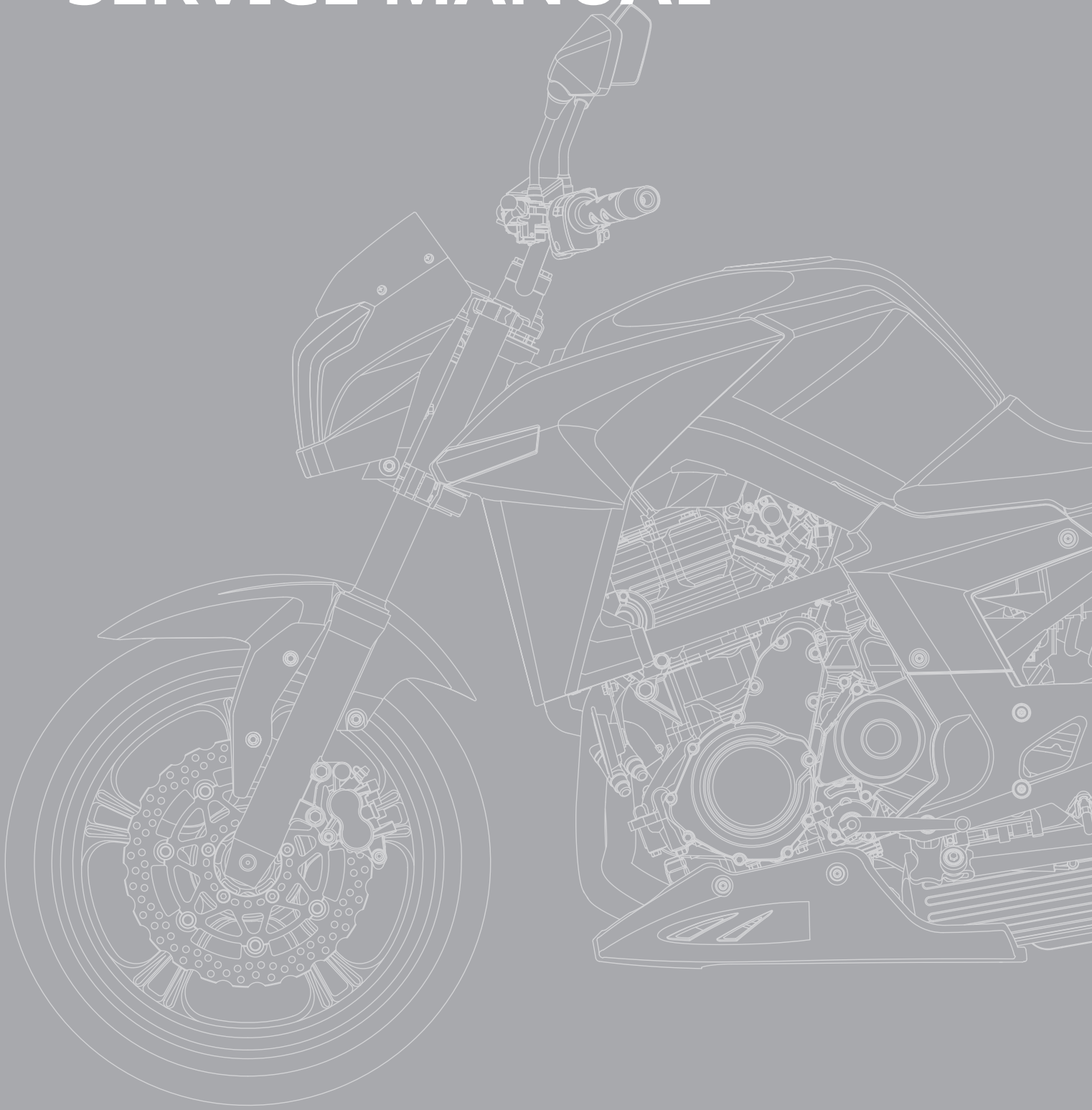
CFMOTO

650NK

# SERVICE MANUAL



## FOREWORD

This manual introduces 650NK (CF650 model) maintenance information, disassembly procedure, check & adjustment methods, troubleshooting and technical specifications. There are illustrations, drawings to guide your operation.

CFMOTO has final explanations to this manual information. Without our prior written approval, the manual cannot be dupliacted and disclosed to third party.

CFMOTO reserves rights to make improvements and modifications to the products without prior notice. Overhaul and maintenance should be done according to actual condition of vehicle.

This manual is compiled according to standard GB9969.1-1998 and GB/T19678-2005.

## INDEX



**Click on index line to go.**

## Abbreviations Table

| | | | |
|---|---|---|---|
| A | ampere | ib | pound(s) |
| ABDC | after bottom dead center | m | meter(s) |
| AC | alternating current | min | minute(s) |
| ATDC | after top dead center | N | newton(s) |
| BBDC | before bottom dead center | Pa | pascal(s) |
| BDC | bottom dead center | PS | horsepower |
| BTDC | before top dead center | psi | pound(s) per square inch |
| °C | degree(s) Celsius | r | revolution |
| DC | direct current | rpm | revolution(s) per minute |
| F | farad(s) | TDC | top dead center |
| °F | degree(s) Fahrenheit | TIR | total indicator reading |
| ft | foot, feet | V | volt(s) |
| g | gram(s) | W | watt(s) |
| h | hour(s) | Ω | ohm(s) |
| l | liter(s) | | |

# INTRODUCTION

This manual is designed primarily for use by well-trained mechanics in a properly equipped workshop. So the operator should have basic and necessary mechanical and electrical knowledge, as well as knowledge of proper use of tools. If you don't have enough experience, it is better to ask qualified operator to work. In order to perform the work efficiently and to avoid costly mistakes, it is important to read the manual thoroughly. **For the warranty period,** it is recommended to repair and maintain completely following this service manual. Any maintenance or repair procedure not performed in accordance with this manual may void warranty.

**To get the longest life out of your vehicle.**

- Perform periodic maintenance by following this manual. Be alert for problems and non-scheduled maintenance.
- Use genuine CFMOTO parts and proper tools. There are necessary information about genuine parts and special tools in our parts catalogue and special tools list. Follow the service manual procedures step by step. Do not take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any new parts installed.

## How to Use This Manual

Whenever you see these WARING or CAUTION symbols, heed the instructions. Always follow safe operating and maintenance practices.

**⚠ WARNING**

This warning symbol identifies special instructions or procedures which, if not correctly followed, could result in personal injury or loss of life.

**CAUTION**

**This caution symbol identifies special instructions or procedures which, if not strictly observed, could result in damage to or destruction of equipment.**

This manual contains four more symbols (in addition to WARNING and CAUTON) which will help you distinguish different types of information.

**NOTE**

○ *This note symbol indicates points of particular interest for more efficient and convenient operation.*

● Indicates a procedural step or work to be done.

○ Indicates a procedural sub-step or how to do the work. It also precedes the text of NOTE.

★ Indicates a conditional step or what action to take based on the results of text or inspection.

# General Information

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## Safety Precautions

Exhaust contains toxic ingredients. Do not run the engine in enclosed or poorly-ventilated areas.

When the engine just stops, the temperature of engine, muffler is still high; please do not touch them with bare hands, for avoiding burn. Please wear uniform with long sleeves as well as gloves when maintaining.

The liquor (dilute sulfuric acid) in Battery is strongly corrosive; it may burn the skin and blind the eyes when it contacts them. In case of contact, please wash it with a great deal of clear water immediately, and seek medical treatment in hospital. Besides, please also wash it by a great deal of clear water when it contacts the clothes, for avoiding skin burn. The Battery and Battery liquor must be stored strictly out of reach of children.

The coolant is poisonous, please do not drink it, do not let it contact the skin, eyes neither clothes. In case it contacts the skin or clothes, please rinse it immediately. When it contacts the eyes, please wash it thoroughly with a great deal of clear water immediately, and seek medical treatment in hospital. In case the coolant is drunk by mistake, please try to throw it up, and seek medical treatment immediately after gargling. The coolant must be stored strictly out of reach of children.

Uniform (pilot uniform etc), cap, safety boots suitable for the operation must be worn, and the safety articles such as dustproof goggles, dustproof respirator and gloves shall be worn for protection when necessary.

No smoking or naked fire is allowed at the operation site, for the gasoline is combustible. Not only flames, but electric sparks shall be avoided. Besides, the vapored gasoline is explosive, please operate it in the place with nice ventilation.

## Safety Precautions

The Battery may produce combustible and explosive hydrogen when it is being charged. So it may explode if there is f ame or electric spark. So please charge it in the place with nice ventilation.

The personnel shall make them be aware of each other from time to time when operating, for safety conf rmation.

Do not touch the turning or movable pieces such as rear wheel, clutch, etc. Pay attention not to get pinched when servicing.

## Before Servicing

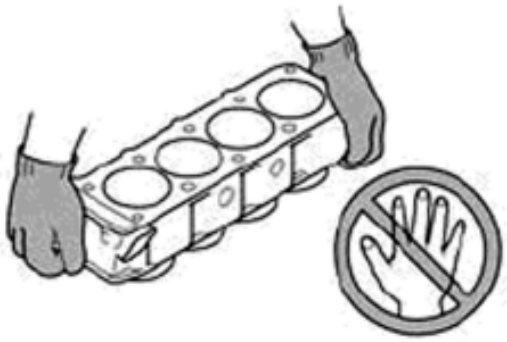
Before starting to perform an inspection service or carry out disassembly and installation on a motorcycle, read the precautions given below. To facilitate acutal operations, notes, illustrations, photograghs, cautions and descriptions have been included in each chapter wherever necessary.This section explains the items that require particular attentions during removal and reassembly.

## Special Notes for the Following:

*Battery Ground*

Before completing any service on the motorcycle, disconnect the battery cables from the battery to prevent the engine from accidentally turning over. Disconnect the ground cable (-) first and then the positive (+).When finishing the service, first connect positive(+) cable to the positive (+) terminal of the battery and then the negative (-) cable to the negative (-) terminal.

Disassembly Assembly

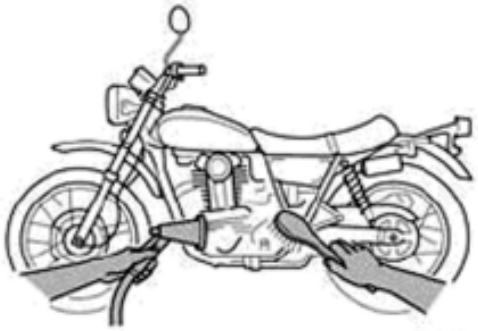


*Edges of Parts*

When service parts with edges, wearing gloves to prevent injury.

*Solvent*

Use a high-flush point solvent when cleaning parts. High-flush point solvent should be used according to directions of solvent manufacturer.

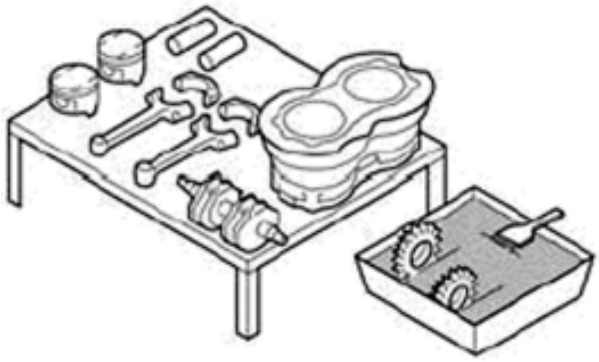


*Cleaning Vehicle Before Disassembly*

Clean the vehicle completely before disassembly.Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and reduce vehicle performance.

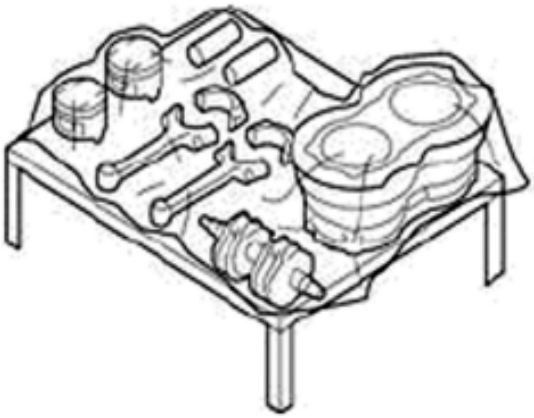
*Arrangement and Cleaning of Removed Parts*

Disassembled parts are easy to confuse.Arrange the parts according to the order of parts disassembled and clean the parts in order prior to installation.



*Storage of Removed Parts*

After all the parts including subassembly parts have been cleaned, store the parts in a clean area, put a clean cloth or plastic sheet over the parts to protect from any foreign materials that may collect before re-assembly.

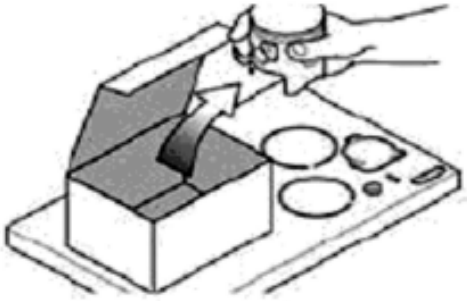


*Inspection*

Reuse of worn or damaged parts may lead to serious accidents.Visually inspect removed parts for corrosion, discoloration or other damage.Refer to the appropriate sections of this manual for service limits on individual parts. Replace the parts if any damage has been found or if the part beyond the service limits.

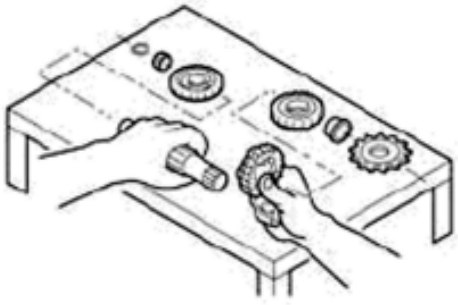
*Replacement Parts*

Replacement parts must be CFMOTO genuine or recommended by CFMOTO. Gaskets, O-rings, oil seals, grease seals, circlips or cotter pins must be replaced with new ones whenever disassembled



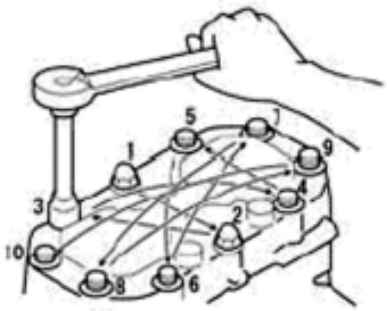
*Assembly Order*

In most cases assembly order is the reverse of disassembly.However,if assembly order is provided in the Service Manual, follow the procedures given.



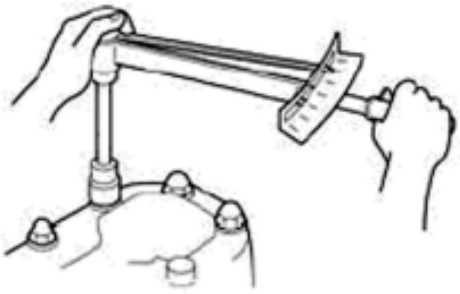
*Tightening Sequence*

Generally, when installing a part with several bolts, nuts or screws, start them all in their holes and tighten them in snug fit. Then tighten them according to specified sequence to prevent case warpage or deformation which can lead to malfunction.Conversely when loosening the bolts, nuts or screws, first loosen all of them by a quarter turn and then remove them. If the specified sequences is not indicated, tighten the fasteners alternating diagnoally.



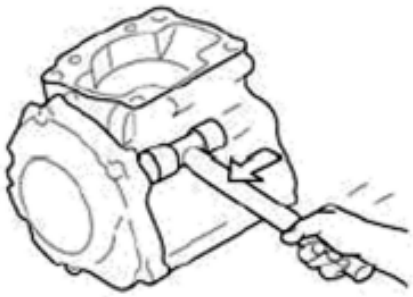

*Tightening Torque*

Incorrect torque applied to a bolt, nut or screw may lead to serious damage. Tighten fasteners to the specified torque by using a good quality torque wrench. Often, the tightening sequence is followed twice initial tightening and final tightening torque.



*Porper Force*

Use common sense during disassembly and assembly.excessive force can cause expensive or hard to repair damage.When necessary, remove screws that have non-permanent locking agent applied using an impact driver. Use a plastic-faced mallet whenever tapping is necessary.



*Gasket and O-ring*

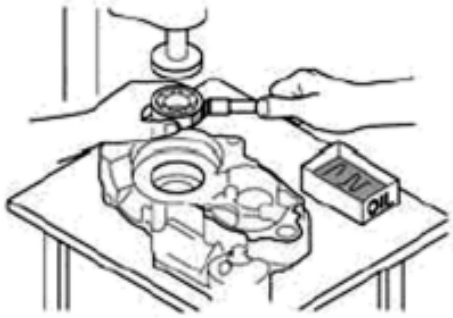
Hardening, shrinkage, or damage of both gaskets and O-ring after disassembly can reduce sealing performance.

*Liquid Gasket,Non-permanent Locking Agent*

For applications that require Liquid Gasket or a non-permanent locking agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively, excessive application can clog oil passages and causes serious damage.

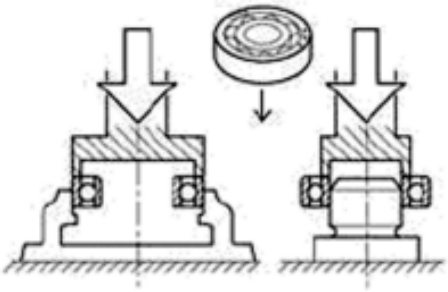
*Press*

For items such as bearing or oil seals that must be pressed into place, apply small amount of oil on contact area. Be sure to maintain proper alignment and use smooth movements when installing.



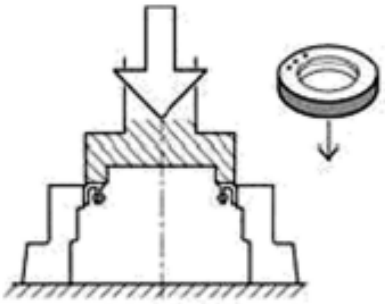

*Ball Bearing and Needle Bearing*

Do not remove ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with manufacturer and size marks facing out. Press bearing into place by putting pressure on the correct bearing race as shown.

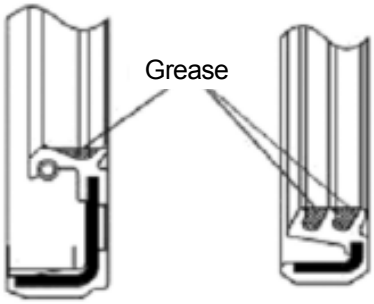


*Oil seal & Grease Seal*

Do not remove pressed oil or grease sealsunless removal is absolutely necessary. Replace with new ones whenever removed. Press new oil seals with manufacturer and size marks facing out.Make sure the seal is aligned properly when installing.

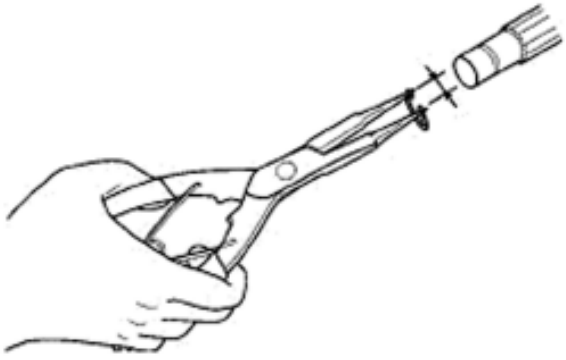


Apply specified grease to the lip of the seal before installing the seal.



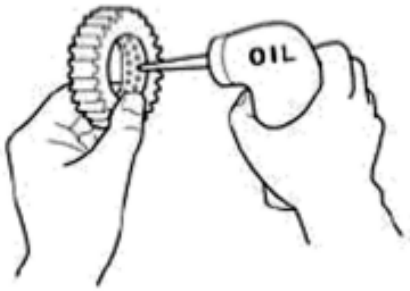

*Circlips, Cotter Pins*

Replace circlips or cotter pins that were removed with new ones. Take care not to open the clip excessively when installing to prevent deformation.



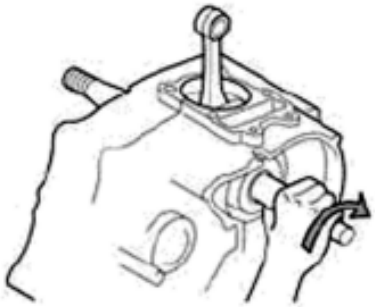
*Lubrication*

It is important to lubricate rotating or sliding parts during assembly to minimize wear during initial operation. Lubrication points are called out throughout this manual.Apply specific oil or grease as specified.



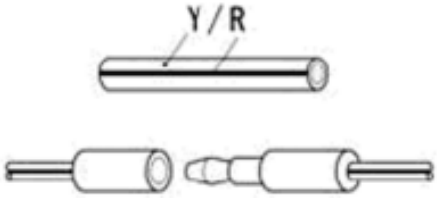

*Direction of Engine Rotation*

When rotating crankshaft by hand, the free play of amount of rotating direction will affect adjustment. Rotate the crankshaft to positive direction (Clockwise viewed from output side)



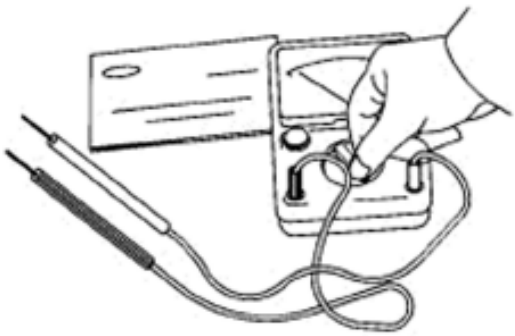
*Electrical Wires*

When connecting electrical wires, first to check color of wires and unless special instruction, same color of wires should be connected.

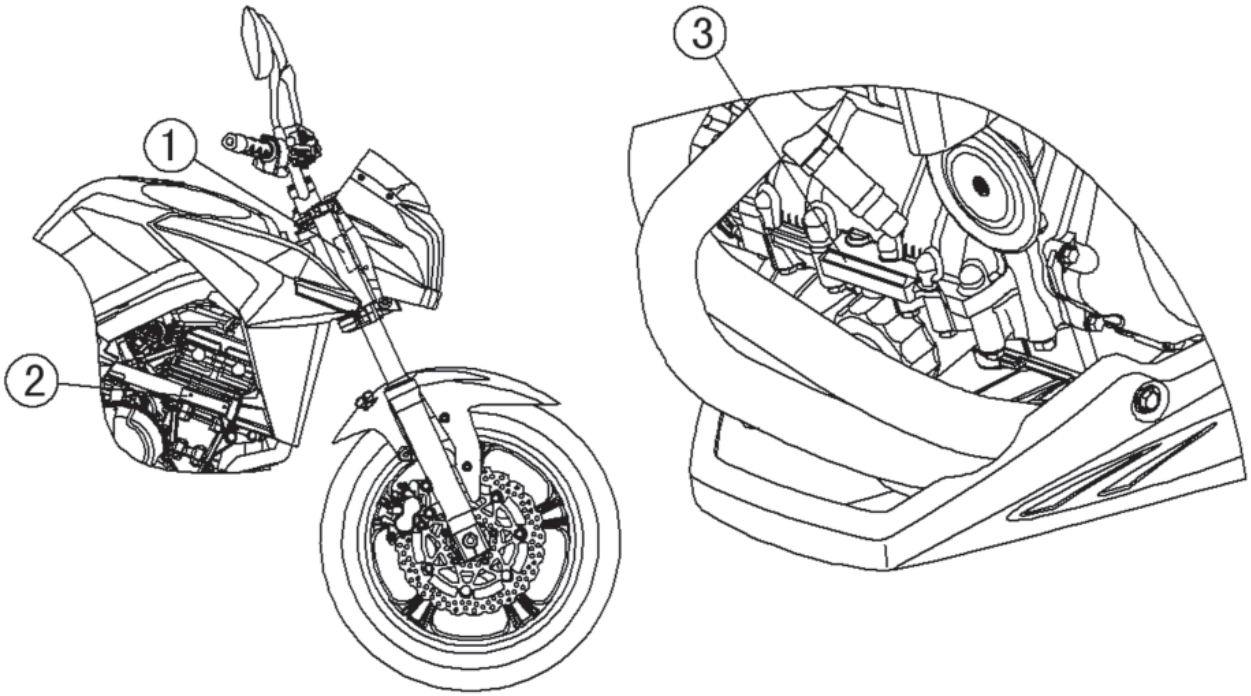



*Instrument*

Use a meter that has enough accuracy for an accurate measurement. Read the manufacturer's instructions completely before using the meter.Incorrect values may lead to improper adjustments.



**Marking Locations**
**Model:** **CF650**
**VIN No.:** **LCEPEVL1-**
**Engine serial No.:** **283MT-**




① **VIN No.:** _____
② **Name Plate:** _____
③ **Engine Serial N0.:** _____

## General Specifications

| Items | CF650 (650NK) |
|---|---|
| **Dimensions:** | |
| Overall length | 2120mm (83.5in.) |
| Overall width | 780mm (30.7in.) |
| Overall height | 1100mm (43.3in.) |
| Wheelbase | 1415mm (55.7in.) |
| Road clearance | 150mm (5.9in.) |
| Seat height | 895mm (35.2in.) |
| Dry mass | 206kg (454.3lb) |
| Curb mass | 281kg (619.7lb) |
| Front: | 129kg (284.5lb) |
| Rear: | 152kg (335.2lb) |
| Fuel tank capacity | 17L (4.5USgal.) |
| **Performance** | |
| Minimum turning radius (LH or RH) | 5.4m (17.8ft) |
| **Engine** | |
| Type | 2-cylinder in line, 4-strokes, DOHC, 8 valves and liquid-cooled |
| Cooling system | liquid-cooled |
| Bore and stroke | 83 × 60 mm (3.3 × 2.4 in.) |
| Displacement | 649.3 cm³ (39.60 cu in.) |
| Compression ratio | 11.3 : 1 |
| Max. power | 52 kW (70.6 PS) @8 500 r/min (rpm) |
| Max. torque | 62 N•m (6.3 kgf•m, 46 ft•lb) @7 000 r/min (rpm) |
| Carburetion system | Fuel injection system |
| Starting system | Electric starter |
| Ignition system | ECU |
| Timing advance | Controlled by ECU |
| Ignition timing | From 10° BTDC @1 300 r/min (rpm)to 33° BTDC @6000r/min (rpm) |
| Spark plug | CR8EI |
| Cylinder numbering methods | left to right 1-2 |
| Firing order | 1-2 |
| **Valve timing** | |
| Intake: | |
| Open | 31° BTDC |
| Close | 61° ABDC |
| Duration | 272° |

| Items | CF650 (650NK) |
|---|---|
| Exhaust: | |
| Open | 50°BBDC |
| Close | 30°ATDC |
| Duration | 260° |
| Lubrication system | Forced lubrication(semi-dry sump) |
| Engine oil： | |
| Type | API SG or API SH,SJ or SL with JASOMA |
| Viscosity | SAE 15W-40 |
| Oil capacity | |
| | Without replacement of oil filter：2.0L |
| | If replacement of oil filter：2.2L |
| | If drain oil completely：2.6L |
| **Drive train** | |
| Primary reduction system: | |
| Type | Gear |
| Reduction ratio | 2.095(88/42) |
| Clutch type | Wet, multi disc |
| Transmission: | |
| Type | 6-speed,constant mesh, return shift |
| Gear ratios: | |
| 1st | 2.353 (39/16) |
| 2nd | 1.714 (36/21) |
| 3rd | 1.333 (32/24) |
| 4th | 1.111 (30/27) |
| 5th | 0.966 (28/29) |
| 6th | 0.852 (23/27) |
| Final drive system | |
| Type | Chain drive |
| Reduction ratio | 3.067(46/15) |
| Overall drive ratio | 5.474（@ Top gear） |
| **Frame** | |
| Type | Tubular, diamond |
| Caster angle（Rake angle） | 24.5° |
| Trail | 102mm (4.0in.) |
| Front tire | |
| Type | Tubeless |
| Size | 120/70R17 (58H) |
| Rim size | 17×3.50 |
| Rear tire | |
| Type | Tubeless |
| Size | 160/60R17 (69H) |
| Rim size | 17×4.50 |
| Front suspension | |
| Type | Telescopic fork |
| Wheel travel | 120mm (4.7in.) |

| Items | CF650 (650NK) |
|---|---|
| Rear suspension | |
| Type | Swingarm |
| Wheel travel | 125mm(4.9 in.) |
| Brake type | |
| Front | Double disc |
| Rear | Single disc |
| **Electrical system** | |
| Battery | 12V 10Ah |
| Headlight | |
| Type | Semi-sealed beam |
| Bulb | Hi: H7 12V55W Low: H7 12V55W |
| Tail/Brake light | LED 12V 0.39W/1.55W |
| Alternator | |
| Type | Three-phase AC |
| Rated output | 25A/14V @5000 rpm |

| Prefixes for units | | |
|---|---|---|
| Prefix | Symbol | Power |
| Mega | M | ×1000000 |
| Kilo | k | ×1000 |
| Centi | c | ×0.01 |
| Milli | m | ×0.001 |
| Micro | μ | ×0.000001 |

| Units of Mass |
|---|
| Kg × 2.205 = Lb |
| g × 0.03527 = oz |

| Units of Volume |
|---|
| L × 0.2642 = gal (US) |
| L × 0.2200 = gl (imp) |
| L × 1.057 = qt (US) |
| L × 0.8799 = qt (imp) |
| L × 2.113 = pint (US) |
| L × 1.816 = pint(imp) |
| mL × 0.03381 = oz (US) |
| mL × 0.02816 = oz (imp) |
| mL×0.06102 = cuin |

| Units of Force |
|---|
| N × 0.1020 = Kg |
| N × 0.2248 = Lb |
| Kg × 9.807 = N |

| Units of Length |
|---|
| Km × 0.6214 = mile |
| m × 3.281 = ft |
| mm × 0.03937 = in |

| Units of Torque |
|---|
| N·m × 0.1020 = Kgf·m |
| N·m × 0.7376 = Ft·lb |
| N·m × 8.851 = In·lb |
| Kgf·m × 9.807 = N·m |
| Kgf·m × 7.233 = Ft·lb |
| Kgf·m × 86.80=In·lb |

| Units of Pressure |
|---|
| KPa × 0.01020 = $Kgf/cm^2$ |
| KPa × 0.1450 = psi |
| KPa × 0.7501 = cmHg |
| $Kgf/cm^2$ × 98.07 = KPa |
| $Kgf/cm^2$ × 14.22 = psi |
| cmHg × 1.333 = KPa |

| Units of Speed |
|---|
| Km/h×0.6214=mph |

| Units of Power |
|---|
| Kw×1.360=PS |
| Kw×1.341=HP |
| PS×0.7355=KW |

# Periodic Maintenance

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## Periodic Maintenance Chart

The scheduled maintenance must be done in accordance with this chart to keep the motorcycle in good running condition.The initial maintenance is vitally important and must not be neglected.

■:This service must be performed by an authorized CFMOTO dealer.

*:For higher odometer readings,repeat at the frequency interval established here.

#:Service more frequently when operating in servere conditions;dusty,wet,muddy,high speed,or frequent starting/stopping.

## 1.Periodic Inspection

| FREQUENCY / INSPECTION | Whichever Comes First ↓ Every | *ODOMETER READINGS → km×1000 | | | | | | | See Page |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 6 | 12 | 18 | 24 | 30 | 36 | |
| ■ Air filter element - clean | | | | ● | | ● | | ● | 2-14 |
| ■Valve clearance-inspect | 42000km | | | | | | | | 2-19 |
| Throttle control system (play, smooth return, no drag) - inspect | year | ● | | ● | | ● | | ● | 2-15 |
| Idle speed - inspect | | ● | | ● | | ● | | ● | 2-16 |
| ■ Fuel leak (fuel hose and pipe) - inspect | year | ● | | ● | | ● | | ● | 2-17 |
| ■ Fuel hose and pipe damage - inspect | year | ● | | ● | | ● | | ● | 2-17 |
| ■ Fuel hose and pipe installation condition - inspect | year | ● | | ● | | ● | | ● | 2-17 |
| ■Throttle body—clean | | | ● | ● | ● | ● | ● | ● | — |
| Coolant level - inspect | | ● | | ● | | ● | | ● | 2-18 |
| Coolant leak (radiator hose and pipe) - inspect | year | ● | | ● | | ● | | ● | 2-18 |
| Radiator hose damage - inspect | year | ● | | ● | | ● | | ● | 2-18 |
| Radiator hose installation condition - inspect | year | ● | | ● | | ● | | ● | 2-18 |
| ■ Air intake system damage - inspect | | | | ● | | ● | | ● | |
| **Clutch and Drive Train** | | | | | | | | | |
| Clutch operation (play, disengagement, engagement) - inspect | | ● | | ● | | ● | | ● | 2-25 |
| Drive chain lubrication condition - inspect # | 600km | | | | | | | | 2-27 |
| Drive chain slack - inspect # | 1000km | | | | | | | | 2-28 |
| Drive chain wear - inspect # | | | | ● | | ● | | ● | 2-30 |
| ■ Drive chain guide wear - inspect | | | | ● | | ● | | ● | 2-30 |

| FREQUENCY / INSPECTION | Whichever comes first ↓ Every | *ODOMETER READING → km×1000 | | | | | | | See Page |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 6 | 12 | 18 | 24 | 30 | 36 | |
| **Wheels/Tires** | | | | | | | | | |
| Tire air pressure - inspect | year | ● | | ● | | ● | | ● | 2-25 |
| Wheel/tire damage - inspect | | | | ● | | ● | | ● | 2-26 |
| Tire tread wear, abnormal wear - inspect | | | | ● | | ● | | ● | 2-26 |
| ■Wheel bearing damage - inspect | year | | | ● | | ● | | ● | 2-27 |
| Footrest—lubricate | | ● | | ● | | ● | | ● | — |
| **Brake System** | | | | | | | | | |
| Brake fluid leak (brake hose and pipe) - inspect | year | ● | ● | ● | ● | ● | ● | ● | 2-31 |
| Brake hose and pipe damage - inspect | year | ● | ● | ● | ● | ● | ● | ● | 2-31 |
| Brake pad wear - inspect # | | | ● | ● | ● | ● | ● | ● | 2-33 |
| Brake hose and pipe installation condition - inspect | year | ● | ● | ● | ● | ● | ● | ● | 2-31 |
| Brake fluid level - inspect | 6 months | ● | ● | ● | ● | ● | ● | ● | 2-32 |
| Brake operation (effectiveness, play, no drag) - inspect | year | ● | ● | ● | ● | ● | ● | ● | 2-33 |
| Brake light switch operation - inspect | | ● | ● | ● | ● | ● | ● | ● | 2-33 |
| **Suspensions** | | | | | | | | | |
| Front forks/rear shock absorber operation (damping and smooth stroke) - inspect | | | | ● | | ● | | ● | 2-34 |
| Front forks/rear shock absorber oil leak - inspect | year | | | ● | | ● | | ● | 2-34 |
| **Steering System** | | | | | | | | | |
| ■Steering play - inspect | year | ● | | ● | | ● | | ● | 2-35 |
| ■Steering stem bearings - lubricate | year | | | | | ● | | | 2-36 |
| **Electrical System** | | | | | | | | | |
| Lights and switches operation - inspect | year | | | ● | | ● | | ● | 2-37 |
| Headlight aiming - inspect | year | | | ● | | ● | | ● | 2-39 |
| Sidestand switch operation - inspect | year | | | ● | | ● | | ● | — |
| Engine stop switch operation - inspect | year | | | ● | | ● | | ● | — |
| **Chassis** | | | | | | | | | |
| ■Chassis parts - lubricate | year | | | ● | | ● | | ● | — |
| ■Bolts,nuts tightening torque—inspect | | ● | | ● | | ● | | ● | — |

| FREQUENCY / CHANGE/REPLACE ITEM | Whichever comes first ↓ Every | *ODOMETER READING →km×1000 | | | | | See Page |
|---|---|---|---|---|---|---|---|
| | | 1 | 12 | 24 | 36 | 48 | |
| ■Air filter element# | 2 years | | | | | | 2-14 |
| Engine oil # | 6 months | Every 6000 km | | | | | 2-48 |
| Oil filter | 6 months | Every 6000 km | | | | | 2-48 |
| ■Fuel line | 4 years | | | | | ● | — |
| ■Coolant | 2 years | | | | ● | | 2-45 |
| ■Radiator hose | 2 years | | | | ● | | — |
| ■Brake hose and pipe | 4 years | | | | | ● | — |
| ■Brake fluid (F/R) | 2 years | | | ● | | ● | 2-50 |
| ■Rubber parts of master cylinder and caliper | 4 years | | | | | ● | — |
| ■Spark plug | | | ● | ● | ● | ● | 2-54 |

## Torque Specifications

The following tables list the tightening torque for the major fasteners requiring use of a threadlocker.
Letters used in "emarks" column mean:
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque;
EO: Apply engine oil;
L: Apply a threadlocker to the threads;
Lh: Left-hand threads;
MO: Apply molibdenum disulfide oil solution(mixture of engine oil and molybdenum disulfide grease in a weight ratio 10:1);
R: Replacement Parts;
S: Follow the specified tightening sequence;
Si: Apply silicone grease (ex.PBC grease);
SS: Apply silicone sealant

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| **Electronic Fuel Injection(EFI)** | | | | |
| Coolant Temp. Sensor | 12 | 1.2 | 106in·lb | |
| Speed Sensor Bolt | 8 | 0.80 | 69in·lb | L |
| Fuel Pump Bolts | 5 | 0.5 | — | L,S |
| Oxygen Sensor | 60 | 6.60 | 44.3 | |
| **Cooling System** | | | | |
| Radiator Hose Clamp Bolts | 2.5 | 0.25 | — | |
| Water Pump Impeller Bolt | 10 | 1.0 | 87in·lb | |
| Water Pump Cover Bolts | 10 | 1.0 | 87in·lb | |
| Water Pump Drain Bolt | 7.0 | 0.70 | 62in·lb | |
| Thermostat Housing Bolts | 10 | 1.0 | 87in·lb | |
| Coolant Temp. Sensor | 12 | 1.2 | 106in·lb | |
| Baffle Plate Bolts | 6 | 0.60 | 52in·lb | See text |
| **Engine Top End** | | | | |
| Valve Cover Bolts | 10 | 1.0 | 87in·lb | |
| Camshaft Cap Bolts | 12 | 1.2 | 106in·lb | S |
| Cylinder Head Bolts (M10 New Bolts) | 54 | 5.5 | 40 | MO,S |
| Cylinder Head Bolts (M10 Used Bolts) | 49 | 5.0 | 36 | MO,S |
| Cylinder Bolt (M8) | 27.5 | 2.8 | 20 | MO,S |
| Cylinder Nut (M10) | 49 | 5.0 | 36 | MO,S |
| Cylinder Head Bolts (M6) | 12 | 1.2 | 106in·lb | S |
| Cylinder Bolts (M6) | 12 | 1.2 | 106in·lb | S |
| Intake Manifold Bolts | 12 | 1.2 | 106in·lb | |
| Intake Manifold Clamp | 2.0 | 0.2 | 1.5 | |
| Camshaft Chain Tensioner Bolts | 12 | 1.2 | 12 | |
| Camshaft Chain Tensioner Nuts Mounting Bolts | 20 | 1.2 | 20 | |
| Camshaft Sprocket Bolts | 15 | 1.5 | 11 | L |
| Spark Plug | 15 | 1.5 | 11 | |
| Exhaust Pipe Manifold Holder Nuts | 17 | 1.7 | 12 | |
| Muffler Body Mounting Bolt (Front) | 20 | 2.0 | 15 | |

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Muffler Body Mounting Bolt (Rear) | 20 | 2.0 | 15 | |
| Baffle Plate Bolts | 6 | 0.60 | 52in·lb | See text |
| **Clutch** | | | | |
| Oil Filler Plug | – | – | – | Finger tighten |
| Clutch Cover Mounting Bolts | 10 | 1.0 | 87in·lb | |
| Clutch Spring Bolts | 10 | 1.0 | 87in·lb | |
| Clutch Hub Nut | 132 | 13.5 | 98 | R |
| Clutch Lever Clamp Bolts | 10 | 1.0 | 87in·lb | S |
| Oil Pump Chain Guide Bolts | 12 | 1.2 | 106in·lb | L |
| Clutch Cable Holder Bolts | 10 | 1.0 | 87in·lb | L |
| Clutch Cable Clamp Bolt | 10 | 1.0 | 87in·lb | |
| **Engine Lubrication** | | | | |
| Drain Bolt | 30 | 3.0 | 22 | |
| Filler Plate Bolts | 10 | 1.0 | 87in·lb | L |
| Oil Filter | 17 | 1.75 | 13 | EO,R |
| Holder Mounting Bolt | 25 | 2.5 | 18 | L |
| Oil Pan Bolts | 12 | 1.2 | 106in·lb | |
| Oil Pump Chain Guide Bolts | 12 | 1.2 | 106in·lb | L |
| Oil Pipe Plate Bolt | 10 | 1.0 | 87in·lb | L |
| Oil Pressure Relief Valve | 15 | 1.5 | 11 | L |
| Oil Pressure Switch | 15 | 1.5 | 11 | SS |
| Oil Pump Cover Bolts | 10 | 1.0 | 87in·lb | L |
| Lower Fairing Bracket Bolts | 12 | 1.2 | 106in·lb | L |
| Oil Pump Sprocket Bolt | 12 | 1.2 | 106in·lb | L,Lh |
| Oil Passage Plug | 20 | 2.0 | 15 | L |
| **Engine Removal/Installation** | | | | |
| Rear Engine Mounting Nuts | 45 | 4.6 | 32 | S |
| Engine Mounting Bracket Bolts | 25 | 2.5 | 18 | S |
| Front Engine Mounting Bolts | 45 | 4.6 | 32 | S |
| **Crankshaft/Transmission** | | | | |
| Breather Plate Bolts | 10 | 1.0 | 87in·lb | L |
| Crankcase Bolts (M9, L = 113 mm) | 44 | 4.5 | 32 | MO,S |
| Crankcase Bolts (M9, L = 83 mm) | 44 | 4.5 | 32 | MO,S |
| Crankcase Bolts (M8, L = 73 mm) | 35 | 3.6 | 26 | MO,S |
| Crankcase Bolts (M8, L = 60 mm) | 35 | 3.6 | 26 | MO,S |
| Crankcase Bolts (M8, L = 110 mm) | 27.5 | 2.8 | 20 | S |
| Crankcase Bolts (M8, L = 50 mm) | 27.5 | 2.8 | 20 | S |
| Crankcase Bolts (M7) | 20 | 2.0 | 15 | S |
| Upper Crankcase Bolts | 27.5 | 2.8 | 20 | S |

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Shift Drum Bearing Holder Screw | 5 | 0.50 | 43in·lb | L |
| Connecting Rod Big End Nuts | see text | ← | ← | MO |
| Timing Rotor Bolt | 40 | 4.1 | 30 | |
| Oil Pressure Switch | 15 | 1.5 | 11 | SS |
| Gear Positioning Lever Bolt | 12 | 1.2 | 106in·lb | L |
| Shift Shaft Return Spring Pin | 29 | 2.9 | 22 | L |
| Shift Drum Cam Bolt | 12 | 1.2 | 106in·lb | L |
| Neutral Switch | 15 | 1.5 | 11 | |
| Transmission Case Bolts | 20 | 2.0 | 15 | |
| Neutral Switch Holder Screw | 5 | 0.50 | 43in·lb | L |
| Shift Shaft Cover Bolts | 10 | 1.0 | 87in·lb | L(2) |
| Shift Shaft Cover Screw | 5 | 0.50 | 43in·lb | L |
| **Wheels/Tires** | | | | |
| Front Axle | 108 | 11.0 | 80 | |
| Front Axle Clamp Bolt | 34 | 3.5 | 25 | |
| Rear Axle Nut | 108 | 11.0 | 80 | |
| **Final Drive** | | | | |
| Engine Sprocket Nut | 125 | 12.7 | 92 | MO |
| Rear Axle Nut | 108 | 11.0 | 80 | |
| Rear Sprocket Nuts | 59 | 6.0 | 44 | |
| Speed Sensor Bolt | 8 | 0.80 | 69in·lb | L |
| Speed Sensor Bracket Bolts | 10 | 1.0 | 87in·lb | |
| **Brakes** | | | | |
| Bleed Valve | 7.8 | 0.80 | 69in·lb | |
| Brake Hose Banjo Bolts | 25 | 2.5 | 18 | |
| Brake Lever Pivot Bolt | 1.0 | 0.10 | 9in·lb | Si |
| Brake Lever Pivot Bolt Locknut | 5.9 | 0.60 | 52in·lb | |
| Brake Pedal Bolt | 8.8 | 0.90 | 78in·lb | |
| Front Brake Disc Mounting Bolts | 27 | 2.8 | 20 | L |
| Front Brake Light Switch Screw | 1.0 | 0.10 | 9in·lb | |
| Front Brake Reservoir Cap Screws | 1.0 | 0.10 | 9in·lb | |
| Front Caliper Mounting Bolts | 34 | 3.5 | 25 | |
| Front Master Cylinder Clamp Bolts | 8.8 | 0.90 | 78in·lb | S |
| Rear Brake Disc Mounting Bolts | 27 | 2.8 | 20 | L |
| Rear Caliper Mounting Bolts | 25 | 2.5 | 18 | |
| Rear Master Cylinder Mounting Bolts | 25 | 2.5 | 18 | |
| Rear Master Cylinder Push Rod Locknut | 18 | 1.8 | 13 | |
| **Suspension** | | | | |
| Front Axle Clamp Bolt | 34 | 3.5 | 25 | |
| Front Fork Bottom Allen Bolts | 30 | 3.1 | 22 | L |

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Front Fork Clamp Bolts (Lower) | 20 | 2.0 | 15 | AL |
| Front Fork Clamp Bolts (Upper) | 20 | 2.0 | 15 | |
| Front Fork Top Plugs | 25 | 2.5 | 18 | |
| Rear Shock Absorber Bolt | 59 | 6.0 | 44 | |
| Rear Shock Absorber Nut | 59 | 6.0 | 44 | |
| Swingarm Pivot Shaft Nut | 180 | — | — | |
| **Steering** | | | | |
| Front Fork Clamp Bolts (Lower) | 20 | 2.0 | 15 | AL |
| Front Fork Clamp Bolts (Upper) | 20 | 2.0 | 15 | |
| Handlebar Holder Bolts | 25 | 2.5 | 18 | S |
| Left Switch Housing Screws | 3.5 | 0.36 | 31 in·lb | |
| Right Switch Housing Screws | 3.5 | 0.36 | 31 in·lb | |
| Steering Stem Head Bolt | 108 | 11.0 | 80 | |
| Steering Stem Nut | 20 | 2.0 | 15 | |
| **Frame** | | | | |
| Footrest Stay Bolts | 34 | 3.5 | 25 | |
| Front Fender Bolts | 3.9 | 0.40 | 35 in·lb | |
| Front Fender Bracket Bolts | 8.8 | 0.90 | 78 in·lb | L |
| Front Turn Signal Light Mounting Screws | 1.2 | 0.12 | 11 in·lb | |
| Grab Rail Mounting Bolts | 25 | 2.5 | 18 | |
| Lower Fairing Mounting Bolts | 8.8 | 0.90 | 78 in·lb | |
| Seat Lock Mounting Screws | 1.2 | 0.12 | 11 in·lb | |
| Sidestand Bolt | 44 | 4.5 | 32 | |
| Sidestand Switch Bolt | 8.8 | 0.90 | 78 in·lb | L |
| **Electrical System** | | | | |
| Alternator Cover Bolts | 10 | 1.0 | 87 in·lb | |
| Alternator Lead Holding Plate Bolt | 10 | 1.0 | 87 in·lb | L |
| Alternator Rotor Bolt | 155 | 15.8 | 114 | MO |
| Crankshaft Position Sensor Bolts | 6.0 | 0.60 | 53 in·lb | |
| Engine Ground Cable Terminal Bolt | 9.8 | 1.0 | 87 in·lb | |
| Front Brake Light Switch Screw | 1.2 | 0.12 | 11 in·lb | |
| Front Turn Signal Light Mounting Screws | 1.2 | 0.12 | 11 in·lb | |
| Left Switch Housing Screws License | 3.5 | 0.36 | 31 in·lb | |
| Plate Light Cover Screws License | 0.90 | 0.090 | 8 in·lb | |
| Plate Light Mounting Screws Meter | 1.2 | 0.12 | 11 in·lb | |
| Neutral Switch | 15 | 1.5 | 11 | |
| Oil Pressure Switch | 15 | 1.5 | 11 | SS |
| Oxygen Sensor | 60 | 6.10 | 44.3 | |
| Regulator/Rectifier Bolts | 8.8 | 0.90 | 78 in·lb | |
| Right Switch Housing Screws | 3.5 | 0.36 | 31 in·lb | |
| Sidestand Switch Bolt | 8.8 | 0.90 | 78 in·lb | L |
| Spark Plugs | 15 | 1.5 | 11 | |

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Speed Sensor Bolt | 8.0 | 0.80 | 69in·lb | L |
| Starter Motor Cable Terminal Nut | 6.0 | 0.60 | 53in·lb | |
| Starter Motor Mounting Bolts | 10 | 1.0 | 87in·lb | L |
| Stator Coil Bolts | 12 | 1.2 | 106in·lb | L |
| Timing Rotor Bolt | 40 | 4.1 | 30 | |
| Coolant Temp. Sensor | 12.0 | 1.2 | 106in·lb | |

The table below, relating tightening torque to thread diameter, lists the basic torque for the bolts and nuts. Use this table for only the bolts and nuts which do not require a specific torque value. All of the values are for use with dry solvent-cleaned threads.

## Basic Torque for General Fasteners

| Threads Diameter (mm) | Torque | | |
|---|---|---|---|
| | N·m | kgf·m | ft·lb |
| 5 | 3.4-4.9 | 0.35-0.50 | 30-43in·lb |
| 6 | 5.9-7.8 | 0.60-0.80 | 52-69in·lb |
| 8 | 14-19 | 1.4-1.9 | 10.0-13.5 |
| 10 | 25-34 | 2.6-3.5 | 19.0-25 |
| 12 | 44-61 | 4.5-6.2 | 33-45 |
| 14 | 73-98 | 7.4-10.0 | 54-72 |
| 16 | 115-155 | 11.5-16.0 | 83-115 |
| 18 | 165-225 | 17.0-23.0 | 125-165 |
| 20 | 225-325 | 23.0-33.0 | 165-240 |

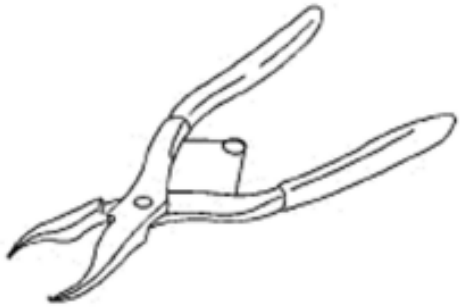
## Specifications and Service Limit

| Item | Standard | Service Limit |
|---|---|---|
| **EFI** | | |
| Throttle Grip Free Play | 2~3mm(0.08~0.12in.) | |
| Idle Speed | 1300±130r/min(rpm) | |
| Air Filter Element | Polyurethane Foam | |
| **Cooling System** | | |
| Coolant: | | |
| Type(recommended) | Permanent type of antifreeze | |
| Color | Green | |
| Mixed Ratio | Soft water 50%, Coolant 50% | |
| Freezing Point | –35°C(–31°F) | |
| Total Amount | 1.6L(1.7USqt) | |
| **Engine Top End** | | |
| Valve Clearance | | |
| Exhaust | 0.20~0.26mm(0.0078~0.0102in.) | – – – |
| Intake | 0.08~0.13mm(0.0031~0.0051in.) | – – – |
| **Clutch** | | |
| Clutch Lever Free Play | 2~3mm(0.08~0.12in.) | – – – |
| **Engine Lubrication System** | | |
| Engine Oil: | | |
| Type | API SG or higher | – – – |
| Viscosity | SAE 15W-40 | – – – |
| Capacity | 2.0L(1.8USqt)( when filter is not replaced) | – – – |
| | 2.2L(2.0USqt)( when filter is replaced) | – – – |
| | 2.6L(2.5USqt)( when engine is completely dry) | – – – |
| Level | Between upper and lower level lines (after idling or running) | – – – |
| **Wheels/Tirs** | | |
| Tread Depth: | | |
| Front | 4.5mm(0.18in.) | 0.8~1.0mm |
| Rear | 5.5mm(0.22in.) | 0.8~1.0mm |
| Air Pressure (when Cold): | | |
| Front | 280kPa(2.80kgf/cm$^2$,39.8psi) | – – – |
| Rear | 280kPa(2.80kgf/cm$^2$,39.8psi) | – – – |

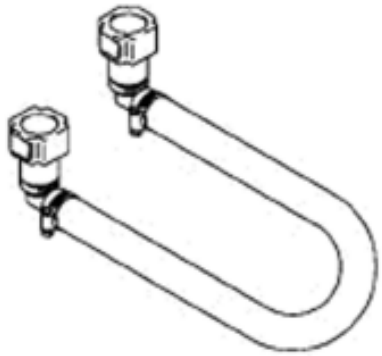
| Item | Standard | Service Limit |
|---|---|---|
| **Final Drive** | | |
| Drive Chain Slack | 30~40mm(1.2~1.6in.) | – – – |
| Drive Chain Wear (20-link Length) | 317.5~318.2mm(12.5012.53in.) | 323mm(12.7in.) |
| Standard Chain: | | |
| Make | Japan RK | – – – |
| Type | 520×S01 | – – – |
| Link | 114 links | – – – |
| **Brakes** | | |
| Brake Fluid: | | |
| Grade | DOT4 or DOT5 | – – – |
| Brake Pad Lining | | |
| Thickness: | 4mm(0.15in.) | |
| Front | 5mm(0.196in.) | |
| Rear | | 1mm(0.04in.) |
| Brake Light Timing: | | 1mm(0.04in.) |
| Front | Pulled ON | |
| Rear | ON after about 10 mm (0.39 in.) of pedal travel | – – – |
| **Electrical System** | | |
| Spark Plug Gap | 0.7~0.9mm(0.027~0.035in.) | – – – |

## Special Tools

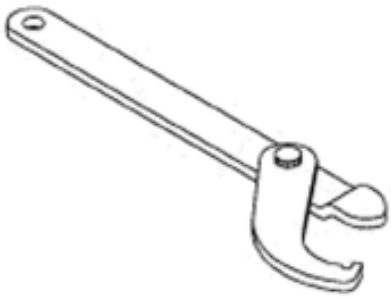
**Inside Circlip Pliers**



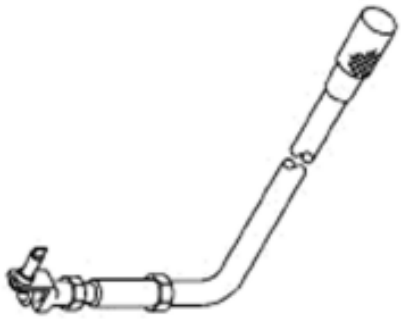
**Extension Tube**



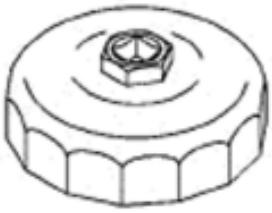
**Steering Stem Nut Wrench**



**Pilot Screw Adjuster,E**



**Oil Filter Wrench**



## Electronic Fuel Injection

*Air Filter Element Cleaning*

**NOTE**

- *In dusty areas,the element should be cleaned frequently than the recommended interval.*
- *After rding through rain or on muddily road,element should be cleaned immediately.*

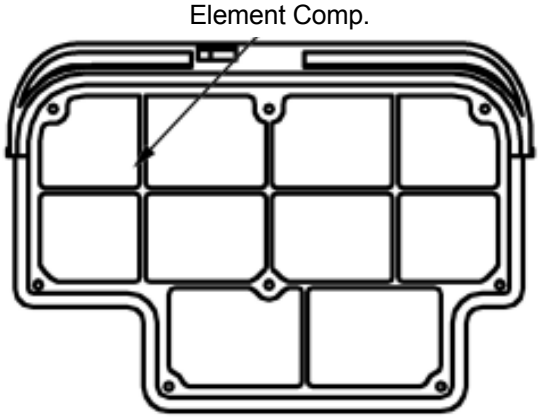
**⚠ WARNING**

**If dirt or dust is allowed to pass through into the throttle assy, the throttle may become stuck, possibly causing accident.**

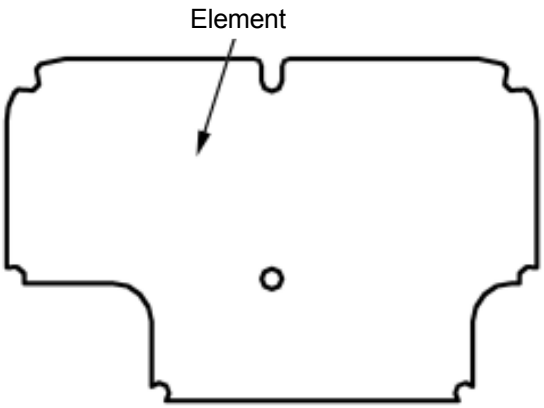
**CAUTION**

**If dirt gets through into the engine,excessive engine wear and possibly engine damage will occur.**


- Remove:
  Fuel tank(see Fuel Tank Removal in the Fuel System);
- Remove air filter element screw;
- Remove air filter element comp..




- Remove the holder.
- Remove element



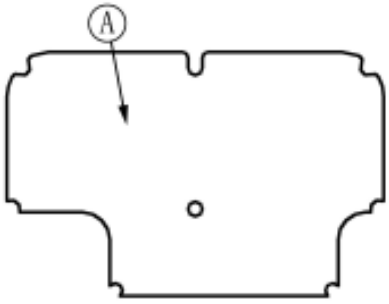

**NOTE**

- *The wire screen is fastened with an adhesive for the shaded portion.Do not remove the wire screen.*

**⚠ WARNING**

**Clean the element in a well-ventilated area, and make sure that there are no sparks or flame anywhere near the working area. Because of the danger of highly flammable liquids,do not use gasoline or a low-flash point solvent to clean the element.**

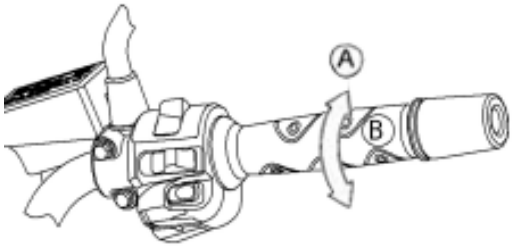
- Clean the element element [A] in a bath of high-flash point solvent, and then dry it with compressed air or by shaking it.
- After cleaning, saturate a clean, lint-free towel with SE, SF, or SG class SAE 30 oil and apply the oil to the element by tapping the element outside with the towel.
- Visually check the element for tears or breaks.
- If the element has any tears or breaks, replace the element.
- Install the element unit [A] with the foam element outside (gray) facing down.




*Throttle Control System Inspection*

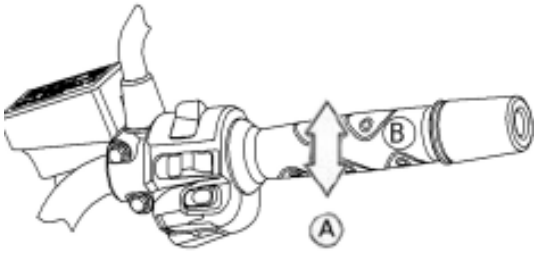
- Check that the throttle grip moves smoothly from full open to close [A], and the throttle closes quickly and completely by the return spring in all steering positions.

★If the throttle grip doesn't return properly, check the throttle cable routing, grip free play, and cable damage. Then lubricate the throttle cable.




- Check the throttle grip free play [A].

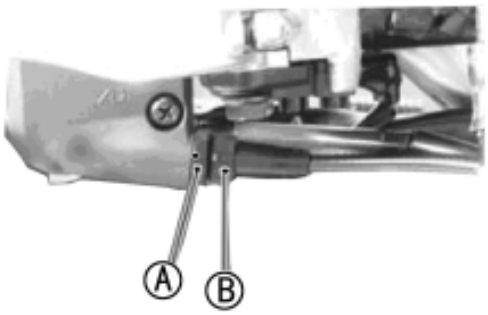
★If the free play is incorrect, adjust the throttle cable.

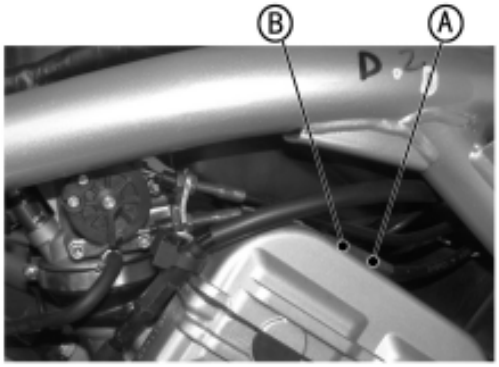



**Throttle Grip Free Play**

**Standard: 2~3 mm(0.08~0.12in.)**

★If necessary,adjust the throttle cable as follows.
- Loosen the locknut [A] at the upper end of the accelerate cable.
- Turn the adjuster [B] in completely so as to give the throttle grip plenty of play.

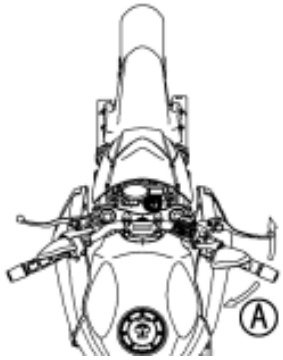



- Loosen the locknut [A] at the middle of the decelerate cable.
- Turn the adjuster [B] until there is no play when the throttle grip is completely closed.
- Tighten the locknut.
- Turn the accelerate cable adjuster until the proper amount of throttle grip free play is obtained.
- Tighten the locknut.

*Idle Speed Inspection*
- Start the engine and warm it up thoroughly. With the engine idling, turn the handlebar to both sides [A].

★If handlebar movement changes the idle speed, the throttle cables may be improperly adjusted or incorrectly routed or damaged. Be sure to correct any of these conditions before diding.




**⚠ WARNING**

**Operation with improperly adjusted,incorrectly routed or damaged cables could result in an unsafe riding condition.**

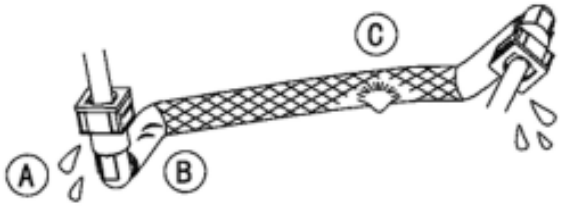
- Check the idle speed.

★If the idle speed is out of the specified range, check throttle body for air leaks and calibration.

**Idle Speed**

**Standard: 1300 ± 130 r/min(rpm)**

*Fuel Line Inspection (fuel leak, damage, installation condition)*




○ The fuel line is designed to be used throughout the motorcycle's life without any maintenance. However, if the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the line to burst. Remove the fuel tank (see FuelTank Removal in the Fuel System chapter) and check the fuel line.

★Replace the fuel line if any fraying, cracks [B] or bulges [C] are noticed.

● Check the line if it has been sharply bent or kinked.

Hose Joints [A]

Fuel Line [B]

● Check that the hose joints are securely connected.

○ Push and pull [A] the hose joint [B] back and forth more than two times, and make sure it is locked.

★If it is not locked,reinstall the hose joint.

**⚠ WARNING**

**Make sure the hose joint is installed correctly on the delivery pipe by sliding the joint, or the fuel could leak.**

## Cooling System

*Coolant Level Inspection*

**NOTE**

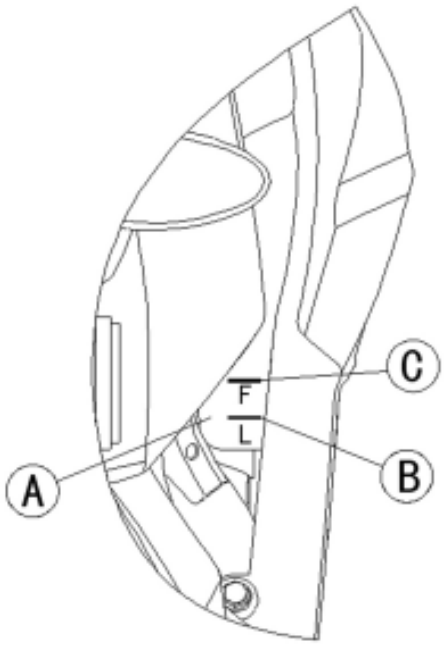
○ *Check the level when the engine is cold (room or ambient temperature).*

● Check the coolant level in the reserve tank [A] with the motorcycle held perpendicular (Do not use the sidestand).

★If the coolant level is lower than the “L” level line [B], remove the right center fairing (see Center Fairing Removal in the Frame chapter) and unscrew the reserve tank cap, and add coolant to the “F” level line [C].

“L”: low

“F”: full




**CAUTION**

**For refilling,add the specified mixture of coolant and soft water.Adding water alone dilutes the coolant and degrades its anticorrosion properties.The diluted coolant can attack the aluminum engine parts.In an emergency, soft water alone can be added.But the diluted coolant must be returned to the correct mixture ratio within a few days.If coolant must be added often or the reservoir tank has run completely dry,there is a probably leakage in the cooling system.Check the system for leaks. Coolant ruins paited surfaces.Immediately wash away any coolant that spills on the frame,engine,wheels or other painted parts.**

*Radiator Hose Damage and installation condition inspection*

○ The high pressure inside the radiator hose and pipe can cause coolant to leak [A] or the hose to burst if the line is not properly maintained.

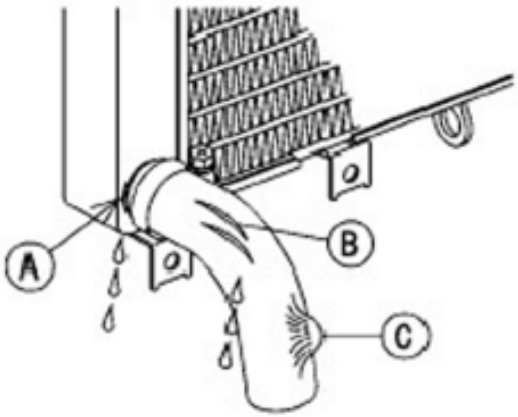
● Visually inspect the hoses for signs of deterioration. Squeeze the hoses.A hose should not be hard and brittle,nor should it be soft or swollen.

★Replace the hose if any fraying, cracks [B] or bulges [C] are noticed.

● Check that the hoses are securely connected and clamps are tightened correctly.

**Torque-Radiator Hose Clamp Screws:**

**2.5 N • m(0.25 kgf • m)**



## Engine Top End

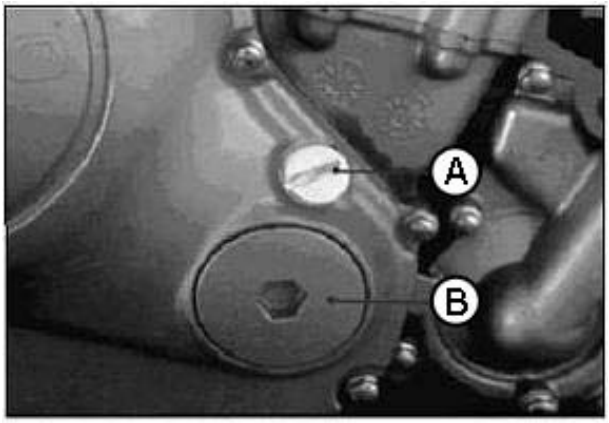
*Valve Clearance Inspection*

**NOTE**

○ *Valve clearance must be checked and adjusted when the engine is cold (room temperature).*

● Remove the cylinder head cover (see Cylinder Head Cover Removal in the EngineTop End chapter)

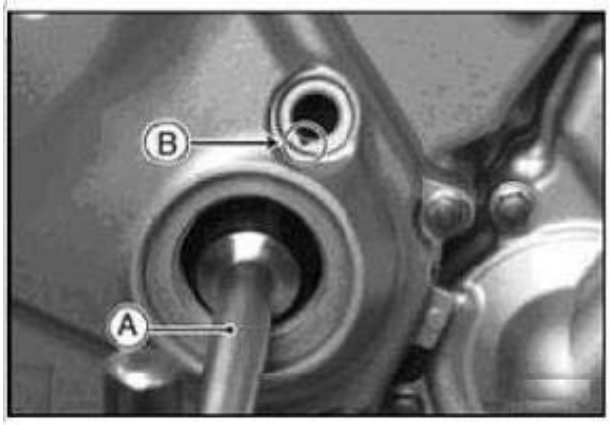
● Unscrew the upper [A] and lower [B] caps on the clutch cover.



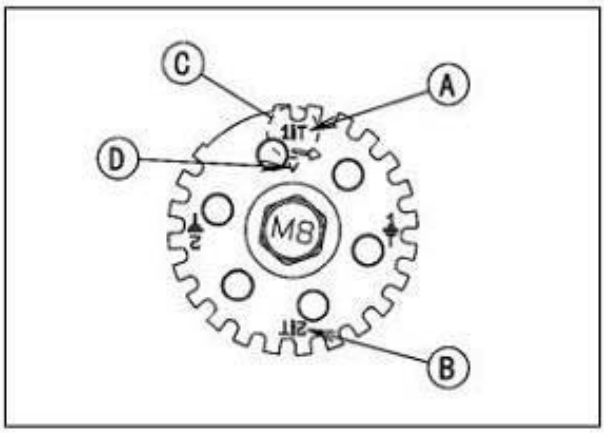

● Check the valve clearance when the pistons are at TDC.

○ The pistons are numbered beginning with the engine left side.

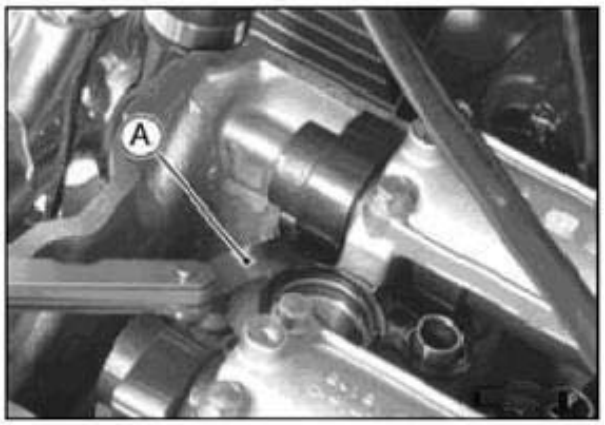
● Using a wrench [A] on the crankshaft rotation bolt, turn the crankshaft clockwise until the “1/T” mark on the timing rotor is aligned with the notch [B] in the edge of the upper hole in the clutch cover for #1 piston and “2/T” mark for #2 piston.




1/T Mark [A]
2/T Mark [B]
Hole [C] of Upper Cap
Notch [D] in Edge of Upper Hole




● Using the feeler gauge [A], measure the valve clearance between cam and valve lifter.




**Valve Clearance**

**Standard:**

**Exhaust: 0.22~0.31 mm (0.0087~0.0122 in.)**

**Intake: 0.15~0.21 mm (0.0059~0.0083 in.)**

**Valve Clearance Measuring Position #1 Piston TDC at End of Compression Stroke→Intake valve clearances of #1 piston,and Exhaust valve clearances of #1 piston**

**NOTE**

○ *Check the valve clearance using this method only. Checking the clearance at any other cam position may result in improper valve clearance.*

**Valve Clearance Measuring Position #2 Piston TDC at End of Compression Stroke→Intake valve clearances of #2 piston,and Exhaust valve clearances of #2 piston**

★If the valve clearance is not within the specified range,first record the clearance,and adjust it.

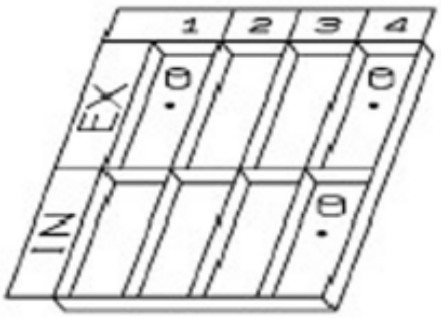
*Valve Clearance Adjustment*

● To change the valve clearance,remove the cam shaft chain tensioner,camshafts and valve lifters. Replace the shim with one of a different thickness.

**NOTE**

○ *Mark and record the valve lifter and shim location so they can be reinstalled in their original positions.*

○ *If there is no clearance,select a shim which is several sizes smaller and then measure the clearance.*




● To select a new shim which brings the valve clearance within the specified range, refer to the Valve Clearance Adjustment Charts.

● Apply a thin coat of molybdenum disulfide grease to the valve lifters.

● Install the camshafts. Be sure to time the cam shafts properly (see Camshaft Installation in the Engine Top End chapter).

● Remeasure any valve clearance that wasadjusted. Readjust if necessary.

Valve Adjustment Chart(Intake Valve)

| | | Present Shim | | | | | | | | | | | | | | | Example | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mark | 320 | 322 | 324 | 326 | 328 | 330 | 332 | 334 | 336 | 338 | 340 | 342 | 344 | 346 | 348 | 350 | 352 | 354 | 356 | 358 | 360 | 362 | 364 | 366 |
| | Thickness | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Valve Clearance Measurement | 0 ~ 0.01 | — | — | — | — | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 |
| | 0.02 ~ 0.03 | — | — | — | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 |
| | 0.04 ~ 0.05 | — | — | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 |
| | 0.06 ~ 0.07 | — | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 |
| | 0.08 ~ 0.13 | Specified Clearance/No Change Required | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.14 ~ 0.15 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 |
| | 0.16 ~ 0.17 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 |
| | 0.18 ~ 0.19 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 |
| | 0.20 ~ 0.21 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 |
| | 0.22 ~ 0.23 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 |
| | 0.24 ~ 0.25 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 |
| | 0.26 ~ 0.27 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 |
| | 0.28 ~ 0.29 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 |
| | 0.30 ~ 0.31 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 |
| | 0.32 ~ 0.33 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 |
| | 0.34 ~ 0.35 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 |
| | 0.36 ~ 0.37 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 |
| | 0.38 ~ 0.39 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 |
| | 0.40 ~ 0.41 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 |
| | 0.42 ~ 0.43 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 |
| | 0.44 ~ 0.45 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 |
| | 0.46 ~ 0.47 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 |
| | 0.48 ~ 0.49 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 |
| | 0.50 ~ 0.51 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 |
| | 0.52 ~ 0.53 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 |
| | 0.54 ~ 0.55 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 |
| | 0.56 ~ 0.57 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 |
| | 0.58 ~ 0.59 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 |
| | 0.60 ~ 0.61 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 |
| | 0.62 ~ 0.63 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 |
| | 0.64 ~ 0.65 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 |
| | 0.66 ~ 0.67 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | |
| | 0.68 ~ 0.69 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | |
| | 0.70 ~ 0.71 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | |
| | 0.72 ~ 0.73 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | |
| | 0.74 ~ 0.75 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | |
| | 0.76 ~ 0.77 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | |
| | 0.78 ~ 0.79 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | |
| | 0.80 ~ 0.81 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | |
| | 0.82 ~ 0.83 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | |
| | 0.84 ~ 0.85 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | |
| | 0.86 ~ 0.87 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | |
| | 0.88 ~ 0.89 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | |
| | 0.90 ~ 0.91 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | |
| | 0.92 ~ 0.93 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | |
| | 0.94 ~ 0.95 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | |
| | 0.96 ~ 0.97 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | |
| | 0.98 ~ 0.99 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | |
| | 1.00 ~ 1.01 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | |
| | 1.02 ~ 1.03 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | |
| | 1.04 ~ 1.05 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | |
| | 1.06 ~ 1.07 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | |
| | 1.08 ~ 1.09 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | |
| | 1.10 ~ 1.11 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | |

| Valve Clearance Adjustment Chart(Intake Valve) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Present Shim | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mark | | 368 | 370 | 372 | 374 | 376 | 378 | 380 | 382 | 384 | 386 | 388 | 390 | 392 | 394 | 396 | 398 | 400 | 402 | 404 | 406 | 408 | 410 | 412 | 414 | 416 | 418 |
| Thickness | | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Clearance Measurement | 0~0.01 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 |
| | 0.02~0.03 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 |
| | 0.04~0.05 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 |
| | 0.06~0.07 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 |
| | 0.08~0.13 | Specified Clearance/No Change Required | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.14~0.15 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | |
| | 0.16~0.17 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | |
| | 0.18~0.19 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | |
| | 0.20~0.21 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | |
| | 0.22~0.23 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | |
| | 0.24~0.25 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | |
| | 0.26~0.27 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | |
| | 0.28~0.29 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | |
| | 0.30~0.31 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | |
| | 0.32~0.33 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | |
| | 0.34~0.35 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | |
| | 0.36~0.37 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | |
| | 0.38~0.39 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | |
| | 0.40~0.41 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | |
| | 0.42~0.43 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | |
| | 0.44~0.45 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | |
| | 0.46~0.47 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | |
| | 0.48~0.49 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | |
| | 0.50~0.51 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | |
| | 0.52~0.53 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | |
| | 0.54~0.55 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | |
| | 0.56~0.57 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | |
| | 0.58~0.59 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.60~0.61 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.62~0.63 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | | | |

1.Measure the clearance (when engine is cold).

2.Check present shim size.

Example: Present shim is 3.50 mm.

Measured clearance is 0.25 mm.

Replace 3.50 mm shim with 3.62 mm shim.

Remeasure the valve clearance and readjust if necessary.

Valve Clearance Adjustment(Exhaust Valve)

| | Present Shim / Example | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mark | 320 | 322 | 324 | 326 | 328 | 330 | 332 | 334 | 336 | 338 | 340 | 342 | 344 | 346 | 348 | 350 | 352 | 354 | 356 | 358 | 360 | 362 | 364 | 366 | 368 | 370 | |
| Thickness | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | |

Example Clearance Measurement

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0～0.01 | — | — | — | — | — | — | — | — | | — | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 |
| 0.02～0.03 | — | — | — | — | — | — | — | — | | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 |
| 0.04～0.05 | — | — | — | — | — | — | — | — | | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 |
| 0.06～0.07 | — | — | — | — | — | — | — | | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 |
| 0.08～0.09 | — | — | — | — | — | — | | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 |
| 0.10～0.11 | — | — | — | — | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | |
| 0.12～0.13 | — | — | — | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | |
| 0.14～0.15 | — | — | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | |
| 0.16～0.17 | | | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | |
| 0.18～0.19 | — | 3.2 | 3.22 | 3.24 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | |
| 0.20～0.26 | Specified Clearance/No Change Required | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.27～0.28 | 3.26 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | |
| 0.29～0.30 | 3.28 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | |
| 0.31～0.32 | 3.3 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | |
| 0.33～0.34 | 3.32 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | |
| 0.35～0.36 | 3.34 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | |
| 0.37～0.38 | 3.36 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | |
| 0.39～0.40 | 3.38 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | |
| 0.41～0.42 | 3.4 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | |
| 0.43～0.44 | 3.42 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | |
| 0.45～0.46 | 3.44 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | |
| 0.47～0.48 | 3.46 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | |
| 0.49～0.50 | 3.48 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | |
| 0.51～0.52 | 3.5 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | |
| 0.53～0.54 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | |
| 0.55～0.56 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | |
| 0.57～0.58 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | |
| 0.59～0.60 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | |
| 0.61～0.62 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | |
| 0.63～0.64 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | |
| 0.65～0.66 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | |
| 0.67～0.68 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | |
| 0.69～0.70 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | |
| 0.71～0.72 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | |
| 0.73～0.74 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | |
| 0.75～0.76 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | |
| 0.77～0.78 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | |
| 0.79～0.80 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | |
| 0.81～0.82 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | |
| 0.83～0.84 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | |
| 0.85～0.86 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | |
| 0.87～0.88 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | |
| 0.89～0.90 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | |
| 0.91～0.92 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | |
| 0.93～0.94 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | |
| 0.95～0.96 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | |
| 0.97～0.98 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | |
| 0.99～1.00 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | |
| 1.01～1.02 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | |
| 1.03～1.04 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | |
| 1.05～1.06 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | |
| 1.07～1.08 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | |
| 1.09～1.10 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | |
| 1.11～1.12 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | |
| 1.13～1.14 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | |
| 1.15～1.16 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.17～1.18 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.19～1.20 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Valve Clearance Adjustment Exhaust Valve(Continued) | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Present Shim | | | | | | | | | | | | | | | | | | | | | | | |
| Mark | | 372 | 374 | 376 | 378 | 380 | 382 | 384 | 386 | 388 | 390 | 392 | 394 | 396 | 398 | 400 | 402 | 404 | 406 | 408 | 410 | 412 | 414 | 416 | 418 |
| Thickness | | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Clearance Measurement | 0~0.01 | 3.52 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 |
| | 0.02~0.03 | 3.54 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 |
| | 0.04~0.05 | 3.56 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 |
| | 0.06~0.07 | 3.58 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 |
| | 0.08~0.09 | 3.6 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 |
| | 0.10~0.11 | 3.62 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 |
| | 0.12~0.13 | 3.64 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 |
| | 0.14~0.15 | 3.66 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 |
| | 0.16~0.17 | 3.68 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 |
| | 0.18~0.19 | 3.7 | 3.72 | 3.74 | 3.76 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 |
| | 0.20~0.26 | Specified Clearance/No Change Required | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.27~0.28 | 3.78 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | |
| | 0.29~0.30 | 3.8 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | |
| | 0.31`0.32 | 3.82 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | |
| | 0.33~0.34 | 3.84 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | |
| | 0.35~0.36 | 3.86 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | |
| | 0.37~0.38 | 3.88 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | |
| | 0.39~0.40 | 3.9 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | |
| | 0.41~0.42 | 3.92 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | |
| | 0.43~0.44 | 3.94 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | |
| | 0.45~0.46 | 3.96 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | |
| | 0.47~0.48 | 3.98 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | |
| | 0.49~0.50 | 4 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | |
| | 0.51~0.52 | 4.02 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | |
| | 0.53~0.54 | 4.04 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | |
| | 0.55~0.56 | 4.06 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | |
| | 0.57~0.58 | 4.08 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | |
| | 0.59~0.60 | 4.1 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | |
| | 0.61~0.62 | 4.12 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | |
| | 0.63~0.64 | 4.14 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | |
| | 0.65~0.66 | 4.16 | 4.18 | | | | | | | | | | | | | | | | | | | | | | |
| | 0.67~0.68 | 4.18 | | | | | | | | | | | | | | | | | | | | | | | |

## Clutch

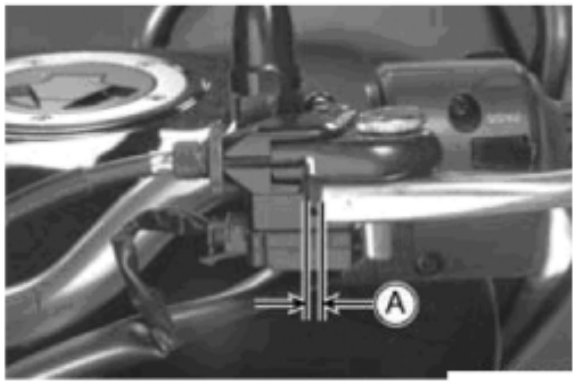
*Clutch Operation Inspection*

- Pull the clutch lever just enough to take up the free play [A].
- Measure the gap between the lever and the lever holder.

★If the gap is too wide,the clutch may not release fully. If the gap is too narrow, the clutch may not engage fully. In either case, adjust it.

**Clutch Lever Free Play**

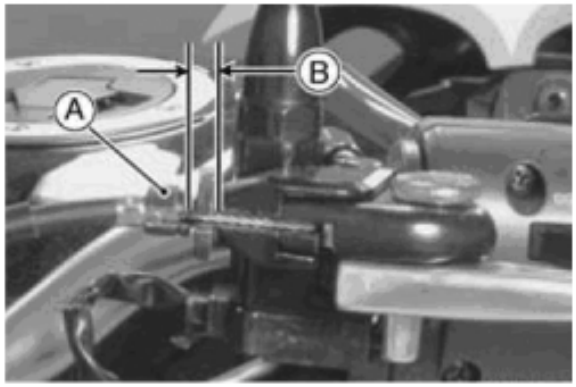
**Standard: 2~3 mm (0.08~0.12 in.)**



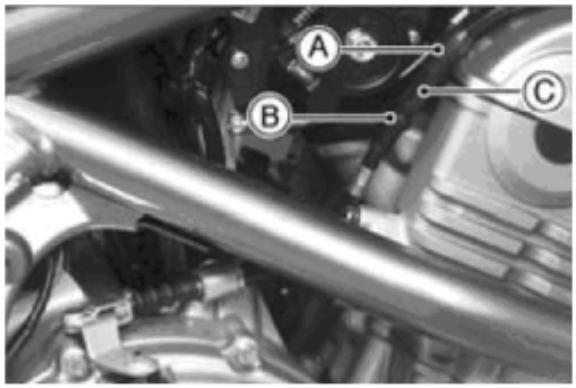

**⚠ WARNING**

**To avoid a serious burn,never tough the engine or exhaust pipe during clutch adjustment.**

- Turn the adjuster [A] so that 5~6mm (0.20~0.24 in.) [B] of threads are visible.




- Slide the dust cover [A] at the middle of the clutch cable out of place.
- Loosen the locknut [B] at the middle of clutch cable.
- Turn the adjustment nut [C] until the free play is correct.




**⚠ WARNING**

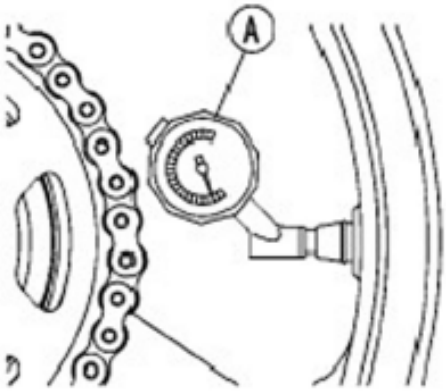
**Be sure that the outer cable end at the clutch lever is fully seated in the adjuster at the clutch lever,or it could slip into place later,creating enough cable play to prevent clutch disengagement.**

- After the adjustment, tighten the locknut and start the engine and check that the clutch does not slip and that it releases properly.

## Wheels/Tires

*Air Pressure Inspection*

- Remove the air valve cap.
- Measure the tire air pressure with an air pressure gauge [A] when the tires are cold (that is,when the motorcycle has not been ridden more than a mile during the past 3 hours).
- Install the air valve cap.
- Adjust the tire pressure according to the specifications if necessary.




**Air Pressure (when cold)**

**Front: 280 kPa (2.80 kgf/cm$^2$, 39.8 psi)**

**Rear: 280 kPa (2.80 kgf/cm$^2$, 39.8 psi)**

*Wheel/Tire Damage Inspection*

● Remove any imbedded stones [A] or other foreign particles [B] from tread.

● Visually inspect the tire for cracks and cuts, and replace the tire if necessary. Swelling or high spots indicate internal damage, requiring tire replacement.

● Visually inspect the wheel for cracks, cuts and dents damage.

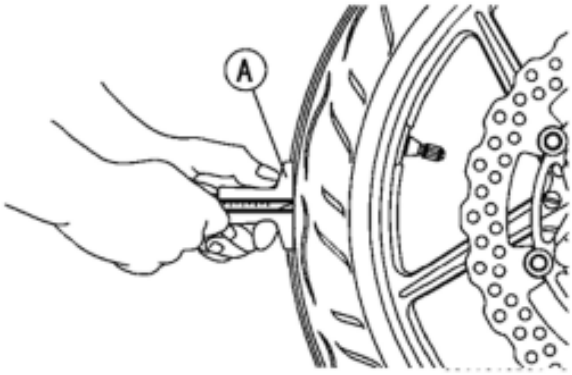
★If any damage is found, replace the wheel if necessary.


*Tire Tread Wear, Abnormal Wear Inspection*

○ As the tire tread wears down, the tire becomes more susceptible to puncture and failure. An accepted estimate is that 90% of all tire failures occur during the last 10% of tread life (90% worn). So it is false economy and unsafe to use the tires until they are bald.

● Measure the tread depth at the center of the tread with a depth gauge [A]. Since the tire may wear unevenly,take measurement at several places.

★If any measurement is less than the service limit, replace the tire (see Tire Removal/Installation in the Wheels/Tires chapter).




**Tread Depth**

**Standard:**

**Front: 4.5 mm (0.18 in.)**

**Rear: 5.5 mm (0.22 in.)**

**Service Limit:**

**Front: 0.8~1.0 mm (0.03~0.04 in.)**

**Rear: 0.8~1.0 mm (0.03~0.04 in.)**

**⚠ WARNING**

**To ensure safe handling and stability,use only the recommended standard tires for replacement,inflated to the standard pressure.**

**NOTE**

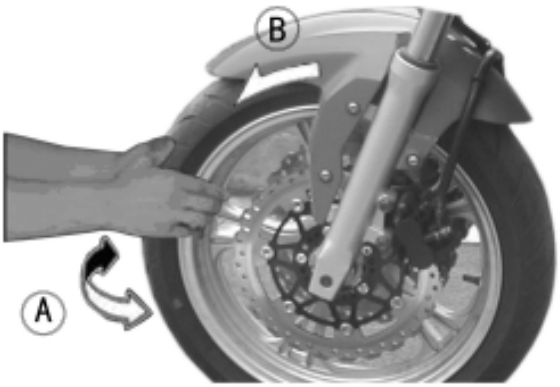
○ *Most countries may have their own regulations a minimum tire tread depth:be sure to follow them.*

○ *Check and balance the wheel when a tire is replaced with a new one.*

*Wheel Bearing Damage Inspection*

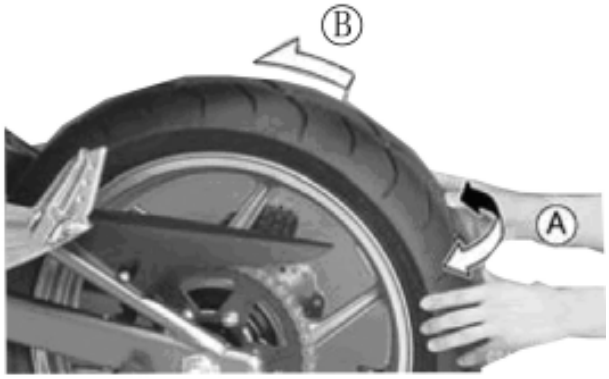
- Raise the front wheel off the ground with jack (see Front Wheel Removal in the Wheels/Tires chapter).
- Turn the handlebar all the way to the right or left.
- Inspect the roughness of the front wheel bearing by pushing and pulling [A] the wheel.
- Spin [B] the front wheel lightly, and check for smoothly turn, roughness, binding or noise.

★If roughness, binding or noise is found, remove the front wheel and inspect the wheel bearing (see Front Wheel Removal, Hub Bearing Inspection in the Wheels/Tires chapter).




- Raise the rear wheel off the ground with stand (see Rear Wheel Removal in the Wheels/Tires chapter).
- Inspect the roughness of the rear wheel bearing by pushing and pulling [A] the wheel.
- Spin [B] the rear wheel lightly, and check for smoothly turn, roughness,binding or noise.

★If roughness, binding or noise is found, remove the rear wheel and inspect the wheel bearing (see Rear Wheel Removal, Hub Bearing Inspection in the Wheels/Tire chapter) and coupling (see Coupling Bearing Inspection in the Final Drive chapter).



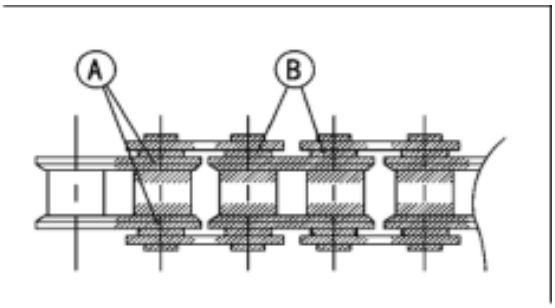

## Drive Train

*Drive Chain Lubrication Condition Inspection*

- If a special lubricant is not available, a heavy oil such as SAE 90 is preferred to a lighter oil be cause it will stay on the chain longer and provide better lubrication.
- If the chain appears especially dirty, clean it before lubrication.

| CAUTION |
| --- |
| **The O-rings between the side plates seal in the lubricant between the pin and the bushing. To avoid damaging the O-ring and resultant loss of lubricant,observe the following rules. Use only kerosene or diesel oil for cleaning and O-ring drive chain. Any other cleaning solution such as gasoline or trichloroethylene will cause deterioration and swelling of the O-ring. Immediately blow the chain dry with compressed air after cleaning. Complete cleaning and drying the chain within 10 minutes.** |

● Apply oil to the sides of the rollers so that oil will penetrate to the rollers and bushings. Apply the oil to the O-rings so that the O-rings will be coated with oil. Wipe off any excess oil.
Oil Applied Areas [A]
O-rings [B]




*Drive Train Slack Inspection*

**NOTE**

○ *Check the slack with the motorcycle setting on its sidestand.*

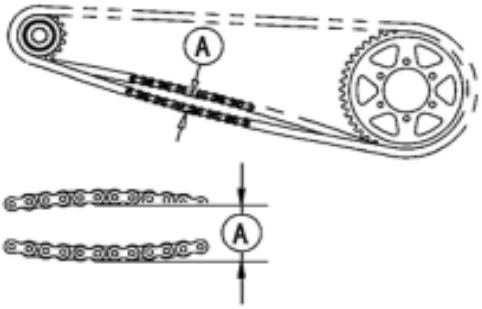
○ Clean the chain if it is dirty, and lubricate it if it appears dry.

● Check the wheel alignment (see Wheel Alignment Inspection).

● Rotate the rear wheel to find the position where the chain is tightest.

● Measure the vertical movement (chain slack) [A] midway between the sprockets.

★If the chain slack exceeds the standard, adjust it.




**Chain Slack**

**Standard: 30~40 mm (1.2~1.6 in.)**

*Drive Chain Slack Adjustment*

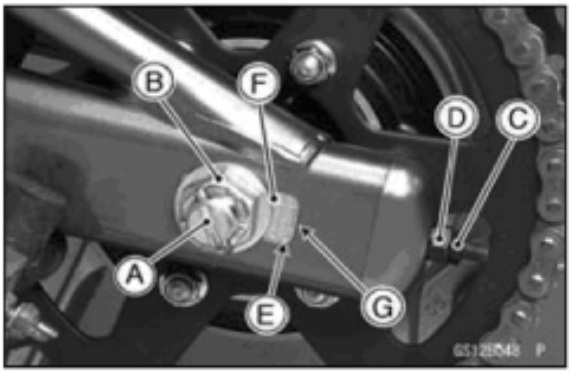
● Remove the cotter pin [A], and loosen the axle nut [B].

● Loosen the both chain adjuster locknuts [C].

★If the chain is too loose, turn in the left and right chain adjuster nuts [D] evenly.

★If the chain is too tight, turn out the left and right chain adjuster nuts evenly, and kick the wheel forward.

● Turn both chain adjuster nuts evenly until the drive chain has the correct amount of slack. To keep the chain and wheel properly aligned, the value [E] on the left wheel alignment adjuster [F] should align with the same (left or right) edge [G] of inspection window on the swingarm that the right wheel alignment adjuster value aligns with.




**⚠ WARNING**

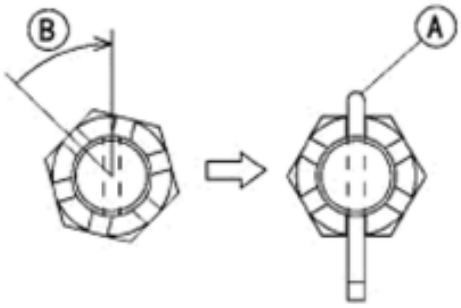
**Misalignment of the wheel will result in abnormal wear and may result in an unsafe riding condition.**

● Tighten both chain adjuster locknuts securely.

● Tighten the axle nut.

**Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 80 ft·lb)**

● Turn the wheel, measure the chain slack again the tightest position, and readjust if necessary.
● Insert a new cotter pin [A].

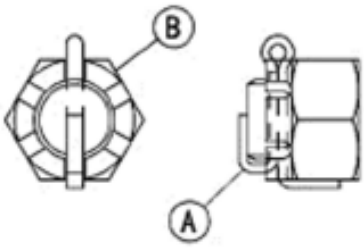



**NOTE**

○ *When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○ *It should be within 30 ° .*
○ *Loosen once and tighten again when the slot goes past the nearest hole.*

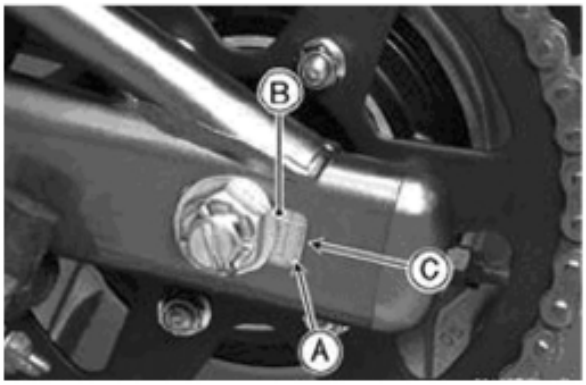
**⚠ WARNING**

**If the rear axle nut is not securely tightened or the cotter pin is not installed, an unsafe riding condition may result.**




*Wheel Alignment Inspection*

● Check that the value [A] on the left wheel alignment adjuster [B] aligns with the same (left or right) edge [C] of inspection window on swingarm that the right wheel alignment adjuster value aligns with.
★If they do not, adjust the chain slack and align the wheel alignment (see Drive Chian SlackAdjustment).



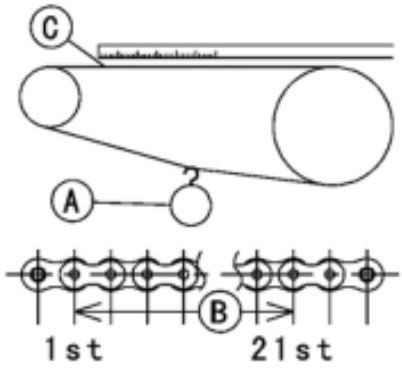

**NOTE**

○ *Wheel alignment can be also checked using the straightedge or string method.*

**⚠ WARNING**

**Misalignment of the wheel will result in abnormal wear, and may result in an unsafe riding condirion.**

*Drive Train Wear Inspection*




● Remove:
Chain Cover (see Swingarm Removal in the Suspension chapter)
● Rotate the rear wheel to inspect the drive chain for damaged rollers, and loose pins and links.
★If there is any irregularity, replace the drive chain.
★Lubricate the drive chain if it appears dry.
● Stretch the chain taut by hanging a 98 N (10 kg, 20 lb) weight [A] on the chain.
● Measure the length of 20 links [B] on the straight part[C] of the chain from the pin center of the 1st pin to the pin center of the 21st pin. Since the chain may wear unevenly, take measurements at several places.
★If any measurements exceed the service limit, replace the claim. Also, replace the front and rear sprockets when the drive chain is replaced.

**Drive Chain 20-link Length**
**Standard: 317.5~318.2 mm (12.50~12.53 in.)**
**Service Limit: 323 mm (12.7 in.)**

**⚠ WARNING**

**If the drive train wear exceeds the service limit,replace the chain or an unsafe riding condition may result. A chain that breaks or jumps off the sprockets could snap on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing it to go out of control. For safety, use only the standard chain. It is an endless type and should not be cut for installation.**

**Standard Chain**
**Make: RK,Japan**
**Type: 520xS01**
**Link: 114 links**

*Chain Guide Inspection*

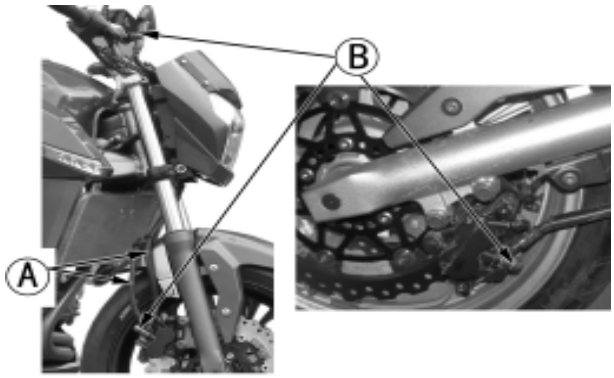

● Remove:
Swingarm (see Swingarm Removal in the Suspension chapter)
● Visually inspect the chain guide [A].
● Replace the chain guide if it shows any signs of abnormal wear or damage.

**Brake System**

*Brake Fluid Leak (Brake Hose and Pipe) Inspection*

● Apply the brake lever or pedal and inspect the brake fluid leak from the brake hoses [A], fittings [B] and.

★If the brake fluid leaked from any position, inspect or replace the problem part.




*Brake Hose and Pipe Damage and Installation Condition Inspection*

● Inspect the brake hoses, fittings and pipes for deterioration, cracks and signs of leakage.

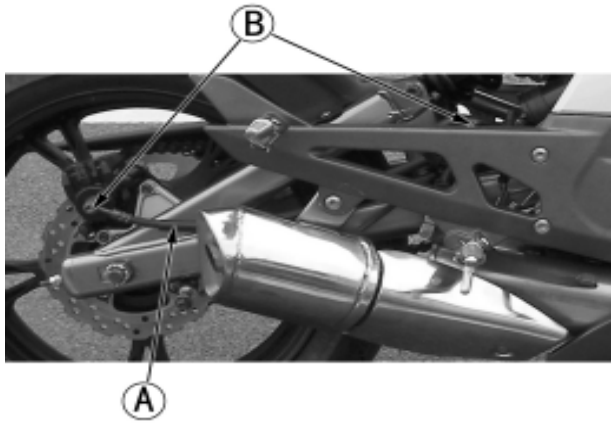
○ The high pressure inside the brake line can cause fluid to leak [A] or the hose to burst if the line is not properly maintained. Bend and twist the rubber hose while examing it.

★Replace the hose and pipe if any crack [B], bulge [C] of leakage is noticed.

★Tighten any brake hose banjo bolts and brake pipe joint nuts.

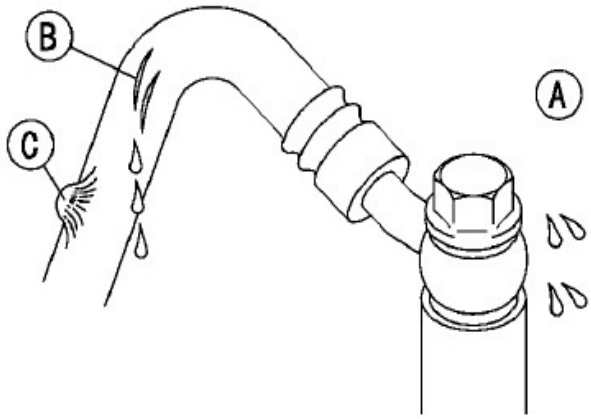
**Torque-Brake Hose Banjo Bolts: 25 N · m (2.5 kgf · m, 18 ft · lb)**

**Brake Pipe Joit Nuts: 18 N · m (1.8 kgfm, 13 ft · lb)**




● Inspect the brake hose routing.

★If any brake hose routing is incorrect, reroute the brake hose.



*Brake Operation Inspection*

● Inspect the operation of the front and rear brake by running the vehicle on the dry road.

★If the brake operation is insufficient, inspect the brake system.

**⚠WARNING**

**When inspecting by running the vehicle, note a surrounding traffic situation enough in the place of sefety.**

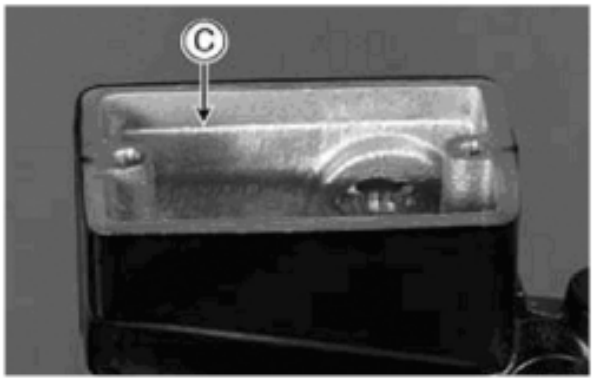
*Brake Fluid Level Inspection*

● Check taht the brake fluid level in the front brake reservoir [A] is above the lower level line [B].

**NOTE**

○ *Hold the reservoir horizontal by turning the handle-bar when checking brake fluid level.*

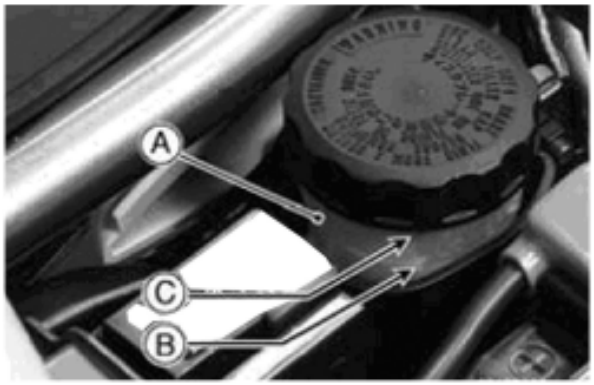
★If the fluid level is lower than the lower level line, fill the reservoir to the upper level line [C] in the reservoir.


● Remove the seat (see Seat Removal in the Frame Chapter).

● Check that the brake fluid level in the rear brake reservoir [A] is above the lower level line [B].

★If the fluid level is lower than the lower level line, fill the reservoir to the upper level line [C].




**⚠WARNING**

**Change the brake fluid in the brake line completely if the brake fluid must be refilled but the type and brand of the brake fluid that is already in the reservoir are unidentified. After changing the fluid , use only the same type and brand of fluid thereafter.**

**Recommended Disc Brake Fluid**

**Grade: DOT4**

● Follow the procedure below to install the rear brake fluid reservoir cap correctly.

○ First, tighten the rear brake fluid reservoir cap [B] clockwise [C] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body, then tighten the cap an additional 1/6 turn [D] while holding the brake reservoir body [A].


*Brake Pad Wear Inspection*

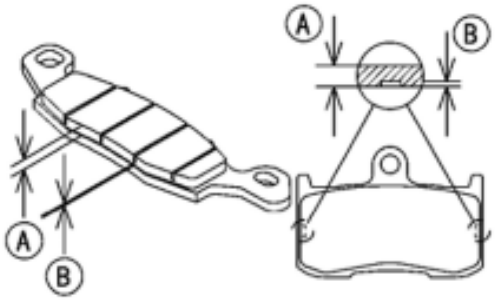
● Check the lining thickness [A] of the pads in each caliper.

★If the lining thickness of either pad is less than the service limit [B], replace both pads in the caliper as a set.

**Pad Lining Thickness**

**Standard:**

| | |
|---|---|
| **Front** | **4.5 mm (0.18 in.)** |
| **Rear** | **5.0 mm (0.20 in.)** |
| **Service Limit:** | **1 mm (0.04 in.)** |




*Brake Light Switch Operation Inspection*

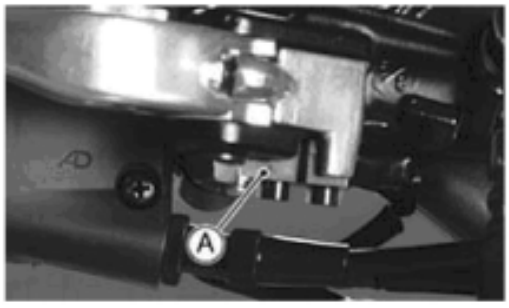
● Turn on the ignition switch.

● The brake light [A] should go on when the brake lever is applied of after the brake pedal is depressed about 10 mm (0.39 in.).

★If it does not, adjust the brake light switch.
Disconnect the connector [A].
Turn the brake light switch to adjust the switch.
Connect the connector.

★If it does not go on, inspect or replace the following items.
Battery (see Charging Condition Inspection in the Electrical System chapter)
Brake Light (see Tail/Brake Light Removal in the Electrical System chapter)
Main Fuse 30 A and Taillight Fuse 10A (see Switch Inspection in the Electrical System chapter)
Front Brake Light Switch [A] (see Switch Inspection in Electrical System chapter)
Rear Brake Light Switch (see Switch Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System)





## Suspensions

*Front Forks/Rear Shock Absorber Operation Inspection*

● Pump the forks down and up [A] 4 or 5 times, and inspect the smooth stroke.

★If the forks do not work smoothly or noise is found, inspect the fork oil level or fork clamps (see Front Fork Oil Change in the Suspension chapter).

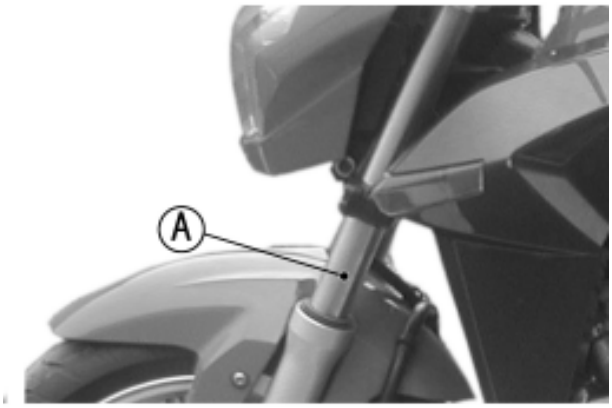

● Pump the seat down and up [A] 4 or 5 times, and inspect the smooth stroke.

★If the shock absorber does not work smoothly stroke or noise is found, inspect the oil leak (see Rear Shock Absorber Oil Leak Inspection).


*Front Fork Oil Leak Inspection*

● Visually inspect the front forks [A] for oil leakage.

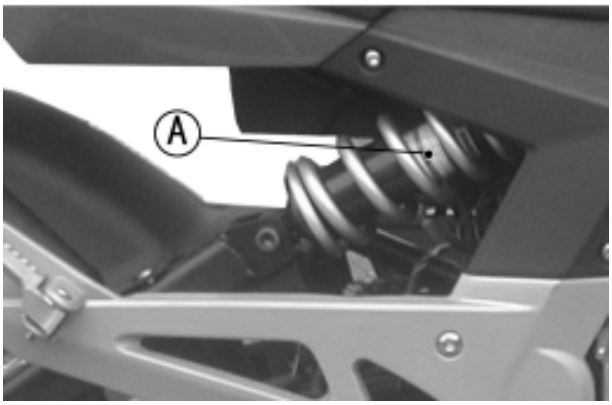
★Replace or repair any defective parts, if necessary.




*Rear Shock Absorber Oil Leak Inspection*

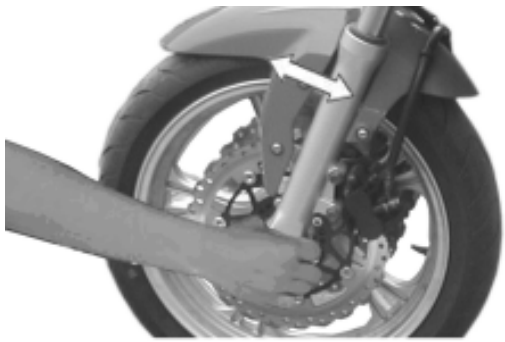
● Visually inspect the shock absorber [A] for oil leakage.

★If the oil leakage is found on it, replace the shock absorber with a new one.



## Steering System

*Steering Play Inspection*

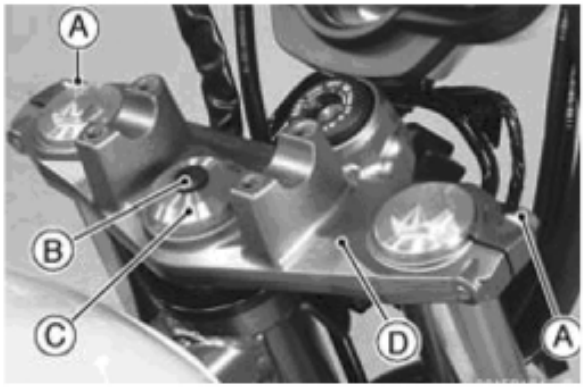


- Raise the front wheel off the ground with jack (see Front Wheel Removal in the Wheels/Tires chapter).
- With the front wheel pointing straight ahead, alternately tap each end of the handlebar. The front wheel should swing fully left and right from the force of gravity until the fork hits the stop.

★If the wheel binds or catches before the stop, the steering is too tight.

- Feel for steering looseness by pushing and pulling the forks.

★If you feel looseness, the steering is too loose.



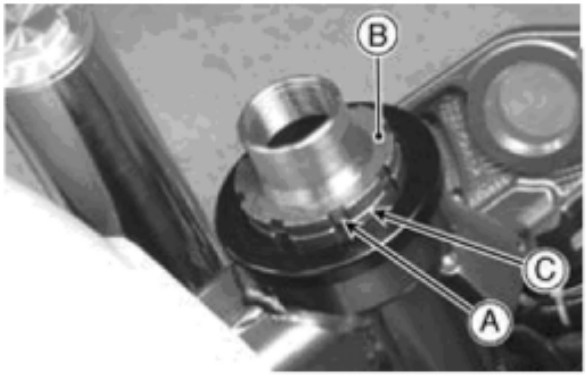

**NOTE**

○ *The cables and wiring will have some effect on the motion of the fork which must be taken into account.*

○ *Be sure the wires and cables are properly routed.*

○ *The bearings must be in good condition and properly lubricated in order for any test to be valid.*

*Steering Play Adjustment*




- Remove:
  Headlight Assy (see Headlight Removal/Installation in the Electrical System chapter)
  Handlebar (see Handlebar Removal in the Steering chapter)
  Upper Fork Clamp Bolts [A]
  Steering Stem Head Bolt Plug [B] Stem Head Bolt [C].
- Remove the steering stem head [D].
- Bend the claws [A] of the claw washer straighten.
- Remove the steering stem locknut [B] and claw washer [C].
- Adjust the steering.

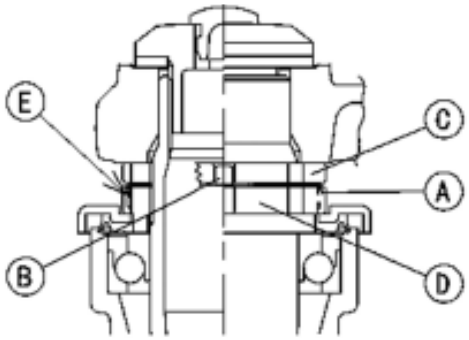

**Special Tool - Steering Stem Nut Wrench [A]**

★If the steering is too tight, loosen the stem nut [B] a fraction of a turn.

★If the steering is too loose, tighten the stem nut a

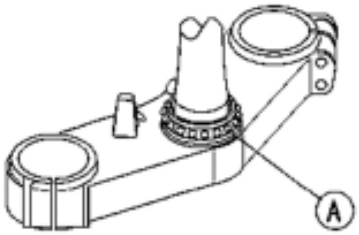
- Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].
- Hand tighten the stem locknut until it touches the claw washer.
- Tighten the stem locknut clockwise until the claws are aligned with the grooves (ranging from 2nd to 4th) of stem nut [D], and bend the 2 claws downward [E].
- Install the steering stem head.
- Install the washer, and tighten the stem head bolt.
- Tighten:

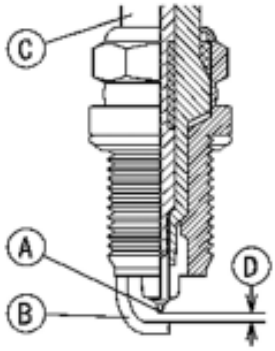
  **Torque - Steering Stem Head Bolt: 108 N • m (11.0 kgf • m, 80 ft • lb), Front Fork Clamp Bolts (Upper): 20 N • m (2.0 kgf • m, 15 ft • lb)**
- Check the steering again.
- If the steering is still too tight or too loose, repeat the adjustment.
- Install the removed parts (see appropriate chapters).




*Steering Stem Bearing Lubrication*

- Remove the steering stem (see Stem, Stem Bearing Removal in the Steering chapter).
- Using a high-flash point solvent, wash the upper and lower ball bearings in the cages, and wipe the upper and lower outer races, which are press-fitted into the frame head pipe, clean off grease and dirt.
- Visually check the outer races and the ball bearings.
- Replace the bearing assemblies if they show wear or damage.
- Pack the upper and lower ball bearings [A] in the cages with grease, and apply a light coat of grease to the upper and lower outer races.
- Install the steering stem (see Stem, Stem Bearing Installation in the Steering chapter).
- Adjust the steering (see Steering Play Adjustment).




## Electrical System

*Spark Plug Condition Inspection*

- Remove the spark plugs (see Spark Plug Replacement).
- Visually inspect the spark plugs.
- If the spark plug center electrode [A] and/or side electrode [B] are corroded or damaged, or if the insulator [C] is cracked, replace the plug.
- If the spark plug is dirtied or the carbon is accumulated, replace the spark plug.
- Measure the gap [D] with a wire-type thickness gauge.

★If the gap is incorrect, replace the spark plug.

**Spark Plug Gap: 0.8~0.9 mm (0.03~0.04 in.)**

- Use the standard spark plug or its equivalent.

**Spark Plug: CR8EI**

*Lights and Switches Operation Inspection*

**First Step**

● Turn on the ignition switch.

● The following lights should go on according to below table.

| | |
|---|---|
| City Light [A] | Goes on |
| Taillight [B] | Goes on |
| License Plate Light [C] | Goes on |
| Meter Panel LCD [D] | Goes on |
| Neutral Indicator Light (LED) [E] | Goes on |
| Oil Pressure/Coolant Temp. Warning Indicator Light (LED) [F] | Goes on |
| FI Indicator Light (LED) [G] | Goes on ( about 5 seconds ) |

★If the light does not go on, inspect or replace the following item.

Battery (see Charging Condition Inspection in the Electrical System chapter)

Applicable Bulb (see Wiring Diagram in the Electrical System chapter)

Meter Unit for Meter Panel LCD (see Electronic Combination Meter Unit Inspection in the Electrical System chapter)

Meter Unit for Neutral Indicator Light (LED) (see Electronic Combination Meter Unit Inspection in the Electrical System chapter)

Meter Unit for Oil Pressure/CoolantTemperature Warning Indicator Light (LED) (see Electronic Combination Meter Unit Inspection in the Electrical System chapter)

Meter Unit for FI Indicator Light (LED) (see Electronic Combination Meter Unit Inspection in the Electrical System chapter)

ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)

Main Fuse 30 A and Taillight Fuse 10 A (see Fuse Inspection in the Electrical System chapter)

Ignition Switch (see Switch Inspection in the Electrical System chapter)

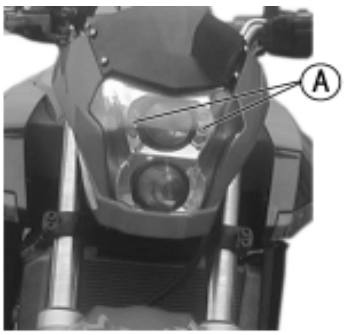
Neutral Switch (see Switch Inspection in the Electrica System chapter)

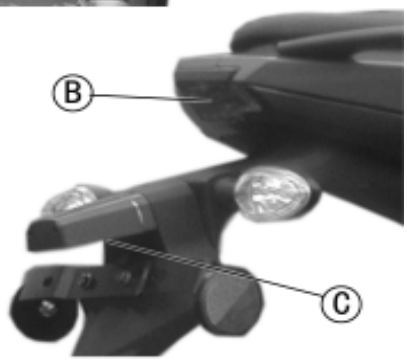
Harness (see Wiring Inspection in the Electrical System chapter)

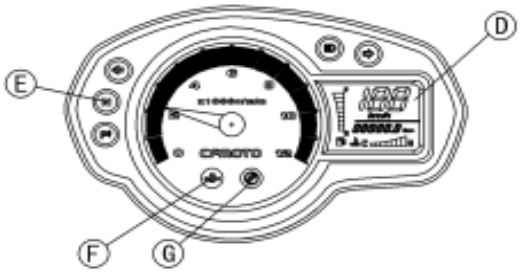
● Turn off the ignition switch.

● The all lights should go off.

★If the light does not go off, replace the ignition switch.



### Second Step

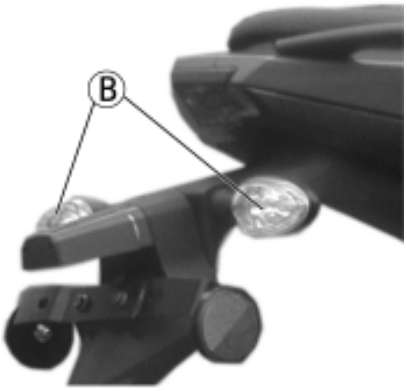
- Turn the ignition switch to P (Park) position.
- The city light, taillight and license plate light should go on.

★ If the light does not go on, inspect or replace the following item.
Ignition Switch (see Switch Inspection in the Electrical System chapter)


### Third Step

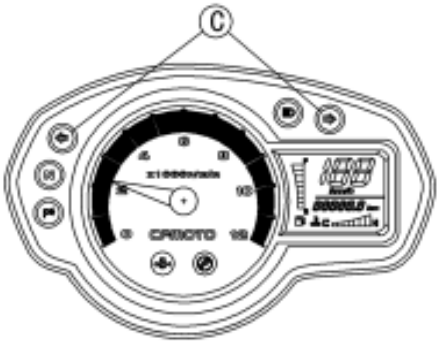
- Turn on the turn signal switch [A] (left or right position).
- The left or right turn signal lights [B] (front and rear) according to the switch position should flash.
- The turn signal indicator light (LED) [C] in the meter unit should flash.

★ If the each light does not flash, inspect or replace the following item.
Turn Signal Light Bulb (see Turn Signal Light Bulb Replacement in the Electrical System chapter)
Meter Unit for Turn Signal Light Indicator Light (LED) (see Electronic Combination Meter Unit Inspection in the Electrical System chapter)
Turn Signal Relay Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Turn Signal Switch (see Switch Inspection in the Electrical System chapter)
Turn Signal Relay (see Turn Signal Relay Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)




- Push the turn signal switch.
- The turn signal lights and indicator light (LED) should go off.

★If the light does not go off, inspect or replace the following item.
Turn Signal Switch (see Switch Inspection in the Electrical System chapter)
Turn Signal Relay (see Turn Signal Relay Inspection in the Electrical System chapter)

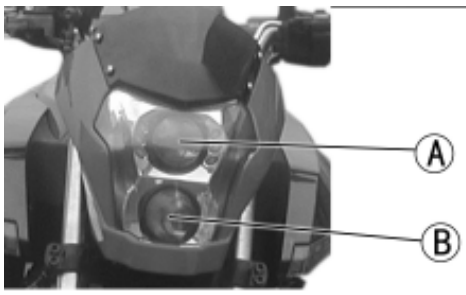


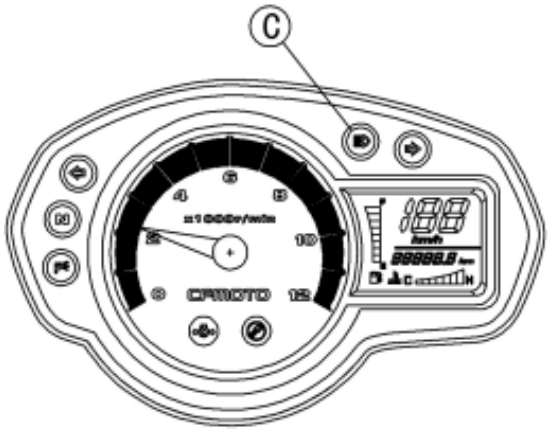

### Fourth Step

- Set the dimmer switch [A] to low beam position.
- Start the engine.
- The low beam headlight should go on.

★If the low beam headlight does not go on, inspect or replace the following item.
Headlight Low Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
Headlight Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)
Headlight Relay in Relay Box (see Relay Circuit Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

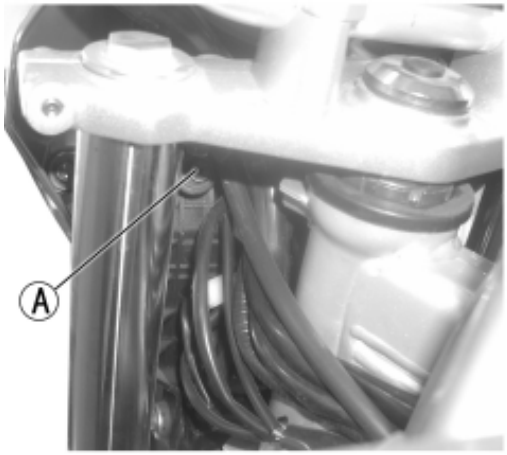
● Set the dimmer switch to high beam position.
● The low beam [A] and high beam [B] headlights should go on.
● The high beam indicator light (LED) [C] should go on.
★If the high beam headlight and/or high beam indicator light (LED) does not go on, inspect or replace the following item.
Headlight High Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)
● Turn off the engine stop switch.
● The low beam and high beam headlights should stay going on.
★If the headlights and high beam indicator light (LED) does go off, inspect or replace the following item.
Headlight Relay in Relay Box (see Relay Circuit Inspection in the Electrical System chapter)
● Turn off the ignition switch.
● The headlights and high beam indicator light (LED) should go off.



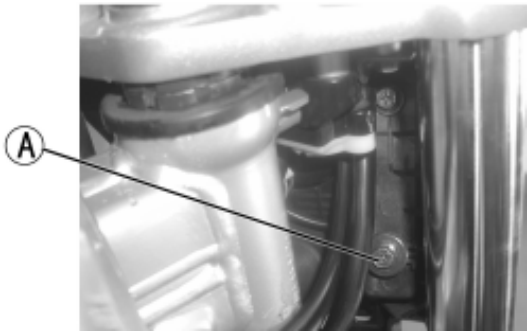

*Headlight Aiming Inspection*

● Inspect the headlight beam for aiming.
★If the headlight beam points to one side rather than straight ahead, adjust the horizontal beam.




*Headlight Beam Horizontal Adjustment*

● Turn the horizontal adjuster [A] on the headlight with the screwdriver in or out until the beam points straight ahead.
★If the headlight beam points too low or high, adjust the vertical beam.

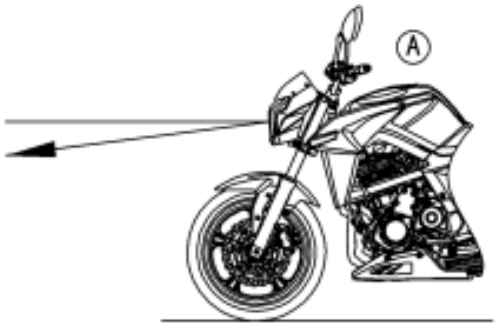



*Headlight Beam Vertical Adjustment*

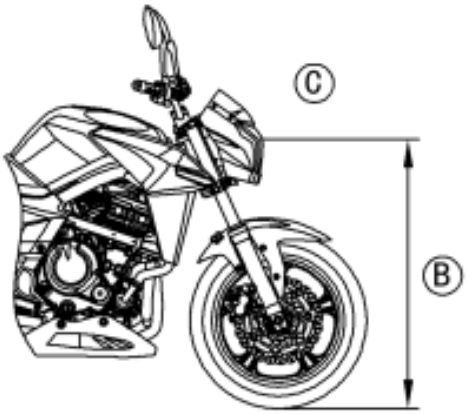
● Turn the vertical adjuster [A] on the headlight with the screwdriver in or out to adjust the headlight vertically.

**NOTE**

○ *On high beam, the brightest points should be slightly below horizontal with the motorcycle on its wheels and the rider seated. Adjust the headlight to the proper angle according to local regulations.*

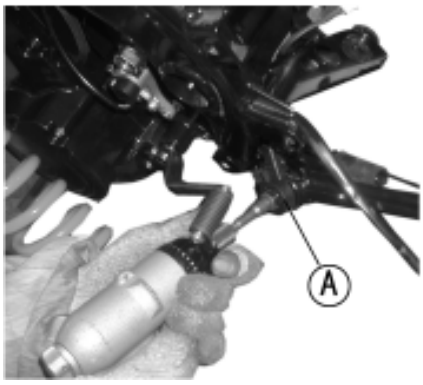



Low Beam [A]
Height of Headlight Center [B]
High Beam [C]




*Sidestand Switch Operation Inspection*

● Inspect the sidestand switch [A] operation accordance to below table.




**Sidestand Switch Operation**

| Sidestand | Gear Position | Clutch Lever | Engine Start | Engine Run |
|---|---|---|---|---|
| Up | Neutral | Released | Starts | Continue Running |
| Up | Neutral | Pulled in | Starts | Continue Running |
| Up | In Gear | Released | Doesn't start | Stops |
| Up | In Gear | Pulled in | Starts | Continue Running |
| Down | Neutral | Released | Starts | Continue Running |
| Down | Neutral | Pulled in | Starts | Continue Running |
| Down | In Gear | Released | Doesn't start | Stops |
| Down | In Gear | Pulled in | Doesn't start | Stops |

★If the sidestand switch operation does not work, inspect or replace the following item.

Battery (see Charging Condition Inspection in the Electrical System chapter)
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)
Ignition Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Ignition Switch (see Switch Inspection in the Electrical System chapter)
Sidestand Switch (see Switch Inspection in the Electrical System chapter)
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)
Starter Button (see Switch Inspection in the Electrical System chapter)
Neutral Switch (see Switch Inspection in the Electrical System chapter)
Starter Relay (see Starter Relay Inspection in the Electrical System chapter)
Relay Box (see Relay Circuit Inspection in the Electrical System chapter)
Starter Circuit Relay (see Relay Circuit Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

★If the all parts are good condition, replace the ECU (see ECU Removal/Installation in the Fuel System (EFI) chapter).

*Engine Stop Switch Operation Inspection*

**First Step**

- Turn on the ignition switch.
- Set the neutral position.
- Turn the engine stop switch to stop position [A].
- Push the starter button.
- The engine does not start.

★If the engine starts, inspect or replace the following item.
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)


**Second Step**

- Turn on the ignition switch.
- Set the neutral position.
- Turn the engine stop switch to run position [A].
- Push the starter button and run the engine.
- Turn the engine stop switch to stop position.
- Immediately the engine should be stop.

★If the engine does not stop, inspect or replace the following item.
Engine Stop Switch (see Switch Inspection in the Electrical System chapter)

★If the engine stop switch is good condition, replace the ECU (see ECU Removal/Installation in the Fuel System (EFI) chapter).

## Others

*Chassis Parts Lubrication*

● Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.

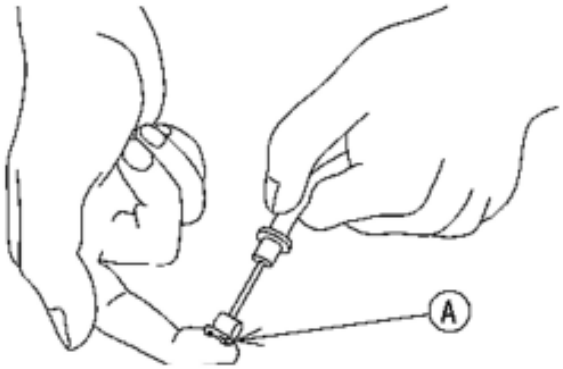
● Lubricate the points listed below with indicated lubricant.

**NOTE**

○ *Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.*

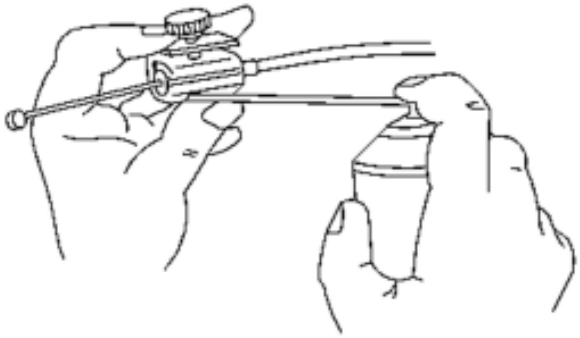
**Pivots: Lubricate with Grease.**

Brake Lever
Brake Pedal
Clutch Lever
Rear Brake Joint Pin
Sidestand




**Points: Lubricate with Grease.**

Clutch Inner Cable Upper and Lower Ends [A]
Throttle Inner Cable Upper and Lower Ends

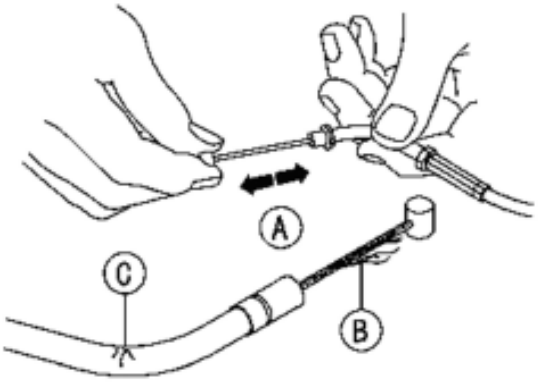


**Cables: Lubricate with Rust Inhibitor.**

Clutch Cable
Throttle Cables

● Lubricate the cables by seeping the oil between the cable and housing.

○ The cable may be lubricated by using a commercially available pressure cable lubricator with an aerosol cable lubricant.




● With the cable disconnected at both ends, the inner cable should move freely [A] within the cable housing.

★If cable movement is not free after lubricating, if the cable is frayed [B], or if the cable housing is kinked [C], replace the cable.

*Bolts, Nuts and Fasteners Tightness Inspection*

● Check the tightness of the bolts and nuts listed here. Also, check to see that each cotter pin is in place and in good condition.

**NOTE**

○ *For the engine fasteners, check the tightness of them when the engine is cold (at room temperature).*

★If there are loose fasteners, retighten them to the specified torque following the specified tightening sequence. Refer to the appropriate chapter for torque specifications. If torque specifications are not in the appropriate chapter, see the Standard Torque Table. For each fastener, first loosen it by 1/2 turn, then tighten it.

★If cotter pins are damaged, replace them with new ones.

**Bolt, Nut and Fastener to be checked**

Engine:
- Clutch Lever Pivot Nut
- Engine Mounting Bolts and Nuts Exhaust Pipe Manifold Holder Nuts Muffler Body Mounting Bolts

Wheels:
- Front Axle
- Front Axle Clamp Bolt
- Rear Axle Nut
- Rear Axle Nut Cotter Pin

Brakes:
- Brake Lever Pivot Nut
- Brake Pedal Bolt
- Brake Rod Joint Cotter Pin
- Caliper Mounting Bolts
- Front Master Cylinder Clamp Bolts
- Rear Master Cylinder Mounting Bolts

Suspension:
- Front Fork Clamp Bolts
- Rear Shock Absorber Bolt and Nut
- Swingarm Pivot Shaft Nut

Steering:
- Steering Stem Head Bolt
- Handlebar Holder Bolts

Others:
- Footpeg Stay Bolts
- Front Fender Bolts
- Sidestand Bolt

## Replacement Parts

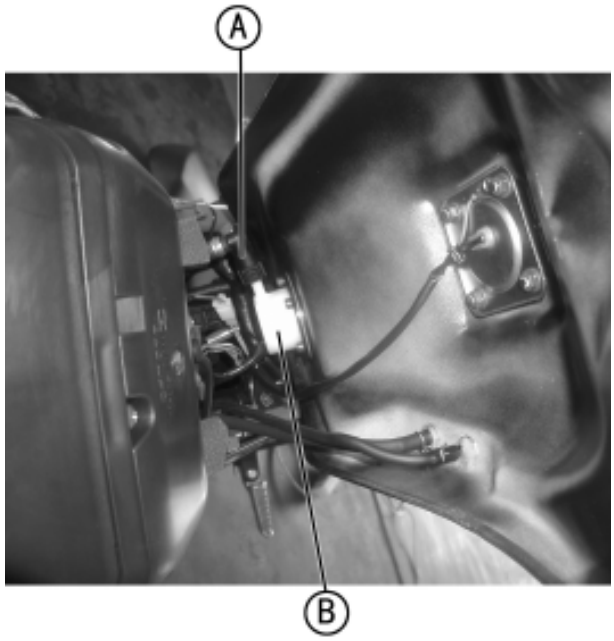
*Air Filter Element Replacement*

● Refer to the Air Cleaner Element Cleaning.

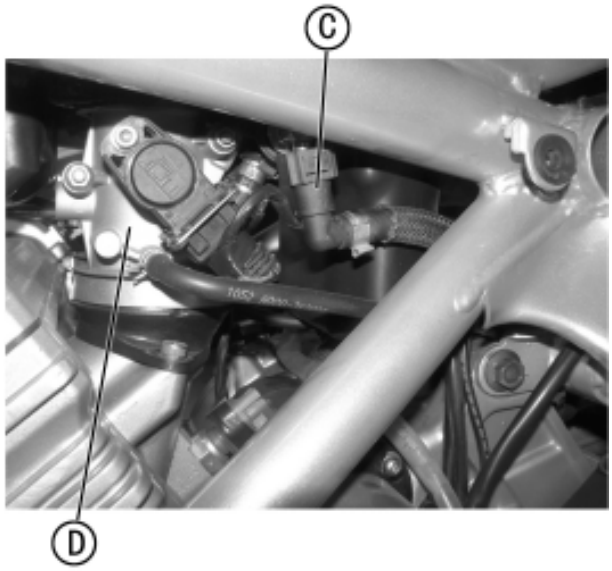
*Fuel Line Replacement*

**CAUTION**

**When removing and installing the fuel line joint, do not apply strong force to the outlet pipe on the fuel pump and delivery pipe on the throttle body assy. The pipes made from resin could be damaged.**




● Remove the fuel tank (see Fuel Tank Removal in the Fuel System (EFI) chapter).
● Be sure to place a piece of cloth [A] around the fuel hose joint.
● Insert a minus screw driver [B] into the slit [C] on the joint lock.
● Turn [A] the driver to disconnect the joint lock [B].
● Pull [C] the fuel line joint [D] out of the delivery pipe.




**⚠ WARNING**

**Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel line is disconnected, fuel spills out from the line and the pipe. Cover the line connection with a clean shop towel to prevent fuel spillage.**

● Install the new fuel line.
● Insert [A] the fuel line joint [B] straight onto the delivery pipe until the hose joint clicks.
● Push [C] the joint lock [D].
● Push and pull [A] the fuel line joint [B] back and forth more than two times and make sure it is locked and doesn't come off.

**⚠ WARNING**

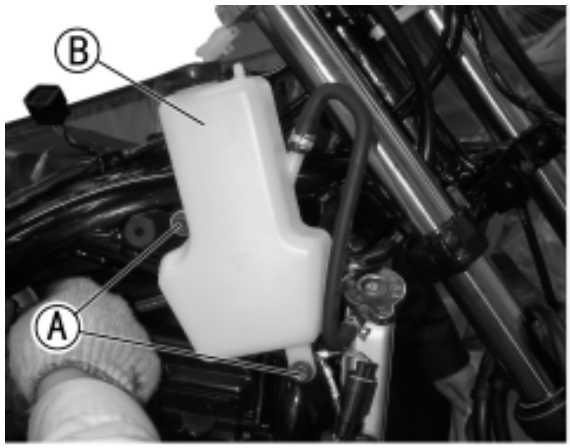
**Make sure the fuel hose joint is installed correctly on the delivery pipe or the fuel could leak.**

★If it comes off, reinstall the hose joint.
● Run the fuel line correctly.
● Install the removed parts (see appropriat chapters).
● Start the engine and check the fuel line for leaks.

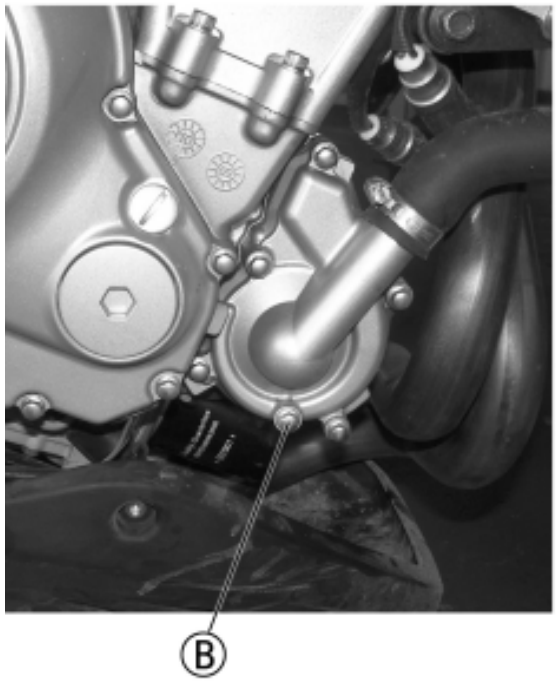
*Coolant Change*

**⚠ WARNING**

**To avoid burns, do not remove the radiator cap or try to change the coolant when the engine is still hot. Wait until it cools down. Coolant on tires will make them slippery and can cause an accident and injury. Immediately wipe up or wash away any coolant that spills on the frame, engine, or other painted parts. Since coolant is harmful to the human body, do not use for drinking.**




● Remove:
Right Center Fairing (see Center Fairing Removal in the Frame chapter)
Lower Fairing (see Lower Fairing Removal in the Frame chapter)
Reserve Tank Bolts [A] Reserve Tank [B]



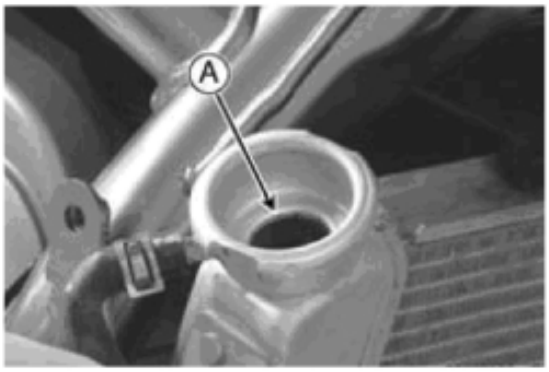

● Put [A] the projection [B] on the reserve tank into the hole [C] on the frame bracket, and place the reserve tank on the right side of frame.

