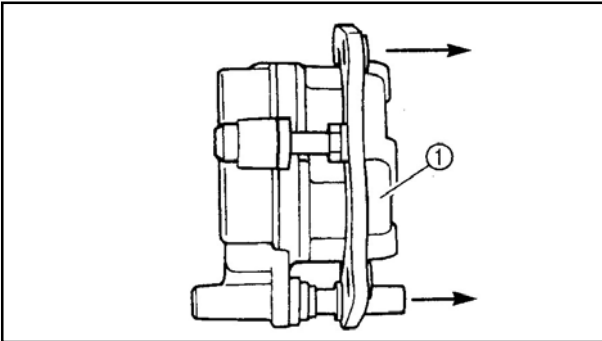
1. Remove:
  - Screws 1 (brake hose fastening).
  - Brake hose fastener 2.
3. Loosen:
  - Connection screws 4

**NOTE:** \_\_\_\_\_  
 Loosen just a little in order to prevent the brake fluid from leaking.

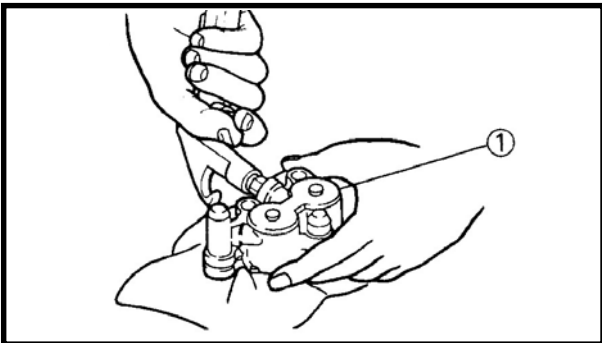
4. Remove:
  - Screws 3
  - Connection screw 4 and copper washers

**NOTE:** \_\_\_\_\_  
 Place a container under the caliper in order to collect the remaining brake fluid.

5. Remove:
- Pads
  - Springs
- See Section "BRAKE PAD REPLACEMENT."



6. Remove:
- Caliper support ①



7. Remove:
- Pistons ①

\*\*\*\*\*

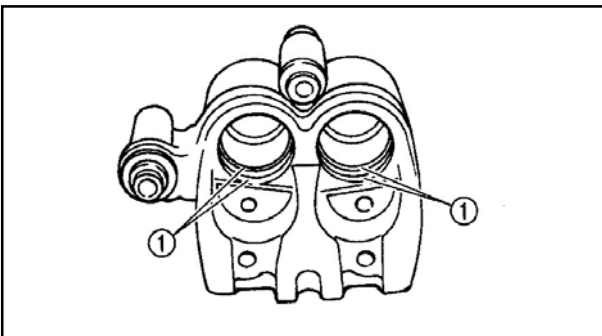
**Removal steps:**

- Blow compressed air through the connection tube in order to force the ejection of the pistons.

**⚠ WARNING**

- Do not try to force the removal of the piston.
- Cover the piston with a cloth. Take care to prevent the piston from being damaged when ejected from the caliper.

\*\*\*\*\*



8. Remove:
- Repair kit ① (dust protector)

**CAUTION:**

Remove the piston retainer pushing it manually. Do not use a screwdriver.





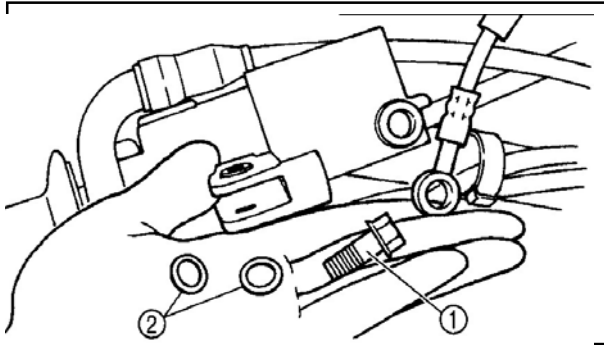
## MASTER CYLINDER DISMOUNTING

### NOTE:

Before dismantling the master cylinder, drain the brake fluid.

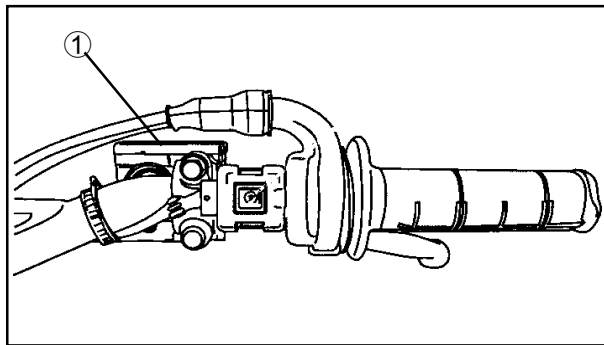
### ⚠ WARNING

Support the motorcycle firmly preventing it from falling.



#### 1. Remove:

- Connection screw ①
- Copper washers ②

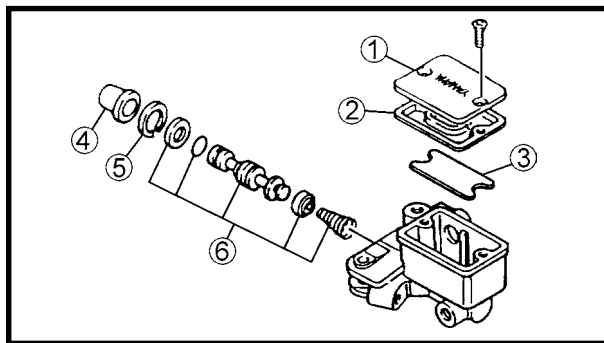


#### 2. Remove:

- Master cylinder ①

### NOTE:

Place a container under the master cylinder in order to collect the remaining brake fluid.



#### 3. Remove:

- Master cylinder cover ①
- Diaphragm ②
- Plate ③
- Dust protector ④
- Lock ring ⑤
- Master cylinder kit ⑥

### NOTE:

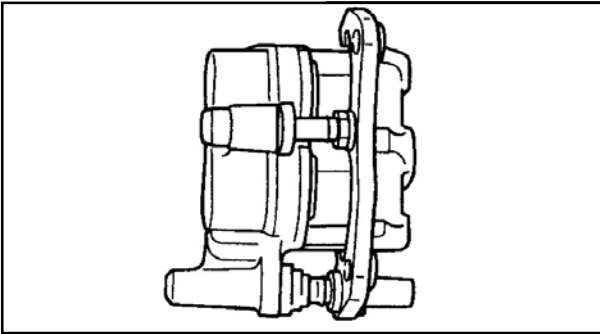
Remove the lock ring using a pair of pliers for internal lock ring.



## INSPECTION AND REPAIRS

**⚠ WARNING**

All internal parts should be cleaned using new brake fluid. Do not use solvents, since this will result in deformations.



## 1. Check:

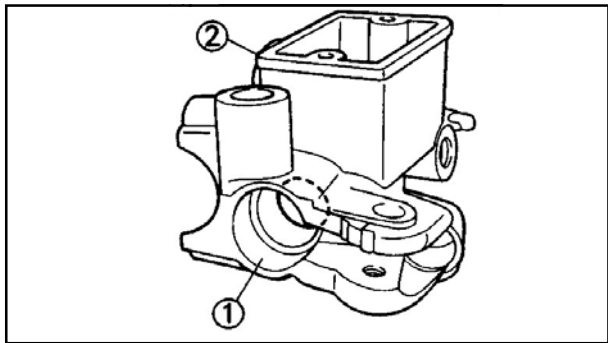
- Caliper cylinder
- Wear/scratches = > Replace the caliper assembly
- Caliper piston  
Scratches/corrosion/wear = > Replace the caliper assembly

**⚠ WARNING**

When dismantling the caliper, replace the piston retainer and the dust protector.

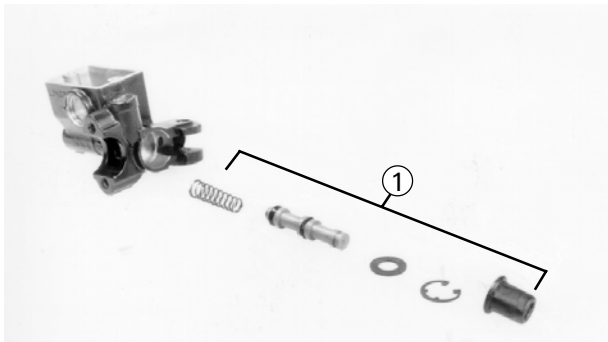
## 2. Check:

- Caliper support  
Damage = > Replace the caliper assembly
- Caliper body  
Damage = > Replace the caliper assembly
- Rubber protectors  
Damage/wear = > Replace.
- Brake fluid passages (caliper)  
Blow with compressed air



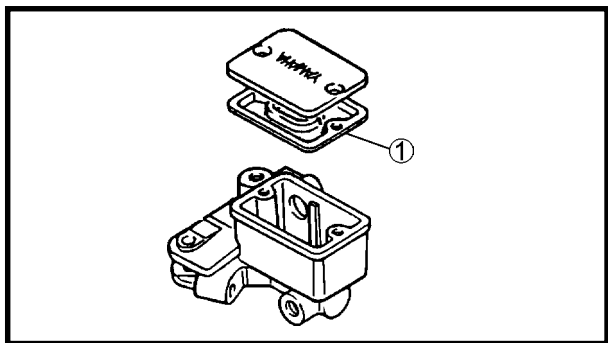
3. Check:

- Brake fluid passage (master cylinder) ①  
Blow with compressed air.  
Wear/scratches = > Replace the master cylinder assembly
- Master cylinder reservoir  
Wear/scratches = > Replace the master cylinder assembly



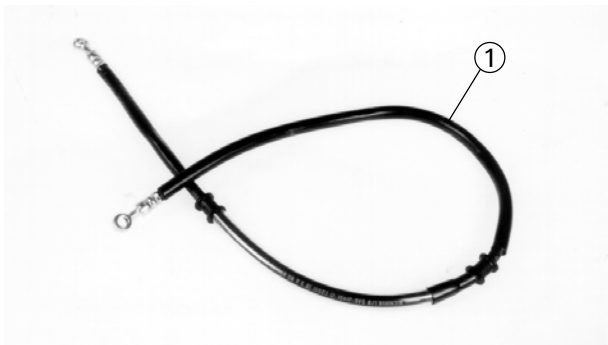
4. Check:

- Master cylinder kit ①  
Scratches/wear/damage = > Replace as an assembly



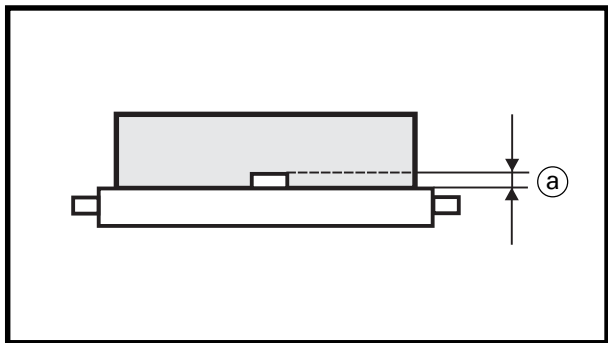
5. Check:

- Diaphragm ①  
Damage = > Replace




6. Check:

- Brake hoses ①  
Damage = > Replace

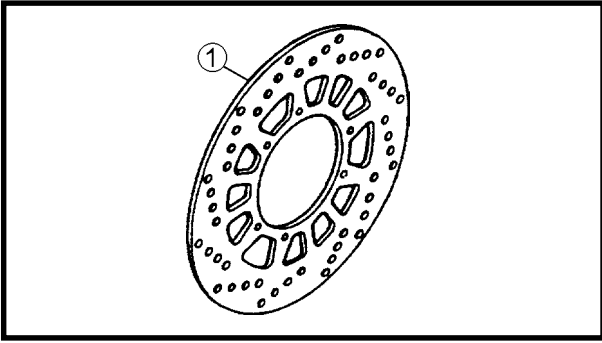


7. Measure:

- Brake pad thickness  
Out of specification = > Replace.

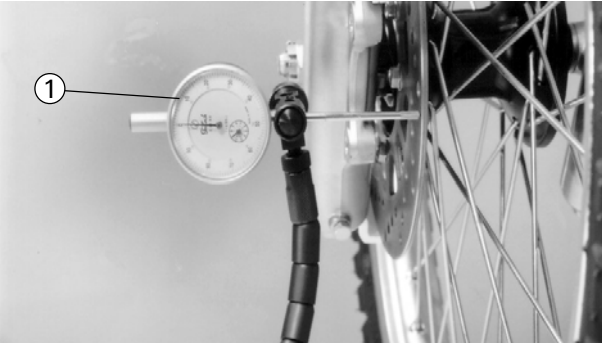
|   |                           |                       |
|---|---------------------------|-----------------------|
|  | <b>Pad wear limit a :</b> | <input type="radio"/> |
|   | <b>0.8 mm</b>             |                       |

**NOTE:** \_\_\_\_\_  
Replace the pad assembly in case of wear or if the wear limit has been reached.



8. Check:

- Brake disc ①
- Damage => Replace



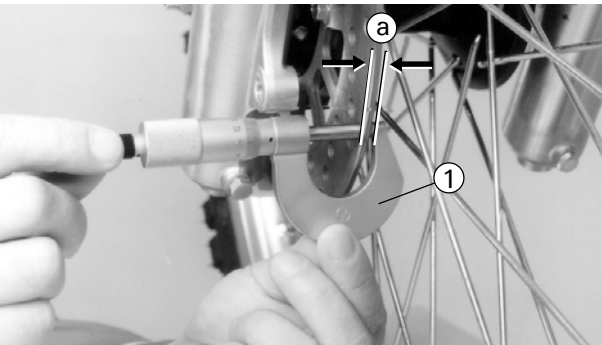
9. Measure:

- Brake disc warping
- Out of specification => Check for warping  
Warping = > Replace the disc.



**Maximum warping:**  
**0.3 mm**

- ① Dial gage
  - Brake disc thickness
- Out of specification => Replace



**Brake disc thickness ① :**  
**3.5 mm**  
**<Wear limit: 3.0 mm>**

- ① Micrometer

**NOTE:**

Tighten the screws (brake disc) in a cross pattern.



**Screw (brake disc):**  
**10 N.m (1.0 kgf.m; 7.2 ft.lb)**  
**Use LOCTITE®**

**CALIPER MOUNTING**



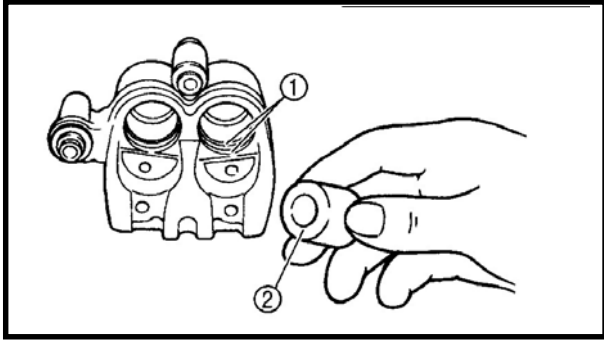
**WARNING**

- All internal parts should be cleaned using new brake fluid.
- Internal parts should be lubricated with brake fluid before being reinstalled.



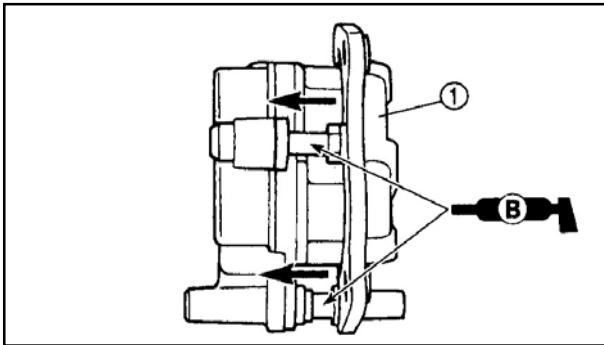
**Brake fluid:**  
**DOT # 4**

- When dismantling the caliper, replace the piston retainer and the dust protector.

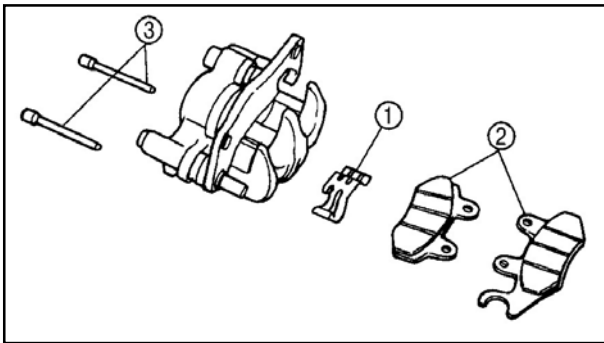


1. Install:
  - Piston retainer ①
  - Piston ②

**NOTE:** \_\_\_\_\_  
 First, mount the piston retainer and, then, the piston. Stop when almost finishing and connect the dust protector. While moving the piston to its position, mount the dust protector on the assembly. Mount the dust protector ring.




2. Install:
  - Caliper support ①

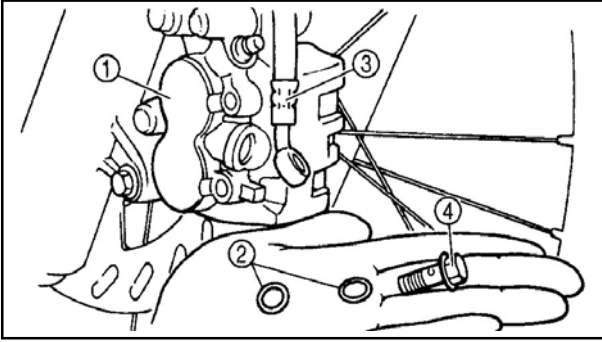


3. Install:
  - Pad springs ①
  - Brake pads ②
  - Brake pad pins ③

See Section "BRAKE PAD REPLACEMENT."

**NOTE:** \_\_\_\_\_  
 Position the rubber protector firmly on the dowel pin race when installing the brake caliper.

|   |  |
|---|--|
|  | <p><b>Screw:</b><br/>                 18 N.m (1.8 kgf.m; 13.0 ft.lb)</p> |
|---|--|



## 4. Install:

- Brake caliper ①
- Copper washers ②
- Brake hose ③
- Connection screw ④

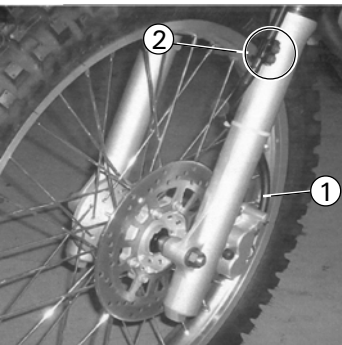


## Screw:

27 N.m (2.7 kgf.m; 19 ft.lb)

**⚠ WARNING**

- Route the brake hose properly in order to ensure the safe riding.
- Always use new copper washers.



## 5. Connect:

- Brake hose ①

## 6. Install:

- Screws ② (brake hose fastener)



## Screw (brake hose fastener):

7 N.m (0.7 kgf.m; 5.1 ft.lb)

## 7. Fill:

- Brake fluid



## Recommended brake fluid:

DOT # 4

**CAUTION:**

Brake fluid can damage plastic or painted surfaces.

**⚠ WARNING**

- Use the recommended brake fluid only. Otherwise, rubber retainers may deteriorate, resulting in leakage and brake performance loss.
- Fill with the same type of brake fluid. Mixing fluids may result in undesired chemical reaction, resulting in brake performance loss.



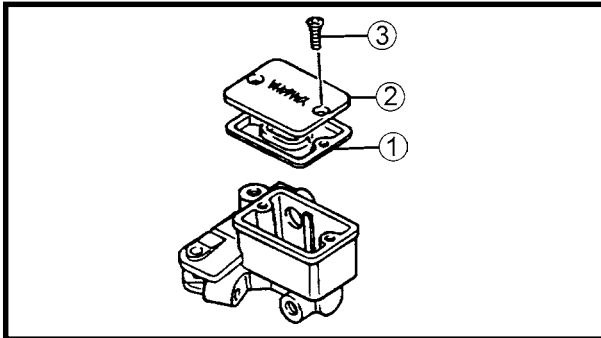
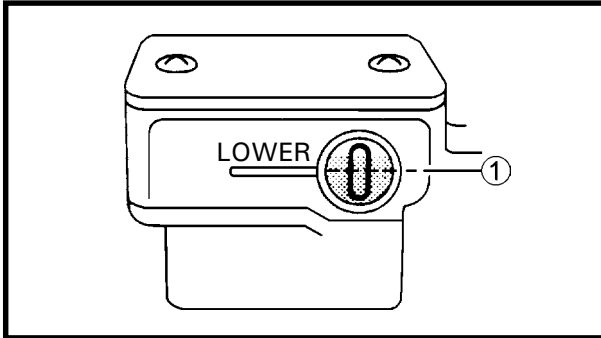
- Make sure to prevent water from entering the master cylinder when filling it. Water decreases the fluid boiling point and may result in plugging.

8. Air bleeding:

- Brake system  
See Section "AIR BLEEDING," CHAPTER 3.

9. Check:

- Brake fluid level.  
Brake fluid level below the "LOWER" mark => Fill.  
See Section, "BRAKE FLUID INSPECTION," CHAPTER 3.



10. Install:

- Diaphragm ①
- Master cylinder cover ②
- Screws ③



**Screw (master cylinder cover):**  
1.5 N.m (0.15 kgf.m; 1.1 ft.lb)

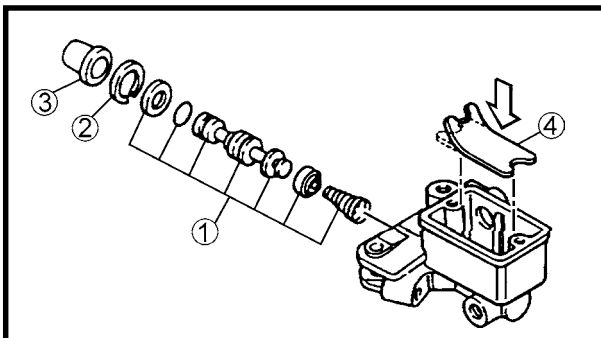
MASTER CYLINDER MOUNTING

**⚠ WARNING**

- All internal parts should be cleaned using new brake fluid.
- Internal parts should be lubricated with brake fluid when installed



**Brake fluid:**  
DOT # 4

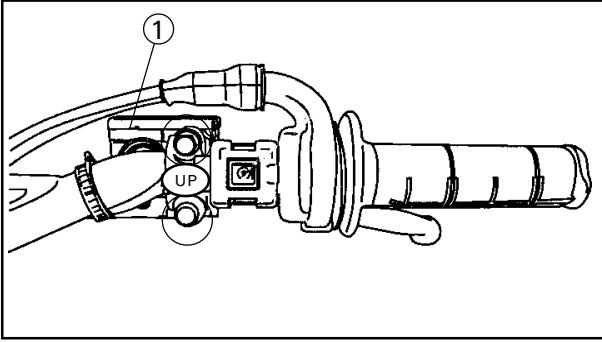


1. Install

- Master cylinder kit ①
- Lock ring ②
- Dust protector ③
- Plate ④

**NOTE:**

When installing the plate ④ push it firmly to the position shown in the figure.



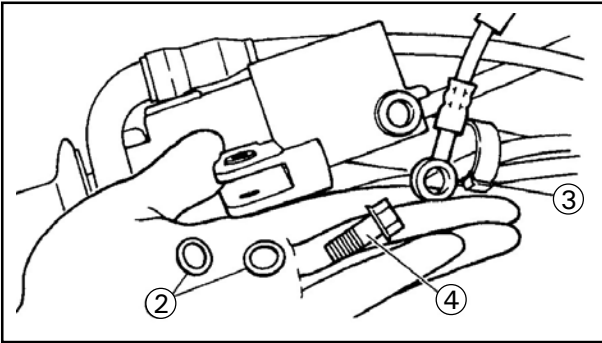
2. Install:
- Master cylinder ①

**NOTE:** Install the master cylinder with the "UP" mark up.

Tighten the upper screw first.



**Screw (master cylinder support):**  
7 N.m (0.7 kgf.m; 5.1 ft.lb)

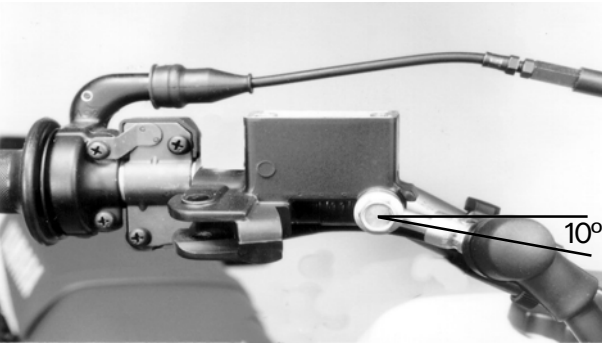


3. Install:
- Copper washers ②
  - Brake hose ③
  - Screw ④



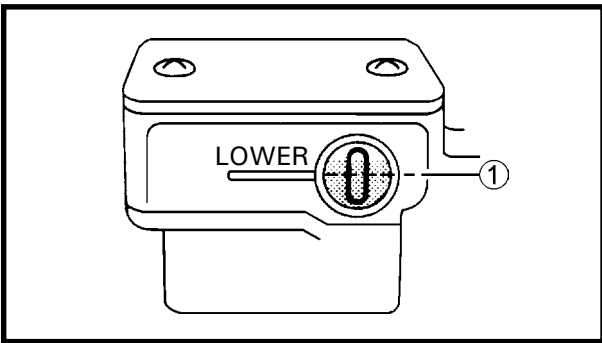
**Connection screw:**  
30 N.m (3.0 kgf.m; 16.6 ft.lb)

**NOTE:** Install the brake hose as indicated in the figure.



**⚠ WARNING**

- Route the hose properly in order to ensure the safe riding.
- Always use new copper washers.

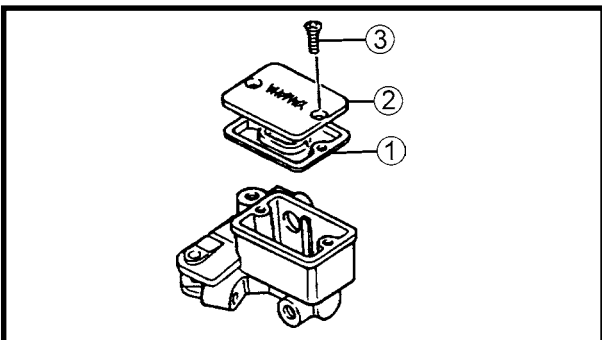


4. Fill:
- Brake fluid

5. Air bleeding:
- Brake system
- See Section "AIR BLEEDING," CHAPTER 3.

6. Check:
- Brake fluid level.

7. Install:
- Diaphragm ①
  - Master cylinder cover ②
  - Screws ③



**Screw (master cylinder cover):**  
1.5 N.m (0.15 kgf.m; 1.1 ft.lb)





FRAME

REAR WHEEL

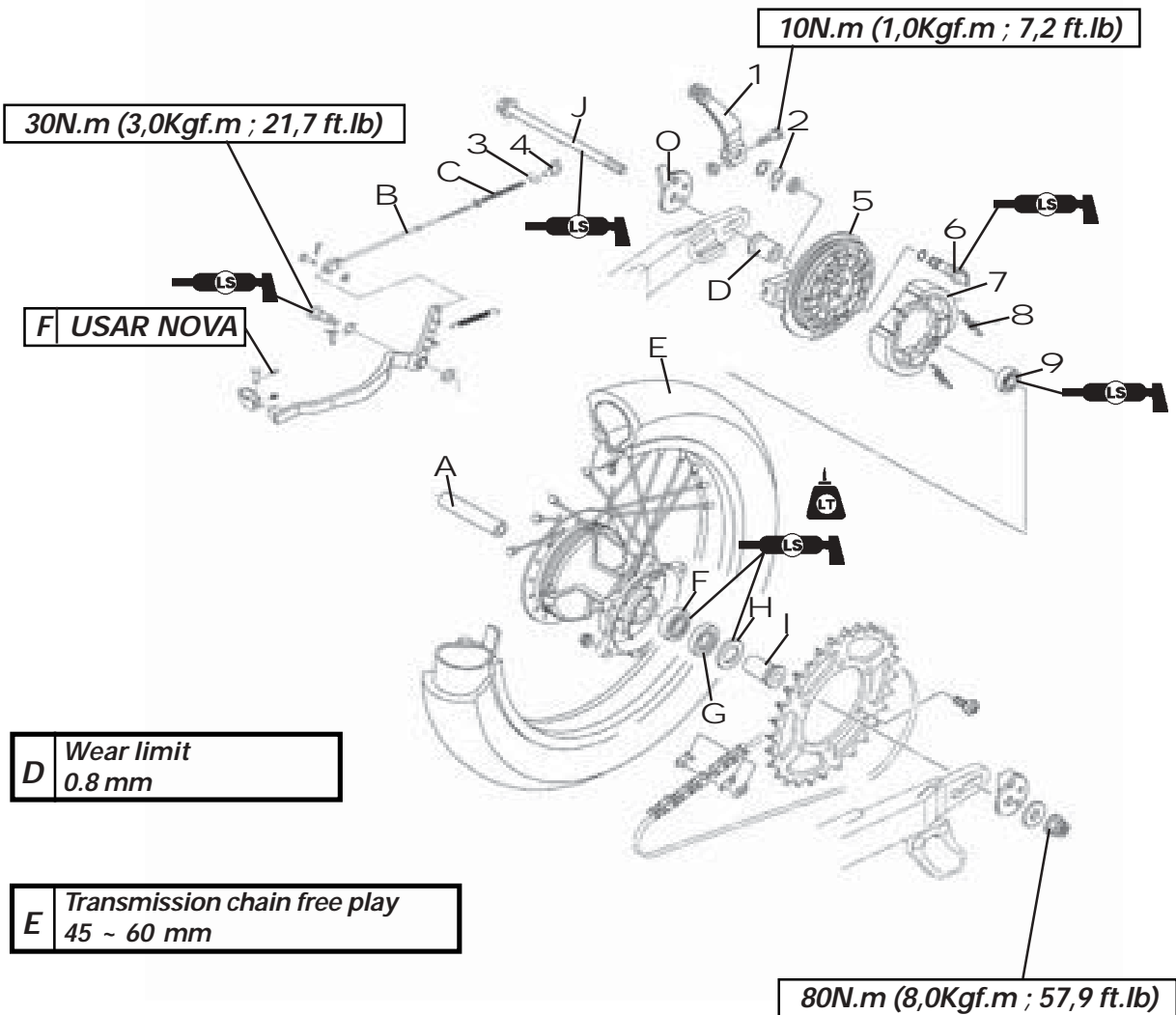
- ① Driving lever
- ② Wear indicator
- ③ Pin
- ④ Adjuster
- ⑤ Shoe plate
- ⑥ Camshaft
- ⑦ Brake shoe
- ⑧ Spring
- ⑨ Bearing
- ⑩ Tighteners
- ⑪ Spacer
- ⑫ Brake stem
- ⑬ Spring
- ⑭ Spacer
- ⑮ Rear wheel
- ⑯ Bearing
- ⑰ Retainer
- ⑱ Dust protector
- ⑲ Spacer
- ⑳ Axle

| Tire pressure (cold) |         |         |
|----------------------|---------|---------|
| Maximum load *       | 90kg    |         |
| Tire pressure        | Front   | Rear    |
|                      | (15psi) | (15psi) |

\* Load is the total weight of driver, passenger and accessories.

|          |                                     |
|----------|-------------------------------------|
| <b>A</b> | Tire dimensions<br>110/100 - 18 NHS |
| <b>B</b> | Rim dimensions<br>2.15 x 18         |

|          |  |
|----------|--|
| <b>C</b> | Rim warping limit:<br>Vertical: 2.0 mm<br>Side: 2.0 mm |
|----------|--|



|          |                      |
|----------|----------------------|
| <b>D</b> | Wear limit<br>0.8 mm |
|----------|----------------------|

|          |  |
|----------|--|
| <b>E</b> | Transmission chain free play<br>45 ~ 60 mm |
|----------|--|



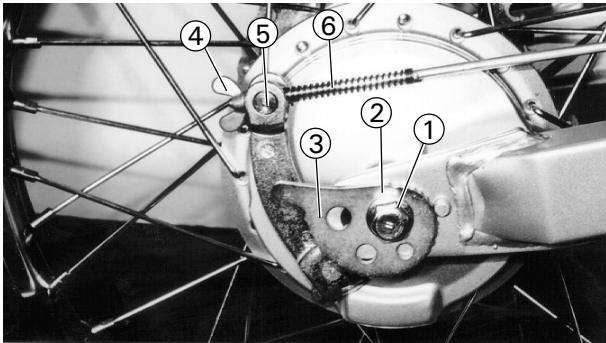
**REAR WHEEL REMOVAL**

**⚠ WARNING**

Support the motorcycle firmly preventing it from falling.

