Kawasaki

# Ninja ZX-10R


# Motorcycle Service Manual

# Quick Reference Guide



This quick reference guide will assist you in locating a desired topic or procedure.

- Bend the pages back to match the black tab of the desired chapter number with the black tab on the edge at each table of contents page.
- Refer to the sectional table of contents for the exact pages to locate the specific topic required.

Kawasaki

# Ninja ZX-10R

# Motorcycle Service Manual



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## LIST OF ABBREVIATIONS

| | | | |
|---|---|---|---|
| A | ampere(s) | lb | 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) | | |

## COUNTRY AND AREA CODES

| | | | |
|---|---|---|---|
| AT | Austria | GB | United Kingdom |
| AU | Australia | MY | Malaysia |
| BR | Brazil | SEA | Southeast Asia |
| CA | Canada | TH | Thailand |
| CAL | California | US | United States |
| CH | Switzerland | WVTA (FULL H) | WVTA Model with Honeycomb Catalytic Converter (Full Power) |
| DE | Germany | GB WVTA (FULL H) | WVTA Model with Honeycomb Catalytic Converter (Left Side Traffic Full Power) |
| EUR | Europe | WVTA (78.2 H) | WVTA Model with Honeycomb Catalytic Converter (Restricted Power) |

# EMISSION CONTROL INFORMATION

To protect the environment in which we all live, Kawasaki has incorporated crankcase emission (1) and exhaust emission (2) control systems in compliance with applicable regulations of the United States Environmental Protection Agency and California Air Resources Board. Additionally, Kawasaki has incorporated an evaporative emission control system (3) in compliance with applicable regulations of the California Air Resources Board on vehicles sold in California only.

1. Crankcase Emission Control System

This system eliminates the release of crankcase vapors into the atmosphere. Instead, the vapors are routed through an oil separator to the inlet side of the engine. While the engine is operating, the vapors are drawn into combustion chamber, where they are burned along with the fuel and air supplied by the fuel injection system.

2. Exhaust Emission Control System

This system reduces the amount of pollutants discharged into the atmosphere by the exhaust of this motorcycle. The fuel, ignition, and exhaust systems of this motorcycle have been carefully designed and constructed to ensure an efficient engine with low exhaust pollutant levels.

The exhaust system of this model motorcycle manufactured primarily for sale in California includes a catalytic converter system.

3. Evaporative Emission Control System

Vapors caused by fuel evaporation in the fuel system are not vented into the atmosphere. Instead, fuel vapors are routed into the running engine to be burned, or stored in a canister when the engine is stopped. Liquid fuel is caught by a vapor separator and returned to the fuel tank.

The Clean Air Act, which is the Federal law covering motor vehicle pollution, contains what is commonly referred to as the Act's "tampering provisions".

"Sec. 203(a) The following acts and the causing thereof are prohibited...

(3)(A) for any person to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title prior to its sale and delivery to the ultimate purchaser, or for any manufacturer or dealer knowingly to remove or render inoperative any such device or element of design after such sale and delivery to the ultimate purchaser.

(3)(B) for any person engaged in the business of repairing, servicing, selling, leasing, or trading motor vehicles or motor vehicle engines, or who operates a fleet of motor vehicles knowingly to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this title following its sale and delivery to the ultimate purchaser..."

**NOTE**

○ *The phrase "remove or render inoperative any device or element of design" has been generally interpreted as follows.*

1. *Tampering does not include the temporary removal or rendering inoperative of devices or elements of design in order to perform maintenance.*
2. *Tampering could include.*
   a. *Maladjustment of vehicle components such that the emission standards are exceeded.*
   b. *Use of replacement parts or accessories which adversely affect the performance or durability of the motorcycle.*
   c. *Addition of components or accessories that result in the vehicle exceeding the standards.*
   d. *Permanently removing, disconnecting, or rendering inoperative any component or element of design of the emission control systems.*

**WE RECOMMEND THAT ALL DEALERS OBSERVE THESE PROVISIONS OF FEDERAL LAW, THE VIOLATION OF WHICH IS PUNISHABLE BY CIVIL PENALTIES NOT EXCEEDING $10 000 PER VIOLATION.**

# TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED

Federal law prohibits the following acts or the causing thereof. (1) The removal or rendering inoperative by any person other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use, or (2) the use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

Among those acts presumed to constitute tampering are the acts listed below.

- Replacement of the original exhaust system or muffler with a component not in compliance with Federal regulations.
- Removal of the muffler(s) or any internal portion of the muffler(s).
- Removal of the air box or air box cover.
- Modifications to the muffler(s) or air inlet system by cutting, drilling, or other means if such modifications result in increased noise levels.

# Foreword

This manual is designed primarily for use by trained mechanics in a properly equipped shop. However, it contains enough detail and basic information to make it useful to the owner who desires to perform his own basic maintenance and repair work. A basic knowledge of mechanics, the proper use of tools, and workshop procedures must be understood in order to carry out maintenance and repair satisfactorily. Whenever the owner has insufficient experience or doubts his ability to do the work, all adjustments, maintenance, and repair should be carried out only by qualified mechanics.

In order to perform the work efficiently and to avoid costly mistakes, read the text, thoroughly familiarize yourself with the procedures before starting work, and then do the work carefully in a clean area. Whenever special tools or equipment are specified, do not use makeshift tools or equipment. Precision measurements can only be made if the proper instruments are used, and the use of substitute tools may adversely affect safe operation.

**For the duration of the warranty period,** we recommend that all repairs and scheduled maintenance be performed in accordance with this service manual. Any owner maintenance or repair procedure not performed in accordance with this manual may void the warranty.

To get the longest life out of your vehicle.

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki Motorcycle parts. Special tools, gauges, and testers that are necessary when servicing Kawasaki motorcycles are introduced by the Service Manual. Genuine parts provided as spare parts are listed in the Parts Catalog.
- Follow the procedures in this manual carefully. Don't take shortcuts.
- Remember to keep complete records of maintenance and repair with dates and any new parts installed.

## How to Use This Manual

In this manual, the product is divided into its major systems and these systems make up the manual's chapters. The Quick Reference Guide shows you all of the product's system and assists in locating their chapters. Each chapter in turn has its own comprehensive Table of Contents.

For example, if you want ignition coil information, use the Quick Reference Guide to locate the Electrical System chapter. Then, use the Table of Contents on the first page of the chapter to find the Ignition Coil section.

Whenever you see these WARNING and CAUTION symbols, heed their 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 CAUTION) 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 of the procedural step it follows. It also precedes the text of a NOTE.

★Indicates a conditional step or what action to take based on the results of the test or inspection in the procedural step or sub-step it follows.

In most chapters an exploded view illustration of the system components follows the Table of Contents. In these illustrations you will find the instructions indicating which parts require specified tightening torque, oil, grease or a locking agent during assembly.

# General Information

## Table of Contents

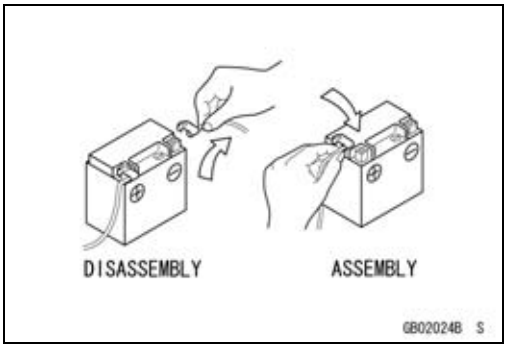
## Before Servicing

Before starting to perform an inspection service or carry out a disassembly and reassembly operation on a motorcycle, read the precautions given below. To facilitate actual operations, notes, illustrations, photographs, cautions, and detailed descriptions have been included in each chapter wherever necessary. This section explains the items that require particular attention during the removal and reinstallation or disassembly and reassembly of general parts.

Especially note the following.

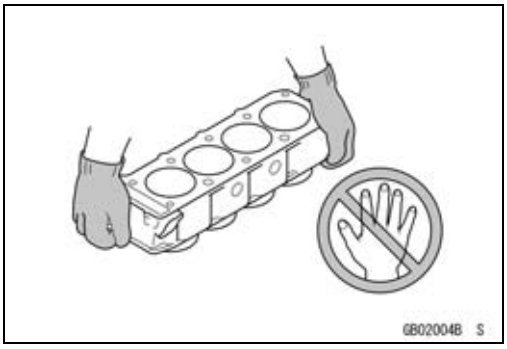
### *Battery Ground*

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 completed with the service, first connect the positive (+) cable to the positive (+) terminal of the battery then the negative (–) cable to the negative terminal.



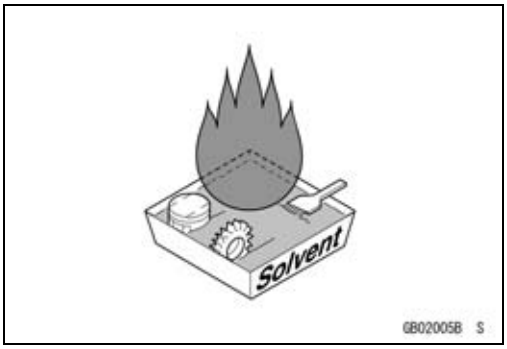

### *Edges of Parts*

Lift large or heavy parts wearing gloves to prevent injury from possible sharp edges on the parts.



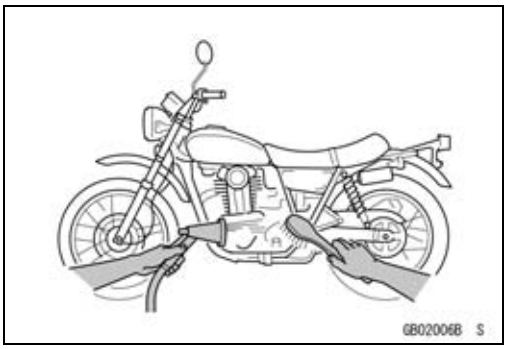

### *Solvent*

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




### *Cleaning Vehicle before Disassembly*

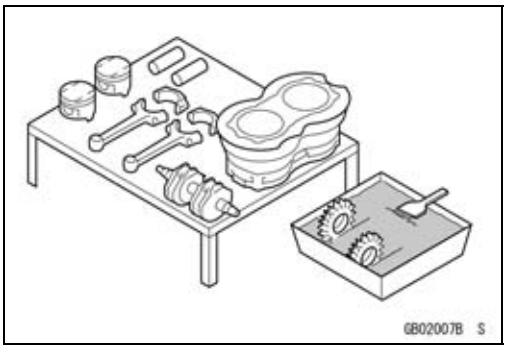
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



## Before Servicing

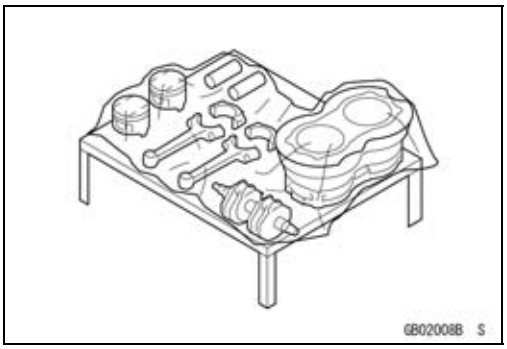
### *Arrangement and Cleaning of Removed Parts*

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



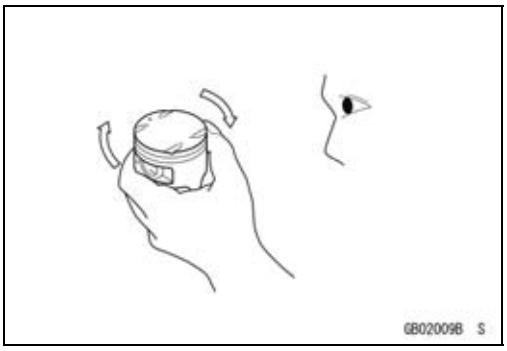

### *Storage of Removed Parts*

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.



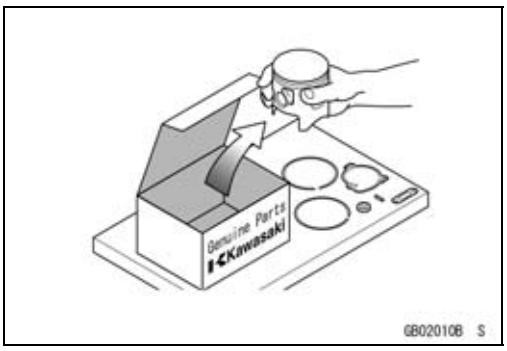

### *Inspection*

Reuse of worn or damaged parts may lead to serious accident. 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 is beyond its service limit.



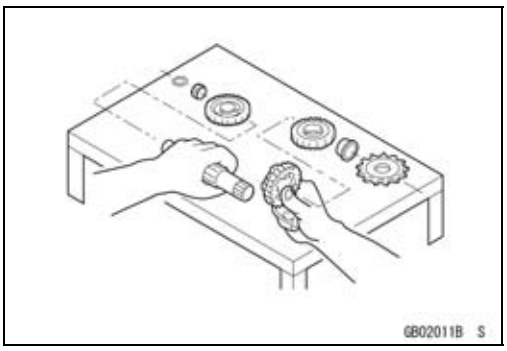

### *Replacement Parts*

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




### *Assembly Order*

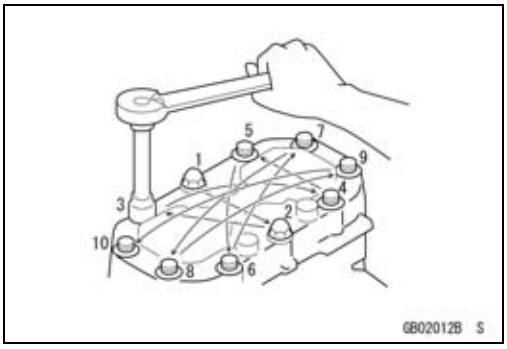
In most cases assembly order is the reverse of disassembly, however, if assembly order is provided in this Service Manual, follow the procedures given.



## Before Servicing

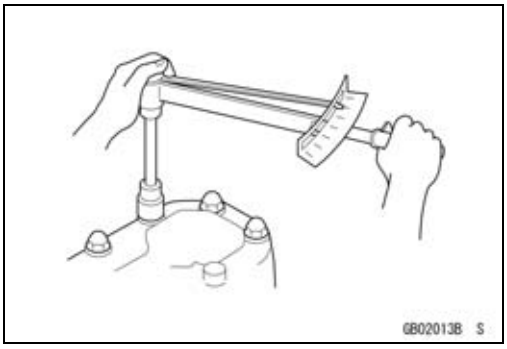
### *Tightening Sequence*

Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them according to the 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 about a quarter turn and then remove them. If the specified tightening sequence is not indicated, tighten the fasteners alternating diagonally.



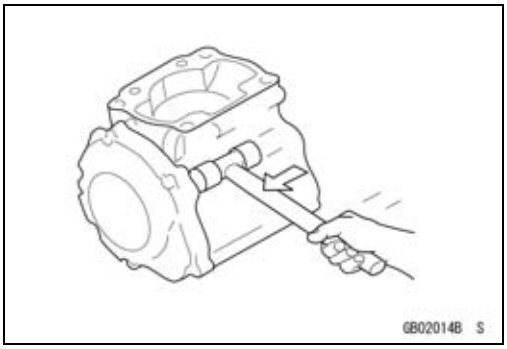

### *Tightening Torque*

Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.



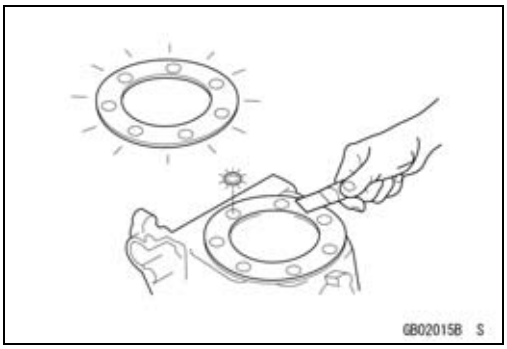

### *Force*

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



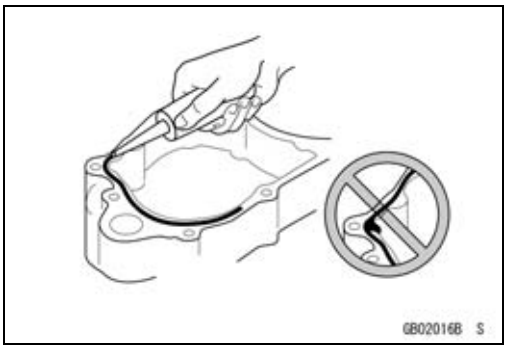

### *Gasket, O-ring*

Hardening, shrinkage, or damage of both gaskets and O-rings after disassembly can reduce sealing performance. Remove old gaskets and clean the sealing surfaces thoroughly so that no gasket material or other material remains. Install the new gaskets and replace the used O-rings when re-assembling.




### *Liquid Gasket, Non-permanent Locking Agent*

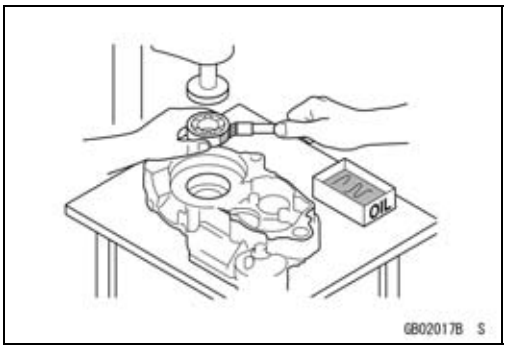
For applications that require Liquid Gasket or a Non-permanent Locking Agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



## Before Servicing

### *Press*

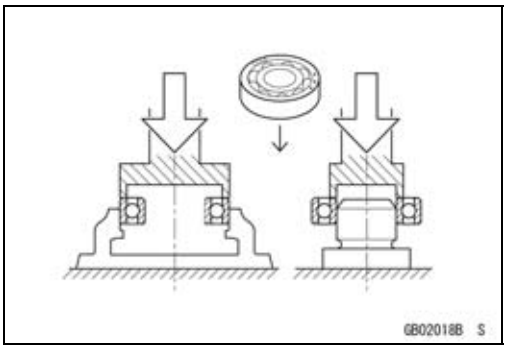
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.




### *Ball Bearing and Needle Bearing*

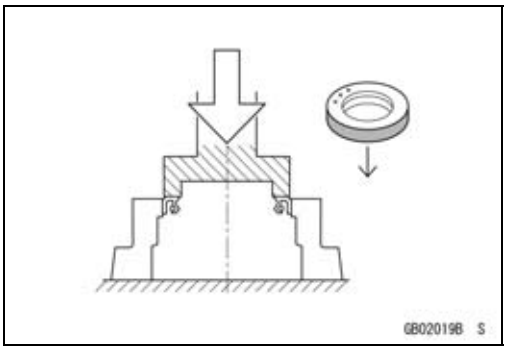
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

Pressing the incorrect race can cause pressure between the inner and outer race and result in bearing damage.

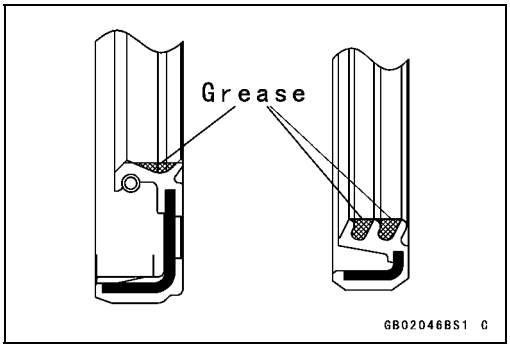



### *Oil Seal, Grease Seal*

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

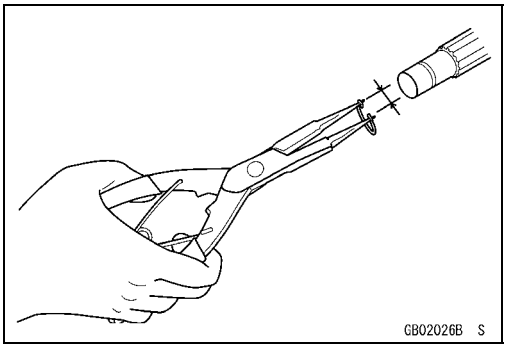



Apply specified grease to the lip of seal before installing the seal.




### *Circlips, Cotter Pins*

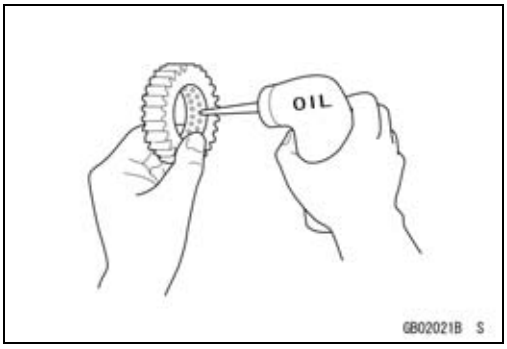
Replace the circlips or cotter pins that were removed with new ones. Take care not to open the clip excessively when installing to prevent deformation.



## Before Servicing

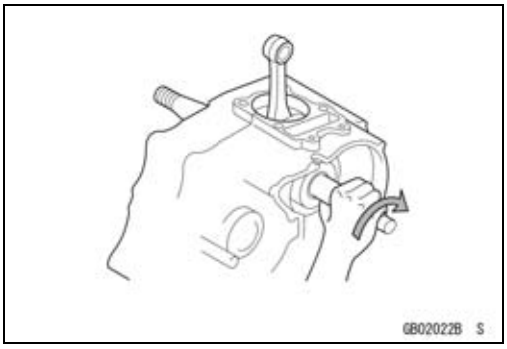
### *Lubrication*

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 the specific oil or grease as specified.



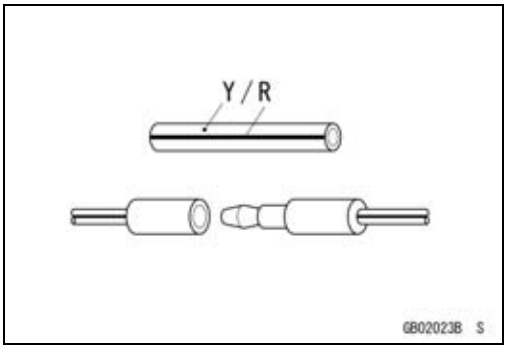

### *Direction of Engine Rotation*

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



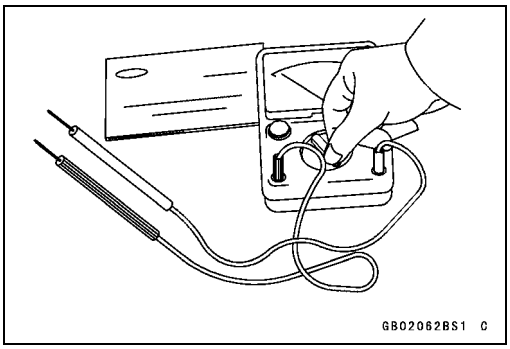

### *Electrical Wires*

A two-color wire is identified first by the primary color and then the stripe color. Unless instructed otherwise, electrical wires must be connected to those of the same color.




### *Instrument*

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



## Model Identification

**ZX1000E8F (US and CA Models) Left Side View**


**ZX1000E8F (US and CA Models) Right Side View**

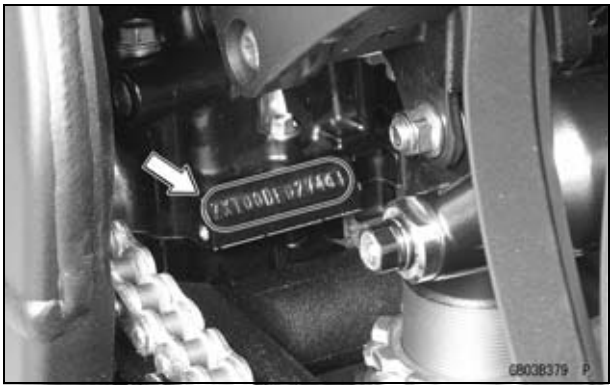
## Model Identification

**ZX1000E8F (EUR Models) Left Side View**


**ZX1000E8F (EUR Models) Right Side View**


**Frame Number**


**Engine Number**



## General Specifications

| Items | ZX1000E8F ~ E9F |
|---|---|
| **Dimensions** | |
| Overall Length | 2 110 mm (83.1 in.) |
| Overall Width | 710 mm (28.0 in.) |
| Overall Height | 1 135 mm (44.7 in.) |
| Wheelbase | 1 415 mm (55.7 in.) |
| Road Clearance | 125 mm (4.9 in.) |
| Seat Height | 830 mm (32.7 in.) |
| Dry Mass | |
| ZX1000E8F | 179 kg (395 lb) |
| Curb Mass: | |
| ZX1000E9F | 208 kg (459 lb) |
| Front | 106 kg (234 lb) |
| Rear | 102 kg (225 lb) |
| Fuel Tank Capacity | 17 L (4.5 US gal) |
| **Performance** | |
| Minimum Turning Radius | 3.4 m (11.2 ft) |
| **Engine** | |
| Type | 4-stroke, DOHC, 4-cylinder |
| Cooling System | Liquid-cooled |
| Bore and Stroke | 76.0 × 55.0 mm (3.0 × 2.2 in.) |
| Displacement | 998 cm³ (60.9 cu in.) |
| Compression Ratio | 12.9 : 1 |
| Maximum Horsepower | 138.3 kW (188.1 PS) @12 500 r/min (rpm),<br>WVTA (78.2 H) 78.2 kW (106 PS) @11 000 r/min (rpm),<br>(MY), (TH) 119.2 kW (162.1 PS) @10 000 r/min (rpm),<br>(SEA) 133 kW (181 PS) @12 500 r/min (rpm),<br>(CA), (CAL), (US) – – – |
| Maximum Torque | 113 N·m (11.5 kgf·m, 83.3 ft·lb) @8 700 r/min (rpm),<br>WVTA (78.2 H) 83 N·m (8.5 kgf·m, 61.2 ft·lb) @5 100 r/min (rpm),<br>(CA), (CAL), (US) – – – |
| Carburetion System | FI (Fuel injection), KEIHIN TTK43 × 4 |
| Starting System | Electric starter |
| Ignition System | Battery and coil (transistorized)<br>KIMS (Kawasaki Ignition Management System) |
| Timing Advance | Electronically advanced (IC igniter in ECU) |
| Ignition Timing | From 10° BTDC @1 100 r/min (rpm) |
| Spark Plug | NGK CR9EIA-9 |
| Cylinder Numbering Method | Left to right, 1-2-3-4 |
| Firing Order | 1-2-4-3 |
| Valve Timing: | |
| Inlet: | |
| Open | 35° BTDC |
| Close | 77° ABDC |
| Duration | 292° |

## General Specifications

| Items | ZX1000E8F ~ E9F |
|---|---|
| Exhaust: | |
| Open | 62° BBDC |
| Close | 38° ATDC |
| Duration | 280° |
| Lubrication System | Forced lubrication (wet sump with oil cooler) |
| Engine Oil: | |
| Grade | API SE, SF or SG<br>API SH, SJ or SL with JASO MA, MA1 or MA2 |
| Viscosity | SAE10W-40 |
| Capacity | 4.0 L (4.2 US qt) |
| **Drive Train** | |
| Primary Reduction System: | |
| Type | Gear |
| Reduction Ratio | 1.611 (87/54) |
| Clutch Type | Wet multi disc |
| Transmission: | |
| Type | 6-speed, constant mesh, return shift |
| Gear Ratios: | |
| 1st | 2.600 (39/15) |
| 2nd | 2.053 (39/19) |
| 3rd | 1.737 (33/19) |
| 4th | 1.550 (31/20) |
| 5th | 1.400 (28/20) |
| 6th | 1.304 (30/23) |
| Final Drive System: | |
| Type | Chain drive |
| Reduction Ratio | 2.412 (41/17) |
| Overall Drive Ratio | 5.068 @Top gear |
| **Frame** | |
| Type | Tubular, diamond |
| Caster (Rake Angle) | 25.5° |
| Trail | 110 mm (4.3 in.) |
| Front Tire: | |
| Type | Tubeless |
| Size | 120/70 ZR17 M/C (58 W) |
| Rim Size | 17 × 3.50 |
| Rear Tire: | |
| Type | Tubeless |
| Size | 190/55 ZR17 M/C (75 W) |
| Rim Size | 17 × 6.00 |
| Front Suspension: | |
| Type | Telescopic fork (upside-down) |
| Wheel Travel | 120 mm (4.7 in.) |

## General Specifications

| Items | ZX1000E8F ~ E9F |
|---|---|
| Rear Suspension: | |
| Type | Swingarm (uni-trak) |
| Wheel Travel | 125 mm (4.9 in.) |
| Brake Type: | |
| Front | Dual discs |
| Rear | Single disc |
| **Electrical Equipment** | |
| Battery | 12 V 10 Ah |
| Headlight: | |
| Type | Semi-sealed beam |
| Bulb: | |
| High | 12 V 55 W + 65 W (quartz-halogen) |
| Low | 12 V 55 W (quartz-halogen) |
| Tail/Brake Light | 12 V 0.5/4.1 W (LED) |
| Alternator: | |
| Type | Three-phase AC |
| Rated Output | 30 A/14 V @5 000 r/min (rpm) |

Specifications are subject to change without notice, and may not apply to every country.

## Technical Information-KIMS (Kawasaki Ignition Management System)

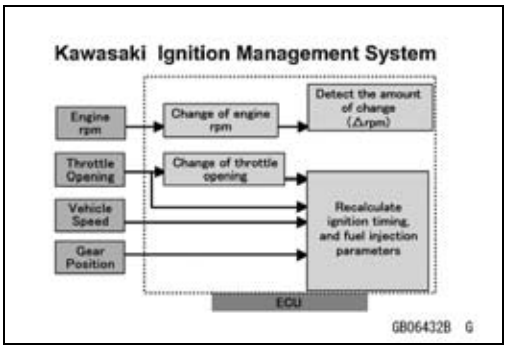
**Overview**

This motorcycle is equipped with the Kawasaki ignition management system which was developed as a rider aid for track riding using technology borrowed from racing machines. Experienced racers or track riders can deliberately cause wheel spin to occur when exiting mid/high speed corners. However, they rely on precise throttle control to maintain the optimum acceleration level without sacrificing too much wheel spin. KIMS was designed to aid such riding where precise throttle control is required.

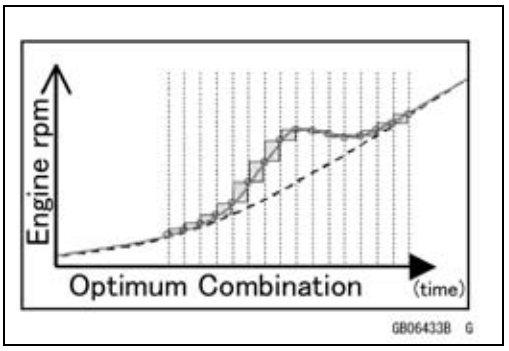
This system has not been developed to eliminate all wheel spin, as there are times when this can be advantageous for experienced riders, and too much control would lead to a very sterile riding experience.

**Operation**

In addition to normal DFI activity the ECU's complex programme monitors throttle opening, vehicle speed, gear position, and the rate of change of engine speed.

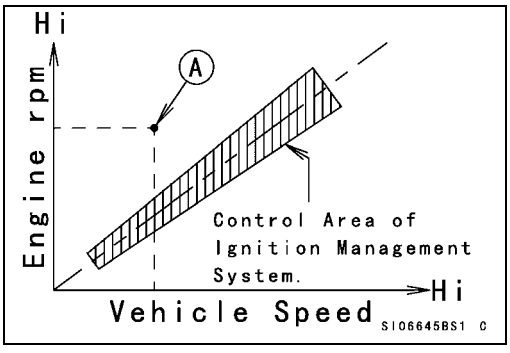



When the ECU detects the rear wheel is slipping by a sudden change in engine speed, the previously mentioned factors are calculated and within certain parameters the ignition timing is retarded to reduce excessive engine speed. The number of degrees that the ECU retards the ignition is determined by continuous sampling, with the aim being to optimize the relationship between throttle opening, engine/vehicle speed and ultimately ensuring the optimum combination of grip/acceleration.




To ensure that this system does not act unnecessarily, the following situations are taken into account.

1. This system does not act at idle speed, small throttle openings, or at full throttle.
2. In cases of snapping open the throttle with the clutch half-engaged (example [A]), the system compares the gear position, engine speed and the vehicle speed to determine whether or not to engage. This system does not act when the clutch is at the partially disengaged or slipping.




3. This system does not act on sudden throttle openings.

## Unit Conversion Table

### Prefixes for Units:

| Prefix | Symbol | Power |
|---|---|---|
| mega | M | × 1 000 000 |
| kilo | k | × 1 000 |
| 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 | = | gal (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 | = | cu in |

### Units of Force:

| | | | | |
|---|---|---|---|---|
| N | × | 0.1020 | = | kg |
| N | × | 0.2248 | = | lb |
| kg | × | 9.807 | = | N |
| kg | × | 2.205 | = | lb |

### 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/cm² |
| kPa | × | 0.1450 | = | psi |
| kPa | × | 0.7501 | = | cmHg |
| kgf/cm² | × | 98.07 | = | kPa |
| kgf/cm² | × | 14.22 | = | psi |
| cmHg | × | 1.333 | = | kPa |

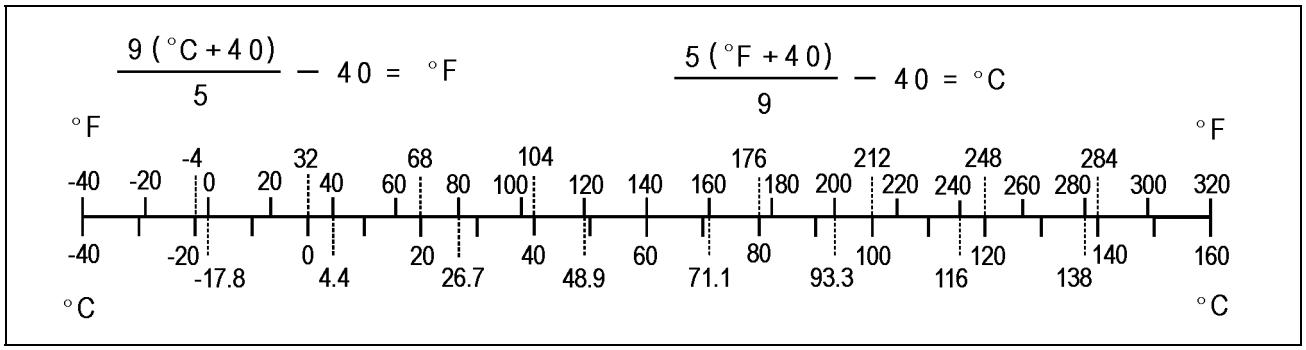
### Units of Speed:

| | | | | |
|---|---|---|---|---|
| km/h | × | 0.6214 | = | mph |

### Units of Power:

| | | | | |
|---|---|---|---|---|
| kW | × | 1.360 | = | PS |
| kW | × | 1.341 | = | HP |
| PS | × | 0.7355 | = | kW |
| PS | × | 0.9863 | = | HP |

### Units of Temperature:



# Periodic Maintenance

## Table of Contents

## 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.**

### Periodic Inspection

| FREQUENCY / ITEM | Whichever comes first ➡ / ⬇ Every | * ODOMETER READING × 1 000 km (× 1 000 mile) 1 (0.6) | 6 (4) | 12 (7.5) | 18 (12) | 24 (15) | 30 (20) | 36 (24) | See Page |
|---|---|---|---|---|---|---|---|---|---|
| **Fuel System** | | | | | | | | | |
| Throttle control system (play, smooth return, no drag)-inspect | year | ● | | ● | | ● | | ● | 2-16 |
| Engine vacuum synchronization-inspect | | | | ● | | ● | | ● | 2-16 |
| Idle speed-inspect | | ● | | ● | | ● | | ● | 2-20 |
| Fuel leak (fuel hose and pipe)-inspect | year | ● | | ● | | ● | | ● | 2-21 |
| Fuel hose and pipe damage-inspect | year | ● | | ● | | ● | | ● | 2-21 |
| Fuel hose and pipe installation condition-inspect | year | ● | | ● | | ● | | ● | 2-21 |
| Evaporative emission control system function (CAL, SEA and TH Models) -inspect | | ● | ● | ● | ● | ● | ● | ● | 2-22 |
| **Cooling System** | | | | | | | | | |
| Coolant level-inspect | | ● | | ● | | ● | | ● | 2-23 |
| Coolant leak (water hose and pipe)-inspect | year | ● | | ● | | ● | | ● | 2-23 |
| Water hose damage-inspect | year | ● | | ● | | ● | | ● | 2-23 |
| Water hose installation condition-inspect | year | ● | | ● | | ● | | ● | 2-23 |
| **Engine Top End** | | | | | | | | | |
| Valve clearance-inspect | | | | | | ● | | | 2-24 |
| Air suction system damage-inspect | | | | ● | | ● | | ● | 2-27 |
| **Clutch** | | | | | | | | | |
| Clutch operation (play, disengagement, engagement)-inspect | | ● | | ● | | ● | | ● | 2-28 |
| **Wheels and Tires** | | | | | | | | | |
| Tire air pressure-inspect | year | | | ● | | ● | | ● | 2-29 |
| Wheel/tire damage-inspect | | | | ● | | ● | | ● | 2-30 |
| Tire tread wear, abnormal wear-inspect | | | | ● | | ● | | ● | 2-30 |
| Wheel bearing damage-inspect | year | | | ● | | ● | | ● | 2-31 |
| **Final Drive** | | | | | | | | | |
| Drive chain lubrication condition-inspect # | Every 600 km (400 mile) | | | | | | | | 2-31 |
| Drive chain slack-inspect # | Every 1 000 km (600 mile) | | | | | | | | 2-32 |
| Drive chain wear-inspect # | | | | ● | | ● | | ● | 2-33 |
| Drive chain guide wear-inspect | | | | ● | | ● | | ● | 2-34 |
| **Brakes** | | | | | | | | | |
| Brake fluid leak (brake hose and pipe)-inspect | year | ● | ● | ● | ● | ● | ● | ● | 2-34 |

# 2-4 PERIODIC MAINTENANCE

## Periodic Maintenance Chart

| FREQUENCY / ITEM | Whichever comes first ➡ / ⬇ Every | * ODOMETER READING × 1 000 km (× 1 000 mile) | | | | | | | See Page |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 (0.6) | 6 (4) | 12 (7.5) | 18 (12) | 24 (15) | 30 (20) | 36 (24) | |
| Brake hose and pipe damage-inspect | year | ● | ● | ● | ● | ● | ● | ● | 2-35 |
| Brake hose installation condition-inspect | year | ● | ● | ● | ● | ● | ● | ● | 2-35 |
| Brake operation (effectiveness, play, no drag)-inspect | year | ● | ● | ● | ● | ● | ● | ● | 2-35 |
| Brake fluid level-inspect | 6 months | ● | ● | ● | ● | ● | ● | ● | 2-35 |
| Brake pad wear-inspect # | | | ● | ● | ● | ● | ● | ● | 2-36 |
| Brake light switch operation-inspect | | ● | ● | ● | ● | ● | ● | ● | 2-36 |
| **Suspension** | | | | | | | | | |
| Front forks/rear shock absorber operation (damping and smooth stroke)-inspect | | | | ● | | ● | | ● | 2-37 |
| Front forks/rear shock absorber oil leak-inspect | year | | | ● | | ● | | ● | 2-37, 2-38 |
| Rocker arm operation-inspect | | | | ● | | ● | | ● | 2-38 |
| Tie-rods operation-inspect | | | | ● | | ● | | ● | 2-38 |
| **Steering** | | | | | | | | | |
| Steering play-inspect | year | ● | | ● | | ● | | ● | 2-38 |
| Steering stem bearings-lubricate | 2 years | | | | | ● | | | 2-40 |
| Steering damper oil leak-inspect | | | ● | ● | ● | ● | ● | ● | 2-40 |
| **Electrical System** | | | | | | | | | |
| Lights and switches operation-inspect | year | | | ● | | ● | | ● | 2-41 |
| Headlight aiming-inspect | year | | | ● | | ● | | ● | 2-43 |
| Sidestand switch operation-inspect | year | | | ● | | ● | | ● | 2-44 |
| Engine stop switch operation-inspect | year | | | ● | | ● | | ● | 2-45 |
| **Others** | | | | | | | | | |
| Chassis parts-lubricate | year | | | ● | | ● | | ● | 2-45 |
| Bolts and nuts tightness-inspect | | ● | | ● | | ● | | ● | 2-46 |

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

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

## Periodic Maintenance Chart

### Periodic Replacement Parts

| FREQUENCY / ITEM | Whichever come first ➡ / Every ⬇ | * ODOMETER READING × 1 000 km (× 1 000 mile) | | | | | See Page |
|---|---|---|---|---|---|---|---|
| | | 1 (0.6) | 12 (7.5) | 24 (15) | 36 (24) | 48 (30) | |
| Air cleaner element # - replace | Every 18 000 km (12 000 mile) | | | | | | 2-48 |
| Fuel hose - replace | 4 years | | | | | ● | 2-48 |
| Coolant - change | 3 years | | | | ● | | 2-52 |
| Radiator hose and O-ring - replace | 3 years | | | | ● | | 2-54 |
| Engine oil # - change | year | ● | ● | ● | ● | ● | 2-55 |
| Oil filter - replace | year | ● | ● | ● | ● | ● | 2-56 |
| Brake hose and pipe - replace | 4 years | | | | | ● | 2-56 |
| Brake fluid - change | 2 years | | | ● | | ● | 2-57 |
| Rubber parts of master cylinder and caliper - replace | 4 years | | | | | ● | 2-59, 2-60 |
| Spark plug - replace | | | ● | ● | ● | ● | 2-64 |

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

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

# 2-6 PERIODIC MAINTENANCE

## Torque and Locking Agent

The following tables list the tightening torque for the major fasteners requiring use of a non-permanent locking agent or silicone sealant etc.

Letters used in the “Remarks” column mean:
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
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
S: Follow the specified tightening sequence.
Si: Apply silicone grease.
SS: Apply silicone sealant.

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| **Fuel System (DFI)** | | | | |
| Inlet Air Temperature Sensor Screw | 1.2 | 0.12 | 11 in·lb | |
| Air Inlet Duct Mounting Bolts | 7.0 | 0.71 | 62 in·lb | L |
| Air Cleaner Housing Bracket Bolt | 7.0 | 0.71 | 62 in·lb | |
| Air Cleaner Housing Mounting Bolt (Upper) | 7.0 | 0.71 | 62 in·lb | |
| Air Cleaner Housing Mounting Bolts (Lower) | 4.2 | 0.43 | 37 in·lb | L |
| Air Cleaner Housing Assembly Screws | 1.1 | 0.11 | 9.7 in·lb | |
| Rubber Plate Holder Screws | 1.1 | 0.11 | 9.7 in·lb | |
| Delivery Pipe Assy Mounting Screws (Nozzle Assy) | 3.4 | 0.35 | 30 in·lb | |
| Nozzle Assy Mounting Bolts | 7.0 | 0.71 | 62 in·lb | |
| Delivery Pipe Assy Mounting Screws (Throttle Body Assy) | 3.4 | 0.35 | 30 in·lb | |
| Throttle Body Assy Holder Clamp Bolts | 2.0 | 0.20 | 18 in·lb | |
| Throttle Body Assy Holder Bolts | 10 | 1.0 | 89 in·lb | S |
| Vehicle-down Sensor Bolts | 6.0 | 0.61 | 53 in·lb | |
| Camshaft Position Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| Water Temperature Sensor | 25 | 2.5 | 18 | |
| Crankshaft Sensor Bolts | 6.0 | 0.61 | 53 in·lb | L |
| Fuel Pump Bolts | 10 | 1.0 | 89 in·lb | L, S |
| Gear Position Switch Screws | 3.0 | 0.31 | 27 in·lb | L |
| Speed Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| Inlet Air Pressure Sensor Bracket Screws | 3.4 | 0.35 | 30 in·lb | |
| Exhaust Butterfly Valve Actuator Mounting Screws | 4.3 | 0.44 | 38 in·lb | |
| Exhaust Butterfly Valve Actuator Pulley Bolt | 5.0 | 0.51 | 44 in·lb | |
| Separator Bracket Bolts | 7.0 | 0.71 | 62 in·lb | |
| Canister Bracket Bolts | 4.3 | 0.44 | 38 in·lb | |
| **Cooling System** | | | | |
| Water Hose Clamp Screws | 2.0 | 0.20 | 18 in·lb | |
| Coolant Drain Bolt (Cylinder) | 10 | 1.0 | 89 in·lb | |
| Water Pump Cover Bolts | 10 | 1.0 | 89 in·lb | |
| Water Temperature Sensor | 25 | 2.5 | 18 | |
| Coolant Reserve Tank Mounting Bolts | 7.0 | 0.71 | 62 in·lb | |

## Torque and Locking Agent

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Coolant By-pass Fitting Bolt | 9.0 | 0.92 | 80 in·lb | L |
| Thermostat Housing Cover Bolts | 6.0 | 0.61 | 53 in·lb | |
| Thermostat Housing Mounting Bolts | 10 | 1.0 | 89 in·lb | |
| Oil Cooler Mounting Bolts | 20 | 2.0 | 15 | |
| Water Hose Fitting Bolts | 10 | 1.0 | 89 in·lb | |
| Water Passage Plugs | 20 | 2.0 | 15 | L |
| Radiator Bracket Mounting Bolt | 7.0 | 0.71 | 62 in·lb | |
| Radiator Upper Bolt | 7.0 | 0.71 | 62 in·lb | |
| Radiator Lower Bolt | 7.0 | 0.71 | 62 in·lb | |
| Coolant Drain Bolt (Water Pump) | 10 | 1.0 | 89 in·lb | |
| Radiator Overflow Hose Clamp Bolt | 10 | 1.0 | 89 in·lb | |
| **Engine Top End** | | | | |
| Air Suction Valve Cover Bolts | 10 | 1.0 | 89 in·lb | L |
| Cylinder Head Cover Bolts | 10 | 1.0 | 89 in·lb | |
| Camshaft Cap Bolts | 12 | 1.2 | 106 in·lb | S |
| Upper Camshaft Chain Guide Bolts | 12 | 1.2 | 106 in·lb | S |
| Cylinder Head Bolts (M10 New Bolts) | 59 | 6.0 | 44 | MO, S |
| Cylinder Head Bolts (M10 Used Bolts) | 57 | 5.8 | 42 | MO, S |
| Cylinder Head Bolts (M6) | 12 | 1.2 | 106 in·lb | S |
| Water Passage Plugs | 19.6 | 2.0 | 14.5 | L |
| Throttle Body Assy Holder Bolts | 10 | 1.0 | 89 in·lb | S |
| Throttle Body Assy Holder Clamp Bolts | 2.0 | 0.20 | 18 in·lb | |
| Camshaft Position Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| Front Camshaft Chain Guide Bolt (Upper) | 25 | 2.5 | 18 | |
| Front Camshaft Chain Guide Bolt (Lower) | 12 | 1.2 | 106 in·lb | |
| Camshaft Chain Tensioner Mounting Bolts | 10 | 1.0 | 89 in·lb | |
| Camshaft Chain Tensioner Cap Bolt | 20 | 2.0 | 15 | |
| Spark Plugs | 13 | 1.3 | 115 in·lb | |
| Cam Sprocket Mounting Bolts | 15 | 1.5 | 11 | L |
| Starter Clutch Cover Bolts (M6, L = 30) | 10 | 1.0 | 89 in·lb | |
| Starter Clutch Cover Bolts (M6, L = 20) | 10 | 1.0 | 89 in·lb | |
| Torque Limiter Cover Bolts | 10 | 1.0 | 89 in·lb | L (1), S |
| Coolant Drain Plug (Cylinder) | 10 | 1.0 | 89 in·lb | |
| Starter Clutch Bolt Cap | – | – | – | Hand-tighten |
| Timing Inspection Cap | – | – | – | Hand-tighten |
| Right Engine Bracket Bolts (Cylinder Head) | 9.8 | 1.0 | 87 in·lb | L |
| Exhaust Pipe Holder Nuts | 17 | 1.7 | 13 | |
| Exhaust Manifold Clamp Bolt | 25 | 2.5 | 18 | |
| Premuffler Chamber Mounting Bolt | 25 | 2.5 | 18 | |
| Premuffler Chamber Outer Cover Bolts | 7.0 | 0.71 | 62 in·lb | |
| Premuffler Chamber Inner Cover Bolts | 7.0 | 0.71 | 62 in·lb | |
| Exhaust Butterfly Valve Cable Clamp Bolt | 10 | 1.0 | 89 in·lb | |
| Exhaust Butterfly Valve Pulley Cover Bolts | 7.0 | 0.71 | 62 in·lb | |

## Torque and Locking Agent

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Muffler Body Clamp Bolt | 25 | 2.5 | 18 | |
| Muffler Body Mounting Bolt | 25 | 2.5 | 18 | |
| Muffler Body Front Cover Bolts | 7.0 | 0.71 | 62 in·lb | |
| Muffler Body Rear Cover Bolts | 7.0 | 0.71 | 62 in·lb | |
| **Clutch** | | | | |
| Clutch Lever Clamp Bolts | 7.8 | 0.80 | 69 in·lb | S |
| Clutch Cover Bolts (M6, L = 25) | 10 | 1.0 | 89 in·lb | S |
| Clutch Cover Bolts (M6, L = 35) | 10 | 1.0 | 89 in·lb | S |
| Oil Filler Plug | – | – | – | Hand-tighten |
| Clutch Spring Bolts | 11 | 1.1 | 97 in·lb | |
| Clutch Hub Nut | 130 | 13.3 | 96 | R |
| Sub Clutch Hub Bolts | 25 | 2.5 | 18 | L |
| **Engine Lubrication System** | | | | |
| Engine Oil Drain Bolt | 30 | 3.1 | 22 | |
| Oil Filter | 17 | 1.7 | 13 | G, R |
| Oil Filter Pipe | 35 | 3.6 | 26 | L |
| Oil Pan Bolts | 10 | 1.0 | 89 in·lb | |
| Oil Pressure Relief Valve | 15 | 1.5 | 11 | L |
| Oil Pressure Switch | 15 | 1.5 | 11 | SS |
| Oil Pressure Switch Terminal Bolt | – | – | – | Hand-tighten |
| Oil Pump Gear Bolts | 10 | 1.0 | 89 in·lb | L |
| Oil Passage Plugs | 20 | 2.0 | 15 | L |
| Oil Pump Cover Bolts | 10 | 1.0 | 89 in·lb | |
| Oil Cooler/Oil Filter Case Mounting Bolts | 20 | 2.0 | 15 | L |
| Oil Cooler Mounting Bolts | 20 | 2.0 | 15 | |
| **Engine Removal/Installation** | | | | |
| Adjusting Collar Locknut | 49 | 5.0 | 36 | S |
| Left Front Engine Mounting Bolt (M10, L = 42) | 44 | 4.5 | 32 | S |
| Right Front Engine Mounting Bolt (M10, L = 67) | 44 | 4.5 | 32 | S |
| Middle Engine Mounting Bolt | 9.8 | 1.0 | 87 in·lb | S |
| Middle Engine Mounting Nut | 44 | 4.5 | 32 | S |
| Lower Engine Mounting Bolt | 9.8 | 1.0 | 87 in·lb | S |
| Lower Engine Mounting Nut | 44 | 4.5 | 32 | S |
| Left Engine Bracket Bolts (M10, L = 30) | 44 | 4.5 | 32 | S |
| Right Engine Bracket Bolts (M10, L = 30) | 44 | 4.5 | 32 | S |
| Right Engine Bracket Bolt (M10, L = 35) | 44 | 4.5 | 32 | S |
| Right Engine Bracket Bolts (Cylinder Head) | 9.8 | 1.0 | 87 in·lb | L |
| **Crankshaft/Transmission** | | | | |
| Breather Plate Bolts | 10 | 1.0 | 89 in·lb | L |
| Crankcase Bolts (M9) | 39 | 4.0 | 29 | MO, S |
| Crankcase Bolts (M8) | 27 | 2.8 | 20 | S |
| Crankcase Bolts (M7, L = 32) | 20 | 2.0 | 15 | S |
| Crankcase Bolt (M7, L = 50) | 20 | 2.0 | 15 | S |

## Torque and Locking Agent

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Crankcase Bolt (M7, L = 85) | 20 | 2.0 | 15 | S |
| Crankcase Bolts (M6, L = 45) | 12 | 1.2 | 106 in·lb | S |
| Crankcase Bolts (M6, L = 40) | 12 | 1.2 | 106 in·lb | S |
| Shift Drum Bearing Holder Screws | 5.0 | 0.51 | 44 in·lb | L |
| Plate Screw | 5.0 | 0.51 | 44 in·lb | L |
| Drive Shaft Bearing Holder Screws | 5.0 | 0.51 | 44 in·lb | L |
| Connecting Rod Big End Nuts | see Text | ← | ← | MO |
| Oil Passage Plugs | 20 | 2.0 | 15 | L |
| Piston Oil Jet | 3.0 | 0.30 | 27 in·lb | |
| Coolant Drain Bolt (Cylinder) | 10 | 1.0 | 89 in·lb | |
| Drive Shaft Cover Bolts | 25 | 2.5 | 18 | |
| Plug | 20 | 2.0 | 15 | L |
| Shift Pedal Mounting Bolt | 25 | 2.5 | 18 | L |
| Gear Positioning Lever Bolt | 12 | 1.2 | 106 in·lb | |
| Shift Ratchet Assembly Holder Bolts | 15 | 1.5 | 11 | L |
| Shift Shaft Return Spring Pin | 29 | 3.0 | 21 | L |
| Shift Drum Cam Bolt | 12 | 1.2 | 106 in·lb | L |
| Shift Lever Bolt | 7.0 | 0.71 | 62 in·lb | |
| Tie-Rod Locknuts | 7.0 | 0.71 | 62 in·lb | Lh (1) |
| Gear Position Switch Screws | 3.0 | 0.30 | 27 in·lb | L |
| Torque Limiter Cover Bolts | 10 | 1.0 | 89 in·lb | L (1), S |
| Starter Clutch Bolt Cap | – | – | – | Hand-tighten |
| Timing Inspection Cap | – | – | – | Hand-tighten |
| Starter Clutch Cover Bolts (M6, L = 30) | 10 | 1.0 | 89 in·lb | |
| Starter Clutch Cover Bolts (M6, L = 20) | 10 | 1.0 | 89 in·lb | |
| Starter Clutch Bolt | 49 | 5.0 | 36 | |
| **Wheels/Tires** | | | | |
| Front Axle Clamp Bolts | 20 | 2.0 | 15 | AL |
| Front Axle Nut | 127 | 13.0 | 94 | |
| Rear Axle Nut | 108 | 11.0 | 80 | |
| **Final Drive** | | | | |
| Rear Axle Nut | 108 | 11.0 | 80 | |
| Rear Sprocket Nuts | 59 | 6.0 | 44 | |
| Engine Sprocket Nut | 125 | 12.7 | 92 | MO |
| Engine Sprocket Cover Bolts | 10 | 1.0 | 89 in·lb | |
| **Brakes** | | | | |
| Bleed Valves | 7.8 | 0.80 | 69 in·lb | |
| Brake Hose Banjo Bolts | 25 | 2.5 | 18 | |
| Brake Lever Pivot Bolt | 1.0 | 0.10 | 9 in·lb | Si |
| Brake Lever Pivot Bolt Nut | 5.9 | 0.60 | 52 in·lb | |
| Front Brake Disc Mounting Bolts | 27 | 2.8 | 20 | L |
| Front Brake Light Switch Screw | 1.2 | 0.12 | 11 in·lb | |
| Front Brake Pad Pins | 15 | 1.5 | 11 | |

## Torque and Locking Agent

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Front Brake Reservoir Cap Stopper Screw | 1.2 | 0.12 | 11 in·lb | |
| Front Caliper Assembly Bolts | 22 | 2.2 | 16 | |
| Front Caliper Mounting Bolts | 34 | 3.5 | 25 | |
| Front Master Cylinder Bleed Valve | 5.4 | 0.55 | 48 in·lb | |
| Front Master Cylinder Clamp Bolts | 11 | 1.1 | 97 in·lb | S |
| Brake Pedal Bolt | 8.8 | 0.90 | 78 in·lb | |
| 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 | 17 | 1.7 | 13 | |
| **Suspension** | | | | |
| Front Axle Clamp Bolts | 20 | 2.0 | 15 | AL |
| Front Fork Bottom Allen Bolts | 23 | 2.3 | 17 | L |
| Lower Front Fork Clamp Bolts | 30 | 3.1 | 22 | AL |
| Upper Front Fork Clamp Bolts | 20 | 2.0 | 15 | |
| Front Fork Top Plugs | 23 | 2.3 | 17 | |
| Piston Rod Nuts | 15 | 1.5 | 11 | |
| Rear Shock Absorber Bracket Nut | 59 | 6.0 | 44 | |
| Lower Rear Shock Absorber Nut | 34 | 3.5 | 25 | |
| Upper Rear Shock Absorber Nut | 34 | 3.5 | 25 | |
| Uni-Trak Rocker Arm Nut | 34 | 3.5 | 25 | |
| Swingarm Pivot Shaft | 20 | 2.0 | 15 | |
| Swingarm Pivot Adjusting Collar Locknut | 98 | 10.0 | 72 | |
| Swingarm Pivot Shaft Nut | 108 | 11.0 | 80 | |
| Tie-Rod Nuts | 59 | 6.0 | 44 | |
| **Steering** | | | | |
| Left Switch Housing Screws | 3.5 | 0.36 | 31 in·lb | |
| Right Switch Housing Screws | 3.5 | 0.36 | 31 in·lb | |
| Handlebar Clamp Bolts | 25 | 2.5 | 18 | |
| Handlebar Positioning Bolts | 9.8 | 1.0 | 87 in·lb | L |
| Steering Stem Head Bolt | 108 | 11.0 | 80 | |
| Upper Front Fork Clamp Bolts | 20 | 2.0 | 15 | |
| Steering Stem Nut | 20 | 2.0 | 15 | |
| Lower Front Fork Clamp Bolts | 30 | 3.1 | 22 | AL |
| Steering Damper Mounting Bolts | 11 | 1.1 | 97 in·lb | L |
| **Frame** | | | | |
| Front Footpeg Bracket Bolts | 25 | 2.5 | 18 | |
| Rear Footpeg Bracket Bolts | 25 | 2.5 | 18 | |
| Rear Frame Front Bolts | 44 | 4.5 | 32 | L |
| Rear Frame Rear Bolts | 25 | 2.5 | 18 | L |
| Sidestand Bolt | 44 | 4.5 | 32 | |
| Sidestand Switch Bolt | 8.8 | 0.90 | 78 in·lb | L |
| Sidestand Bracket Bolts | 49 | 5.0 | 36 | L |

## Torque and Locking Agent

| Fastener | Torque | | | Remarks |
|---|---|---|---|---|
| | N·m | kgf·m | ft·lb | |
| Front Fender Mounting Bolts | 3.9 | 0.40 | 35 in·lb | |
| Windshield Mounting Bolts | 0.40 | 0.041 | 3.5 in·lb | |
| **Electrical System** | | | | |
| Meter Unit Mounting Screws | 1.2 | 0.12 | 11 in·lb | |
| Front Turn Signal Light Lens Screws | 1.0 | 0.10 | 9 in·lb | |
| Rear Turn Signal Light Lens Screws | 1.0 | 0.10 | 9 in·lb | |
| License Plate Light Cover Screws | 1.0 | 0.10 | 9 in·lb | |
| Camshaft Position Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| Water Temperature Sensor | 25 | 2.5 | 18 | |
| Oxygen Sensors (Equipped Models) | 25 | 2.5 | 18 | |
| Vehicle-down Sensor Bolts | 6.0 | 0.61 | 53 in·lb | |
| Gear Position Switch Screws | 3.0 | 0.30 | 27 in·lb | L |
| Spark Plugs | 13 | 1.3 | 115 in·lb | |
| Stator Coil Bolts | 12 | 1.2 | 106 in·lb | |
| Alternator Rotor Bolt | 155 | 15.8 | 114 | |
| Crankshaft Sensor Bolts | 6.0 | 0.61 | 53 in·lb | L |
| Regulator/Rectifier Bolts | 7.0 | 0.71 | 62 in·lb | |
| Regulator/Rectifier Bracket Bolts | 7.0 | 0.71 | 62 in·lb | |
| Speed Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| Alternator Cover Bolts | 10 | 1.0 | 89 in·lb | |
| Alternator Lead Holding Plate Bolt | 10 | 1.0 | 89 in·lb | L |
| Oil Pressure Switch | 15 | 1.5 | 11 | SS |
| Oil Pressure Switch Terminal Bolt | – | – | – | Hand-tighten |
| Torque Limiter Cover Bolts | 10 | 1.0 | 89 in·lb | L (1), S |
| Starter Clutch Cover Bolts (M6, L = 30) | 10 | 1.0 | 89 in·lb | |
| Starter Clutch Cover Bolts (M6, L = 20) | 10 | 1.0 | 89 in·lb | |
| Starter Clutch Bolt | 49 | 5.0 | 36 | |
| Front Brake Light Switch Screw | 1.2 | 0.12 | 11 in·lb | |
| Right Switch Housing Screws (M5, L = 45) | 3.5 | 0.36 | 31 in·lb | |
| Left Switch Housing Screws (M5, L = 25) | 3.5 | 0.36 | 31 in·lb | |
| Starter Motor Mounting Bolts | 10 | 1.0 | 89 in·lb | |
| Sidestand Switch Bolt | 8.8 | 0.90 | 78 in·lb | L |
| Starter Motor Cable Mounting Bolt | 4.0 | 0.41 | 35 in·lb | |
| Starter Motor Cable Terminal Nut | 6.0 | 0.61 | 53 in·lb | |
| Battery Cable Mounting Bolt | 4.0 | 0.41 | 35 in·lb | |
| Starter Motor Terminal Locknut | 6.9 | 0.70 | 61 in·lb | |
| Starter Motor Through Bolts | 3.4 | 0.35 | 30 in·lb | |
| Engine Ground Cable Terminal Bolt | 10 | 1.0 | 89 in·lb | |
| Fuel Pump Bolts | 10 | 1.0 | 89 in·lb | L, S |

## Torque and Locking Agent

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 ~ 43 in·lb |
| 6 | 5.9 ~ 7.8 | 0.60 ~ 0.80 | 52 ~ 69 in·lb |
| 8 | 14 ~ 19 | 1.4 ~ 1.9 | 10 ~ 13.5 |
| 10 | 25 ~ 34 | 2.6 ~ 3.5 | 19 ~ 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

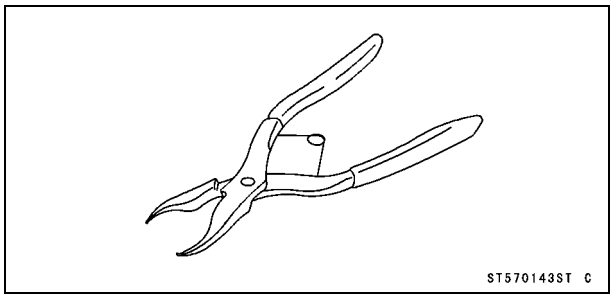
| Item | Standard | Service Limit |
|---|---|---|
| **Fuel System (DFI)** | | |
| Throttle Grip Free Play | 2 ~ 3 mm (0.08 ~ 0.12 in.) | – – – |
| Idle Speed | 1 100 ±50 r/min (rpm) | – – – |
| Bypass Screws (Turn Out) | 2 1/2 (for reference) | – – – |
| Throttle Body Vacuum | 32.7 ±1.33 kPa (245 ±10 mmHg) at idle speed | – – – |
| Air Cleaner Element | Viscous paper element | – – – |
| **Cooling System** | | |
| Coolant: | | |
| Type (Recommended) | Permanent type antifreeze | – – – |
| Color | Green | – – – |
| Mixed Ratio | Soft water 50%, coolant 50% | – – – |
| Freezing Point | –35°C (–31°F) | – – – |
| Total Amount | 2.9 L (3.1 US qt) | – – – |
| **Engine Top End** | | |
| Valve Clearance: | | |
| Exhaust | 0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.) | – – – |
| Inlet | 0.15 ~ 0.22 mm (0.0059 ~ 0.0087 in.) | – – – |
| **Clutch** | | |
| Clutch Lever Free Play | 2 ~ 3 mm (0.08 ~ 0.12 in.) | – – – |
| **Engine Lubrication System** | | |
| Engine Oil: | | |
| Grade | API SE, SF or SG | – – – |
| | API SH, SJ or SL with JASO MA, MA1 or MA2 | |
| Viscosity | SAE 10W-40 | – – – |
| Capacity | 3.2 L (3.4 US qt) (when filter is not removed) | – – – |
| | 3.7 L (3.9 US qt) (when filter is removed) | – – – |
| | 4.0 L (4.2 US qt) (when engine is completely dry) | – – – |
| Level | Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running) | – – – |
| **Wheels/Tires** | | |
| Tread Depth: | | |
| EUR, CA and BR Models: | | |
| Front | 3.8 mm (0.15 in.) | 1 mm (0.04 in.)<br>(AT, CH, DE) 1.6 mm (0.06 in.) |
| Rear | 5.2 mm (0.20 in.) | Up to 130 km/h (80 mph): 2 mm (0.08 in.)<br>Over 130 km/h (80 mph): 3 mm (0.12 in.) |

## Specifications

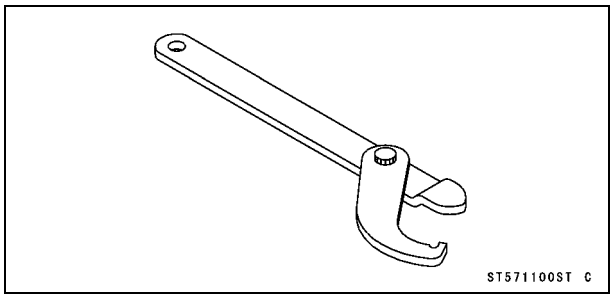
| Item | Standard | Service Limit |
|---|---|---|
| Other than EUR, CA and BR Models: | | |
| Front | 3.6 mm (0.14 in.) | 1 mm (0.04 in.) |
| Rear | 5.3 mm (0.21 in.) | Up to 130 km/h (80 mph): 2 mm (0.08 in.)<br>Over 130 km/h (80 mph): 3 mm (0.12 in.) |
| Air Pressure (when Cold): | | |
| Front | Up to 180 kg (397 lb) load: 250 kPa (2.5 kgf/cm², 36 psi) | – – – |
| Rear | Up to 180 kg (397 lb) load: 290 kPa (2.9 kgf/cm², 42 psi) | – – – |
| **Final Drive** | | |
| Drive Chain Slack | 30 ~ 40 mm (1.2 ~ 1.6 in.) | – – – |
| Drive Chain Wear (20-link Length) | 317.5 ~ 318.2 mm (12.50 ~ 12.53 in.) | 323 mm (12.7 in.) |
| Standard Chain: | | |
| Make | RK EXCEL | – – – |
| Type | RK 525MFOZ, Endless | – – – |
| Link | 110 links | – – – |
| **Brakes** | | |
| Brake Fluid: | | |
| Grade | DOT4 | – – – |
| Brake Pad Lining Thickness: | | |
| Front | 4.0 mm (0.16 in.) | 1 mm (0.04 in.) |
| Rear | 5.0 mm (0.20 in.) | 1 mm (0.04 in.) |
| Brake Light Timing: | | |
| Front | Pulled ON | – – – |
| Rear | On after about 10 mm (0.39 in.) of pedal travel | – – – |
| **Electrical System** | | |
| Spark Plug: | | |
| Type | NGK CR9EIA-9 | – – – |

## Special Tools

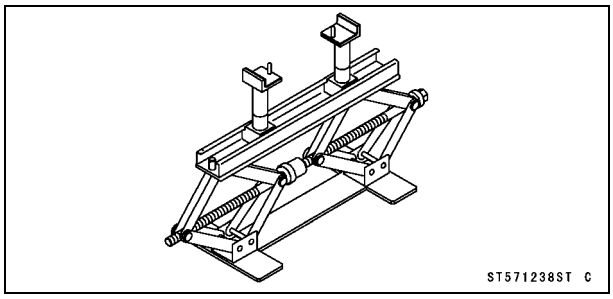
**Inside Circlip Pliers:**
**57001-143**



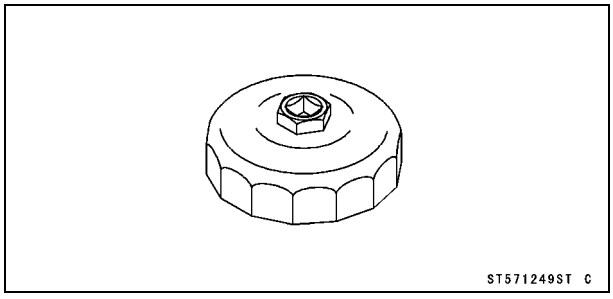

**Steering Stem Nut Wrench:**
**57001-1100**



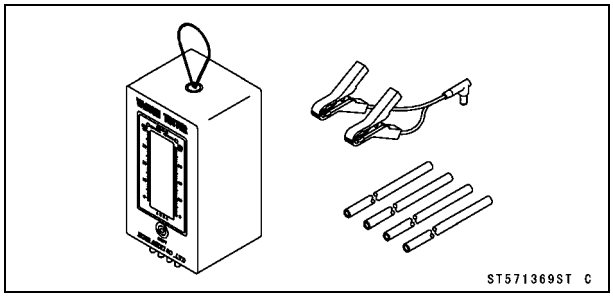

**Jack:**
**57001-1238**



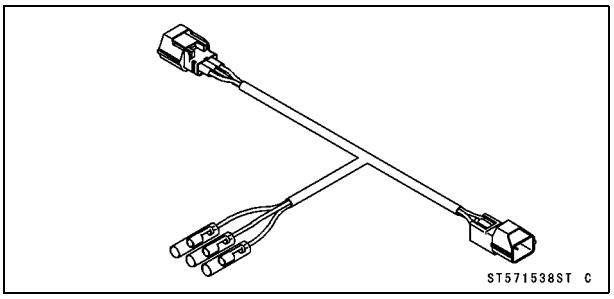

**Oil Filter Wrench:**
**57001-1249**



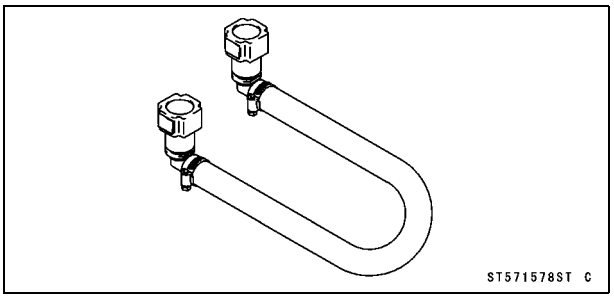

**Vacuum Gauge:**
**57001-1369**



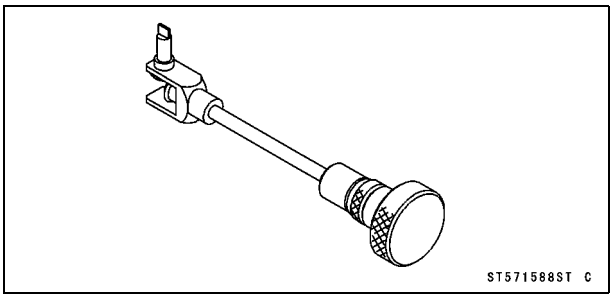

**Throttle Sensor Setting Adapter:**
**57001-1538**



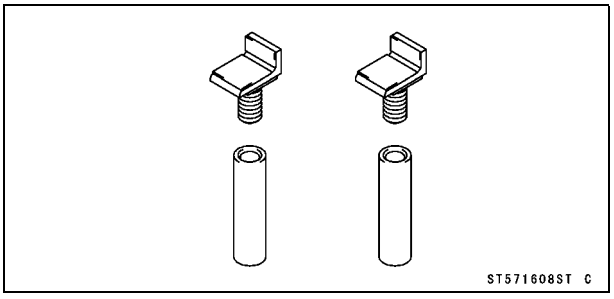

**Extension Tube:**
**57001-1578**




**Pilot Screw Adjuster, D:**
**57001-1588**



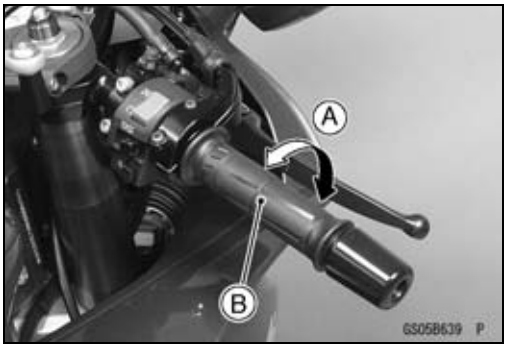

**Jack Attachment:**
**57001-1608**



## Maintenance Procedure

## Fuel System (DFI)

### *Throttle Control System Inspection*




- Check the throttle grip free play [A].

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

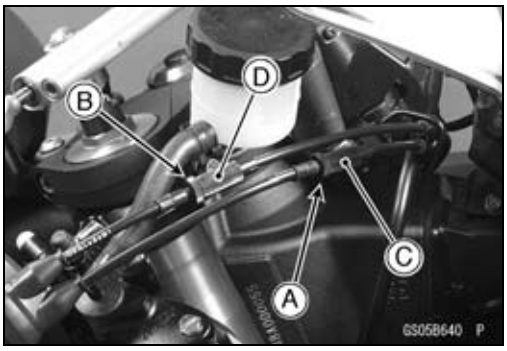
**Throttle Grip Free Play**
**Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)**

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

★If the throttle grip does not return properly, check the throttle cables routing, grip free play, and cable damage. Then lubricate the throttle cable.

- Run the engine at the idle speed, and turn the handlebar all the way to the right and left to ensure that the idle speed does not change.

★If the idle speed increases, check the throttle cable free play and the cable routing.

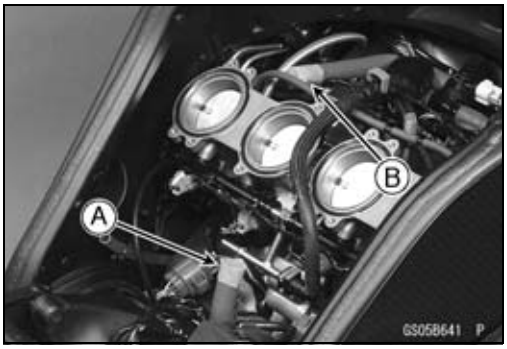



★If necessary, adjust the throttle cable as follows.

- Loosen the locknuts [A] [B].
- Screw both throttle cable adjusters [C] [D] to give the throttle grip plenty of play.
- Turn the decelerator cable adjuster [C] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut [A].
- Turn the accelerator cable adjuster [D] until 2 ~ 3 mm (0.08 ~ 0.12 in.) of throttle grip play is obtained.
- Tighten the locknut [B].

★If the free play can not be adjusted with the adjusters, replace the cable.

### *Engine Vacuum Synchronization Inspection*



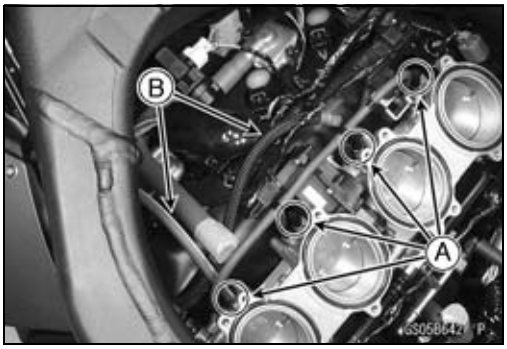

**NOTE**

○*These procedures are explained on the assumption that the inlet and exhaust systems of the engine are good condition.*

- Situate the motorcycle so that it is vertical.
- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Primary Fuel Hose (see Fuel Hose Replacement)
- Plug the breather hose end [A] and air switching valve hose end [B].

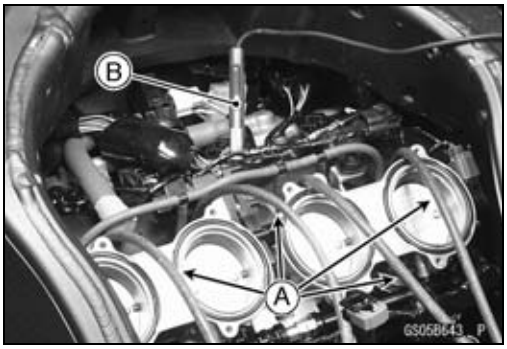
## Maintenance Procedure

- Remove the rubber caps [A] from the fittings of each throttle body
- For the California and Southeast Asia models, pull off the vacuum hoses [B].




- Connect a vacuum gauge and hoses [A] (Special Tool: 57001-1369) to the fittings on the throttle body.

  **Special Tool - Vacuum Gauge: 57001-1369**
- Connect a highly accurate tachometer [B] to one of the stick coil primary leads.




- Connect the following parts temporarily.
  Fuel Pump Lead Connector [A]
  Extension Tube [B]

  **Special Tool - Extension Tube: 57001-1578**

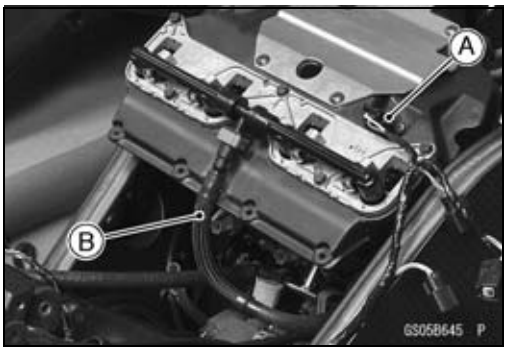

- Connect the following parts temporarily.
  Inlet Air Temperature Sensor Connector [A]
  Secondary Fuel Hose [B] (see Fuel Hose Replacement)

**NOTE**

○*Be sure to connect the air temperature sensor connector. When the ignition switch is turned ON with inlet air temperature sensor connector disconnected, the ECU detects the service code 13. Then the ECU starts the fail-safe (see Self-diagnosis Outline in the Fuel System (DFI) chapter). In this case, the engine vacuum synchronization can not be inspected correctly.*

○*Do not connect the secondary fuel injector connectors. The engine vacuum synchronization is inspected with the air cleaner housing removed and the engine started. The secondary fuel injectors are operating with following conditions.*

1. The engine speed is more than 6 000 r/min (rpm).
2. The throttle opening is more than 30°.

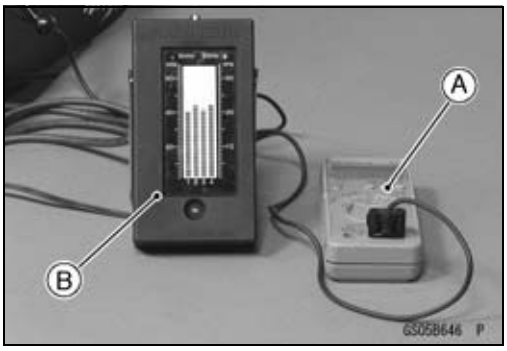



**⚠ WARNING**

**Gasoline is extremely flammable and can be explosive under certain condition. Especially, the gasoline jetted from the secondary fuel injector is extremely flammable for atomizing the gasoline by the injector.**

## Maintenance Procedure

- Start the engine and warm it up thoroughly.
- Check the idle speed, using a highly accurate tachometer [A].




**Idle Speed**
**Standard: 1 100 ±50 r/min (rpm)**

★If the idle speed is out of the specified range, adjust it with the adjusting screw (see Idle Speed Adjustment).

**CAUTION**

**Do not measure the idle speed by the tachometer of the meter unit.**

- While idling the engine, inspect the throttle body vacuum, using the vacuum gauge [B].

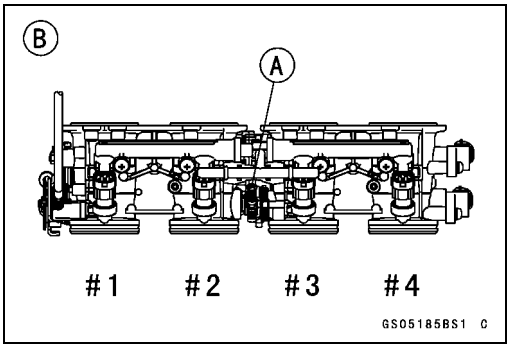
**Throttle Body Vacuum**
**Standard: 32.7 ±1.33 kPa (245 ± 10 mmHg) at idle speed**

★If any vacuum is not within specifications, first synchronize the balance of the left (#1, #2 throttle valves) and right (#3, #4 throttle valves) assemblies.


**Example:**
#1: 220 mmHg
#2: 250 mmHg
#3: 210 mmHg
#4: 230 mmHg

- With the engine at the correct idle speed, equalize higher vacuum of #1 or #2 (for example 250 mmHg) to higher vacuum of #3 or #4 (for example 230 mmHg) by turning the center adjusting screw [A].

Rear View [B]




**NOTE**

○*After adjustment, the final vacuum measurement between the highest throttle valves may not be 250 mmHg (for example). The goal is to have the highest two vacuums between the left (#1 and #2) and right (#3 and #4) banks be the same.*

- Open and close the throttle after each measurement, and adjust the idle speed as necessary.

**NOTE**

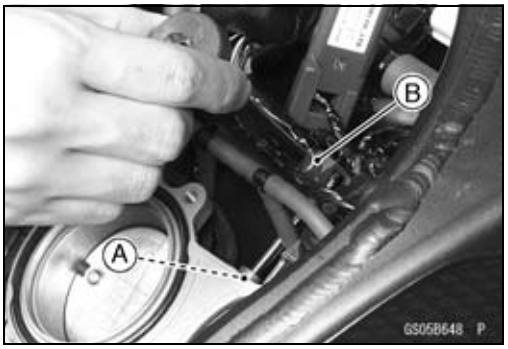
○*The engine vacuum synchronization is adjusted with the secondary fuel injector connectors disconnected. Therefore, the secondary fuel injectors do not operate while adjusting the engine vacuum synchronization. If raising the engine speed more than 6 000 r/min (rpm), the engine may not operate smoothly.*

- Once the throttle valves have been synchronized, inspect output voltage of the main throttle sensor to ensure proper operation (procedure is explained at the end of this section).

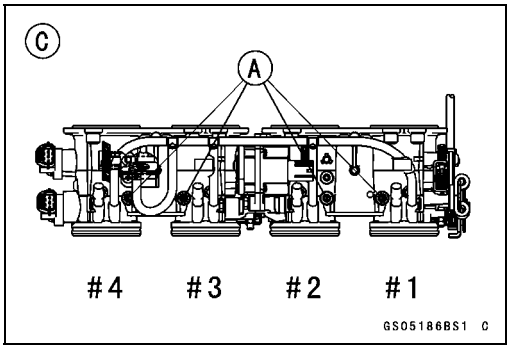
## Maintenance Procedure

★If any one vacuum measurement is out of the specified range after left (#1, #2) and right (#2, #3) synchronization, adjust the bypass screws [A] Using the pilot screw adjuster [B].
Front View [C]

**Special Tool - Pilot Screw Adjuster, D: 57001-1588**




- Adjust the lower vacuum between #1 and #2 to the higher vacuum of #1 and #2.
- Adjust the lower vacuum between #3 and #4 to the higher vacuum of #3 and #4.
- Open and close the throttle valves after each measurement, and adjust the idle speed as necessary.




**NOTE**

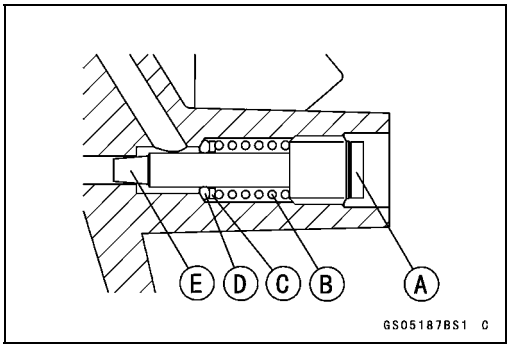
○*The engine vacuum synchronization is adjusted with the secondary injector connectors disconnected. Therefore, the secondary injectors do not operate while adjusting the engine vacuum synchronization. If raising the engine speed more than 6 000 r/min (rpm), the engine may not operate smoothly.*

- Check the vacuums as before.

★If all vacuums are within the specification range, finish the engine vacuum synchronization.

★If any vacuum can not be adjusted within the specification, remove the bypass screws #1 ~ #4 and replace them with new ones.

- Turn in the bypass screw [A] with counting the number of turns until it seals fully but not tightly. Record the number of turns.
- Remove:
  Bypass Screw
  Spring [B]
  Washer [C]
  O-ring [D]




- Check the bypass screw hole in the throttle body for carbon deposits.

★If any carbons accumulate, wipe the carbons off from the hole, using a cotton pad penetrated with a high-flash point solvent.

- Replace the bypass screw, spring, washer and O-ring as a set.
- Turn in the bypass screw until it seats fully but not tightly.

**CAUTION**

**Do not over-tighten the bypass screw. The tapered portion [E] of the bypass screw could be damaged.**

## Maintenance Procedure

● Back out the same number of turns counted when first turned in. This is to set the screw to its original position.

**NOTE**

○*A throttle body has different "turns out" of the bypass screw for each individual unit. On setting the bypass screw, use the "turns out" determined during disassembly.*

● Repeat the same procedure for other bypass screws.
● Repeat the synchronization.
★If the vacuums are correct, check the output voltage of the main throttle sensor (see Main Throttle Sensor Output Voltage Inspection in the Fuel System (DFI) chapter).

**Special Tool - Throttle Sensor Setting Adapter: 57001 -1538**

**Main Throttle Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (sensor Y/W) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

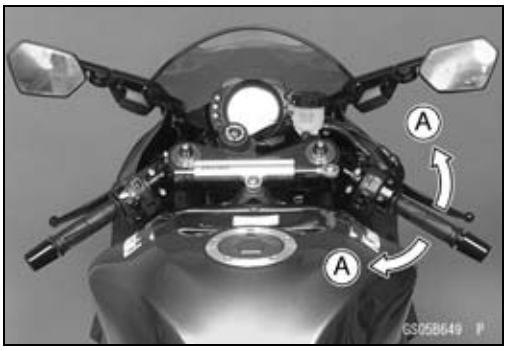
**Standard: DC 0.645 ~ 0.675 V at idle throttle opening**

★If the output voltage is out of the standard, check the input voltage of the main throttle sensor (see Main Throttle Sensor Input Voltage Inspection in the Fuel System (DFI) chapter).

● Remove the vacuum gauge hoses and install the rubber caps on the original position.
● For the California and Southeast Asia models, install the vacuum hoses.
○Run the vacuum hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter. Refer to the diagram of the evaporative emission control system in the Fuel System (DFI) chapter too.

### *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 riding (see Cable, Wire, and Hose Routing section in the Appendix chapter).

**⚠ WARNING**

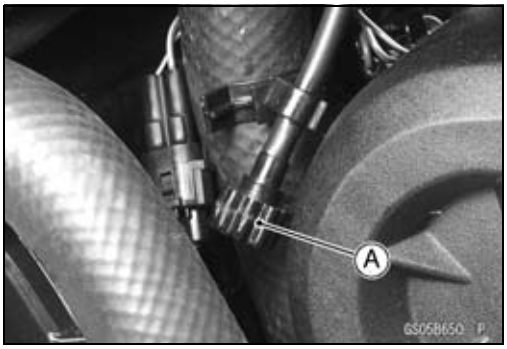
**Operation with improperly adjusted, incorrectly routed, or damaged cables could result in an unsafe riding condition.**

● Check the idle speed.
★If the idle speed is out of specified range, adjust it.

**Idle Speed**
**Standard: 1 100 ±50 r/min (rpm)**

## Maintenance Procedure

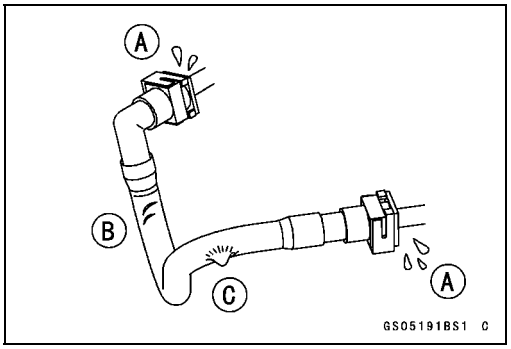
### *Idle Speed Adjustment*




- Start the engine and warm it up thoroughly.
- Turn the adjusting screw [A] until the idle speed is correct.

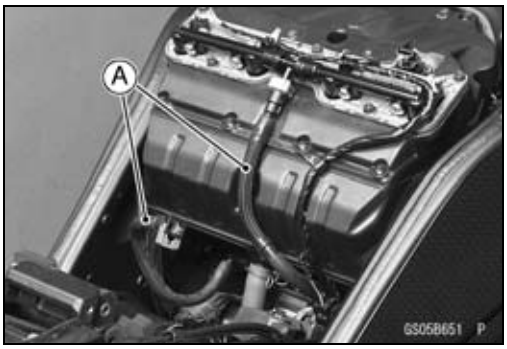
○Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.

### *Fuel Hose Inspection (fuel leak, damage, installation condition)*



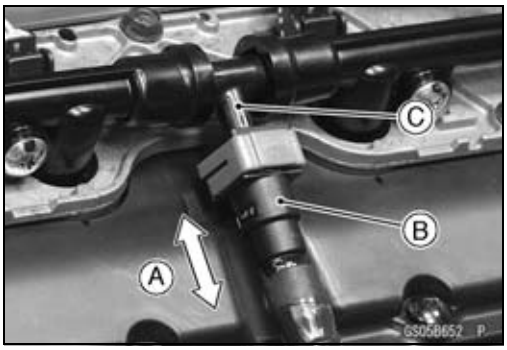

○If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the hose to burst. Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter) and check the fuel hoses.

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




- Check that the fuel hoses [A] are routed according to Cable, Wire, and Hose Routing section in the Appendix chapter.

★Replace the hose if it has been sharply bent or kinked.




- Check that the fuel hose joints are securely connected.

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

○Check the other hose joint in the same way.

**CAUTION**

**When pushing and pulling the fuel hose joint, do not apply strong force to the delivery pipe [C] on the nozzle assy. The pipe made from resin could be damaged.**

**⚠ WARNING**

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

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

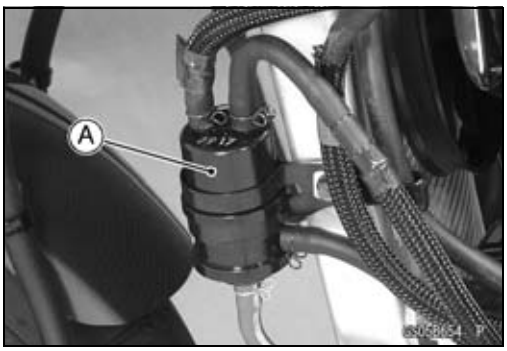
## Maintenance Procedure

### *Evaporative Emission Control System Inspection (CAL, SEA and TH Models)*


● Inspect the canister as follows.
○Remove the left upper inner fairing (see Upper Inner Fairing Removal in the Frame chapter).
○Remove the canister [A], and disconnect the hoses from the canister.
○Visually inspect the canister for cracks or other damage.
★If the canister has any cracks or bad damage, replace it with a new one.

**NOTE**

○*The canister is designed to work well through the motorcycle's life without any maintenance if it is used under normal conditions.*

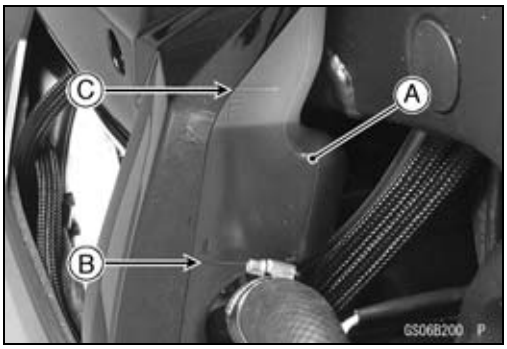



● Check the liquid/vapor separator as follows.
○Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
○Disconnect the hoses from the separator, and remove the separator [A] from the motorcycle left side.
○Visually inspect the separator for cracks and other damage.
★If the separator has any cracks or damage, replace it with a new one.
○To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
● Check the hoses of the evaporative emission control system as follows.
○Check that the hoses are securely connected and clips are in position.
○Replace any kinked, deteriorated or damaged hoses.
○Route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
○When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and route the hoses with a minimum of bending so that the emission flow will not be obstructed.

## Maintenance Procedure

## 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).

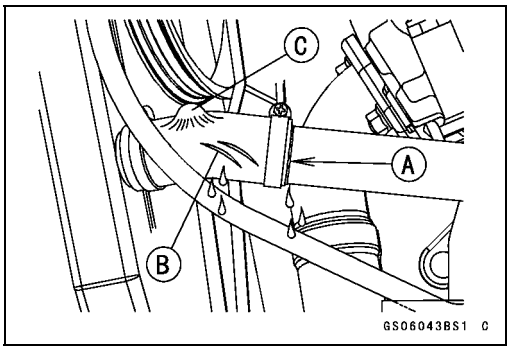
★If the coolant level is lower than the "L" level line [B], remove the left upper fairing cover (see Upper Fairing Cover Removal in the Frame chapter), and then unscrew the reserve tank cap and add coolant to the "F" level line [C].

"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 probably leakage in the cooling system. Check the system for leaks.**
**Coolant ruins painted surfaces. Immediately wash away any coolant that spills on the frame, engine, wheels or other painted parts.**

### *Radiator Hose and Pipe Inspection (coolant leak, damage, installation condition)*




○The high pressure inside the radiator hose 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 (Water) Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

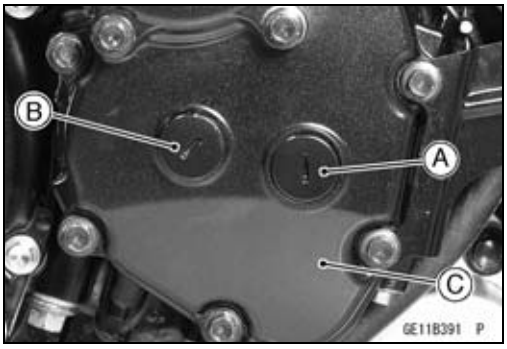
## Maintenance Procedure

## Engine Top End

### *Valve Clearance Inspection*

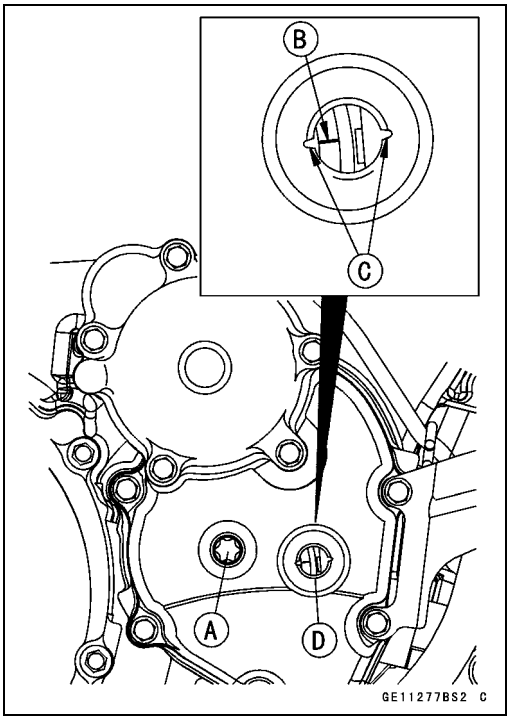
**NOTE**

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




- Remove the cylinder head cover (see Cylinder Head Cover Removal in the Engine Top End chapter).
- Remove the timing inspection cap [A] and starter clutch bolt cap [B] on the starter clutch cover [C].

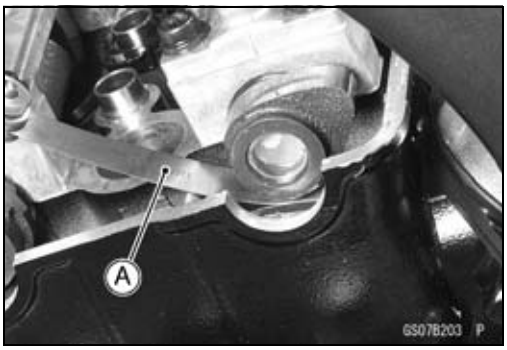
- Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch is aligned with the notch [C] in the edge of the timing inspection hole [D] in the starter clutch cover.




- Using a thickness gauge [A], measure the valve clearance between the cam and the valve lifter.

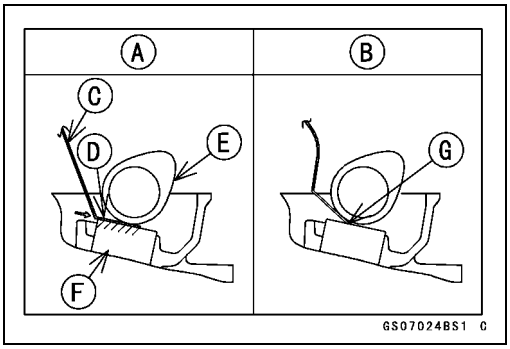
**Valve Clearance**
**Standard:**

| | |
|---|---|
| **Exhaust** | **0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.)** |
| **Inlet** | **0.15 ~ 0.22 mm (0.0059 ~ 0.0087 in.)** |




**NOTE**

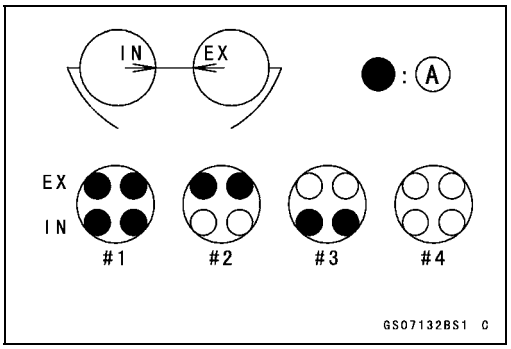
○*Thickness gauge is horizontally inserted on the valve lifter.*



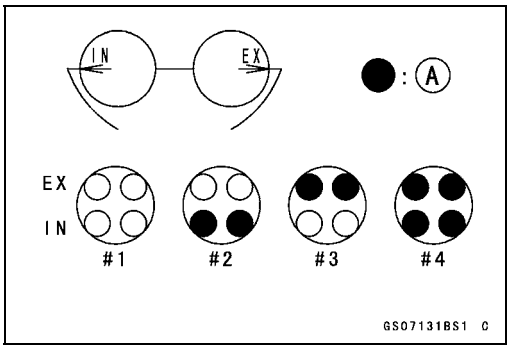

Appropriateness [A]
Inadequacy [B]
Thickness Gauge [C]
Horizontally Inserts [D]
Cam [E]
Valve Lifter [F]
Hits the Valve Lifter Ahead [G]

## Maintenance Procedure

○**When positioning #1 piston TDC at the end of the compression stroke:**
Inlet Valve Clearance of #1 and #3 Cylinders
Exhaust Valve Clearance of #1 and #2 Cylinders
Measuring Valve [A]




○**When positioning #4 piston TDC at the end of the compression stroke:**
Inlet Valve Clearance of #2 and #4 Cylinders
Exhaust Valve Clearance of #3 and #4 Cylinders
Measuring Valve [A]



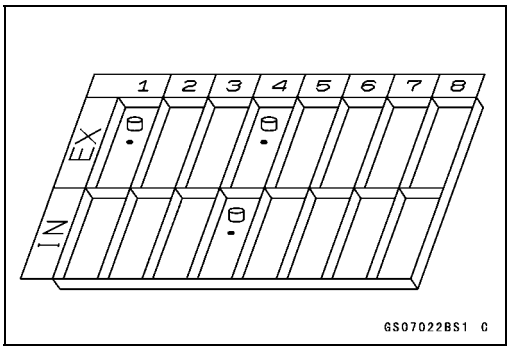

★If the valve clearance is not within the specified range, first record the clearance, and then adjust it.

### *Valve Clearance Adjustment*

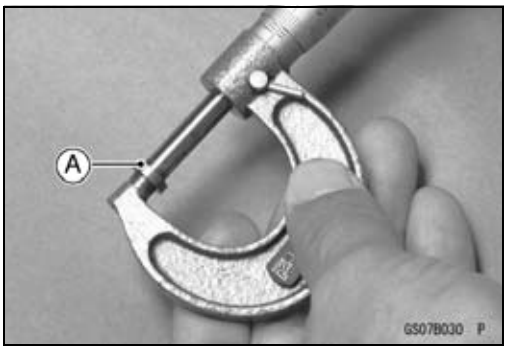
- To change the valve clearance, remove the camshafts (see Camshaft Removal in the Engine Top End chapter) and valve lifters.
- Replace the shim with one of a different thickness.

**NOTE**

○*Mark and record the locations of the valve lifters and shims so that they can be reinstalled in their original positions.*




- Clean the shim to remove any dust or oil.
- Measure the thickness of the removed shim [A].
- Select a new shim thickness calculation as follows.




a + b – c = d

[a] Present Shim Thickness

[b] Measured Valve Clearance

[c] Specified Valve Clearance (Mean Value = 0.195 mm (Exhaust), 0.185 mm (Inlet))

[d] Replace Shim Thickness

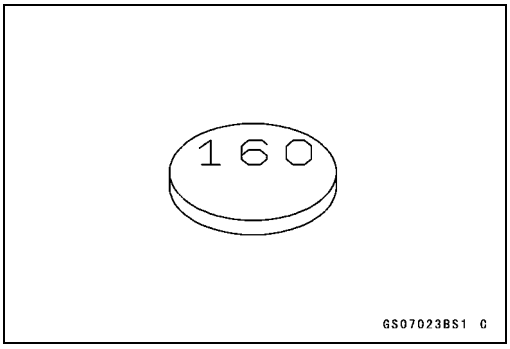
**Example (Exhaust):**
1.600 + 0.31 – 0.195 = 1.715 mm

○Exchange the shim for the 1.725 size shim.

## Maintenance Procedure

**Adjustment Shims**

| Thickness | Part Number | Mark |
|---|---|---|
| 1.300 | 92180-0108 | 130 |
| 1.325 | 92180-0109 | 132 |
| 1.350 | 92180-0110 | 135 |
| 1.375 | 92180-0111 | 138 |
| 1.400 | 92180-0112 | 140 |
| 1.425 | 92180-0113 | 142 |
| 1.450 | 92180-0114 | 145 |
| 1.475 | 92180-0115 | 148 |
| 1.500 | 92180-0116 | 150 |
| 1.525 | 92180-0117 | 152 |
| 1.550 | 92180-0118 | 155 |
| 1.575 | 92180-0119 | 158 |
| 1.600 | 92180-0120 | 160 |
| 1.625 | 92180-0121 | 162 |
| 1.650 | 92180-0122 | 165 |
| 1.675 | 92180-0123 | 168 |
| 1.700 | 92180-0124 | 170 |
| 1.725 | 92180-0125 | 172 |
| 1.750 | 92180-0126 | 175 |
| 1.775 | 92180-0127 | 178 |
| 1.800 | 92180-0128 | 180 |
| 1.825 | 92180-0129 | 182 |
| 1.850 | 92180-0130 | 185 |
| 1.875 | 92180-0131 | 188 |
| 1.900 | 92180-0132 | 190 |
| 1.925 | 92180-0133 | 192 |
| 1.950 | 92180-0134 | 195 |
| 1.975 | 92180-0135 | 198 |
| 2.000 | 92180-0136 | 200 |
| 2.025 | 92180-0137 | 202 |
| 2.050 | 92180-0138 | 205 |
| 2.075 | 92180-0139 | 208 |
| 2.100 | 92180-0140 | 210 |
| 2.125 | 92180-0141 | 212 |
| 2.150 | 92180-0142 | 215 |
| 2.175 | 92180-0143 | 218 |
| 2.200 | 92180-0144 | 220 |
| 2.225 | 92180-0145 | 222 |
| 2.250 | 92180-0146 | 225 |
| 2.275 | 92180-0147 | 228 |
| 2.300 | 92180-0148 | 230 |



## Maintenance Procedure

**CAUTION**

**Be sure to remeasure the clearance after selecting a shim. The clearance can be out of the specified range because of the shim tolerance.**

○If there is no valve clearance, use a shim that is a few sizes smaller, and remeasure the valve clearance.

- When installing the shim, face the marked side toward the valve lifter. At this time, apply engine oil to the shim or the valve lifter to keep the shim in place during camshaft installation.

**CAUTION**

**Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.**
**Do not grind the shim. This may cause it to fracture, causing extensive engine damage.**

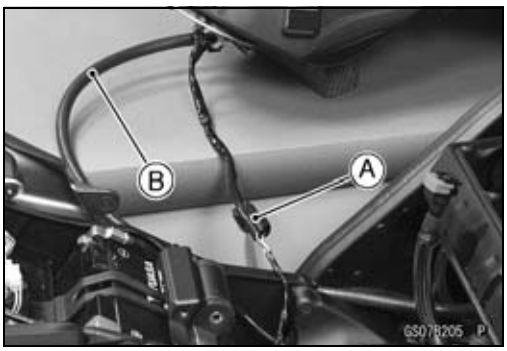
- Apply molybdenum disulfide oil solution to the valve lifter surface and install the lifter.
- Install the camshafts (see Camshaft Installation in the Engine Top End chapter).
- Recheck the valve clearance and readjust if necessary.
- Install the removed parts (see appropriate chapters).

### *Air Suction System Damage Inspection*

- Remove:
  Middle Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Primary Fuel Hose (see Fuel Hose Replacement)
- Separate the air switching valve hose [A] from the lower air cleaner housing.

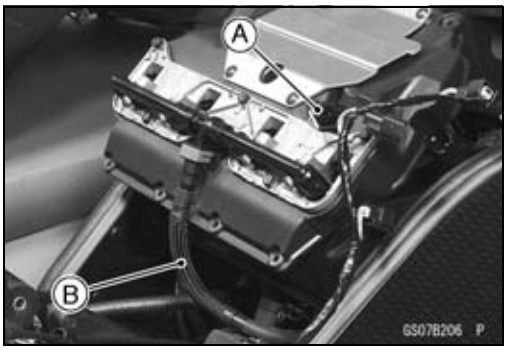

- Connect the following parts temporarily.
  Fuel Pump Lead Connector [A]
  Extension Tube [B]

**Special Tool - Extension Tube: 57001-1578**



## Maintenance Procedure

● Connect the following parts temporarily.
Inlet Air Temperature Sensor Connector [A]
Secondary Fuel Hose [B] (see Fuel Hose Replacement)




**NOTE**

○*When the ignition switch is turned ON with inlet air temperature sensor connector disconnected, the ECU detects the service code 13 (see Self-diagnosis Outline in the Fuel System (DFI) chapter).*

○*Do not connect the secondary fuel injector connectors. The air suction system is inspected with the middle air cleaner housing removed and the engine started. The secondary fuel injectors are operating with following conditions.*

1. The engine speed is more than 6 000 r/min (rpm).
2. The throttle opening is more than 30°

**⚠ WARNING**

**Gasoline is extremely flammable and can be explosive under certain condition. Especially, the gasoline jetted from the secondary fuel injector is extremely flammable for atomizing the gasoline by the injector.**

● Start the engine and run it at idle speed.
● Plug the air switching valve hose end [A] with your finger and feel vacuum pulsing in the hose.
★If there is no vacuum pulsation, check the hose line for leak. If there is no leak, check the air switching valve (see Air Switching Valve Unit Test in the Electrical System chapter) or air suction valve (see Air Suction Valve Inspection in the Engine Top End chapter).


## 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.

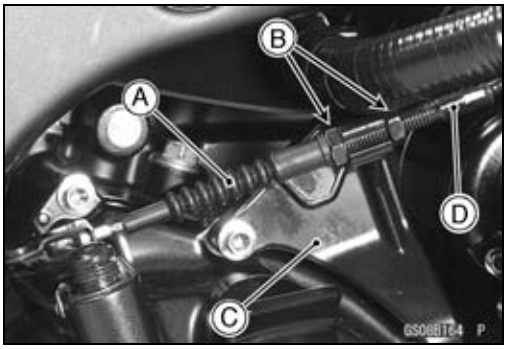
**Clutch Lever Free Play**
**Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)**

## Maintenance Procedure

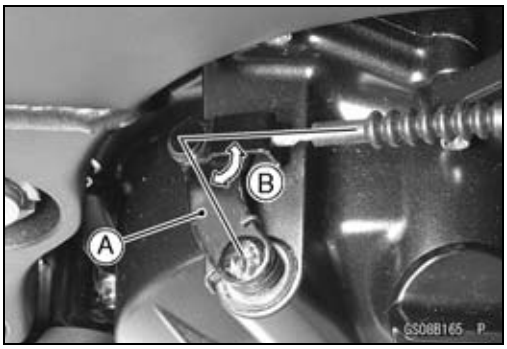
**⚠ WARNING**

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


- Turn the adjuster [A] so that 4 ~ 6 mm (0.16 ~ 0.24 in.) [B] of threads is visible.




- Slide the dust cover [A] at the clutch cable lower end out of place.
- Loosen both adjusting nuts [B] at the bracket [C] on the clutch cover as far as they will go.
- Pull the clutch outer cable [D] tight and tighten the adjusting nuts against the bracket.
- Slip the rubber dust cover back onto place.
- Turn the adjuster at the clutch lever until the free play is correct.




- Push the release lever [A] toward the front of the motorcycle until it becomes hard to turn.

○At this time, the release lever should have the proper angle shown.
60° [B]

★If the angle is wrong, check the clutch and release parts for wear.

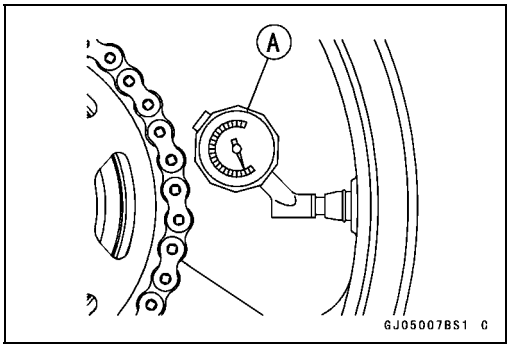
**⚠ WARNING**

**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, start the engine and check that the clutch does not slip and that it releases properly.

## Wheels/Tires

### *Tire Air Pressure Inspection*




- 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 air pressure according to the specifications if necessary.

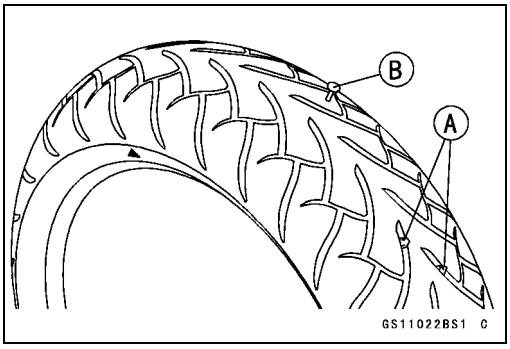
**Air Pressure (when Cold)**

**Front: Up to 180 kg (397 lb)**
**250 kPa (2.5 kgf/cm², 36 psi)**

**Rear: Up to 180 kg (397 lb)**
**290 kPa (2.9 kgf/cm², 42 psi)**

## Maintenance Procedure

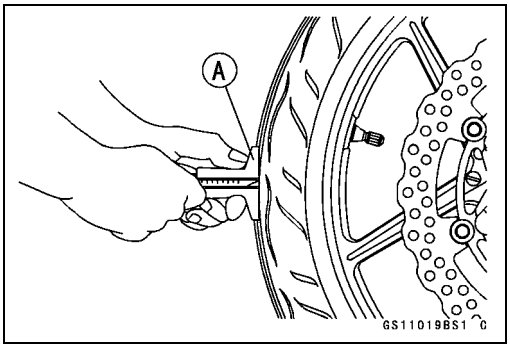
### *Wheel/Tire Damage Inspection*




- 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 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:**
**EUR, CA and BR Models:**

| | |
|---|---|
| **Front** | **3.8 mm (0.15 in.)** |
| **Rear** | **5.2 mm (0.20 in.)** |

**Other than EUR, CA and BR Models:**

| | |
|---|---|
| **Front** | **3.6 mm (0.14 in.)** |
| **Rear** | **5.3 mm (0.21 in.)** |

**Service Limit:**

| | |
|---|---|
| **Front** | **1 mm (0.04 in.)** |
| | **(AT, CH, DE) 1.6 mm (0.06 in.)** |
| **Rear** | **2 mm (0.08 in.) (Up to 130 km/h)** |
| | **3 mm (0.12 in.) (Over 130 km/h)** |

**⚠ WARNING**

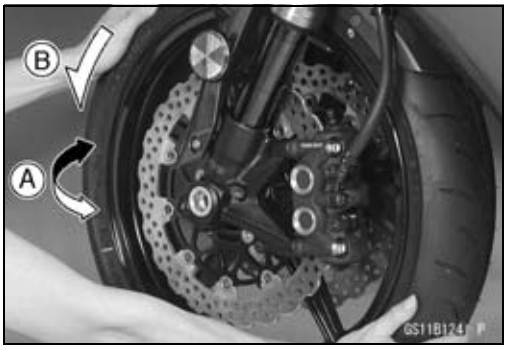
**To ensure safe handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.**

**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.*

## Maintenance Procedure

### *Wheel Bearing Damage Inspection*




- Raise the front wheel off the ground with the jack (see Front Wheel Removal in the Wheels/Tires chapter).

**Special Tool - Jack: 57001-1238**
**Jack Attachment: 57001-1608**

- Turn the handlebar all the way to the right or left.
- Inspect the roughness of the front wheel bearing by moving [A] the wheel with both hands to both sides.
- 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 the stand (see Rear Wheel Removal in the Wheels/Tires chapter).
- Spin [A] 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/Tires chapter) and coupling (see Coupling Bearing Inspection in the Final Drive chapter).

## Final Drive

### *Drive Chain Lubrication Condition Inspection*

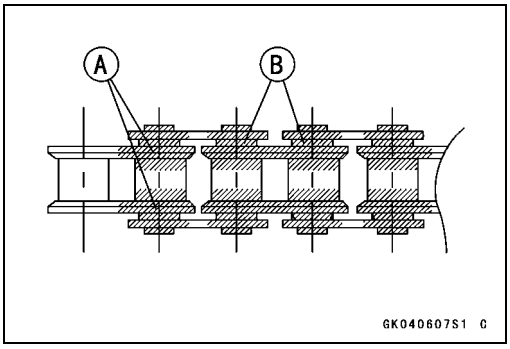
- If a special lubricant is not available, a heavy oil such as SAE 90 is preferred to a lighter oil because it will stay on the chain longer and provide better lubrication.
- If the chain appears especially dirty, clean it before lubrication.

**CAUTION**

**The O-rings between the side plates seal in the lubricant between the pin and the bushing. To avoid damaging the O-rings and resultant loss of lubricant, observe the following rules.**
**Use only kerosene or diesel oil for cleaning of the O-ring of the 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.**

## Maintenance Procedure

- 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]

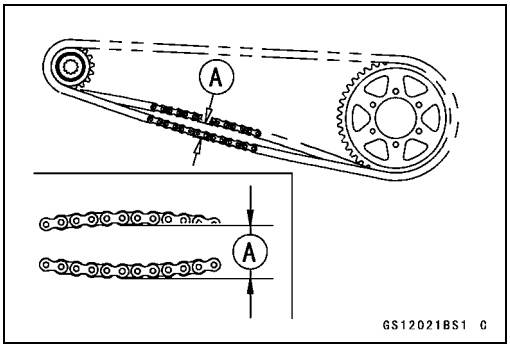



### *Drive Chain Slack Inspection*

**NOTE**

○*Check the slack with the motorcycle setting on its side stand.*

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

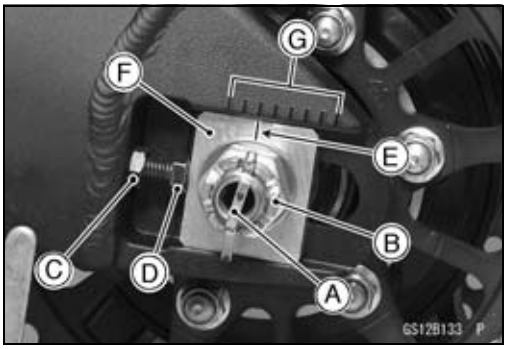



- Check the wheel alignment (see Wheel Alignment Inspection).
- Rotate the rear wheel to find the position where the chain is tightest.
- Measure the vertical movement (chain slack) [A] midway between the sprockets.

★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 rear axle nut [B].
- Loosen the both chain adjuster locknuts [C].

★If the chain is too loose, turn out the left and right chain adjusters [D] evenly.

★If the chain is too tight, turn in the left and right chain adjusters evenly, and kick the wheel forward.

- Turn the left and right chain adjusters evenly until the drive chain has the correct amount of slack. To keep the chain and wheel properly aligned, the notch [E] on the left wheel alignment indicator [F] should align with the same swingarm mark or position [G] that the right indicator notch aligns with.

**⚠ WARNING**

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

- Tighten the both chain adjuster locknuts securely.
- Tighten the rear axle nut.

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

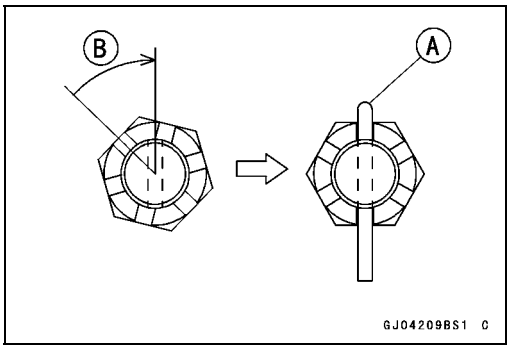
- Turn the wheel, measure the chain slack again at the tightest position, and readjust if necessary.

## Maintenance Procedure

● Insert a new cotter pin [A].

**NOTE**

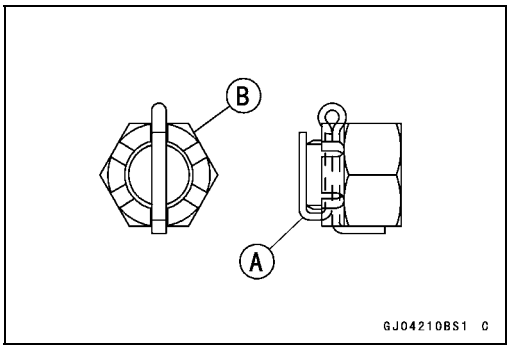
○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○*It should be within 30 degree.*
○*Loosen once and tighten again when the slot goes past the nearest hole.*




● 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.**

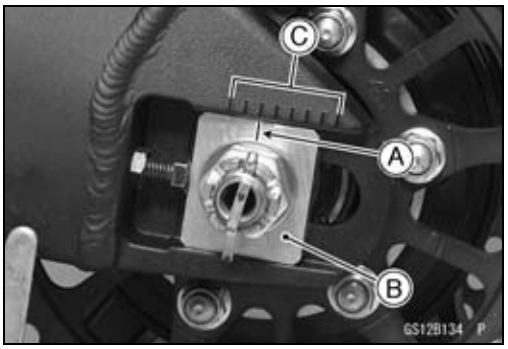



### *Wheel Alignment Inspection*

● Check that the notch [A] on the left alignment indicator [B] aligns with the same swingarm mark or position [C] that the right alignment indicator notch aligns with.
★If they do not, adjust the chain slack and align the wheel alignment (see Drive Chain Slack Adjustment).

**NOTE**

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

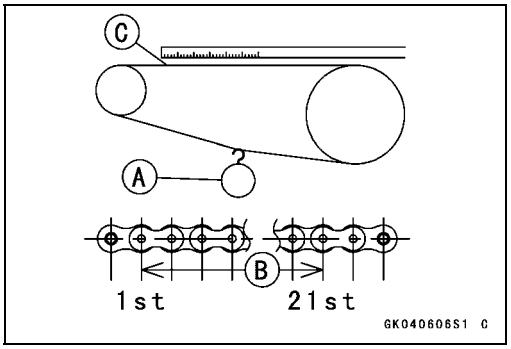



**⚠ WARNING**

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

### *Drive Chain Wear Inspection*

● Remove the chain cover (see Drive Chain Removal in the Final Drive 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 chain. 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.)**

## Maintenance Procedure

**⚠ WARNING**

**If the drive chain 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 snag 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 EXCEL** |
| **Type:** | **RK 525MFOZ, Endless** |
| **Link:** | **110 links** |

### *Chain Guide Wear Inspection*

- Visually inspect the chain guide [A].

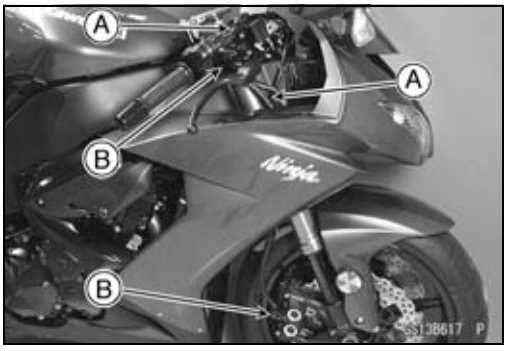
★Replace the chain guide if it shows any signs of abnormal wear or damage.

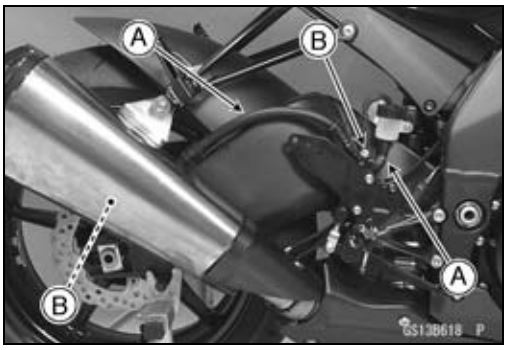

## Brake

### *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] and fittings [B].

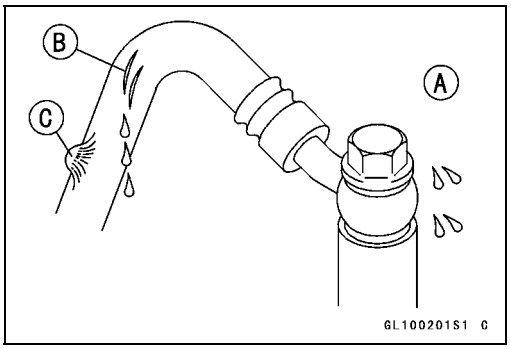
★If the brake fluid leaked from any position, inspect or replace the problem part.



## Maintenance Procedure

### *Brake Hose Damage and Installation Condition Inspection*




- Inspect the brake hoses and fittings 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 examining it.

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

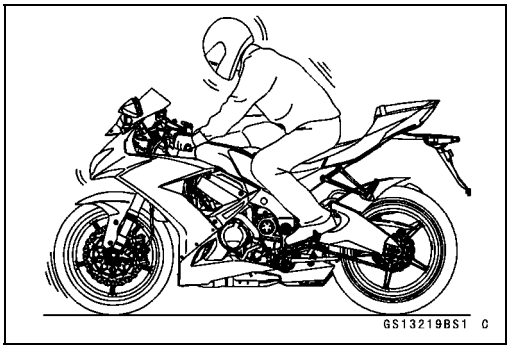
★Tighten any brake hose banjo bolts.

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

- Inspect the brake hose routing.

★If any brake hose routing is incorrect, route the brake hose according to Cable, Wire, and Hose Routing section in the Appendix chapter.

### *Brake Operation Inspection*



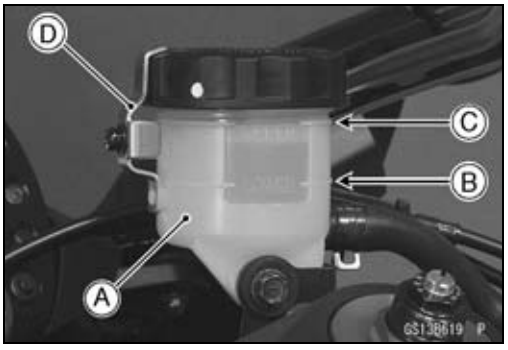

- Inspect the operation of the front and rear brake by running the vehicle on the dry road.

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

**⚠ WARNING**

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

### *Brake Fluid Level Inspection*



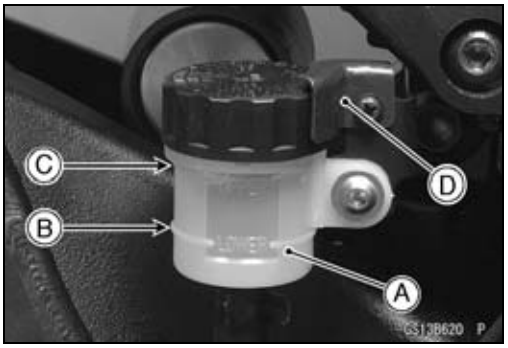

- Check that the brake fluid level in the front brake reservoir [A] is above the lower level line [B].

**NOTE**

○*Hold the reservoir horizontal by turning the handlebar 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].

○Remove the stopper [D].




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

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

○Remove the stopper [D].

**⚠ 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**

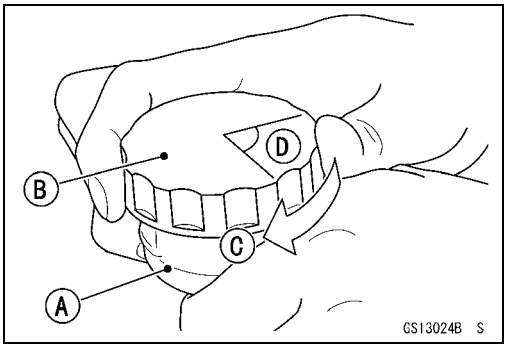
## Maintenance Procedure

- Follow the procedure below to install the front/rear brake fluid reservoir cap correctly.

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

○Tighten:

**Torque - Front Brake Reservoir Cap Stopper Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)**




### *Brake Pad Wear Inspection*

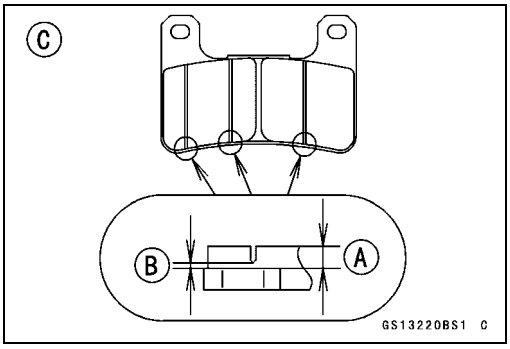
- Remove the brake pads (see Front/Rear Brake Pad Removal in the Brakes chapter).
- Check the lining thickness [A] of the pads in each caliper.

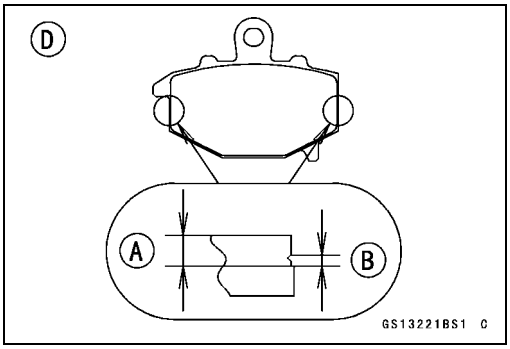
★If the lining thickness of either pad is less than the service limit [B], replace both pads in the caliper as a set.

Front Brake Pad [C]
Rear Brake Pad [D]

**Pad Lining Thickness**
**Standard:**

| | |
|---|---|
| **Front** | **4.0 mm (0.16 in.)** |
| **Rear** | **5.0 mm (0.20 in.)** |
| **Service Limit:** | **1 mm (0.04 in.)** |



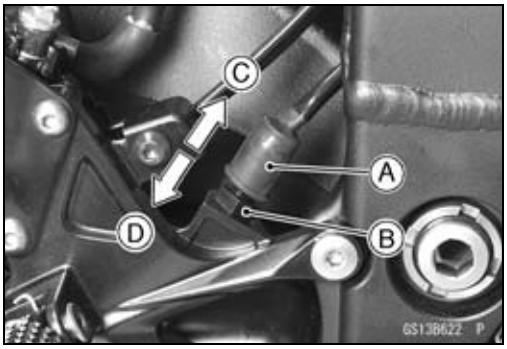

### *Brake Light Switch Operation Inspection*

- Turn the ignition switch ON.
- The brake light [A] should go on when the brake lever is applied or after the brake pedal is depressed about 10 mm (0.39 in.).


★If it does not, adjust the brake light switch.

- While holding the switch body, turn the adjusting nut to adjust the switch.

Switch Body [A]
Adjusting Nut [B]
Light sooner as the body rises [C]
Light later as the body lowers [D]

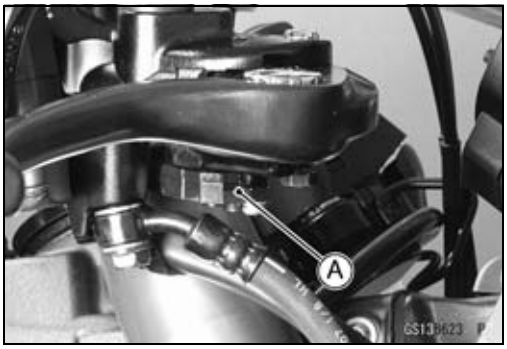



**CAUTION**

**To avoid damaging the electrical connections inside the switch, be sure that the switch body does not turn during adjustment.**

## Maintenance Procedure

★If it does not go on, inspect or replace the following parts.
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 10 A (see Fuse Inspection in the Electrical System chapter)
Front Brake Light Switch [A] (see Switch Inspection in the Electrical System chapter)
Rear Brake Light Switch (see Switch Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

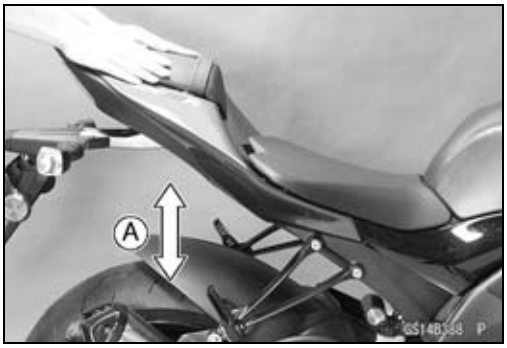



### Suspensions

#### *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 smoothly or noise is found, inspect the fork oil level or fork clamps (see Front Fork Oil Change in the Suspension chapter).


● Pump the rear seat down and up [A] 4 or 5 times, and inspect the smooth stroke.
★If the shock absorber does not 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.

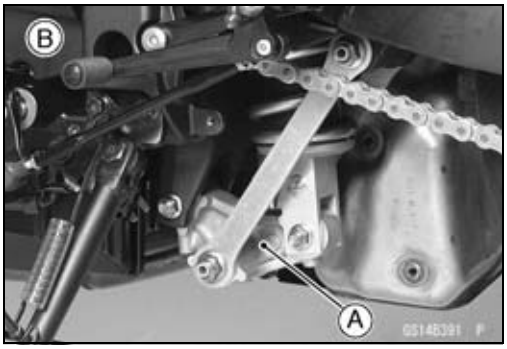
## Maintenance Procedure

### *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.

### *Rocker Arm Operation Inspection*

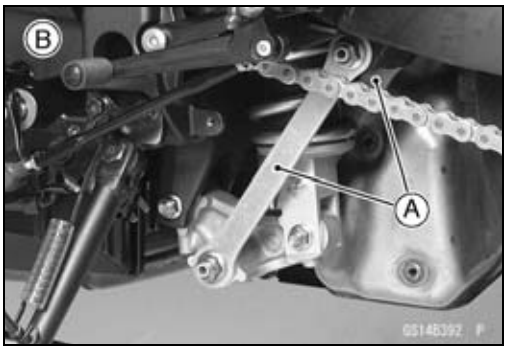



- Pump the seat down and up 4 or 5 times, and inspect the smooth stroke.

○In this photo [B], the left lower fairing has been removed for clarity.

★If the rocker arm [A] does not smoothly stroke or noise is found, inspect the fasteners and bearings (see Tie-Rod/Rocker Arm Bearing, Sleeve Inspection in the Suspension chapter).

### *Tie-Rod Operation Inspection*



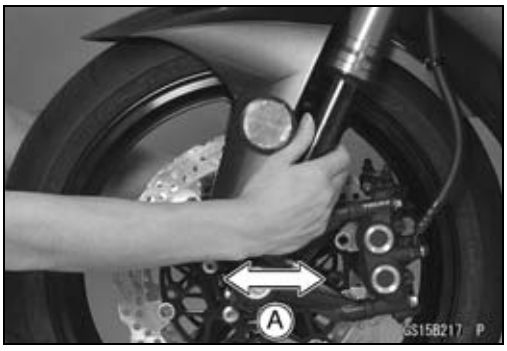

- Pump the seat down and up 4 or 5 times, and inspect the smooth stroke.

○In this photo [B], the left lower fairing has been removed for clarity.

★If the tie-rod [A] do not smoothly stroke or noise is found, inspect the fasteners and tie-rod bearings (see Rocker Tie-Rod/Rocker Arm Bearing, Sleeve Inspection in the Suspension chapter).

## Steering

### *Steering Play Inspection*




- Raise the front wheel off the ground with the jack (see Front Wheel Removal in the Wheel/Tires chapter).

**Special Tools - Jack: 57001-1238**
**Jack Attachment: 57001-1608**

- 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 [A] the forks.

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

**NOTE**

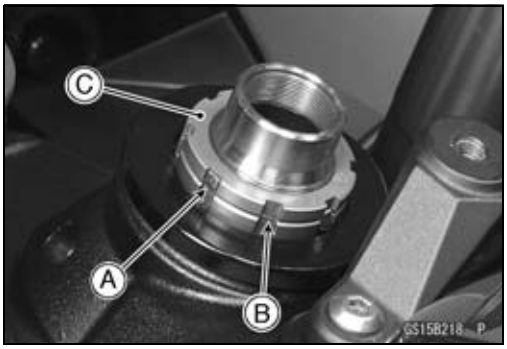
○*The cables and wiring will have some effect on the motion of the fork which must be taken into account.*

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

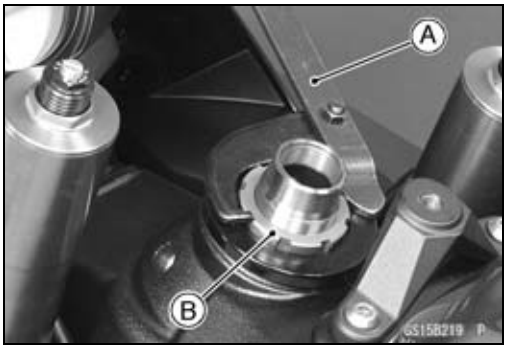
○*The bearings must be in good condition and properly lubricated in order for any test to be valid.*

## Maintenance Procedure

### *Steering Play Adjustment*




- Remove the steering stem head with the handlebars (see Handlebar Removal in the Steering chapter).
- Straighten the claws [A] of the lock washer [B].
- Remove:
  Steering Stem Locknut [C]
  Lock Washer




- Adjust the steering using the steering stem nut wrench [A].

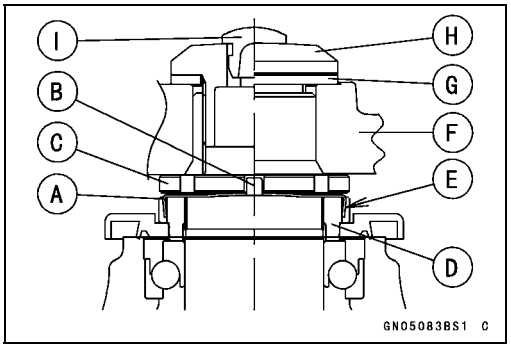
**Special Tool - Steering Stem Nut Wrench: 57001-1100**

★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 fraction of a turn.

**NOTE**

○*Turn the stem nut 1/8 turn at time maximum.*




- Install the lock washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of the steering stem locknut [C].
- Tighten the stem locknut by hand until the lock washer touches the steering stem nut [D].
- Tighten the stem locknut again until the claws are aligned with the grooves (ranging from 2nd to 4th) of the stem nut, and bend the two claws downward [E].
- Install the steering stem head [F].
- Install the washer [G], and tighten the steering stem head bolt [H].

**Torque - Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 80 ft·lb)**

- Tighten:

**Torque - Upper Front Fork Clamp Bolts 20 N·m (2.0 kgf·m, 15 ft·lb)**
**Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

**⚠ WARNING**

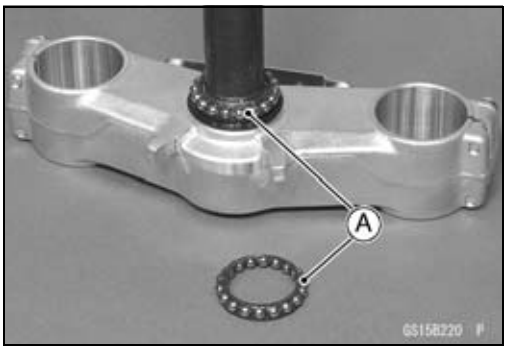
**Do not impede the handlebar turning by routing the cables, harness and hoses improperly (see Cable, Wire, and Hose Routing section in the Appendix chapter).**

- Install the plug [I] on the steering stem head bolt.
- Check the steering again.

★If the steering is still too tight or loose, repeat the adjustment.

## Maintenance Procedure

### *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).

### *Steering Damper Oil Leak Inspection*


- Visually inspect the steering damper [A] for oil leakage.

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

## Maintenance Procedure

## Electrical System

### *Lights and Switches Operation Inspection*

**First Step**

- Set the gear position in the neutral position.
- Turn the ignition switch ON.
- The following lights should go on according to below table.

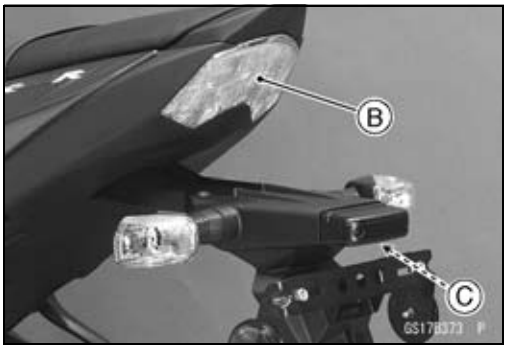
| | |
|---|---|
| City Lights [A] | Go on |
| Taillight [B] | Goes on |
| License Plate Light [C] | Goes on |
| Meter Panel Illumination Light (LED) [D] | Goes on |
| Meter Panel LCD [E] | Goes on |
| Neutral Indicator Light (LED) [F] | Goes on |
| Fuel Level Warning Indicator Light (LED) [G] | Goes on (for 3 seconds) |
| Oil Pressure Warning Symbol [H] and Warning Indicator Light (LED) [I] | Blinks (about 3 seconds after) |

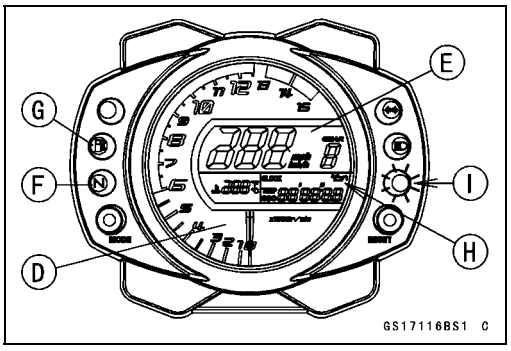
★If the light does not go on, inspect or replace the following parts.

Battery (see Charging Condition Inspection in the Electrical System chapter)
City Light Bulb (see City Light Bulb Replacement in the Electrical System chapter)
Licence Plate Light Bulb (see Licence Plate Light Bulb Replacement in the Electrical System chapter)
Meter Panel LCD (see Meter Unit Inspection in the Electrical System chapter)
Neutral Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)
Warning Indicator Light (LED) (Oil Pressure Warning) (see Meter Unit Inspection in the Electrical System chapter)
Meter Panel Illumination Light (LED) (see Meter Unit Inspection in the Electrical System chapter)
Fuel Level Warning Indicator Light (LED) (see 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)
Oil Pressure Switch (see Switch Inspection in the Electrical System chapter)
Gear Position Switch (see Gear Position Switch Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)

- Turn the ignition switch OFF.
- The all lights should go off (for models equipped with an immobilizer system, warning indicator light (LED) will blinks. Refer to the Immobilizer System (Equipped Models) section in the Electrical System chapter).

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

## Maintenance Procedure

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

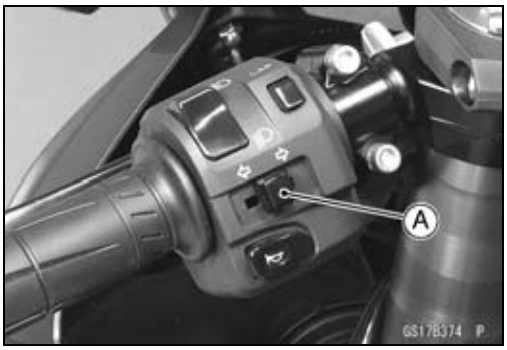
★If the light does not go on, inspect or replace the ignition switch (see Switch Inspection in the Electrical System chapter).

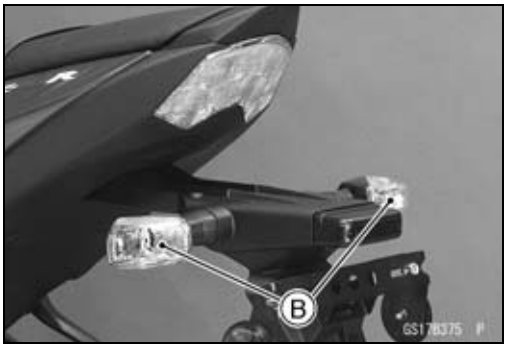
**Third Step**
- Turn the ignition switch ON.
- Turn the turn signal switch [A] ON (left or right position).
- The left or right turn signal lights [B] (front and rear) according to the switch position should flash.
- The turn signal indicator light (LED) [C] in the meter unit should flash.

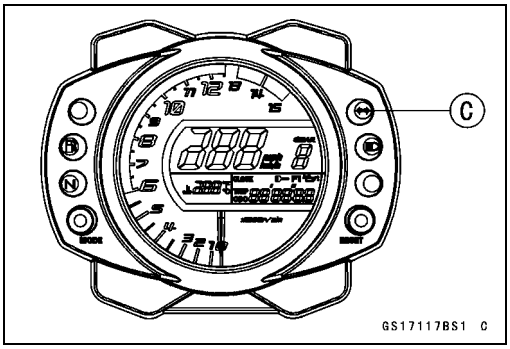
★If the each light does not flash, inspect or replace the following parts.
Turn Signal Light Bulb (see Turn Signal Light Bulb Replacement in the Electrical System chapter)
Turn Signal Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)
Turn Signal Relay Fuse 10 A (see Fuse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

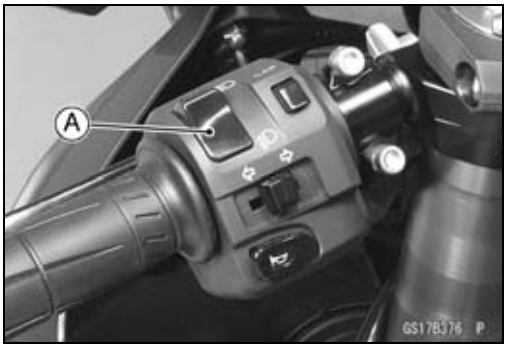



**Fourth Step**
- Set the dimmer switch [A] to low beam position.
- Start the engine.
- The low beam headlight should go on.

★If the low beam headlight does not go on, inspect or replace the following parts.
Headlight Low Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
Headlight Fuse 15 A (see Fuse Inspection in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)
Headlight Relay (see Relay Circuit Inspection in the Electrical System chapter)
Harness (see Wiring Inspection in the Electrical System chapter)



## Maintenance Procedure

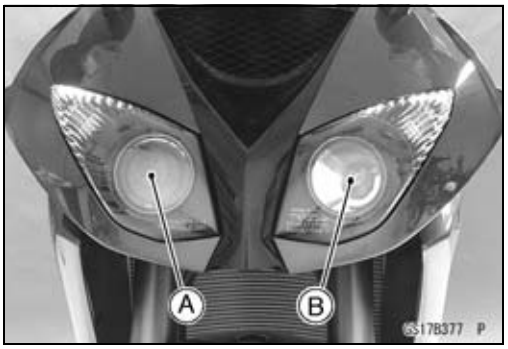
- Set the dimmer switch to high beam position.
- The low beam [A] and high beam [B] headlights should go on.
- The high beam indicator light (LED) [C] should go on.

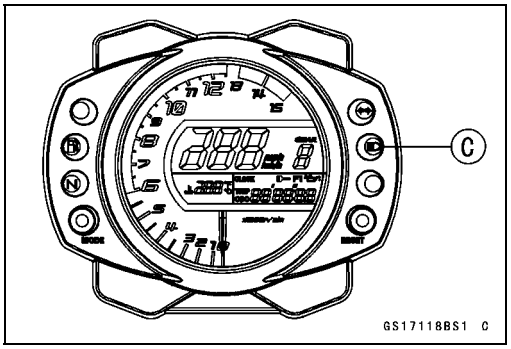
★If the high beam headlight and/or high beam indicator light (LED) does not go on, inspect or replace the following parts.
Headlight High Beam Bulb (see Headlight Bulb Replacement in the Electrical System chapter)
Dimmer Switch (see Switch Inspection in the Electrical System chapter)

- Turn the engine stop switch to stop position.
- 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 headlight relay (see Relay Circuit Inspection in the Electrical System chapter).

- Turn the ignition switch OFF.
- 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**

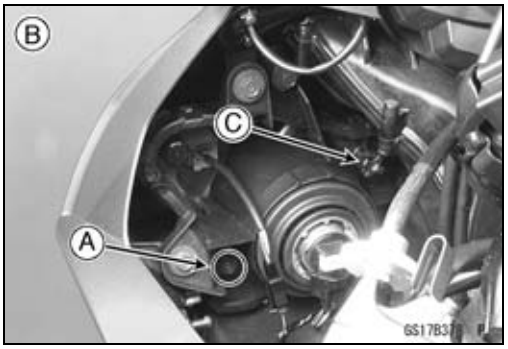
- Turn the horizontal adjuster [A] in both headlights with the screwdriver in or out until the beam points straight ahead.

○In this photo [B], the left upper inner faring has been removed for clarity.

★If the headlight beam points too low or high, adjust the vertical beam.

**Headlight Beam Vertical Adjustment**

- Turn the vertical adjuster [C] in both headlights in or out to adjust the headlight vertically.



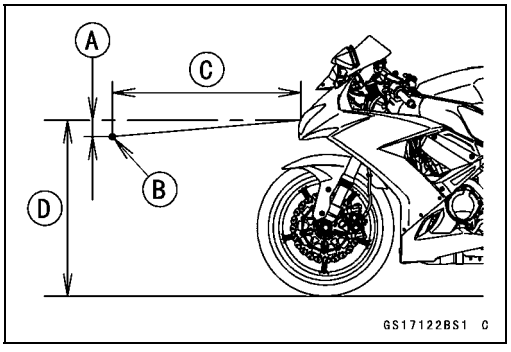

**NOTE**

○*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.*

**NOTE**

○*For the United States model, the proper angle is 0.4 degrees below horizontal. This is 50 mm (2.0 in.) drop at 7.6 m (25 ft) measured from the center of the headlight with the motorcycle on its wheels and the rider seated.*

50 mm (2.0 in.) [A]
Center of Brightest Spot [B]
7.6 m (25 ft) [C]
Height of Headlight Center [D]



## Maintenance Procedure

### *Sidestand Switch Operation Inspection*


- Raise the rear wheel off the ground with the stand (see Rear Wheel Removal in the Wheels/Tires chapter).
- 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 | Does not start | Continue running |
| 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 | Does not start | Stops |
| Down | In Gear | Pulled in | Does not start | Stops |

★If the sidestand switch operation does not work, inspect or replace the following parts.
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)
Gear Position Switch (see Gear Position 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 (DFI) chapter).

## Maintenance Procedure

### *Engine Stop Switch Operation Inspection*


**First Step**
- Set the gear position in the neutral position.
- Turn the ignition switch ON.
- 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 engine stop switch (see Switch Inspection in the Electrical System chapter).


**Second Step**
- Set the gear position in the neutral position.
- Turn the ignition switch ON.
- Turn the engine stop switch to run position [A].
- Push the starter button and start 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 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 (DFI) 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**

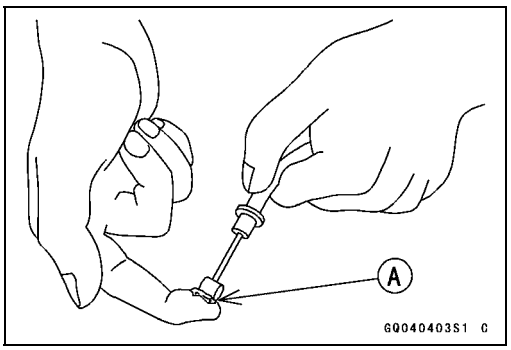
○*Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication*

**Pivots: Lubricate with Grease.**

Brake Lever
Brake Pedal
Clutch Lever
Rear Master Cylinder Push Rod Joint Pin
Sidestand

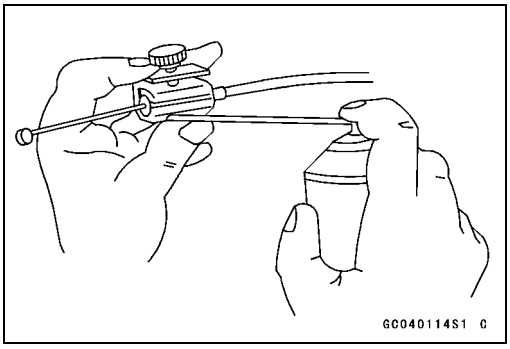
**Points: Lubricate with Grease.**

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



## Maintenance Procedure

**Cables: Lubricate with Rust Inhibitor**
Clutch Cable
Throttle Cables

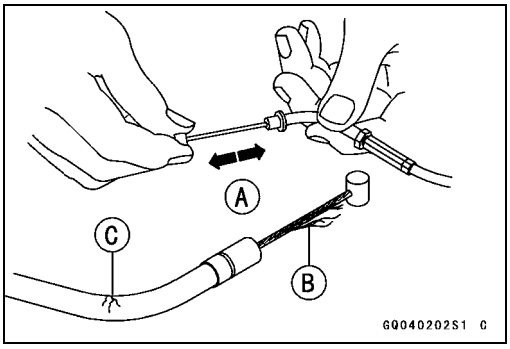



- Lubricate the cables by seeping the oil between the cable and housing.

○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, retorque 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.

## Maintenance Procedure

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

Engine:
- Radiator Bolts
- Exhaust Pipe Holder Nuts
- Exhaust Manifold Clamp Bolt
- Premuffler Chamber Mounting Bolt
- Muffler Body Clamp Bolt
- Muffler Body Mounting Bolt
- Clutch Lever Pivot Bolt Nut
- Engine Mounting Bolts and Nuts
- Engine Bracket Bolts

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

Brakes:
- Brake Lever Pivot Bolt and Nut
- Brake Pedal Bolt
- Rear Master Cylinder Push 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 Nuts
- Swingarm Pivot Shaft Nut
- Uni-Trak Rocker Arm Nut
- Tie-Rod Nuts

Steering:
- Handlebar Clamp Bolts
- Steering Stem Head Bolt

Others:
- Footpeg Bracket Bolts
- Front Fender Mounting Bolts
- Sidestand Bracket Bolts
- Sidestand Bolt
- Rear Frame Bolts

## Maintenance Procedure

## Replacement Parts

### *Air Cleaner Element Replacement*

**NOTE**

○*In dusty areas, the element should be replaced more frequently than the recommended interval.*
○*After riding through rain or on muddy roads, the element should be replaced immediately.*

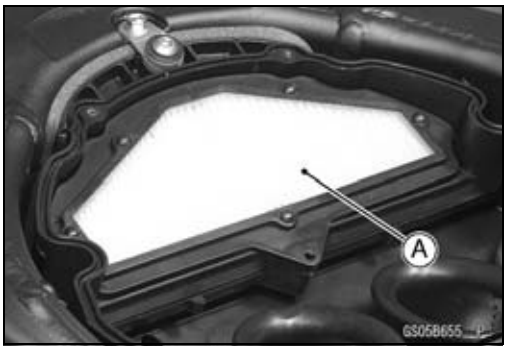
**⚠ WARNING**

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

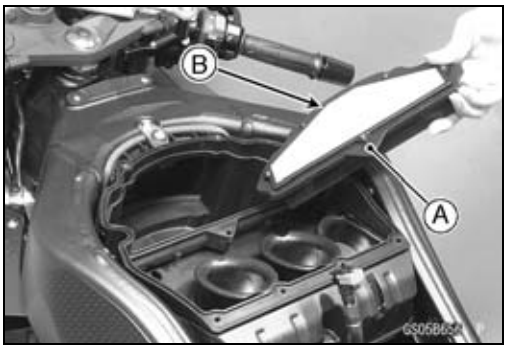
**CAUTION**

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

- Remove the upper air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Discard the air cleaner element [A].




- Install a new element [A] so that the screen side [B] faces upward.




**CAUTION**

**Use only the recommended air cleaner element (Kawasaki part number 11013-0026). Using another air cleaner element will wear the engine prematurely or lower the engine performance.**

- Install the upper air cleaner housing (see Air Cleaner Housing Installation in the Fuel System (DFI) chapter).

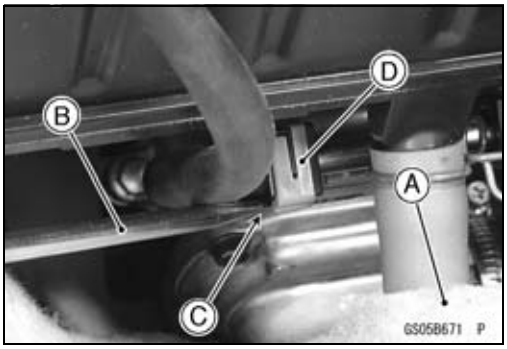
### *Fuel Hose Replacement*

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).

## Maintenance Procedure

**For Primary Fuel Hose (Fuel Tank ~ Throttle Body Assy)**

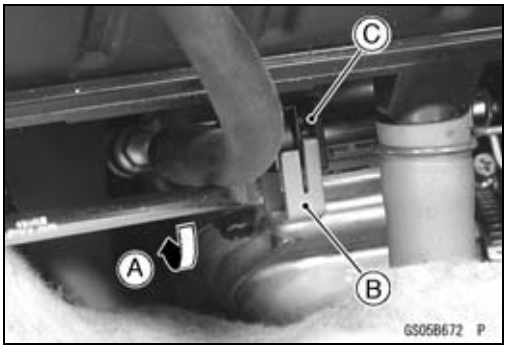
- Be sure to place a piece of cloth [A] around the fuel hose joint.
- Insert a thin blade screwdriver [B] into the slit [C] on the joint lock [D].



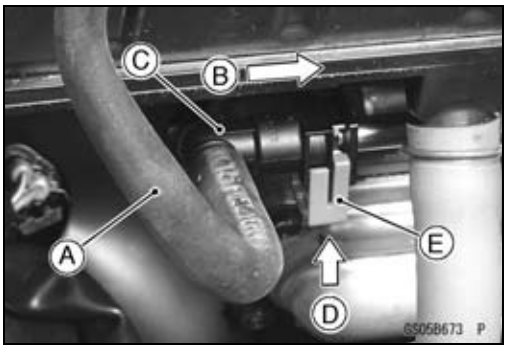

- Turn [A] the driver to disconnect the joint lock [B].
- Pull the fuel hose joint [C] out of the delivery pipe.

**⚠ 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. Cover the hose connection with a clean shop towel to prevent fuel spillage.**




- Replace the fuel hose [A] with a new one.
- Run the fuel hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Insert [B] the fuel hose joint [C] straight onto the delivery pipe until the hose joint clicks.
- Push [D] the joint lock [E].

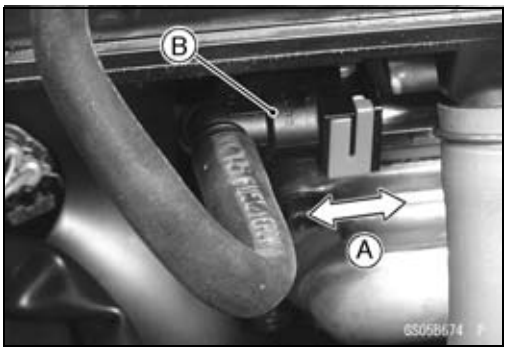



- Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and does not come off.

**⚠ WARNING**

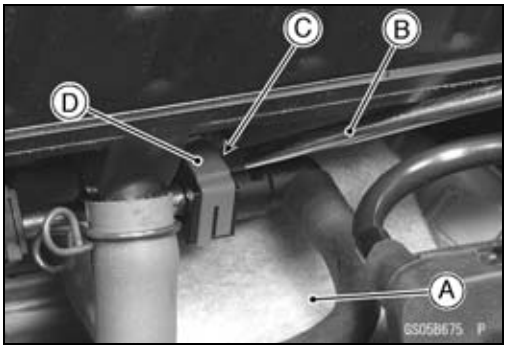
**Make sure the fuel hose joint is installed correctly on the delivery pipe or the fuel could leak.**

★If it comes off, reinstall the hose joint.



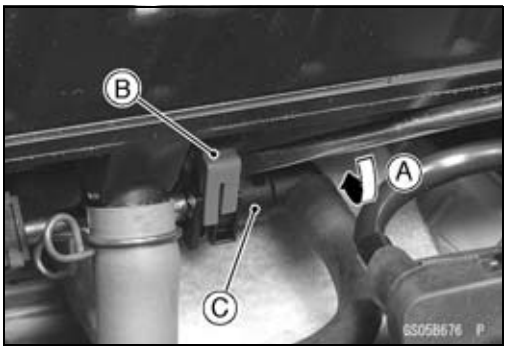

**For Secondary Fuel Hose (Throttle Body Assy ~ Nozzle Assy)**

- Be sure to place a piece of cloth [A] around the fuel hose joint.
- Insert a thin blade screwdriver [B] into the slit [C] on the joint lock [D].



## Maintenance Procedure

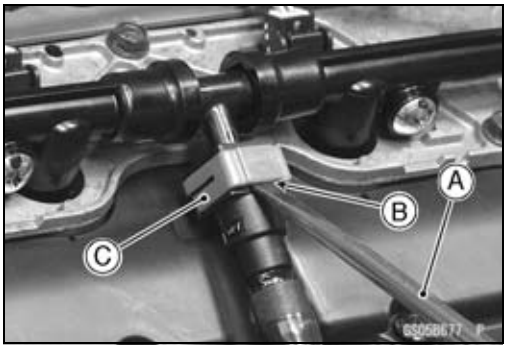
- Turn [A] the driver to disconnect the joint lock [B].
- Pull the fuel hose joint [C] out of the delivery pipe.



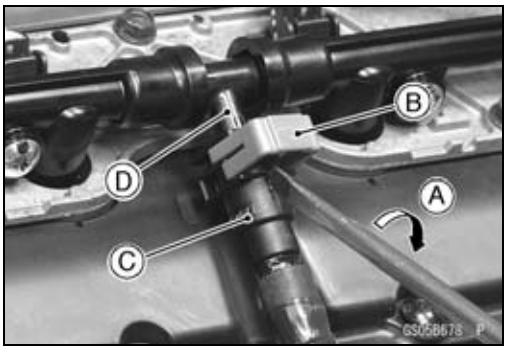

**⚠ WARNING**

**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. Cover the hose connection with a clean shop towel to prevent fuel spillage.**

- Insert a thin blade screwdriver [A] into the slit [B] on the joint lock [C].



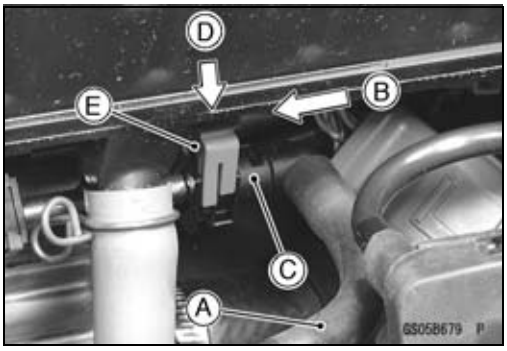

- Turn [A] the driver to disconnect the joint lock [B].
- Pull the fuel hose joint [C] out of the delivery pipe.



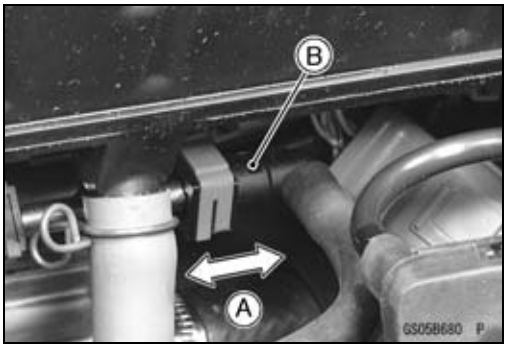

**CAUTION**

**When pulling out the fuel hose joint, do not apply strong force to the delivery pipe [D] on the nozzle assy. The pipe made from resin could be damaged.**

- Replace the fuel hose [A] with a new one.
- Insert [B] the fuel hose joint [C] straight onto the delivery pipe until the hose joint clicks.
- Push [D] the joint lock [E].




- Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and does not come off.




**⚠ WARNING**

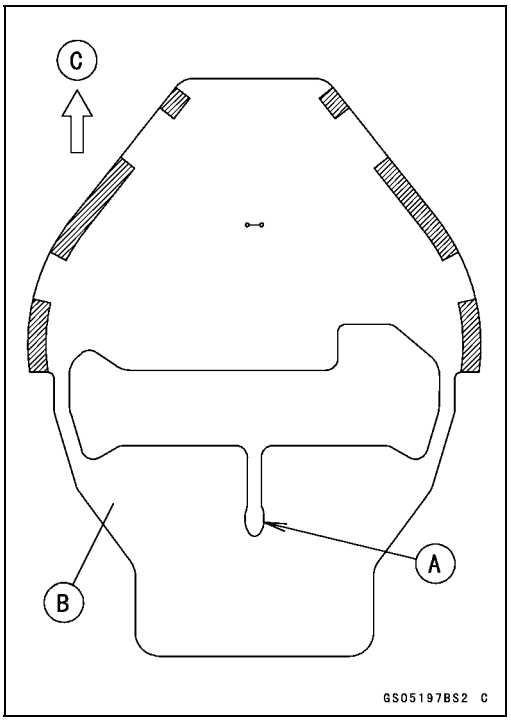
**Make sure the fuel hose joint is installed correctly on the delivery pipe or the fuel could leak.**

★If it comes off, reinstall the hose joint.

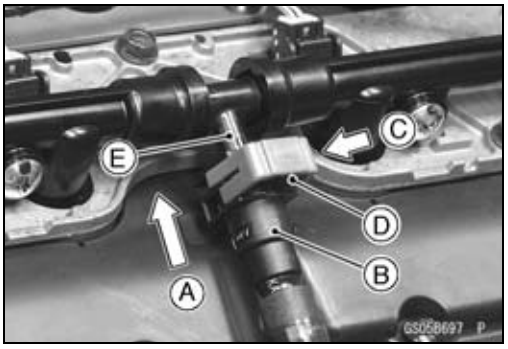
## Maintenance Procedure

● For the United States, Canada and California models, note the following.

○Run the fuel hose to the hole [A] of the rubber plate [B].
Front [C]



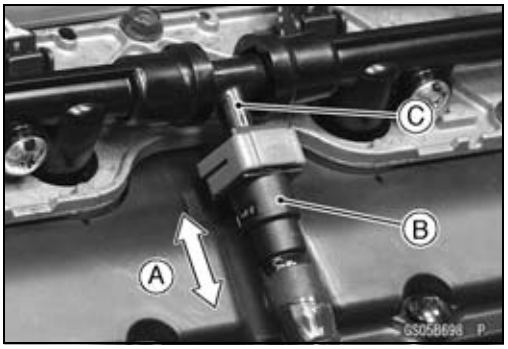

● Insert [A] the fuel hose joint [B] straight onto the delivery pipe until the hose joint clicks.
● Push [C] the joint lock [D].




**CAUTION**

**When inserting the fuel hose joint, do not apply strong force to the delivery pipe [E] on the nozzle assy. The pipe made from resin could be damaged.**

● Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and does not come off.




**CAUTION**

**When pushing and pulling the fuel hose joint, do not apply strong force to the delivery pipe [C] on the nozzle assy. The pipe made from resin could be damaged.**

**⚠ 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.
● Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).
● Start the engine and check the fuel hose for leaks.

## Maintenance Procedure

### *Coolant Change*

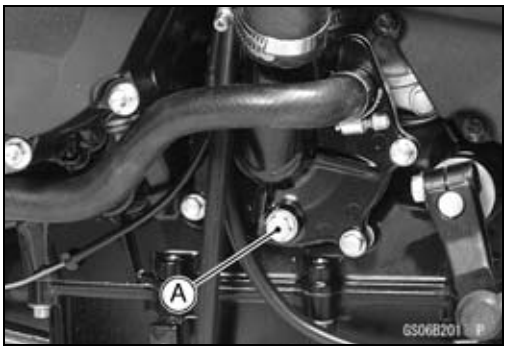
**⚠ WARNING**

**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 Upper Inner Fairing (see Upper Inner Fairing Removal in the Frame chapter)
  Radiator Cap [A]

○Remove the radiator cap 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.


- Remove the left lower fairing (see Lower Fairing Removal in the Frame chapter).
- Place a container under the drain bolt [A] of the water pump cover.
- Drain the coolant from the radiator by removing the drain bolt.

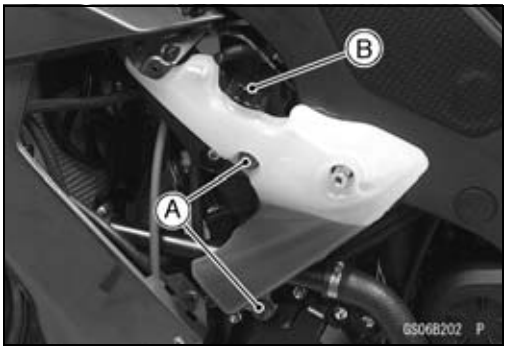



- Remove:
  Left Upper Fairing Cover (see Upper Fairing Cover Removal in the Frame chapter)
  Coolant Reserve Tank Mounting Bolts [A]
- Remove the cap [B] and poor the coolant into a container.
- Tighten:

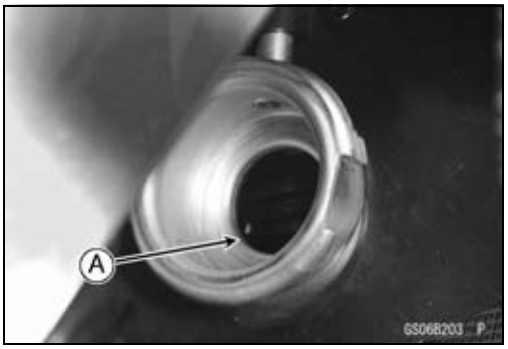
**Torque - Coolant Reserve Tank Mounting Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Tighten the drain bolt with gasket.

**Torque - Coolant Drain Bolt (Water Pump): 10 N·m (1.0 kgf·m, 89 in·lb)**



## Maintenance Procedure




● Fill the radiator up to the radiator filler neck [A] with coolant, and install the radiator cap.

**NOTE**

○*Pour in the coolant slowly so that it can expel the air from the engine and radiator.*

● Fill the reserve tank up to the "F" level line with coolant, and install the cap (see Coolant Level Inspection).

**CAUTION**

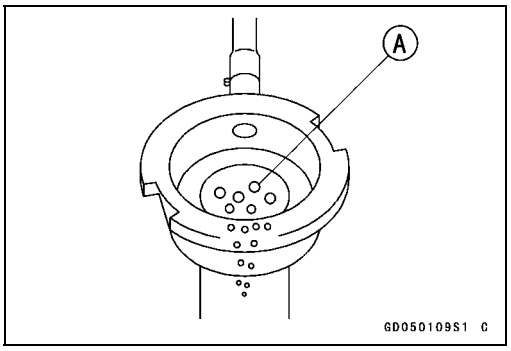
**Soft or distilled water must be used with the antifreeze (see below for antifreeze) in the cooling system.**
**If hard water is used in the system, it causes scales accumulation in the water passages, and considerably reduces the efficiency of the cooling system.**

**Water and Coolant Mixture Ratio (Recommended)**

| | |
|---|---|
| **Soft Water:** | **50%** |
| **Coolant:** | **50%** |
| **Freezing Point:** | **–35°C (–31°F)** |
| **Total Amount:** | **2.9 L (3.1 US qt)** |

**NOTE**

○*Choose a suitable mixture ratio by referring to the coolant manufacturer's directions.*




● Bleed the air from the cooling system as follows.
○Start the engine with the radiator cap removed and run it until no more air bubbles [A] can be seen in the coolant.
○Tap the radiator hoses to force any air bubbles caught inside.
○Stop the engine and add coolant up to the radiator filler neck.
● Install the radiator cap.
● 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 (see Coolant Level Inspection).

**CAUTION**

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

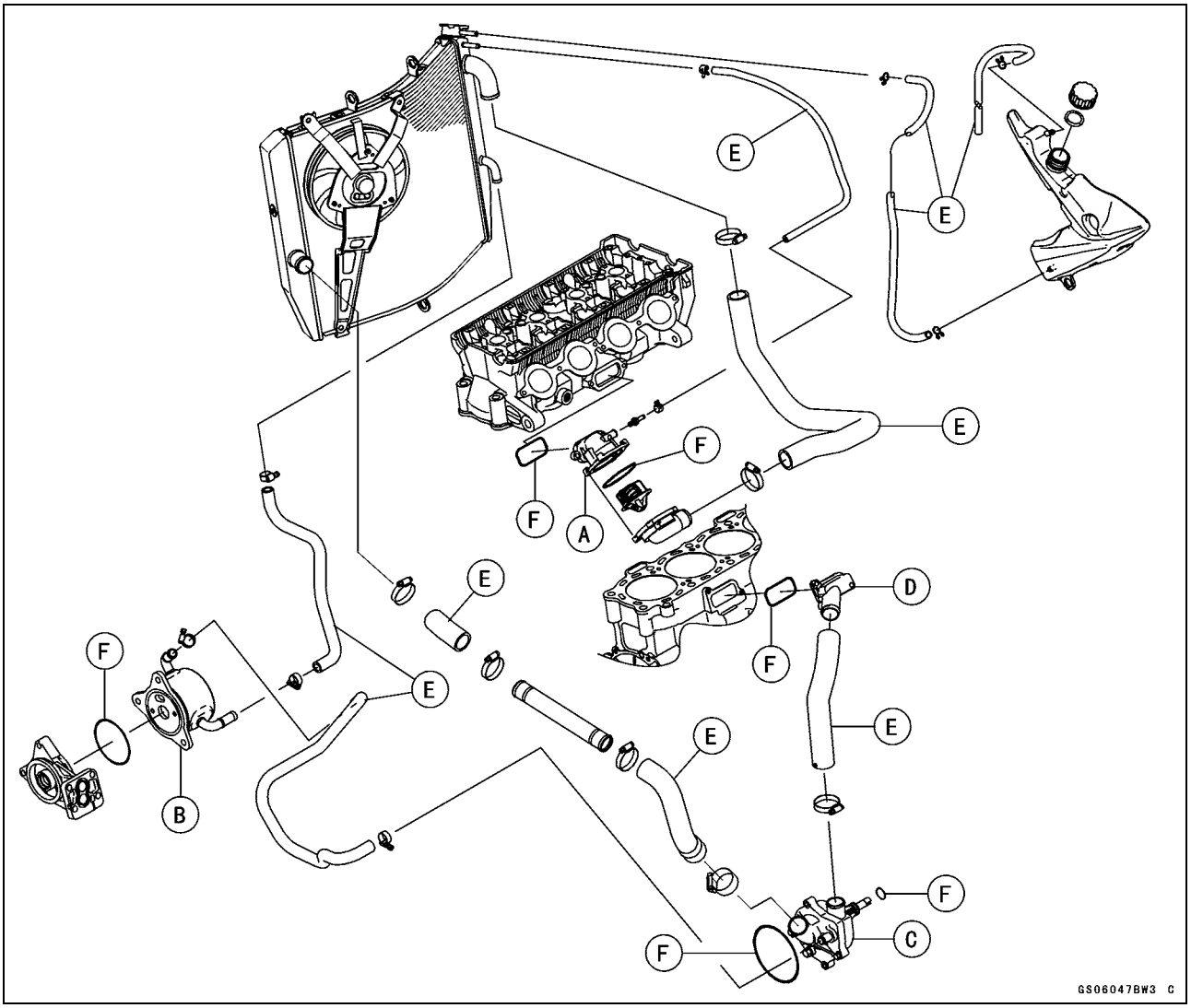
## Maintenance Procedure

### *Radiator Hose and O-ring Replacement*

- Drain the coolant (see Coolant Change).
- Remove:
  Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
  Thermostat Housing [A] (see Thermostat Housing Removal in the Cooling System chapter)
  Oil Cooler [B] (see Oil Cooler Removal in the Engine Lubrication System chapter)
  Water Pump [C] (see Water Pump Removal in the Cooling System chapter)
  Fitting [D]
- Replace the hose [E] and O-rings [F] with new ones.
- Apply grease to the new O-rings.
- Run the new hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Tighten:

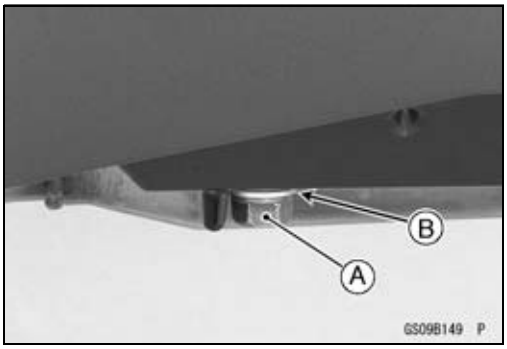
**Torque - Radiator (Water) Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

- Install the removed parts (see appropriate chapters).
- Fill the coolant (see Coolant Change).
- Check the cooling system for leaks.



## Maintenance Procedure

### *Engine Oil Change*




- Situate the motorcycle so that it is vertical after warming up the engine.
- Remove the engine oil drain bolt [A] to drain the oil.

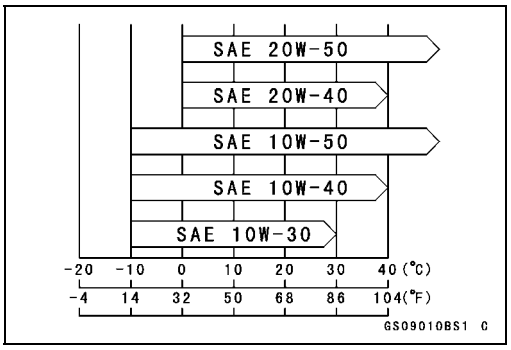
○The oil in the oil filter can be drained by removing the filter (see Oil Filter Replacement).

★Replace the drain bolt gasket [B] with a new one if it is damaged.

- Tighten the drain bolt with gasket.

**Torque - Engine Oil Drain Bolt: 30 N·m (3.1 kgf·m, 22 ft·lb)**


- Remove the oil filler plug [A].




- Pour in the specified grade and amount of oil.

**Recommended Engine Oil**

| | |
|---|---|
| **Grade:** | **API SE, SF or SG** |
| | **API SH, SJ or SL with JASO MA, MA1 or MA2** |
| **Viscosity:** | **SAE 10W-40** |
| **Capacity:** | **3.2 L (3.4 US qt) (when filter is not removed)** |
| | **3.7 L (3.9 US qt) (when filter is removed)** |
| | **4.0 L (4.2 US qt) (when engine is completely dry)** |

**NOTE**

○*Do not add any chemical additive to the oil. Oils fulfilling the above requirements are fully formulated and provide adequate lubrication for both the engine and the clutch.*

○*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.*

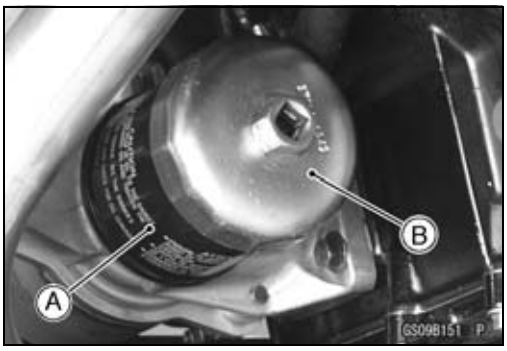
- Replace the O-ring of the oil filler plug with a new one.
- Apply engine oil to the new O-ring.
- Install the oil filler plug.

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

- Check the oil level (see Oil Level Inspection in the Engine Lubrication chapter).

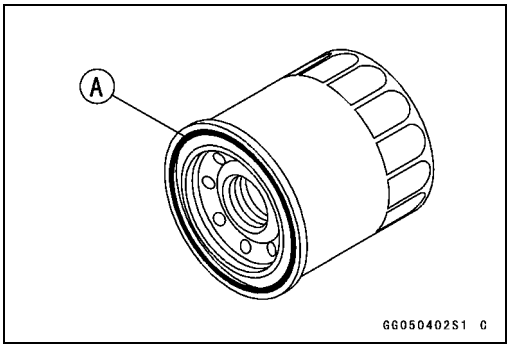
## Maintenance Procedure

### *Oil Filter Replacement*




- Drain the engine oil (see Engine Oil Change).
- Remove the lower fairings (see Lower Fairing Removal in the Frame chapter).
- Remove the oil filter [A] with the oil filter wrench [B].

**Special Tool - Oil Filter Wrench: 57001-1249**




- Replace the filter with a new one.
- Apply grease to the gasket [A] before installation.
- Tighten the filter with the oil filter wrench.

**Special Tool - Oil Filter Wrench: 57001-1249**

**Torque - Oil Filter: 17 N·m (1.7 kgf·m, 13 ft·lb)**

**NOTE**

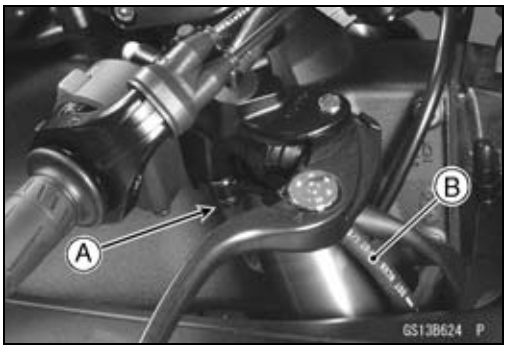
○*Hand tightening of the oil filter can not be allowed since it does not reach to this tightening torque.*

- Pour in the specified grade 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.**

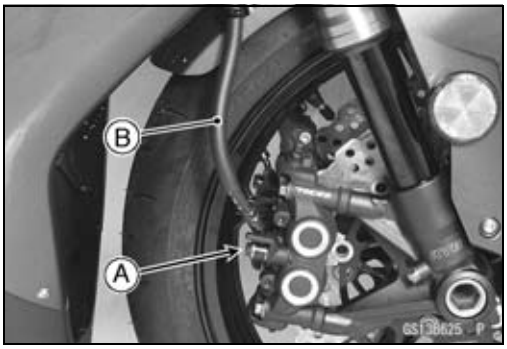



- Remove the brake hose banjo bolts [A].
- When removing the brake hoses [B], note the following.

○Take care not to spill the brake fluid on the painted or plastic parts.

○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.



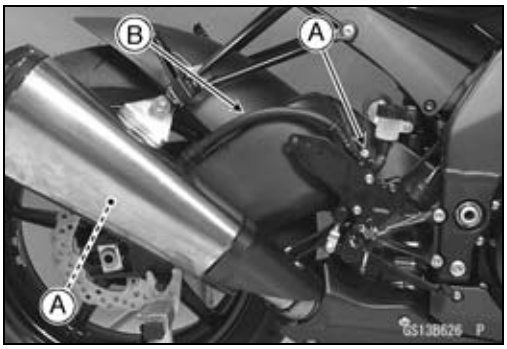

- When installing the brake hoses, note the following.

○Avoid sharp bending, kinking, flatting or twisting, and route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.

○There are washers on each side of the brake hose fitting. Replace them with new ones.

○Tighten:

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




- Fill the brake line after installing the brake hose (see Brake Fluid Change).

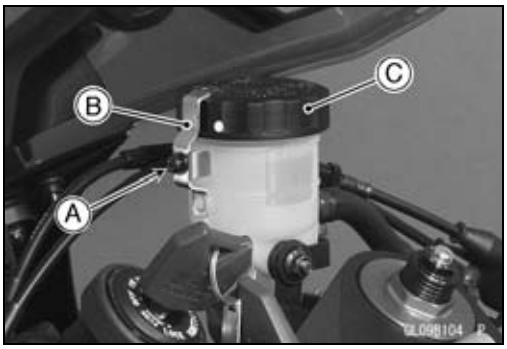
## Maintenance Procedure

### *Brake Fluid Change*

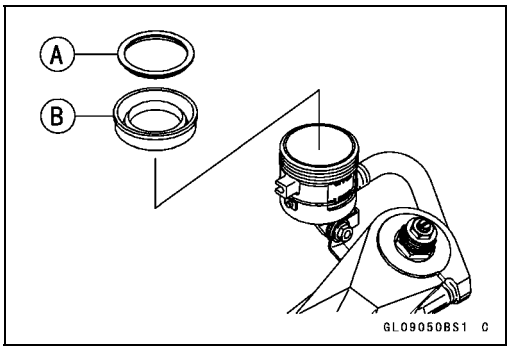
**NOTE**

○*The procedure to change the front brake fluid is as follows. Changing the rear brake fluid is the same as for the front brake.*

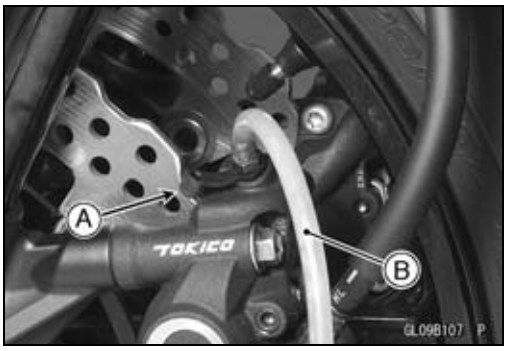
- Level the brake fluid reservoir.
- Remove:
  Screw [A]
  Stopper [B]
  Front Brake Reservoir Cap [C]




- Remove:
  Diaphragm Plate [A]
  Diaphragm [B]
- Fill the reservoir with fresh brake fluid.




- Remove the rubber cap [A] from the bleed valve on the caliper.
- Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.



## Maintenance Procedure

● Change the brake fluid.

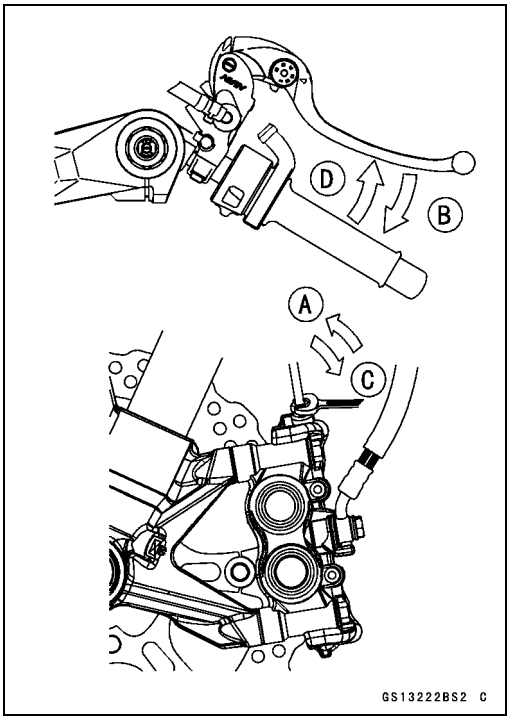
○Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.

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**

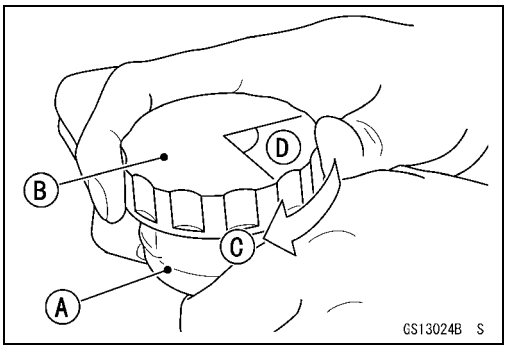
○*The fluid level must be checked often during the changing operation and replenished with fresh brake fluid. If the fluid in the reservoir runs out any time during the changing operation, the brakes will need to be bled since air will have entered the brake line.*

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




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

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




● Install the stopper on the reservoir.

● Tighten:

**Torque - Front Brake Reservoir Cap Stopper Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

● 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.

## Maintenance Procedure

### *Master Cylinder Rubber Parts Replacement*

**Front Master Cylinder Disassembly**

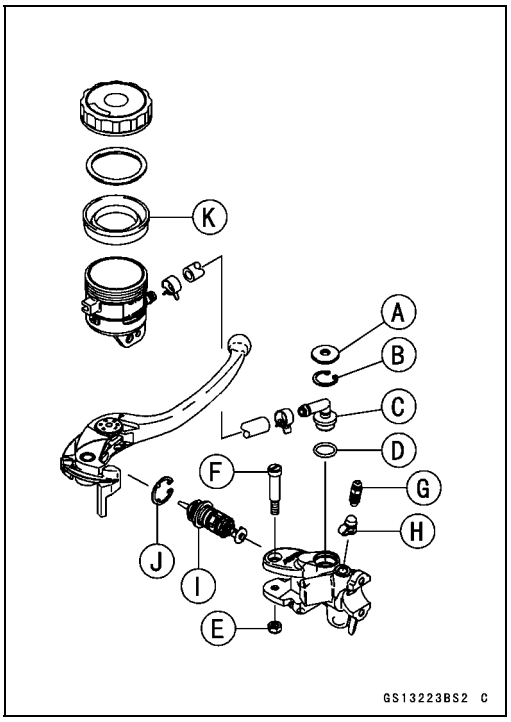
- Remove the front master cylinder (see Front Master Cylinder Removal in the Brakes chapter).
- Remove the seal cover [A], circlip [B], connector [C] and O-ring [D].

**Special Tool - Inside Circlip Pliers: 57001-143**

- Unscrew the nut [E] and pivot bolt [F], and remove the brake lever.
- Remove the bleed valve [G] and rubber cap [H].
- Remove the piston assembly [I] as follows.

○Remove the dust cover and push rod.
○Remove the circlip [J].
○Pull out the piston (with primary cup and secondary cup).
○Remove the return spring and spring guide.

- Replace:
  Seal Cover [A]
  Circlip [B]
  O-ring [D]
  Rubber Cap [H]
  Piston Assembly [I]
  Circlip [J]
  Diaphragm [K]

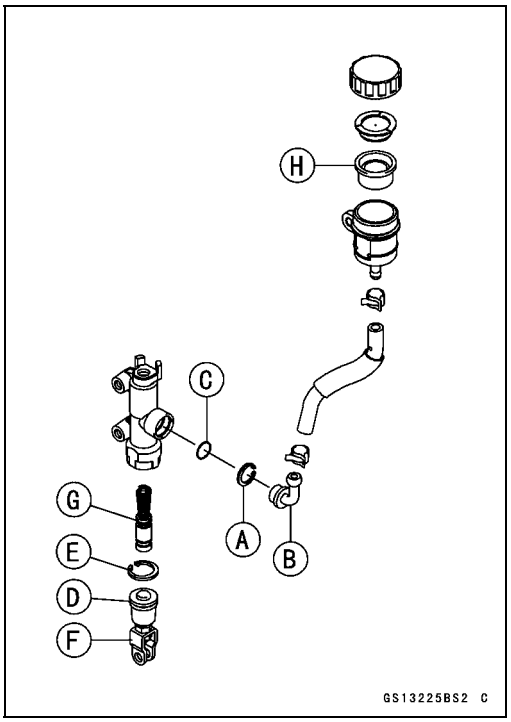



**Rear Master Cylinder Disassembly**

- Remove the rear master cylinder (see Rear Master Cylinder Removal in the Brakes chapter).
- Remove the circlip [A], connector [B] and O-ring [C].

**Special Tool - Inside Circlip Pliers: 57001-143**

- Slide the dust cover [D] out of place, and remove the circlip [E].
- Pull out the push rod assembly [F].
- Remove the piston assembly [G] (piston, primary cup, secondary cup and return spring)
- Replace:
  Circlip [A]
  O-ring [C]
  Circlip [E]
  Push Rod Assembly [F]
  Piston Assembly [G]
  Diaphragm [H]



## Maintenance Procedure

**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 sliding surface of the piston assembly (piston, primary cup and secondary cap) and to the inner wall of the cylinder.
- When installing the piston assembly, take care not to scratch the piston or the inner wall of the cylinder.
- Fit the circlip into the groove of the cylinder securely.
- For the front master cylinder, apply silicone grease to the sliding surface of the bake lever pivot bolt.
- Tighten:

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

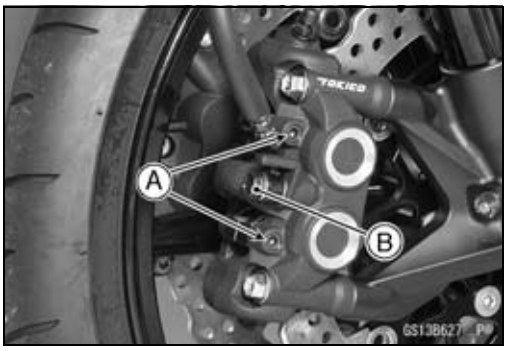
- For the front master cylinder, install the bleed valve and rubber cap.

**Torque - Front Master Cylinder Bleed Valve: 5.4 N·m (0.55 kgf·m, 48 in·lb)**

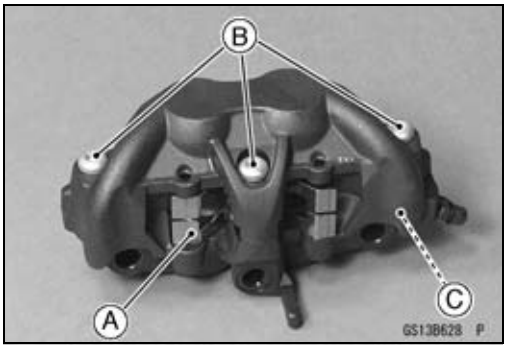
### *Caliper Rubber Parts Replacement*

**Front Caliper Disassembly**

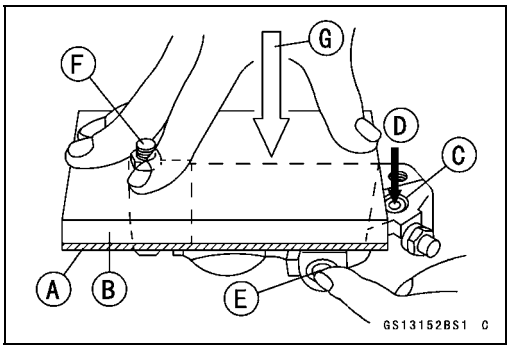
- Loosen the front brake pad pins [A] and banjo bolt [B], and tighten the banjo bolt loosely.
- Remove:
  Front Caliper (see Front Caliper Removal in the Brakes chapter)
  Front Brake Pads (see Front Brake Pad Removal in the Brakes chapter)




- Remove the pad spring [A].
- Remove the front caliper assembly bolts [B] and split the caliper.
- Remove the O-ring [C] on the oil passage of the caliper half.



## Maintenance Procedure




- Using compressed air, remove the pistons. One way to remove the pistons is as follows.

○Install a rubber gasket [A] and a wooden board [B] more than 10 mm (0.39 in.) thick on the caliper half, and fasten them together with a suitable bolt and nut as shown. Leave one of the oil passages [C] open.

○Lightly apply compressed air [D] to the oil passage until the pistons hit the rubber gasket. Block the hose joint opening [E] during this operation if the caliper half has the opening.

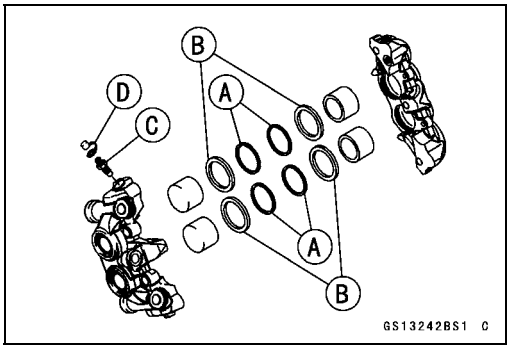
Bolt and Nut [F]
Push down [G].

**⚠ 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.

- Repeat the previous step to remove the pistons from the other side of the caliper body.




- 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, do as follows for both calipers coincidentally, with the brake hose connected to the caliper.*

○*Prepare a container for brake fluid, and perform the work above it.*

○*Remove the brake pads (see Front Brake Pad Removal in the Brakes chapter).*

○*Pump the brake lever until the pistons come out of the cylinders, and then disassemble the caliper.*

**Front Caliper Assembly**

- Clean the caliper parts except for the pads.

**CAUTION**

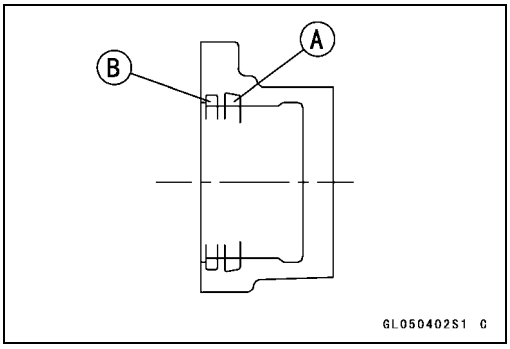
**For cleaning the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.**

- Install the bleed valve and rubber cap.

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

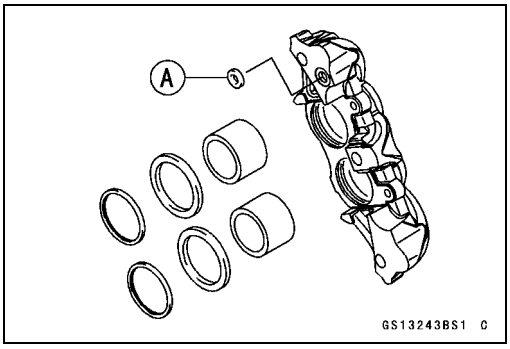
## Maintenance Procedure

- Replace the fluid seals [A] with new ones.
- ○Apply silicone grease to the fluid seals, and install them into the cylinders by hand.
- Replace the dust seals [B] with new ones.
- ○Apply silicone grease to the dust seals, and install them into the cylinders by hand.

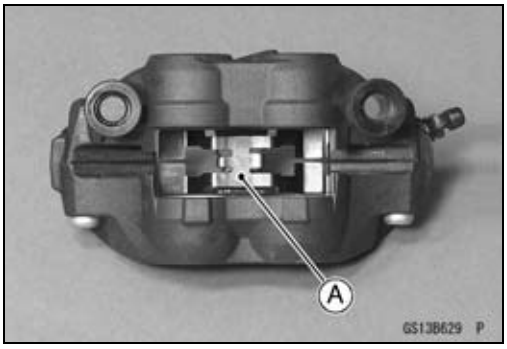



- Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand as far as they will go.
- Replace the O-ring [A] and install it.
- Tighten:

**Torque - Front Caliper Assembly Bolts: 22 N·m (2.2 kgf·m, 16 ft·lb)**



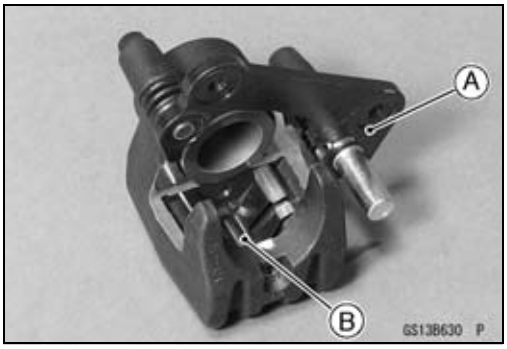

- Install the pad spring [A] on the calipar as shown in the figure.
- Install the brake pads (see Front Brake Pad Installation in the Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.




**Rear Caliper Disassembly**

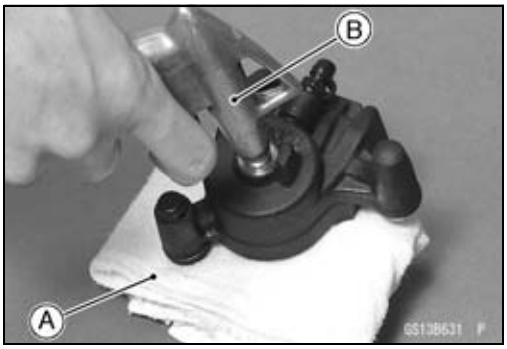
- Remove:

Rear Caliper (see Rear Caliper Removal in the Brakes chapter)
Rear Brake Pads (see Rear Brake Pads Removal in the Brakes chapter)
Caliper Holder [A]
Pad Spring [B]



## Maintenance Procedure

● Using compressed air, remove the piston.
○Cover the caliper opening with a clean, heavy cloth [A].
○Remove the piston by lightly applying compressed air [B] to where the brake line fits into the caliper.




**⚠ WARNING**

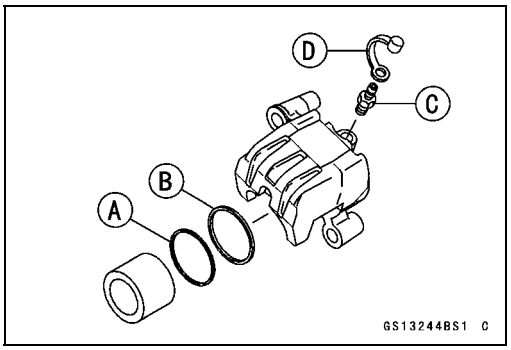
**To avoid serious injury, never place your fingers or palm inside the caliper opening. If you apply compressed air into the caliper, the piston may crush your hand or fingers.**

○Pull out the piston by hand.

**NOTE**

○*If compressed air is not available, do as follows with the brake hose connected to the caliper.*
○*Prepare a container for brake fluid, and perform the work above it.*
○*Remove the brake pads (see Rear Brake Pad Removal in the Brakes chapter).*
○*Pump the brake pedal to remove the caliper piston.*

● Remove the dust seal [A] and fluid seal [B].
● Remove the bleed valve [C] and rubber cap [D].




**Rear Caliper Assembly**

● Clean the caliper parts except for the pads.

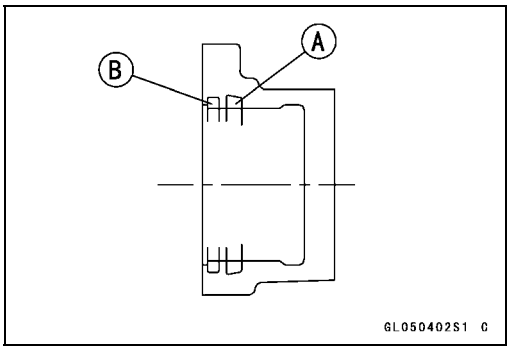
**CAUTION**

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

● Install the bleed valve and rubber cap.

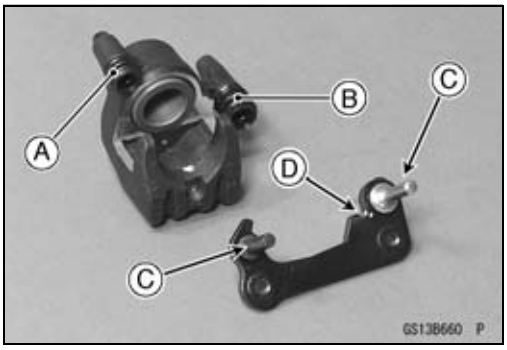
**Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

● Replace the fluid seal [A] with a new one.
○Apply silicone grease to the fluid seal, and install it into the cylinder by hand.
● Replace the dust seal [B] with a new one.
○Apply silicone grease to the dust seal, and install it into the cylinder by hand.

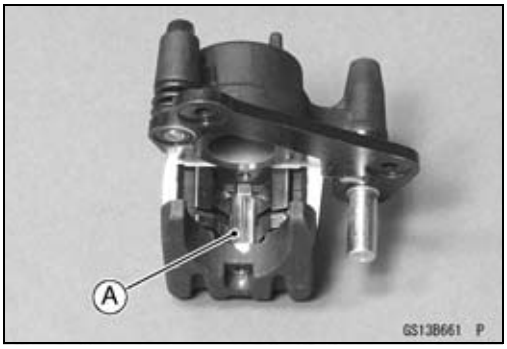


## Maintenance Procedure

- Apply brake fluid to the outside of the piston, and push it into the cylinder by hand as far as it will go.
- Replace the friction boot [A] and dust boot [B] with new ones.
- Apply silicone grease to the sliding surface of the caliper holder shafts [C].
- Check that the guide [D] is in place on the caliper holder.



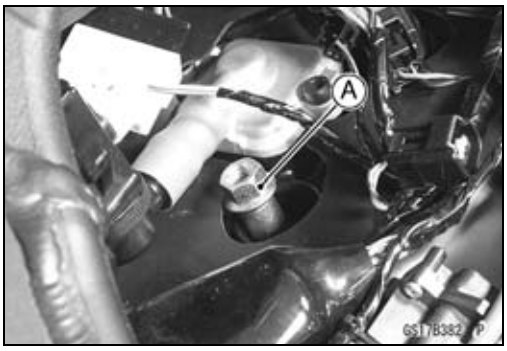

- Install the pad spring [A] on the caliper as shown in the figure.
- Install the brake pads (see Rear Brake Pad Installation in the Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.




### *Spark Plug Replacement*

- Remove the stick coils (see Stick Coil Removal in the Electrical System chapter).
- Remove the spark plugs using the 16 mm plug wrench (Owner's Tool: 92110-1132) [A] vertically.
- Replace the spark plug with new ones.

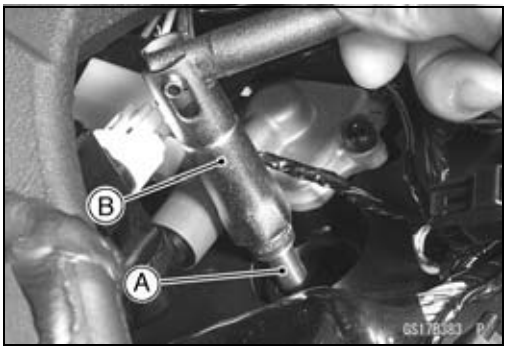
**Standard Spark Plug**
**Type: NGK CR9EIA-9**




- Insert the spark plug [A] vertically into the spark plug hole with the spark plug installed in the plug wrench [B] , and finger-tighten it first.

**CAUTION**

**If tightening the spark plug with the wrench inclined, the insulator of the spark plug may break.**




- Tighten:

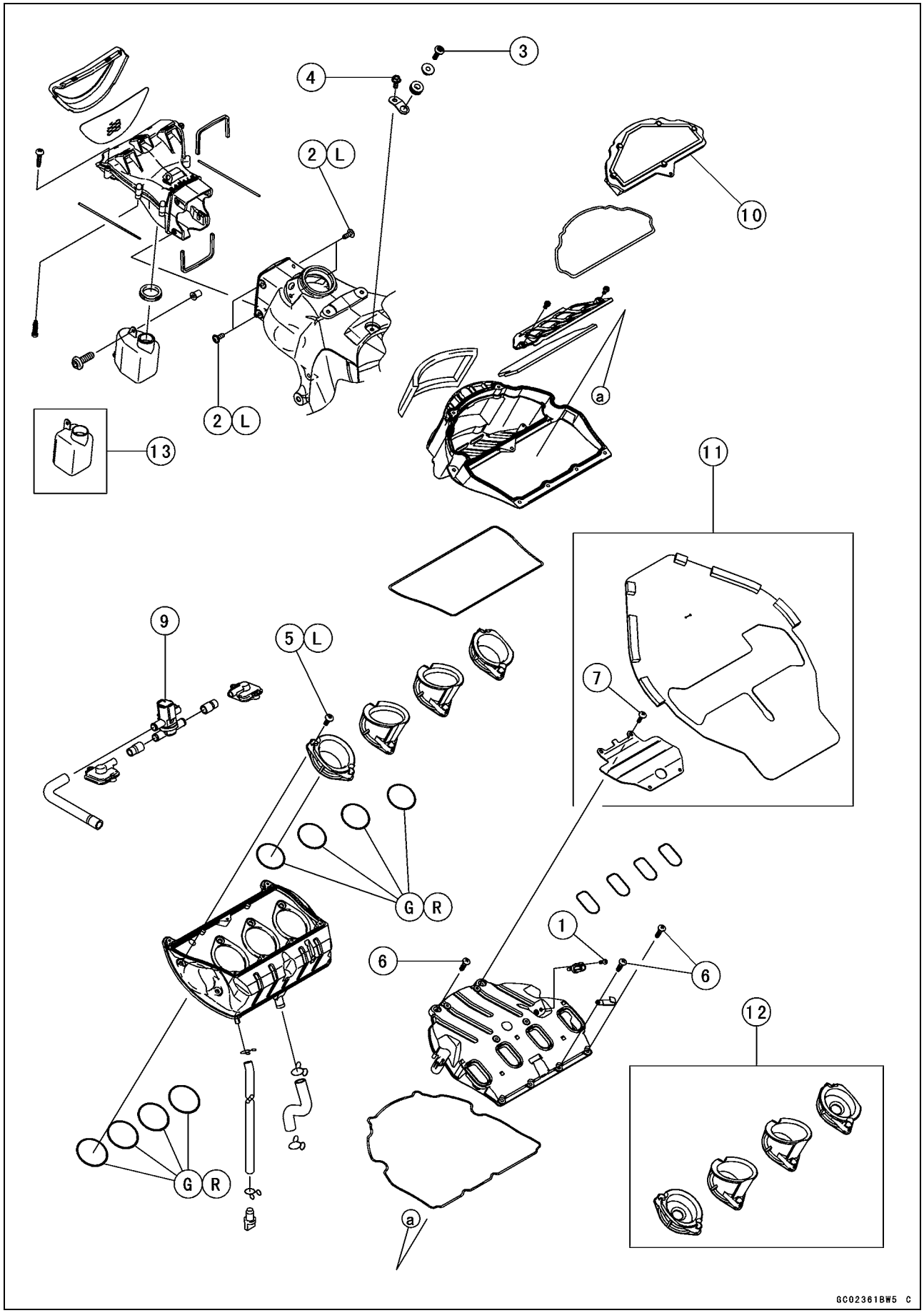
**Torque - Spark Plugs: 13 N·m (1.3 kgf·m, 115 in·lb)**

- Install the stick coils (see Stick Coil Installation in the Electrical System chapter).
- After installation, be sure the stick coils are installed securely by pulling up them lightly.

# Fuel System (DFI)

## Table of Contents

## Exploded View



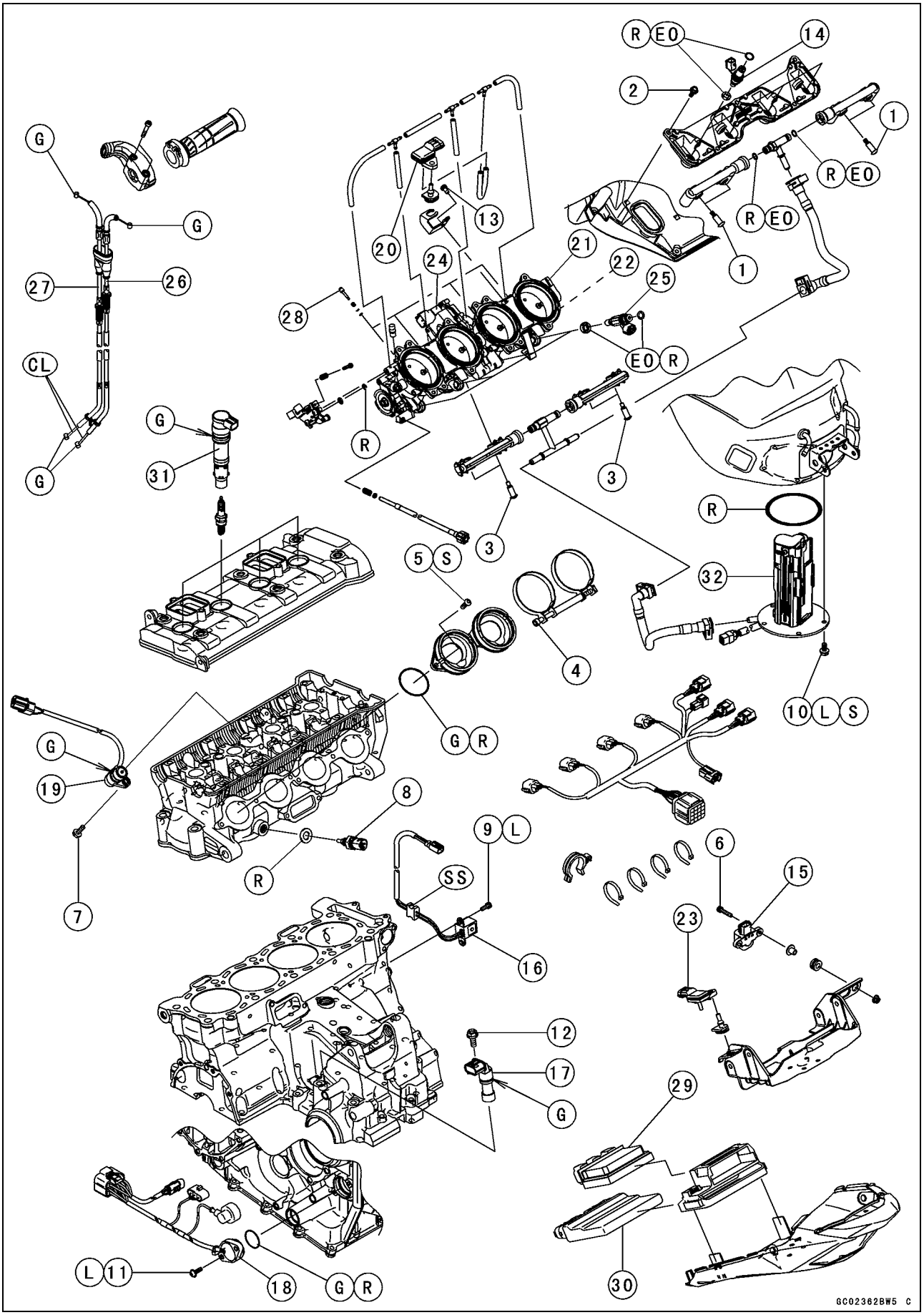
## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Inlet Air Temperature Sensor Screw | 1.2 | 0.12 | 11 in·lb | |
| 2 | Air Inlet Duct Mounting Bolts | 7.0 | 0.71 | 62 in·lb | L |
| 3 | Air Cleaner Housing Bracket Bolt | 7.0 | 0.71 | 62 in·lb | |
| 4 | Air Cleaner Housing Mounting Bolt (Upper) | 7.0 | 0.71 | 62 in·lb | |
| 5 | Air Cleaner Housing Mounting Bolts (Lower) | 4.2 | 0.43 | 37 in·lb | L |
| 6 | Air Cleaner Housing Assembly Screws | 1.1 | 0.11 | 9.7 in·lb | |
| 7 | Rubber Plate Holder Screws | 1.1 | 0.11 | 9.7 in·lb | |

8. Inlet Air Temperature Sensor
9. Air Switching Valve
10. Air Cleaner Element
11. US, CA and CAL Models
12. WVTA (78.2 H) Model
13. Other than US, CA and CAL Models

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

## Exploded View



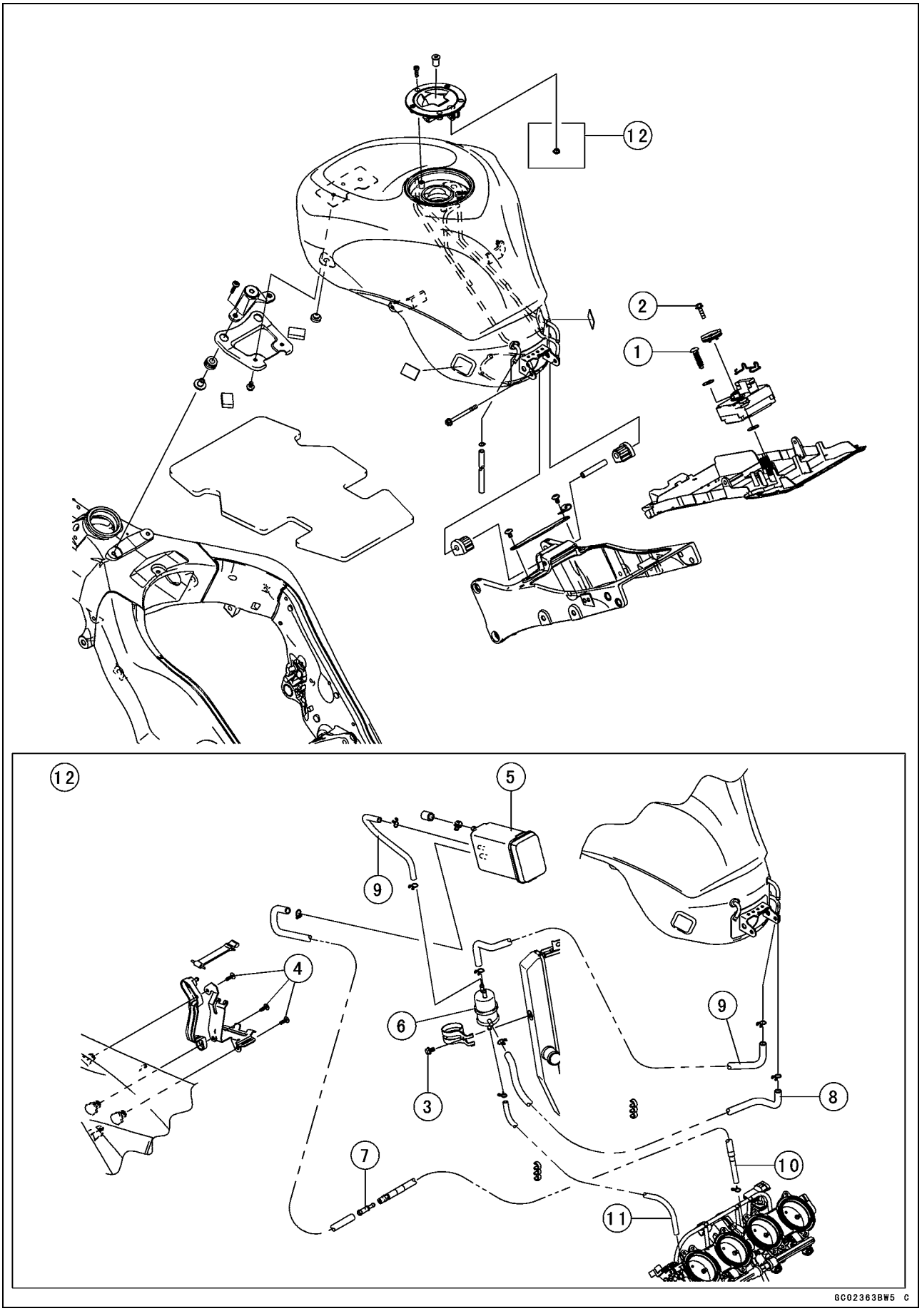
## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Delivery Pipe Assy Mounting Screws (Nozzle Assy) | 3.4 | 0.35 | 30 in·lb | |
| 2 | Nozzle Assy Mounting Bolts | 7.0 | 0.71 | 62 in·lb | |
| 3 | Delivery Pipe Assy Mounting Screws (Throttle Body Assy) | 3.4 | 0.35 | 30 in·lb | |
| 4 | Throttle Body Assy Holder Clamp Bolts | 2.0 | 0.20 | 18 in·lb | |
| 5 | Throttle Body Assy Holder Bolts | 10 | 1.0 | 89 in·lb | S |
| 6 | Vehicle-down Sensor Bolts | 6.0 | 0.61 | 53 in·lb | |
| 7 | Camshaft Position Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| 8 | Water Temperature Sensor | 25 | 2.5 | 18 | |
| 9 | Crankshaft Sensor Bolts | 6.0 | 0.61 | 53 in·lb | L |
| 10 | Fuel Pump Bolts | 10 | 1.0 | 89 in·lb | L, S |
| 11 | Gear Position Switch Screws | 3.0 | 0.31 | 27 in·lb | L |
| 12 | Speed Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| 13 | Inlet Air Pressure Sensor Bracket Screws | 3.4 | 0.35 | 30 in·lb | |

14. Secondary Fuel Injectors
15. Vehicle-down Sensor
16. Crankshaft Sensor
17. Speed Sensor
18. Gear Position Sensor
19. Camshaft Position Sensor
20. Inlet Air Pressure Sensor
21. Subthrottle Sensor
22. Main Throttle Sensor
23. Atmospheric Pressure Sensor
24. Subthrottle Valve Actuator
25. Primary Fuel Injectors
26. Throttle Cable (Accelerator)
27. Throttle Cable (Decelerator)
28. Bypass Screws
29. Relay Box
30. ECU
31. Stick Coils
32. Fuel Pomp

CL: Apply cable lubricant.
EO: Apply engine oil.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
S: Following the specific tightening sequence.
SS: Apply silicone sealant.

