

# Ninja H2R

---

## Motorcycle Service Manual

---



**Kawasaki**



# Quick Reference Guide

|                                    |           |
|------------------------------------|-----------|
| <b>General Information</b>         | <b>1</b>  |
| <b>Periodic Maintenance</b>        | <b>2</b>  |
| <b>Fuel System (DFI)</b>           | <b>3</b>  |
| <b>Cooling System</b>              | <b>4</b>  |
| <b>Engine Top End</b>              | <b>5</b>  |
| <b>Clutch</b>                      | <b>6</b>  |
| <b>Engine Lubrication System</b>   | <b>7</b>  |
| <b>Engine Removal/Installation</b> | <b>8</b>  |
| <b>Crankshaft/Transmission</b>     | <b>9</b>  |
| <b>Wheels/Tires</b>                | <b>10</b> |
| <b>Final Drive</b>                 | <b>11</b> |
| <b>Brakes</b>                      | <b>12</b> |
| <b>Suspension</b>                  | <b>13</b> |
| <b>Steering</b>                    | <b>14</b> |
| <b>Frame</b>                       | <b>15</b> |
| <b>Electrical System</b>           | <b>16</b> |
| <b>Self-Diagnosis System</b>       | <b>17</b> |
| <b>Appendix</b>                    | <b>18</b> |

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.





# Ninja H2R

# Motorcycle Service Manual

---

All rights reserved. No parts of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic mechanical photocopying, recording or otherwise, without the prior written permission of Quality Assurance Division/Motorcycle & Engine Company/Kawasaki Heavy Industries, Ltd., Japan.

No liability can be accepted for any inaccuracies or omissions in this publication, although every possible care has been taken to make it as complete and accurate as possible.

The right is reserved to make changes at any time without prior notice and without incurring an obligation to make such changes to products manufactured previously. See your Motorcycle dealer for the latest information on product improvements incorporated after this publication.

All information contained in this publication is based on the latest product information available at the time of publication. Illustrations and photographs in this publication are intended for reference use only and may not depict actual model component parts.

## LIST OF ABBREVIATIONS

|        |                               |      |  |
|--------|-------------------------------|------|--|
| A      | ampere(s)                     | KIBS | Kawasaki intelligent antilock brake system |
| ABDC   | after bottom dead center      | KLCM | Kawasaki lunch control mode                |
| ABS    | antilock brake system         | km/h | kilometers per hour                        |
| AC     | alternating current           | KTRC | Kawasaki traction control                  |
| Ah     | ampere hour                   | KQS  | Kawasaki quick shift                       |
| ATDC   | after top dead center         | L    | liter(s)                                   |
| BBDC   | before bottom dead center     | LCD  | liquid crystal display                     |
| BDC    | bottom dead center            | LED  | light emitting diode                       |
| BTDC   | before top dead center        | lb   | pound(s)                                   |
| °C     | degree(s) Celsius             | m    | meter(s)                                   |
| cmHg   | centimeters of mercury        | min  | minute(s)                                  |
| CU     | central processing unit       | mmHg | millimeters of mercury                     |
| cu in. | cubic inch(s)                 | mph  | miles per hour                             |
| DC     | direct current                | N    | newton(s)                                  |
| DFI    | digital fuel injection        | oz   | ounce(s)                                   |
| DOHC   | double overhead camshaft      | Pa   | pascal(s)                                  |
| DOT    | department of transportation  | PS   | horsepower                                 |
| ECU    | electronic control unit       | psi  | pound(s) per square inch                   |
| ESD    | electronic steering damper    | qt   | quart(s)                                   |
| F      | farad(s)                      | r    | revolution                                 |
| °F     | degree(s) Fahrenheit          | rpm  | revolution(s) per minute                   |
| ft     | foot, feet                    | s    | second(s)                                  |
| g      | gram(s)                       | TDC  | top dead center                            |
| gal    | gallon(s)                     | TIR  | total indicator reading                    |
| h      | hour(s)                       | V    | volt(s)                                    |
| HP     | horsepower(s)                 | W    | watt(s)                                    |
| IC     | integrated circuit            | Ω    | ohm(s)                                     |
| in.    | inch(es)                      |      |  |
| KEBC   | Kawasaki engine brake control |      |  |

## COUNTRY AND AREA CODES

|     |             |                  |   |
|-----|-------------|------------------|---|
| AT  | Austria     | GB               | United Kingdom  |
| AU  | Australia   | ID               | Indonesia   |
| CA  | Canada      | MY               | Malaysia  |
| CH  | Switzerland | US               | United States   |
| DE  | Germany     | WVTA<br>(FULL H) | WVTA Model with Honeycomb<br>Catalytic Converter (Full Power) |
| EUR | Europe      |                  |   |

# 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.

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 stick 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 Stick Coil section.

Whenever you see symbols, heed their instructions! Always follow safe operating and maintenance practices.

### **DANGER**

**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.

### **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.

### **NOTICE**

**NOTICE** is used to address practices not related to personal injury.

This manual contains four more symbols which will help you distinguish different types of information.

### **NOTE**

○ *NOTE* indicates information that may help or guide you in the operation or service of the vehicle.

- 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 .....                              | 1-2  |
| Model Identification.....                           | 1-7  |
| General Specifications.....                         | 1-8  |
| Technical Information - Supercharger (SC) .....     | 1-11 |
| Technical Information - Dog Ring Transmission ..... | 1-17 |
| Unit Conversion Table .....                         | 1-20 |

## 1-2 GENERAL INFORMATION

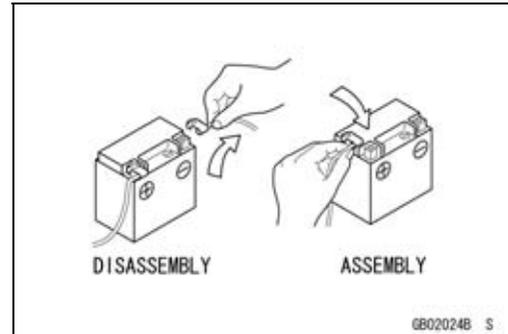
### Before Servicing

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.

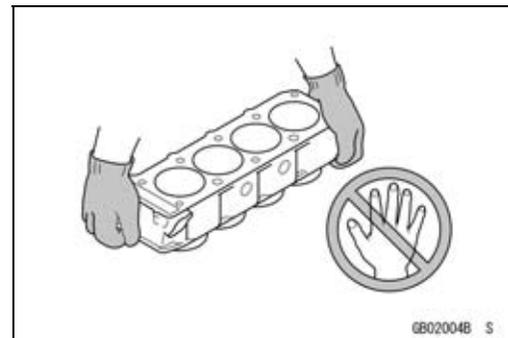
#### **Battery Ground**

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.