1. Place the motorcycle on a flat area.
2. Lift the rear wheel placing a support under the engine.
3. Remove:

- Axle nut ①
- Washer ②
- Chain Puller ③
- Adjuster ④
- Pin ⑤
- Spring ⑥

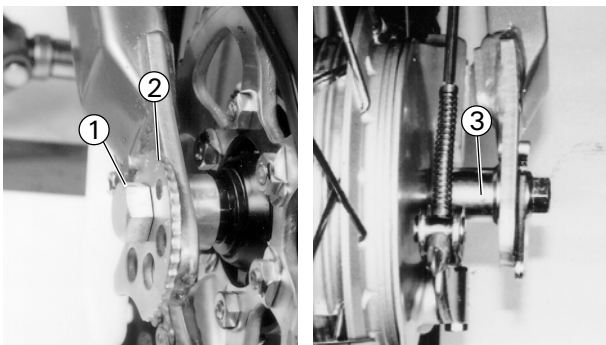


4. Remove:

- Axle ①
- Chain puller ②
- Spacer ③

**NOTE:**

When removing the axle, the spacer ③ may fall.

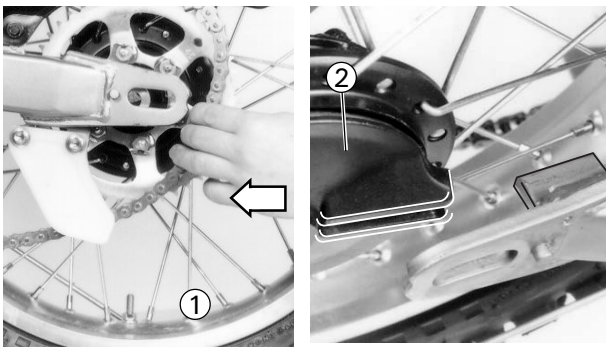


5. Remove:

- Rear wheel ①
- Shoe plate ②

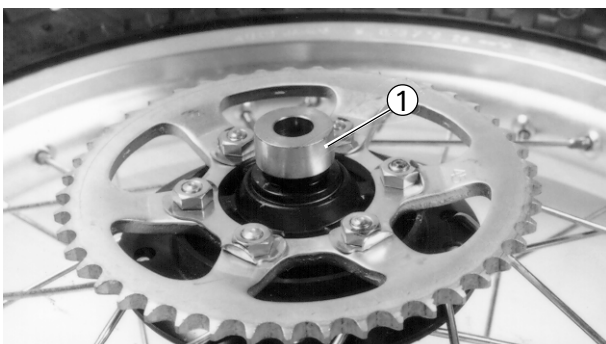
**NOTE:**

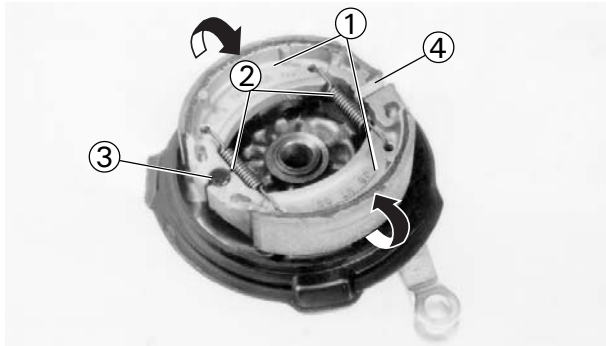
To remove the wheel, push it forward as shown in the figure and remove the transmission chain.



6. Remove:

- Spacer/dust protector ①

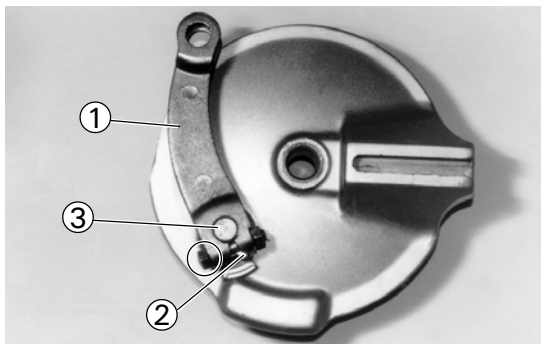




**REAR BRAKE**

1. Remove:
- Brake shoes ①
  - Springs ②

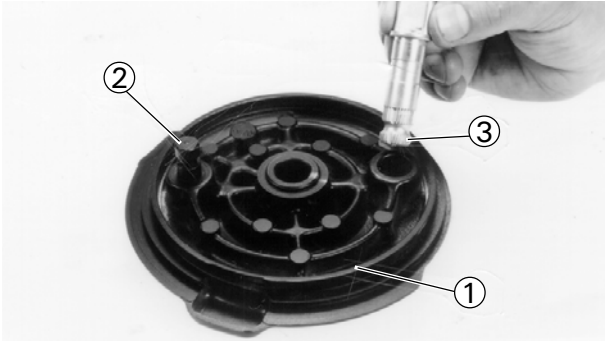
**NOTE:** \_\_\_\_\_  
 Remove the shoes pulling them up, using the hinge pin ③ and the camshaft stem ④ as support points, in the arrow direction.



2. Remove:
- Driving lever ①
  - Wear indicator ②
  - Camshaft ③

**INSPECTION**

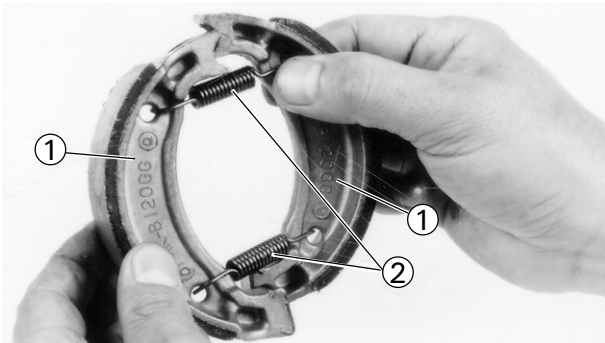
1. Check:
- Axle
  - Tire
  - Wheel
- See Section "INSPECTION - FRONT WHEEL."
2. Check:
- Spokes
- See Section "INSPECTION - FRONT WHEEL."
3. Measure:
- Wheel warping
- See Section "INSPECTION - FRONT WHEEL."
4. Check:
- Wheel bearings
  - Retainers
- See Section "INSPECTION - FRONT WHEEL."



5. Check:

- Shoe plate ①
- Hinge pin ②
- Camshaft ③

Damage => Replace.



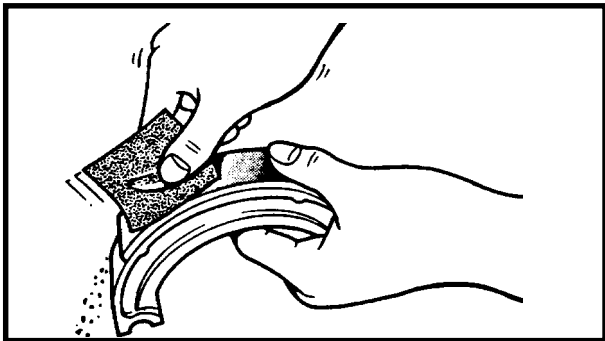
6. Check:

- Brake shoe ①
- Springs ②

Damage/wear => Replace.

**NOTE:**

When replacing the brake shoes, replace the springs.

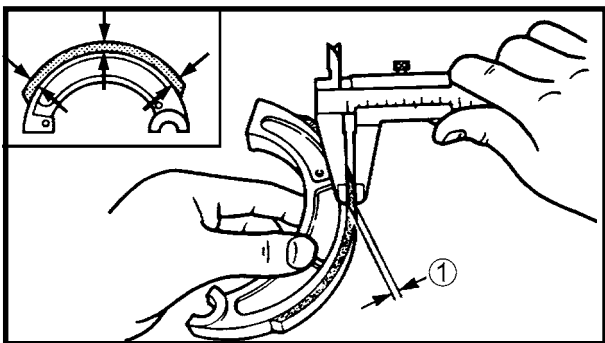


7. Check:

- Brake shoe surface
- Glazed areas => Remove.  
Use coarse sandpaper.

**NOTE:**

After using the sandpaper, remove the glazed particles with a cloth.



8. Measure:

- Brake shoe thickness
- Out of specification => Replace.

① Measurement point.

**NOTE:**

If the wear limit has been reached, replace the shoes.

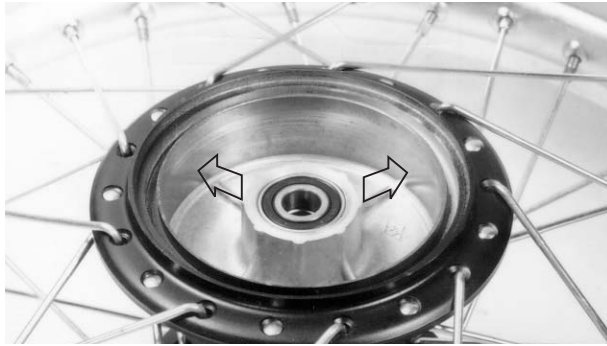


**Brake shoe thickness:**

4.0 mm

**Wear limit:**

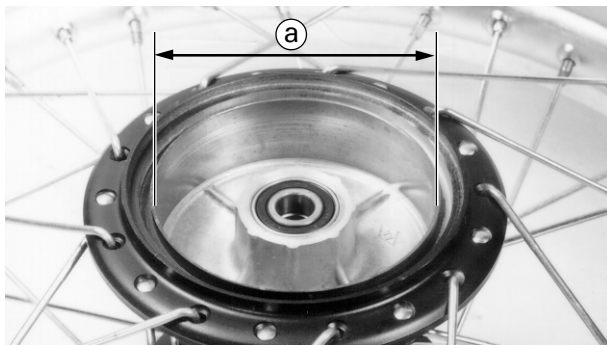
2.0 mm



9. Check:

- Internal surface of the brake drum  
Oil/scratches = > Replace.

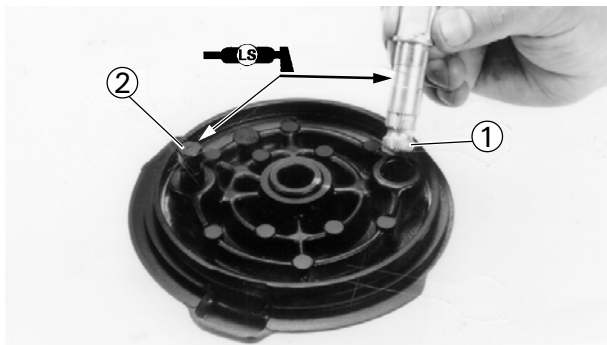
|           |   |
|-----------|---|
| Oil       | Clean using a cloth damped with solvent or thinner. |
| Scratches | Polish, using light sandpaper.                      |



10. Measure:

- Internal diameter of the brake drum <sup>Ⓐ</sup>  
Out of specification = > Replace.

|  |   |
|--|---|
|  | Internal diameter of the brake drum:<br>Standard: 110 mm<br>Limit: 111 mm |
|--|---|



**MOUNTING**

Rear brake

Reverse the "REMOVAL" procedures.

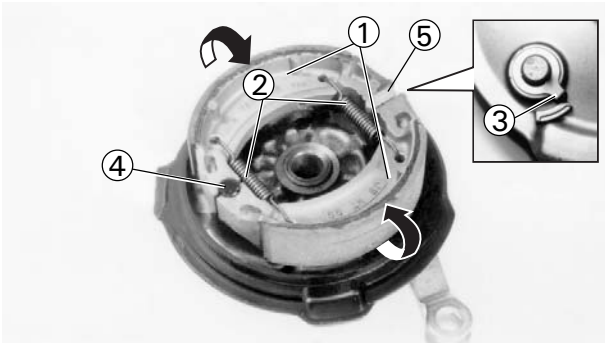
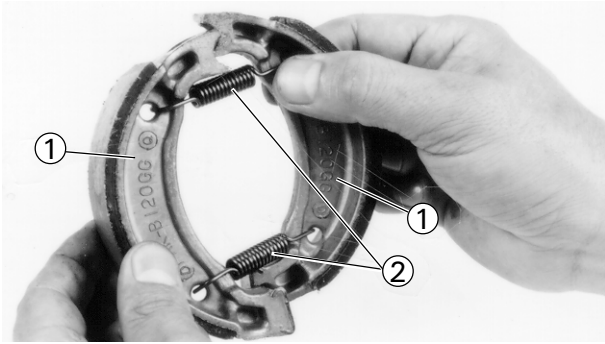
1. Lubricate:

- Camshaft ①
- Hinge pin ②

|  |                      |
|--|----------------------|
|  | Lithium-based grease |
|--|----------------------|

**CAUTION:**

Install the camshaft and the hinge pin with a small quantity of grease. Remove the excessive grease.



2. Install:
- Brake shoes ①
  - Spring ②

**NOTE:**

- When installing the camshaft, make sure the channel ③ is facing the wear indicator.
- When installing the brake shoes, use the hinge pin ④ and the camshaft ⑤ as support points, pressing the shoes in the arrow direction.

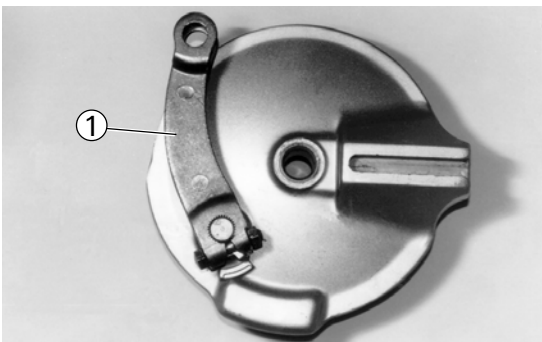
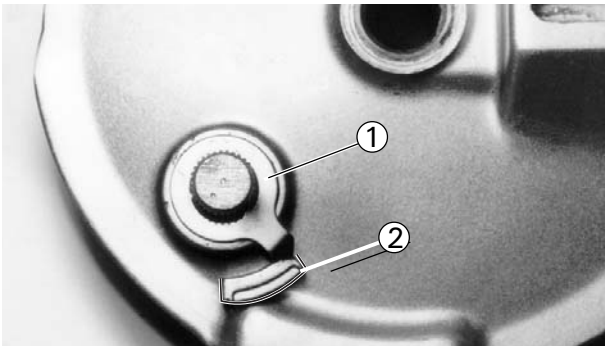
**CAUTION:**

- Do not deform or damage the spring hooks using pliers during the installation.
- Do not apply grease to the shoe surfaces.


3. Install:
- Wear indicator ①

**NOTE:**

When installing the wear indicator, place the salience in the camshaft channel and align the pointer with the wear indicator ①.



4. Install:
- Driving lever ①


|   |  |
|---|--|
|  | <p><b>Screw (driving lever):</b><br/> <b>10 N.m (1.0 kgf.m; 7.2 ft.lb)</b></p> |
|---|--|

**INSTALLATION**

Reverse the "REMOVAL" procedure.


1. Lubricate:

- Axle
- Bearings
- Retainer lips

|   |                             |
|---|-----------------------------|
|  | <b>Lithium-based grease</b> |
|---|-----------------------------|

2. Adjust:


- Transmission chain free play

|   |   |
|---|---|
|  | <b>Transmission chain free play:<br/>45 ~ 60 mm</b> |
|---|---|

See Section "TRANSMISSION CHAIN FREE PLAY ADJUSTMENT," CHAPTER 3.

3. Tighten:

- Axle nut

|   |   |
|---|---|
|  | <b>Axle nut:<br/>80 N.m (8.0 kgf.m; 57.9 ft.lb)</b> |
|---|---|

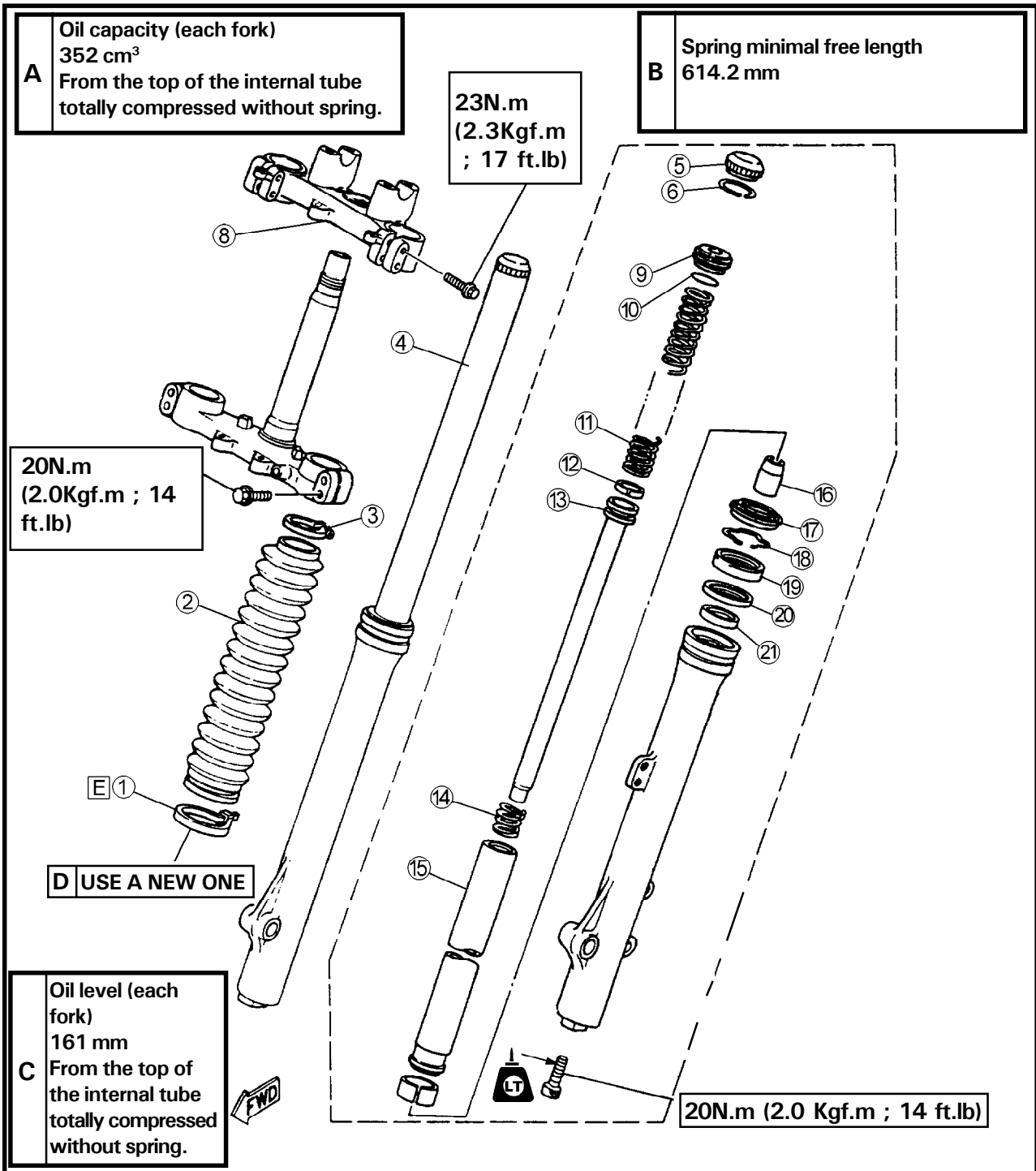
**NOTE:**

Do not loosen the axle nut after applying torque. If the nut hole is not aligned with the axle hole, tighten the nut until the holes are aligned.

FRONT FORK

- ① Plastic belt
- ② Dust cover
- ③ Tie wrap
- ④ Front fork (RH)
- ⑤ Cover
- ⑥ Lock ring
- ⑧ Handle-bars board
- ⑨ Handle-bars board
- ⑩ O-ring
- ⑪ Fork spring
- ⑫ Piston spring
- ⑬ Damper stem
- ⑭ Return spring
- ⑮ Internal tube
- ⑯ Oil retainer
- ⑰ Dust protector
- ⑱ Lock ring
- ⑲ Retainer
- ⑳ Spacer
- ㉑ Guide bushing
- ㉒ External tube
- ㉓ Front fork (LH)

E Cut the plastic belt



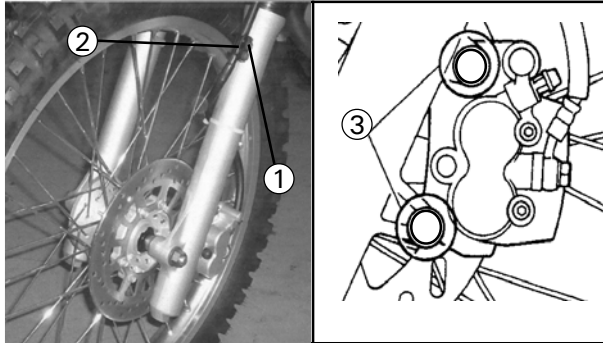




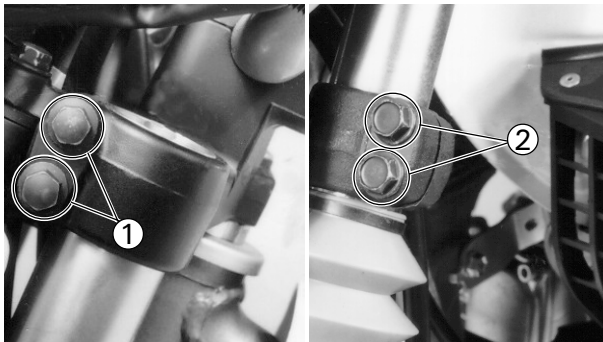
## REMOVAL

**⚠ WARNING**

Support the motorcycle firmly preventing it from falling.



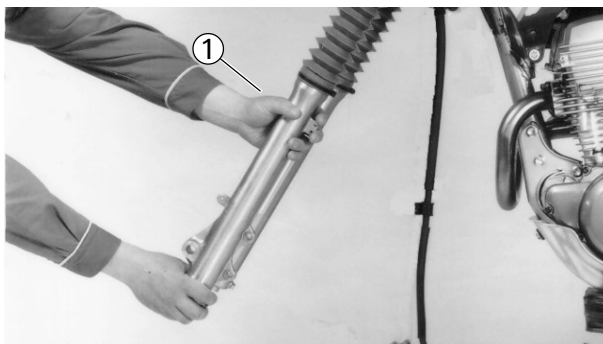
1. Place the motorcycle on a flat area.
2. Lift the front wheel placing a support under the engine.
3. Remove:
  - Front wheel  
See Section "REMOVAL - FRONT WHEEL."
4. Remove:
  - Screws ① (brake hose fastener)
  - Fastener ② (brake hose)
  - Screw ③ (brake caliper)



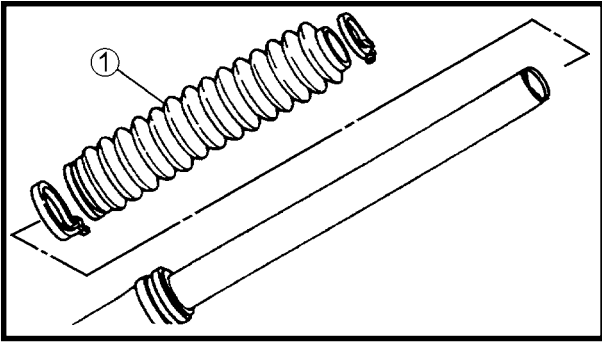
5. Loosen:
  - Screws ① (upper board)
  - Screws ② (lower board)

**⚠ WARNING**

Hold the forks before loosening the board screws.

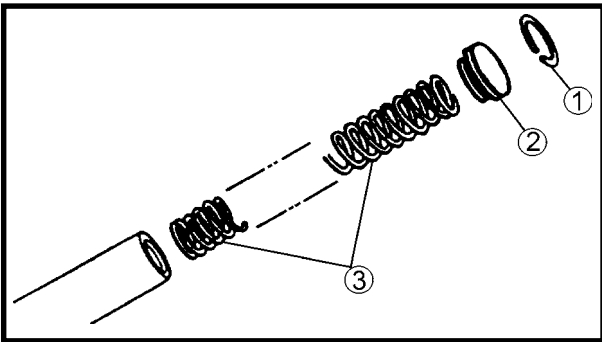


6. Remove:
  - Front forks ①



**DISMOUNTING**

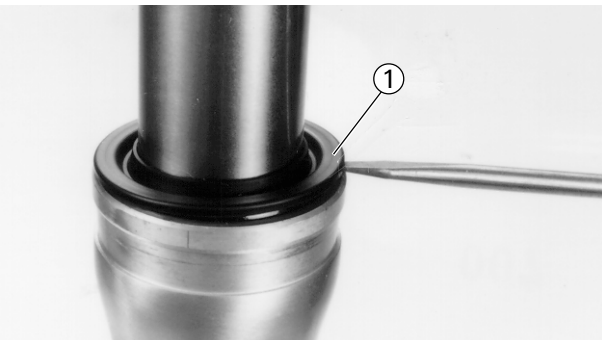
1. Remove:
  - Dust over ①



2. Remove:
  - Lock ring ①
  - Spring seat ②
  - Spring ③

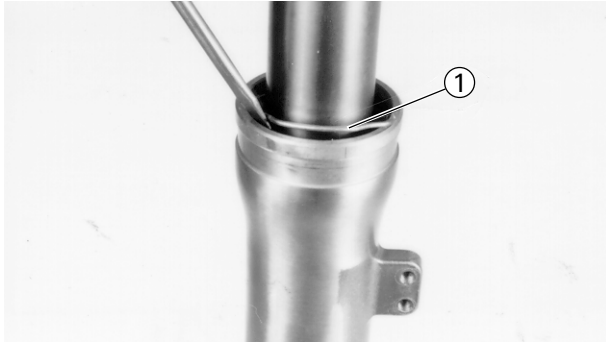
**NOTE:** \_\_\_\_\_  
 Press the spring seat and remove the lock ring. Take care because the part may jump.

3. Drain:
  - Fork oil



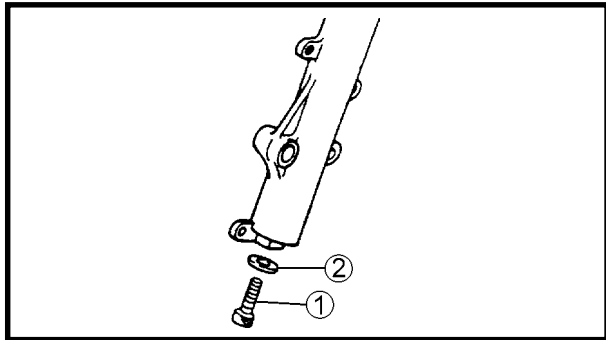
4. Remove:
  - Dust protector ①

**NOTE:** \_\_\_\_\_  
 Use a screwdriver. Take care not to scratch the external tube.

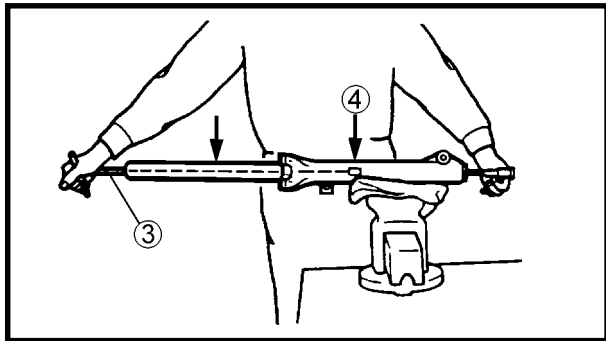


5. Remove:
- Lock ①

**NOTE:** \_\_\_\_\_  
 Use a thin screwdriver. Take care not to scratch the internal tube.  
 \_\_\_\_\_



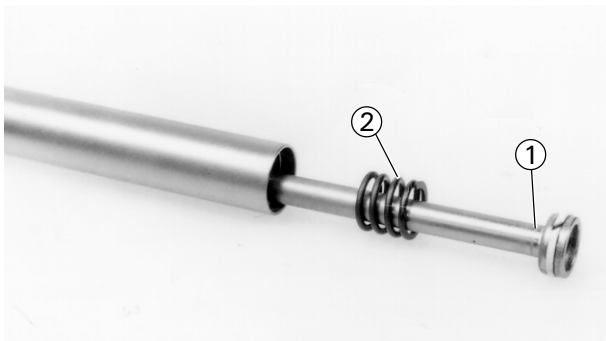
6. Remove:
- Screw ①
  - Washer ②



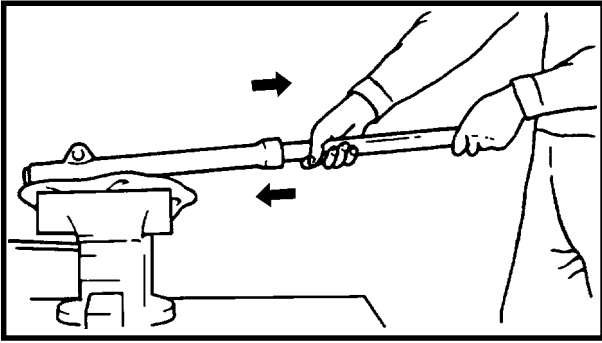
**NOTE:** \_\_\_\_\_  
 Hold the damper stem to loosen the screw (from the damper stem) using the "T" wrench ③ and the fastener ④ .  
 \_\_\_\_\_



"T" wrench:  
 90890-01326  
 Fastener:  
 90890-01294



7. Remove:
- Damper stem ①
  - Return spring ②



8. Remove:
- Internal tube

\*\*\*\*\*

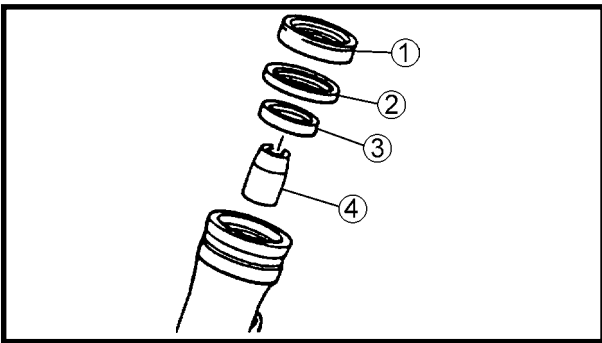
**Removal steps**

- Hold the fork horizontally.
- Fasten the external tube in a bench vise, protecting its surface.
- Carefully, pull the internal tube vigorously.

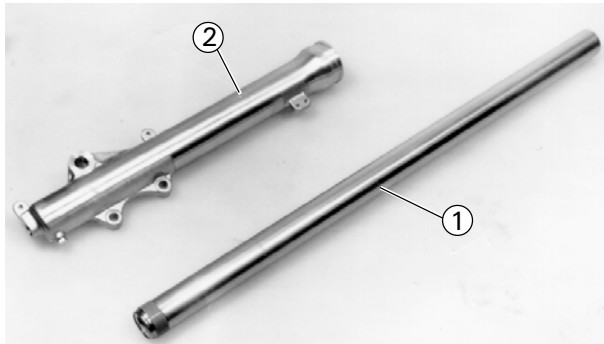
**CAUTION:**

- Excessive force will damage the oil retainer and/or bushings.
- When removing, do not force the internal tube up to the end of stroke, since this may damage the oil retainer.