● Place a container under the water pump drain bolt [A], then remove the drain bolt.


● Remove the radiator cap [A] in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.
○ The coolant will drain from the radiator and engine.

| CAUTION |
| --- |
| **Soft or distilled water must be used with the antifreeze in the cooling system.**<br>**If hard water is used in the system, it causes scales accumulation in the water passages, and considerably reduces the efficiency of the cooling system.** |

● Turn over [A] the reservoir tank, remove the cap, and pour the coolant into a suitable container.
● Place the reserve tank on the right side of frame.
● Tighten the drain bolt with the gasket.
○ Replace the drain bolt gasket with a new one.
**Torque - Water Pump Drain Bolt: 7.0 N·m (0.70 kgf·m, 62 in·lb)**



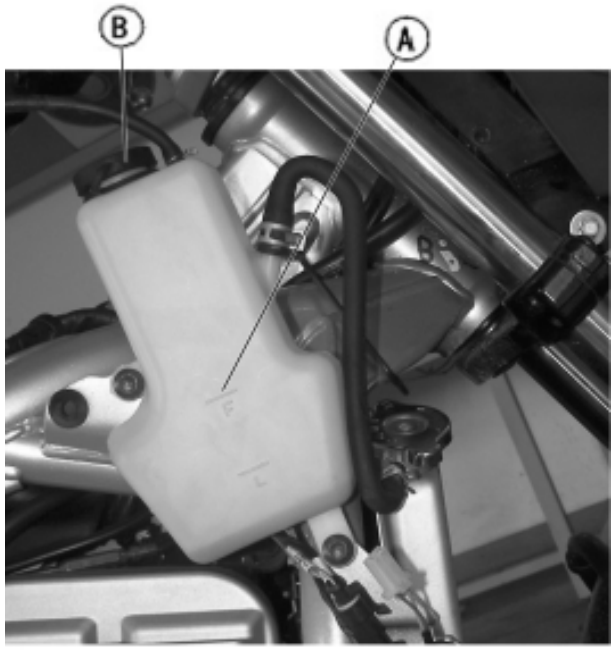

● When filling the coolant, choose a suitable mixture ratio by referring to the coolant manufacturer's directions.

**Water and Coolant Mixture Ratio (Recommended)**
**Soft Water: 50%**
**Coolant: 50%**
**Freezing Point:** -35 °C **(-31** °F**) Total Amount: 1.2 L (1.3 US qt)**
● Fill the radiator up to the filler neck [A] with coolant.

**NOTE**

○ *Pour in the coolant slowly so that it can expel the air from the engine and radiator.*
● Check the cooling system for leaks.
● Tap the radiator hoses to force any air bubbles caught inde.
● Fill the radiator up to the filler neck with coolant.

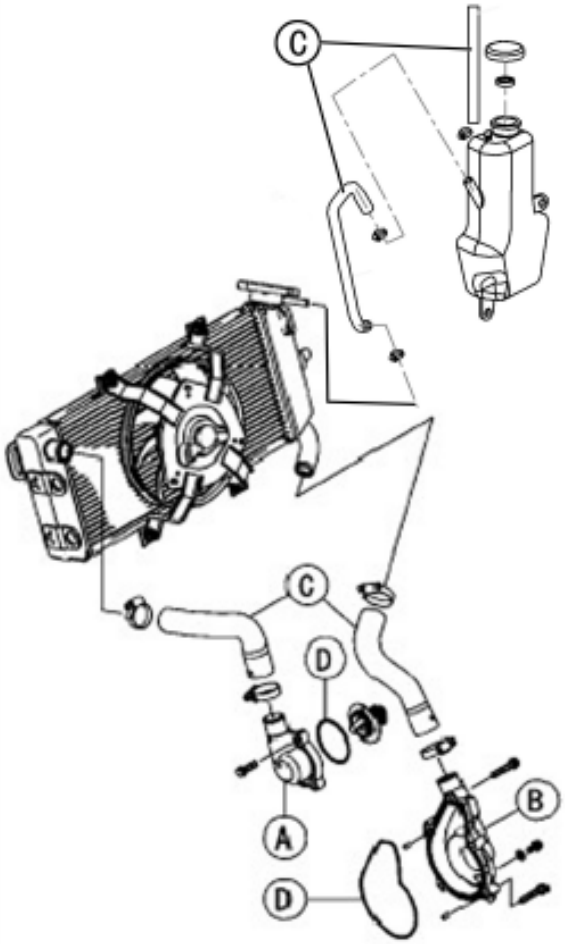
● Temporarily install the reserve tank to the frame with two bolts.
● Fill the reserve tank up to the "F" (full) level line [A] with coolant and install the cap [B].
● Start the engine, warm it up thoroughly until the radiator fan turns on and then stop the engine.
● Check the coolant level in the reserve tank after the engine cools down.
★If the coolant level is lower than the "L" level line, add coolant to the "F" level line.




| CAUTION |
| --- |
| **Do not add more coolant above the "F" level line.** |

*Radiator Hose and O-ring Replacement*

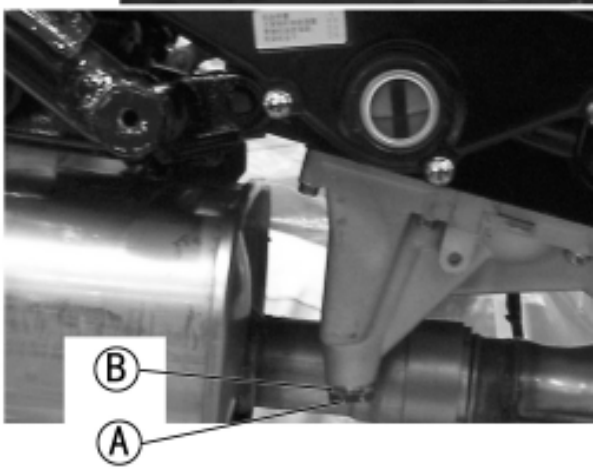
● Drain the coolant (see Coolant Change).
● Remove:
Thermostat Housing [A] (see Water Pump Removal in the Cooling System chapter)
Water Pump Cover [B] (see Water Pump Removal in the Cooling System chapter) Hoses [C]
O-rings [D]
● Apply grease to the new O-rings and install them.
● Install the new hoses and tighten the clamps securely.
● Fill the coolant (see Coolant Change).
● Check the cooling system for leaks.



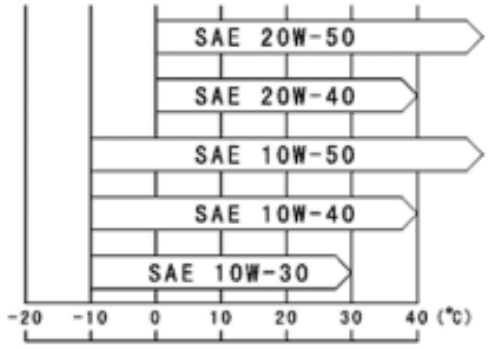
*Engine Oil Change*

● Situate the motorcycle so that it is vertical after warming up the engine.
● Unscrew the oil filler plug [A].
● Place on oil pan beneath the engine.


● Remove the engine oil drain bolt [A] to drain the oil.
○ The oil in the oil filter can be drained by removing the filter (see Oil Filter Replacement).
★Replace the drain bolt gasket [B] with a new one.
● Tighten the drain bolt.
**Torque - Engine Oil Drain Bolt: 30 N · m (3.0 kgf · m, 22 ft · lb)**
● Pour in the specified type and amount of oil.

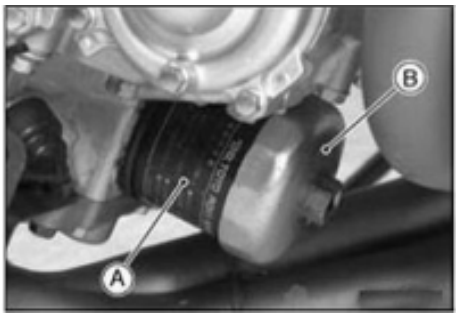



**Recommended Engine Oil**
**Type: API SE, SF or SG**
**API SH, SJ or SL with JASO MA Viscosity: SAE 10W-40**
**Capacity: 1.7 L (1.8 US qt) (when filter is not removed)**
**1.9 L (2.0 US qt) (when filter is removed)**
**2.4 L (2.5 US qt) (when engine is completely dry)**




**NOTE**

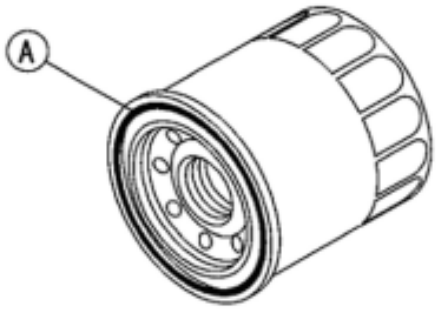
○ *Although 10W-40 engine oil is the recommended oil for most conditions, the oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.*
○ *Check the oil level (see Oil Level Inspection in the Engine Lubrication System chapter).*




*Oil Filter Replacement*

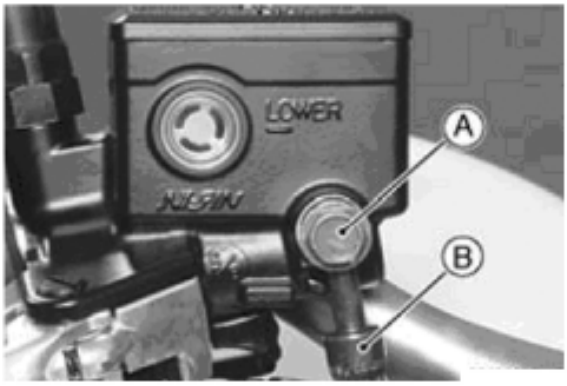
● Drain the engine oil (see Engine Oil Change).
● Remove the oil filter [A] with the oil filter wrenc [B].
**Special Tool - Oil Filter Wrench**

● Replace the filter with a new one.
● Apply engine oil to the gasket [A] before installation.
● Tighten the filter with the oil filter wrench.
**Torque - Oil Filter: 17.2 N · m (1.75 kgf · m, 13 ft · lb)**




**NOTE**

○ *Hand tightening of the oil filter can not be allowed since it does not reach to this tightening torque.*
○ *Pour in the specified type and amount of oil (see Engine Oil Change).*

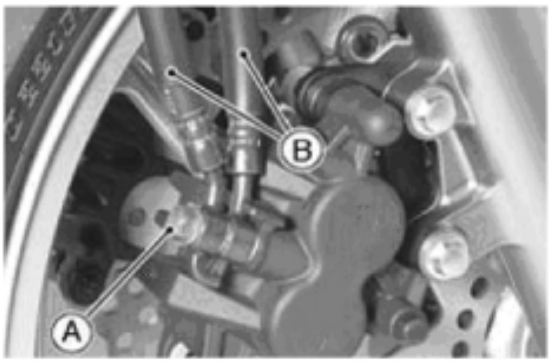



*Brake Hose and Pipe Replacement*

**CAUTION**

**Brake fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.**

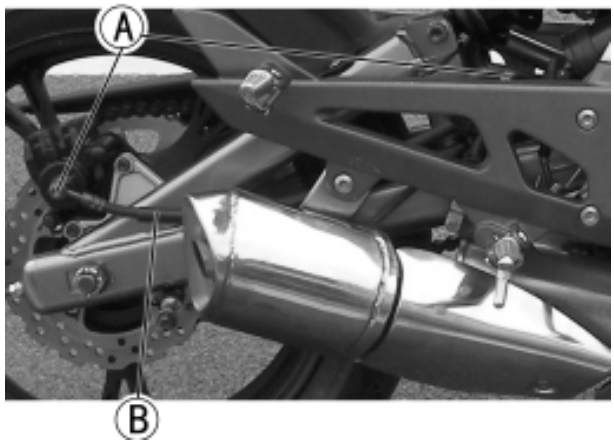
● Remove the banjo bolts [A].
● When removing the brake hose, take care not to spill the brake fluid on the painted or plastic parts.
● When removing the brake hoses [B], temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
● Immediately wash away any brake fluid that spills.




*Brake Fluid Replacement*

**NOTE**

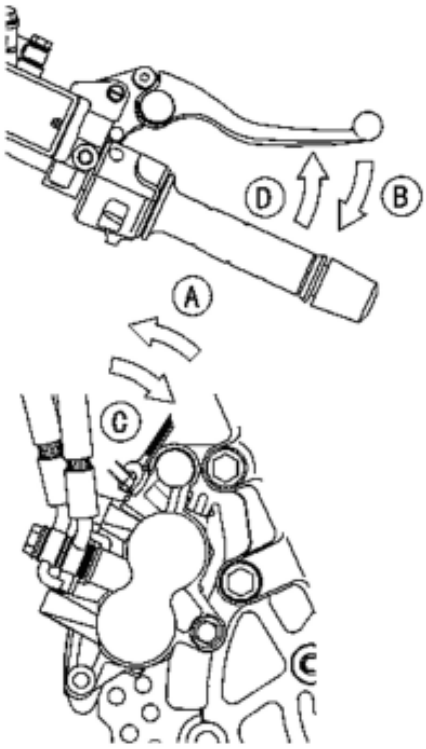
○ *The procedure to change the front brake fluid is as follows. Changing the rear brake fluid is the same as for the front brake.*
● Level the brake fluid reservoir.
● Remove the reservoir cap and diaphragm.
● Remove the rubber cap from the bleed valve [A] on the caliper.
● Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.
● Fill the reservoir with fresh specified brake fluid.



● Change the brake fluid.

○ Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.

1. Open the bleed valve [A].
2. Apply the brake and hold it [B].
3. Close the bleed valve [C].
4. Release the brake [D].




**NOTE**

○ *The fluid level must be checked often during the changing operation and replenished with fresh brake fluid. If the fluid in the reservoir runs out any time during the changing operation, the brakes will need to be bled since air will have en tered the brake line.*

○ *Front Brake: Repeat the above steps for the other caliper.*

● Remove the clear plastic hose.

● Install the diaphragm and reservoir cap.

● Tighten:

**Torque - Front Brake Reservoir Cap Screws: 1.0 N·m (0.10 kgf·m, 9 in·lb)**

● Follow the procedure below to install the rear brake fluid reservoir cap correctly.

○ First, tighten the rear brake fluid reservoir cap [B] clock-wise [C] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body, then tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir body [A].


● Tighten the bleed valve, and install the rubber cap.

**Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

● After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.

★If necessary, bleed the air from the lines.

*Master Cylinder Rubber Parts Replacement*

**Front Master Cylinder Disassembly**

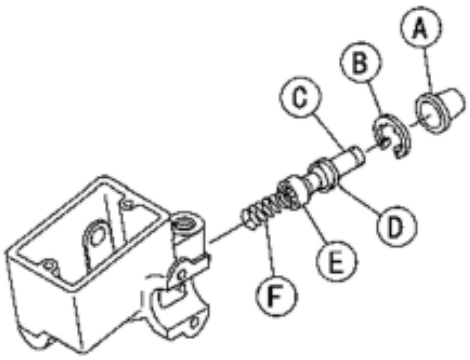
● Remove the front master cylinder (see Front Master Cylinder Removal in the Brakes chapter).

● Remove the reservoir cap and diaphragm, and pour the brake fluid into a container.

● Unscrew the locknut and pivot bolt, and remove the brake lever.

● Pull the dust cover [A] out of place, and remove the circlip [B].

**Special Tool - Inside Circlip Pliers**




● Pull out the piston [C], secondary cup [D], primary cup [E], and return spring [F].

| CAUTION |
| --- |
| **Do not remove the secondary cup from the piston since removal will damage it.** |

### Rear Master Cylinder Disassembly

**NOTE**

○ *Do not remove the push rod clevis for master cylinder disassembly since removal reguires brake position adjustment.*

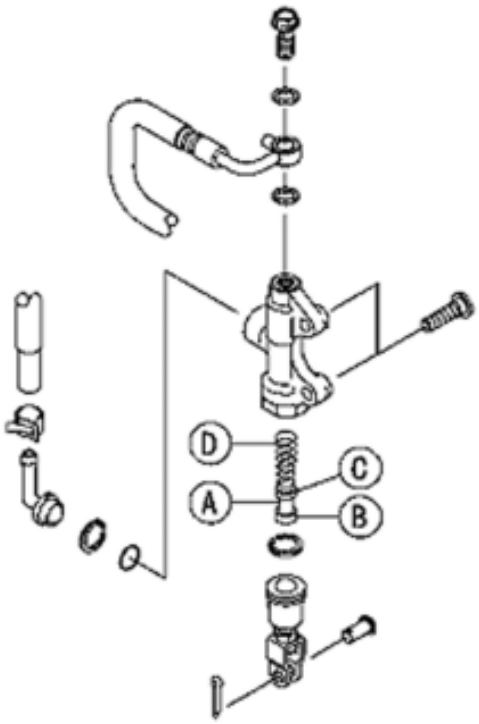
● Remove the rear master cylinder (see Rear Master Cylinder Removal in the Brakes chapter).

● Slide the dust cover on the push rod out of place, and remove the circlip.

**Special Tool - Inside Circlip Pliers**

● Pull out the push rod with the piston stop.

● Take off the piston [A], secondary cup [B], primary cup [C] and return spring [D].




| CAUTION |
| --- |
| **Do not remove the secondary cup from the piston since removal will damage it.** |

*Master Cylinder Assembly*

● Before assembly, clean all parts including the master cylinder with brake fluid or alcohol.

| CAUTION |
| --- |
| **Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely, and will eventually deteriorate the rubber used in the disc brake.** |

● Apply brake fluid to the new parts and to the inner wall of the cylinder.

● Take care not to scratch the piston or the inner wall of the cylinder.

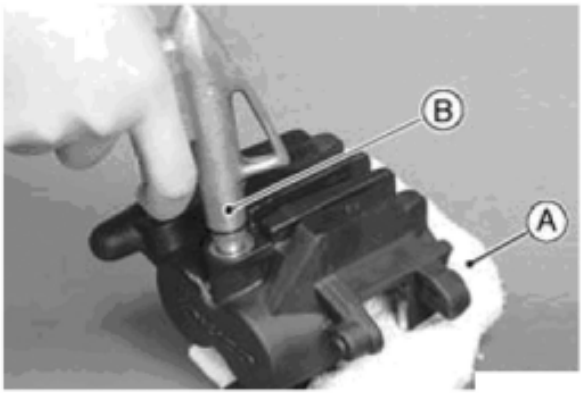
● Tighten the brake lever pivot bolt and locknut.

● Apply silicone grease.
Brake Lever Pivot Bolt

● Tighten:
**Torque - Brake Lever Pivot Bolt: 1.0 N·m (0.10 kgf·m, 9 in·lb)**
**Brake Lever Pivot Bolt Locknut: 5.9 N·m (0.60 kgf·m, 52 in·lb)**

*Caliper Rubber Parts Replacement*

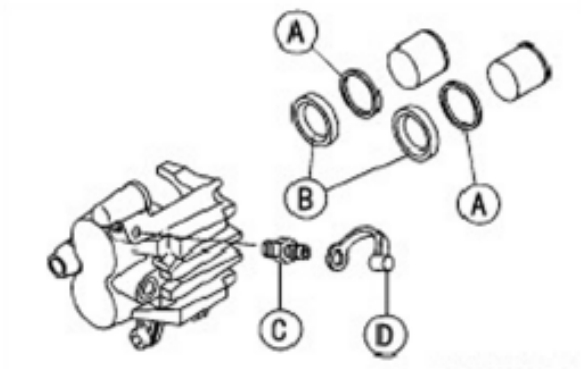
*Front Caliper Disassembly*




● Remove:
Front Caliper (see Front Caliper Removal in the Brakes chapter)
Brake Pads (see Front Brake Pad Removal in the Brakes chapter)
● Using compressed air, remove the pistons.
● Cover the piston area with a clean, thick cloth [A].
● Blow compressed air [B] into the hole for the banjo bolt to remove the piston.

**⚠ WARNING**

**To avoid serious injury, never place your fingers or palm in front of the piston. If you apply compressed air into the caliper, the piston may crush your hand or fingers.**




● Pull out the pistons by hand.
● Remove the dust seals [A] and fluid seals [B].
● Remove the bleed valve [C] and rubber cap [D].

**NOTE**

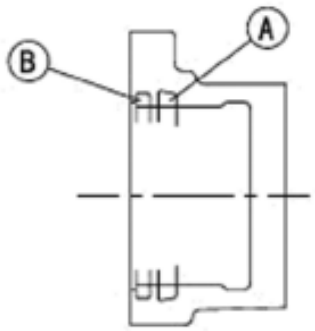
○ *If compressed air is not available, with the brake hose still attached, apply the brake lever to remove the piston. The remaining process is as described above.*

*Front Caliper Assembly*

● Clean the caliper parts except for the pads.

**CAUTION**

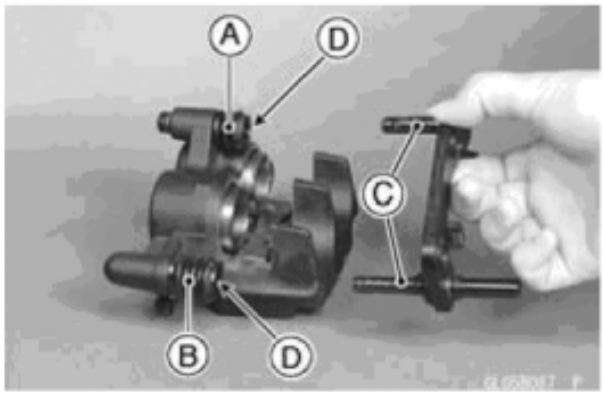
**For cleaning the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.**



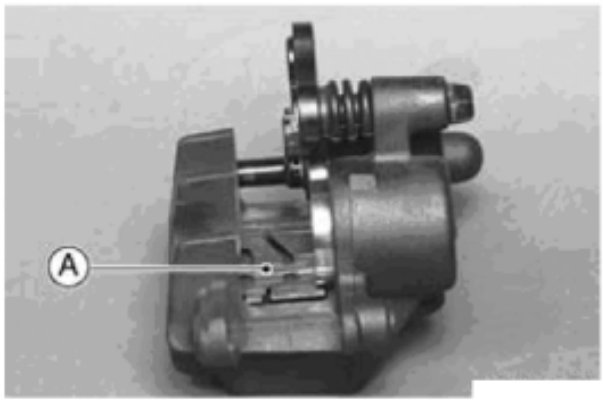

● Install the bleed valve and rubber cap.
**Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

● Replace the fluid seals [A] with new ones.
● Apply brake fluid to the fluid seals, and install them into the cylinders by hand.
● Replace the dust seals [B] with new ones if they are damaged.
● Apply brake fluid to the dust seals, and install them into the cylinders by hand.

● Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand.
● Check the shaft rubber friction boot [A] and the dust cover [B] replace them with new ones if they are damaged.
● Apply a thin coat of PBC (Poly Butyl Cuprysil) grease to the caliper holder shafts [C] and holder holes [D] (PBC is a special high-temperature, water-resistance grease).

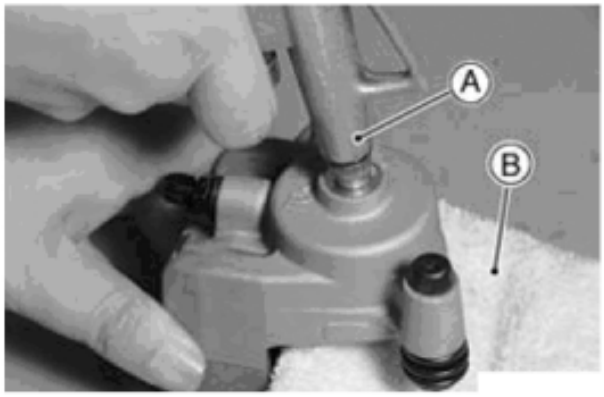



● Install the anti-rattle spring [A].
● Install the pads (see Front Brake Pad Installation in the Brakes chapter).
● Wipe up any spilled brake fluid on the caliper with wet cloth.




*Rear Caliper Disassembly*

● Remove the rear caliper (see Rear Caliper Re moval in the Brakes chapter).
● Remove the pads and anti-rattle spring (see Rear Brake Pad Removal in the Brakes chapter).
● Using compressed air, remove the piston.
● Cover the piston area with a clean, thick cloth [B].
● Blow compressed air [A] into the hole for the banjo bolt to remove the piston.




**CAUTION**

**To avoid serious injury, never place your fingers or palm inside the caliper opening. If you apply com- pressed air into the caliper, the piston may crush your hand or fingers.**

● Remove the dust seal and fluid seal.
● Remove the bleed valve and rubber cap.

**NOTE**

○ *If compressed air is not available, with the brake hose still attached, apply the brake pedal to remove the piston. The remaining process is as described above.*

*Rear Caliper Assembly*

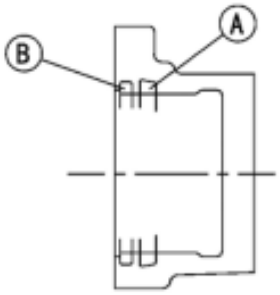
● Clean the caliper parts except for the pads.

**CAUTION**

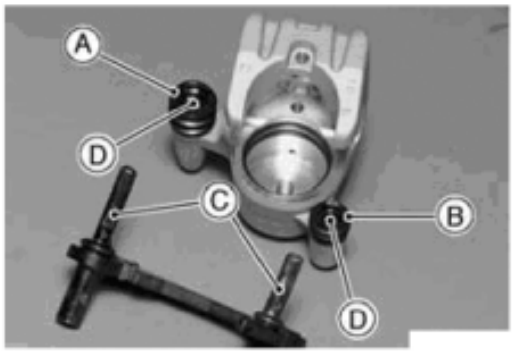
**For cleaning of the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.**

● **Install the bleed valve and rubber cap.**
**Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

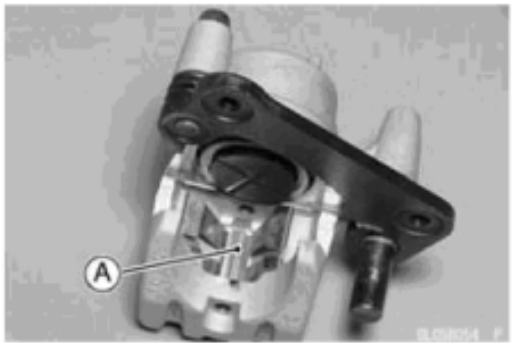
● Replace the fluid seal [A] with a new one.
● Apply brake fluid to the fluid seal, and install it into the cylinder by hand.
● Replace the dust seal [B] with a new one if it is damaged.
● Apply brake fluid to the dust seal, and install it into the cylinder by hand.




● Apply brake fluid to the outside of the piston, and push it into the cylinder by hand.
● Replace the shaft rubber friction boot [A] and dust cover [B] if they are damaged.
● Apply a thin coat of PBC (Poly Butyl Cuprysil) grease to the caliper holder shafts [C] and holder holes [D] (PBC is a special high-temperature, water-resistance grease).

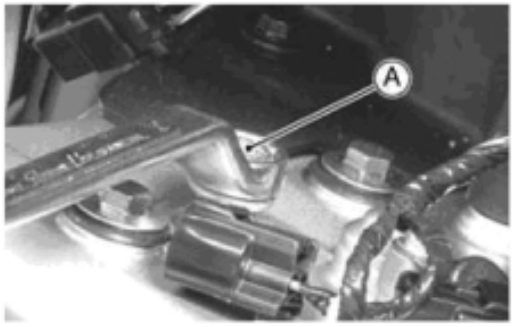



● Install the anti-rattle spring [A] in the caliper as shown.
● Install the pads (see Rear Brake Pad Installation in the Brakes chapter).
● Wipe up any spilled brake fluid on the caliper with wet cloth.




*Spark Plug Replacement*

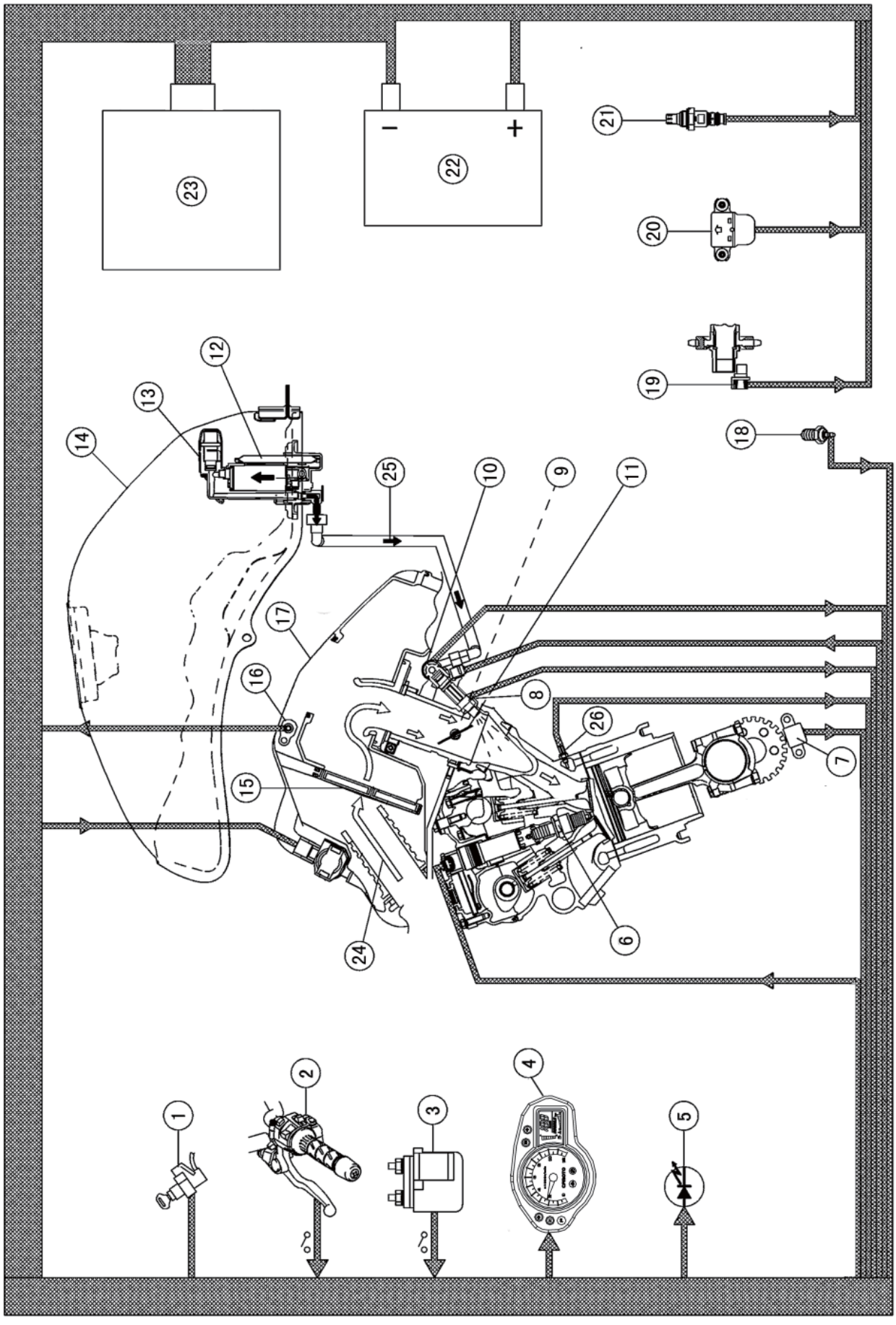
● Remove:
Ignition Coils (see Ignition Coil (Ignition Coil together with Spark Plug Cap) Removal in the Electrical System chapter)
● Remove the spark plugs using the 16 mm plug wrench [A].
Owner's Tool - Spark Plug Wrench, 16 mm
o Insert the spark plug vertically into the plug hole with the spark plug installed in the plug wrench [A]. Owner's Tool - Spark Plug Wrench, 16 mm
o Tighten:
**Torque - Spark Plugs: 15 N·m (1.5 kgf·m, 11 ft·lb)**
o Install:
Ignition Coils (see Ignition Coil (Ignition Coil together with Spark Plug Cap) Installation in the Electrical System chapter)




# FUEL SYSTEM (EFI)

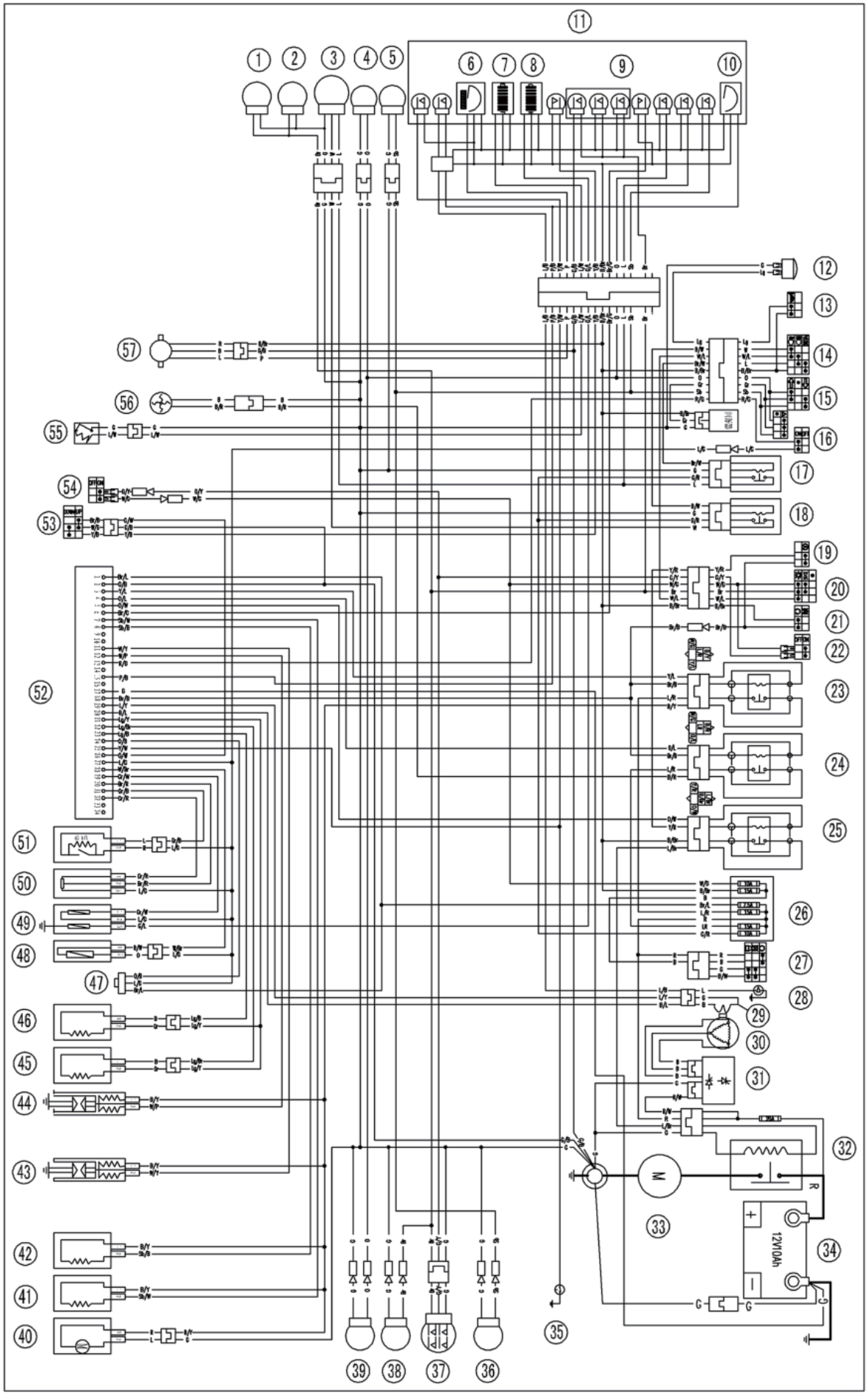
## Table of Contents

## Exploded View



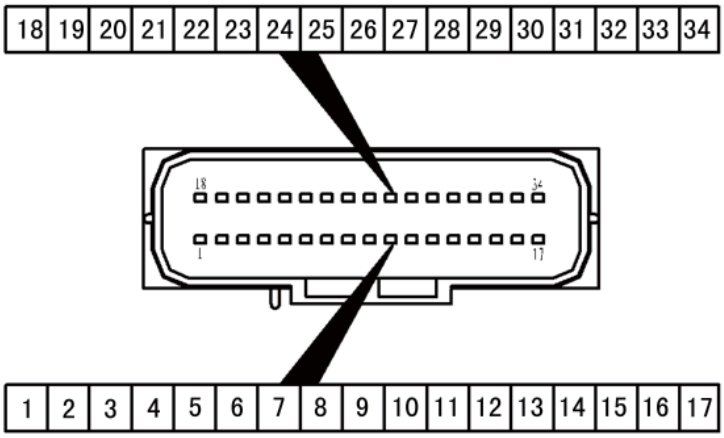
① . Ignition Switch
② . Engine Stop Switch
③ . Starter Switch
④ . Tachometer
⑤ . FI Indicator Light(LED)
⑥ . Spark Plug
⑦ . Crankshaft Position Sensor
⑧ . Fuel Injector
⑨ . Throttle Position Sensor
⑩ . Fuel Rail
⑪ . Throttle Body
⑫ . Fuel Pump
⑬ . Pressure Regulator
⑭ . Fuel Tank
⑮ . Air Filter Element
⑯ . Inlet Air Temperature Sensor
⑰ . Air Filter Housing
⑱ . Neutral Switch
⑲ . Speed Sensor
⑳ . Roll-over Sensor
㉑ . Oxygen Sensor
㉒ . Battery
㉓ . ECU
㉔ . Inlet Airflow Direction
㉓ . Pressurized Fuel Direction
㉖ . Coolant Temperature Sensor

## EFI Wiring Diagram



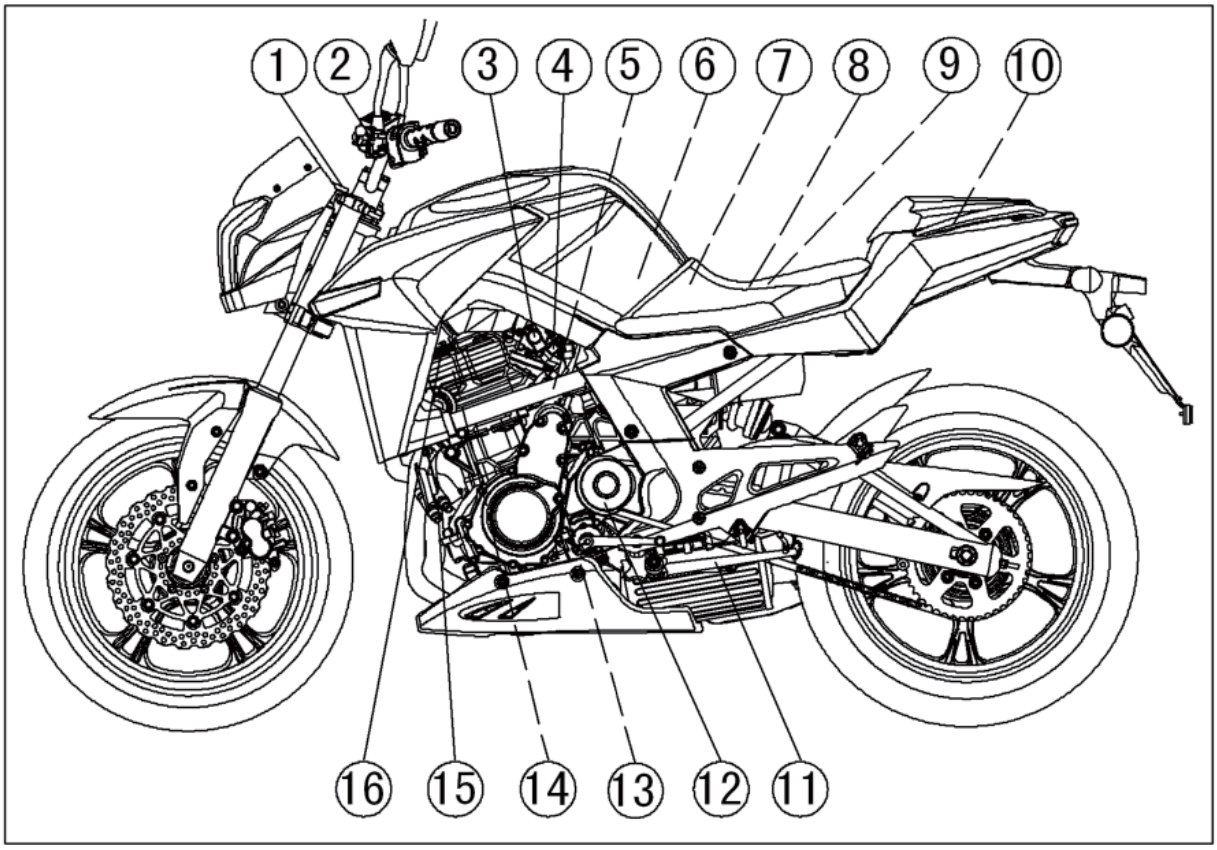
① . Front Position Light
② . Rear Position Light
③ . Headlight
④ . Front left turn light
⑤ . Auxiliary Starter Relay
⑥ . Speedometer
⑦ . Fuel Meter
⑧ . Coolant Temperature Sensor
⑨ . FI Indicator Light
⑩ . Tachometer
⑪ . Meter Unit
⑫ . Horn
⑬ . Horn Switch
⑭ . Dimmer Switch
⑮ . Turn Switch
⑯ . Clutch Lever Switch
⑰ . High Beam Relay
⑱ . Low Beam Relay
⑲ . Starter Switch
⑳ . Light Switch
㉑ . Engine Stop Switch
㉒ . Front Brake Switch
㉓ . Fuel Pump Relay
㉔ . Fan Relay
㉕ . Auxiliary Starter Relay
㉖ . Fuse Box
㉗ . Ignition Switch
㉘ . Oil Pressurre Switch
㉙ . Crankshaft Position Sensor
㉚ . Magneto Assembly
㉛ . Regulator/Rectifier
㉜ . Starter Relay
㉝ . Starter Motor
㉞ . Battery
㉟ . Neutral Switch
㊱ . Rear Right Turn Light
㊲ . Tail/btake Light
㊳ . License Plate Light
㊴ . Rear Left Turn Light
㊵ . Fuel Pump
㊶ . Fuel Injector 1
㊷ . Fuel Injector 2
㊸ . Ignition Coil & Spark Plug 1
㊹ . Ignition Coil & Spark Plug 2
㊺ . Oxygen Sensor 1
㊻ . Oxygen Sensor 2
㊼ . Diagnosis Connector
㊽ . Inlet Air Temperature sensor
㊾ . Coolant Temperature Sensor
㊿ . Throttle Position Sensor
(51) . Tip-over Sensor
(52) . ECU
(53) . Sidestand Switch
(54) . Rear Brake Switch

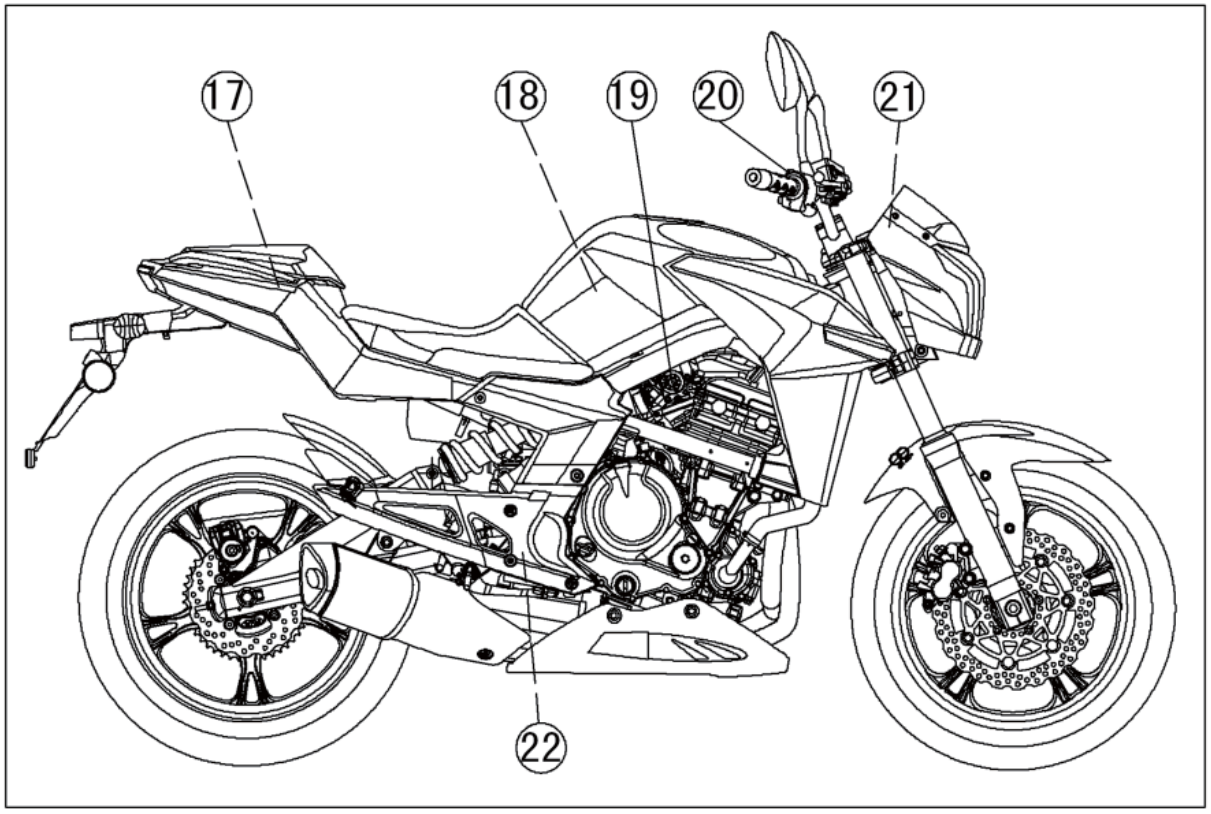
## ECU Pin and Function




① . Power Supply to ECU (from Battery Positive Terminal)
② . Ground to ECU (from Battery Negative Terminal)
③ . Fuel Pump Relay
④ . Fan Relay
⑤ . Auxiliary Starter Relay
⑥ . FI Indicator Light
⑦ . Fuel Injector 1
⑧ . Fuel Injector 2
⑨ . Unused
⑩ . Unused
⑪ . Ignition Coil 1
⑫ . Ignition Coil 1
⑬ . Clutch Switch
⑭ . Unused
⑮ . RPM Output (0-12V)
⑯ . Unused
⑰ . Ground to ECU (Battery Negative Terminal)
⑱ . ECU Power (Ignition Switch or Starter Switch)
⑲ . Crankshaft Position Sensor Signal A
⑳ . Crankshaft Position Sensor SignalB
㉑ . Ground to Oxygen
㉒ . Oxygen Sensor 1 Signal
㉓ . Oxygen Sensor 2 Signal
㉔ . Cable K Diagnosis
㉕ . Neutral Switch
㉖ . Sidestand Switch
㉗ . Ground to Sensors
㉘ . Inlet Air Temperature Sensor Signal
㉙ . Coolant Temperature Sensor Signal
㉚ . TPS Signal
㉛ . Roll-over Sensor Signal
㉜ . +5V Power Supply
㉝ . Unused
㉞ . Unused

## EFI Parts Location



## EFI Parts Location

① Ignition Coil
②. Clutch Lever Sensor
③. Throttle Position Sensor
④. Fuel Sensor
⑤. Coolant Temperature Sensor
⑥. Fuel Pump
⑦. Fuel Pump Relay
⑧. Fuse Box
⑨. Battery
⑩. ECU
⑪. Sidestand Switch
⑫. Speed Sensor
⑬. Neutral Switch
⑭. Spark Plug
⑮. Oxygen Sensor
⑯. Ignition Coil
⑰. Diagnosis Connector
⑱. Inlet Air Temperature Sensor
⑲. Throttle Body
⑳. Engine Stop Switch
㉑. FI Indicator
㉒. Roll-over Sensor

## Specifications

| Item | Standard |
|---|---|
| EFI: | |
| Idle Speed | 1300±50 r/min(rpm) |
| Thrttle Body Assy: | |
| Type | Two barrel type |
| Bore | Ø 38 mm |
| ECU: | |
| Make | Ducati |
| Type | Digital memory type, with bult in IC igniter, sealed with resin |
| Usable Engine Speed | 100-11000 r/min (rpm) |
| Fuel Pressure (High Pressure Line): | |
| Right After Ignition Switch ON | 323 kPa (3.3 kgf/cm$^2$, 47 psi ) with fuel pump running |
| After 3 Seconds from Ignition Switch ON | 265 kPa (2.7 kgf/cm$^2$, 38 psi ) with fuel pump stopped |
| With Engine Idling | 333 kPa (3.4 kgf/cm$^2$, 48 psi ) with fuel pump running |
| Fuel Pump: | |
| Type | In-tank friction pump |
| Fuel Injectors: | |
| Type | IWP 156 |
| Nozzle Type | One spray with 5 holes |
| Resistance | About 13.5-15.5 Ω at 20 °C (68 °F ) |
| Throttle Position Sensor | Non-adjustable and non-movable |
| Input Voltage | 4.75~5.25 V DC between L/G and Gr/R |
| Output Voltage at Idle Throttle Opening | 0.4~0.7 V DC between L/G and Br/R |
| Output Voltage at Full Throttle Opening | 2.9~3.4 V DC between L/G and Br/R |
| Resistance | 1.1~1.4 kΩ |
| Inlet Air Temperature Sensor: | |
| Resistance | See text in Inlet Air Temperature Sensor Section |
| Output Voltage at ECU | About 2.5~3.50 V at 20 20 °C (68 °F ) |
| Coolant Temperature Sensor: | |
| Resistance | See Electrical System chapter |
| Output Voltage at ECU | About 2.5-3.50 V at 20 20 °C (68 °F ) |
| Speed Sensor: | |
| Input Voltage at Sensor | About 9~11 V DC at Ignition Switch ON |
| Output Voltage at Sensor | About 0.05~1 V DC at Ignition Switch ON and 0 km/h |
| Tip-over Sensor: | |
| Detection Method | Resistance detection method |
| Detection Angle | More than 40 °~50 ° for each bank |
| Resistance | More than 40 °~50 ° : ≤ 0.5 Ω<br>Less than 40 °: 60~63 kΩ |
| Oxygen Sensor: | |
| Outout Voltage (rich) | 0.7 V or more |
| Outout Voltage (lean) | o.2 V or less |
| Throttle Grip and Cables: | |
| Throttle Grip Free Play | 2~3 mm (0.08~0.12 in.) |

## Specifications

| Item | Standard |
|---|---|
| Oxygen Sensor: | |
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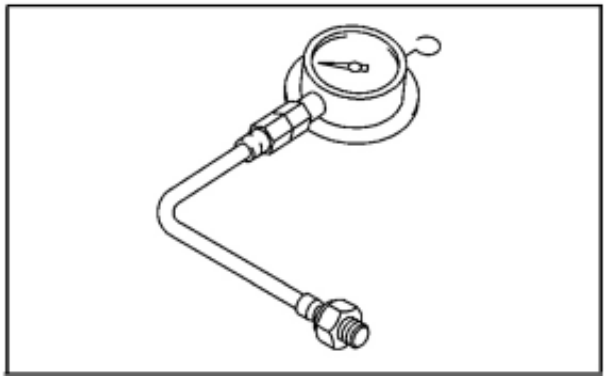
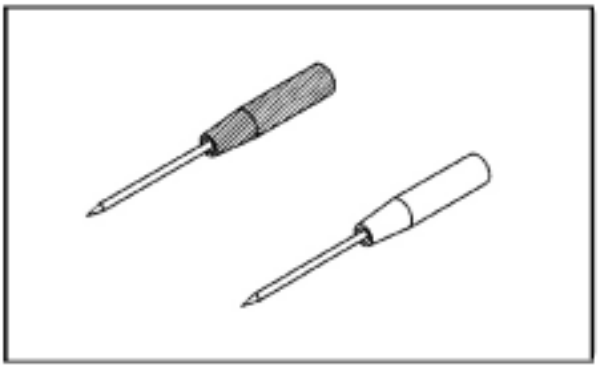
| Throttle Grip and Cables: | |
| Throttle Grip Free Play | 2~3 mm (0.08~0.12 in.) |

## Special Tools

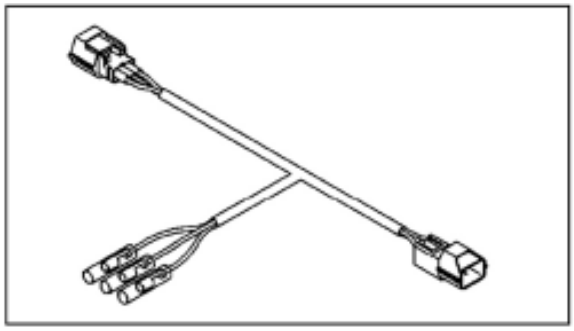
Oil Pressure Gauge



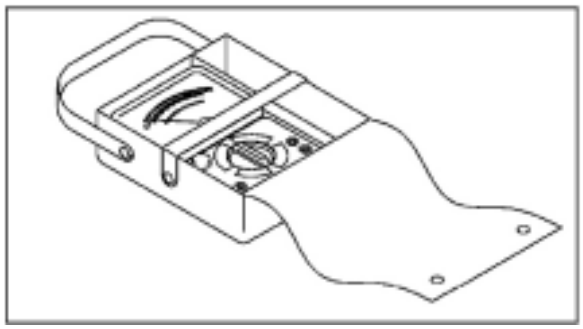
Needle Adaptor Set



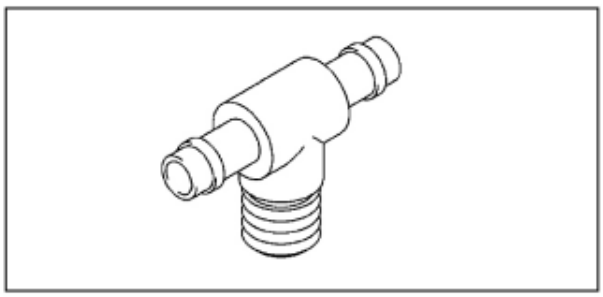
Throttle Sensor Setting Harness



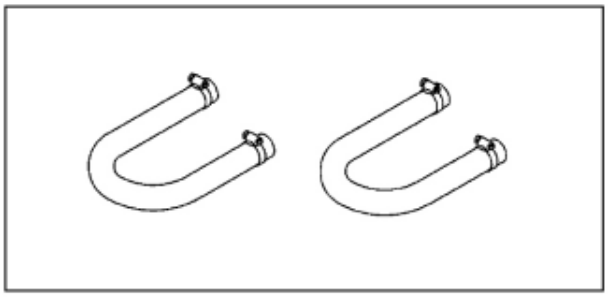
Hand Tester



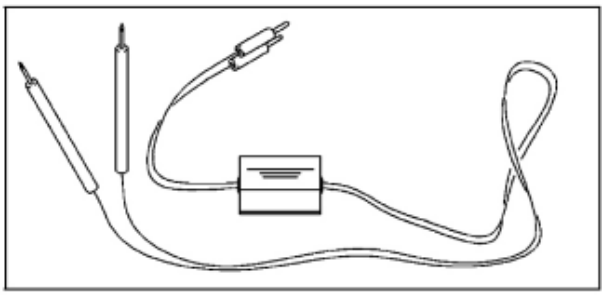
Fuel Pressure Gauge Adaptor



Fuel Hose



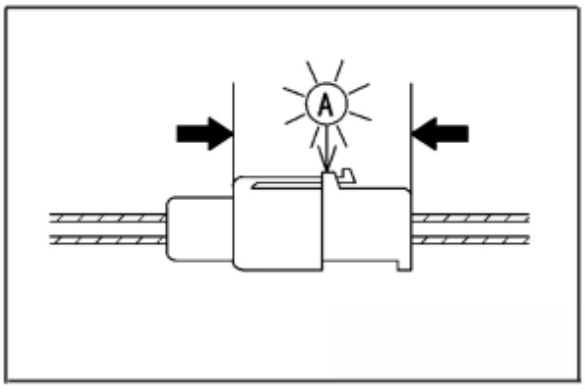
Peak Voltage Adapter



### EFI Servicing Precautions

There are a number of important precautions that should be followed servicing the EFI system.

- This EFI system is designed to be used with a 12 V sealed battery as its power source. Do not use any other battery except for a 12 V sealed battery as a power source.
- Do not reverse the battery cable connections. This will damage the ECU.
- To prevent damage to the EFI parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is on or while the engine is running.
- Take care not to short the leads that are directly connected to the battery positive (+) terminal to the chassis ground.
- When charging, remove the battery from the motorcycle. This is to prevent ECU damage by excessive voltage.
- Do not turn the ignition switch ON while any of the EFI electrical connectors are disconnected. The ECU memorizes service codes.
- Do not spray water on the electrical parts, EFI parts, connectors, leads, and wiring.
- Whenever the EFI electrical connections are to be disconnected, first turn off the ignition switch, and disconnect the battery (-) terminal. Do not pull the lead, only the con- nector. Conversely, make sure that all the EFI electrical connections are firmly reconnected before starting the engine.




- Connect these connectors until they click [A].

- If a transceiver is installed on the motorcycle, make sure that the operation of the EFI system is not influenced by electric wave radiated from the antenna. Check operation of the system with the engine at idle. Locate the antenna as far as pos sible away from the ECU.

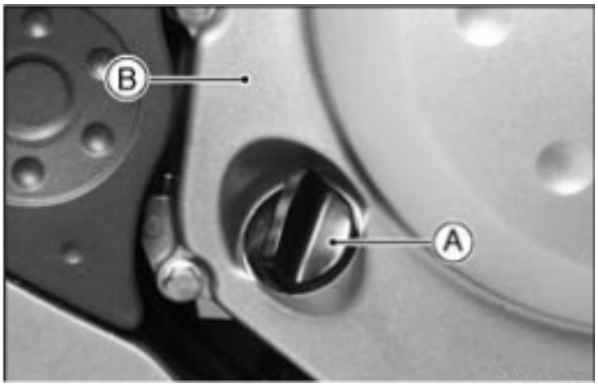
### EFI Servicing Precautions

- When any fuel hose is disconnected, fuel may spout out by residual pressure in the fuel line. Cover the hose joint with a piece of clean cloth to prevent fuel spillage.
- When any fuel hose is disconnected, do not turn on the ignition switch. Otherwise, the fuel pump will operate and fuel will spout from the fuel hose.
- Do not operate the fuel pump if the pump is com pletely dry. This is to prevent pump seizure.

- Before removing the fuel system parts, blow the outer surfaces of these parts clean with compressed air.
- To prevent corrosion and deposits in the fuel system, do not add to fuel any fuel antifreeze chemicals.
- To maintain the correct fuel/air mixture (F/A), there must be no inlet air leaks in the EFI system. Be sure to install the oil filler plug [A] after filling the engine oil.

  Clutch Cover [B]

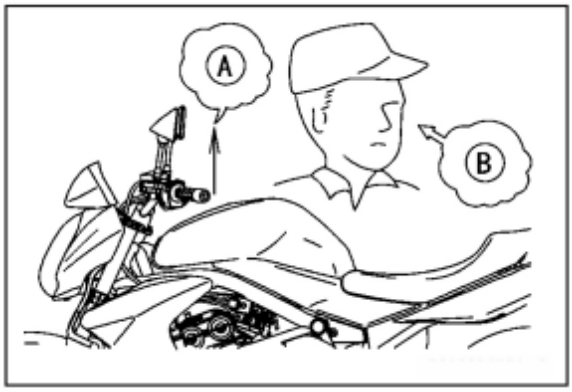
  **Torque-Oil Filler Plug: Hand-tighten**



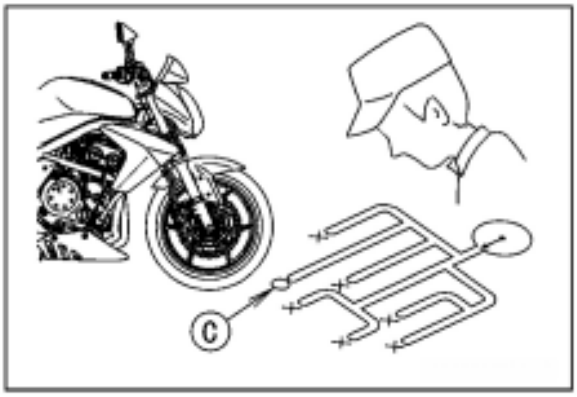
## EFI Servicing Precautions

### Outline

When an abnormality in the system occurs, the FI indicator light (LED) goes on to alert the rider on the meter panel. In addition, the condition of the problem is stored in the memory of the ECU (electronic control unit). With the engine stopped and turned in the self-diagnosis mode, the service code [A] is indicated by the number of times the FI indicator light (LED) blinks. When due to a malfunction, the FI indicator light (LED) remains lit, ask the rider about the conditions [B] under which the problem occurred and try to determine the cause [C].

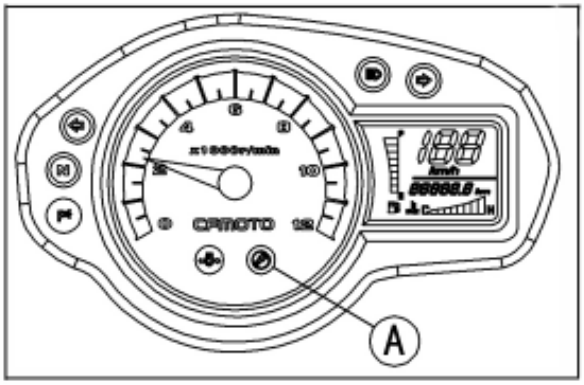



- First, conduct a self-diagnosis inspection and then a non-self-diagnosis inspection. The non-self-diagnosis items are not indicated by the FI indicator light (LED). Don't rely solely on the EFI self-diagnosis function, use common sense.




Even when the EFI system is operating normally, the FI indicator light (LED) [A] may light up under strong electrical interference. No repair needed. Turn the ignition switch OFF to stop the indicator light.

When the FI indicator light (LED) goes on and the motorcycle is brought in for repair, check the service codes. When the repair has been done, the light (LED) doesn't go on. But the service codes stored in memory are not erased to preserve the problem history, and the light (LED) can display the codes in the self-diagnosis mode. The problem history is referred when solving unstable problems.

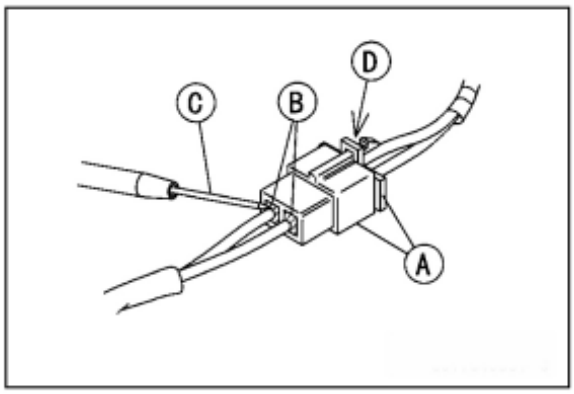



When the motorcycle is down, the vehicle-down sensor is turned OFF and the ECU shuts off the fuel injectors and ignition system. The FI indicator light (LED) blinks but the service code cannot be displayed. The ignition switch is left ON. If the starter button is pushed, the electric starter turns but the engine doesn't start. To start the engine again, raise the motorcycle, turn the ignition switch OFF, and then ON. The vehicle-down sensor is turned ON and the light (LED) goes OFF.

### EFI Servicing Precautions

○ The DFI part connectors [A] have seals [B], including the ECU.

● Join the connector and insert the needle adapters [C] inside the seals [B] from behind the connector until the adapter reaches the terminal.
**Special Tool - Needle Adapter Set**




| CAUTION |
| --- |
| **Insert the needle adapter straight along the terminal in the connector to prevent short-circuit between terminals.** |

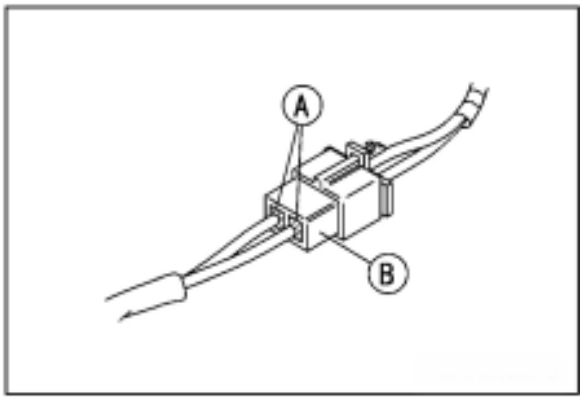
● Make sure that measuring points are correct in the connector, noting the position of the lock [D] and the lead color before measurement. Do not reverse connections of the hand tester or a digital meter.

● Be careful not to short-circuit the leads of the EFI or electrical system parts by contact between adapters.

● Turn the ignition switch ON and measure the voltage with the connector joined.

| CAUTION |
| --- |
| **Incorrect, reverse connection or short circuit by needle adapters could damage the DFI or electrical system parts.** |

● After measurement, remove the needle adapters and apply silicone sealant to the seals [A] of the connector [B] for waterproofing.



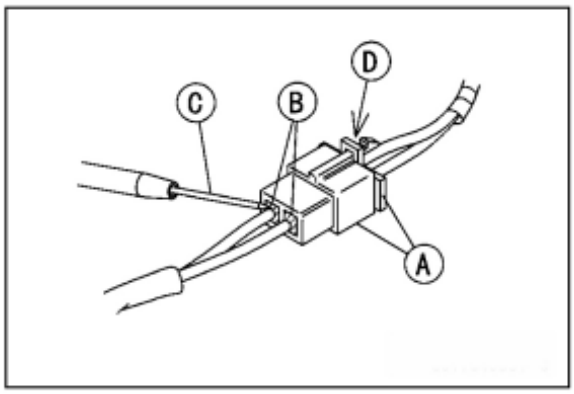

● Always check battery condition before replacing the EFI parts. A fully charged battery is a must for conducting accurate tests of the DFI system.

● Trouble may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the problem. If the problem was caused by some other item or items, they too must be repaired or replaced, or the new replacement part will soon fail again.

## EFI Troubleshooting

○ The EFI part connectors [A] have seals [B], including the ECU.

● Join the connector and insert the needle adapters [C] inside the seals [B] from behind the connector until the adapter reaches the terminal.
**Special Tool - Needle Adapter Set**




| CAUTION |
| --- |
| **Insert the needle adapter straight along the terminal in the connector to prevent short-circuit between terminals.** |

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| --- |
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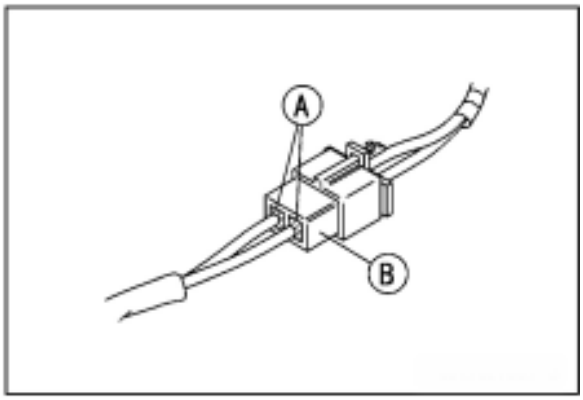



● Always check battery condition before replacing the EFI parts. A fully charged battery is a must for conducting accurate tests of the EFI system.

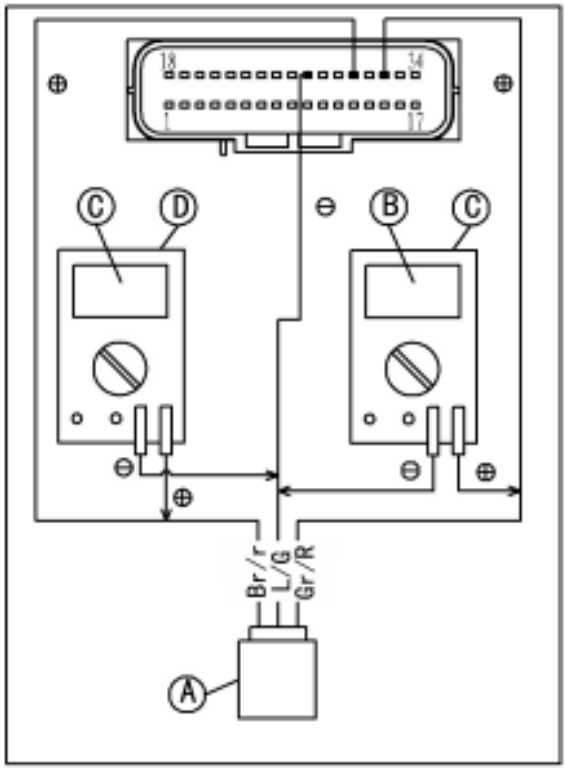
● Trouble may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the problem. If the problem was caused by some other item or items, they also must be repaired or replaced, or the new replacement part will soon fail again.

## EFI Servicing Precautions

o Lead Color Codes:

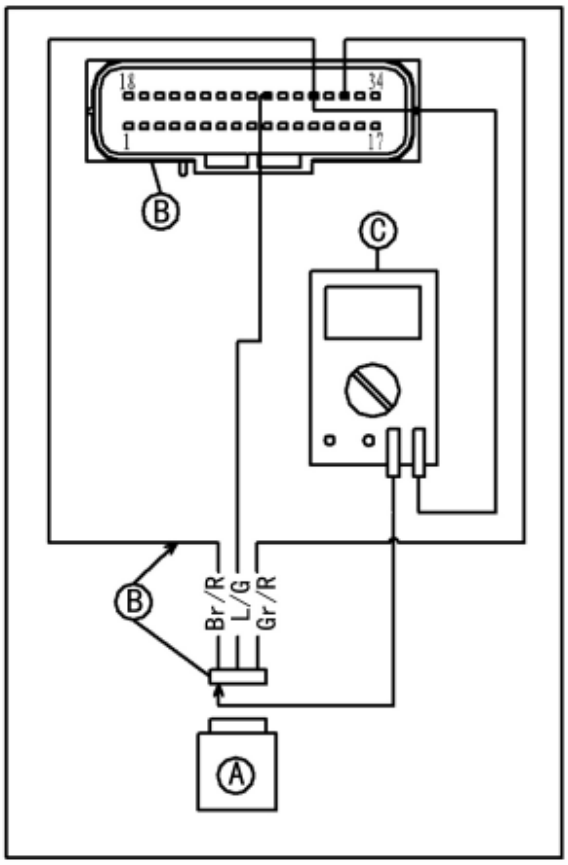
| | | |
|---|---|---|
| B: Black | L: Blue | Gr: Grey |
| B: Brown | G: Green | Lg: Light green |
| Sb: Sky blue | O: Orange | R: Red |
| P: Purple | W : White | Y: Yellow |

o There are two ways to inspect the EFI system. One is voltage Check Method and the other is Resistance Check Method.




(Voltage Check Method)

o This method is conducted by measuring the input voltage [B] to a sensor [A] first, and then the output voltage [C] from the sensor.
o Sometimes this method can detect a fault of the ECU.
o Refer to each sensor inspection section for detail in this chapter.
o Use a fully charged battery and a digital meter [D] which can be read two decimal places voltage or resistance.




(Resistance Check Method)

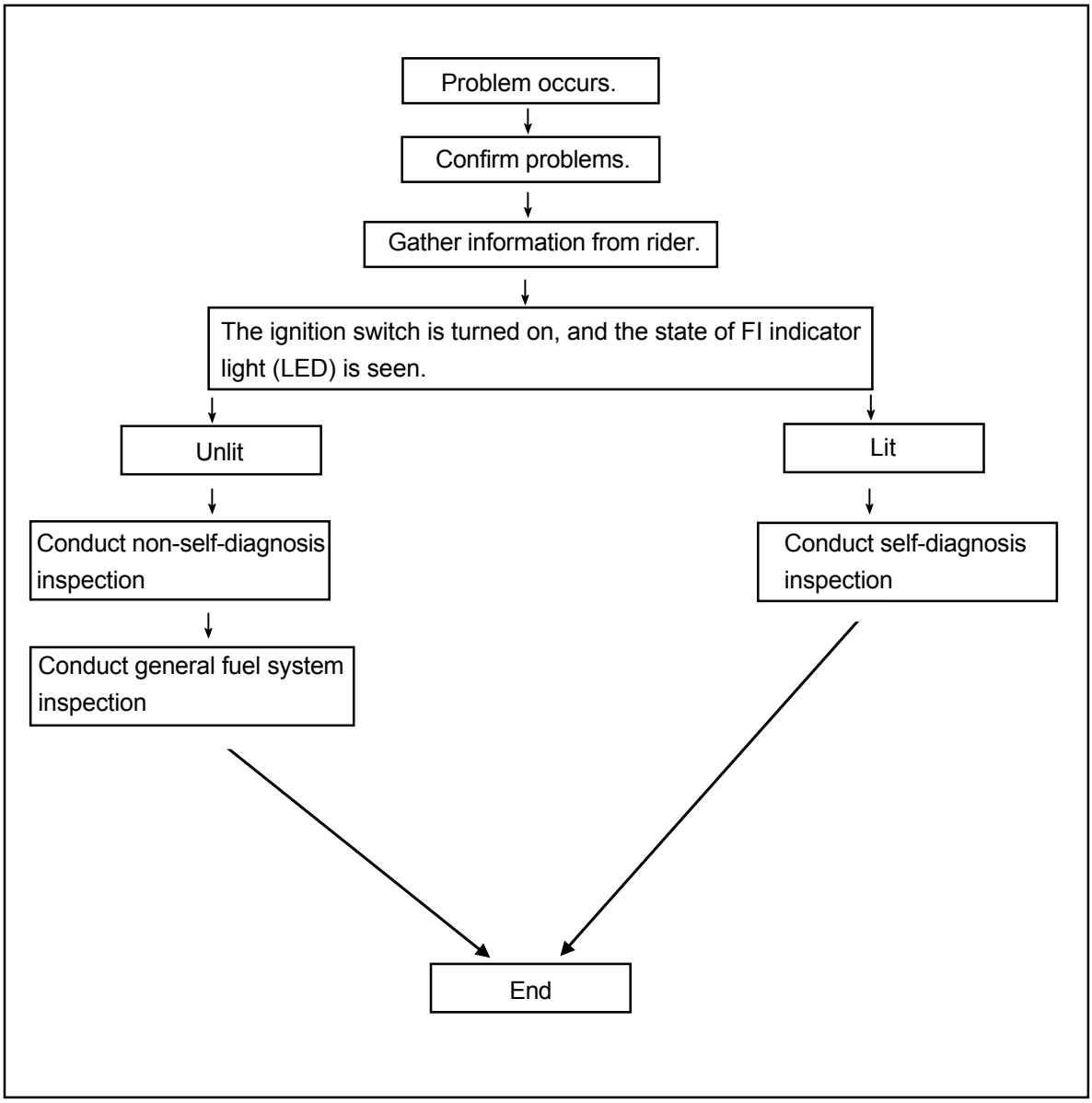
o This method is simple. No need for a fully charged battery and the needle adapter. Just do the follow ing especially when a sensor [A] is suspect.
o Turn the ignition switch OFF and disconnect the connectors.
o Inspect the sensor resistance, using a digital meter (see each sensor inspection).
o Inspect the wiring and connectors [B] for continuity, using the hand tester [C] (analog tester) rather than a digital meter.

**Special Tool - Hand Tester**

If the sensor, the wiring and connections are good, inspect the ECU for its ground and power supply (see ECU Power Supply Inspection). If the ground and power supply are good, the ECU is suspect. Replace the ECU.

### EFI Servicing Precautions

### EFI Diagnosis Flow Chart




### Inquiries to Rider

- Each rider reacts to problems in different ways, so it is important to confirm what kind of symptoms the rider has encountered.
- Try to find out exactly what problem occurred under exactly what conditions by asking the rider; knowing this information may help you reproduce the problem.
- The following sample diagnosis sheet will help prevent you from overlooking any areas, and will help you decide if it is an EFI system problem, or a general engine problem.

**Sample Diagnosis Sheet**

| | |
|---|---|
| **Rider name:** | **Registration No. (license plate No.):** |
| Year of initial registration: | Model: |
| **Engine No.:** | **Frame No.:** |
| **Date problem occurred:** | **Mileage:** |
| **Environment when problem occurred.** | |
| Weather | □fine, □cloudy,□rain, □snow, □always, □other: |
| Temperature | □hot, □warm, □cold, □very cold, □always |
| Problem frequency | □chronic, □often, □once |
| Road | □street, □highway, □mountain road (□uphill, □downhill), □bumpy, □pebble |
| Altitude | □normal, □high (about 1 000 m or more) |
| **Motorcycle conditions when problem occurred.** | |
| FI indicator light (LED) | □light up immediately after ignition switch ON, and goes off after 1 ~2 seconds (normal) |
| | □lights blinks immediately after ignition switch ON, and stays on (EFI problem) |
| | □lights up immediately after ignition switch ON, but goes off after about 10 seconds (EFI problem) |
| | □unlights (light (LED), ECU or its wiring fault) |
| | □sometimes lights up (probably wiring fault) |
| Starting difficulty | □starter motor not rotating |
| | □starter motor rotating but engine doesn't turn over |
| | □starter motor and engine don't turn over |
| | □no fuel flow (□no fuel in tank, □no fuel pump sound) |
| | □engine flooded (do not crank engine with throttle opened, which promotes engine flooding) |
| | □no spark |
| | □other |
| Engine stops | □right after starting |
| | □when opening throttle grip |
| | □when closing throttle grip |
| | □when moving off |
| | □when stopping the motorcycle |
| | □when cruising |
| | □other |
| Poor running at low speed | □very low idle speed, □very high idle speed, □rough idle speed |
| | □battery voltage is low (charge the battery) |
| | □spark plug loose (tighten it) |
| | □spark plug dirty, broken, or gap maladjusted (remedy it) |
| | □backfiring |
| | □afterfiring |
| | □hesitation when acceleration |
| | □engine oil viscosity too high |
| | □brake dragging |
| | □engine overheating |
| | □clutch slipping |

### Sample Diagnosis Sheet

| | |
|---|---|
| | □other |
| Poor running or no power at high speed | □spark plug loose (tighten it) |
| | □spark plug dirty, broken, or gap maladjusted (remedy it) |
| | □spark plug incorrect (replace it) |
| | □knocking (fuel poor quality or incorrect, → use high-octane gasoline) |
| | □brake dragging |
| | □clutch slipping |
| | □engine overheating |
| | □engine oil level too high |
| | □engine oil viscosity too high |
| | □other |

**NOTE**

○ This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.
○ The ECU may be involved in the EFI electrical and ignition system troubles. If these parts and circuits are checked out good, be sure to check the ECU for ground and power supply. If the ground and power supply are checked good, replace the ECU.

### Engine Doesn't Start, Starting Difficulty

| Symptoms or possible Causes | Actions (chapter) |
|---|---|
| **Starter motor not rotating:** | |
| Ignition and engine stop switches not ON | Turn both switches ON. |
| Starter lockout switch or neutral switch trouble | Inspect (see chapter 16). |
| Starter motor trouble | Inspect (see chapter 16). |
| Battery voltage low | Inspect and charge (see chapter 16). |
| Starter relays not contacting or operating | Inspect the starter relay (see chapter 16). |
| Starter button not contacting | Inspect and replace (see chapter 16). |
| Starter system wiring open or shorted | Inspect the wiring (see chapter 16). |
| Ignition switch trouble | Inspect and replace (see chapter 16). |
| Engine stop switch trouble | Inspect and repair or replace (see chapter 16). |
| Main 30A or ignition fuse blown | Inspect and replace (see chapter 16). |
| **Starter motor rotating but engine doesn't turn over:** | |
| Starter clutch trouble | Inspect (see chapter 16). |
| Starter idle gear trouble | Inspect (see chapter 16). |
| Engine won't turn over: | |
| Valve seizure | Inspect and replace (see chapter 5). |
| Cylinder, piston seizure | Inspect and replace (see chapter 5). |
| Camshaft seizure | Inspect and replace (see chapter 5). |
| Connecting rod small end seizure | Inspect and replace (see chapter 5). |
| Connecting rod big end seizure | Inspect and replace (see chapter 5). |
| Crankshaft seizure | Inspect and replace (see chapter 5). |
| Transmission gear or bearing seizure | Inspect and replace (see chapter 5). |
| Balancer bearing seizure | Inspect and replace (see chapter 5). |
| **No fuel flow:** | |
| No or little fuel in tank | Supply fuel (see Owner's Manual). |
| Fuel pump not rotating | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect and replace (see chapter 3). |
| Fuel tank air vent obstructed | Inspect and repair (see chapter 3). |
| Fuel filter or pump screen clogged | Inspect and replace fuel pump (see chapter 3). |
| Fuel pressure regulator clogged | Inspect and replace fuel pump (see chapter 3). |
| Fuel line clogged | Inspect and repair (see chapter 3). |
| **Engine flooded:** | |
| Spark plug dirty, broken or gap maladjusted | Replace (see chapter 2). |
| Starting technique faulty | When flooded, don't crank engine with throttle fully opened. |
| **No spark or spark weak:** | |
| Ignition and engine stop switches not ON | Turn both switches ON . |

| Symptoms or possible Causes | Actions (chapter) |
|---|---|
| Clutch lever not pulled in and gear not in neutral whether sidestand up or not | Pull the lever in and shift the gear in neutral. |
| Though clutch lever pulled in, sidestand up and gear not in neutral | Sidestand down and clutch lever pulled in whether gear in neutral or not |
| Vehicle-down-sensor coming off | Reinstall (see chapter 3). |
| Vehicle-down-sensor trouble | Inspect (see chapter 3). |
| ECU ground or power supply trouble | Inspect (see chapter 3). |
| Battery voltage low | Inspect and charge (see chapter 16). |
| Spark plug dirty, broken or gap maladjusted | Replace (see chapter 2). |
| Stick coil trouble | Inspect stick coil (see chapter 16). |
| Stick coil shorted or not in good contact | Reinstall or inspect stick coil (see chapter 16). |
| Spark plug incorrect | Replace it with the correct plug (see chapter 16). |
| IC igniter in ECU trouble | Inspect (see chapter 16). |
| Neutral, starter lockout or sidestand switch trouble | Inspect each switch (see chapter 16). |
| Crankshaft sensor trouble | Inspect (see chapter 16). |
| Stick coil trouble | Inspect (see chapter 16). |
| Ignition switch shorted | Inspect and replace (see chapter 16). |
| Engine stop switch shorted | Inspect and repair or replace (see chapter 2). |
| Starter system wiring shorted or open | Inspect and repair or replace (see chapter 16). |
| Main 30A or ignition fuse blown | Inspect and replace (see chapter 16). |
| **Fuel/air mixture incorrect:** | |
| Air cleaner clogged, poorly sealed or missing | Clean or reinstall (see chapter 3). |
| Leak from oil filler cap, crankcase breather hose or air cleaner drain hose | Inspect and repair or replace (see chapter 3). |
| Water or foreign matter in fuel | Change fuel. Inspect and clean fuel system (see chapter 3). |
| Fuel pressure regulator trouble | Inspect fuel pressure and replace fuel pump (see chapter 3). |
| Main throttle sensor trouble | Inspect (see chapter 3). |
| Fuel pressure may be low | Inspect (see chapter 3). |
| Fuel pump trouble | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3) |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Crankshaft sensor trouble | Inspect (see chapter 3). |
| **Compression low:** | |
| Spark plug loose | Reinstall (see chapter 16). |
| Cylinder head not sufficiently tightened down | Tighten (see chapter 5). |
| Cylinder, piston worn | Inspect and replace (see chapter 5). |
| Piston ring bad (worn, weak, broken or sticking) | Inspect and replace (see chapter 5). |
| Piston ring/groove clearance excessive | Inspect and replace (see chapter 5). |
| Cylinder head gasket damaged | Replace (see chapter 5). |
| Cylinder head warped | Inspect and replace (see chapter 5). |
| No valve clearance | Adjust (see chapter 2). |
| Valve guide worn | Inspect and replace (see chapter 5). |
| Valve spring broken or weak | Inspect and replace (see chapter 5). |
| Valve not seating properly (valve bent, worn or carbon accumulating on seating surface) | Inspect and repair or replace (see chapter 5). |

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| **Spark weak:** | |
| Battery voltage low | Inspect and charge (see chapter 16). |
| Spark plug dirty, broken or gap maladjusted | Replace (see chapter 2). |
| Stick coil trouble | Inspect the stick coil (see chapter 16). |
| Stick coil shorted or not in good contact | Reinstall or inspect stick coil (see chapter 16). |
| Spark plug incorrect | Replace it with the correct plug (see chapter 16). |
| IC igniter in ECU trouble | Inspect (see chapter 16). |
| Crankshaft position sensor trouble | Inspect (see chapter 16). |
| Stick coil trouble | Inspect (see chapter 16). |
| **Fuel/air mixture incorrect:** | |
| Little fuel in tank | Supply fuel (see Owner's Manual). |
| Air cleaner clogged, poorly sealed, or missing | Clean element or inspect sealing (see chapter 2, 3). |
| Air cleaner duct loose | Reinstall (see chapter 3). |
| Air cleaner O-ring damaged | Replace (see chapter 3). |
| Fuel tank air vent obstructed | Inspect and repair (see chapter 3). |
| Throttle body assy loose | Reinstall (see chapter 3). |
| Throttle body assy O-ring damage | Replace (see chapter 3). |
| Fuel filter or pump screen clogged | Inspect and replace fuel pump (see chapter 3). |
| Fuel pressure regulator clogged | Inspect fuel pressure and replace fuel pump (see chapter 3). |
| Fuel line clogged | Inspect and repair (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Thermostat trouble | Inspect and replace (see chapter 4). |
| **Unstable (rough) idling:** | |
| Fuel injector trouble | Inspect (see chapter 3). |
| Main throttle sensor trouble | Inspect (see chapter 3). |
| Crankshaft position sensor trouble | Inspect (see chapter 3). |
| Throttle valves not synchronizing | Inspect (see chapter 2). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Coolant temperature sensor trouble | Inspect (see chapter 3). |
| Fuel pressure too low or too high | Inspect (see chapter 3). |
| Battery voltage low | Inspect and charge (see chapter 16). |
| **Incorrect idle speed:** | |
| Coolant temperature sensor trouble | Inspect (see chapter 3) |
| Main throttle sensor trouble | Inspect (see chapter 3). |
| | |

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| **Engine stalls easily:** | |
| Fuel pump trouble | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Main throttle sensor trouble | Inspect (see chapter 3). |
| Fuel pressure too low or too high | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Coolant temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Fuel line clogged | Inspect and repair (see chapter 3). |
| Fuel pressure too low or too high | Inspect (see chapter 3). |
| Fuel pressure regulator trouble | Inspect fuel pressure and replace fuel pump (see chapter 3). |
| Crankshaft sensor trouble | Inspect (see chapter 16). |
| Stick coil trouble | Inspect (see chapter 16). |
| **Compression Low:** | |
| Spark plug loose | Reinstall (see chapter 16). |
| Cylinder head not sufficiently tightened down | Tighten (see chapter 5). |
| No valve clearance | Adjust (see chapter 2). |
| Cylinder, piston worn | Inspect and replace (see chapter 5). |
| Piston ring bad (worn, weak, broken or sticking ) | Inspect and replace (see chapter 5). |
| Piston ring/groove clearance excessive | Inspect and replace (see chapter 5). |
| Cylinder head gasket damaged | Replace (see chapter 5). |
| Cylinder head warped | Inspect and replace (see chapter 5). |
| Valve guide worn or stem seal damaged | Inspect and replace (see chapter 5). |
| Valve spring broken or weak | Inspect and replace (see chapter 5). |
| Valve not seating properly (valve bent, worn or carbon accumulating on seating surface) | Inspect and repair or replace (see chapter 5). |
| Camshaft cam worn | Inspect and replace (see chapter 5). |
| **Hesitation:** | |
| Too low fuel pressure | Inspect (see chapter 3). |
| Clogged fuel line | Inspect and repair (see chapter 3). |
| Cracked or obstructed inlet air pressure sensor hose | Inspect and repair or replace (see chapter 3). |
| Fuel pump trouble | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Main throttle sensor trouble | Inspect (see chapter 3). |
| Subthrottle sensor trouble | Inspect (see chapter 3). |
| Subthrottle valve actuator trouble | Inspect (see chapter 3). |
| Coolant temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Loose injector connectors | Remedy (see chapter 3). |
| Crankshaft position sensor trouble | Inspect and repair or replace (see chapter 16). |
| Stick coil trouble | Inspect and repair or replace (see chapter 16). |
| Loose terminal of battery (–) cable or engine ground lead | Inspect and repair (see chapter 16). |
| Delay of ignition timing | Inspect crankshaft sensor and IC igniter in ECU (see chapter 16). |

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Loose terminal of battery (–) cable or engine ground lead | Inspect and repair (see chapter 16). |
| Delay of ignition timing | Inspect crankshaft sensor and IC igniter in ECU (see chapter 16). |
| **Poor acceleration:** | |
| Too low fuel pressure | Inspect (see chapter 3). |
| Water or foreign matter in fuel | Change fuel. Inspect and clean fuel system (see chapter 3). |
| Clogged fuel filter or pump screen | Inspect and replace fuel pump (see chapter 3). |
| Fuel pump trouble | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Coolant temperature sensor trouble | Inspect (see chapter 3). |
| Subthrottle sensor trouble | Inspect (see chapter 3). |
| Subthrottle valve actuator trouble | Inspect (see chapter 3). |
| Stick coil trouble | Inspect and replace (see chapter 16). |
| Engine oil level to high | Repair (see chapter 7). |
| Spark plug dirty, broken or gap maladjusted | Replace (see chapter 2). |
| **Stumble:** | |
| Too low fuel pressure | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Main throttle sensor malfunction | Inspect (see chapter 3). |
| Subthrottle sensor trouble | Inspect (see chapter 3). |
| Subthrottle valve actuator trouble | Inspect (see chapter 3). |
| Coolant temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| **Surge:** | |
| Unstable fuel pressure | Fuel pressure regulator trouble (Inspect and replace fuel pump) or kinked fuel line (Inspect and repair fuel line) (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Backfiring when deceleration: | |
| Spark plug dirty, broken or gap maladjusted | Replace (see chapter 2). |
| Too low fuel pressure | Inspect (see chapter 3). |
| Fuel pump trouble | Inspect (see chapter 3). |
| Main throttle sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Air switching valve broken | Inspect and replace (see chapter 5). |
| Air suction valve trouble | Inspect and replace (see chapter 5). |
| **After fire:** | |
| Crankshaft position sensor trouble | Inspect (see chapter 16). |
| Spark plug burned or gap maladjusted | Replace (see chapter 2). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Coolant temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |
| **Run-on (dieseling):** | |
| Ignition switch trouble | Inspect and replace (see chapter 16). |
| Engine stop switch trouble | Inspect and repair or replace (see chapter 2). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Loose terminal of battery (–) cable or ECU ground lead | Inspect and repair (see chapter 16). |
| Carbon accumulating on valve seating surface | Repair (see chapter 5). |
| Engine overheating | (see Overheating of Troubleshooting Guide, see chapter 17) |
| Other: | |
| Engine oil viscosity too high | Change (see chapter 2). |
| Drive train trouble | Inspect drive chain (see chapter 2) and sprocket (see chapter 11). |
| Brake dragging | Inspect caliper fluid seal damage or clogging of master cylinder relief and supply ports (see chapter 12). |
| Clutch slipping | Inspect friction plates for wear (see chapter 6). |
| Engine overheating | (see Overheating of Troubleshooting Guide, see chapter 17) |
| Air switching valve trouble | Inspect and replace (see chapter 5). |
| Air suction valve trouble | Inspect and replace (see chapter 5). |
| Intermittent any EFI fault and its recovery | Check that EFI connectors are clean and tight, and examine wires for signs of burning or fraying (see chapter 3). |

### Poor Running or No Power at High Speed

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Firing incorrect: | |
| Spark plug dirty, broken or maladjusted | Replace (see chapter 2). |
| Stick coil trouble | Inspect stick coil (see chapter 16). |
| Stick coil shorted or not in good contact | Reinstall or inspect stick coil (see chapter 16). |
| Spark plug incorrect | Replace it with the correct plug (see chapter 16). |
| IC igniter in ECU trouble | Inspect (see chapter 16). |
| Crankshaft sensor trouble | Inspect (see chapter 16). |
| Stick coil trouble | Inspect (see chapter 16). |
| Fuel/air mixture incorrect: | |
| Air cleaner clogged, poorly sealed, or missing | Clean element or inspect sealing (see chapter 3). |
| Air cleaner duct loose | Reinstall (see chapter 3). |
| Air cleaner O-ring damaged | Replace (see chapter 3). |
| Water or foreign matter in fuel | Change fuel. Inspect and clean fuel system (see chapter 3). |
| Throttle body assy loose | Reinstall (see chapter 3). |

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Throttle body assy O-ring damaged | Replace (see chapter 3). |
| Fuel tank air vent obstructed | Inspect and repair (see chapter 3). |
| Fuel line clogged | Inspect and repair (see chapter 3). |
| Fuel pump operates intermittently and often EFI fuse blows. | Pump bearings may wear. Replace the pump (see chapter 3). |
| Fuel pump trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Main throttle sensor trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Cracked or obstructed inlet air pressure sensor hose | Inspect and repair or replace (see chapter 3). |
| Injector clogged | Visually inspect and replace (see chapter 3). |
| Compression low: | |
| Spark plug loose | Reinstall (see chapter 16). |
| Cylinder head not sufficiently tightened down | Tighten (see chapter 5). |
| No valve clearance | Adjust (see chapter 2). |
| Cylinder, piston worn | Inspect and replace (see chapter 5). |
| Piston ring bad (worn, weak, broken or sticking) | Inspect and replace (see chapter 5). |
| Piston ring/groove clearance excessive | Inspect and replace (see chapter 5). |
| Cylinder head gasket damaged | Replace (see chapter 5) . |
| Cylinder head warped | Inspect and replace (see chapter 5). |
| Valve spring broken or weak | Inspect and replace (see chapter 5). |
| Valve not seating properly (valve bent , worn or carbon accumulating on the seating surface) | Inspect and repair or replace (see chapter 5). |
| Knocking: | |
| Carbon built up in combustion chamber | Repair (see chapter 5). |
| Fuel poor quality or incorrect (Use the gasoline recommended in the Owner's Manual) | Change fuel (see chapter 3). |
| Spark plug incorrect | Replace it with the correct plug (see chapter 16). |
| Stick coil trouble | Inspect (see chapter 16). |
| IC igniter in ECU trouble | Inspect (see chapter 16). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Miscellaneous: | |
| Throttle valves won't fully open | Inspect throttle cable and lever linkage (see chapter 3). |
| Brake dragging | Inspect caliper fluid seal damage or clogging of master cylinder relief and supply ports (see chapter 12). |
| Clutch slipping | Inspect friction plates for wear (see chapter 6). |
| Engine overheating - Water temperature sensor, crankshaft sensor or speed sensor trouble | (see Overheating of Troubleshooting Guide in chapter 17). |
| Engine oil level too high | Repair (see chapter 7). |
| Engine oil viscosity too high | Change (see chapter 2). |

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Drive train trouble | Inspect drive chain (see chapter 2) and sprockets (see chapter 11). |
| Camshaft cam worn | Inspect and replace (see chapter 5). |
| Air switching valve trouble | Inspect and replace (see chapter 5). |
| Air suction valve trouble | Inspect and replace (see chapter 5). |
| Catalytic converters melt down due to muffler overheating | Replace muffler (see chapter 5). |
| Exhaust Smokes Excessively: | |
| (White smokes) | |
| Piston oil ring worn | Inspect and replace (see chapter 5). |
| Cylinder worn | Inspect and replace (see chapter 5). |
| Valve oil seal damaged | Replace (see chapter 5). |
| Valve guide worn | Replace the guide (see chapter 5). |
| Engine oil level too high | Repair (see chapter 7). |
| (Black smoke) | |
| Air cleaner clogged | Clean (see chapter 3). |
| Too high fuel pressure | Clean (see chapter 3). |
| Injector stuck open | Clean (see chapter 3). |
| Coolant temperature sensor trouble | Inspect and replace (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect and replace (see chapter 3). |
| (Brown smoke) | |
| Air cleaner duct loose | Reinstall (see chapter 3). |
| Air cleaner O-ring damaged | Replace (see chapter 3). |
| Too low fuel pressure | Inspect fuel line and fuel pump (see chapter 3). |
| Water temperature sensor trouble | Inspect and replace (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect and replace (see chapter 3). |

### Self-diagnosis Outline

○ ECU constantly monitor sensors, actuators and circuits, FI indicator light and battery voltage, etc, even ECU itself and inspect the sensor output signal, actuator drive signal and internal signal ( such as λ close loop control, coolant temperature, idel speed control and battery voltage control, etc.) for reliablity. If any process or signal is suspect, ECU records the trouble code in the RAM memory.

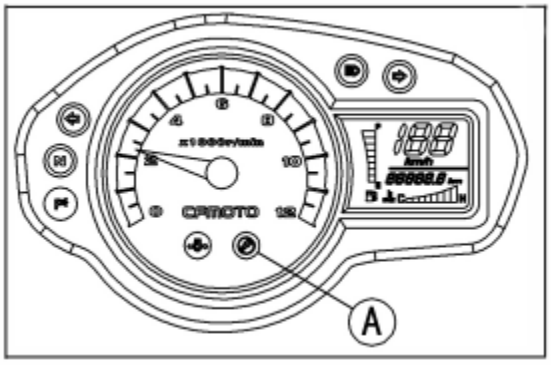
Faulty information is recorded in the form of trouble code, and in the sequence of which trouble comes first. Trouble code is divided into 2 parts: present trouble code and past trouble code.

When servicing, using PDA and FI indicator, the defective parts can be promptly foud to improve the service efficiency and quality.

### Self-diagnosis Procedures

*Self-diagnosis Procedures*

○ When a problem occurs with the EFI system and ignition system, the FI indicator light (LED) [A] goes on.




**NOTE**

○ *Use a fully charged battery when conducting self-diagnosis. Otherwise, the light (LED) blinks very slowly or doesn't blink.*

### FI Indicator Light Conditions

**1) Turn on the ignition switch and the engine does not work. No trouble code appears:**

● FI indicator light keeps on for 5 seconds and then turns off.

**2)Turn on the ignition switch and the engine works. Only one trouble code:**

● FI indicator light keeps on for 10 seconds and then starts to blink the trouble code.

● FI indicator light turns off 10 seconds after blinking the trouble code, then blinks the trouble code in turn.

● FI indicator works in turn as above until the engine runs (if possible) or ignition switch is turned off.

### Self-diagnosis Procedures

**3) Turn on the ignition switch, the engine does not work and a number of trouble codes appear:**

- FI indicator light keeps on for 10 seconds and turns off, then starts to blink the trouble codes. When the first trouble code is blinked, FI indicat light keeps on for 10 seconds and then off. Then FI indicator light starts to blink the second trouble code. FI indiicator blinks in turn as above. When the last touble code is blinked, FI indicator light keeps on for 10 seconds and then off.
- Then FI indicator light blink all the trouble codes in the sequence as above again.
- The circle stops until the engine works or ignition switch is turned off.

**4) Turn on the ignition switch and the engine does not work. No trouble code appears after maintenance interval:**

- Keep on full throttle and turn on the ignition switch.
- FI indicator light turns off (keep on full throttle).
- FI indicator keeps on for 5 seconds after full throttle is kept on 10 seconds. During the 5 seconds, turn off the ignition switch.
- Above is the procedure of reset if the maintenance is overtime.
- When the maintenace is overtime again, repeat the procedure above.

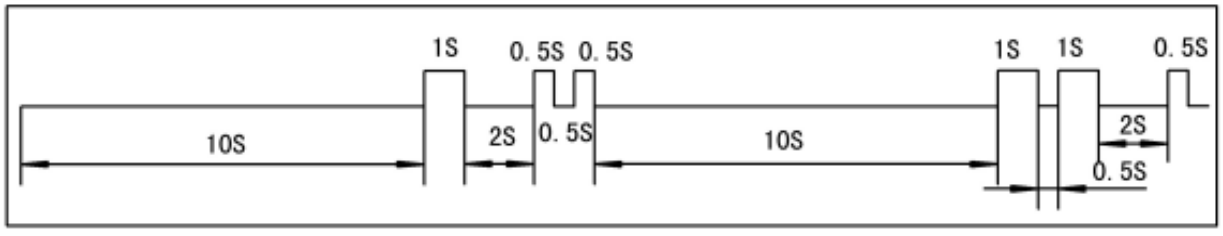
**5)Turn on the ignition switch and the engine does not work. Trouble code is displayed after maintenance interval:**

- FI indicator light keeps on for 10 seconds and turns off, then blink the trouble codes in turn. When the first trouble code is blinked, FI indicator keeps on for 10 seconds and turns off, then blinks the second trouble code. FI indicator light works in this manner unitil all the trouble codes are displayed.
- Afterwards, FI indicator light starts to blink the first trouble code until the last one.
- FI indicator light runs in cycle until the engine starts to work or the ignition switch is turned off.
- Overtime maintenance trouble only be displayed after no other trouble codes are left to be displayed.
- Restore the EFI system and turn on the ignition switch. The engine does not work and the same condition appears again as the 4th point as above(no trouble code appears after maintenance interval).

## How to Read Trouble Codes

*How to Read Service Codes*

- Trouble codes are shown by a series of long and short blinks of the FI indicator light (LED) as shown below.
- Read 10th digit and unit digit as the FI indicator light (LED) blinks.
- When there are a number of problems, all the trouble codes can be stored and the display will begin starting from the lowest number trouble code in the numerical order. Then after completing all codes, the display is repeated until the self-diagnosis indicator terminal is open.
- If there is no problem, no code and unlight.
- For example, if two problems occurred in the order of 21, 12, the trouble codes are displayed from the lowest number in the order listed.
  (12→21) →(12→21) →. . . (repeated)



### How to Erase Trouble Codes

*How to Erase Trouble Codes*

- Even if ignition switch is turned off, the battery or the ECU is disconnected or the problem is solved, all trouble codes remain in ECU.
- As for present trouble codes, if the trouble still exsits, present trouble codes can not be cleared; when the trouble is solved, service codes are cleared automatically but turned into past trouble codes. Past trouble codes can be deleted with PDA.

### Self-Diagnosis
### Trouble Code Table

**Short blink [S.B.] =unit digit of trouble coode Long blink [L.B.] =10th digit of trouble code S.C. = Short to battery positive terminal S.C.G = Short circuit to ground O.C. = Open Circuit**

| Problems | Error Code | Blink Times |
|---|---|---|
| Error-TPS(Throttle Position Sensor)_Low | 1 | 1 (S.B.) |
| Error-TPS(Throttle Position Sensor)_High | 2 | 2 (S.B) |
| Error-$TH_2O$(Water Temp. Sensor)_low | 3 | 3 (S.B.) |
| Error-$TH_2O$(Water Temp. Sensor)_High | 4 | 4 (S.B.) |
| Error-TAIR(Air Temp. Sensor)_Low | 5 | 5 (S.B.) |
| Error-TAIR(Air Temp. Sensor)_High | 6 | 6 (S.B.) |
| Error-PAIR(Air Pressure Sensor)_Low | 7 | 7 (S.B.) |
| Error-PAIR(Air Pressure Sensor)_High | 8 | 8 (S.B.) |
| Error-BV(Battery Voltage)_Low | 9 | 9 (S.B.) |
| Error-INJ1(1 cyllinder injector)_SC | 11 | 1 (L.B)+1 (S.B.) |
| Error-INJ1(1 cyllinder injector)_SCG | 12 | 1 (L.B)+2 (S.B.) |
| Error-INJ1(1 cyllinder injector)_OC | 13 | 1 (L.B)+3 (S.B.) |
| Error-INJ2(2 cyllinder injector)_SC | 14 | 1 (L.B)+4 (S.B.) |
| Error-INJ2(2 cyllinder injector)_SCG | 15 | 1 (L.B)+5 (S.B.) |
| Error-INJ2(2 cyllinder injector)_OC | 16 | 1 (L.B)+6 (S.B.) |
| Error-FANR (Fan Relay)_SC | 23 | 2 (L.B)+3 (S.B.) |
| Error-FANR (Fan Relay)_OC | 25 | 2 (L.B)+5 (S.B.) |
| Error_MAINR (Main Relay)_SC | 26 | 2 (L.B)+6 (S.B.) |
| Error_MAINR (Main Relay)_OC | 28 | 2 (L.B)+8 (S.B.) |
| Error_ENSTR (Auxiliary Starter Relay)_SC | 29 | 2 (L.B)+9 (S.B.) |
| Error_DLAMP (Error indicator light)_SC | 35 | 3 (L.B)+5 (S.B.) |
| Error_DLAMP (Error indicator light)_SCG | 36 | 3 (L.B)+6 (S.B.) |
| Error_DLAMP (Error indicator light)_OC | 37 | 3 (L.B)+7 (S.B.) |
| Error_LAMBDA 1 (1 cylinder Oxygen Sensor)_OC | 47 | 4 (L.B)+7 (S.B.) |
| Error_LAMBDA 2 (2 cylinder Oxygen Sensor)_OC | 48 | 4 (L.B)+8 (S.B.) |
| Error_SAFETYSW (Roll-over Sensor) 0 | 49 | 4 (L.B)+9 (S.B.) |
| Error_SAFETYSW (Roll-over Sensor) 1 | 50 | 5(L.B) |
| Error_PK (Pick up)_OC | 53 | 5 (L.B)+3 (S.B.) |
| Error_PK (Pick up) | 54 | 5 (L.B)+4 (S.B.) |
| Error_IGN1 (1 cylinder ignition coil)_CURRENT | 55 | 5 (L.B)+5 (S.B.) |
| Error_IGN1 (1 cylinder ignition coil_CURRENT | 56 | 5 (L.B)+6 (S.B.) |

**Self-diagnosis Procedures**

**Note:**

- If all the parts and circuits checked out good, be sure to check the ECU for ground and power supply. If the ground and power supply are checked good, replace the ECU.
- When no trouble code is displayed, the electrical parts of the EFI system has no fault, and the mechanical parts of the EFI system and the engine are suspect.
- If FI indicator light keeps on for 10 seconds and turns off, then shortly blinks 15 times. This alerts the owner to maintain the EFI system. The first maintenance should be done after the ECU has been worked for 50 hours. Then every 100 hours, do a maintenance.

## Self-diagnosis Procedures

*Backups*

○ The ECU takes the following measures to prevent engine damage when the EFI or the ignition system parts have troubles.

| Trouble Codes | Parts | Output Signal Unstable Range or Criteria | Backups by ECU |
|---|---|---|---|
| 5 or 6 | Inlet Air Temp Sensor | Inlet Air Temp<br>Ta=-30$^{O}$C~+130$^{O}$C | If the inlet air tem sensor fails(the signal is out of the usable range, wiring short or open), the ECU sets Ta at 20$^{O}$C. |
| 3 or 4 | Coolant Temp Sensor | Water Temp Sensor<br>Tw=-30$^{O}$C~+130$^{O}$C | If the water temp sensor system fails(the signal is out of the usable range, wiring short or open), the ECU sets Tw at 45$^{O}$C. |
| 50 | Roll-over Sensor | Roll-over Sensor Output Resistance R=62kΩ or R=0Ω | If roll-over sensor has this failure, the ECU shuts off the fuel pump, the fuel injectors and the ignition system. |
| 47 | Oxygen Sensor #1 | The oxygen sensor is active and sensor must send signals (output voltage) continuously to the ECU. | If the oxygen sensor is not activated, the ECU stops oxygen sensor feedback mode. |
| 48 | Oxygen Sensor #2 | The oxygen sensor is active and sensor must send signals (output voltage) continuously to the ECU. | If the oxygen sensor is not activated, the ECU stops oxygen sensor feedback mode. |

### Throttle Position Sensor

*Throttle Position Sensor Removal/Adjustment*

| CAUTION |
| --- |
| **Do not remove or adjust the throttle position sensor [A] since it has been adjusted and set with precision at the factory.**<br>**Never drop the throttle body assy, especially on a hard surface. Such a shock to the sensor can damage it.** |


*Throttle Position Sensor Input Voltage Inspection*

**NOTE**

○ *Be sure the battery is fully charged.*

● Turn the ignition switch OFF.

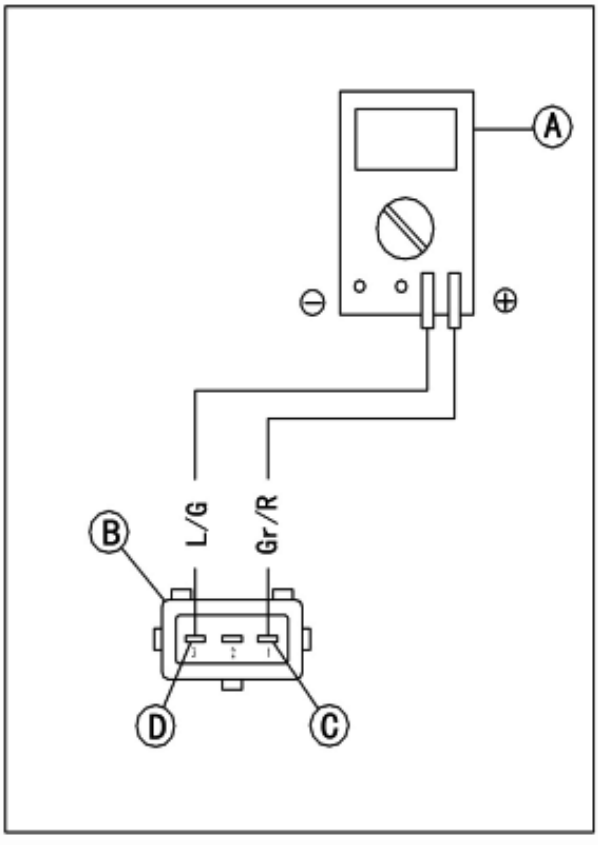
● Disconnect the throttle position sensor connector and connect the harness adapter [A] between these connectors.

● Connect a digital meter to the harness adapter lead.


● Measure the sensor input voltage with the engine stopped and with the connector joined.

● Turn the ignition switch ON.

**Throttle Position Sensor Input Voltage**
**Connections to Adapter**
**Meter (+)→ Gr/R (C)**
**Meter (-) → L/G (D)**
**Standard: 4.75 5.25 V DC**




● Turn the ignition switch OFF.

★If the input voltage is normal, check the sensor output voltage.

★ If the input voltage is less than the standard, remove the ECU and check the wiring between these connectors.

○ Disconnect the ECU and sensor connectors.

### Throttle Position Sensor

*Wiring Connection*

- Turn the ignition switch OFF.
- Disconnect ECU connector and throttle position sensor connector.
- Test the continuity of the 2 lead wires.

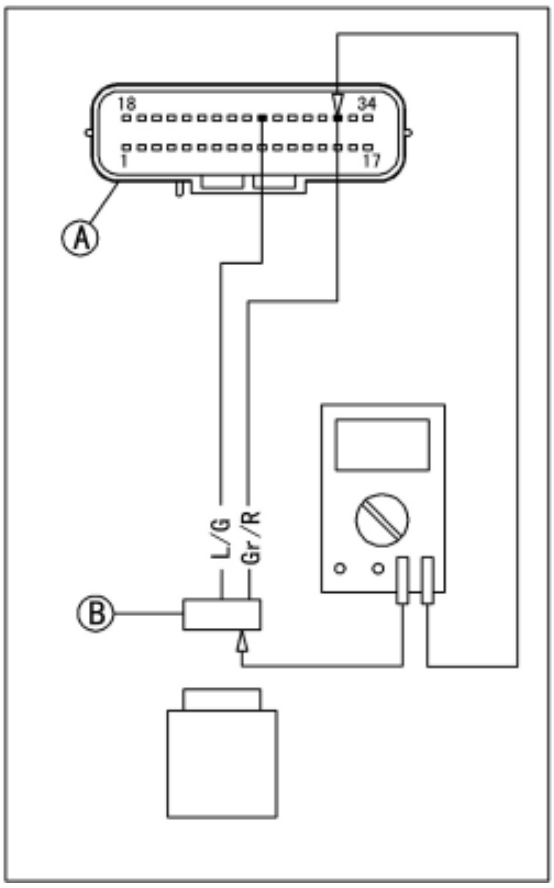
**ECU Connector [A] ←→ Throttle Body Connector [B]**

**Throttle Body Connector ←→ (ECU terminal 32)**

**Throttle Body Connector ←→ (ECU terminal 27)**

**Standard: 0 Ω**

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).




*Main Throttle Sensor Output Voltage Inspection*

- Measure the output voltage at the main throttle sensor in the same way as input voltage inspection, Note the following.
- Disconnect the main throttle sensor connector and connect the harness adapter [A] between these connectors.
- Start the engine and warm it up thoroughly.
- Check idle speed to ensure the throttle opening is correct.

**Idle Speed**

**Standard: 1 300 ± 130 r/min (rpm)**

★If the idle speed is out of the specified range, adjust it (Inspect throttle cable and EFI system).


- Turn the ignition switch OFF.
- Measure the output voltage of the sensor with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.

**Throttle Position Sensor**

*Throttle Position Sensor Output Voltage*

Connections to Adapter

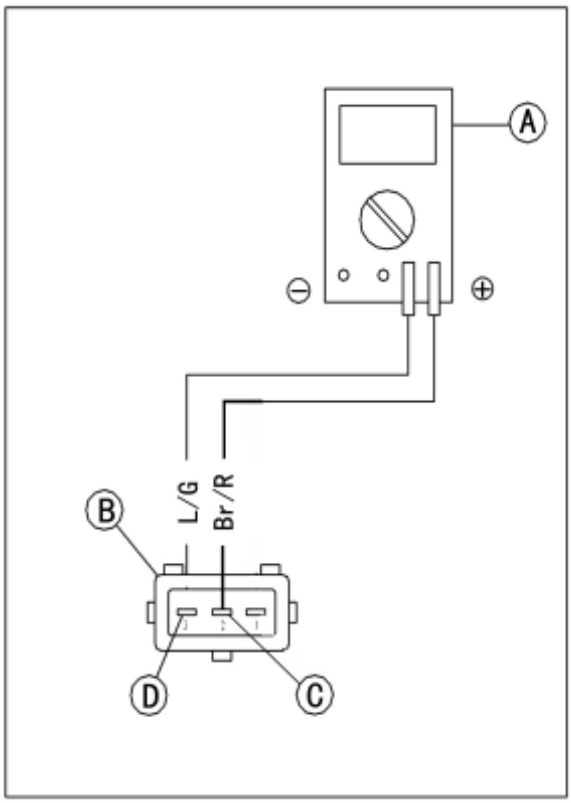
Meter (+) → Br/R (sensor output) lead

Meter (-) → L/G(sensor ground) lead

**Standard:**

0.4~0.7 V DC (at idle throttle opening)

2.9~3.4 V DC (at full throttle opening)




★If the output voltage is out of the standard, inspect the main throttle sensor resistance.

★If the output voltage is normal, check the wiring for continuity.

*Wiring Connection*

- Turn the ignition switch OFF.
- Disconnect ECU connector and throttle position sensor connector.
- Test the continuity of the lead wires.

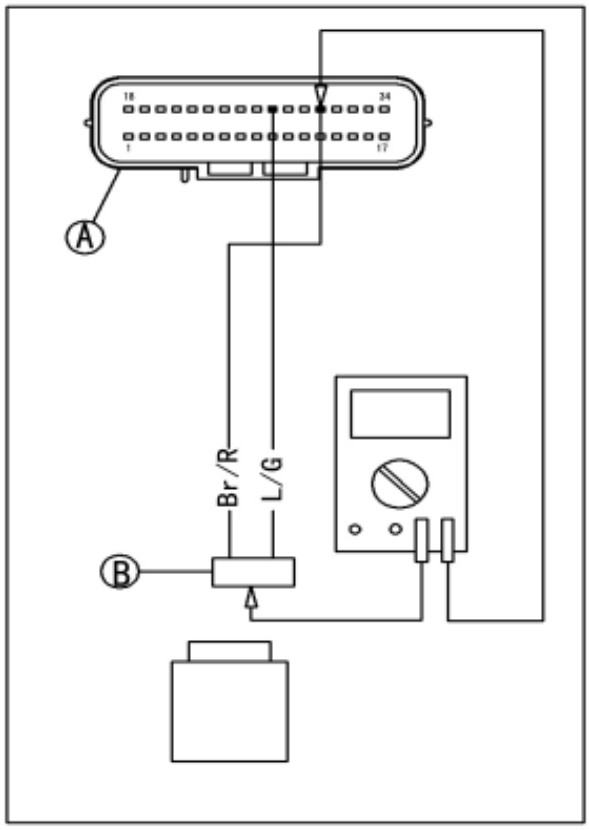
**ECU Connector [A] ←→ Throttle Body Connector [B]**

**Thrrottle Body Connector Br/R←→(ECU terminal 30)**

**Thrrottle Body Connector L/G ←→(ECU terminal 27)**

**Standard: 0 Ω**

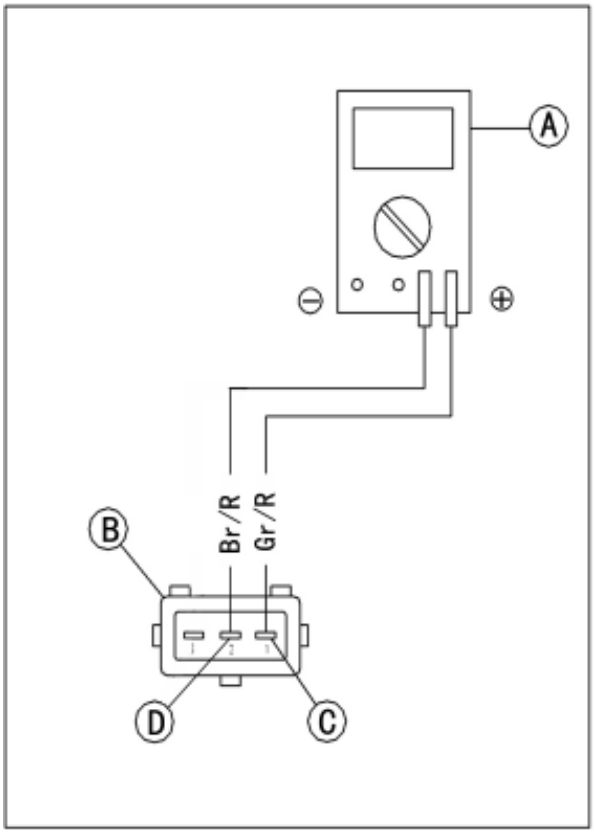
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).



### Throttle Position Sensor

*Throttle Position Sensor Resistance Inspection*

- Turn the ignition switch OFF.
- Disconnect ECU connector and throttle position sensor connector.
- Connect a hand tester [A] to the throttle position sensor connector [B].
- Measure the throttle position sensor resistance.




**Main Throttle Sensor Resistance**

Connections: Gr/R lead [C] ←→ Br/R lead [D]

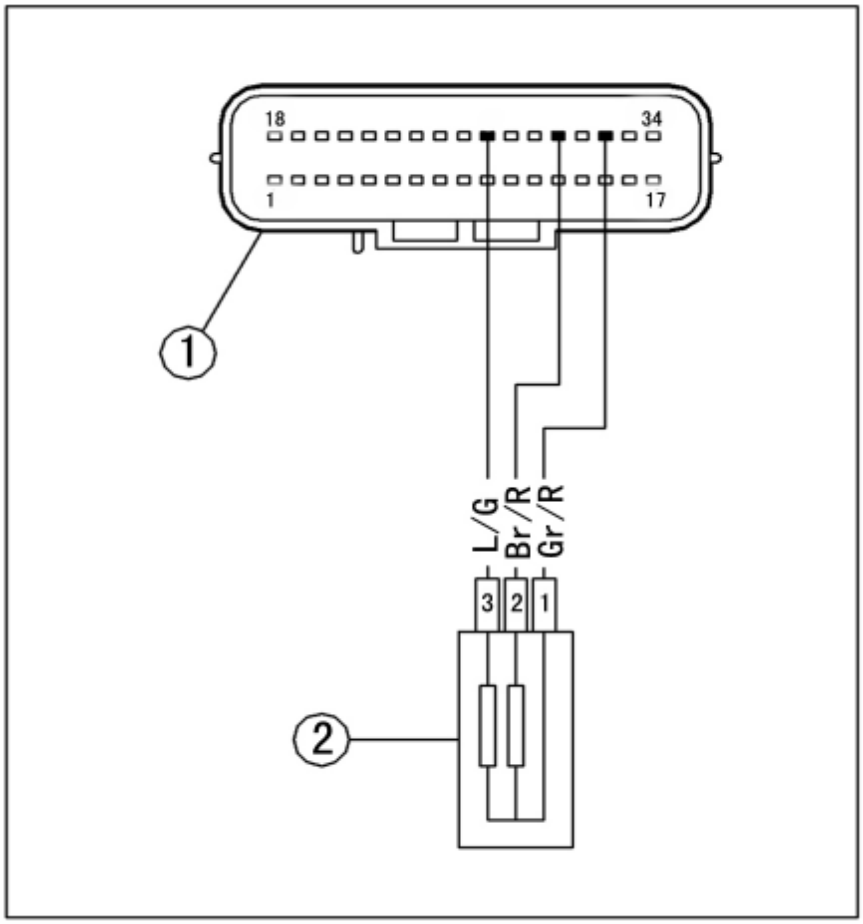
**Standard: 1.1~1.4 k Ω**

★If the reading is out of the range, replace the throttle body assy.

★If the reading is within the range, but the problem still exists, replace the ECU (see ECU Removal/ Installation).

*Throttle Position Sensor Calibration*

- Calibrate the TPS using a PDA(see PDA section)



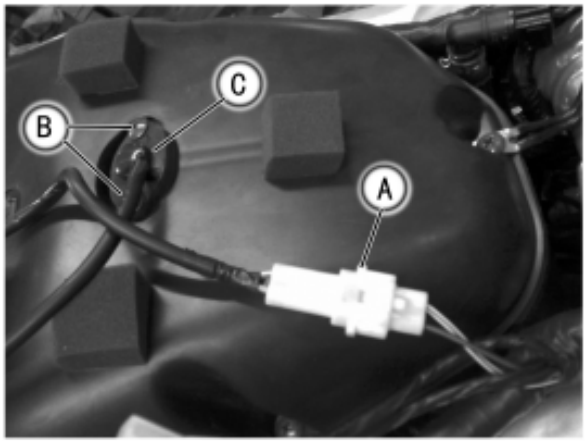

1. ECU 2. TPS

### Inlet Air Pressure Sensor

| CAUTION |
| --- |
| **Never drop the sensor, especially on a hard surface. Such a shock to the part can damage it.** |

*Inlet Air Pressure Sensor Removal*

- Remove fuel tank(see FuelTank Removal).
- Disconnect the inlet air pressure sensor connector [A].
- Remove screws [B].
- Pull up the inlet air pressure sensor [C].




*Inlet Air Pressure Sensor Installation*

- Place inlet air pressure sensor on the air filter housing.
- Securely tighten screws [B].

*Inlet Air Pressure Sensor Input Voltage Inspection*

**NOTE**

- Be sure the battery is fully charged.
- The output voltage varies with the temperature change.

- Remove the ECU (see ECU Removal). Do not disconnect the ECU connectors.
- Connect a hand tester to the connector with the needle adapter set.
- Measure the input voltage with the engine stopped, and with the connectors joined.
- Turn the ignition switch ON.

**Inlet Air Pressure Sensor Input Voltage**

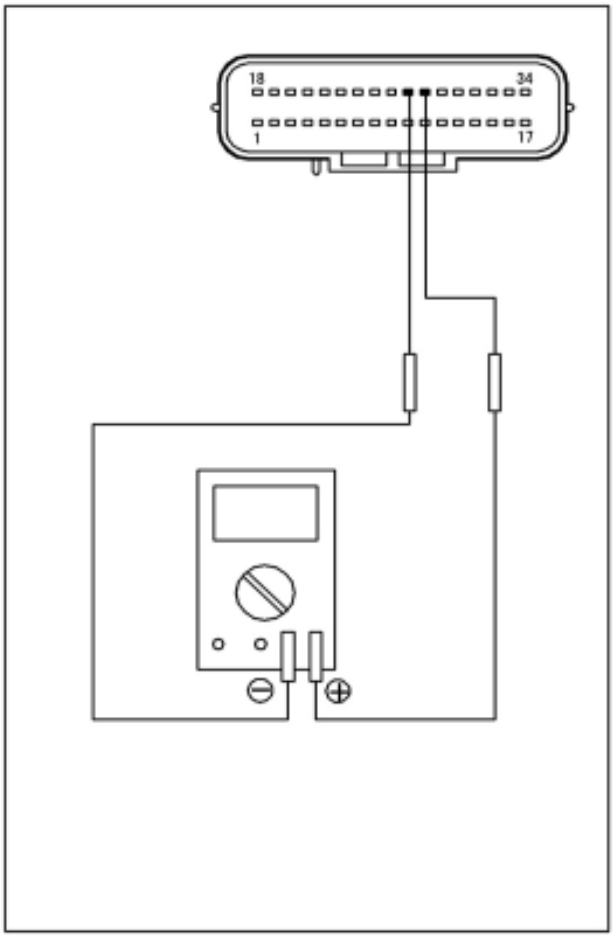
**Connections to ECU**

**Meter (+) → W/Br lead(ECU terminal 28)**

**Meter(-) → L/G lead (terminal 27)**

**Standard: 2.5~3.5V DC when inlet air temperature is 20** °C

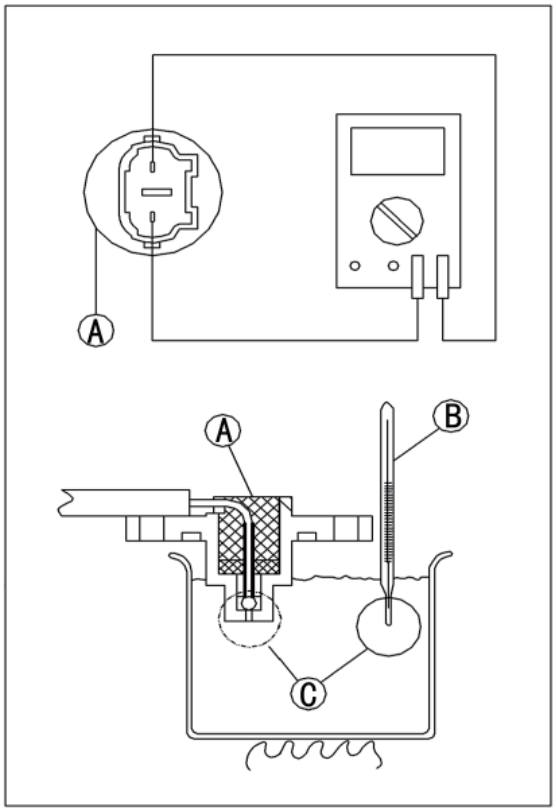
- Turn the ignition switch off.
- If the reading is within the standard range, check the sensor output voltage.
- If the reading is less than the standard range, re move the ECU and check the wiring between these connectors.
- If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).



## Inlet Air Temperature Sensor

*Inlet Air Temperature Sensor Resistance Inspection*

- Remove the inlet air temperature sensor (see Inlet Air Temperature Sensor Removal/Installation).
- Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion issubmerged.
- Suspend a thermometer [B] with the heat-sensitive portion [C] located in almost the same depth with the sensor.




**NOTE**

○ *The sensor and thermometer must not touch the container side or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.

- Using a hand tester, measure the internal resistance of the sensor across the terminals at the temperatures shown in the table.

**Inlet Air Temperature Sensor Resistance**
**Standard: 8.4~9.4 k (0 $^{O}$C)**
**2.3~2.6 k Ω (30 $^{0}$C)**

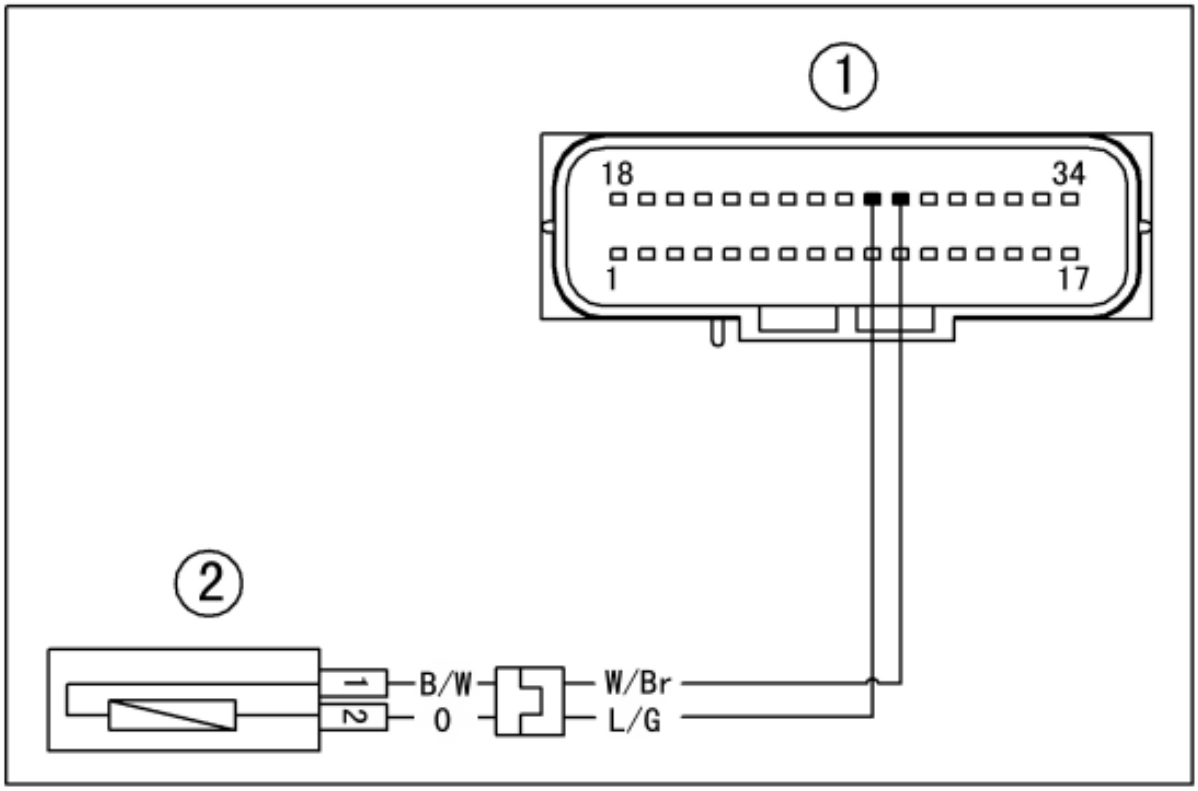
★If the measurement is out of the range, replace the sensor.

**Inlet Air Temp Sensor Resistance (room temp)**

| T ($^{O}$C) | Upper Limit | Middle Data | Lower Limit |
|---|---|---|---|
| -10 | 13887.17 | 14618.07 | 15348.98 |
| -5 | 10798.63 | 11366.98 | 11935.33 |
| 0 | 8474.68 | 8920.71 | 9366.75 |
| 5 | 6709.06 | 7062.17 | 7415.27 |
| 10 | 5355.29 | 5637.15 | 5919.01 |
| 15 | 4308.25 | 4535.00 | 4761.76 |
| 20 | 3491.75 | 3675.52 | 3859.30 |
| 22 | 3216.66 | 3385.96 | 3555.25 |
| 24 | 2966.52 | 3122.65 | 3278.78 |
| 26 | 2738.79 | 2882.94 | 3027.09 |
| 28 | 2531.23 | 2664.65 | 2797.68 |
| 30 | 2341.84 | 2465.09 | 2588.34 |
| 35 | 1936.58 | 2038.51 | 2140.43 |
| 40 | 1611.20 | 1696.00 | 1780.80 |
| 45 | 1348.27 | 1419.23 | 1490.19 |
| 50 | 1134.48 | 1194.19 | 1253.89 |
| 55 | 959.62 | 1010.13 | 1060.63 |

## Inlet Air Temperature Sensor

### Inlet Air Temperature Sensor Circuit




1. ECU
2. Inlet Temperature Sensor

## Water Temperature Sensor

*Water Temperature Sensor Removal/Installation*


- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Disconnect the sensor connector [A], and unscrew the water temperature sensor [B].

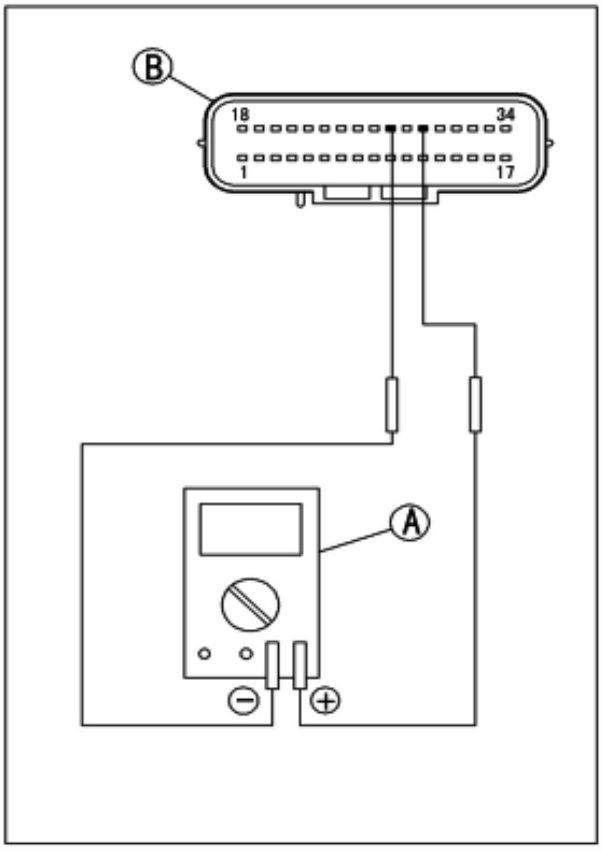
**Torque - Water Temperature Sensor: 12 N•m (1.2 kgf • m, 106 in • lb)**

- Apply grease to new O-ring on the water temperature sensor.
- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).

*Water Temperature Sensor Output Voltage Inspection*

**NOTE**

○ *Be sure the battery is fully charged.*




- Remove the ECU (see ECU Removal). Do not disconnect the connectors.
- Connect a hand tester [A] to the ECU connector [B] with the needle adapter set.
- Measure the sensor output voltage with the engine stopped and the connector joined.
- Turn the ignition switch ON.

**Water Temperature Sensor Output Voltage**
Hand tester(+)→Gr/W lead(ECU terminal 29)
Hand tester(-)→L/G lead(ECU terminal 27)
Standard: 2.5~3.5 V (20°C)

### Coolant Temperature Sensor

**NOTE**

○*Coolant temperature sensor output voltage varies with the coolant temperature change.*

● Turn the ignition switch off.

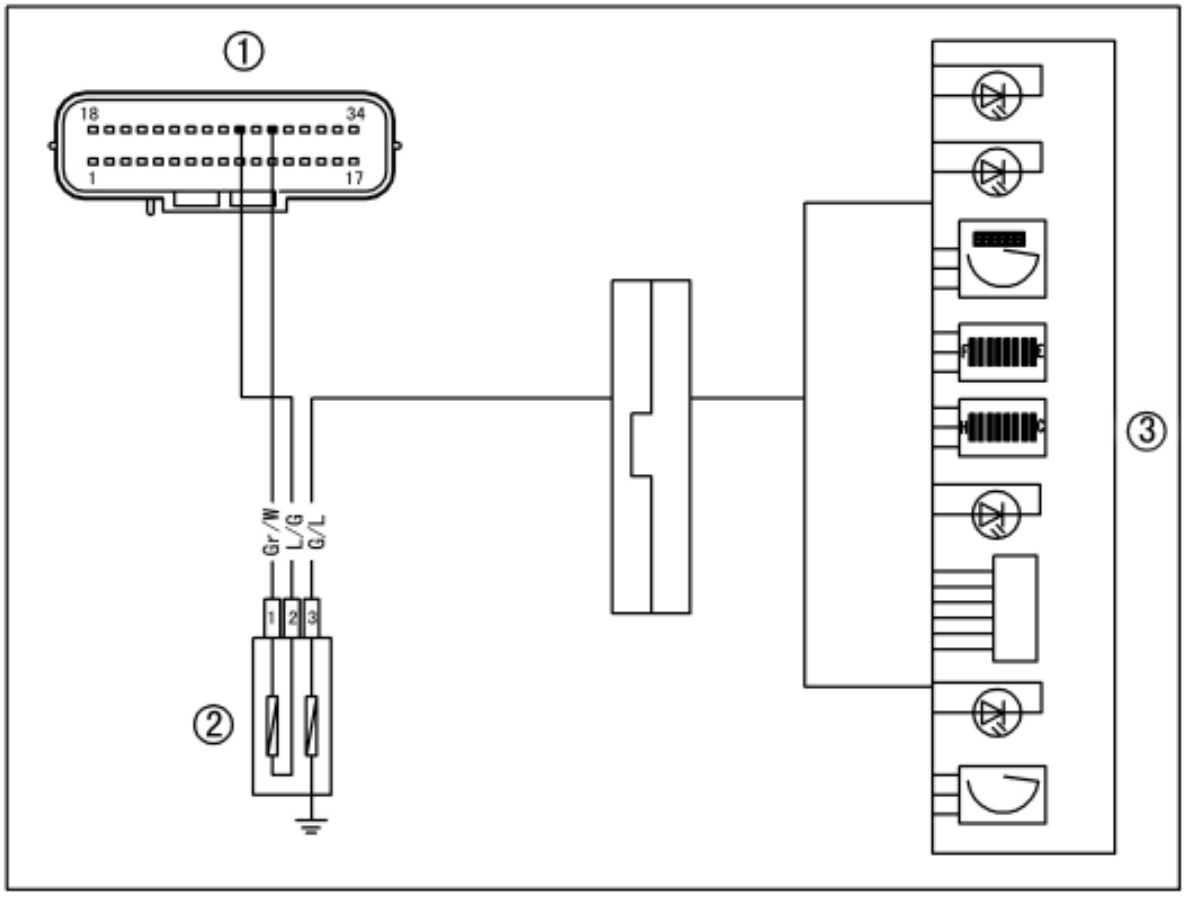
★If the output voltage is within the standard, check the ECU for its ground, and power supply (see ECU Power Supply Inspection).

★If the output voltage is out of the standard, check the wiringAnd if the output voltage is 4.8 V, the ECU is normal.

★If the wiring is good, check the water temperature sensor resistance.

Remove the needle adapter set, and apply silicone sealant to the seals of the connector for waterproofing.

### Water Temperature Sensor Circuit




1. ECU　　2 . Coolant Temperature Sensor　　3. Meter Unit

*Coolant Temperature Sensor Resistance Inspection*

● Remove coolant temperature sensor (refer to*Coolant Temperature Sensor Removal/Installation*).

● Refer to *Coolant Temperature Sensor Inspection*.

## Crankshaft Position Sensor

*Crankshaft Position Sensor Removal/Installation*

● Refer to the Crankshaft Sensor Removal/Installation in the Electrical System chapter.

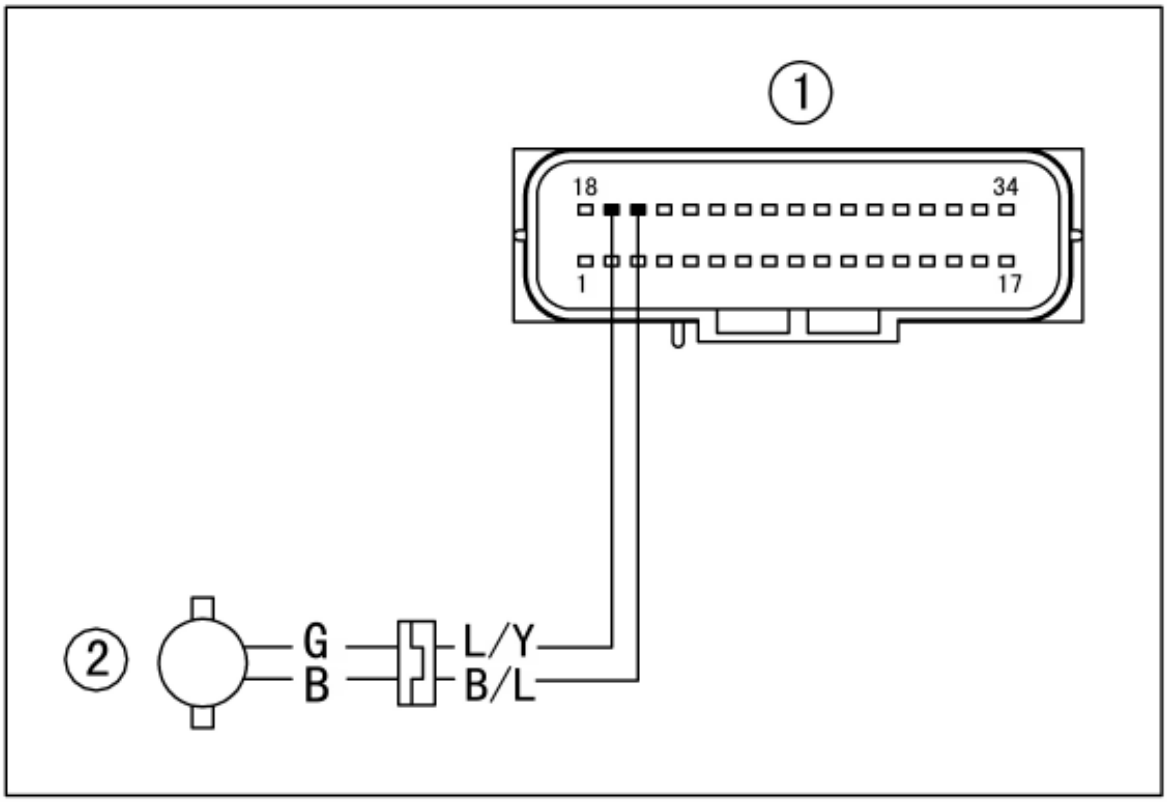
*Crankshaft Position Sensor Inspection*

● The crankshaft sensor has no power source, and when the engine stops, the crankshaft sensor generates no signals.