## Exploded View



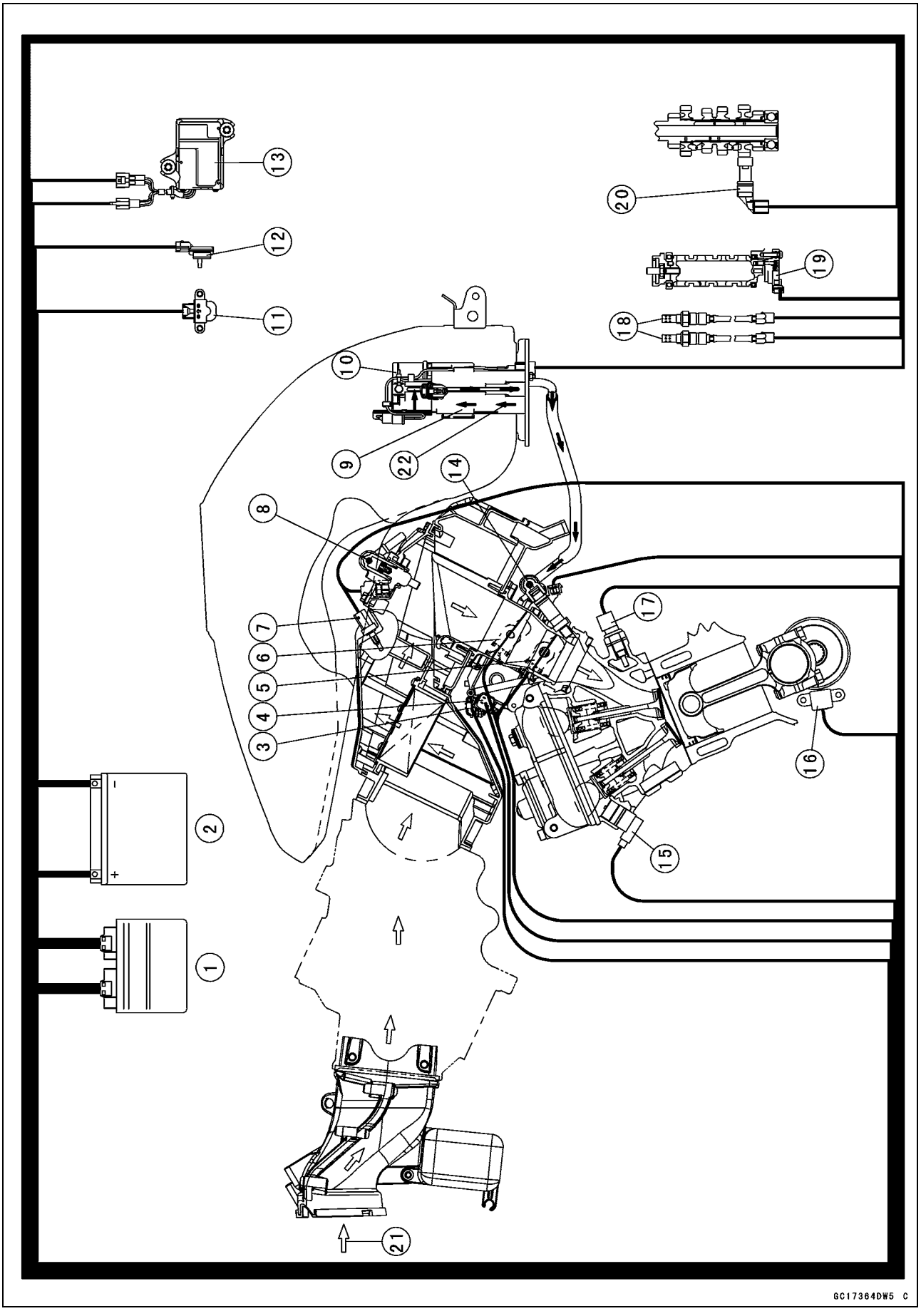
## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Exhaust Butterfly Valve Actuator Mounting Screws | 4.3 | 0.44 | 38 in·lb | |
| 2 | Exhaust Butterfly Valve Actuator Pulley Bolt | 5.0 | 0.51 | 44 in·lb | |
| 3 | Separator Bracket Bolts | 7.0 | 0.71 | 62 in·lb | |
| 4 | Canister Bracket Bolts | 4.3 | 0.44 | 38 in·lb | |

5. Canister
6. Separator
7. Fitting
8. Red Hose
9. Blue Hose
10. Green Hose
11. White Hose
12. CAL and SEA Models

## DFI System

### DFI System

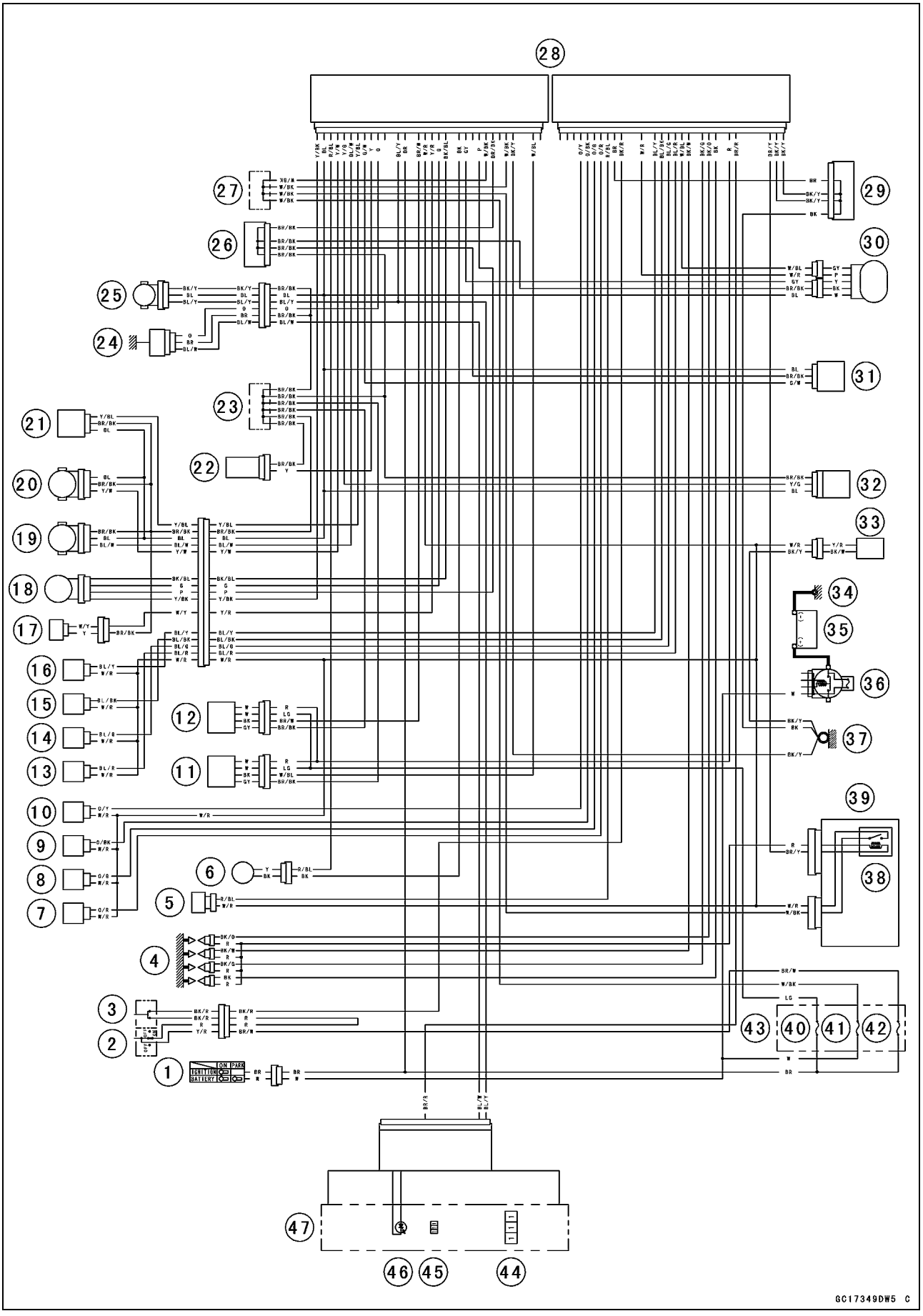


## DFI System

1. ECU
2. Battery 12 V 10 Ah
3. Inlet Air Pressure Sensor
4. Subthrottle Valve Actuator
5. Main Throttle Sensor
6. Subthrottle Sensor
7. Inlet Air Temperature Sensor
8. Secondary Fuel Injectors
9. Fuel Pump
10. Pressure Regulator
11. Vehicle-down Sensor
12. Atmospheric Pressure Sensor
13. Exhaust Butterfly Valve Actuator
14. Primary Fuel Injectors
15. Camshaft Position Sensor
16. Crankshaft Sensor
17. Water Temperature Sensor
18. Oxygen Sensors (Equipped Models)
19. Gear Position Switch
20. Speed Sensor
21. Air Flow
22. Fuel Flow

## DFI System

### DFI System Wiring Diagram



## DFI System

**Part Names**

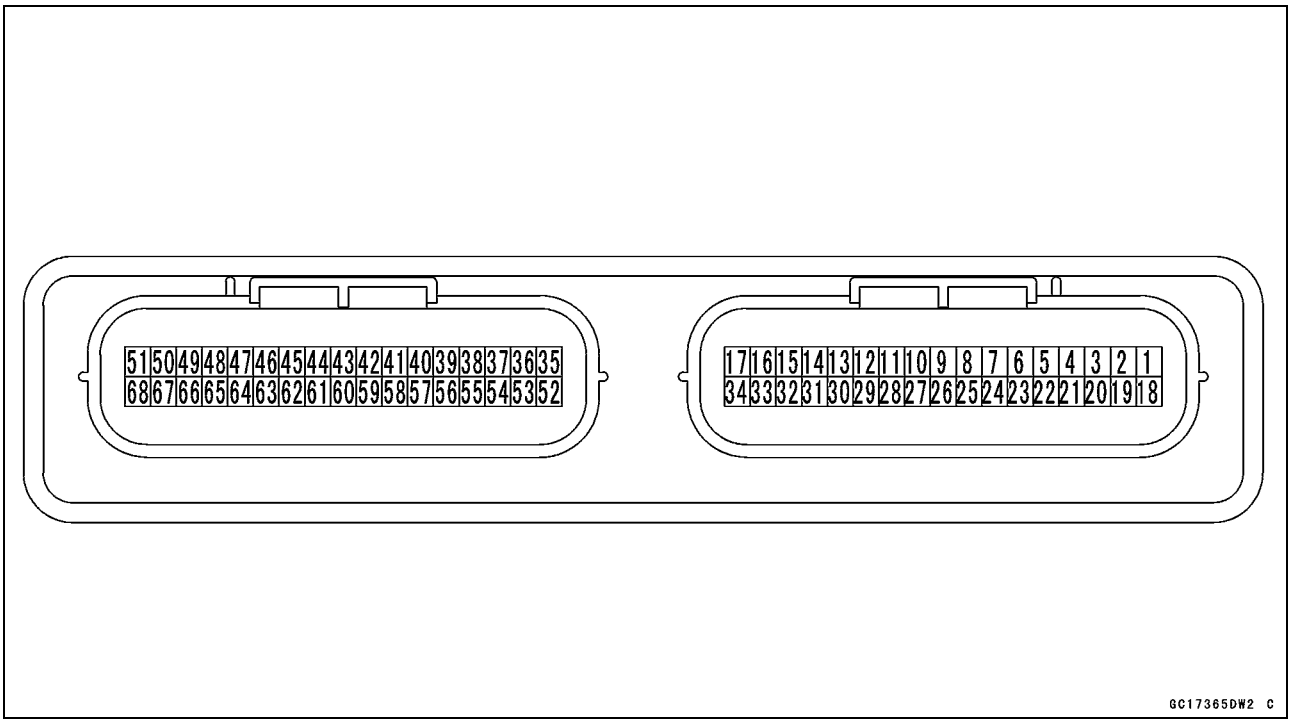
1. Ignition Switch
2. Engine Stop Switch
3. Starter Button
4. Stick Coil #1, #2, #3, #4
5. Air Switching Valve
6. Crankshaft Sensor
7. Secondary Fuel Injector #1
8. Secondary Fuel Injector #2
9. Secondary Fuel Injector #3
10. Secondary Fuel Injector #4
11. Oxygen Sensor #1 (Equipped Models)
12. Oxygen Sensor #2 (Equipped Models)
13. Primary Fuel Injector #1
14. Primary Fuel Injector #2
15. Primary Fuel Injector #3
16. Primary Fuel Injector #4
17. Camshaft Position Sensor
18. Subthrottle Valve Actuator
19. Subthrottle Sensor
20. Main Throttle Sensor
21. Inlet Air Pressure Sensor
22. Inlet Air Temperature Sensor
23. Joint Connector 3
24. Water Temperature Sensor
25. Speed Sensor
26. Joint Connector 4
27. Water-proof Joint 2
28. ECU
29. Water-proof Joint 1
30. Exhaust Butterfly Valve Actuator
31. Atmospheric Pressure Sensor
32. Vehicle-down Sensor
33. Fuel Pump
34. Engine Ground
35. Battery 12 V 10 Ah
36. Main Fuse 30 A
37. Frame Ground 1
38. Fuel Pump Relay
39. Relay Box
40. Oxygen Sensor Heater Fuse 10 A (Equipped Models)
41. ECU Fuse 10 A
42. Ignition Fuse 15 A
43. Fuse Box
44. Speedometer
45. Water Temperature Meter
46. Warning Indicator Light (LED)
47. Meter Unit

○Color Codes:

| | | |
|---|---|---|
| BK: Black | GY: Gray | PU: Purple |
| BL: Blue | LB: Light Blue | R: Red |
| BR: Brown | LG: Light Green | V: Violet |
| CH: Chocolate | O: Orange | W: White |
| DG: Dark Green | P: Pink | Y: Yellow |
| G: Green | | |

## DFI System

### Terminal Numbers of ECU Connectors




**Terminal Names**

1. Unused
2. Subthrottle Valve Actuator: G
3. Subthrottle Valve Actuator: BK/BL
4. Gear Position Switch: W/Y
5. Oxygen Sensor #1 (Equipped Models): W/BL
6. Unused
7. Power Supply to Sensors: BL
8. Inlet Air Temperature Sensor: Y
9. Vehicle-down Sensor: Y/G
10. Exhaust Butterfly Valve Actuator Sensor: GY
11. Atmospheric Pressure Sensor: G/W
12. Speed Sensor: BL/Y
13. Camshaft Position Sensor: Y/R
14. Battery Monitor Voltage Line: W/R
15. Power Supply to ECU (from Battery): W/BK
16. Unused
17. Ground for Control System: BK/Y
18. Unused
19. Subthrottle Valve Actuator: Y/BK
20. Subthrottle Valve Actuator: P
21. External Communication Line (Immobilizer System, Equipped Models/*KDS): LG/BK
22. Oxygen Sensor #2 (Equipped Models): BR/W
23. Unused
24. Power Supply to ECU (from Ignition Switch): BR
25. Water Temperature Sensor: O
26. Main Throttle Sensor: Y/W
27. Subthrottle Sensor: BL/W
28. Inlet Air Temperature Sensor: Y/BL
29. Crankshaft Sensor (+): R/BL
30. Crankshaft Sensor (–): BK
31. Unused
32. Power Supply to ECU (from Battery): W/BK
33. Unused
34. Ground for Sensors: BR/BK

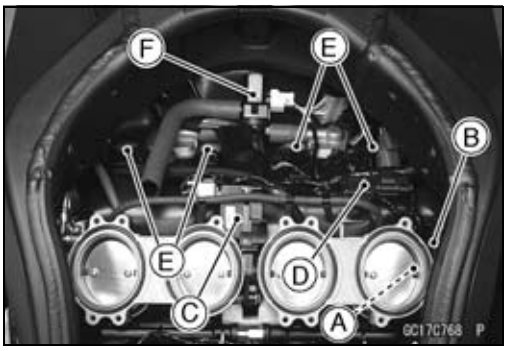
## DFI System

35. Meter Unit (Tachometer): LB
36. ECU Communication Line (to Meter Unit): BR/R
37. Ground: P
38. Unused
39. Starter Lockout Switch: R/G
40. Radiator Fan Relay: P/BL
41. Engine Ground: BK/Y
42. Immobilizer Amplifier (Equipped Models): BL
43. Immobilizer Amplifier (Equipped Models): W/R
44. Primary Fuel Injector #3: BL/BK
45. Exhaust Butterfly Valve Actuator (+): W/BL
46. Primary Fuel Injector #3: BL/G
47. Secondary Fuel Injector #2: O/G
48. Primary Fuel Injector #4: BL/Y
49. Stick Coil #1: BK
50. Oxygen Sensor Heater #1 and #2 (Equipped Models): R
51. Stick Coil #2: BK/G
52. External Communication Line (Immobilizer System, Equipped Models/*KDS): G
53. Unused
54. Unused
55. Sidestand Switch: G/BK
56. Starter Button: BK/R
57. Ground: BR
58. Engine Ground: BK/Y
59. Immobilizer Amplifier (Equipped Models): O
60. Immobilizer Amplifier (Equipped Models): Y
61. Secondary Fuel Injector #3: O/BK
62. Air Switching Valve: R/BL
63. Primary Fuel Injector #1: BL/R
64. Secondary Fuel Injector #1: O/R
65. Secondary Fuel Injector #4: O/Y
66. Stick Coil #3: BK/W
67. Fuel Pump Relay: BR/Y
68. Stick Coil #4: BK/O

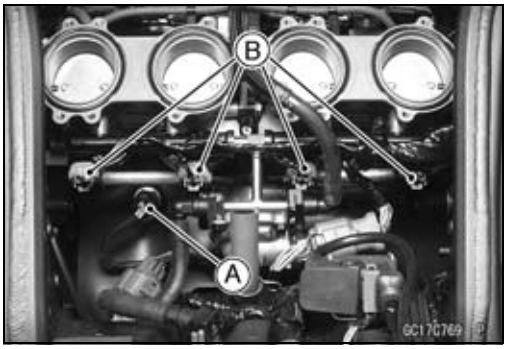
*: KDS (Kawasaki Diagnostic System)

## DFI Parts Location

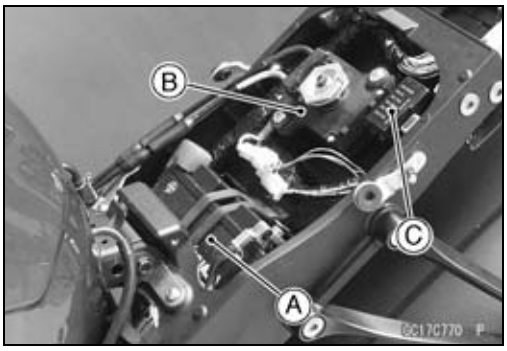
Main Throttle Sensor [A]
Subthrottle Sensor [B]
Subthrottle Valve Actuator [C]
Inlet Air Pressure Sensor [D]
Stick Coils #1, #2, #3, #4 [E]
Air Switching Valve [F]



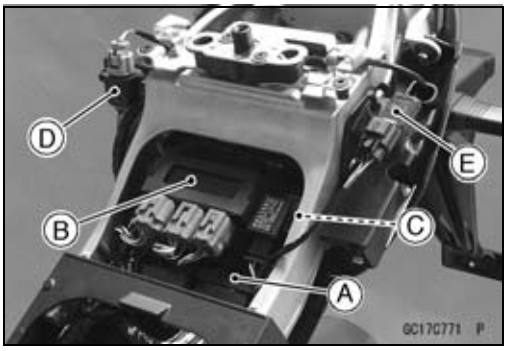

Water Temperature Sensor [A]
Primary Fuel Injectors #1, #2, #3, #4 [B]



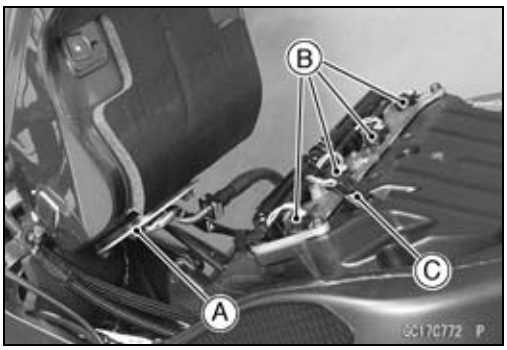

Battery 12 V 10 Ah [A]
Exhaust Butterfly Valve Actuator [B]
Fuse Box [C] (Ignition Fuse 15 A, ECU Fuse 10 A, Oxygen Sensor Heater Fuse 10 A (Equipped Models))




ECU [A]
Relay Box [B] (Fuel Pump Relay, Radiator Fan Relay)
Immobilizer (Equipped Models)/Kawasaki Diagnostic System Connector [C]
Vehicle-down Sensor [D]
Atmospheric Pressure Sensor [E]

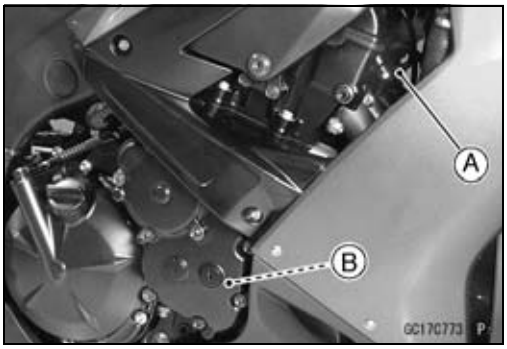



Fuel Pump [A]
Secondary Fuel Injectors #1, #2, #3, #4 [B]
Inlet Air Temperature Sensor [C]

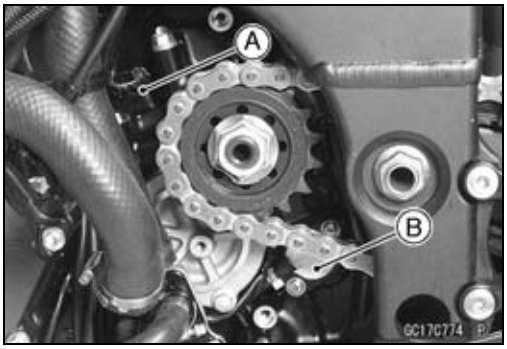


## DFI Parts Location

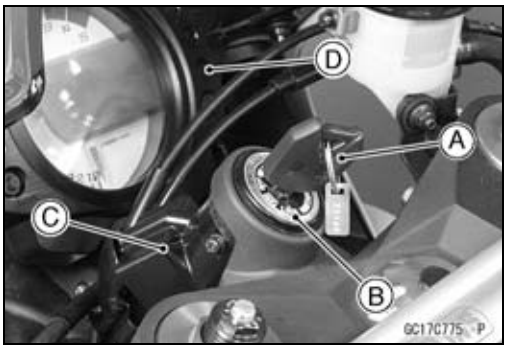
Camshaft Position Sensor [A]
Crankshaft Sensor [B]



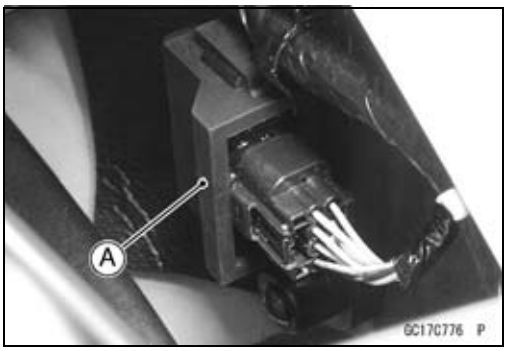

Speed Sensor [A]
Gear Position Switch [B]



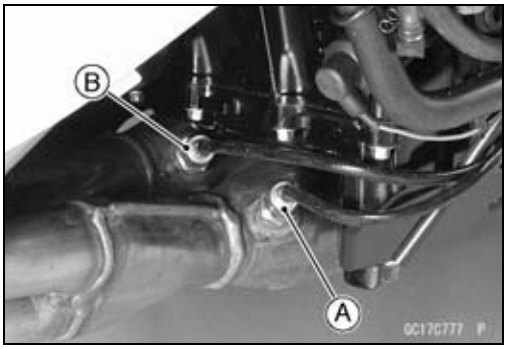

Ignition Key [A] (Transponder, Immobilizer System Equipped Models)
Immobilizer Antenna [B] (Equipped Models)
Ignition Switch [C]
Warning Indicator Light (LED) [D]




Immobilizer Amplifier [A] (Equipped Models)




Oxygen Sensor #1 [A] (Equipped Models)
Oxygen Sensor #2 [B] (Equipped Models)



## Specifications

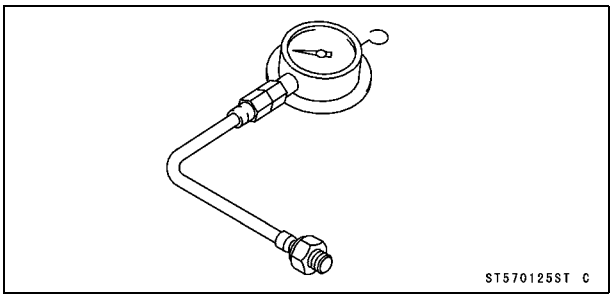
| Item | Standard |
|---|---|
| **Digital Fuel Injection System** | |
| Idle Speed | 1 100 ±50 r/min (rpm) |
| Throttle Body Assy: | |
| Type | Four oval type |
| Bore | $\phi$43 mm (1.69 in.) |
| Throttle Body Vacuum | 32.7 ±1.33 kPa (245 ±10 mmHg) |
| Bypass Screws (Turn Out) | 2 1/2 (for reference) |
| ECU: | |
| Make | MITSUMISHI ELECTRIC |
| Type | Digital memory type, with built in IC igniter, sealed with resin |
| Fuel Pressure (High Pressure Line) | 294 kPa (3.0 kgf/cm², 43 psi) with engine idling |
| Fuel Pump: | |
| Type | Wesco pump |
| Discharge | 67 mL (2.3 US oz.) or more for 3 seconds |
| Primary Fuel Injectors: | |
| Type | INP-287 |
| Nozzle Type | Fine atomizing type with 12 holes |
| Resistance | About 11.7 ~ 12.3 Ω at 20°C (68°F) |
| Secondary Fuel Injectors: | |
| Type | KN-7 STD |
| Nozzle Type | Fine atomizing type with 10 holes |
| Resistance | About 10.5 Ω at 20°C (68°F) |
| Main Throttle Sensor: | |
| Input Voltage | DC 4.75 ~ 5.25 V |
| Output Voltage | DC 0.645 ~ 0.675 V at idle throttle opening |
| | DC 3.84 ~ 4.04 V at full throttle opening (for reference) |
| Resistance | 4 ~ 6 kΩ |
| Inlet Air Pressure Sensor/Atmospheric Pressure Sensor: | |
| Input Voltage | DC 4.75 ~ 5.25 V |
| Output Voltage | DC 3.80 ~ 4.20 V at standard atmospheric pressure (see this text for details) |
| Inlet Air Temperature Sensor: | |
| Output Voltage | About DC 2.25 ~ 2.50 V at inlet air temperature 20°C (68°F) |
| Resistance | 5.4 ~ 6.6 kΩ at 0°C (32°F) |
| | About 0.29 ~ 0.39 kΩ at 80°C (176°F) |
| Water Temperature Sensor: | |
| Output Voltage | About DC 2.80 ~ 2.97 V at 20°C (68°F) |
| Speed Sensor: | |
| Input Voltage | DC 4.75 ~ 5.25 V |
| Output Voltage | About DC 0.05 ~ 0.09 V or DC 4.5 ~ 4.9 at ignition switch ON and 0 km/h |

## Specifications

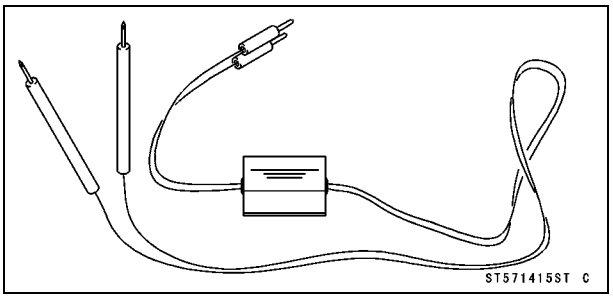
| Item | Standard |
|---|---|
| Vehicle-down Sensor: | |
| Input Voltage | DC 4.75 ~ 5.25 V |
| Output Voltage | With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V |
| | With sensor arrow mark pointed up: DC 3.55 ~ 4.45 V |
| Subthrottle Sensor: | |
| Input Voltage | DC 4.75 ~ 5.25 V |
| Output Voltage | DC 0.8 ~ 1.0 V at subthrottle valve full close position (for reference) |
| | DC 4.28 ~ 4.32 V at subthrottle valve full open position |
| Resistance | 4 ~ 6 kΩ |
| Exhaust Butterfly Valve Actuator Sensor: | |
| Input Voltage | DC 4.75 ~ 5.25 V |
| Output Voltage | DC 3.46 ~ 3.76 V at pulley original position |
| Resistance | 4 ~ 6 kΩ |
| Immobilizer Antenna (Equipped Models): | |
| Resistance | About 0.6 ~ 0.9 Ω |
| Exhaust Butterfly Valve Actuator: | |
| Resistance | 5 ~ 200 Ω (for reference) |
| Subthrottle Valve Actuator: | |
| Resistance | About 6.3 ~ 9.5 Ω |
| Input Voltage | About DC 8.5 ~ 10.5 V |
| Oxygen Sensor (Equipped Models): | |
| Output Voltage (Rich) | DC 0.8 V or more |
| Output Voltage (Lean) | DC 0.24 V or less |
| Heater Resistance | 6.7 ~ 10.5 Ω at 20°C (68°F) |
| **Throttle Grip and Cables** | |
| Throttle Grip Free Play | 2 ~ 3 mm (0.08 ~ 0.12 in.) |
| **Air Cleaner** | |
| Element | Viscous paper element |

## Special Tools and Sealant

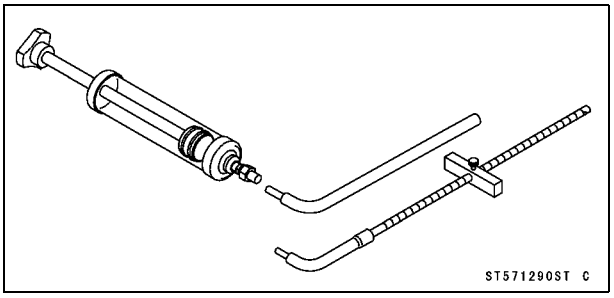
**Oil Pressure Gauge, 5 kgf/cm²:**
**57001-125**



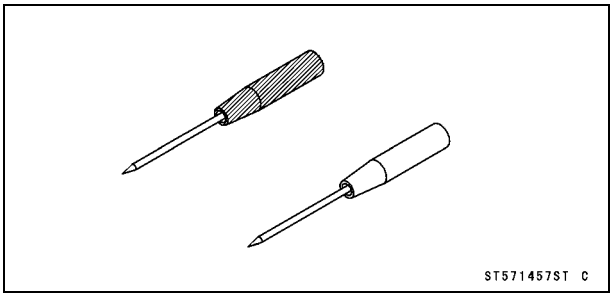

**Peak Voltage Adapter:**
**57001-1415**



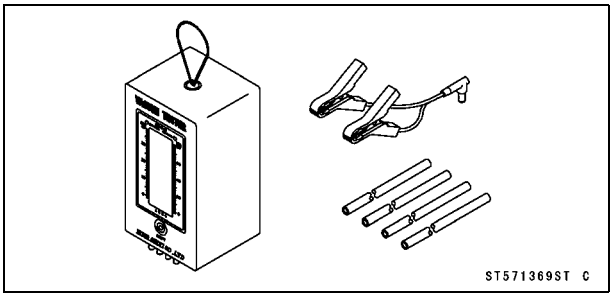

**Fork Oil Level Gauge:**
**57001-1290**



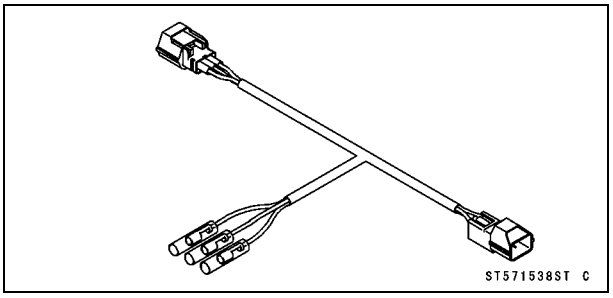

**Needle Adapter Set:**
**57001-1457**



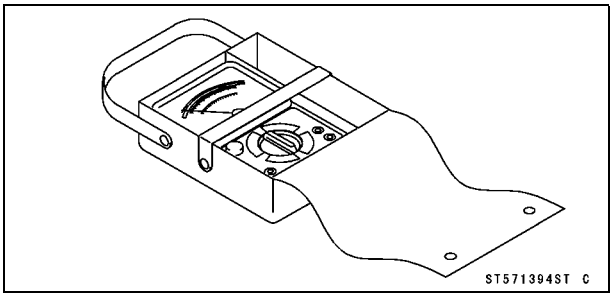

**Vacuum Gauge:**
**57001-1369**



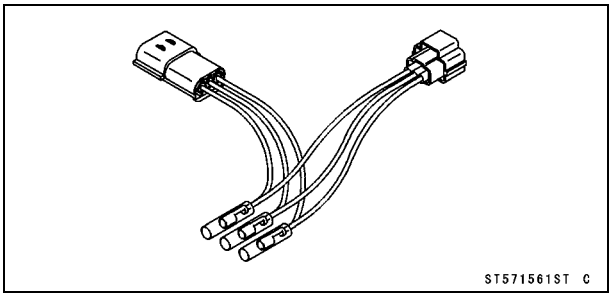

**Throttle Sensor Setting Adapter:**
**57001-1538**



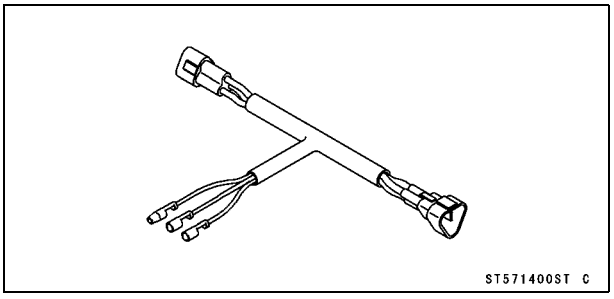

**Hand Tester:**
**57001-1394**



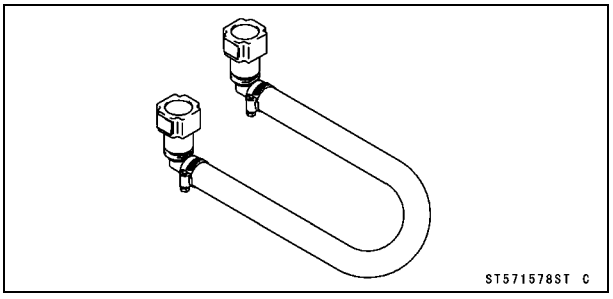

**Sensor Harness Adapter:**
**57001-1561**




**Throttle Sensor Setting Adapter #1:**
**57001-1400**

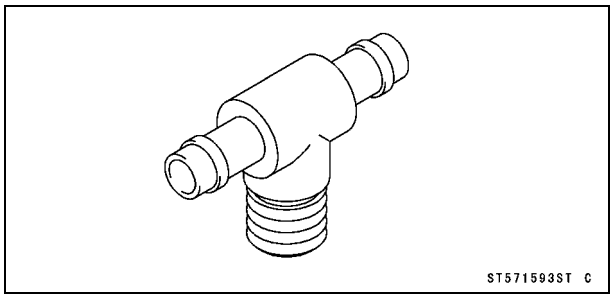



**Extension Tube:**
**57001-1578**

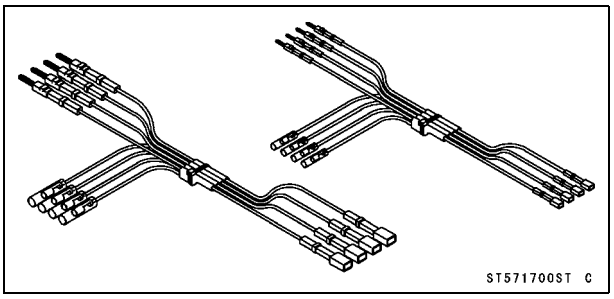


## Special Tools and Sealant

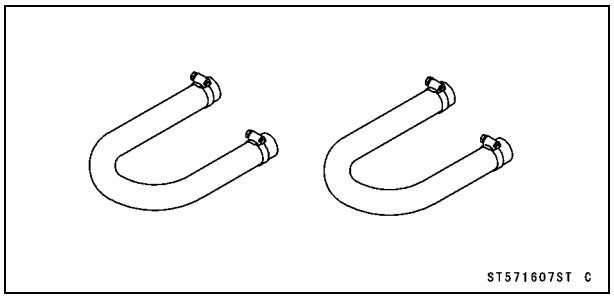
**Fuel Pressure Gauge Adapter:**
**57001-1593**



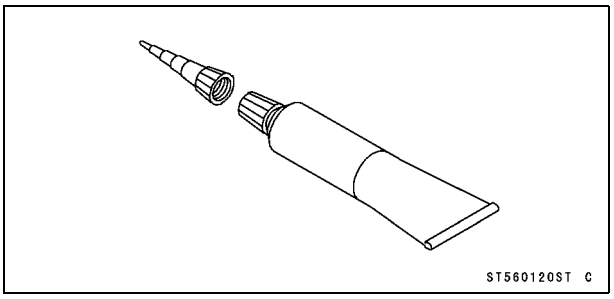

**Measuring Adapter:**
**57001-1700**



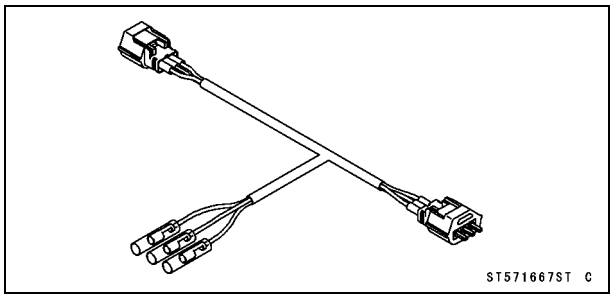

**Fuel Hose:**
**57001-1607**




**Kawasaki Bond (Silicone Sealant):**
**56019-120**




**Speed Sensor Measuring Adapter:**
**57001-1667**



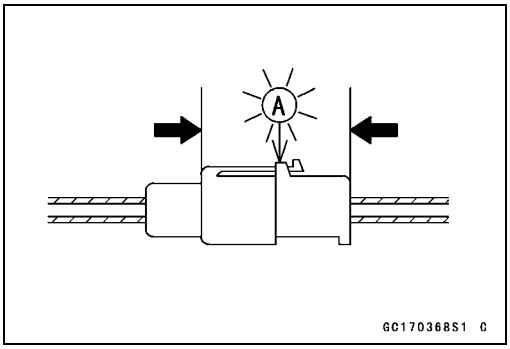
## DFI Servicing Precautions

## DFI Servicing Precautions

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

- This DFI 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 DFI 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.

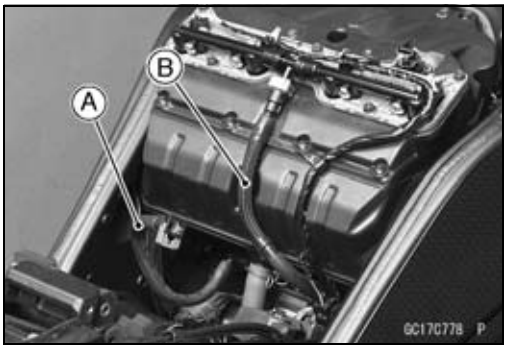
- Whenever the DFI electrical connections are to be disconnected, first turn off the ignition switch, and disconnect the battery (–) terminal. Do not pull the lead, only the connector. Conversely, make sure that all the DFI electrical connections are firmly reconnected before starting the engine.
- Connect these connectors until they click [A].




- Do not turn the ignition switch ON while any of the DFI electrical connectors are disconnected. The ECU memorizes service codes.
- Do not spray water on the electrical parts, DFI parts, connectors, leads and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of the DFI 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 possible away from the ECU.
- 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 completely dry. This is to prevent pump seizure.
- Before removing the fuel system parts, blow the outer surfaces of these parts clean with compressed air.
- 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 installing the fuel hoses, avoid sharp bending, kinking, flattening or twisting, and route the fuel hoses with a minimum of bending so that the fuel flow will not be obstructed.
- Run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- To prevent corrosion and deposits in the fuel system, do not add to fuel any fuel antifreeze chemicals.

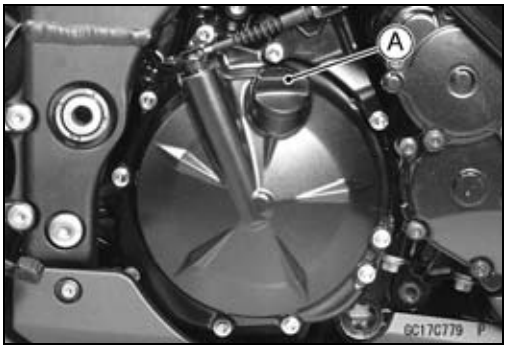
## DFI Servicing Precautions

○If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak or the hose to burst. Remove the fuel tank (see Fuel Tank Removal) and check the fuel hose.
Primary Fuel Hose [A]
Secondary Fuel Hose [B]
★Replace the fuel hose if any fraying, cracks or bulges are noticed.



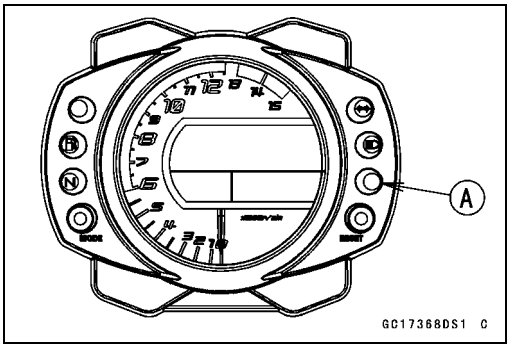

○To maintain the correct fuel/air mixture (F/A), there must be no inlet air leaks in the DFI system. Be sure to install the oil filler plug [A] after filling the engine oil.

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



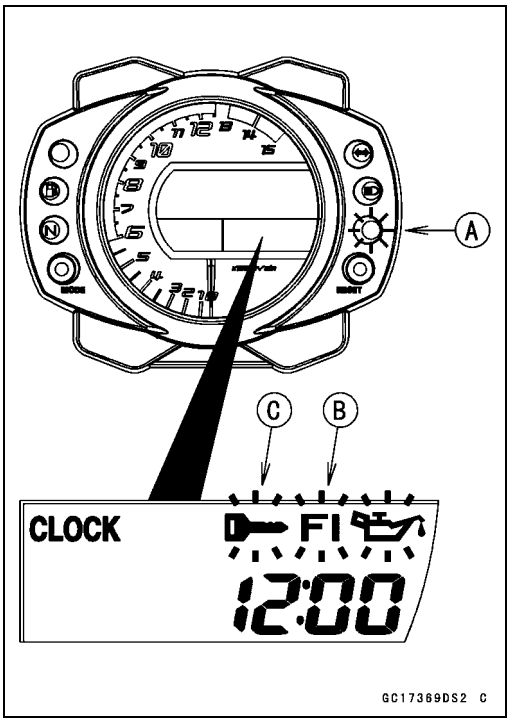
## Troubleshooting the DFI System

The warning indicator light (LED) [A] is used for the FI indicator, immobilizer indicator (equipped models) and oil pressure warning indicator.




### Outline

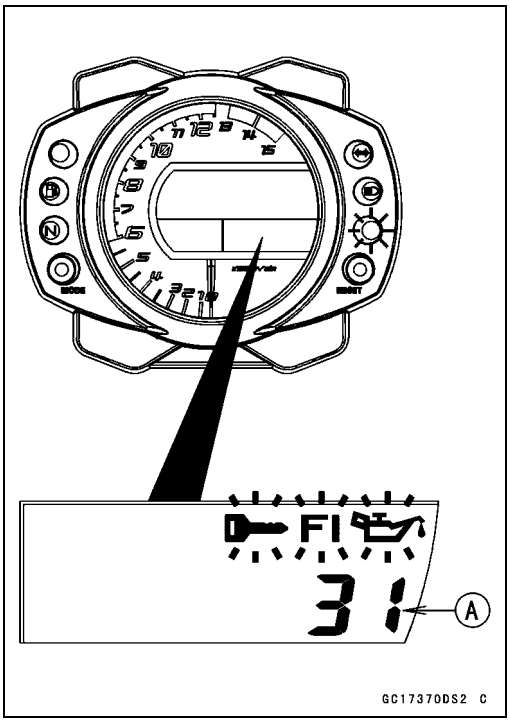
When a problem occurs with DFI system, the warning indicator light (LED) [A] and FI warning symbol [B] blinks to alert the rider. In addition, the condition of the problem is stored in the memory of the ECU. For models equipped with an immobilizer system, the warning indicator light (LED) and immobilizer warning symbol [C] blinks, when a problem occurs in the system.




With the engine stopped and turned in the self-diagnosis mode, the service code [A] is displayed on the LCD (Liquid Crystal Display) by the number of two digits.

If the problem is with the following parts, the ECU can not recognize these problem. Therefore, the warning indicator light (LED), FI and/or immobilizer warning symbols do not blinks, and service code is not displayed.

LCD for Meter Unit
Fuel Pump
Primary and Secondary Fuel Injectors
Stick Coil Secondary Wiring and Ground Wiring
ECU Power Source Wiring and Ground Wiring

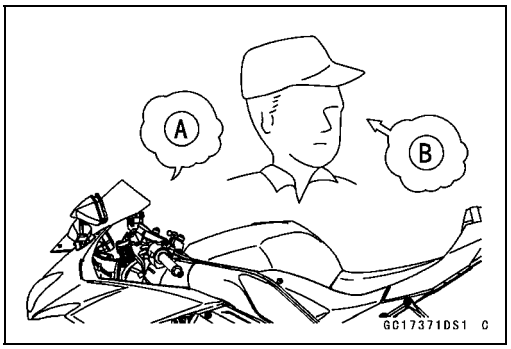


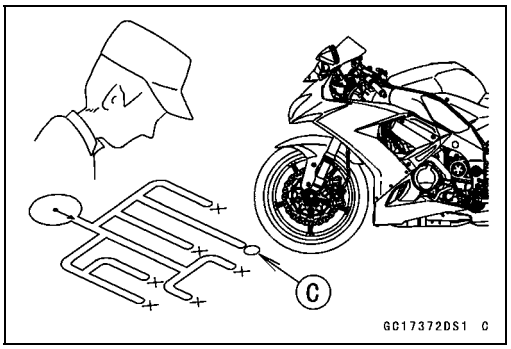
## Troubleshooting the DFI System

When the service code [A] is displayed, for first ask the rider about the conditions [B] of trouble, and then start to determine the cause [C] of problem.

As a pre-diagnosis inspection, check the ECU for ground and power supply, the fuel line for no fuel leaks, and for correct pressure. The pre-diagnosis items are not indicated by the warning indicator light (LED) and FI warning symbol.

Don't rely solely on the DFI self-diagnosis function, use common sense.




Even when the DFI system is operating normally, the warning indicator light (LED) and FI warning symbol may blink under strong electrical interference. Additional measures are not required. Turn the ignition switch OFF to stop the indicator light and symbol.

If the warning indicator light (LED) and FI warning symbol of the motorcycle brought in for repair still blinks, check the service code.

When the repair has been done, the FI warning symbol goes off. But the service codes stored in memory of the ECU are not erased to preserve the problem history. The problem history can be referred using the KDS (Kawasaki Diagnostic System) when solving unstable problems.

When the motorcycle is down, the vehicle-down sensor operates and the ECU shuts off the fuel pump relay, fuel injectors (primary and secondary) and ignition system. The ignition switch is left ON. If the starter button is pushed, the electric starter turns but the engine does not start. When the starter button is pushed, the warning indicator light (LED) and FI warning symbol blink but the service code is not displayed. To start the engine again, raise the motorcycle, turn the ignition switch OFF, and then ON.

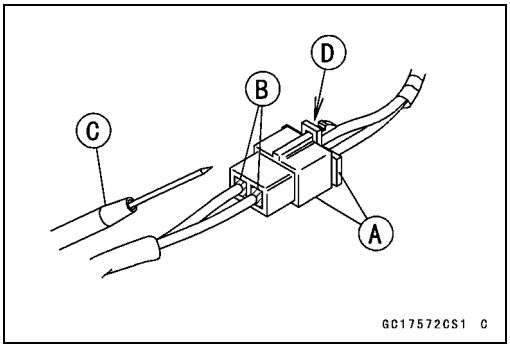
Much of the DFI system troubleshooting work consists of confirming continuity of the wiring. The DFI parts are assembled and adjusted with precision, and it is impossible to disassemble or repair them.

## Troubleshooting the DFI System

- When checking the DFI parts, use a digital meter which can be read two decimal place voltage or resistance.

○The DFI part connectors [A] have seals [B], including the ECU. When measuring the input or output voltage with the connector joined, use the needle adapter set [C]. Insert the needle adapter inside the seal until the needle adapter reaches the terminal.

**Special Tool - Needle Adapter Set: 57001-1457**




**CAUTION**

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

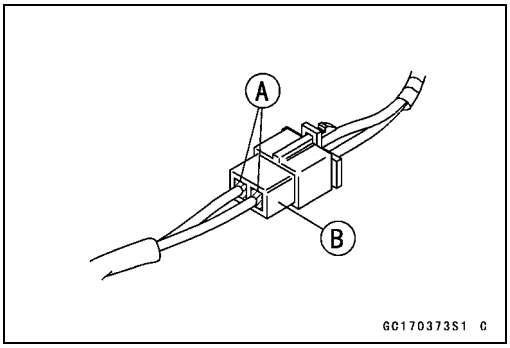
- Make sure that measuring points are correct in the connector, noting the position of the lock [D] and the lead color before measurement. Do not reverse connections of a digital meter.
- Be careful not to short-circuit the leads of the DFI or electrical system parts by contact between adapters.
- Turn 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.

**Sealant - Kawasaki Bond (Silicone Sealant): 56019-120**




- Always check battery condition before replacing the DFI 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.
- Measure coil winding resistance when the DFI part is cold (at room temperature).
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, short, etc. Deteriorated wires and bad connections can cause reappearance of problems and unstable operation of the DFI system.

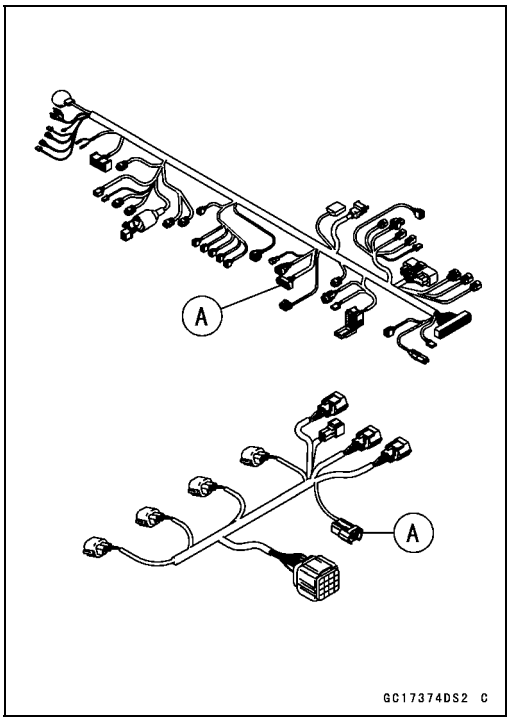
★If any wiring is deteriorated, replace the wiring.

## Troubleshooting the DFI System

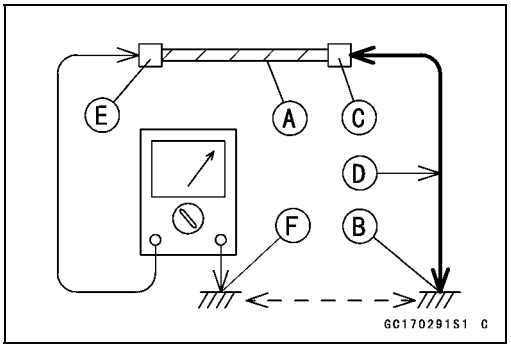
● Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.
★If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect the connectors securely.
● Check the wiring for continuity.
○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
○Connect the hand tester between the ends of the leads.

**Special Tool - Hand Tester: 57001-1394**

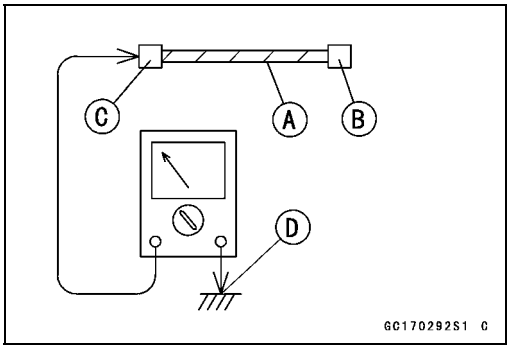
○Set the tester to the × 1 Ω range, and read the tester.
★If the tester does not read 0 Ω, the lead is defective. Replace the lead or the main harness or the subharness.




○If both ends of a harness [A] are far apart, ground [B] the one end [C], using a jumper lead [D] and check the continuity between the end [E] and the ground [F]. This enables to check a long harness for continuity. If the harness is open, repair or replace the harness.



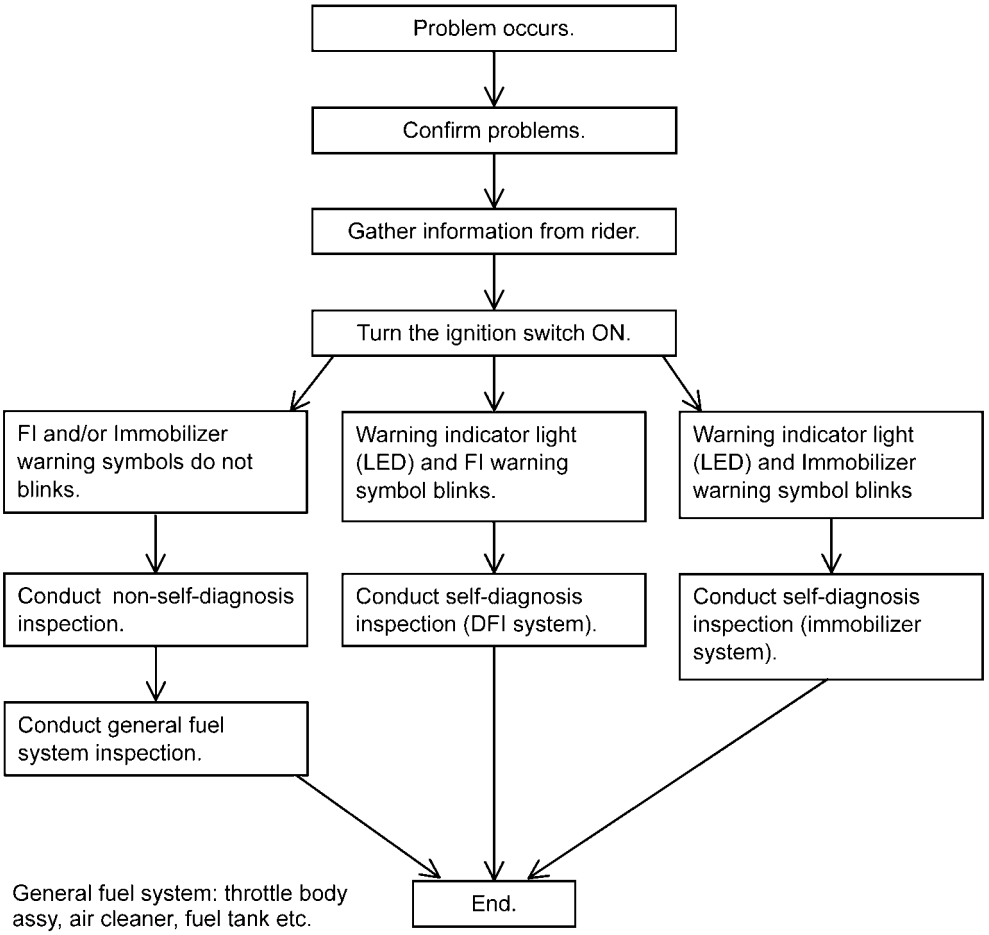

○When checking a harness [A] for short circuit, open one end [B] and check the continuity between the other end [C] and ground [D]. If there is continuity, the harness has a short circuit to ground, and it must be repaired or replaced.




● Narrow down suspicious locations by repeating the continuity tests from the ECU connectors.
★If no abnormality is found in the wiring or connectors, the DFI parts are the next likely suspects. Check the part, starting with input and output voltages. However, there is no way to check the ECU itself.
★If an abnormality is found, replace the affected DFI part.
★If no abnormality is found in the wiring, connectors, and DFI parts, replace the ECU.

## Troubleshooting the DFI System

### DFI 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 a DFI system problem, or a general engine problem.

## Troubleshooting the DFI System

### 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, ☐ other: | |
| 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.** | | |
| Warning indicator light (LED) | ☐ Start blinks about 3 seconds after ignition switch ON, and goes off after engine pressure becomes high enough (with engine running). | |
| | ☐ Start blinks immediately after ignition switch ON, and the FI warning symbol on the LCD starts blinking (DFI system problem). | |
| | ☐ Start blinks immediately after ignition switch ON, and the immobilizer warning symbol on the LCD starts blinking (immobilizer system problem). | |
| | ☐ Start blinks about 3 seconds after ignition switch ON, and about 10 seconds after, the FI warning symbol on the LCD starts blinking (ECU communication error). | |
| | ☐ Does not blink about 3 seconds after ignition switch ON. | |
| | ☐ light up (ECU or meter unit replace). | |
| Starting difficulty | ☐ starter motor not rotating. | |
| | ☐ starter motor rotating but engine do not turn over. | |
| | ☐ starter motor and engine do not turn over. | |
| | ☐ no fuel flow (☐ no fuel in tank, ☐ no fuel pump sound). | |
| | ☐ no spark. | |
| | ☐ other: | |
| Engine stalls | ☐ right after starting. | |
| | ☐ when opening throttle grip. | |
| | ☐ when closing throttle grip. | |
| | ☐ when moving off. | |
| | ☐ when stopping the motorcycle. | |
| | ☐ when cruising. | |
| | ☐ other: | |

## Troubleshooting the DFI System

| | |
|---|---|
| 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. |
| | ☐ 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: |

## DFI System Troubleshooting Guide

**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 in DFI system.*

○*The ECU may be involved in the DFI 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 Won't Turn Over

| Symptoms or possible Causes | Actions (chapter) |
|---|---|
| Neutral, starter lockout or sidestand switch trouble | Inspect each switch (see chapter 16). |
| Immobilizer system trouble | Inspect (see chapter 3). |
| Vehicle-down sensor operated | Turn ignition switch OFF (see chapter 3). |
| Vehicle-down sensor trouble | Inspect (see chapter 3). |
| Crankshaft sensor trouble | Inspect (see chapter 16). |
| Stick coil shorted or not in good contact | Inspect or Reinstall (see chapter 16). |
| Stick coil trouble | Inspect (see chapter 16). |
| Spark plug dirty, broken or gap maladjusted | Inspect and replace (see chapter 2). |
| Spark plug incorrect | Replace it with the correct plug (see chapter 2). |
| ECU ground and power supply trouble | Inspect (see chapter 3). |
| ECU trouble | Inspect (see chapter 3). |
| No or little fuel in tank | Supply fuel (see Owner's Manual). |
| Fuel injector trouble | Inspect and replace (see chapter 3). |
| Fuel pump not operating | Inspect (see chapter 3). |
| Fuel pump relay trouble | Inspect and replace (see chapter 3). |
| Fuel filter or pump screen clogged | Inspect and replace fuel pump (see chapter 3). |
| Fuel pressure regulator trouble | Inspect fuel pressure and replace fuel pump (see chapter 3). |
| Fuel line clogged | Inspect and repair (see chapter 3). |

### Poor Running at Low Speed

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| **Spark weak:** | |
| Stick coil shorted or not in good contact | Inspect or reinstall (see chapter 16). |
| Stick coil trouble | Inspect (see chapter 16). |
| Spark plug dirty, broken or gap maladjusted | Inspect and replace (see chapter 2). |
| Spark plug incorrect | Replace it with the correct plug (see chapter 2). |
| ECU trouble | Inspect (see chapter 3). |
| **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). |
| Air duct loose | Reinstall (see chapter 3). |
| Throttle body assy holder loose | Reinstall (see chapter 3). |
| Throttle body assy dust seal damage | Replace (see chapter 3). |
| Fuel injector O-ring damage | Replace (see chapter 3). |
| Fuel filter or pump screen clogged | Inspect and replace fuel pump (see chapter 3). |

## DFI System Troubleshooting Guide

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Fuel pressure regulator trouble | 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). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor 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). |
| **Unstable (rough) idling:** | |
| Fuel pressure too low or too high | Inspect (see chapter 3). |
| Fuel injector 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). |
| Engine vacuum not synchronizing | Inspect and adjust (see chapter 2). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| **Engine stalls easily:** | |
| Spark plug dirty, broken or gap maladjusted | Inspect and replace (see chapter 2). |
| Stick coil trouble | Inspect (see chapter 16). |
| Camshaft position sensor trouble | Inspect (see chapter 16). |
| Main throttle sensor trouble | Inspect (see chapter 3). |
| Subthrottle sensor trouble | Inspect (see chapter 3). |
| Subthrottle valve actuator trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Fuel pump trouble | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (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). |
| Fuel line clogged | Inspect and repair (see chapter 3). |
| **Poor acceleration:** | |
| Fuel pressure too low | Inspect (see chapter 3). |
| Water or foreign matter in fuel | Change fuel. Inspect and clean fuel system (see chapter 3). |
| Fuel filter or pump screen clogged | Inspect and replace fuel pump (see chapter 3). |
| Fuel pump trouble | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |

## DFI System Troubleshooting Guide

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Main throttle sensor trouble | Inspect (see chapter 3). |
| Subthrottle sensor trouble | Inspect (see chapter 3). |
| Subthrottle valve actuator trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Spark plug dirty, broken or gap maladjusted | Inspect and replace (see chapter 2). |
| Stick coil trouble | Inspect (see chapter 16). |
| **Stumble:** | |
| Fuel pressure too low | Inspect (see chapter 3). |
| Fuel injector 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). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature 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 replace fuel pump) (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 | Inspect and replace (see chapter 2). |
| Fuel pressure too low | Inspect (see chapter 3). |
| Fuel pump 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). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| Air switching valve trouble | Inspect and replace (see chapter 16). |
| Air suction valve trouble | Inspect and replace (see chapter 5). |
| **After fire:** | |
| Spark plug burned or gap maladjusted | Replace (see chapter 2). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |

## DFI System Troubleshooting Guide

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| **Other:** | |
| Intermittent any DFI fault and its recovery | Check that DFI connectors are clean and tight, and examine leads for signs of burning or fraying (see chapter 3). |

### Poor Running or No Power at High Speed:

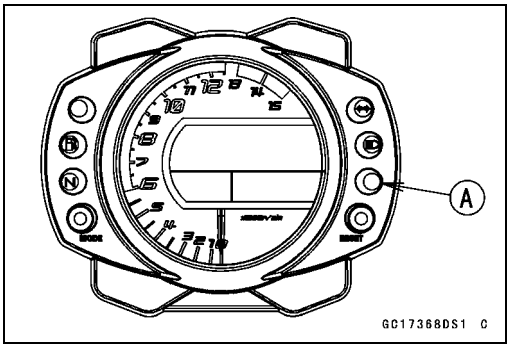
| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| **Firing incorrect:** | |
| Stick coil shorted or not in good contact | Inspect or Reinstall (see chapter 16). |
| Stick coil trouble | Inspect (see chapter 16). |
| Spark plug dirty, broken or gap maladjusted | Inspect and replace (see chapter 2). |
| Spark plug incorrect | Replace it with the correct plug (see chapter 2). |
| ECU trouble | Inspect (see chapter 3). |
| **Fuel/air mixture incorrect:** | |
| Air cleaner clogged, poorly sealed, or missing | Clean element or inspect sealing (see chapter 2). |
| Air duct loose | Reinstall (see chapter 3). |
| Throttle body assy holder loose | Reinstall (see chapter 3). |
| Throttle body assy dust seal damage | Replace (see chapter 3). |
| Water or foreign matter in fuel | Change fuel. Inspect and clean fuel system (see chapter 3). |
| Fuel injector O-ring damage | Replace (see chapter 3). |
| Fuel injector clogged | Inspect and repair (see chapter 3). |
| Fuel line clogged | Inspect and repair (see chapter 3). |
| Fuel pump operates intermittently and often DFI fuse blows. | Fuel pump bearings may wear. Replace the fuel pump (see chapter 3). |
| Fuel pump trouble | Inspect (see chapter 3). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Cracked or obstructed inlet air pressure sensor vacuum hose | Inspect and repair or replace (see chapter 3). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |
| Water temperature sensor 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). |
| **Knocking:** | |
| Fuel poor quality or incorrect | Fuel change (Use the gasoline recommended in the Owner's Manual). |
| Spark plug incorrect | Replace it with the correct plug (see chapter 2). |
| Stick coil trouble | Inspect (see chapter 16). |
| ECU trouble | Inspect (see chapter 3). |
| Engine vacuum not synchronizing | Inspect and adjust (see chapter 2). |
| Inlet air pressure sensor trouble | Inspect (see chapter 3). |
| Atmospheric pressure sensor trouble | Inspect (see chapter 3). |

## DFI System Troubleshooting Guide

| Symptoms or Possible Causes | Actions (chapter) |
|---|---|
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| **Miscellaneous:** | |
| Subthrottle sensor trouble | Inspect (see chapter 3). |
| Subthrottle valve actuator trouble | Inspect (see chapter 3). |
| Speed sensor trouble | Inspect (see chapter 3). |
| Throttle valves will not fully open | Inspect throttle cables and lever linkage (see chapter 3). |
| Engine overheating - Water temperature sensor, crankshaft sensor or speed sensor trouble | (see Overheating of Troubleshooting Guide in chapter 17) |
| Air switching valve trouble | Inspect and replace (see chapter 16). |
| Air suction valve trouble | Inspect and replace (see chapter 5). |
| **Exhaust Smokes Excessively:** | |
| **(Black smokes)** | |
| Air cleaner element clogged | Clean element (see chapter 2). |
| Fuel pressure too high | Inspect (see chapter 3). |
| Fuel injector trouble | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |
| **(Brown smoke)** | |
| Air duct loose | Reinstall (see chapter 3). |
| Fuel pressure too low | Inspect (see chapter 3). |
| Water temperature sensor trouble | Inspect (see chapter 3). |
| Inlet air temperature sensor trouble | Inspect (see chapter 3). |

## Self-Diagnosis

The warning indicator light (LED) [A] is used for the FI indicator, immobilizer indicator (equipped models) and oil pressure warning indicator.

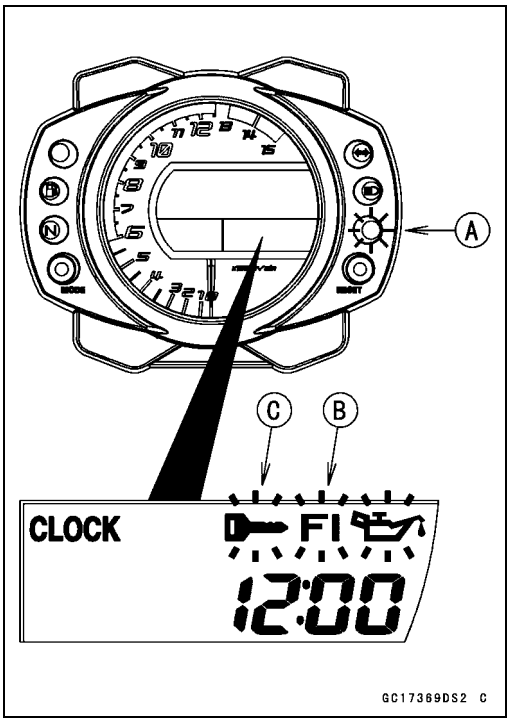



## Self-diagnosis Outline

The self-diagnosis system has two modes and can be switched to another mode by operating the meter unit.

**User Mode**

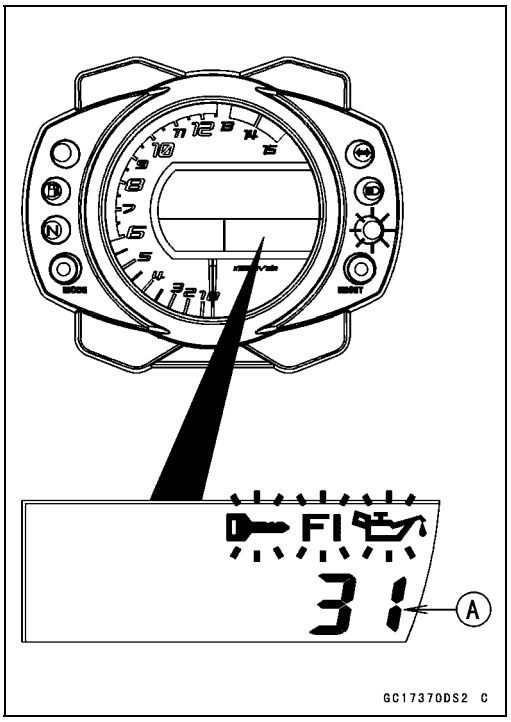
The ECU notifies the rider of troubles in DFI system, ignition system and immobilizer system by blinking the warning indicator light (LED) [A], FI warning symbol [B] and immobilizer warning symbol [C] when DFI, ignition and immobilizer system parts are faulty, and initiates fail-safe function. In case of serious troubles ECU stops the injection/ignition/starter motor operation.



## Self-Diagnosis

**Dealer Mode**

The LCD (Liquid Crystal Display) display the service code(s) [A] to show the problem(s) which the DFI system, ignition system and immobilizer system has at the moment of diagnosis.



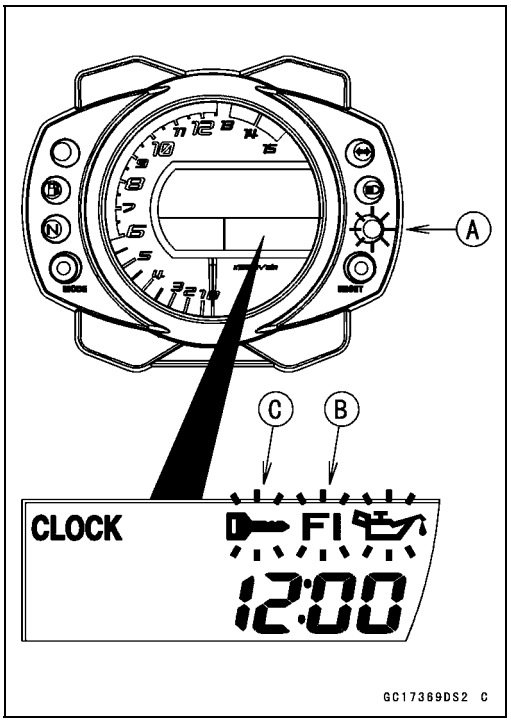

## Self-diagnosis Procedures

○When a problem occurs with the DFI system and ignition system, the warning indicator light (LED) [A] and FI warning symbol [B] blinks.

○For models equipped with an immobilizer system, when a problem occurs with the system, the warning indicator light (LED) and immobilizer warning symbol [C] blinks.

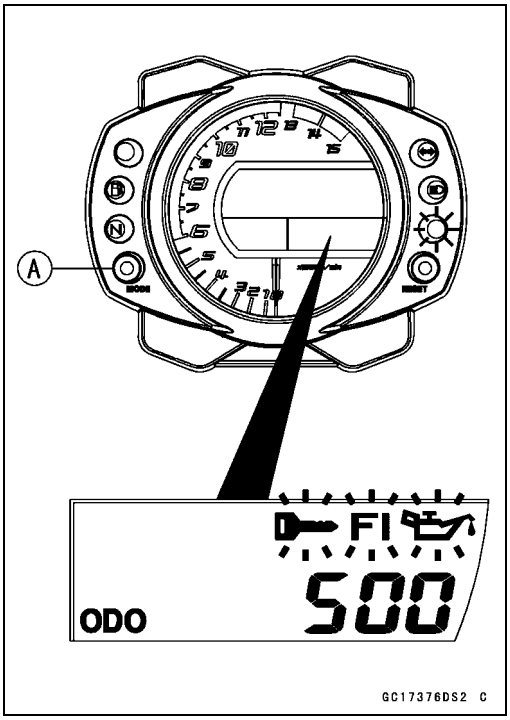
**NOTE**

○*Use a fully charged battery when conducting self-diagnosis. Otherwise, the light (LED) and symbol blinks very slowly or do not blink.*



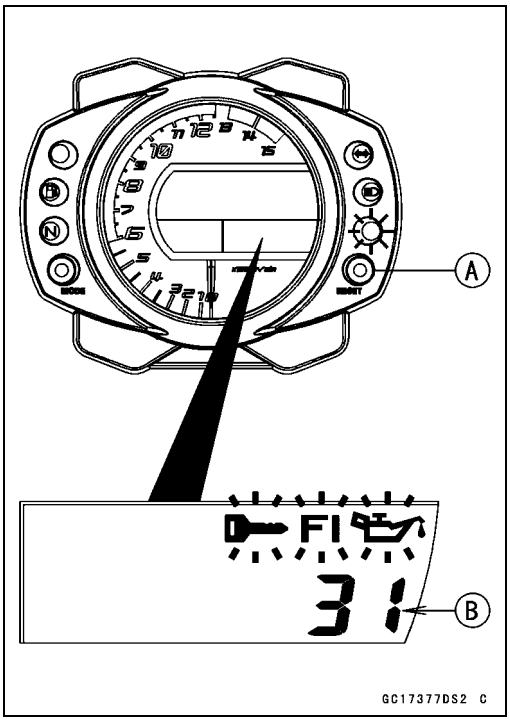
## Self-Diagnosis

- Turn the ignition switch ON.
- Push the MODE button [A] to display the odometer.




- Push the RESET button [A] for more than two seconds.
- The service code [B] is displayed on the LCD by the number of two digits.

○After switching to the engine speed setting mode of the shift up indicator light (LED) from odometer display, the service code can not be displayed even if pushing the RESET button for more than two seconds.



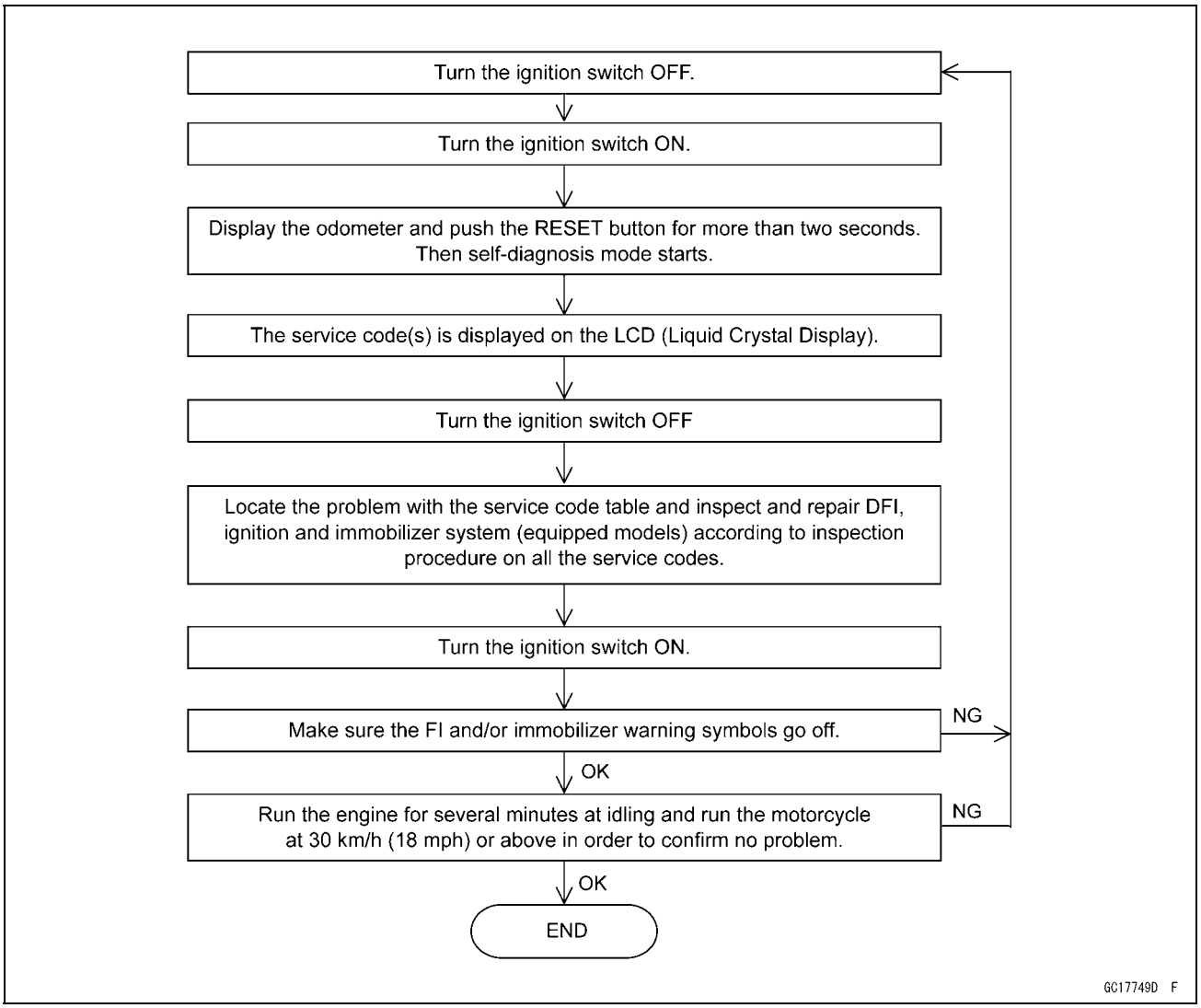

- Any of the following procedures ends self-diagnosis.

○When the service code is displayed on the LCD, push the RESET button for more than two seconds.

○When the ignition switch is turned OFF.

## Self-Diagnosis

### Self-Diagnosis Flow Chart



## Self-Diagnosis

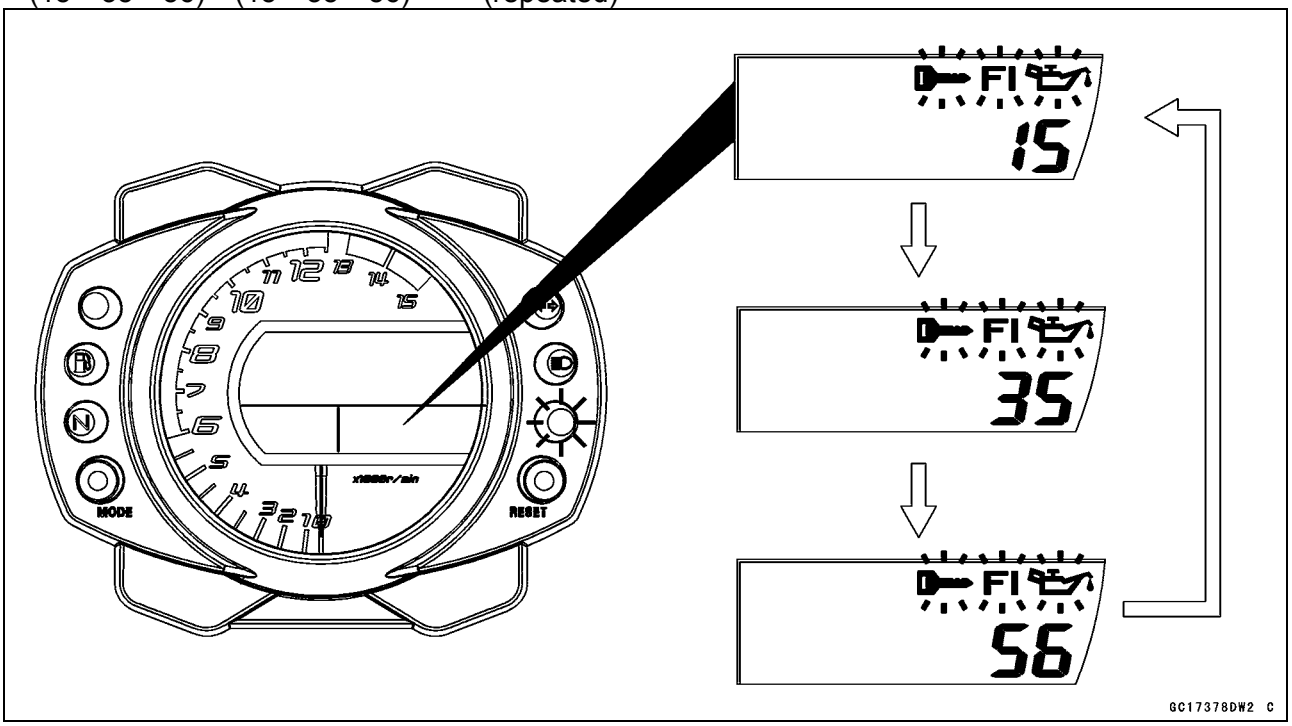
### *Service Code Reading*

○The service code(s) is displayed on the LCD by the number of two digits.

○When there are a number of problems, all the service codes can be stored and the display will begin starting from the lowest number service code in the numerical order.

○Then after completing all codes, the display is repeated until the ignition switch is turned OFF or RESET button is pushed for more than two seconds.

○For example, if three problems occurred in the order of 56, 15, 35, the service codes are displayed (each two seconds) from the lowest number in the order listed as shown below. (15→35→56)→(15→35→56)→· · ·(repeated)




○If there is no problem or when the repair has been done, FI and/or immobilizer symbols go off and service code is not displayed.

### *Service Code Erasing*

○When repair has been done, FI and/or immobilizer warning symbols go off and service code is not displayed.

★But the service codes stored in memory of the ECU are not erased to preserve the problem history. In this model, the problem history can not be erased.

## Self-Diagnosis

**Service Code Table**

| Service Code | Problems |
|---|---|
| **11** | Main throttle sensor malfunction, wiring open or short |
| **12** | Inlet air pressure sensor malfunction, wiring open or short |
| **13** | Inlet air temperature sensor malfunction, wiring open or short |
| **14** | Water temperature sensor malfunction, wiring open or short |
| **15** | Atmospheric pressure sensor malfunction, wiring open or short |
| **21** | Crankshaft sensor malfunction, wiring open or short |
| **23** | Camshaft position sensor malfunction, wiring open or short |
| **24** | Speed sensor malfunction, wiring open or short |
| **25** | Gear position switch malfunction, wiring open or short |
| **31** | Vehicle-down sensor malfunction, wiring open or short |
| **32** | Subthrottle sensor malfunction, wiring open or short |
| **33** | Oxygen sensor #1 inactivation, wiring open or short (Equipped Models) |
| **34** | Exhaust butterfly valve actuator sensor malfunction, wiring open or short |
| **35** | Immobilizer amplifier malfunction (Equipped Models) |
| **36** | Blank Key detection (Equipped Models) |
| **39** | ECU communication error |
| **46** | Fuel pump relay malfunction, relay is stuck |
| **51** | Stick coil #1 malfunction, wiring open or short |
| **52** | Stick coil #2 malfunction, wiring open or short |
| **53** | Stick coil #3 malfunction, wiring open or short |
| **54** | Stick coil #4 malfunction, wiring open or short |
| **56** | Radiator fan relay malfunction, wiring open or short |
| **62** | Subthrottle valve actuator malfunction, wiring open or short |
| **63** | Exhaust butterfly valve actuator malfunction, wiring open or short |
| **64** | Air switching valve malfunction, wiring open or short |
| **67** | Oxygen sensor heater #1 and/or #2 malfunction, wiring open or short (Equipped Models) |
| **83** | Oxygen sensor #2 inactivation, wiring open or short (Equipped Models) |

**Notes:**

○The ECU may be involved in these problems. 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 service code is displayed, the electrical parts of the DFI system has no fault, and the mechanical parts of the DFI system and the engine are suspect.

## Self-Diagnosis

### Backups

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

| Service Codes | Parts | Output Signal Usable Range or Criteria | Backups by ECU |
|---|---|---|---|
| **11** | Main Throttle Sensor | Output Voltage<br>0.2 ~ 4.8 V | If the main throttle sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method. |
| **12** | Inlet Air Pressure Sensor | Inlet Air Pressure (Absolute)<br>Pv = 50 ~ 910 mmHg | If the inlet air pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets the DFI in the α-N method (1). |
| **13** | Inlet Air Temperature Sensor | Inlet Air Temperature<br>Ta = – 30 ~ + 100°C | If the inlet air temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Ta at 30°C. |
| **14** | Water Temperature Sensor | Water Temperature<br>Tw = – 30 ~ + 120°C | If the water temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Tw at 80°C and the radiator fan operates. |
| **15** | Atmospheric Pressure Sensor | Atmospheric Pressure (Absolute)<br>Pa = 50 ~ 910 mmHg | If the atmospheric pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Pa at 760 mmHg (the standard atmospheric pressure). |
| **21** | Crankshaft Sensor | Crankshaft sensor must send 22 signals to the ECU at the 1 cranking. | If the crankshaft sensor fails, the engine stops by itself. |
| **23** | Camshaft Position Sensor | Camshaft position sensor must send 1 signal to the ECU at the 2 crankings. | If the camshaft position sensor system fails (the signal is missing, wiring short or open), the ECU continues to ignite cylinders in the same sequence following the last good signal. However, it can not be restarted after the engine was stopped once. |
| **24** | Speed Sensor | Speed sensor must send 30 signals to the ECU at the 1 rotation of the output shaft. | If the speed sensor system fails (no signal, wiring short or open), the speedometer shows 0. |
| **25** | Gear Position Switch | Output Voltage<br>0.2 ~ 4.8 V | If the gear position switch system fails (no signal, wiring short or open), the ECU set the top (6th) gear position. |
| **31** | Vehicle -down Sensor | Output Voltage<br>0.2 ~ 4.8 V | If the vehicle-down sensor system has failures (the output voltage is out of the usable range, wiring short or open), the ECU shuts off the fuel pump relay, the fuel injectors (primary and secondary) and the ignition system. |
| **32** | Subthrottle Sensor | Output Voltage<br>0.2 ~ 4.8 V | If the subthrottle sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU drive the subthrottle valve to the full closed position, and it stops the current to the subthrottle valve actuator. |

## Self-Diagnosis

| Service Codes | Parts | Output Signal Usable Range or Criteria | Backups by ECU |
|---|---|---|---|
| **33** | Oxygen Sensor #1 (Equipped Models) | The oxygen sensor #1 is active and sensor must send signals (output voltage) continuously to the ECU. | If the oxygen sensor #1 is not activated, the ECU stops the feedback mode of the oxygen sensor #1 and #2. |
| **34** | Exhaust Butterfly Valve Actuator Sensor | Output Voltage<br>0.2 ~ 4.8 V | If the exhaust butterfly valve actuator sensor system fails (the output voltage is out of the usable range, wiring short or open), the ECU drive the exhaust butterfly valve at full open position near, and it stops the current to the exhaust butterfly valve actuator. |
| **35** | Immobilizer Amplifier (Equipped Models) | – | If the immobilizer system fails (no signal, wiring short or open), the vehicle is no start and run. |
| **36** | Master or User Key (Equipped Models) | The user or master key must use register key. | If the blank key or broken key is used, the vehicle is no start and run. |
| **39** | ECU | The ECU send the data (for gear position, service code and key registration) to the meter unit. | – |
| **46** | Fuel Pump Relay | When the relay ON condition, battery monitor voltage 5 V or more | – |
| **51** | Stick Coil #1* | The stick coil primary winding must send signals 32 or more times continuously to the ECU. | If the stick coil #1 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #1 to stop fuel to the cylinder #1, though the engine keeps running. |
| **52** | Stick Coil #2* | The stick coil primary winding must send signals 32 or more times continuously to the ECU. | If the stick coil #2 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #2 to stop fuel to the cylinder #2, though the engine keeps running. |
| **53** | Stick Coil #3* | The stick coil primary winding must send signals 32 or more times continuously to the ECU. | If the stick coil #3 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #3 to stop fuel to the cylinder #3, though the engine keeps running. |
| **54** | Stick Coil #4* | The stick coil primary winding must send signals 32 or more times continuously to the ECU. | If the stick coil #4 primary winding has failures (no signal, wiring short or open), the ECU shuts off the injector #4 to stop fuel to the cylinder #4, though the engine keeps running. |
| **56** | Radiator Fan Relay | When the relay OFF condition, the fan relay is open. | – |
| **62** | Subthrottle Valve Actuator | The actuator operates open and close of the subthrottle valve by the pulse signal from the ECU. | If the subthrottle valve actuator fails (the signal is out to the usable range, wiring short or open), the ECU stops the current to the actuator. |

## Self-Diagnosis

| Service Codes | Parts | Output Signal Usable Range or Criteria | Backups by ECU |
|---|---|---|---|
| **63** | Exhaust Butterfly Valve Actuator | The actuator operates open and close of the exhaust butterfly valve by the pulse signal from the ECU. | If the exhaust butterfly valve actuator fails (the signal is out to the usable range, wiring short or open), the ECU stops the current to the actuator. |
| **64** | Air Switching Valve | The air switching valve controls the flow of the secondary air by opening and shutting the solenoid valve. | – |
| **67** | Oxygen Sensor Heater #1 and/or #2 (Equipped Models) | The oxygen sensor heater #1 and/or #2 raise temperature of the sensor for its earlier activation. | If the oxygen sensor heater #1 and/or #2 fails (wiring short or open), the ECU stops the current to the heater, and it stops the feedback mode of the oxygen sensor #1 and #2 . |
| **83** | Oxygen Sensor #2 (Equipped Models) | The oxygen sensor #2 is active and sensor must send signals (output voltage) continuously to the ECU. | If the oxygen sensor #2 is not activated, the ECU stops feedback mode of the oxygen sensor #1 and #2. |

**Note:**

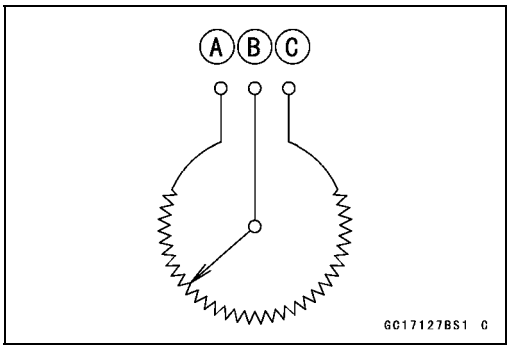
(1) α-N Method: the DFI control method from medium to heavy engine load. When the engine load is light like at idling or low speed, the ECU determines the injection quantity by calculating from the throttle vacuum (inlet air pressure sensor output voltage) and engine speed (crankshaft sensor output voltage). This method is called D-J method. As the engine speed increases, and the engine load turns middle to heavy, the ECU determines the injection quantity by calculating from the throttle opening (main throttle sensor output voltage) and the engine speed. This method is called α-N method.

*: This depends on the number of stopped cylinders.

## Main Throttle Sensor (Service Code 11)

The main throttle sensor is a rotating variable resistor that change output voltage according to throttle operating. The ECU senses this voltage change and determines fuel injection quantity, and ignition timing according to engine rpm, and throttle opening.

Input Terminal [A]: BL
Output Terminal [B]: Y/W
Ground Terminal [C]: BR/BK




### *Main Throttle Sensor Removal/Adjustment*

**CAUTION**

**Do not remove or adjust the main throttle sensor since it has been adjusted and set with precision at the factory.**
**Never drop the throttle body assy, especially on a hard surface. Such a shock to the main throttle sensor can damage it.**


Main Throttle Sensor Connector [A]

### *Main Throttle Sensor Input Voltage Inspection*

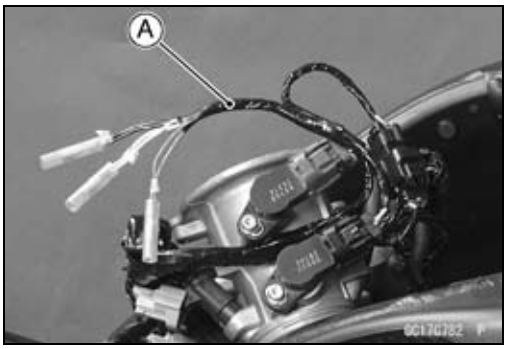
**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the throttle body assy temporarily (see Throttle Body Assy Removal).
- Disconnect the main throttle sensor connector [A].


- Connect the harness adapter [A] between the main harness connector and main throttle sensor connector.

**Special Tool - Throttle Sensor Setting Adapter: 57001 -1538**




- Reinstall the throttle body assy (See Throttle Body Assy Installation).
- Connect a digital meter to the harness adapter leads.

**Main Throttle Sensor Input Voltage**
**Connections to Adapter:**
**Digital Meter (+) → W (sensor BL) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.

**Input Voltage**
**Standard: DC 4.75 ~ 5.25 V**

- Turn the ignition switch OFF.

★If the reading is within the standard, check the output voltage (see Main Throttle Sensor Output Voltage Inspection).

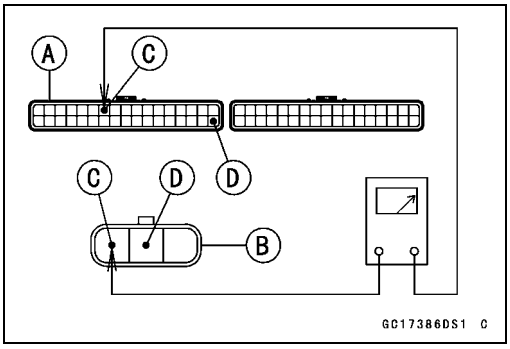
## Main Throttle Sensor (Service Code 11)

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Main Throttle Sensor Connector [B]**
**BL lead (ECU terminal 7) [C]**
**BR/BK lead (ECU terminal 34) [D]**



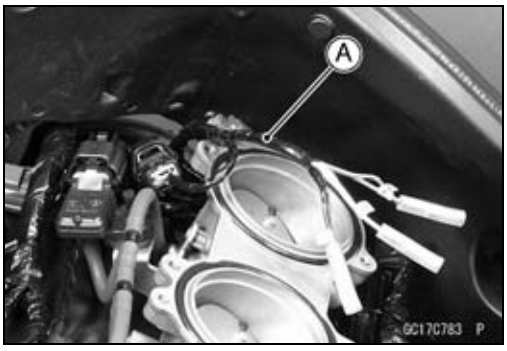

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

### *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.

**Special Tool - Throttle Sensor Setting Adapter: 57001 -1538**




**Main Throttle Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (sensor Y/W) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

● Start the engine and warm it up thoroughly.
● Check idle speed to ensure the throttle opening is correct.

**Idle Speed**
**Standard: 1 100 ±50 r/min (rpm)**

★If the idle speed is out of the specified range, adjust it (see Idle Speed Inspection in the Periodic Maintenance chapter).

## Main Throttle Sensor (Service Code 11)

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

**Output Voltage**
**Standard: DC 0.645 ~ 0.675 V at idle throttle opening**
**DC 3.84 ~ 4.04 V at full throttle opening (for reference)**

**NOTE**

○*Open the throttle, confirm the output voltage will be raise.*
○*The standard voltage refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.*
○*When the input voltage reading shows other than 5 V, derive a voltage range as follows.*
*Example:*
*In the case of a input voltage of 4.75 V.*
*0.645 × 4.75 ÷ 5.00 = 0.613 V*
*0.675 × 4.75 ÷ 5.00 = 0.641 V*
*Thus, the valid range is 0.613 ~ 0.641 V*

- Turn the ignition switch OFF.

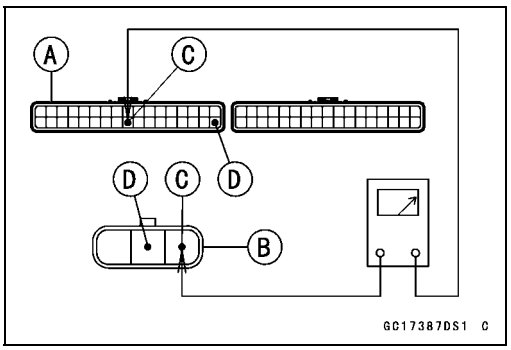
★If the reading is out of the standard, check the main throttle sensor resistance (see Main Throttle Sensor Resistance Inspection).

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Main Throttle Sensor Connector [B]**
**Y/W lead (ECU terminal 26) [C]**
**BR/BK lead (ECU terminal 34) [D]**

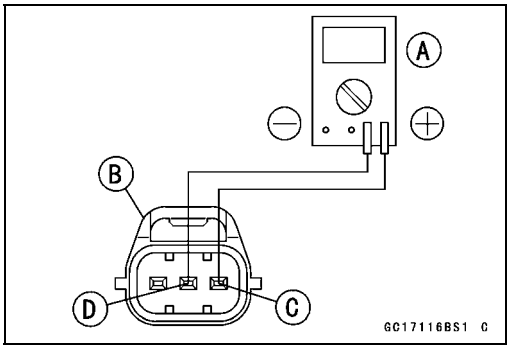



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

### *Main Throttle Sensor Resistance Inspection*

- Turn the ignition switch OFF.
- Disconnect the main throttle sensor connector.
- Connect a digital meter [A] to the main throttle sensor connector [B].
- Measure the main throttle sensor resistance.

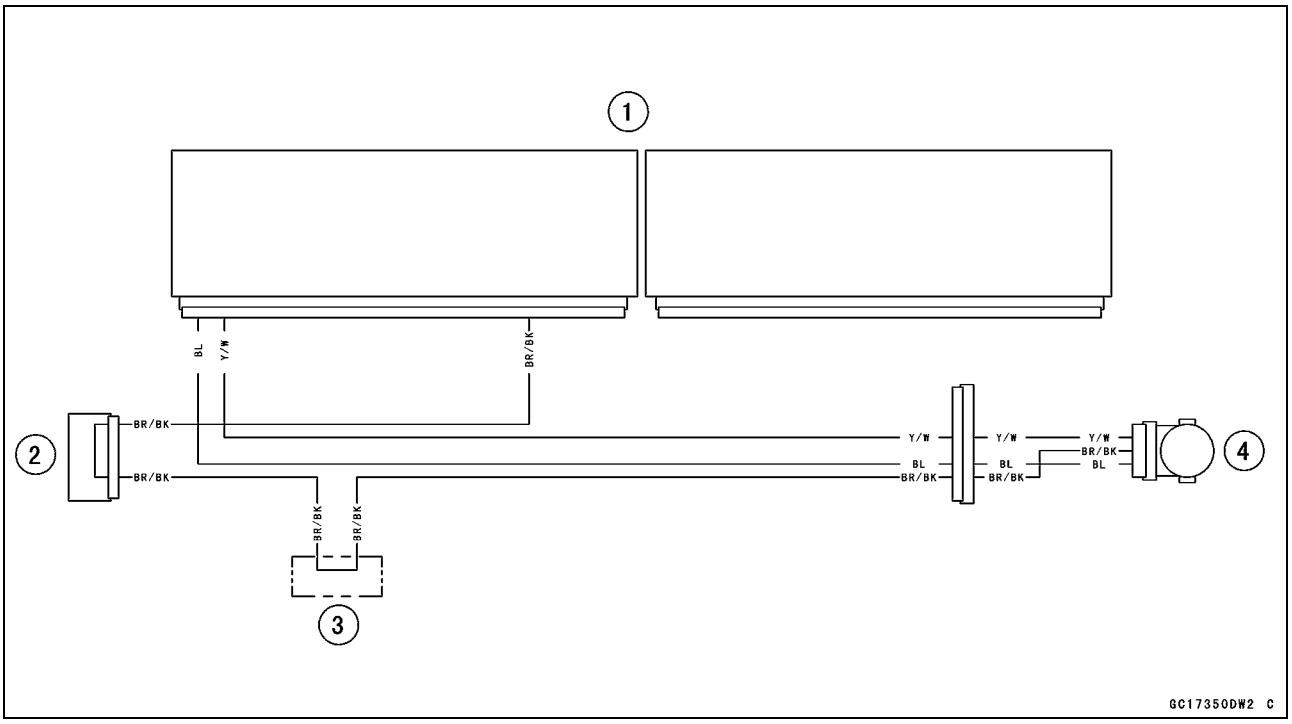
**Main Throttle Sensor Resistance**
**Connections: BL lead [C] ←→ BR/BK lead [D]**
**Standard: 4 ~ 6 kΩ**




★If the reading is out of the standard, replace the throttle body assy.
★If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

## Main Throttle Sensor (Service Code 11)

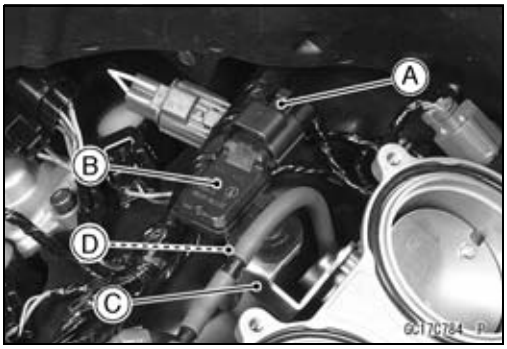
### Main Throttle Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Main Throttle Sensor

## Inlet Air Pressure Sensor (Service Code 12)

### *Inlet Air Pressure Sensor Removal*




**CAUTION**

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

- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal)
  Inlet Air Pressure Sensor Connector [A]
- Remove the inlet air pressure sensor [B] from the rubber damper in the bracket [C] and separate the vacuum hose [D].

### *Inlet Air Pressure Sensor Installation*

**NOTE**

○*The inlet air pressure sensor is the same part as the atmospheric pressure sensor except that the sensor has a vacuum hose and different wiring.*

- Installation is the reverse of removal.

### *Inlet Air Pressure Sensor Input Voltage Inspection*


**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the inlet air pressure sensor connector and connect the harness adapter [A] between these connectors.

**Special Tool - Sensor Harness Adapter: 57001-1561**

- Connect a digital meter to the harness adapter leads.

**Inlet Air Pressure Sensor Input Voltage**
**Connections to Adapter:**
**Digital Meter (+) → G (sensor BL) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.

**Input Voltage**
**Standard: DC 4.75 ~ 5.25 V**

- Turn the ignition switch OFF.

★If the reading is within the standard, check the output voltage (see Inlet Air Pressure Sensor Output Voltage Inspection).

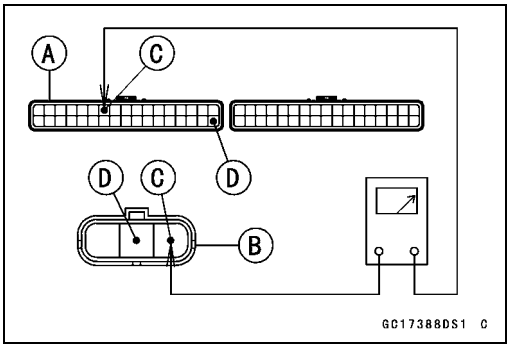
## Inlet Air Pressure Sensor (Service Code 12)

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) A] ←→**
**Inlet Air Pressure Sensor Connector [B]**
**BL lead (ECU terminal 7) [C]**
**BR/BK lead (ECU terminal 34) [D]**




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

### *Inlet Air Pressure Sensor Output Voltage Inspection*

● Measure the output voltage at the inlet air pressure sensor in the same way as input voltage inspection, note the following.
○Disconnect the inlet air pressure sensor connector and connect the harness adapter [A] between these connectors.

**Special Tool - Sensor Harness Adapter: 57001-1561**


**Inlet Air Pressure Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → G/W (sensor Y/BL) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

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

**Output Voltage**
**Usable Range: DC 3.80 ~ 4.20 V at standard atmospheric pressure (101.32 kPa, 76 cmHg)**

**NOTE**

○*The output voltage changes according to local atmospheric pressure.*

● Turn the ignition switch OFF.
★If the reading is out of the usable range, replace the sensor.

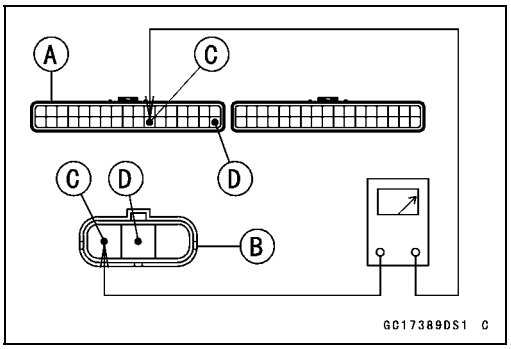
## Inlet Air Pressure Sensor (Service Code 12)

★If the reading is within the usable range, remove the ECU and check the wiring for continuity between main harness connector.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Inlet Air Pressure Sensor Connector [B]**
**Y/BL lead (ECU terminal 28) [C]**
**BR/BK lead (ECU terminal 34) [D]**

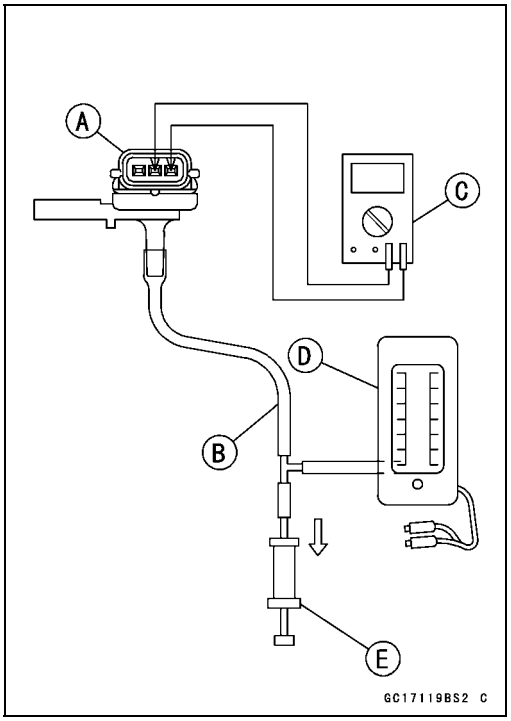



★If the wiring is good, check the sensor for various vacuum.
- Remove the inlet air pressure sensor [A] and disconnect the vacuum hose from the sensor.
- Connect an auxiliary hose [B] to the inlet air pressure sensor.
- Temporarily install the inlet air pressure sensor.

○Connect a digital meter [C], vacuum gauge [D], the fork oil level gauge [E] and the harness adapter to the inlet air pressure sensor.

**Special Tools - Fork Oil Level Gauge: 57001-1290**
**Vacuum Gauge: 57001-1369**
**Sensor Harness Adapter: 57001-1561**

**Inlet Air Pressure Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → G/W (sensor Y/BL) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**




○Turn the ignition switch ON.
○Measure the inlet air pressure sensor output voltage from various vacuum readings, while pulling the handle of the fork oil level gauge.
○Check the inlet air pressure sensor output voltage, using the following formula and chart.

Suppose:
Pg: Vacuum Pressure (Gauge) of Throttle Body
Pl: Local Atmospheric Pressure (Absolute) measured by a barometer
Pv: Vacuum Pressure (Absolute) of Throttle Body
Vv: Sensor Output Voltage (V)

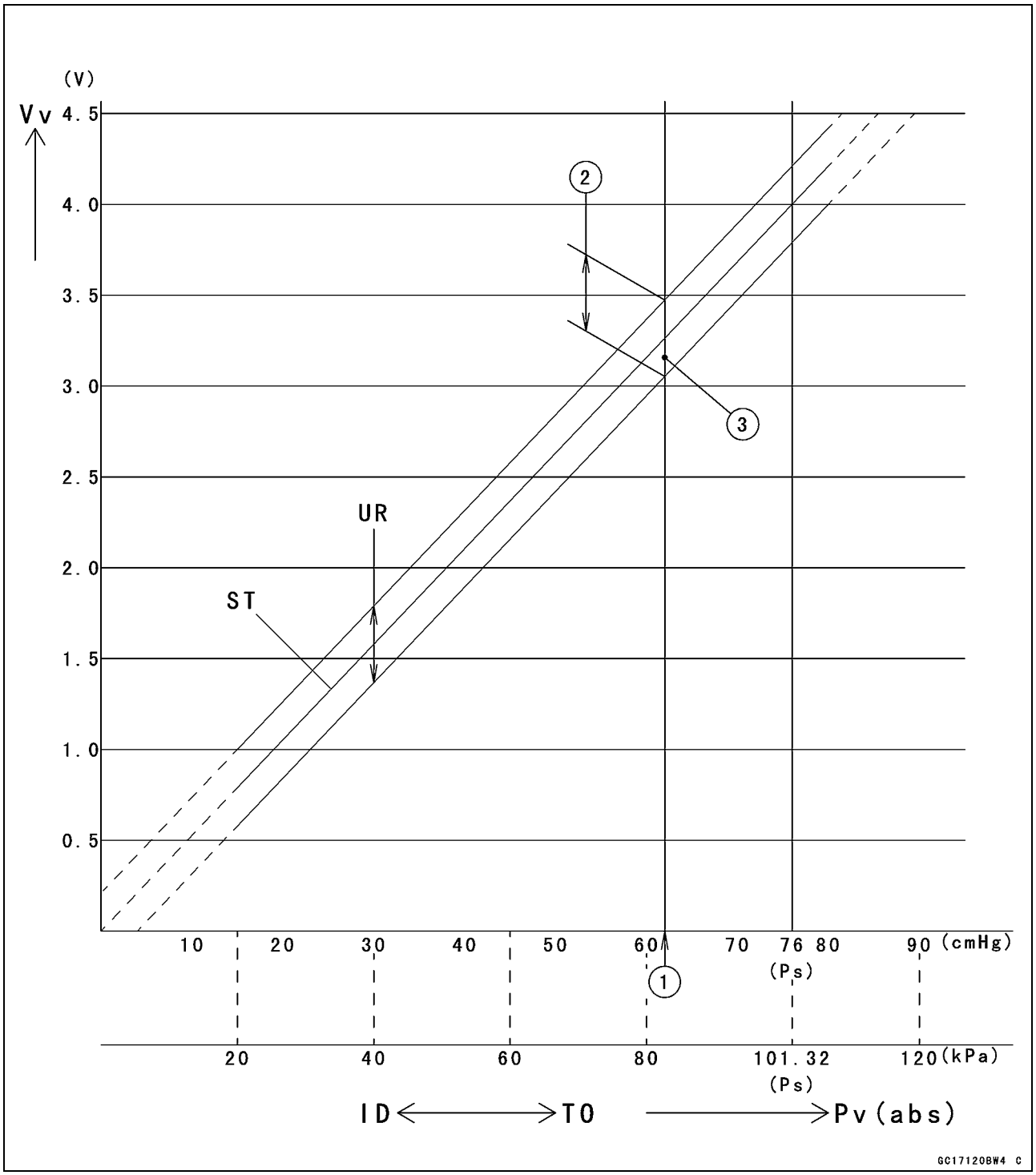
then
Pv = Pl – Pg

For example, suppose the following data is obtained:
Pg = 8 cmHg (Vacuum Gauge Reading)
Pl = 70 cmHg (Barometer Reading)
Vv = 3.2 V (Digital Meter Reading)

then
Pv = 70 – 8 = 62 cmHg (Absolute)

Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.
Usable range = 3.08 ~ 3.48 V
Plot Vv (3.2 V) on the vertical line. → Point [3].
**Results: In the chart, Vv is within the usable range and the sensor is normal.**
★If the reading is out of the usable range, replace the sensor.
★If the reading is within the usable range, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

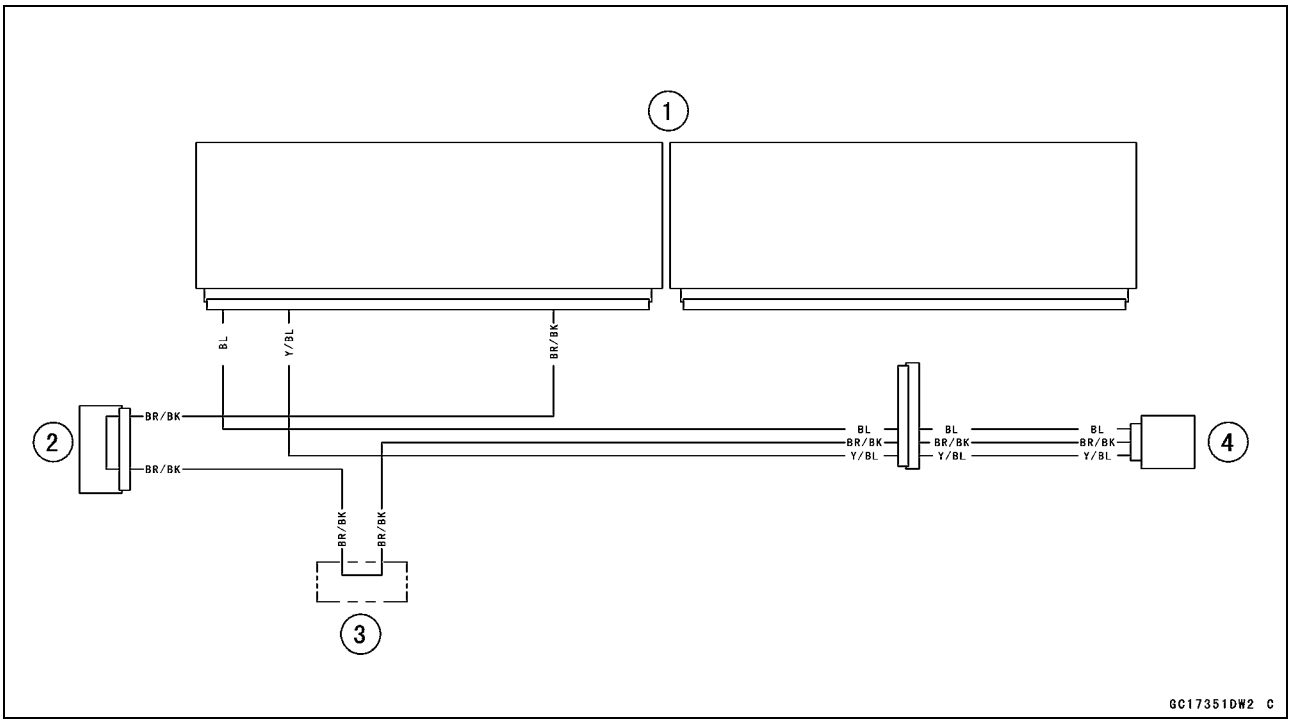
## Inlet Air Pressure Sensor (Service Code 12)




ID: Idling
Ps: Standard Atmospheric Pressure (Absolute)
Pv: Throttle Vacuum Pressure (Absolute)
ST: Standard of Sensor Output Voltage (V)
TO: Throttle Full Open
UR: Usable Range of Sensor Output Voltage (V)
Vv: Inlet Air Pressure Sensor Output Voltage (V) (Digital Meter Reading)

## Inlet Air Pressure Sensor (Service Code 12)

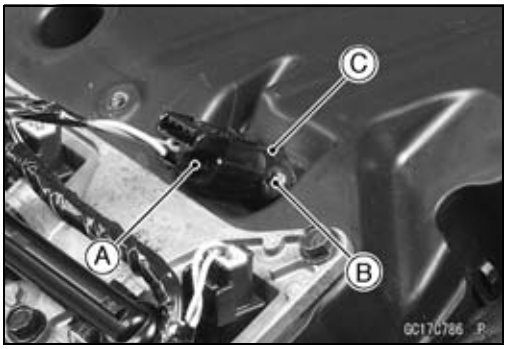
### Inlet Air Pressure Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Inlet Air Pressure Sensor

## Inlet Air Temperature Sensor (Service Code 13)

### *Inlet Air Temperature Sensor Removal/Installation*



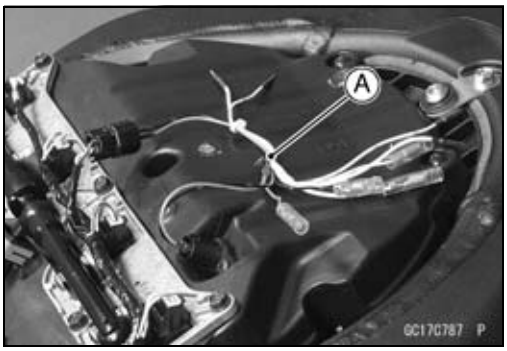

**CAUTION**

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

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the connector [A].
- Remove the screw [B].
- Pull out the inlet air temperature sensor [C].
- Put the inlet air temperature sensor into the air cleaner housing.
- Tighten:

**Torque - Inlet Air Temperature Sensor Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

### *Inlet Air Temperature Sensor Output Voltage Inspection*

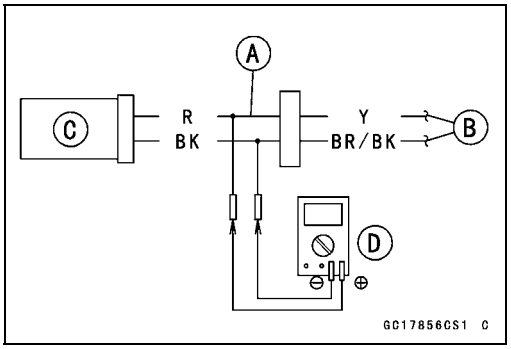



**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the inlet air temperature sensor connector and connect the harness adapter [A] between these connectors as shown in the figure.
  Main Harness [B]
  Inlet Air Temperature Sensor [C]

**Special Tool - Measuring Adapter: 57001-1700**




- Connect a digital meter [D] to the harness adapter leads.

**Inlet Air Temperature Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (sensor Y) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

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

**Output Voltage**
**Standard: About DC 2.25 ~ 2.50 V at inlet air temperature 20°C (68°F)**

**NOTE**

○*The output voltage changes according to the inlet air temperature.*

- Turn the ignition switch OFF.

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

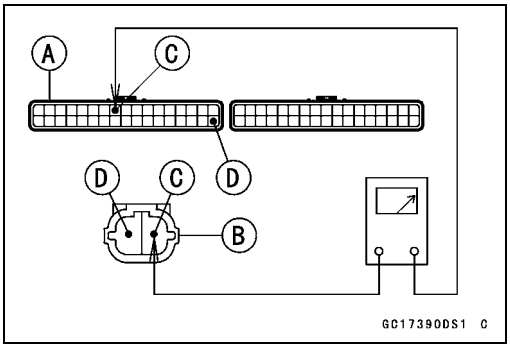
## Inlet Air Temperature Sensor (Service Code 13)

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Inlet Air Temperature Sensor Connector [B]**
**Y lead (ECU terminal 8) [C]**
**BR/BK lead (ECU terminal 34) [D]**




★If the wiring is good, check the inlet air temperature sensor resistance (see Inlet Air Temperature Sensor Resistance Inspection).

### *Inlet Air Temperature Sensor Resistance Inspection*

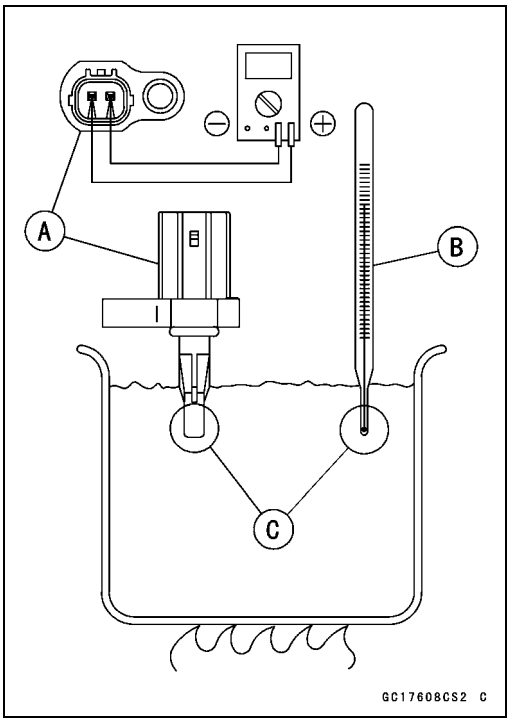
- Remove the inlet air temperature sensor (see Inlet Air Temperature Sensor Removal/Installation).
- Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion is submerged.
- Suspend a thermometer [B] with the heat-sensitive portion [C] located in almost the same depth with 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 digital meter, measure the internal resistance of the sensor across the terminals at the temperatures shown in the following.

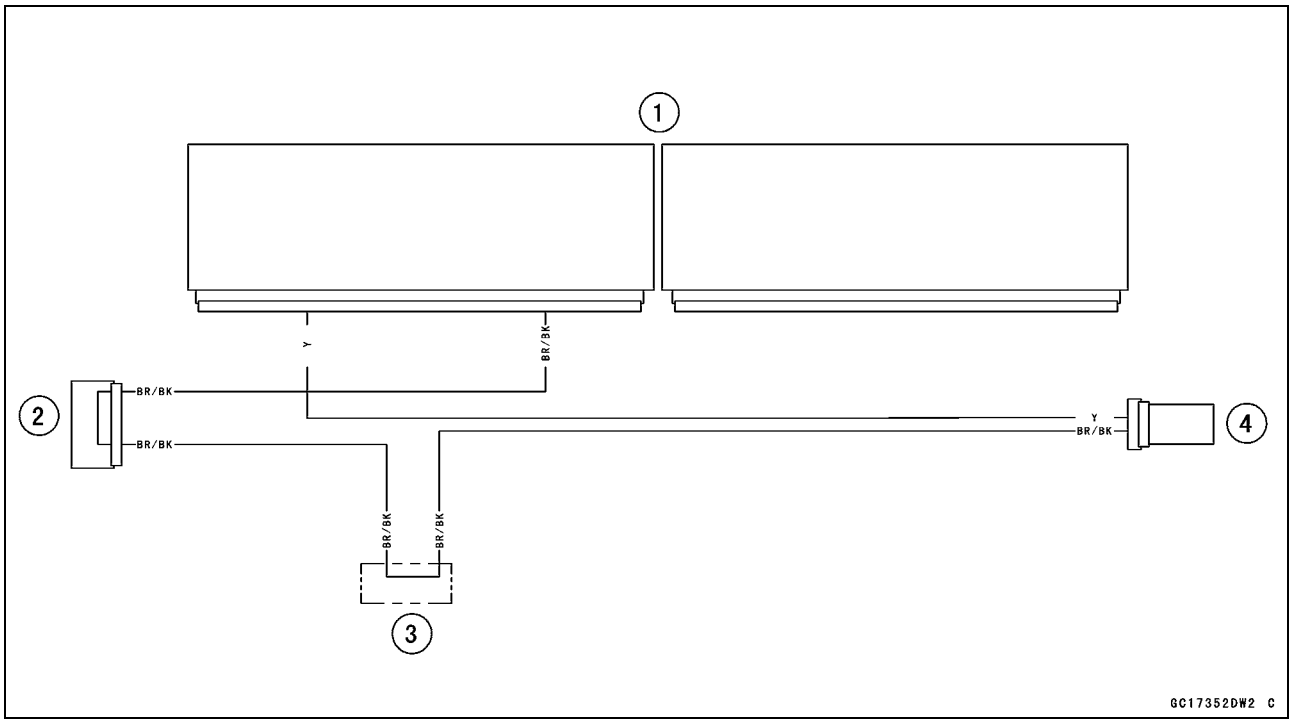
**Inlet Air Temperature Sensor Resistance**
**Standard: 5.4 ~ 6.6 kΩ at 0°C (32°F)**
**0.29 ~ 0.39 kΩ at 80°C (176°F)**




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

## Inlet Air Temperature Sensor (Service Code 13)

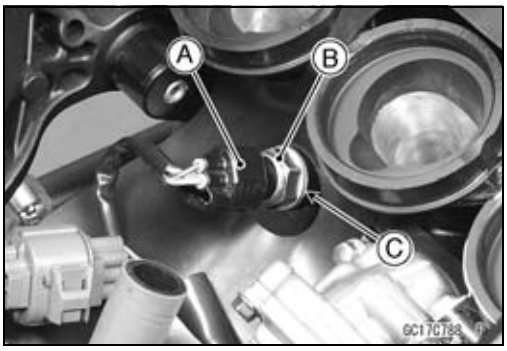
### Inlet Air Temperature Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Inlet Air Temperature Sensor

## Water Temperature Sensor (Service Code 14)

### *Water Temperature Sensor Removal/Installation*




**CAUTION**

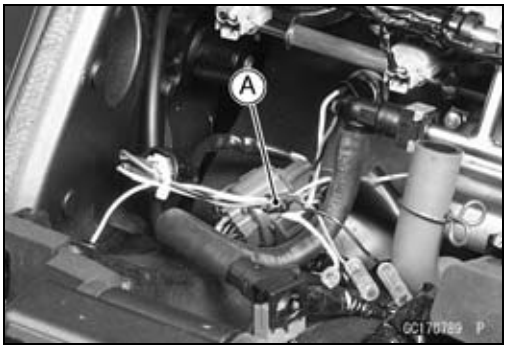
**Never drop the water temperature sensor, especially on a hard surface. Such a shock to the sensor can damage it.**

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Connector [A]
  Water Temperature Sensor [B] with Gasket [C]
- Replace the gasket with a new one.
- Tighten:

**Torque - Water Temperature Sensor: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- 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*

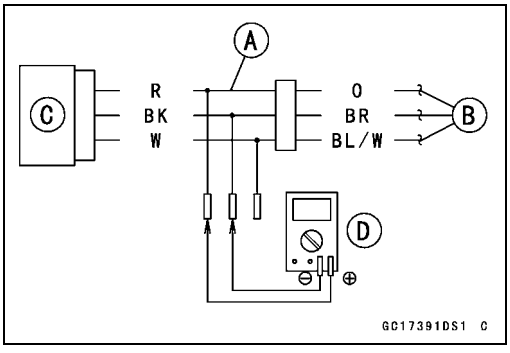



**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the water temperature sensor connector and connect the harness adapter [A] between these connectors as shown in the figure.
  Main Harness [B]
  Water Temperature Sensor [C]

**Special Tool - Measuring Adapter: 57001-1700**




- Connect a digital meter [D] to the harness adapter leads.

**Water Temperature Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (sensor O) lead**
**Digital Meter (–) → BK (sensor BR) lead**

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

**Output Voltage**
**Standard: About DC 2.80 ~ 2.97 V at 20°C (68°F)**

**NOTE**

○*The output voltage changes according to the coolant temperature in the engine.*

- Turn the ignition switch OFF.

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

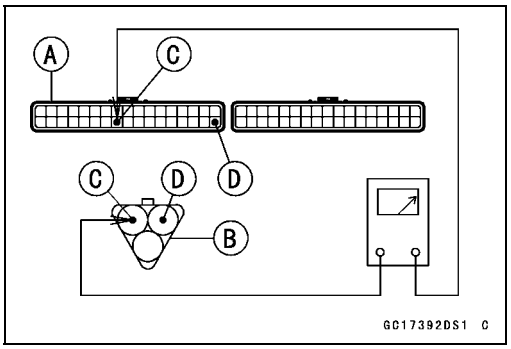
## Water Temperature Sensor (Service Code 14)

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Water Temperature Sensor Connector [B]**
**O lead (ECU terminal 25) [C]**
**BR/BK lead (ECU terminal 34) [D]**



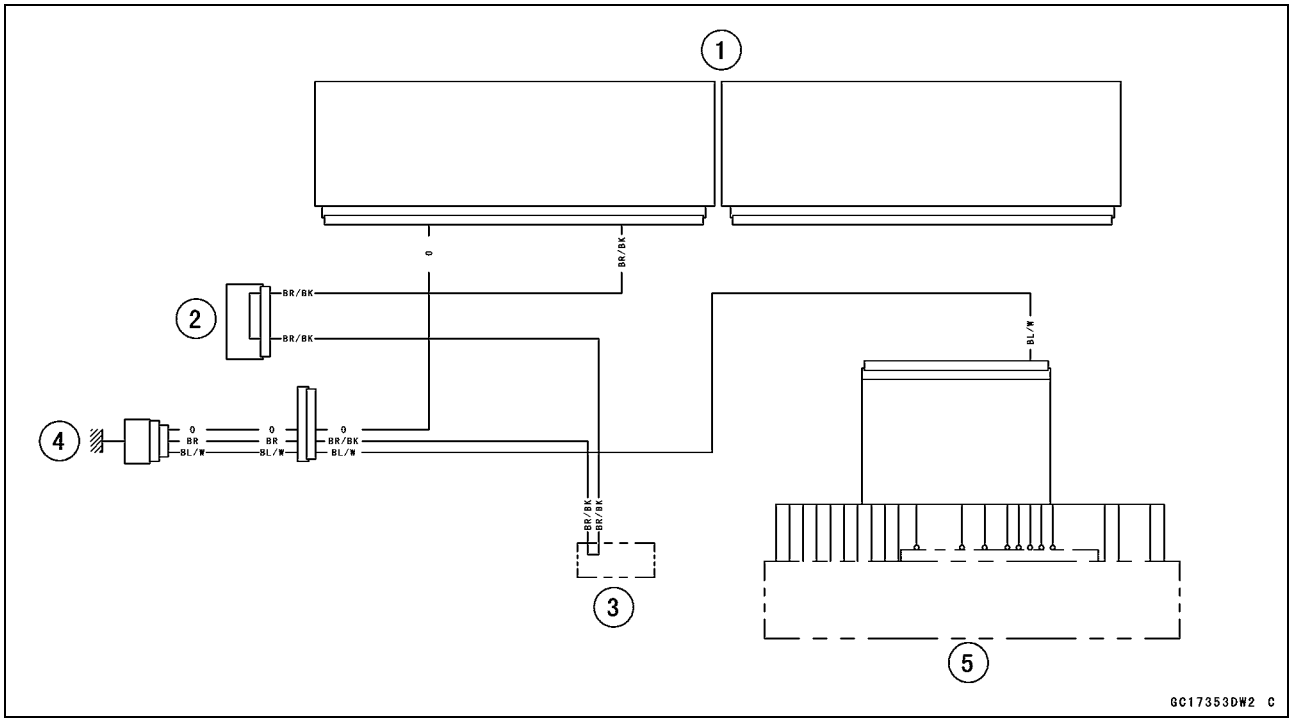

★If the wiring is good, check the water temperature sensor resistance (see Water Temperature Sensor Resistance Inspection).

### *Water Temperature Sensor Resistance Inspection*

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

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

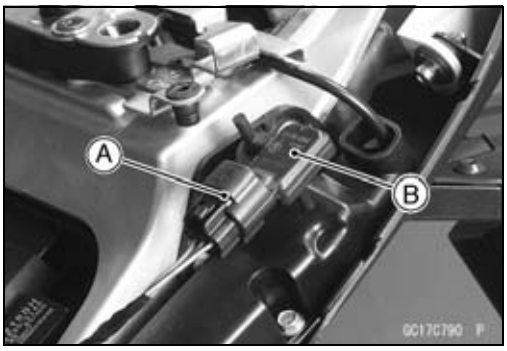
### Water Temperature Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Water Temperature Sensor
5. Meter Unit

## Atmospheric Pressure Sensor (Service Code 15)

### *Atmospheric Pressure Sensor Removal*




**CAUTION**

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

- Remove the left seat cover (see Seat Cover Removal in the Frame chapter).
- Disconnect the sensor connector [A].
- Remove the atmospheric pressure sensor [B] from the rubber damper in the rear fender rear bracket.

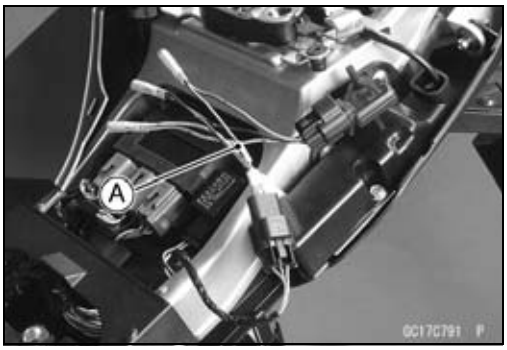
### *Atmospheric Pressure Sensor Installation*

**NOTE**

○*The atmospheric pressure sensor is the same part as the inlet air pressure sensor except that the inlet air pressure sensor has the vacuum hose and different wiring.*

- Installation is the reverse of removal.

### *Atmospheric Pressure Sensor Input Voltage Inspection*




**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the left seat cover (see Seat Cover Removal in the Frame chapter).
- Disconnect the atmospheric pressure sensor connector and connect the harness adapter [A] between these connectors.

**Special Tool - Sensor Harness Adapter: 57001-1561**

- Connect a digital meter to the harness adapter leads.

**Atmospheric Pressure Sensor Input Voltage**
**Connections to Adapter:**

**Digital Meter (+) → G (sensor BL) lead**

**Digital Meter (–) → BK (sensor BR/BK) lead**

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.

**Input Voltage**
**Standard: DC 4.75 ~ 5.25 V**

- Turn the ignition switch OFF.

★If the reading is within the standard, check the output voltage (Atmospheric Pressure Sensor Output Voltage Inspection).

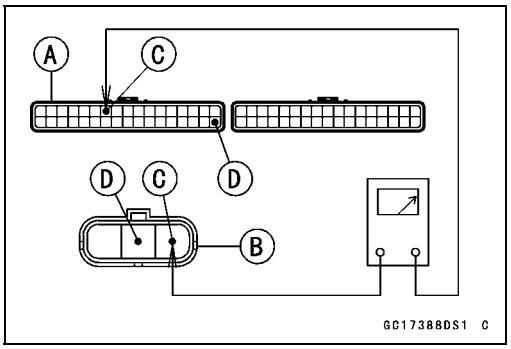
## Atmospheric Pressure Sensor (Service Code 15)

★If the input voltage is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Atmospheric Pressure Sensor Connector [B]**
**BL lead (ECU terminal 7) [C]**
**BR/BK lead (ECU terminal 34) [D]**

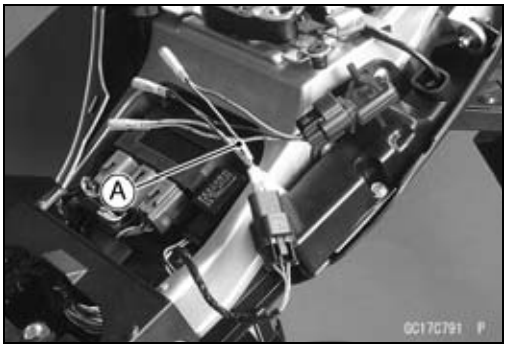



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

### *Atmospheric Pressure Sensor Output Voltage Inspection*

● Measure the output voltage at the atmospheric pressure sensor in the same way as input voltage inspection, note the following.
○Disconnect the atmospheric pressure sensor connector and connect the harness adapter [A] between these connectors.

**Special Tool - Sensor Harness Adapter: 57001-1561**




**Atmospheric Pressure Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → G/W (sensor G/W) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

● Measure the output voltage with the engine stopped and with the connector joined.
● Turn the ignition switch ON.

**Output Voltage**
**Usable Range: DC 3.80 ~ 4.20 V at the standard atmospheric pressure (101.32 kPa, 76 cmHg abs.)**

**NOTE**

○*The output voltage changes according to the local atmospheric pressure.*

● Turn the ignition switch OFF.
★If the reading is out of the usable range, replace the sensor.

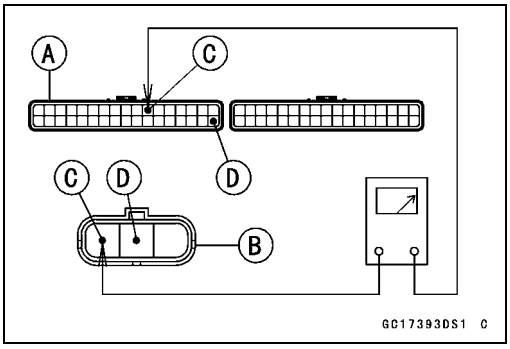
## Atmospheric Pressure Sensor (Service Code 15)

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connector.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

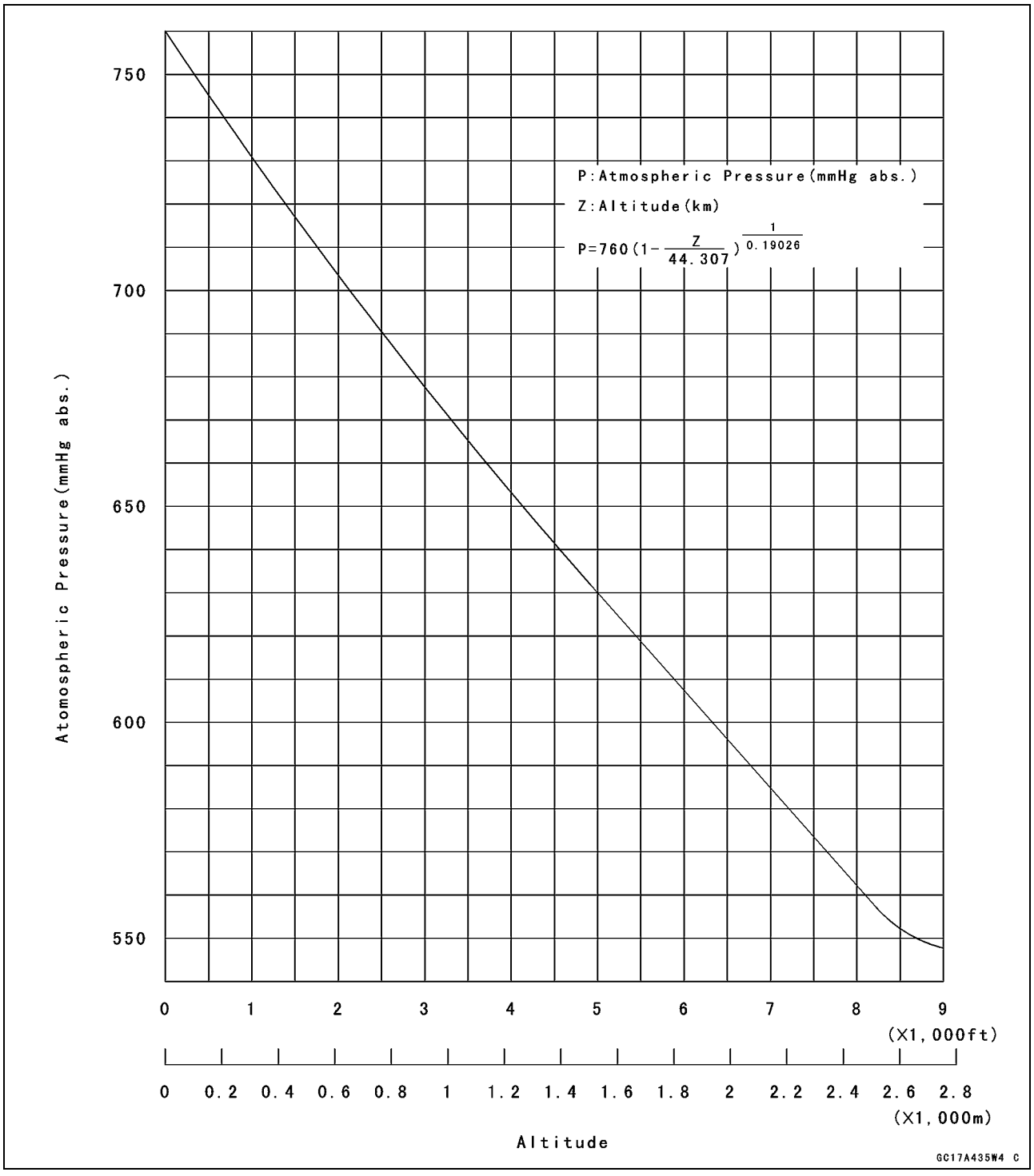
**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Atmospheric Pressure Sensor Connector [B]**
**G/W lead (ECU terminal 11) [C]**
**BR/BK lead (ECU terminal 34) [D]**




★If the wiring is good, check the sensor for various vacuum.
○Determine the local altitude (elevation).
★If you know the local altitude, use the chart in this section.
★If you know the local atmospheric pressure using a barometer, substitute the atmospheric pressure for Pv (vacuum pressure) in the inlet air pressure sensor chart (see Inlet Air Pressure Sensor Output Voltage Inspection).
○Get the usable range of the atmospheric pressure sensor output voltage in the same way as Output Voltage Inspection of the inlet air pressure sensor and check if Va (output voltage) is within the usable range or not.
★If the reading is out of the usable range, replace the sensor.
★If the reading is within the usable range, check the ECU for its ground, and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

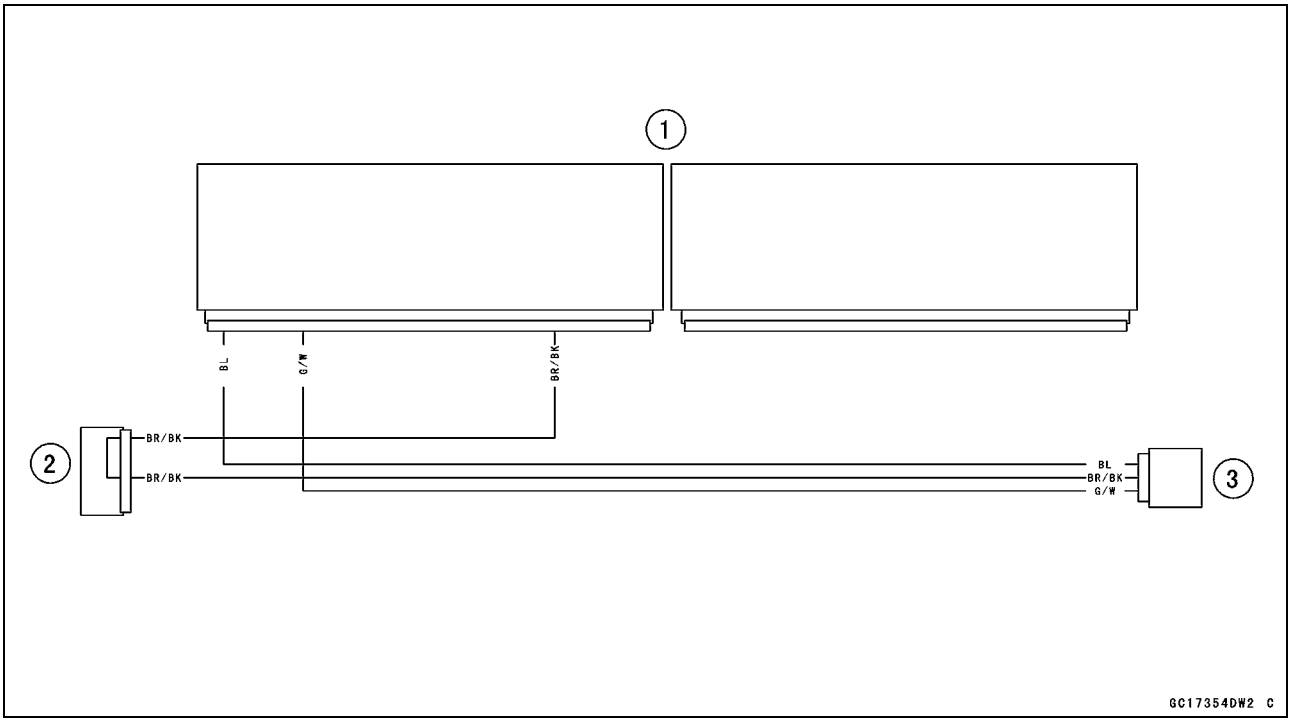
## Atmospheric Pressure Sensor (Service Code 15)

### Atmospheric Pressure/Altitude Relationship



## Atmospheric Pressure Sensor (Service Code 15)

### Atmospheric Pressure Sensor Circuit




1. ECU
2. Joint Connector 4
3. Atmospheric Pressure Sensor

## Crankshaft Sensor (Service Code 21)

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

### *Crankshaft Sensor Removal/Installation*

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

### *Crankshaft Sensor Resistance Inspection*

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

★If the reading is within the standard, check the peak voltage (see Crankshaft Sensor Peak Voltage Inspection).

### *Crankshaft Sensor Peak Voltage Inspection*

● Refer to the Crankshaft Sensor Peak Voltage Inspection in the Electrical System chapter.

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

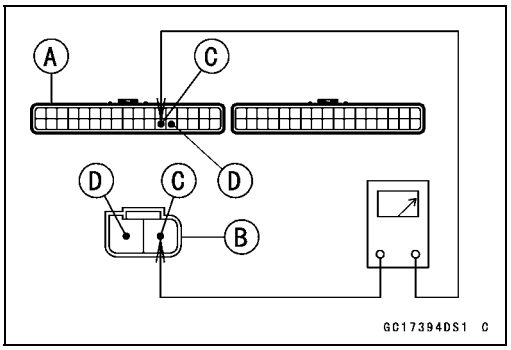
**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Crankshaft Sensor Connector [B]**
**R/BL lead (ECU terminal 29) [C]**
**BK lead (ECU terminal 30) [D]**

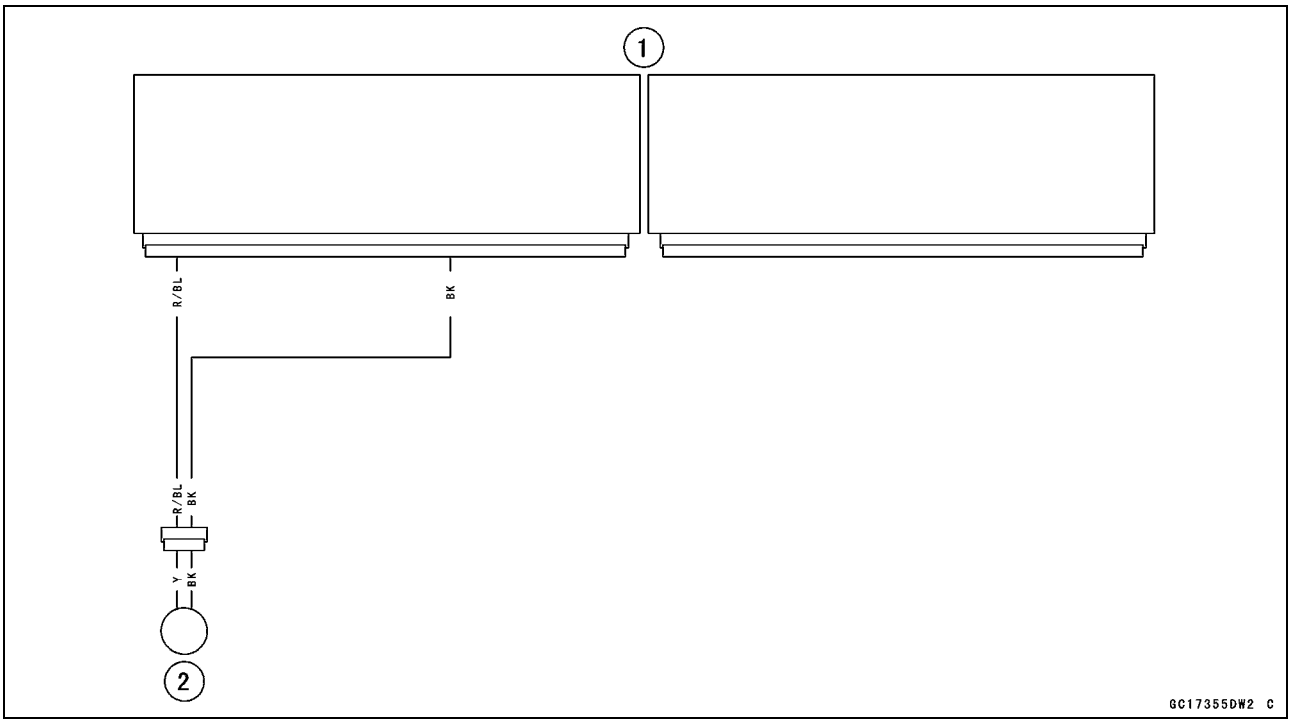
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



## Crankshaft Sensor (Service Code 21)

### Crankshaft Sensor Circuit




1. ECU
2. Crankshaft Sensor

## Camshaft Position Sensor (Service Code 23)

The camshaft position sensor detects the position of the camshaft, and distinguishes the cylinder.

The camshaft position sensor has no power source, and when the engine stops, the camshaft position sensor generates no signals.

### *Camshaft Position Sensor Removal/Installation*

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

### *Camshaft Position Sensor Resistance Inspection*

● Refer to the Camshaft Position Sensor Inspection in the Electrical System chapter.

★If the reading is within the standard, check the peak voltage (see Camshaft Position Sensor Peak Voltage Inspection).

### *Camshaft Position Sensor Peak Voltage Inspection*

● Refer to the Camshaft Position Sensor Peak Voltage Inspection in the Electrical System chapter.

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

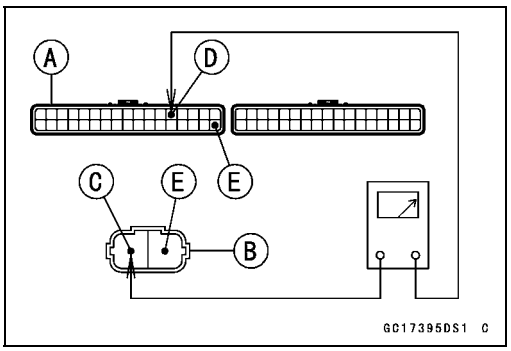
**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Camshaft Position Sensor Connector [B]**
**W/Y lead [C]**
**Y/R lead (ECU terminal 13) [D]**
**BR/BK lead (ECU terminal 34) [E]**

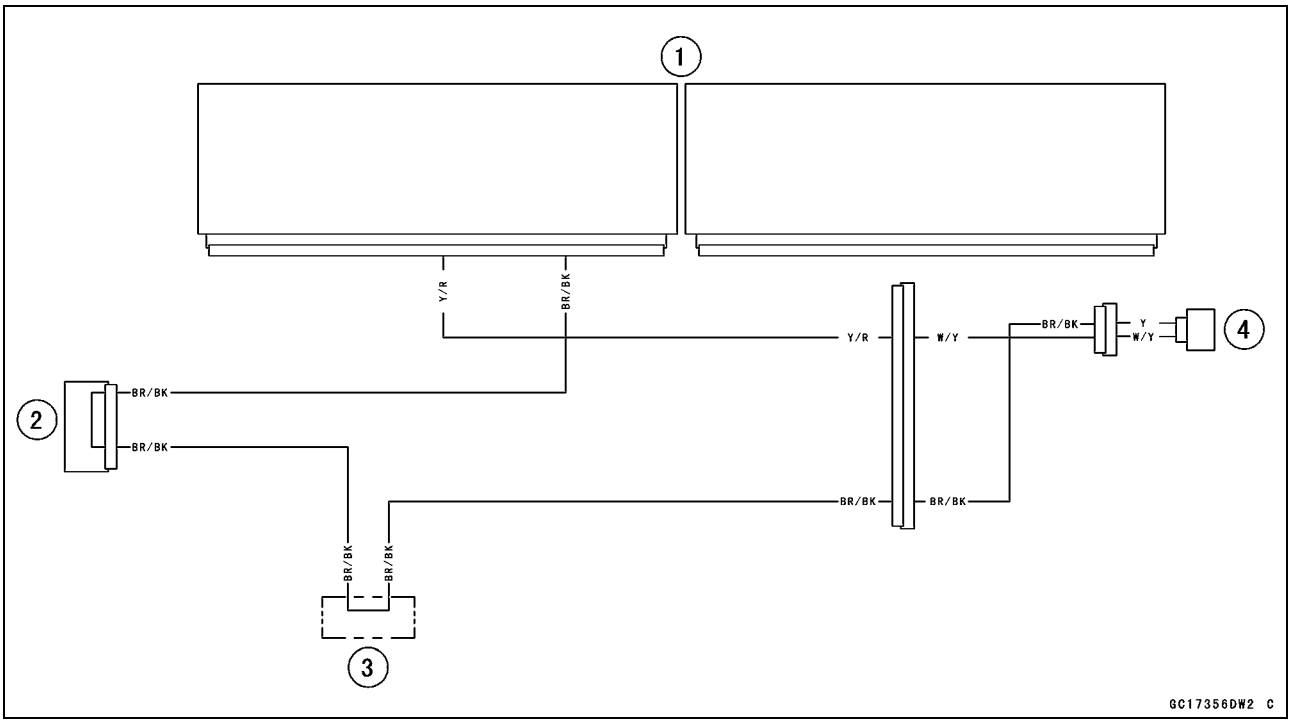
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).



## Camshaft Position Sensor (Service Code 23)

### Camshaft Position Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Camshaft Position Sensor

## Speed Sensor (Service Code 24)

### *Speed Sensor Removal/Installation*

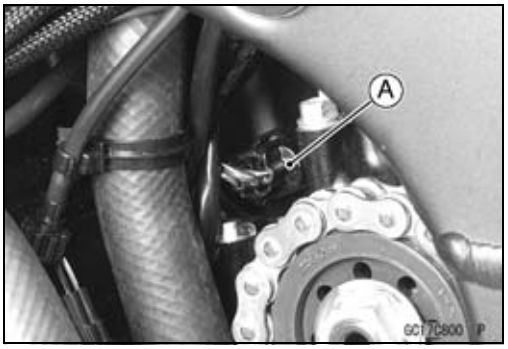
● Refer to the Speed Sensor Removal/Installation in the Electrical System chapter.

### *Speed Sensor Input Voltage Inspection*

**NOTE**

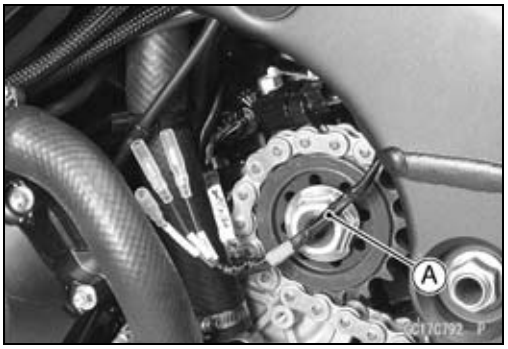
○*Be sure the battery is fully charged.*

● Turn the ignition switch OFF.
● Remove the engine sprocket cover (see Engine Sprocket Removal in the Final Drive chapter).
● Disconnect the speed sensor connector [A].




● Connect the harness adapter [A] between the main harness connector and speed sensor connector.

**Special Tool - Speed Sensor Measuring Adapter: 57001 -1667**




● Connect a digital meter to the harness adapter leads.

**Speed Sensor Input Voltage**
**Connections to Adapter:**
**Digital Meter (+) → BL (sensor BL) lead**
**Digital Meter (–) → BK/Y (sensor BK/Y) lead**

● Measure the input voltage with the engine stopped and with the connector joined.
● Turn the ignition switch ON.

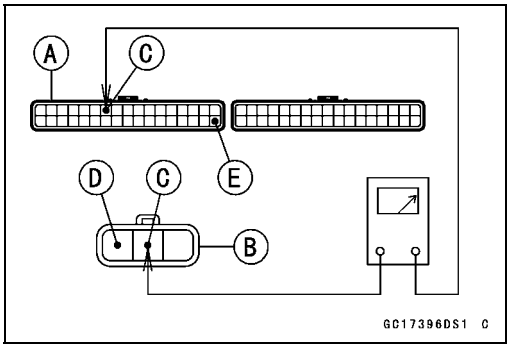
**Input Voltage**
**Standard: DC 4.75 ~ 5.25 V**

● Turn the ignition switch OFF.
★If the reading is within the standard, check the output voltage (see Speed Sensor Output Voltage Inspection).

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

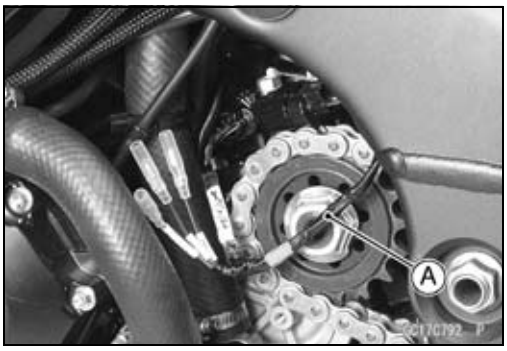



**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Speed Sensor Connector [B]**
**BL lead (ECU terminal 7) [C]**
**BK/Y lead [D]**
**BR/BK lead (ECU terminal 34) [E]**

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

## Speed Sensor (Service Code 24)

### *Speed Sensor Output Voltage Inspection*




- Using the stand, raise the rear wheel off the ground.
- Measure the output voltage at the speed sensor in the same way as input voltage inspection, note the following.

○Disconnect the speed sensor connector and connect the harness adapter [A] between these connectors.

**Special Tool - Speed Sensor Measuring Adapter: 57001 -1667**

**Speed Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → BL/Y (sensor BL/Y) lead**
**Digital Meter (–) → BK/Y (sensor BK/Y) lead**

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

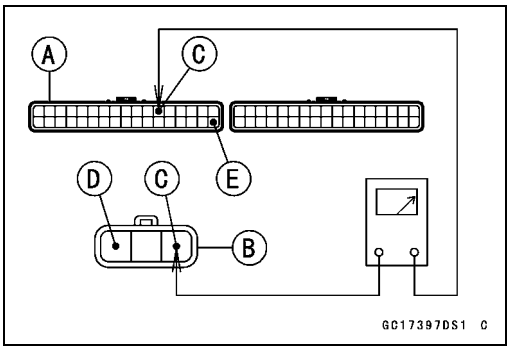
**Output Voltage**
**Standard: About DC 0.05 ~ 0.09 V or DC 4.5 ~ 4.9 V at ignition switch ON and 0 km/h**

**NOTE**

○*Rotate the rear wheel by hand, confirm the output voltage will be raise or lower.*

- Turn the ignition switch OFF.

★If the reading is out of the standard, replace the sensor.




★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

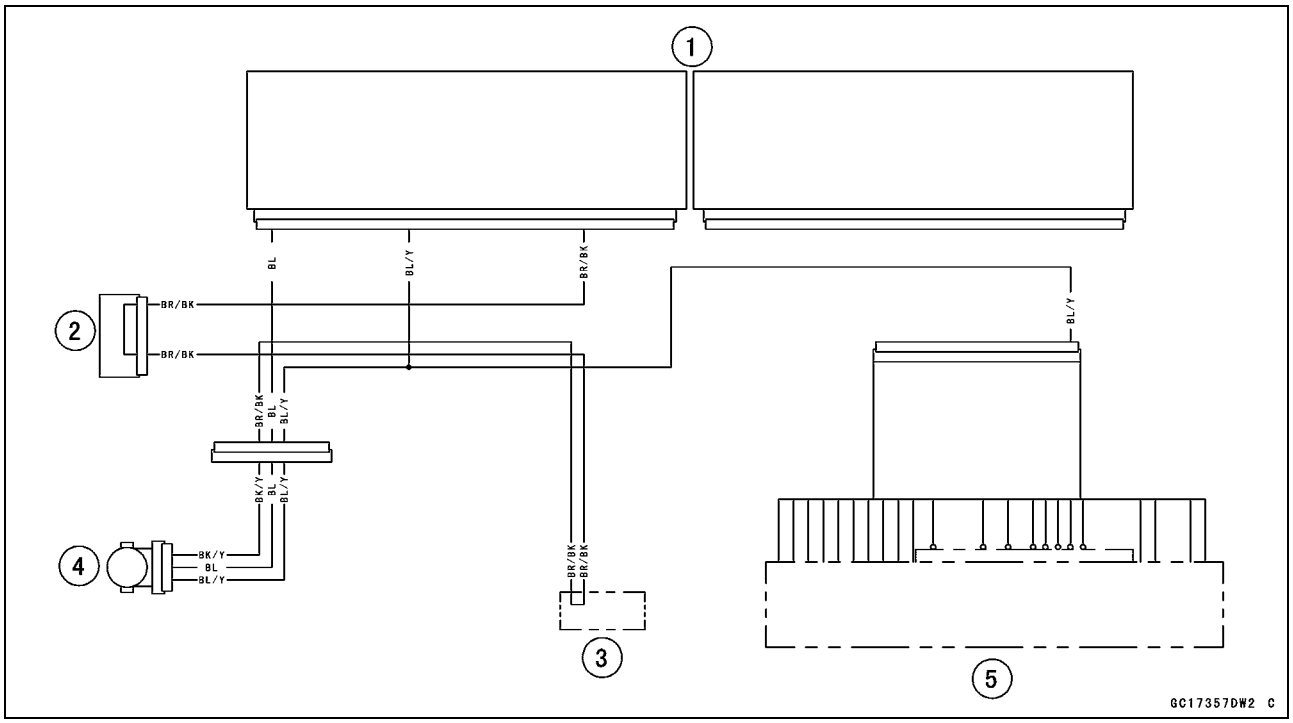
**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Speed Sensor Connector [B]**
**BL/Y lead (ECU terminal 12) [C]**
**BK/Y lead [D]**
**BR/BK lead (ECU terminal 34) [E]**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Speed Sensor (Service Code 24)

### Speed Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Speed Sensor
5. Meter Unit

## Gear Position Switch (Service Code 25)

### *Gear Position Switch Removal/Installation*

● Refer to the Gear Position Switch Removal/Installation in the Electrical System chapter.

### *Gear Position Switch Resistance Inspection*

● Refer to the Gear Position Switch Inspection in the Electrical System chapter.

★If the reading is as the specified, check the output voltage (see Gear Position Switch Output Voltage Inspection).

### *Gear Position Switch Output Voltage Inspection*

**NOTE**

○*Be sure the battery is fully charged.*

● Turn the ignition switch OFF.

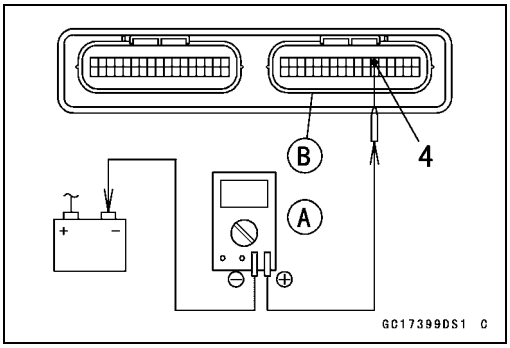
● Remove the ECU (see ECU Removal).

○Do not disconnect the ECU connectors.

● Connect a digital meter [A] to the connector [B] with the needle adapter set.

**Special Tool - Needle Adapter Set: 57001-1457**

**Gear Position Switch Output Voltage**
**Connections to ECU Connector:**
**Digital Meter (+) → W/Y lead (terminal 4)**
**Digital Meter (–) → Battery (–) terminal**




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

● Turn the ignition switch ON.

○When changing the gear position from lower gear to higher gear, raise the rear wheel off the ground with the stand and rotate the rear wheel by hand.

**Output Voltage at 1 ~ 6 Gear Positions**
**Standard:**

| | |
|---|---|
| **1st** | **About 3.0 V** |
| **2nd** | **About 2.5 V** |
| **3rd** | **About 2.0 V** |
| **4th** | **About 1.5 V** |
| **5th** | **About 1.1 V** |
| **6th** | **About 0.7 V** |

● Turn the ignition switch OFF.

★If the reading is out of the standard, check the wiring for continuity, using the wiring diagram in this section.

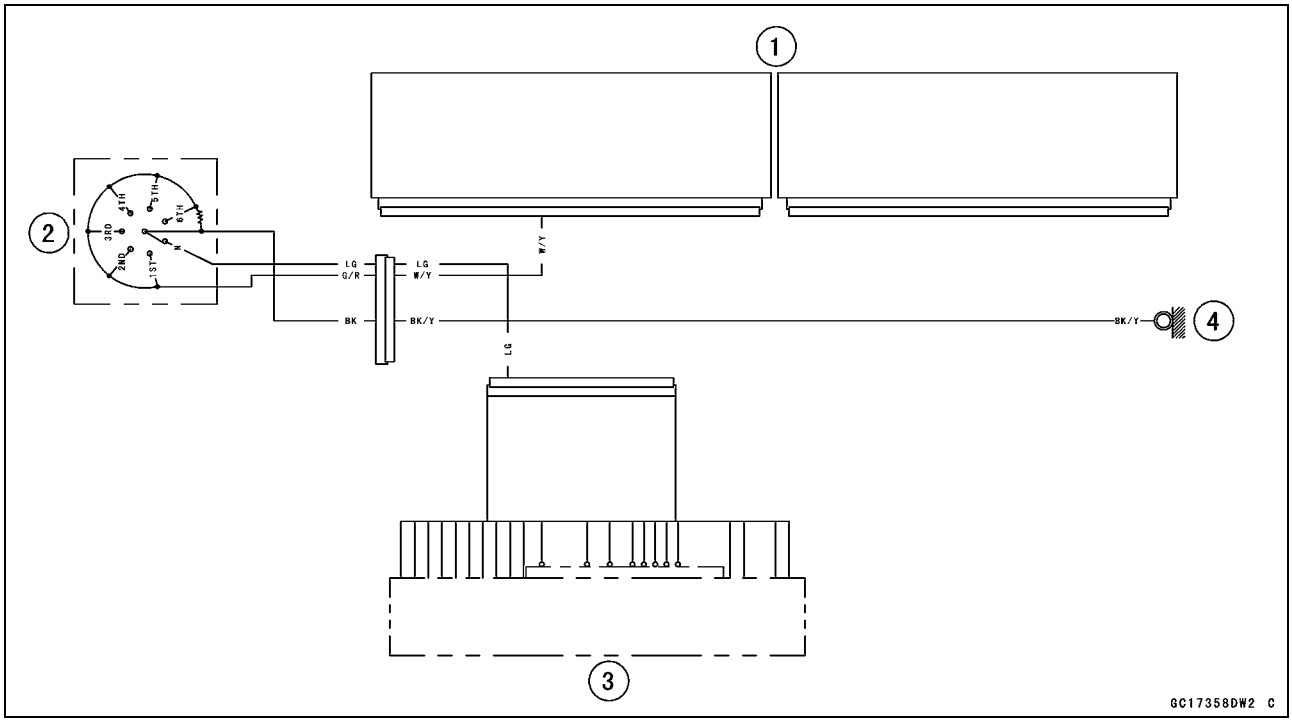
**Special Tool - Hand Tester: 57001-1394**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Gear Position Switch (Service Code 25)

### Gear Position Switch Circuit




1. ECU
2. Gear Position Switch
3. Meter Unit
4. Frame Ground 1

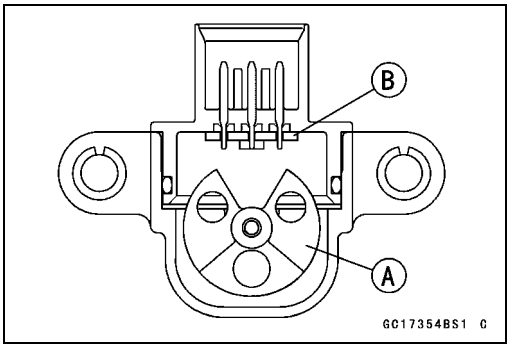
## Vehicle-down Sensor (Service Code 31)

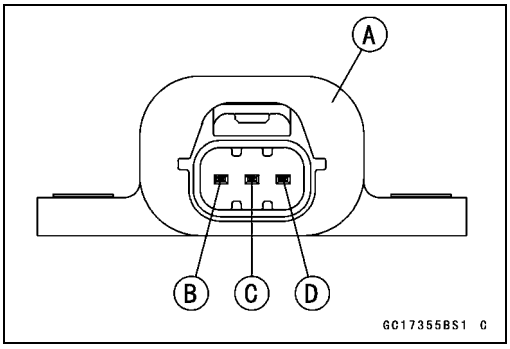
This sensor has a weight [A] with two magnets inside, and sends a signal to the ECU. But when the motorcycle banks 60 ~ 70° or more to either side (in fact falls down), the weight turns and the signal changes. The ECU senses this change, and stops the fuel pump relay, the fuel injectors (primary and secondary) and the ignition system.

Hall IC [B]

When the motorcycle is down, the ignition switch is left ON. If the starter button is pushed, the electric starter turns but the engine does not start. To start the engine again, raise the motorcycle, turn the ignition switch OFF, and then ON.

Vehicle-down Sensor [A]
Ground Terminal [B]: BR/BK
Output Terminal [C]: Y/G
Power Source Terminal [D]: BL

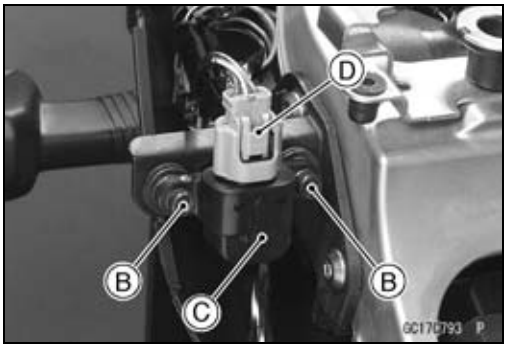



### *Vehicle-down Sensor Removal*

**CAUTION**

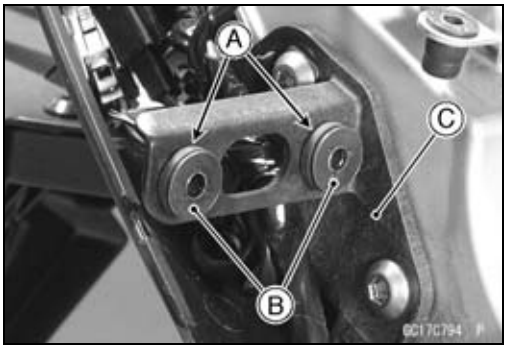
**Never drop the vehicle-down sensor, especially on a hard surface. Such a shock to the sensor can damage it.**




- Remove:
  Left Seat Cover (see Seat Cover Removal in the Frame chapter)
  Connector [A]
  Bolts [B]
  Vehicle-down Sensor [C]

### *Vehicle-down Sensor Installation*

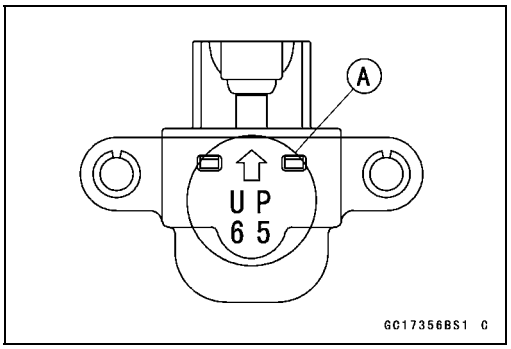
- Be sure to install the rubber dampers [A] and collars [B] on the rear fender rear bracket [C].



## Vehicle-down Sensor (Service Code 31)

● The UP mark [A] of the sensor should face upward.
● Tighten:

**Torque - Vehicle-down Sensor Bolts: 6.0 N·m (0.61 kgf·m, 53 in·lb)**




**⚠ WARNING**

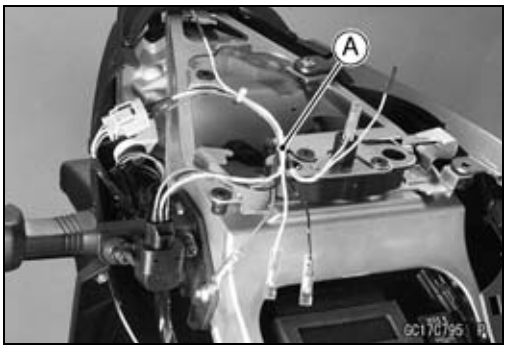
**Incorrect installation of the vehicle-down sensor could cause sudden loss of engine power. The rider could lose balance during certain riding situations like leaning over in a turn with the potential for an accident resulting in injury or death. Ensure that the vehicle-down sensor is held in place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

### *Vehicle-down Sensor Input Voltage Inspection*

**NOTE**

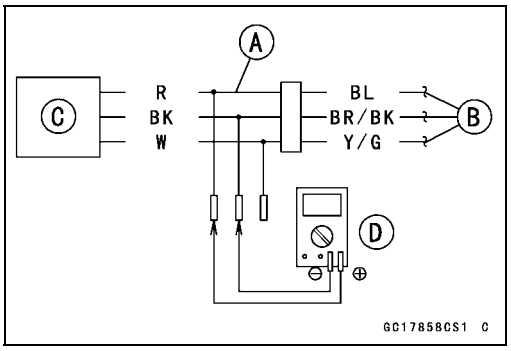
○*Be sure the battery is fully charged.*

● Turn the ignition switch OFF.
● Disconnect the vehicle-down sensor connector and connect the harness adapter [A] between these connectors as shown in the figure.
Main Harness [B]
Vehicle-down Sensor [C]




**Special Tool - Measuring Adapter: 57001-1700**

● Connect a digital meter [D] to the harness adapter leads.



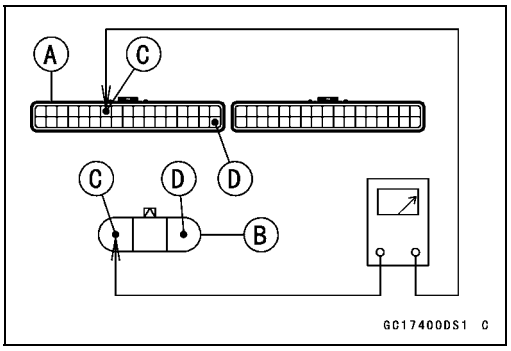

**Vehicle-down Sensor Input Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (sensor BL) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

● Measure the input voltage with the engine stopped and with the connector joined.
● Turn the ignition switch ON.

**Input Voltage**
**Standard: DC 4.75 ~ 5.25 V**

● Turn the ignition switch OFF.
★If the reading is within the standard, check the output voltage (see Vehicle-down Sensor Output Voltage Inspection).

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.




**Special Tool - Hand Tester: 57001-1394**

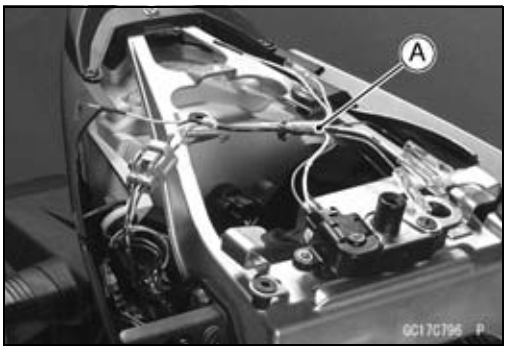
○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Vehicle-down Sensor Connector [B]**
**BL lead (ECU terminal 7) [C]**
**BR/BK lead (ECU terminal 34) [D]**

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

## Vehicle-down Sensor (Service Code 31)

### *Vehicle-down Sensor Output Voltage Inspection*



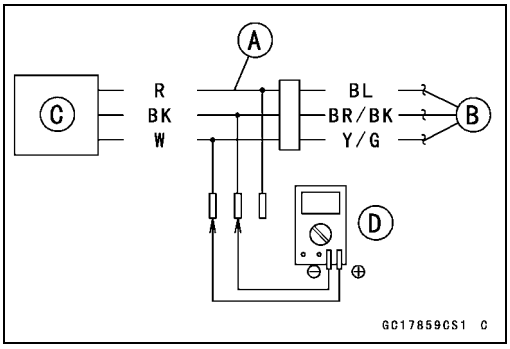

- Remove the vehicle-down sensor.
- Connect the harness adapter [A] to the vehicle-down sensor connectors as shown in the figure.

**Special Tool - Measuring Adapter: 57001-1700**

Main Harness [B]
Vehicle-down Sensor [C]

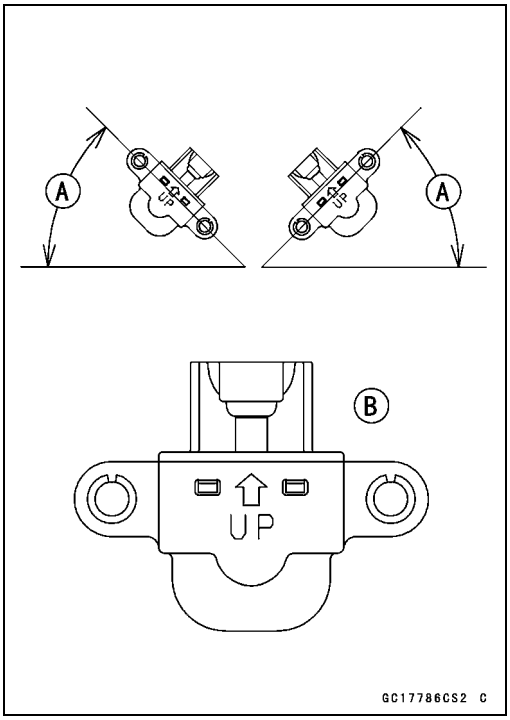
- Connect a digital meter [D] to the harness adapter leads.

**Vehicle-down Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → W (sensor Y/G) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**




- Hold the sensor vertically.
- Measure the output voltage with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.
- Tilt the sensor 60 ~ 70° or more [A] right or left, then hold the sensor almost vertical with the arrow mark pointed up [B], and measure the output voltage.

**Output Voltage**
**Standard: With sensor tilted 60 ~ 70° or more right or left: DC 0.65 ~ 1.35 V**
**With sensor arrow mark pointed up: DC 3.55 ~ 4.45 V**




**NOTE**

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

- Turn the ignition switch OFF.

★If the reading is out of the standard, replace the sensor.

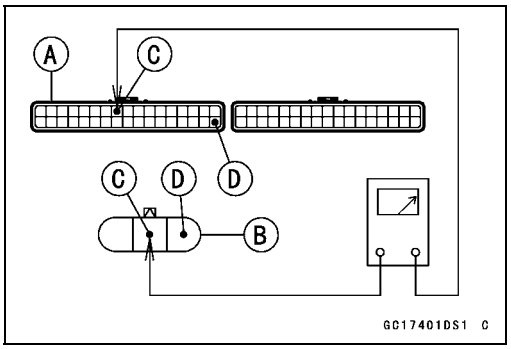
## Vehicle-down Sensor (Service Code 31)

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

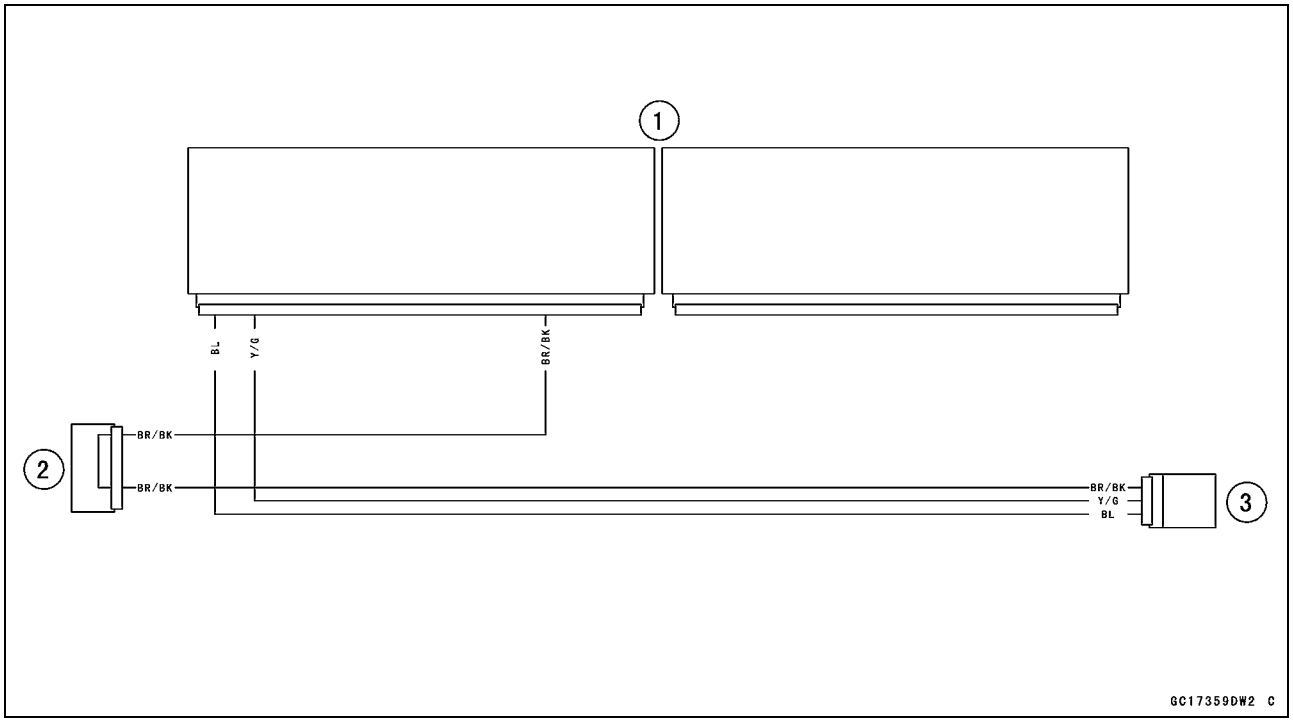
○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Vehicle-down Sensor Connector [B]**
**Y/G lead (ECU terminal 9) [C]**
**BR/BK lead (ECU terminal 34) [D]**




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

### Vehicle-down Sensor Circuit

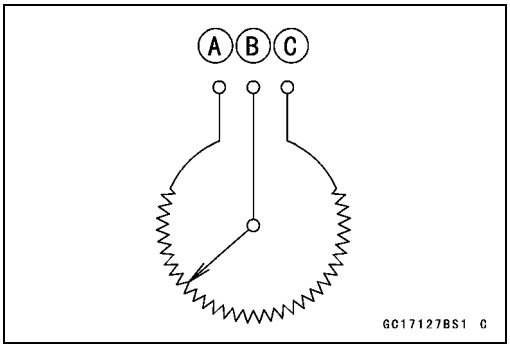



1. ECU
2. Joint Connector 4
3. Vehicle-down Sensor

## Subthrottle Sensor (Service Code 32)

The subthrottle sensor is a rotating variable resistor that change output voltage according to throttle operating. The ECU senses this voltage change and determines fuel injection quantity, and ignition timing according to engine rpm, and throttle opening.

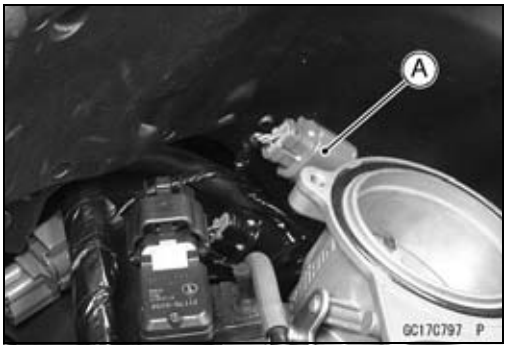
Input Terminal [A]: BL
Output Terminal [B]: BL/W
Ground Terminal [C]: BR/BK




### *Subthrottle Sensor Removal/Adjustment*

**CAUTION**

**Do not remove or adjust the subthrottle sensor since it has been adjusted and set with precision at the factory.**
**Never drop the throttle body assy, especially on a hard surface. Such a shock to the subthrottle sensor can damage it.**

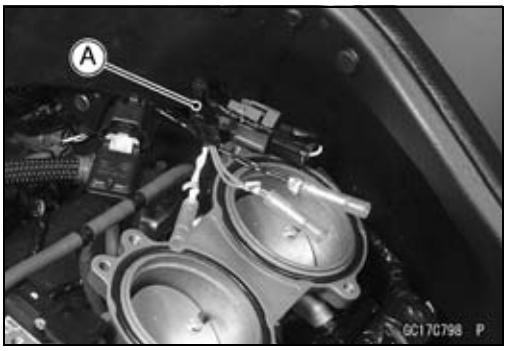



Subthrottle Sensor Connector [A]

### *Subthrottle Sensor Input Voltage Inspection*

**NOTE**

○*Be sure the battery is fully charged.*




- Turn the ignition switch OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the subthrottle sensor connector and connect the harness adapter [A] between these connectors.

**Special Tool - Throttle Sensor Setting Adapter: 57001 -1538**

- Connect a digital meter to the harness adapter leads.

**Subthrottle Sensor Input Voltage**
**Connections to Adapter:**
**Digital Meter (+) → W (sensor BL) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.

**Input Voltage**
**Standard: DC 4.75 ~ 5.25 V**

- Turn the ignition switch OFF.

★If the reading is within the standard, check the output voltage (see Subthrottle Sensor Output Voltage Inspection).

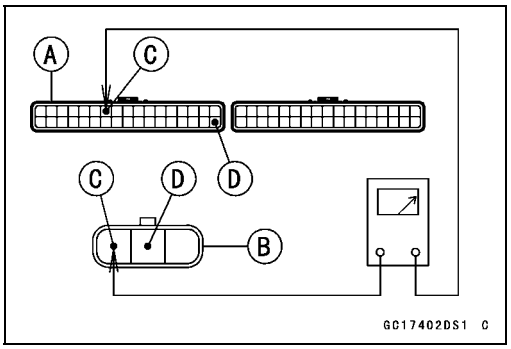
## Subthrottle Sensor (Service Code 32)

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Subthrottle Sensor Connector [B]**
**BL lead (ECU terminal 7) [C]**
**BR/BK lead (ECU terminal 34) [D]**




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

### *Subthrottle Sensor Output Voltage Inspection*

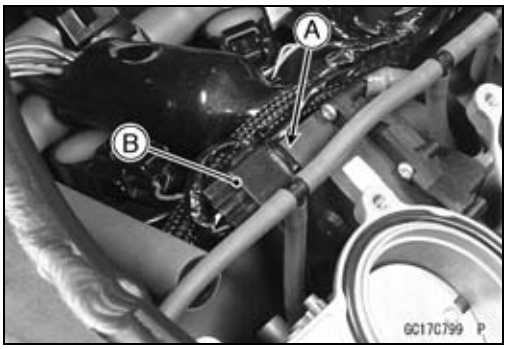
● Measure the output voltage at the subthrottle sensor in the same way as input voltage inspection, note the following.

○Disconnect the subthrottle sensor connector and connect the harness adapter [A] between these connectors.

**Special Tool - Throttle Sensor Setting Adapter: 57001 -1538**


**Subthrottle Sensor Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (sensor BL/W) lead**
**Digital Meter (–) → BK (sensor BR/BK) lead**

● Cut the band [A], and disconnect the subthrottle valve actuator connector [B].



## Subthrottle Sensor (Service Code 32)

- Measure the output voltage with the engine stopped with the connector joined.
- Turn the ignition switch ON.
- Measure the output voltage when the subthrottle valves are fully opened by hand.

**Output Voltage**

**Standard: DC 0.8 ~ 1.0 V at subthrottle valve full close position (for reference)**

**DC 4.28 ~ 4.32 V at subthrottle valve full open position**

**NOTE**

○*Close the subthrottle valves, confirm the output voltage will be lower.*

○*The standard voltage refers to the value when the voltage reading at the Input Voltage Inspection shows 5 V exactly.*

○*When the input voltage reading shows other than 5 V, derive a voltage range as follows.*
*Example:*
*In the case of a input voltage of 4.75 V.*
*4.28 × 4.75 ÷ 5.00 = 4.07 V*
*4.32 × 4.75 ÷ 5.00 = 4.10 V*
*Thus, the valid range is 4.07 ~ 4.10 V*

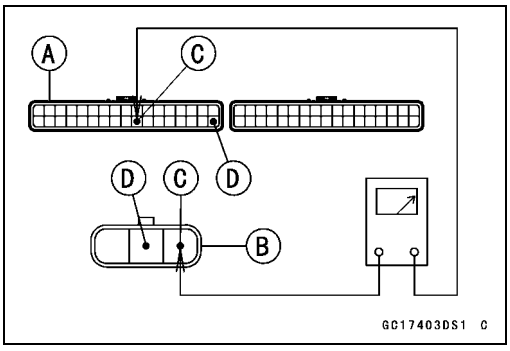
★If the reading is out of the standard, check the subthrottle sensor resistance (see Subthrottle Sensor Resistance Inspection).

★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Subthrottle Sensor Connector [B]**
**BL/W lead (ECU terminal 27) [C]**
**BR/BK lead (ECU terminal 34) [D]**

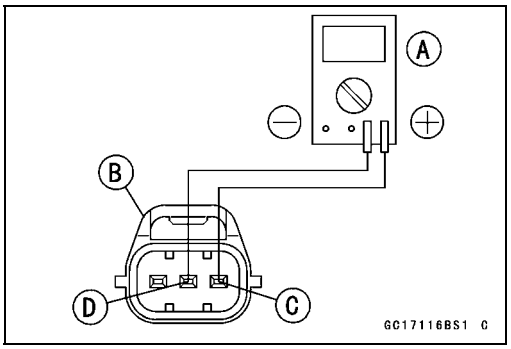



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Subthrottle Sensor (Service Code 32)

### *Subthrottle Sensor Resistance Inspection*

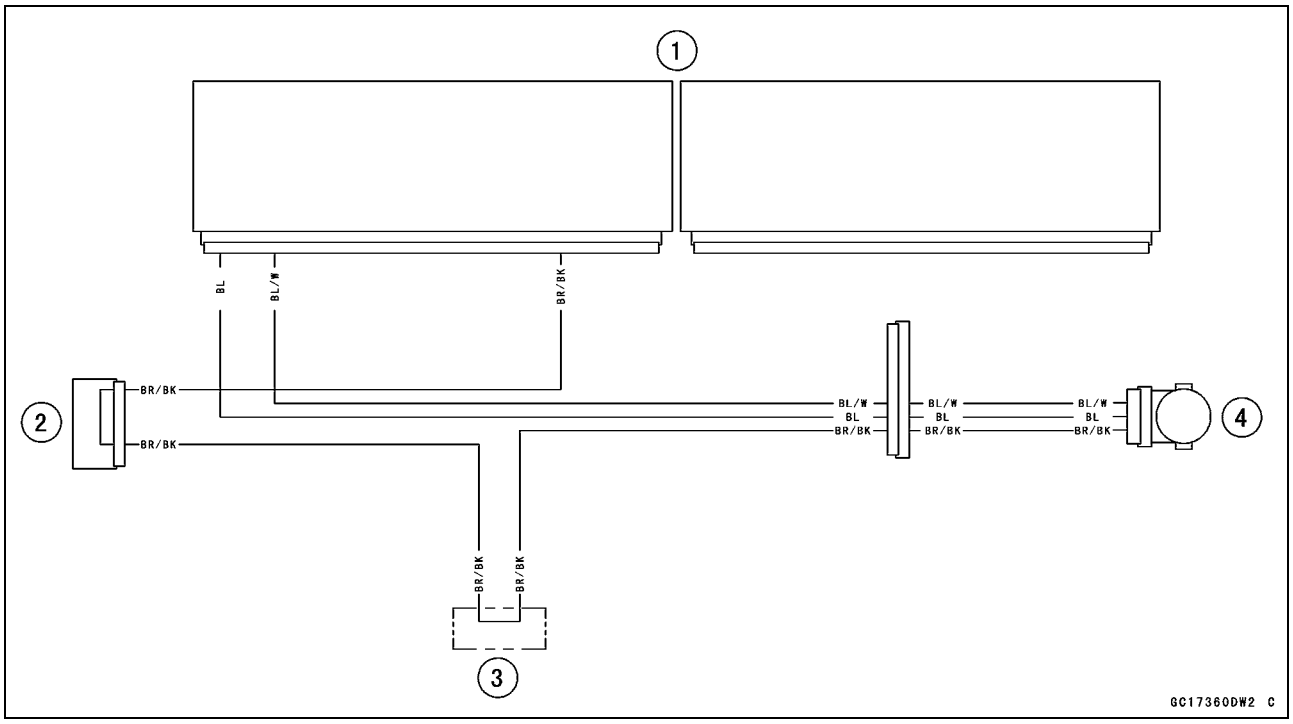



- Turn the ignition switch OFF.
- Disconnect the subthrottle sensor connector.
- Connect a digital meter [A] to the subthrottle sensor connector [B].
- Measure the subthrottle sensor resistance.

**Subthrottle Sensor Resistance**
**Connections: BL lead [C] ←→ BR/BK lead [D]**
**Standard: 4 ~ 6 kΩ**

★If the reading is out of the standard, replace the throttle body assy.
★If the reading is within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

### Subthrottle Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Subthrottle Sensor

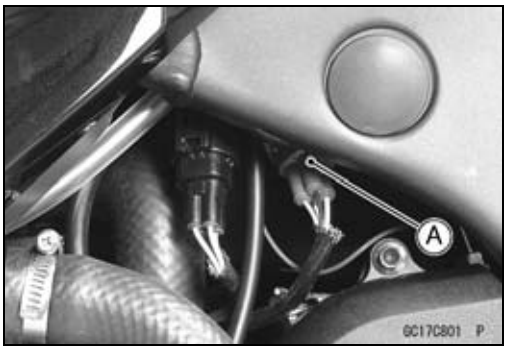
## Oxygen Sensor #1 - not activated (Service Code 33, Equipped Models)

### *Oxygen Sensor #1 Removal/Installation*

- Refer to the Oxygen Sensor Removal/Installation (Equipped Models) in the Electrical System chapter.

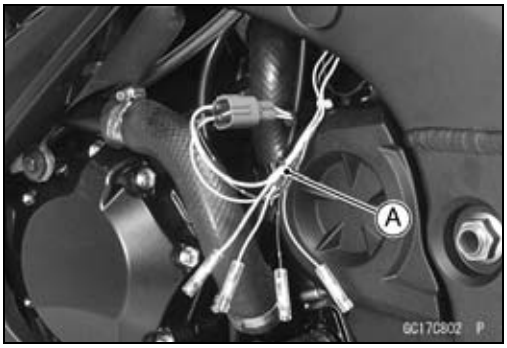
### *Oxygen Sensor #1 Inspection*

- Warm up the engine thoroughly until the radiator fan starts.
- Turn the ignition switch OFF.
- Remove:
  Middle Air Cleaner Housing (see Air Cleaner Housing Removal)
  Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
  Oxygen Sensor #1 Lead Connector (Gray) [A]



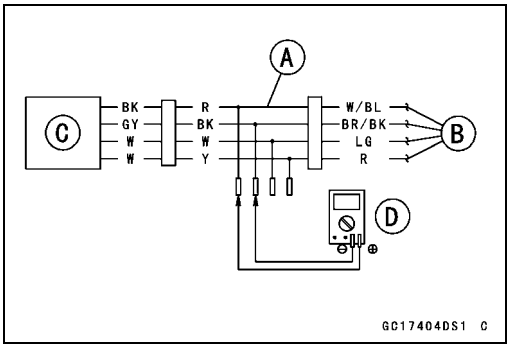

- Connect the harness adapter [A] between the main harness connector and oxygen sensor #1 lead connector as shown in the figure.
  Main Harness [B]
  Oxygen Sensor #1 [C]

**Special Tool - Measuring Adapter: 57001-1700**



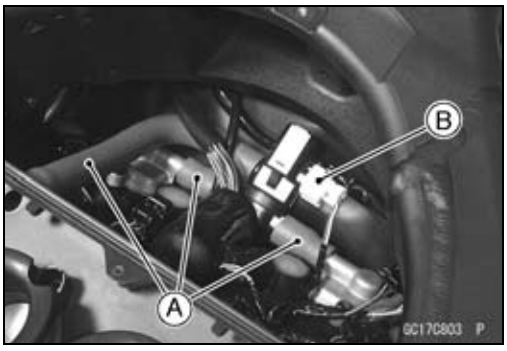

- Connect a digital meter [D] to the harness adapter leads.

**Oxygen Sensor #1 Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (sensor BK) lead**
**Digital Meter (–) → BK (sensor GY) lead**




- Separate the air switching valve hoses [A] from the air suction valve covers and lower air cleaner housing.

○Do not disconnect the air switching valve connector [B].

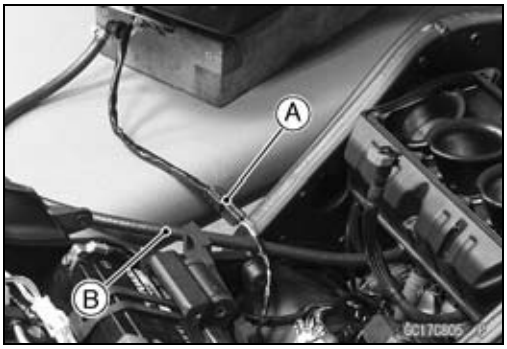


## Oxygen Sensor #1 - not activated (Service Code 33, Equipped Models)

● Install the suitable plugs [A] on the fitting of the air suction valve covers, and shut off the secondary air.


● Connect the following parts temporarily.
Fuel Pump Lead Connector [A]
Extension Tube [B]

**Special Tool - Extension Tube: 57001-1578**




● Connect the following parts temporarily.
Inlet Air Temperature Sensor Connector [A]
Secondary Fuel Hose [B] (see Fuel Hose Replacement in the Periodic Maintenance Chapter)


**NOTE**

○*Be sure to connect the inlet air temperature sensor connector. When the ignition switch is turned ON with inlet air temperature sensor connector disconnected, the ECU detects the service code 13. (see Self-diagnosis Outline).*

○*Do not connect the secondary fuel injector connectors. The oxygen sensor #1 is inspected with the middle air cleaner housing removed and the engine started. The secondary fuel injectors are operating with following conditions.*

1. The engine speed is more than 6 000 r/min (rpm).
2. The throttle opening is more than 30°.

**⚠ WARNING**

**Gasoline is extremely flammable and can be explosive under certain condition. Especially, the gasoline jetted from the secondary fuel injector is extremely flammable for atomizing the gasoline by the injector.**

● Start the engine, and let it idle.
● Measure the output voltage with the connector joined.

**Output Voltage (with Plugs)**
**Standard: DC 0.8 V or more**

## Oxygen Sensor #1 - not activated (Service Code 33, Equipped Models)

● Next, remove the plugs from the fittings [A] with idling.
● Measure the output voltage with the connector joined.

**Output Voltage (without Plugs)**
**Standard: DC 0.24 V or less**

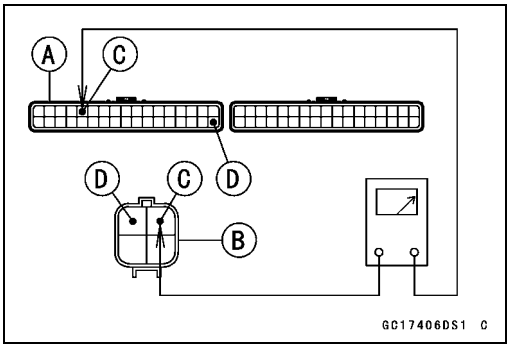

● Turn the ignition switch OFF.

★If the reading is out of the standard (with plugs: 0.8 V or more, without plugs: 0.24 V or less), remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

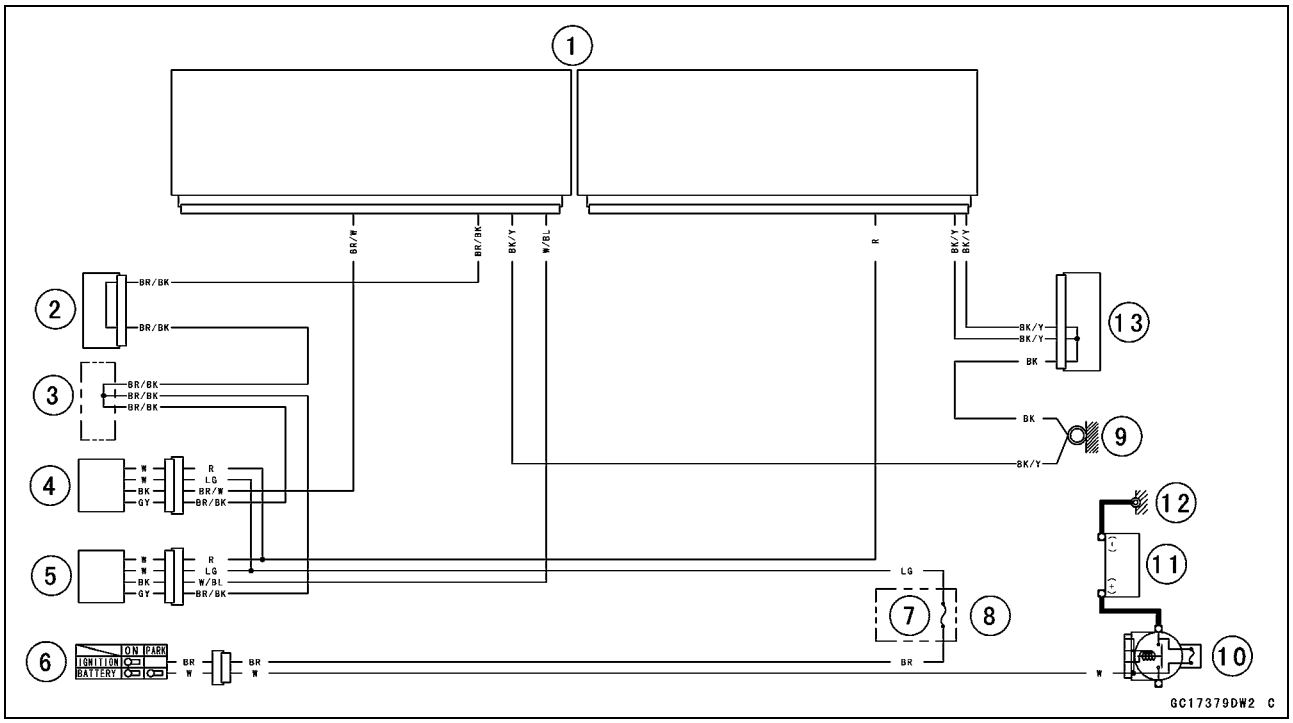
**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Oxygen Sensor #1 Connector [B]**
**W/BL lead (ECU terminal 5) [C]**
**BR/BK lead (ECU terminal 34) [D]**




★If the wiring is good, replace the sensor.
★If the reading is within the standard (with plugs: 0.8 V or more, without plugs: 0.24 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Oxygen Sensor #1 - not activated (Service Code 33, Equipped Models)

### Oxygen Sensor Circuit



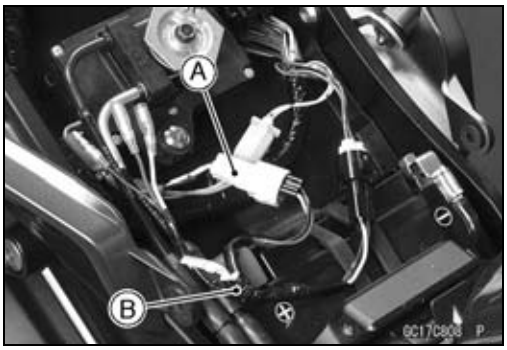

1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Oxygen Sensor #2
5. Oxygen Sensor #1
6. Ignition Switch
7. Oxygen Sensor Heater Fuse 10 A
8. Fuse Box
9. Frame Ground 1
10. Main Fuse 30 A
11. Battery 12 V 10 Ah
12. Engine Ground
13. Water-proof Joint 1

## Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

### *Exhaust Butterfly Valve Actuator Sensor Removal/Installation*

The exhaust butterfly valve actuator sensor is built in the exhaust butterfly valve actuator. So, the sensor itself can not be removed. Remove the exhaust butterfly valve actuator (see Exhaust Butterfly Valve Actuator Removal).

### *Exhaust Butterfly Valve Actuator Sensor Input Voltage Inspection*




**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the exhaust butterfly valve actuator sensor lead connector (3 pins connector) [A] and connect the harness adapter [B] between these connector.

**Special Tool - Throttle Sensor Setting Adapter #1: 57001 -1400**

- Connect a digital meter to the harness adapter leads.

**Exhaust Butterfly Valve Actuator Sensor Input Voltage**
**Connections to Adapter:**
**Digital Meter (+) → Y/W (actuator W) lead**
**Digital Meter (−) → BK/BL (actuator BK) lead**

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.

**Input Voltage**
**Standard: DC 4.75 ~ 5.25 V**

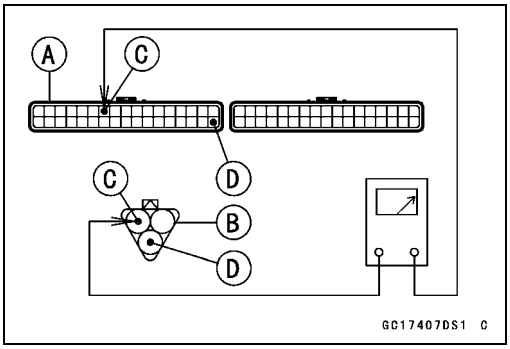
- Turn the ignition switch OFF.

★If the reading is within the standard, check the output voltage (see Exhaust Butterfly Valve Actuator Sensor Output Voltage Inspection).

★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main harness connectors.

○Disconnect the ECU and sensor connectors.

**Special Tool - Hand Tester: 57001-1394**



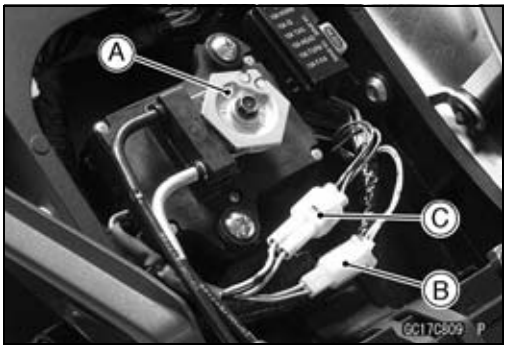

**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Exhaust Butterfly Valve Actuator Sensor Connector [B]**
**BL lead (ECU terminal 7) [C]**
**BR/BK lead (ECU terminal 34) [D]**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

### *Exhaust Butterfly Valve Actuator Sensor Output Voltage Inspection*




**NOTE**

○*Before this inspection, confirm the pulley [A] is original position (see Exhaust Butterfly Valve Actuator Installation).*

- Disconnect:
  2 pins Connector [B]
  3 pins Connector [C]


- Connect the harness adapter [A] between the 3 pins connectors.

**Special Tool - Throttle Sensor Setting Adapter #1: 57001 -1400**

- Connect a digital meter to the harness adapter leads.

**Exhaust Butterfly Valve Actuator Sensor Output Voltage Connections to Adapter:**

**Digital Meter (+) → BL (actuator Y) lead**

**Digital Meter (−) → BK/BL (actuator BK) lead**

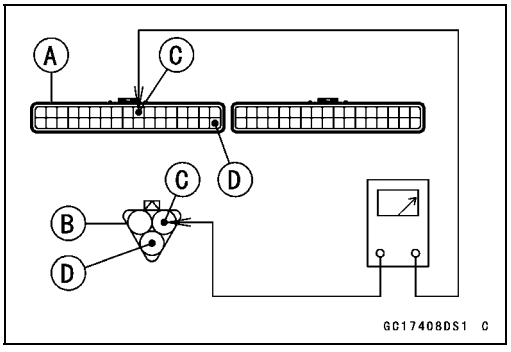
- Measure the output voltage at the 3 pins connector of the exhaust butterfly valve actuator when the pulley is original position.
- Turn the ignition switch ON.

**Output Voltage**

**Standard: DC 3.46 ~ 3.76 V at pulley original position**

- Turn the ignition switch OFF.

★If the reading is out of the standard, check the exhaust butterfly valve actuator sensor resistance (see Exhaust Butterfly Valve Actuator Sensor Resistance Inspection).




★If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**

**ECU Connector (Black) [A] ←→**

**Exhaust Butterfly Valve Actuator Sensor Connector [B]**

**GY lead (ECU terminal 10) [C]**

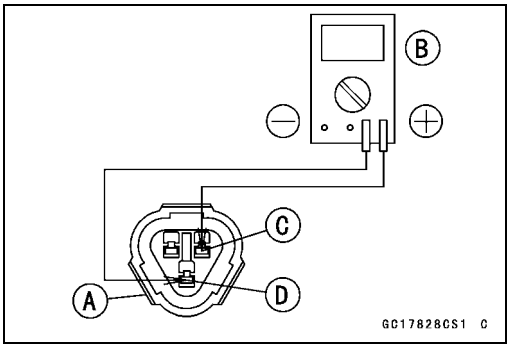
**BR/BK lead (ECU terminal 34) [D]**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Exhaust Butterfly Valve Actuator Sensor (Service Code 34)

### *Exhaust Butterfly Valve Actuator Sensor Resistance Inspection*

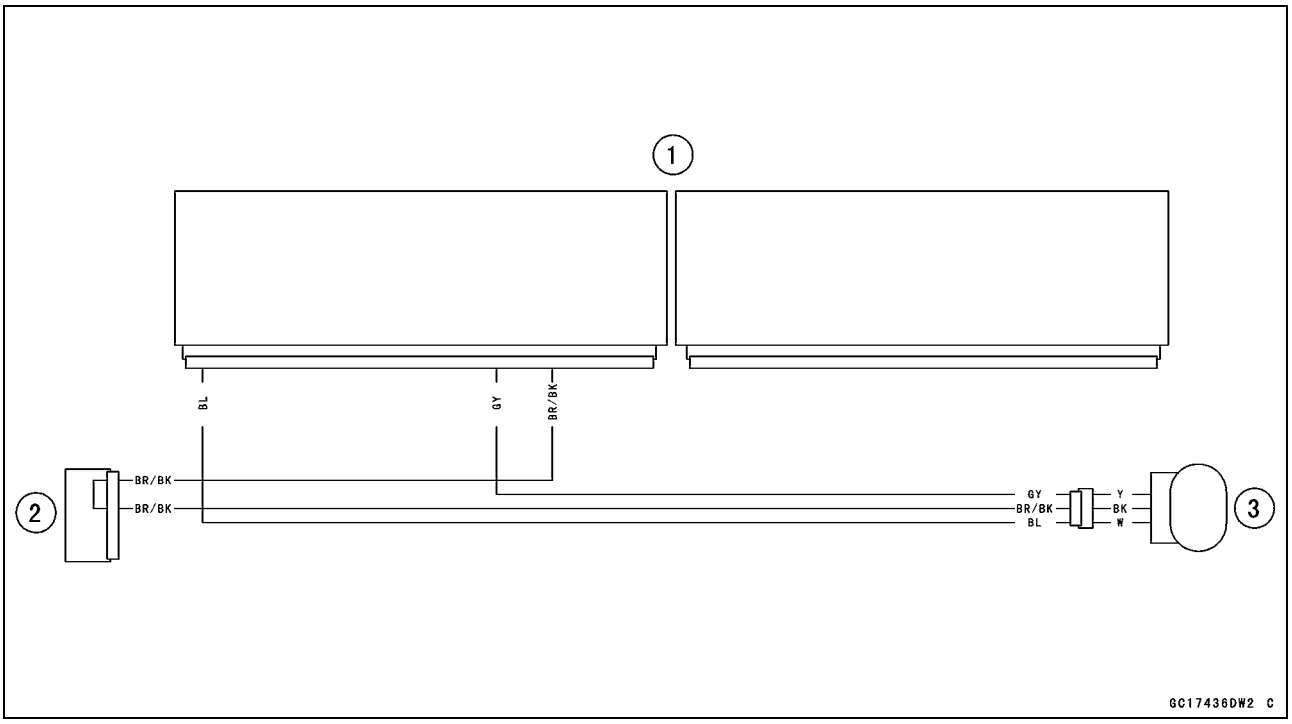



- Turn the ignition switch OFF.
- Disconnect the exhaust butterfly valve actuator sensor connector (3 pins connector) [A].
- Connect a digital meter [B] to the exhaust butterfly valve actuator sensor connector.
- Measure the exhaust butterfly valve actuator sensor resistance.

**Exhaust Butterfly Valve Actuator Sensor Resistance**
**Connections: W lead [C] ←→ BK lead [D]**
**Standard: 4 ~ 6 kΩ**

★If the reading is out of the standard, replace the exhaust butterfly valve actuator.
★If the reading within the standard, but the problem still exists, replace the ECU (see ECU Removal/Installation).

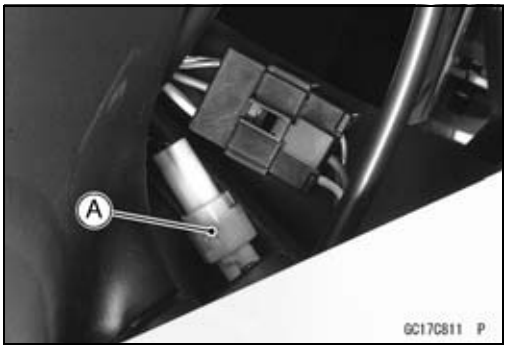
### Exhaust Butterfly Valve Actuator Sensor Circuit




1. ECU
2. Joint Connector 4
3. Exhaust Butterfly Valve Actuator

## Immobilizer Amplifier (Service Code 35, Equipped Models)

### *Antenna Resistance Inspection*

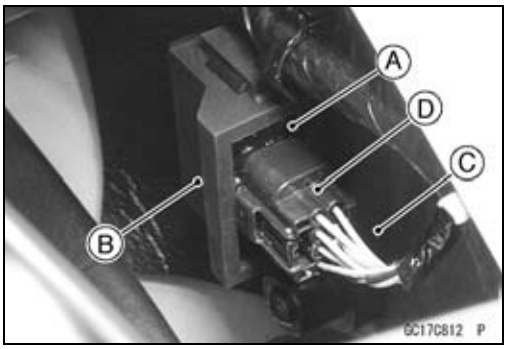



- Turn the ignition switch OFF.
- Remove the right upper inner fairing (see Upper Inner Fairing Removal in the Frame chapter).
- Disconnect the antenna lead connector [A].
- Measure the antenna resistance.

**Antenna Resistance**
**Connections: BK lead ←→ BK lead**
**Standard: About 0.6 ~ 0.9 Ω**

★If the reading is out of the standard, replace the antenna (see Immobilizer System Parts Replacement in the Electrical System chapter).
★If the reading is within the standard, check the wiring to the amplifier (see wiring diagram in next section).
★If the wiring is good, check the input voltage of the amplifier (see Amplifier Input Voltage Inspection).

### *Amplifier Input Voltage Inspection*




**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the right upper inner (see Upper Inner Fairing Removal in the Frame chapter).
- Pull out the immobilizer amplifier [A] with the rubber protector [B] from the bracket [C].
- Connect a digital meter to the amplifier connector [D] with needle adapter set.

**Special Tool - Needle Adapter Set: 57001-1457**

**Amplifier Input Voltage**
**Connections to Amplifier Connector:**
**Digital Meter (+) → BR/W lead**
**Digital Meter (–) → BK/Y lead**

- Measure the input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.

**Input Voltage**
**Standard: Battery Voltage**

- Turn the ignition switch OFF.

★If the reading is out of the standard, check the wiring (see wiring diagram in next section).

**Special Tool - Hand Tester: 57001-1394**

★If the reading is within the standard, check the wiring to ECU (see wiring diagram in next section).

**Special Tool - Hand Tester: 57001-1394**

★If the wiring is good, replace the amplifier (see Immobilizer System Parts Replacement in the Electrical System chapter).

## Blank Key Detection (Service Code 36, Equipped Models)


- This code appears in the following conditions.

○The transponder [A] in the master and/or user key is malfunction.

○When the spare key of unregistration is used.

○When the master key is registered in the registered ECU.

- Therefore, the service code 36 will disappear when the above issue is solved.

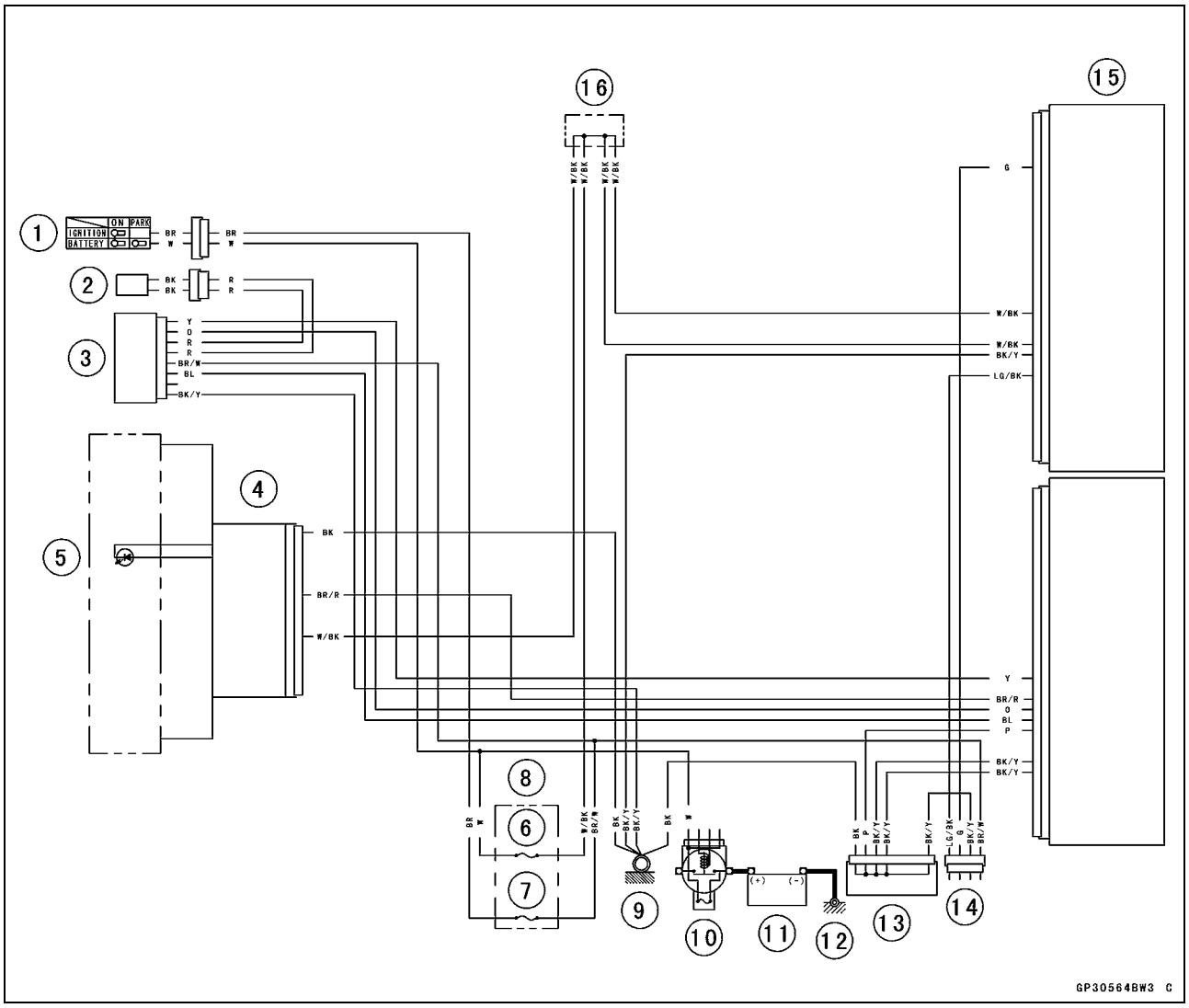
### *User Key Inspection*

- Register the user key correctly (see Key Registration in the Electrical System chapter).

★If the service code 36 appears again, the transponder in the key is malfunction, replace it.

## Blank Key Detection (Service Code 36, Equipped Models)

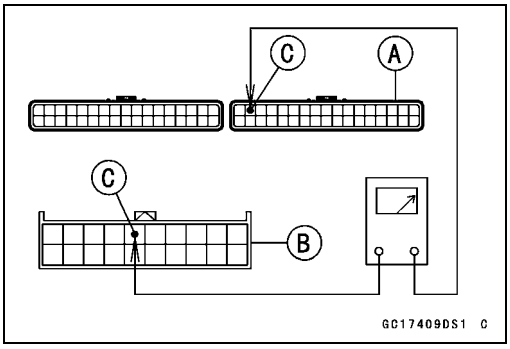
### Immobilizer System Circuit




1. Ignition Switch
2. Immobilizer Antenna
3. Immobilizer Amplifier
4. Meter Unit
5. Warning Indicator Light (LED)
6. ECU Fuse 10 A
7. Ignition Fuse 15 A
8. Fuse Box
9. Frame Ground 1
10. Main Fuse 30 A
11. Battery 12 V 10 Ah
12. Engine Ground
13. Water-proof Joint 1
14. Immobilizer/Kawasaki Diagnostic System Connector
15. ECU
16. Water-proof Joint 2

## ECU Communication Error (Service Code 39)

### *ECU Communication Line Inspection*




○When the data is not sent from the ECU to the meter unit for more than about 10 seconds, the service code 39 is displayed.

○The service code 39 is detected with meter unit.

● Remove the ECU and meter unit, check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

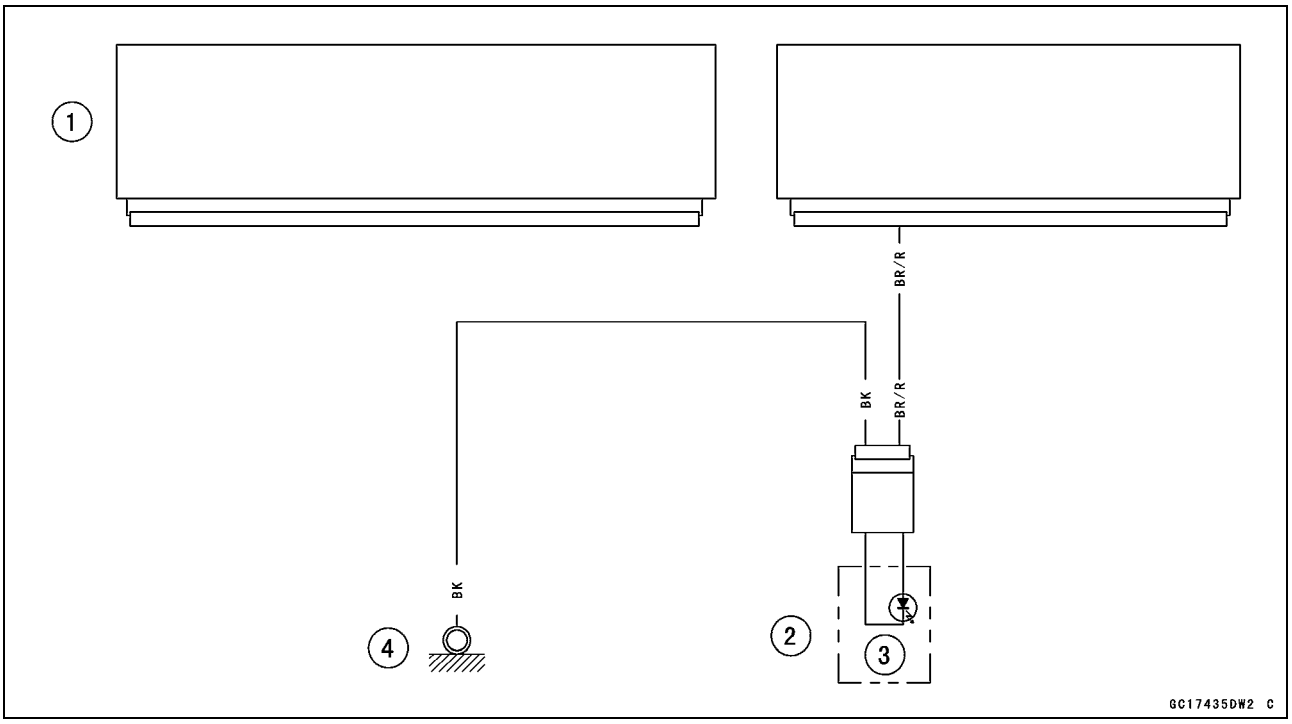
○Disconnect the ECU and meter unit connectors.

**Wiring Continuity Inspection**
**ECU Connector (Gray) [A] ←→**
**Meter Unit Connector [B]**
**BR/R lead (ECU terminal 36) [C]**

★If the wiring is good, check the meter unit (see Meter Unit Inspection in the Electrical System chapter).

★If the meter unit is normal, replace the ECU (see ECU Removal/Installation).

### ECU Communication Line Circuit




1. ECU
2. Meter Unit
3. Warning Indicator Light (LED)
4. Frame Ground 1

## Fuel Pump Relay (Service Code 46)

### *Fuel Pump Relay Removal/Installation*


○The fuel pump relay is built in the relay box [A].

● Refer to the Relay Box Removal in the Electrical System chapter.

### *Fuel Pump Relay Inspection*

● Refer to the Relay Circuit Inspection in the Electrical System chapter.

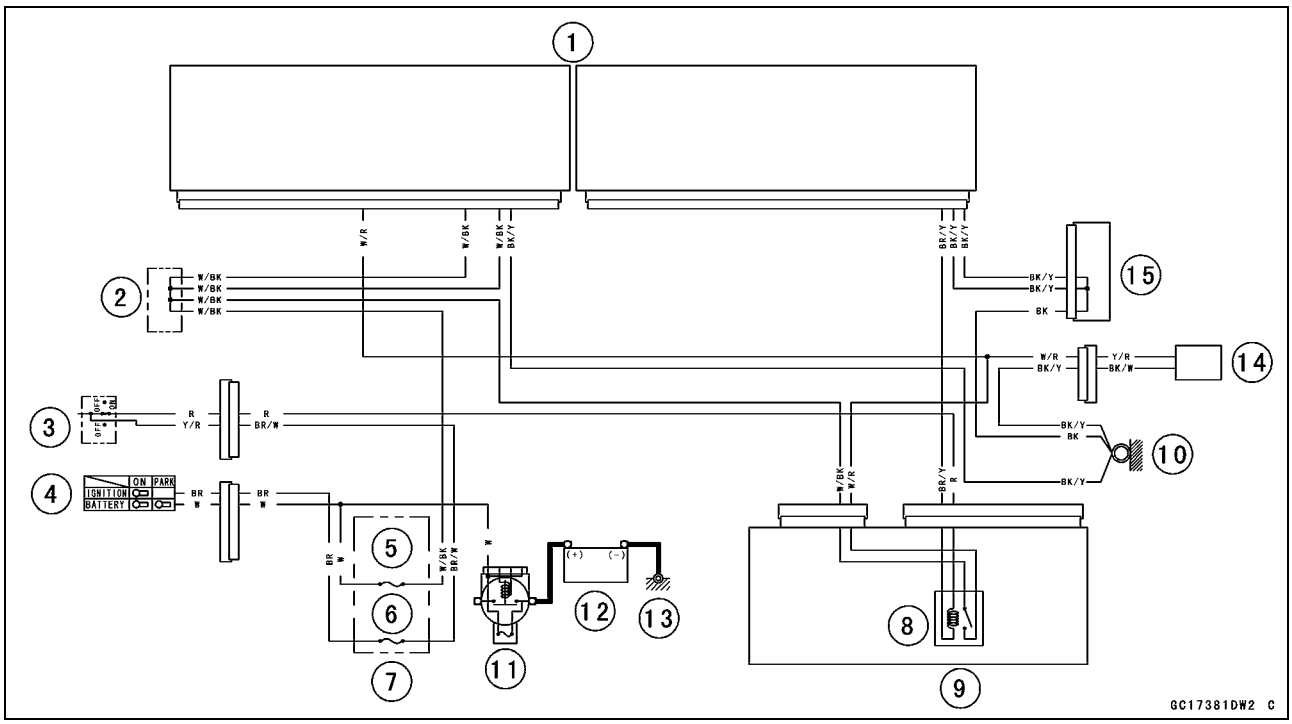
★If the fuel pump relay is normal, check the wiring for continuity (see wiring diagram in this section).

**Special Tool - Hand Tester: 57001-1394**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

### Fuel Pump Relay Circuit




1. ECU
2. Water-proof Joint 2
3. Engine Stop Switch
4. Ignition Switch
5. ECU Fuse 10 A
6. Ignition Fuse 15 A
7. Fuse Box
8. Fuel Pump Relay
9. Relay Box
10. Frame Ground 1
11. Main Fuse 30 A
12. Battery 12 V 10 Ah
13. Engine Ground
14. Fuel Pump
15. Water-proof Joint 1

## Stick Coils #1, #2, #3, #4 (Service Code 51, 52, 53, 54)

Stick Coil #1: Service Code 51
Stick Coil #2: Service Code 52
Stick Coil #3: Service Code 53
Stick Coil #4: Service Code 54

### *Stick Coil Removal/Installation*

- Refer to the Stick Coil Removal/Installation in the Electrical System chapter.

### *Stick Coil Primary Winding Resistance Inspection*

- Refer to the Stick Coil Inspection in the Electrical System chapter.

★If the reading is within the standard, check the input voltage (see Stick Coil Input Voltage Inspection).

### *Stick Coil Input Voltage Inspection*

**NOTE**

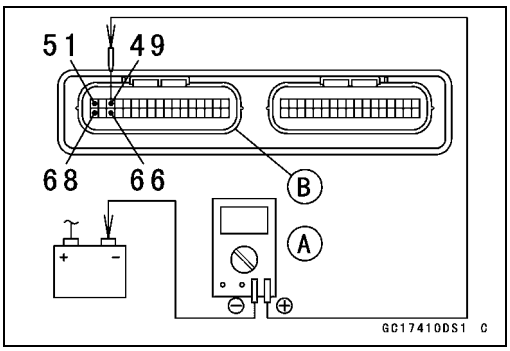
○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the ECU (see ECU Removal).

○Do not disconnect the ECU connectors.

- Connect a digital meter [A] to the connector [B] with the needle adapter set.

**Special Tool - Needle Adapter Set: 57001-1457**




**Stick Coil Input Voltage**
**Connections to ECU Connector:**
**For Stick Coil #1**
**Digital Meter (+) → BK lead (terminal 49)**
**Digital Meter (–) → Battery (–) terminal**
**For Stick Coil #2**
**Digital Meter (+) → BK/G lead (terminal 51)**
**Digital Meter (–) → Battery (–) terminal**
**For Stick Coil #3**
**Digital Meter (+) → BK/W lead (terminal 66)**
**Digital Meter (–) → Battery (–) terminal**
**For Stick Coil #4**
**Digital Meter (+) → BK/O lead (terminal 68)**
**Digital Meter (–) → Battery (–) terminal**

- Measure the input voltage to each primary winding of the stick coils with the engine stopped, and with the connectors joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

**Input Voltage**
**Standard: Battery Voltage**

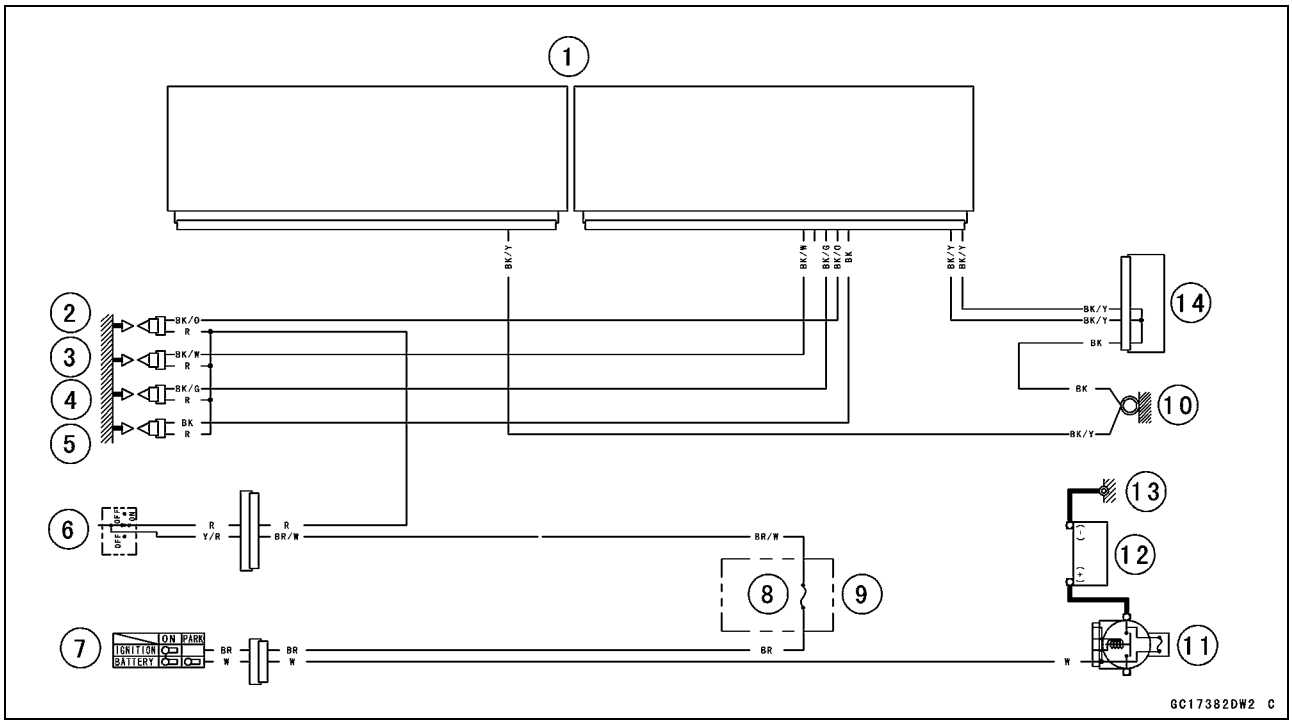
## Stick Coils #1, #2, #3, #4 (Service Code 51, 52, 53, 54)

● Turn the ignition switch OFF.
★If the input voltage is out of the standard, check the wiring for continuity (see wiring diagram in this section).

**Special Tool - Hand Tester: 57001-1394**

★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).
★If the input voltage is within the standard, check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

### Stick Coil Circuit




1. ECU
2. Stick Coil #4
3. Stick Coil #3
4. Stick Coil #2
5. Stick Coil #1
6. Engine Stop Switch
7. Ignition Switch
8. Ignition Fuse 15 A
9. Fuse Box
10. Frame Ground 1
11. Main Fuse 30 A
12. Battery 12 V 10 Ah
13. Engine Ground
14. Water-proof Joint 1

## Radiator Fan Relay (Service Code 56)

### *Radiator Fan Relay Removal/Installation*


○The radiator fan relay is built in the relay box [A].

● Refer to the Relay Box Removal in the Electrical System chapter.

### *Radiator Fan Relay Inspection*

● Refer to the Relay Circuit Inspection in the Electrical System chapter.

★If the radiator fan relay is normal, check the wiring for continuity (see wiring diagram in this section).