\*\*\*\*\*



9. Remove:
- Retainer ①
  - Spacer ②
  - Guide bushing ③
  - Oil retainer ④

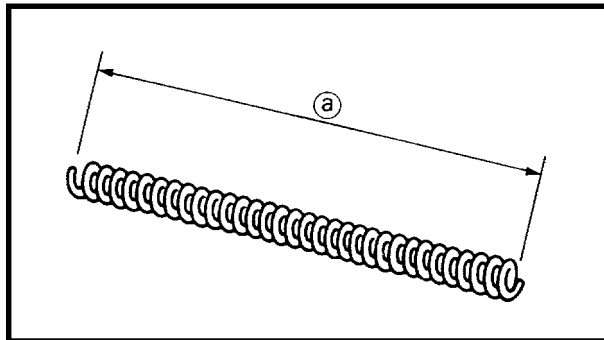


**INSPECTION**

1. Check:
  - Internal tube ①
  - External tube ②
 Scratches/warping/damage => Replace.

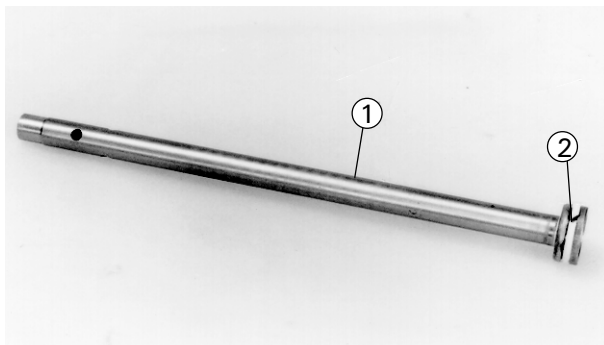
**⚠ WARNING**

**Do not try to straighten out the internal tube, since it may be impaired.**



2. Measure:
  - Spring free length ①
 Out of specification => Replace

**Spring free length ①:  
614.2 mm**



3. Check:
  - Damper stem ①
 Wear/warping/damage => Replace.  
 Contamination => Blow all passages with compressed air.
  - Stem ring ②

**⚠ WARNING**

**Do not try to straighten out the damper stem, since this may impair the tube.**



4. Check:
  - Return spring 1
 Damage => Replace.



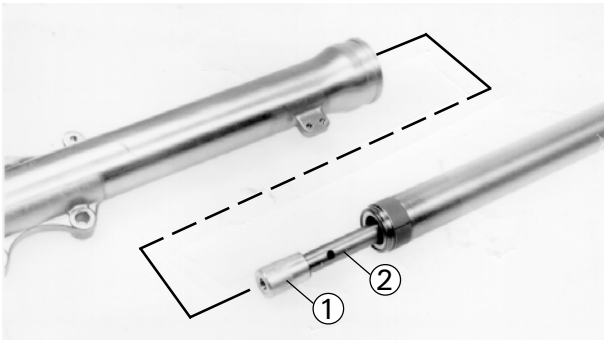
5. Check:
  - Oil retainer ①
  - O-ring ②
 Damage => Replace.

**MOUNTING**

Reverse the "DISMOUNTING" procedures.

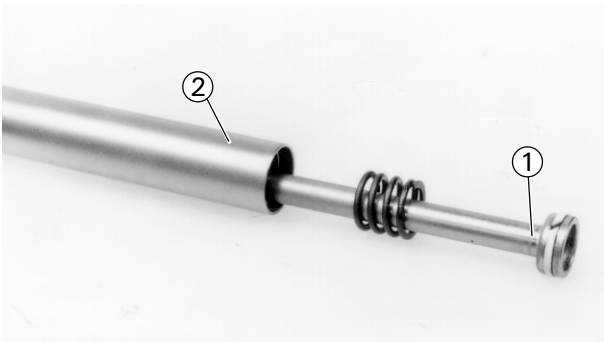
**NOTE:**

- When mounting the front fork, the following new parts should be used:
  - \* Guide bushing
  - \* Retainer
  - \* Dust protector
- Clean all components before mounting.



1. Install:

- Oil retainer ① (on the damper stem ②)



2. Install:

- Damper stem ①

**CAUTION:**

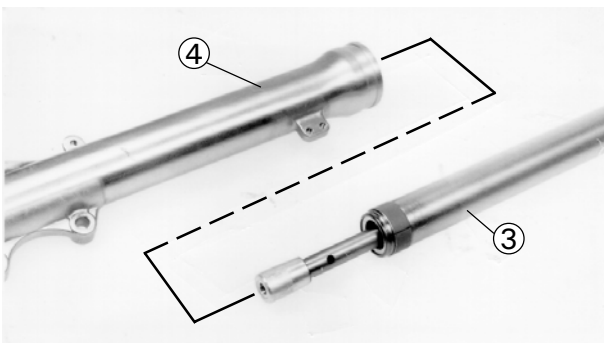
Let the damper stem slide slowly to the end of the internal tube ② .



**Suspension oil 10W or equivalent.**

3. Lubricate:

Internal tube (external surface) ③

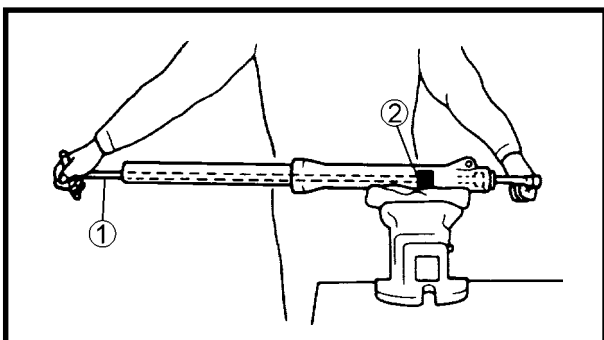


4. Install:

- Internal tube (in the external tube ④)

5. Tighten:

- Screw (damper stem)
- Hold the damper stem, using the "T" wrench ① and the fastener ②.




**"T" wrench:**  
90890-01326  
**Fastener:**  
90890-01294



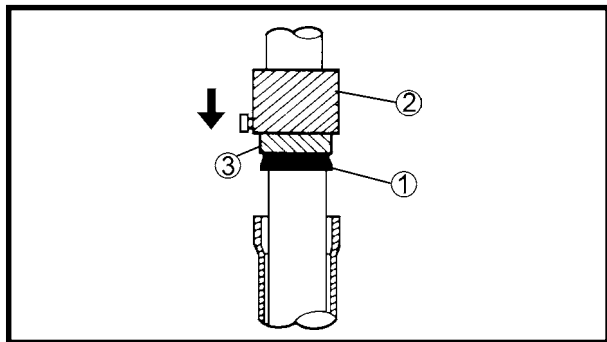
**Screw (damper stem):**  
20 N.m (2.0 kgf.m; 14 ft.lb)  
Use LOCTITE



6. Lubricate:
- Internal tube (external surface) ①

 **Suspension oil 10W or equivalent.**

7. Install:
- Guide bushing ②
  - Spacer ③

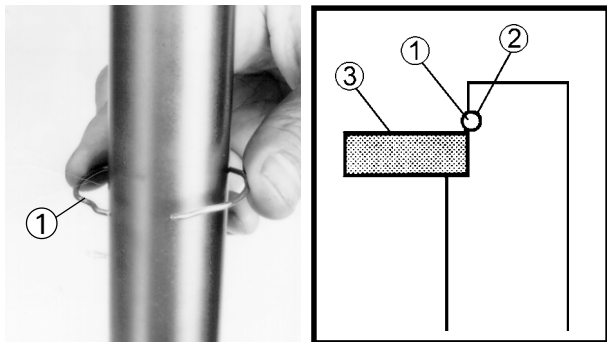


8. Install:
- Retainer ①
- Use the sliding hammer ② and the adapter ③.

 **Sliding hammer:**  
90890-01367  
**Adapter 36 mm:**  
90890-01370

**NOTE:** \_\_\_\_\_  
Before installing the retainer, apply lithium-based grease to the retainer lips.

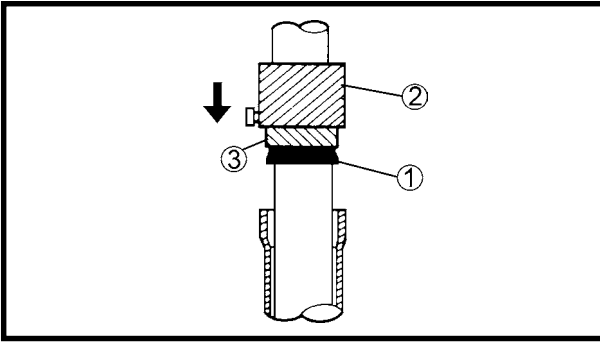
**CAUTION:** \_\_\_\_\_  
Install the retainer with the numbered face up.



9. Install:
- Lock ring ①

**NOTE:** \_\_\_\_\_  
Install the lock ring ① properly in the external tube channel ②.

- Retainer ③



10. Install:

- Dust protector ①

Use the sliding hammer ① and the adapter ①.



Sliding hammer:

90890-01367

Adapter 36 mm:

90890-01370

11. Fill:

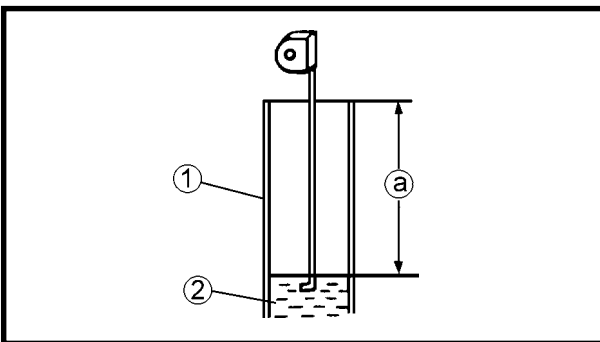
- Front fork



Each fork:

352 ± 10 cc

After filling, pump the fork up and down slowly in order to distribute the oil.



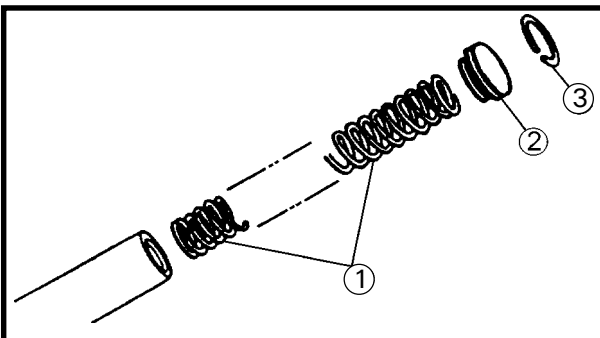
Oil level at:

161 mm

From the top of the internal tube with the external tube totally compressed without spring.

① Internal tube

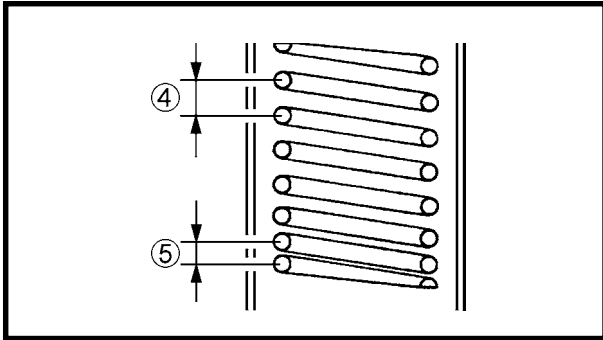
② Oil



12. Install:

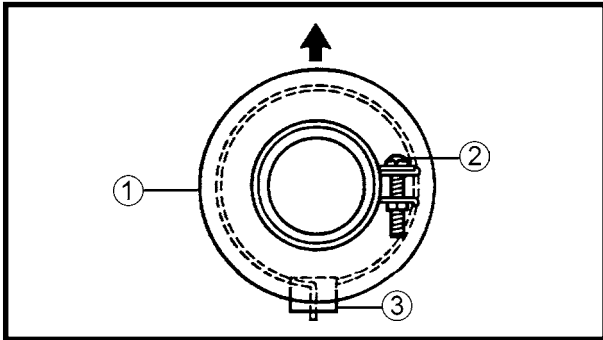
- Spring ①
- Spring seat ②
- Lock ring ③





**NOTE:**

- Install the spring with the longest pitch ④ up. ⑤ shorter pitch.
- Before installing the spring seat, apply grease to the O-ring.
- Compress the spring seat and install the lock ring.



13. Install:

- Dust cover ① (LH)
- Tie wrap ②
- Plastic belt ③

**NOTE:**

Install the tie wrap and the plastic belt as shown in the figure.  
Cut the plastic belt end ③.

**⚠ WARNING**

Always use a new plastic belt.

**INSTALLATION**

Reverse the "REMOVAL" procedure.

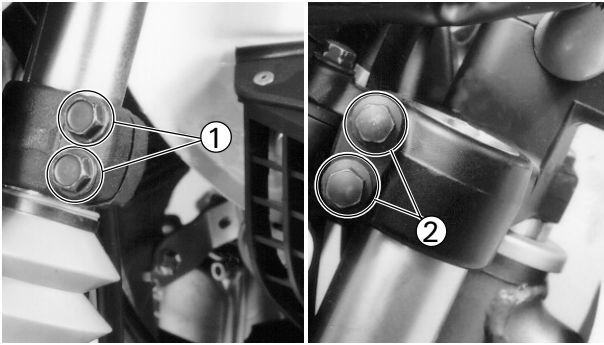
1. Install:

- Front fork
- Tighten the board screws temporarily.



**NOTE:**

Adjust the internal tube flush @ with the top of the upper handle-bars board.

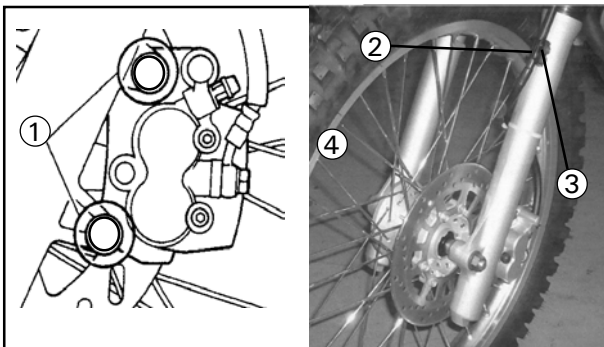


2. Tighten:
- Screws 1 (lower board)
  - Screws 2 (upper board)

|  |  |
|--|--|
|  | <b>Screw (lower board):</b><br>20 N.m (2.0 kg.m; 14 ft.lb) |
|  | <b>Screw (upper board):</b><br>23 N.m (2.3 kg.m; 17 ft.lb) |

3. Install:
- Screws ① (brake caliper)
  - Fastener ② (brake hose)
  - Screws ③ (brake hose fastener)

|  |  |
|--|--|
|  | <b>Screw (brake caliper):</b><br>35 N.m (3.5 kg.m; 25 ft.lb) |
|  | <b>Screw (fastener):</b><br>7 N.m (0.7 kg.m; 5.1 ft.lb)      |



**⚠ WARNING**

Route the hose properly in order to ensure the safe riding.

4. Install:
- Front wheel ④

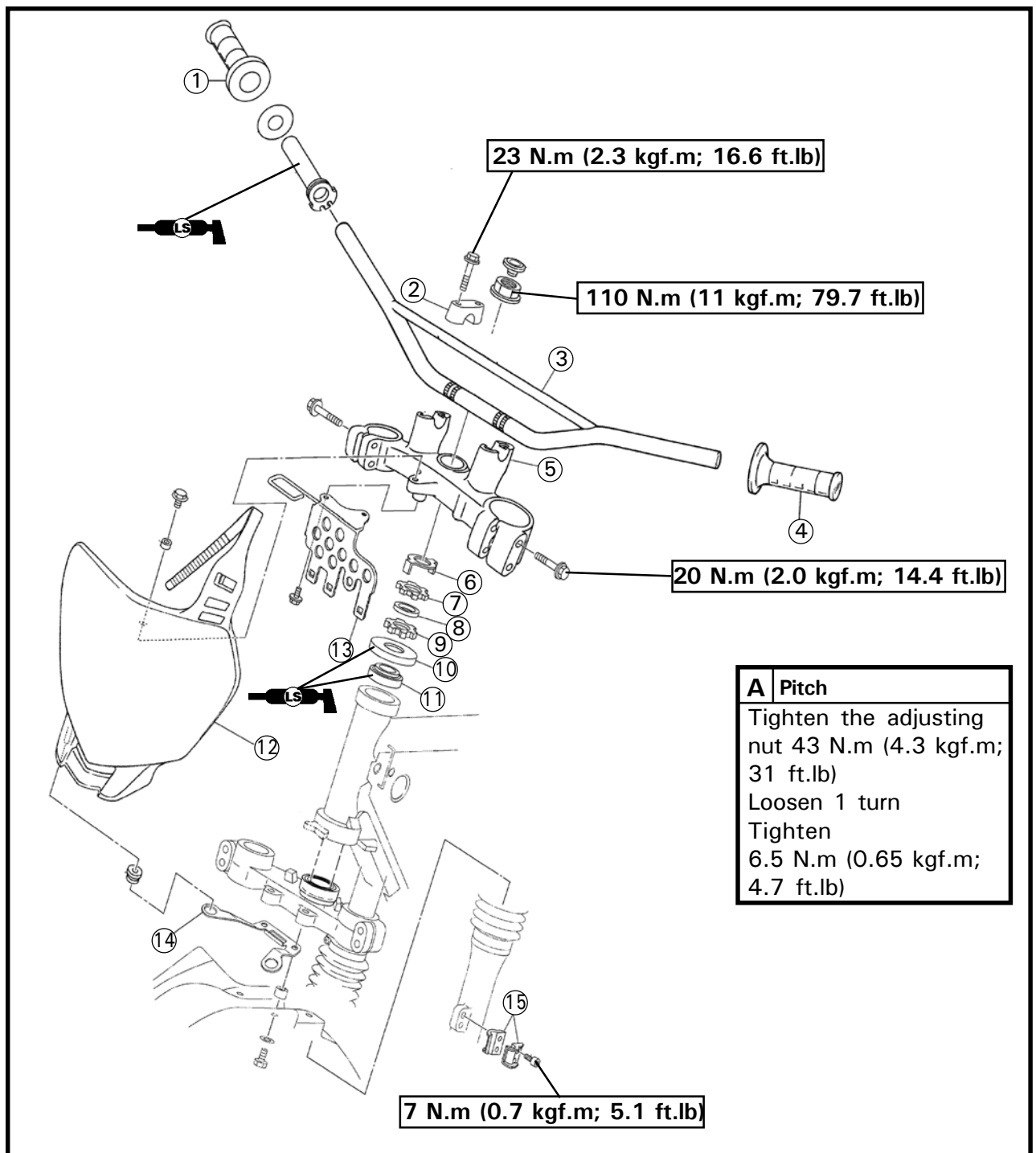
|  |  |
|--|--|
|  | <b>Nut (axle):</b><br>80 N.m (8.0 kgf.m; 58 ft.lb) |
|--|--|

See Section "INSTALLATION - FRONT WHEEL."



## STEERING COLUMN AND HANDLE-BARS

- ① Grip (RH)
- ② Handle-bars fastener
- ③ Handle-bars
- ④ Grip (LH)
- ⑤ Upper board
- ⑥ Lock washer
- ⑦ Adjusting nut
- ⑧ Washer
- ⑨ Ring nut
- ⑩ Bearing cap
- ⑪ Bearing
- ⑫ Fairing
- ⑬ Cable support
- ⑭ Lower support
- ⑮ Brake hose fastener



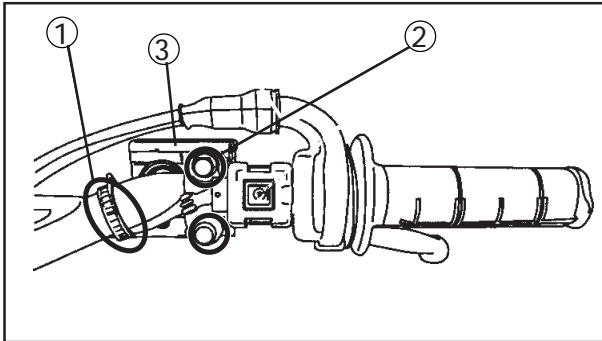
## REMOVAL

### HANDLE-BARS

#### **WARNING**

*Support the motorcycle firmly preventing it from falling.*

1. Place the motorcycle on a flat area.

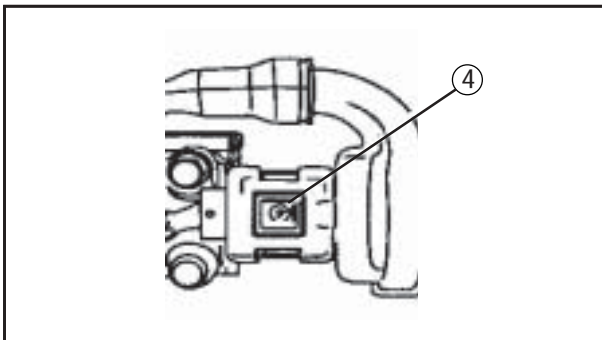


2. Remove::

- Plastic belt 1

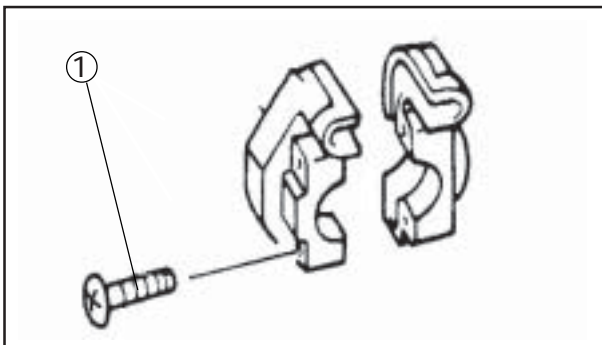
3. Remove:

- Master cylinder screws 2
- Master cylinder 3



4. Remove:

- Starting switch 4 (LD)

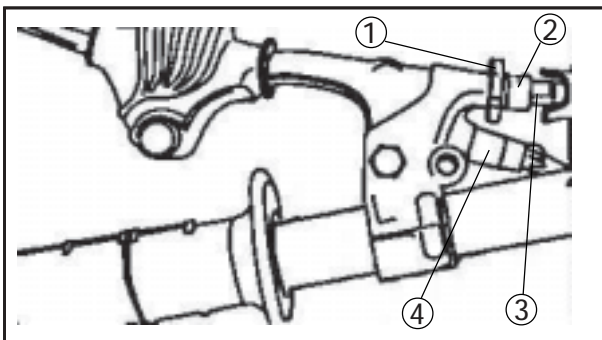


5. Loosen:

- Screws 1 and throttle grip

6. Remove:

- Plastic belt

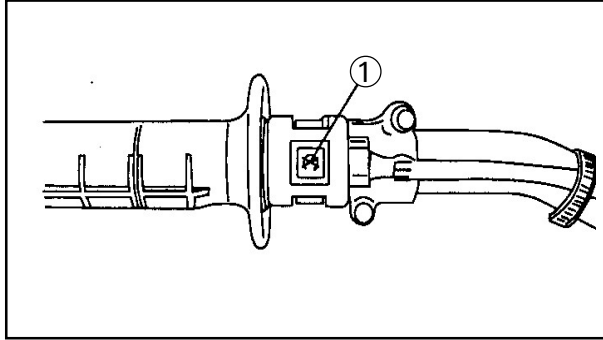


7. Loosen:

- Lock-nut 1 (clutch cable)
- Adjuster 2 (clutch cable)

8. Remove:

- Clutch cable 3
- Clutch switch 4



9. Remove:
- Engine stop switch ①

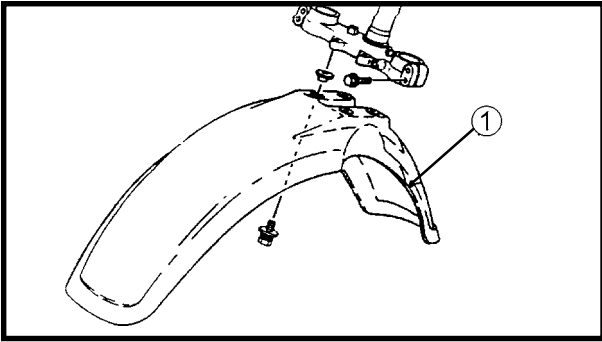
10. Remove:
- Handle-bars
  - Throttle grip

### STEERING COLUMN

#### **WARNING**

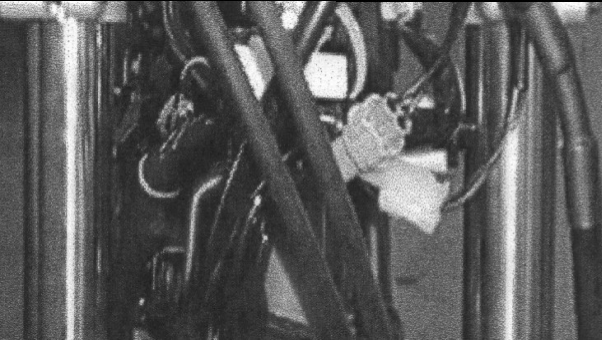
**Support the motorcycle firmly preventing it from falling.**

1. Place the motorcycle on a flat area
2. Lift the front wheel placing a support under the engine.
3. Remove:
  - Handle-bars  
See Section "REMOVAL - HANDLE-BARS."
4. Remove:
  - Fuel tank  
See Section "SEAT, FUEL TANK AND COVERS," CHAPTER 3.
5. Remove:
  - Front wheel  
See Section "REMOVAL - FRONT WHEEL."

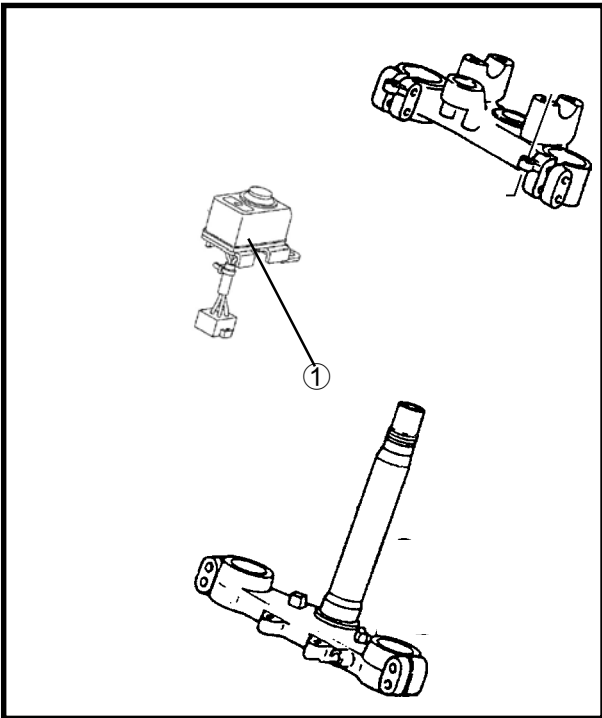


6. Remove:
- Fender ①

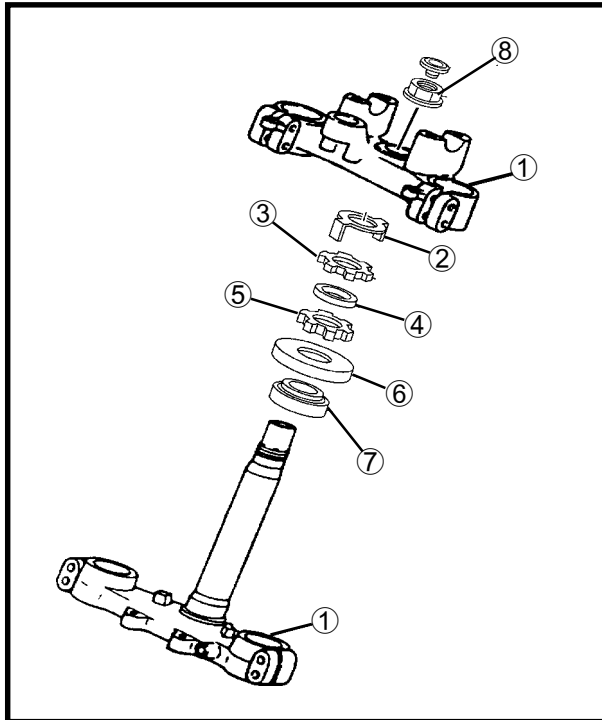
7. Remove:
- Front frock
- See Section "REMOVAL - FRONT FORK."



8. Disconnect:
- Main harness connectors



9. Remove:
- Main switch ①



**NOTE:**

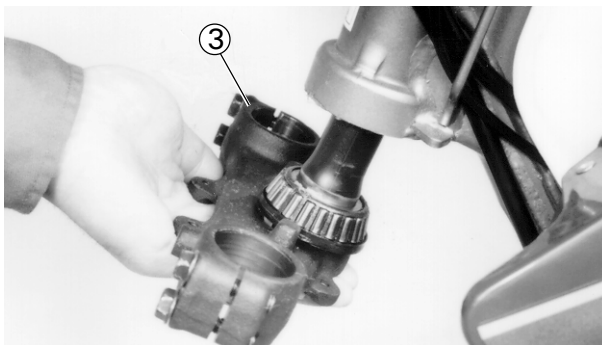
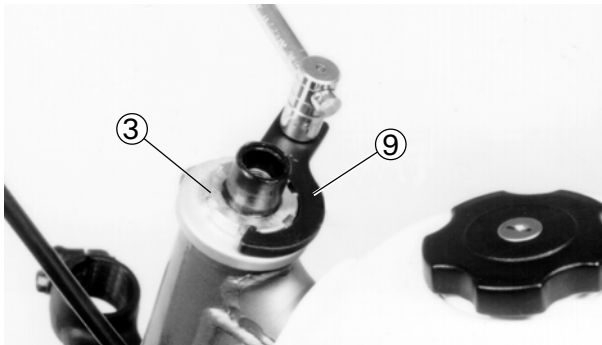
- Loosen the nut ⑧ and remove the upper board ①. Use the special tool ⑨ to remove the ring and adjusting nuts.



**Adjusting nut wrench:  
90890-01403**

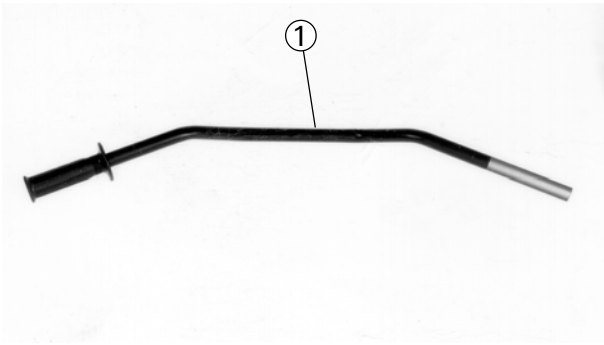
**10. Remove:**

- Lock washer ②
- Adjusting nut ③
- Washer ④
- Ring nut ⑤
- Bearing cap ⑥
- Bearing ⑦



**⚠ WARNING**

Support the lower board ③ preventing it from falling.



## INSPECTION

1. Check:
  - Handle-bars ①Warping/cracks/damage = > Replace.

### **WARNING**

Do not try to straighten out a bent handle-bars, since it may be impaired, resulting in a hazardous condition.

\*\*\*\*\*

#### Replacement steps:

- Remove the grips from the handle-bars.
- Apply a thin layer of rubber glue to the left end of the new handle-bars.
- Install the grips.

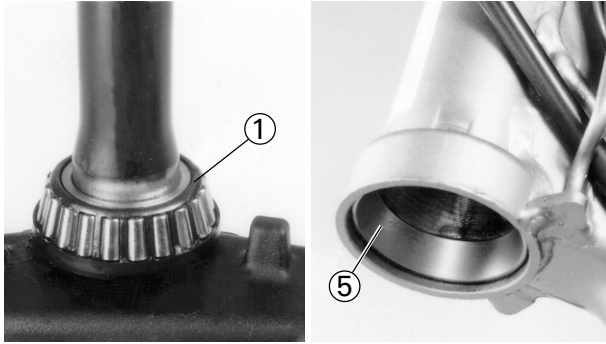
**NOTE:** \_\_\_\_\_  
Remove the excess of glue, using a clean cloth.

### **WARNING**

Do not touch the handle-bars until the glue is sufficiently cured in order to ensure that the grip is firmly in place.

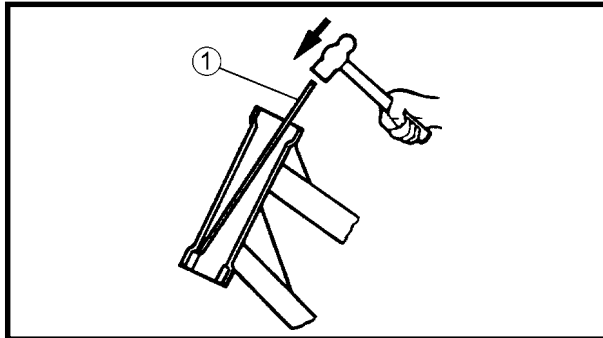
2. Check:
  - Bearing ①Wear/protuberances/damage = > Replace the assembly.