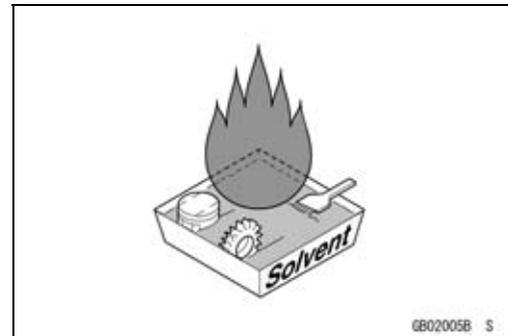
#### **Edges of Parts**

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



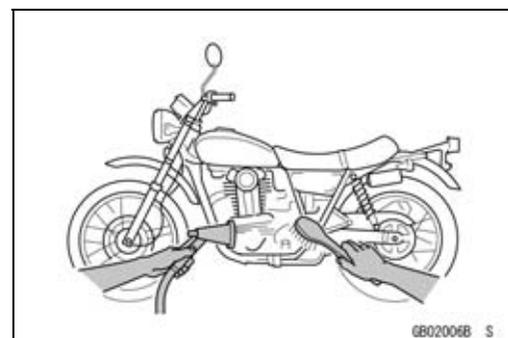
#### **Solvent**

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



#### **Cleaning Vehicle before Disassembly**

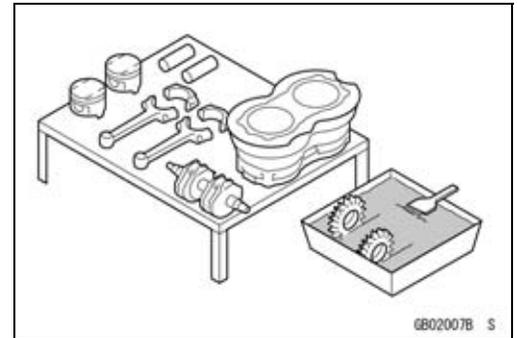
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



## Before Servicing

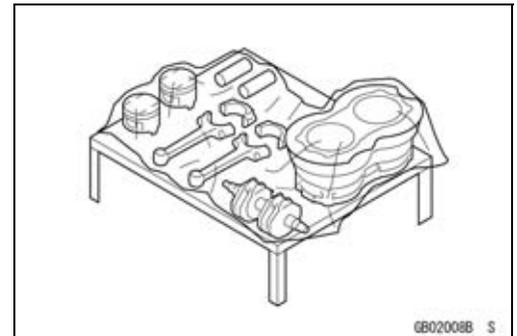
### **Arrangement and Cleaning of Removed Parts**

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.



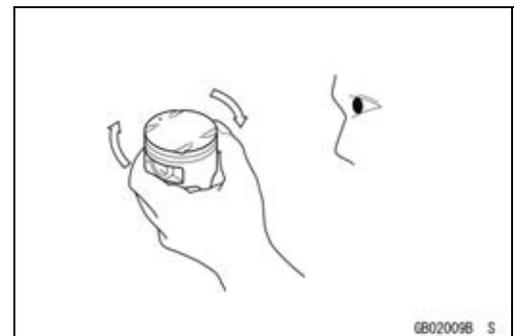
### **Storage of Removed Parts**

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.



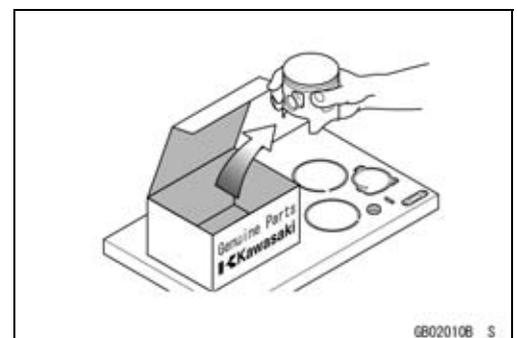
### **Inspection**

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.



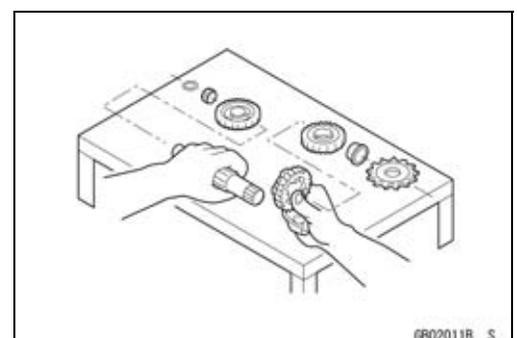
### **Replacement Parts**

Replacement parts must be KAWASAKI genuine or recommended by KAWASAKI. Gaskets, O-rings, oil seals, grease seals, circlips, cotter pins or self-locking nuts 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.

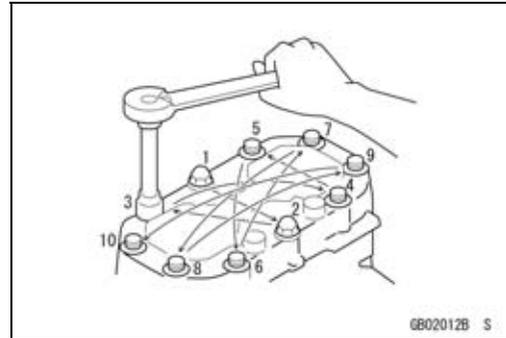


## 1-4 GENERAL INFORMATION

### Before Servicing

#### **Tightening Sequence**

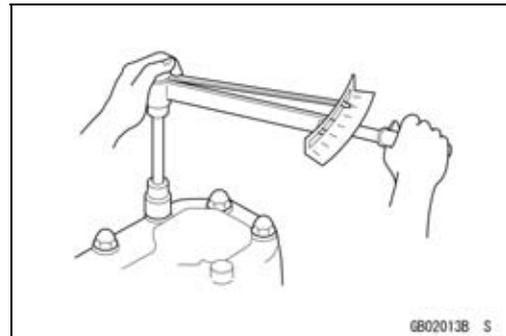
Generally, when installing a part with several bolts, nuts, or screws, start them all in their holes and tighten them to a snug fit. Then tighten them according to the specified sequence to prevent case warpage or deformation which can lead to malfunction. Conversely when loosening the bolts, nuts, or 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**

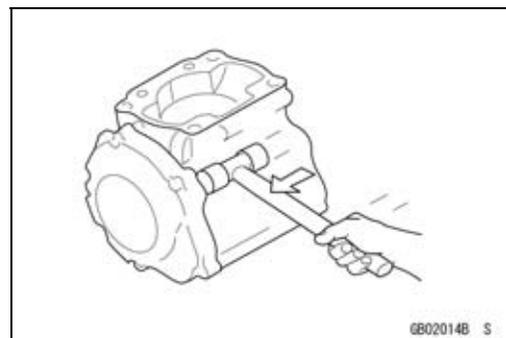
Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.

All of the tightening torque values are for use with dry, solvent - cleaned threads unless otherwise indicated. If a fastener which should have dry, clean threads gets contaminated with lubricant, etc., applying even the specified torque could damage it.



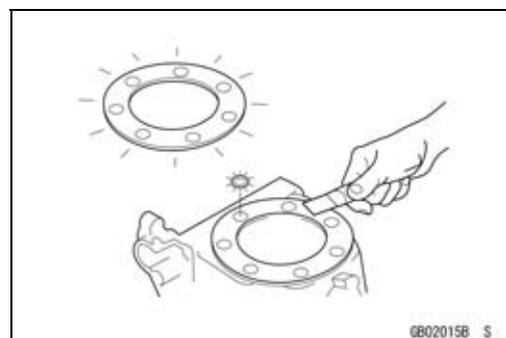
#### **Force**

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**

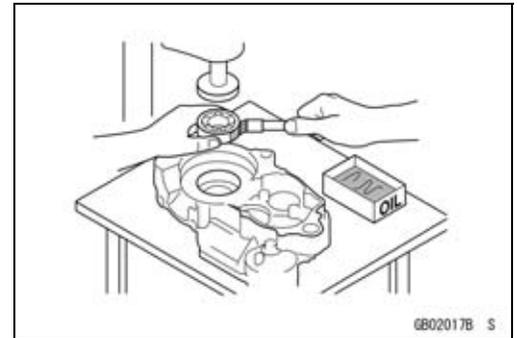
For applications that require Liquid Gasket or a Non-permanent Locking Agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