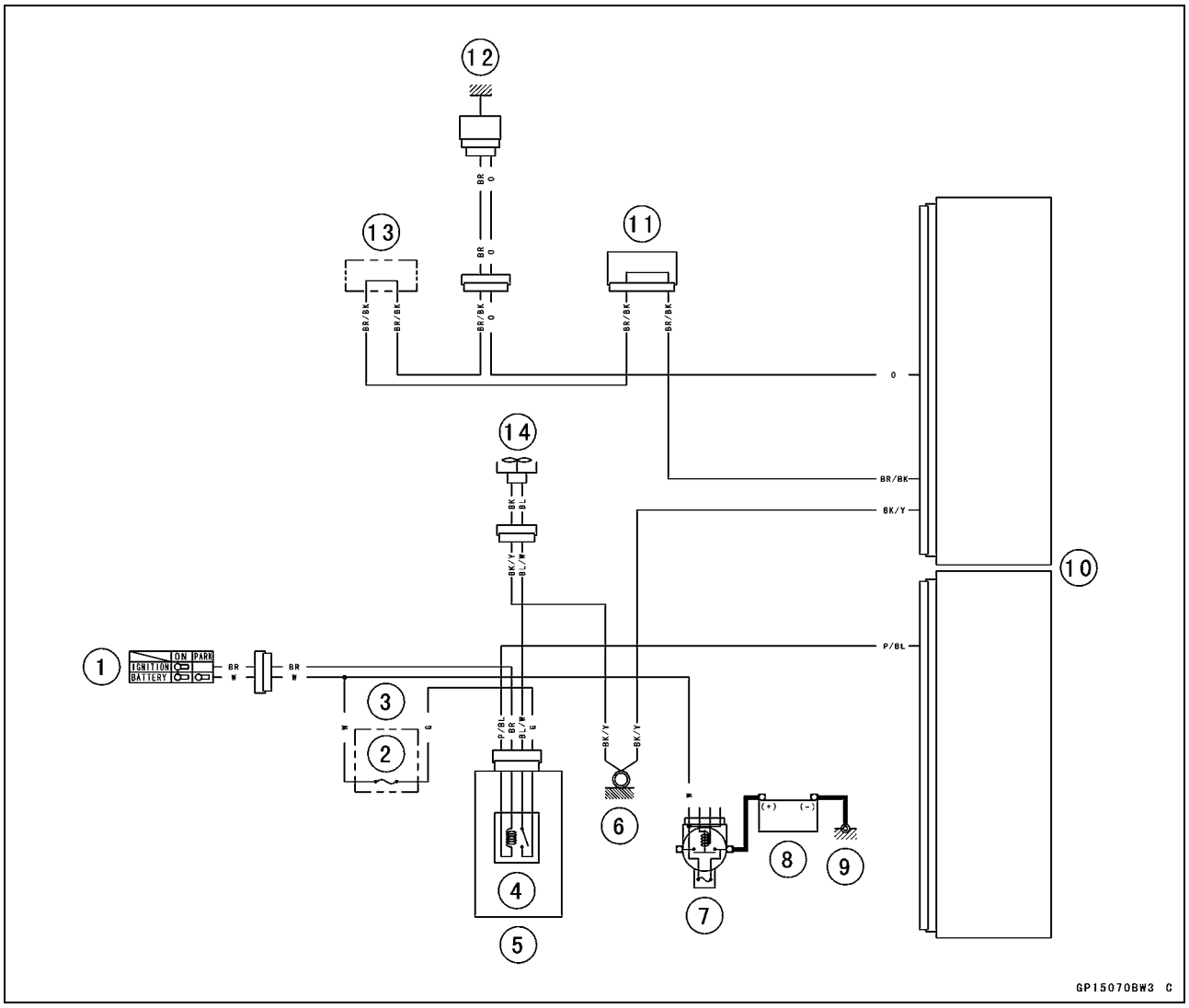
**Special Tool - Hand Tester: 57001-1394**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Radiator Fan Relay (Service Code 56)

### Radiator Fan Relay Circuit




1. Ignition Switch
2. Fan Fuse 15 A
3. Fuse Box
4. Fan Relay
5. Relay Box
6. Frame Ground 1
7. Main Fuse 30 A
8. Battery 12 V 10 Ah
9. Engine Ground
10. ECU
11. Joint Connector 4
12. Water Temperature Sensor
13. Joint Connector 3
14. Fan Motor

## Subthrottle Valve Actuator (Service Code 62)

### *Subthrottle Valve Actuator Removal*

**CAUTION**

**Do not remove the subthrottle valve actuator [A] since it has been adjusted and set with precision at the factory.**
**Never drop the throttle body assy, especially on a hard surface. Such a shock to the subthrottle valve actuator can damage it.**

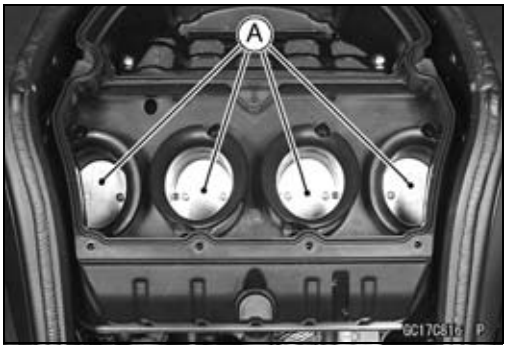

### *Subthrottle Valve Actuator Inspection*

**NOTE**

○*Be sure the battery is fully charged.*

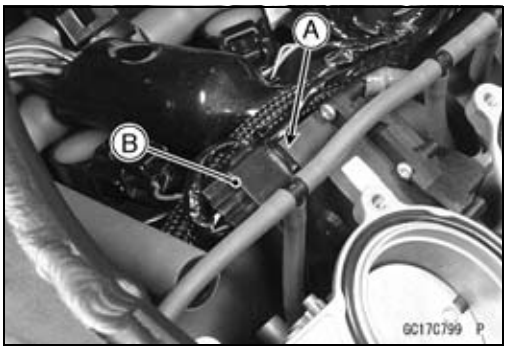
- Remove the upper air cleaner housing (see Air Cleaner Housing Removal).
- Turn the ignition switch ON.
- Check to see that all the subthrottle valves [A] open and close smoothly.
- Turn the ignition switch OFF.

★If the subthrottle valves do not operate, check the subthrottle valve actuator resistance (see Subthrottle Valve Actuator Resistance Inspection).



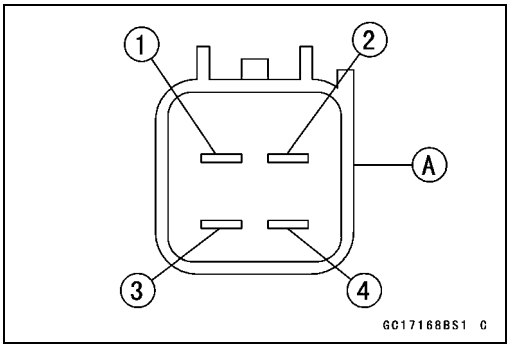

### *Subthrottle Valve Actuator Resistance Inspection*

- Turn the ignition switch OFF.
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Cut the band [A], and disconnect the subthrottle valve actuator connector [B].




- Connect a digital meter to the subthrottle valve actuator connector [A].
- Measure the subthrottle valve actuator resistance.

**Subthrottle Valve Actuator Resistance**
**Connections: Y/BK lead [1] ←→ P lead [2]**
**G lead [3] ←→ BK/BL lead [4]**
**Standard: About 6.3 ~ 9.5 Ω**




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

★If the reading is within the standard, check the input voltage (see Subthrottle Valve Actuator Input Voltage Inspection).

## Subthrottle Valve Actuator (Service Code 62)

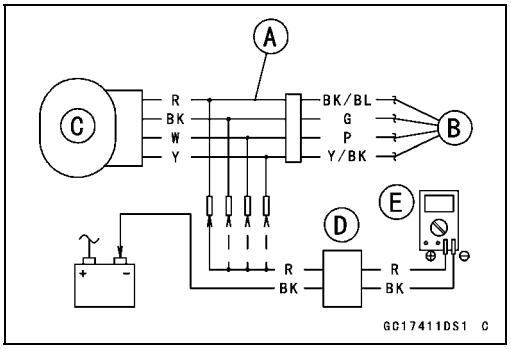
### *Subthrottle Valve Actuator Input Voltage Inspection*


**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Disconnect the subthrottle valve actuator connector and connect the harness adapter [A] between these connectors as shown in the figure.
  Main Harness [B]
  Subthrottle Valve Actuator [C]

**Special Tool - Measuring Adapter: 57001-1700**




- Connect the peak voltage adapter [D] and a digital meter [E] to the harness adapter leads.

**Special Tool - Peak Voltage Adapter: 57001-1415**
**Type: KEK-54-9-B**

**Subthrottle Valve Actuator Input Voltage**
**Connections to Adapter:**

**(I) Digital Meter (+) → R (actuator BK/BL) lead**
**Digital Meter (–) → Battery (–) terminal**
**(II) Digital Meter (+) → BK (actuator G) lead**
**Digital Meter (–) → Battery (–) terminal**
**(III) Digital Meter (+) → W (actuator P) lead**
**Digital Meter (–) → Battery (–) terminal**
**(IV) Digital Meter (+) → Y (actuator Y/BK) lead**
**Digital Meter (–) → Battery (–) terminal**

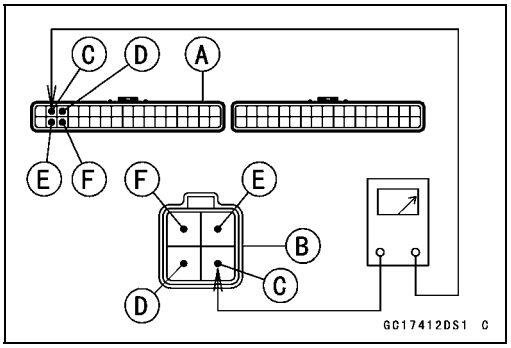
- Measure the actuator input voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.

**Input Voltage**
**Standard: About DC 8.5 ~ 10.5 V, and then 0 V**

- Turn the ignition switch OFF.

★If the reading is in specification, but the actuator does not operate, replace the throttle body assy.

★If the reading is out of the specification, remove the ECU and check the wiring for continuity between main harness connector.




**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and actuator connectors.

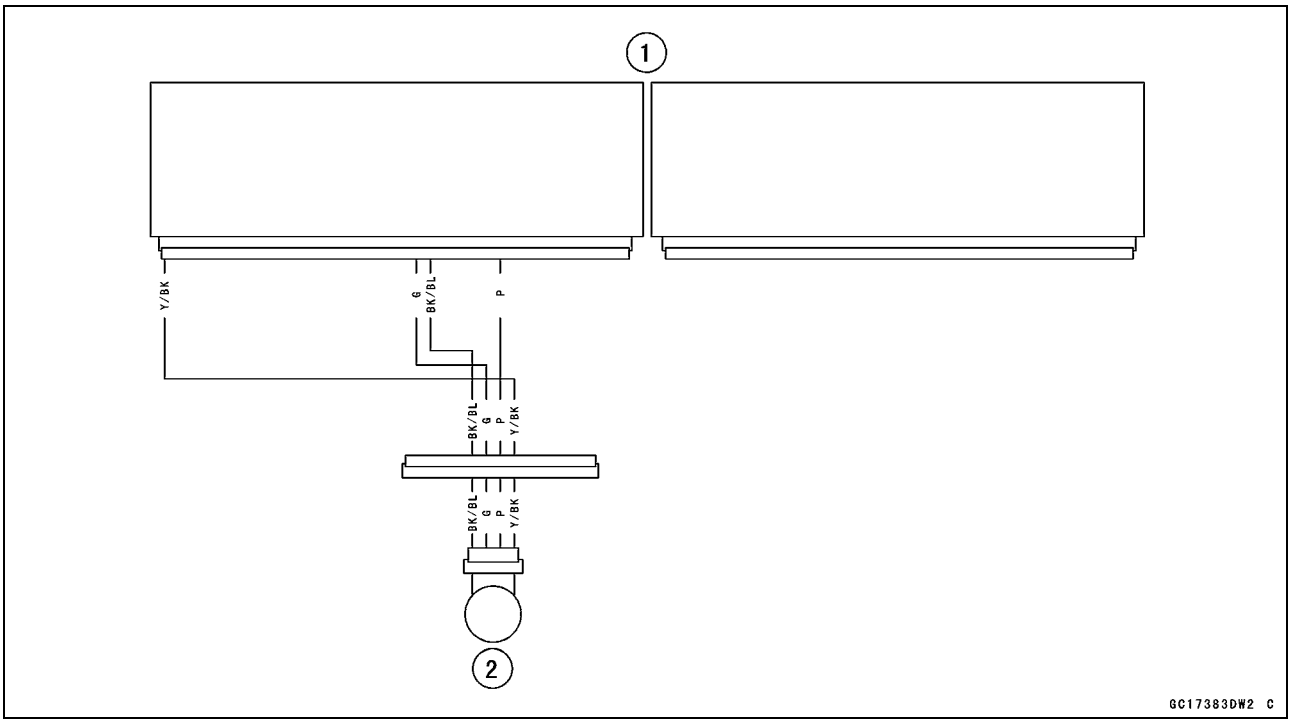
**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Subthrottle Valve Actuator Connector [B]**
**G lead (ECU terminal 2) [C]**
**BK/BL lead (ECU terminal 3) [D]**
**Y/BK lead (ECU terminal 19) [E]**
**P lead (ECU terminal 20) [F]**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Subthrottle Valve Actuator (Service Code 62)

### Subthrottle Valve Actuator Circuit



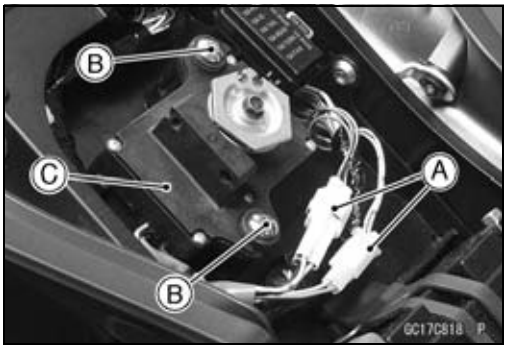

1. ECU
2. Subthrottle Valve Actuator

## Exhaust Butterfly Valve Actuator (Service Code 63)

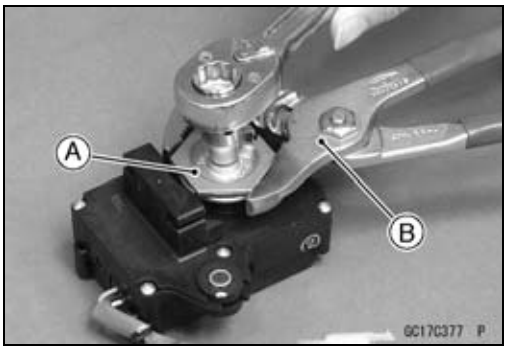
### *Exhaust Butterfly Valve Actuator Removal*

**CAUTION**

**Never drop the exhaust butterfly valve actuator, especially on a hard surface. Such a shock to the actuator can damage it.**




- Remove:
  Exhaust Butterfly Valve Cable Upper Ends (see Exhaust Butterfly Valve Cable Removal in the Engine Top End chapter)
  Connectors [A]
  Screws [B]
  Exhaust Butterfly Valve Actuator [C]



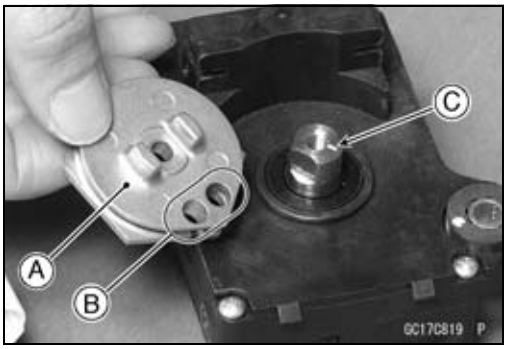

- Remove the pulley bolt while holding the pulley [A] with the suitable tool [B].

**CAUTION**

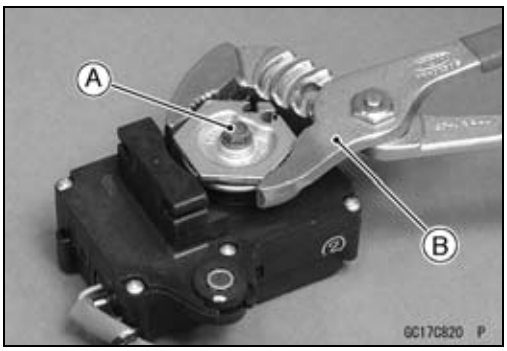
**If the pulley bolt is removed without holding, the actuator damage will occur.**

- Remove the pulley from the actuator.

### *Exhaust Butterfly Valve Actuator Installation*




- Install the pulley [A] on the actuator so that the hole side [B] align with the groove [C] on the shaft.




- Tighten the pulley bolt [A] while holding the pulley with the suitable tool [B].

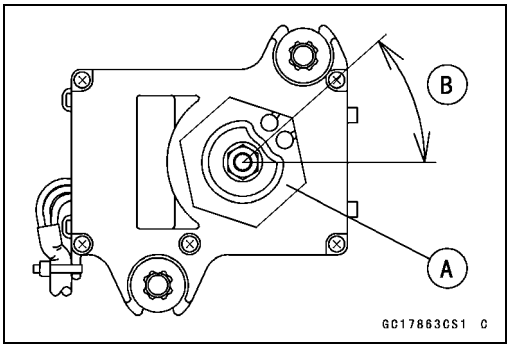
**Torque - Exhaust Butterfly Valve Actuator Pulley Bolt: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

**CAUTION**

**If the pulley bolt is tightened without holding, the actuator damage will occur.**

## Exhaust Butterfly Valve Actuator (Service Code 63)

● After tightening the pulley bolt, confirm whether pulley [A] is an angle shown in the figure.
41.7° ±7° [B]
○This position is original position of the pulley.




**NOTE**

○*Correct the position electrically after confirming the use is discontinued and there is no damage when differing from the angle of shown in the figure.*

**CAUTION**

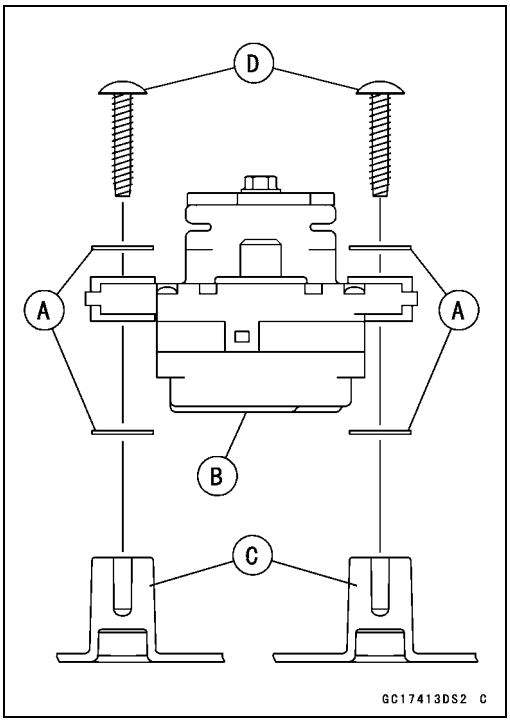
**Do not correct the pulley position with the tool, forcibly. The actuator damage will occur.**

★If the pulley angle is wrong, adjust the angle as follows.
○Connect:
2 pins Connector
3 pins Connector
○Turn the ignition switch ON.
○The pulley turns clockwise and then counterclockwise, and clockwise again.
○Turn the ignition switch OFF.
○Confirm that the pulley turns counterclockwise and the pulley returns to the original position.
★If the position is not within the specified angle above, replace the exhaust butterfly valve actuator.

● Be sure to install the washers [A] on the exhaust butterfly valve actuator [B] and rear fender front [C].
● Tighten:

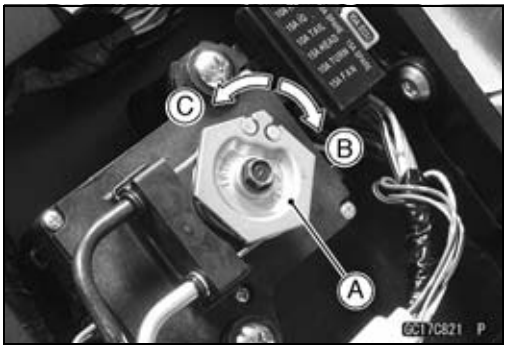
**Torque - Exhaust Butterfly Valve Actuator Mounting Screws [D]: 4.3 N ·m (0.44 kgf ·m, 38 in·lb)**

● Install the upper ends of the exhaust butterfly valve cables and adjust them (see Exhaust Butterfly Valve Cable Installation in the Engine Top End chapter).



## Exhaust Butterfly Valve Actuator (Service Code 63)

### *Exhaust Butterfly Valve Actuator Inspection*




**NOTE**

○*Be sure the battery is fully charged*

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Turn the ignition switch ON.
- Check to see the pulley [A] turns clockwise [B] and counterclockwise [C] smoothly.

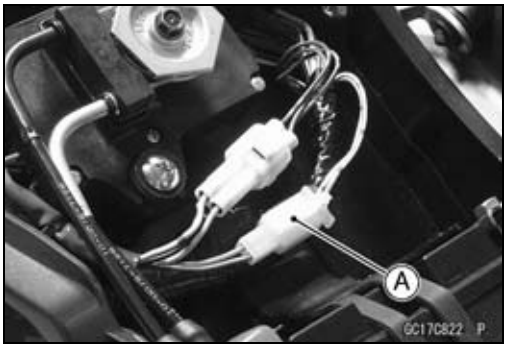
○The pulley turns clockwise and then counterclockwise, and clockwise again.

- Turn the ignition switch OFF.

○The pulley turns counterclockwise.

★If the pulley does not operate, check the exhaust butterfly valve actuator resistance (see Exhaust Butterfly Valve Actuator Inspection Resistance Inspection).

### *Exhaust Butterfly Valve Actuator Resistance Inspection*




- Turn the ignition switch OFF.
- Disconnect the exhaust butterfly valve actuator lead connector (2 pins connector) [A].
- Set the hand tester to the × 1 Ω range and connect it to the exhaust butterfly valve actuator connector.

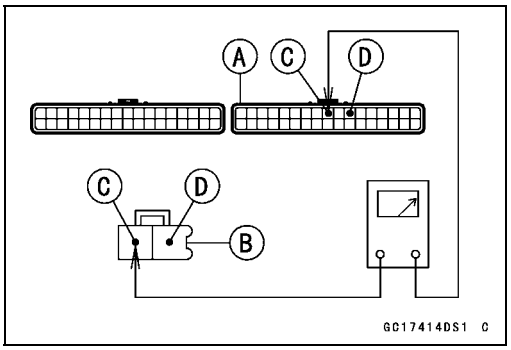
**Special Tool - Hand Tester: 57001-1394**

- Measure the exhaust butterfly valve actuator resistance.

**Exhaust Butterfly Valve Actuator Resistance**

| | |
|---|---|
| **Connections:** | **P lead ←→ GY lead** |
| **Standard:** | **Any Reading Resistance (reference 5 ~ 200 Ω)** |

★If the reading is 0 or infinity (∞) Ω, replace the exhaust butterfly valve actuator.




★If the reading is in specification, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and actuator connectors.

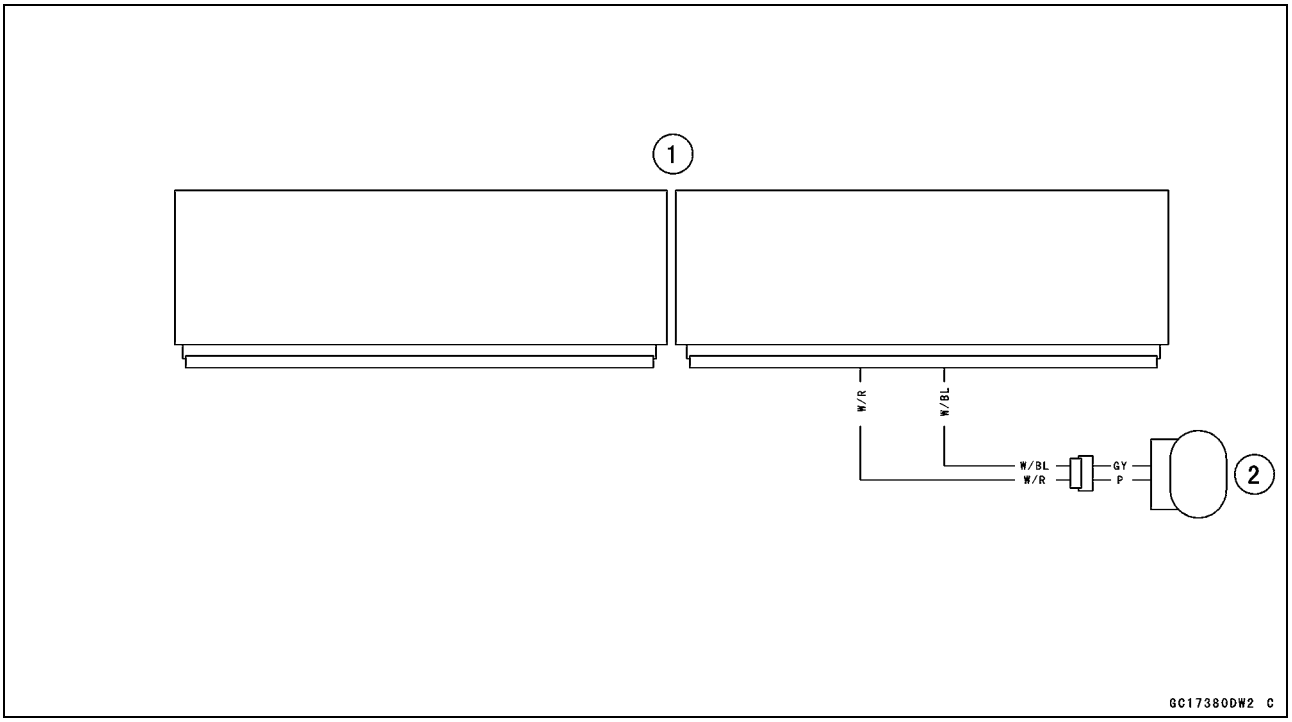
**Wiring Continuity Inspection**
**ECU Connector (Gray) [A] ←→**
**Exhaust Butterfly Valve Actuator Connector [B]**
**W/R lead (ECU terminal 43) [C]**
**W/BL lead (ECU terminal 45) [D]**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Exhaust Butterfly Valve Actuator (Service Code 63)

### Exhaust Butterfly Valve Actuator Circuit




1. ECU
2. Exhaust Butterfly Valve Actuator

## Air Switching Valve (Service Code 64)

### *Air Switching Valve Removal/Installation*

- Refer to the Air Switching Valve Removal/Installation in the Engine Top End chapter.

### *Air Switching Valve Inspection*

- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

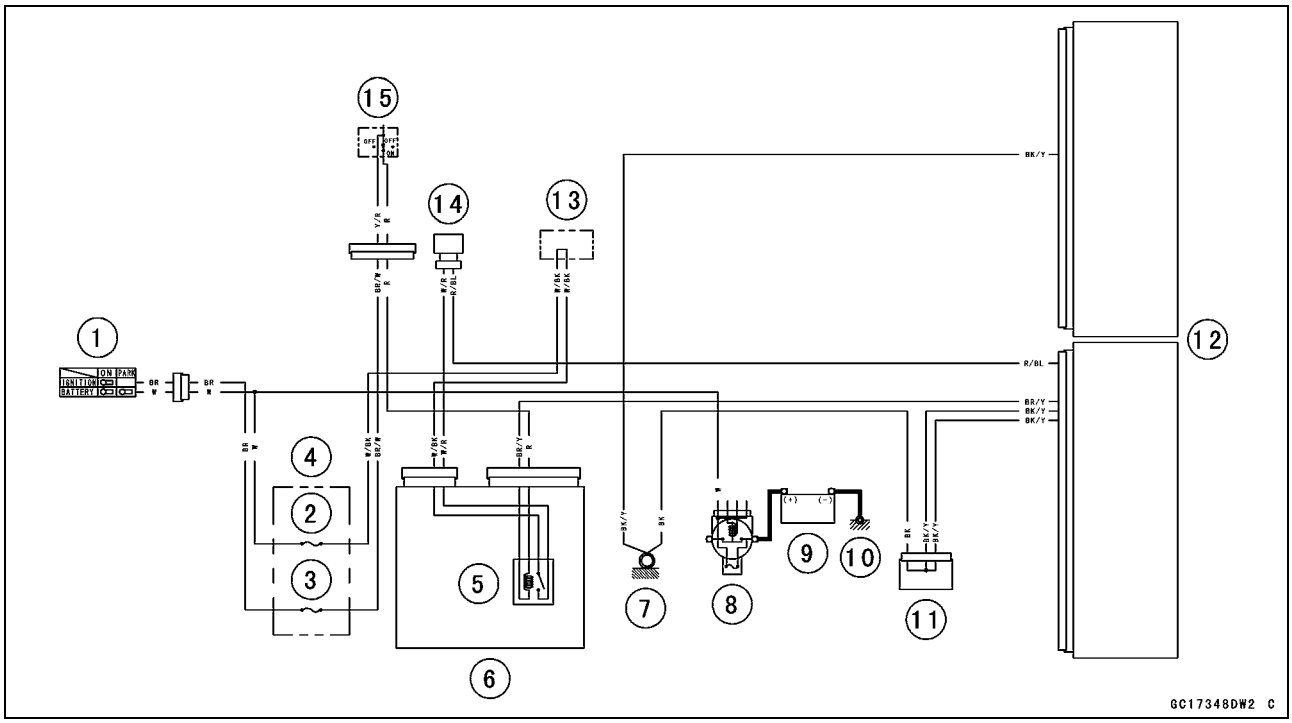
★If the air switching valve is normal, check the wiring for continuity, using the wiring diagram in this section.

**Special Tool - Hand Tester: 57001-1394**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

### Air Switching Valve Circuit



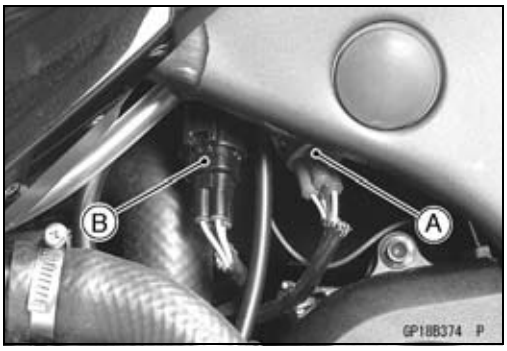

1. Ignition Switch
2. ECU Fuse 10 A
3. Ignition Fuse 15 A
4. Fuse Box
5. Fuel Pump Relay
6. Relay Box
7. Frame Ground 1
8. Main Fuse 30 A
9. Battery 12 V 10 Ah
10. Engine Ground
11. Water-proof Joint 1
12. ECU
13. Water-proof Joint 2
14. Air Switching Valve
15. Engine Stop Switch

## Oxygen Sensor Heater #1 and/or #2 (Service Code 67, Equipped Models)

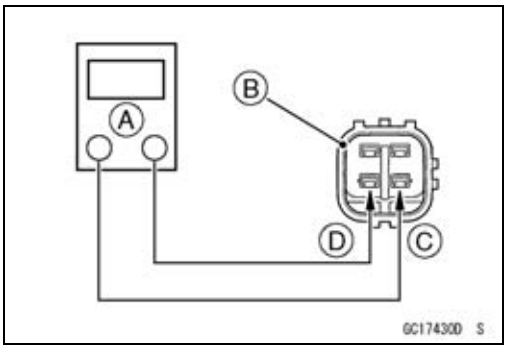
### *Oxygen Sensor Heater Removal/Installation*

The oxygen sensor heater is built in the oxygen sensor. So, the heater itself can not be removed. Remove the oxygen sensor (see Oxygen Sensor Removal (Equipped Models) in the Electrical System chapter).

### *Oxygen Sensor Heater Resistance Inspection*




- Turn the ignition switch OFF.
- Disconnect:
  Oxygen Sensor #1 Lead Connector (Gray) [A]
  Oxygen Sensor #2 Lead Connector (Black) [B]




- Connect a digital meter [A] to the terminals in each oxygen sensor lead connector [B].
- Measure the oxygen sensor heater resistance.

**Oxygen Sensor Heater #1 and #2 Resistance**
**Connections: W lead [C] ←→ W lead [D]**
**Standard: 6.7 ~ 10.5 Ω at 20° (68°F)**

★If the reading is out of the standard, replace the sensor.
★If the reading is within the standard, check the power source voltage (see Oxygen Sensor Heater Power Source Voltage Inspection).

## Oxygen Sensor Heater #1 and/or #2 (Service Code 67, Equipped Models)

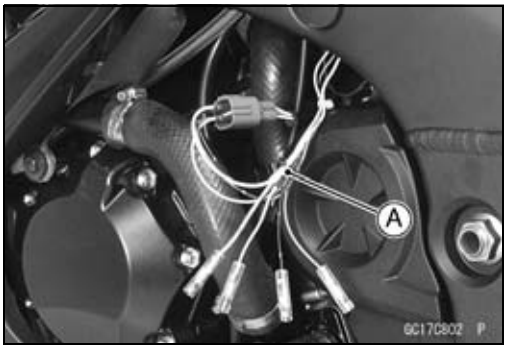
### *Oxygen Sensor Heater Power Source Voltage Inspection*

**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Disconnect the oxygen sensor #1 and #2 lead connectors and connect the harness adapter [A] between these connectors as shown in the figure.
  Main Harness [B]
  Oxygen Sensor #1 [C]
  Oxygen Sensor #2 [D]

**Special Tool - Measuring Adapter: 57001-1700**

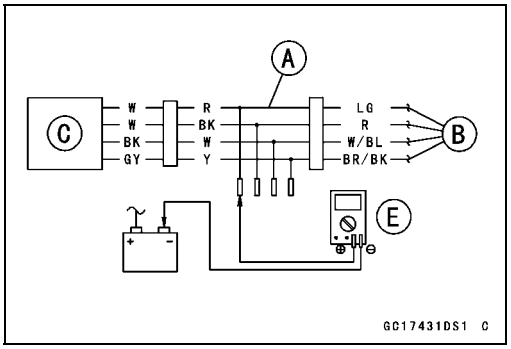



- Connect a digital meter [E] to the harness adapter leads.

**Oxygen Sensor Heater #1 and #2 Power Source Voltage Connections to Adapter:**

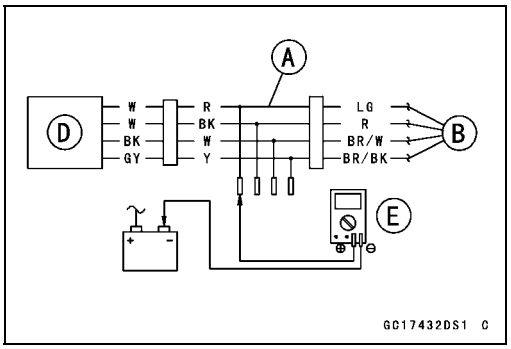
**Digital Meter (+) → R (main harness LG) lead**

**Digital Meter (–) → Battery (–) terminal**




- Measure the power source voltage with the engine stopped and with the connector joined.
- Turn the ignition switch ON.

**Power Source Voltage**
**Standard: Battery Voltage**




- Turn the ignition switch OFF.

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

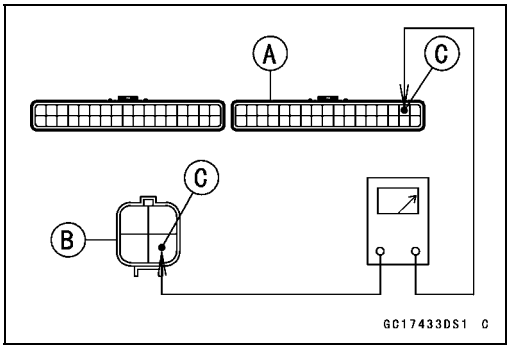
★If the reading is out of the standard, check the following.
Oxygen Sensor Heater Fuse 10 A (see Fuse Inspection in the Electrical System chapter)
Power Source Wiring (see wiring diagram in this section)

★If the fuse and wiring are good, remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**
**ECU Connector (Gray) [A] ←→**
**Oxygen Sensor #1 and #2 Connectors [B]**
**R lead (ECU terminal 50) [C]**

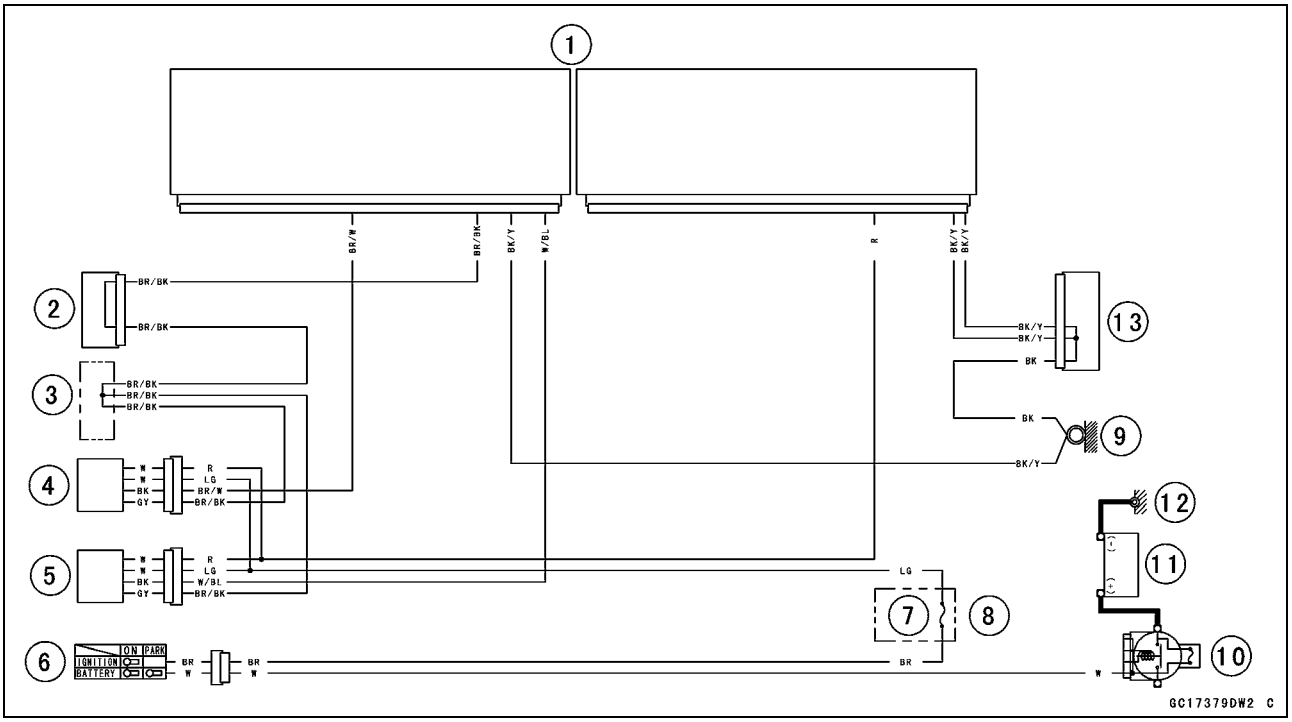



★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Oxygen Sensor Heater #1 and/or #2 (Service Code 67, Equipped Models)

### Oxygen Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Oxygen Sensor #2
5. Oxygen Sensor #1
6. Ignition Switch
7. Oxygen Sensor Heater Fuse 10 A
8. Fuse Box
9. Frame Ground 1
10. Main Fuse 30 A
11. Battery 12 V 10 Ah
12. Engine Ground
13. Water-proof Joint 1

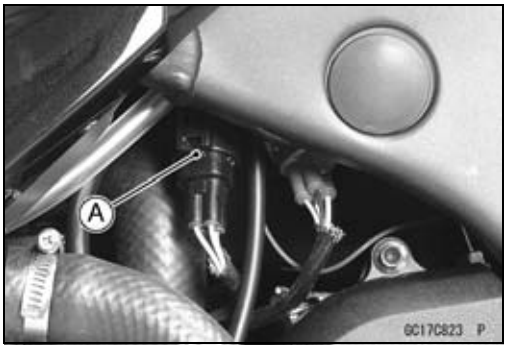
## Oxygen Sensor #2 - not activated (Service Code 83, Equipped Models)

### *Oxygen Sensor #2 Removal/Installation*

● Refer to the Oxygen Sensor Removal/Installation (Equipped Models) in the Electrical System chapter.

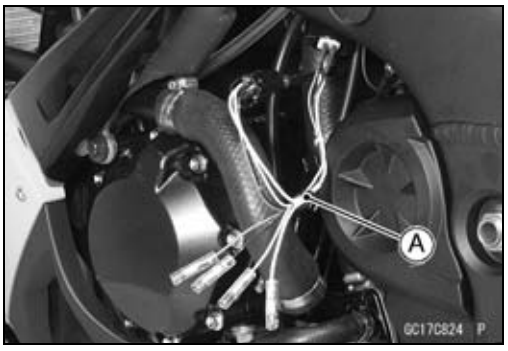
### *Oxygen Sensor #2 Inspection*

● Warm up the engine thoroughly until the radiator fan starts.
● Turn the ignition switch OFF.
● Remove:
Middle Air Cleaner Housing (see Air Cleaner Housing Removal)
Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
Oxygen Sensor #2 Lead Connector (Black) [A]



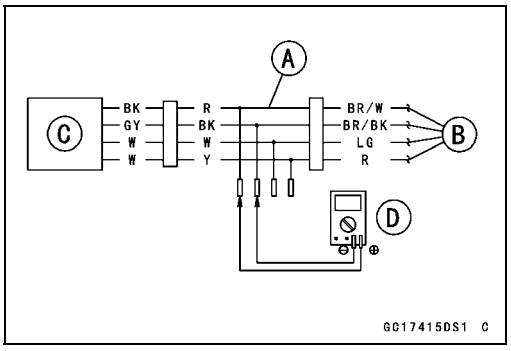

● Connect the harness adapter [A] between the main harness connector and oxygen sensor #2 lead connector as shown in the figure.
Main Harness [B]
Oxygen Sensor #2 [C]

**Special Tool - Measuring Adapter: 57001-1700**

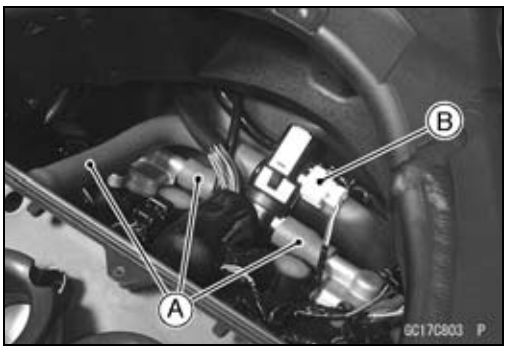



● Connect a digital meter [D] to the harness adapter leads.

**Oxygen Sensor #2 Output Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (sensor BK) lead**
**Digital Meter (−) → BK (sensor GY) lead**

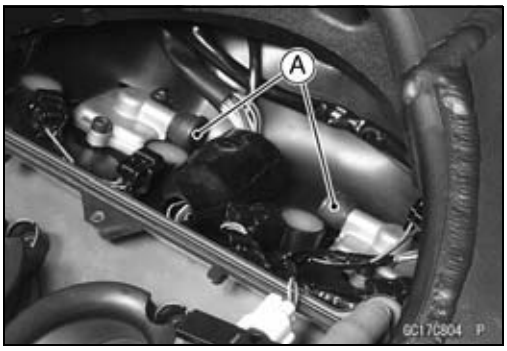



● Separate the air switching valve hoses [A] from the air suction valve covers and lower air cleaner housing.
○Do not disconnect the air switching valve connector [B].



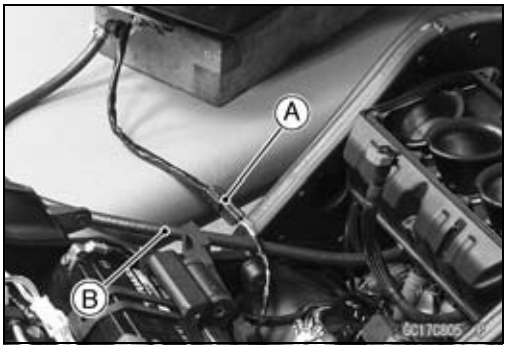
## Oxygen Sensor #2 - not activated (Service Code 83, Equipped Models)

● Install the suitable plugs [A] on the fitting of the air suction valve covers, and shut off the secondary air.




● Connect the following parts temporarily.
Fuel Pump Lead Connector [A]
Extension Tube [B]

**Special Tool - Extension Tube: 57001-1578**




● Connect the following parts temporarily.
Inlet Air Temperature Sensor Connector [A]
Secondary Fuel Hose [B] (see Fuel Hose Replacement in the Periodic Maintenance Chapter)

**NOTE**

○*Be sure to connect the inlet air temperature sensor connector. When the ignition switch is turned ON with inlet air temperature sensor connector disconnected, the ECU detects the service code 13. (see Self-diagnosis).*

○*Do not connect the secondary fuel injector connectors. The oxygen sensor #1 is inspected with the middle air cleaner housing removed and the engine started. The secondary fuel injectors are operating with following conditions.*

1. The engine speed is more than 6 000 r/min (rpm).
2. The throttle opening is more than 30°.


**⚠ WARNING**

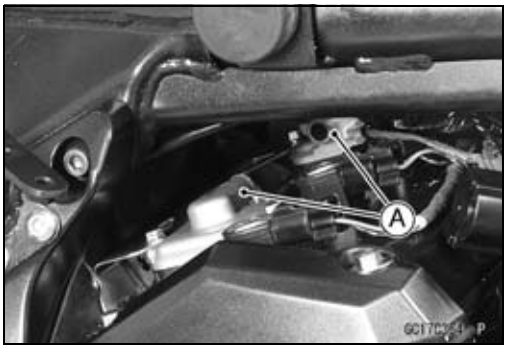
**Gasoline is extremely flammable and can be explosive under certain condition. Especially, the gasoline jetted from the secondary fuel injector is extremely flammable for atomizing the gasoline by the injector.**

● Start the engine, and let it idle.
● Measure the output voltage with the connector joined.

**Output Voltage (with Plugs)**
**Standard: DC 0.8 V or more**

## Oxygen Sensor #2 - not activated (Service Code 83, Equipped Models)

● Next, remove the plugs from the fittings [A] with idling.
● Measure the output voltage with the connector joined.



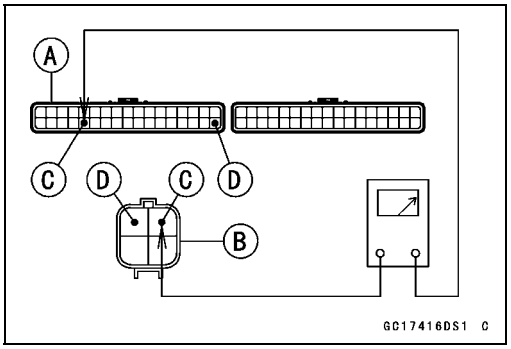

**Output Voltage (without Plugs)**
**Standard: DC 0.24 V or less**

● Turn the ignition switch OFF.

★If the reading is out of the standard (with plugs: 0.8 V or more, without plugs: 0.24 V or less), remove the ECU and check the wiring for continuity between main harness connectors.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and sensor connectors.

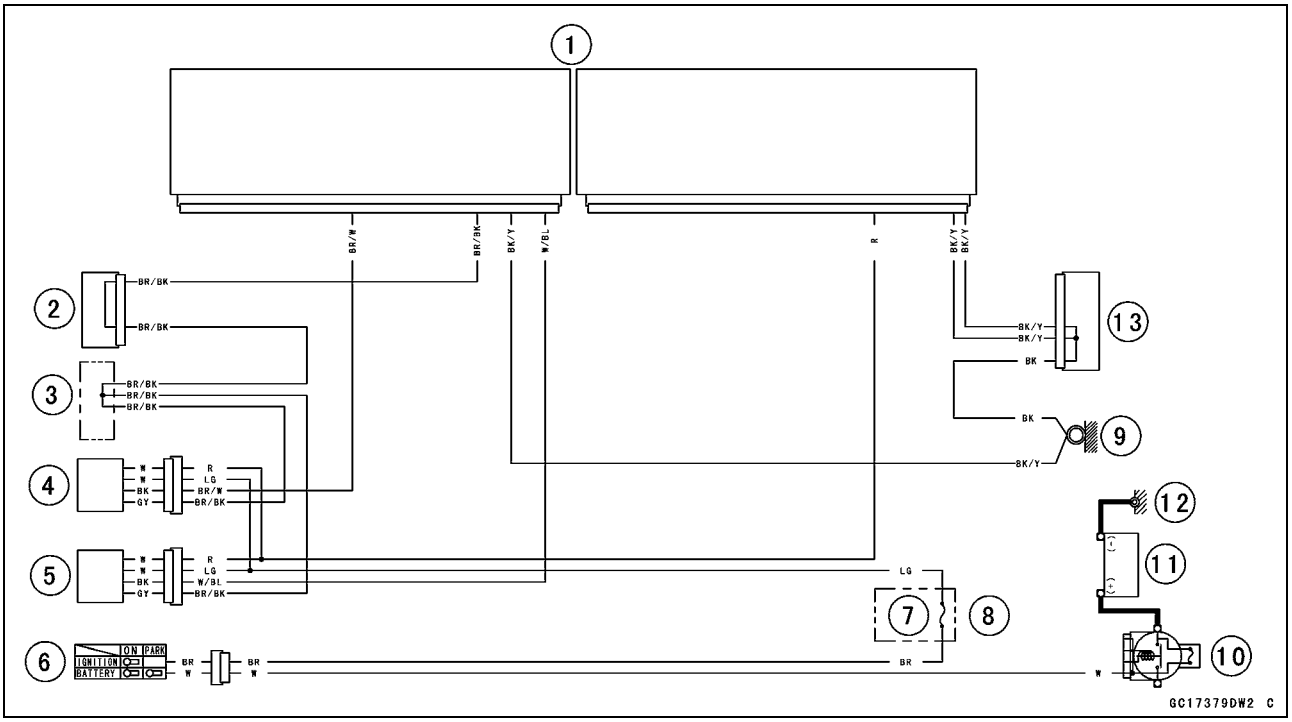



**Wiring Continuity Inspection**
**ECU Connector (Black) [A] ←→**
**Oxygen Sensor #2 Connector [B]**
**BR/W lead (ECU terminal 22) [C]**
**BR/BK lead (ECU terminal 34) [D]**

★If the wiring is good, replace the sensor.
★If the reading is within the standard (with plugs: 0.8 V or more, without plugs: 0.24 V or less), check the ECU for its ground and power supply (see ECU Power Supply Inspection).
★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Oxygen Sensor #2 - not activated (Service Code 83, Equipped Models)

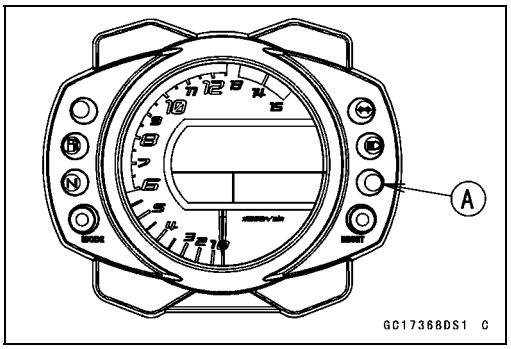
### Oxygen Sensor Circuit




1. ECU
2. Joint Connector 4
3. Joint Connector 3
4. Oxygen Sensor #2
5. Oxygen Sensor #1
6. Ignition Switch
7. Oxygen Sensor Heater Fuse 10 A
8. Fuse Box
9. Frame Ground 1
10. Main Fuse 30 A
11. Battery 12 V 10 Ah
12. Engine Ground
13. Water-proof Joint 1

## Warning Indicator Light (LED)

### *Light (LED) Inspection*

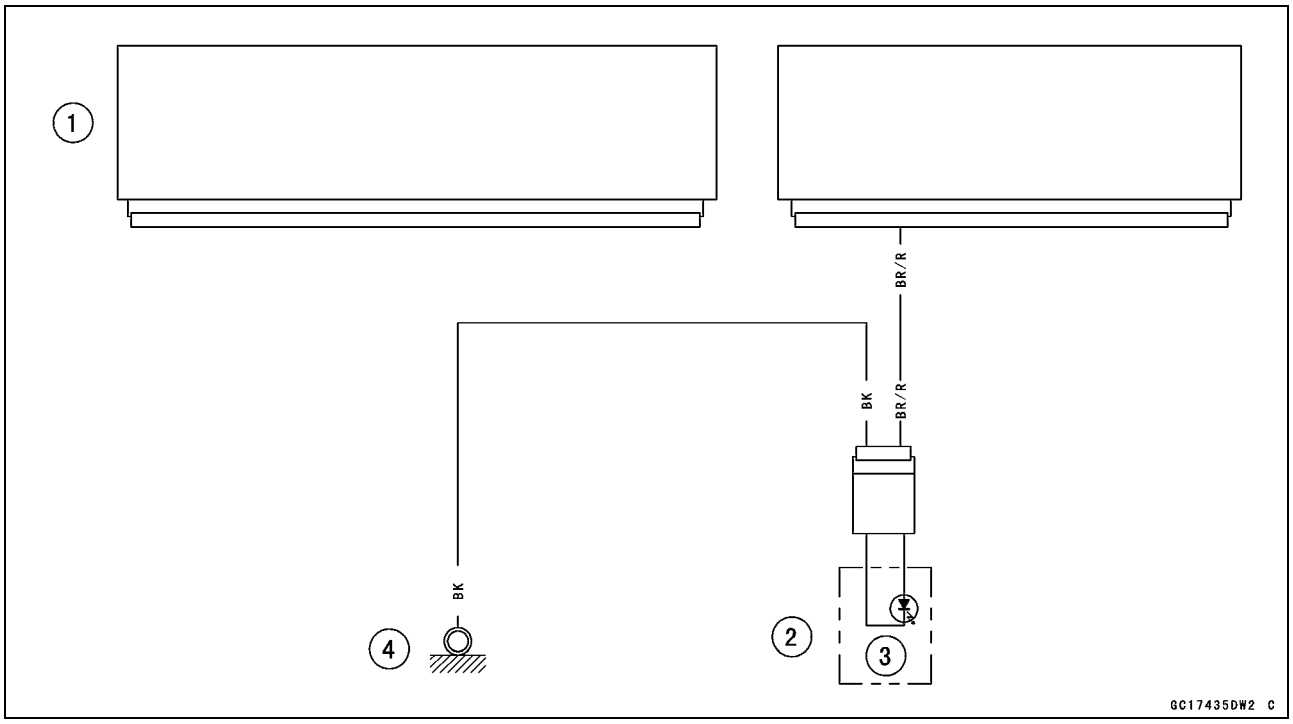



○The warning indicator light (LED) [A] is used for the FI indicator, immobilizer indicator (equipped models) and oil pressure warning indicator.

○In this model, the warning indicator light (LED) (FI/immobilizer) blinks by the data sent from the ECU.

● Refer to the Meter Unit Inspection in the Electrical System chapter.

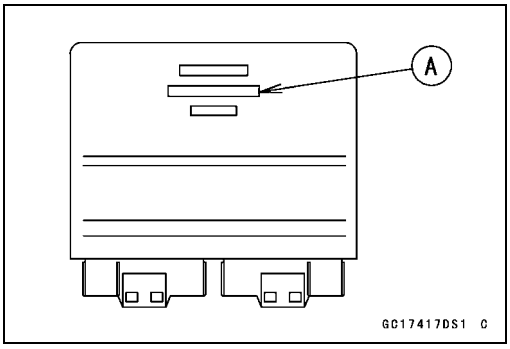
### Warning Indicator Light (LED) (FI/Immobilizer) Circuit




1. ECU
2. Meter Unit
3. Warning Indicator Light (LED)
4. Frame Ground 1

## ECU

### *ECU Identification*




○Most countries have their own regulations, so each ECU has different characteristic. So, do not confuse ECU with each other and use only the ECU for your model. Otherwise, the motorcycle can not clear the regulation.

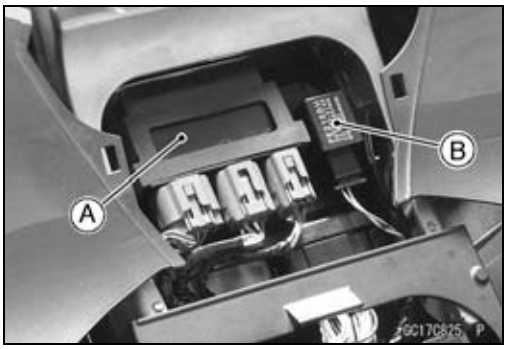
**ECU Identification**

| Part Number [A] | | Specification |
|---|---|---|
| ZX1000E8F | ZX1000E9F | |
| 21175-0158 | | WVTA (FULL H), with Immobilizer |
| | | GB WVTA (FULL H), with Immobilizer |
| 21175-0163 | 21175–0240 | US, without Immobilizer |
| | | CA, without Immobilizer |
| 21175-0164 | 21175–0241 | CAL, without Immobilizer |
| 21175-0188 | | AU, with Immobilizer |
| 21175-0189 | 21175–0242 | MY, with Immobilizer |
| 21175-0190 | | WVTA (78.2 H), with Immobilizer |
| 21175-0192 | | SEA, with Immobilizer |
| 21175-0233 | | TH, with Immobilizer |

### *ECU Removal*

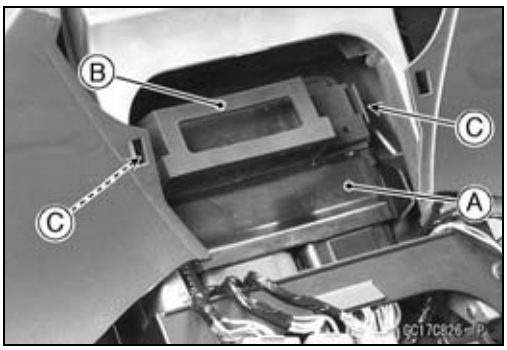
| CAUTION |
|---|
| **Never drop the ECU, especially on a hard surface. Such a shock to the ECU can damage it.** |

- Remove the center seat cover (see Seat Cover Removal in the Frame chapter).
- Pull out the relay box [A] and turn signal relay [B] from the rubber protector.



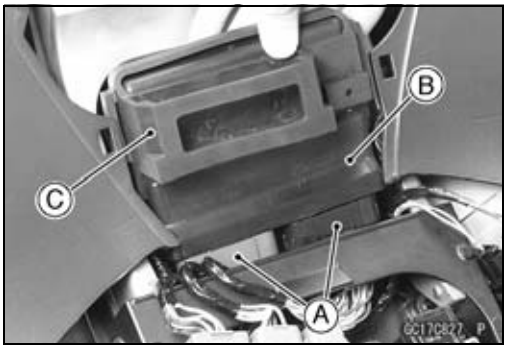

○Do not disconnect the relay box connectors and turn signal relay connector.

- Lift up the ECU [A] with rubber protector [B] to clear the projections [C].



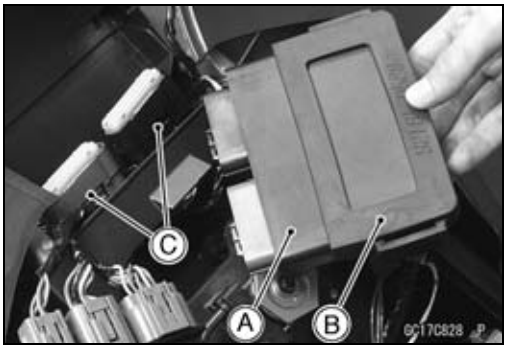
## ECU

- Remove:
  ECU Connectors [A]
  ECU [B] (with Rubber Protector [C])

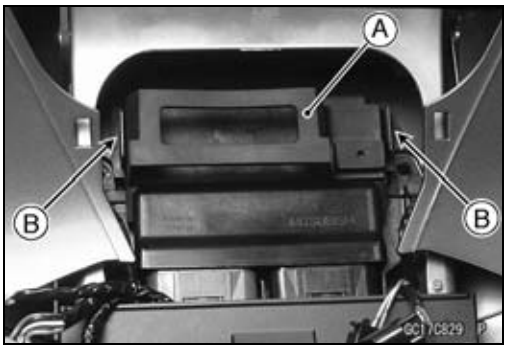



### *ECU Installation*

- Install:
  ECU [A] (in Rubber Protector [B])
  ECU Connectors [C]




- Insert the slits of the rubber protector [A] to the projections [B] of the rear fender front.




### *ECU Power Supply Inspection*

- Remove the center seat cover (see Seat Cover Removal in the Frame chapter).
- Visually inspect the ECU connectors.

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

- Remove the ECU (see ECU Removal).
- Visually inspect the terminals [A] of the ECU connectors.

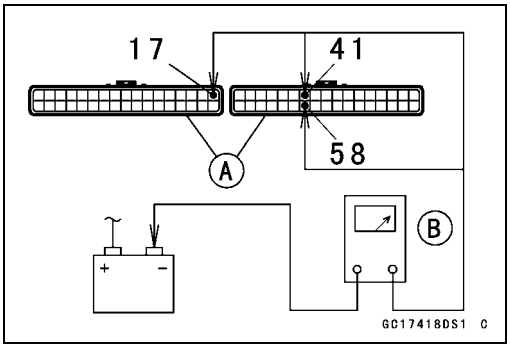
★If the terminals of the main harness connectors are damaged, replace the main harness.

★If the terminals of the ECU connectors are damaged, replace the ECU.

## ECU

- Turn the ignition switch OFF.
- Disconnect the ECU connectors [A].
- Set the hand tester [B] to the × 1 Ω range and check the following wiring for continuity.

**Special Tool - Hand Tester: 57001-1394**




**ECU Grounding Inspection**
**Connections:**
**(I) BK/Y leads (ECU terminal 17, 41 or 58) ←→ Battery (–) Terminal**
**(II) Engine Ground ←→ Battery (–) Terminal**
**Criteria:**
**Both: 0 Ω**

★If no continuity, check the connectors, the engine ground lead, or main harness, and repair or replace them if necessary.

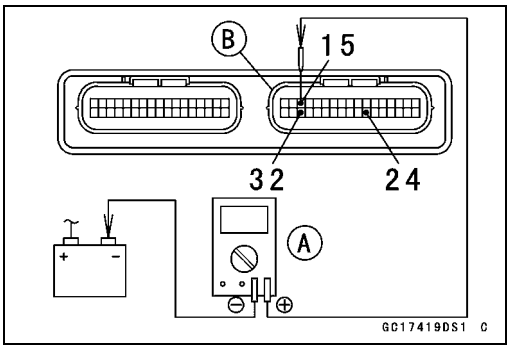
★If the wiring is good, check the power source voltage of the ECU.

**NOTE**

○*Be sure the battery is fully charged.*

- Connect the ECU connectors.
- Connect a digital meter [A] to the connector [B] with the needle adapter set.

**Special Tool - Needle Adapter Set: 57001-1457**



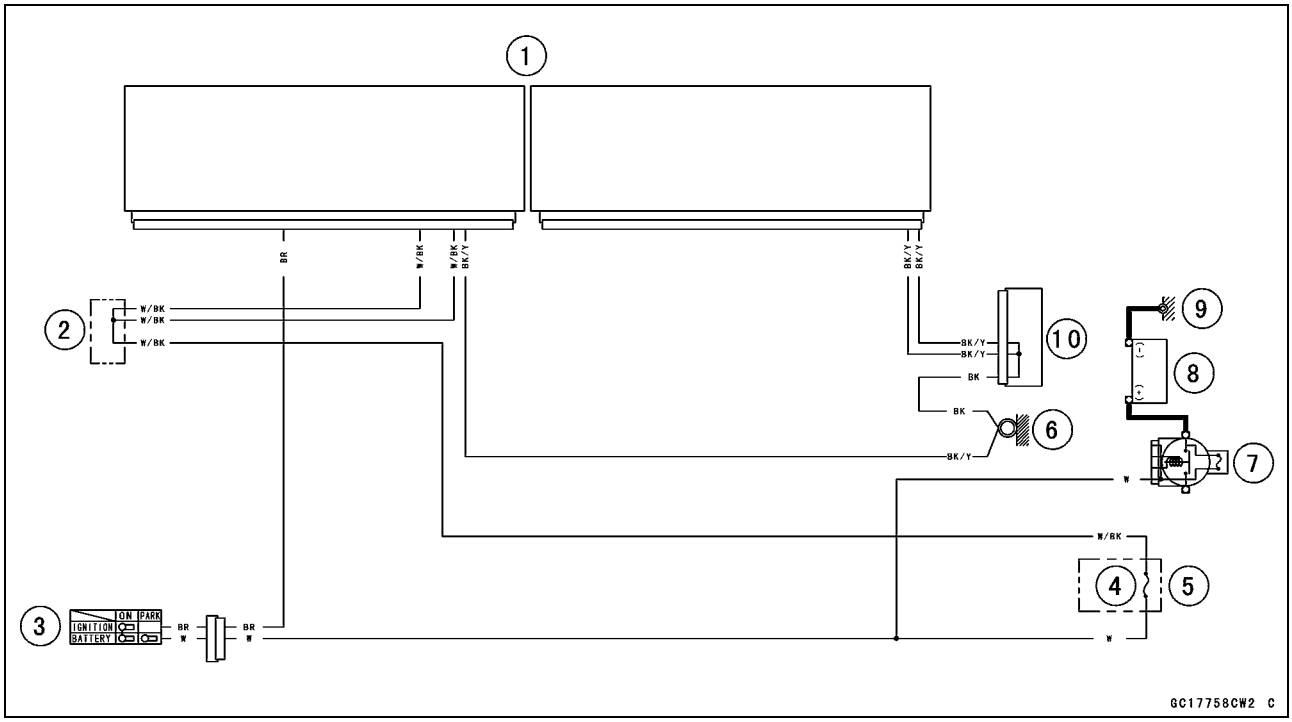

**ECU Power Supply Inspection**
**Connections:**
**(I) Digital Meter (+) → Terminal 15 (W/BK)**
**Digital Meter (–) → Battery (–) terminal**
**(II) Digital Meter (+) → Terminal 24 (BR)**
**Digital Meter (–) → Battery (–) terminal**
**(III) Digital Meter (+) → Terminal 32 (W/BK)**
**Digital Meter (–) → Battery (–) terminal**
**Ignition Switch OFF:**
**Terminal 15 (W/BK): Battery Voltage**
**Terminal 24 (BR): 0 V**
**Terminal 32 (W/BK): Battery Voltage**
**Ignition Switch ON:**
**All: Battery Voltage**

★If the reading is out of the specification, check the following.
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)
ECU Fuse 10 A (see Fuse Inspection Electrical System chapter)
Power Source Wiring (see wiring diagram in this section )

★If the fuse and wiring are good, replace the ECU (see ECU Removal/Installation).

# ECU

## ECU Power Source Circuit




1. ECU
2. Water-proof Joint 2
3. Ignition Switch
4. ECU Fuse 10 A
5. Fuse Box
6. Frame Ground 1
7. Main Fuse 30 A
8. Battery 12 V 10 Ah
9. Engine Ground
10. Water-proof Joint 1

## DFI Power Source

### *ECU Fuse Removal*

- Refer to the 10 A ECU Fuse Removal in the Electrical System chapter.

### *ECU Fuse Installation*

★If a fuse fails during operation, inspect the DFI system to determine the cause, and then replace it with a new fuse of proper amperage.

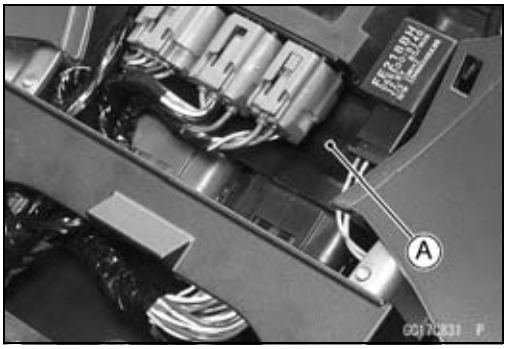
- Refer to the Fuse Installation in the Electrical System chapter.

### *ECU Fuse Inspection*

- Refer to the Fuse Inspection in the Electrical System chapter.

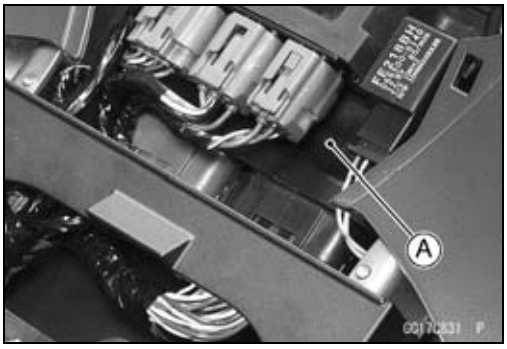
### *ECU Main Relay Removal/Installation*

○The ECU main relay function is included in the ECU [A] and can not be removed.




### *ECU Main Relay Inspection*

○The ECU main relay function is included in the ECU [A] and can not be inspected.



## Fuel Line

### *Fuel Pressure Inspection*


**NOTE**

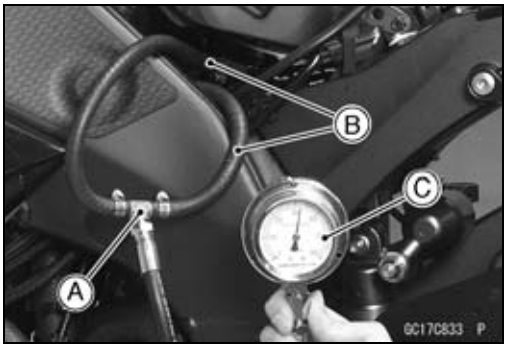
○*Be sure the battery is fully charged.*

● Remove:
Fuel Tank Bolts [A]
Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)

○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

**⚠ 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 (Special Tool: 57001-1607) [B] between the fuel outlet pipe and delivery pipe.
● Secure the fuel hoses with the clamps.
● Connect the pressure gauge [C] to the fuel pressure gauge adapter.

**Special Tools - Oil Pressure Gauge, 5 kgf/cm²: 57001-125**
**Fuel Pressure Gauge Adapter: 57001-1593**
**Fuel Hose: 57001-1607**

**⚠ WARNING**

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

● Turn the engine stop switch run position.
● Turn the ignition switch ON.

○The fuel pump should operate for 3 seconds, and then should stop.

**NOTE**

○*After turning on the engine stop switch and ignition switch, inspect the fuel leakage from the connected portion of the special tools.*

**CAUTION**

**Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.**

● Start the engine, and let it idle.
● Measure the fuel pressure with the engine idling.

**Fuel Pressure (with Engine Idling)**
**Standard: 294 kPa (3.0 kgf/cm², 43 psi)**

## Fuel Line

**NOTE**

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

- Turn the ignition switch OFF.

★If the fuel pressure is much higher than specified, replace the fuel pump because the fuel pressure regulator in the fuel pump have been clogged or stuck.

★If the fuel pressure is much lower than specified, check the following.
Fuel Line Leakage (see Fuel Injector Fuel Line Inspection)
Amount of Fuel Flow (see Fuel Flow Rate Inspection)

- After above checks, measure the fuel pressure again.
- Remove the fuel pressure gauge, hoses and adapter.
- Install:
Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
Fuel Tank (see Fuel Tank Installation)
- Start the engine and check for fuel leakage.

### *Fuel Flow Rate Inspection*

**⚠ 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.**


**NOTE**

○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Wait until the engine cools down.
- Prepare a fuel hose (Special Tool: 57001-1607) and a measuring cylinder.

**Special Tool - Fuel Hose: 57001-1607**

- Remove the fuel tank bolts [A].
- Open the fuel tank cap [A] to lower the pressure in the tank.
- Remove the primary fuel hose from the fuel pump (see Fuel Tank Removal).

○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump.


**⚠ 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.**

## Fuel Line


- Connect the prepared fuel hose [A] to the fuel outlet pipe.
- Secure the fuel hose with a clamp.
- Insert the fuel hose into the measuring cylinder [B].

**⚠ WARNING**

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

- Close the fuel tank cap.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

○The fuel pump should operate for 3 seconds, and then should stop.

**CAUTION**

**Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.**

- Measure the discharge for 3 seconds.

○Repeat this operation several times.

**Amount of Fuel Flow**
**Standard: 67 mL (2.3 US oz.) or more for 3 seconds**

- Turn the ignition switch OFF.

★If the fuel flow is much less than the specified, replace the fuel pump (see Fuel Pump Removal/Installation).

- Install the fuel tank (see Fuel Tank Installation).
- Start the engine and check for fuel leakage.

## Fuel Pump

### *Fuel Pump Removal*

**⚠ 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 and 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.**

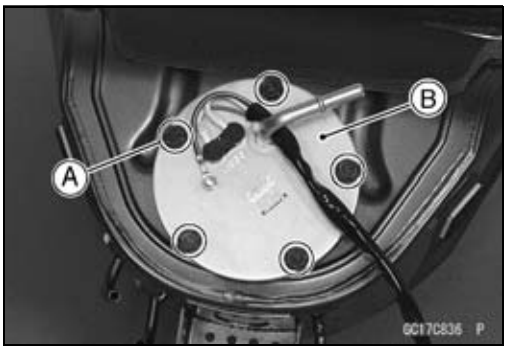
**CAUTION**

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

- Draw the fuel out from the fuel tank with a commercially available electric pump.
- Remove the fuel tank (see Fuel Tank 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.
- Unscrew the fuel pump bolts [A], and take out the fuel pump [B].



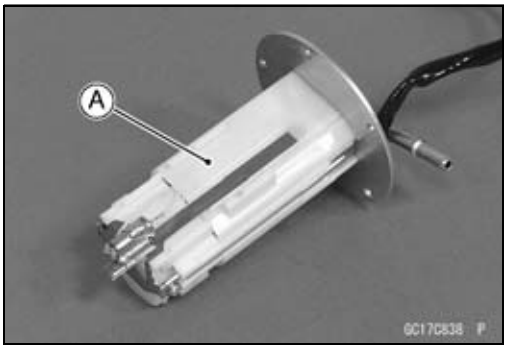

**CAUTION**

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

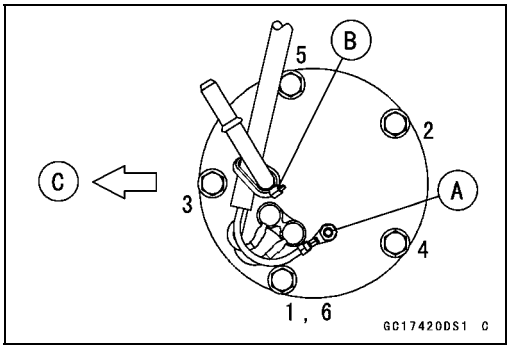
- Discard the fuel pump gasket [A].

## Fuel Pump

### *Fuel Pump Installation*




- Remove dirt or dust from the fuel pump [A] by lightly applying compressed air.
- Replace the fuel pump gasket with a new one.




- Check that the fuel pump terminal [A] and band [B] are in place.
  Front [C]
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Tighten the fuel pump bolts to a snug fit, following the tightening sequence as shown in the figure.
- Following the tightening sequence, tighten the fuel pump bolts to the specified torque.

  **Torque - Fuel Pump Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Tighten the pump bolts again to check the tightness in the order shown.

### *Fuel Pump Operation Inspection*

**NOTE**

○*Be sure the battery is fully charged.*

- Turn the engine stop switch to run position.
- 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 operate as described above, check the operating voltage (see Fuel Pump Operating Voltage Inspection).

## Fuel Pump

### *Fuel Pump Operating Voltage Inspection*

**NOTE**

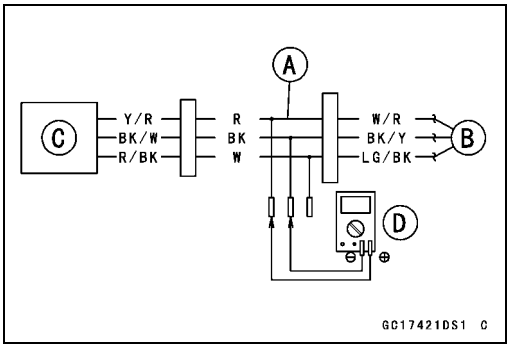
○*Be sure the battery is fully charged.*

- Turn the ignition switch OFF.
- Remove the left side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the fuel pump lead connector and connect the harness adapter [A] between these connectors as shown in the figure.
  Main Harness [B]
  Fuel Pump [C]


**Special Tool - Measuring Adapter: 57001-1700**

- Connect a digital meter [D] to the harness adapter leads.

**Fuel Pump Operating Voltage**
**Connections to Adapter:**
**Digital Meter (+) → R (pump Y/R) lead**
**Digital Meter (–) → BK (pump BK/W) lead**




- Measure the operating voltage with engine stopped and with the connector joined.
- Turn the engine stop switch run position.
- Turn the ignition switch ON.

**Operating Voltage**
**Standard: Battery Voltage for 3 seconds, and then 0 V**

- Turn the ignition switch OFF.

★If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).

★If the fuel pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

★If there is still no battery voltage, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).

★If the fuel pump relay is normal, check the wiring for continuity (see wiring diagram in this section).

**Special Tool - Hand Tester: 57001-1394**

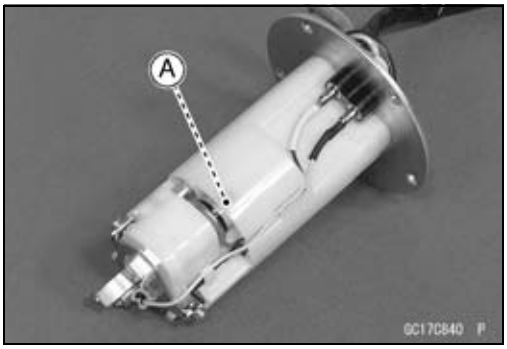
★If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

★If the reading is in specification, but the pump does not operate, replace the fuel pump (see Fuel Pump Removal/Installation).

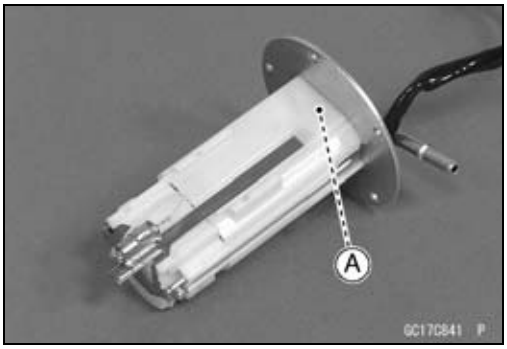
## Fuel Pump

### *Pressure Regulator Removal*




○The pressure regulator [A] is built into the fuel pump and can not be removed.

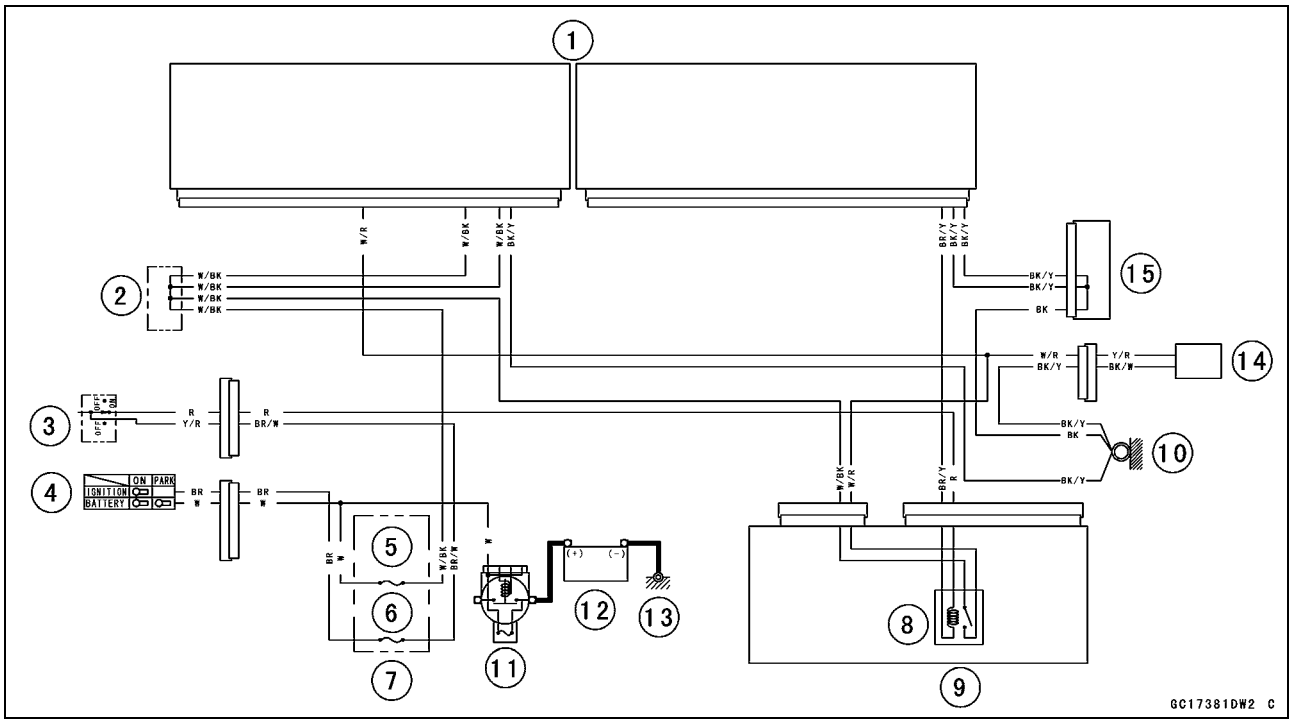
### *Fuel Filter Cleaning*




○The fuel filter [A] is built into the pump and can not 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 Circuit




1. ECU
2. Water-proof Joint 2
3. Engine Stop Switch
4. Ignition Switch
5. ECU Fuse 10 A
6. Ignition Fuse 15 A
7. Fuse Box
8. Fuel Pump Relay
9. Relay Box
10. Frame Ground 1
11. Main Fuse 30 A
12. Battery 12 V 10 Ah
13. Engine Ground
14. Fuel Pump
15. Water-proof Joint 1

## Fuel Injectors

### *Primary Fuel Injector Removal/Installation*

● Refer to the Throttle Body Assy Disassembly/Assembly.

### *Secondary Fuel Injector Removal/Installation*

● Refer to the Nozzle Assy Disassembly/Assembly.

### *Fuel Injector Audible Inspection*

**NOTE**

○*Be sure the battery is fully charged.*

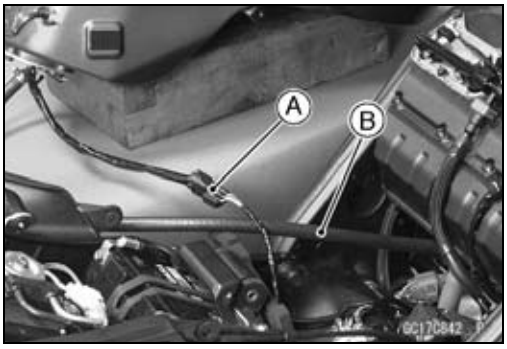
○*The secondary fuel injectors are operating with following conditions.*

1. The engine speed is more than 6 000 r/min (rpm).
2. The throttle opening is more than 30°.

● Remove:
Fuel Tank (see Fuel Tank Removal)
Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)

● Connect the following parts temporarily.
Fuel Pump Lead Connector [A]
Extension Tube [B]

**Special Tool - Extension Tube: 57001-1578**




● Start the engine, and let it idle.

● Apply the tip of a screwdriver [A] to the fuel injector. Put the grip end onto your ear, and listen whether the fuel injector is clicking or not.
Primary Fuel Injector [B]
Secondary Fuel Injector [C]

○A sound scope can also be used.

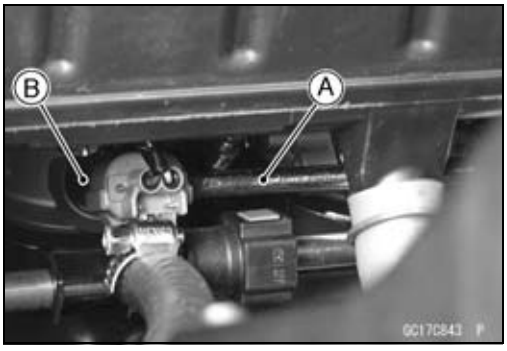
○The click interval becomes shorter as the engine speed rises.

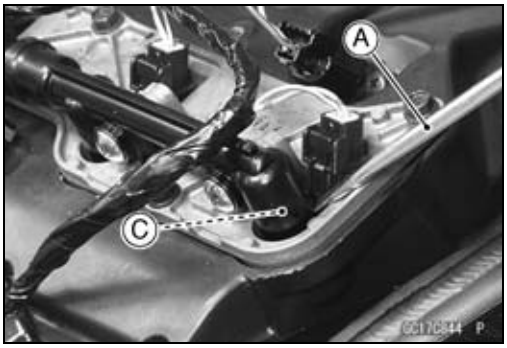
● Do the same for the other fuel injectors.

★If all the fuel injectors click at a regular intervals, the fuel injectors are normal.

● Turn the ignition switch OFF.

★If any fuel injector does not click, check the fuel injector resistance (see Fuel Injector Resistance Inspection).



## Fuel Injectors

### *Fuel Injector Resistance Inspection*

**For Primary Fuel Injectors**

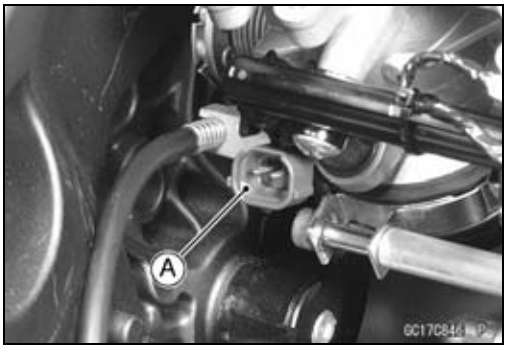
- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the primary fuel injector connector [A].


- Connect a digital meter to the terminals in each primary fuel injector [A].
- Measure the primary fuel injector resistance.

**Primary Fuel Injector Resistance**
**Standard: About 11.7 ~ 12.3 Ω at 20°C (68°F)**

★If the reading is out of the standard, replace the primary fuel injector.

★If the reading within the standard, check the power source voltage (see Fuel Injector Power Source Voltage Inspection).




**For Secondary Fuel Injectors**

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the secondary fuel injector connector [A].


- Connect a digital meter to the terminals in each secondary fuel injector [A].
- Measure the secondary fuel injector resistance.

**Secondary Fuel Injector Resistance**
**Standard: About 10.5 Ω at 20°C (68°F)**

★If the reading is out of the standard, replace the secondary fuel injector.

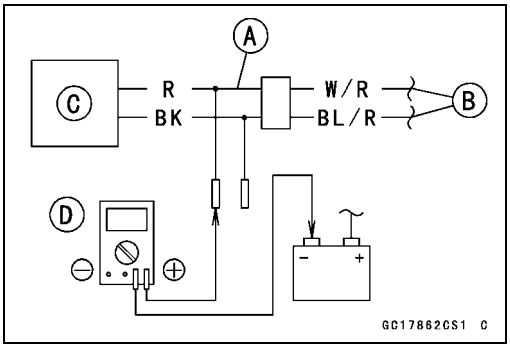
★If the reading within the standard, check the power source voltage (see Fuel Injector Power Source Voltage Inspection).

## Fuel Injectors

### *Fuel Injector Power Source Voltage Inspection*

**NOTE**

○*Be sure the battery is fully charged.*


- Turn the ignition switch OFF.

**For Primary Fuel Injectors**

- Remove the air cleaner housing (see Air Cleaner Housing Removal).
- Disconnect the injector connector and connect the harness adapter [A] between these connectors as shown in the figure.
  Main Harness [B]
  Primary Fuel Injector #1 [C]

**Special Tool - Measuring Adapter: 57001-1700**

- Connect a digital meter [D] to the harness adapter lead.

**Primary Fuel Injector Power Source Voltage**
**Connections to Adapter:**
**For Primary Fuel Injector #1, #2, #3, #4**
**Digital Meter (+) → R (injector W/R) lead**
**Digital Meter (–) → Battery (–) terminal**

- Measure the power source voltage with the engine stopped.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

**Power Source Voltage**
**Standard: Battery Voltage for 3 seconds, and then 0 V**

- Turn the ignition switch OFF.

★If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).

★If the fuel pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

★If there is still no battery voltage, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).

★If the fuel pump relay is normal, check the power source wiring (see wiring diagram in this section).

**Special Tool - Hand Tester: 57001-1394**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

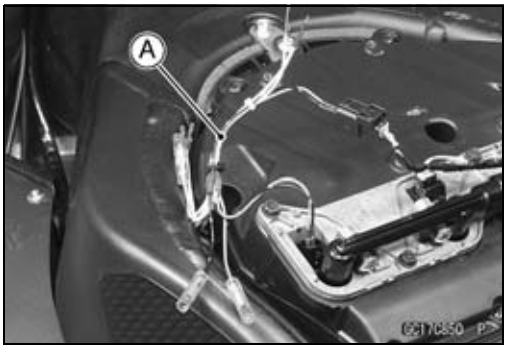
★If the reading is in specification, check the output voltage (see Fuel Injector Output Voltage Inspection).

## Fuel Injectors

### For Secondary Fuel Injectors

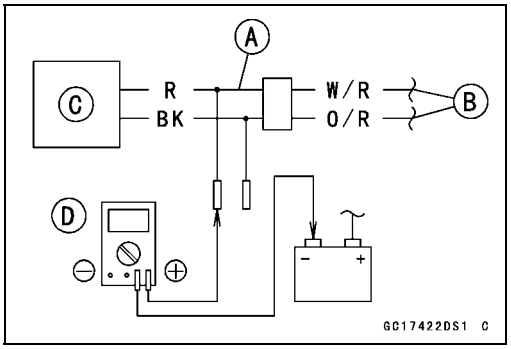
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the injector connector and connect the harness adapter [A] between these connectors as shown in the figure.
  Main Harness [B]
  Secondary Fuel Injector #1 [C]

**Special Tool - Measuring Adapter: 57001-1700**




- Connect a digital meter [D] to the harness adapter lead.

**Secondary Fuel Injector Power Source Voltage**
**Connections to Adapter:**
**For Secondary Fuel Injector #1, #2, #3, #4**
**Digital Meter (+) → R (injector W/R) lead**
**Digital Meter (–) → Battery (–) terminal**




- Measure the power source voltage with the engine stopped.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

**Power Source Voltage**
**Standard: Battery Voltage for 3 seconds, and then 0 V**

- Turn the ignition switch OFF.

★If the reading stays on battery voltage and never shows 0 V, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).

★If the fuel pump relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection).

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

★If there is still no battery voltage, check the fuel pump relay (see Relay Circuit Inspection in the Electrical System chapter).

★If the fuel pump relay is normal, check the power source wiring (see wiring diagram in this section).

**Special Tool - Hand Tester: 57001-1394**

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

★If the reading is in specification, check the output voltage (see Fuel Injector Output Voltage Inspection).

## Fuel Injectors

### *Fuel Injector Output Voltage Inspection*

**NOTE**

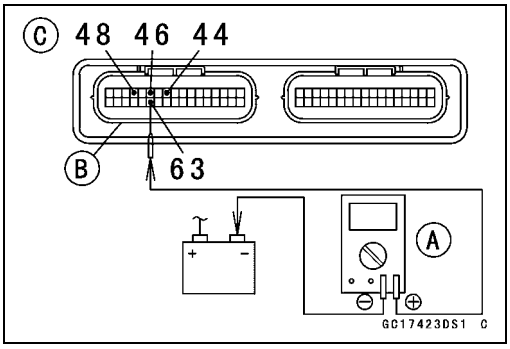
○*Be sure the battery is fully charged.*

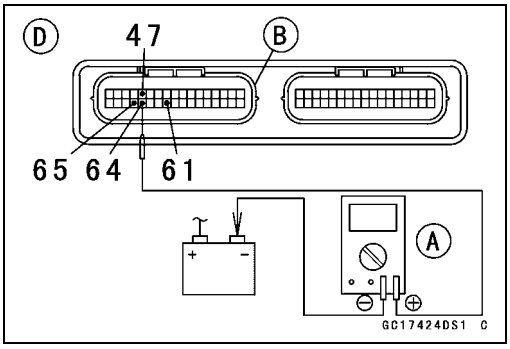
- Turn the ignition switch OFF.
- Remove the ECU (see ECU Removal).

○Do not disconnect the ECU connector.

- Connect a digital meter [A] to the connector [B] with the needle adapter set.

**Special Tool - Needle Adapter Set: 57001-1457**




**Primary Fuel Injector Output Voltage [C]**
**Connections to ECU Connector:**
**For Primary Fuel Injector #1**
**Digital Meter (+) → BL/R lead (ECU terminal 63)**
**Digital Meter (–) → Battery (–) terminal**
**For Primary Fuel Injector #2**
**Digital Meter (+) → BL/G lead (ECU terminal 46)**
**Digital Meter (–) → Battery (–) terminal**
**For Primary Fuel Injector #3**
**Digital Meter (+) → BL/BK lead (ECU terminal 44)**
**Digital Meter (–) → Battery (–) terminal**
**For Primary Fuel Injector #4**
**Digital Meter (+) → BL/Y lead (ECU terminal 48)**
**Digital Meter (–) → Battery (–) terminal**

**Secondary Fuel Injector Output Voltage [D]**
**Connections to ECU Connector:**
**For Secondary Fuel Injector #1**
**Digital Meter (+) → O/R lead (ECU terminal 64)**
**Digital Meter (–) → Battery (–) terminal**
**For Secondary Fuel Injector #2**
**Digital Meter (+) → O/G lead (ECU terminal 47)**
**Digital Meter (–) → Battery (–) terminal**
**For Secondary Fuel Injector #3**
**Digital Meter (+) → O/BK lead (ECU terminal 61)**
**Digital Meter (–) → Battery (–) terminal**
**For Secondary Fuel Injector #4**
**Digital Meter (+) → O/Y lead (ECU terminal 65)**
**Digital Meter (–) → Battery (–) terminal**

- Measure the output voltage with the engine stopped and with the connector joined.
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.

**Output Voltage**
**Standard: Battery Voltage for 3 seconds, and then 0 V**

- Turn the ignition switch OFF.

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

★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation).

## Fuel Injectors

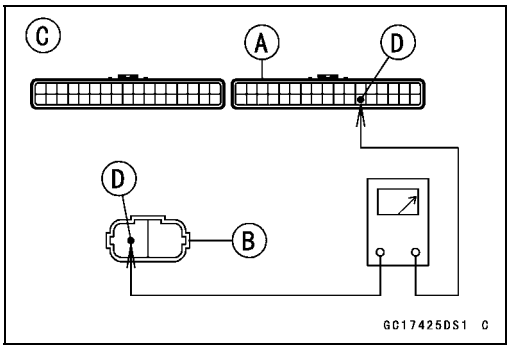
★If the reading is out of the specification, remove the ECU and check the wiring for continuity between main harness connector.

**Special Tool - Hand Tester: 57001-1394**

○Disconnect the ECU and injector connector.

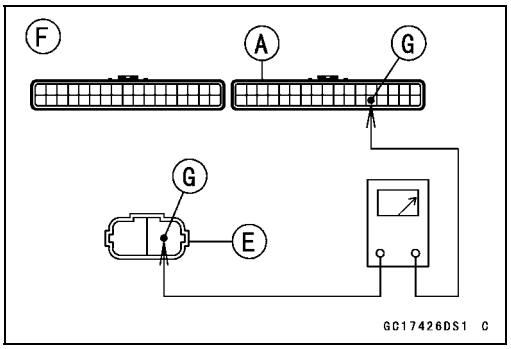
**Wiring Continuity Inspection (Primary Fuel Injectors)**
**ECU Connector (Gray) [A] ←→ Primary Fuel Injector Connector [B]**

**For Primary Fuel Injector #1 [C]**
**BL/R lead (ECU terminal 63) [D]**
**For Primary Fuel Injector #2**
**BL/G lead (ECU terminal 46)**
**For Primary Fuel Injector #3**
**BL/BK lead (ECU terminal 44)**
**For Primary Fuel Injector #4**
**BL/Y lead (ECU terminal 48)**




**Wiring Continuity Inspection (Secondary Fuel Injectors)**
**ECU Connector (Gray) [A] ←→ Secondary Fuel Injector Connector [E]**

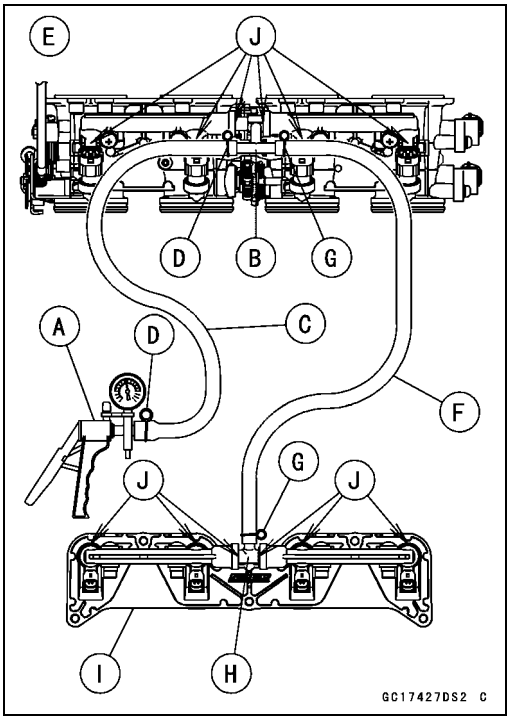
**For Secondary Fuel Injector #1 [F]**
**O/R lead (ECU terminal 64) [G]**
**For Secondary Fuel Injector #2**
**O/G lead (ECU terminal 47)**
**For Secondary Fuel Injector #3**
**O/BK lead (ECU terminal 61)**
**For Secondary Fuel Injector #4**
**O/Y lead (ECU terminal 65)**




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

## Fuel Injectors

### *Fuel Injector Fuel Line Inspection*




● Remove:
Fuel Tank (see Fuel Tank Removal)
Air Cleaner Housing (see Air Cleaner Housing Removal)
Primary and Secondary Fuel Hoses (see Fuel Hose Replacement in the Periodic Maintenance chapter)

○Do not remove the nozzle assy from the upper air cleaner housing.

○Be sure to place a piece of cloth around the fuel outlet pipe of the fuel pump and the delivery pipe of the throttle body assy.

**⚠ 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.**

● Check the injector fuel line for leakage as follows.

○Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with the fuel hose [C] (both ends with the clamps [D]) as shown in the figure.
Rear View [E]

● Connect the fuel hose [F] (both ends with the clamps [G]) between the delivery pipes [H] of the throttle body assy and nozzle assy [I] as shown in the figure.

○Apply soap and water solution to the areas [J] as shown in the figure.

○Watching the pressure gauge, squeeze the pump lever, and build up the pressure until the pressure reaches the maximum pressure.

**Injector Fuel Line Maximum Pressure**
**Standard: 300 kPa (3.06 kgf/cm², 43 psi)**

**CAUTION**

**During pressure testing, do not exceed the maximum pressure for which the system is designed.**

○Watch the gauge for at least 6 seconds.

★If the pressure holds steady, the fuel line is good.

★If the pressure drops at once or if bubbles are found in the area, the fuel line is leaking. Replace the delivery pipe assy, injectors and related parts.

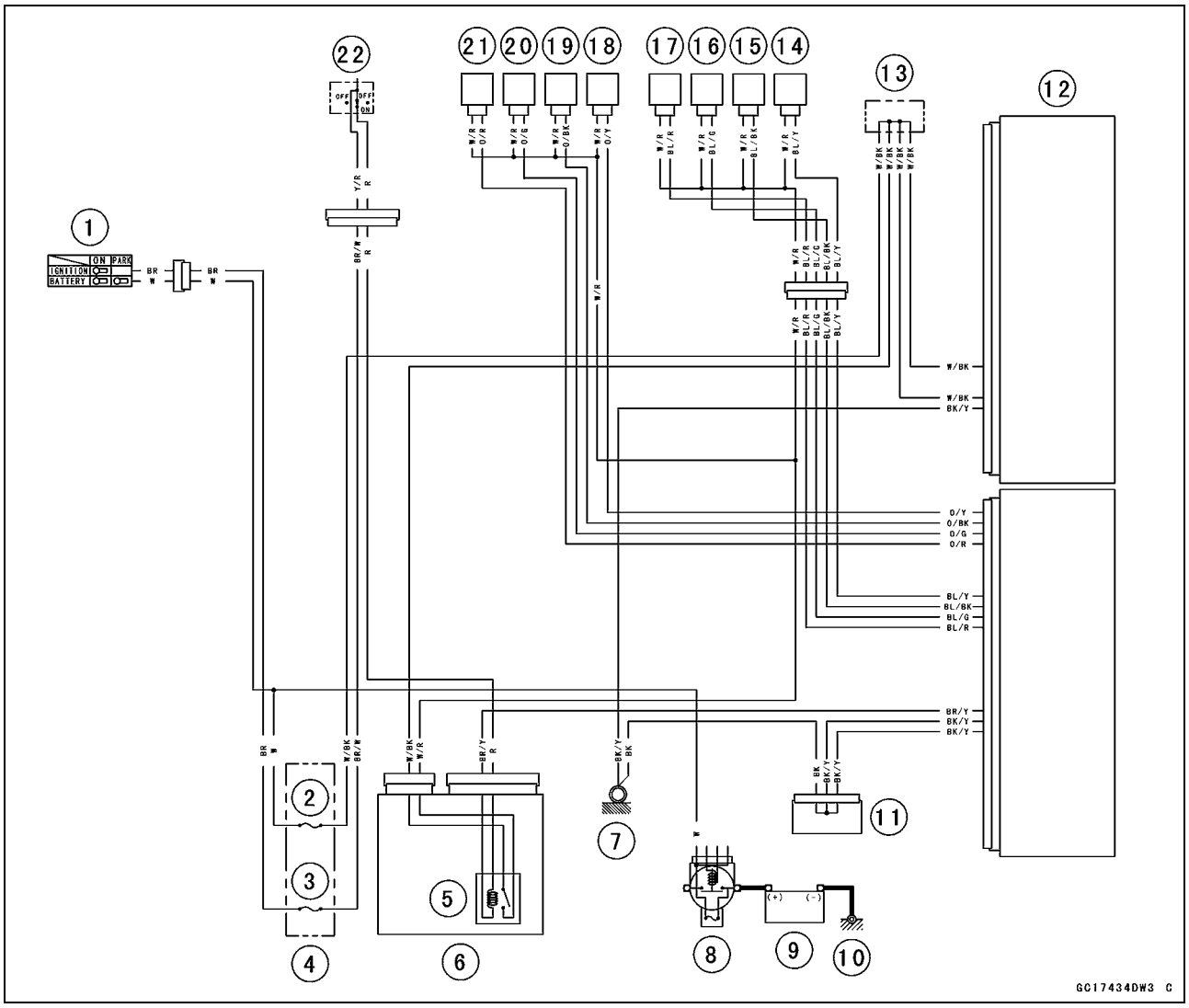
○Repeat the leak test, and check the fuel line for no leakage.

● Install:
Primary and Secondary Fuel Hoses (see Fuel Hose Replacement in the Periodic Maintenance chapter)
Air Cleaner Housing (see Air Cleaner Housing Removal)
Fuel Tank (see Fuel Tank Removal)

● Start the engine and check for fuel leakage.

## Fuel Injectors

### Fuel Injector Circuit




1. Ignition Switch
2. ECU Fuse 10 A
3. Ignition Fuse 15 A
4. Fuse Box
5. Fuel Pump Relay
6. Relay Box
7. Frame Ground 1
8. Main Fuse 30 A
9. Battery 12 V 10 Ah
10. Engine Ground
11. Water-proof Joint 1
12. ECU
13. Water-proof Joint 2
14. Primary Fuel Injector #4
15. Primary Fuel Injector #3
16. Primary Fuel Injector #2
17. Primary Fuel Injector #1
18. Secondary Fuel Injector #4
19. Secondary Fuel Injector #3
20. Secondary Fuel Injector #2
21. Secondary Fuel Injector #1
22. Engine Stop Switch

## Throttle Grip and Cables

### *Free Play Inspection*

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

### *Free Play Adjustment*

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

### *Cable Installation*

- Install the throttle cables in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
- Install the lower ends of the throttle cables in the throttle pulley on the throttle body assy after installing the upper ends of the throttle cables in the grip.
- After installation, adjust each cable properly (see Throttle Control System Inspection in the Periodic Maintenance chapter).

**⚠ WARNING**

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

### *Cable Lubrication*

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

## Throttle Body Assy

### *Idle Speed Inspection/Adjustment*

- Refer to the Idle Speed Inspection/Adjustment in the Periodic Maintenance chapter.

### *Synchronization Inspection/Adjustment*

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

### *Throttle Body Assy Removal*

**⚠ WARNING**

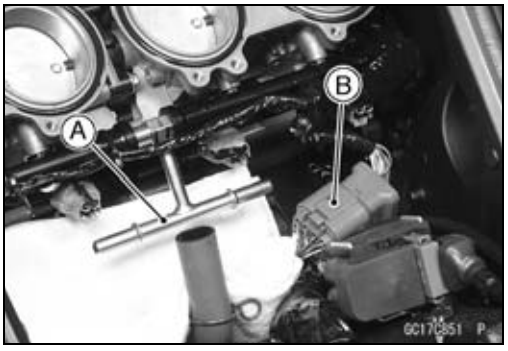
**Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch OFF. Be prepared for fuel spillage: any spilled fuel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

**CAUTION**

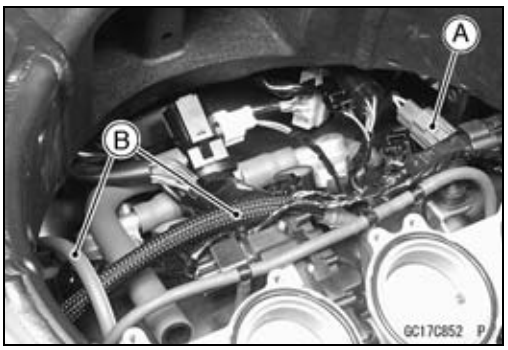
**Never drop the throttle body assy, especially on a hard surface. Such a shock to the body assy can damage it.**

- Remove:
  Air Cleaner Housing (see Air Cleaner Housing Removal)
  Primary and Secondary Fuel Hoses (see Fuel Hose Replacement in the Periodic Maintenance chapter)
  Upper Fairing Covers (see Upper Fairing Cover Removal in the Frame chapter)
  Coolant Reserve Tank (see Coolant Reserve Tank Removal in the Cooling System chapter)

- Be sure to place a piece of cloth around the delivery pipe [A] of the throttle body assy.
- Disconnect the engine subharness #2 connector [B].

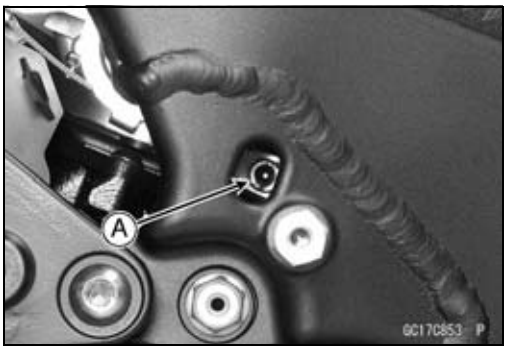



- Disconnect the camshaft position sensor lead connector [A].
- For the California and Southeast Asia models, pull off the vacuum hoses [B].

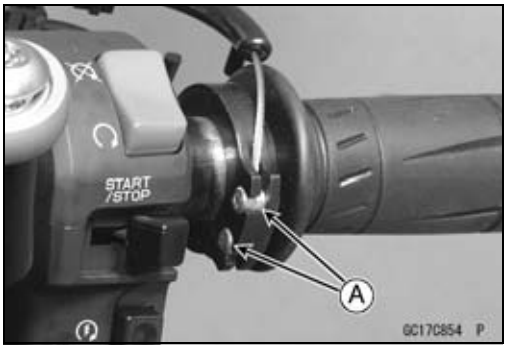


## Throttle Body Assy

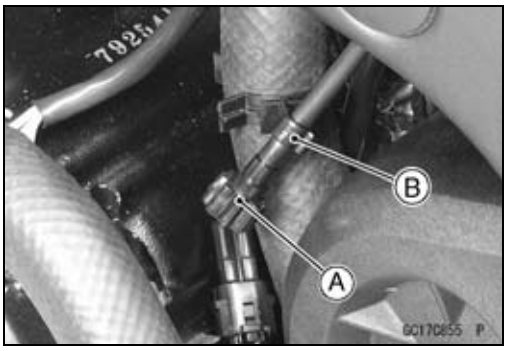
- Loosen the throttle body assy holder clamp bolts [A] on both sides.




- Remove:
  Throttle Case
  Throttle Cable Upper Ends [A]



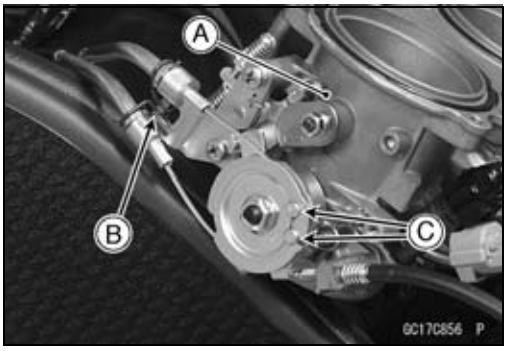

- Remove the adjusting screw [A] from the clamp [B].




- Remove the throttle body assy [A] from the throttle body assy holders.
- After removing the throttle body assy, stuff pieces of lint -free, clean cloth into the throttle body assy holders.

**CAUTION**

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




- Remove:
  Clamp [B]
  Throttle Cable Lower Ends [C]

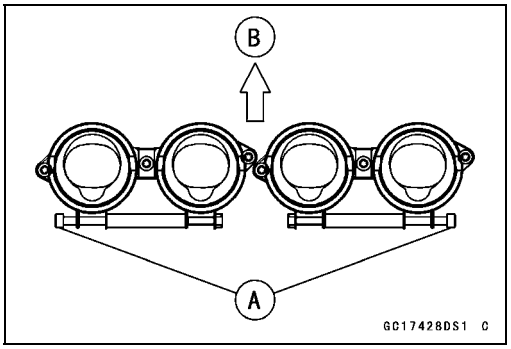
## Throttle Body Assy

### *Throttle Body Assy Installation*


- Apply a thin coat of grease to the throttle cable lower ends.
- Fit the accelerator cable end [A] and the decelerator cable end [B] into the throttle pulley.

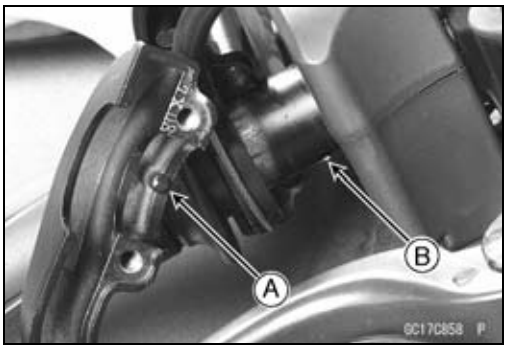
○The accelerator cable has a clamp [C].

- Install the clamp securely.




- Install the throttle body assy holder clamp bolts as shown in the figure.
  Bolt Heads [A]
  Front [B]
- Tighten:

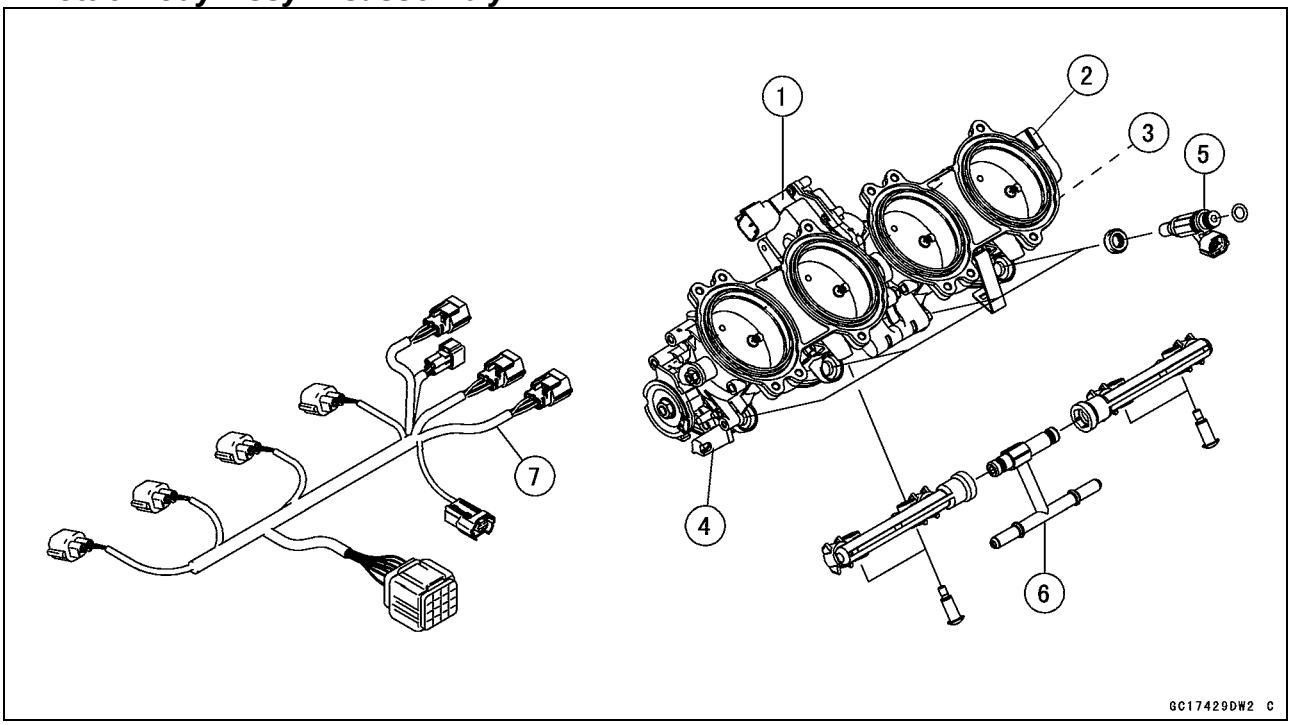
**Torque - Throttle Body Assy Holder Clamp Bolts: 2.0 N·m (0.20 kgf·m, 18 in·lb)**




- Apply a thin coat of grease to the throttle cable upper ends.
- Install the upper ends of the throttle cables in the grip.
- Fit the projection [A] of the throttle case into the hole [B] of the handlebar.
- Turn the throttle grip and make sure that the throttle pulley moves smoothly and return by spring force.
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust:
  Throttle Grip Free Play (see Throttle Control System Inspection in the Periodic Maintenance chapter)
  Idle Speed (see Idle Speed Adjustment in the Periodic Maintenance chapter)

## Throttle Body Assy

### *Throttle Body Assy Disassembly*

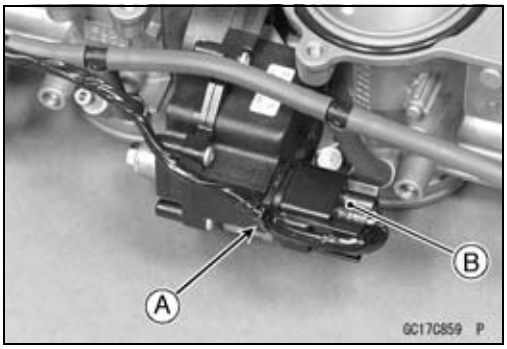



1. Subthrottle Valve Actuator
2. Subthrottle Sensor
3. Main Throttle Sensor
4. Throttle Body Assy
5. Primary Fuel Injectors
6. Delivery Pipe Assy
7. Engine Subharness #2

**CAUTION**

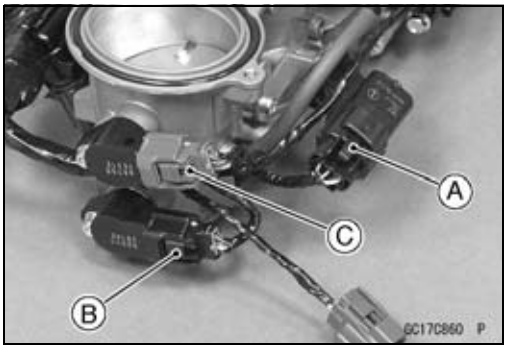
**Do not remove, disassemble or adjust the main throttle sensor, subthrottle sensor, subthrottle valve actuator, throttle link mechanism and throttle body assy, because they are adjust or set surely at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the throttle body assy.**

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Cut the band [A], and disconnect the subthrottle valve actuator connector [B].

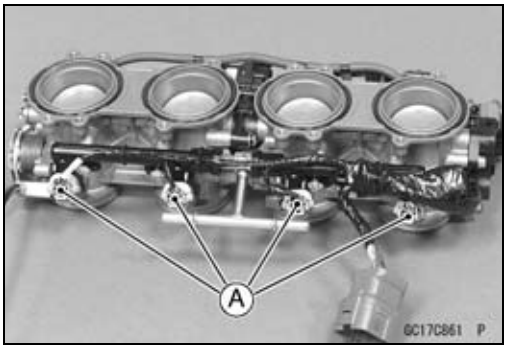


## Throttle Body Assy

- Disconnect:
  Inlet Air Pressure Sensor Connector [A]
  Main Throttle Sensor Connector [B]
  Subthrottle Sensor Connector [C]




- Disconnect the primary fuel injector connectors [A].

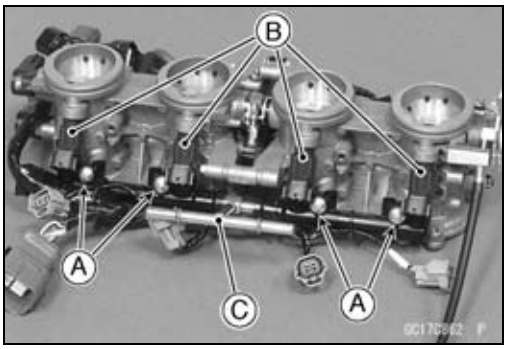



- Remove the screws [A] to pull out the primary fuel injectors [B] from the throttle body assy together with the delivery pipe assy [C].

**NOTE**

○*Do not damage the insertion portions of the injectors when they are pulled out from the throttle body.*

- Pull out the primary fuel injectors from the delivery pipe assy.




**NOTE**

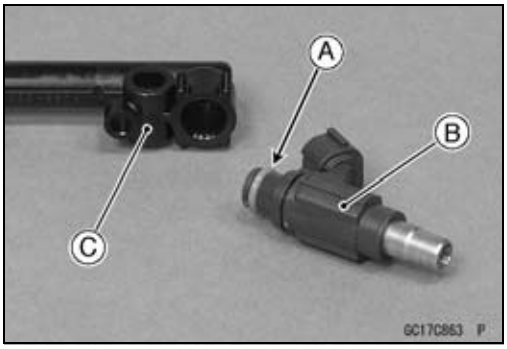
○*Do not damage the insertion portions of the injectors when they are pulled out from the delivery pipe assy.*

**CAUTION**

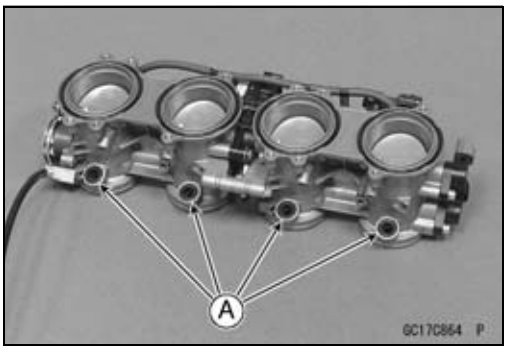
**Never drop the primary fuel injector, especially on a hard surface. Such a shock to the injector can damage it.**

### *Throttle Body Assy Assembly*

- Before assembling, blow away dirt or dust from the throttle body and delivery pipe assy by applying compressed air.
- Replace the O-rings [A] of each primary fuel injector [B] with new ones.
- Apply engine oil to the new O-rings, insert them to the delivery pipe assy [C] and confirm whether the injectors turn smoothly or not.



## Throttle Body Assy



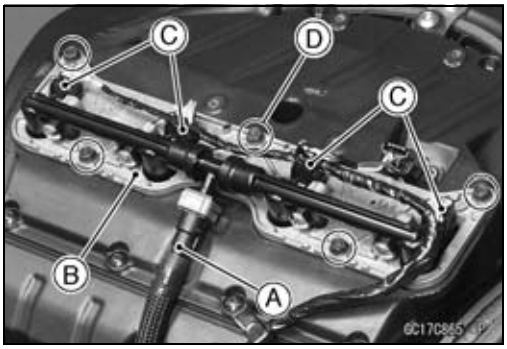

- Replace the dust seals [A] with new ones.
- Apply engine oil to the new dust seals.
- Install the primary fuel injectors along with the delivery pipe assy to the throttle body.
- Tighten:

**Torque - Delivery Pipe Assy Mounting Screws (Throttle Body Assy): 3.4 N·m (0.35 kgf·m, 30 in·lb)**

- Connect the subthrottle valve actuator connector, and bind the harness with band.
- Install the throttle body assy (see Throttle Body Assy Installation).

## Nozzle Assy

### *Nozzle Assy Removal*




- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the secondary fuel hose [A] from the delivery pipe of the nozzle assy [B] (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Disconnect the secondary fuel injector connectors [C].
- Remove:
  Nozzle Assy Mounting Bolts [D]
  Nozzle Assy

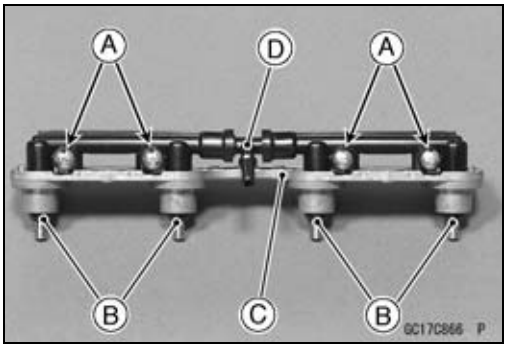
### *Nozzle Assy Installation*

- Tighten:

**Torque - Nozzle Assy Mounting Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Connect the secondary fuel hose to the delivery pipe of the nozzle assy (see Fuel Hose Replacement in the Periodic Maintenance chapter).

### *Nozzle Assy Disassembly*




- Remove the nozzle assy (see Nozzle Assy Removal).
- Remove the screws [A] to pull out the secondary fuel injectors [B] from the stay plate [C] together with the delivery pipe assy [D].

**NOTE**

○*Do not damage the insertion portions of the injectors when they are pulled out from the stay plate.*

- Pull out the secondary fuel injectors from the delivery pipe assy.

**NOTE**

○*Do not damage the insertion portions of the injectors when they are pulled out from the delivery pipe assy.*

**CAUTION**

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

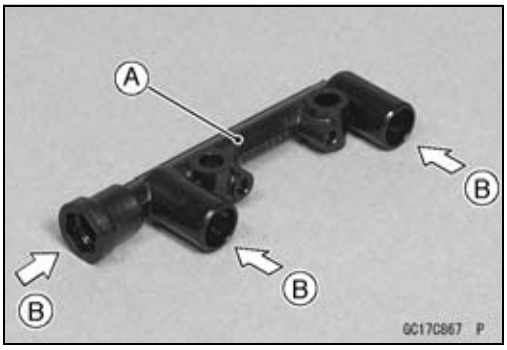
- Separate the delivery pipe assy.

**NOTE**

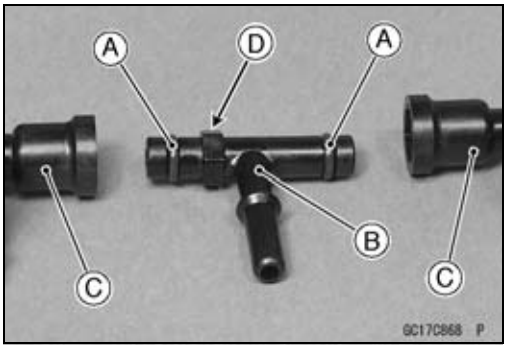
○*Mark and record the location of the delivery pipes and the joint pipe so that the delivery pipe assy can be reassembled in the original position.*

## Nozzle Assy

### *Nozzle Assy Assembly*



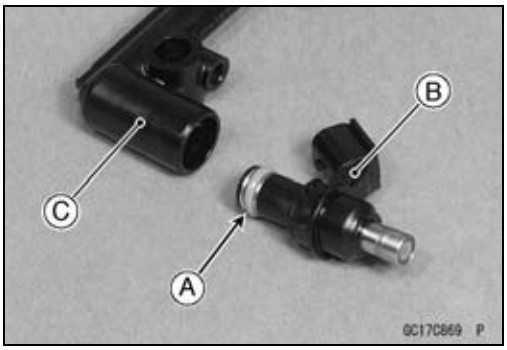

- Before assembling, blow away dirt or dust from the delivery pipes [A] by applying compressed air [B].



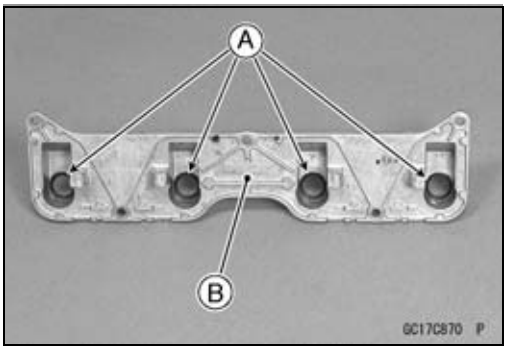

- Replace the O-rings [A] of the joint pipe [B] with new ones.
- Apply engine oil to the new O-rings, and insert it to the delivery pipes [C].

○Insert the joint pipe so that the stepped side [D] faces left side.

○Left and right delivery pipes are identical.




- Replace the O-rings [A] of each secondary fuel injector [B] with new ones.
- Apply engine oil to the new O-rings, and insert them to the delivery pipe assy [C] and confirm whether the injectors turn smoothly or not.




- Replace the dust seals [A] with new ones.
- Apply engine oil to the new dust seals.
- Install the secondary fuel injectors along with the delivery pipe assy to the stay plate [B].
- Tighten:

**Torque - Delivery Pipe Assy Mounting Screws (Nozzle Assy): 3.4 N·m (0.35 kgf·m, 30 in·lb)**

- Install the nozzle assy (see Nozzle Assy Installation).

## Air Cleaner

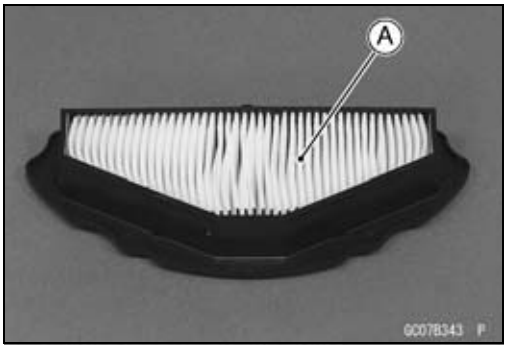
### *Air Cleaner Element Removal/Installation*

- Refer to the Air Cleaner Element Replacement in the Periodic Maintenance chapter.

### *Air Cleaner Element Inspection*

- Remove the air cleaner element (see Air Cleaner Element Replacement in the Periodic Maintenance chapter).
- Visually check the element [A] for tears or breaks.

★If the element has any tears or breaks, replace the element.

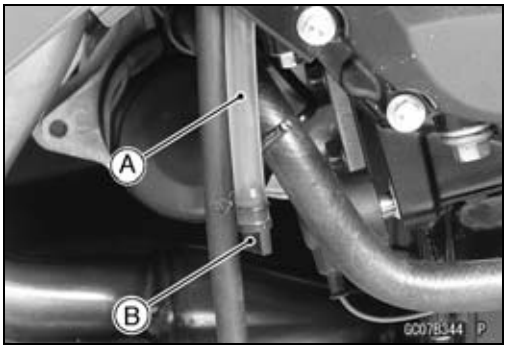



### *Air Cleaner Oil Draining*

A drain hose is connected to the bottom of the air cleaner to drain water or oil accumulated in the cleaner part.

- Remove the left lower fairing (see Lower Fairing Removal in the Frame chapter).
- Visually check the drain hose [A] if the water or oil accumulates.

★If any water or oil accumulates in the hose, remove the plug [B] from the drain hose and drain it.

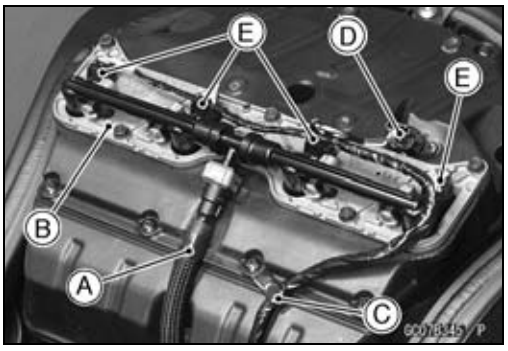



**⚠ WARNING**

**Be sure to reinstall the plug in the drain hose after draining. Oil on tires will make them slippery and can cause an accident and injury.**

### *Air Cleaner Housing Removal*

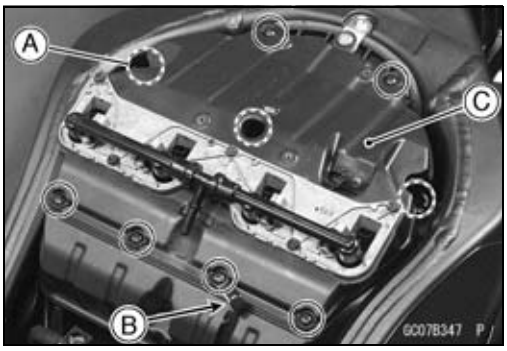
- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the secondary fuel hose [A] from the delivery pipe of the nozzle assy [B] (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Open the clamp [C].
- Disconnect:
  Inlet Air Temperature Sensor Connector [D]
  Secondary Fuel Injector Connectors [E]




- For the United States, Canada and California models, remove the rubber plate [A].

## Air Cleaner

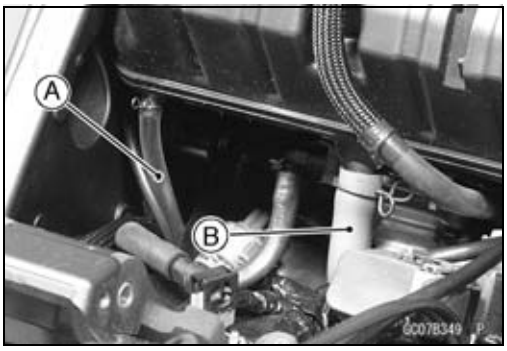
- Remove:
  Air Cleaner Housing Assembly Screws [A]
  Clamp [B]
  Upper Air Cleaner Housing [C]



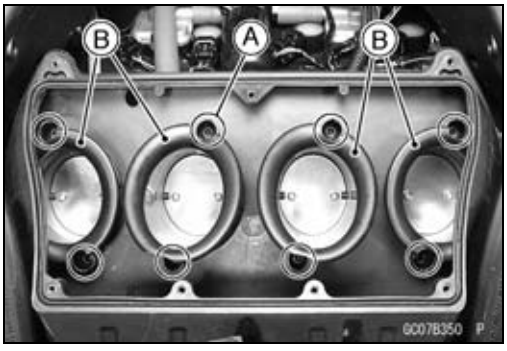

- Remove:
  Air Cleaner Housing Mounting Bolt (Upper) [A]
  Middle Air Cleaner Housing [B] (with Element [C])


- Separate the air switching valve hose [A] from the lower air cleaner housing.


- Remove:
  Air Cleaner Drain Hose [A]
  Breather Hose [B]

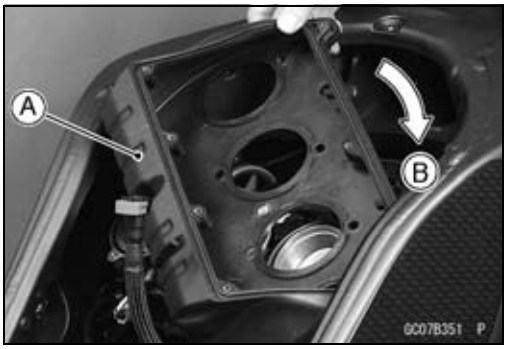



- Remove:
  Air Cleaner Housing Mounting Bolts (Lower) [A]
  Air Ducts [B]



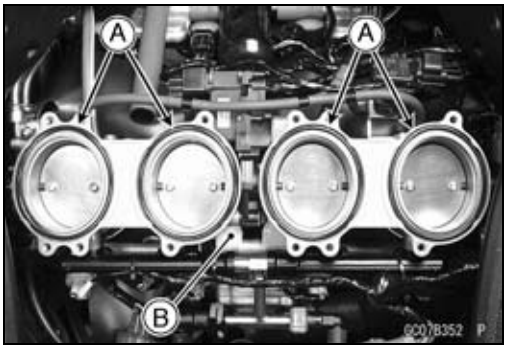
## Air Cleaner

● Turn the lower air cleaner housing [A] clockwise [B], and remove it upward.

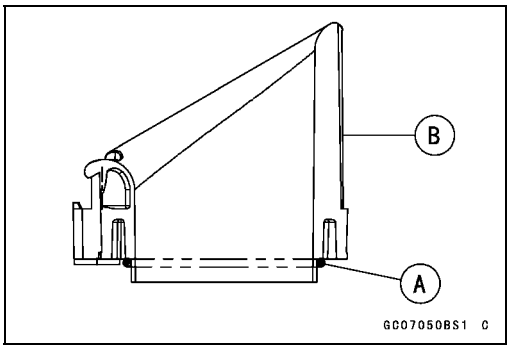



### *Air Cleaner Housing Installation*

● Replace the O-rings [A] with new ones.
● Apply grease to the new O-rings, and fit them into the grooves of the throttle body assy [B] securely.

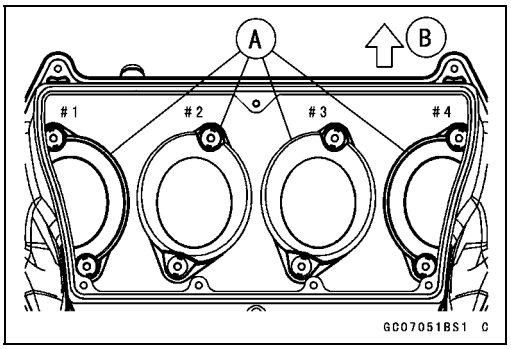



● Replace the O-rings [A] with new ones.
● Apply grease to the new O-rings, and install them on each air duct [B] as shown in the figure.




● Install the air ducts [A] as shown in the figure.
Front [B]
○The air duct #2 and #3 are identical.
● Apply a non-permanent locking agent to the treads of the air cleaner housing mounting bolts (lower), and tighten them.

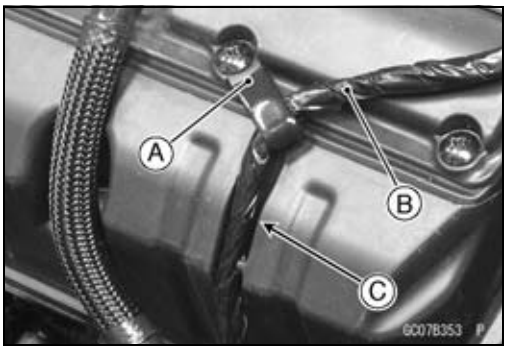
**Torque - Air Cleaner Housing Mounting Bolts (Lower): 4.2 N·m (0.43 kgf·m, 37 in·lb)**




● Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
● Tighten:

**Torque - Air Cleaner Housing Mounting Bolt (Upper): 7.0 N·m (0.71 kgf·m, 62 in·lb)**

## Air Cleaner




- Install the clamp [A] as shown in the figure.
- Tighten:

**Torque - Air Cleaner Housing Assembly Screws: 1.1 N·m (0.11 kgf·m, 9.7 in·lb)**

- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

○Fit the harness (for secondary fuel injectors and inlet air temperature sensor) [B] into the groove [C] of the lower air cleaner housing and fix it with the clamp.

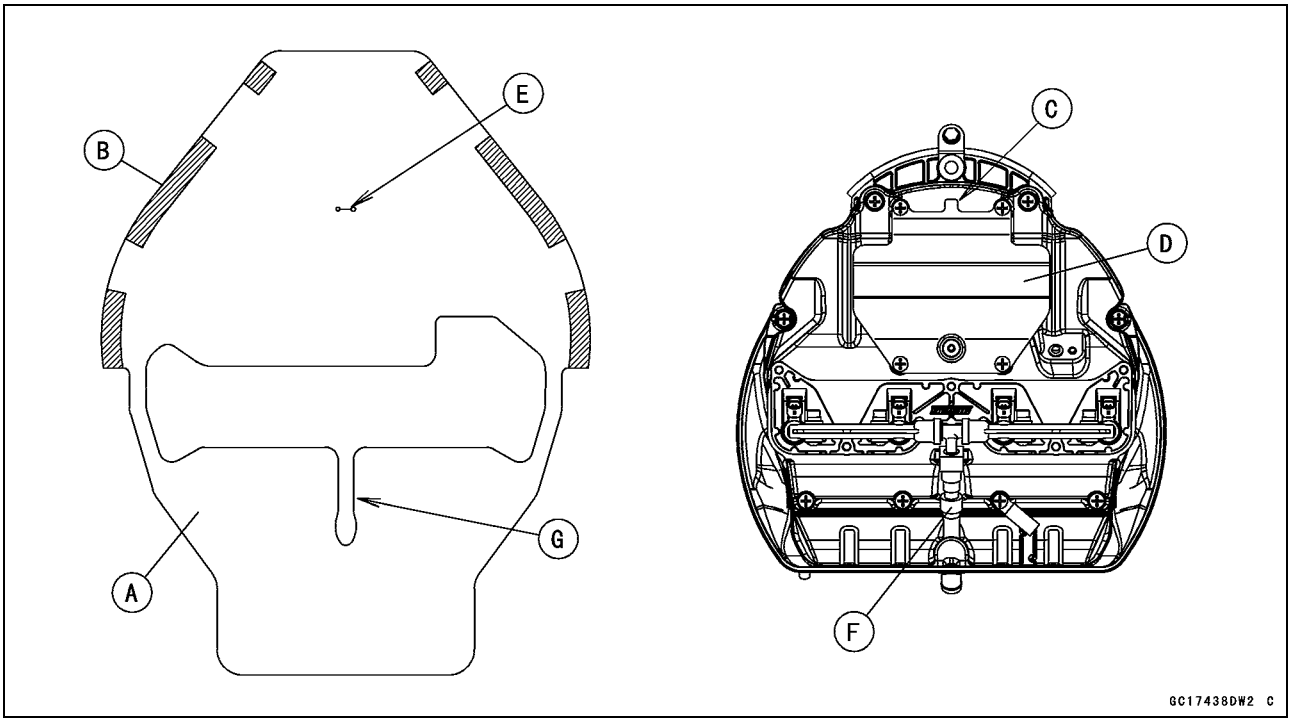
- Connect the secondary fuel hose to the delivery pipe of the nozzle assy (see Fuel Hose Replacement in the Periodic Maintenance chapter).

- For United States, Canada and California models, install the rubber plate [A] as follows.

○Install the rubber plate so that the pads [B] faces upward.

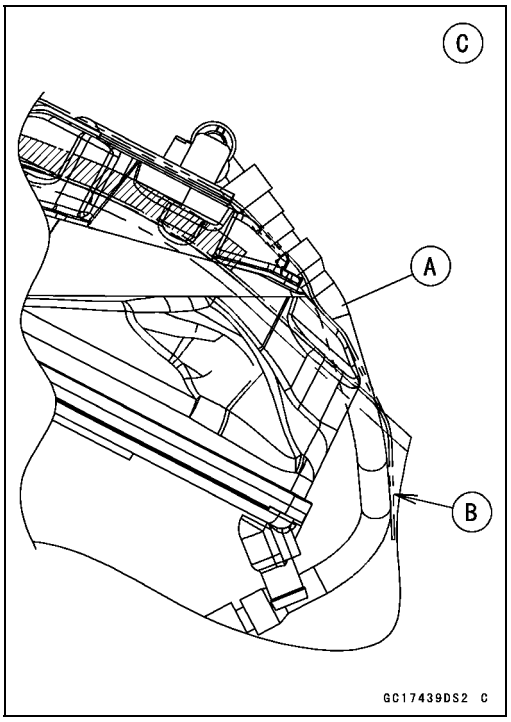
○Insert the projection [C] of the holder [D] into the slit [E] of the rubber plate.

○Install the rubber plate so that the secondary fuel hose [F] fits into groove [G].



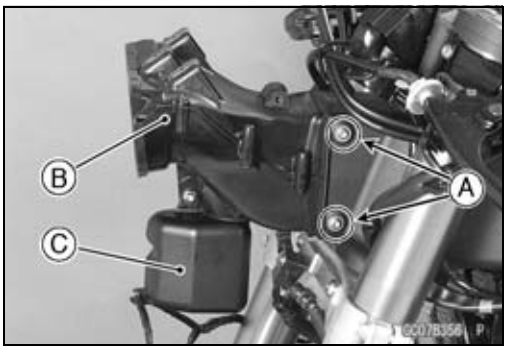
## Air Cleaner

○Cover the secondary fuel hose [A] with the rear end [B] of the rubber plate as shown in the figure.
Left Side View [C]
○Set the rear end of the rubber plate faces downward.



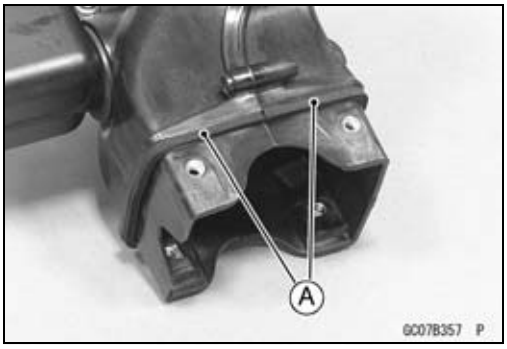
## Air Line

### *Air Inlet Duct Removal*




- Remove:
  Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
  Air Inlet Duct Mounting Bolts [A] (Both Sides)
  Air Inlet Duct [B] (with Resonator Tank [C])

### *Air Inlet Duct Installation*




- Check that the pads [A] are in place on the air inlet duct.
- Apply a non-permanent locking agent to the treads of the air inlet duct mounting bolts, and tighten them.

  **Torque - Air Inlet Duct Mounting Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## Fuel Tank

### *Fuel Tank Removal*

**⚠ 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 and disconnect the battery (–) terminal.**
**To avoid fire, do not remove the fuel tank when the engine is still hot. Wait until it cools down.**
**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.**

- Turn the ignition switch OFF.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Wait until the engine cools down.
- Disconnect the battery (–) terminal (see Battery Removal in the Electrical System chapter).
- Remove the fuel tank bolts [A].


- Open the fuel tank cap [A] to lower the pressure in the tank.

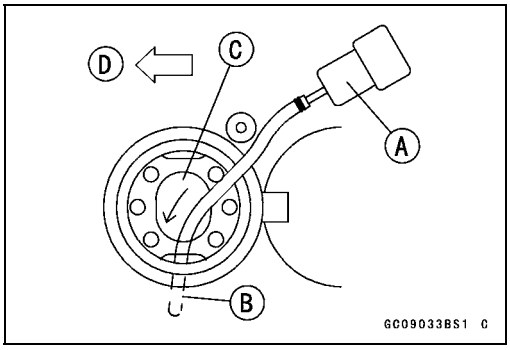
○During tank removal, keep the tank cap open to release pressure in the tank. This makes fuel spillage less.


- Draw the fuel out from the fuel tank with a commercially available pump [A].

○Use a soft plastic hose [B] as a pump inlet hose in order to insert the hose smoothly.

○Put the hose through the fill opening [C] into the tank and draw the fuel out.

Front [D]

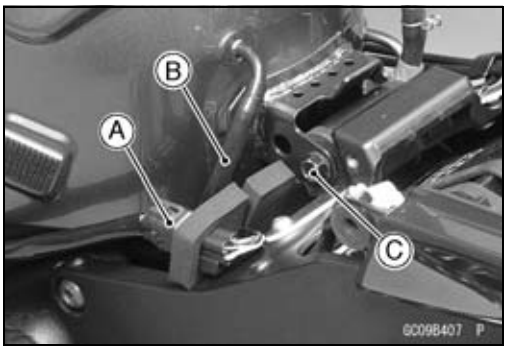



**⚠ WARNING**

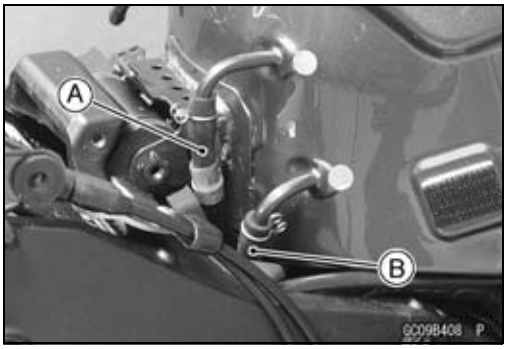
**The fuel could not be removed completely from the fuel tank. Be careful for remained fuel spillage.**

## Fuel Tank

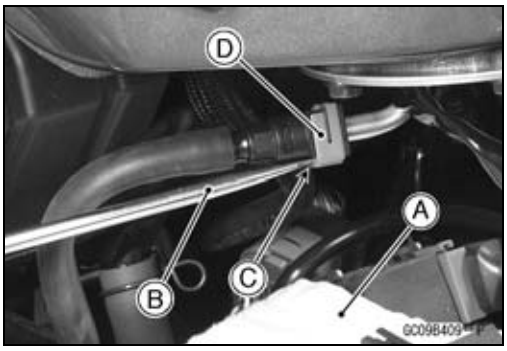
- Disconnect the fuel pump lead connector [A].
- Remove:
  Fuel Tank Drain Hose [B]
  Fuel Tank Bolt [C]




- For the California and Southeast Asia models, remove the following.
  Fuel Return Hose [A] (left side, red)
  Fuel Tank Breather Hose [B] (right side, blue)



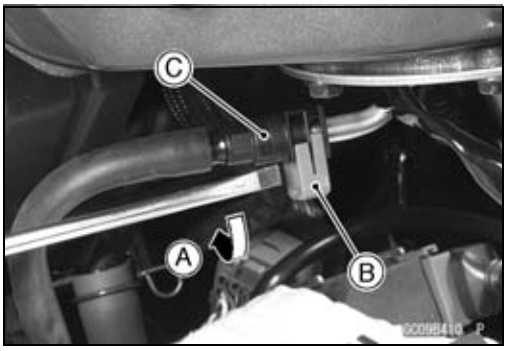

- Be sure to place a piece of cloth [A] around the fuel hose joint.
- Insert a thin blade screwdriver [B] into the slit [C] on the joint lock [D].




- Turn [A] the driver to disconnect the joint lock [B].
- Pull the fuel hose joint [C] out of the outlet pipe.

**⚠ 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. Cover the hose connection with a clean shop towel to prevent fuel spillage.**




- Close the fuel tank cap.
- Remove the fuel tank, and place a it on a flat surface.

○Do not apply the load to the fuel outlet pipe of the fuel pump.

## Fuel Tank

● For the California and Southeast Asia models, note the following.

**CAUTION**

**For the California and Southeast Asia models, if gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.**

○Be sure to plug the evaporative fuel return hose to prevent fuel spilling before fuel tank removal.

**⚠ WARNING**

**For the California and Southeast Asia models, be careful not to spill the gasoline through the return hose. Spilled fuel is hazardous.**

★If liquid or gasoline flows into the breather hose, remove the hose and blow it clean with compressed air.

○Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump.

**⚠ WARNING**

**Store the fuel tank in an area which is well -ventilated and free from any source of flame or sparks. Do not smoke in this area. Place the fuel tank on a flat surface and plug the fuel pipes to prevent fuel leakage.**

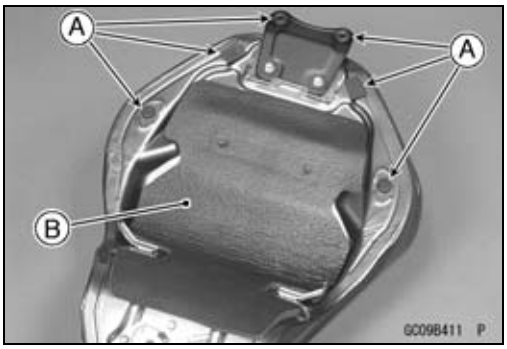
### *Fuel Tank Installation*

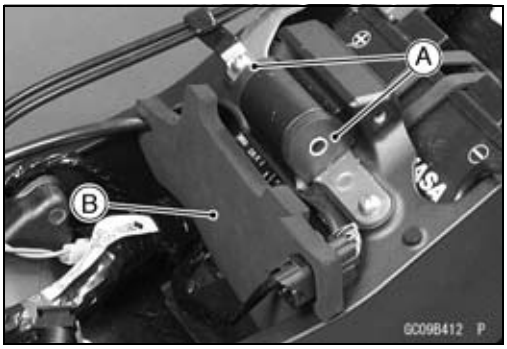
● Note the above WARNING (see Fuel Tank Removal).

● Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

● Check that the dampers [A] and pads [B] are in place on the frame and the fuel tank.

★If the dampers are damaged or deteriorated, replace them.



## Fuel Tank

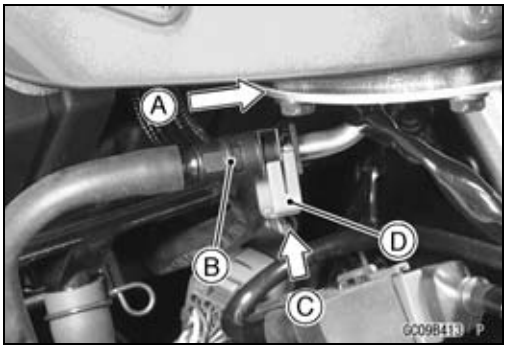
- For the California and Southeast Asia models, note the following.

○To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.

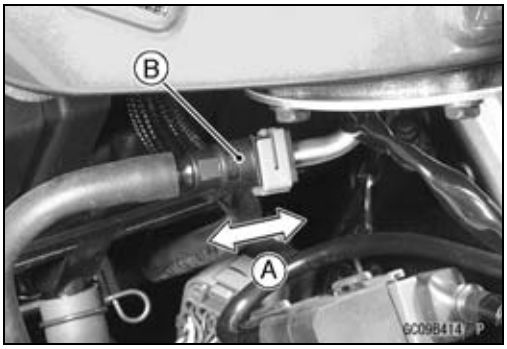
○Connect the hoses according to the diagram of the evaporative emission control system. Make sure they do not get pinched or kinked.

○Run the hoses with a minimum of bending so that the air or vapor will not be obstructed.

- Insert [A] the fuel hose joint [B] straight onto the fuel outlet pipe until the hose joint clicks.
- Push [C] the joint lock [D] until the hose joint clicks.




- Push and pull [A] the fuel hose joint [B] back and forth more than two times, and make sure it is locked and does not come off.




**⚠ WARNING**

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

★If it comes off, reinstall the hose joint.

- Connect the fuel pump lead connector and the battery (–) terminal (see Battery Installation in the Electrical System chapter).

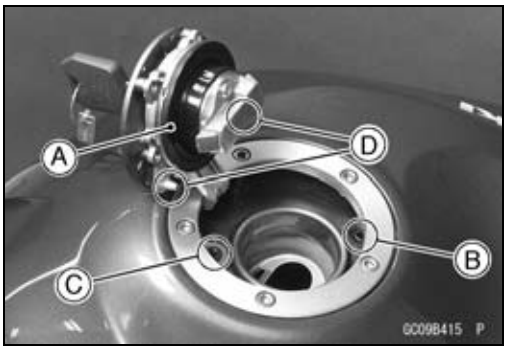
### *Fuel Tank Inspection*

- Visually inspect the gasket [A] on the tank cap for any damage.

★Replace the gasket if it is damaged.

- Check to see if the water drain pipe [B] and fuel breather pipe [C] (California and Southeast Asia models) in the tank are not clogged. Check the tank cap breather also.

★If they are clogged, remove the tank and drain it, and then blow the breather free with compressed air.




**CAUTION**

**Do not apply compressed air to the air vent holes [D] in the tank cap. This could cause damage and clogging of the labyrinth in the cap.**

## Fuel Tank

### *Fuel Tank Cleaning*

**⚠ WARNING**

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

- Remove:
  Fuel Tank (see Fuel Tank Removal)
  Fuel Pump (see Fuel Pump Removal)
- Pour some high-flash point solvent into the fuel tank and shake the tank to remove dirt and fuel deposits.
- Draw the solvent out of the fuel tank.
- Dry the tank with compressed air.
- Install:
  Fuel Pump (see Fuel Pump Installation)
  Fuel Tank (see Fuel Tank Installation)

## Evaporative Emission Control System (CAL and SEA Models)

The Evaporative Emission Control System routes fuel vapors from the fuel system into the running engine or stores the vapors in a canister when the engine is stopped. Although no adjustments are required, a thorough visual inspection must be made at the intervals specified by the Periodic Maintenance Chart.

### *Parts Removal/Installation*

**⚠ 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.**

**CAUTION**

**If gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.**

- To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
- Connect the hoses according to the diagram of the system (see Cable, Wire, and Hose Routing section in the Appendix chapter). Make sure they do not get pinched or kinked.

### *Hose Inspection*

- Refer to the Evaporative Emission Control System Inspection (CAL and SEA Models) in the Periodic Maintenance chapter.

### *Separator Inspection*

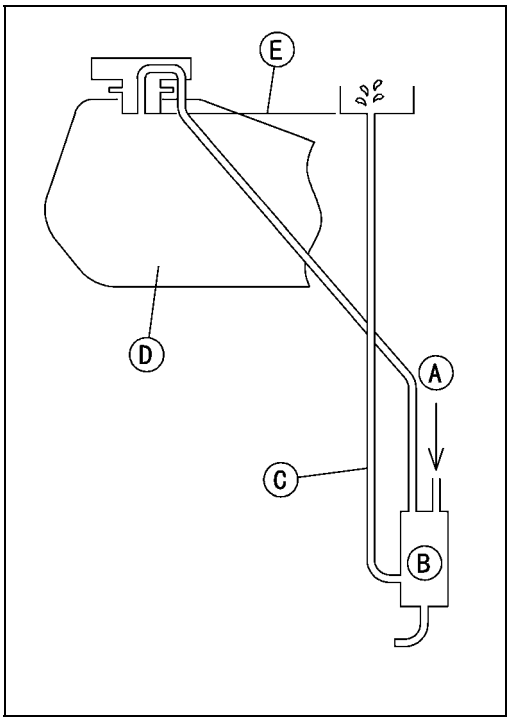
- Refer to the Evaporative Emission Control System Inspection (CAL and SEA Models) in the Periodic Maintenance chapter.

## Evaporative Emission Control System (CAL and SEA Models)

### *Separator Operation Test*

**⚠ WARNING**

**Gasoline is extremely flammable and can be explosive under certain conditions. Do not smoke. Turn the ignition switch OFF. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**



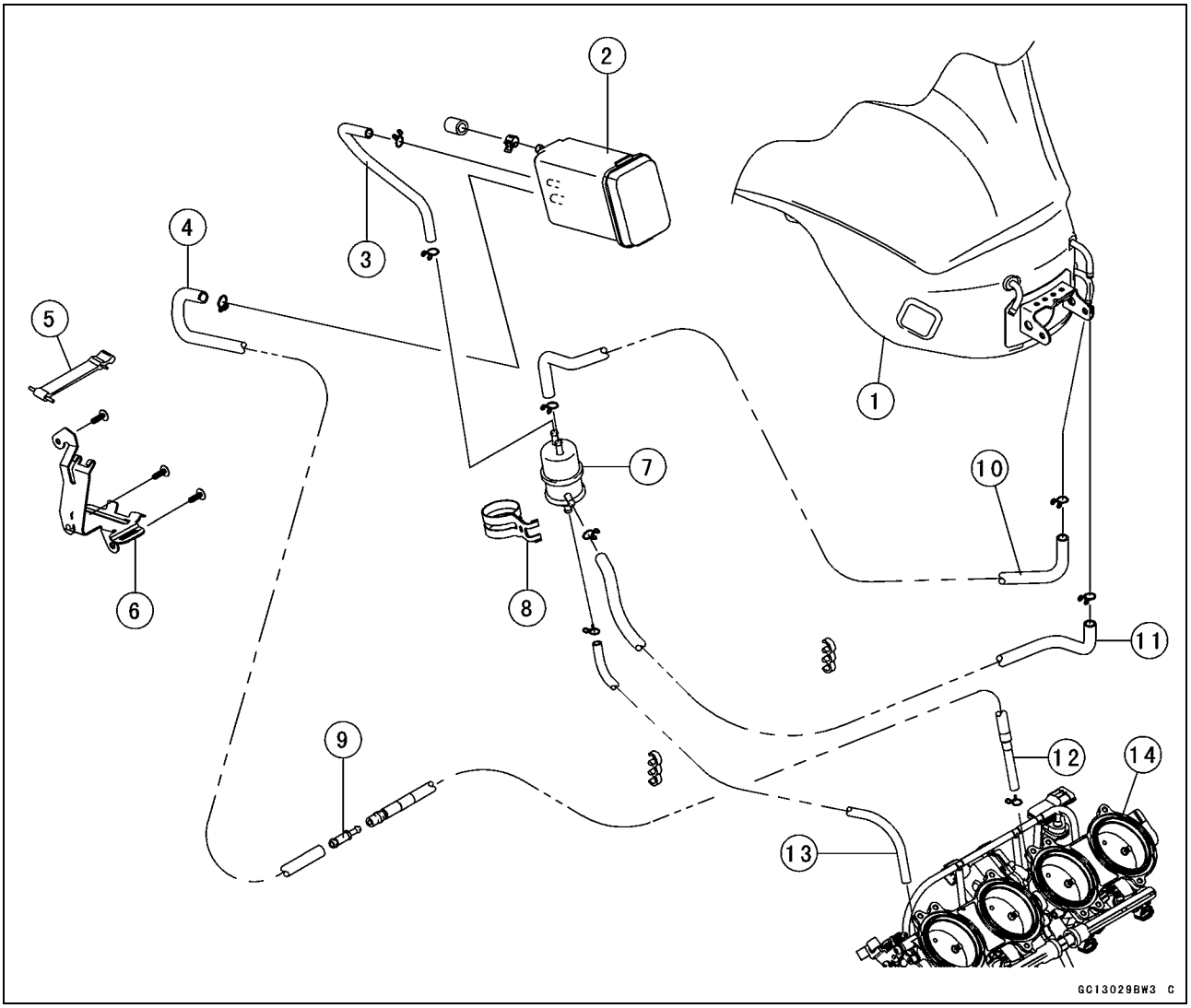

- Connect the hoses to the separator, and install the separator on the motorcycle.
- Disconnect the breather hose from the separator, and inject about 20 mL (0.68 US oz.) of gasoline [A] into the separator [B] through the hose fitting.
- Disconnect the fuel return hose [C] from the fuel tank [D].
- Run the open end of the return hose into the container and hold it level with the tank top [E].
- Start the engine, and let it idle.

★If the gasoline in the separator comes out of the hose, the separator works well. If it does not, replace the separator with a new one.

### *Canister Inspection*

- Refer to the Evaporative Emission Control System Inspection (CAL and SEA Models) in the Periodic Maintenance chapter.

## Evaporative Emission Control System (CAL and SEA Models)

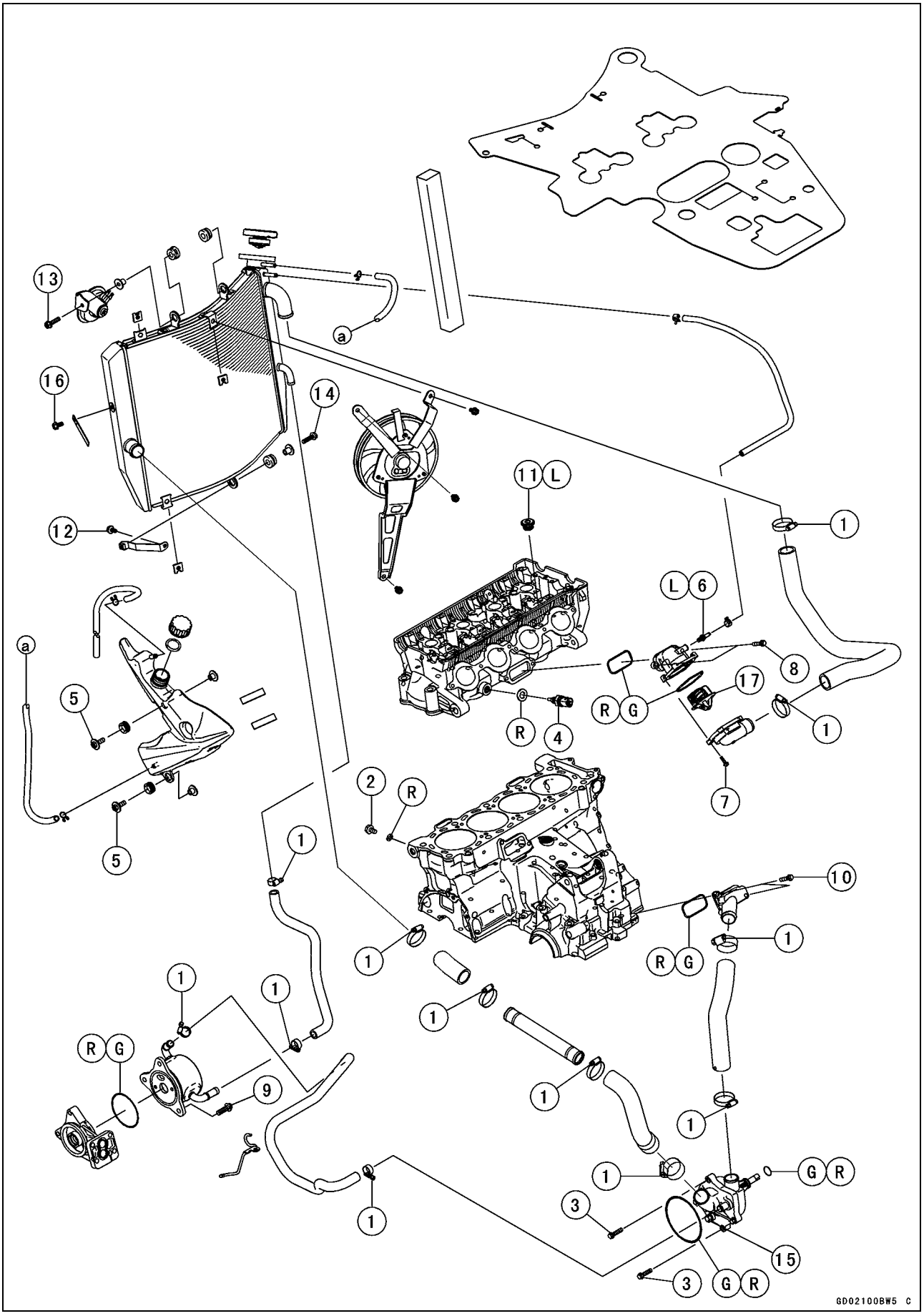



1. Fuel Tank
2. Canister
3. Blue Hose (Breather)
4. Green Hose (Purge)
5. Band (for Canister)
6. Bracket (for Canister)
7. Separator
8. Bracket (for Separator)
9. Fitting
10. Blue Hose (Breather)
11. Red Hose (Return)
12. Green Hose (Purge)
13. White Hose (Vacuum)
14. Throttle Body Assy

# Cooling System

## Table of Contents

## Exploded View



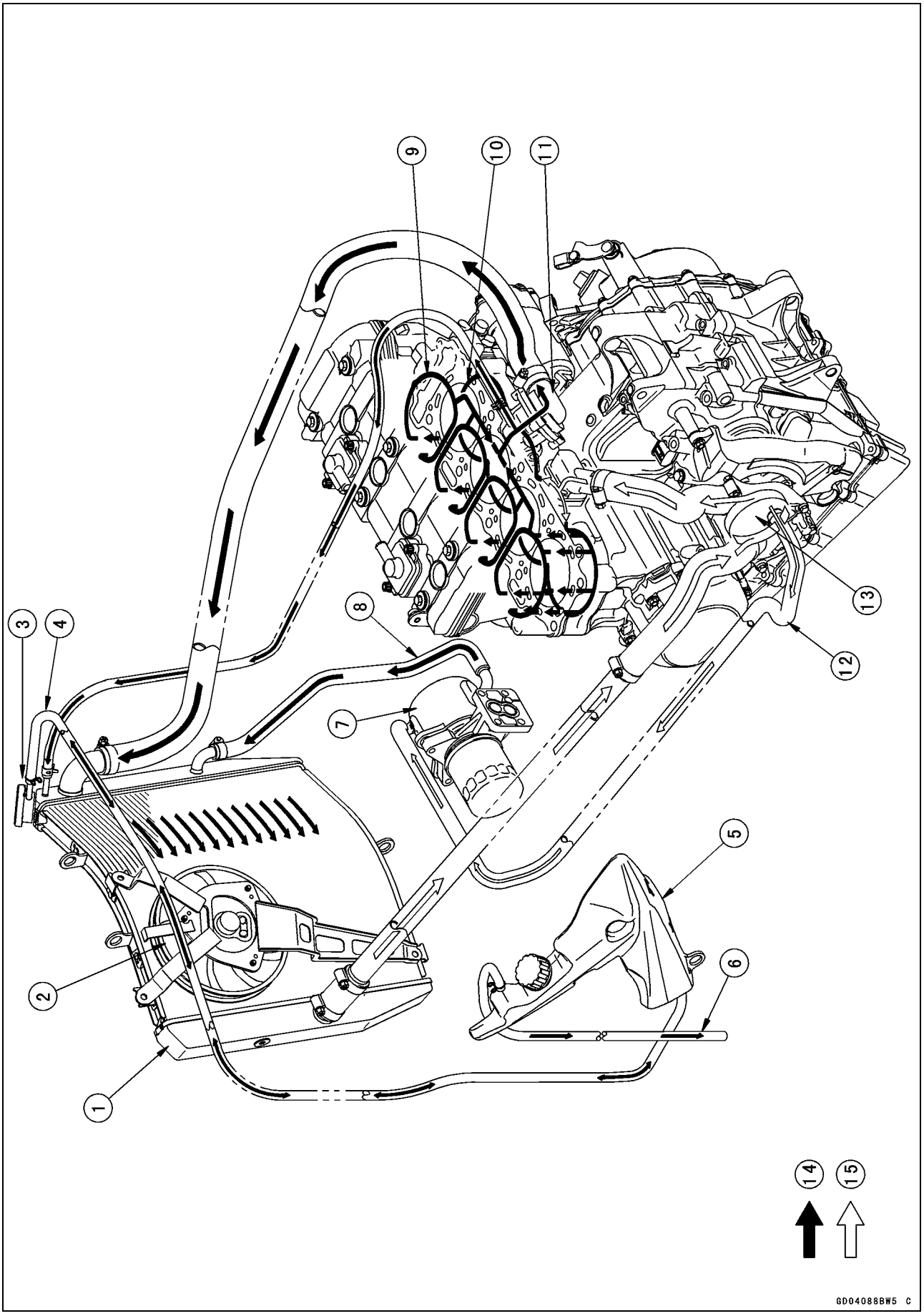
## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Water Hose Clamp Screws | 2.0 | 0.20 | 18 in·lb | |
| 2 | Coolant Drain Bolt (Cylinder) | 10 | 1.0 | 89 in·lb | |
| 3 | Water Pump Cover Bolts | 10 | 1.0 | 89 in·lb | |
| 4 | Water Temperature Sensor | 25 | 2.5 | 18 | |
| 5 | Coolant Reserve Tank Mounting Bolts | 7.0 | 0.71 | 62 in·lb | |
| 6 | Coolant By-pass Fitting Bolt | 9.0 | 0.92 | 80 in·lb | L |
| 7 | Thermostat Housing Cover Bolts | 6.0 | 0.61 | 53 in·lb | |
| 8 | Thermostat Housing Mounting Bolts | 10 | 1.0 | 89 in·lb | |
| 9 | Oil Cooler Mounting Bolts | 20 | 2.0 | 15 | |
| 10 | Water Hose Fitting Bolts | 10 | 1.0 | 89 in·lb | |
| 11 | Water Passage Plugs | 20 | 2.0 | 15 | L |
| 12 | Radiator Bracket Mounting Bolt | 7.0 | 0.71 | 62 in·lb | |
| 13 | Radiator Upper Bolt | 7.0 | 0.71 | 62 in·lb | |
| 14 | Radiator Lower Bolt | 7.0 | 0.71 | 62 in·lb | |
| 15 | Coolant Drain Bolt (Water Pump) | 10 | 1.0 | 89 in·lb | |
| 16 | Radiator Overflow Hose Clamp Bolt | 10 | 1.0 | 89 in·lb | |

17. Thermostat

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

## Coolant Flow Chart



## Coolant Flow Chart

1. Radiator
2. Radiator Fan
3. Radiator Cap
4. Radiator Overflow Hose
5. Reserve Tank
6. Reserve Tank Overflow Hose
7. Oil Cooler
8. Outlet Hose
9. Cylinder Head Jacket
10. Cylinder Jacket
11. Thermostat Housing
12. Inlet Hose
13. Water Pump
14. Hot Coolant
15. Cold Coolant

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 less than 55°C (131°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 58 ~ 62°C (136 ~ 144°F), the thermostat opens and the coolant flows.

When the coolant temperature goes up beyond 95°C (203°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 coolant temperature is below 90°C (194°F), 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 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 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 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 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.

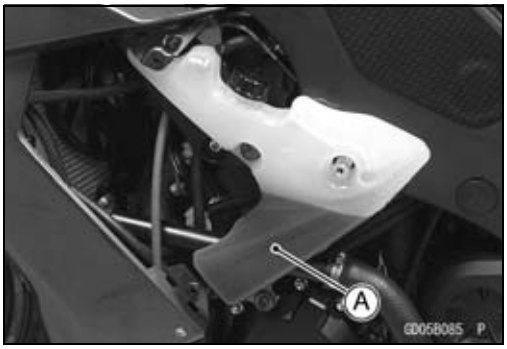
# 4-6 COOLING SYSTEM

## 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 | 2.9 L (3.1 US qt) (Reserve tank full level, including radiator and engine) |
| **Radiator Cap** | |
| Relief Pressure | 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 psi) |
| **Thermostat** | |
| Valve Opening Temperature | 58 ~ 62°C (136 ~ 144°F) |
| Valve Full Opening Lift | 8 mm (0.31 in.) or more at 75°C (167°F) |

## Coolant

### *Coolant Deterioration Inspection*




- Remove the left upper fairing cover (see Upper Fairing Cover Removal in the Frame chapter).
- Visually inspect the coolant in the reserve tank [A].

★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 Inspection in the Periodic Maintenance chapter.

### *Coolant Draining*

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

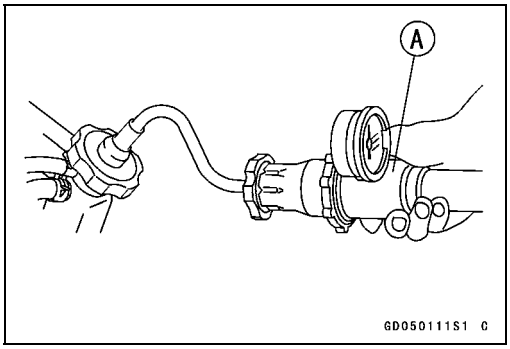
### *Coolant Filling*

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

### *Pressure Testing*


- Remove:
  Right Upper Inner Fairing (see Upper Inner Fairing Removal in the Frame chapter)
  Radiator Cap [A]

○Remove the radiator cap 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.




- Install the cooling system pressure tester [A] on the filler neck.

**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 123 kPa (1.25 kgf/cm², 18 psi).

**CAUTION**

**During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kgf/cm², 18 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.

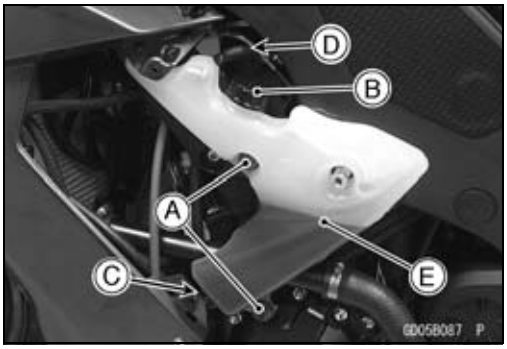
- Drain the cooling system (see Coolant Change in the Periodic Maintenance chapter).
- Fill the cooling system with fresh water mixed with a flushing compound.

| 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*

- Remove:
  Left Upper Fairing Cover (see Upper Fairing Cover Removal in the Frame chapter)
  Coolant Reserve Tank Mounting Bolts [A]
- Remove the cap [B] and poor the coolant into a container.
- Remove:
  Radiator Overflow Hose [C]
  Reserve Tank Overflow Hose [D]
  Coolant Reserve Tank [E]



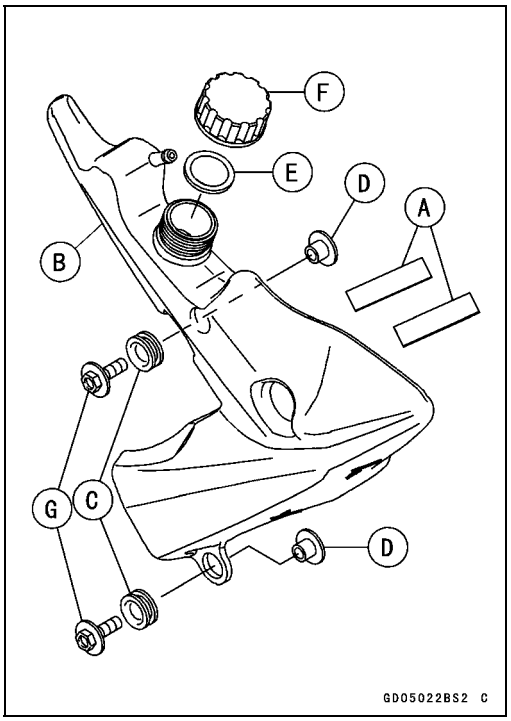
## Coolant

### *Coolant Reserve Tank Installation*

- Be sure that the pads [A] are in positions on the coolant reserve tank [B].
- Install the following to the coolant reserve tank.
  Rubber Dampers [C]
  Collars [D]
  Gasket [E]
  Cap [F]
- Tighten:

**Torque - Coolant Reserve Tank Mounting Bolts [G]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

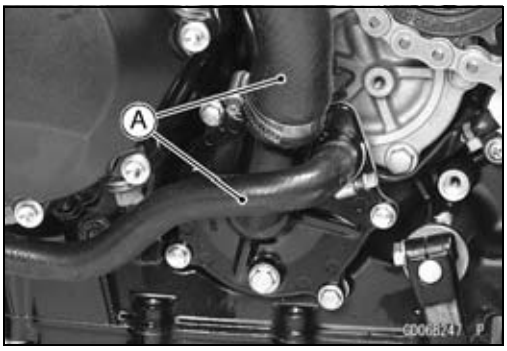
- Run the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Fill the coolant reserve tank with coolant (see Coolant Change in the Periodic Maintenance chapter).



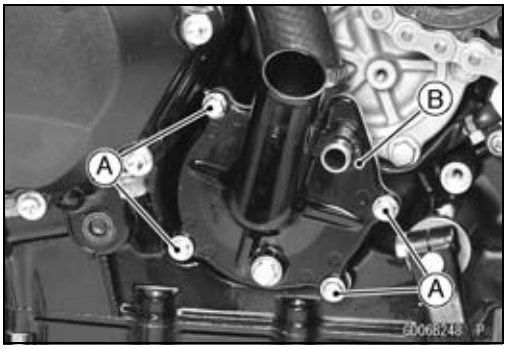
## Water Pump

### *Water Pump Removal*

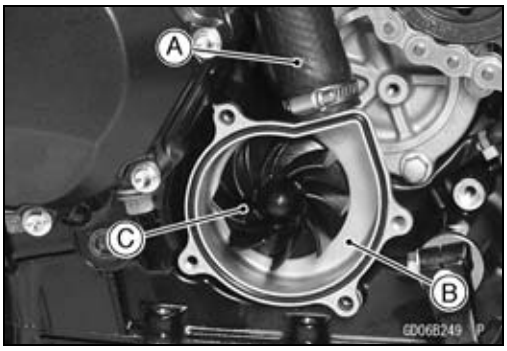
- Drain:
  Coolant (see Coolant Change in the Periodic Maintenance chapter)
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
  Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  Water Hoses [A]




- Remove:
  Water Pump Cover Bolts [A]
  Water Pump Cover [B]

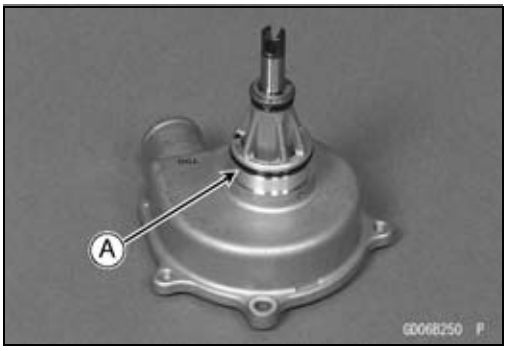



- Remove the water hose [A].
- Remove the water pump body [B] with impeller [C].

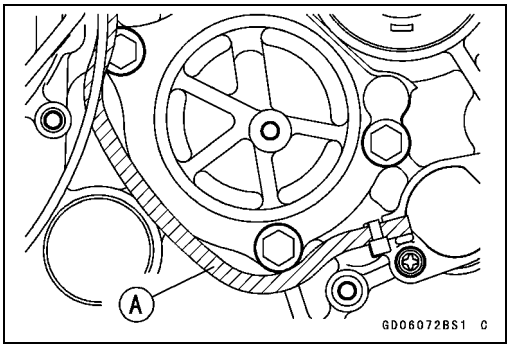



### *Water Pump Installation*

- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.



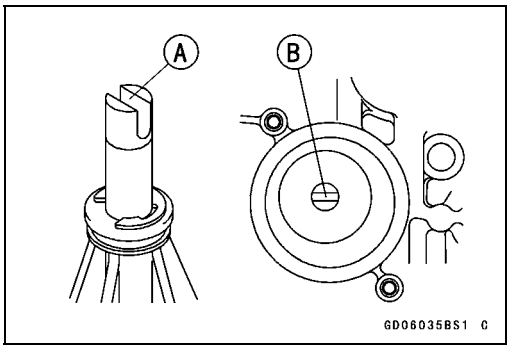

- Run the gear position switch lead [A] as shown in the figure.



## Water Pump

● Turn the impeller shaft so that the slot [A] in its shaft fits onto the projection [B] of the oil pump gear shaft.

| CAUTION |
| --- |
| **Do not pinch the gear position switch lead.** |

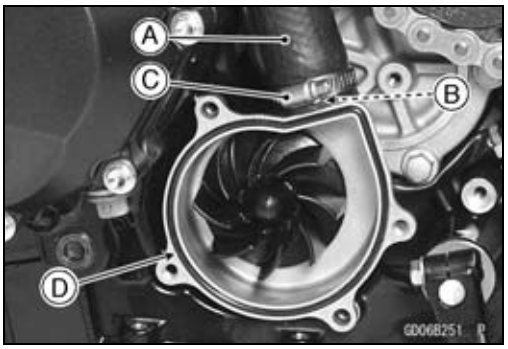



● Install the water hose [A] so that the white mark [B] faces outside.
● Install the hose clamp [C] as shown in the figure.
● Tighten:

**Torque - Water Hose Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

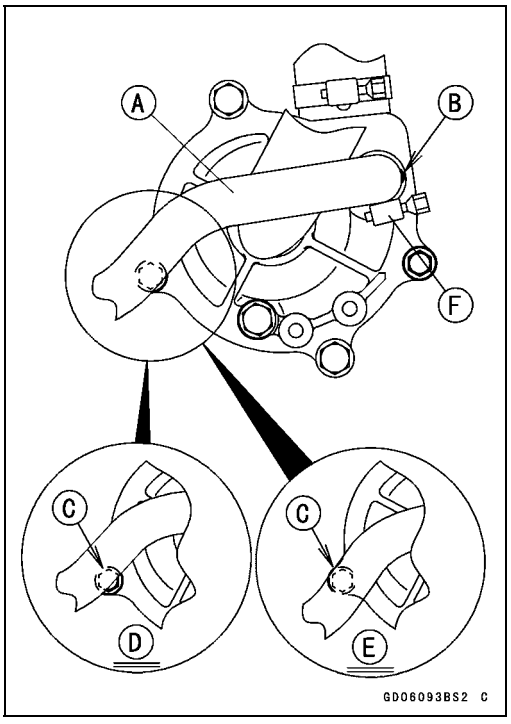
● Replace the O-ring [D] with a new one.
● Apply grease to the new O-ring.
● Tighten:

**Torque - Water Pump Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**




● Install the water hose [A] as follows.
○Install the water hose so that the white mark [B] faces backward.
○Run the water hose over the water pump cover bolt [C] as shown in the figure.
Limit of Upper Side [D]
Limit of Lower Side [E]
● Install the hose clamp [F] as shown in the figure.
● Tighten:

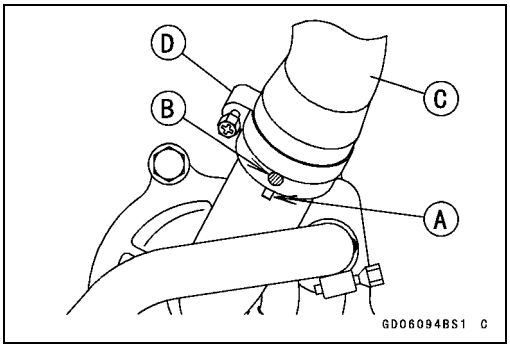
**Torque - Water Hose Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**



## Water Pump

- Align the line [A] of the water pump cover and the white mark [B] of the water hose [C].
- Install the hose clamp [D] as shown in the figure.
- Tighten:

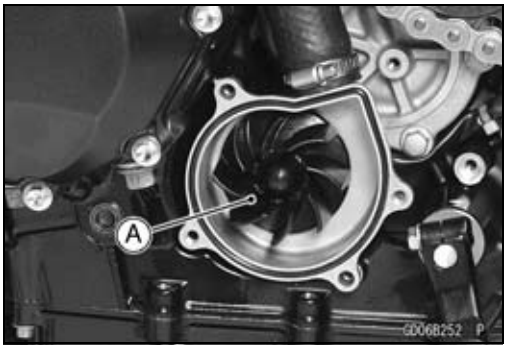
**Torque - Water Hose Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**




### *Water Pump Impeller Inspection*

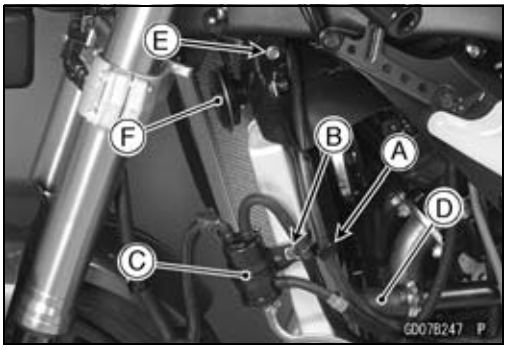
- Remove the water pump cover (see Water Pump Removal).
- Visually inspect the water pump impeller [A].

★If the surface is corroded or if the blades are damaged, replace the water pump assy.

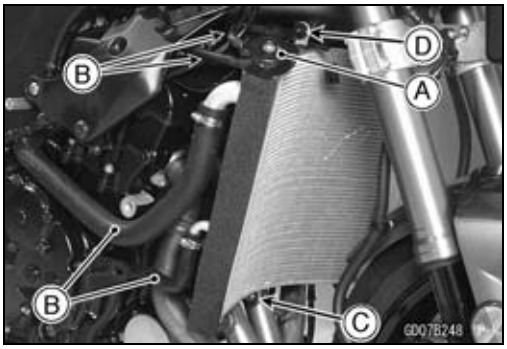


## Radiator

### *Radiator and Radiator Fan Removal*



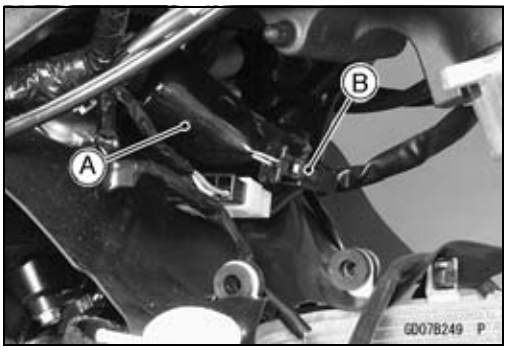

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Open the clamp [A].
- For the California and Southeast Asia models, remove the following.
  Separator Bracket Mounting Bolt [B]
  Clamp
  Separator [C]
- Remove:
  Radiator Hose [D]
  Radiator upper Bolt [E]
  Horn [F]




- Remove:
  Radiator Cap [A]
  Radiator Hoses [B]
  Radiator Lower Bolt [C]
- Pull the radiator from the projection [D], and lower the radiator.

**CAUTION**

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

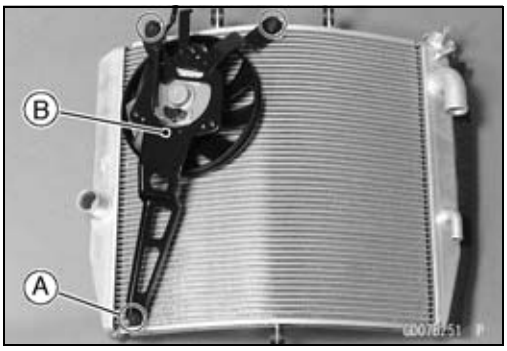



- Slide the dust cover [A].
- Disconnect the radiator fan lead connector [B] and remove the radiator.

○Remove the bolt [A] and radiator bracket [B] as necessary.

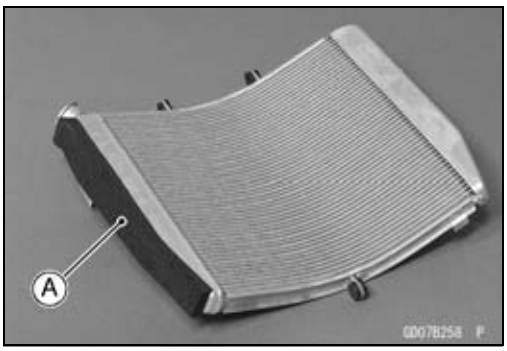
## Radiator

- Remove:
  Radiator Fan Mounting Bolts [A]
  Radiator Fan [B]

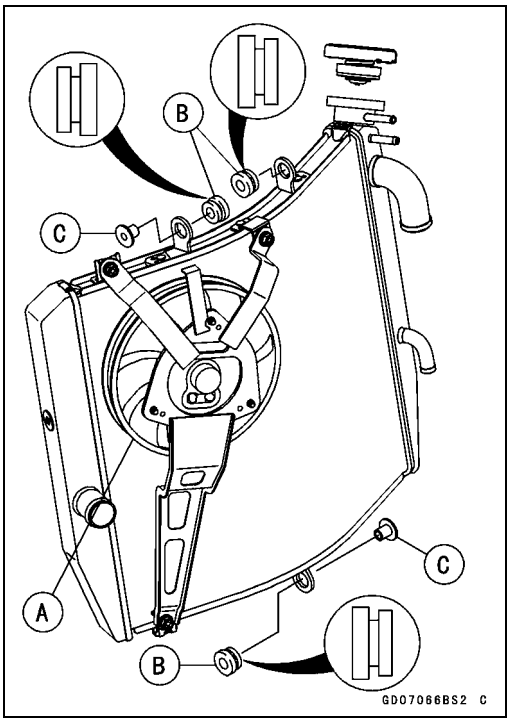



### *Radiator and Radiator Fan Installation*

- Check that the pad [A] is in place on the radiator.

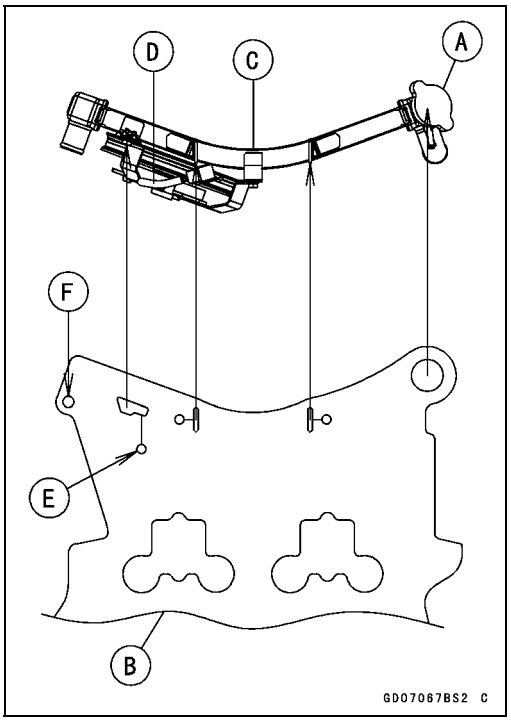



- Install the radiator fan [A].
- Install the rubber dampers [B] and collars [C] as shown in the figure.

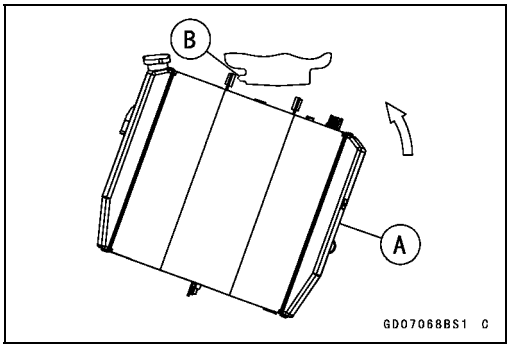


## Radiator

- Remove the radiator cap [A] temporarily.
- Cover the heat insulation rubber plate [B] on the radiator [C] as shown in the figure.
- Reinstall the radiator cap.
- Run the radiator fan lead [D] to the hole [E] of the heat insulation rubber plate.
- Connect radiator fan lead connector.
- Run the radiator overflow hose to the hole [F] of the heat insulation rubber plate, then run it over the rubber plate.




- Install the radiator [A] in the projection [B] as shown in the figure.



## Radiator

★If the radiator bracket [A] was removed, install it.

**Torque - Radiator Bracket Mounting Bolt [B]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Install the horn [C].
- Tighten:

**Torque - Radiator Upper Bolt [D]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**
**Radiator Lower Bolt [E]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Face the white mark [F] of the radiator hose [G] direction as shown in the figure.
- Install the water hose clamp [H].

**Torque - Water Hose Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

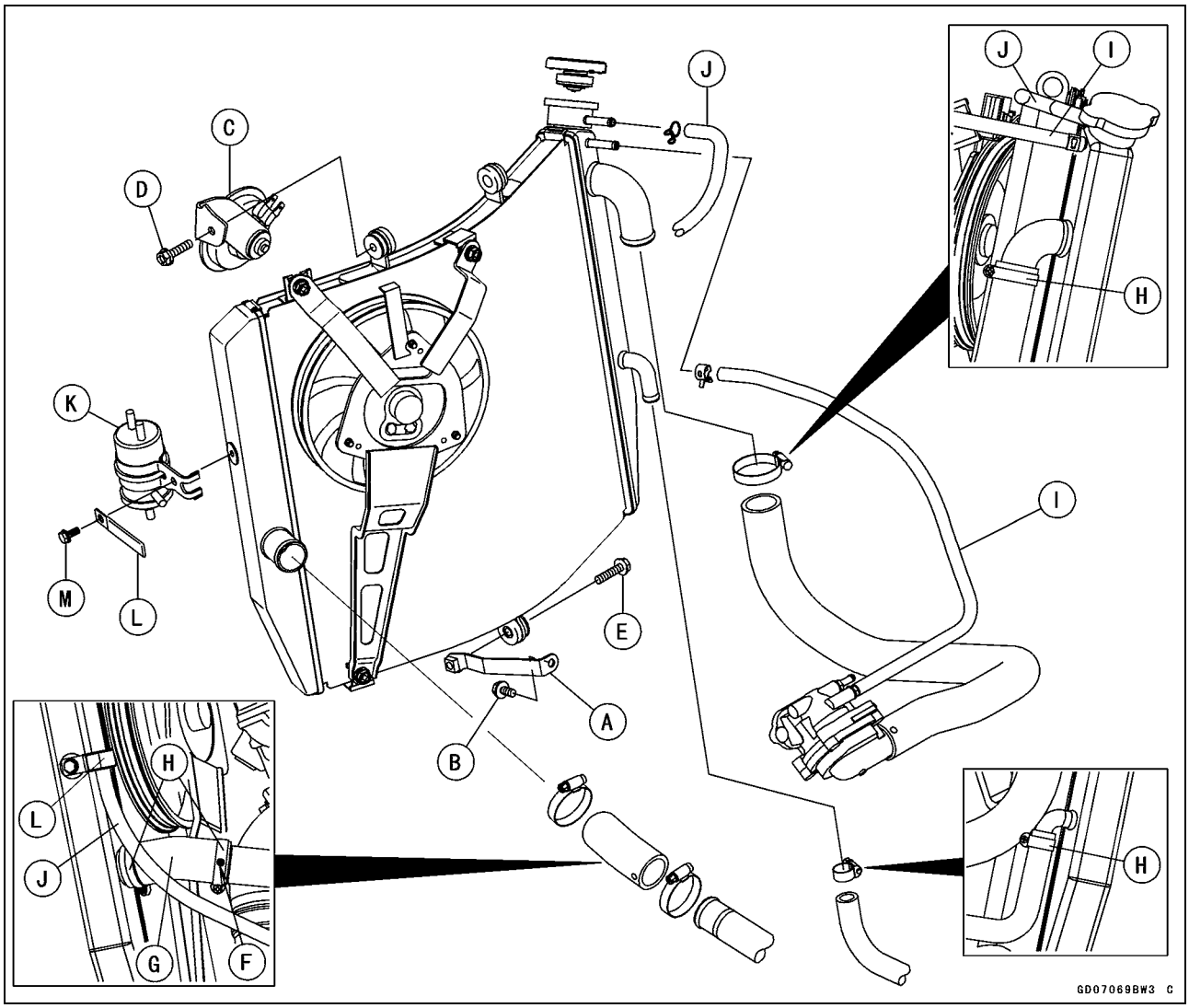
- Run the coolant return hose [I] under the heat insulation rubber plate and install it.
- Run the radiator overflow hose [J] over the heat insulation rubber plate and install it.
- For the California and Southeast Asia models, install the separator [K] and clamp [L].

**Torque - Separator Bracket Mounting Bolt [M]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

○Run the canister and separator hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.

- Fix the radiator overflow hose to the radiator with clamp [L].
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).

## Radiator



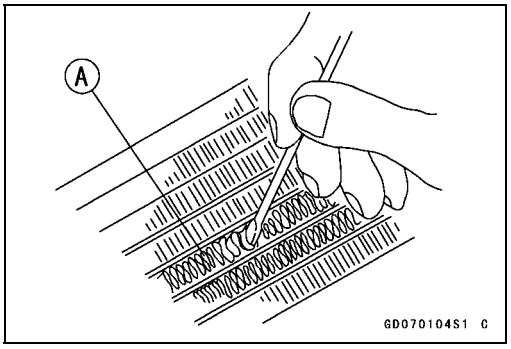

### *Radiator Inspection*

- Remove the radiator (see Radiator and Radiator Fan Removal).
- Check the radiator core.

★If there are obstructions to air flow, remove them.

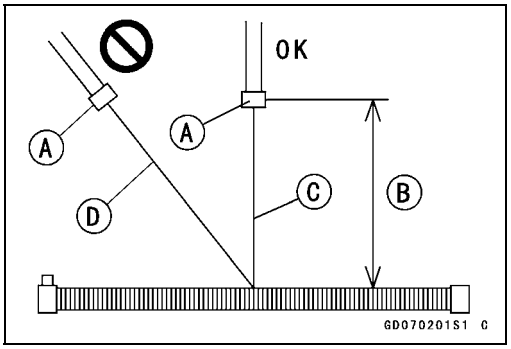
★If the corrugated fins [A] are deformed, carefully straighten them.

★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.



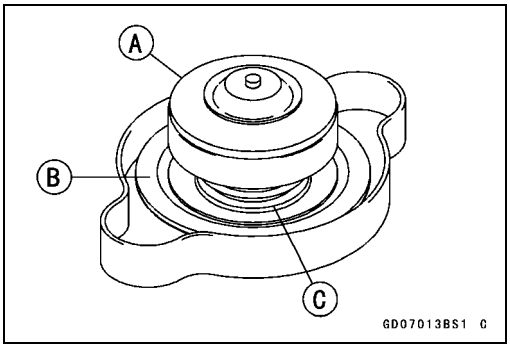

**CAUTION**

**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

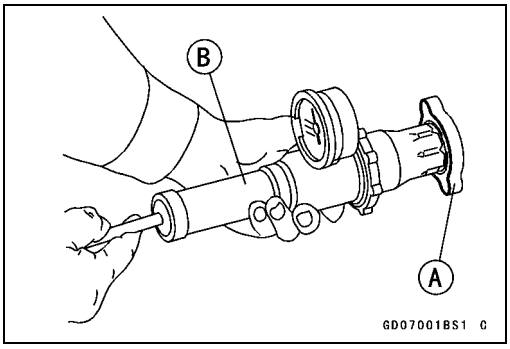
### *Radiator Cap Inspection*




- Remove the radiator cap (see Pressure Testing).
- 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 the cap with a new one.

- 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.*

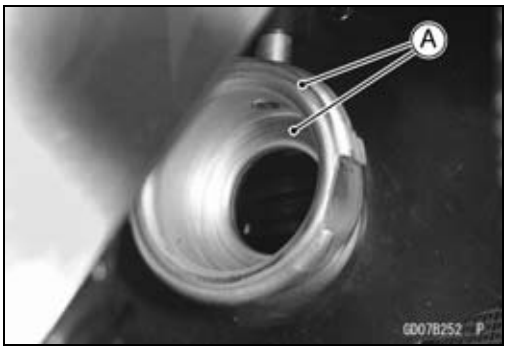
- Watching the pressure gauge, pump the pressure tester to build up the pressure until the relief valve opens: the gauge needle flicks downward. Stop pumping and measure leak time at once. The relief valve must open within the specified range in the table below and the gauge hand must remain within the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

**Radiator Cap Relief Pressure**

**Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm², 13 ~ 18 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*

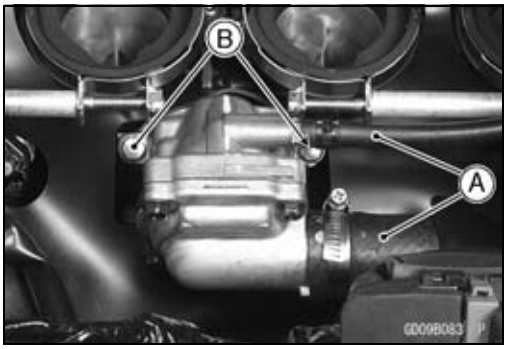



- Remove the radiator cap (see Pressure Testing).
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.

## Thermostat

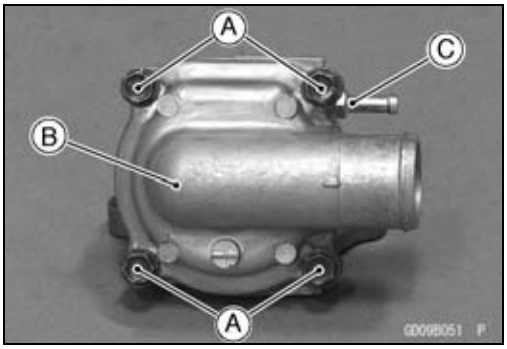
### *Thermostat Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Water Hoses [A]
  Thermostat Housing Mounting Bolts [B]



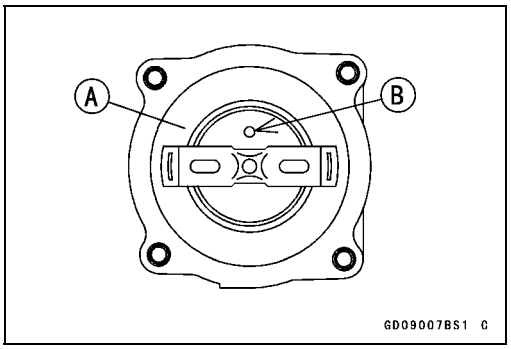

- Remove:
  Thermostat Housing Cover Bolts [A]
  Thermostat Housing Cover [B]
  Thermostat

○Remove the coolant by-pass fitting bolt [C] as necessary.




### *Thermostat Installation*

- Install the thermostat [A] in the housing so that the air bleeder hole [B] is on top.




- Replace the O-rings [A] with new ones.
- Apply grease to the new O-rings.
- Install a new O-rings into the thermostat housing [B] and cover [C].

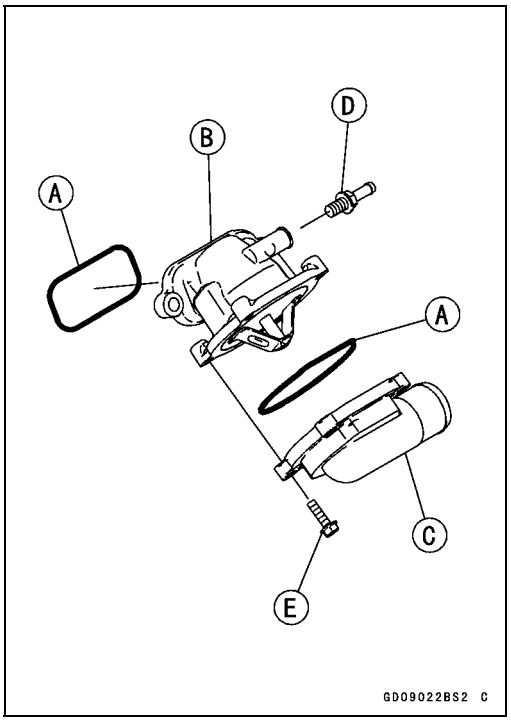
★If the coolant by-pass fitting bolt [D] was removed, install it as follows.

○Apply a non-permanent locking agent to the threads of the coolant by-pass fitting bolt, and tighten it.

**Torque - Coolant By-pass Fitting Bolt: 9.0 N·m (0.92 kgf·m, 80 in·lb)**

- Tighten the thermostat housing cover bolts [E].

**Torque - Thermostat Housing Cover Bolts: 6.0 N·m (0.61 kgf·m, 53 in·lb)**



## Thermostat

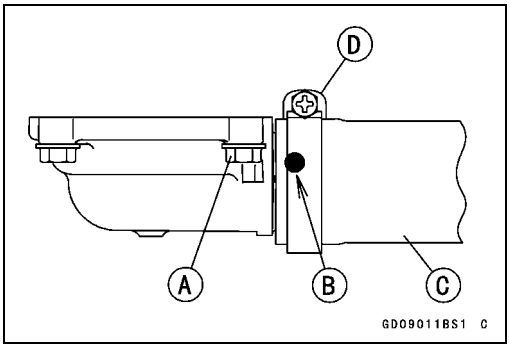
- Install the thermostat housing.
- Tighten:

**Torque - Thermostat Housing Mounting Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Run the water hose under the heat insulation rubber plate (see Engine Installation in the Engine Removal/Installation chapter).
- Align the thermostat housing cover bolt [A] and the white mark [B] of the water hose [C].
- Install the water hose clamp [D].
- Tighten:

**Torque - Water Hose Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

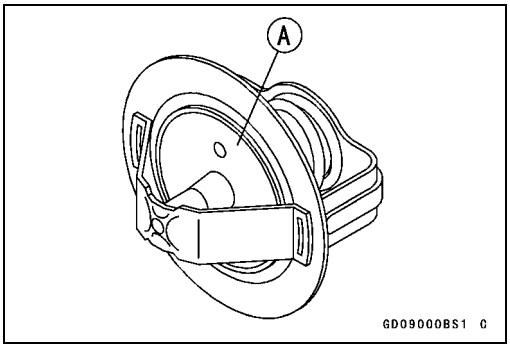
- Install the removed parts (see appropriate chapters).
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).




### *Thermostat Inspection*

- Remove the thermostat (see Thermostat Removal).
- Inspect the thermostat valve [A] at room temperature.

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

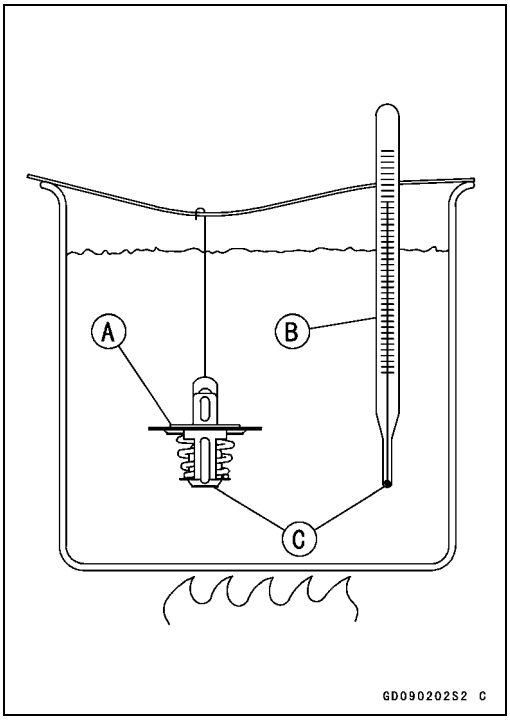



- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.

○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.

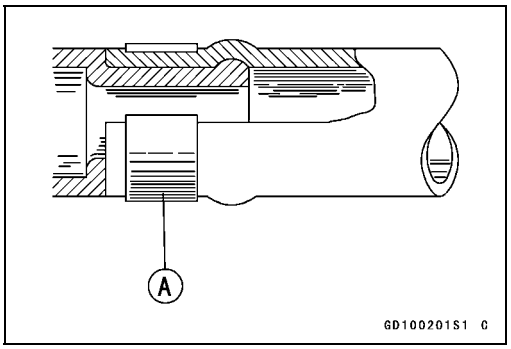
**Thermostat Valve Opening Temperature**
**58 ~ 62°C (136 ~ 144°F)**



## Hoses 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 in accordance with the 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.

○Tighten:

**Torque - Water Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

### *Hose Inspection*

- Refer to the Radiator Hose and Pipe Inspection in the Periodic Maintenance chapter.

## Water Temperature Sensor

### *Water Temperature Sensor Removal/Installation*

- Refer to the Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter.

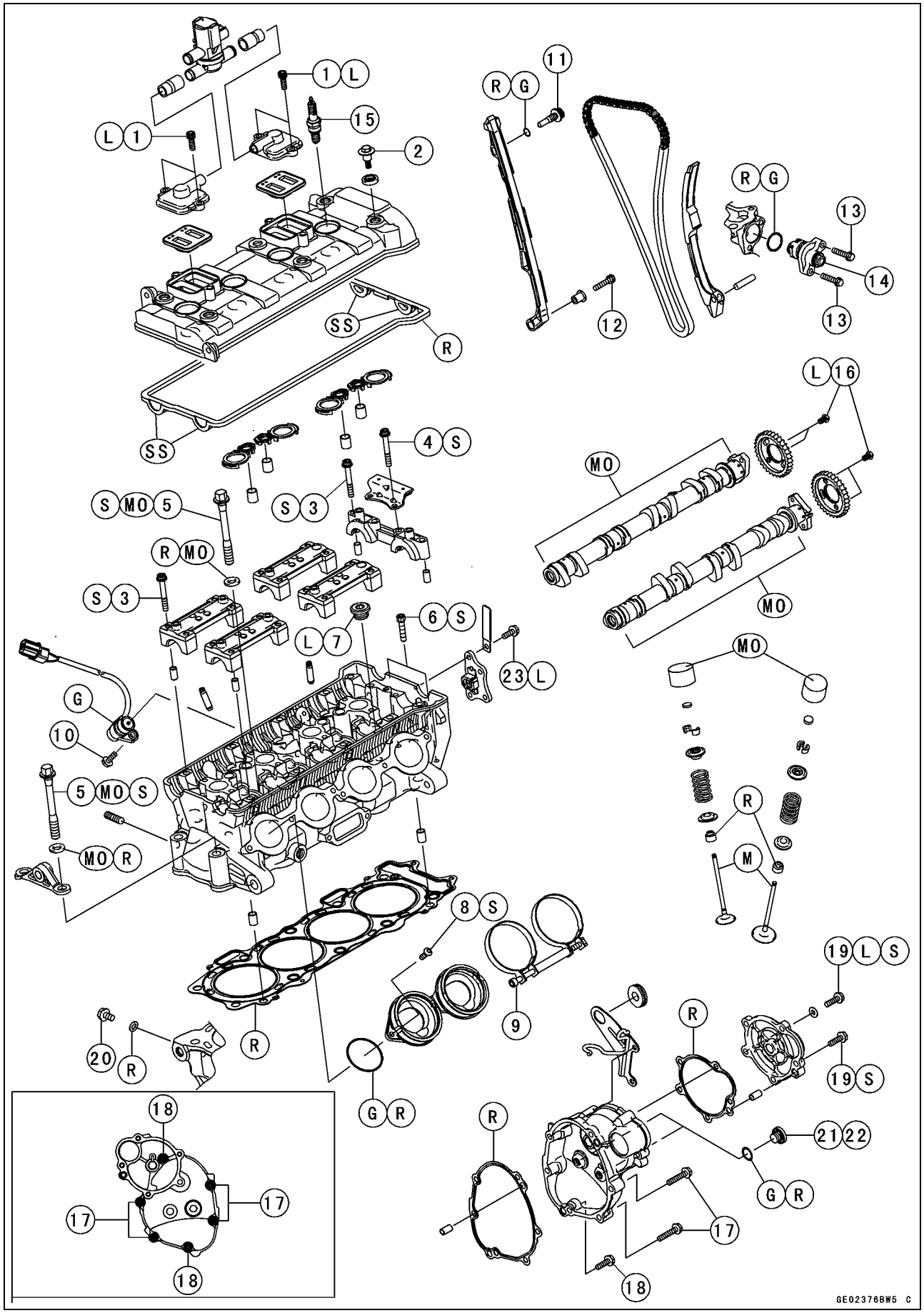
### *Water Temperature Sensor Inspection*

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

# Engine Top End

## Table of Contents

## Exploded View

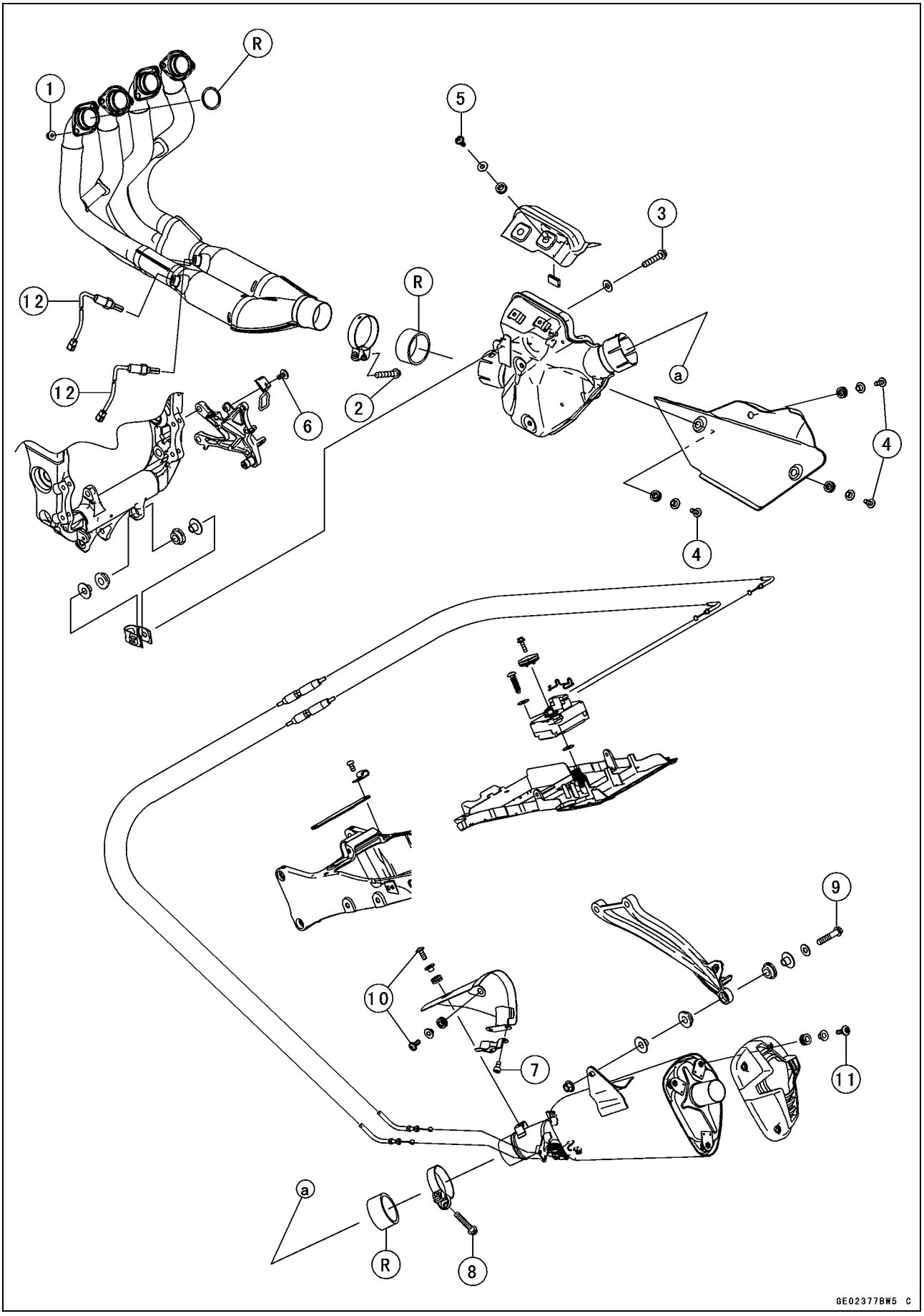


## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Air Suction Valve Cover Bolts | 10 | 1.0 | 89 in·lb | L |
| 2 | Cylinder Head Cover Bolts | 10 | 1.0 | 89 in·lb | |
| 3 | Camshaft Cap Bolts | 12 | 1.2 | 106 in·lb | S |
| 4 | Upper Camshaft Chain Guide Bolts | 12 | 1.2 | 106 in·lb | S |
| 5 | Cylinder Head Bolts (M10 New Bolts) | 59 | 6.0 | 44 | MO, S |
| | Cylinder Head Bolts (M10 Used Bolts) | 57 | 5.8 | 42 | MO, S |
| 6 | Cylinder Head Bolts (M6) | 12 | 1.2 | 106 in·lb | S |
| 7 | Water Passage Plugs | 19.6 | 2.0 | 14.5 | L |
| 8 | Throttle Body Assy Holder Bolts | 10 | 1.0 | 89 in·lb | S |
| 9 | Throttle Body Assy Holder Clamp Bolts | 2.0 | 0.20 | 18 in·lb | |
| 10 | Camshaft Position Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| 11 | Front Camshaft Chain Guide Bolt (Upper) | 25 | 2.5 | 18 | |
| 12 | Front Camshaft Chain Guide Bolt (Lower) | 12 | 1.2 | 106 in·lb | |
| 13 | Camshaft Chain Tensioner Mounting Bolts | 10 | 1.0 | 89 in·lb | |
| 14 | Camshaft Chain Tensioner Cap Bolt | 20 | 2.0 | 15 | |
| 15 | Spark Plugs | 13 | 1.3 | 115 in·lb | |
| 16 | Cam Sprocket Mounting Bolts | 15 | 1.5 | 11 | L |
| 17 | Starter Clutch Cover Bolts (M6, L = 30) | 10 | 1.0 | 89 in·lb | |
| 18 | Starter Clutch Cover Bolts (M6, L = 20) | 10 | 1.0 | 89 in·lb | |
| 19 | Torque Limiter Cover Bolts | 10 | 1.0 | 89 in·lb | L (1), S |
| 20 | Coolant Drain Plug (Cylinder) | 10 | 1.0 | 89 in·lb | |
| 21 | Starter Clutch Bolt Cap | – | – | – | Hand-tighten |
| 22 | Timing Inspection Cap | – | – | – | Hand-tighten |
| 23 | Right Engine Bracket Bolts (Cylinder Head) | 9.8 | 1.0 | 87 in·lb | L |

G: Apply grease.
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

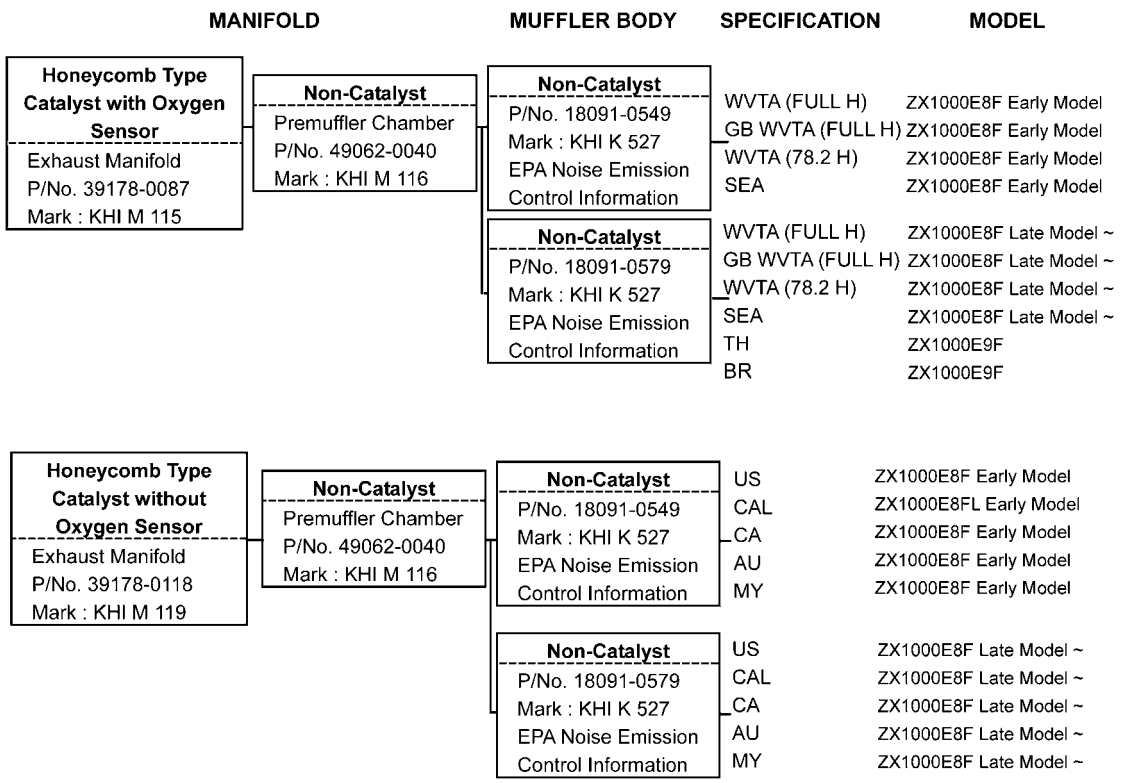


## Exploded View

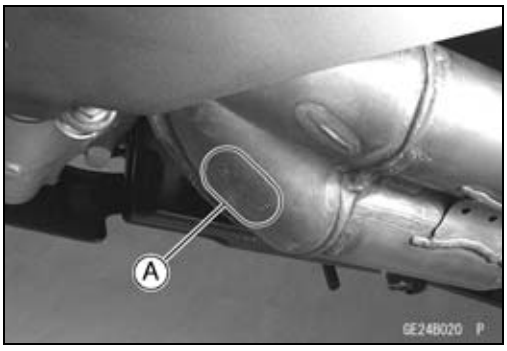
| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Exhaust Pipe Holder Nuts | 17 | 1.7 | 13 | |
| 2 | Exhaust Manifold Clamp Bolt | 25 | 2.5 | 18 | |
| 3 | Premuffler Chamber Mounting Bolt | 25 | 2.5 | 18 | |
| 4 | Premuffler Chamber Outer Cover Bolts | 7.0 | 0.71 | 62 in·lb | |
| 5 | Premuffler Chamber Inner Cover Bolts | 7.0 | 0.71 | 62 in·lb | |
| 6 | Exhaust Butterfly Valve Cable Clamp Bolt | 10 | 1.0 | 89 in·lb | |
| 7 | Exhaust Butterfly Valve Pulley Cover Bolts | 7.0 | 0.71 | 62 in·lb | |
| 8 | Muffler Body Clamp Bolt | 25 | 2.5 | 18 | |
| 9 | Muffler Body Mounting Bolt | 25 | 2.5 | 18 | |
| 10 | Muffler Body Front Cover Bolts | 7.0 | 0.71 | 62 in·lb | |
| 11 | Muffler Body Rear Cover Bolts | 7.0 | 0.71 | 62 in·lb | |

12. Oxygen Sensors (Equipped Models)
R: Replacement Parts

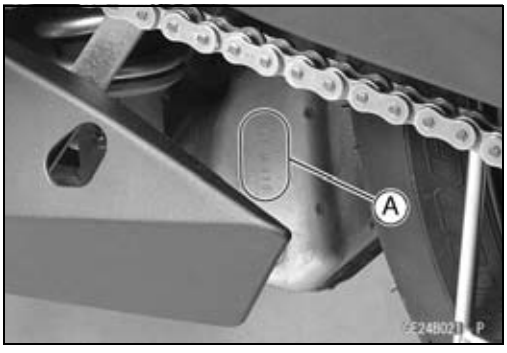
## Exhaust System Identification




Exhaust Manifold Mark Position [A]

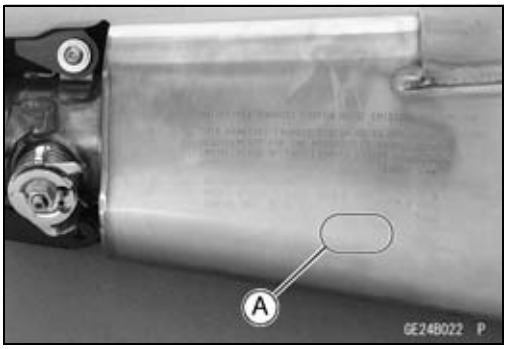



Premuffler Chamber Mark Position [A]

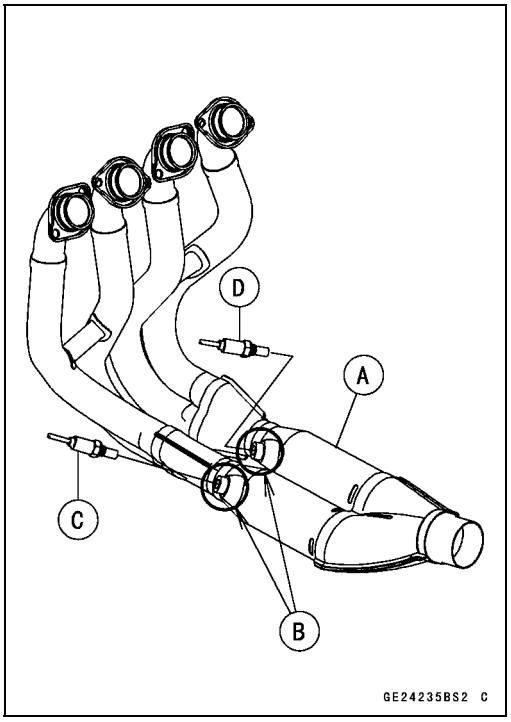


## Exhaust System Identification

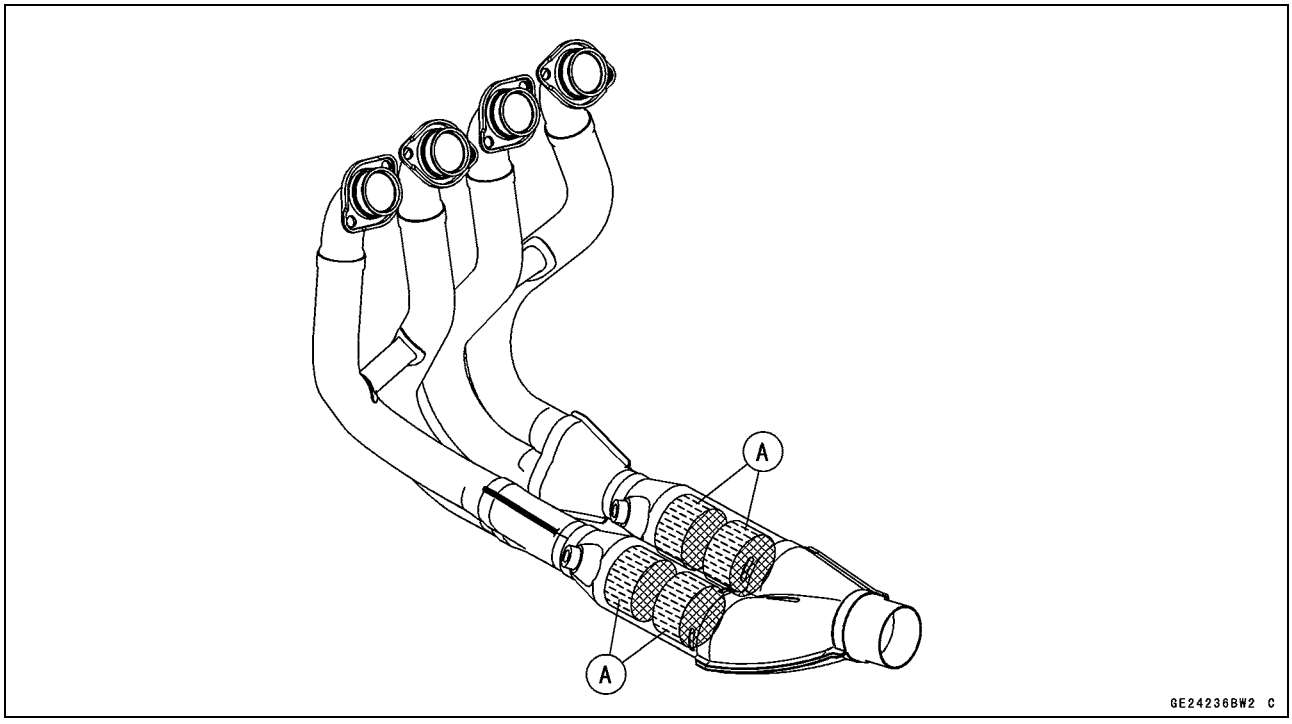
Muffler Body Mark Position [A]




Exhaust Manifold [A] with Holes [B] for Oxygen Sensors
Oxygen Sensor #1 [C]
Oxygen Sensor #2 [D]




Honeycomb Type Catalyst Positions [A]

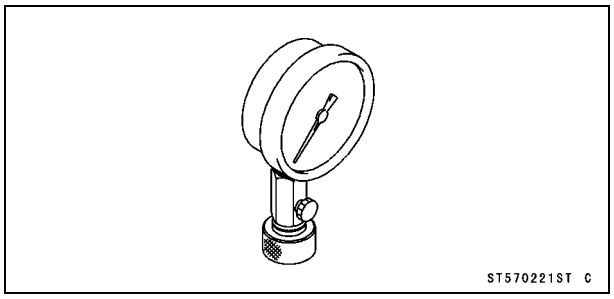


## Specifications

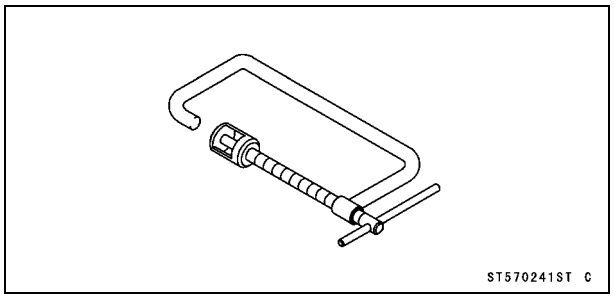
| Item | Standard | Service Limit |
|---|---|---|
| **Camshafts** | | |
| Cam Height: | | |
| Exhaust | 34.443 ~ 34.557 mm (1.3560 ~ 1.3605 in.) | 34.34 mm (1.352 in.) |
| Inlet | 35.643 ~ 35.757 mm (1.4033 ~ 1.4078 in.) | 35.54 mm (1.399 in.) |
| Camshaft Journal/Camshaft Cap Clearance | 0.038 ~ 0.081 mm (0.0015 ~ 0.0032 in.) | 0.17 mm (0.0067 in.) |
| Camshaft Journal Diameter | 23.940 ~ 23.962 mm (0.9425 ~ 0.9434 in.) | 23.91 mm (0.941 in.) |
| Camshaft Bearing Inside Diameter | 24.000 ~ 24.021 mm (0.9449 ~ 0.9457 in.) | 24.08 mm (0.948 in.) |
| Camshaft Runout | TIR 0.02 mm (0.0008 in.) or less | TIR 0.1 mm (0.004 in.) |
| **Cylinder Head** | | |
| Cylinder Compression | (Usable Range)<br>1 099 ~ 1 668 kPa (11.2 ~ 17.0 kgf/cm², 159 ~ 242 psi) at 320 r/min (rpm) | – – – |
| Cylinder Head Warp | – – – | 0.05 mm (0.002 in.) |
| **Valves** | | |
| Valve Clearance: | | |
| Exhaust | 0.17 ~ 0.22 mm (0.0067 ~ 0.0087 in.) | – – – |
| Inlet | 0.15 ~ 0.22 mm (0.0059 ~ 0.0087 in.) | – – – |
| Valve Head Thickness: | | |
| Exhaust | 0.8 mm (0.031 in.) | 0.4 mm (0.016 in.) |
| Inlet | 1.25 mm (0.0492 in.) | 0.6 mm (0.024 in.) |
| Valve Stem Bend | TIR 0.01 mm (0.0004 in.) or less | TIR 0.05 mm (0.002 in.) |
| Valve Stem Diameter: | | |
| Exhaust | 4.470 ~ 4.485 mm (0.1760 ~ 0.1766 in.) | 4.46 mm (0.176 in.) |
| Inlet | 4.475 ~ 4.490 mm (0.1762 ~ 0.1768 in.) | 4.46 mm (0.176 in.) |
| Valve Guide Inside Diameter: | | |
| Exhaust | 4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.) | 4.58 mm (0.180 in.) |
| Inlet | 4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.) | 4.58 mm (0.180 in.) |
| Valve/valve Guide Clearance (Wobble Method): | | |
| Exhaust | 0.04 ~ 0.12 mm (0.0016 ~ 0.0047 in.) | 0.32 mm (0.013 in.) |
| Inlet | 0.03 ~ 0.11 mm (0.0012 ~ 0.0043 in.) | 0.30 mm (0.012 in.) |
| Valve Seat Cutting Angle | 32°, 45°, 60° | – – – |
| Valve Seating Surface: | | |
| Width: | | |
| Exhaust | 0.8 ~ 1.2 mm (0.031 ~ 0.047 in.) | – – – |
| Inlet | 0.5 ~ 1.0 mm (0.020 ~ 0.039 in.) | – – – |
| Outside Diameter: | | |
| Exhaust | 23.9 ~ 24.1 mm (0.941 ~ 0.949 in.) | – – – |
| Inlet | 29.4 ~ 29.6 mm (1.157 ~ 1.165 in.) | – – – |
| Valve Spring Free Length: | | |
| Exhaust | 44.8 mm (1.764 in.) | 42.9 mm (1.689 in.) |
| Inlet | 39.5 mm (1.555 in.) | 37.7 mm (1.484 in.) |

## Special Tools and Sealant

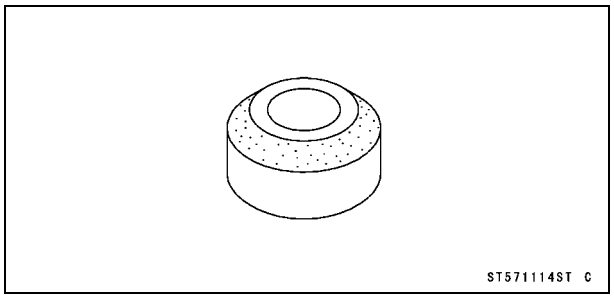
**Compression Gauge, 20 kgf/cm²:**
**57001-221**



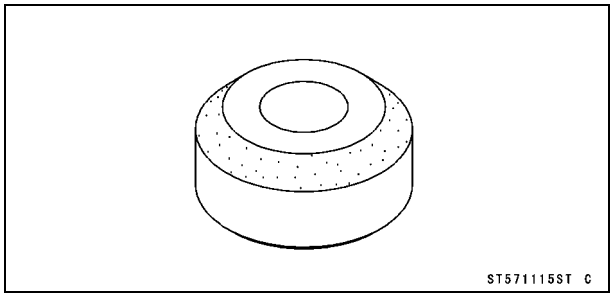

**Valve Spring Compressor Assembly:**
**57001-241**



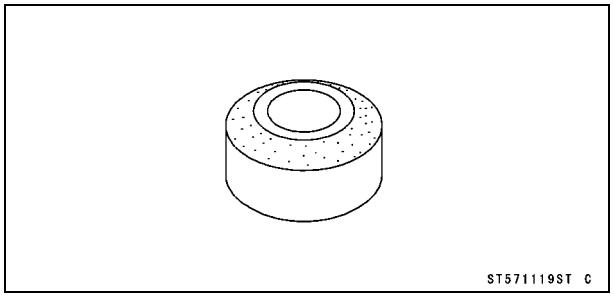

**Valve Seat Cutter, 45° - $\phi$27.5:**
**57001-1114**



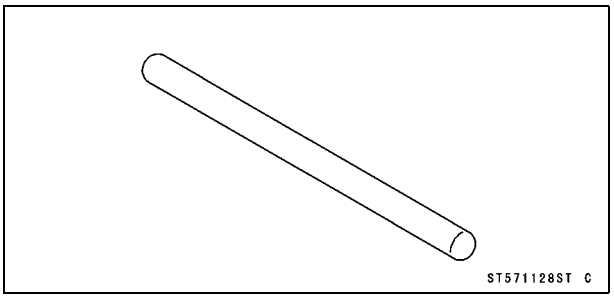

**Valve Seat Cutter, 45° - $\phi$32:**
**57001-1115**



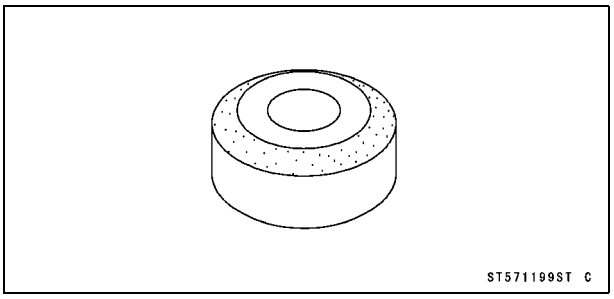

**Valve Seat Cutter, 32° - $\phi$28:**
**57001-1119**



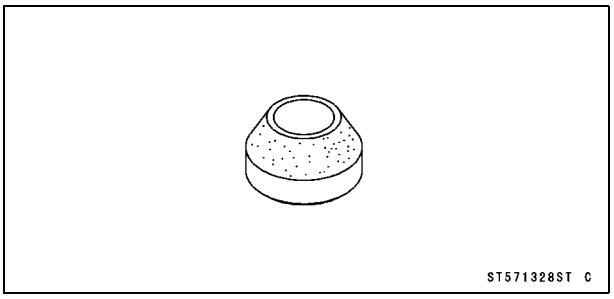

**Valve Seat Cutter Holder Bar:**
**57001-1128**



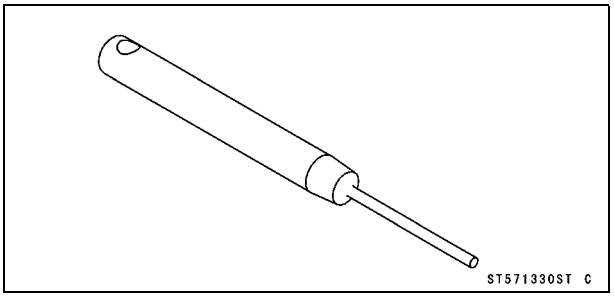

**Valve Seat Cutter, 32° - $\phi$33:**
**57001-1199**



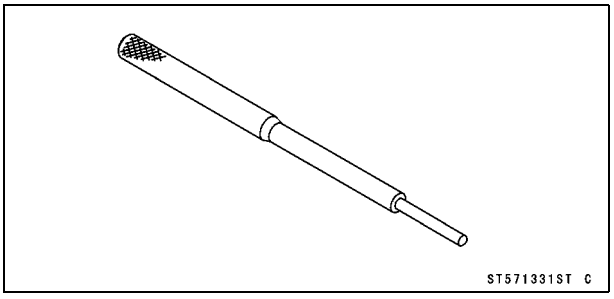

**Valve Seat Cutter, 60° - $\phi$25:**
**57001-1328**




**Valve Seat Cutter Holder, $\phi$4.5:**
**57001-1330**

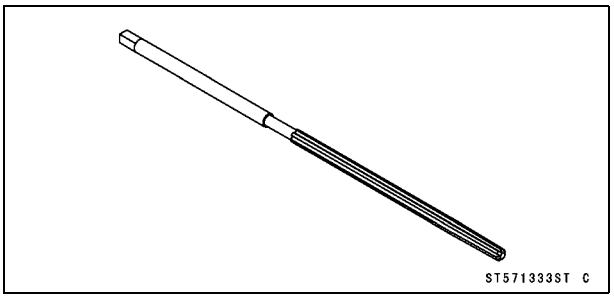



**Valve Guide Arbor, $\phi$4.5:**
**57001-1331**

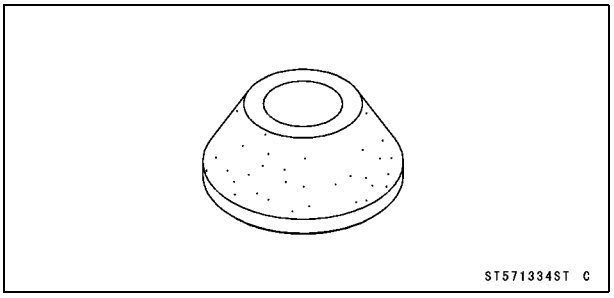


## Special Tools and Sealant

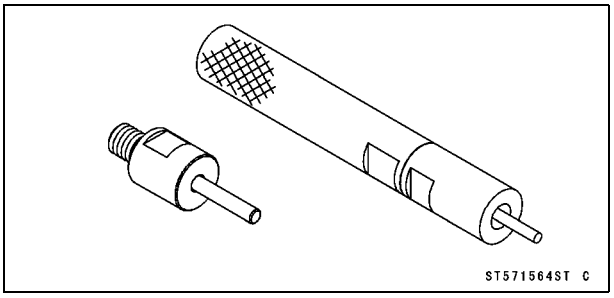
**Valve Guide Reamer, $\phi$4.5:**
**57001-1333**



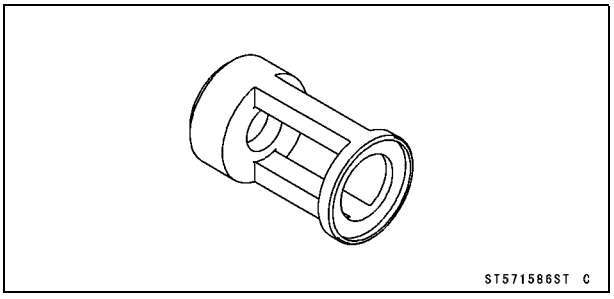

**Valve Seat Cutter, 60° - $\phi$33:**
**57001-1334**



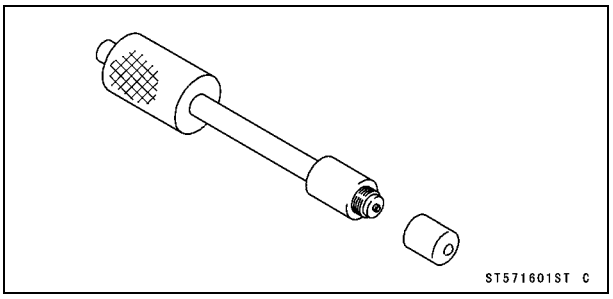

**Valve Guide Driver:**
**57001-1564**



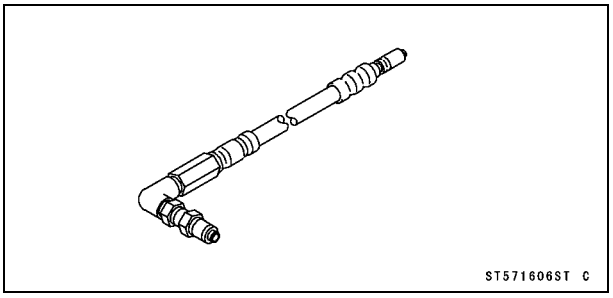

**Valve Spring Compressor Adapter, $\phi$24:**
**57001-1586**



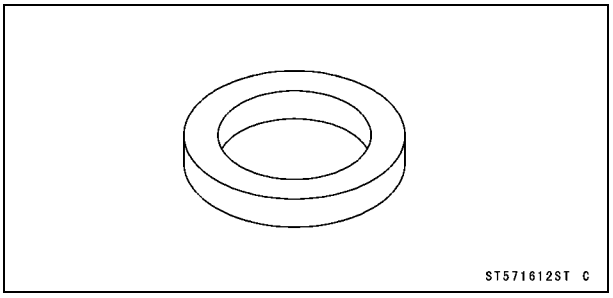

**Compression Gauge Adapter, M10 × 1.0:**
**57001-1601**



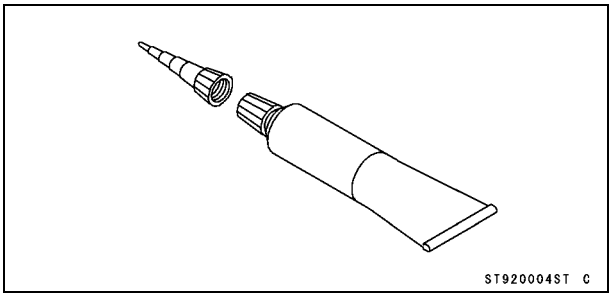

**L-Shape Hose:**
**57001-1606**




**Washer:**
**57001-1612**



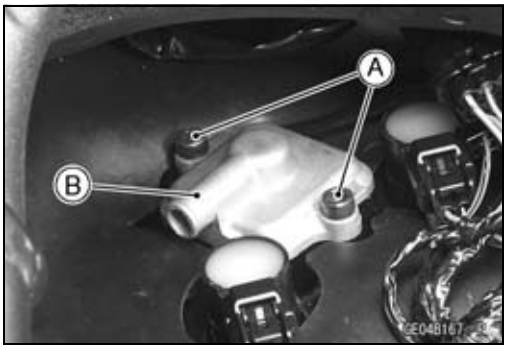

**Kawasaki Bond (Silicone Sealant):**
**92104-0004**



## Clean Air System

### *Air Suction Valve Removal*

- Remove:
  Air Switching Valve (see Air Switching Valve Removal)
  Air Suction Valve Cover Bolts [A] (Both Sides)
  Air Suction Valve Covers [B] (Both Sides)

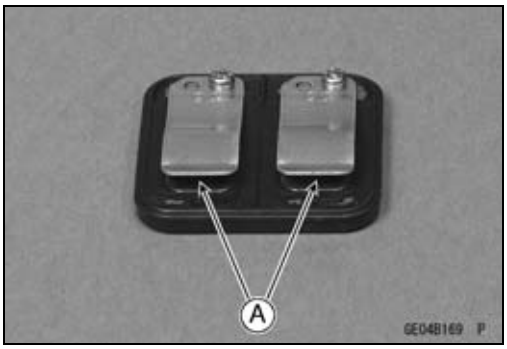



- Remove the air suction valves [A] on both sides.