3. Check:

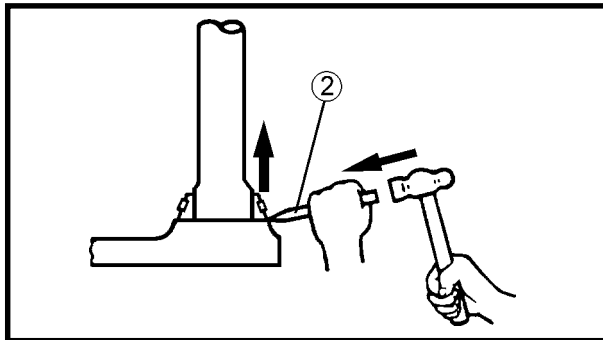
- Bearing (lower) ①  
Damage/protuberances/wear = > Replace the assembly.
- Bearing race (lower) ②  
Damage/protuberances/wear = > Replace the assembly.



\*\*\*\*\*  
**Replacement steps:**

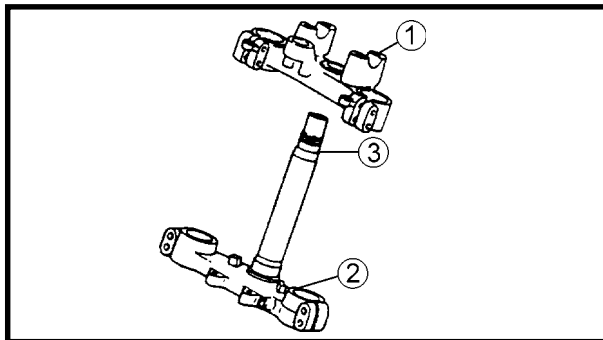
- Remove the bearing races from its fittings on the tube, using a long stem ① and a hammer.
- Remove the bearing race from the lower board, using a chisel ② and a hammer.
- Install the new bearings, races and dust protector.

\*\*\*\*\*



**CAUTION:** \_\_\_\_\_

- Replace bearings, races and dust protectors as an assembly.
- Installing bearings and races inclined may damage the frame. Therefore, install these components horizontally.
- Do not beat balls or bearing faces.



4. Check:

- Upper board ①  
Cracks/damages = > Replace.
- Lower support ②  
Warping/damage => Replace the lower board assembly.
- Steering column ③

**⚠ WARNING** \_\_\_\_\_

Do not try to straighten out the steering column.


**INSTALLATION**

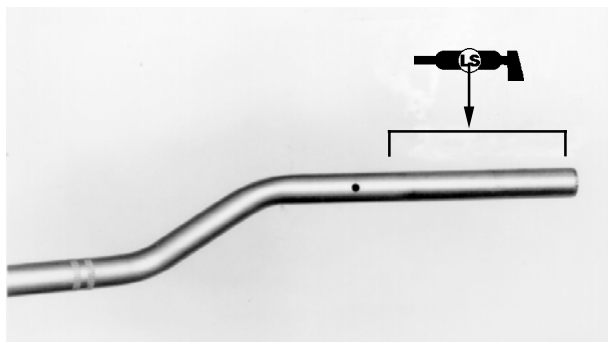
**HANDLE-BARS**

Reverse the "REMOVAL" procedures.

1. Lubricate:

- Handle-bars

|   |                             |
|---|-----------------------------|
|  | <b>Lithium-based grease</b> |
|---|-----------------------------|




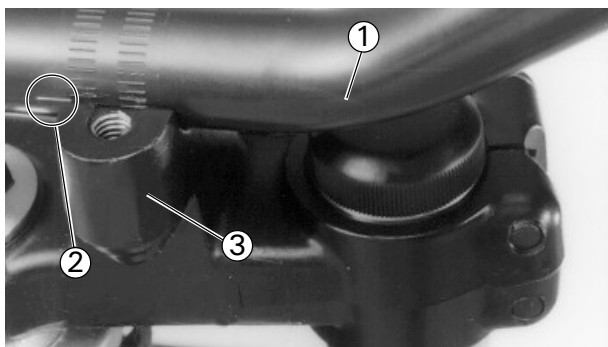
**NOTE:**

Before installing the throttle grip on the handle-bars, apply a thin layer of lithium-based grease to the right end of the handle-bars.

2. Install:

- Throttle grip
- Handle-bars

|   |  |
|---|--|
|  | <b>Screw (handle-bars):<br/>15 N.m (1.5 kgf.m; 11 ft.lb)</b> |
|---|--|

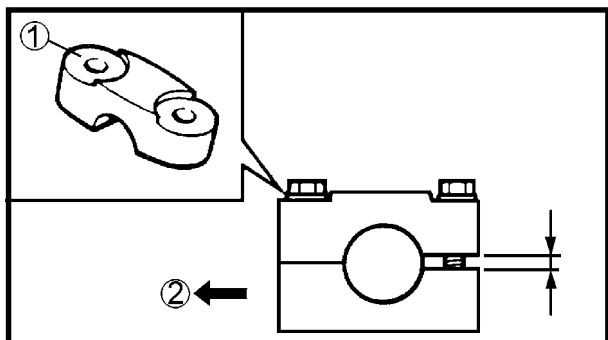


**NOTE:**

Align the mark ② on the handle-bars ① with the upper end of the lower right handle-bars fastener ③ and install the handle-bars.

**NOTE:**

The upper handle-bars fastener should be installed with the punch mark (1) towards the front part.



② Front

**CAUTION:**

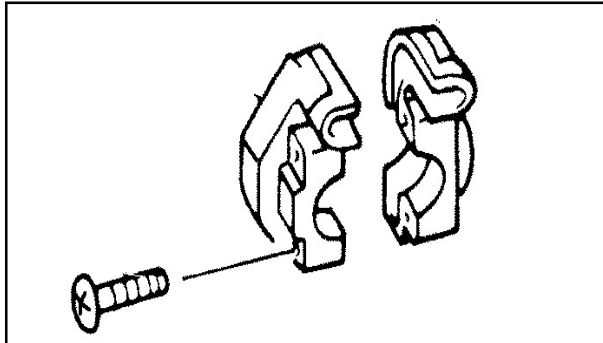
Tighten the front handle-bars fastener screws first and, then, tighten the rear screws.


**3. Install:**

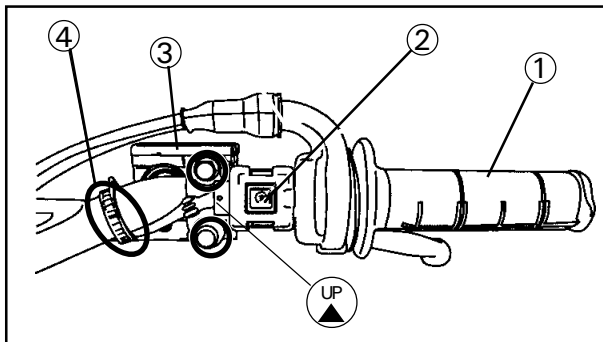
- Engine stop switch (LH)
- Clutch grip fastener
- Clutch cable

**NOTE:**

Apply a thin layer of lithium-based grease to the end of the clutch cable.


**4. Install:**

- Plastic belts
- Throttle case


**5. Install:**

- Throttle grip ①
- Starting switch ②

**NOTE:**

When installing the starting switch make sure it is properly fastened.

**6. Install:**

- Brake master cylinder ③

**NOTE:**

- Install the master cylinder support with the "UP" mark up.
- Tighten the upper screw first.



**Screw (master cylinder support):**  
7 N.m (0.7 kgf.m; 5.1 ft.lb)


**WARNING**

**Screw (master cylinder support):**  
7 N.m (0.7 kgf.m; 5.1 ft.lb)

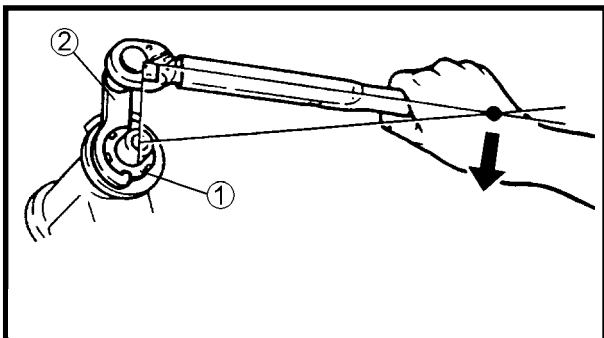
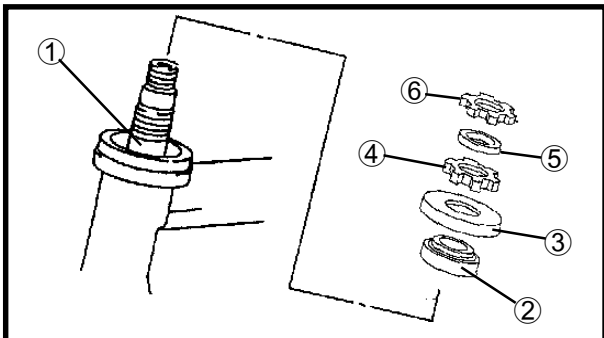
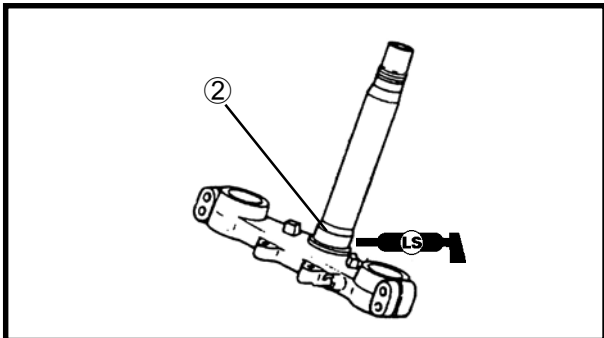
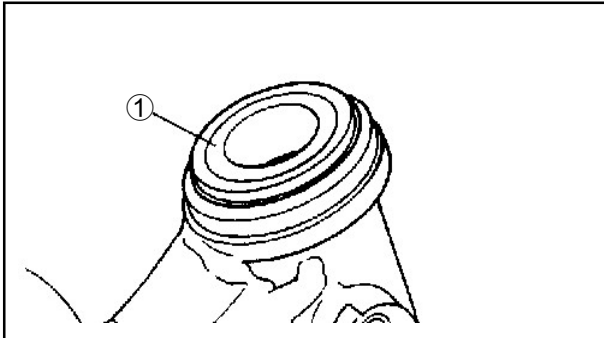
**7. Install:**

- Plastic belts ④

8. Adjust:
- Clutch cable free play

|   |  |
|---|--|
|  | Free play:<br>10 ~ 15 mm at the grip end |
|---|--|

See Section "CLUTCH ADJUSTMENT," CHAPTER 3.



**Steering Column**  
Reverse the "REMOVAL" procedures.

1. Lubricate:
- Lower and upper bearings ①
  - Bearing race ②

|   |                      |
|---|----------------------|
|  | Lithium-based grease |
|---|----------------------|


2. Install:
- Lower board ①
  - Upper bearing ②
  - Bearing cap ③
  - Ring nut ④
  - Washer ⑤
  - Adjusting nut ⑥

3. Tighten:
- Adjusting nut ①


\*\*\*\*\*

**Tightening steps:**


- Tighten the adjusting nut, using the wrench (2).

|   |                                      |
|---|--------------------------------------|
|  | Adjusting nut wrench:<br>90890-01403 |
|---|--------------------------------------|

**NOTE:** \_\_\_\_\_  
 Attach the torquemeter to the adjusting nut wrench, forming a right angle (90°).

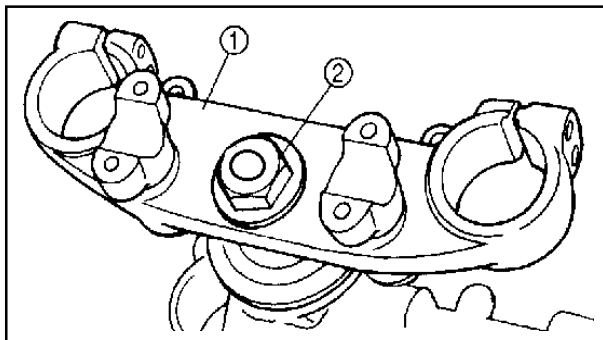
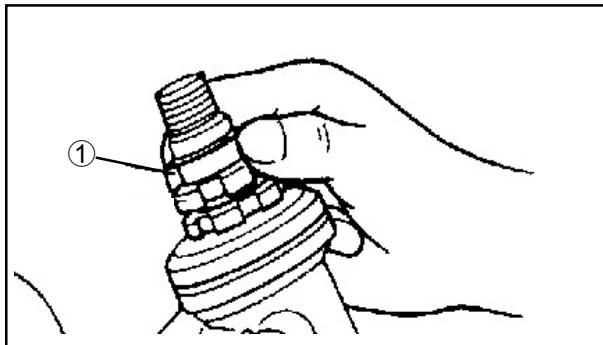
|   |   |
|---|---|
|  | <b>Adjusting nut (initial torque):</b><br><b>43 N.m (4.3 kgf.m; 31.1 ft.lb)</b> |
|---|---|

- Turn the lower board to the right and to the left, making sure there is no irregular movement. Then, loosen the nut one turn.
- Tighten the adjusting nut, using the adjusting nut wrench.

|   |  |
|---|--|
|  | <b>Adjusting nut (final torque):</b><br><b>6.5 N.m (0.65 kgf.m; 4.7 ft.lb)</b> |
|---|--|

**⚠ WARNING** \_\_\_\_\_  
**Do not apply excessive torque.**

**NOTE:** \_\_\_\_\_  
 Check the steering column, turning it from side to side after its adjustment.  
 If the movement is difficult, loosen the adjusting nut. If the movement is loose, repeat the adjustment steps.

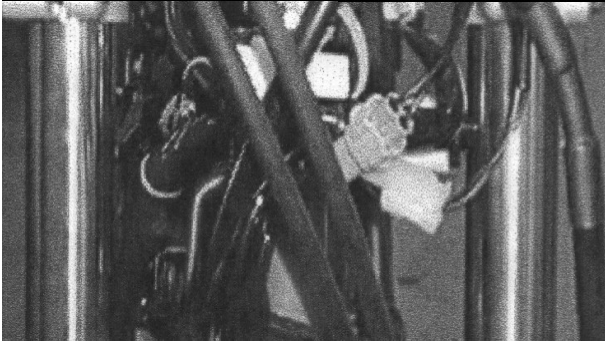


\*\*\*\*\*

4. Install:
- Lock washer ①
  - Upper board ②

**NOTE:** \_\_\_\_\_  
 Tighten the upper board anchor nut ② temporarily.

5. Install:
- Main switch ①

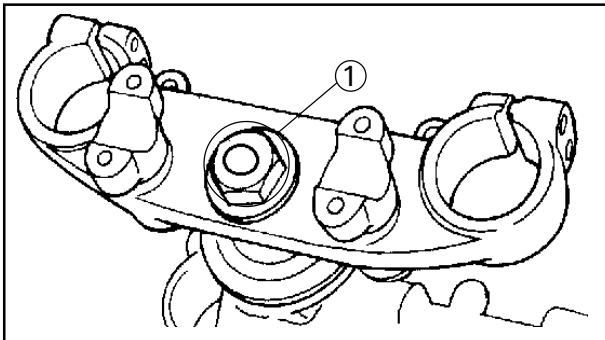


6. Connect:
- Main switch connector


7. Install:
- Front fork

See Section "INSTALLATION - FRONT FORK."

**NOTE:** \_\_\_\_\_  
Tighten the lower and upper board screws temporarily.



8. Tighten
- Upper board anchor nut ①

|   |  |
|---|--|
|  | <b>Upper board anchor nut:</b><br>110 N.m (11 kgf.m; 79.7 ft.lb) |
|---|--|



9. Tighten:

- Lower and upper board screws.



**Screw (lower board):**  
20 N.m (2.0 kgf.m; 14 ft.lb)

**Screw (upper board):**  
20 N.m (2.0 kgf.m; 14.4 ft.lb)

10. Install:

- Brake caliper
- Fastener (brake hose)
- Plastic belt

See Section "INSTALLATION - FRONT FORK."

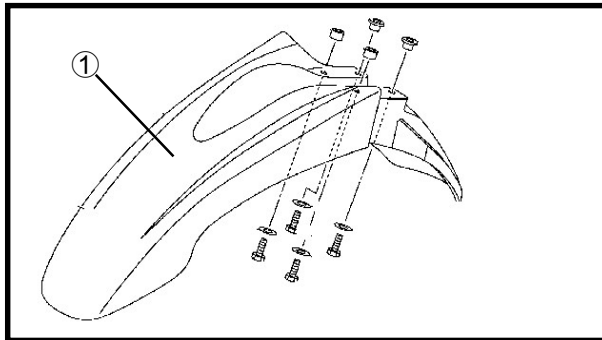


**Screw (brake caliper):**  
40 N.m (4.0 kgf.m; 28.9 ft.lb)

**Screw (fastener):**  
7 N.m (0.7 kgf.m; 5.1 ft.lb)

11. Install:

- Fender ①



**Screws (fender):**  
7 N.m (0.7 kgf.m; 5.0 ft.lb)

12. Install:

- Front wheel

See Section "INSTALLATION - FRONT WHEEL."



**Axle nut:**  
80 N.m (8.0 kgf.m; 57.9 ft.lb)

13. Install:

- Handle-bars

See Section "INSTALLATION - HANDLE-BARS."



**Screw (handle-bars):**  
23 N.m (2.3 kgf.m; 16.6 ft.lb)

**Screw (master cylinder support):**  
7 N.m (0.7 kgf.m; 5.1 ft.lb)

14. Install:

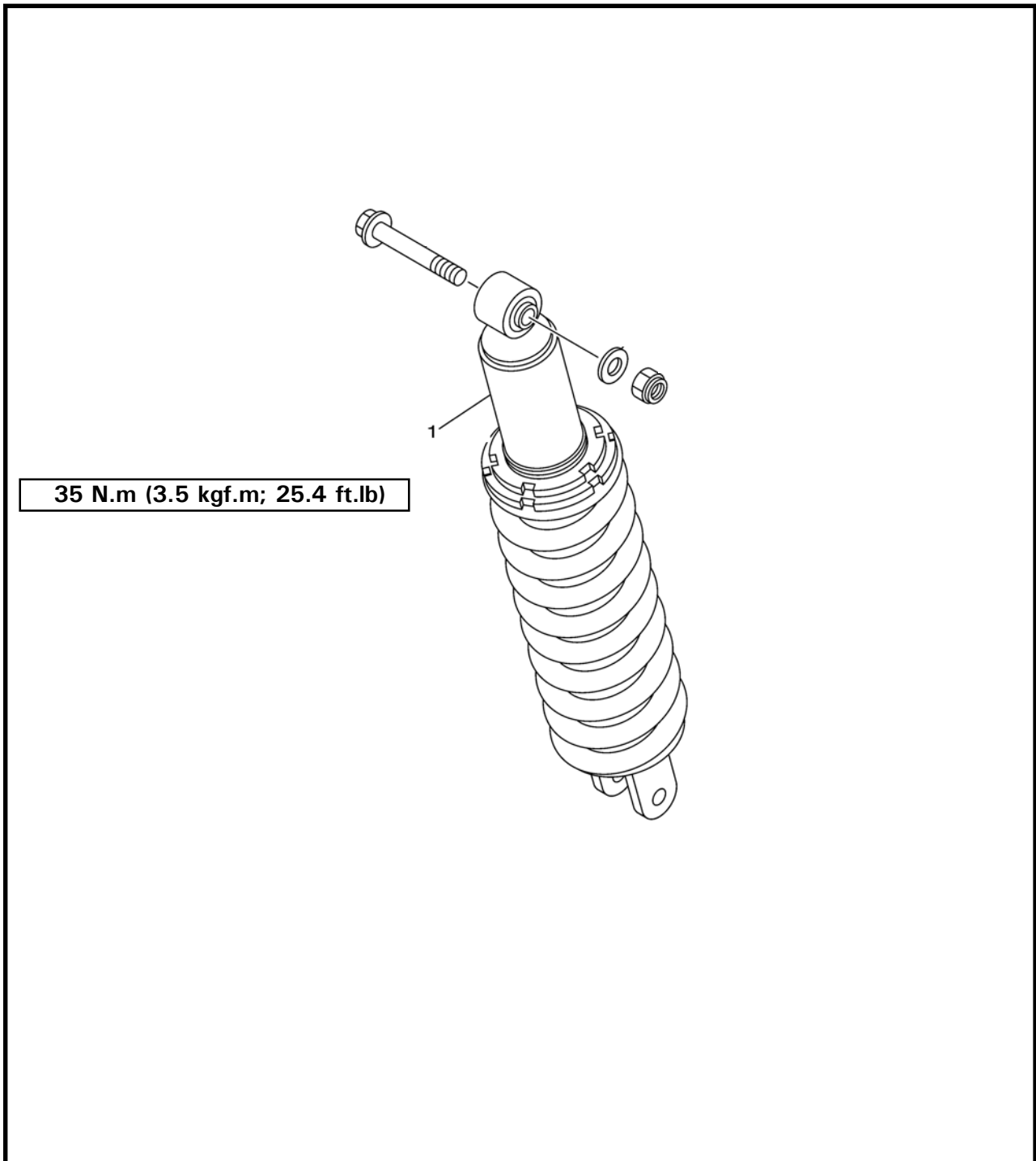
- Fuel tank

See Section "SEAT, FUEL TANK AND COVERS," CHAPTER 3.



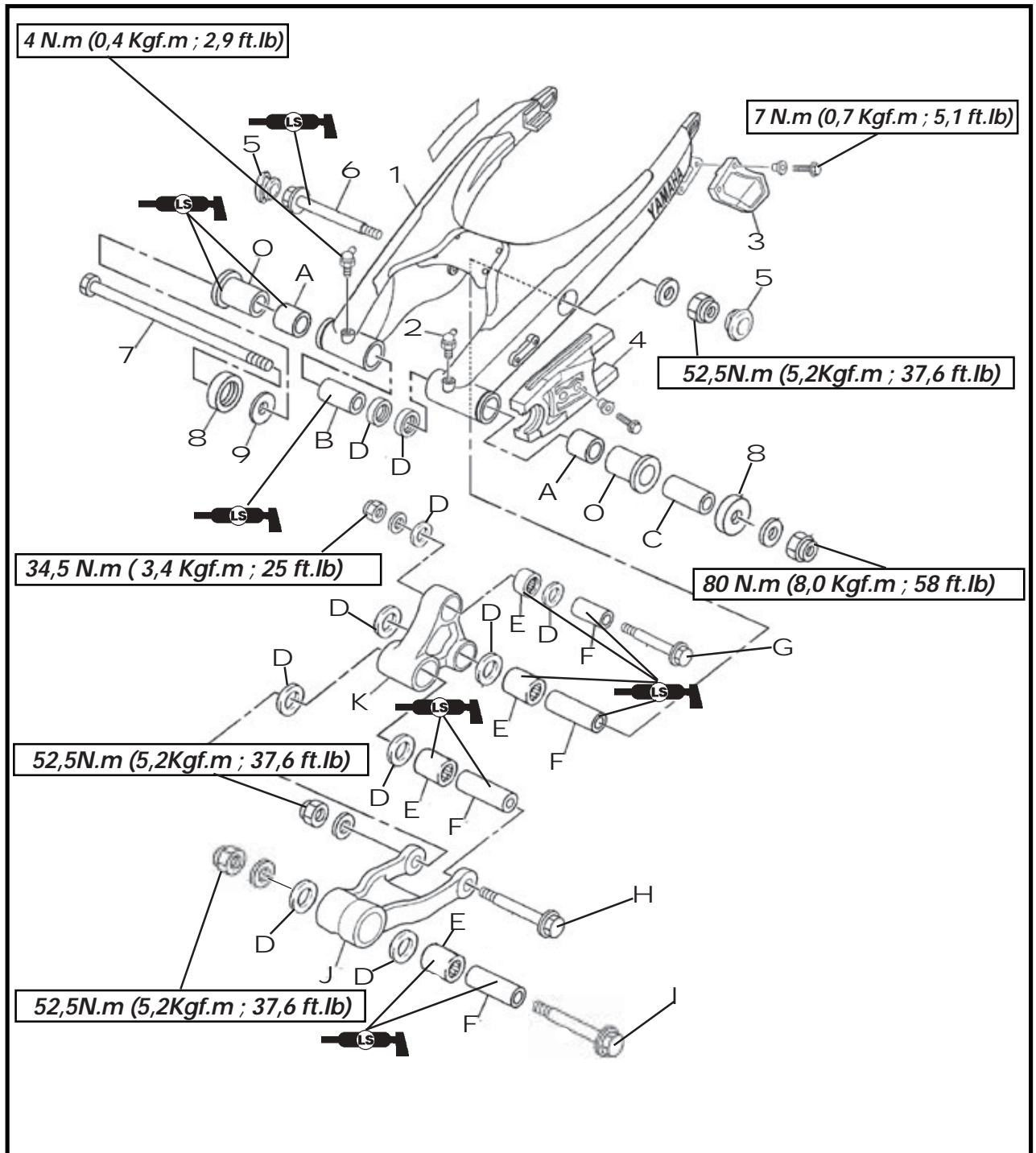
## REAR SHOCK ABSORBER AND BALANCE

- ① Shock absorber





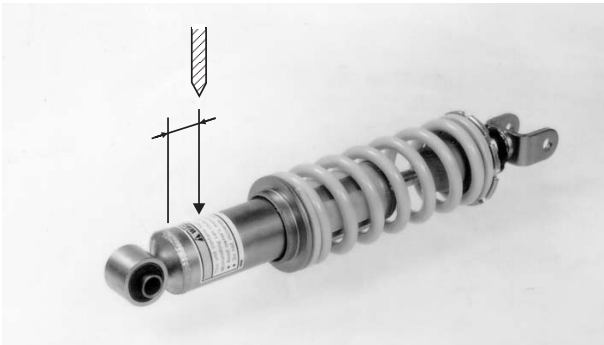
- ① Rear balance
- ② Lubricating screw
- ③ Chain guide
- ④ Chain guard
- ⑤ Dust protector
- ⑥ Hinge shaft
- ⑦ Balance shaft
- ⑧ Stop cap
- ⑨ Shim
- ⑩ Bushing
- ⑪ Bushing
- ⑫ Spacer
- ⑬ Spacer
- ⑭ Retainer
- ⑮ Bearing
- ⑯ Spacer
- ⑰ Screw (shock absorber - relay arm)
- ⑱ Screw (relay arm connection - relay arm)
- ⑲ Screw (frame - relay arm)
- ⑳ Relay arm connection
- ㉑ Relay arm



NOTES ON HANDLING

**⚠ WARNING**

- This shock absorber contains nitrogen gas at high pressure. Read and understand the following information before handling. The manufacturer assumes no liability for injuries or damage resulting from mishandling.
- Do not try to pierce or open the shock absorber assembly.
- Do not subject the shock absorber to flames or other high temperature sources, since this may result in explosion of the unit due to excessive gas pressure.
- Do not deform or damage the cylinder in any way. Damage to the cylinder will result in poor performance of the shock absorber.
- When discarding the shock absorber, observe the following instructions in Section "NOTES ON DISCARDING."



NOTES ON DISCARDING

\*\*\*\*\*

**Shock absorber discarding steps:**

- Before discarding the shock absorber, exhaust the nitrogen. Drill a 2 ~ 3 mm hole on the gas chamber at 15 ~ 20 mm from the gas chamber end.

**⚠ WARNING**

Use goggles in order to protect the eyes against the gas and drilling chips.

\*\*\*\*\*

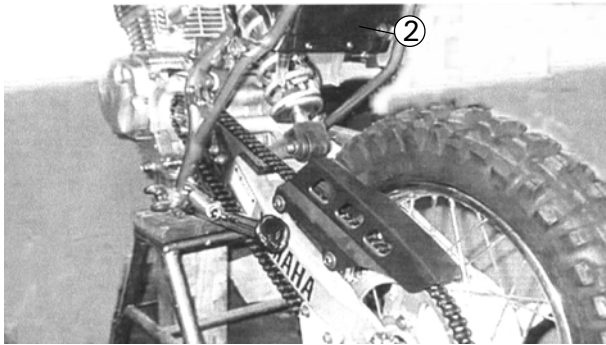
## REMOVAL

### Shock Absorber

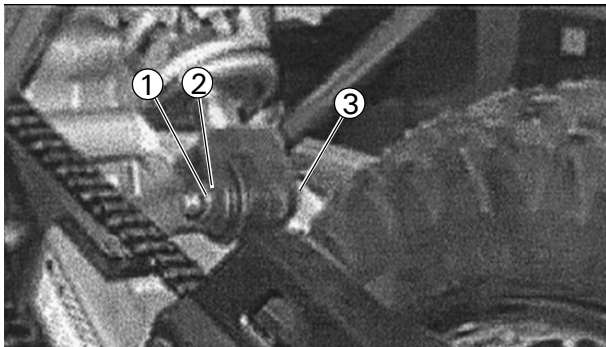
#### WARNING

Support the motorcycle firmly preventing it from falling.

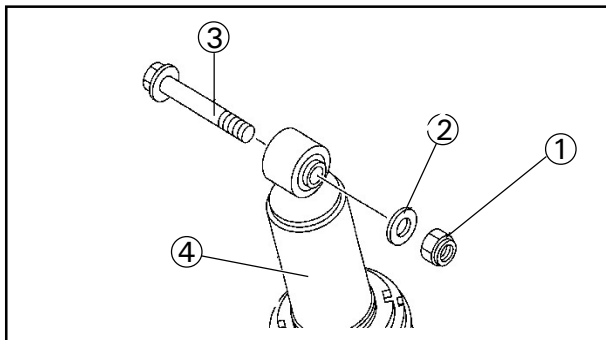
1. Place the motorcycle on a flat area.
2. Remove:
  - LH side cover
  - Seat
 See Section "SEAT, FUEL TANK AND COVERS," CHAPTER 3.
3. Lift the rear wheel placing a support under the engine.



4. Remove:
  - Air filter box 2



5. Remove:
  - Lower nut ①
  - Washer ②
  - Lower screw ③



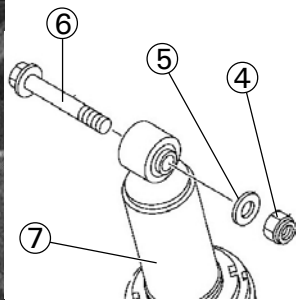
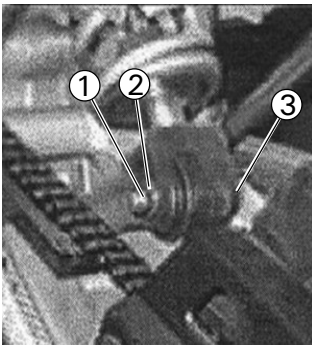
6. Remove:
  - Upper nut ①
  - Washer ②
  - Upper screw ③
  - Shock absorber ④

## REAR BALANCE

### **WARNING**

**Support the motorcycle firmly preventing it from falling.**

1. Place the motorcycle on a flat area.
2. Lift the rear wheel placing a support under the engine.
3. Remove:
  - LH side cover
  - Seat
  - Air filter box
 See Section "SEAT, FUEL TANK AND COVERS," CHAPTER 3.