**Before Servicing**

**Press**

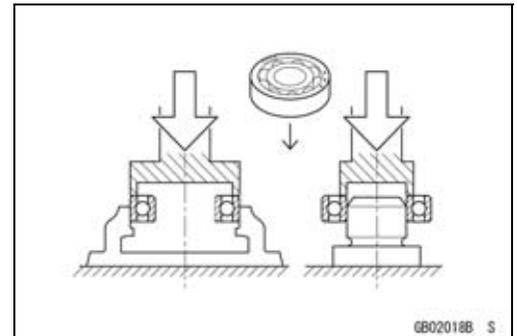
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



**Ball Bearing and Needle Bearing**

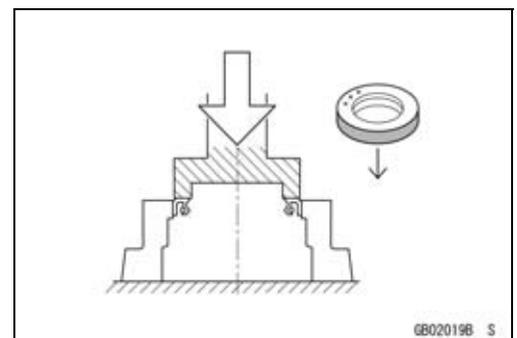
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

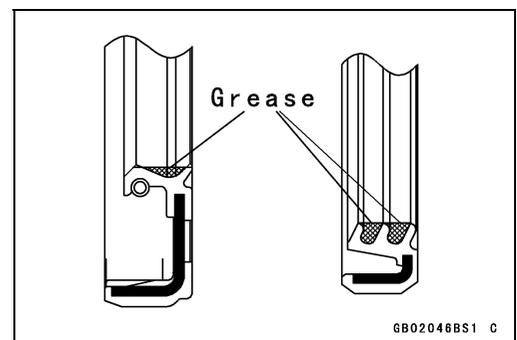


**Oil Seal, Grease Seal**

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.

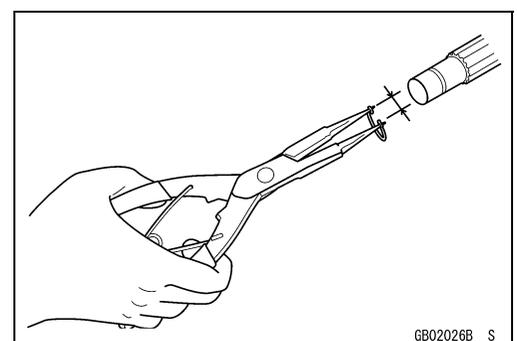


Apply specified grease to the lip of seal before installing the seal.



**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.

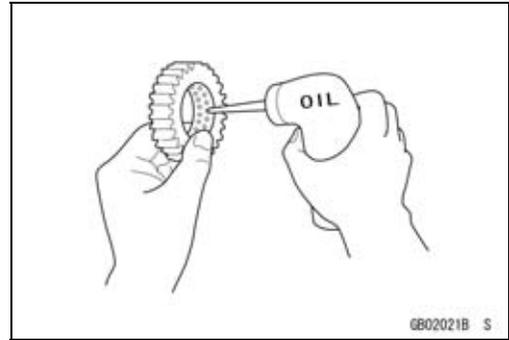


# 1-6 GENERAL INFORMATION

## Before Servicing

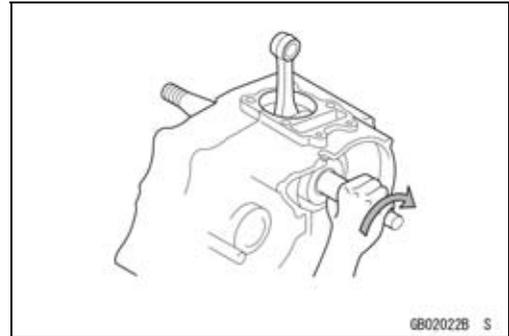
### **Lubrication**

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.



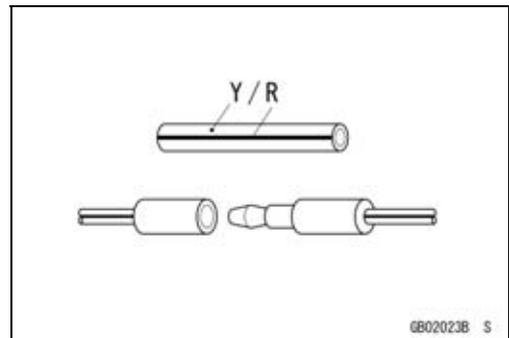
### **Direction of Engine Rotation**

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).



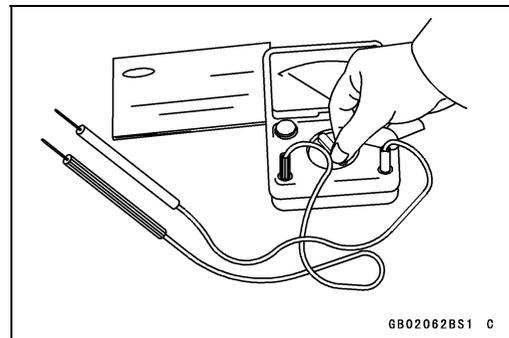
### **Electrical Wires**

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

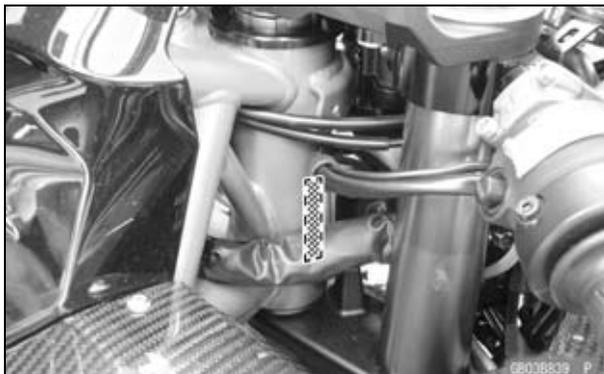
ZX1000PF Left Side View



ZX1000PF Right Side View



Frame Number



Engine Number



# 1-8 GENERAL INFORMATION

## General Specifications

| Items   | ZX1000PF  |
|---|---|
| <b>Dimensions</b><br>Overall Length<br>Overall Width<br>Overall Height<br>Wheelbase<br>Road Clearance<br>Seat Height<br>Curb Mass:<br>Front<br>Rear<br>Fuel Tank Capacity   | 2 070 mm (81.50 in.)<br>770 mm (30.3 in.)<br>1 160 mm (45.67 in.)<br>1 450 mm (57.09 in.)<br>130 mm (5.12 in.)<br>830 mm (32.7 in.)<br>216 kg (476 lb)<br>114 kg (251 lb)<br>102 kg (225 lb)<br>17 L (4.5 US gal.)  |
| <b>Performance</b><br>Minimum Turning Radius  | 3.4 m (11 ft)   |
| <b>Engine</b><br>Type<br>Cooling System<br>Bore and Stroke<br>Displacement<br>Compression Ratio<br>Fuel System<br>Fuel Type:<br>Minimum Octane Rating:<br>Research Octane Number (RON)<br>Antiknock Index (RON + MON)/2<br>Starting System<br>Ignition System<br>Timing Advance<br>Ignition Timing<br><br>Spark Plug<br>Cylinder Numbering Method<br>Firing Order<br>Valve Timing:<br>Intake:<br>Open<br>Close<br>Duration<br>Exhaust:<br>Open<br>Close<br>Duration<br>Lubrication System | 4-stroke, DOHC, 4-cylinder<br>Liquid-cooled<br>76.0 × 55.0 mm (2.99 × 2.17 in.)<br>998 cm <sup>3</sup> (60.9 cu in.)<br>8.3:1<br>FI (Fuel Injection) MIKUNI 50 EIDW × 4<br><br>95<br>90<br>Electric starter<br>Battery and coil (transistorized)<br>Electronically advanced (IC igniter in ECU)<br>From 10° BTDC @1 100 r/min (rpm) to 38.3° BTDC @5 500 r/min (rpm)<br><br>NGK SILMAR9B9<br>Left to right, 1-2-3-4<br>1-2-4-3<br><br>65° BTDC<br>75° ABDC<br>320°<br>75° BBDC<br>25° ATDC<br>280°<br>Forced lubrication (wet sump) |