### *Air Suction Valve Installation*

- Install the air suction valve so that opening [A] of the reed faces the rear and downward.
- Apply a non-permanent locking agent to the threads of the air suction valve cover bolts, and tighten them.

**Torque - Air Suction Valve Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

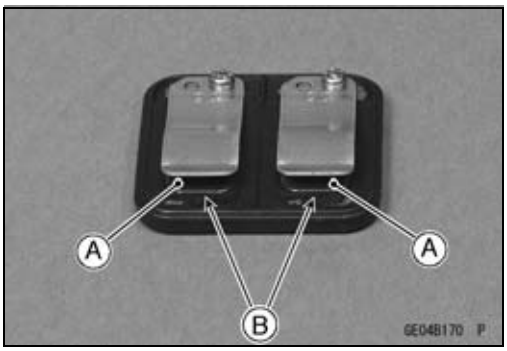



### *Air Suction Valve Inspection*

- Remove the air suction valve (see Air Suction Valve Removal).
- Visually inspect the reeds for cracks, folds, warps, heat damage or other damage.

★If there is any doubt as to the condition of the reeds [A], replace the air suction valve as an assembly.

- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder or heat damage.
- If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.
- If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high-flash point solvent.



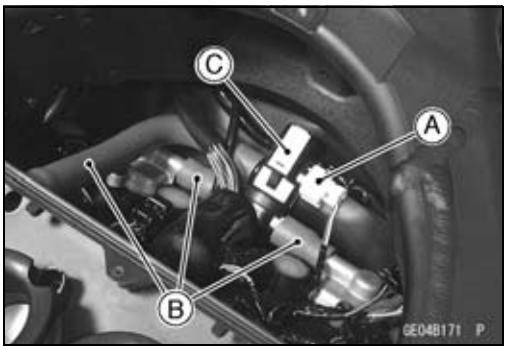

| CAUTION |
| --- |
| **Do not scrape off the deposits with a scraper as this could damage the rubber, requiring replacement of the suction valve assembly.** |

## Clean Air System

### *Air Switching Valve Removal*

**CAUTION**

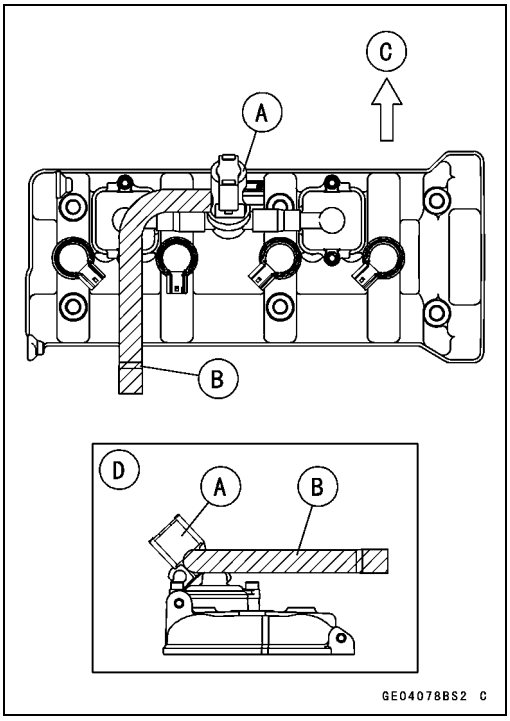
**Never drop the air switching valve, especially on a hard surface. Such a shock to the air switching valve can damaged it.**




- Remove the middle air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Disconnect the connector [A].
- Separate the hoses [B] from the air suction valve covers and lower air cleaner housing, and remove the air switching valve [C].

### *Air Switching Valve Installation*

- Install the air switching valve [A] with hose [B] as shown in the figure.
  Front [C]
  Left Side View [D]




### *Air Switching Valve Operation Test*

- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

### *Air Switching Valve Unit Test*

- Refer to the Air Switching Valve Unit Test in the Electrical System chapter.

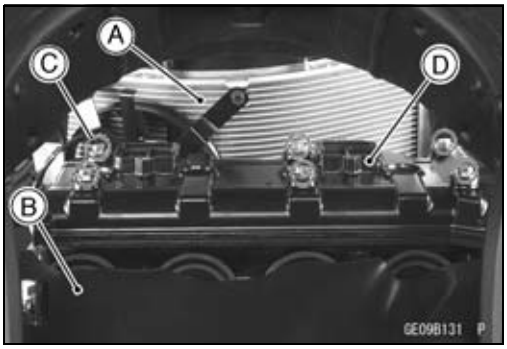
### *Clean Air System Hose Inspection*

- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, air switching valve and air suction valve covers.

★If they are not, correct them. Replace them if they are damaged.

## Cylinder Head Cover

### *Cylinder Head Cover Removal*



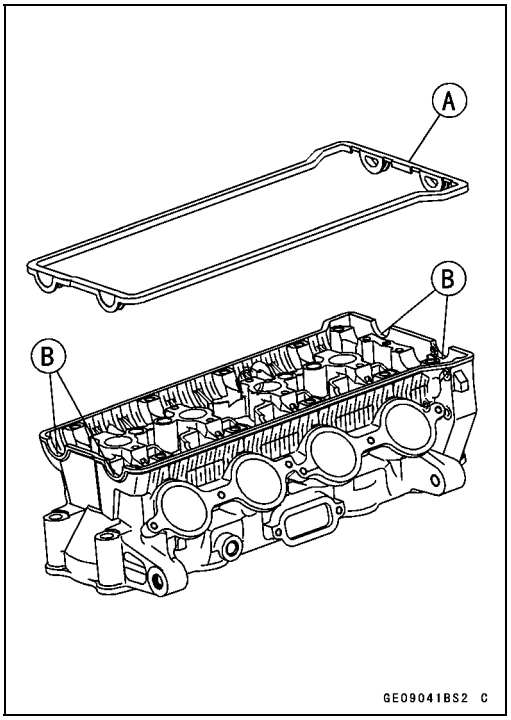

- Remove:
  Air Suction Valves (see Air Suction Valve Removal)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Stick Coils (see Stick Coil Removal in the Electrical System chapter)
- Remove the radiator [A] temporarily (see Radiator and Radiator Fan Removal in the Cooling System chapter), and then free the heat insulation rubber plate [B].

**NOTE**

○*Do not remove radiator hoses.*

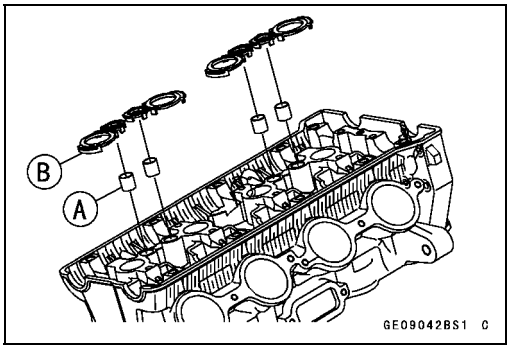
- Remove the cylinder head cover bolts [C] with rubber washers.
- Remove the cylinder head cover [D] forward.

### *Cylinder Head Cover Installation*




- Replace the cylinder head cover gasket [A] with a new one.
- Apply silicone sealant [B] to the cylinder head as shown in the figure.

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**



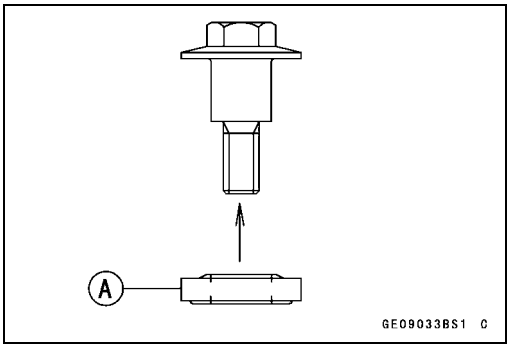

- Be sure to install the following parts.
  Dowel Pins [A]
  Plug Hole Gaskets [B]

## Cylinder Head Cover

- Install the rubber washers [A] with the metal side faces upward.
- Tighten:

  **Torque - Cylinder Head Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Install the removed parts (see appropriate chapters).



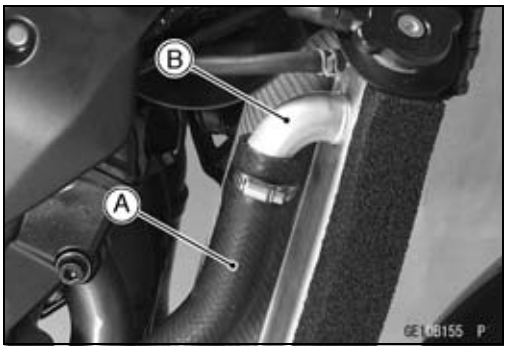
## Camshaft Chain Tensioner

### *Camshaft Chain Tensioner Removal*

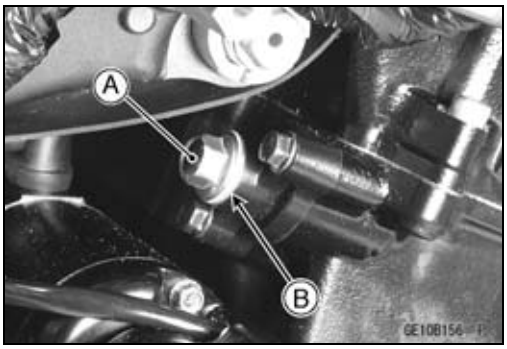
**CAUTION**

**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:**
**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.**

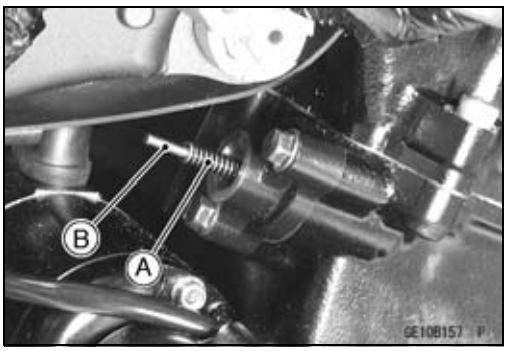
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the upper fairing assembly (see Upper Fairing Assembly Removal in the Frame chapter).
- Remove the radiator hose [A] from the radiator pipe [B], and then clear it backward.




- Remove:
  Cap Bolt [A]
  Washer [B]

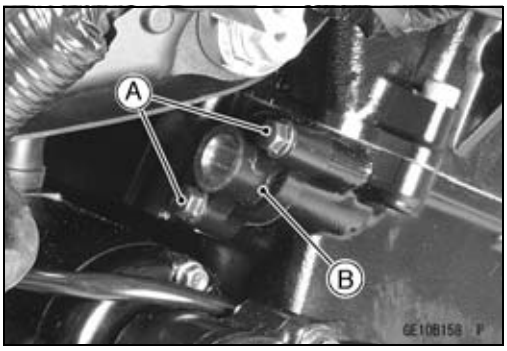



- Remove:
  Spring [A]
  Rod [B]



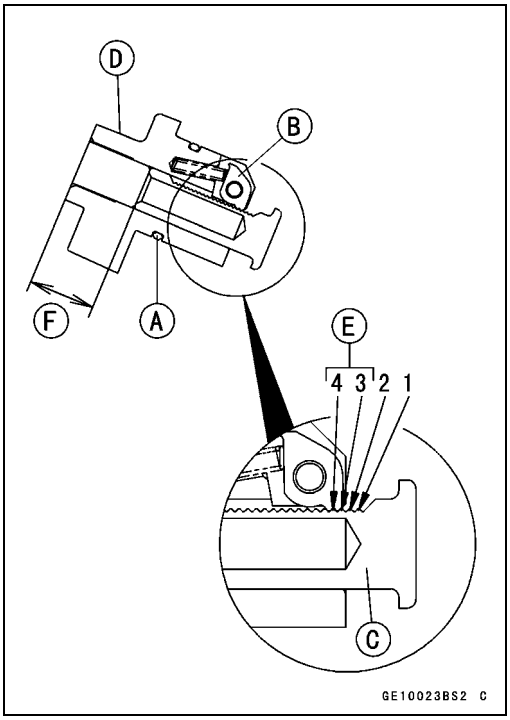
## Camshaft Chain Tensioner

- Remove the mounting bolts [A] and take off the camshaft chain tensioner body [B].




### *Camshaft Chain Tensioner Installation*

- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Release the stopper [B] and push the push rod [C] into the interior of the tensioner body [D] so that the position of the push rod is 3 or 4 notches [E] as shown in the figure.
  About 15.6 mm (0.614 in.) [F]
- Install the tensioner body so that the stopper faces upward.

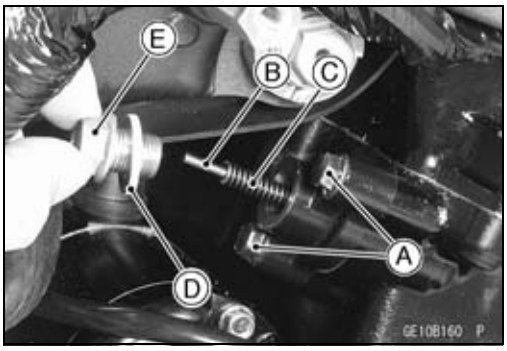



- Tighten the tensioner mounting bolts [A].

  **Torque - Camshaft Chain Tensioner Mounting Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Install:
  Rod [B]
  Spring [C]
  Washer [D]
- Tighten the cap bolt [E].

  **Torque - Camshaft Chain Tensioner Cap Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**




- Run the radiator hose correctly (see Cable, Wire, and hose Routing section in the Appendix chapter).
- Tighten:

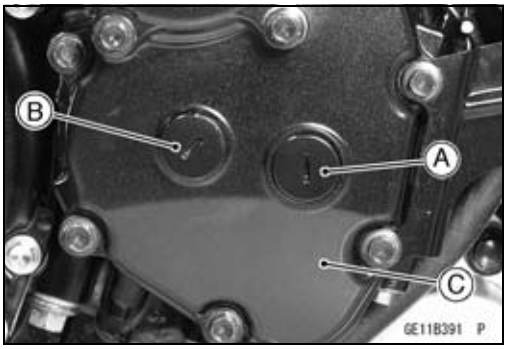
  **Torque - Water Hose Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

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

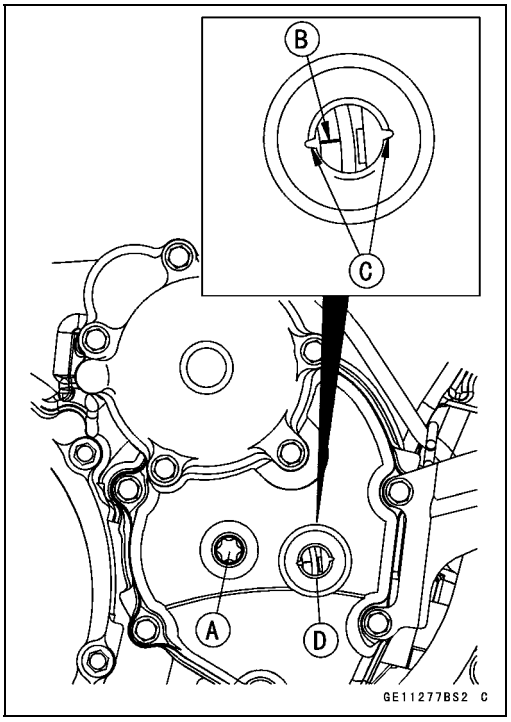
## Camshaft, Camshaft Chain

### *Camshaft Removal*

- Remove the cylinder head cover (see Cylinder Head Cover Removal).
- Remove the timing inspection cap [A] and starter clutch bolt cap [B] on the starter clutch cover [C].

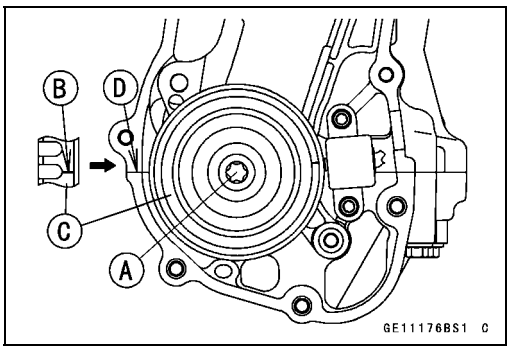



- Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch is aligned with the notch [C] in the edge of the timing inspection hole [D] in the starter clutch cover.



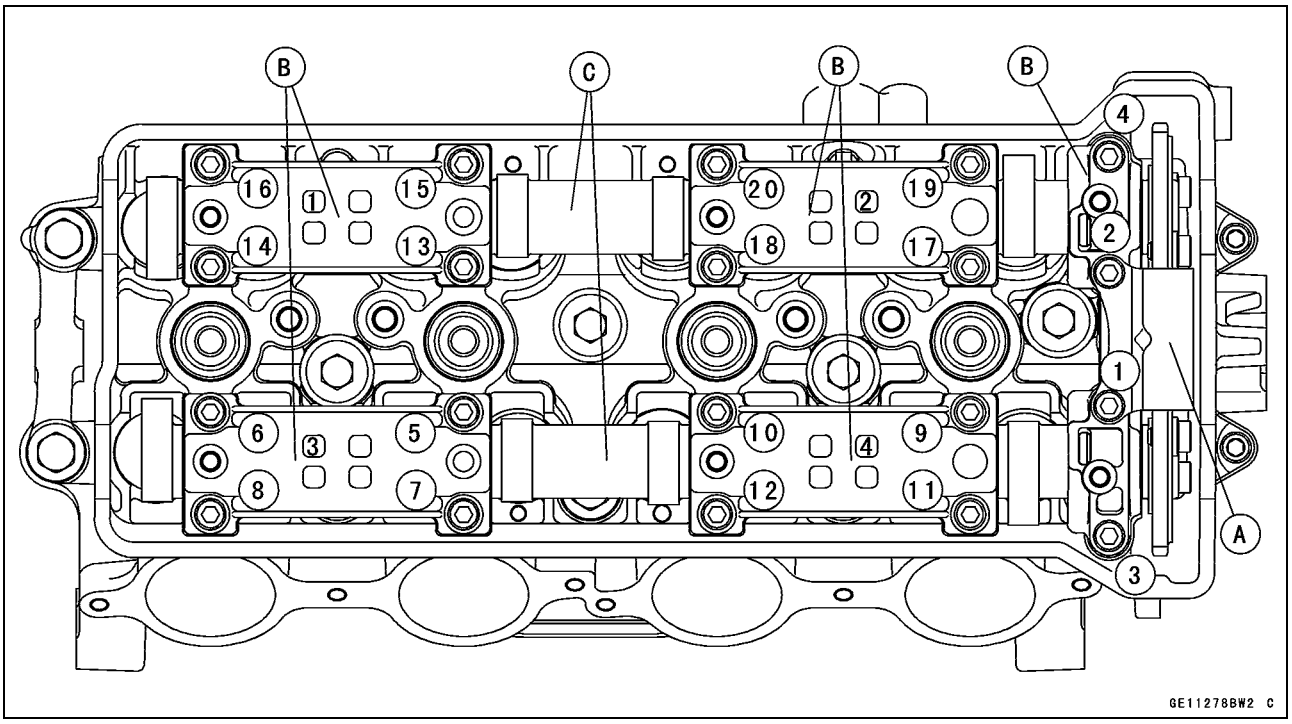

★If the starter clutch cover was removed, perform the next procedure.

○Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch [C] is aligned with the mating surface [D] of the crankcase.

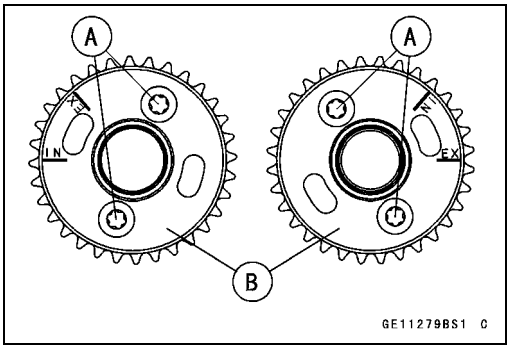


## Camshaft, Camshaft Chain

- Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal).
- Loosen the upper chain guide bolts and camshaft cap bolts as shown sequence [1 ~ 20] in the figure, and remove them.
- Remove:
  Upper Chain Guide [A]
  Camshaft Caps [B]
  Camshafts [C]
- Stuff a clean cloth into the chain tunnel to keep any parts from dropping into the crankcase.




- Remove:
  Cam Sprocket Mounting Bolts [A]
  Cam Sprockets [B]

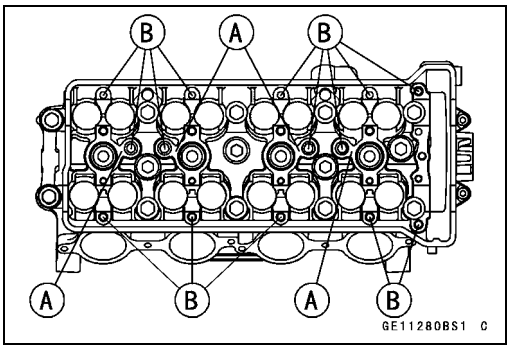



**CAUTION**

**The crankshaft may be turned while the camshafts are removed. Always 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 Installation*

- Be sure to install the following parts.
  Plug Hole Gaskets [A]
  Dowel Pins [B]

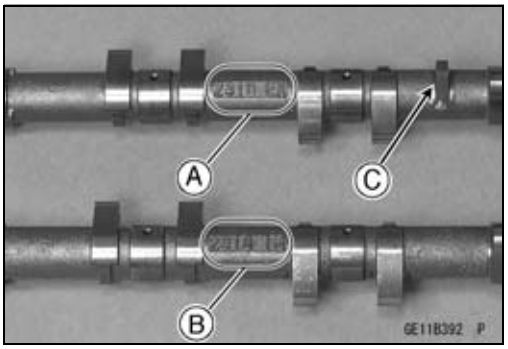


## Camshaft, Camshaft Chain

**NOTE**

○*The exhaust camshaft has a 2310 EX mark [A] and the inlet camshaft has a 2310 IN mark [B]. Be careful not to mix up these shafts.*

○*The exhaust camshaft has the projection [C] for camshaft position sensor.*

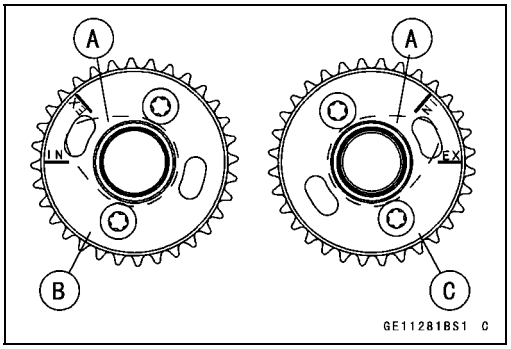



● Install the cam sprockets as shown in the figure.
#4 Cam Positions [A]
Inlet Cam Sprocket [B]
Exhaust Cam Sprocket [C]

○The inlet cam sprocket and exhaust cam sprocket are identical.

● Apply a non-permanent locking agent to the threads of the cam sprocket mounting bolts and tighten them.

**Torque - Cam Sprocket Mounting Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**



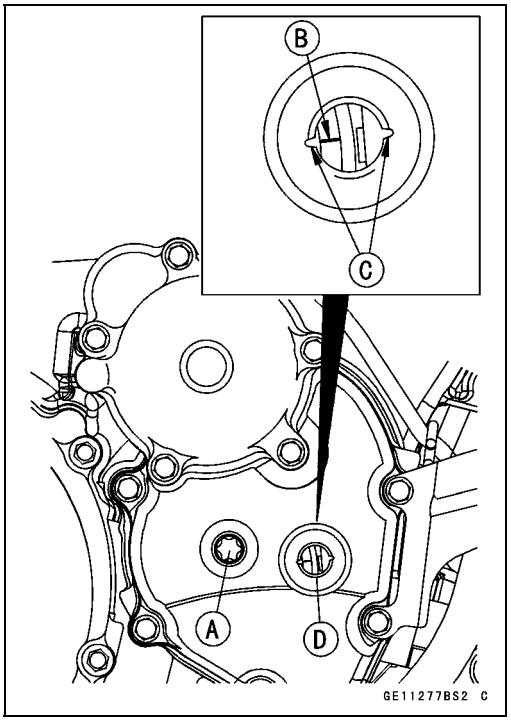

● Apply molybdenum disulfide oil solution to all cam parts and journals.

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

● Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch is aligned with the notch [C] in the edge of the timing inspection hole [D] in the starter clutch cover.

**CAUTION**

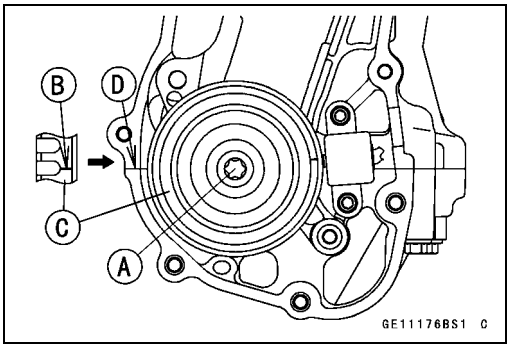
**The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.**



## Camshaft, Camshaft Chain

★If the starter clutch cover was removed, perform the next procedure.

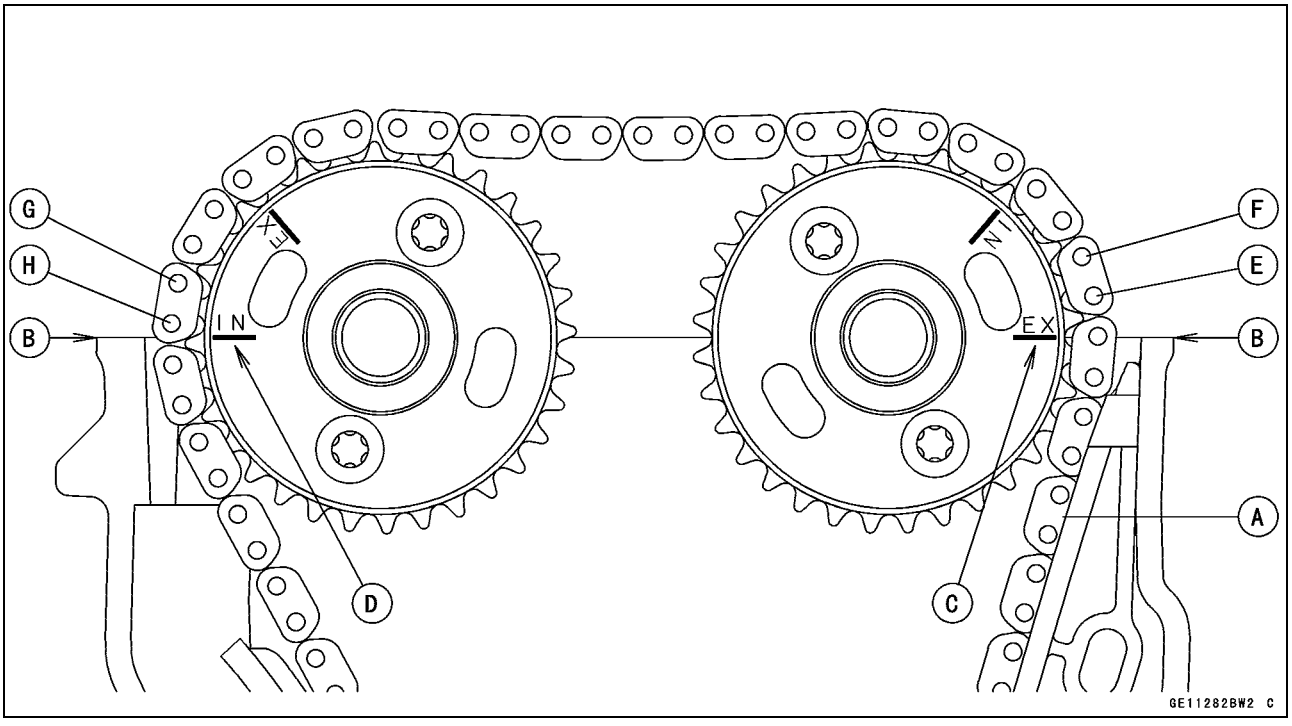
○Using a wrench on the starter clutch bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the starter clutch [C] is aligned with the mating surface [D] of the crankcase.




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

○The timing marks must be aligned with the cylinder head upper surface [B].

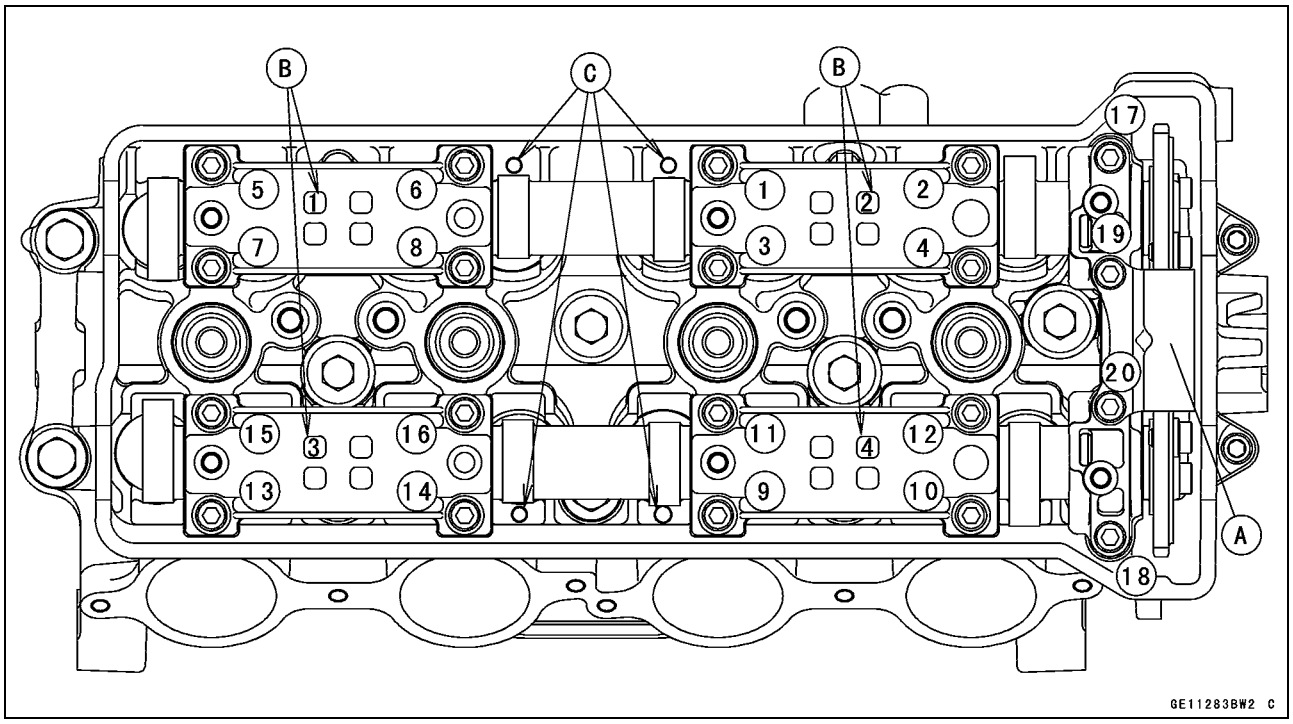
EX mark [C]
IN mark [D]
#1 pin [E]
#2 pin [F]
#27 pin [G]
#28 pin [H]



## Camshaft, Camshaft Chain

- Before installing the camshaft caps and upper chain guide, install the camshaft chain tensioner body temporarily (see Camshaft Chain Tensioner Installation).
- Install the camshaft caps and upper camshaft chain guide [A] as shown in the figure.
  Identification No. 1 ~ 4 (Camshaft Cap) [B]
  Identification No. 1 ~ 4 (Cylinder Head) [C]
- First tighten the camshaft cap bolt [17, 18] and upper chain guide bolts [19, 20] evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence.

**Torque - Camshaft Cap Bolts [1 ~ 18]: 12 N·m (1.2 kgf·m, 106 in·lb)**
**Upper Camshaft Chain Guide Bolts [19, 20]: 12 N·m (1.2 kgf·m, 106 in·lb)**



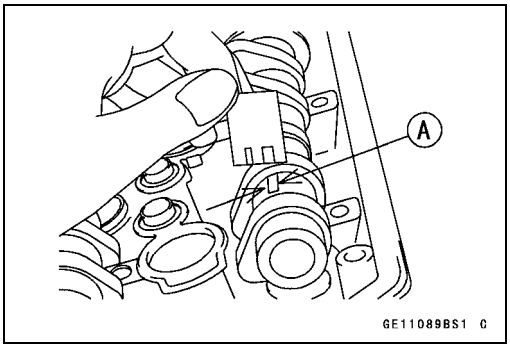

- Install the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.
- Replace the O-ring of the timing inspection cap and starter clutch bolt cap with new ones.
- Apply grease to the new O-rings.
- Install the timing inspection cap and starter clutch bolt cap.
- Tighten:

**Torque - Timing Inspection Cap: Hand-tighten**
**Starter Clutch Bolt Cap: Hand-tighten**

- Install the cylinder head cover (see Cylinder Head Cover Installation).

## Camshaft, Camshaft Chain

### *Camshaft, Camshaft Cap Wear*




- Remove the camshaft cap (see Camshaft Removal).
- Cut strips of plastigage to journal width. Place a strip on each journal parallel to the camshaft installed in the correct position.
- Tighten the camshaft cap bolts and upper chain guide bolts to the specified torque (see Camshaft Installation).

**NOTE**

○*Do not turn the camshaft when the plastigage is between the journal and camshaft cap.*

- Remove the camshaft cap again, measure each clearance between the camshaft journal and the camshaft cap using plastigage (press gauge) [A].

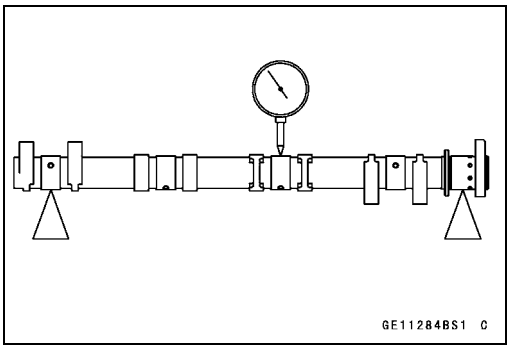
**Camshaft Journal/Camshaft Cap Clearance**
**Standard: 0.038 ~ 0.081 mm (0.0015 ~ 0.0032 in.)**
**Service Limit: 0.17 mm (0.0067 in.)**

★If any clearance exceeds the service limit, measure the diameter of each camshaft journal with a micrometer.

**Camshaft Journal Diameter**
**Standard: 23.940 ~ 23.962 mm (0.9425 ~ 0.9434 in.)**
**Service Limit: 23.91 mm (0.941 in.)**

★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 Runout*

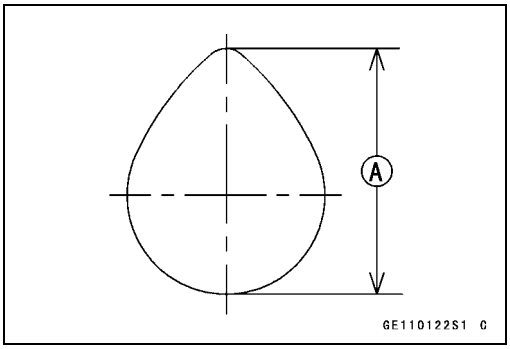



- Remove the camshaft (see Camshaft Removal).
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure runout with a dial gauge at the specified place as shown.

★If the runout exceeds the service limit, replace the shaft.

**Camshaft Runout**
**Standard: TIR 0.02 mm (0.0008 in.) or less**
**Service Limit: TIR 0.1 mm (0.004 in.)**

### *Cam Wear*




- Remove the camshaft (see Camshaft Removal).
- Measure the height [A] of each cam with a micrometer.

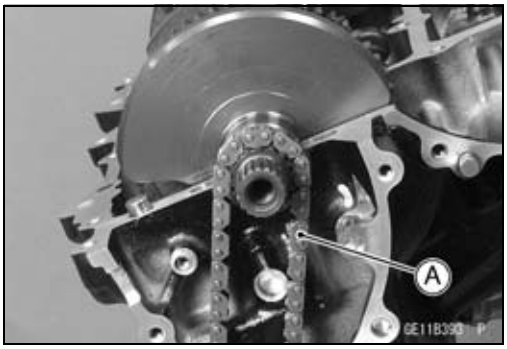
★If the cams are worn down past the service limit, replace the camshaft.

**Cam Height**
**Standard:**
**Exhaust 34.443 ~ 34.557 mm (1.3560 ~ 1.3605 in.)**
**Inlet 35.643 ~ 35.757 mm (1.4033 ~ 1.4078 in.)**
**Service Limit:**
**Exhaust 34.34 mm (1.352 in.)**
**Inlet 35.54 mm (1.399 in.)**

## Camshaft, Camshaft Chain

### *Camshaft Chain Removal*

- Split the crankcase (see Crankcase Splitting in the Crankshaft/Transmission chapter).
- Remove the camshaft chain [A] from the crankshaft sprocket.



## Cylinder Head

### *Cylinder Compression Measurement*

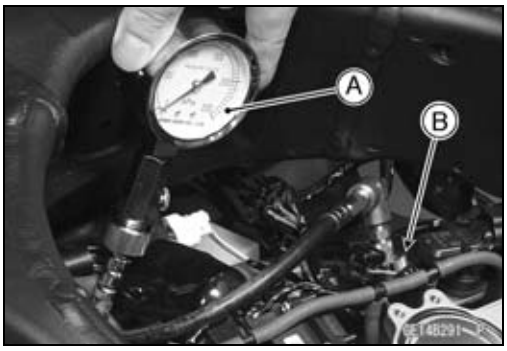
**NOTE**

○*Use the battery which is fully charged.*

- Warm up the engine thoroughly.
- Stop the engine.
- Remove spark plugs (see Spark Plug Replacement in the Periodic Maintenance chapter).

- 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, 20 kgf/cm²: 57001-221**
**Compression Gauge Adapter, M10 × 1.0: 57001-1601**
**L-Shape Hose: 57001-1606**

**Cylinder Compression**
**Usable Range: 1 099 ~ 1 668 kPa (11.2 ~ 17.0 kgf/cm², 159 ~ 242 psi) at 320 r/min (rpm)**

- Repeat the measurement for the other cylinders.
- Install the spark plugs (see Spark Plug Replacement in the Periodic Maintenance chapter).

The following table should be consulted if the obtainable compression reading is not within the usable range.

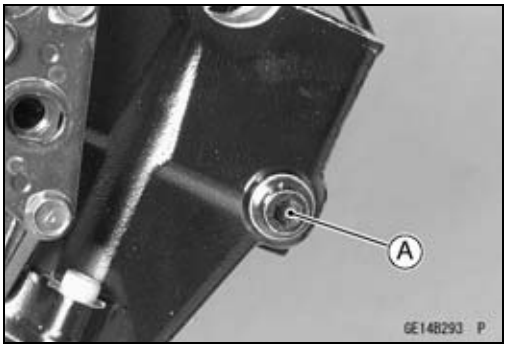
| Problem | Diagnosis | Remedy (Action) |
|---|---|---|
| Cylinder compression is higher than usable range | Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke). | Remove the 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 check gasket and 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 as necessary. |
| | Bad condition of piston ring and/or piston ring grooves | Replace the piston and/or the piston rings. |

## Cylinder Head

### *Cylinder Head Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Exhaust Manifold (see Exhaust Manifold Removal)
  Camshafts (see Camshaft Removal)
  Crankshaft Sensor (see Crankshaft Sensor Removal in the Electrical System chapter)
  Starter Clutch (see Starter Clutch Removal in the Crankshaft/Transmission chapter)
  Left and Right Front Engine Mounting Bolts (see Engine Removal in the Engine Removal/Installation chapter)
- Disconnect the water temperature sensor connector [A].

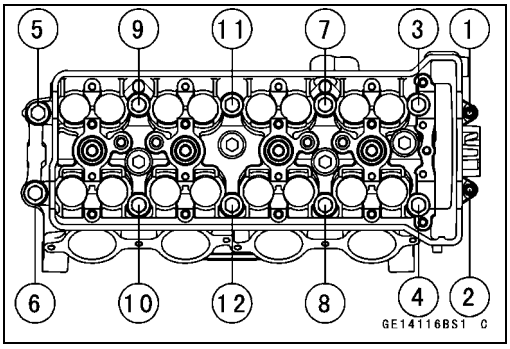

- Remove the front camshaft chain guide bolt (upper) [A].




- Remove:
  Front Camshaft Chain Guide Bolt (Lower) [A]
  Collar
  Front Camshaft Chain Guide [B]

## Cylinder Head

- Loosen the M6 and M10 cylinder head bolts as shown sequence [1 ~ 12] in the figure, and remove them with washers.
- Remove the cylinder head forward.




### *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.*

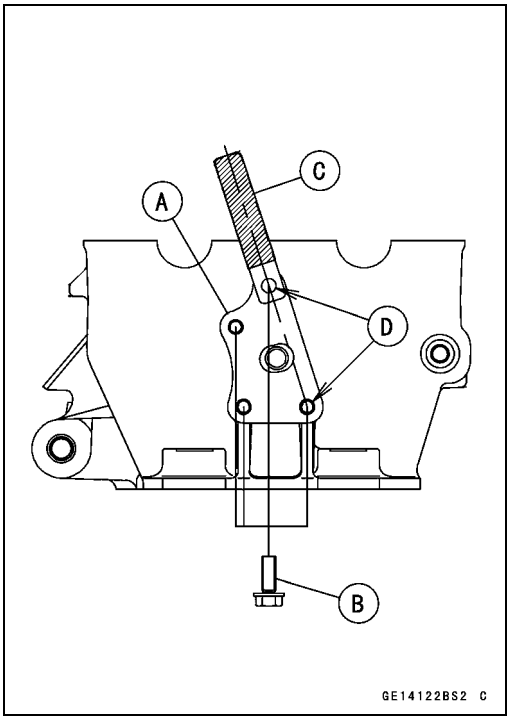
★If the right engine bracket (cylinder head) [A] was removed, install it as follows.

○Apply a non-permanent locking agent to the threads of the right engine bracket bolts (cylinder head) [B].

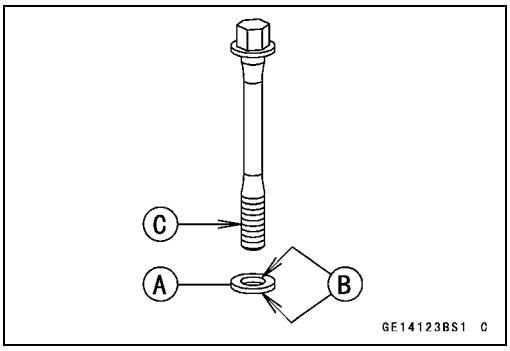
○Install the clamp [C] so that it becomes straight to the bolt holes [D] of the bracket.

○Tighten:

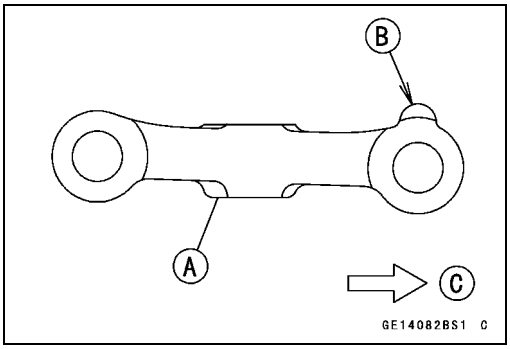
**Torque - Right Engine Bracket Bolts (Cylinder Head): 9.8 N·m (1.0 kgf·m, 87 in·lb)**



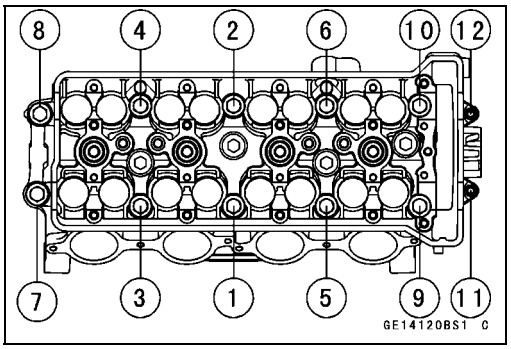

- Install the dowel pins.
- Replace the cylinder head gasket with a new one.
- Replace the cylinder head bolt washers [A] with new ones.
- Apply molybdenum disulfide oil solution to both sides [B] of the cylinder head bolt washers and the threads of the head bolts [C].




- Install the left engine bracket (cylinder head) [A] so that the boss side [B] faces outward.
  Front [C]



## Cylinder Head

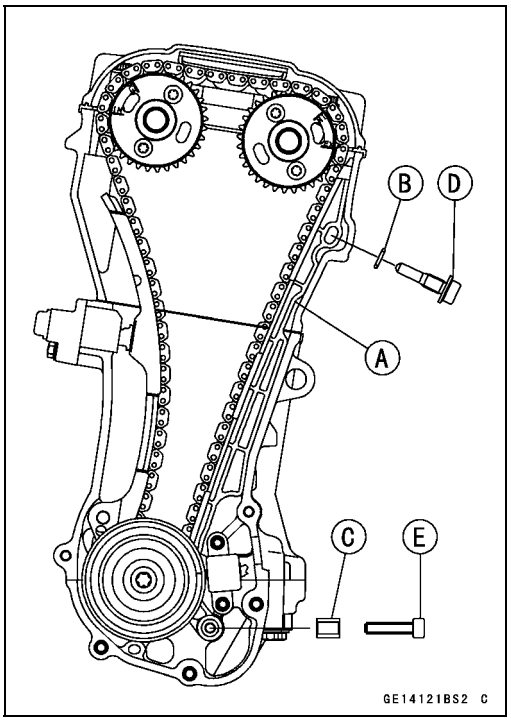



- Tighten the M10 cylinder head bolts as shown sequence [1 ~ 10] in the figure.

**Torque - Cylinder Head Bolts (M10):**
**First: 20 N·m (2.0 kgf·m, 15 ft·lb)**
**Final (New Bolts): 59 N·m (6.0 kgf·m, 44 ft·lb)**
**Final (Used Bolts): 57 N·m (5.8 kgf·m, 42 ft·lb)**

- Tighten the M6 cylinder head bolts as shown sequence [11 ~ 12] in the figure.

**Torque - Cylinder Head Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)**




- Install:
  Left and Right Front Engine Mounting Bolts (see Engine Removal in the Engine Removal/Installation chapter)
  Front Camshaft Chain Guide [A]
  New O-ring [B]
  Collar [C]

○Apply grease to the new O-ring.

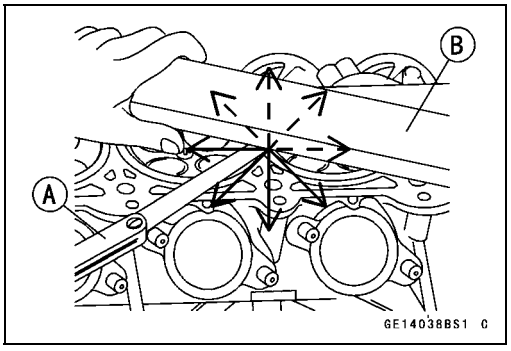
- Tighten:

**Torque - Front Camshaft Chain Guide Bolt (Upper) [D]: 25 N·m (2.5 kgf·m, 18 ft·lb)**
**Front Camshaft Chain Guide Bolt (Lower) [E]: 12 N·m (1.2 kgf·m, 106 in·lb)**

- 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

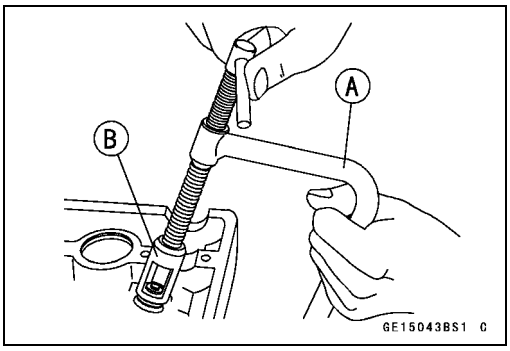
### *Valve Clearance Inspection*

● Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

### *Valve Removal*

● Remove the 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]: 57001-241**
**Valve Spring Compressor Adapter, $\phi$24 [B]: 57001-1586**

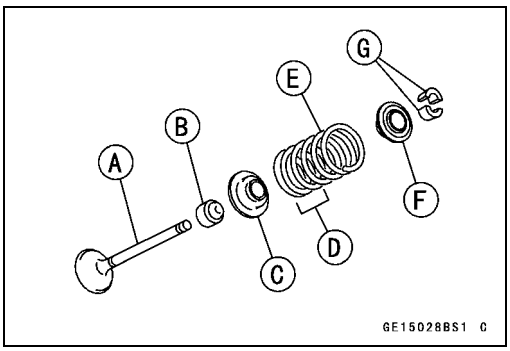



### *Valve Installation*

**CAUTION**

**Do not lap the valve to the valve seat, using the grinding compound. It will come off oxide film treated surface of the valve.**

● Replace the oil seal with a new one.
● Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.
○The inlet valves are larger than the exhaust valves.
● Install the springs so that the closed coil end faces downwards.
Valve Stem [A]
Oil Seal [B]
Spring Seat [C]
Closed Coil End [D]
Valve Spring [E]:
EX-Purple Paint
IN-Blue Paint
Retainer [F]
Split Keepers [G]



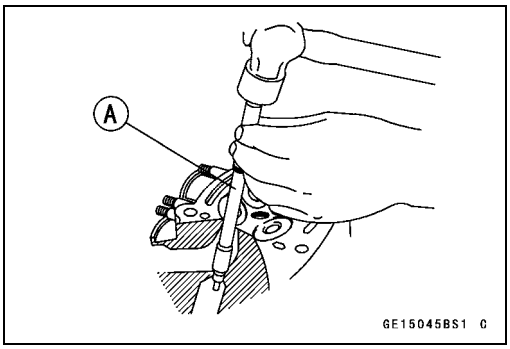

### *Valve Guide Removal*

● 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.**

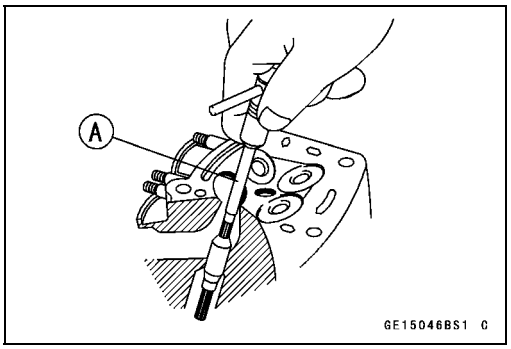
**Special Tool - Valve Guide Arbor, $\phi$4.5: 57001-1331**



## Valves

### *Valve Guide Installation*

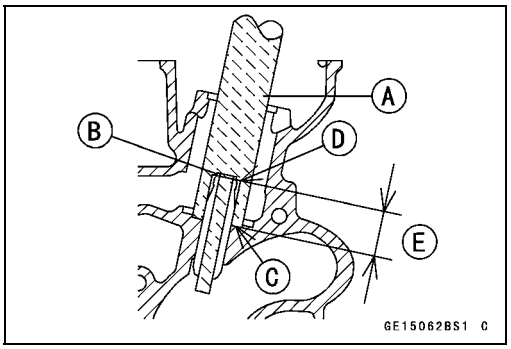
- Apply oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F).




| CAUTION |
| --- |
| **Do not heat the cylinder head with a torch. This Will warp the cylinder head. Soak the cylinder head and heat the oil.** |

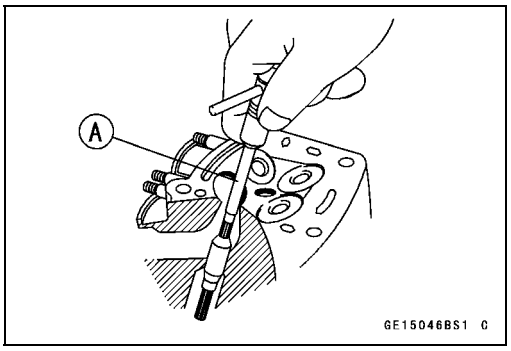
- Using the valve guide driver [A] and washer [B], press and insert the valve guide in until the valve guide driver surface [C] touches the head surface [D].
  13.3 ~ 13.5 mm (0.52 ~ 0.53 in.) [E]

  **Special Tools - Valve Guide Driver: 57001-1564**
  **Washer: 57001-1612**




- Ream the valve guide with valve guide reamer [A], even if the old guide is reused.

  **Special Tool - Valve Guide Reamer, $\phi$4.5: 57001-1333**

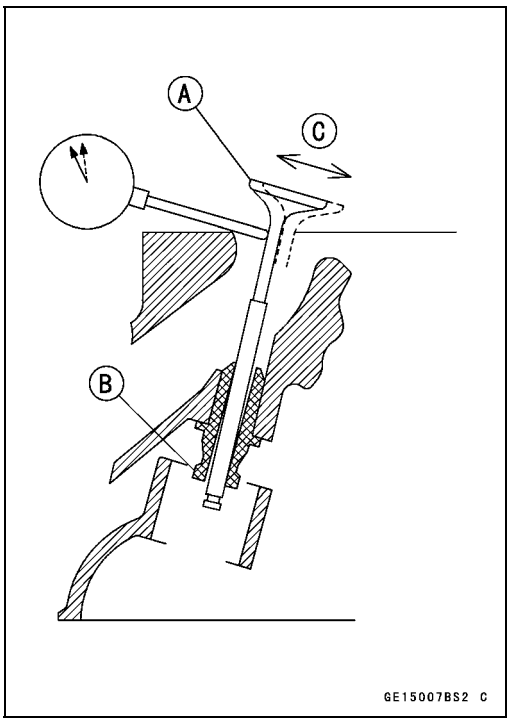



### *Valve-to-Guide Clearance Measurement (Wobble Method)*

If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method as indicated below.

- 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.

★If the reading exceeds the service limit, replace the guide.



## Valves

**NOTE**

○*The reading is not actual valve/valve guide clearance because the measuring point is above the guide.*

**Valve/Valve Guide Clearance (Wobble Method)**
**Standard:**

| | |
|---|---|
| **Exhaust** | **0.04 ~ 0.12 mm (0.0016 ~ 0.0047 in.)** |
| **Inlet** | **0.03 ~ 0.11 mm (0.0012 ~ 0.0043 in.)** |

**Service Limit:**

| | |
|---|---|
| **Exhaust** | **0.32 mm (0.013 in.)** |
| **Inlet** | **0.30 mm (0.012 in.)** |

### *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 Seat Repair).

**Valve Seating Surface Outside Diameter**
**Standard:**

| | |
|---|---|
| **Exhaust** | **23.9 ~ 24.1 mm (0.941 ~ 0.949 in.)** |
| **Inlet** | **29.4 ~ 29.6 mm (1.157 ~ 1.165 in.)** |

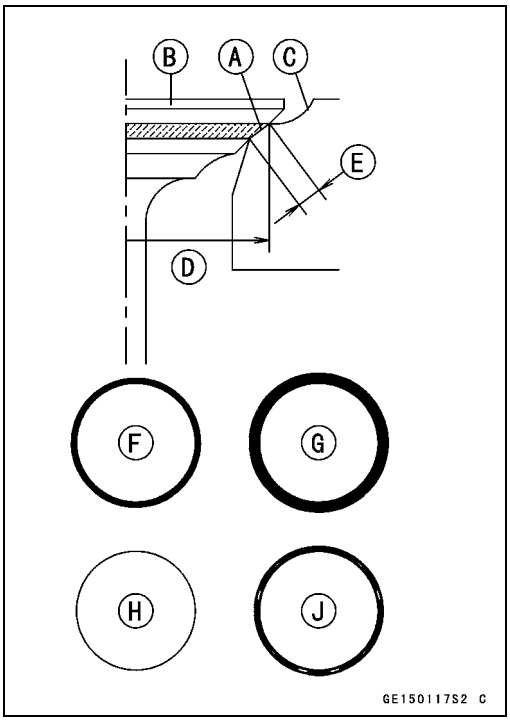
○Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.

Good [F]

★If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Valve Seat Repair).

**Valve Seating Surface Width**
**Standard:**

| | |
|---|---|
| **Exhaust** | **0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)** |
| **Inlet** | **0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)** |




### *Valve Seat Repair*

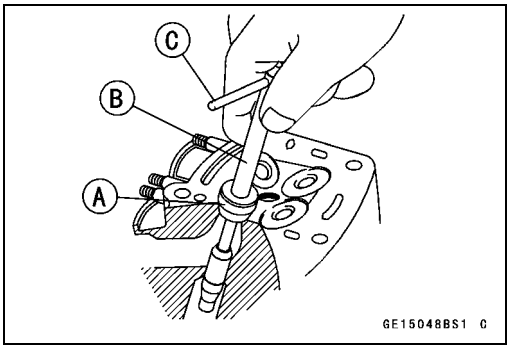
- Repair the valve seat with the valve seat cutters [A].

**Special Tools - Valve Seat Cutter Holder Bar: 57001-1128 [C]**
**Valve Seat Cutter Holder, $\phi$4.5: 57001-1330 [B]**

**[For Exhaust Valve Seat]**
**Valve Seat Cutter, 45° - $\phi$27.5: 57001-1114**
**Valve Seat Cutter, 32° - $\phi$28: 57001-1119**
**Valve Seat Cutter, 60° - $\phi$25: 57001-1328**

**[For Inlet Valve Seat]**
**Valve Seat Cutter, 45° - $\phi$32: 57001-1115**
**Valve Seat Cutter, 32° - $\phi$33: 57001-1199**
**Valve Seat Cutter, 60° - $\phi$33: 57001-1334**

★If the manufacturer's instructions are not available, use the following procedure.



## Valves

**Seat Cutter Operation Care**

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

**NOTE**

○*Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.*

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

**NOTE**

○*Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.*

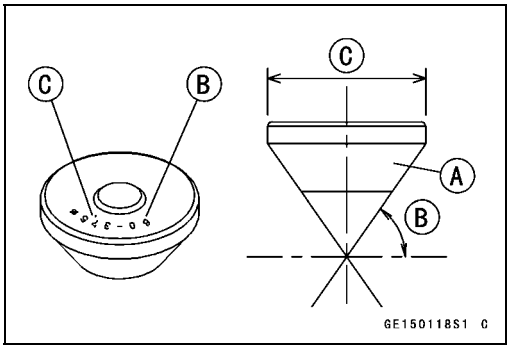
5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

**Marks Stamped on the Cutter**

The marks stamped on the back of the cutter [A] represent the following.

60° ..... Cutter angle [B]

37.5$\phi$ ..... Outer diameter of cutter [C]




**Operating Procedures**

- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

**CAUTION**

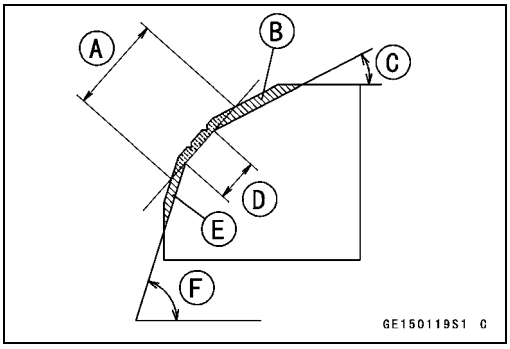
**Do not grind the seat too much. Overgrinding will reduce valve clearance by sinking the valve into the head. If the valve sinks too far into the head, it will be impossible to adjust the clearance, and the cylinder head must be replaced.**

## Valves

● Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.

Widened Width [A] of engagement by machining with 45° cutter
Ground Volume [B] by 32° cutter
32° [C]
Correct Width [D]
Ground Volume [E] by 60° cutter
60° [F]




● Measure the outside diameter of the seating surface with a vernier caliper.

★If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.

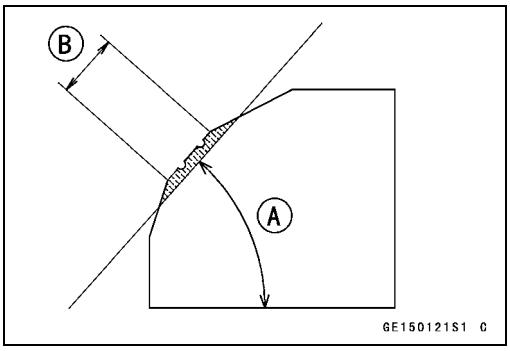
Original Seating Surface [B]

**NOTE**

○*Remove all pittings of flaws from 45° ground surface.*

○*After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° grinding operation easier.*

○*When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.*



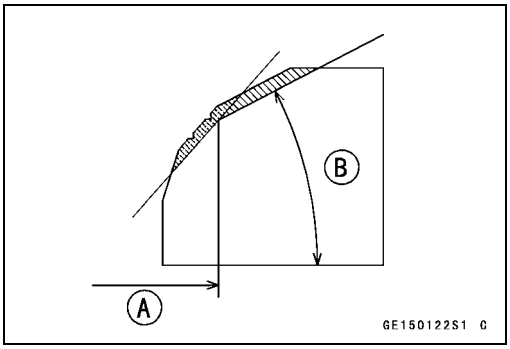

★If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.

★If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.

● Grind the seat at a 32° angle [B] until the seat O.D. is within the specified range.

○To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.

○Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.




**CAUTION**

**The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.**

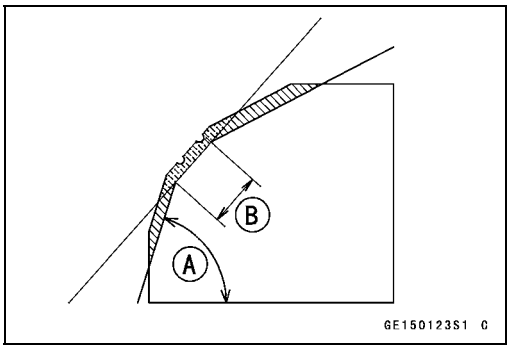
○After making the 32° grind, return to the seat O.D. measurement step above.

● To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.

★If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.

## Valves

★If the seat width is too wide, make the 60° [A] grind described below.
★If the seat width is within the specified range, lap the valve to the seat as described below.
● Grind the seat at a 60° angle until the seat width is within the specified range.
○To make the 60° grind, fit 60° cutter into the holder, and slide it into the valve guide.
○Turn the holder, while pressing down lightly.
○After making the 60° grind, return to the seat width measurement step above.
Correct Width [B]



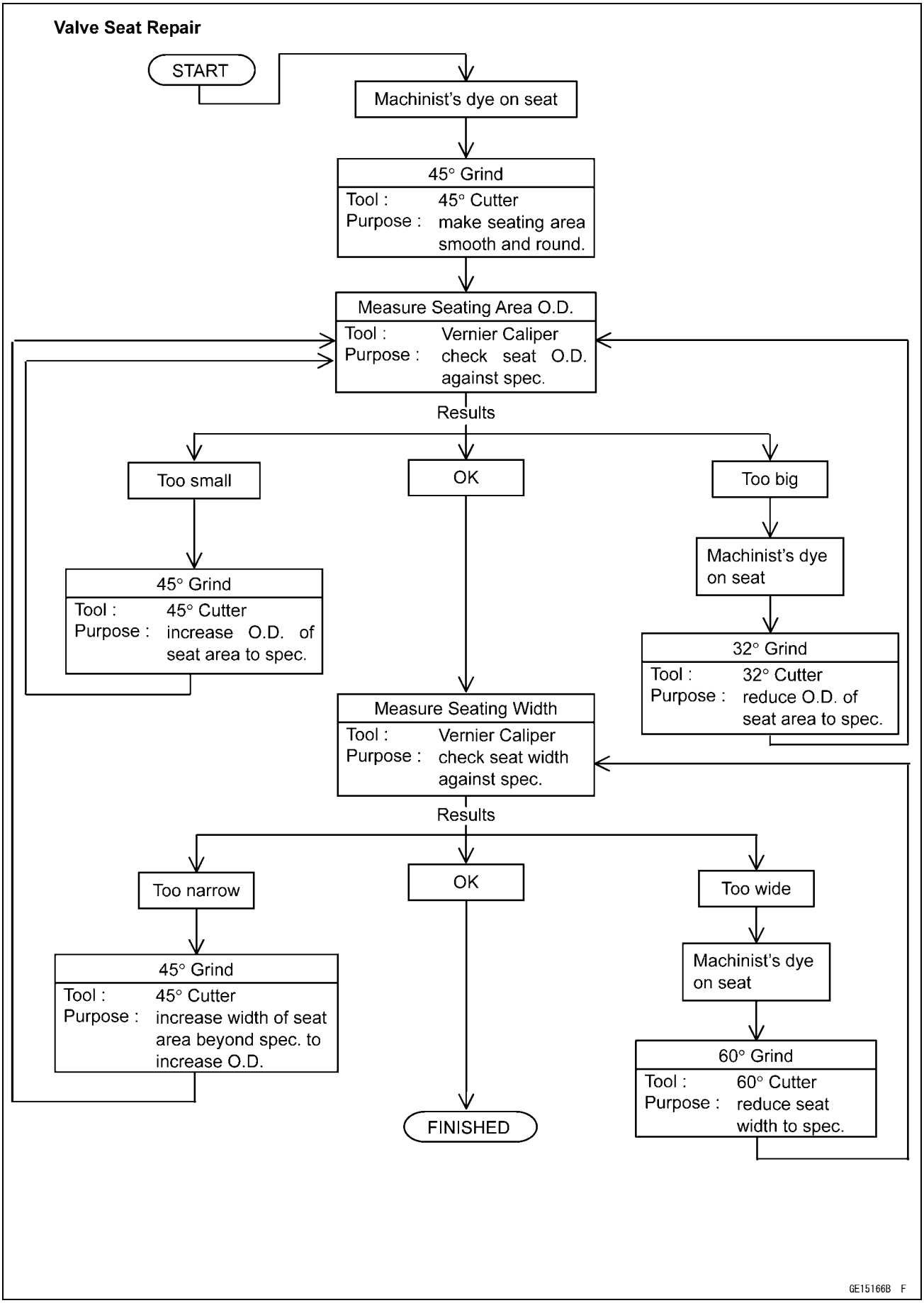

**CAUTION**

**Do not lap the valve to the valve seat, using the grinding compound. It will come off oxide film treated surface of the valve.**

● When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).

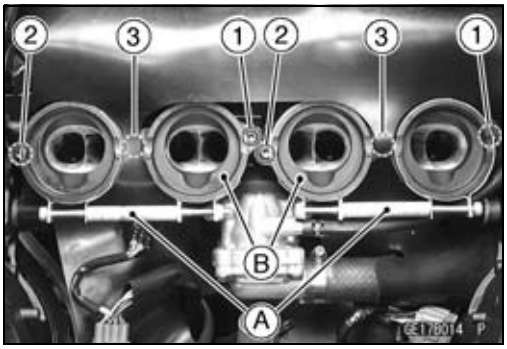
## Valves

**Valve Seat Repair**



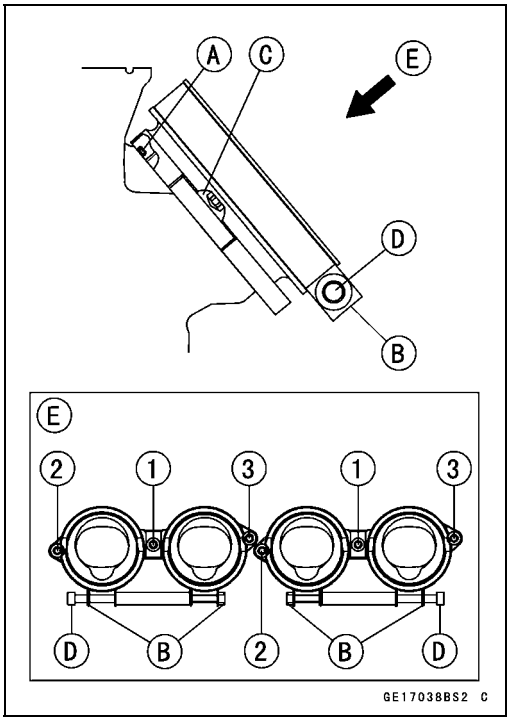
## Throttle Body Assy Holder

### *Throttle Body Assy Holder Removal*




- Remove:
  Throttle Body Assy (Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Clamps [A]
- Loosen the throttle body assy holder bolts as shown sequence [1 ~ 3] in the figure, and remove them.
- Remove the throttle body assy holders [B].

### *Throttle Body Assy Holder Installation*




- Be sure to install the new O-rings [A].
- Apply grease to the new O-ring.
- Install the clamps [B] as shown in the figure.
- Tighten the holder bolts as shown sequence [1 ~ 3] in the figure.

**Torque - Throttle Body Assy Holder Bolts [C]: 10 N·m (1.0 kgf·m, 89 in·lb)**
**Throttle Body Assy Holder Clamp Bolts [D]: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

Upside View [E]

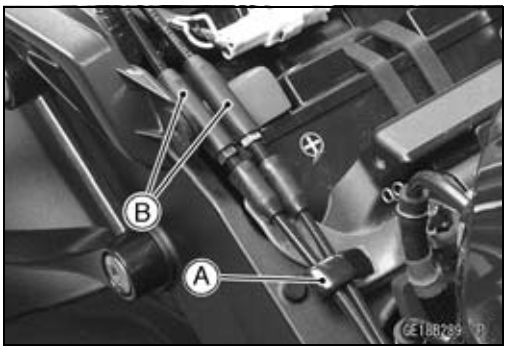
## Muffler

**⚠ WARNING**

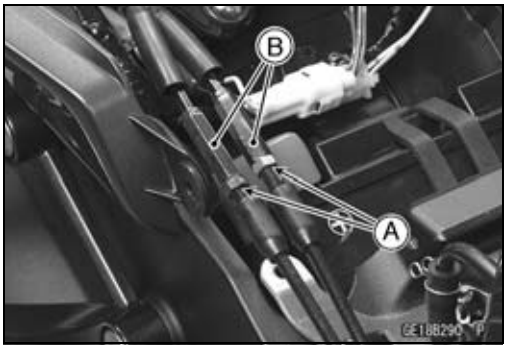
**To avoid a serious burn, do not remove the muffler when the engine is still hot. What until the muffler cool down.**

### *Muffler Body Removal*

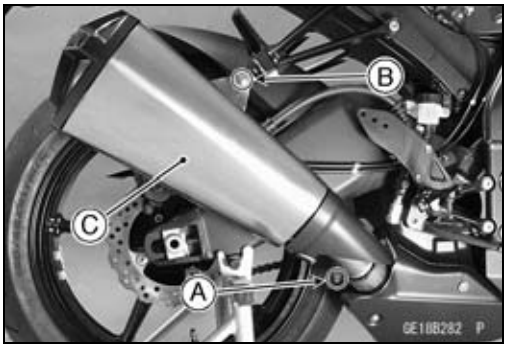
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Open the clamp [A] and free the cables.
- Slide the dust covers [B].




- Loosen the locknuts [A], and turn the adjusters [B] clockwise to give the cable plenty of play.




- Remove the lower ends of the exhaust butterfly valve cables from the pulley of the muffler body (see Exhaust Butterfly Valve Cable Removal).
- Loosen the muffle body clamp bolt [A].
- Remove the muffler body mounting bolt [B], and pull out the muffler body [C] backward from the premuffler chamber.



## Muffler

### *Muffler Body Installation*

★If the muffler body front [A] and rear [B] covers were removed, install them.

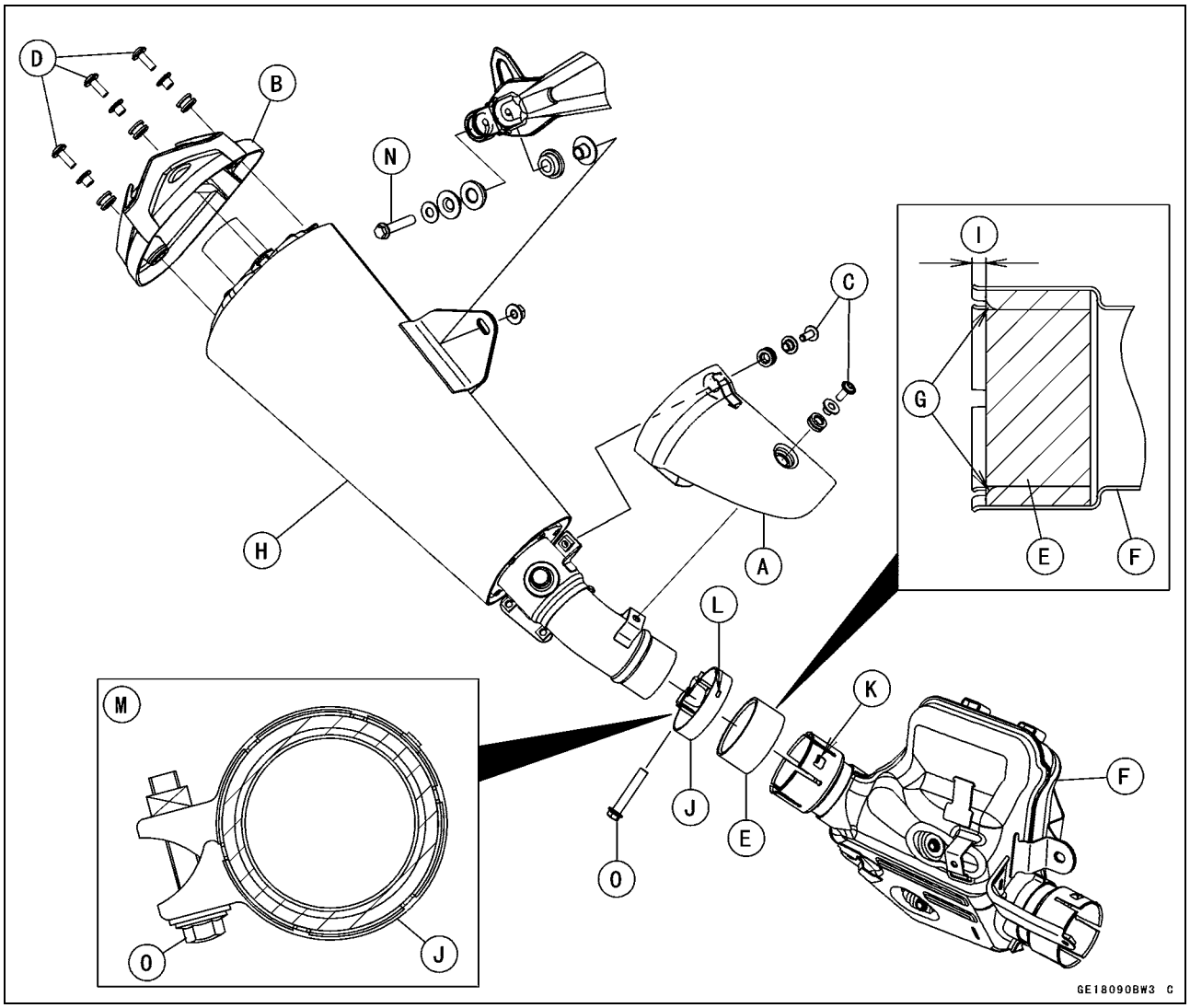
**Torque - Muffler Body Front Cover Bolts [C]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**
**Muffler Body Rear Cover Bolts [D]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Replace the muffler body gasket [E] with a new one.
- Install the muffler body gasket to the premuffler chamber [F] until it is bottomed so that the chamfer side [G] faces muffler body [H].
  About 4.0 mm (0.16 in.) [I]
- Install the muffler body clamp [J] as shown in the figure.

○Insert the projection [K] into the slot [L].
Rear View [M]

- Tighten:

**Torque - Muffler Body Mounting Bolt [N]: 25 N·m (2.5 kgf·m, 18 ft·lb)**
**Muffler Body Clamp Bolt [O]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

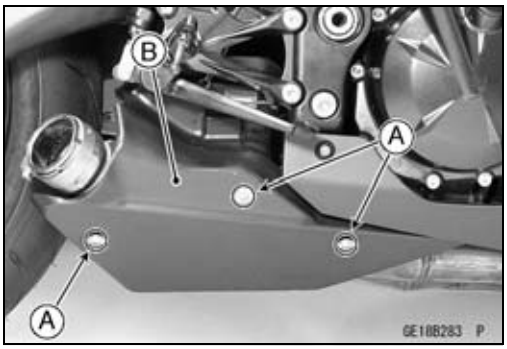


## Muffler

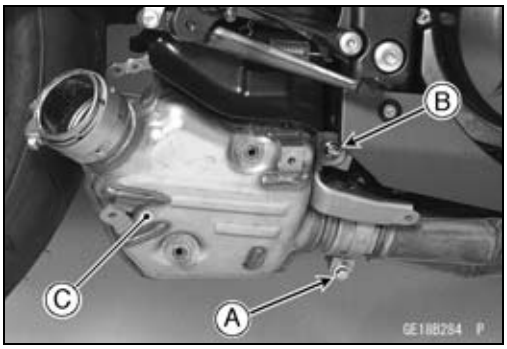
- Install the lower ends of the exhaust butterfly valve cables, and adjust the cables correctly (see Exhaust Butterfly Valve Cable Installation).
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nuts.

### *Premuffler Chamber Removal*

- Remove:
  Muffler Body (see Muffler Body Removal)
  Bolts [A]
  Premuffler Chamber Outer Cover [B]




- Loosen the exhaust manifold clamp bolt [A].
- Remove the premuffler chamber mounting bolt [B], and pull out the premuffler chamber [C] backward from the exhaust manifold.




### *Premuffler Chamber Installation*

★If the premuffler chamber inner cover [A] was removed, install it as follows.
○Insert the projection [B] of the premuffler chamber [C] into the slot of the damper [D].
○Tighten:

**Torque - Premuffler Chamber Inner Cover Bolts [E]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- Replace the exhaust manifold gasket [F] with a new one.
- Install the exhaust manifold gasket to the premuffler chamber until it is bottomed so that the chamfer side [G] faces exhaust manifold [H].
  About 4.0 mm (0.16 in.) [I]
- Install the exhaust manifold clamp [J] as shown in the figure.

○Insert the projection [K] into the slot [L].
  Front View [M]

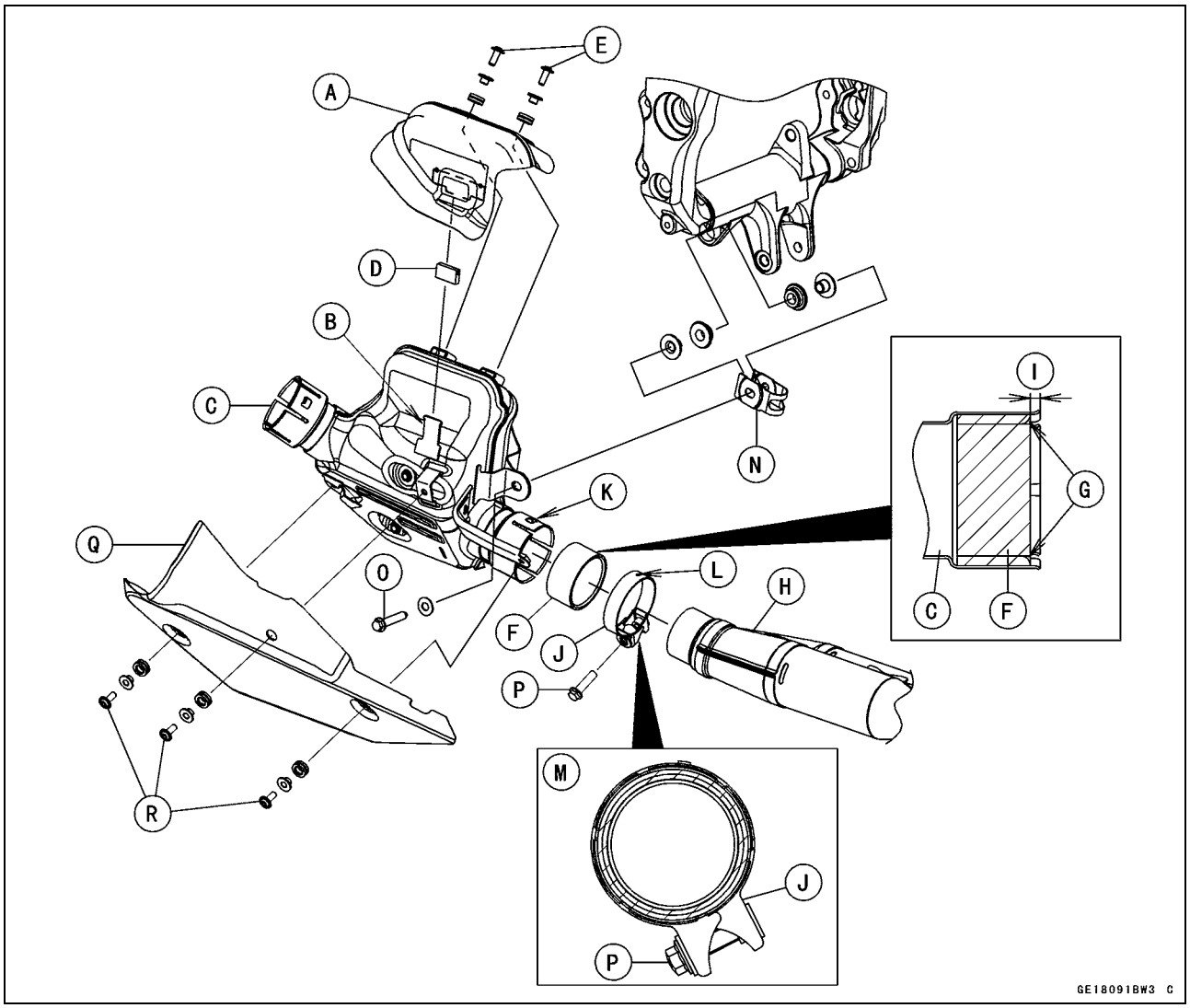
- Install the nut [N] on the frame as shown in the figure.
- Tighten:

**Torque - Premuffler Chamber Mounting Bolt [O]: 25 N·m (2.5 kgf·m, 18 ft·lb)**
**Exhaust Manifold Clamp Bolt [P]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Install the premuffler chamber outer cover [Q].

**Torque - Premuffler Chamber Outer Cover Bolts [R]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

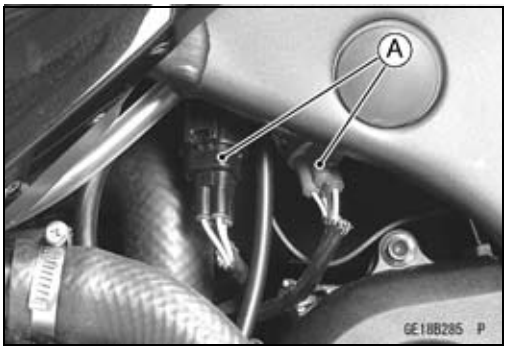
## Muffler




- Install the muffler body (see Muffler Body Installation).
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nuts.

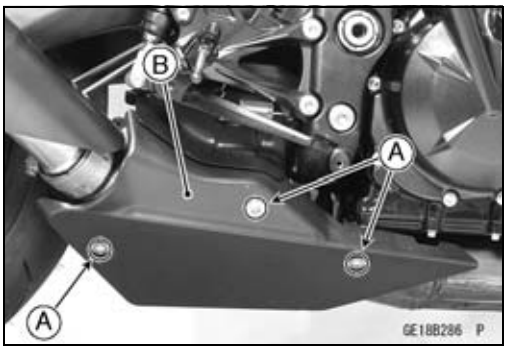
### *Exhaust Manifold Removal*

- For models equipped with oxygen sensors, disconnect the oxygen sensor lead connectors [A], and then open the clamp of the oil pan and free the oxygen sensor leads.

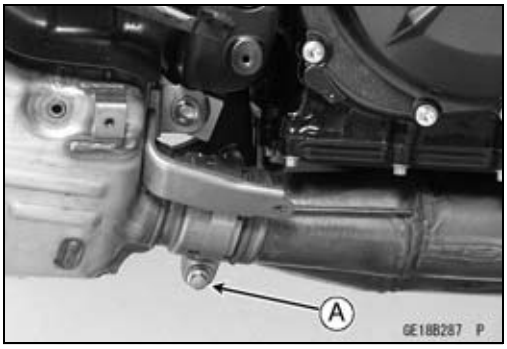


## Muffler

● Remove:
Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
Bolts [A]
Premuffler Chamber Outer Cover [B]




● Loosen the exhaust manifold clamp bolt [A].




● Remove the exhaust pipe holder nuts [A], and pull out the exhaust manifold forward from the premuffler chamber.


### *Exhaust Manifold Installation*

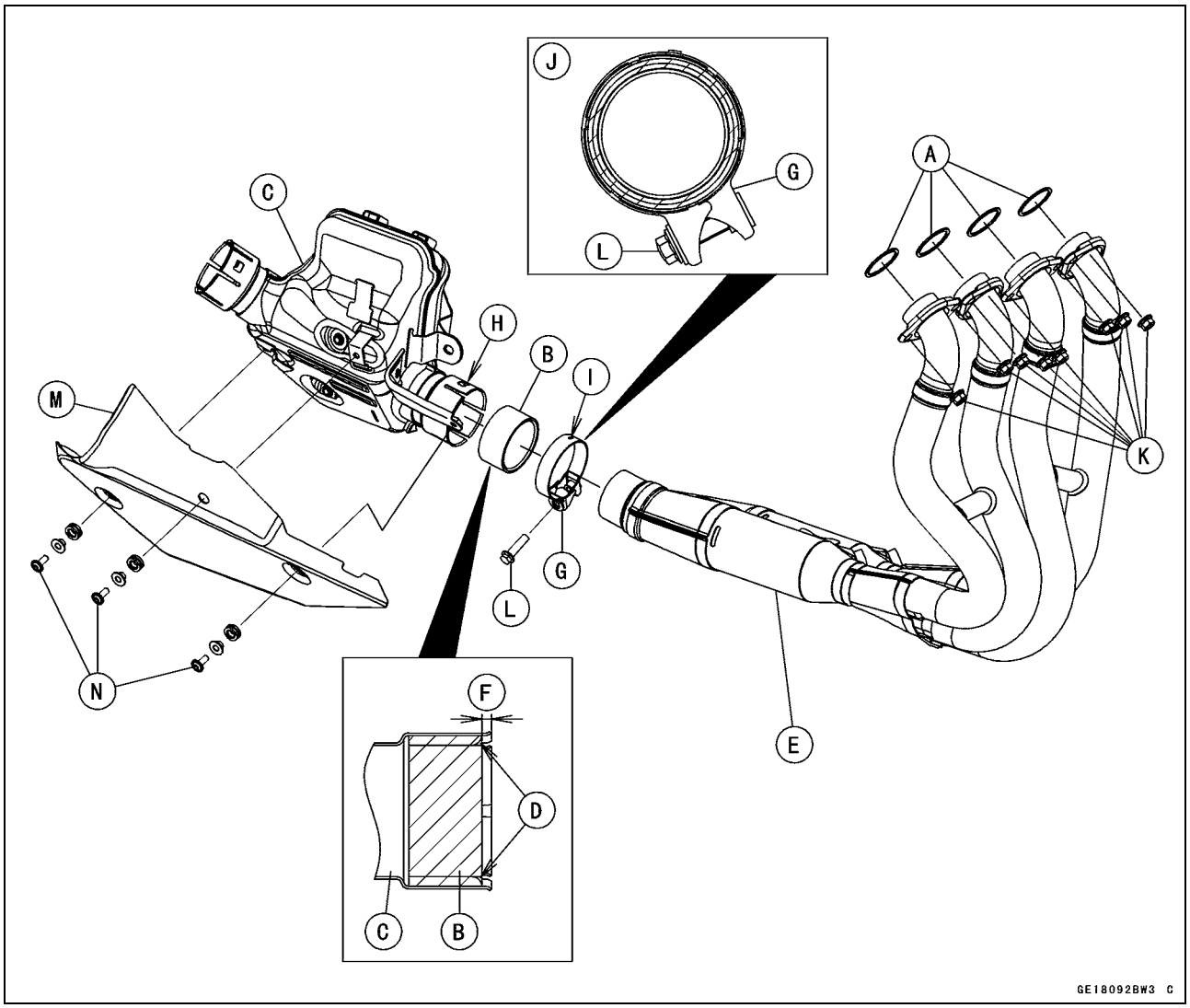
● Replace the exhaust pipe gaskets [A] with new ones.
● Replace the exhaust manifold gasket [B] with a new one.
● Install the exhaust manifold gasket to the premuffler chamber [C] until it is bottomed so that the chamfer side [D] faces exhaust manifold [E].
About 4.0 mm (0.16 in.) [F]
● Install the exhaust manifold clamp [G] as shown in the figure.
○Insert the projection [H] into the slot [I].
Front View [J]
● Tighten:

**Torque - Exhaust Pipe Holder Nuts [K]: 17 N·m (1.7 kgf·m, 13 ft·lb)**
**Exhaust Manifold Clamp Bolt [L]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

● Install the premuffler chamber outer cover [M].

**Torque - Premuffler Chamber Outer Cover Bolts [N]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

## Muffler



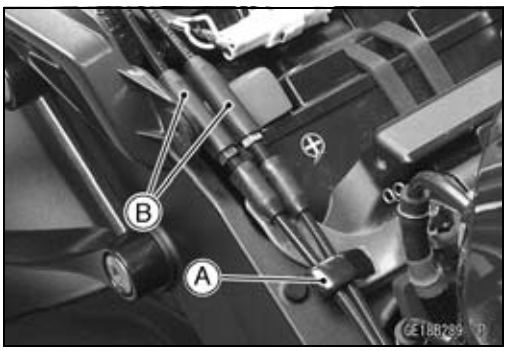

- Install the removed parts (see appropriate chapters).

○For models equipped with oxygen sensors, run the oxygen sensor leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nuts.

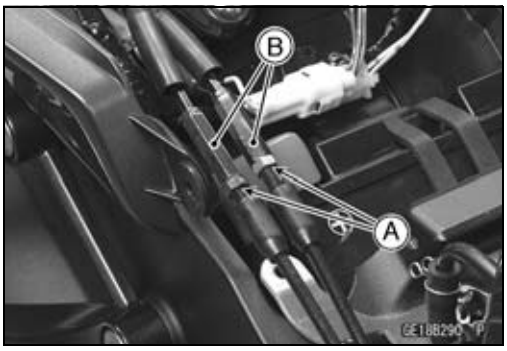
### *Exhaust Butterfly Valve Cable Removal*

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Open the clamp [A] and free the cables.
- Slide the dust covers [B].

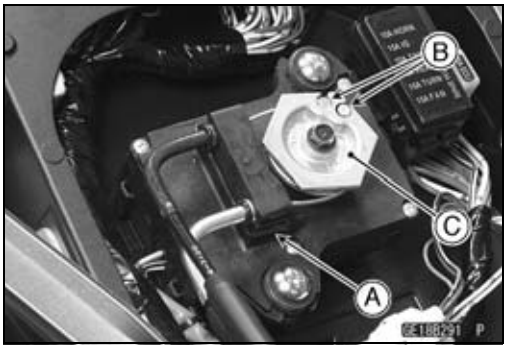


## Muffler

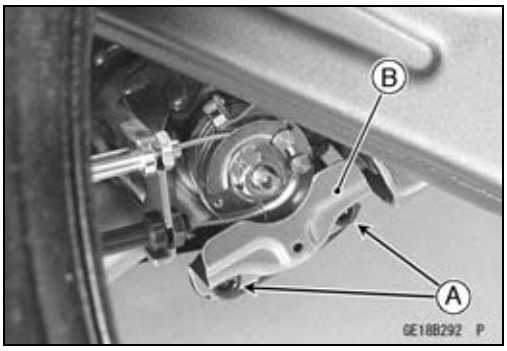
- Loosen the locknuts [A], and turn the adjusters [B] clockwise to give the cable plenty of play.



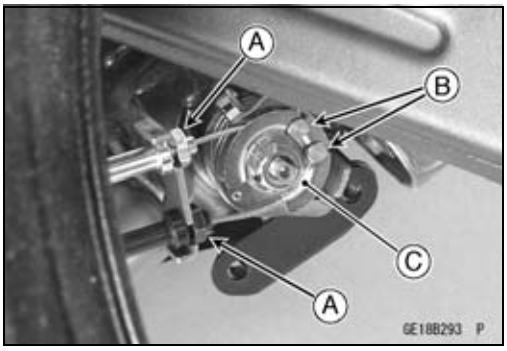

- Remove the clamp [A].
- Remove the upper ends [B] of the exhaust butterfly valve cables from the pulley [C].




- Remove:
  Bolts [A]
  Exhaust Butterfly Valve Pulley Cover [B]

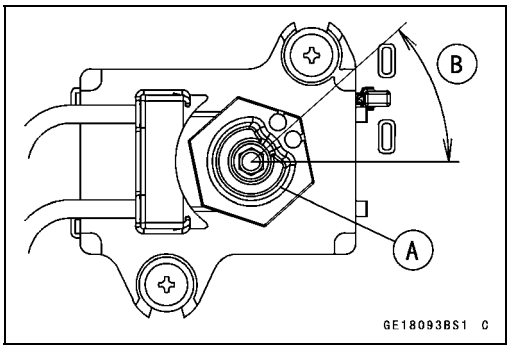



- Loosen the locknuts [A].
- Remove the lower ends [B] of the exhaust butterfly valve cables from the pulley [C].
- Pull the exhaust butterfly valve cables out of the frame.



## Muffler

### *Exhaust Butterfly Valve Cable Installation*




- Confirm whether pulley [A] is an angle shown in the figure.
  41.7° ±7° [B]

○This position is original position of the pulley.

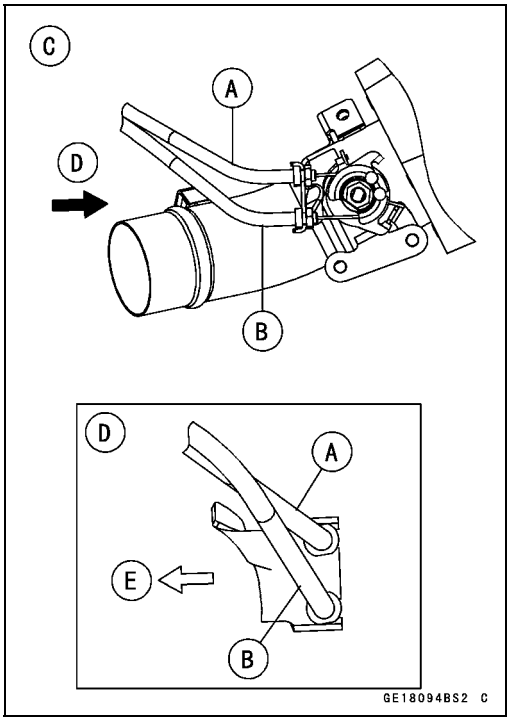
**NOTE**

○*Correct the position electrically after confirming use is discontinued and there is no damage when differing from the angle of shown in the figure.*

**CAUTION**

**Do not correct the pulley position with the tool, forcibly. The actuator damage will occur.**

★If the angle is wrong, adjust the pulley (see Exhaust Butterfly Valve Actuator Installation in the Fuel System (DFI) chapter).




- Run the exhaust butterfly valve cables correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the lower ends of the exhaust butterfly valve cables to the pulley of the muffler body as shown in the figure.
  Open Cable (White) [A]
  Close Cable (Black) [B]
  Left Side View [C]
  Front View [D]
  Outside [E]
- Tighten the locknuts securely.
- Install the exhaust butterfly valve pulley cover.

**Torque - Exhaust Butterfly Valve Pulley Cover Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

## Muffler

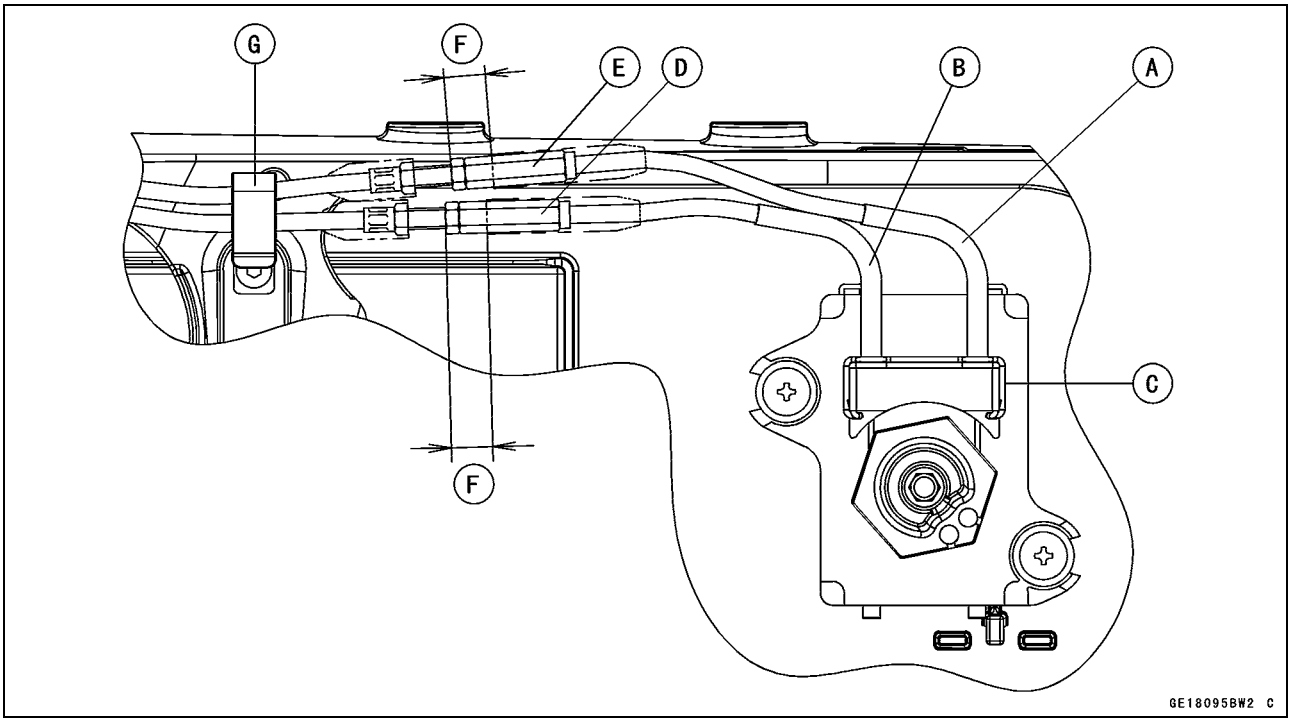
- Install the upper ends of the exhaust butterfly valve cables to the pulley of the exhaust butterfly valve actuator, following the specified installing sequence.

○First, install the close cable (black) [A].
○Second, install the open cable (white) [B].
○Third, install the clamp [C].
○Fourth, stretch the open cable (white) by using the adjuster [D].
○Turn the adjuster counterclockwise until the play of the open cable becomes no play.

| CAUTION |
| --- |
| **To keep the correct exhaust butterfly valve position, be sure to adjust the open cable first. Do not overstretch the cable.** |

○Fifth, tighten the adjuster locknut (white) of the open cable securely.
○Sixth, stretch the close cable (black) by using the adjuster [E].
○Turn the adjuster counterclockwise until the play of the close cable becomes no play.
○Seventh, turn the adjuster of the close cable (black) clockwise by 1/2 to 1 rotation.
○Lastly, tighten the adjuster locknut (black) of the close cable securely.

- After installation, cover the dust covers on the adjusters as shown in the figure.
  15 mm (0.59 in.) or less [F]
- Fix the exhaust butterfly valve cables with the clamp [G].



# Clutch

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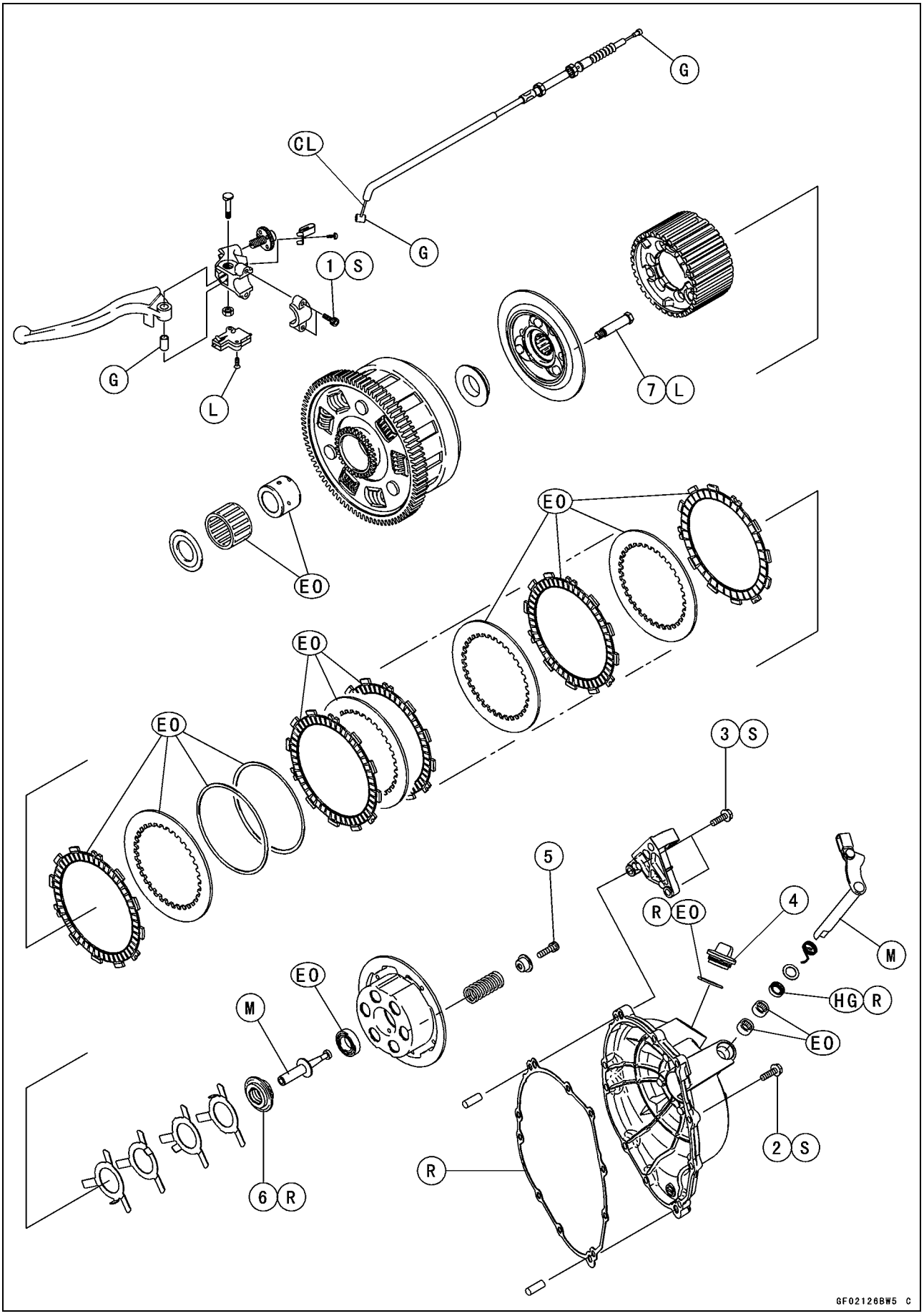
## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Clutch Lever Clamp Bolts | 7.8 | 0.80 | 69 in·lb | S |
| 2 | Clutch Cover Bolts (M6, L = 25) | 10 | 1.0 | 89 in·lb | S |
| 3 | Clutch Cover Bolts (M6, L = 35) | 10 | 1.0 | 89 in·lb | S |
| 4 | Oil Filler Plug | – | – | – | Hand-tighten |
| 5 | Clutch Spring Bolts | 11 | 1.1 | 97 in·lb | |
| 6 | Clutch Hub Nut | 130 | 13.3 | 96 | R |
| 7 | Sub Clutch Hub Bolts | 25 | 2.5 | 18 | L |

CL: Apply cable lubricant.
EO: Apply engine oil.
G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
R: Replacement Parts
S: Follow the specified tightening sequence.

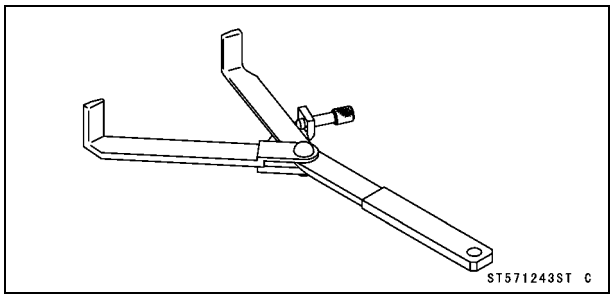
# 6-4 CLUTCH

## Specifications

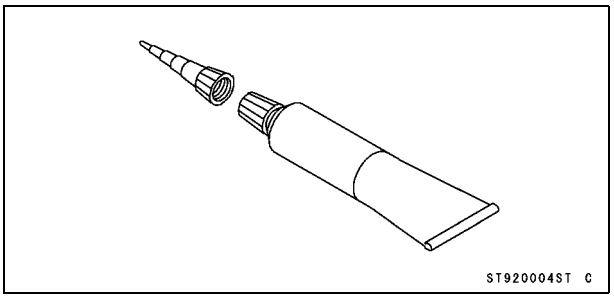
| Item | Standard | Service Limit |
|---|---|---|
| **Clutch Lever Free Play** | 2 ~ 3 mm (0.08 ~ 0.12 in.) | – – – |
| **Clutch** | | |
| Spring Plate Free Play | (Usable Range) | |
| | 0.05 ~ 0.70 mm (0.002 ~ 0.028 in.) | – – – |
| Clutch Plate Assembly Length | (Reference) | |
| | 53.5 mm (2.11 in.) | – – – |
| Friction Plate Thickness | 2.72 ~ 2.88 mm (0.107 ~ 0.113 in.) | 2.6 mm (0.102 in.) |
| Friction and Steel Plate Warp | 0.15 mm (0.0059 in.) or less | 0.3 mm (0.012 in.) |
| Clutch Spring Free Length | 43.5 mm (1.71 in.) | 42.1 mm (1.66 in.) |

## Special Tool and Sealant

**Clutch Holder:**
**57001-1243**




**Kawasaki Bond (Silicone Sealant):**
**92104-0004**



## Clutch Lever and Cable

### *Clutch Lever Free Play Inspection*

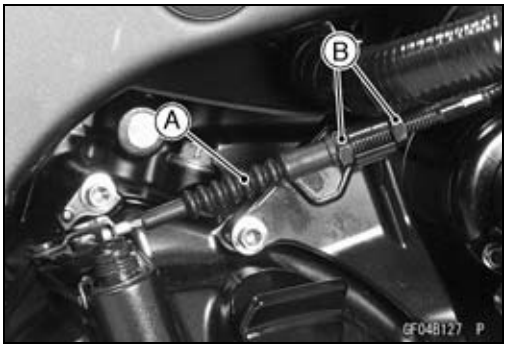
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

### *Clutch Lever Free Play Adjustment*

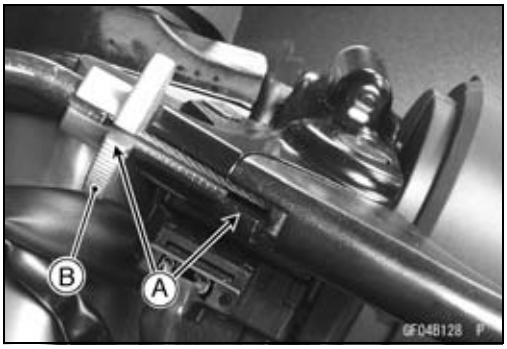
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

### *Cable Removal*

- Remove the right upper fairing cover (see Upper Fairing Cover Removal in the Frame chapter).
- Slide the dust cover [A] at the clutch cable lower end out of place.
- Loosen the nuts [B], and slide the lower end of the clutch cable to give the cable plenty of play.




- Screw in the adjuster.
- Line up the slots [A] in the clutch lever and adjuster [B], and then free the cable from the lever.
- Free the clutch inner cable tip from the clutch release lever.
- Push the release lever toward the front of the motorcycle and tape the release lever to the clutch cover to prevent the release shaft from falling out.
- Pull the clutch cable out of the frame.




### *Cable Installation*

- Run the clutch cable correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Adjust the clutch cable (see Clutch Operation Inspection in the Periodic Maintenance chapter).
- Install the right upper fairing cover (see Upper Fairing Cover Installation in the Frame chapter).

### *Cable Lubrication*

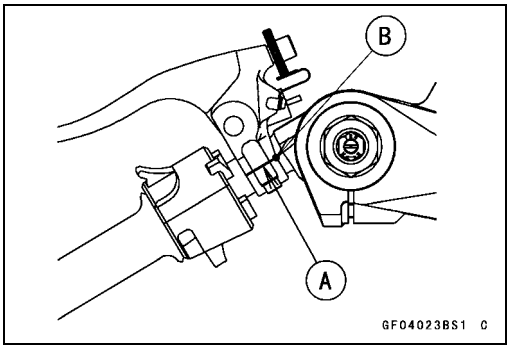
- Refer to the Chassis Parts Lubrication in the Periodic Maintenance chapter.

### *Clutch Lever Installation*

- Install the clutch lever so that the mating surface [A] of the clutch lever clamp is aligned with the punch mark [B] of the handlebar.
- Tighten the upper clamp bolt first, and then the lower clamp bolt.

○There will be a gap at the lower part of the clamp after tightening.

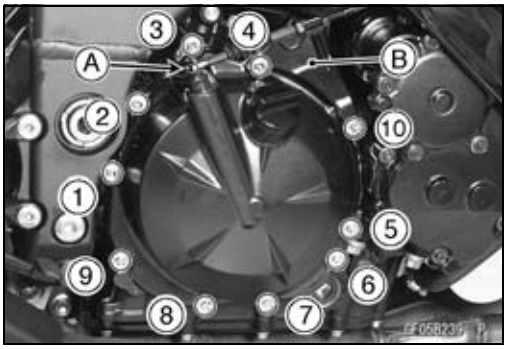
**Torque - Clutch Lever Clamp Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)**



## Clutch Cover

### *Clutch Cover Removal*

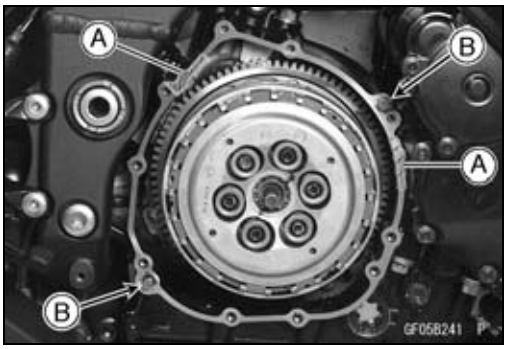
- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Clutch Cable Lower End [A] (see Cable Removal)
- Loosen the clutch cover mounting bolts as shown sequence [1 ~ 10] in the figure, and remove them and the bracket [B].



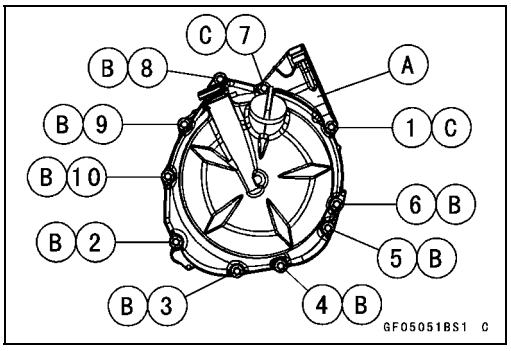

- Turn the release lever [A] toward the rear as shown, and remove the clutch cover [B].
  About 90° [C]


### *Clutch Cover Installation*

- Apply silicone sealant to the area [A] where the mating surface of the crankcase touches the clutch cover gasket.
  **Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**
- Be sure that the dowel pins [B] are in position.
- Replace the clutch cover gasket with a new one.




- Install the bracket [A].
- Tighten the clutch cover mounting bolts as shown sequence [1 ~ 10] in the figure.
  **Torque - Clutch Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**
  L = 25 mm (0.98 in.) [B]
  L = 35 mm (1.38 in.) [C]
- Install:
  Clutch Cable Lower End (see Cable Installation)
  Right Lower Fairing (see Lower Fairing Installation in the Frame chapter)

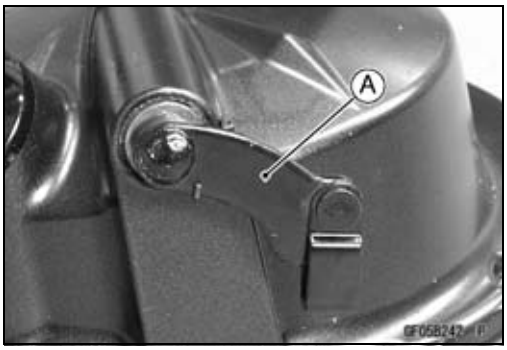



### *Release Shaft Removal*

**CAUTION**

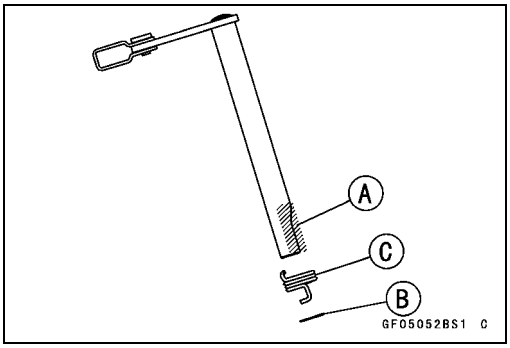
**Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.**

- Remove the clutch cover (see Clutch Cover Removal).
- Pull the release lever and shaft assembly [A] straight out of the clutch cover.



## Clutch Cover

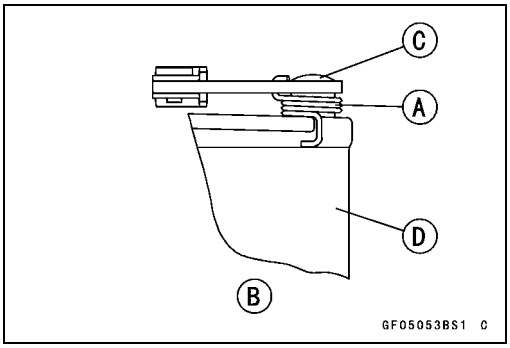
### *Release Shaft Installation*




- Apply high-temperature grease to the oil seal lips on the upper ridge of the clutch cover.
- Apply 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 of the clutch cover.

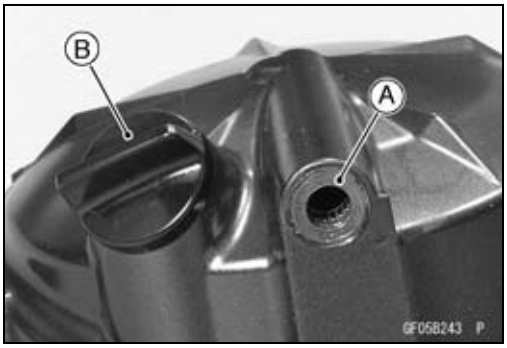
**CAUTION**

**When inserting the release shaft, be careful not to remove the spring of the oil seal.**

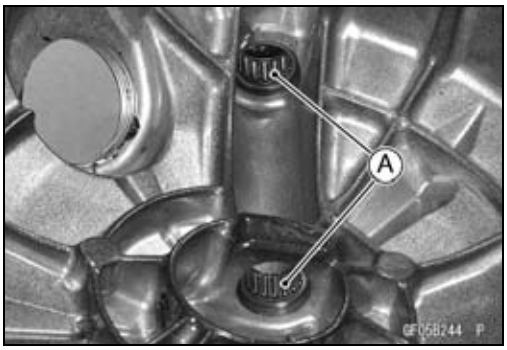



- Fit the spring [A] as shown in the figure.
  Rear View [B]
  Release Shaft [C]
  Clutch Cover [D]
- Install the clutch cover (see Clutch Cover Installation).

### *Clutch Cover Disassembly*



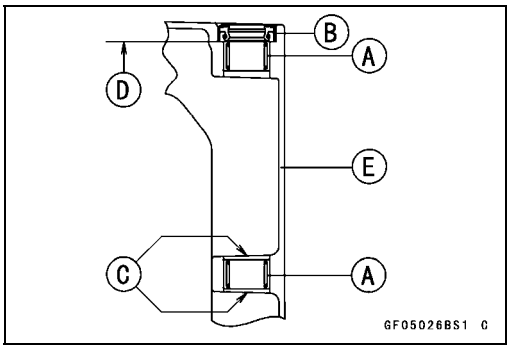

- Remove:
  Clutch Cover (see Clutch Cover Removal)
  Release Lever and Shaft Assembly (see Release Shaft Removal)
  Oil Seal [A]
  Oil Filler Plug [B]




- Remove the needle bearings [A].

## Clutch Cover

### *Clutch Cover Assembly*

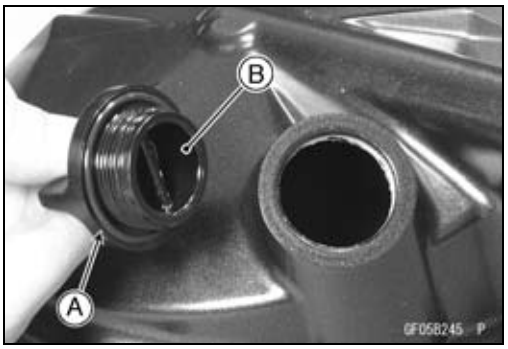



● Replace the needle bearings and oil seal with new ones.

**NOTE**

○*Install the needle bearings so that the manufacture's make face out.*

● Install the needle bearings [A] and oil seal [B] position as shown.
○Press the lower bearing, do not protrude from the boss [C] of the clutch cover.
○Press the upper bearing so that the bearing surface [D] is flush with the housing end of clutch cover [E].
○Press the oil seal until the bottom.

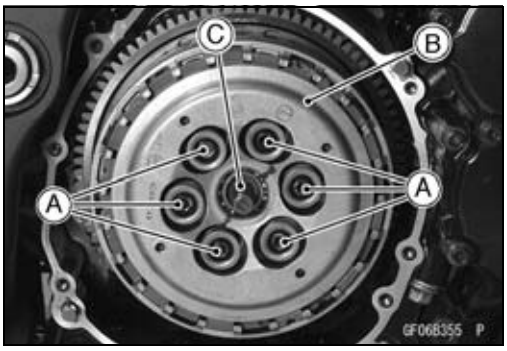



● Replace the O-ring [A] of the oil filler plug [B] with a new one.
● Apply engine oil to the new O-ring.
● Install the oil filler plug.

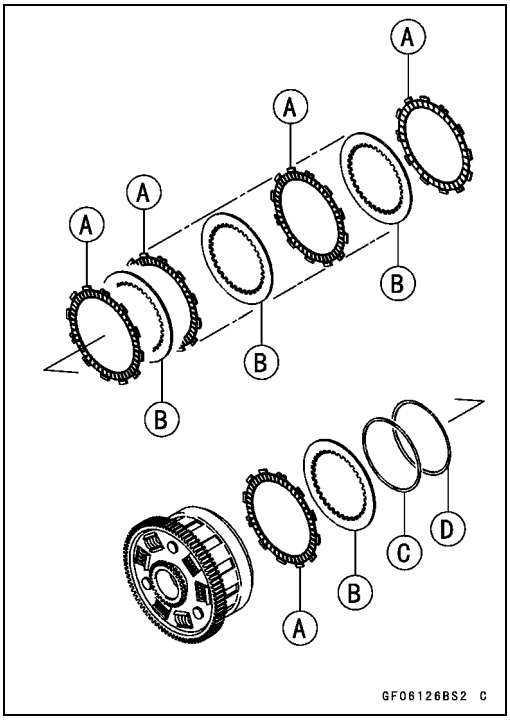
**Torque - Oil Filler Plug: Hand-tighten**

## Clutch

### *Clutch Removal*



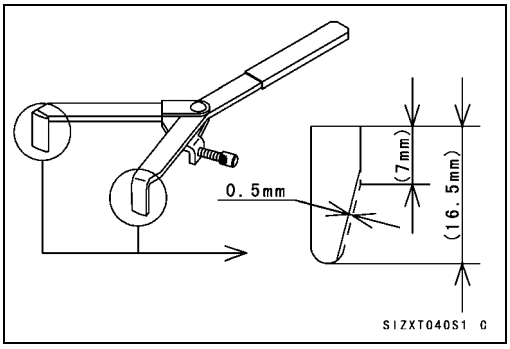

● Remove:
Clutch Cover (see Clutch Cover Removal)
Clutch Spring Bolts [A]
Clutch Springs (with Clutch Spring Holders)
Clutch Spring Plate [B] (with Bearing )
Pusher [C]




● Remove:
Friction Plates (10) [A]
Steel Plates (9) [B]
Spring [C]
Spring Seat [D]


● Hold the sub clutch hub [A] steady with the clutch holder [B], and remove the nut [C].

**Special Tool - Clutch Holder: 57001-1243**




○Use the clutch holder with sharpened hook nose by grinding.

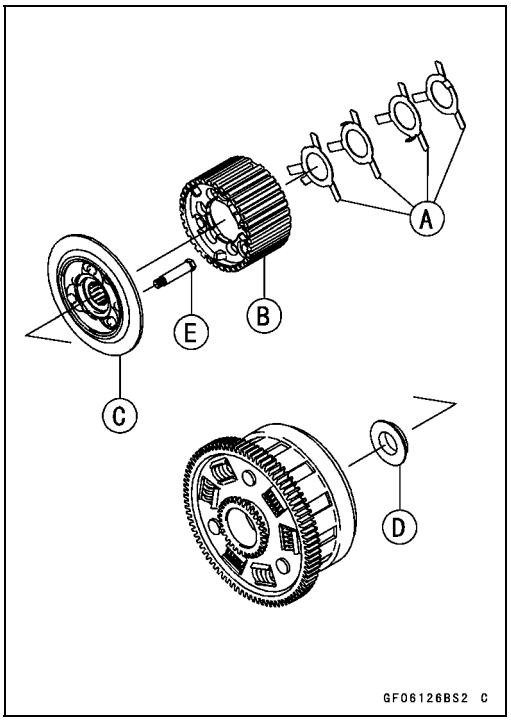
**Special Tool - Clutch Holder: 57001-1243**

○Grind the hook nose by 0.5 mm (0.02 in.) as shown in the figure.

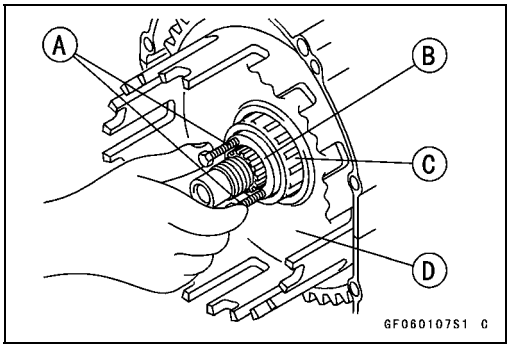
## Clutch

- Remove:
  Torque Limiter Springs [A]
  Sub Clutch Hub [B]
  Clutch Hub [C]
  Spacer [D]

○Remove the sub clutch hub bolts [E] as necessary.

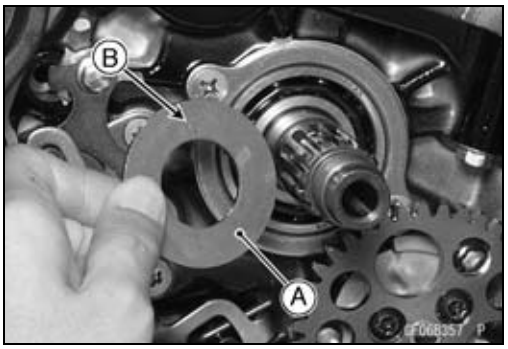



- Using the two 4 mm (0.16 in.) screws [A], pull out the sleeve [B], needle bearing [C] and clutch housing [D].
- Remove the spacer.

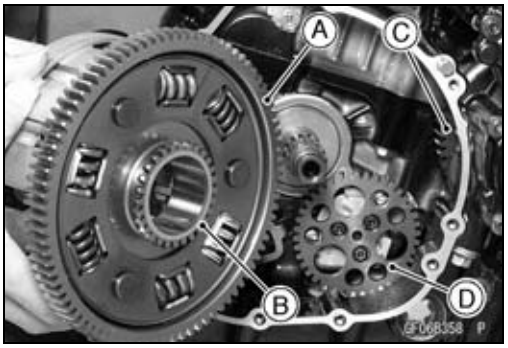



### *Clutch Installation*

- Install the spacer [A] so that the circle mark [B] faces outward.

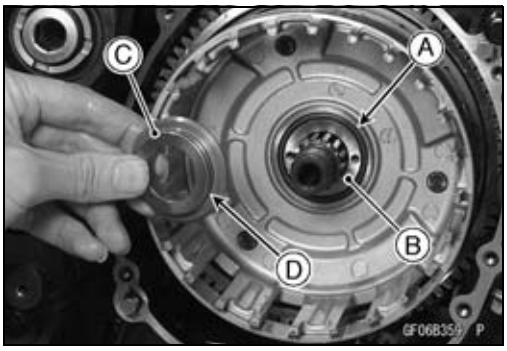



- Engage the clutch housing gear [A] and oil pump drive gear [B] with the crankshaft primary gear [C] and oil pump gear [D].



## Clutch

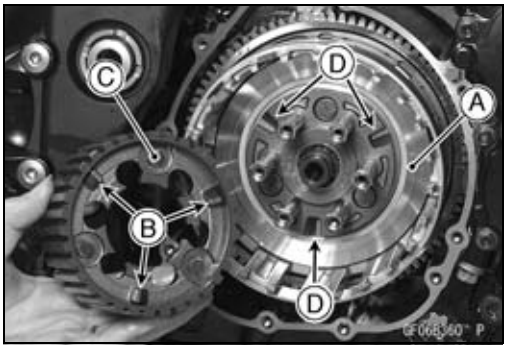
● Install:
Needle Bearing [A]
Sleeve [B]
○Apply engine oil to the sleeve and needle bearing.
● Install the spacer [C] so that the stepped side [D] faces outward.



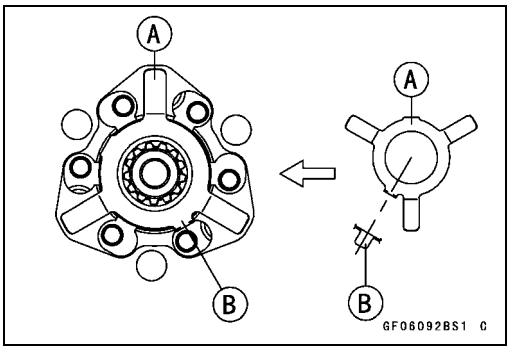

★If the sub clutch hub bolts were removed, install them as follows.
○Apply a non-permanent locking agent to the threads of the sub clutch hub bolts, and tighten them.

**Torque - Sub Clutch Hub Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

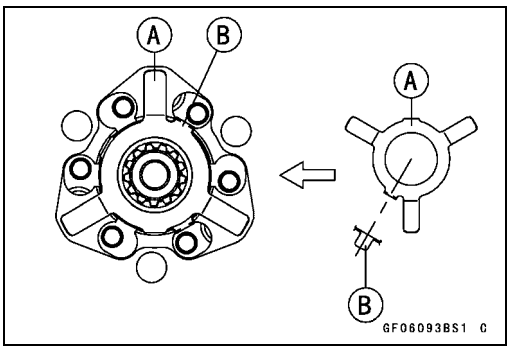
● Install the clutch hub [A] on the drive shaft.
● Align the damper cam [B] of the sub clutch hub [C] to the cam followers [D] of the clutch hub.



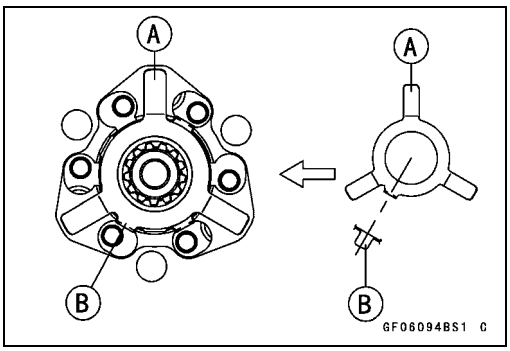

● Install the four torque limiter springs [A] as shown in the figure.
○First Torque Limiter Spring
Tang [B]




○Second Torque Limiter Spring
Tang [B]

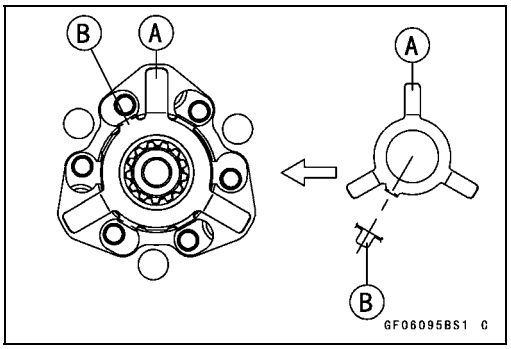



○Third Torque Limiter Spring
Tang [B]



## Clutch

○Fourth Torque Limiter Spring Tang [B]




- Replace the clutch hub nut [A] with a new one.
- Hold the sub clutch hub [B] steady with the clutch holder [C], and tighten the clutch hub nut.

**Special Tool - Clutch Holder: 57001-1243**

**Torque - Clutch Hub Nut: 130 N·m (13.3 kgf·m, 96 ft·lb)**

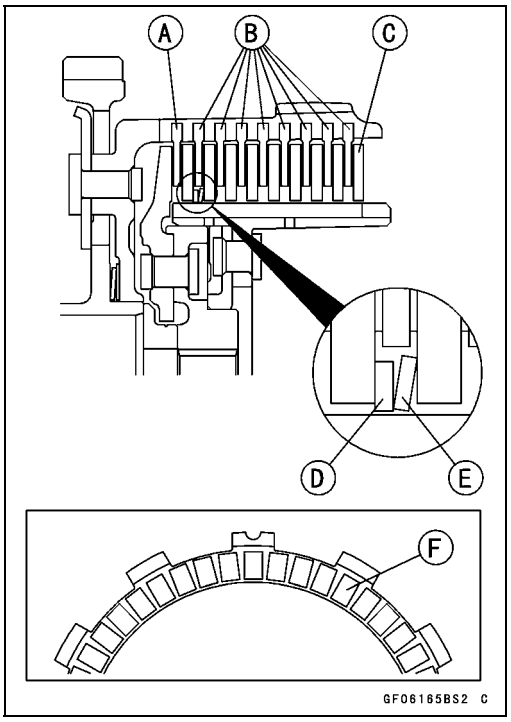

- Install the following as shown in the figure.
  Friction Plate (48 Lining Blocks) [A]
  Friction Plates (36 Lining Blocks) [B]
  Steel Plates [C]
  Spring Seat [D]
  Spring [E]

**NOTE**

○*The lining blocks [F] of the friction plate [A] are smaller than them of the friction plates [B].*
○*Install the spring seat and spring between first steel plate and second steel plate.*

**CAUTION**

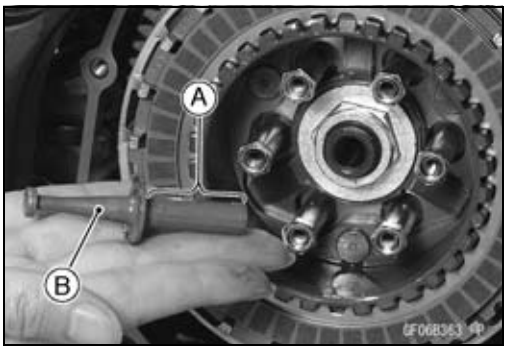
**If new dry friction plates and steel plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**




- Install the last friction plate (48 lining blocks) [A] fitting the tangs in the grooves in the housing as shown in the figure.

## Clutch

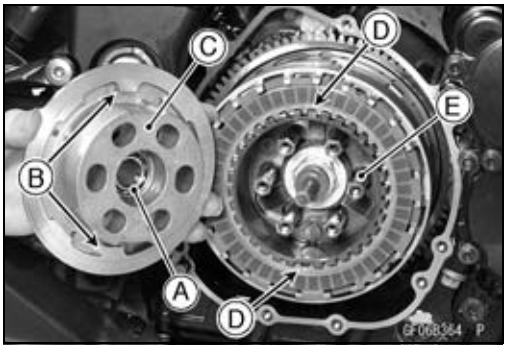
- Apply molybdenum disulfide grease to the pusher end [A].
- Install the pusher [B] to the drive shaft direction as shown.




- Apply engine oil to the sliding surfaces of the bearing [A].
- Align the projections [B] of the spring plate [C] to the grooves [D] of the sub clutch hub [E] to install the spring plate on the sub clutch hub.
- Install the clutch springs and spring holders, and tighten the clutch spring bolts.

**Torque - Clutch Spring Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**

- Install the clutch cover (see Clutch Cover Installation).

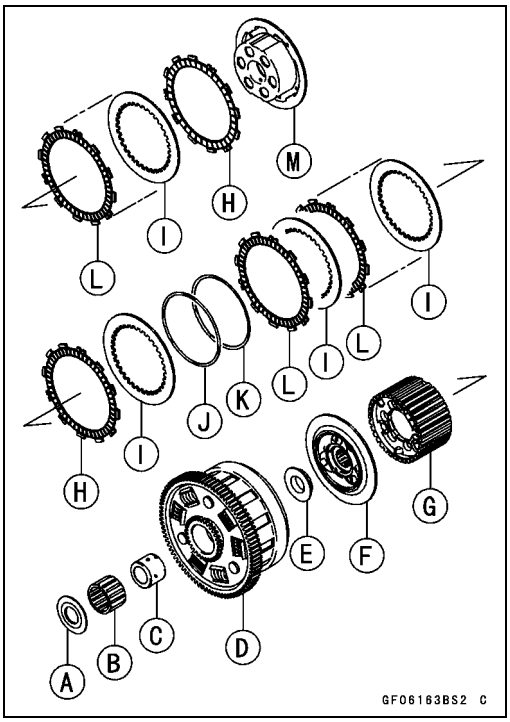



### *Spring Plate Free Play Measurement*

Insufficient clutch free play will cause the engine braking effect to be more sudden, resulting in rear wheel hop. On the other hand, if the free play is excessive, the clutch lever may feel “spongy” or pulsate when pulled.

- Hold an extra drive shaft in a vise and install the following clutch parts on the shaft (see Clutch Installation).

Spacer [A]
Needle Bearing [B]
Sleeve [C]
Clutch Housing [D]
Spacer [E]
Clutch Hub [F]
Sub Clutch Hub [G]
Friction Plates (48 Lining Blocks) [H]
Steel Plates [I]
Spring Seat [J]
Spring [K]
Friction Plates (36 Lining Blocks) [L]
Clutch Spring Plate [M]

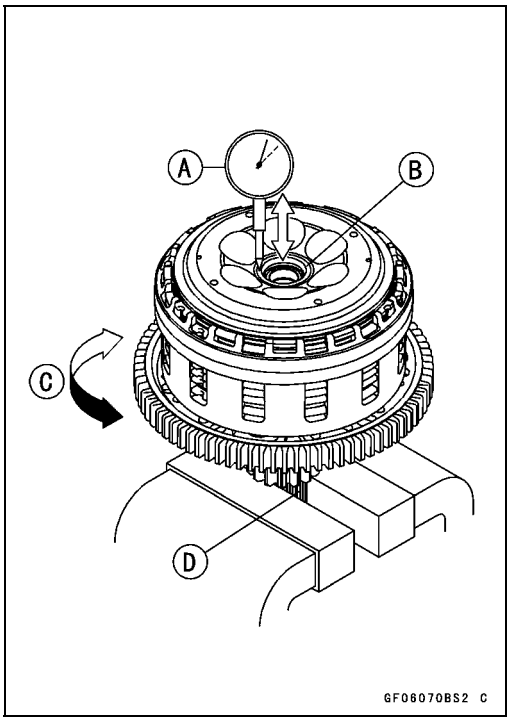


## Clutch

- Engage the clutch hub with the sub clutch hub.
- To measure the free play, set a dial gauge [A] against the raised center [B] of the clutch spring plate.
- Move the clutch housing gear back and forth [C]. The difference between the highest and lowest gauge readings is the amount of free play.
  Drive Shaft [D]
- Measure the spring plate free play.

**Spring Plate Free Play**
**Usable Range: 0.05 ~ 0.70 mm (0.002 ~ 0.028 in.)**

★If the free play is not within the usable range, change all of the friction plate and measure the free play again.
★If the free play is not whithin the usable range, adjust the free play (see Spring Plate Free Play Adjustment).




### *Spring Plate Free Play Adjustment*

**NOTE**

○*The free play adjustment is performed by replacing the steel plate(s).*
○*Replace the steel plate(s) so that the free play is within the usable range when the total number of the steel plates are 9 plates.*

- Measure the clutch spring plate free play (see Clutch Spring Plate Free Play Measurement), and then replace the steel plate(s) which brings the free play within the usable range.

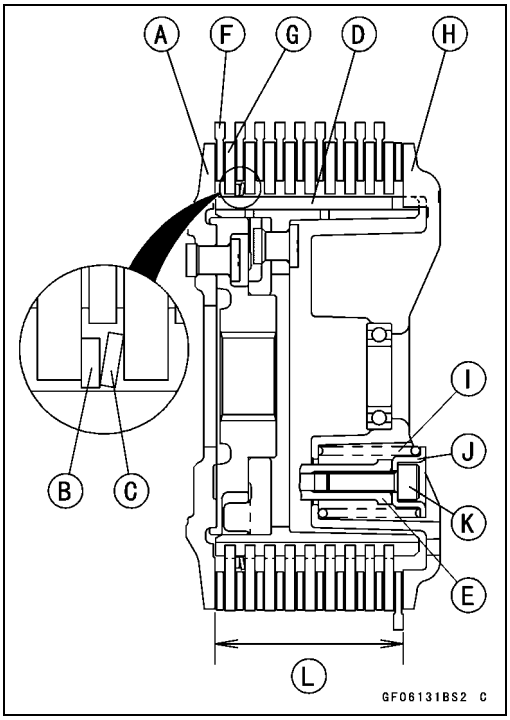
**Spring Plate Free Play**
**Usable Range: 0.05 ~ 0.70 mm (0.002 ~ 0.028 in.)**

○Replace the following steel plate(s).

| Thickness | Part Number |
|---|---|
| 2.3 mm (0.090 in.) | 13089-0008 |
| 2.6 mm (0.102 in.) | 13089-0009 |
| 2.9 mm (0.114 in.) (STD) | 13089-1093 |

## Clutch

### Clutch Plate Assembly Length (Reference Information)




- Assemble the following parts.
  Clutch Hub [A]
  Spring Seat [B]
  Spring [C]
  Sub Clutch Hub [D]
  Sub Clutch Hub Bolts [E]
  New Friction Plates [F]
  Steel Plates [G]
  Spring Plate [H]
  Clutch Springs [I]
  Clutch Spring Holders [J]
  Clutch Spring Bolts [K]

**Torque - Clutch Spring Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**

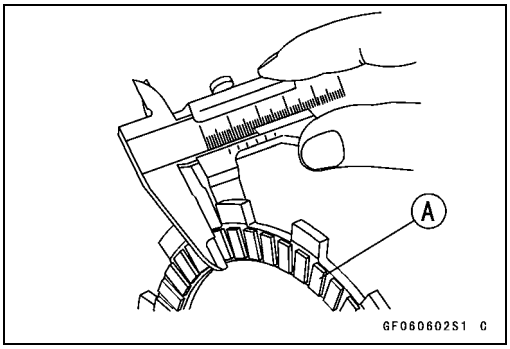
- Measure the clutch plate assembly length [L].

**Clutch Plate Assembly Length (Reference)**
**53.5 mm (2.11 in.)**

**NOTE**

○*The length of the clutch plate assembly changes by the steel plate thickness.*

### *Clutch Plate, Wear, Damage Inspection*

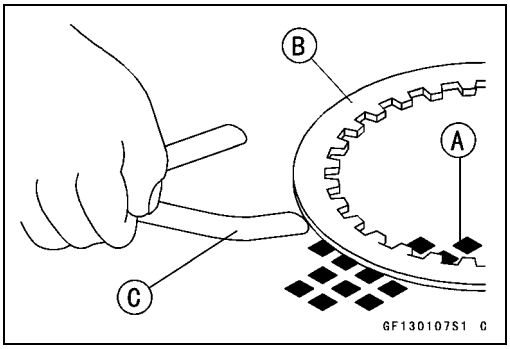



- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of each friction plate [A] at several points.

★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: 2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)**
**Service Limit: 2.6 mm (0.102 in.)**

### *Clutch Plate Warp Inspection*



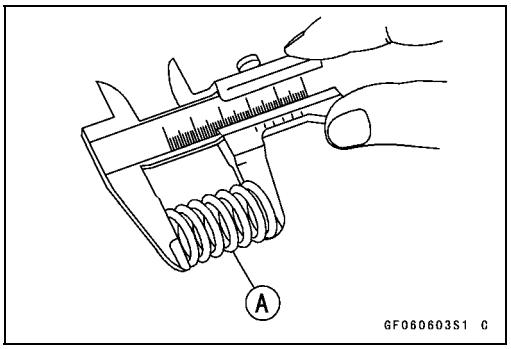

- Place each friction plate or steel plate on a surface plate and measure the gap between the surface plate [A] and each friction plate or steel plate [B] with a thickness gauge [C]. The gap is the amount of friction or steel plate warp.

★If any plate is warped over the service limit, replace it with a new one.

**Friction and Steel Plate Warp**
**Standard: 0.15 mm (0.0059 in.) or less**
**Service Limit: 0.3 mm (0.012 in.)**

## Clutch

### *Clutch Spring Free Length Measurement*




- Measure the free length of the clutch springs [A].

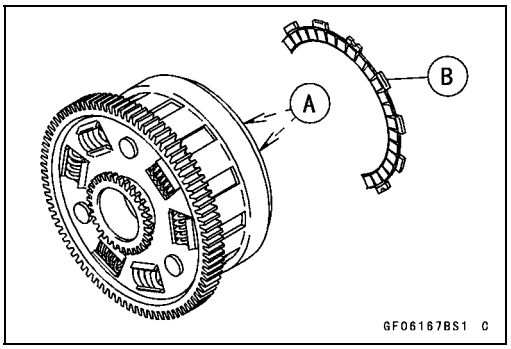
★If any spring is shorter than the service limit, it must be replaced.

**Clutch Spring Free Length**

**Standard: 43.5 mm (1.71 in.)**

**Service Limit: 42.1 mm (1.66 in.)**

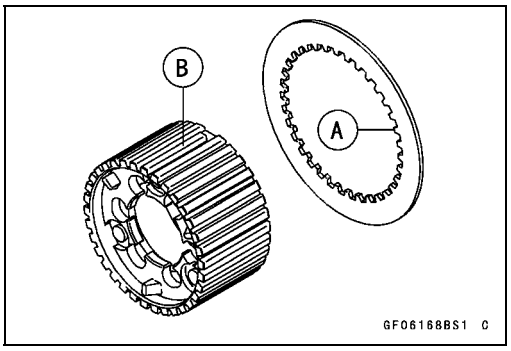
### *Clutch Housing Finger Inspection*




- 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.

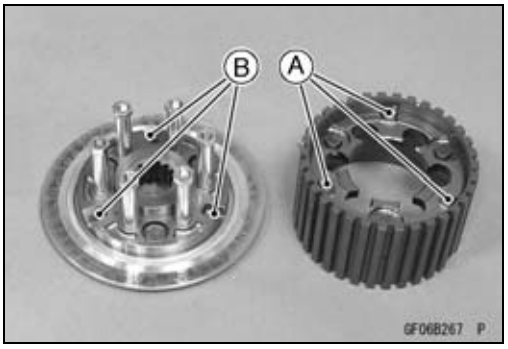
### *Clutch Housing Spline Inspection*



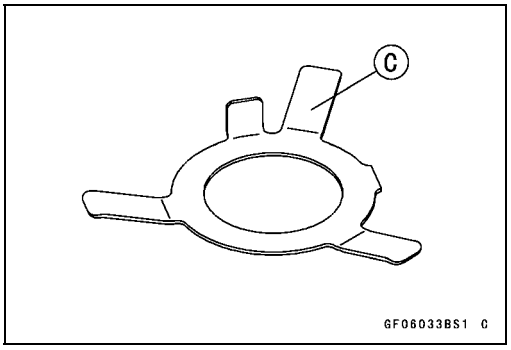

- Visually inspect where the teeth [A] on the steel plates wear against the sub clutch hub splines [B].

★If there are notches worn into the splines, replace the sub clutch hub. Also, replace the steel plates if their teeth are damaged.

### *Damper Cam Inspection*



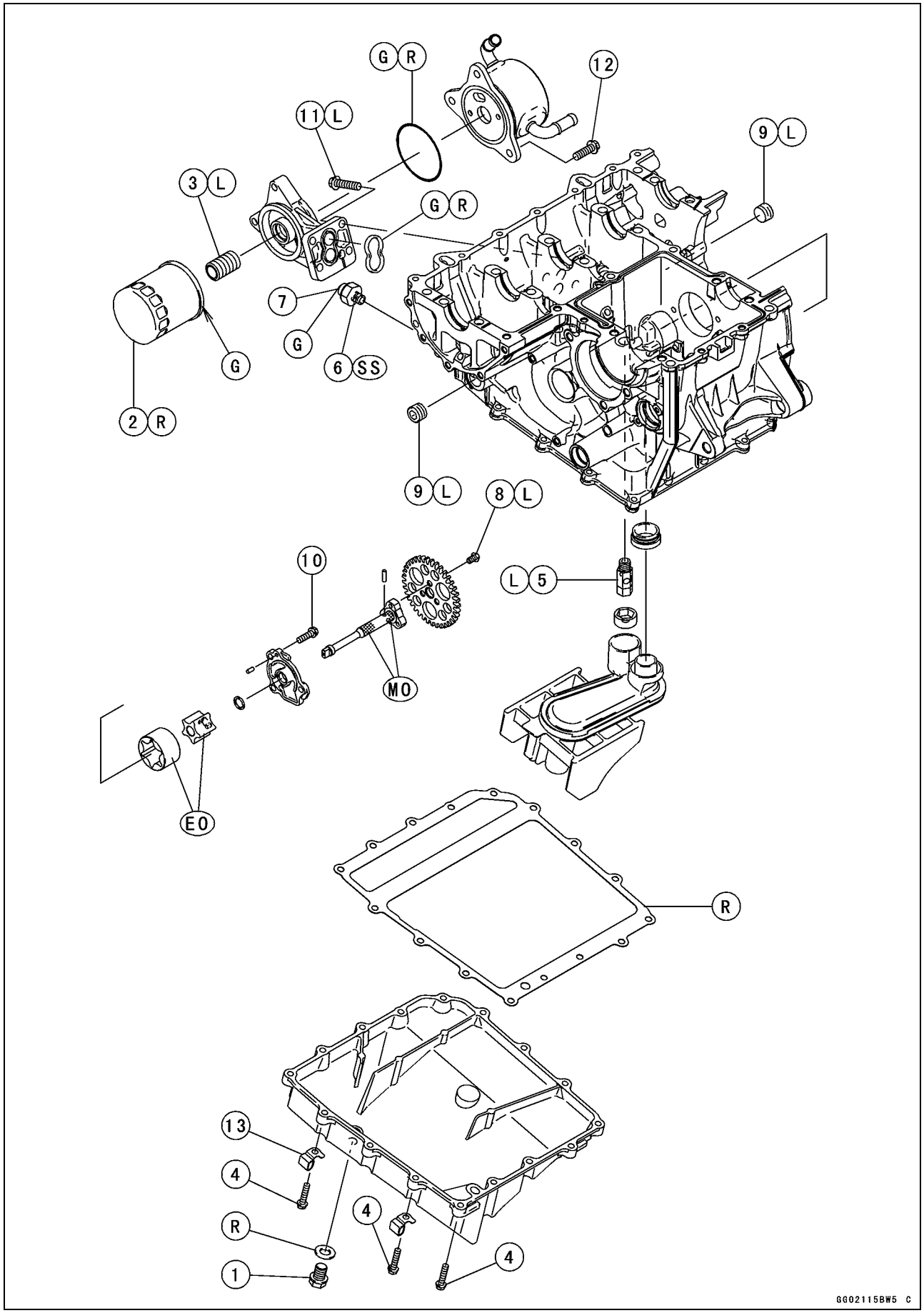

- Remove the clutch (see Clutch Removal).
- Visually inspect the damper cam [A], cam follower [B], and the torque limiter spring [C].
- Replace the part if it appears damaged.



# Engine Lubrication System

## Table of Contents

## Exploded View

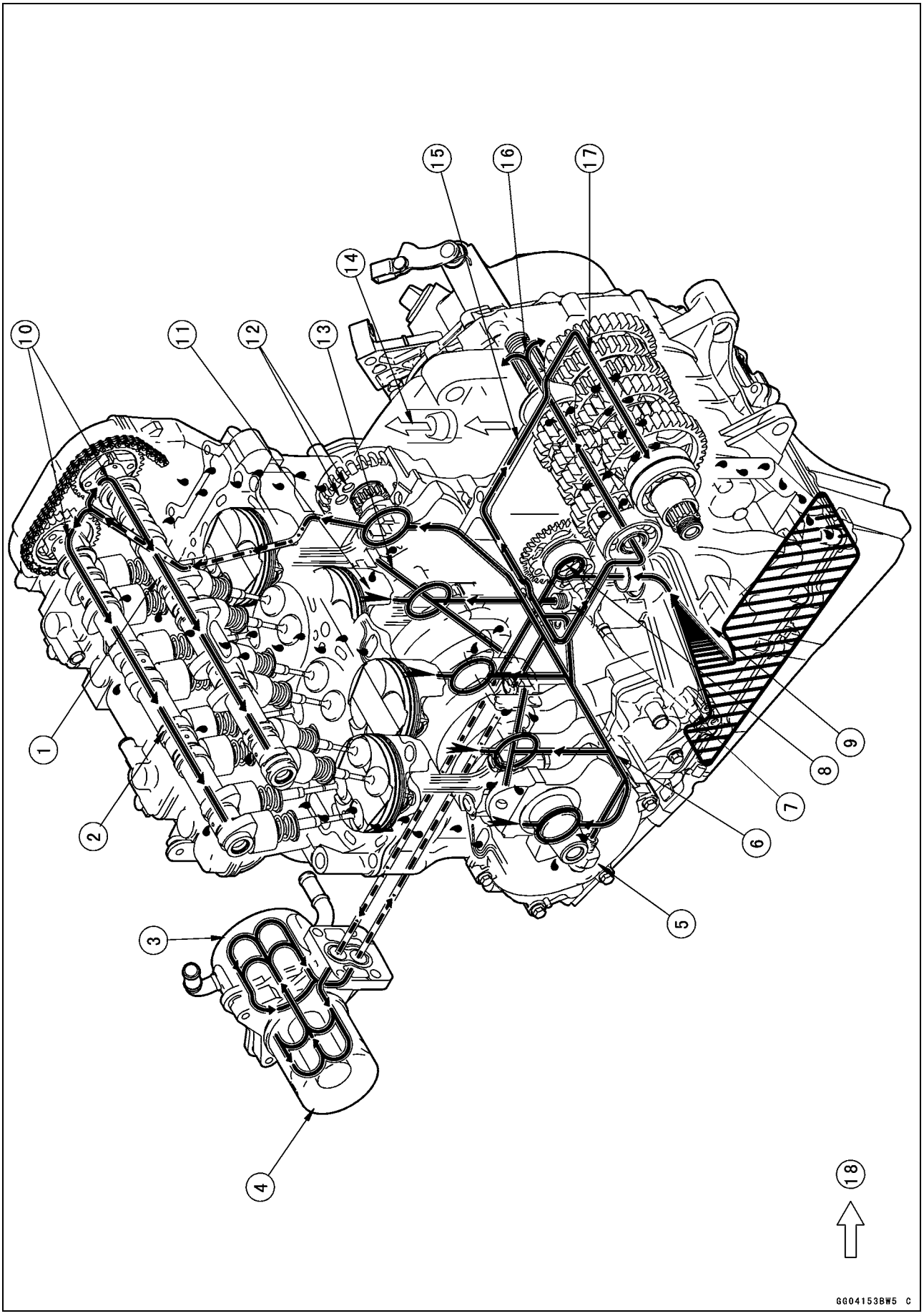


## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Engine Oil Drain Bolt | 30 | 3.1 | 22 | |
| 2 | Oil Filter | 17 | 1.7 | 13 | G, R |
| 3 | Oil Filter Pipe | 35 | 3.6 | 26 | L |
| 4 | Oil Pan Bolts | 10 | 1.0 | 89 in·lb | |
| 5 | Oil Pressure Relief Valve | 15 | 1.5 | 11 | L |
| 6 | Oil Pressure Switch | 15 | 1.5 | 11 | SS |
| 7 | Oil Pressure Switch Terminal Bolt | – | – | – | Hand-tighten |
| 8 | Oil Pump Gear Bolts | 10 | 1.0 | 89 in·lb | L |
| 9 | Oil Passage Plugs | 20 | 2.0 | 15 | L |
| 10 | Oil Pump Cover Bolts | 10 | 1.0 | 89 in·lb | |
| 11 | Oil Cooler/Oil Filter Case Mounting Bolts | 20 | 2.0 | 15 | L |
| 12 | Oil Cooler Mounting Bolts | 20 | 2.0 | 15 | |

13. Oxygen Sensor Equipped Models
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
SS: Apply silicone sealant.

## Engine Oil Flow Chart



## Engine Oil Flow Chart

1. Inlet Camshaft
2. Exhaust Camshaft
3. Oil Cooler
4. Oil Filter
5. Oil Pressure Switch
6. Main Oil Passage
7. Oil Pressure Relief Valve
8. Oil Pump
9. Oil Screen
10. Camshaft Oil Passage
11. Oil Jet
12. Starter Clutch Oil Passage
13. Crankshaft Oil Passage
14. To Air Cleaner Housing
15. Crankcase Oil Passage
16. Drive Shaft Oil Passage
17. Output Shaft Oil Passage
18. Blowby Gas

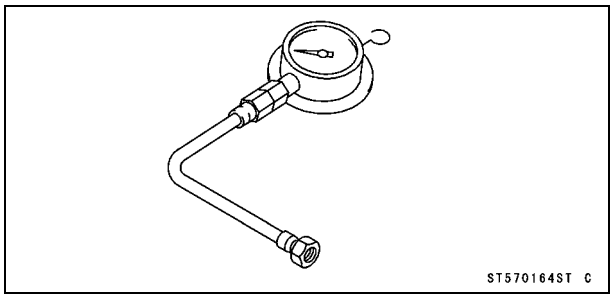
# 7-6 ENGINE LUBRICATION SYSTEM

## Specifications

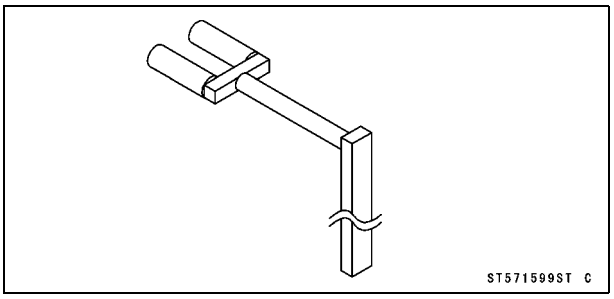
| Item | Standard |
|---|---|
| **Engine Oil** | |
| Grade | API SE, SF or SG |
| | API SH, SJ or SL with JASO MA, MA1 or MA2 |
| Viscosity | SAE 10W-40 |
| Capacity | 3.2 L (3.4 US gt) (when filter is not removed) |
| | 3.7 L (3.9 US gt) (when filter is removed) |
| | 4.0 L (4.2 US gt) (when engine is completely dry) |
| Level | Between upper and lower level lines (wait 2 ~ 3 minutes after idling or running) |
| **Oil Pressure Measurement** | |
| Oil Pressure | 150 ~ 230 kPa (1.5 ~ 2.4 kgf/cm², 22 ~ 33 psi) at 4 000 r/min (rpm), oil temperature 90°C (194°F) |

## Special Tools and Sealant

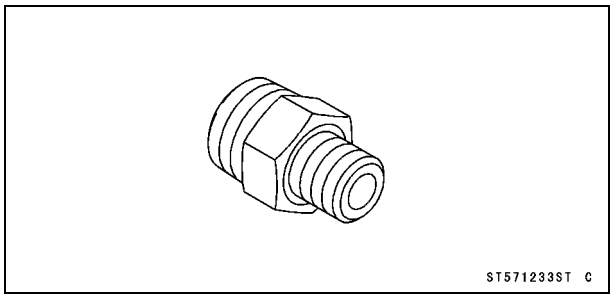
**Oil Pressure Gauge, 10 kgf/cm²:**
**57001-164**



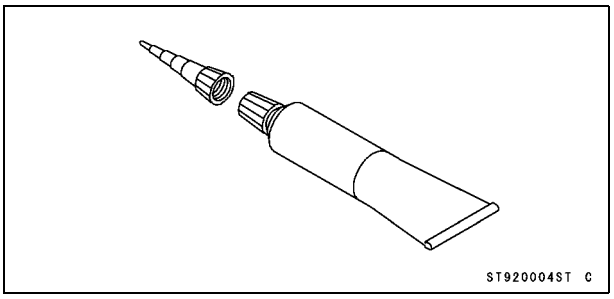

**Gear Holder:**
**57001-1599**




**Oil Pressure Gauge Adapter, PT3/8:**
**57001-1233**




**Kawasaki Bond (Silicone Sealant):**
**92104-0004**

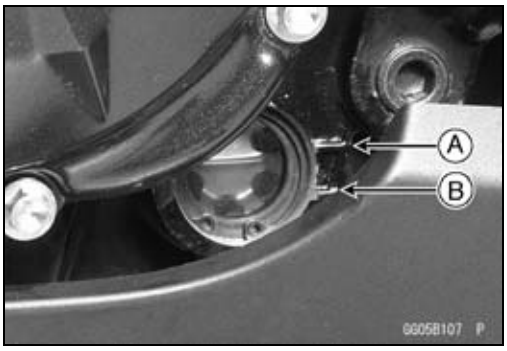


## Engine Oil and Oil Filter

**⚠ 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 gauge.

**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 warning indicator light and oil pressure warning symbol will blink. If this blink stays on when the engine is running above idle speed, stop the engine immediately and find the cause.**

★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 amount of oil through the oil filler 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.

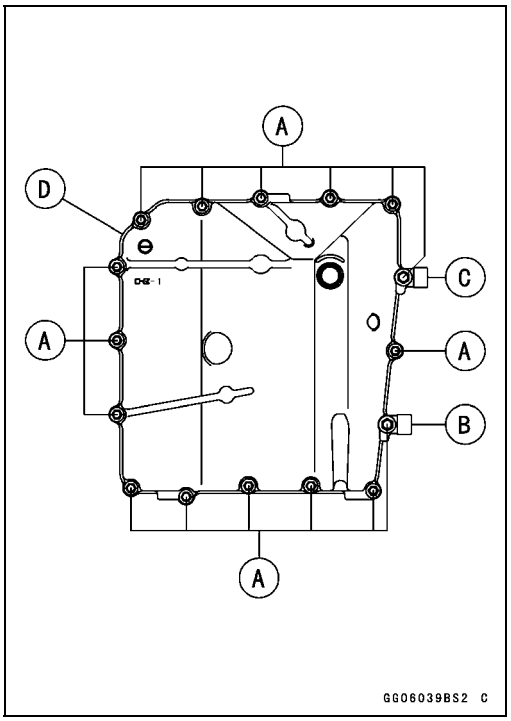
### *Oil Filter Replacement*

- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

## Oil Pan

### *Oil Pan Removal*

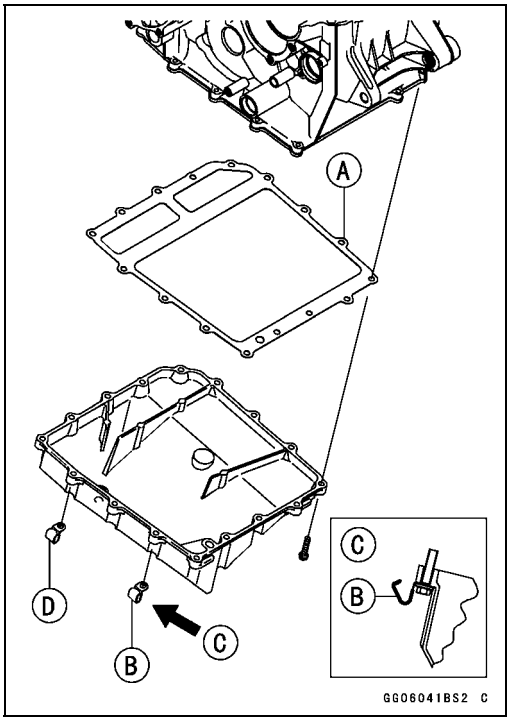
- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  Exhaust Manifold (see Exhaust Manifold Removal in the Engine Top End chapter)
  Oil Pan Bolts [A]
  Clamp [B]
  Clamp [C] (Oxygen Sensor Equipped Models)
  Oil Pan [D]




### *Oil Pan Installation*

- Replace the oil pan gasket [A] with a new one.
- Install the clamps [B] as shown in the figure.
  Rear View [C]
- For models equipped with oxygen sensors, install the clamp [D] in the same way as above.
- Tighten:

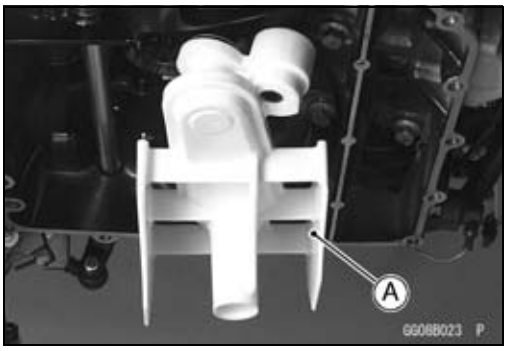
**Torque - Oil Pan Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**



## Oil Pressure Relief Valve

### *Oil Pressure Relief Valve Removal*

● Remove:
Oil Pan (see Oil Pan Removal)
Oil Screen [A]




● Remove the oil pressure relief valve [A].


### *Oil Pressure Relief Valve Installation*

● Apply a non-permanent locking agent to the threads of the oil pressure relief valve [A], and tighten it.

**CAUTION**

**Do not apply too much non-permanent locking agent to the threads. This may block the oil passage.**

**Torque - Oil Pressure Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)**

● Clean the oil screen [B] with a high-flash point solvent and remove any particles stuck to them.
○Blow away the particles by applying compressed air [C] from the inside to the outside (from the clean side to the dirty side).

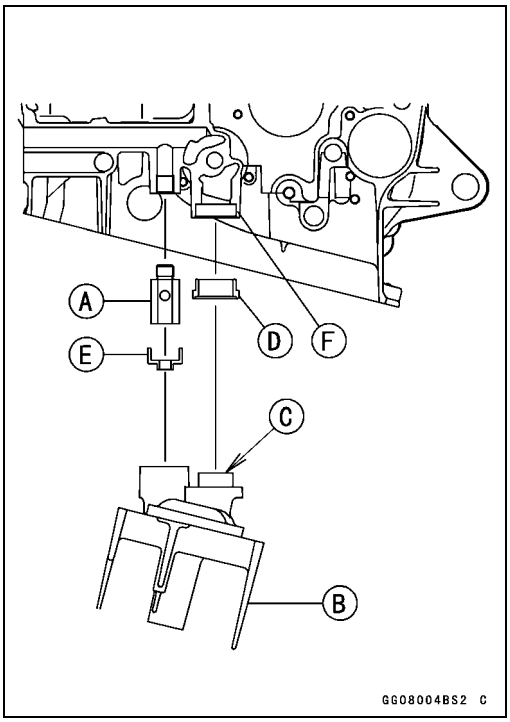
**⚠ WARNING**

**Clean the screen 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.**

**NOTE**

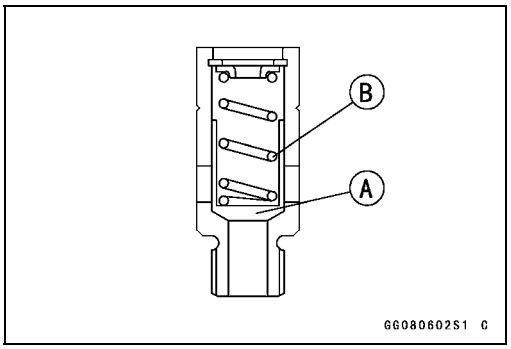
○*While cleaning the oil screen, check for any metal particles that might indicate internal engine damage.*

● Check the screen carefully for any damage, holes, broken wires.
★If the screen is damaged, replace it.
● Install the O-ring [D] and damper [E] to the oil screen.
● Install the oil screen so that the crankcase rib [F] and relief valve fits the oil screen.
● Install the oil pan (see Oil Pan Installation).



## Oil Pressure Relief Valve

### *Oil Pressure Relief Valve Inspection*




- Remove the oil pressure relief valve (see Oil Pressure Relief Valve Removal).
- 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**

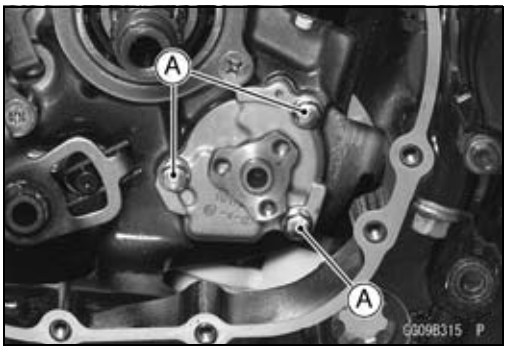
**Clean the oil pressure relief valve in a well -ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent.**

★If cleaning does not solve the problem, replace the oil pressure relief valve as an assembly. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.

## Oil Pump

### *Oil Pump Removal*

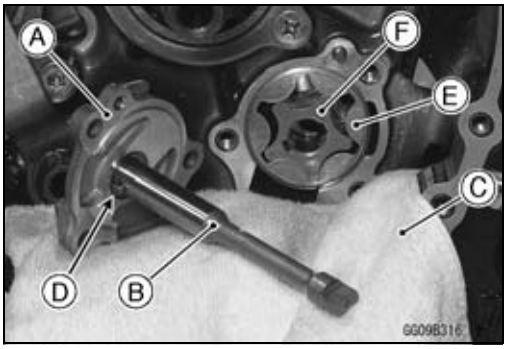
- Remove:
  Oil Pump Gear (see Oil Pump Gear Removal)
  Oil Pump Cover Bolts [A]




- Remove the oil pump cover [A] with oil pump gear shaft [B].

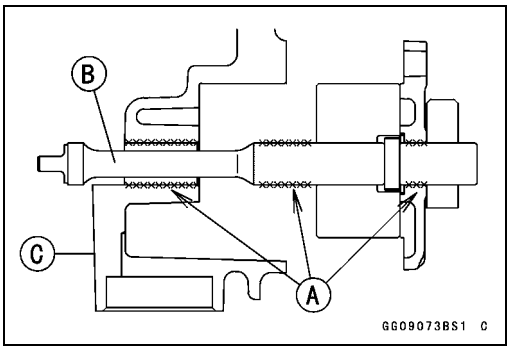
○Stuff the cloth [C] on the hole of the crankcase so that the pin [D] dose not drop into the crankcase bottom.

- Remove the outer rotor [E] and inner rotor [F].

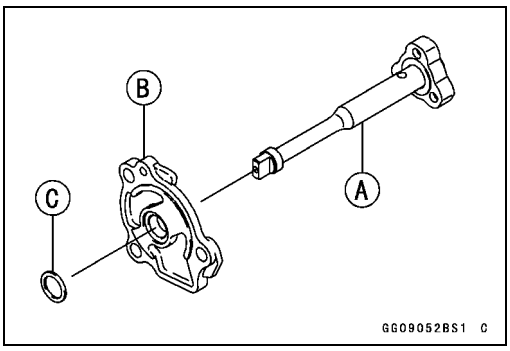



### *Oil Pump Installation*

- Apply molybdenum disulfide oil solution to the journal portions [A] on the oil pump gear shaft [B] and crankcase [C].

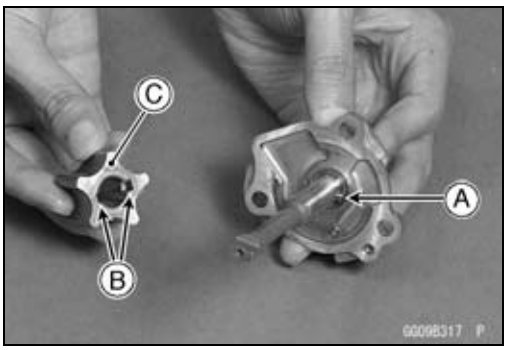



- Install the following to the oil pump gear shaft [A].
  Oil Pump Cover [B]
  Washer [C]



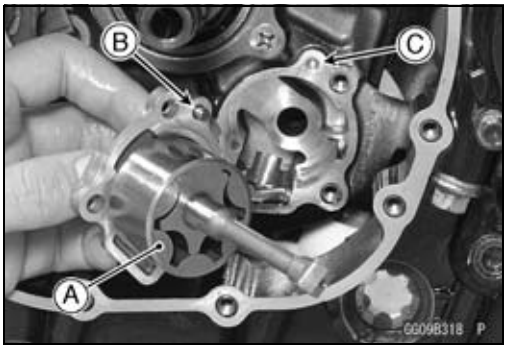

- Install the pin [A].
- Fit the pin into the slot [B] of the inner rotor [C].

○Apply engine oil to the inner rotor.

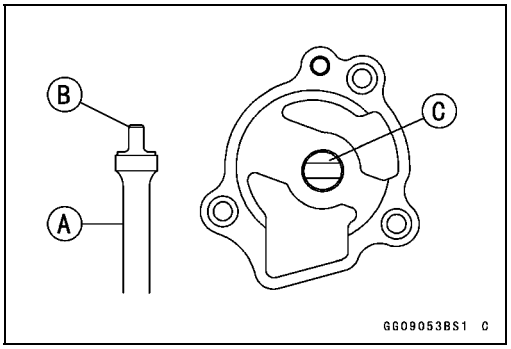


## Oil Pump

● Install the outer rotor [A] on the inner rotor.
○Apply engine oil to the outer rotor.
● Install the dowel pin [B].
● Fit the pin of the oil pump cover into the hole [C] in the crankcase.




○Turn the oil pump gear shaft [A] so that the projection [B] in its shaft fits onto the slot [C] of the impeller shaft.




● Tighten the oil pump cover bolts.

**Torque - Oil Pump Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

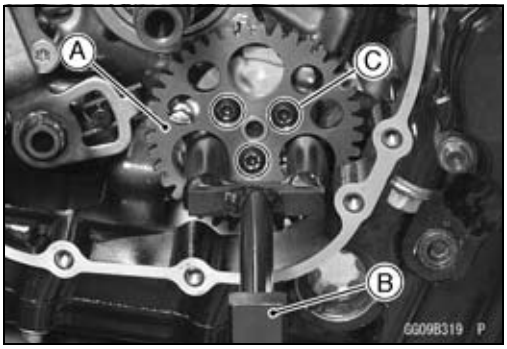
● Install the oil pump gear (see Oil Pump Gear Installation).

### *Oil Pump Gear Removal*

● Remove the clutch (see Clutch Removal in the Clutch chapter).
● Hold the oil pump gear [A] steady with the gear holder [B], and remove the oil pump gear bolts [C].

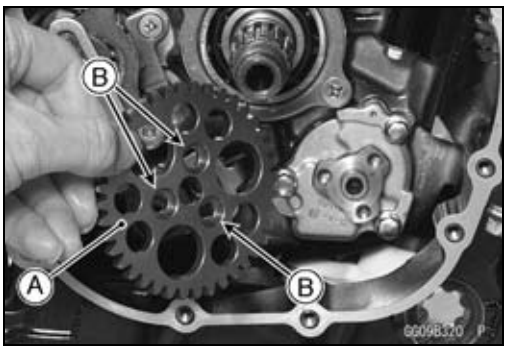
**Special Tool - Gear Holder: 57001-1599**

● Remove the oil pump gear.




### *Oil Pump Gear Installation*

● Install the oil pump gear [A] so that the stepped side [B] faces outward.

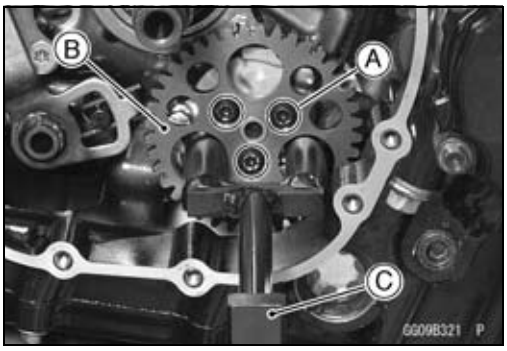


## Oil Pump

- Apply a non-permanent locking agent to the threads of the oil pump gear bolts [A].
- Hold the oil pump gear [B] steady with the gear holder [C], and tighten the oil pump gear bolts.

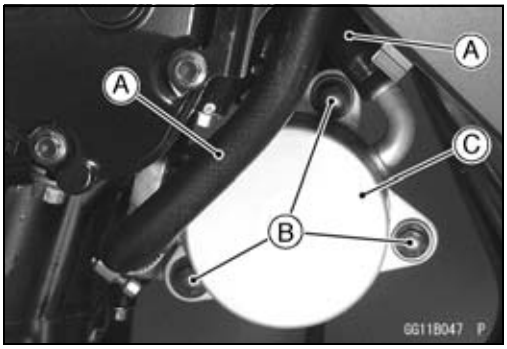
  **Special Tool - Gear Holder: 57001-1599**

  **Torque - Oil Pump Gear Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Install the clutch (see Clutch Installation in the Clutch chapter).



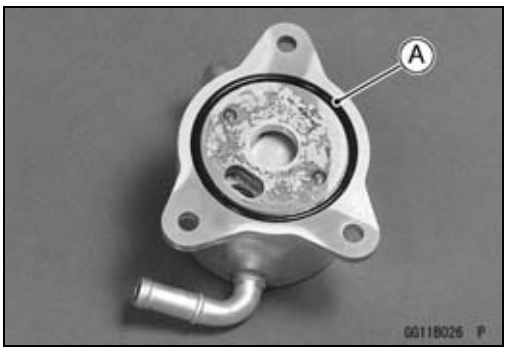
## Oil Cooler

### *Oil Cooler Removal*




- Drain:
  Coolant (see Coolant Change in the Periodic Maintenance chapter)
  Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
  Right Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Water Hoses [A]
  Oil Cooler Mounting Bolts [B]
  Oil Cooler [C]

### *Oil Cooler Installation*




- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.

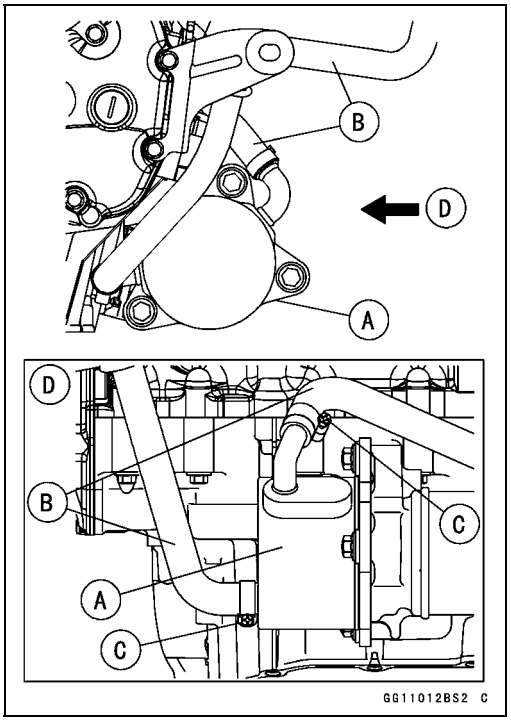
- Install the oil cooler [A].
- Tighten:

**Torque - Oil Cooler Mounting Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**

- Install the water hoses [B] and hose clamps [C] as shown in the figure.
  Front View [D]
- Tighten:

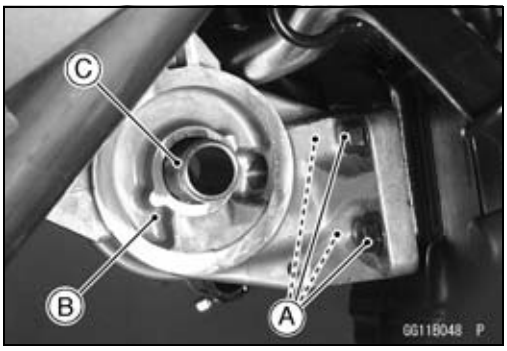
**Torque - Water Hose Clamp Screw: 2.0 N·m (0.20 kgf·m, 18 in·lb)**

- Pour:
  Engine Oil (see Oil Change in the Periodic Maintenance chapter)
  Coolant (see Coolant Change in the Periodic Maintenance chapter)



## Oil Cooler

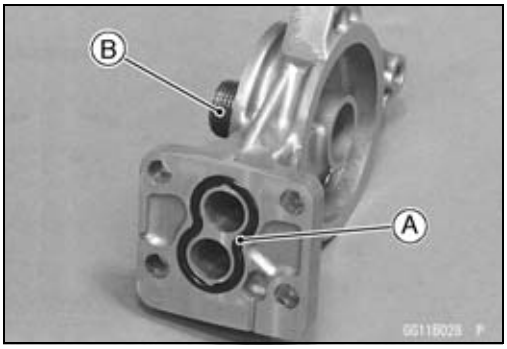
### *Oil Cooler/Oil Filter Case Removal*




- Remove:
  Oil Filter (see Oil Filter Replacement in the Periodic Maintenance chapter)
  Oil Cooler (see Oil Cooler Removal)
  Bolts [A]
  Oil Cooler/Oil Filter Case [B]

○Remove the oil filter pipe [C] as necessary.

### *Oil Cooler/Oil Filter Case Installation*




- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.

★If the oil filter pipe [B] was removed, install it as follows.

○Apply a non-permanent locking agent to the threads of the oil filter pipe, and tighten it.

**Torque - Oil Filter Pipe: 35 N·m (3.6 kgf·m, 26 ft·lb)**

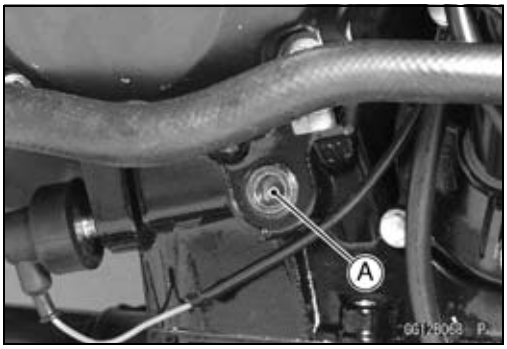
- Apply non-permanent locking agent to the threads of the oil cooler/oil filter case mounting bolts, and tighten them.

**Torque - Oil Cooler/Oil Filter Case Mounting Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**

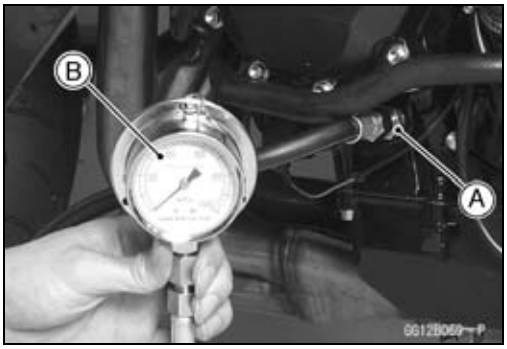
- Install:
  Oil Cooler (see Oil Cooler Installation)
  Oil Filter (see Oil Filter Replacement in the Periodic Maintenance chapter)

## Oil Pressure Measurement

### *Oil Pressure Measurement*




- Remove:
  Left Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Oil Passage Plug [A]




- Attach the adapter [A] and gauge [B] to the plug hole.

**Special Tools - Oil Pressure Gauge, 10 kgf/cm²: 57001-164**
**Oil Pressure Gauge Adapter, PT3/8: 57001 -1233**

- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.

**Oil Pressure**
**Standard: 150 ~ 230 kPa (1.5 ~ 2.4 kgf/cm², 22 ~ 33 psi) at 4 000 r/min (rpm), oil temperature 90°C (194°F)**

★If the reading 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.

- Stop the engine.
- Remove the oil pressure gauge and adapter.

**⚠ WARNING**

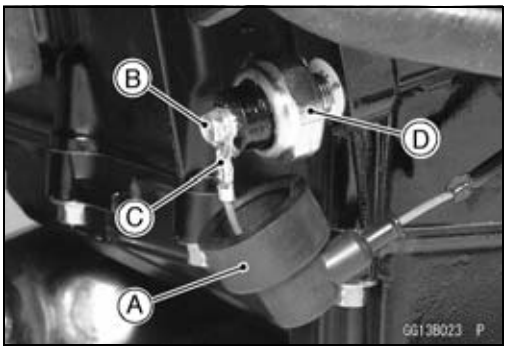
**Take care against burns form hot engine oil that will drain through the oil passage when the gauge adapter is removed.**

- Apply a non-permanent locking agent to the oil passage plug, and install it.

**Torque - Oil Passage Plugs: 20 N·m (2.0 kgf·m, 15 ft·lb)**

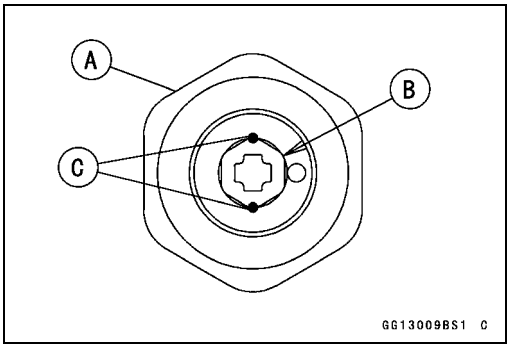
## Oil Pressure Switch

### *Oil Pressure Switch Removal*




- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove the left lower fairing (see Lower Fairing Removal in the Frame chapter).
- Slide out the rubber boot [A].
- Loosen the oil pressure switch terminal bolt [B], and remove the switch lead [C].
- Remove the oil pressure switch [D].

### *Oil Pressure Switch Installation*




- Apply silicone sealant to the threads of the oil pressure switch [A] and tighten it.

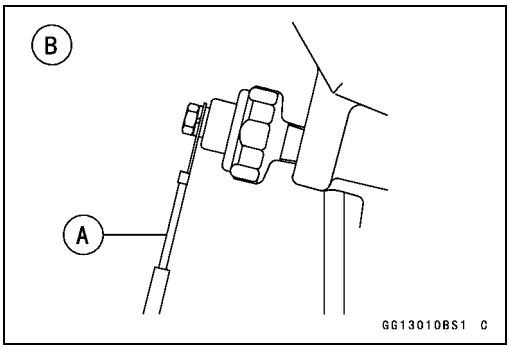
  **Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

  **Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)**

- Apply grease to the switch terminal [B].

**NOTE**

○*Apply a small amount grease to the terminal so that grease should not close two breather holes [C] for switch diaphragm.*




- Install the switch lead [A] direction downward.
  Left Side View [B]
- Tighten:

  **Torque - Oil Pressure Switch Terminal Bolt: Hand-tighten**

- Slide back the rubber boot to the original position.

# Engine Removal/Installation

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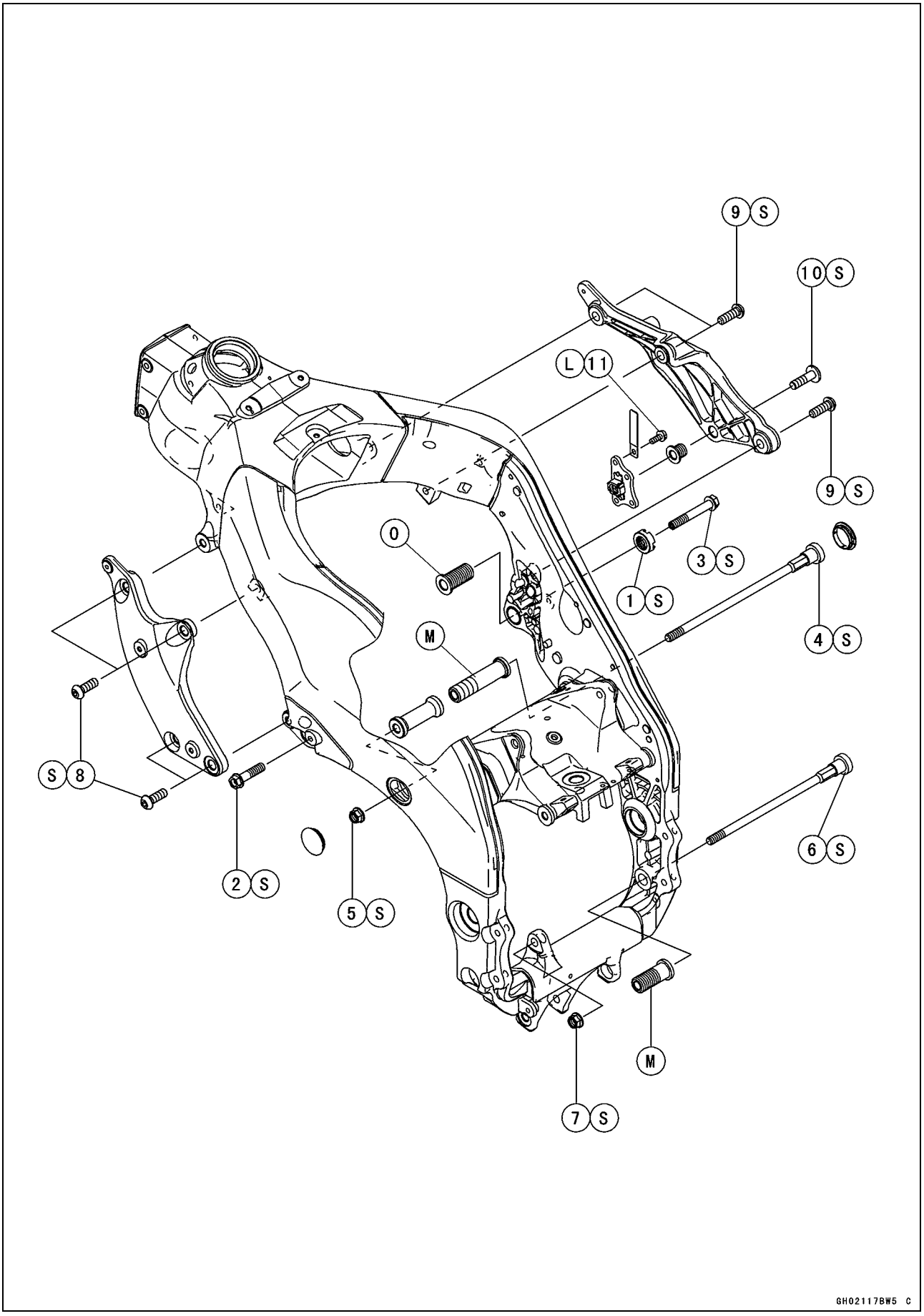
## Exploded View



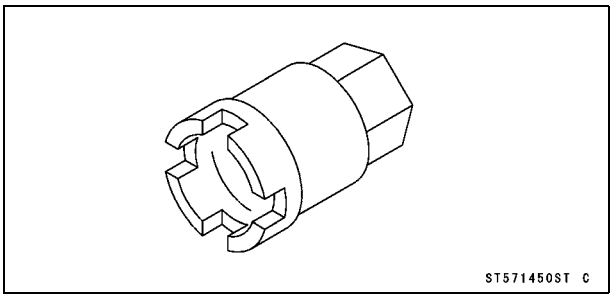
## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Adjusting Collar Locknut | 49 | 5.0 | 36 | S |
| 2 | Lef Front Engine Mounting Bolt (M10, L = 42) | 44 | 4.5 | 32 | S |
| 3 | Right Front Engine Mounting Bolt (M10, L = 67) | 44 | 4.5 | 32 | S |
| 4 | Middle Engine Mounting Bolt | 9.8 | 1.0 | 87 in·lb | S |
| 5 | Middle Engine Mounting Nut | 44 | 4.5 | 32 | S |
| 6 | Lower Engine Mounting Bolt | 9.8 | 1.0 | 87 in·lb | S |
| 7 | Lower Engine Mounting Nut | 44 | 4.5 | 32 | S |
| 8 | Left Engine Bracket Bolts (M10, L = 30) | 44 | 4.5 | 32 | S |
| 9 | Right Engine Bracket Bolts (M10, L = 30) | 44 | 4.5 | 32 | S |
| 10 | Right Engine Bracket Bolt (M10, L = 35) | 44 | 4.5 | 32 | S |
| 11 | Right Engine Bracket Bolts (Cylinder Head) | 9.8 | 1.0 | 87 in·lb | L |

L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
O: Apply 2-stroke oil.
S: Follow the specified tightening sequence.

## Special Tool

**Engine Mount Nut Wrench:**
**57001-1450**



## 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].

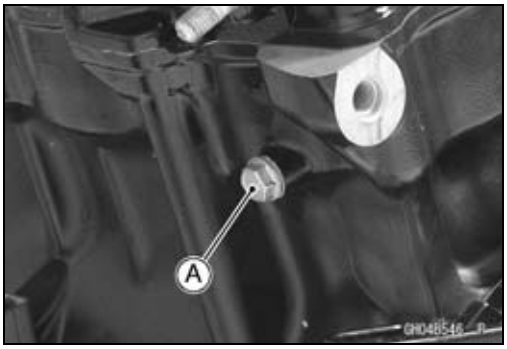
**⚠ WARNING**

**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:
  Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
  Coolant Reserve Tank (see Coolant Reserve Tank Removal in the Cooling System chapter)
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Clutch Cable Lower End (see Cable Removal in the Clutch chapter)
  Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  Exhaust Manifold (see Exhaust Manifold Removal in the Engine Top End chapter)
  Shift Lever (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
  Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)



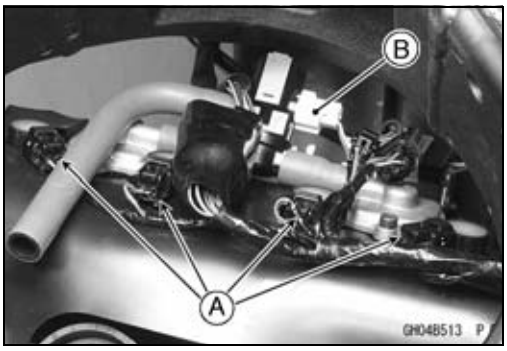

★Drain the coolant from the cylinder (upper crankcase) beforehand if the engine is to be disassembled.
○Place a container under the drain bolt [A] and remove it.
- Tighten the drain bolt with gasket.

★Replace the drain bolt gasket with a new one if it is damaged.

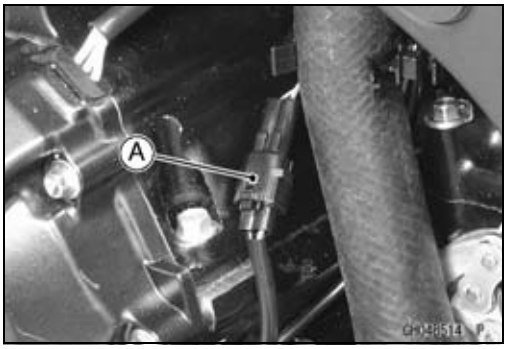
**Torque - Coolant Drain Bolt (Cylinder): 10 N·m (1.0 kgf·m, 89 in·lb)**

## Engine Removal/Installation

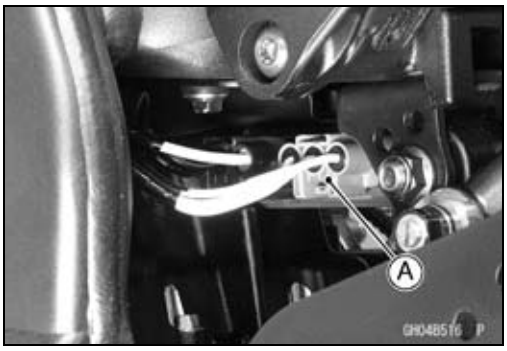
- Pull off the connectors from the engine and free the wiring from the clamps.
- Disconnect:
  Stick Coil Connectors [A]
  Air Switching Valve Connector [B]




- Disconnect the sidestand switch lead connector [A].

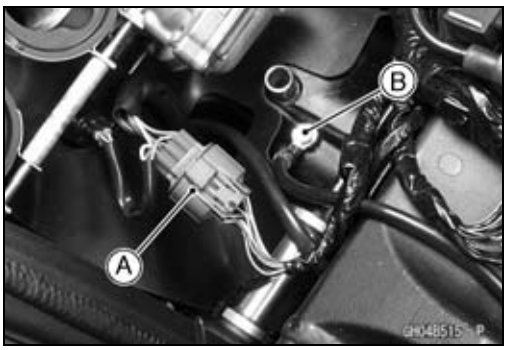



- Disconnect:
  Regulator/Rectifier Connector (Gray) [A]




- Disconnect the crankshaft sensor lead connector [A].

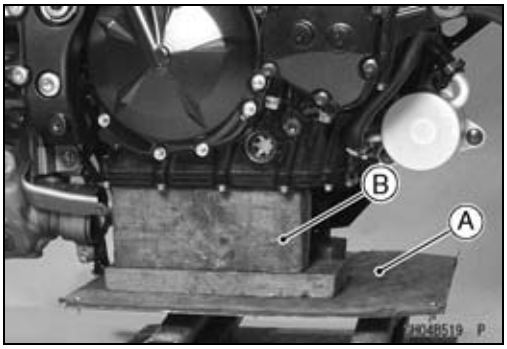

- Disconnect the engine subharness #1 connector [A].
- Remove the engine ground cable terminal bolt [B].



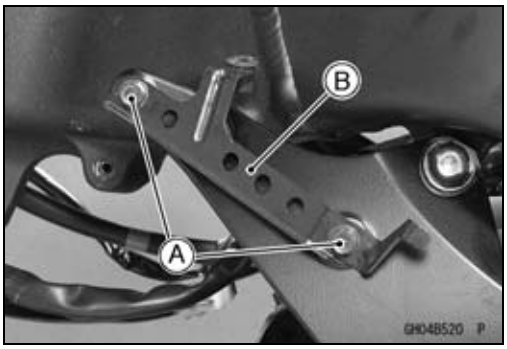
## Engine Removal/Installation

● Remove the starter motor cable [A].

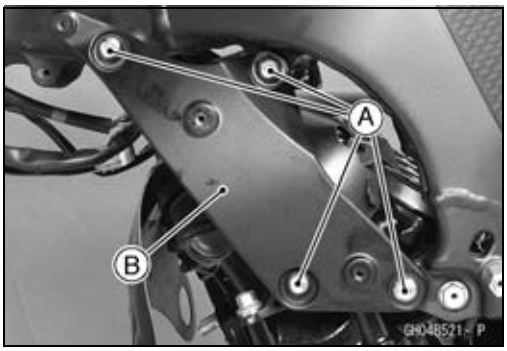

● Support the engine with a suitable stand [A].
○Put a plank [B] onto the suitable stand for engine balance.



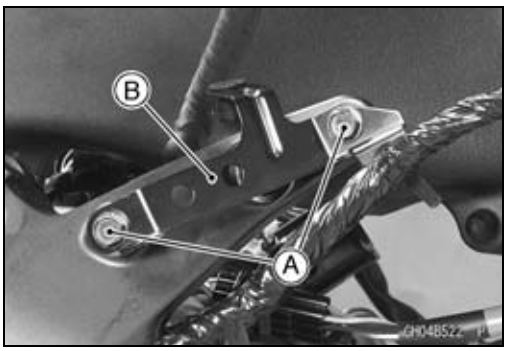

● Remove:
Left Upper Inner Fairing Bracket Bolts [A]
Left Upper Inner Fairing Bracket [B]




● Remove:
Left Engine Bracket Bolts [A]
Left Engine Bracket [B]

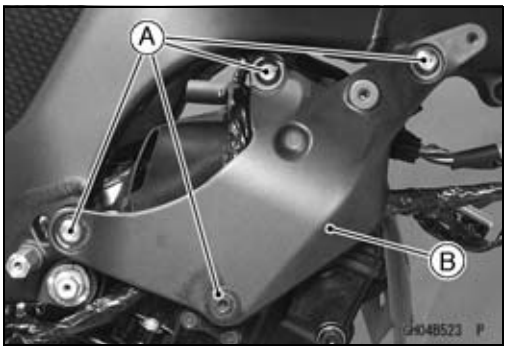



● Remove:
Right Upper Inner Fairing Bracket Bolts [A]
Right Upper Inner Fairing Bracket [B]

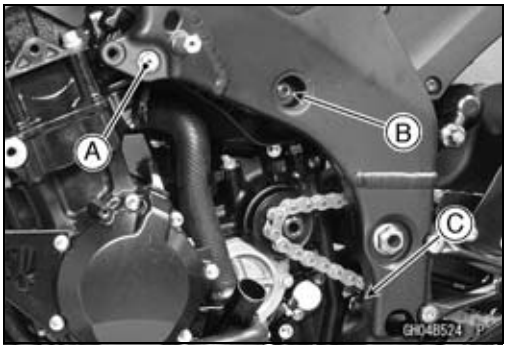


## Engine Removal/Installation

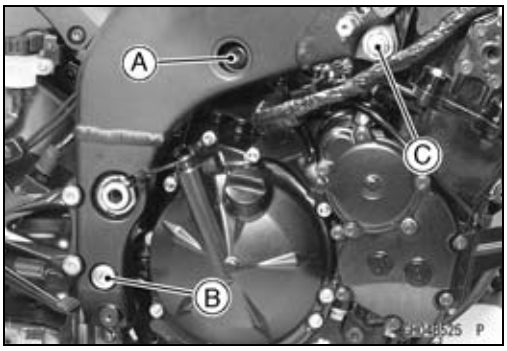
● Remove:
Right Engine Bracket Bolts [A]
Right Engine Bracket [B]



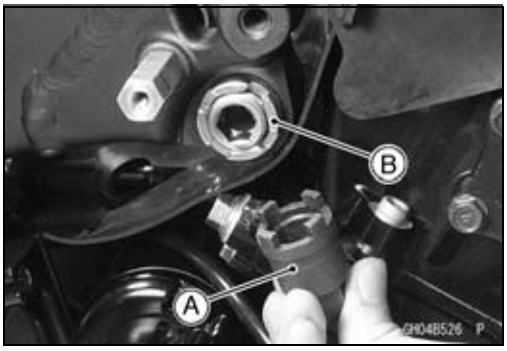

● Remove:
Left Front Engine Mounting Bolt [A]
Plug (Both Sides)
Middle Engine Mounting Nut [B]
Lower Engine Mounting Nut [C]



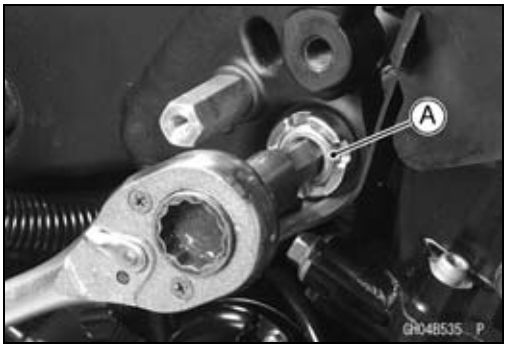

● Turn the middle [A] and lower [B] engine mounting bolts clockwise to make the gap between the adjusting collar and frame.
● Pull out the engine mounting bolts from the right side.
○Remove the collar while pulling out the middle engine mounting bolt.
● Remove the right front engine mounting bolts [C].




● Using the nut wrench [A], loosen the locknut [B].
**Special Tool - Engine Mount Nut Wrench: 57001-1450**

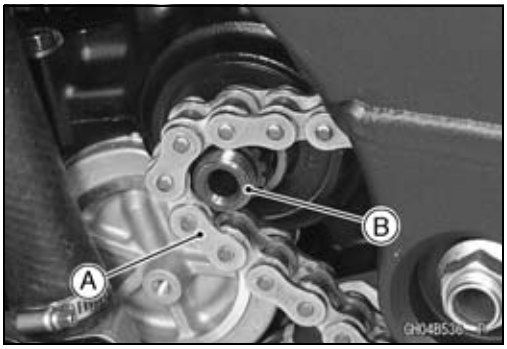



● Using the Hexagon Wrench, turn the adjusting collar [A] counterclockwise to make the gap between the engine and adjusting collar.



## Engine Removal/Installation

● Remove the drive chain [A] from the output shaft [B].
● Using the stand, take out the engine.

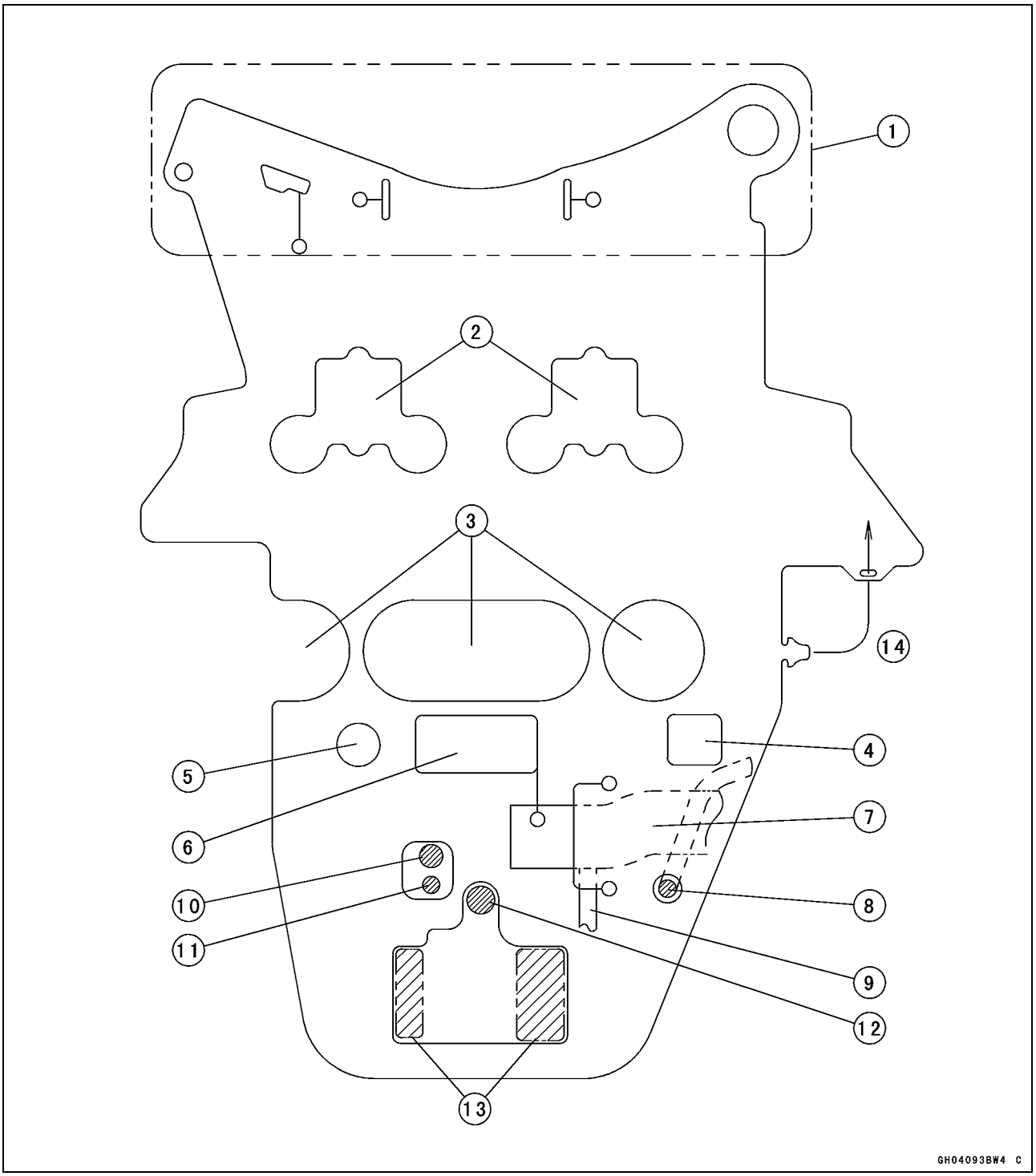



### *Engine Installation*

● Support the engine with a suitable stand.
○Put a plank onto the suitable stand for engine balance.

## Engine Removal/Installation

- Install the heat insulation rubber plate onto the engine as shown in the figure.




1. To Radiator
2. To Air Suction Valve Cover and Stick Coil
3. To Throttle Body Assy Holder
4. To Right Front Engine Mount
5. To Water Temperature Sensor
6. To Thermostat Housing
7. Water Hose (Run the water hose under the heat insulation rubber plate.)
8. Crankshaft Sensor Lead
9. Starter Motor Cable (Run the starter motor cable under the heat insulation rubber plate and water hose.)
10. Gear Position Switch Lead
11. Alternator Lead
12. Breather Hose
13. Middle Engine Mount
14. After installation, insert the projection into the slot.

## Engine Removal/Installation

● Install the engine mounting bolts and nuts, following the specified installing sequence.

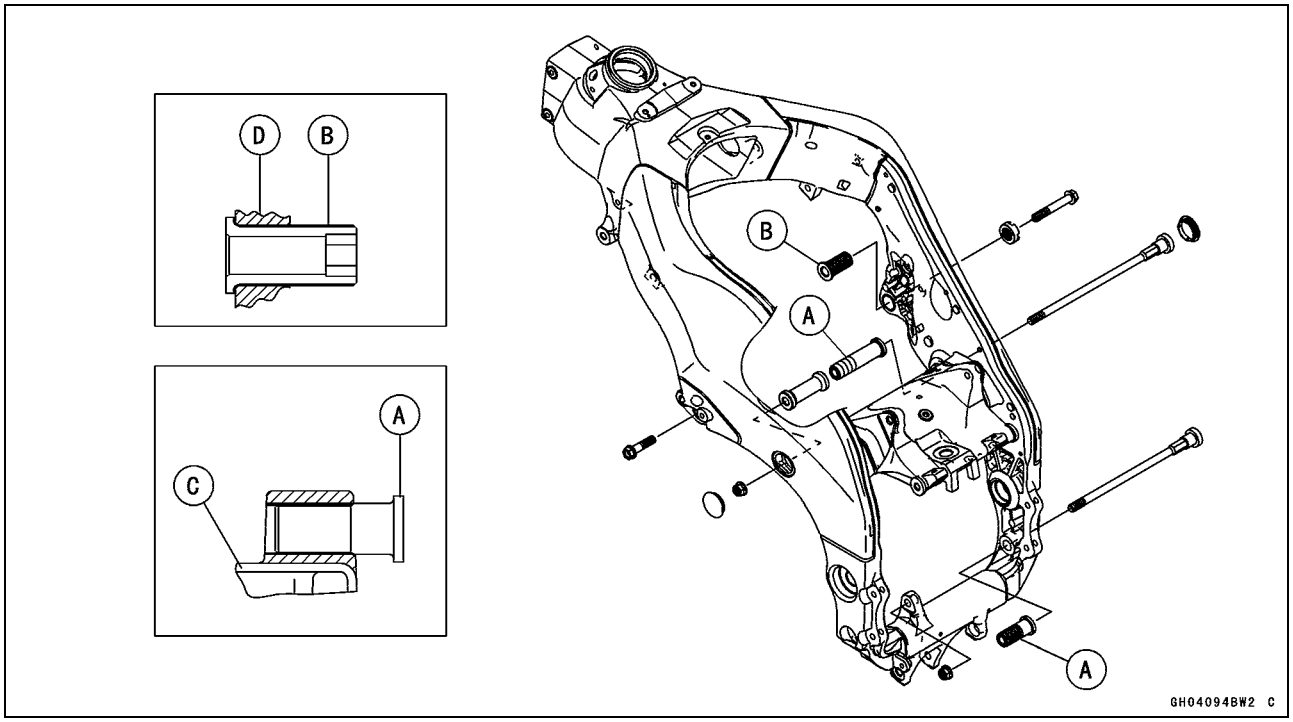
○Apply molybdenum disulfide grease to the threads of the adjusting collars [A].

○Apply 2-stroke oil to the threads of the adjusting collar [B].

○First, install the adjusting collars [A] [B] to the crankcase and frame.

Crankcase [C]

Frame [D]



## Engine Removal/Installation

○Second, hang the drive chain over the output shaft just before mounting the engine into its final position in the frame.
○Third, install the bolts [A] [B] [C] [D] temporarily, and tighten the bolt [C].

**Torque - Left Front Engine Mounting Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)**

○When installing the middle engine mounting bolt [B], install the collar [E] between frame and crankcase.
○Forth, Insert the lower [A] and middle [B] engine mounting bolts to the adjusting collars [F], and tighten the bolts counterclockwise.

**NOTE**

○*Tighten the bolts until the clearance [G] between the frame and collar come to 0 mm (0 in.).*

**Torque - Middle Engine Mounting Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
**Lower Engine Mounting Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

○Fifth, tighten the middle engine mounting nut [H], and then lower engine mounting nut [I].

**Torque - Middle Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)**
**Lower Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)**

○After tightening the middle engine mounting nut, install the plug [J] on both sides.
○Sixth, remove the bolt [D] temporarily, and using the hexagon wrench, turn the adjusting collar [K] until the clearance [L] between the cylinder head and collar come to 0 mm (0 in.).
○Seventh, using the engine mount nut wrench (special tool), tighten the adjusting collar locknut [M].