● Crank the engine and measure the peak voltage of the crankshaft position sensor (see Crankshaft Sensor Inspection in the Electrical System) in order to check the sensor.

● Check the wiring for continuity, using the following diagram.

**Crankshaf Position Sensor Circuit**




1. ECU 2. Crankshaft Position Sensor

## Speed Sensor

*Speed Sensor Removal/Installation*

● Refer to the Speed Sensor Removal/Installation in the Electrical System chapter.

*Speed Sensor Inspection*

● Refer to the Speed Sensor Inspection in the Electrical System chapter.

*Speed Sensor Input Voltage Inspection*

**NOTE**

○ *Be sure the battery is fully charged.*

● Turn the ignition switch OFF.

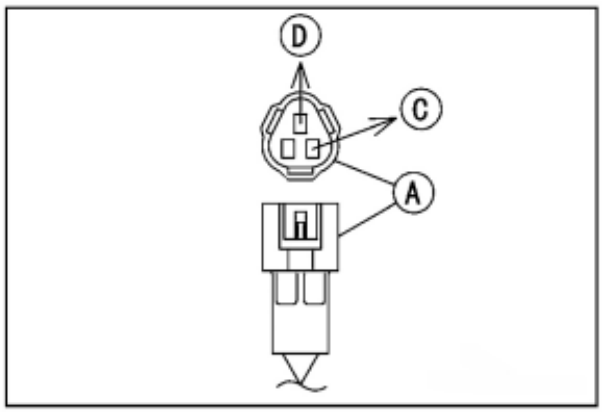
● Disconnect the speed sensor connector and connect the harness adapter [A] between the harness connector and speed sensor connector.


● Connect a hand tester to the harness adapter leads.

● Measure the sensor input voltage with the engine stopped, and with the connector joined.

● Turn the ignition switch ON.

**Speed Sensor Input Voltage**
**Connection to Adapter**
**Meter (+) → B/Br (sensor) lead [C]**
**Meter (-) → G/B (sensor) lead [D]**




**Standard: About 9~13 V DC at Ignition Switch ON**

★If the reading is out of the range, check the wiring (see wiring diagram in this section), and meter (see Electronic Combination Meter Unit Inspection in the Electrical System chapter).

★If the reading is good, check the output voltage.

● Turn the ignition switch OFF.

*Speed Sensor Output Voltage*

● Before this inspection, inspect the input voltage (see Speed Sensor Input Voltage Inspection).

**NOTE**

○ *Be sure the battery is fully charged.*

● Turn the ignition switch OFF.

● Disconnect the speed sensor connector and con nect the harness adapter [A] between the harness connector and speed sensor connector.


● Connect a hand tester to the harness adapter leads.

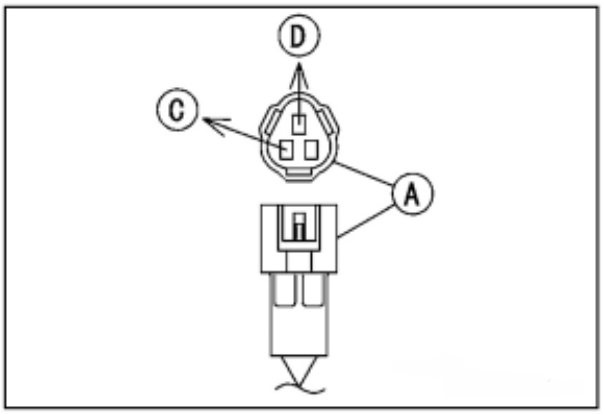
### Speed Sensor

- Measure the sensor output voltage with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.

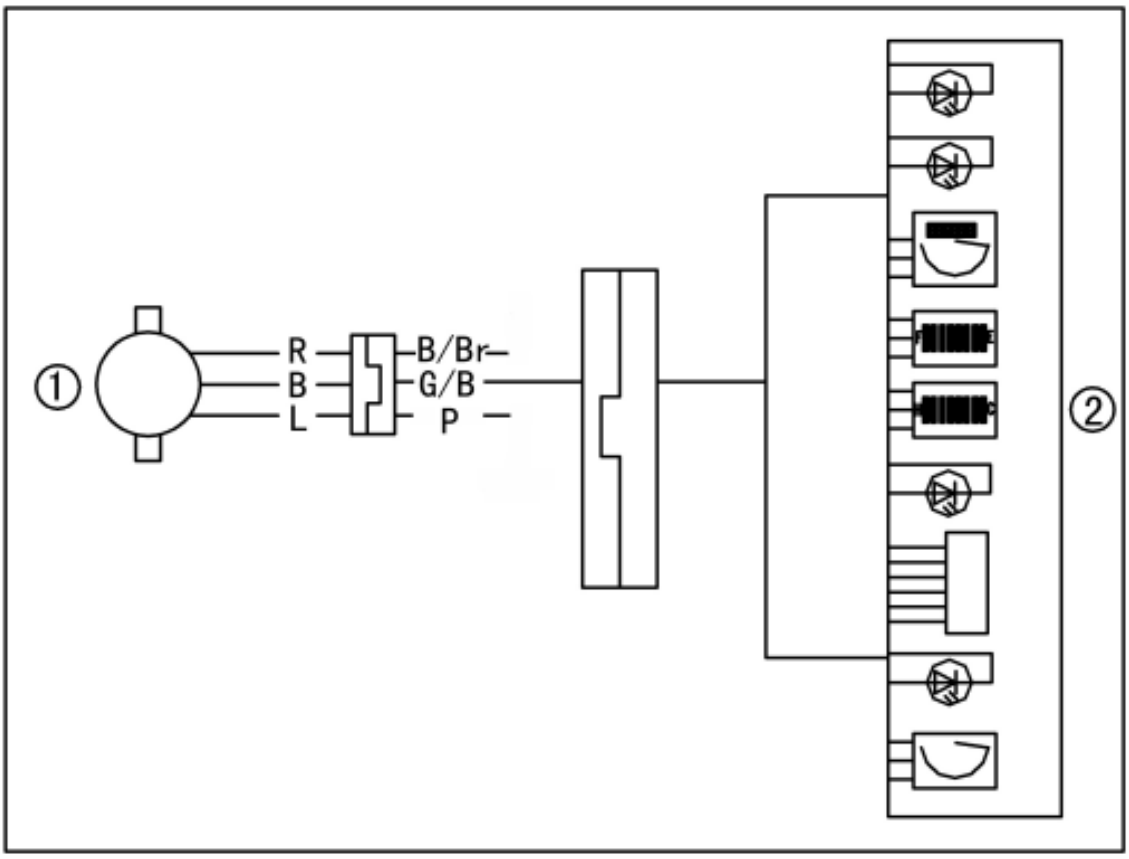
**Speed Sensor Output Voltage at Sensor Connections to Adapter**

Meter (+) → P (sensor) lead [C]
Meter (-) →G/B(sensor) lead [D]

Standard: About 0.05~1.0 V DC



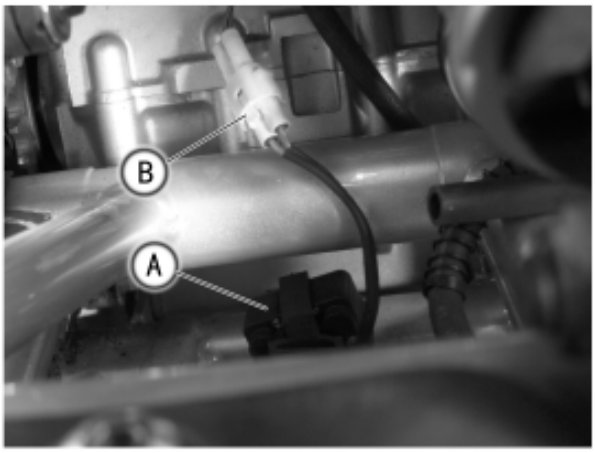

### Speed Sensor Circuit




1. Speed Sensor 2. Meter Unit

## Roll-over Sensor

*Roll-over Sensor Removal*

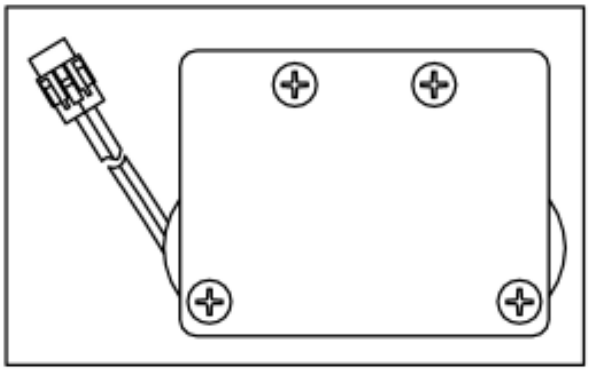



**CAUTION**

**Never drop the sensor, especially on a hard surface. Such a shock to the part can damage it.**

● Removal:
Disconnect connector [B] and roll-over sensor [A].

● Installation:
Roll-over sensor should be installed as illustrated.



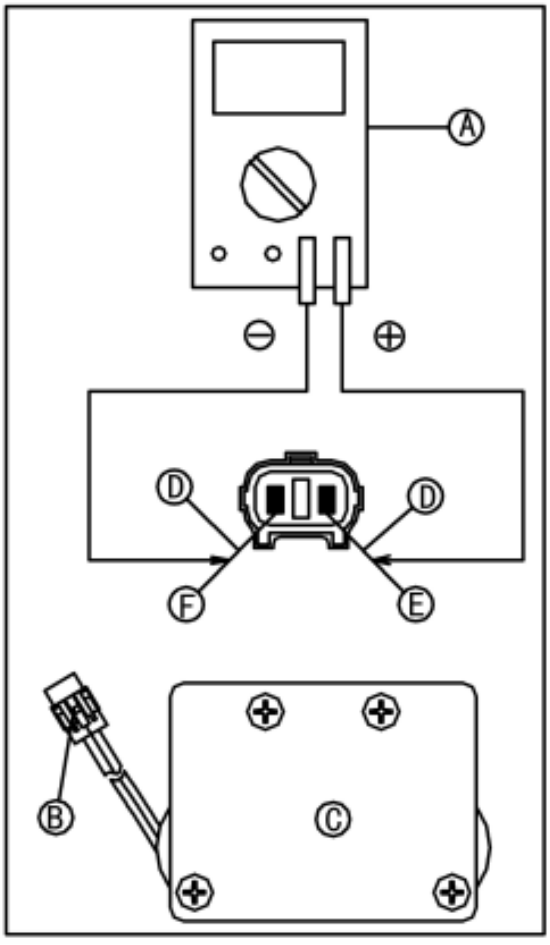
**⚠ WARNING**

**Incorrect installation of the vehicle-down sensor could cause sudden loss of engine power.**
**The rider could lose balance during certain riding situ- ations like leaning over in a turn with the potential for an accident resulting in injury or death. Ensure that the down sensor is held in place by the sensor brackets.**

**Roll-over Sensor Output Voltage Inspection (when tilted)**

**NOTE**

○ *Be sure the battery is fully charged.*




● Connect a hand tester [A] to the connector [B] of the roll-over sensor [C] with the needle adapter set [D].
● Measure the sensor output voltage with the engine stopped, and with the connector joined.
● Turn the ignition switch ON.

**Roll-over Sensor Output Voltage**

**Meter(+)→ Gr/B lead [E]**
**Meter (-)→ L/G lead [F]**

### Roll-over Sensor

● Turn the ignition switch on and measure roll-over sensor power source voltage.

**Roll-over Sensor Output Voltage(when tilted):**
**Standard:**
**4.75~5.25V (connector disconnected)**
**3.5~4.0V (connector joined)**

● Turn the ignition switch OFF.

★ If the reading of input voltage is less than the standard, check the ECU for its ground, power supply and wiring shorted.

★ If the wiring is normal, check roll-over sensor resistance.

**Roll-over Sensor Output Voltage Inspection (when tilted)**

● Remove the sensor [D] (see Roll-over Sensor Removal).

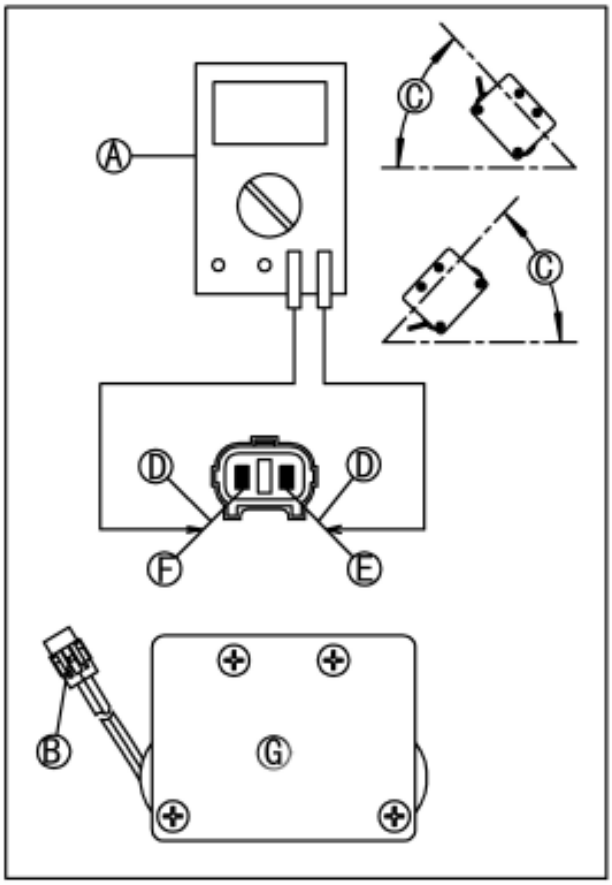
● Connect a hand tester [A] to the connector [B] with needle adapter set [D].

**Roll-over Sensor Output Voltage**
**Meter(+)→ Gr/B lead [E]**
**Meter(-)→ L/G lead [F]**

● Hold the sensor vertically.

● Turn the ignition switch ON, and measure the output voltage with the connector joined.

● Tilt the sensor 40~50º or more [C] right or left, then and measure the output voltage.




**NOTE**

○ *If you need to test again, turn the ignition switch OFF, and then ON.*

● Turn the ignition switch OFF.

● Remove the needle adapter set, and apply silicone sealant to the seals of the connector for waterproofing.

★ If the output voltage is normal, the wiring is suspect. Check the wiring.

★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★ If the output voltage is out of the specified, replace the roll-over sensor.

**Roll-over Sensor**

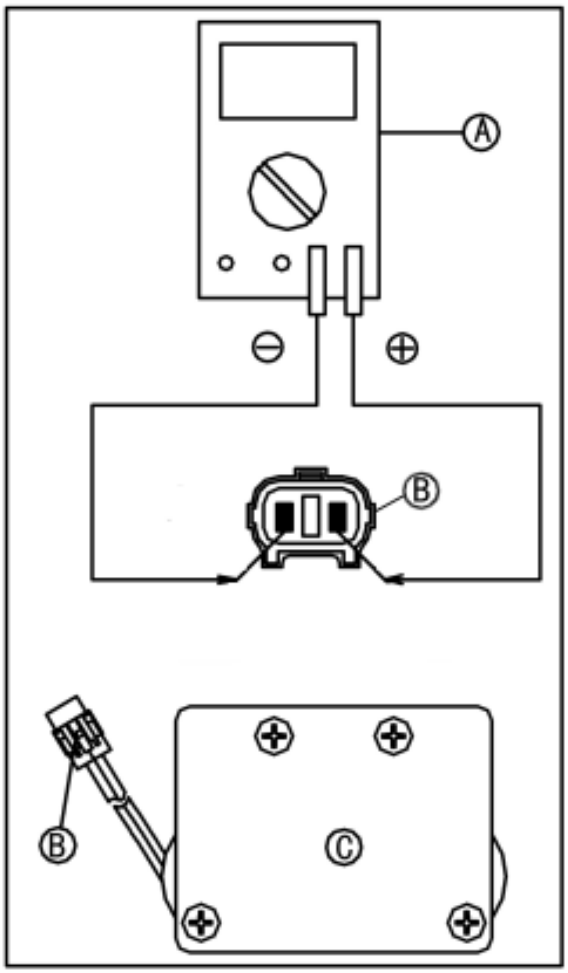
*Roll-over Sensor Resistance Inspection(when not tilted)*

- Remove roll-over sensor [C] (see Roll-over Sensor Removal/Installation).
- Disconnect roll-over sensor connector [B].
- Connect hand tester [A] to connector[B] and measure the resistance.

**Roll-over Sensor Output Resistance:**

**Standard:R ⩽ 0.5 Ω**

**Roll-over sensor is placed as showin in the right figure.**



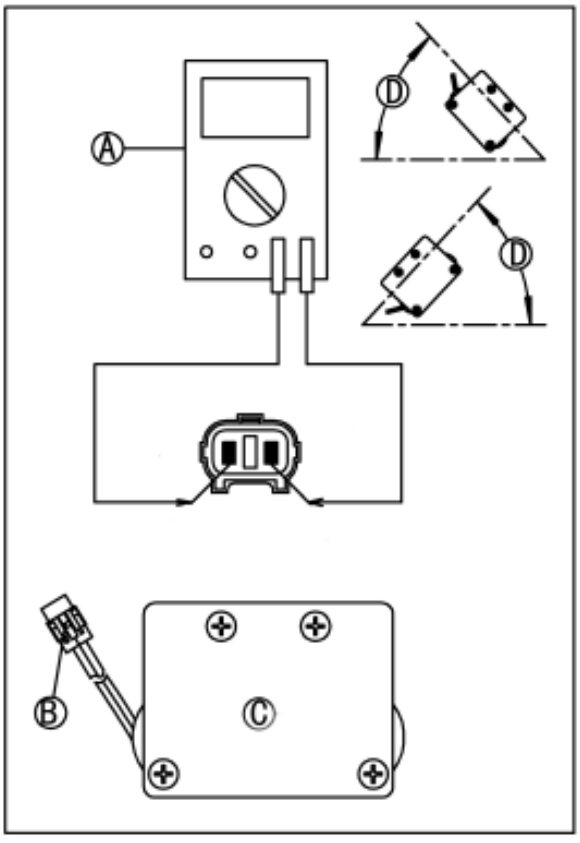

*Roll-over Resistance Inspection (when not tilted)*

- Remove roll-over sensor [C] (see Roll-over Sensor Removal/Installation).
- Disconnect roll-over sensor connector [B].
- Connect hand tester [A] to connector [B] and measure the resistance.
- Tilt the sensor 40~50° or more [C] right or left, then and measure the output resistance.

**Roll-over Sensor Output Resistance**

**Standard:R=62 ± 5k Ω(20°C)**

**Sensor tilted 40~50° or more [C] right or left**

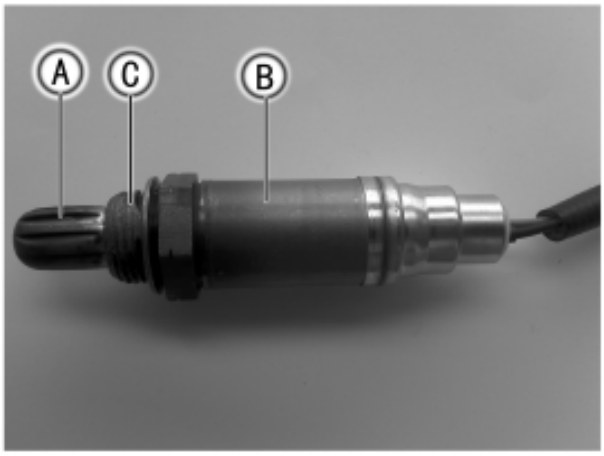


### Oxygen Sensor

*Oxygen Sensor Removal/Installation*

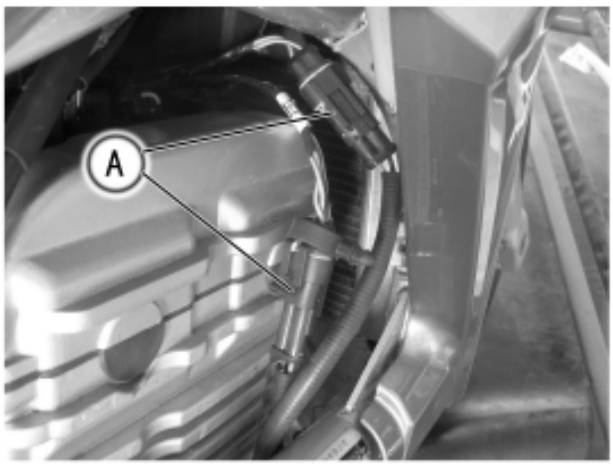
**⚠ WARNING**

**Never drop the sensor [B], especially on a hard surface. Such a shock to the part can damage it. Do not touch the portion [A] of the sensor, otherwise, the oil residue on your hand may contaminate the sensor and cause performance degeneration.**




*Oxygen Removal*

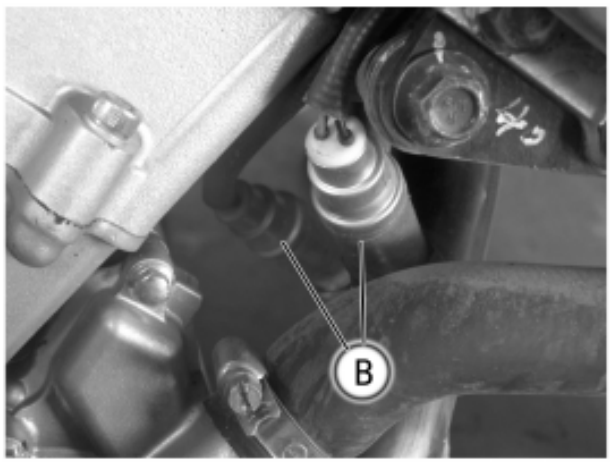
● Disconnect connector[A] and remove oxygen sensor [B].




*Oxygen Sensor Installation*

● Connect oxygen sensor [B] and connector[A].

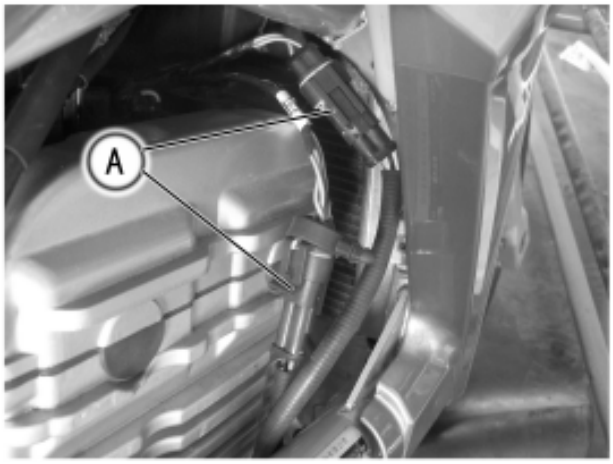
**Torque: 60N • m ± 2 N • m**



### Oxygen Sensor

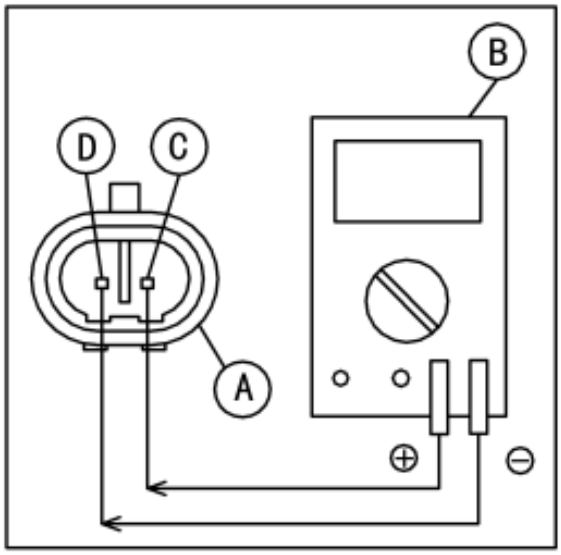
*Oxygen Sensor Inspection*

- Disconnect the oxygen sensor connector [A]of one cylinder.
- Place the transmission in neutral.
- Start the engine and throughly warm it up, then have the engine run at more than 5000rpm.
- Measure oxygen sensor output volatage using hand tester[B].

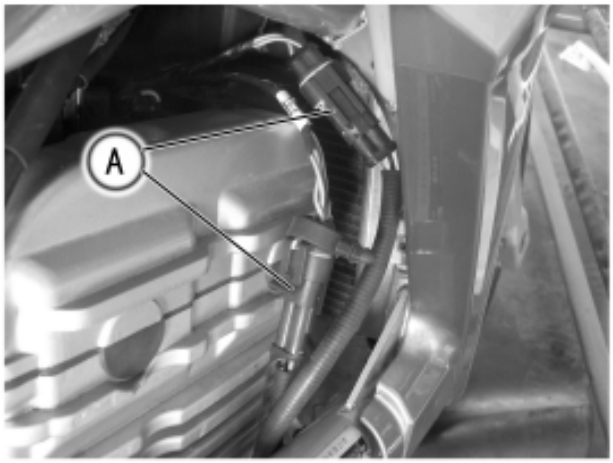



**Oxygen Sensor Output Voltage**
**Cylinder 1:**
**Meter(+)→ B lead [C]**
**Meter(-)→ Grlead [D]**
**Cylinder 2:**
**Meter(+)→ B lead [C]**
**Meter(-)→ Gr lead [D]**

**Oxygen Sensor Output Voltage**
**Standard: about 0.8V**

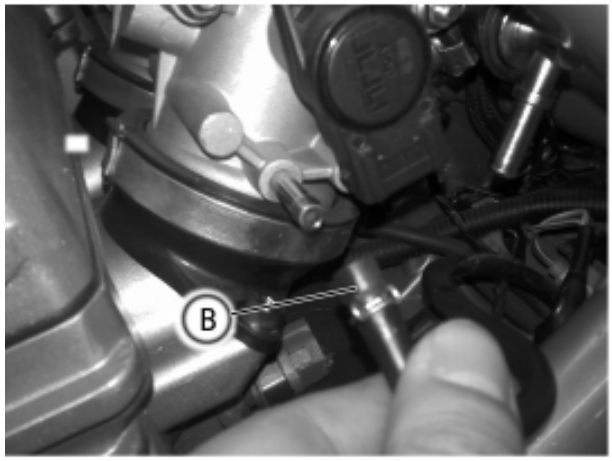



- Disconnect the oxygen sensor connector [A] of one cylinder.
- Place the transmission in neutral.
- Start the engine and let it idle.



## Oxygen Sensor

● Remove the hose [B].



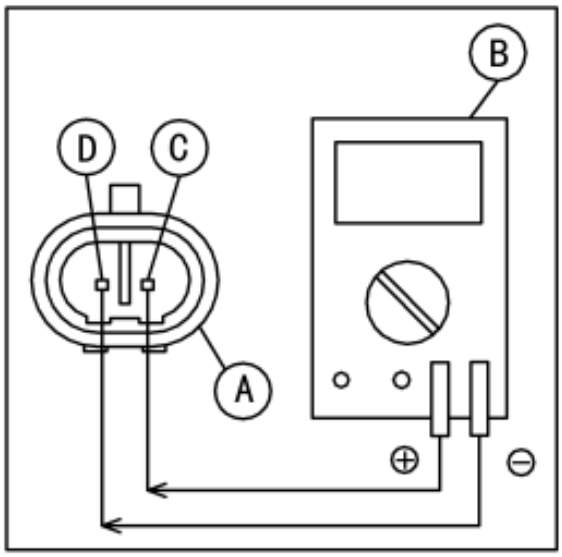

● Measure oxygen sensor output voltage with hand tester [B].

**Oxygen Sensor Output Voltage:**

**Cylinder 1:**
**Meter(+)→ B lead [C]**
**Meter(-)→ Gr lead [D]**

**Cylinder 2:**

**Meter(+)→ B lead [C]**
**Meter(-)→ Gr lead [D]**




**Oxygen Sensor Output Voltage:**

**Standard: about 0.1V**

**Ignition Coil**

*Ignition Coil Removal/Installation*

**⚠ WARNING**

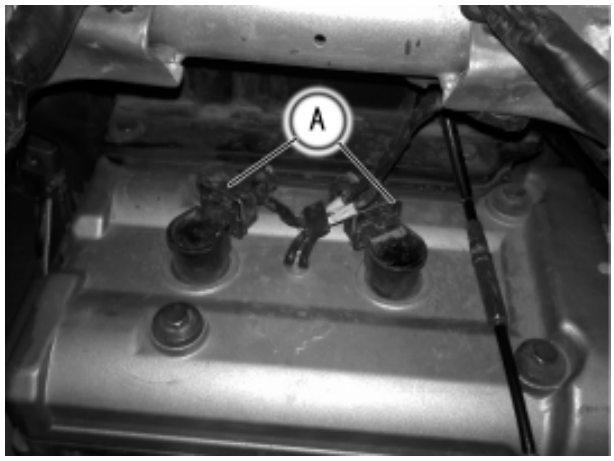
**Never drop the sensor, especially on a hard surface. Such a shock to the part can damage it.**

*Stick Coil Input Voltage Inspection*

**NOTE**

○ *Be sure the battery is fully charged.*

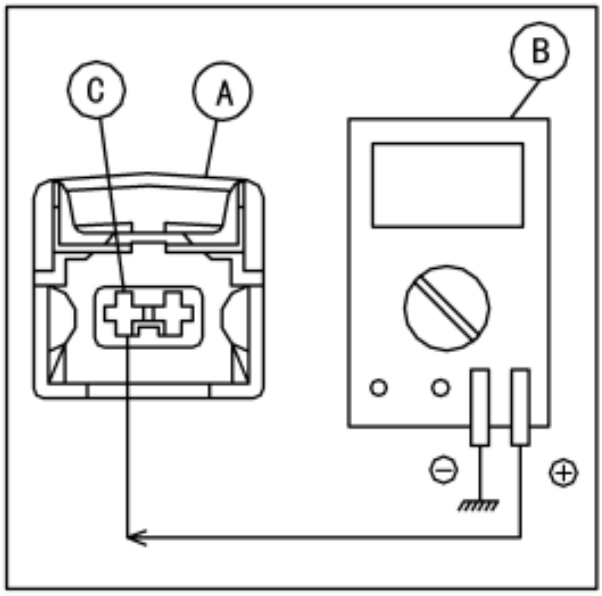
- Turn the iignition switch OFF.
- Remove the fuel tank.
- Remove the air filter.
- Remove the ignition switch connector [A].
- Connect a hand tester [B] as shown.
- Measure the input voltage to each primary winding of the ignition coils with the engine stopped, and with the connectors joined.
- Turn the ignition switch ON. Measure the ignition coil input voltage during fuel pump working time.




**Ignition Coil Input Voltage:**

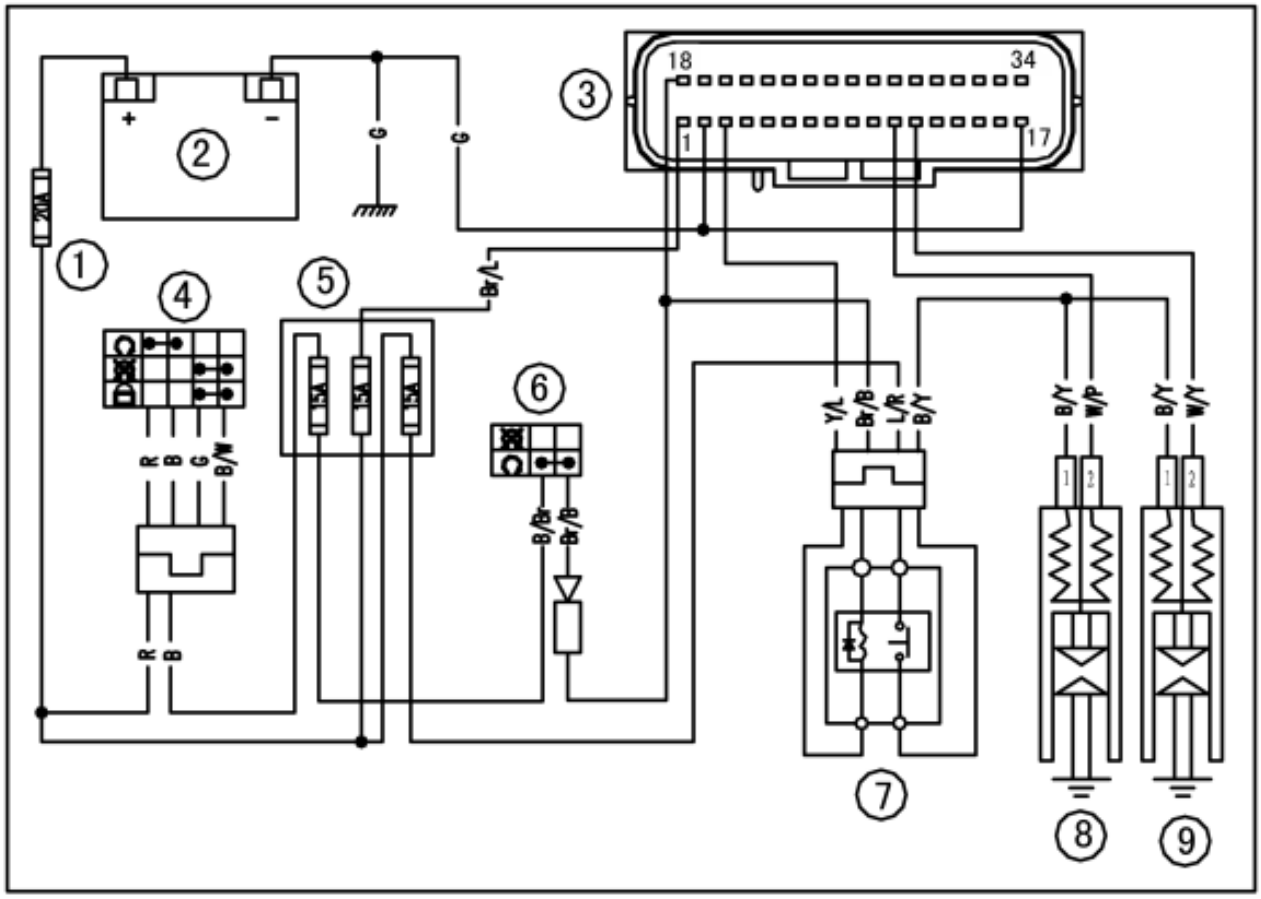
**Ignition coil 1:**
**Meter (+)→ B/Y lead [C]**
**Meter (-)→ Ground**
**Standard: about 12 V DC**

**Ignition coil 2:**
**Meter (+)→ B/Y lead [C]**
**Meter (+)→ Ground**
**Standard: about 12 V DC**

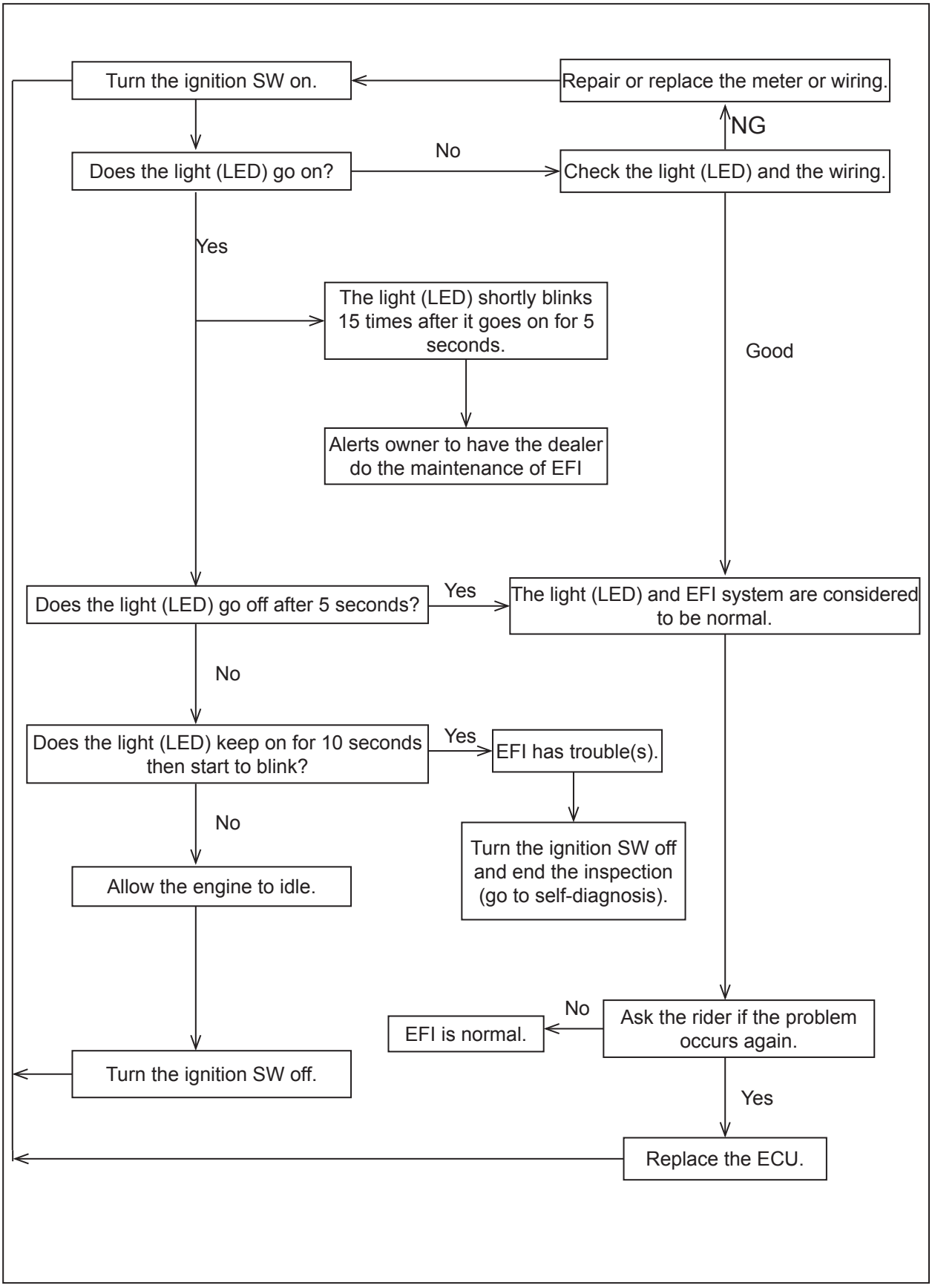


## Ignition Coil

### Ignition Coil Circuit




1. Main Fuse
2. Battery
3. ECU
4. Ignition Switch
5. Fuse Box
6. Engine Stop Switch
7. Fuel Pump Relay
8. Ignition Coil 1
9. Ignition Coil 2


Turn the ignition SW on.
Repair or replace the meter or wiring.
NG
Does the light (LED) go on?
No
Check the light (LED) and the wiring.
Yes
The light (LED) shortly blinks 15 times after it goes on for 5 seconds.
Good
Alerts owner to have the dealer do the maintenance of EFI
Does the light (LED) go off after 5 seconds?
Yes
The light (LED) and EFI system are considered to be normal.
No
Does the light (LED) keep on for 10 seconds then start to blink?
Yes
EFI has trouble(s).
No
Turn the ignition SW off and end the inspection (go to self-diagnosis).
Allow the engine to idle.
No
EFI is normal.
Ask the rider if the problem occurs again.
Turn the ignition SW off.
Yes
Replace the ECU.

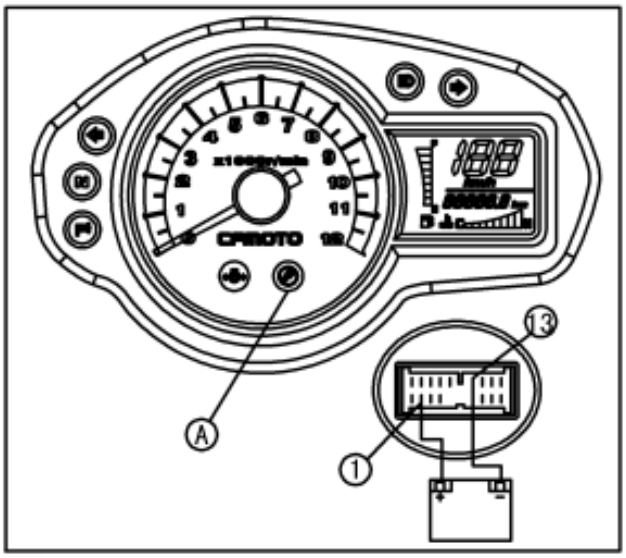
### FI Indicator Light

*FI Indicator Light Inspection*

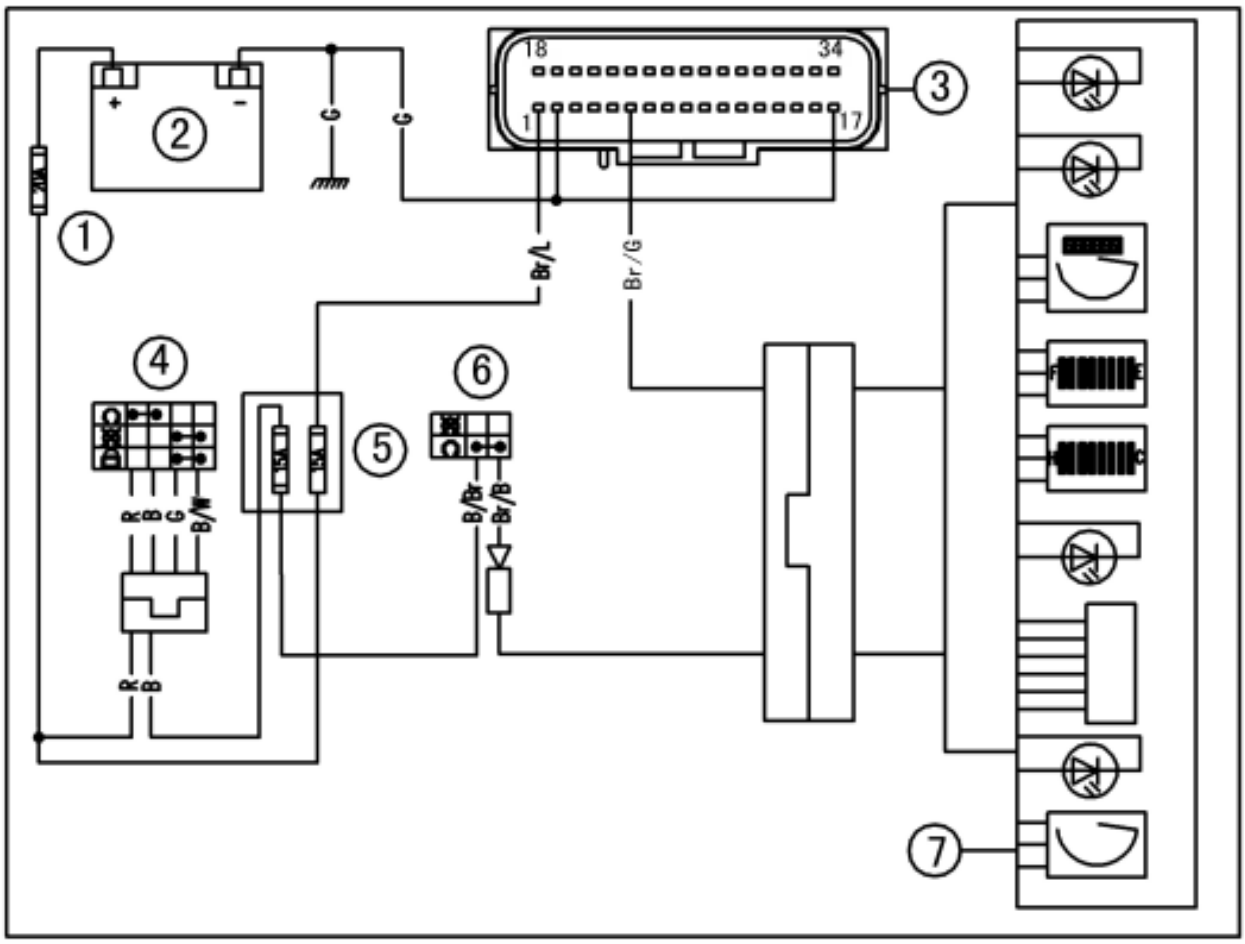
- Remove the meter unit (see Meter Unit Removal in the Electrical System chapter).
- Using two auxiliary leads, supply battery power to the FI indicator light (LED) [A].
- Battery [B] 12 V.

**Battery (+) terminal → Meter lead terminal 1**
**Battery (-)terminal → Meter lead terminal 13**
**Criterion: The light (LED) should light.**

★If the light does not go on, replace the meter unit (see Meter Unit Removal/Installation in the Electrical Sys- tem chapter).




**FI Indicator Light Circuit**




1. Main Fuse
2: Battery
3. ECU
4. Ignition Switch
5. Fuse Box
6. Engine Stop Switch
7. Meter Unit

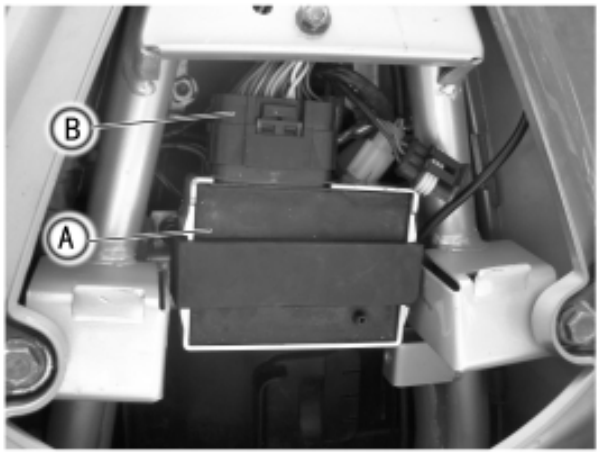
**ECU**

*ECU Removal/Installation*

| CAUTION |
| --- |
| **Never drop the sensor, especially on a hard surface. Such a shock to the part can damage it.** |

*ECU Removal*

- Remove rear seat (see Seat Removal in the Frame chapter)
- ECU [A] and the harness.
- Disconnect the ECU lead connectors.




*ECU Installation:*

- Fit the ECU unit and connect the lead connectors.

*ECU Power Supply Inspection*

- Visually inspect the terminals [A] of the ECU connectors.

★If the connector is clogged with mud or dust, blow it off with compressed air.

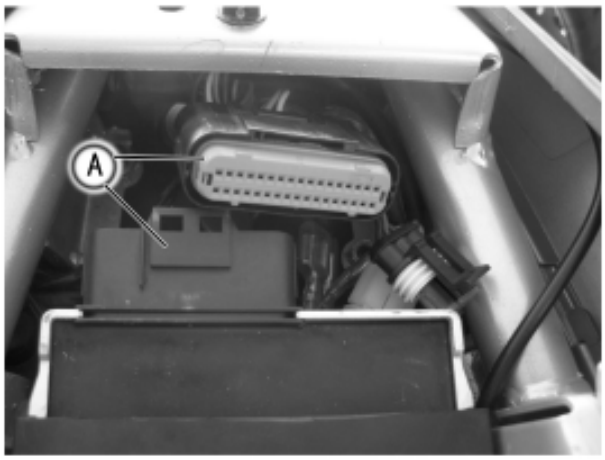
★Replace the main harness if the terminals of the main harness connectors are cracked, bent, or otherwise damaged.

★Replace the ECU if the terminals of the ECU connectors are cracked, bent, or otherwise damaged.

★With the ECU connectors [A] connected, check the following ground lead for continuity with the ignition switch OFF, using a tester and needle adapter set.

Battery [B]

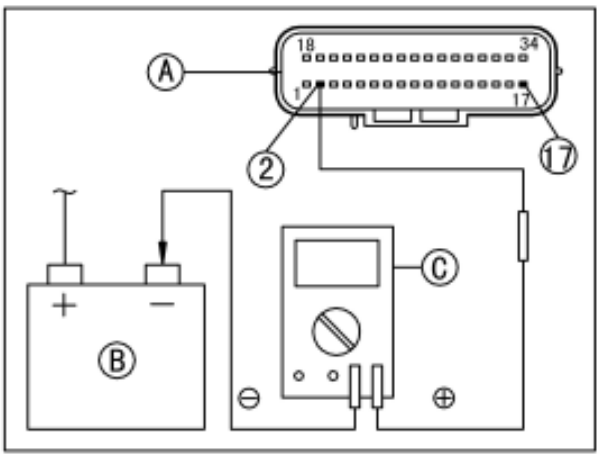
Tester [C]




*ECU Grounding Inspection*

**Terminal 2 (G/B), 17 (G) ←→ Battery (-) terminal: 0 Ω**

**Engine ground ←→ Battery (-) terminal: 0 Ω**




★If no continuity, check the connector, the engine ground lead, or main harness, and repair or replace them if nec- essary.

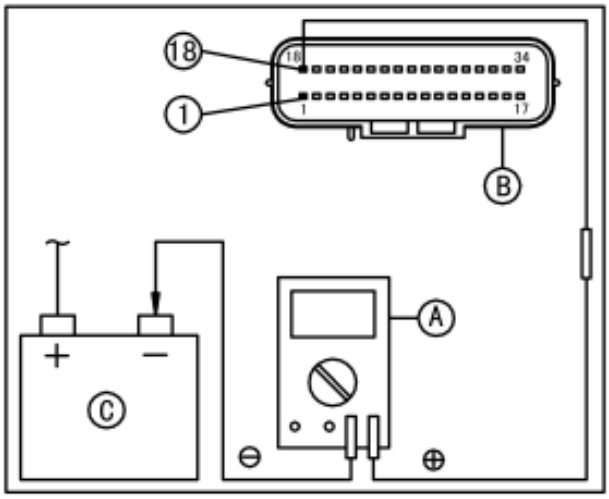
## ECU

*ECU Power Source Inspection*

● Check the ECU power source voltage with a hand tester [A].

*ECU Power Source Inspection*

Meter Connections:
Between Terminal 1 (Br/L) and Battery (+) Terminal
Between Terminal 18 (Br/B) and Battery (+) Terminal
Ignition Switch OFF:
Terminal 1 (Br/L) and Battery (-) Terminal:
Battery Voltage (12.8 V or more)
Terminal 18 (Br/B) and Battery (-) Terminal:
Ignition Switch ON, Engine Stop Switch ON:
Both: Battery Voltage (12.8 V or more)

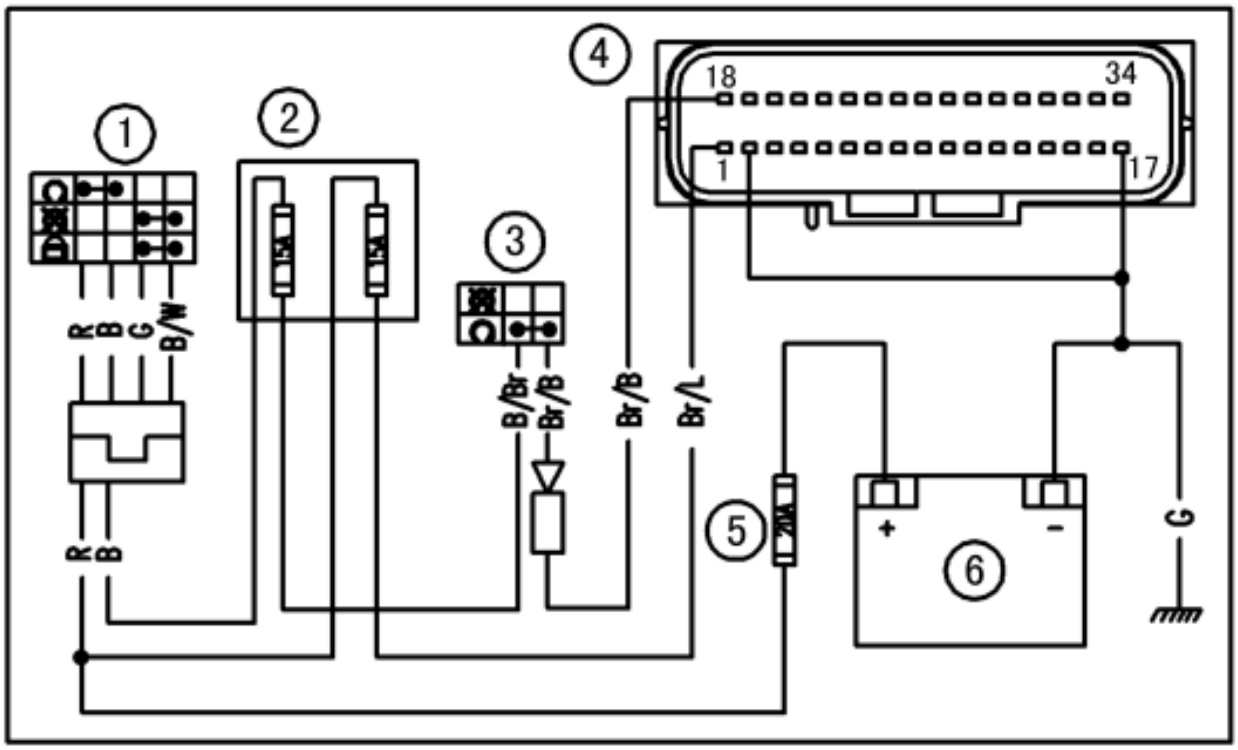



★If the meter does not read as specified, check the following.
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)
ECU Fuse 15 A (see Fuse Inspection in the Electrical System chapter)
ECU Main Relay (see Relay Circuit Inspection in the Electrical System chapter)
Power Source Wiring (see wiring diagram below)

★If the inspection checks good, the ECU is damaged.
Replace the ECU (see ECU Removal/Installation).
The ECU itself cannot be checked or serviced.

## ECU

### ECU Circuit Diagram




1. Ignition Switch
2. Fuse Box
3. Engine Stop Switch
4. ECU
5. Main Fuse
6. Battery

## Fuel Line

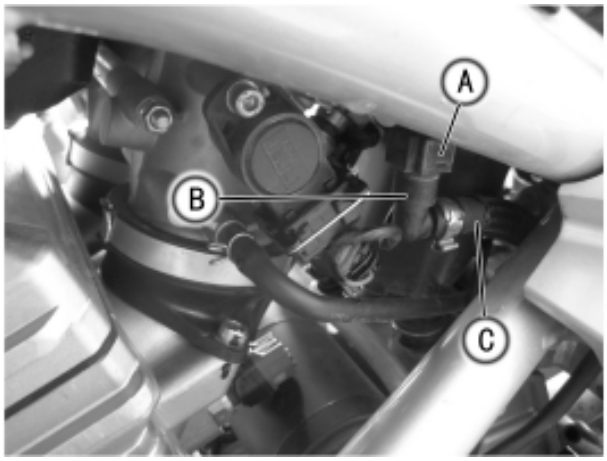
*Fuel Pressure Inspection*

**NOTE**

- *This inspection can determine which trouble the EFI system has, mechanical or electrical trouble.*
- *It is preferable to measure the fuel pressure while running the motorcycle just when trouble occurred in order to know symptom well.*
- *Be sure the battery is fully charged.*

### Fuel Pressure Measurement

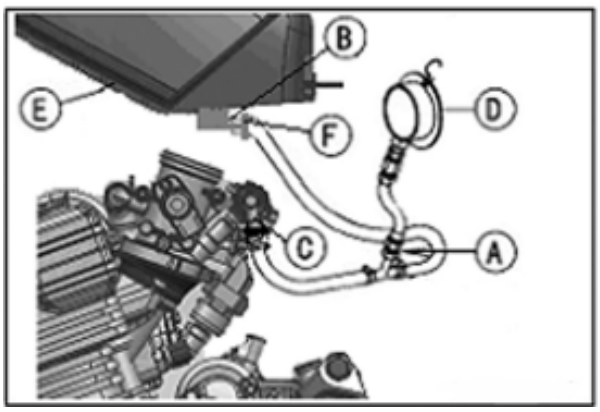
- Remove the fuel tank (see FuelTank Removal).
- Be sure to place a piece of cloth around the fuel hose joint and the delivery pipe.
- Insert a minus screw driver [A] into the slit on the joint lock [B].
- Turn the driver to disconnect the joint lock.




**⚠ WARNING**

**Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.**

- Install the fuel pressure gauge adapter [A] and fuel hoses between the fuel pump outlet pipe [B] and the delivery pipe [C].
- Connect the pressure gauge [D] to the fuel pressure gauge adapter.




**⚠ WARNING**

**Do not try to start the engine with the fuel hoses disconnected.**

E: Fuel Tank D: Fuel Pressure Gauuge F: Joint

- Connect the joints and ensure no leaks.
- Turn the ignition switch ON. Fuel pump will turn for 3 seconds, then stop.

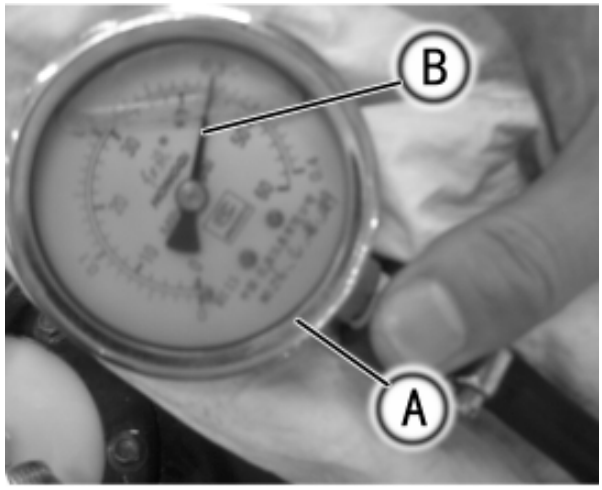
**⚠ WARNING**

**Do not drive the fuel pump without the fuel in the fuel tank.**

## Fuel Line

*Fuel Pressure Inspection*

● Measure the fuel pressure with the engine stopped.




**Fuel Pressure**

**Right after Ignition Switch ON, with pump running:**

**Standard: 330 kPa (0.33 MPa)**

**After 3 seconds from Ignition Switch ON, with pump stopped:**

**Standard: 265 kPa (0.265 MPa)**

**The system should hold the residual pressure about 30 seconds.**

**NOTE**

○*The gauge needle will fluctuate. Read the pressure at the average of the maximum and minimum indications*.

★If the fuel pressure is normal, the fuel circulation system (fuel pump, pressure regulator, and fuel passage) is no faults. Check the EFI electronic control system (injectors, sensors, crankshaft sensor, and ECU).

★If the fuel pressure is much lower than specified, check the following.

Fuel Line Leakage

Fuel Pump Operation (check the sound of the pump)

Amount of Fuel Flow (see Fuel Flow Rate Inspection)

★If the fuel pressure is much higher than specified, check the following.

Delivery Pipe Clogging

Injector Clogging

Fuel pressure regulator damage

### Fuel Pump

*Fuel Flow Rate Inspection*

**NOTE**

○ *Be sure the battery is fully charged.*

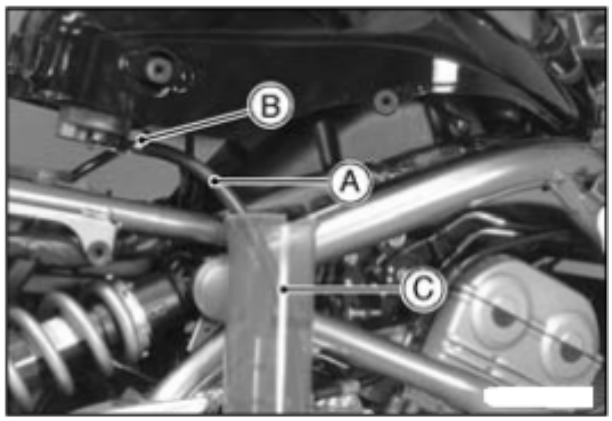
**⚠ WARNING**

**Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch OFF. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.**


- Turn the ignition switch, and engine stop switch OFF.
- Wait until the engine cools down.
- Prepare a plastic hose of the inside diameter 7.5 mm (0.30 in.) and a measuring cylinder.
- Remove the fuel tank bolt (see FuelTank Removal).
- Open the fuel tank cap [A] to lower the pressure in the tank.

**⚠ WARNING**

**Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe because of residual pressure. Cover the hose connection with a piece of clean cloth to prevent fuel spillage.**




- Connect the plastic hose [A] to the fuel pump outlet pipe.
- Secure the plastic hose with a clamp [B].
- Run the other side of the plastic hose into the measuring cylinder [C].

**⚠ WARNING**

**Wipe off spilled out fuel immediately.Be sure to hold the measuring cylinder vertical.**

**Fuel Pump**

*Fuel Flow Rate Inspection*

**⚠ WARNING**

**Do not drive the fuel pump without the fuel in the fuel tank.**

- Measure the discharge for 3 seconds with the plastic hose filled with fuel.
- Repeat this operation several times.

**Amount of Fuel Flow**
**Standard:**
**60 mL or more for 3 seconds**

★If the fuel flow is much less than the specified, check the battery condition (see Charging Condition In spection in the Electrical System chapter). If the battery is good, replace the fuel pump (see Fuel Pump Removal/Installation).

- After inspection, install the fuel tank (see FuelTank Installation).
- Start the engine and check for fuel leakage.

### Fuel Pump

*Fuel Pump Removal/Installation*

*Fuel Pump Removal*

**⚠ WARNING**

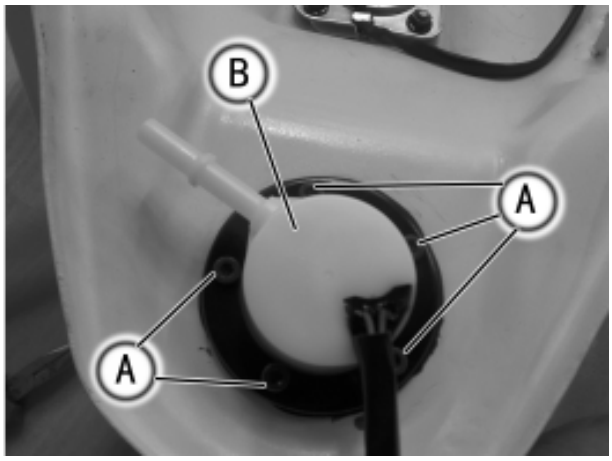
**Never drop the fuel pump, especially on a hard surface. Such a shock to the pump can damage it.**

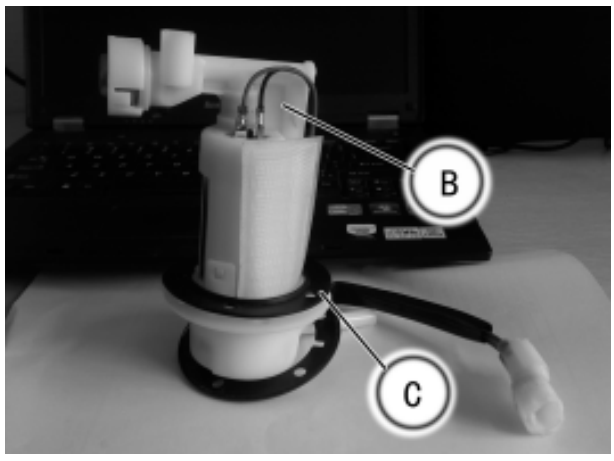
**⚠ WARNING**

**Gasoline is extremely flammable and can be explo- sive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch OFF. Disconnect the battery (-) terminal.To make fuel spillage minimum, draw the fuel out from the fuel tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.**

- Draw the fuel out from the fuel tank with a commercially available electric pump.
- Remove the fuel tank (see FuelTank Removal).
- Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump. Plug the fuel pipe of the fuel tank.
- Turn the fuel tank upside down.

Remove:
Fuel Pump Bolts [A].
Fuel Pump [B].
Replace fuel pump gasket [C] if damaged.



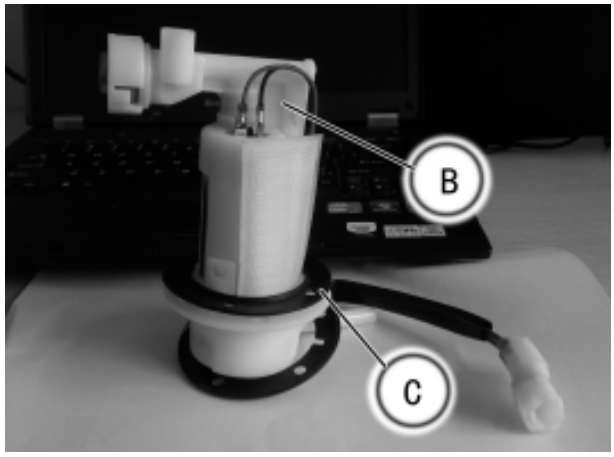




**CAUTION**

**Do not pull the lead of the fuel pump. If they are pulled, the lead terminals may be damaged.**

## Fuel Pump

*Fuel Pump Installation*

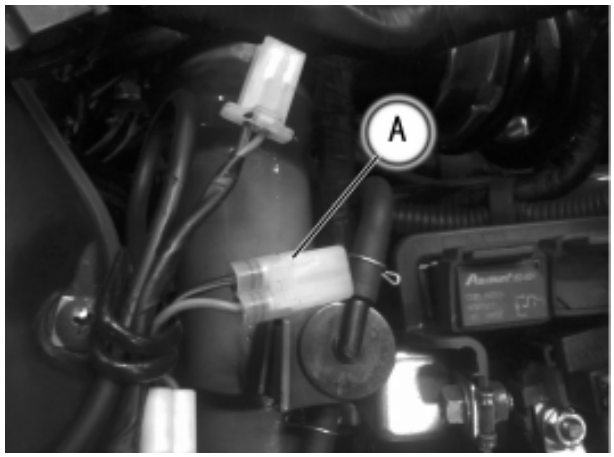



- Remove dirt or dust from the fuel pump [B] by lightly applying compressed air.
- Replace the fuel pump gasket [C] with a new one if damaged.
- Tighten the fuel pump bolts to a snug fit, tighten them in a crisscross pattern.
  **Torque - Fuel Pump Bolts: 5 N • m**
- Tighten the pump bolts again in a crisscross pattern to check the tightness.

*Fuel Pump Operation Inspection*

**NOTE**

- *Be sure the battery is fully charged.*
- *Just listen to the pump sound in the fuel tank to confirm pump operation.*

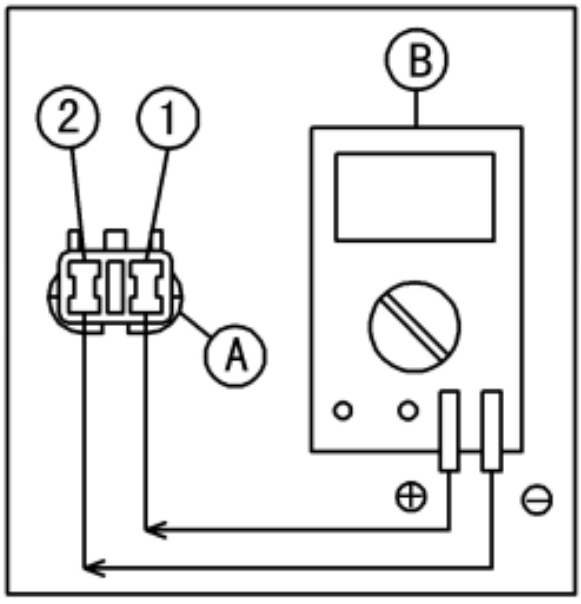



- Turn the ignition switch ON and make sure that the fuel pump operates (make light sounds) for 3 seconds, and then stops.
- Turn the ignition switch OFF.
- If the pump does not work as described above, inspect the operating voltage.

*Fuel Pump Operation Inspection*

**NOTE**

- *Be sure the battery is fully charged.*




- Turn the ignition switch OFF.
- Remove the fuel tank.
- Disconnect the fuel pump connector[A].
- Measure the operating voltage with the engine stopped.
- Turn the ignition switch ON.
- The tester needle should indicate battery voltage for 3 seconds, and then 0 V.

**Connections to Pump Connectors:**
**Tester(+)→ terminal 1(lead B/Y)**
**Tester(-)→ terminal 2(lead G)**
**With the ignition switch ON:**
**Standard:**
**Battery Voltage for 3 seconds, and then 0 V.**

### Fuel Pump

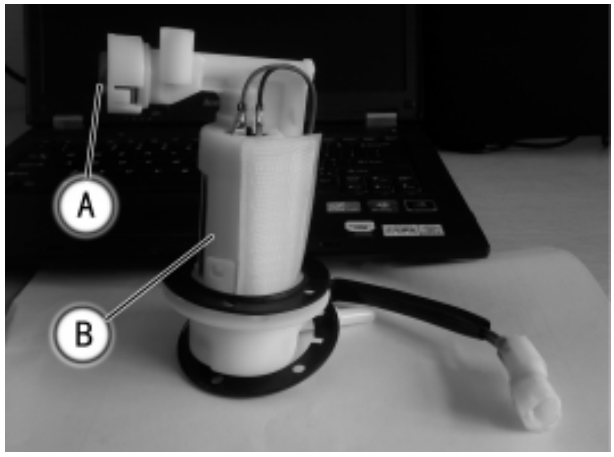
★If the reading stays on battery voltage, and never shows 0 V. Check the ECU and fuel pump relay.

★If the voltage is in specification, but the pump doesn't work, replace the pump (see Fuel Pump Removal/ Installation).

*Pressure Regulator Removal*

● The pressure regulator [A] is built into the fuel pump [B] and cannot be removed.

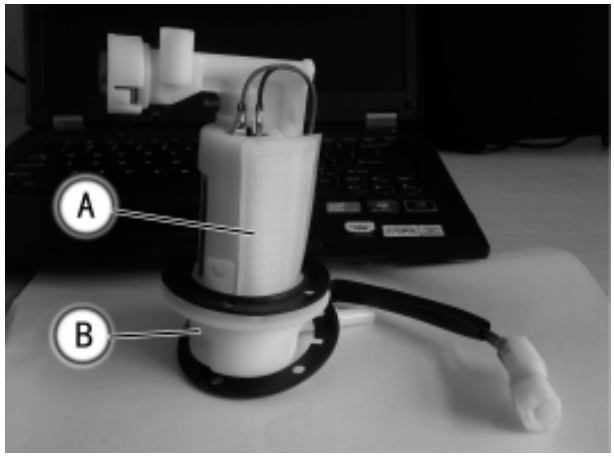
★If the fuel filter is suspected of clogging or being damaged, replace it with the fuel pump as a set.




*Pump Screen, Fuel Filter Cleaning*

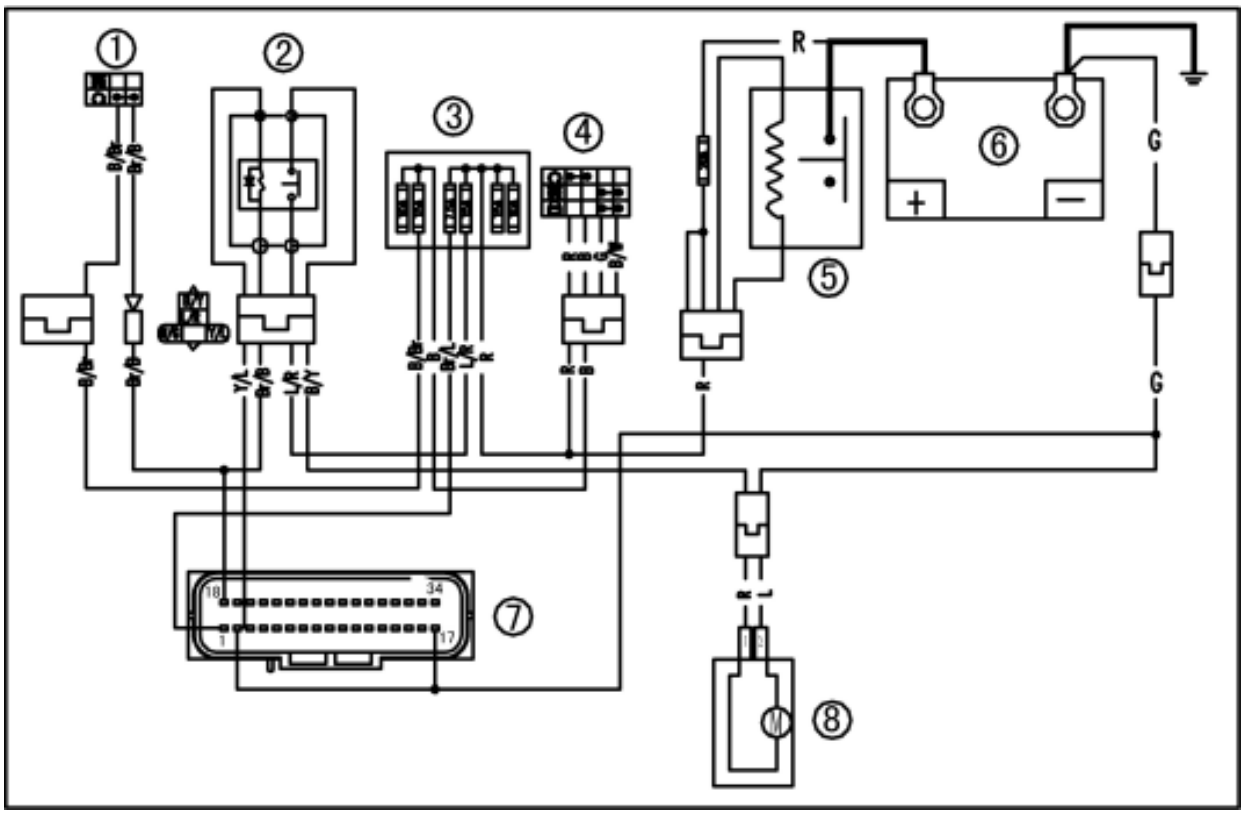
● The fuel filter [A] is built into the pump and cannot be cleaned or checked.

★If the fuel filter is suspected of clogging or being damaged, replace it with the fuel pump as a set.



## Fuel Pump

### Fuel Pump Circuit




1. Engine Stop Switch
2. Fuel Pump Relay
3. Fuse Box
4. Ignition Switch
5. Starte Relay
6. Battery
7. ECU
8. Fuel Pump

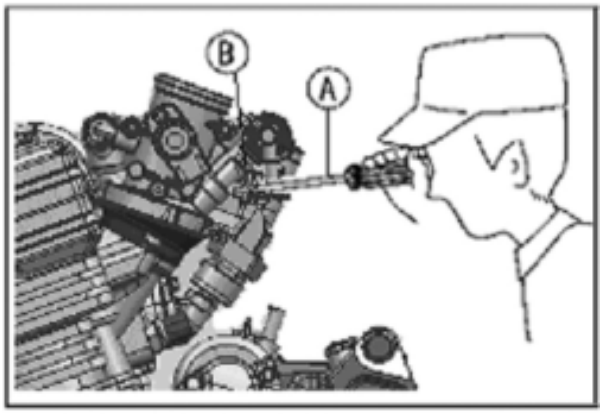
**Fuel Injectors**

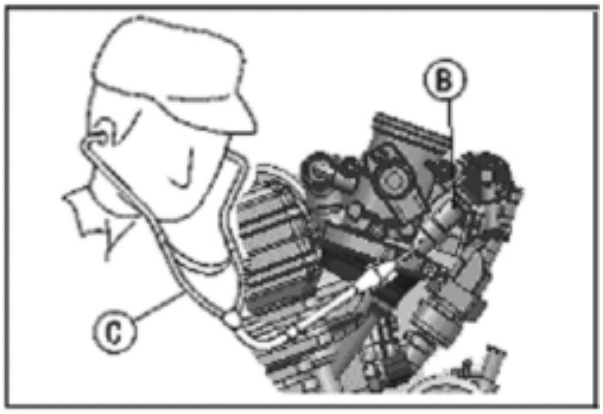
*Fuel Pump Removal/Installation*

● Refer to the Throttle Body Assy Disassembly/Assembly.

*Audible Inspection*

● Start the engine.
● Apply the tip of a screwdriver [A] to the injector [B].
● Put the grip end onto your ear, and listen whether the injector is clicking or not.
● A sound scope [C] can also be used.
● Do the same for the other injectors.
★If all the injectors click at a regular intervals, the injectors are good. The trouble may be related to the fuel line, requiring fuel pressure inspection (see Fuel Pressure Inspection).
● The click interval becomes shorter as the engine speed rises.
★If any injector(s) doesn't click, the EFI circuit or the injector is suspect. Perform "Fuel Injector Power Source Voltage Inspection", first.

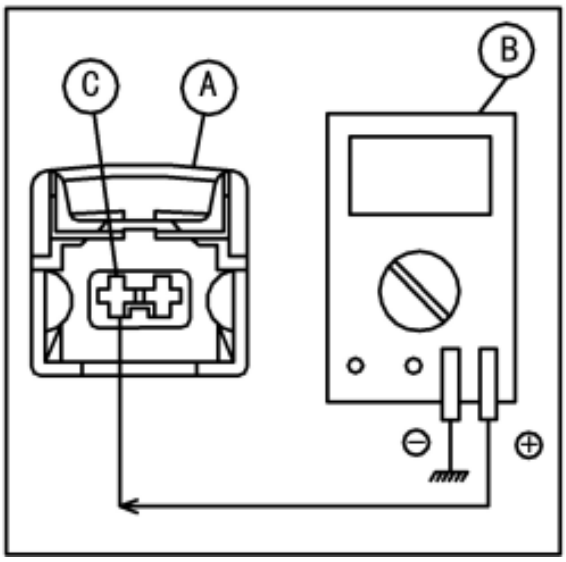



*Fuel Injector Power Source Voltage Inspection*

● Turn the ignition coil OFF.
● Remove the fuel tank.
● Remove the air filter.
● Connect a hand tester [B] to the fuel injector connector.
● Disonnect the fuel injector connector [A].

**Fuel Injector Output Voltage:**
**Cylinder 1:**
**Meter (+)→ B/Y lead [C]**
**Meter (-)→ Battery (-)**
**Cylinder 2:**
**Meter (+)→ B/Y lead [C]**
**Meter (-)→ Battery (-)**



### Fuel Injectors

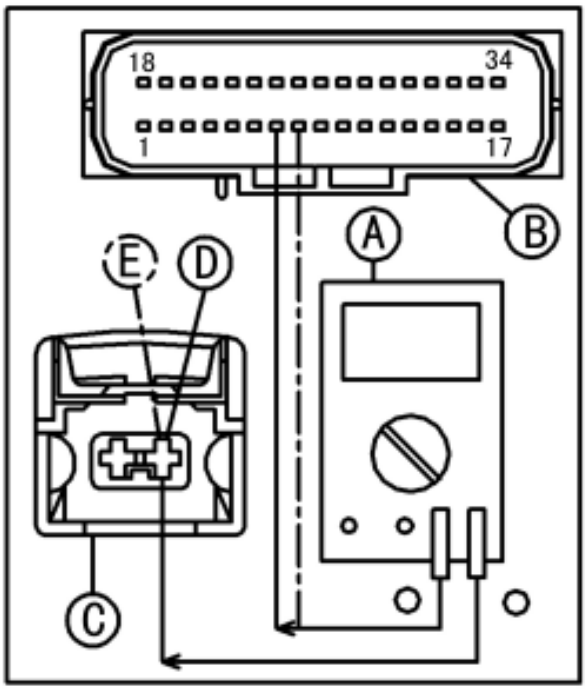
● Turn the ignition switch ON.
● Fuel fump input voltage is the battery voltage in first 3 seconds, then 0 V.
★If the output voltage is normal, perform "Injector Signal Test".
★If the meter does not read as specified, check the following:
● Main Fuse 20A fuel pump relay fuse 15A(see Fuse Inspection in the Electrical System chapter)
● Fuel Pump Relay (see Relay Circuit Inspection in the Electrical System chapter)
● Power Source Wiring (see wiring diagram below)

### Fuel Injector Wiring Inspection

● Connect a hand tester [A] to check the continuity between ECU connector [B] and fuel injector connector [C].

**Cylinder 1:**
**ECU terminal 7 ←→ Sb/W lead [D]**
**Standard: continuity**
**Cylinder 2:**
**ECU terminal 8 ←→ Sb/B lead [E]**
**Standard: continuity**

★ If the wiring is good, inspect the resistance of the injectors (see Injector Resistance Inspection).



### Fuel Injectors

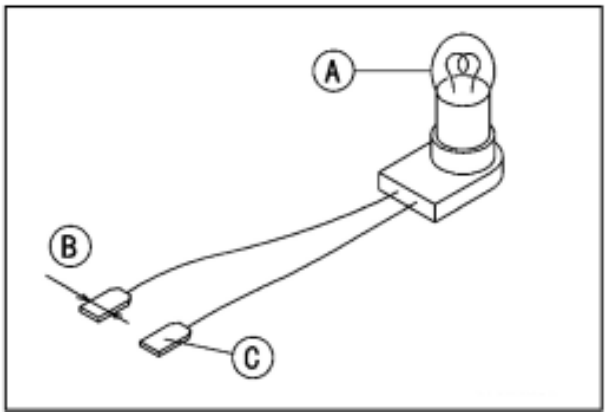
*Injector Signal Test*

● Prepare two test light sets with male terminals as shown.

**Rating of Bulb [A]: 12 V x3 ~ 3.4 W**

**Terminal Width [B]: 1.8 mm (0.071 in.)**

**Terminal Thickness [C]: 0.8 mm (0.031 in.)**




| CAUTION |
| --- |
| **Do not use larger terminals than specified above. A larger terminal could damage the injector main harness connector (female), leading to harness repair or replacement.**<br>**Be sure to connect bulbs in series. The bulb works as a current limiter to protect the solenoid in the injector from excessive current.** |

*Test Lights Wiring*

● Remove the fuel tank(see FuelTank removal).

● Remove the air filter housing (seeAir Filter Housing remval).

● Disconnect the connector of fuel injector [A].

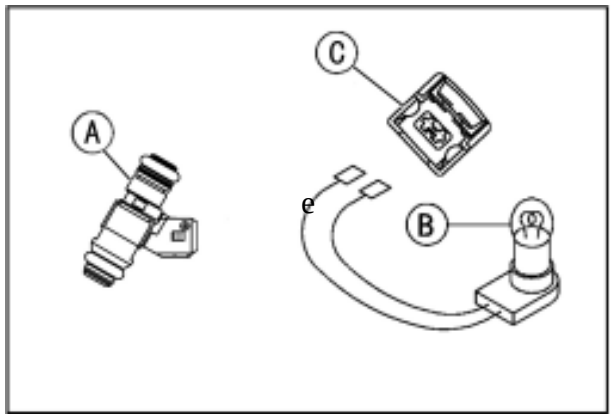
● Connect each test light set [B] to the injector sub harness connector [C].

● Turn the ignition switch ON.

● While cranking the engine with the starter motor, watch the test lights.

★ If the test lights flicker at regular intervals, the injector circuit in the ECU, and the wiring are good. Perform the "Injector Resistance Inspection". Injector signals can be also confirmed by connecting the hand tester (x10 V AC) instead of the test light set to the injector main harness (female) connector. Crank the engine with the starter motor, and check to see if the hand oscillates at regular intervals.

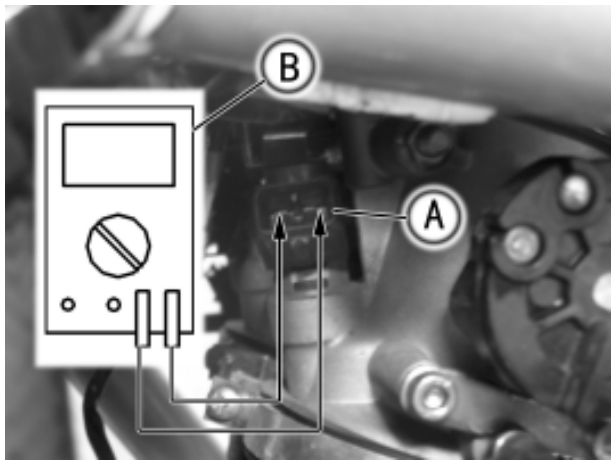
★If the test light doesn't flicker (or the tester needle doesn't oscillates), check the wiring and connectors again. If the wiring is good, check the injector voltage. If the wiring is good, inspect the ECU for its ground and power supply (see ECU Power Supply Inspection).



### Fuel Injectors

*Fuel Injector Resistance Inspection*

- Remove the fuel tank(see FuelTank Removal).
- Remove the air filter housing(seeAir Filter Housing Removal).
- Disconnect the connector from the connector [A].
- Measure the injector resistance with the hand tester [B].




**Injector Resistance:**

**Standard: 12.1 ± 1 Ω（20℃）**

★If the reading is out of the range, perform the "Injector Unit Test".

*Injector Unit Test*

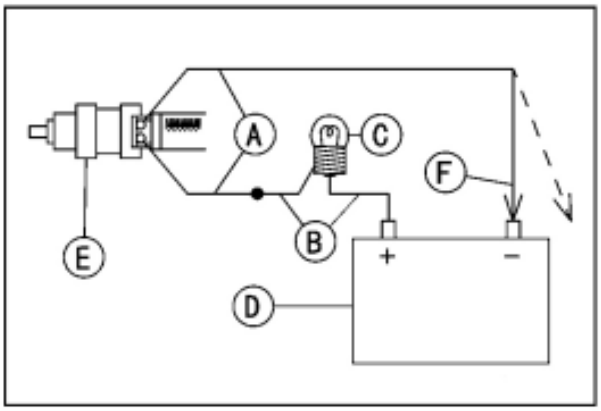
- Use two leads [A] and the same test light set [B] as in "Injector Signal Test".
  **Rating of Bulb [C]: 12 Vx (3 ~ 3.4) W**
  **12 V Battery [D]**

| CAUTION |
| --- |
| **Be sure to connect the bulb in series. The bulb works as a current limiter to protect the solenoid in the injector from excessive current.** |

- Connect the test light set to the injector [E] as shown.
- Open and connect [F] the end of the lead to the battery (-) terminal repeatedly. The injector should click.

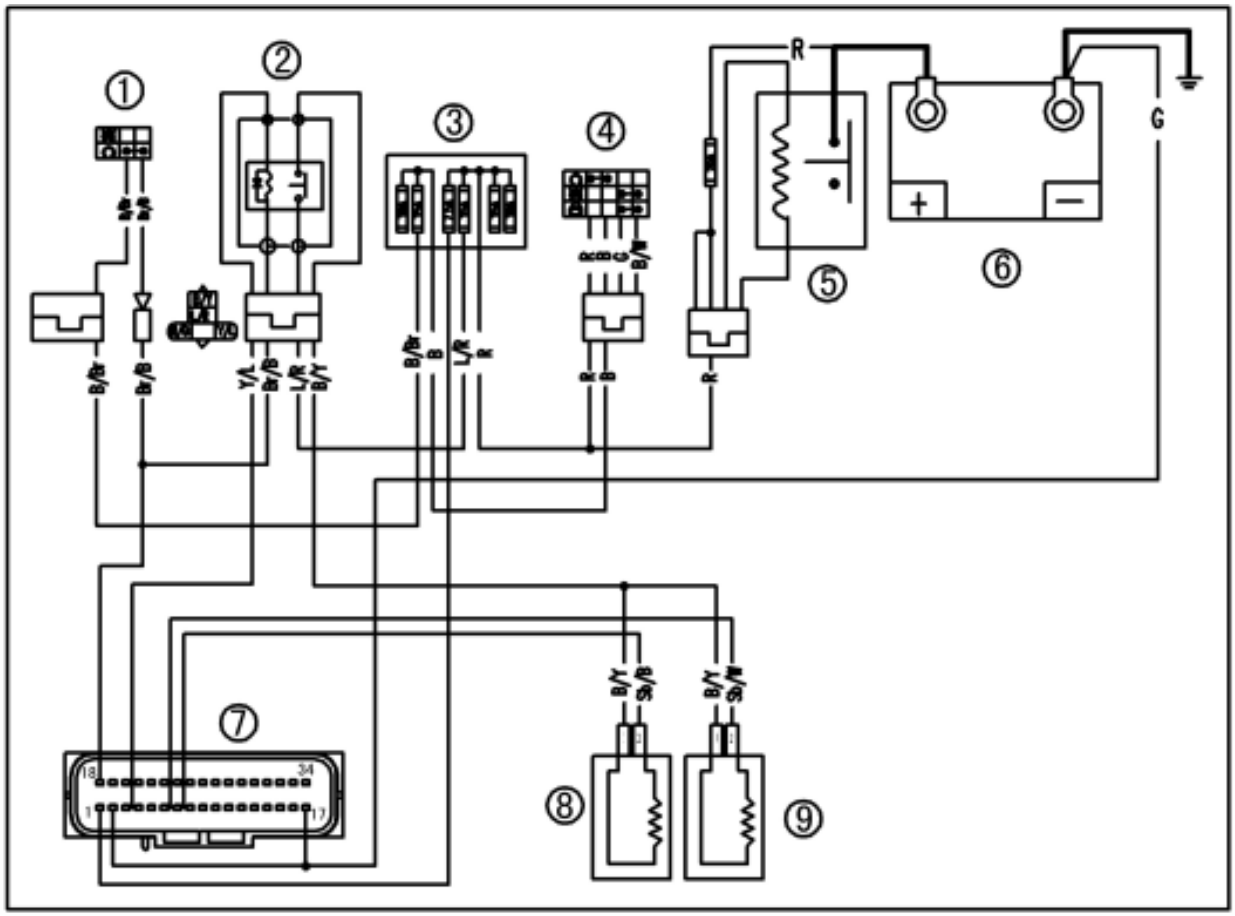
★If the injector does not click, replace the injector.

★ If the injector clicks, check the wiring again. If the wiring is good, replace the injector (may be clogged) or ECU.



### Fuel Injectors

### Fuel Injector Circuit




1. Engine Stop Switch
2: Fuel Pump Relay
3. Fuse Box
4. Ignition Switch
5. Starter Relay
6. Battery
7. ECU
8. Fuel Injector 2
9. Fuel Injector 1

### Throttle Grip and Cables

*Throttle Grip Free Play Inspection*

- Refer to the Throttle Control System Inspection in the Periodic Maintenance chapter.

*Throttle Grip Free Play Adjustment*

- Refer to the Throttle Control System Inspection in the Periodic Maintenance chapter.

*Throttle Cable Installation*

- Install the throttle cables in accordance with Cable, Wire, and Hose Routing section in the Appendix chapter.
- Install the lower ends of the throttle cables in the cable bracket on the throttle body assy after installing the upper ends of the throttle cables in the grip.
- After installation, adjust each cable properly.

**⚠ WARNING**

**Operation with incorrectly routed or improperly adjusted cables could result in an unsafe riding condition.**

*Throttle Cable Lubrication*

- Refer to the Chassis Parts Lubrication in the Periodic Maintenance chapter.

**Throttle Body Assy**

*Idle Speed Inspection*

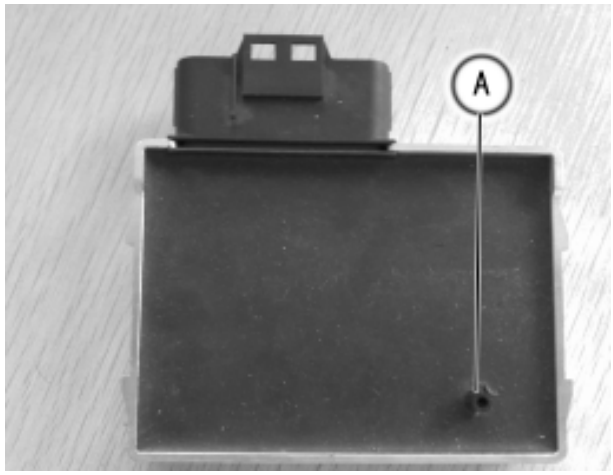
● Refer to the Idle Speed Inspection in the Periodic Maintenance chapter.

*Engine Vacuum Synchronization Inspection/ Adjustment*

● Refer to the Engine Vacuum Synchronization Inspection in the Periodic Maintenance chapter.

*High Altitude Performance Adjustment*

● Any modification is not necessary in this model since the inlet air pressure sensor[A] senses inlet air pres sure change due to high altitude and the ECU compensates the change.

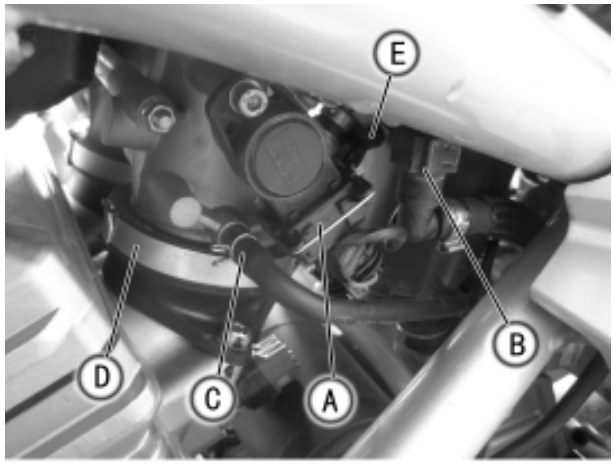


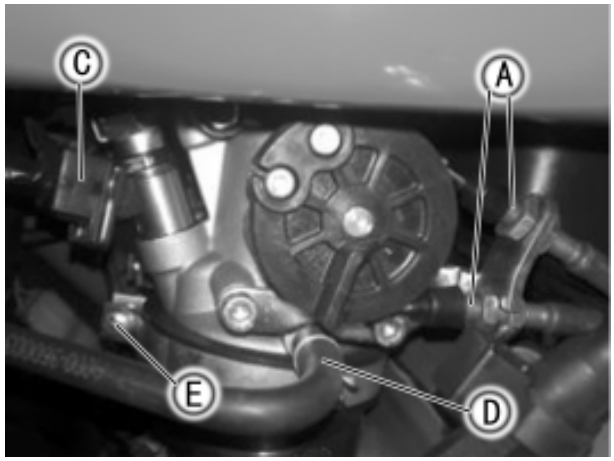

*Throttle Body Assy Removal*

**⚠ WARNING**

**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Disconnect the battery (-) cable terminal. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**
**Be prepared for fuel spillage: any spilled fuel must be completely wiped up immediately.**

● Remove:
Fuel Tank (see Fuel Tank Removal)
Air Filter Housing (see Air Filter Housing Removal)
● Disconnect:
Throttle Body Sensor Connector [A]
Fuel Hose Lower End [B]
Evaporative emission control hose [C] of cylinder 1
● Loosen:
Clamp [D] of cylinder 1
● Disconnect:
Fuel injector connector [E] of cylinder 1
Throttle cable [A] connections
● Loosen:
Clamp [B]
● Disconnect:
Fuel injector connector [C] of clinder 2
Evaporative emission control hose [D] of cylinder 2



### Throttle Body Assy

● After removing the throttle body assy, stuff pieces of lint-free, clean cloth into the throttle body holders.

**⚠ WARNING**

**If dirt gets into the engine, excessive engine wear and possible engine damage will occur.**

*Throttle Body Assy Installation*

● Istall the throttle body on the intake manifold [A].

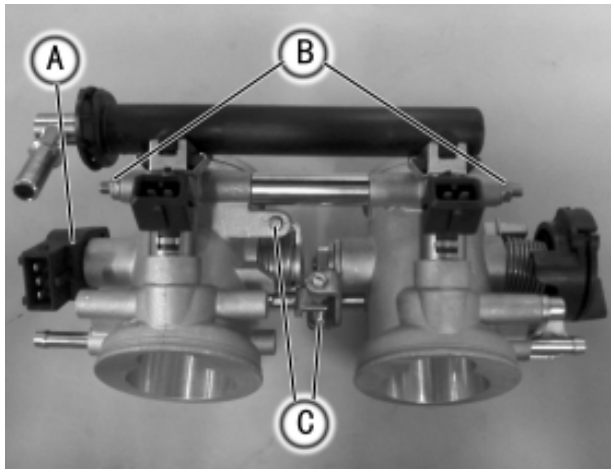
● Install the holder clamp bolts [B] in the direction shown with each bolt heads [B], facing outwards. Install the fuel injector connector, evaporative emission control hose, throttle cable, high pressure fuel line joint.


**⚠ WARNING**

**Operation with an incorrectly routed cable could result in an unsafe riding condition.**

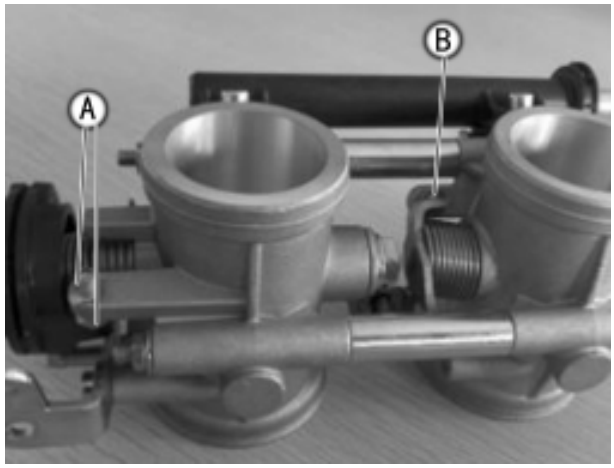
**CAUTION**

**Do not remove, disassemble or adjust the throttle position sensor [A], throttle link mechanism [B] and throttle pulley [C], because they are adjusted or set at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the throttle body assy.**




**CAUTION**

**Do not remove, disassemble or adjust the idle adjusting screw [A], [B], because they are adjusted or set at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the throttle body assy.**

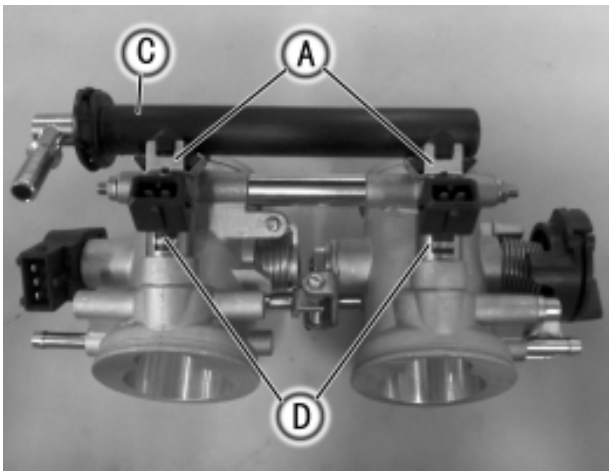


**Throttle Body Assy**

*Throttle Body Assy Disassembly*

| CAUTION |
| --- |
| **Never drop the throttle body assy , especially on a hard surface. Such a shock to the body assy can damage it.** |

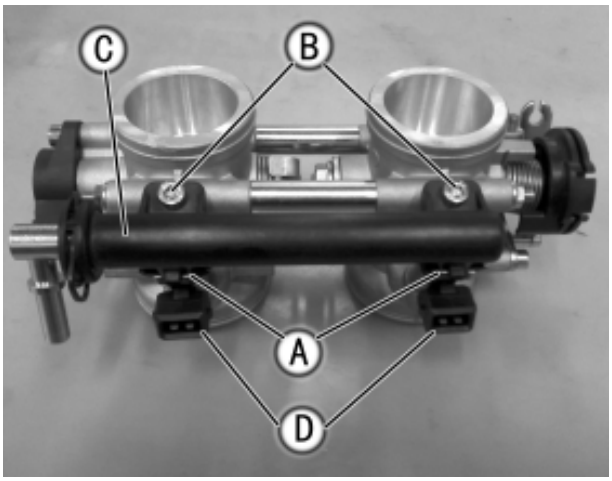
- Remove the fuel injector clamps [A].
- Remove the fuel rail bolts [B].
- Remove the fuel rail [C].
- Remove the fuel injector [D].




*Throttle Body Assy Disassembly*

- Install the fuel injector [D] and have it securely seated.
- Apply engine oil to the new O-rings of each injector
- Install the fuel rail [C].
- Install the fuel rail bolts [B].
- Install the fuel injector clamp [A].

**Fuel Rail Bolt Tightening Torque: 5~7N.m**



### Error Code Troubleshooting

○ If any error codes are checked out, do the maintenance as per error code.

| ERROR TYPE | ERROR CODE | POSSIBLE CAUSES |
|---|---|---|
| ERROR_TPS_LOW | 1 | ● TPS NOT CONNECTED<br>● TPS CALIBRATIN ERROR<br>● WIRING FAULTY [Wire that connecting PIN30 ECU to PIN2 TPS is at potential ≥ 5V] or [S.C. between Wire1 that connecting PIN32 ECU to PIN1 TPS and Wire2 that connecting PIN30 ECU to PIN2 TPS]<br>● TPS FAULTY |
| ERROR_TPS_HIGH | 2 | |
| ERROR_TEMP-ENGINE_LOW | 3 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN29 ECU to PIN1 TH2O sensor and Wire2 that connecting PIN27 ECU to PIN2 TH2O sensor or GND]<br>● TH2O SENSOR DAMAGED |
| ERROR_TEMP-ENGINE_HIGH | 4 | ● TH2O SENSOR NOT CONNECTED<br>● WIRING FAULTY [Short Circuit between Wire1 that connected PIN29 ECU to PIN1 TH2O sensor and GND].<br>● TH2O SENSOR DAMAGED |
| ERROR_TEMP-AIR_LOW | 5 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN28 ECU to PIN1 TAIR sensor and Wire2 that connecting PIN27 ECU to PIN2 TAIR sensor or GND]<br>● TAIR SENSOR DAMAGED |
| ERROR_TEMP-AIR_HIGH | 6 | ● TAIR SENSOR NOT CONNECTED<br>● WIRING FAULTY<br>● TAIR SENSOR DAMAGED |
| ERROR_PRES-AIR_LOW | 7 | ● ECU DAMAGED |
| ERROR_PRES-AIR_HIGH | 8 | |
| ERROR_VB_LOW | 9 | ● VOLTAGE REGULATOR DAMAGED<br>● WIRING FAULTY |
| ERROR_INJECTOR 1_S.C. TO VBAT | 11 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN7 ECU to PIN2 INJECTOR 1 and Wire 2 that connecting PIN87 MAIN RELAY to PIN1 INJECTOR 1]<br>● INJECTOR 1 DAMAGED |
| ERROR_INJECTOR 1_S.C. TO GND | 12 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN7 ECU to PIN2 INJECTOR 1 and GND] |
| ERROR_INJECTOR 1_O.C. | 13 | ● INJECTOR 1 NOT CONNECTED<br>● WIRING FAULTY<br>● INJECTOR 1 DAMAGED |
| ERROR_INJECTOR 2_S.C. TO VBAT | 14 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN8 ECU to PIN2 INJECTOR 2 and Wire 2 that connecting PIN87 MAIN RELAY to PIN1 INJECTOR 2]<br>● INJECTOR 2 DAMAGED |
| ERROR_INJECTOR 2_S.C. TO GND | 15 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN8 ECU to PIN2 INJECTOR 2 and GND] |

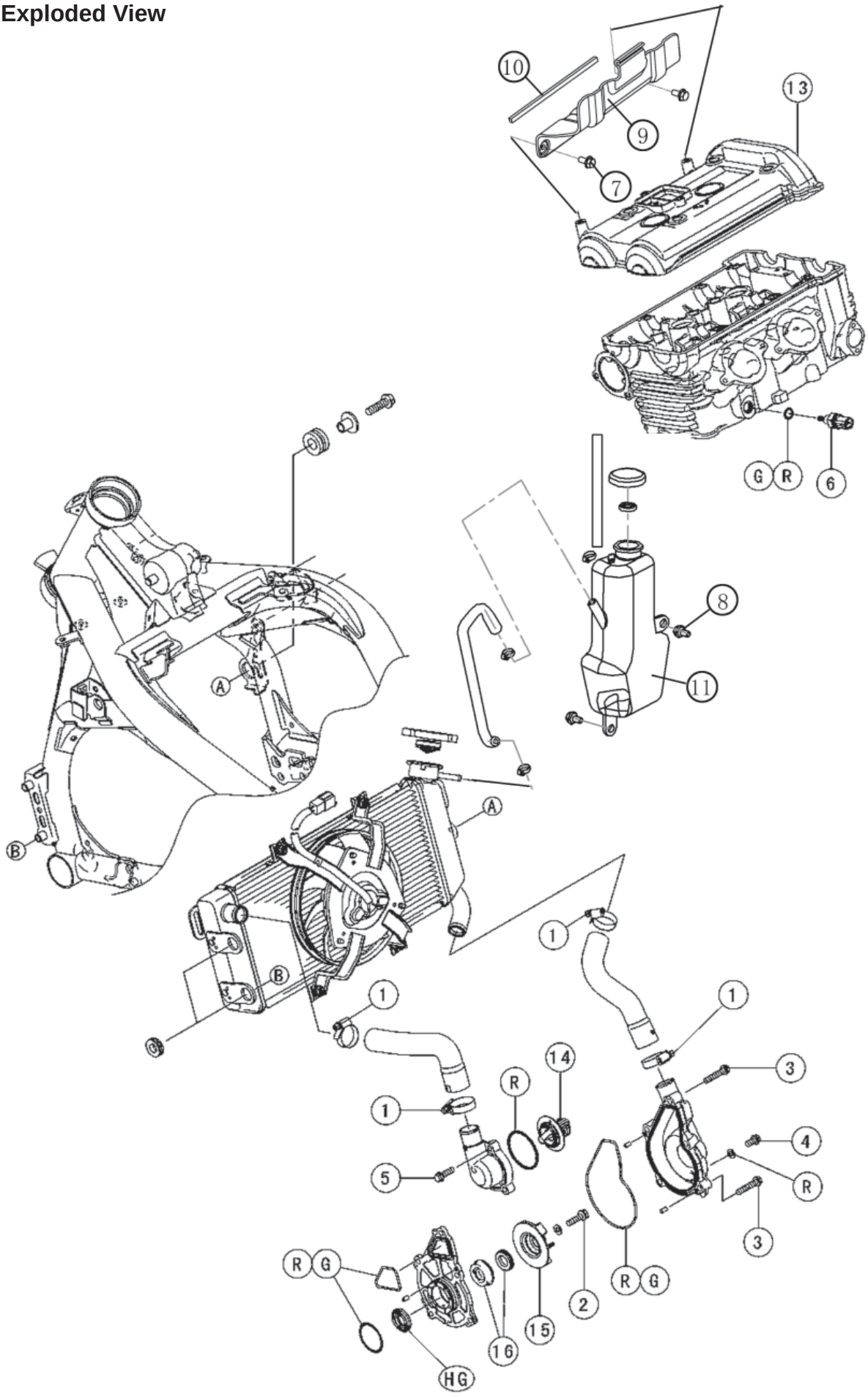
| ERROR TYPE | ERROR CODE | POSSIBLE CAUSES |
|---|---|---|
| ERROR_INJECTOR 2_O.C. | 16 | ● INJECTOR 2 NOT CONNECTED<br>● WIRING FAULTY<br>● INJECTOR 2 DAMAGED |
| ERROR_FAN_RELAY_S.C. TO VBAT | 23 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN4 ECU to PIN85 FAN RELAY and +BATTERY]<br>● FAN RELAY DAMAGED |
| ERROR_FAN_RELAY_O.C. | 25 | ● FAN RELAY NOT CONNECTED<br>● WIRING FAULTY [S.C. between Wire that connecting PIN4 ECU to PIN85 FAN RELAY and GND]<br>● FAN RELAY DAMAGED |
| ERROR_MAIN_RELAY_S.C. TO VBAT | 26 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN3 ECU to PIN85 MAIN RELAY and +BATTERY]<br>● MAIN RELAY DAMAGED |
| ERROR_MAIN_RELAY_O.C. | 28 | ● MAIN RELAY NOT CONNECTED<br>● WIRING FAULTY [S.C. between Wire1 that connecting PIN3 ECU to PIN85 MAIN RELAY and GND]<br>● MAIN RELAY DAMAGED |
| ERROR_ENABLE START RELAY_S.C. TO VBAT | 29 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN5 ECU to PIN85 ENABLE START RELAY and +BATTERY]<br>● ENABLE START RELAY DAMAGED |
| ERROR_DLAMP_S.C. TO VBAT | 35 | ● WIRING FAULTY [S.C. between Wire1 that connecting PIN6 ECU to DLAMP and +BATTERY]<br>● DLAMP DAMAGED |
| ERROR_DLAMP_O.C. | 37 | ● DLAMP NOT CONNECTED<br>● WIRING FAULTY [S.C. between Wire1 that connecting PIN6 ECU to DLAMP and GND]<br>● DLAMP DAMAGED |
| ERROR_LAMBDA 1 | 47 | ● LAMBDA 1 SENSOR DAMAGED<br>● LAMBDA 1 SENSOR NOT CONNECTED<br>● WIRING FAULTY [S.C. between Wire 1 that connecting PIN22 ECU to PIN1 LAMBDA 1 and Wire 2 that connecting PIN21 ECU to PIN2 LAMBDA 1 or GND] |
| ERROR_LAMBDA 2 | 48 | ● LAMBDA 2 SENSOR DAMAGED<br>● LAMBDA 2 SENSOR NOT CONNECTED<br>● WIRING FAULTY [S.C. between Wire 1 that connecting PIN23 ECU to PIN1 LAMBDA 2 and Wire 2 that connecting PIN21 ECU to PIN2 LAMBDA 2 or GND] |

| ERROR TYPE | ERROR CODE | POSSIBLE CAUSES |
|---|---|---|
| ERROR_SAFETY-SWITCH_0 | 49 | ● ROLL OVER SENSOR NOT CONNECTED<br>● ROLL OVER SENSOR DAMAGED<br>● WIRING FAULTY [Wire1 that connecting PIN31 ECU to PIN1 ROLL OVER SENSOR is at potential ≥ 5V] |
| ERROR_SAFETY-SWITCH_1 | 50 | ● ROLL OVER SENSOR IN ON CONDITION (WORK)<br>● ROLL OVER SENSOR DAMAGED<br>● WIRING FAULTY [S.C. between Wire1 that connecting PIN31 ECU to PIN1 ROLL OVER SERNSOR and Wire2 that connecting PIN27 ECU to PIN2 ROLL OVER SENSOR or GND] |
| ERROR_PICK-UP_O.C. | 53 | ● PICK-UP NOT CONNECTED<br>● PICK-UP DAMAGED |
| ERROR_PICK-UP | 54 | ● PICK-UP DAMAGED<br>● WIRING FAULTY [INVERTED WIRES]<br>● N° TOOTH PHONIC WHEEL NOT CORRECT<br>● GAP PICK UP NOT CORRECT |
| ERROR_IGNITION COIL 1 | 55 | ● IGNITION COIL 1 NOT CONNECTED<br>● IGNITION COIL 1 DAMAGED<br>● DISCHARGE BATTERY<br>● WIRING FAULTY |
| ERROR_IGNITION COIL 2 | 56 | ● IGNITION COIL 2 NOT CONNECTED<br>● IGNITION COIL 2 DAMAGED<br>● DISCHARGE BATTERY<br>● WIRING FAULTY |

# Cooling System

## Table of Contents

## Exploded View



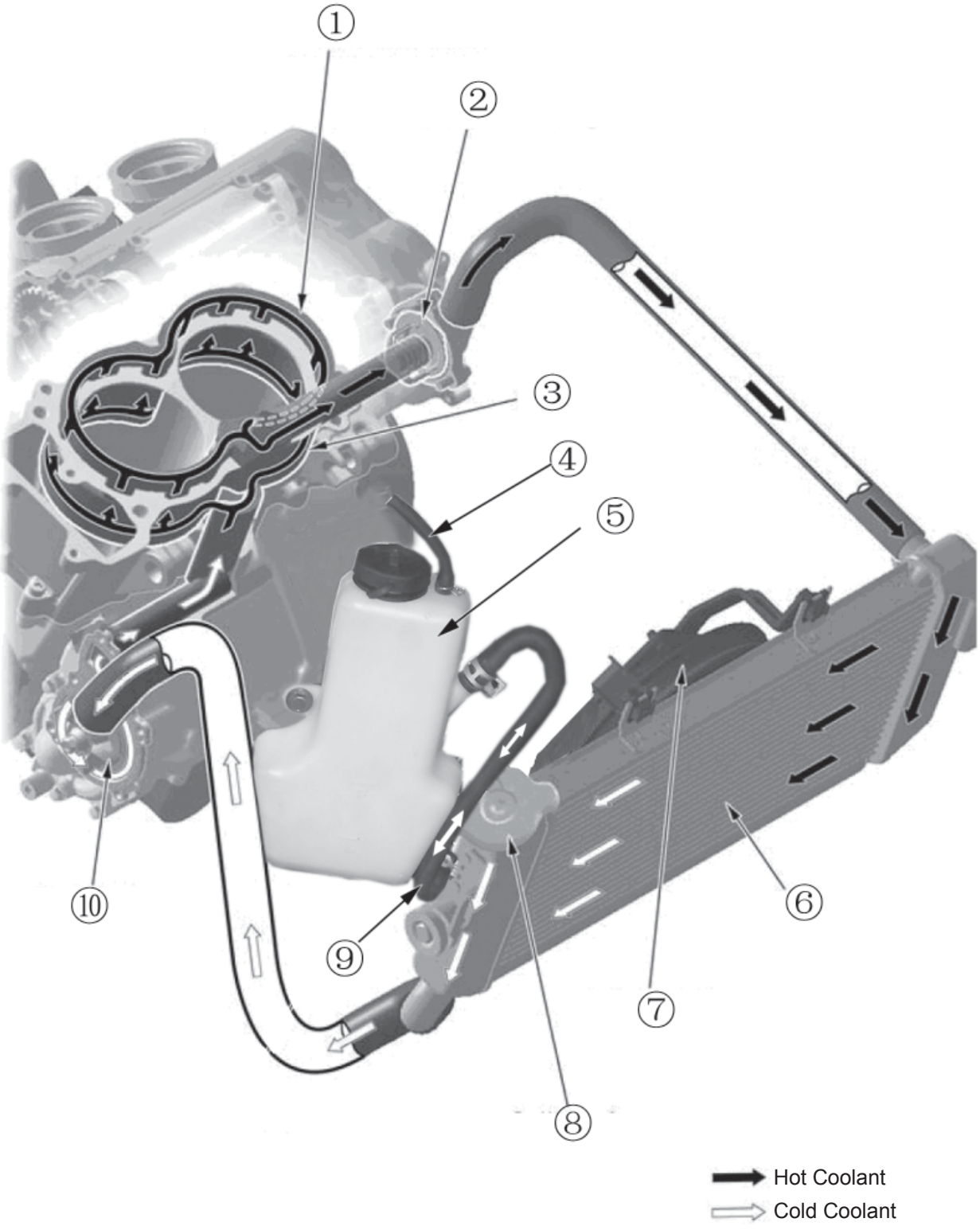
## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Radiator Hose Clamp Screws | 2.0 | 0.20 | 17 in·lb | |
| 2 | Water Pump Impeller Bolt | 9.8 | 1.0 | 87 in·lb | |
| 3 | Water Pump Cover Bolts | 9.8 | 1.0 | 87 in·lb | |
| 4 | Water Pump Drain Bolt | 7.0 | 0.70 | 62 in·lb | |
| 5 | Thermostat Housing Bolts | 9.8 | 1.0 | 87 in·lb | |
| 6 | Coolant Temperature Sensor | 12 | 1.2 | 106 in·lb | |
| 7 | Baffle Plate Bolts | 5.9 | 0.60 | 52 in·lb | L |
| 8 | Baffle Plate Bolts | 5.9 | 0.60 | 52 in·lb | |

9. Fairing
10. Seal Plate
11. Reserve Tank
12. Baffle Plate
13. Cylinder Head Cover
14. Thermostat
15. Water Pump Impeller
16. Mechanical Seal

G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

## Coolant Flow Chart



## Coolant Flow Chart

Permanent type antifreeze is used as a coolant to protect the cooling system from rust and corrosion. When the engine starts, the water pump turns and the coolant circulates.
The thermostat is a wax pellet type which opens or closes with coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is below 80.5 ~ 83.5°C (177 ~ 182°F), the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is more than 80.5 ~ 83.5°C, the thermostat opens and the coolant flows. When the coolant temperature goes up beyond 93 ~ 103°C (199 ~ 217°F), the radiator fan relay conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the temperature is below 91°C (196°F) ~ temperature less than ON temperature, the fan relay opens and the radiator fan stops.
In this way, this system controls the engine temperature within narrow limits where the engine operates most efficiently even if the engine load varies.
The system is pressurized by the radiator cap to suppress boiling and the resultant air bubbles which can cause engine overheating. As the engine warms up, the coolant in the radiator and the water jacket expands. The excess coolant flows through the radiator cap and hose to the reserve tank to be stored there temporarily. Conversely, as the engine cools down, the coolant in the radiator and the water jacket contracts, and the stored coolant flows back to the radiator from the reserve tank.
The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 112.3 ~ 141.7 kPa (1.15 ~ 1.45 kgf/cm², 16.3 ~ 20.5 psi), the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 112.3 ~ 141.7 kPa (1.15 ~ 1.45 kgf/cm², 16.3 ~ 20.5 psi). When the engine cools down, another small valve (vacuum valve) in the cap opens. As the coolant cools, the coolant contracts to form a vacuum in the system. The vacuum valve opens and allows the coolant from the reserve tank to enter the radiator.

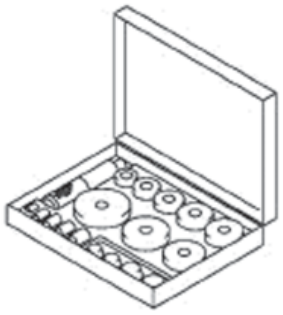
# 4-6 COOLING SYSTEM

## Specifications

| Item | Standard |
|---|---|
| **Coolant Provided when Shipping** | |
| Type (Recommended) | Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators) |
| Color | Green |
| Mixed Ratio | Soft water 50%, coolant 50% |
| Freezing Point | -35°C (-31°F) |
| Total Amount | 1.2 L (1.3 US qt) (reserve tank full level, including radiator and engine) |
| Radiator Cap | |
| Relief Pressure | 112.3 ~ 141.7 kPa (1.15 ~ 1.45 kgf/cm², 16.3 ~ 20.5 psi) |
| Thermostat | |
| Valve Opening Temperature | 80.5 ~ 83.5°C (177 ~ 182°F) |
| Valve Full Opening Lift | 8 mm (0.31 in.) or more at 95°C (203°F) |

## Special Tools

Bearing Driver Set

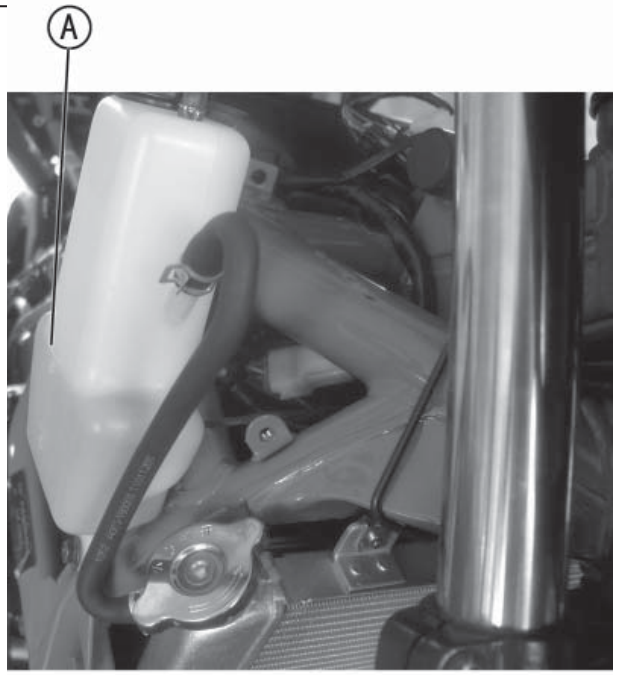


Oil Seal Driver

## Coolant

*Coolant Deterioration Inspection*

● Remove the right center fairing (see Center Fairing Removal in the Frame chapter).
● Visually inspect the coolant [A] in the reserve tank.
★If whitish cotton-like wafts are observed, aluminum parts in the cooling system are corroded. If the coolant is brown, iron or steel parts are rusting. In either case, flush the cooling system.
★If the coolant gives off an abnormal smell, check for a cooling system leak. It may be caused by exhaust gas leaking into the cooling system.




*Coolant Level Inspection*

● Refer to the Coolant Level in the Periodic Maintenance chapter.

*Coolant Draining*

● Refer to the Coolant Change in the Periodic Maintenance chapter.

*Coolant Filling*

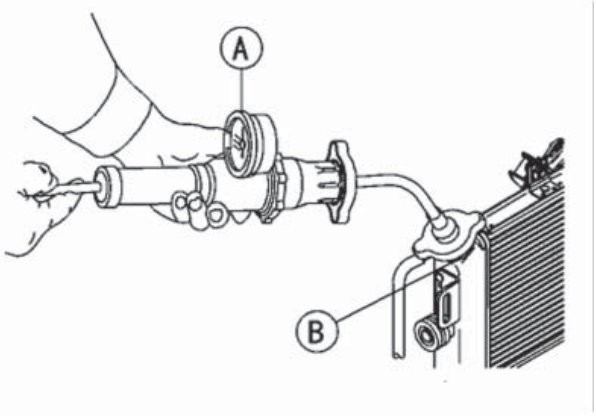
● Refer to the Coolant Change in the Periodic Maintenance chapter.

*Pressure Testing*

● Remove the reserve tank (see Coolant Change in the Periodic Maintenance chapter).
● Remove the radiator cap, and install a cooling system pressure tester [A] on the filler neck [B].

**NOTE**

○ *Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.*




● Build up pressure in the system carefully until the pressure reaches 141.7 kPa (1.45 kgf/cm², 20.5 psi).

| CAUTION |
| --- |
| **During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 141.7 kPa (1.45 kgf/cm², 20.5 psi).** |

● Watch the gauge for at least 6 seconds.
★If the pressure holds steady, the system is all right.
★If the pressure drops and no external source is found, check for internal leaks. Droplets in the engine oil indicate internal leakage. Check the cylinder head gasket and the water pump.
● Remove the pressure tester, replenish the coolant, and install the radiator cap.

## Coolant

*Cooling System Flushing*

Over a period of time, the cooling system accumulates rust, scale, and lime in the water jacket and radiator. When this accumulation is suspected or observed, flush the cooling system. If this accumulation is not removed, it will clog up the water passage and considerable reduce the efficiency of the cooling system.

- Drain the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Fill the cooling system with fresh water mixed with a flushing compound.

| CAUTION |
| --- |
| **Do not use a flushing compound which is harmful to the aluminum engine and radiator. Carefully follow the instructions supplied by the manufacturer of the cleaning product.** |

- Warm up the engine, and run it at normal operating temperature for about ten minutes.
- Stop the engine, and drain the cooling system.
- Fill the system with fresh water.
- Warm up the engine and drain the system.
- Repeat the previous two steps once more.
- Fill the system with a permanent type coolant and bleed the air from the system (see Coolant Change in the Periodic Maintenance chapter).

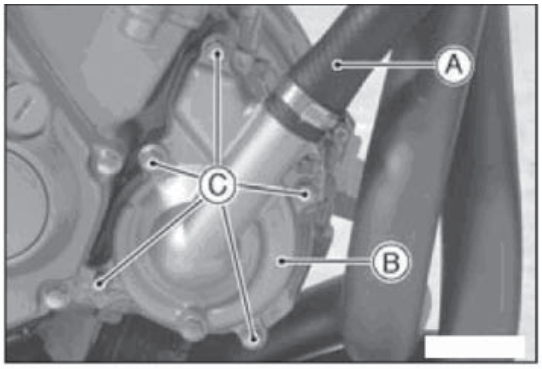
*Coolant Reserve Tank Removal/Installation*

- The coolant reserve tank is removed and installed during coolant change (see Coolant Change in the Periodic Maintenance chapter).

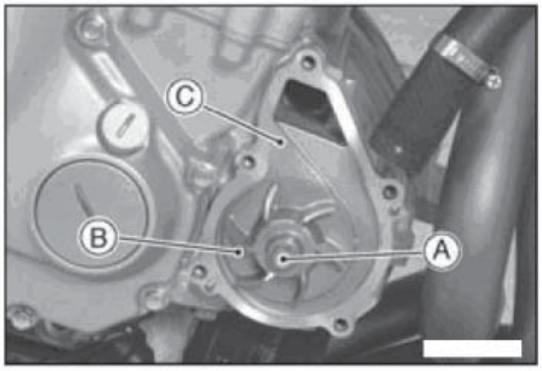
## Water Pump

*Water Pump Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Loosen the clamp and remove the radiator hose [A] from the water pump cover [B].
- Remove the water pump cover bolts [C].

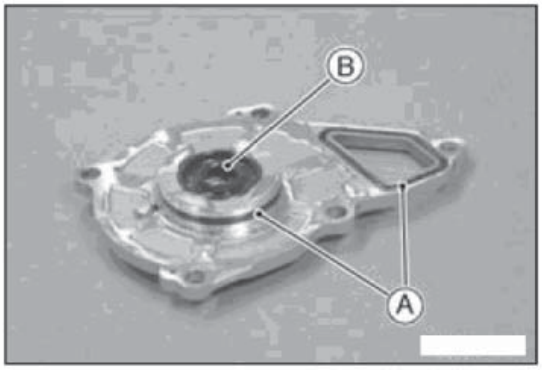



- Shift the transmission into 1st gear.
- While applying the rear brake, remove the water pump impeller bolt [A].
- Remove:
  Impeller [B]
  Water Pump Housing [C]

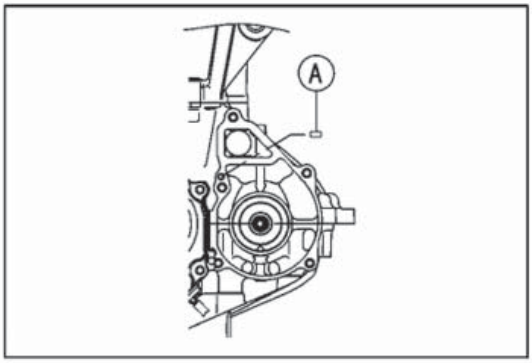



*Water Pump Installation*

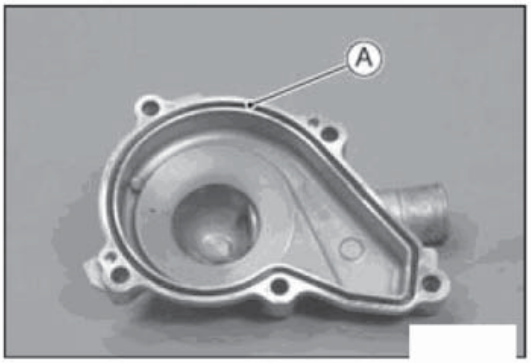
- When installing the water pump impeller bolt, shift the transmission into 1st gear and apply the rear brake.
- Replace the O-rings [A] on the water pump housing with new ones and apply grease them.
- Apply high-temperature grease to the lips of the water pump housing oil seal [B].




- Be sure that the dowel pin [A] is in position.
- Install the water pump housing.
- Tighten:
  **Torque - Water Pump Impeller Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



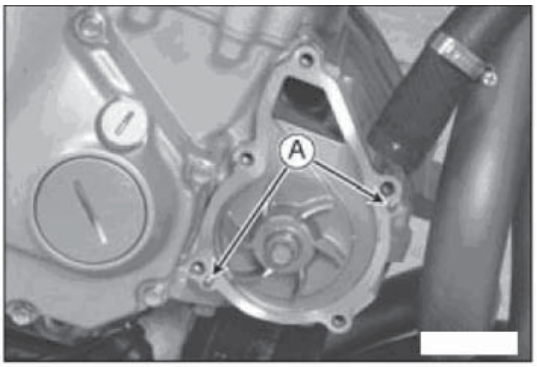

- Replace the O-ring [A] on the water pump cover with a new one and grease it.



## Water Pump

● Install the water pump cover, being careful of the two dowel pins [A].

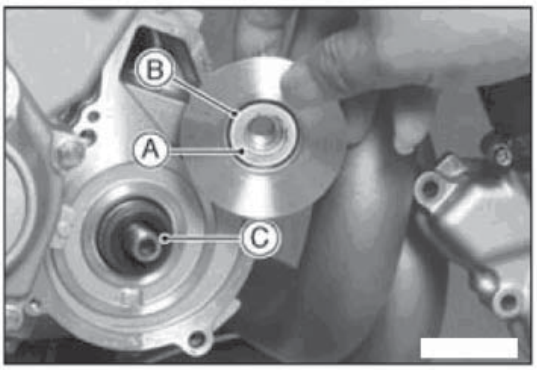
**Torque - Water Pump Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**




*Mechanical Seal Inspection*

● Visually inspect the mechanical seal.
If any one of the parts is damaged, replace the mechanical seal as a unit.

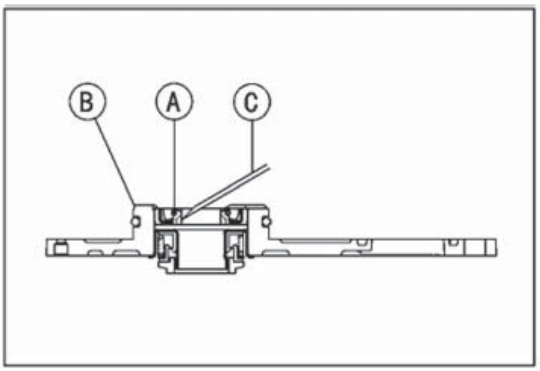
○ The sealing seat and rubber seal may be removed easily by hand.
Impeller Sealing Seat Surface [A]
Rubber Seal [B]
Mechanical Seal Diaphragm [C]



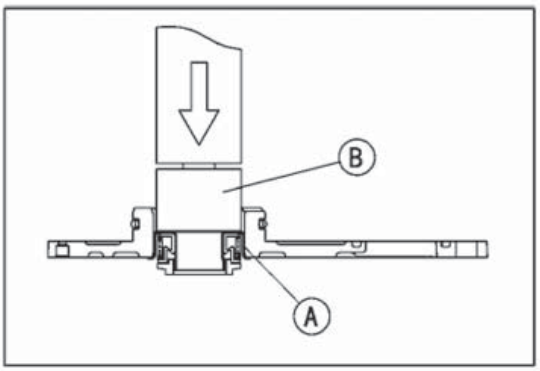

*Water Pump Housing Disassembly*

| CAUTION |
| --- |
| **Be careful not to damage the sealing surface of the mechanical seal.** |

● Take the oil seal [A] out of the housing [B] with a hook [C].




● Press the mechanical seal [A] out of the housing with a bearing driver [B].
**Special Tool - Bearing Driver Set**

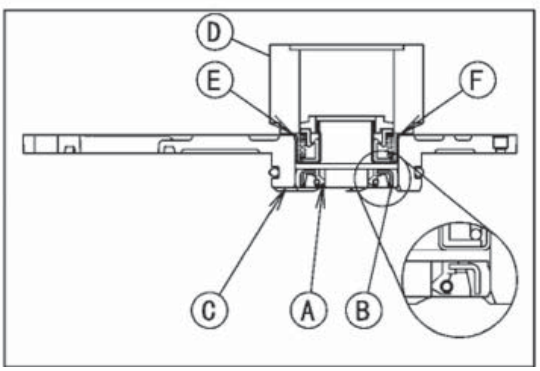



*Water Pump Housing Assembly*

● Apply high-temperature grease [A] to the new oil seal [B].

● Press the oil seal into the housing with a bearing driver so that the seal surface is flush [C] with the end of the hole.

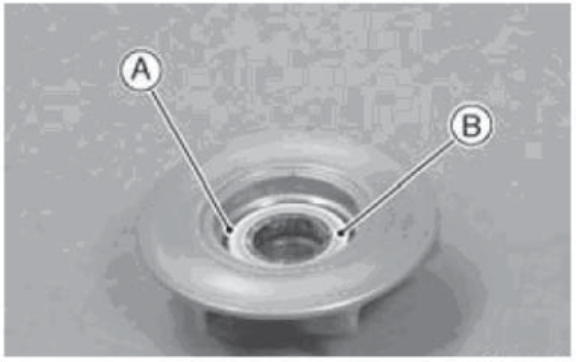
● Press the new mechanical seal into the housing with the oil seal driver [D] until its flange [E] touches the surface [F] of the housing.
**Special Tool - Oil Seal Driver**



## Water Pump

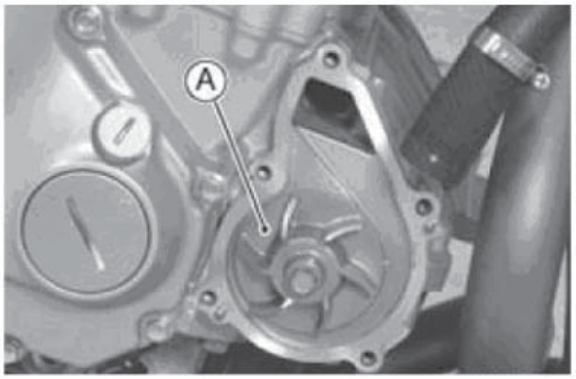
*Impeller Assembly*

- Clean the sliding surface of the mechanical seal with a high-flash point solvent, and apply a little coolant to the sliding surface to give the mechanical seal initial lubrication.
- Apply coolant to the surfaces of the rubber seal [A] and sealing seat [B], and install the rubber seal and sealing seat into the impeller by pressing them by hand until the seat stops at the bottom of the hole.




*Pump Impeller Inspection*

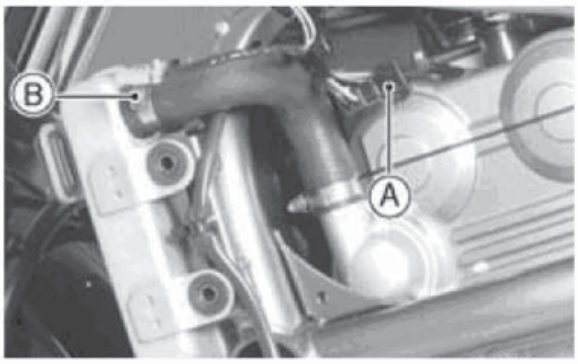
- Visually check the impeller [A].
  If the surface is corroded, or if the blades are damaged,replace the impeller (see Water Pump Removal).



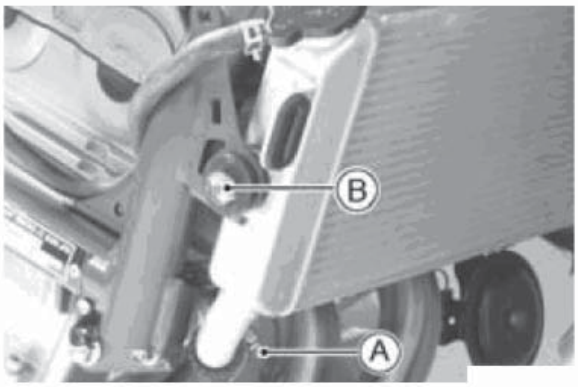
## Radiator

*Radiator and Radiator Fan Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Center Fairings (see Center Fairing in the Frame chapter)
  Reserve Tank (see Coolant Change in the PeriodicMaintenance chapter)
  Radiator Fan Motor Connector [A] (Disconnect)
  Radiator Hose Clamp Screw [B] (Loosen)

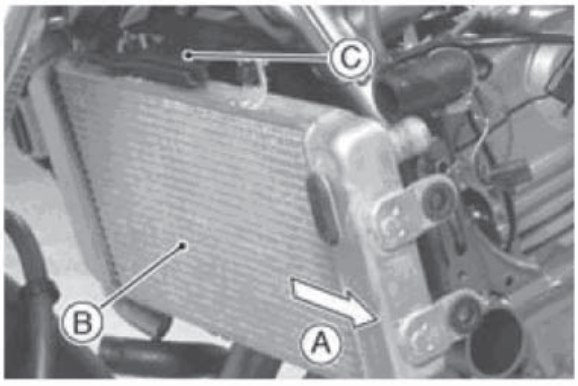



- Loosen:
  Radiator Hose Clamp Screw [A]
- Remove:
  Radiator Bolt [B]

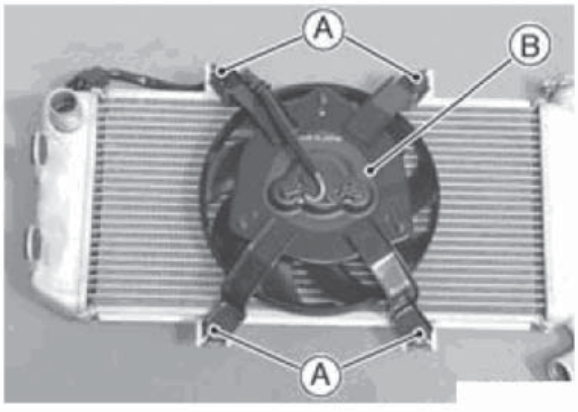



- Pull [A] the radiator [B] toward the left, noting the baffle plate [C] on the cylinder head cover.

| CAUTION |
| --- |
| **Do not touch the radiator core. This could damage the radiator fins, resulting in loss of cooling efficiency.** |



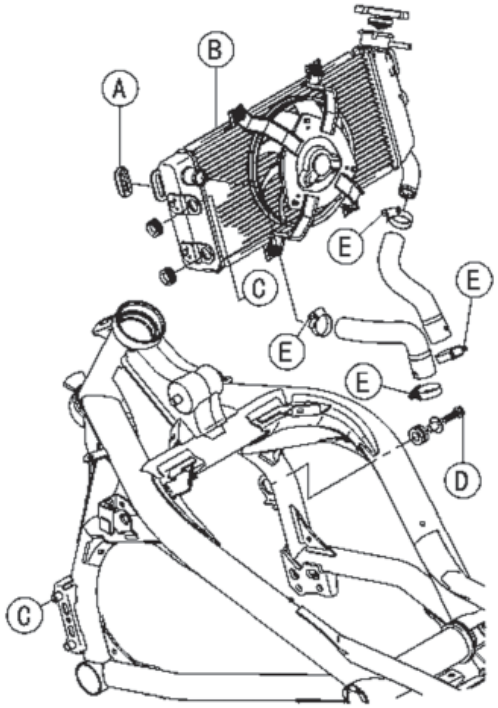

- If necessary, remove:
  Radiator Fan Mounting Bolts [A]
  Radiator Fan [B]



## Radiator

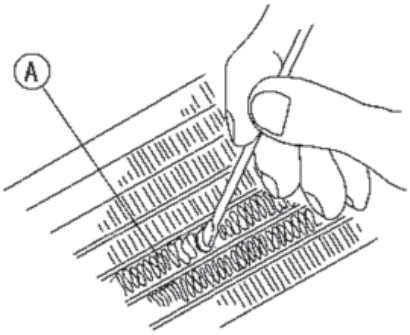
*Radiator and Radiator Fan Installation*

- Install the grommets [A] so that its large side faces the front.
- Install the radiator [B] to the frame.
- ○ Align [C] the projection on the frame with the hole on the radiator.
- ○ Tighten the radiator bolt [D].
- ○ Note the baffle plate on the cylinder head cover when installing the radiator.
- ○ Position the radiator hose clamp screws [E] as shown.

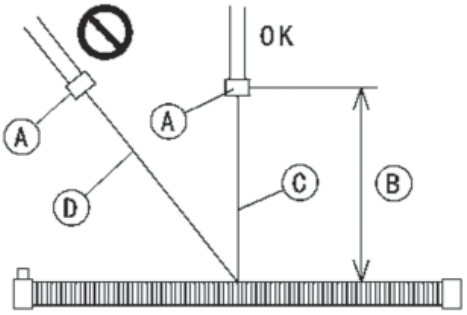



*Radiator Inspection*

- Check the radiator core.
  If there are obstructions to air flow, remove them.
  If the corrugated fins [A] are deformed, carefully straighten them.
  If the air passages of the radiator core are blocked more than 20% by unremovable obstructions or irreparably deformed fins, replace the radiator with a new one.