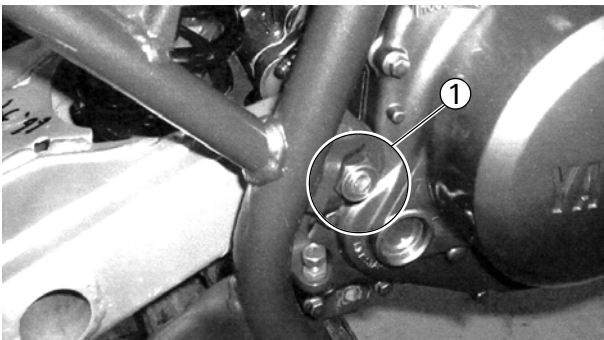


4. Remove:
 

Rear shock absorber

  - Lower nut ①
  - Washer ②
  - Lower screw ③
  - Upper nut ④
  - Washer ⑤
  - Upper screw ⑥
  - Rear shock absorber ⑦

5. Remove:
  - Rear wheel
 See Section "REMOVAL - REAR WHEEL."




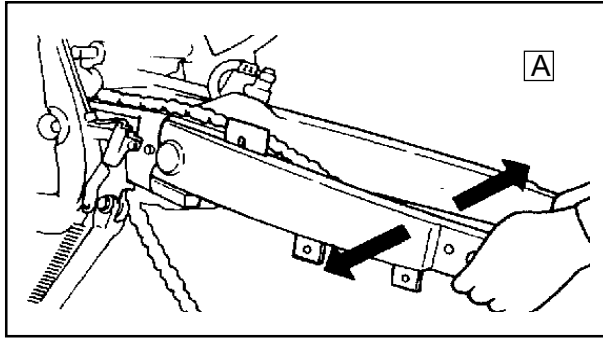
6. Check:
  - Rear balance free play

\*\*\*\*\*

**Check steps:**

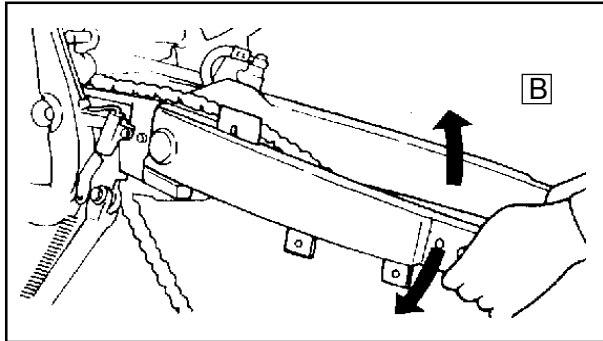
  - Check the torque at the rear balance shaft end ①.

|   |   |
|---|---|
|  | <p><b>Nut:</b><br/> <b>80 N.m (8.0 kgf.m; 58 ft.lb)</b></p> |
|---|---|



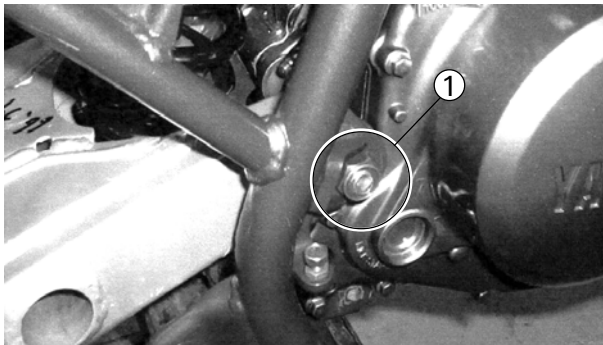
- Check the side free play **A**, moving the balance from side to side.
- While checking the free play, verify the internal spacer, bearing, washer and stop cap.

 **Side free play:**  
**Limit: 1.0 mm**



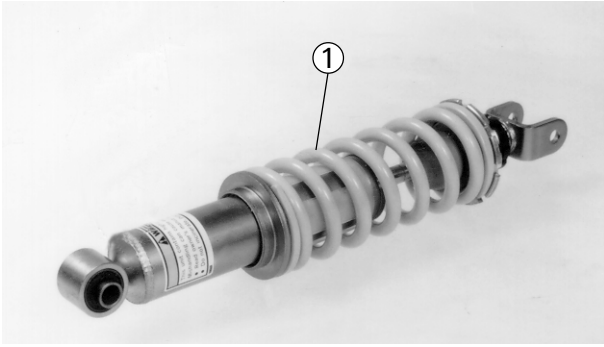
- Check the vertical displacement **B** of the rear balance, moving it up and down. In case of irregular movement, check the internal spacer, bearing, washer and stop cap.

\*\*\*\*\*



7. Remove:
- Nut **1**
  - Balance shaft
  - Dust protector
  - Hinge shaft

8. Remove:
- Relay arm
  - Relay arm connection



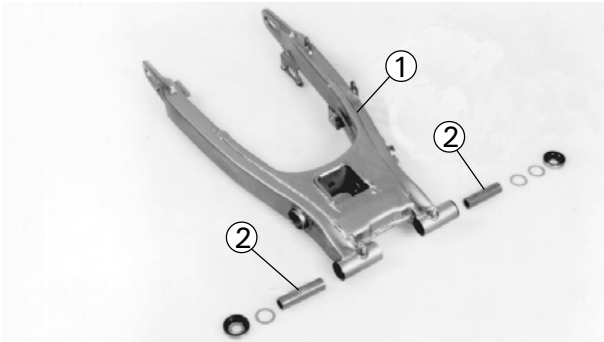
## INSPECTION

### 1. Check:

- Shock absorber ①
- Leakage/damage = > Replace.

### **⚠ WARNING**

**This shock absorber contains nitrogen gas at high pressure. Do not disassemble the shock absorber.**



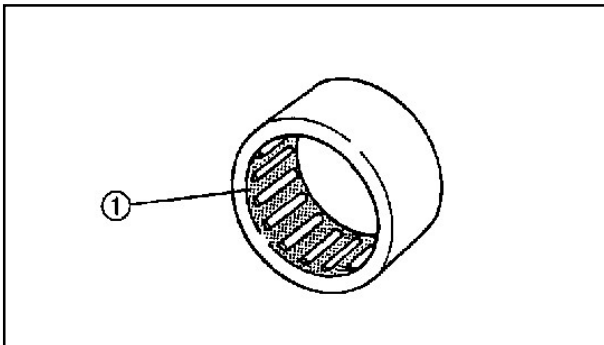
### 2. Check:

- Rear balance ①
- Warping/cracks/damage = > Replace.
  - Spacers ②
  - Bushings
  - Shims

Wear/damage = > Replace.

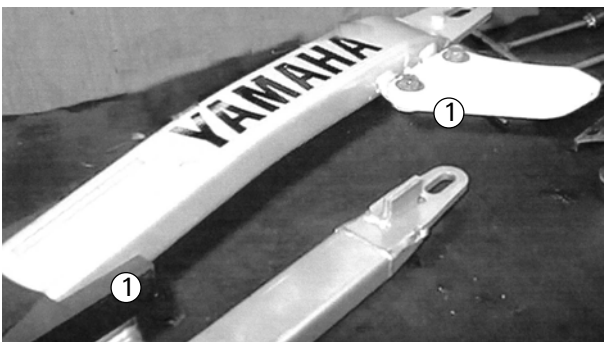
### 3. Check:

- Relay arm
  - Relay arm connection
- Warping/cracks/damage = > Replace.
- Dust protector
- Wear/damage = > Replace.



### 4. Check:

- Stop cap
  - Retainer
  - Washers
  - Spacers
  - Bearings ①
- Wear/damage/scratches = > Replace.



### 5. Check:

- Chain guide ①
- Chain guard ②
- Damage/cracks = > Replace.



## INSTALLATION

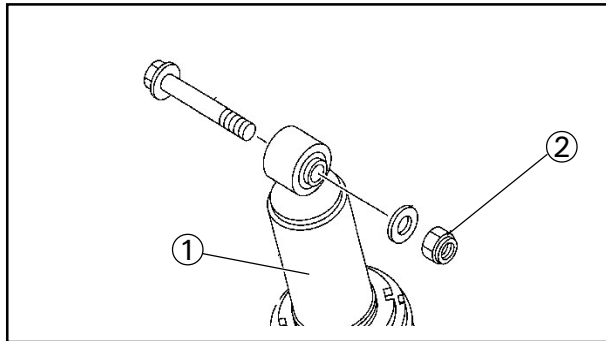
### Shock Absorber

Reverse the "REMOVAL" procedures.

1. Lubricate:

- Bushing (internal surface)

|  |                             |
|--|-----------------------------|
|  | <b>Lithium-based grease</b> |
|--|-----------------------------|



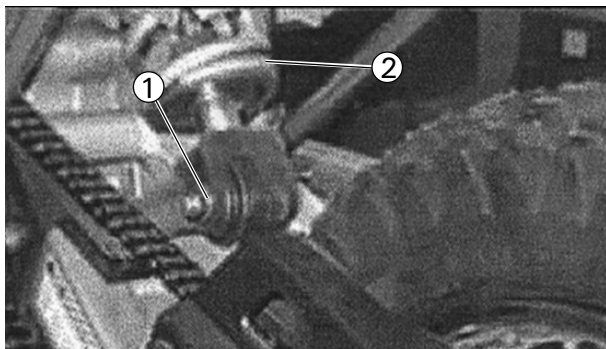
2. Install:

- Shock absorber ① (upper part)

3. Tighten:

- Nut ②

|  |   |
|--|---|
|  | <b>Nut ② (upper part):</b><br><b>34.5 N.m (3.4 kgf.m; 25 ft.lb)</b> |
|--|---|



4. Install:

- Shock absorber ① (lower part)

5. Tighten:

- Nut ②

|  |   |
|--|---|
|  | <b>Nut ② (lower part):</b><br><b>34.5 N.m (3.4 kgf.m; 25 ft.lb)</b> |
|--|---|

6. Install:

- Air filter box
- Seat
- LH side cover



## Rear Balance

Reverse the "REMOVAL" procedure.

1. Lubricate

- Retainer
- Bearings
- Stop caps (inside)
- Spacers
- Shafts
- Hinges



**Lithium-based grease**

2. Tighten:

- Nut (connection arm - relay arm)



**Nut:**  
**52.5 N.m (5.2 kgf.m; 25 ft.lb)**

3. Tighten:

- Nut (balance - relay arm)



**Nut:**  
**52 N.m (5.2 kgf.m; 37.6 ft.lb)**

4. Install:

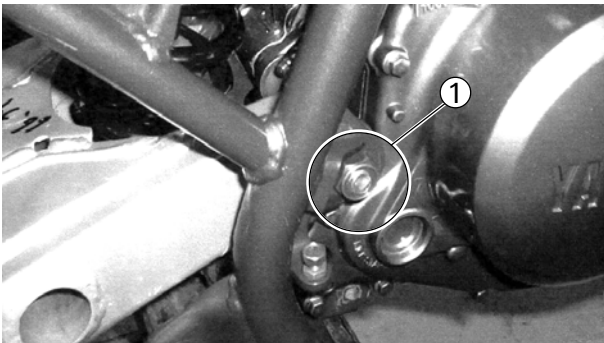
- Rubber caps

5. Tighten:

- Balance shaft 1



**Nut 1:**  
**80 N.m (8.0 kgf.m; 48 ft.lb)**



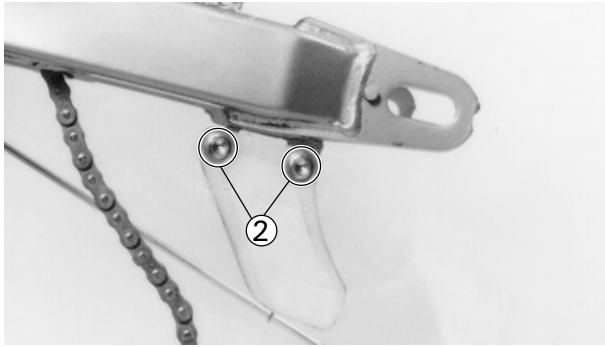
6. Tighten:

- Nut (frame - relay arm connection)



**Nut:**  
**52 N.m (5.2 kgf.m; 37.6 ft.lb)**





7. Tighten:

- Bolt ① (chain guide)



**Bolt ①:**

**7 N.m (0.7 kgf.m; 5.0 ft.lb)**

8. Install:

- Shock absorber  
See Section "REAR SHOCK ABSORBER."

9. Install:

- Rear wheel  
See Section "REAR WHEEL."

10. Adjust:

- Transmission chain free play  
See Section "TRANSMISSION CHAIN FREE PLAY ADJUSTMENT," CHAPTER 3.



**Transmission chain free play:**

**45 ~ 60 mm**

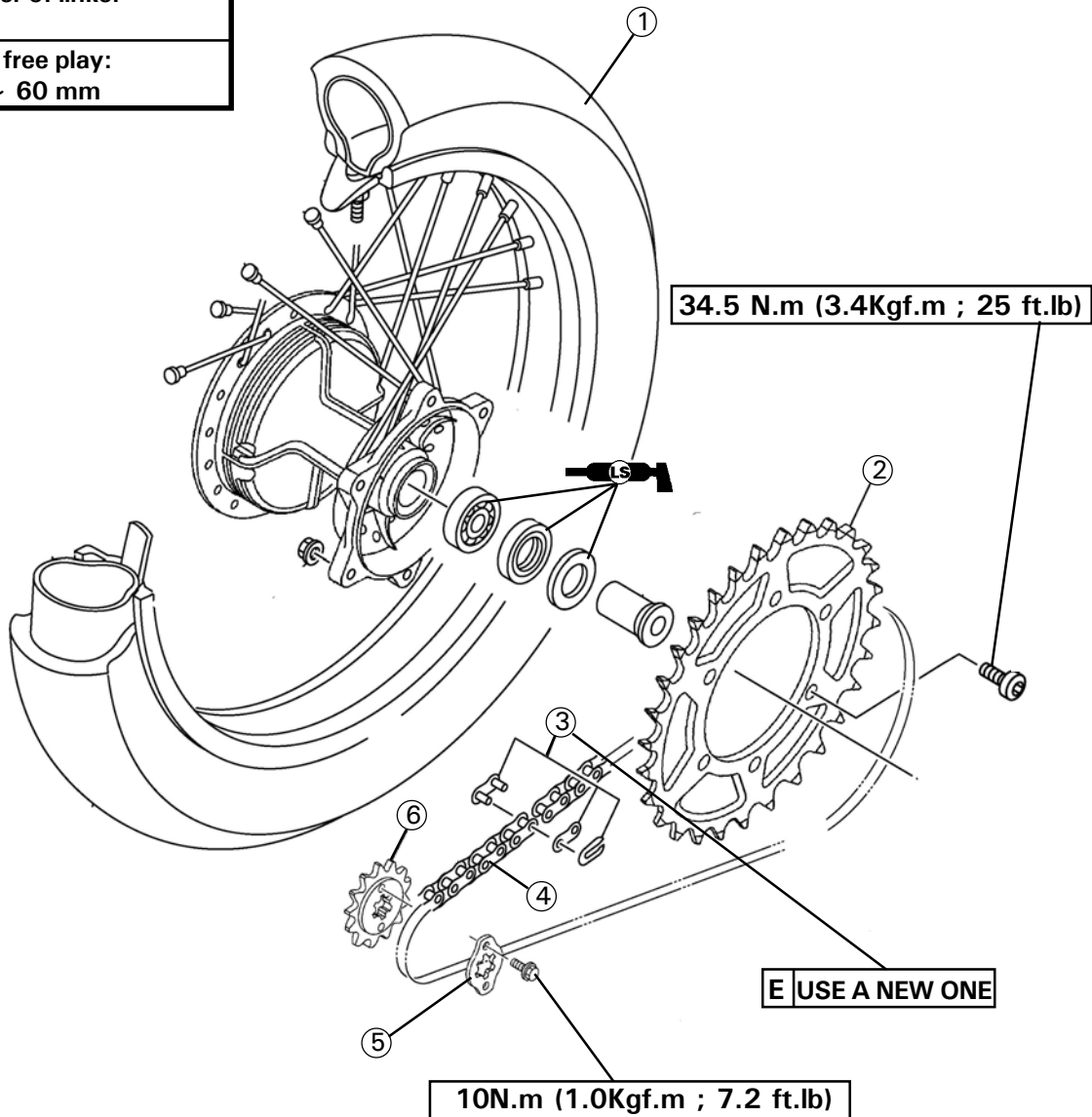
11. Install:

- Air filter box
  - LH side cover
  - Seat
- See Section "SEAT, FUEL TANK AND COVERS," CHAPTER 3.

TRANSMISSION RATIO

- ① Rear wheel
- ② Sprocket
- ③ Chain seam
- ④ Transmission chain
- ⑤ Pinion gear fastener
- ⑥ Pinion gear

|          |                                |
|----------|--------------------------------|
| <b>A</b> | Transmission chain             |
| <b>B</b> | Type:<br>520V2                 |
| <b>C</b> | Number of links:<br>106        |
| <b>D</b> | Chain free play:<br>45 ~ 60 mm |





**NOTE:** \_\_\_\_\_  
 Before removing the transmission chain and gears, measure the transmission chain free play.  
 \_\_\_\_\_

## REMOVAL

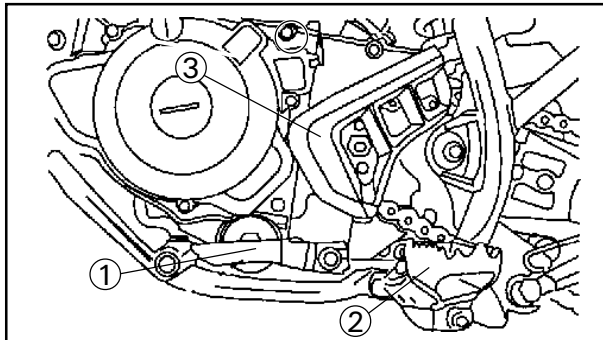
1. Lift the rear wheel placing a support under the engine.

### **A** WARNING

Support the motorcycle firmly preventing it from falling.  
 \_\_\_\_\_

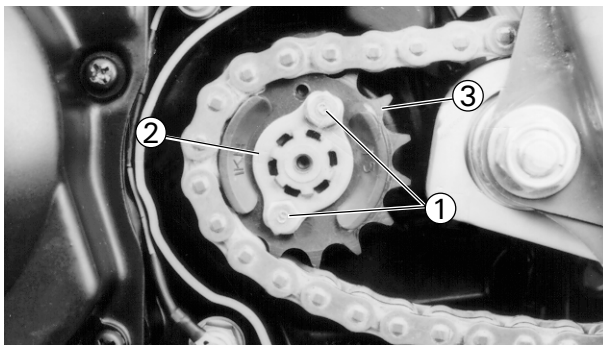
2. Remove:

- Shift lever ①
- Pinion gear cover ③



3. Loosen:

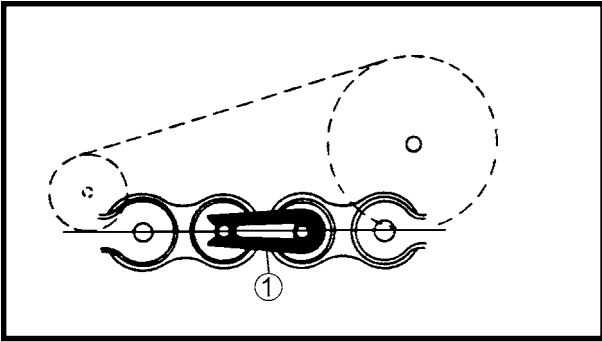
- Transmission chain



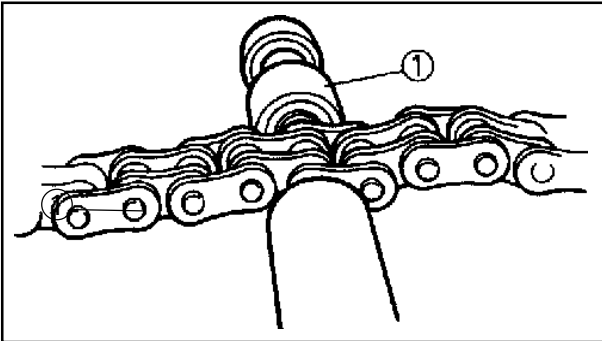
4. Remove:

- Screws ① (pinion gear)
- Pinion gear fastener ②
- Pinion gear ③

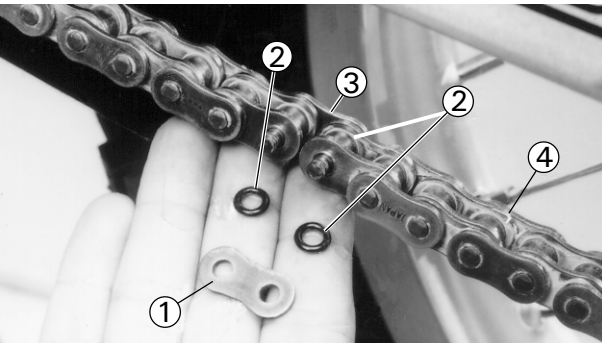
**NOTE:** \_\_\_\_\_  
 Loosen the screw (pinion gear) while actuating the rear brake.  
 \_\_\_\_\_



5. Remove:
- Chain seam lock ①



6. Remove:
- Chain seam
- Use the chain pin puller ①.

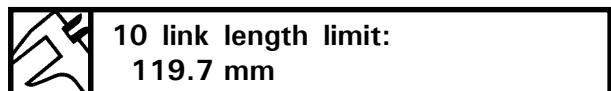


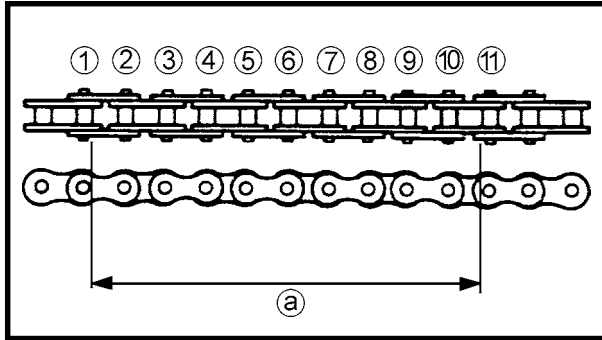
7. Remove:
- Link plate ①
  - O-ring ②
  - Seam ③
  - Transmission chain ④

8. Remove:
- Rear wheel

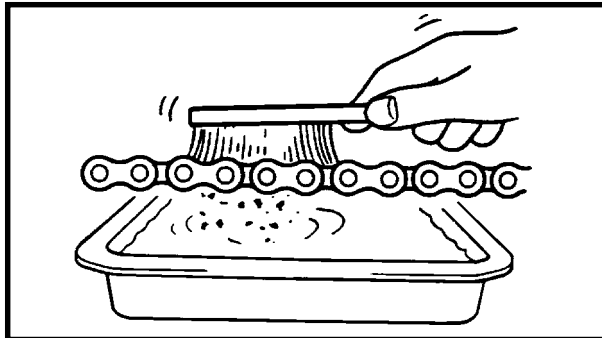
## INSPECTION

1. Measure:
- 10 link length @
- Out of specification = > Replace the chain.



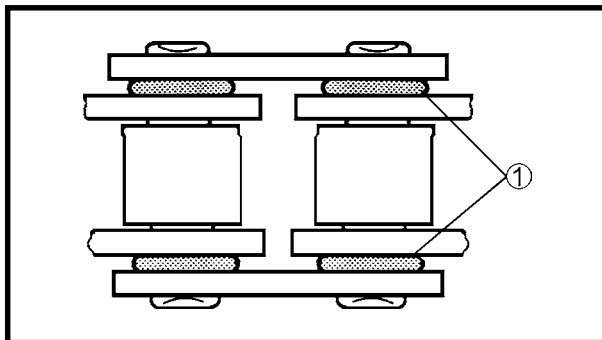

**NOTE:**

- Pull the chain manually in order to measure it.
- The measurement **a** of the 10 links should be taken between the internal rollers ① to (11).
- Measure the 10 links at two or three different positions.


**2. Clean:**

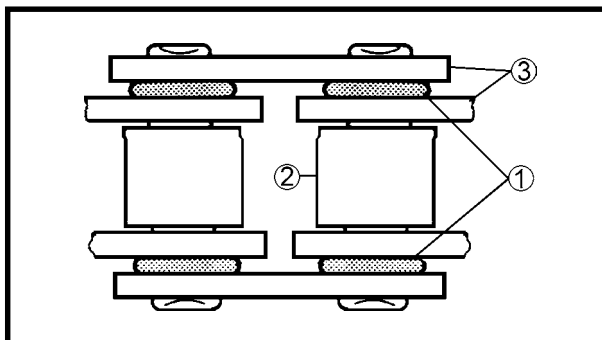
- Transmission chain

Plunge the chain in kerosene and brush it, removing the dirt. Then, dry the chain.


**CAUTION:**

This motorcycle is equipped with a transmission chain with small rubber O-rings (1) between its plates.

Cleaning with steam, high-pressure jets and some solvents may damage these rings. Use only kerosene to clean the chain.

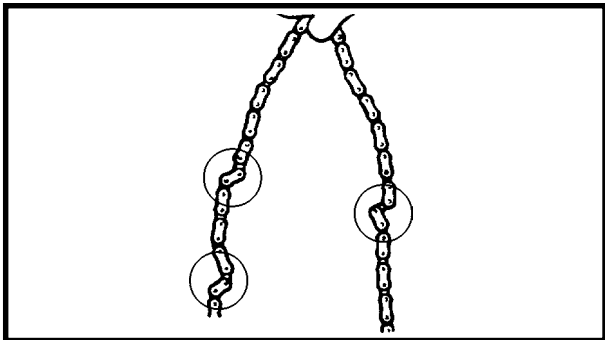

**3. Check:**

- O-ring ① (transmission chain)  
Damage = > Replace the chain.

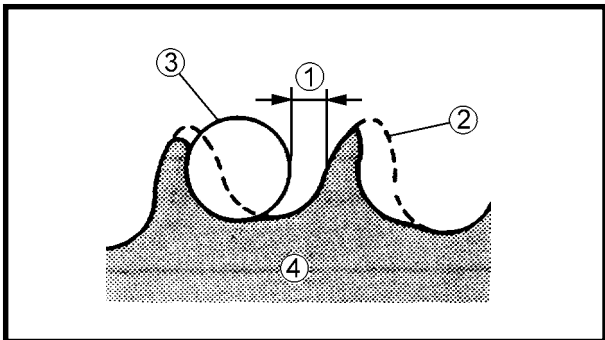
- Rollers ②
- Link plates ③  
Damage/wear = > Replace.

**CAUTION:**

- If one of the O-rings has fallen, replace the transmission chain.
- Replace the transmission chain, sprocket and pinion gear as an assembly.



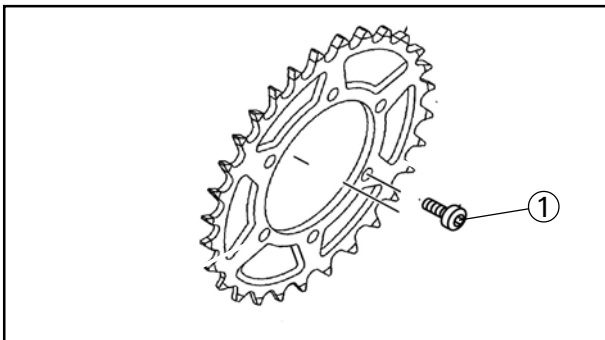
4. Check:
- Climbing of the transmission chain links
  - Clean and lubricate or replace.



5. Check:
- Pinion gear
  - Sprocket
- Wear over 1/4 of tooth = > Replace ratio.  
 Inclined tooth = > Replace ratio.

- ② Correct
- ③ Roller
- ④ Pinion gear


\*\*\*\*\*



**Replacement steps**

- Remove the screws ①. Remove sprocket.
- Install a new sprocket.

**NOTE:** \_\_\_\_\_  
 Tighten the screws in a cross pattern.  
 \_\_\_\_\_


|   |   |
|---|---|
|  | <p><b>Screws (sprocket):</b><br/>                 34.5 N.m (3.45 kgf.m; 25 ft.lb)</p> |
|---|---|

\*\*\*\*\*

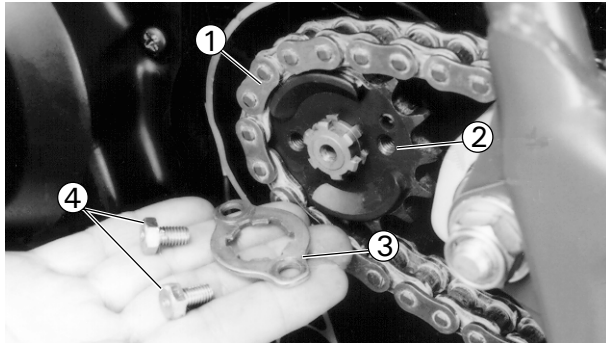
**INSTALLATION**

Reverse the "REMOVAL" procedures.


1. Lubricate:
- Transmission chain
  - Chain seam (new)

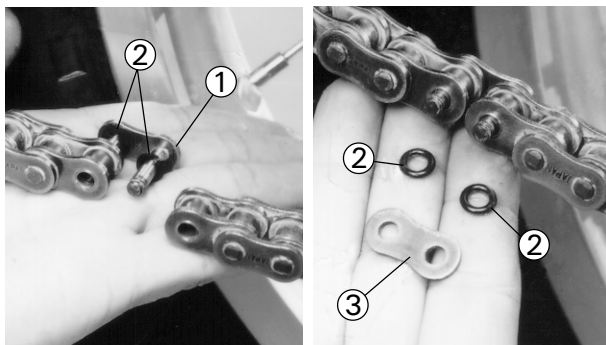
|   |   |
|---|---|
|  | <p><b>Transmission chain lubricant:</b><br/>                 Engine oil SAE 20W40</p> |
|---|---|

2. Install:
- Rear wheel
- See Section "REAR WHEEL."




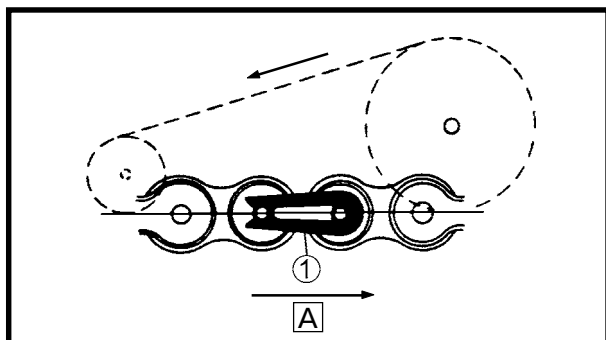
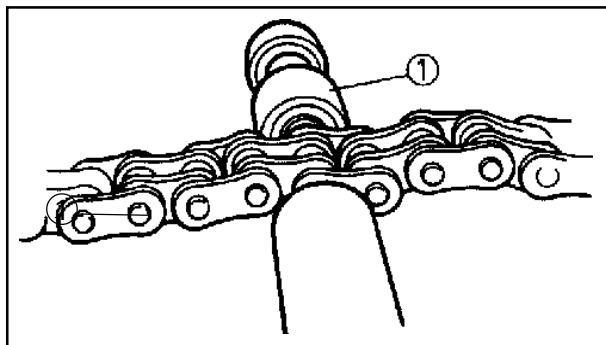
3. Install:
- Transmission chain ①
  - Pinion gear ②
  - Pinion gear fastener ③
  - Screws (pinion gear) ④

|   |  |
|---|--|
|  | <b>Pinion gear screw:</b><br>10 N.m (1.0 kgf.m; 7.2 ft.lb) |
|---|--|



4. Install:
- Chain seam ①
  - O-ring ②
  - Link plate ③
- Use the chain pin puller ④.

|   |   |
|---|---|
|  | <b>Chain pin puller:</b><br>90890-01286 |
|---|---|



5. Install:
- Chain seam lock ①

**CAUTION:** \_\_\_\_\_  
Install the chain seam lock in the direction shown in the figure.  
\_\_\_\_\_

**A** Rotation direction



6. Adjust:
- Transmission chain free play



**Chain free play:**  
45 ~ 60 mm

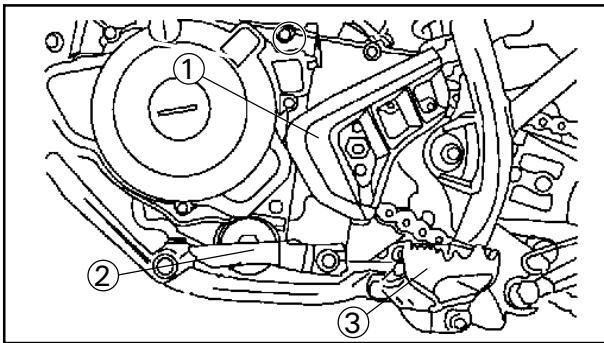
**CAUTION:**

A too small free play will result in overload on the engine and other essential parts. Keep the free play within the specified limits.