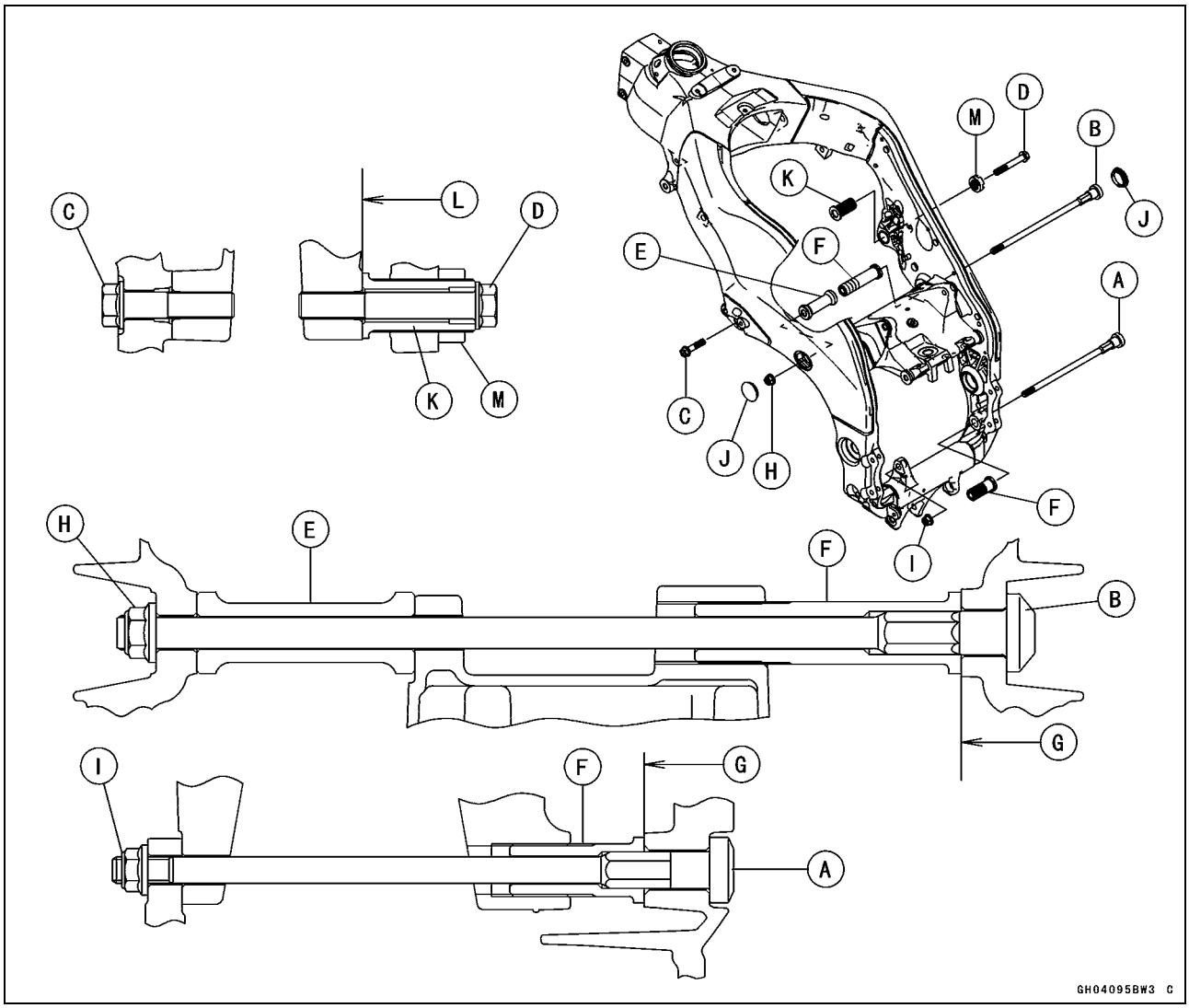
**Special Tool - Engine Mount Nut Wrench: 57001-1450**

**Torque - Adjusting Collar Locknut: 49 N·m (5.0 kgf·m, 36 ft·lb)**

○Lastly, reinstall the bolt [D] and tighten it.

**Torque - Right Front Engine Mounting Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)**

## Engine Removal/Installation



## Engine Removal/Installation

- Install the left [A] and right [B] engine bracket, following the specified installing sequence.

○First, install the adjusting collar [C] to the right engine bracket [B].

○Second, install the bolts [D] [E] [F] [G] temporarily as shown sequence [1 ~ 8] in the figure.

○Third, tighten the bolts [D] as shown sequence [1 ~ 3] in the figure.

**Torque - Left Engine Bracket Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)**

○Forth, tighten the bolts [E] as shown sequence [5 ~ 7] in the figure.

**Torque - Right Engine Bracket Bolts (M10, L = 30): 44 N·m (4.5 kgf·m, 32 ft·lb)**

○Fifth, tighten the bolt [F].

**Torque - Left Engine Bracket Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)**

○Sixth, remove the bolt [G] temporarily, and using the hexagon wrench, turn the adjusting collar [C] until the clearance [H] between the right engine bracket (cylinder head) [I] and collar come to 0 mm (0 in.).

○Lastly, reinstall the bolt [G], and tighten it.

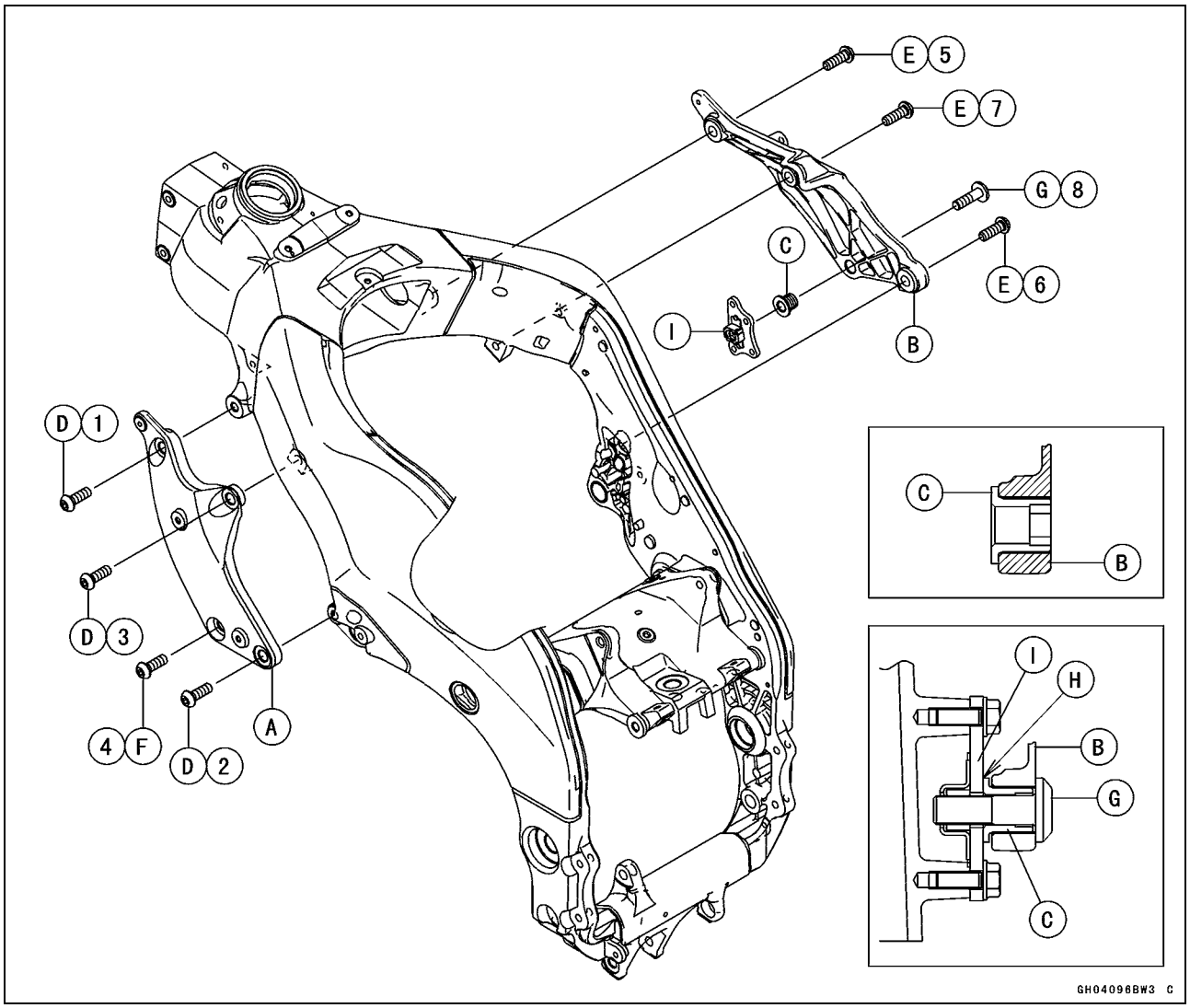
**Torque - Right Engine Bracket Bolt (M10, L = 35): 44 N·m (4.5 kgf·m, 32 ft·lb)**

- Install the left and right upper inner fairing brackets.
- Run the leads, cable and hoses correctly (see Cable, Wire and Hose Routing section in the Appendix chapter).
- Tighten:

**Torque - Engine Ground Cable Terminal Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Install the removed parts (see appropriate chapters).
- Adjust:
  Throttle Cables (see Throttle Control System Inspection in the Periodic Maintenance chapter)
  Clutch Cable (see Clutch Operation Inspection in the Periodic Maintenance chapter)
  Drive Chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter)
- Fill the engine with engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).

## Engine Removal/Installation



# Crankshaft/Transmission

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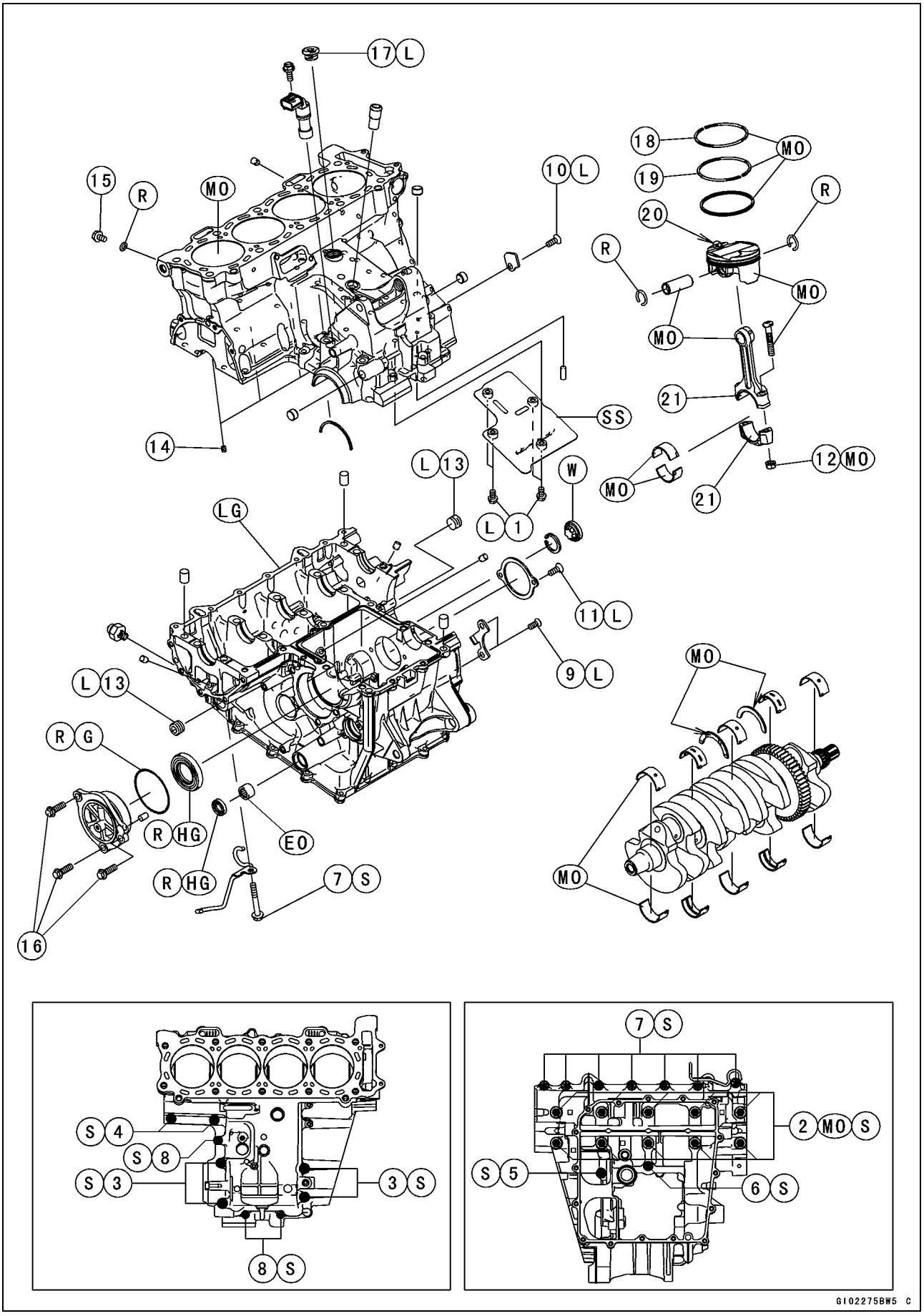
## Exploded View



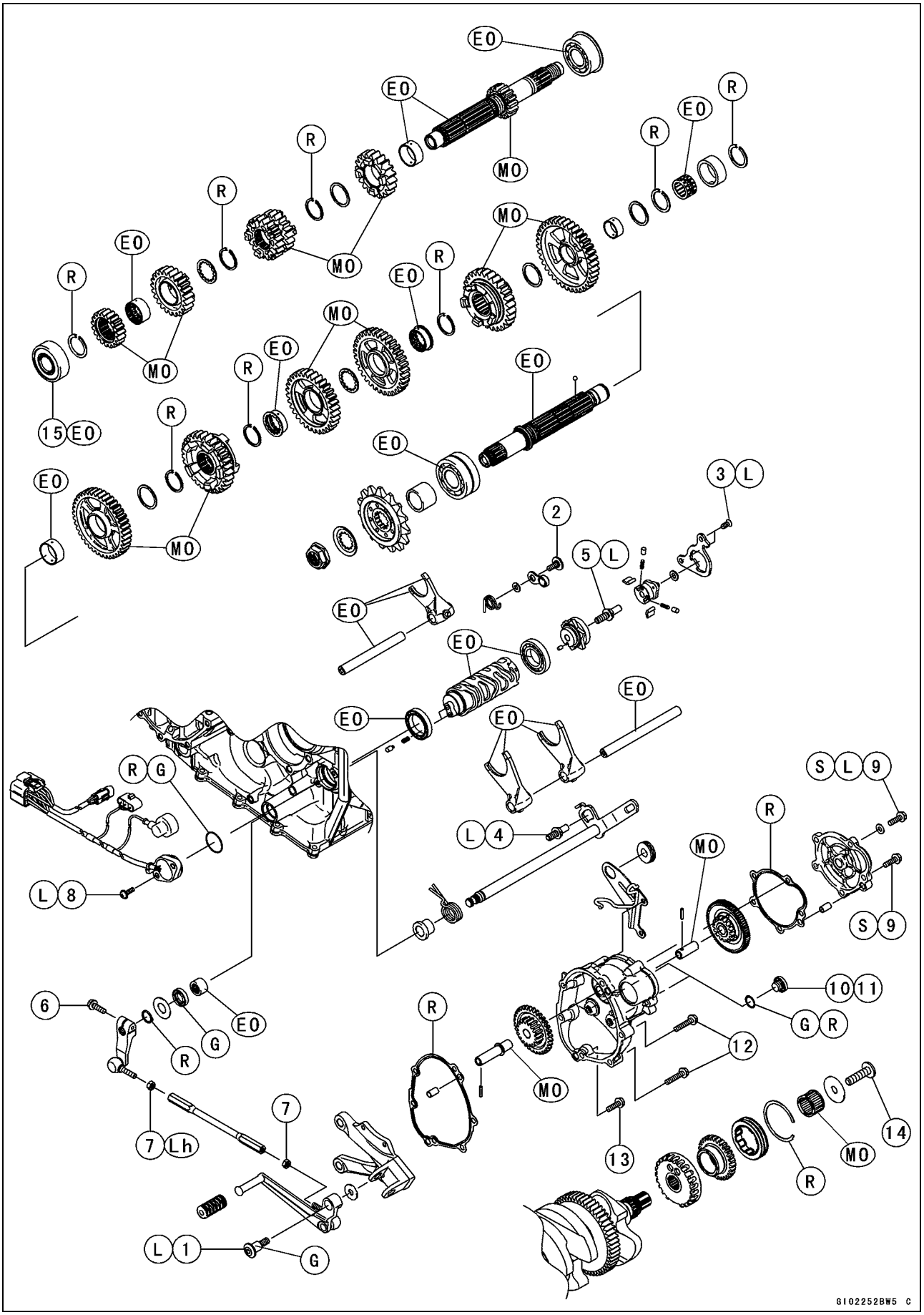
## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Breather Plate Bolts | 10 | 1.0 | 89 in·lb | L |
| 2 | Crankcase Bolts (M9) | 39 | 4.0 | 29 | MO, S |
| 3 | Crankcase Bolts (M8) | 27 | 2.8 | 20 | S |
| 4 | Crankcase Bolts (M7, L = 32) | 20 | 2.0 | 15 | S |
| 5 | Crankcase Bolt (M7, L = 50) | 20 | 2.0 | 15 | S |
| 6 | Crankcase Bolt (M7, L = 85) | 20 | 2.0 | 15 | S |
| 7 | Crankcase Bolts (M6, L = 45) | 12 | 1.2 | 106 in·lb | S |
| 8 | Crankcase Bolts (M6, L = 40) | 12 | 1.2 | 106 in·lb | S |
| 9 | Shift Drum Bearing Holder Screws | 5.0 | 0.51 | 44 in·lb | L |
| 10 | Plate Screw | 5.0 | 0.51 | 44 in·lb | L |
| 11 | Drive Shaft Bearing Holder Screws | 5.0 | 0.51 | 44 in·lb | L |
| 12 | Connecting Rod Big End Nuts | see Text | ← | ← | MO |
| 13 | Oil Passage Plugs | 20 | 2.0 | 15 | L |
| 14 | Piston Oil Jet | 3.0 | 0.30 | 27 in·lb | |
| 15 | Coolant Drain Bolt (Cylinder) | 10 | 1.0 | 89 in·lb | |
| 16 | Drive Shaft Cover Bolts | 25 | 2.5 | 18 | |
| 17 | Plug | 20 | 2.0 | 15 | L |

18. “R” marked side faces up.
19. “RN” marked side faces up.
20. Hollow mark faces exhaust side.
21. Do not apply any grease or oil.

EO: Apply engine oil.
G: Apply grease.
HG: Apply high-temperature grease.
L: Apply a non-permanent locking agent.
LG: Apply liquid gasket.
MO: Apply molybdenum disulfide oil solution.
(mixture of engine oil and molybdenum disulfide grease in a weight ratio is 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.
SS: Apply silicone sealant.
W: Apply water.

## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Shift Pedal Mounting Bolt | 25 | 2.5 | 18 | L |
| 2 | Gear Positioning Lever Bolt | 12 | 1.2 | 106 in·lb | |
| 3 | Shift Ratchet Assembly Holder Bolts | 15 | 1.5 | 11 | L |
| 4 | Shift Shaft Return Spring Pin | 29 | 3.0 | 21 | L |
| 5 | Shift Drum Cam Bolt | 12 | 1.2 | 106 in·lb | L |
| 6 | Shift Lever Bolt | 7.0 | 0.71 | 62 in·lb | |
| 7 | Tie-Rod Locknuts | 7.0 | 0.71 | 62 in·lb | Lh (1) |
| 8 | Gear Position Switch Screws | 3.0 | 0.30 | 27 in·lb | L |
| 9 | Torque Limiter Cover Bolts | 10 | 1.0 | 89 in·lb | L (1), S |
| 10 | Starter Clutch Bolt Cap | – | – | – | Hand -tighten |
| 11 | Timing Inspection Cap | – | – | – | Hand -tighten |
| 12 | Starter Clutch Cover Bolts (M6, L = 30) | 10 | 1.0 | 89 in·lb | |
| 13 | Starter Clutch Cover Bolts (M6, L = 20) | 10 | 1.0 | 89 in·lb | |
| 14 | Starter Clutch Bolt | 49 | 5.0 | 36 | |

15. Install the bearing into the drive shaft cover so that the seal side faces inside.
EO: Apply engine oil.
G: Apply grease.
L: Apply a non-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 ratio 10 : 1)
R: Replacement Parts
S: Follow the specified tightening sequence.

## Specifications

| Item | Standard | Service Limit |
|---|---|---|
| **Crankcase, Crankshaft, Connecting Rods** | | |
| Connecting Rod Bend | – – – | TIR 0.2/100 mm (0.008/3.94 in.) |
| Connecting Rod Twist | – – – | TIR 0.2/100 mm (0.008/3.94 in.) |
| Connecting Rod Big End Side Clearance | 0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.) | 0.58 mm (0.023 in.) |
| Connecting Rod Big End Bearing Insert/crankpin Clearance | 0.030 ~ 0.060 mm (0.0012 ~ 0.0024 in.) | 0.10 mm (0.0039 in.) |
| Crankpin Diameter: | 34.484 ~ 34.500 mm (1.3576 ~ 1.3583 in.) | 34.47 mm (1.3571 in.) |
| Marking: | | |
| None | 34.484 ~ 34.492 mm (1.3576 ~ 1.3579 in.) | – – – |
| ○ | 34.493 ~ 34.500 mm (1.3580 ~ 1.3583 in.) | – – – |
| Connecting Rod Big End Inside Diameter: | 37.500 ~ 37.516 mm (1.4764 ~ 1.4770 in.) | – – – |
| Marking: | | |
| None | 37.500 ~ 37.508 mm (1.4764 ~ 1.4766 in.) | – – – |
| ○ | 37.509 ~ 37.516 mm (1.4767 ~ 1.4770 in.) | – – – |
| Connecting Rod Big End Bearing Insert Thickness: | | |
| Brown | 1.478 ~ 1.483 mm (0.05819 ~ 0.05839 in.) | – – – |
| Black | 1.483 ~ 1.488 mm (0.05839 ~ 0.05858 in.) | – – – |
| Blue | 1.488 ~ 1.493 mm (0.05858 ~ 0.05878 in.) | – – – |
| Connecting Rod Bolt Stretch | (Usable Range) | |
| | 0.24 ~ 0.34 mm (0.0094 ~ 0.0134 in.) | – – – |
| Crankshaft Side Clearance | 0.05 ~ 0.25 mm (0.0020 ~ 0.0098 in.) | 0.45 mm (0.0177 in.) |
| Crankshaft #3 Main Journal Width | 23.49 ~ 23.54 mm (0.9248 ~ 0.9267 in.) | – – – |
| Crankshaft Runout | TIR 0.02 mm (0.0008 in.) or less | TIR 0.05 mm (0.0020 in.) |
| Crankshaft Main Bearing Insert/journal Clearance | 0.010 ~ 0.034 mm (0.0004 ~ 0.0013 in.) | 0.06 mm (0.0024 in.) |
| Crankshaft Main Journal Diameter: | 34.984 ~ 35.000 mm (1.3773 ~ 1.3780 in.) | 34.96 mm (1.3764 in.) |
| Marking: | | |
| None | 34.984 ~ 34.992 mm (1.3773 ~ 1.3776 in.) | – – – |
| 1 | 34.993 ~ 35.000 mm (1.3777 ~ 1.3780 in.) | – – – |
| Crankcase Main Bearing Inside Diameter: | 38.000 ~ 38.016 mm (1.4961 ~ 1.4967 in.) | – – – |
| Marking | | |
| None | 38.009 ~ 38.016 mm (1.4964 ~ 1.4967 in.) | – – – |
| ○ | 38.000 ~ 38.008 mm (1.4961 ~ 1.4963 in.) | – – – |

## Specifications

| Item | Standard | Service Limit |
|---|---|---|
| Crankshaft Main Bearing Insert Thickness: | | |
| Brown | 1.491 ~ 1.495 mm (0.0587 ~ 0.0589 in.) | – – – |
| Black | 1.495 ~ 1.499 mm (0.0589 ~ 0.0590 in.) | – – – |
| Blue | 1.499 ~ 1.503 mm (0.0590 ~ 0.0592 in.) | – – – |
| **Cylinder (Upper Crankcase), Pistons** | | |
| Cylinder Inside Diameter | 75.994 ~ 76.006 mm (2.9919 ~ 2.9924 in.) | 76.09 mm (2.9957 in.) |
| Piston Diameter | 75.959 ~ 75.974 mm (2.9905 ~ 2.9911 in.) | 75.81 mm (2.9846 in.) |
| Piston/Cylinder Clearance | 0.020 ~ 0.047 mm (0.0008 ~ 0.0019 in.) | – – – |
| Piston Ring/Groove Clearance: | | |
| Top | 0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.) | 0.17 mm (0.0067 in.) |
| Second | 0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.) | 0.17 mm (0.0067 in.) |
| Piston Ring Groove Width: | | |
| Top | 0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.) | 0.92 mm (0.036 in.) |
| Second | 0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.) | 0.92 mm (0.036 in.) |
| Piston Ring Thickness: | | |
| Top | 0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.) | 0.70 mm (0.028 in.) |
| Second | 0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.) | 0.70 mm (0.028 in.) |
| Piston Ring End Gap: | | |
| Top | 0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in.) | 0.6 mm (0.024 in.) |
| Second | 0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.) | 0.8 mm (0.031 in.) |
| **Transmission** | | |
| Shift Fork Ear Thickness | 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.) | 5.8 mm (0.228 in.) |
| Gear Groove Width | 6.05 ~ 6.15 mm (0.238 ~ 0.242 in.) | 6.25 mm (0.246 in.) |
| Shift Fork Guide Pin Diameter | 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.) | 5.8 mm (0.228 in.) |
| Shift Drum Groove Width | 6.05 ~ 6.20 mm (0.238 ~ 0.244 in.) | 6.3 mm (0.248 in.) |

## Specifications

### Connecting Rod Big End Bearing Insert Selection

| Con-rod Big End Bore Diameter Marking | Crankpin Diameter Marking | Bearing Insert | |
|---|---|---|---|
| | | Size Color | Part Number |
| None | ○ | Brown | 92139-0124 |
| None | None | Black | 92139-0123 |
| ○ | ○ | | |
| ○ | None | Blue | 92139-0122 |

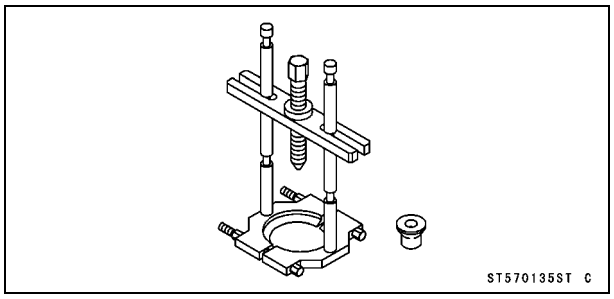
### Crankshaft Main Bearing Insert Selection

| Crankcase Main Bearing Inside Diameter Marking | Crankshaft Main Journal Diameter Marking | Bearing Insert* | | |
|---|---|---|---|---|
| | | Size Color | Part Number | Journal Nos. |
| ○ | 1 | Brown | 92139-0034 | 2, 4 |
| | | | 92139-0219 | 1, 3, 5 |
| None | 1 | Black | 92139-0033 | 2, 4 |
| ○ | None | | 92139-0218 | 1, 3, 5 |
| None | None | Blue | 92139-0032 | 2, 4 |
| | | | 92139-0217 | 1, 3, 5 |

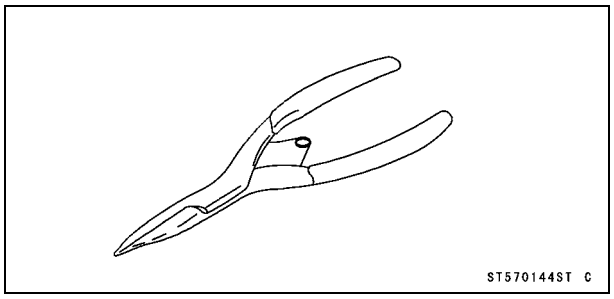
*: The bearing inserts for Nos. 2 and 4 journals have an oil groove, respectively.

## Special Tools and Sealants

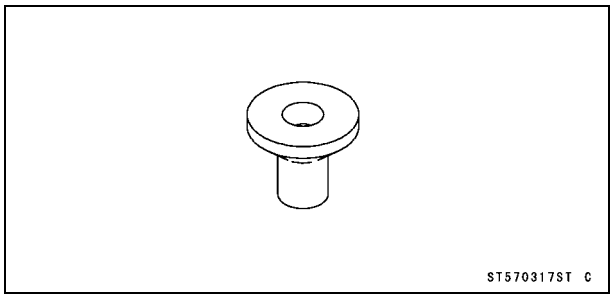
**Bearing Puller:**
**57001-135**



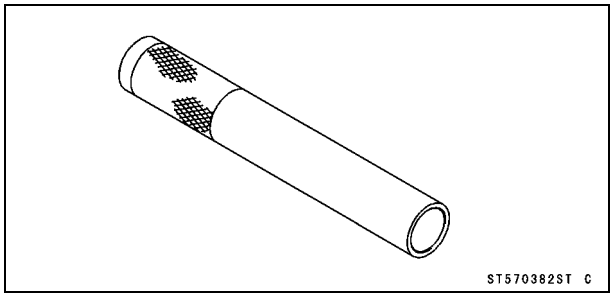

**Outside Circlip Pliers:**
**57001-144**



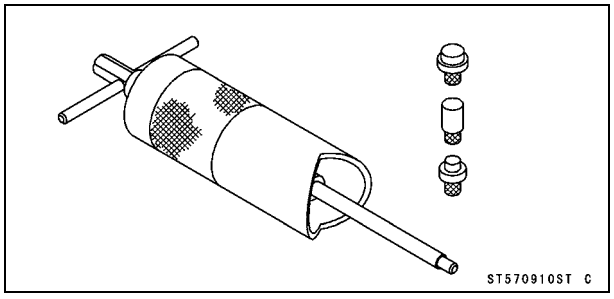

**Bearing Puller Adapter:**
**57001-317**



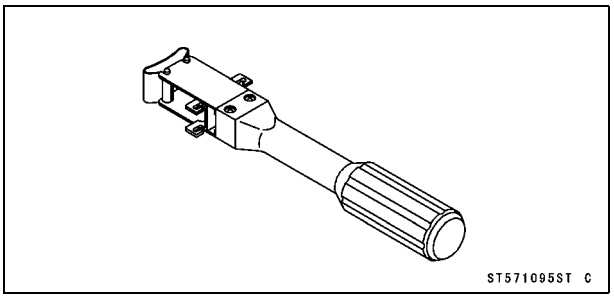

**Bearing Driver, $\phi$32:**
**57001-382**



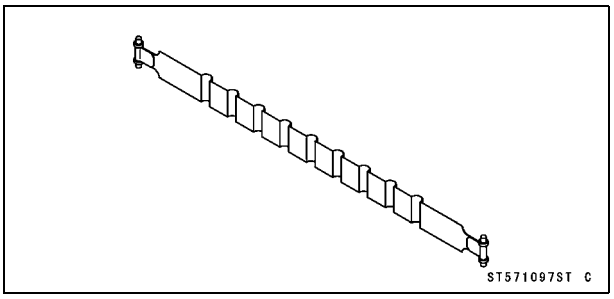

**Piston Pin Puller Assembly:**
**57001-910**



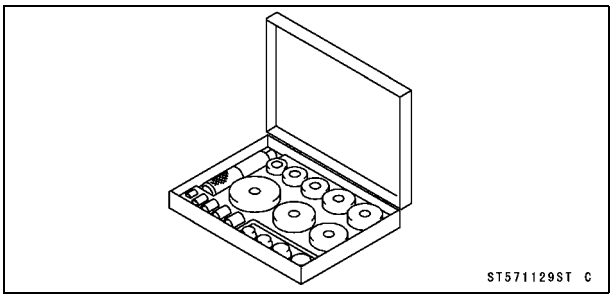

**Piston Ring Compressor Grip:**
**57001-1095**



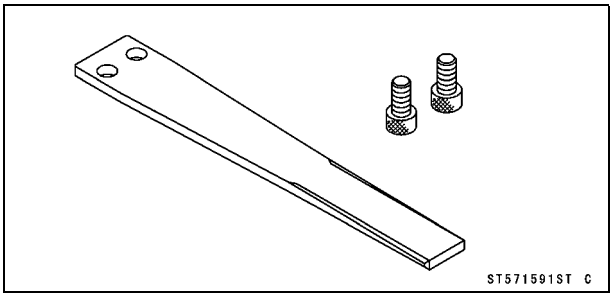

**Piston Ring Compressor Belt, $\phi$67 ~ $\phi$79:**
**57001-1097**



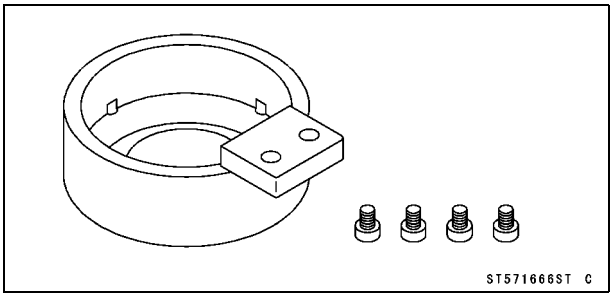

**Bearing Driver Set:**
**57001-1129**




**Grip:**
**57001-1591**

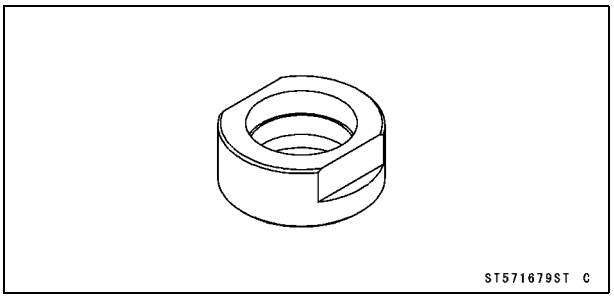



**Rotor Holder:**
**57001-1666**

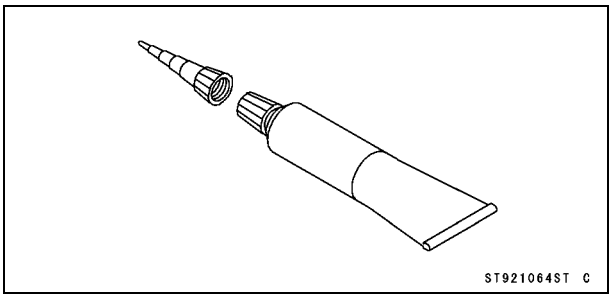


## Special Tools and Sealants

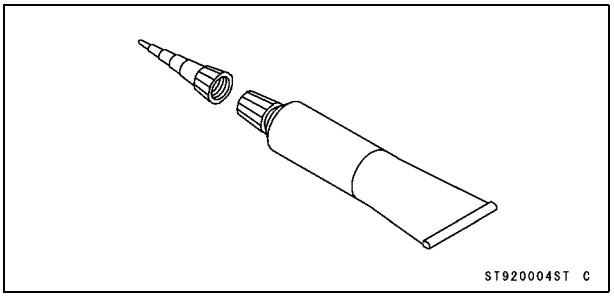
**Stopper:**
**57001-1679**




**Kawasaki Bond (Liquid Gasket - Black):**
**92104-1064**




**Kawasaki Bond (Silicone Sealant):**
**92104-0004**



## Crankcase

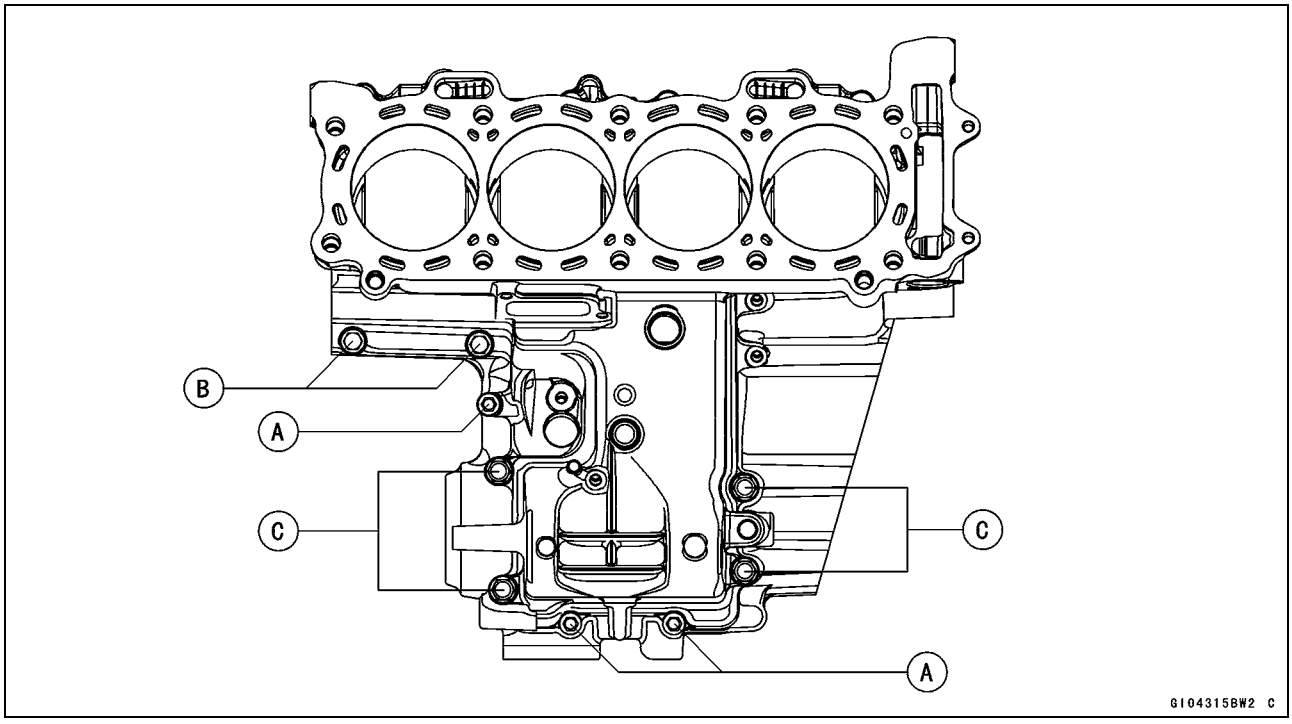
### *Crankcase Splitting*

- Remove the engine (see Engine Removal in the Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove:

  Crankshaft Sensor (see Crankshaft Sensor Removal in the Electrical System chapter)
  Starter Clutch (see Starter Clutch Removal)
  Cylinder Head (see Cylinder Head Removal in the Engine Top End chapter)
  Starter Motor (see Starter Motor Removal in the Electrical System chapter)
  Clutch (see Clutch Removal in the Clutch chapter)
  Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
  Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
  Oil Cooler/Oil Filter Case (see Oil Cooler/Oil Filter Case Removal in the Engine Lubrication System chapter)
  Oil Pan (see Oil Pan Removal in the Engine Lubrication System chapter)
  Oil Screen (see Oil Pressure Relief Valve Removal in the Engine Lubrication System chapter)
  External Shift Mechanism (see External Shift Mechanism Removal)

- Remove the upper crankcase bolts, following the specified sequence.

○Firstly, loosen the M6 bolts [A].
○Secondly, loosen the M7 bolts [B].
○Lastly, loosen the M8 bolts [C].



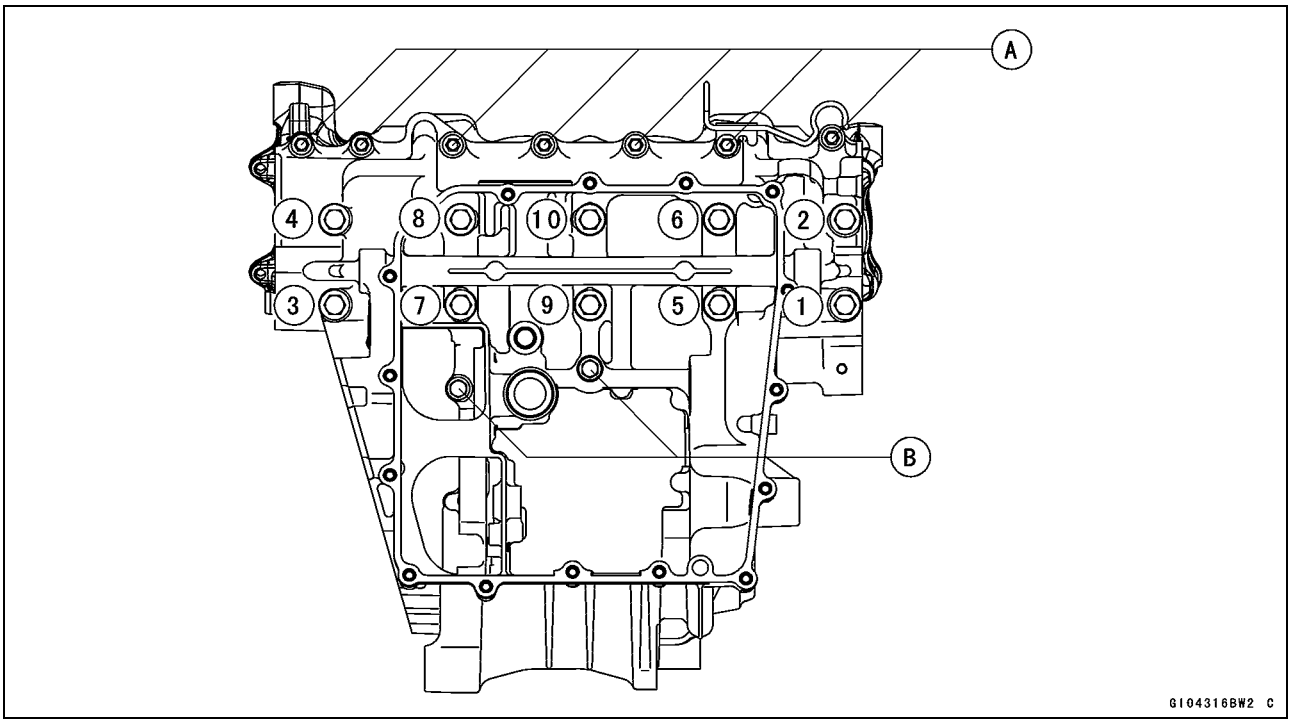
## Crankcase

- Remove the lower crankcase bolts, following the specified sequence.

○First, loosen the M6 bolts [A].
○Second, loosen the M7 bolts [B].
○Lastly, loosen the M9 bolts as shown sequence [1 ~ 10] in the figure.

- Tap lightly around the crankcase mating surface with a plastic mallet, and split the crankcase.

○Take care not to damage the crankcase.




### *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 crankcase halves and wipe dry.

**⚠ WARNING**

**Clean the crankcase 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.**

- Using compressed air, blow out the oil passage in the crankcase halves.

## Crankcase

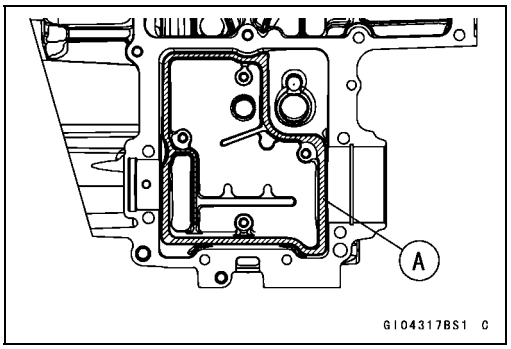
● Apply liquid gasket to the breather plate mating surface [A] 1 mm (0.04 in.) or more thick, and then install the breather plate.

**Sealant - Three Bond: TB1207B**

**NOTE**

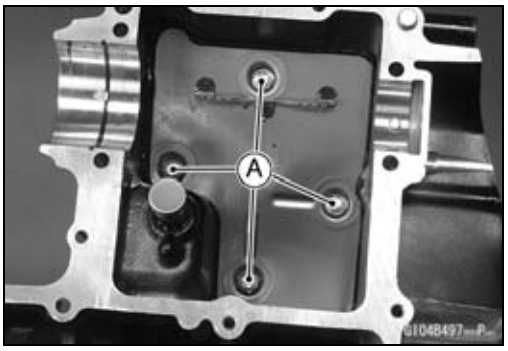
○*Make the application finish within 7 minutes when the liquid gasket to the mating surface of the breather plate is applied.*

○*Moreover fit the plate and tighten the bolts just after application of the liquid gasket.*

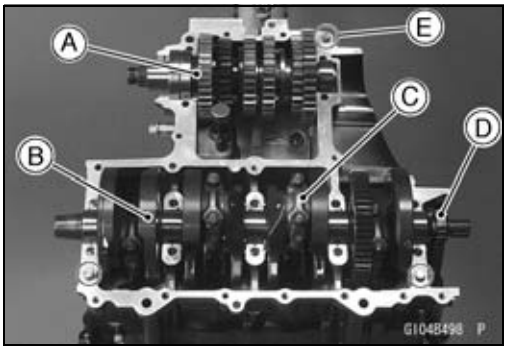



● Apply a non-permanent locking agent to the treads of the breather plate bolts [A] and tighten them.

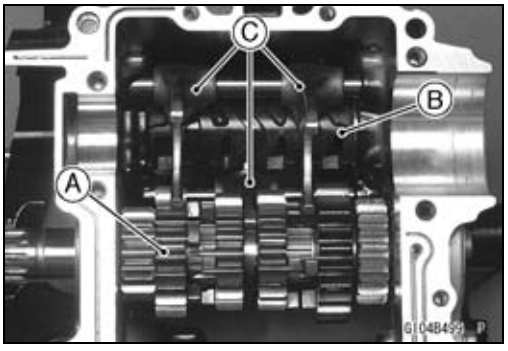
**Torque - Breather Plate Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**




● Install the following parts on the upper crankcase half.
Output Shaft [A] (see Transmission Shaft Installation)
Crankshaft [B] (see Crankshaft Installation)
Pistons and Connecting Rods [C] (see Connecting Rod Installation)
Camshaft Chain [D]
Dowel Pins [E]



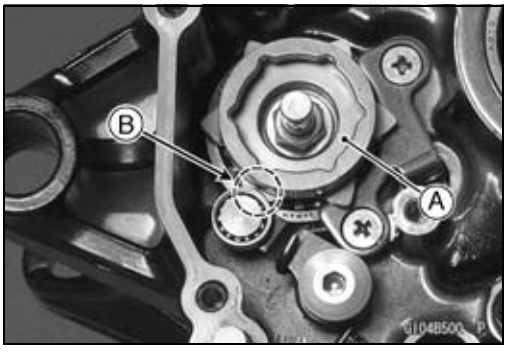

● Install the following parts on the lower crankcase half.
Drive Shaft [A] (see Transmission Installation)
Shift Drum [B] (see Shift Drum and Fork Installation)
Shift Forks [C] and Shift Rods (see Shift Drum and Fork Installation)




● Before fitting the lower case on the upper case, check the following items.

○Check to see that the shift drum cam [A] and transmission gears are in the neutral position [B].

○Be sure to hang the camshaft chain on the crankshaft.



## Crankcase

● Apply liquid gasket [A] to the mating surface of the lower crankcase half.

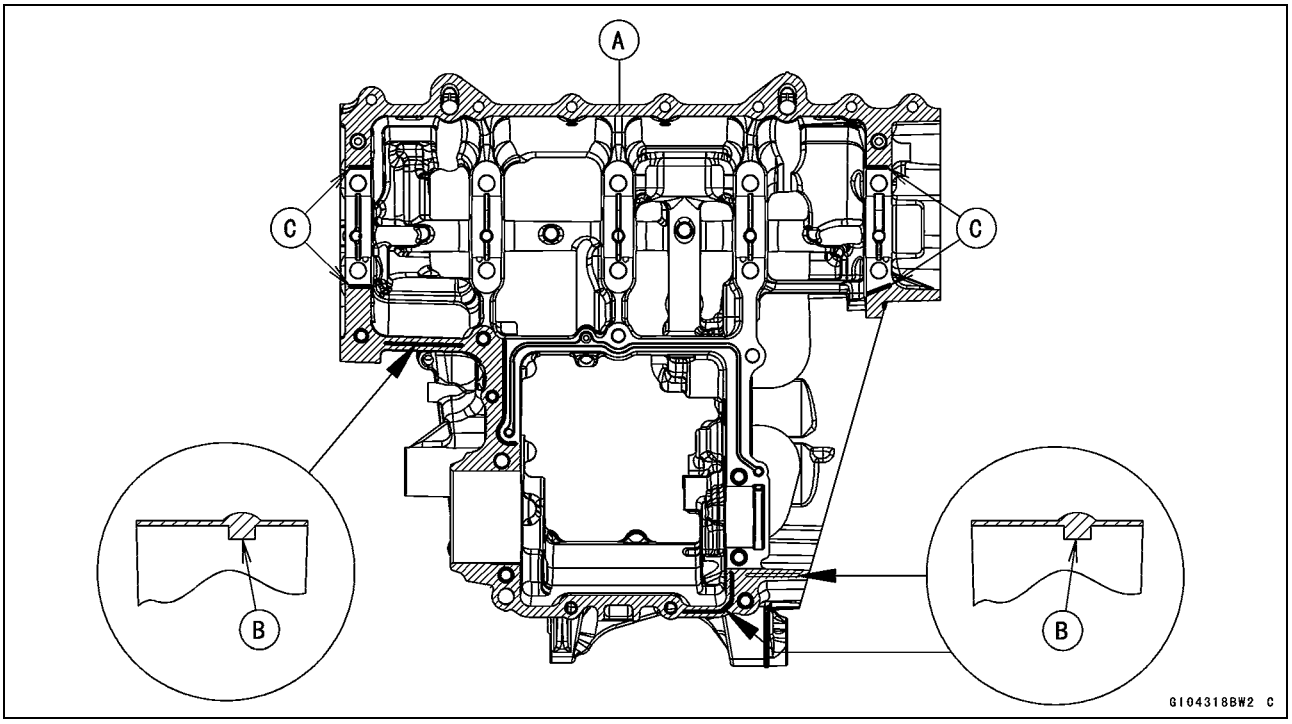
**Sealant - Kawasaki Bond (Liquid Gasket - Black): 92104 -1064**

**NOTE**

○*Especially, apply a sealant so that it shall be filled up on the grooves [B].*

○*Do not apply liquid gasket to the inside of the grooves [C].*

| **CAUTION** |
| --- |
| **Do not apply liquid gasket around the crankshaft main bearing inserts, and oil passage hole.** |




● Fit the lower crankcase half to the upper crankcase half.

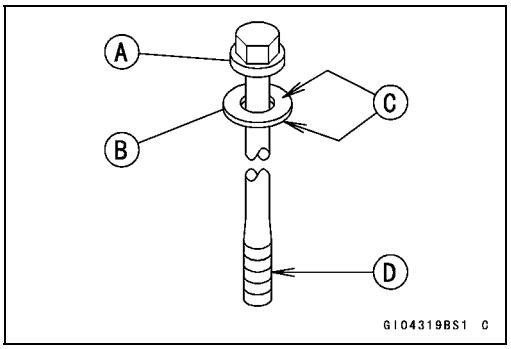
**NOTE**

○*Make the application finish within 20 minutes when the liquid gasket to the mating surface of the crankcase half is applied.*

○*Moreover fit the case and tighten the bolts just after application of the liquid gasket.*

## Crankcase

- The M9 bolts [A] has a copper plated washer [B], replace it with a new one.
- Apply molybdenum disulfide oil solution to both sides [C] of the washers and threads [D] of M9 bolts.




- Tighten the lower crankcase bolts using the following steps.

○Following the sequence numbers on the lower crankcase half, M9 bolts [1 ~ 10] with copper plated washers.

**Torque - Crankcase Bolts (M9): 39 N·m (4.0 kgf·m, 29 ft·lb)**

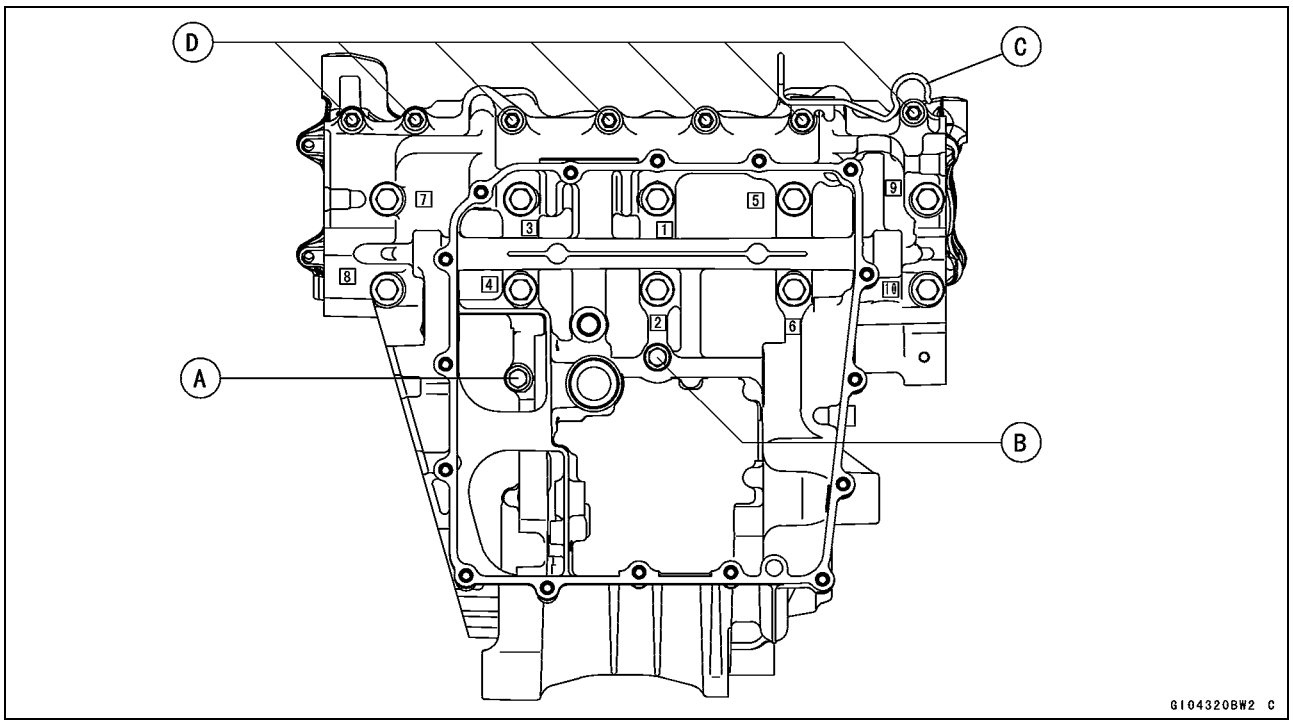
○Tighten the M7 bolts.

**Torque - Crankcase Bolts (M7): 20 N·m (2.0 kgf·m, 15 ft·lb)**

L = 50 mm (1.97 in.) [A]
L = 85 mm (3.35 in.) [B]

○Install the clamp [C], and tighten the M6 bolts [D].

**Torque - Crankcase Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)**



## Crankcase

● Tighten the upper crankcase bolts using the following steps.

○The M8 bolts [A] has a washer, replace it with a new one.

○Tighten the M8 bolts with washers.

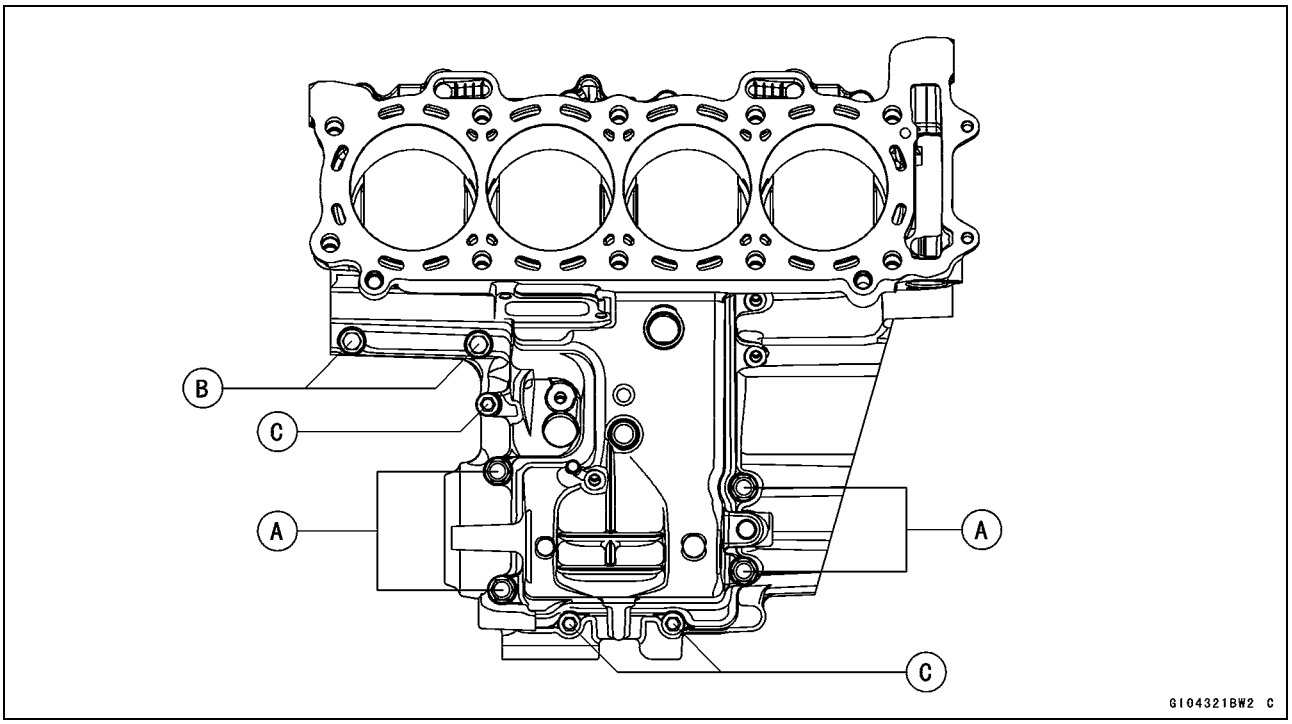
**Torque - Crankcase Bolts (M8): 27 N·m (2.8 kgf·m, 20 ft·lb)**

○Tighten the M7 bolts [B].

**Torque - Crankcase Bolts (M7): 20 N·m (2.0 kgf·m, 15 ft·lb)**

○Tighten the M6 bolts [C].

**Torque - Crankcase Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)**




● After tightening all crankcase bolts, check the following items.

○Wipe up the liquid gasket that seeps out around the crankcase mating surface.

○Crankshaft and transmission shaft turn freely.

○Wile spinng the output shaft, gears shift smoothly from the 1st to 6th gear, and 6th to 1st.

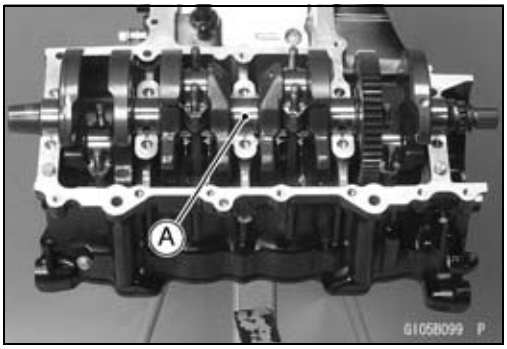
○When the output shaft stays still, the gear can not be shifted to 2nd gear or other higher gear positions.

● Install the removed parts (see appropriate chapters).

## Crankshaft and Connecting Rods

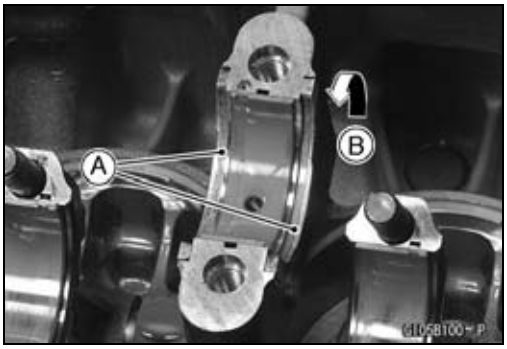
### *Crankshaft Removal*

- Split the crankcase (see Crankcase Splitting).
- Remove:
  Camshaft Chain (Camshaft Chain Removal in the Engine Top End chapter)
  Connecting Rod Big End Caps (see Connecting Rod Removal)
  Crankshaft [A]




- Remove the thrust washers [A] from the #3 main journal of the upper crankcase half as follows.

○Slide [B] the thrust washers upward and remove them.




### *Crankshaft Installation*

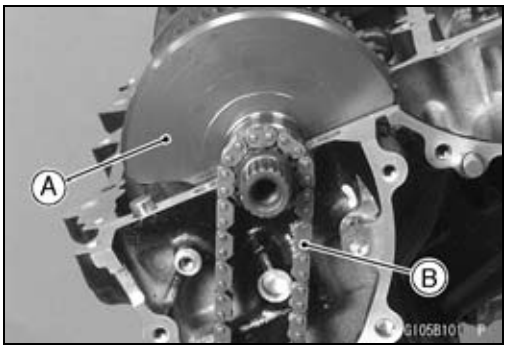
**NOTE**

○*If the crankshaft is replaced with a new one, refer to the Connecting Rod Big End Bearing/Crankshaft Main Bearing Insert Selection in the Specifications.*

**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.
- Install the crankshaft [A] with the camshaft chain [B] hanging on it.
- Install the connecting rod big end caps (see Connecting Rod Installation).



## Crankshaft and Connecting Rods

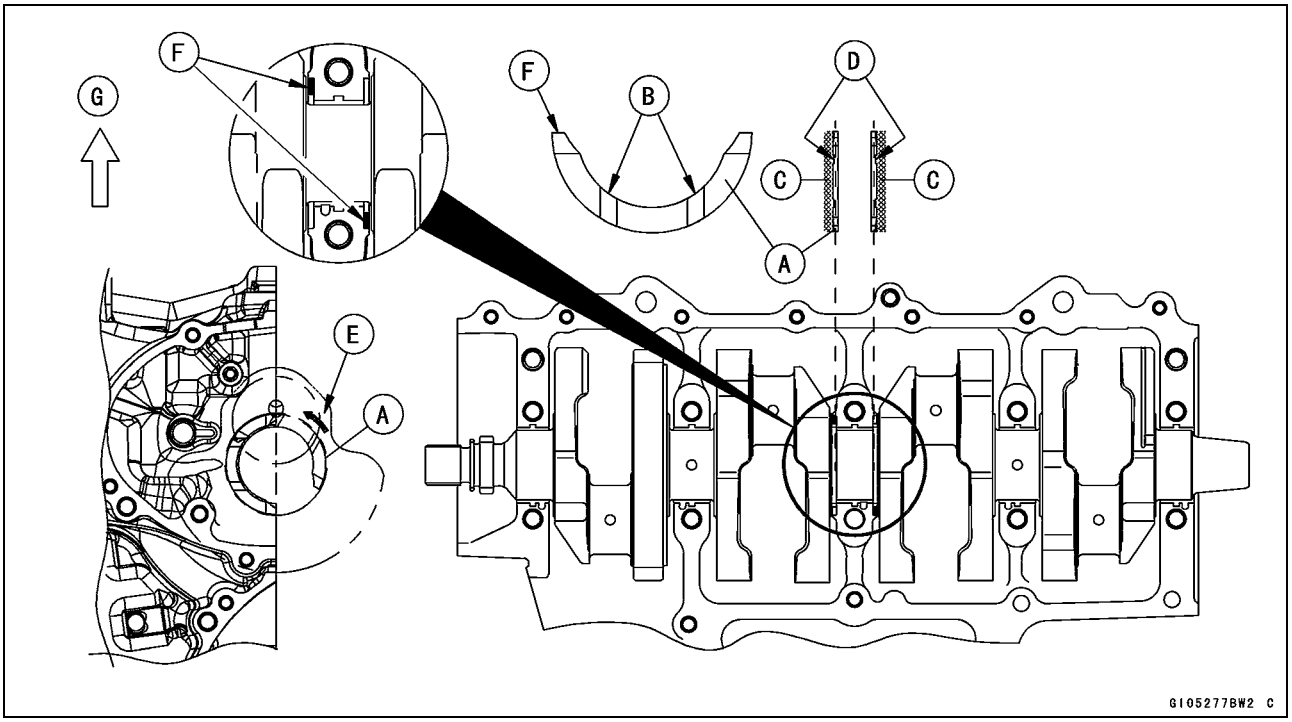
**NOTE**

○*The thrust washer [A] has oil grooves [B] on the one side.*

○*The thrust washers are identical.*

- Apply molybdenum disulfide grease [C] to the oil groove side [D] of the thrust washers.
- Slide [E] the thrust washer of the one side into the groove of the #3 main journal so that the oil grooves face outward.
- Move the crankshaft to the left or right, and then slide the thrust washer of the other side into the groove of the #3 main journal in the same way.
- After installation, confirm that the blue-painted edges [F] of the thrust washers are positioned as shown in the figure.

Front [G]

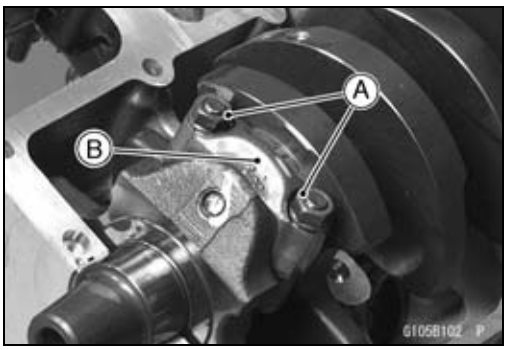



### *Connecting Rod Removal*

- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod nuts [A] and big end caps [B].

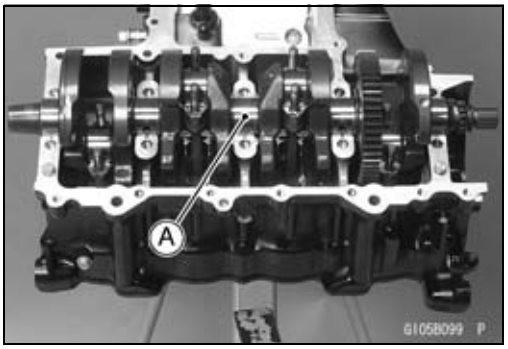
**NOTE**

○*Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.*



## Crankshaft and Connecting Rods

- Remove:
  Camshaft Chain (see Camshaft Chain Removal in the engine Top End chapter)
  Crankshaft [A]
  Pistons (see Piston Removal)



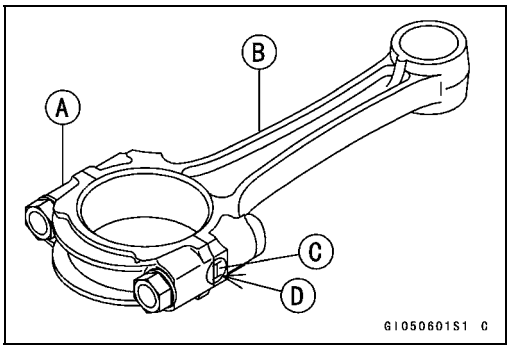

**CAUTION**

**Discard the connecting rod bolts and nuts. 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.**

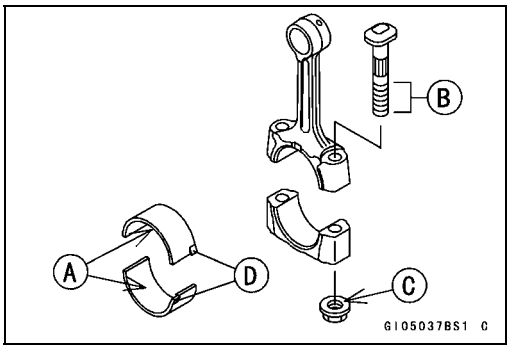



Big End Cap [A]
Connecting Rod [B]
Weight Mark, Alphabet [C]
Diameter Mark [D]: "○" or no mark

**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.**

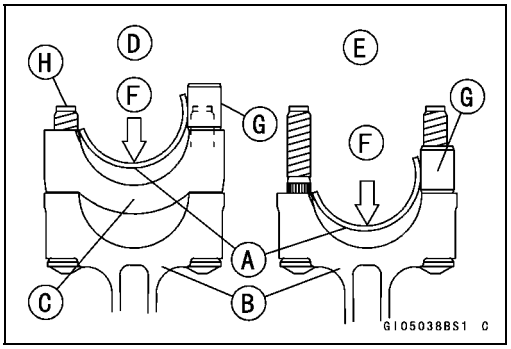
- Apply molybdenum disulfide oil solution to the inner surface of the upper and lower bearing inserts [A].
- Apply molybdenum disulfide oil solution to the threads [B] and seating surface [C] of the connecting rod nuts.
- Install the inserts so that their nails [D] are on the same side and fit them into 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]




- Remove debris and clean the surface of inserts.
- Install the cap on the connecting rod, aligning the weight and diameter marks.

## Crankshaft and Connecting Rods

● Install each connecting rod on its original crankpin.
○The connecting rod big end is bolted using the “plastic region fastening method”.
○This method precisely achieves the needed clamping force without exceeding it unnecessarily, allowing the use of thinner, lighter bolts further decreasing connecting rod weight.
○There are two types of the plastic region fastening. One is a bolt length measurement method and other is a rotation angle method. Observe one of the following two, but the bolt length measurement method is preferable because this is a more reliable way to tighten the big end nuts.

**CAUTION**

**The connecting rod bolts are designed to stretch when tightened. Never reuse the connecting rod bolts. See the table below for correct bolt and nut usage.**

**CAUTION**

**Be careful not to overtighten the nuts.**
**The bolts must be positioned on the seating surface correctly to prevent the bolt heads from hitting the crankcase.**

(1) Bolt Length Measurement Method
● Be sure to clean the bolts, nuts, and connecting rods thoroughly with a high-flash point solvent, because the new connecting rods, bolts, and nuts are treated with an anti-rust solution.

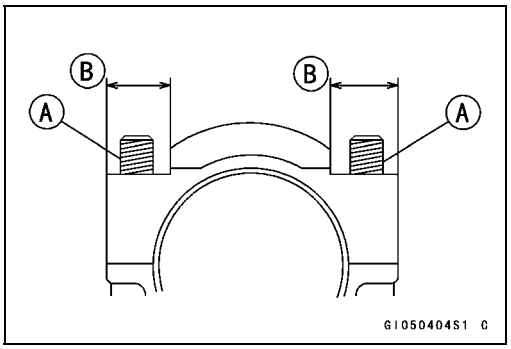
**⚠ WARNING**

**Clean the bolts, nuts, and connecting rods in a well -ventilated area, and take care that there is no spark or flame anywhere near the working area. This includes any appliance with a pilot light. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents to clean them.**

**CAUTION**

**Immediately dry the bolts and nuts with compressed air after cleaning.**
**Clean and dry the bolts and nuts completely.**

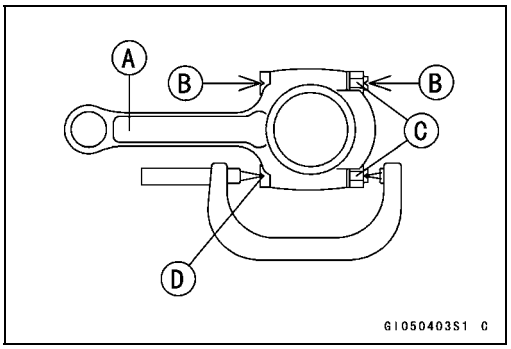
## Crankshaft and Connecting Rods




- Install new bolts and nuts in reused connecting rod.

★If the connecting rod assy was replaced, use the bolts and nuts attached to the new connecting rod assy.

- Apply a small amount of molybdenum disulfide oil solution to the following portions.
  Threads [A] of Nuts and Bolts
  Seating Surfaces [B] of Nuts and Connecting Rods




- Dent both bolt head and bolt tip with a punch as shown in the figure.
- Before tightening, use a point micrometer to measure the length of new connecting rod bolts and record the values to find the bolt stretch.
  Connecting Rod [A]
  Dent here with a punch [B].
  Nuts [C]
  Fit micrometer pins into dents [D].
- Tighten the big end nuts until the bolt elongation reaches the length specified as follows.

Bolt Length after tightening – Bolt Length before tightening = Bolt Stretch

**Connecting Rod Bolt Stretch**
**Usable Range: 0.24 ~ 0.34 mm (0.0094 ~ 0.0134 in.)**

- Check the length of the connecting rod bolts.

★If the stretch is more than the usable range, the bolt has stretched too much. An overelongated bolt may break in use.

(2) Rotation Angle Method

★If you do not have a point micrometer, you may tighten the nuts using the “Rotation Angle Method”.

- Be sure to clean the bolts, nuts and connecting rods thoroughly with a high-flash point solvent, because the new connecting rods, bolts and nuts are treated with an anti -rust solution.

**⚠ WARNING**

**Clean the bolts, nuts and connecting rods in a well -ventilated area, and take care that there is no spark or flame anywhere near the working area. This includes any appliance with a pilot light. Because of the danger or highly flammable liquids, do not use gasoline or low-flash point solvents to clean them.**

**CAUTION**

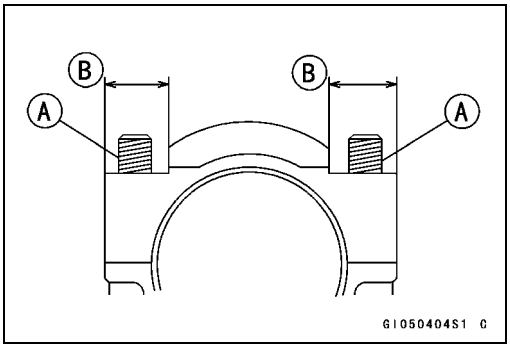
**Immediately dry the bolts and nuts with compressed air after cleaning.**
**Clean and dry the bolts and nuts completely.**

## Crankshaft and Connecting Rods

- Install new bolts and nuts in reused connecting rods.

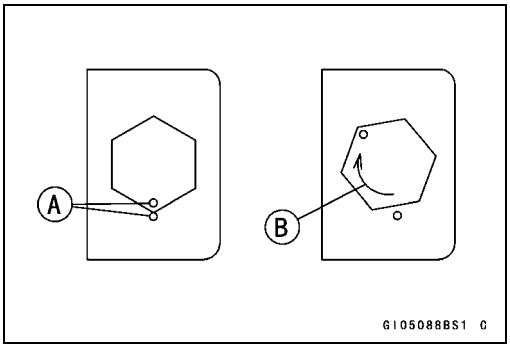
★If the connecting rod assy was replaced, use the bolts and nuts attached to the new connecting rod assy.

- Apply a small amount of molybdenum disulfide oil solution to the following portions.
  Threads [A] of Nuts and Bolts
  Seating Surfaces [B] of Nuts and Connecting Rods




- First, tighten the nuts with **20 N·m (2.0 kgf·m, 15 ft·lb)** of torque.
- Next, tighten the nuts **150°**.

○Mark [A] the connecting rod big end caps and nuts so that nuts can be turned 150° [B] properly.




| Connecting Rod Assy | Bolt | Nut | Torque + Angle N·m (kgf·m, ft·lb) |
|---|---|---|---|
| New | Attached to new con-rod | Attached to new con-rod | 20 (2.0, 15) + 150° |
| | New | New | |
| Used | Replace the bolts with new ones | Replace the nuts with new ones | 20 (2.0, 15) + 150° |

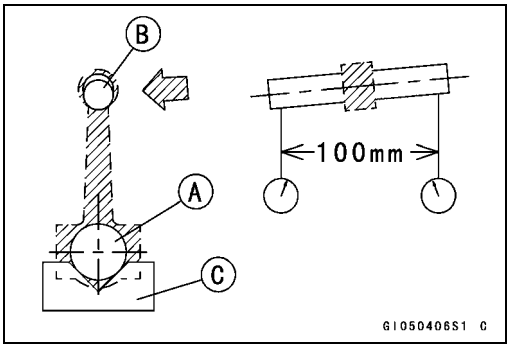
### *Crankshaft/Connecting Rod Cleaning*

- After removing the connecting rods from the crankshaft, clean them with a high-flash point solvent.
- Blow the crankshaft oil passages with compressed air to remove any foreign particles or residue that may have accumulated in the passages.

### *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.

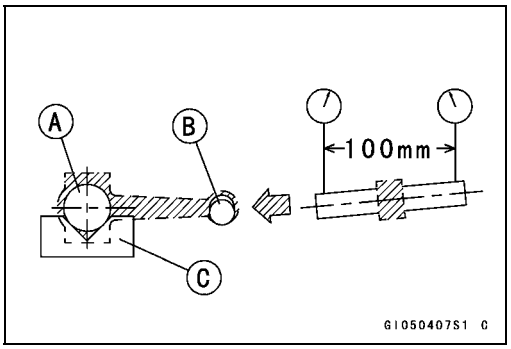
★If connecting rod bend exceeds the service limit, the connecting rod must be replaced.




**Connecting Rod Bend**
**Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)**

## Crankshaft and Connecting Rods

### *Connecting Rod Twist*

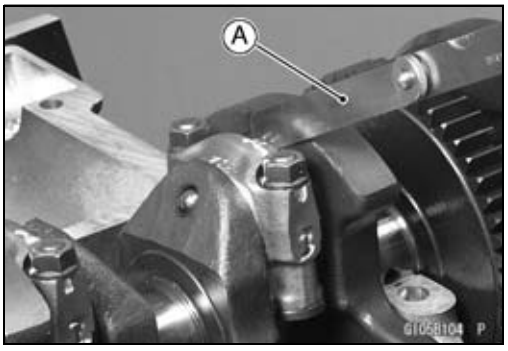



- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being paralleled with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.

★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*



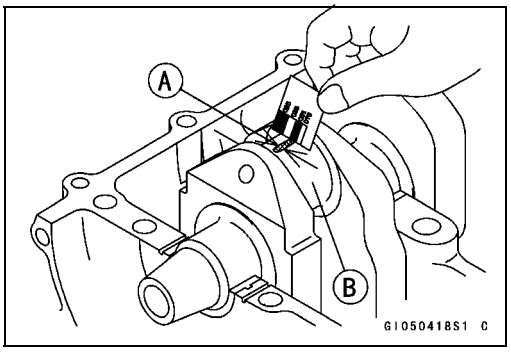

- Measure connecting rod big end side clearance.

○Insert a thickness gauge [A] between the big end and either crank web to determine clearance.

**Connecting Rod Big End Side Clearance**
**Standard: 0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)**
**Service Limit: 0.58 mm (0.023 in.)**

★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.

### *Connecting Rod Big End Bearing Insert/Crankpin Wear*




- Remove the connecting rod big end (see Connecting Rod Removal).
- Cut strips of plastigage to crankpin width. Place a strip on the crankpin parallel to the crankshaft installed in the correct position.
- Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).

**NOTE**

○*Do not move the connecting rod and crankshaft during clearance measurement.*

- Remove the connecting rod big end again, measure each clearance between the bearing insert and crankpin [B] using plastigage (press gauge) [A].

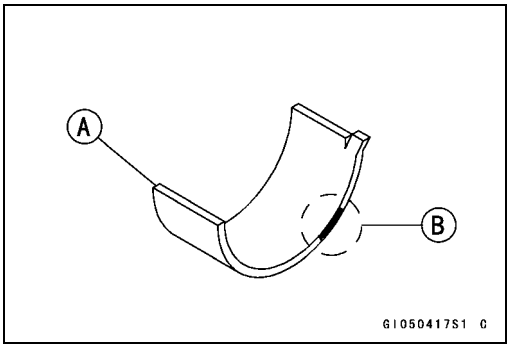
**CAUTION**

**After measurement, replace the connecting rod bolts and nuts.**

**Connecting Rod Big End Bearing Insert/Crankpin Clearance**
**Standard: 0.030 ~ 0.060 mm (0.0012 ~ 0.0024 in.)**
**Service Limit: 0.10 mm (0.0039 in.)**

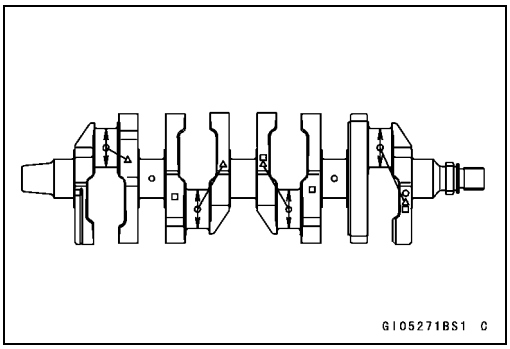
## Crankshaft and Connecting Rods

★If the clearance is within the standard, no bearing replacement is required.
★If the clearance is between 0.061 mm (0.0024 in.) and the service limit (0.10 mm, 0.0039 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/crankpin clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
★If the clearance exceeds the service limit, measure the diameter of the crankpins.




**Crankpin Diameter**
**Standard: 34.484 ~ 34.500 mm (1.3576 ~ 1.3583 in.)**
**Service Limit: 34.47 mm (1.3571 in.)**

★If any crankpin has worn past the service limit, replace 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.



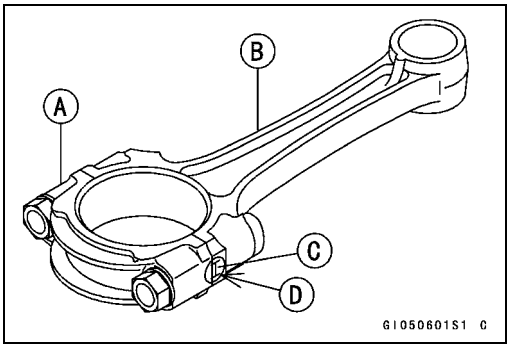

**Crankpin Diameter Marks**
**None 34.484 ~ 34.492 mm (1.3576 ~ 1.3579 in.)**
**○ 34.493 ~ 34.500 mm (1.3580 ~ 1.3583 in.)**
△: Crankpin Diameter Marks, "○" or no mark.

● Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.
● Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).

**NOTE**
○*The mark already on the big end should almost coincide with the measurement.*

**Connecting Rod Big End Inside Diameter Marks**
**None 37.500 ~ 37.508 mm (1.4764 ~ 1.4766 in.)**
**○ 37.509 ~ 37.516 mm (1.4767 ~ 1.4770 in.)**

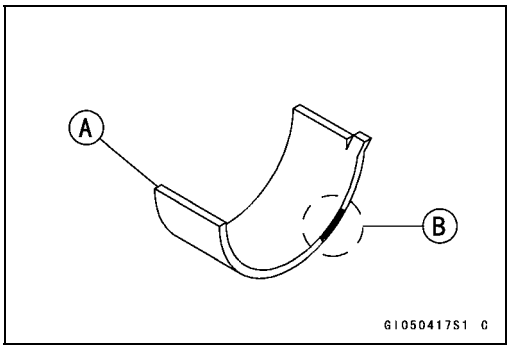
Big End Cap [A]
Connecting Rod [B]
Weight Mark, Alphabet [C]
Diameter Mark (Around Weight Mark) [D]: "○" or no mark



## Crankshaft and Connecting Rods

● Select the proper bearing insert [A] in accordance with the combination of the connecting rod and crankshaft coding.
Size Color [B]

| Con-rod Big End Inside Diameter Marking | Crankpin Diameter Marking | Bearing Insert | |
|---|---|---|---|
| | | Size Color | Part Number |
| None | ○ | Brown | 92139-0124 |
| None | None | Black | 92139-0123 |
| ○ | ○ | | |
| ○ | None | Blue | 92139-0122 |



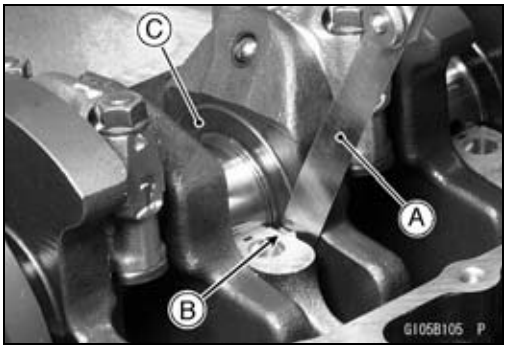

● Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.

### *Crankshaft Side Clearance*

● Insert a thickness gauge [A] between the thrust washer [B] on the crankcase and the crank web [C] at the #3 main journal to determine clearance.

★If the clearance exceeds the service limit, replace the thrust washers as a set and check the width of the crankshaft #3 main journal.

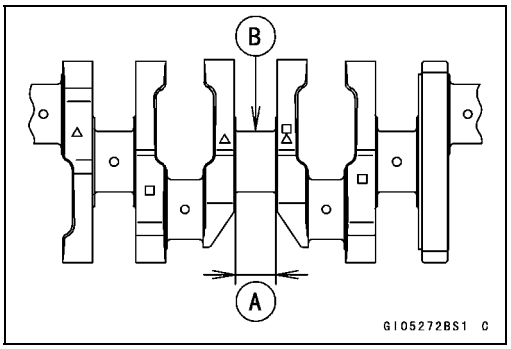
**Crankshaft Side Clearance**
**Standard: 0.05 ~ 0.25 mm (0.0020 ~ 0.0098 in.)**
**Service Limit: 0.45 mm (0.0177 in.)**




● Measure the width [A] of the crankshaft #3 main journal [B].

★If the measurement exceeds the standard, replace the crankshaft.

**Crankshaft #3 Main Journal Width**
**Standard: 23.49 ~ 23.54 mm (0.9248 ~ 0.9267 in.)**

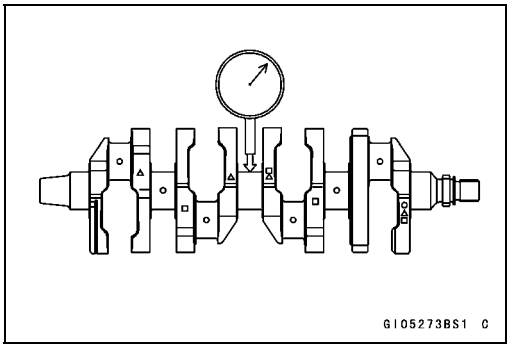



### *Crankshaft Runout*

● Measure the crankshaft runout.

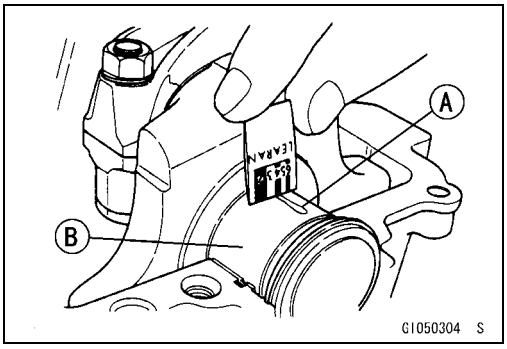
★If the measurement exceeds the service limit, replace the crankshaft.

**Crankshaft Runout**
**Standard: TIR 0.02 mm (0.0008 in.) or less**
**Service Limit: TIR 0.05 mm (0.0020 in.)**



## Crankshaft and Connecting Rods

### *Crankshaft Main Bearing Insert/Journal Wear*




- Split the crankcase (see Crankcase Splitting).
- Cut strips of plastigage to journal width. Place a strip on each journal parallel to the crankshaft installed in the correct position.
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).

**NOTE**

○*Do not turn the crankshaft during clearance measurement.*

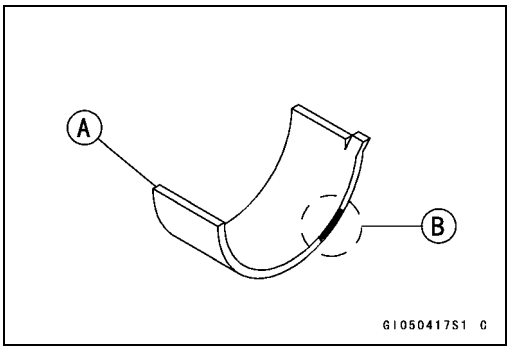
○*Journal clearance less than 0.025 mm (0.00098 in.) can not be measured by plastigage, however, using genuine parts maintains the minimum standard clearance.*

- Split the crankcase again, measure each clearance between the bearing insert and journal [B] using plastigage (press gauge) [A].

**Crankshaft Main Bearing Insert/Journal Clearance**

**Standard: 0.010 ~ 0.034 mm (0.0004 ~ 0.0013 in.)**

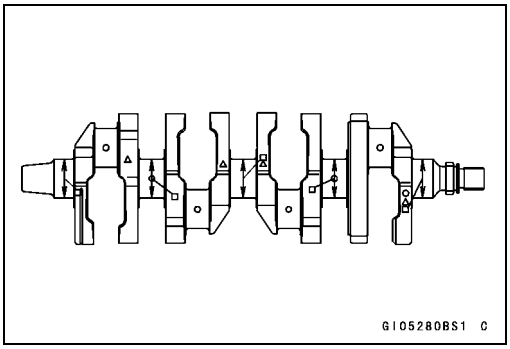
**Service Limit: 0.06 mm (0.0024 in.)**




★If the clearance is within the standard, no bearing replacement is required.

★If the clearance is between 0.035 mm (0.0014 in.) and the service limit (0.06 mm, 0.0024 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/journal clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.

★If the clearance exceeds the service limit, measure the diameter of the crankshaft main journal.




**Crankshaft Main Journal Diameter**

**Standard: 34.984 ~ 35.000 mm (1.3773 ~ 1.3780 in.)**

**Service Limit: 34.96 mm (1.3764 in.)**

★If any journal has worn past the service limit, replace the crankshaft with a new one.

★If the measured 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.

**Crankshaft Main Journal Diameter Marks**

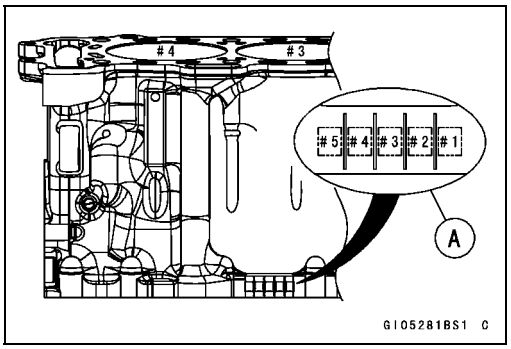
**None 34.984 ~ 34.992 mm (1.3773 ~ 1.3776 in.)**

**1 34.993 ~ 35.000 mm (1.3777 ~ 1.3780 in.)**

□: Crankshaft Main Journal Diameter Marks, “1” or no mark.

## Crankshaft and Connecting Rods

- Measure the main bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.
  [A]: Crankcase Main Bearing Inside Diameter Marks, "○" mark or no mark.
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).




**NOTE**

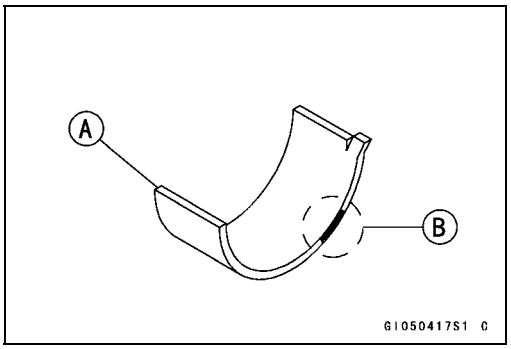
○*The mark already on the upper crankcase half should almost coincide with the measurement.*

**Crankcase Main Bearing Inside Diameter Marks**

**○ 38.000 ~ 38.008 mm (1.4961 ~ 1.4963 in.)**

**None 38.009 ~ 38.016 mm (1.4964 ~ 1.4967 in.)**

- Select the proper bearing insert [A] in accordance with the combination of the crankcase and crankshaft coding.
  Size Color [B]




| Crankcase Main Bearing Inside Diameter Marking | Crankshaft Main Journal Diameter Marking | Bearing Insert* | | |
|---|---|---|---|---|
| | | Size Color | Part Number | Journal Nos. |
| ○ | 1 | Brown | 92139-0034 | 2, 4 |
| | | | 92139-0219 | 1, 3, 5 |
| None | 1 | Black | 92139-0033 | 2, 4 |
| ○ | None | | 92139-0218 | 1, 3, 5 |
| None | None | Blue | 92139-0032 | 2, 4 |
| | | | 92139-0217 | 1, 3, 5 |

*: The bearing inserts for Nos. 2 and 4 journals have an oil groove, respectively.

- Install the new inserts in the crankcase halves and check insert/journal clearance with the plastigage.

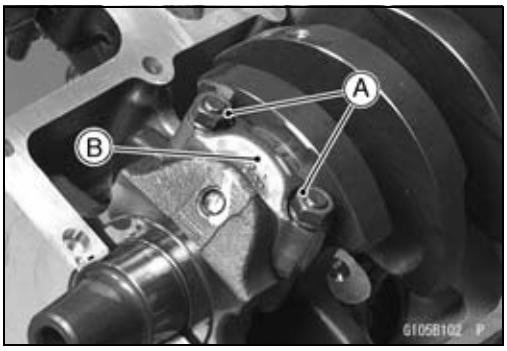
## Pistons

### *Piston Removal*

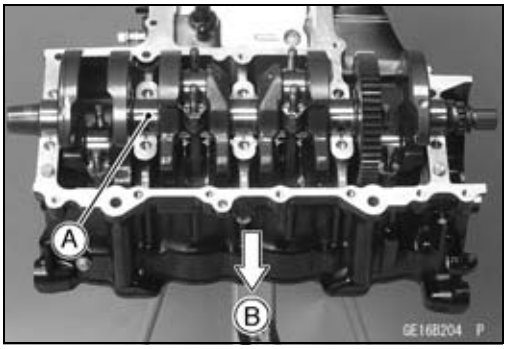
- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod nuts [A] and big end caps [B].

**NOTE**

○*Mark and record the locations of the connecting rods and their big end caps so that they can be reassembled in their original positions.*




- Remove:
  Camshaft Chain (see Camshaft Chain Removal in the engine Top End chapter)
  Crankshaft [A]
- Remove the connecting rods with pistons to the cylinder head side [B].

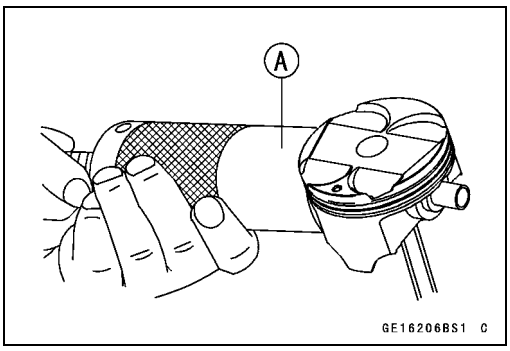



- Remove the piston pin snap rings [A].

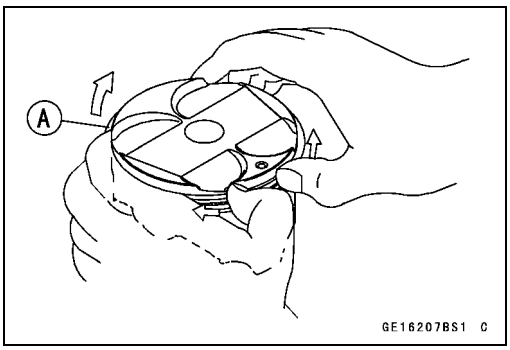

- Using the piston pin puller assembly [A], remove the piston pins.

  **Special Tool - Piston Pin Puller Assembly: 57001-910**

- Remove the pistons from the connecting rods.

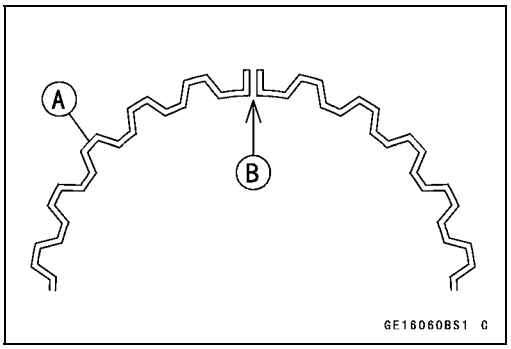



- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



## Pistons

### *Piston Installation*



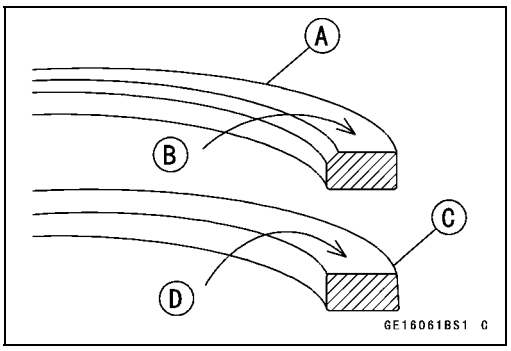

- Apply molybdenum disulfide oil solution to the oil ring expander, and install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Apply molybdenum disulfide oil solution to the oil ring steel rails, and install the oil ring steel rails, one above the expander and one below it.

○Spread the rail with your thumbs, but only enough to fit the rail over the piston.

○Release the rail into the bottom piston ring groove.

**NOTE**

○*The oil ring rails have no "top" or "bottom".*

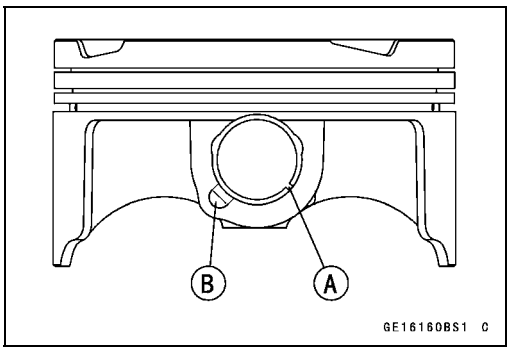



- Apply molybdenum disulfide oil solution to the piston rings.

**NOTE**

○*Do not mix up the top and second 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.




- Apply molybdenum disulfide oil solution to the piston pins and piston journals.

**NOTE**

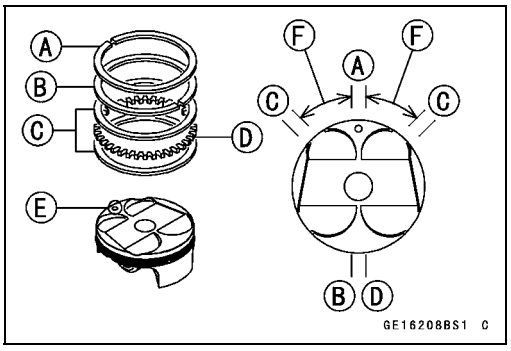
○*If a new piston is used, use new piston ring.*

- 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.

○When installing the piston pin snap ring, compress it only enough to install it and no more.

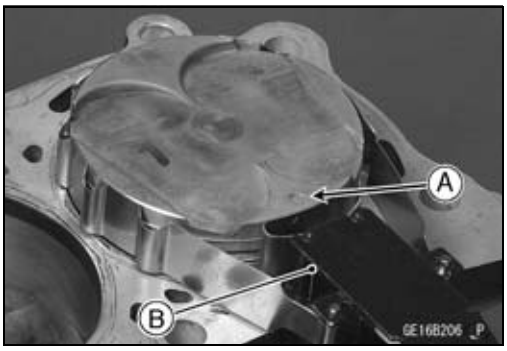
**CAUTION**

**Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.**




- 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]

## Pistons

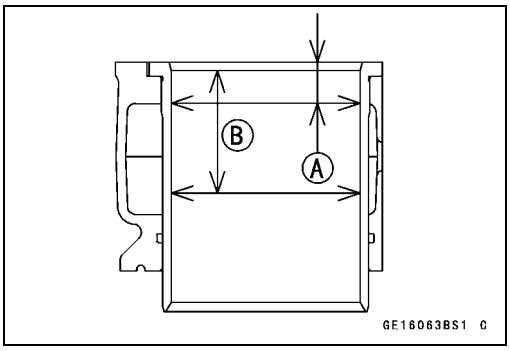



- Apply molybdenum disulfide oil solution to the cylinder bore and piston skirt.
- Install the piston with its marking hollow [A] facing exhaust side.
- Using the piston ring compressor assembly [B] to install the piston from the cylinder head side.

**Special Tools - Piston Ring Compressor Grip: 57001-1095**
**Piston Ring Compressor Belt, $\phi$67 ~ $\phi$79: 57001-1097**

- Install:
  Crankshaft (see Crankshaft Installation)
  Connecting Rod Big End Cap (see Connecting Rod Installation)

### *Cylinder (Upper Crankcase) Wear*

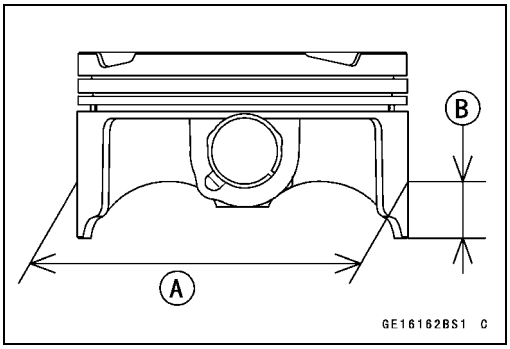



- Since there is a difference in cylinder wear (upper crankcase) in different directions, take a side-to-side and a front-to-back measurement at each of the two locations (total of four measurements) as shown in the figure.

★If any of the cylinder inside diameter measurements exceeds the service limit, replace the crankcase.
10 mm (0.39 in.) [A]
60 mm (2.36 in.) [B]

**Cylinder Inside Diameter**
**Standard: 75.994 ~ 76.006 mm (2.9919 ~ 2.9924 in.)**
**Service Limit: 76.09 mm (2.9957 in.)**

### *Piston Wear*

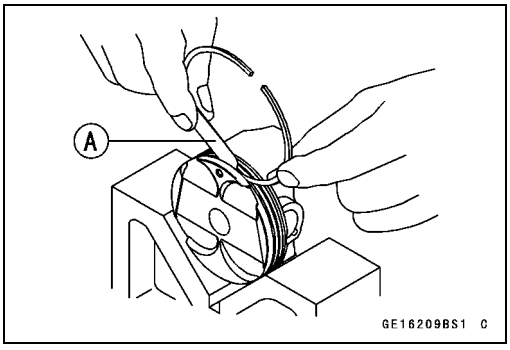



- Measure the outside diameter [A] of each piston 8.5 mm (0.33 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.

★If the measurement is under service limit, replace the piston.

**Piston Diameter**
**Standard: 75.959 ~ 75.974 mm (2.9905 ~ 2.9911 in.)**
**Service Limit: 75.81 mm (2.9846 in.)**

### *Piston Ring, Piston Ring Groove Wear*




- Check for uneven groove wear by inspecting the ring seating.

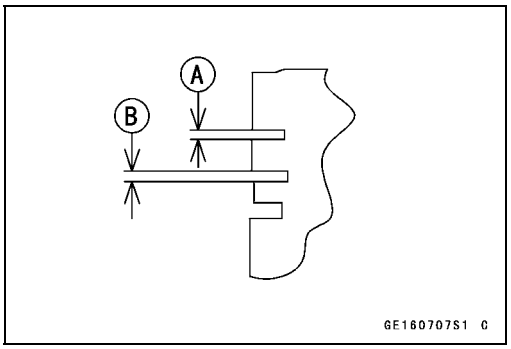
★The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.

- 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**
**Standard:**
**Top 0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)**
**Second 0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)**
**Service Limit:**
**Top 0.17 mm (0.0067 in.)**
**Second 0.17 mm (0.0067 in.)**

## Pistons

### *Piston Ring Groove Width*




● Measure the piston ring groove width.

○Use a vernier caliper at several points around the piston.

**Piston Ring Groove Width**

**Standard:**

**Top [A] 0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)**

**Second [B] 0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)**

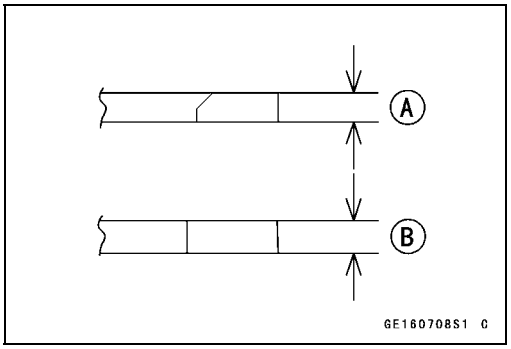
**Service Limit:**

**Top [A] 0.92 mm (0.036 in.)**

**Second [B] 0.92 mm (0.036 in.)**

★If the width of any of the two grooves is wider than the service limit at any point, replace the piston.

### *Piston Ring Thickness*




● Measure the piston ring thickness.

○Use the micrometer to measure at several points around the ring.

**Piston Ring Thickness**

**Standard:**

**Top [A] 0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)**

**Second [B] 0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)**

**Service Limit:**

**Top [A] 0.70 mm (0.028 in.)**

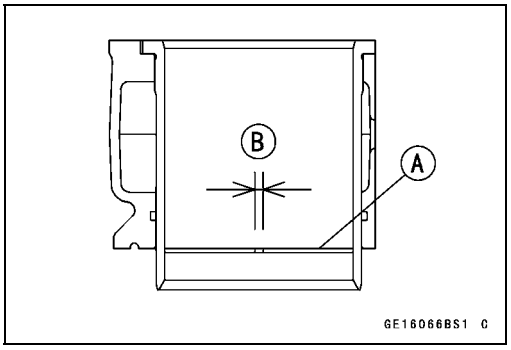
**Second [B] 0.70 mm (0.028 in.)**

★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 uneven 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 (upper crankcase), 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**

**Standard:**

**Top 0.15 ~ 0.30 mm (0.0059 ~ 0.0118 in.)**

**Second 0.30 ~ 0.45 mm (0.0118 ~ 0.0177 in.)**

**Service Limit:**

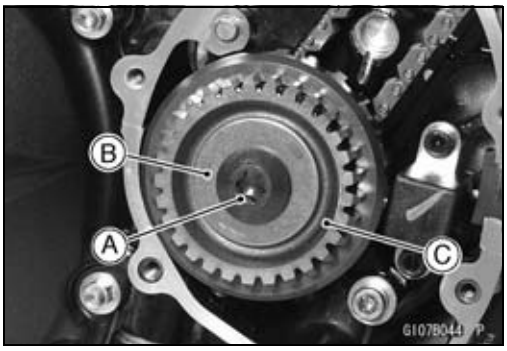
**Top 0.6 mm (0.024 in.)**

**Second 0.8 mm (0.031 in.)**

★If the end gap of either ring is greater than the service limit, replace all the rings.

## Starter Clutch

### *Starter Clutch Removal*



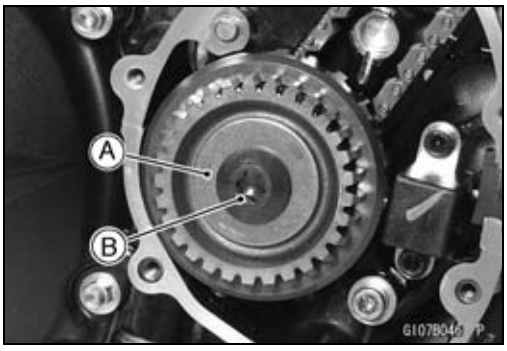

- Remove the starter idle gear (see Starter Idle Gear Removal).
- Unscrew the starter clutch bolt [A] while holding the alternator rotor steady with the rotor holder (see Alternator Rotor Removal in the Electrical System chapter).

**Special Tools - Grip: 57001-1591**
**Rotor Holder: 57001-1666**
**Stopper: 57001-1679**

- Remove:
  Washer [B]
  Starter Clutch [C]

### *Starter Clutch Installation*


- Install the starter clutch [A] while fitting the alignment notch [B] of the splines onto the alignment tooth [C].



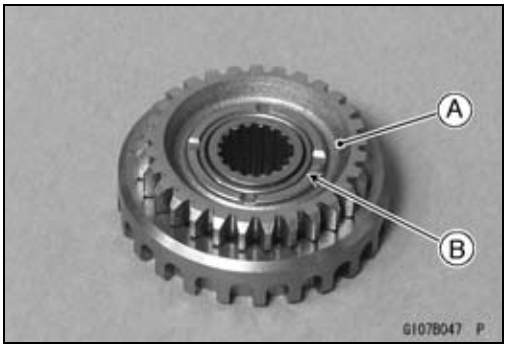

- Install the washer [A].
- Tighten the starter clutch bolt [B] while holding the alternator rotor steady with the rotor holder (see Alternator Rotor Installation in the Electrical System chapter).

**Special Tools - Grip: 57001-1591**
**Rotor Holder: 57001-1666**
**Stopper: 57001-1679**

**Torque - Starter Clutch Bolt: 49 N·m (5.0 kgf·m, 36 ft·lb)**

- Install the removed parts (see appropriate chapters).

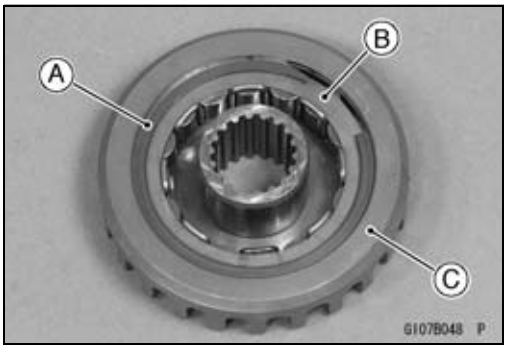
### *Starter Clutch Disassembly*




- Remove the starter clutch (see Starter Clutch Removal).
- Pull the starter clutch gear [A] out of the starter clutch.
- Remove the needle bearing [B].

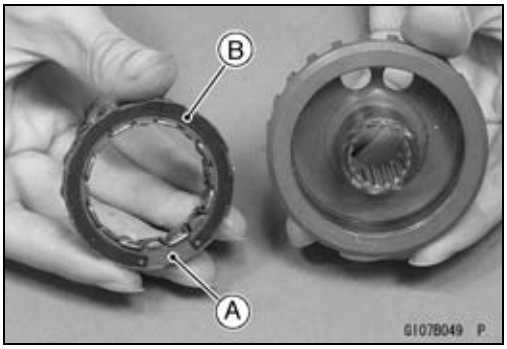
## Starter Clutch

- Remove the snap ring [A].
- Pull the one-way clutch [B] out of the starter clutch case [C].

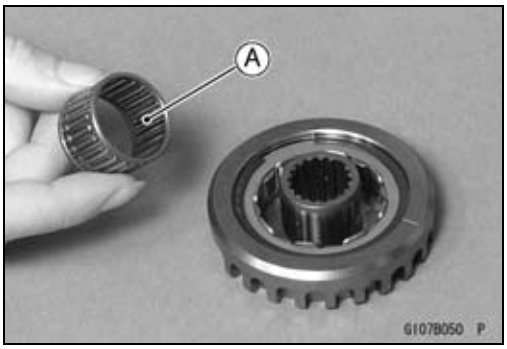



### *Starter Clutch Assembly*

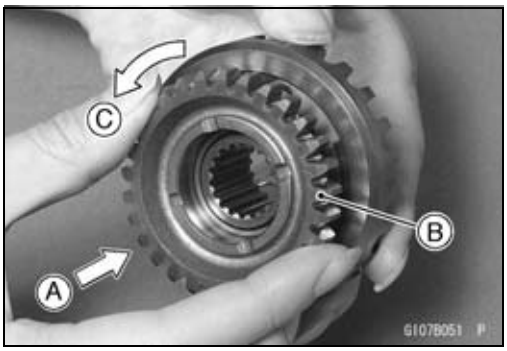
- Install the one-way clutch [A] so that the circlip side [B] faces inside.
- Install the new snap ring.




- Apply molybdenum disulfide oil solution to the needle bearing [A], and install it.



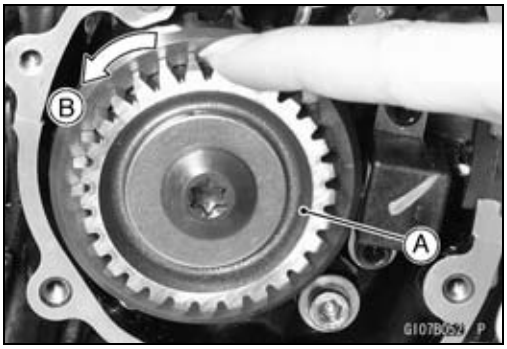

- Push [A] the starter clutch gear [B] in while turning it counterclockwise [C], and install it.




### *Starter Clutch Inspection*

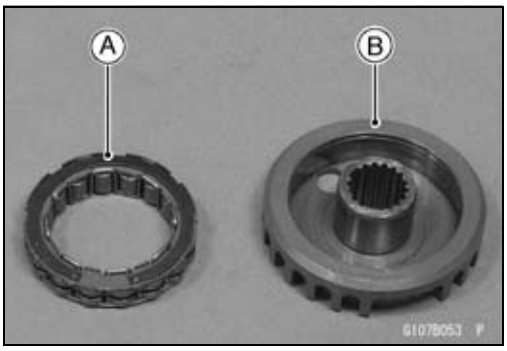
- Remove the starter idle gear (see Starter Idle Gear Removal).
- Turn the starter clutch gear [A] by hand. The starter clutch gear should turn counterclockwise freely [B], but should not turn clockwise.

★If the starter clutch does not operate as it should or if it makes noise, go to the next step.

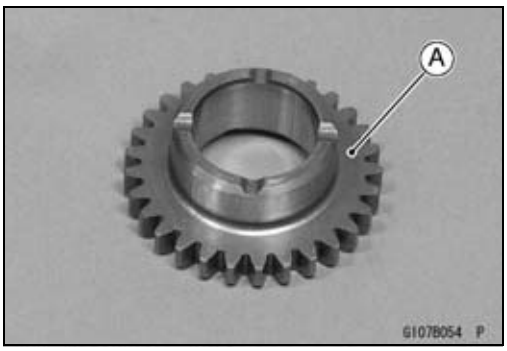


## Starter Clutch

● Disassemble the starter clutch (see Starter Clutch Disassembly), and visually inspect the clutch parts.
One-way Clutch [A]
Starter Clutch Case [B]
★If there is any worn or damaged part, replace it.



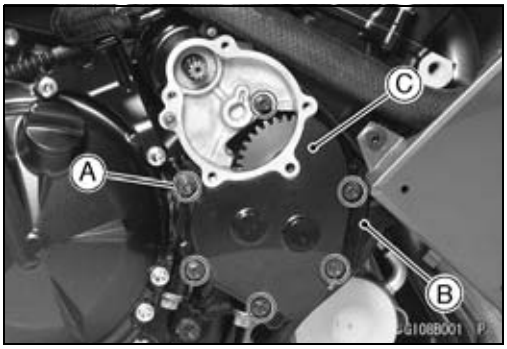

○Examine the starter clutch gear [A] as well. Replace the clutch gear if it is worn or damaged.



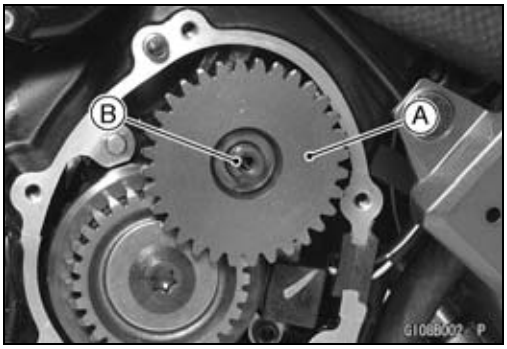
## Starter Idle Gear

### *Starter Idle Gear Removal*

- Remove:
  Torque Limiter (see Torque Limiter Removal)
  Right Lower Fairing (see Right Lower Fairing Removal in the Frame chapter)
  Bolts [A]
  Bracket [B]
  Starter Clutch Cover [C]

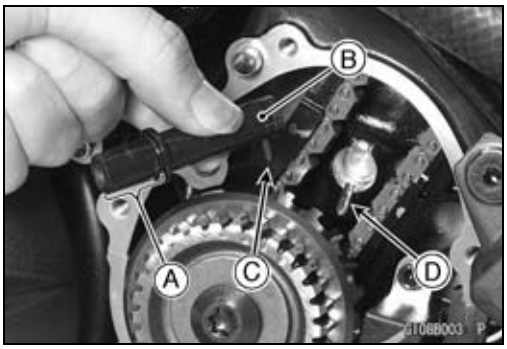



- Pull out the starter idle gear [A] with the shaft [B].



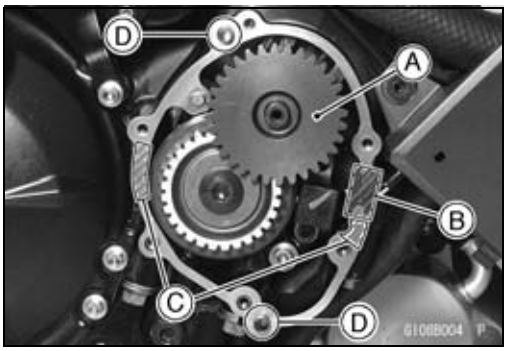

### *Starter Idle Gear Installation*

- Apply molybdenum disulfide grease [A] to the starter idle gear shaft [B].
- Fit the pin [C] into the groove [D] of the crankcase.




- Install the starter idle gear [A] on the shaft.
- Engage the starter idle gear with the starter clutch gear.
- Apply silicone sealant to the following portions.
  Crankshaft Sensor Lead Grommet [B]
  Mating Surfaces [C] of Crankcase

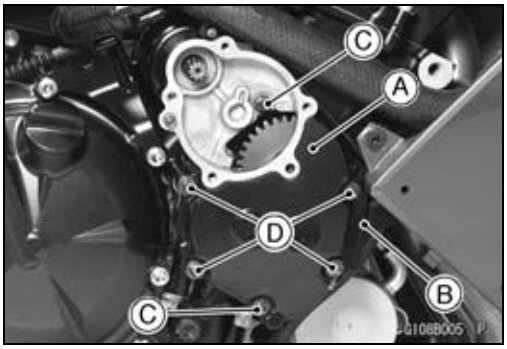
  **Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**
- Install the dowel pins [D].
- Replace the starter clutch cover gasket with a new one.




- Apply grease to the O-rings of the starter motor.
- Install:
  Starter Clutch Cover [A]
  Bracket [B]
- Tighten:

  **Torque - Starter Clutch Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

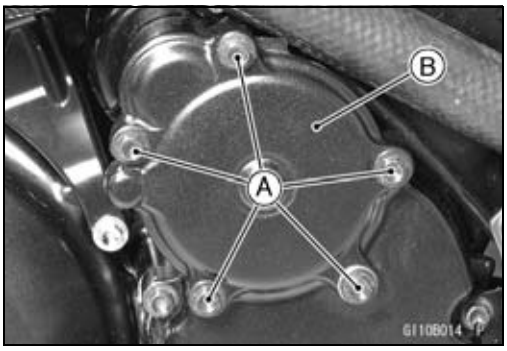
  L = 20 mm (0.79 in.) [C]
  L = 30 mm (1.18 in.) [D]
- Install the removed parts (see appropriate chapters).



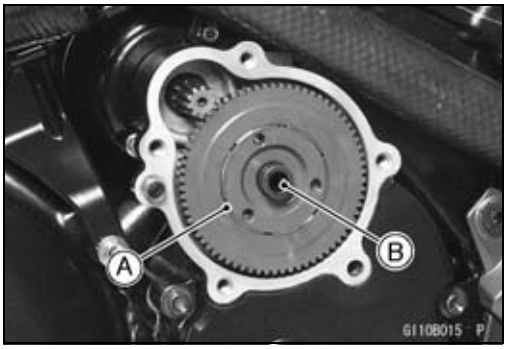
## Torque Limiter

### *Torque Limiter Removal*

- Remove:
  Right Upper Fairing Cover (see Upper Fairing Cover Removal in the Frame chapter)
  Bolts [A]
  Torque Limiter Cover [B]

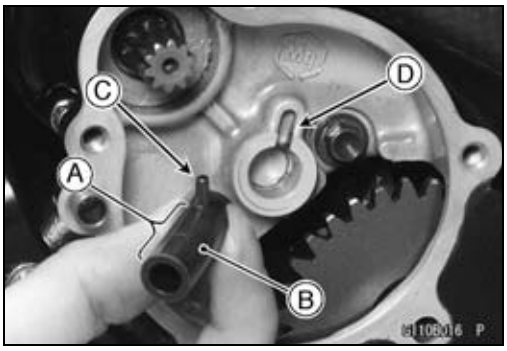



- Pull out the torque limiter [A] with the shaft [B].



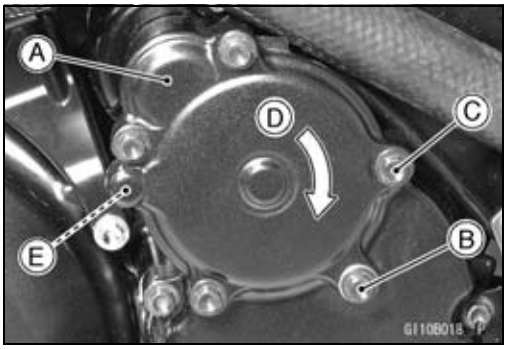

### *Torque Limiter Installation*

- Apply molybdenum disulfide grease [A] to the torque limiter shaft [B].
- Fit the pin [C] into the groove [D] of the starter clutch cover.




- Install the torque limiter [A] on the shaft.
- Engage the torque limiter with the starter motor gear and starter idle gear.
- Install the dowel pin [B].
- Replace the torque limiter cover gasket with a new one.

## Torque Limiter




- Install the torque limiter cover [A].
- Apply a non-permanent locking agent to the threads of the torque limiter cover bolt [B], and install it together with gasket.

○Do not apply a non-permanent locking agent to the other bolts.

- Tighten the torque limiter cover bolts, following the specified sequence.

○First, tighten the cover bolts evenly by hand until the torque limiter cover can be moved a little.

○Do not tighten the cover bolts to the specified torque yet.

○Next, tighten the torque limiter cover bolt [C] with the specified torque while pushing the torque limiter cover lightly clockwise [D] centering on the dowel pin [E].

**Torque - Torque Limiter Cover Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**

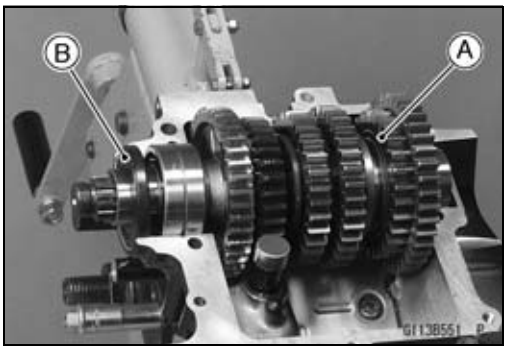
○Lastly, tighten the other bolts evenly with the specified torque.

**Torque - Torque Limiter Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

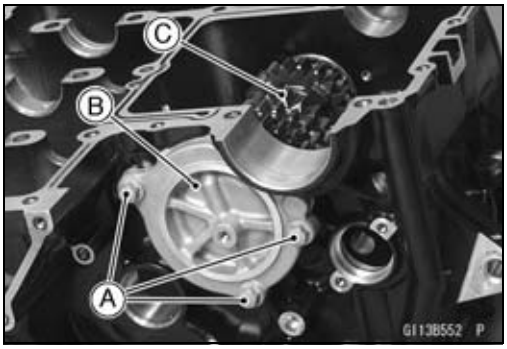
## Transmission

### *Transmission Shaft Removal*

- Split the crankcase (see Crankcase Splitting).
- Remove the output shaft [A] from the upper crankcase half.
- Discard the oil seal [B].



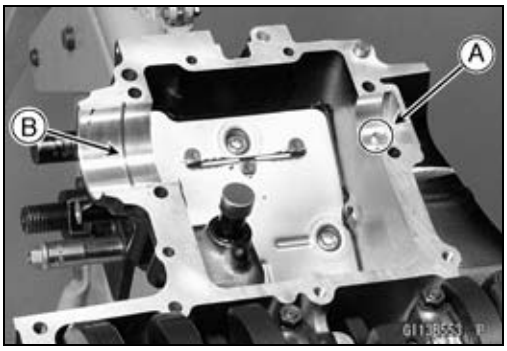

- Remove:
  Water Pump (see Water Pump Removal in the Cooling System chapter)
  Shift Forks (see Shift Drum and Shift Forks Removal)
  Bolts [A]
  Drive Shaft Cover [B]
- Pull out the drive shaft [C] from the lower crankcase half.




### *Transmission Shaft Installation*

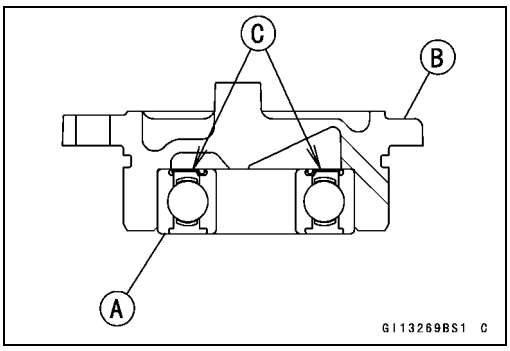
- Be sure that the set pin [A] and set ring [B] are in place.
- Apply engine oil to the sliding surface of the bearings.
- Apply molybdenum disulfide oil solution to the gears.
- Install the output shaft into the upper crankcase half.

○The bearing set pin and ring must match properly with the hole or groove in the bearing outer races. When they are properly matched, there is no clearance between the crankcase and the bearing outer races.



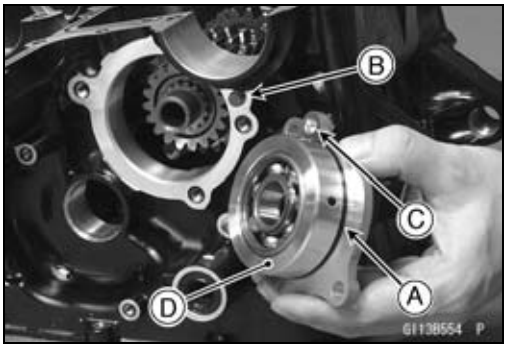

- When the new ball bearing [A] is installed in the drive shaft cover [B], press and insert the new ball bearing so that seal side [C] faces inside.

**Special Tool - Bearing Driver Set: 57001-1129**



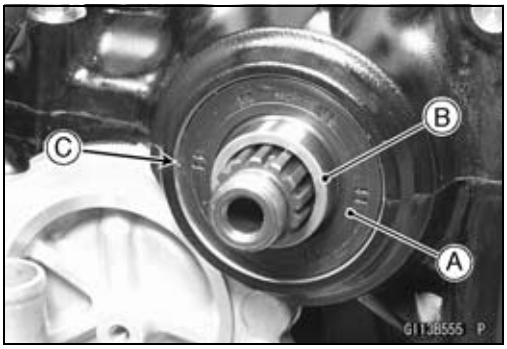

- Apply engine oil to the sliding surface of the bearings.
- Apply molybdenum disulfide oil solution to the gears.
- Install the drive shaft into the lower crankcase half.
- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Install the dowel pin [B].
- Fit the pin of the crankcase into the hole [C] in the drive shaft cover [D].
- Tighten:

**Torque - Drive Shaft Cover Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**



## Transmission

● Assemble the crankcase (see Crankcase Assembly).
● Press in the new oil seal [A] onto collar [B] so that the surface of the oil seal is flush with the counterbore bottom surface [C] of the crankcase.
○Apply high-temperature grease to the oil seal lips.

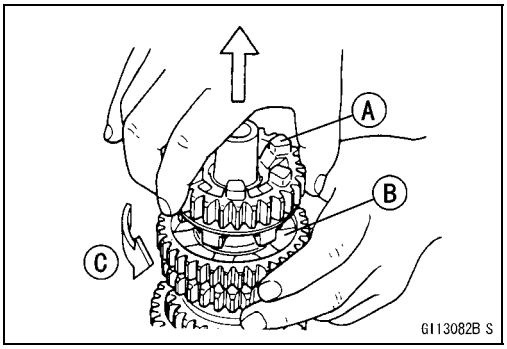



### *Transmission Shaft Disassembly*

● Remove the transmission shafts (see Transmission Shaft Removal).
● Remove the circlips, and then disassemble the transmission shafts.

**Special Tool - Outside Circlip Pliers: 57001-144**

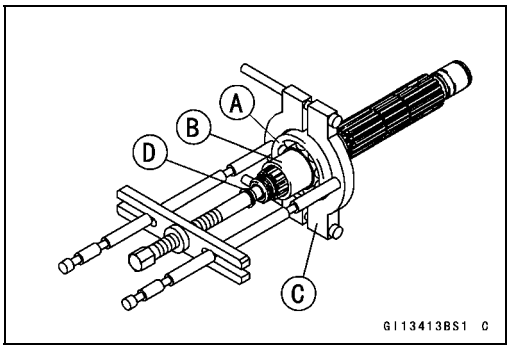
● The 5th gear [A] on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism. Remove the 5th gear.
○Set the output shaft in a vertical position holding the 3rd gear [B].
○Spin the 5th gear quickly [C] and pull it off upward.




● Remove the ball bearing [A] with collar [B] from the output shaft.

**Special Tools - Bearing Puller [C]: 57001-135**
**Bearing Puller Adapter [D]: 57001-317**

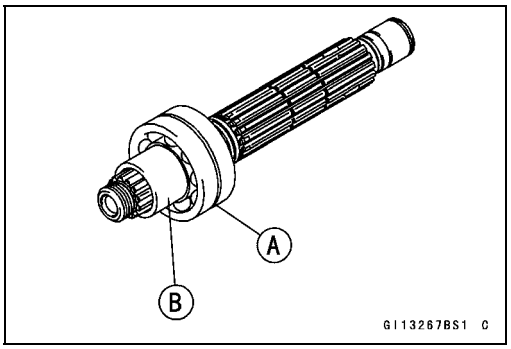
● Discard the bearing.




### *Transmission Shaft Assembly*

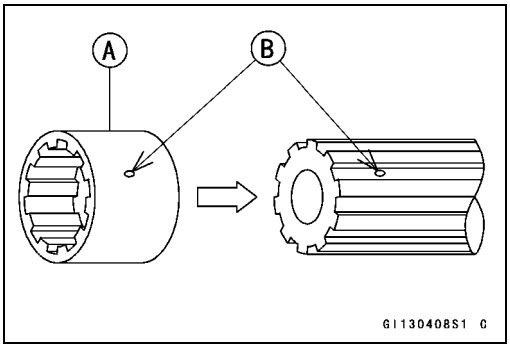
● Install the new ball bearing [A] and collar [B] on the output shaft, using the bearing driver.

**Spacial Tool - Bearing Driver, $\phi$32: 57001-382**

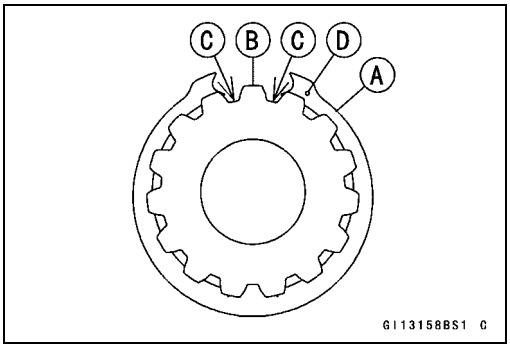


## Transmission

- Apply engine oil to the bushings, ball bearings and shafts.
- Install the gear bushings [A] on the shaft with their holes [B] aligned.



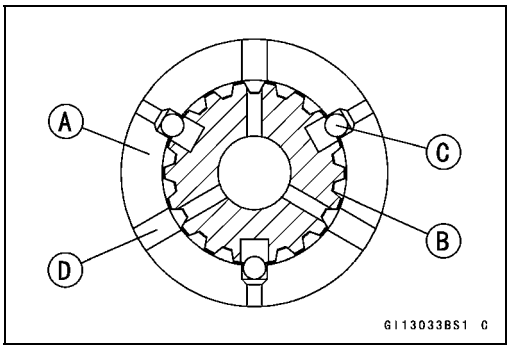

- Replace any circlips removed with new ones.
- Install the circlips [A] so that the opening [B] of it is aligned with spline grooves [C].
- Install the circlips so that the mark [D] on them faces to each gear side.




- 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 3rd/4th gear onto the drive shaft with their oil holes aligned.
- Install the 6th gear 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 5th and 6th gears onto the output shaft with their oil holes aligned.
- Install the 3rd/4th gear bushings onto the output shaft with their oil holes aligned.

## Transmission

- Fit the steel balls into the 5th gear holes in the output shaft, aligning three oil holes [D].
  5th Gear [A]
  Output Shaft [B]
  Steel Balls [C]



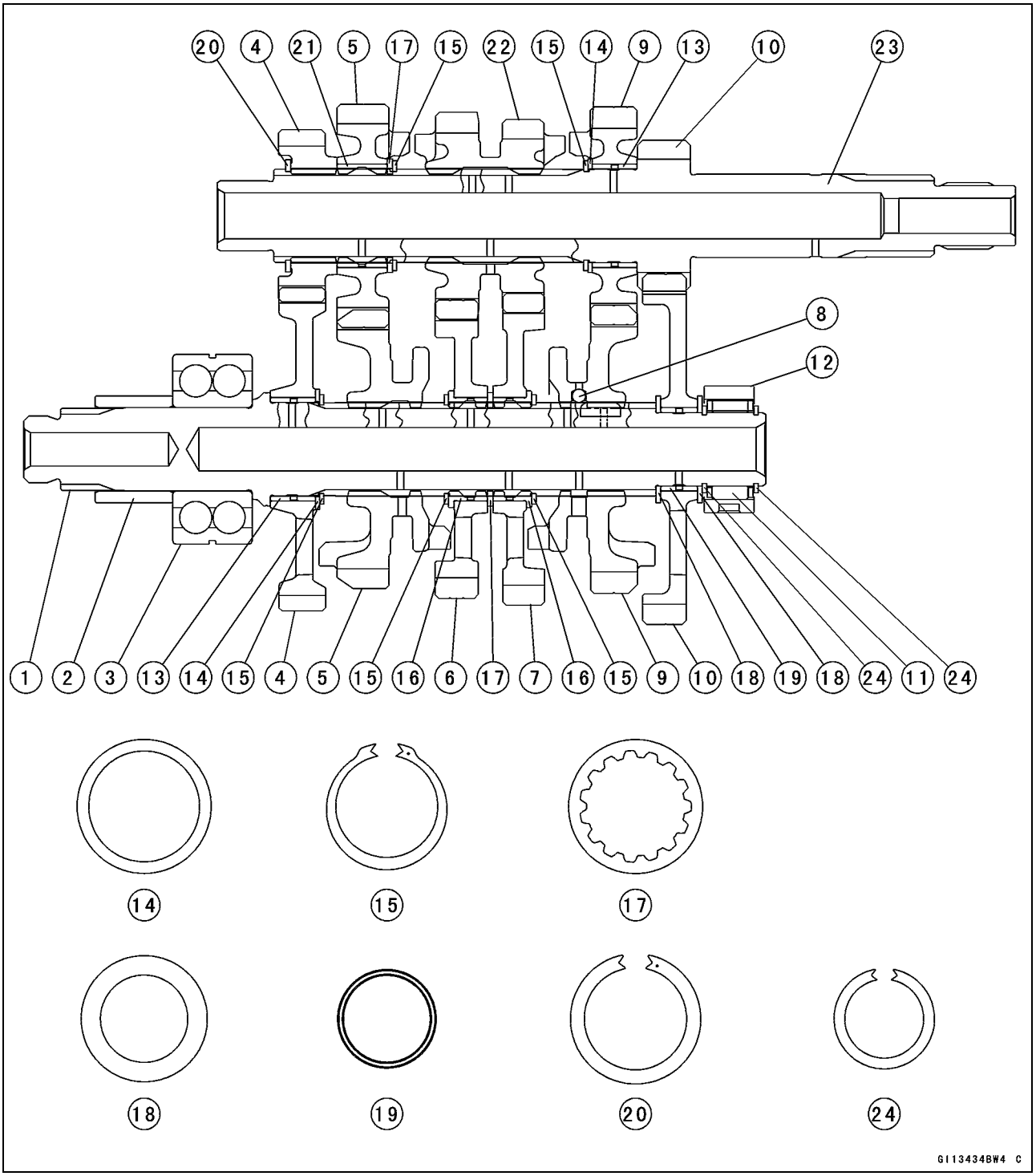

**CAUTION**

**Do not apply grease to the balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.**

○After assembling the 5th gear with steel balls in place on the output shaft, check the ball-locking effect that the 5th gear does not come out of the output shaft when moving it up and down by hand.

- Check that each gear spins or slides freely on the transmission shafts without binding after assembly.

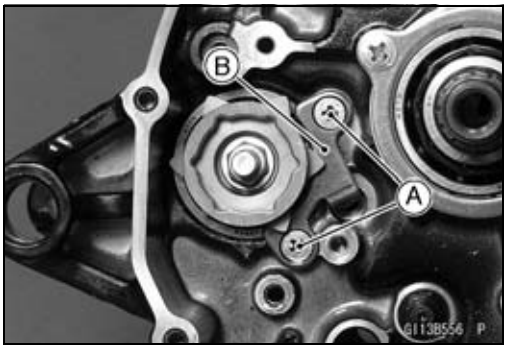
## Transmission



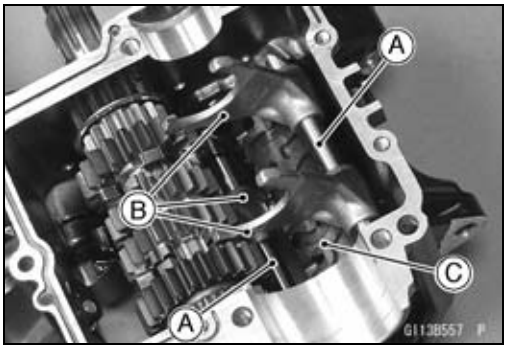

1. Output Shaft
2. Collar
3. Ball Bearing
4. 2nd Gear
5. 6th (Top) Gear
6. 4th Gear
7. 3rd Gear
8. Steel Ball
9. 5th Gear
10. 1st Gear
11. Needle Bearing
12. Bearing Outer Race
13. Bushing
14. Thrust Washer, $\phi$34 mm (1.34 in.)
15. Circlip
16. Bushing
17. Toothed Washer, $\phi$34 mm (1.34 in.)
18. Thrust Washer, $\phi$32 mm (1.26 in.)
19. Bushing
20. Circlip
21. Bushing
22. 3rd/4th Gear
23. Drive Shaft
24. Circlip

## Transmission

### *Shift Drum and Fork Removal*

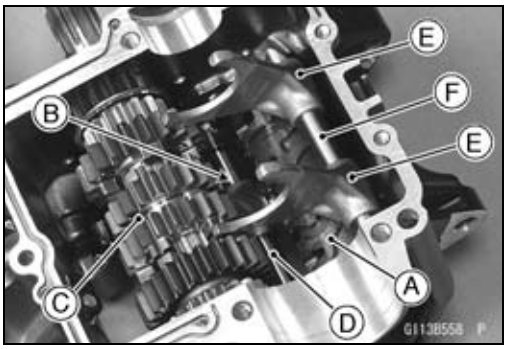



- Split the crankcase (see Crankcase Splitting).
- Remove:
  Gear Position Switch (see Gear Position Switch Removal in the Electrical System chapter)
  Screws [A]
  Shift Drum Bearing Holder [B]




- Pull out the shift rods [A], and take off the shift forks [B].
- Pull out the shift drum [C].

### *Shift Drum and Fork Installation*




- Apply engine oil to the shift drum, forks and rods.
- Install the shift drum [A].
- Install the fork [B] of the shortest ears on the drive shaft as follows.

○Fit the ears on the groove of the 3rd/4th gear [C] and place the pin in the center groove in the shift drum.

- Insert the rod (shorter side) [D].
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder screw, and tighten them.

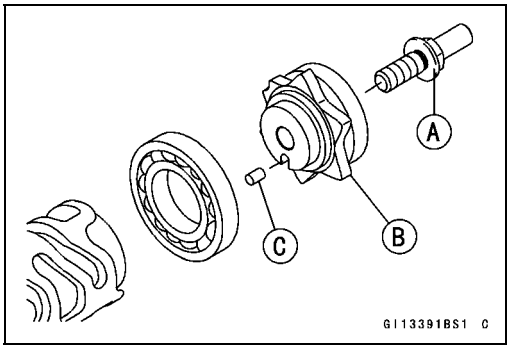
**Torque - Shift Drum Bearing Holder Screws: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

- Install the two forks [E] as shown in the figure, and place the pins in the grooves on both sides in the shift drum.

○The two forks on the output shaft are identical.

- Insert the rod (longer side) [F].

### *Shift Drum Disassembly*




- Remove the shift drum (see Shift Drum and Fork Removal).
- While holding the shift drum with a vise, remove the shift drum cam bolt [A].
- Remove:
  Shift Drum Cam [B]
  Dowel Pin [C]

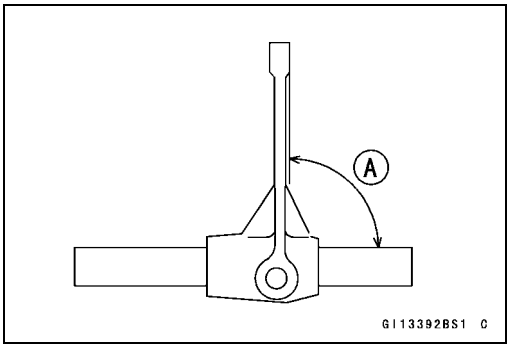
### *Shift Drum Assembly*

- Be sure to install the dowel pin.
- Apply a non-permanent locking agent to the threads of the shift drum cam bolt, and tighten it.

**Torque - Shift Drum Cam Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)**

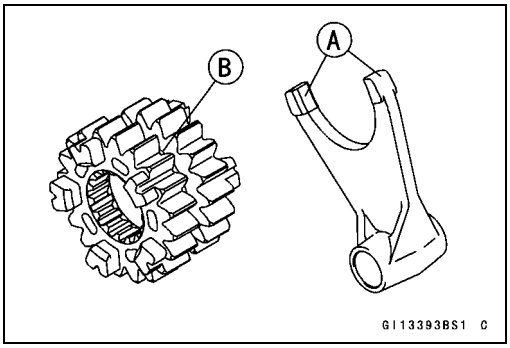
## Transmission

### *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.

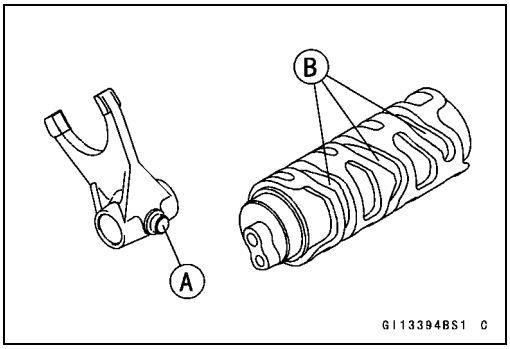
★If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

**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.

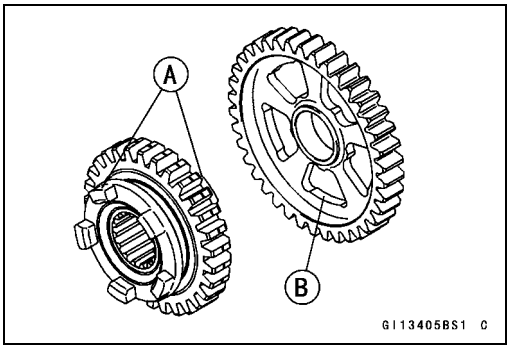
★If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

**Shift Fork Guide Pin Diameter**
**Standard: 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)**
**Service Limit: 5.8 mm (0.228 in.)**

★If any shift drum groove is worn over the service limit, the drum must be replaced.

**Shift Drum Groove Width**
**Standard: 6.05 ~ 6.20 mm (0.238 ~ 0.244 in.)**
**Service Limit: 6.3 mm (0.248 in.)**

### *Gear Dog and Gear Dog Hole Damage*

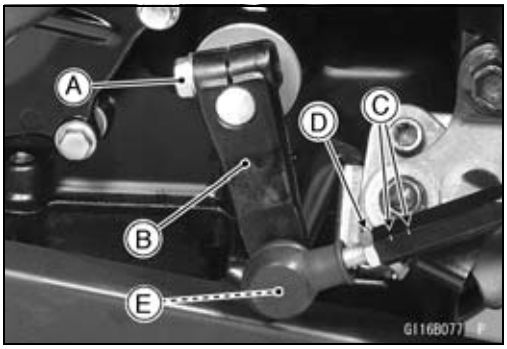



- Visually inspect the gear dogs [A] and gear dog holes [B].

★Replace any damaged gears or gears with excessively worn dogs or dog holes.

## External Shift Mechanism

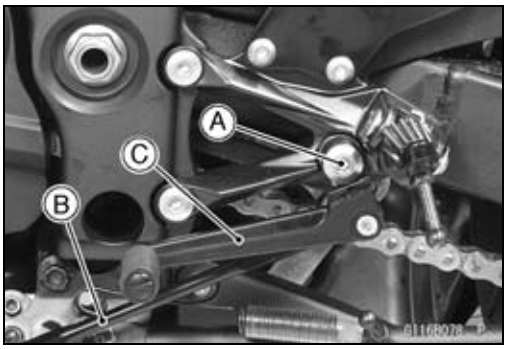
### *Shift Pedal Removal*




- Remove:
  Shift Lever Bolt [A]
  Shift Lever [B]

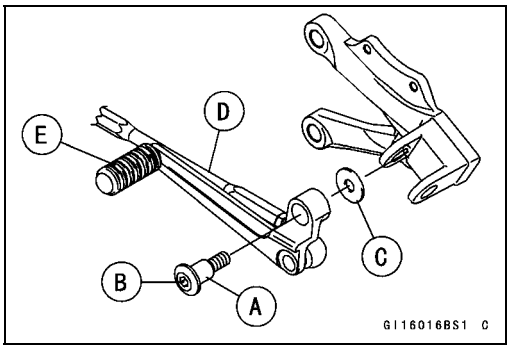
★If the tie-rod is removed from the shift pedal and shift lever, note the following.

○The following portions have left-hand threads.
  Shift Lever Side of Tie-Rod (The shift lever side of the tie-rod has the grooves [C].)
  Locknut [D] of Shift Lever Side
  Ball Joint [E] of Shift Lever



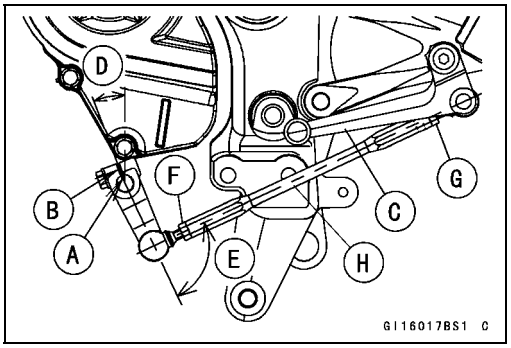

- Remove:
  Shift Pedal Mounting Bolt [A]
  Tie-Rod [B] and Shift Pedal [C]

### *Shift Pedal Installation*




- Apply grease to the sliding surface [A] on the sift pedal mounting bolt [B].
- Apply a non-permanent locking agent to the thread of the shift pedal mounting bolt.
- Install:
  Washer [C]
  Tie-Rod [D] and Shift Pedal [E]
- Tighten:

**Torque - Shift Pedal Mounting Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**




- Align the punch mark [A] on the shift shaft with the slit [B] of the shift lever.
- Tighten:

**Torque - Shift Lever Bolt: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

- After installation, confirm that the shift pedal [C] is positioned as shown in the figure.
  About 20.8° [D]
  About 90° [E]

★If the pedal position is different, adjust it as follows.

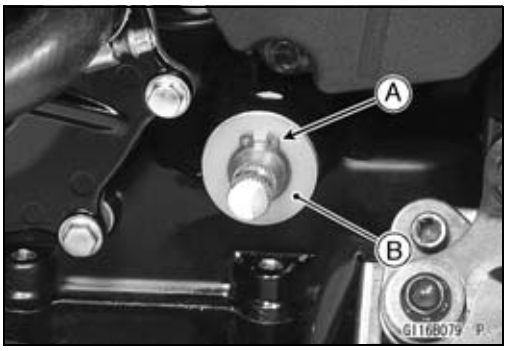
○To adjust the pedal position, loosen the front locknut [F] (left-hand threads) and rear locknut [G], and then turn the tie-rod [H].

○Tighten:

**Torque - Tie-Rod Locknuts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**

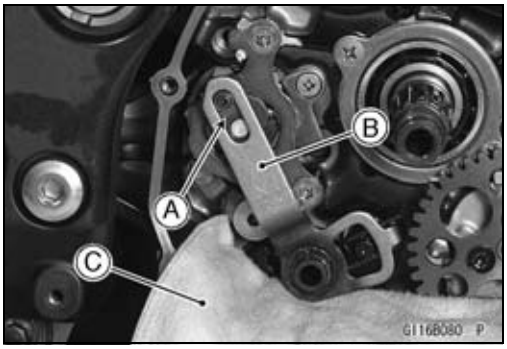
## External Shift Mechanism

### *External Shift Mechanism Removal*



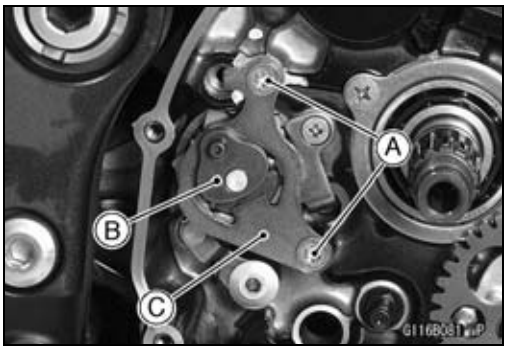

- Remove:
  Shift Lever (see Shift Pedal Removal)
  Clutch (see Clutch Removal in the Clutch chapter)
  Circlip [A]
  Washer [B]

**Special Tool - Outside Circlip Pliers: 57001-144**



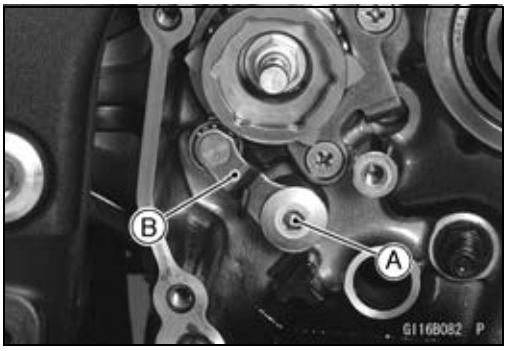

- Remove the shift shaft assembly, collar [A] while pulling out the shift mechanism arm [B].

○Stuff the cloth [C] on the hole of the crankcase so that the collar does not drop into the crankcase bottom.



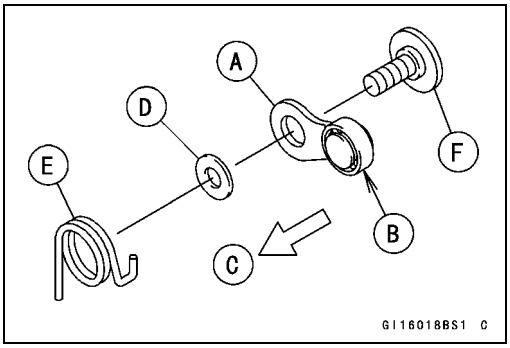

- Remove the shift ratchet assembly holder bolts [A].
- Take off the shift ratchet assembly [B] together with the holder [C].

○Pull out the shift ratchet assembly from the shift drum cam.




- Remove:
  Gear Positioning Lever Bolt [A]
  Gear Positioning Lever [B]
  Washer and Spring

### *External Shift Mechanism Installation*

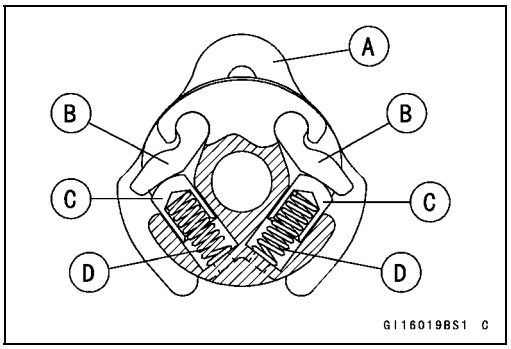



- Install the gear positioning lever [A] so that the bearing [B] faces inside [C].
- Install:
  Washer [D]
  Spring [E]
- Tighten:

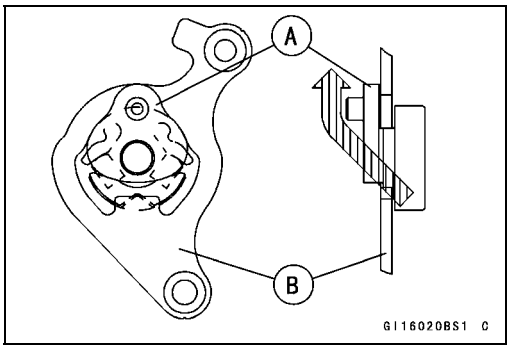
**Torque - Gear Positioning Lever Bolt [F]: 12 N·m (1.2 kgf·m, 106 in·lb)**

## External Shift Mechanism

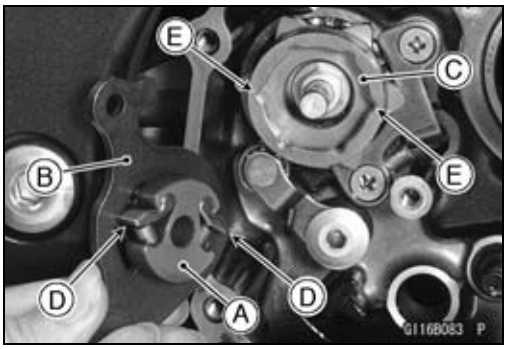
★If the shift ratchet assembly was disassembled, assemble it as shown in the figure.
Ratchet [A]
Pawls [B]
Pins [C]
Springs [D]




● Install the shift ratchet assembly [A] on the holder [B] as shown in the figure.

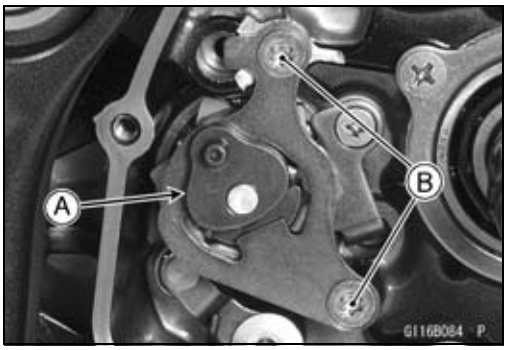



● Install the shift ratchet assembly [A] together with the holder [B] on the shift drum cam [C].
○Insert the pawls [D] into the grooves [E] on the shift drum cam.

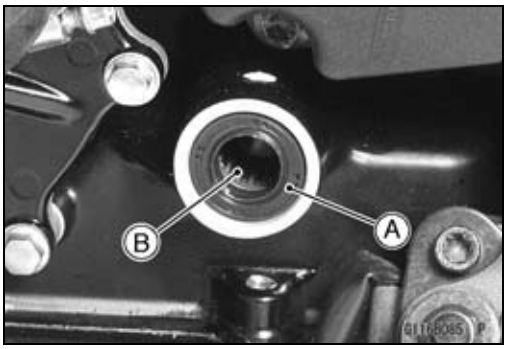



● Set the shift ratchet assembly [A] as shown in the figure.
○Turn the shift ratchet assembly while pushing the pawls.
● Apply a non-permanent locking agent to the shift ratchet assembly holder bolts [B], and tighten them.

**Torque - Shift Ratchet Assembly Holder Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**

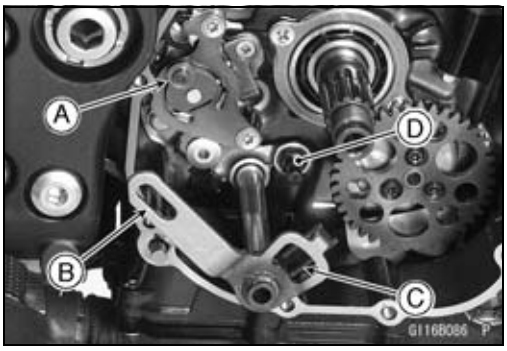



● Apply grease to the lips of the grease seal [A].
● Apply engine oil to the needle bearing [B].



## External Shift Mechanism

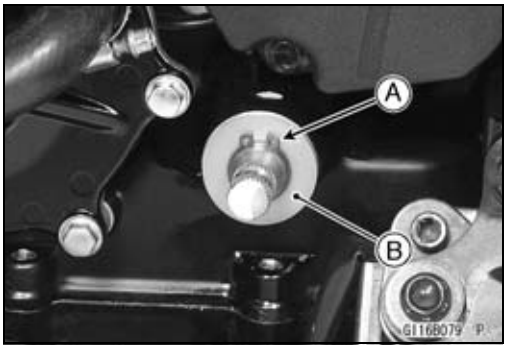
- Install the collar [A] on the shift ratchet assembly.
- Install the shift shaft assembly so that the groove [B] and return spring [C] align with the collar and shift shaft return spring pin [D].




- Replace the circlip [A] with a new one.
- Install:
  Washer [B]
  Circlip

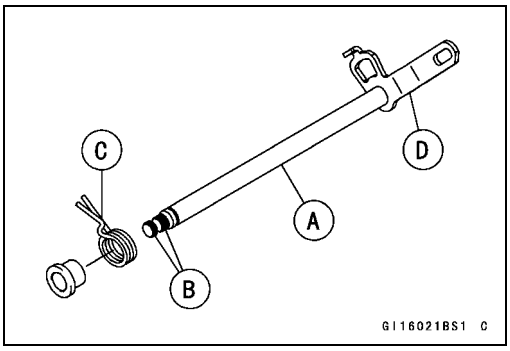
**Special Tool - Outside Circlip Pliers: 57001-144**

○Fit the circlip into the groove of the shift shaft securely.

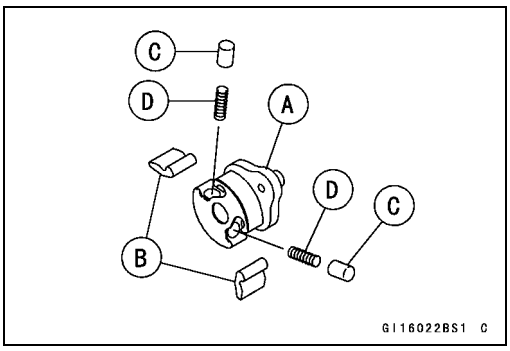



### *External Shift Mechanism Inspection*

- Examine the shift shaft [A] for any damage.
★If the shaft is bent, straighten or replace it.
★If the serration [B] are damaged, replace the shaft.
★If the spring [C] is damaged in any way, replace it.
★If the shift mechanism arm [D] is damaged in any way, replace the shaft.



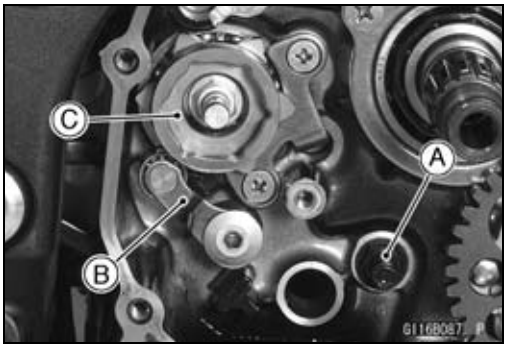

- Check the shift ratchet assembly for any damage.
★If the ratchet [A], pawls [B], pins [C] or springs [D] are damaged in any way, replace them.




- 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 (3.0 kgf·m, 21 ft·lb)**

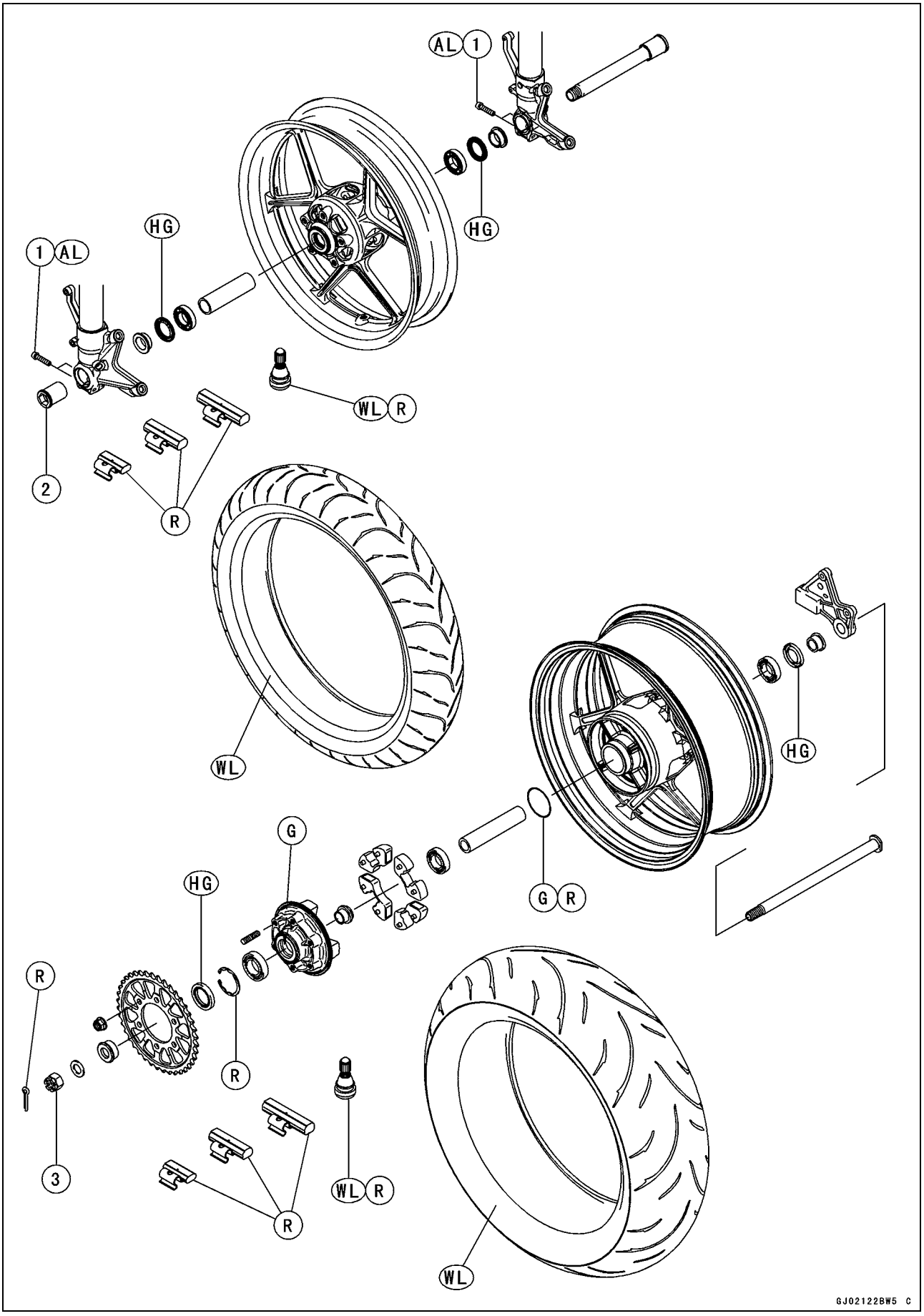
- Check the gear positioning lever [B] and its spring for breaks or distortion.
★If the lever or spring are damaged in any way, replace them.
- Visually inspect the shift drum cam [C].
★If they are badly worn or if they show any damage, replace it.



# Wheels/Tires

## Table of Contents

## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Front Axle Clamp Bolts | 20 | 2.0 | 15 | AL |
| 2 | Front Axle Nut | 127 | 13.0 | 94 | |
| 3 | Rear Axle Nut | 108 | 11.0 | 80 | |

AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
HG: Apply high-temperature grease.
R: Replacement Parts
WL: Apply soap and water solution or rubber lubricant.

## Specifications

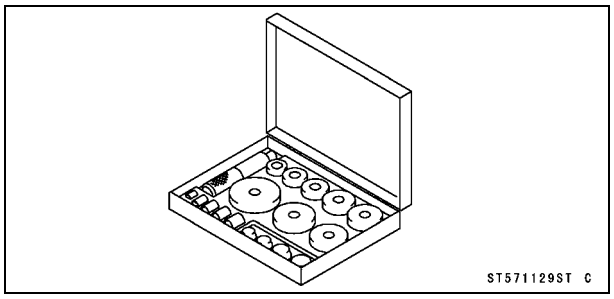
| Item | Standard | Service Limit |
|---|---|---|
| **Wheels (Rims)** | | |
| Rim Runout: | | |
| Axial | TIR 0.5 mm (0.02 in.) or less | TIR 1.0 mm (0.04 in.) |
| Radial | TIR 0.8 mm (0.03 in.) or less | TIR 1.0 mm (0.04 in.) |
| Axle Runout/100 mm | TIR 0.03 mm (0.0012 in.) or less | TIR 0.2 mm (0.01 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 × 6.00 | – – – |
| **Tires** | | |
| Air Pressure (when Cold): | | |
| Front | Up to 180 kg (397 lb) load: 250 kPa (2.5 kgf/cm², 36 psi) | – – – |
| Rear | Up to 180 kg (397 lb) load: 290 kPa (2.9 kgf/cm², 42 psi) | – – – |
| Tread Depth: | | |
| EUR, CA and BR Models: | | |
| Front | 3.8 mm (0.15 in.) | 1 mm (0.04 in.)<br>(AT, CH, DE) 1.6 mm (0.06 in.) |
| Rear | 5.2 mm (0.20 in.) | Up to 130 km/h (80 mph): 2 mm (0.08 in.)<br>Over 130 km/h (80 mph): 3 mm (0.12 in.) |
| Other than EUR, CA and BR Models: | | |
| Front | 3.6 mm (0.14 in.) | 1 mm (0.04 in.) |
| Rear | 5.3 mm (0.21 in.) | Up to 130 km/h (80 mph): 2 mm (0.08 in.)<br>Over 130 km/h (80 mph): 3 mm (0.12 in.) |
| Standard Tires: | | |
| EUR, CA and BR Models: | | |
| Front | PIRELLI, DIABLO CORSA III N | 120/70 ZR17 M/C (58 W) |
| Rear | PIRELLI, DIABLO CORSA III | 190/55 ZR17 M/C (75 W) |
| Other than EUR, CA and BR Models: | | |
| Front | BRIDESTONE, BATTLAX BTO16F J | 120/70 ZR17 M/C (58 W) |
| Rear | BRIDESTONE, BATTLAX BTO16R J | 190/55 ZR17 M/C (75 W) |

**⚠ WARNING**

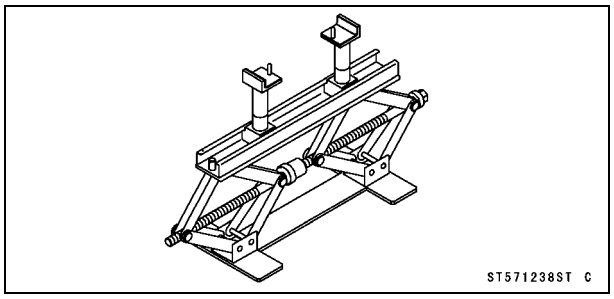
**Use the same manufacturer's tires on both front and rear wheels.**

## Special Tools

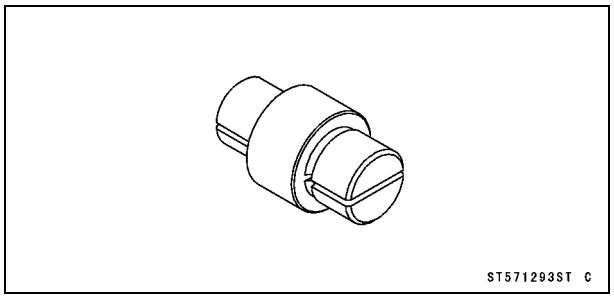
**Bearing Driver Set:**
**57001-1129**



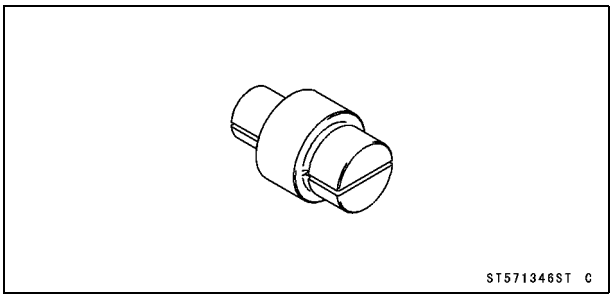

**Jack:**
**57001-1238**



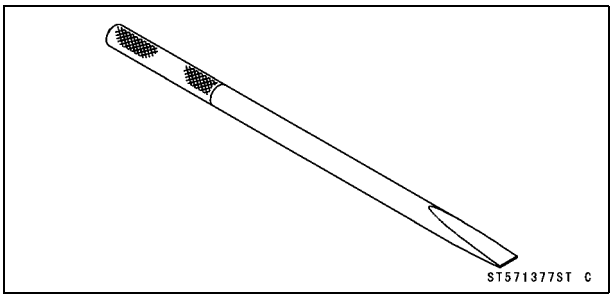

**Bearing Remover Head, $\phi$20 × $\phi$22:**
**57001-1293**



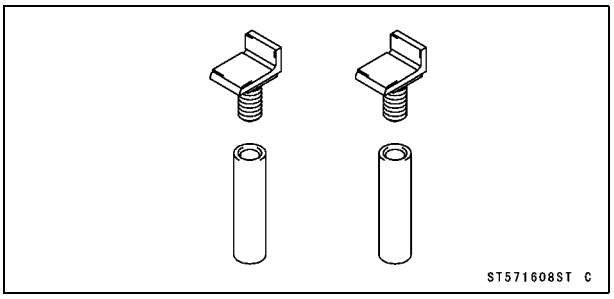

**Bearing Remover Head, $\phi$25 × $\phi$28:**
**57001-1346**




**Bearing Remover Shaft, $\phi$13:**
**57001-1377**




**Jack Attachment:**
**57001-1608**

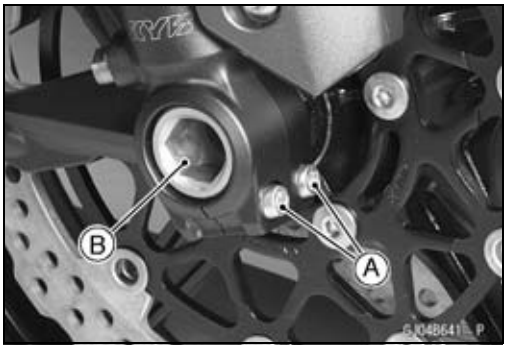


## Wheels (Rims)

### *Front Wheel Removal*

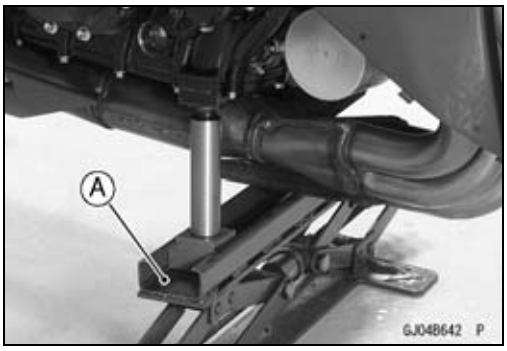
- Remove:
  Front Caliper Mounting Bolts [A] (Both Sides)
  Front Calipers [B] (Both Sides)


- Loosen:
  Axle Clamp Bolts [A] (Right Side)
  Axle [B]




- Remove the lower fairings (see Lower Fairing Removal in the Frame chapter).
- Raise the front wheel off the ground with the jack [A].

**Special Tools - Jack: 57001-1238**
**Jack Attachment: 57001-1608**

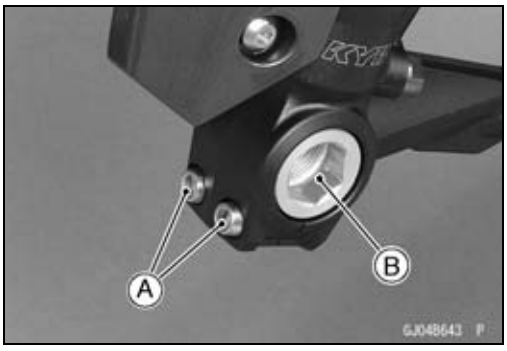



- Pull out the axle to the right side and drop the front wheel out of the front forks.

**CAUTION**

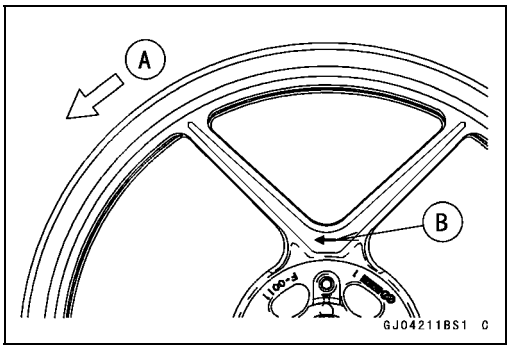
**Do not lay the wheel down on one of the discs. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

- Loosen the axle clamp bolts (left side) [A] and remove the axle nut [B].



## Wheels (Rims)

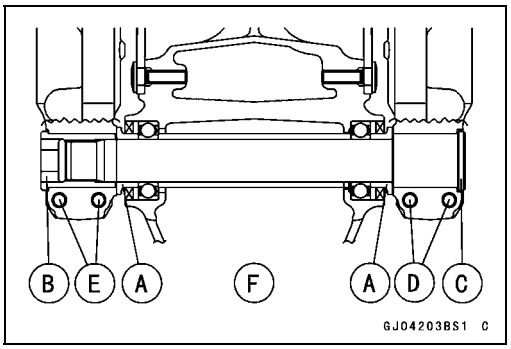
### *Front Wheel Installation*




**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.




- Apply high-temperature grease to the grease seal lips.
- Fit the collars [A] on the both sides of the hub.

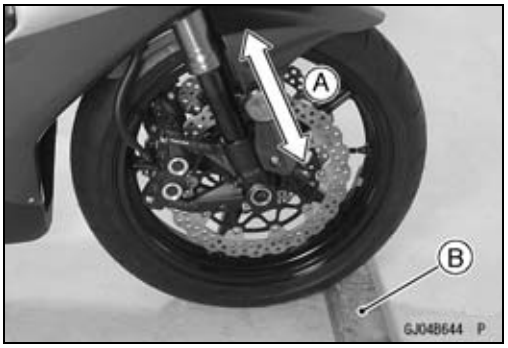
○The collars are identical.

- Install the axle nut [B] and insert the axle [C] from the right side.

  Axle Clamp Bolts (Right Side) [D]
  Axle Clamp Bolts (Left Side) [E]
  Rear View [F]

- Tighten:

**Torque - Front Axle Nut: 127 N·m (13.0 kgf·m, 94 ft·lb)**




- Before tightening the axle clamp bolts, pump the front fork up and down [A] 4 or 5 times to allow the right fork leg to find a neutral position on the front axle.

**NOTE**

○*Put a block [B] in front of the front wheel to stop moving.*

- Tighten the axle clamp bolts on the right fork leg first, next, the axle clamp bolts on the left fork leg.

**Torque - Front Axle Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**

**NOTE**

○*Tighten the two axle clamp bolts alternately two times to ensure even tightening torque.*

- Install the lower fairing (see Lower Fairing installation in the Frame chapter).
- Install the front calipers (see Caliper Installation in the Brakes chapter).
- Check the front brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

**⚠ WARNING**

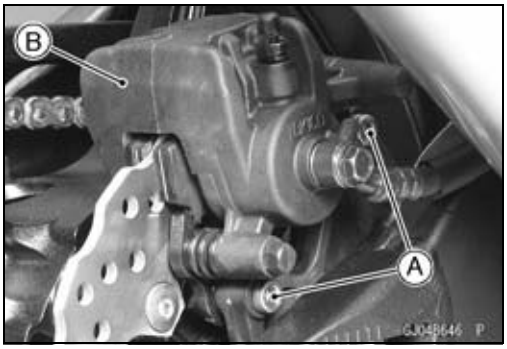
**Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

## Wheels (Rims)

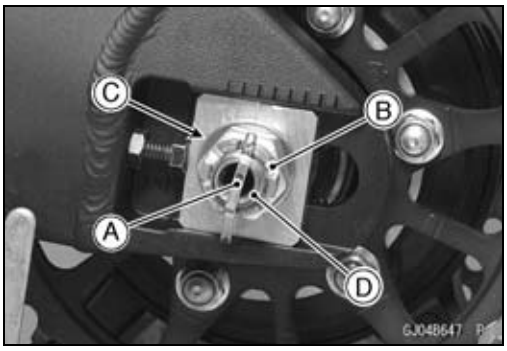
### *Rear Wheel Removal*

● Raise the rear wheel off the ground with the stand [A].


● Remove:
Rear Caliper Mounting Bolts [A]
Rear Caliper [B]




● Remove:
Cotter Pin [A]
Axle Nut [B]
Washer [C]
● Pull out the axle [D] to the right side.



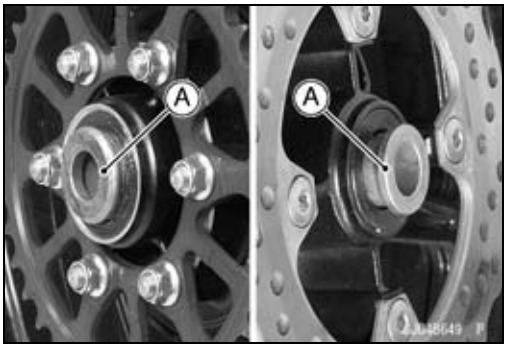

● Remove the drive chain [A] from the rear sprocket toward the left.
● Move the rear wheel back and remove it.


**CAUTION**

**Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

### *Rear Wheel Installation*

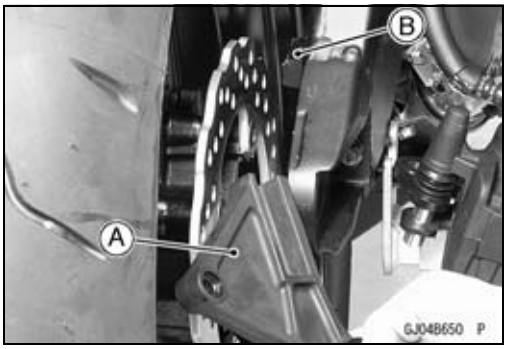
● Apply high-temperature grease to the grease seal lips.
● Fit the collars [A] on the both sides of the hub.
○The collar of the rear sprocket side is large than the collar of the brake disc side.



## Wheels (Rims)

- Engage the drive chain with the rear sprocket.
- Install the caliper bracket [A] onto the stopper [B] of the swingarm.
- Insert the axle from the right side of the wheel.
- Install the washer and axle nut.
- Adjust the drive chain slack before tightening the axle nut (see Drive Chain Slack Inspection in the Periodic Maintenance chapter).
- Tighten:

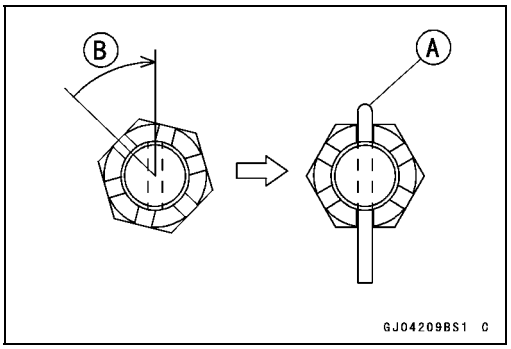
**Torque - Rear Axle Nut: 108 N·m (11.0 kgf·m, 80 ft·lb)**




- Insert a new cotter pin [A].

**NOTE**

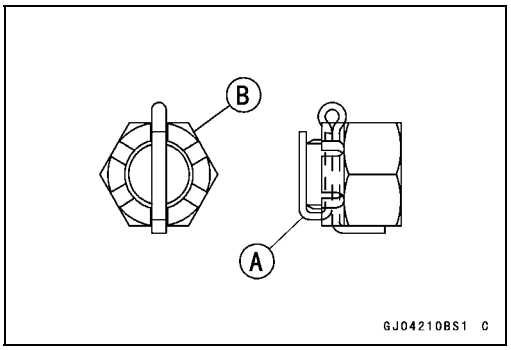
○*When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.*
○*It should be within 30 degree.*
○*Loosen once and tighten again when the slot goes past the nearest hole.*




- 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.**



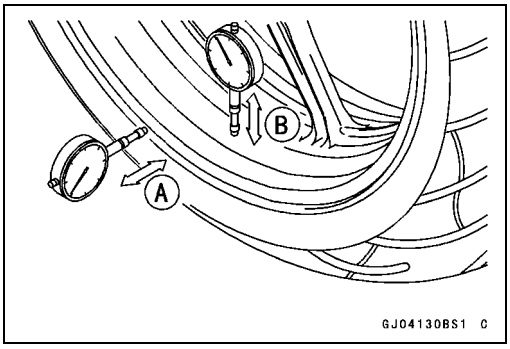

- Install the rear caliper (see Caliper Installation in the Brakes chapter).
- Check the rear brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

**⚠ 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.**

## Wheels (Rims)

### *Wheel Inspection*




- Raise the front/rear wheel off the ground.

**Special Tools - Jack: 57001-1238**
**Jack Attachment: 57001-1608**

- 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 with 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 Runout (with tire installed)**
**Standard:**

| | |
|---|---|
| **Axial** | **TIR 0.5 mm (0.02 in.) or less** |
| **Radial** | **TIR 0.8 mm (0.03 in.) or less** |

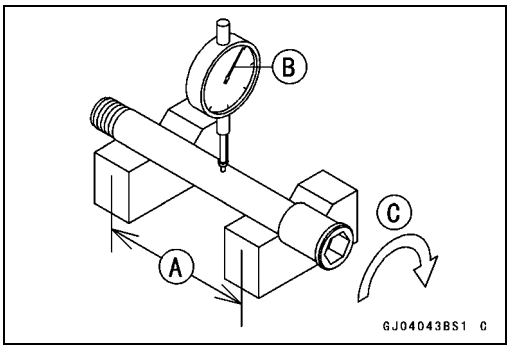
**Service Limit:**

| | |
|---|---|
| **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/rear axle (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.

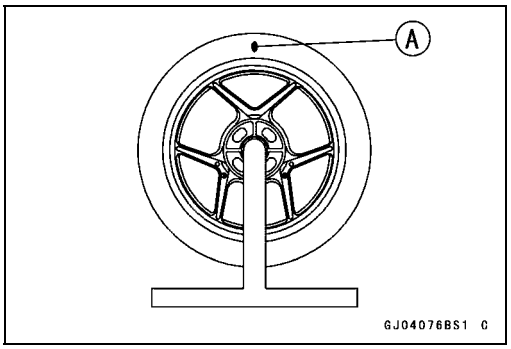
★If axle runout exceeds the service limit, replace the axle.

**Axle Runout/100 mm (3.94 in.)**

| | |
|---|---|
| **Standard:** | **TIR 0.03 mm (0.0012 in.) or less** |
| **Service Limit:** | **TIR 0.2 mm (0.01 in.)** |

## Wheels (Rims)

### *Balance Inspection*

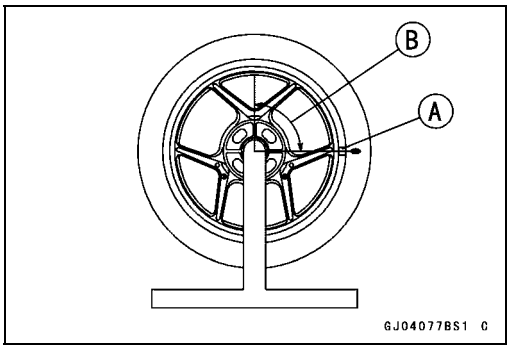



- Remove the front/rear wheel (see Front/Rear Wheel Removal).
- Support the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark [A] the wheel at the top when the wheel stops.

○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*

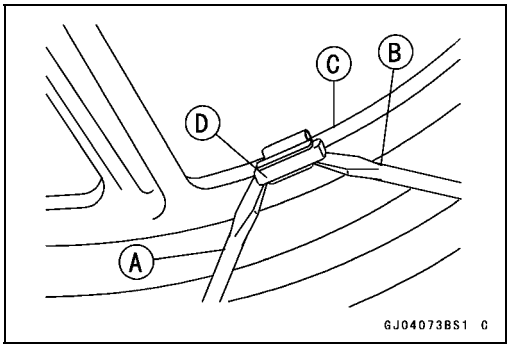



- If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.

★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*

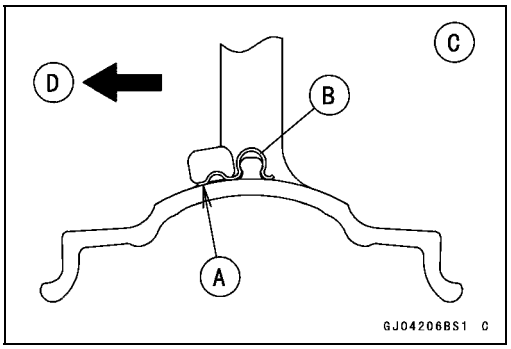



- Insert a regular tip screwdrivers [A] [B] between the rib [C] and weight [D] as shown in the figure.
- Pry the balance weight with two screwdrivers and remove the balance weight.
- Discard the used balance weight.

**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].
  Rear View [C]
  Left Side [D]

★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.**

## Wheels (Rims)

**Balance Weight**

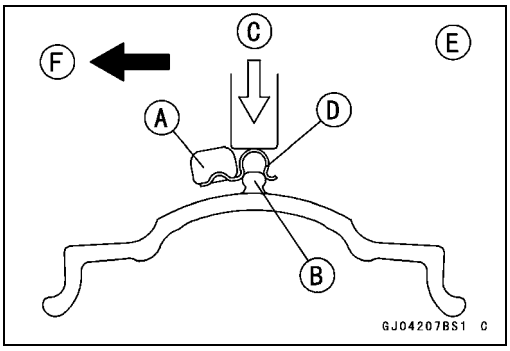
| Part Number | Weight |
|---|---|
| 41075-0007 | 10 g (0.35 oz.) |
| 41075-0008 | 20 g (0.71 oz.) |
| 41075-0009 | 30 g (1.06 oz.) |

**NOTE**

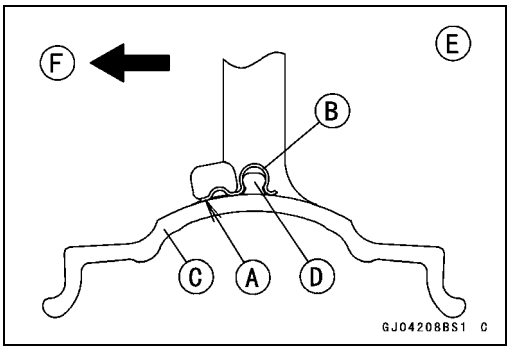
○*Balance weights are available from Kawasaki dealers in 10, 20 and 30 gram (0.35 oz., 0.71 oz. and 1.06 oz.) sizes. An imbalance of less than 10 grams (0.35 oz.) will not usually affect running stability.*

○*Do not use four or more balance weight (more than 90 gram). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.*

● Slip the balance weight [A] on to the rib [B], by pushing or lightly hammering [C] the clip [D].
Rear View [E]
Left 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].
Rear View [E]
Left Side [F]



## Tires

### *Air Pressure Inspection/Adjustment*

- Refer to the Tires Air Pressure Inspection in the Periodic Maintenance chapter.

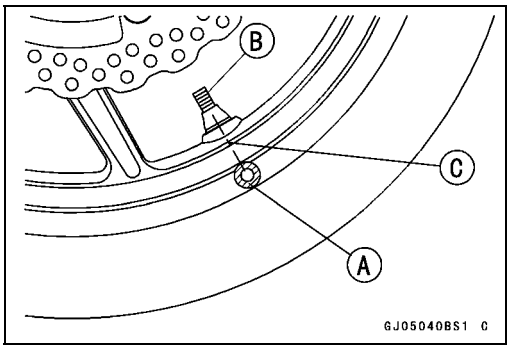
### *Tire Inspection*

- Refer to the Wheels/Tires Damage Inspection in the Periodic Maintenance chapter.

### *Tire Removal*

- Remove:
  Front/Rear 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]
  Valve Stem [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 can not be removed with hand tools because they fit the rims too tightly.*

### *Tire Installation*

**⚠ WARNING**

**Use the same manufacture's 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.**

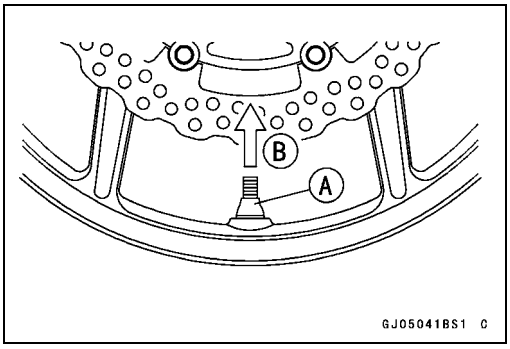
## Tires

● 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.

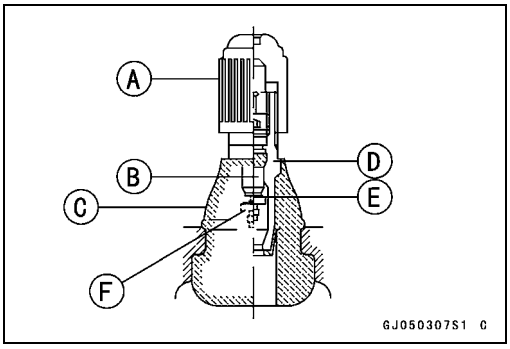
**CAUTION**

**Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.**



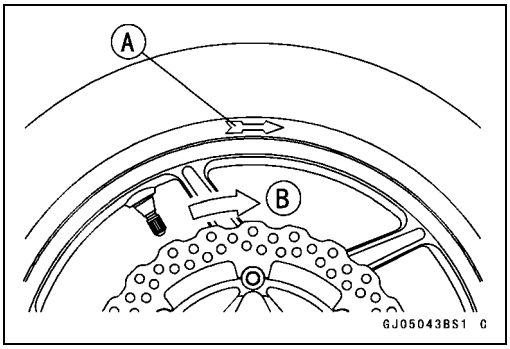

○The air valve is shown in the figure.

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]

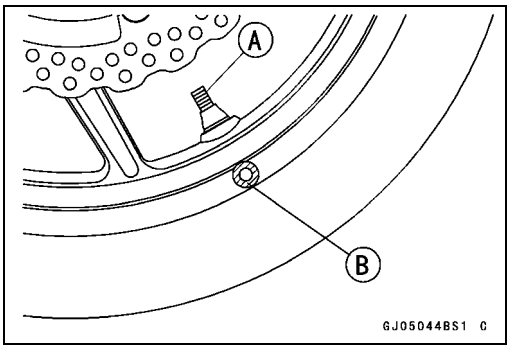



● Position the tire on the rim so that the valve stem [A] align with the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).

● 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.

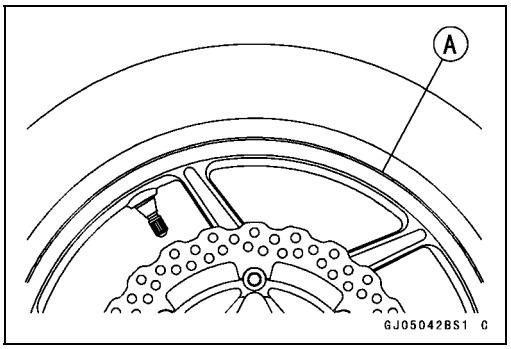
● Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.




**⚠ 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.**

## Tires




- 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, Kawasaki 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

### *Hub Bearing Removal*

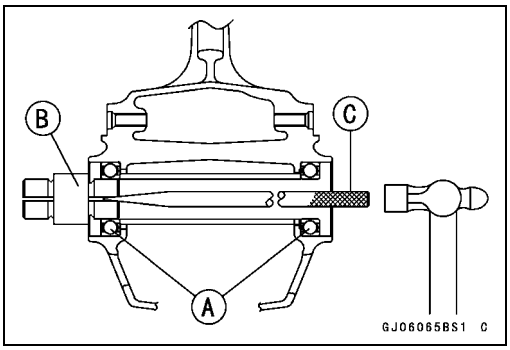
- Remove the front/rear wheel (see Front/Rear Wheel Removal), and take out the following parts.
  Collars
  Coupling (Out of Rear Wheel)
  Grease Seals

- Use the bearing remover to remove the hub bearing [A].

**CAUTION**

**Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

**Special Tools - Bearing Remover Head, $\phi$20 × $\phi$22: 57001-1293 (For Rear Wheel)**
**Bearing Remover Head, $\phi$25 × $\phi$28 [B]: 57001-1346 (For Front Wheel)**
**Bearing Remover Shaft, $\phi$13 [C]: 57001-1377**




### *Hub Bearing Installation*

- Before installing the wheel 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.

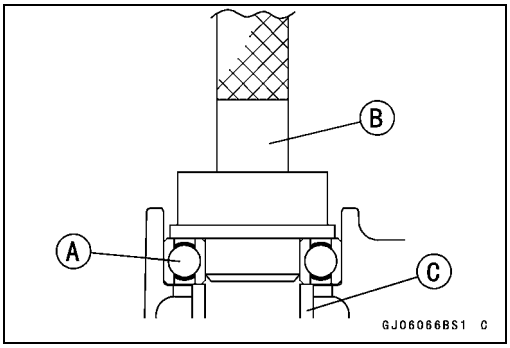
**NOTE**

○*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 right the bearing [A] until they are bottomed.

**Special Tool - Bearing Driver Set [B]: 57001-1129**

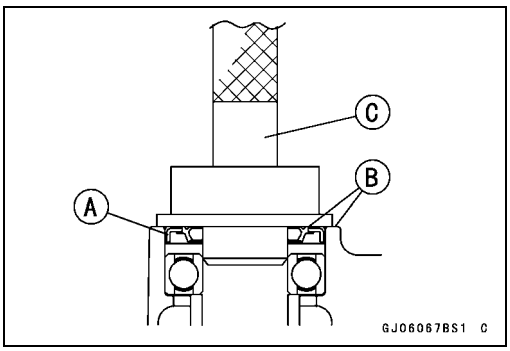
○Before pressing in the bearing of the other side, install the sleeve [C].




- 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.

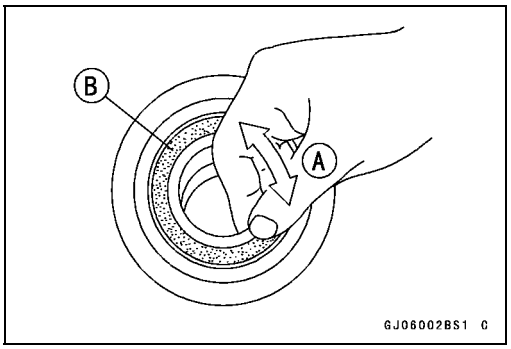
**Special Tool - Bearing Driver Set [C]: 57001-1129**



## Hub Bearing

### *Hub Bearing Inspection*

Since the hub bearings are made to extremely close tolerances, 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.

★If the seal is torn or is leaking, replace the bearing.

### *Hub Bearing Lubrication*

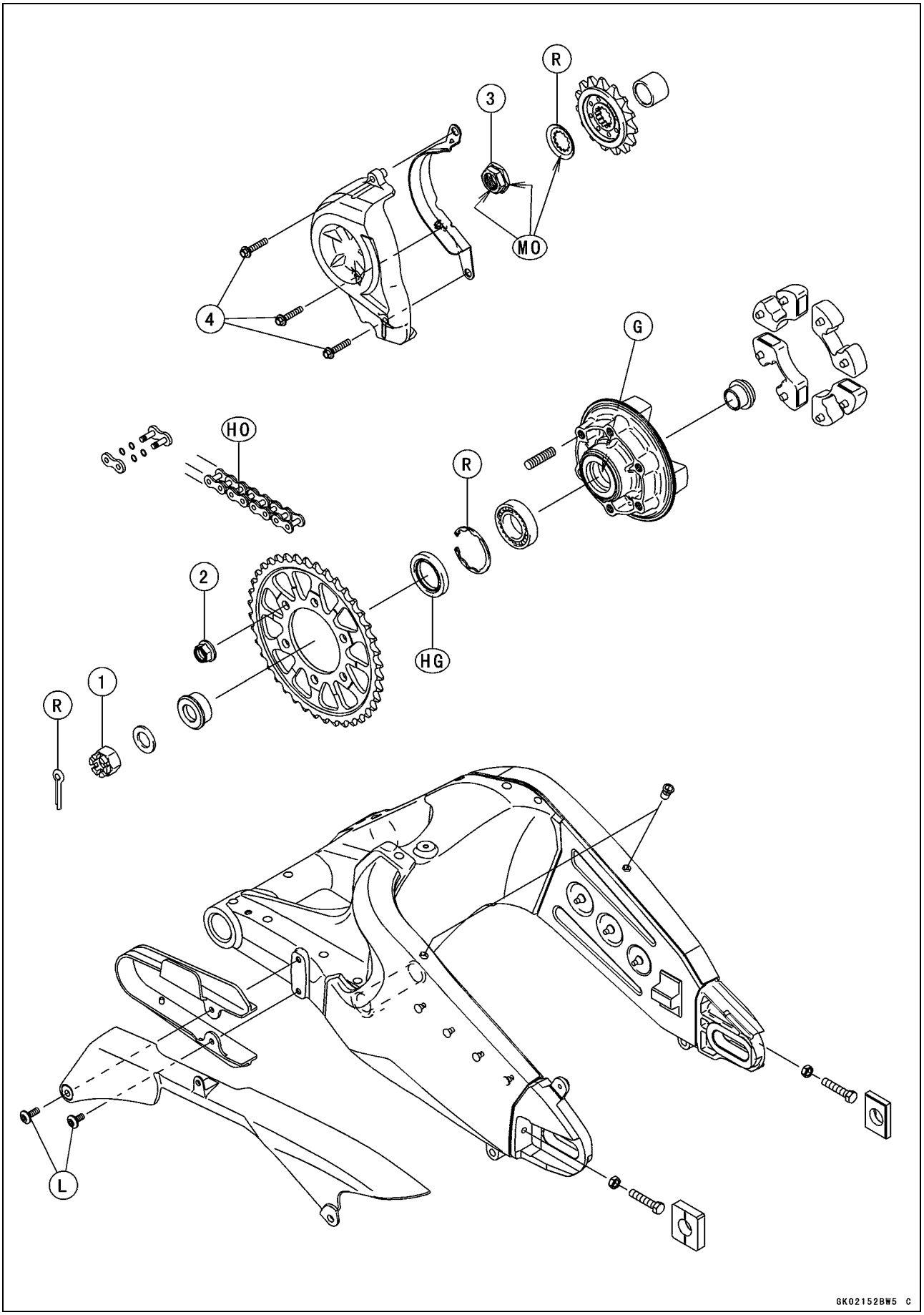
**NOTE**

○*Since the hub bearings are packed with grease and sealed, lubrication is not required.*

# Final Drive

## Table of Contents

## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Rear Axle Nut | 108 | 11.0 | 80 | |
| 2 | Rear Sprocket Nuts | 59 | 6.0 | 44 | |
| 3 | Engine Sprocket Nut | 125 | 12.7 | 92 | MO |
| 4 | Engine Sprocket Cover Bolts | 10 | 1.0 | 89 in·lb | |

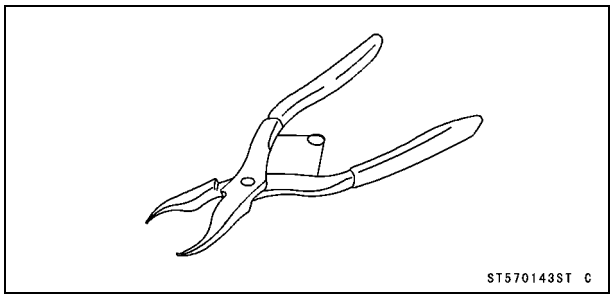
G: Apply grease.
HG: Apply high-temperature grease.
HO: Apply heavy oil.
L: Apply a non-permanent locking agent.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio is 10 : 1)
R: Replacement Parts

## Specifications

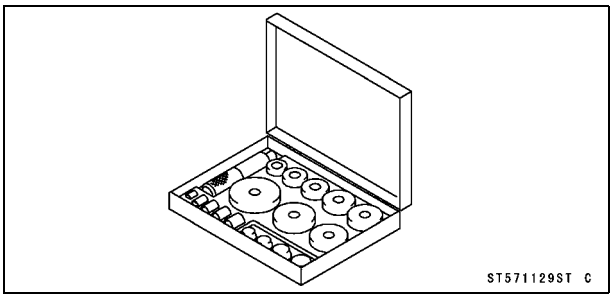
| Item | Standard | Service Limit |
|---|---|---|
| **Drive Chain** | | |
| Drive Chain Slack | 30 ~ 40 mm (1.2 ~ 1.6 in.) | – – – |
| Drive Chain Wear (20-link Length) | 317.5 ~ 318.2 mm (12.50 ~ 12.53 in.) | 323 mm (12.7 in.) |
| Standard Chain: | | |
| Make | RK EXCEL | – – – |
| Type | RK 525MFOZ, Endless | – – – |
| Link | 110 links | – – – |
| **Sprockets** | | |
| Rear Sprocket Warp | 0.4 mm (0.016 in.) or less | 0.5 mm (0.02 in.) |

## Special Tools

**Inside Circlip Pliers:**
**57001-143**




**Bearing Driver Set:**
**57001-1129**



## Drive Chain

### *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 Inspection 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 in the Periodic Maintenance chapter.

### *Drive Chain Guide Wear Inspection*

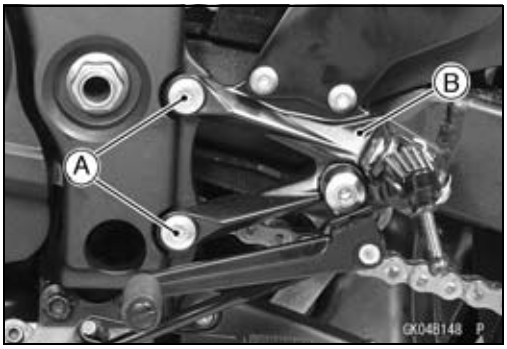
- Refer to the Drive Chain Guide Wear Inspection in the Periodic Maintenance chapter.

### *Drive Chain Removal*

**NOTE**

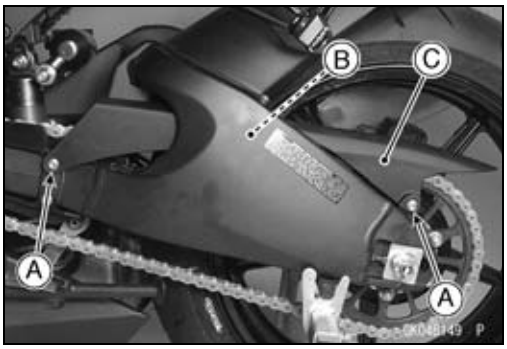
○*Since the drive chain is installed through the swingarm, The chain can not be removed other than by cutting it. Prepare the new link pin, link plate, grease seals, and tools for rejoining the chain.*

- Remove:
  Bolts [A]
  Front Footpeg Bracket [B]




- Remove:
  Bolts [A]
  Quick Rivet [B]
  Chain Cover [C]

○Push the central pin, and then remove the quick rivet.

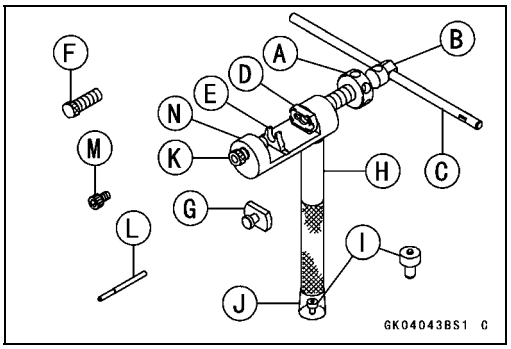


## Drive Chain

- Using a suitable tool, cut the drive chain by removing the link pins.

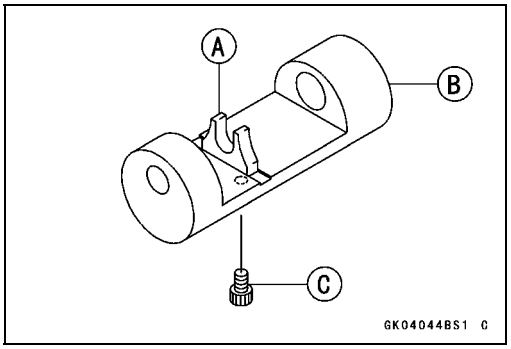
**Recommended Tool: RK EXCEL 70 or 90 Tool (RK-700 or RK-90)**

| CAUTION |
| --- |
| **Read the Tool Manual before cutting the drive chain.** |

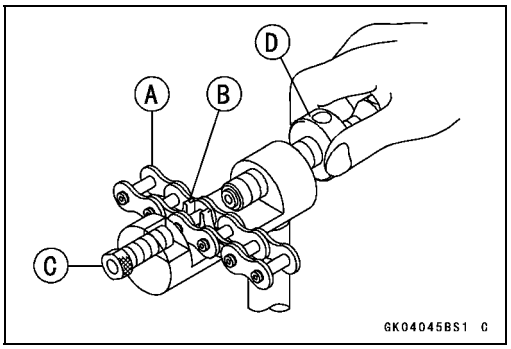



Pressure Bolt (a) [A]
Pressure Bolt (b) [B]
Handle Lever [C]
Pressure Holder [D]
Guide Plate [E]
Adjuster Bolt (Yellow) [F]
Wedge Holder [G] and Wedge Pin
Grip Handle [H]
Flare Pin [I]
Cap [J]
Adjuster Bolt [K]
Pin Puller [L]
Body [N]
Cap Bolt [M]

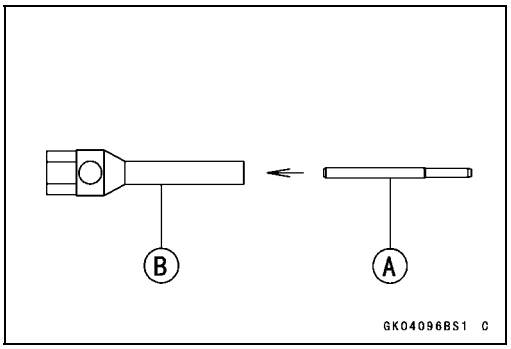
- Install the guide plate [A] on the body [B].
- Screw the cap bolt [C].
- Install the grip handle.




- Set the chain [A] to the guide plate [B].
- Screw in the adjuster bolt [C] for holding the chain.
- Screw in the pressure bolt (a) [D] for holding the chain.

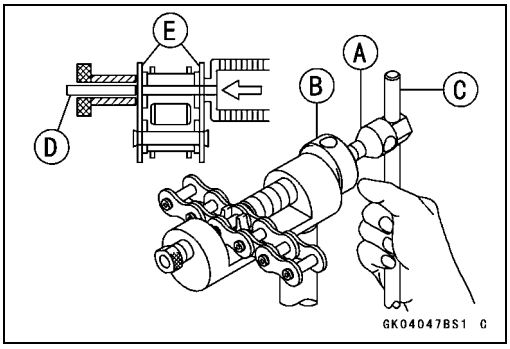



- Insert the pin puller [A] to the pressure bolt (b) [B].

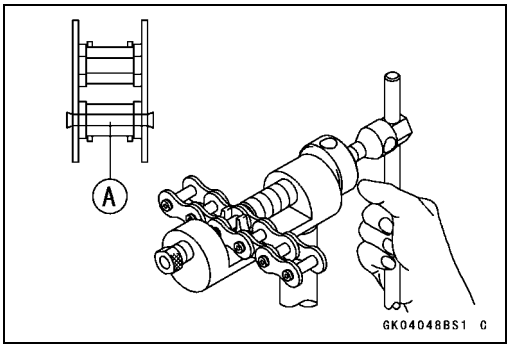


## Drive Chain

- Screw in the pressure bolt assy [A] in the pressure bolt (a) [B].
- Install the handle lever [C] to the pressure bolt assy.
- Turn in the handle lever until the link pin [D] removed at the link plate [E].

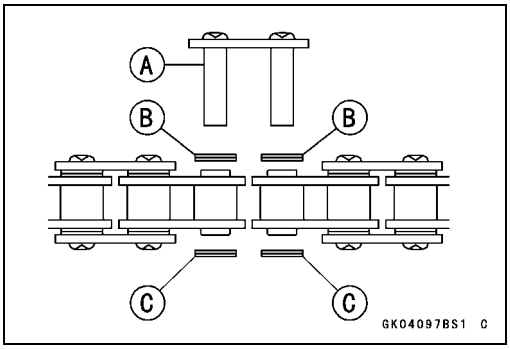



- Repeat the above steps for other link pin [A].



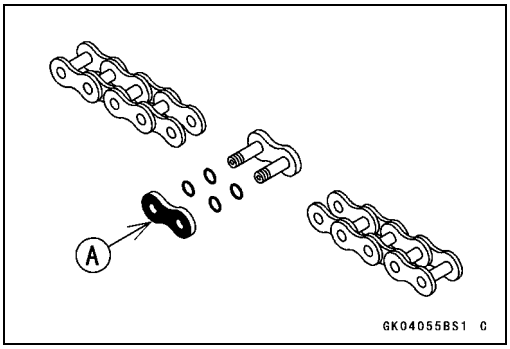

### *Drive Chain Installation*

- Engage 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 the swingarm.
- Install the grease seals [B] on the link pins.
- Insert the link pins in the drive chain ends from the inside.
- Install the grease seals [C].

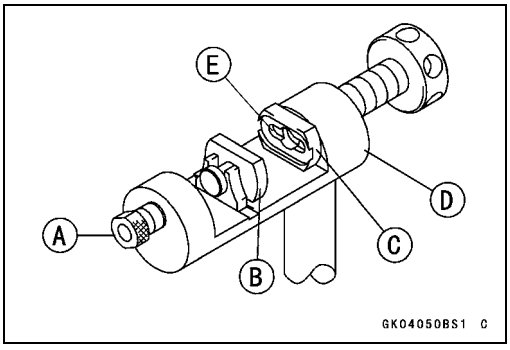



- Install the link plate so that the gold painted [A] faces outside.
- Push the link plate by hand or plier to fix it.

○Be sure to set the grease seals correctly.

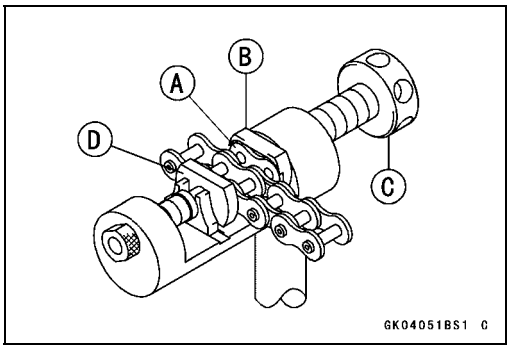



- Set the adjuster bolt (yellow) [A], wedge holder and wedge pin [B], and pressure holder [C] on the body [D].
- Hold the wedge holder and wedge pin, using the adjuster bolt (yellow).
- Apply grease to the inside [E] of the pressure holder.

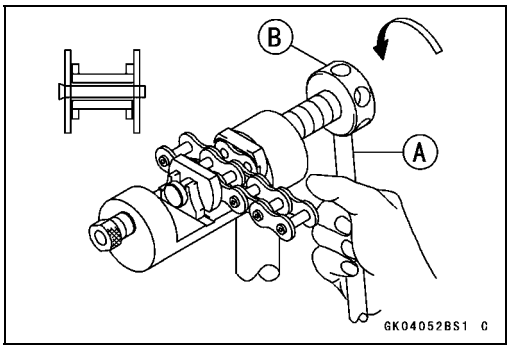


## Drive Chain

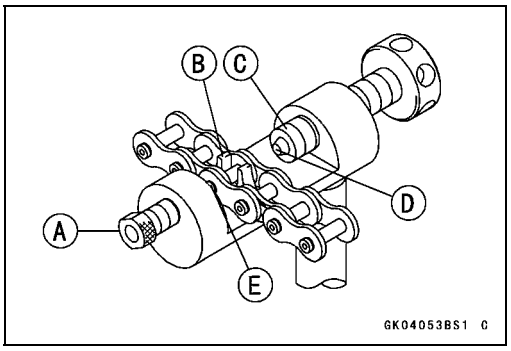
- Fit the link plate [A] in the pressure holder [B].
- Fit the link plates of the chain into the wedge holder and wedge pin [D].
- Turn the pressure bolt (a) [C] by hand until link plate touches the link pins.



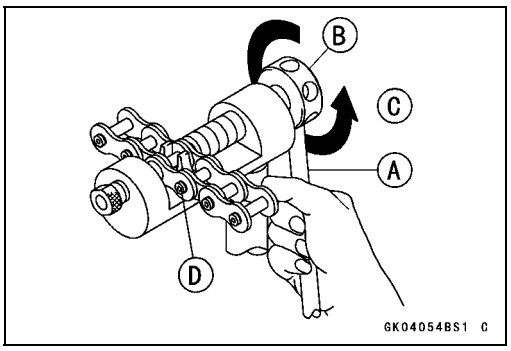

- Install the handle lever [A] onto the pressure bolt (a) [B].
- Turn the handle lever, press in the link plate to the link pins.




- Set the adjuster bolt (yellow) [A], guide plate [B], and flare pin [C] on the body.
- Apply grease to the tip [D] of the flare pin.
- Fit the adjuster bolt (yellow) to the link pin [E].




- Install the grip lever [A] onto the pressure bolt (a) [B].
- Stake the link pin end by the handle lever about 9/10 turns [C].
- Repeat the above steps for other link pin [D].

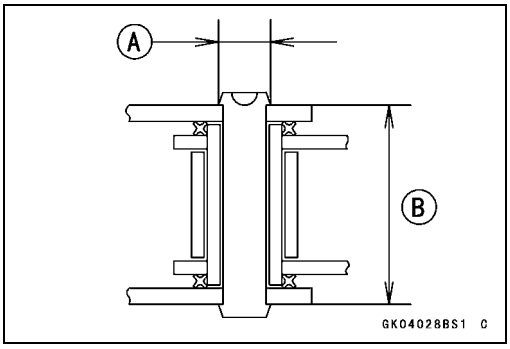


## Drive Chain

- 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: 5.6 ~ 5.9 mm (0.22 ~ 0.23 in.)**

**Link Plates Outside Width**
**Standard: 19.7 ~ 20.0 mm (0.775 ~ 0.787 in.)**

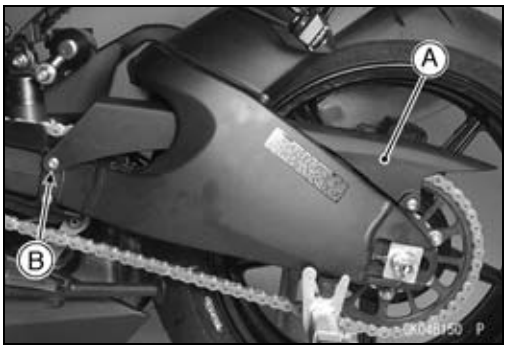



★If the reading exceeds the specified length, cut and rejoin the chain again.
- Check the movement of the rollers.
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

- When installing the chain cover [A], note the following.

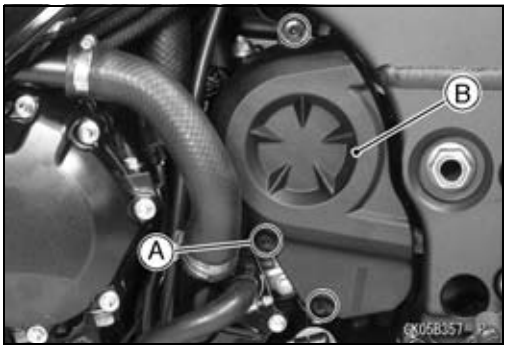
○Apply a non-permanent locking agent to the bolt [B] only.
- Install the front footpeg bracket.

**Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

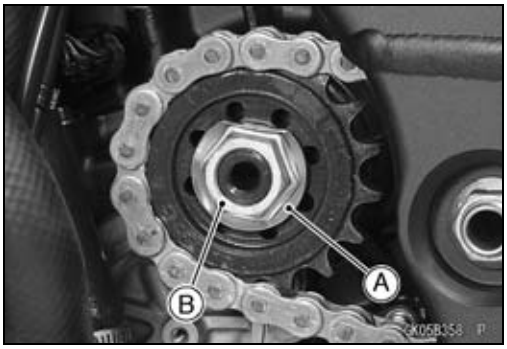


## Sprocket, Coupling

### *Engine Sprocket Removal*



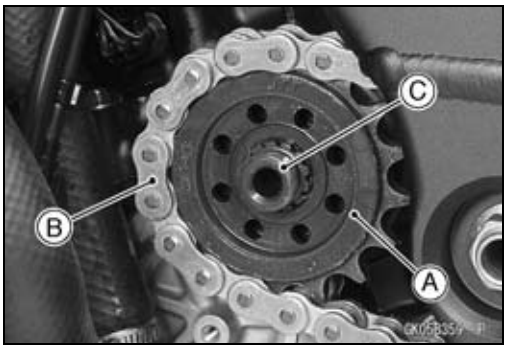

- Remove:
  Engine Sprocket Cover Bolts [A]
  Engine Sprocket Cover [B]




- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

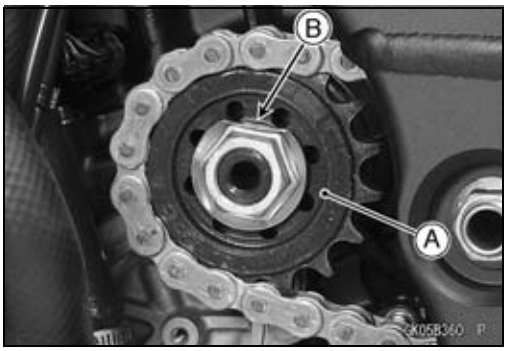
**NOTE**

○*When loosening the engine sprocket nut, hold the rear brake on.*




- Raise the rear wheel off the ground with stand.
- 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 with a new one.
- Install the engine sprocket onto the output shaft.
- Apply molybdenum disulfide oil solution to the threads of the output shaft and the seating surface of the engine sprocket nut.
- Tighten:

**Torque - Engine Sprocket Nut: 125 N·m (12.7 kgf·m, 92 ft·lb)**

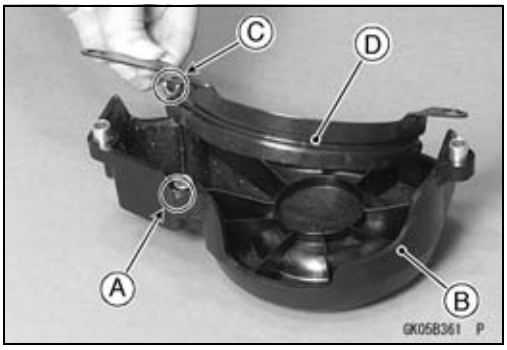
**NOTE**

○*Tighten the engine sprocket nut while applying the rear brake.*

- After tightening the engine sprocket nut, bend [B] the one side of the washer over the nut.
- Adjust the drive chain slack after installing the sprocket (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

## Sprocket, Coupling

- Fit the projection [A] of the engine sprocket cover [B] into the slot [C] of the chain guide [D].




- Fit the pins [A] of the engine sprocket cover [B] into the holes [C] of the crankcase.
- Tighten:

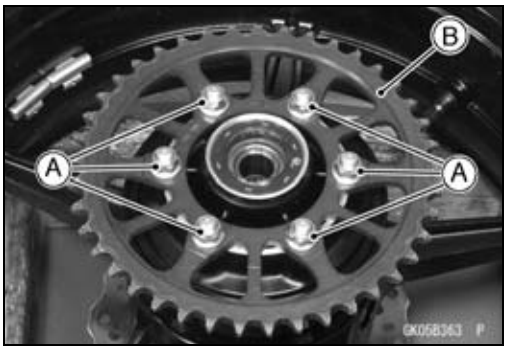
**Torque - Engine Sprocket Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**


### *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 blocks under the wheel so that the disc does not touch the ground.**



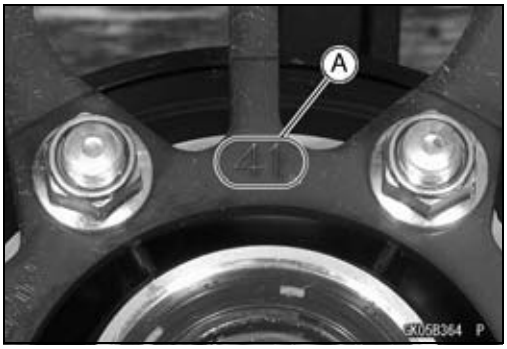

- Remove:
  Rear Sprocket Nuts [A]
  Rear Sprocket [B]

### *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)**

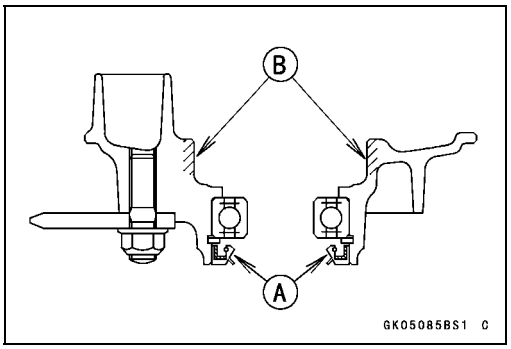
- Install the rear wheel (see Rear Wheel Installation in the Wheels/Tires chapter).



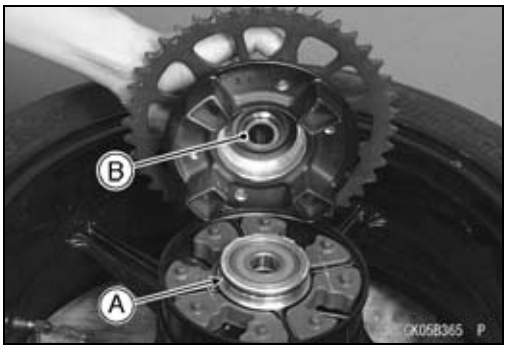
## Sprocket, Coupling

### *Coupling Installation*

- Apply high-temperature grease to the coupling grease seal lips [A].
- Apply grease to the coupling internal surface [B].




- Apply grease to the new O-ring [A].
- Install the collar [B].



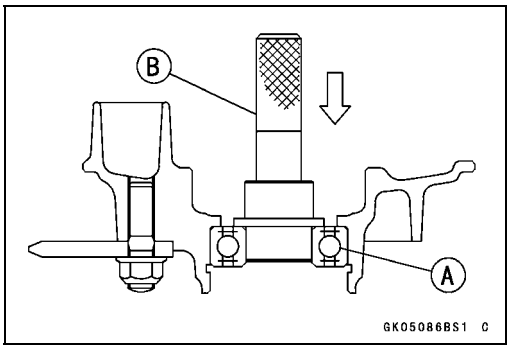

### *Coupling Bearing Removal*

- Remove:
  Coupling
  Grease Seal
  Circlip [A]

  **Special Tool - Inside Circlip Pliers: 57001-143**


- Remove the bearing [A] by tapping from the wheel side.

  **Special Tool - Bearing Driver Set [B]: 57001-1129**



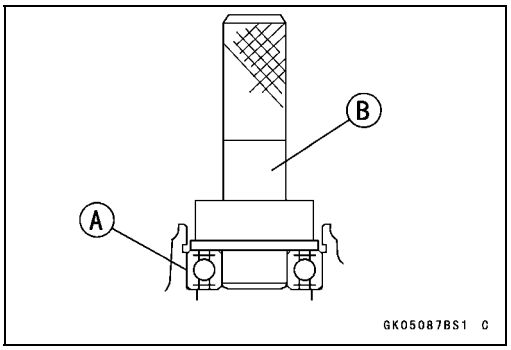

### *Coupling Bearing Installation*

- Replace the bearing with a new one.
- Press in the bearing [A] until it is bottomed.

  **Special Tool - Bearing Driver Set [B]: 57001-1129**

- Replace the circlip with a new one.

  **Special Tool - Inside Circlip Pliers: 57001-143**

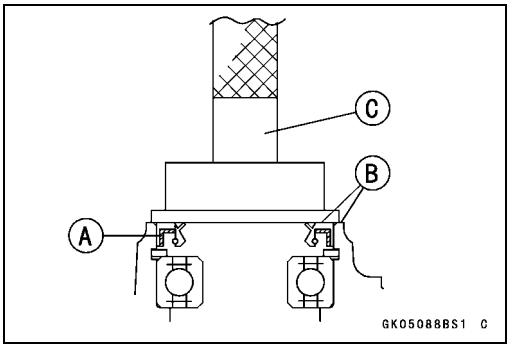


## Sprocket, Coupling

- Replace the grease seal with a new one.
- Press in the grease seal [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**

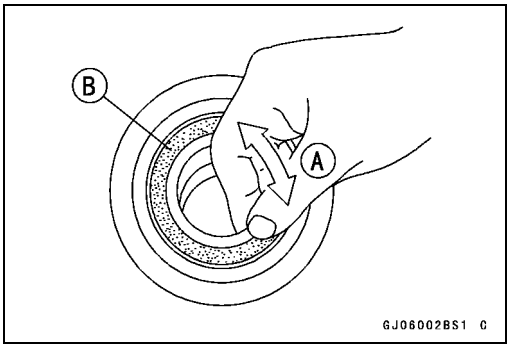



### *Coupling Bearing Inspection*

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 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.

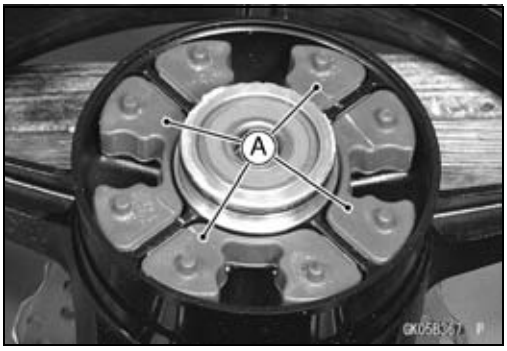
### *Coupling Bearing Lubrication*

**NOTE**

○*Since the coupling bearing is packed with grease and sealed, lubrication is not required.*

### *Coupling Damper Inspection*

- Remove the coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.