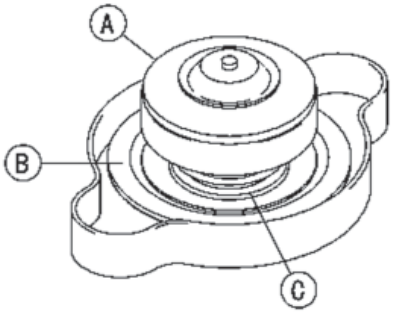



| CAUTION |
| --- |
| **When cleaning the radiator with steam cleaner, be careful of the following to prevent radiator damage: Keep the steam gun [A] away more than 0.5 m (1.6 ft) [B] from the radiator core. Hold the steam gun perpendicular [C] (not oblique [D]) to the core surface. Run the steam gun, following the core fin direction.** |



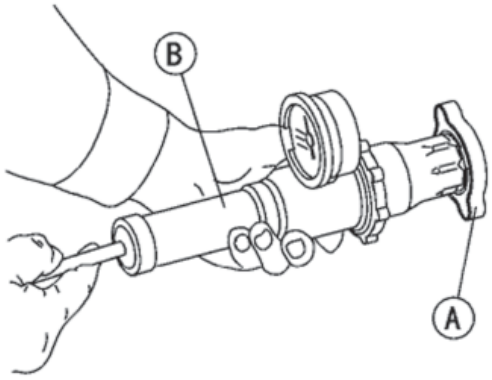

*Radiator Cap Inspection*

- Remove:
  Reserve Tank (see Coolant Change in the Periodic Maintenance chapter)
  Radiator Cap
- Check the condition of the bottom [A] and top [B] valve seals and valve spring [C].
  If any one of them shows visible damage, replace



## Radiator

● Install the cap [A] on a cooling system pressure tester [B].




**NOTE**

○ *Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.*

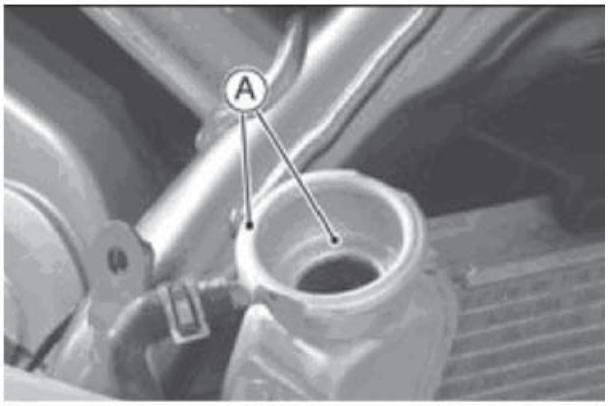
● Watching the pressure gauge, pump the pressure tester to build up the pressure until the relief valve opens: the gauge needle flicks downward. Stop pumping and measure leak time at once. The relief valve must open within the specified range in the table below and the gauge hand must remain within the same range at least 6 seconds.

**Radiator Cap Relief Pressure**
**Standard: 112.3 ~ 141.7 kPa (1.15 ~ 1.45 kgf/cm², 16.3 ~ 20.5 psi)**

If the cap can not hold the specified pressure or if it holds too much pressure, replace it with a new one.

*Radiator Filler Neck Inspection*

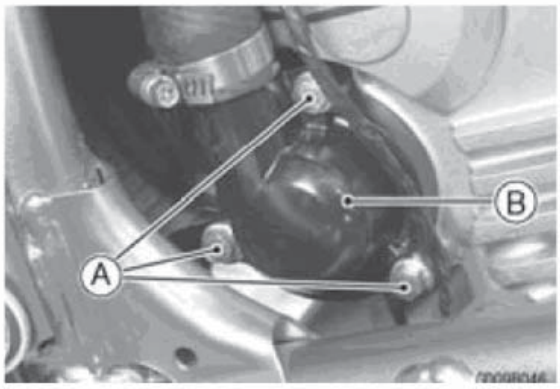
● Remove the reserve tank (see Coolant Change in the Periodic Maintenance chapter).
● Remove the radiator cap.
● Check the radiator filler neck for signs of damage.
● Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.



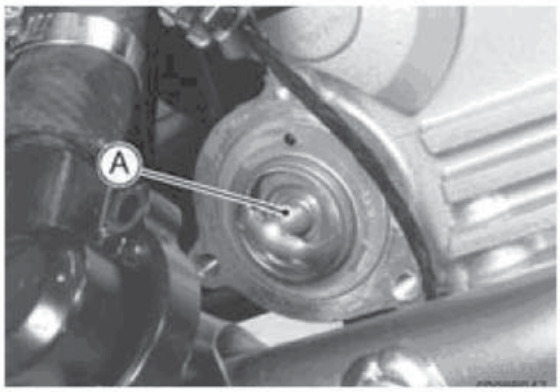
## Thermostat

*Thermostat Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Left Center Fairing (see Center Fairing Removal in the Frame chapter)
  Thermostat Hosing Bolts [A]
  Thermostat Hosing [B]




- Pull the thermostat [A] out of the cylinder head.

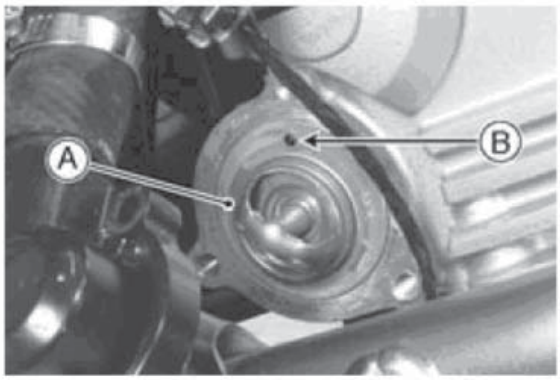



*Thermostat Installation*

- Install the thermostat [A] in the cylinder head so that the air bleeder hole [B] is on top.
- Install a new O-ring into the housing and apply grease it.
- Tighten:

  **Torque - Thermostat Hosing Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

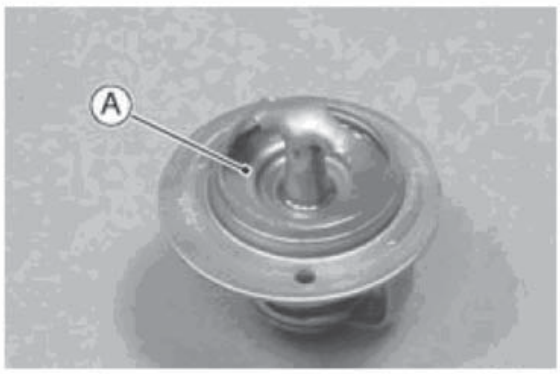
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).




*Thermostat Inspection*

- Remove the thermostat, and inspect the thermostat valve [A] at room temperature.

★If the valve is open, replace the thermostat with a new one



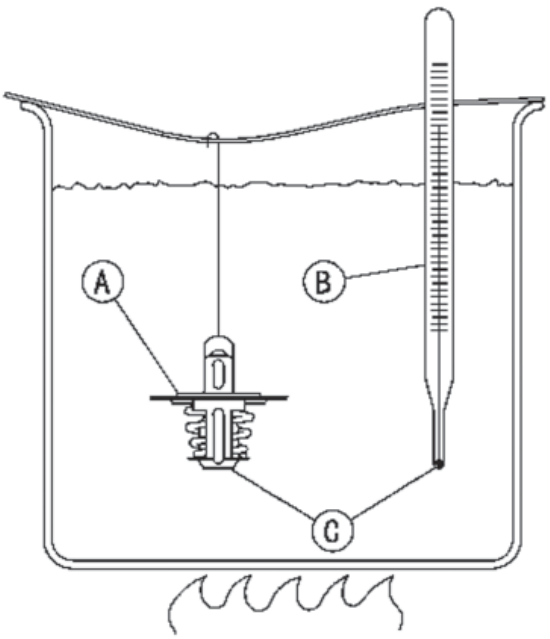
## Thermostat

● To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.

○ The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water so that the heat sensitive portions [C] are located in almost the same depth. It must not touch the container, either.

★If the measurement is out of the specified range, replace the thermostat with a new one.

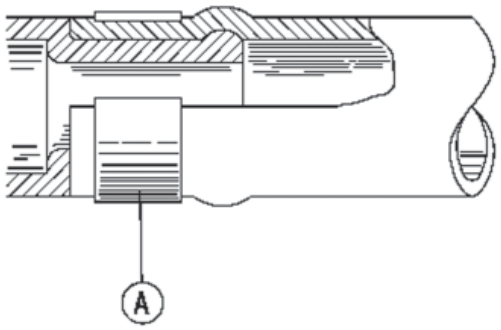
**Thermostat Valve Opening Temperature**
**80.5 ~ 83.5°C (177 ~ 182°F)**



## Hose and Pipes

*Hose Installation*

- Install the hoses and pipes, being careful to follow bending direction. Avoid sharp bending, kinking, flattening or twisting.
- Run the hoses (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the clamp [A] as near as possible to the hose end to clear the raised rib of the fitting. This will prevent the hoses from working loose.
  - The clamp screws should be positioned correctly to prevent the clamps from contacting the other parts.




**Torque - Radiator Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 17 in·lb)**

*Hose Inspection*

- Refer to the Radiator Hose Damage and Installation Condition Inspection in the Periodic Maintenance chapter.

## Coolant Temperature Sensor

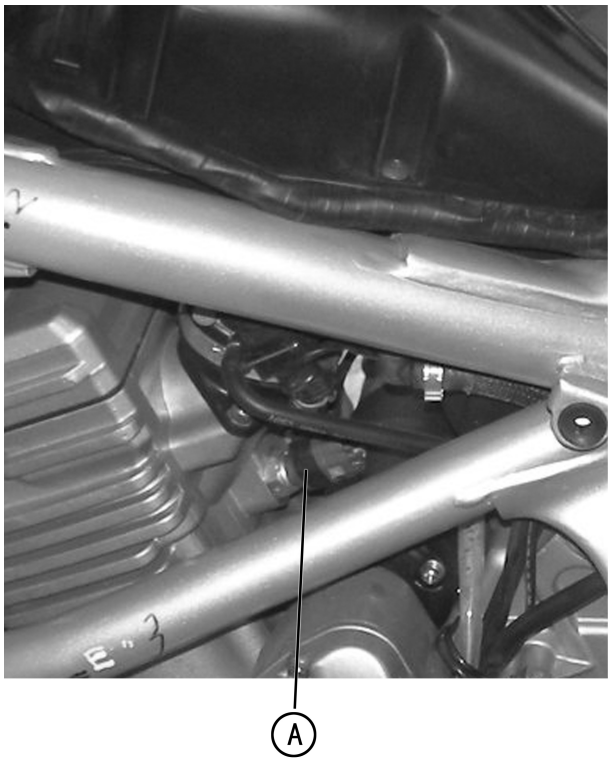
| CAUTION |
| --- |
| **The coolant temperature sensor should never be allowed to fall on a hard surface. Such a shock to the water temperature sensor can damage it.** |

*Coolant Temperature Sensor Removal/ Installation*

- Refer to the Water Temperature Sensor Removal/ Installation in the Fuel System (EFI) chapter. Coolant Temperature Sensor [A]

*Coolant Temperature Sensor Inspection*

- Refer to the Water Temperature Sensor Inspection in the Electrical System chapter.



# Engine Top End

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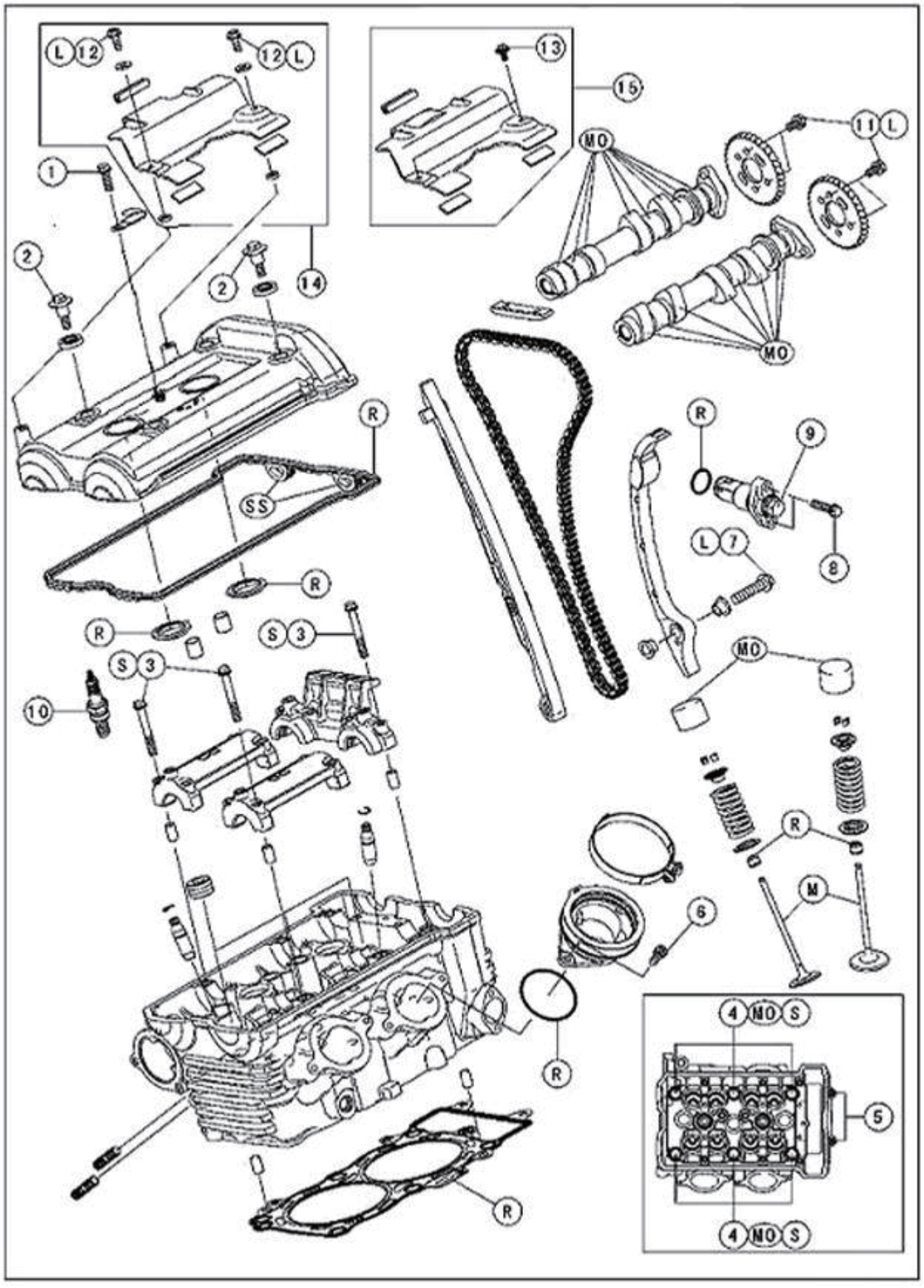
## Exploded View



| Item | Fastner | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Air Suction Valve Cover Bolts | 10 | 1.0 | 87 in·lb | |
| 2 | Cylinder Head Cover Bolts | 10 | 1.0 | 87 in·lb | |
| 3 | Camshaft Cap Bolts | 12 | 1.2 | 106 in·lb | S |
| 4 | Cylinder Head Bolts (M10 New Bolts) | 54 | 55 | 40 | MO,S |
| | Cylinder Head Bolts (M10 Used Bolts) | 49 | 50 | 36 | MO,S |
| 5 | Cylinder Head Bolts (M6) | 12 | 1.2 | 106 in·lb | S |
| 6 | Throttle Body Holder Bolts | 12 | 1.2 | 106 in·lb | |
| 7 | Camshaft Chain Guide Bolts | 20 | 2.0 | 15 | L |
| 8 | Camshaft Chain Tensioner Mounting Bolts | 10 | 1.0 | 87 in·lb | |
| 9 | Tensioner Nut | 20 | 2.0 | 15 | |
| 10 | Spark plug | 15 | 1.5 | 11 | |
| 11 | Camshaft Sprocket Bolts | 15 | 1.5 | 11 | L |
| 12 | Baffle Plate Bolts | 6 | 0.60 | 52 in·lb | L |
| 13 | Baffle Plate Bolts | 6 | 0.60 | 52 in·lb | |

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

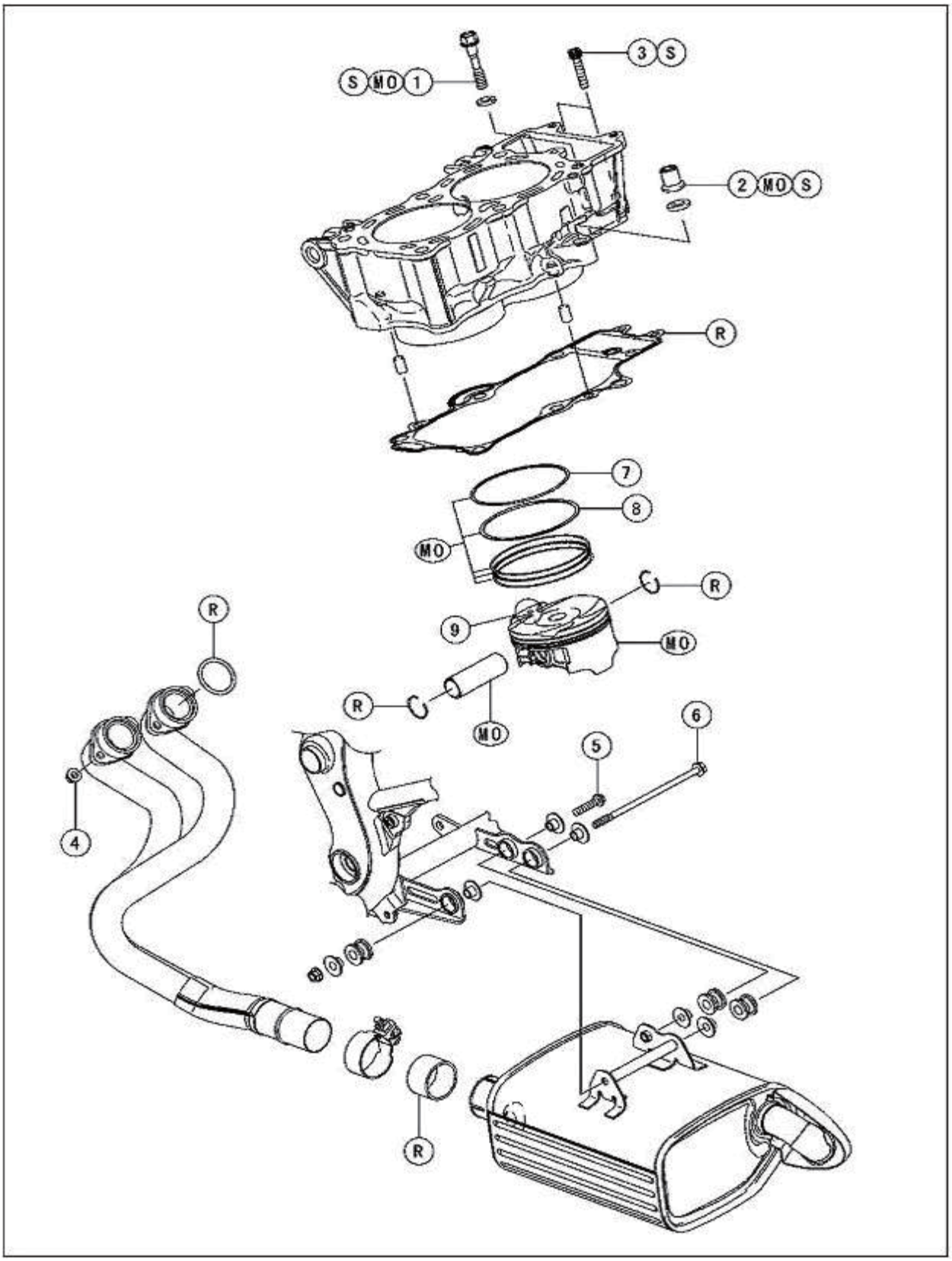
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)

R: Replacement Parts

S: Follow the specified tightening sequence.

SS:Apply silicone sealant.

## Exploded View



| Item No. | Fastner | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Cylinder Bolt (M8) | 27.5 | 2.8 | 20 | MO,S |
| 2 | Cylinder Nut (M10) | 49 | 5.0 | 36 | MO,S |
| 3 | Cylinder Bolts (M6) | 12 | 1.2 | 106in·lb | S |
| 4 | Exhaust Pipe Manifold Holder Nuts | 17 | 1.7 | 12 | |
| 5 | Muffler Body Mounting Bolt (Front) | 20 | 2.0 | 15 | |
| 6 | Muffler Body Mounting Bolt (Rear) | 20 | 2.0 | 15 | |

7: “A” marked side faces up.

8: “A”marked side faces up

9: Hollow mark faces forward.

MO: Apply molybdenum disulfide oil solution.

(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)

R: Replacement Parts

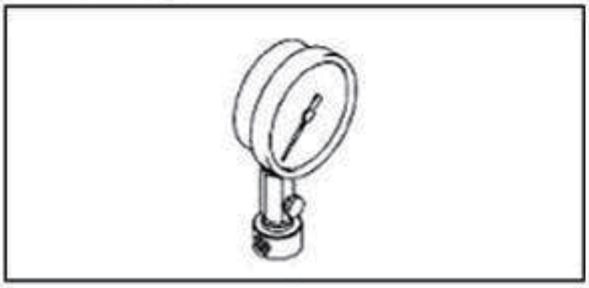
S: Follow the specified tightening sequence.

## Technical Specifications

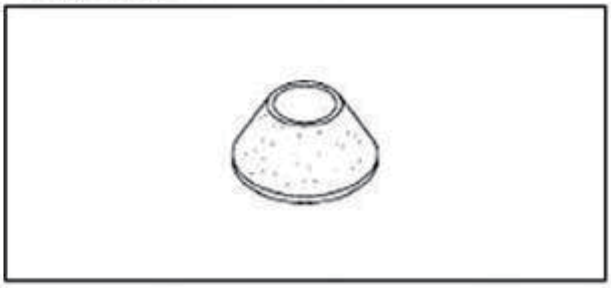
| Item | Standard data | Service limit |
|---|---|---|
| **Camshafts** | | |
| Cam Height: | | |
| Exhaust | 35.843-35.957mm(1.4111~1.4156in.) | 35.74mm(1.4071in.) |
| Intake | 36.543~36.657mm | 36.44mm(1.4346in.) |
| | (1.4387~1.4432in.) | |
| Camshaft Journal, Camshaft Cap Clearance | 0.028~0.071mm(0.0011-0.0028in.) | 0.16mm(0.0063in.) |
| Camshaft Journal Diameter | 23.950~23.972mm (0.9429~0.9438in.) | 23.92mm(0.942in.) |
| Camshaft Bearing Inside Diameter | 24.000~24.021mm (0.9449~0.9457in.) | 24.08mm(0.948in.) |
| Camshaft Runout(wear) | 0.02mm(0.0008in.) | 0.1mm(0.004in.) |
| **Cylinder Head** | | |
| Cylinder Compression pressure | 961~1471kPa(9.8-15.0kgf/$cm^2$) at400r/min(rpm) | —— |
| Cylinder Head Flatness | —— | 0.05mm(0.002in.) |
| **Valves** | | |
| Valve Clearance: | | |
| Exhaust | 0.20~0.26mm(0.0078-0.0102in.) | —— |
| Intake | 0.08~0.13mm(0.0031-0.0051in.) | —— |
| Valve Stem Bend | 0.01mm(0.0004in.) | 0.05mm(0.002in.) |
| Valve Stem Diameter: | | |
| Exhaust | 4.455~4.470mm(0.1754-0.1760in.) | 4.44mm(0.175in.) |
| Intake | 4.475~4.490mm(0.1762-0.1768in.) | 4.46mm(0.176in.) |
| Valve Guide Inside Diameter: | | |
| Exhaust | 4.500~4.512mm(0.1772-0.1776in.) | 4.58mm(0.180in.) |
| Intake | 4.500~4.512mm(0.1772-0.1776in.) | 4.58mm(0.180in.) |
| Valve/Valve Guide Clearance (Wobble Method): | | |
| Exhaust | 0.07~0.14mm(0.0028-0.0055in.) | 0.27mm(0.0106in.) |
| Intake | 0.02~0.08mm(0.0008-0.0032in.) | 0.22mm(0.0087in.) |
| Valve Seating Surface: | | |
| Width: | | |
| Exhaust | 0.5~1.0mm(0.020-0.039in.) | —— |
| Intake | 0.5~1.0mm(0.020-0.039in.) | —— |
| Outside Diameter: | | |
| Exhaust | 26.6~26.7mm(1.087-1.094in.) | —— |
| Intake | 31.2~31.3mm(1.283-1.291in.) | —— |

| Item | Standard data | Service limit |
|---|---|---|
| Valve Spring Free Length: | | |
| Exhaust | 41.6mm(1.638in.) | 40mm(1.575in.) |
| Intake | 41.6mm(1.638in.) | 40mm(1.575in.) |
| **Cylinder & Pistons** | | |
| Cylinder Inside Diameter | 82.98-83.00mm(3.2669~3.2677in.) | 83.10mm(3.2716in.) |
| Piston(skirt) Diameter | 82.975-82.995mm(3.2667~3.2675in.) | 82.82mm(3.2606in.) |
| Piston/Cylinder Clearance | 0.010-0.037mm(0.0004-0.0015in.) | —— |
| Piston Ring/Groove Clearance: | | |
| Top | 0.04~0.075mm(0.00157-0.00295in.) | 0.17mm(0.0067in.) |
| Second | 0.02~0.06mm(0.0008-0.0024in.) | 0.16mm(0.0063in.) |
| Piston Ring Groove Width: | | |
| Top | 0.92~0.94mm(0.0362-0.0370in.) | 1.02mm(0.040in.) |
| Second | 1.01~1.03mm(0.0398-0.0406in.) | 1.11mm(0.044in.) |
| Piston Ring Thickness: | | |
| Top | 0.865~0.88mm(0.0341-0.03465in.) | 0.80mm(0.031in.) |
| Second | 0.97~0.99mm(0.0382-0.0390in.) | 0.90mm(0.035in.) |
| Piston Ring End Gap: | | |
| Top | 0.15~0.30mm(0.0059-0.0118in.) | 0.7mm(0.028in.) |
| Second | 0.30~0.45mm(0.0118-0.0177in.) | 0.8mm(0.031in.) |

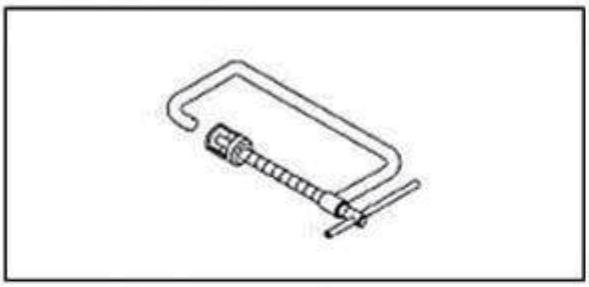
Compression Gauge



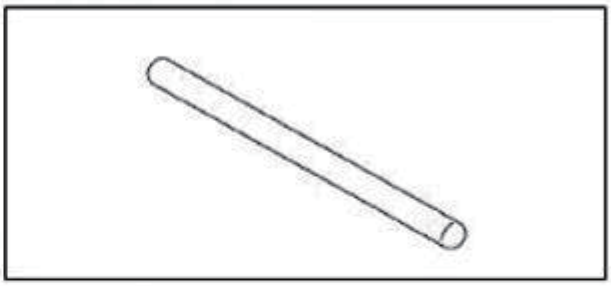
Valve Seat Cutter, 60°-Ø30:



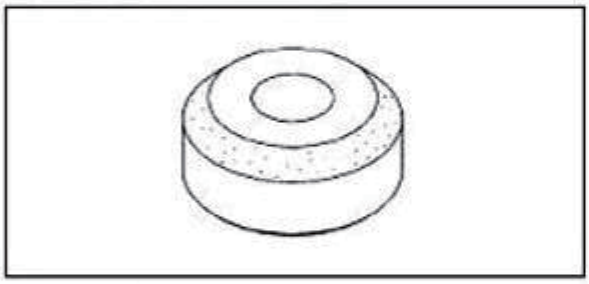
Valve Spring Compressor Assembly



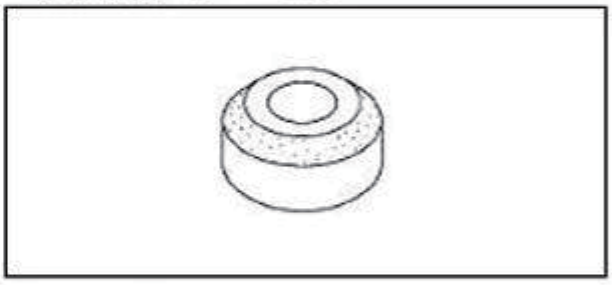
Valve Seat Cutter Holder Bar:



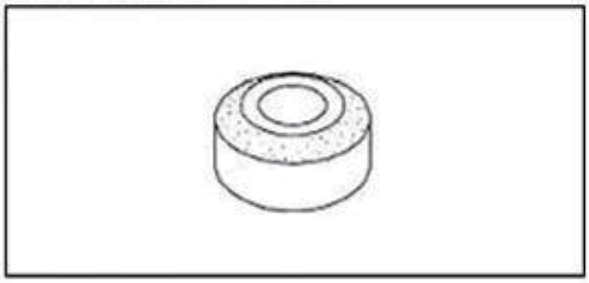
Valve Seat Cutter, 45°-Ø35:



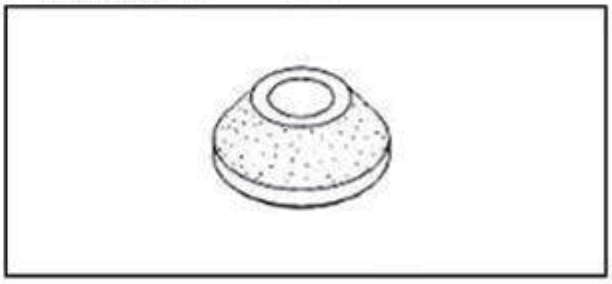
Valve Seat Cutter, 45°-Ø30:



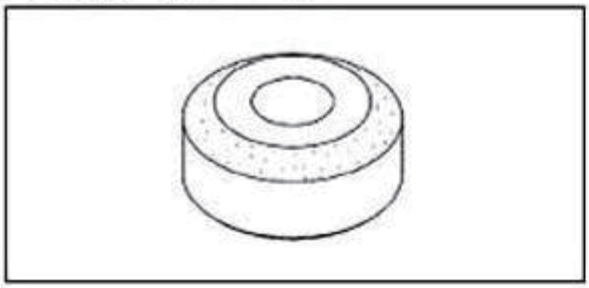
Valve Seat Cutter, 32°-Ø30:



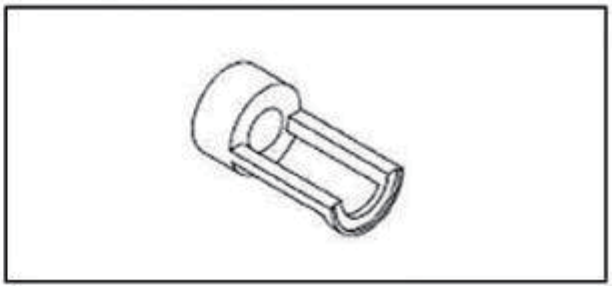
Valve Seat Cutter, 55°-Ø35:



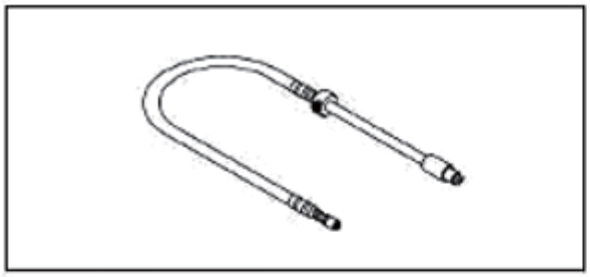
Valve Seat Cutter, 32°-Ø35:



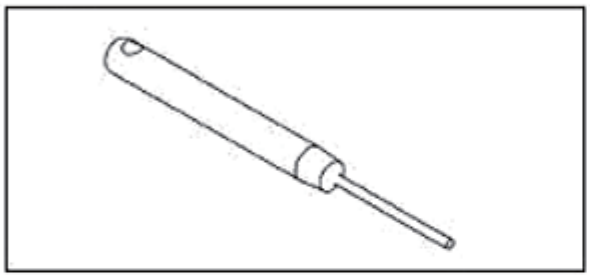
Valve Spring Compressor Adapter, Ø21:



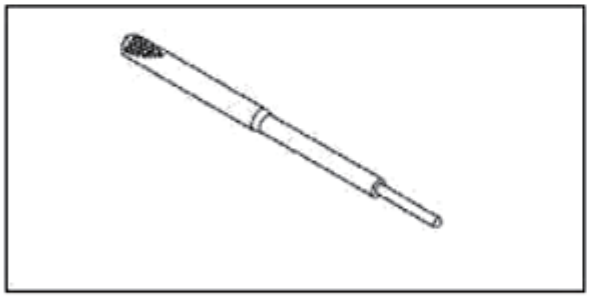
Compression Gauge Adapter, M10×1.0:



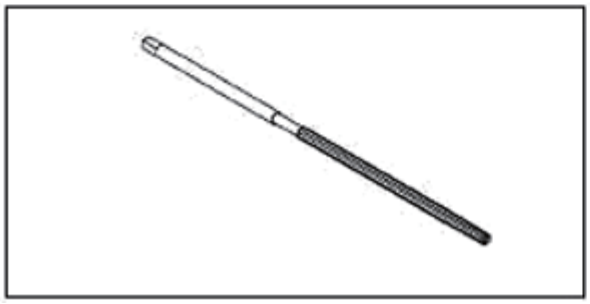
Valve Seat Cutter Holder, Ø4.5 :



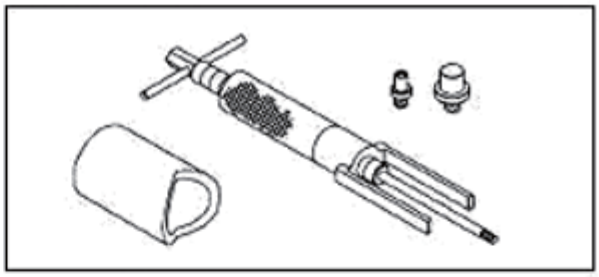
Valve Guide Arbor, Ø4.5 :



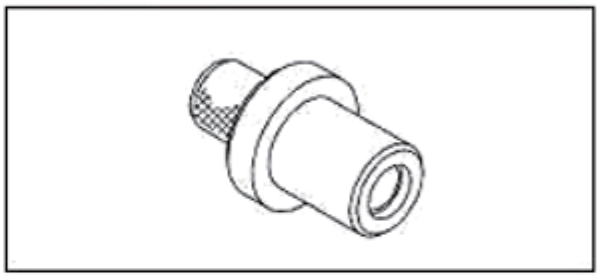
Valve Guide Reamer, Ø4.5 :



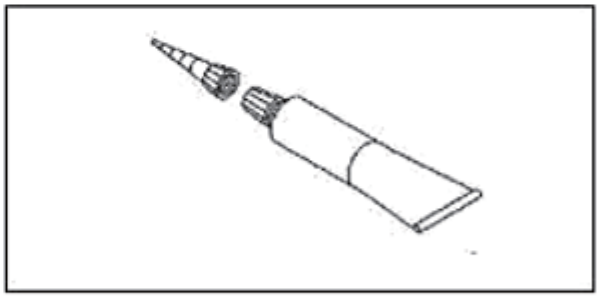
Piston Pin Puller:



Piston Pin Puller Adapter C:



Silicone Sealant :

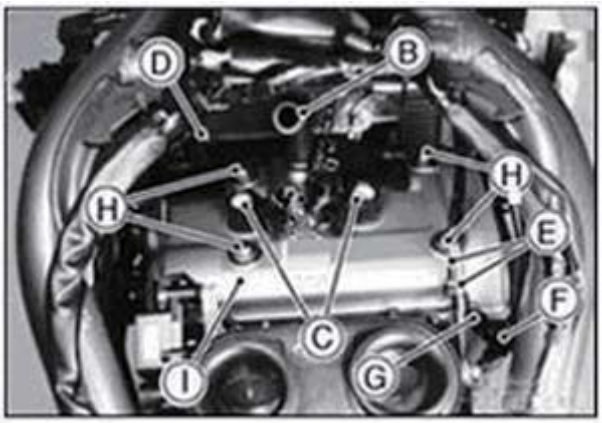


## Cylinder Head Cover

*Cylinder Head Ccover Removal*

● Remove:

1. Fuel Tank (see Fuel Tank Removal in the Fuel System (EFI) chapter)
2. Housing of air filter (see Air filter Housing Removal in the Fuel System (EFI) chapter)
3. Ignition coil[C]
4. Baffle plate[D]
5. Throttle cables[E]
6. Clutch Cable Holder [F] with Bolt [G]
7. Cylinder Head Cover Bolts [H]
8. Cylinder Head Cover [I]




*Cylinder Head Cover Installation*

● Replace the head cover gasket [A] with a new one.

● Apply silicone sealant [B] to the cylinder head as shown.

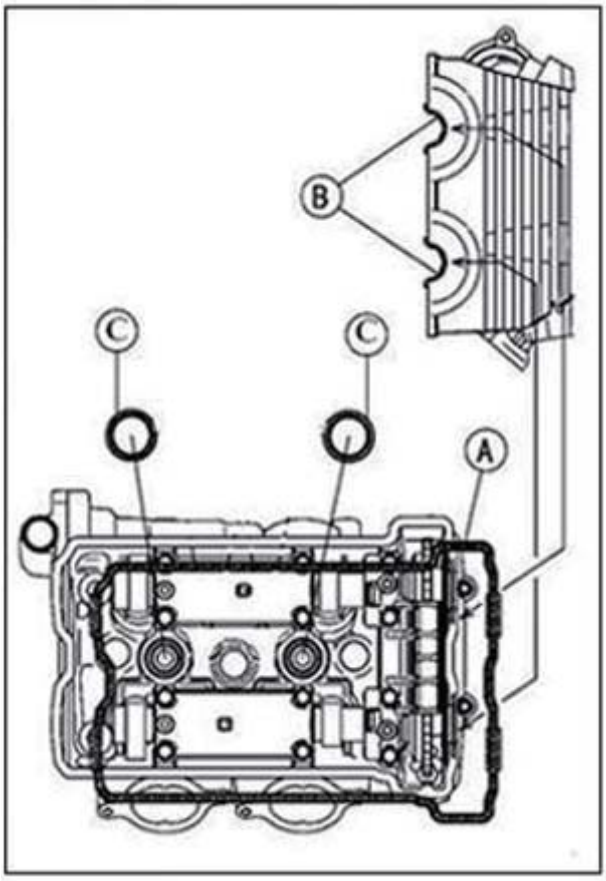
● Install gaskets of spark plug hole [C].

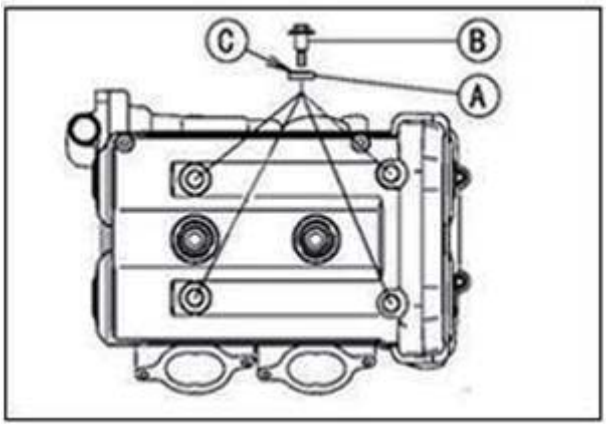
● Install:
Washers [A]
Cylinder Head Cover Bolts [B]

● Install the washers with metal side [C] faces upward.

● Tighten bolt of cylinder head cover.

**Torque - Cylinder Head Cover Bolts : 10 N·m**

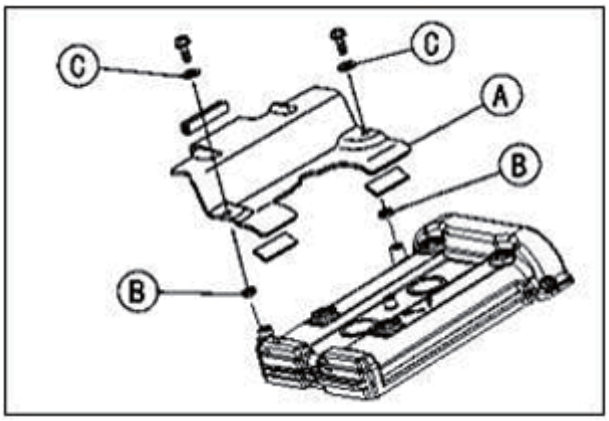


## Cylinder Head Cover

● Install the baffle plate [A].
○ Put the insulators [B] under the baffle plate and the washers [C] on the baffle plate.
○ Apply a non-permanent locking agent to the baffle plate bolts and tighten them.

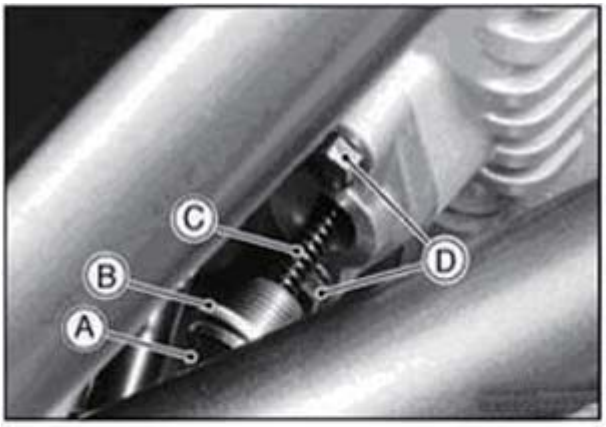
**Torque - Baffle Plate Bolts : 6 N·m**

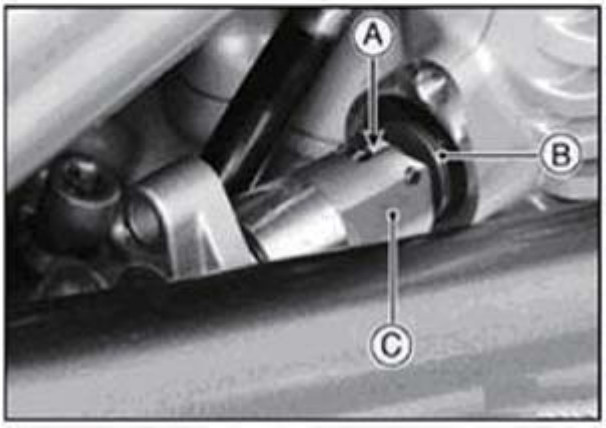


## Camshaft Chain Tensioner

*Camshaft Chain Tensioner Removal*

| CAUTION |
| --- |
| **This is a non-return type camshaft chain tensioner. The push rod does not return to its original position once it moves out to take up camshaft chain slack. Observe all the rules listed below:**<br>**When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Camshaft Chain Tensioner Installation". Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing, and damage the valves.** |




- Remove:
  1.Cap Bolt [A]
  2. Washer[B]
  3. Spring [C]
- Remove the mounting bolts [D] and take off the camshaft chain tensioner.

*Camshaft Chain Tensioner Installation*

- Release the stopper [A] and push the push rod [B] into the tensioner [C].
- Install the tensioner so that the stopper faces upward.

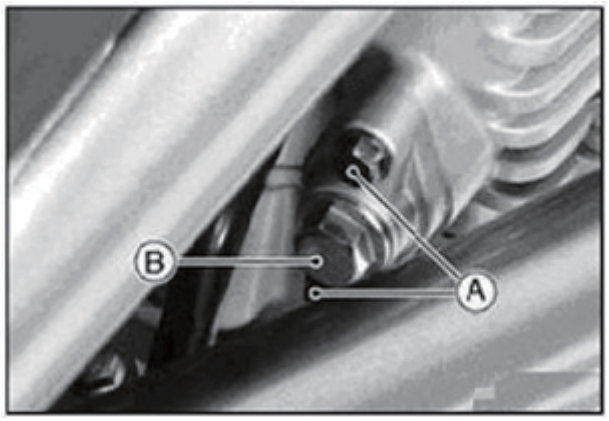
## Camshaft Chain Tensioner

● Tighten the tensioner mounting bolts [A].

**Torque - Camshaft Chain Tensioner Mounting Bolts : 12N·m**

● Install the spring and washer.
● Tighten the cap bolt [B].

**Torque - Camshaft Chain Tensioner Cap Bolt: 20N·m**

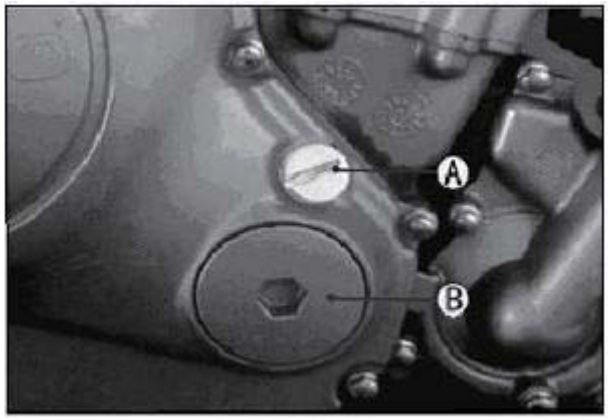


**Camshaft/Timingchain**

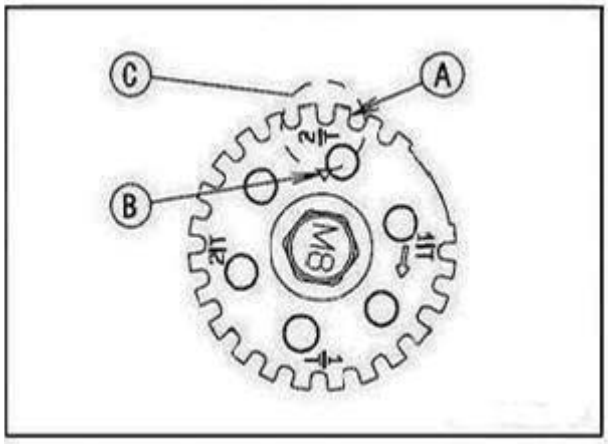
| CAUTION |
| --- |
| **The crankshaft maybe tured while the crankshafts are removed.Aways pull the chain taut while turning the crankshaft.This avoids kinking the chain on the lower(crankshaft) sprocket.A kinked chain could damage both the chain and the sprocket.** |

*Camshaft Removal*

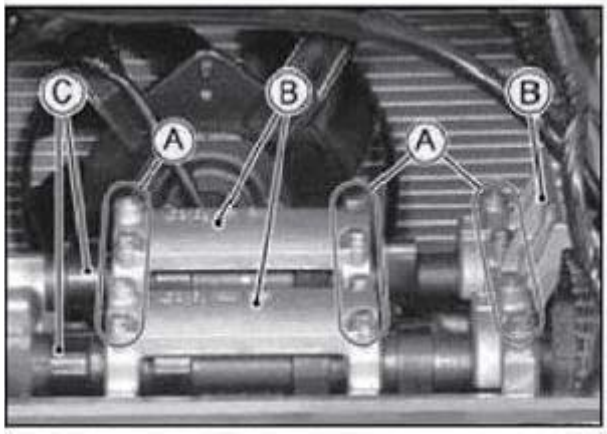
● Remove:
Cylinder Head Cover (see Cylinder Head Cover Removal)
● Position the crankshaft as follows.
○ Remove the upper [A] and lower [B] caps on the clutch cover(right side cover).




○ Using a wrench on the crankshaft rotation bolt, turn the crankshaft clockwise until the 2/T mark line [A] on the timing rotor is aligned with the notch [B] in the edge of the upper hole [C] in the clutch cover.



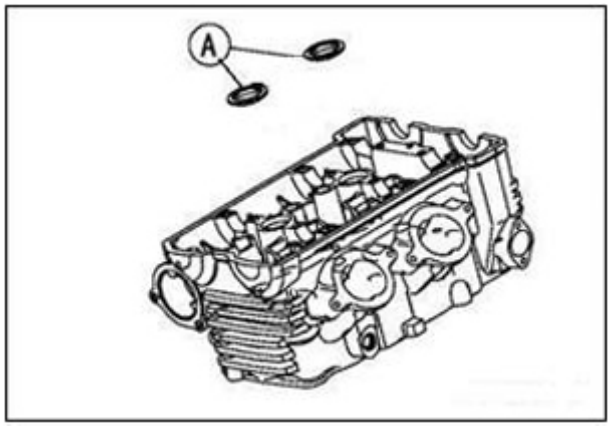

● Remove:
Camshaft Chain Tensioner (see Camshaft Chain Ten-sioner Removal)
Camshaft Cap Bolts [A]
Camshaft Caps [B]
Camshafts [C]



## Camshaft/Timing Chain

*Camshaft Installation*

● Be sure to install the following parts.
Plug Hole Gaskets [A]

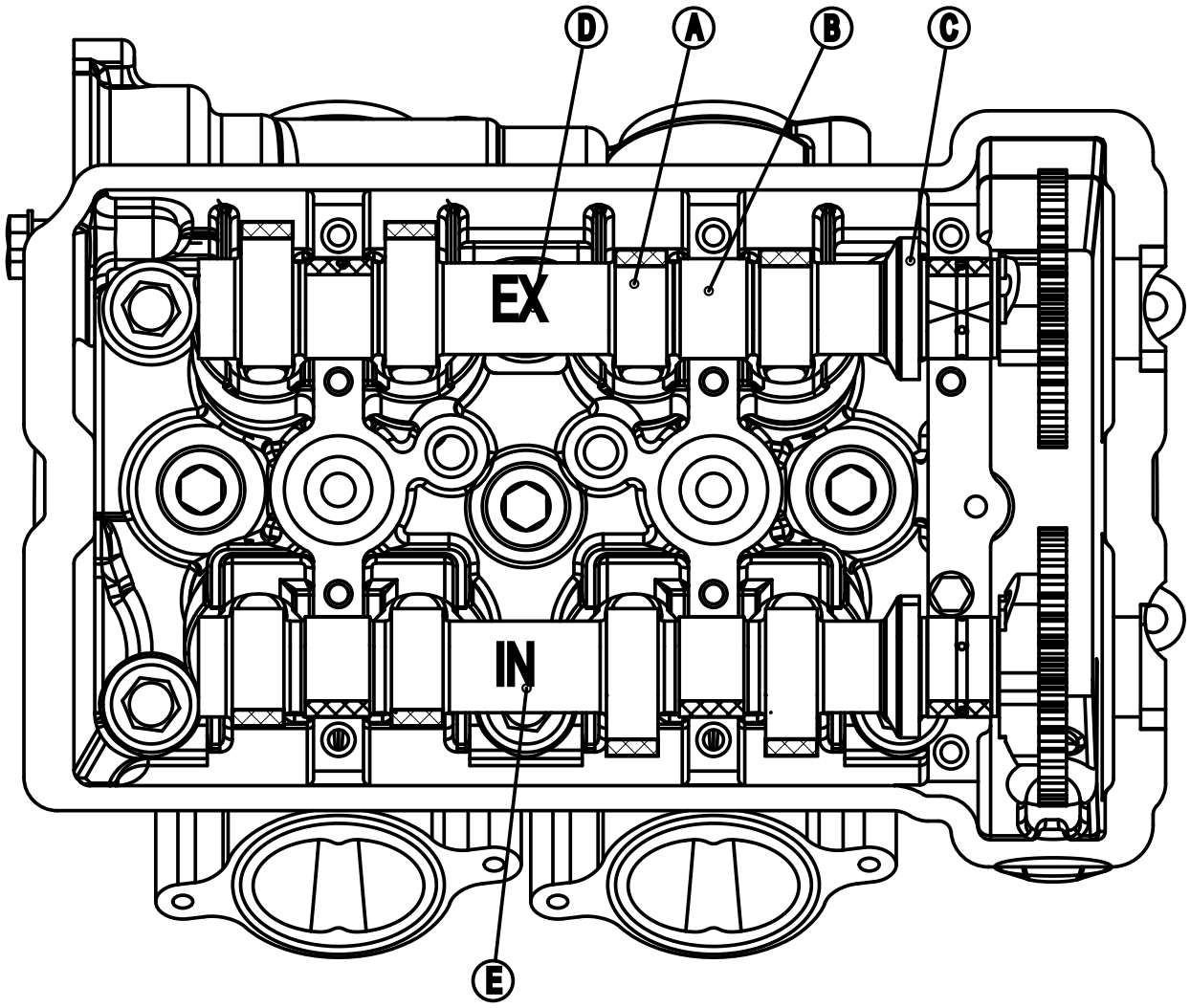



● Apply molybdenum disulfide oil solution to all cams [A] journals [B] and thrust blocks [C] with × marks.

★If a new camshaft is to be used, apply a thin coat of molyb-denum disulfide grease to the cam surfaces.

**NOTE**

○ *The exhaust camshaft has a EX mark [D] and the inlet camshaft has a 2 412 IN mark [E]. Be careful not to mix up these shafts.*



## Camshaft/Timing Chain

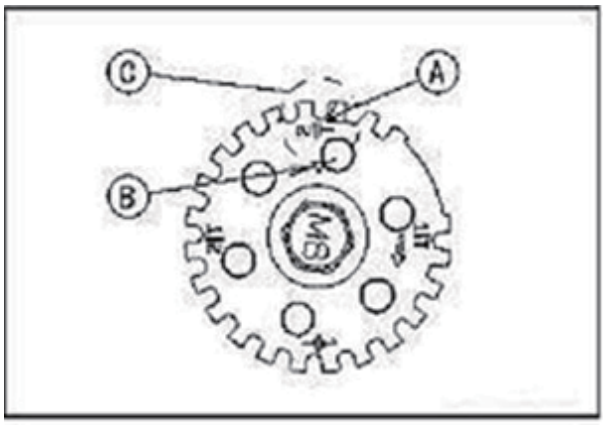
- Pull the tension side (exhaust side) of the chain taut to install the chain.
- Engage the camshaft chain with the camshaft sprockets so that the timing marks on the sprockets are positioned as shown.

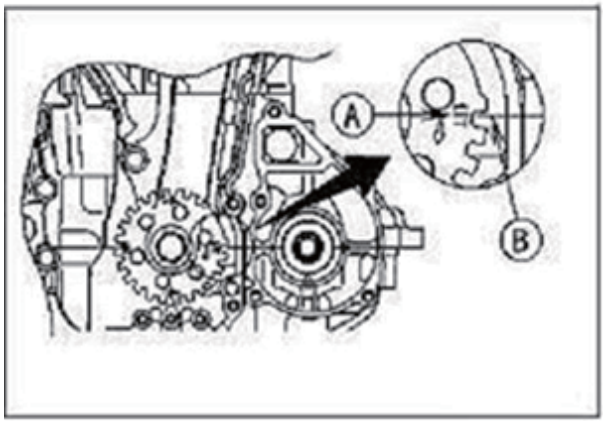
○ Using a wrench on the crankshaft rotation bolt, turn thecrankshaft clockwise until the 2/T mark line [A] on the timing rotor is aligned with the notch [B] in the edge of the upper hole [C] in the clutch cover.

- If the clutch cover is removed, perform the next procedure.

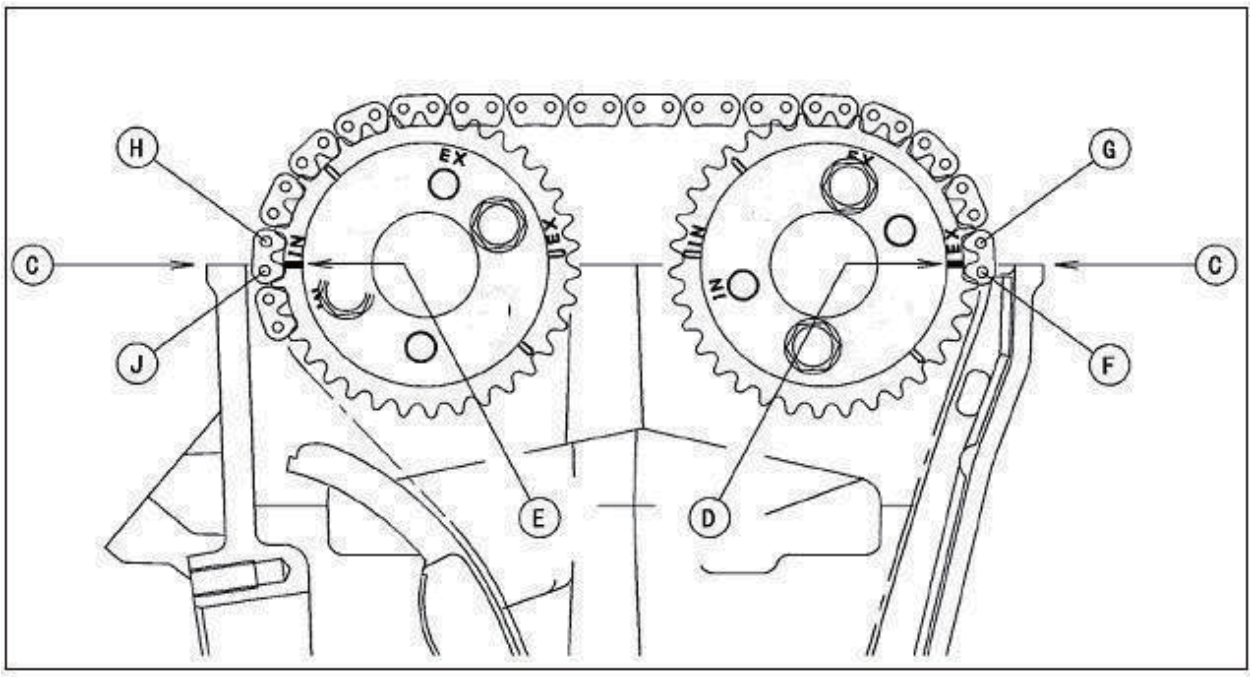
○ Using a wrench on the crankshaft rotation bolt, turn the crankshaft clockwise until the 1/T mark line [A] on the timing rotor is aligned with the wating surface [B] of the crankcase halves.

○ The timing marks must be aligned with the cylinder head upper surface [C].
EX Mark [D] (between #1 pin and #2 pin)
IN Mark [E] (between #31 pin and #32 pin)



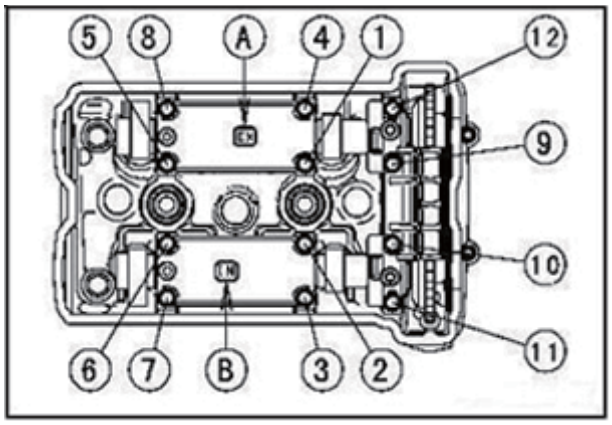

#1 Pin [F]
#2 Pin [G]
#31 Pin [H]
#32 Pin [J]



## Camshaft/Timing Chain

**NOTE**

○ *The exhaust cap has a "EX" mark [A] and the inlet cap has a "IN" mark [B]. Be careful not to mix up these caps.*




○ First tighten all the camshaft cap bolts evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence.

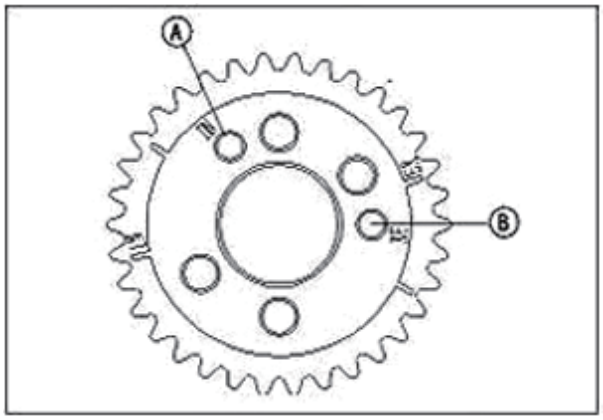
**Torque-Camshaft Cap Bolts (1 < 12)**
**12 N·m (1.2 kgf·m, 106 in·lb)**

● Installation:
Camshaft Chain Tensioner (see Camshaft Chain Tensioner Installation)
Cylinder Head Cover (see Cylinder Head Cover Installation)

*Camshaft and Sprocket Assembly*

○ The inlet and exhaust sprockets are identical.

● Install the sprockets so that the marked ("IN" and "EX") side faces to the right side.




| CAUTION |
| --- |
| **Inlet sprocket must use "IN" marked bolts holes [A].Exhaust sprocket must use "EX" marked bolts holes [B].** |

● Apply a non-permanent locking agent to the camshaft sprockets bolts and tighten them.

**Torque-Camshaft Shaft Sprockets Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**

★If a new camshaft is to be used, apply a thin coat of molybdenum disulfide to the cam surfaces.

## Camshaft/Timing chain

*Camshaft, Camshaft Cap Wear*

● Remove:
Camshaft Caps (see Camshaft Removal)
● Retighten camshaft cap and measure hole diameter of camshaft cap <A>,<B>,<C>.

**Torque: Camshaft cap bolt 12N.m**
**Hole diameter of camshaft cap**
**Standard : 24.00~24.021mm**
**Service Limit: 24.05mm**

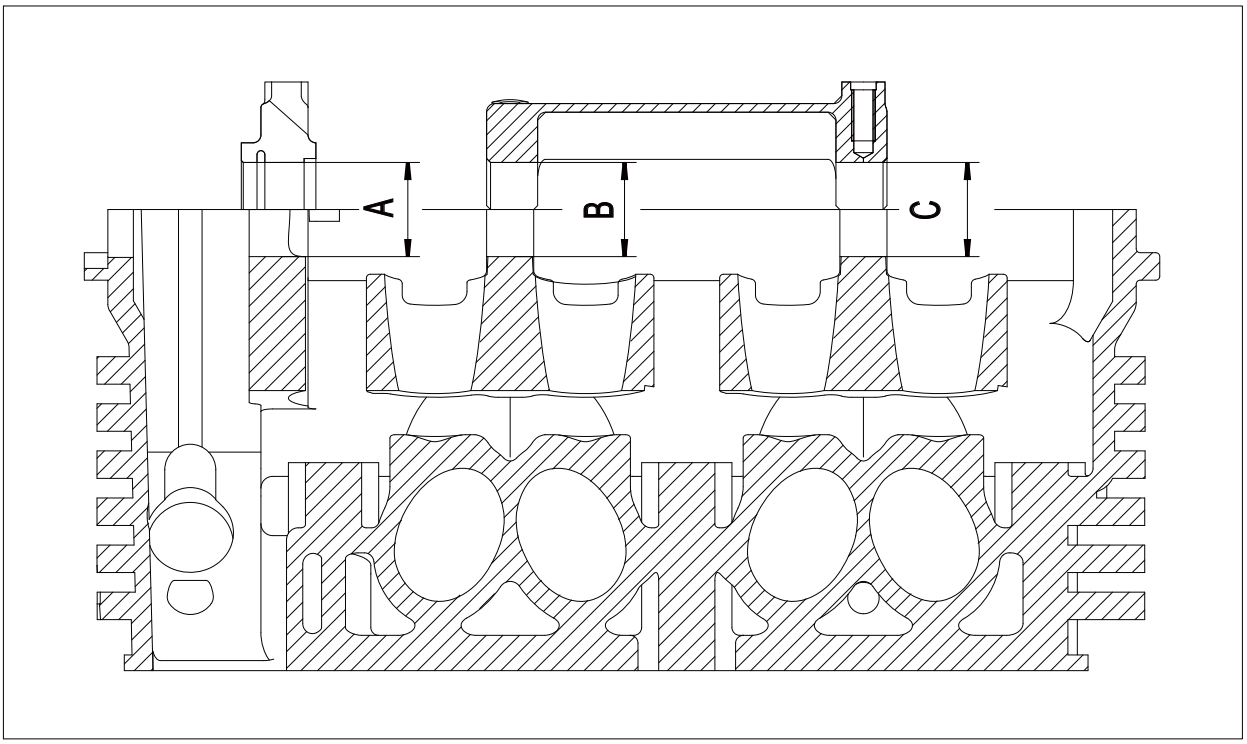
★If out of service limit, replace new cylinder head.

● Measure camshaft journal diameter.

**Diameter of Camshaft Journal Standard : 23.950~23.972mm**
**Service Limit : 23.920mm**

★If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one and measure the clearance again. If the clearance still remains out of the limit, replace the cylinder head unit.

**Camshaft Journal, Camshaft Cap Clearance**
**Standard: 0.028~0.071mm**
**Service Limit : 0.13mm**



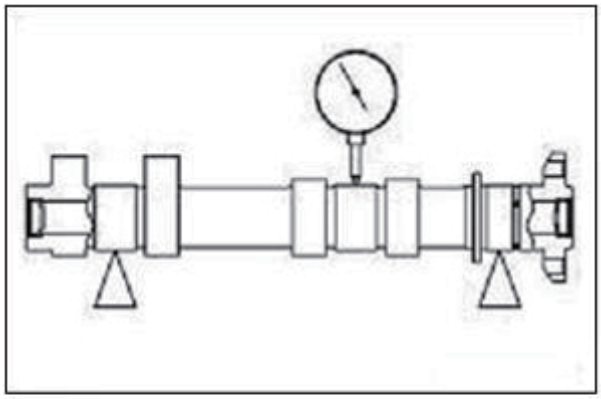

*Camshaft run-out*

● Remove the camshaft (see Camshaft Removal).
★If the runout exceeds the service limit, replace the shaft.

*Camshaft/Timing chain*

● Set the camshaft in a camshaft alignment jig or on V blocks.

● Measure runout with a dial gauge at the specified place as shown.



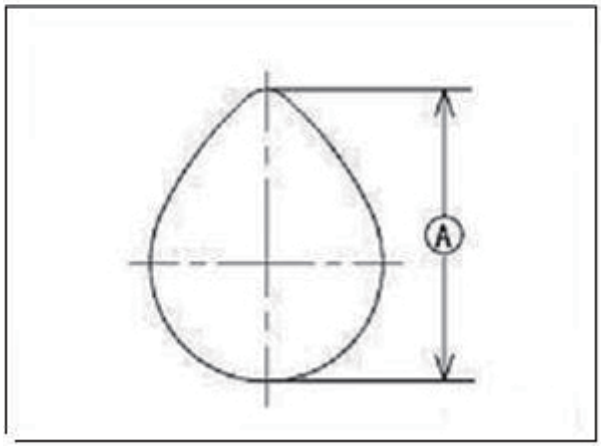
**Camshaft Runout**
**Standard: Less than 0.02mm**
**Service limit: 0.04mm**

*Camshaft wear*

● Remove the camshaft (see Camshaft Removal).

● Measure the height [A] of each cam with a micrometer.

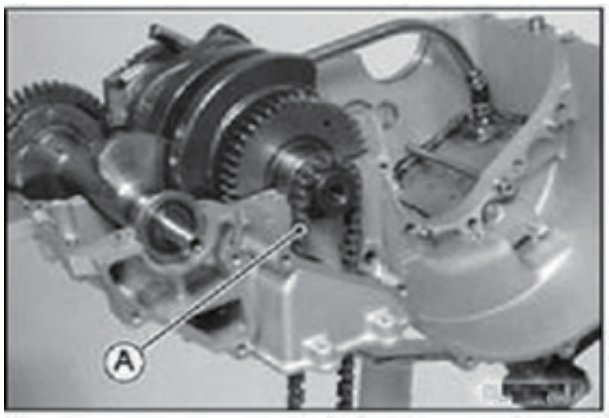
★If the cams are worn down past the service limit, replace the camshaft.




**Cam Height**
**EX : 35.843~35.957mm**
**IN : 36.543~36.657mm**
**Service Limit**
**EX :35.74mm**
**IN :36.44mm**

*Camshaft Chain Removal*

● Split the crankcase (see Crankcase Splitting in the Crankshaft/Transmission chapter).

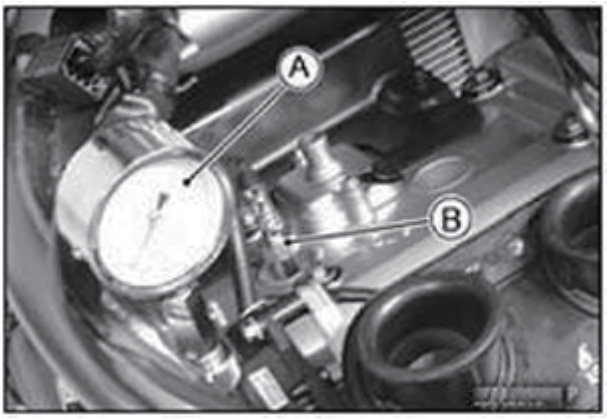


## Cylinder head

*Cylinder Compression Measurement*

**NOTE**

○ *Use the battery which is fully charged.*




● Warm up the engine thoroughly.
● Stop the engine.
● Remove
Fuel Tank (see Fuel Tank Removal in the Fuel System (EFI) chapter)
Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (EFI) chapter)
Ignition Coils (see Ignition Coil together with Spark Plug Cap) Removal in the Electrical System chapter) Spark Plugs (see Spark Plug Replacement in the Periodic Maintenance chapter)

**Owner's Tool - Spark Plug Wrench 16mm**

● Attach the compression gauge [A] and adapter [B] firmly into the spark plug hole.
Using the starter motor, turn the engine over with the throttle fully open until the compression gauge stops rising; the compression is the highest reading obtainable.

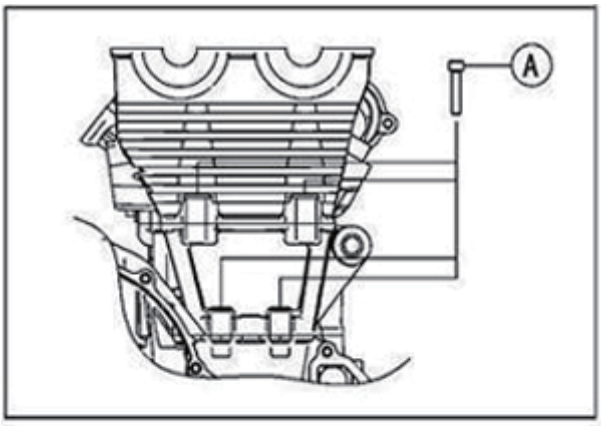
**Special tools: Compression Gauge, 20kgf/cm$^2$**

## Cylinder head

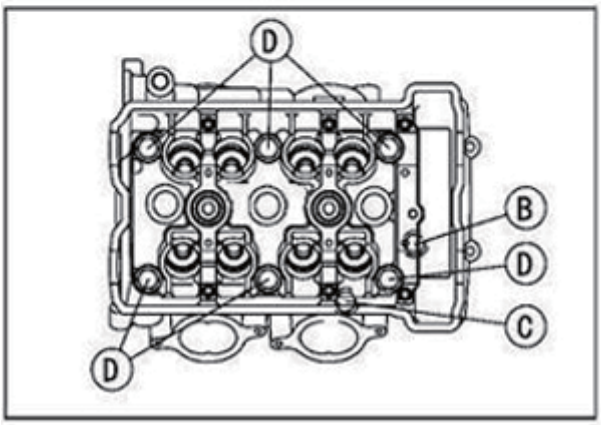
| Problem | Diagnosis | Countermeasures (Action) |
|---|---|---|
| Cylinder compression is higher than usable range | Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke). | Remove the carbon deposits and replace damaged parts if necessary. |
| | Incorrect cylinder head gasket thickness | Replace the gasket with a standard part. |
| Cylinder compression is lower than usable range | Gas leakage around cylinder head | Replace damaged gasket and check cylinder head warp. |
| | Bad condition of valve seating | Repair if necessary. |
| | Incorrect valve clearance | Adjust the valve clearance. |
| | Incorrect piston/cylinder clearance | Replace the piston and/or cylinder. |
| | Piston seizure | Inspect the cylinder and replace/ repair the cylinder and/or piston asnecessary. |
| | Bad condition of piston ring and/or piston ring grooves | Replace the piston and/or the piston rings. |

*Cylinder Head Removal*

- Remove:
  Exhaust Pipes (see Exhaust Pipe Removal)
  Cylinder Head Cover (see Cylinder Head Cover Removal)
  Camshafts (see Camshaft Removal)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (EFI) chapter)
  Intake manifold
  Water Hose
  Water Temperature Sensor Connector
  Front Camshaft Chain Guide




- Firstly remove the 4 pcs of M6 cylinder head bolts and M6 cylinder bolts [A].
- Secondly, remove the M8 bolts [B].
- Thirdly, remove the M10 nut [C].
- Finally, remove the M10 bolts [D].

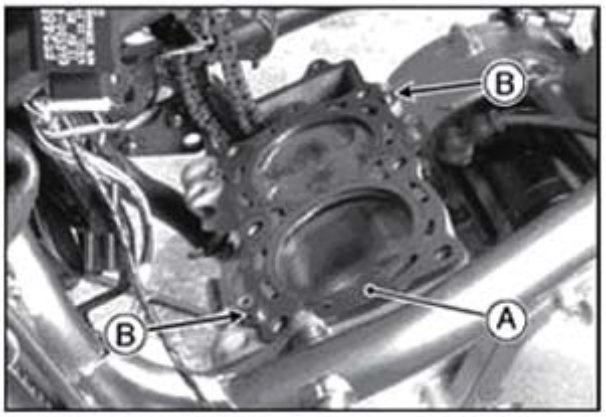


## Cylinder head

*Cylinder head installation*

**NOTE**

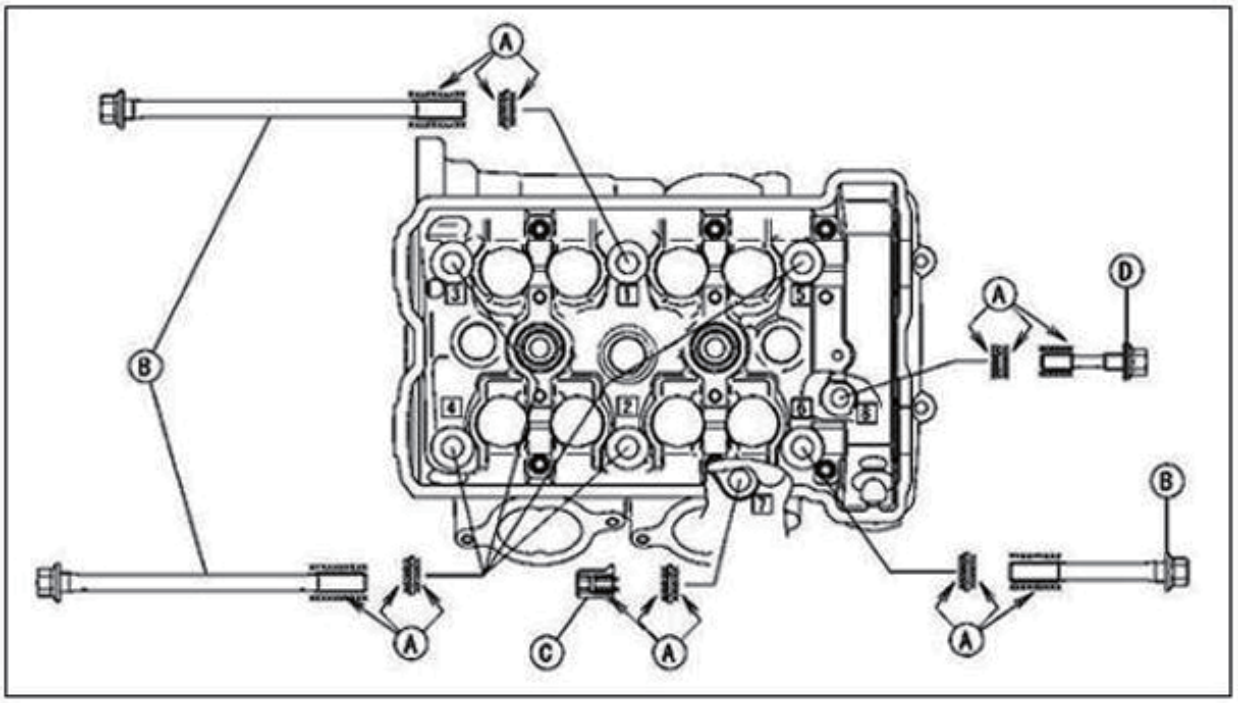
○ *The camshaft cap is machined with the cylinder head,so if a new cylinder head is installed, use the cap that is supplied with the new head.*




- Install a new cylinder head gasket [A] and dowel pins [B]
- Apply molybdenum disulfide oil solution [A] to both sides of washers and the threads of bolts and nut.

M10 Cylinder Head Bolts [B]
M10 Cylinder Nut [C]
M8 Cylinder Bolt [D]

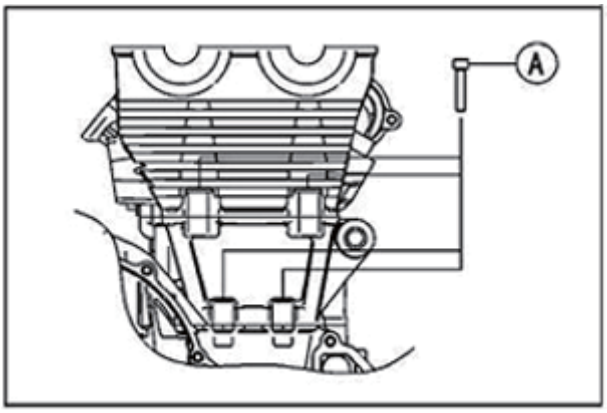
**Torque - Cylinder head bolt (M10):**
**First: 25N·m**
**Final:**
**Used Cylinder Head Bolts: 49 N·m**
**New Cylinder Head Bolts: 54 N·m**
**Cylinder Nut(M10): 49 N·m**



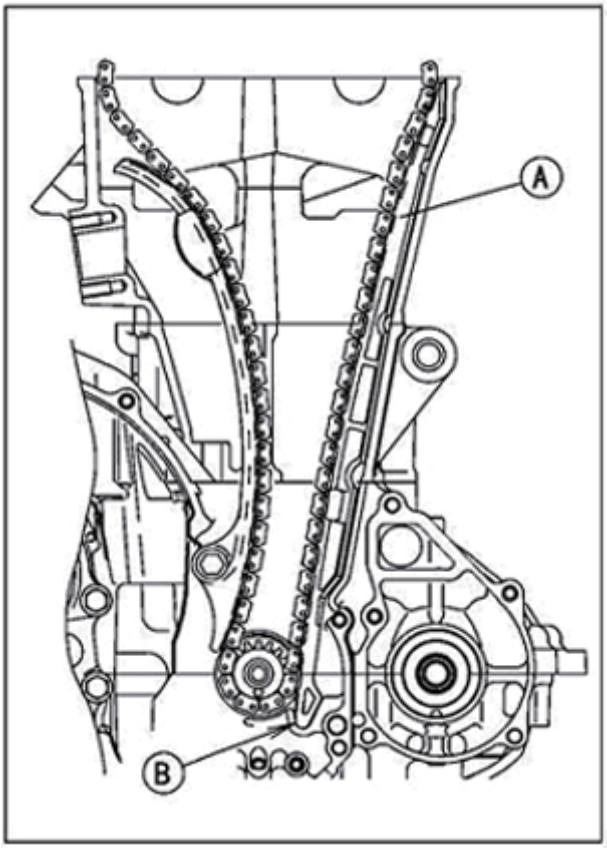
## Cylinder head

●Tighten the M6 cylinder head bolts and M6 cylinder bolts [A].

**Torque - Cylinder Head Bolts (M6):**
**12 N·m(1.2 kgf·m, 106 in·lb)**
**Cylinder Bolts (M6):**
**12 N·m (1.2 kgf·m, 106 in·lb)**




● Install the front camshaft chain guide [A].
○ Insert the end [B] of front camshaft chain guide into the hollow on the lower crankcase half.
● Install the removed parts (see appropriate chapters).

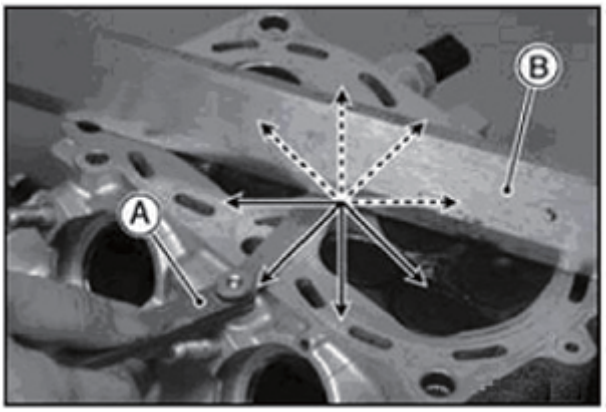



*Cylinder Head Warp*

● Clean the cylinder head.
● Lay a straightedge across the lower surface of the cylinder head at several positions.
● Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

**Cylinder Head Warp**
**Standard:**
**Service Limit: 0.05 mm (0.002 in.)**

★If the cylinder head is warped more than the service limit, replace it.
★If the cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No.400).



## Valves

*Valve Clearance Inspection*

● Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

*Valve Clearance Adjustment*

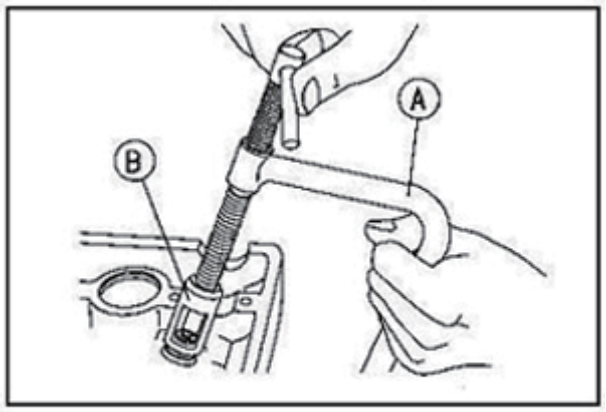
● Refer to the Valve Clearance Adjustment in the Periodic Maintenance chapter.

*Valve Removal*

● Remove cylinder head (see Cylinder Head Removal).

● Remove the valve lifter and shim Mark and record the valve lifter and shim locations so they can be installed in their original positions.

● Using the valve spring compressor assembly, remove the valve.



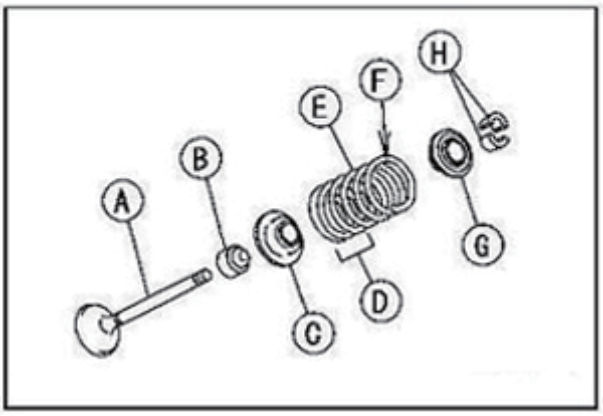

**Special Tools -Valve Spring Compressor Assembly [A]:**
**Valve Spring Compressor Adapter, [B]:**

*Valve Installation*

● Replace the oil seal with a new one.

● Apply engine oil to the oil seal lip. Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.

● Install the springs so that the closed coil end faces downwards (the side painted in green faces upwards).

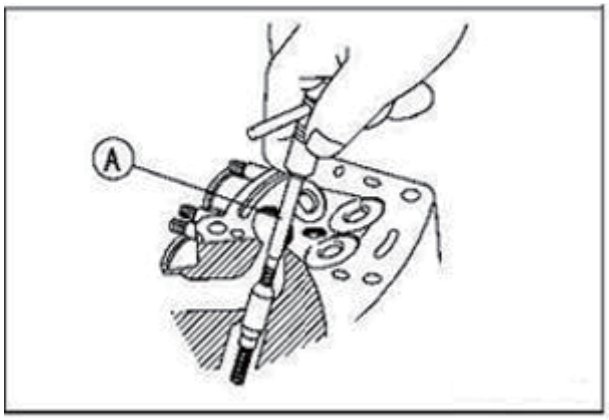



| | |
|---|---|
| Valve[A] | Valve spring[E] |
| Valve oil seal[B] | Side Painted [F] |
| Spring seat[C] | Retainer[G] |
| Closed coil end[D] | Split Keepers[H] |

## Valves

*Valve Guide Removal*

- Remove:
  Valve (see Valve Removal)
  Oil Seal
  Spring Seat
- Heat the area around the valve guide to 120 < 150°C (248< 302°F), and hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.




| CAUTION |
| --- |
| **Do not heat the cylinder head with a torch. This will warp the cylinder head. Soak the cylinder head in oil and heat the oil.** |

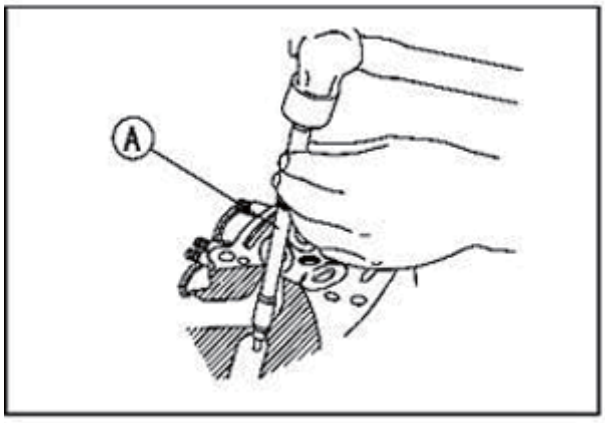
**Special Tool - Valve Guide Arbor, Φ 4.5**

*Valve Guide Installation*

- Apply engine oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 <150 °C (248 < 302 °F).
- Drive the valve guide in from the top of the head using the valve guide arbor. The flange stops the guide from going in too far.

**Special Tool - Valve Guide Arbor, Φ 4.5**

- Wait until the cylinder head cools down and then ream the valve guide with the valve guide reamer [A] even if the old guide is reused.



## Valves

○ Turn the reamer in a clockwise direction until the reamer turns freely in the guide. Never turn the reamer counter-clockwise or it will be dulled.

○ Once the guides are reamed they must be cleaned thoroughly.

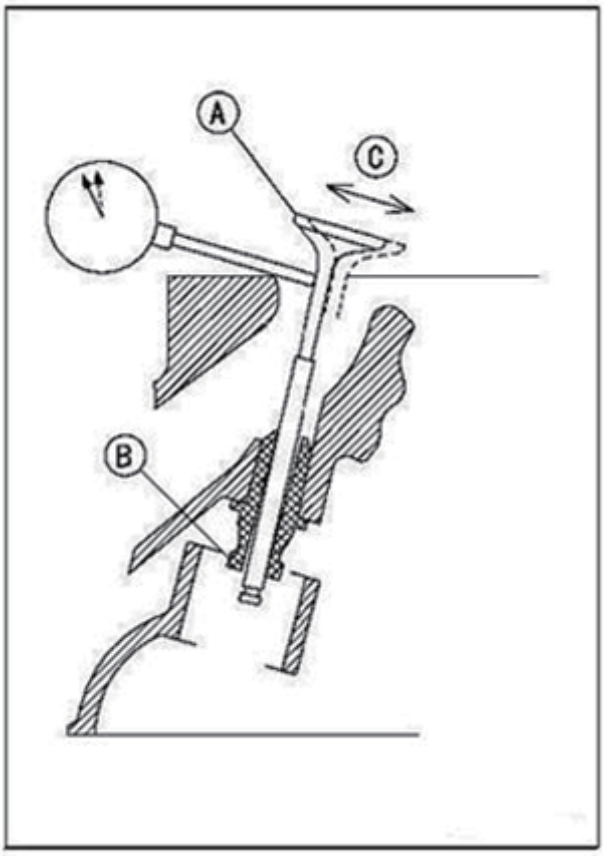
**Special tool - Valve Guide Reamer Φ 4.5**

*Valve-to-Guide Clearance Measurement*
(Wobble Method)

● Insert a new valve [A] into the guide [B] and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.

● Move the stem back and forth [C] to measure valve/valve guide clearance.

● Repeat the measurement in a direction at a right angle to the first.




**NOTE**

○ *The reading is not actual valve/valve guide clearance because the measuring point is above the guide.*

**Valve/Valve guide clearance**
**Standard**
**EX: 0.07~ 0.14mm**
**IN: 0.02~ 0.08mm**
**Service limit**
**EX: 0.27mm**
**IN: 0.22mm**

## Valves

*Valve Seat Inspection*

● Remove the valve (see Valve Removal).

● Check the valve seating surface [A] between the valve [B] and valve seat [C]

○ Measure the outside diameter [D] of the seating pattern on the valve seat.

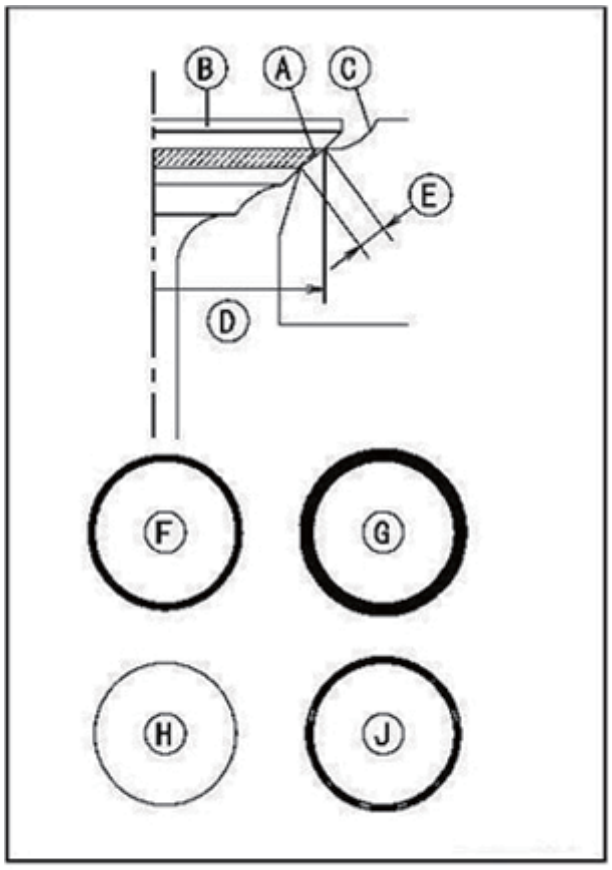
★If the outside diameter is too large or too small, repair the seat (see Valve Seat Repair).

**Valve Seating Surface Outside Diameter**
**EX: 27.6 ~ 27.7mm**
**IN: 32.6 ~32.7mm**

○ Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.

★If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Valve Seat Repair).

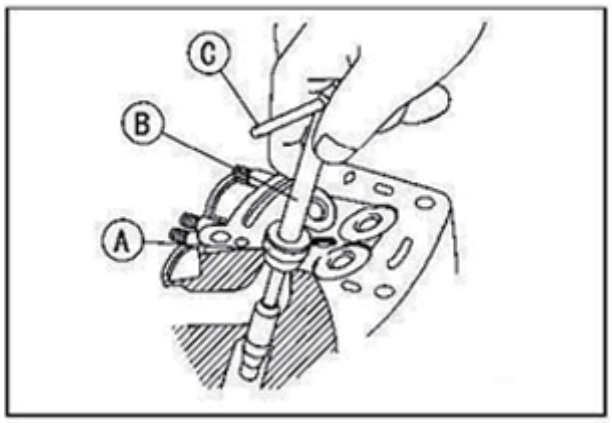
**Valve Seating Surface Width**
**EX: 0.5 ~1.0mm**
**IN: 0.5 ~1.0 mm**




*Valve Seat Repair*

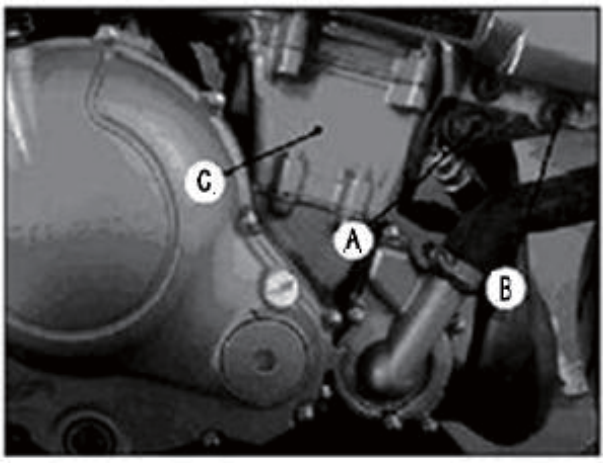
● Repair the valve seat with the valve seat cutters [A].

**Special Tools -**
**Valve Seat Cutter Holder Bar [C]:**
**Valve Seat Cutter Holder Φ 4.5 [B]:**



*Cylinder Removal*

● Remove:
Cylinder Head (see Cylinder Head Removal)
Front Engine Mounting Bolts (Both Side) [A] (see Engine Removal in the Engine Removal/ Installation chapter)
Front Engine Brackets (Both Side) [B] (see Engine Removal in the Engine Removal/ Installation chapter)
Cylinder [C]

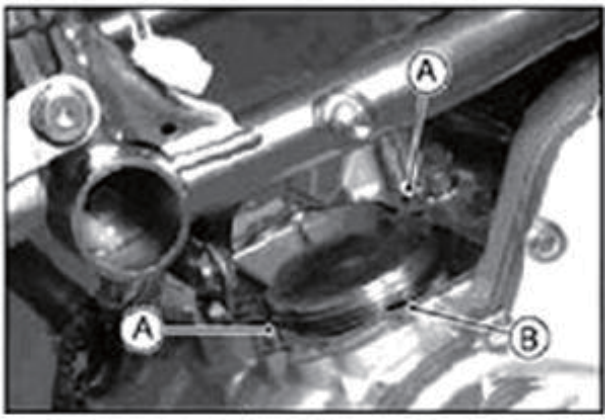



*Cylinder installation*

**NOTE**

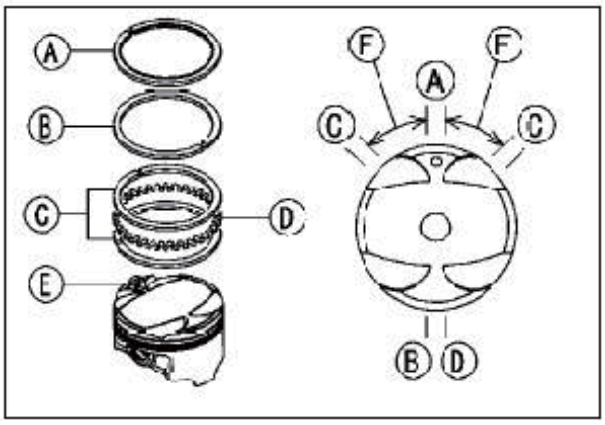
○ *If a new cylinder is used, use new piston ring.*

● Install the dowel pins [A] and new cylinder gasket [B].



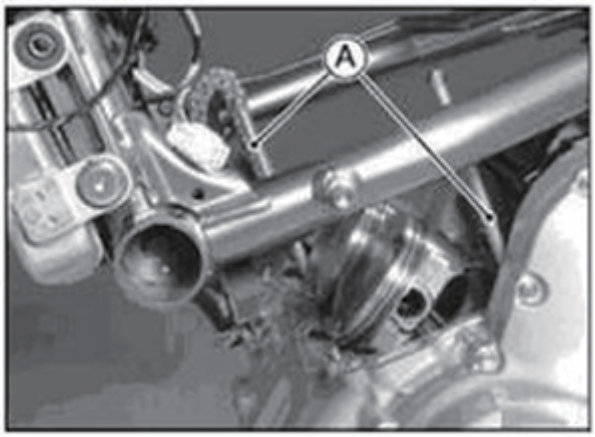

● The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 30 < 40?of angle from the opening of the top ring.

● Top Ring [A]
Second Ring [B]
Oil Ring Steel Rails [C]
Oil Ring Expander [D]
Hollow [E]
30 < 40° [F]



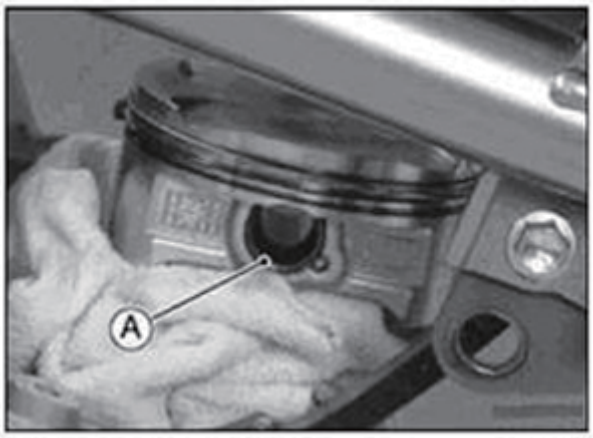
## Cylinder/Pistons

- Apply molybdenum disulfide oil solution to the cylinder bore, piston rings and piston.
- Prepare two auxiliary head bolts with their head cut.
- Install the two bolts [A] diagonally in the crankcase.
- Position the crankshaft so that all the piston heads are almost level.
- Install the cylinder block. Insert the piston rings with your thumbs.

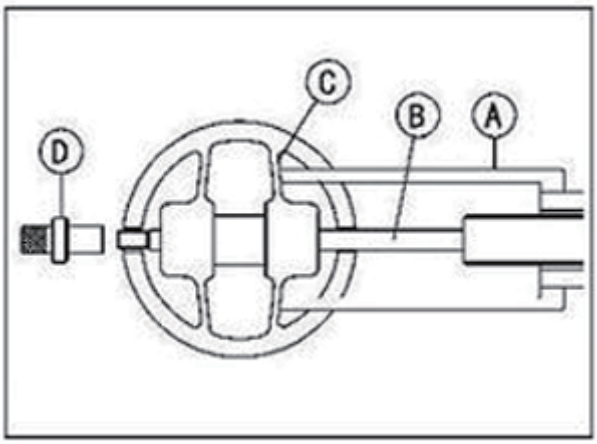



*Piston Removal*

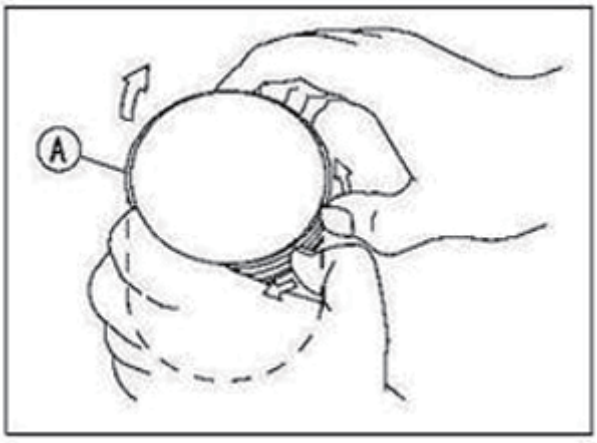
- Remove the cylinder (see Cylinder Removal).
- Place a clean cloth under the pistons and remove the piston pin snap ring [A] from the outside of each piston.




- Remove the piston pins.
  **Special tool :**
  **Piston Pin Puller [A]**
  **Piston Pin Puller Adapter [D]**
- Remove pistons.



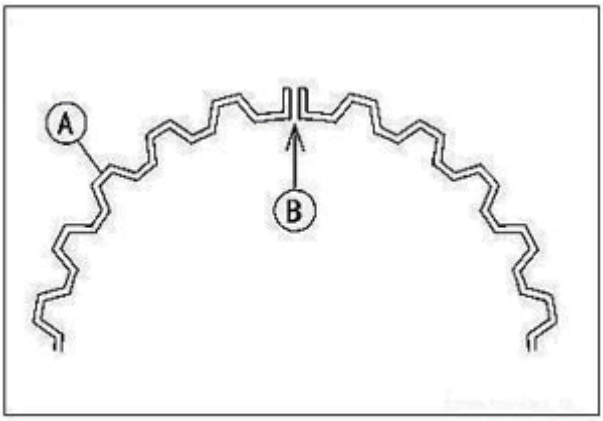

- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



## Cylinder/Pistons

*Piston installation*

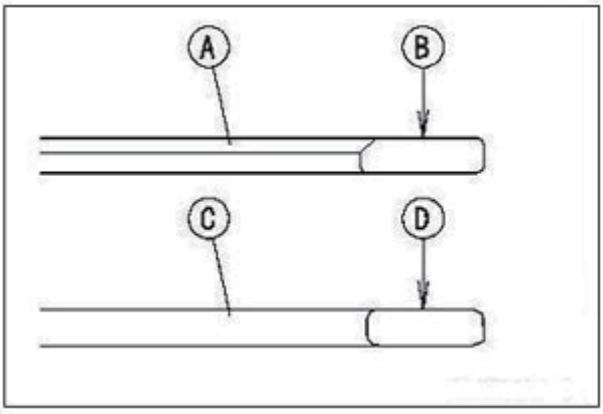
- Install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Install the oil ring steel rails, one above the expander and one below it.




**NOTE**

○ *Do not mix up the top [A] and second [C] ring.*

- Install the top ring [A] so that the "R" mark [B] faces up.
- Install the second ring [C]so that the "RN" mark [D] faces up.



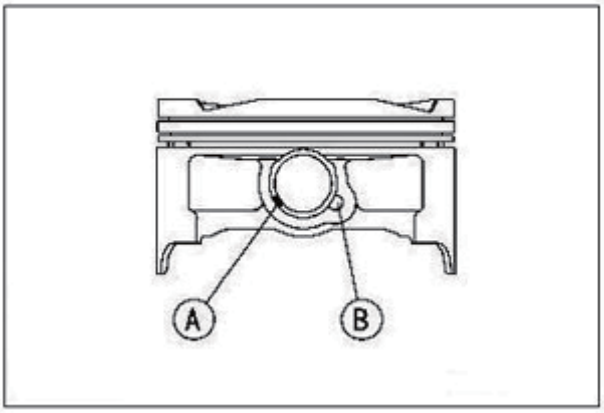

**NOTE**

○ *If a new piston is used, use new piston ring.*

- Install the piston with its marking hollow facing forward.
- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- Install piston pin.
- Use same way to install the other piston pin ring.

○ Apply molybdenum disulfide oil solution to the piston pins and piston journals.

When installing the piston pin snap ring, compress it only enough to install it and no more.




| CAUTION |
| --- |
| **Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.** |

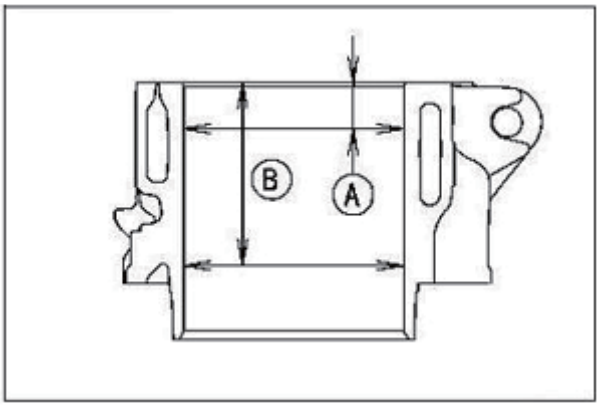
## Cylinder/Pistons

*Cylinder Wear*

● Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the two locations (total of four measure- ments) shown in the figure.

10mm [A]
60mm [B]

**Cylinder Inside Diameter**
**Standard:83.00mm~83.02mm**
**Service limit:83.10mm**

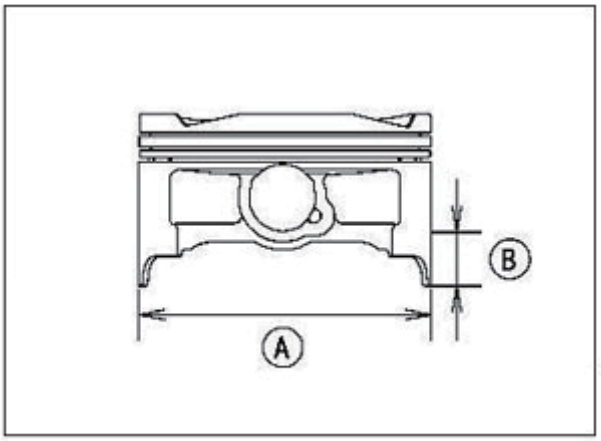



*Piston wear*

● Measure the outside diameter [A] of each piston 10mm [B] up from the bottom of the piston at a right angle to the direction of the piston pin.

★If themeasurement is under service limit, replace the piston.

***Piston diameter***
**Standard:82.975mm~82.995mm**
**Service limit : 82.90mm**



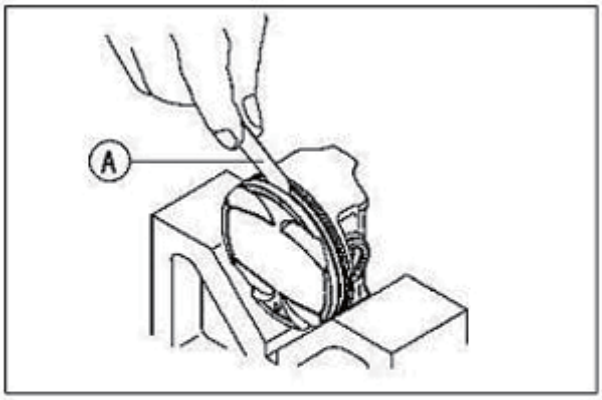

*Piston Ring, Piston Ring Groove Wear*

● Check for uneven groove wear by inspecting the ring seat.

## Cylinder/Piston

○ The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.

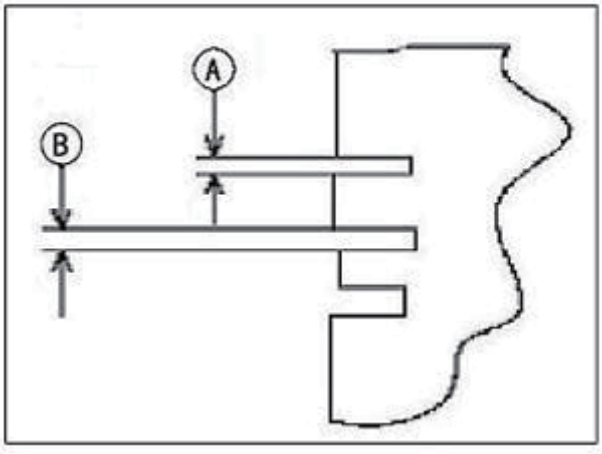
● With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.




**Piston Ring/Groove Clearance**
**Top**
**Standard: 0.04mm~0.075mm**
**Service limit : 0.17mm**
**Second**
**Standard: 0.02mm~ 0.06mm**
**Service limit: 0.16mm**

*Piston Ring Groove Width*

● Measure the piston ring groove width.
Use a vernier caliper at several points around the piston.



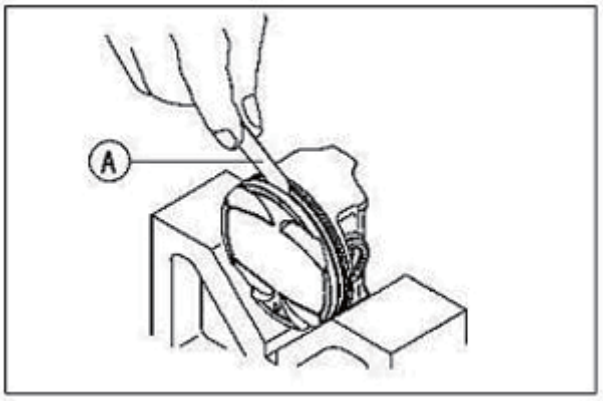

**Piston Ring Groove Width**
**Top [A]**
**Standard: 0.92mm~0.94mm**
**Service limit: 1.02mm**
**Second [B]**
**Standard: 1.01mm ~1.03mm**
**Service limit: 1.11mm**

## Cylinder/Piston

● Measure the piston ring thickness:

○ Use the micrometer to measure at several points around the ring.

Piston Ring Thickness
Top ring [A]
Standard: 0.865mm ~0.88mm
Service limit: 0.80mm
Second ring [B]
Standard: 0.97mm~0.99mm
Service limit: 0.90mm




★If any of the measurements is less than the service limit on either of the rings, replace all the rings.

**NOTE**

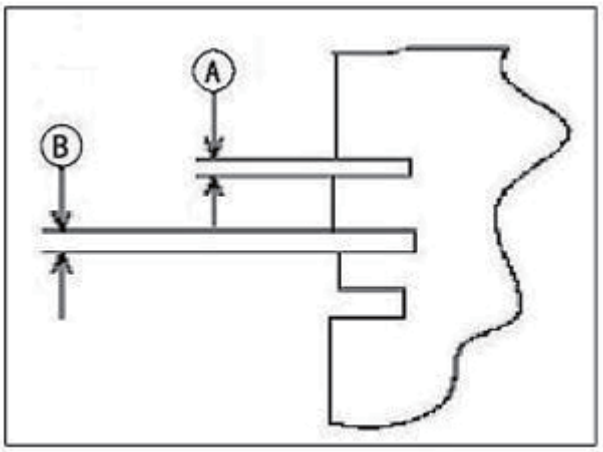
○ *When using new rings in a used piston, check for un-even groove wear. The rings should fit perfectly parallel to the groove sides. If not, replace the piston.*

*Piston Ring End Gap*

● Place the piston ring [A] inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.

● Measure the gap [B] between the ends of the ring with a thickness gauge.

**Piston Ring End Gap**
**Top**
**Standard: 0.15mm~ 0.30mm**
**Service limit: 0.60mm**
**Second**
**Standard: 0.30mm~ 0.45mm**
**Service limit : 0.70mm**



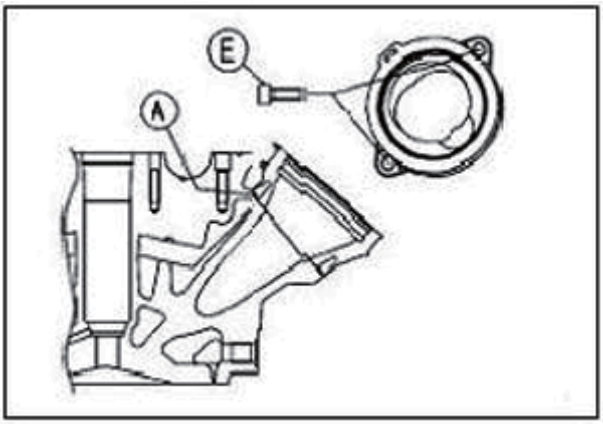

★If the end gap of either ring is greater than the service limit, replace all the rings.

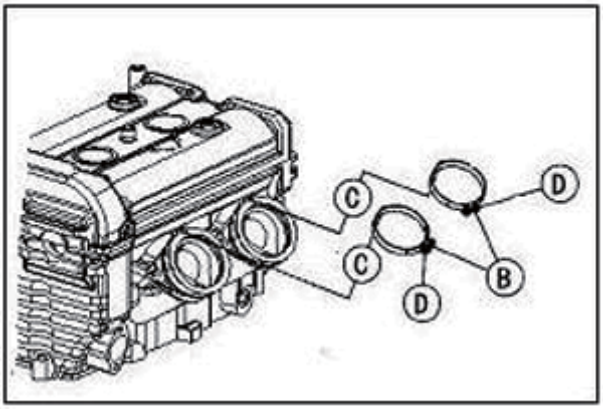
**Intake Manifold**

*Intake manifold installation*

- Be sure to install the O-rings [A].
- Install the clamps [B] as shown and so that their projections fit [C] on the holes of intake manifold.
  Be sure that the clamp bolt heads [D] face outwards.

- **Tighten screw [E].**
  **Torque - Intake manifold screw: 12N·m**



# Clutch

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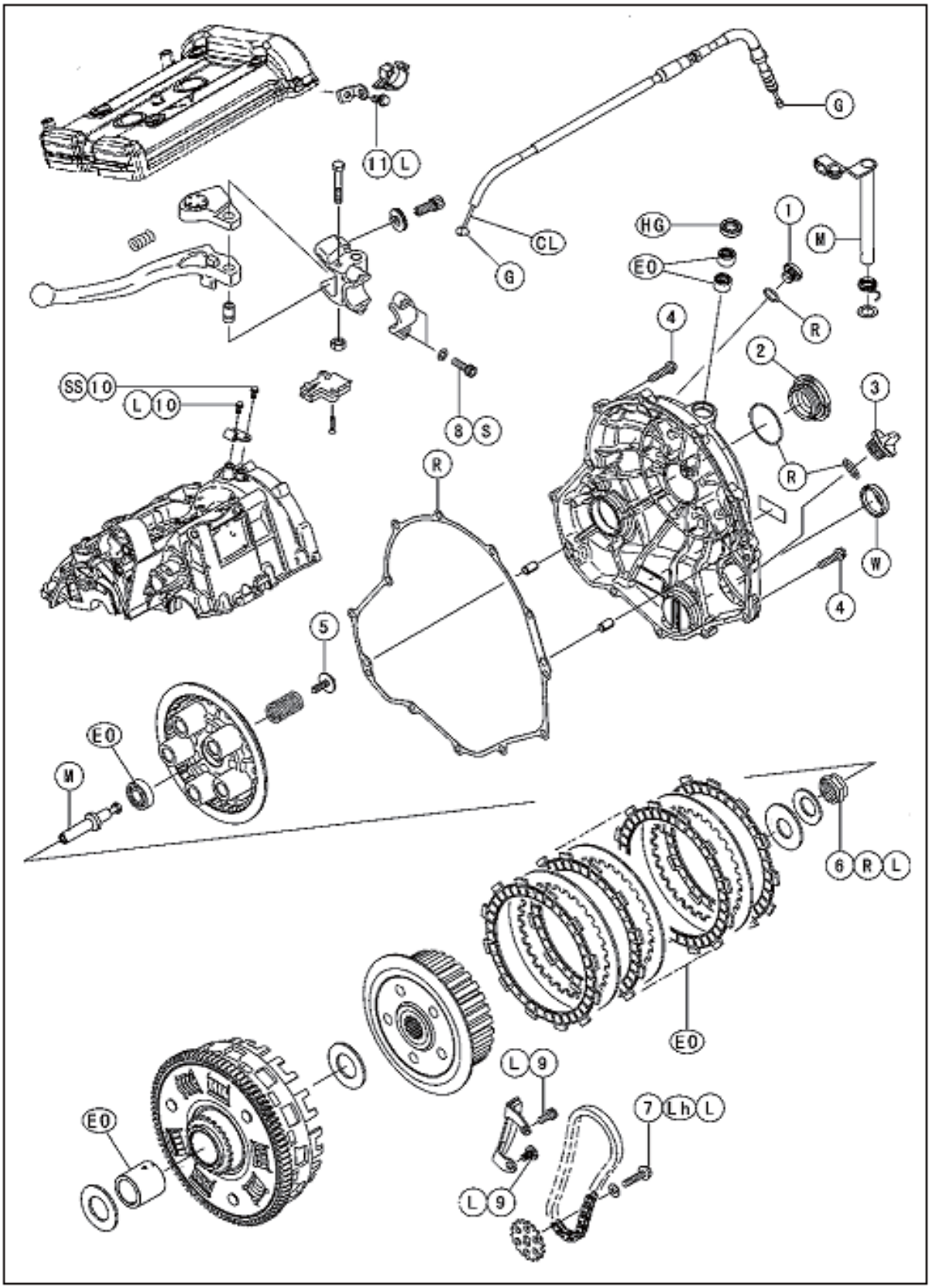
**Exploded View**



## Exploded View

| NO | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Upper Cap on Clutch Cover | – | – | – | Hand-tighten |
| 2 | Lower Cap on Clutch Cover | (25) | (2.5) | (18) | Hand-tighten |
| 3 | Oil Filler Plug | – | – | – | Hand-tighten |
| 4 | Clutch Cover Mounting Bolts | 12 | 1.2 | 106 in·lb | |
| 5 | Clutch Spring Bolts | 10 | 1.0 | 87 in·lb | |
| 6 | Clutch Hub Nut | 132 | 13.5 | 98 | L,R |
| 7 | Oil Pump Sprocket Bolt | 12 | 1.2 | 106 in·lb | L,Lh |
| 8 | Clutch Lever Clamp Bolts | 7.8 | 0.80 | 69 in·lb | S |
| 9 | Oil Pump Chain Guide Bolts | 10 | 1.0 | 87 in·lb | L |
| 10 | Clutch Cable Holder Bolts | 10 | 1.0 | 87 in·lb | L/SS |
| 11 | Clutch Cable Clamp Bolt | 10 | 1.0 | 87 in·lb | L |

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

Lh: Left-hand threads

M: Apply molybdenum disulfide grease.

R: Replacement Parts

S: Follow the specified tightening sequence.

W: Apply cylindrical surface grease.

SS: Apply Silicone sealant

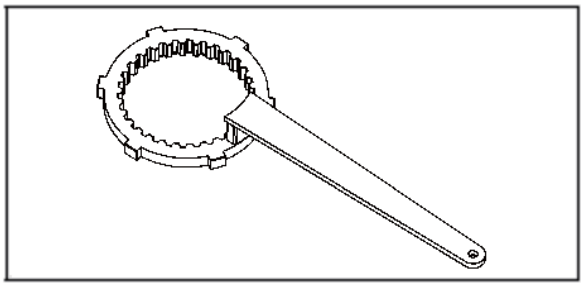
# 6-4 CLUTCH

## Specifications

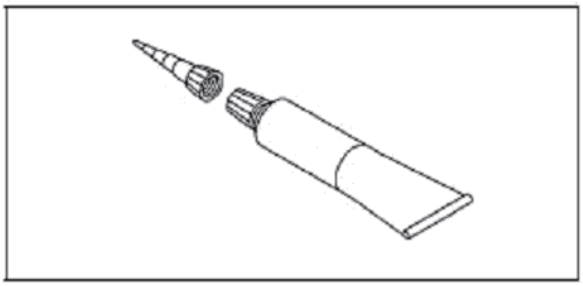
| Item | Standard | Service Limit |
|---|---|---|
| Clutch Lever Free Play | 2~3mm(0.08~0.12in.) | —— |
| Clutch | | |
| Friction Plate Thickness | 2.95~3.05mm (0.116~0.120in.) | 2.83mm(0.110in.) |
| Friction Plate Warp | 0.15mm (0.16in.) or less | 0.3mm(0.012in.) |
| Steel Plate Warp | 0.2mm (0.008in.) or less | 0.3mm(0.012in.) |
| Clutch Spring Free Length | 33.6mm (1.32in.) | 32.6mm (1.28in.) |

**Special Tool and Sealant**

**Clutch Holder**



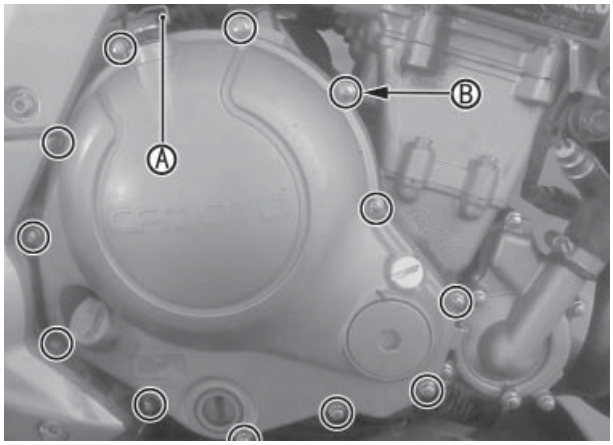
**Silicone Sealant**



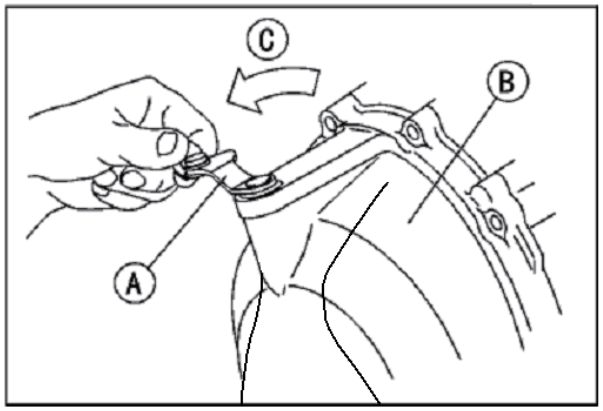
## Clutch Cover

*Clutch Cover Removal*

● Removal:
Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
Right Frame Cover (see Frame Cover Removal in the Frame chapter)
Clutch Cable Lower End [A]
Clutch Cover Mounting Bolts [B]




● Turn the release lever [A] toward the rear as shown, and remove the clutch cover [B] About 90° [C].

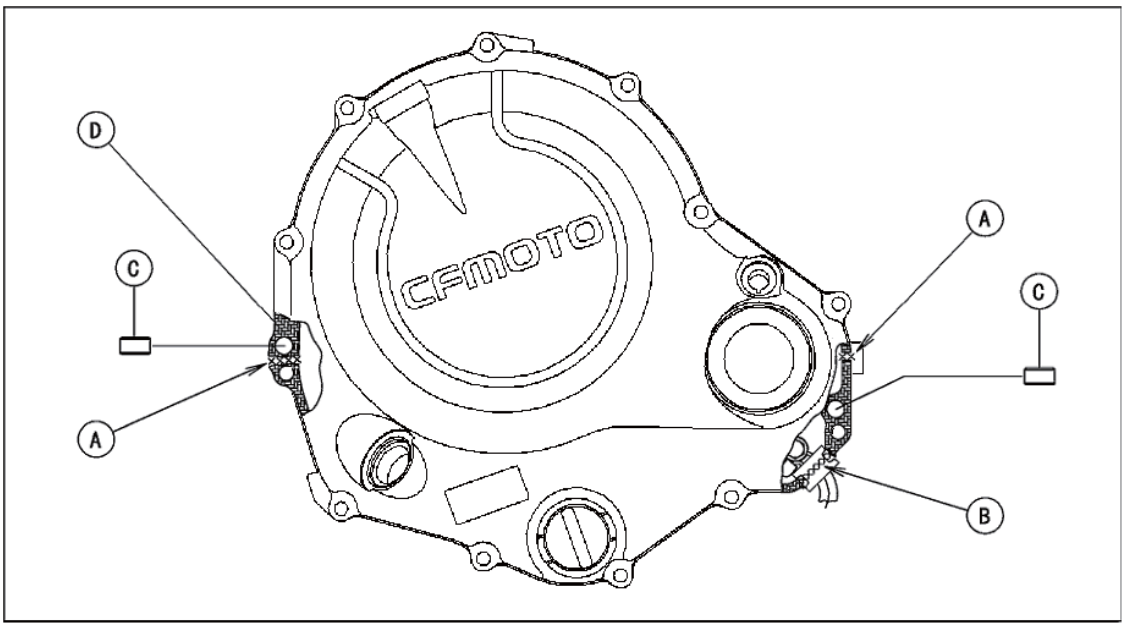


## Clutch Cover

*Clutch Cover Installation*

- Apply silicone sealant to the area [A] where the mating surface of the crankcase touches the clutch cover gasket and to the crankshaft sensor lead grommet [B].
- Be sure that the dowel pins [C] are in position.
- Replace the clutch cover gasket [D] with a new one.
- Tighten the clutch cover mounting bolts.

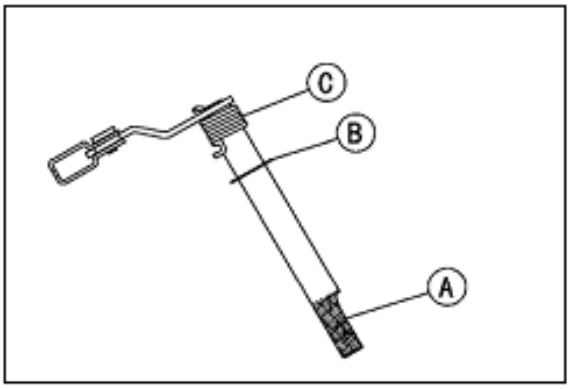
**Torque - Clutch Cover Mounting Bolts: 12 N·m**



## Clutch Cover

*Release Shaft Removal*

- Remove the clutch cover (see Clutch Cover Removal).
- Pull the lever and shaft assembly straight out of the clutch cover

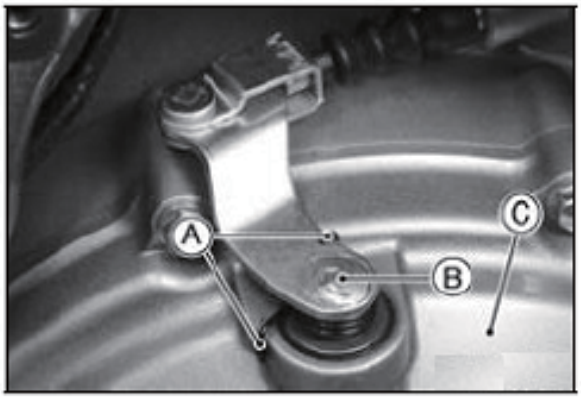



*Release Shaft Installation*

- Apply high-temperature grease to the oil seal lips on the upper ridge of the clutch cover.
- Apply engine oil to the needle bearings in the hole of the clutch cover.
- Apply molybdenum disulfide grease to the pusher-holding portion [A] on the release shaft.
- Install the washer [B] and spring [C].
- Insert the release shaft straight into the upper hole hole of theclutch cover.

| CAUTION |
| --- |
| **When inserting the release shaft, be careful not to remove the spring of the oil seal.** |

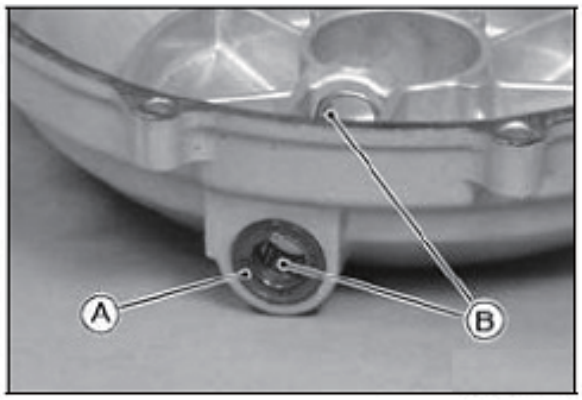
- Fit the spring [A] as shown.
  Release Shaft [B]
  Clutch Cover [C]



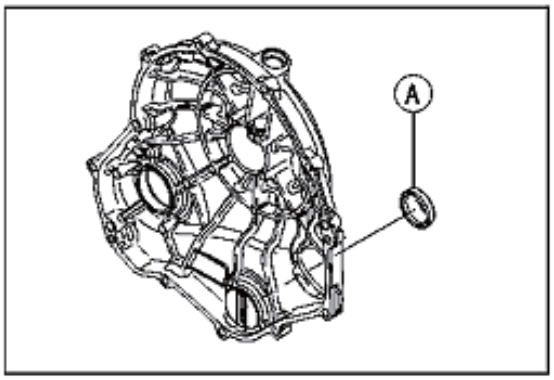
## Clutch Cover

*Clutch Cover Disassembly*

● Remove:
Oil Seal [A]
Needle Bearings [B]



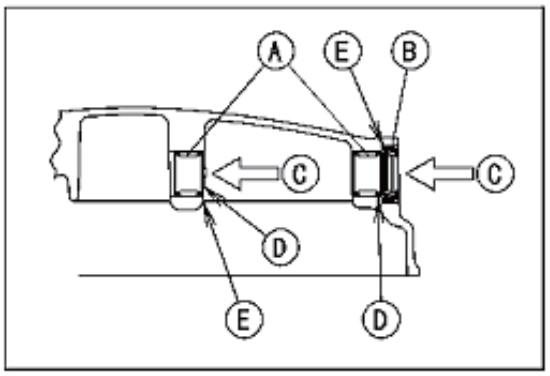

● Remove the oil level gauge [A].



## Clutch Cover

*Clutch Cover Assembly*

- Replace the needle bearings and oil seal with new ones.



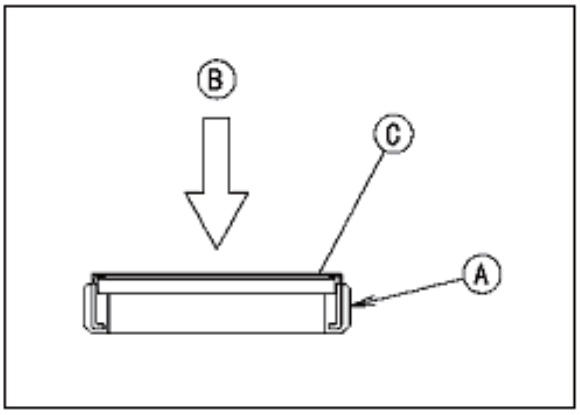

**NOTE**

○ *Install the needle bearings so that the manufacture's mark face out.*

- Install the needle bearings [A] and oil seal [B] position as shown.

- Press [C] the bearing so that the bearing surface [D] is flush with the housing end of clutch cover [E].

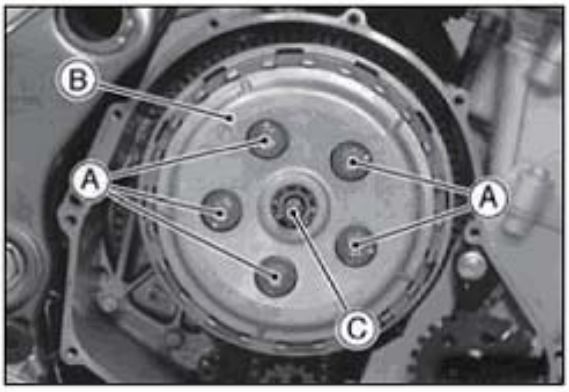
- Apply grease to the rubber of the oil gauge [A] and press [B] it so that the ring [C] face outside.



## Clutch

*Clutch Removal*

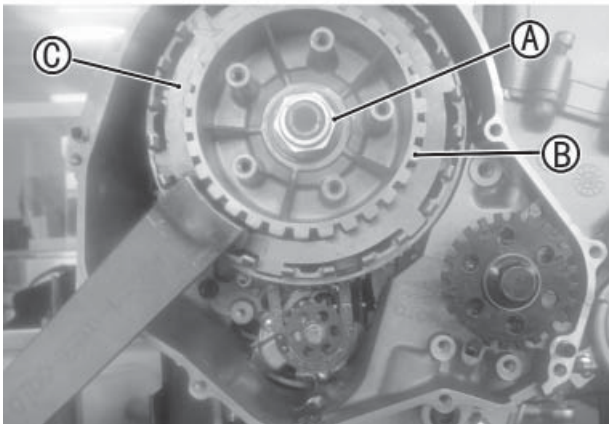
● Remove:
Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter) Clutch Cover (see Clutch Cover Removal) Clutch Spring Bolts [A]
Clutch Springs
Clutch Spring Plate [B] (with thrust bearing and pusher [C])




● Remove:
Friction Plates, Steel Plates
Clutch Hub Nut [A]
Holding the clutch hub [B], remove the nut and washer.

**Special Tool - Clutch Holder [C]**

● Remove:
Clutch Hub Spacer



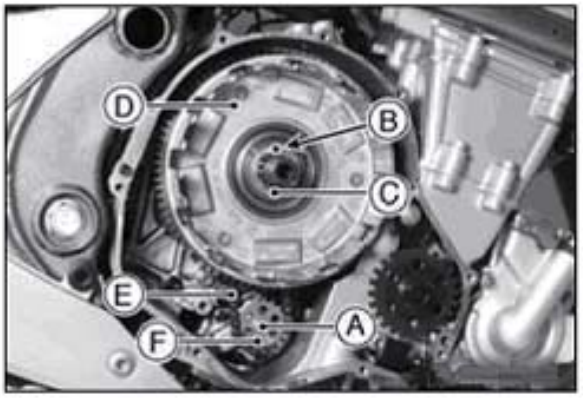
## Clutch

● Remove the oil pump sprocket bolt [A].

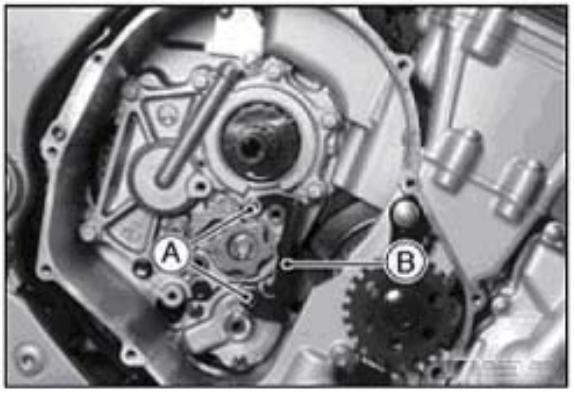
**NOTE**

◦ *The oil pump sprocket bolt has a left-hand threads.*

● Using the hole [B], pull out the sleeve [C].
● Remove the following as a set.
Clutch Housing [D]
Oil Pump Chain [E]
Oil Pump Sprocket [F]




● Unscrew the bolts [A] and remove the oil pump chain guide [B].

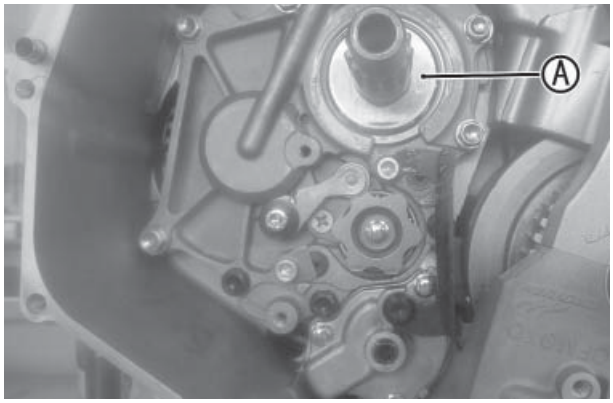



*Clutch Installation*

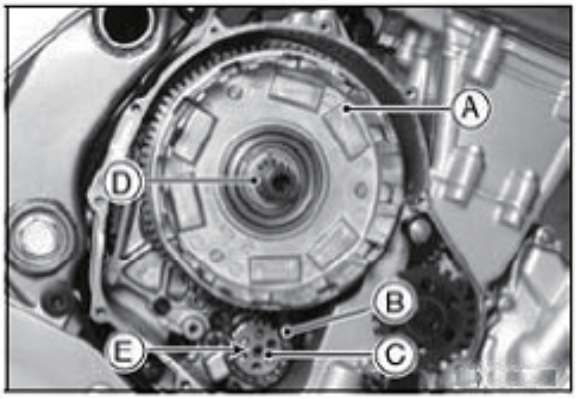
● Apply a non-permanent locking agent to the oil pump chain guide bolts and tighten them.
Torque - Oil Pump Chain Guide Bolts: 10**N·m**
● Put the oil pump chain [A] on the clutch housing gear [B] and the oil pump sprocket [C].

## Clutch

● Be sure that the spacer [A] is in position.



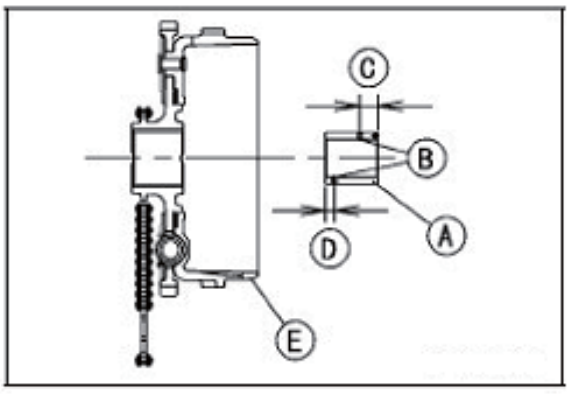

● Insert the following on the drive shaft.
Clutch Housing [A] with Chain [B] and Sprocket [C]
● Align [E] the hole on the oil pump sprocket with the oil pump shaft.
● Apply engine oil on the sleeve [D] and insert to Clutch Housing [A].




**NOTE**

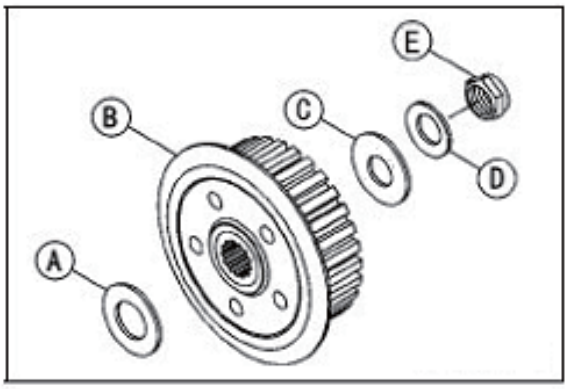
○ *Insert the sleeve into the clutch housing, noting its direction as shown.*

Sleeve [A]
Oil Holes [B]
Long Distance [C]
Short Distance [D]
Clutch Housing [E]



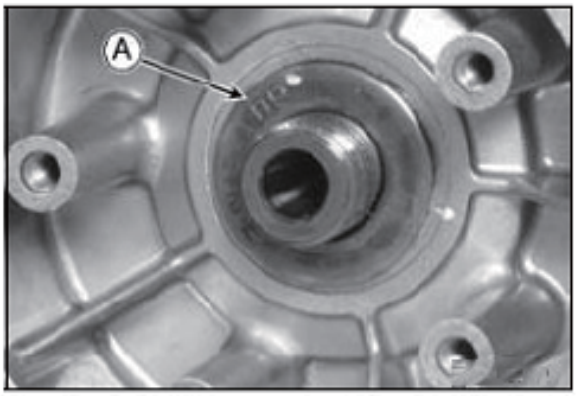
## Clutch

● Install the following parts on the drive shaft.
Spacer [A]
Clutch Hub [B]
Washer [C]
Elastic washer[D]
Nut [E]



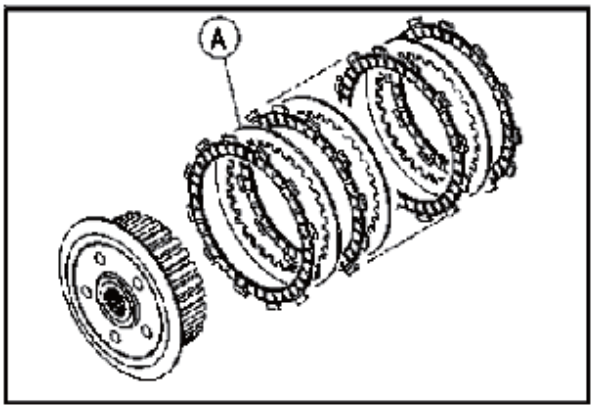

○ Install the washer so that the OUTSIDE mark [A] faces outward.
○ Replace the clutch hub nut with a new one and apply screw fastening grease.
○ Holding the clutch hub, tighten the clutch hub nut.

**Special Tool - Clutch Holder**
**Torque - Clutch Hub Nut: 132 N·m**



## Clutch

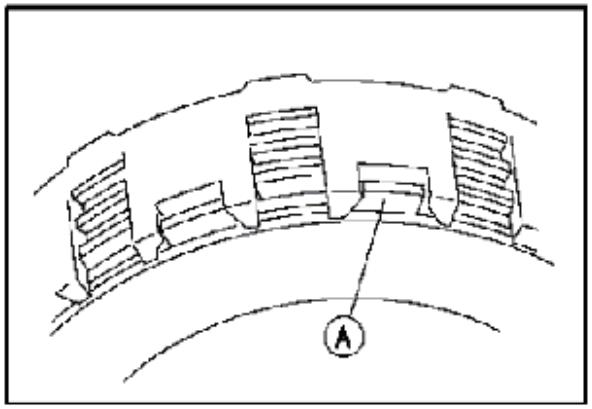
● Install the friction plates and steel plates, starting with a friction plate and alternating them.




| CAUTION |
| --- |
| **If new dry friction plates and steel plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.** |

○ For the first and second steel plate [A], its thickness is 2 mm The others are 2.5 mm

○ Install the last friction plate [A] fitting the tangs in the grooves in the housing as shown.



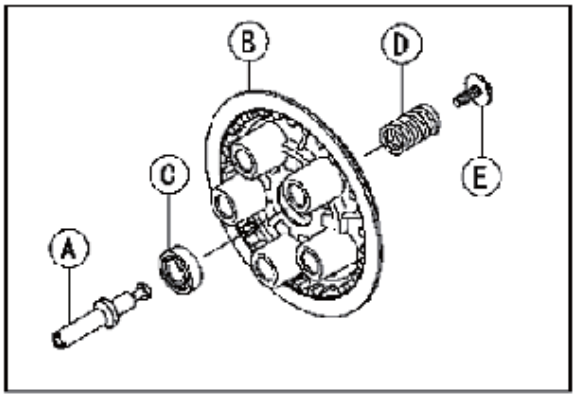

● Apply molybdenum disulfide grease to the pusher ends [A] and install it in the clutch spring plate [B].

○ Apply engine oil to the bearing [C].

● Install the clutch spring plate and springs [D], and tighten the clutch spring bolts [E].

**Torque - Clutch Spring Bolts: 10 N·m**

● Install the clutch cover (see Clutch Cover Installation).

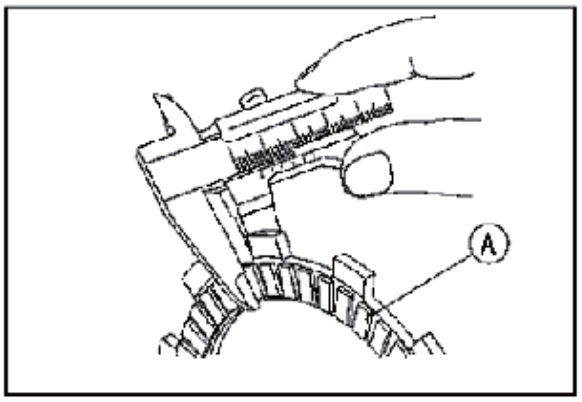


## Clutch

*Clutch Plate, Wear, Damage Inspection*

- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of each friction plate [A] at several points.