7. Tighten:
- Axle nut



**Axle nut:**  
80 N.m (8.0 kgf.m; 57.9 ft.lb)



8. Install:
- Pinion gear cover ①
  - Shift lever ②



**Screw (shift lever):**  
10 N.m (1.0 kgf.m; 7.2 ft.lb)  
**Screw (pinion gear cover):**  
10 N.m (1.0 kgf.m; 7.2 ft.lb)



---

**CHAPTER 7.  
ELECTRIC SYSTEM**

**ELECTRIC CIRCUIT DIAGRAM TTR230** ..... 7-1  
    COLOR CODE ..... 7-1  
    ELECTRIC COMPONENTS. .... 7-2

**SWITCH CHECKS** ..... 7-3  
    UNDERSTANDING THE SWITCH CONNECTIONS ..... 7-3  
    CHECKING THE SWITCH CONNECTIONS ..... 7-4

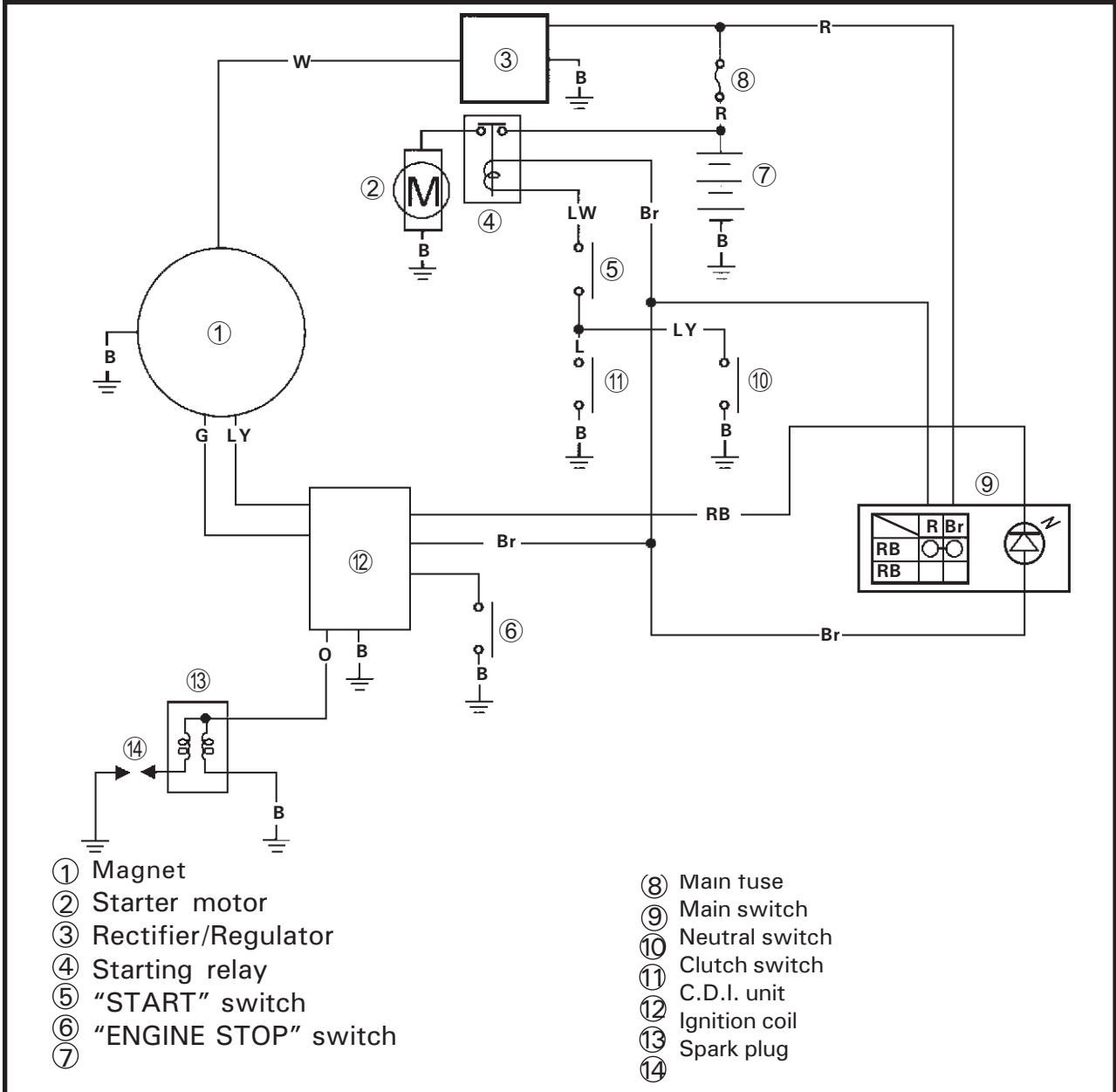
**IGNITION SYSTEM** ..... 7-6  
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    TROUBLESHOOTING ..... 7-7

**ELECTRIC STARTING SYSTEM** ..... 7-13  
    TROUBLESHOOTING ..... 7-13  
    STARTER MOTOR ..... 7-17

**CHARGING SYSTEM** ..... 7-24  
    TROUBLESHOOTING ..... 7-24



ELECTRIC  
ELECTRIC CIRCUIT DIAGRAM - TTR230



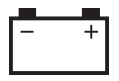
- ① Magnet
- ② Starter motor
- ③ Rectifier/Regulator
- ④ Starting relay
- ⑤ "START" switch
- ⑥ "ENGINE STOP" switch
- ⑦ "ENGINE STOP" switch

- ⑧ Main fuse
- ⑨ Main switch
- ⑩ Neutral switch
- ⑪ Clutch switch
- ⑫ C.D.I. unit
- ⑬ Ignition coil
- ⑭ Spark plug

|    |             |    |            |     |              |
|----|-------------|----|------------|-----|--------------|
| W  | White       | O  | Orange     | BW  | Black/White  |
| B  | Black       | RB | Red/Black  | BY  | Black/Yellow |
| L  | Blue        |    |            | BrW | Brown/White  |
| R  | Red         | Sb | Light blue | LW  | Blue/White   |
| G  | Green       | Br | Brown      | LY  | Blue/Yellow  |
| LY | Blue/Yellow | Y  | Yellow     | RW  | Red/White    |

# ELECTRIC COMPONENTS

ELECT



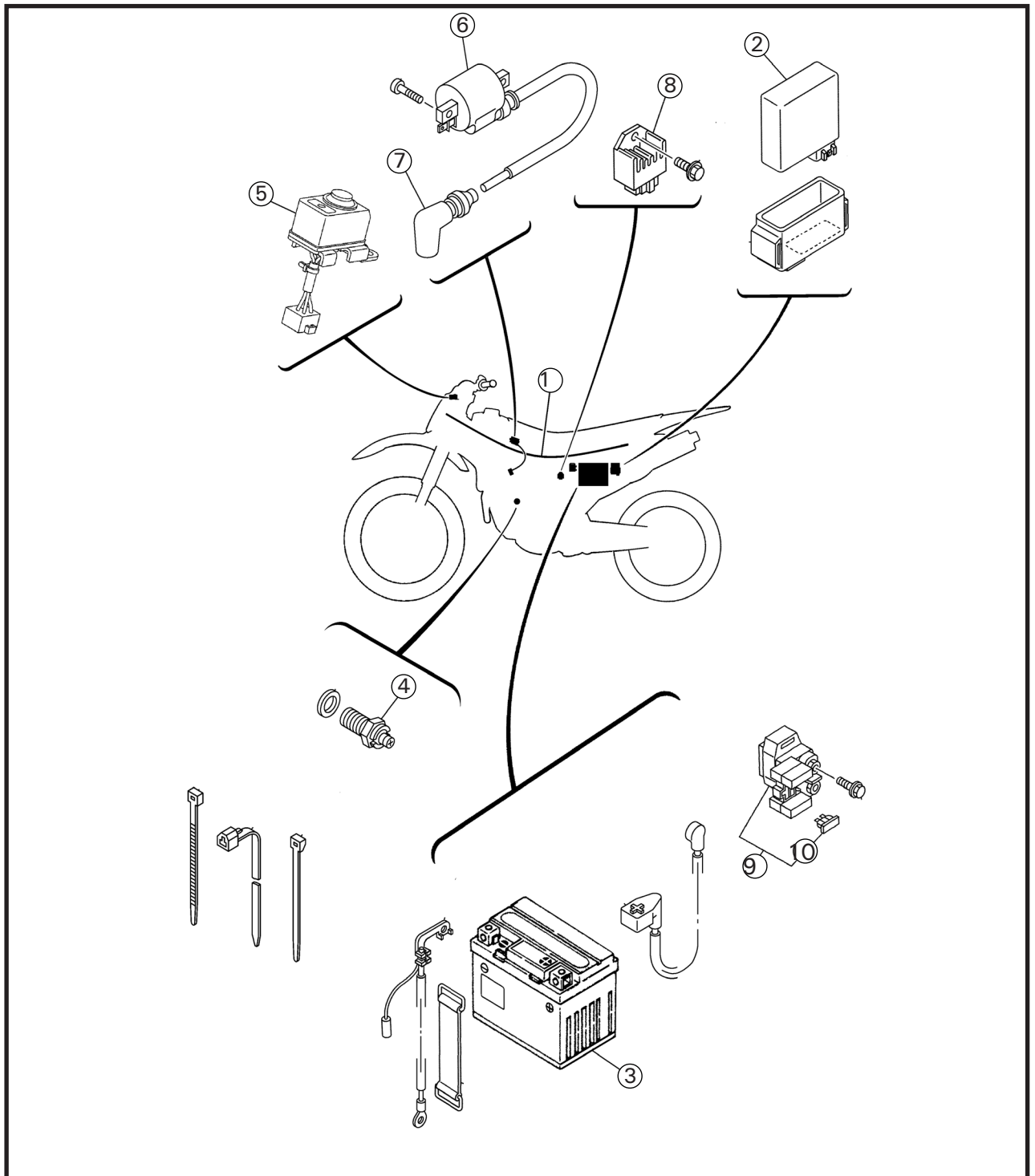
- ① Harness
- ② C.D.I. unit
- ③ Battery
- ④ Neutral switch
- ⑤ Main switch
- ⑥ Ignition coil
- ⑦ Spark plug cap
- ⑧ Rectifier/Regulator
- ⑨ Starting relay
- ⑩ Fuse

### BATTERY:

Capacity: 12 V 4 Ah  
Solution Density: 1.320

### IGNITION COIL:

Primary winding resistance:  
0,18 ~ 0,28Ω at 20°C  
Secondary winding resistance:  
6.32 ~ 9.48Ω at 20°C





**SWITCH CHECKS**

Check the switches for continuity between terminals.

Read the following text in order to check the switches properly.

**UNDERSTANDING THE SWITCH CONNECTIONS**

This manual contains the connection tables as shown to the left. The switch terminal connections are shown.

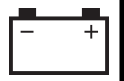
The column to the left indicates the switch position, and the upper row indicates the colors of the wires connected to the switch terminals.

|      | Br/L  | R | L/B   | L/Y |
|------|-------|---|-------|-----|
| LOCK |       |   |       |     |
| OFF  |       |   |       |     |
| ON   | ○ — ○ |   | ○ — ○ |     |

"O - O" indicates the terminals between which there is electrical continuity.

**In this example:**

"L/B" and "L/Y" and "R" and "Br/L" have continuity at switch "ON" position.



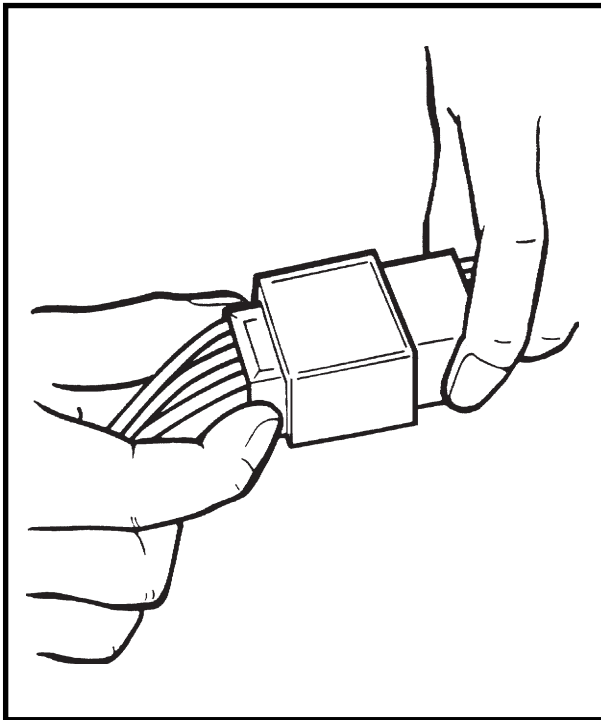
### CHECKING THE SWITCH CONNECTIONS

Before checking the switches, see the connection table and check the color combinations.

To understand how to check the switches, see the following example:

**CAUTION:**

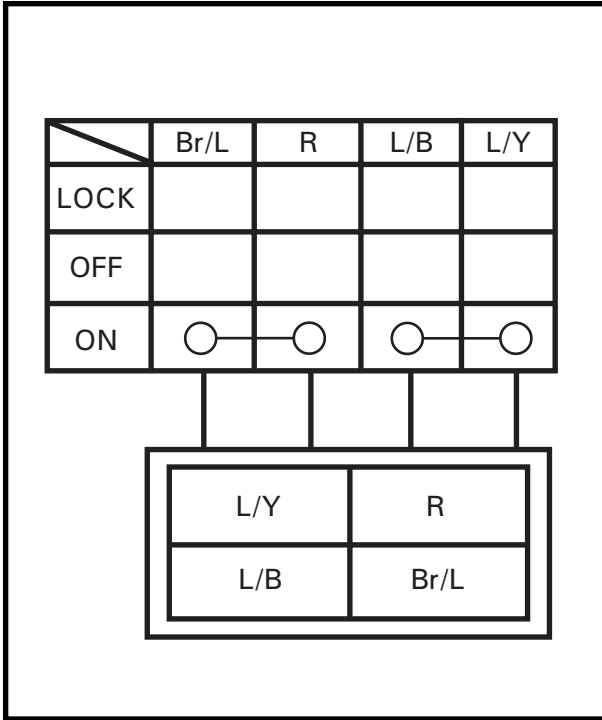
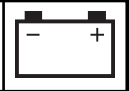
Do not disconnect the couplings by pulling them by the wires, otherwise the wires may separate from their terminals.



1. Disconnect the main switch coupling from the harness.
2. Verify if some wire is disconnected from its terminal inside the coupling. If a wire is disconnected, repair it.

**NOTE:**

If the coupling is dirty with mud or dust, blow it with compressed air.



3. See the connection table and check the color combinations and continuity.

See the example:

“R” and “Br/L” and “L/B and L/Y” have continuity at switch “ON” position.

Observe that there is no continuity (open circuit) for color combinations other than those aforementioned.

4. Check for continuity between wires “R” and “Br/L” in the switch.

\*\*\*\*\*

**Checking steps:**

- Set the switch to “ON” and “OFF” positions.
- Set the multimeter to “ x1” W
- Connect the multimeter terminal (+) to the wire “R” terminal in the connector and terminal (-) to the wire “Br” terminal.

**NOTE:**

Use a multimeter with pointed terminals for continuity testing, otherwise the tips may close the circuit with other terminals.

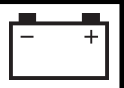
- Check the continuity between “R” and “Br” wires at “ON” and “OFF” positions, respectively.

At “ON” the multimeter will read “0” (zero Ω). At “OFF” the multimeter will read “∞” .

If the conditions above are not met the switch will be regarded as defective.

\*\*\*\*\*

5. If data other than that specified is read, replace the switch.



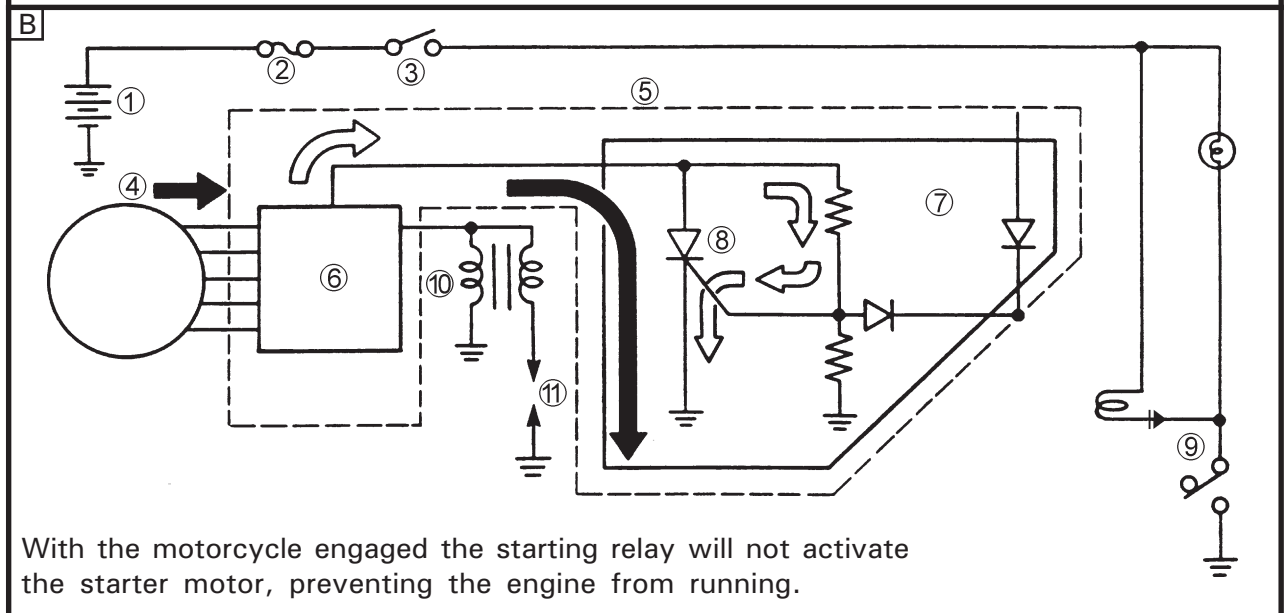
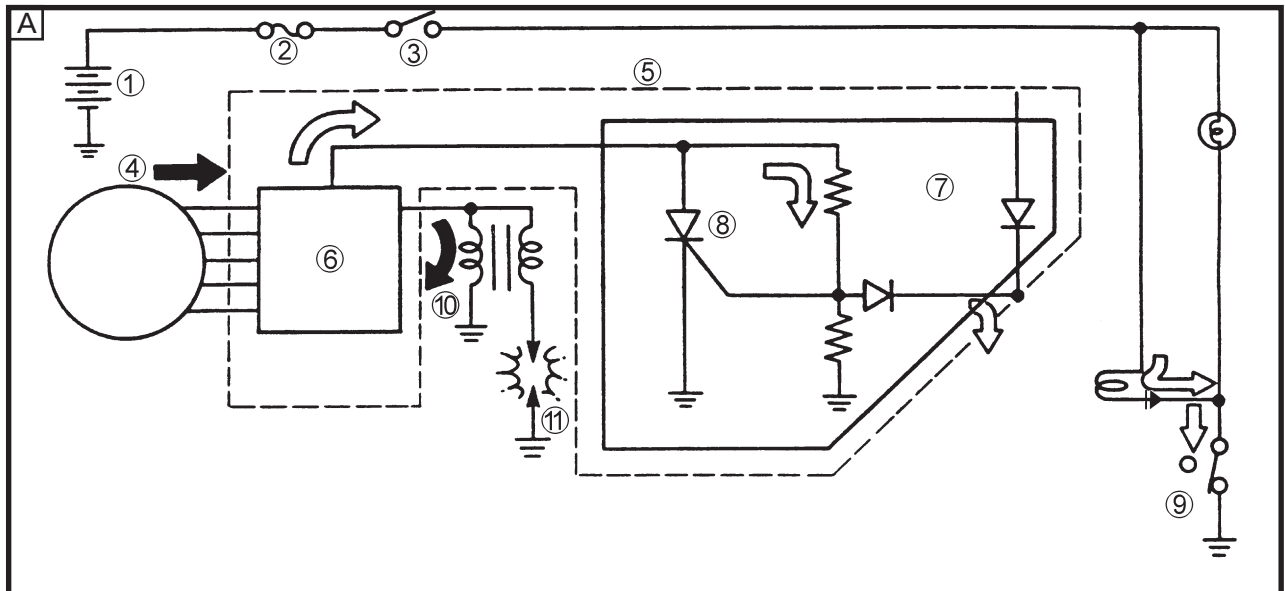
**IGNITION CIRCUIT OPERATION**

The ignition control circuit of this model consists of: ignition control unit (C.D.I.), neutral switch, and neutral light.

If the "ENGINE STOP" switch and the main switch are set to "ON," the spark will flash only if:

- The transmission is set to neutral (the neutral switch is "ON").

- |                |                         |                      |
|----------------|-------------------------|----------------------|
| ① Battery      | ⑦ Ignition control unit | ← Bypass current     |
| ② Fuse         | ⑧ Thyristor             | → Field coil current |
| ③ Main switch  | ⑨ Neutral switch        |                      |
| ④ Magnet rotor | ⑩ Ignition coil         |                      |
| ⑤ C.D.I. unit  | ⑪ Spark plug            |                      |
| ⑥ C.D.I. unit  |                         |                      |



With the motorcycle engaged the starting relay will not activate the starter motor, preventing the engine from running.



## TROUBLESHOOTING

**IF THE IGNITION SYSTEM STOPS OPERATING  
(WITH NO SPARK OR INTERMITTENT SPARKS)**

**Procedures**

**Check:**

- |                             |                         |
|-----------------------------|-------------------------|
| 1. Fuse                     | 7. Main switch          |
| 2. Battery                  | 8. "ENGINE STOP" switch |
| 3. Spark plug               | 9. Neutral switch       |
| 4. Spark                    | 10. Clutch switch       |
| 5. Cap resistance           | 11. Connections         |
| 6. Ignition coil resistance |                         |

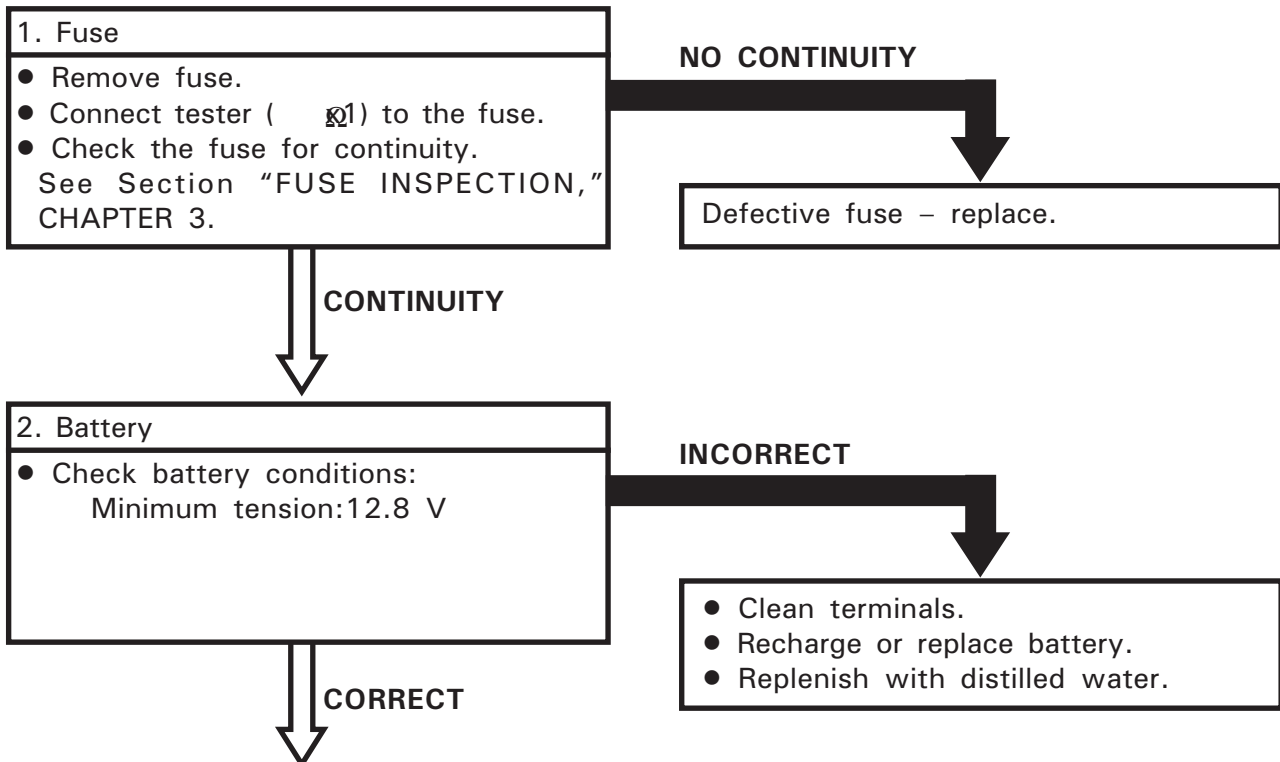
**NOTE:**

- Remove the following parts before starting the analysis:
 

|                |              |
|----------------|--------------|
| 1) Side covers | 3) Fuel tank |
| 2) Seat        |              |
- Use the following tools in the analysis:


|  |  |
|--|--|
|  | <b>Dynamic spark tester</b><br>90890-06754 |
|--|--|

|  |                                   |
|--|-----------------------------------|
|  | <b>Multimeter:</b><br>90890-03112 |
|--|-----------------------------------|





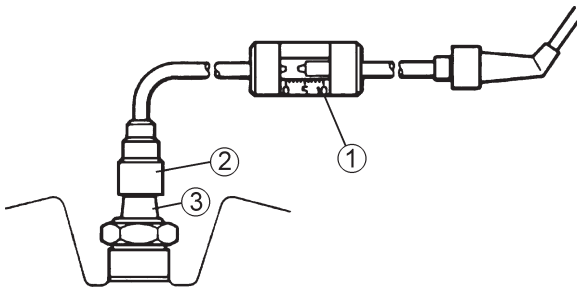



|   |   |
|---|---|
| <b>3. Spark plug</b>  |   |
| <ul style="list-style-type: none"> <li>• Check the spark plug conditions.</li> <li>• Check the spark plug type.</li> <li>• Check the electrode clearance.</li> </ul> See Section "SPARK PLUG CHECK," CHAPTER 3. |   |
| Spark plug<br>DR8EA   |   |
|    | <b>Electrode clearance:</b><br>0.6~0.7 mm |

**INCORRECT**

Defective spark plug, replace or calibrate the electrode clearance.

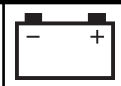
**CORRECT**

|  |                                     |
|--|-------------------------------------|
| <b>4. Spark clearance</b>  |                                     |
| <ul style="list-style-type: none"> <li>• Disconnect the spark plug cap. Connect the dynamic spark tester ①</li> </ul> Spark plug ③ <ul style="list-style-type: none"> <li>• Set the button to "ON."</li> </ul> |                                     |
|   |                                     |
| <ul style="list-style-type: none"> <li>• Check spark:</li> <li>• Start the engine and increase the clearance until the spark become intermittent.</li> </ul>   |                                     |
|   | <b>Minimum clearance:</b><br>6.0 mm |

**ACCORDING TO SPECIFICATION**

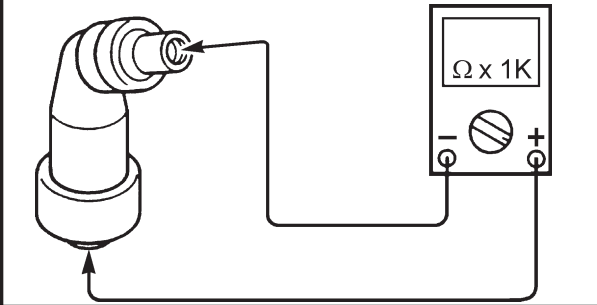
The ignition system is in good conditions

**OUT OF SPECIFICATION OR NO SPARK**



5. Cap resistance

- Remove cap.
- Connect the multimeter ( $\Omega \times 1$ ) to the cap.



OUT OF SPECIFICATION



Cap resistance:  
10 K $\Omega$  at 20° C



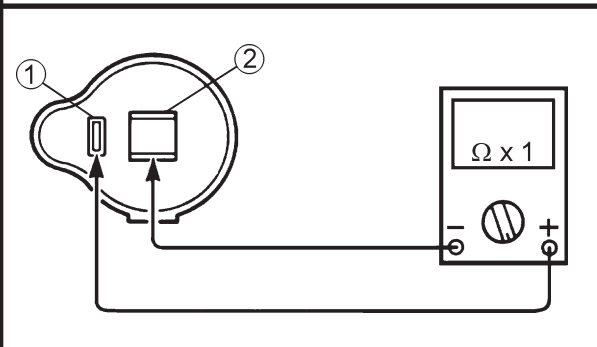
ACCORDING TO SPECIFICATION

Defective cap – replace.

6. Ignition coil resistance

- Disconnect the coil from its wires.
- Connect the multimeter ( $\Omega \times 1$ ) to the coil.

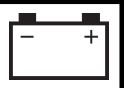
Terminal (+)  $\Rightarrow$  terminal ①  
Terminal (-)  $\Rightarrow$  body ground ②



- Check the primary winding resistance:

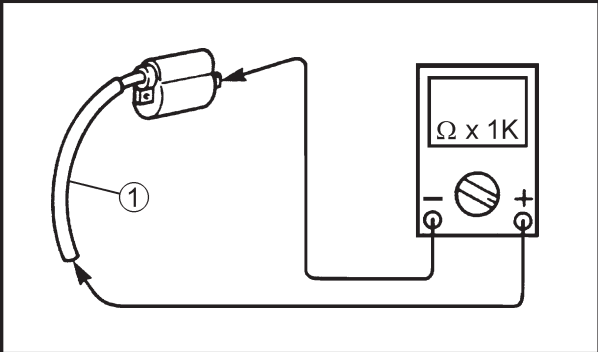


Primary winding resistance:  
0.18 ~ 0.28  $\Omega$  at 20° C



Connect the multimeter ( $\Omega \times 1$ ) to the ignition coil.

Terminal (+)  $\Rightarrow$  spark plug cable  
Terminal (-)  $\Rightarrow$  body ground



- Check the secondary winding resistance.

 Secondary winding resistance:  
6.32k  $\Omega$  ~ 9.48k  $\Omega$  at 20° C

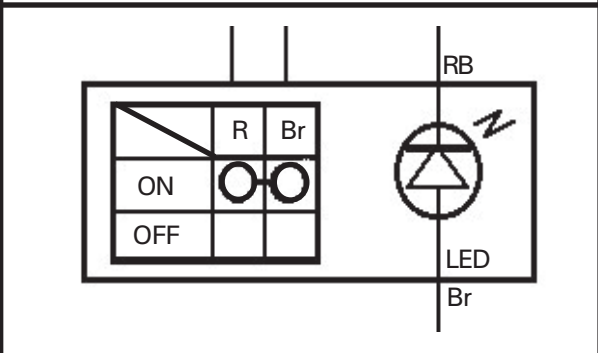
INCORRECT

Ignition coil defective – Replace.

ACCORDING TO SPECIFICATIONS

7. Main switch

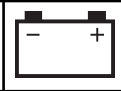
- Disconnect the main switch from the harness.
  - Check the continuity between wires "BROWN (Br) and RED (R)" set to "ON" and "OFF."
- The LED should not be tested.  
See Section "SWITCH CHECKS."



INCORRECT

Main switch defective – Replace.

CORRECT



**8. "ENGINE STOP" switch**

- Disconnect the handle-bars switch connector (LH) from the harness.
- Check the continuity between wires "BLACK/WHITE (B/W) and "BLACK ' (B) .  
See Section "SWITCH CHECKS."

INCORRECT



"ENGINE STOP" switch defective – Replace.

CORRECT



**9. Neutral switch**

- Disconnect the neutral switch wire from the harness.
- Check the continuity between wires "LIGHT BLUE" and "GROUND."
- See Section "SWITCH CHECKS."

INCORRECT



Neutral switch defective – Replace.

CORRECT





10. Pulse coil resistance

- Disconnect the field coil connector from the harness.
- Connect the multimeter (  $\Omega \times 100$  ) to the field coil terminal.

Terminal (+)  $\Rightarrow$  Blue/Yellow wire  
Terminal (-)  $\Rightarrow$  Green wire

- Check the pulse coil resistance.



Pulse coil resistance:

192 ~ 288 $\Omega$  at 20° C

OUT OF SPECIFICATIONS

Pulse coil defective – Replace.

ACCORDING TO SPECIFICATIONS

11. Connections

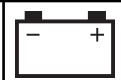
- Check the ignition system connections. See Section "SWITCH CHECKS."

INCORRECT CONNECTION

Correct.