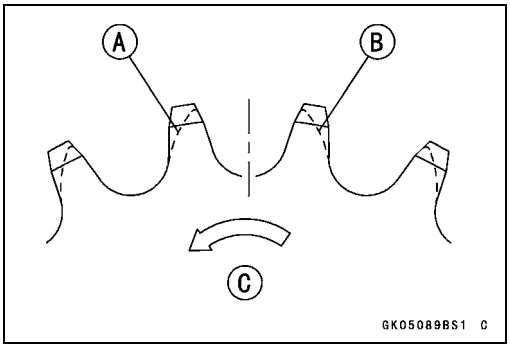



### *Sprocket Wear Inspection*

- 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]

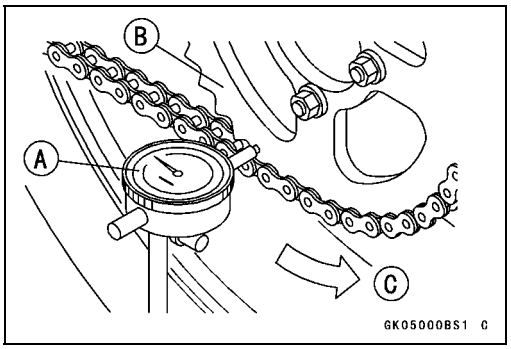



**NOTE**

○*If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.*

## Sprocket, Coupling

### *Rear Sprocket Warp Inspection*




- Raise the rear wheel off the ground with stand so that it will 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**

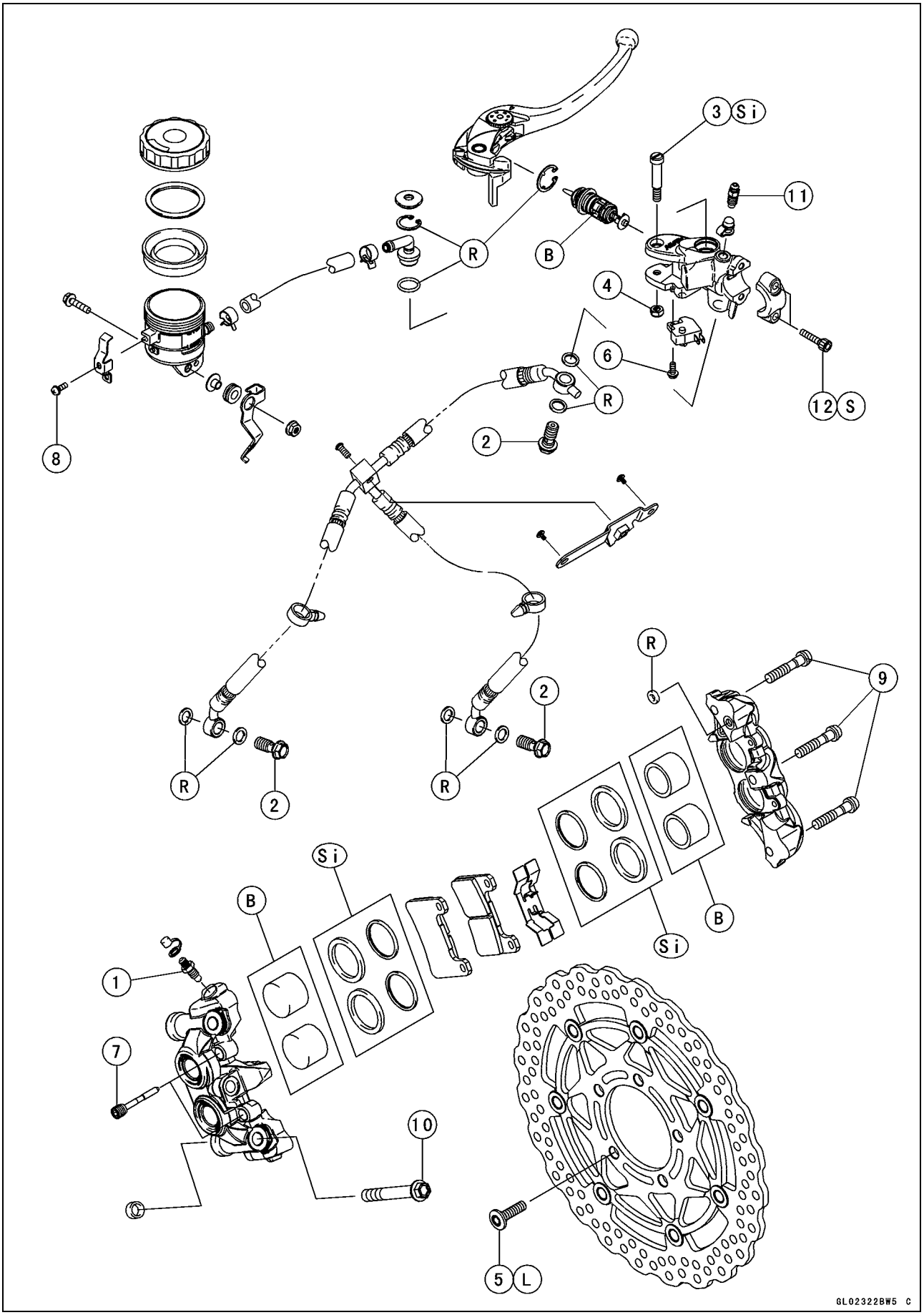
**Standard: 0.4 mm (0.016 in.) or less**

**Service Limit: 0.5 mm (0.02 in.)**

# Brakes

## Table of Contents

## Exploded View

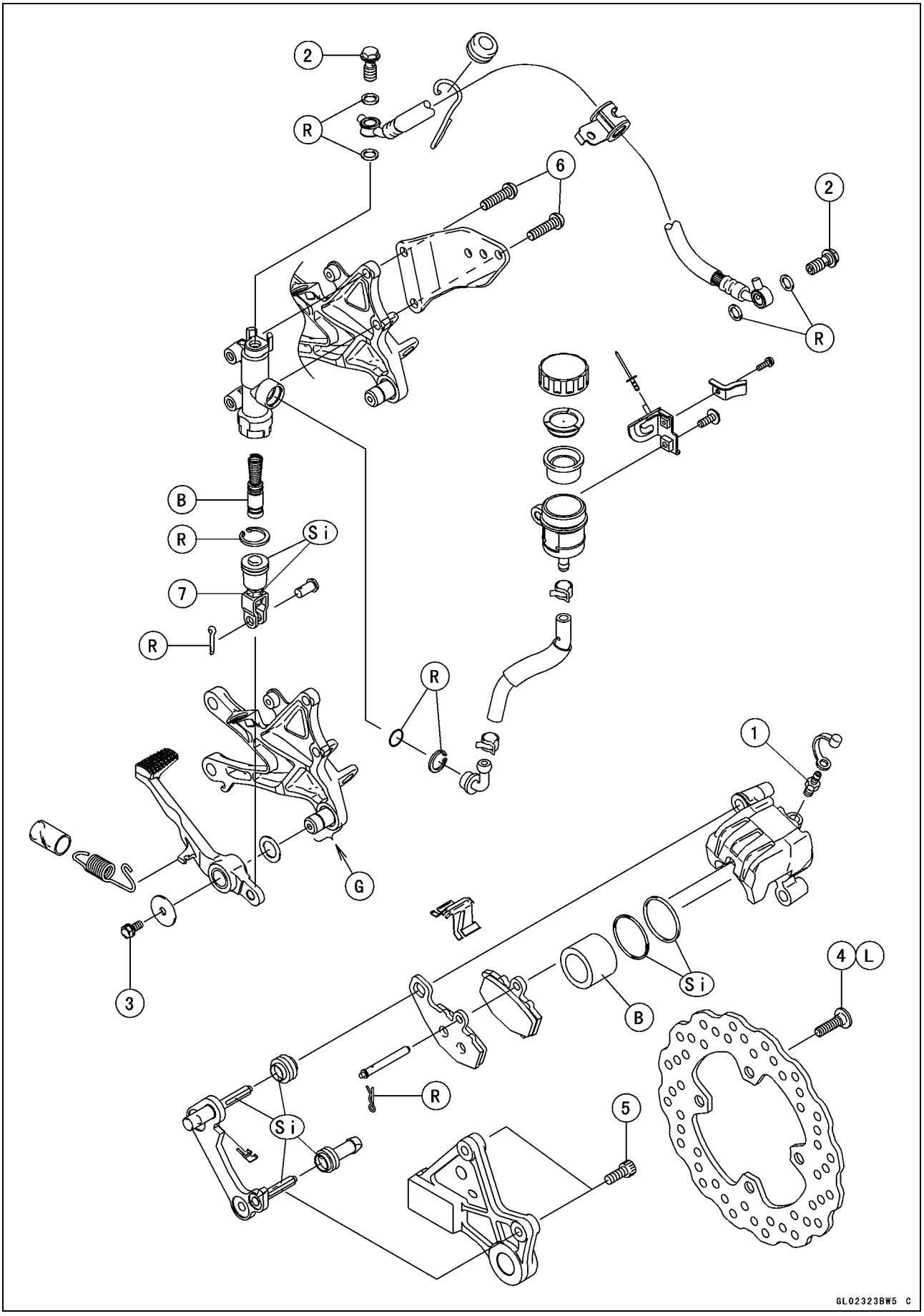


## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Bleed Valves | 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 Nut | 5.9 | 0.60 | 52 in·lb | |
| 5 | Front Brake Disc Mounting Bolts | 27 | 2.8 | 20 | L |
| 6 | Front Brake Light Switch Screw | 1.2 | 0.12 | 11 in·lb | |
| 7 | Front Brake Pad Pins | 15 | 1.5 | 11 | |
| 8 | Front Brake Reservoir Cap Stopper Screw | 1.2 | 0.12 | 11 in·lb | |
| 9 | Front Caliper Assembly Bolts | 22 | 2.2 | 16 | |
| 10 | Front Caliper Mounting Bolts | 34 | 3.5 | 25 | |
| 11 | Front Master Cylinder Bleed Valve | 5.4 | 0.55 | 48 in·lb | |
| 12 | Front Master Cylinder Clamp Bolts | 11 | 1.1 | 97 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.

## Exploded View



## 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 | 17 | 1.7 | 13 | |

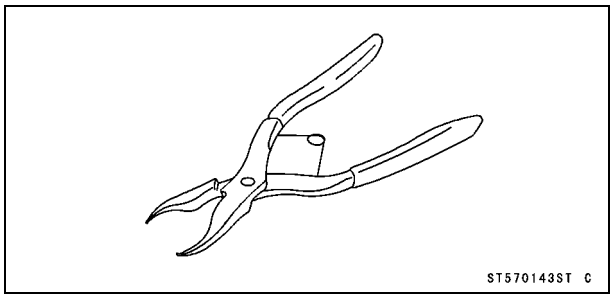
B: Apply brake fluid.
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts
Si: Apply silicone grease.

## Specifications

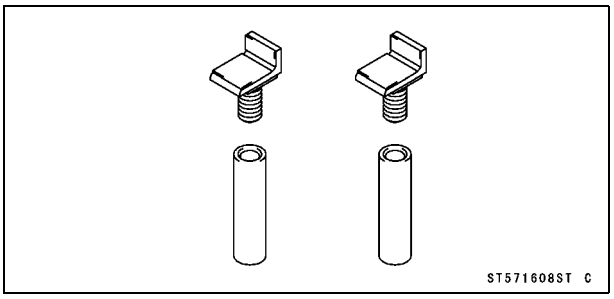
| Item | Standard | Service Limit |
|---|---|---|
| **Brake Lever, Brake Pedal** | | |
| Brake Lever Position | 6-way adjustable (to suit rider) | – – – |
| Brake Lever Free Play | Non-adjustable | – – – |
| Pedal Free Play | Non-adjustable | – – – |
| Pedal Position | About 90 mm (3.5 in.) below top of footpeg | – – – |
| **Brake Fluid** | | |
| Grade | DOT4 | – – – |
| **Brake Pad** | | |
| Lining Thickness: | | |
| Front | 4.0 mm (0.16 in.) | 1 mm (0.04 in.) |
| Rear | 5.0 mm (0.20 in.) | 1 mm (0.04 in.) |
| **Brake Discs** | | |
| Thickness: | | |
| Front | 5.3 ~ 5.7 mm (0.21 ~ 0.22 in.) | 5.0 mm (0.20 in.) |
| Rear | 4.8 ~ 5.2 mm (0.19 ~ 0.20 in.) | 4.5 mm (0.18 in.) |
| Runout | TIR 0.15 mm (0.006 in.) or less | TIR 0.3 mm (0.01 in.) |

## Special Tools

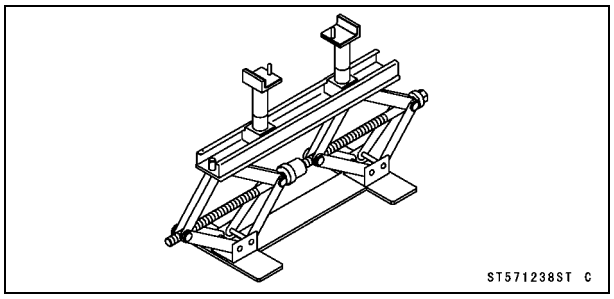
**Inside Circlip Pliers:**
**57001-143**




**Jack Attachment:**
**57001-1608**




**Jack:**
**57001-1238**



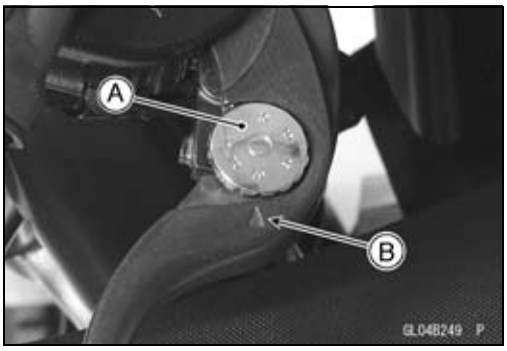
## Brake Lever, Brake Pedal

### *Brake Lever Position Adjustment*

The brake lever adjuster has 6 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 6 and maximum at number 1.

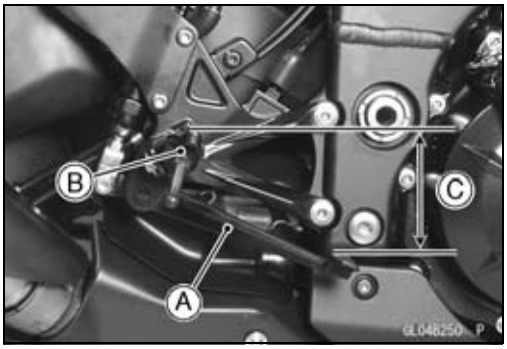



### *Brake Pedal Position Inspection*

- Check that the brake pedal [A] is in the correct position.
  Footpeg [B]

**Pedal Position**
**Standard: About 90 mm (3.5 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 push rod locknut has been loosened.*

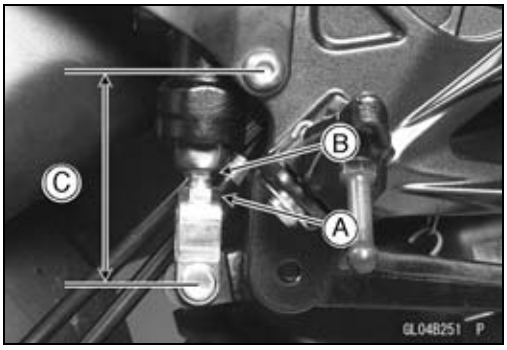
- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.

★If the length [C] shown is **70 ±1 mm (2.8 ±0.04 in.)**, the pedal position will be within the standard range.

- Tighten:

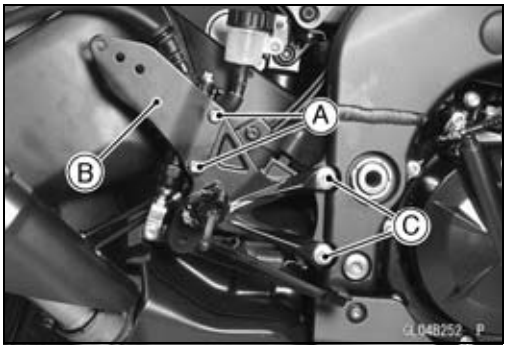
**Torque - Rear Master Cylinder Push Rod Locknut: 17 N·m (1.7 kgf·m, 13 ft·lb)**

- Check the rear brake light switch operation (see Brake Light Switch Operation Inspection in the Periodic Maintenance chapter).



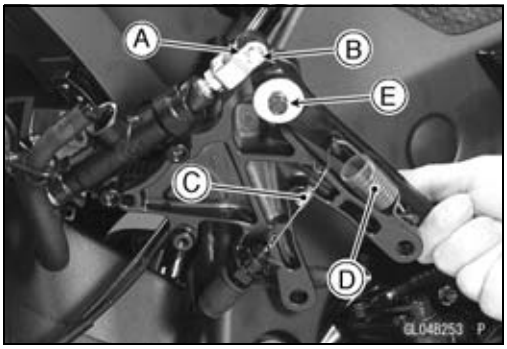

### *Brake Pedal Removal*

- Remove:
  Rear Master Cylinder Mounting Bolts [A]
  Foot Guard [B]
  Front Footpeg Bracket Bolts [C]



## Brake Lever, Brake Pedal

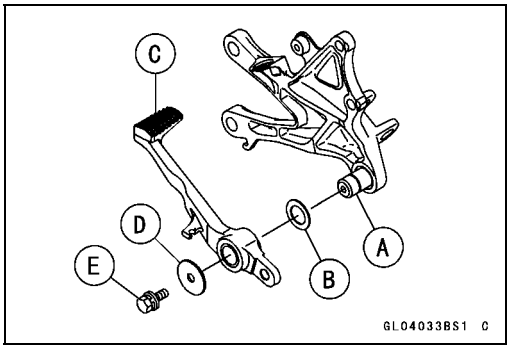
- Remove:
  Cotter Pin [A]
  Joint Pin [B]
  Rear Brake Light Switch Spring [C]
  Return Spring [D]
- Remove the mounting bolt [E] and take out the brake pedal.



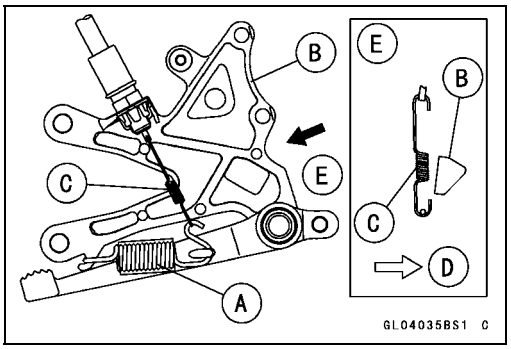

### *Brake Pedal Installation*

- Apply grease to the pivot shaft [A].
- Install:
  Washer [B]
  Brake Pedal [C]
  Washer [D]
  Brake Pedal Bolt [E]
- Tighten:

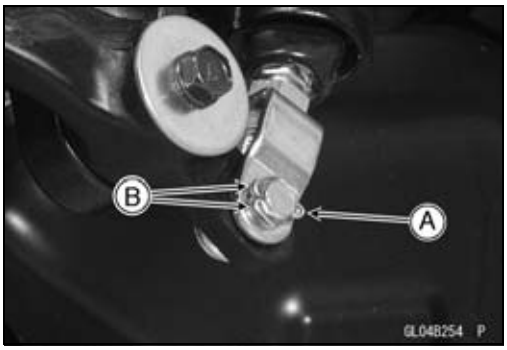
**Torque - Brake Pedal Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



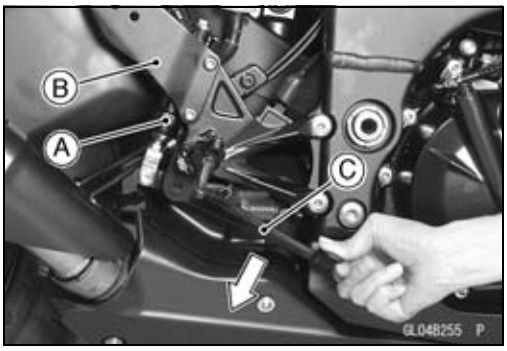

- Hook the return spring [A] on the brake pedal and front footpeg bracket [B] as shown in the figure.
- Hook the rear brake light switch spring [C] on the switch and return spring as shown in the figure.
  Outside [D]
  Rear View [E]




- Replace the cotter pin [A] with a new one.
- Insert the cotter pin and bend the pin ends [B].



## Brake Lever, Brake Pedal




- Install the front footpeg bracket.

  **Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Install the rear master cylinder [A] and foot guard [B].

**NOTE**

○*Depress the brake pedal [C] and then align the holes of the master cylinder.*

○*After installation, check that the rear brake light switch spring is hooked on the return spring.*

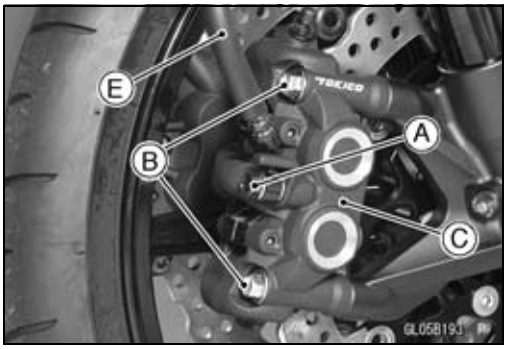
- Tighten:

  **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).

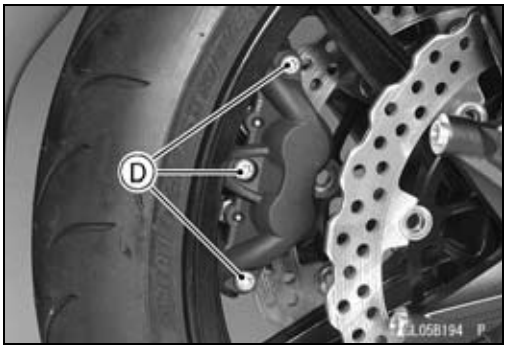
## Calipers

### *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.

| CAUTION |
|---|
| **Do not loosen the caliper assembly bolts [D]. Take out only the caliper mounting bolts for caliper removal. Loosening the caliper assembly bolts will cause brake fluid leakage.** |




- Unscrew the banjo bolt and remove the brake hose [E] from the caliper (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).

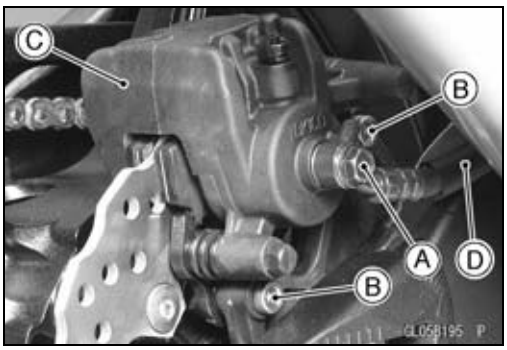
| CAUTION |
|---|
| **Immediately wash away any brake fluid that spills.** |

**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 Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).*


- Remove the collars [A] from the fork leg.

### *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 and Pipe Replacement in the Periodic Maintenance chapter).

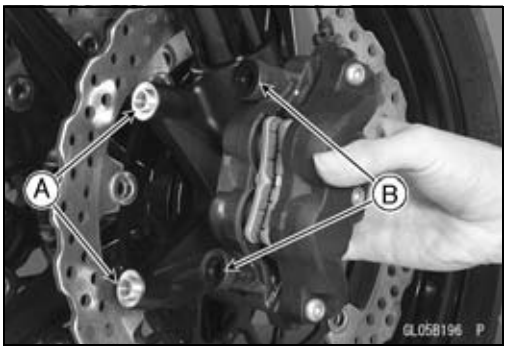
| CAUTION |
|---|
| **Immediately wash away any brake fluid that spills.** |

**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 Caliper Rubber Parts Replacement in the Periodic Maintenance chapter).*

## Calipers

### *Caliper Installation*




- Install the caliper and brake hose lower end.

○For the front caliper, install the collars [A] on the fork leg and fit the holes [B] of the front caliper to the collars.

○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)**

- 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.

## Calipers

### *Caliper Fluid Seal Damage*

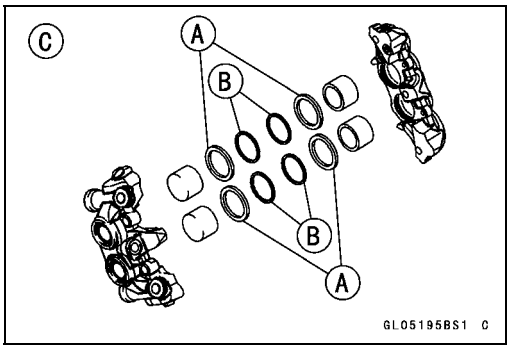
The fluid seal (piston seal) [A] is placed around the piston to maintain clearance between the pad and the disc. If the seal is in a poor condition, it could lead the pad to wear excessively or the brake to drag, which may cause the temperature of the discs or the brake fluid to increase.

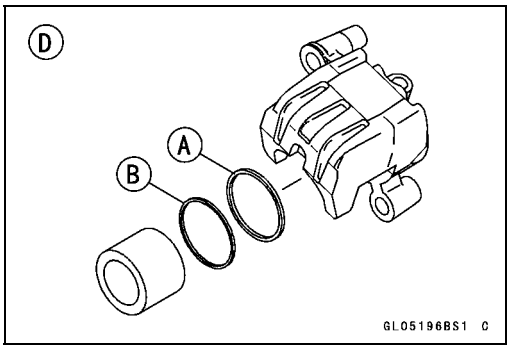
- Replace the fluid seal if it exhibits any of the conditions listed below.

○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.

Front Caliper [C]
Rear Caliper [D]

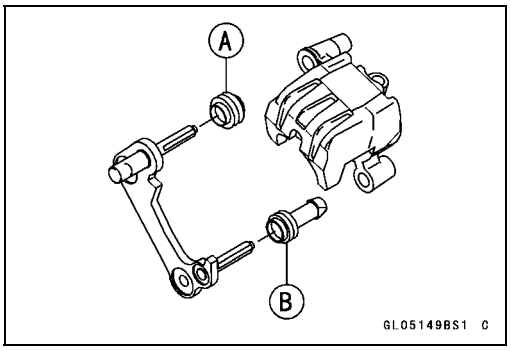



### *Rear Caliper Dust Boot and Friction Boot Damage*

- 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.

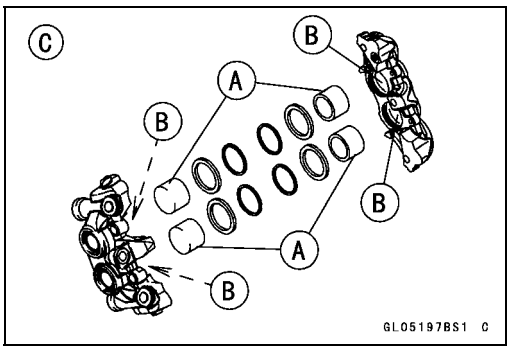


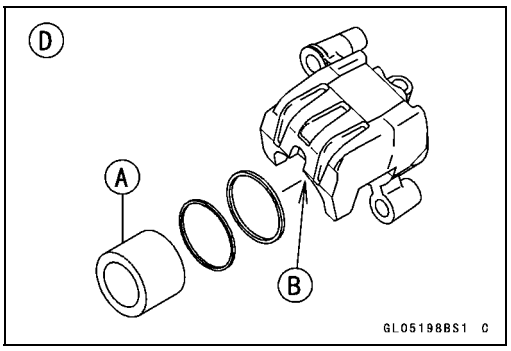

### *Caliper Piston and Cylinder Damage*

- Visually inspect the pistons [A] and cylinder surfaces [B].

★Replace the caliper if the cylinder and piston are badly scores or rusty.

Front Caliper [C]
Rear Caliper [D]



## Calipers

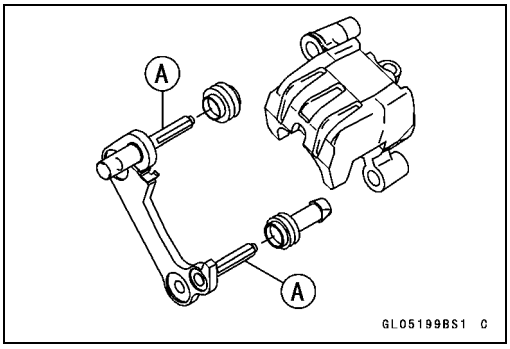
### *Rear Caliper Holder Shaft Wear*

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.

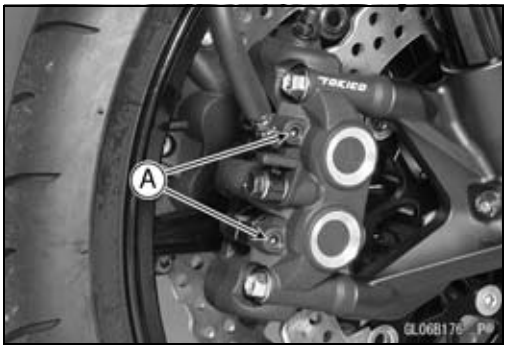
★If the caliper holder shaft is damage, replace the caliper bracket.



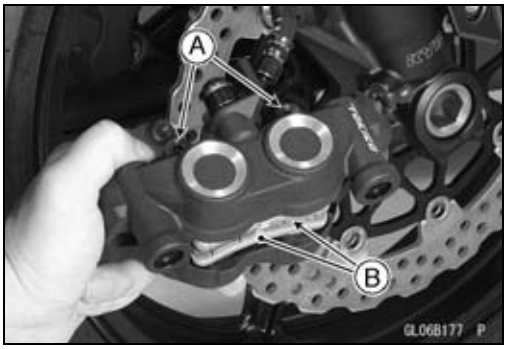
## Brake Pads

### *Front Brake Pad Removal*

- Loosen the pad pins [A].

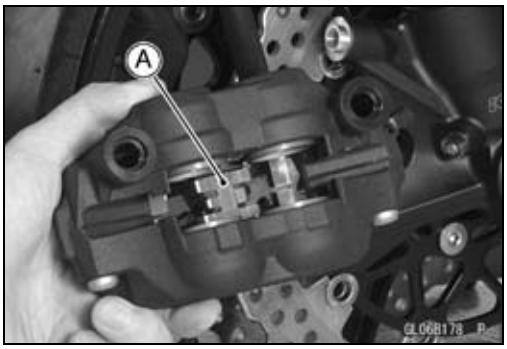



- Remove the front caliper with the hose installed (see Front Caliper Removal).
- Remove:
  Pad Pins [A]
  Brake Pads [B]




### *Front Brake Pad Installation*

- Check that the pad spring [A] is in place on the caliper.
- Push the caliper pistons in by hand as far as they will go.

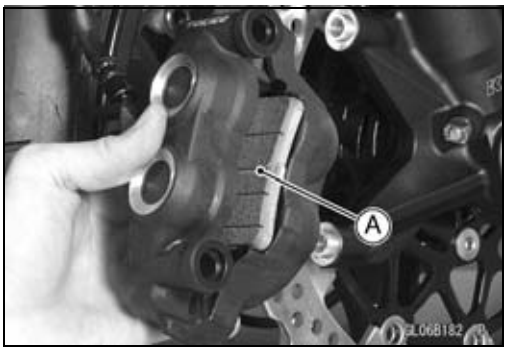



- Install the brake pads on the pad spring correctly.

○Fit the pad [A] into the groove of the caliper as shown in the figure.

- Install the pad pins while pushing the brake pads lightly.
- Tighten the pad pins temporarily.
- Install the front caliper (see Caliper Installation).
- Tighten:

**Torque - Front Brake Pad Pins: 15 N·m (1.5 kgf·m, 11 ft·lb)**

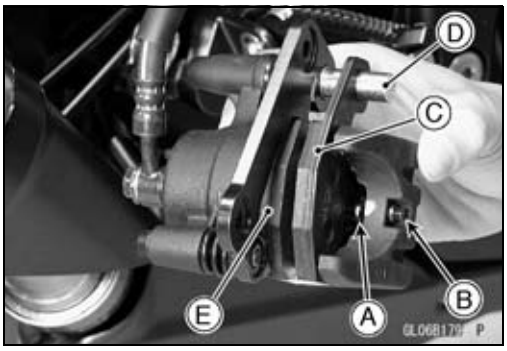



**⚠ WARNING**

**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.**

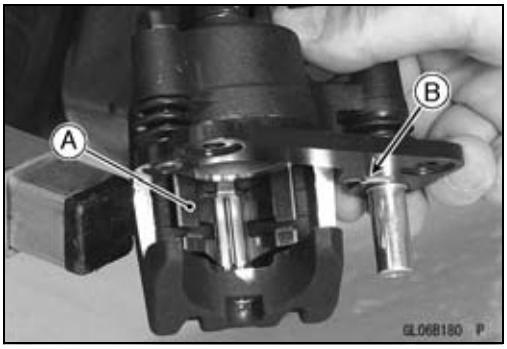
## Brake Pads

### *Rear Brake Pad Removal*

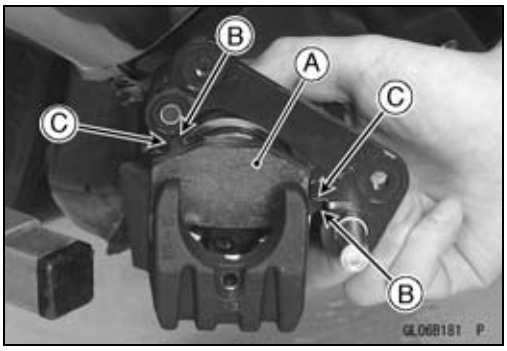



- Remove the rear caliper with the hose installed (see Rear Caliper Removal).
- Remove:
  Clip [A]
  Pad Pin [B]
- Remove the brake pad [C] of the jaw side from the holder shaft [D], then remove the other pad [E].

### *Rear Brake Pad Installation*




- Check that the pad spring [A] and guide [B] are in place on the caliper and holder.
- Push the caliper piston in by hand as far as it will go.




- Install the brake pad [A] on the piston side first, then install the other pad on the holder shaft.
  ○Fit the projections [B] of the piston side pad into the recesses [C] of the caliper holder.
- Install the pad pin while pushing the brake pad of the jow side lightly.
- Install a new clip.
  ○The clip must be “outside” of the pad.
- Install the rear caliper (see Rear 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.**

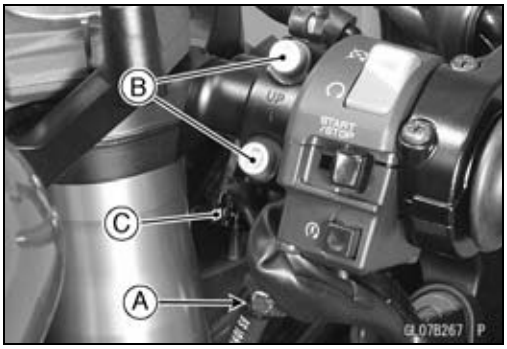
### *Brake Pad Wear Inspection*

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

## Master Cylinder

### *Front Master Cylinder Removal*

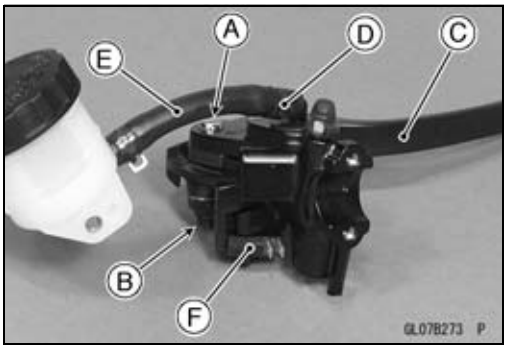

- Remove the reservoir mounting bolt and nut [A].




- Unscrew the banjo bolt [A] and remove the brake hose from the master cylinder (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).
- Unscrew the clamp bolts [B], and take off the master cylinder as an assembly with the reservoir, brake lever, and front brake light switch installed.
- Disconnect the front brake light switch connector [C].

**CAUTION**

**Immediately wash away any brake fluid that spills.**




- Remove:
  Brake Lever Pivot Bolt [A] and Nut [B]
  Brake Lever [C]
  Clamp [D] (Slide Out)
  Brake Hose [E]
  Front Brake Light Switch [F]

### *Front Master Cylinder Installation*

- Apply silicone grease to the sliding surface of the 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 Nut: 5.9 N·m (0.60 kgf·m, 52 in·lb)**

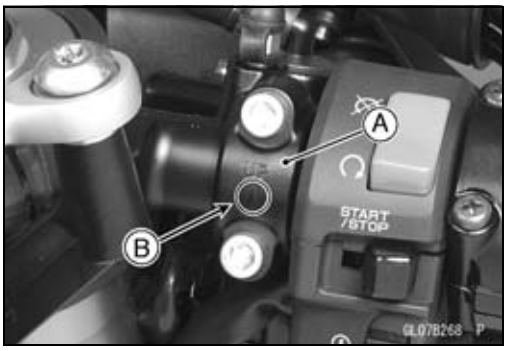
- Install the front brake light switch.

**Torque - Front Brake Light Switch Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

## Master Cylinder

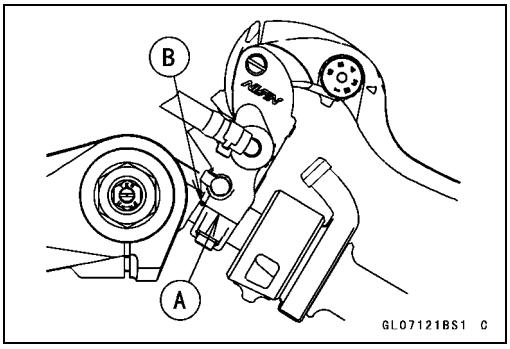
- Install the master cylinder clamp [A] so that the arrow mark [B] faces upward.

○There will be a gap at the lower part of the clamp.




- Install the master cylinder so that the mating surface [A] of the master cylinder clamp is aligned with the punch mark [B] of the handlebar.
- Tighten the upper clamp bolt first, then the lower clamp bolt.

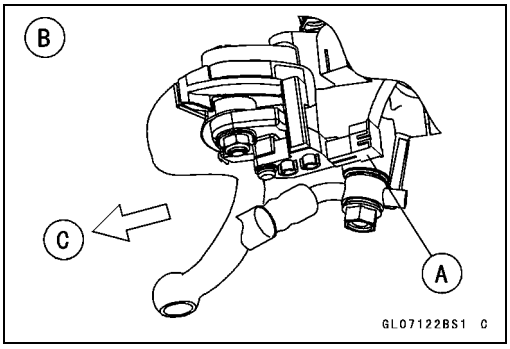
**Torque - Front Master Cylinder Clamp Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**




- Connect the front brake light switch connector [A] as shown in the figure.
  Left Side View [B]
  Front [C]
- Replace the washers on each side of the hose fitting with new ones.
- Tighten:

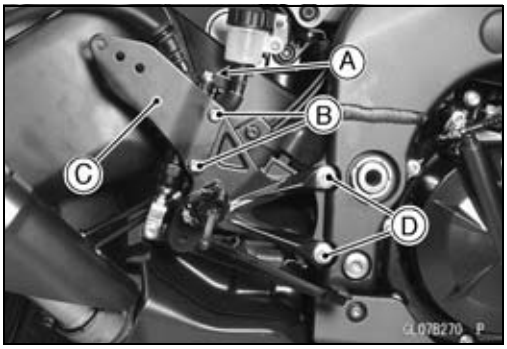
**Torque - Brake Hose Banjo Bolt: 25 N·m (2.5 kgf·m, 18 in·lb)**

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.



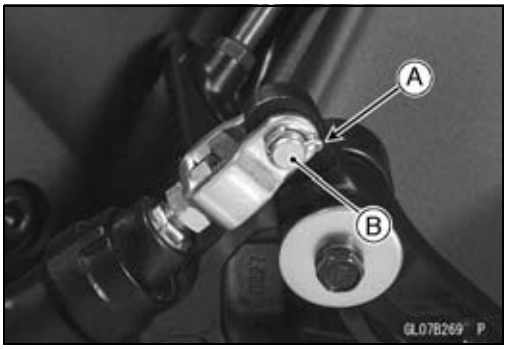

### *Rear Master Cylinder Removal*

- Unscrew the brake hose banjo bolt [A] and remove the brake hose (see Brake Hose and Pipe Replacement in the Periodic Maintenance chapter).
- Remove:
  Rear Master Cylinder Mounting Bolts [B]
  Foot Guard [C]
  Front Footpeg Bracket Bolts [D]

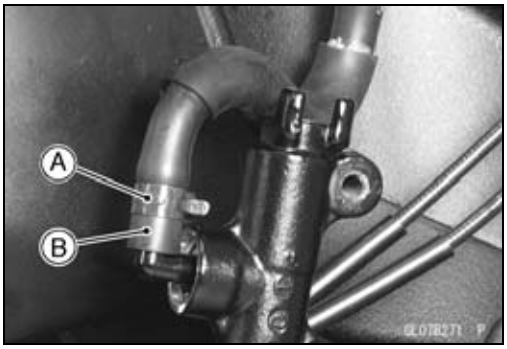


## Master Cylinder

- Remove:
  Cotter Pin [A]
  Joint Pin [B]

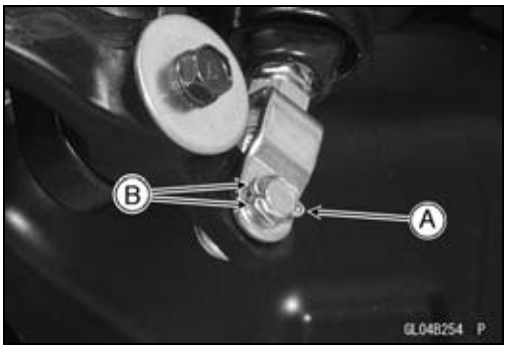



- Slide the reservoir hose lower end clamp [A].
- Pull off the reservoir hose lower end [B], and drain the brake fluid into a container.



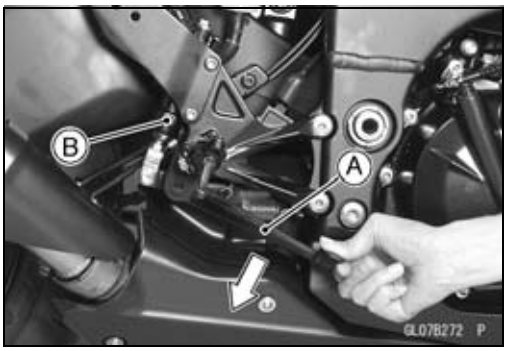

### *Rear Master Cylinder Installation*

- Replace the cotter pin [A] with a new one.
- Insert the cotter pin and bend the pin ends [B].




- Replace the washers on each side of hose fitting with new ones.
- Tighten the following bolts.

**Torque - Front Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
**Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
**Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**




**NOTE**

○*Depress the brake pedal [A] and then align the holes of the master cylinder [B].*
○*After installation, check that the rear brake light switch spring is hooked on the return spring.*

- 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.

## Master Cylinder

### *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 front/rear master cylinder (see Front/Rear Master Cylinder Removal).
- Disassemble the front/rear master cylinder (see Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter).
- 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.

- Check the dust covers [E] for damage.

★If they are damaged, replace them.

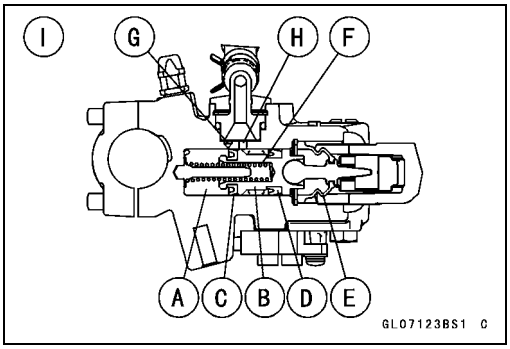
- Check the piston return spring [F] for any damage.

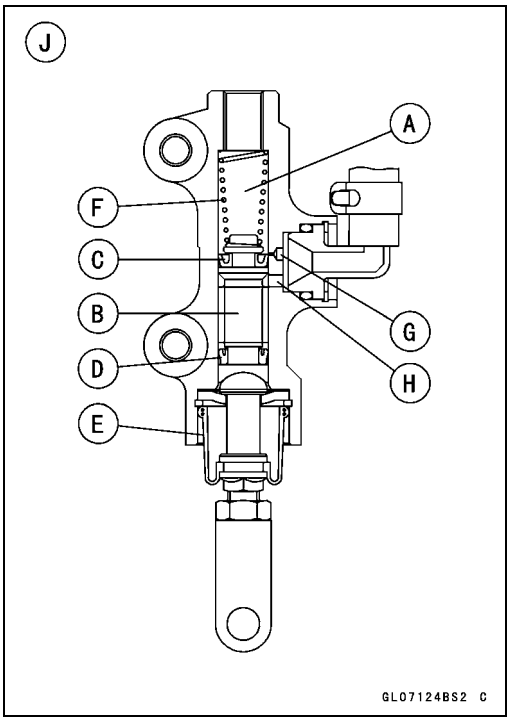
★If the springs are damaged, replace them.

- 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.

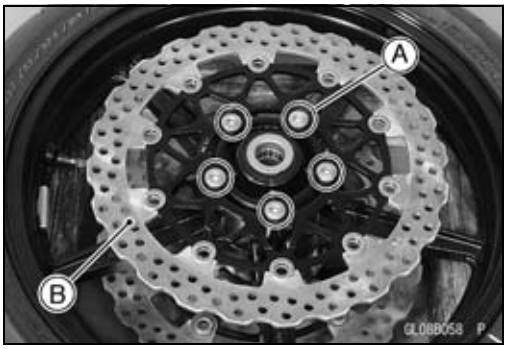
Front Master Cylinder [I]
Rear Maser Cylinder [J]



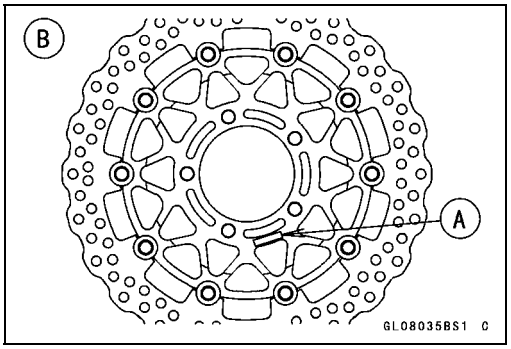
## Brake Disc

### *Brake Disc Removal*



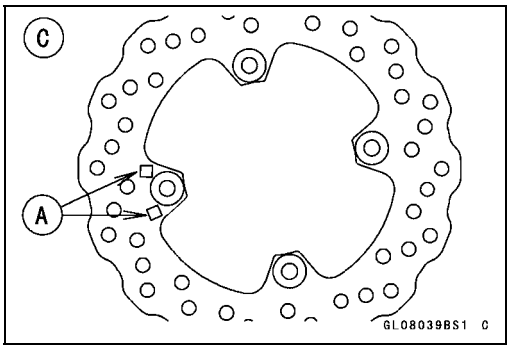

- Remove the front/rear wheel (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Unscrew the mounting bolts [A], and take off the disc [B].

### *Brake Disc Installation*

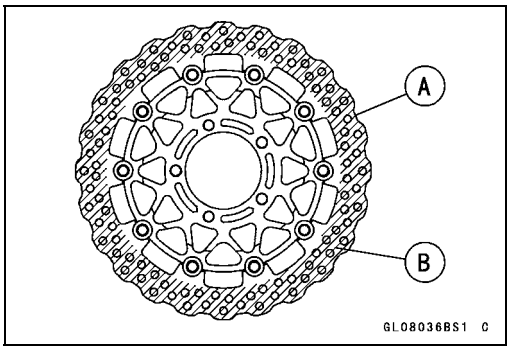



- Install the brake disc on the wheel so that the marked side [A] faces out.
  Front Brake Discs [B]
  Rear Brake Disc [C]
- Apply a non-permanent locking agent to the threads of the brake disc mounting bolts.
- Tighten:

**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.

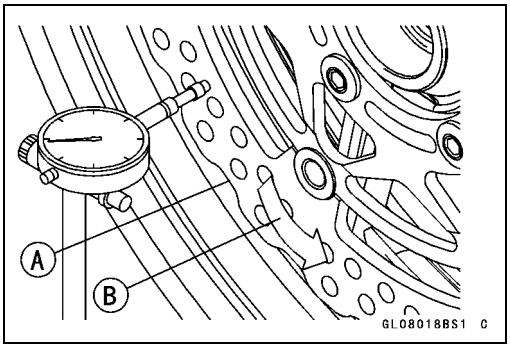
★If the disc has worn past the service limit, replace it.
  Measuring Area [B]

**Brake Discs Thickness**

| | |
|---|---|
| **Standard:** | |
| **Front** | **5.3 ~ 5.7 mm (0.21 ~ 0.22 in.)** |
| **Rear** | **4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)** |
| **Service Limit:** | |
| **Front** | **5.0 mm (0.20 in.)** |
| **Rear** | **4.5 mm (0.18 in.)** |

## Brake Disc

### *Brake Disc Warp*




● Raise the wheel off the ground with jack.

**Special Tools - Jack: 57001-1238**
**Jack Attachment: 57001-1608**

● Set up a dial gauge against the disc [A] as shown and measure disc runout, while turning [B] the wheel by hand.
○For front disc inspection, turn the handlebar fully to one side.
★If runout exceeds the service limit, replace the disc.

**Disc Runout**
**Standard: TIR 0.15 mm (0.006 in.) or less**
**Service Limit: TIR 0.3 mm (0.01 in.)**

## Brake Fluid

### *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.

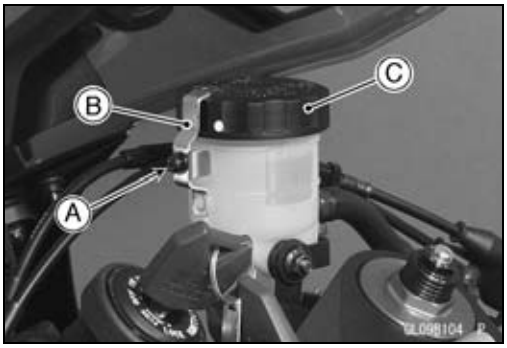
**⚠ WARNING**

**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:
Screw [A]
Stopper [B]
Front Brake Reservoir Cap [C]

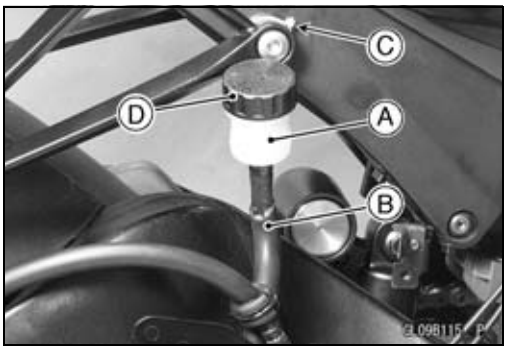



● For the rear brake, remove the rear brake reservoir cap as follows.

○Remove the rear brake reservoir mounting bolt [A].

## Brake Fluid

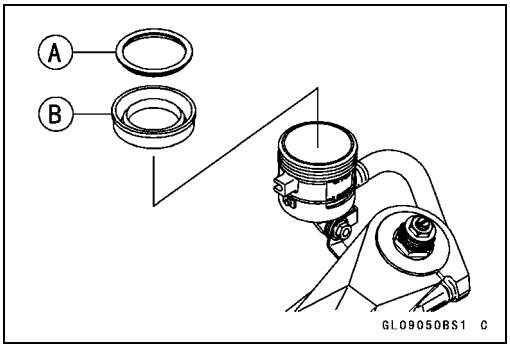
○Hold up the rear brake reservoir [A] so that the brake hose [B] becomes straight, and then fix it with the band [C] as shown in the figure.
○Remove the rear brake reservoir cap [D].




**CAUTION**

**Do not bend the brake hose. The air may not be bled from the rear brake line completely.**

- Remove:
  Diaphragm Plate [A]
  Diaphragm [B]
- 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.

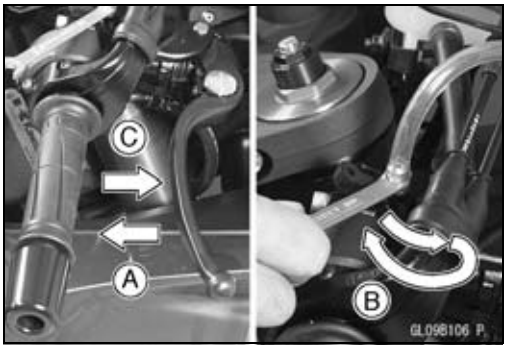



- Remove the rubber cap [A] from the bleed valve on the front master cylinder.
- Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.


- Bleed the brake line and the master cylinder.

○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**

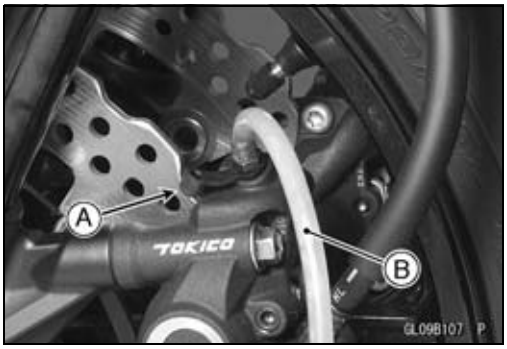
○*The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*

- Remove the clear plastic hose.
- Tighten the bleed valve, and install the rubber cap.

**Torque - Front Master Cylinder Bleed Valve: 5.4 N·m (0.55 kgf·m, 48 in·lb)**

## Brake Fluid

- Remove the rubber cap [A] from the bleed valve 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.

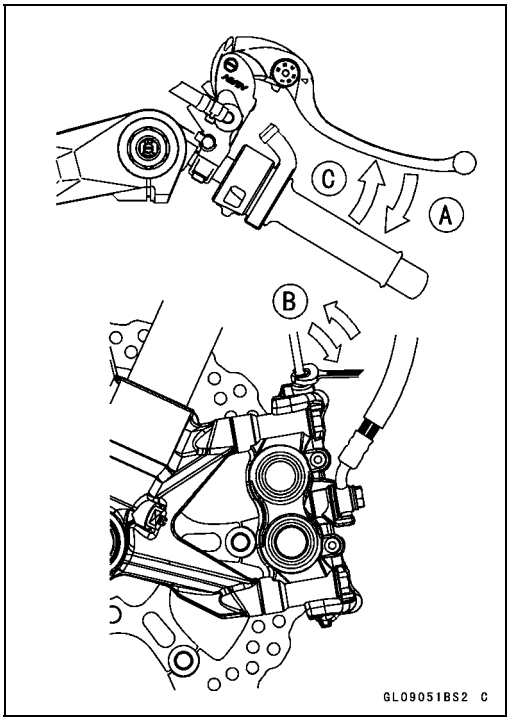
1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
2. Quickly open and close [B] the bleed valve while holding the brake applied.
3. Release the brake [C].

**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: Repeat the above steps for the other caliper.*

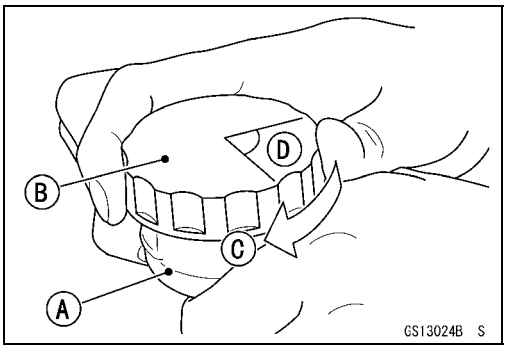



- Remove the clear plastic hose.
- Install:

  Diaphragm
  Diaphragm Plate
  Front Brake Reservoir Cap

- Follow the procedure below to install the front/rear brake fluid reservoir cap correctly.

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



## Brake Fluid

- Install the stopper on the reservoir.
- Tighten:

**Torque - Front Brake Reservoir Cap Stopper Screw: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

- 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 **AIR MUST BE BLED FROM THE BRAKE LINE.**

## Brake Hose

### *Brake Hose Removal/Installation*

- Refer to the Brake Hose and Pipe Replacement in the Periodic Maintenance chapter.

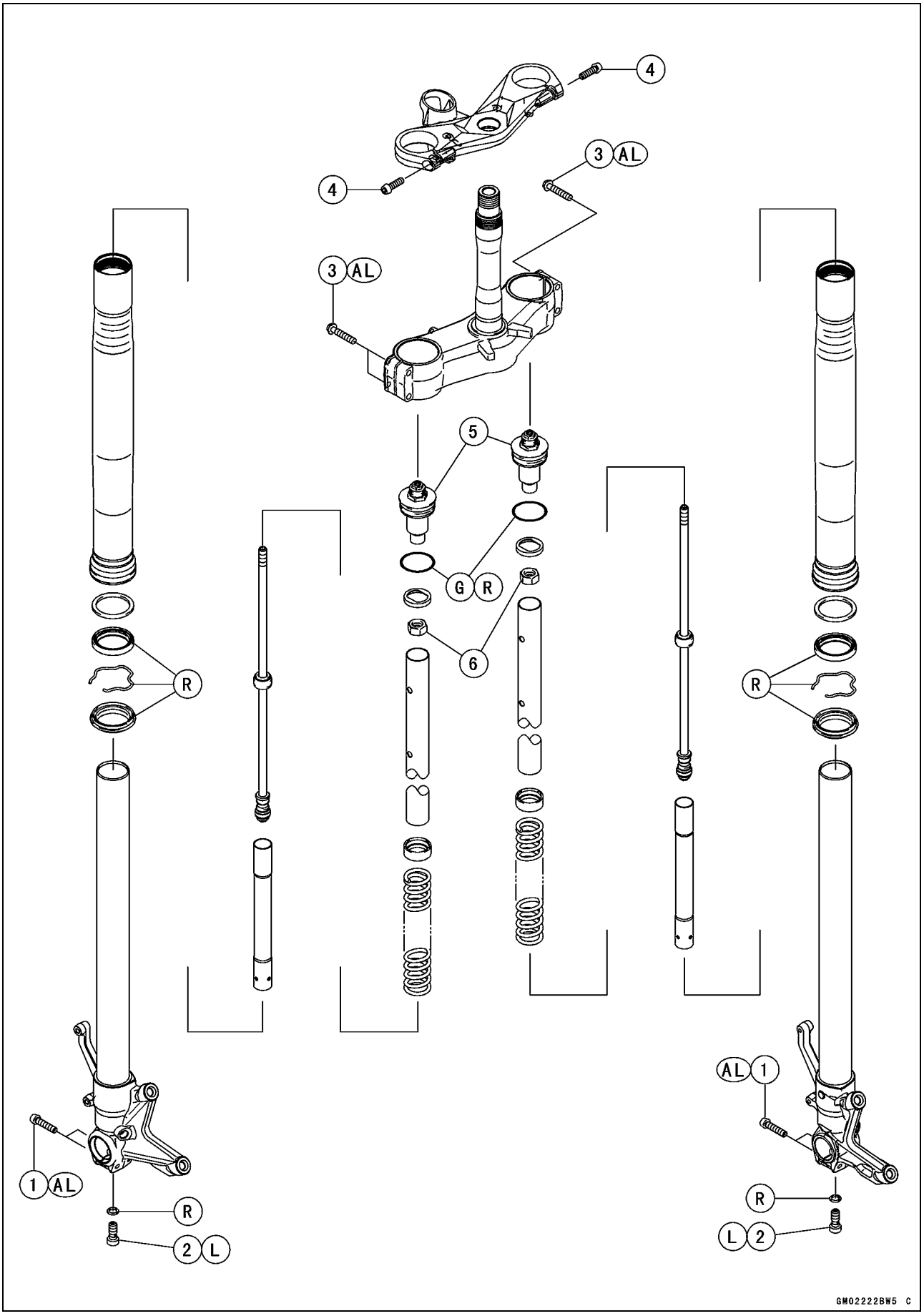
### *Brake Hose Inspection*

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

# Suspension

## Table of Contents

## Exploded View

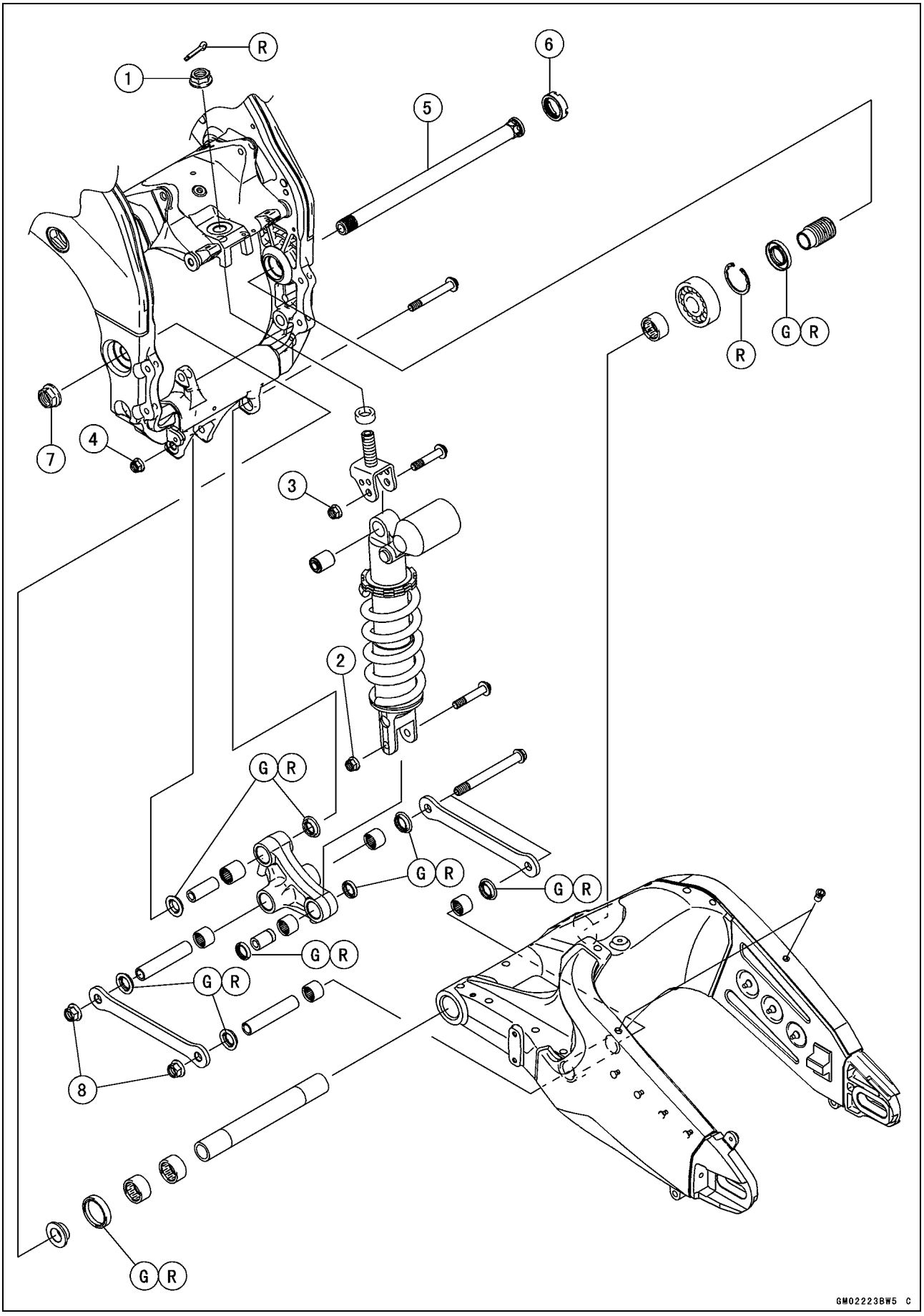


## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Front Axle Clamp Bolts | 20 | 2.0 | 15 | AL |
| 2 | Front Fork Bottom Allen Bolts | 23 | 2.3 | 17 | L |
| 3 | Lower Front Fork Clamp Bolts | 30 | 3.1 | 22 | AL |
| 4 | Upper Front Fork Clamp Bolts | 20 | 2.0 | 15 | |
| 5 | Front Fork Top Plugs | 23 | 2.3 | 17 | |
| 6 | Piston Rod Nuts | 15 | 1.5 | 11 | |

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



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Rear Shock Absorber Bracket Nut | 59 | 6.0 | 44 | |
| 2 | Lower Rear Shock Absorber Nut | 34 | 3.5 | 25 | |
| 3 | Upper Rear Shock Absorber Nut | 34 | 3.5 | 25 | |
| 4 | Uni-Trak Rocker Arm Nut | 34 | 3.5 | 25 | |
| 5 | Swingarm Pivot Shaft | 20 | 2.0 | 15 | |
| 6 | Swingarm Pivot Adjusting Collar Locknut | 98 | 10.0 | 72 | |
| 7 | Swingarm Pivot Shaft Nut | 108 | 11.0 | 80 | |
| 8 | Tie-Rod Nuts | 59 | 6.0 | 44 | |

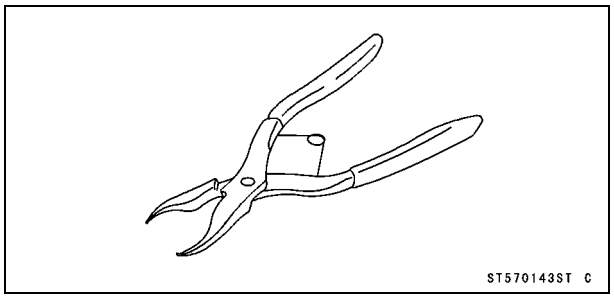
G: Apply or add grease.
R: Replacement Parts

## Specifications

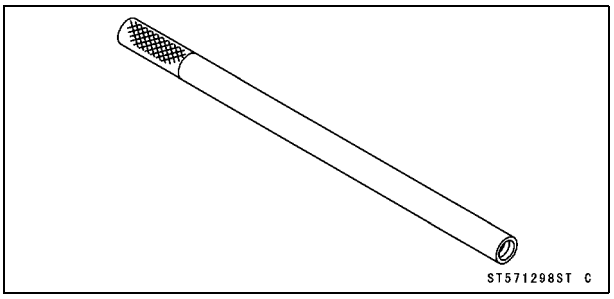
| Item | Standard |
|---|---|
| **Front Fork (Per One Unit)** | |
| Fork Inner Tube Diameter | $\phi$43 mm (1.7 in.) |
| Air Pressure | Atmospheric pressure (Non-adjustable) |
| Rebound Damper Setting | 10th click from the first click of the fully clockwise position<br>(Usable Range: 0 ←→ 13 clicks) |
| Compression Damper Setting | 10th click from the first click of the fully clockwise position<br>(Usable Range: 0 ←→ 13 clicks) |
| Fork Spring Preload Setting | Adjuster protrusion is 14 mm (0.55 in.)<br>(Usable Range: 4 ~ 19 mm) (0.16 ~ 0.75 in.) |
| Fork Oil: | |
| Viscosity | KHL15-10 (KAYABA01) or equivalent SAE 5W |
| Amount | Approx. 490 mL (16.6 US oz.) (when changing oil)<br>575 ±4 mL (19.4 ±0.14 US oz.) (after disassembly and completely dry) |
| Fork Oil Level | 107 ±2 mm (4.21 ±0.08 in.) (fully compressed, without fork spring, below from the top of inner tube) |
| Fork Spring Free Length | 232.3 mm (9.15 in.) (Service limit: 228 mm (8.98 in.)) |
| **Rear Shock Absorber** | |
| Rebound Damper Setting | 2 turns out from the fully clockwise position<br>(Usable Range: 0 ←→ 2 1/2 turns out) |
| Compression Damper Setting: | |
| High Speed | 2 3/4 turns out from the fully clockwise position<br>(Usable range: 0 ←→ 5 1/2 turns out) |
| Low Speed | 2 1/4 turns out from the fully clockwise position<br>(Usable range: 0 ←→ 4 1/2 turns out) |
| Spring Preload Setting Position: | |
| Standard | Spring length: 179 mm (7.05 in.) |
| Usable Range | Spring length: 173.5 ~ 191.5 mm (6.831 ~ 7.539 in.)<br>(stronger to weaker) |
| Gas Pressure | 980 kPa (10 kgf/cm², 142 psi, Non-adjustable) |

## Special Tools

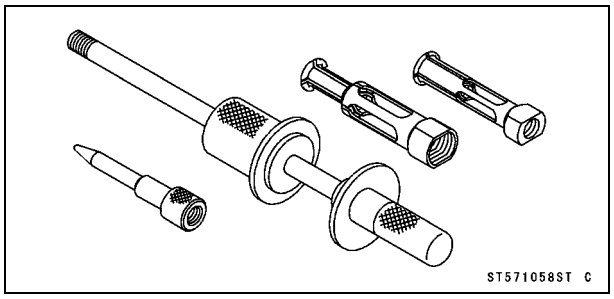
**Inside Circlip Pliers:**
**57001-143**



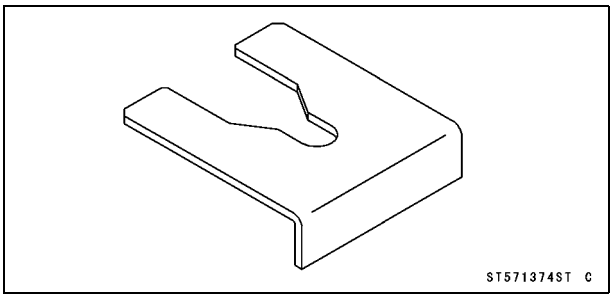

**Fork Piston Rod Puller, M10 × 1.0:**
**57001-1298**



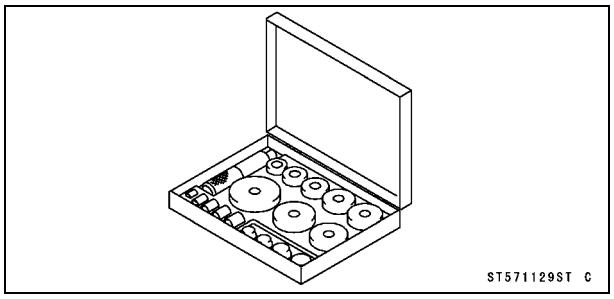

**Oil Seal & Bearing Remover:**
**57001-1058**



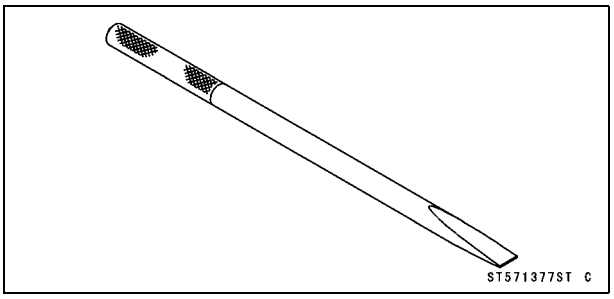

**Fork Spring Stopper:**
**57001-1374**



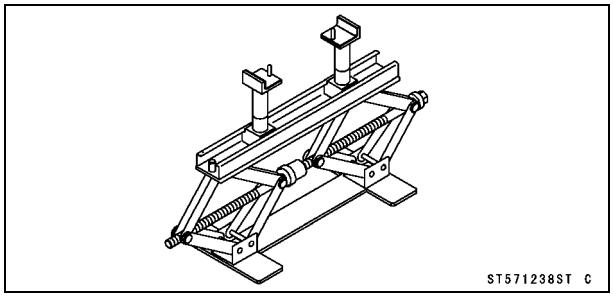

**Bearing Driver Set:**
**57001-1129**



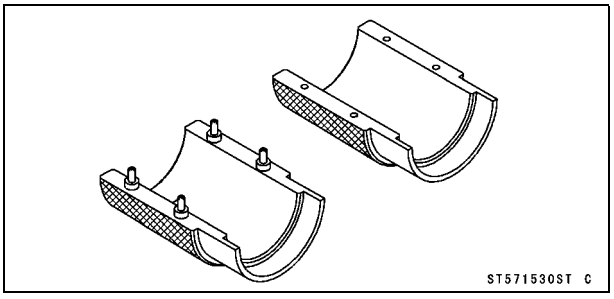

**Bearing Remover Shaft, $\phi$13:**
**57001-1377**



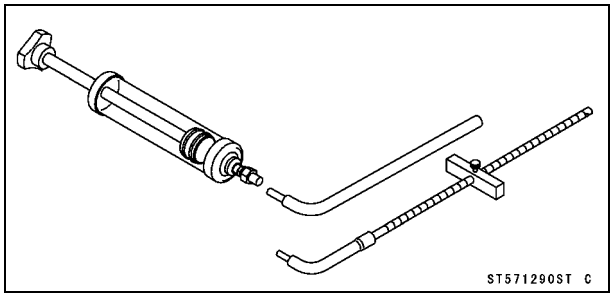

**Jack:**
**57001-1238**



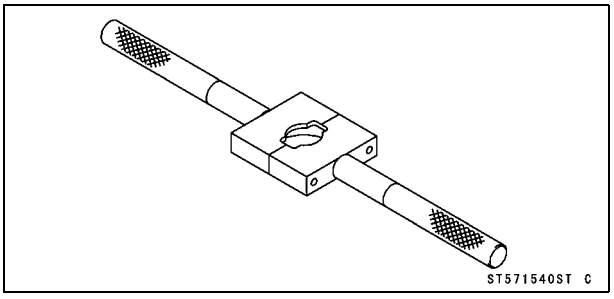

**Fork Oil Seal Driver, $\phi$43:**
**57001-1530**




**Fork Oil Level Gauge:**
**57001-1290**

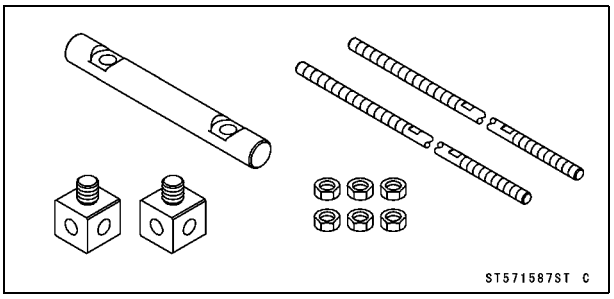



**Fork Spring Compressor:**
**57001-1540**

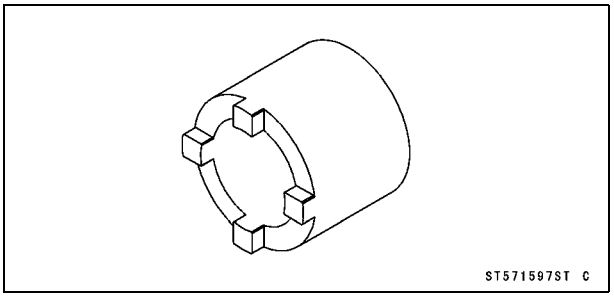


## Special Tools

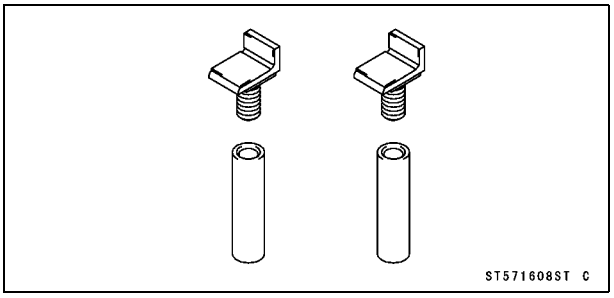
**Fork Spring Compressor:**
**57001-1587**



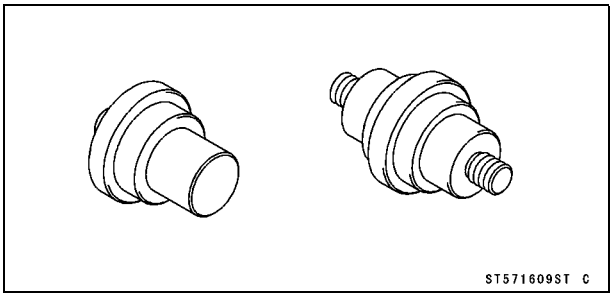

**Swingarm Pivot Nut Wrench:**
**57001-1597**



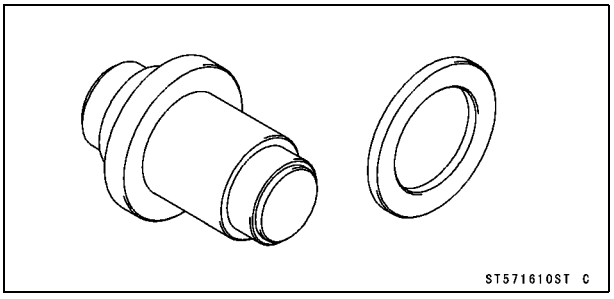

**Jack Attachment:**
**57001-1608**



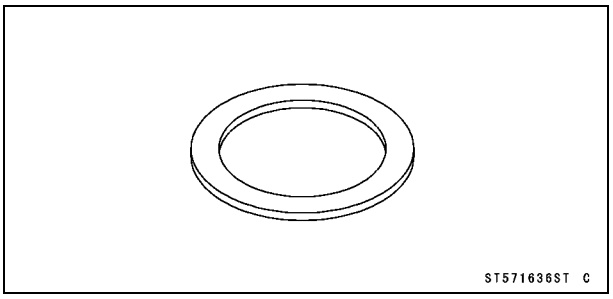

**Needle Bearing Driver, $\phi$17/$\phi$18:**
**57001-1609**



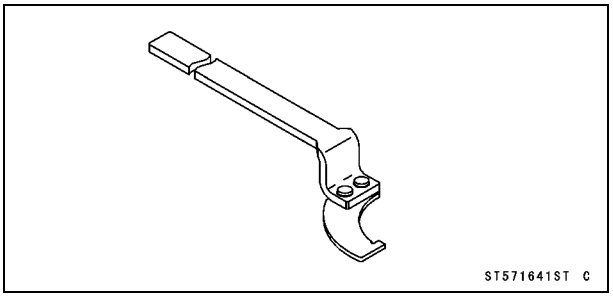

**Needle Bearing Driver, $\phi$28:**
**57001-1610**



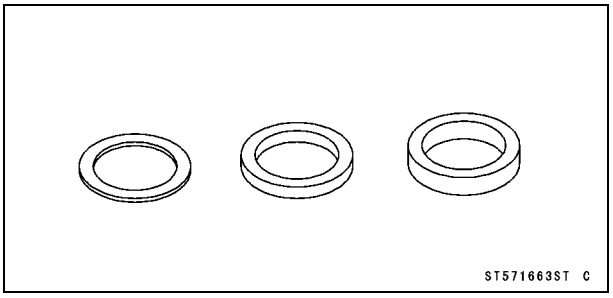

**Spacer, $\phi$18:**
**57001-1636**



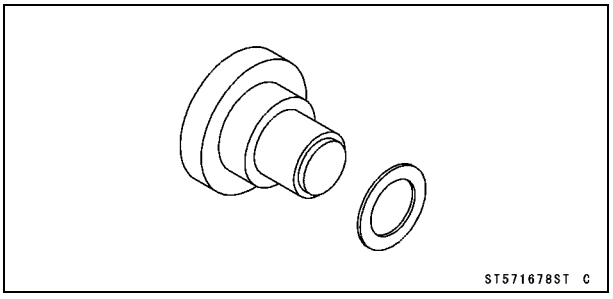

**Hook Wrench:**
**57001-1641**




**Spacer$\phi$28:**
**57001-1663**

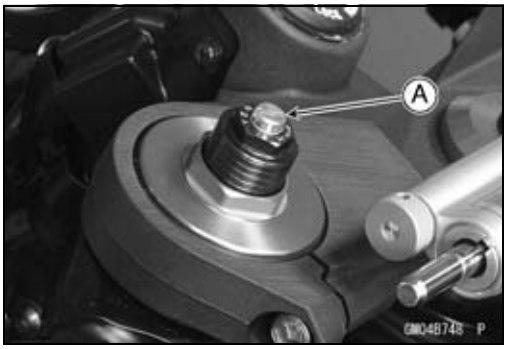



**Needle Bearing Driver, $\phi$20 & Spacer, $\phi$28:**
**57001-1678**



## Front Fork

### *Rebound Damping Force Adjustment*



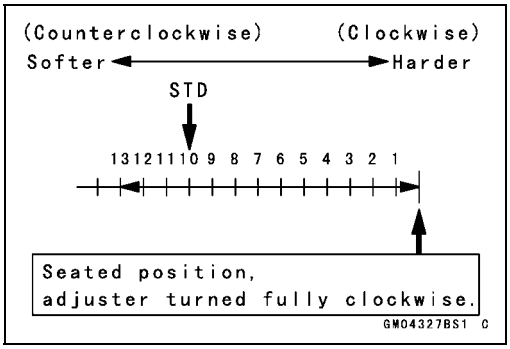

- To adjust the rebound damping force, turn the rebound damping adjuster [A] until you feel a click.

○The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **10th click** from the 1st click of the fully clockwise position.

**⚠ WARNING**

**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.**

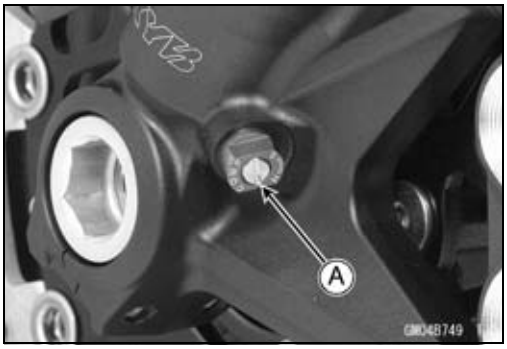
○The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.




**Rebound Damping Force Adjustment**

| Adjuster Position | Damping Force | Setting | Load | Road | Speed |
|---|---|---|---|---|---|
| 13 | Weak | Soft | Light | Good | Low |
| ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 0 | Strong | Hard | Heavy | Bad | High |

### *Compression Damping Force Adjustment*



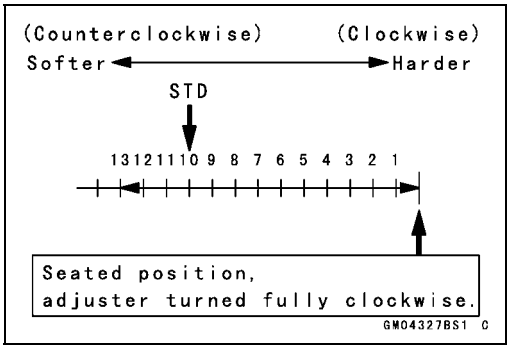

- To adjust the compression damping force, turn the compression damping adjuster [A] until you feel a click.

○The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **10th click** from the 1st click of the fully clockwise position.

**⚠ WARNING**

**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.**

○The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.

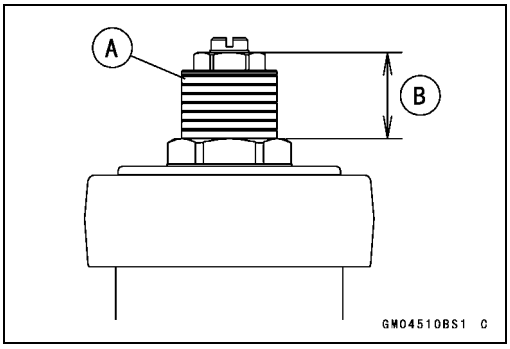



**Compression Damping Force Adjustment**

| Adjuster Position | Damping Force | Setting | Load | Road | Speed |
|---|---|---|---|---|---|
| 13 | Weak | Soft | Light | Good | Low |
| ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 0 | Strong | Hard | Heavy | Bad | High |

## Front Fork

### *Spring Preload Adjustment*




● Turn the spring preload adjuster [A] to change spring preload setting.

○The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **14 mm (0.55 in.)** [B] from the top plug nut surface as shown in the figure.

**Adjuster Protrusion (from the top plug nut surface)**
**Standard: 14 mm (0.55 in.)**
**Usable Range: 4 ~ 19 mm (0.16 ~ 0.75 in.)**

**⚠ WARNING**

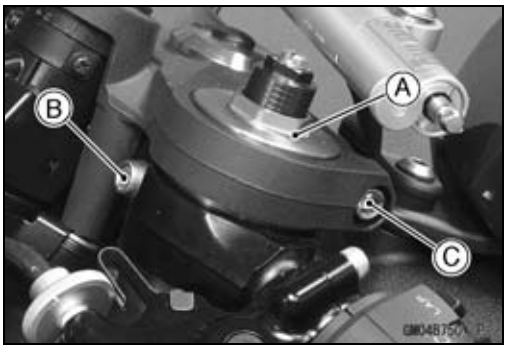
**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.**

○The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

**Spring Action**

| Adjuster Position | Damping Force | Setting | Load | Road | Speed |
|---|---|---|---|---|---|
| 19 mm | Weak | Soft | Light | Good | Low |
| ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 4 mm | Strong | Hard | Heavy | Bad | High |

### *Front Fork Removal (Each Fork Leg)*




● Remove:
Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
Front Fender (see Front Fender Removal in the Frame chapter)
Upper Inner Fairing (see Upper Inner Fairing Removal in the Frame chapter)

★Loosen the front fork top plug [A] beforehand if the fork leg is to be disassembled.

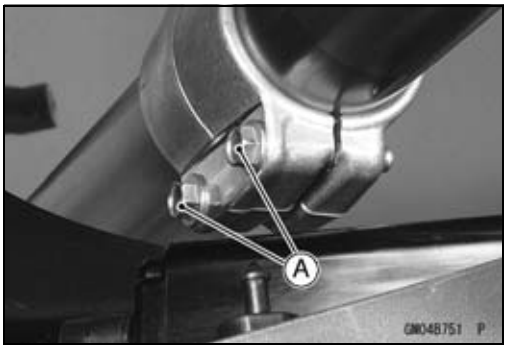
**NOTE**

○*Loosen the top plug after loosening the handlebar clamp bolt [B] and upper front fork clamp bolt [C].*


● Loosen:
Handlebar Clamp Bolt [A]
Upper Front Fork Clamp Bolt [B]

## Front Fork

- Loosen the lower front fork clamp bolts [A].
- With a twisting motion, work the fork leg down and out.



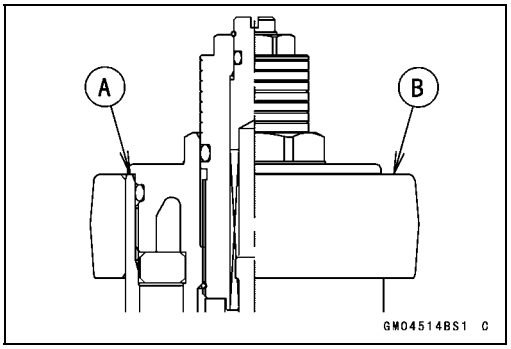

### *Front Fork Installation*

- Install the fork leg so that the top [A] of the outer tube is flush with the upper surface [B] of the steering stem head.
- Tighten the lower front fork clamp bolts and top plug.

**Torque - Lower Front Fork Clamp Bolts: 30 N·m (3.1 kgf·m, 22 ft·lb)**
**Front Fork Top Plug: 23 N·m (2.3 kgf·m, 17 ft·lb)**

**NOTE**

○*Tighten the two lower front fork clamp bolts alternately two times to ensure even tightening torque.*
○*Tighten the front fork top plug before tightening the handlebar clamp bolt and upper front fork clamp bolt.*



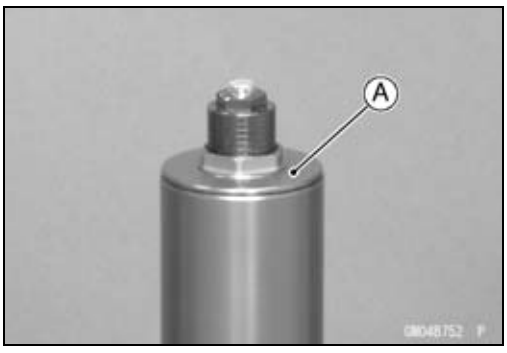

- Tighten the upper front fork clamp bolt and handlebar clamp bolt.

**Torque - Upper Front Fork Clamp Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**
**Handlebar Clamp Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Install the removed parts (see appropriate chapters).
- Adjust:
  Spring Preload (see Spring Preload Adjustment)
  Rebound Damping Force (see Rebound Damping Force Adjustment)
  Compression Damping Force (see Compression Damping Force Adjustment)

### *Front Fork Oil Change*

- Remove the front fork (see Front Fork Removal (Each Fork Leg)).
- Hold the inner tube lower end in a vise.
- Unscrew the top plug [A] out of the outer tube.



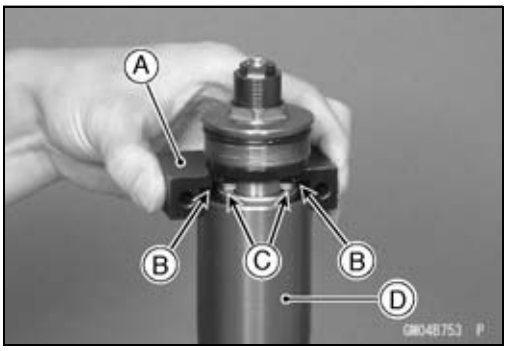
## Front Fork

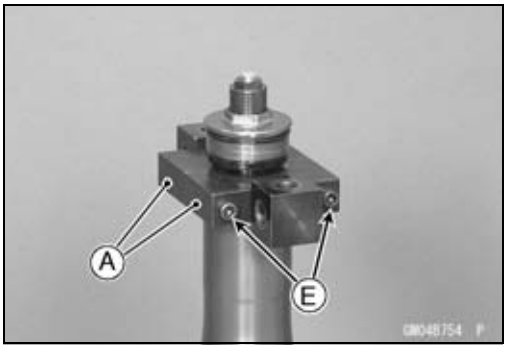
● Install the clamps [A] as shown in the figure.

**NOTE**

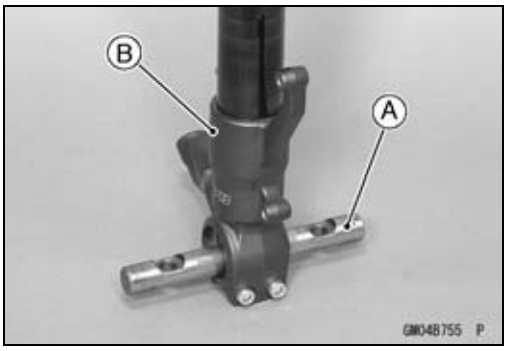
○*Set the clamps so that the cutouts [B] do not touch the stoppers [C] of the top plug, pull up the outer tube [D] to hold it by the clamps, and then tighten the two bolts [E]. The outer tube is used as a guide.*

**Special Tools - Fork Spring Compressor (Clamp): 57001 -1540**
**Fork Spring Compressor: 57001-1587**

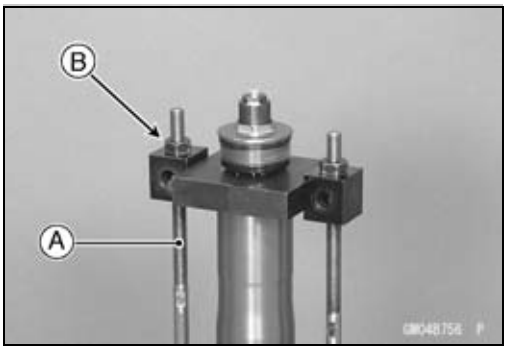


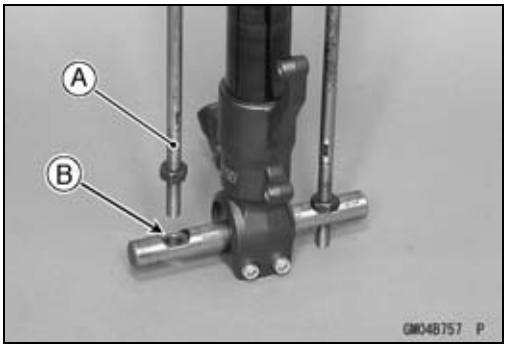

● Insert the holder bar [A] into the axle hole of the front fork [B].




● Insert the compression shaft [A] and install the nut [B].
○Set the other side compression shaft same process.

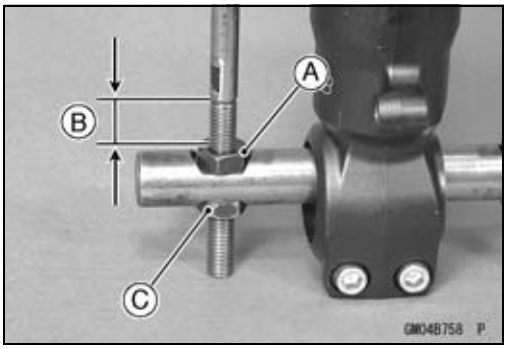



● Insert the lower end of the compression shaft [A] into the hole [B] of the holder bar.



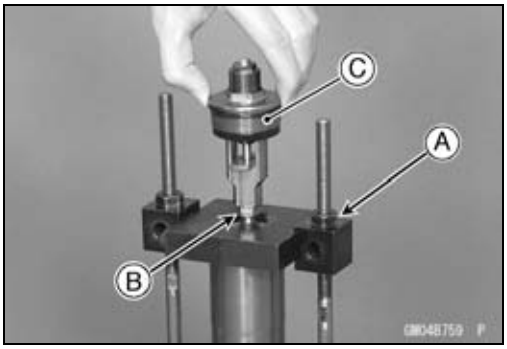
## Front Fork

- Screw the adjust nut [A] onto the compression shaft as shown in the figure.
  20 mm (0.79 in.) [B]
- Screw the locknut [C].



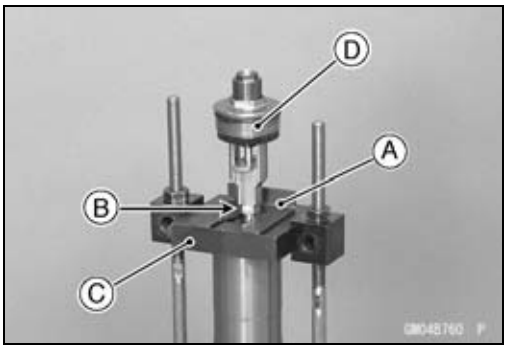

- Screw in one side nut [A] come out the piston rod nut [B].

○Hold up the top plug [C] while screwing in the nut.

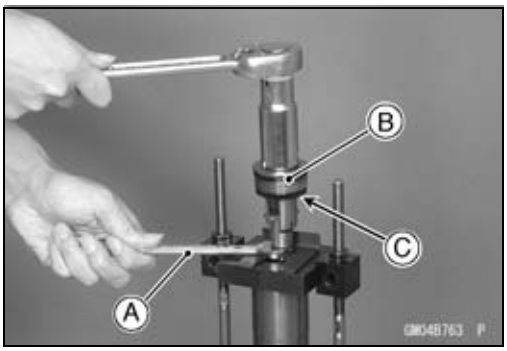



- Insert the fork spring stopper [A] between the piston rod nut [B] and the clamp [C] while holding up the top plug [D].

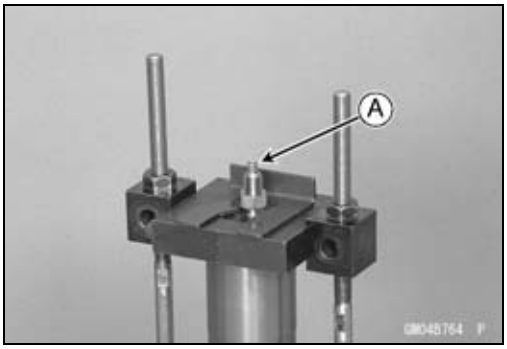
**Special Tool - Fork Spring Stopper: 57001-1374**




- Holding the piston rod nut with a wrench [A], remove the top plug [B] with damper [C] from the piston rod.

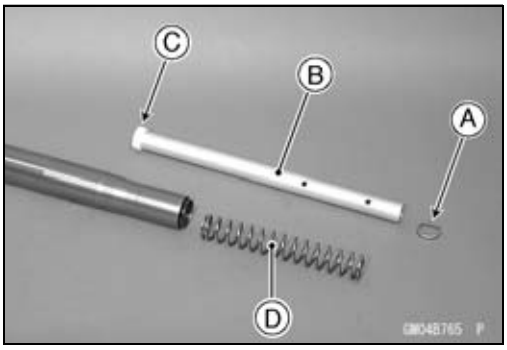



- Remove the rebound damping adjuster rod [A] from the piston rod.



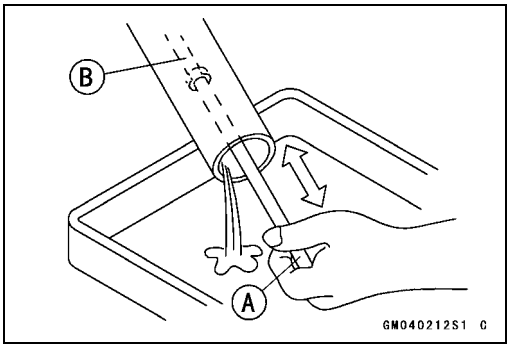
## Front Fork

● Remove:
Washer [A]
Collar [B] (with Spring Seat [C])
Fork Spring [D]



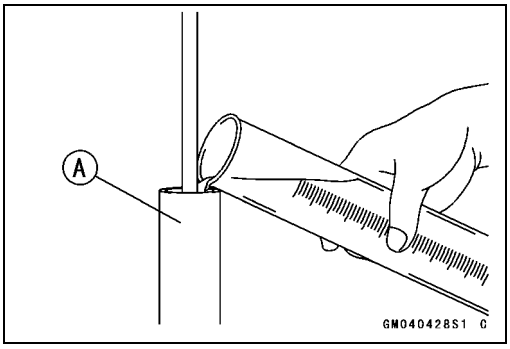

● Drain the fork oil into a suitable container.
○Using the fork piston rod puller [A], pump the piston rod [B] up and down at least ten times to expel the oil from the fork.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001 -1298**



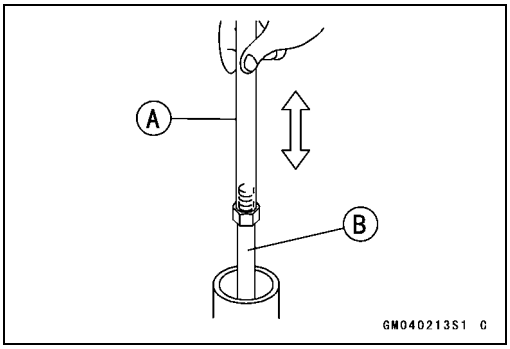

● Hold the fork tube upright, press the outer tube [A] and the piston rod all the way down.
● Pour in the type and amount of fork oil specified.

**Fork Oil**
**Viscosity:**
**KHL15-10 (KAYABA01) or equivalent SAE 5W**
**Amount (Per Side):**
**When changing oil:**
**Approx. 490 mL (16.6 US oz.)**
**After disassembly and completely dry:**
**575 ±4 mL (19.4 ±0.14 US oz.)**




★If necessary, measure the oil level as follows.
○Hold the inner tube vertically in a vise.
○Using the fork piston rod puller [A], move the piston rod [B] up and down more than ten times in order to expel all the air from the fork oil.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001 -1298**



## Front Fork

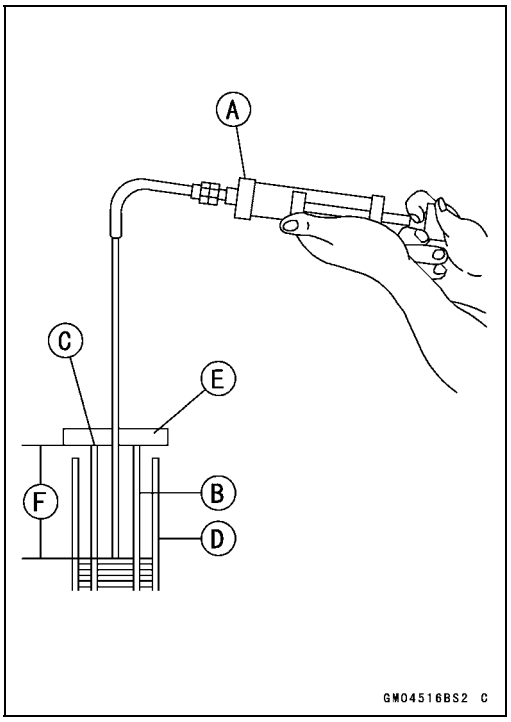
○Remove the fork piston rod puller.
○Wait until the oil level settles.
○With the fork fully compressed and the piston rod fully pushed in, insert a tape measure or rod into the inner tube, and measure the distance from the top of the inner tube to the oil.

**Oil Level (fully compressed, without spring)**
**Standard: 107 ±2 mm (4.21 ±0.08 in.)**

**NOTE**

○*Fork oil level may also be measured using the fork oil level gauge.*

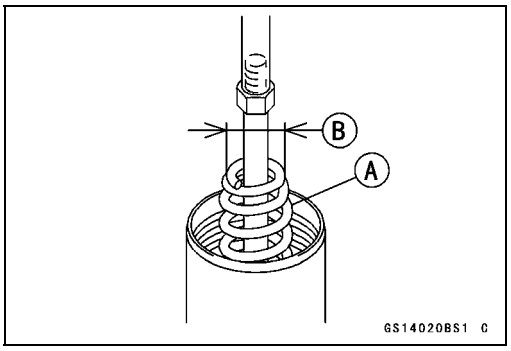
**Special Tool - Fork Oil Level Gauge [A]: 57001-1290**




○With the fork fully compressed and without fork spring, insert the gauge tube into the inner tube [B] and position the stopper across the top end [C] of the inner tube.
Outer Tube [D]
○Set the gauge stopper [E] so that its lower side shows the oil level distance specified [F].
○Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
★If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.

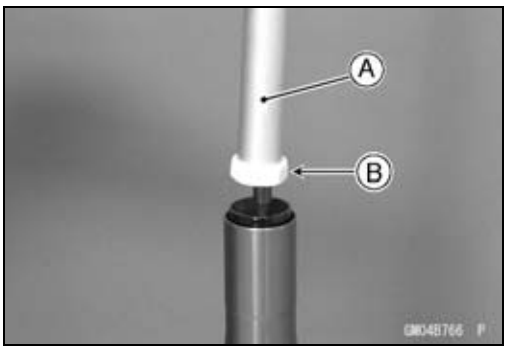
● Screw the fork piston rod puller onto the end of the piston rod.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001 -1298**




● Pull the puller up above the outer tube top.
● Install the fork spring [A] with the smaller end facing [B] upward.

● Install the collar [A] so that the spring seat [B] faces downward.
● Install the washer on the collar.



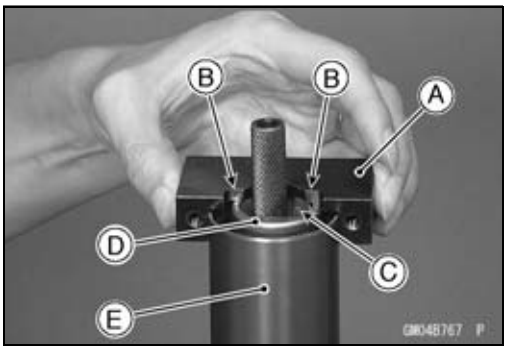
## Front Fork

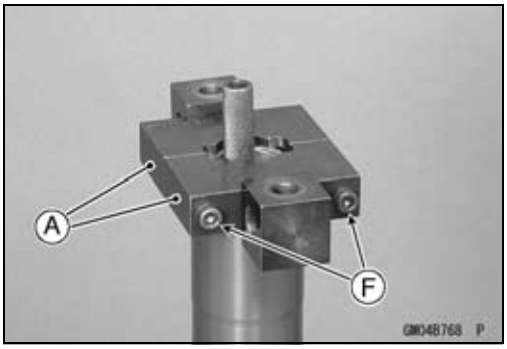
● Install the clamps [A] as shown in the figure.

**Special Tools - Fork Spring Compressor (Clamp): 57001 -1540**
**Fork Spring Compressor: 57001-1587**

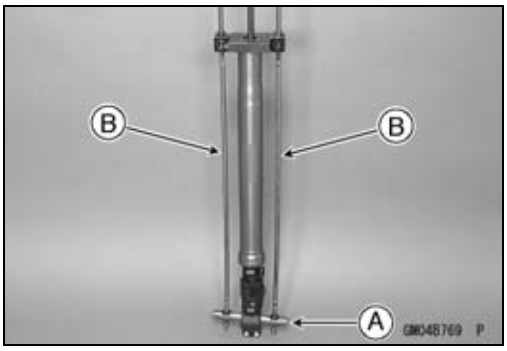
**NOTE**

○*Set the clamps so that the cutouts [B] do not fit the hole [C] of the washer [D], pull up the outer tube [E] to hold it by the clamps, and then tighten the two bolts [F]. The outer tube is used as a guide.*



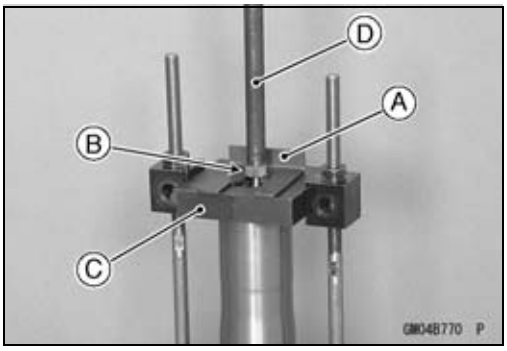

● Set the holder bar [A] and compression shafts [B].
● Screw in the fork compressor nut come out the piston rod nut.
○Hold up the fork piston rod puller while screwing in the nut.



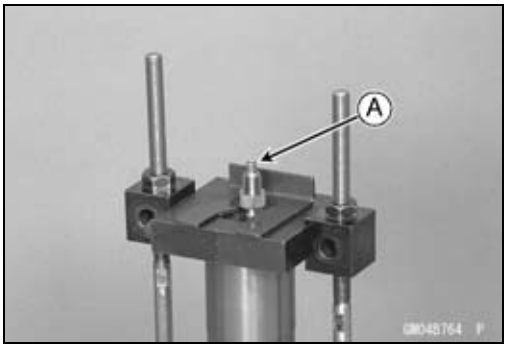

● Insert the fork spring stopper [A] between the piston rod nut [B] and the clamp [C] while holding up the fork piston rod puller [D].

**Special Tool - Fork Spring Stopper: 57001-1374**

● Remove the fork piston rod puller.

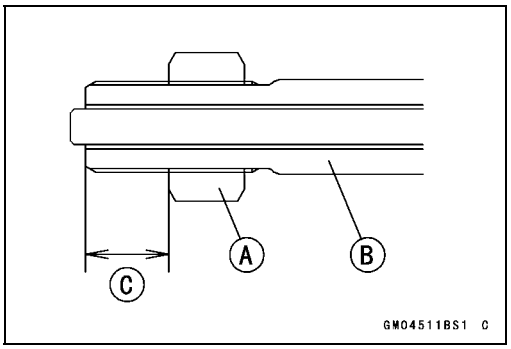



● Install the rebound damping adjuster rod [A].

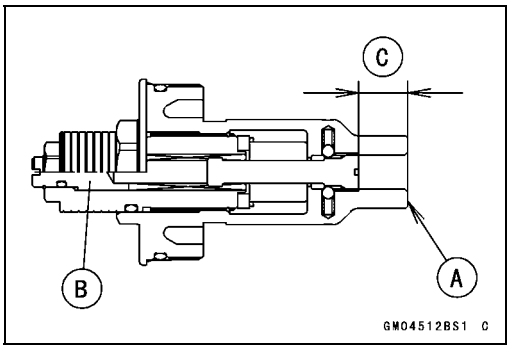


## Front Fork

● Screw the piston rod nut [A] onto the piston rod [B] as shown in the figure.
12 mm (0.47 in.) or more [C]

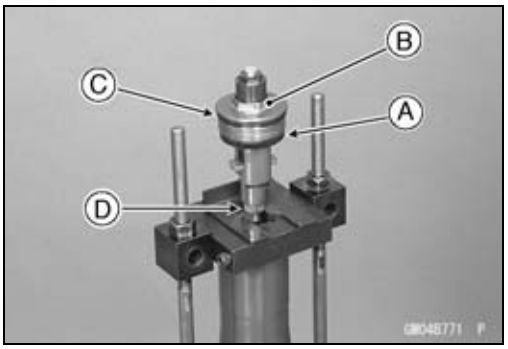



● Check the distance between the bottom end [A] of the top plug and rebound damping adjuster [B] with a pair of vernier caliper.
13 mm (0.51 in.) [C]




● Install the damper [A] on the top plug [B].
● Check the O-ring [C] on the top plug and replace it with a new one if damaged.
○Apply grease to the new O-ring.
● Screw in the top plug stopped onto the piston rod.
● Holding the top plug with a wrench, tighten the piston rod nut [D] against the top plug.

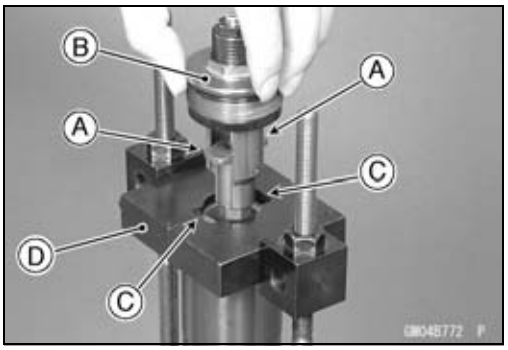
**Torque - Piston Rod Nuts: 15 N·m (1.5 kgf·m, 11 ft·lb)**




● Remove the fork spring stopper.
● Align the stoppers [A] of the top plug [B] with the grooves [C] of the clamp [D], and loosen the fork spring compressor nut.
● Remove the clamp and fork spring compressor.
● Raise the outer tube and screw the top plug into it.
● Install the front fork (see Front Fork Installation).

**NOTE**

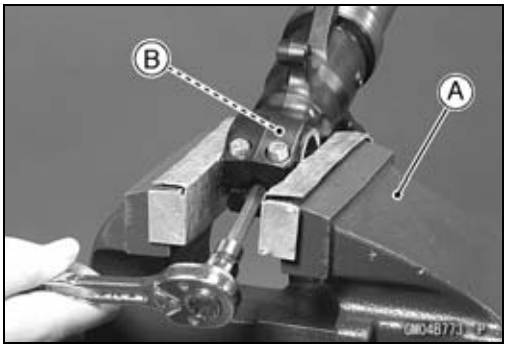
○*After installing the front fork, adjust the spring preload and damping force correctly.*




### *Front Fork Disassembly*

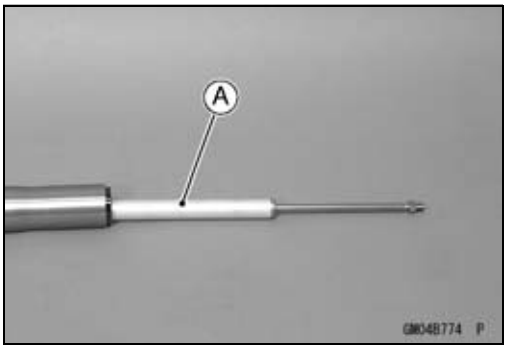
● Remove the front fork (see Front Fork Removal (Each Fork Leg)).
● Drain the fork oil (see Front Fork Oil Change).
● Hold the fork leg with a vise [A].
● Unscrew the Allen bolt [B], then take the bolt and gasket out of the bottom of the inner tube.
★If the cylinder unit is turned, loosen the Allen bolt while pushing the piston rod using the fork piston rod puller.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001 -1298**

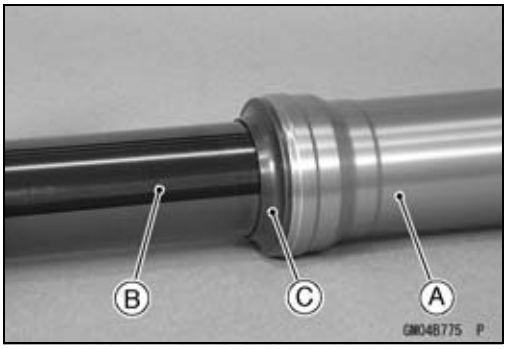


## Front Fork

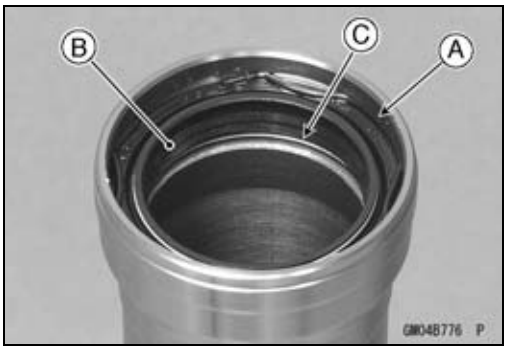
● Take the cylinder unit [A] out of the inner tube.
○Do not disassemble the cylinder unit.




● Separate the outer tube [A] from the inner tube [B].
● Pull out the dust seal [C] from the outer tube.




● Remove the following parts from the outer tube.
Retaining Ring [A]
Oil Seal [B]
Washer [C]




### *Front Fork Assembly*

● Replace the following parts with new ones.
Dust Seal
Oil Seal
Retaining Ring
Bottom Allen Bolt Gasket

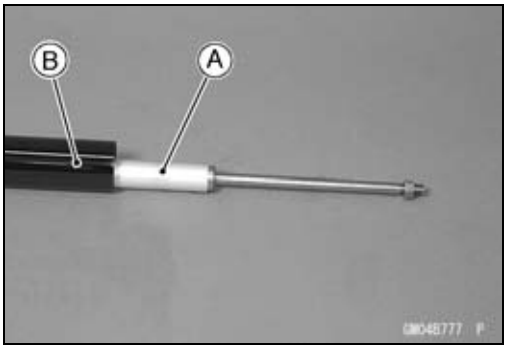
● Insert the cylinder unit [A] into the inner tube [B].
● Apply a non-permanent locking agent to the Allen bolt and tighten it.

**Non-permanent Locking Agent - Three Bond: TB1342**

**Torque - Front Fork Bottom Allen Bolts: 23 N·m (2.3 kgf·m, 17 ft·lb)**

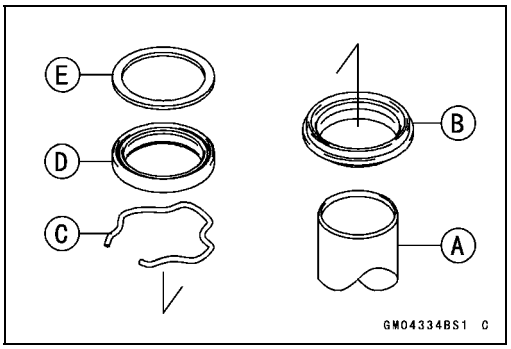
★If the cylinder unit is turned, tighten the Allen bolt while pushing the piston rod using the fork piston rod puller.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001 -1298**



## Front Fork

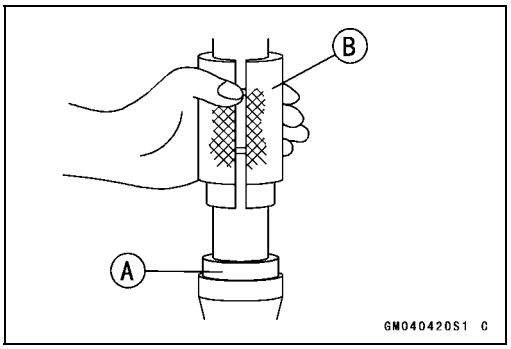
● Install the following parts into the inner tube [A].
Dust Seal [B]
Retaining Ring [C]
Oil Seal [D]
Washer [E]




● Insert the inner tube to the outer tube.
● After installing the washer, install the oil seal [A] by using the fork oil seal driver [B].

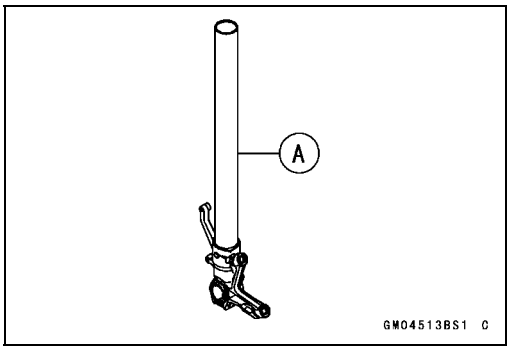
**Special Tool - Fork Oil Seal Driver, $\phi$43: 57001-1530**

● Install the retaining ring and dust seal.
● Pour in the specified type of oil (see Front Fork Oil Change).




### *Inner Tube Inspection*

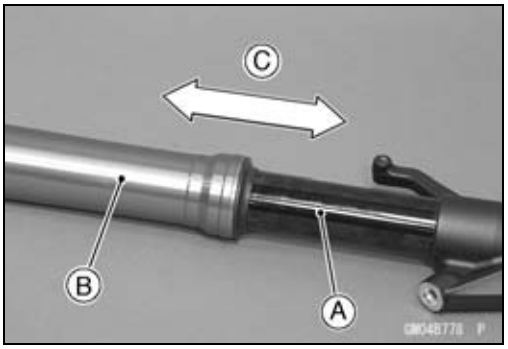
● Visually inspect the inner tube [A], and repair any damage.
● Nick or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas which cause seal damage.
★If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, 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 tube [A] and outer tube [B], and pump [C] 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**

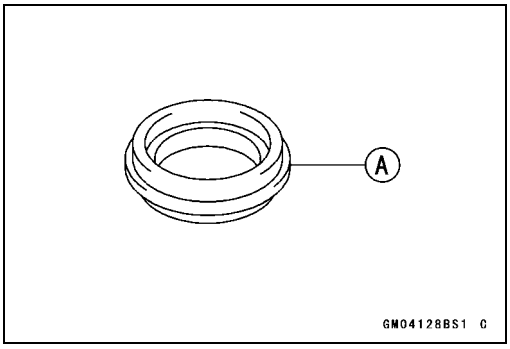
**A straightened inner or outer fork tube may fall in use, possibly causing an accident. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.**

## Front Fork

### *Dust Seal Inspection*

- Inspect the dust seals [A] for any signs of deterioration or damage.

★Replace it if necessary.




### *Spring Tension*

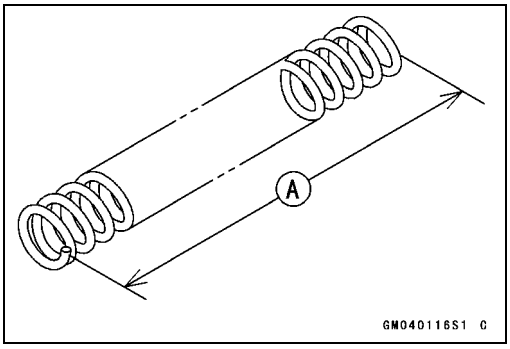
- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.

★If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a 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 for motorcycle stability.

**Spring Free Length**

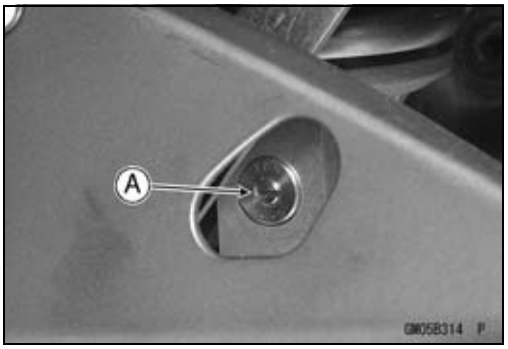
**Standard: 232.3 mm (9.15 in.)**

**Service Limit: 228 mm (8.98 in.)**



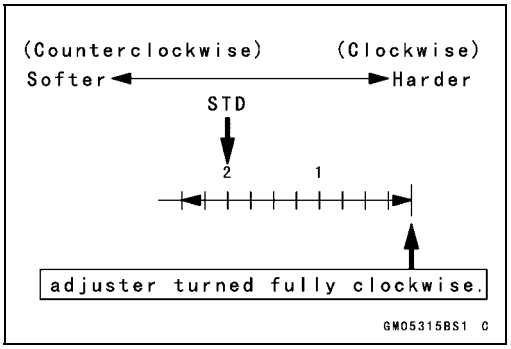
## Rear Shock Absorber

### *Rebound Damping Force Adjustment*




● To adjust the rebound damping force, turn the rebound damping adjuster [A] to the desired position.

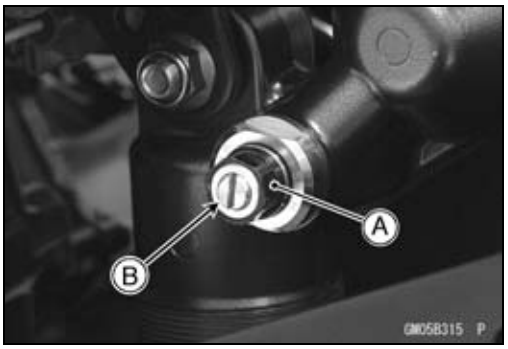
○The standard adjuster setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **2 turns out** from the fully clockwise position.




**Rebound Damping Force Adjustment**

| Adjuster Position | Damping Force | Setting | Load | Road | Speed |
|---|---|---|---|---|---|
| 2 1/2 Turns Out | Weak | Soft | Light | Good | Low |
| ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 0 | Strong | Hard | Heavy | Bad | High |

### *Compression Damping Force Adjustment*

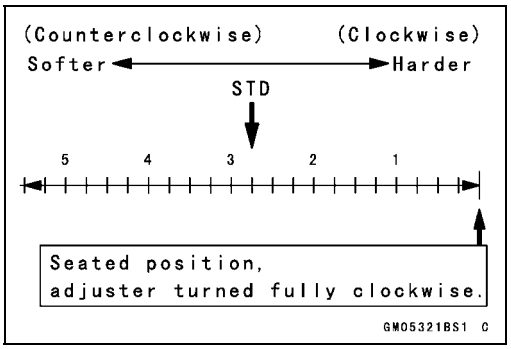



○There are two adjustments you can make to the compression damping force.

High Speed Compression Damping Adjuster [A]
Low Speed Compression Damping Adjuster [B]

● To adjust the high speed compression damping force, turn the outside damping adjuster with a 14 mm wrench to the desired position.

○The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **2 3/4 turns out** from the fully clockwise position.




**High Speed Compression Damping Force Adjustment**

| Adjuster Position | Damping Force | Setting | Load | Road |
|---|---|---|---|---|
| 5 1/2 Turns Out | Weak | Soft | Light | Good |
| ↑ | ↑ | ↑ | ↑ | ↑ |
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 0 | Strong | Hard | Heavy | Bad |

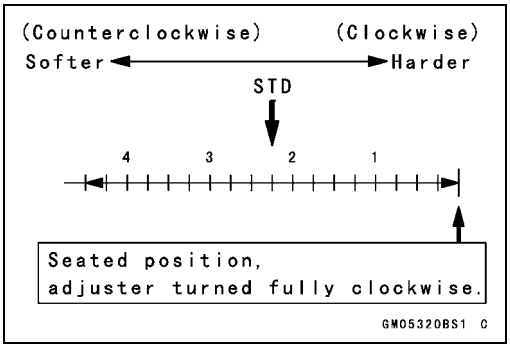
**NOTE**

○*When turning the high speed compression damping force adjuster (outside), turn the low speed compression damping force adjuster (inside) too. But, the low speed compression damping force (setting position) dose not change.*

## Rear Shock Absorber

● To adjust the low speed compression damping force, turn the inside damping adjuster with a flat-head screwdriver to the desired position.

○The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the **2 1/4 turns out** from the fully clockwise position.




**Low Speed Damping Force Adjustment**

| Adjuster Position | Damping Force | Setting | Load | Road |
|---|---|---|---|---|
| 4 1/2 Turns Out | Weak | Soft | Light | Good |
| ↑ | ↑ | ↑ | ↑ | ↑ |
| ↓ | ↓ | ↓ | ↓ | ↓ |
| 0 | Strong | Hard | Heavy | Bad |

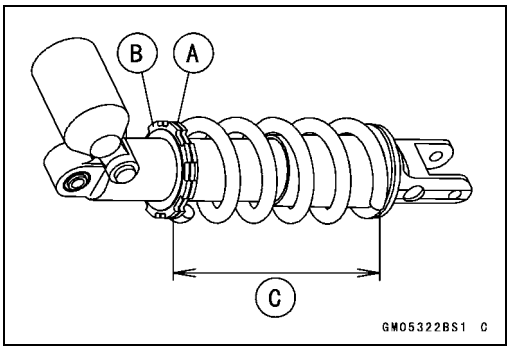
### *Spring Preload Adjustment*

● Loosen the locknut and turn out the adjusting nut to free the spring.

**Special Tool - Hook Wrench: 57001-1641**

● To adjust the spring preload, turn in the adjusting nut [A] to the desired position and tighten the locknut [B].
Spring Length [C]

○The standard adjusting nut setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories is **179 mm (7.05 in.)** spring length.

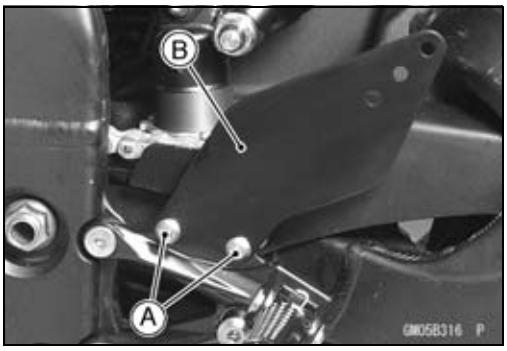



**Spring Preload Setting**

**Standard:** **Spring length 179 mm (7.05 in.)**

**Usable Range:** **Spring length 173.5 ~ 191.5 mm (6.831 ~ 7.539 in.)**

● Remove the bolts [A] and foot guard [B] for turning the hook wrench easily.

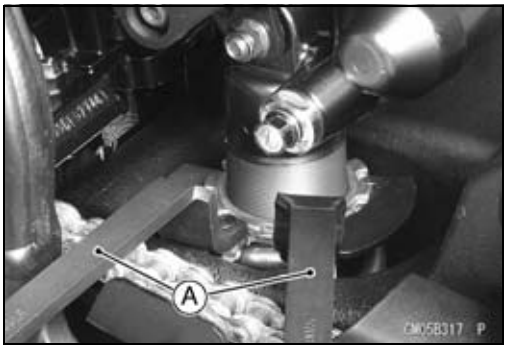


## Rear Shock Absorber

● To adjust the spring preload, turn in the adjusting nut to the desired position and tighten the locknut using by hook wrenches [A] with the rear shock absorber attached the frame.

**Special Tool - Hook Wench: 57001-1641**

★If the spring action feels too soft or too stiff, adjust it.




**Spring Adjustment**

| Spring Length | Damping Force | Setting | Load | Road | Speed |
|---|---|---|---|---|---|
| 191.5 mm (7.539 in.) | Weak | Soft | Light | Good | Low |
| ↑ | ↑ | ↑ | ↑ | ↑ | ↑ |
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| 173.5 mm (6.831 in.) | Strong | Hard | Heavy | Bad | High |

### *Rear Shock Absorber Removal*

● Remove:
Lower Fairings (see Lower Fairing Removal in the Frame chapter)
Premuffler Chamber (see Premuffler Chamber Removal in the Engine Top End chapter)

● Squeeze the brake lever slowly and hold it with a band [A].


**⚠ WARNING**

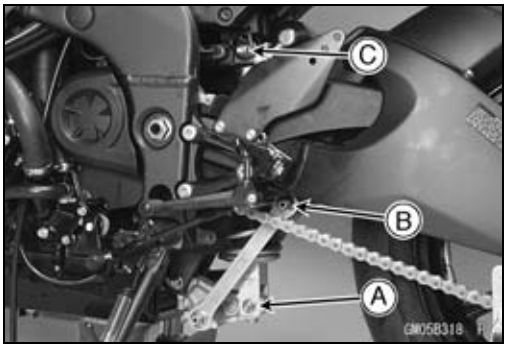
**Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. It could cause an accident and injury.**

● Using the jack, raise the rear wheel off the ground.

**Special Tools - Jack: 57001-1238**
**Jack Attachment: 57001-1608**

● Remove:
Lower Rear Shock Absorber Bolt and Nut [A]
Upper Tie-Rod Bolt and Nut [B]
Upper Rear Shock Absorber Bolt and Nut [C]

● Remove the rear shock absorber downward while lifting up the rear wheel.



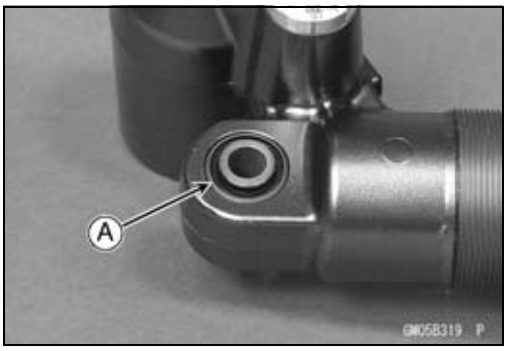

### *Rear Shock Absorber Installation*

● Tighten:

**Torque - Rear Shock Absorber Nuts (Upper and Lower): 34 N·m (3.5 kgf·m, 25 ft·lb)**
**Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**

## Rear Shock Absorber

### *Rear Shock Absorber Inspection*



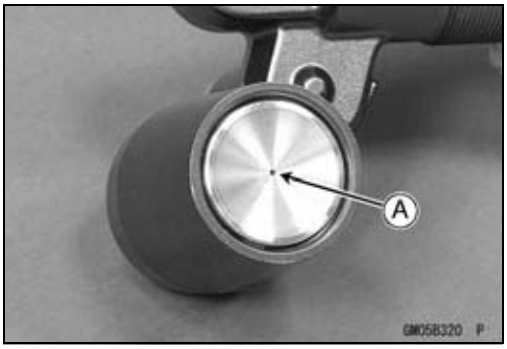

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Visually inspect the following items.
  Smooth Stroke
  Oil Leakage
  Crack or Dent

★If there is any damage to the rear shock absorber, replace it.

- Visually inspect the rubber bushing [A].

★If it show any signs of damage, replace it.

### *Rear Shock Absorber Scrapping*




**⚠ WARNING**

**Since the reservoir tank of the rear shock absorber contains nitrogen gas, do not incinerate the reservoir tank without first releasing the gas or it may explode.**

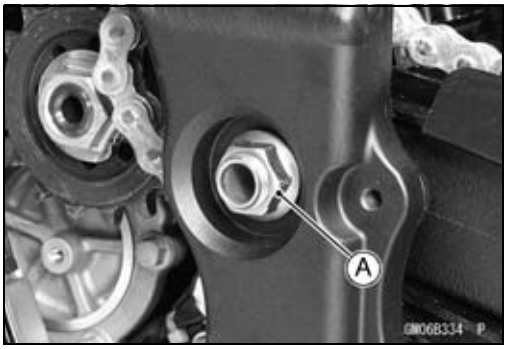
- Remove the rear shock absorber. (see Rear Shock Absorber Removal).
- Drill the hole [A] of the reservoir tank using about 2 mm (0.08 in.) drillbit.

**⚠ WARNING**

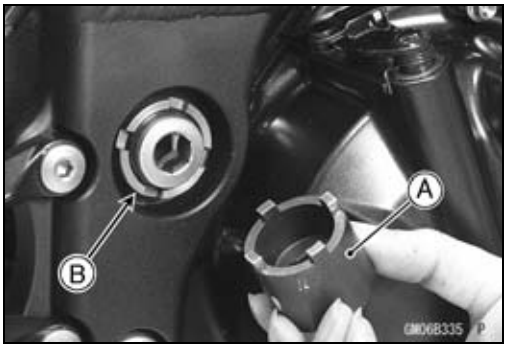
**Wear safety glasses when drilling the hole, as the high pressure gas may blow out bits or drilled metal when the hole opens.**

## Swingarm

### *Swingarm Removal*

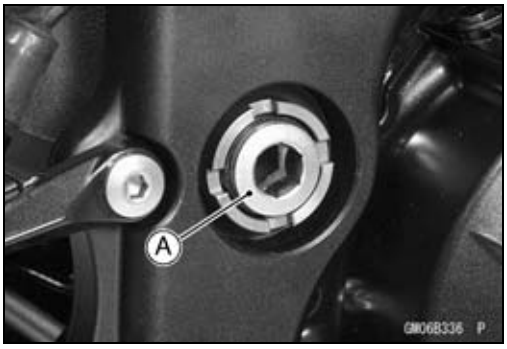



- Remove:
  Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
  Chain Cover (see Drive Chain Removal in the Final Drive chapter)
  Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  Mud Guard (see Mad Guard Removal in the Frame chapter)
  Rear Shock Absorber (see Rear Shock Absorber Removal)
- Disengage the drive chain from the engine sprocket.
- Unscrew the swingarm pivot shaft nut [A].




- Using the swingarm pivot nut wrench [A], loosen the swingarm pivot adjusting collar locknut [B].

**Special Tool - Swingarm Pivot Nut Wrench: 57001-1597**

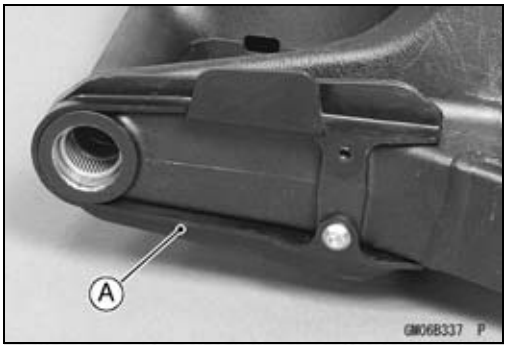



- Turn the swingarm pivot shaft [A] counterclockwise to free the adjusting collar from the swingarm.

○Make the gap between the adjusting collar and swingarm.

- Pull out the pivot shaft to the right side and remove the swingarm.

### *Swingarm Installation*



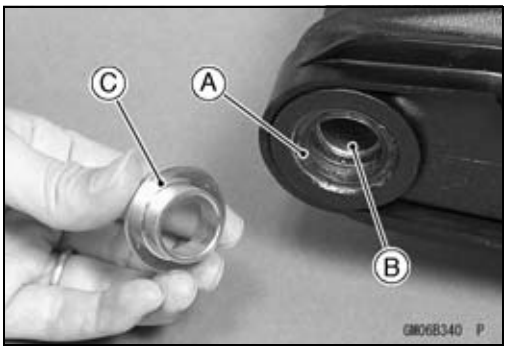

- Visually inspect the chain guide [A].

★Replace the chain guide if it shows any signs of abnormal wear or damage.

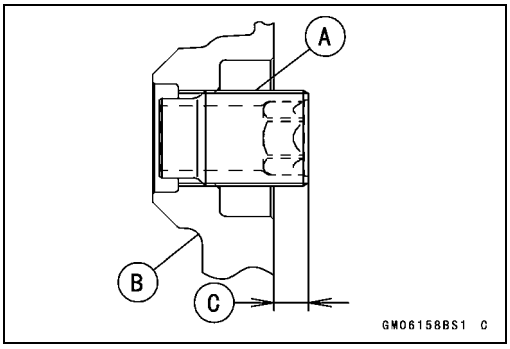
○Apply a non-permanent locking agent to the threads of the chain guide bolt.

## Swingarm

- Apply grease to the lips of the grease seals [A].
- Be sure to install the grease seals and sleeve [B] to the swingarm.
- Fit the collar [C] on the grease seal of the left side.




- Install the swingarm pivot adjusting collar [A] on the frame [B] as shown in the figure.
  11 mm (0.43 in.) [C]




- Insert the swingarm pivot shaft [A] into the adjusting collar [B] from the right side, and tighten the pivot shaft.

**NOTE**

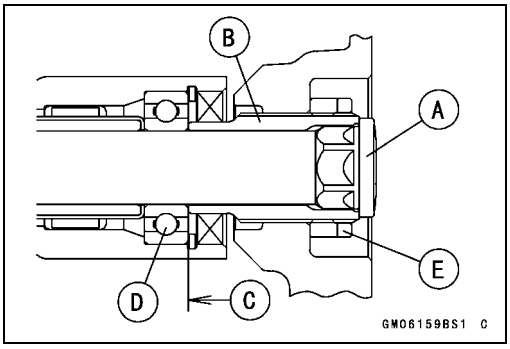
○*Tighten the swingarm pivot shaft until the clearance [C] between the ball bearing [D] and collar come to 0 mm (0 in.).*

**Torque - Swingarm Pivot Shaft: 20 N·m (2.0 kgf·m, 15 ft·lb)**

- Using the swingarm pivot nut wrench, tighten the swingarm pivot adjusting collar locknut [E].

**Special Tool - Swingarm Pivot Nut Wrench: 57001-1597**

**Torque - Swingarm Pivot Adjusting Collar Locknut: 98 N·m (10.0 kgf·m, 72 ft·lb)**




- Tighten the swingarm pivot shaft nut.

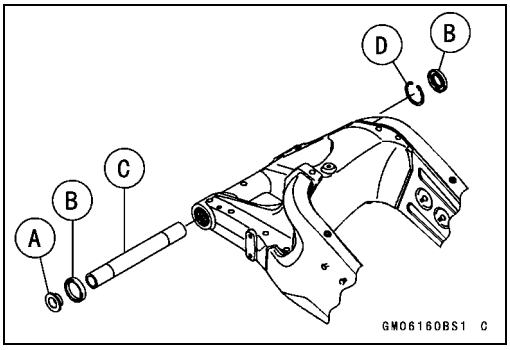
**Torque - Swingarm Pivot Shaft Nut: 108 N·m (11.0 kgf·m, 80 ft·lb)**

- Move the swingarm up and down to check for abnormal friction.
- Install the removed parts (see appropriate chapters).

### *Swingarm Bearing Removal*

- Remove:
  Swingarm (see Swingarm Removal)
  Collar [A]
  Grease Seals [B]
  Sleeve [C]
  Circlip (Right Side) [D]

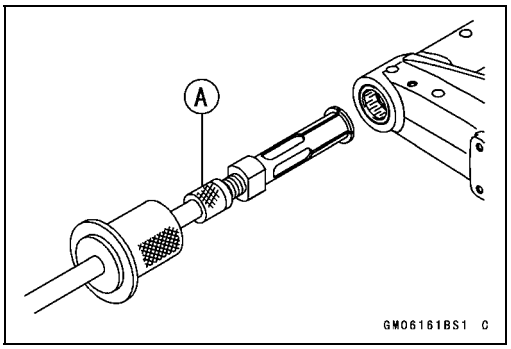
**Special Tool - Inside Circlip Pliers: 57001-143**



## Swingarm

● Remove the ball bearing and needle bearings.

**Special Tool - Oil Seal & Bearing Remover [A]: 57001-1058**



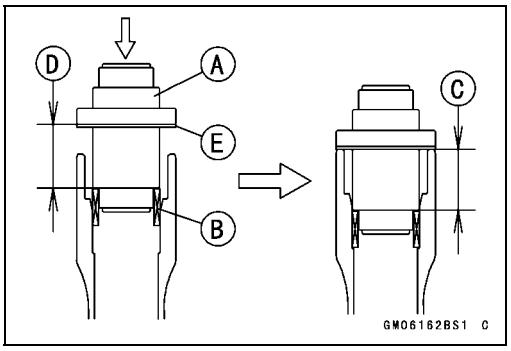

### *Swingarm Bearing Installation*

● Replace the needle bearings, ball bearing, grease seals and circlip with new ones.

● Install the needle bearings, ball bearing, grease seals and circlip as shown in the figure.

○Insert the needle bearing driver [A] into the needle bearing [B] and press the needle bearing into the housing until the driver contacts the end surface of the housing.

Bearing Pressing Depth: 27.5 mm (1.08 in.) [C]
32 mm (1.25 in.) [D]




**NOTE**

○*For a bearing of the left side, select the pressing side of the needle bearing driver according to its pressing depth.*

○*When pressing in the needle bearings of the left side, adjust the pressing depth with the spacer [E].*

○*Install the needle bearings so that the marked side faces out.*

**Special Tools - Bearing Driver Set: 57001-1129**
**Needle Bearing Driver, $\phi$28: 57001-1610**
**Spacer $\phi$28: 57001-1663**
**Needle Bearing Driver, $\phi$20 & Spacer, $\phi$28 (Spacer): 57001-1678**

○Press in the ball bearing until it bottomed.

**Special Tool - Bearing Driver Set: 57001-1129**

○Install the circlip.

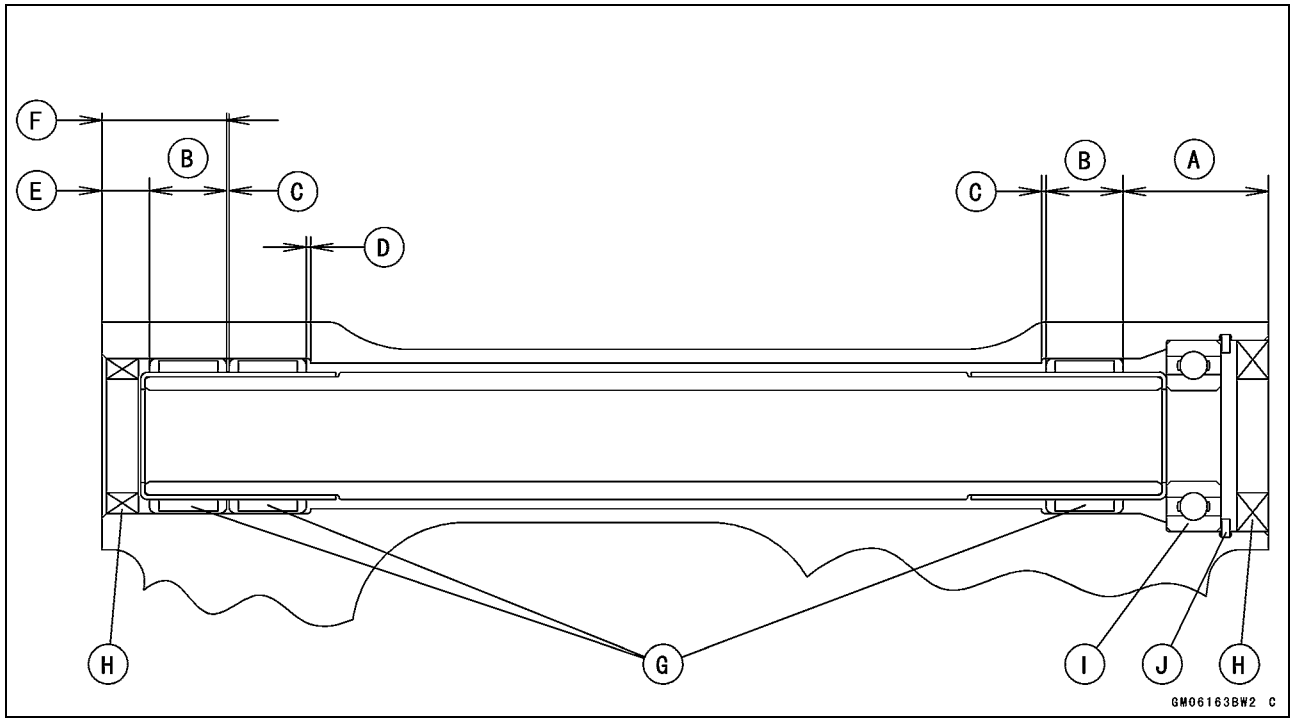
**Special Tool - Inside Circlip Pliers: 57001-143**

○Press in the grease seals so that seal surface is flushed with the end of housing.

**Special Tool - Bearing Driver Set: 57001-1129**

## Swingarm

32 mm (1.26 in.) [A]
17 mm (0.67 in.) [B]
1 mm (0.04 in.) [C]
1.5 mm (0.06 in.) [D]
9.5 mm (0.37 in.) [E]
27.5 mm (1.08 in.) [F]
Needle Bearings [G]
Grease Seals [H]
Ball Bearing [I]
Circlip [J]



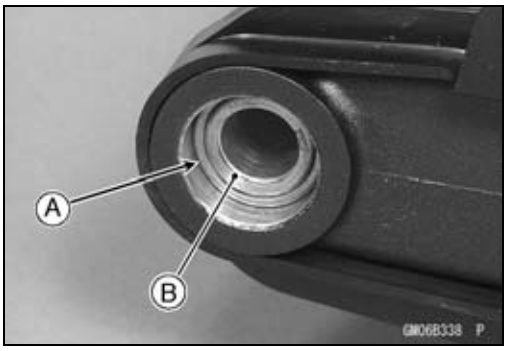

### *Swingarm Bearing, Sleeve Inspection*

| CAUTION |
| --- |
| **Do not remove the bearings 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.



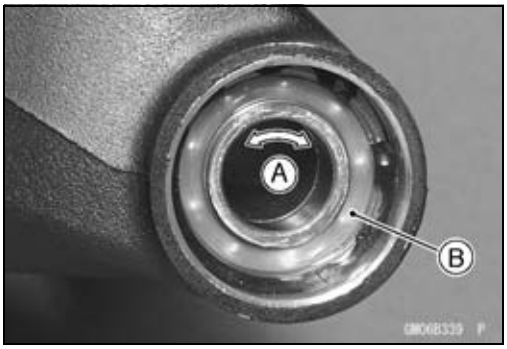
## Swingarm

- Turn the ball bearing in the swingarm 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.

★If the seal is torn or is leaking, replace the bearing.




### *Swingarm Bearing Lubrication*

**NOTE**

○*Since the bearing are packed with grease and sealed, lubrication is not required.*

## Tie-Rod, Rocker Arm

### *Tie-Rod Removal*

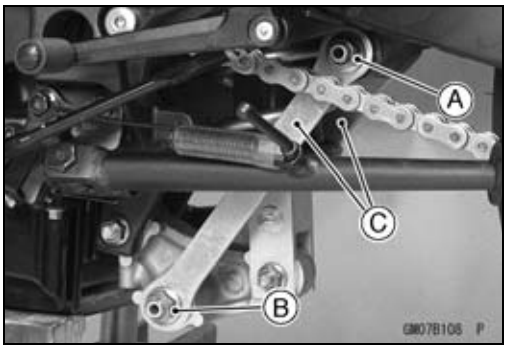

- Remove:
  Lower Fairings (see Lower Fairing Removal in the Frame chapter)
  Premuffler Chamber (see Premuffler Chamber Removal in the Engine Top End chapter)
- Squeeze the brake lever slowly and hold it with a band [A].

**⚠ WARNING**

**Be sure to hold the brake lever when removing the tie-rod, or the motorcycle may fall over. If could cause an accident and injury.**

- Using the jack, raise the rear wheel off the ground.

**Special Tools - Jack: 57001-1238**
**Jack Attachment: 57001-1608**




- Remove:
  Upper Tie-Rod Bolt and Nut [A]
  Lower Tie-Rod Bolt and Nut [B]
  Tie-Rods [C]

### *Tie-Rod Installation*


- Install the tie-rods so that the marked side [A] faces outward.
- Tighten:

**Torque - Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**

### *Rocker Arm Removal*


- Remove:
  Lower Fairings (see Lower Fairing Removal in the Frame chapter)
  Premuffler Chamber (see Premuffler Chamber Removal in the Engine Top End chapter)
- Squeeze the brake lever slowly and hold it with a band [A].

**⚠ WARNING**

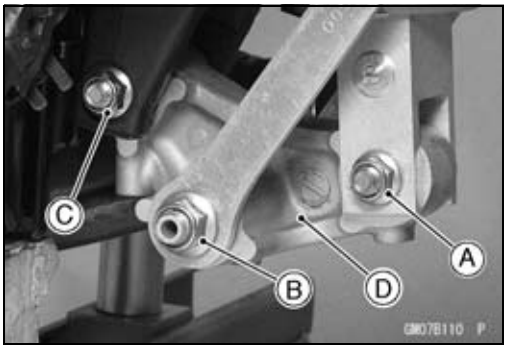
**Be sure to hold the brake lever when removing the rocker arm, or the motorcycle may fall over. If could cause an accident and injury.**

- Using the jack, raise the rear wheel off the ground.

**Special Tools - Jack: 57001-1238**
**Jack Attachment: 57001-1608**

## Tie-Rod, Rocker Arm

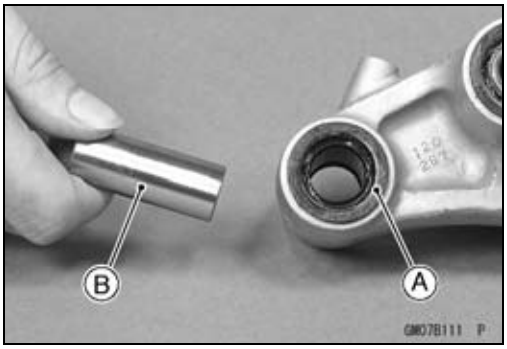
- Remove:
  Lower Rear Shock Absorber Bolt and Nut [A]
  Lower Tie-Rod Bolt and Nut [B]
  Rocker Arm Bolt and Nut [C]
  Rocker Arm [D]




### *Rocker Arm Installation*

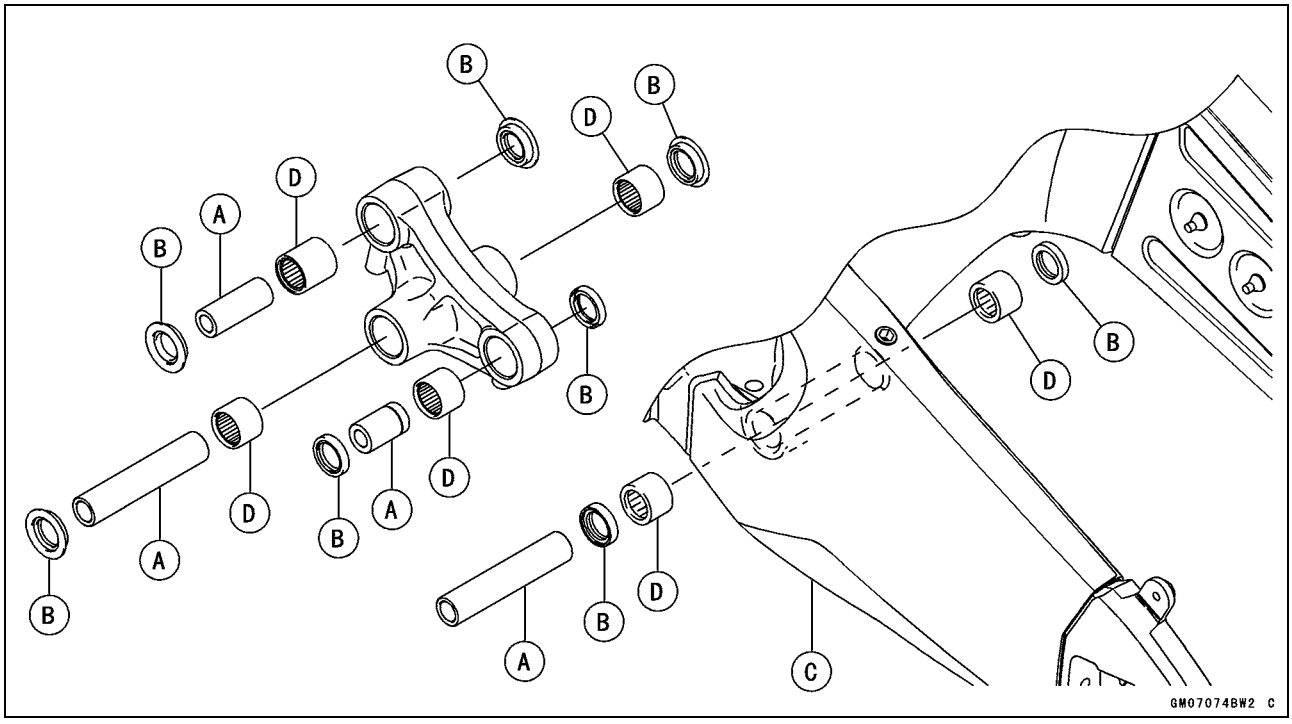
- Apply grease to the lips of the grease seals [A].
- Be sure to install the grease seals and sleeves [B] to the rocker arm.
- Tighten:

**Torque - Uni-Trak Rocker Arm Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)**
**Tie-Rod Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**
**Rear Shock Absorber Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)**




### *Tie-Rod and Rocker Arm Bearing Removal*

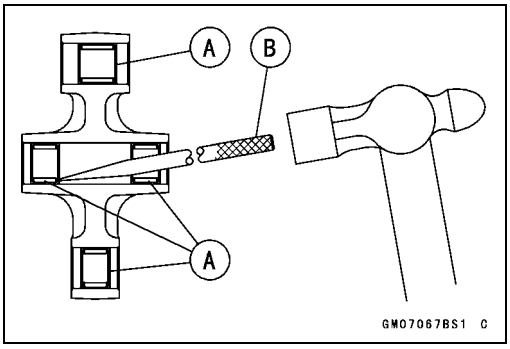
- Remove:
  Tie-Rods (see Tie-Rod Removal)
  Rocker Arm (see Rocker Arm Removal)
  Sleeves [A]
  Grease Seals [B]
  Swingarm [C]
  Needle Bearings [D]



## Tie-Rod, Rocker Arm

○When removing the needle bearings [A], tap the bearings evenly with the bearing remover shaft [B].

**Special Tool - Bearing Remover Shaft, $\phi$13: 57001-1377**



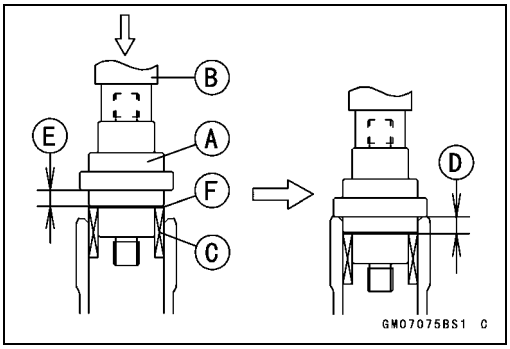

### *Tie-Rod and Rocker Arm Bearing Installation*

- Replace the needle bearings and grease seals with new ones.
- Install the needle bearings and grease seals position as shown in the figure.

○Screw the needle bearing driver [A] into the driver holder [B].

○Insert the needle bearing [C] driver into the needle bearing and press the needle bearing into the housing until the driver contacts the end surface of the housing.

Bearing Pressing Depth: 5.5 mm (0.22 in.) [D]
5.0 mm (0.20 in.) [E]




**NOTE**

○*For a bearing of inside diameter $\phi$18, select the pressing side of the needle bearing driver according to its pressing depth.*

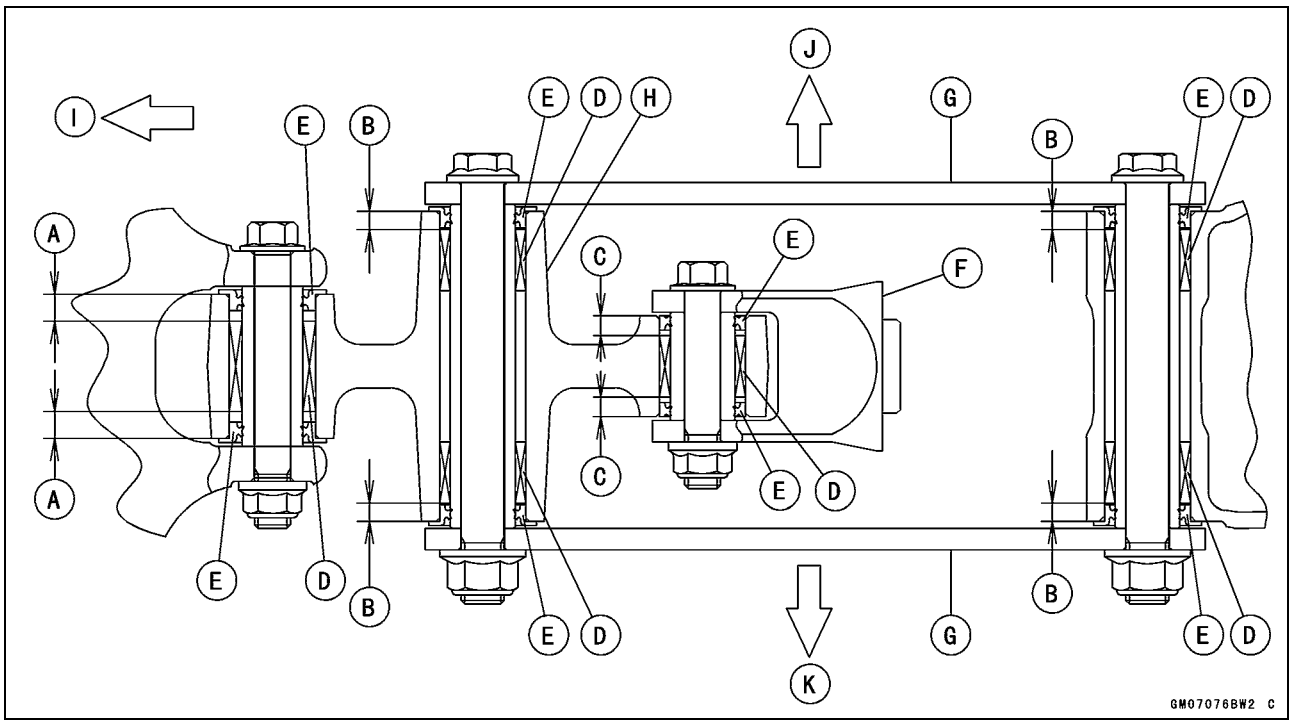
○*When pressing in the needle bearings to the 5.5 mm (0.22 in.) depth, adjust the pressing depth with the spacer [F].*

○*Install the needle bearings so that the marked side faces out.*

**Special Tools - Bearing Driver Set: 57001-1129**
**Needle Bearing Driver, $\phi$17/$\phi$18: 57001-1609**
**Spacer, $\phi$18: 57001-1636**

## Tie-Rod, Rocker Arm

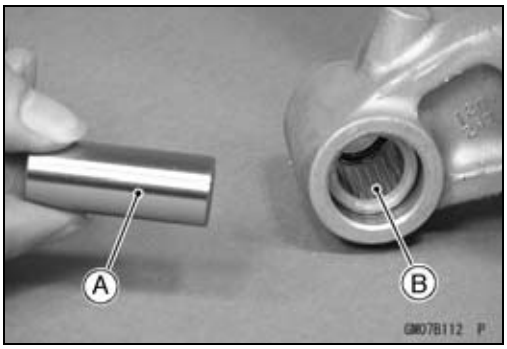
7.5 mm (0.30 in.) [A]
5.0 mm (0.20 in.) [B]
5.5 mm (0.22 in.) [C]
Needle Bearings [D]
Grease Seals [E]
Rear Shock Absorber [F]
Tie-Rod [G]
Rocker Arm [H]
Front [I]
Right Side [J]
Left Side [K]




### *Tie-Rod/Rocker Arm Bearing, Sleeve Inspection*

**CAUTION**

**Do not remove the bearings for inspection. Removal may damage them.**




- Visually inspect the rocker arm, or tie-rod sleeves [A] and needle bearings [B].
- The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.

★If there is any doubt as to the condition of any of the needle bearings or sleeves, replace the sleeves and needle bearings as a set.

### *Tie-Rod/Rocker Arm Bearing Lubrication*

**NOTE**

○*Since the bearings are packed with grease, lubrication is not required.*

# Steering

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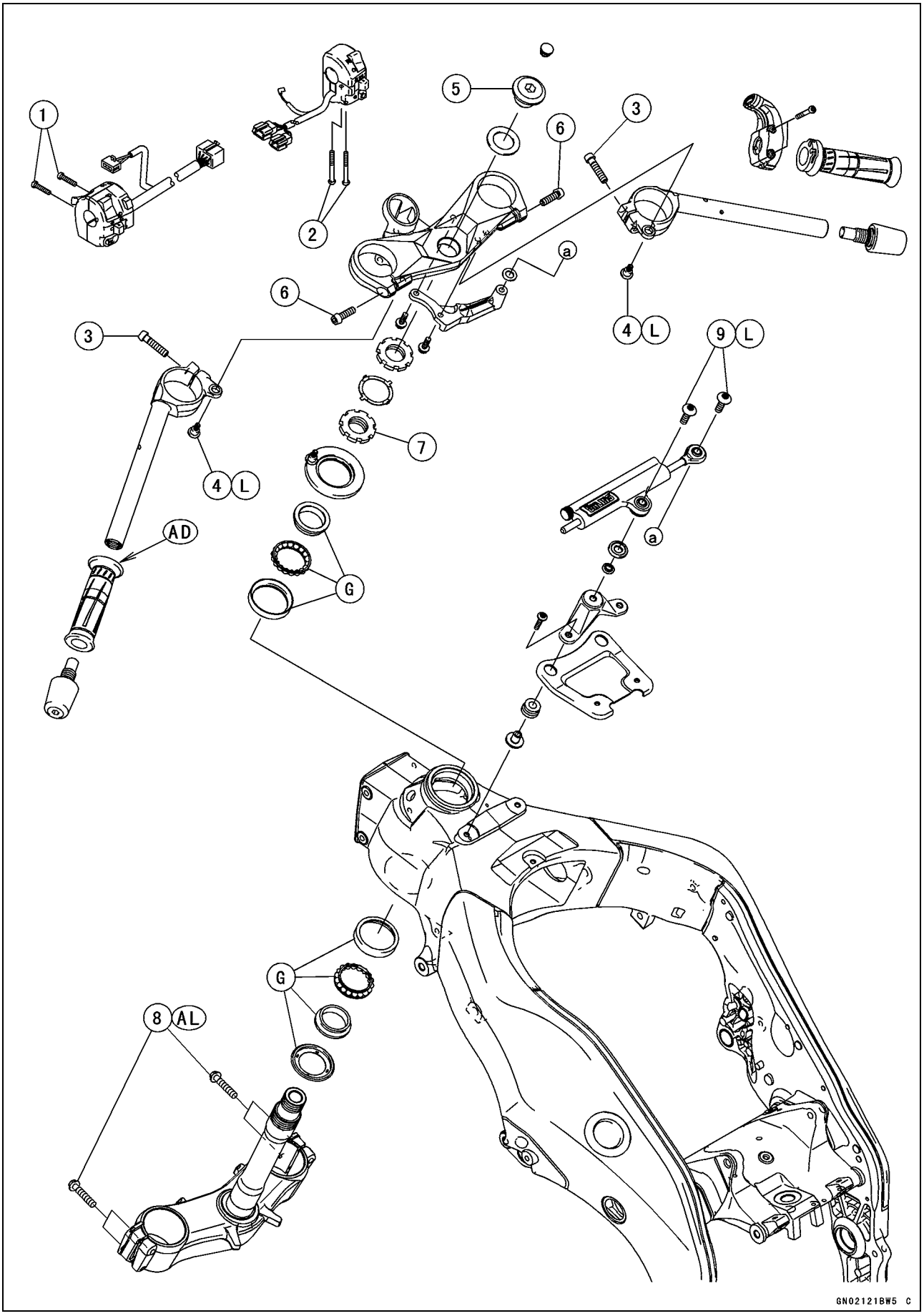
## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Left Switch Housing Screws | 3.5 | 0.36 | 31 in·lb | |
| 2 | Right Switch Housing Screws | 3.5 | 0.36 | 31 in·lb | |
| 3 | Handlebar Clamp Bolts | 25 | 2.5 | 18 | |
| 4 | Handlebar Positioning Bolts | 9.8 | 1.0 | 87 in·lb | L |
| 5 | Steering Stem Head Bolt | 108 | 11.0 | 80 | |
| 6 | Upper Front Fork Clamp Bolts | 20 | 2.0 | 15 | |
| 7 | Steering Stem Nut | 20 | 2.0 | 15 | |
| 8 | Lower Front Fork Clamp Bolts | 30 | 3.1 | 22 | AL |
| 9 | Steering Damper Mounting Bolts | 11 | 1.1 | 97 in·lb | L |

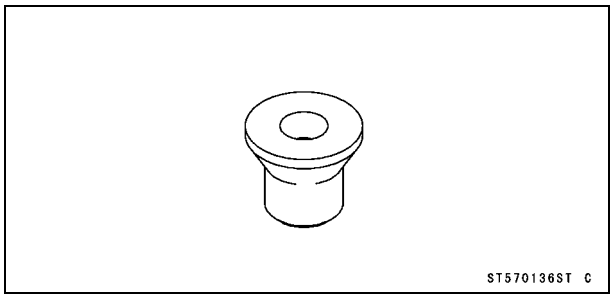
AD: Apply adhesive.
AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.
G: Apply grease.
L: Apply a non-permanent locking agent.

## Exploded View

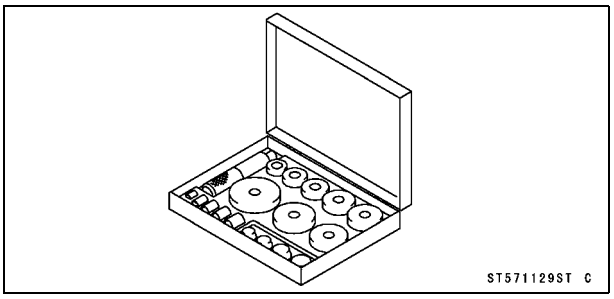
| Item | Standard |
|---|---|
| **Steering Damper** | |
| Damper Setting | 18th click from the first click of the fully clockwise position<br>(Usable Range: 0 ←→ 18 Clicks) |

## Special Tools

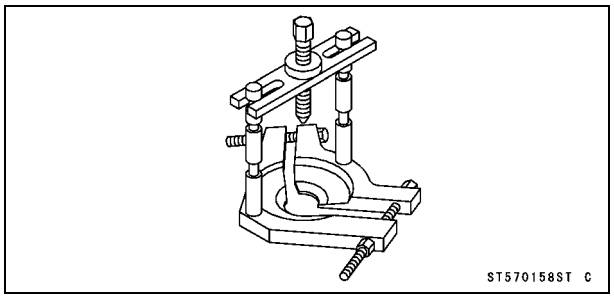
**Bearing Puller Adapter:**
**57001-136**



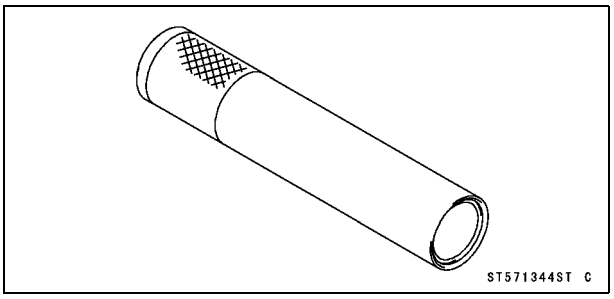

**Bearing Driver Set:**
**57001-1129**



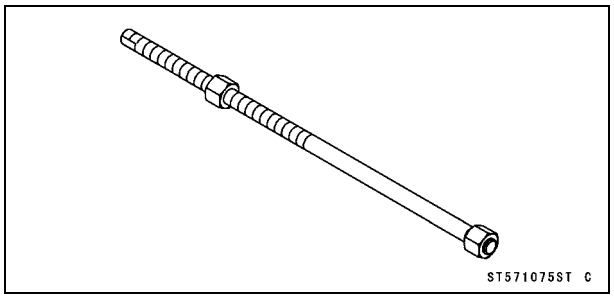

**Bearing Puller:**
**57001-158**



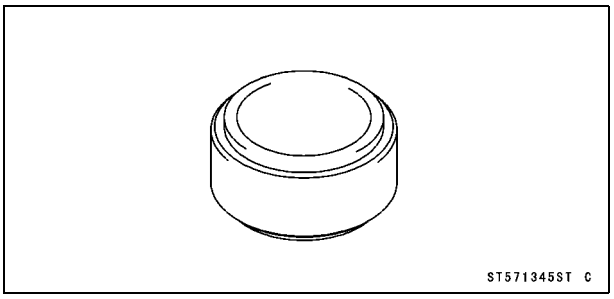

**Steering Stem Bearing Driver, $\phi$42.5:**
**57001-1344**



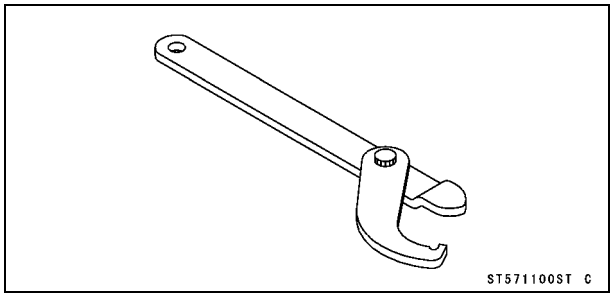

**Head Pipe Outer Race Press Shaft:**
**57001-1075**



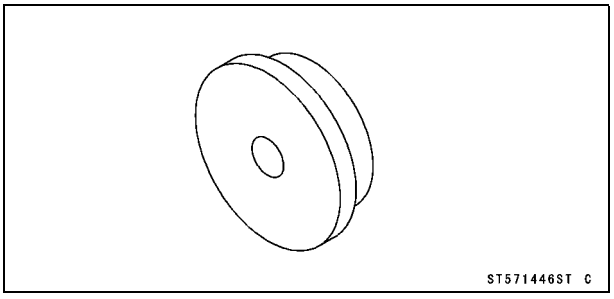

**Steering Stem Bearing Driver Adapter, $\phi$41.5:**
**57001-1345**




**Steering Stem Nut Wrench:**
**57001-1100**




**Head Pipe Outer Race Driver, $\phi$55:**
**57001-1446**



## Steering

### *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.

## Steering Damper

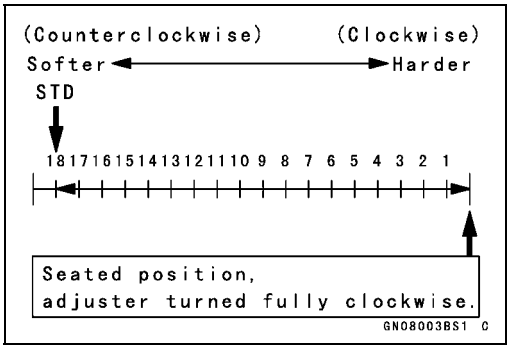
### *Damping Force Adjustment*


- To adjust the damping force, turn the damping adjuster [A] until you feel a click.

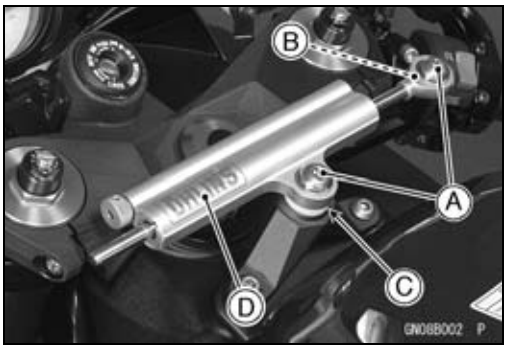
○The standard adjuster setting is the **18th click** from the 1st of the fully clockwise position. If the damping feels too soft or too stiff, adjust it in accordance with the following table.

**Damping Force Adjustment**

| Adjuster Position | Damping Force | Setting |
|---|---|---|
| 18 | Weak | Soft |
| ↑ | ↑ | ↑ |
| ↓ | ↓ | ↓ |
| 0 | Strong | Hard |

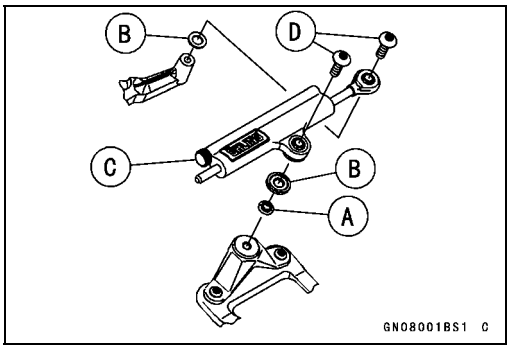



### *Steering Damper Removal*



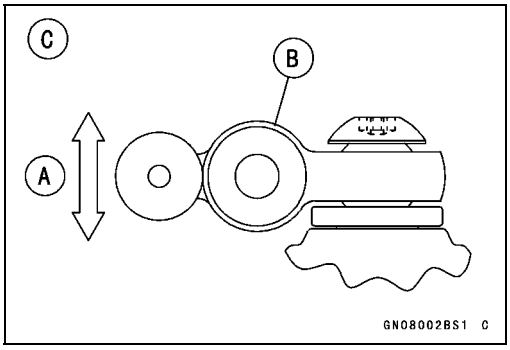

- Remove:
  Steering Damper Mounting Bolts (TORX Bolts) [A]
  Washer [B]
  Washer and Collar [C]
  Steering Damper [D]

### *Steering Damper Installation*




- Install the following parts as shown in the figure.
  Collar [A]
  Washers [B]
  Steering Damper [C]
- Apply a non-permanent locking agent to the threads of the steering damper mounting bolts (TORX bolts) [D].
- Tighten:

**Torque - Steering Damper Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**



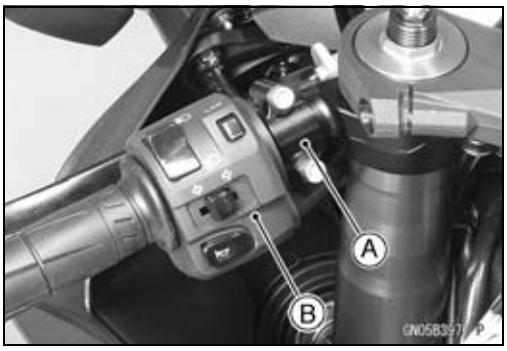

- After tightening the steering damper mounting bolts, confirm that there is play [A] in the steering damper [B].
  Left Side View [C]

### *Steering Damper Oil Leak Inspection*

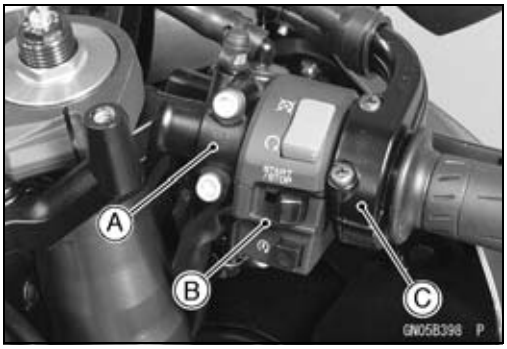
- Refer to the Steering Damper Oil Leak Inspection in the Periodic Maintenance chapter.

## Steering Stem

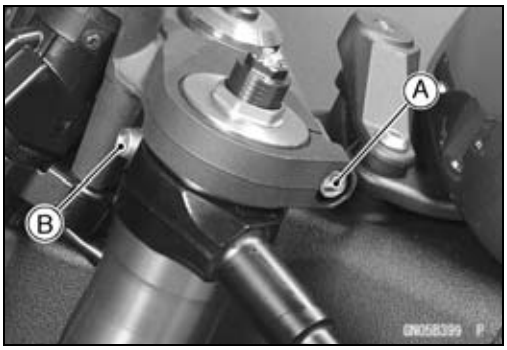
### *Stem, Stem Bearing Removal*



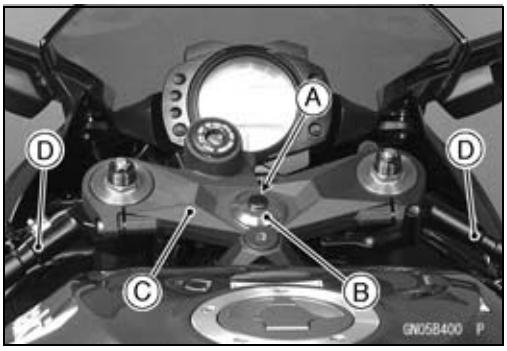

- Remove:
  Steering Damper (see Steering Damper Removal)
  Clutch Lever Assembly [A]
  Left Switch Housing [B]



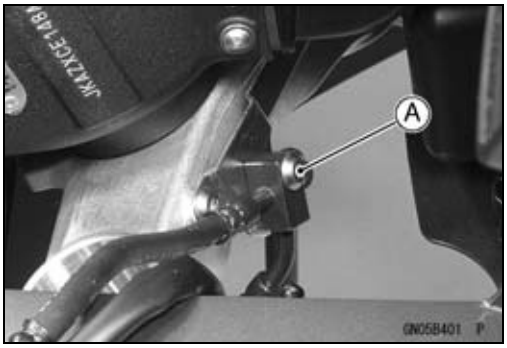

- Remove:
  Front Master Cylinder [A] (see Front Master Cylinder Removal in the Brakes chapter)
  Right Switch Housing [B]
  Throttle Case [C]




- Loosen:
  Upper Front Fork Clamp Bolt [A] (Both Sides)
  Handlebar Clamp Bolt [B] (Both Sides)



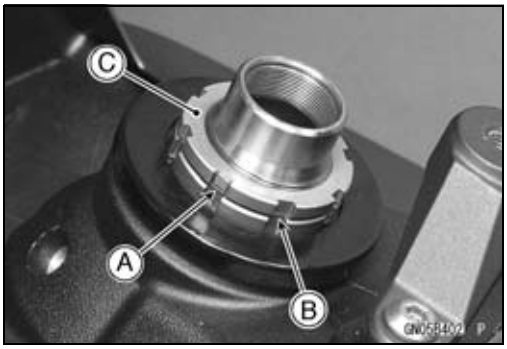

- Remove:
  Plug [A]
  Steering Stem Head Bolt [B] and Washer
  Steering Stem Head [C] with Handlebars [D]
  Front Forks (see Front Fork Removal (Each Fork Leg) in the Suspension chapter)




- Remove the brake hose fitting bolt [A].

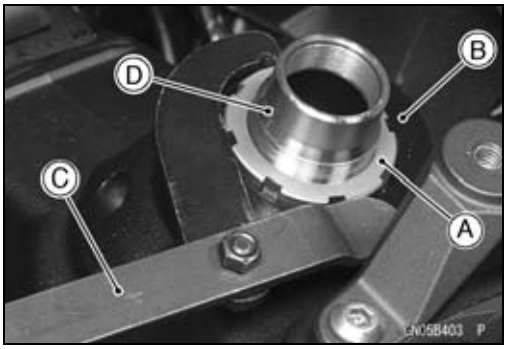
## Steering Stem

- Straighten the claws [A] of the lock washer [B].
- Remove:
  Steering Stem Locknut [C]
  Lock Washer

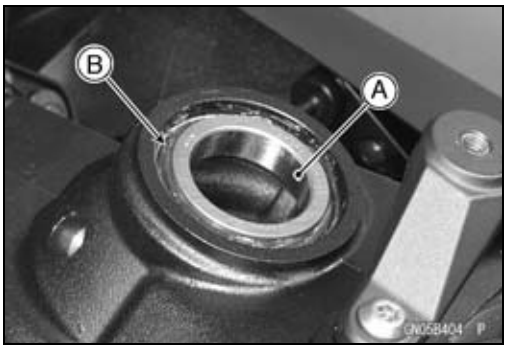



- Pushing up the stem base, and remove the steering stem nut [A] with stem cap [B].

  **Special Tool - Steering Stem Nut Wrench [C]: 57001-1100**
- Remove the steering stem [D] under side.



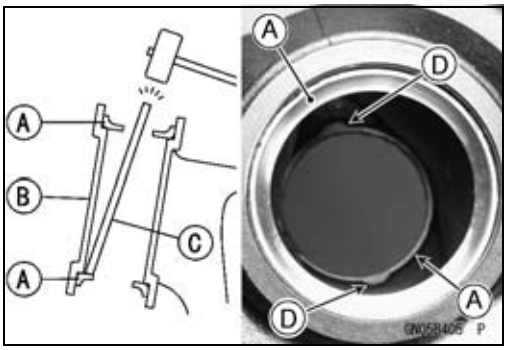

- Remove the upper bearing inner race [A] and bearing [B].



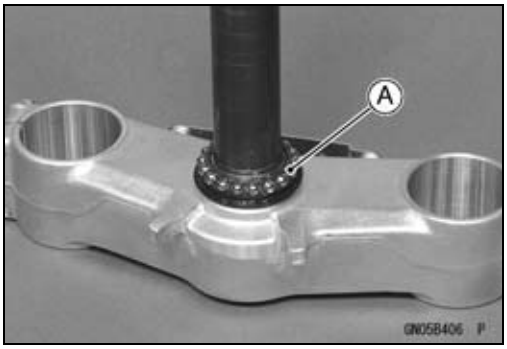

- To remove the bearing outer races [A] pressed into the head pipe [B], insert a bar [C] into the recesses [D] of head pipe, and applying it to both recess alternately hammer it to drive the race out.

**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 bearing [A] from the steering stem.

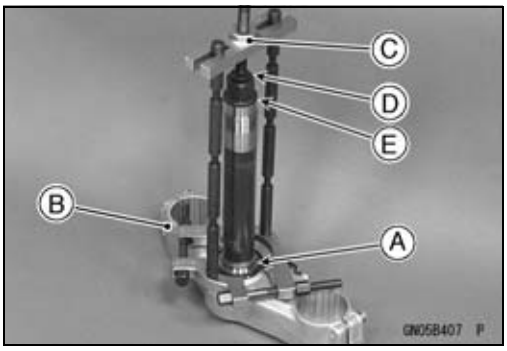


## Steering Stem

- Remove the lower bearing inner race (with its grease seal) [A] which is pressed onto the steering stem [B] with the bearing puller [C], adapter [D] and suitable tool [E].

○Install the suitable tool between the steering stem and adapter.

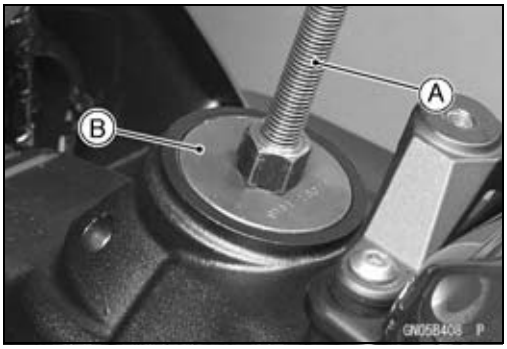
**Special Tools - Bearing Puller Adapter: 57001-136**
**Bearing Puller: 57001-158**




### *Stem, Stem Bearing Installation*

- Replace the bearing outer races with new ones.
- Drive them into the head pipe at the same time.

**Special Tools - Head Pipe Outer Race Press Shaft [A]: 57001-1075**
**Bearing Driver Set: 57001-1129**
**Head Pipe Outer Race Driver, $\phi$55 [B]: 57001-1446**

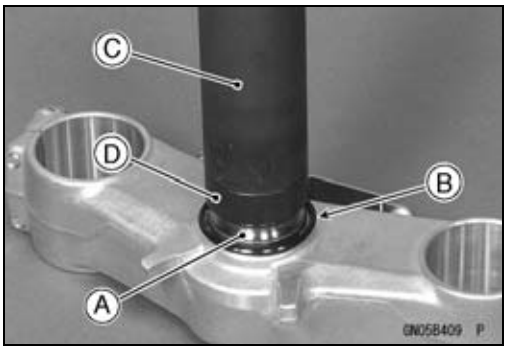



- Apply grease to the outer races.

- Replace the bearing inner races [A] and grease seal [B] with new ones.
- Install the grease seal on the steering stem, and drive the lower bearing inner race applied the grease onto the stem.

○The upper and lower inner races are identical.

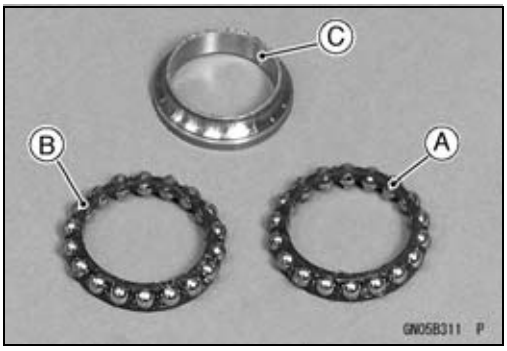
**Special Tools - Steering Stem Bearing Driver, $\phi$42.5 [C]: 57001-1344**
**Steering Stem Bearing Driver Adapter, $\phi$41.5 [D]: 57001-1345**



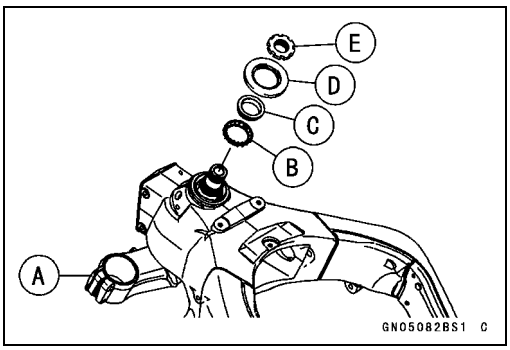

- Apply grease to the lower bearing [A], and install it onto the steering stem.

○The upper and lower bearings are identical.

- Apply grease to the upper bearing [B] and inner race [C].




- Install the steering stem [A] through the head pipe and install the upper bearing [B] and inner race [C] on it.
- Install the stem cap [D] and steering stem nut [E].

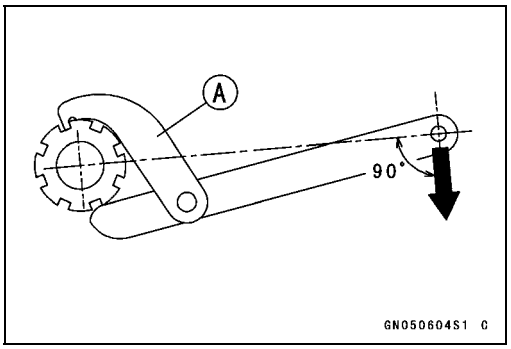


## Steering Stem

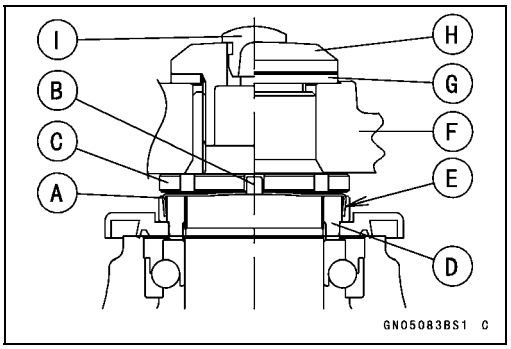
● Settle the inner races in place as follows.
○Tighten the steering stem nut with **55 N·m (5.6 kgf·m, 41 ft·lb)** of torque first, and loosen it a fraction of a turn until it turns lightly. Afterward tighten it again with specified torque using a stem nut wrench [A] in the direction shown.
○Check that 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: 57001-1100**

**Torque - Steering Stem Nut: 20 N·m (2.0 kgf·m, 15 ft·lb)**




● Install the lock washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of the steering stem locknut [C].
● Tighten the stem locknut by hand until the lock washer touches the steering stem nut [D].
● Tighten the stem locknut again until the claws are aligned with the grooves (ranging from 2nd to 4th) of the stem nut, and bend the two claws downward [E].
● Install the steering stem head [F].
● Install the washer [G], and tighten the steering stem head bolt [H] temporarily.
● Install the front forks (see Front Fork Installation in the Suspension chapter).




**NOTE**

○*Tighten the upper front fork clamp bolts first, next the steering stem head bolt, last the lower front fork clamp bolts and handlebar clamp bolts.*
○*Tighten the two lower front fork clamp bolts alternately two times to ensure even tightening torque.*

**Torque - Upper Front Fork Clamp Bolts 20 N·m (2.0 kgf·m, 15 ft·lb)**
**Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 80 ft·lb)**
**Lower Front Fork Clamp Bolts: 30 N·m (3.1 kgf·m, 22 ft·lb)**
**Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

**⚠ WARNING**

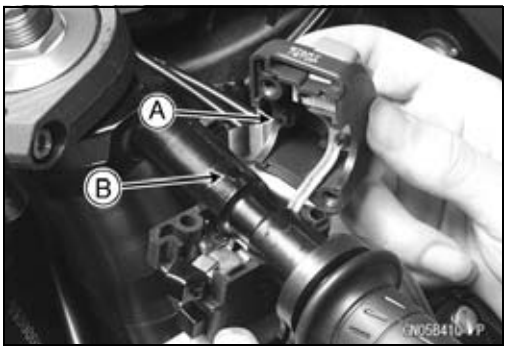
**Do not impede the handlebar turning by routing the cables, harness and hoses improperly (see Cable, Wire, and Hose Routing section in the Appendix chapter).**

● Install the plug [I] on the steering stem head bolt.

## Steering Stem

● Install the left and right switch housings.
○Fit the projection [A] into a small hole [B] in the handlebar.

**Torque - Left and Right Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)**



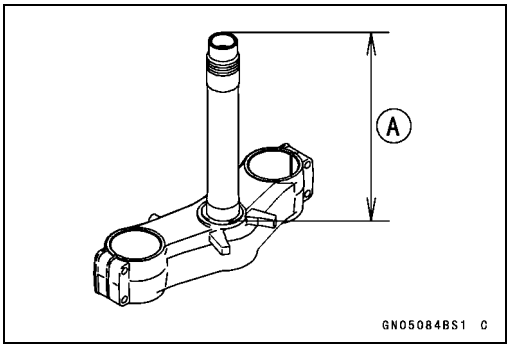

● Install:
Front Master Cylinder (see Front Master Cylinder Installation in the Brakes chapter)
Clutch Lever Assembly (see Clutch Lever Installation in the Clutch chapter)
Throttle Case (see Throttle Body Assy Installation in the Fuel System (DFI) chapter
Steering Damper (see Steering Damper Installation)

### *Steering Stem Bearing Lubrication*

● Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.

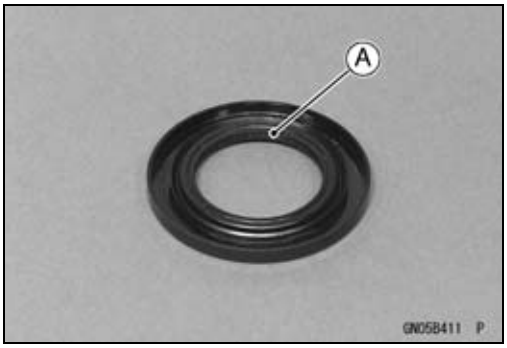
### *Steering Stem Warp*

● Whenever the steering stem is removed, or if the steering can not be adjusted for smooth action, check the steering stem for straightness.
★If the steering stem [A] is bent, replace the steering stem.



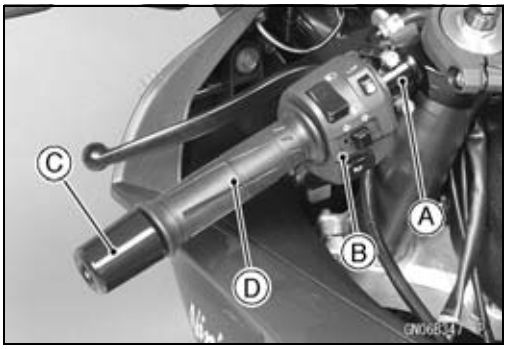

### *Stem Cap Deterioration, Damage*

★Replace the stem cap if its grease seal [A] shows damage.

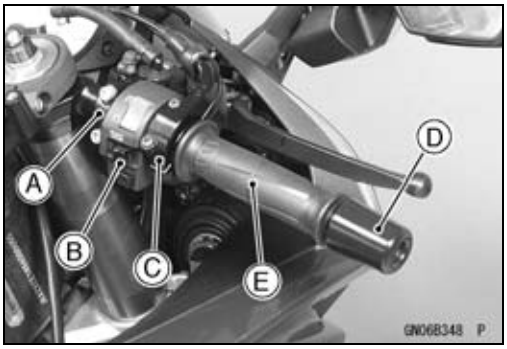


## Handlebar

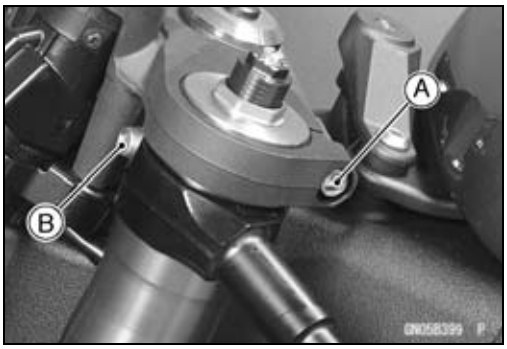
### *Handlebar Removal*



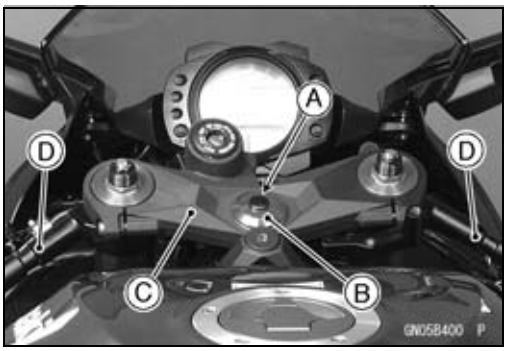

● Remove:
Steering Damper (see Steering Damper Removal)
Clutch Lever Assembly [A]
Left Switch Housing [B]
Left Handlebar Weight [C]
Left Handlebar Grip [D]



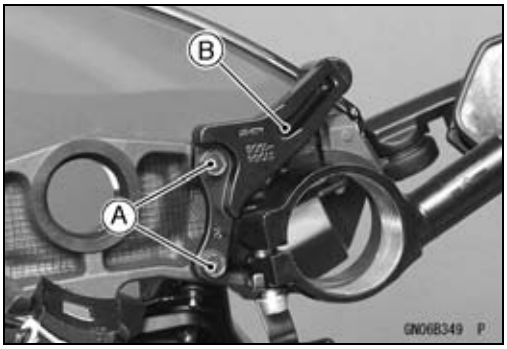

● Remove:
Front Master Cylinder [A] (see Front Master Cylinder Removal in the Brakes chapter)
Right Switch Housing [B]
Throttle Case [C]
Left Handlebar Weight [D]
Throttle Grip [E]




● Loosen:
Upper Front Fork Clamp Bolt [A] (Both Sides)
Handlebar Clamp Bolt [B] (Both Sides)



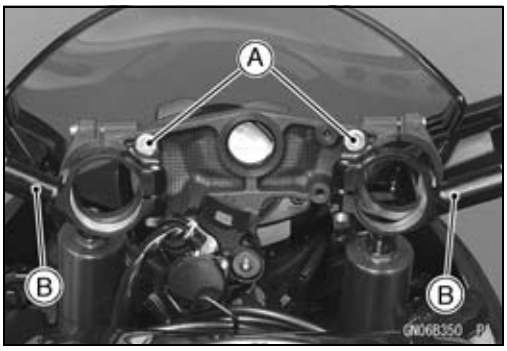

● Remove:
Plug [A]
Steering Stem Head Bolt [B] and Washer
Steering Stem Head [C] with Handlebars [D]




● Remove:
Bolts [A]
Steering Damper Bracket [B]

## Handlebar

● Remove:
Handlebar Positioning Bolts [A]
Handlebars [B]



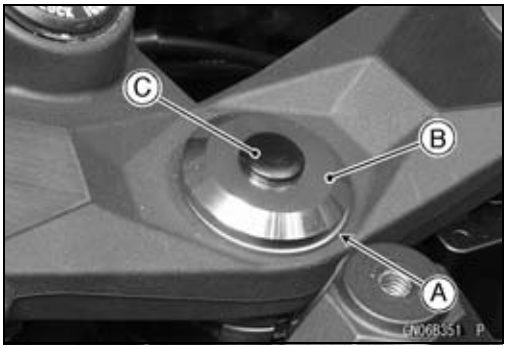

### *Handlebar Installation*

● Apply a non-permanent locking agent to the threads of the handlebar positioning bolts and tighten them.

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

● Install the steering damper bracket.
● Install the washer [A] and steering stem head bolt [B].
● Tighten:

**Torque - Steering Stem Head Bolt: 108 N·m (11.0 kgf·m, 80 ft·lb)**
**Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**
**Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**




**NOTE**

○*Tighten the steering stem head bolt before tightening the upper front fork clamp bolts and handlebar clamp bolts.*

**⚠ WARNING**

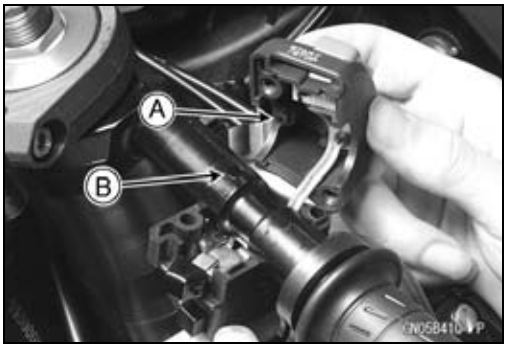
**Do not impede the handlebar turning by routing the cables, harness and hoses improperly (see Cable, Wire, and Hose Routing section in the Appendix chapter).**

● Install the plug [C] on the steering stem head bolt.

● Apply adhesive cement to the inside of the left handlebar grip.
● Install the handlebar weight securely.

● Install the left and right switch housings.
○Fit the projection [A] into a small hole [B] in the handlebar.

**Torque - Left and Right Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)**



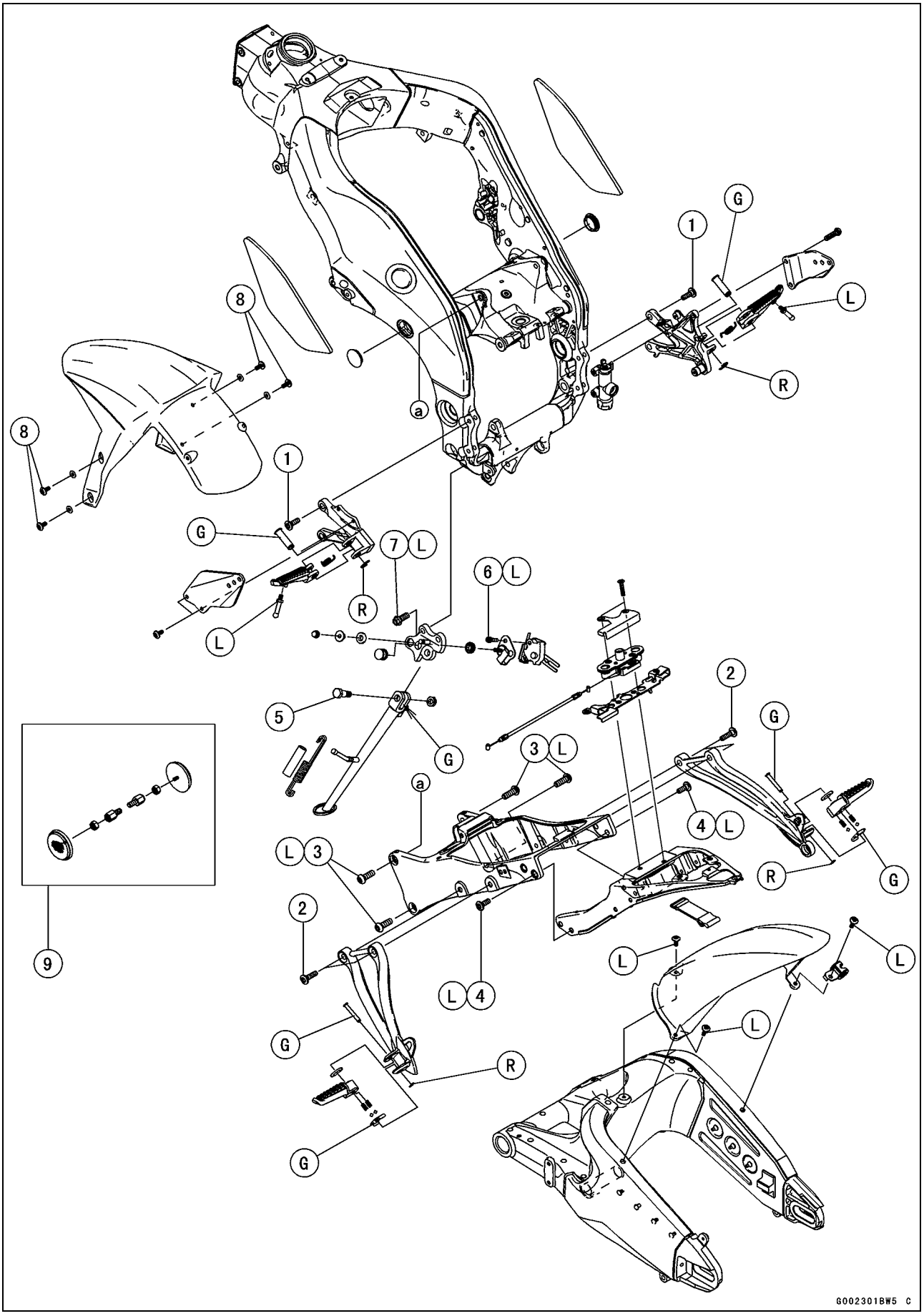
## Handlebar

- Install:
  Front Master Cylinder (see Front Master Cylinder Installation in the Brakes chapter)
  Clutch Lever Assembly (see Clutch Lever Installation in the Clutch chapter)
  Throttle Case (see Throttle Body Assy Installation in the Fuel System (DFI) chapter
  Steering Damper (see Steering Damper Installation)

# Frame

## Table of Contents

## Exploded View



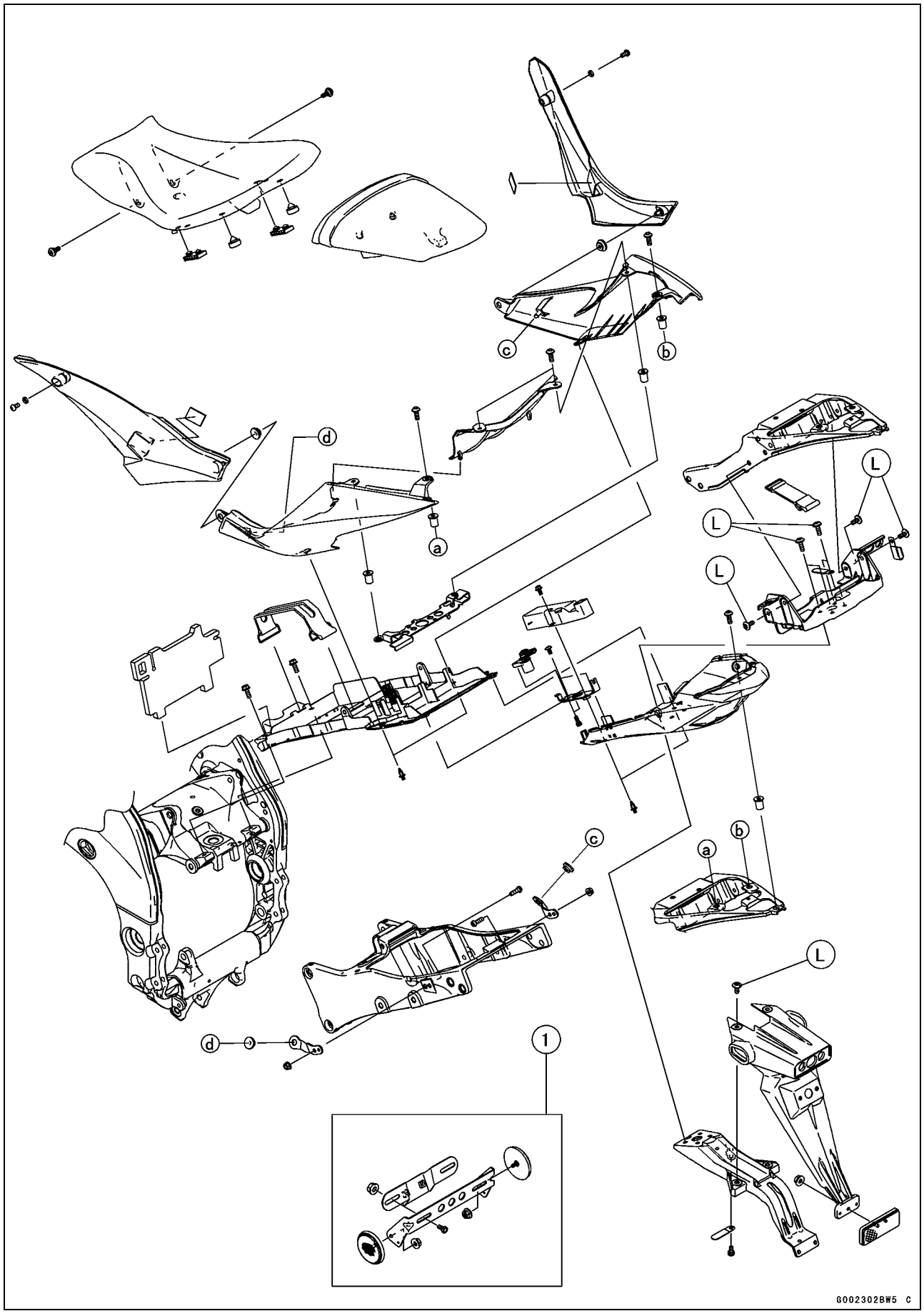
## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Front Footpeg Bracket Bolts | 25 | 2.5 | 18 | |
| 2 | Rear Footpeg Bracket Bolts | 25 | 2.5 | 18 | |
| 3 | Rear Frame Front Bolts | 44 | 4.5 | 32 | L |
| 4 | Rear Frame Rear Bolts | 25 | 2.5 | 18 | L |
| 5 | Sidestand Bolt | 44 | 4.5 | 32 | |
| 6 | Sidestand Switch Bolt | 8.8 | 0.90 | 78 in·lb | L |
| 7 | Sidestand Bracket Bolts | 49 | 5.0 | 36 | L |
| 8 | Front Fender Mounting Bolts | 3.9 | 0.40 | 35 in·lb | |

9. US, CA, CAL, AU and SEA Models
G: Apply grease.
L: Apply a non-permanent locking agent.
R: Replacement Parts

## Exploded View

### Other than AU Model

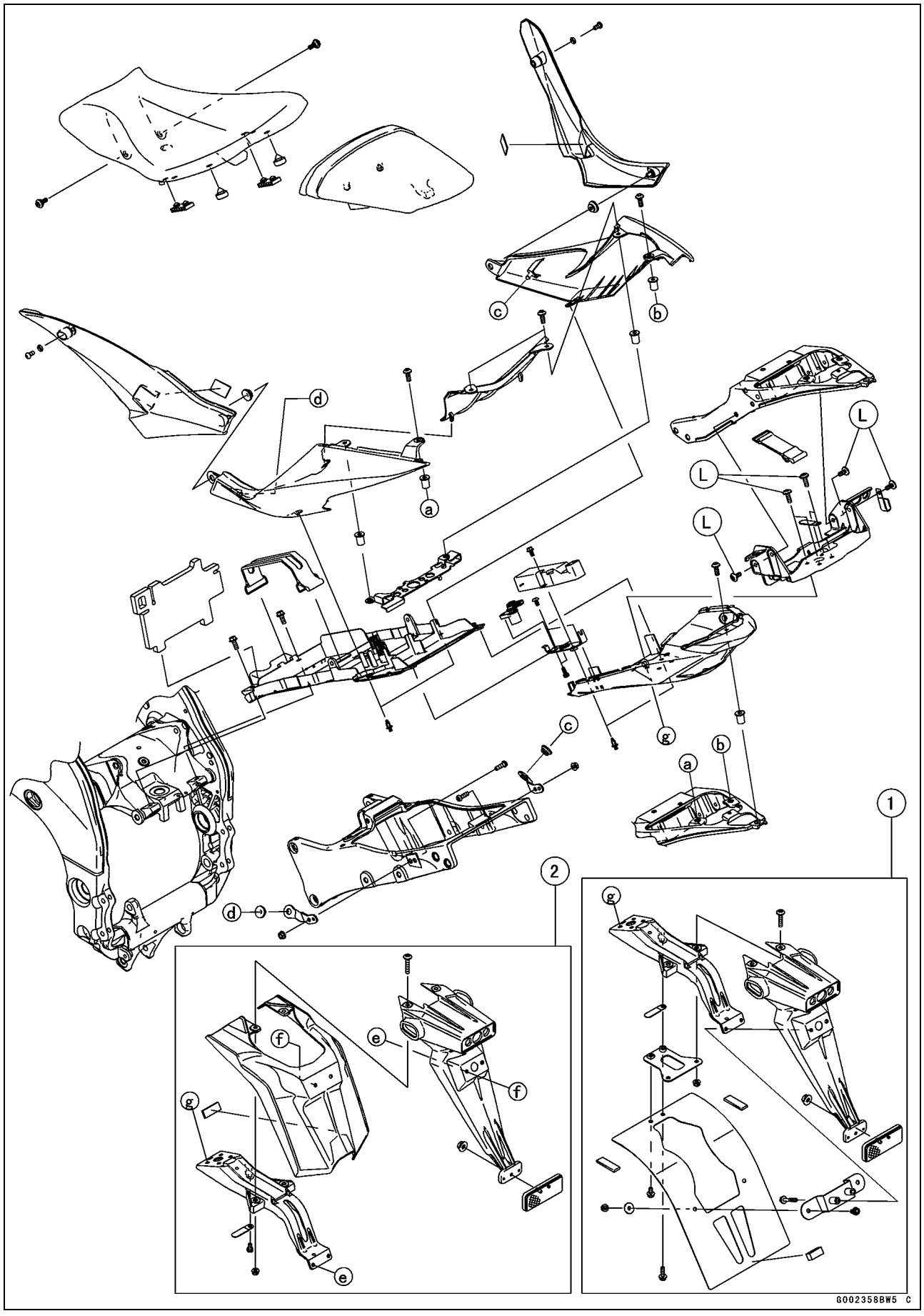


## Exploded View

1. US, CA, CAL and SEA Models
L: Apply a non-permanent locking agent.

## Exploded View

### AU Model

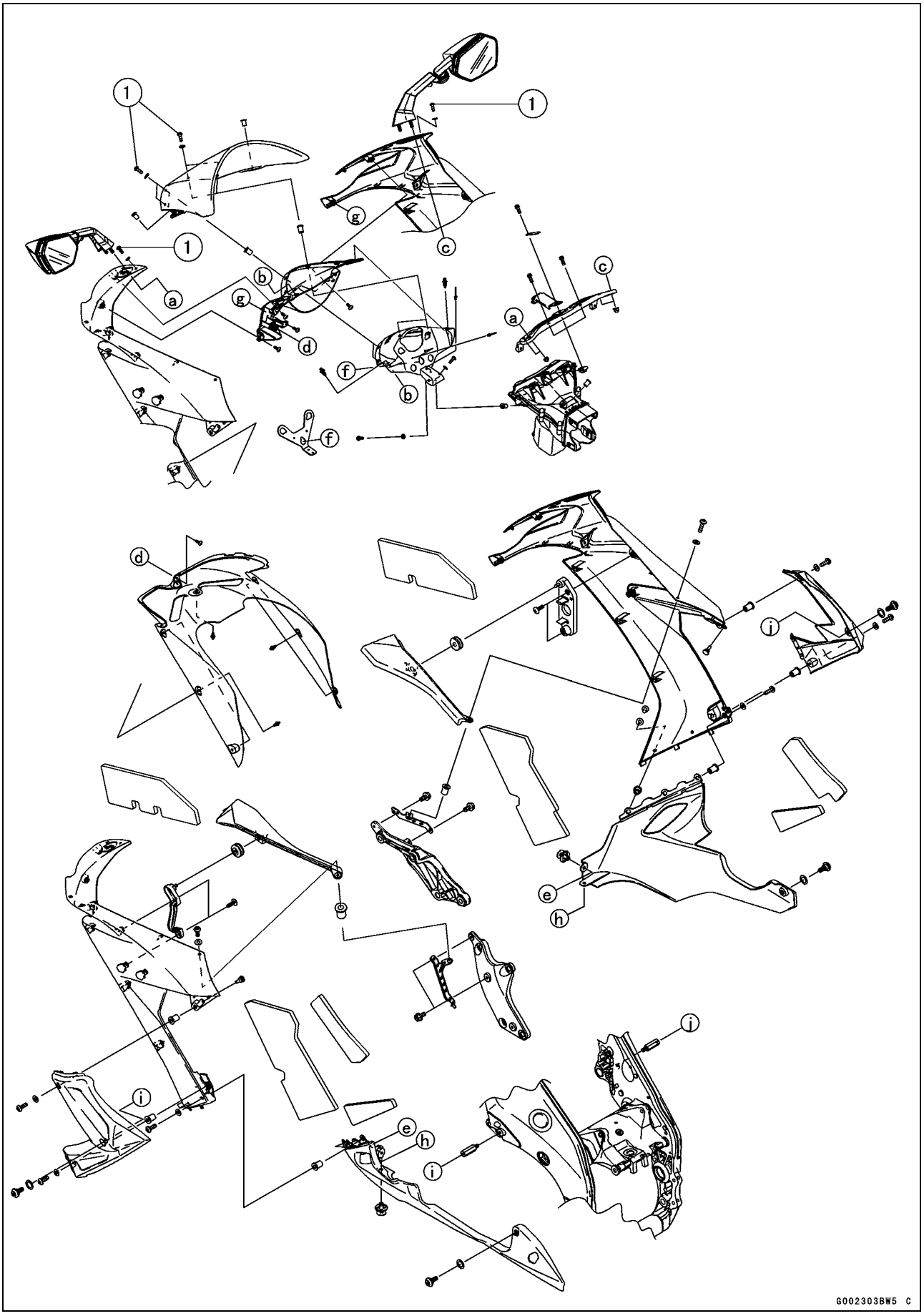


## Exploded View

1. ZX1000E8F
2. ZX1000E9F

L: Apply a non-permanent locking agent.

## Exploded View

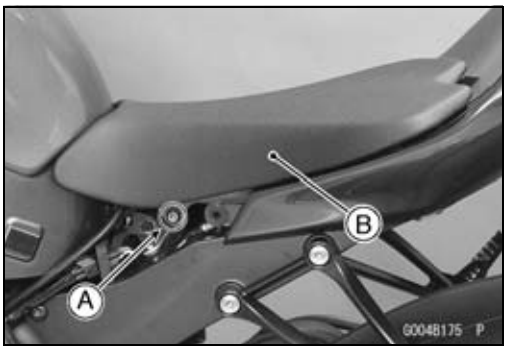


## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Windshield Mounting Bolts | 0.40 | 0.041 | 3.5 in·lb | |

## Seats

### *Front Seat Removal*



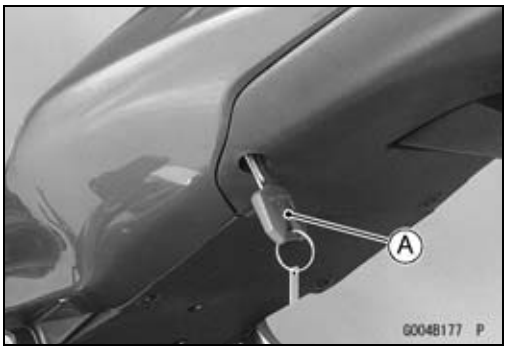

- Remove:
  Side Covers (see Side Cover Removal)
  Bolts [A] (Both Sides)
- Remove the seat [B] forward while lifting up the front part of the seat.

### *Front Seat Installation*


- Installation is the reverse of removal, note the following.

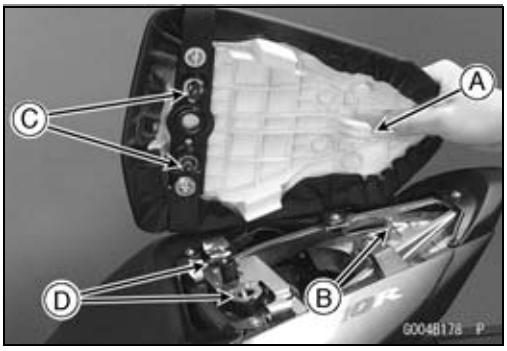
○Slip the seat hook [A] under the rib [B] on the rear frame front.

### *Rear Seat Removal*




- Insert the ignition switch key [A] into the seat lock.
- Pull up the seat upward while turning the key clockwise, and remove it forward.

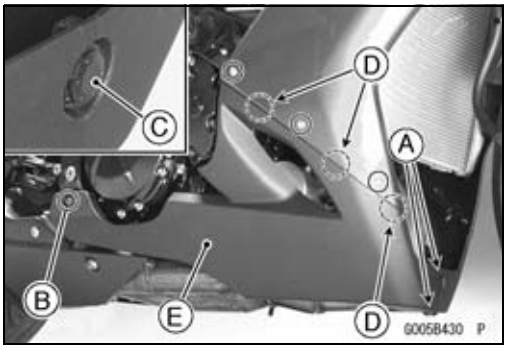
### *Rear Seat Installation*




- Slip the seat hook [A] under the rib [B] on the rear frame rear.
- Insert the seat latches [C] into the latch holes [D].
- Push down the seat until the lock clicks.

## Fairings

### *Lower Fairing Removal*

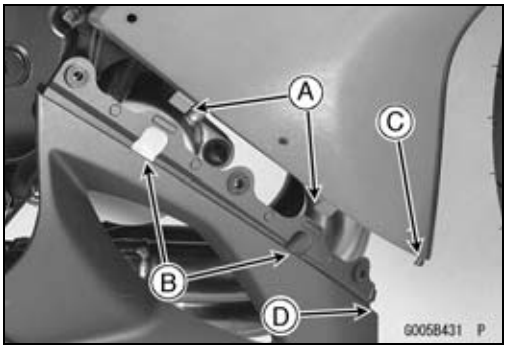



- Remove:
  Quick Rivets [A]
  Bolts [B] with Washers (Both Sides)

○Pull up the core [C] by the flat-head screwdriver, and then remove the quick rivet.

- Clear the hook portions [D] from the slots and remove the right lower fairing [E].
- Remove the left lower fairing in the same way.

### *Lower Fairing Installation*

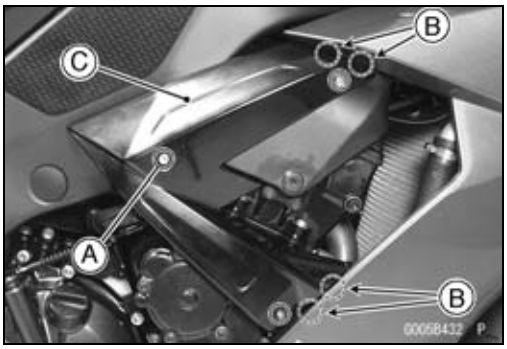



- Installation is the reverse of removal, note the following.

○Insert the hook portions [A] into the slots [B].

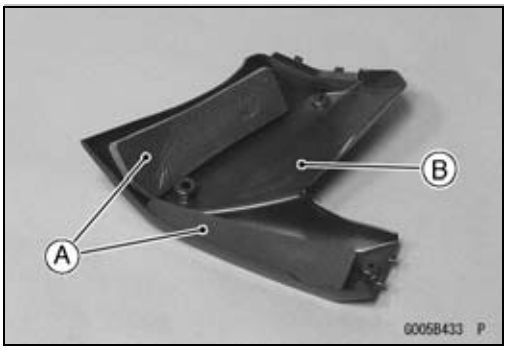
○Hang the hook portion [C] inside the rib [D].

### *Upper Fairing Cover Removal*



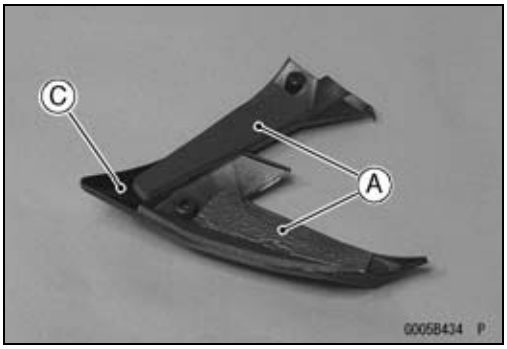

- Remove bolts [A] with washers.
- Clear the hook portions [B] from the slots and ribs (right side only), and remove the upper fairing cover [C].

### *Upper Fairing Cover Installation*



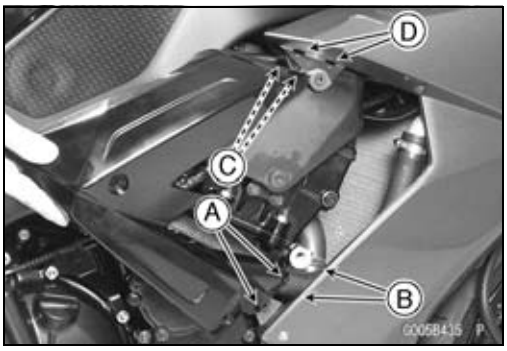

- Installation is the reverse of removal, note the following.

○Check that the pads [A] are in place on the upper fairing cover.
  Left Upper Fairing Cover [B]
  Right Upper Fairing Cover [C]



## Fairings

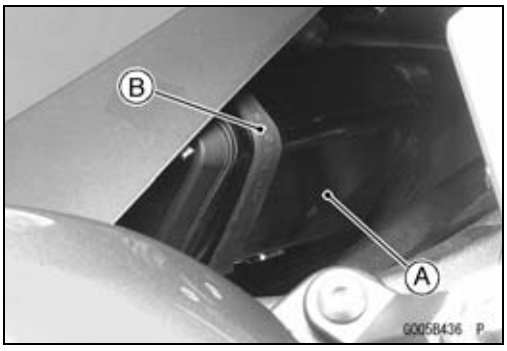
○For the right upper fairing cover, hang the lower hook portions [A] inside the ribs [B] of the upper fairing, and then insert the upper hook portions [C] into the slots [D].
○For the left upper fairing, insert the hook portions into the slots of the upper fairing cover.



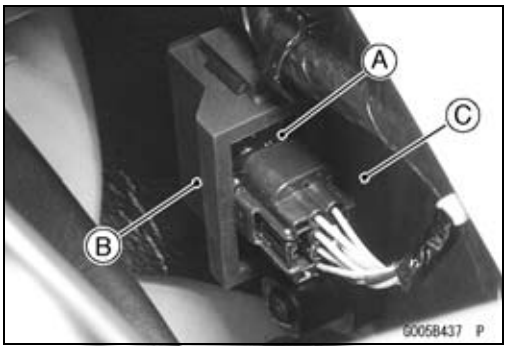

### *Upper Faring Assembly Removal*

● Remove:
Lower Fairings (see Lower Fairing Removal)
Upper Fairing Covers (see Upper Fairing Cover Removal)
Upper Inner Fairings (see Upper Inner Fairing Removal)
Meter Unit (see Meter Unit Removal in the Electrical System chapter)

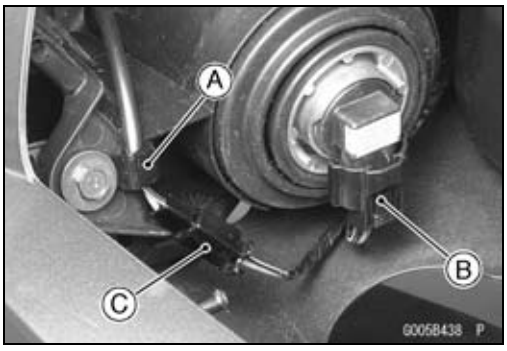
● For the California and Southeast Asia models, remove the canister [A].
○Remove the band [B], and then remove the canister.




● For models equipped with an immobilizer system, remove the immobilizer amplifier [A].
○Pull out the immobilizer amplifier with the rubber protector [B] from the bracket [C].

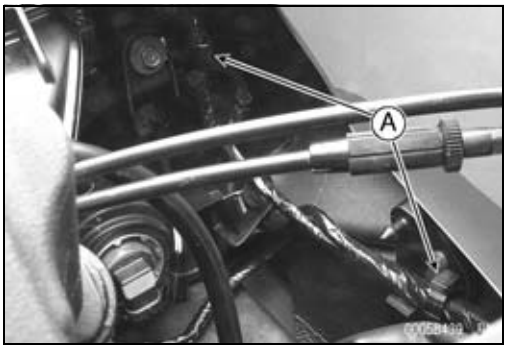



● Open the clamps [A] on both sides and free the leads.
● Disconnect:
Headlight Connectors [B] (Both Sides)
City Light Lead Connectors [C] (Both Sides)

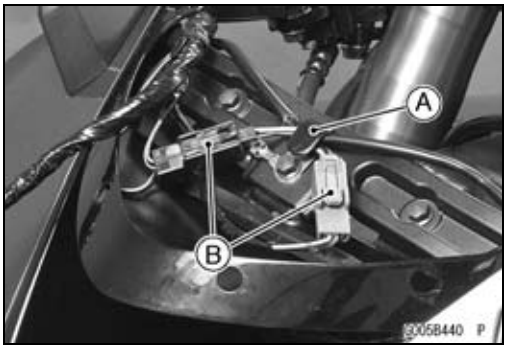


## Fairings

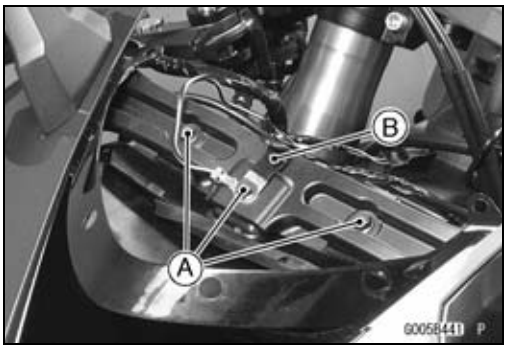
● Open the clamps [A] and free the main harness.




● Open the clamp [A] and free the leads.
● Disconnect the turn signal light lead connectors [B].




● Remove the bolts [A] and clamp [B].



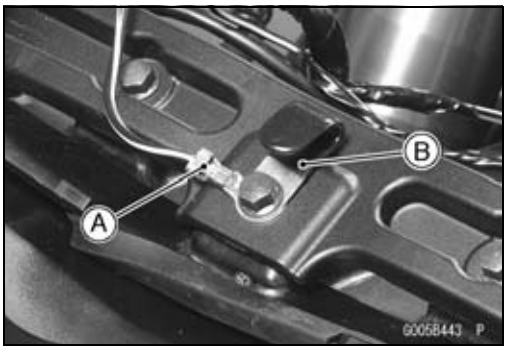

● Pull the upper fairing [A] outward to clear the projections [B] on both sides.
● Remove the upper fairing assembly forward [C].


### *Upper Fairing Assembly Installation*

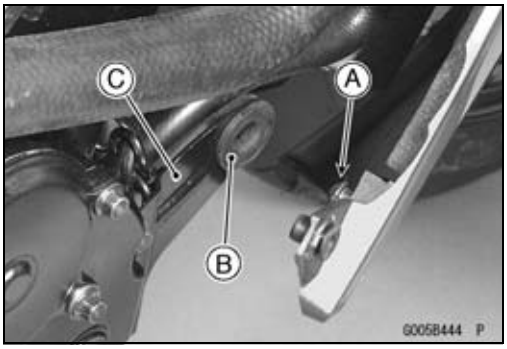
● Installation is the reverse of removal, note the following.
○Run the harness and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## Fairings

○Install the frame ground lead [A] and clamp [B] as shown in the figure.

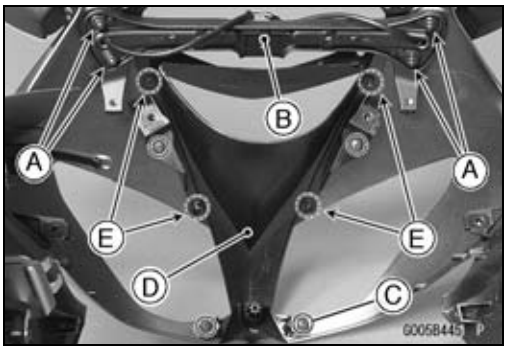



○Insert the projection [A] of the right upper fairing into the grommet [B] on the bracket [C] of the starter clutch cover.
○Insert the projection of the left upper fairing into the grommet on the bracket of the alternator cover in the same way.