★If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

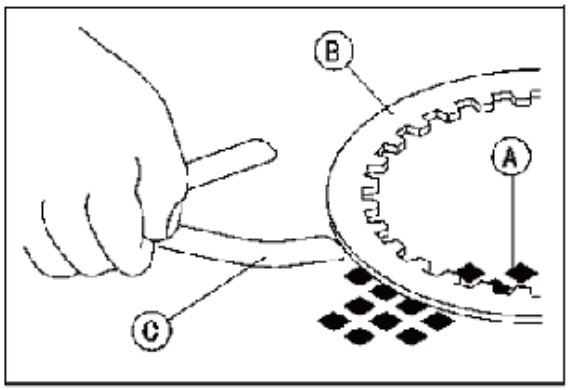



**Friction Plate Thickness**
**Standard: 2.95< 3.05 mm**
**Service Limit: 2.8 mm (0.110 in.)**

*Clutch Plate Warp Inspection*

- Place each friction plate or steel plate on a surface plate and measure the gap between the surface plate [A] and each friction plate or steel plate [B] with a thickness gauge [C]. The gap is the amount of friction or steel plate warp. If any plate is warped over the service limit, replace it with a new one.

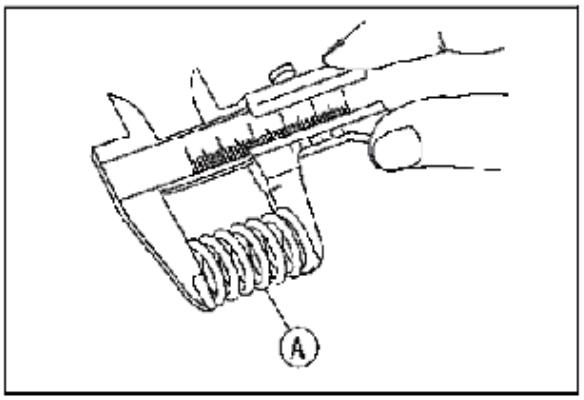
  **Friction and Steel Plate Warp**
  **Standard: 0.15 mm or less**
  **Service Limit: 0.3 mm**




*Clutch Spring Free Length Measurement*

- Measure the free length of the clutch springs [A].

★ If any spring is shorter than the service limit, it must be replaced.



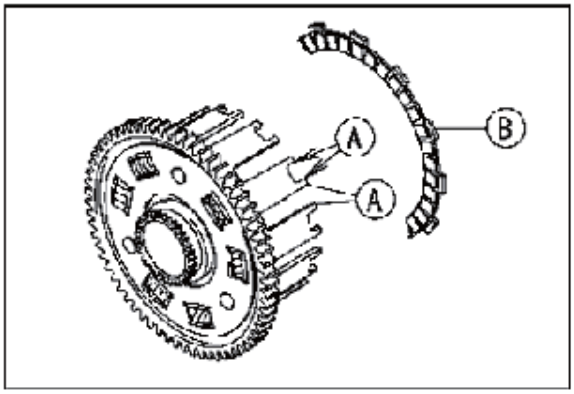

**Clutch Spring Free Length**
**Standard: 33.6 mm**
**Service Limit: 32.6 mm**

## Clutch

*Clutch Housing Finger Inspection*

● Visually inspect the clutch housing fingers [A] where the friction plate tangs [B] hit them.

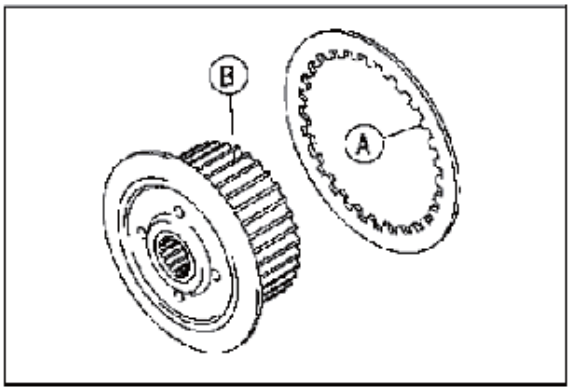
★If they are badly worn or if there are groove cuts where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.




*Clutch Housing Spline Inspection*

● Visually inspect where the teeth [A] on the steel plates wear against the clutch hub splines [B].

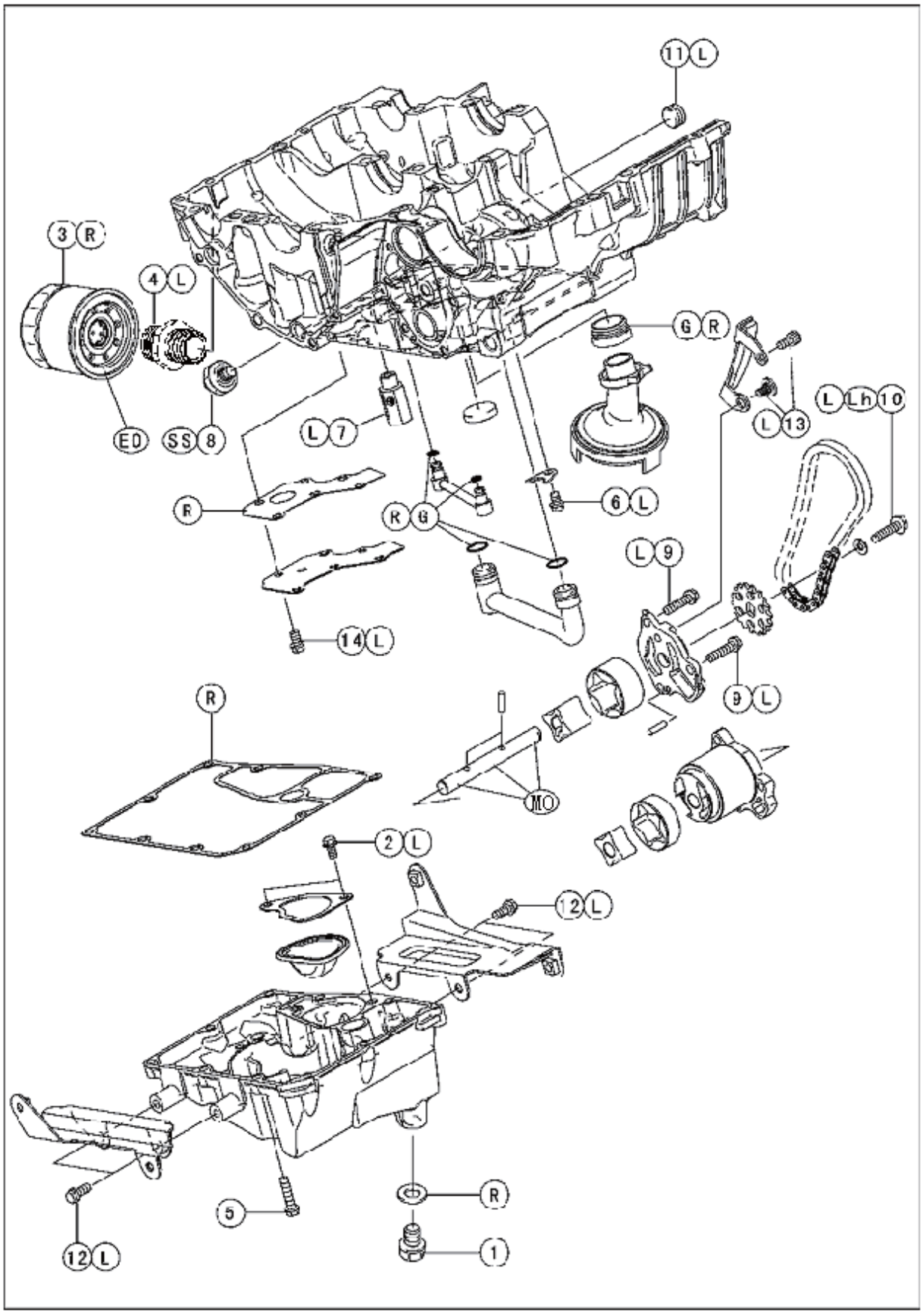
★If there are notches worn into the splines, replace the clutch hub. Also, replace the steel plates if their teeth are damaged.



# Engine Lubrication System

## Table of Contents

## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Engine Oil Drain Bolt | 30 | 3.0 | 22 | |
| 2 | Filter Plate Bolts | 10 | 1.0 | 87in·lb | L |
| 3 | Oil Filter | 17 | 1.75 | 13 | EO, R |
| 4 | Holder Mounting Bolt | 25 | 2.5 | 18 | L |
| 5 | Oil Pan Bolts | 12 | 1.2 | 106in·lb | |
| 6 | Oil Pipe Plate Bolt | 8 | 0.8 | 71in·lb | L |
| 7 | Oil Pressure Relief Valve | 15 | 1.5 | 11 | L |
| 8 | Oil Pressure Switch | (15) | (1.5) | (11) | SS |
| 9 | Oil Pump Cover Bolt | 12 | 1.2 | 106in·lb | L |
| 10 | Oil Pump Sprocket Bolt | 12 | 1.2 | 106in·lb | L, Lh |
| 11 | Oil Passage Plug | 20 | 2.0 | 15 | L |
| 12 | Lowe Fairing Bracket Bolts | 12 | 1.2 | 106in·lb | L |
| 13 | Oil Pump Chain Guide Bolts | 10 | 1.0 | 87in·lb | L |
| 14 | Oil Plate Bolts | 10 | 1.0 | 87in·lb | L |

EO: Apply engine oil

G: Apply grease

L: Apply an on-permanent locking agent

Lh: Left-hand threads

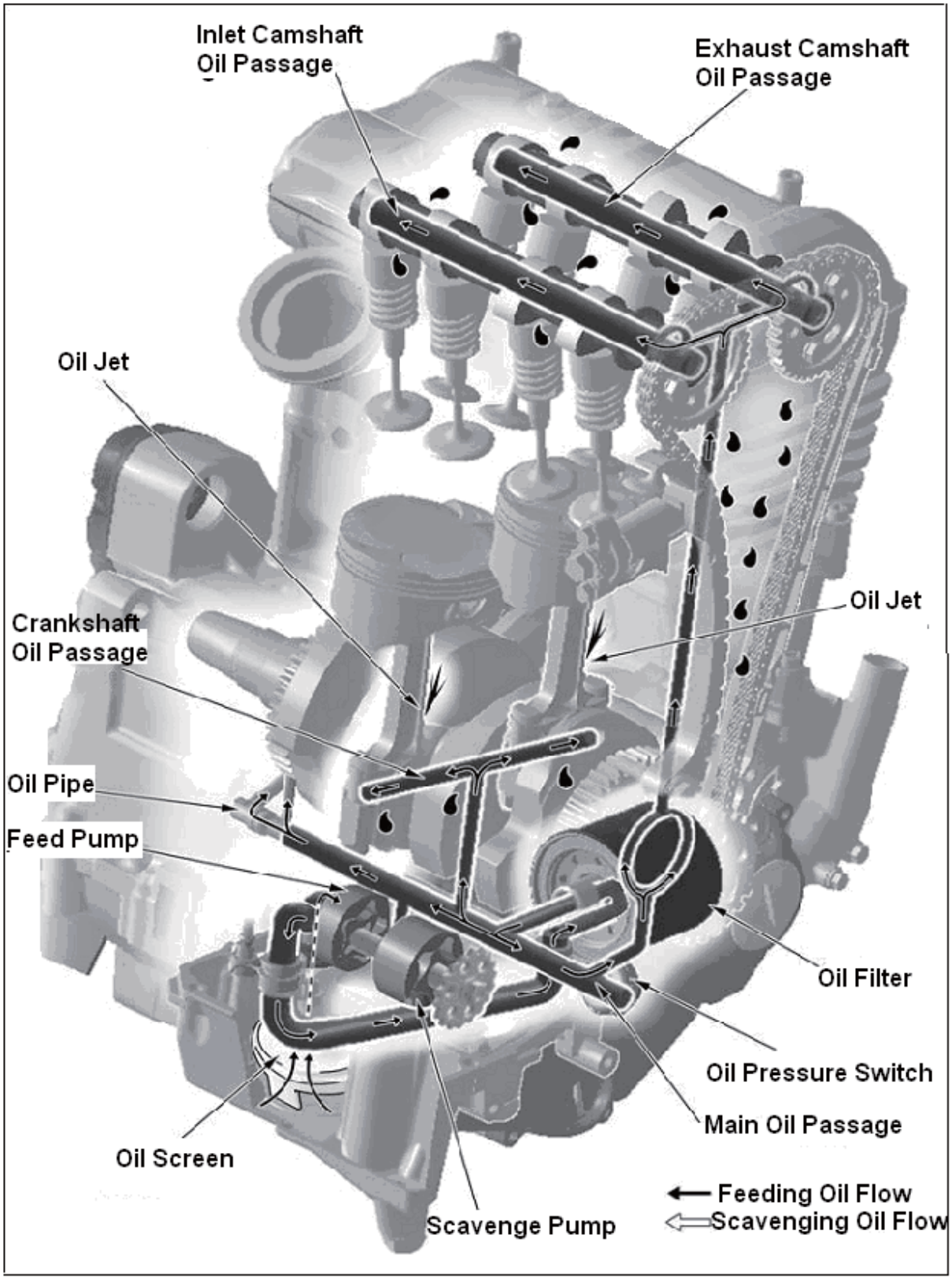
MO: Apply molybdenum disulfide oil solution

(Mixture of the engine oil and molybdenum disulfide grease in a weight ratio10:1)

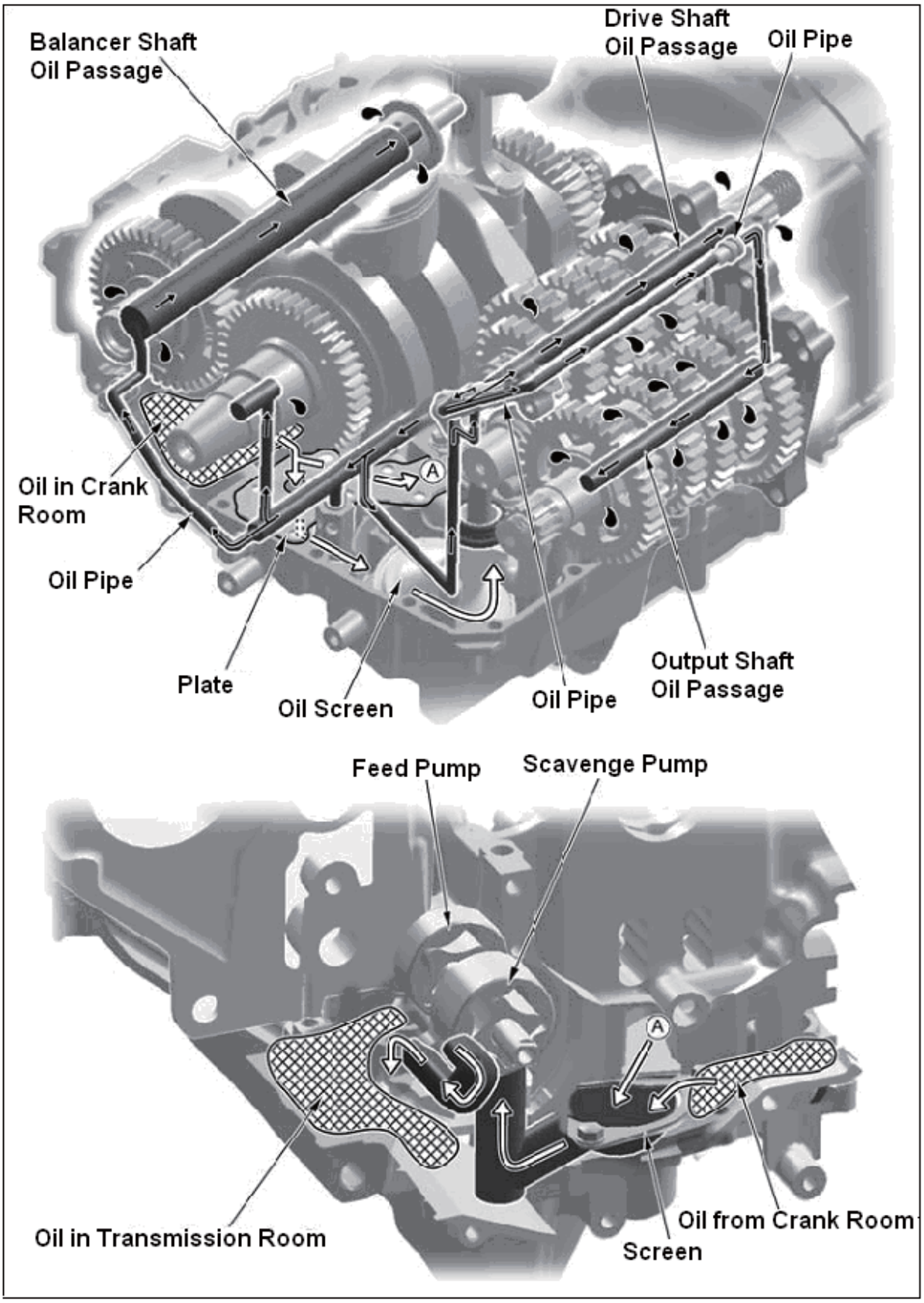
R: ReplacementParts

SS: Applysiliconesealant

### Engine Oil Flow Chart



**Engine Oil Flow Chart**



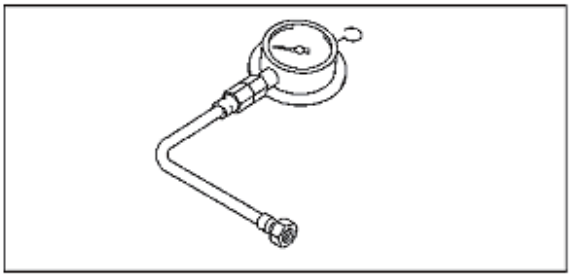
# 7-6 ENGINE LUBRICATION SYSTEM

## Specifications

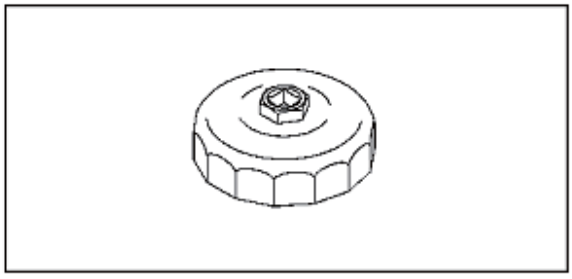
| Item | Standard |
|---|---|
| **Engine Oil** | |
| Type | API SG |
| Viscosity | SAE 15W-40 |
| Capacity | 2.0L(2.1US gt)(when filter is not removed)<br>2.2L(2.3US gt)(when filter is removed)<br>2.6L(2.7US gt)(when engine is completely dry) |
| Level | Between upper and lower level lines |
| **Oil Pressure Measurement** | 216~294kPa(2.2~3.0kgf/cm$^2$,31~43 psi) at 4000r/min(rpm), Oil Temperature 90°C(194°F) |
| Oil Pressure | |

## Special Tools and Sealant

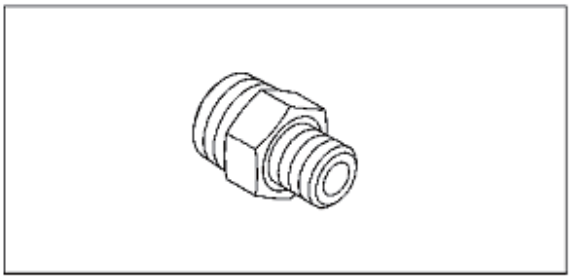
Oil Pressure Gauge, 10kgf/cm$^2$



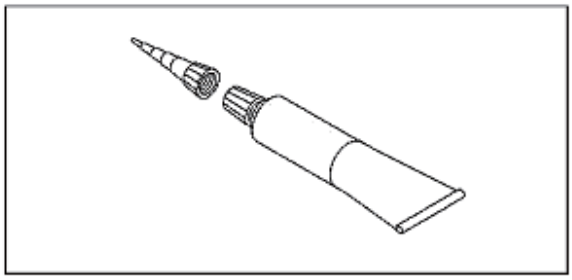
Oil Filter Wrench



Oil Pressure Gauge Adapter, PT3/8



Silicone Sealant



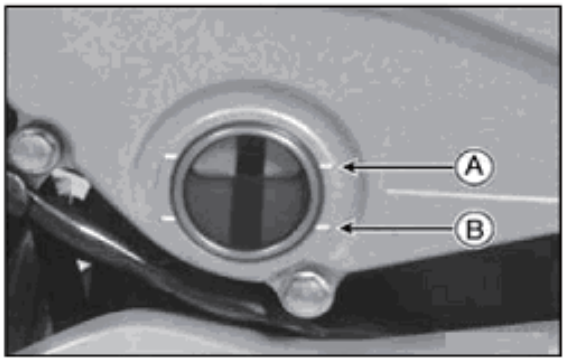
## Engine Oil and Oil Filter

**⚠ WARNING**

**Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.**

*Oil Level Inspection*

● Check that the engine oil level is between the upper [A] and lower [B] levels in the engine.




**NOTE**

○ *Situate the motorcycle so that it is perpendicular to the ground.*

★If the motorcycle has just been used, wait several minutes for all the oil to drain down.

★ If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.

**CAUTION**

**Racing the engine before the oil reaches every part can cause engine seizure.**
**If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the oil pressure warning light will light. If this light stays on when the engine is running above idle speed, stop the engine immediately and find the cause.**

## Engine Oil and Oil Filter

★If the oil level is too high, remove the excess oil, using a syring or some other suitable device.

★If the oil level is too low, add the correct acmount of oil through the oil filter opening. Use the same type and make of oil that is already in the engine.

**NOTE**

○ *If the engine oil type and make are unknown, use any brand of the specified oil to top off the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.*

*Engine Oil Change*

● Refer to the Engine Oil Change in the Periodic Maintenance chapter.

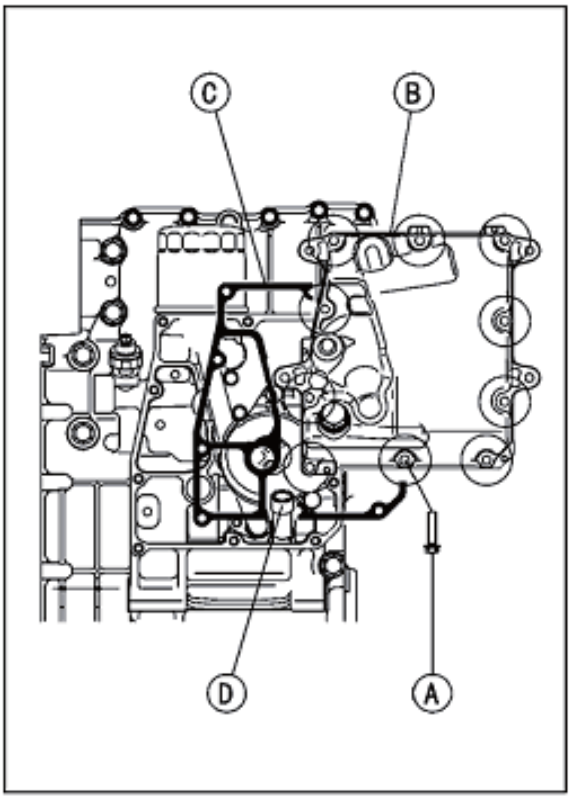
*Oil Filter Replacement*

● Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

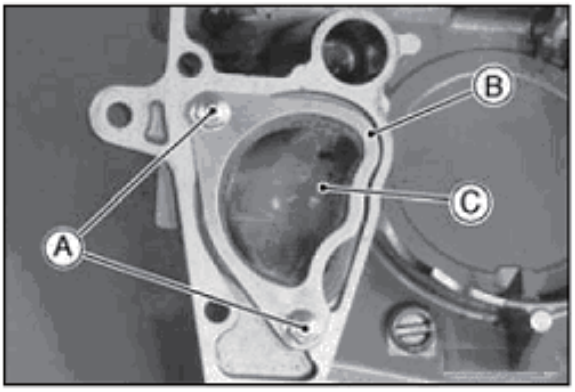
## Oil Pan

*Oil Pan Removal*

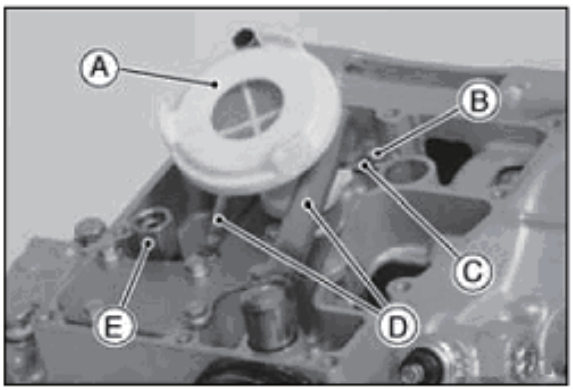
● Remove:
Engine oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
Exhaust Pipe (see Exhause Pipe Removal in the Engine Top End chapter)
Muffler body (see Muffler Body Removal in the Engine Top End chapter)
Oil Pan Bolts [A]
Oil Pan [B]
Gasket [C]
Damper [D]




● Remove the following from the oil pan as necessary.
Filter Plate Bolts [A]
Filter Plate [B]
Filter [C]




● Remove the following from the lower crankcase half as necessary.
Oil Screen [A]
Oil Pipe Plate Bolt [B]
Oil Pipe Plate [C]
Oil Pipes [D]
Oil Pressure Relief Valve [E]



## Oil Pan

*Oil Pan Installation*

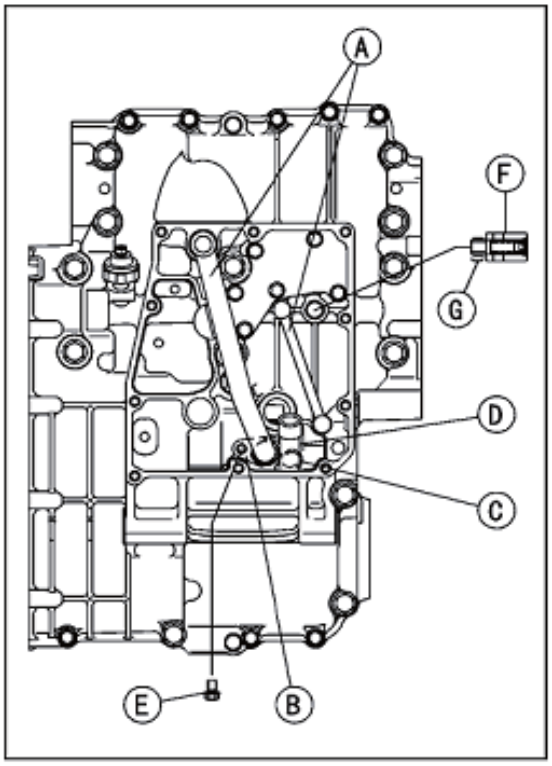
● Apply grease to the O-rings on the oil pipes [A] Install the oil pipe plate [B] so that its guide portion [C] fits the breather pipe [D] as shown.
● Apply a non-permanent locking agent to the oil pipe plate bolt.

**Torque: Oil Pipe Plate Bolt [E]: 8N·m**

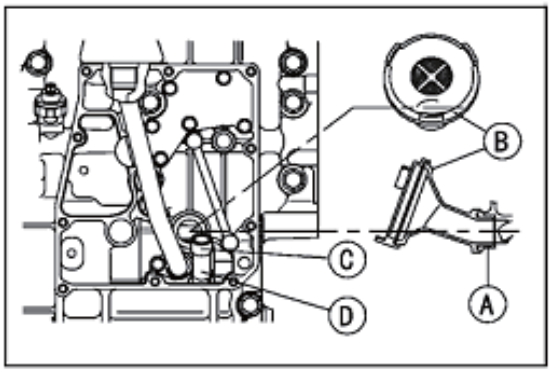
If the oil pressure relief valve [F] was removed, install it.
○ Apply a non-permanent locking agent to the threads [G] of the oil pressure relief valve, and tighten it.

**Torque: Oil Pressure Relief Valve 15N·m**

| CAUTION |
| --- |
| **Do not apply too much non-permanent locking agent to the threads. This may block the oil passage.** |

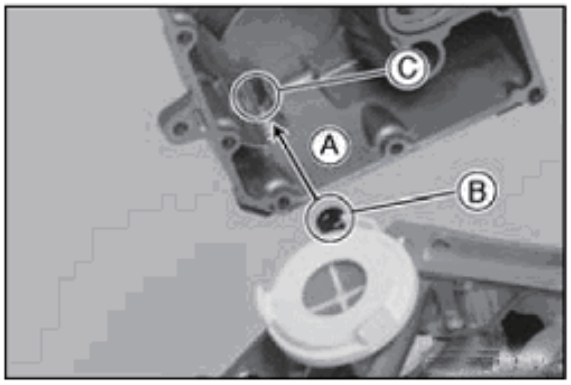



● Apply grease to the O-ring [A] on the oil screen [B] and install it on the lower crankcase hald as shown.
● Be sure the damper [C] is on the end of the breather pipe [D].



## Oil Pan

● Replace the oil pan gasket with a new one.
When installing the oil pan, align [A] the damper [B] on the breather pipe with the hollow [C] on the oil pan.




● Tighten Oil Pan Bolts

**Torque: Oil Pan Bolts 12N·m**

## Oil Pressure Relief Valve

*Oil Pressure Relief Valve Removal*

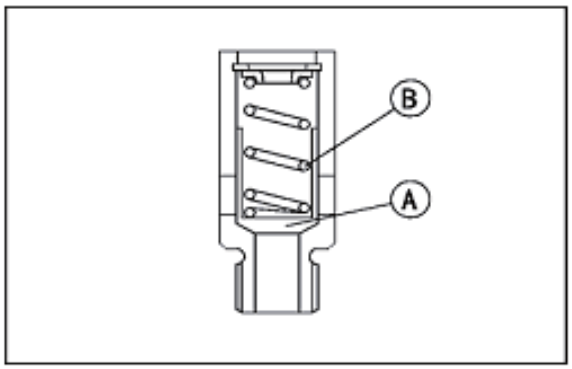
● Refer to the Oil Pan Removal.

*Oil Pressure Relief Valve Installation*

● Refer to the Oil Pan Installation.

*Oil Pressure Relief Valve Inspection*

● Check to see if the valve [A] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [B] pressure.




**NOTE**

○ *Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.*

★If any rough spots are found during above inspection, wash the valve clean with a high-flash point solvent and blow out any foreign particles that may be in the valve with compressed air.

**⚠ WARNING**

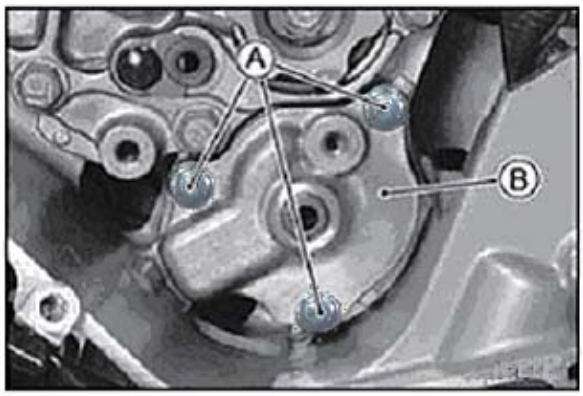
**Clean the oil pressure relief valve in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent.**

★If cleaning does no solve the problem, replace the oil pressure relief valve as an accessory. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.

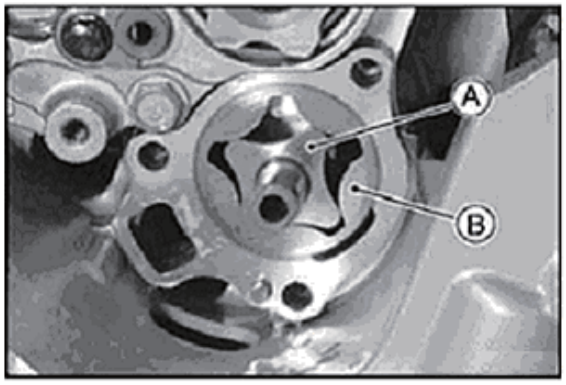
## Oil Pump

*Oil Pump Removal*

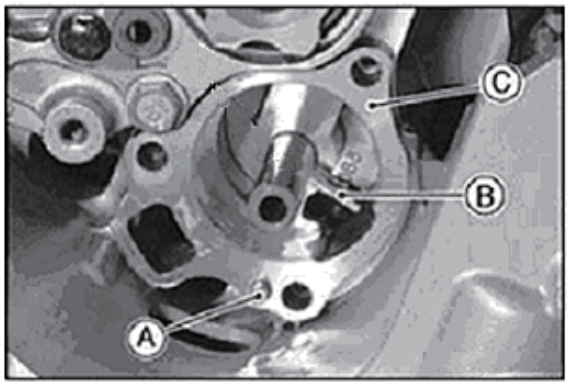
● Drain:
Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
Remove:
Clutch (see Clutch Removal in the Clutch chapter)
Oil Pump Cover Bolts [A]
Oil Pump Cover [B]



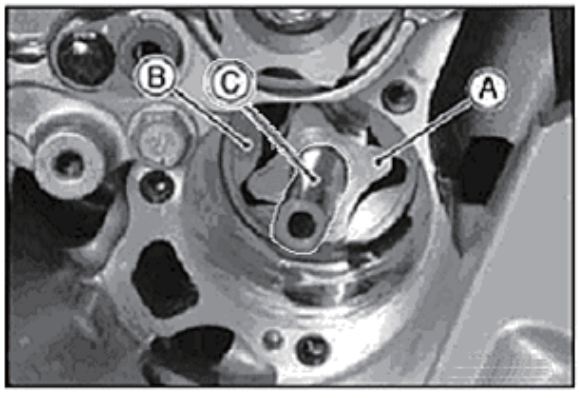

● Remove:
Inner Rotor [A] for Scavenge Pump
Outer Rotor [B] for Scavenge Pump




● Remove:
Dowel Pin [A]
Pin [B]
Oil Pump Body [C]




● Remove:
Oil Pump Shaft [C] with Inner Rotor [A] and Pin for Feed Pump
Outer Rotor [B] for Feed Pump



## Oil Pump

*Oil Pump Installation*

● Apply molybdenum disulfide grease to the portion [A] of the oil pump shaft as shown.

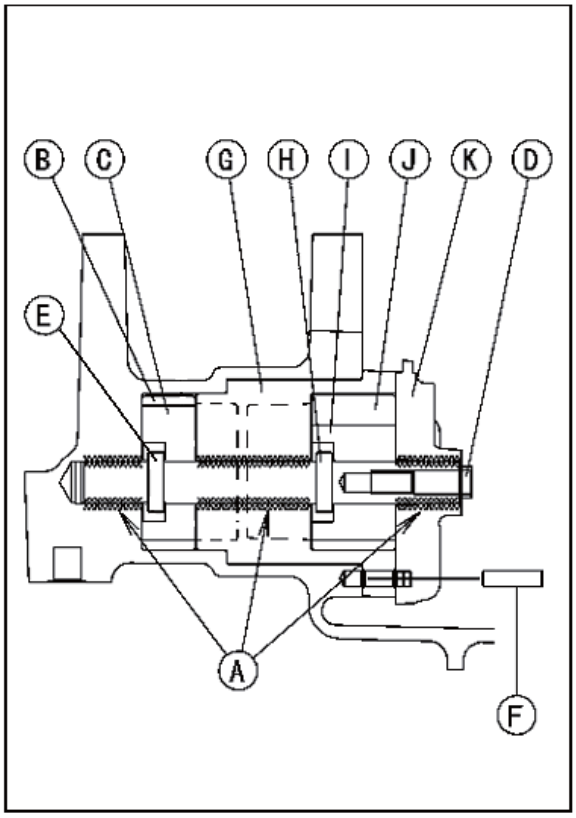
● Install:
Outer Rotor [B] for Feed Pump
Inner Rotor [C] for Feed Pump
Oil Pump Shaft [D] and Pin [E]
Dowel Pin [F]
Oil Pump Body [G]
Pin [H] and Inner Rotor [I] for Scavenge Pump
Outer Rotor [J] for Scavenge Pump
Oil Pump Cover [K]

**NOTE**

○ *The scavenge pump rotors are wider than the feed pump rotors*

● Apply a non-permanent locking agent to the oil pump cover bolts and tighten them.

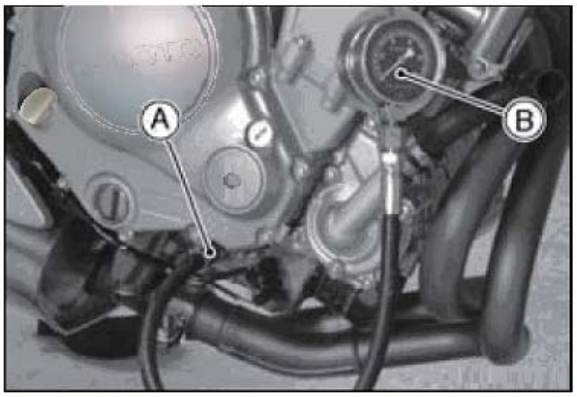
**Torque: Oil Pump Cover Bolts 12N.m**



## Oil Pressure Measurement

*Oil Pressure Measurement*

- Remove the lower fairing (see Lower Fairing Removal in the Frame chapter)
- Remove the oil passage plug, and attach the adapter [A] and gauge [B] to the plug hole.




**Special Tools:**
**Oil Pressure Gauge 10kgf/cm2**
**Oil Pressure Gauge Adapter, PT3/8**

- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.

★ If the oil pressure is much lower than the standard, check the oil pump, relief valve, and/or crankshaft bearing insert wear immediately.

★ If the reading is much higher than the standard, check the oil passages for clogging.

**Oil Pressure**
**Standard: at 4000r/min(rpm), oil temperature 90 °C(194 °F)216~294kPa ( 2.2~3.0kgf/cm2,31~43psi)**

- Stop the engine
- Remove the oil pressure gauge and adapter

**⚠ WARNING**

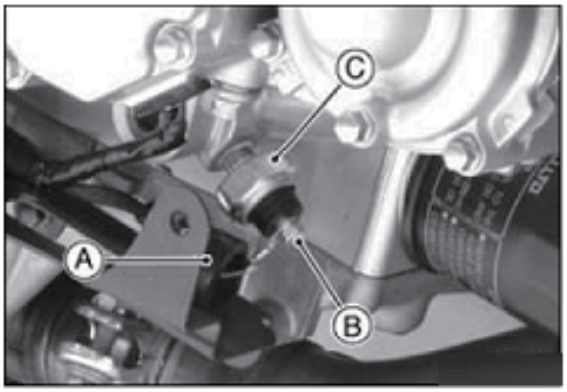
**Takt care against burns form hot engine oil that will drain through the oil passage when the gauge adapter is removed.**

- Apply a non-permanent locking agent to the oil passage plug, and install it.

**Torque: Oil Passage Plug 20N·m**

## Oil Pressure Switch

*Oil Pressure Switch Removal*




● Remove:
Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
Switch Cover [A]
Switch Terminal Bolt [B]
Oil Pressure Switch [C]

*Oil Pressure Switch Installation*

● Apply silicone sealant to the threads of the oil pressure switch and tighten it.
Sealant: Silicone Sealant

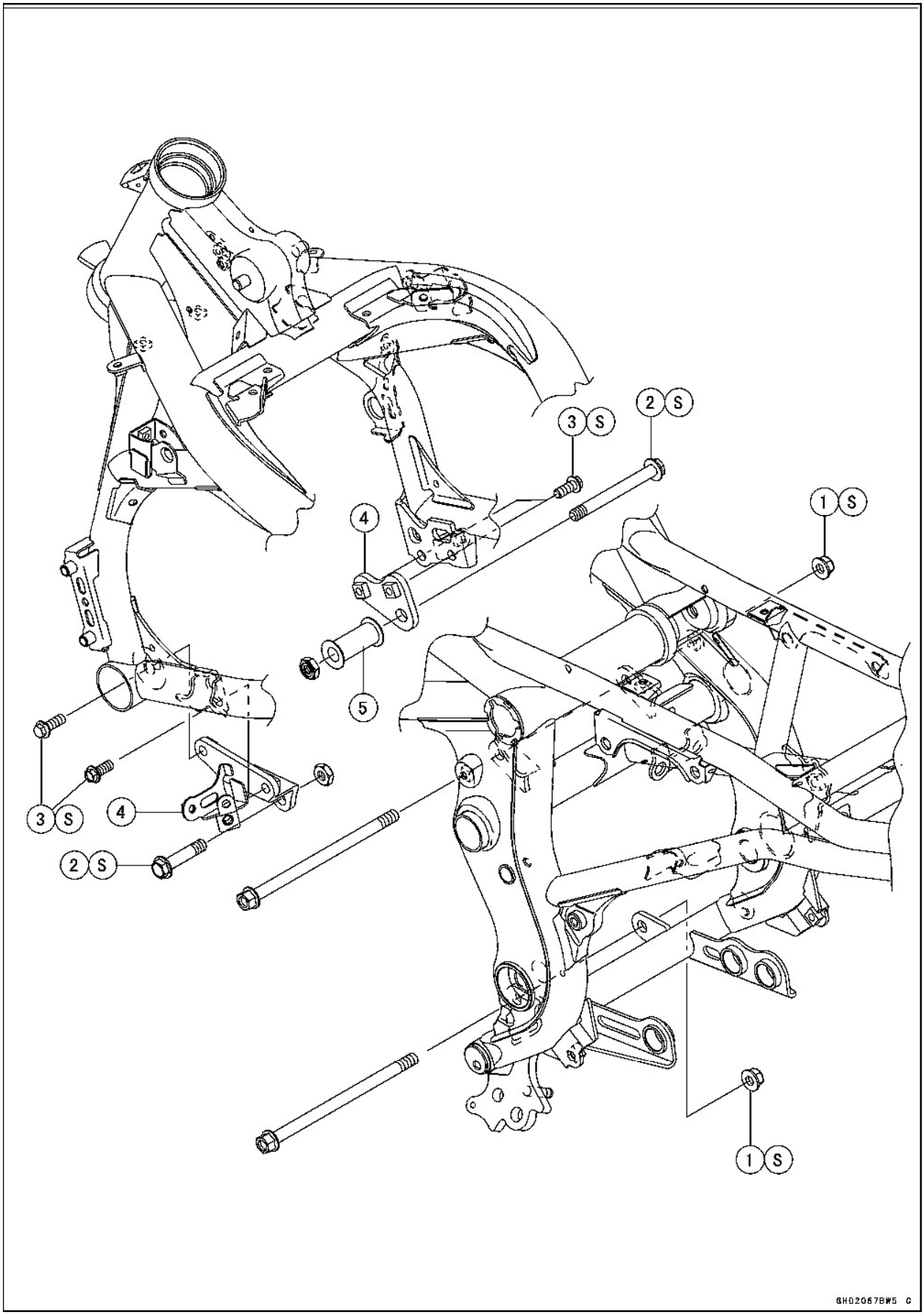
**Torque: Oil Pressure Switch 15N·m**

● Tighten the terminal bolt securely.

# Engine Removal/Installation

## Table of Contents

## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Rear Engine Mounting Nuts | 44 | 4.5 | 32 | S |
| 2 | Front Engine Mounting Bolts | 44 | 4.5 | 32 | S |
| 3 | Engine Mounting Bracket Bolts | 25 | 2.5 | 18 | S |

4. Engine Mounting Brackets

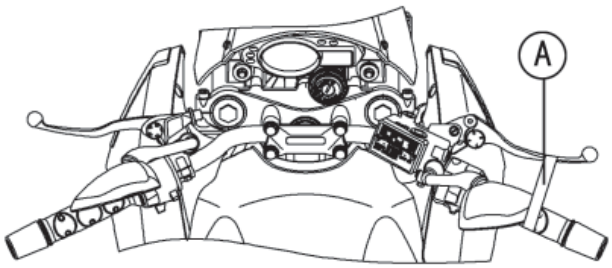
5. Collar

S: Follow the specified tightening sequence.

## Engine Removal/Installation

*Engine Removal*

- Support the rear part of the swingarm with a stand.
- Squeeze the brake lever slowly and hold it with a band [A].




**⚠ WARNING**

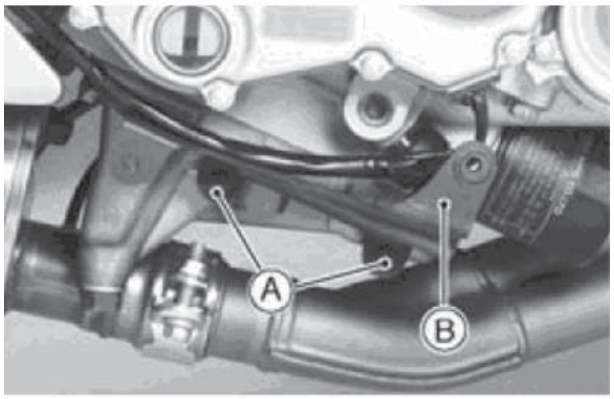
**Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. It could cause an accident and injury.**

**CAUTION**

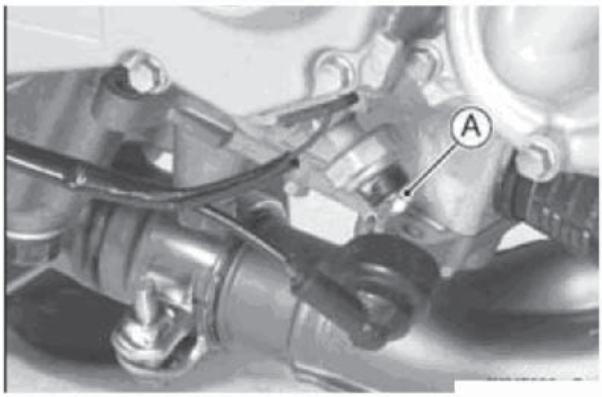
**Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.**

- Drain:
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
  Coolant (see Coolant Change in the Periodic Maintenance chapter)

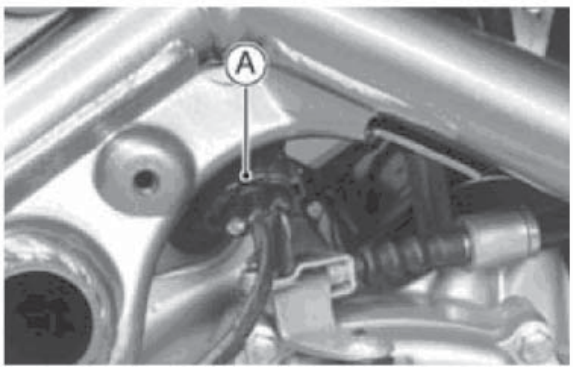
- Remove:
  Seat (see Seat Removal in the Frame chapter)
  Lower Fairing and Center Fairings (see Fairing section in the Frame chapter)
  Side Covers (see Side Cover Removal in the Frame chapter)
  Frame Covers (see Frame Cover Removal in the Frame chapter)
  Radiator and Hoses (see Radiator and Radiator Fan Removal in the Cooling System chapter)
- Unscrew the lower fairing bracket bolts (both sides) [A] and remove the brackets (both sides) [B].




- Disconnect the oil pressure switch terminal [A].

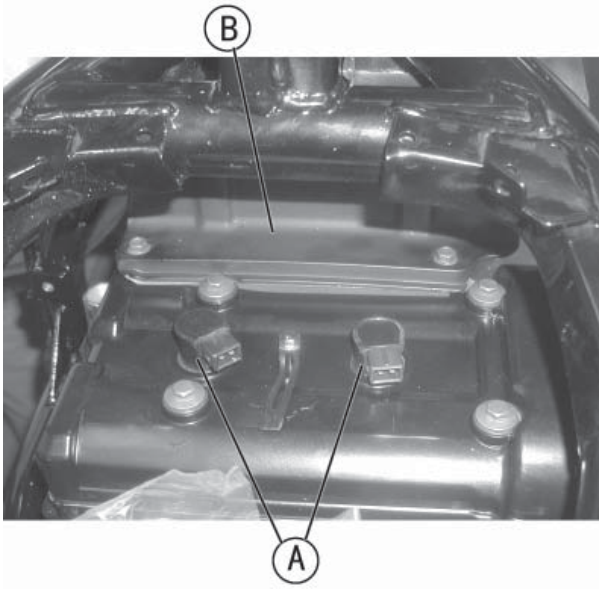


● Disconnect the crankshaft sensor lead connector [A].

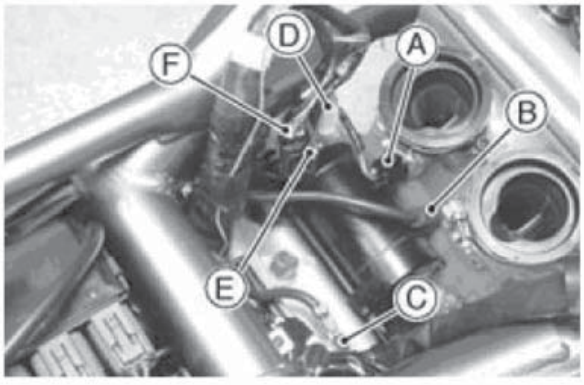



● Remove:
Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
Fuel Tank (see Fuel Tank Removal in the Fuel System (EFI) chapter)
Air Filter Housing (see Air Filter Housing Removal in the Fuel System (EFI) chapter)
Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (EFI) chapter)
Clutch Cable (see Clutch Cable Removal in the Clutch chapter)

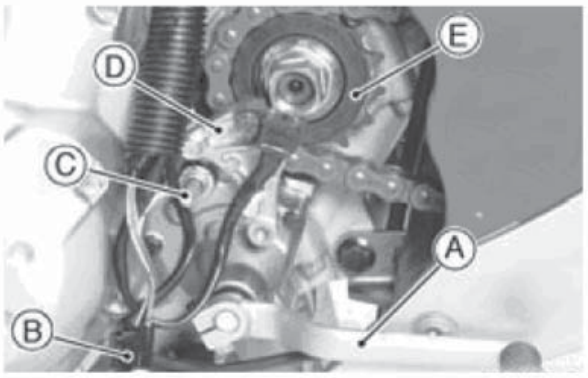
● Remove:
Stick Coils [A]
Baffle Plate [B]



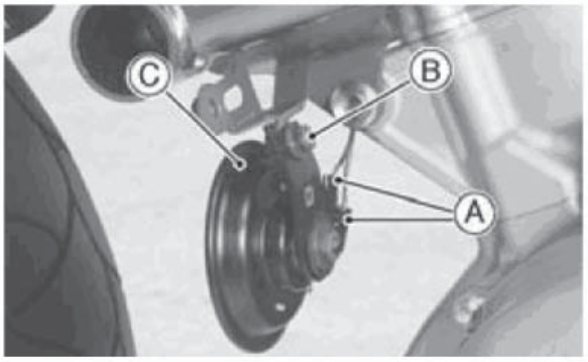

● Remove or Disconnect:
Coolant Temperature Sensor Lead Connector [A]
Starter Motor Cable [B]
Engine Ground Cable Terminal Bolt [C]
Alternator Lead Connector [D]
Sidestand Switch Lead Connector [E]
Speed Sensor Lead Connector [F]



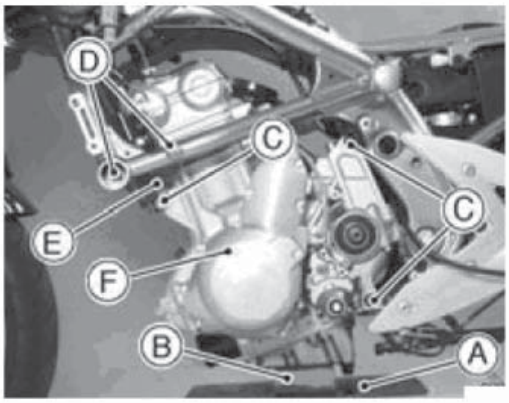
## Engine Removal/Installation




- Remove the engine sprocket cover (see Engine Sprocket Removal in the Final Drive chapter).
- Remove the shift pedal [A] (see Shift Pedal Removal in the Crankshaft/Transmission chapter).
- Disconnect:
  Oxygen Sensor Lead Connector [B]
  Neutral Switch Lead Terminal [C]
- Remove the bracket [D] and the engine sprocket [E] (see Engine Sprocket Removal in the Final Drive chapter).




- Remove:
  Horn Leads [A] (Disconnect)
  Horn Bolt [B]
  Horn [C]




- Support the engine with a stand or jack [A].
- Put a wooden board [B] on the suitable stand.
- Remove the engine mounting bolts [C].
- Remove the engine mounting bracket bolts (both sides) [D] and remove the brackets [E].
- Remove the engine [F].

*Engine Installation*

- Firstly, insert the rear engine mounting bolts [A] from the left side of the engine.
- Secondly, temporally tighten the right engine mounting bracket bolts [B] and then the right front engine mounting bolt [C].
- Position the collar [D] as shown.
- Thirdly, temporally tighten the left engine mounting bracket bolts [E] and then the left front engine mounting bolt [F].
- Fourthly, temporally tighten the rear engine mounting nuts[G].
- Fifthly, tighten the rear engine mounting nuts.

**Torque - Rear Engine Mounting Nuts: 44 N·m (4.5 kgf·m, 32 ft·lb)**

- Sixthly, tighten the right engine mounting bracket bolts.

**Torque - Engine Mounting Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Seventhly, tighten the right front engine mounting bolt.

**Torque - Front Engine Mounting Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)**

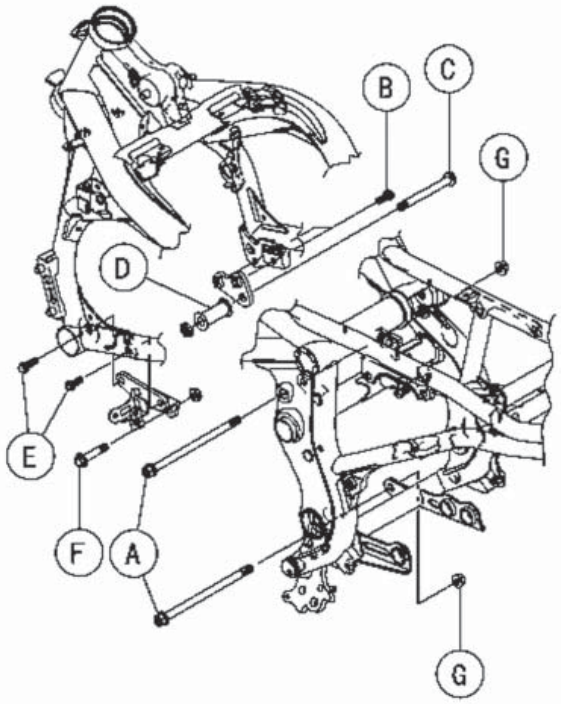
- Eighthly, tighten the left engine mounting bracket bolts.

**Torque - Engine Mounting Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Lastly, tighten the left front engine mounting bolt.

**Torque - Front Engine Mounting Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)**

- Install the engine sprocket (see Engine Sprocket Installation in the Final Drive chapter).
- Run the leads, cables, and hoses correctly.



# Crankshaft/Transmission

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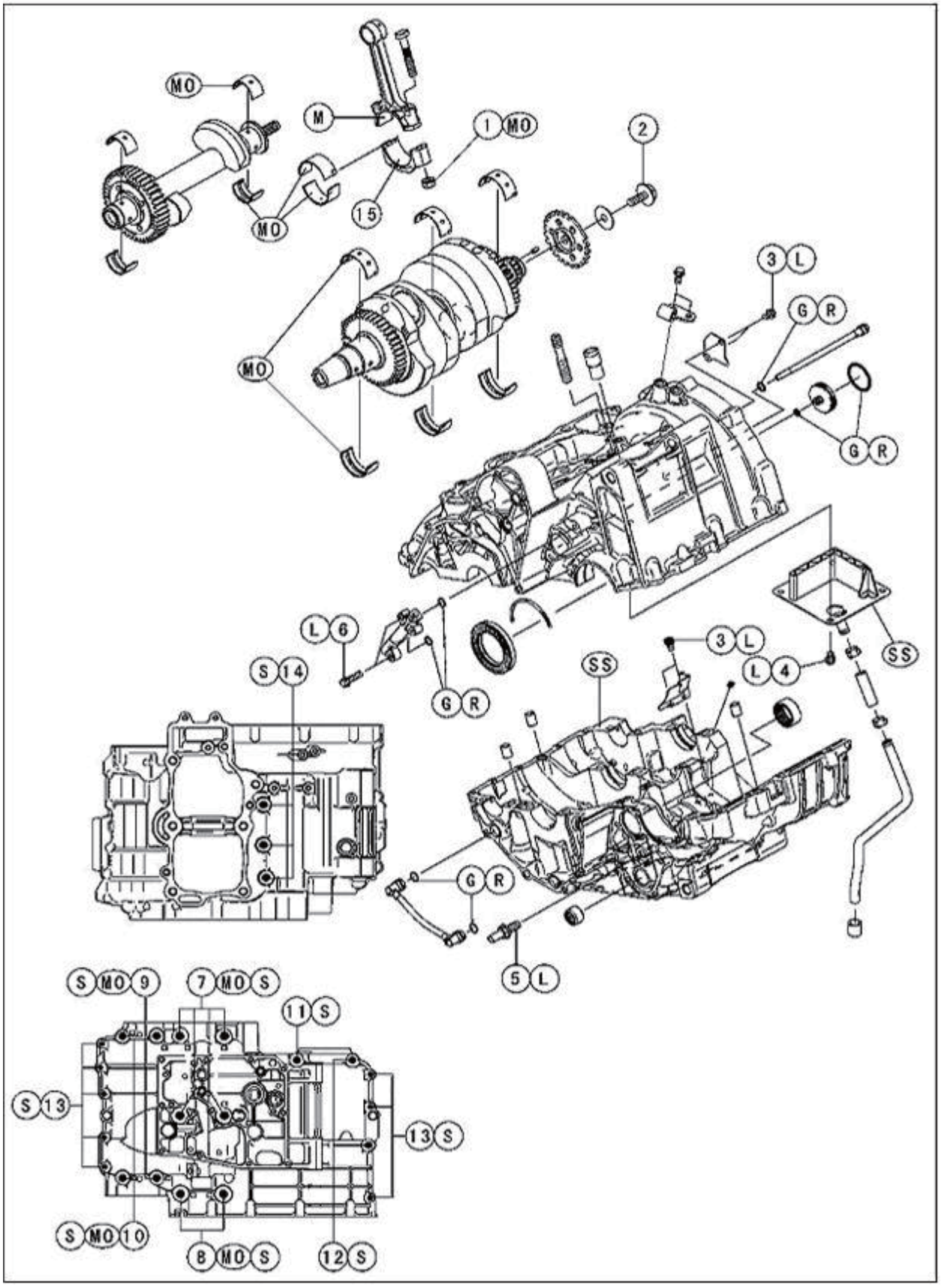
### Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Connecting Rod Big End Nuts | See Text | --- | --- | MO |
| 2 | Timing Rotor Bolt | 40 | 4.1 | 30 | |
| 3 | Oil Plate Bolts | 10 | 1.0 | 87in·lb | L |
| 4 | Breather Plate Bolts | 10 | 2.0 | 87in·lb | L |
| 5 | Shift Shaft Return Spring Pin | 29 | 2.9 | 22 | L |
| 6 | Oil Plate Bolts | 10 | 1.0 | 87in·lb | L |
| 7 | Crankcase Bolts (M9,L=113mm) | 44 | 4.5 | 32 | MO,S |
| 8 | Crankcase Bolts (M9,L=83mm) | 44 | 4.5 | 32 | MO,S |
| 9 | Crankcase Bolts (M8,L=73mm) | 35 | 3.6 | 26 | MO,S |
| 10 | Crankcase Bolts (M8,L=60mm) | 35 | 3.6 | 26 | MO,S |
| 11 | Crankcase Bolts (M8,L=110mm) | 27.5 | 2.8 | 20 | S |
| 12 | Crankcase Bolts (M8,L=50mm) | 27.5 | 2.8 | 20 | S |
| 13 | Crankcase Bolts (M7) | 20 | 2.0 | 15 | S |
| 14 | Upper Crankcase Bolts | 27.5 | 2.8 | 20 | S |

15. Do not apply any grease or oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

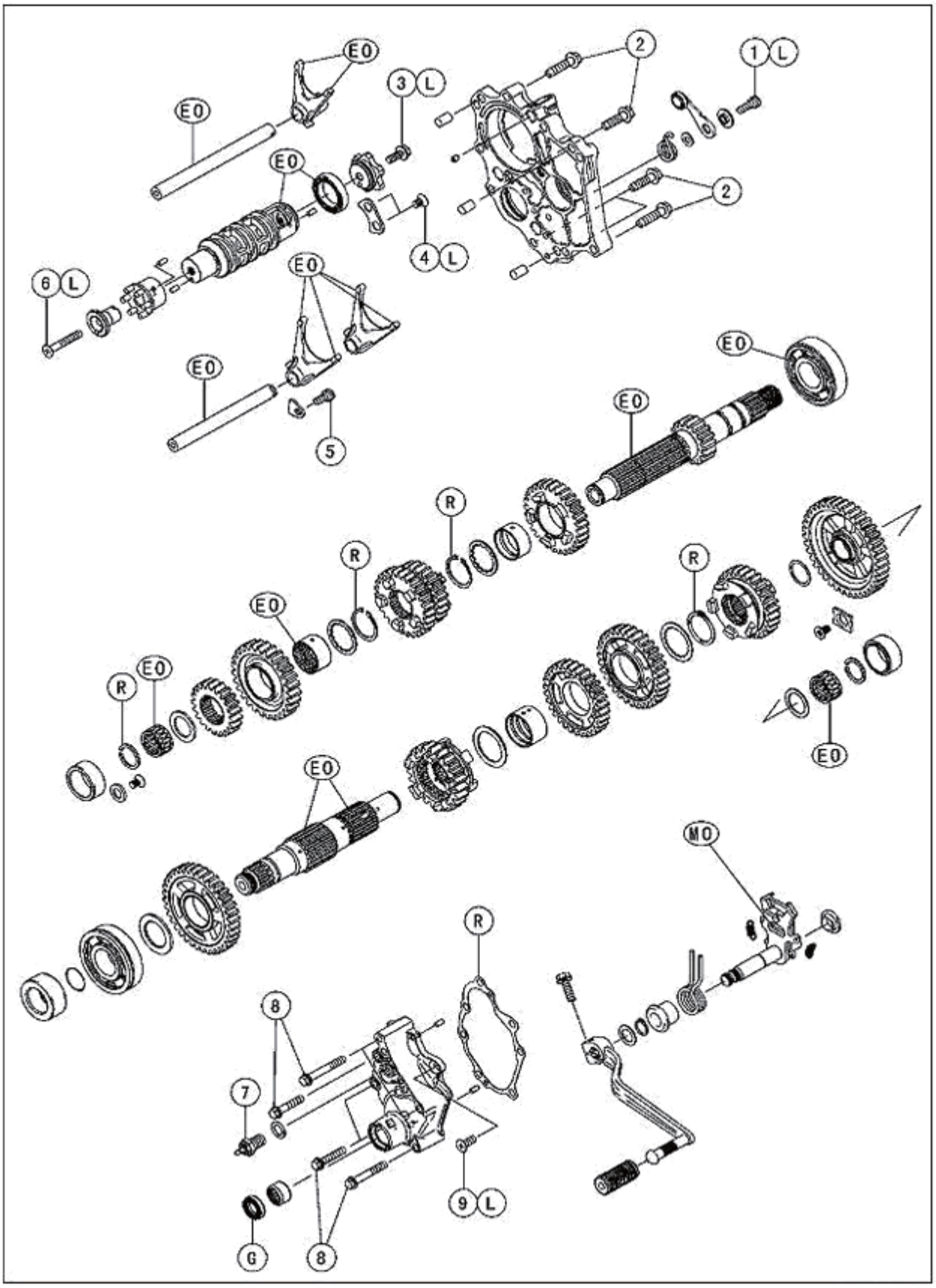
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)

R: Replacement Parts

S: Follow the specified tightening sequence.

SS: Apply silicone sealant.

## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Gear Positioning Lever Bolt | 12 | 1.2 | 106in·lb | L |
| 2 | Transmission Case Bolts | 20 | 2.0 | 15 | |
| 3 | Shift Drum Cam Bolt | 12 | 1.2 | 106in·lb | L |
| 4 | Shift Drum Bearing Holder Screw | 5 | 0.50 | 43in·lb | L |
| 5 | Shift Rod Plate Bolt | 10 | 1.0 | 87in·lb | |
| 6 | Neutral Switch Holder Screw | 5 | 0.50 | 43in·lb | L |
| 7 | Neutral Switch | 15 | 1.5 | 11 | |
| 8 | Shift Shaft Cover Bolts | 12 | 1.0 | 87in·lb | |
| 9 | Shift Shaft Cover Screw | 5 | 0.50 | 43in·lb | L |

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil solution.

(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)

R: Replacement Parts

## Specificatons

| Item | Standard | Service Limit |
|---|---|---|
| Crankshaft, Connecting Rods | | |
| Connecting Rod Bend | 0.04/100mm | 0.2/100mm |
| Connecting Rod Twist | 0.08/100mm | 0.2/100mm |
| Connecting Rod Big End Side Clearance | 0.15 ~ 0.30mm | 0.55mm |
| Connecting Rod Big End Bearing Insert/ Crankpin Clearance | 0.02 ~ 0.04mm | 0.08mm |
| Crankpin Diameter: | 37.984 ~ 38.00mm | 37.97mm |
| Marking: | | |
| 2 | 37.984 ~ 37.992mm | – – – |
| 1 | 37.993 ~ 38.000mm | – – – |
| Connecting Rod Big End Inside Diameter: | 41.000 ~ 41.016mm | – – – |
| Marking: | | |
| 1 | 41.000 ~ 41.008mm | – – – |
| 2 | 41.009 ~ 41.016mm | – – – |
| Connecting Rod Big End Bearing Insert Thickness: | | |
| Marking: | | |
| Black | 1.485 ~ 1.490mm | – – – |
| Blue | 1.490 ~ 1.495mm | – – – |
| Green | 1.495 ~ 1.500mm | – – – |

Connecting Rod Big End Bearing Insert Selection:

| Con-rod Big End Bore Diameter Marking | Crankpin Diameter Marking | Bearing Insert |
|---|---|---|
| 1 | 1 | Black |
| 1 | 2 | Blue |
| 2 | 1 | |
| 2 | 2 | Green |

## Specifications

| Item | Standard | Service Limit |
|---|---|---|
| Crankshaft/Upper Crankcase Clearance | 0.05 ~ 0.25mm | 0.40mm |
| Crankshaft Runout | 0.02mm | 0.05mm |
| Crankshaft Main Bearing Insert/Journal Clearance | 0.02 ~ 0.04mm | 0.07mm |
| Crankshaft Main Journal Diameter: | 37.984 ~ 38.00mm | 37.96mm |
| Marking: | | |
| 2 | 37.984 ~ 37.992mm | – – – |
| 1 | 37.993 ~ 38.000mm | – – – |
| Crankcase Main Bearing Inside Diameter: | 41.000 ~ 41.016mm | – – – |
| Marking: | | |
| Blue | 41.000 ~ 41.008mm | – – – |
| None | 41.009 ~ 41.016mm | – – – |
| Crankshaft Main Bearing Insert Thickness: | | |
| Marking: | | |
| Brown | 1.496 ~ 1.500mm | – – – |
| Black | 1.500 ~ 1.504mm | – – – |
| Blue | 1.504 ~ 1.508mm | – – – |

Crankshaft Main Bearing Insert Selection:

| Crankcase Main Bearing Bore Diameter Marking | Crankshaft Main Journal Diameter Marking | Bearin Insert |
|---|---|---|
| Blue | 1 | Brown |
| Blue | 2 | Black |
| None | 1 | |
| None | 2 | Blue |

| | | |
|---|---|---|
| Balancer Shaft Bearing Insert/Journal Clearance | 0.02 ~ 0.04mm | 0.07mm |
| Balancer Shaft Journal Diameter: | 27.987 ~ 28.00mm | 27.96mm |
| Marking: | | |
| 1 | 27.987 ~ 27.993mm | —— |
| 2 | 27.993 ~ 28.000mm | —— |

## Specifications

| | | |
|---|---|---|
| Crankcase Bearing Bore Diameter: | 31.000 ~ 31.016mm | —— |
| Marking: | | |
| Blue | 31.000 ~ 31.008mm | —— |
| None | 31.009 ~ 31.016mm | —— |
| Balancer Shaft Bearing Insert Thickness: | | |
| Marking: | | |
| Brown | 1.490 ~ 1.494mm | —— |
| Black | 1.494 ~ 1.498mm | —— |
| Blue | 1.498 ~ 1.502mm | —— |

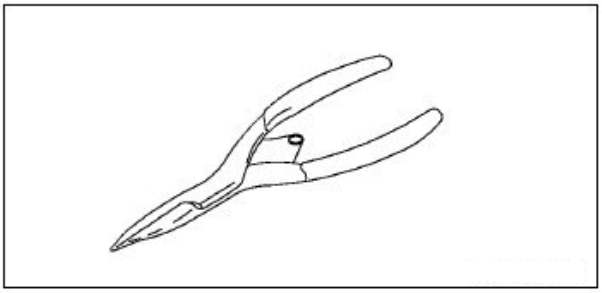
Balancer Shaft Bearing Insert Selection

| Crankcase Bearing Bore Diameter Marking | Balancer Shaft Journal Diameter Marking | Bearing Insert |
|---|---|---|
| Blue | 2 | Brown |
| Blue | 1 | Black |
| None | 2 | |
| None | 1 | Blue |

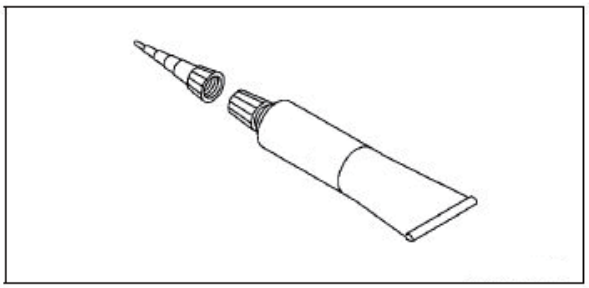
| **Transmission** | | |
|---|---|---|
| Shift Fork Ear Thickness | 5.9 ~ 6.0mm | 5.8mm |
| Gear Groove Width | 6.05 ~ 6.15mm | 6.25mm |
| Shift Fork Guide Pin Diameter | 6.90 ~ 7.0mm | 6.8mm |
| Shift Drum Groove Width | 7.1 ~ 7.15mm | 7.3mm |

## Special Tools

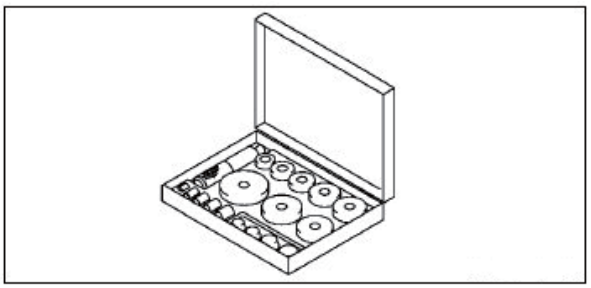
Outside Circlip Pliers



Silicone Sealant



Bearing Driver Set

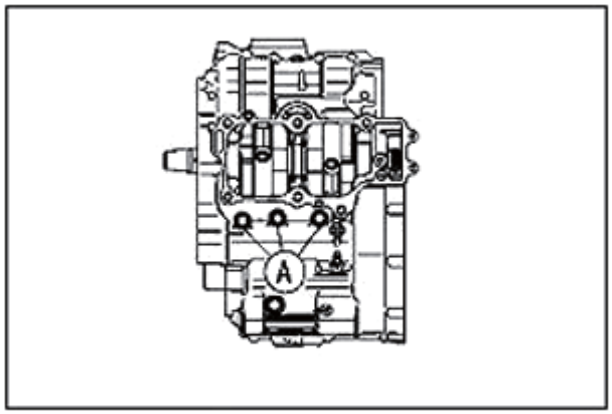


## Crankcase Splitting

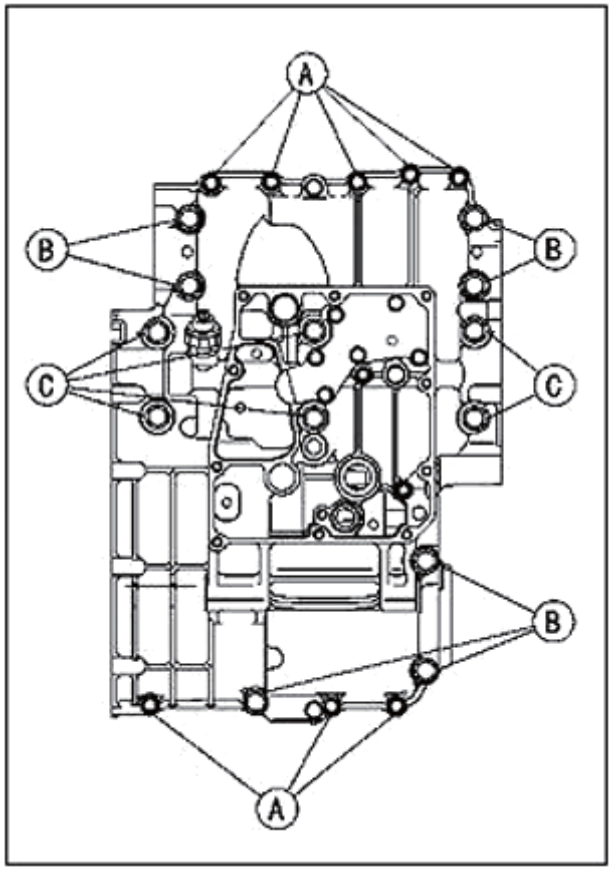
*Crankcase Splitting*

● Remove:
Engine (see Engine Removal in the Engine Removal/Installation chapter)
Cylinder (see Cylinder Removal in the Engine Top End chapter)
Pistons (see Piston Removal in the Engine Top End chapter)
Stater Motor (see Starter Motor Removal in the Electrical System chapter)
Clutch (see Clutch Removal in the Clutch chapter)
Transmission Assy (see Transmission Assy Removal)
Alternator Rotor (see Alternator Rotor Re moval in the Electrical System chapter)

● Remove the upper crankcase bolts [A] and the washers.



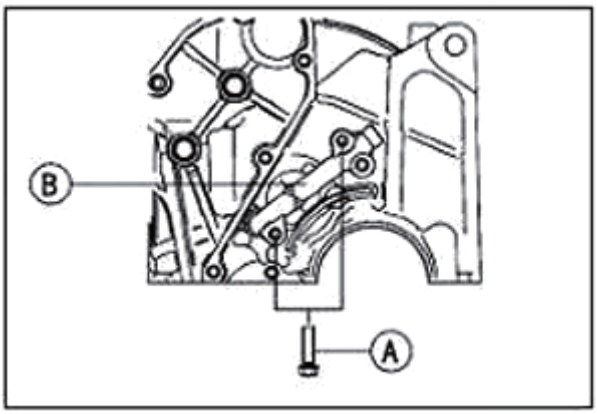

● Remove the oil pan, relief valve, oil screen and oil pipes (see Oil Pan Removal in the Engine Lubrication System chapter).
● Remove the lower crankcase bolts.
○ Firstly loosen the M7 bolts, secondly the M8 bolts and lastly the M9 bolts.
M7 Bolts [A]
M8 Bolts [B]
M9 Bolts [C] and Washers



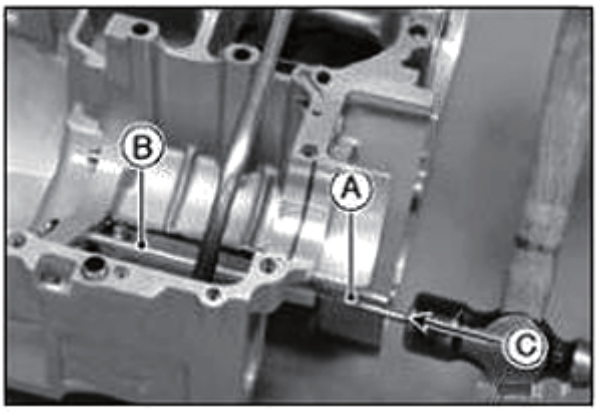
## Crankcase Splitting

● Tap lightly around the crankcase mating surface with a plastic mallet, and split the crankcase. Take care not to damage the crankcase.

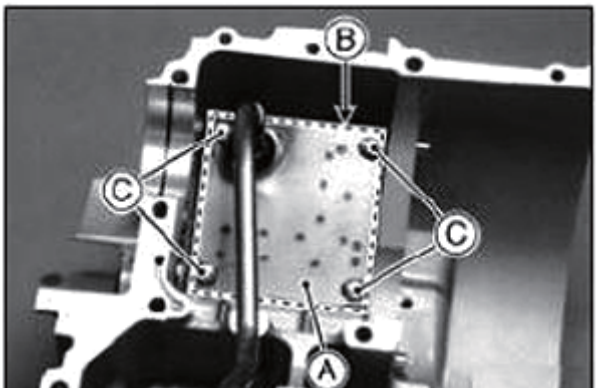
★ If the oil pipe is to be removed, follow the next procedure.
○ Unscrew the bolts [A] and remove the oil pipe [B].




○ Prepare a 5 mm rod [A], and insert it to the hole of the upper crankcase half.
○ Remove the oil pipe [B], tapping [C] the rod as shown.




★ If the breather plate [A] is to be removed, follow the next procedure.
○ Remove the oil pipe (see above).
○ Cut the gasket around the plate [B].
○ Remove:
Breather Plate Bolts [C]
Breather Plate with Pipe



## Crankcase Splitting

*Crankcase Assembly*

| CAUTION |
| --- |
| **The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.** |

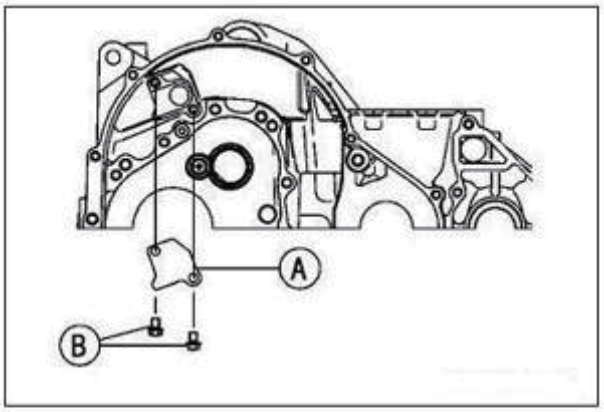
● With a high-flash point solvent, clean off the mating surfaces of the crankcases halves and wipe dry.

● Using compressed air, blow out the oil passages in the crankcase halves.

○ If the oil plate [A] on the upper crankcase half was removed, install it as shown.

○ Apply a non-permanent locking agent to the oil plate bolts and torque them.

**Torque - Oil Plate Bolts [B]: 10 N·m (1.0 N·m, 87 in·lb)**

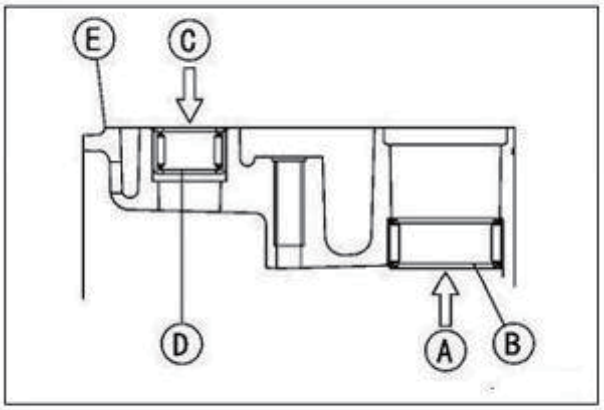



○ Press and insert [A] the new needle bearing [B] for the shift drum until it is bottomed.

**Special Tool - Bearing Driver Set**

○ Press and insert [C] the new needle bearing [D] for the shift shaft so that the bearing surface is flush with the end of the hole.

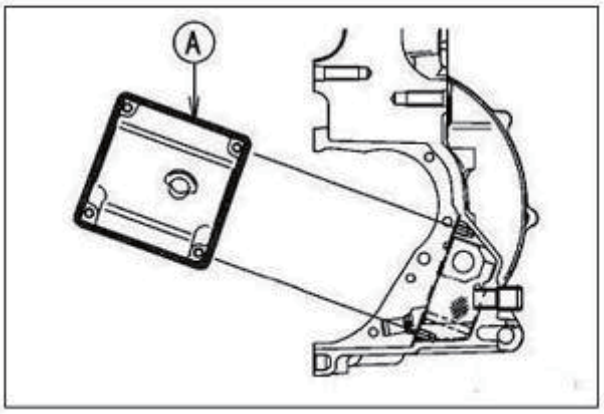
**Special Tool - Bearing Driver Set**
Lower Crankcase Half [E]




○ Apply silicone sealant to the breather plate mating surface [A] 1 mm (0.04 in.) or more thick, and then install the breather plate.

**NOTE**

○ *Make the application finish within 7 minutes when the liquid gasket to the mating surface of the breather plate is applied.*

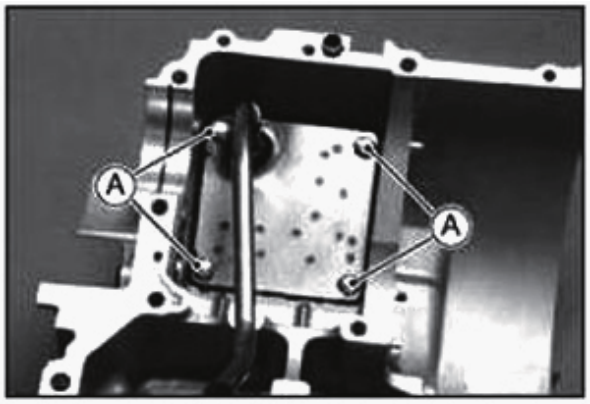


## Crankcase Splitting

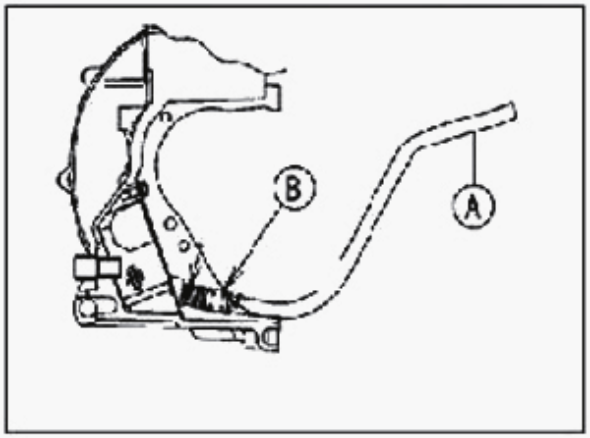
○ Moreover fit the plate and tighten the bolts just after application of the liquid gasket.

● Apply a non-permanent locking agent to the threads and tighten the bolts [A].

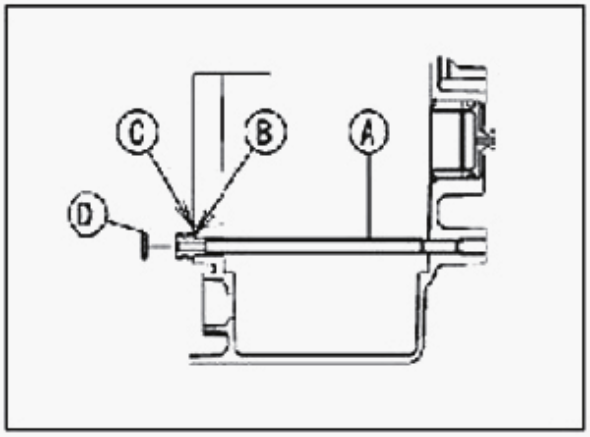
**Torque - Breather Plate Bolts: 10 N·m (1.0 kgf·m, 87 in·lb)**




● Install the breather pipe [A].
● Align the white mark [B] on the pipe with the white mark [C] on the breather fittling.
● Install the clamp [D] so that the pinch portions [E] face the white marks.

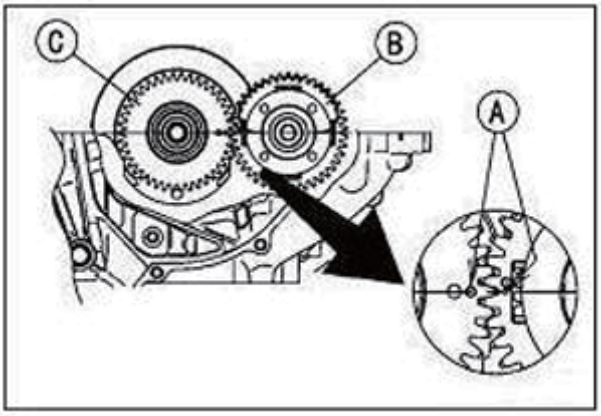



● Install the oil pipe [A] so that its flange [B] touches to the surface [C] of the upper crankcase half.
● Apply grease to the O-ring [D] on the oil pipe.

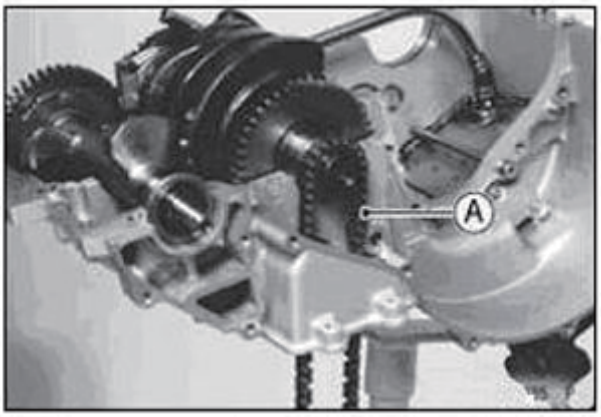


## Crankcase Splitting

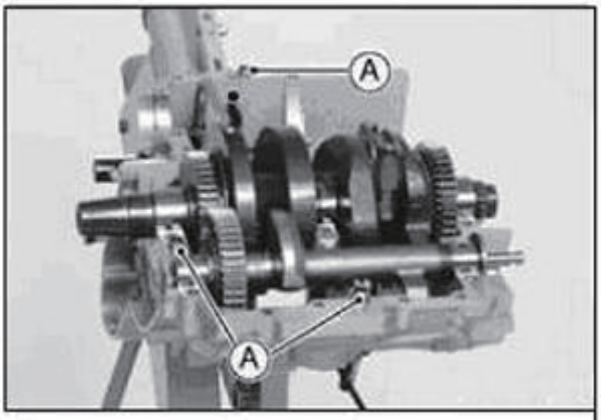
● Install the crankshaft assembly and the balancer shaft assembly on the upper crankcase half.
○ Align [A] the timing mark on the balancer gear [B] with the timing mark on the balancer drive gear [C] of the crankshaft.



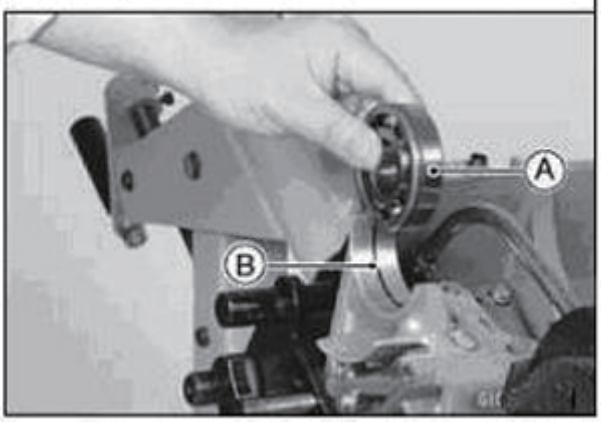

● Be sure to hang the camshaft chain [A] on the crankshaft.




● Be sure that the dowel pins [A] are in position.




● Set the bearing groove [A] on the positioning ring [B] as shown.



## Crankcase Splitting

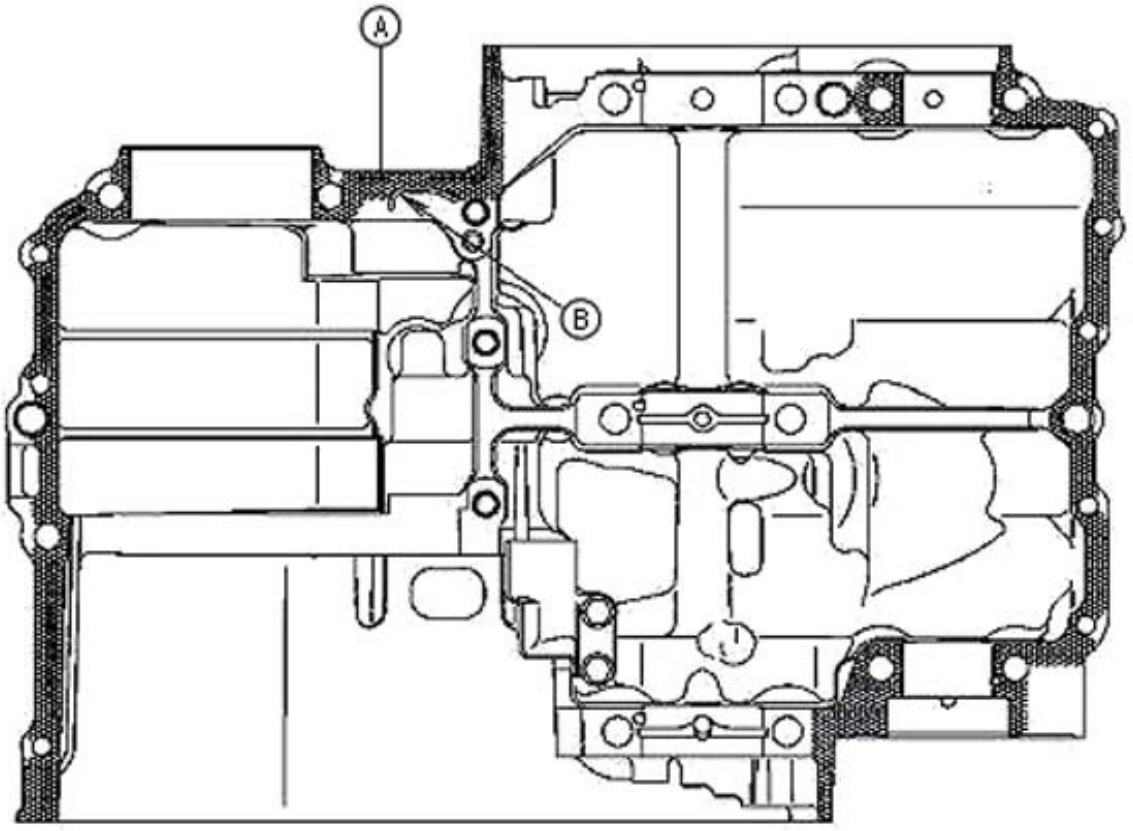
● Apply liquid gasket [A] to the mating surface of the lower crankcase half.

**NOTE**

○ *Apply the sealant evenly on the mating surfcae.*

| CAUTION |
| --- |
| **Do not apply liquid gasket around the crankshaft main bearing inserts, and oil passage holes.** |

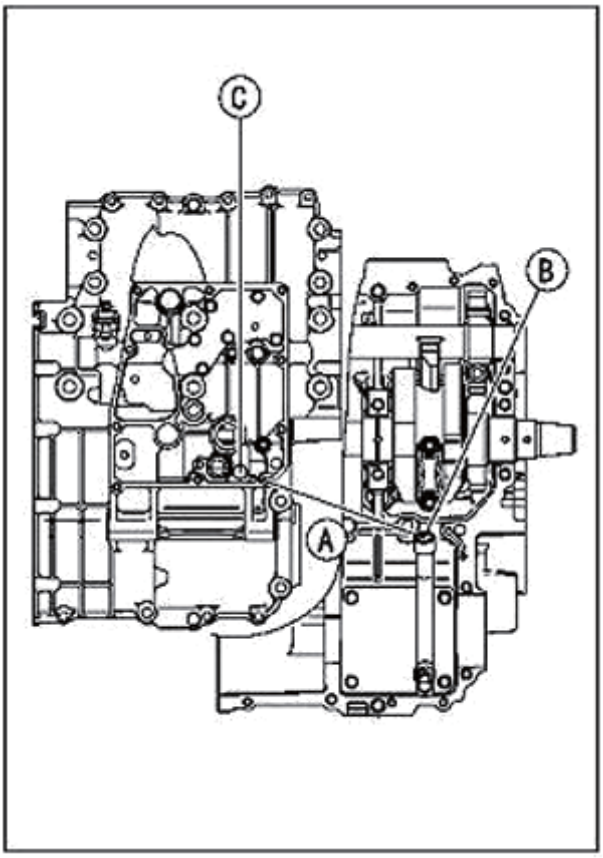
○ Do not apply liquid gasket to the oil passage [B].



## Crankcase Splitting

● Fit the lower crankcase half to the upper crankcase half.

○ Insert [A] the breather pipe [B] on the upper crankcase half through the hole [C] on the lower crankcase half.



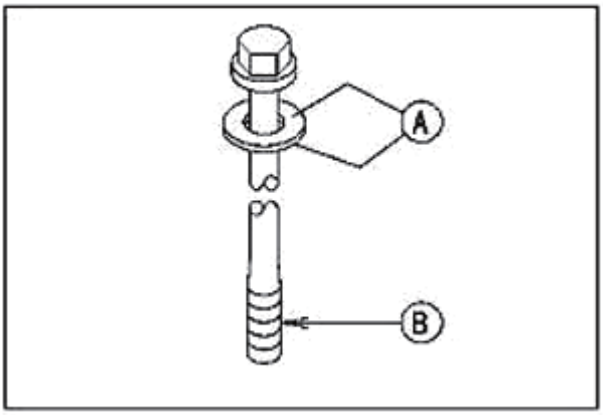

**NOTE**

○ *Make the application finish within 20 minutes when the liquid gasket to the mating surface of the lower crankcase half is applied.*

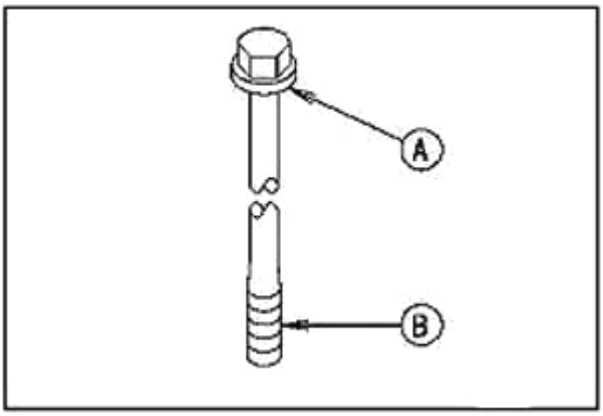
○ *Moreover fit the case and tighten the case bolts just after finishing the application of the liquid gasket.*

○ The M9 bolts [1 ~ 6] (see the next figure) have copper plated washers. Replace them with new ones.

● Apply molybdenum disulfide oil solution to both sides [A] of the M9 bolts washers and the threads [B] of the M9 bolts.

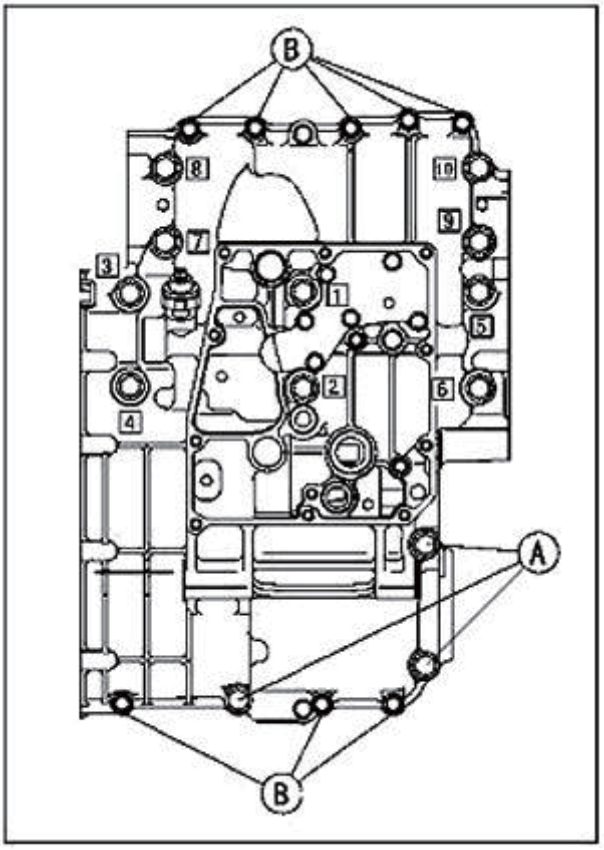



● Apply molybdenum disulfide oil solution to flange [A] and the threads [B] of the M8 bolts which is tightening order is [7~10] only (see the next figure).

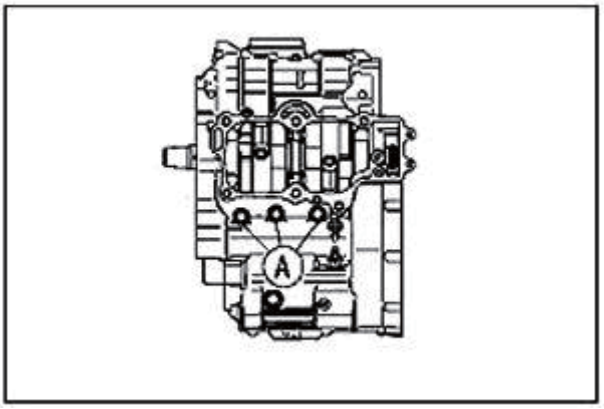


## Crankase Splitting

● Tighten the lower crankcase bolts using the followwing steps.
○ Tighten the M9 bolts [1, 2] L= 113 mm (4.45 in.) with washers.
Torque - Crankcase Bolts (M9): 44 N·m (4.5 kgf·m, 32 ft·lb)
○ Tighten the M9 bolts [3, 4] L= 83 mm (3.27 in.) with washers.
Torque - Crankcase Bolts (M9): 44 N·m (4.5 kgf·m, 32 ft·lb)
○ Tighten the M9 bolts [5, 6] L= 113 mm (4.45 in.) with washers.
Torque - Crankcase Bolts (M9): 44 N·m (4.5 kgf·m, 32 ft·lb)
○ Tighten the M8 bolts [7~10].
Torque - Crankcase Bolts (M8): 35 N·m (3.6 kgf·m, 26 ft·lb)
○ Tighten the M8 bolts [A] (Do not apply molybdenum oil solution).
Torque - Crankcase Bolts (M8): 27.5 N·m (2.8 kgf·m, 20 ft·lb)
○ Tighten the M7 bolts [B].
Torque - Crankcase Bolts (M6): 20 N·m (2.0 kgf·m, 15 ft·lb)




● Tighten the upper crankcase bolts [A].
○ The upper crankcase bolts have copper plated washers. Replace them with new ones.
Torque - Upper Crankcase Bolts [A]: 27.5 N·m (2.8 kgf·m,

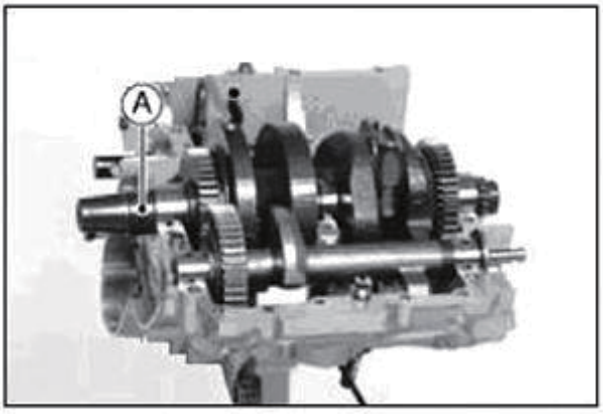



● After tightening all crankcase bolts, check the following items.
○ Crankshaft and balancer shafts turn freely.

**Crankshaft and Connecting Rods**

*Crankshaft Removal*

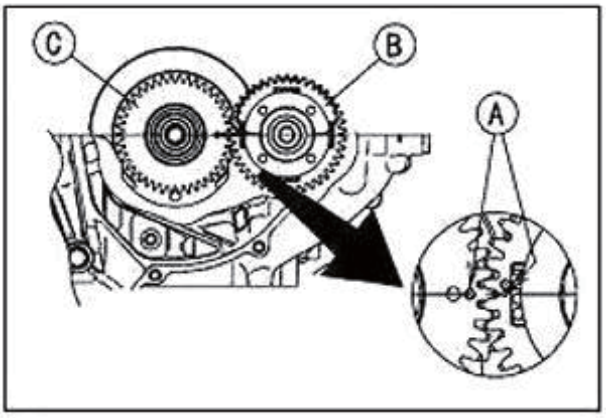
● Split the crankcase (see Crankcase Splitting).
● Remove the crankshaft [A].



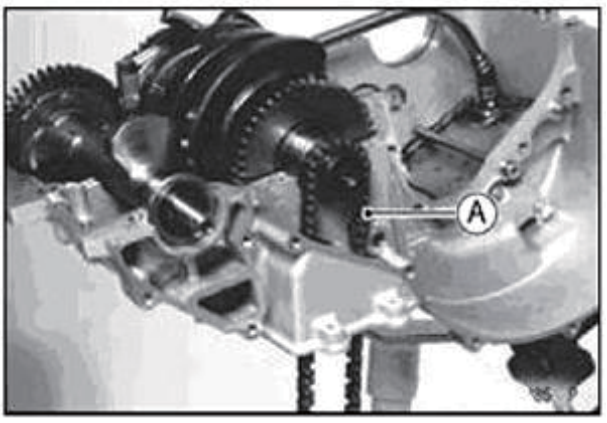

*Crankshaft Installation*

| CAUTION |
| --- |
| **If the crankshaft, bearing inserts, or crankcase halves are replaced with new ones, select the bearing inserts and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.** |

● Apply molybdenum disulfide oil solution to the crankshaft main bearing inserts.
○ Align [A] the timing mark on the balancer gear [B] with the timing mark on the balancer drive gear [C] of the crankshaft.



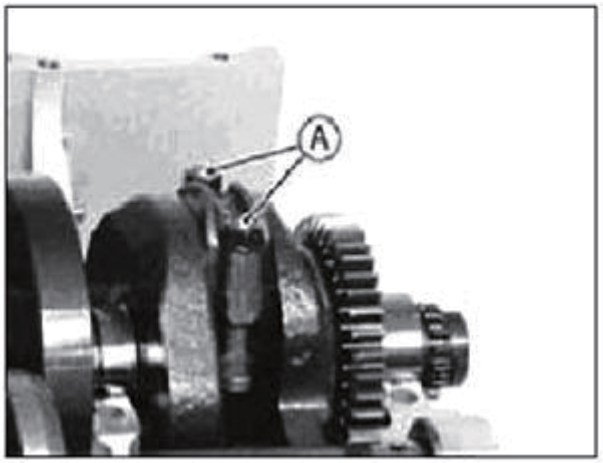

● Install the crankshaft with the camshaft chain [A] hanging on it.



## Crankshaft and Connecting Rods

*Connecting Rod Removal*

- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod nuts [A].
- Remove the connecting rod.
- Remove the connecting rod bolts.



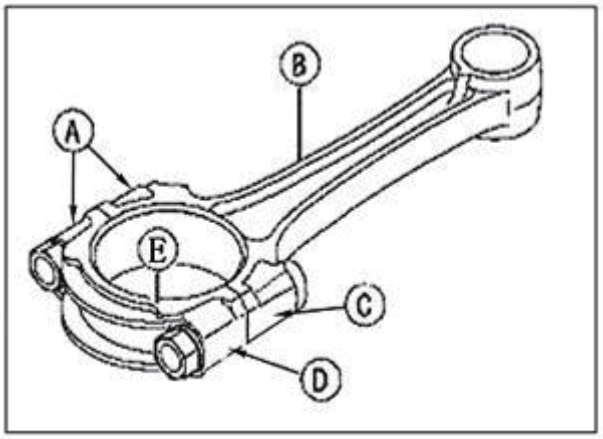

**CAUTION**

**To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.**

*Connecting Rod Installation*

**CAUTION**

**To minimize vibration, the connecting rods should have the same weight mark. Always use new connecting rod bolts and nuts.**



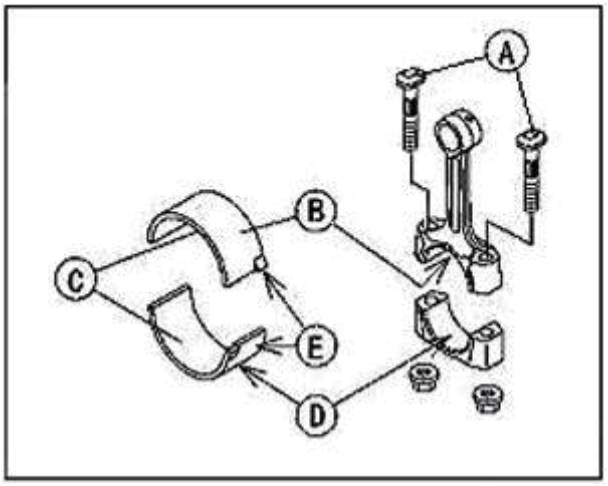

Match Mark [A]
Connecting Rod [B]
Diameter Mark [C]
Weight Mark [D]
Connecting Rod Big End Cap [E]

**CAUTION**

**If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.**

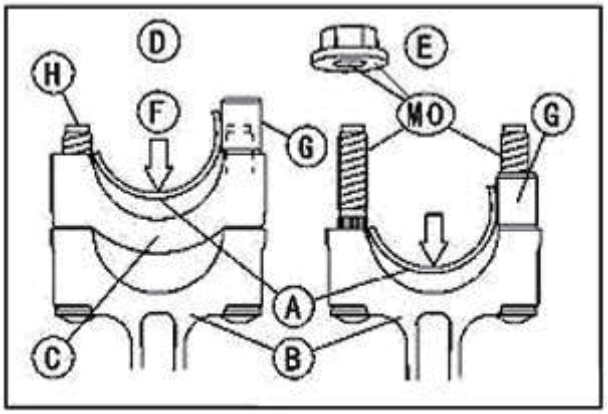
### Crankshaft and Connecting Rods

● Install the 2 connecting rod bolts.
● Apply molybdenum disulfide grease [B] to the outer surface of the upper insert and the inner surface of the connecting rod big end.
● Apply molybdenum disulfide oil solution [C] to the inner surfaces of upper and lower bearing inserts.
○ The molybdenum disulfide oil solution is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10 : 1).
○ Do not apply any grease or oil [D] to the cap inside and cap insert outside.
○ Install the inserts so that their nails [E] are on the same side and fit them into the recess of the connecting rod and cap.

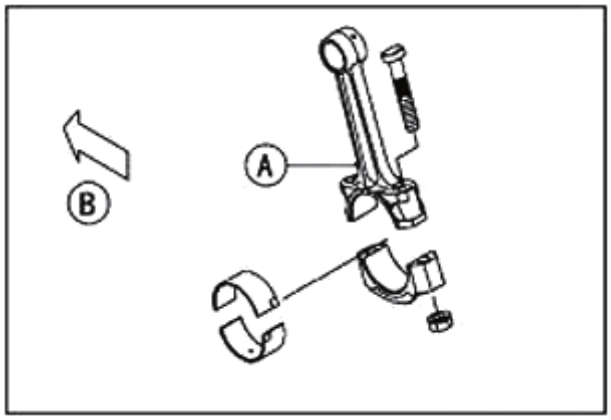



| CAUTION |
| --- |
| **Wrong application of oil and grease could cause bearing damage.** |

○ When installing the inserts [A], be careful not to damage the insert surface with the edge of the connecting rod [B] or the cap [C].
○ One way to install inserts is as follows.
Installation [D] to Cap
Installation [E] to Connecting Rod
Push [F]
Spare Dowel Pin [G]
Connecting Rod Bolts [H]



### Crankshaft and Connecting Rods




- Apply molybdenum disulfide oil solution [MO] to the threads and seating surfaces of the big end nuts and bolts.
- Install the crankshaft (see Crankshaft Installation).
- Install each connecting rod on its original crankpin.

**NOTE**

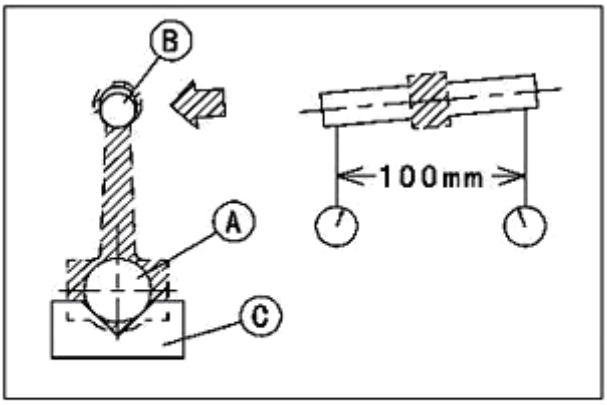
○ *Install each connecting rod so that its oil jet [A] faces the exhaust side (the front [B]) (see Engine Oil Flow Chart in the Engine Lubrication System chapter).*

○ *The connecting rod big end is bolted using the rotation angle method, which can precisely achieves the needed clamping force without exceeding it unnecessarily*

- First tighten the 2 nuts of a connecting rod alter nately to 40 N·m
  - ○ Loosen the 2 nuts completely.
  - ○ Tighten them alternatly to 29 N·m.
  - ○ After the connecting bolts are tightened to 29 N·m, the connecting rod can turn freely.
- Turn the connecting rod nuts clockwise 100°.
  - ○ Check if the connecting rod turns freely. If not, re-install the connecting rod bearing.

## Crankshaft and Connecting Rods

*Connecting Rod Bend*

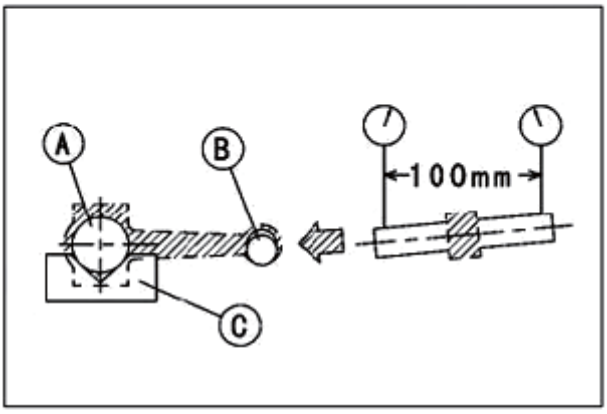



- Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
- Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
- Select an arbor of the same diameter as the piston pin and at least 100 mm (3.94 in.) long, and insert the arbor [B] through the connecting rod small end.
- On a surface plate, set the big-end arbor on V block [C].
- With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.94 in.) length to determine the amount of connecting rod bend.

★If connecting rod bend exceeds the service limit, the connecting rod must be replaced.

**Connecting Rod Bend Service Limit:**
**TIR 0.2/100 mm (0.008/3.94 in.)**

*Connecting Rod Twist*

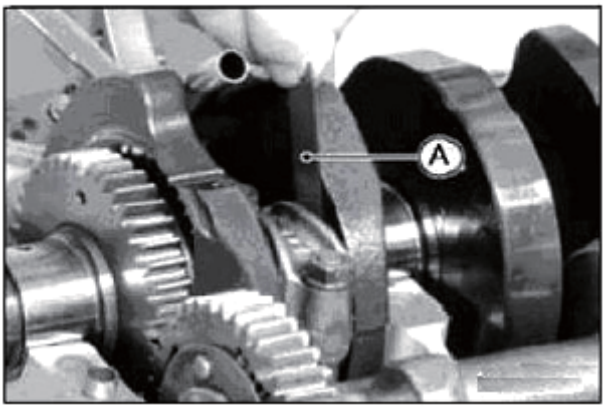



- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being paralleled with the surface plate over a 100 mm (3.94 in.)
  length of the arbor to de- termine the amount of connecting rod twist.

★If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

**Connecting Rod Twist**
**Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)**

*Connecting Rod Big End Side Clearance*




- Measure connecting rod big end side clearance.

○ Insert a thickness gauge [A] between the big end and either crank web to determine clearance.

**Connecting Rod Big End Side Clearance**
**Standard: 0.15 ~ 0.30 mm**
**Service Limit: 0.55 mm**

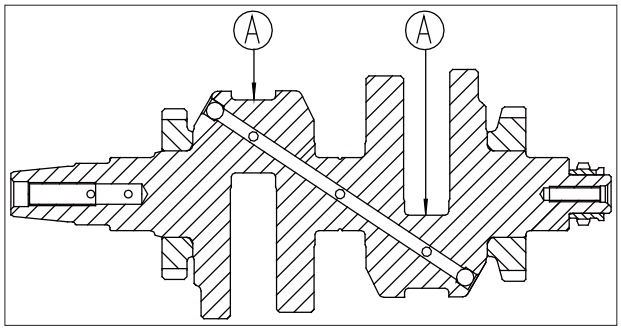
## Crankshaft and Connecting Rods

★If the clearance exceeds the service limit, replace the connecting rod with new one and then check clearance again. If clearance is too large after connecting rod replacement, the crankshaft also must be replaced.

*Crankpin/Connecting Rod Big End Bearing Insert Wear*

● Measure the crankpin diameter using a micrometer.
Crankpin [A]

**Crankpin Diameter Standards:**
**37.984~38.00 mm**
**Service Limit: 37.97 mm**




★If any crankpin has worn past the service limit, re place the crankshaft with a new one.
If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

Crankpin Diameter Marks:

**2: 37.984~37.992 mm (1.4954~1.4957 in.)**
**1: 37.993~38.000 mm (1.4958~1.4961 in.)**

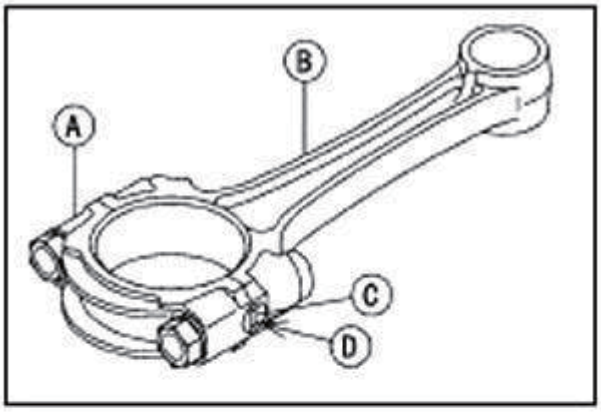
● Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.

**Connecting Rod Big End Inside Diameter Marks:**

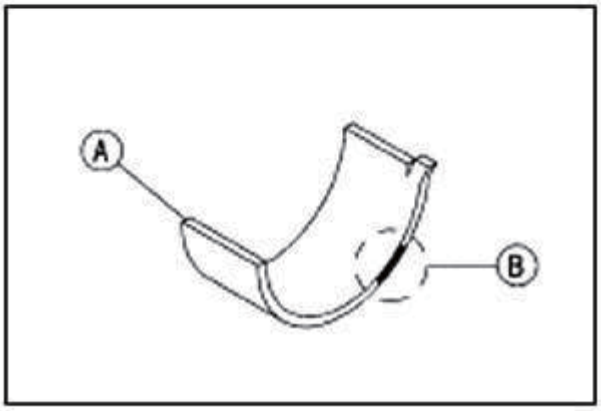
**1: 41.000 41.008 mm (1.6142 1.6145 in.)**
**2: 41.009 41.016 mm (1.6145 1.6148 in.)**

## Crankshaft and Connecting Rods

Match Mark [A]
Connecting Rod [B]
Diameter Mark [C]
Weight Mark [E]




● Select the proper bearing insert [A] according to the crankpin diameter mark and the big end inside diameter mark.
Size Color [B]



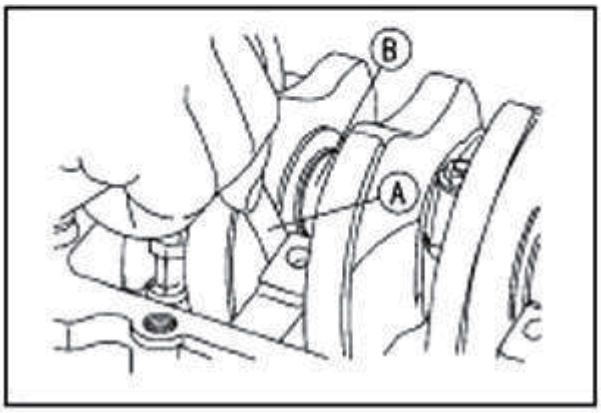

| Con-rod Big End Inside Diameter Marking | Crankpin Diameter Marking | Size Color |
|---|---|---|
| 1 | 1 | Black |
| 1 | 2 | Blue |
| 2 | 1 | |
| 2 | 2 | Green |

*Crankshaft Side Clearance*

● Insert a thickness gauge [A] between the crankcase main bearing and the crank web at the No.2 journal [B] to determine clearance.

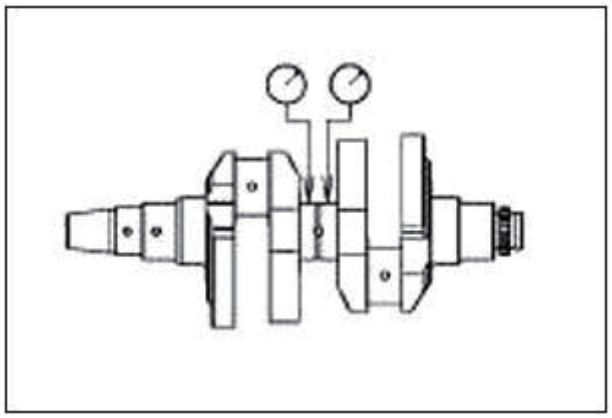
★If the clearance exceeds the service limit, replace the crankcase halves as a set.

**Crankshaft Side Clearance**
**Standard: 0.05~0.20 mm**
**Service Limit: 0.40 mm (0.0157 in.)**



## Crankshaft and Connecting Rods

*Crankshaft Runout*

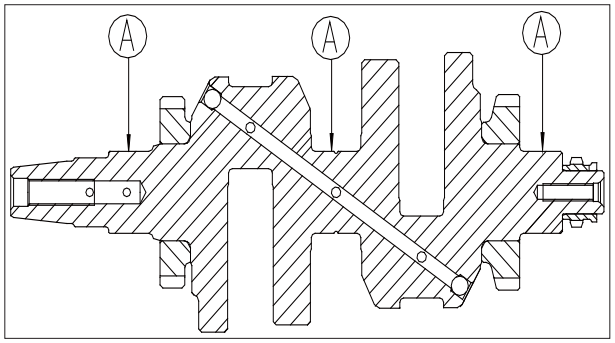


● Measure the crankshaft runout.

★If the measurement exceeds the service limit, replace the crankshaft.

**Crankshaft Runout**
**Standard: TIR 0.02 mm (0.0008 in.) or less**
**Service Limit: TIR 0.05 mm (0.0020 in.)**

*Crankshaft Main Bearing Insert/Journal Wear*




● Using a micrometer, measure the diameter of the main bearing journal [A].
Main Bearing Journal Diameter Standards:
37.984~38.00mm
Service Limit:
37.97 mm

★ If the main bearing journal has worn past the service limit, replace the crankshaft with a new one.

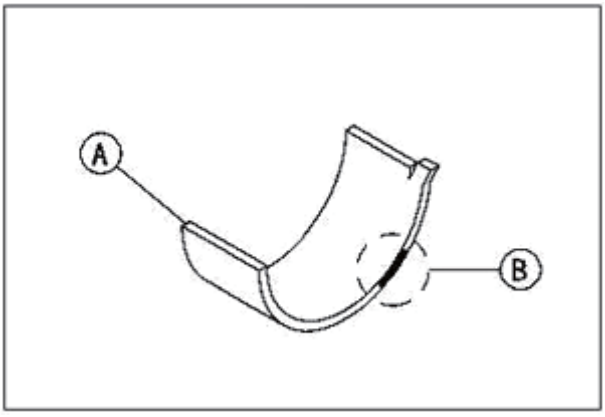
★ If the measured main bearing journal diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

**Main Bearing Journal Diameter Marks:**

**2: 37.984~37.992 mm (1.4954~1.4957 in.)**
**1: 37.993~38.000 mm (1.4958~1.4961 in.)**

## Crankshaft and Connecting Rods

- Select the proper bearing insert [A] in accordance with the combination of the crankcase and crankshaft coding.
  Size Color [B]



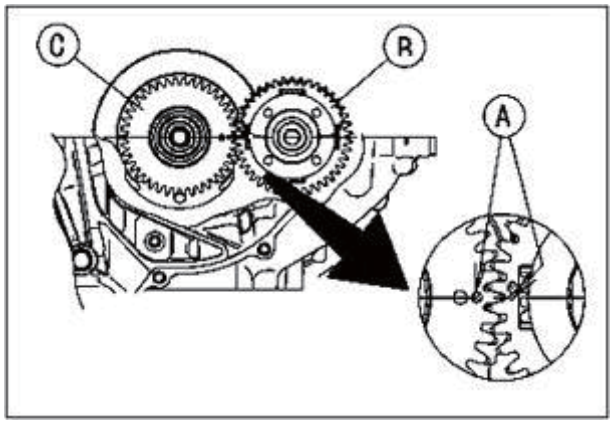
## Balancer

*Balancer Removal*

- Split the crankcase (see Crankcase Splitting).
- Pull the balancer shaft with the balancer gear out of the crankcase.

*Balancer Installation*

- Apply molybdenum disulfide oil solution to the inside of the balancer shaft bearing insert.
- Align [A] the timing mark on the balancer gear [B] with the timing mark on the balancer drive gear [C] of the crankshaft.
- Assemble the crankcase (see Crankcase Assembly).




*Balancer Shaft Bearing Insert/Journal Clearance*

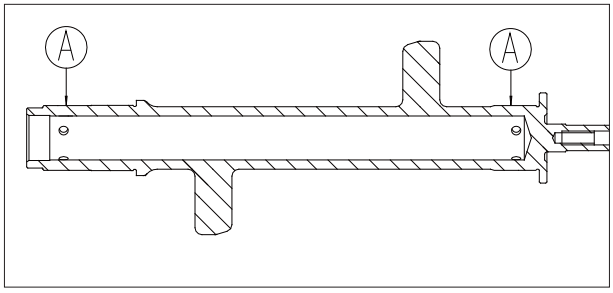
- Measure the balancer shaft bearing journal diameter, using a micrometer.

**Blancer Shaft Bearing Journal Diameter Standards:**
**27.987~28.000 mm**
**Service Limit:**
**27.96 mm**

★If the balancer shaft bearing journal has worn past the service limit, replace the balancer shaft with a new one.

★If the measured balancer shaft bearing journal diameter is not less than the service limit, but does not coincide with the original diameter markings on the balancer shaft, make new marks on it.

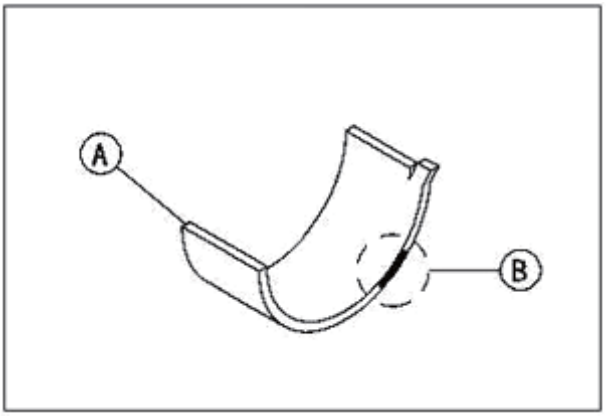
**Balancer Shaft Bearing Journal Diameter:**
**2: 27.987~27.993 mm**
**1: 27.994~28.000 mm**



## Balancer

● Measure the crankcase bearing bore diameter for the balancer shaft, and mark the upper crankcase half in accordance with the bore diameter.

**Crankcase Bearing Bore Diameter Marking:**
**1 : 31.000~31.008 mm**
**2 : 31.009~31.016 mm**




● Select the proper bearing insert [A] in accor dance with the combination of the crankcase and the balancer shaft coding.
Size Color [B]

| Crankcase Bearing Bore Diameter Mark | Crankshaft Main Journal Diameter Mark | Bearing Insert |
|---|---|---|
| Blue | 2 | Brown |
| Blue | 1 | Black |
| None | 2 | |
| None | 1 | Blue |

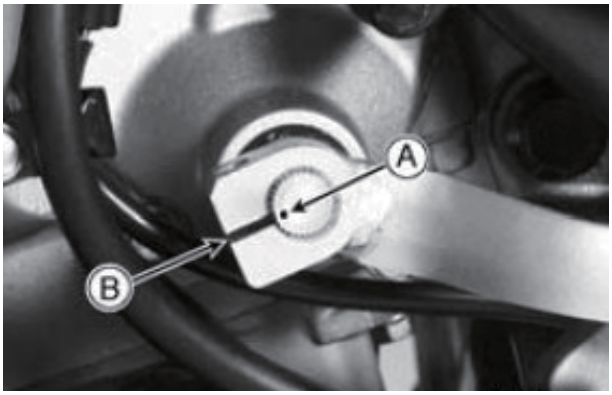
## Transmission

*Shift Pedal Removal*

● Remove:
Shift Lever Bolt [A]
Shift Lever [B]

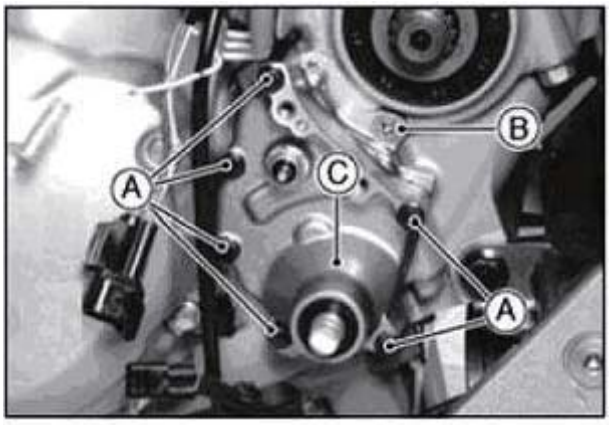

*Shift Pedal Installation*

● Align the mark [A] on the shift shaft with the slit [B] on the shift lever.
● Tighten the shift lever bolt securely.

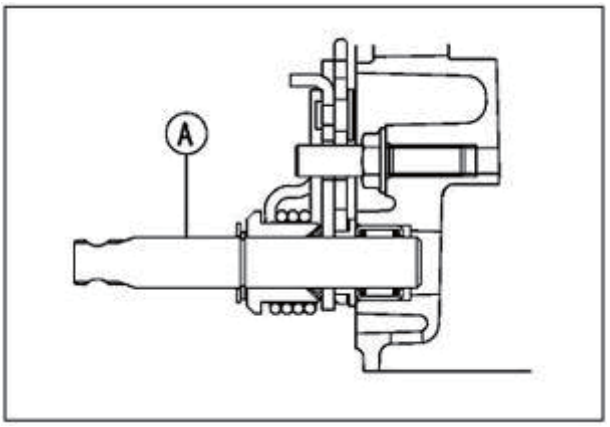



*External Shift Mechanism Removal*

● Remove:
Engine Oil (Drain, see Engine Oil Change in the Periodic Maintenance chapter)
Shift Pedal (see Shift Pedal Removal)
Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
Neutral Switch Lead Connector (Disconnect)
Shift Shaft Cover Bolts [A]
Shift Shaft Cover Screw [B]
Shift Shaft Cover [C]




● Remove the shift shaft assembly [A].



## Transmission

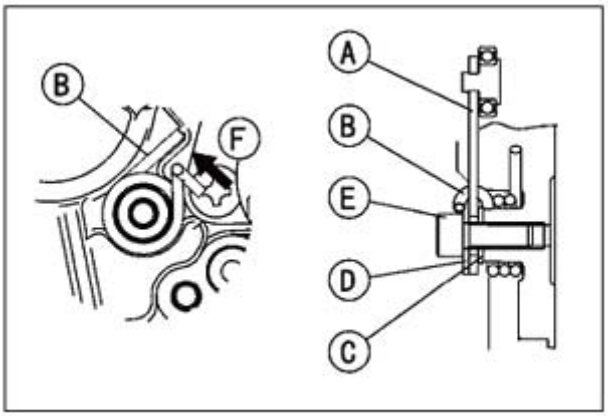
● Remove:
Clutch (see Clutch Removal in the Clutch chapter).
Gear Positioning Lever Bolt [A]
Gear Positioning Lever [B], Spacer, Washer and Spring.


*External Shift Mechanism Installation*

● Install the gear positioning lever [A] as shown.
Spring [B]
Washer [C]
Spacer [D]
Bolt [E]

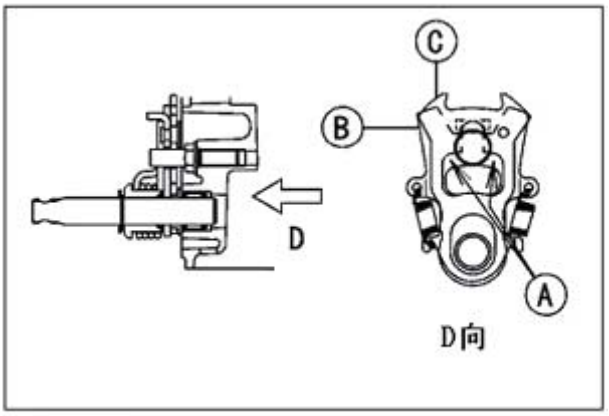
○ Hook the spring at gear positioning lever, pushing up [F] the hook portion, as shown.

○ Apply a non-permanent locking agent to the gear positioning lever bolt and tighten it.
Torque - Gear Positioning Lever Bolt: 12 N·m (1.2 kgf·m,106 in·lb)



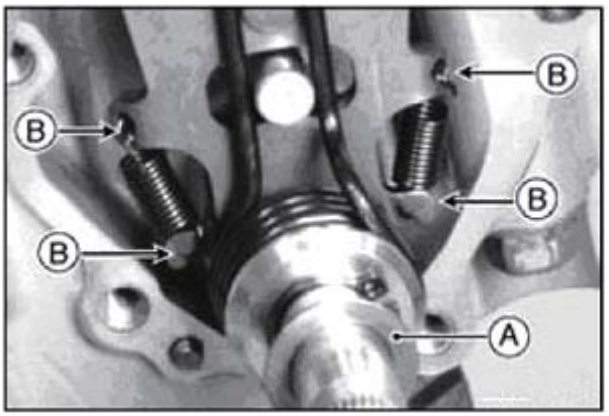

● Install the shift shaft assembly.

○ Apply [A] molybdenum disulfide oil solution to the rubbing surface between the lever [B] and pawl [C] and move them two or three times up and down to lubricate them.




○ Be sure that the washer [A] is on the shaft.

○ Be sure that the spring hook portions [B] are as shown.

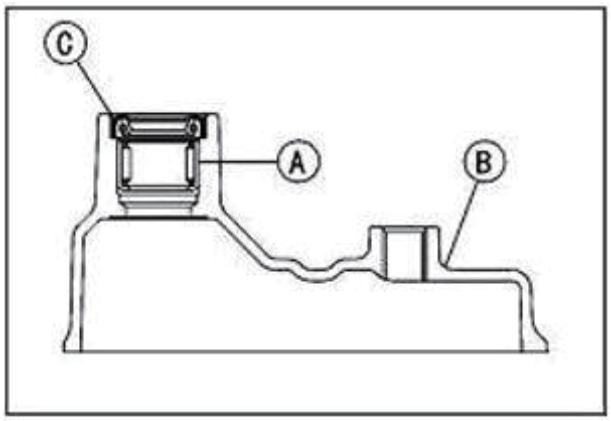


## Transmission

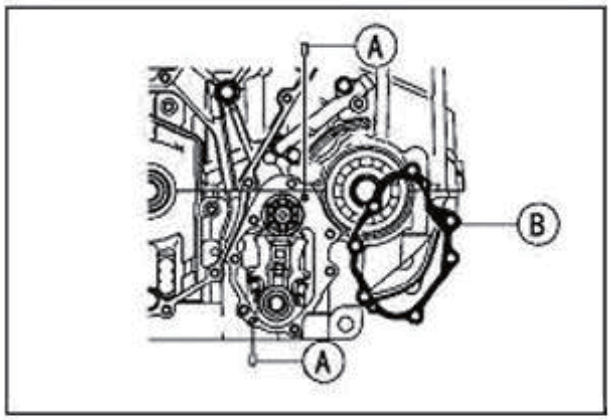
● When the new needle bearing [A] is installed in the shift shaft cover [B], press and insert the new needle bearing until it is bottomed.

**Special Tool - Bearing Driver Set**

● When the new oil seal [C] is installed in the shift cover, press and insert the new oil seal so that its surface is flush with the end of the hole.
Special Tool - Oil Seal Installer

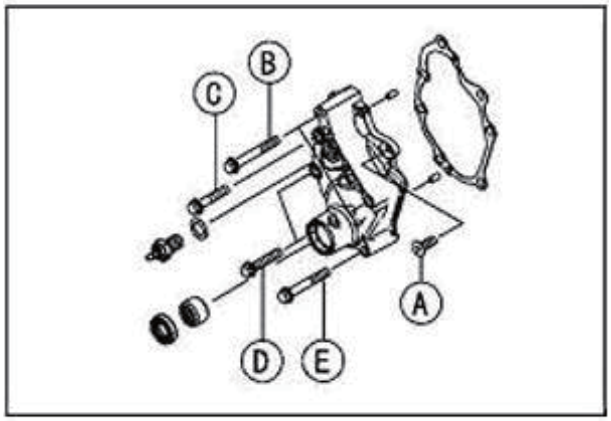



● Install the shift shaft cover.
○ Be sure that the dowel pins [A] are in position.
○ Install the new gasket [B].



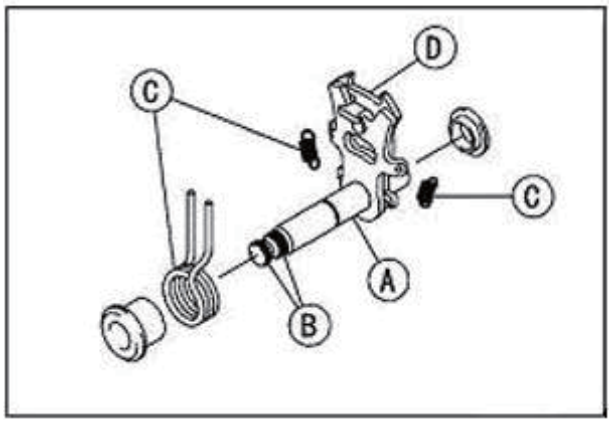

● Apply a non-permanent locking agent to the shift shaft cover screw [A].
○ Do not apply a non-permanent locking agent to the shift shaft cover bolts [B,C,D, E].
● Tighten the cover screw lastly.

**Torque - Shift Shaft Cover Bolts: 12 N·m**
**Shift Shaft Cover Screw: 5 N·m**




*External Shift Mechanism Inspection*

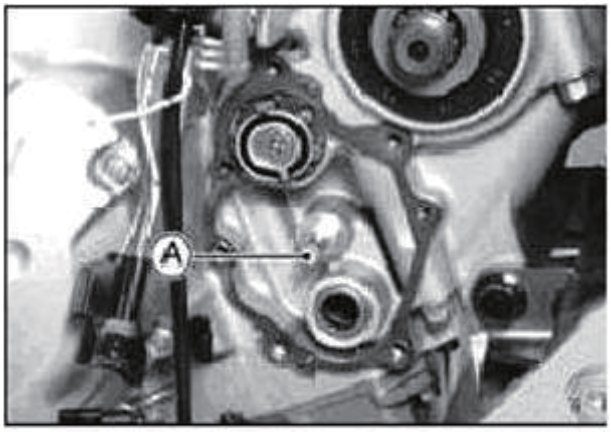
● Examine the shift shaft [A] for any damage.
★If the shaft [A] is bent, replace it.
★If the splines [B] are damaged, replace the shaft.
★If the springs [C] are damaged, replace the spring.



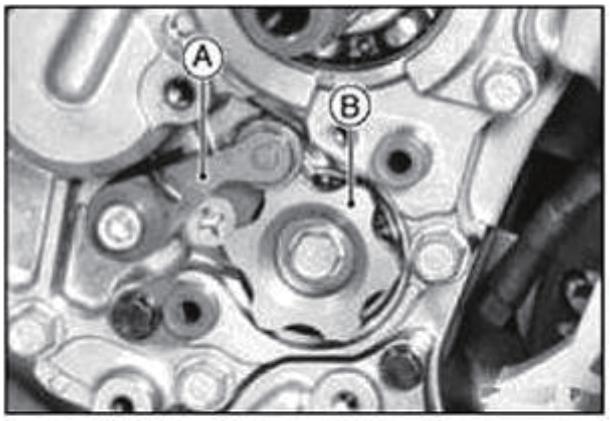
## Transmission

● Check the return spring pin [A] is not loose.
★ If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.

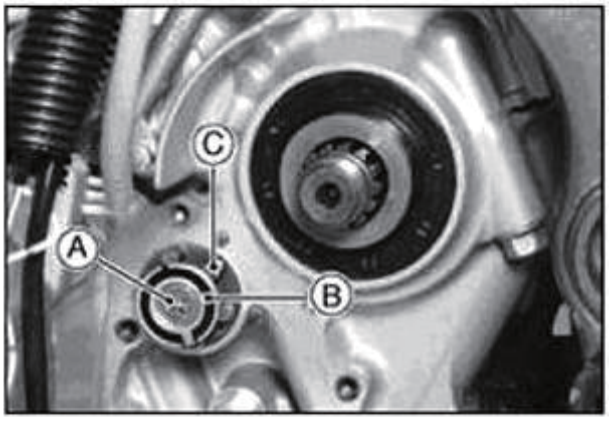
**Torque - Shift Shaft Return Spring Pin: 29 N·m (2.9 kgf·m, 21 ft·lb)**



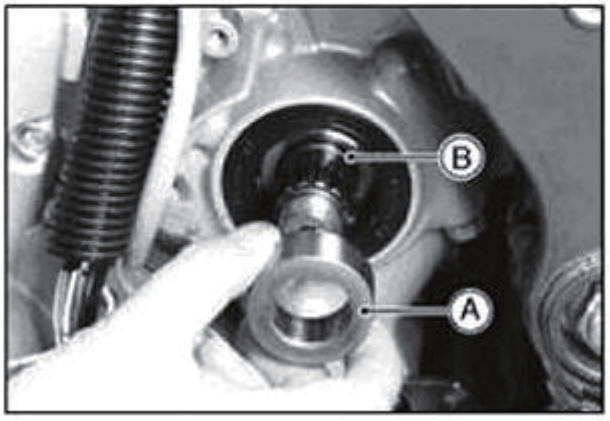

● Check the gear positioning lever [A] and its spring for breaks or distortion.
★If the lever or spring are damaged in any way, replace them.
○ Visually inspect the shift drum cam [B].
If they are badly worn or if they show any damage, replace it.




Transmission Assy Removal
● Remove:
Shift Shaft Assembly (see External Shift Mechanism Removal)
Neutral Switch Holder Bolt [A] Neutral Switch Holder [B] and Pin Shift Drum Holder [C] and Pin

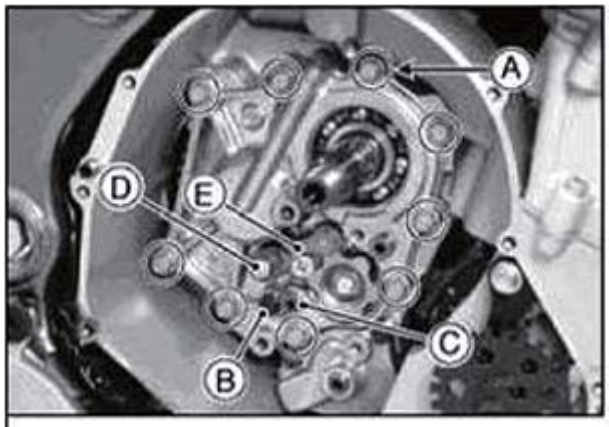



● Remove: Collar [A]
O-ring [B]

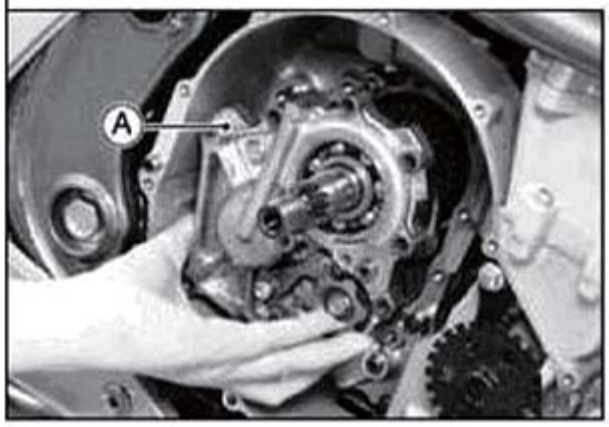


## Transmission

- Remove:
  Clutch (see Clutch Removal in the Clutch chapter)
  Transmission Case Bolts [A]
- If the transmission assy is to be disassembled, remove the following.
  Shift Rod Plate Bolt [B]
  Shift Rod Plate [C]
  Gear Positioning Lever Bolt [D]
  Gear Positioning Lever [E] with Spring, Washer and Spacer.