## General Specifications

| Items  | ZX1000PF  |
|--|---|
| Engine Oil:<br>Type<br>Viscosity<br>Capacity   | API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2<br>SAE 10W-40<br>5.0 L (5.3 US qt)  |
| <b>Drive Train</b><br>Primary Reduction System:<br>Type<br>Reduction Ratio<br>Clutch Type<br>Transmission:<br>Type<br>Gear Ratios:<br>1st<br>2nd<br>3rd<br>4th<br>5th<br>6th<br>Final Drive System:<br>Type<br>Reduction Ratio<br>Overall Drive Ratio              | Gear<br>1.551 (76/49)<br>Wet multi disc<br>6-speed, constant mesh, return shift<br>3.188 (51/16)<br>2.526 (48/19)<br>2.045 (45/22)<br>1.727 (38/22)<br>1.524 (32/21)<br>1.348 (31/23)<br>Chain drive<br>2.333 (42/18)<br>4.878 at Top gear                                |
| <b>Frame</b><br>Type<br>Caster (Rake Angle)<br>Trail<br>Front Tire:<br>Type<br>Size<br>Rim Size<br>Rear Tire:<br>Type<br>Size<br>Rim Size<br>Front Suspension:<br>Type<br>Wheel Travel<br>Rear Suspension:<br>Type<br>Wheel Travel<br>Brake Type:<br>Front<br>Rear | Trellis, high-tensile steel<br>25.1°<br>108 mm (4.25 in.)<br>Tubeless<br>120/600 R17<br>J17M/C × MT3.50<br>Tubeless<br>190/650 R17<br>J17M/C × MT6.00<br>Telescopic fork (upside-down)<br>120 mm (4.72 in.)<br>Swingarm<br>135 mm (5.31 in.)<br>Dual discs<br>Single disc |

## 1-10 GENERAL INFORMATION

### General Specifications

| Items                       | ZX1000PF                       |
|-----------------------------|--------------------------------|
| <b>Electrical Equipment</b> |                                |
| Battery                     | 12 V 8.6 Ah                    |
| Brake/Tail Light            | *LED                           |
| Alternator:                 |                                |
| Type                        | Three-phase AC                 |
| Maximum Output              | 14.0 ~ 30.0 @5 000 r/min (rpm) |

\*: LED (Light Emitting Diode) brake/tail light does not illuminate in a factory shipping state.

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

Technical Information - Supercharger (SC)

**Overview**

This model uses a centrifugal compressor-type supercharger [A]. The crankshaft drives the supercharger impeller through the chain and gears. Therefore, the supercharging effect of the low-speed range is high, and the response to the throttle opening is quick. The focus was not only on power, but also acceleration and response.

This supercharger was completely developed in-house.

Ideal motorcycle-use supercharger is designed using KHI Group technology.

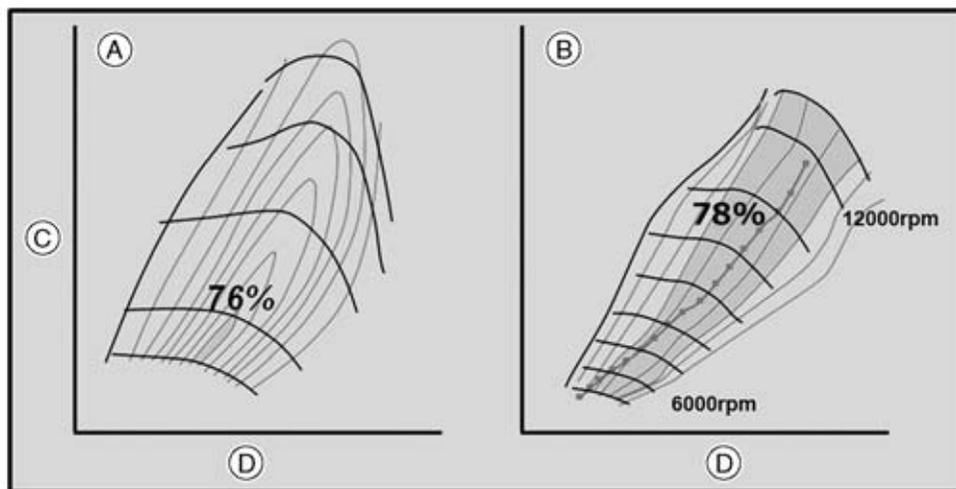
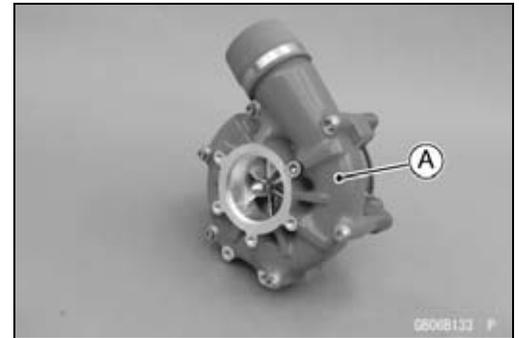
Technical collaboration with:

- Aerospace Company
- Gas Turbine & Machinery Company
- Corporate Technology Division

This SC design produces high efficiency under wide range of conditions and little heat, resulting in no need to add intercooler.

The wide range of high-efficiency SC operation (similar to wide power band) easily translates to strong acceleration.

- Max pumping capacity: Over 200 L/s (atm. pressure)
- Max intake speed: 100 m/s
- Max pressure increase: 2.4×