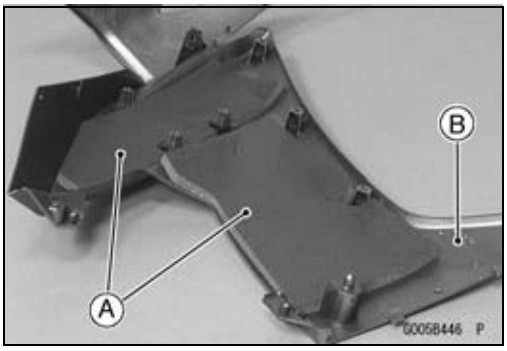


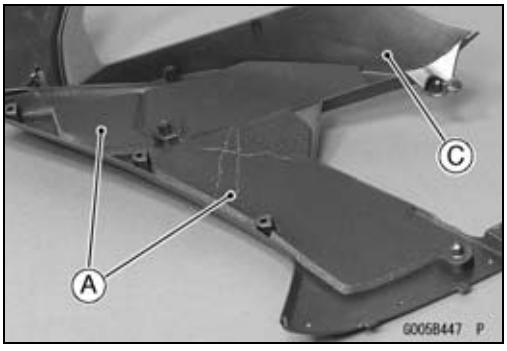

### *Upper Fairing Assembly Disassembly/Assembly*

● Remove:
Center Inner Fairing (see Center Inner Fairing Removal)
Nuts [A] and Rear View Mirrors
Bracket [B]
Screws [C]
● Separate the center fairing [D] and upper fairings.
○Clear the hook portions [E] from the slots.



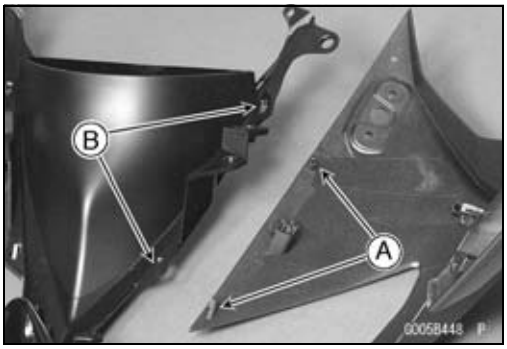

● Assembly is the reverse of disassembly, note the following.
○Check that the pads [A] are in place on the upper fairing.
Left Upper Fairing [B]
Right Upper Fairing [C]



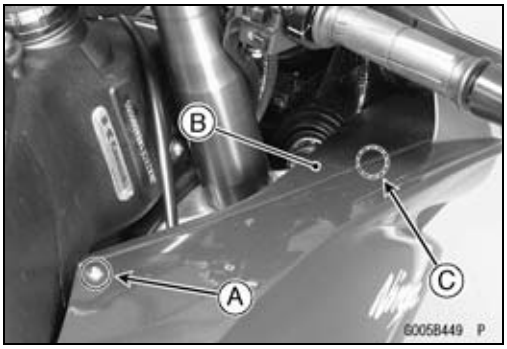
## Fairings

○Insert the hook portions [A] into the slots [B].




### *Upper Inner Fairing Removal*

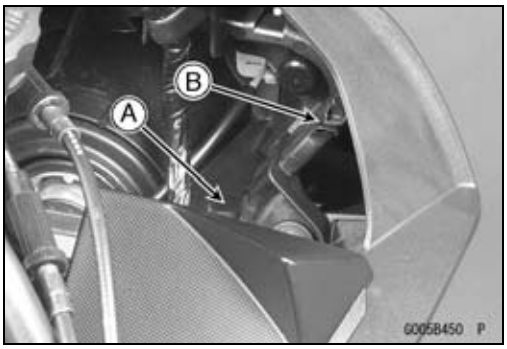
- Remove the bolt [A] with washer.
- Pull the upper inner fairing [B] inward to clear the projection [C].
- Remove the upper inner fairing backward while lifting up the rear part.



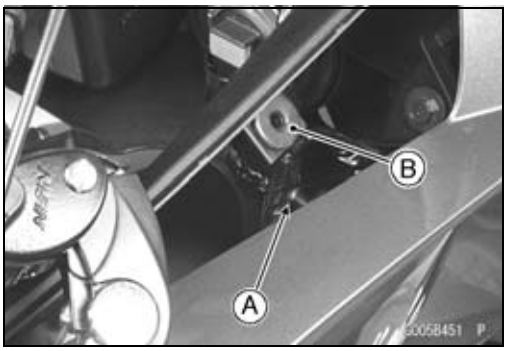

### *Upper Inner Fairing Installation*

- Installation is the reverse of removal, note the following.

○Insert the hook portion [A] into the slot [B] of the headlight.




○Insert the projection [A] of the upper fairing into the grommet [B] on the upper inner fairing.




### *Center Fairing Removal/Installation*

- Refer to the Upper Fairing Assembly Disassembly/Assembly.

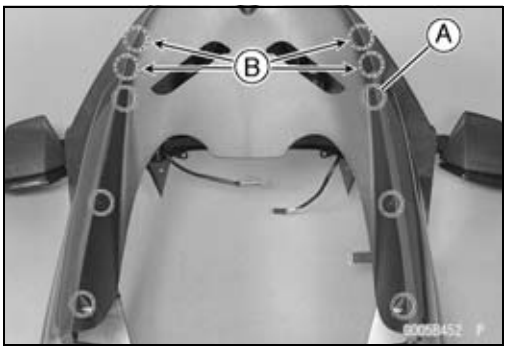
## Fairings

### *Center Inner Fairing Removal*

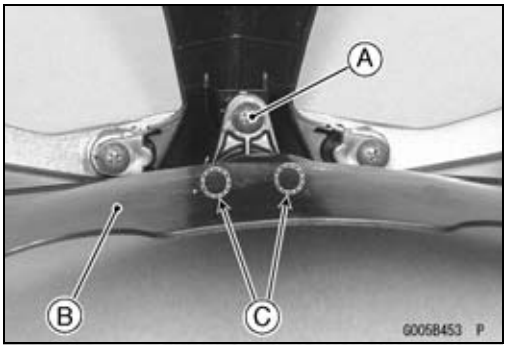
- Remove:
  Upper Fairing Assembly (see Upper Fairing Assembly Removal)
  Headlight (see Headlight Removal in the Electrical System chapter)
  Quick Rivets [A]

○Push the central pin, and then remove the quick rivet.

- Clear the hook portions [B].



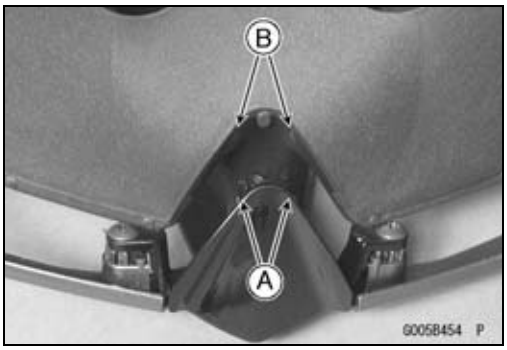

- Remove the screw [A].
- Pull the center inner fairing [B] backward to clear the hook portions [C] from the slots, and remove it.



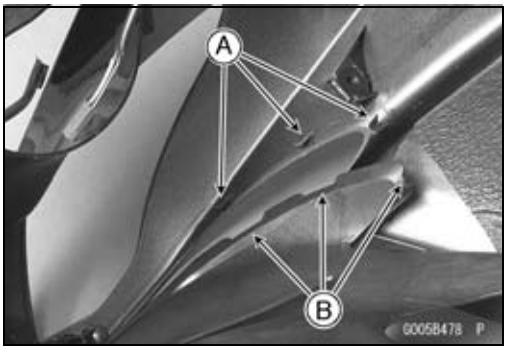

### *Center Inner Fairing Installation*

- Installation is the reverse of removal, note the following.

○Insert the hook portions [A] of the front into the slots [B].



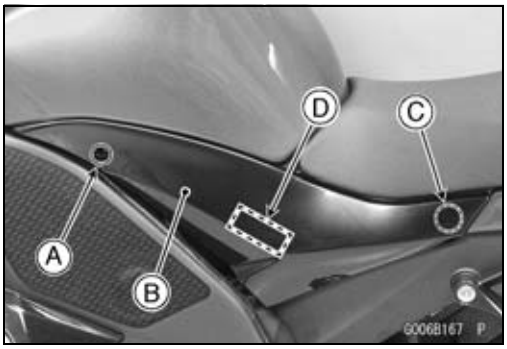

○Insert the hook portions [A] of the left and right into the ribs [B].



## Side Covers

### *Side Cover Removal*

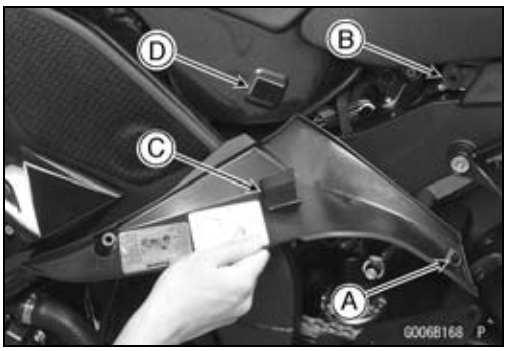
- Remove the bolt [A] with washer.
- Pull the side cover [B] evenly outward to clear the projection [C] and hook fastener [D], and remove it.




### *Side Cover Installation*

- Installation is the reverse of removal, note the following.

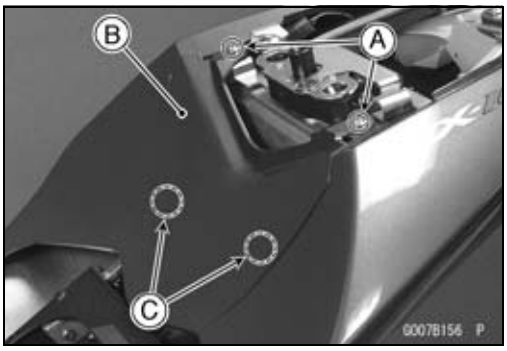
○Insert the projection [A] into the grommet [B] on the seat cover, and then attach the hook fastener [C] to the hook fastener [D] on the fuel tank.



## Seat Covers

### *Seat Cover Removal*

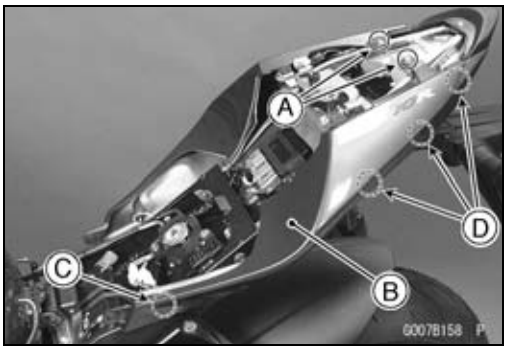
- Remove:
  Seats (see Front/Rear Seat Removal)
  Bolts [A]
- Pull the center seat cover [B] backward to clear the hook portions [C], and remove it upward.




- Remove the quick rivets [A].

○Push the central pin, and then remove the quick rivet.

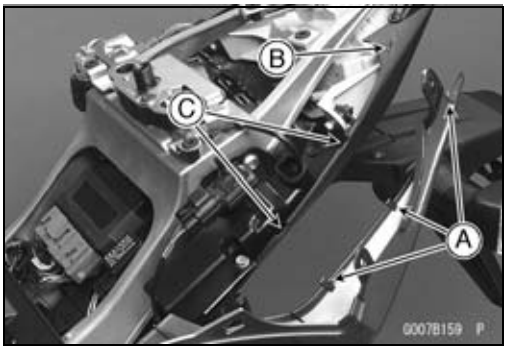

- Remove the bolts [A].
- Pull the left seat cover [B] evenly outward to clear the projection [C] and hook portions [D], and remove it.
- Remove the right seat cover in the same way.



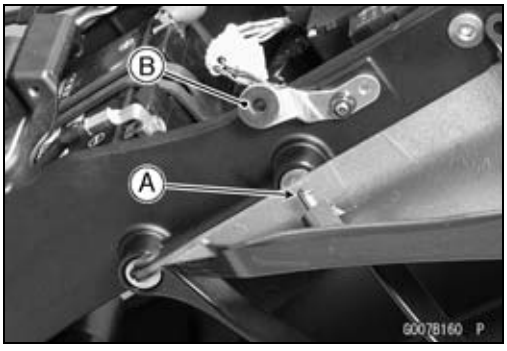

### *Seat Cover Installation*

- Installation is the reverse of removal, note the following.

○Insert the hook portions [A] into the slot [B] and ribs [C].

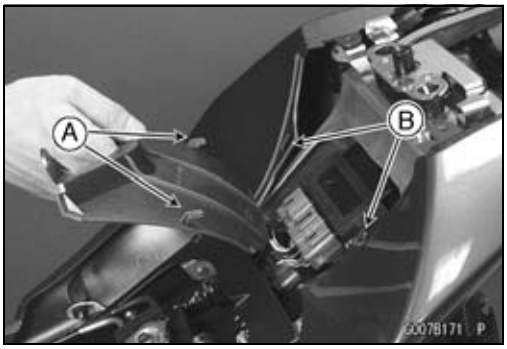



○Insert the projection [A] into the grommet [B] on the bracket of the rear frame front.



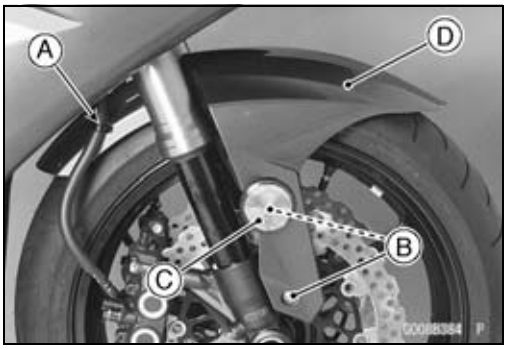
## Seat Covers

○Insert the hook portions [A] into the slots [B].



## Fenders

### *Front Fender Removal*



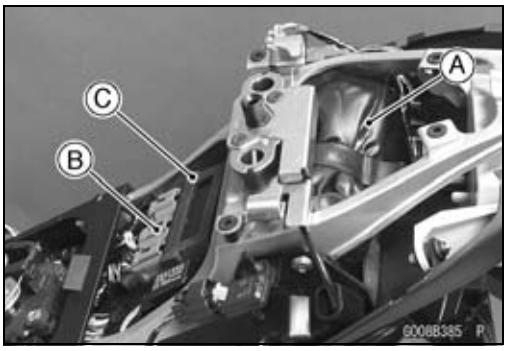

- Remove:
  Clamps [A] (Both Sides)
  Bolts [B] with Washers (Both Sides)
  Reflectors [C] (Both Sides, US, CA, CAL, AU and SEA Models)
  Front Fender [D]

### *Front Fender Installation*

- Tighten:

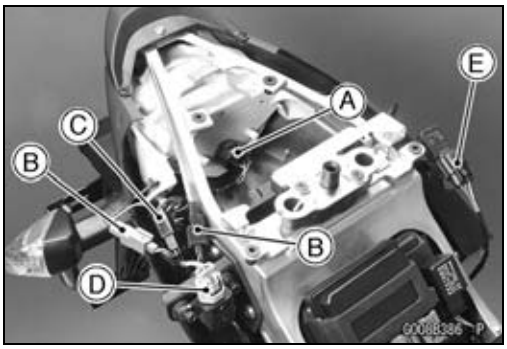
**Torque - Front Fender Mounting Bolts: 3.9 N·m (0.40 kgf·m, 35 in·lb)**

### *Flap and Rear Fender Rear Removal*

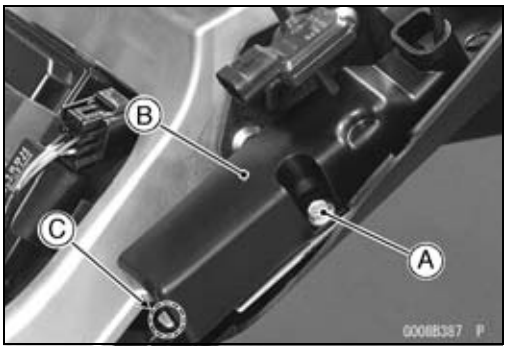



- Remove:
  Seat Covers (see Seat Cover Removal)
  Owner's Tool [A]
- Lift up the relay box [B] and the ECU together with rubber protector [C].

○Do not disconnect the relay box connectors and ECU connectors.




- Disconnect:
  Tail/Brake Light Connector [A]
  Turn Signal Light Lead Connectors [B]
  License Plate Light Lead Connector [C]
  Vehicle-down Sensor Connector [D]
  Atmospheric Pressure Sensor Connector [E]

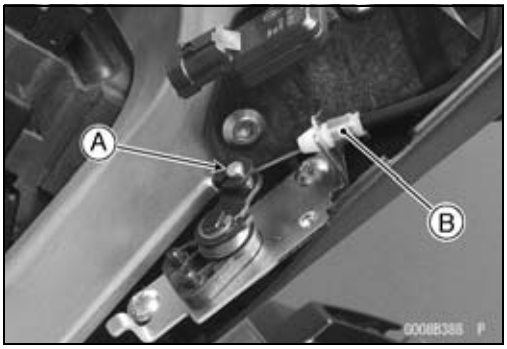



- Remove:
  Bolt [A]
  Seat Lock Cover [B]

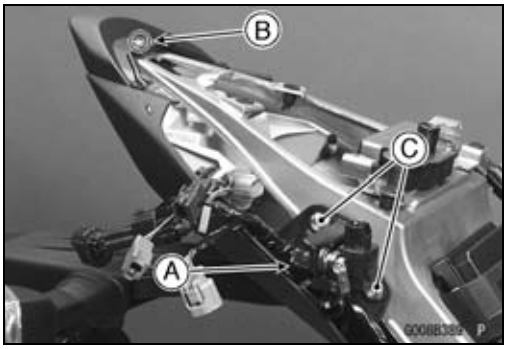
○Clear the hook portion [C] from the slot.

## Fenders

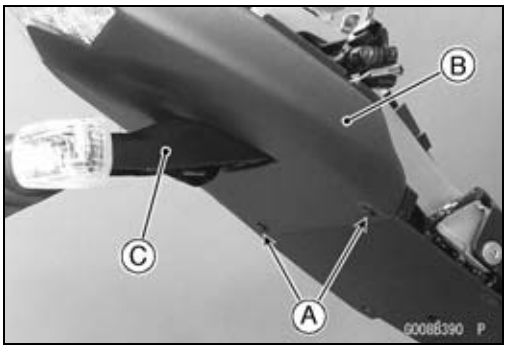
● Remove the lower end [A] of the seat lock cable [B].



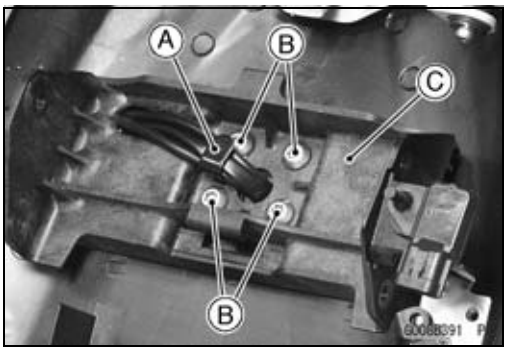

● Open the clamp [A] and free the leads.
● Remove:
Bolt [B]
Rear Fender Rear Bracket Bolts [C] (Both Sides) and Clamp




● Remove the quick rivets [A].
○Push the central pin, and then remove the quick rivet.
● Pull the rear fender rear [B] together with the flap [C] backward, and remove them as an assembly.




● Open the clamp [A] and free the leads.
● Remove the flap mounting bolts [B] and clamp.
● Remove the rear fender rear bracket [C] while clearing the leads from it.
● Separate the flap and rear fender rear.

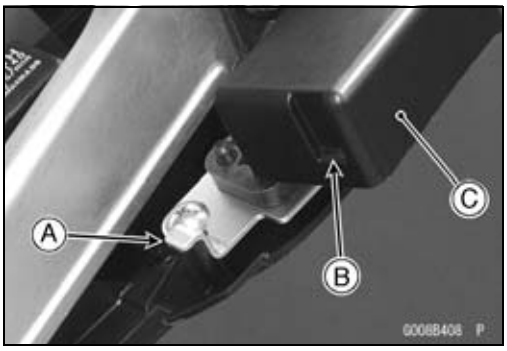



### *Flap and Rear Fender Rear Installation*

● Installation is the reverse of removal, note the following.
○Run the harness, cable and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
○Apply a non-permanent locking agent to the threads of the following bolts.
Flap Mounting Bolts
Rear Fender Rear Mounting Bolts

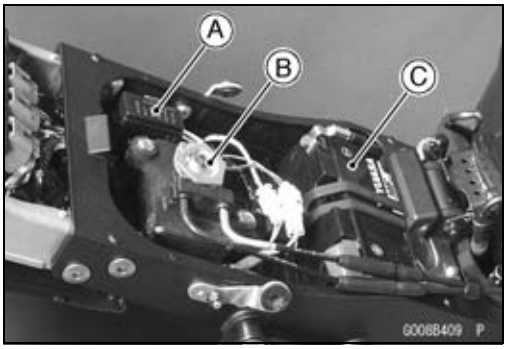
## Fenders

○Insert the hook portion [A] into the slot [B] of the seat lock cover [C].

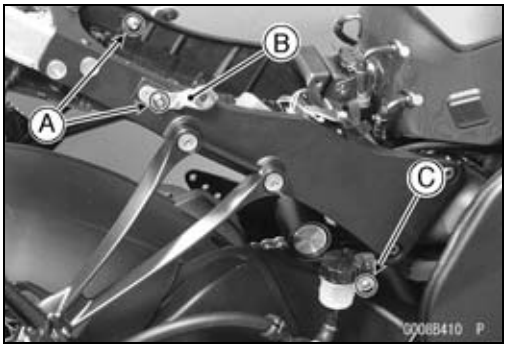



### *Rear Fender Front Removal*

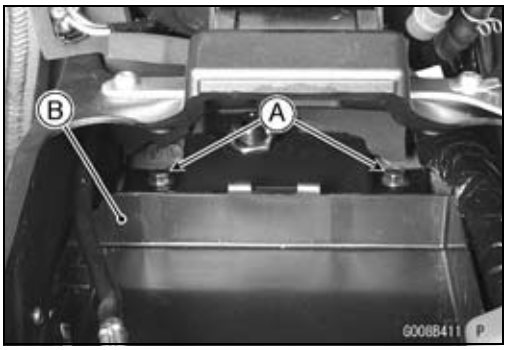
● Remove:
Rear Fender Rear (see Flap and Rear Fender Rear Removal)
Fuse Box [A]
Exhaust Butterfly Valve Actuator [B] (see Exhaust Butterfly Valve Actuator Removal in the Fuel System (DFI) chapter)
Battery [C] (see Battery Removal in the Electrical System chapter)




● Remove:
Bolts [A] and Nuts
Seat Cover Brackets [B] (Both Sides)
Brake Reservoir Mounting Bolt [C]




● Remove the bolts [A].
● Remove the rear fender front [B] backward.

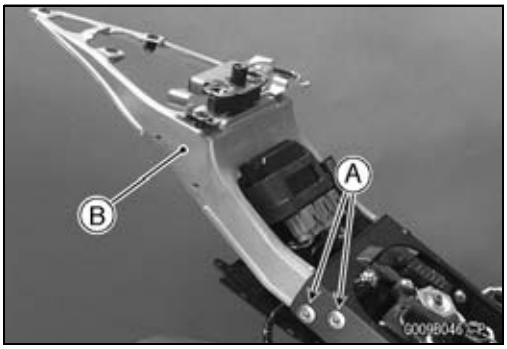



### *Rear Fender Front Installation*

● Installation is the reverse of removal, note the following.
○Run the harness, cables and leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## Frame

### *Rear Frame Rear Removal*




- Remove:
  Rear Fender Rear (see Flap and Rear Fender Rear Removal)
  Rear Frame Rear Bolts [A] (Both Sides)
  Rear Frame Rear [B]

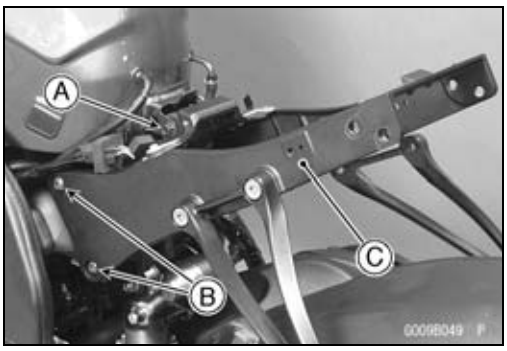
### *Rear Frame Rear Installation*

- Apply a non-permanent locking agent to the threads of the rear frame rear bolts and tighten them.

**Torque - Rear Frame Rear Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

### *Rear Frame Front Removal*


- Remove:
  Rear Frame Rear (see Rear Frame Rear Removal)
  Rear Fender Front (see Rear Fender Front Removal)
  Right Rear Footpeg Bracket Bolts [A]




- Remove:
  Fuel Tank Bolt [A]
  Rear Frame Front Bolts [B] (Both Sides)
  Rear Frame Front [C]

### *Rear Frame Front Installation*

- Apply a non-permanent locking agent to the threads of the rear frame front bolts.
- Tighten:

**Torque - Rear Frame Front Bolts: 44 N·m (4.5 kgf·m, 32 ft·lb)**
**Rear Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

## Frame

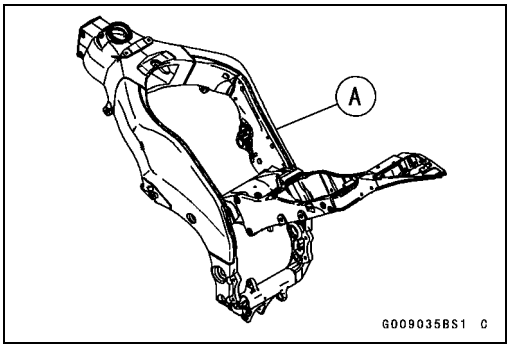
### *Frame Inspection*

- Visually inspect the frame [A] for cracks, dents, bending, or warp.

★If there is any damage to the frame, replace it.

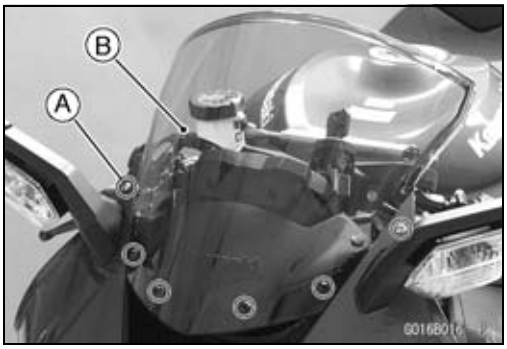
**⚠ WARNING**

**A repaired frame may fail in use, possibly causing an accident. If the frame is bent, dented, cracked, or warped, replace it.**



## Windshield

### *Windshield Removal*

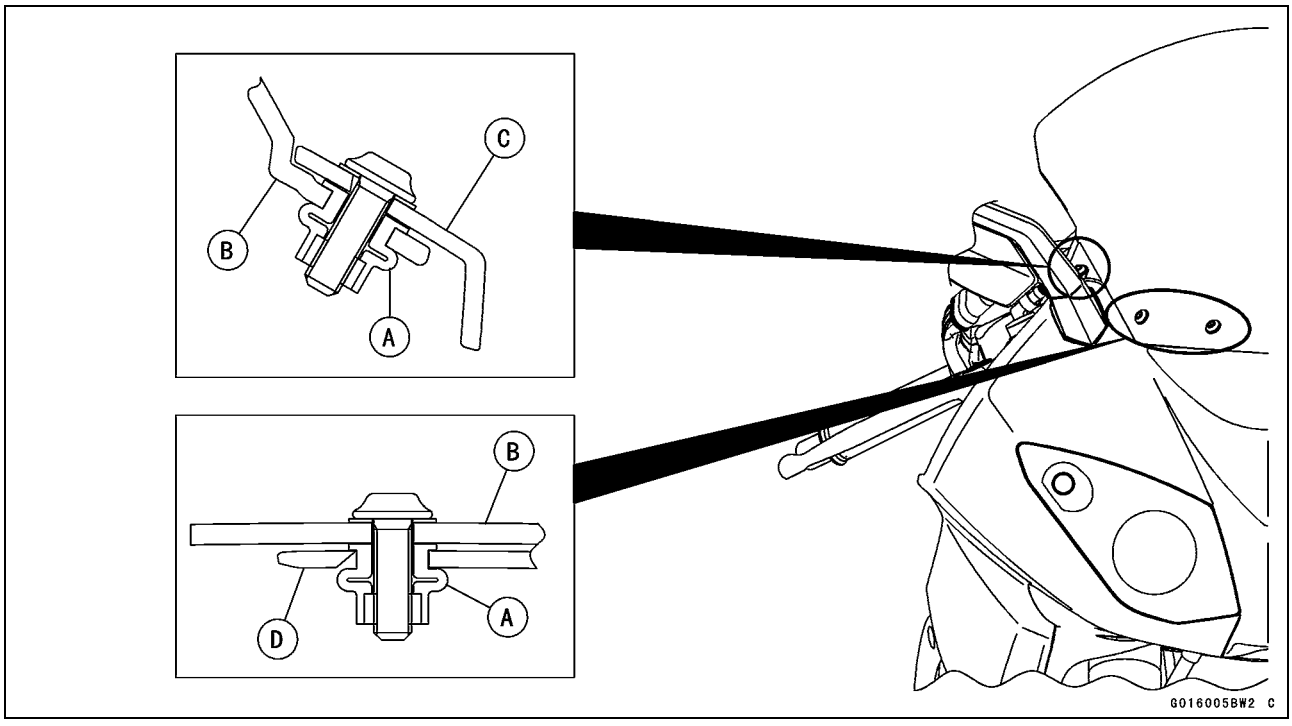



- Remove:
  Bolts with Washers [A]
  Windshield [B]

### *Windshield Installation*

- Be sure that the wellnuts [A] are in position as shown in the figure below.
  Windshield [B]
  Upper Fairing [C]
  Center Fairing [D]
- Tighten:

**Torque - Windshield Mounting Bolts: 0.40 N·m (0.041 kgf·m, 3.5 in·lb)**

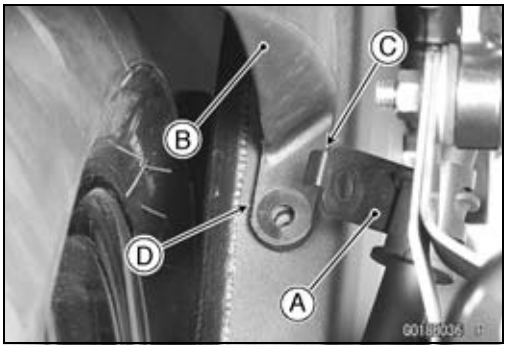


## Guard

### *Mud Guard Removal*


● Remove:
Bolts [A] and Brake Hose Clamp [B]
Mud Guard [C]

### *Mud Guard Installation*



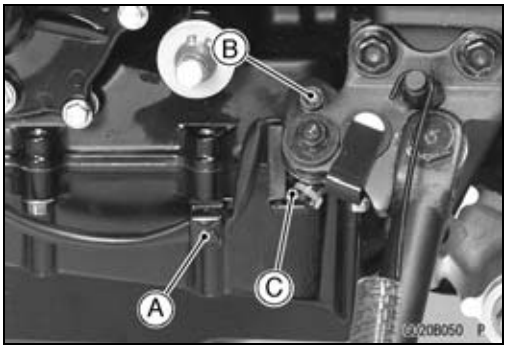

● Installation is the reverse of removal, note the following.
○Install the brake hose clamp [A] on the mud guard [B] so that the hook portion [C] hang to the rib [D].
○Apply a non-permanent locking agent to the thread of the mud guard mounting bolts, and tighten them securely.

## Sidestand

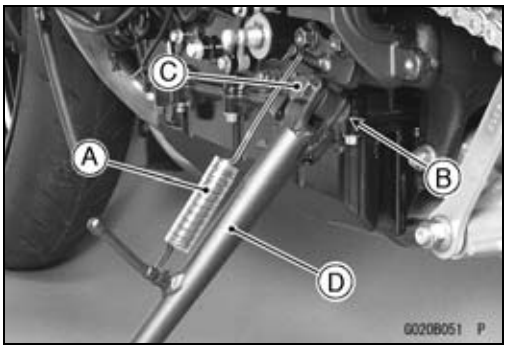
### *Sidestand Removal*

- Raise the rear wheel off the ground with the stand [A].
- Remove:
  Shift Lever (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
  Left Lower Fairing (see Lower Fairing Removal)


- Open the clamp [A] and free the lead.
- Remove:
  Sidestand Switch Bolt [B]
  Sidestand Switch [C]




- Remove:
  Spring [A]
  Sidestand Nut [B]
  Sidestand Bolt [C]
  Sidestand [D]




### *Sidestand Installation*

- Apply grease to the sliding area [A] of the sidestand [B].
- Tighten the sidestand bolt [C], and then lock it with the nut [D].

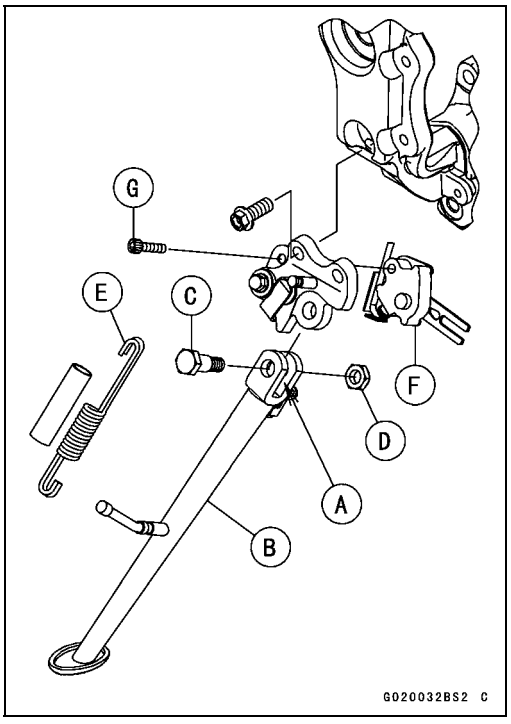
  **Torque - Sidestand Bolt: 44 N·m (4.5 kgf·m, 32 ft·lb)**

- Hook the spring [E] so that the long spring end faces upward.

○Install the spring hook direction as shown in the figure.

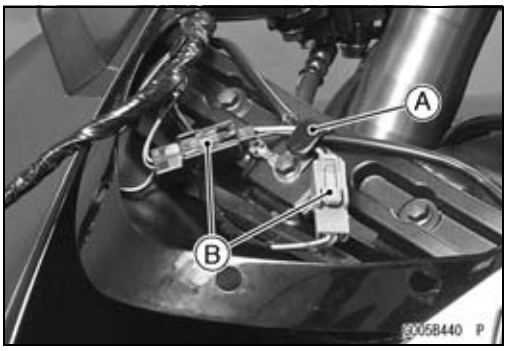
- Install the sidestand switch [F].
- Apply a non-permanent locking agent to the threads of the sidestand switch bolt [G], and tighten it.

  **Torque - Sidestand Switch Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

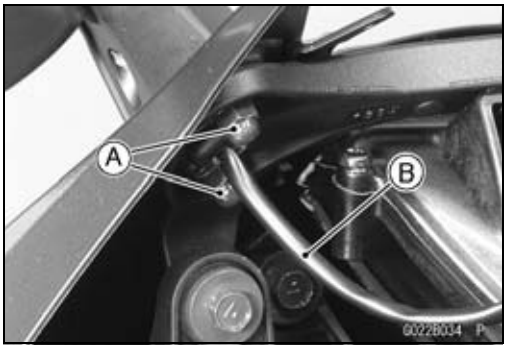


## Rear View Mirrors

### *Rear View Mirror Removal*

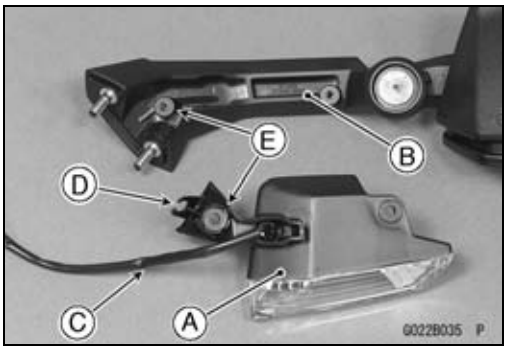



- Remove the meter unit (see Meter Unit Removal in the Electrical System chapter).
- Open the clamp [A] and free the leads.
- Disconnect the turn signal light lead connectors [B].




- Remove the nuts [A].
- Remove the rear view mirror while clearing the turn signal light lead [B] from the bracket and upper fairing.

### *Rear View Mirror Installation*




- Installation is the reverse of removal, note the following.

○Run the turn signal light leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

★If the turn signal light [A] was removed from the rear view mirror [B], install it as follows.

○Fit the turn signal light lead [C] into the cutout portion [D], and install the turn signal light on the rear view mirror.

| CAUTION |
| --- |
| **Do not pinch the turn signal light lead between the bosses [E].** |

# Electrical System

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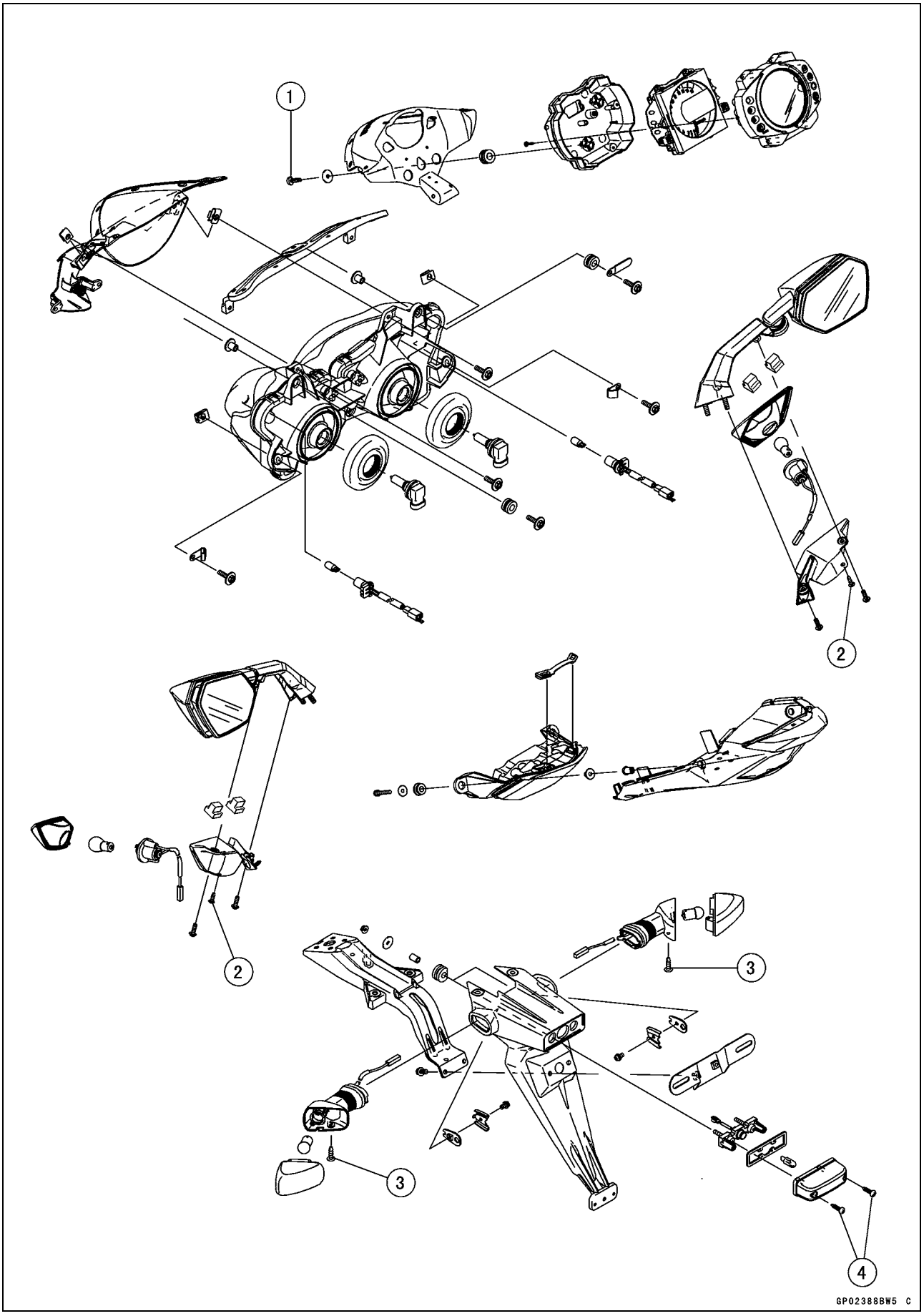
## Exploded View

Dummy Page

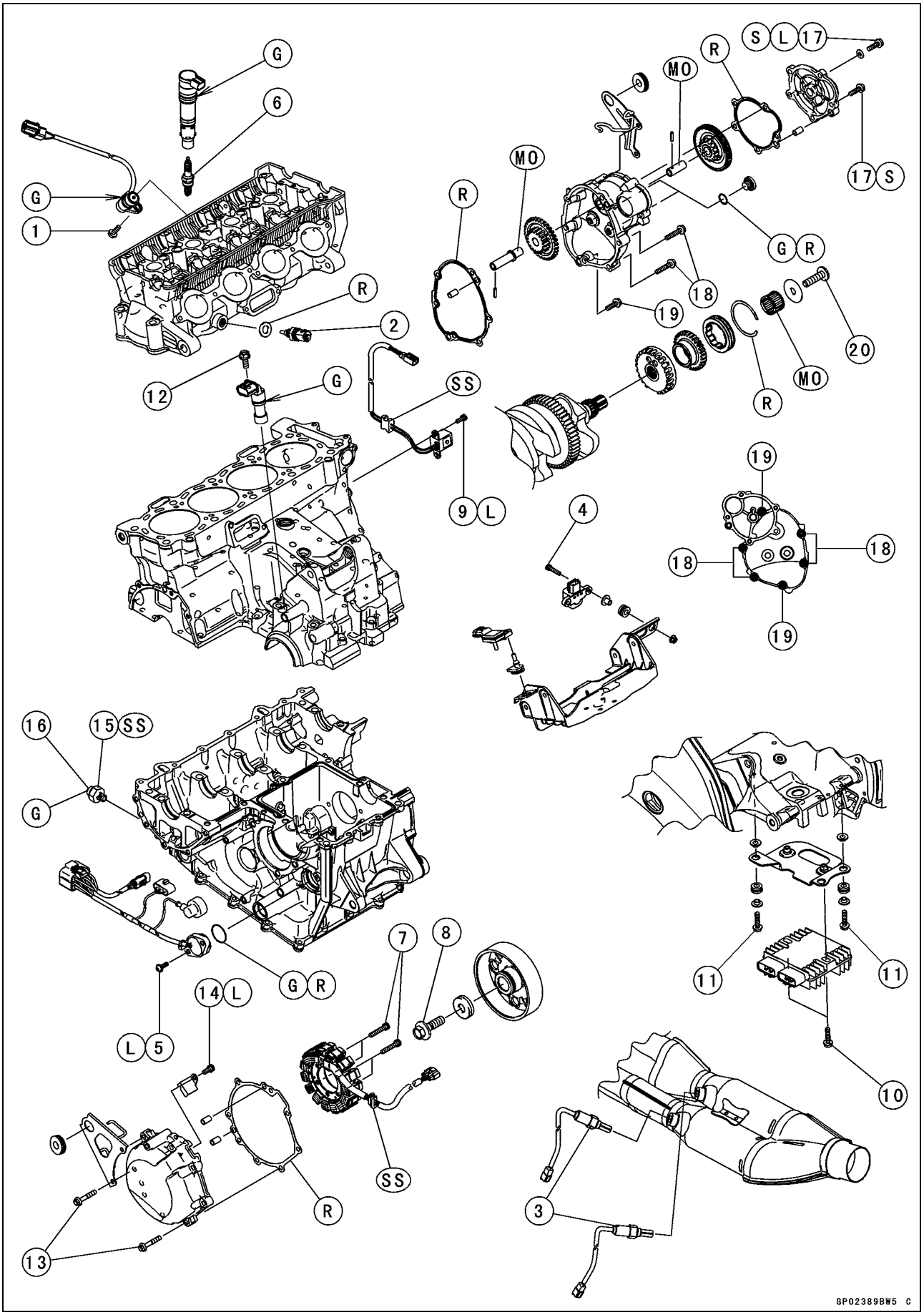
## Exploded View



## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Meter Unit Mounting Screws | 1.2 | 0.12 | 11 in·lb | |
| 2 | Front Turn Signal Light Lens Screws | 1.0 | 0.10 | 9 in·lb | |
| 3 | Rear Turn Signal Light Lens Screws | 1.0 | 0.10 | 9 in·lb | |
| 4 | License Plate Light Cover Screws | 1.0 | 0.10 | 9 in·lb | |

## Exploded View

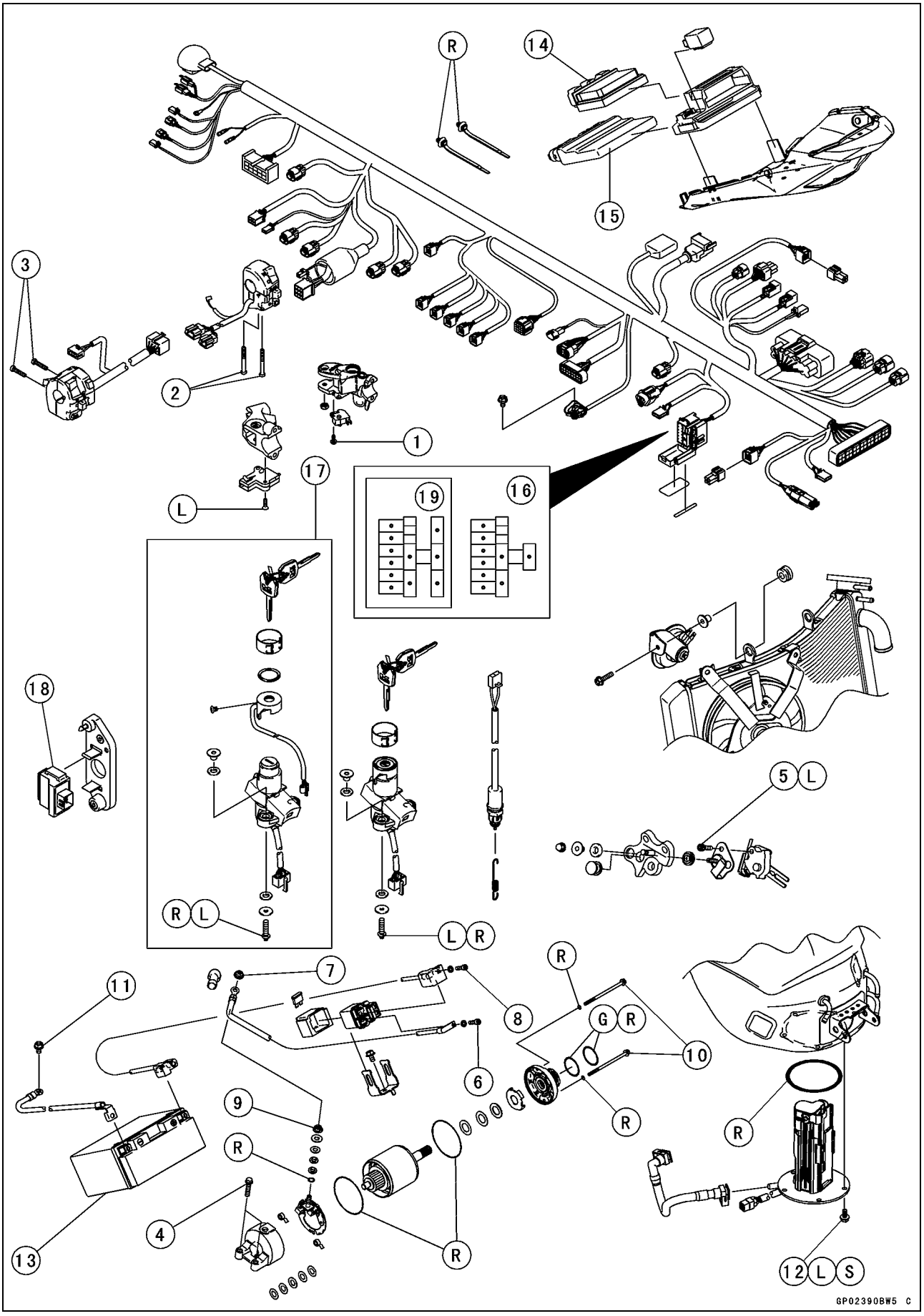


## Exploded View

| No. | Fastener | Torque | | | Remarks |
|---|---|---|---|---|---|
| | | N·m | kgf·m | ft·lb | |
| 1 | Camshaft Position Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| 2 | Water Temperature Sensor | 25 | 2.5 | 18 | |
| 3 | Oxygen Sensors (Equipped Models) | 25 | 2.5 | 18 | |
| 4 | Vehicle-down Sensor Bolts | 6.0 | 0.61 | 53 in·lb | |
| 5 | Gear Position Switch Screws | 3.0 | 0.30 | 27 in·lb | L |
| 6 | Spark Plugs | 13 | 1.3 | 115 in·lb | |
| 7 | Stator Coil Bolts | 12 | 1.2 | 106 in·lb | |
| 8 | Alternator Rotor Bolt | 155 | 15.8 | 114 | |
| 9 | Crankshaft Sensor Bolts | 6.0 | 0.61 | 53 in·lb | L |
| 10 | Regulator/Rectifier Bolts | 7.0 | 0.71 | 62 in·lb | |
| 11 | Regulator/Rectifier Bracket Bolts | 7.0 | 0.71 | 62 in·lb | |
| 12 | Speed Sensor Bolt | 10 | 1.0 | 89 in·lb | |
| 13 | Alternator Cover Bolts | 10 | 1.0 | 89 in·lb | |
| 14 | Alternator Lead Holding Plate Bolt | 10 | 1.0 | 89 in·lb | L |
| 15 | Oil Pressure Switch | 15 | 1.5 | 11 | SS |
| 16 | Oil Pressure Switch Terminal Bolt | – | – | – | Hand -tighten |
| 17 | Torque Limiter Cover Bolts | 10 | 1.0 | 89 in·lb | L (1), S |
| 18 | Starter Clutch Cover Bolts (M6, L = 30) | 10 | 1.0 | 89 in·lb | |
| 19 | Starter Clutch Cover Bolts (M6, L = 20) | 10 | 1.0 | 89 in·lb | |
| 20 | Starter Clutch Bolt | 49 | 5.0 | 36 | |

G: Apply grease.
L: Apply a non-permanent locking agent.
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 | Front Brake Light Switch Screw | 1.2 | 0.12 | 11 in·lb | |
| 2 | Right Switch Housing Screws (M5, L = 45) | 3.5 | 0.36 | 31 in·lb | |
| 3 | Left Switch Housing Screws (M5, L = 25) | 3.5 | 0.36 | 31 in·lb | |
| 4 | Starter Motor Mounting Bolts | 10 | 1.0 | 89 in·lb | |
| 5 | Sidestand Switch Bolt | 8.8 | 0.90 | 78 in·lb | L |
| 6 | Starter Motor Cable Mounting Bolt | 4.0 | 0.41 | 35 in·lb | |
| 7 | Starter Motor Cable Terminal Nut | 6.0 | 0.61 | 53 in·lb | |
| 8 | Battery Cable Mounting Bolt | 4.0 | 0.41 | 35 in·lb | |
| 9 | Starter Motor Terminal Locknut | 6.9 | 0.70 | 61 in·lb | |
| 10 | Starter Motor Through Bolts | 3.4 | 0.35 | 30 in·lb | |
| 11 | Engine Ground Cable Terminal Bolt | 10 | 1.0 | 89 in·lb | |
| 12 | Fuel Pump Bolts | 10 | 1.0 | 89 in·lb | L, S |

13. Battery 12 V 10 Ah
14. Relay Box
15. ECU
16. Fuse Box
17. Immobilizer System Equipped Models
18. Immobilizer Amplifier (Equipped Models)
19. Oxygen Sensor Equipped Models

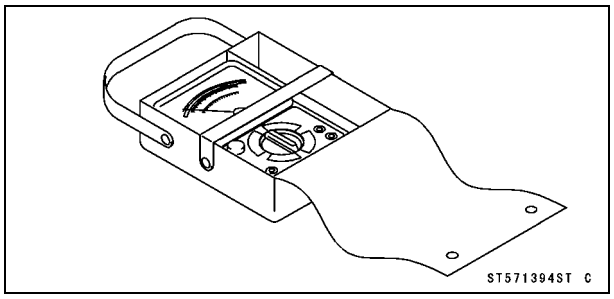
G: Apply grease.
L: Apply a non-permanent locking agent.
M: Apply molybdenum disulfide grease.
MO: Apply molybdenum disulfide oil solution.
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)
R: Replacement Parts
S: Follow the specified tightening sequence.

## Specifications

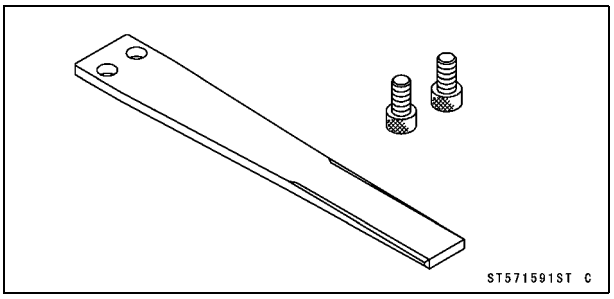
| Item | Standard |
|---|---|
| **Battery** | |
| Type | Sealed battery |
| Model Name | YT12B-BS |
| Capacity | 12 V 10 Ah |
| Voltage | 12.8 V or more |
| **Charging System** | |
| Type | Three-phase AC |
| Alternator Output Voltage | 46 V or more at 4 000 r/min (rpm) |
| Stator Coil Resistance | 0.1 ~ 0.2 Ω at 20°C (68°F) |
| Charging Voltage (Regulator/Rectifier Output Voltage) | 14.2 ~ 15.2 V |
| **Ignition System** | |
| Crankshaft Sensor: | |
| Resistance | 376 ~ 564 Ω |
| Peak Voltage | 3.2 V or more |
| Camshaft Position Sensor: | |
| Resistance | 400 ~ 460 Ω |
| Peak Voltage | 0.4 V or more |
| Stick Coil: | |
| Primary Winding Resistance | 1.2 ~ 1.6 Ω |
| Secondary Winding Resistance | 8.5 ~ 11.5 kΩ |
| Primary Peak Voltage | 72 V or more |
| Spark Plug: | |
| Type | NGK CR9EIA-9 |
| Gap | 0.8 ~ 0.9 mm (0.031 ~ 0.035 in.) |
| **Electric Starter System** | |
| Starter Motor: | |
| Brush Length | 10 mm (0.39 in.) (Service limit 5.0 mm, 0.20 in.) |
| Commutator Diameter | 28 mm (1.10 in.) (Service limit 27 mm, 1.06 in.) |
| **Air Switching Valve** | |
| Resistance | 20 ~ 24 Ω at 20°C (68°F) |
| **Switch and Sensor** | |
| Rear Brake Light Switch Timing | ON after about 10 mm (0.39 in.) pedal travel |
| Oil Pressure Switch Connections | When engine is stopped: ON<br>When engine is running: OFF |
| Water Temperature Sensor Resistance | in the text |
| Gear Position Switch Resistance | in the text |

## Special Tools and Sealant

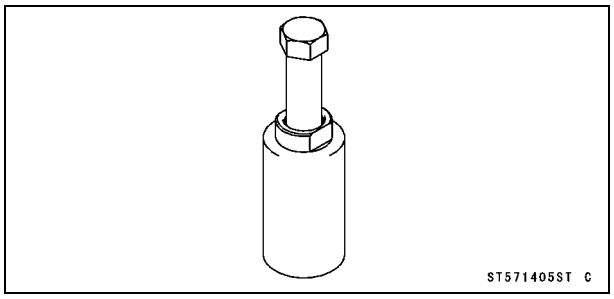
**Hand Tester:**
**57001-1394**



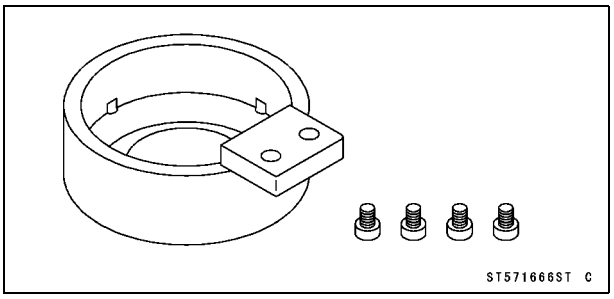

**Grip:**
**57001-1591**



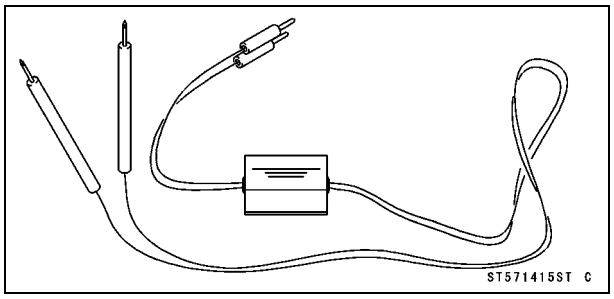

**Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5:**
**57001-1405**



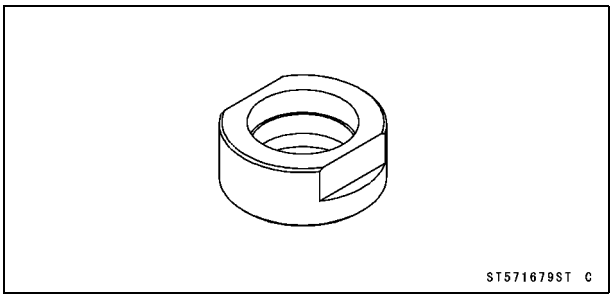

**Rotor Holder:**
**57001-1666**



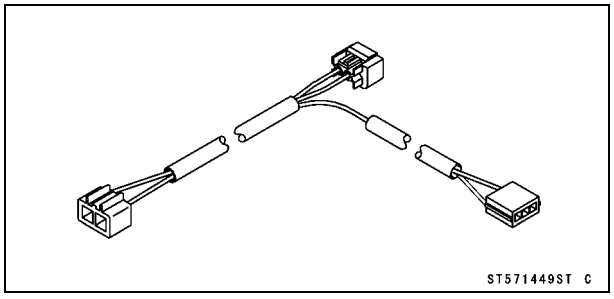

**Peak Voltage Adapter:**
**57001-1415**



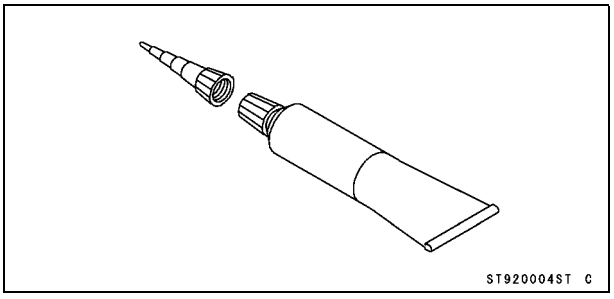

**Stopper:**
**57001-1679**



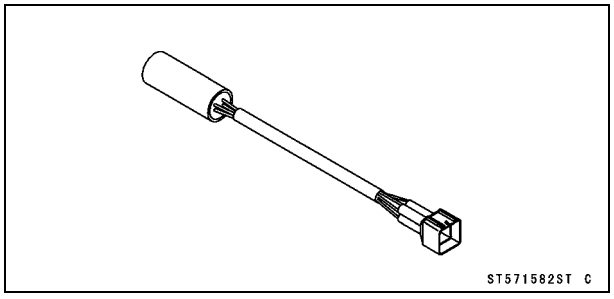

**Lead Wire - Peak Voltage Adapter:**
**57001-1449**



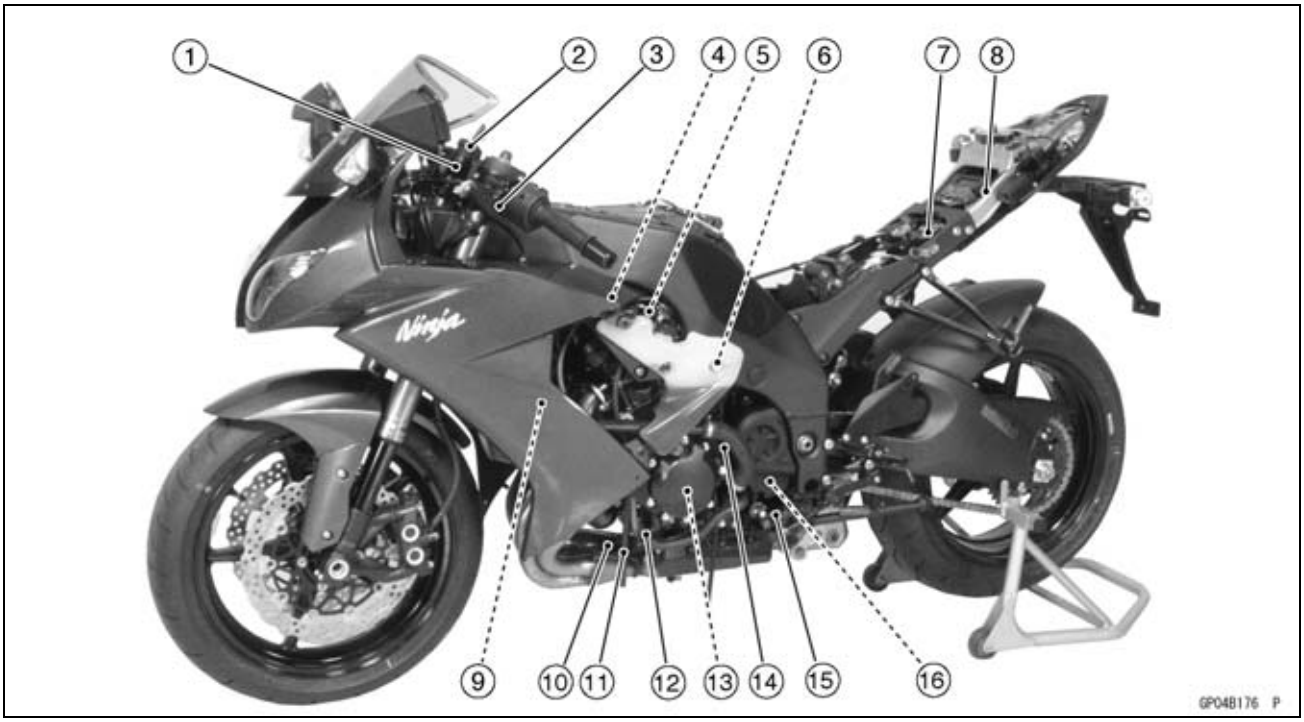

**Kawasaki Bond (Silicone Sealant):**
**92104-0004**

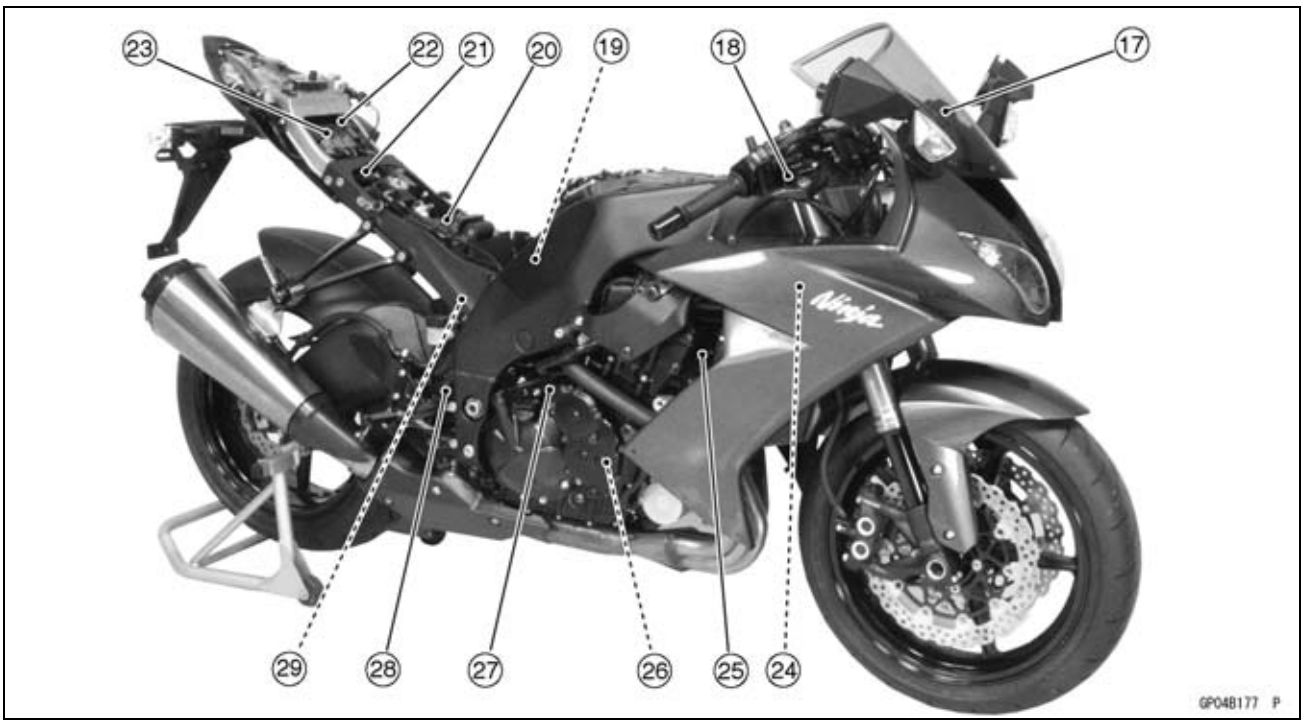


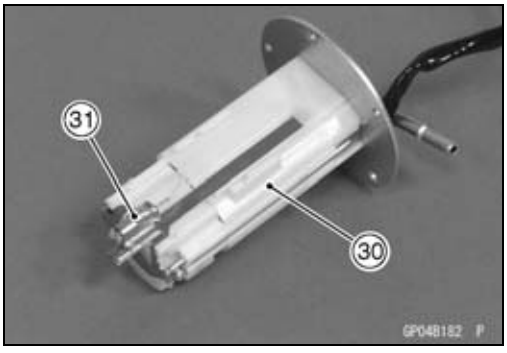

**Key Registration Unit:**
**57001-1582**



## Parts Location



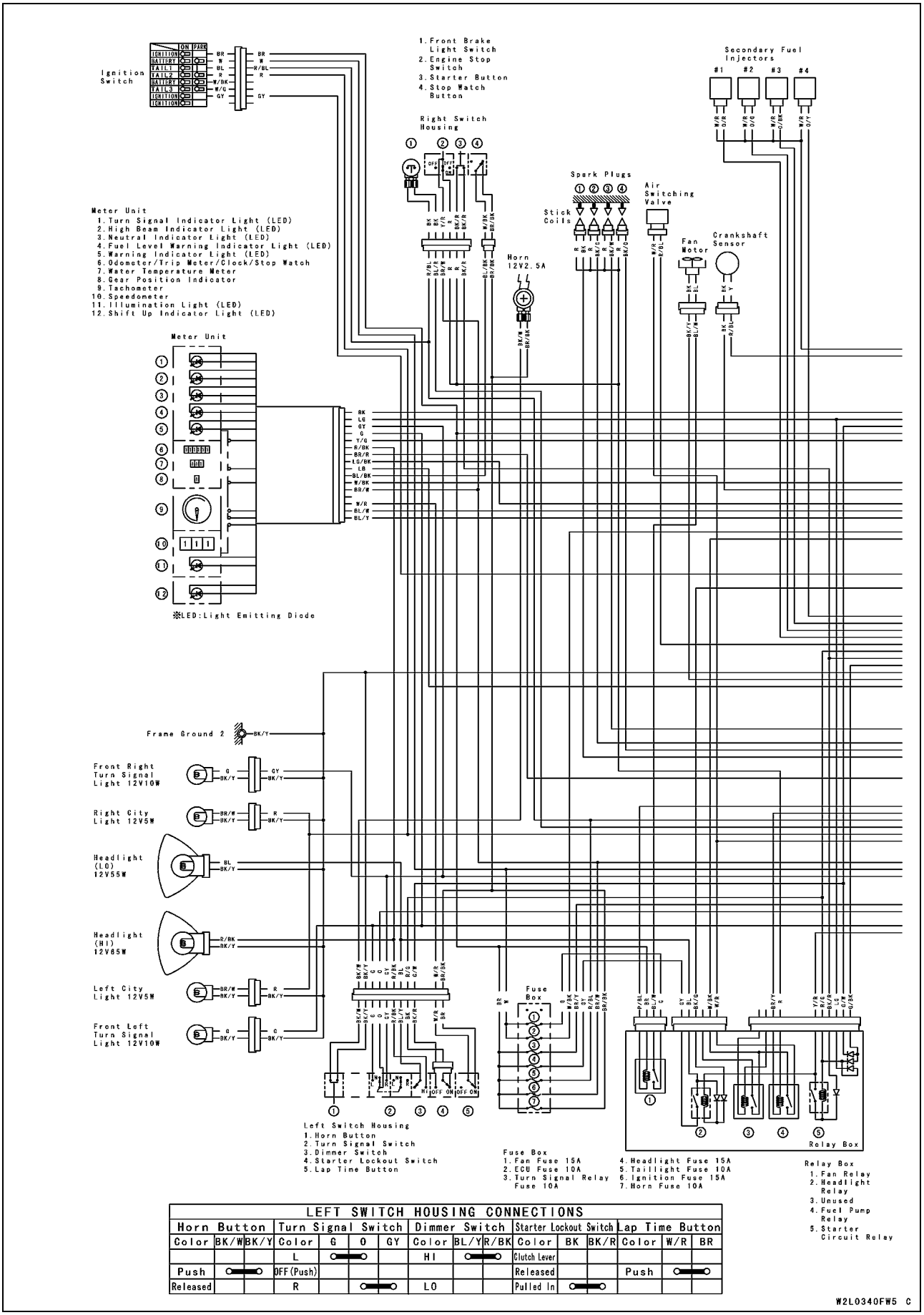



## Parts Location

1. Ignition Switch
2. Immobilizer Antenna (Equipped Models)
3. Starter Lockout Switch
4. Air Switching Valve
5. Stick Coils
6. Water Temperature Sensor
7. Fuse Box
8. Turn Signal Relay
9. Fan Motor
10. Oxygen Sensor #2 (Equipped Models)
11. Oxygen Sensor #1 (Equipped Models)
12. Oil Pressure Switch
13. Alternator
14. Speed Sensor
15. Sidestand Switch
16. Gear Position Switch
17. Meter Unit
18. Front Brake Light Switch
19. Starter Relay
20. Battery 12 V 10 Ah
21. ECU
22. Immobilizer (Equipped Models)/Kawasaki Diagnostic System Connector
23. Relay Box
24. Immobilizer Amplifier (Equipped Models)
25. Camshaft Position Sensor
26. Crankshaft Sensor
27. Starter Motor
28. Rear Brake Light Switch
29. Regulator/Rectifier
30. Fuel Pump
31. Fuel Reserve Switch

## Wiring Diagram (US, CAL and CA Models)

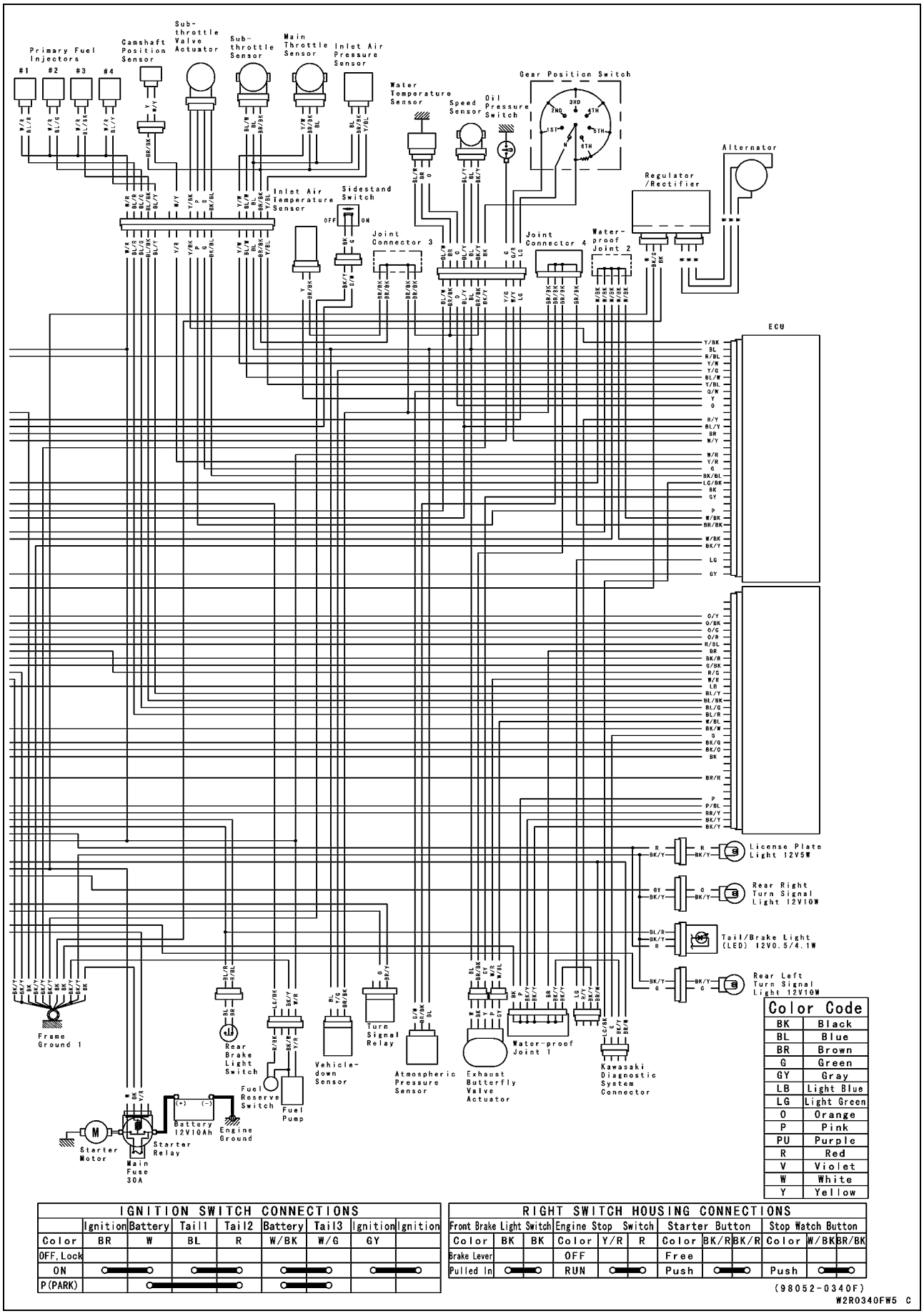



LEFT SWITCH HOUSING CONNECTIONS

| Horn Button | | | Turn Signal Switch | | | | Dimmer Switch | | | Starter Lockout Switch | | | Lap Time Button | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | BK/W | BK/Y | Color | G | O | GY | Color | BL/Y | R/BK | Color | BK | BK/R | Color | W/R | BR |
| | | | L | ○ | ● | | HI | ● | | Clutch Lever | | | | | |
| Push | ● | | OFF(Push) | | | | | | | Released | | | Push | ● | |
| Released | | | R | | ● | ○ | LO | | | Pulled In | ● | ○ | | | |

W2L0340FW5 C

## Wiring Diagram (US, CAL and CA Models)




| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Gray |
| LB | Light Blue |
| LG | Light Green |
| O | Orange |
| P | Pink |
| PU | Purple |
| R | Red |
| V | Violet |
| W | White |
| Y | Yellow |

**IGNITION SWITCH CONNECTIONS**

| | Ignition | Battery | Tail1 | Tail2 | Battery | Tail3 | Ignition | Ignition |
|---|---|---|---|---|---|---|---|---|
| Color | BR | W | BL | R | W/BK | W/G | GY | |
| OFF, Lock | | | | | | | | |
| ON | ○ | ○ | ○ | | ○ | | ○ | |
| P(PARK) | | ○ | ○ | | ○ | | | |

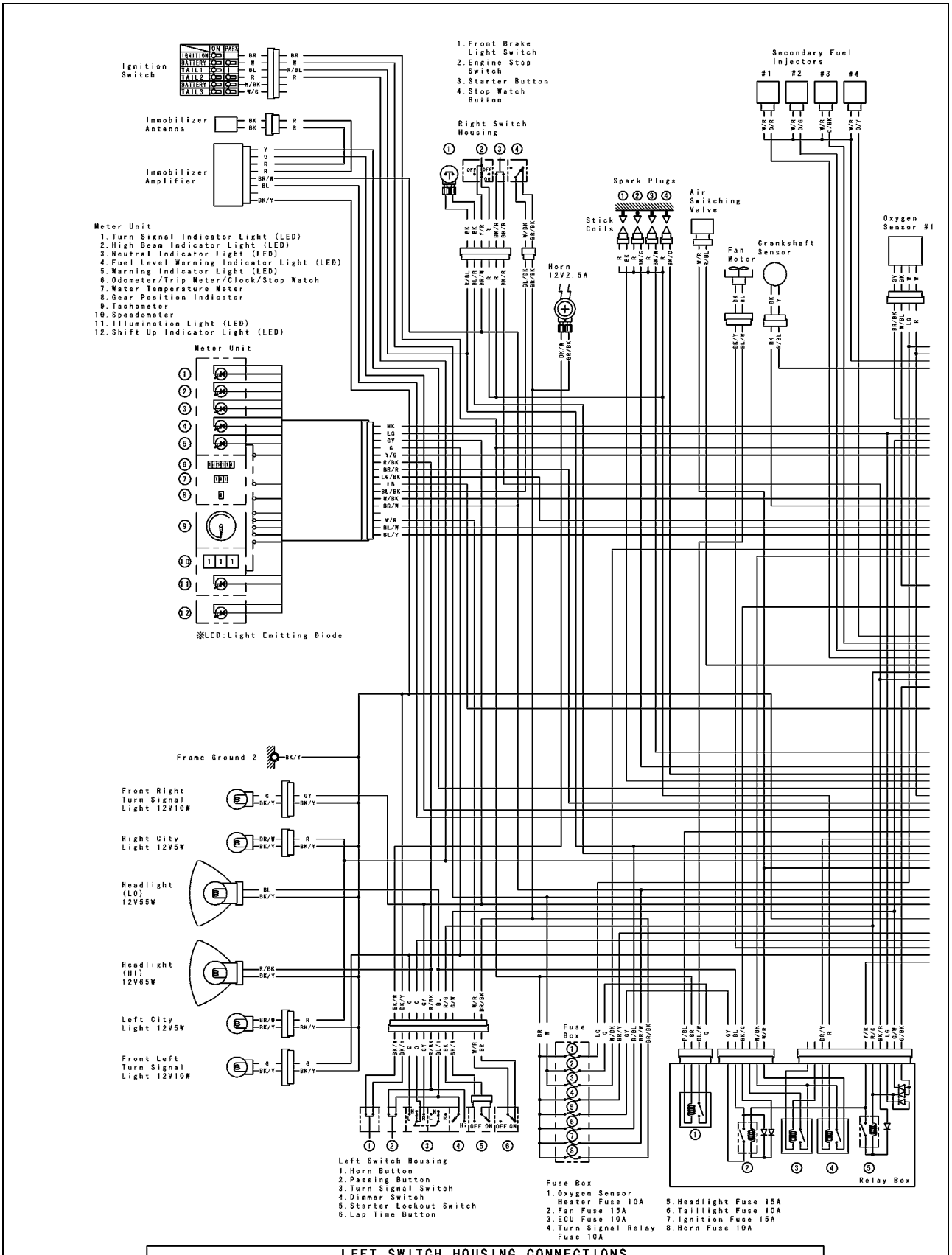
**RIGHT SWITCH HOUSING CONNECTIONS**

| Front Brake Light Switch | | | Engine Stop Switch | | | Starter Button | | | Stop Watch Button | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | BK | BK | Color | Y/R | R | Color | BK/R | BK/R | Color | W/BK | BR/BK |
| Brake Lever | | | OFF | | | Free | | | | | |
| Pulled In | ○ | | RUN | ○ | | Push | ○ | | Push | ○ | |

(98052-0340F)

W2R0340FW5 C

## Wiring Diagram (Other than US, CA, AU and MY Models)

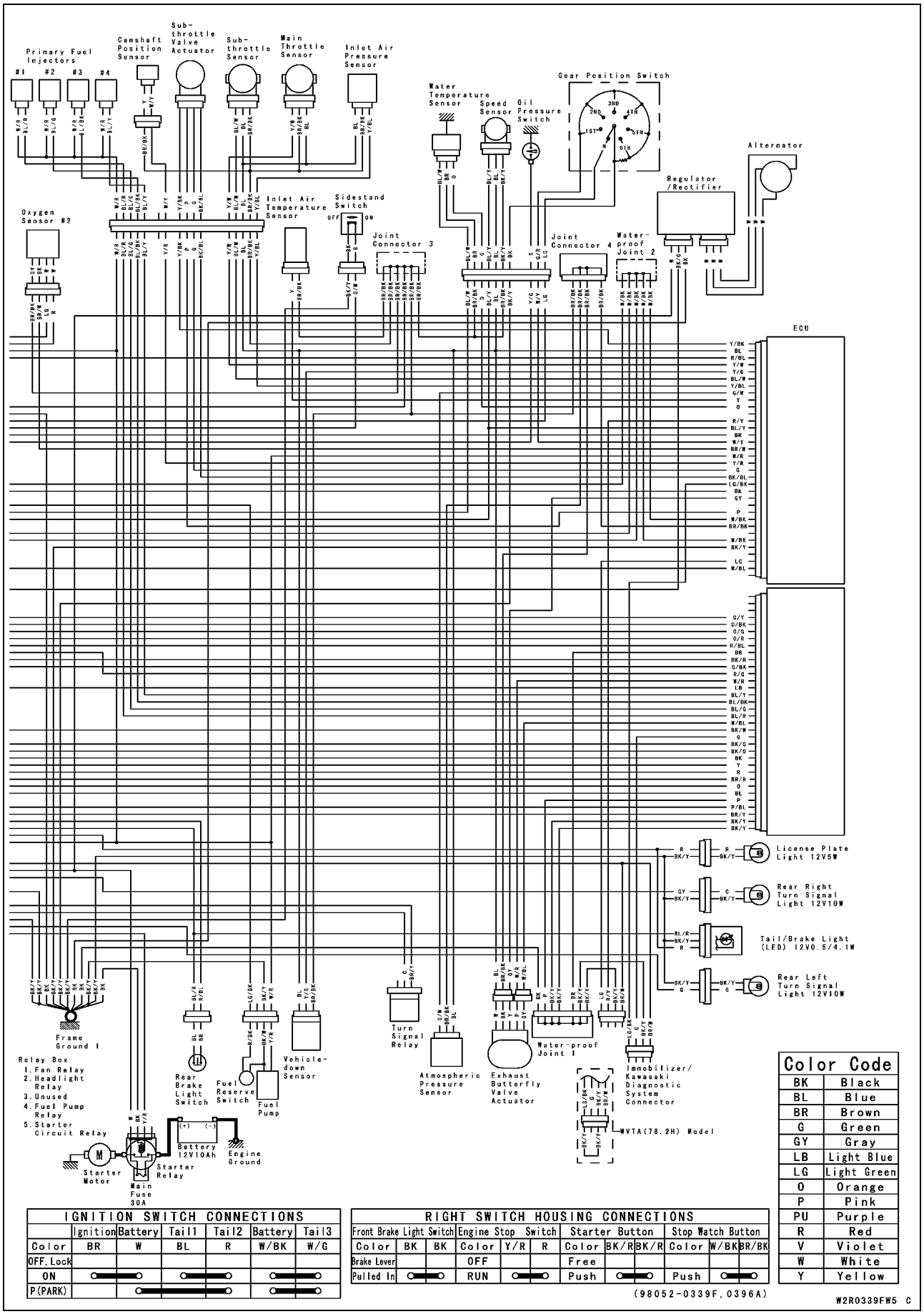



LEFT SWITCH HOUSING CONNECTIONS

| Horn Button | | | Turn Signal Switch | | | | Dimmer Switch | | | Starter Lockout Switch | | | Lap Time Button | | | Passing Button | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color | BK/W | BK/Y | Color | G | O | GY | Color | BL/Y | R/BK | Color | BK | BK/R | Color | W/R | BR | Color | BL/Y | R/BK |
| | | | L | | ● | | HI | | ● | Clutch Lever | | | | | | | | |
| Push | ● | | OFF (Push) | | | | | | | Released | | | Push | ● | | Push | ● | |
| Released | | | R | | ● | | LO | | | Pulled In | ● | | | | | | | |

W2L0339FW5 C

## Wiring Diagram (Other than US, CA, AU and MY Models)




| IGNITION SWITCH CONNECTIONS | | | | | | |
|---|---|---|---|---|---|---|
| | Ignition | Battery | Tail1 | Tail2 | Battery | Tail3 |
| Color | BR | W | BL | R | W/BK | W/G |
| OFF, Lock | | | | | | |
| ON | ● | ● | ● | ● | ● | ● |
| P(PARK) | | ● | ● | ● | ● | |

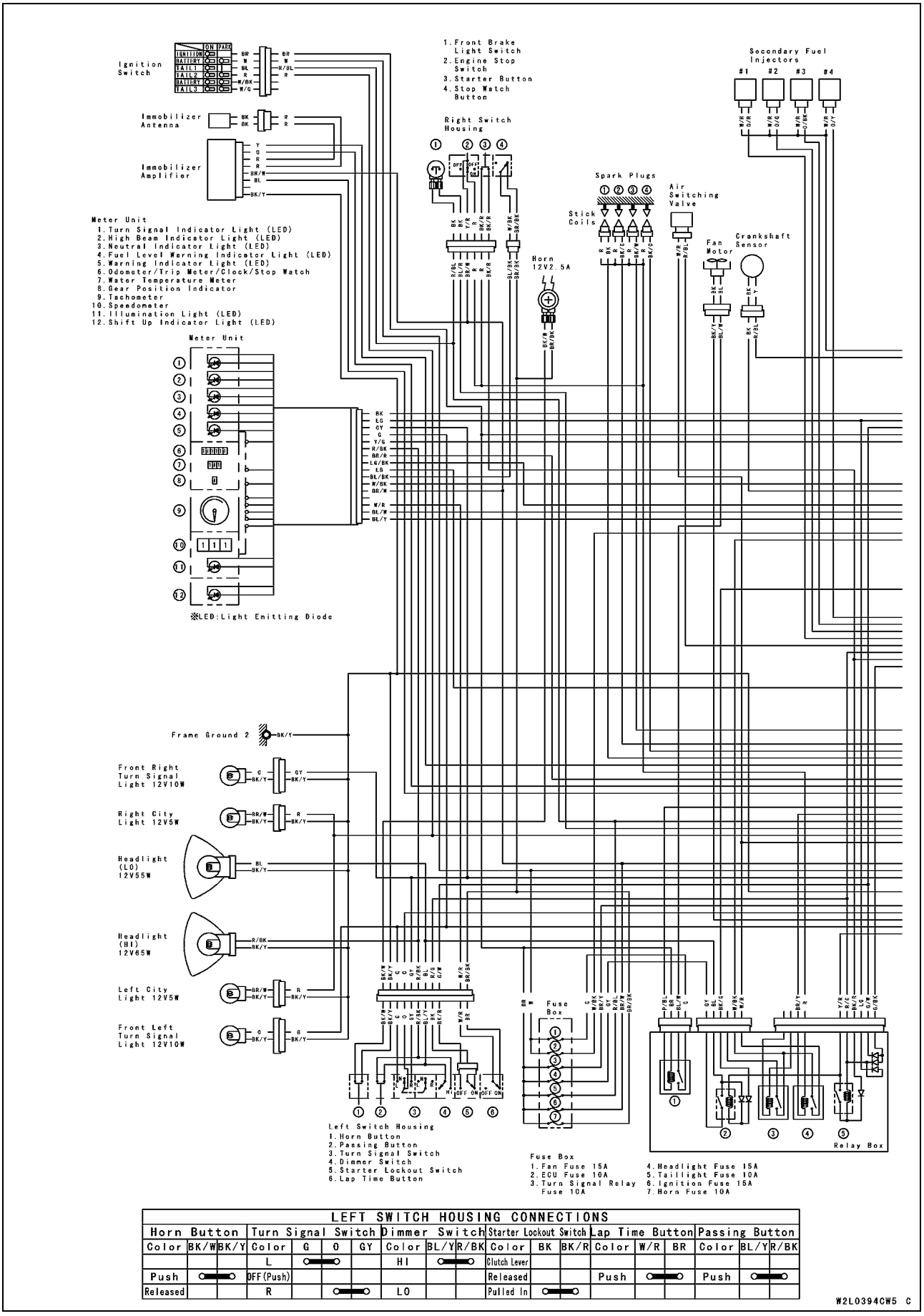
| RIGHT SWITCH HOUSING CONNECTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Front Brake Light Switch | | | Engine Stop Switch | | | Starter Button | | | Stop Watch Button | | |
| Color | BK | BK | Color | Y/R | R | Color | BK/R | BK/R | Color | W/BK | BR/BK |
| Brake Lever | | | OFF | | | Free | | | | | |
| Pulled In | ● | ● | RUN | ● | ● | Push | ● | ● | Push | ● | ● |

| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Gray |
| LB | Light Blue |
| LG | Light Green |
| O | Orange |
| P | Pink |
| PU | Purple |
| R | Red |
| V | Violet |
| W | White |
| Y | Yellow |

(98052-0339F, 0396A)

W2R0339FW5 C

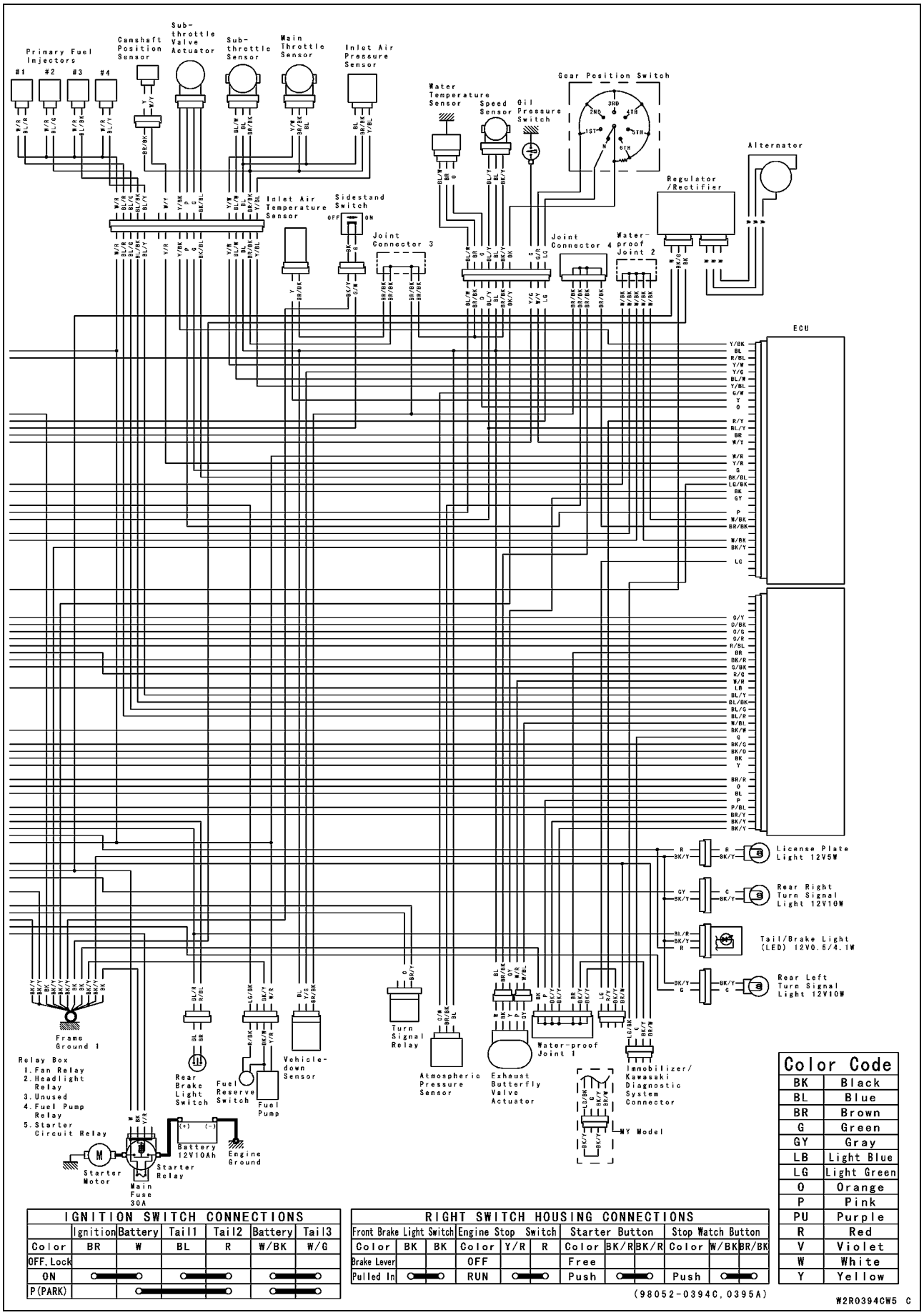
## Wiring Diagram (AU and MY Models)




| LEFT SWITCH HOUSING CONNECTIONS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Horn Button | | | Turn Signal Switch | | | | Dimmer Switch | | | Starter Lockout Switch | | | Lap Time Button | | | Passing Button | | |
| Color | BK/W | BK/Y | Color | G | O | GY | Color | BL/Y | R/BK | Color | BK | BK/R | Color | W/R | BR | Color | BL/Y | R/BK |
| | | | L | ● | | | HI | | ● | Clutch Lever | | | | | | | | |
| Push | ● | | OFF(Push) | | | | | | | Released | | | Push | ● | | Push | ● | |
| Released | | | R | | ● | | LO | | | Pulled In | ● | | | | | | | |

W2L0394CW5 C

## Wiring Diagram (AU and MY Models)




| IGNITION SWITCH CONNECTIONS | | | | | | |
|---|---|---|---|---|---|---|
| | Ignition | Battery | Tail1 | Tail2 | Battery | Tail3 |
| Color | BR | W | BL | R | W/BK | W/G |
| OFF, Lock | | | | | | |
| ON | ● | ● | ● | ● | ● | ● |
| P(PARK) | | ● | ● | ● | ● | |

| RIGHT SWITCH HOUSING CONNECTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Front Brake Light Switch | | | Engine Stop Switch | | | Starter Button | | | Stop Watch Button | | |
| Color | BK | BK | Color | Y/R | R | Color | BK/R | BK/R | Color | W/BK | BR/BK |
| Brake Lever | | | OFF | | | Free | | | | | |
| Pulled In | ● | ● | RUN | ● | ● | Push | ● | ● | Push | ● | ● |

(98052-0394C, 0395A)

| Color Code | |
|---|---|
| BK | Black |
| BL | Blue |
| BR | Brown |
| G | Green |
| GY | Gray |
| LB | Light Blue |
| LG | Light Green |
| O | Orange |
| P | Pink |
| PU | Purple |
| R | Red |
| V | Violet |
| W | White |
| Y | Yellow |

W2R0394CW5 C

## 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.
- 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 items. Never 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 leads for signs of burning, fraying, etc. Poor leads and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

## Electrical Wiring

### *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.

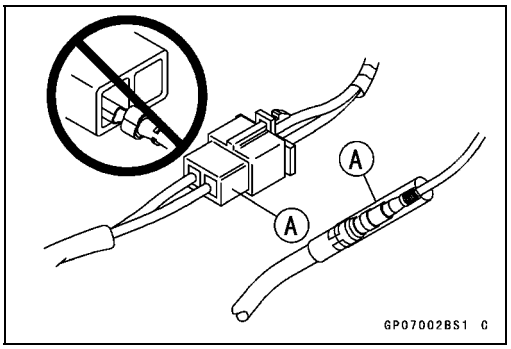
○Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

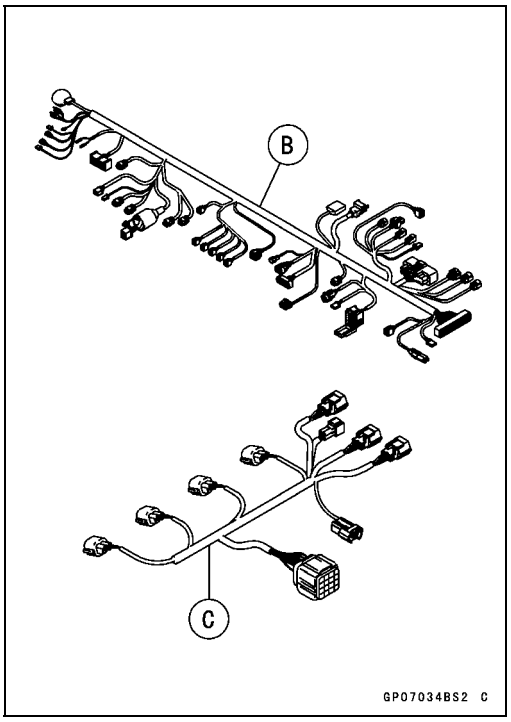
○Connect the hand tester between the ends of the leads.

**Special Tool - Hand Tester: 57001-1394**

○Set the tester to the × 1 Ω range, and read the tester.

★If the tester does not read 0 Ω, the lead is defective. Replace the lead or the wiring harness [B] [C] if necessary.

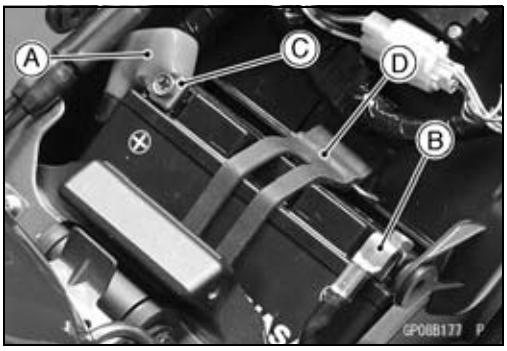


## Battery

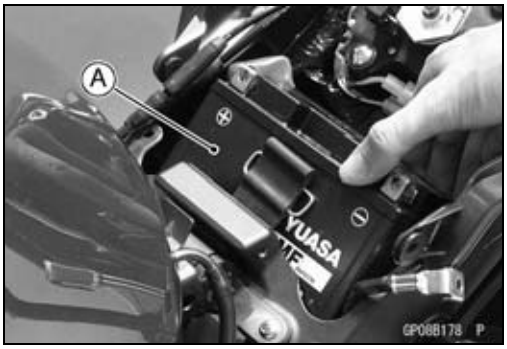
### *Battery Removal*

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Slide the red cap [A].
- Disconnect the negative (–) cable [B] and then positive (+) cable [C].



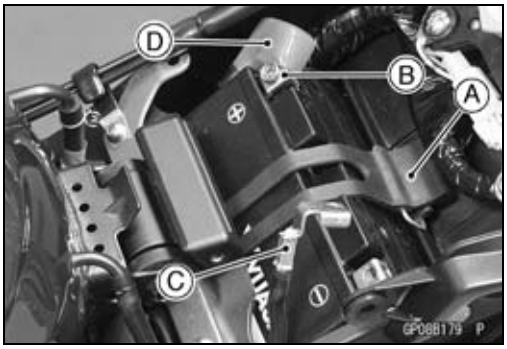

| CAUTION |
| --- |
| **Be sure to disconnect the negative (–) cable first.** |

- Remove the band [D].
- Pull the battery [A] out of the case.




### *Battery Installation*

- Visually inspect the surface of the battery container.
- ★If any signs of cracking or electrolyte leakage from the sides of the battery.
- Put the battery into the rear fender front so that the positive (+) terminal faces right side of the motorcycle.
- Install the band [A].
- Connect the positive (+) cable [B] (red cap) to the positive (+) terminal first, and then the negative (–) cable [C] to the negative (–) terminal.
- Apply a light coat of grease on the terminals to prevent corrosion.
- Cover the positive (+) terminal with the red cap [D].



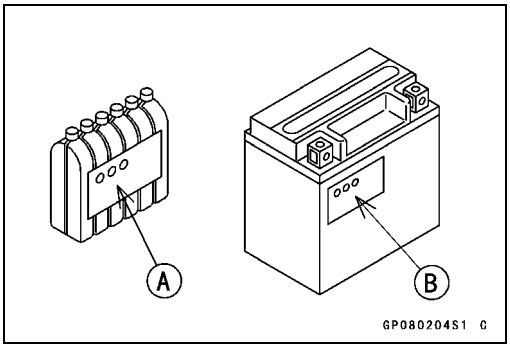

| CAUTION |
| --- |
| **If each battery cable is not correctly disconnected or connected, sparks can arise at electrical connections, causing damage to electrical and DFI parts.** |

### *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 ZX1000E: YT12B-BS**

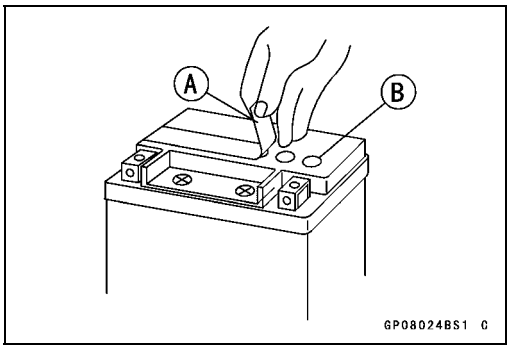



| CAUTION |
| --- |
| **Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type. This is to prevent overfilling of the electrolyte, shorting the battery life, and deterioration of the battery performance.** |

## Battery

**CAUTION**

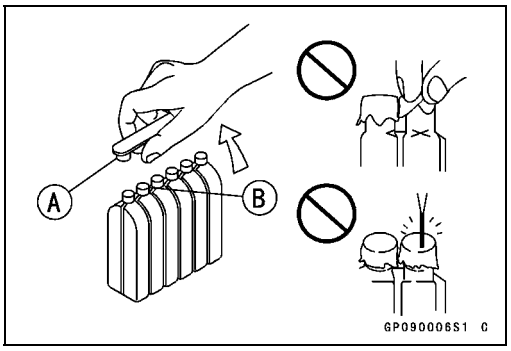
**Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.**




- 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.

**NOTE**

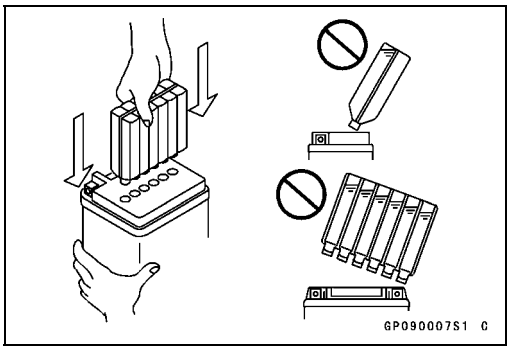
○*The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.*




- 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**

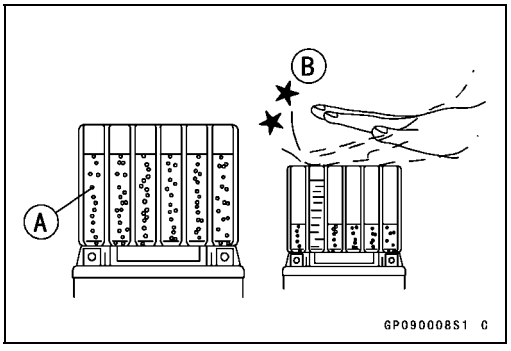
○*Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.*




- 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**

○*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.**

## Battery

- 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**

○*Charging the battery immediately after filling can shorten service life. Let the battery sit for at least **30** minutes after filling.*

**Initial Charge**

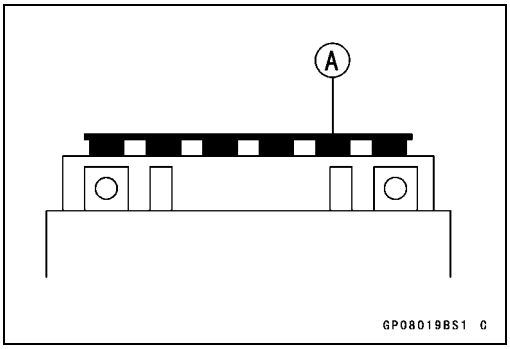
- Place the strip [A] of caps loosely over the filler ports.
- Newly activated sealed batteries require an initial charge.

**Standard Charge: 1.2 A × 5 ~ 10 hours**

★If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

**Kawasaki-recommended chargers:**
**Optimate III**
**Yuasa 1.5 Amp Automatic Charger**
**Battery Mate 150-9**

★If the above chargers are not available, use equivalent one.



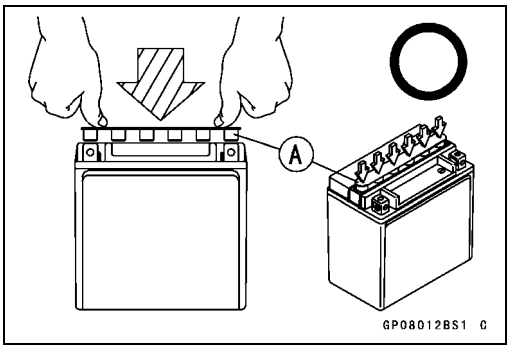

**NOTE**

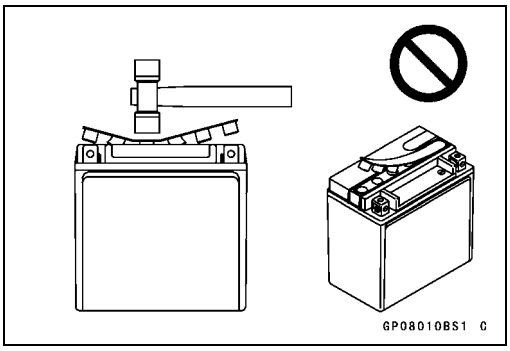
○*Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. If it is not at least 12.8 volts, repeat charging cycle.*

- 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.**



## Battery

**NOTE**

○ *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. Re-check voltage and if less than 12.8 volts repeat the charging cycle and load test. If still below 12.8 volts the battery is defective.*

### *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 this chapter).

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 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 exceeded 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.**
**This procedure prevents sparks at the battery terminals which could ignite any battery gases.**
**No fire should be drawn near the battery, or no terminals should have the tightening loosened.**
**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.**

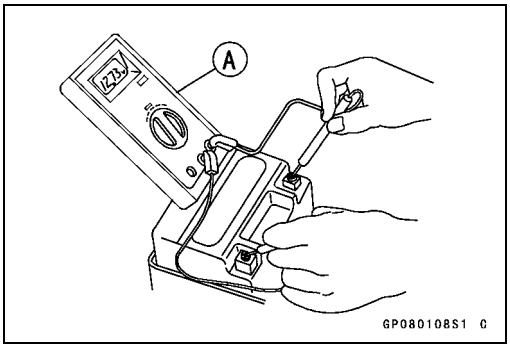
### *Interchange*

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 meter [A].

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Slide the red cap and disconnect the battery cables from the battery terminals (see Battery Removal).

**CAUTION**

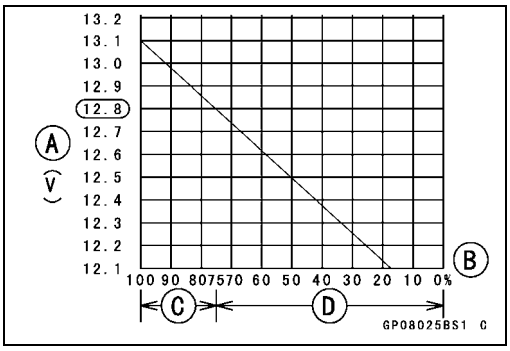
**Be sure to disconnect the negative (–) cable first.**

- Measure the battery terminal voltage.

**NOTE**

○*Measure with a digital voltmeter which can be read one decimal place voltage.*

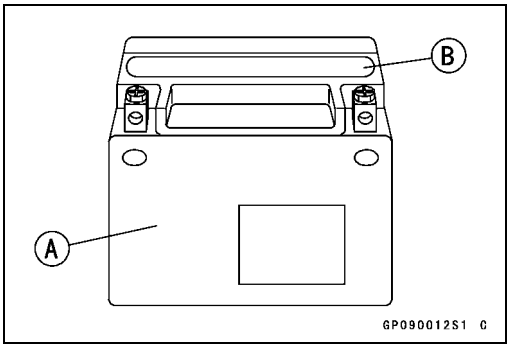
★If the reading is 12.8 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.




**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.

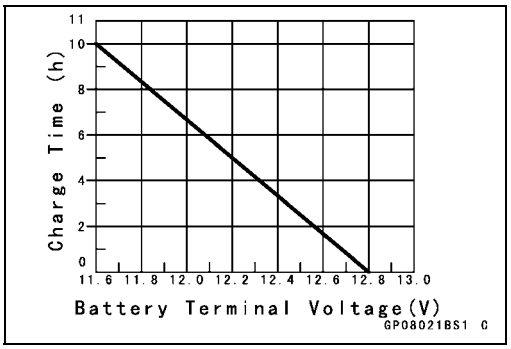
**⚠ WARNING**

**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 A × 5 ~ 10 h (see following chart)**
**Quick Charge 5 A × 1 h**

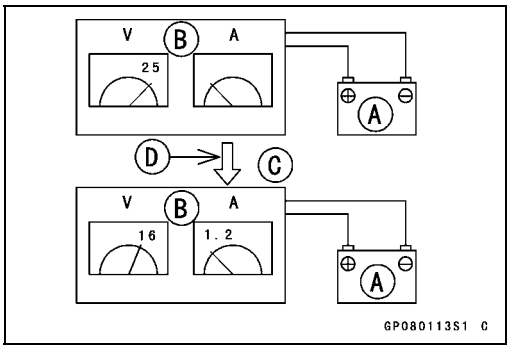
| CAUTION |
| --- |
| **If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.** |




**Terminal Voltage: less than 11.5 V**
**Charging Method: 1.2 A × 20 h**

### NOTE

○*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 minutes, replace the battery.*




Battery [A]
Battery Charger [B]
Standard Value [C]
Current starts to flow [D]

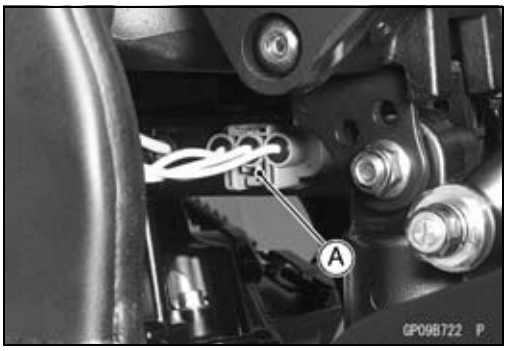
● Determine the battery condition after refresh charge.
○Determine the condition of the battery left for 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

| Criteria | Judgement |
| --- | --- |
| 12.8 V or higher | Good |
| 12.0 ~ lower than 12.8 V | Charge insufficient → Recharge |
| lower than 12.0 V | Unserviceable → Replace |

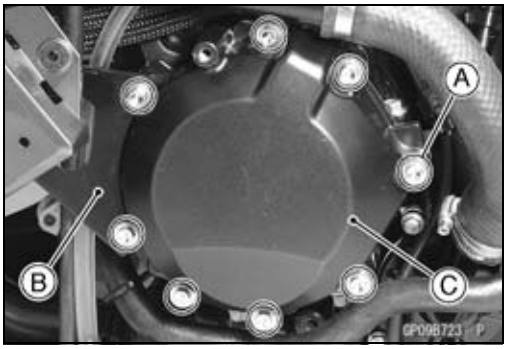
## Charging System

### *Alternator Cover Removal*

- Remove:
  Left Lower Fairing (see Lower Fairing Removal in the Frame chapter)
  Coolant Reserve Tank (see Coolant Reserve Tank Removal in the Cooling System chapter)
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Regulator/Rectifier Connector (Gray) [A]




- Remove:
  Bolts [A]
  Bracket [B]
  Alternator Cover [C]




### *Alternator Cover Installation*

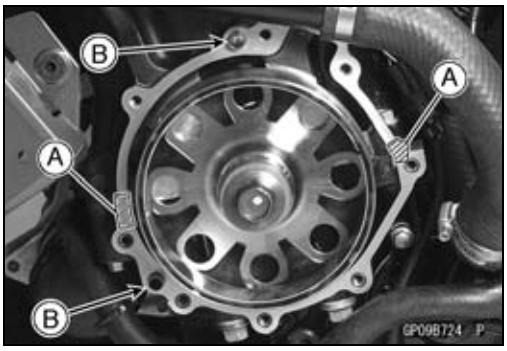
- Apply silicone sealant to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.

  **Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Check that dowel pins [B] are in place on the crankcase.
- Replace the alternator cover gasket with a new one.
- Tighten:

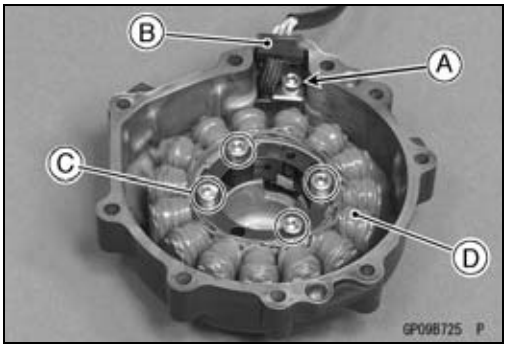
  **Torque - Alternator Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Run the lead correctly (see Cable, Wire and Hose Routing section in the Appendix chapter).



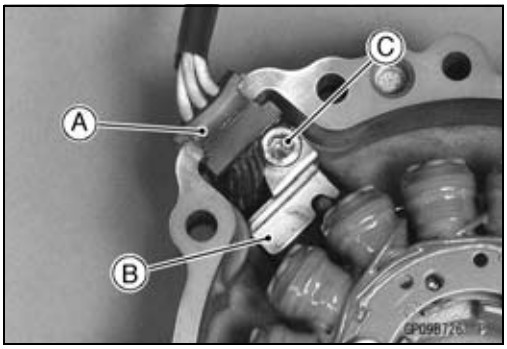

### *Stator Coil Removal*

- 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*




- Tighten the stator coil bolts to the specified torque.

  **Torque - Stator Coil Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)**

- Apply silicone sealant to the circumference of the alternator lead grommet [A], and fit the grommet into the notch of the cover securely.

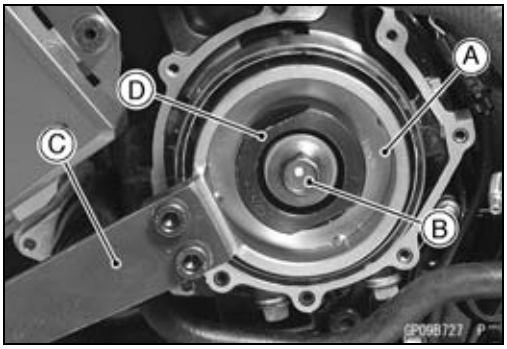
  **Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Secure the alternator lead with a holding plate [B], and apply a non-permanent locking agent to the thread of the plate bolt [C] and tighten it.

  **Torque - Alternator Lead Holding Plate Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**

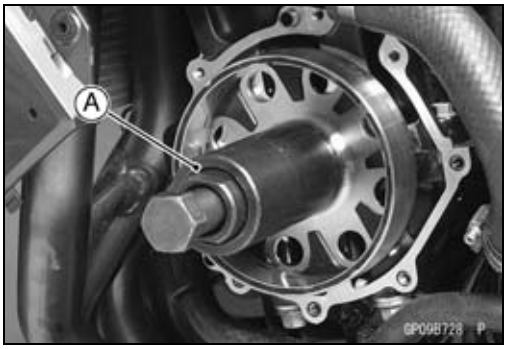
- Install the alternator cover (see Alternator Cover Installation).

### *Alternator Rotor Removal*




- Remove the alternator cover (see Alternator Cover Removal).
- Clean off the oil from 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 Tools - Grip [C]: 57001-1591**
  **Rotor Holder: 57001-1666**
  **Stopper [D]: 57001-1679**



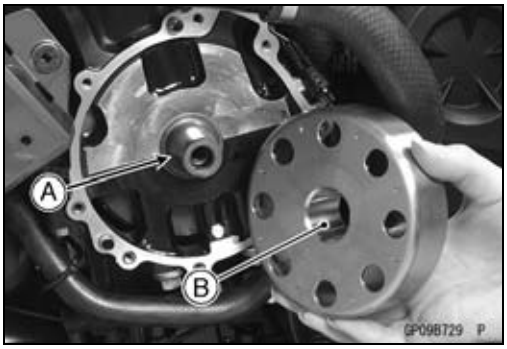

- Using the flywheel puller [A], remove the alternator rotor from the crankshaft.

  **Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1405**

**CAUTION**

**Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.**

### *Alternator Rotor Installation*



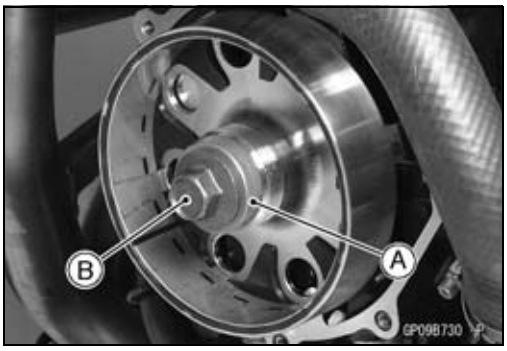

- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
  Crankshaft Tapered Portion [A]
  Alternator Rotor Tapered Portion [B]
- Install the alternator rotor.

- Using a cleaning fluid, clean off any oil or dirt on the washer [A] and dry it with a clean cloth.
- Install the washer.

**NOTE**

○*Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.*

- Install the rotor bolt [B] and tighten it with 70 N·m (7.0 kgf·m, 52 ft·lb) of torque.

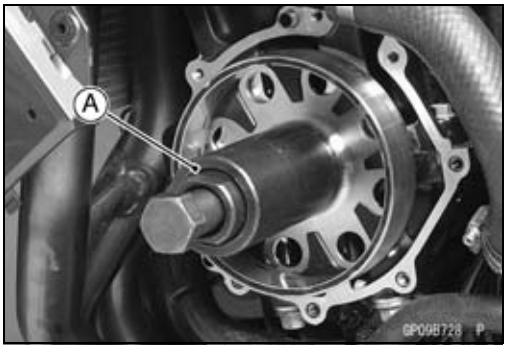



- Remove the rotor bolt and washer.
- Check the tightening torque with flywheel puller [A].

**Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1405**

★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.

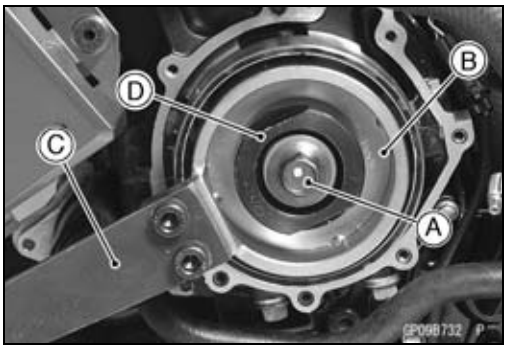



- Install the rotor bolt and washer.
- Tighten the alternator rotor bolt [A] while holding the alternator rotor steadily with the holder [B].

**Special Tools - Grip [C]: 57001-1591**
**Rotor Holder: 57001-1666**
**Stopper [D]: 57001-1679**

**Torque - Alternator Rotor Bolt: 155 N·m (15.8 kgf·m, 114 ft·lb)**

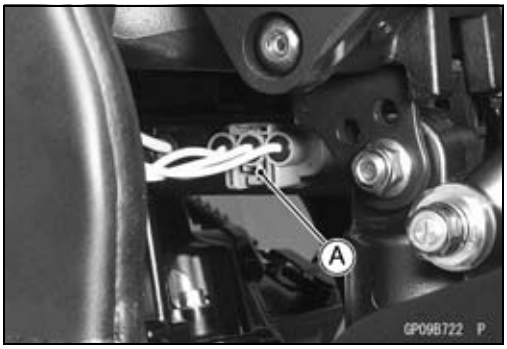
- Install the alternator cover (see Alternator Cover Installation).




### *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.

## Charging System




● To check the alternator output voltage, do the following procedures.
○Turn the ignition switch OFF.
● Disconnect:
Regulator/Rectifier Connector (Gray) [A]
○Connect the hand tester as shown in the table 1.

**Special Tool - Hand Tester: 57001-1394**

○Start the engine.
○Run it at the rpm given in the table 1.
○Note the voltage readings (total 3 measurements).

**Table 1 Alternator Output Voltage**

| Tester Range | Connections | | Reading at 4 000 rpm |
|---|---|---|---|
| | Tester (+) to | Tester (–) to | |
| AC 250 V | One W lead | Another W lead | 46 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.
● Check the stator coil resistance as follows.
○Stop the engine.
○Connect the hand tester as shown in the table 2.

**Special Tool - Hand Tester: 57001-1394**

○Note the readings (total 3 measurement).

**Table 2 Stator Coil Resistance at 20°C (68°F)**

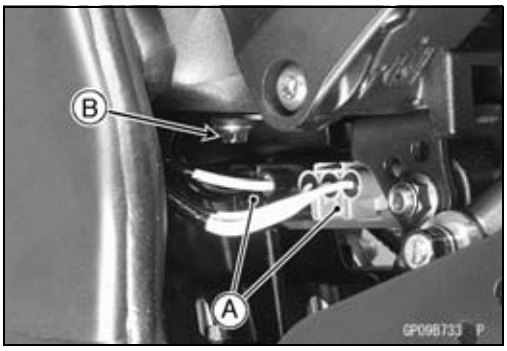
| Tester Range | Connections | | Reading |
|---|---|---|---|
| | Tester (+) to | Tester (–) to | |
| × 1 Ω | One W lead | Another W lead | 0.1 ~ 0.2 Ω |

★If there is more resistance than shown in the table, or no 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 white leads and chassis ground.
★Any hand tester reading less than infinity (∞) indicates a short, necessitating stator replacement.
★If the stator coil has 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.

## Charging System

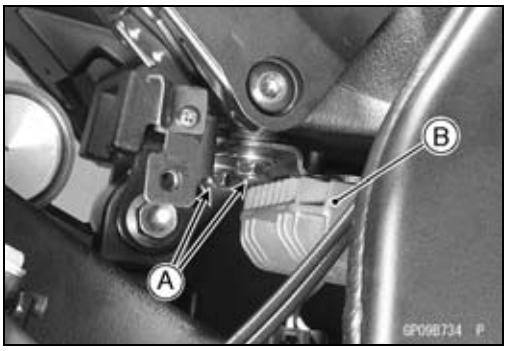
### *Regulator/Rectifier Inspection*

- Disconnect the regulator/rectifier connectors [A].
- Remove the regulator/rectifier bracket bolt [B].

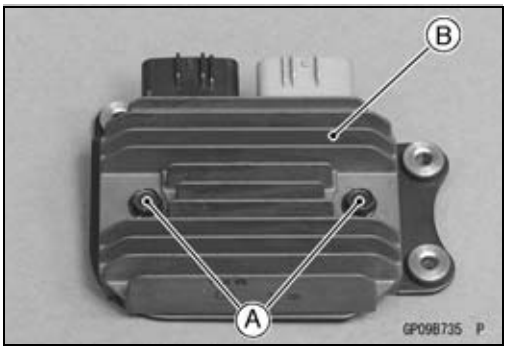



- Remove the rear brake reservoir mounting bolt [A].


- Remove the regulator/rectifier bracket bolts [A], and take off the regulator/rectifier [B] together with the bracket.




- Remove the regulator/rectifier bolts [A], and separate the regulator/rectifier [B] and bracket.

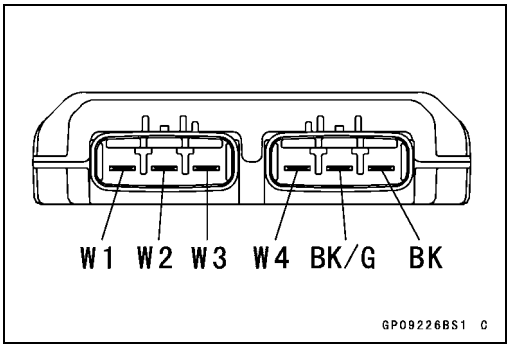



- Set the hand tester to the × 1 kΩ range and make the measurements shown in the table.

**Special Tool - Hand Tester: 57001-1394**

- Connect the hand tester to the regulator rectifier.

★If the tester readings are not as specified, replace the regulator/rectifier.




**CAUTION**

**Use only Kawasaki Hand Tester 57001-1394 for this test. A tester other than the Kawasaki Hand Tester may show different readings.**
**If a megger or a meter with a large capacity battery is used, the regulator/rectifier will be damaged.**

## Charging System

**Regulator/Rectifier Resistance** **(Unit: kΩ)**

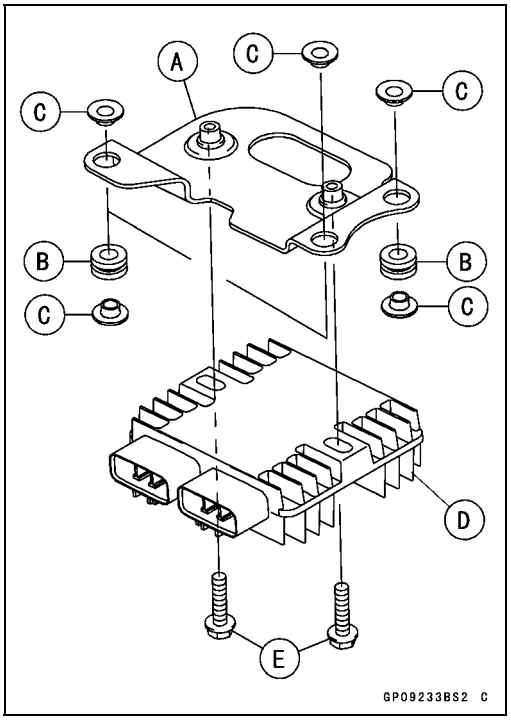
| | | Tester (+) Lead Connection | | | | | |
|---|---|---|---|---|---|---|---|
| | Terminal | W1 | W2 | W3 | W4 | BK/G | BK |
| (–)* | W1 | – | ∞ | ∞ | 3 ~ 11 | ∞ | ∞ |
| | W2 | ∞ | – | ∞ | 3 ~ 11 | ∞ | ∞ |
| | W3 | ∞ | ∞ | – | 3 ~ 11 | ∞ | ∞ |
| | W4 | ∞ | ∞ | ∞ | – | ∞ | ∞ |
| | BK/G | ∞ | ∞ | ∞ | 3 ~ 11 | – | ∞ |
| | BK | 3 ~ 11 | 3 ~ 11 | 3 ~ 11 | 6 ~ 18 | 3 ~ 11 | – |

(−)*: Tester (−) Lead Connection

- Be sure to install the following on the regulator/rectifier bracket [A].
  Rubber Dampers [B]
  Collars [C]
- Install the regulator/rectifier [D] on the bracket as shown in the figure.

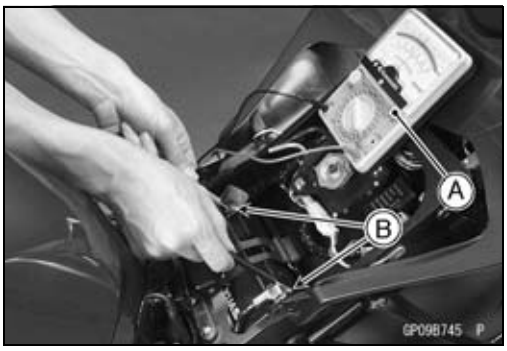
  **Torque - Regulator/Rectifier Bolts [E]: 7.0 N·m (0.71 kgf·m, 62 in·lb)**
- Tighten:

  **Torque - Regulator/Rectifier Bracket Bolts: 7.0 N·m (0.71 kgf·m, 62 in·lb)**



## Charging System

### *Charging Voltage Inspection*




- Check the battery condition (see Charging Condition Inspection).
- Warm up the engine to obtain actual alternator operating conditions.
- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Check that the ignition switch is turned off, and connect the hand tester [A] to the battery terminals [B].

**Special Tool - Hand Tester: 57001-1394**

- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off (To turn off the headlight, disconnect the headlight connector.). The readings should show nearly battery voltage when the engine speed is low, and, as the engine speed rises, the readings should also rise. But they must be kept under the specified voltage.

**Charging Voltage**

| Tester Range | Connections | | Reading |
|---|---|---|---|
| | Tester (+) to | Tester (–) to | |
| DC 25 V | Battery (+) | Battery (–) | 14.2 ~ 15.2 V |

- Turn off the ignition switch to stop the engine, and disconnect the hand tester.

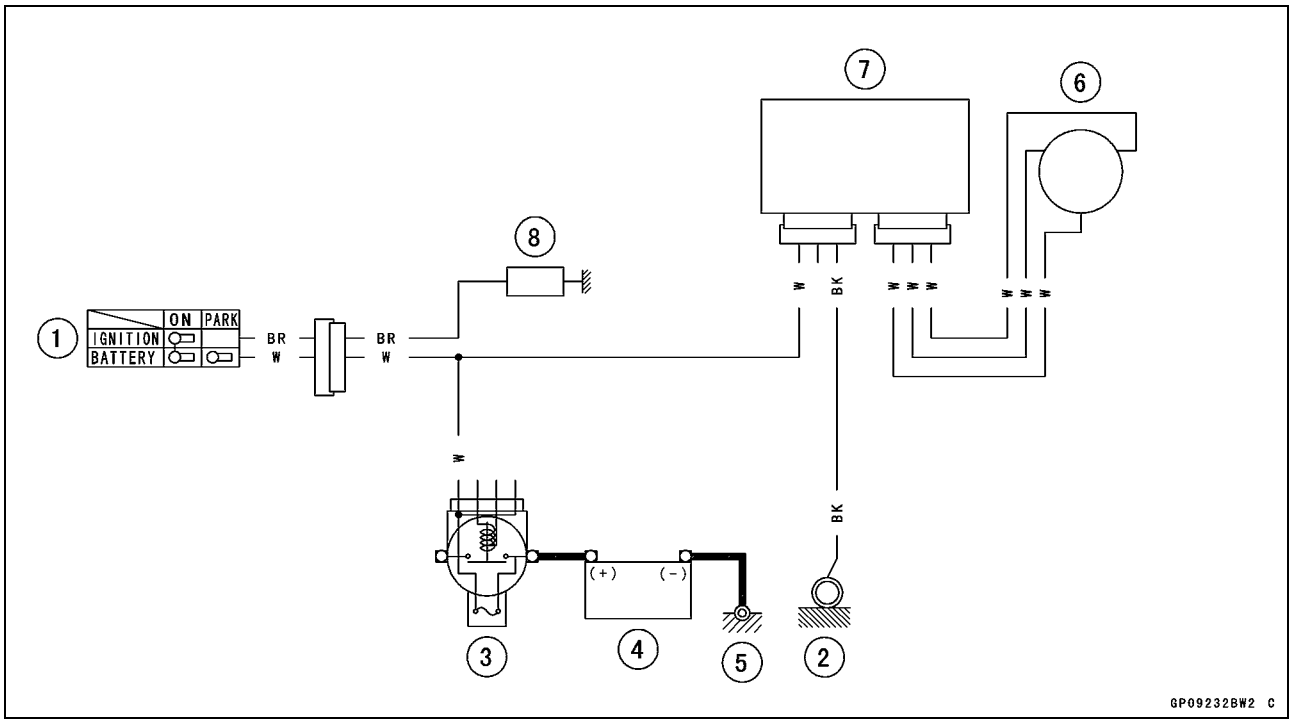
★If the charging voltage is kept between the values given in the table, the charging system is considered to be working normally.

★If the charging voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.

★If the charging voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.

## Charging System

### Charging System Circuit




1. Ignition Switch
2. Frame Ground 1
3. Main Fuse 30 A
4. Battery 12 V 10 Ah
5. Engine Ground
6. Alternator
7. Regulator/Rectifier
8. Load

**⚠ WARNING**

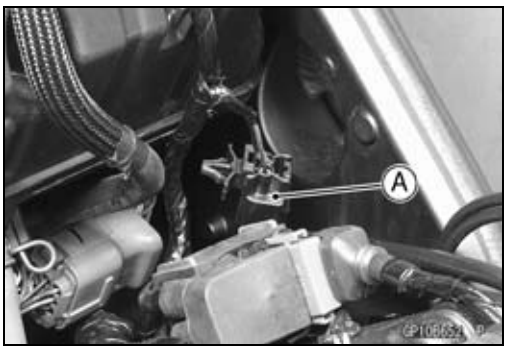
**The ignition system produces extremely high voltage. Do not touch the spark plugs or stick coils while the engine is running, or you could receive a severe electrical shock.**

**CAUTION**

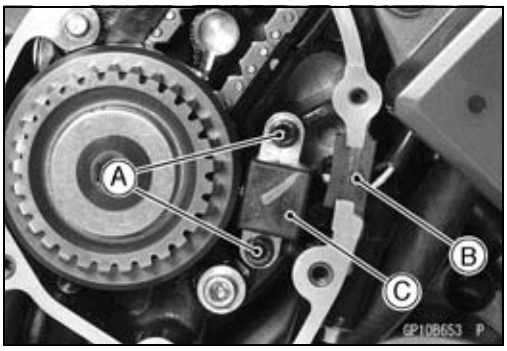
**Do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent ECU damage.**
**Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the ECU.**

### *Crankshaft Sensor Removal*

- Remove:
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Crankshaft Sensor Lead Connector [A]




- Remove:
  Starter Idle Gear (see Starter Idle Gear Removal in the Crankshaft/Transmission chapter)
  Bolts [A]
  Crankshaft Sensor Lead Grommet [B]
  Crankshaft Sensor [C]




### *Crankshaft Sensor Installation*

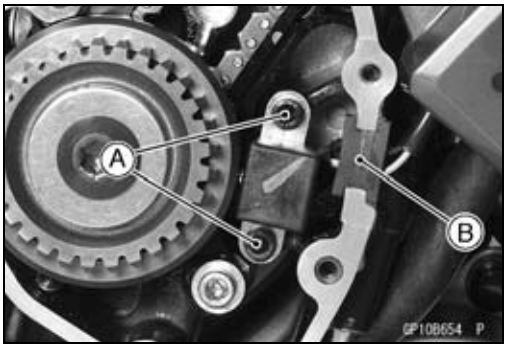
- Apply a non-permanent locking agent to the threads of the crankshaft sensor bolts [A], and tighten them.

  **Torque - Crankshaft Sensor Bolts: 6.0 N·m (0.61 kgf·m, 53 in·lb)**

- Apply silicone sealant to the circumference of the crankshaft sensor lead grommet [B], and fit the grommet into the notch of the crankcase securely.

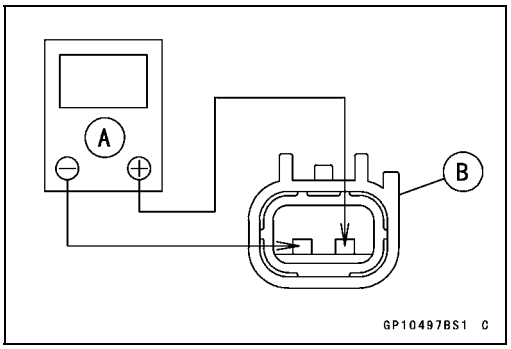
  **Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Install the removed parts (see appropriate chapters).
- Run the crankshaft sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



## Ignition System

### *Crankshaft Sensor Inspection*




- Disconnect the crankshaft sensor lead connector (see Crankshaft Sensor Removal).
- Set the hand tester [A] to the × 10 Ω range and connect it to the crankshaft sensor lead connector [B].

**Special Tool - Hand Tester: 57001-1394**

**Crankshaft Sensor Resistance**

**Connections: Y lead ←→ BK lead**

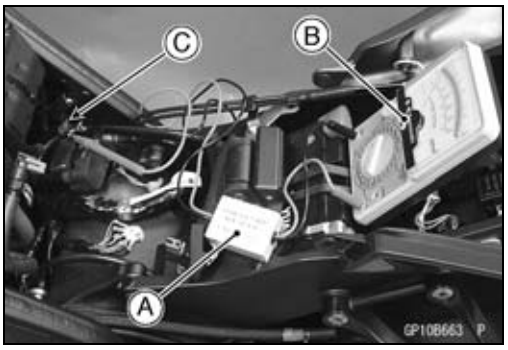
**Standard: 376 ~ 564 Ω**

★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.

★Any tester reading less than infinity (∞) indicates a short, necessitating replacement of the crankshaft sensor.

### *Crankshaft Sensor Peak Voltage Inspection*



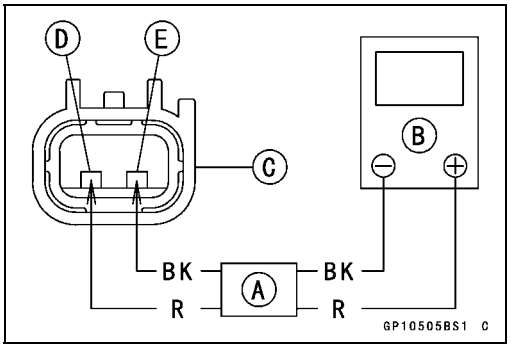

**NOTE**

○*Be sure the battery is fully charged.*

○*Using the peak voltage adapter [A] is more reliable way to determine the condition of the crankshaft sensor than crankshaft sensor internal resistance measurements.*

- Disconnect the crankshaft sensor lead connector (see Crankshaft Sensor Removal).
- Set the hand tester [B] to the DC 10 V range, and connect it peak voltage adapter.

**Special Tools - Hand Tester: 57001-1394**
**Peak Voltage Adapter: 57001-1415**
**Type: KEK-54-9-B**




- Connect the adapter to the terminals of the crankshaft sensor lead connector [C].

**Connections:**

| Crankshaft Sensor Lead Connector | | Peak Voltage Adapter | | Hand Tester |
|---|---|---|---|---|
| Y lead [D] | ← | R lead | → | (+) |
| BK lead [E] | ← | BK lead | → | (–) |

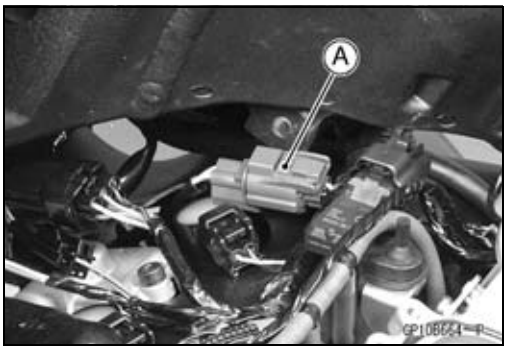
- Turn the engine stop switch to run position.
- Turn the ignition switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the peak voltage.
- Repeat the measurements 5 times or more times.

**Crankshaft Sensor Peak Voltage**
**Standard: 3.2 V or more**

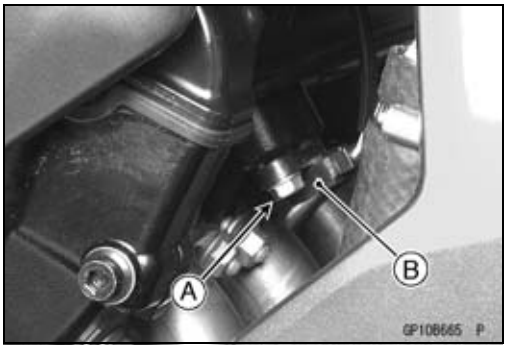
★If the reading is less than the standard, inspect the crankshaft sensor (see Crankshaft Sensor Inspection).

### *Camshaft Position Sensor Removal*

- Remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Disconnect the camshaft position sensor lead connector [A].




- Remove:
  Camshaft Position Sensor Bolt [A]
  Camshaft Position Sensor [B]

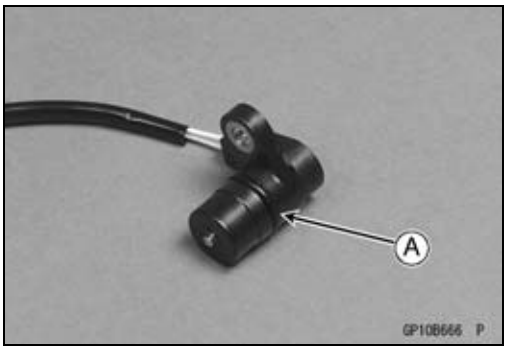



### *Camshaft Position Sensor Installation*

- Apply grease to the O-ring [A].
- Tighten:

**Torque - Camshaft Position Sensor Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

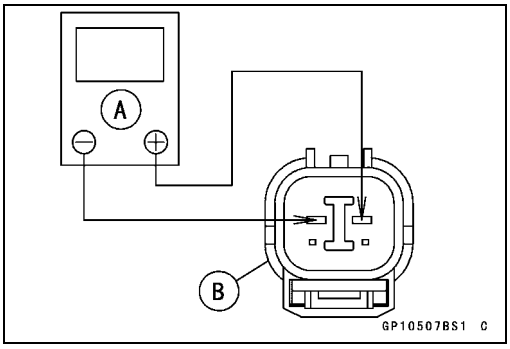



### *Camshaft Position Sensor Inspection*

- Disconnect the camshaft position sensor lead connector (see Camshaft Position Sensor Removal).
- Set the hand tester [A] to the × 10 Ω range and connect it to the camshaft position sensor lead connector [B].

**Special Tool - Hand Tester: 57001-1394**

**Camshaft Position Sensor Resistance**
**Connections: W/Y lead ←→ Y lead**
**Standard: 400 ~ 460 Ω**



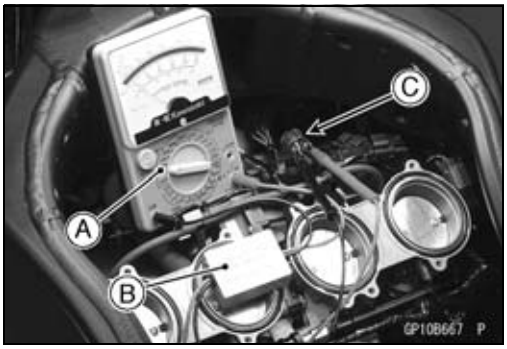

★If there is more resistance than the specified value, the sensor coil has an open lead and must be replaced. Much less than this resistance means the sensor coil is shorted, and must be replaced.

- Using the highest resistance range of the tester, measure the resistance between the camshaft position sensor leads and chassis ground.

★Any tester reading less than infinity (∞) indicates a short, necessitating replacement of the camshaft position sensor.

## Ignition System

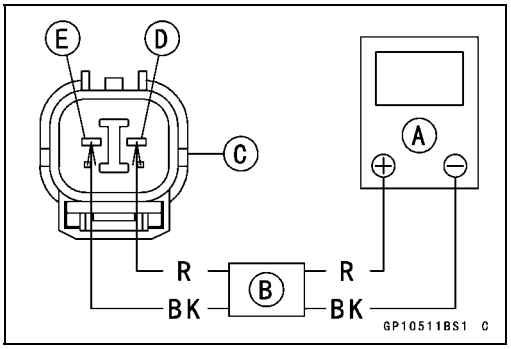
### *Camshaft Position Sensor Peak Voltage Inspection*




- Disconnect the camshaft position sensor lead connector (see Camshaft Position Sensor Removal).
- Set the hand tester [A] to the DC 2.5 V range, and connect it peak voltage adapter [B].

**Special Tool - Hand Tester: 57001-1394**
**Peak Voltage Adapter: 57001-1415**
**Type: KEK-54-9-B**

- Connect the adapter to the terminals of the camshaft position sensor lead connector [C].




**Connections:**

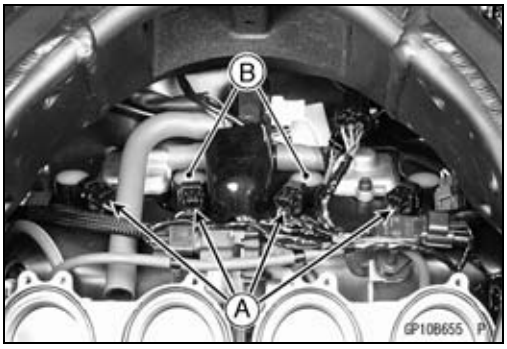
| Camshaft Position Sensor Lead Connector | | Peak Voltage Adapter | | Hand Tester |
|---|---|---|---|---|
| W/Y lead [D] | ← | R lead | → | (+) |
| Y lead [E] | ← | BK lead | → | (–) |

- Turn the engine stop switch to run position.
- Turn the ignition switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the peak voltage.
- Repeat the measurements 5 times or more times.

**Camshaft Position Sensor Peak Voltage**
**Standard: 0.4 V or more**

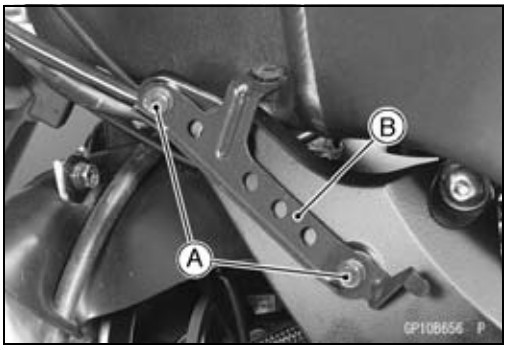
★If the reading is less than the standard, inspect the camshaft position sensor (see Camshaft Position Sensor Inspection).

### *Stick Coil Removal*




- Remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Disconnect the stick coil connectors [A].
- Pull out the stick coils #2, #3 [B] upward.

| CAUTION |
|---|
| **Do not pry the connector part of the coil while removing the coil.** |

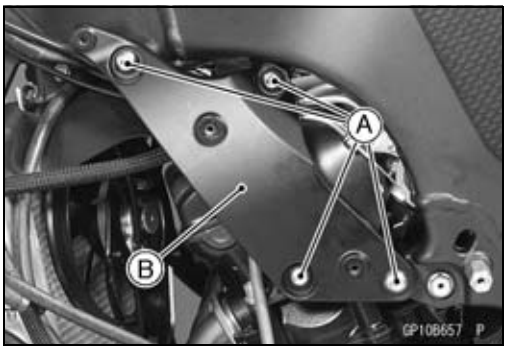



- Remove the stick coil #1 as follows.

○Remove:
Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
Coolant Reserve Tank (see Coolant Reserve Tank Removal in the Cooling System chapter)
Left Upper Inner Fairing Bracket Bolts [A]
Left Upper Inner Fairing Bracket [B]

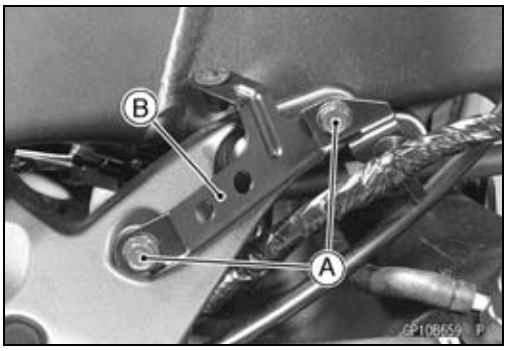
## Ignition System

○Remove:
Left Engine Bracket Bolts [A]
Left Engine Bracket [B]

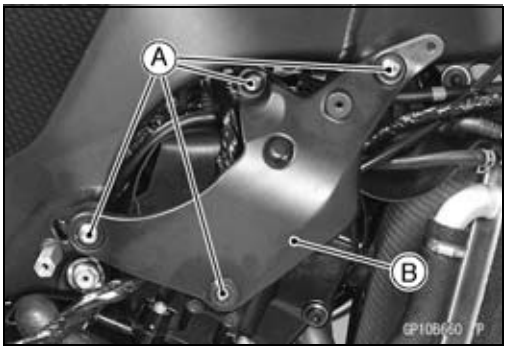



○Pull out the stick coil #1 [A] forward.

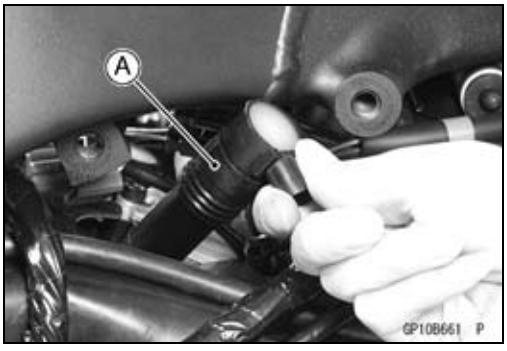

● Remove the stick coil #4 as follows.
○Remove:
Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
Right Upper Inner Fairing Bracket Bolts [A]
Right Upper Inner Fairing Bracket [B]




○Remove:
Right Engine Bracket Bolts [A]
Right Engine Bracket [B]



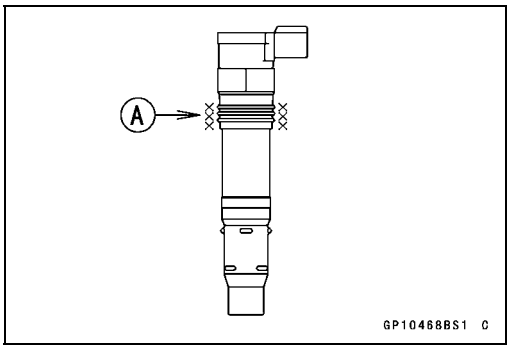

○Pull out the stick coil #4 [A] forward.



## Ignition System

### *Stick Coil Installation*

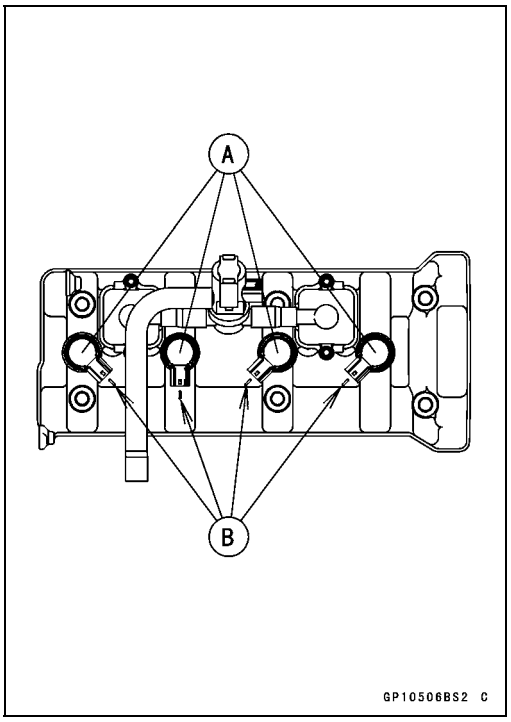
● Apply a thin coat of grease [A] to the stick coils for easy installation.




● Insert the stick coils [A] so that the coil heads align with the lines [B] on the cylinder head cover.

| CAUTION |
| --- |
| **Do not tap the coil head while installing the coil.** |

● After installation, be sure the stick coils are installed securely by pulling up them lightly.
● Run the leads correctly (see Cable, Wire, and Hose Routing section in Appendix chapter).
● Install the left and right engine bracket (see Engine Installation in the Engine Removal/Installation chapter).
● Install the removed parts (see appropriate chapters).



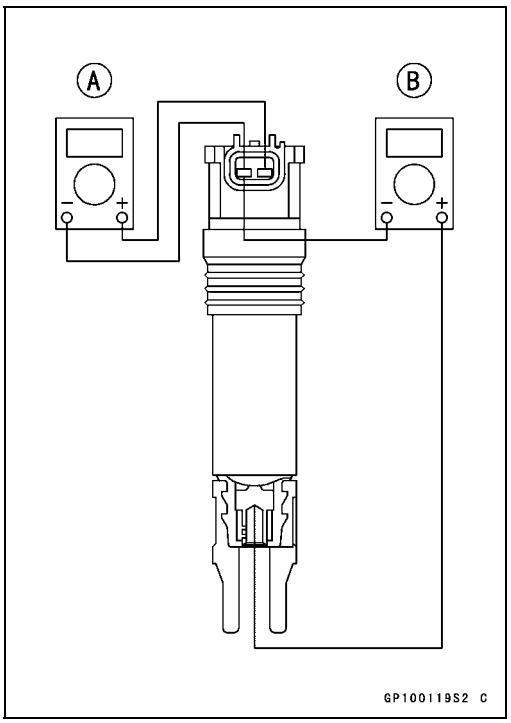

### *Stick Coil Inspection*

● Remove the stick coils (see Stick Coil Removal).
● Measure the primary winding resistance [A] as follows.
○Connect the hand tester between the coil terminals.
○Set the tester to the × 1 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 × 1 kΩ range and read the tester.

**Stick Coil Winding Resistance**

| | |
| --- | --- |
| **Primary Windings:** | **1.2 ~ 1.6 Ω** |
| **Secondary Windings:** | **8.5 ~ 11.5 kΩ** |

★If the tester does not read as specified, replace the coil.

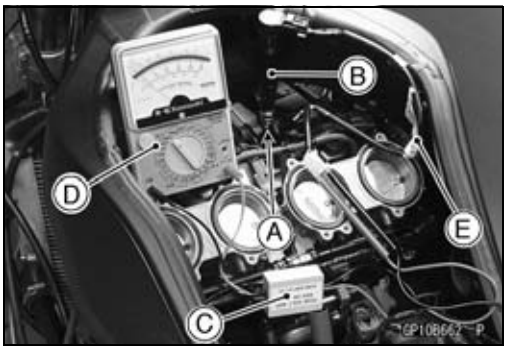


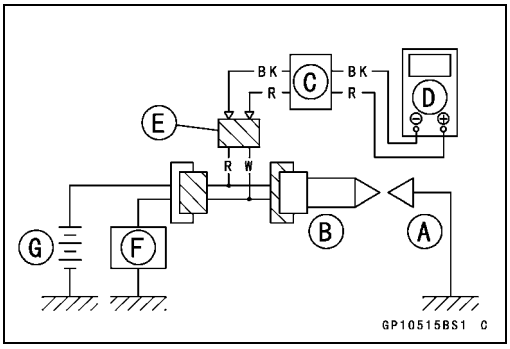
### *Stick Coil Primary Peak Voltage*

**NOTE**

○*Be sure the battery is fully charged.*

● Remove the stick coils (see Stick Coil Removal).
○Do not remove the spark plug.
● Measure the primary peak voltage as follows.
○Install the new spark plug [A] into each stick coil [B], and ground them onto the engine.
○Connect the peak voltage adapter [C] into the hand tester [D] which is set to the DC 250 V range.
○Connect the adapter to the lead wire-peak voltage adapter [E] which is connected between the stick coil connector and stick coil.
ECU [F]
Battery [G]




**Special Tools - Hand Tester: 57001-1394**
**Peak Voltage Adapter: 57001-1415**
**Type: KEK-54-9-B**
**Lead Wire-Peak Voltage Adapter: 57001-1449**

**Connections:**
**Adapter (R, +) → Lead Wire-Peak Voltage Adapter (W)**
**Adapter (BK, –) → Lead Wire-Peak Voltage Adapter (R)**

**⚠ WARNING**

**To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.**

● Turn the engine stop switch to run position.
● Turn the ignition switch ON.
● Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
● Repeat the measurements 5 times for one stick coil.

**Stick Coil Primary Peak Voltage**
**Standard: 72 V or more**

● Repeat the test for the other stick coils.
★If the reading is less than the specified value, check the following.
Stick Coils (see Stick Coil Inspection)
Crankshaft Sensor (see Crankshaft Sensor Inspection)
ECU (see ECU Power Supply Inspection in the Fuel System (DFI) chapter)

### *Spark Plug Removal*

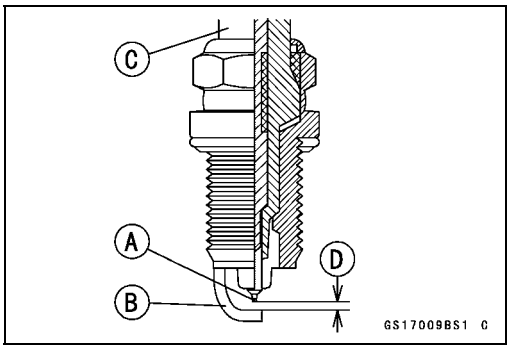
● Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

### *Spark Plug Installation*

● Refer to the Spark Plug Replacement in the Periodic Maintenance chapter.

## Ignition System

### *Spark Plug Condition Inspection*




- 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 (0.031 ~ 0.035 in.)**

- Use the standard spark plug or its equivalent.

**Standard Spark Plug:**
**Type: CR9EIA-9**

### *Interlock Operation Inspection*


- Raise the rear wheel off the ground with the stand [A].

**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, gear position 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 starter lockout switch, gear position switch, sidestand switch and relay box.

★If their parts are normality, replace the ECU.

## Ignition System

**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 → Release**

**Sidestand → Up**

- Set the sidestand on the ground, then the engine will stop.

★If whichever may not be stopped, inspect the gear position switch, starter lockout switch, sidestand switch and relay box.

★If their parts are normality, replace the ECU.

### *IC Igniter Inspection*

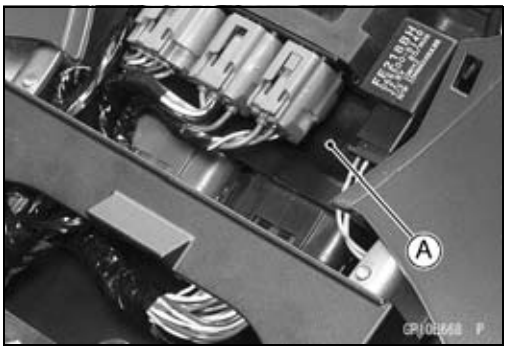
○The IC igniter is built in the ECU [A].

- Refer to the following items.

Interlock Operation Inspection (see Interlock Operation Inspection)

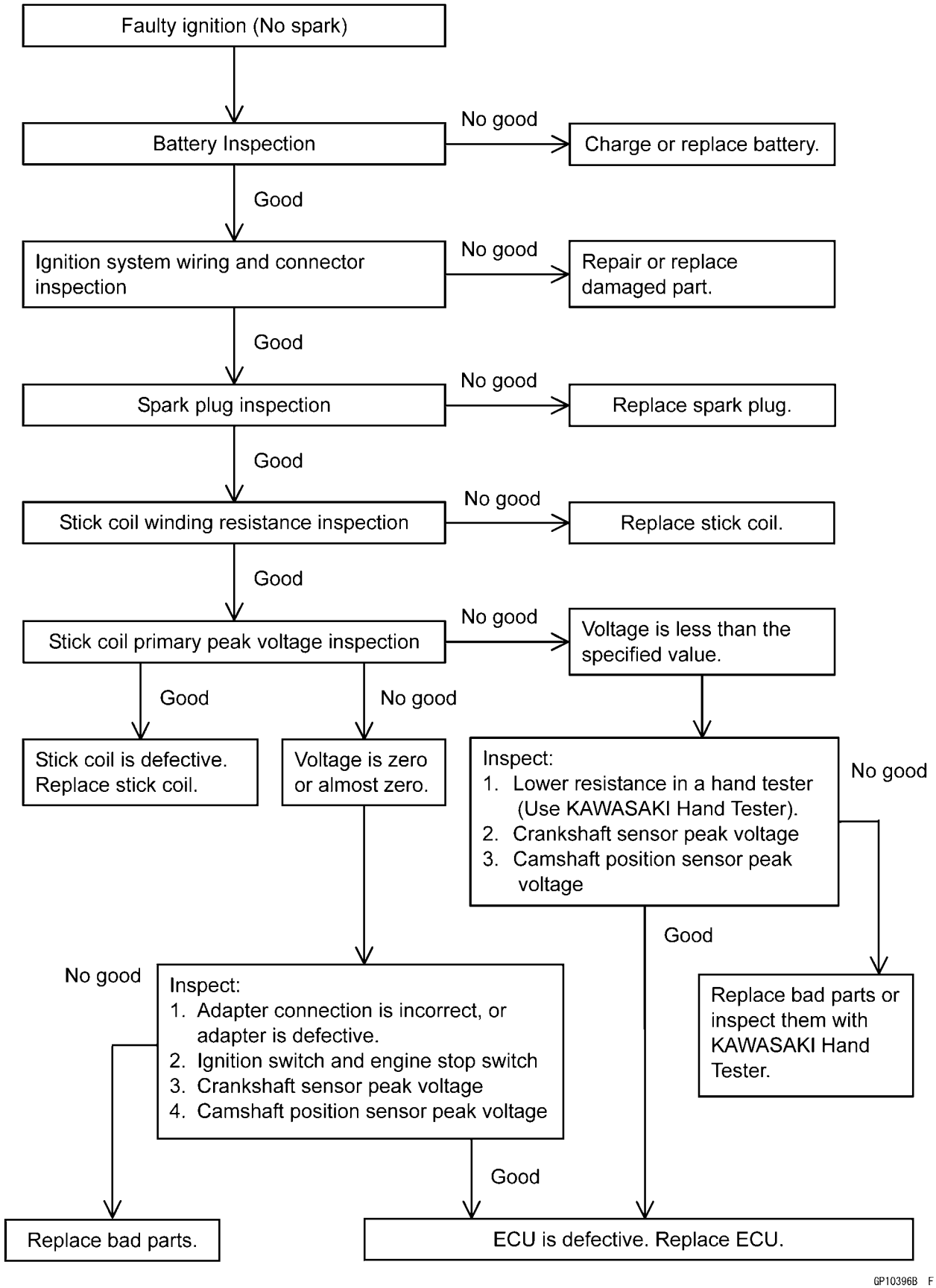
Ignition System Troubleshooting (see Ignition System section)

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



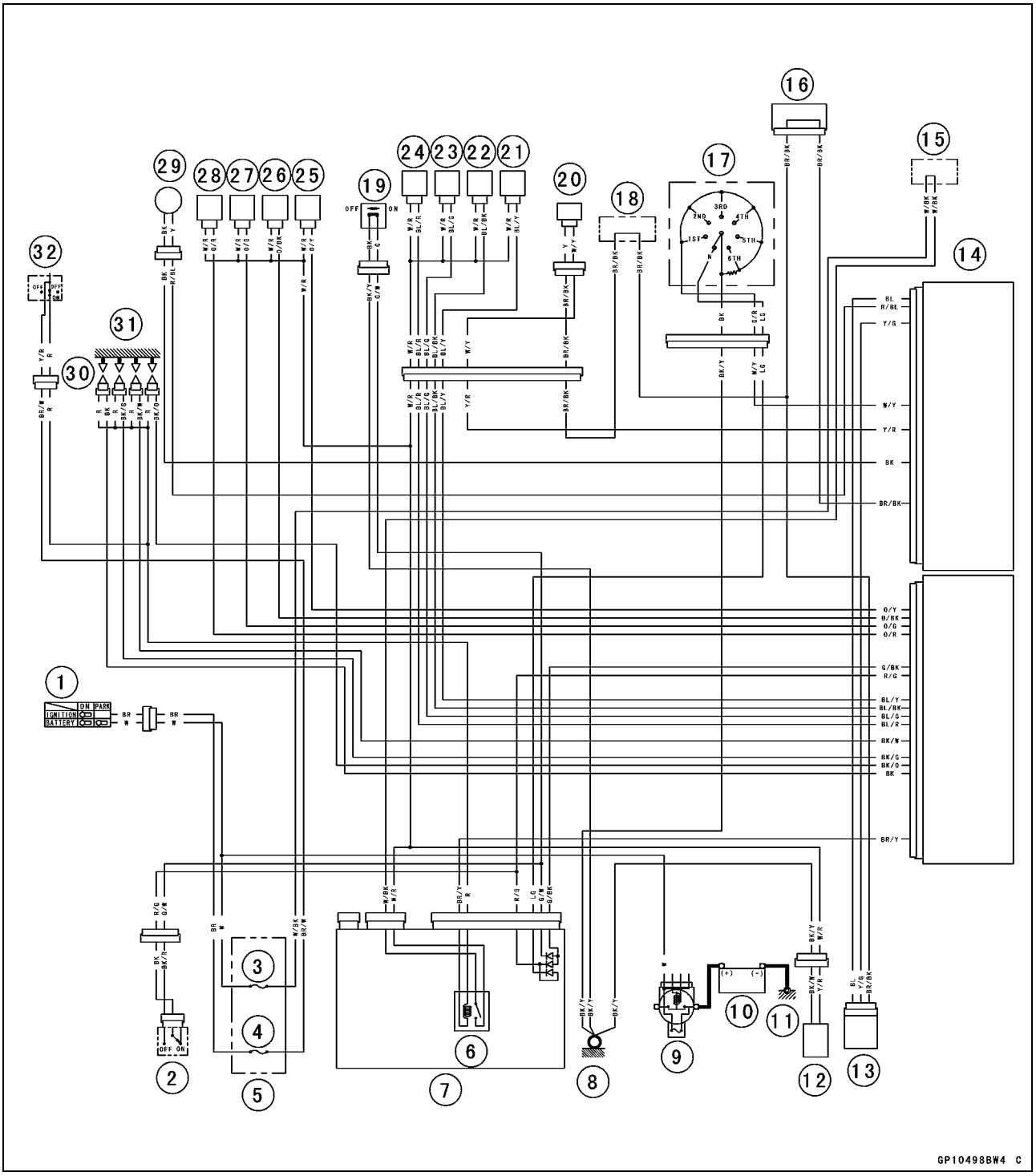
## Ignition System

### Ignition System Troubleshooting



## Ignition System

### Ignition System Circuit



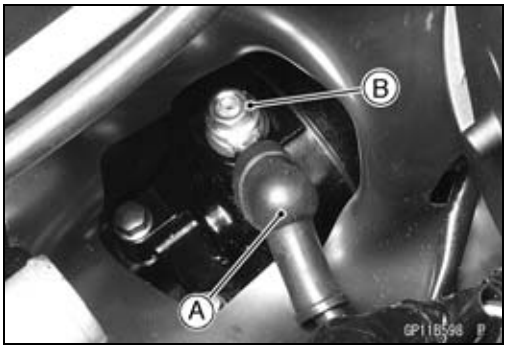

1. Ignition Switch
2. Starter Lockout Switch
3. ECU Fuse 10 A
4. Ignition Fuse 15 A
5. Fuse Box
6. Fuel Pump Relay
7. Relay Box
8. Frame Ground 1
9. Main Fuse 30 A
10. Battery 12 V 10 Ah
11. Engine Ground
12. Fuel Pump
13. Vehicle-down Sensor
14. ECU
15. Water-proof Joint 2
16. Joint Connector 4
17. Gear Position Switch
18. Joint Connector 3
19. Sidestand Switch
20. Camshaft Position Sensor
21. Primary Fuel Injector #4
22. Primary Fuel Injector #3
23. Primary Fuel Injector #2
24. Primary Fuel Injector #1
25. Secondary Fuel Injector #4
26. Secondary Fuel Injector #3
27. Secondary Fuel Injector #2
28. Secondary Fuel Injector #1
29. Crankshaft Sensor
30. Stick Coils
31. Spark Plugs
32. Engine Stop Switch

## Electric Starter System

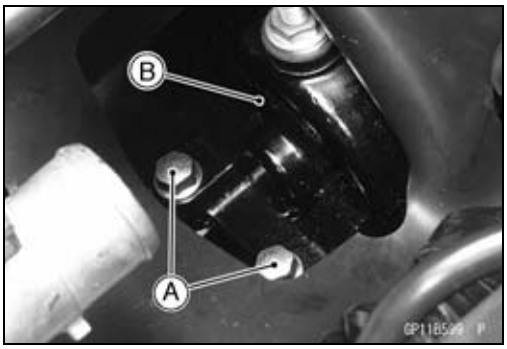
### *Starter Motor Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  Starter Clutch Cover (see Starter Idle Gear Removal in the Crankshaft/Transmission chapter)
  Water Hose [A]


- Slide out the rubber cap [A].
- Remove the starter motor cable terminal nut [B].




- Remove the starter motor mounting bolts [A].
- Take out the starter motor [B] from the right side of the motorcycle.

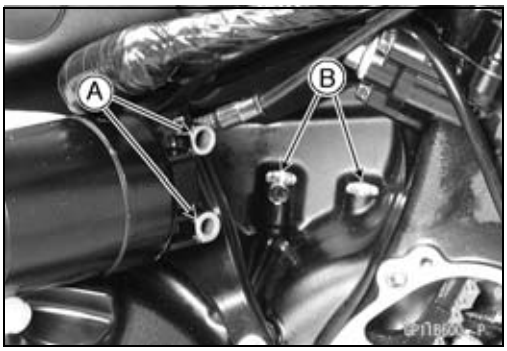



### *Starter Motor Installation*

**CAUTION**

**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- Clean the starter motor legs [A] and crankcase [B] where the starter motor is ground.



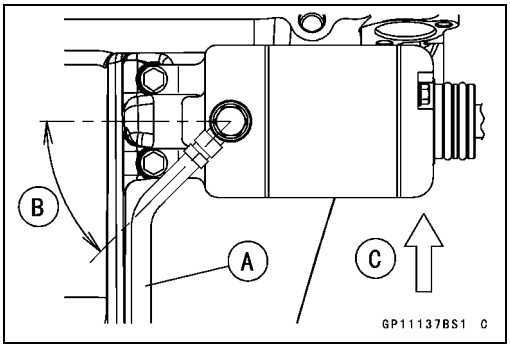

- Replace the O-rings [A] with new ones.
- Apply grease to the new O-rings.
- Set the starter motor mounting bolts [B].
- Tighten the starter motor mounting bolts temporarily.
- Install the starter clutch cover (see Starter Idle Gear Installation in the Crankshaft/Transmission chapter).
- Tighten:

**Torque - Starter Motor Mounting Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

## Electric Starter System

- Run the starter motor cable under the heat insulation rubber plate and water hose (see Engine Installation in the Engine Removal/Installation chapter).
- Install the starter motor cable [A] as shown in the figure.
  About 45° [B]
  Front [C]
- Tighten:

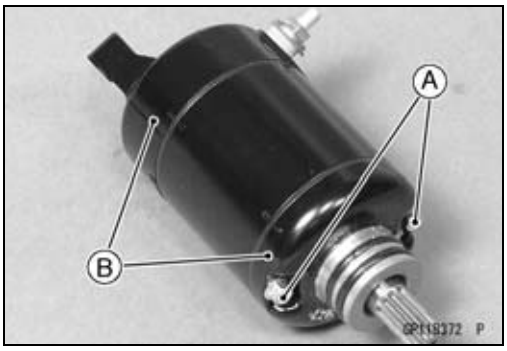
**Torque - Starter Motor Cable Terminal Nut: 6.0 N·m (0.61 kgf·m, 53 in·lb)**



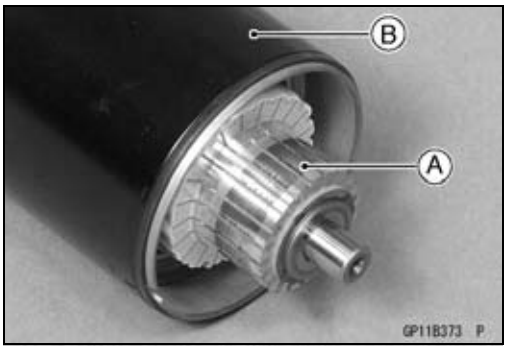

- Slide back the rubber cap to the original position.

### *Starter Motor Disassembly*

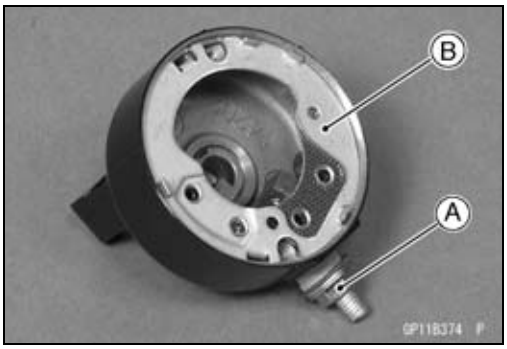
- Remove the starter motor (see Starter Motor Removal).
- Take off the starter motor through bolts [A] and remove both end covers [B].




- Pull the armature [A] out of the yoke [B].

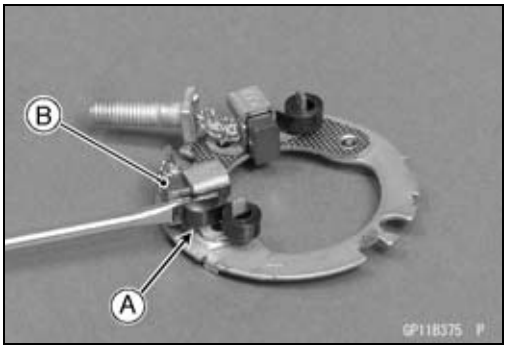



- Remove:
  Starter Motor Terminal Locknut [A]
  Brush Plate Assembly [B]




### *Starter Motor Assembly*

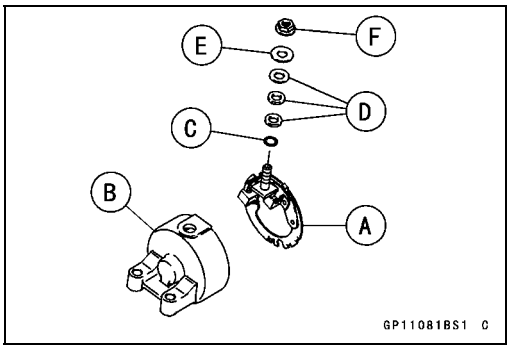
- Pry the spring end [A] and insert the brush [B].



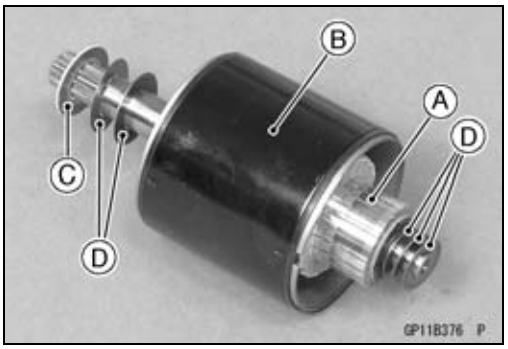
## Electric Starter System

- Install the brush plate assembly [A] into the right-hand end cover [B].
- Replace the O-ring [C] with a new one.
- Install:
  Insulators [D]
  Washer [E]
- Tighten:

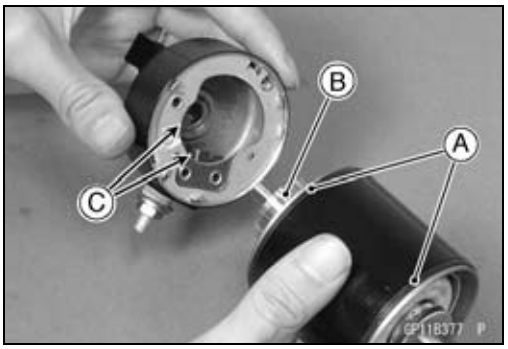
**Torque - Starter Motor Terminal Locknut [F]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**



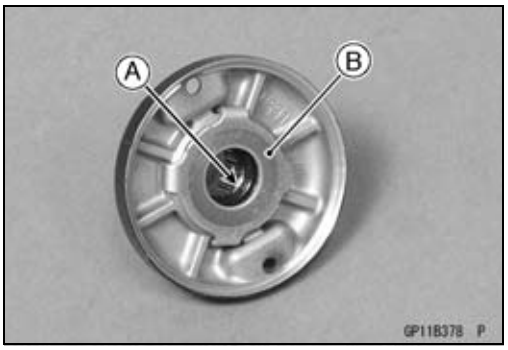

- Install the armature [A] into the yoke [B].
- Install the slip [C] and thrust washers [D] onto each side of the shaft.



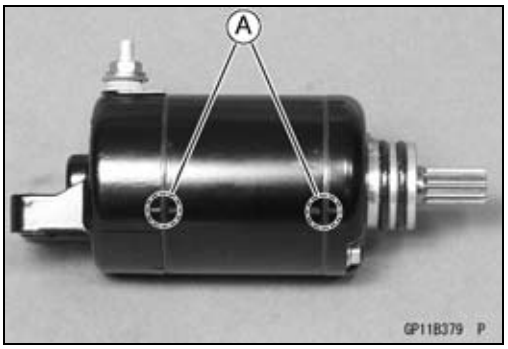

- Replace the O-rings [A] with new ones.
- Put the armature [B] among the brushes [C].




- Apply a thin coat of grease to the oil seal [A].
- Fit the toothed washer [B] into the left-hand end cover.



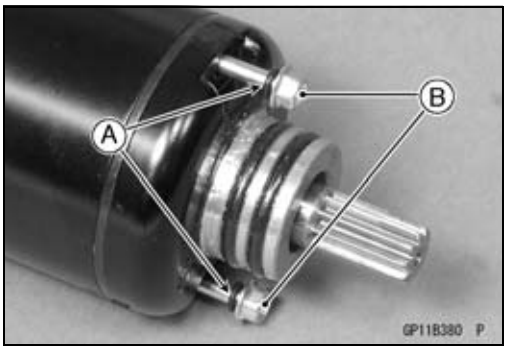

- Align the marks [A] to assembly the yoke and the end covers.



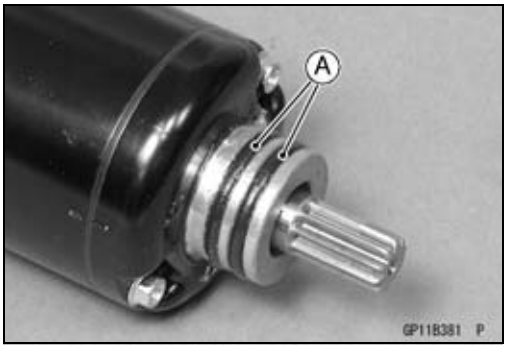
## Electric Starter System

● Replace the O-rings [A] with new ones.
● Tighten:

**Torque - Starter Motor Through Bolts [B]: 3.4 N·m (0.35 kgf·m, 30 in·lb)**



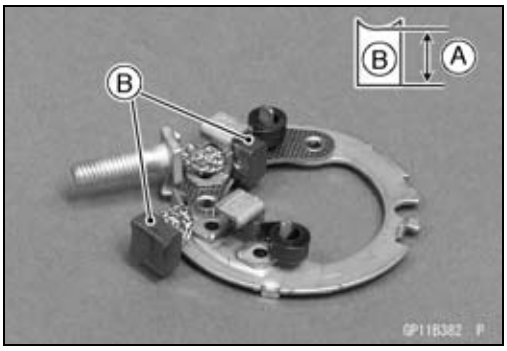

● Replace the O-rings [A] with new ones.
● Apply grease to the new O-rings.




### *Brush Inspection*

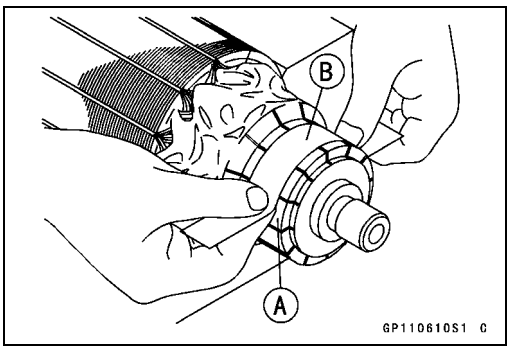
● Measure the length [A] of each brush [B].
★If any is worn down to the service limit, replace the brush holder assembly.

**Starter Motor Brush Length**
**Standard: 10 mm (0.39 in.)**
**Service Limit: 5.0 mm (0.20 in.)**



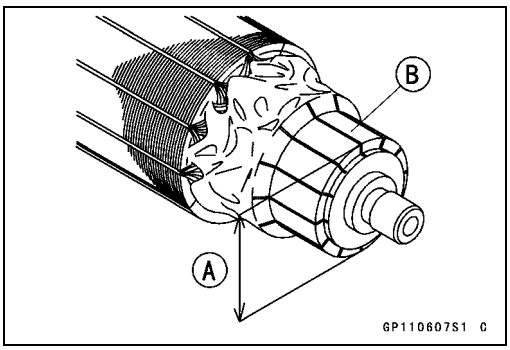

### *Commutator Cleaning and Inspection*

● Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.



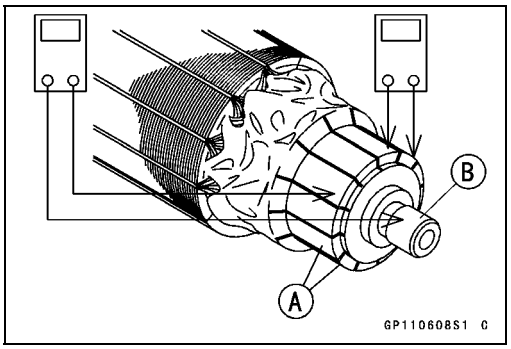

● Measure the diameter [A] of the commutator [B].
★If the commutator diameter is less than the service limit, replace the starter motor with a new one .

**Commutator Diameter**
**Standard: 28 mm (1.10 in.)**
**Service Limit: 27 mm (1.06 in.)**



## Electric Starter System

### *Armature Inspection*




- Using the × 1 Ω hand tester range, measure the resistance between any two commutator segments [A].

**Special Tool - Hand Tester: 57001-1394**

★If there is a high resistance or no reading (∞) between any two segments, a winding is open and the starter motor must be replaced.

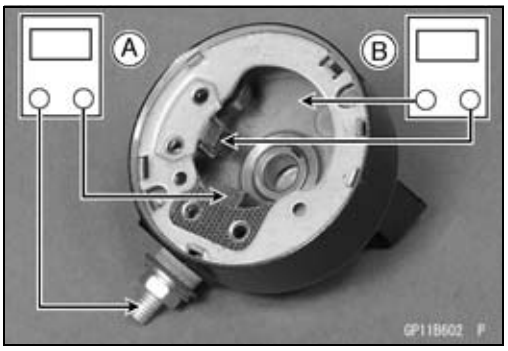
- Using the highest hand tester range, measure the resistance between the segments and the shaft [B].

★If there is any reading at all, the armature has a short and the starter motor must be replaced.

**NOTE**

○*Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the hand tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.*

### *Brush Lead Inspection*

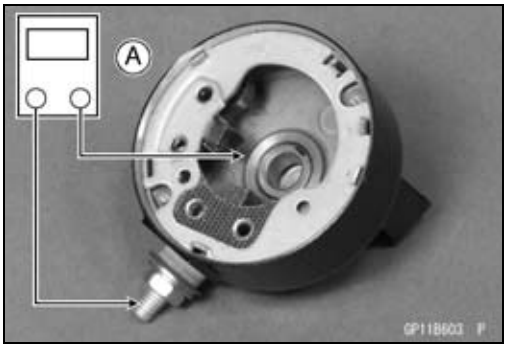



- Using the × 1 Ω hand tester range, measure the resistance as shown in the figure.
  Terminal Bolt and Positive Brush [A]
  Right-hand End Cover and Negative Brush [B]

**Special Tool - Hand Tester: 57001-1394**

★If there is not close to zero ohms, the brush lead has an open. Replace the brush holder assembly.

### *Right-hand End Cover Assembly Inspection*

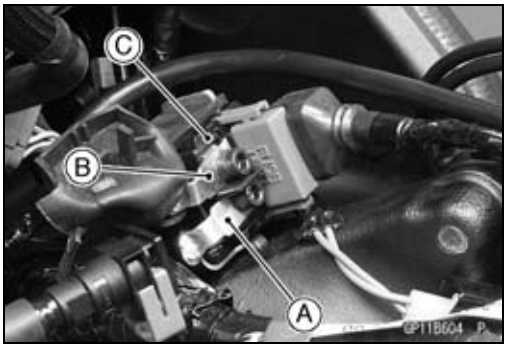



- Using the highest hand tester range, measure the resistance as shown in the figure.
  Terminal Bolt and Right-hand End Cover [A]

**Special Tool - Hand Tester: 57001-1394**

★If there is any reading, the right-hand end cover assembly have a short. Replace the starter motor.

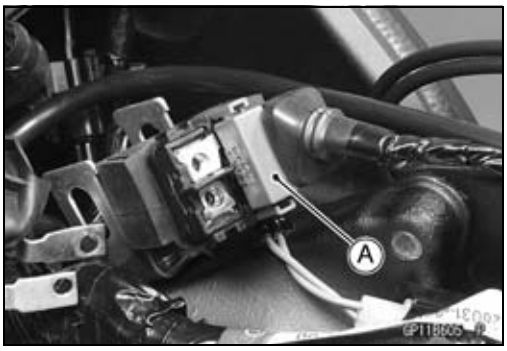
### *Starter Relay Inspection*




- Remove the battery negative (–) cable from the battery negative (–) terminal (see Battery Removal).
- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Remove the starter motor cable [A] and battery positive (+) cable [B].
- Pull out the starter relay [C] from the bracket on the frame.

## Electric Starter System

● Disconnect the connector [A].




● Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown in the figure.

**Special Tool - Hand Tester: 57001-1394**

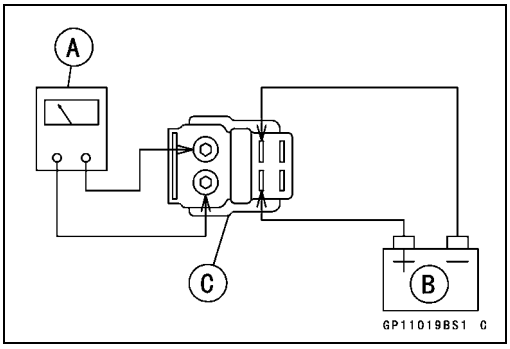
★If the relay does not work as specified, the relay is defective. Replace the relay.

**Testing Relay**

**Tester Range: × 1 Ω range**

**Criteria: When battery is connected → 0 Ω**

**When battery is disconnected → ∞ Ω**



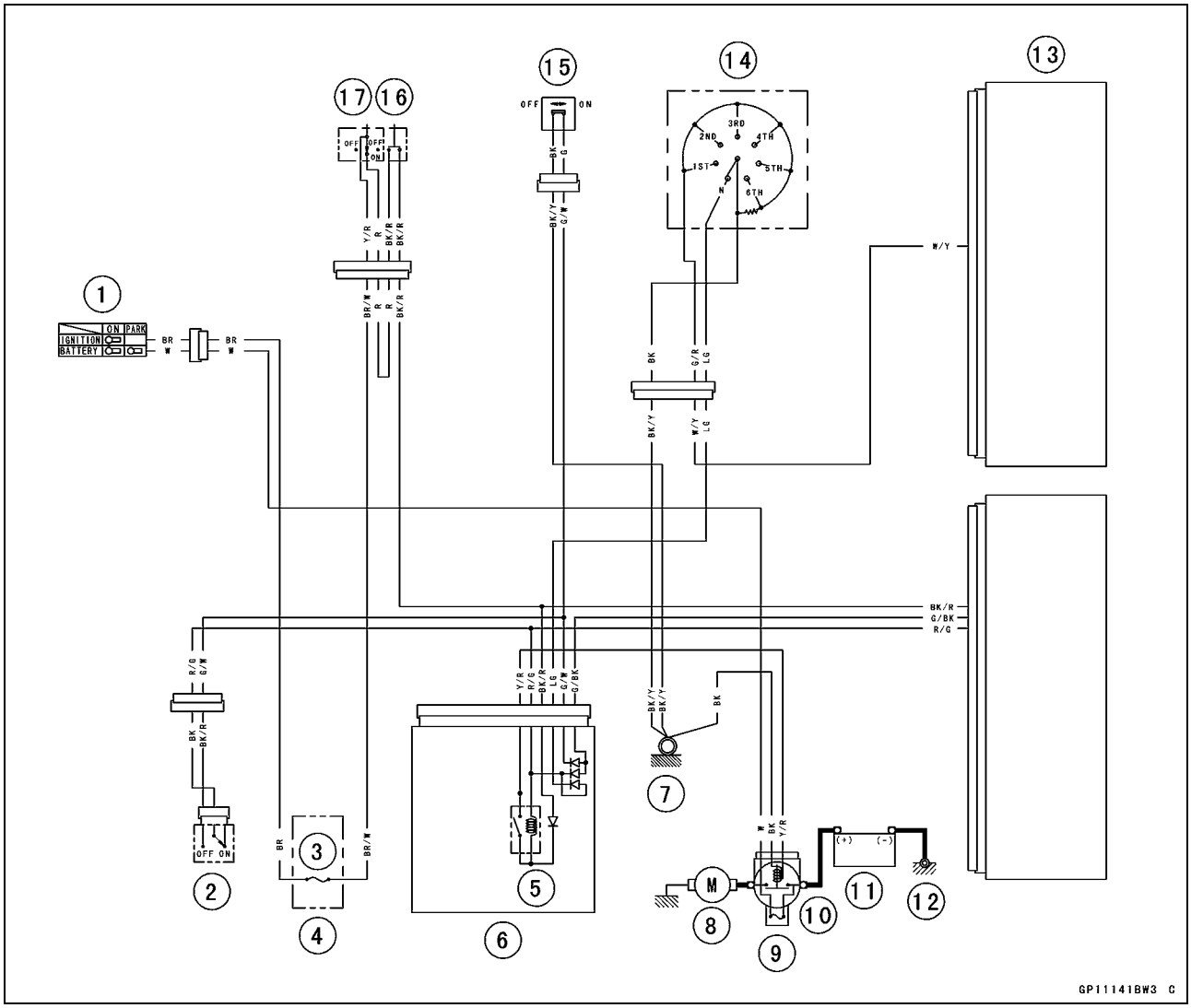

● Tighten:

**Torque - Starter Motor Cable Mounting Bolt: 4.0 N·m (0.41 kgf·m, 35 in·lb)**

**Battery Cable Mounting Bolt: 4.0 N·m (0.41 kgf·m, 35 in·lb)**

## Electric Starter System

### Electric Starter Circuit




1. Ignition Switch
2. Starter Lockout Switch
3. Ignition Fuse 15 A
4. Fuse Box
5. Starter Circuit Relay
6. Relay Box
7. Frame Ground 1
8. Starter Motor
9. Main Fuse 30 A
10. Starter Relay
11. Battery 12 V 10 Ah
12. Engine Ground
13. ECU
14. Gear Position Switch
15. Sidestand Switch
16. Starter Button
17. Engine Stop Switch

## Lighting System

This motorcycle adopt the daylight system and have a headlight relay in the relay box. The headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on after the starter button is released and stays on until the ignition switch is turned off. The headlight will go out momentarily whenever the starter button is pressed and come back on when the button is released.

### *Headlight Beam Horizontal Vertical Adjustment*

- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

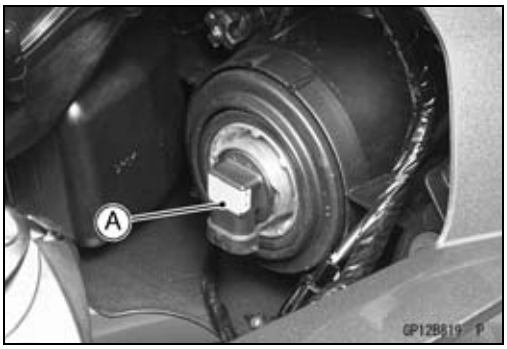
### *Headlight Beam Vertical Adjustment*

- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

### *Headlight Bulb Replacement*

- Remove the upper inner fairing (see Upper Inner Fairing Removal in the Frame chapter).
- Disconnect the headlight connector [A].


- Turn the headlight bulb [A] counterclockwise and pull out the bulb from the headlight.



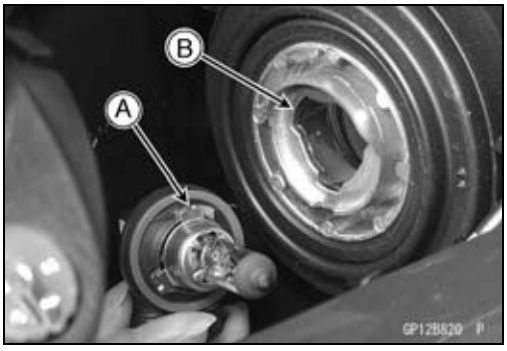

**CAUTION**

**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**

○*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.



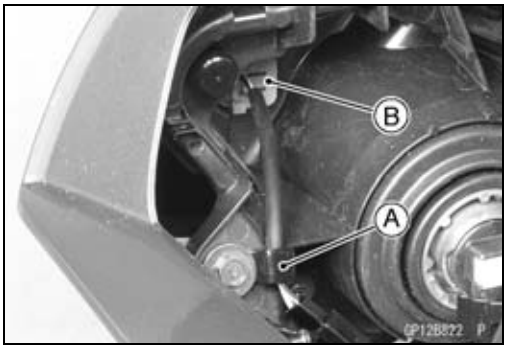
## Lighting System

- Turn the headlight bulb [A] clockwise.
- Connect the headlight connector.
- After installation, adjust the headlight aim (see Headlight Aiming Inspection in the Periodic Maintenance chapter).

○Other Bulb: Repeat the above steps.


### *City Light Bulb Replacement*

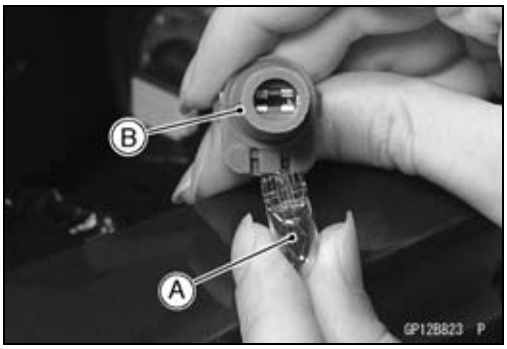
- Remove the upper inner fairing (see Upper Inner Fairing Removal in the Frame chapter).
- Open the clamp [A].
- Pull out the socket [B] together with the bulb.




- Pull the bulb [A] out of the socket [B].

**CAUTION**

**Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.**

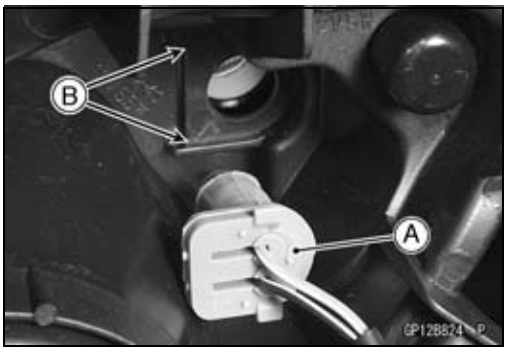



- Replace the bulb with a new one.

- Insert the socket [A] to the headlight.

○Fit the socket into the grooves [B] of the headlight.

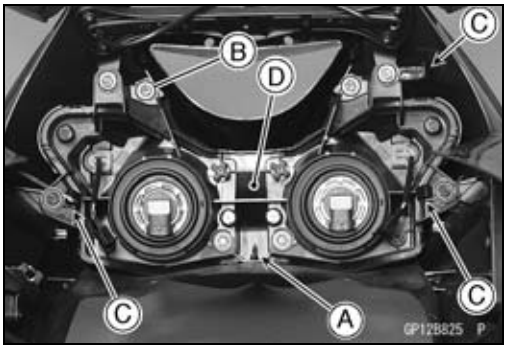
○Other Bulb: Repeat the above steps.




### *Headlight Removal/Installation*

- Remove:
  Upper Fairing Assembly (see Upper Fairing Assembly Removal in the Frame chapter)
  Quick Rivet [A]
  Bolts [B] and Clamps [C]
  Headlight [D]

○Push the central pin, and then remove the quick rivet.

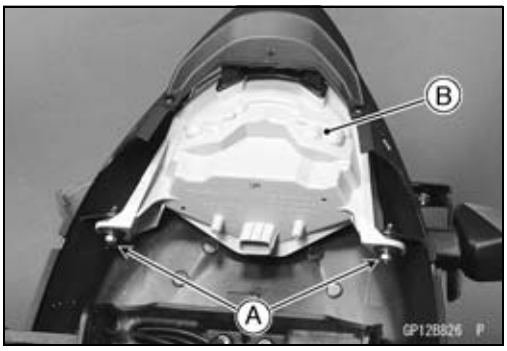



- Installation is the reverse of removal, note the following.

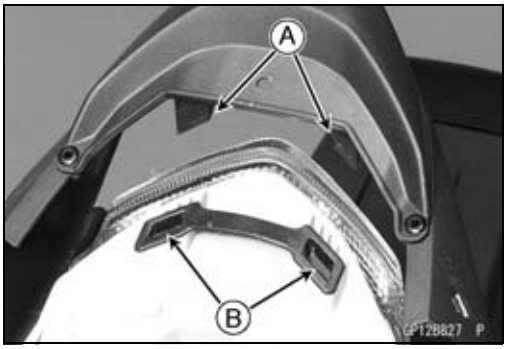
○Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## Lighting System

### *Tail/Brake Light (LED) Removal/Installation*



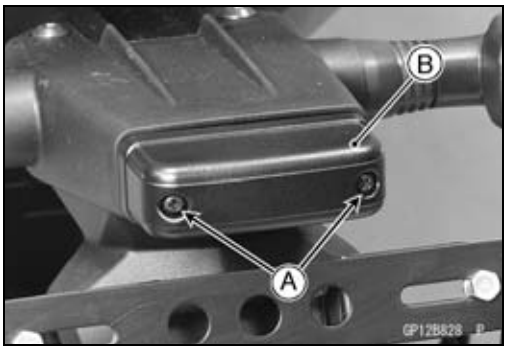

- Remove:
  Rear Fender Rear (see Flap and Rear Fender Rear Removal in the Frame chapter)
  Bolts [A]
  Tail/Brake Light [B]



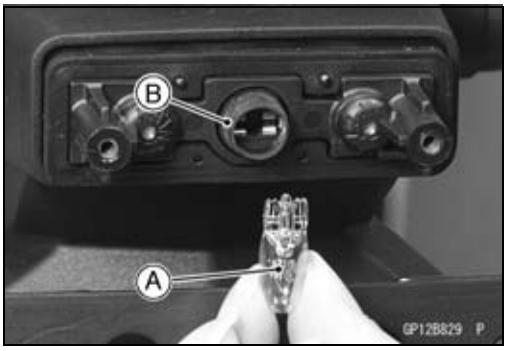

- Installation is the reverse of removal, note the following.

○Fit the projections [A] of the rear fender rear into the slots [B] of the tail/brake light.

### *License Plate Light Bulb Replacement*




- Remove:
  Screws [A]
  License Plate Light Cover [B]




- Pull the bulb [A] out of the socket [B].

**CAUTION**

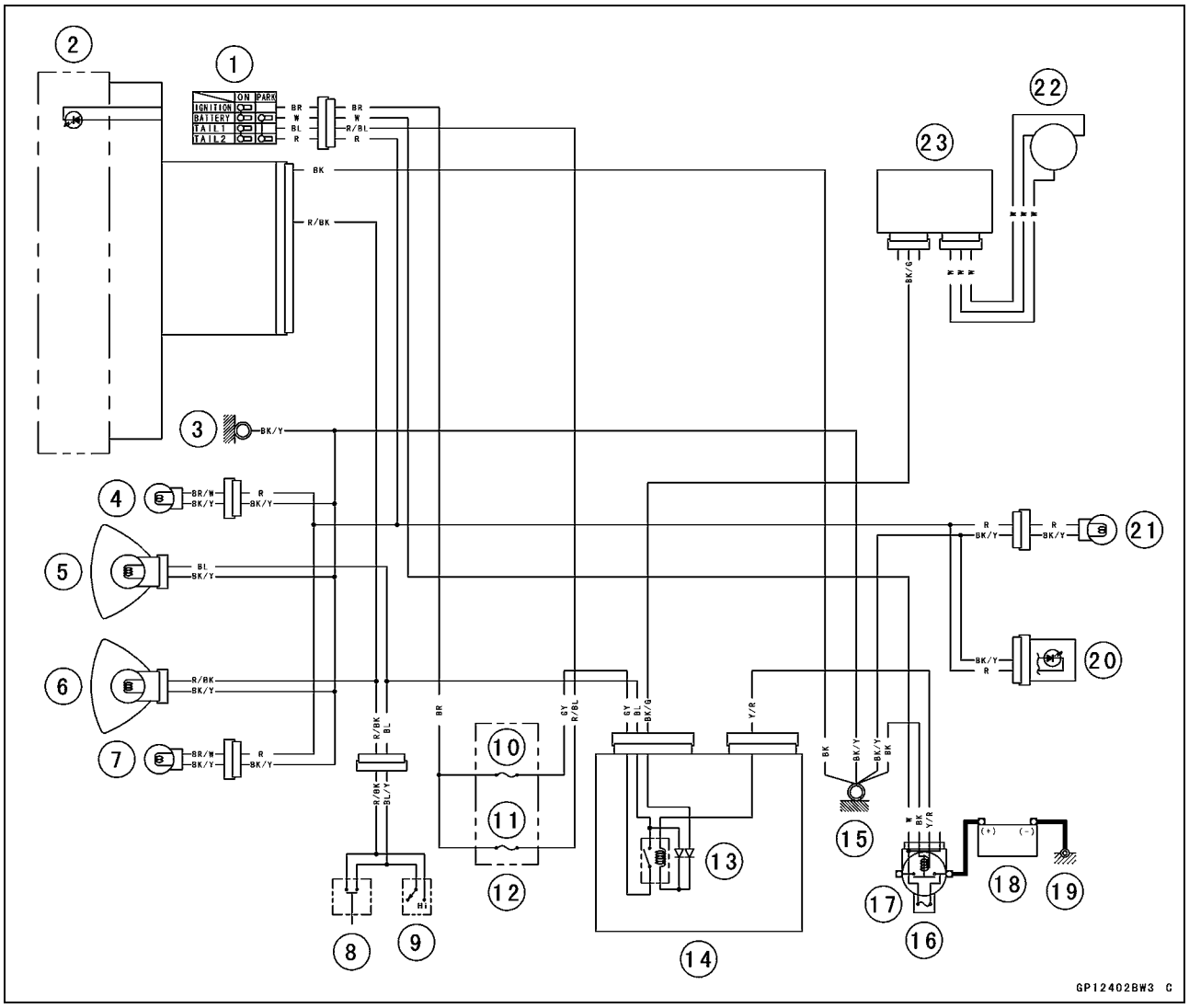
**Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.**

- Replace the bulb with a new one.
- Tighten:

**Torque - Licence Plate Light Cover Screws: 1.0 N·m (0.10 kgf·m, 9 in·lb)**

## Lighting System

### Headlight/Tail Light Circuit



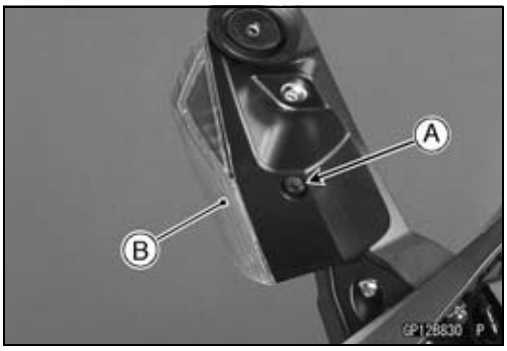

1. Ignition Switch
2. High Beam Indicator Light (LED)
3. Frame Ground 2
4. Right City Light 12 V 5 W
5. Headlight (LO) 12 V 55 W
6. Headlight (HI) 12 V 65 W
7. Left City Light 12 V 5 W
8. Passing Button
9. Dimmer Switch
10. Headlight Fuse 15 A
11. Taillight Fuse 10 A
12. Fuse Box
13. Headlight Relay
14. Relay Box
15. Frame Ground 1
16. Main Fuse 30 A
17. Starter Relay
18. Battery 12 V 10 Ah
19. Engine Ground
20. Tail/Brake Light (LED) 12 V 0.5/4.1 W
21. License Plate Light 12 V 5 W
22. Alternator
23. Regulator/Rectifier

## Lighting System

### *Turn Signal Light Bulb Replacement*

**Front Turn Signal Light**

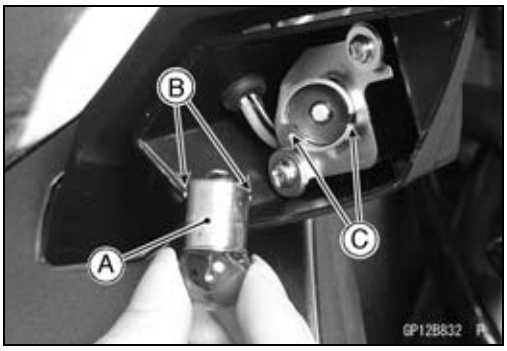
- Remove:
  Screw [A]
  Front Turn Signal Light Lens [B]




- Push and turn the front turn signal light bulb [A] counterclockwise and remove it.
- Replace the bulb with a new one.


- Insert the new bulb [A] by aligning its left and right pins [B] with the left and right grooves [C] in the socket, and turn the bulb clockwise.

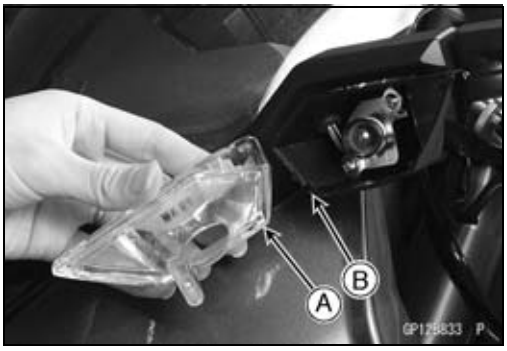
○Turn the bulb about 15°.




- Fit the projection [A] of the lens into the groove [B] of the turn signal light.
- Tighten:

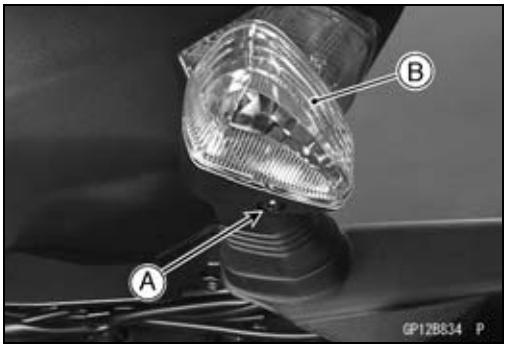
**Torque - Front Turn Signal Light Lens Screw: 1.0 N·m (0.10 kgf·m, 9 in·lb)**

○Other Bulb: Repeat the above steps.




**Rear Turn Signal Light**

- Remove:
  Screw [A]
  Rear Turn Signal Light Lens [B]

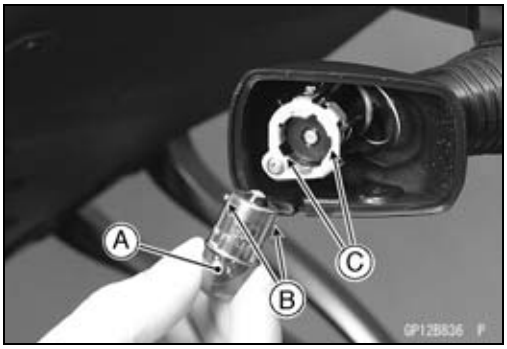


## Lighting System

● Push and turn the rear turn signal light bulb [A] counterclockwise and remove it.


● Insert the new bulb [A] by aligning its left and right pins [B] with the left and right grooves [C] in the socket, and turn the bulb clockwise.

○Turn the bulb about 15°.




● Fit the projection [A] of the lens into the groove [B] of the turn signal light.

● Tighten:

**Torque - Rear Turn Signal Light Lens Screw: 1.0 N·m (0.10 kgf·m, 9 in·lb)**

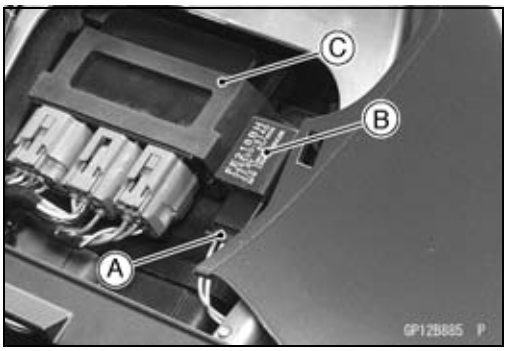
○Other Bulb: Repeat the above steps.


### *Turn Signal Relay Inspection*

● Remove the center seat cover (see Seat Cover Removal in the Frame chapter).

● Disconnect the connector [A].

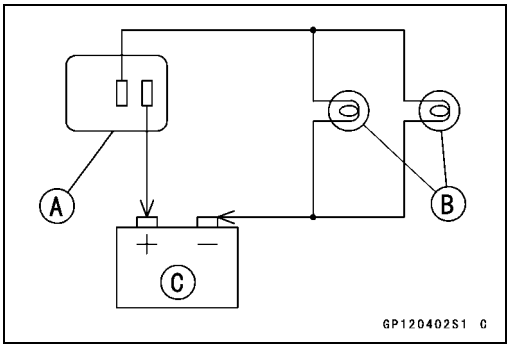
● Pull out the turn signal relay [B] backward, and remove it from the rubber protector [C].



## Lighting System

● Connect one 12 V battery and turn signal lights as indicated in the figure, and count how many times the lights flash for one minute.
  Turn Signal Relay [A]
  Turn Signal Lights [B]
  12 V Battery [C]

★If the lights do not flash as specified, replace the turn signal relay.



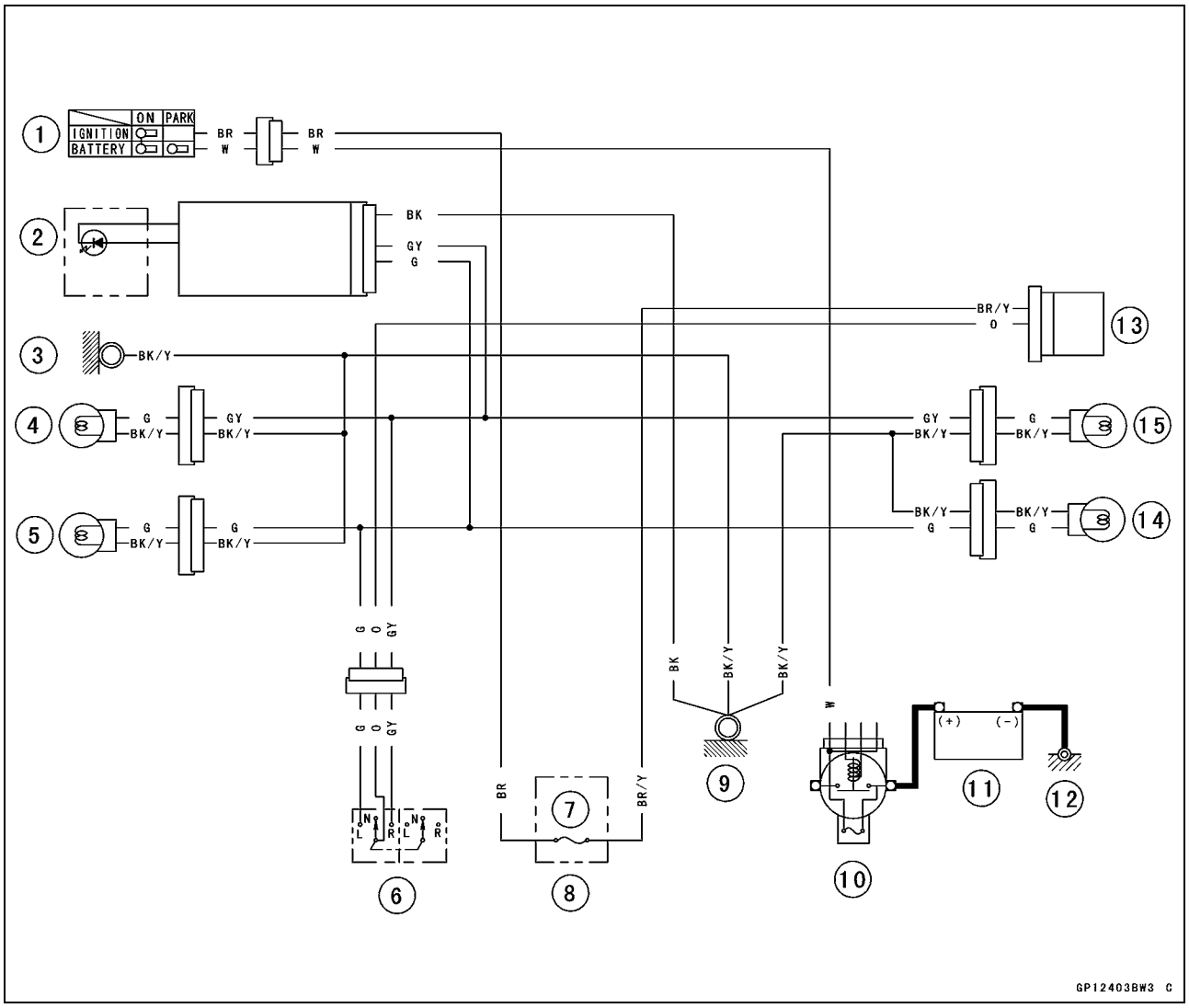

**Testing Turn Signal Relay**

| Load | | Flashing Times (c/m*) |
|---|---|---|
| The Number of Turn Signal Lights | Wattage (W) | |
| 1** | 10 | 140-250 |
| 2 | 20 | 75-95 |

*: Cycle(s) per minute
**: Correspond to “one light burned out”

## Lighting System

### Turn Signal Light Circuit




1. Ignition Switch
2. Turn Signal Indicator Light (LED)
3. Frame Ground 2
4. Front Right Turn Signal Light 12 V 10 W
5. Front Left Turn Signal Light 12 V 10 W
6. Turn Signal Switch
7. Turn Signal Relay Fuse 10 A
8. Fuse Box
9. Frame Ground 1
10. Main Fuse 30 A
11. Battery 12 V 10 Ah
12. Engine Ground
13. Turn Signal Relay
14. Rear Left Turn Signal Light 12 V 10 W
15. Rear Right Turn Signal Light 12 V 10 W

## Air Switching Valve

### *Air Switching Valve Operation Test*

- Refer to the Air Suction System Damage Inspection in the Periodic Maintenance chapter.

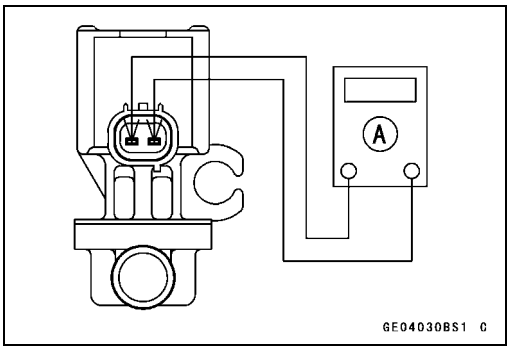
### *Air Switching Valve Unit Test*

- Remove the air switching valve (see Air Switching Valve Removal in the Engine Top End chapter).
- Set the hand tester [A] to the × 1 Ω range and connect it to the air switching valve terminals as shown in the figure.

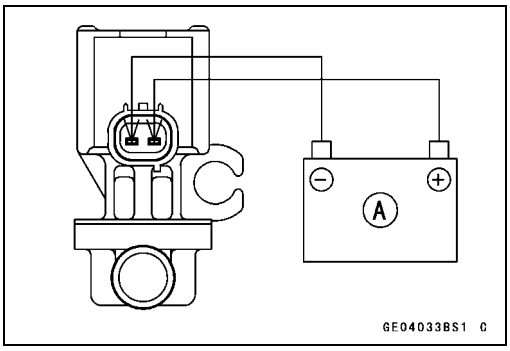
**Special Tool - Hand Tester: 57001-1394**

**Air Switching Valve Resistance**
**Standard: 20 ~ 24 Ω at 20°C (68°F)**

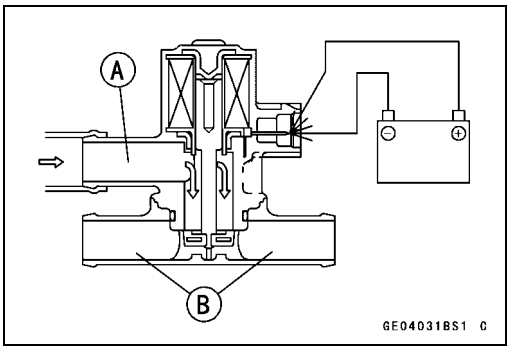
★If the resistance reading is out of the specified value, replace it with a new one.




- Connect the 12 V battery [A] to the air switching valve terminals as shown.




- Blow the air to the inlet air duct [A], and make sure does not flow the blown air from the outlet air ducts [B].

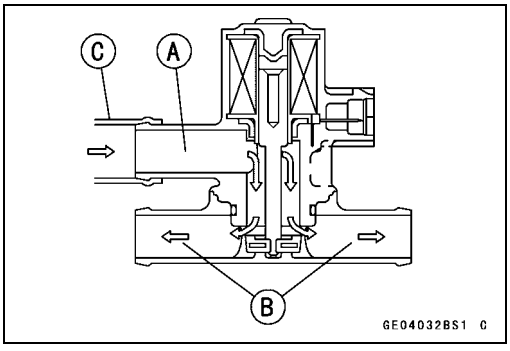



- Disconnect the 12 V battery.
- Blow the air to the inlet air duct [A] again, and make sure flow the blown air from the outlet air ducts [B].

★If the air switching valve dose not operate as described, replace it with a new one.

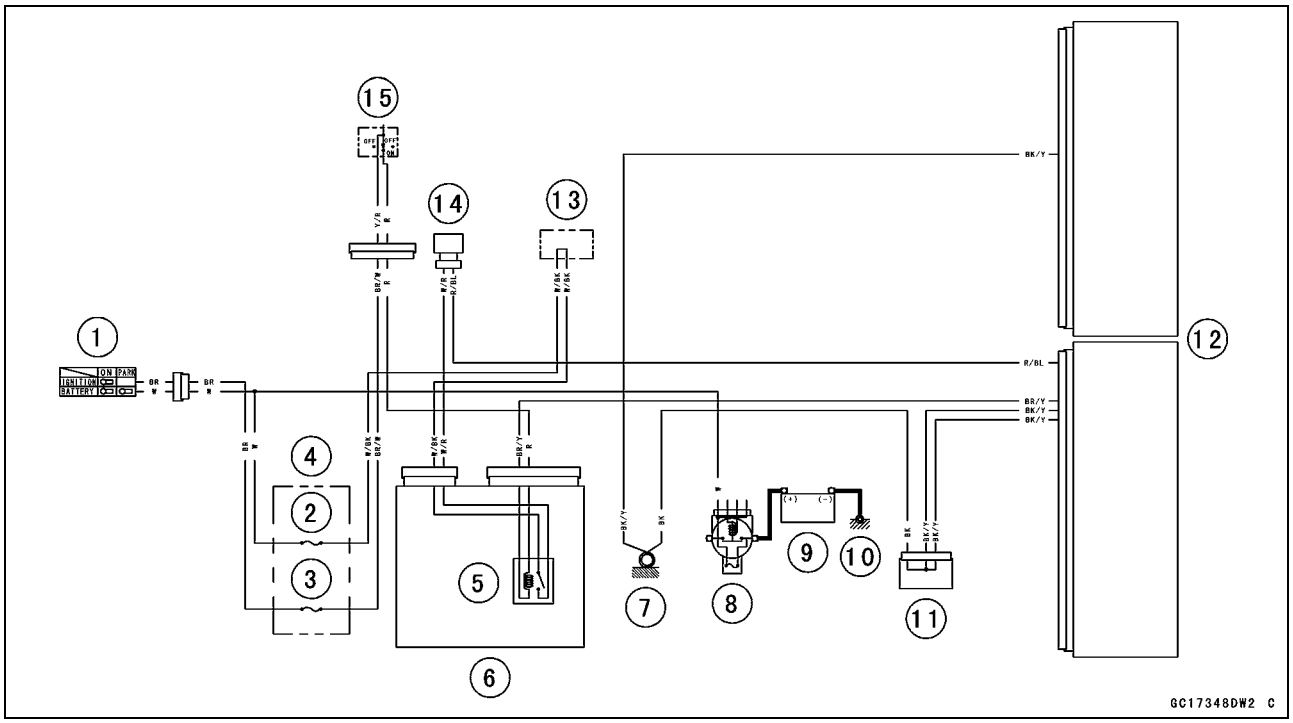
**NOTE**

○*To check air flow through the air switching valve, just blow through the air switching valve hose (inlet side) [C].*



## Air Switching Valve

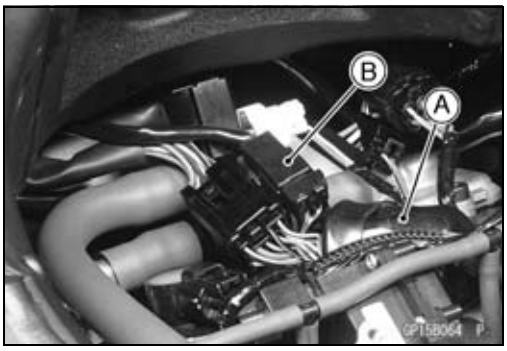
### Air Switching Valve Circuit




1. Ignition Switch
2. ECU Fuse 10 A
3. Ignition Fuse 15 A
4. Fuse Box
5. Fuel Pump Relay
6. Relay Box
7. Frame Ground 1
8. Main Fuse 30 A
9. Battery 12 V 10 Ah
10. Engine Ground
11. Water-proof Joint 1
12. ECU
13. Water-proof Joint 2
14. Air Switching Valve
15. Engine Stop Switch

## Radiator Fan System

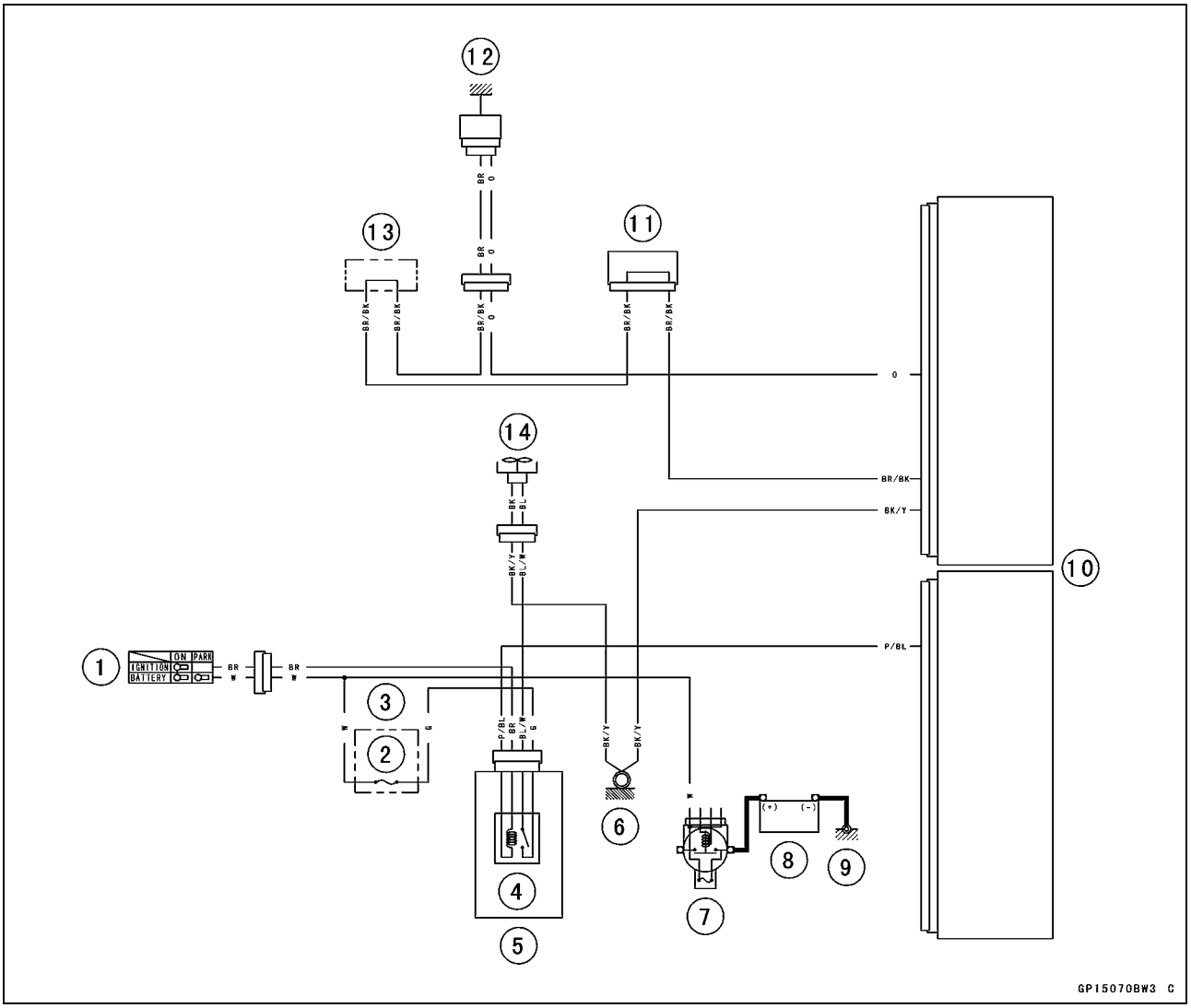
### *Fan Motor Inspection*




- Remove the air cleaner housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter).
- Slide the dust cover [A].
- Disconnect the connector [B].
- 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.