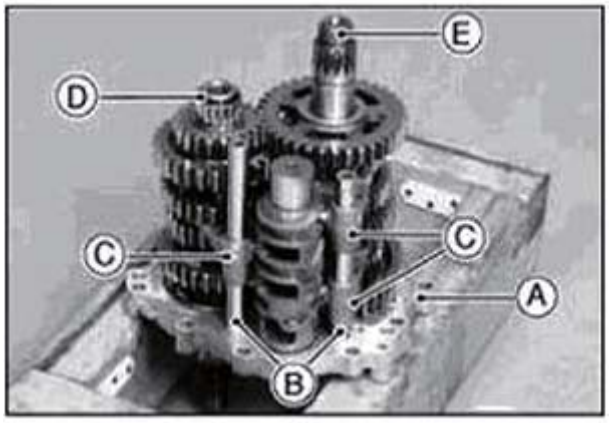



- Pull the transmission assy [A] out of the crankcase.

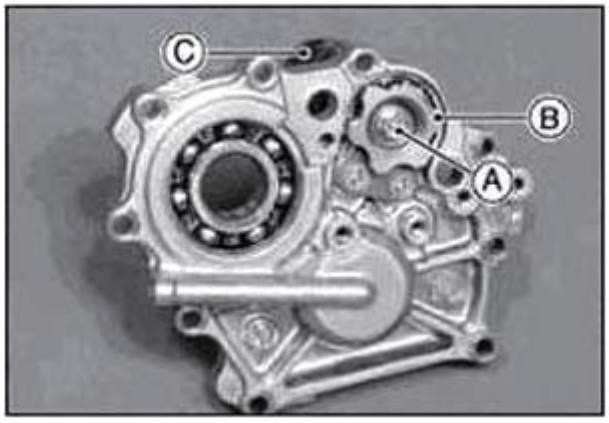



*Transmission Assy Disassembly*

- Remove the transmission assy (see Transmission Assy Removal).
- Remove the following from the transmission case [A].
  Shift Rods [B]
  Shift Forks [C]
  Drive Shaft [D]
  Output Shaft [E]




- Remove:
  Shift Drum Cam Bolt [A]
  Shift Drum [B] and Pin
  Shift Drum [C]

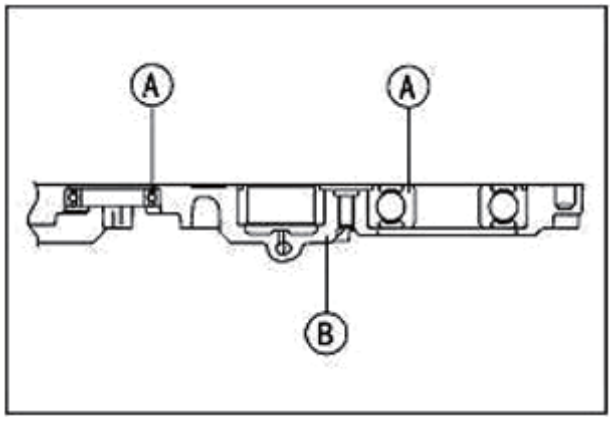


## Transmission

*Transmission Assy Assembly*

○ When the new ball bearings [A] are installed in the transmission case [B], press and insert them until they are bottomed.

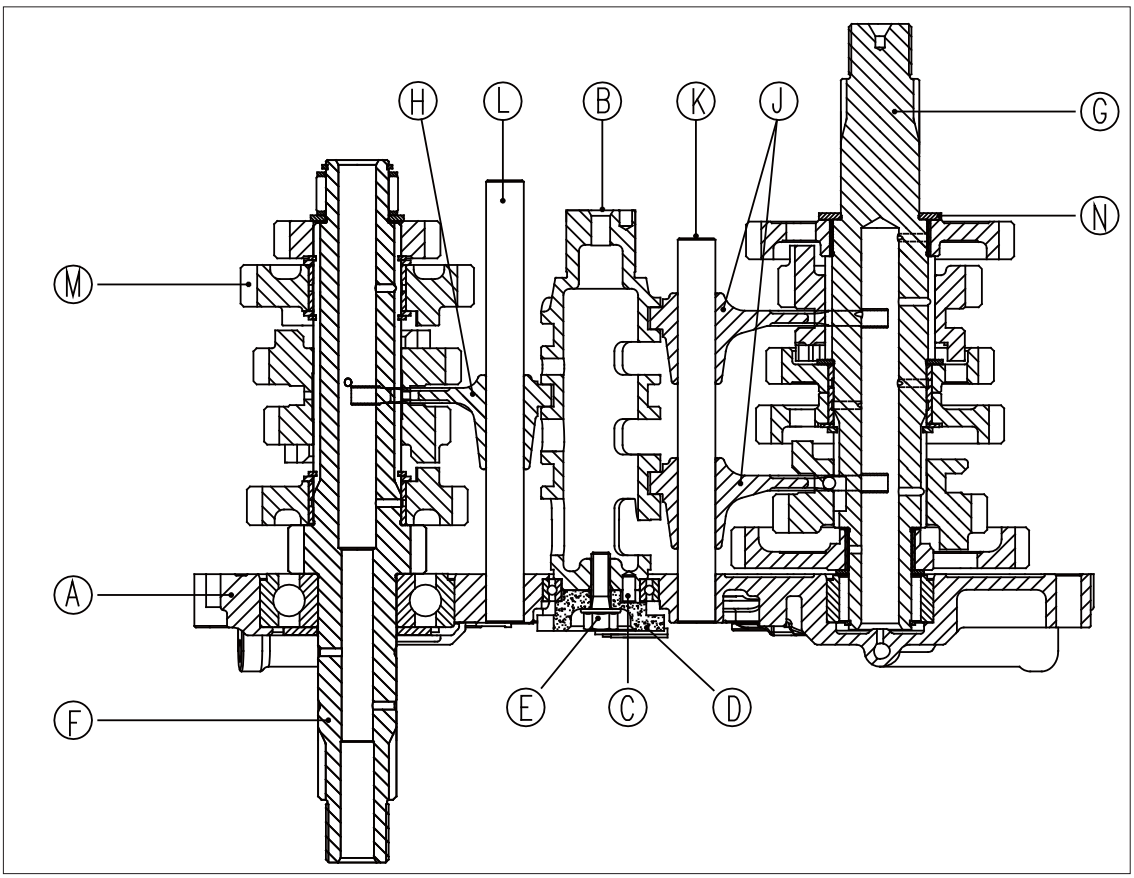
**Special Tool - Bearing Driver Set**




● Install the following on the transmission case [A].
Shift Drum [B]
Pin [C]
Shift Drum Cam [D]
● Align the pin with the hole on the shift drum cam.
● Apply a non-permanent locking agent to the shift drum cam bolt [E] and tighten it.

**Torque - Shift Drum Cam Bolt: 10 N·m**

● Install the following as a set.
Drive Shaft [F]
Output Shaft [G]
● Install the forks as shown.
○ Position the one [H] with shortest ears on the drive shaft and place the pin in the center groove in the shift drum.
○ The two forks [J] on the output shaft are identical.
○ Install the shift rods, noting the groove position.
● The rod [K] length of the output shaft side is shorterthan the rod [L] length of the drive shaft side.
● Apply molybdenum disulfide oil solution to the transmission gears shown with X marks [M].
● Be sure that the spacer [N] is on the output shaft.

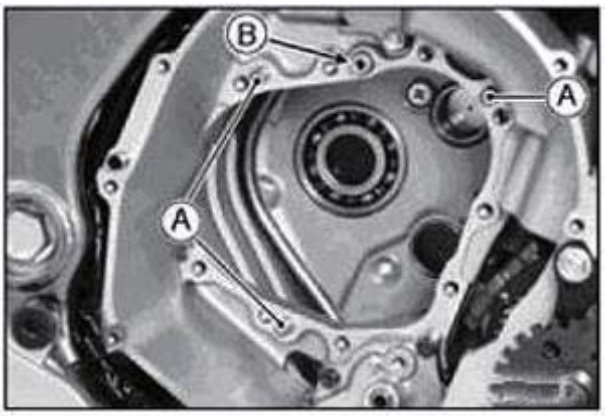


## Transmission

*Transmission Assy Installation*

- Assemble the transmission assy (see Transmission Assy Assembly).
- Be sure that the dowel pins [A] are in position.
- Apply grease to the O-ring [B] on the oil pipe.
- Install the transmission assy on the crankcase.
- Tighten the transmission case bolts.

**Torque - Transmission Case Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**



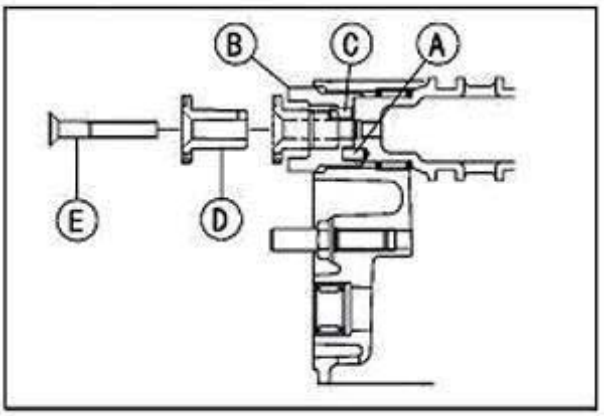

- Install the gear positioning lever (see External Shift Mechanism Installation).
- Install the shift rod plate.

**Torque - Shift Rod Plate Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

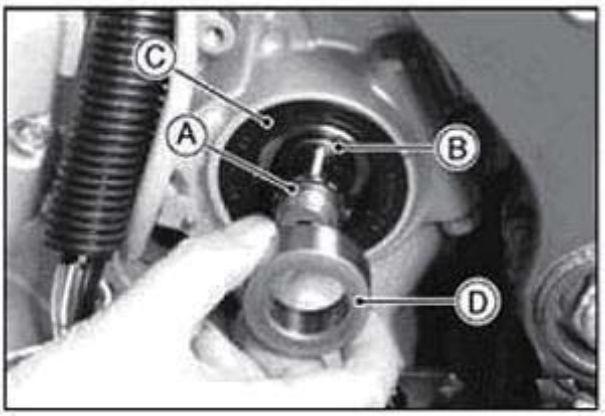
- Set the gear positioning lever to the neutral position [A].
- Check that the drive and output shaft turn freely.


- Install: Pin [A]
  Shift Drum Holder [B] Pin [C]
  Neutral Switch Holder [D]
  Neutral Switch Holder Screw [E]
- Apply a non-permanent locking agent to the neutral switch holder screw and tighten it.

**Torque - Neutral Switch Holder Screw: 4.9 N·m (0.50 kgf·m, 43 in·lb)**



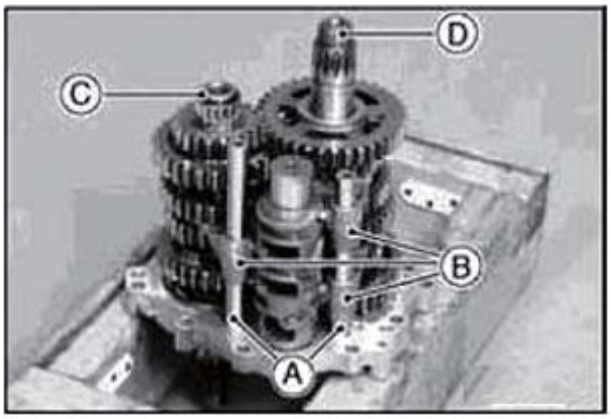

- Apply grease to the O-ring [A] and install its position [B] on the output shaft.
- Apply grease to the lip of the oil seal [C].
- Install the collar [D].



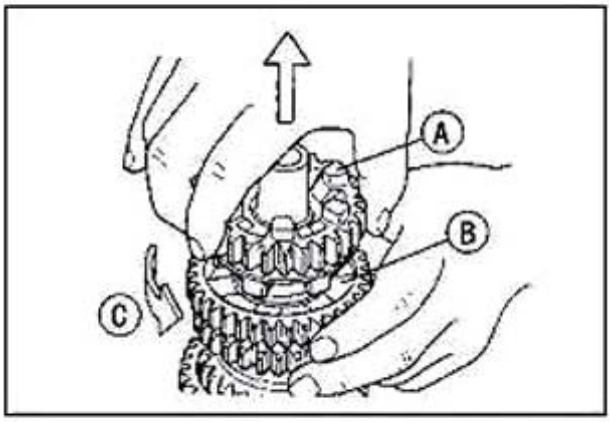
## Transmission

*Transmission Shaft Disassembly*

- Remove the transmission assy (see Transmission Assy Removal).
- Remove:
  Shift Rods [A]
  Shift Forks [B]
  Drive Shaft [C] and Output Shaft [D]

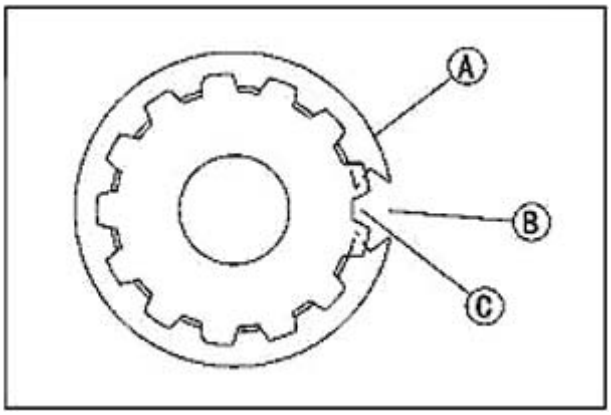



- Remove the circlips, disassemble the transmission shafts.
- Remove the fifth 5th gear.



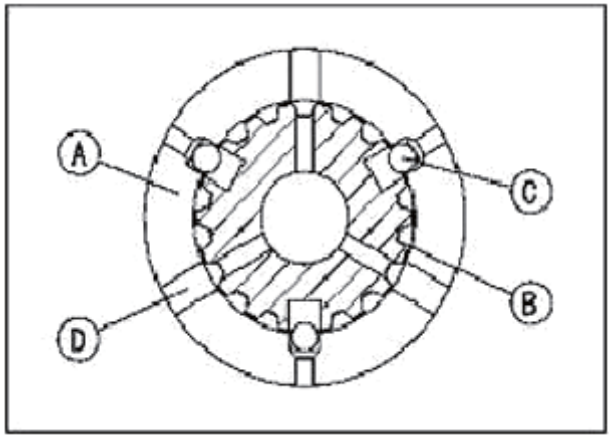

*Transmission Shaft Assembly*

- Apply engine oil to the collar, needle bearing and the shaft.
- Install the collar to the shaft.
- Replace all the removed circlips.
- Install the circlips [A] so that the opening [B] is aligned with a spline groove [C].

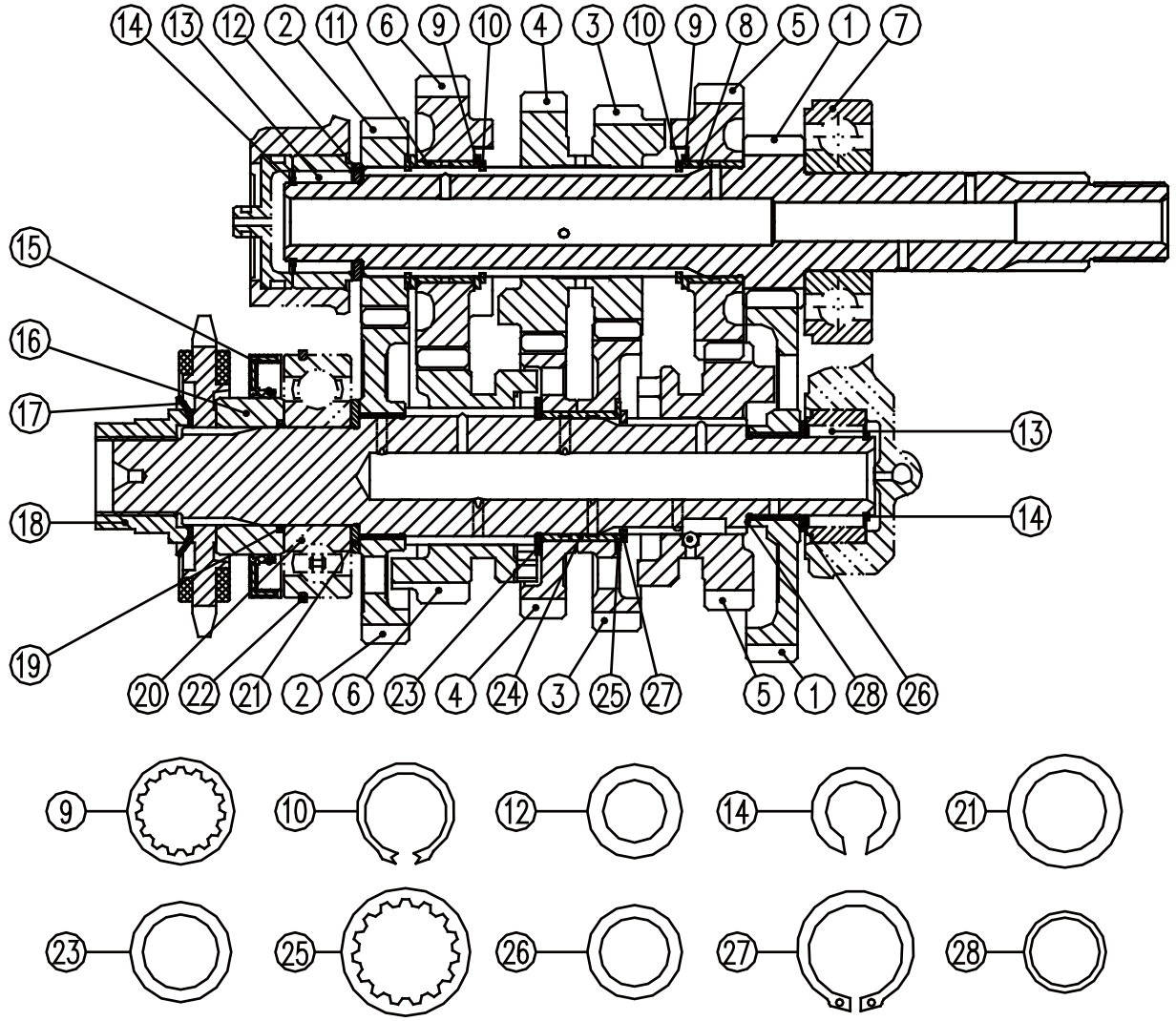


## Transmission

- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the fifth gear and the bushing onto the drive shaft.
- Install the 3rd/4th gear onto the drive shaft with their oil holes aligned.
- Install the 6th gear and the bushing onto the drive shaft with their oil holes aligned.
- The output shaft gears can be recognized by size:
  the gear with the largest diameter is 1st gear, and the smallest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 3rd/4th gear and the bushings onto the output shaft with their oil holes aligned.
- Install the fifth gear onto the output shaft.
- Check that each gear spins or slides freely on the transmission shafts without binding after assembly.



## Transmission

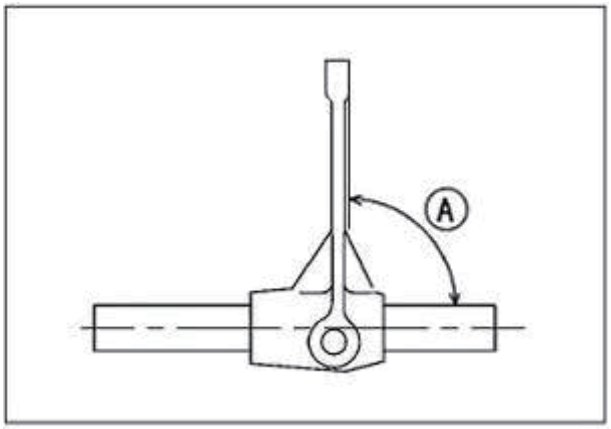



| | | | |
|---|---|---|---|
| 1.1st Gear | 8.Bushing | 15.Oil Seal | 22.Positioning Ring |
| 2.2nd Gear | 9.Toothed Washer | 16.Collar | 23.Washer Φ38.5 |
| 3.3th Gear | 10.Circlip | 17.Washer | 24.Bushing |
| 4.4th Gear | 11.Bushing | 18. Nut | 25.Toothed Washer |
| 5.5th Gear | 12.Thrust Washer | 19.O-ring | 26. Shim Φ28 |
| 6.6th Gear | 13.Needle Bearing | 20.Ball Bearing | 27.Circlip Φ30 |
| 7.Ball Bearing | 14. Circlip | 21.Spacerφ39 | 28.Circlip Φ30 |

## Transmission

*Shift Fork Bending*

● Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power.
90° [A]



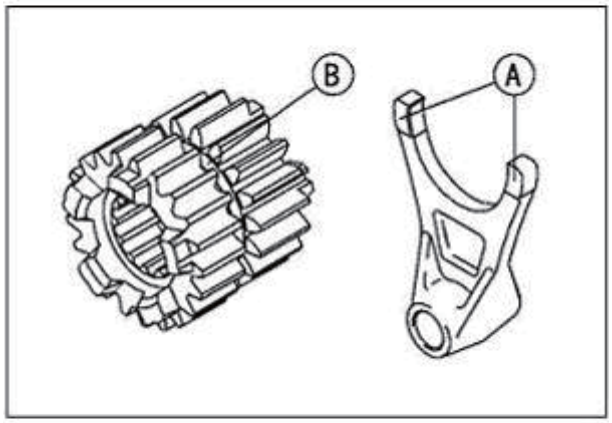

*Shift Fork/Gear Groove Wear*

● Measure the thickness of the shift fork ears [A], and measure the width [B] of the gear grooves. If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

**Shift Fork Ear Thickness**
**Standard: 5.9 6.0 mm (0.232 0.236 in.)**
**Service Limit: 5.8 mm (0.228 in.)**

If the gear groove is worn over the service limit, the gear must be replaced.

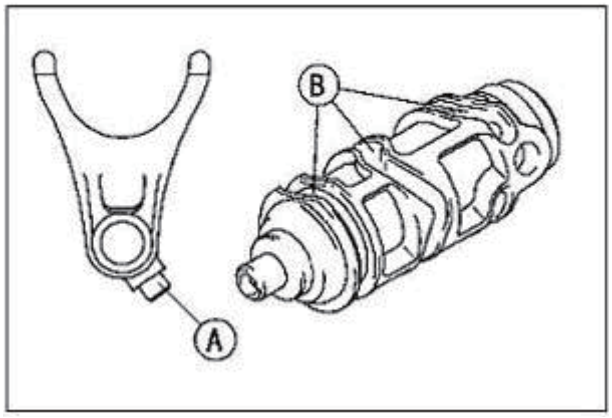
**Gear Groove Width**
**Standard: 6.05 6.15 mm (0.238 0.242 in.)**
**Service Limit: 6.25 mm (0.246 in.)**




*Shift Fork Guide Pin/Drum Groove Wear*

● Measure the diameter of each shift fork guide pin [A], and measure the width [B] of each shift drum groove.
If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

**Shift Fork Guide Pin Diameter**
**Standard: 6.9 7.0 mm (0.272 0.276 in.)**
**Service Limit: 6.8 mm (0.268 in.)**



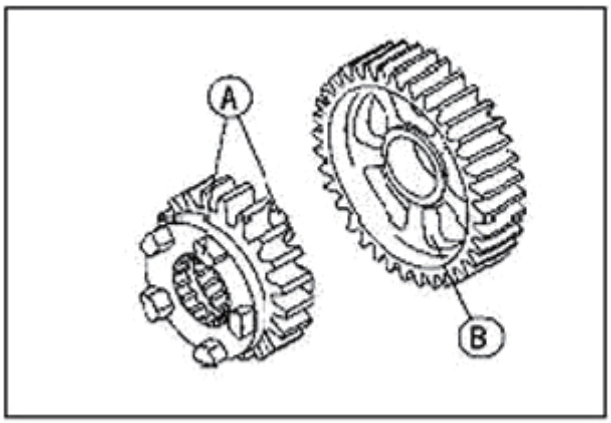
## Transmission

★If any shift drum groove is worn over the service limit, the drum must be replaced.

**Shift Drum Groove Width**
**Standard: 7.10~7.15 mm**
**Service Limit: 7.30 mm (0.287 in.)**

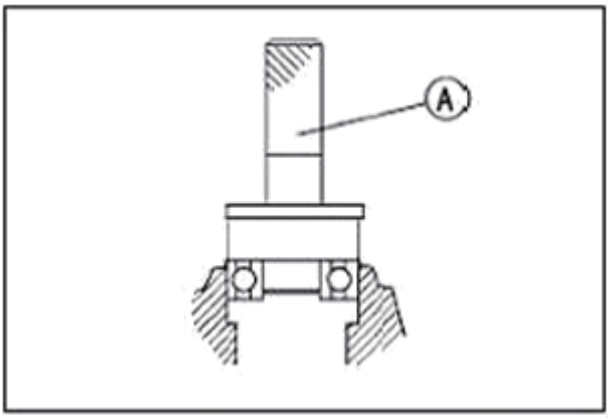
*Gear Dog and Gear Dog Hole Damage*

● Visually inspect the gear dogs [A] and gear dog holes [B].
★Replace any damaged gears or gears with excessively worn dogs or dog holes.



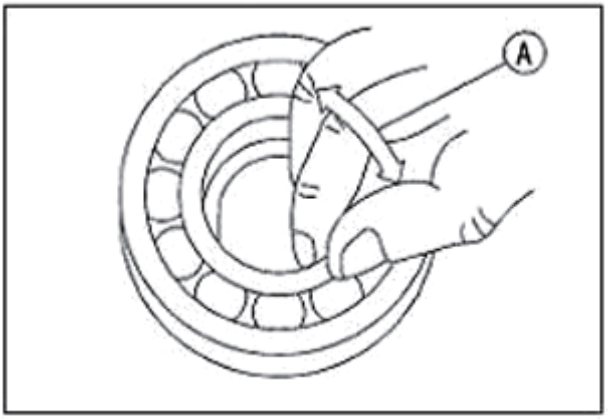

*Ball and Needle Bearing Replacement*

● Using a press or puller, remove the ball bearing and/or needle bearings.
● Using a press and the bearing driver set [A], install the new ball bearing until it stops at the bottom of its housing.




Ball and Needle Bearing Wear

● Spin [A] the bearing by hand to check its condition.
★If the bearing is noisy, does not spin smoothly, or has any rough spots, replace it.



# Wheels/Tires

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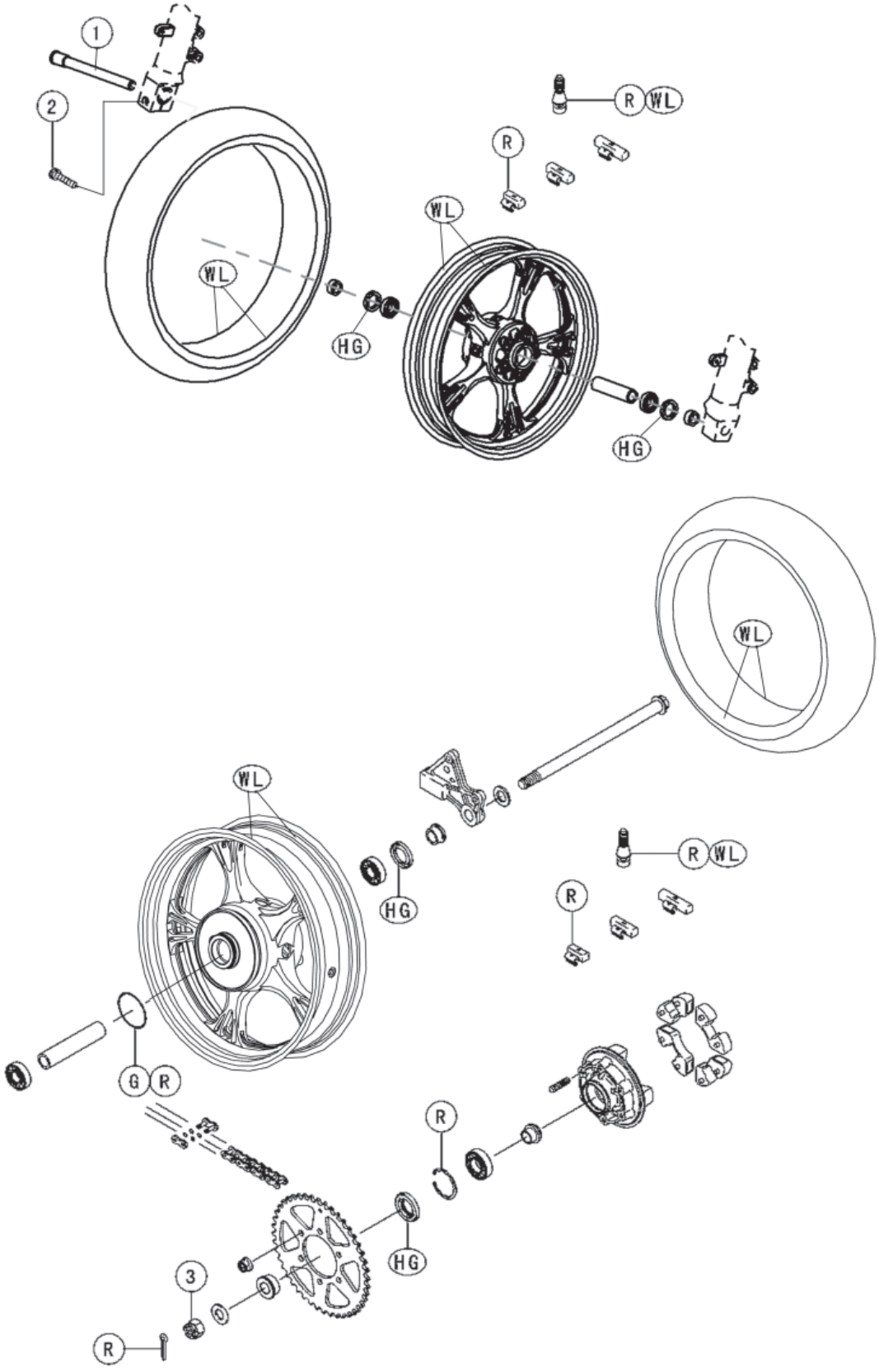
## Exploded View



## Exploded View

| No. | faster | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Front Axle | 108 | 11.0 | 80 | |
| 2 | Front Axle Clamp Bolt | 34 | 3.5 | 25 | |
| 3 | Rear Axle Nut | 108 | 11.0 | 80 | |

4. Caliper Bracket

G: Apply grease.

HG: Apply high-temperature grease.

R: Replacement Parts

WL: Apply soap and water solution or rubber lubricant.

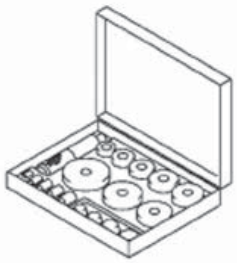
| Item | Standard | Service Limit |
|---|---|---|
| **Wheels (Rims)** | | |
| Rim Runout: | | |
| Axial | TIR 0.5 mm (0.02 in.) or less | TIR 1.0 mm (0.04 in.) |
| Radial | TIR 0.8 mm (0.03 in.) or less | TIR 1.0 mm (0.04 in.) |
| Axle Runout/100 mm (3.94 in.) | TIR 0.03 mm (0.0012 in.) or less | TIR 0.2 mm (0.008 in.) |
| Wheel Balance | 10 g (0.35 oz.) or less | – – – |
| Balance Weights | 10 g (0.35 oz.), 20 g (0.71 oz.), 30 g (1.06 oz.) | – – – |
| Rim Size: | | |
| Front | 17 × 3.50 | – – – |
| Rear | 17 × 4.50 | – – – |
| **Tires** | | |
| Air Pressure (when Cold): | | |
| Front | Up to 236 kg (520.51 lb) load: 280 kPa (2.80 kgf/cm², 39.8 psi) | – – – |
| Rear | Up to 325 kg (716.8 lb) load: 280 kPa (2.80 kgf/cm², 39.8 psi) | – – – |
| Tread Depth: | | |
| Front | 4.5 mm (0.18 in.) | 0.8~1mm |
| Rear | 5.5 mm (0.22 in.) | 0.8~1mm |
| | **Make, Type** | **Size** |
| Standard Tires: | | |
| Front | CST TYRE | 120/70R17M/C(58H) |
| Rear | CST TYRE | 160/60R17M/C(69H) |

**⚠ WARNING**

**Use the same manufacturer's tires on both front and rear wheels.**

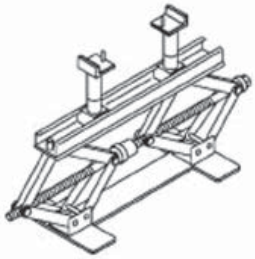
## Special Tools

Bearing Driver Set

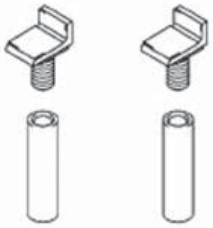


Bearing Remover Shaft

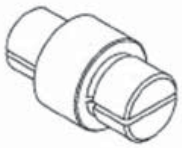
Jack



Jack Attachment



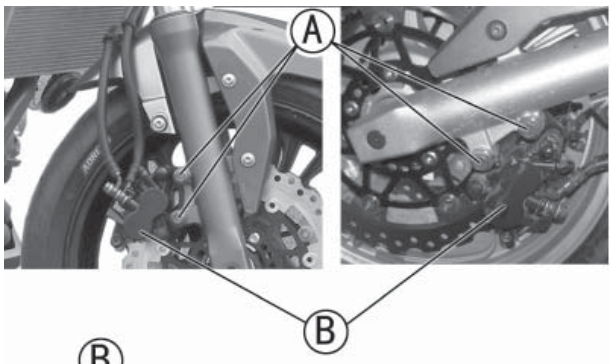
Bearing Remover Head, Φ20 × Φ22



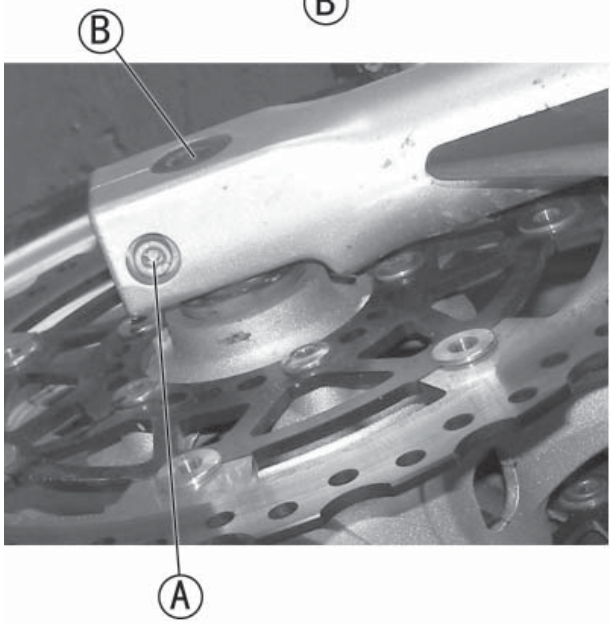
## Wheels (Rims)

*Front Wheel Removal*

● Remove:
Brake Caliper Mounting Bolts [A]
Front Brake Calipers [B]




● Loosen:
Axle Clamp Bolt [A]
● Remove the front axle [B].




● Remove the lower fairing (see Lower Fairing Removal in the Frame chapter).
● Raise the front wheel off the ground with jack.

**Special Tools - Jack**

**Jack Attachmen**

● Pull out the axle to the right and drop the front wheel out of the forks.

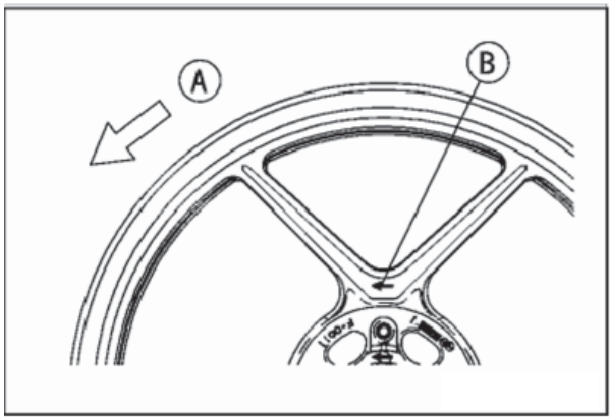
| CAUTION |
| --- |
| **Do not lay the wheel on the ground with the discs facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.** |

*Front Wheel Installation*

NOTE

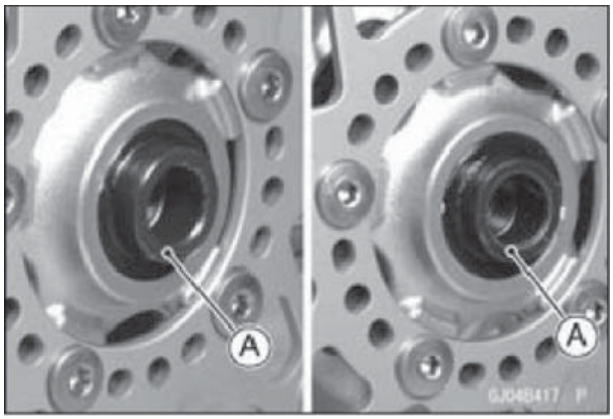
○ *The direction of the wheel rotation [A] is shown by an arrow [B] on the wheel spoke.*

● Check the wheel rotation mark on the front wheel and install it.



## Wheels (Rims)

- Apply high-temperature grease to the grease seal lips.
- Fit the collars [A] on the both sides of the hub.




- Insert the front axle, and tighten the axle.

**Torque - Front Axle: 108 N•m (11.0 kgf•m, 80 ft•lb)**

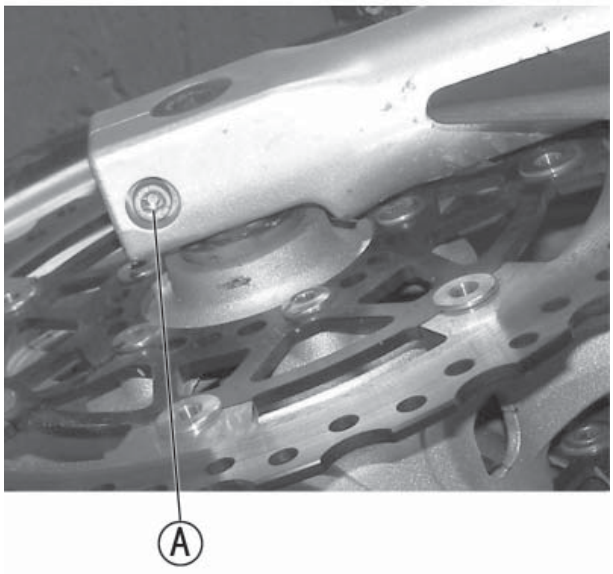
- Before tightening the axle clamp bolt on the right front fork leg, pump the front fork up and down 4 or 5 times to allow the right front fork leg to seat on the front axle.

**NOTE**

○ *Put a block in front of the front wheel to stop moving.*

- Tighten the axle clamp bolt [A].

**Torque - Front Axle Clamp Bolt: 34 N•m (3.5 kgf•m, 25 ft•lb)**



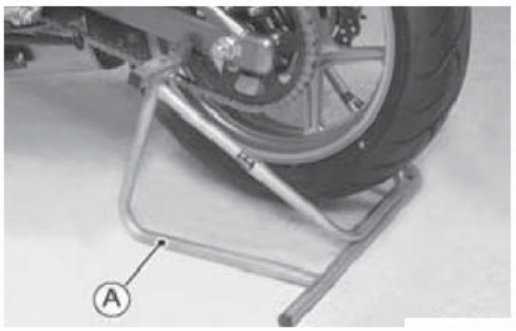

- Install the lower fairing (see Lower Fairing Installation in the Frame chapter).
- Install the front brake calipers (see Caliper Installation in the Brakes chapter).
- Check the front brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

**⚠ WARNING**

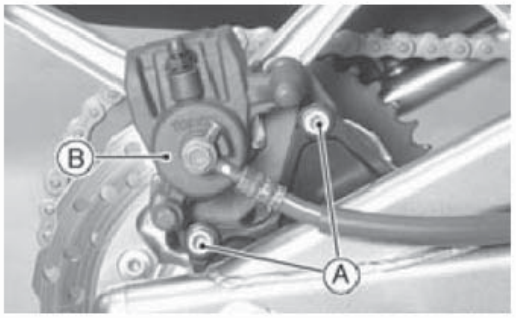
**Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

*Rear Wheel Removal*

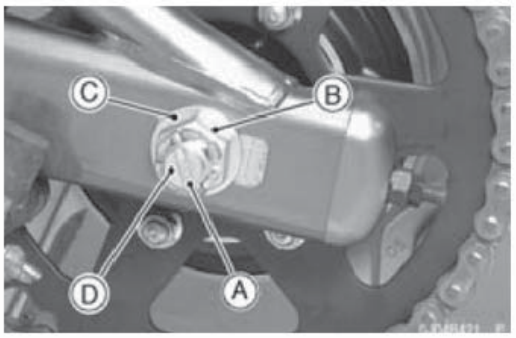
● Raise the rear wheel off the ground with stand [A].



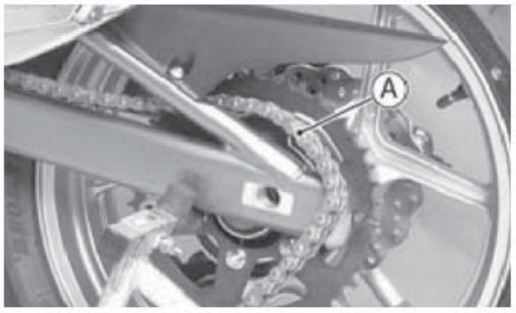

● Remove:
Brake Caliper Mounting Bolts [A]
Rear Brake Caliper [B]




● Remove:
Cotter Pin [A]
Axle Nut [B] Washer [C]
Axle [D] with Washer



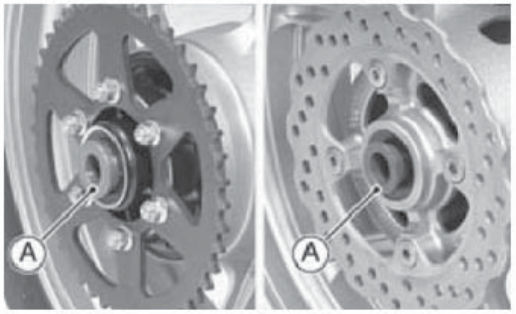

● Remove the drive chain [A] from the rear sprocket toward the left.
● Move the rear wheel back and remove it.




| CAUTION |
| --- |
| **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.** |

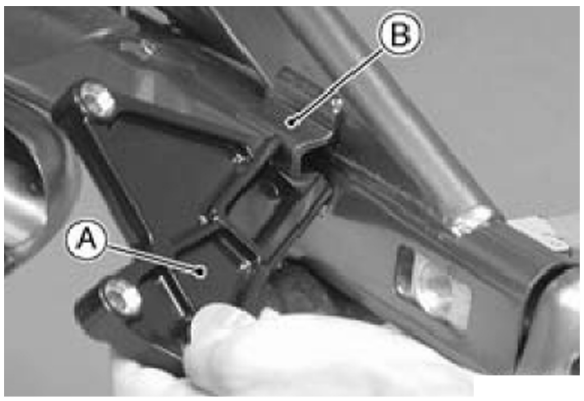
*Rear Wheel Installation*

● Apply high-temperature grease to the grease seal lips.
● Fit the collars [A] on the both sides of the hub.



## Wheels (Rims)

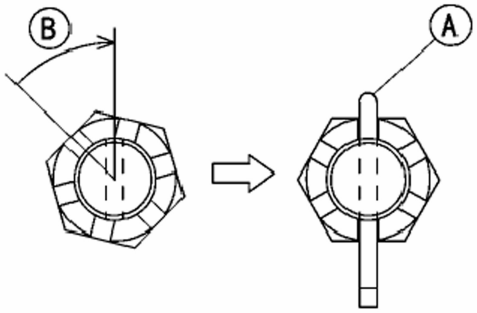
● Engage the drive chain with the rear sprocket.
● Install the caliper bracket [A] onto the swingarm stop [B].
● Insert the axle from the right side of the wheel, and tighten the axle nut.
**Torque - Rear Axle Nut: 108 N•m (11.0 kgf•m, 80 ft•lb)**



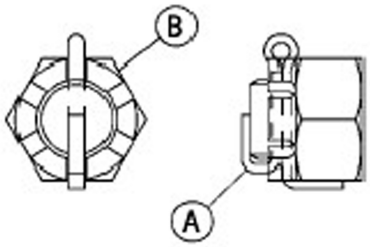

● Insert a new cotter pin [A].

**NOTE**

○ *When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten th nut clockwise [B] up to next alignment.*
○ *It should be within 30°.*
○ *Loosen once and tighten again when the slot goes past the nearest hole.*




● Bend the cotter pin [A] over the nut [B].




**⚠ WARNING**

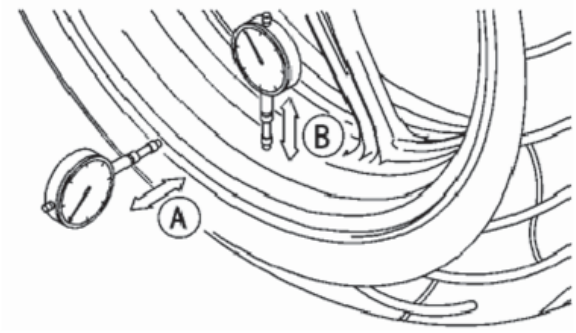
**If the rear axle nut is not securely tightened or the cotter pin is not installed, an unsafe riding condition may result.**

● Adjust the drive chain slack after installation (see Drive Chain Slack Inspection in the Periodic Maintenance chapter).
● Install the rear brake caliper (see Caliper Installation in the Brakes chapter).
● Install the rear wheel rotation sensor (see Rear Wheel Rotation Sensor Installation in the Brakes chapter).
● Check the rear brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

**⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.**

*Wheel Inspection*




- Raise the front/rear wheel off the ground with jack.

  **Special Tools – Jack, Jack Attachment**
- Spin the wheel lightly, and check for roughness or binding. If roughness or binding is found, replace the hub bearingWheel Inspection
- Raise the front/rear wheel off the ground with jack.

  **Special Tools – Jack, Jack Attachment**
- Spin the wheel lightly, and check for roughness or binding. If roughness or binding is found, replace the hub bearings.
- Inspect the wheel for small cracks, dents, bending, or warp.

★If there is any damage to the wheel, replace the wheel.

- Remove the wheel, and support it without the tire by the axle.
- Measure the rim runout, axial [A] and radial [B], with a dial gauge.
  If rim runout exceeds the service limit, check the hub bearings.

★If the problem is not due to the bearings, replace the wheel.

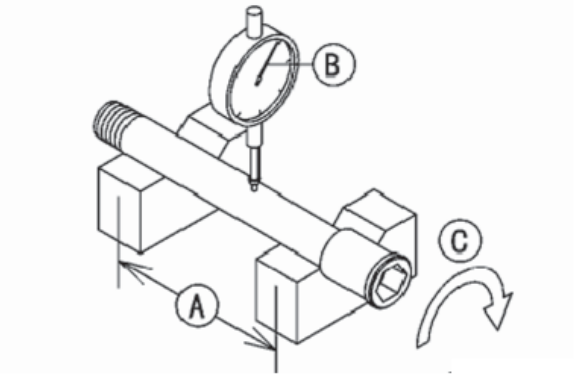
**Rim run out**
**Standard:**

| | |
|---|---|
| **Axial** | **TIR 0.5 mm (0.02 in.) or less** |
| **Radial** | **TIR 0.8 mm (0.03 in.) or less** |
| **Service Limit:** | |
| **Axial** | **TIR 1.0 mm (0.04 in.)** |
| **Radial** | **TIR 1.0 mm (0.04 in.)** |

**⚠ WARNING**

**Never attempt to repair a damaged wheel. If there is any damage besides wheel bearings, the wheel must be replaced to insure safe operational condition.**

*Axle Inspection*




- Remove the front and rear axles (see Front/Rear Wheel Removal).
- Visually inspect the front and rear axle for damages.
  If the axle is damaged or bent, replace it.
- Place the axle in V blocks that are 100 mm (3.94 in.) [A]apart, and set a dial gauge [B] on the axle at a point halfway between the blocks.Turn [C] the axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.

★ If axle runout exceeds the service limit, replace the axle.

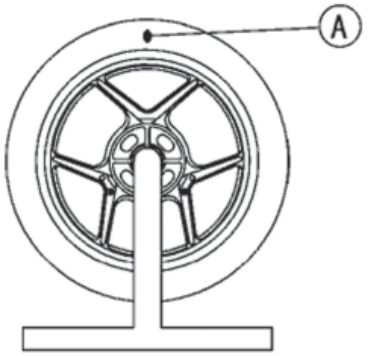
**Axle Runout/100 mm (3.94 in.)**
**Standard: TIR 0.03 mm (0.0012 in.) or less**
**Service Limit: TIR 0.2 mm (0.008 in.)**

*Balance Inspection*

- Remove the front and rear wheels (see Front/ Rear Wheel Removal).
- Support the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark [A] the wheel at the top when the wheel stops.

○ Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.

★If the wheel always stops in one position, adjust the wheel balance (see Balance Adjustment).

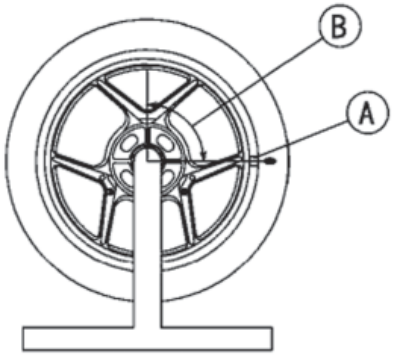



*Balance Adjustment*

- If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.

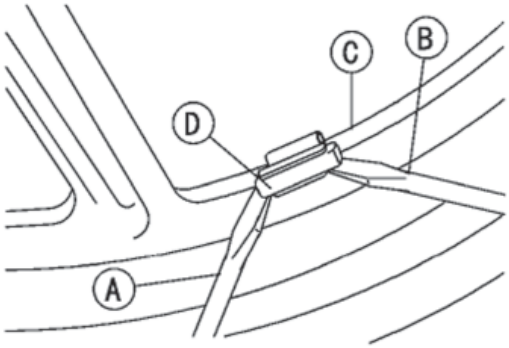
★If the wheel rotates and the weight goes up, replace the weight with the next heavier size. If the wheel rotates and the weight goes down, replace the weight with the next lighter size.

- Repeat these steps until the wheel remains at rest after being rotated 1/4 turn.
- Rotate the wheel another 1/4 turn and then another 1/4 turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance.
- Permanently install the balance weight.




*Balance Weight Removal*

- Insert a regular tip screwdrivers [A] [B] between the rib [C] and the weight [D] as shown.
- Pry the balance weight with two screwdrivers and remove the balance weight.
- Discard the used balance weight.

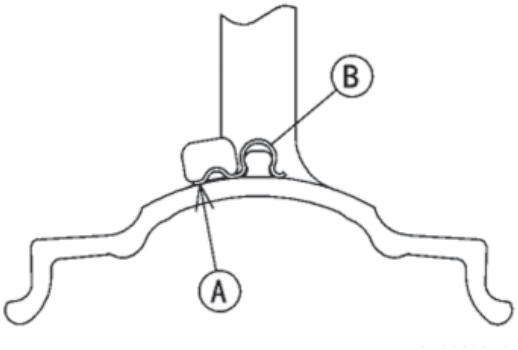



| CAUTION |
| --- |
| **Do not tap the screwdrivers. The rim could be damaged.** |

*Balance Weight Installation*

- Check if the weight portion has any play on the blade [A] and clip [B].

★If it does, discard it.




| ⚠ WARNING |
| --- |
| **If the balance weight has any play on the rib of the rim, the blade and/or clip have been stretched. Replace the loose balance weight. Do not reuse used balance weight. Unbalanced wheels can create an unsafe riding condition.** |

**Balance Weight**

| Number | Weight |
|---|---|
| 1 | 10g (0.35oz.) |
| 2 | 20g (0.71oz.) |
| 3 | 30g (1.06oz.) |

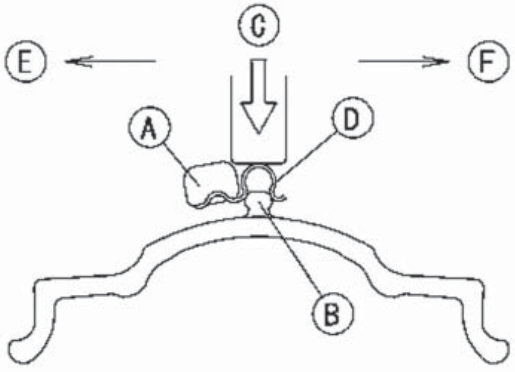
**NOTE**

○ *Balance weights are available from cfmoto dealers in 10, 20, and 30 grams (0.35, 0.71, and 1.06 oz.) sizes.*
*An imbalance of less than 10 grams (0.35 oz.) will not usually affect running stability.*

○ *Do not use four or more balance weight (more than 90gram, 3.17 oz.). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.*

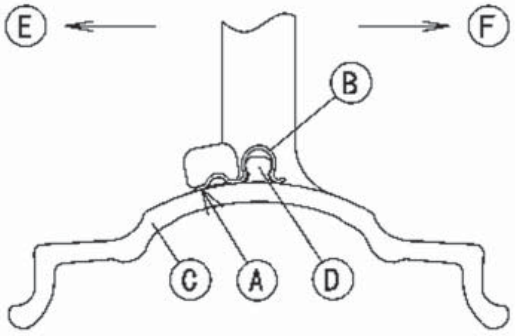
● Slip the balance weight [A] onto the rib [B] by pushing or lightly hammering [C] the clip [D].

Left Side [E] Right Side [F]




● Be sure to install the balance weight.
○ Check that the blade [A] and clip [B] are fully seated on the rim [C] and that the clip is hooked over the rib [D].

Left Side [E]
Right Side [F]



*Air Pressure Inspection/Adjustment*

● Refer to the Air Pressure Inspection in the Periodic Maintenance chapter.

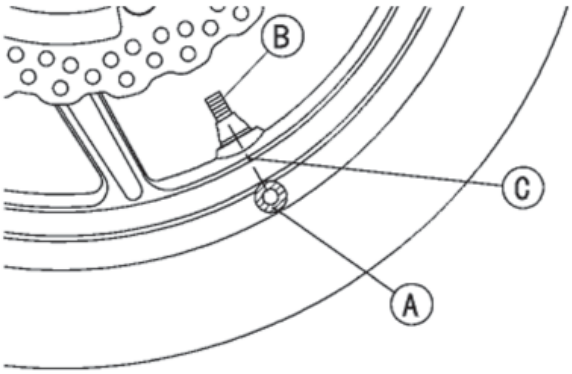
*Tire Inspection*

● Refer to the Wheel/Tire Damage Inspection in the Periodic Maintenance chapter.

*Tire Removal*

● Remove:
Wheel (see Front/Rear Wheel Removal)
Valve Core (Let out the air)

● To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire can be reinstalled in the same position.




Chalk Mark or Yellow Mark [A]
Air Valve [B]
Align [C]

● Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

| CAUTION |
| --- |
| **Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.** |

● Remove the tire from the rim using a suitable commercially available tire changer.

**NOTE**

○ *The tires cannot be removed with hand tools because they fit the rims too tightly.*

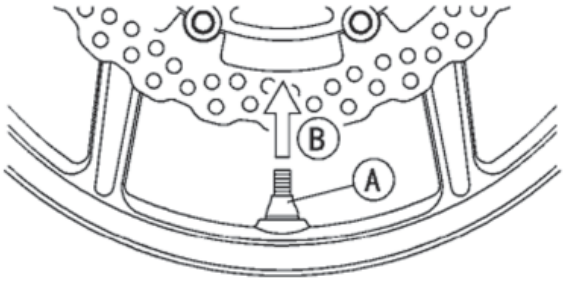
*Tire Installation*

| ⚠ WARNING |
| --- |
| **Use the same manufacturer's tires on both front and rear wheels.** |

● Inspect the rim and tire, and replace them if necessary.
● Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
● Remove the air valve and discard it.

| CAUTION |
| --- |
| **Replace the air valve whenever the tire is replaced. Do not reuse the air valve.** |

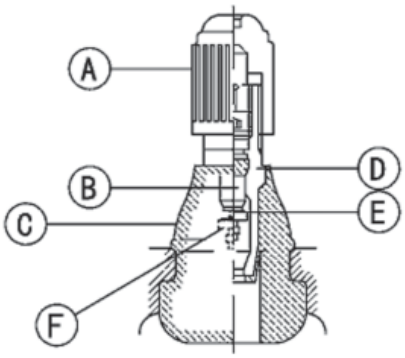
● Install a new valve in the rim.
● Remove the valve cap, lubricate the stem seal [A] with a soap and water solution or rubber lubricant, and pull [B] the valve stem through the rim from the inside out until it snaps into place.



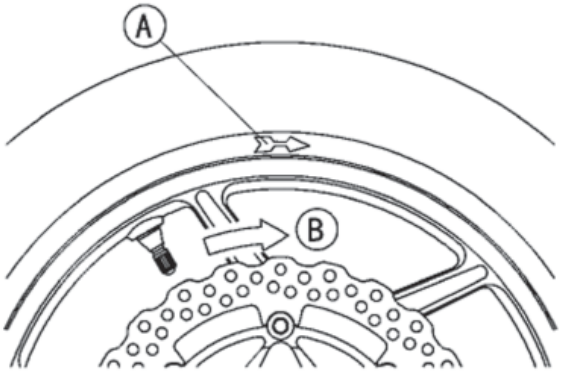

**CAUTION**

**Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.**

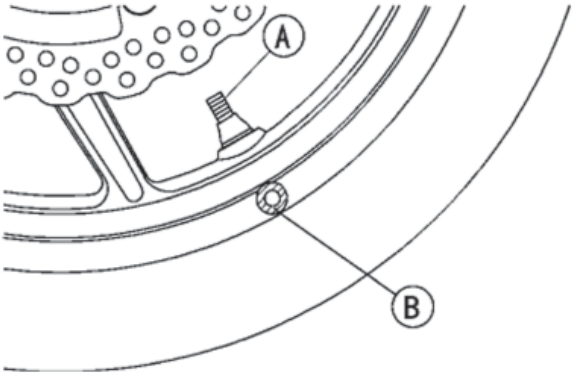
○ The air valve is shown in the figure.
Valve Cap [A]
Valve Core [B]
Stem Seal [C]
Valve Stem [D]
Valve Seat [E]
Valve Opened [F]




● Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.
Tire Rotation Mark [A] Rotating Direction [B]




● Position the tire on the rim so that the valve [A] align with the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
● Install the tire bead over the rim flange using a suitable commercially available tire changer.
● Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
● Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.




**⚠ WARNING**

**Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 400 kPa (4.0 kgf/cm², 57 psi). Overinflation can explode the tire with possibility of injury and loss of life.**

● Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.

★ If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core.

● Lubricate the rim flanges and tire beads.

● Install the valve core and inflate the tire again.

● After the tire beads seat in the rim flanges, check for air leakage.

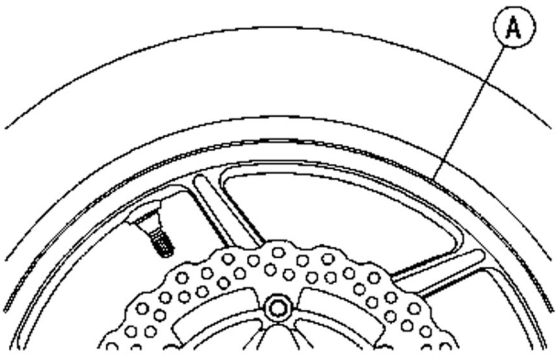
○ Inflate the tire slightly above standard inflation.

○ Use a soap and water solution or submerge the tire, and check for bubbles that would indicate leakage.

● Adjust the air pressure to the specified pressure (see Air Pressure Inspection in the Periodic Maintenance chapter).

● Install the air valve cap.

● Adjust the wheel balance (see Balance Adjustment).

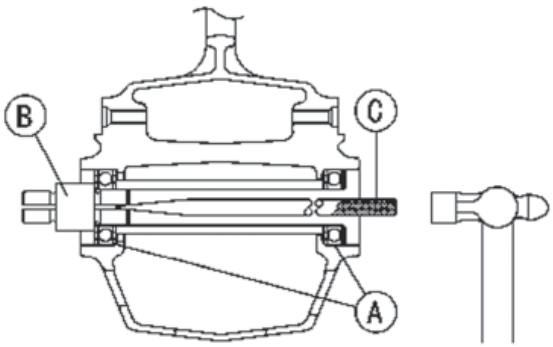



*Tire Repair*

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, CFMOTO does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

*Hub Bearing Removal*

- Remove the wheel (see Front/Rear Wheel Removal), and take out the following.
  Collars Coupling (Out of rear hub) Grease Seals
- Use the bearing remover to remove the hub bearings [A].




| CAUTION |
| --- |
| **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.** |

**Special Tools –**
**Bearing Remover Head, 20 ×22 [B]**
**Bearing Remover Shaft, 13 [C]**

*Hub Bearing Installation*

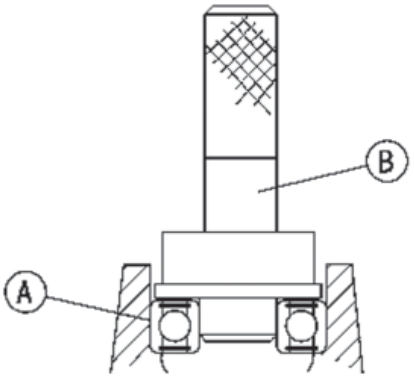
- Before installing the hub bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.

**NOTE**

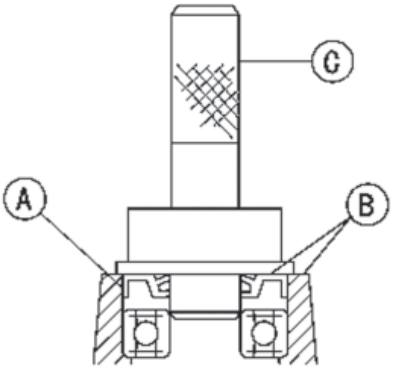
○ *Install the bearings so that the marked side faces out.*

- Install the bearings by using the bearing driver set which does not contact the bearing inner race.
- Press in each bearing [A] right until they are bottomed.

**Special Tool - Bearing Driver Set [B]**




- Replace the grease seals with new ones.
- Press in the grease seals [A] so that the seal surface is flush [B] with the end of the hole.
- Apply high-temperature grease to the grease seal lips.
  Special Tool - Bearing Driver Set [C]: 57001-1129

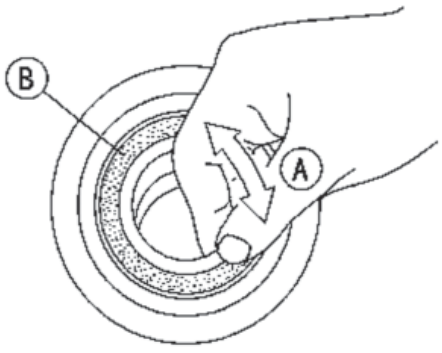



*Hub Bearing Inspection*

Since the hub bearings are made to extremely close tol- erances, the clearance can not normally be measured.

**NOTE**

○ *Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.*




- Turn each bearing in the hub back and forth [A] while checking for plays, roughness or binding.
  If bearing play, roughness or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.

# Final Drive

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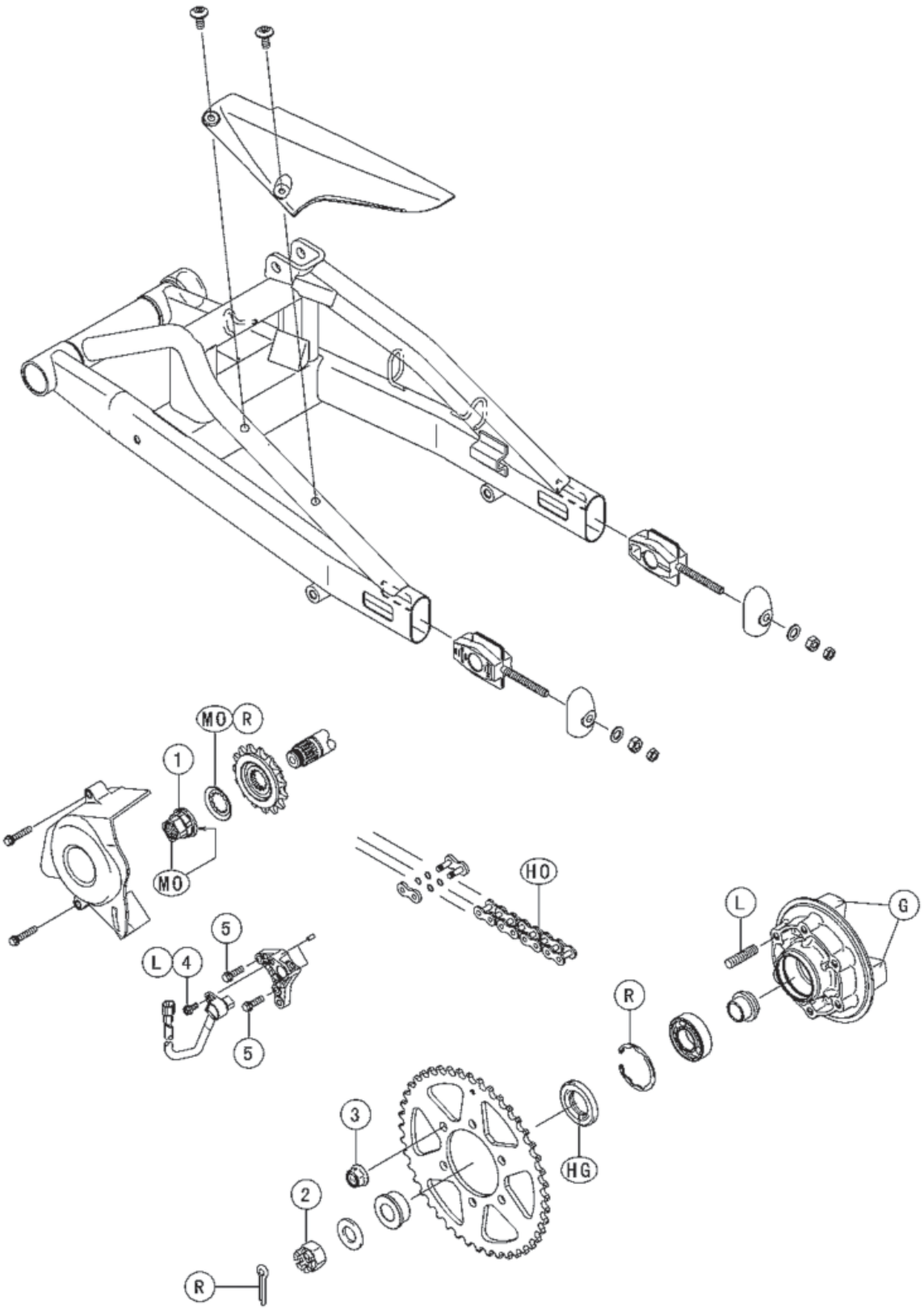
## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Engine Sprocket Nut | 125 | 12.7 | 92 | MO |
| 2 | Rear Axle Nut | 108 | 11.0 | 80 | |
| 3 | Rear Sprocket Nuts | 59 | 6.0 | 44 | |
| 4 | Speed Sensor Bolt | 7.8 | 0.80 | 69in·lb | L |
| 5 | Speed Sensor Bracket Bolts | 9.8 | 1.0 | 87in·lb | |

G: Apply grease.

HG: Apply high-temperature grease.

HO: Apply heavy oil.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil solution.

(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)

R: Replacement Parts

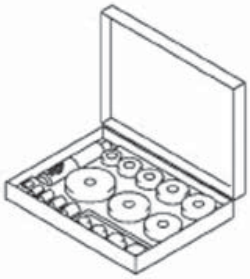
## Specifications

| Item | Standard | Service Limit |
|---|---|---|
| **Drive Chain** | | |
| Drive Chain Slack | 30~40mm(1.2~1.6in.) | — |
| Drive Chain Wear (20-link Length) | 317.5~318.2mm(12.50~12.53in.) | 323mm(12.7in.) |
| Standard Chain: | | |
| Make | JAPAN RK | — |
| Type | 520 × 901 | — |
| Link | 114 links | — |
| **Sprockets** | | |
| Rear Sprocket Warp | 0.4mm(0.016in.) or less | 0.5mm(0.020in.) |

## Special Tools

Inisde Circlip Pliers

Bearing Driver Set



*Drive Chain Slack Inspection*

● Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

*Drive Chain Slack Adjustment*

● Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

*Wheel Alignment Inspection/Adjustment*

● Refer to the Wheel Alignment Inspection in the Periodic Maintenance chapter.

*Drive Chain Wear Inspection*

● Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

*Drive Chain Lubrication*

● Refer to the Drive Chain Lubrication Condition Inspection in the Periodic Maintenance chapter.

*Drive Chain Removal*

**NOTE**

○ *Since the drive chain is installed through the swingarm, the chain cannot be removed other than by cutting it.*

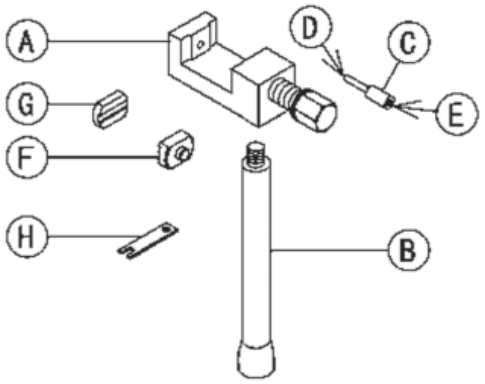
● Prepare the new link pin, link plate, grease seals, and tools for rejoining the chain.
● Using a suitable tool, cut the drive chain by removing the link pins.

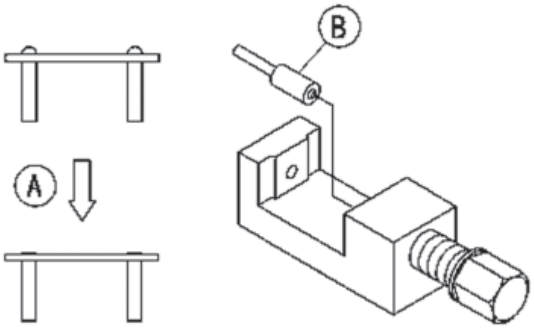
Recommended Tool: RK

| CAUTION |
| --- |
| **Read the Tool Manual before removing.** |

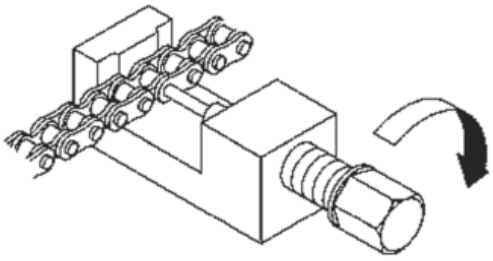
Body [A]
Handlebar [B]
Cutting and Riveting Pin [C]
For Cutting [D]
Riveting [E]
Plate Holder (a)[F]
Plate Holder (b)[G]
Gauge [H]

● Grind [A] the pin head to make it flat.
● Set the cutting and riveting pin[B]as shown

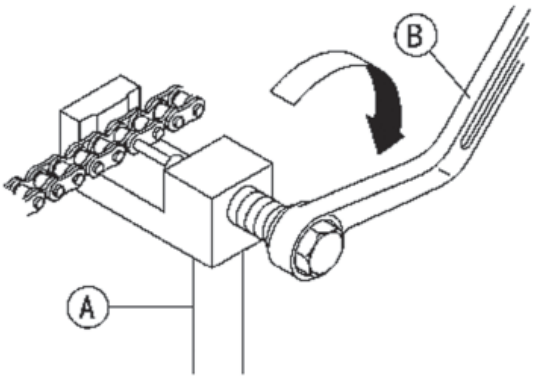


● Screw the pin holder until it touches chain pin.
● Be sure that the cutting pin hits center of chain pin.

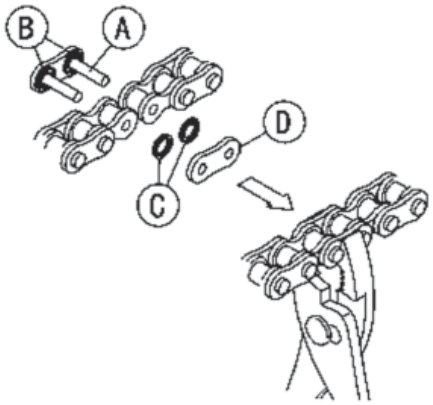


● Screw the handlebar [A] into body.
● Turn the pin holder with wrench [B] clockwise to extract chain pin.

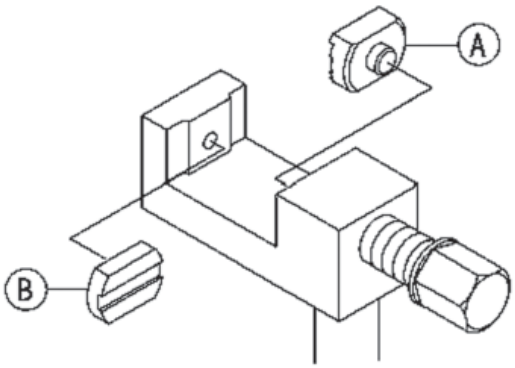



*Drive Chain Installation*

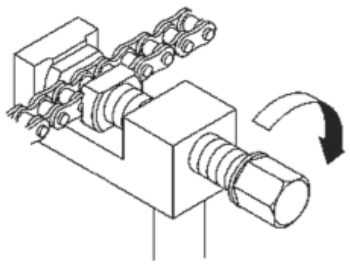
● Engage the new drive chain to the old drive chain and pull the end of the old drive chain until they are changing the position.
● Remove the old drive chain from the new drive chain.
● Apply grease to the link pins [A] and grease seals [B] [C].
● Engage the drive chain on the rear sprocket through theswingarm.
● Insert the link pins in the drive chain ends.
● Install the grease seals [C].
● Install the link plate so that the mark [D] faces out.
● Push the link plate by hand or plier to fix it.
● In case of grease seal chain, be sure to set the greaseseals correctly.



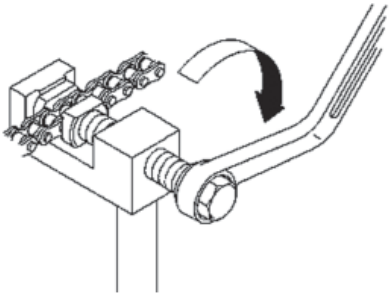

● Set the plate holder (a) [A] and plate holder (b) [B] on the body.



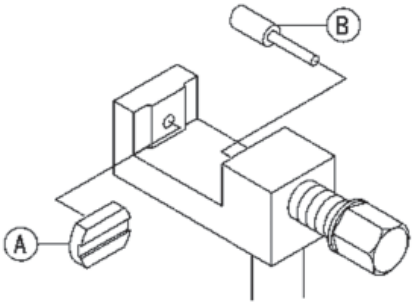
- Fit the plate holder (a) to link plate.
- Turn the pin holder by hand until plate holder (b) touches the other link plate.



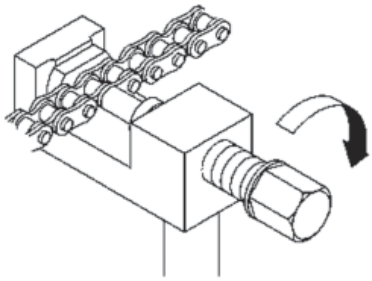
- Turn the pin holder by wrench clockwise until two pins of link come into groove of plate holder (a).
- Take off the plate holder (a).



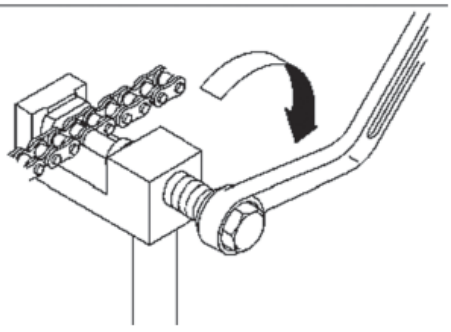
- Set the plate holder (b) [A] and cutting and riveting pin [B]as shown.




- Turn the pin holder until riveting pin touches link pin.



- Turn the wrench clockwise until tip of riveting pin hits of link pin.
- Rivet it.
- Same work for the other link pin.



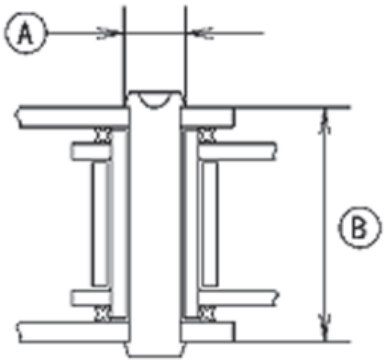
● After staking, check the staked area of the link pin for cracks.

.

● Measure the outside diameter [A] of the link pin and link plates width [B].

**Link Pin Outside Diameter**
**Standard: 5.7 < 6.0 mm (0.22< 0.24 in.)**
**Link Plates Outside Width**
**Standard: 17.25 < 17.45 mm (0.679< 0.687 in.)**

● If the reading exceeds the specified length, cut and rejoin the chain again.

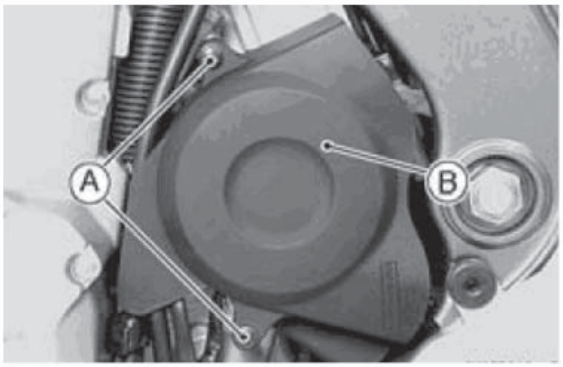



● Check:
Movement of the Rollers

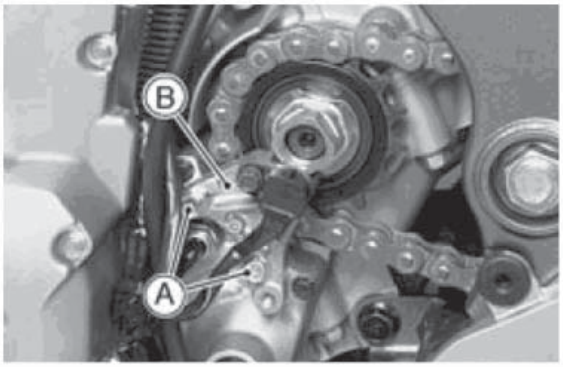
● Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

*Engine Sprocket Removal*

● Remove:
Engine Sprocket Cover Bolts [A]
Engine Sprocket Cover [B]



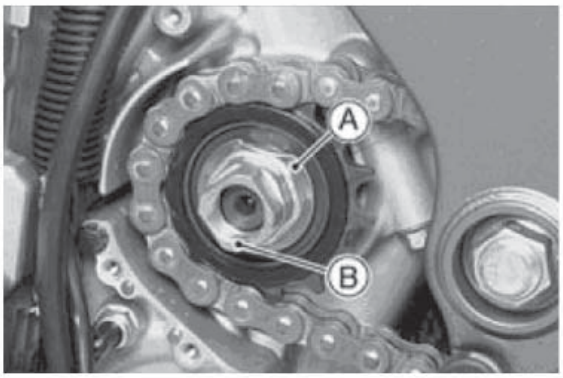

● Remove:
Speed Sensor Bracket Bolts [A]
Speed Sensor Bracket [B]



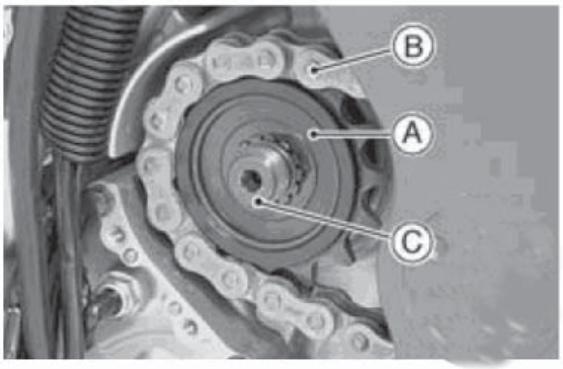

● Flatten out the bended washer [A].
● Remove the engine sprocket nut [B] and washer.

**NOTE**

○ *When loosening the engine sprocket nut, hold the rearbrake on.*

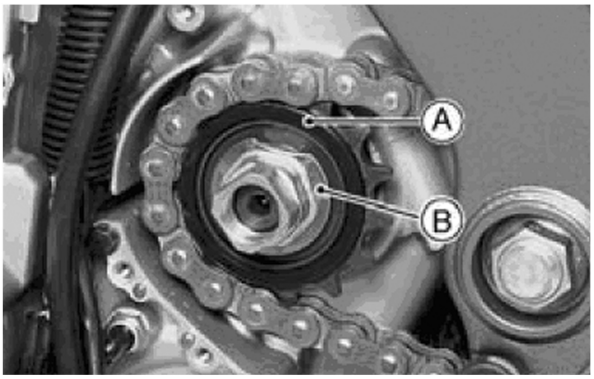



● Raise the rear wheel off the ground with stand.
● Remove the axle cotter pin, and loosen the rear axle nut.
● Loosen the drive chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
● Remove the drive chain from the rear sprocket toward the right.
● Pull the engine sprocket [A] with drive chain [B] off the output shaft [C].
● Disengage the drive chain from the engine sprocket.



*Engine Sprocket Installation*

- Replace the sprocket washer and axle cotter pin.
- Install the engine sprocket [A] so that "OUTSIDE" letters face outward.
- Apply molybdenum disulfide oil solution to the threads of the output shaft and seating surface of the engine sprocket nut.
- After torquing the engine sprocket nut, bend the one side of the washer [B] over the nut.




**NOTE**

○ *Tighten the engine sprocket nut while applying the rear brake.*

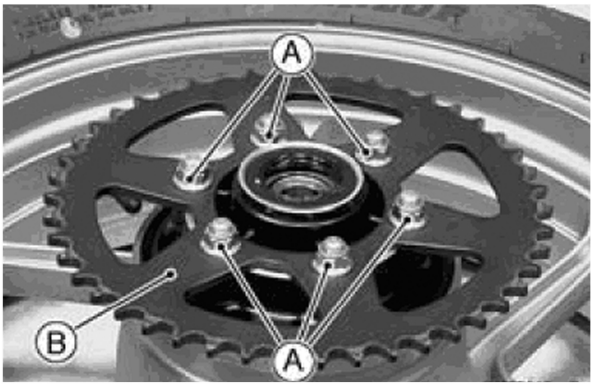
- Tighten:
  **Torque - Engine Sprocket Nut: 125 N•m (12.7 kgf•m, 92 ft•lb)**
  **Speed Sensor Bracket Bolts: 9.8 N•m (1.0 kgf•m, 87 in•lb)**

- Install the engine sprocket cover, and tighten the bolts.
- Adjust the drive chain slack after installing the sprocket (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Bend the end of axle cotter pin surely after tightening the axle nut (see Rear Wheel Installation in the Wheels/Tires chapter).

*Rear Sprocket Removal*

- Remove the rear wheel (see Rear Wheel Removal in the Wheels/Tires chapter).

| CAUTION |
| --- |
| **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place wooden blocks under the wheel so that the disc does not touch the ground.** |




- Remove the rear sprocket nuts [A].
- Remove the rear sprocket [B].

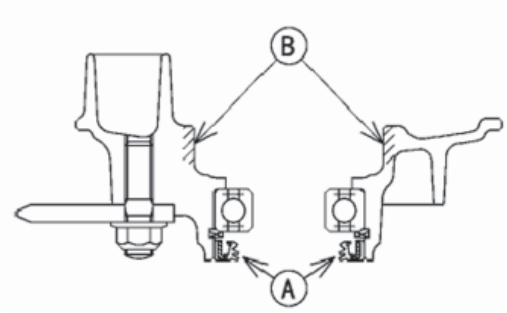
*Rear Sprocket Installation*

- Install the sprocket facing the tooth number marking [A] outward.
- Tighten the rear sprocket nuts.
  **Torque - Rear Sprocket Nuts: 59 N•m (6.0 kgf•m, 44 ft•lb)**
- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).

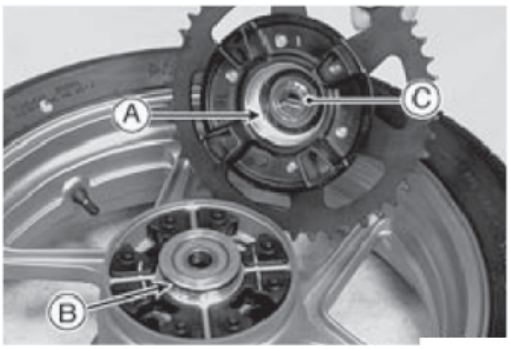
*Coupling Installation*

● Apply high-temperature grease to the coupling grease seal lips [A].

● Apply grease to the coupling internal surface [B].



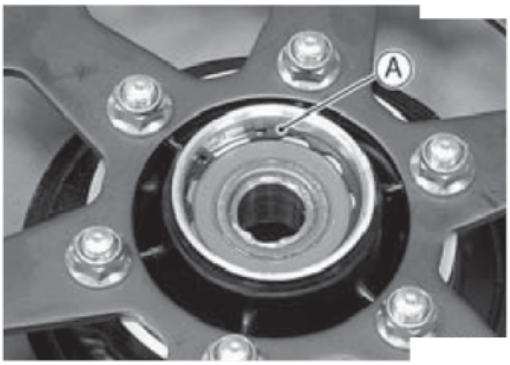

● Grease the following.
Wheel Flange Portion [A]
O-ring [B]
● Install the collar [C].



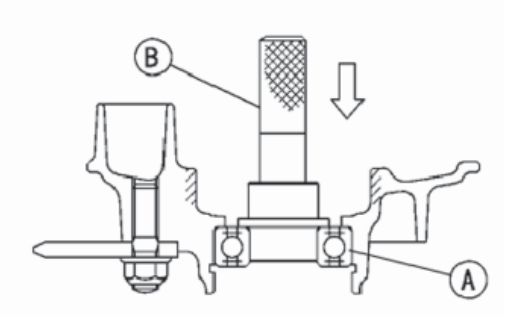

Coupling Bearing Removal

● Remove:
Coupling
Grease Seal
Circlip [A]

**Special Tool - Inside Circlip Pliers**

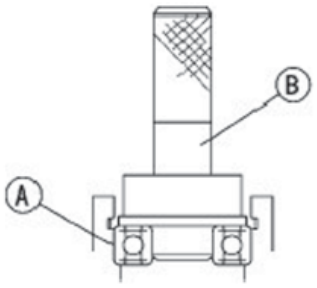



● Remove the bearing [A] by tapping from the wheel side.
**Special Tool - Bearing Driver Set [B]**




*Coupling Bearing Installation*

● Replace the bearing with a new one.
● Press in the bearing [A] until it is bottomed.
**Special Tool - Bearing Driver Set [B]**
● Replace the circlip with a new one.
**Special Tool - Inside Circlip Pliers**



● Replace the grease seal with a new one.
● Press in the grease seal so that the seal surface is flush with the end of the hole.
● Apply high-temperature grease to the grease seal lips.

**Special Tool - Bearing Driver Set**

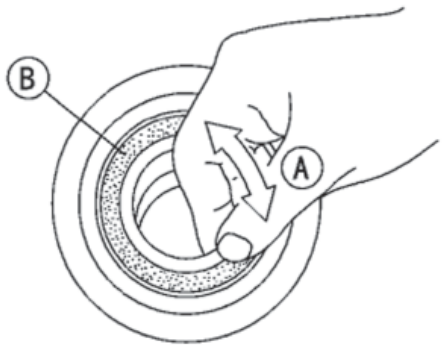
*Coupling Bearing Inspection*

● Since the coupling bearing is made to extremely close tolerances, the clearance can not normally be measured.

**NOTE**

○ *It is not necessary to remove the coupling bearing for inspection. If the bearing is removed, it will need to be replaced with a new one.*

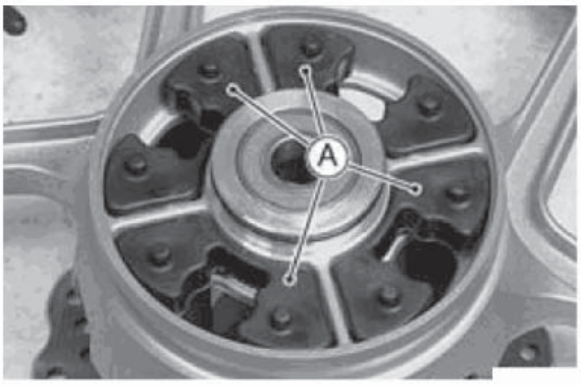
● Turn the bearing in the coupling back and forth [A] while checking for plays, roughness or binding. If the bearing play, roughness or binding is found, replace the bearing.
● Examine the bearing seal [B] for tears or leakage. If the seal is torn or is leaking, replace the bearing.




Coupling Bearing Lubrication
NOTE
○Since the coupling bearing is packed with grease and
sealed, lubrication is not required.

*Coupling Damper Inspection*

● Remove the rear wheel coupling, and inspect the rubber dampers [A].
● Replace the damper if it appears damaged or deteriorated.

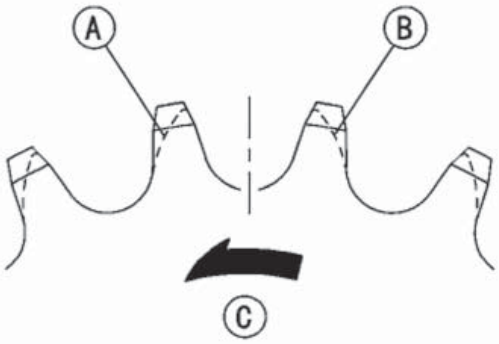



*Sprocket Wear Inspection*

● Visually inspect the engine and rear sprocket teeth for wear and damage.
If the teeth are worn as illustrated, replace the sprocket, and inspect the drive chain wear (see Drive Chain Wear Inspection in the Periodic Maintenance chapter).
Worn Tooth (Engine Sprocket) [A] Worn Tooth (Rear Sprocket) [B] Direction of Rotation [C]

**NOTE**

○ *If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket,*

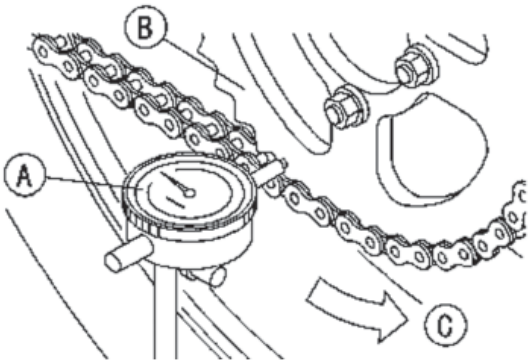


*Rear Sprocket Warp Inspection*

- Raise the rear wheel off the ground with stand so that itwill turn freely.
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).

★ If the runout exceeds the service limit, replace the rear sprocket.

**Rear Sprocket Warp**
**Standard: 0.4 mm (0.016 in.) or less**
**Service Limit: 0.5 mm (0.020 in.)**



# Brakes

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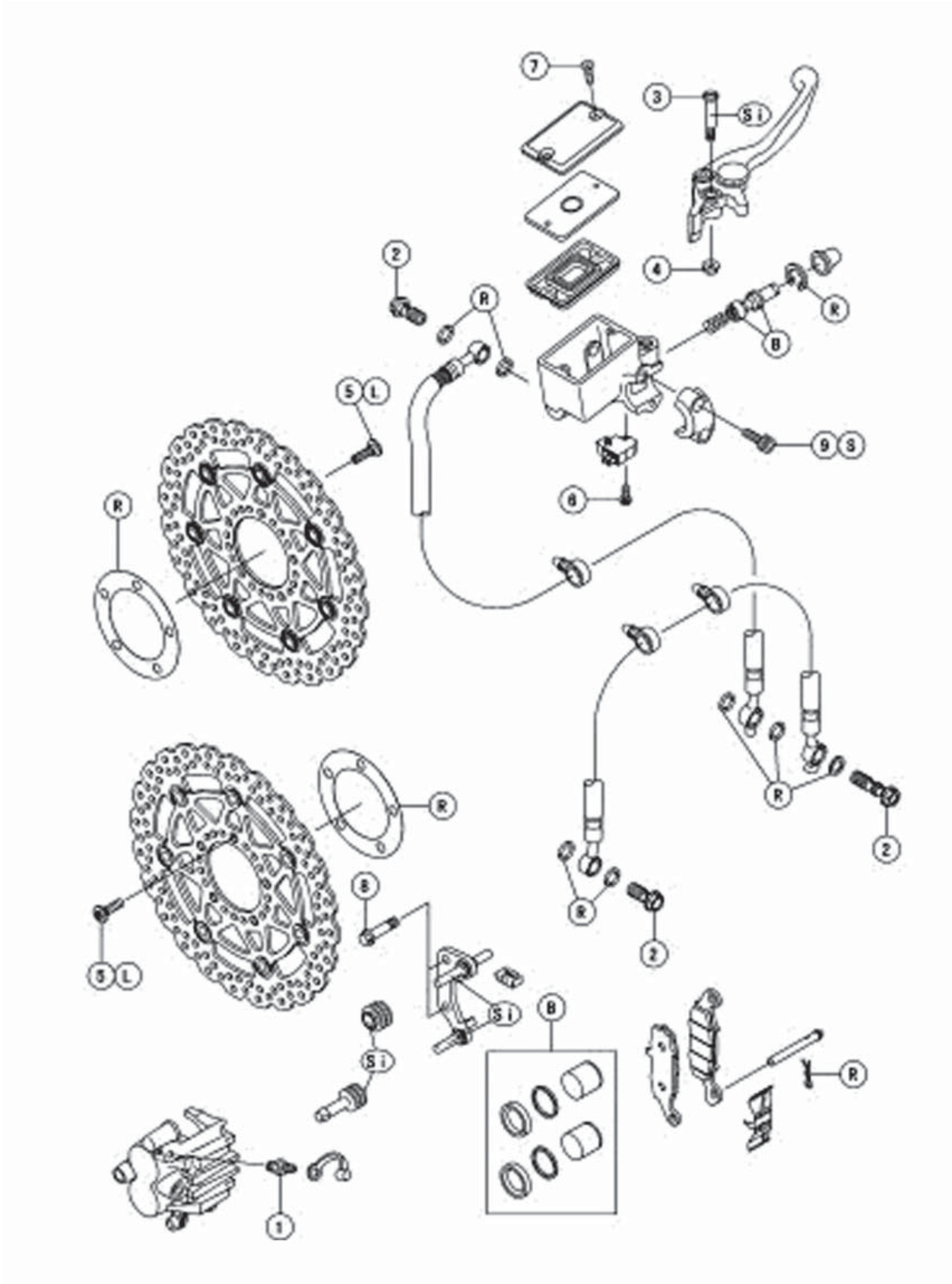
## Exploded View (Front Brake)

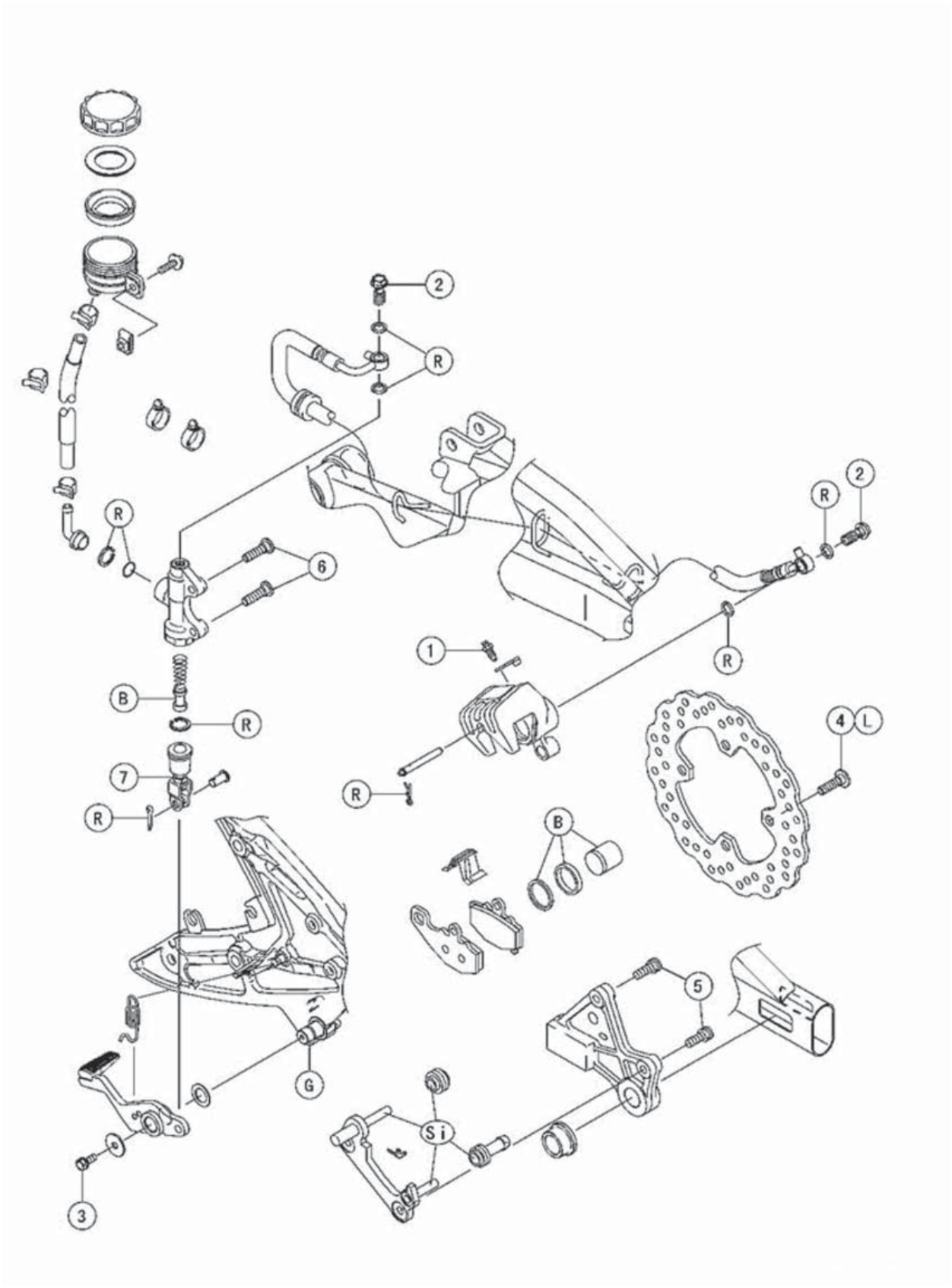


## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Bleed Valve | 7.8 | 0.80 | 69 in·lb | |
| 2 | Brake Hose Banjo Bolts | 25 | 2.5 | 18 | |
| 3 | Brake Lever Pivot Bolt | 1.0 | 0.10 | 9 in·lb | Si |
| 4 | Brake Lever Pivot Bolt Locknut | 5.9 | 0.60 | 52 in·lb | |
| 5 | Front Brake Disc Mounting Bolts | 27 | 2.8 | 20 | L |
| 6 | Front Brake Light Switch Screw | 1.0 | 0.10 | 9 in·lb | |
| 7 | Front Brake Reservoir Cap Screws | 1.0 | 0.10 | 9 in·lb | |
| 8 | Front Caliper Mounting Bolts | 34 | 3.5 | 25 | |
| 9 | Front Master Cylinder Clamp Bolts | 8.8 | 0.90 | 78 in·lb | S |

B: Apply brake fluid.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Follow the specified tightening sequence.
Si: Apply silicone grease (ex. PBC grease).

## Exploded View (Rear Brake)



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Bleed Valve | 7.8 | 0.80 | 69 in·lb | |
| 2 | Brake Hose Banjo Bolts | 25 | 2.5 | 18 | |
| 3 | Brake Pedal Bolt | 8.8 | 0.90 | 78 in·lb | |
| 4 | Rear Brake Disc Mounting Bolts | 27 | 2.8 | 20 | L |
| 5 | Rear Caliper Mounting Bolts | 25 | 2.5 | 18 | |
| 6 | Rear Master Cylinder Mounting Bolts | 25 | 2.5 | 18 | |
| 7 | Rear Master Cylinder Push Rod Locknut | 18 | 1.8 | 13 | |

B: Apply brake fluid.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
Si: Apply silicone grease (ex. PBC grease).

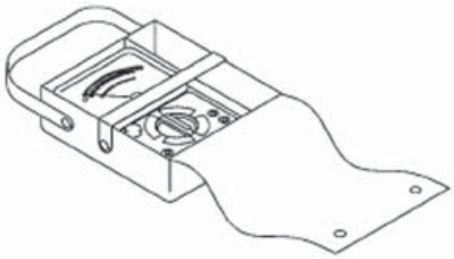
## Specifications

| Item | Standard | Service Limit |
|---|---|---|
| **Brake Lever, Brake Pedal** | | |
| Brake Lever Position | 5-way adjustable (to suit rider) | |
| Brake Lever Free Play | Non-adjustable | – – – |
| Pedal Free Play | Non-adjustable | |
| Pedal Position | About 40 mm (1.6 in.) below top of footpeg | |
| **Brake Pads** | | |
| Lining Thickness: | | |
| Front | 4.5 mm (0.18 in.) | 1 mm (0.04 in.) |
| Rear | 5.0 mm (0.20 in.) | 1 mm (0.04 in.) |
| **Brake Disc** | | |
| Thickness: | | |
| Front: | 4.3 ~ 4.7 mm (0.17 ~ 0.19 in.) | 4.0 mm (0.16 in.) |
| Rear | 4.8 ~ 5.2 mm (0.19 ~ 0.20 in.) | 4.5 mm (0.18 in.) |
| Runout | 0.15 mm (0.006 in.) or less | 0.3 mm (0.01 in.) |
| **Brake Fluid** | | |
| Grade | DOT4 or DOT5 | – – – |

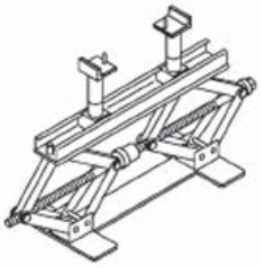
## Special Tools

Inside Circlip Pliers

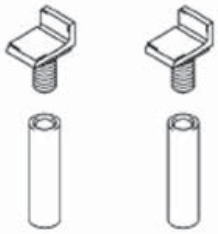
Hand Tester



Jack



Jack Attachment

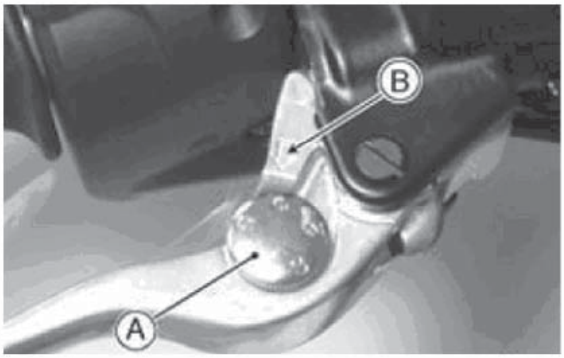


*Brake Lever Position Adjustment*

The brake lever adjuster has 5 positions so that the brake lever position can be adjusted to suit the operator's hand.

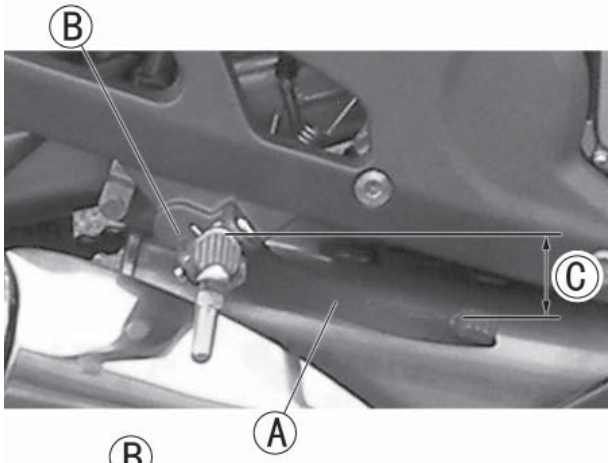
● Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.

○ The distance from the grip to the lever is minimum at number 5 and maximum at number 1.




*Brake Pedal Position Inspection*

● Check that the brake pedal [A] is in the correct position.
Footpeg [B]
Pedal Position
Standard: About 40 mm (1.6 in.) [C] below top of footpeg
If it is incorrect, adjust the brake pedal position.

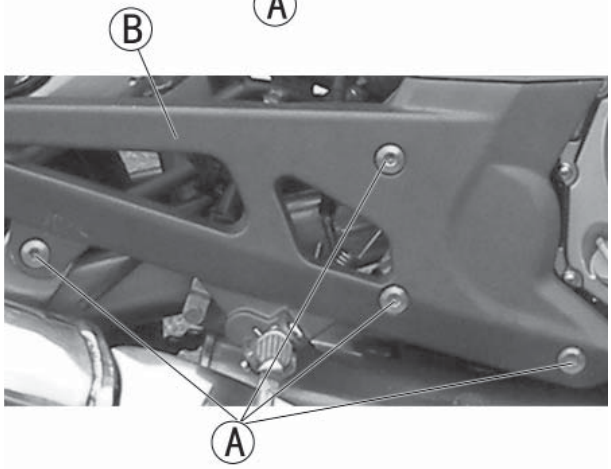



*Brake Pedal Position Adjustment*

**NOTE**

○ *Usually it is not necessary to adjust the pedal position, but always adjust it when the push rod locknut has been loosened.*

● Remove:
Frame Cover (see Frame Cover Removal in the Frame chapter)
Bolts [A]
Right Footpeg Stay [B]




● Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.

★If the length [C] shown is 70 ±1 mm (2.76 ±0.04 in.), the pedal position will be within the standard range.

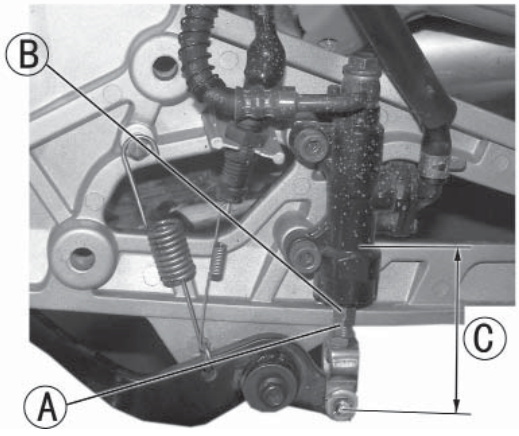
● Tighten:

**Torque - Rear Master Cylinder Push Rod Locknut: 18 N·m (1.8 kgf·m, 13 ft·lb)**

● Install the footpeg stay, and tighten the bolts.

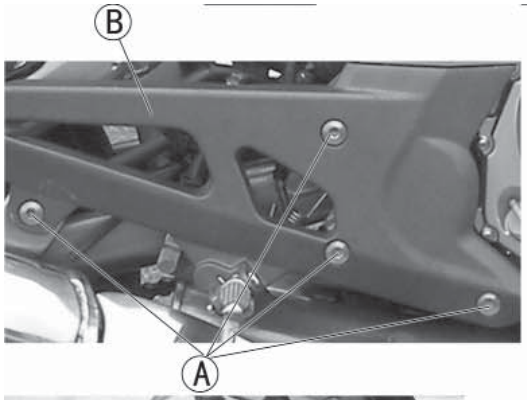
**Torque - Footpeg Stay Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)**

● Check the brake light switch operation (see Brake Light Switch Operation Inspection in the Periodic Maintenance chapter).

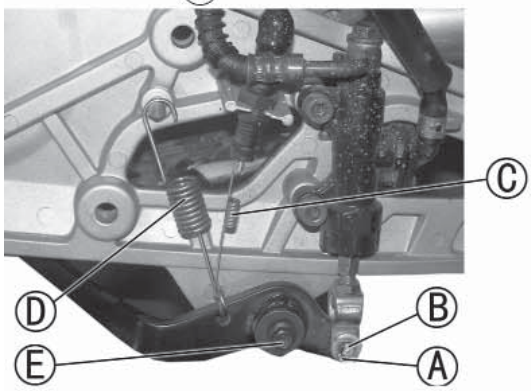


*Brake Pedal Removal*

● Remove:
Frame Cover (see Frame Cover Removal in the Frame chapter)
Bolts [A]
Right Footpeg Stay [B]



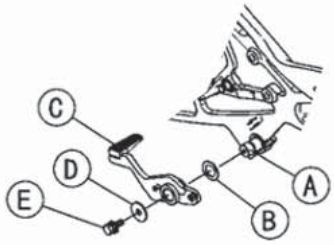

● Remove:
Cotter Pin [A]
Joint Pin [B]
Rear Brake Light Switch Spring [C]
Return Spring [D]
● Remove the mounting bolt [E] and take out the brake pedal.



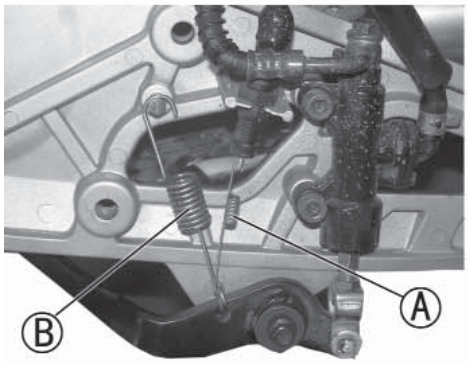

Brake Pedal Installation

● Apply grease to the pivot shaft [A] and install the washer [B].
● Install:
Brake Pedal [C]
Washer [D]
Brake Pedal Bolt [E]

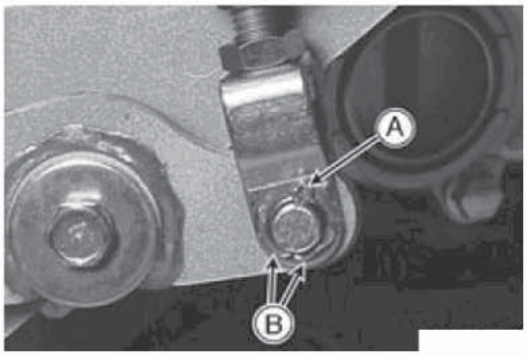
**Torque - Brake Pedal Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**




● Hook the lower end of the rear brake light switch spring [A] on the pedal hook.
● Hook the upper end of the return spring [B] on the pedal hook.




● Replace the cotter pin with a new one.
● Insert the cotter pin [A] and bend the pin ends [B].



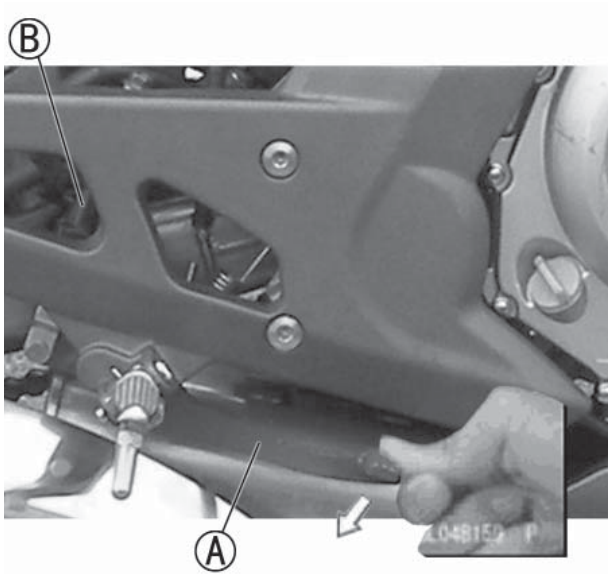
● Install the right footpeg stay, and tighten the bolts.

**Torque - Footpeg Stay Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)**

○ Depress the brake pedal [A] and then align the bolts holes of the master cylinder [B].

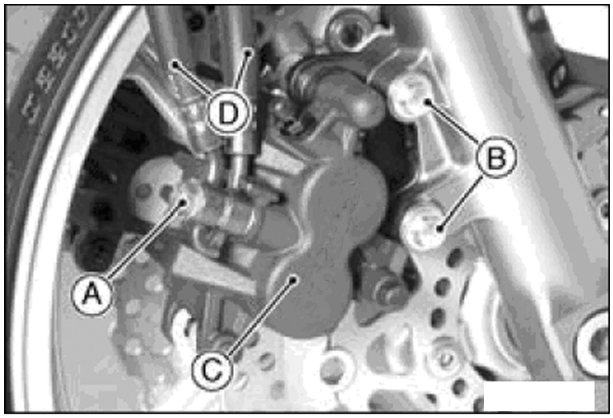
**Torque - Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

● Check the brake pedal position (see Brake Pedal Position Inspection).



*Front Caliper Removal*

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hoses [D] from the caliper (see Brake Hose Removal/Installation).




**CAUTION**

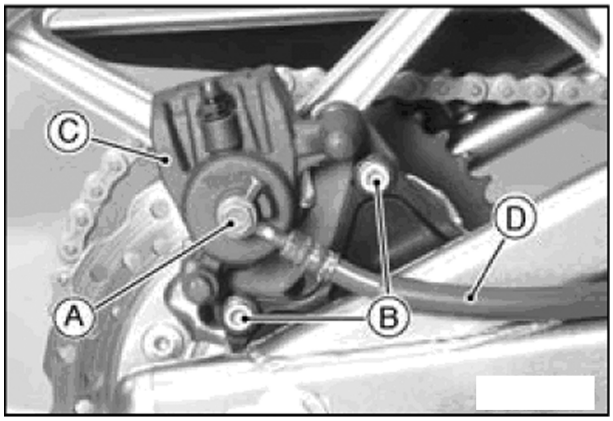
**Immediately wash away any brake fluid that spills.**

**NOTE**

○ *If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Front Caliper Disassembly).*

*Rear Caliper Removal*

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hose [D] from the caliper (see Brake Hose Removal/Installation).




**CAUTION**

**Immediately wash away any brake fluid that spills.**

**NOTE**

○ *If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Rear Caliper Disassembly).*

*Caliper Installation*

- Install the caliper and brake hose lower end.
  - ○ Replace the washers on each side of hose fitting with new ones.
- Tighten:
  **Torque - Caliper Mounting Bolts**
  **Front: 34 N·m (3.5 kgf·m, 25 ft·lb)**
  **Rear: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  **Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Check the fluid level in the brake reservoirs.
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

**⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brakes will not function on the first application of the lever or pedal if this is not done.**

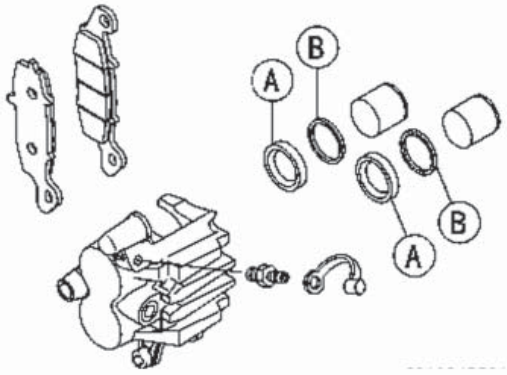
*Front Caliper Disassembly*
● Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

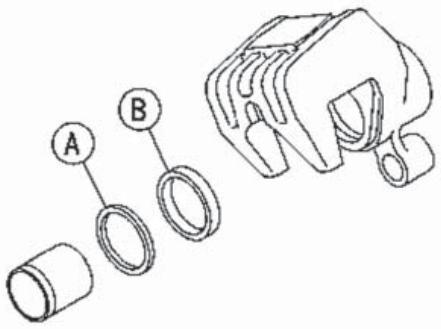
*Front Caliper Assembly*
● Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

*Rear Caliper Disassembly*
● Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

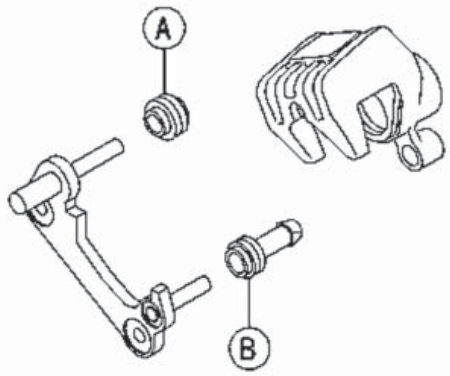
*Rear Caliper Assembly*
● Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

*Caliper Fluid Seal Damage*
The fluid seal (piston seal) [A] is placed around the piston to maintain clearance between the pad and the disc. If the seal is in a poor condition, it could lead the pad to wear excessively or the brake to drag, which may cause the temperature of the discs or the brake fluid to increase.
● Replace the fluid seal if it exhibits any of the conditions listed below.
○ Brake fluid leakage around the pad.
○ Brakes overheat.
○ Considerable difference in inner and outer pad wear.
○ Seal and piston are stuck together.
★If the fluid seal is replaced, replace the dust seal [B] as well. Also, replace all seals every other time the pads are changed.



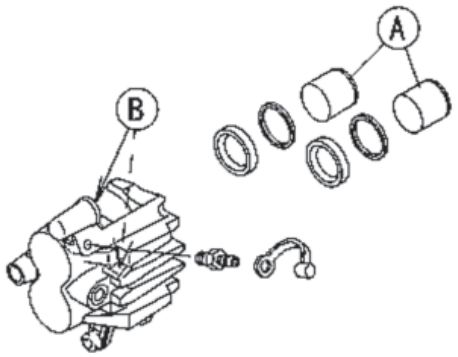

*Rear Caliper Dust Boot and Friction Boot Damage*
● Check that the dust boot [A] and friction boot [B] are not cracked, worn, swollen, or otherwise damaged.
★If they show any damage, replace it.

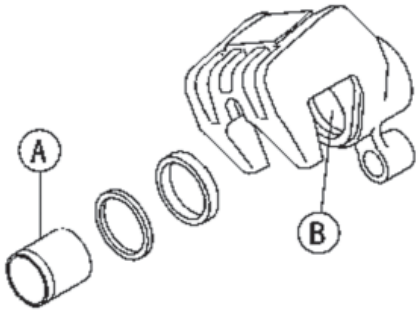


*Caliper Piston and Cylinder Damage*

● Visually inspect the pistons [A] and cylinder surfaces [B].

★Replace the caliper if the cylinder and piston are badly scores or rusty.



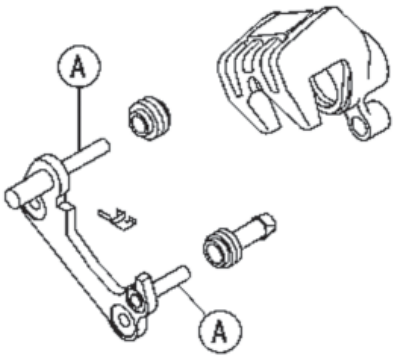

*Rear Caliper Holder Shaft Wear*

● The caliper body must slide smoothly on the caliper holder shafts [A]. If the body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

● Check to see that the caliper holder shafts are not badly worn or stepped, and that the rubber friction boots are not damaged.

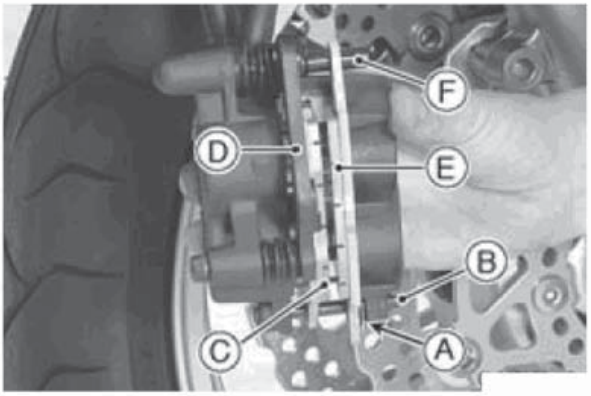
★If the rubber friction boot is damaged, replace the rubber friction boot. To replace the friction boot, remove the pads and the caliper bracket.

★If the caliper holder shaft is damage, replace the caliper bracket.



*Front Brake Pad Removal*

- Remove the front caliper with the hose installed (see Front Caliper Removal).
- Draw out the holder shaft pin [A], and take off the holder shaft [B].
- Remove the pad [C] on the piston side.
- Push the holder [D] towards the piston, and remove the pad of the other side [E] from the holder shaft [F].




*Front Brake Pad Installation*

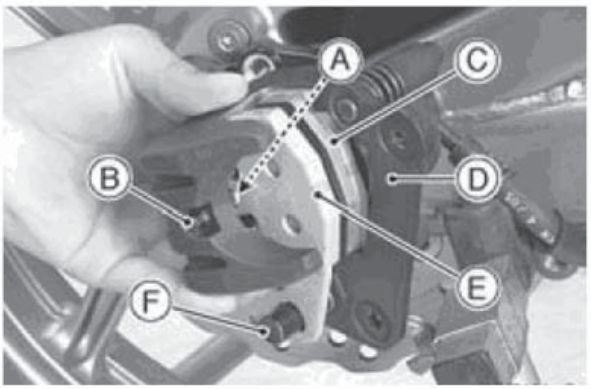
- Push the caliper pistons in by hand as far as they will go.
- Install the anti-rattle spring in its correct position.
- Install the pad on the piston side first, then install the other pad on the holder.
- Install the front caliper (see Caliper Installation).

**⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

*Rear Brake Pad Removal*

- Remove the rear caliper with the hose installed (see Rear Caliper Removal).
- Draw out the holder shaft pin [A], and take off the holder shaft [B].
- Remove the pad [C] on the piston side.
- Push the holder [D] towards the piston, and remove the pad of the other side [E] from the holder shaft [F].




*Rear Brake Pad Installation*

- Push the caliper piston in by hand as far as it will go.
- Install the anti-rattle spring in its correct position.
- Install the pad on the piston side first, then install the other pad on the holder.
- Install the rear caliper (see Caliper Installation).

**⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.**

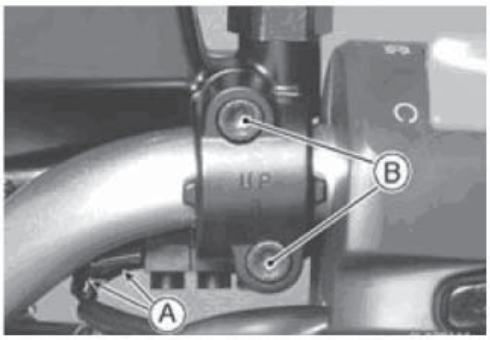
*Brake Pad Wear Inspection*

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

*Front Master Cylinder Removal*

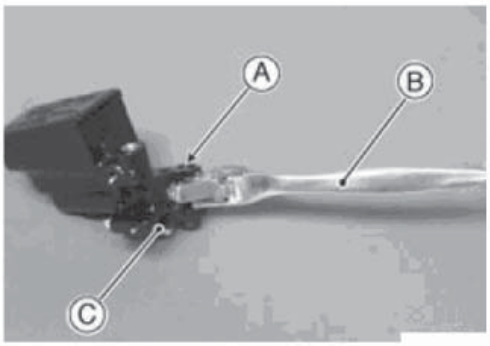
- Remove the banjo bolt [A] to disconnect the brake hose from themaster cylinder [B] (see Brake Hose Removal/Installation).


- Disconnect the front brake light switch connectors [A].
- Unscrew the clamp bolts [B], and take off the master cylinder as an assembly with the reservoir, brake lever and brake switch installed.



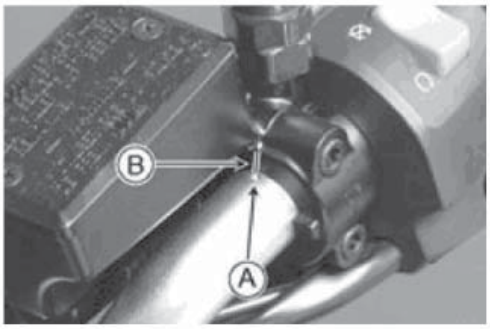

| CAUTION |
| --- |
| **Immediately wash away any brake fluid that spills.** |

- Remove:
  Brake Lever Pivot Bolt [A] and Locknut
  Brake Lever [B]
  Front Brake Light Switch [C]

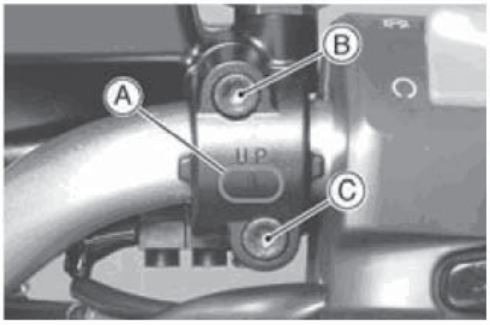



*Front Master Cylinder Installation*

- Install the front master cylinder so that the punch mark [A] of the handlebar is aligned with the mating surface [B] of the master cylinder clamp to level the reservoir.

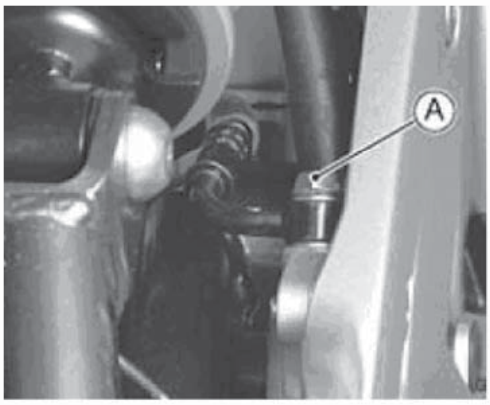



- The master cylinder clamp must be installed with the arrow mark [A] upward.
- Tighten the upper clamp bolt [B] first, and then the lower clamp bolt [C]. There will be a gap at the lower part of the clamp after tightening.
  **Torque - Front Master Cylinder Clamp Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
- Replace the washers on each side of the hose fitting with new ones.
- Tighten the brake hose banjo bolt.
  **Torque - Brake Hose Banjo Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.



*Rear Master Cylinder Removal*

● Unscrew the brake hose banjo bolt [A] on themaster cylinder (see Brake Hose Removal/ Installation).

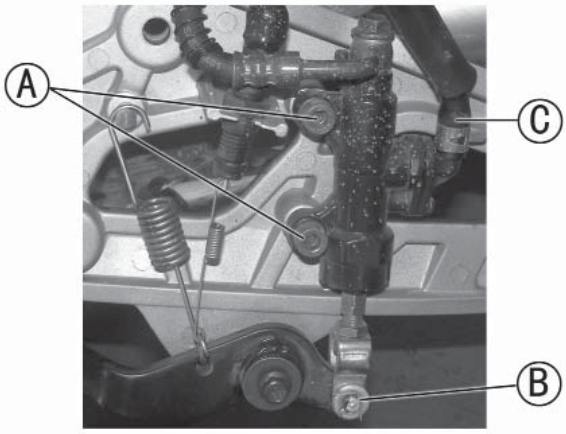



● Unscrew the master cylinder mounting bolts [A].
● Remove the cotter pin [B].

**NOTE**

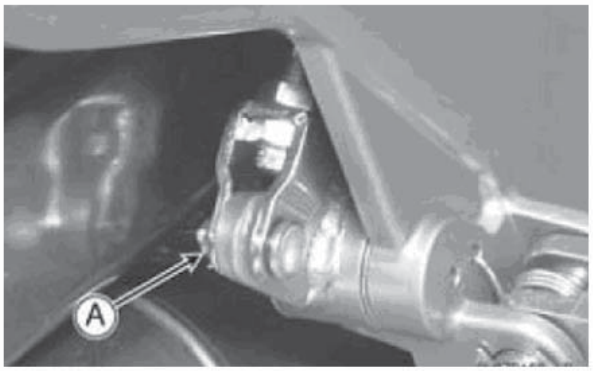
○ *Pull off the joint pin while pressing down the brake pedal.*

● Pull off the reservoir hose lower end [C], and drain the brake fluid into a container. •Remove the master cylinder.




*Rear Master Cylinder Installation*

● Replace the cotter pin [A] with a new one.
● Replace the washers on each side of hose fitting with new ones.
● Tighten the following bolts.
**Torque - Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
**Brake Hose BanjoBolt: 25 N·m(2.5 kgf·m, 18 ft·lb)**
● Bleed the brake line (see Brake Line Bleeding).
● Check the brake for good braking power, no brake drag, and no fluid leakage.




*Front Master Cylinder Disassembly*

● Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

*Rear Master Cylinder Disassembly*

● Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

*Master Cylinder Assembly*

● Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

*Master Cylinder Inspection*

- Remove the master cylinders (see Front/Rear Master Cylinder Removal).
- Disassemble the front and rear master cylinders.
- Check that there are no scratches, rust or pitting on the inner wall [A] of each master cylinder and on the outside of each piston [B].

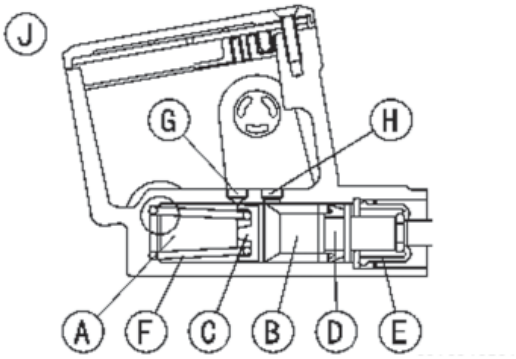
★If a master cylinder or piston shows any damage, replace them.

- Inspect the primary cup [C] and secondary cup [D].

★If a cup is worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.

★If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.

Front Master Cylinder [J]




- Check the dust covers [E] for damage.

★If they are damaged, replace them.

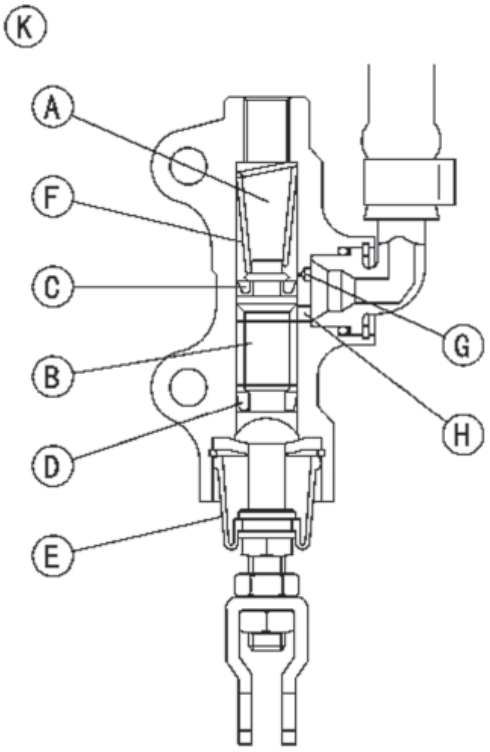
- Check the piston return springs [F] for any damage.

★If the springs are damaged, replace them.

- Check that relief port [G] and supply port [H] are not plugged.

★If the relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.

Rear Master Cylinder [K]



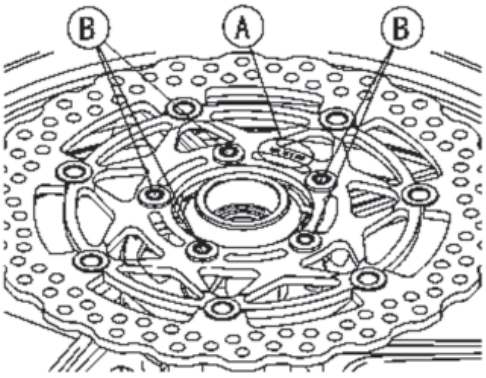
*Brake Disc Removal*

● Remove the wheel (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
● Unscrew the mounting bolts, and take off the disc.
● Remove the gaskets.

*Brake Disc Installation*

● Replace the gaskets with new ones.
● Install the brake disc on the wheel so that the marked side [A] faces out.
● Apply a non-permanent locking agent to the threads of the front and rear brake disc mounting bolts [B].
● Tighten:

**Torque - Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)**

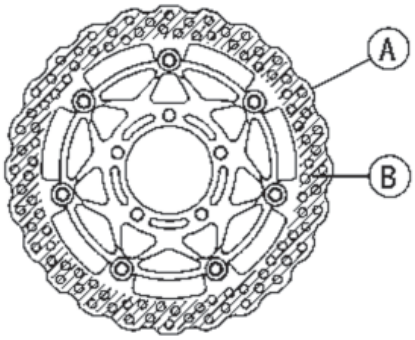



*Brake Disc Wear*

● Measure the thickness of each disc [A] at the point where it has worn the most.
★If the disc has worn past the service limit, replace it.

Measuring Area [B]

**Brake Discs Thickness Standard:**
**Front:**
**4.3 ~ 4.7 mm (0.17 ~ 0.19 in.)**
**Rear:**
**4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)**
**Service Limit:**
**Front:**
**4.0 mm (0.16 in.)**
Rear:
**4.5 mm (0.18 in.)**



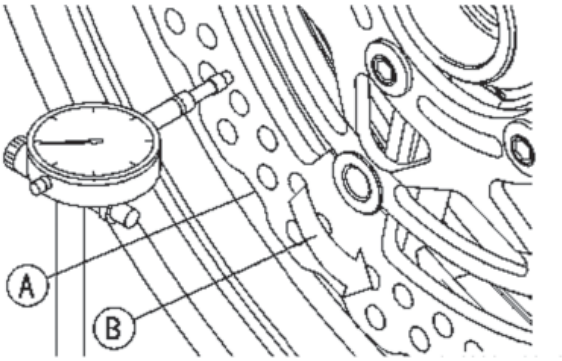

*Brake Disc Warp*

● Raise the wheel off the ground with jack (see Front/Rear Wheel Removal in the Wheels/Tires chapter).

**Special Tools - Jack, Jack Attachment**

○ For front disc inspection, turn the handlebar fully to one side.
● Set up a dial gauge against the disc [A] as shown and measure disc runout, while turning [B] the wheel by hand.
★If runout exceeds the service limit, replace the disc.

**Disc Runout**
**Standard: 0.15 mm (0.006 in.) or less**
**Service Limit: 0.3 mm (0.01 in.)**



*Brake Fluid Level Inspection*

● Refer to the Brake Fluid Level Inspection in the Periodic Maintenance chapter.

*Brake Fluid Change*

● Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

*Brake Line Bleeding*

The brake fluid has a very low compression coefficient so that almost all the movement of the brake lever or pedal is transmitted directly to the caliper for braking action. Air, however, is easily compressed. When air enters the brake lines, brake lever or pedal movement will be partially used in compressing the air. This will make the lever or pedal feel spongy, and there will be a loss in braking power.

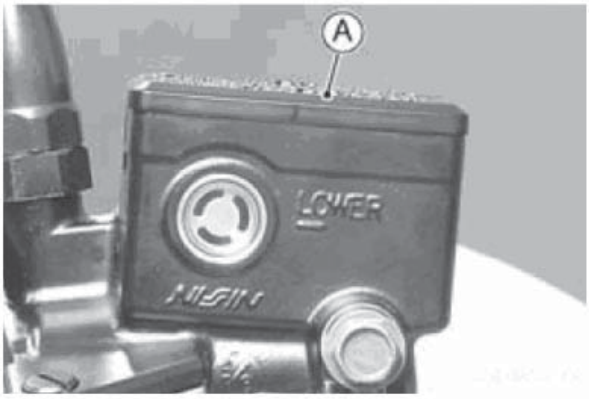
**⚠ WARNING**

**Be sure to bleed the air from the brake line whenever brake lever or pedal action feels soft or spongy after the brake fluid is changed, or whenever a brake line fitting has been loosened for any reason.**

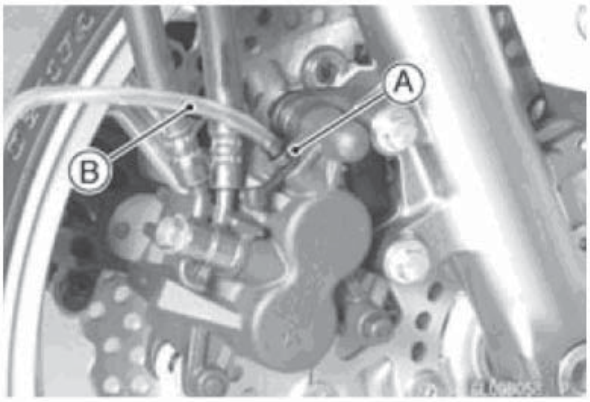
**NOTE**

○ *The procedure to bleed the front brake line is as follows. Bleeding the rear brake line is the same as for the front brake.*

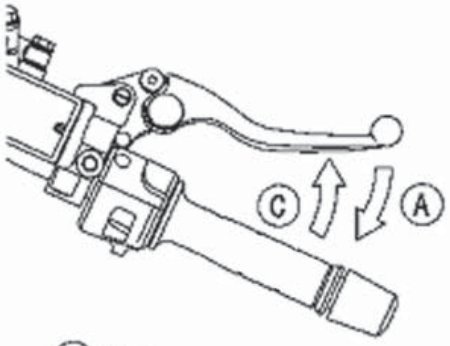
● Remove the reservoir cap [A] and diaphragm.
● Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
● Slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir.
○ Bleed the air completely from the master cylinder by this operation.




● Remove the rubber cap from the bleed valve [A] on the caliper.
● Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.

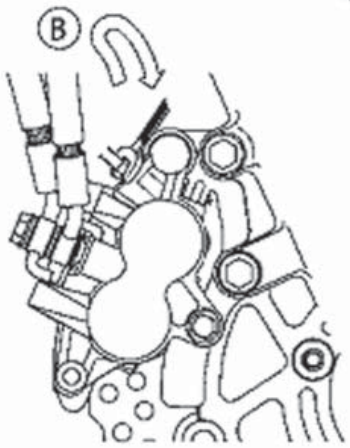


● Bleed the brake line and the caliper.
○ Repeat this operation until no more air can be seen coming out into the plastic hose.
1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
2. Quickly open and close [B] the bleed valve while holding the brake applied.
3. Release the brake [C].




**NOTE**

○ *The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*
○ *Tap the brake hose lightly from the caliper to the reservoir for more complete bleeding.*
○ *Front Brake: First bleeding the right caliper then repeat the above steps for the left caliper.*
● Remove the clear plastic hose.
● Install the diaphragm and reservoir cap.
● Tighten:
**Torque - Front Brake Reservoir Cap Screws: 1.0 N·m (0.10 kgf·m, 9 in·lb)**




● Follow the procedure below to install the rear brake fluid reservoir cap correctly.
○ First, tighten the rear brake fluid reservoir cap [B] clockwise [C] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body, then tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir body [A].


● Tighten the bleed valve, and install the rubber cap.
**Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
● Check the fluid level (see Brake Fluid Level Inspection in the Periodic Maintenance chapter).
● After bleeding is done, check the brake for good braking power, no brake drag, and no fluid leakage.

**⚠ WARNING**

**When working with the disc brake, observe the precautions listed below.**

1. **Never reuse old brake fluid.**
2. **Do not use fluid from a container that has been left unsealed or that has been open for a long time.**
3. **Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.**
4. **Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.**
5. **Don't change the fluid in the rain or when a strong wind is blowing.**
6. **Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning of the brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.**
7. **When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high-flash point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.**
8. **Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.**
9. **If any of the brake line fittings or the bleed valve is opened at any time, the AIRMUSTBEBLEDFROM THE BRAKE LINE.**

*Brake Hose Removal/Installation*

- Refer to the Brake Hose and Pipe Replacement in the Periodic Maintenance chapter.

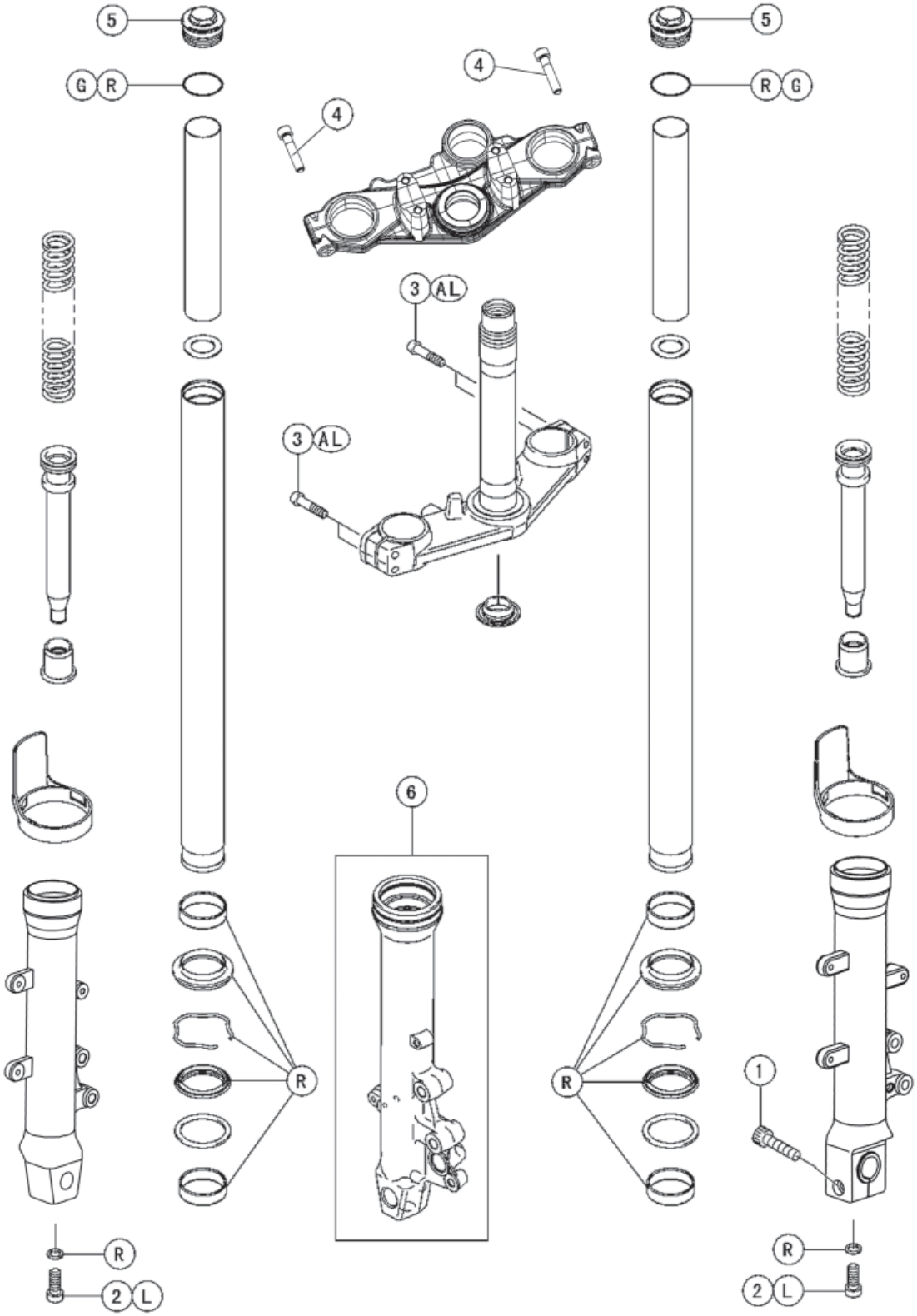
*Brake Hose Inspection*

- Refer to the Brake Hose Damage and Installation Condition Inspection in the Periodic Maintenance chapter.