CORRECT

Replace the CDI unit



## TROUBLESHOOTING

### THE STARTER MOTOR DOES NOT OPERATE

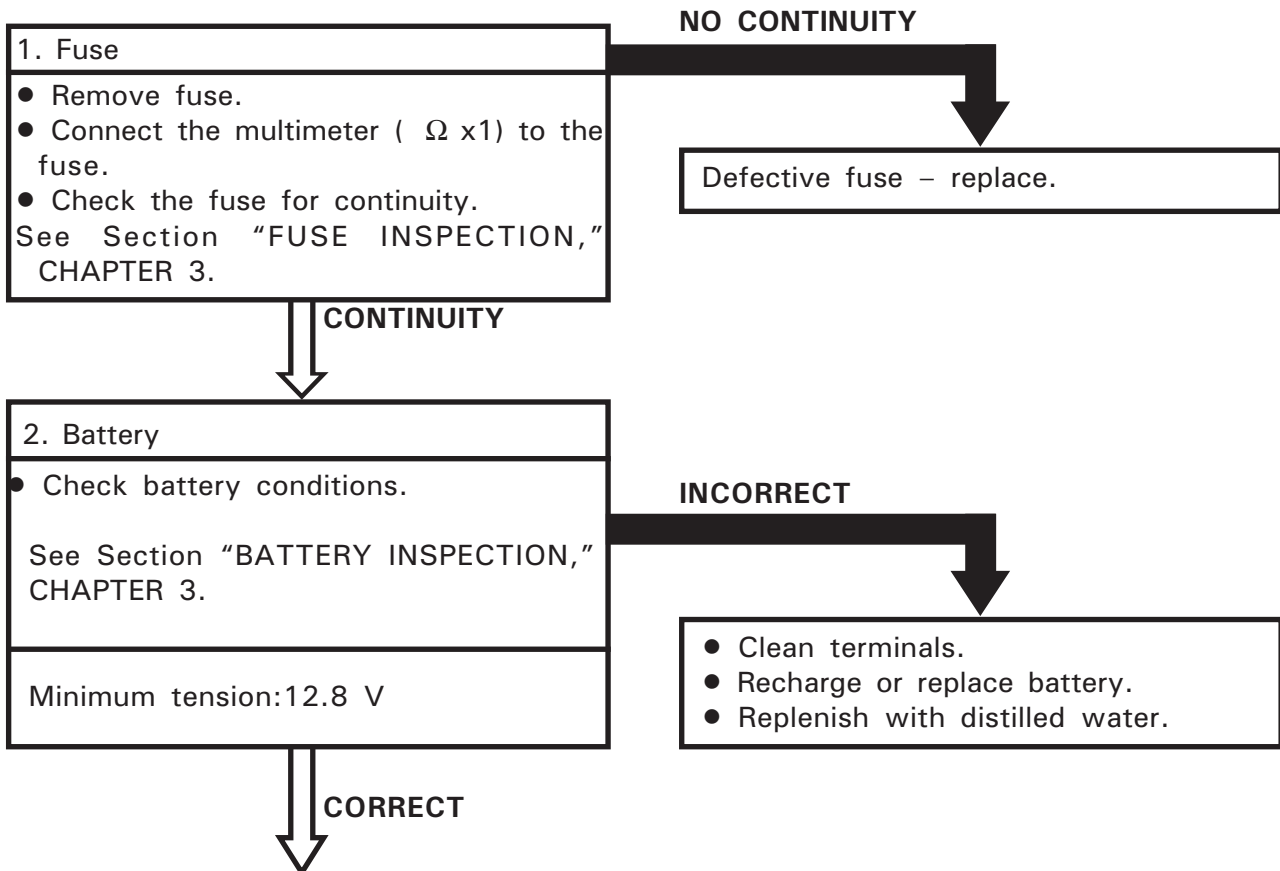
Check:

- |                    |                         |
|--------------------|-------------------------|
| 1. Main fuse       | 6. "ENGINE STOP" switch |
| 2. Battery         | 7. Neutral switch       |
| 3. Starter motor   | 8. Clutch switch        |
| 4. Starting relay  | 9. Connections          |
| 5. Starting switch |                         |

**NOTE:**

- Remove the following parts before starting the analysis:
  - 1) Side covers
  - 2) Seat
- Use the following device for analysis:

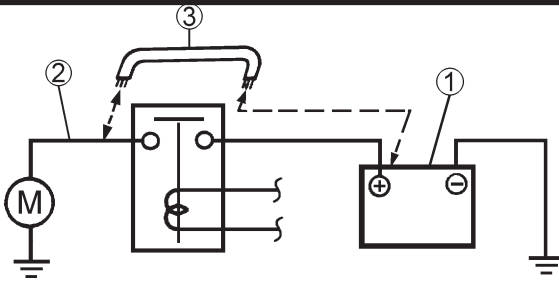
**Multimeter:**  
90890-03112





3. Starter motor

- Connect the battery positive terminal ① and the starter motor cable ② using a jumper wire ③ \*as shown.



- Check the starter motor operation.

**WARNING**

The jumper wire capacity should be compatible with the starter motor capacity. Otherwise, it may blow.

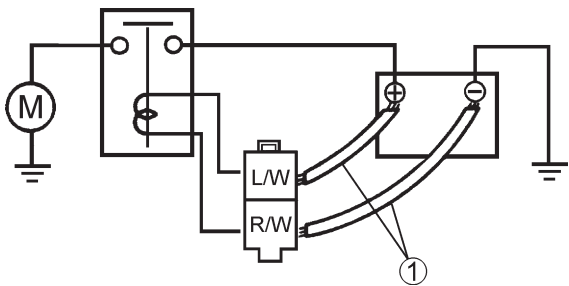
**DOES NOT START**

Starter motor defective – Repair or replace.

**STARTS**

4. Starting relay

- Disconnect the starting relay connector from the harness.
- Connect the battery to the starting relay using jumper wires ①.



- Check the starter motor operation.

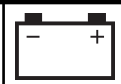
**DOES NOT START**

Starting relay defective – Replace.

**STARTS**

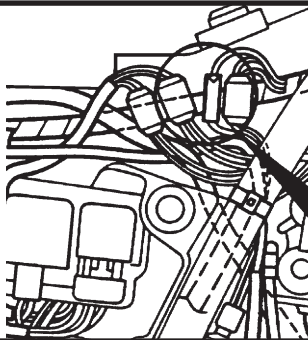
**CAUTION:**

- Take care not to invert the connections.
- Take care not to short-circuit the positive and negative terminals when connecting the battery and relay.



5. Neutral switch

- Disconnect the neutral switch wire from the harness.
  - Check the continuity between wires "LIGHT BLUE" ① and "GROUND."
- See Section "SWITCH CHECKS."



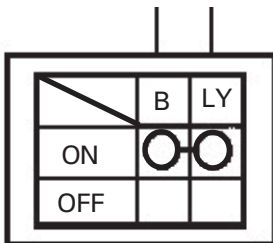
INCORRECT

Neutral switch defective – Replace.

CORRECT

6. Clutch switch

- Disconnect the clutch switch connector from the harness.
  - Check the continuity between wires "BLUE/YELLOW (LY) and BLACK (B)."
- See Section "SWITCH CHECKS."



INCORRECT

Clutch switch defective – Replace.

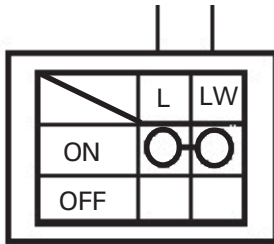
CORRECT





## 7. Starting switch

- Disconnect the handle-bars switch connector (RH) from the harness.
- Check the starting switch continuity between the wires.  
"BLUE/WHITE (LW) and BLUE (L)."  
See Section  
"SWITCH CHECKS."



INCORRECT

Starting switch defective – Replace.

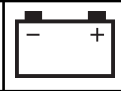
CORRECT

## 8. Connections

- Check the ignition system connections.  
See Section  
"SWITCH CHECKS."

INCORRECT CONNECTION

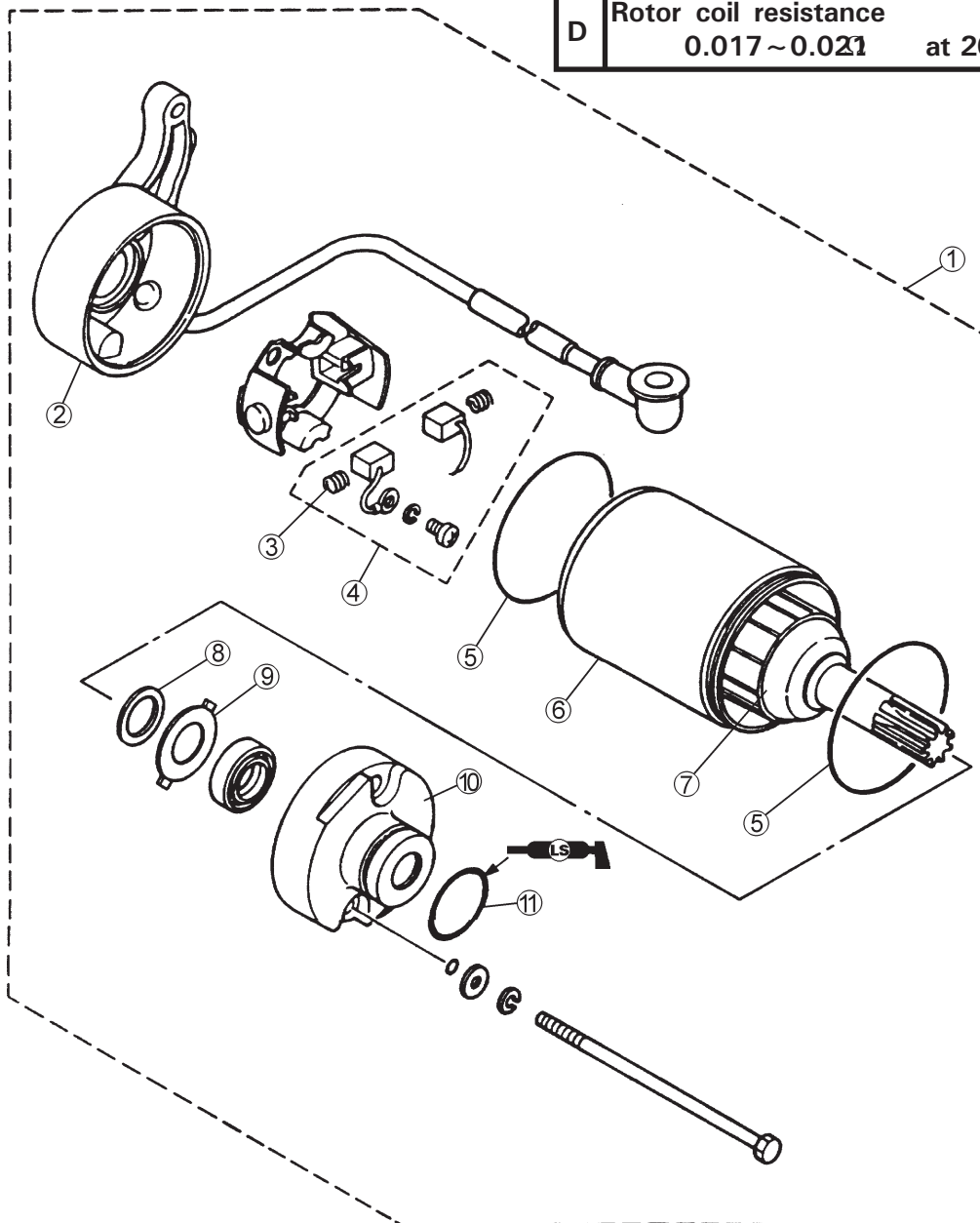
Correct.

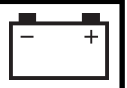


**STARTER MOTOR**

- ① Starter motor
- ② Rear support
- ③ Spring
- ④ Brush assembly
- ⑤ O-ring
- ⑥ Stator assembly
- ⑦ Rotor assembly
- ⑧ Shim
- ⑨ Lock washer
- ⑩ Front support
- ⑪ O-ring

|   |   |
|---|---|
| A | Minimum brush length limit<br>3.5 mm            |
| B | Switch wear limit<br>21.0 mm                    |
| C | Mica depth<br>1.5 mm                            |
| D | Rotor coil resistance<br>0.017 ~ 0.021 at 20° C |

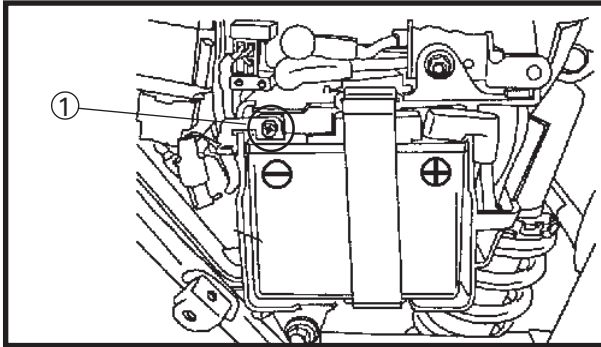




### REMOVAL

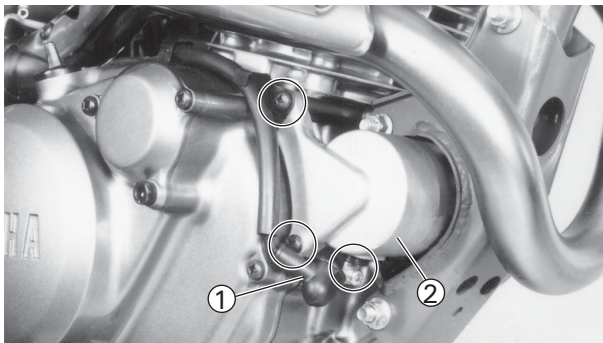
1. Remove:
  - Crankcase guard

See Section "ENGINE OIL CHANGE" CHAPTER 3.

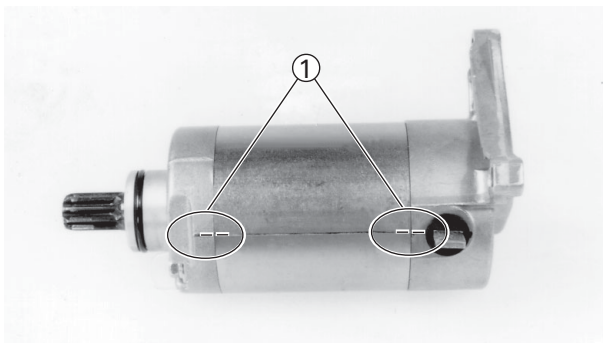


2. Disconnect:
  - Battery negative cable ①

See Section "BATTERY INSPECTION," CHAPTER 3.

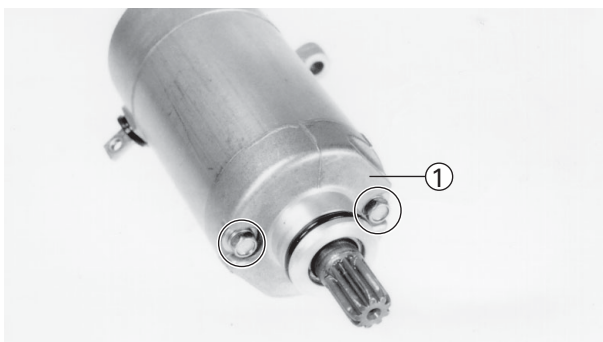


3. Remove:
  - Starter motor cable ①
  - Starter motor ②

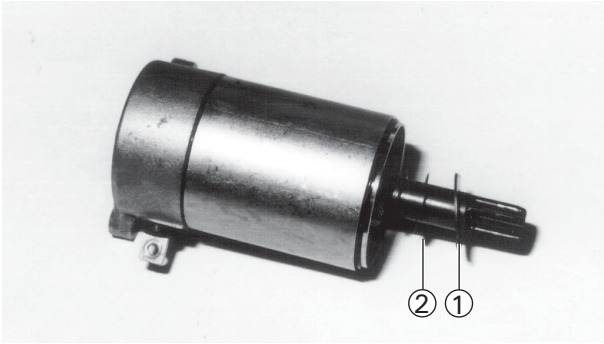
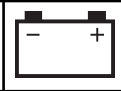


#### Disassembly:

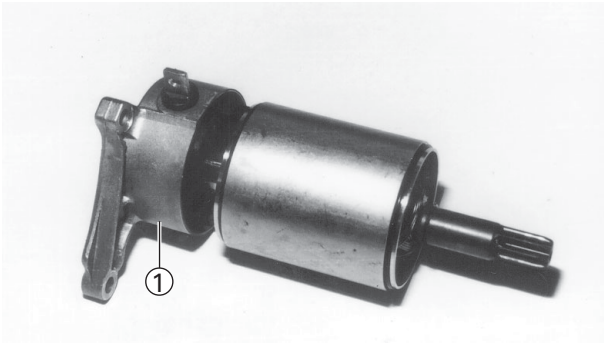
1. Trace identification marks ① on the supports in order to facilitate the assembly, as shown in the figure.



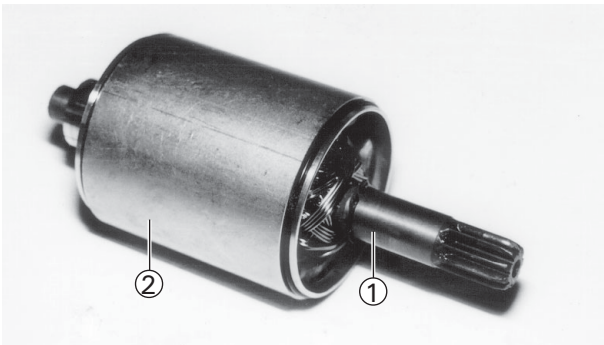
2. Remove:
  - Front support ①



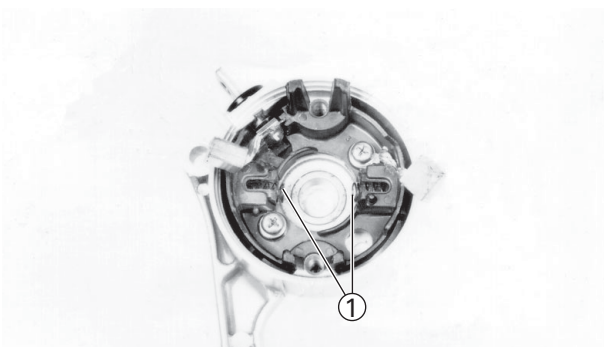
3. Remove:
- Lock washer ①
  - Shim ②



4. Remove:
- Rear support 1 ○



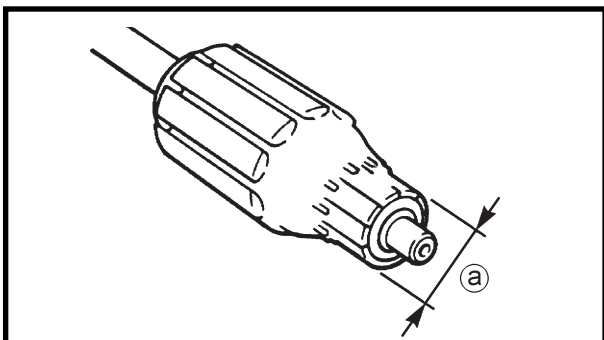
5. Remove:
- Rotor assembly ①
  - Stator assembly ②



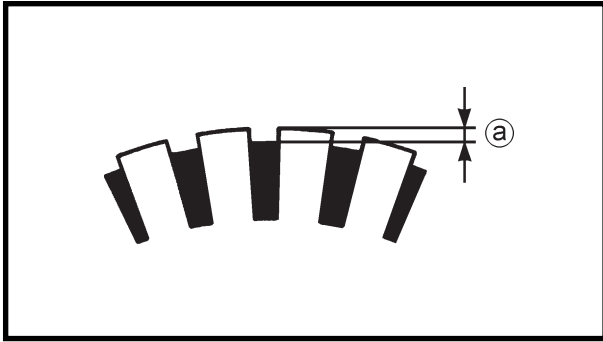
6. Remove:
- Springs ①

**Inspection and repairs:**

1. Check:
  - Armature  
Dirt => Clean using a sandpaper # 600.
2. Measure:
  - Armature diameter ①
  - Out of specification => Replace starter motor.



|  |                                      |
|--|--------------------------------------|
|  | <b>Armature wear limit:</b><br>21 mm |
|--|--------------------------------------|



3. Measure:

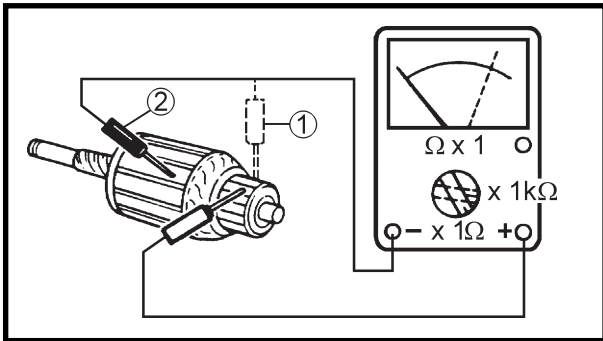
- Mica depth (a)

Out of specification => Scrape the mica using a band saw.

|  |                              |
|--|------------------------------|
|  | <b>Mica depth:</b><br>1.5 mm |
|--|------------------------------|

**NOTE:**

The switch mica insulation should have the proper depth in order to enable the proper switch operation.



4. Check:

- Rotor coil (insulation/continuity)
- Defects => Replace starter motor.

\*\*\*\*\*

**Checking steps:**

- Connect the multimeter as shown in order to check the continuity (1) and insulation (2).
- Measure the rotor resistance.

|  |                               |
|--|-------------------------------|
|  | <b>Rotor coil resistance:</b> |
|  | <b>Continuity test (1):</b>   |
|  | 0.017 ~ 0.02Ω at 20° C        |
|  | <b>Insulation test (2):</b>   |
|  | More than 1MΩ at 20° C        |

- If the resistance is not correct, replace the starter motor.

\*\*\*\*\*

5. Measure:

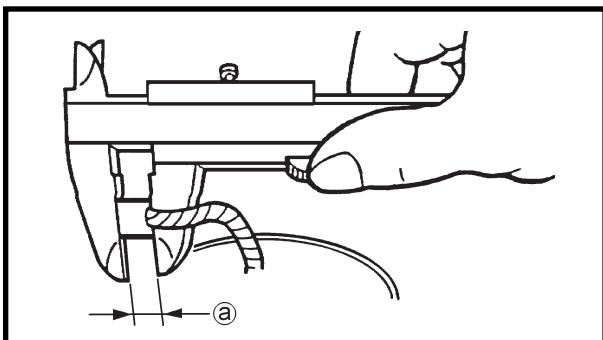
- Brush length (a)

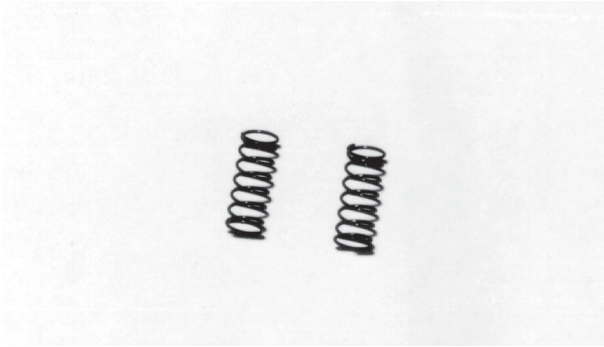
Out of specification => Replace assembly.

|  |  |
|--|--|
|  | <b>Minimum brush length limit:</b><br>3.5 mm |
|--|--|

**NOTE:**

Take care when replacing the brushes, since one side is welded.





6. Measure:

- Brush spring load

Fatigue/out of specification => Replace assembly.

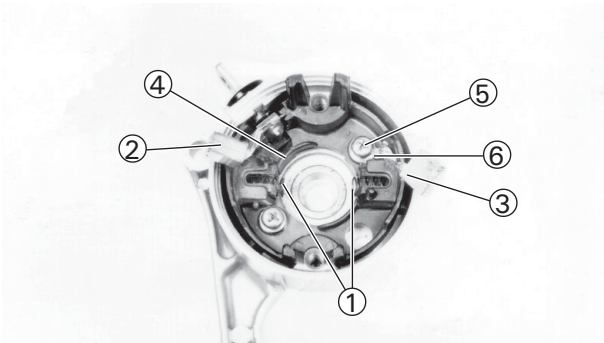


Spring load:  
560 ~ 840g

7. Check:

- Roller bearing
- Retainer
- Bushing
- Damage => Replace support.
- O-ring

Damage/wear => Replace.



### Mounting

Reverse the "REMOVAL" procedures.

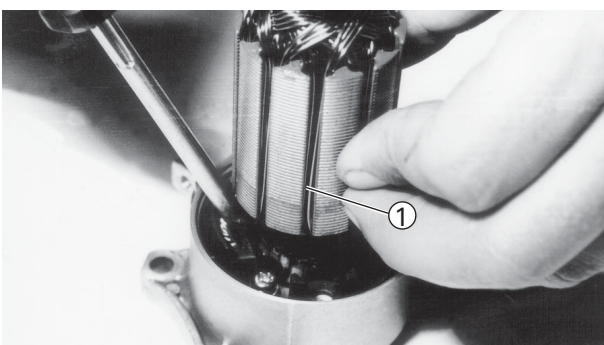
1. Install:

- Spring ①
- Brushes ② and ③

**NOTE:**

When installing the brush ②, route its wire outside the salience ④, on the brush spring fastener.

When installing the brush ③, rest the wire terminal of brush ⑤ on the salience 6 beside the brush spring fastener.

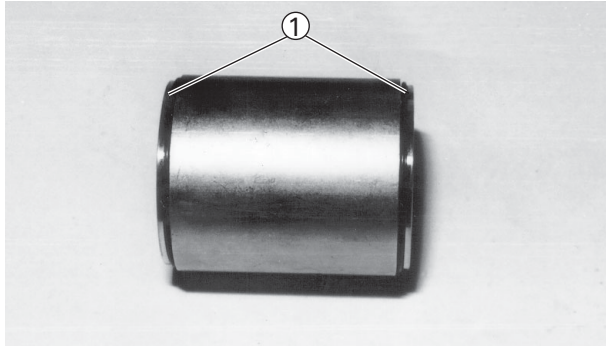
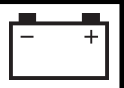


2. Install:

- Rotor ①

**NOTE:**

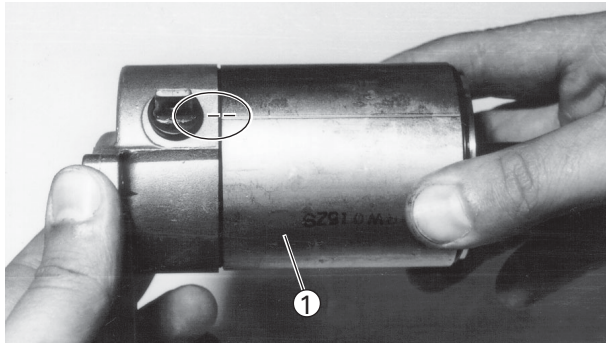
When installing the rotor, press the brushes using a thin screwdriver in order to prevent damage.



3. Install:
- O-ring ①

**CAUTION:**

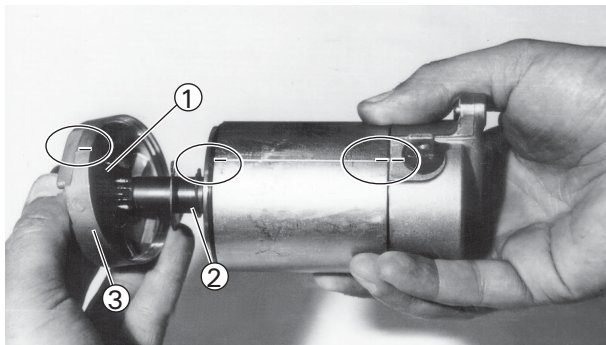
Always use new O-rings.



4. Install:
- Stator assembly ①

**NOTE:**

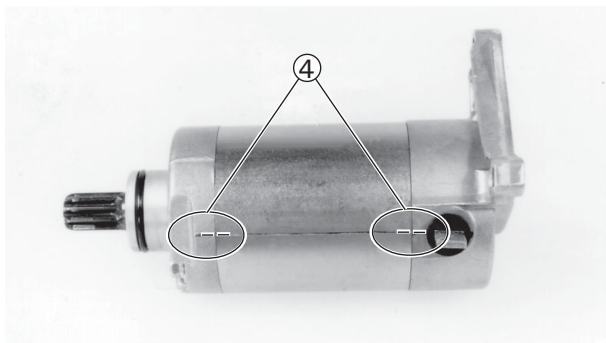
Align the stator marks with those on the rear support.



5. Install:
- Lock washer ①
  - Shim ②
  - Front support ③

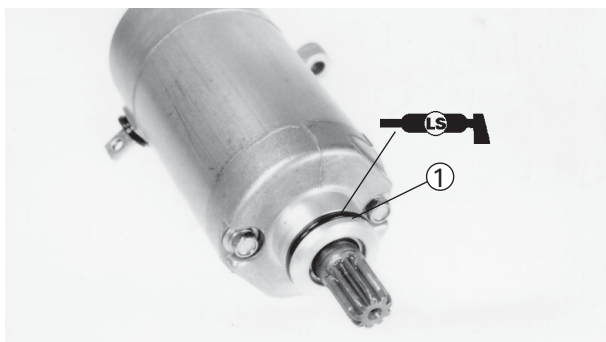
**NOTE:**

- Align the lock washer salience ① with the slot on the front support ③ and install.
- Align the stator marks ④ with those on the supports.



**Bolt:**

**5 N.m (0.5 Kgf.m; 3.6 ft.lb)**

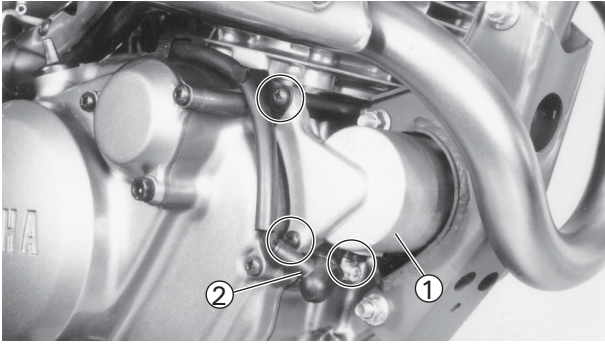


**Installation:**

1. Apply:
- Starter motor

**NOTE:**

Apply a thin layer of grease to the O-ring ①.



2. Install:

- Starter motor ①
- Starter motor cable ②



Bolt (starter motor):

7 N.m (0.7 Kgf.m; 5.1 ft.lb)

3. Connect:

- Battery negative cable

See Section "BATTERY INSPECTION,"  
CHAPTER 3.

4. Install:

- Crankcase guard

See Section "ENGINE OIL CHANGE"  
CHAPTER 3.