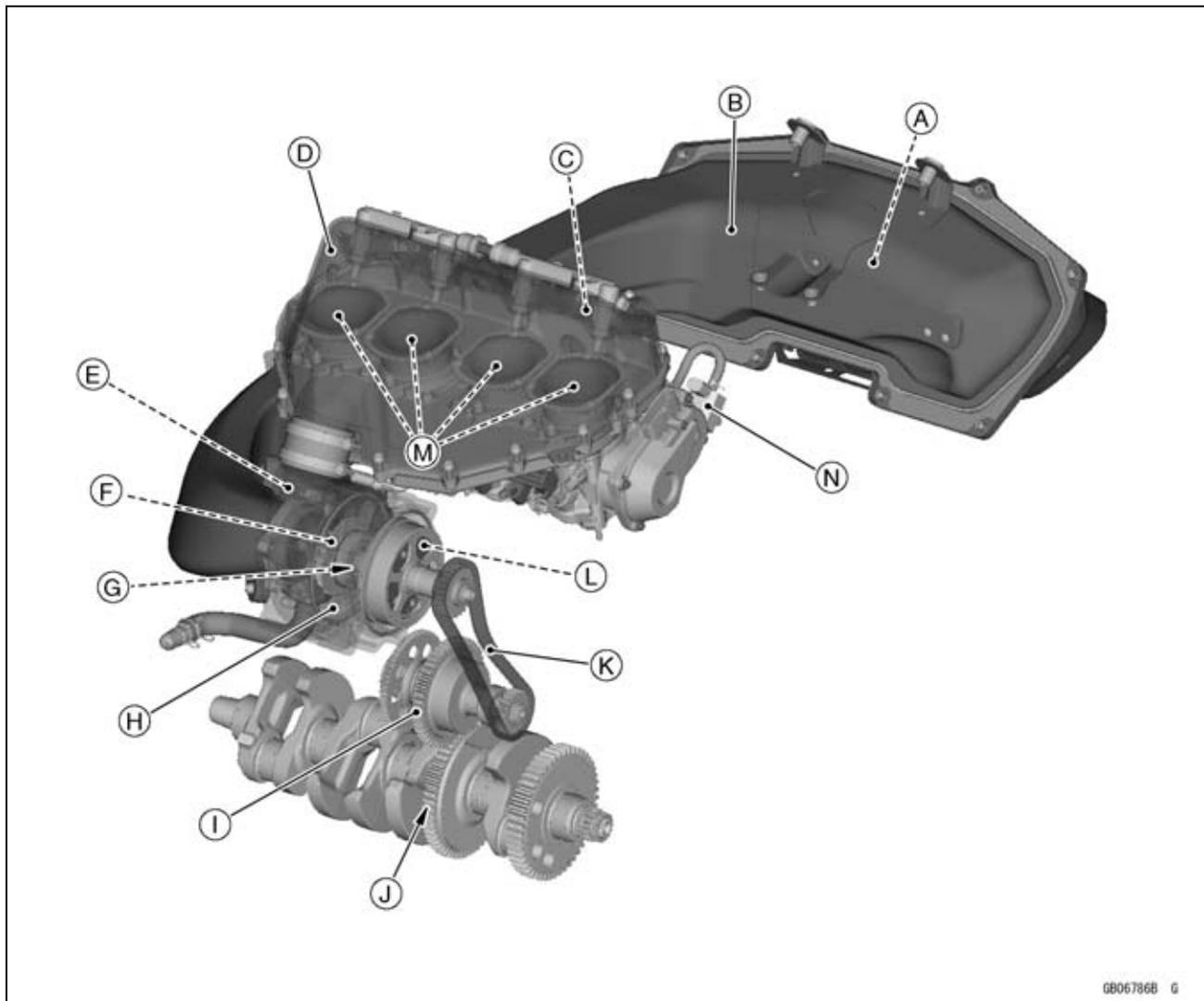


GB06774B G

- [A] Rival Image
- [B] Kawasaki Image
- [C] Pressure Ratio
- [D] Mass Flow Rate

# 1-12 GENERAL INFORMATION

## Technical Information - Supercharger (SC)



- [A] Air Cleaner Element
- [B] Ram Air Intake Duct
- [C] Blow-off Valve
- [D] Intake Chamber (Aluminum)
- [E] Blow-off Valve Hose Fitting Box
- [F] Impeller
- [G] Thrust Bearings (Ball Bearings)

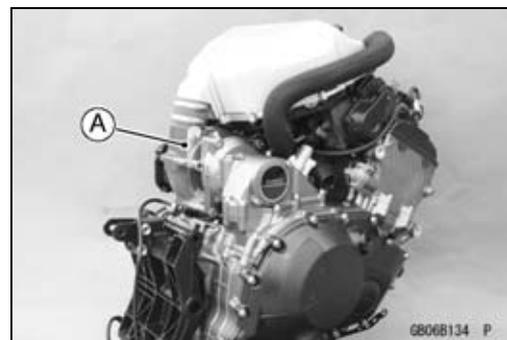
- [H] Supercharger
- [I] Driven Gear
- [J] Drive Gear (6th Web of Crankshaft)
- [K] Supercharger Chain
- [L] Planetary Gears
- [M] Nets (Stainless Steel)
- [N] Relief Valve

### **Supercharger Construction**

#### **Supercharger**

The supercharger [A] located centrally behind the cylinder bank. Best position to efficiently provide compressed air to all 4 cylinders evenly.

The supercharger housing is made of cast aluminum.

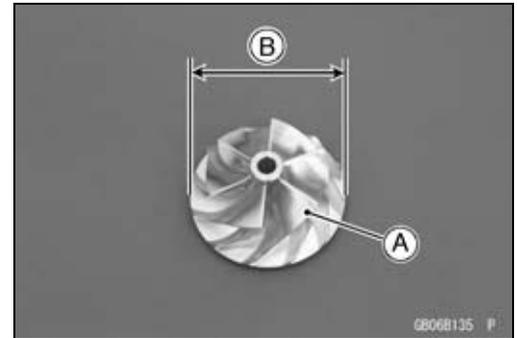


Technical Information - Supercharger (SC)

**Impeller [A]**

3D machined from forged aluminum block.

- 6 vanes at tip, 12 vanes at base
- Impeller diameter: 69 mm (2.7 in.) [B]
- High durability, high precision

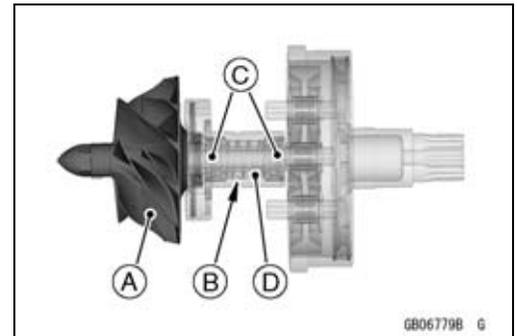


**Impeller Bearing**

Thrust bearing structure: Ceramic ball bearings

- Oil-film damper mechanism (floating)
- Reduce shaft vibration at up to 140 000 r/min (rpm)
- Controls both axial and radial vibrations, maintains alignment

- [A] Impeller
- [B] Floating Structure
- [C] Ball Bearings
- [D] Spring



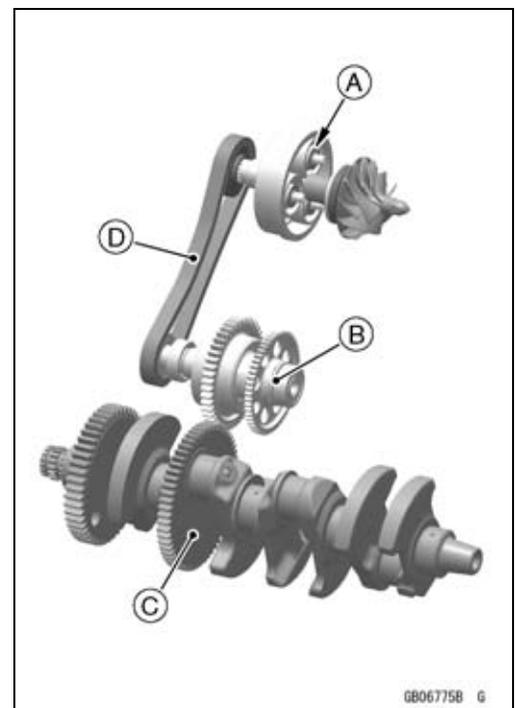
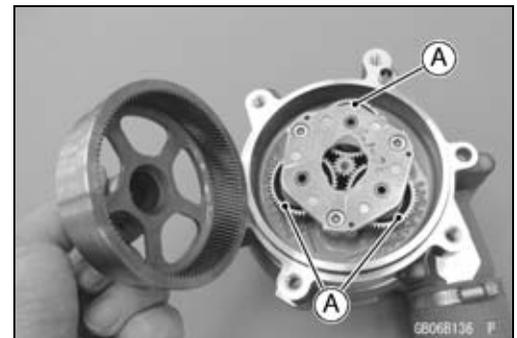
**Gear Train**

The engine oil is used for lubrication.