# Suspension

## Table of Contents

## Exploded View



| No | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Front Axle Clamp Bolt | 34 | 3.5 | 25 | |
| 2 | Front Fork Bottom Allen Bolts | 30 | 3.1 | 22 | L |
| 3 | Front Fork Clamp Bolts (Lower) | 20 | 2.0 | 15 | AL |
| 4 | Front Fork Clamp Bolts (Upper) | 20 | 2.0 | 15 | |
| 5 | Front Fork Top Plugs | 25 | 2.5 | 18 | |

6. Outer Tube

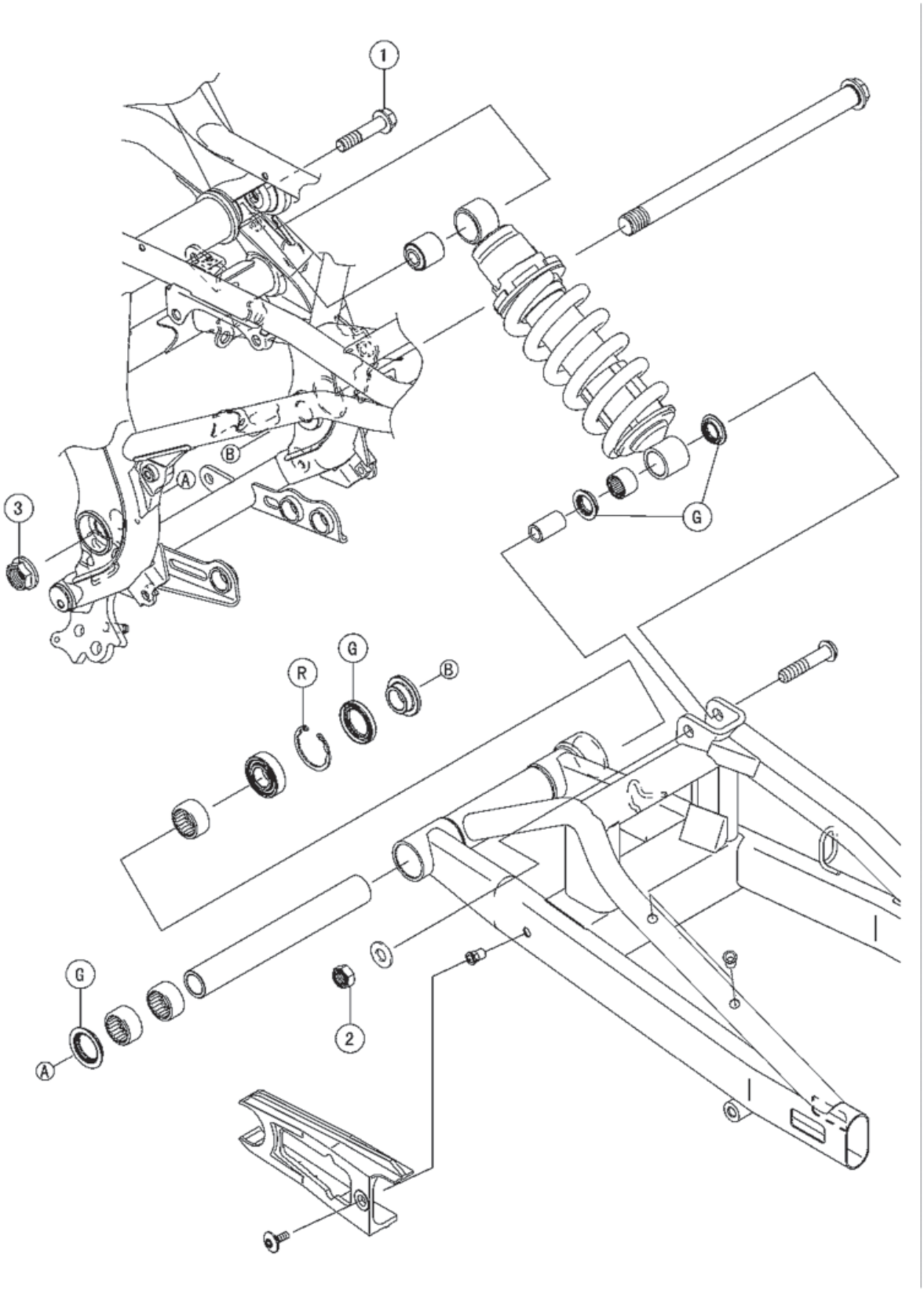
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque..

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

## Exploded View



| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Rear Shock Absorber Bolt | 59 | 6.0 | 44 | |
| 2 | Rear Shock Absorber Nut | 59 | 6.0 | 44 | |
| 3 | Swingarm Pivot Shaft Nut | 108 | 11.0 | 80 | |

G: Apply grease.

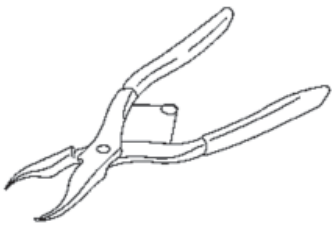
R: Replacement Parts

## Specifications

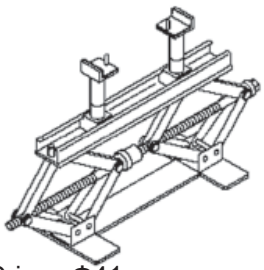
| Item | Standard |
|---|---|
| **Front Fork (Per One Unit)** | |
| Fork Inner Tube Outside Diameter | 41 mm (1.6 in.) |
| Air Pressure | Atmospheric pressure (Non-adjustable) |
| Fork Spring Setting | Non-adjustable |
| Damper Setting | Non-adjustable |
| Fork Oil: | |
| Viscosity | KAYABA KHL34-G10 or equivalent |
| Amount: | approx. 390 mL (13.2 US oz.) (when changing oil)<br>458 ±4 mL (15.5 ±0.14 US oz.) (after disassembly and completely dry) |
| Fork Oil Level: | 115 ± 2 mm (4.5 ±0.08 in.) (below from inner tube top with fully compressed, without fork spring) |
| Fork Spring Free Length | 277.8 mm (10.94 in.) (Service limit 272 mm (10.7 in.)) |
| **Rear Shock Absorber** | |
| Spring Preload | 3rd position (Adjustable Range: 1st ~ 7th position) |
| Gas Pressure | 980 kPa (10 kgf/cm², 142 psi, Non-adjustable) |

## Special Tools

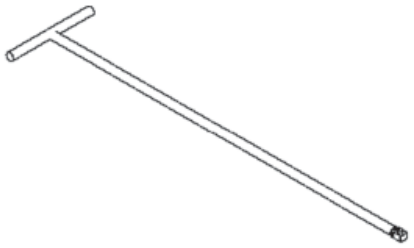
Inside Circlip Pliers



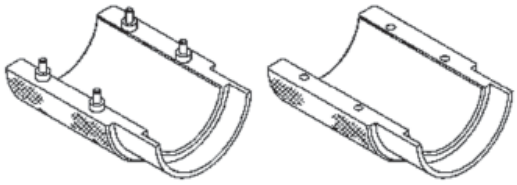
Jack



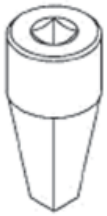
Fork Cylinder Holder Handle



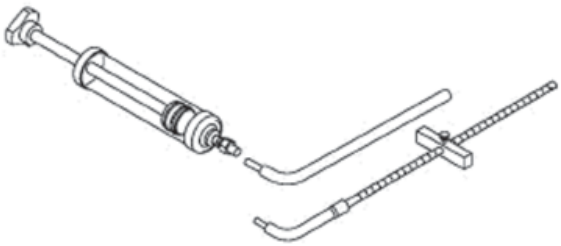
Fork Oil Seal Driver, Φ41



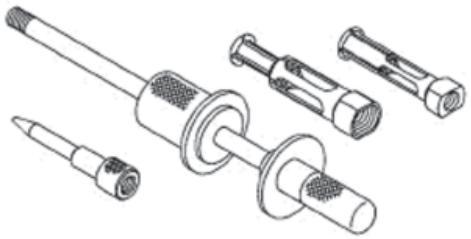
Fork Cylinder Holder Adapter



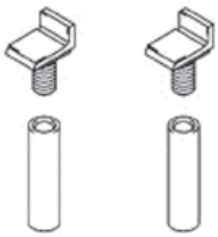
Fork Oil Level Gauge



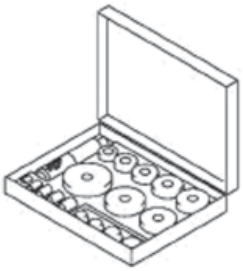
Oil Seal & Bearing Remover



Jack Attachment

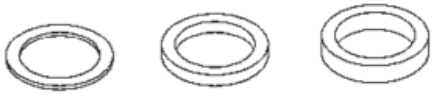


Bearing Driver Set



Stem Bearing Driver, Φ28

Spacer, Φ28



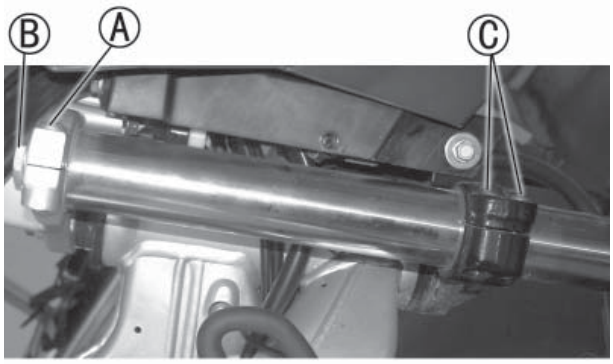
*Front Fork Removal*

● Remove:
Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
Front Fender (see Front Fender Removal in the Frame chapter)

★Loosen the upper fork clamp bolt [A] and fork top plug [B]beforehand if the fork leg is to be disassembled.

**NOTE**

○ *Loosen the top plug after loosening the upper forkclamp bolt.*



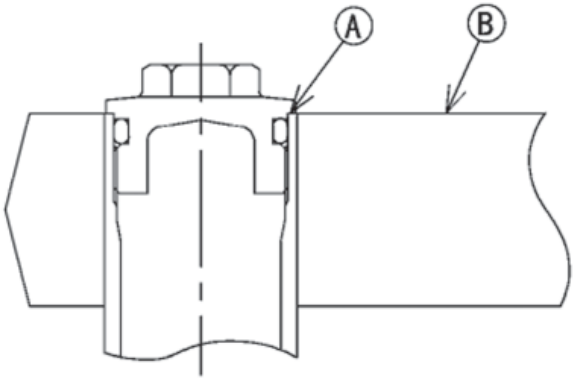

● Loosen the upper fork clamp bolt and lower fork clamp bolts [C].
● With a twisting motion, work the fork leg down and out.

*Front Fork Installation*

● Install the fork with the upper end of the inner tube flush [A] against the top surface of the stem head [B]
● Tighten:

**Torque - Front Fork Clamp Bolt (Upper): 20 N•m (2.0 kgf•m,15 ft•lb)**

**Front Fork Top Plug: 25 N•m (2.5 kgf•m, 18 ft•lb)**



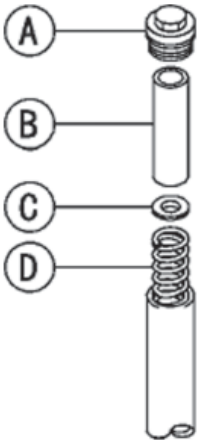

**NOTE**

○ *Tighten the top plug before tightening the upper Fork clamp bolt.*
○ *Tighten the two clamp bolts alternately two times to ensure even tightening torque.*

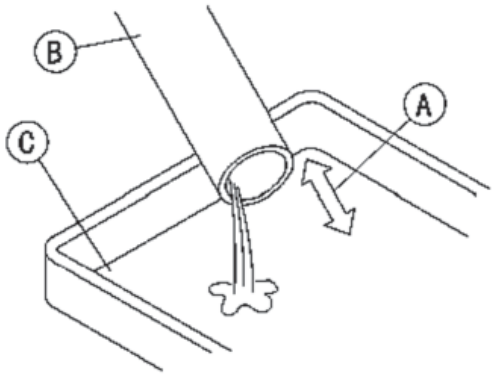
● Tighten:
**Torque - Front Fork Clamp Bolt (Upper): 20 N•m (2.0 kgf•m,15 ft•lb): 20N•m(2.0kgf•m,15ft•lb)**
● Install the removed parts (see appropriate chapters)

*Front Fork Oil Change*

● Remove the front fork (see Front Fork Removal).
● Remove:
Top Plug [A] with O-ring Collar [B]
Fork Spring Seat [C] Fork Spring [D]



● Compress [A] the fork [B] upside down to draw out the oil into the suitable container [C].
● Pour in the specified amount of oil.
**Fork oil**
**Viscosity KAYABA KHL34-G10 or equivalent**
**Amount (Per Side):**
**When changing oil:**
**approx. 390 mL (13.2 US oz.)**
**After disassembly and completely dry:**
**458 ±4 mL (15.5 ±0.14 US oz.)**

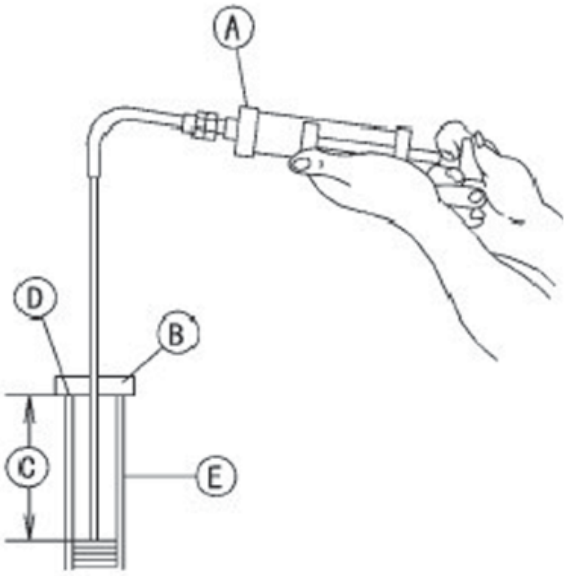



**NOTE**

○ *Move the outer tube up and down a few times, to remove the air that is trapped in the fork oil in order to stabilize the oil level.*

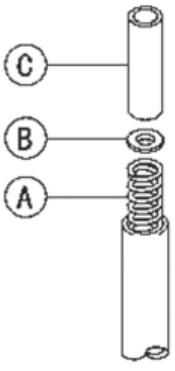
● Hold the outer tube vertically in a vise and compress the Fork completely.
● Wait until the oil level stabilizes.
● Use the fork oil level gauge [A] to measure the distance between the top of the inner tube to the oil level.

**Special Tool - Fork Oil Level Gauge**



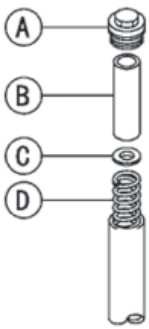

○ Set the oil level gauge stopper [B] so that the distance[C]from the bottom of the stopper to the lower end of the pipe is the standard oil level distance.
○ A correct measurement can not be obtained unless the level gauge pipe is placed in the center of the inner tube.
Oil Level (fully compressed, without spring)
**Standard:**
**115 ±2 mm (4.5 ±0.08 in.)**
○ Place the stopper of the level gauge at the top [D] of the inner tube [E] and pull the handle slowly to draw out the excess oil from fork into the gauge, thus attaining the standard level.
○ If not oil is drawn out, there is not enough oil in the fork.Pour in some more oil and measure again.

● Repeat the same procedure for adjusting the other fork.
● Install the fork spring [A], fork spring seat [B] and collar [C].
● Inspect the top plug O-ring and replace it with a New.



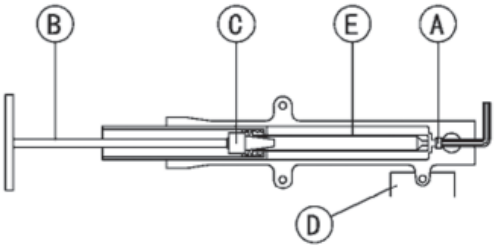
*Front Fork Disassembly*

● Remove the front fork (see Front Fork Removal).
● Remove the top plug [A] with O-ring, take out the Collar [B], fork spring seat [C], and fork spring [D]
● Drain the fork oil (see Front Fork Oil Change).




● Remove the Allen bolt [A] from the bottom of the fork.

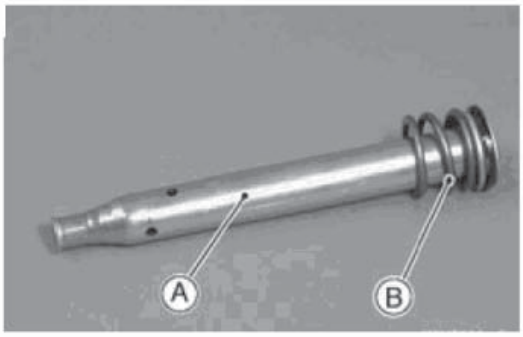
**Special Tools –**
**Fork Cylinder Holder Handle [B]**
**Fork Cylinder Holder Adapter [C]**



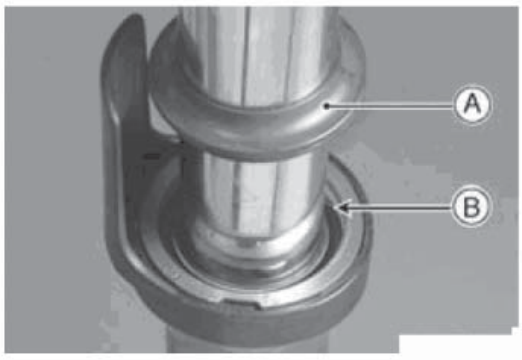

**NOTE**

○ *Hold the outer tube in a vise [D], stop the cylinder unit [E] from turning by using the special tools, and unscrew the Allen bolt.*

● Remove the cylinder unit [A], washer, and the spring [B] from the inner tube.



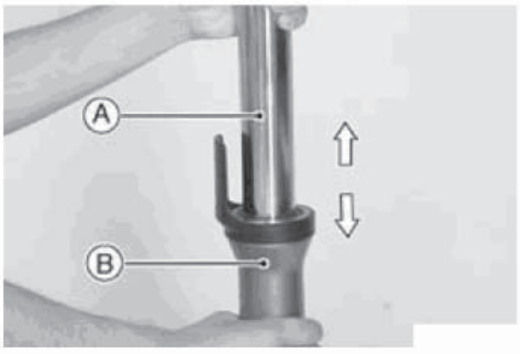

● Remove the following from the top of the outer tube.
Dust Seal [A]
Retaining Ring [B]



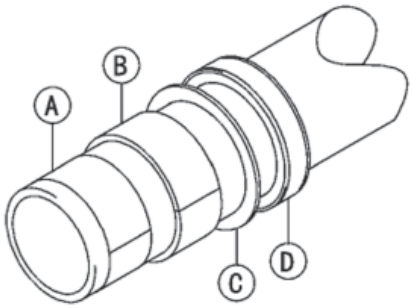

● Separate the inner tube [A] from the outer tube [B].

**NOTE**

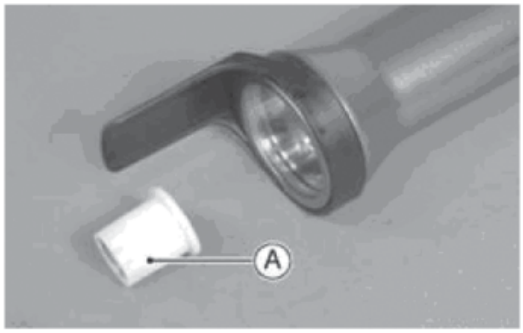
○ *From the compressed state, firmly pull down the outertube a few times towards the direction of elongation.*



● Remove the following from the inner tube.
Inner Guide Bushing [A]
Outer Guide Bushing [B] Washer [C]
Oil Seal [D]

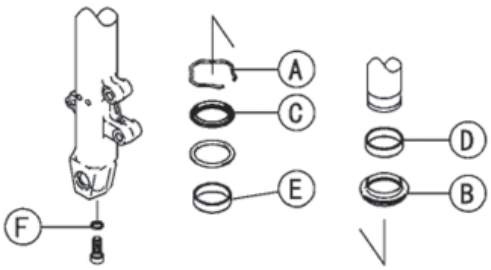



● Remove the cylinder base [A] from the bottom of the outer tube.

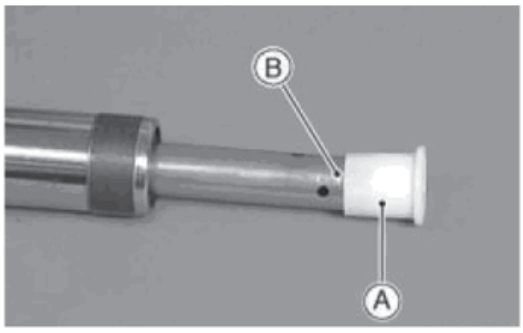



*Front Fork Assembly*

● Check the top plug O-ring and replace it with a new one.
● Replace the following parts with new ones.
Retaining Ring [A]
Dust Seal [B]
Oil Seal [C]
Inner Guide Bushing [D]
Outer Guide Bushing [E]
Fork Bottom Allen Bolt Gasket [F]



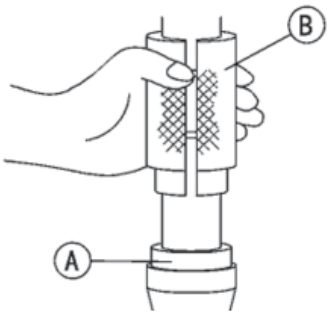

● Install the guide bushing on the end of the inner tube.
● Insert the cylinder unit and the spring into the inner tube,and install the cylinder base [A] onto the cylinder end [B], that protrudes from the bottom
● Install the cylinder base starting with its stepped end.
● Insert the inner tube, cylinder unit, washer, spring, andcylinder base as a set into the outer tube.




● Install the guide bushing into the outer tube.
● After installing the washer, install the oil seal [A] by using the fork oil seal driver[B].

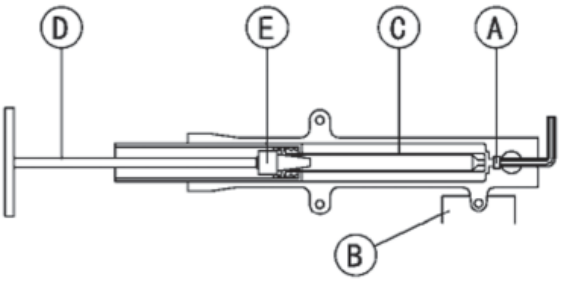
**Special Tool - Fork Oil Seal Driver, Φ41**

● Install the retaining ring into the outer tube.
● Install the dust seal by hand



● Apply non-permanent locking agent to the threads of the bottom Allen bolt [A].
● Hold the front fork horizontally in a vise [B].
● Hold the cylinder unit [C] with the special tools and tighten the bottom Allen bolt to secure the cylinder in place.

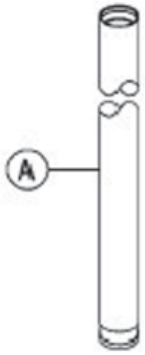
**Torque - Front Fork Bottom Allen Bolt: 30N•m(3.1kgf•m,22ft•lb)**
**Special Tools - Fork Cylinder Holder Handle [D]**
Fork Cylinder Holder Adapter [E]: 57001-1057




● Pour in the specified type of oil (see Front Fork Oil Change)

*Inner Tube Inspection*

● Visually inspect the inner tube [A], and repair any damage.
● Nicks or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas whichcause seal damage
If the damage is not repairable, replace the inner
★ tube.Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced



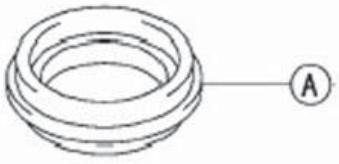

| CAUTION |
| --- |
| **If the inner tube is badly bent or creased, replace it. Excessive bending, followed by subsequent straightening, can weaken the inner tube.** |

● Temporarily assemble the inner and outer tubes, and pump them back and forth manually to check for smooth operation.
● If you feel binding or catching, the inner and outer tubes must be replaced.

| ⚠ WARNING |
| --- |
| **A straightened inner or outer fork tube may fall in use, possibly causing an accident. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.** |

*Dust Seal Inspection*

● Inspect the dust seal [A] for any signs of deterioration or damage.
Replace it if necessary.
★

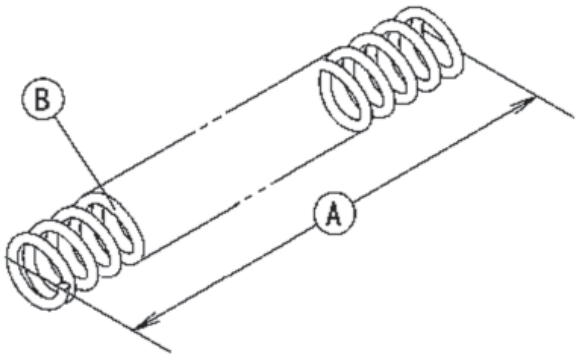


*Fork Spring Inspection*

● Measure the free length [A] of the fork spring [B].

★If the measured length is shorter than the service limit, the spring must be replaced.

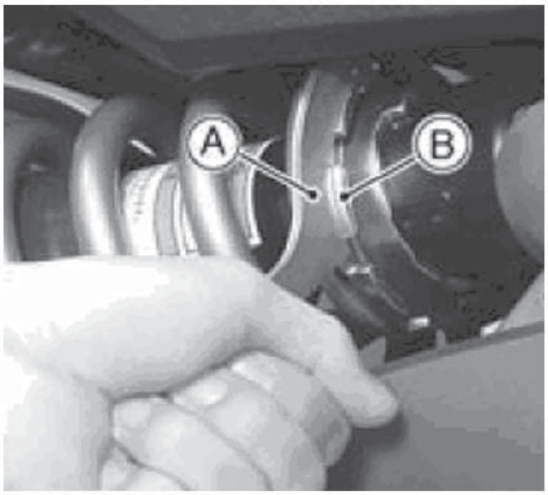
If the free length of the replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced to ensure stability.




**Fork Spring Free Length**
**Standard: 277.8mm(10.94in.)**
**Service Limit: 272mm(10.7in.)**

*Spring Preload Adjustment*

- Using the hook wrench [A], turn the adjusting nut [B] to adjust the spring preload.
- Using the hook wrench [A], turn the adjusting
- The standard adjuster setting for average-build rider of 68kg (150 lb) with no passenger and no accessories is 3rd position.
  Spring Preload Setting
  Standard Position: 3rd position
  Adjustable Range: 1st to 7th position
- If the compression of the spring is not suited to the operating conditions, adjust it to an appropriate position by referring to the table below.



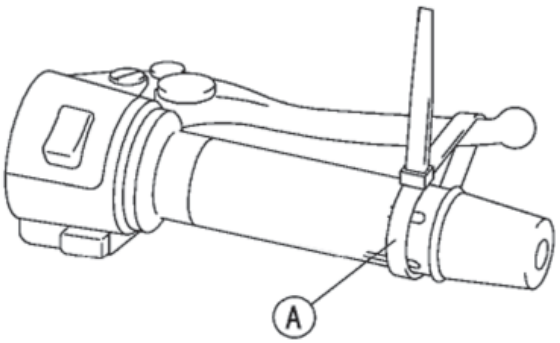

**Spring Preload Adjustment**

| Adjuster Position | Damping Force | Shock Absorber Hardness | Load | Road Conditions | Driving Speed |
|---|---|---|---|---|---|
| 1st ↑ ↓ 7st | Weak ↑ ↓ Strong | Soft ↑ ↓ Hard | Light ↑ ↓ Heavy | Good ↑ ↓ Bad | Low ↑ ↓ Highway |

Rear Shock Absorber Removal

- Remove:
  Frame Covers (see Frame Cover Removal in the Frame chapter)
  Muffler Body
  (see Muffler Body Removal in the Engine Top End Chapter)
- Raise the rear wheel off the ground with jack

**Special Tools – Jack**
**Jack Attachment**

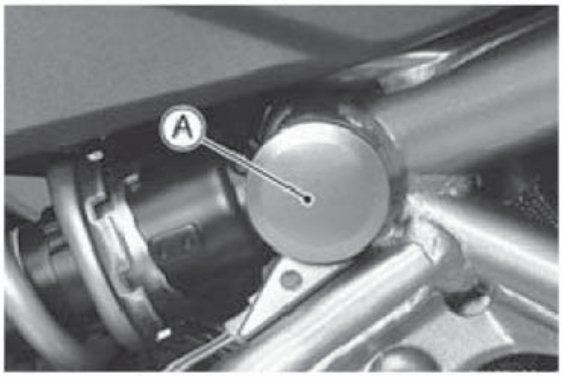



- Squeeze the brake lever slowly and hold it with a band[A].

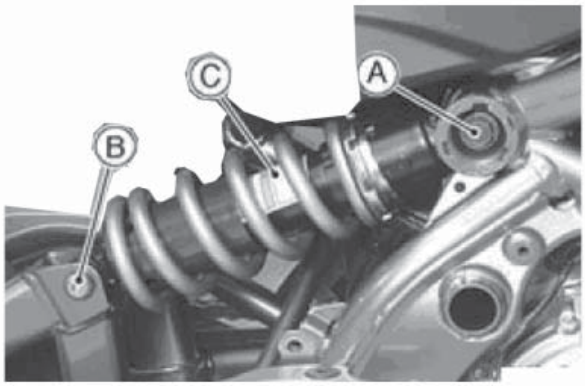
**⚠ WARNING**

**Be sure to hold the front brake when removing the shock absorber, or the motorcycle may tall over. It could cause an accident and injury.**

- Remove
- Right Stay Cover[A]



● Remove:
Upper Shock Absorber Bolt [A]
Lower Shock Absorber Nut and Washer
Lower Shock Absorber Bolt [B]
● Remove the shock absorber [C] from backward.

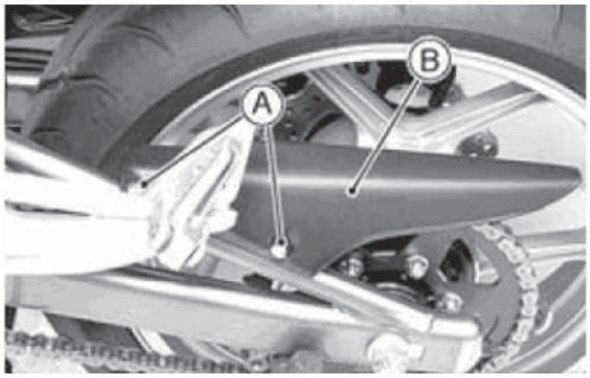



*Rear Shock Absorber Installation*
● Installation is the reverse of removal.
● Apply grease to the lip of oil seals.
● Be sure to install the oil seals to the shock absorber.
● Tighten:
**Torque - Rear Shock Absorber Bolt : 59N•m(6.0kgf•m,44ft•lb)**
**Rear Shock Absorber Nut: 59N•m(6.0kgf•m,44ft•lb)**
● Install the removed parts (see appropriate chapters).

*Rear Shock Absorber Inspection*
● Remove the rear shock absorber (see Rear Shock Absorber Removal)
● Visually inspect the following items. Smooth Stroke Oil Leakage Crack or Dent
★If there is any damage to the rear shock absorber, replace it.
● Visually inspect the rubber bushing.
★If it shows any signs of damage, replace it.

*Swingarm Removal*

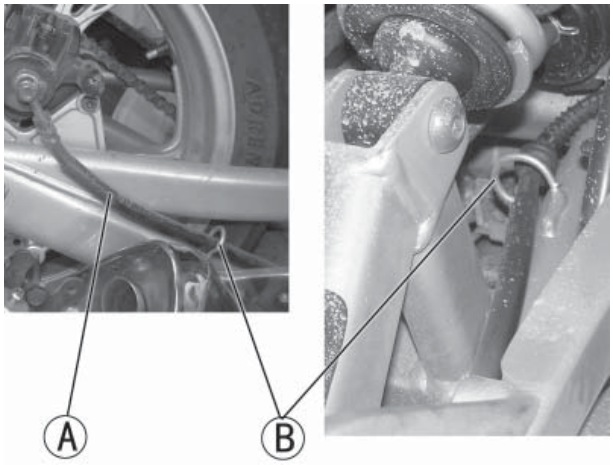
● Remove:
Chain Cover Bolts [A] and Cover [B]




● Remove:
Right Side Cover (see Side Cover Removal in the Frame chapter)
Frame Covers (see Frame Cover Removal in the Frame chapter)

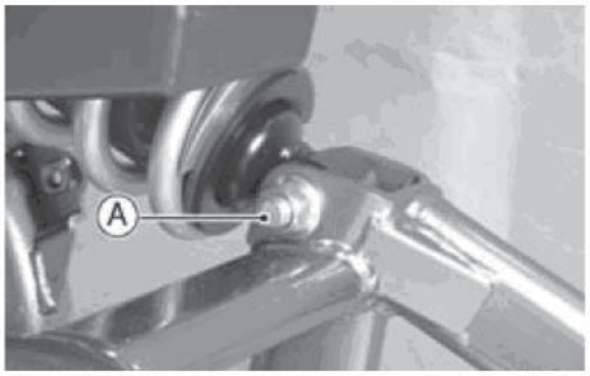
● Remove the brake hose banjo bolt from the rear caliper,free the brake hose [A] from the clamps [B], and removethe foot peg stay with the rear master cylinder.(see Rear Caliper Removal in the Brakes chapter)

● Remove:
Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)

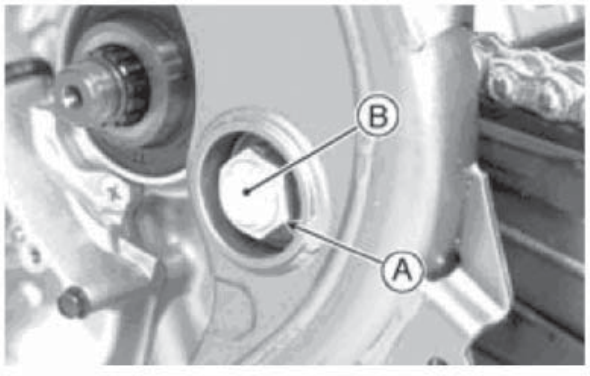



● Raise the rear wheel off the ground with jack
Special Tools - Jack
Jack Attachment

● Remove the lower shock absorber nut and bolt [A].




● Remove the drive chain (see Drive Chain Removal in the Final Drive chapter).
● Unscrew the swingarm pivot shaft nut [A].
● Pull off the pivot shaft [B], and remove the swingarm.




*Swingarm Installation*

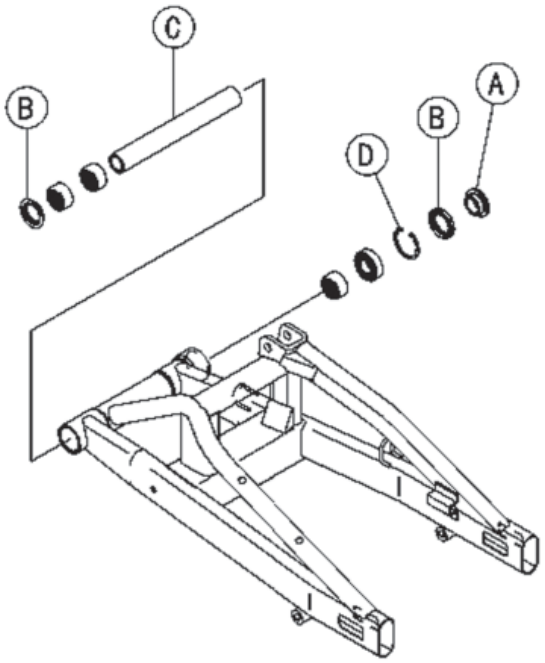
● Installation is the reverse of removal.
○ Apply grease to the lip of the oil seals.
○ Be sure to install the oil seal and collar to the swingarm.
● Tighten the pivot shaft nut.

**Torque - Swingarm Pivot Shaft Nut:**
**108 N•m (11.0 kgf•m,80 ft•lb)**

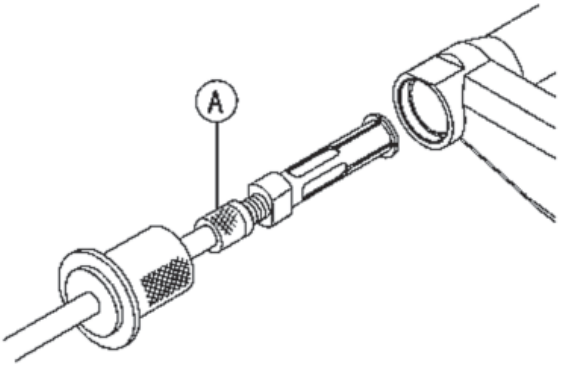
● Install the removed parts
(see appropriate chapters).

*Swingarm Bearing Removal*

● Remove:
Swingarm (see Swingarm Removal)
Collar [A]
Oil Seals [B]
Sleeve [C]
Circlip [D]
**Special Tool - Inside Circlip Pliers**




● Remove the ball bearing and needle bearings.
Special Tool - Oil Seal & Bearing Remover [A]

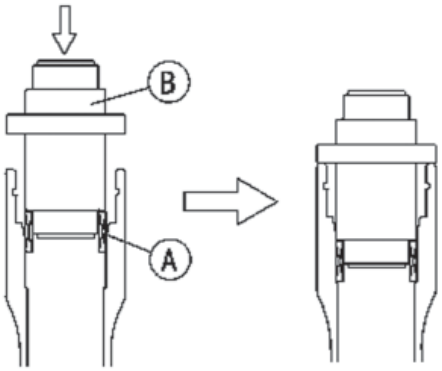



*Swingarm Bearing Installation*

● Replace the ball and needle bearings [A] with new ones
● Install the ball and needle bearings so that the manufacturer's marks face out.

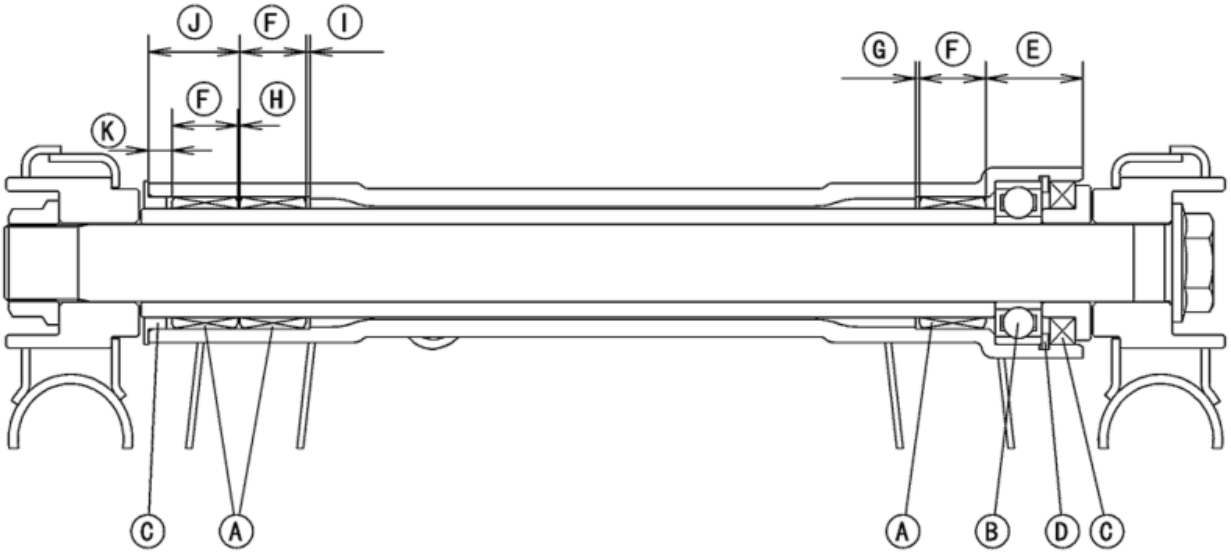
**Special Tools - Bearing Driver Set**
**Stem Bearing Driver, Φ28 [B]**
**Spacer, Φ28**

.



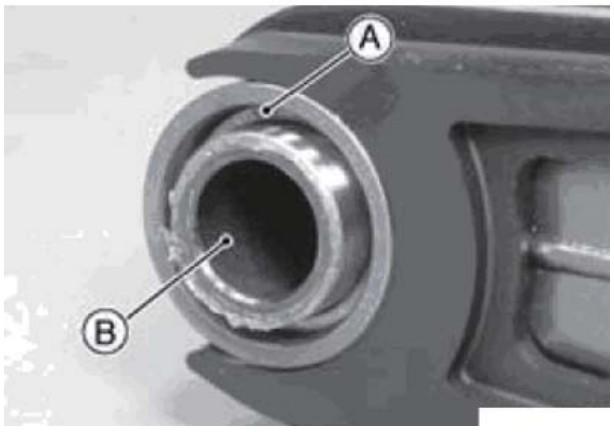
● Install the needle bearings [A], ball bearing [B] and oil seals [C] position as shown.

Circlip [D]
25mm(0.98in.)[E]
17mm(0.67in.)[F]
1mm(0.04in.)[G]
0.5mm(0.02in.)[H]
1mm(0.04in.)[I]
23.5mm(0.93in.)[J]
6mm(0.24in.)[K]




*Swingarm Bearing, Sleeve Inspection*

| CAUTION |
| --- |
| **Do not remove the bearing for inspection. Removal may damage them.** |

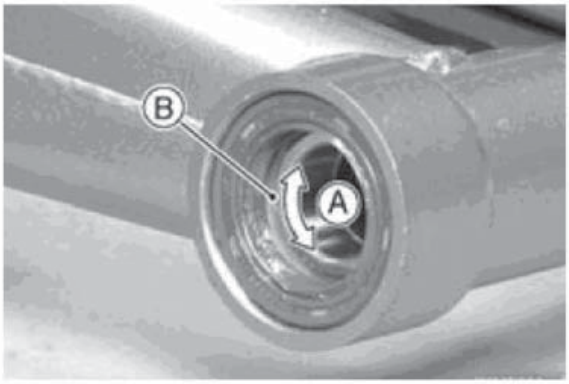



● Inspect the needle bearings [A] and ball bearing installed in the swingarm.

○ The rollers and ball in a bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearing for abrasion, discoloration, or other damage.

★If the needle bearing and sleeve [B] show any sings of abnormal wear, discoloration, or damage, replace them as a set.

● Turn the bearing in the swingarm back and forth [A] while checking for plays, roughness, or binding.
★ If the bearing play, roughness, or binding is found, replace the bearing.
● Examine the bearing seal [B] for tears or leakage.
★If the seal is torn or is leaking, replace the bearing.




*Swingarm Bearing Lubrication*

**NOTE**

○ *Since the bearings are packed with grease and sealed lubrication is not required.*

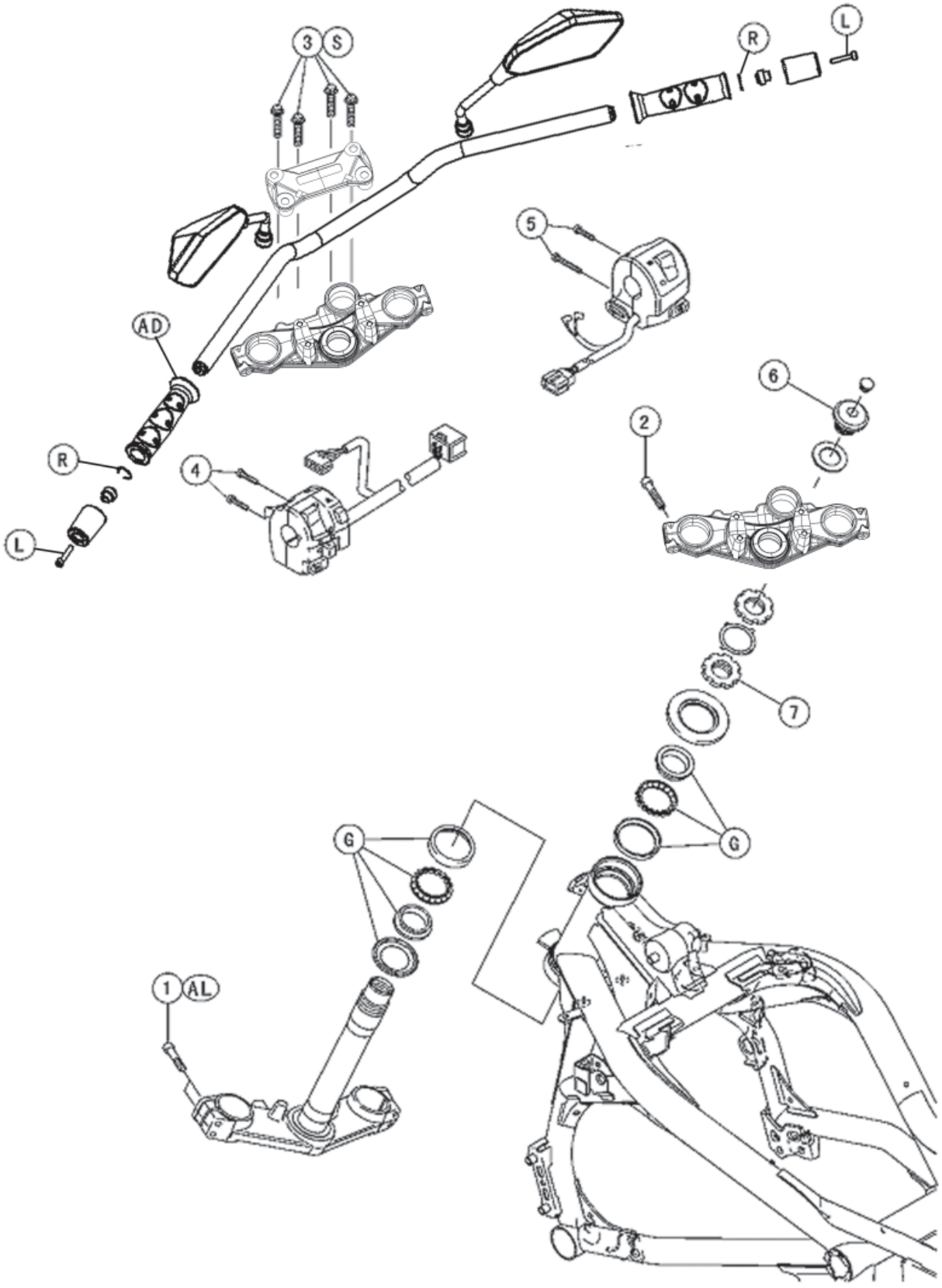
*Chain Guide Inspection*

● Refer to the Chain Guide Wear Inspection in the Periodic, Maintenance chapter.

# Steering

## Table of Contents

## Exploded View



| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Front Fork Clamp Bolts (Lower) | 20 | 2.0 | 15 | AL |
| 2 | Front Fork Clamp Bolts (Upper) | 20 | 2.0 | 15 | |
| 3 | Handlebar Holder Bolts | 25 | 2.5 | 18 | S |
| 4 | Left Switch Housing Screws | 3.5 | 0.36 | 31in·lb | |
| 5 | Right Switch Housing Screws | 3.5 | 0.36 | 31in·lb | |
| 6 | Steering Stem Head Bolt | 108 | 11.0 | 80 | |
| 7 | Steering Stem Nut | 20 | 2.0 | 15 | |

AD: Apply adhesive.

AL: Tighten the two clamp bolts alternately two times to ensure even tighten torque.

G: Apply grease.

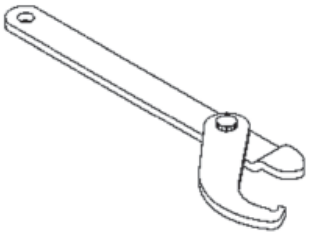
L: Apply a non-permanent locking agent.

Replacement Parts

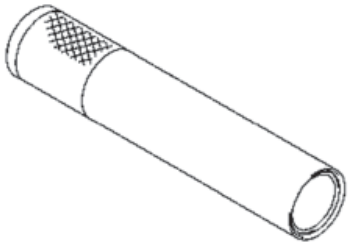
S: Follow the specified tightening sequence.

## Special Tools

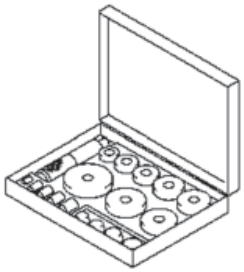
Steering Stem Nut Wrench



Steering Stem Bearing Driver, Φ42.5



Bearing Driver Set



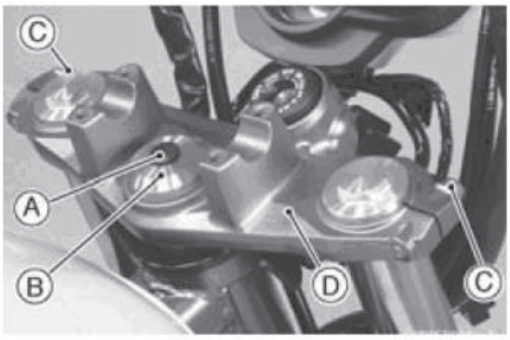
Steering Stem Bearing Driver Adapter, Φ41.5

*Steering Inspection*
Refer to the Steering Play Inspection in the Periodic Maintenance chapter.

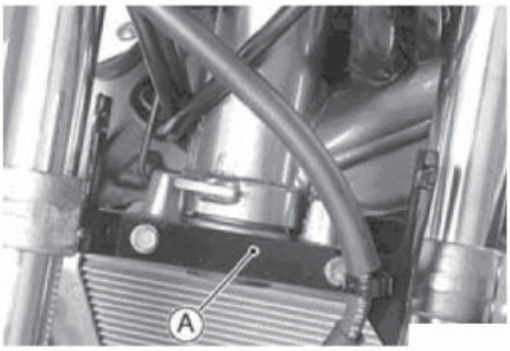
*Steering Adjustment*
Refer to the Steering Play Adjustment in the Periodic Maintenance chapter.

*Stem, Stem Bearing Removal*

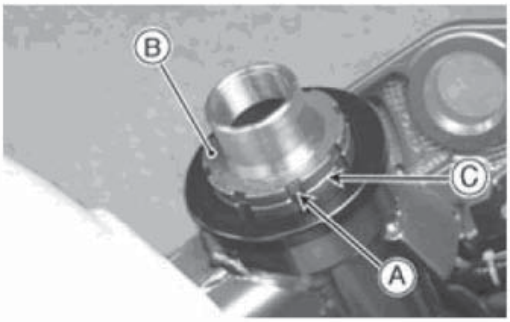
● Remove:
Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
Headlight Assy (see Headlight Removal/ Installation in the Electrical System chapter)
Handlebar (see Handlebar Removal) Steering Stem Head Bolt Plug [A] Steering Stem Head Bolt [B] and Washer
Front Fork Clamp Bolts (Upper) [C] (Loosen)
Steering Stem Head [D]




● Remove:
Under Bracket [A] (see Upper Fairing Bracket Removal in the Frame chapter)
Front Forks (see Front Fork Removal in the Suspension chapter)



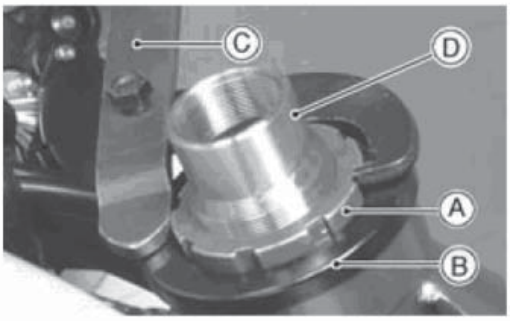

● Bend the claws [A] of the claw washer straighten.
● Remove the steering stem locknut [B] and claw washer [C].




● Pushing up the stem base, and remove the steering stem nut [A] with stem cap [B].

**Special Tool - Steering Stem Nut Wrench [C]**

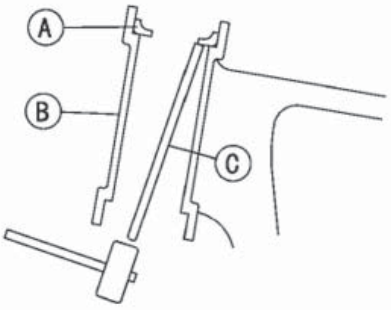
● Remove the steering stem [D] under side.
● Remove the upper stem bearing inner race and bearing.



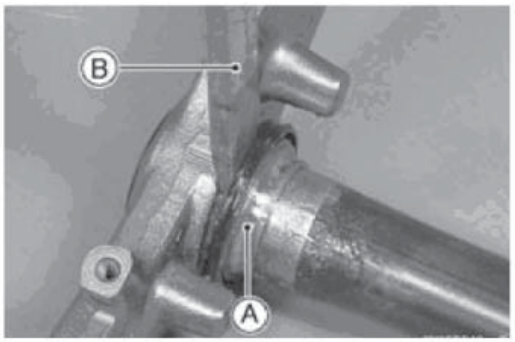

● To remove the bearing outer races [A] pressed into the head pipe [B], insert a bar [C] into the recesses of head pipe, and applying it to both recess alternately hammer it to drive the race out.

**NOTE**

○ *If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.*



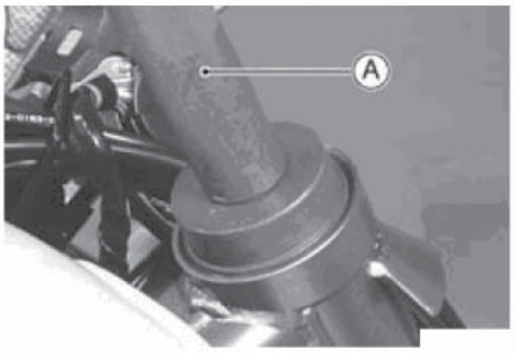
● Remove the lower bearing inner race [A] which is pressed onto the steering stem with a suitable commercially available chisel [B].




*Stem, Stem Bearing Installation*

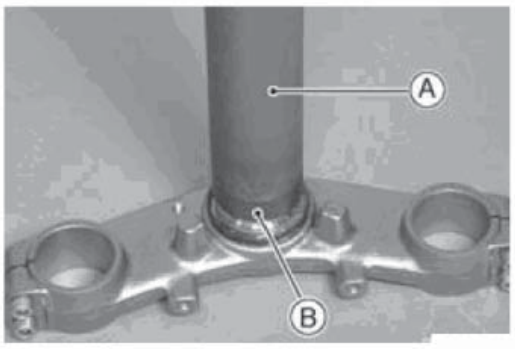
● Replace the bearing outer races with new ones.
● Apply grease to the outer races, and drive them into the head pipe at the same time.

**Special Tool - Bearing Driver Set [A]**

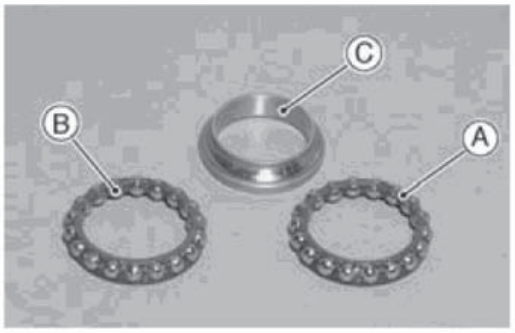



● Replace the bearing inner races and oil seal with new ones.
● Apply grease to the oil seal.
● Drive the lower ball bearing inner race applied the grease onto the stem.

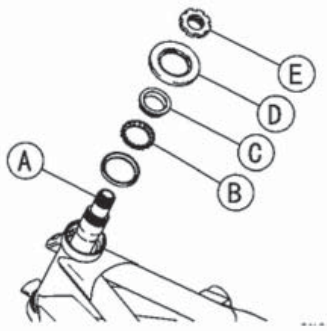
**Special Tools - Steering Stem Bearing Driver, 42.5 [A]**
**Steering Stem Bearing Driver Adapter, 41.5 [B]**



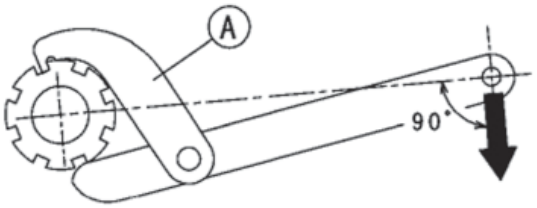

● Apply grease to the lower ball bearing [A], and install it onto the stem.
● Apply grease to the upper ball bearing [B] and inner race [C].




● Install the stem [A] through the head pipe and install the ball bearing [B] and inner race [C] on it.
● Install the stem cap [D] and steering stem nut [E].

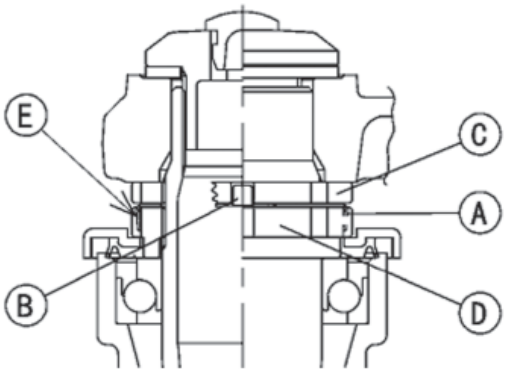


● Settle the inner races in place as follows.
○ Tighten the steering stem nut with 39 N•m (4.0 kgf•m, 29ft•lb) of torque first, and loosen it a fraction of a turn untilit turns lightly. Afterward tighten it again withspecified torque using a stem nut wrench [A] in the direction shown.
○ Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings may be damaged.




**Special Tool - Steering Stem Nut Wrench**
**Torque - Steering Stem Nut: 20 N•m (2.0 kgf•m, 15 ft•lb)**

● Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].
● Hand tighten the stem locknut until it touches the claw washer.
● Tighten the stem locknut clockwise until the claws arealigned with the grooves (ranging from 2nd to 4th) of stem nut [D], and bend the 2 claws downward [E].
● Install the stem head.
● Install the washer, and tighten the stem head bolt withspecified torque.
● Install the front forks (see Front Fork Installation in the Suspension chapter).




**NOTE**

○ *Tighten the upper fork clamp bolts first, next the stem head bolt, last the lower fork clamp bolts.*
○ *Tighten the two clamp bolts alternately two times to ensure even tightening torque.*

**Torque - Front Fork Clamp Bolts (Upper): 20 N•m (2.0 kgf•m, 15 ft•lb)**

**Steering Stem Head Bolt: 108 N•m (11.0 kgf•m, 80 ft•lb)**
**Front Fork Clamp Bolts (Lower): 20 N•m (2.0 kgf•m, 15 ft•lb)**

**⚠ WARNING**

**Do not impede the handlebar turning by routing the cables, harnesses and hoses improperly.**

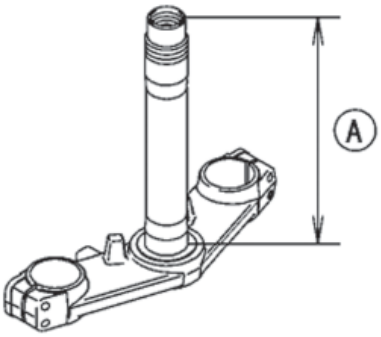
● Install the steering stem head bolt plug.
● Install the removed parts (see appropriate chapters).

*Stem Bearing Lubrication*

● Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.

*Steering Stem Warp*

● Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem for straightness.
If the steering stem [A] is bent, replace the steering stem.

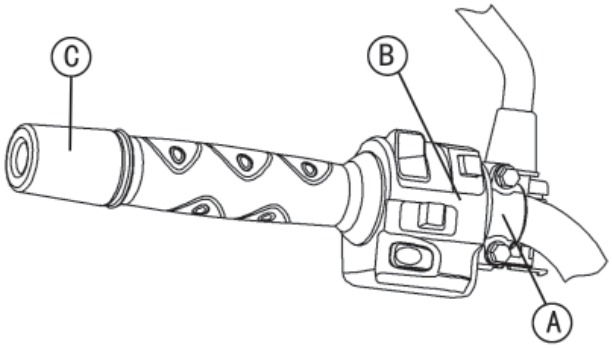



*Stem Cap Deterioration, Damage*

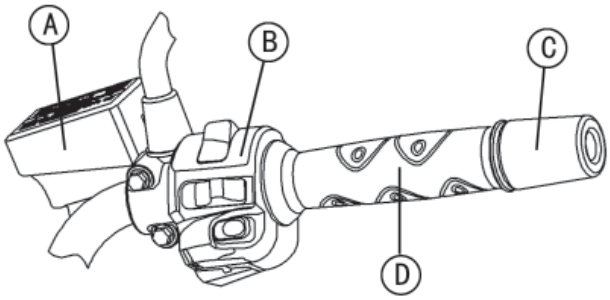
● Replace the stem cap if its oil seal [A] shows damage.

*Handlebar Removal*

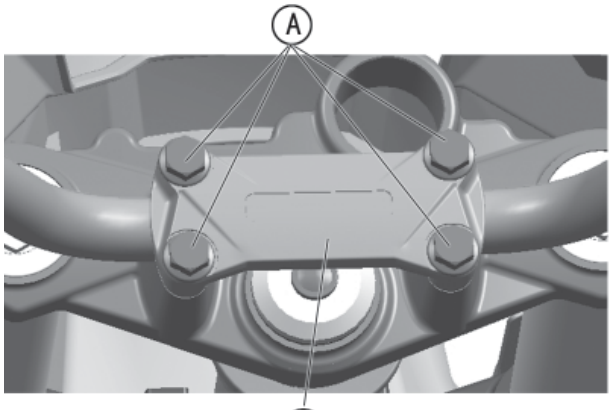
● Remove:
Clutch Lever Assembly [A]
Left Switch Housing [B] Left Handlebar Weight [C]




● Remove:
Front Brake Master Cylinder [A] (see Front Master Cylinder Removal in the Brakes chapter)
Right Switch Housing [B]
Right Handlebar Weight [C] Throttle Grip [D]

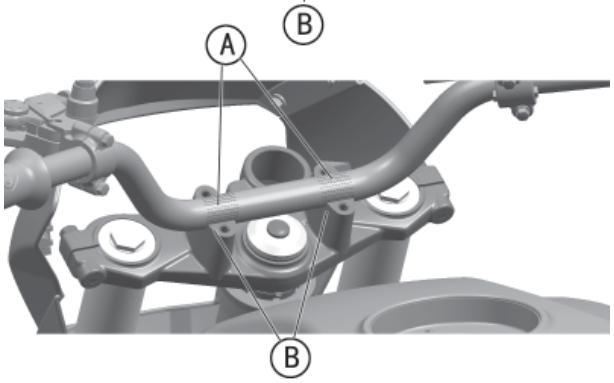



● Remove the handlebar holder bolts [A].
● Remove the handlebar holder [B] and then pull out the handlebar.



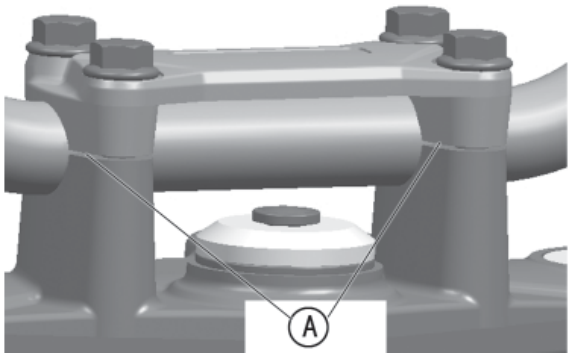

*Handlebar Installation*

● Align the punch mark [A] on the handlebar and the corner edge [B] on the stem head.



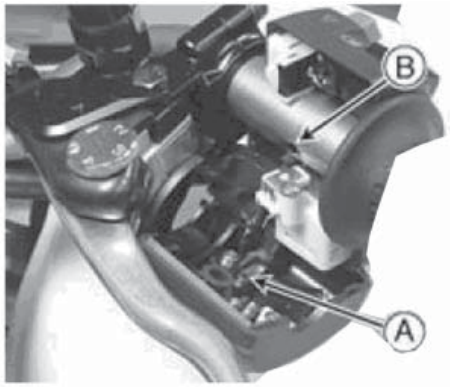

● Tighten the front holder bolts first, and then the rear holder bolts. There will be a gap [A] at the rear part of the handlebar holder after tightening.

**Torque - Handlebar Holder Bolts: 25 N•m (2.5 kgf•m, 18 ft•lb)**



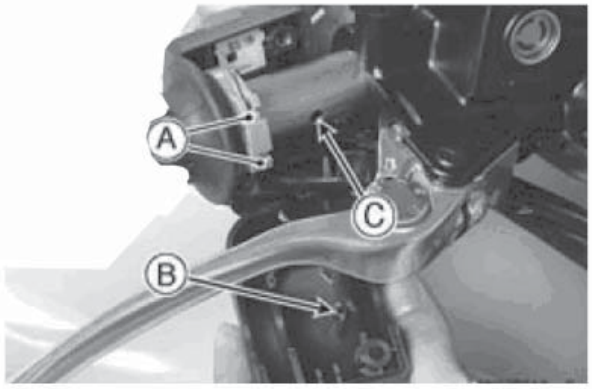
- Install the clutch lever (see Clutch Lever Installation in the Clutch chapter).
- Apply adhesive cement to the inside of the left handlebar grip.
- Apply a non-permanent locking agent to the left handlebar weight bolt.
- Install the left switch housing.
- Fit the projection [A] into a small hole [B] in the handlebar.

**Torque - Left Switch Housing Screws: 3.5 N•m (0.36 kgf•m, 31 in•lb)**




- Install:
  Throttle Grip
  Throttle Cable Tips [A] Right Switch Housing
- Fit the projection [B] into a small hole [C] in the handlebar.

**Torque - Right Switch Housing Screws: 3.5 N•m (0.36 kgf•m, 31 in•lb)**




- Apply a non-permanent locking agent to the right handlebar weight bolt.
- Install the front brake master cylinder (see Front Master Cylinder Installation in the Brakes chapter).

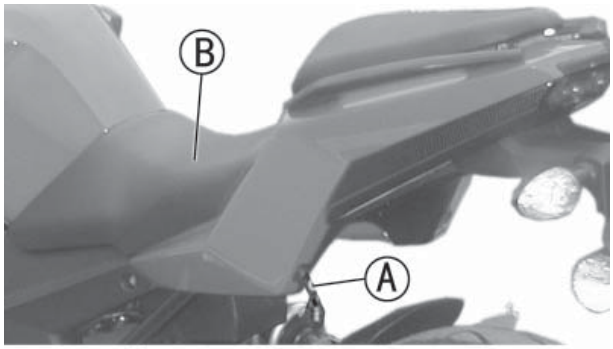
# FRAME

## Table of Contents

## Seats

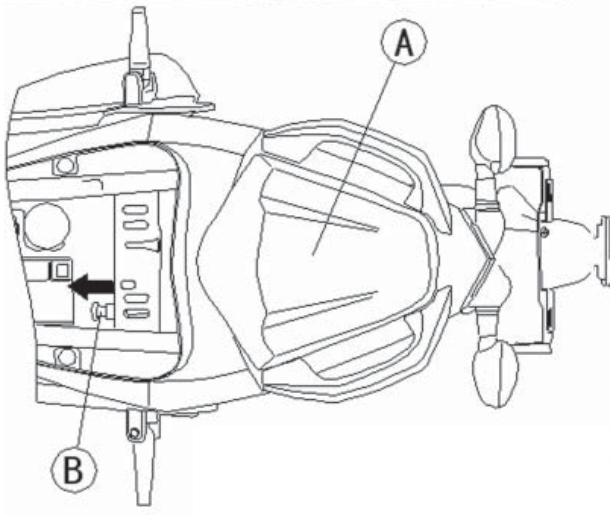
*Front Seat Removal*

- Insert the ignition switch key [A] into the seat lock, turning the key clockwise, pulling up on the rear of the seat [B], and pulling the seat backward.




*Rear Seat Removal*

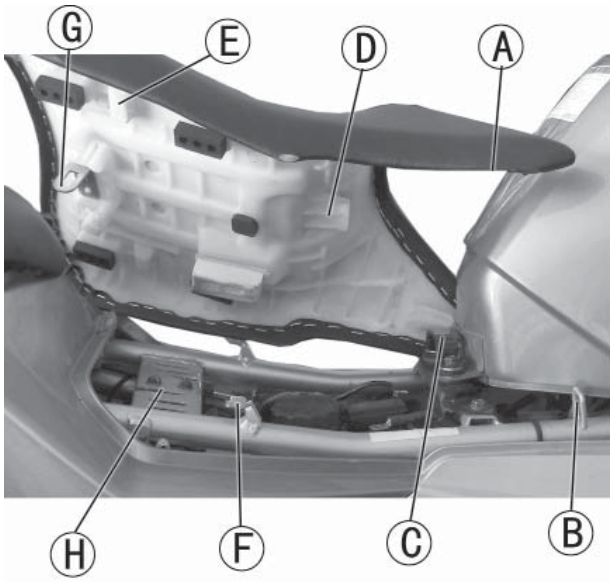
- Pull out the rear seat release pin [B] in the arrow direction, pulling up on the rear of the seat [A], and pulling the seat backward.



## Seats

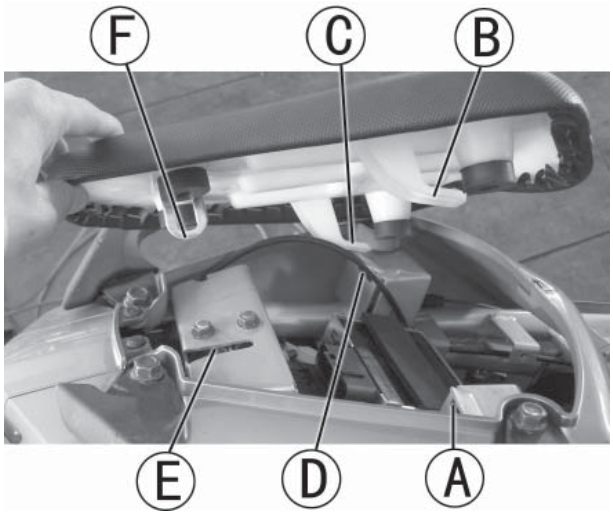
*Front Seat Installation*

- Slip the seat hook [A] under the brace [B] on the fuel tank bracket.
- Slip projection [D] under the brace [C].
- Slip projection [E] under the brace [F].
- Push down the rear part of the seat until the lock clicks.




*Rear Seat Installation*

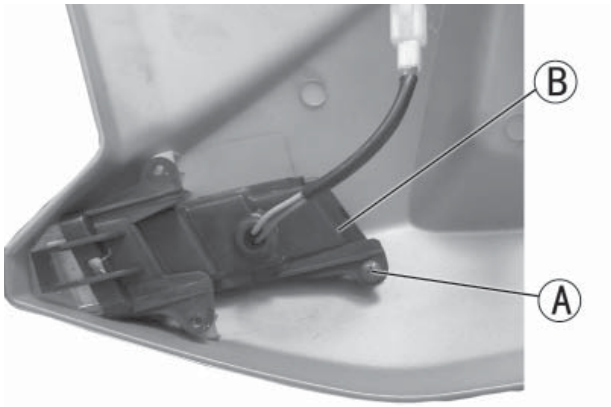
- Insert projection [B] into hole [A].
- Insert projection [C] into hole [D].
- Insert seat latch [F] into latch hole [E].



## Fairings

*Lower Fairing Removal*

● Remove the mounting bolts [A] and lower fairing [B].



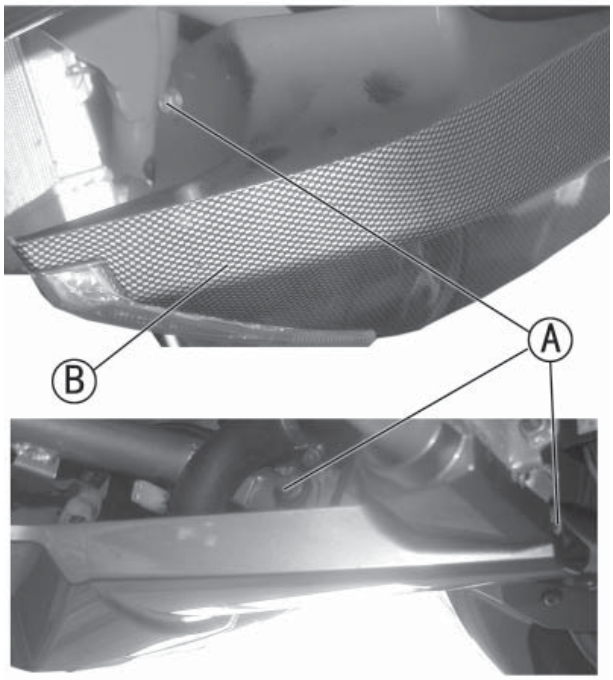

*Lower Fairing Installation*

● Install the lower fairing, and tighten the mounting bolts.

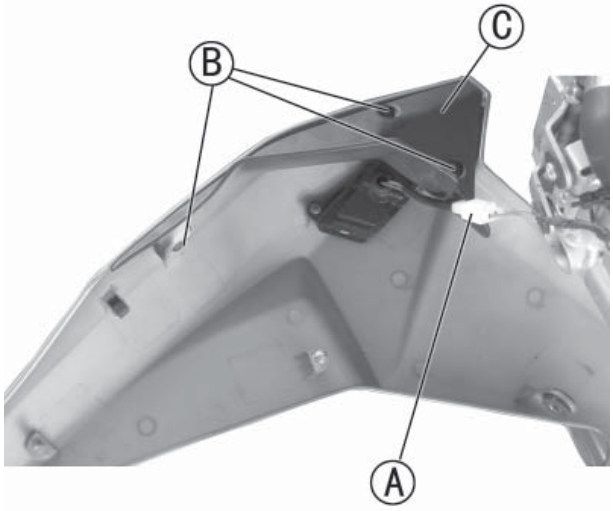
**Torque - Lower Fairing Mounting Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

*Left Center Fairing Removal*

● Remove the mounting bolts [A].
● Pull the left center fairing [B] evenly outward to clear the stoppers.




● Disconnect the turn signal lead connector [A].
● Remove the inner fairing (see Inner Fairing Removal).
● Remove the bracket screws and turn signal light.

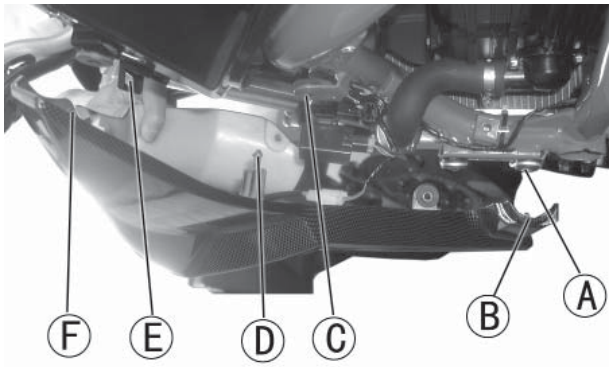


## Fairings

*Left Center Fairing Installation*

- Install the turn signal light to the center fairing.
- Install the inner fairing (see Inner Fairing Installation).

- Connect the turn signal lead connector.
- Insert the projections [F], [D], [B] respectively into the holes [E], [C], [A].
- Install the mounting bolts.

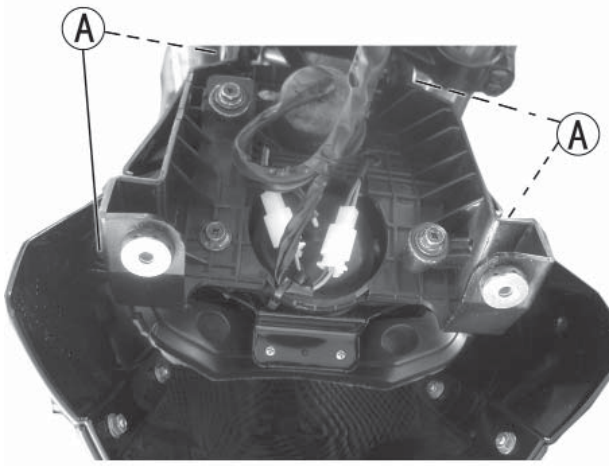



*Right Center Fairing Removal/Installation*

- Right Center Fairing Removal/Installation is the reverse of the Left Center Fairing Removal/ Installation

*Upper Fairing Removal*

- Remove:
  Headlight Assy (see Headlight Removal/ Installation in the Electrical System chapter)
  Mounting Bolts [A]
  Upper Fairings

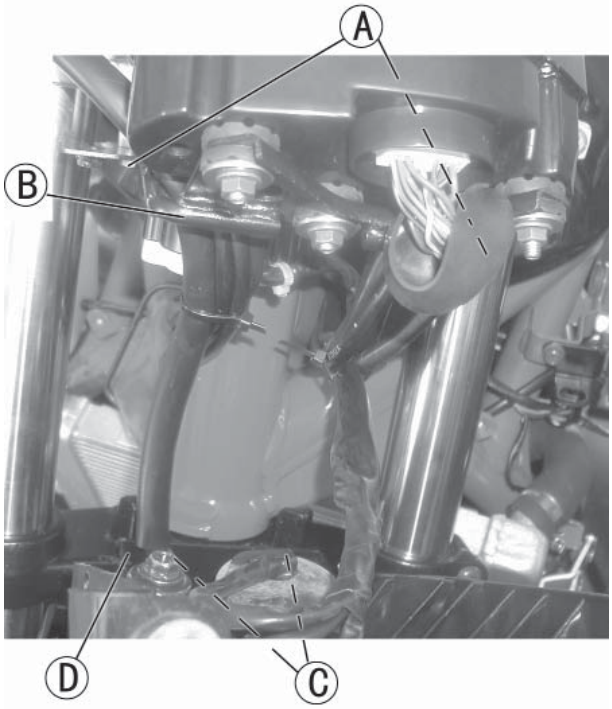



*Upper Fairing Installation*

- For installation, reverse the removal procedure.

*Upper Fairing Bracket Removal*

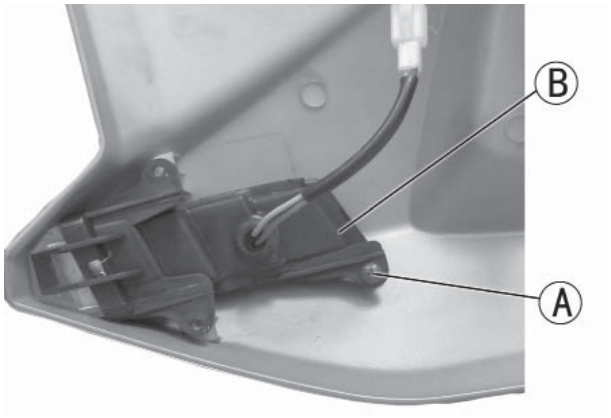
- Remove:
  Headlight Assy (see Headlight Removal/ Installation in the Electrical System chapter)
  Meter Unit (seeMeter Unit Removal in the Electrical System chapter)
  Bolts [A]
- Free the following parts from the bracket.
  Clutch Cable
  Ignition Switch Lead
  Main Harness
  Brake Hose
  Throttle Cables
  Switch Housing Leads
- Remove the upper fairing bracket [B].
- Remove:
  Clamp [A]
  Bolts [B]
  Under Bracket [C]



## Fairings

*Left Inner Fairing Removal*

● Remove:
Left Center Fairings (see Center Fairing Removal)
Left Inner Fairing
Mounting Screws [A]




*Left Inner Fairing Installation*

● Tighten the mounting screws [A].

**Torque - Front Turn Signal Light Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

● Install the left inner fairing.
● Install the left center fairing (see Left Center Fairing Installation)

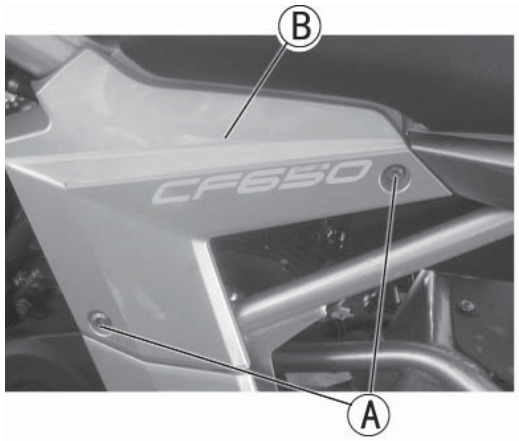
*Right Inner Fairing Removal/Installation*

● Right turn signal light removal/instalation is the reverse of the left turn signal light removal/installation.

## Side Covers

*Left Side Cover Removal*

- Remove the front seat (see Front Seat Removal).
- Remove the bolt [A].
- Pull the side cover [B] evenly outward to clear the stoppers.

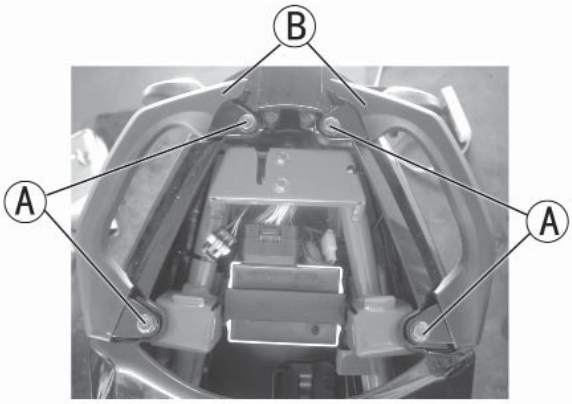



*Left Side Cover Installation*

- Insert the tabs [A] into the holes.
- Tighten the bolt.
- Install the front seat (see Front Seat Installation).

*Grab Rails Removal*

- Remove the bolts [A].
- Remove grab rails [B].




*Grap Rails Installation*

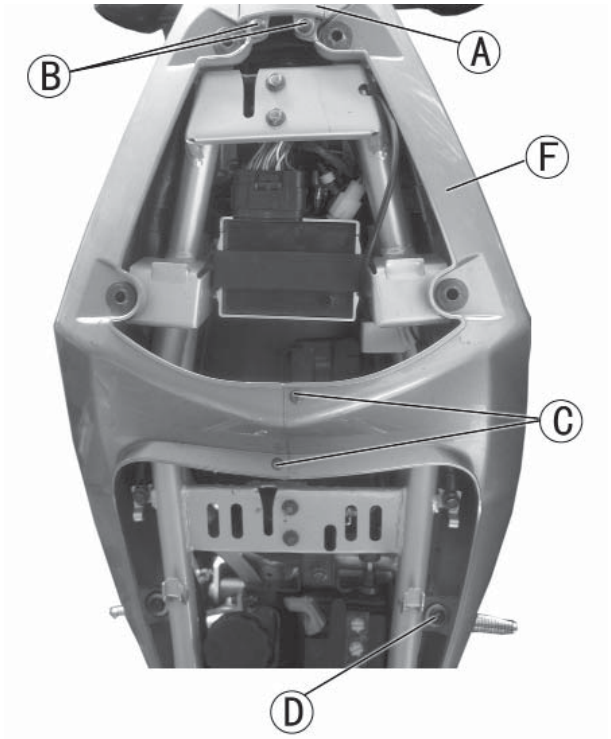
- Grab rails installation is the revverse of the removal.

**Torque - Grab Rails Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

## Seat Covers

*Seat Cover Removal*

● Remove:
  Seats (see Seat Removal)
  Grab Rails
  Screw Rivets [B]
● Remove seat cover [F].

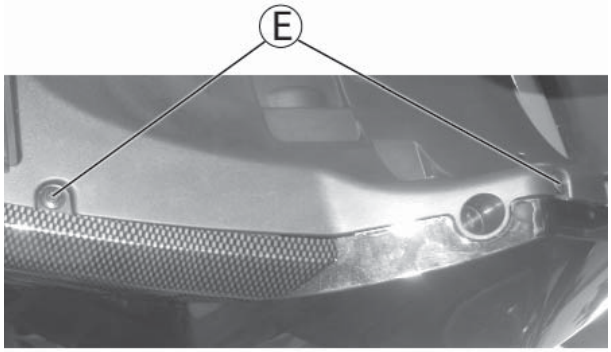



*Seat Cover Installation*

● Installation is the reverse of removal.

*Rear Left Seat Cover Removal*

● Remove:
  Seats (see Seat Removal)
  Grab Rails
  Sea Cover [F]
● Remove screw [B].
● Remove rivets [E].
● Remove screw [D].
● Remove rear left seat cover.




*Rear Left Seat Cover Installation*

● Installation is the reverse of removal.

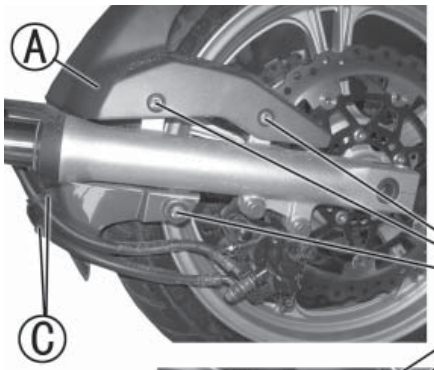
*Rear Right Seat Cover Removal/Installation*

● Refer to Rear Left Seat Cover Removal/
  Installation.

## Fenders

*Front Fender Removal*

- Remove:
  Brake Hose Clamps [C]
  Bolts [B]
- Remove the front fender [A].

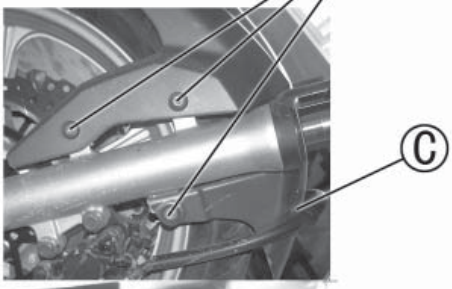



*Front Fender Installation*

- Tighten:

  **Torque - Front Fender Bolts: 3.9 N·m (0.40 kgf·m, 35 in·lb)**

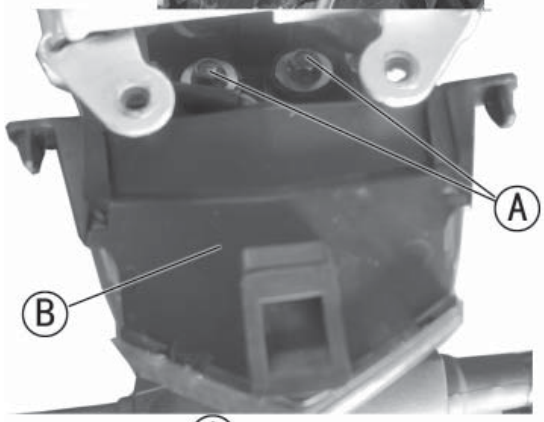
- Install the brake hose clamps to the front fender holes.



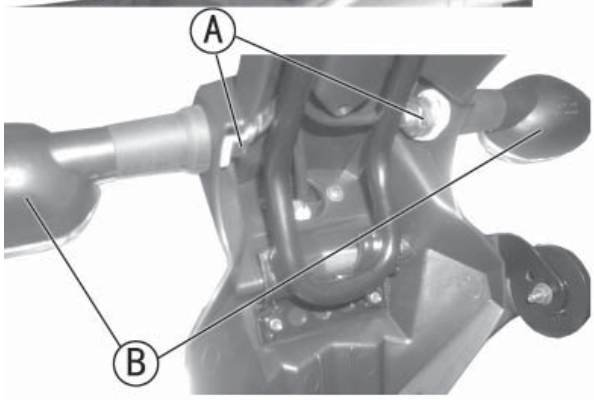

*Flap and Rear Fender Rear Removal*

- Remove:

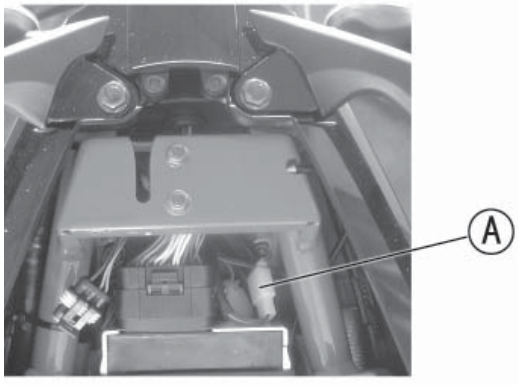
  Seat (see Seat Removal)
  Seat Covers (see Seat Cover Removal)
  Tail/Brake Light [B] (see Tail/Brake Light Removal in the Electrical System chapter)




- Remove:
  Bolts [A]
  Tail/Brake Light nuts [A]
  Rear Turn Signal Lights

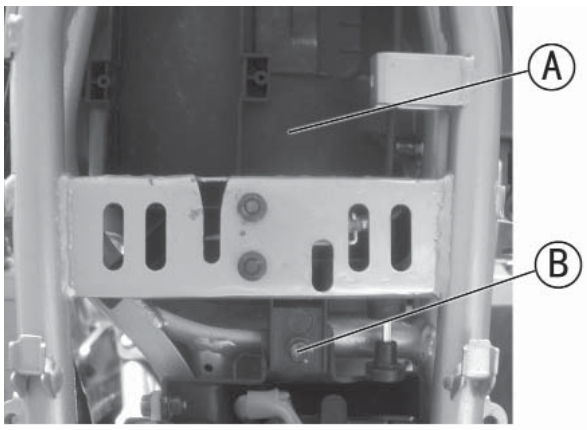


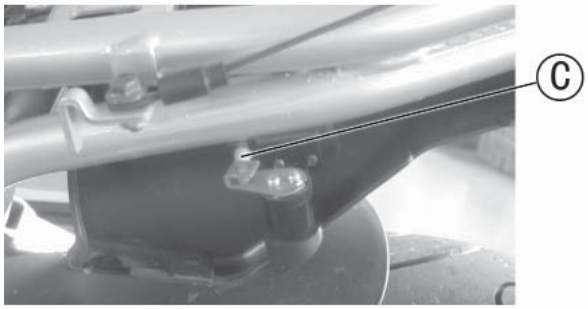

- Remove:
  Seat Lock Cable Lower End [A]

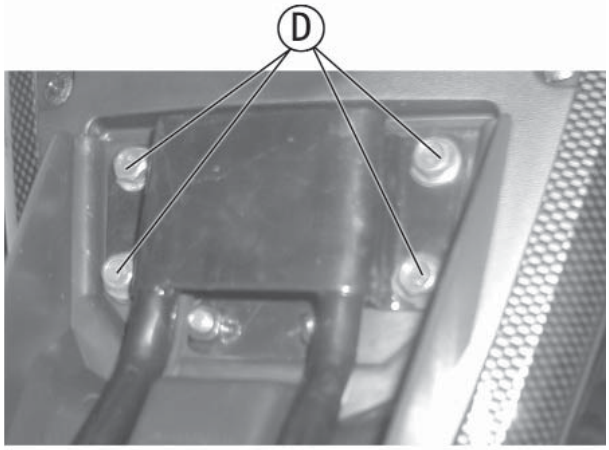


*Rear Fender Front Removal*

● Remove:
Tail/Brake Light, Turn Signal Lights (Tail/Brake Light, Turn Signal Lights Removal)
Battery (see Battery Removal in the Electrical System chapter)
Relay Box (see Relay Box Removal in the Electrical System chapter)
Starter Relay (see Starter Relay Inspection in the Electrical System chapter)
ECU (see ECU Removal in the Electrical System chapter)
Screw [B]
Bolt [D]
License Plate Light Connector




*Rear Fender Front Installation*

● The installation is the reverse of the removal.
● Install the removed parts (see appropriate chapters).

## Frame

*Frame Inspection*

- Visually inspect the frame for cracks, dents, bending or warp.

○ If there is any damage to the frame, replace it.

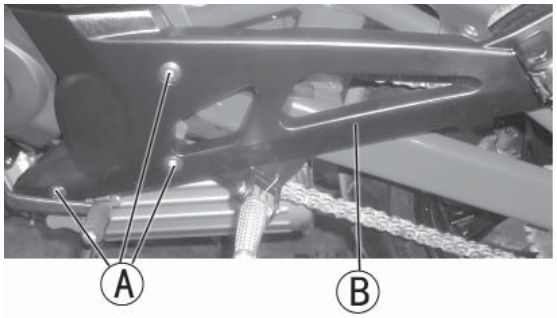
**⚠ WARNING**

**A repaired frame may fail in use, possibly causing an accident. If the frame is bent, dented, cracked, or warped, replace it.**

## Footpeg

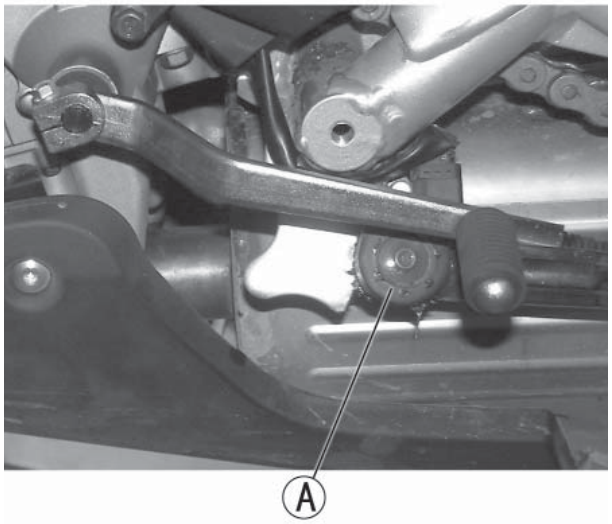
*Left Footpeg Stay Removal*

● Remove:
Left Side Cover (see Left Side Cover Removal)
Bolts [A]
Footpeg Stay [B]




● Remove:
Sidestand Switch Bolt [A]

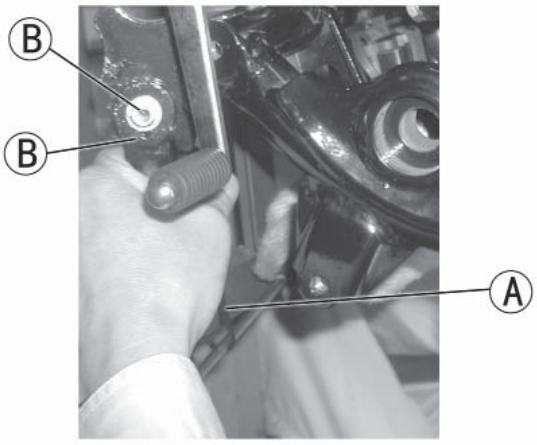
● Remove:
Spring [A]
Sidestand Nut [B]
Sidestand [B]




*Sidestand Installation*

● Apply grease to the sliding area [A] of the sidestand [B].
● Tighten the bolt and lock them with the nut.

**Torque - Sidestand Bolt: 44 N·m (4.5 kgf·m, 33 ft·lb)**

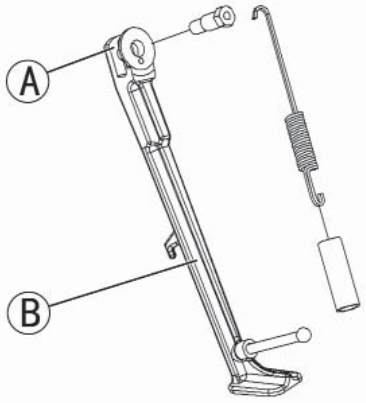



● Hook the spring.
● Install the sidestand switch.
○ Apply a non-permanent locking agent to the thread of the switch bolt.

**Torque - Sidestand Switch Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

● Install the footpeg stay.
● Tighten:

**Torque - Footpeg Stay Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)**




*Right Footpeg Removal*

● Refer to Left Footpeg Removal.

## Rear View Mirrors

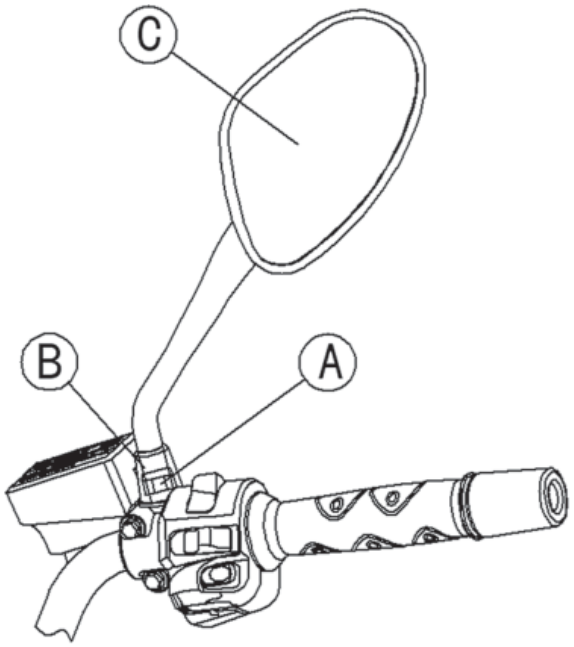
*Rear View Mirrors Removal*

● Loosen the lower hexagonal area [A] for tightening to remove the rear view mirror from the holder.

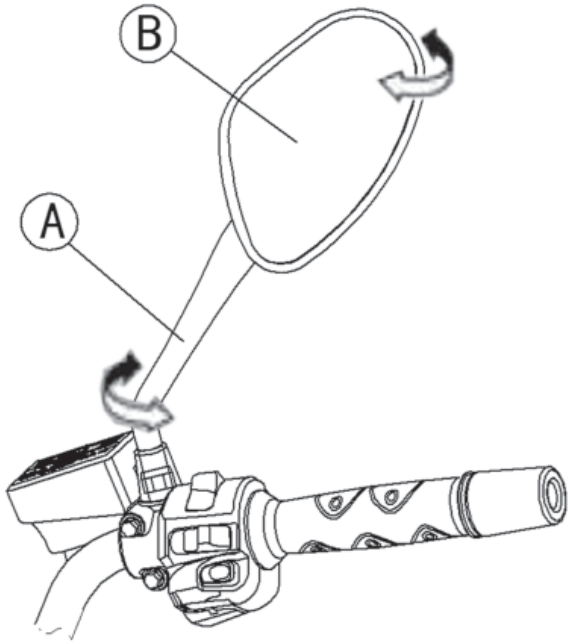
| CAUTION |
| --- |
| **Do not force to tighten and/or loosen the rear view mirror stays, or the damage of the threads could happen.** |

*Rear View Mirrors Installation*

● Screw the mounting area of the rear view mirror into the holder all the way, and tighten the lower hexagonal area for tightening securely.
Lower Hexagonal Area for Tightening [A]
Rear View Mirror (Right) [C]




● Turn the stay [A] to assure the safe conditions of the rear with the operator sat on the motorcycle.
● Adjust the rear view mirror slightly with its mirror [B].
○ Installation and adjustment of the left side are common with those of the right side. Follow the procedure specified at the right side.



# Electrical System

## Table of Contents

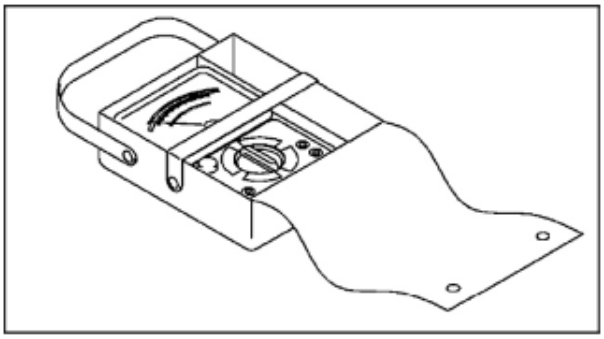
## Specifications

| Item | Standard |
|---|---|
| **Battery** | |
| Type | Sealed Battery |
| Model Name | YTX12-BS |
| Capacity | 12 V 10 Ah |
| **Voltage** | 12.8 V or more |
| **Charging System** | |
| Type | Three-phase AC |
| Alternator Output Voltage | 42 V or more at 4 000 r/min (rpm) |
| Stator Coil Resistance | 0.18~0.27 Ω |
| Charging Voltage | 14.2~15.2 V |
| **Ignition System** | |
| Crankshaft Position Sensor Resistance | 376~564 Ω |
| Crankshaft Sensor Peak Voltage | 1.9 V or more |
| Primary Winding Resistance | 1.1~1.5 Ω |
| Secondary Winding Resistance | 10.8 ~16.2 kΩ |
| Primary Peak Voltage | 88 V or more |
| **Spark Plug** | |
| **Spark Plug Gap** | 0.8 0.9 mm (0.03 0.04 in.) |
| **Switch and Sensors** | |
| Rear Brake Light Switch | ON after about 10 mm (0.39 in.) pedal travel |
| Engine Oil Pressure | When engine is stopped: ON |
| Switch Connections | When engine is running: OFF |
| Water Temperature Sensor Resistance | in the text |

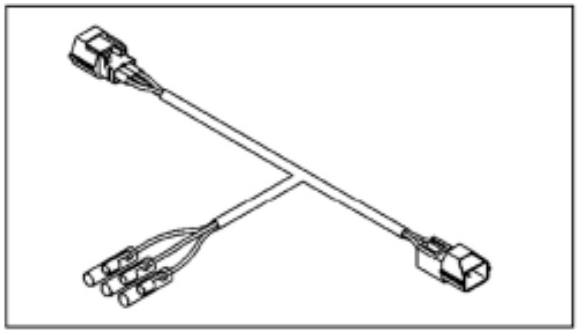
## Electrical System

### Special Tools

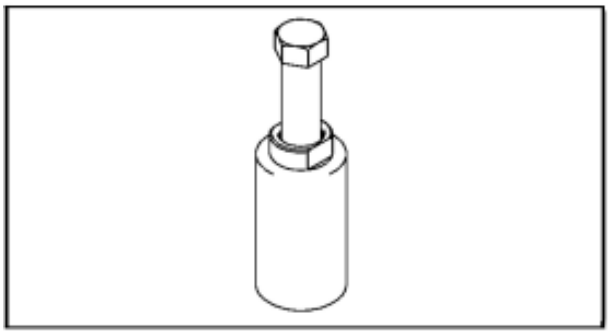
Hand Tester



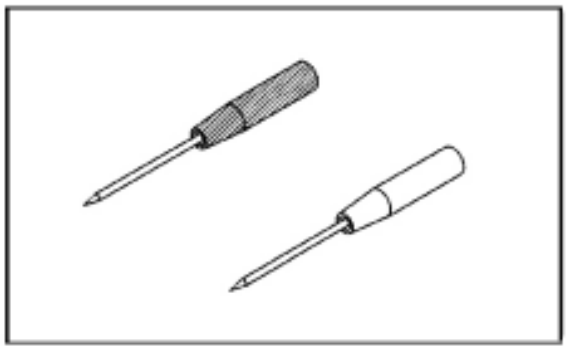
Lead W ire Adaptor



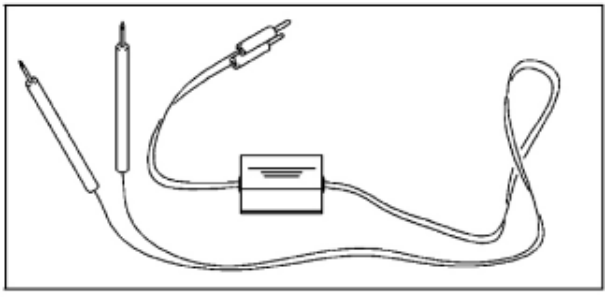
Magneto Rotor Puller



Needle Adaptor Set

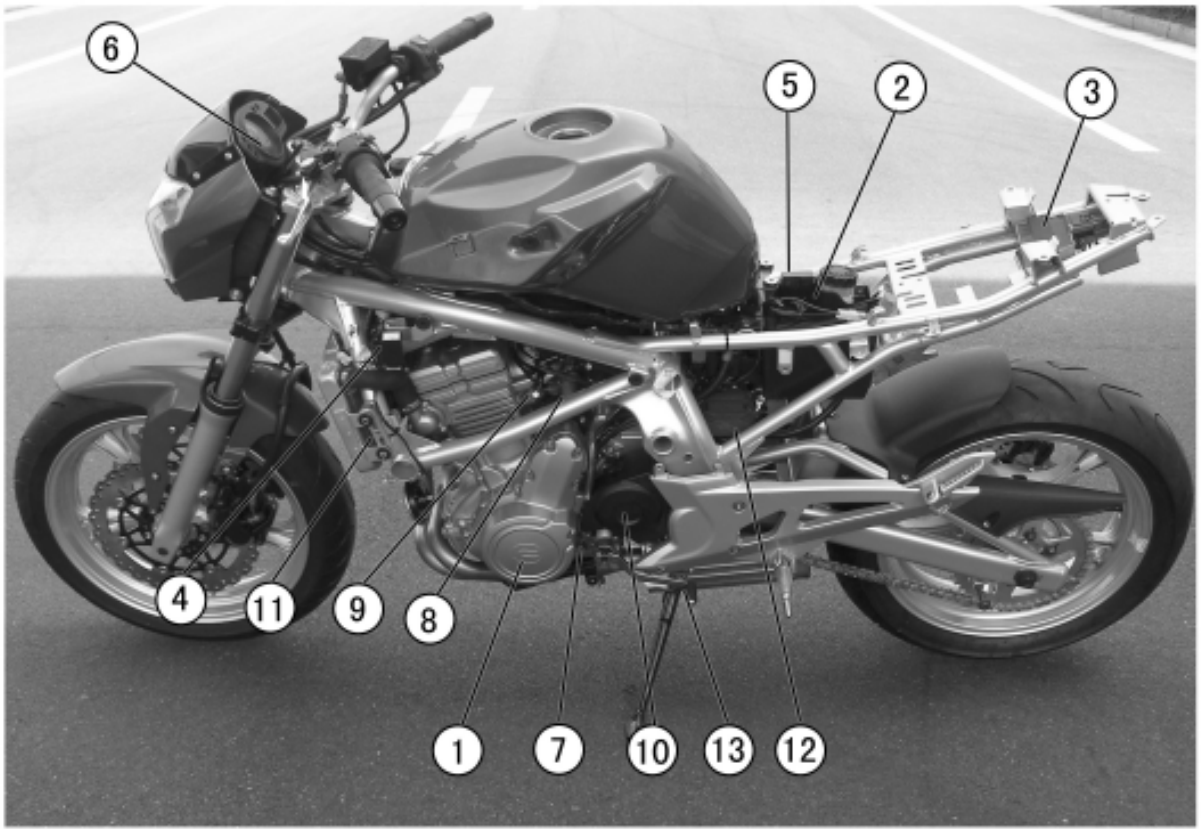


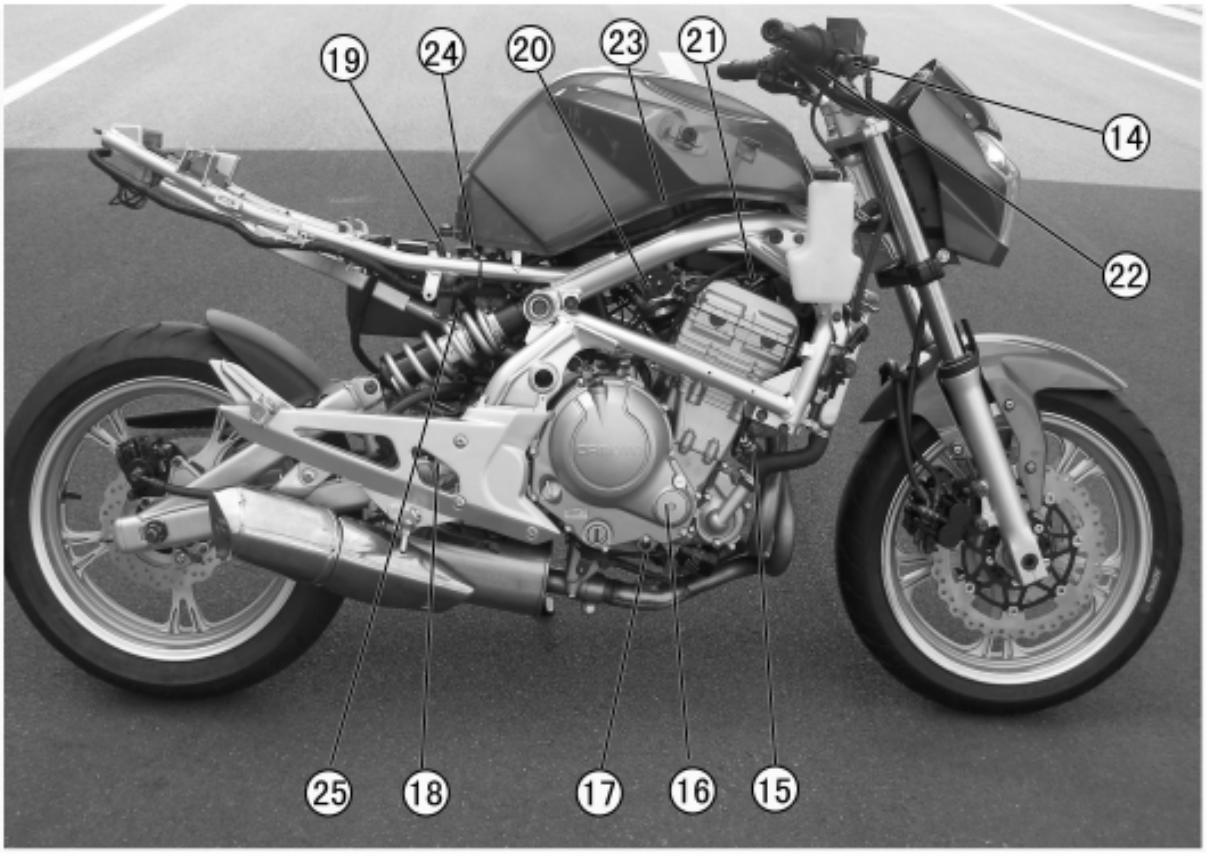
Peak Voltage Adapter



Magneto Rotor Holder

**Electrical System**
**Parts Location**

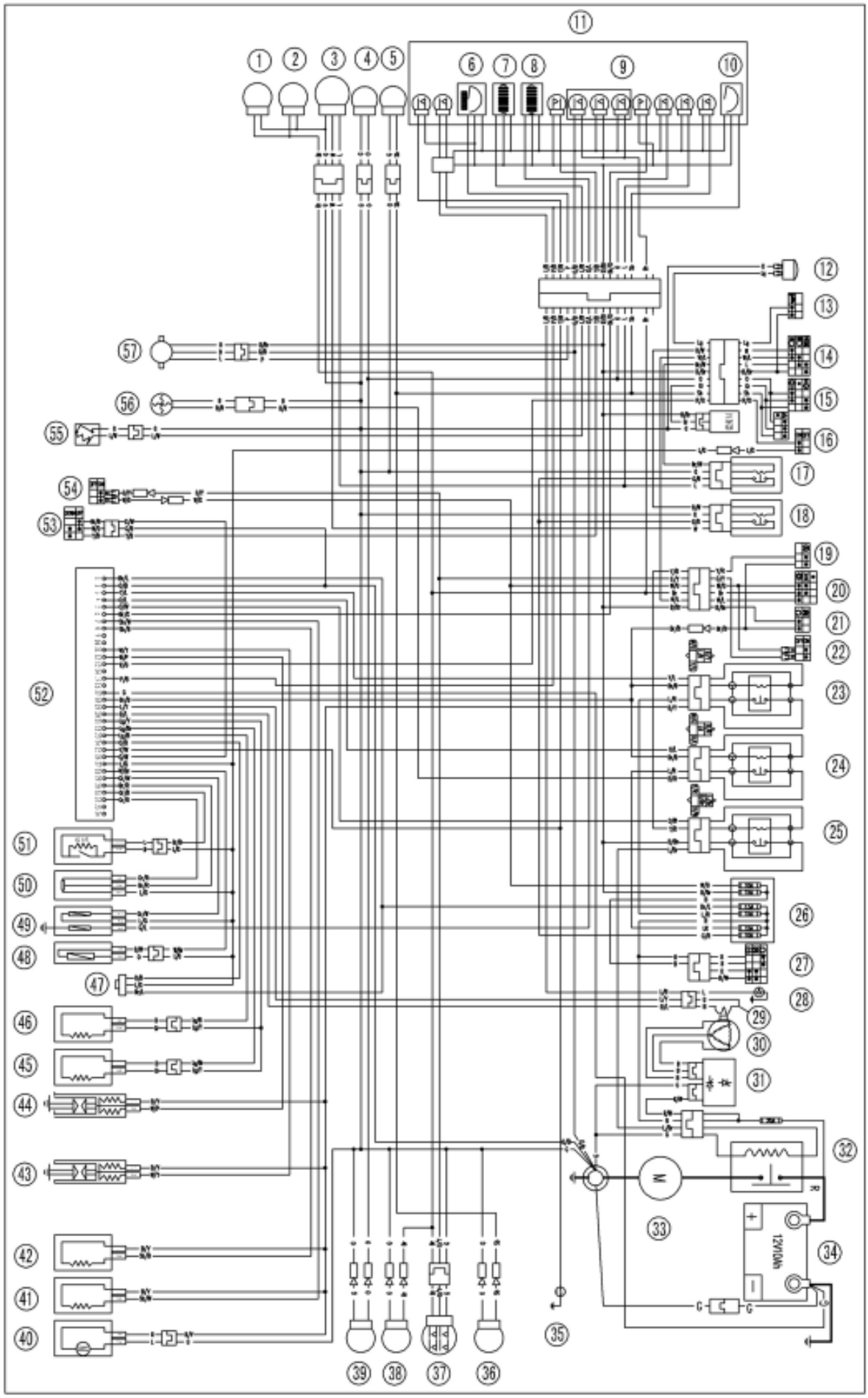


## Electrical System
## Parts Location

1. Alternator
2. Battery 12V10Ah
3. ECU
4. Fan Motor
5. Fuse Box with ECU Main Fuse
6. Meter Unit
7. Neutral Switch
8. Starter Motor
9. Coolant Temperature Sensor
10. Speed Sensor
11. Turn Signal Relay
12. Regulator/Rectifier
13. Side Stand Switch
14. Front Brake Switch
15. Oxygen Sensor
16. Crankshaft Position Senssor
17. Oil Pressure Sensor
18. Rear Brake Light Switch
19. Relay
20. Throttle Body
21. Ignition Coil
22. Ignition Switch
23. Fuel Fump (in the fuel tank)
24. Inlet Air Temperature Sensor
25. Roll-over Sensor

### Wiring Diagram



### Wiring Diagram

1. Front Position Light
2. Rear Position Light
3. Headlight
4. Front Left Turn Light
5. Auxiliary Relay
6. Speed Meter
7. Fuel Meter
8. Coolant Temperature Meter
9. FI Indicator Light
10. Tachometer
11. Meter Unit
12. Horn
13. Horn Switch
14. Dimmer Switch
15. Turn Switch
16. Clutch Switch
17. High Beam Relay
18. Low Beam Relay
19. Engine Start Switch
20. Light Switch
21. Engine Stop Switch
22. Front Brake Switch
23. Fuel Pump Relay
24. Fan Relay
25. Auxiliary Relay
26. Fuse Box
27. Ignition Switch
28. Oil Pressure Sensor
29. Crankshaft Position Sensor
30. Alternator
31. Regulator/Rectifier
32. Starter Relay
33. Starter Motor
34. Battery
35. Neutral Switch
36. Rear Right Turn Light
37. Tail/Brake Light
38. License Plate Light
39. Rear Left Turn Light
40. Fuel Pump
41. Fuel Injector 1
42. Fuel Injector 2
43. Ignition Coil and Spark Plug 1
44. Ignition Coil and Spark Plug 2
45. Oxygen Sensor 1
46. Oxygen Sensor 2
47. Diagnostic Connector
48. Inlet Air Temperature Sensor
49. Coolant Temperature Sensor
50. Throttle Position Sensor
51. Roll-over Sensor
52. ECU
53. Sidestand Switch
54. Rear Brake Switch
55. Fuel Level Sensor
56. Fan Motor
57. Speed Sensor

# 16-8 ELECTRICAL SYSTEM

## Electrical System

## Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

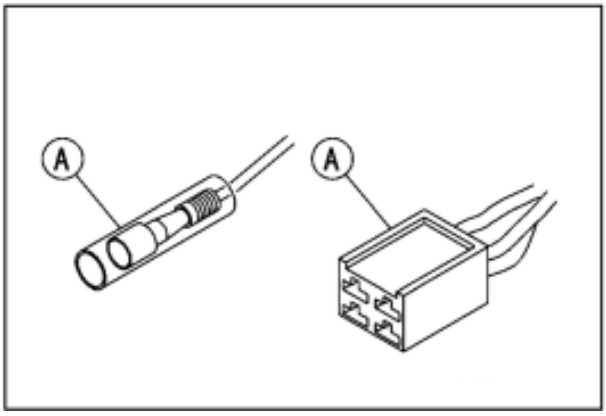
- Do not reverse the battery cable connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Do not use a meter illumination bulb rated for other than voltage or wattage specified in the wiring diagram, as the meter or gauge panel could be warped by excessive heat radiated from the bulb.
- Take care not to short the cables that are directly connected to the battery positive (+) terminal to the chassis ground.
- Troubles may involve one or in some cases all itemsNever replace a defective part without determining what CAUSED the failure. If the failure was caused by some other item or items, they must be repaired or replaced, or the new replacement will soon fail again.
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

### Color Codes:

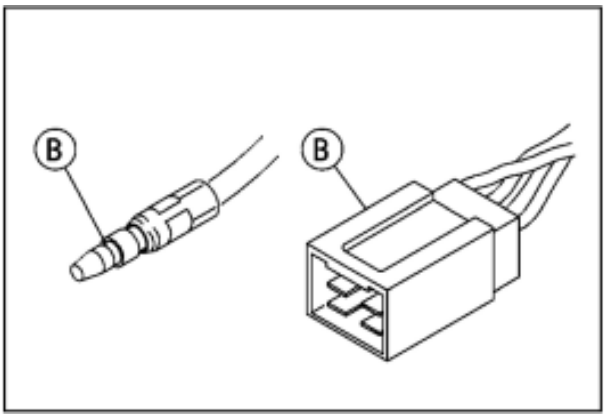
R: Red R/W: Red/White R/G: Red/Green B: Black B/Y: Black/Yellow
B/Br: Black/Brown B/L: Black/Blue G: Green Gr: Grey Lg: Lght green
Lg/G: Light green/Green Lg/Y: Light green/Yellow Sb: Sky blue Sb/W: Sky blue/White
Y: Yellow O: Orange L: Blue P: Purple Br: Brown W: White

**Electrical System**

Female Connectors [A]




Male Connectors [B]




*Wiring Inspection*

● Visually inspect the wiring for signs of burning, fraying, etc.

★If any wiring is poor, replace the damaged wiring.

● Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.

★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.

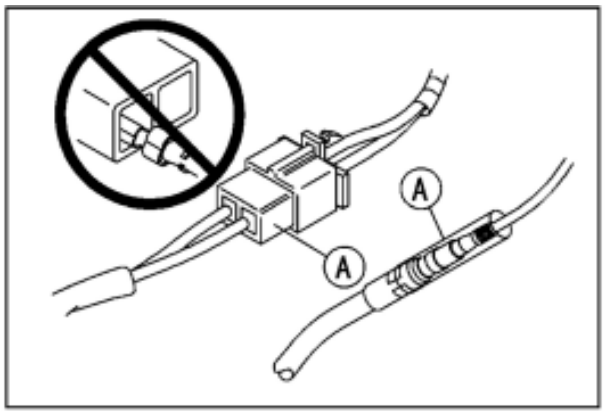
● Check the wiring for continuity.

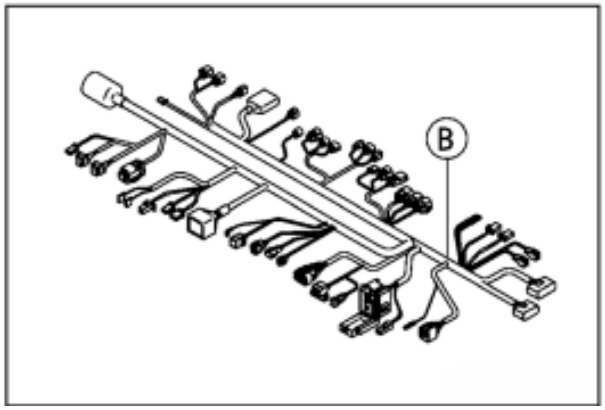
o Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

o Connect the hand tester between the ends of the leads.

o Set the tester to the × 1 ? range, and read the tester.

★If the tester does not read 0 ?, the lead is defective. Replace the lead or the wiring harness [B] if necessary.

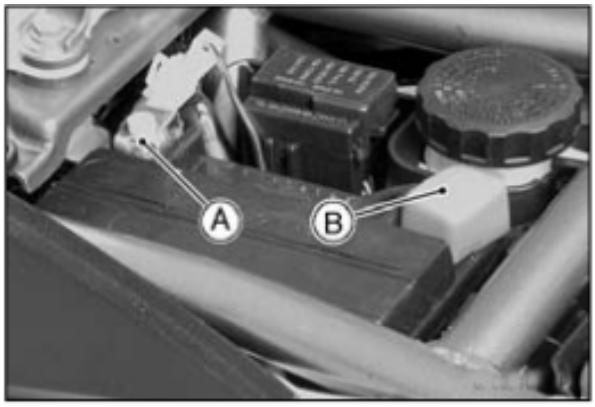


## Battery

*Battery Removal*

● Remove:
Seat (see Seat Removal in the Frame chapter)
● Disconnect the negative (-) cable [A].
● Slide out the positive (+) terminal cap [B] and then disconnect the positive (+) cable.

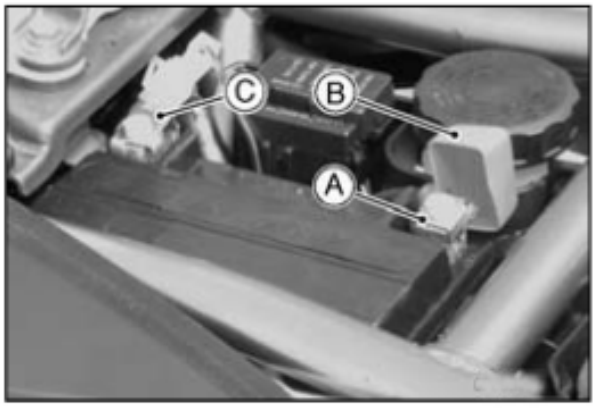



| CAUTION |
| --- |
| **Be sure to disconnect the negative (-) cable first.** |

● Remove the battery.

*Battery Installation*

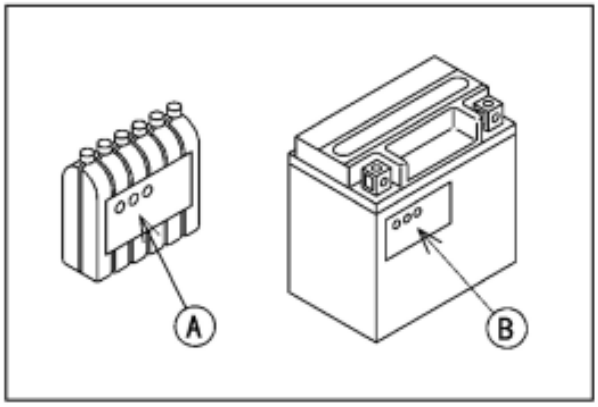
● Put the battery into the rear fender front.
● Apply a light coat of grease on the terminals to prevent corrosion.
● Install the positive (+) cable [A] first.
● Cover the positive (+) terminal with the cap [B].
● Install the negative (-) cable [C].




*Battery Activation*

Electrolyte Filling

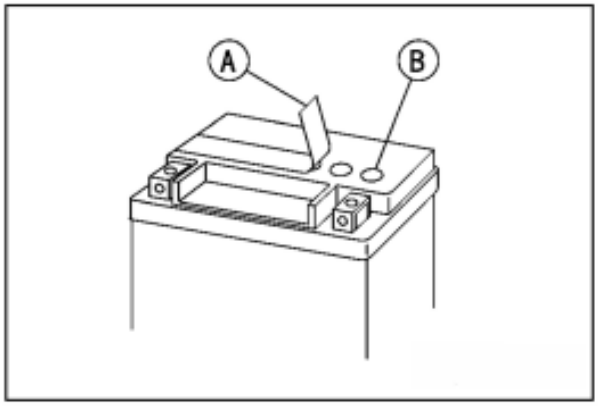
● Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.
**Battery Model Name for 650NK: YTX12-BS**




| CAUTION |
| --- |
| **Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type. This is to prevent overfilling of the electrolyte, shorting the battery life, and deterioration of the battery performance.** |

| CAUTION |
| --- |
| **Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.** |

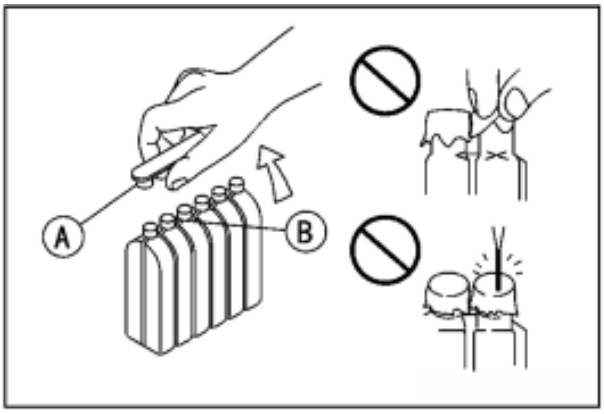
● Place the battery on a level surface.
● Check to see that the sealing sheet has no peeling, tears, or holes in it.
● Remove the sealing sheet.



## Battery

**NOTE**

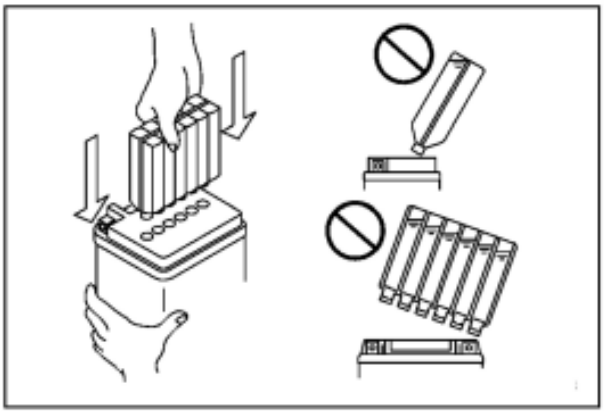
o *The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.*




● Remove the electrolyte container from the vinyl bag.
● Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.

**NOTE**

o *Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.*

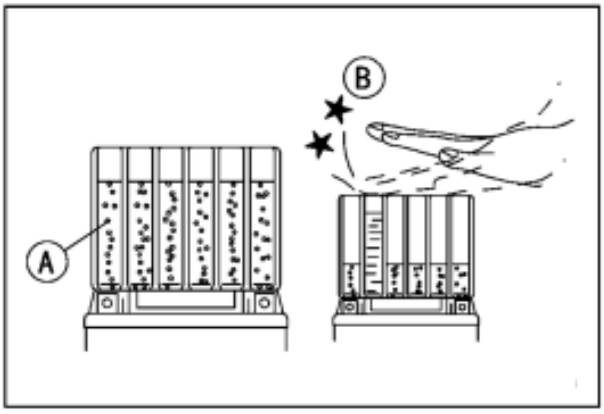


● Place the electrolyte container upside down with the six sealed cells into the filler ports of the battery. Hold the container level, push down to break the seals of all six cells. You will see air bubbles rising into each cell as the ports fill.

**NOTE**

o *Do not tilt the electrolyte container.*

● Check the electrolyte flow.
● If no air bubbles [A] are coming up from the filler ports, or if the container cells have not emptied completely, tap the container [B] a few times.
● Keep the container in place for 20 minutes or more. Don't remove the container from the battery until it's empty, the battery requires all the electrolyte from the container for proper operation.




| CAUTION |
| --- |
| **Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the electrolyte container until it is completely empty and 20 minutes have elapsed.** |

● Gently remove the container from the battery.
● Let the battery sit for 30 minutes prior to charging to allow the electrolyte to permeate into the plates for optimum performance.

**NOTE**

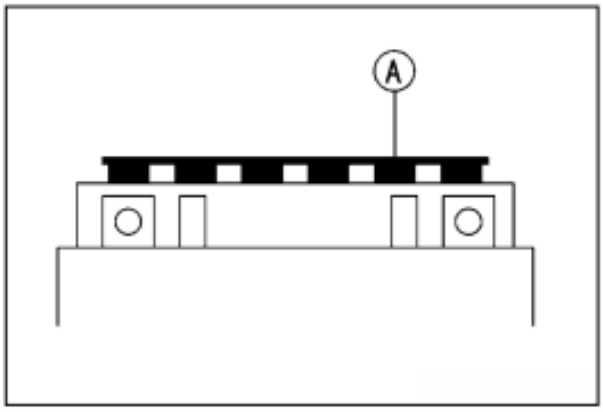
o *Charging the battery immediately after filling can shorten service life. Let the battery sit for at least 30 minutes after filling.*

**Battery**

*Initial Charge*

- Place the strip [A] of caps loosely over the filler ports.
- Newly activated sealed batteries require an initial charge.

Standard Charge: 1.2 A x 5~10 hours

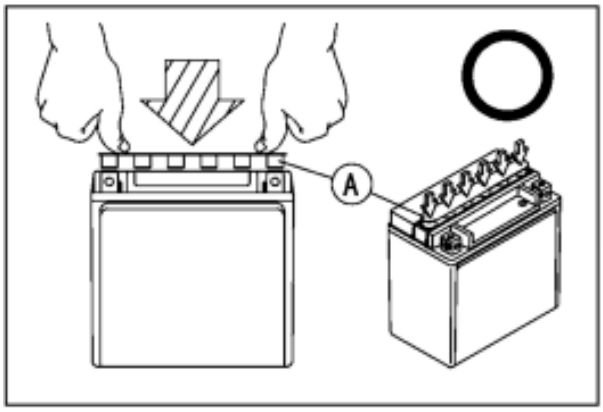



**NOTE**

o *Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. If it is not at least 12.8 V, repeat charging cycle.*

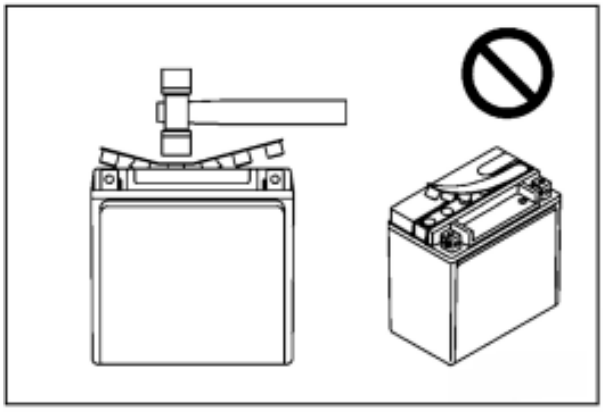
- After charging is completed, press down firmly with both hands to seat the strip of caps [A] into the battery (don't pound or hammer.). When properly installed, the strip of the caps will be level with the top of the battery.

| CAUTION |
| --- |
| **Once the strip of the caps [A] is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.** |




**NOTE**

o *To ensure maximum battery life and customer satisfaction, it is recommended the battery be load tested at three times its amp-hour rating for 15 seconds. Recheck voltage and if less than 12.8 V repeat the charging cycle and load test. If still be low 12.8 V the battery is defective.*



**Battery**

*Precautions*

1) No need of topping-up.

No topping-up is necessary in this battery until it ends its life under normal use. Forcibly prying off the seal cap to add water is very dangerous. Never do that.

2) Refreshing charge.

If an engine will not start, a horn sounds weak, or lamps are dim, it indicates the battery has been discharged. Give refresh charge for 5 to 10 hours with charge current shown in the specification (see Specifications).

When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

| CAUTION |
| --- |
| **This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above. Never remove the seal cap during refresh charge. If by chance an excessive amount of gas is generated due to overcharging, the relief valve releases the gas to keep the battery normal.** |

3) When you do not use the motorcycle for months.

Give a refresh charge before you store the motorcycle and store it with the negative cable re- moved. Give a refresh charge once a month during storage.

4) Battery life.

If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it (Provided, however, the vehicle's starting system has no problem).

3) When you do not use the motorcycle for months.

Give a refresh charge before you store the motorcycle and store it with the negative cable removed. Give a refresh charge once a month during storage.

4) Battery life.

If the battery will not start the engine even after several refresh charges, the battery has ex- ceeded its useful life. Replace it (Provided, however, the vehicle's starting system has no problem).

| ⚠ WARNING |
| --- |
| **Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger.**<br>**This procedure prevents sparks at the battery terminals which could ignite any battery gases.**<br>**No fire should be drawn near the battery, or no terminals should have the tightening loos- ened.**<br>**The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water. Get medial attention if severe.** |

*Interchange*

A sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace a sealed battery only on a motorcycle which was originally equipped with a sealed battery.

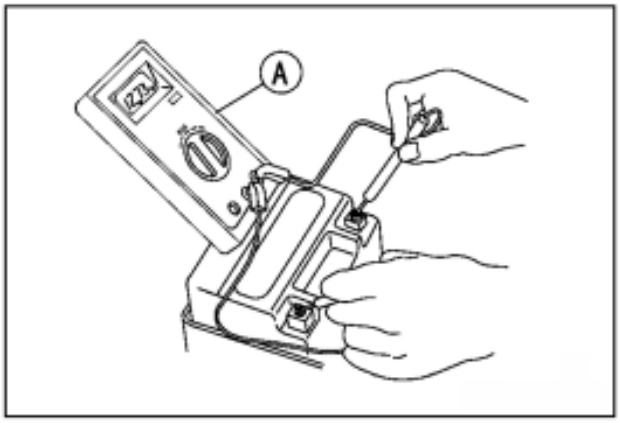
Be careful, if a sealed battery is installed on a motorcycle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

## Battery

*Charging Condition Inspection*

Battery charging condition can be checked by measuring battery terminal voltage with a digital voltmeter [A].

● Remove:
  Seat (see Seat Removal in the Frame chapter)
  Battery Cable Cap (see Battery Removal)
● Disconnect the battery terminals.




| CAUTION |
| --- |
| **Be sure to disconnect the negative (-) cable first.** |

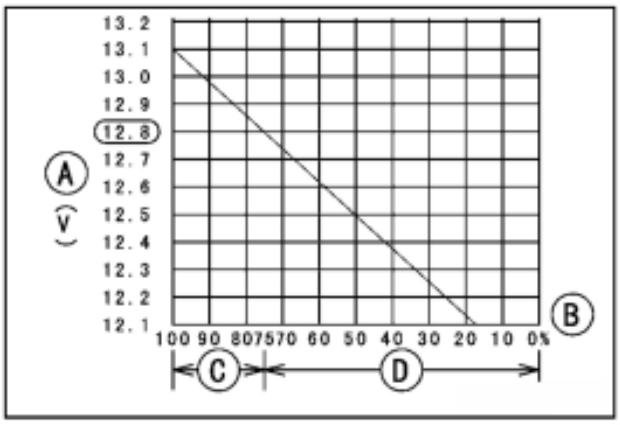
● Measure the battery terminal voltage.

**NOTE**

o *Measure with a digital voltmeter which can be read one decimal place voltage.*

★If the reading is 12.8 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.

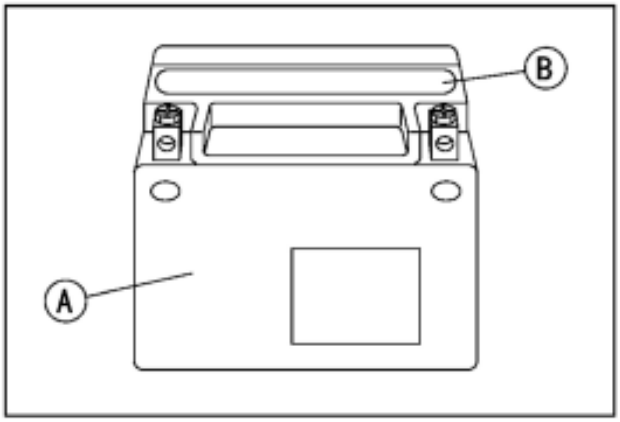
**Battery Terminal Voltage**
**Standard: 12.8 V or more**
**Terminal Voltage (V) [A]**
**Battery Charge Rate (%) [B] Good [C]**
**Refresh charge is required [D]**




*Refreshing Charge*

● Remove the battery [A] (see Battery Removal).
● Do refresh charge by following method according to the battery terminal voltage.

| ⚠ WARNING |
| --- |
| **This battery is sealed type. Never remove sealing cap [B] even at charging. Never add water. Charge with current and time as stated below.** |



## Battery

**Terminal Voltage: 11.5 less than 12.8 V**
**Standard Charge 1.2 Ax5~10 h (see following chart) Quick Charge 5 A x1 h**

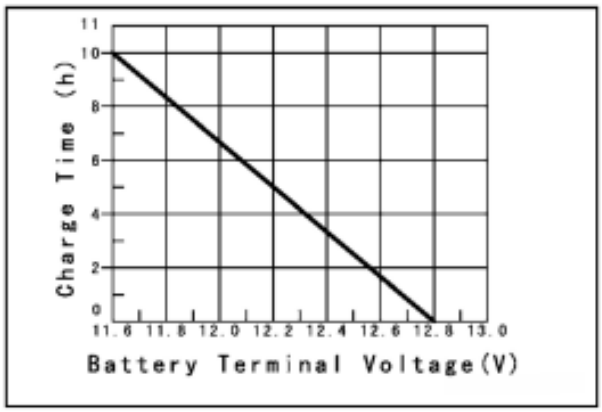
| CAUTION |
| --- |
| **If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.** |

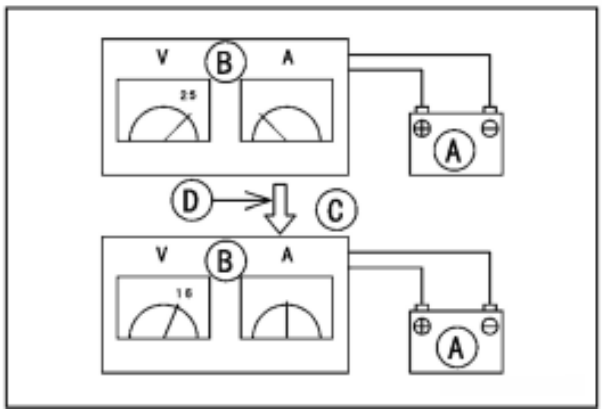
**Terminal Voltage: less than 11.5 V Charging Method 1.2 Ax20 h**

**NOTE**

o *Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than 5 minutes at the increased voltage then check if the battery is drawing current. If the battery will accept current decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 min- utes, replace the battery.*

Battery [A]
Battery Charger [B]
Standard Value [C]
Current starts to flow [D]



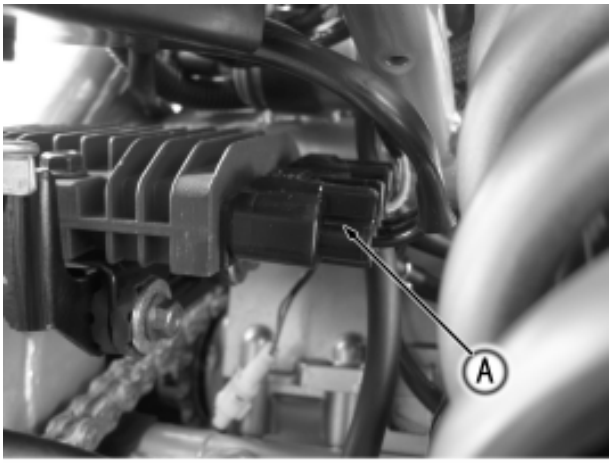

- Determine the battery condition after refresh charge.
- Determine the condition of the battery left for 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

| Criteria | Judgement |
| --- | --- |
| 12.8 V or higher | Good |
| 12.0 lower than 12.8 V | Charge insufficient ¡ú Recharge |
| lower than 12.0 V | Unserviceable ¡ú Replace |

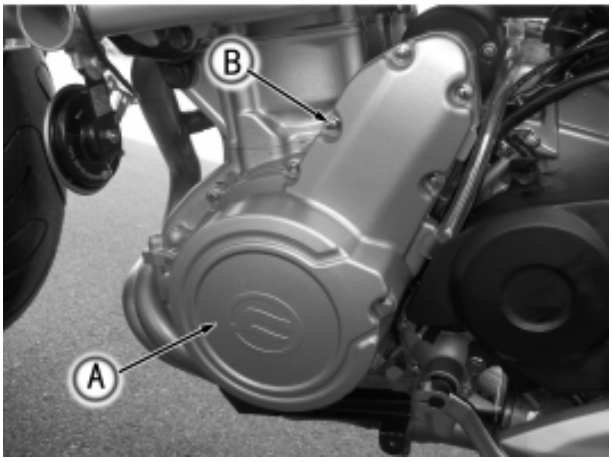
## Charging System

*Alternator Cover Removal*

● Remove:
Lower Fairing (see Lower Fairing Removal in the Frame chapter)
Alternator Lead Connector [A]

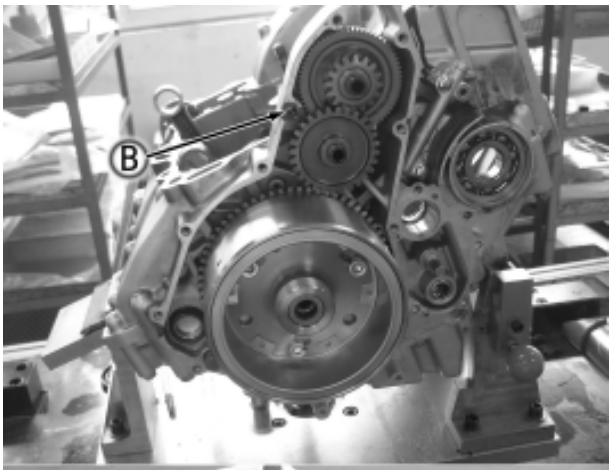



● Place a suitable container under the alternator cover [A], and remove the cover bolts [B].
● Pull the alternator cover outside.