Bolt (crankcase guard):

55 N.m (5.5 Kgf.m; 40.2 ft.lb)





TROUBLESHOOTING

BATTERY NOT CHARGING

Procedures

Check:

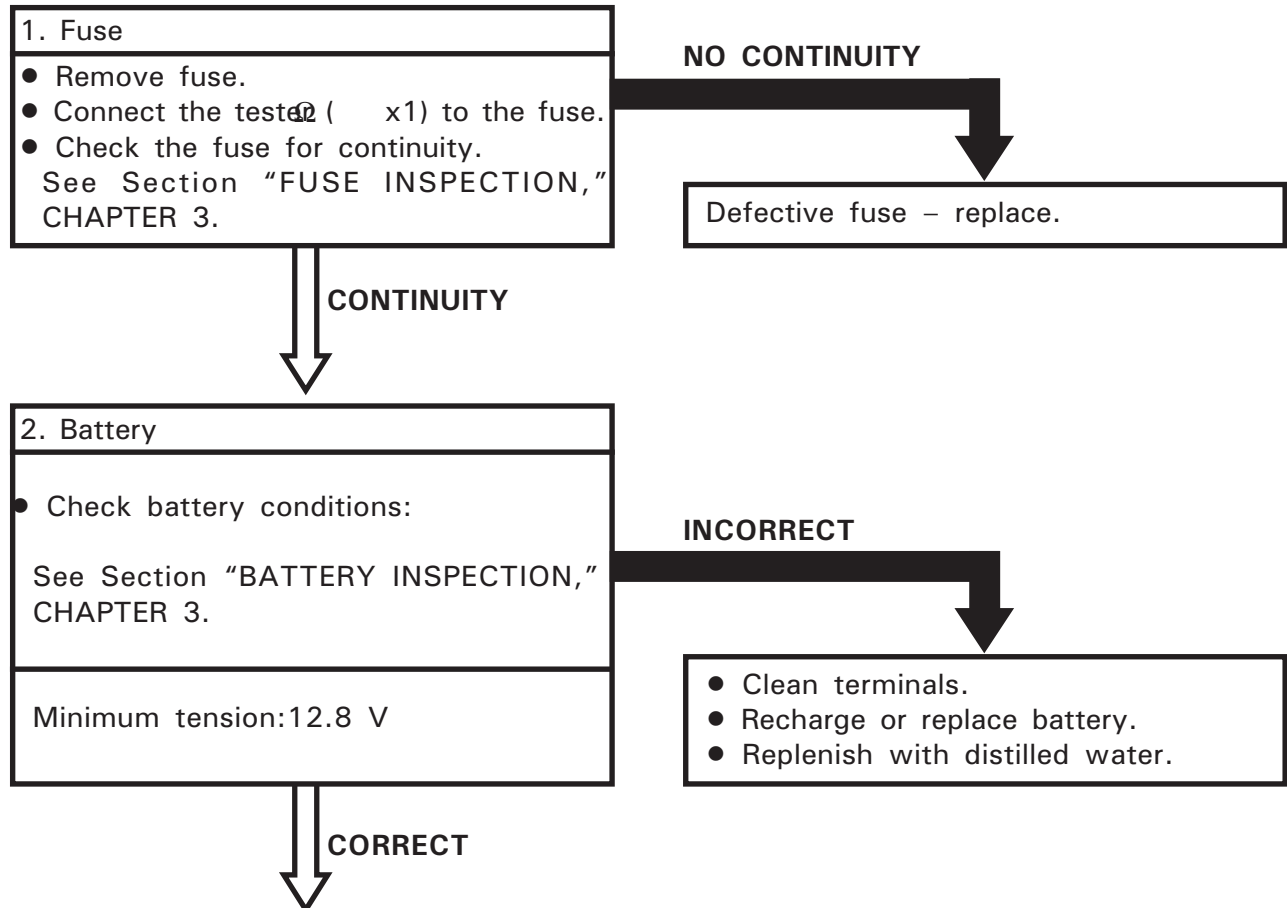
1. Fuse
2. Battery
3. Charging voltage
4. Stator coil resistance
5. System connections

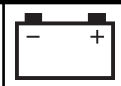
NOTE:

- Remove the following parts before starting the analysis:
  - 1) Side covers (RH)
  - 2) Seat
- Use the following device for analysis:

|  |   |
|--|---|
|  | <b>Inductive tachometer:</b><br>90890-03113 |
|--|---|

|  |                                   |
|--|-----------------------------------|
|  | <b>Multimeter:</b><br>90890-03112 |
|--|-----------------------------------|

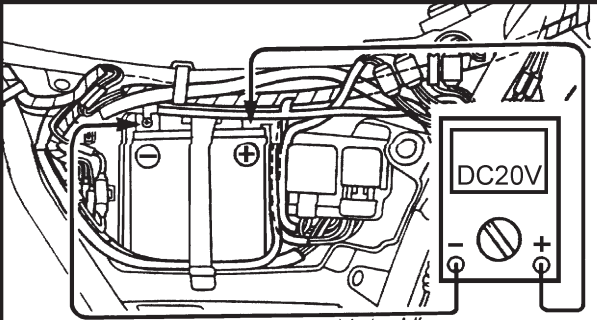




3. Charging voltage

- Connect the inductive tachometer to the spark plug cable.
- Connect the multimeter (DC20V) to the battery.

Terminal ( + ) → Battery terminal ( + )  
 Terminal ( - ) → Battery terminal ( - )



- Start the engine and speed up to 5,000 rpm.
- Check the charging voltage.

 **Charging voltage:**  
 14.0V at 5,000 rpm

**NOTE:** \_\_\_\_\_  
 Use a fully charged battery.

ACCORDING TO SPECIFICATIONS

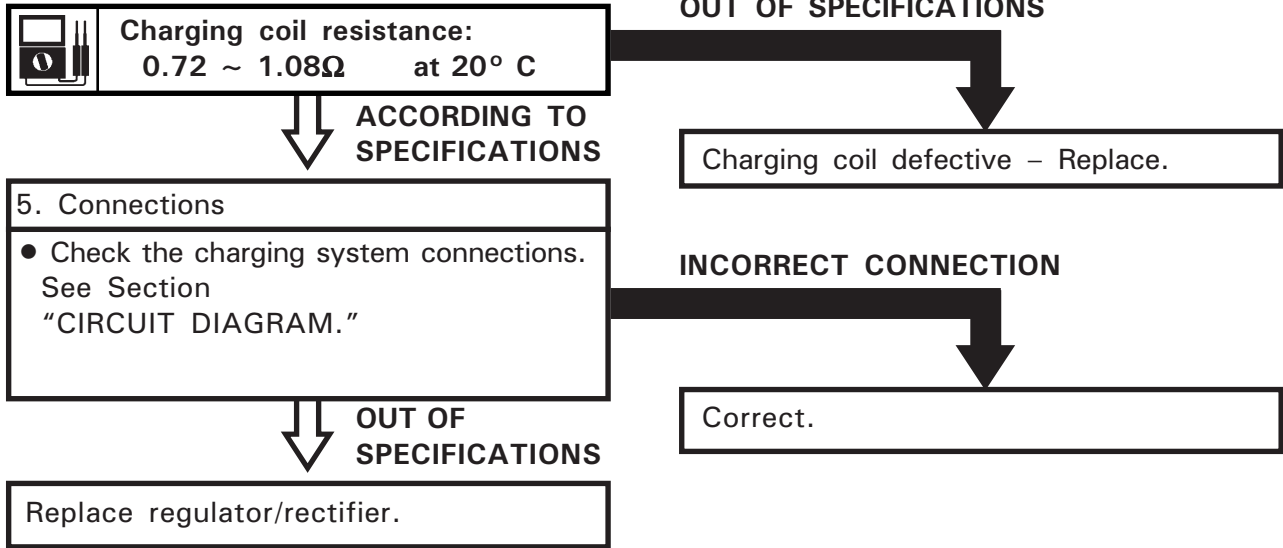
Charging system at normal conditions.

OUT OF SPECIFICATIONS

4. Charging coil resistance.

- Disconnect the charging coil connector from the harness.
- Connect the multimeter (  $\Omega$  x1 ) to the charging coil.
- Measure the charging coil resistance.

Terminal ( + ) → white wire (W)  
 Terminal ( - ) → ground (B)



---

**CHAPTER 8.**  
**TROUBLESHOOTING**

|  |     |
|--|-----|
| <b>STARTING FAILURE / DIFFICULTY</b> .....                 | 8-1 |
| FUEL SYSTEM .....  | 8-1 |
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| POOR PERFORMANCE AT MEDIUM AND HIGH SPEEDS .....           | 8-3 |
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| UNSTABLE GEAR.....   | 8-4 |
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| DRAGGING CLUTCH .....                                      | 8-5 |
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| OVERHEATING .....  | 8-5 |
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| MALFUNCTION .....  | 8-6 |
| UNSTABLE DRIVING .....                                     | 8-7 |

TROUBLESHOOTING

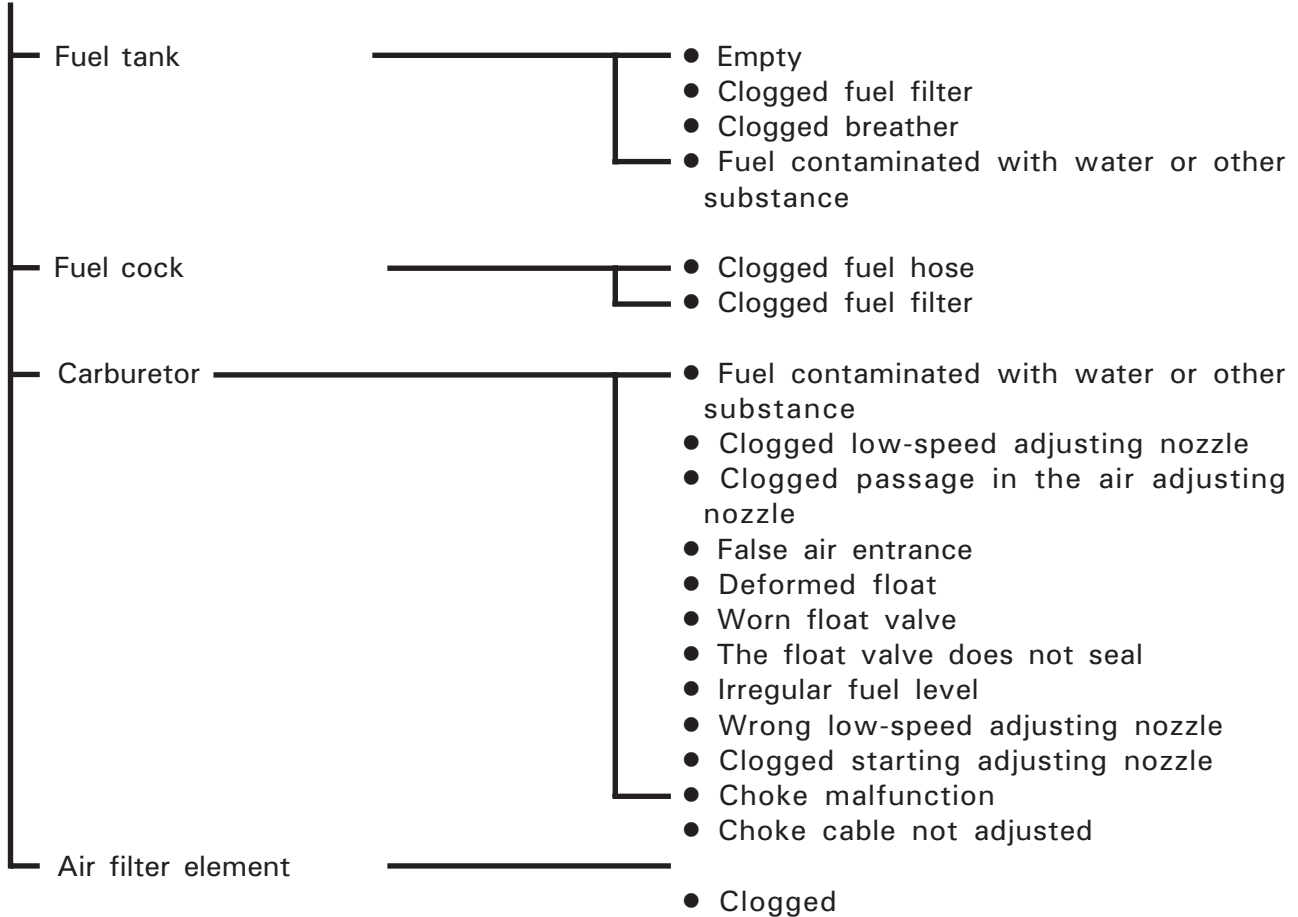
NOTE:

This chapter does not cover all possible causes of problems. Nevertheless, it will help as a troubleshooting guide.

STARTING FAILURE / DIFFICULTY

FUEL SYSTEM

POSSIBLE CAUSE



# STARTING FAILURE / DIFFICULTY

PROB

?

## ELECTRIC SYSTEM

## POSSIBLE CAUSE

|                  |  |
|------------------|--|
| Spark plug       | <ul style="list-style-type: none"><li>● Wrong cap</li><li>● Worn electrode</li><li>● Broken cable between terminals</li><li>● Wrong thermal grade</li><li>● Defective cap</li></ul>  |
| Ignition coil    | <ul style="list-style-type: none"><li>● Broken or shorted primary/secondary winding</li><li>● Defective spark plug cable</li><li>● Broken body</li></ul>   |
| C.D.I. system    | <ul style="list-style-type: none"><li>● Defective C.D.I. unit</li><li>● Defective pulse coil</li><li>● Defective charging coil</li><li>● Broken crankshaft key</li></ul>   |
| Switch and wires | <ul style="list-style-type: none"><li>● Defective main switch</li><li>● Defective "ENGINE STOP" switch</li><li>● Broken or shorted wire</li><li>● Defective neutral switch</li><li>● Defective starting switch</li><li>● Defective clutch switch</li></ul> |
| Starter motor    | <ul style="list-style-type: none"><li>● Defective starter motor</li><li>● Defective starting relay</li><li>● Defective starting bendix</li></ul>   |

## COMPRESSION SYSTEM

## POSSIBLE CAUSE

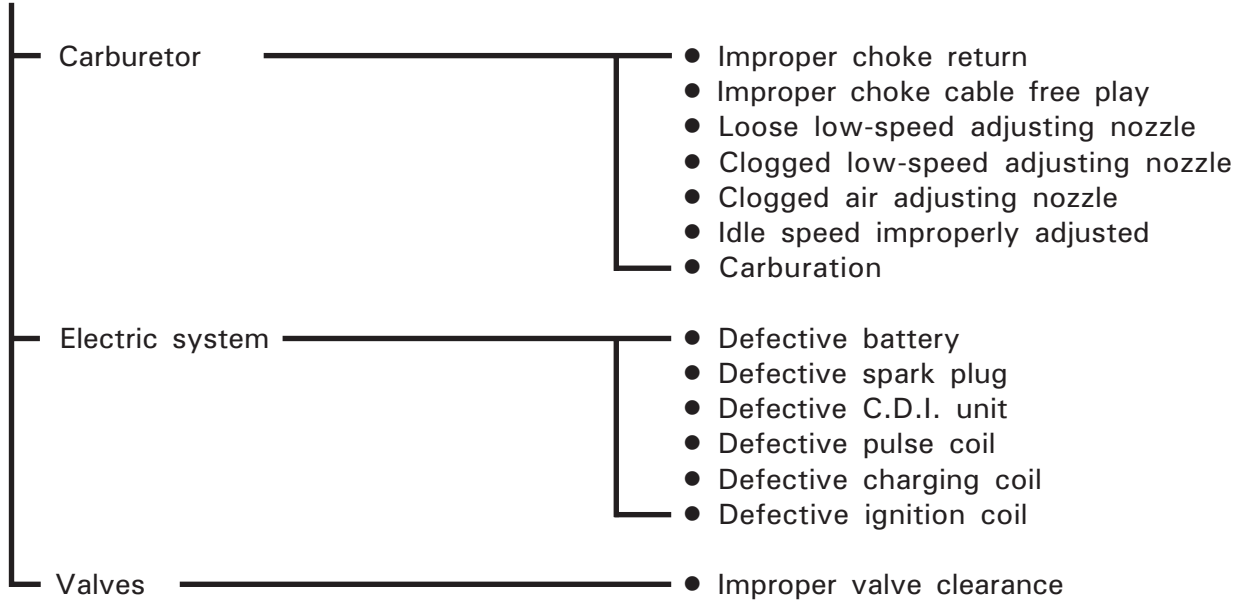
|                                 |   |
|---------------------------------|---|
| Cylinder and head               | <ul style="list-style-type: none"><li>● Loose spark plug</li><li>● Loose cylinder or head</li><li>● Broken head gasket</li><li>● Scratched, worn or locked cylinder</li></ul>               |
| Piston and rings                | <ul style="list-style-type: none"><li>● Ring not properly installed</li><li>● Broken or worn ring</li><li>● Locked ring</li><li>● Locked or damaged piston</li></ul>                        |
| Valves, camshaft and crankshaft | <ul style="list-style-type: none"><li>● Valve not properly seated</li><li>● Broken valve spring</li><li>● Wrong valve point</li><li>● Locked camshaft</li><li>● Locked crankshaft</li></ul> |

# POOR PERFORMANCE AT IDLE SPEED / POOR PERFORMANCE AT MEDIUM AND HIGH SPEEDS

|             |          |
|-------------|----------|
| <b>PROB</b> | <b>?</b> |
|-------------|----------|

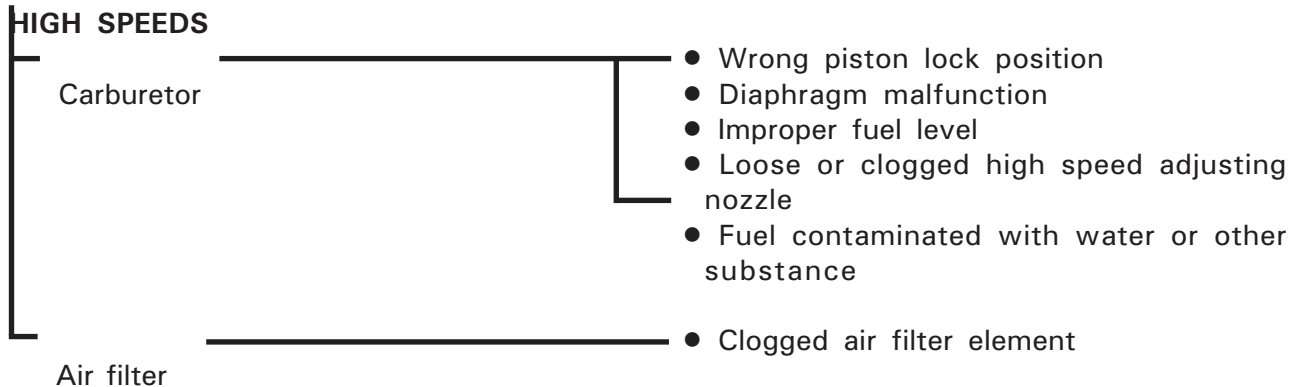
## POOR PERFORMANCE AT IDLE SPEED

## POSSIBLE CAUSE



## POOR PERFORMANCE AT MEDIUM AND HIGH SPEEDS

## POSSIBLE CAUSE

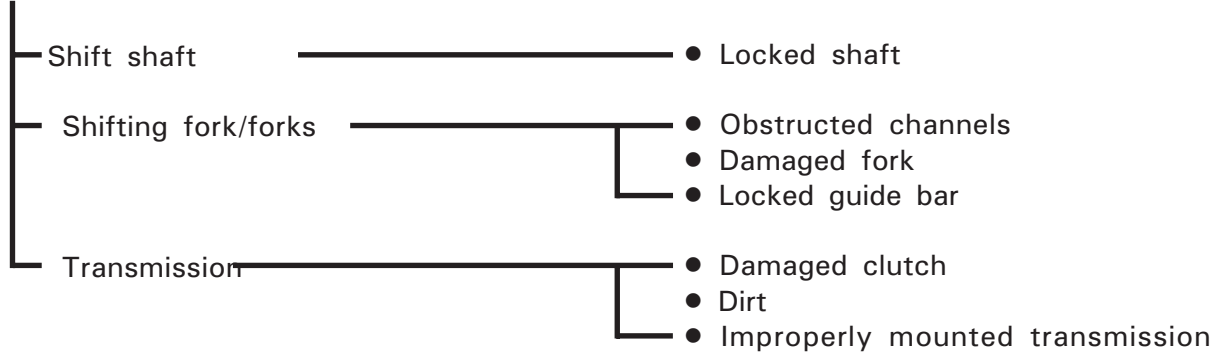


# GEAR SHIFTING DIFFICULTY/CLUTCH PROBLEMS

|             |          |
|-------------|----------|
| <b>PROB</b> | <b>?</b> |
|-------------|----------|

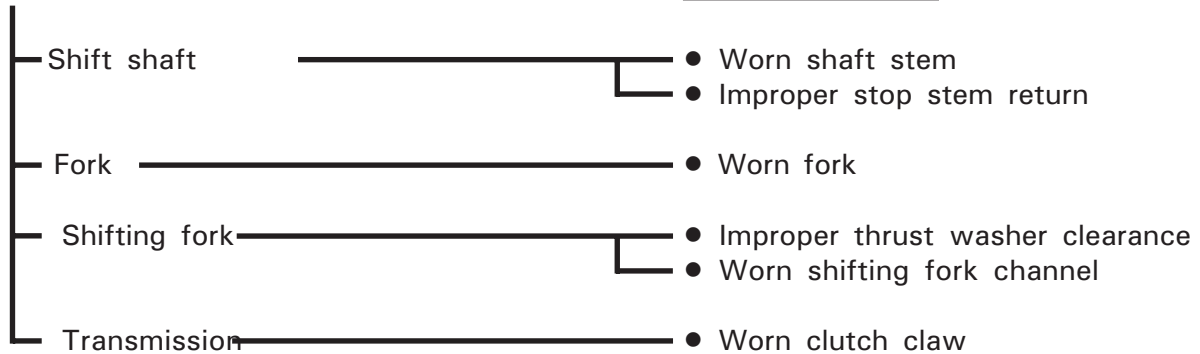
## GEAR SHIFTING DIFFICULTY

### POSSIBLE CAUSE



## UNSTABLE GEAR

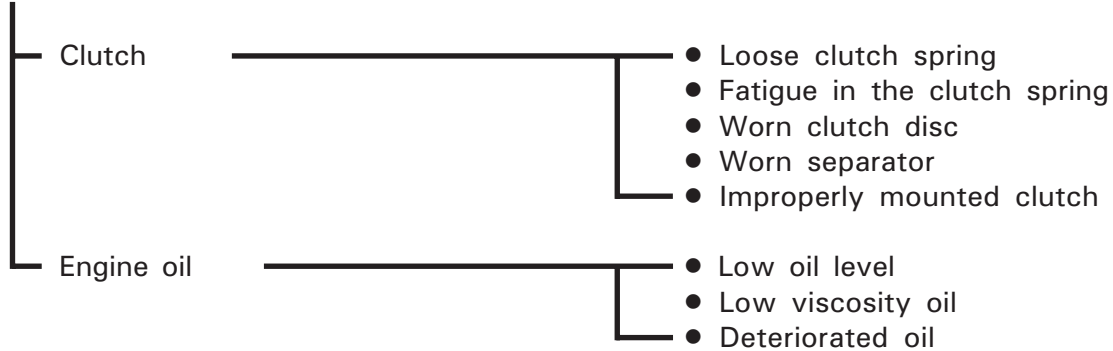
### POSSIBLE CAUSE



## CLUTCH PROBLEMS

### SLIPPING CLUTCH

### POSSIBLE CAUSE





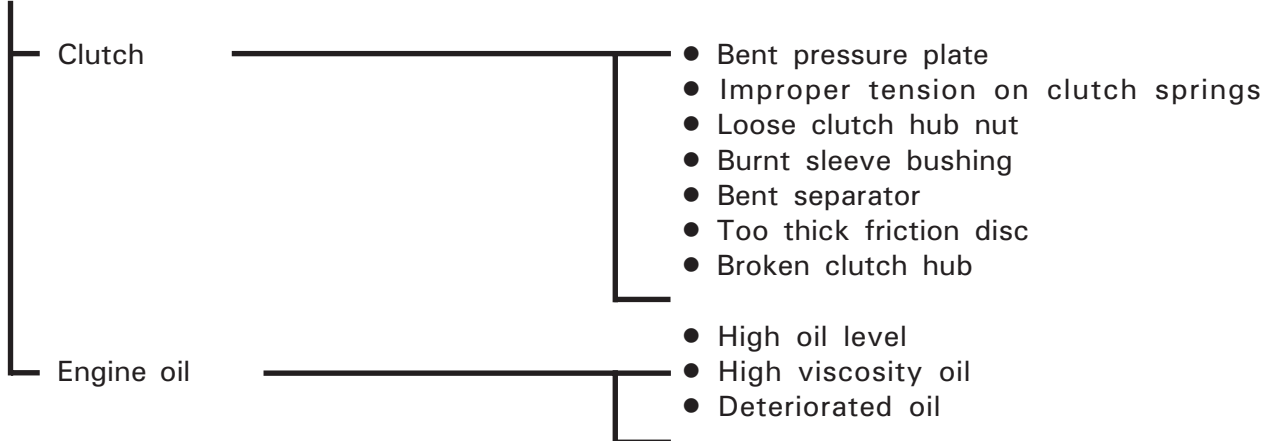
# OVERHEATING

PROB

?

## DRAGGING CLUTCH

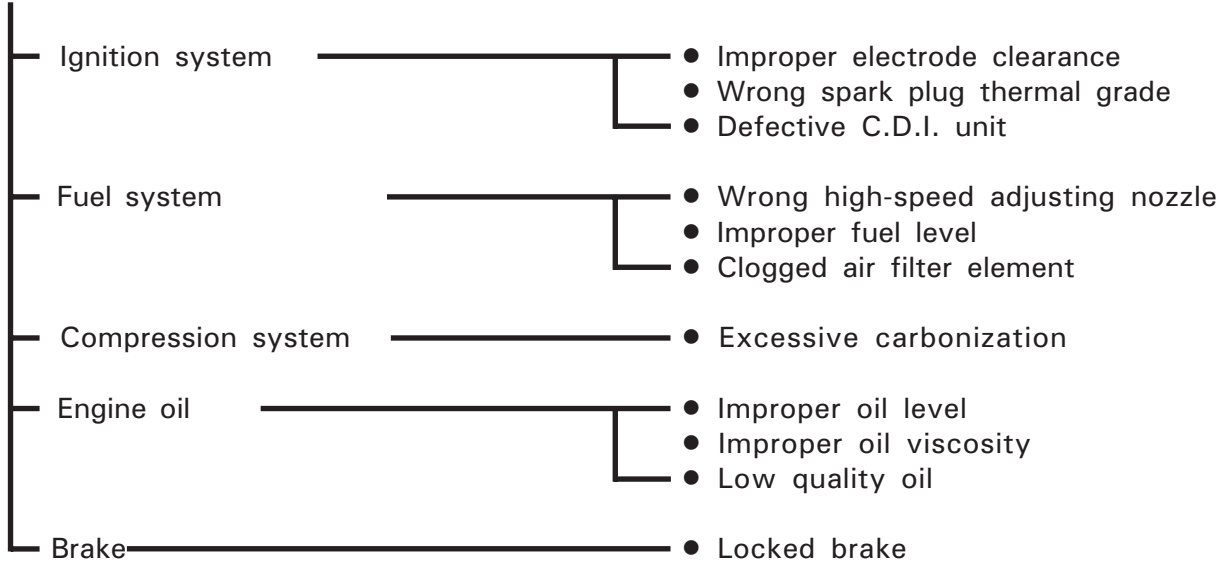
## POSSIBLE CAUSE



## OVERHEATING

### OVERHEATING

### POSSIBLE CAUSE



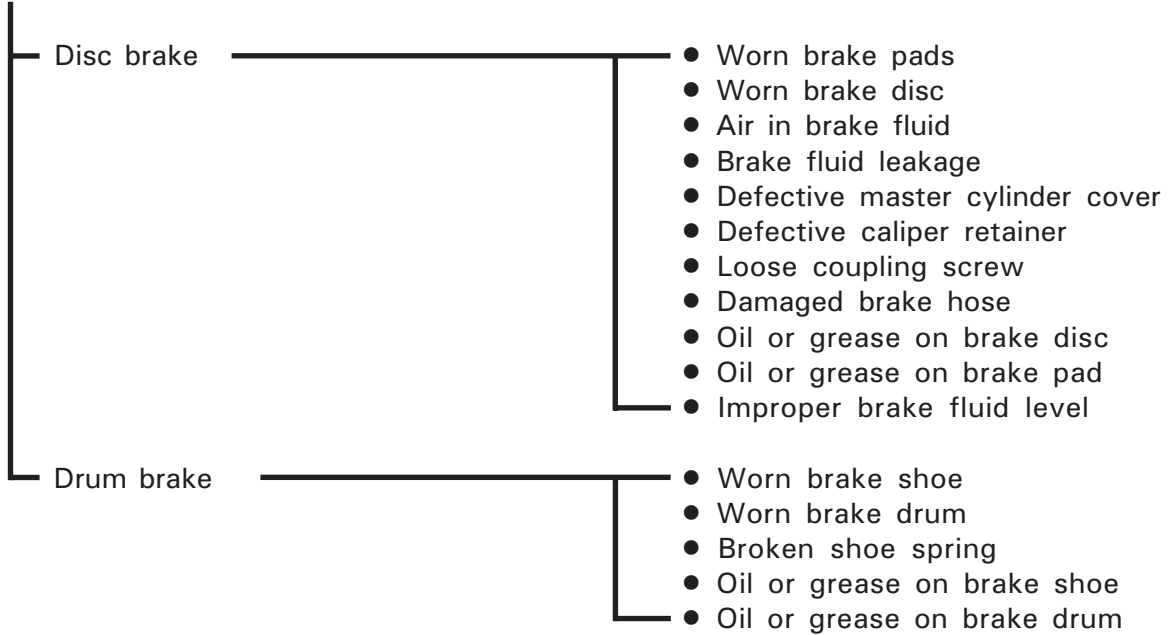
# BRAKE FAULT/ LEAKAGE ON THE FRONT FORK

|             |          |
|-------------|----------|
| <b>PROB</b> | <b>?</b> |
|-------------|----------|

## BRAKE FAULT

### DEFECTIVE BRAKING SYSTEM

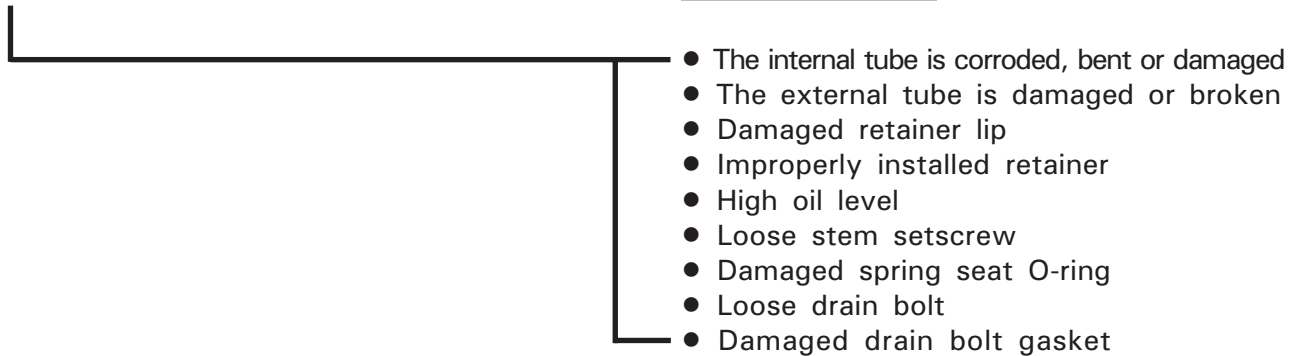
### POSSIBLE CAUSE



## LEAKAGE ON THE FRONT FORK AND MALFUNCTION

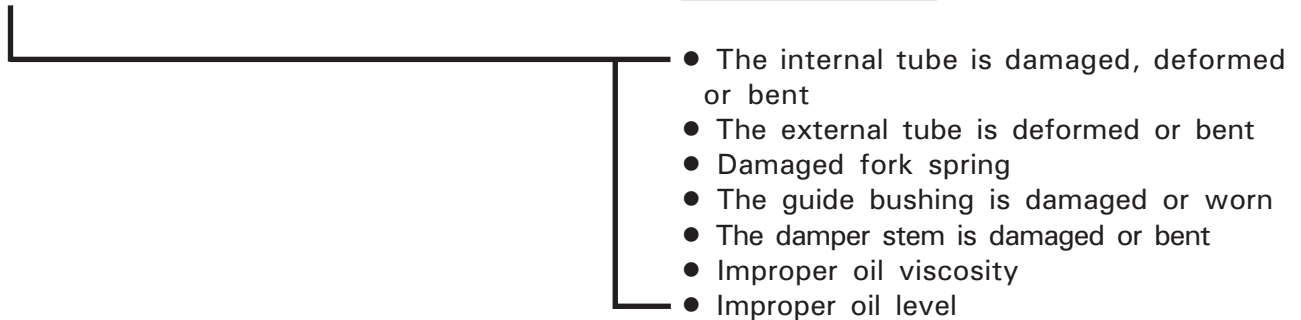
### OIL LEAKAGE

### POSSIBLE CAUSE



### MALFUNCTION

### POSSIBLE CAUSE



# UNSTABLE DRIVING

PROB

?

## UNSTABLE DRIVING

## POSSIBLE CAUSE

|                    |  |
|--------------------|--|
| HANDLE-BARS        | <ul style="list-style-type: none"><li>● Improperly installed or bent</li></ul>   |
| Steering column    | <ul style="list-style-type: none"><li>● Improperly installed upper base</li><li>● Bent steering column</li><li>● Improperly installed steering column (Adjusting nut not adjusted)</li><li>● Damaged raceway or roller bearing</li></ul> |
| Front fork         | <ul style="list-style-type: none"><li>● Different oil levels</li><li>● Broken spring</li><li>● Twisted front forks</li></ul>   |
| Tires              | <ul style="list-style-type: none"><li>● Different pressure levels</li><li>● Improper pressure</li><li>● Uneven wear</li></ul>  |
| Frame              | <ul style="list-style-type: none"><li>● Twisted</li><li>● Damaged pipe</li><li>● Improperly installed raceway or roller bearings</li></ul>   |
| Rear balance       | <ul style="list-style-type: none"><li>● Worn spacer or roller bearings</li><li>● Bent or damaged</li></ul>   |
| Shock absorber     | <ul style="list-style-type: none"><li>● Fatigue in spring 1</li></ul>  |
| Transmission chain | <ul style="list-style-type: none"><li>● Oil and gas leakage</li><li>● Improperly adjusted chain free play</li></ul>  |