Making system more complex by using separate oil for the SC (traction drive fluid) is unnecessary.

Planetary gears [A] are used to set-up impeller speed (8x).

- Impeller driven at 9.18x crank speed (Technology from Aerospace Company)
- Compact, minimal power loss
- [B] Driven Shaft
- [C] Drive Gear (6th Web of Crankshaft)
- [D] Supercharger Chain



# 1-14 GENERAL INFORMATION

## Technical Information - Supercharger (SC)

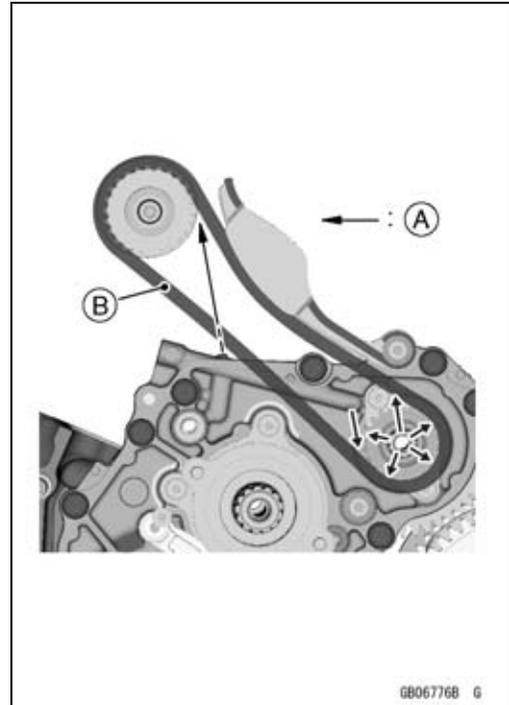
### Oil Jet

The supercharger chain is lubricated by oil jets.

[A] Oil Spouts

[B] Supercharger Chain

- Chain/sprocket contact points lubricated (2 places)
- Suppresses heat gain, prevents oil from running out of parts moving at high speed.

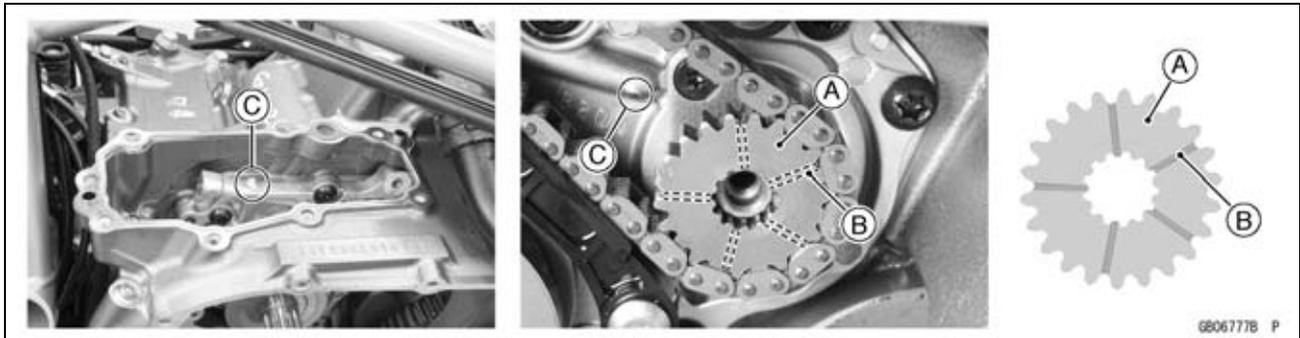


The centrifugal oil jets are used at SC gear.

The lower sprocket [A] has oil passages [B]. Centrifugal force pulls oil out to lubricate chain and gear.

- Suppresses heat gain, prevents oil from running out of parts moving at high speed.

[C] Oil Jets



2 oil jets per cylinder

Nozzle 1: Sprays entire piston underside

Nozzle 2: Sprays EX side of piston underside

- Effective cooling of hot pistons
- Especially for EX side, which gets particularly hot, design ensures oil is always hitting it.

**Technical Information - Supercharger (SC)**

**Supercharger Peripheral  
Ram Air Intake Duct**

The air flow takes fresh air into the SC as straight a line as possible.

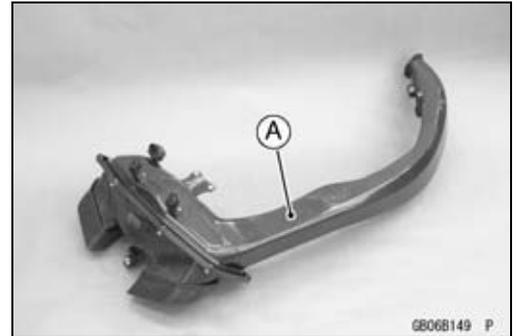
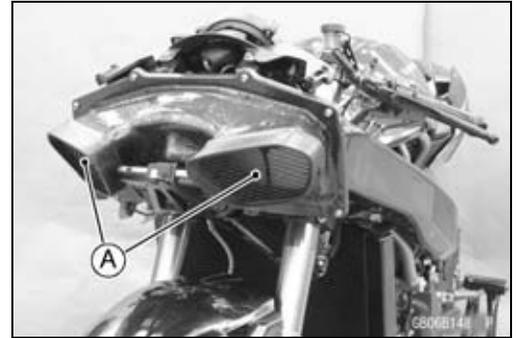
- Frontal area: 13 000 mm<sup>2</sup>

The ram air intake duct [A] enables efficient delivery of fresh air to SC.

The shape derived to match impeller design (characteristics) to achieve high output.

The material of the main duct [A] is CFRP (Carbon Fiber Reinforced Plastics).

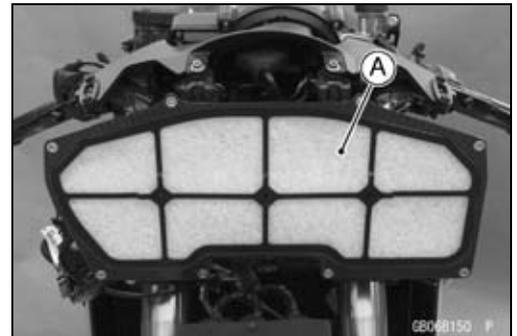
- Smooth surface reduces airflow resistance.
- To achieve ideal intake flow (enables complex shape).



**Air Cleaner Element**

The air cleaner element [A] is non-woven fabric filter.

- Effective filter area: 46 500 mm<sup>2</sup>
- Efficient delivery of fresh air to the SC

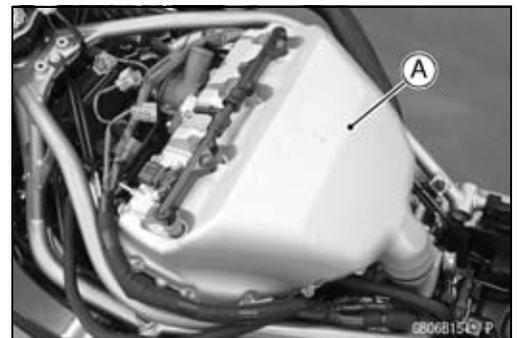


**Intake Chamber**

The intake chamber [A] is made of highly rigid aluminum to ensure airtight performance with the SC air pressure.

The good surface heat radiation helps keep intake air cool.