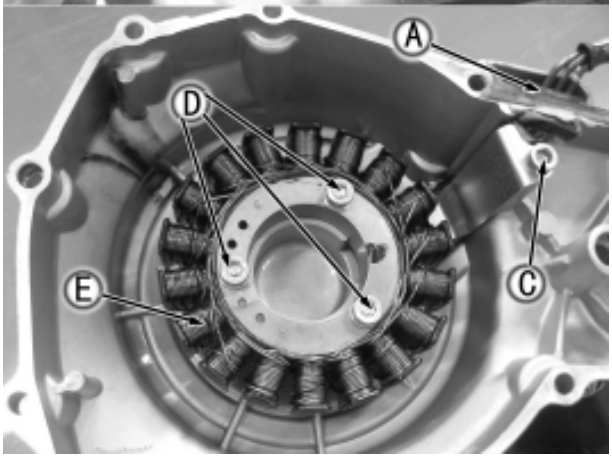

*Alternator Cover Installation*

● Apply silicone sealant to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.
● Check that dowel pins [B] are in place on the crankcase.
● Install a new gasket and the alternator cover.
● Tighten:
**Torque - Alternator Cover Bolts: 9.8 N•m (1.0 kgf • m, 87 in • lb)**




*Stator Coil Removal*

● Remove:
Alternator Cover (see Alternator Cover Removal)
Holding Plate Bolt [A] and Plate Alternator Lead Grommet [B] Stator Coil Bolts [C]
● Remove the stator coil [D] from the alternator cover.



## Charging System

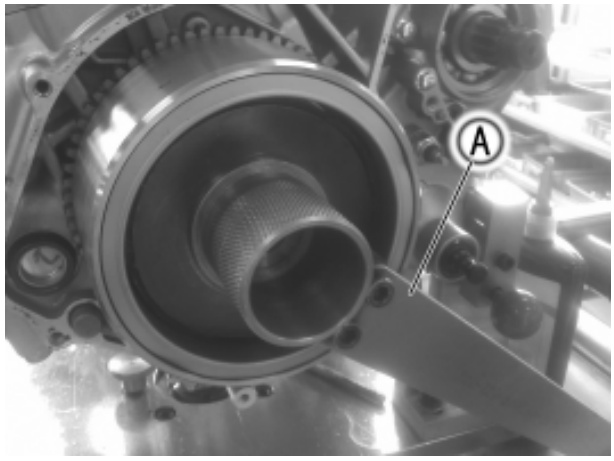
*Stator Coil Installation*

● Apply a non-permanent locking agent to the threads of the stator coil bolts and tighten them.
**Torque - Stator Coil Bolts: 12 N • m (1.2 kgf • m, 106 in • lb)**

● Secure the alternator lead with a holding plate, and tighten the bolt.

● Apply a non-permanent locking agent to the threads of the holding plate bolt.
**Torque - Alternator Lead Holding Plate Bolt: 9.8 N • m (1.0 kgf • m, 87 in • lb)**

● Apply silicone sealant to the circumference of the alternator lead grommet, and fit the grommet into the notch of the cover securely.




● Install the alternator cover (see Alternator Cover Installation).

*Alternator Rotor Removal*

● Remove the alternator cover (see Alternator Cover Removal).

● Remove the starter idle gear, torque limiter and shafts.

● Wipe oil off the outer circumference of the rotor.

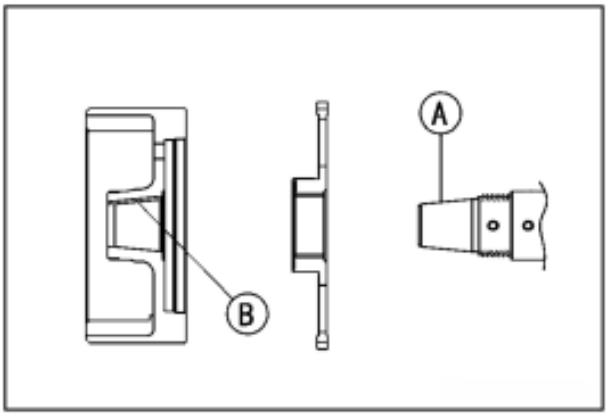
● Hold the alternator rotor steady with the rotor holder [A], and remove the rotor bolt [B] and washer.
Special Tool: Rotor Holder

● Using the flywheel puller [A], remove the alternator rotor from the crankshaft.
Special Tool - Flywheel Puller Assembly


| CAUTION |
| --- |
| **Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.** |

*Alternator Rotor Installation*

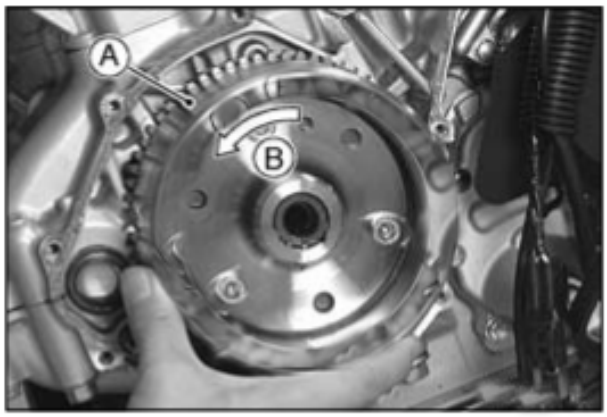
● Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
Crankshaft Tapered Portion [A]
Alternator Rotor Tapered Portion [B]



### Charging System

● Install the starter gear [A] and washer [B].
● Again, clean the crankshaft tapered portion [C] and dry there.


● Install the alternator rotor [A] while turning [B] it counter- clockwise.

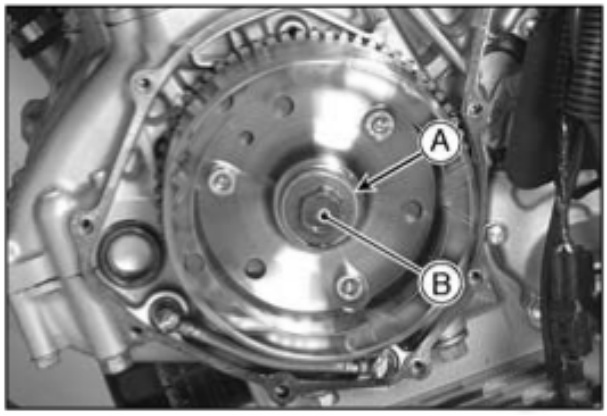



● Install the washer [A].

**NOTE**

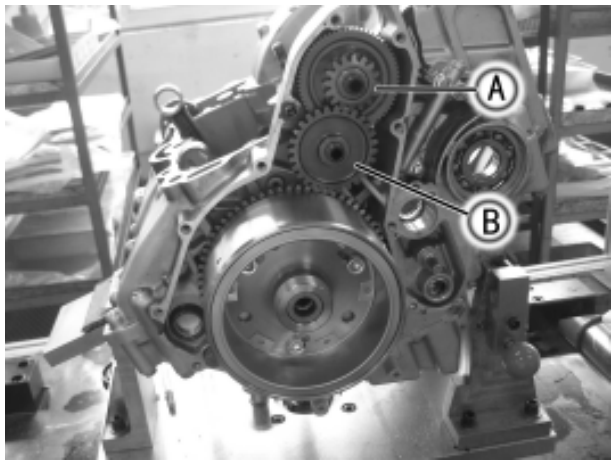
o *Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.*

● Apply molybdenum disulfide oil solution to the threads and seating surface of the rotor bolt.
● Install the rotor bolt [B] and tighten it with 70 N•m (7.0 kgf•m, 52 ft•lb) of torque.
● Remove the rotor bolt and washer.
● Check the tightening torque with flywheel puller.
★If the rotor is not pulled out with 20 N•m (2.0 kgf•m, 15 ft•lb) of drawing torque, it is installed correctly.
★If the rotor is pulled out with under 20 N•m (2.0 kgf•m, 15 ft•lb) of drawing torque, clean off any oil dirt or flaw of the crankshaft and rotor tapered portion, and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.
● Tighten the alternator rotor bolt while holding the alternator rotor steady with the rotor holder.




**Special Tools - Rotor Holder**
**Torque - Alternator Rotor Bolt: 155 N•m (15.8 kgf•m, 114 ft•lb)**

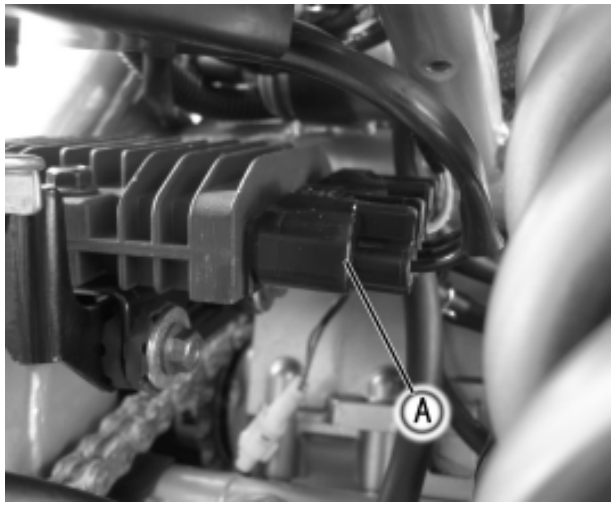
## Charging System




- Install the starter double gear [B] and starter idle gear [C].
- Install the alternator cover (see Alternator Cover Installation).

*Alternator Inspection*

There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.




- To check the alternator output voltage, do the fol lowing procedures.

o Turn off the ignition switch.
o Disconnect the alternator lead connector [A].
o Connect the hand tester as shown in the table 1.
o Start the engine.
o Run it at the rpm given in the table 1.
o Note the voltage readings (total 3 measurements).

**Table 1 Alternator Output Voltage**

| Tester Range | Connections | | Reading at 4000 rpm |
|---|---|---|---|
| | Tester (+) to | Tester (-) to | |
| 250 V AC | One Black lead | Another Black lead | 40 v or more |

★If the output voltage shows the value in the table, the alternator operates properly.
★If the output voltage shows a much higher than the value in the table, the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the alternator is defective.

### Charging System

● Check the stator coil resistance as follows.

o Stop the engine.

o Connect the hand tester as shown in the table 2.

o Note the readings (total 3 measurement).

**Table 2 Stator Coil Resistance**

| Tester Range | Connections | | Reading |
|---|---|---|---|
| | Tester (+) to | Tester (-) to | |
| x 1Ω | One Black lead | Another Black lead | 0.18<0.27Ω |

★If there is more resistance than shown in the table, or no hand tester reading (infinity) for any two leads, the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.

● Using the highest resistance range of the hand tester, measure the resistance between each of the black leads and chassis ground.

★Any hand tester reading less than infinity (∞) indi cates a short, necessitating stator replacement.

★If the stator coils have normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

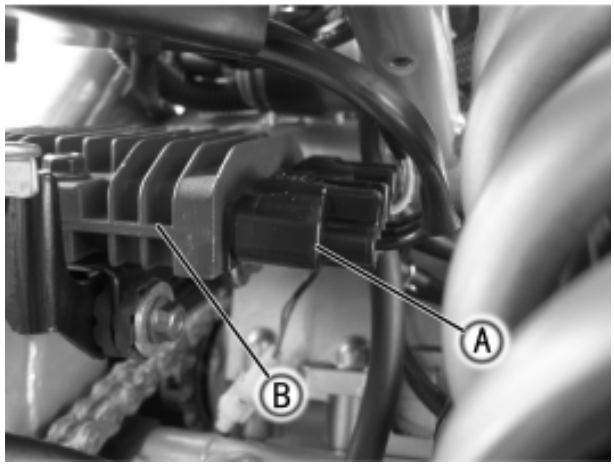
**Special Tool - Hand Tester**

**Charging System**

*Regulator/Rectifier*

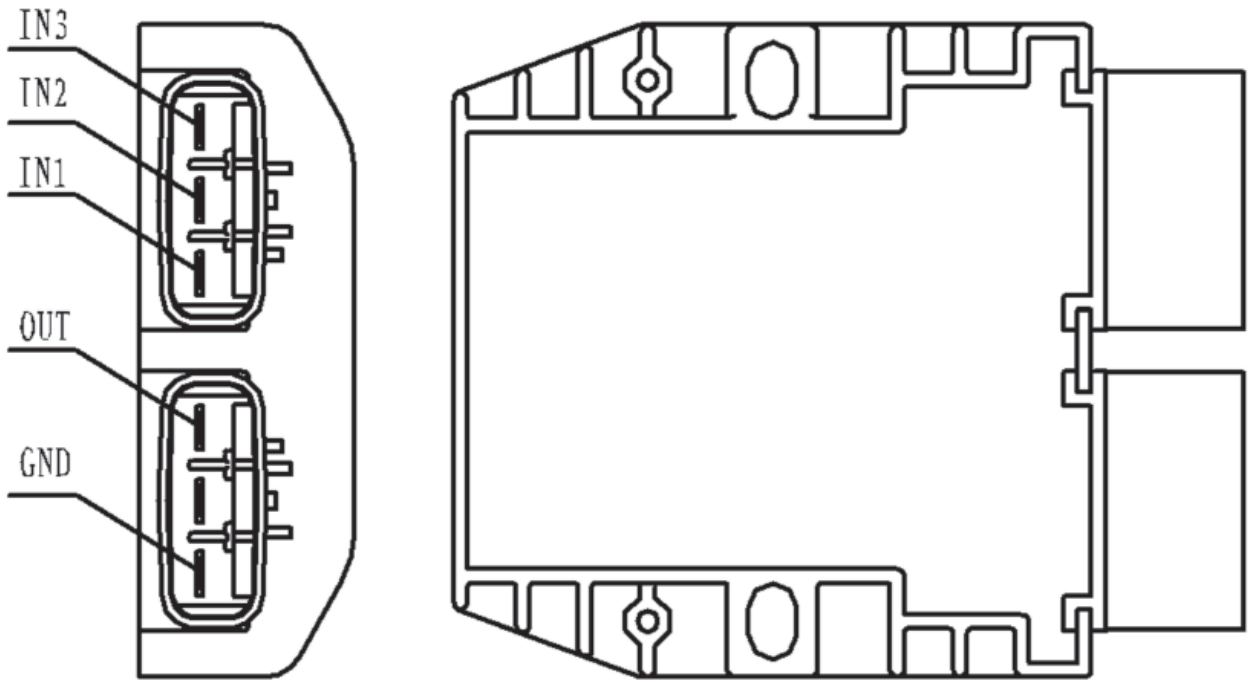
*Regulator/Rectifier Removal*


● Remove Bolts [A]




● Disconnect the connector [A].
● Remove the regulator/rectifier [B].

## Charging System




● Using a hand tester, measure the resistance be tween the following pair of terminals.
★ If any reading is out of the specification, replace the regulator/rectifier with a new one.
● Set the hand tester to Diode range (mv).

**NOTE**

○ *If the hand tester displays less than 1.4 V when the probes are not connected, replace the batteries.*

★After is the engine is running(at 5000 rpm), when the magneto is normal and the battery is fully charged, if the voltage between the red and green terminals is more than 15V or less than 13.5V, replace the regulator/rectifier with a new one.

| | | Red Probe (+) | | | | |
|---|---|---|---|---|---|---|
| | | IN1 | IN2 | IN3 | GND | OUT |
| Black Probe (-) | IN1 | | ∞ | ∞ | 100 - 800 | ∞ |
| | IN2 | ∞ | | ∞ | 100 - 800 | ∞ |
| | IN3 | ∞ | ∞ | | 100 - 800 | ∞ |
| | GND | ∞ | ∞ | ∞ | | ∞ |
| | OUT | 100 - 800 | 100 - 800 | 100 - 800 | 100 - 800 | |

## Charging System

*Starter Motor Clutch Removal/Installation*

● Refer to the Alternator Rotor Removal/Installation.

*Starter Motor Clutch Inspection*

● Remove alternator cover (see Alternator Cover Removal).

● Remove starter idle gear and starter double gear.

● Turn the starter motor clutch gear [A] by hand. The starter motor clutch gear should turn clockwise [B] freely, but should not turn counterclockwise [C].

★ If the starter motor clutch does not operate as it should or if it makes noise, go to the next step.

● Disassemble the starter motor clutch, and visually inspect the clutch parts.

★ If there is any worn or damaged part, replace it.

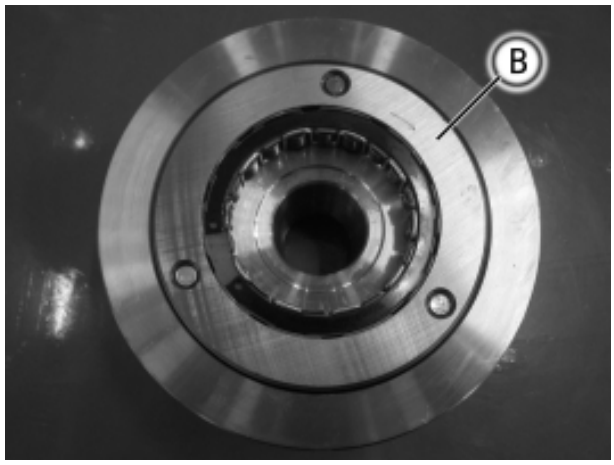

**NOTE**

o *Examine the starter motor clutch gear as well. Replace it if it worn or damaged.*

*Starter Motor Clutch Disassembly*

● Remove:
Alternator Rotor (see Alternator Rotor Removal)
Starter Motor Clutch Bolts [A]


● Remove:
Starter Motor Clutch [B]



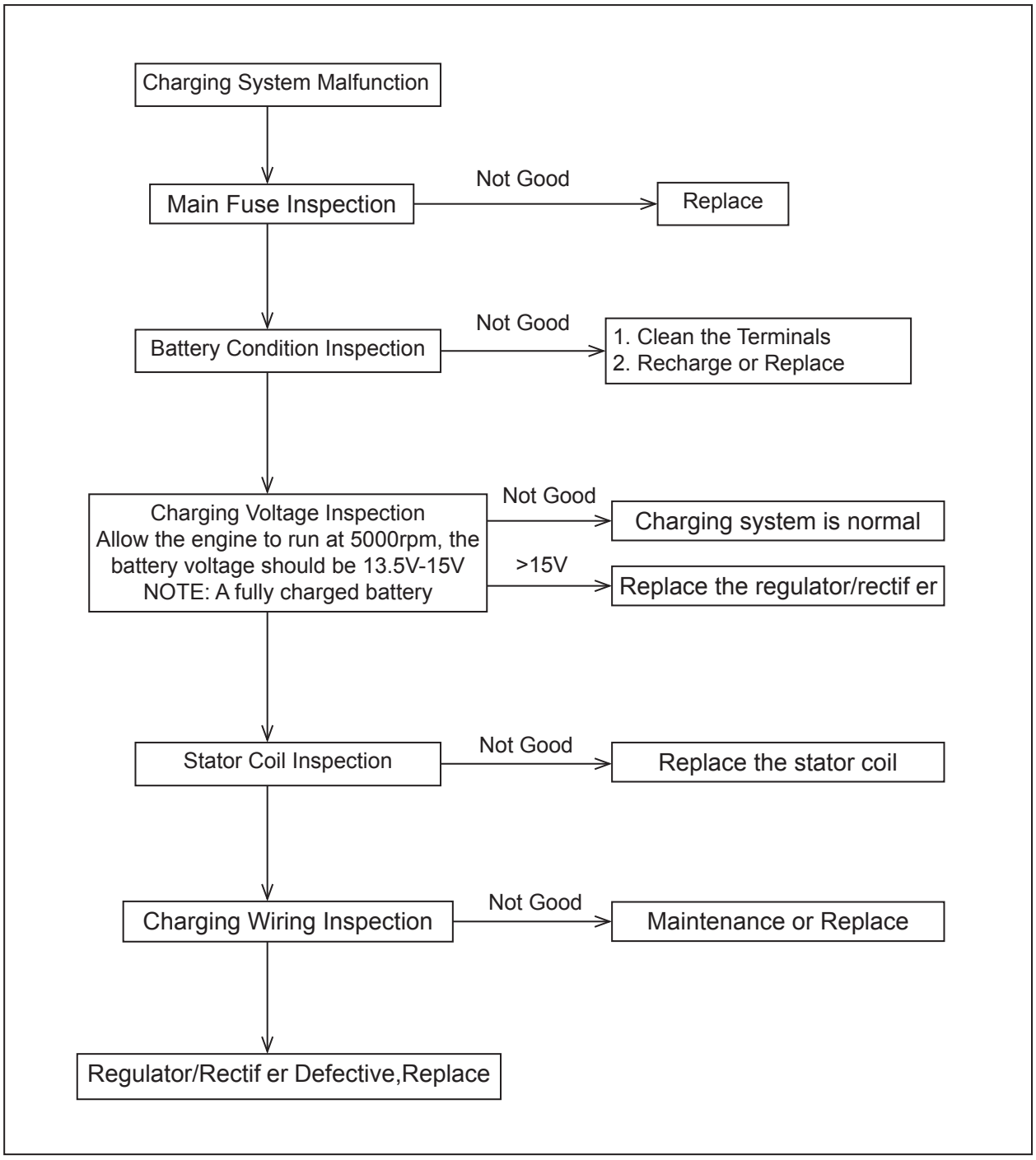

*Starter Motor Clutch Assembly*

● Apply a non-permanent locking agent to the threads of the starter motor clutch bolts and tighten them.

**Torque - Starter Motor Clutch Bolts: 34 N·m (3.5 kgf · m, 25 ft · lb)**

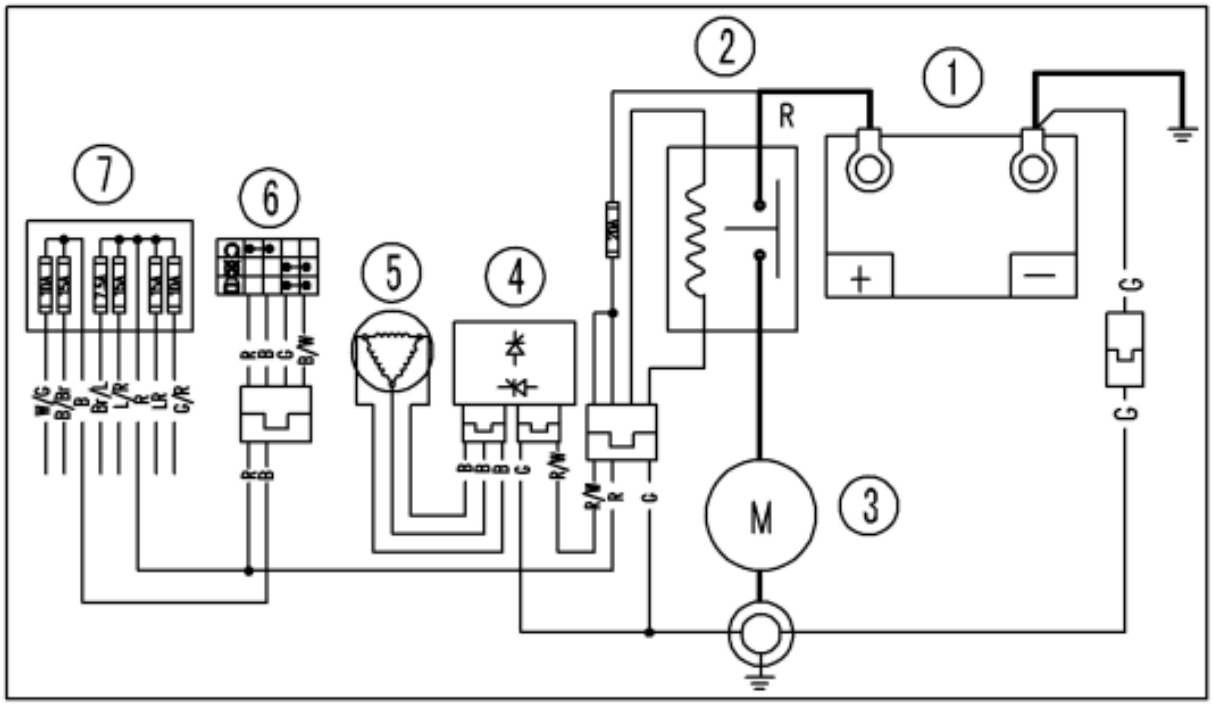
## Charging System

*Charging System Troubleshooting Chart*



**Charging System**

**Charging System Circuit**




1.Battery
2.Starter Relay
3.Starter Motor
4.Regulator/Rectifier
5.Magneto Assy
6.Ignition Switch
7.Fuse Box

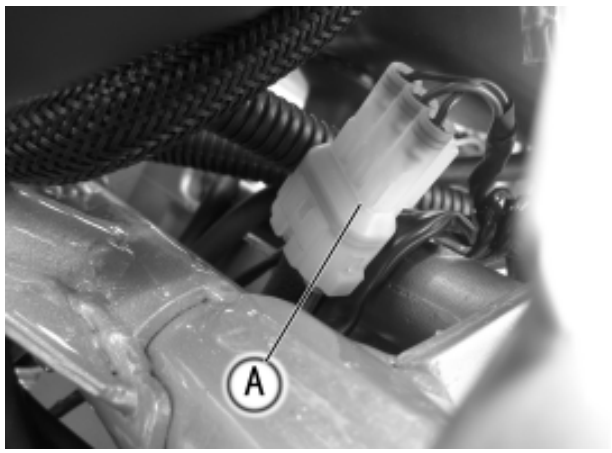
## Charging System

**⚠ WARNING**

**The ignition system produces extremely high voltage. Do not touch the spark plugs or stick coils while the engine is running, or you could receive a severe electrical shock.**

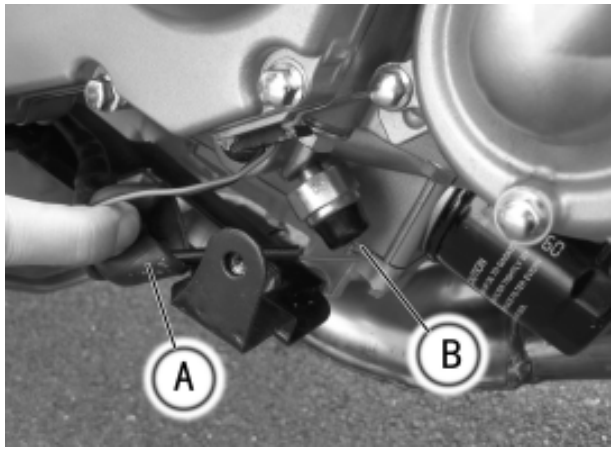
**⚠ WARNING**

**Do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent ECU (Electric Control Unit) damage.Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the ECU.**

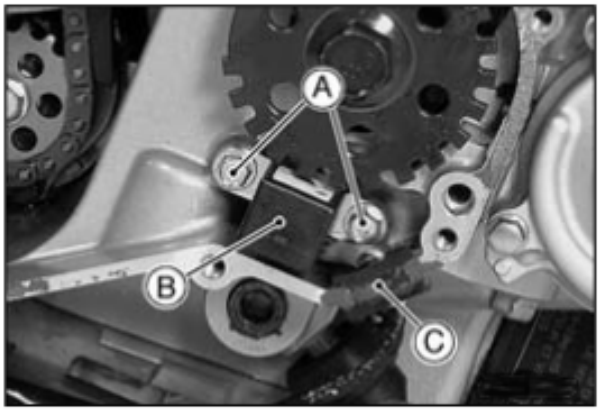



*Crankshaft Sensor Removal*

● Remove:
Lower Fairing (see Lower Fairing Removal in the Frame chapter)
Right Frame Cover (see Frame Cover Removal in the Frame chapter) Crankshaft Sensor Lead Connector [A].



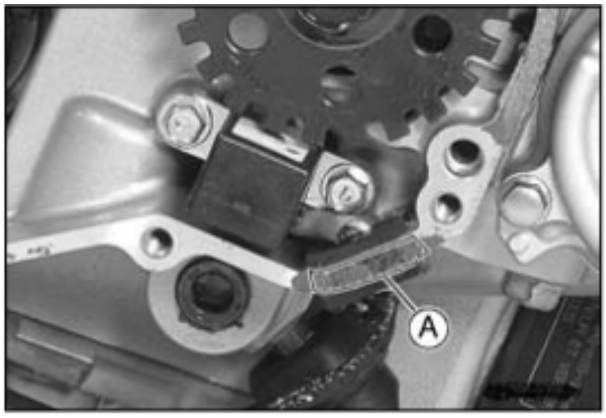

● Remove:
Rubber Boot(Slide Out) [A]
Oil Pressure Switch Lead Terminal [B]
Clutch Cover (see Clutch Cover Removal in the Clutch chapter)




● Remove:
Bolts [A]
Crankshaft Sensor [B]
● Pull out the grommet [C].

## Charging System

*Crankshaft Sensor Removal*




● Route the crankshaft sensor lead correctly.
● Tighten:
**Torque - Crankshaft Sensor Bolts: 6.0 N•m (0.60 kgf • m, 53 in • lb)**

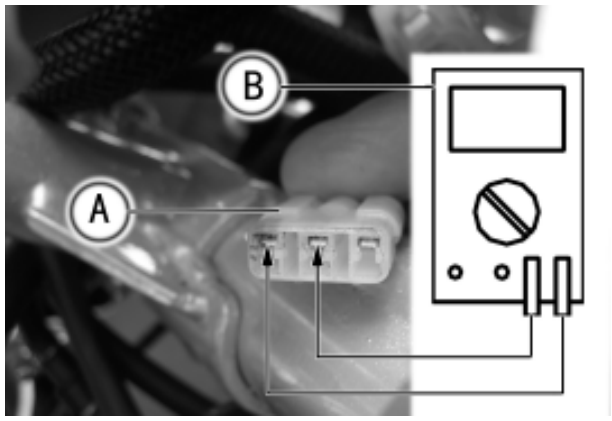
● Apply silicone sealant [A] to the crankshaft sensor lead grommet.
● Install the removed parts (see appropriate chapters).

*Crankshaft Sensor Inspection*

● Remove:
Right Frame Cover (see Frame Cover Removal in the Frame chapter)
Crankshaft Sensor Lead Connector [A].

*Crankshaft Sensor Resistance*

Set the hand tester to the x 100 Ω range

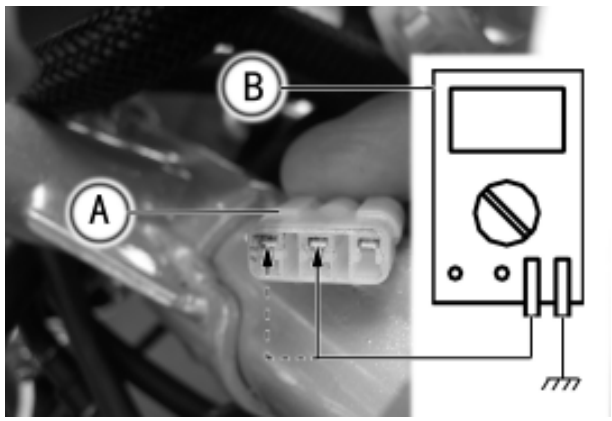



Meter(-)→ Black Lead

Meter(+)→ Green Lead

★If there is more resistance than the specified value, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

● Using the highest resistance range of the tester, measure the resistance between the crankshaft sensor leads and chassis ground.
Meter(+) →Black Lead or Green Lead
**Resistance between the Sensor and the Chassis Ground: ∞**




★Any tester reading less than infinity (∞) indicates a short, necessitating replacement of the crankshaft sensor assembly.

### Ignition System

*Crankshaft Sensor Peak Voltage Inspection*

**NOTE**

o *Be sure the battery is fully charged.*

o *Using the peak voltage adapter [A] is a more reliable way to determine the condition of the crankshaft sensor than crankshaft sensor internal resistance measurements.*

● Remove:
Crankshaft Sensor Lead Connector (see Crankshaft Sensor Removal)

● Set the hand tester [B] to the x DC 10 V range, and connect it to peak voltage adapter.

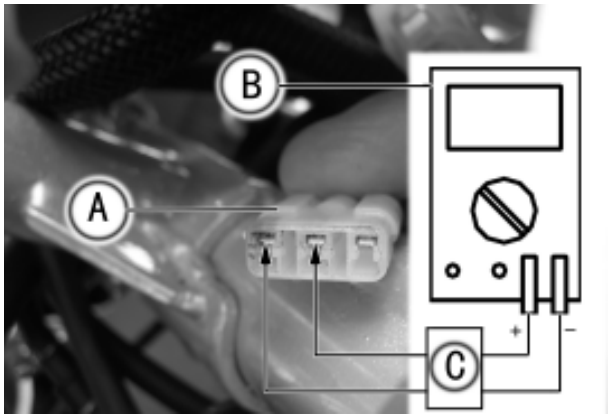
● Connect the positive terminal of the adapter [B] to green lead and connect the negative terminal of the adaper to black lead in the crankshaft sensor connector.

● Turn the ignition switch and engine stop switch ON.

● Pushing the starter button, turn the engine 4~5 seconds with the transmission gear in neutral to measure the crankshaft sensor peak voltage.

● Repeat the measurement 5 or more times.

**Crankshaft Sensor Peak Voltage**
**Standard: 1.9 V or more**




★If the tester reading is not specified one, check the crankshaft sensor.

*Timing Rotor Removal*

● Remove:
Clutch Cover (see Clutch Cover Removal in the Clutch chapter)

● Remove the timing rotor bolt [A].

● Remove the timing rotor.

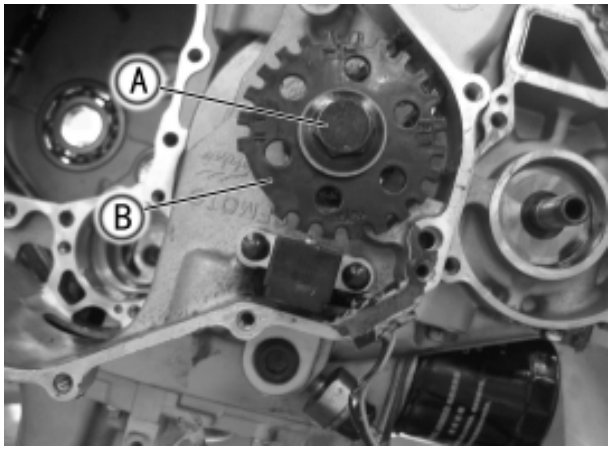
*Timing Rotor Installation*

● Fit the rotor to the crankshaft.

● Tighten the rotor bolt.

**Torque - Timing Rotor Bolt: 40 N • m (4.1 kgf • m, 30 ft • lb)**

● Install the removed parts (see appropriate chapters).

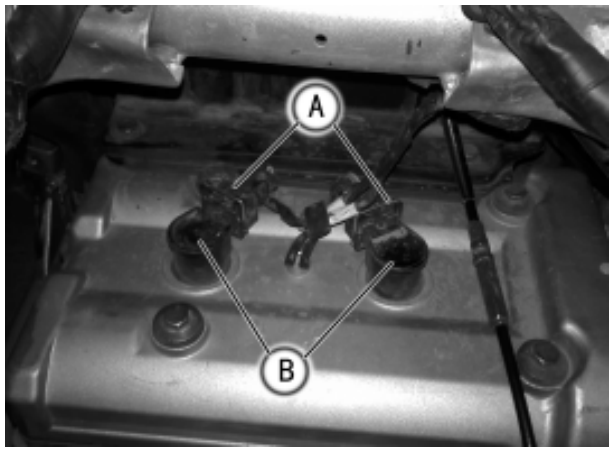


## Ignition System

### Ignition Coil

*Ignition Coil Removal*

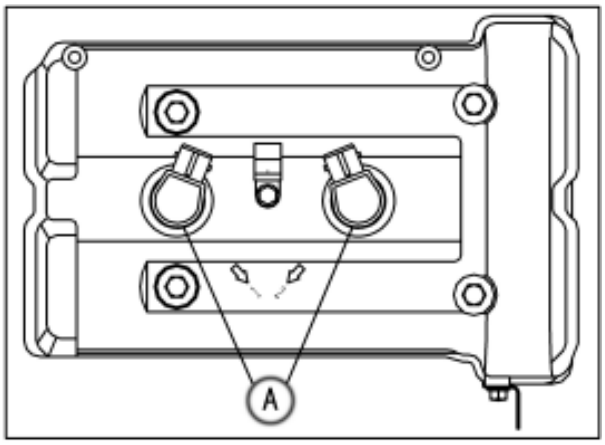
- Remove the air cleaner housing (see Air Cleaner Housing Removal in the EFI System chapter).
- Disconnect the ignition coil connectors [A].
- Pull the ignition coils [B] off the spark plugs.




| CAUTION |
| --- |
| **Do not pry the connector part of the coil while removing the coil.** |

*Ignition Coil Installation*

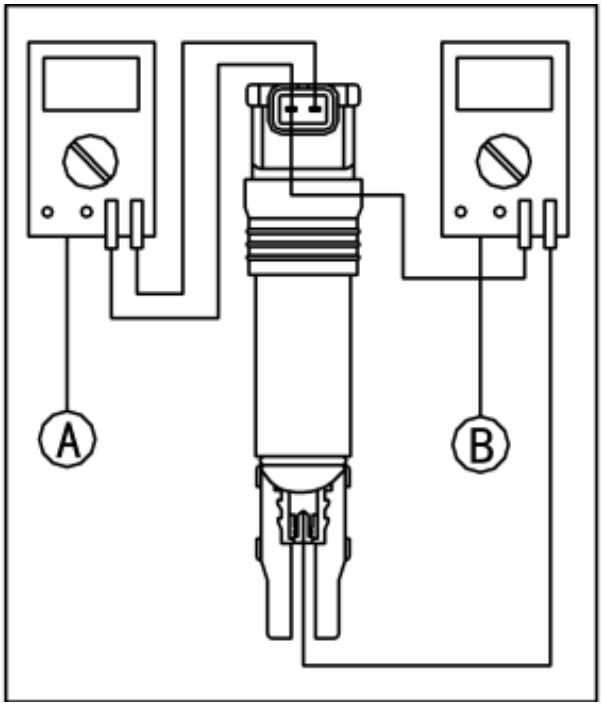
- Insert the coil as shown being careful of the coil heads [A] direction.
- Connect the connectors.




| CAUTION |
| --- |
| **Do not tap the coil head while installing the coil.** |

*Ignition Coil Inspection*

- Remove the ignition coils (see Ignition Coil (Ignition Coil together with Spark Plug Cap) Removal).
- Measure the primary winding resistance [A] as follows.
- Connect the hand tester between the coil terminals.
- Set the tester to the x 10 Ω range, and read the tester.
- Measure the secondary winding resistance [B] as follows.
- Connect the tester between the plug terminal and (-) coil terminal.
- Set the tester to the x1 k Ω range and read the tester.




**Ignition Coil Winding Resistance**
**Primary Windings: 1.1 ~1.5 Ω**
**Secondary Windings: 10.8 ~16.2 k Ω**

★If the tester does not read as specified, replace the coil.

## Ignition System

### Ignition Coil

*Stick Coil Primary Peak Voltage*

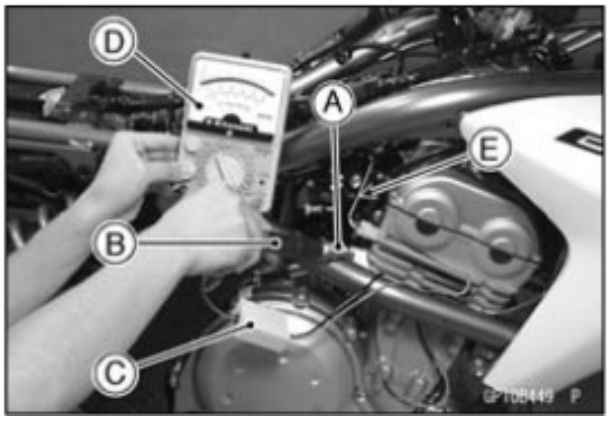
**NOTE**

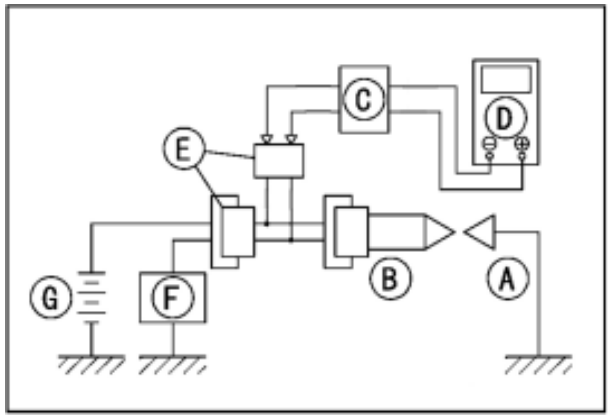
o *Be sure the battery is fully charged.*

- Remove the ignition coils (see Ignition Coil (Ignition Coil together with Spark Plug Cap) Removal), but do not remove the spark plugs.
- Measure the primary peak voltage as follows.
- Install the new spark plug [A] into each ignition coil [B], and ground them onto the engine.
- Connect the peak voltage adapter [C] into the hand tester [D] which is set to the x DC 250 V range.
- Connect the adapter to the lead wire-peak voltage adapter [E] which is connected between the ignition coil connector and ignition coil.

  Battery [G]

  ECU [F]




**⚠ WARNING**

**To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.**

- Turn the ignition switch and the engine stop switch ON.
- Pushing the starter button, turn the engine 4~5 sec onds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 times for one ignition coil.

  **Stick Coil Primary Peak Voltage**

  **Standard: 88 V or more**
- Repeat the test for the other stick coil.

★If the reading is less than the specified value, check the following.

Ignition Coils (see Ignition Coil (Ignition Coil together with Spark Plug Cap) Inspection)

Crankshaft Position Sensor (see Crankshaft Sen sor Inspection)

ECU (see ECU Power Supply Inspection in the EFI chapter)

*Spark Plug Removal*

- Refer to the Spark Plug Replacement in the Peri- odic Maintenance chapter.

*Spark Plug Installation*

- Refer to the Spark Plug Replacement in the Peri- odic Maintenance chapter.

**Ignition System**

*Spark Plug Condition Inspection*

● Refer to the Spark Plug Condition Inspection in the Periodic Maintenance chapter.

*Interlock Operation Inspection*

● Raise the rear wheel off the ground with stand.

**1st Check**

● Start the engine to the following conditions.

**Condition**

**Transmission Gear → 1st Position**

**Clutch Lever → Release**

**Sidestand → Down or Up**

● Turn the ignition switch ON and push the starter button.

● Then the starter motor should not turn when the starter system circuit is normality.

★If the engine is start, inspect the starter lockout switch, neutral switch and relay box.

★If their parts are normality replace the ECU.

**2nd Check**

● Start the engine to the following conditions.

**Condition**

**Transmission Gear → 1st Position Clutch Lever → Pulled in Sidestand → Up**

● Turn the ignition switch ON and push the starter button.

● Then the starter motor should turn when the starter system circuit is normality.

★If the starter motor is not turn, inspect the clutch switch, neutral switch and relay box.

★If their parts are normality replace the ECU.

**3rd Check**

● Inspect the engine for its secure stop after the following operations are completed.

● Run the engine to the following conditions.

**Condition**

**Transmission Gear → 1st Position Clutch Lever → Pulled in Sidestand → Up**

● Set the sidestand on the ground, then the engine will stop.

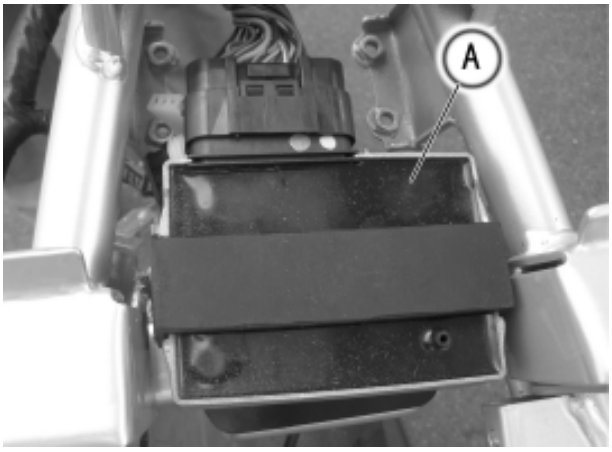
★If whichever may not be stopped, inspect the neutral switch, clutch switch, sidestand switch and re lay box.

★If their parts are normality, replace the ECU.

### Ignition System

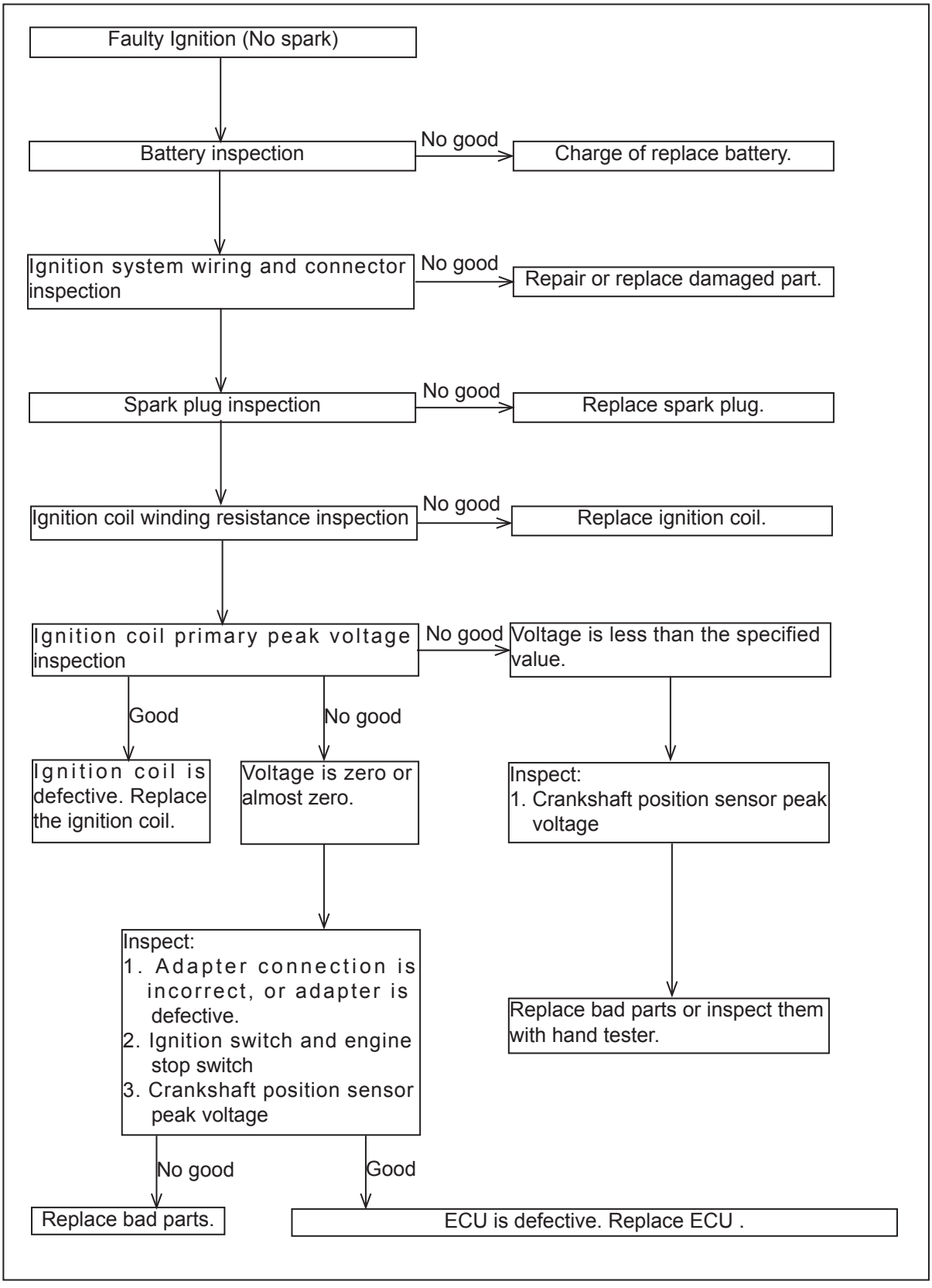
*IC Igniter Inspection*

- The IC igniter is built in the ECU [A].
- Refer to the Interlock Operation Inspection, Ignition System Troubleshooting chart and EFI chapter for ECU Power Supply Inspection.



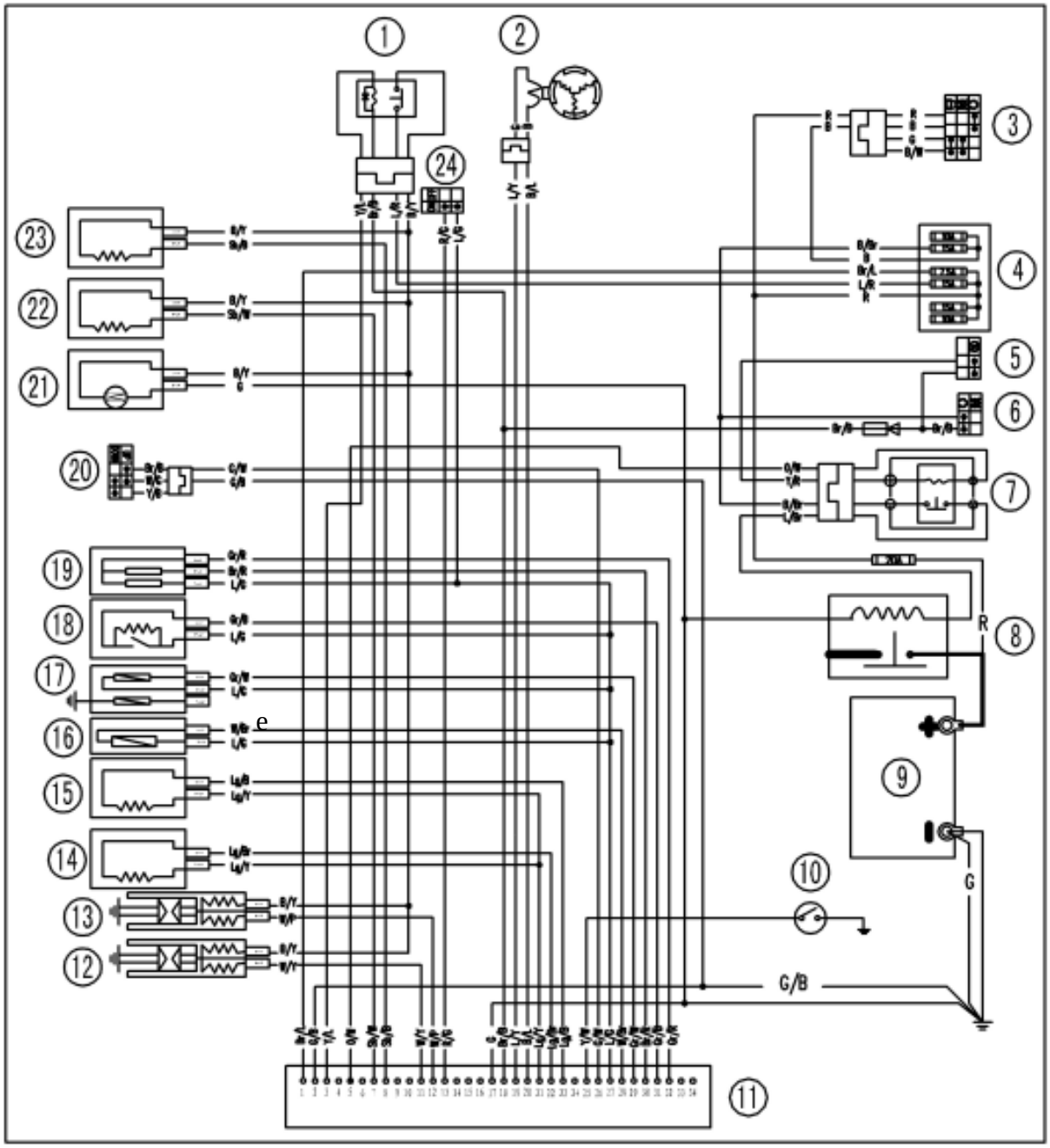
## Ignition System

### Ignition System Troubleshooting Chart



**Ignition System**

**Ignition System Circuit**

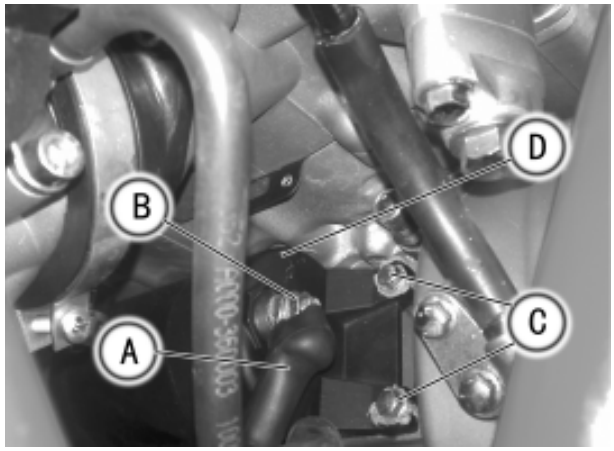



1. Fuel Pump Relay
2. Crankshaft Position Sensor
3. Ignition Switch
4. Fuse Box
5. Starter Button
6. Engine Stop Switch
7. Auxiliary Starter Relay
8. Starter Relay
9. Battery
10. Neutral Switch
11. ECU
12. Ignition Coil &Spark Plug # 1
13. Ignition Coil &Spark Plug #2
14. Oxygen Sensor # 1
15. Oxygen Sensor # 2
16. Air Temperature Sensor
17. Coolant Temperature Sensor
18. Roll-over Sensor
19. Throttle Position Sensor
20. Sideswitch
21. Fuel Pump
22. Fuel Injector # 1
23. Fuel Injector # 2
24. Clutch Swith

## Electric Starter System

*Starter Motor Removal*

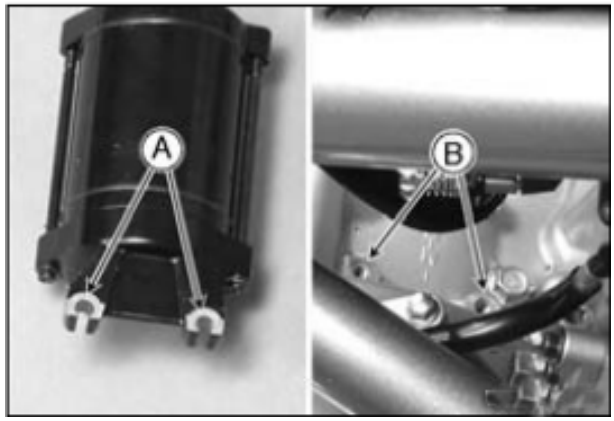
| CAUTION |
| --- |
| **Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.** |




- Remove the fuel tank (see Fuel Tank Removal in the EFI chapter).
- Slide back the rubber cap [A].
- Remove the starter motor cable terminal nut [B].
- Remove the mounting bolts [A].
- Pull out the starter motor [B].

*Starter Motor Installation*

- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.




- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Apply a non-permanent locking agent to the threads of the bolts and tighten the bolts.

**Torque - Starter Motor Mounting Bolts: 9.8 N•m (1.0 kgf • m, 87 in • lb)**

- Install the starter motor cable.
- Tighten:

**Torque - Starter Motor Cable Terminal Nut: 6.0 N • m (0.60 kgf • m, 53 in • lb)**

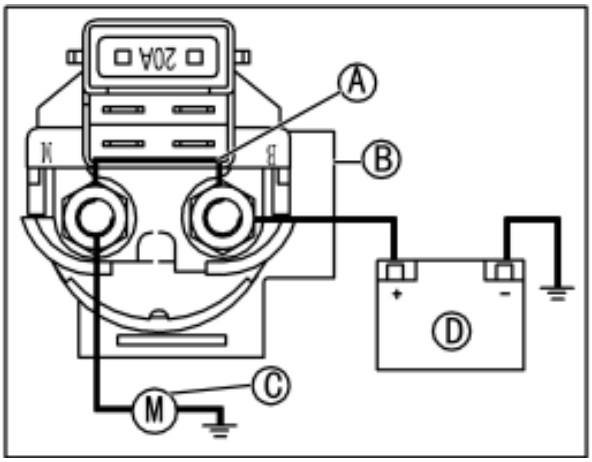

*Starter Motor Test*

- Using a cable as thick as or thicker than starter motor cable [A], connect the 2 terminals of starter relay [B].
  Starter Motor [C]
  Battery [D]

**NOTE**

o *Be sure the battery is fully charged.*

★If the starter motor turns, that indicates it's normal. Otherwise, the starter motor is defective and needs to be replaced.

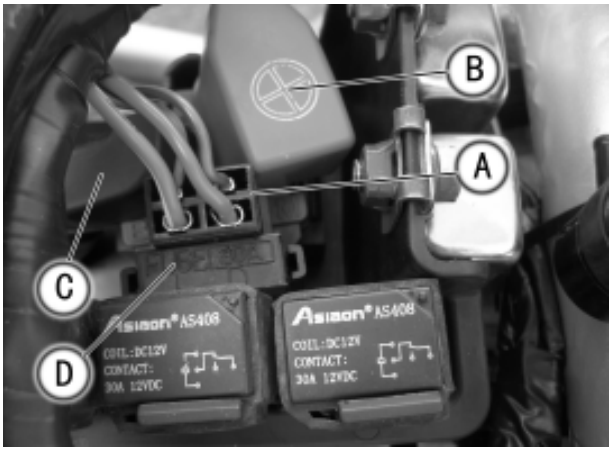


## Ignition System

### Starter Relay

*Starter Relay Removal*

- Remove the fuel tank.
- Discennect the connector [A].
- Disconnect the starter motor cable [B] and battery positive (+) cable [C] from the starter relay [D].
- Disconnect the starter relay [D]

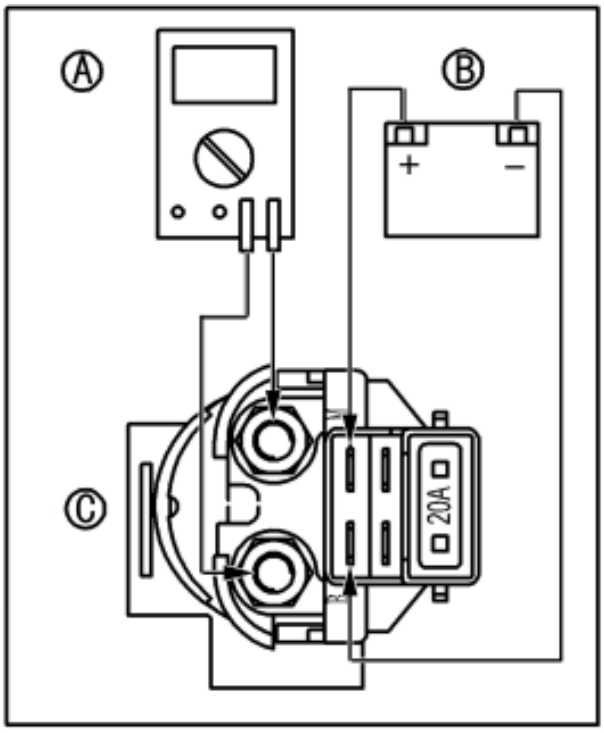



*Starter Relay Test*

- Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown.
  **When battery is connected → 0 Ω**
  **When battery is disconnected → ∞ Ω**

| CAUTION |
| --- |
| **The battery positive (+) cable with the rubber cap is connected directly to the battery positive (+) terminal even when the ignition switch off, so take care not to short the removed cable to chassis ground.** |

★If the relay does not work as specified, the relay is defective. Replace the relay.

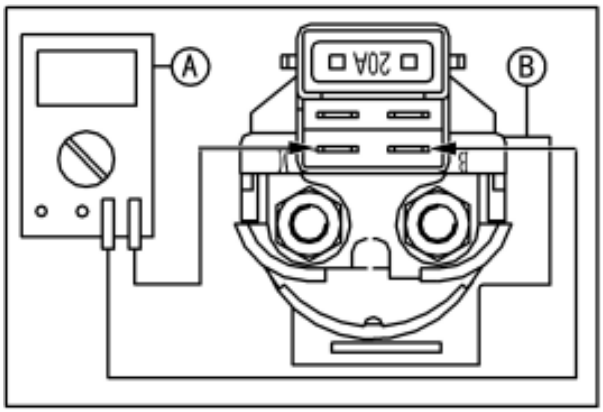



*Starter Relay Resistance Measurement*

- Connect the hand tester [A] and starter relay [B] as shown.
  Starter Relay Resistance: 3~5 Ω(20℃)

★If the reading is out of specification, the relay is defective. Replace the relay.

★Using the relay connection and disconnection test is a more reliable way to determine the condition of the starter relay than starter relay resistance measurements.



## Starting System

### Starting Logic Table

| Sidestand Switch | | Gear Position | | Clutch Switch | | Starter Switch |
|---|---|---|---|---|---|---|
| UP | Grounded | Neutral | Grounded | Released | Disconnected | Can be started |
| UP | Grounded | Neutral | Grounded | Pulled | Grounded | Can be started |
| UP | Grounded | In Gear | Disconnected | Released | Disconnected | Can not be started |
| UP | Grounded | In Gear | Disconnected | Pulled | Grounded | Can be started |
| DOWN | Disconnected | Neutral | Grounded | Released | Disconnected | Can be started |
| DOWN | Disconnected | Neutral | Grounded | Pulled | Grounded | Can be started |
| DOWN | Disconnected | In Gear | Disconnected | Released | Disconnected | Can not be started |
| DOWN | Disconnected | In Gear | Disconnected | Pulled | Grounded | Can not be started |

● Start the engine according to the Starting Logic Table above, otherwise, the engine can not be started. Starting logic is controlled by ECU.

★ If the engine can not be started in accordance with the logic table, check sidestand switch, gear position sensor, clutch switch, engine stop switch, ignition switch, starter switch, ECU, fuse, starter relay, starter motor clutch, double gear,etc.

## Starting System

### Starting Logic Table

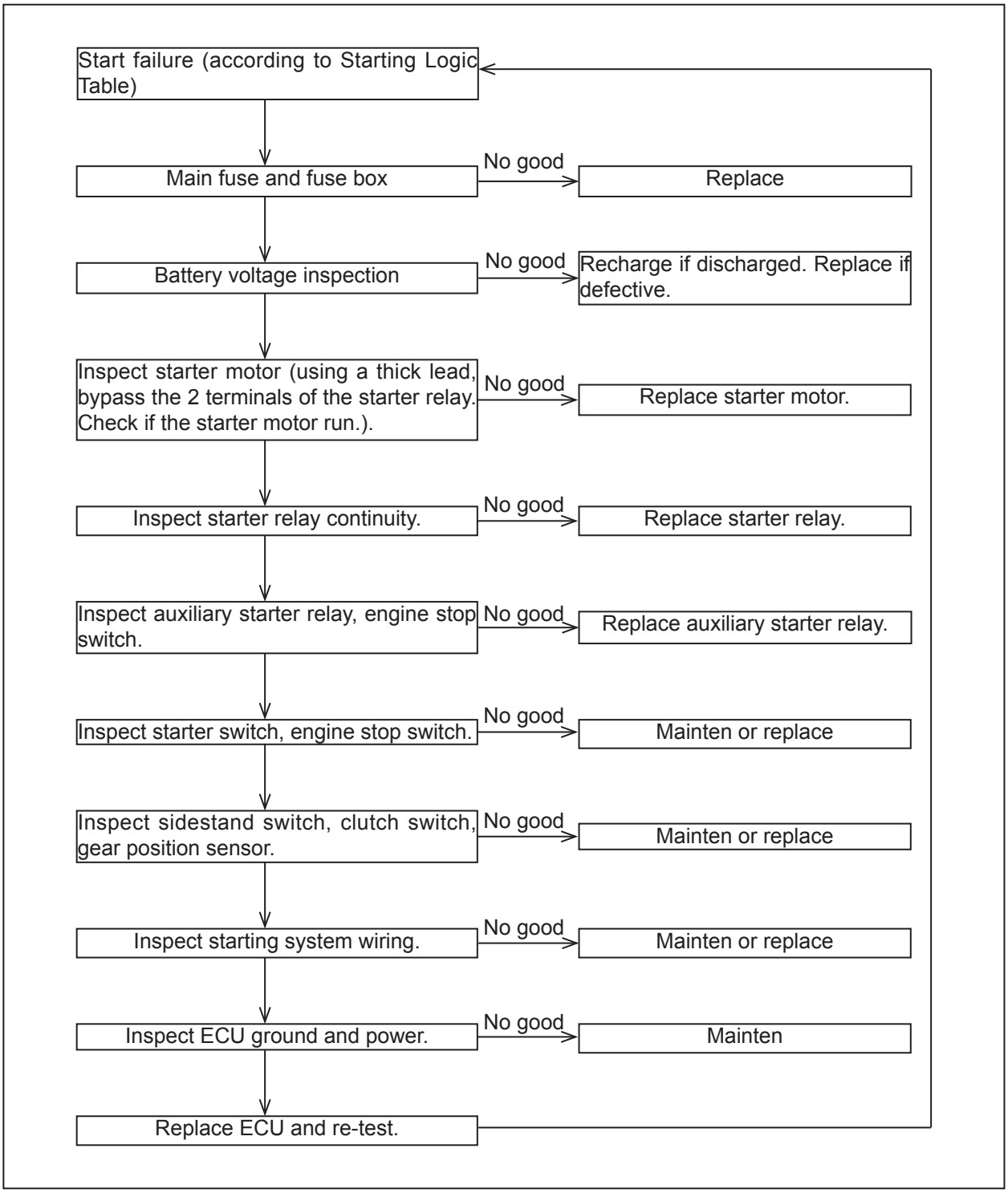
| Sidestand Switch | | Gear Position | | Clutch Switch | | Starter Switch |
|---|---|---|---|---|---|---|
| UP | Grounded | Neutral | Grounded | Released | Disconnected | Can be started |
| UP | Grounded | Neutral | Grounded | Pulled | Grounded | Can be started |
| UP | Grounded | In Gear | Disconnected | Released | Disconnected | Can not be started |
| UP | Grounded | In Gear | Disconnected | Pulled | Grounded | Can be started |
| DOWN | Disconnected | Neutral | Grounded | Released | Disconnected | Can be started |
| DOWN | Disconnected | Neutral | Grounded | Pulled | Grounded | Can be started |
| DOWN | Disconnected | In Gear | Disconnected | Released | Disconnected | Can not be started |
| DOWN | Disconnected | In Gear | Disconnected | Pulled | Grounded | Can not be started |

● Start the engine according to the Starting Logic Table above, otherwise, the engine can not be started. Starting logic is controlled by ECU.

★ If the engine can not be started in accordance with the logic table, check sidestand switch, gear position sensor, clutch switch, engine stop switch, ignition switch, starter switch, ECU, fuse, starter relay, starter motor clutch, double gear,etc.

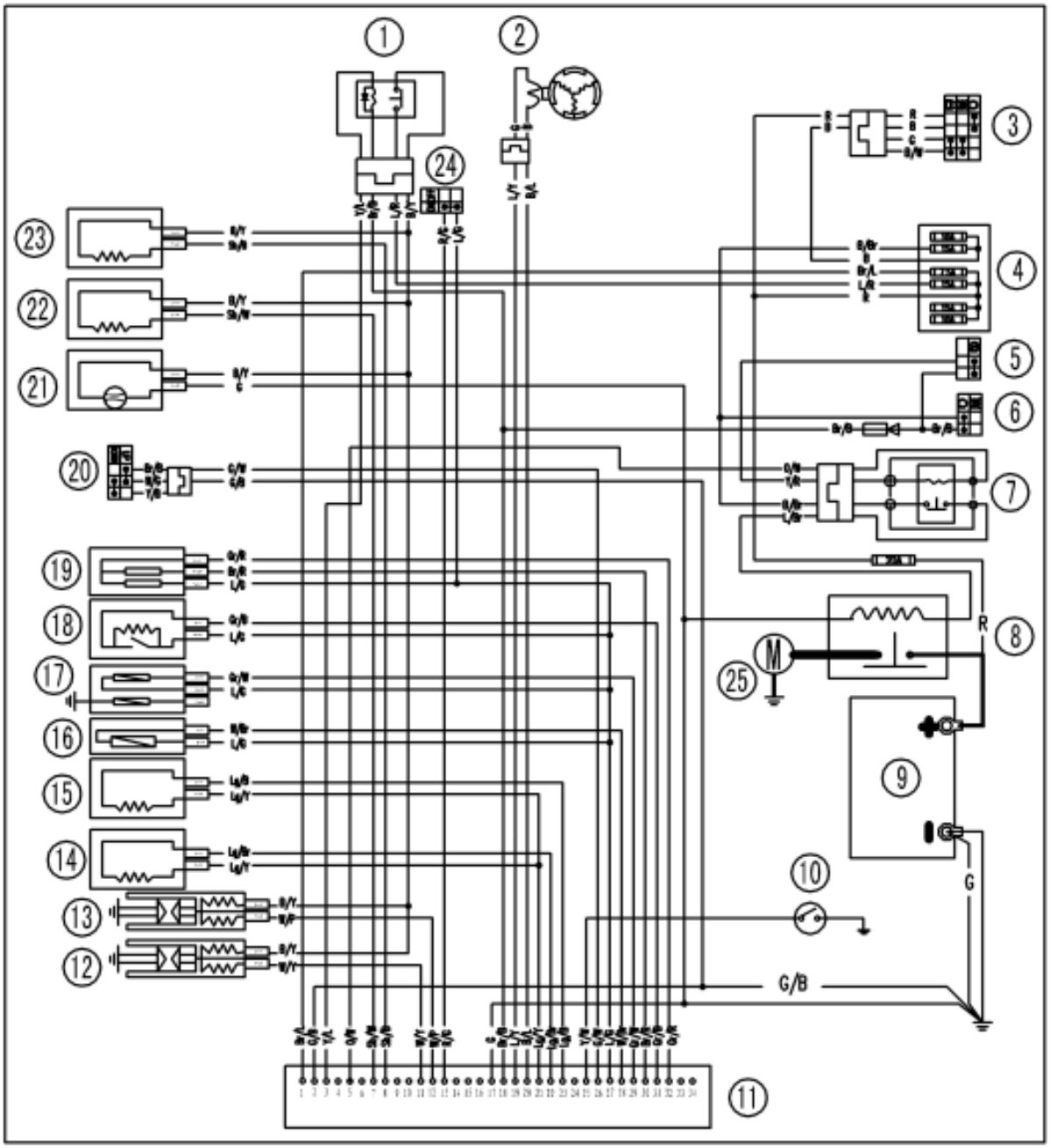
## Starting System

### Starting System Troubleshooting Chart



### Ignition System

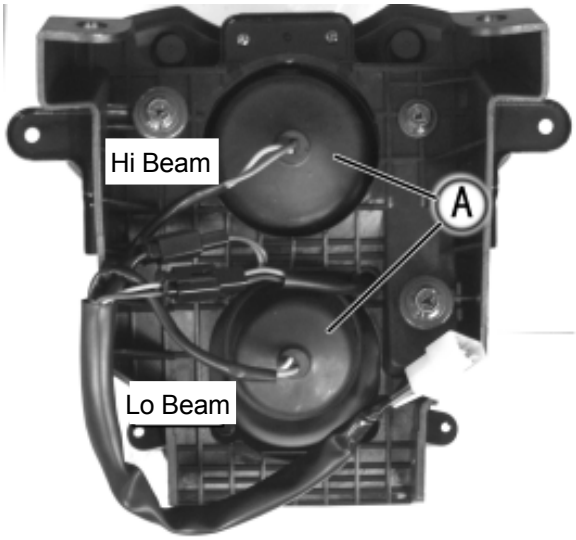
### Ignition System Circuit




1.Fuel Pump Relay
2.Crankshaft Position Sensor
3.Igniition Switch
4.Fuse Box
5.Starter Button
6.Engine Stop Switch
7.Auxiliary Starter Relay
8.Starter Relay
9.Battery
10.Neutral Switch
11.ECU
12.Ignition Coil & Spark Plug # 1
13.Ignition Coil & Spark Plug # 2
14.Oxygen Sensor # 1
15.Oxygen Sensor # 2
16.Air Temperature Sensor
17.Coolant Temperature Sensor
18.Roll-over Sensor
19.Throttle Position Sensor
20.Sidestand Switch
21.Fuel Pump
22.Fuel Injector # 1
23.Fuel Injector # 2
24.Clutch Switch
25.Starter Motor

### Lighting System

● The headlight goes on when the ignition switch and the light switch are turned on. Meanwhile, the head light beam can be switched between high beam and low beam.

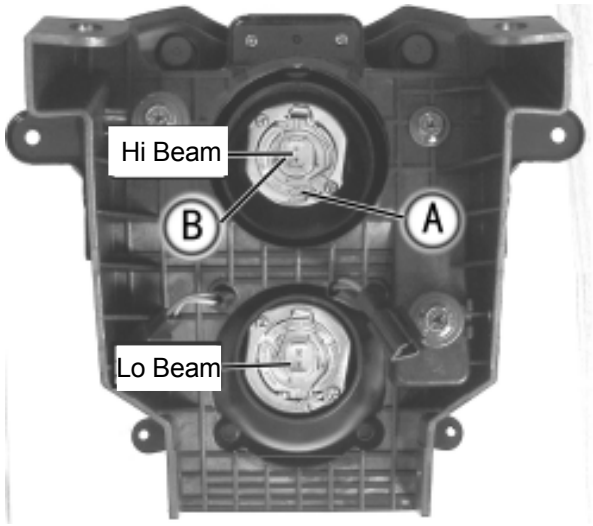



*Headlight Bulb Replacement*

● Remove:
HeadlightAssy (see Headlight Removal/Installation)
Hook [A]
Headlight Bulb [B].

**CAUTION**

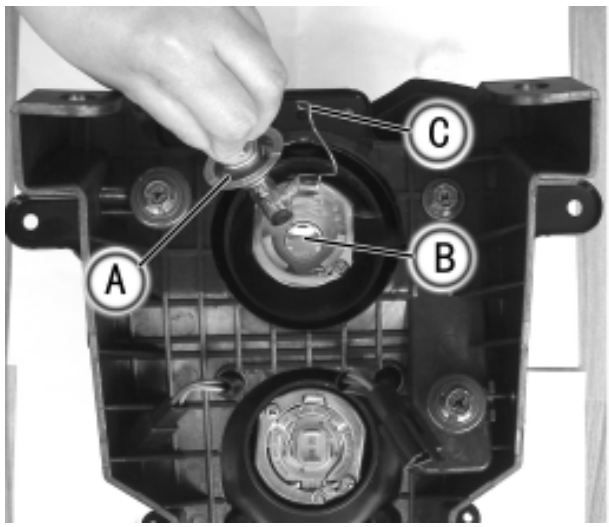
**When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.**



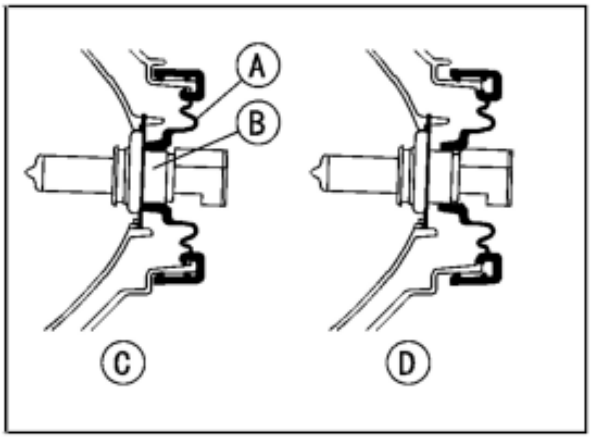

**NOTE**

o *Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.*

● Replace the headlight bulb.
● Fit the projection [A] of the bulb in the hollow [B] of the headlight.
● Install the hook [C].



### Lighting System



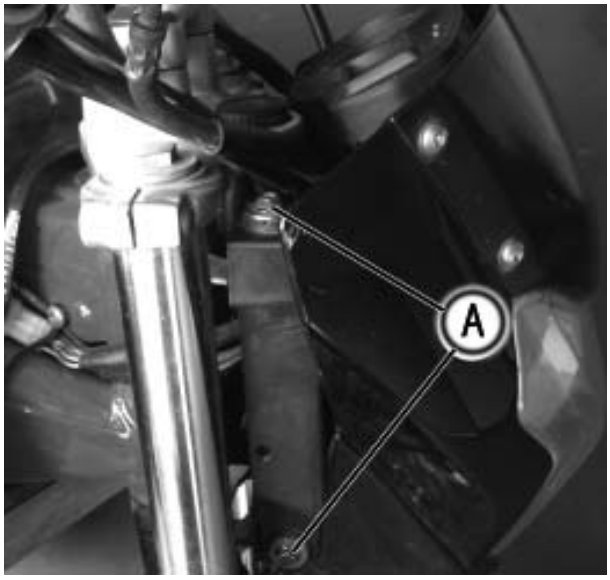

● Fit the dust cover [A] with the "Top" mark upward onto the bulb [B] firmly as shown.
Good [C]
Bad [D]

*Position Light Bulb Replacement*

● Position light bulb is unserviceable. If the position light bulb is defective, replace the headlight assy.

## Lighting System

*Headlight Removal/Installation*



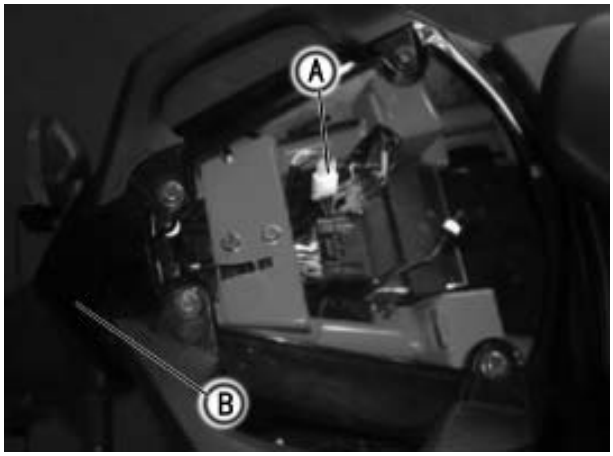

*Headlight Removal/Installation*

- Remove:
  Mounting Bolts [A]


- Disconnect the headlight connector [A].
- Remove the headlight assy.
- Remove the upper fairings (see Upper Fairing Removalin the Frame chapter).
- Installation is the reverse of removal.

*Tail/Brake Light Removal*

- Remove:
  Seat Covers (see Seat Cover Removal in the Frame chapter)
- Disconnect the connector [A].
- Remove the left and right handrails.
- Remove the tail/brake light [B].

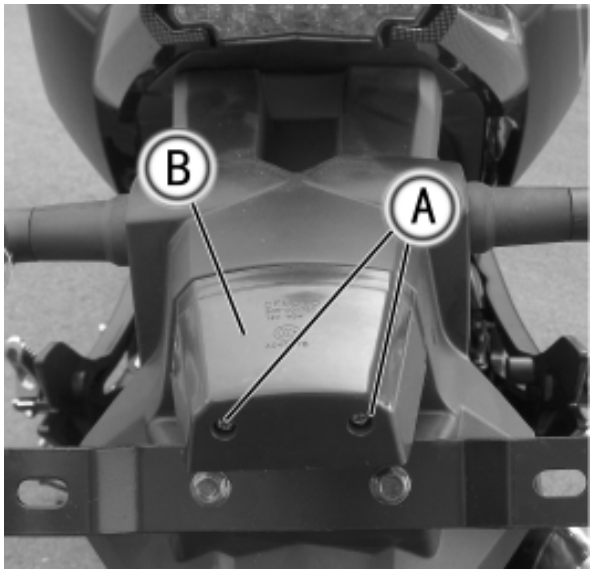



*Tail/Brake Light Installation*

- Installation is the reverse of removal.
  Tail/Brake light bulb is unserviceable. Replace the tail/brake light assy if necessary.

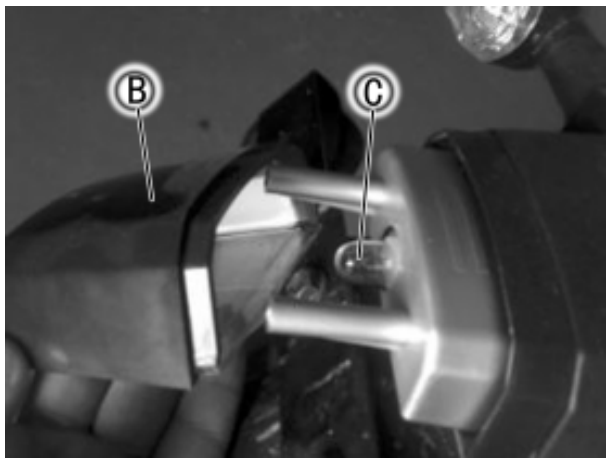
### Lighting System

*License Plate Light Bulb Replacement*




- Remove:
  Screws [A]
  License Plate Light Cover [B]
- Remove the bulb.

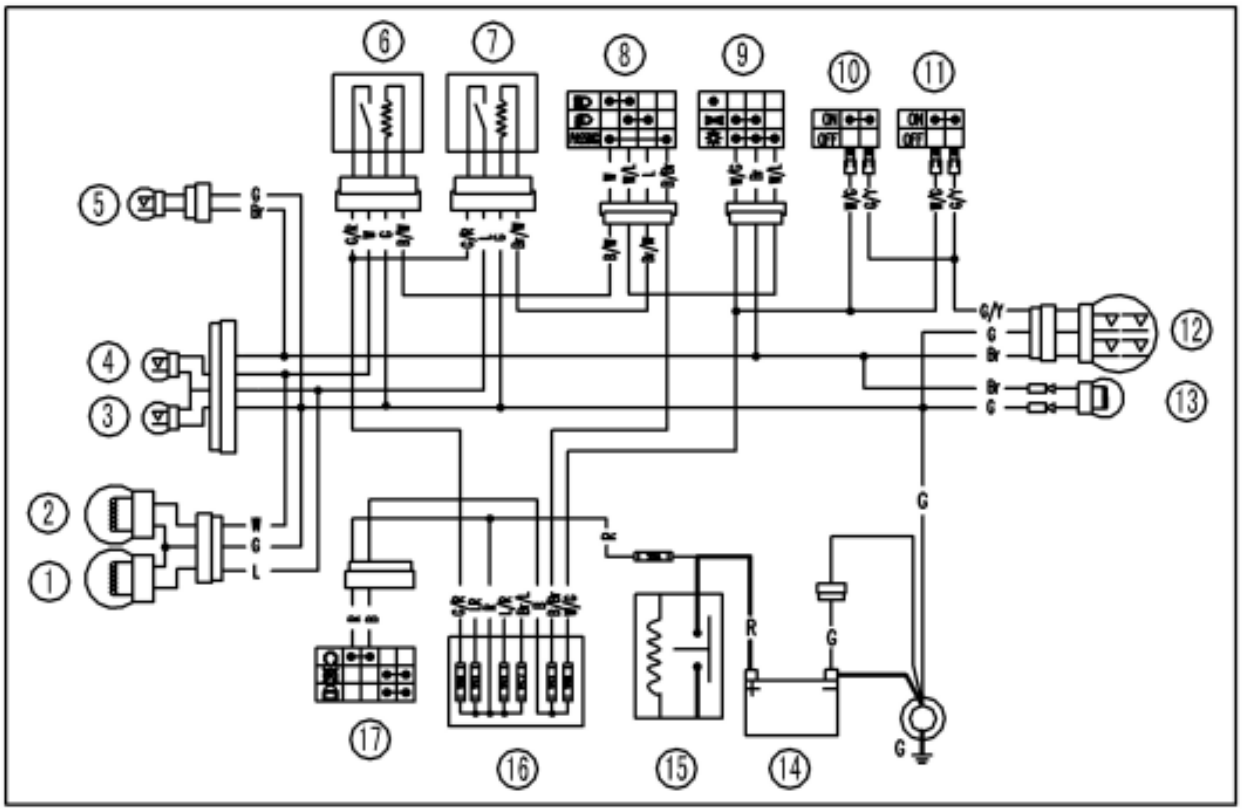
Replace the bulb with a new one.
Install the license plate light cover [B].
Tighten the scew.




**Toreque-license plate light cover screw:**
**0.90 N • m**

## Lighting System

### Headlight/Position Light Circuit



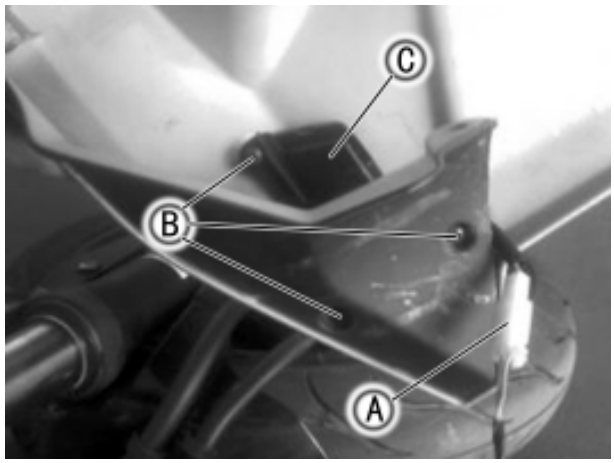

1.Headlight (Hi Beam)
2.Headlight (Lo Beam)
3.Hi Beam Indicator Light
4.Instrument Light
5.Position Light
6.Hi Beam Relay
7.Lo Beam Relay
8.Dimmer Switch
9.Light Switch
10.Front Brake Switch
11.Rear Brake Switch
12.Tail/Brake Light
13.License Plate Light
14.Battery
15.Starter Relay
16.Fuse Box
17.Ignition Switch

## Lighting System

### Turn Signal Light

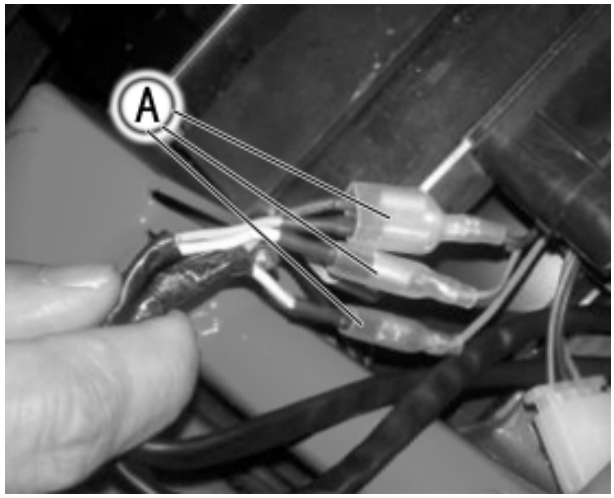
*Front Right Turn Signal Light Assy Replacement*

- Remove the fuel tank right side panel.
- Disconnect the connector [A].
- Remove the screw [B].
- Remove the front right turn signal light assy.
- Installation is the reverse of the removal.



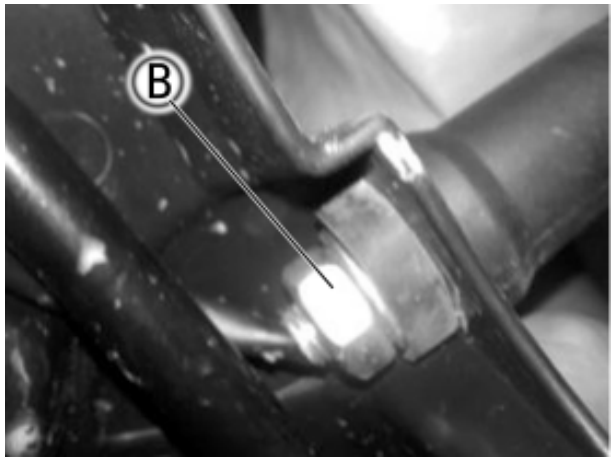

*Front Left Turn Signal Light Assy Replacement*

- Refer to the front right turn signal light assy replacement.




*Rear Right Turn Signal Light Assy Replacement*

- Disconnect the connector [A].
- Remove the rear fender assy.
- Remove the nut [B].
- Remove the rear right turn signal light assy.
- Install a new rear right turn signal light assy.
- Installation is the reverse of the removal.

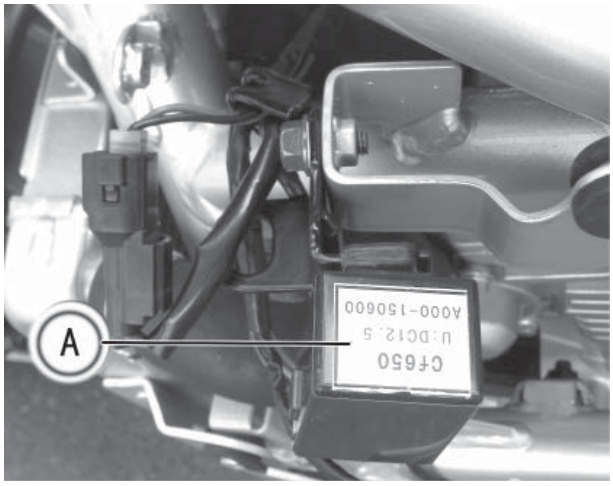



*Rear Left Turn Signal Light Assy Replacement*

- Refer to rear right signal light assy replacement.

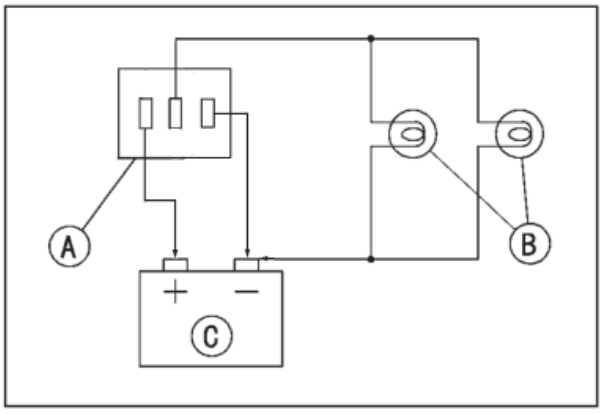
## Lighting System
### Turn Signal Light
### Flasher
*Flasher Removal*

● Remove the middle fairing(Refer to Middle Fairing Removal.)
● Remove the flasher [A].




*Flasher Inspection*

● Connect a 12 V battery and turn signal light as shown and count how many times the flasher blinks in one minute.
Flasher [A]
Turn Signal Light [B]
12 V Battery [C]
If the flasher does not blink as specified, replace the flasher.




*Flasher Test*

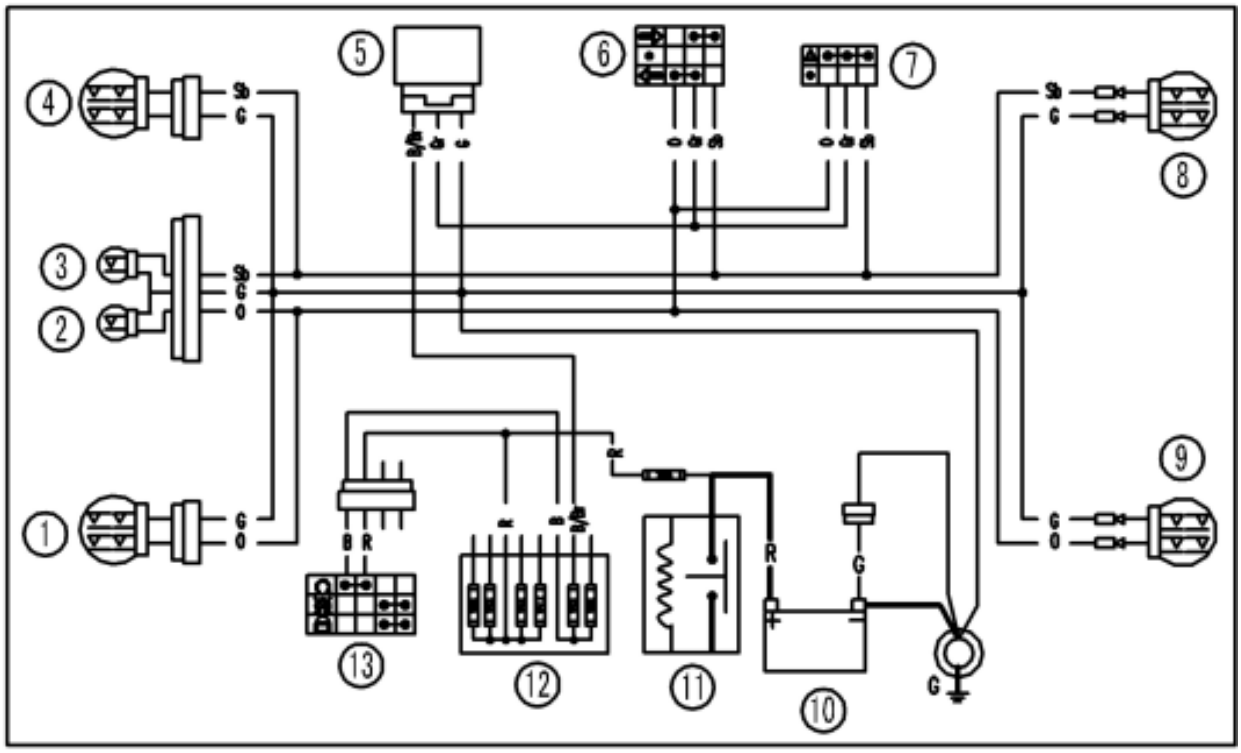
| The Number of Turn Signal Lights | Flashing Times (c/m*) |
|---|---|
| 1** | over 150 |
| 2 | 60 - 120 |

(*): Cycle(s) per minute
(**): Corrected to “one light burned out”.

**Lighting System**

**Turn Signal Light**

**Turn Signal Circuit**




1.Front Left Turn Signal Light
2.Left Turn Signal Indicator Light
3.Right Turn Signal Indicator Light
4.Front Right Turn Signal Light
5.Flasher
6.Turn Switch
7.Hazard Switch
8.Rear Right Turn Signal Light
9.Rear Left Turn Signal Light
10.Battery
11.Starter Relay
12.Fuse Box
13.Ignition Switch

**Radiator Fan System**

**Fan Motor**

*Fan Motor Inspection*

● Disconnect the connector [A].

● Using an auxiliary leads, supply battery power to the fan motor.

★If the fan does not rotate, the fan motor is defective and must be replaced.

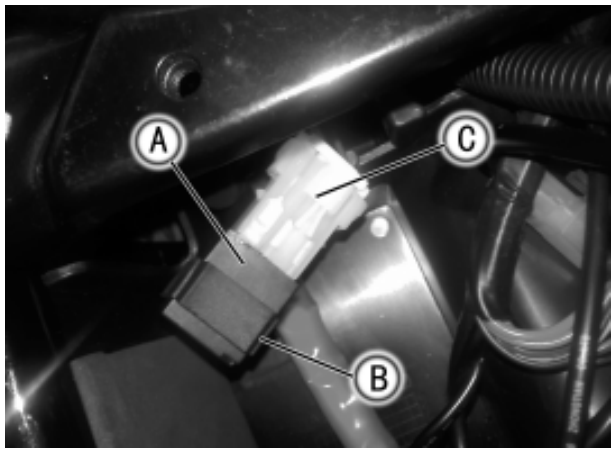

**Fan Relay**

*Fan Relay Inspection*

● Remove the fuel tank.

● Slide out the auxiliary starter relay [A] together with rubber ring [B] from the frame.

● Disconnect the connector [C].




*Fan Relay Test*

● Refer to Auxiliary Starter Relay Test.

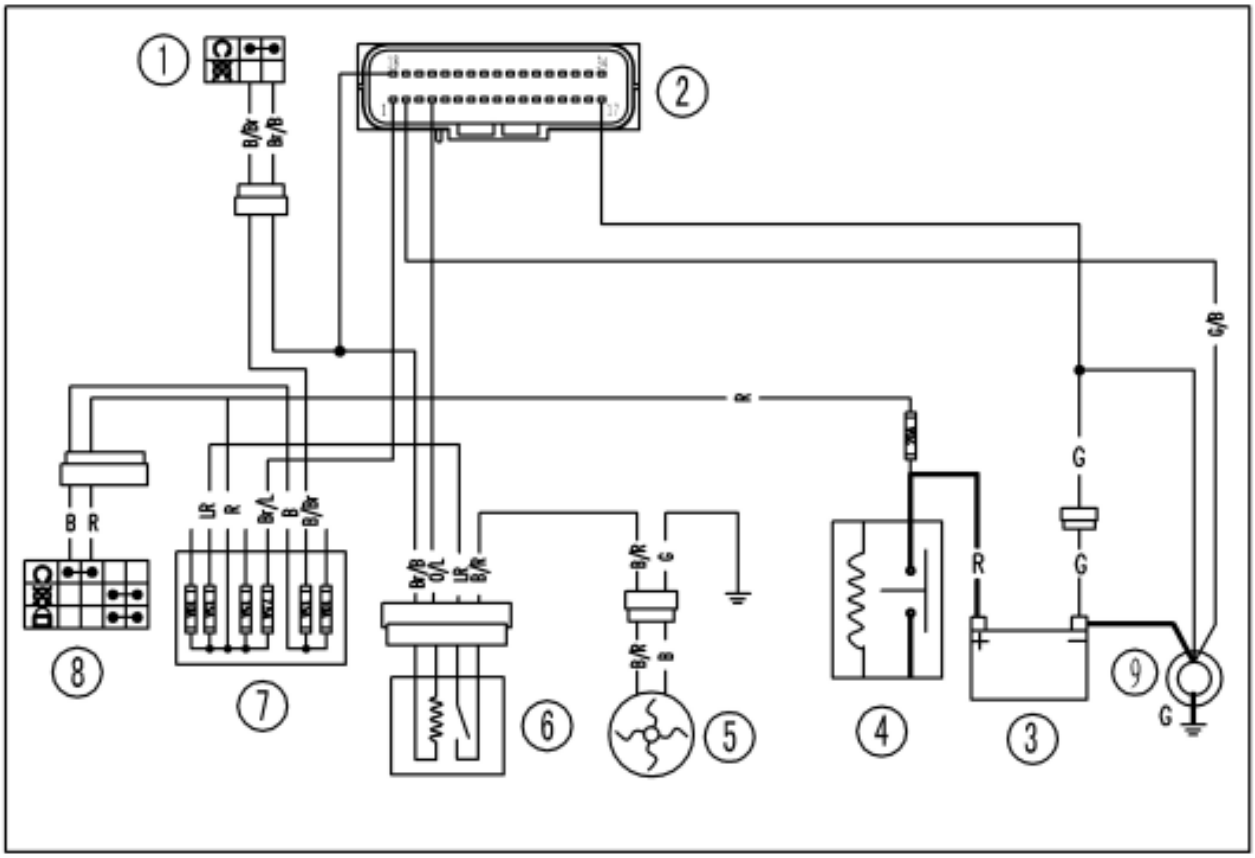
*Fan Relay Resistance Measurement*

● Refer to Auxiliary Starter Relay Resistance Measurement.

★Fan relay and fan motor can be tested with PDA. Using active diagnosis/fan relay test to control fan operation, if it runs, that indicates fan relay and motor , along with the circuit are normal.

**Radiator Fan**

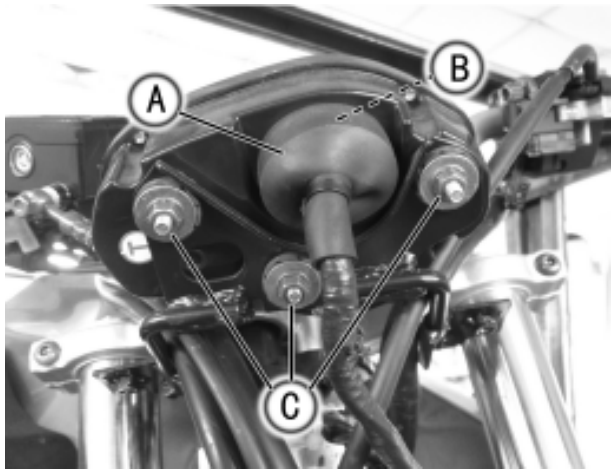
**Radiator Fan Circuit**




1.Engine Stop Switch
2.ECU
3.Battery
4.Starter Relay
5.Fan Motor
6.Fan Relay
7.Fuse Box
8.Ignition Switch

## Meter Unit

*Meter Unit Removal*

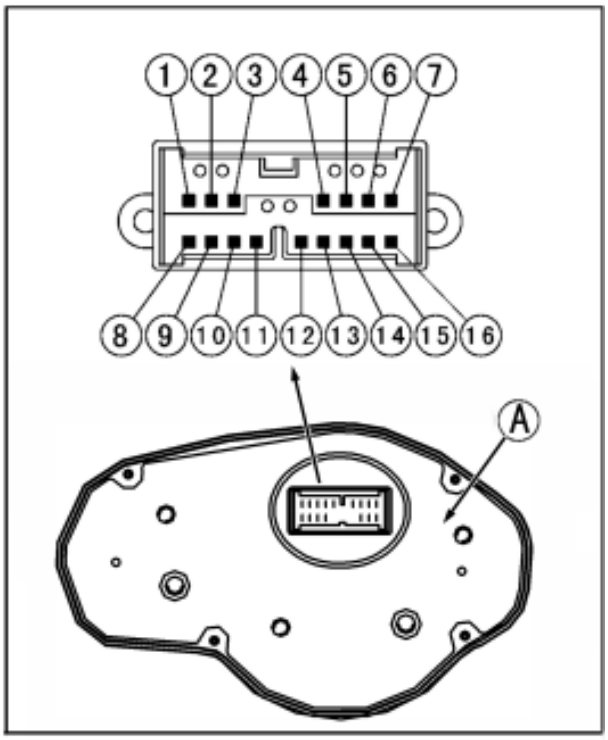



- Remove:
  HeadlightAssy (see Headlight Removal/Installation)
  Dust Cover [A] and Cover [B]
- Slide the dust cover [A] and remove the connector [B].
- Remove the meter unit by taking off the mounting screws [C] with the washers.

| CAUTION |
| --- |
| **Place the meter unit so that the face is up. If a meter unit is left upside down or sideways for any length of time, it will malfunction.** |

*Meter Unit Inspection*

- Remove meter unit [A] (Refer to Meter Unit Removal).



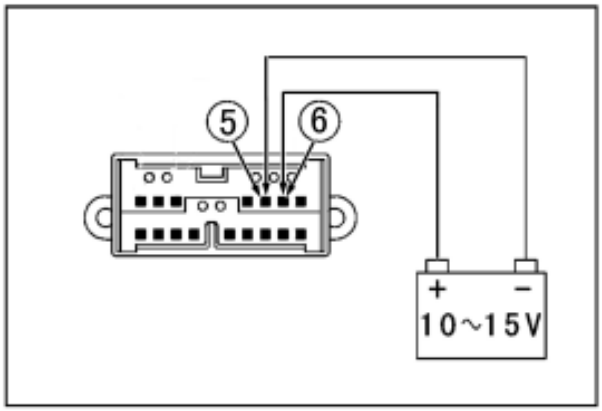

[1] Tachometer Signal
[2] Dash Light (+)
[3] Neutral Indicator Light (LED) (+)
[4] Unused
[5] Ground (-)
[6] Ignition (+)
[7] Unused
[8] Hi Beam Indicator Light (LED) (+)
[9] Left Turn Signal Indicator Light (LED) (+)
[10] Oil Pressure Warning Indicator Light (LED) (-)
[11] FI Indicator Light (LED) (-)
[12] Right Turn Signal Indicator Light (LED) (+)
[13] Parking Indicator Light (-)
[14] Speed Sensor Signal
[15] Coolant Temperature Sensor Signal
[16] Fuel Level Sensor Signal

| CAUTION |
| --- |
| **Do not drop the meter unit. Place the meter unit so that it faces upward. If the meter unit is left upside down or sideways for a long time or dropped, it will malfunction. Do not short each terminals.** |

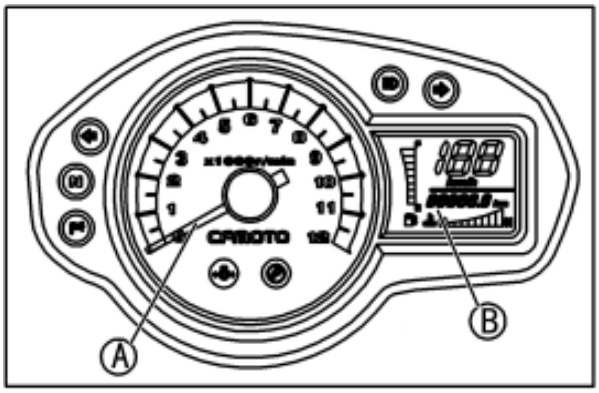
### Meter Unit

#### Liquid Crystal Display (LCD) Segment Check

- Using the auxiliary wires, connect the 12 V battery to the meter unit connector as follows.
- Connect the battery negative terminal to the terminal [5].
- Connect the battery positive terminal to the terminal [6].




- When the terminals are connected, the needle [A] rotates and LCD warning lights [B] appear, meanwhile, fuel level signal and coolant temperature signal flash.

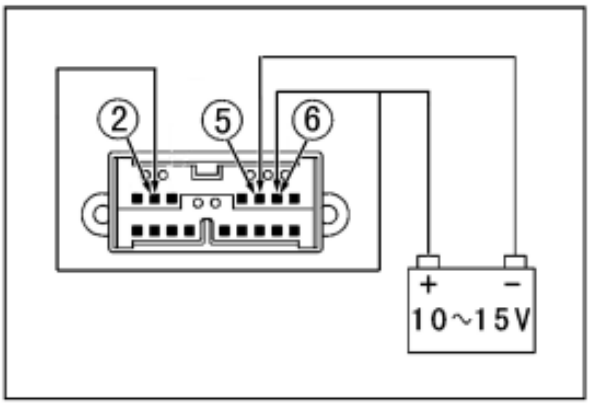


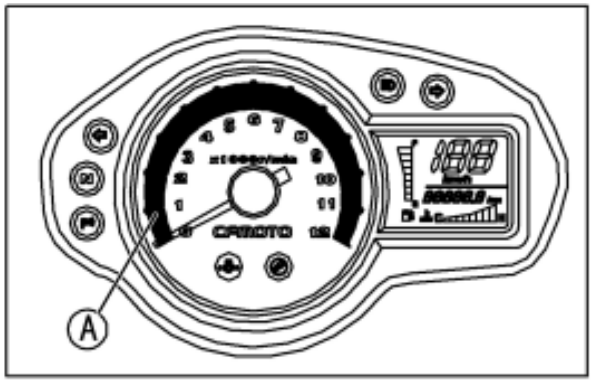

- Connect the terminal [2] to the terminal [6].
- When the connectors are connected, LCD segment backlight and dash light appear.

★If LCD segment backlight and dash light do not appear, replace the meter unit.

- Disconnect the terminal [2].
- LCD segment backlight and dash light disappear.

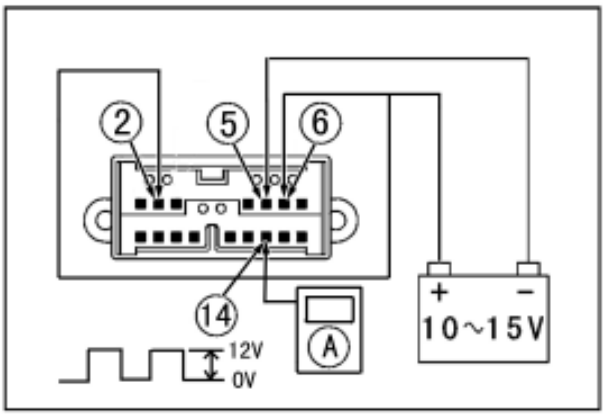
★If LCD segment backlight and dash light do not disappear, replace the meter unit.



## Meter Unit

### Speedometer Check




- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- The speed equivalent to the input frequency is indicated in the oscillator [A], if the square wave (illustrated as shown) would be input into the terminal [14].
- Indicates approximately 60 km/h in case the input frequency would be approximately 105.6 Hz.
- If the oscillator is not available, the speedometer can be checked as follows.

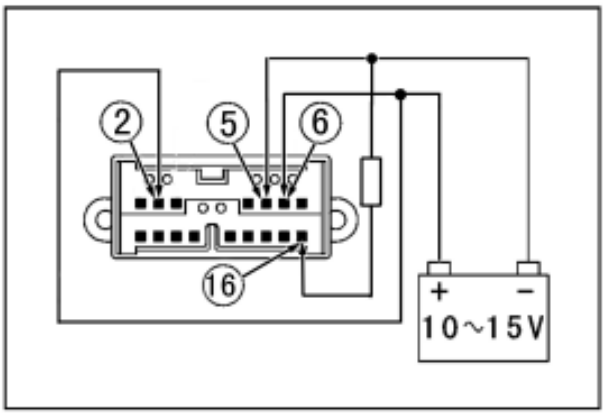
o Install the meter unit.
o Raise the rear wheel off the ground with stand.
o Turn on the ignition switch.
o Rotate the rear wheel by hand.
o Check that the speedometer shows the speed.

★If the speedometer does not work, check the speed sensor electric source voltage and speed sensor.
★The electric source voltage and speed sensor are normal, replace the meter assembly.

### Odometer Check

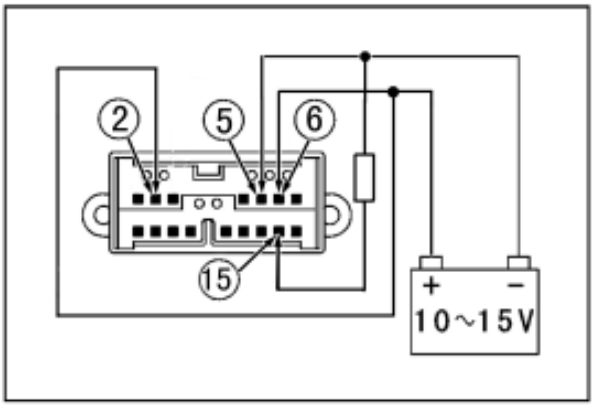
- Check the odometer with the speedometer in the same way.
- If value indicated in the odometer is not added, replace the meter assembly.

### Fuel Gauge Check




- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Connect a resistance (0-1 kΩ) between the battery negative terminal and terminal [16].
- When the resistance is 0 Ω, fuel gauge displays all 8 lights.
- When the resistance is 1k Ω, fuel gauge displays one light and fuel signal appears.

### Coolant Temperature Gauge Check




- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Connect a resistance (0-1 kΩ) between the battery negative terminal and terminal [15].
- When the resistance is 0 Ω, fuel gauge displays all 8 lights and coolant temperature signal appears.
- When the resistance is 1k Ω, fuel gauge displays one light.

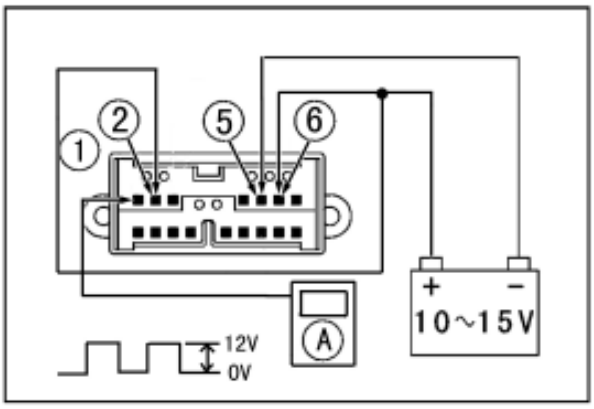
### Meter Unit

### Tachometer Check

● Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".

● The revolutions per minute (rpm) equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown) would be input into the terminal [1].

o Indicates approximately 6 000 rpm in case the input frequency would be approximately 100 Hz.



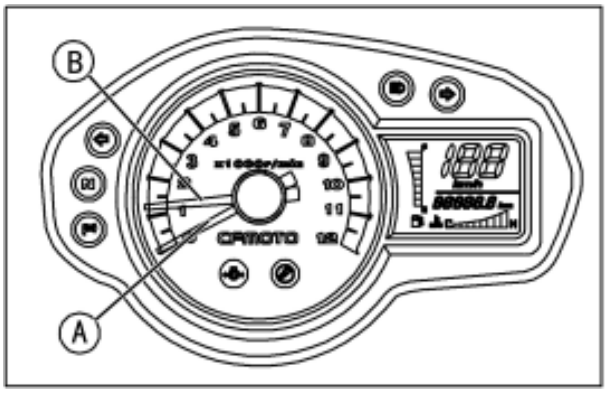

● If the oscillator is not available, the tachometer can be checked as follows.

o Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".

o Using an auxiliary wire, quick open and connect the terminal [2] to the terminal [6] repeatedly.

o Then the tachometer needle [A] should flick [B].

★If the needle does not flick, replace the meter assembly.

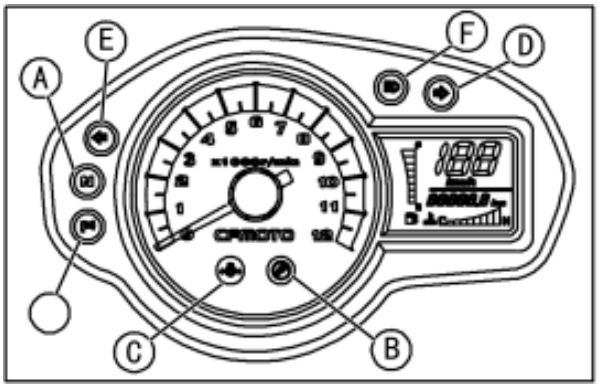



### Indicator Lights Inspection

● Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments check".

Neutral Indicator Light (LED) [A]
FI Indicator Light (LED) [B]
Oil Pressure/Water Temperature Warning Indicator Light (LED) [C]
Right Turn Signal Indicator Light (LED) [D]
Left Turn Signal Indicator Light (LED) [E]
High Beam Indicator Light (LED) [F]
Fuel Level Warning Indicator Light (LED) [G]

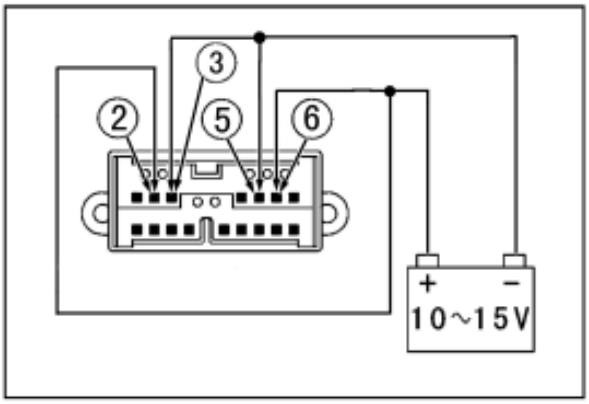
● Using the auxiliary leads, connect a 12 V battery to the meter unit connector as follows.




### Neutral Indicator Light (LED)

● Battery Negative (-) Terminal to Terminal [3].

★When the battery (-) terminal is connected to terminal [3], neutral indicator light should go on. When the battery (-) terminal is disconnected, neutral indicator light should go off. If neutral indicator light does not work as given above, replace the meter unit.

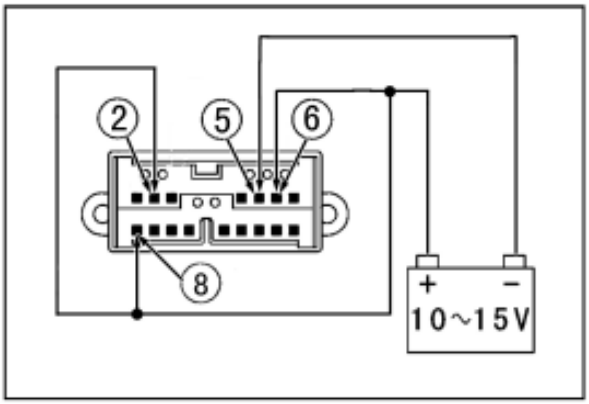


### Meter Unit

### High Beam Indicator Light (LED)

Battery Positive (+) Terminal to Terminal [8].

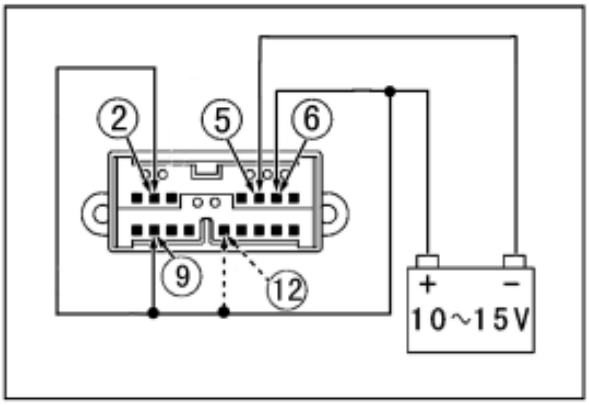
★When the battery (+) terminal is connected to terminal [3], Hi beam indicator light should go on. When the battery (-) terminal is disconnected, neutral indicator light should go off. If Hi beam indicator light does not work as given above, replace the meter unit.




### Right and Left Turn Signal Indicator Light (LED)

Left Turn Signal Indicator Light (LED)
Battery Positive (+) Terminal to Terminal [9]
Right Turn Signal Indicator Light (LED)
Battery Positive (+) Terminal to Terminal [12]

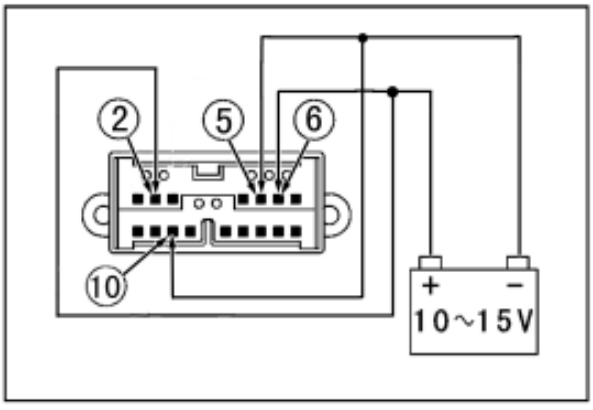
★When the battery (+) terminal is connected to terminal [9] or [12], left or light turn signal indicator light should go on. When the battery (-) terminal is disconnected, left or light turn signal indicator light should go off.left or light turn signal indicator light does not work as given above, replace the meter unit.




### Oil Pressure Warning Indicator Light (LED)

- Connect the 12 V battery and terminals in the same manner as specified in the "Tachometer Check".
- When rpm exceeds 1000 and the battery (-) terminal is connected to terminal [10], the indicator light does not go on.
- When rpm exceeds 1000 and the battery (-) terminal is disconnected from terminal [10], the indicator light goes on.

★If oil pressure warning indicator light does not work as specified, replace the meter unit.

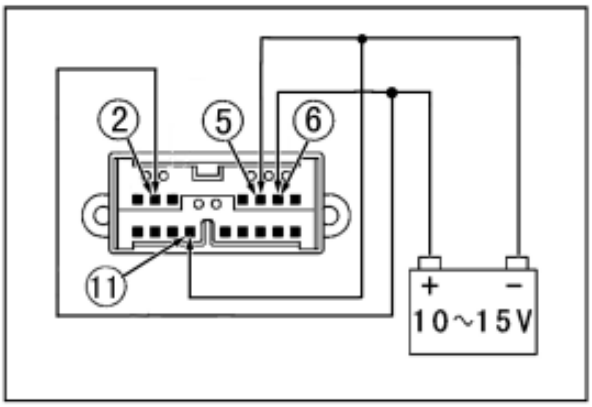


### Meter Unit

### FI Indicator Light

Battery Negative (-) Terminal to Terminal [11].

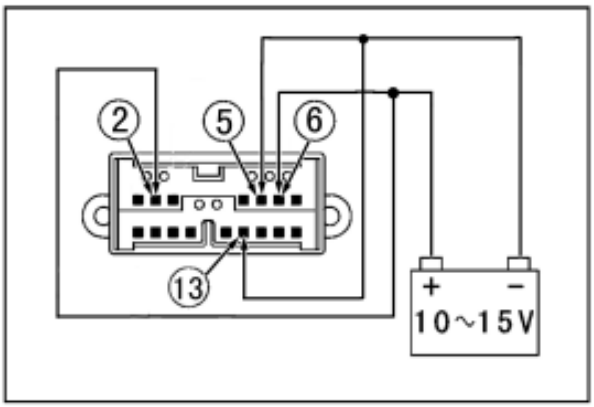
★When the battery (-) terminal is connected to terminal [11], neutral indicator light should go on. When the battery (-) terminal is disconnected, neutral indicator light should go off. If Hi beam indicator light does not work as given above, replace the meter unit.




### Parking Indicator Light

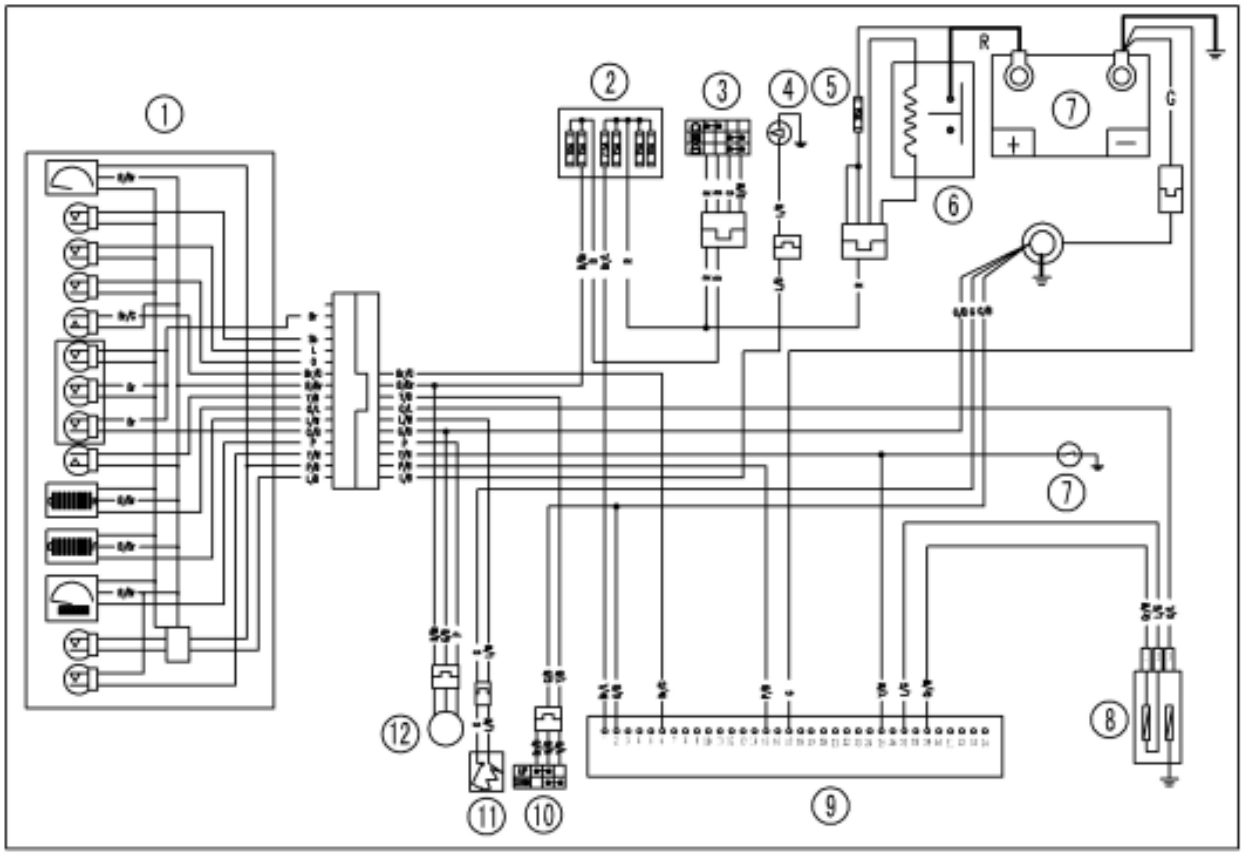
Battery Negative (-) Terminal to Terminal [13].

★When the battery (-) terminal is connected to terminal [13], neutral indicator light should go on. When the battery (-) terminal is disconnected, neutral indicator light should go off. If Hi beam indicator light does not work as given above, replace the meter unit.



**Meter Unit**

**Meter Unit Circuit**




1.Meter Unit
2.Fuse Box
3.Ignition Switch
4.Oil Pressure Warning Light
5.Main Fuse
6.Starter Relay
7.Battery
8.Coolant Temperature Sensor
9.ECU
10.Sidestand Switch
11.Fuel Level Sensor
12.Speed Sensor

## Switches and Sensors

*Brake Light Timing Inspection*

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

*Brake Light Timing Adjustment*

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

*Switch Inspection*

- Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).
- For the switch connections and continuity, refer to the tables given below.

★ If the switch has an open or short, repair it or replace it with a new one.

## Front/Rear Brake Light Switch Connections

| Front/Rear Brake Light Switch Connections | | |
|---|---|---|
| Color | W/G | G/Y |
| When brake pedal is pushed down (ON) | ○——— | ———○ |
| When brake pedal is released (OFF) | | |

## Sidestand Switch Connectons

| Sidestand Switch Connectons | | | |
|---|---|---|---|
| Color | Br/B | W/G | Y/B |
| When sidestand is up | ○——— | | ———○ |
| When sidestand is down | ○——— | | ———○ |

## Neutral Switch Connectiions

| Neutral Switch Connectiions | | |
|---|---|---|
| Color | SW. Terminal | Ground |
| When transmission is in neutral | ○——— | ———○ |
| When transmission is not in neutral | | |

## Oil Pressure Switch Connections

| Oil Pressure Switch Connections (When engine lubrication is in good condition) | | |
|---|---|---|
| Color | SW. Terminal | Ground |
| When engine is stopped | ○——— | ———○ |
| When engine is running | | |

## Clutch Switch Connections

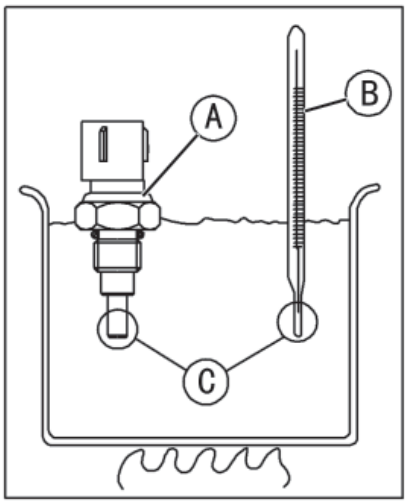
| Clutch Switch Connections | | |
|---|---|---|
| Color | R/G | L/G |
| When clutch is pulled (ON) | ○——— | ———○ |
| When clutch is released (OFF) | | |

**Switches and Sensors**

**Coolant Temperature Sensor**

*Coolant Temperature Sensor Inspection*

- Remove the coolant temperature sensor (see Removal/Installation in the EFI chapter).
- Suspend the sensor [A] in a container of coolant so hat the temperature-sensing projection [C] and threaded portion [C] are submerged.
- Suspend an accurate thermometer [B] with temperature-sensing projection located in almost the same depth.

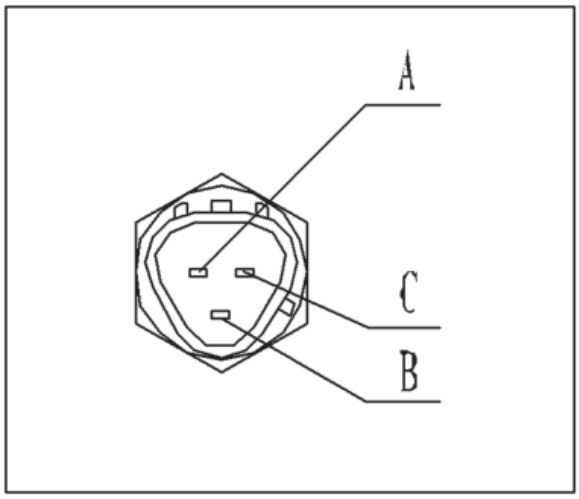



**NOTE**

o *The sensor and thermometer must not touch the container side or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the sensor.

★ If the hand tester does not show the specified values, replace the sensor.




**Water Temperature Sensor Resistance**

● See the right table.

**Resistance betwen Terminal A and Terminal C**

| Temperature (°C) | Resistance (KΩ) |
|---|---|
| -20 | 12-18 |
| 0 | 5-7 |
| 20 | 2-3 |
| 80 | 0.3-0.35 |
| 100 | 0.12-0.18 |

**Resistance betwen Terminal B and Chassis Ground**

| Temperature (°C) | Resistance (Ω) |
|---|---|
| 50 | 135-220 |
| 120 | 16-20 |

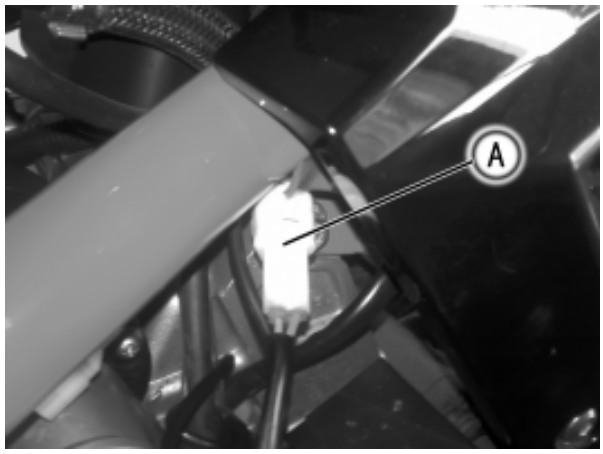
## Switches and Sensors

### Speed Sensor

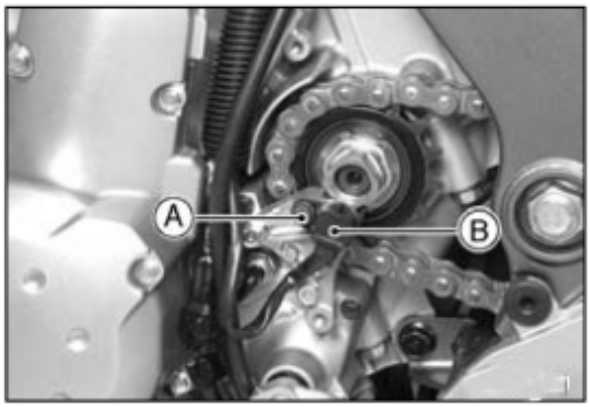
*Speed Sensor Removal*

● Disconnect the speed sensor lead connector [A].

● Remove the engine sprocket cover (see Engine Sprocket Removal in the Final Drive chapter).




● Remove: Bolt [A]
Speed Sensor [B]




*Speed Sensor Installation*

● Installation is the reverse of removal.

● Apply a non-permanent locking agent to the sensor bolt, and tighten it.

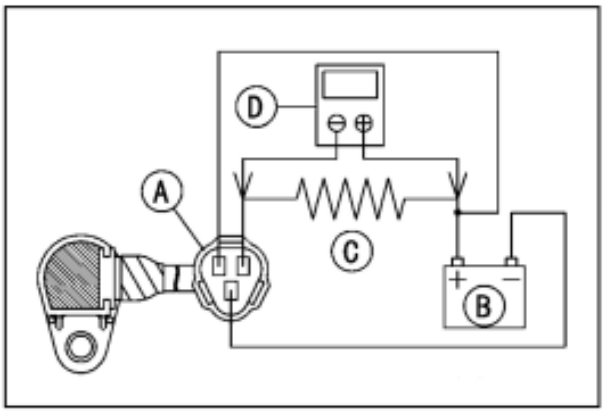
**Torque - Speed Sensor Bolt: 7.0 N • m**

*Speed Sensor Inspection*

● Remove the speed sensor (see Speed Sensor Removal).

● Connect the speed sensor connector [A] with the battery [B], 10 k? resistor [C] and hand tester [D] as shown.

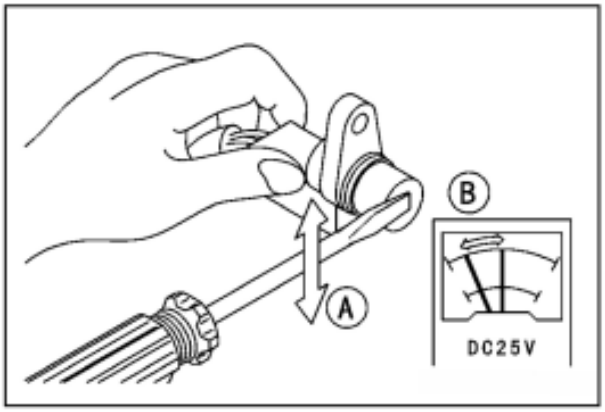
● Set the tester to the DC 25 V range.




● Trace [A] each side of the speed sensor surface with the screw driver.

● Then the tester indicator should flick [B].

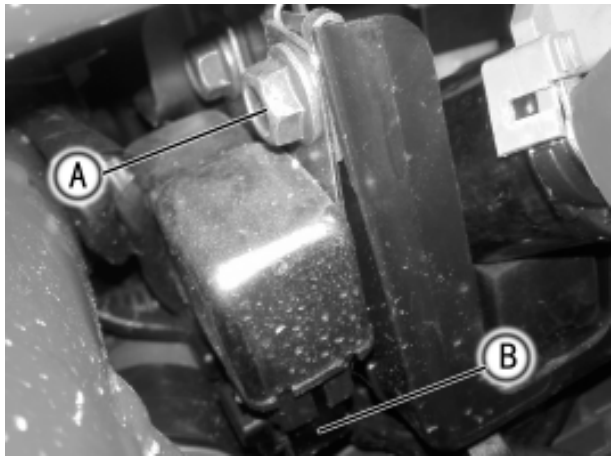
★If the tester indicator does not flick, replace the speed sensor.



**Relay and Fuse**

**Hi Beam Relay & Lo Beam Relay**

*Hi Beam Relay Removal*

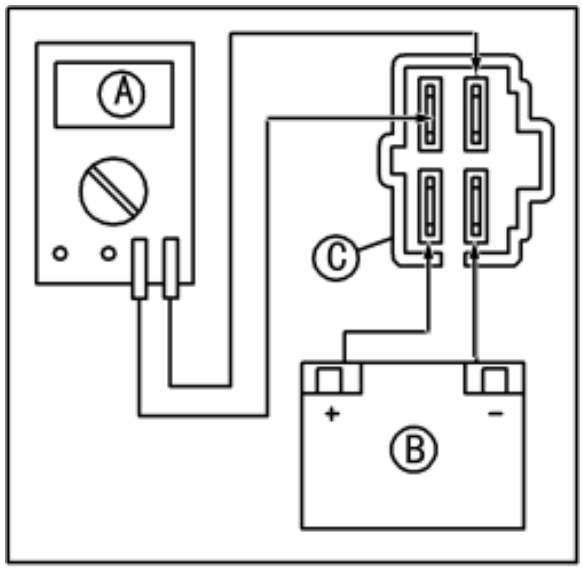



● Remove the fuel tank.
● Remove the bolt [A].
● Disconnect the connector [B].

*Hi Beam Relay Installation*

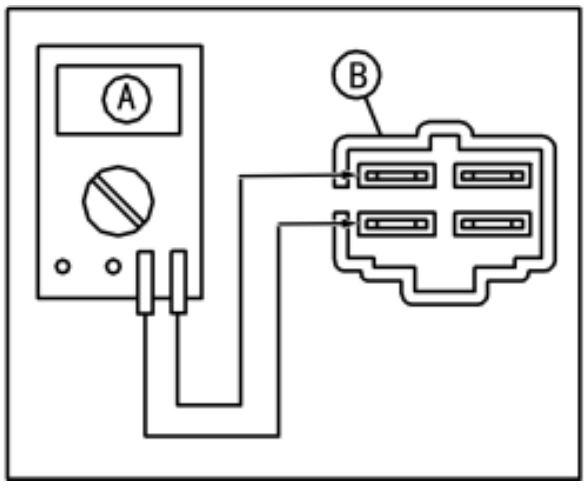
o Installation is the reverse of the removal.

*Hi Beam Relay Circuit Inspection*




● Connect the hand tester [A] and 12V battery as shown to test the Hi beam relay.
● When the battery is connected, the reading of resistance: 0 Ω
● When the battery is disconnected, the reading of resistance: ∞ Ω

*Hi Beam Relay Resistance Inspection*




● Connect the hand tester[A] and A Hi beam relay [B].
Hi beam relay resistance: 90~105 Ω(20℃)
★If the hand tester does not show specified values, the relay is defective. Replace the relay.

● Using the Hi beam relay circuit inspection is a more reliable way to determine the Hi beam relay condition than the Hi beam relay resistance inspection.

*Lo Beam Relay*

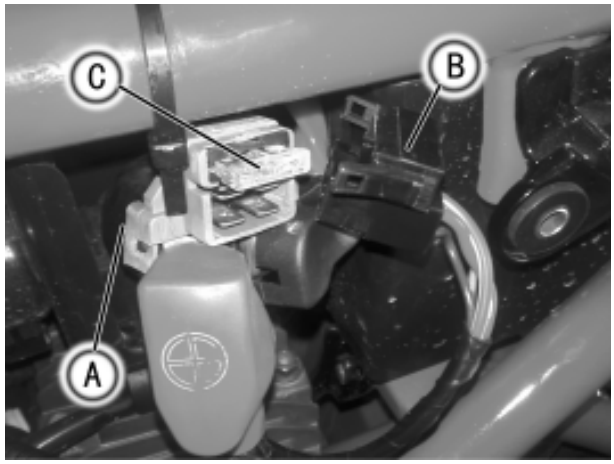
● Refer to Hi beam relay.

## Relay and Fuse

### Main Fuse

*Main Fuse Removal*

● Remove:
Left Side Cover (see Side Cover Removal in the Frame chapter)
Starter Relay [A]
● Disconnect the leads connector [B].
● Pull out the main fuse [C].

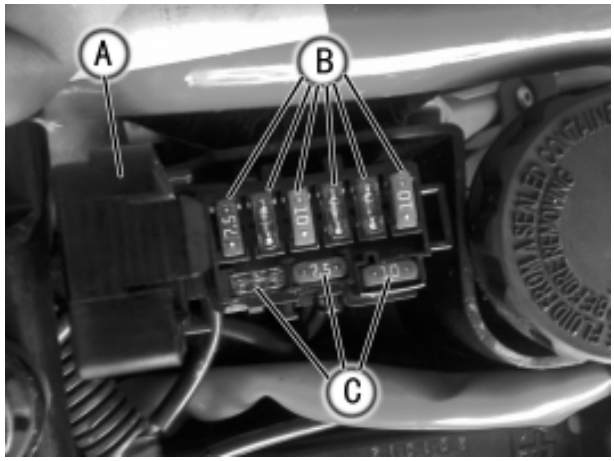



*Main Fuse Installation*

Installation is the reverse of the removal.

*Fuse Box Fuse Removal*

● Remove the seat (see Seat Removal in the Frame chapter).
● Pull out the fuse box cover [A].
● Pull the fuses [B] straight out of the fuse box with needle nose pliers.
Auxiliary Fuses [C].

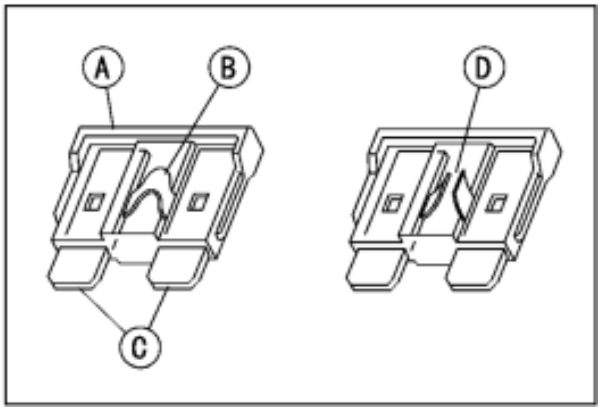



*Fuse Box Fuse Installation*

Installation is the reverse of the removal.

*Fuse Inspection*

o Remove the fuse .
o Inspect the fuse element.
★If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.
Housing [A]
Fuse Element [B]
Terminals [C]
Blown Element [D]




| CAUTION |
| --- |
| **When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.** |