### Radiator Fan Circuit



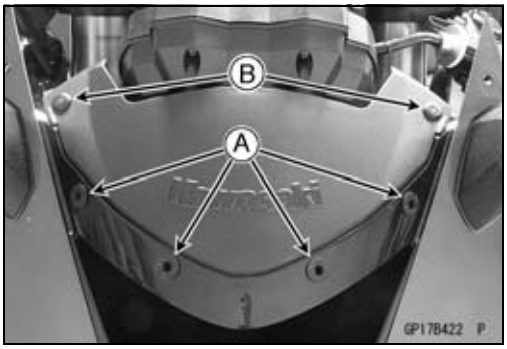

1. Ignition Switch
2. Fan Fuse 15 A
3. Fuse Box
4. Fan Relay
5. Relay Box
6. Frame Ground 1
7. Main Fuse 30 A
8. Battery 12 V 10 Ah
9. Engine Ground
10. ECU
11. Joint Connector 4
12. Water Temperature Sensor
13. Joint Connector 3
14. Fan Motor

## Meter, Gauge, Indicator Unit

### *Meter Unit Removal/Installation*

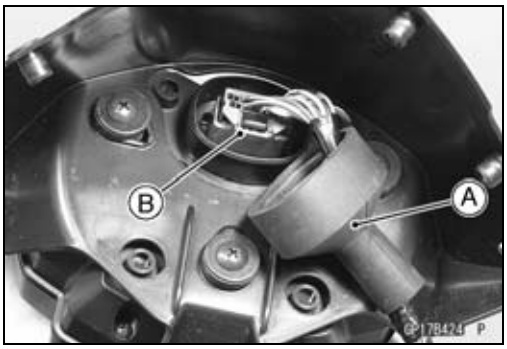
● Remove:
Windshield (see Windshield Removal in the Frame chapter)
Wellnuts [A]
Quick Rivets [B]

○Push the central pin, and then remove the quick rivet.




● Remove the bolts [A] on both sides.

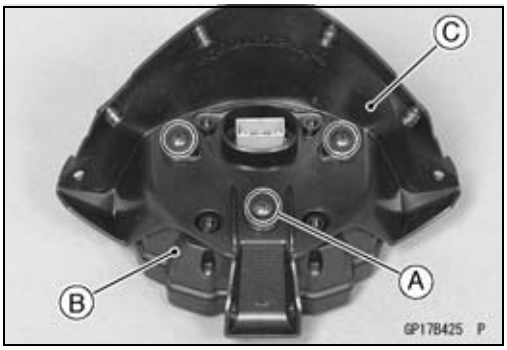

● Slide back the dust cover [A] and disconnect the meter unit connector [B].




● Remove the screws [A] and washers, and separate the meter unit [B] and cover [C].

**CAUTION**

**Place the meter unit so that the face is up. If ammeter unit is left upside down or sideways for any length of time, it will malfunction.**




● Tighten:

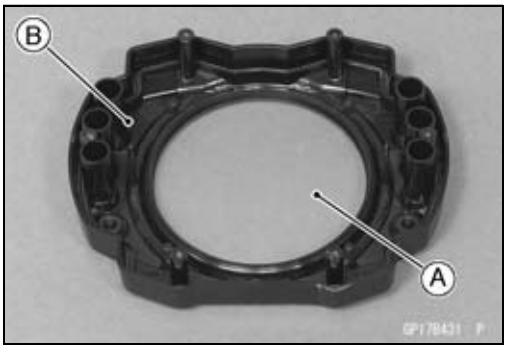
**Torque - Meter Unit Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

● Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## Meter, Gauge, Indicator Unit

### *Meter Unit Disassembly*

● Before disassembling the meter unit, be sure to read the CAUTION below.

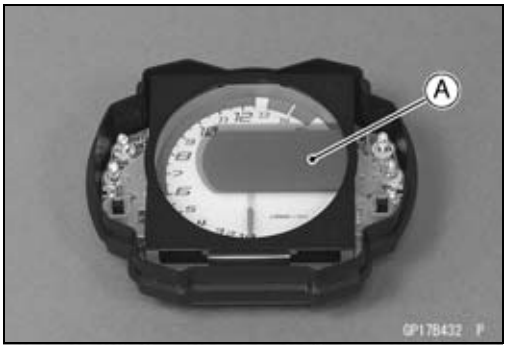



**CAUTION**

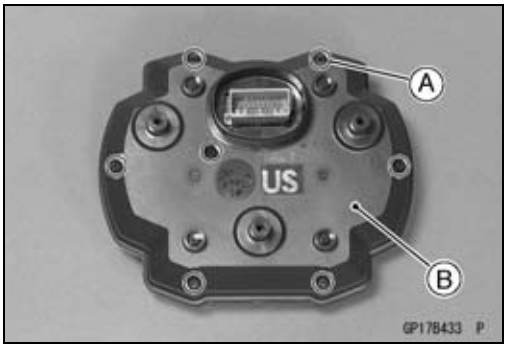
**The anti-frosted agent is applied to the inside of the lens [A] of the upper meter cover [B] for preventing the lens condensation.**
**If the finger touches the inside of the lens, the anti -frosted agent is wiped off, as a result, lens may be misted. Likewise, do not clean the inside of the lens by using the cloth, and so on.**

**CAUTION**

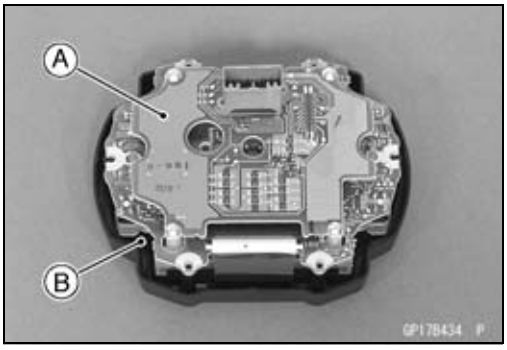
**As the LCD (Liquid Crystal Display) parts [A] of this meter are frail for ultraviolet rays, the LCD parts may have trouble when the parts are exposed to the ultraviolet rays for long time with the parts disassembled.**
**When replacing the meter cover, disassemble it at the indoor not to expose LCD parts to the strong ultraviolet rays and assemble it within one hour.**




● Remove:
Meter Unit (see Meter Unit Removal/Installation)
Screws [A]
Lower Meter Cover [B]

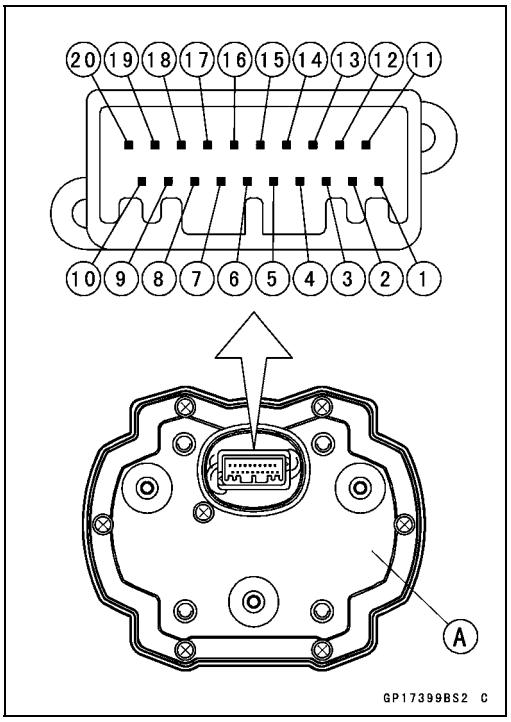



● Separate the meter assembly [A] and upper meter cover [B].



## Meter, Gauge, Indicator Unit

### *Meter Unit Inspection*




- Remove the meter unit [A] (see Meter Unit Removal).
  - [1] Ignition
  - [2] Fuel Level Warning Indicator Light (LED) (–)
  - [3] Stop Watch (+)
  - [4] Lap Time (+)
  - [5] Neutral Indicator Light (LED) (–)
  - [6] ECU Communication Signal
  - [7] Tachometer Signal
  - [8] Water Temperature Sensor (–)
  - [9] Unused
  - [10] Unused
  - [11] Ground (–)
  - [12] Battery (+)
  - [13] Warning Indicator Light (LED) (Oil Pressure Warning) (–)
  - [14] Unused
  - [15] Right Turn Signal indicator Light (LED) (+)
  - [16] Left Turn Signal indicator Light (LED) (+)
  - [17] High Beam Indicator Light (LED) (+)
  - [18] Speed Sensor Signal
  - [19] Unused
  - [20] Unused

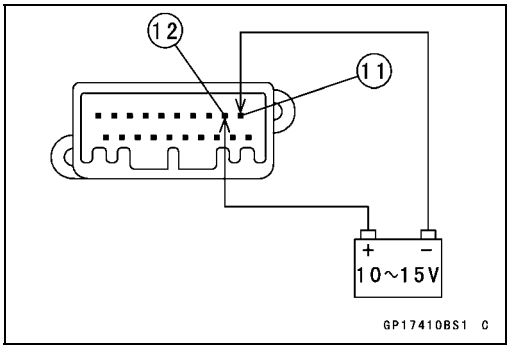
**CAUTION**

**Do not drop the meter unit. Place the meter unit so that it faces upward. If the meter assembly is left upside down or sideways for a long time or dropped, it will malfunction. Do not short each terminals.**

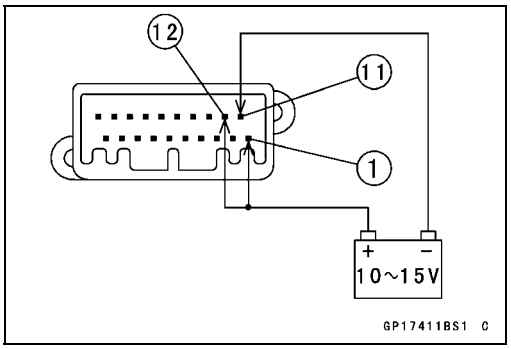
**Liquid Crystal Display (LCD) Segments Check**

- Using the insulated auxiliary leads, connect the 12 V battery to the meter unit connector as follows.

○Connect the battery positive terminal to the terminal [12].
○Connect the battery negative terminal to the terminal [11].

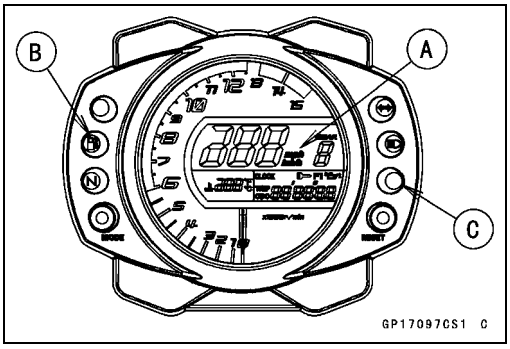



- Connect the terminal [1] to the terminal [12].

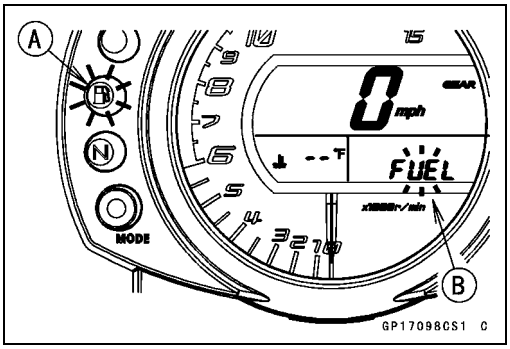


## Meter, Gauge, Indicator Unit

○When the terminals are connected, all the LCD segments [A] appear for 3 seconds.
○The fuel level warning indicator light (LED) [B] goes on for 3 seconds.
★If the LCD segments do not appear, replace the meter unit.
● Disconnect the terminal [1].
○All the LCD segments disappear.
○For models equipped with an immobilizer system, the warning indicator light (LED) [C] starts flashing (see Abstract in the Immobilizer System (Equipped Models) section).
★If the segments do not disappear, replace the meter unit.



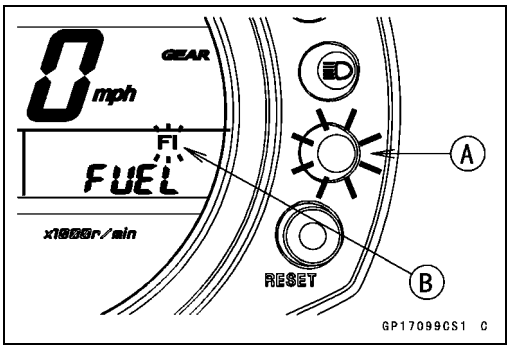

● Connect the terminal [1] to the terminal [12] again.
○About 5 seconds after, the fuel level warning indicator light (LED) blinks [A] and the FUEL segments [B] appears in the display.
○The FUEL segments is flashing.
★If the fuel level warning indicator light (LED) does not blink and/or the FUEL segments does not appear, replace the meter unit.




**NOTE**

○*This meter unit has a failure detection function (for open or short) of the fuel reserve switch. When the fuel reserve switch is open or short, the meter unit alerts the rider by the fuel level warning indicator light (LED) blinks and the FUEL segments appears in the display.*
○*If the failure detection function operates with the meter unit installed on the motorcycle, inspect the fuel reserve switch (see Fuel Reserve Switch Inspection) and wiring.*

○About 10 seconds after, the warning indicator light (LED) [A] blinks and the FI warning symbol [B] appears in the display.
○The FI warning symbol is blinking.
★If the warning indicator light (LED) does not blink and/or the FI warning symbol does not appear, replace the meter unit.




**NOTE**

○*This meter unit has a failure detection function of the ECU communication. When the ECU communication error was detected, the meter unit alerts the rider by the warning indicator light (LED) blinks and the FI warning symbol appears in the display (see ECU Communication Line Inspection in the Fuel System (DFI) chapter).*

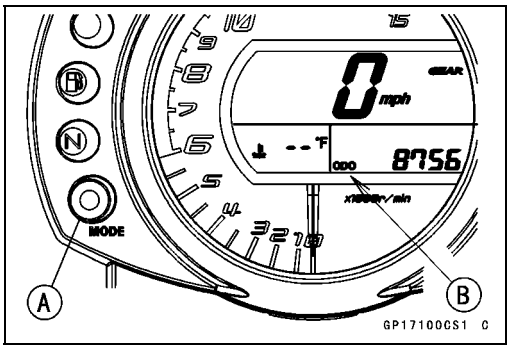
## Meter, Gauge, Indicator Unit

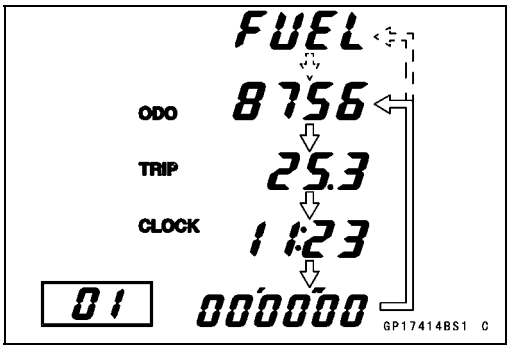
**MODE AND RESET BUTTON Operation Check**

- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Check that the display [B] change to the ODO, TRIP, and CLOCK and STOP WATCH displays each time the MODE button [A] is pressed.

○When the fuel level warning indicator light (LED) blinked, display change to FUEL, ODO, TRIP, CLOCK and, STOP WATCH and FUEL.

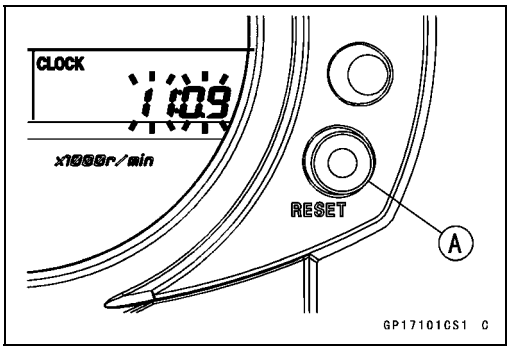
★If the display function does not work, replace the meter unit.




- Indicate the clock mode.
- Check that when the RESET button [A] in CLOCK mode is pushed for more than two seconds, the meter display turns to the clock set mode.

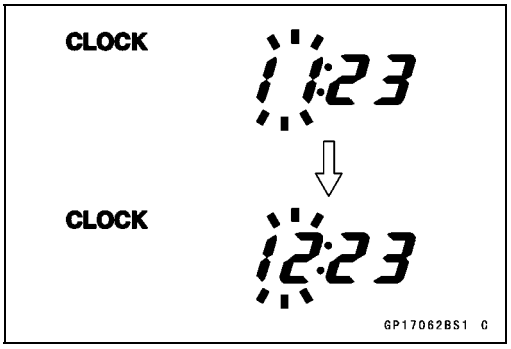
○Both the hour and minute display start flashing.




- In the HOUR/MINUTE setting mode, press the reset button again to effect the HOUR setting mode.

○The hour display flashes on the display.

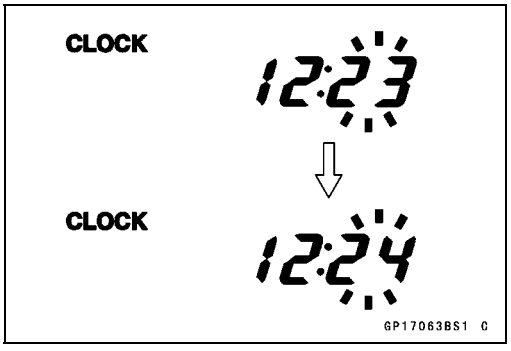
- Press the MODE button to set the hour.




- In the HOUR setting mode, press the RESET button to effect the MINUTE setting mode.

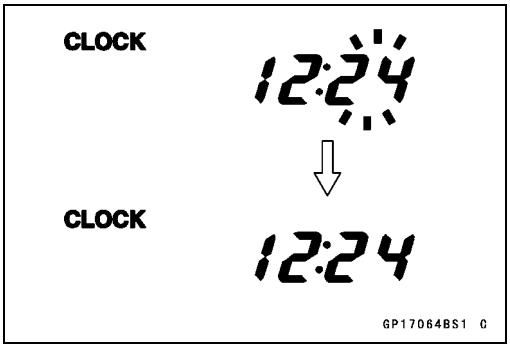
○The minute display flashes on the display.

- Press the MODE button to set the minute.



## Meter, Gauge, Indicator Unit

- In the MINUTE setting mode, press the RESET button to return to the HOUR/MINUTE setting mode.
- Press the MODE button to complete the time setting process.

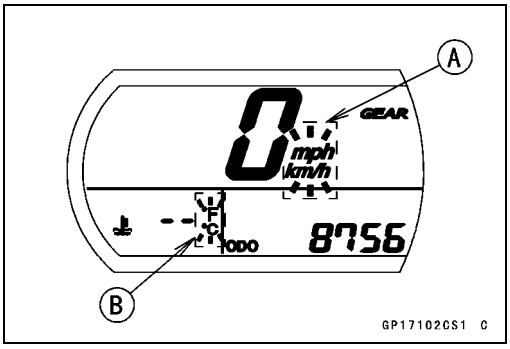



- Indicate the ODO mode.
- Check that the display [A] [B] change to the mile and °F, Mile and °C, km and °F, km and °C display each time by pushing the RESET bottom while MODE bottom pushed in.

**NOTE**

○*Mile/Km Display can alternate between English and metric modes (mile and km) in the digital meter. Make sure that km or mile according to local regulations is correctly displayed before riding.*

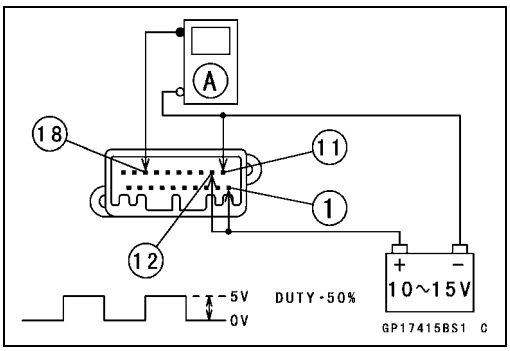
★If the display function does not work and adjust, replace the meter unit.




**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 [18].

○Indicates approximately 65 km/h in case the input frequency would be approximately 605 Hz.
○Indicates approximately 65 mph in case the input frequency would be approximately 968 Hz.
★If the speedometer does not work, replace the meter unit.




★If the oscillator is not available, the speedometer can be checked as follows.
○Connect the meter unit connector temporarily.
○Raise the rear wheel off the ground with the stand.
○Turn the ignition switch ON.
○Rotate the rear wheel by hand.
○Check that the speedometer shows the speed.
★If the speedometer does not work, inspect the speed sensor and wiring (see Speed Sensor Output Voltage Inspection in the Fuel System (DFI) chapter).
★If the speed sensor and wiring are normal, replace the meter unit.

## Meter, Gauge, Indicator Unit

### Odometer Check

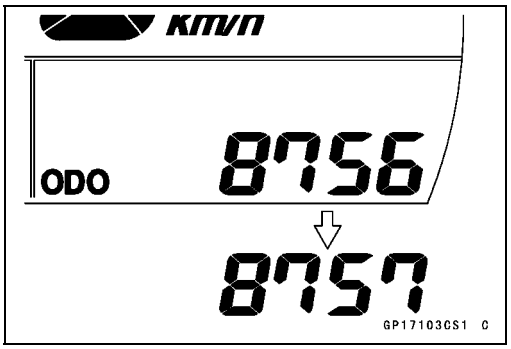
- Check the odometer with the speedometer check in the same way.

★If value indicated in the odometer is not added, replace the meter unit.

**NOTE**

○*The data is maintained even if the battery is disconnected.*

○*When the figures come to 999999, they are stopped and locked.*



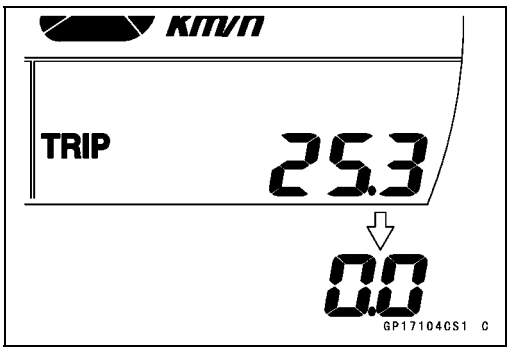

### Trip Meter Check

- Check the trip meter with the speedometer in the same way.

★If value indicated in the trip meter is not added, replace the meter unit.

- Check that when the RESET button is pushed for more than two seconds, the figure display turns to 0.0.

★If the figure display does not indicate 0.0, replace the meter unit.

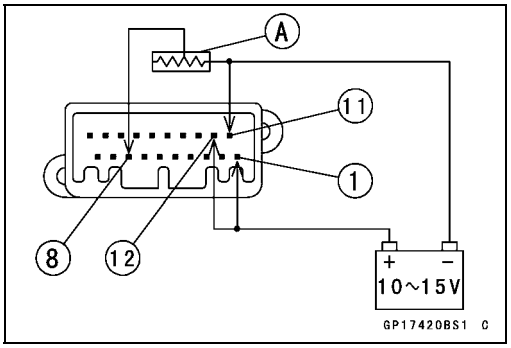



### Water Temperature Meter Check

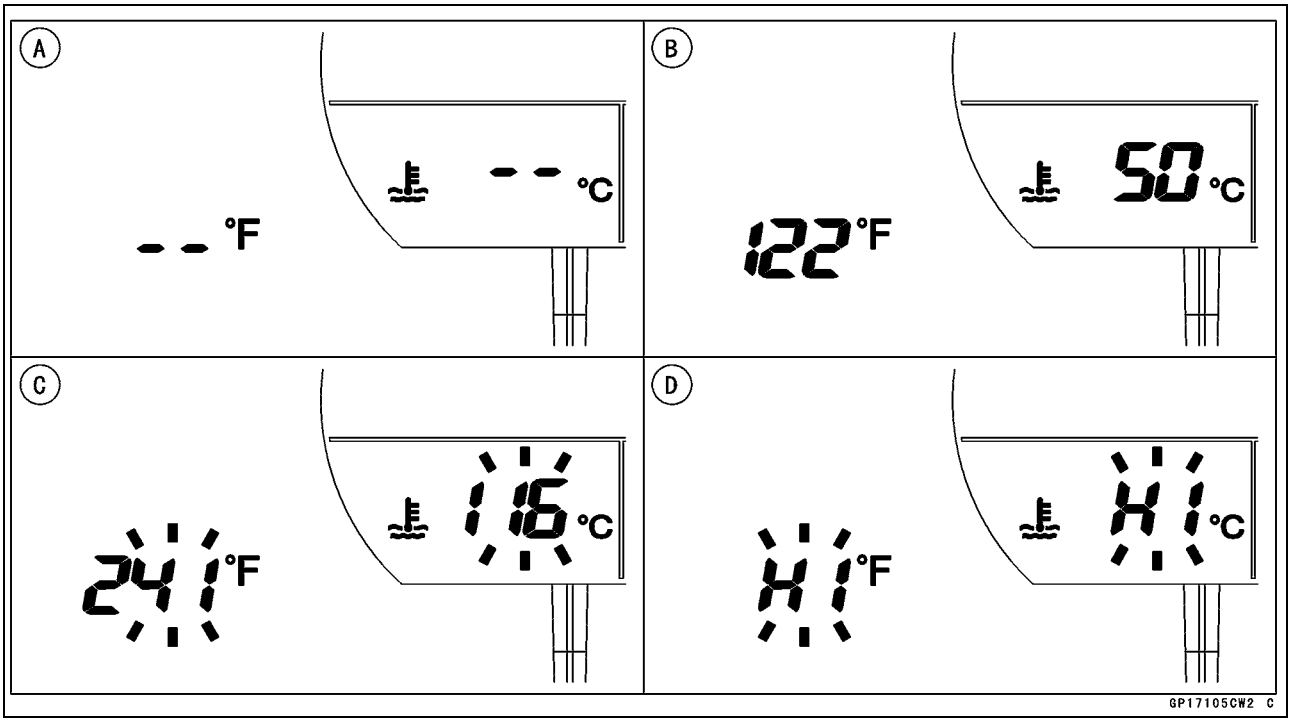
- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Connect the variable rheostat [A] to the terminal [8] as shown in the figure.
- Check that the number of segments matches the resistance value of the variable rheostat.

| Resistance Value (Ω) | Temperature Meter | Warning Indicate |
|---|---|---|
| | – – | - [A] |
| 209.8 | 50°C (122°F) | - [B] |
| 69.1 | 80°C (176°F) | - [B] |
| 25 | 116°C (241°F) | Flash [C] |
| 17 | HI | Flash [D] |

★If any display function does not work, replace the meter unit.



## Meter, Gauge, Indicator Unit




**Tachometer Check**

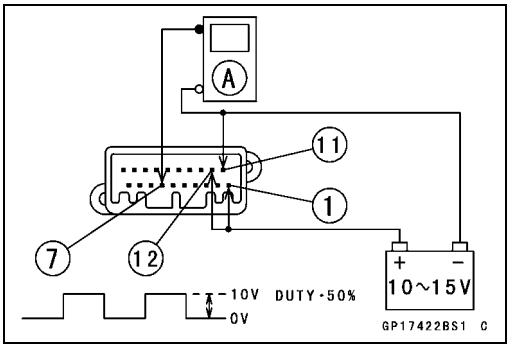
- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".

○When the terminals are connected, the tachometer needle momentary points to the last reading, and then return to the 0 position.

★If the needle function does not work, replace the meter unit.

- The revolutions per minute (rpm) equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown in the figure) would be input into the terminal [7].

○Indicates approximately 4 000 rpm in case the input frequency would be approximately 133.3 Hz.




★If the oscillator is not available, the tachometer can be checked as follows.

○Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".

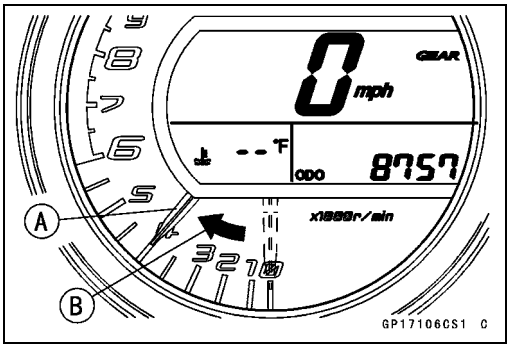
○When the terminals are connected, the tachometer needle momentary points to the last reading, and then return to the 0 position.

★If the needle function does not work, replace the meter unit.

○Using the insulated auxiliary lead, quickly open and connect the terminal [1] to the terminal [7] repeatedly.

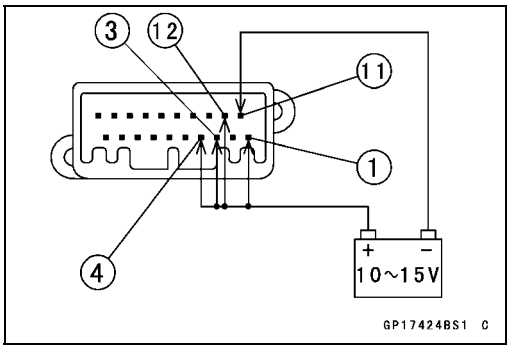
○Then the tachometer needle [A] should flick [B].

★If the needle does not flick, replace the meter unit.

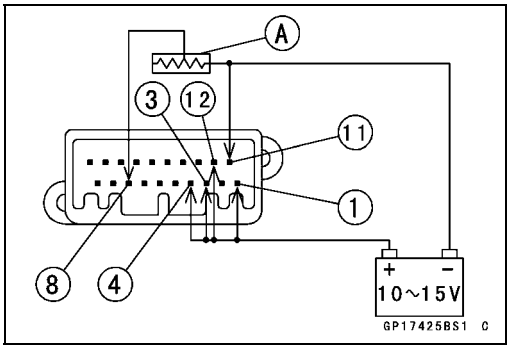


## Meter, Gauge, Indicator Unit

### Stop Watch Check




- Connect the 12 V battery and terminal in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- Press the MODE button each time to set the stop watch mode.
- Connect the insulated auxiliary lead processed insulation to the terminal [3] as shown in the figure, then stop watch start to count.
- While count the stop watch, connect the auxiliary lead to the terminal [4] as shown in the figure, then indicate the counted lap time during 10 seconds.




- Connect the variable rheostat [A] to the terminal [8] as shown in the figure.
- When adjusting the resistance to less than 21.1Ω, lap display segment indicate the water temperature (HI segments).

○The HI segment is flashing.

★If the display function does not work, replace the meter unit.

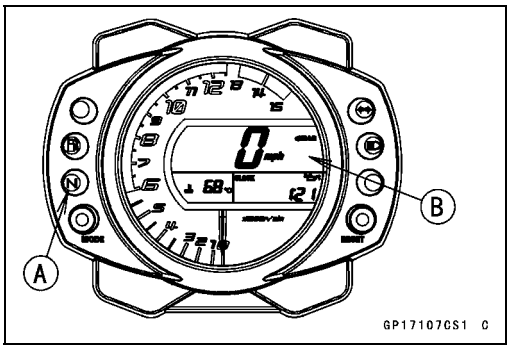
### Gear Position Indication Inspection

**NOTE**

○*The gear position is indicated by the data sent from the ECU.*

○*Be sure the ECU communication line is normal (see ECU Communication Line Inspection in the Fuel System (DFI) chapter).*

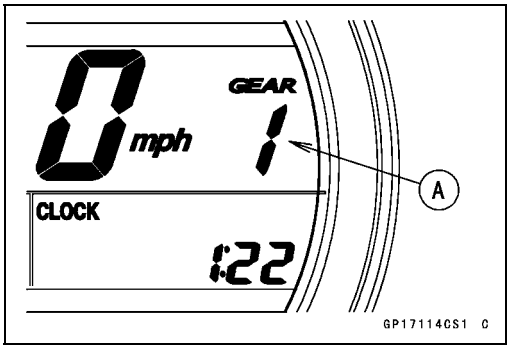
○*Inspect with the meter unit installed on the motorcycle.*




- Set the gear position in the neutral position.
- Turn the ignition switch ON.

○The neutral indicator light (LED) [A] should go on.

○The gear position [B] does not appear in the display.




- Set the gear position in the 1st position.

○The 1 segments [A] should appear in the display.

○The neutral indicator light (LED) goes off.

- Raise the rear wheel off the ground with the stand.
- Start the engine and change the gear position from 2nd to 6th in numerical order (2nd → 3rd → 4th → 5th → 6th).

○Check that the display corresponding to each gear position appears.

- Turn the ignition switch OFF

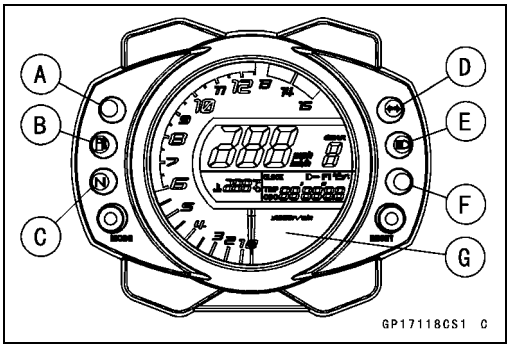
★If the display function does not work, inspect the gear position switch (see Gear Position Switch Inspection) and wiring.

★If the gear position switch and wiring are normal, replace the meter unit.

## Meter, Gauge, Indicator Unit

### Lights (LED) Inspection

Shift Up Indicator Light (LED) [A]
Fuel Level Warning Indicator Light (LED) [B]
Neutral Indicator Light (LED) [C]
Turn Signal Indicator Light (LED) [D]
High Beam Indicator Light (LED) [E]
Warning Indicator Light (LED) [F]
Illumination Light (LED) [G]




### Illumination Light (LED)

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check.”

○When the terminals are connected, the illumination light (LED) should go on.

★If the illumination light (LED) does not go on, replace the meter unit.

- Check whether the level of the illumination light (LED) can be adjusted in 4 levels by pushing the RESET button each time.

★If the light level does not changes, replace the meter unit.

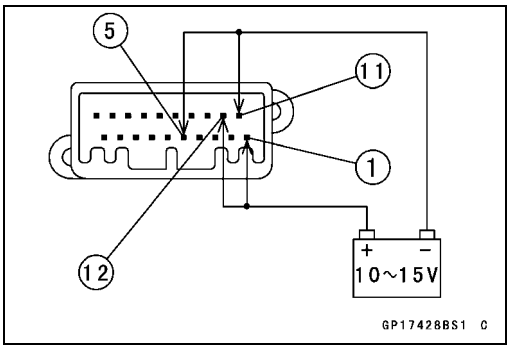
### Neutral Indicator Light (LED)

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check.”
- Using the insulated auxiliary lead, 12 V battery to the meter unit connector as follows.

○Connect the battery negative (–) terminal to the terminal [5].

○When the terminals are connected, the neutral indicator light (LED) should go on.

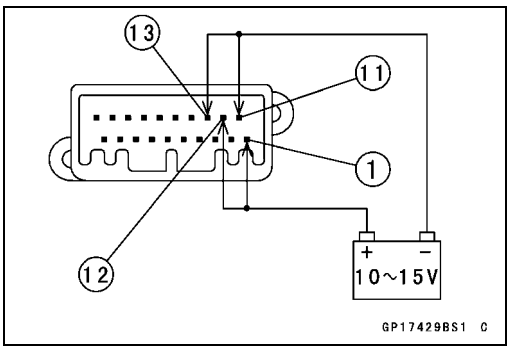
★If the neutral indicator light (LED) does not go on, replace the meter unit.




### Warning Indicator Light (LED) (Oil Pressure Warning)

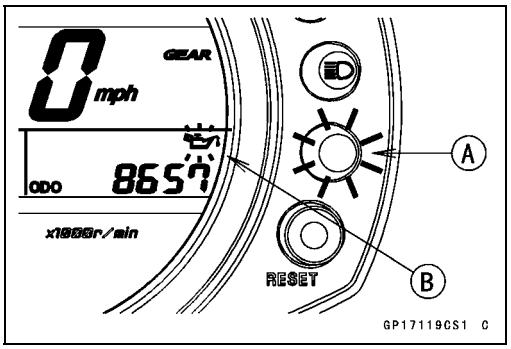
- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check.”
- Using the insulated auxiliary lead, 12 V battery to the meter unit connector as follows.

○Connect the battery negative (–) terminal to the terminal [13].

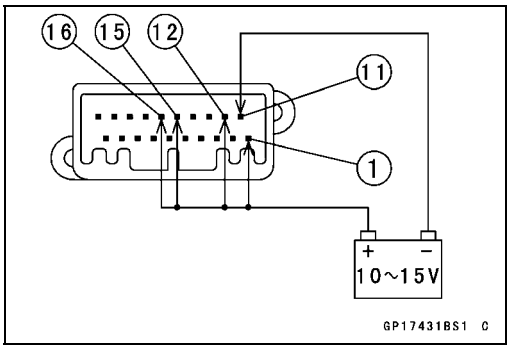


## Meter, Gauge, Indicator Unit

○When the terminals are connected, the warning indicator light (LED) [A] blinks and the oil pressure warning symbol [B] appears in the display.
○The oil pressure warning symbol is blinking.
★If the warning indicator light (LED) does not blink and/or oil pressure warning symbol does not appear, replace the meter unit.

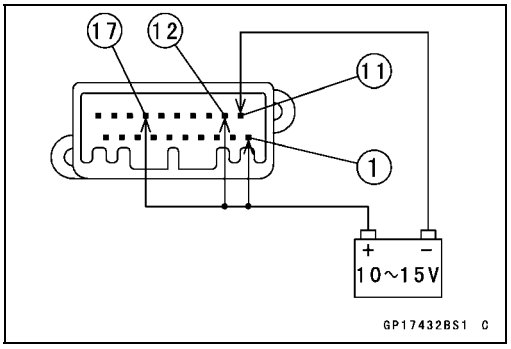



**Left and Right Turn Signal Indicator Light (LED)**
● Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check.”
● Using the insulated auxiliary leads, 12 V battery to the meter unit connector as follows.
○Connect the battery positive (+) terminal to the terminal [15].
○Connect the battery positive (+) terminal to the terminal [16].




○When the terminals are connected, the turn signal indicator light (LED) should go on.
★If the turn signal indicator light (LED) does not go on, replace the meter unit.

**High Beam Indicator Light (LED)**
● Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check.”
● Using the insulated auxiliary lead, 12 V battery to the meter unit connector as follows.
○Connect the battery positive (+) terminal to the terminal [17].

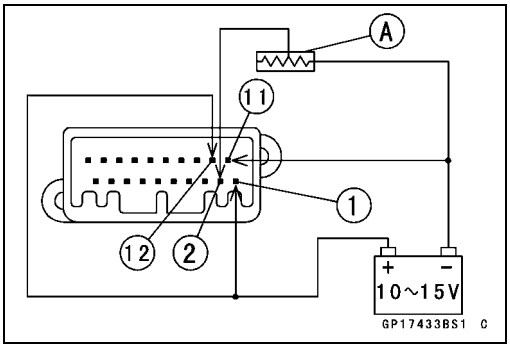



○When the terminals are connected, the high beam indicator light (LED) should go on.
★If the turn signal high beam indicator light (LED) does not go on, replace the meter unit.

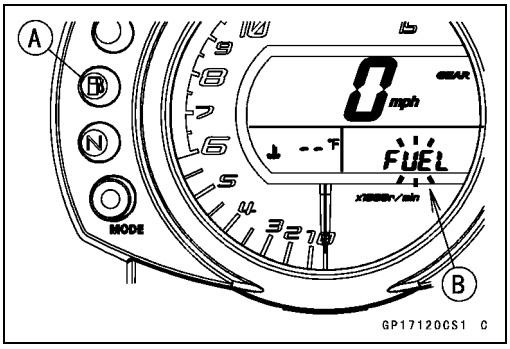
**Fuel Level Warning Indicator Light (LED)**
● Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check.”
○When the terminals are connected, the fuel level warning indicator light (LED) should go on for 3 seconds.
★If the fuel level warning indicator light (LED) does not go on, replace the meter unit.

## Meter, Gauge, Indicator Unit

- Connect the variable rheostat [A] to the terminal [2] as shown in the figure.
- Adjust the resistance value to the approximately 20 Ω.




○When the terminals are connected, the fuel level warning indicator light (LED) [A] should go on and the FUEL segments [B] appears in the display.
○The FUEL segments is flashing.
★If the fuel level warning indicator light (LED) does not go on and/or the FUEL segments does not appear, replace the meter unit.

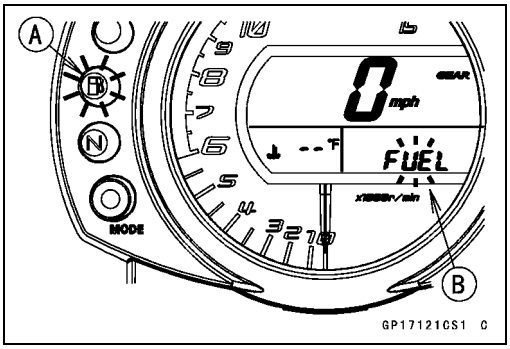



- Adjust the resistance value to the approximately 100 Ω.

○The fuel level warning indicator light (LED) goes off and the FUEL segments disappears from the display.
★If the fuel level warning indicator light (LED) does not go off and/or the FUEL segments does not disappear, replace the meter unit.

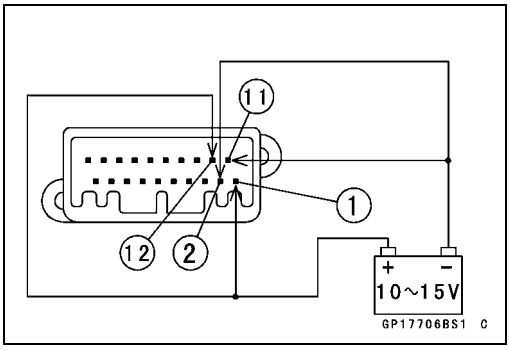
- Disconnect the terminal [2].

○About 5 seconds after, the fuel level warning indicator light (LED) [A] blinks and the FUEL segments [B] appears in the display.
○The FUEL segments is flashing.
★If the fuel level warning indicator light (LED) does not blink and/or the FUEL segments does not appear, replace the meter unit.




- Connect the battery negative (–) terminal to the terminal [2].

○When the terminal is connected, the fuel level warning indicator light (LED) blinks and the FUEL segments flashes on the display.
★If the fuel level warning indicator light (LED) does not blink and/or the FUEL segments does not displayed, replace the meter unit.

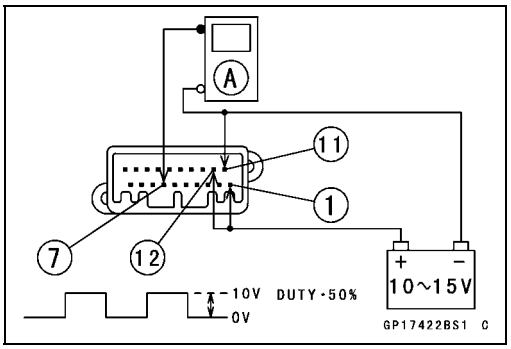


## Meter, Gauge, Indicator Unit

**Shift Up Indicator Light (LED)**

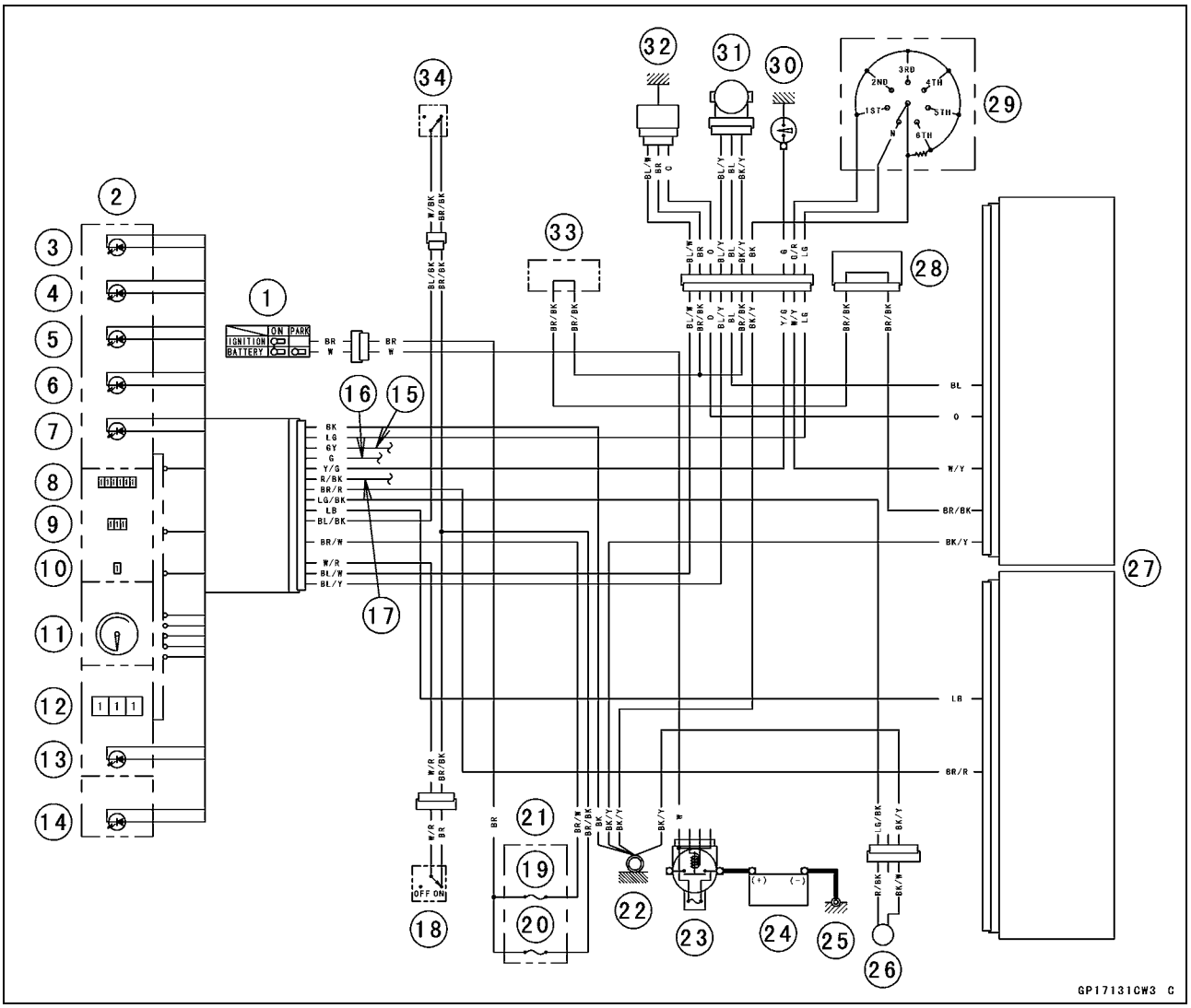
- Connect the 12 V battery and terminal in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- The revolutions per minute (rpm) equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown) would be input into the terminal [7].
- When set the oscillator more than 446 Hz, shift up indicator light (LED) go on.

★If the shift up indicator light (LED) does not go on, replace the meter unit.



## Meter, Gauge, Indicator Unit

### Meter Unit Circuit




1. Ignition Switch
2. Meter Unit
3. Turn Signal Indicator Light (LED)
4. High Beam Indicator Light (LED)
5. Neutral Indicator Light (LED)
6. Fuel Level Warning Indicator Light (LED)
7. Warning Indicator Light (LED)
8. Odometer/Trip Meter/Clock/Stop Watch
9. Water Temperature Meter
10. Gear Position Indicator
11. Tachometer
12. Speedometer
13. Illumination Light (LED)
14. Shift Up Indicator Light (LED)
15. Turn Signal Switch (Right)
16. Turn Signal Switch (Left)
17. Dimmer Switch (High Beam)
18. Lap Time Button
19. Ignition Fuse 15 A
20. Horn Fuse 10 A
21. Fuse Box
22. Frame Ground 1
23. Main Fuse 30 A
24. Battery 12 V 10 Ah
25. Engine Ground
26. Fuel Reserve Switch
27. ECU
28. Joint Connector 4
29. Gear Position Switch
30. Oil Pressure Switch
31. Speed Sensor
32. Water Temperature Sensor
33. Joint Connector 3
34. Stop Watch Button

## Immobilizer System (Equipped Models)

This motorcycle is equipped with an immobilizer system to protect the motorcycle from theft. This system provides a theft proof device by means of matching a code between the inbuilt key transponder and ECU. If the code does not match, ignition system, injectors, sub-throttle valve actuator and exhaust butterfly valve actuator will not operate and the engine will not start.

**Abstract**

- Do not keep more than one immobilizer key of any system on a key ring. Jamming of the key code signal may occur and the operation of the system may be affected.
- The warning indicator light (LED) will flash for a period of 24 hours once the ignition switch has been switched off and the key removed. This flashing can be set to on or off as desired by holding the MODE and RESET buttons down for 2 seconds within 20 seconds of switching the ignition off.
- If all coded keys (master key and user keys) are lost the ECU and ignition switch will have to be replaced.
- The immobilizer system can not function until the master key code is registered in the ECU.
- A total of six keys can be registered in the ECU at any one time (one master key and five user keys).
- If the master key is lost it is not possible to register new user keys.

### *Operational Cautions*

1. Do not put two keys of any immobilizer system on the same key ring.
2. Do not submerge any key in water.
3. Do not expose any key to excessively high temperature.
4. Do not place any key close to magnet.
5. Do not place a heavy item on any key.
6. Do not grind any key or alter its shape.
7. Do not disassemble the plastic part of any key.
8. Do not drop the key and/or apply any shocks to the key.
9. When a user key is lost, the user should go to his dealer to invalidate the lost key registration in the ECU.
10. When the master key is lost, the user should go to his dealer and have a new ECU installed and register a new master key and user keys.

**NOTE**

○*No.9 and 10 are strongly recommended to the customer to ensure security of the motorcycle.*

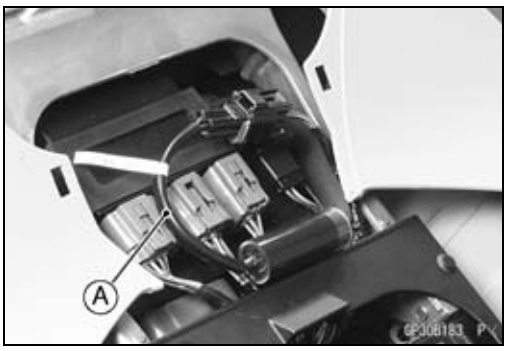
### *Key Registration*

**Case 1: When the user key has been lost or additional spare user key is required.**

- Prepare a new spare user key.
- Cut the key in accordance with the shape of the current user key.
- Remove the center seat cover (see Seat Cover Removal in the Frame).
- Disconnect the immobilizer/Kawasaki diagnostic system connector [A].


- Connect the key registration unit [A].

**Special Tool - Key Registration Unit: 57001-1582**

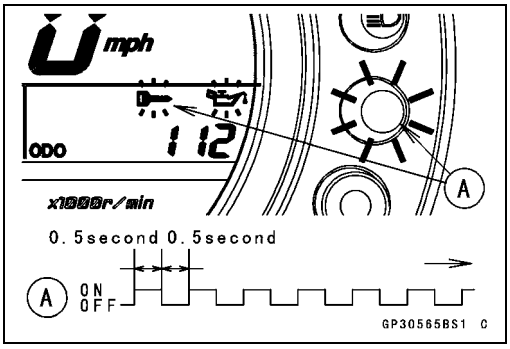


## Immobilizer System (Equipped Models)

● Insert the master key to the ignition switch and turn it ON.

**Verified**

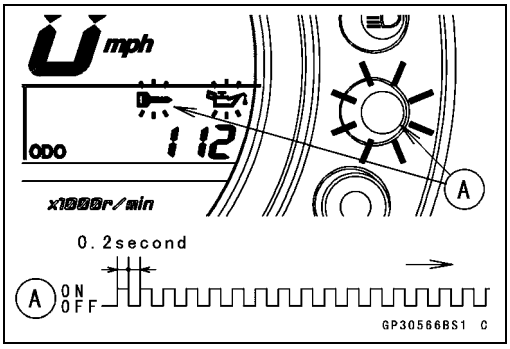
○The warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the registration mode (go to the next step).



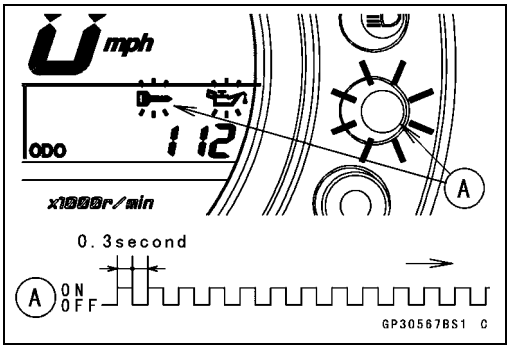

**Not Verified**

○The warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error (refer to the following failure illustrations).

Immobilizer Amplifier Failure

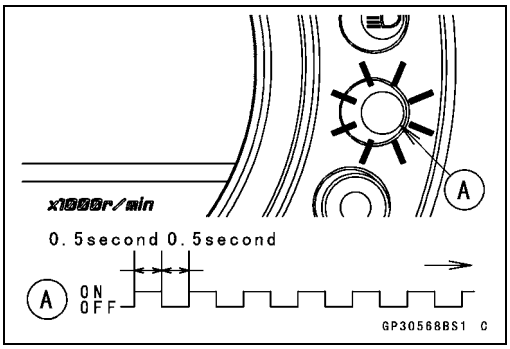



Master Key Collation Error




● Turn the master key OFF and remove the master key.

○The warning indicator light (LED) [A] blinks continuously to display that the ECU is in the registration mode for 15 seconds.




**NOTE**

○*Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the warning indicator light (LED) stops flashing.*

○*To return to the registration mode start the master key verification procedure. This applies to all user key registration.*

● Insert the user key 1 to the ignition switch and turn it ON.

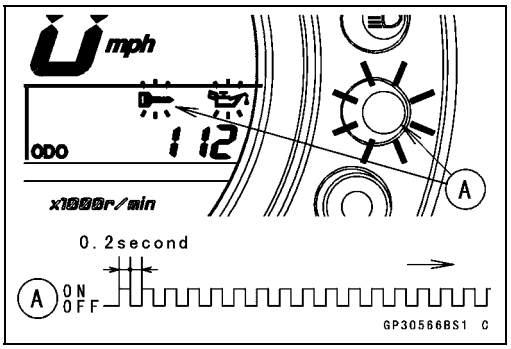
**NOTE**

○*Keep the other user key away from the immobilizer antenna.*

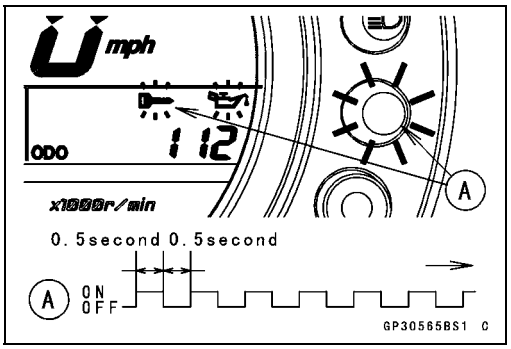
## Immobilizer System (Equipped Models)

○If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.

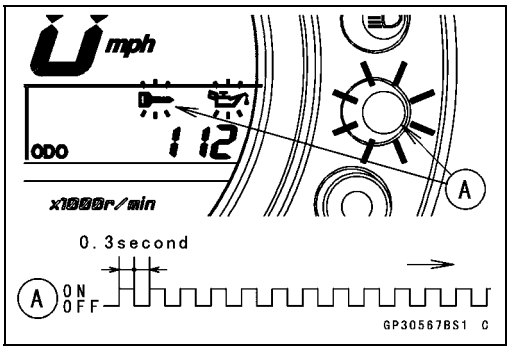
Immobilizer Amplifier Failure




When Registered User Key is Inserted.

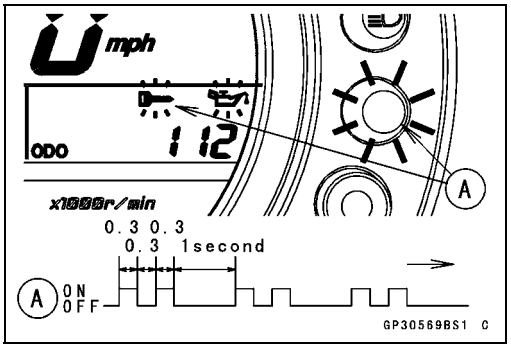



User Key Collation Error




● The user key 1 is successfully registered in the ECU.

○The warning indicator light (LED) and immobilizer warning symbol [A] blinks 2 times and stops for 1 second and then repeats this cycle.




● Turn the user key 1 OFF and remove the user key 1.

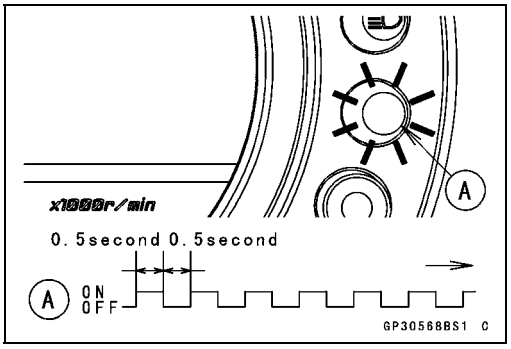
○The warning indicator light (LED) [A] blinks to display the registration mode.

**NOTE**

○*Turn off the ignition switch and wait for the period of 15 seconds or more. The registration mode automatically finishes and the warning indicator light (LED) will switch off.*

○*This procedure registered the master key and one user key.*

○*Continue with the procedure to register the second and later keys before the 15 seconds period has elapsed.*

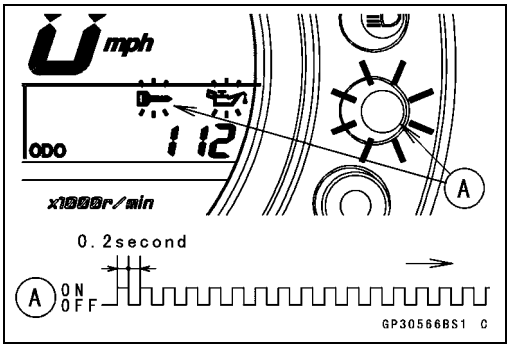



● Insert the user key 2 to the ignition switch and turn it ON.

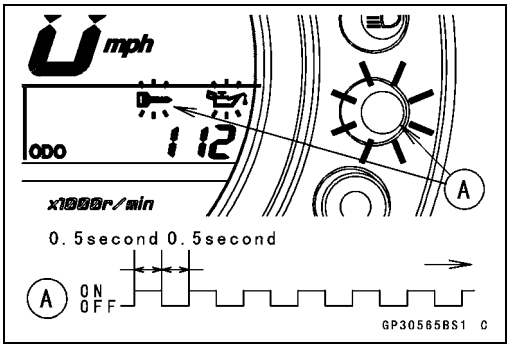
## Immobilizer System (Equipped Models)

○If there is any problem in the registration, the warning indicator light and immobilizer warning symbol [A] blinks to display the collation error.

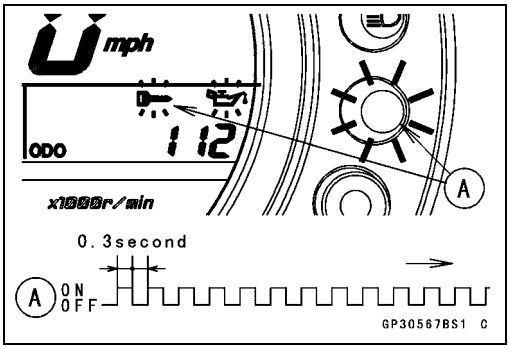
Immobilizer Amplifier Failure




When Registered User Key is Inserted.




User Key Collation Error

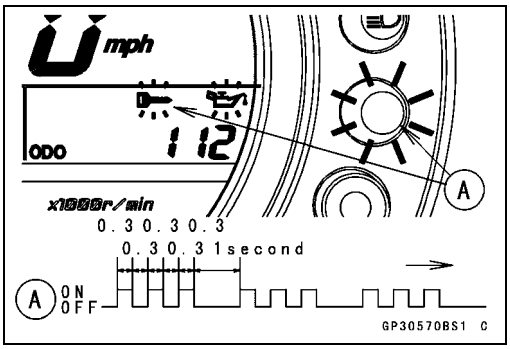



● The user key 2 is registered in the ECU.

○The warning indicator light (LED) and immobilizer warning symbol [A] blinks 3 times and stops for 1 second and then repeats this cycle.

○This procedure has registered the master key and 2 user keys.

● Continue with the procedure to register an additional 3 user keys.




**NOTE**

○*The ECU can store up the six key codes (master key × 1 and user key × 5).*

**User Key Indicator Light and Symbol Flashes**

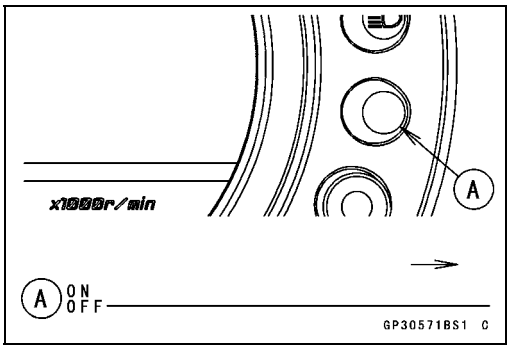
| | Indicator Light and Symbol Blinks | Indicator Light and Symbol Stop | Remarks |
|---|---|---|---|
| **User Key 3** | 4 times | 1 seconds | Repeat |
| **User Key 4** | 5 times | 1 seconds | Repeat |
| **User Key 5** | 6 times | 1 seconds | Repeat |

● Turn OFF the ignition switch and wait for period of more than 15 seconds.

● The registration mode automatically ends.

## Immobilizer System (Equipped Models)

● The warning indicator light (LED) goes off [A].



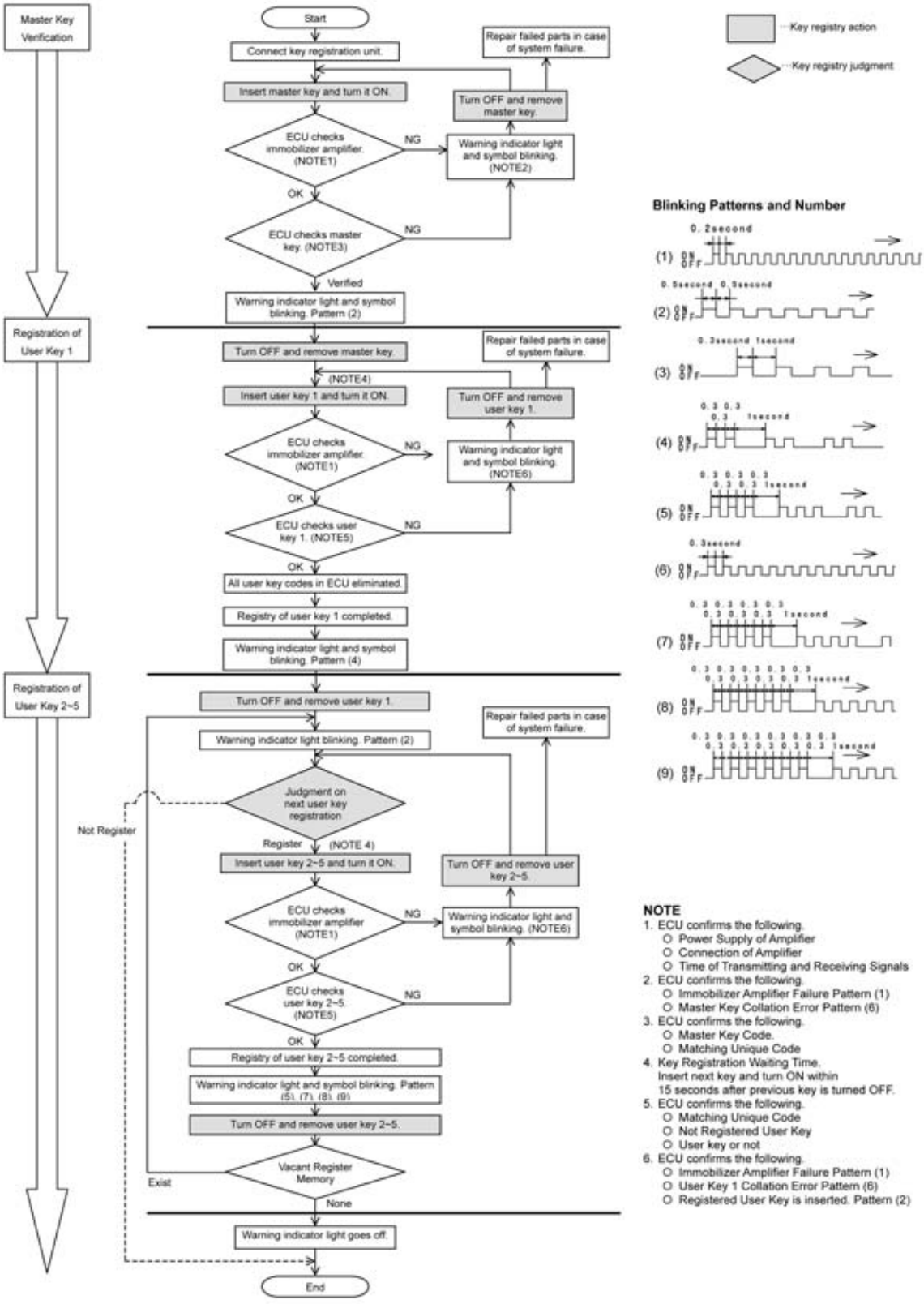

● Remove the key registration unit and connect the immobilizer/Kawasaki diagnostic system connector.

**NOTE**

○*Turn the ignition switch ON with the registered user key.*
○*Check that the engine can be started using all registered user keys.*

## Immobilizer System (Equipped Models)

### Spare User Key Registration Flow Chart




**NOTE**

1. ECU confirms the following.
   - O Power Supply of Amplifier
   - O Connection of Amplifier
   - O Time of Transmitting and Receiving Signals
2. ECU confirms the following.
   - O Immobilizer Amplifier Failure Pattern (1)
   - O Master Key Collation Error Pattern (6)
3. ECU confirms the following.
   - O Master Key Code.
   - O Matching Unique Code
4. Key Registration Waiting Time.
   Insert next key and turn ON within 15 seconds after previous key is turned OFF.
5. ECU confirms the following.
   - O Matching Unique Code
   - O Not Registered User Key
   - O User key or not
6. ECU confirms the following.
   - O Immobilizer Amplifier Failure Pattern (1)
   - O User Key 1 Collation Error Pattern (6)
   - O Registered User Key is inserted. Pattern (2)

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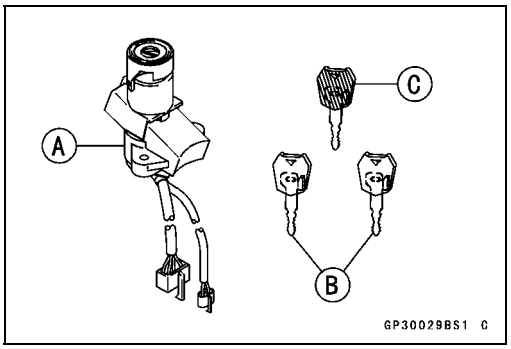
## Immobilizer System (Equipped Models)

**Case 2: When the ignition switch is faulty and to be replaced.**

- Prepare a new ignition switch [A] and two new user keys [B].

○These parts are available as a set. Prepare the current master key [C].

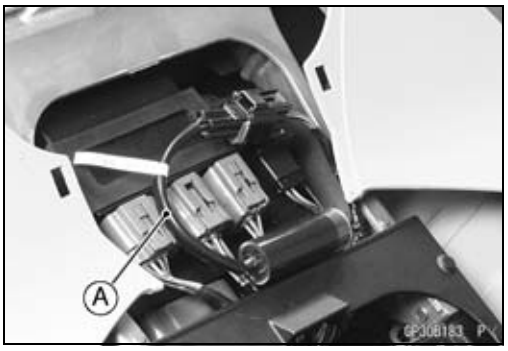



- Remove:
  Ignition Switch and Immobilizer Antenna (see Immobilizer System Parts Replacement)
  Center Seat Cover (see Seat Cover Removal in the Frame chapter)
- After removing the ignition switch and immobilizer antenna, connect the inlet air temperature sensor connector temporarily.

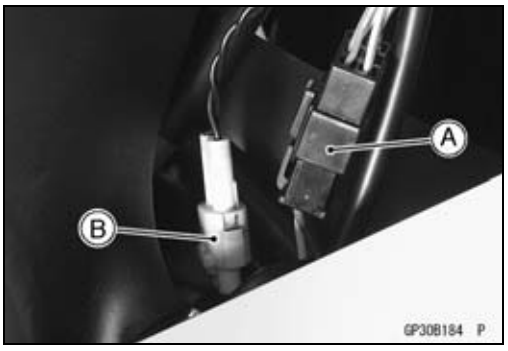

**NOTE**

○*When the ignition switch is turned ON with inlet air temperature sensor connector disconnected, the ECU detects the service code 13 (see Self-diagnosis Outline in the Fuel System (DFI) chapter).*

- Disconnect the immobilizer/Kawasaki diagnostic system connector [A].
- Connect the key registration unit [A].
  **Special Tool - Key Registration Unit: 57001-1582**




- Connect:
  New Ignition Switch Lead Connector [A]
  Immobilizer Antenna Lead Connector [B]



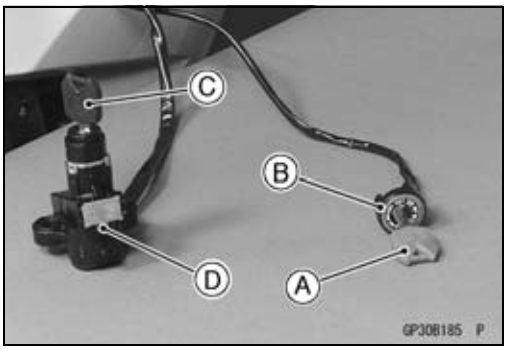
## Immobilizer System (Equipped Models)

● Put the current master key [A] at the antenna [B].

**NOTE**

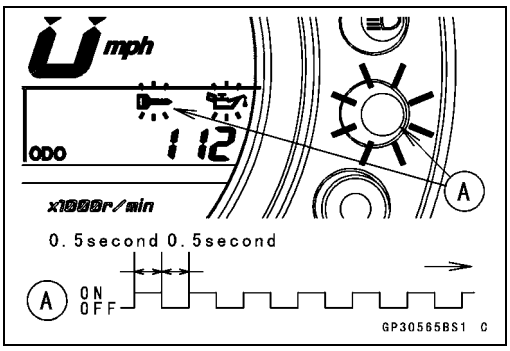
○*Keep the antenna more than 15 cm (5.9 in.) from the ignition switch.*

● Insert the new user key 1 [C] to the new ignition switch [D] and turn it ON.




**Verified**

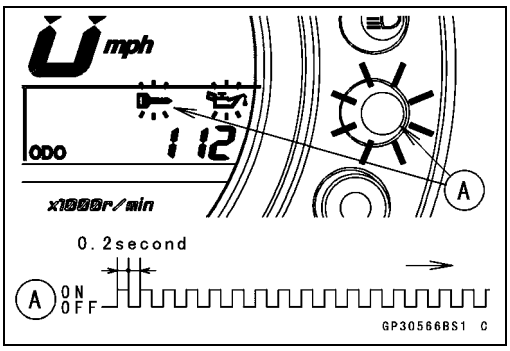
○The warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the ECU is in the registration mode (go to the next step).



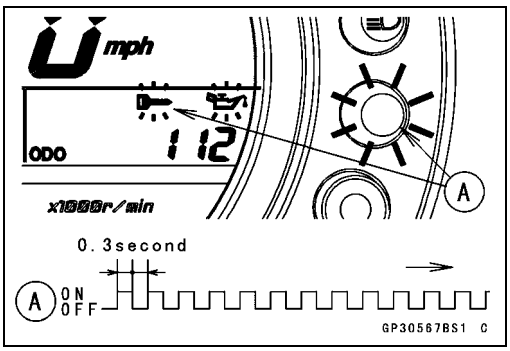

**Not Verified**

○The warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.

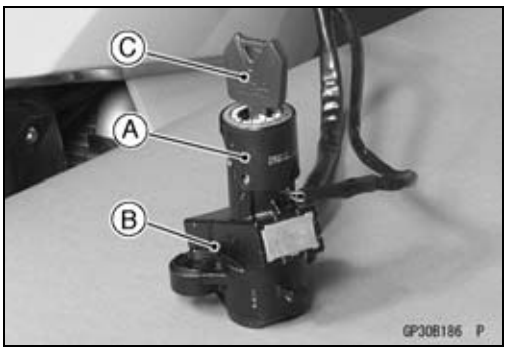
Immobilizer Amplifier Failure




Master Key Collation Error




● Turn OFF and remove the new user key 1.
● Temporarily place the antenna [A] on the new ignition switch [B].
● Insert the user key 1 [C] again into the new ignition switch and turn it ON.



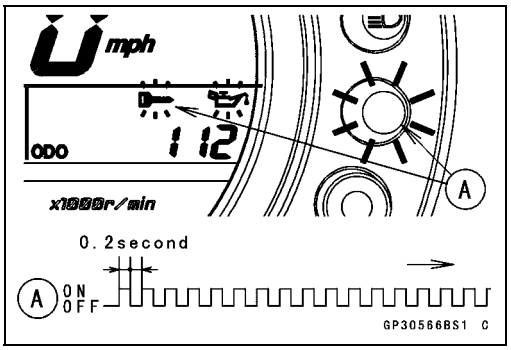
## Immobilizer System (Equipped Models)

**NOTE**

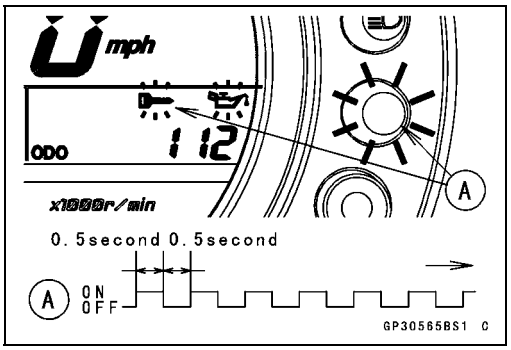
- *Place the antenna on the ignition switch, insert the next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the warning indicator light (LED) stops flashing.*
- *To return to the registration mode start the master key verification procedure. This applies to all user key registration.*
- *Keep other user keys away from the immobilizer antenna.*

- If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.

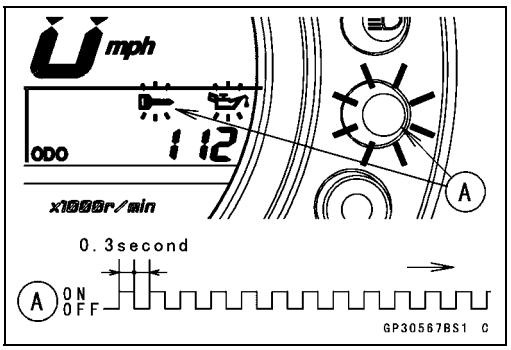
Immobilizer Amplifier Failure




When Registered User Key is Inserted.

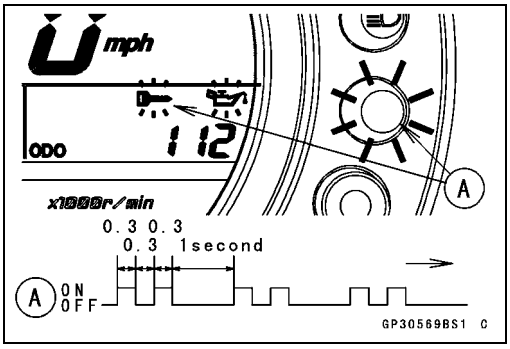



User Key Collation Error



## Immobilizer System (Equipped Models)

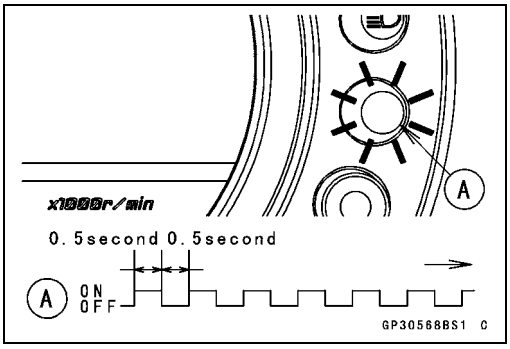
● The user key 1 is successfully registered in the ECU.
○The warning indicator light (LED) and immobilizer warning symbol [A] blinks 2 times and stops for 1 second and then repeats this cycle to indicate successful registering of user key 1.




● Turn OFF and remove user key 1.
○The warning indicator light (LED) [A] blinks to display the registration mode.

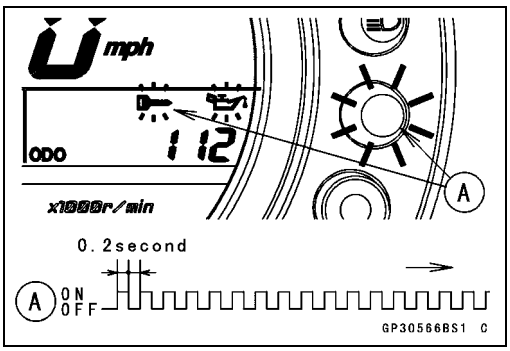
**NOTE**

○*Turn off the ignition switch and wait for the period more than 15 seconds. The registration mode automatically ends and warning indicator light (LED) goes off.*
○*This procedure has , registered the master key and one user key.*
○*Continue the procedure to program the second and later keys.*

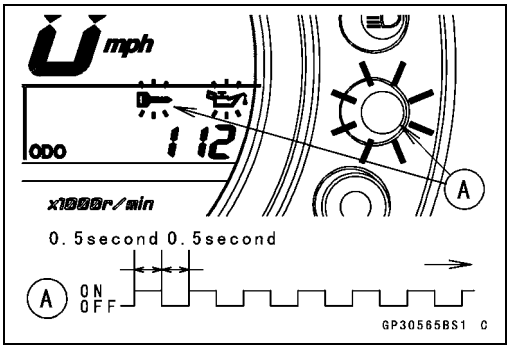



● Insert the user key 2 to the ignition switch and turn it ON.

○If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.
Immobilizer Amplifier Failure

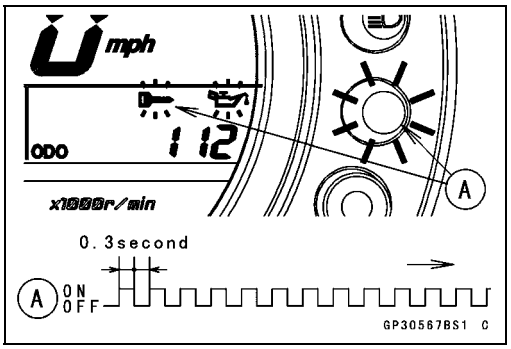



When Registered User Key is Inserted.



## Immobilizer System (Equipped Models)

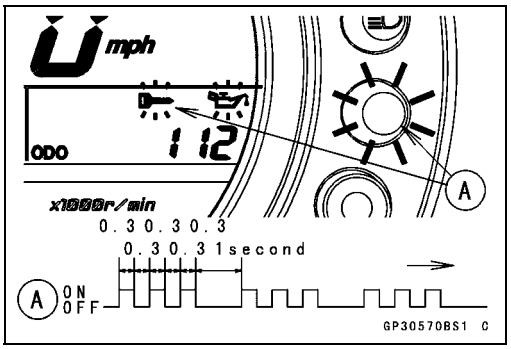
User Key Collation Error



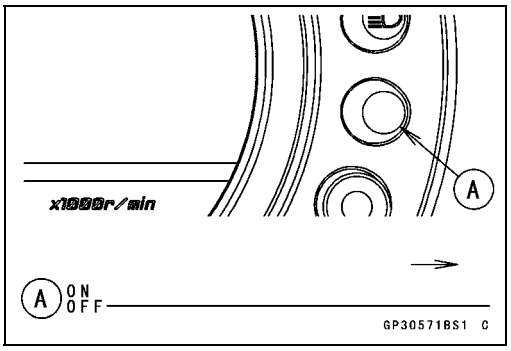

- The user key 2 is successfully registered in the ECU.

○The warning indicator light (LED) and immobilizer warning symbol [A] blinks 3 times and stops for 1 second and then repeat this cycle to indicate successful programming of user key 2.

- Turn OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.




- The warning indicator light (LED) goes off [A].




- Remove the key registration unit and connect the immobilizer/Kawasaki diagnostic system connector.

**NOTE**

○*Turn the ignition switch ON with the registered user key.*

○*Check that the engine can be started using all registered user keys.*

- Install the new ignition switch and antenna (see Immobilizer System Parts Replacement).

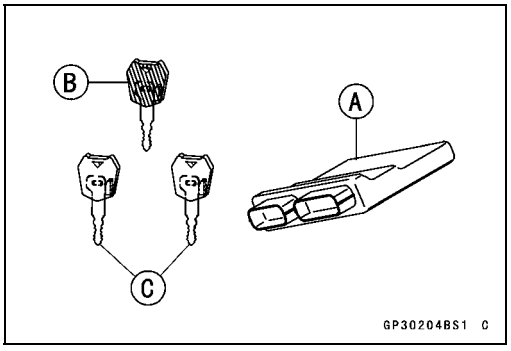
**Case 3: When the ECU is faulty and has to be replaced.**

- Prepare a new ECU [A], current master key [B] and current user keys [C].

**NOTE**

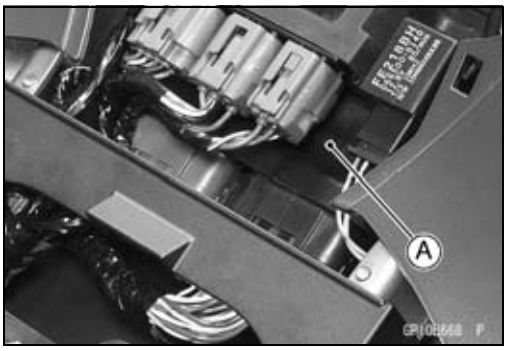
○*The key registration unit is not required.*

○*After replacing the ECU, make sure to register the master key and 2 user keys. If the 3 keys (master key × 1 and user key × 2) are not registered, the engine can not be started.*



## Immobilizer System (Equipped Models)

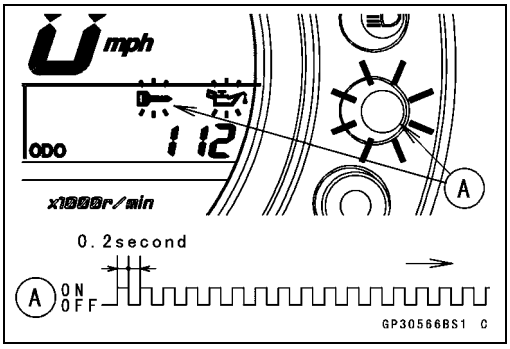
● Replace the ECU [A] (see ECU Removal/Installation in the Fuel System (DFI) chapter).



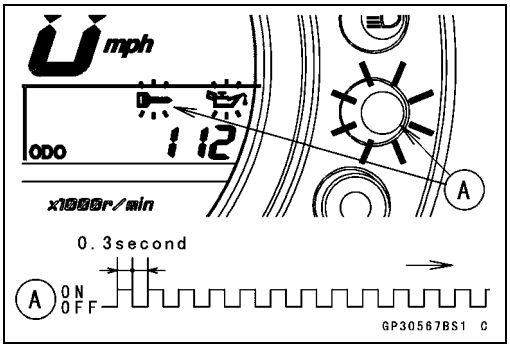

● Insert the current master key into the ignition switch and turn it ON.

○If there is any problem in the registration, the warning indicator light and immobilizer warning symbol [A] blinks to display the collation error.

Immobilizer Amplifier Failure

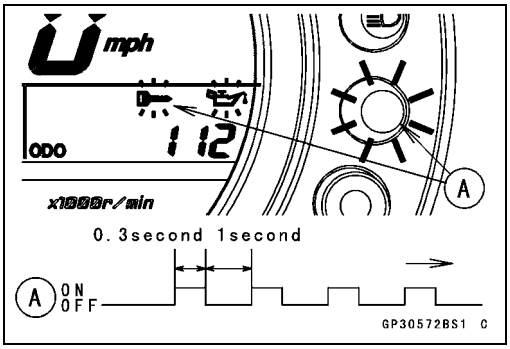



Master Key Collation Error



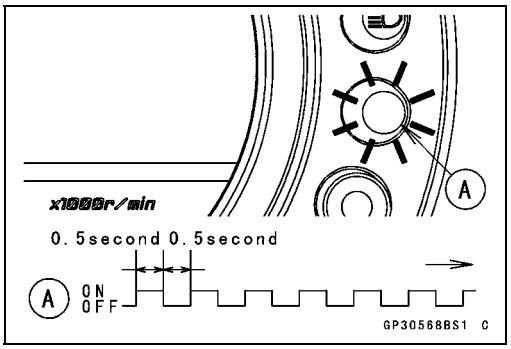

● The master key is registered in the ECU.

○The warning indicator light (LED) and immobilizer warning symbol [A] blinks 1 time and stops for 1 second and the repeats this cycle to indicate successful registration of the master key.



## Immobilizer System (Equipped Models)

● Turn OFF the master key and remove it.
○The warning indicator light (LED) [A] blinks to display the registration mode.




**NOTE**

○*Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the warning indicator light (LED) goes off.*
○*To return to the registration mode start the master key verification procedure. This applies to all user key registration.*

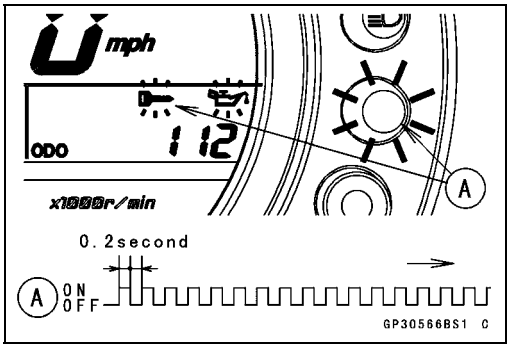
● Insert the user key 1 to the ignition switch and turn it ON.

**NOTE**

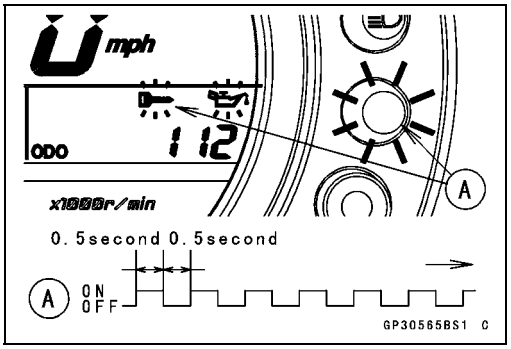
○*Keep the other user keys away from the immobilizer antenna.*

○If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error.

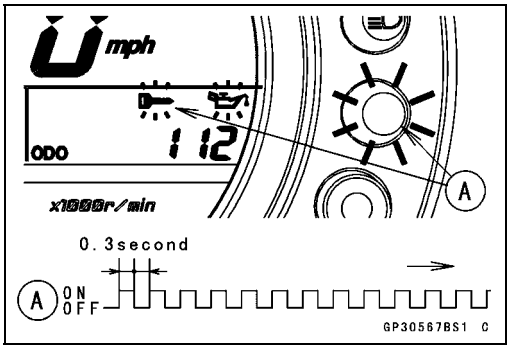
Immobilizer Amplifier Failure




When Registered User Key is Inserted.

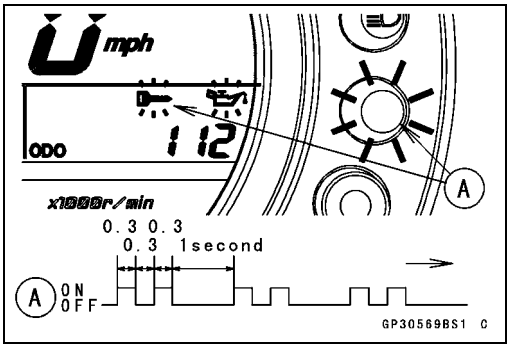



User Key Collation Error



## Immobilizer System (Equipped Models)

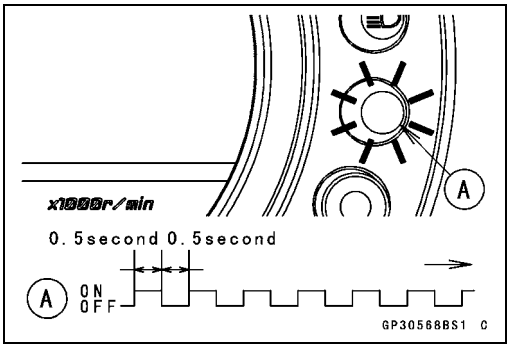
● The user key 1 is registered in the ECU.
○The warning indicator light (LED) and immobilizer warning symbol [A] blinks 2 times and stops for 1 second and then repeats this cycle to indicate successful registration of user key.




● Turn OFF and remove the user key 1.
○The warning indicator light (LED) [A] blinks to display the registration mode codes.

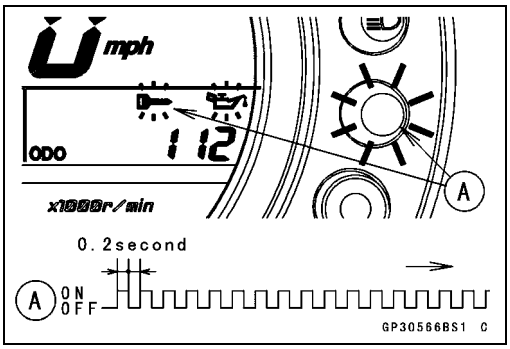
**NOTE**

○*Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the warning indicator light goes off.*
○*To return to the registration mode start the master key verification procedure. This applies to all user key registration.*

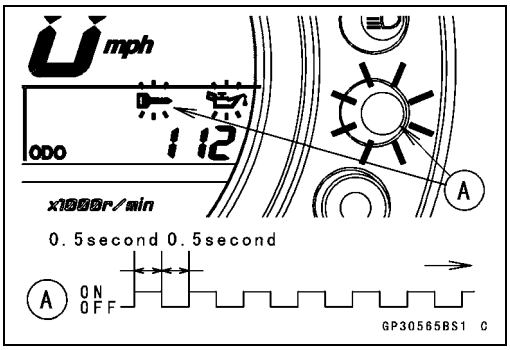



● Insert the user key 2 to the ignition switch and turn it ON.

○If there is any problem in the registration, the warning indicator light (LED) and immobilizer warning symbol [A] blinks to display the collation error code.
Immobilizer Amplifier Failure

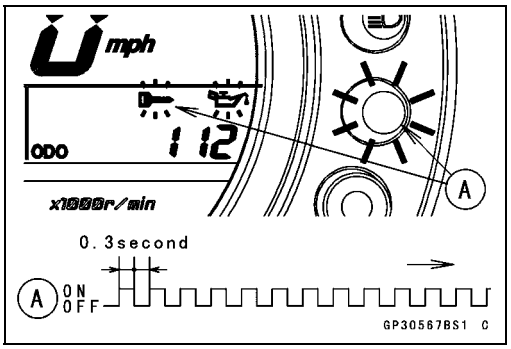



When Registered User Key is Inserted.



## Immobilizer System (Equipped Models)

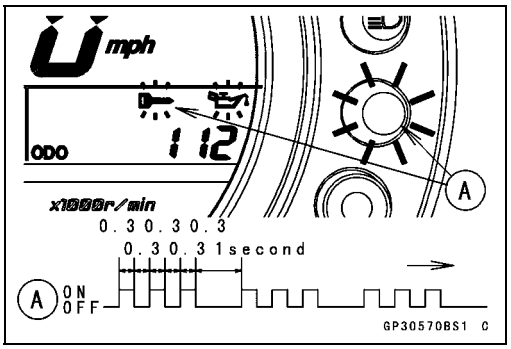
User Key Collation Error



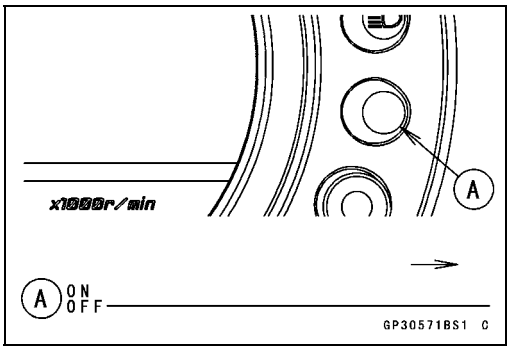

- The user key 2 is registered in the ECU.

○The warning indicator light (LED) and immobilizer warning symbol [A] blinks 3 times and stops for 1 second and then repeats this cycle to indicate successful registration of user key 2.

- Turn OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.




- The warning indicator light (LED) goes off [A].




**NOTE**

○*Turn the ignition switch ON with the registered user key.*

○*Check that the engine can be started using all registered user keys.*

**Case 4: When master key is faulty or lost.**

The master key replacement is considered very rare case. However if it is required, the following is necessary.

**NOTE**

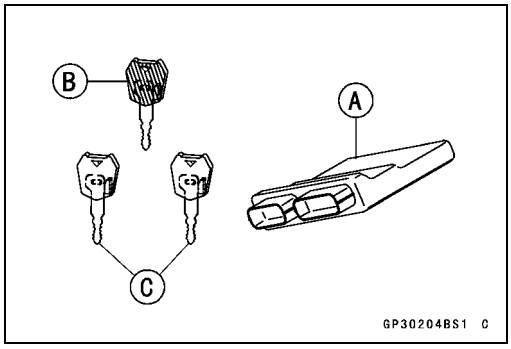
○*The ECU must be replaced with a new one because the master key code that is registered in the current ECU can not be rewritten.*

## Immobilizer System (Equipped Models)

- Prepare a new ECU [A], new master key [B] and current user keys [C].

**NOTE**

○*The key registration unit is not required.*
○*The key registration process is same as the ECU replacement (Case 3).*




**Case 5: When replacing the antenna.**

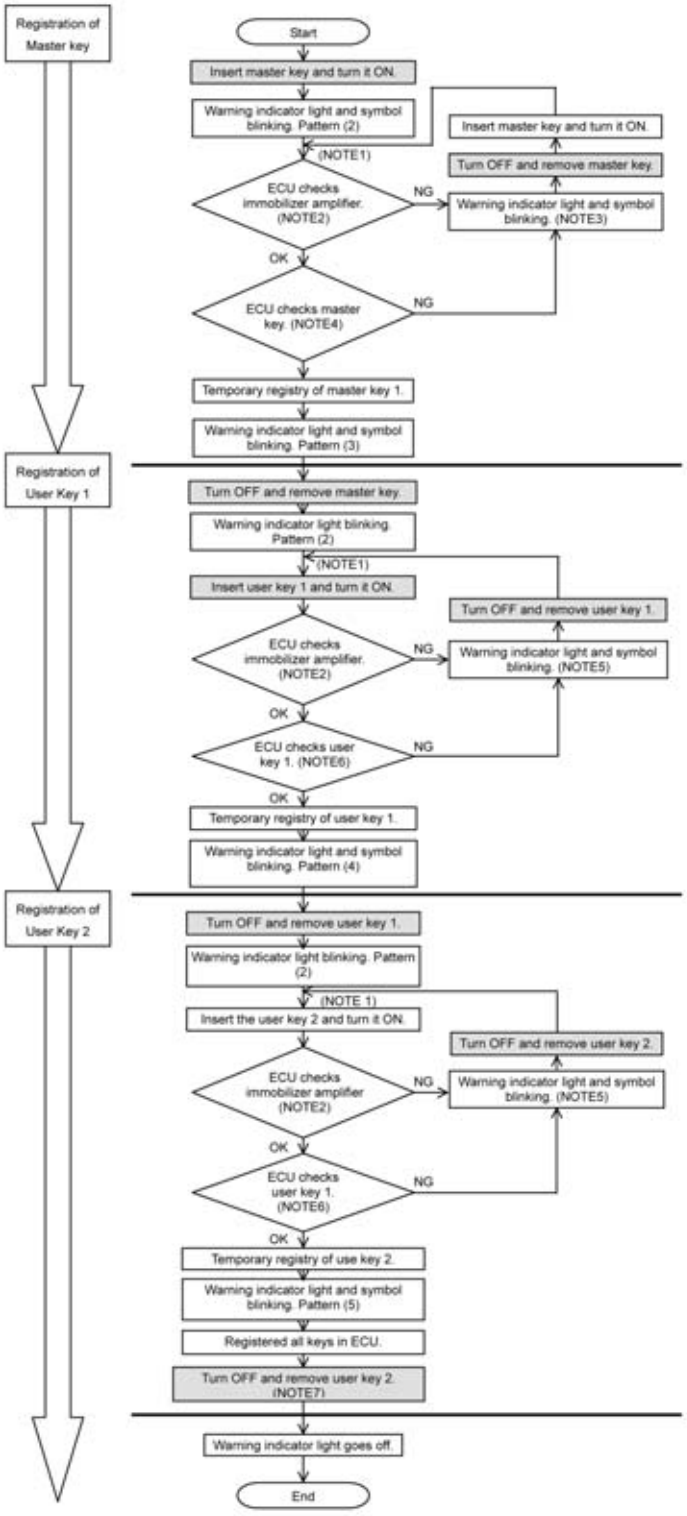
- Prepare a new antenna.
- Refer to the Immobilizer System Parts Replacement.

**NOTE**

○*The key registration is not required.*

# Immobilizer System (Equipped Models)

## All Keys Initial Registration Flow Chart




**NOTE**

1. Key Substitute Time
   Insert next key and turn ON within 15 seconds after previous key is turned OFF.
2. ECU confirms the following.
   - O Power Supply of Amplifier
   - O Connection of Amplifier
   - O Time of Transmitting and Receiving Messages.
3. ECU confirms the following.
   - O Immobilizer Amplifier Failure Pattern (1)
   - O Master Key Collation Error Pattern (6)
   - O User Key is inserted. (6)
4. ECU confirms the following.
   - O Master Key or Not
   - O Match the Unique Code
5. ECU confirms the following.
   - O Immobilizer Amplifier Failure Pattern (1)
   - O User Key 1 Collation Error Pattern (6)
   - O Registered User Key is Inserted Pattern (2)
6. ECU confirms the following.
   - O User Key or Not.
   - O Match the Unique Code
   - O Not Registered User Key
7. When the ECU-registered key is turned "OFF", ECU keeps the power "ON" for two seconds.
   And then, in two seconds after the key is "OFF", ECU turns the power "OFF".

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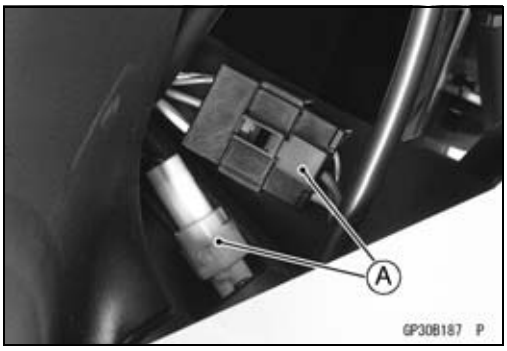
## Immobilizer System (Equipped Models)

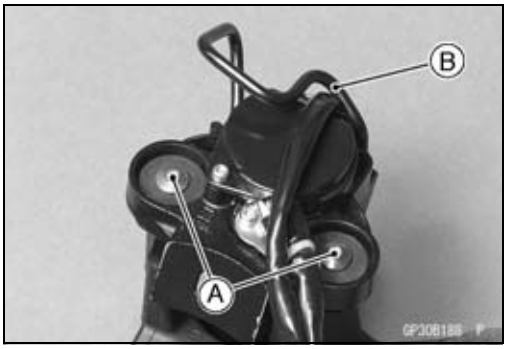
### *Immobilizer System Parts Replacement*

**Immobilizer Antenna**

- Remove the right upper inner fairing (see Upper Inner Faring Removal in the Frame chapter).
- Disconnect the lead connectors [A].

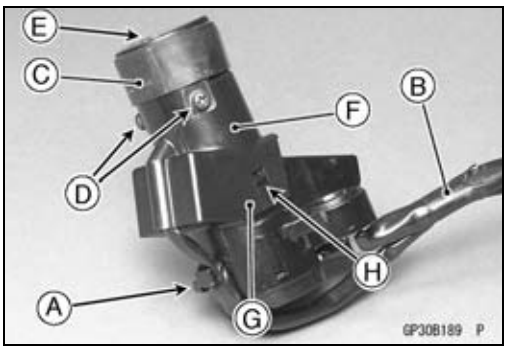



- Remove:
  Middle Air Cleaner Housing (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  Steering Stem Head (see Stem, Stem Bearing Removal in the Steering chapter)
  Handlebars (see Handlebar Removal in the Steering chapter)
- Using a small chisel or punch, turn out the Torx bolts [A].
- Remove the clamp [B].
- Pull out the ignition switch together with the immobilizer antenna from the steering stem head.



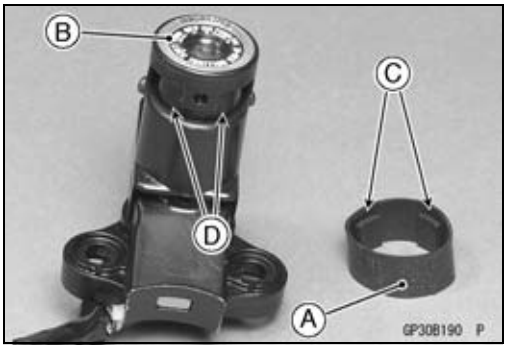

- Cut the band [A] and tape [B].
- Remove:
  Rubber Damper [C]
  Screws [D]
- Remove the antenna [E] together with the cover [F].

○Pull the lower parts [G] of the cover outside to clear the projections [H] of the ignition switch.

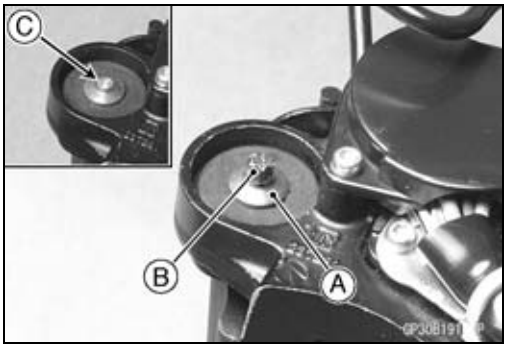



- Install the rubber damper [A] on the immobilizer antenna [B] so that the stepped side [C] of the projections faces upward.

○Fit the projections into the grooves [D].



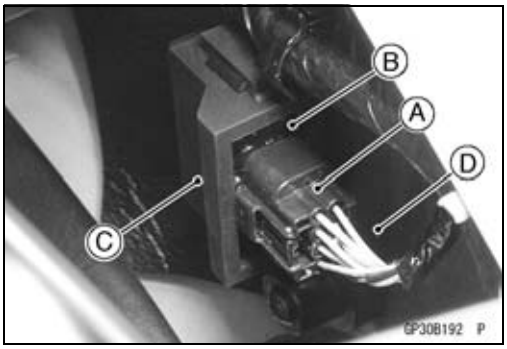

- Install the clamp.
- Tighten a new TORX bolt [A] until the bolt head [B] is broken [C].
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



## Immobilizer System (Equipped Models)

### Immobilizer Amplifier Replacement

- Remove the right upper inner fairing (see Upper Inner Fairing Removal in the Frame chapter).
- Disconnect the connector [A].
- Pull out the immobilizer amplifier [B] together with the rubber protector [C] from the bracket [D].




### ECU Replacement

- Refer to the ECU Removal/Installation in the Fuel System (DFI) chapter.

### Immobilizer Relational Parts Replacement Chart

| | | Failed or Lost Part | | | | | |
|---|---|---|---|---|---|---|---|
| | | Master Key (Red) | User Key (Black) | Ignition Switch | Antenna | Amplifier | ECU |
| | Master Key (Red) | ● | | | | | |
| | User Key (Black) | | ● | ○ | | | |
| * | Ignition Switch | | | ● | | | |
| | Antenna | | | | ● | | |
| | Amplifier | | | | | ● | |
| | ECU | ○ | | | | | ● |

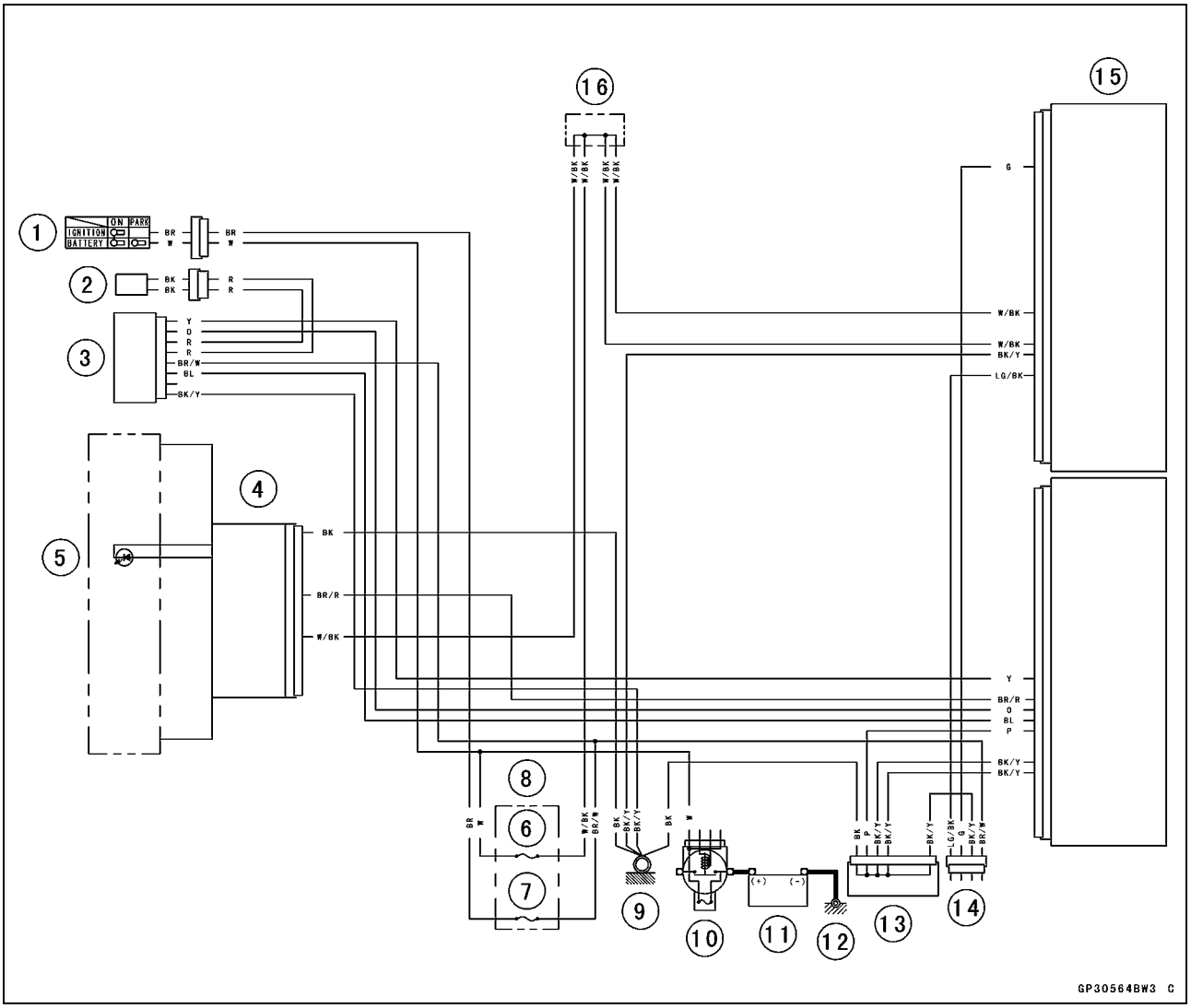
| | |
|---|---|
| * | Replacement Part |
| ● | Main Replacement Part |
| ○ | Additional Replacement Part |

### *Immobilizer System Inspection*

- Refer to the Immobilizer Amplifier and Blank Key Detection section in Fuel System (DFI) chapter.

## Immobilizer System (Equipped Models)

### Immobilizer System Circuit




1. Ignition Switch
2. Immobilizer Antenna
3. Immobilizer Amplifier
4. Meter Unit
5. Warning Indicator Light (LED)
6. ECU Fuse 10 A
7. Ignition Fuse 15 A
8. Fuse Box
9. Frame Ground 1
10. Main Fuse 30 A
11. Battery 12 V 10 Ah
12. Engine Ground
13. Water-proof Joint 1
14. Immobilizer/Kawasaki Diagnostic System Connector
15. ECU
16. Water-proof Joint 2

## 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).

**Special Tool - Hand Tester: 57001-1394**

○For the switch housings and the ignition switch, refer to the tables in the Wiring Diagram.

★If the switch has an open or short, repair it or replace it with a new one.

**Rear Brake Light Switch Connections**

| Rear Brake Light Switch Connections | | |
|---|---|---|
| Color | BR | BL |
| When brake pedal is pushed down | ○ | ○ |
| When brake pedal is released | | |

**Sidestand Switch Connections**

| Sidestand Switch Connections | | |
|---|---|---|
| Color | BK | G |
| When sidestand is down | | |
| When sidestand is up | ○ | ○ |

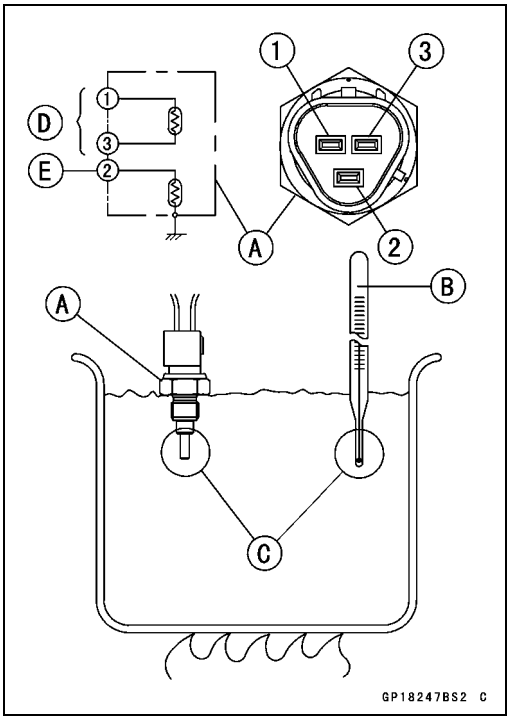
**Oil Pressure Switch Connections***

| Oil Pressure Switch Connections * | | |
|---|---|---|
| Color | SW. Terminal | Ground |
| When engine is stopped | ○ | ○ |
| When engine is running | | |

*: Engine lubrication system is in good condition.

## Switches and Sensors

### *Water Temperature Sensor Inspection*




- Remove the water temperature sensor (see Water Temperature Sensor Removal/Installation in the Fuel System (DFI) chapter).
- Suspend the sensor [A] in a container of coolant so that the threaded portion is submerged.
- Suspend an accurate thermometer [B] with temperature sensing portions [C] located in almost the same depth.

**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 coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the sensor.

**Special Tool - Hand Tester: 57001-1394**

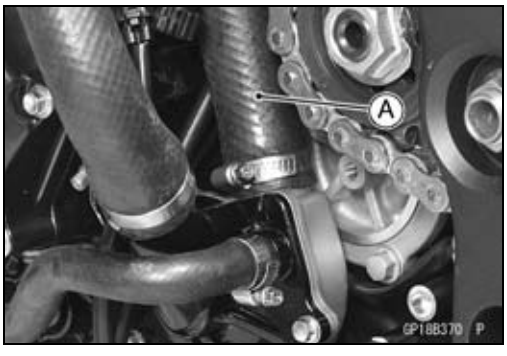
○The sensor sends electric signals to the ECU and water temperature meter in the meter unit.
○Measure the resistance across the terminals and the body (for the gauge) at the temperatures shown in the table.
★If the hand tester does not show the specified values, replace the sensor.

**Water Temperature Sensor**

| Resistance for ECU [D] | |
|---|---|
| Temperature | Resistance (kΩ)<br>(Terminal [1]-[3]) |
| 20°C (68°F) | $2.46\ ^{+0.155}_{-0.143}$ |
| 80°C (176°F) | 0.32 ±0.011 |
| 110°C (230°F) | 0.1426 ±0.0041 |

| Resistance for Water Temperature Gauge [E] | |
|---|---|
| Temperature | Resistance (Ω)<br>(Terminal [2]-Body) |
| 50°C (122°F) | 210 ±40 |
| 120°C (248°F) | 21.2 ±1.5 |

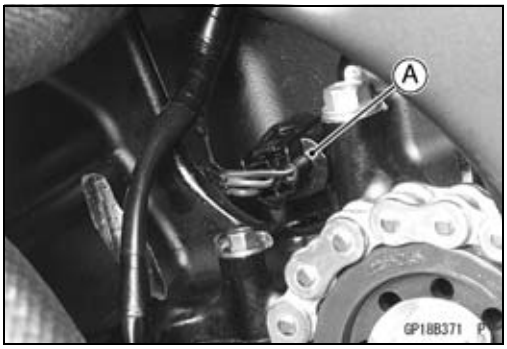
### *Speed Sensor Removal*




- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  Water Hose [A]

## Switches and Sensors

- Disconnect the connector [A].




- Remove:
  Bolt [A]
  Speed Senor [B]


### *Speed Sensor Installation*

- Apply grease to the O-ring [A].
- Set the speed sensor bolt [B].
- Tighten:

**Torque - Speed Sensor Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**

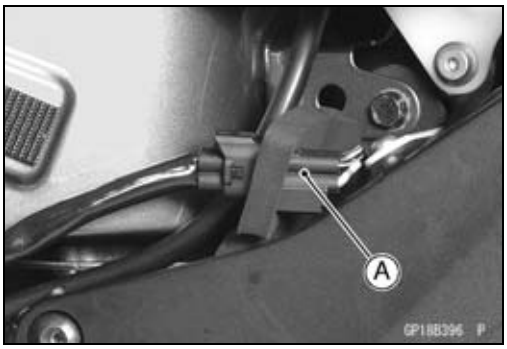
- Install the removed parts (see appropriate chapters).


### *Speed Sensor Inspection*

- Refer to the Speed Sensor Output Voltage Inspection in the Fuel System (DFI) chapter.

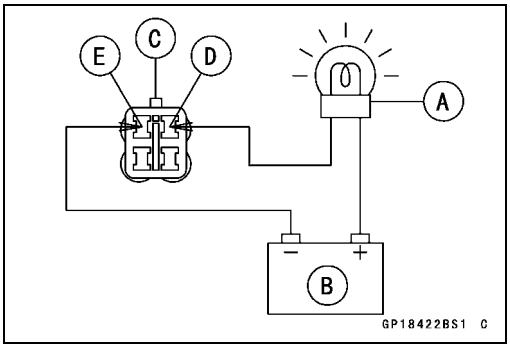
### *Fuel Reserve Switch Inspection*

- Fill the fuel tank with fuel and close the fuel tank cap.
- Remove the right side cover (see Side Cover Removal in the Frame chapter).
- Disconnect the fuel pump lead connector [A].



- Connect the test light [A] (12 V 3.4 W bulb in a socket with leads) and the 12 V battery [B] to the fuel pump lead connector [C].

**Connections:**
**Battery (+) → 12 V 3.4 W Bulb (One Side)**
**12 V 3.4 W Bulb (Other Side) → R/BK lead [D]**
**Battery (–) → BK/W lead [E]**




★If the test light turn on, the reserve switch is defective. Replace the fuel pump.

- Draw the fuel out from the fuel tank with a commercially available pump (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Connect the test light (12 V 3.4 W bulb in a socket with leads) and the 12 V battery to the fuel pump lead connector in the same way again.

**Connections:**
**Battery (+) → 12 V 3.4 W Bulb (One Side)**
**12 V 3.4 W Bulb (Other Side) → R/BK lead**
**Battery (–) → BK/W lead**

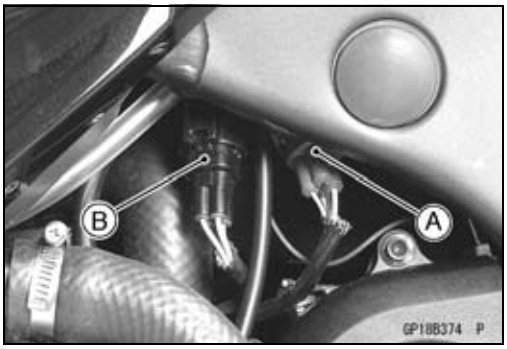
★If the test light does not light, replace the fuel pump.

**NOTE**

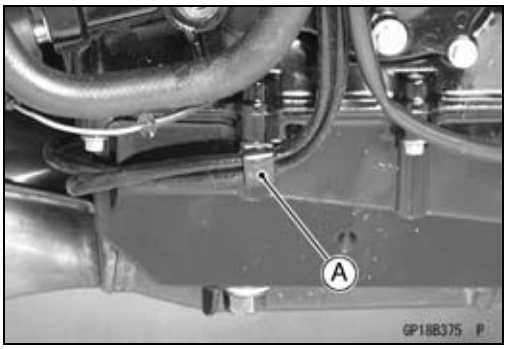
○*It may take a long time to turn on the test light in case that the fuel reserve switch is inspected just after the fuel is drawn. Leave the fuel pump lead connector with leads for inspection connected for few minutes.*

### *Oxygen Sensor Removal (Equipped Models)*

- Disconnect:
  Oxygen Sensor #1 Lead Connector (Gray) [A]
  Oxygen Sensor #2 Lead Connector (Black) [B]

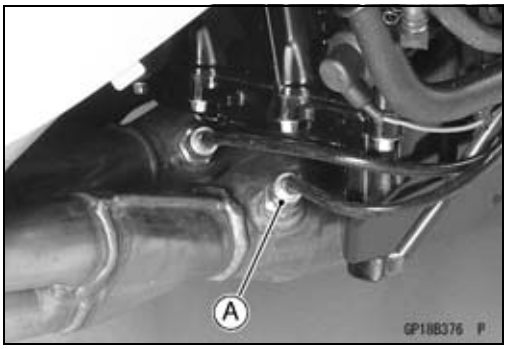



- Open the clamp [A] and free the leads.

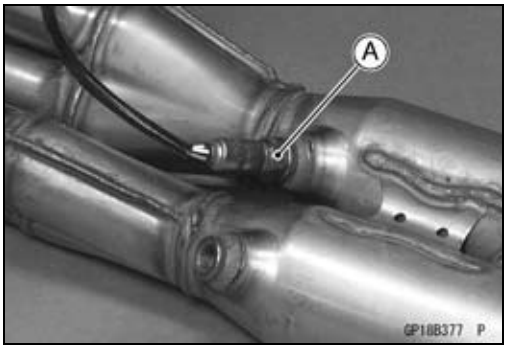


## Switches and Sensors

- Remove the oxygen sensor #1 [A].



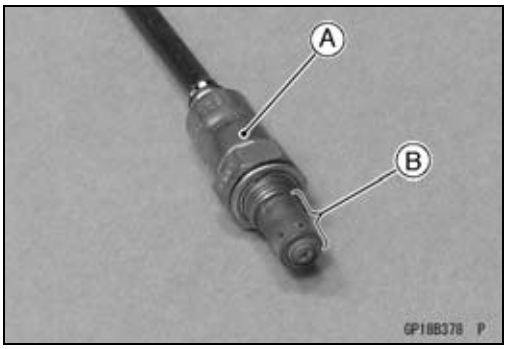

- Remove:
  Exhaust Manifold (see Exhaust Manifold Removal in the Engine Top End chapter)
  Oxygen Sensor #2 [A]




### *Oxygen Sensor Installation (Equipped Models)*

**CAUTION**

**Never drop the oxygen sensor [A], especially on a hard surface. Such a shock to the unit can damage it. Do not touch the sensing part [B] to prevent oil contact. Oil contamination from hands can reduce sensor performance.**




- Tighten:
  **Torque - Oxygen Sensors: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Run the oxygen sensor leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

### *Oxygen Sensor Inspection (Equipped Models)*

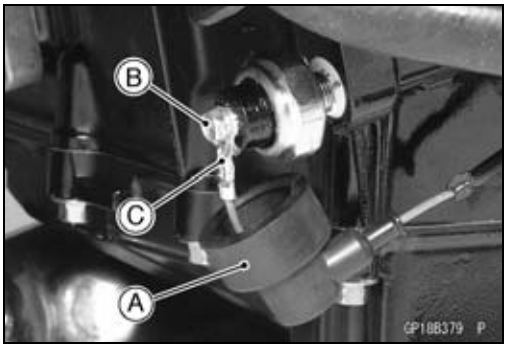
- Refer to the Oxygen Sensor #1/#2 Inspection in the Fuel System (DFI) chapter.

### *Oxygen Sensor Heater Inspection (Equipped Models)*

- Refer to the Oxygen Sensor Heater Inspection in the Fuel System (DFI) chapter.

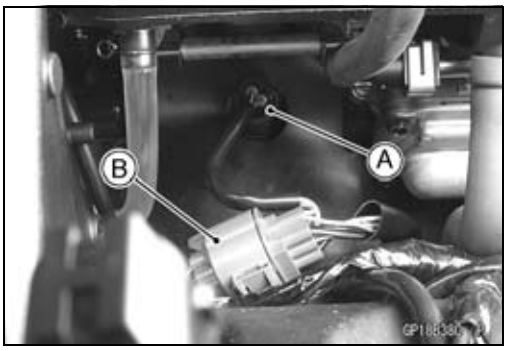
### *Gear Position Switch Removal*

- Remove:
  Lower Fairings (see Lower Fairing Removal in the Frame chapter)
  Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  Water Pump (see Water Pump Removal in the Cooling System chapter)
- Slide out the rubber boot [A].
- Loosen the oil pressure switch terminal bolt [B], and remove the switch lead [C].

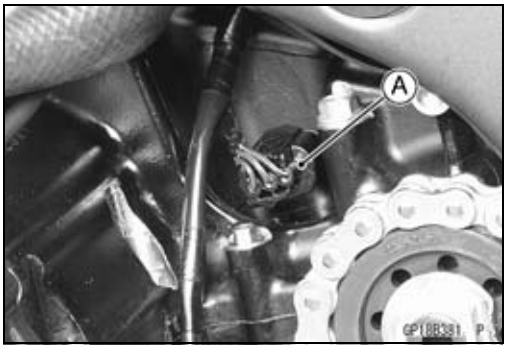


## Switches and Sensors

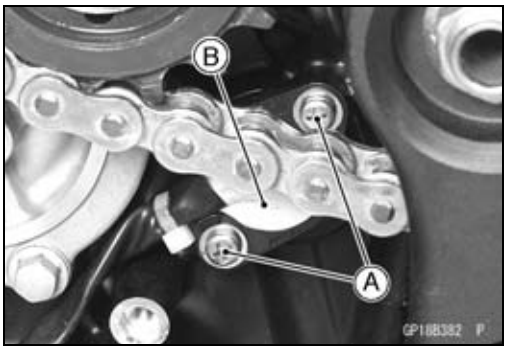
- Disconnect:
  Water Temperature Sensor Connector [A]
  Engine Subharness #1 Connector [B]




- Disconnect the speed sensor connector [A].




- Remove:
  Screws [A]
  Gear Position Switch [B]



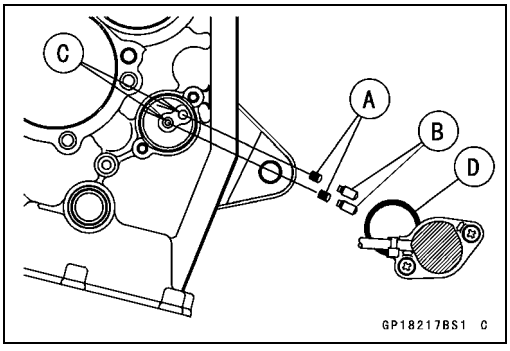

- Remove the pins [A] and springs from the shift drum.


### *Gear Position Switch Installation*

- Securely place the springs [A] and pins [B] into the holes [C] of the shift drum.
- Apply grease to the new O-ring [D].
- Apply a non-permanent locking agent to the threads of the gear position switch screws.
- Tighten:

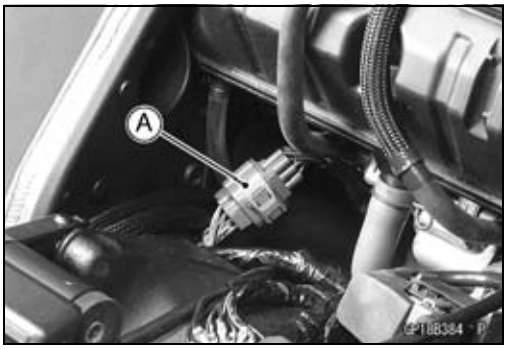
  **Torque - Gear Position Switch Screws: 3.0 N·m (0.30 kgf·m, 27 in·lb)**

- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



## Switches and Sensors

### *Gear Position Switch Inspection*




**NOTE**

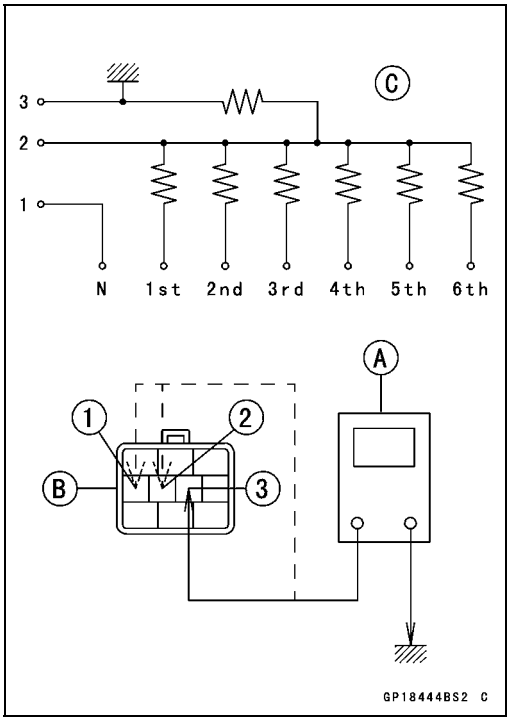
○*Be sure the transmission and external shift mechanism are good condition.*

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the engine subharness #1 connector [A].

- Set the hand tester [A] to the × 1 kΩ or × 100 Ω range and connect it to the terminals in the engine subharness #1 connector [B] and ground.

○When changing the gear position from lower gear to higher gear, raise the rear wheel off the ground with the stand and rotate the rear wheel by hand.

[C] Internal Circuit
[1] LG Lead
[2] G/R Lead
[3] BK Lead




**Special Tool - Hand Tester: 57001-1394**

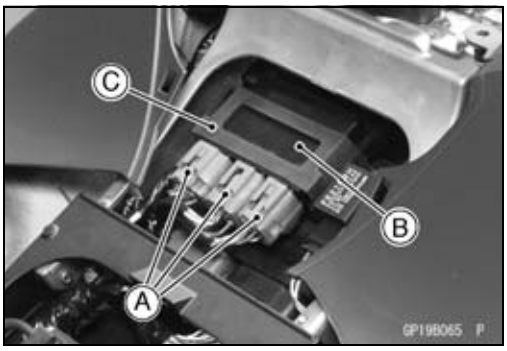
**Gear Position Switch Resistance** **(Unit: kΩ)**

| Gear Position | Connections | | |
|---|---|---|---|
| | [1]-Ground | [2]-Ground | [3]-Ground |
| Neutral | about 0 | 8.64 ~ 9.54 | about 0 |
| 1st | – | 2.22 ~ 2.46 | about 0 |
| 2nd | – | 1.42 ~ 1.58 | about 0 |
| 3rd | – | 0.954 ~ 1.055 | about 0 |
| 4th | – | 0.643 ~ 0.711 | about 0 |
| 5th | – | 0.410 ~ 0.453 | about 0 |
| 6th | – | 0.241 ~ 0.266 | about 0 |

★If the tester reading is not as specified, replace the gear position switch with a new one.

## Relay Box

### *Relay Box Removal*




- Remove the center seat cover (see Seat Cover Removal in the Frame chapter).
- Disconnect the connectors [A].
- Pull out the relay box [B] from the rubber protector [C].

**NOTE**

○*The relay box has relays and diodes. The relays and diodes can not be removed.*

### *Relay Circuit Inspection*

**NOTE**

○*The ECU main relay function is included in the ECU.*

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the relay box as shown in the figure (see Relay Box Internal Circuit).

★If the tester does not read as specified, replace the relay box.

**Relay Circuit Inspection (with the battery disconnected)**

| | Tester Connection | Tester Reading (Ω) |
|---|---|---|
| Headlight Relay | 1-3 | ∞ |
| Fuel Pump Relay | 4-5 | ∞ |
| | 6-7 | Not ∞* |
| Starter Circuit Relay | 8-13 | ∞ |
| | 8-9 | ∞ |
| Fan Relay | 14-17 | ∞ |
| | 15-16 | Not ∞* |

*: The actual reading varies with the hand tester used.

**Relay Circuit Inspection (with the battery connected)**

| | Battery Connection (+) (–) | Tester Connection | Tester Reading (Ω) |
|---|---|---|---|
| Fuel Pump Relay | 6-7 | 4-5 | 0 |
| Fan Relay | 15-16 | 14-17 | 0 |

| | Battery Connection (+) (–) | Tester Connection DC 25 V Range | Tester Reading (V) |
|---|---|---|---|
| Starter Circuit Relay | 13-9 | 8-9 | Battery Voltage |

(+): Apply positive lead.
(–): Apply negative lead.

## Relay Box

### *Diode Circuit Inspection*

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following pairs of terminals (see Relay Box Internal Circuit).

**Diode Circuit Inspection**

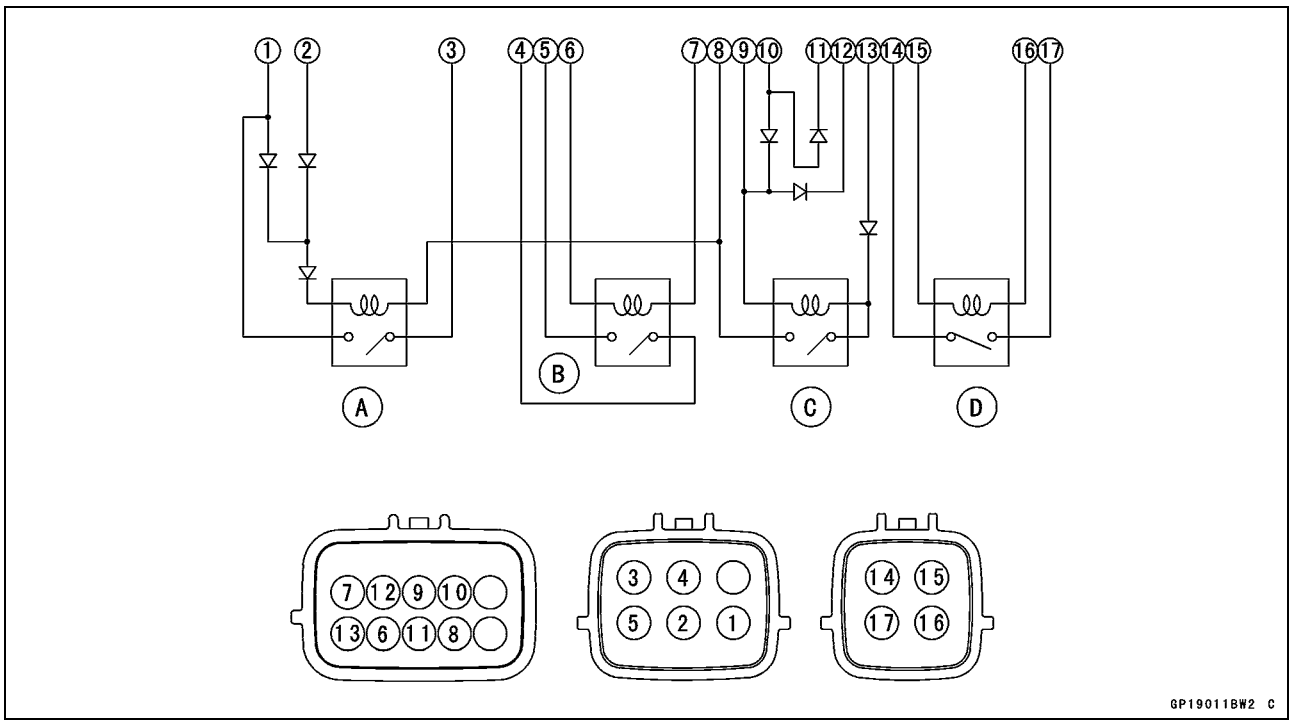
| | |
|---|---|
| Tester Connection | 1-8, 2-8, 9-10, 9-12, 9-13, 10-11, 10-12 |

★The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the relay box must be replaced.

**NOTE**

○*The actual meter reading varies with the meter or tester used and the individual diodes, but generally speaking, the lower reading should be from zero to one half the scale.*

### Relay Box Internal Circuit

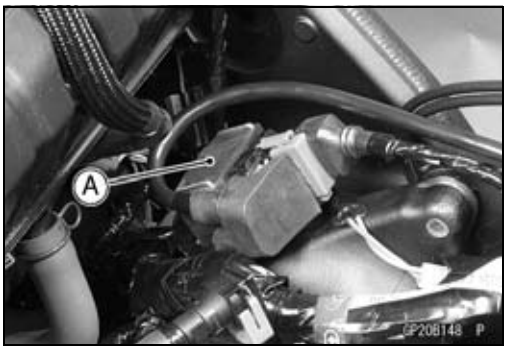



A. Headlight Relay
B. Fuel Pump Relay
C. Starter Circuit Relay
D. Fan Relay

## Fuse

### *30 A Main Fuse Removal*

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Pull out the starter relay [A] from the bracket on the frame.

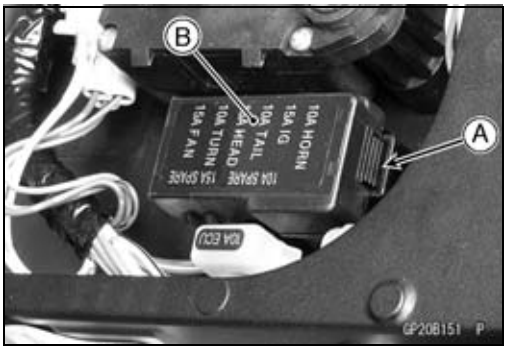



- Disconnect the connector [A].


- Pull out the main fuse [A] from the starter relay with needle nose pliers.


### *Fuse Box Fuse Removal*

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Push the hook [A] to lift up the lid [B].

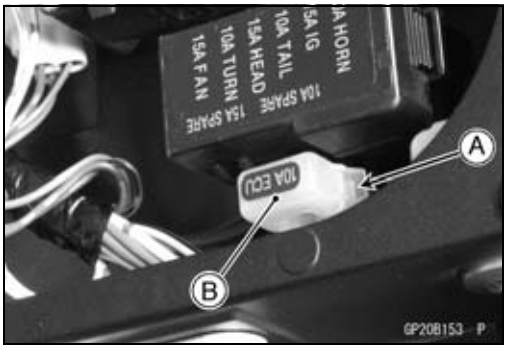



- Pull the fuses [A] straight out of the fuse box with needle nose pliers.

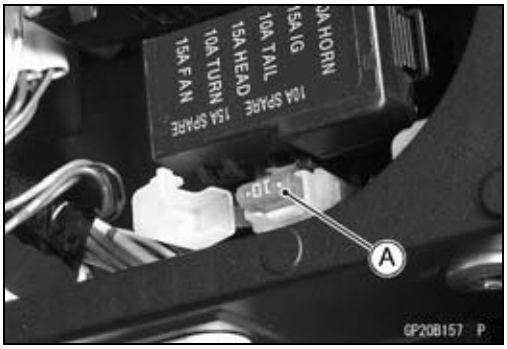
## Fuse

### *10 A ECU Fuse Removal*

- Remove the front seat (see Front Seat Removal in the Frame chapter).
- Pull the hook [A] to lift up the lid [B].




- Pull the ECU fuse [A] straight out of the fuse box with needle nose pliers.




### *Fuse Installation*

★If a fuse fails during operation, inspect the electrical system to determine the cause, and then replace it with a new fuse of proper amperage.

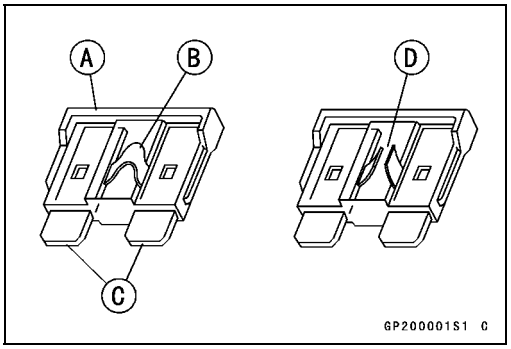
- Install the fuse box fuses on the original position as specified on the lid.

### *Fuse Inspection*

- Remove the fuse.
- 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]




**NOTE**

○*If a mass current flows to the battery which needs refreshing charge when the engine is turned, the main fuse may be blown out.*

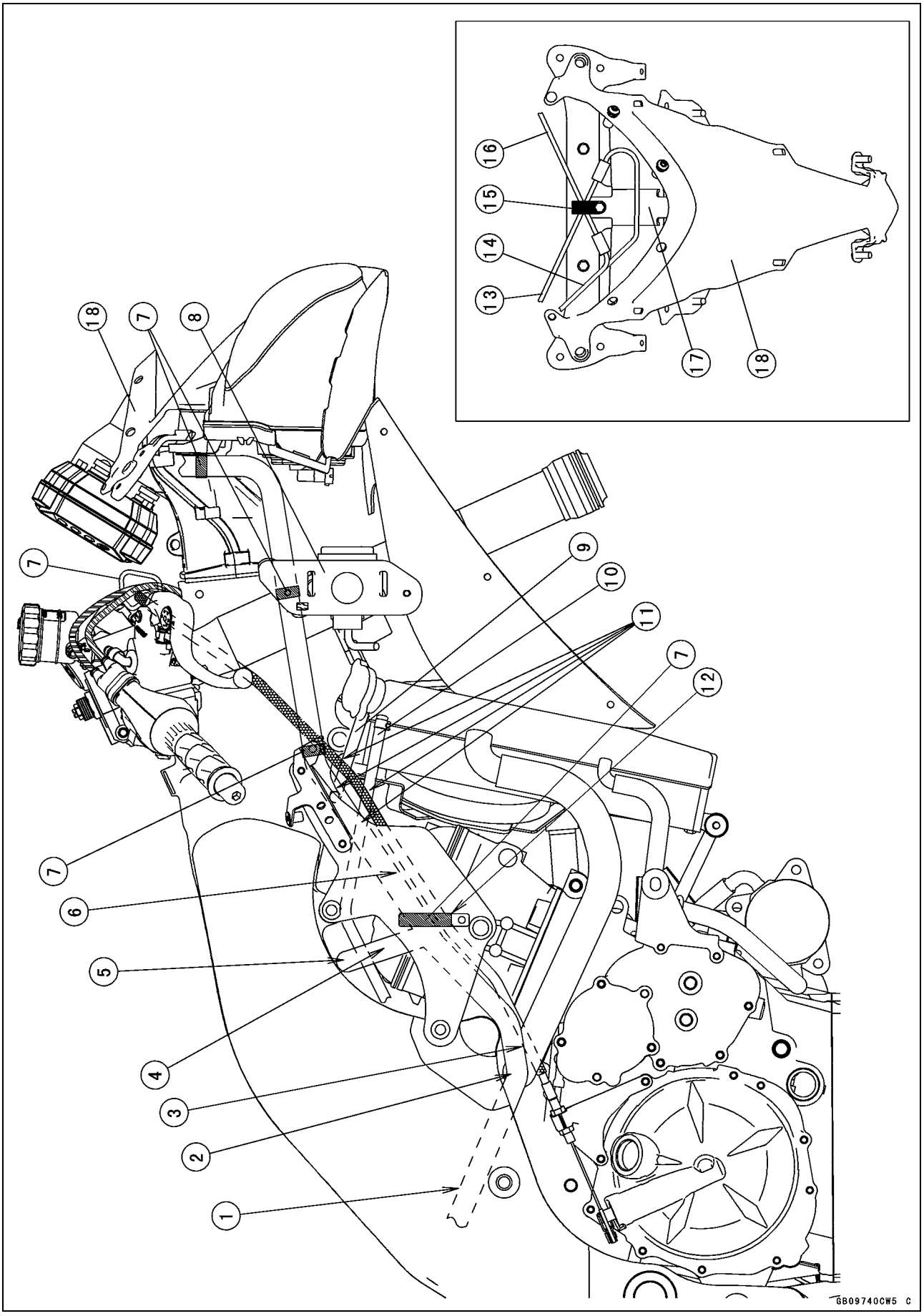
**CAUTION**

**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.**

# Appendix

## Table of Contents

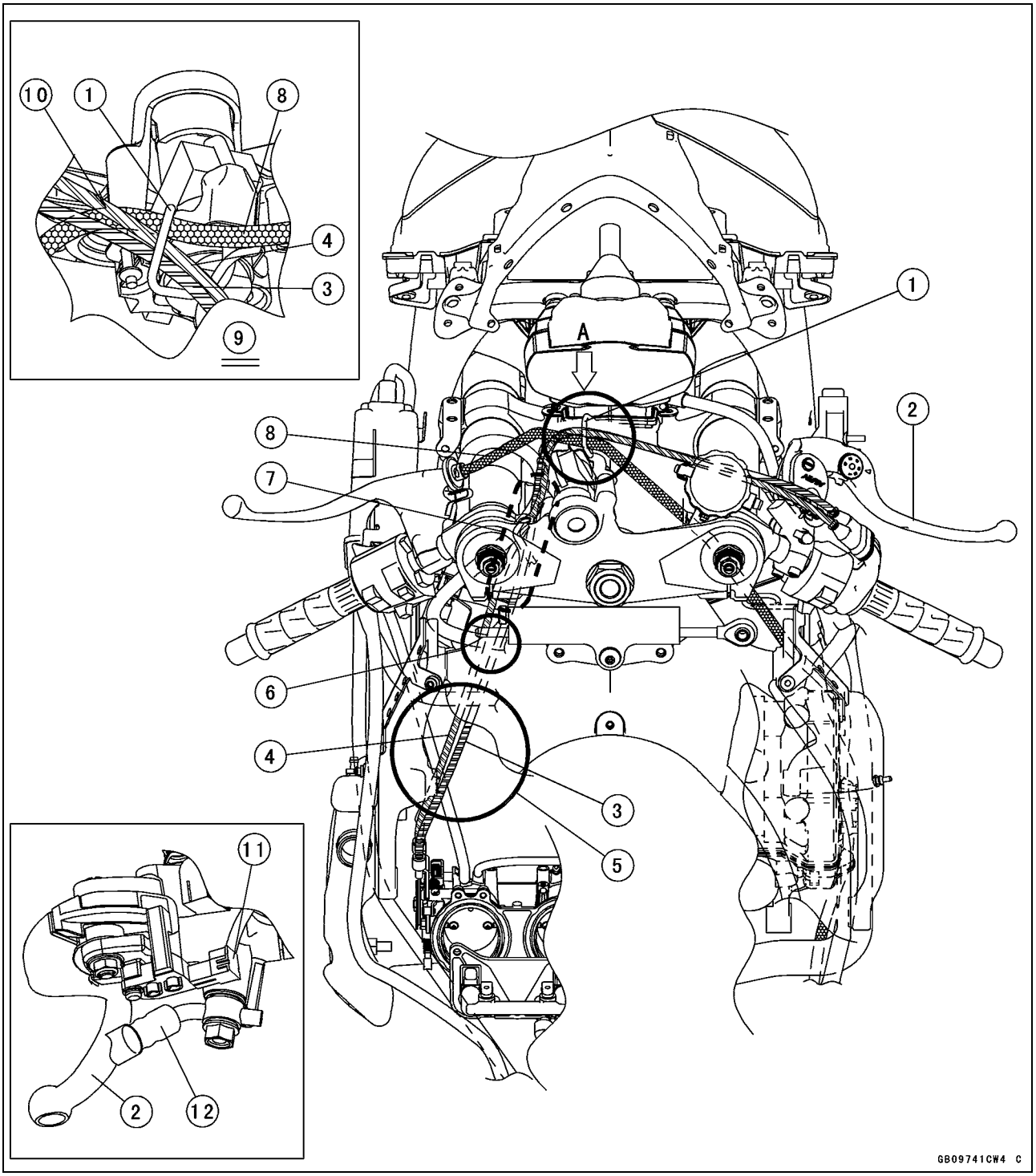
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

1. Main Harness (Run the main harness over the middle engine mounting portion.)
2. Main Harness (Run the main harness outside of the water hose.)
3. Clutch Cable (Run the clutch cable inside of the water hose.)
4. Main Harness (Run the main harness between the right engine bracket and engine.)
5. Main Harness (Run the main harness outside of the water hose.)
6. Run the main harness and clutch cable inside of the right engine bracket.
7. Clamps
8. Bracket
9. Radiator Overflow Hose
10. Water Hose
11. Run the main harness and clutch cable outside of the radiator overflow hose and water hose.
12. Run the main harness over the clutch cable.
13. Right Turn Signal Light Lead (Run the lead outside of the motorcycle so that it does not pinch by the meter unit cover.)
14. Main Harness
15. Clamp
16. Left Turn Signal Light Lead (Run the lead outside of the motorcycle so that it does not pinch by the meter unit cover.)
17. Bracket
18. Center Fairing

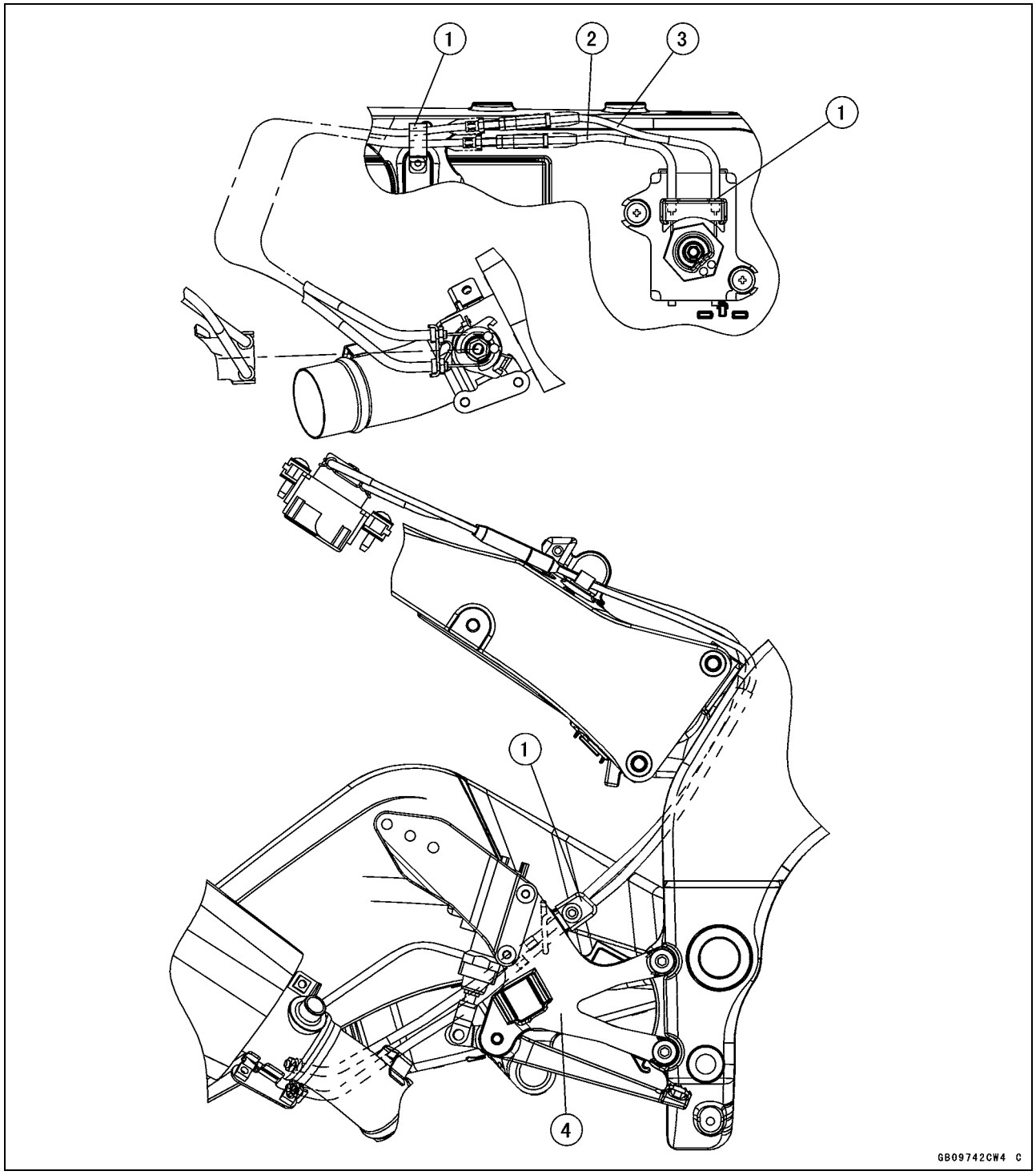
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

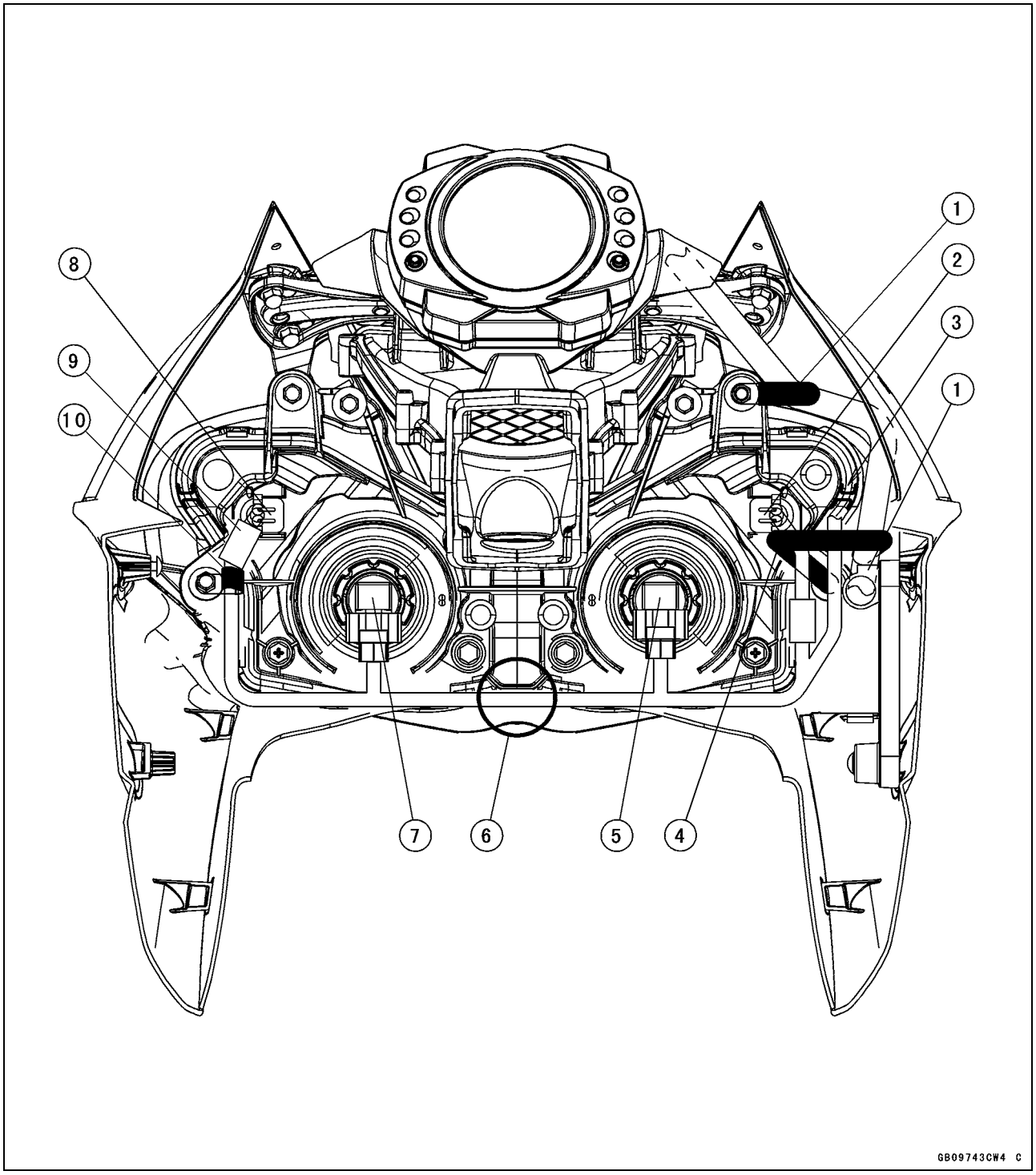
1. Clamp
2. Brake Lever
3. Throttle Cable (Decelerator)
4. Throttle Cable (Accelerator)
5. Run the throttle cables over the white hose (California and Southeast Asia models only).
6. Run the throttle cables outside of the left switch housing lead.
7. Make the throttle cables crossed at this position.
8. Clutch Cable
9. Viewed A
10. Run the clutch cable inside of the throttle cables.
11. Front Brake Light Switch Connector
12. Brake Hose

## Cable, Wire, and Hose Routing



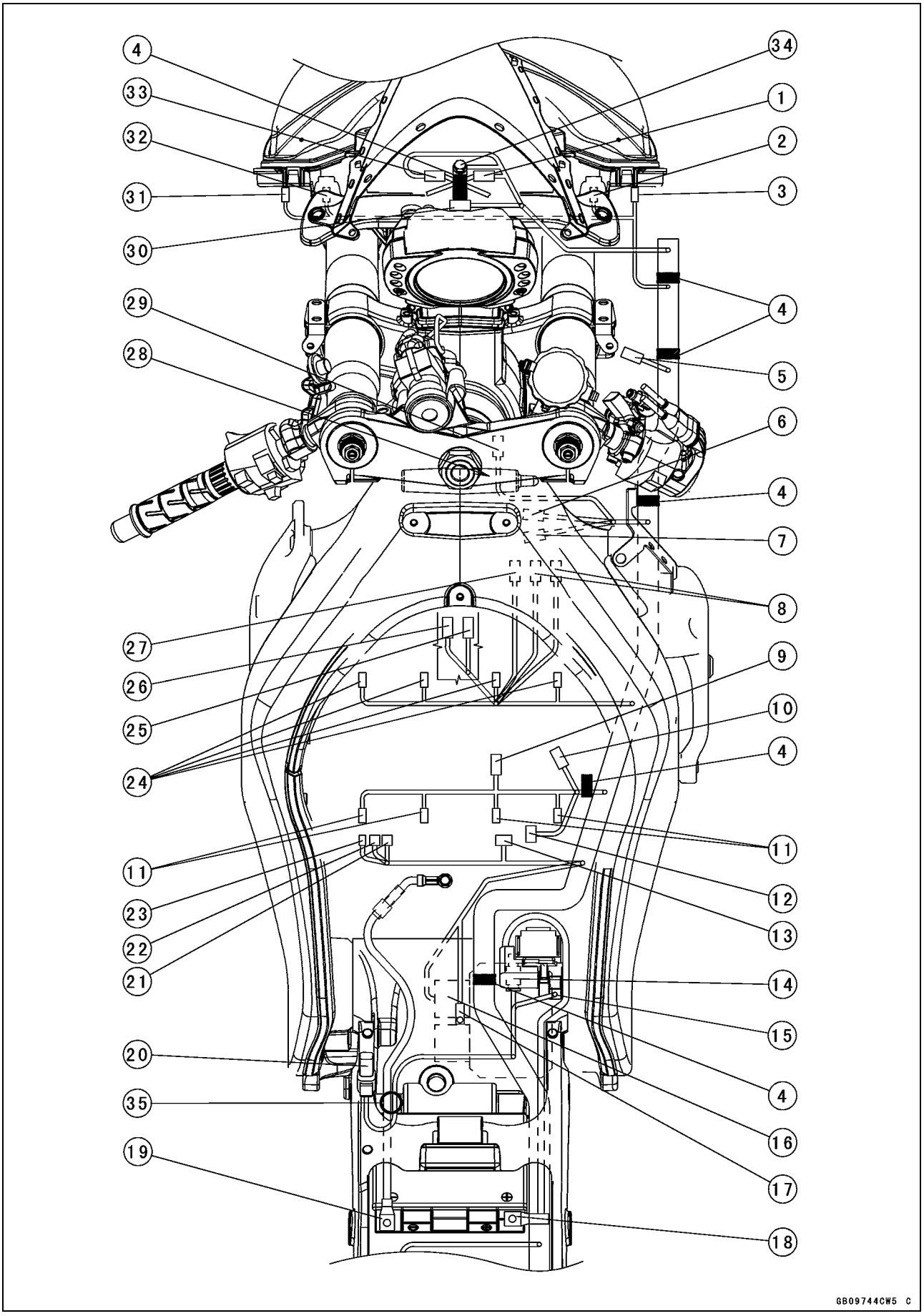

1. Clamps
2. Open Cable (White)
3. Close Cable (Black)
4. Right Front Footpeg Bracket

## Cable, Wire, and Hose Routing




1. Clamps
2. Right City Light
3. Do not touch the main harness to the slot of the headlight.
4. Clamp (Fix the main harness and right city light with the clamp.)
5. Headlight (Low)
6. Run the head light lead to the cutout portion of the resonator tank.
7. Headlight (High)
8. Left City Light
9. Left City Light Lead Connector
10. Clamp (Fix the left city light lead at the lower position of the connector.)

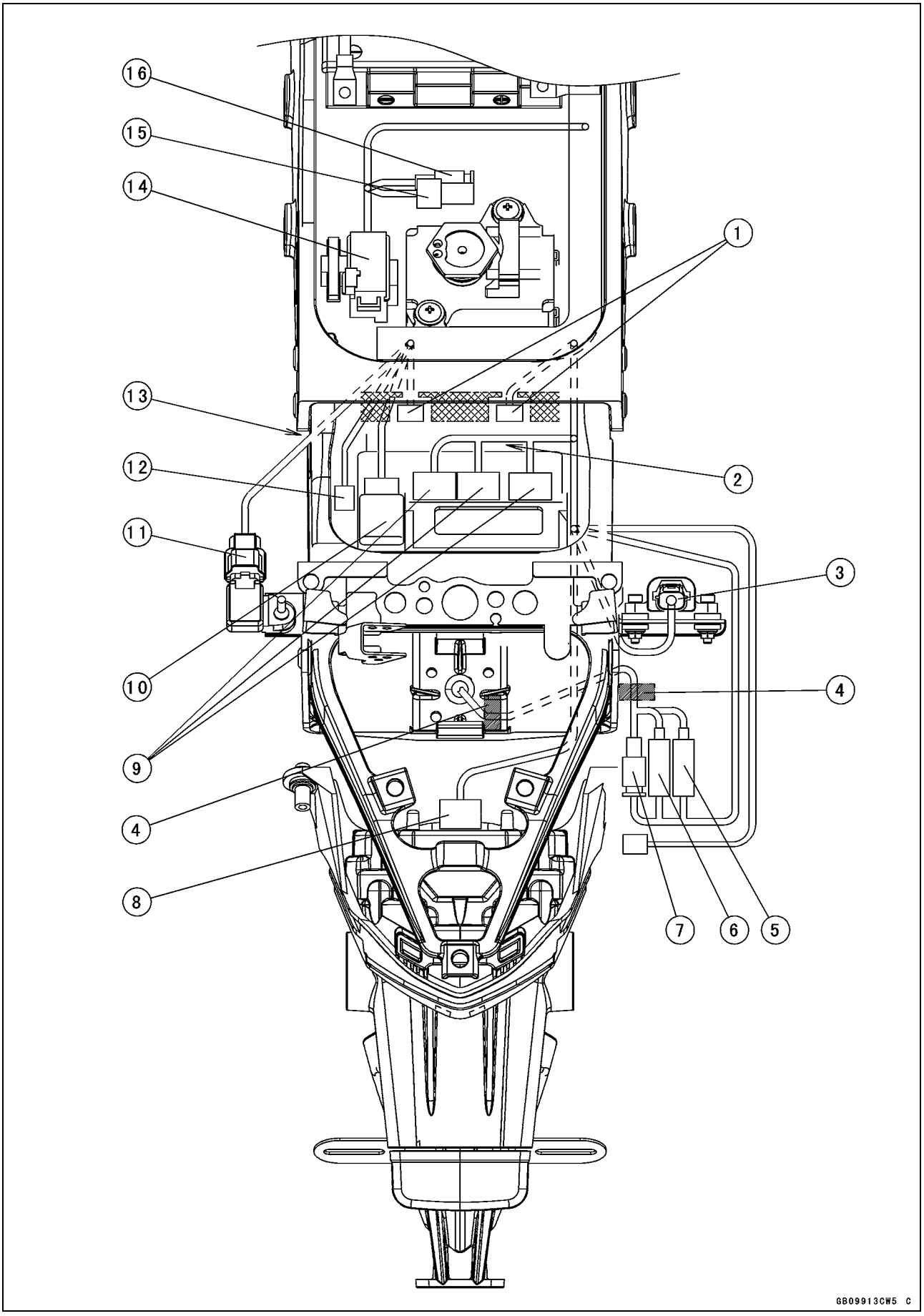
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

1. Left Front Turn Signal Light Connector (Run the lead over the bracket.)
2. Headlight (Low) Connector
3. Right City Light Connector
4. Clamps
5. Immobilizer Amplifier Connector (Equipped Models)
6. Ignition Switch Lead Connector
7. Immobilizer Antenna Lead Connector (Equipped Models)
8. Right Switch Housing Lead Connectors
9. Inlet Air Temperature Sensor Connector
10. Crankshaft Sensor Lead Connector (Run the lead over the middle engine mounting portion.)
11. Secondary Fuel Injector Connectors
12. Engine Subharness #2 Connector (To Throttle Body Assy)
13. Engine Subharness #1 Connector (To Gear Position Switch)
14. Rear Brake Light Switch Connector (Run the lead to the front of the frame upper cross pipe, and put the connector under the starter relay.)
15. Starter Relay Connector
16. Regulator/Rectifier Connector (Black) (Run the lead over the middle engine mounting portion.)
17. Frame Ground 1
18. Battery Positive Cable
19. Battery Negative Cable
20. Fuel Pump Lead Connector (Insert the connector to the pad on the frame.)
21. Oxygen Sensor #2 Lead Connector (Black) (Equipped Models)
22. Oxygen Sensor #1 Lead Connector (Gray) (Equipped Models)
23. Sidestand Switch Lead Connector
24. Stick Coil Connectors
25. Radiator Fan Motor Lead Connector (Cover the connector in the dust boot.)
26. Left Switch Housing Lead Connector (Cover the connector in the dust boot.)
27. Air Switching Valve Connector
28. Run the horn lead between the heat insulation rubber plate and frame bracket.
29. Horn Connectors
30. Meter Unit Connector (Run the lead over the bracket.)
31. Left City Light Connector
32. Headlight (High) Connector
33. Right Front Turn Signal Light Lead Connector (Run the lead over the bracket.)
34. Frame Ground 2
35. Run the battery negative cable and fuel pump lead to the groove of the pad.

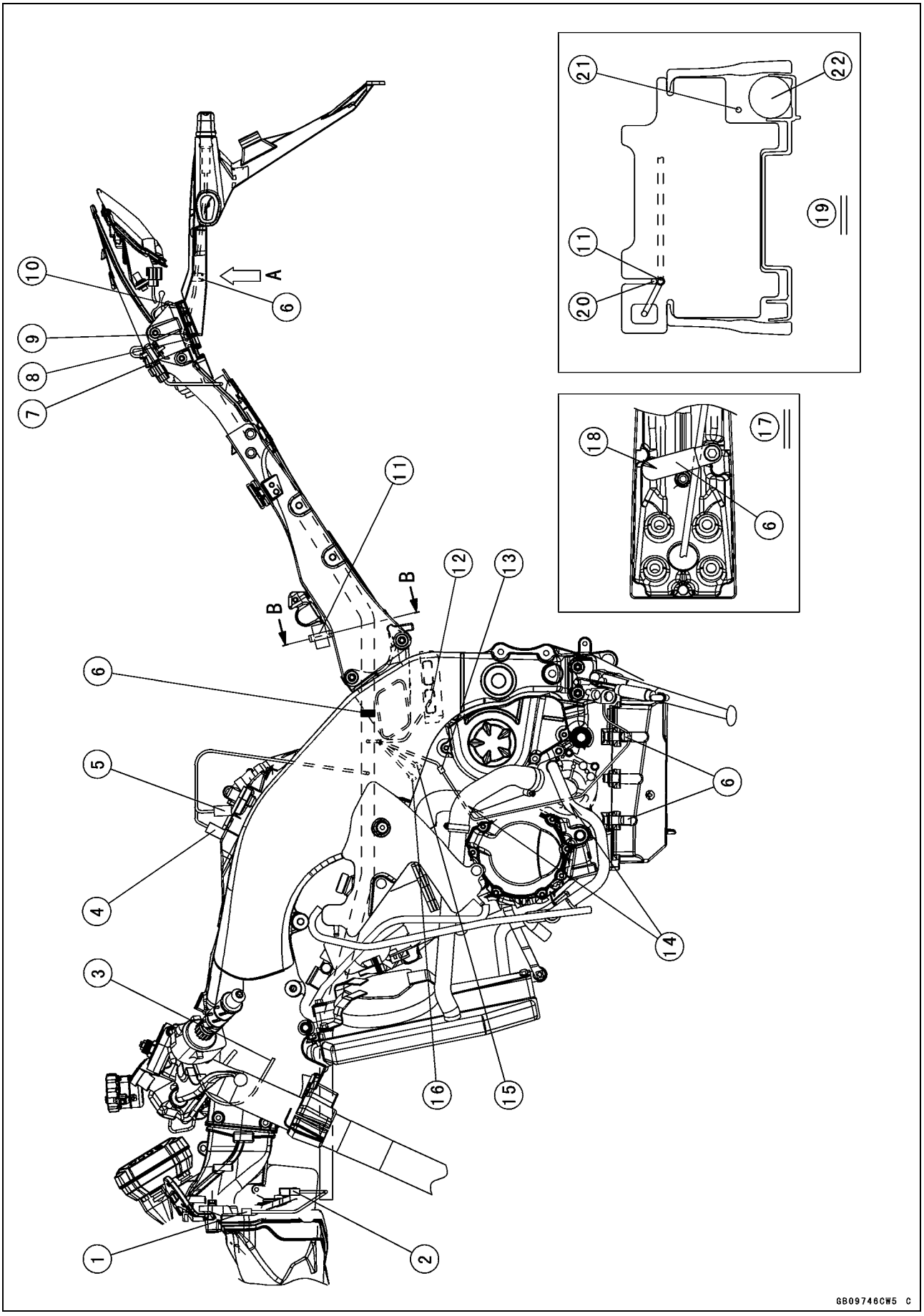
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

1. ECU Connectors (Run the lead between the ribs of the rear fender front.)
2. Run the relay box lead through the back of the rear frame front.
3. Vehicle-down Sensor Connector
4. Clamps
5. Right Rear Turn Signal Light Lead Connector
6. Left Rear Turn Signal Light Lead Connector
7. License Plate Light Lead Connector
8. Tail/Brake Light Connector
9. Relay Box Connectors
10. Turn Signal Relay Connector
11. Atmospheric Pressure Sensor Connector
12. Immobilizer (Equipped Models)/Kawasaki Diagnostic System Connector
13. Run the atmospheric pressure sensor lead under the rear frame rear.
14. Fuse Box
15. Exhaust Butterfly Valve Actuator Lead Connector
16. Exhaust Butterfly Valve Actuator Sensor Lead Connector

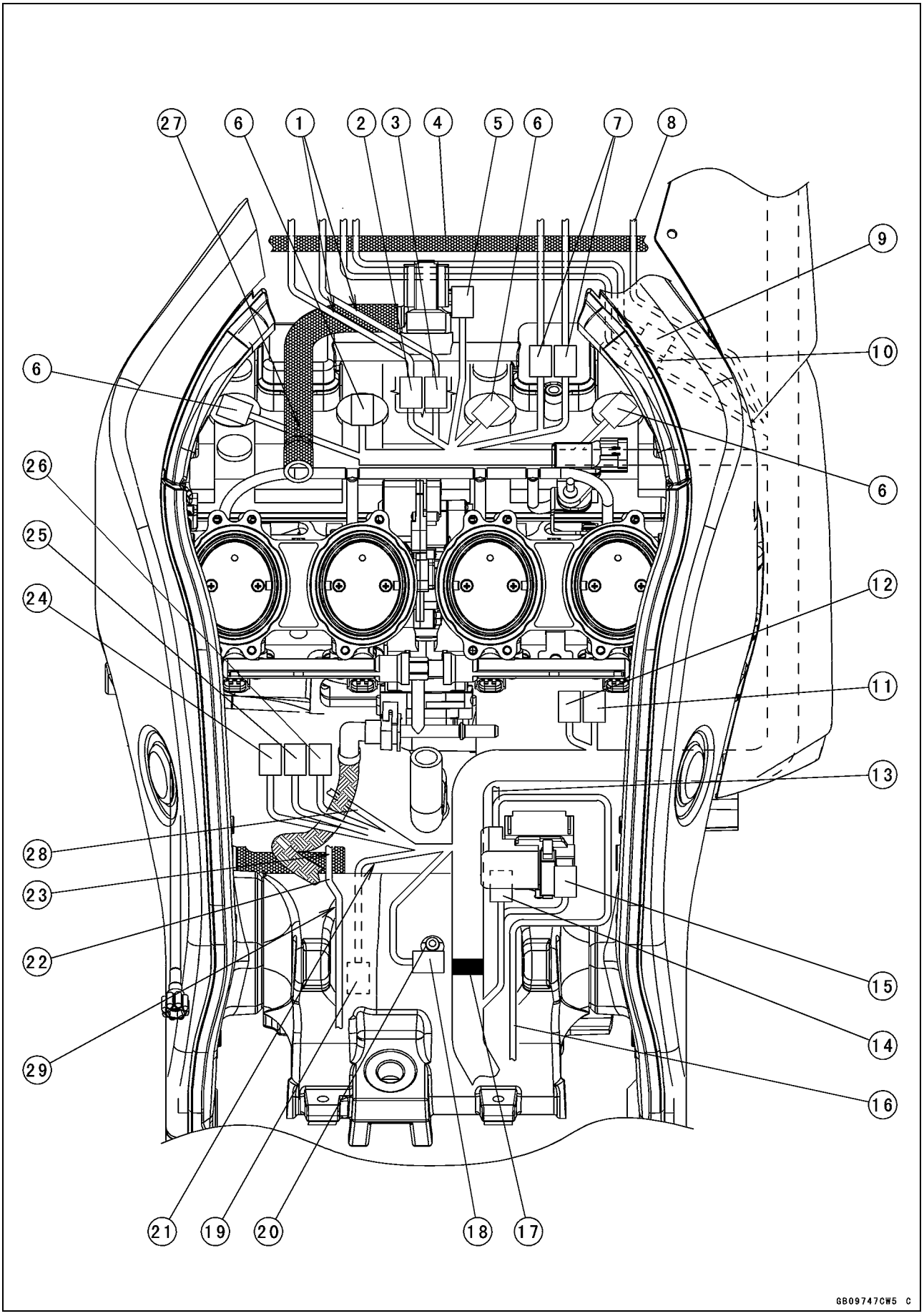
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

1. Left City Light Connector
2. Headlight (High) Connector
3. Left Switch Housing Lead
4. Inlet Air Temperature Sensor Connector
5. Secondary Fuel Injector Connectors
6. Clamps
7. License Plate Light Lead Connector
8. Right Rear Turn Signal Light Lead Connector
9. Left Rear Turn Signal Light Lead Connector
10. Run the license plate light , right and left rear turn signal light lead connectors in the hole of the rear fender rear bracket.
11. Fuel Pump Lead Connector
12. Regulator/Rectifier Connector (Black)
13. Sidestand Switch Lead Connector
14. Run the sidestand switch lead inside of the water hose and inlet hose.
15. Oxygen Sensor #1 Lead Connector (Gray) (Equipped Models)
16. Oxygen Sensor #2 Lead Connector (Black) (Equipped Models)
17. Viewed A
18. Bend the clamp upward, and hold the license plate light, right and left rear turn signal light leads.
19. Section B-B
20. Battery Negative Cable
21. Battery Positive Cable
22. Main Harness

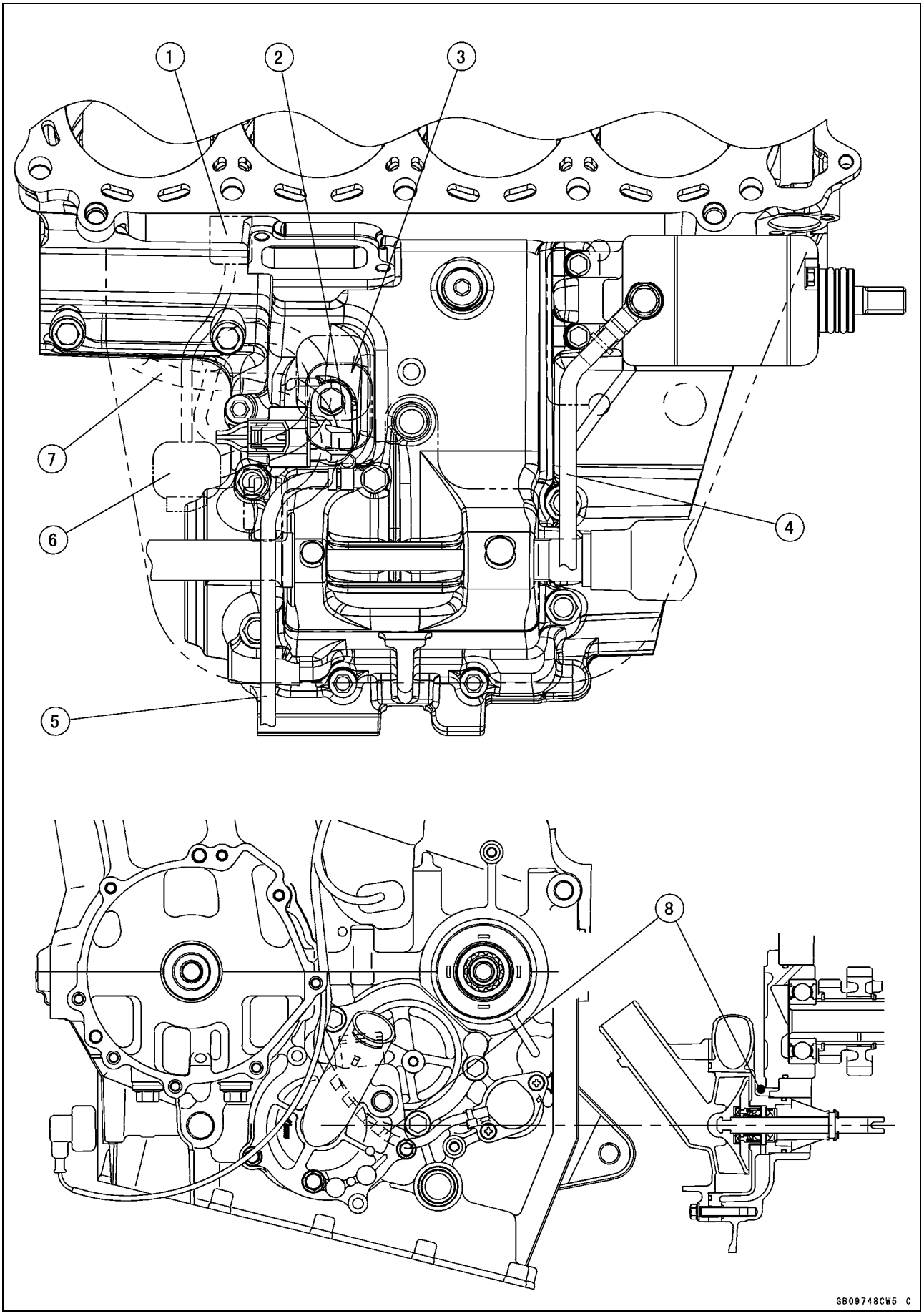
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

1. Run the radiator fan motor and left switch housing leads over the air switching valve hose.
2. Left Switch Housing Lead Connector (Cover the connector in the dust boot.)
3. Radiator Fan Motor Lead Connector (Cover the connector in the dust boot.)
4. Run the radiator overflow hose under the leads.
5. Air Switching Valve Connector
6. Stick Coil Connectors
7. Right Switch Housing Lead Connectors
8. Horn Lead
9. Immobilizer Antenna Lead Connector (Equipped Models)
10. Ignition Switch Lead Connector
11. Crankshaft Sensor Lead Connector
12. Engine Subharness #2 Connector (To Throttle Body Assy)
13. Run the starter motor cable over the middle engine mounting portion.
14. Rear Brake Light Switch Lead Connector
15. Starter Relay Connector
16. Battery Positive Cable
17. Clamp (Main Harness)
18. Frame Ground 1
19. Regulator/Rectifier Connector
20. Boss for Positioning
21. Run the regulator/rectifier lead over the middle engine mounting portion.
22. Battery Negative Cable
23. Run the battery negative cable over the middle engine mounting portion and alternator lead.
24. Oxygen Sensor #2 Lead Connector (Black) (Run the lead over the primary fuel hose.) (Equipped Models)
25. Engine Subharness #1 Connector (Run the harness over the primary fuel hose.) (To Gear Position Switch)
26. Oxygen Sensor #1 Lead Connector (Gray) (Run the lead over the primary fuel hose.) (Equipped Models)
27. Run the stick coil #1 lead under the air switching valve hose.
28. Sidestand Switch Lead (Run the lead under the primary fuel hose.)
29. Run the battery negative cable outside of the motorcycle so that it does not cross the frame ground lead.

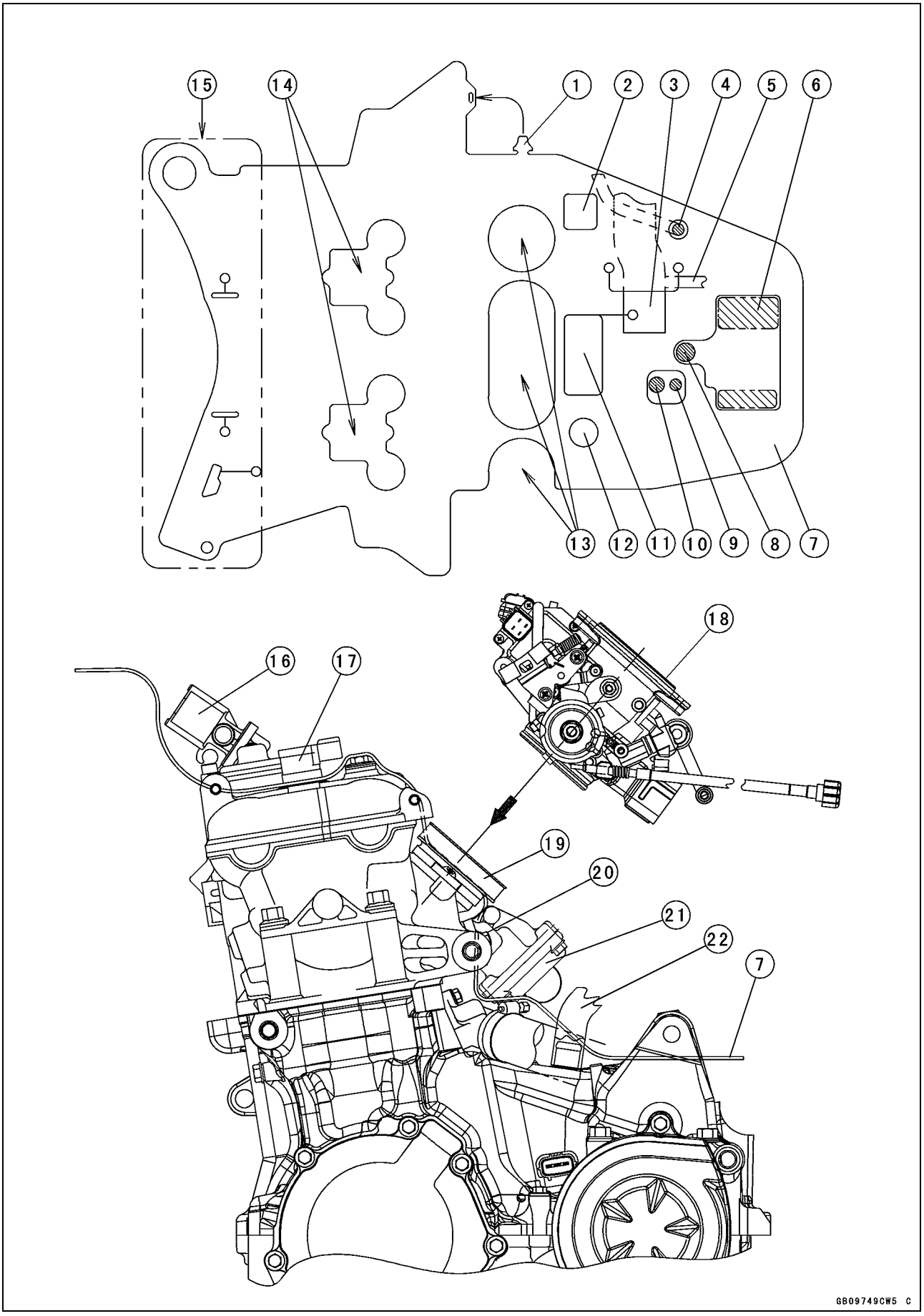
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

1. Water Temperature Sensor Connector
2. Speed Sensor
3. Run the alternator and gear position switch leads to the hole of the heat insulation rubber plate.
4. Run the starter motor cable over the middle engine mounting portion, and run it to the slit of the heat insulation rubber plate.
5. Battery Negative Cable
6. Engine Subharness #1 Connector (To Gear Position Switch)
7. Alternator Lead
8. Run the gear position switch lead as shown in the figure.

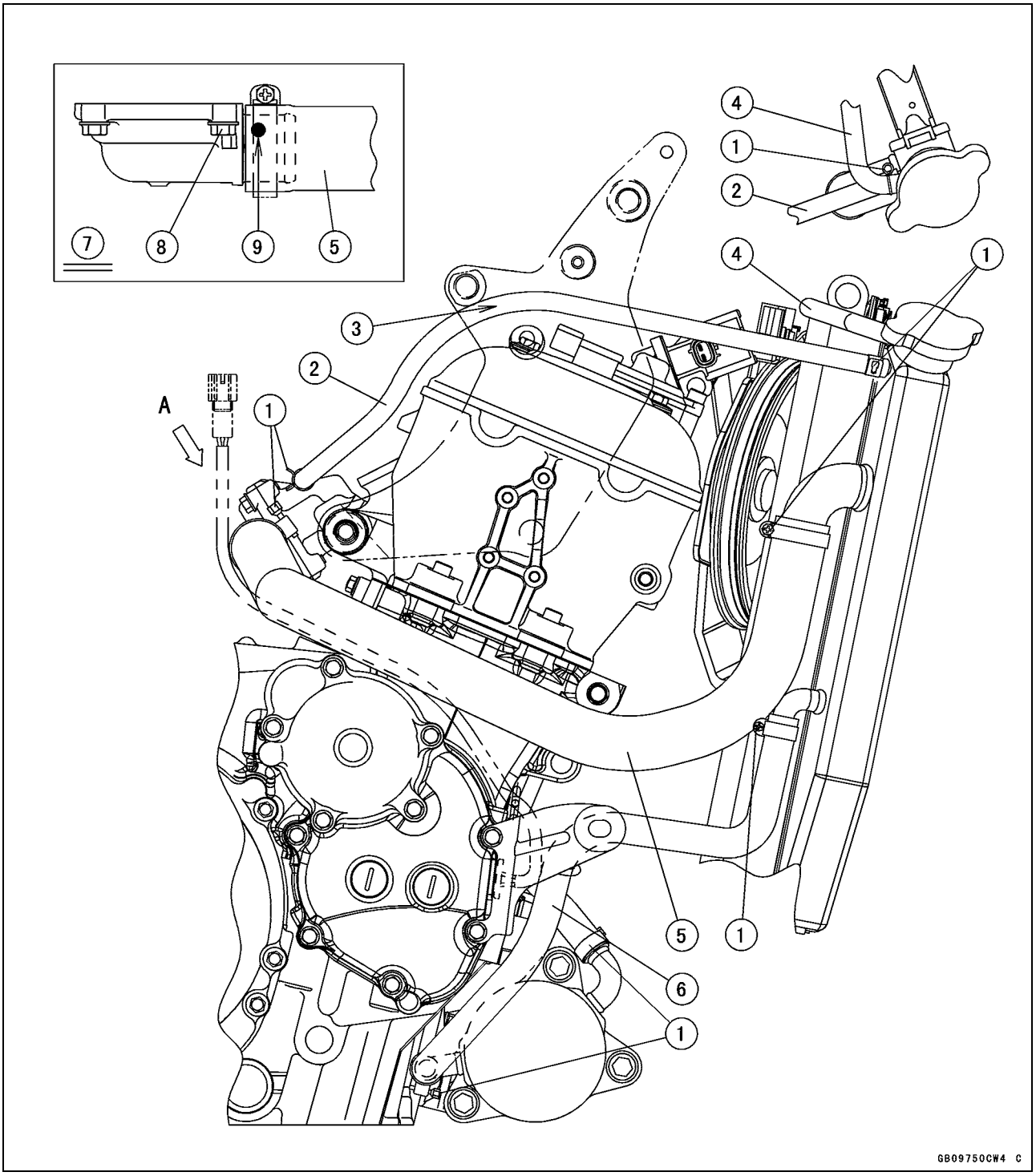
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

1. After installing, insert the projection in the hole.
2. For Right Front Engine Mount
3. Run the water hose to the hole of the heat insulation rubber plate.
4. Run the crankshaft sensor lead under the water hose, and run it to the hole of the heat insulation rubber plate.
5. Run the starter motor cable under the water hose, and run it to the hole of the heat insulation rubber plate.
6. For Middle Engine Mount
7. Heat Insulation Rubber Plate
8. Breather Hose
9. Alternator Lead
10. Gear Position Switch Lead
11. For Thermostat Housing
12. For Water Temperature Sensor
13. For Throttle Body Assy Holder
14. For Air Suction Covers and Stick Coils
15. To Radiator
16. Air Switching Valve
17. Stick Coils
18. Throttle Body Assy
19. Throttle Body Assy Holder
20. Water Temperature Sensor
21. Thermostat Housing
22. Breather Hose

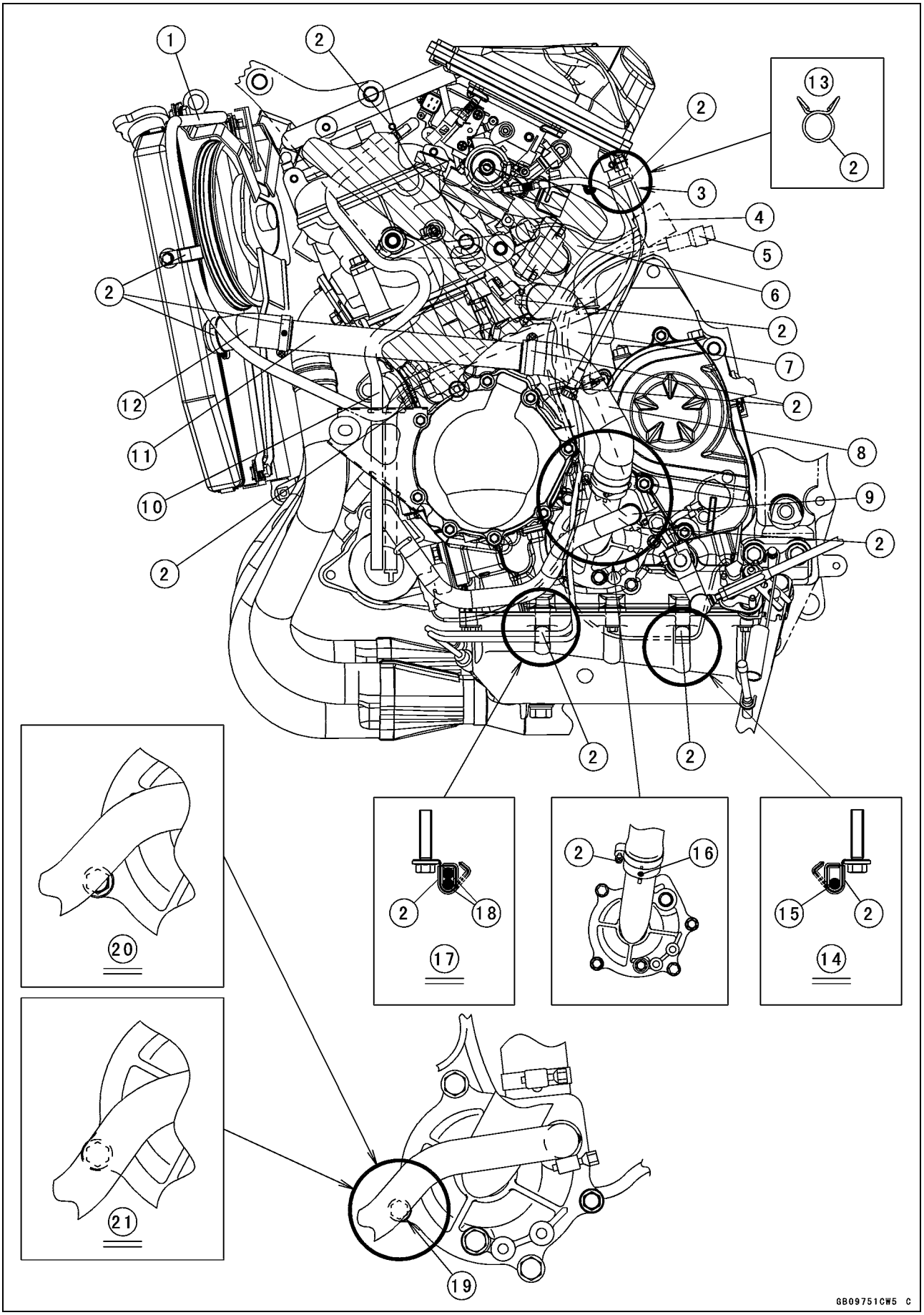
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

1. Clamps
2. Water Hose
3. Run the water hose inside of the right engine bracket.
4. Radiator Overflow Hose
5. Water Hose
6. Outlet Hose
7. Viewed A
8. Thermostat Housing Bolt
9. Paint Mark (Align the paint mark with the thermostat housing bolt.)

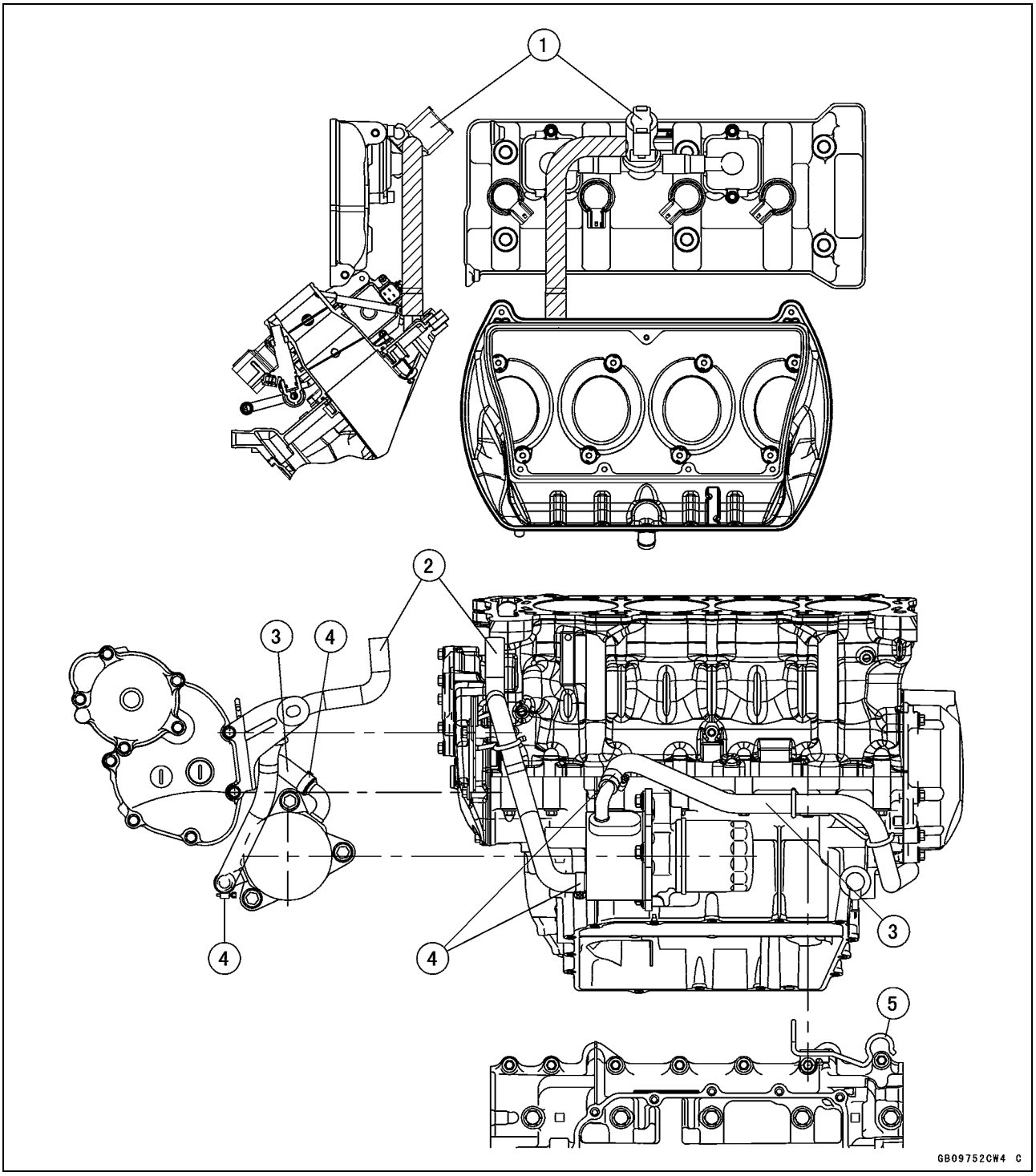
## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

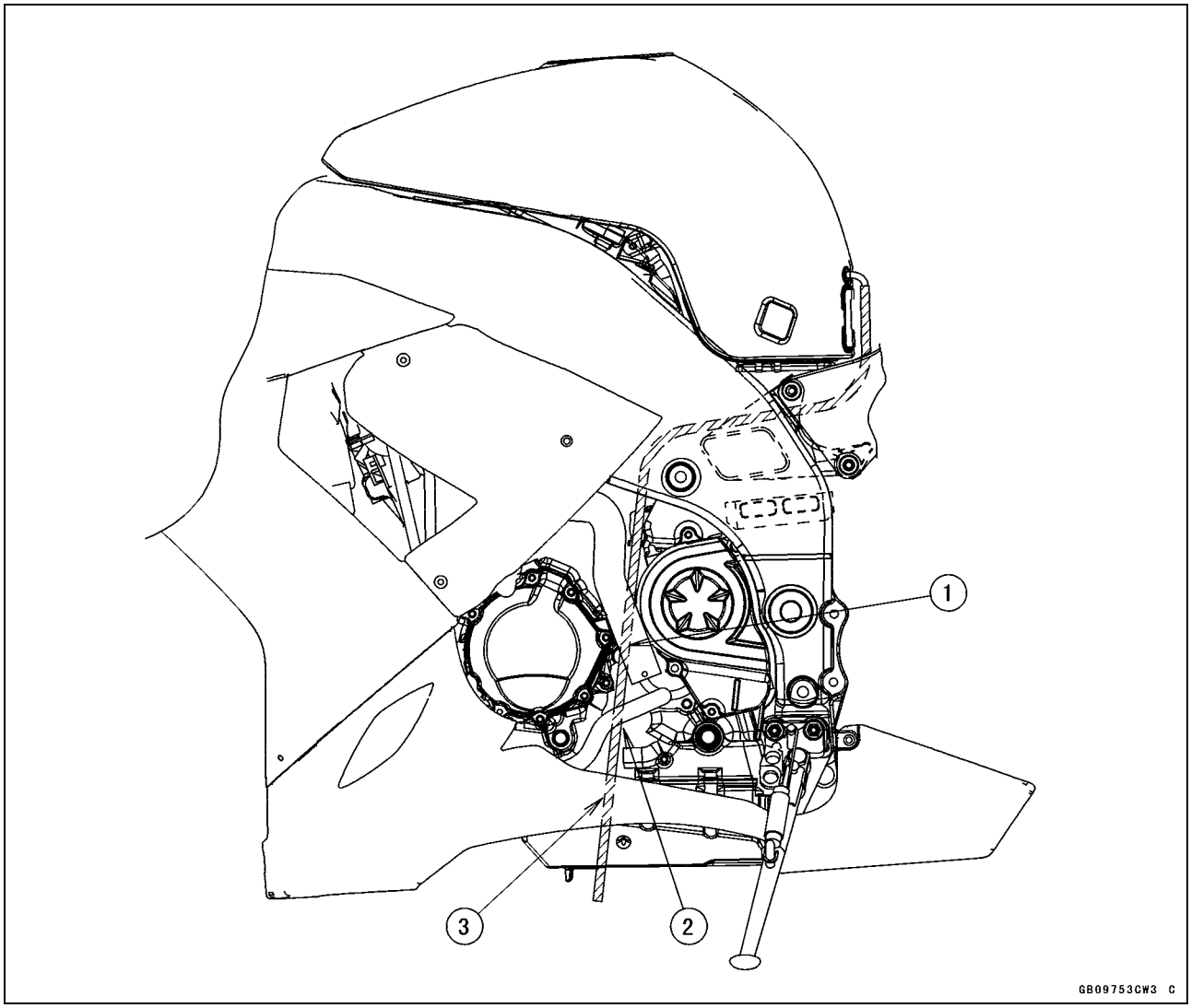
1. Run the radiator overflow hose to the hole of the heat insulation rubber plate.
2. Clamps
3. Air Cleaner Drain Hose (Run the hose to the upper and lower clamps of the bracket.)
4. Engine Subharness #1 Connector (To Gear Position Switch)
5. Oxygen Sensor #1/#2 Lead Connectors (Gray/Black) (Equipped Models)
6. Coolant Reserve Tank
7. Water Hose
8. Water Hose
9. Water Hose
10. Run the reserve tank overflow hose between the engine and left engine bracket, and run it inside of the water pipe. Run the hose to the upper and lower clamps of the bracket.
11. Water Pipe
12. Water Hose (Face the white mark outside.)
13. Right Side
14. After running, bend the clamp as shown in the figure.
15. Sidestand Switch Lead
16. Face the white mark outside.
17. After running, bend the clamp as shown in the figure.
18. Oxygen Sensor Leads (Equipped Models)
19. Run the water hose over the water pump cover bolt as shown in the figure.
20. Limit of Upper Side
21. Limit of Lower Side

## Cable, Wire, and Hose Routing



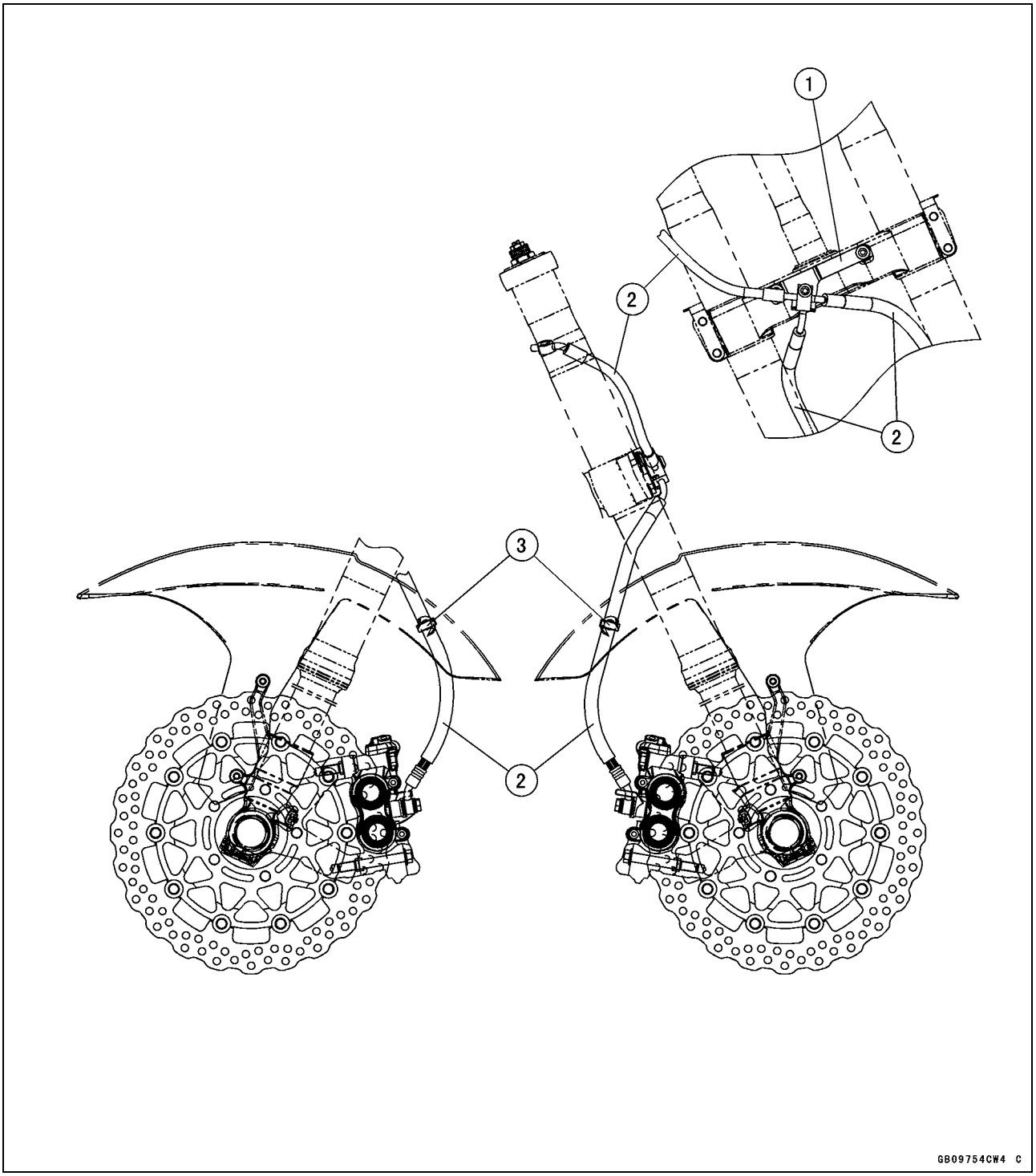

1. Air Switching Valve
2. Outlet Hose
3. Inlet Hose
4. Clamps
5. Clamp

## Cable, Wire, and Hose Routing



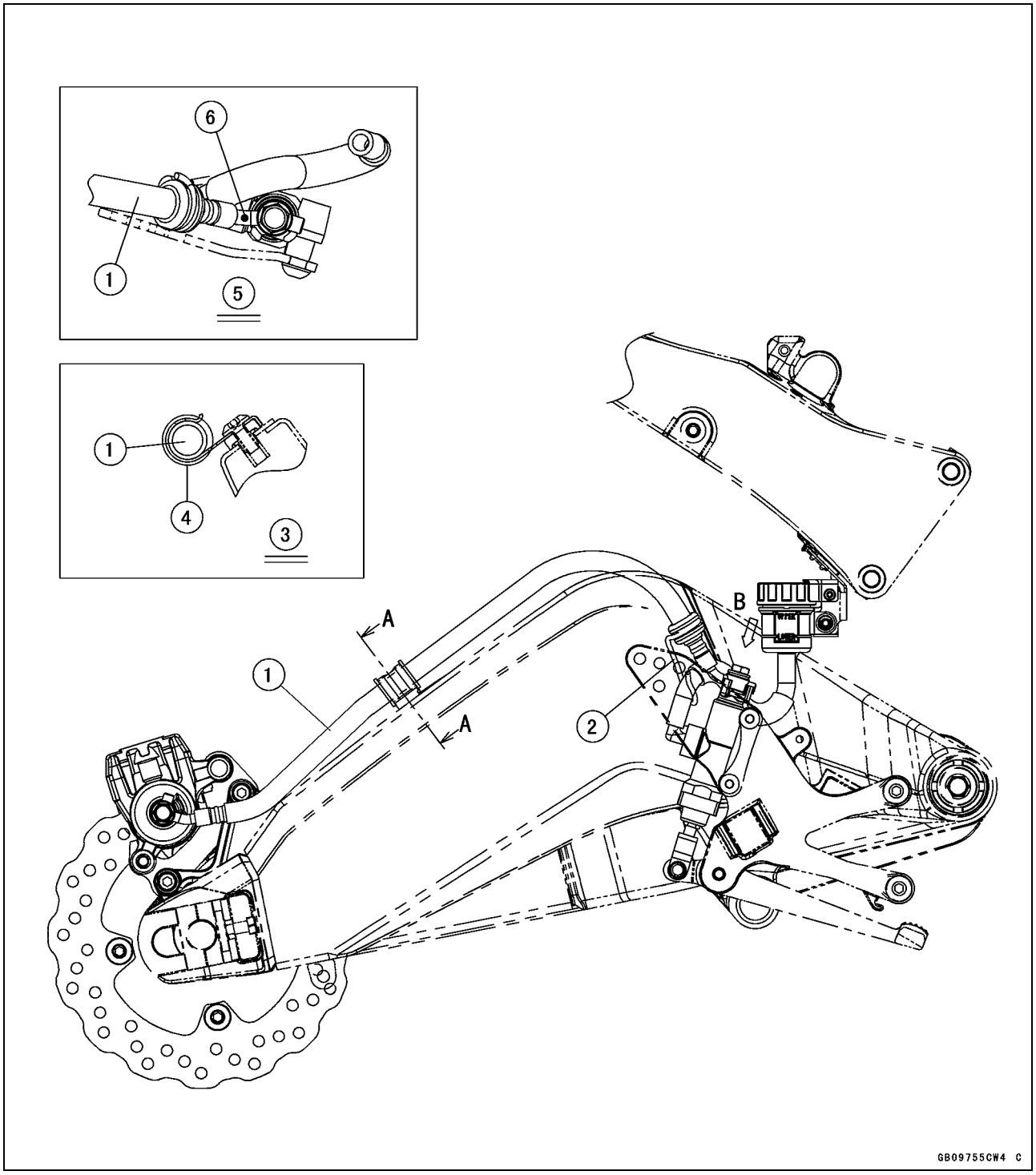

1. Run the fuel tank drain hose inside of the water hose.
2. Run the fuel tank drain hose inside of the inlet hose.
3. Run the fuel tank drain hose inside of the lower fairing.

## Cable, Wire, and Hose Routing




1. Bracket
2. Brake Hoses
3. Clamps

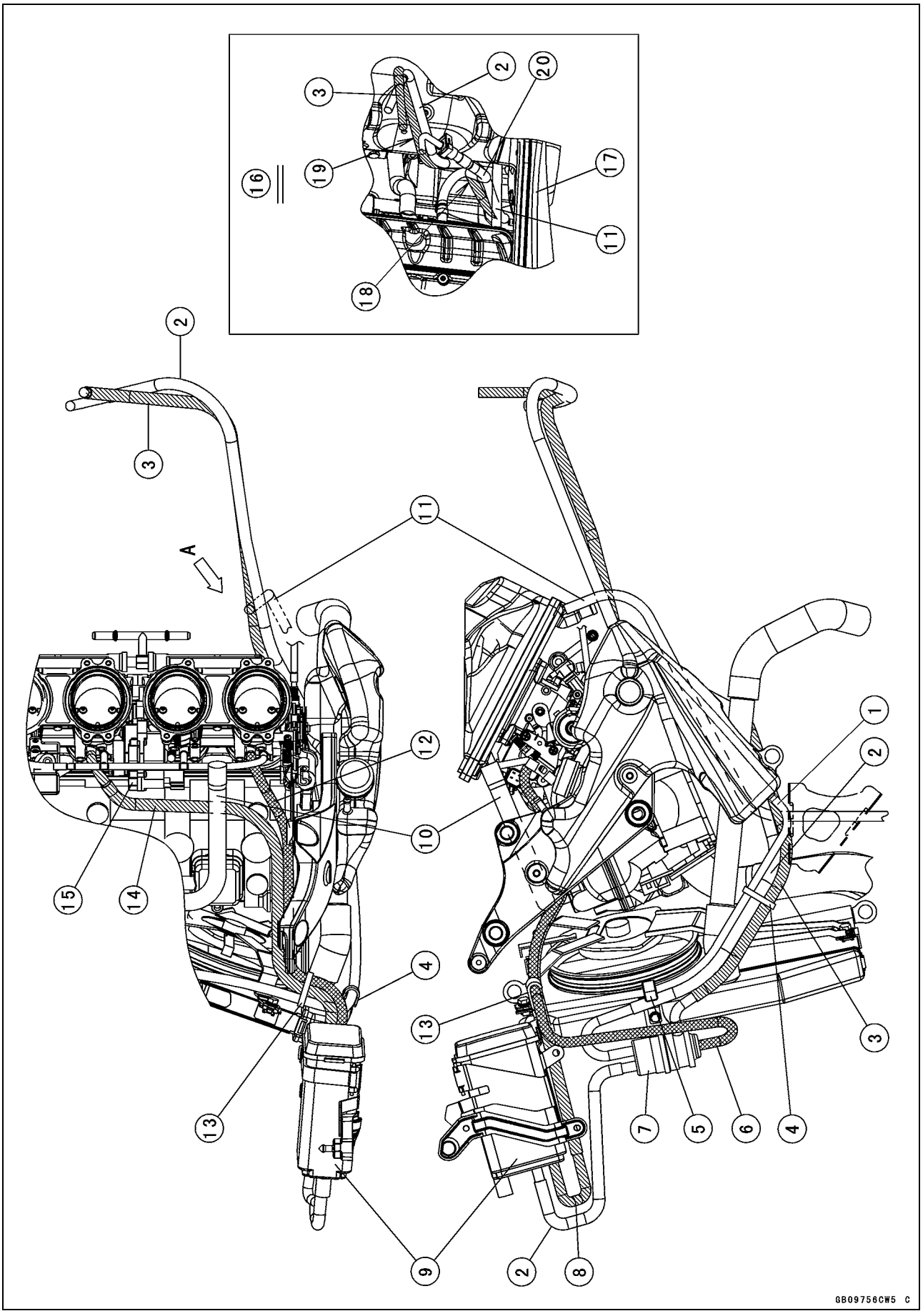
## Cable, Wire, and Hose Routing




1. Brake Hose
2. Clamp
3. Section A-A
4. Clamp
5. Viewed B
6. Face the white mark outside.

## Cable, Wire, and Hose Routing

### CAL and SEA Models

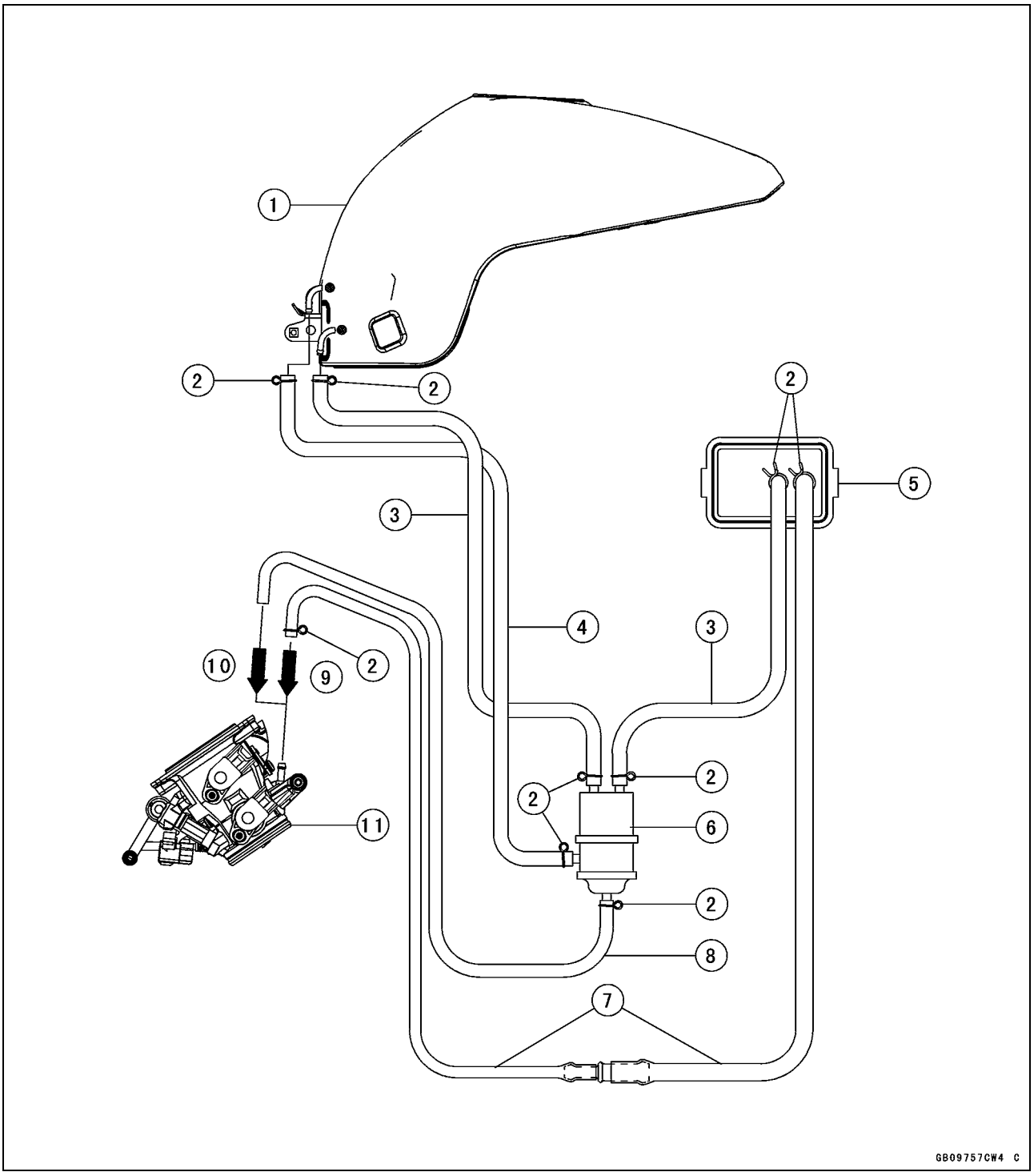


## Cable, Wire, and Hose Routing

1. Radiator Overflow Hose
2. Hoses (Blue)
3. Hose (Red)
4. Clamp
5. Clamp
6. Hose (White)
7. Separator
8. Hoses (Green)
9. Canister
10. Air Switching Valve Hose
11. Run the air cleaner drain hose over the red and blue hoses. Run the air cleaner drain hose between the frame and engine, and run it to the upper and lower clamps of the bracket.
12. Run the white hose under the inlet air hose, and install it to the fitting of the throttle body assy.
13. Clamp
14. Run the green hose under the air switching valve hose. Run the green hose to the front of the subthrottle valve actuator. Run the green hose under the inlet air hose, and install it to the fitting of the throttle body assy.
15. Subthrottle Valve Actuator
16. Viewed A
17. Frame
18. Run the red and blue hoses under the primary fuel hose.
19. Run the red and blue hoses between the fuel pump and main harness.
20. Primary Fuel Hose

## Cable, Wire, and Hose Routing

### CAL and SEA Models




1. Fuel Tank
2. Clamps
3. Hoses (Blue)
4. Hose (Red)
5. Canister
6. Separator
7. Hoses (Green)
8. Hose (White)
9. To Throttle Body Assy #3
10. To Throttle Body Assy #1
11. Throttle Body Assy

## Troubleshooting Guide

**NOTE**

○*Refer to the Fuel System (DFI) chapter for most of DFI trouble shooting guide.*

○*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.*

### Engine Doesn't Start, Starting Difficulty:

**Starter motor not rotating:**
- Ignition and engine stop switch not ON
- Starter lockout switch or gear position switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relay not contacting or operating
- Starter button not contacting
- Starter system wiring open or shorted
- Ignition switch trouble
- Engine stop switch trouble
- Main 30 A or ignition fuse blown

**Starter motor rotating but engine doesn't turn over:**
- Vehicle-down sensor (DFI) coming off
- Immobilizer system trouble
- Starter clutch trouble
- Starter idle gear trouble

**Engine won't turn over:**
- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Starter idle gear seizure

**No fuel flow:**
- No fuel in tank
- Fuel pump trouble
- Fuel tank air vent obstructed
- Fuel filter clogged
- Fuel line clogged

**No spark; spark weak:**
- Vehicle-down sensor (DFI) coming off
- Ignition switch not ON
- Engine stop switch turned OFF
- Clutch lever not pulled in or gear not in neutral
- Battery voltage low
- Immobilizer system trouble
- Spark plug dirty, broken, or gap maladjusted
- Spark plug incorrect
- Stick coil shorted or not in good contact
- Stick coil trouble
- ECU trouble
- Camshaft position sensor trouble
- Gear position, starter lockout, or side stand switch trouble
- Crankshaft sensor trouble
- Ignition switch or engine stop switch shorted
- Starter system wiring shorted or open
- Main 30 A or ignition fuse blown

**Fuel/air mixture incorrect:**
- Bypass screw and/or idle adjusting screw maladjusted
- Air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Leak from oil filler cap, crankcase breather hose or air cleaner drain hose.

**Compression Low:**
- Spark plug loose
- Cylinder head not sufficiently tightened down
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- No valve clearance
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

### Poor Running at Low Speed:

**Spark weak:**
- Battery voltage low
- Immobilizer system trouble
- Stick coil trouble
- Stick coil shorted or not in good contact
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble
- Camshaft position sensor trouble
- Crankshaft sensor trouble

**Fuel/air mixture incorrect:**
- Bypass screw maladjusted
- Air passage clogged
- Air bleed pipe bleed holes clogged
- Pilot passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble
- Throttle body assy holder loose
- Air cleaner housing loose

**Compression low:**
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
- Camshaft cam worm

**Run-on (dieseling):**
- Ignition switch trouble
- Engine stop switch trouble
- Fuel injector trouble
- Loosen terminal of battery (–) cable or ECU ground lead
- Carbon accumulating on valve seating surface
- Engine overheating

**Other:**
- ECU trouble
- Engine vacuum not synchronizing
- Engine oil viscosity too high
- Drive train trouble
- Brake dragging
- Clutch slipping
- Engine overheating
- Air suction valve trouble
- Air switching valve trouble

## Poor Running or No Power at High Speed:

**Firing incorrect:**
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- Stick coil shorted or not in good contact trouble
- Stick coil trouble
- ECU trouble

**Fuel/air mixture incorrect:**
- Air cleaner clogged, poorly sealed, or missing
- Air cleaner housing holder loose
- Water or foreign matter in fuel
- Throttle body assy holder loose
- Fuel to injector insufficient
- Fuel tank air vent obstructed
- Fuel line clogged
- Fuel pump trouble

**Compression low:**
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/groove clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

**Knocking:**
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Spark plug incorrect
- ECU trouble

**Miscellaneous:**
- Throttle valve won't fully open
- Brake dragging
- Clutch slipping
- Engine overheating
- Engine oil level too high
- Engine oil viscosity too high
- Drive train trouble
- Camshaft cam worm
- Air suction valve trouble
- Air switching valve trouble
- Catalytic converter melt down due to muffler overheating (KLEEN)

## Overheating:

**Firing incorrect:**
- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble

**Muffler overheating:**
- For KLEEN, do not run the engine even if with only one cylinder misfiring or poor running (Request the nearest service facility to correct it)
- For KLEEN, do not push-start with a dead battery (Connect another full-charged battery with jumper cables, and start the engine using the electric starter)
- For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the stick coil
- For KLEEN, do not coast the motorcycle with the ignition switch off (Turn the ignition switch ON and run the engine)
- ECU trouble

**Fuel/air mixture incorrect:**
- Throttle body assy holder loose
- Air cleaner housing holder loose
- Air cleaner poorly sealed, or missing

Air cleaner clogged
**Compression high:**
Carbon built up in combustion chamber
**Engine load faulty:**
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Drive train trouble
Brake dragging
**Lubrication inadequate:**
Engine oil level too low
Engine oil poor quality or incorrect
**Oil cooler incorrect:**
Oil cooler clogged
**Water temperature meter incorrect:**
Water temperature meter broken
Water temperature sensor broken
**Coolant incorrect:**
Coolant level too low
Coolant deteriorated
Wrong coolant mixed ratio
**Cooling system component incorrect:**
Radiator fin damaged
Radiator clogged
Thermostat trouble
Radiator cap trouble
Radiator fan relay trouble
Fan motor broken
Fan blade damaged
Water pump not turning
Water pump impeller damaged

## Over Cooling:

**Water temperature meter incorrect:**
Water temperature meter broken
Water temperature sensor broken
**Cooling system component incorrect:**
Thermostat trouble

## Clutch Operation Faulty:

**Clutch slipping:**
Friction plate worn or warped
Steel plate worn or warped
Clutch spring broken or weak
Clutch hub or housing unevenly worn
No clutch lever play
Clutch inner cable trouble
Clutch release mechanism trouble
**Clutch not disengaging properly:**
Clutch plate warped or too rough
Clutch spring compression uneven
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch hub nut loose
Sub clutch hub spline damaged
Clutch friction plate installed wrong
Clutch lever play excessive
Clutch release mechanism trouble

## Gear Shifting Faulty:

**Doesn't go into gear; shift pedal doesn't return:**
Clutch not disengaging
Shift fork bent or seized
Gear stuck on the shaft
Gear positioning lever binding
Shift return spring weak or broken
Shift return spring pin loose
Shift mechanism arm spring broken
Shift mechanism arm broken
Shift pawl broken
Shift ratchet assembly broken
**Jumps out of gear:**
Shift fork ear worn, bent
Gear groove worn
Gear dogs and/or dog holes worn
Shift drum groove worn
Gear positioning lever spring weak or broken
Shift fork guide pin worn
Drive shaft, output shaft, and/or gear splines worn
**Overshifts:**
Gear positioning lever spring weak or broken
Shift mechanism arm return spring weak or broken
Shift ratchet assembly spring weak or broken

## Abnormal Engine Noise:

**Knocking:**
ECU trouble
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect
Overheating
**Piston slap:**
Cylinder/piston clearance excessive
Cylinder, piston worn
Connecting rod bent
Piston pin, piston pin hole worn
**Valve noise:**
Valve clearance incorrect
Valve spring broken or weak
Camshaft bearing worn
Valve lifter worn
**Other noise:**
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive

Piston ring/groove clearance excessive
Piston ring worn, broken, or stuck
Piston ring groove worn
Piston seizure, damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mounting portions loose
Crankshaft bearing worn
Primary gear worn or chipped
Camshaft chain tensioner trouble
Camshaft chain, sprocket, guide worn
Air suction valve damaged
Air switching valve damaged
Alternator rotor loose
Catalytic converter melt down due to muffler overheating (KLEEN)

## Abnormal Drive Train Noise:

**Clutch noise:**
Clutch damper weak or damaged
Clutch housing/friction plate clearance excessive
Clutch housing gear worn
Wrong installation of outside friction plate

**Transmission noise:**
Bearings worn
Transmission gear worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient

**Drive line noise:**
Drive chain adjusted improperly
Drive chain worn
Rear and/or engine sprocket worn
Chain lubrication insufficient
Rear wheel misaligned

## Abnormal Frame Noise:

**Front fork noise:**
Oil insufficient or too thin
Spring weak or broken

**Rear shock absorber noise:**
Shock absorber damaged

**Disc brake noise:**
Pad installed incorrectly
Pad surface glazed
Disc warped
Caliper trouble

**Other noise:**
Bracket, nut, bolt, etc. not properly mounted or tightened

## Warning Indicator Light (Oil Pressure Warning) Doesn't Go OFF:

Engine oil pump damaged
Engine oil screen clogged
Engine oil filter clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearing worn
Crankshaft bearing worn
Oil pressure switch damaged
Wiring faulty
Relief valve stuck open
O-ring at the oil passage in the crankcase damaged

## Exhaust Smokes Excessively:

**White smoke:**
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
Engine oil level too high

**Black smoke:**
Air cleaner clogged

**Brown smoke:**
Air cleaner housing holder loose
Air cleaner poorly sealed or missing

## Handling and/or Stability Unsatisfactory:

**Handlebar hard to turn:**
Cable routing incorrect
Hose routing incorrect
Wiring routing incorrect
Steering stem nut too tight
Steering stem bearing damaged
Steering stem bearing lubrication inadequate
Steering stem bent
Tire air pressure too low

**Handlebar shakes or excessively vibrates:**
Tire worn
Swingarm pivot bearing worn
Rim warped, or not balanced
Wheel bearing worn
Handlebar holder bolt loose
Steering stem nut loose
Front, rear axle runout excessive
Engine mounting portions loose

**Handlebar pulls to one side:**
Frame bent
Wheel misalignment
Swingarm bent or twisted
Swingarm pivot shaft runout excessive
Steering maladjusted
Front fork bent
Right and left front fork oil level uneven

**Shock absorption unsatisfactory:**
(Too hard)
Front fork oil excessive

## Troubleshooting Guide

Front fork oil viscosity too high
Rear shock absorber adjustment too hard
Tire air pressure too high
Front fork bent
(Too soft)
Tire air pressure too low
Front fork oil insufficient and/or leaking
Front fork oil viscosity too low
Rear shock adjustment too soft
Front fork, rear shock absorber spring weak
Rear shock absorber oil leaking

### Brake Doesn't Hold:

Air in the brake line
Pad or disc worn
Brake fluid leakage
Disc warped
Contaminated pad
Brake fluid deteriorated
Primary or secondary cup damaged in master cylinder
Master cylinder scratched inside

### Battery Trouble:

**Battery discharged:**
Charge insufficient
Battery faulty (too low terminal voltage)
Battery cable making poor contact
Load excessive (e.g., bulb of excessive wattage)
Ignition switch trouble
Alternator trouble
Wiring faulty
Regulator/rectifier trouble

**Battery overcharged:**
Alternator trouble
Regulator/rectifier trouble
Battery faulty

## MODEL APPLICATION

| Year | Model | Beginning Frame No. |
|---|---|---|
| 2008 | ZX1000E8F | JKAZXCE1□8A000001 or JKAZXT00EEA000001 or ZXT00E-000001 |
| 2009 | ZX1000E9F | JKAZXCE1□9A02002 or JKAZXT00EEA021002 or ZXT00E-021001 |

□:This digit in the frame number changes from one machine to another.

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