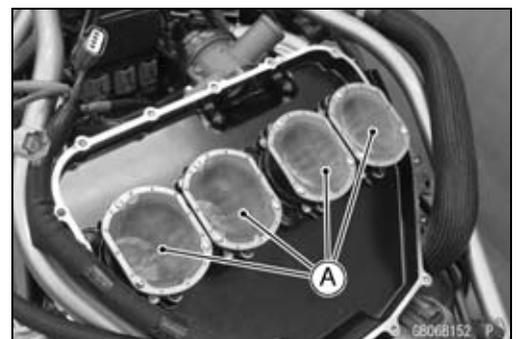
- Large volume, ideal shape for high efficiency, high output



The nets [A] (stainless steel) positioned over intake funnels.

Top injectors spray onto nets.

- Ordering effect >> intakes air-fuel mixture uniformly
- Promotes fuel misting >> cools intake air, increasing filling efficiency



# 1-16 GENERAL INFORMATION

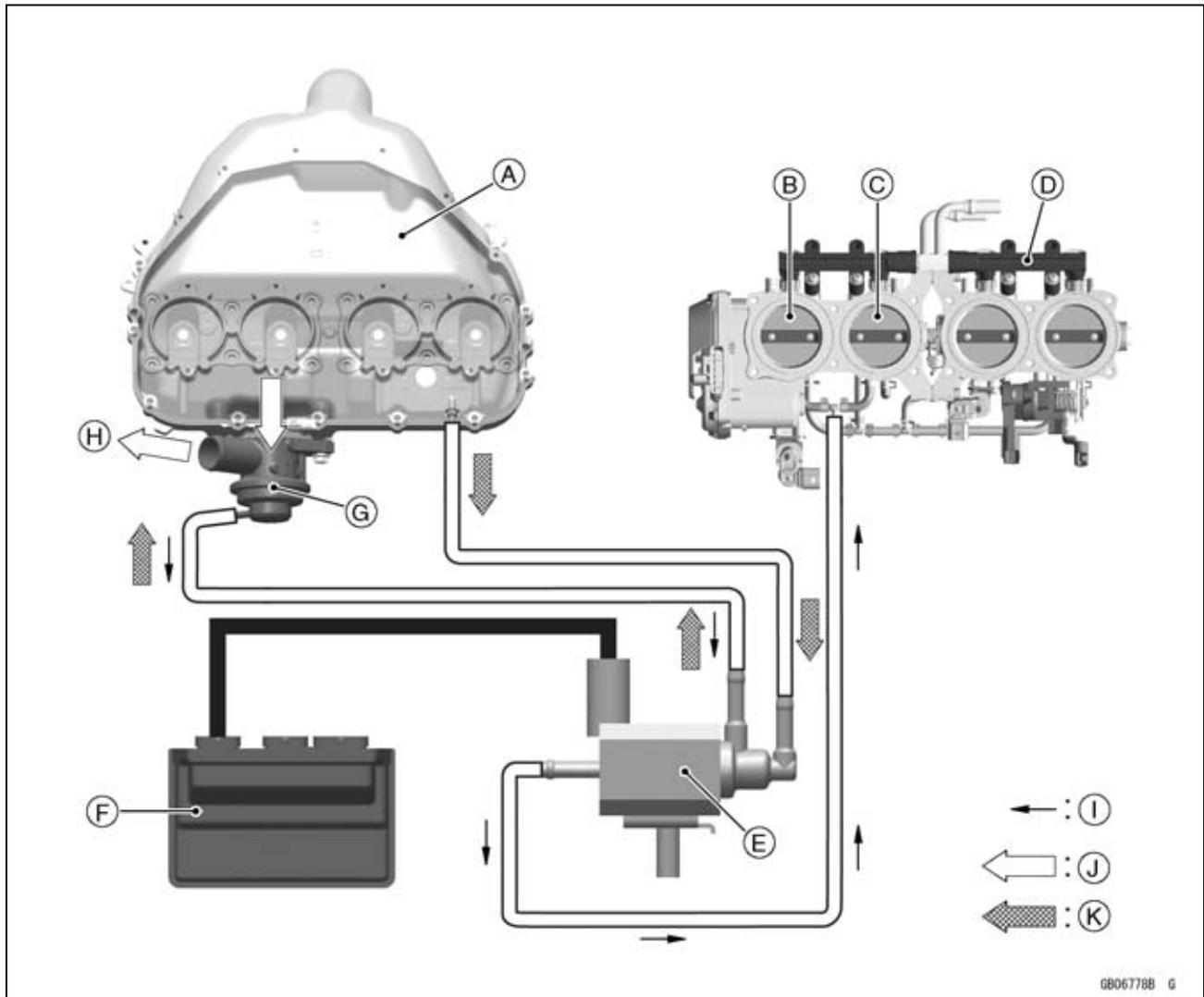
## Technical Information - Supercharger (SC)

### Blow-off Valve

The blow-off valve [A] regulates pressure gain in the intake chamber.

The ECU releases excess pressure from the intake chamber when throttle is closed.

- Prevents impeller surging (abnormal vibration) and impeller damage



GB06778B G

- [A] Intake Chamber
- [B] #4 Throttle Bore
- [C] #3 Throttle Bore
- [D] Throttle Body Assy
- [E] Relief Valve
- [F] ECU

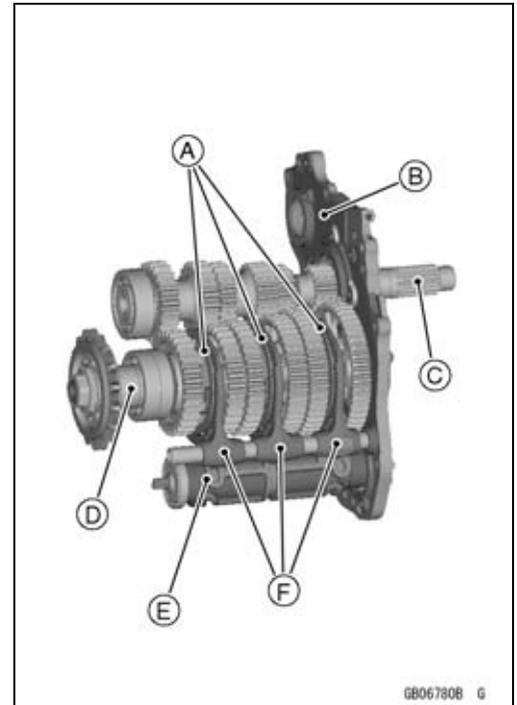
- [G] Blow-off Valve
- [H] To Super Charger Air Cleaner Housing
- [I] Vacuum
- [J] Air Flow
- [K] High Pressure

Technical Information - Dog Ring Transmission

**Overview**

The dog ring transmission is incorporated into the cassette-type transmission.

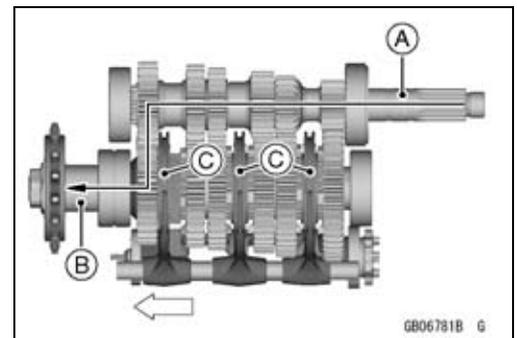
- [A] Dog Rings
- [B] Transmission Case
- [C] Input Shaft
- [D] Output Shaft
- [E] Shift Drum
- [F] Shift Forks



**The dog ring transmission features**

All gears stay in place on the transmission shafts, and the dog rings slide on the transmission shaft to engage gears.

- [A] Input Shaft
- [B] Output Shaft
- [C] Dog Rings
- Technological feedback from Moto GP
- Lighter shift effort
- Improved shift touch
- Shorter shift time

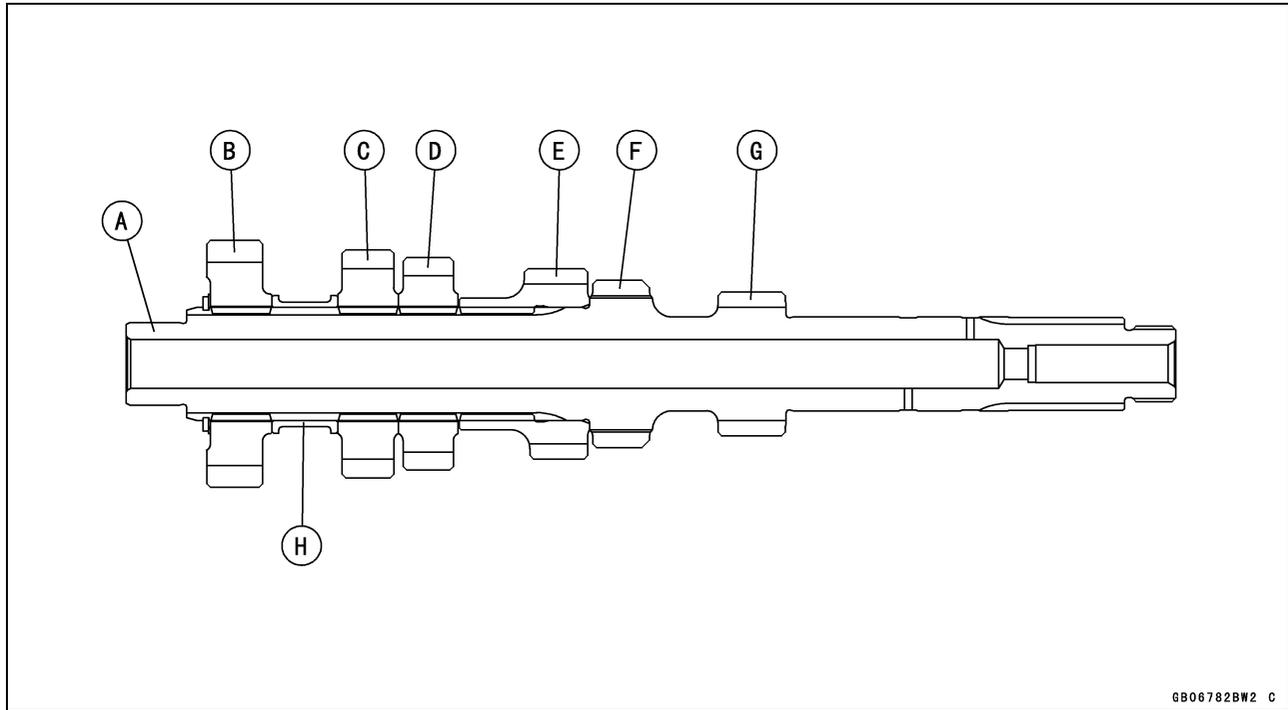


**Input Shaft**

- Input shaft transmission gears are fixed on the input shaft.
- IN 1st, 2nd gears are unitized with the input shaft (more compact)
- Other gears are engaged by the spline.
- Enables short gear ratios for strong acceleration.

# 1-18 GENERAL INFORMATION

## Technical Information - Dog Ring Transmission

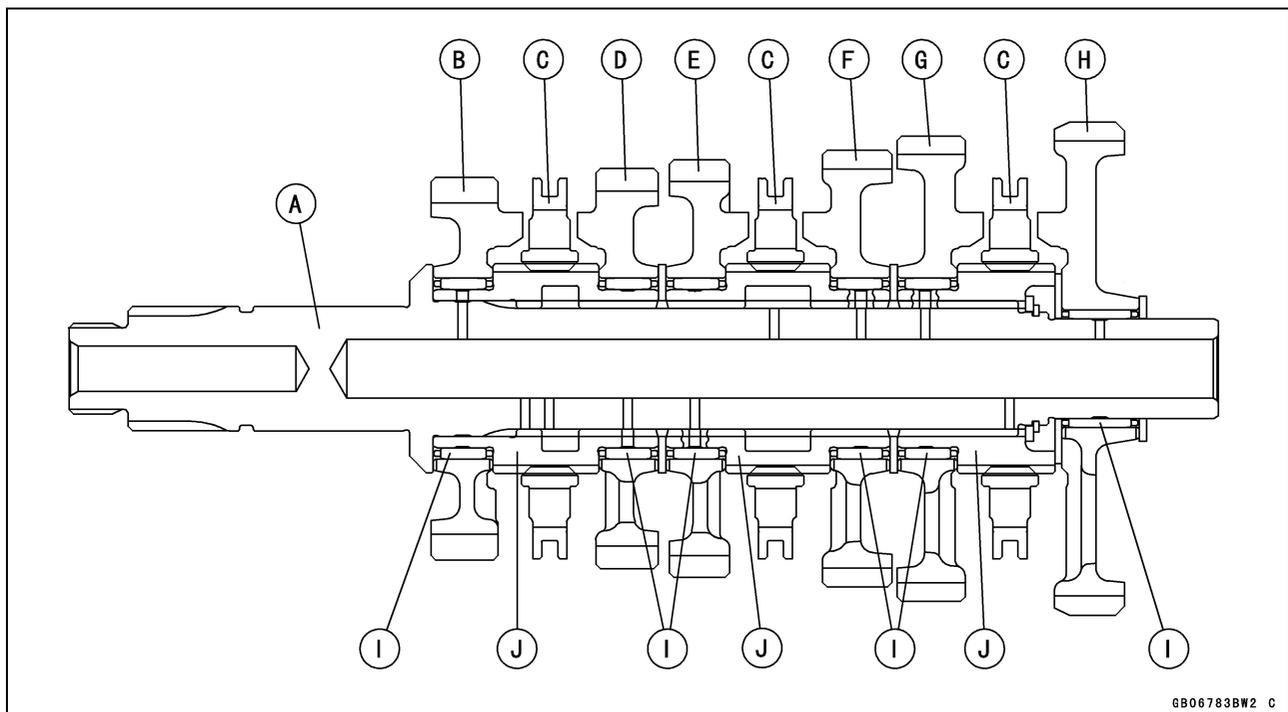


GB06782BW2 C

- [A] Input Shaft
- [B] 6th Gear
- [C] 5th Gear
- [D] 4th Gear
- [E] 3rd Gear
- [F] 2nd Gear
- [G] Low Gear
- [H] Collar

### Output Shaft

Output shaft transmission gears are free on the output shaft.



GB06783BW2 C

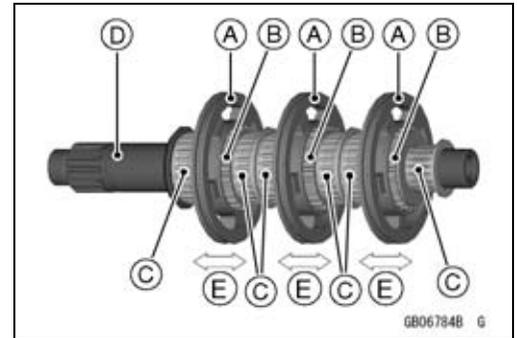
- [A] Output Shaft
- [B] 6th Gear
- [C] Dog Rings
- [D] 5th Gear
- [E] 4th Gear
- [F] 3rd Gear
- [G] 2nd Gear
- [H] Low Gear
- [I] Needle Bearings
- [J] Sleeves

Technical Information - Dog Ring Transmission

**Dog Rings**

When the shift fork slides the dog ring to the driven gear, the dog ring locks the gear on the shaft.

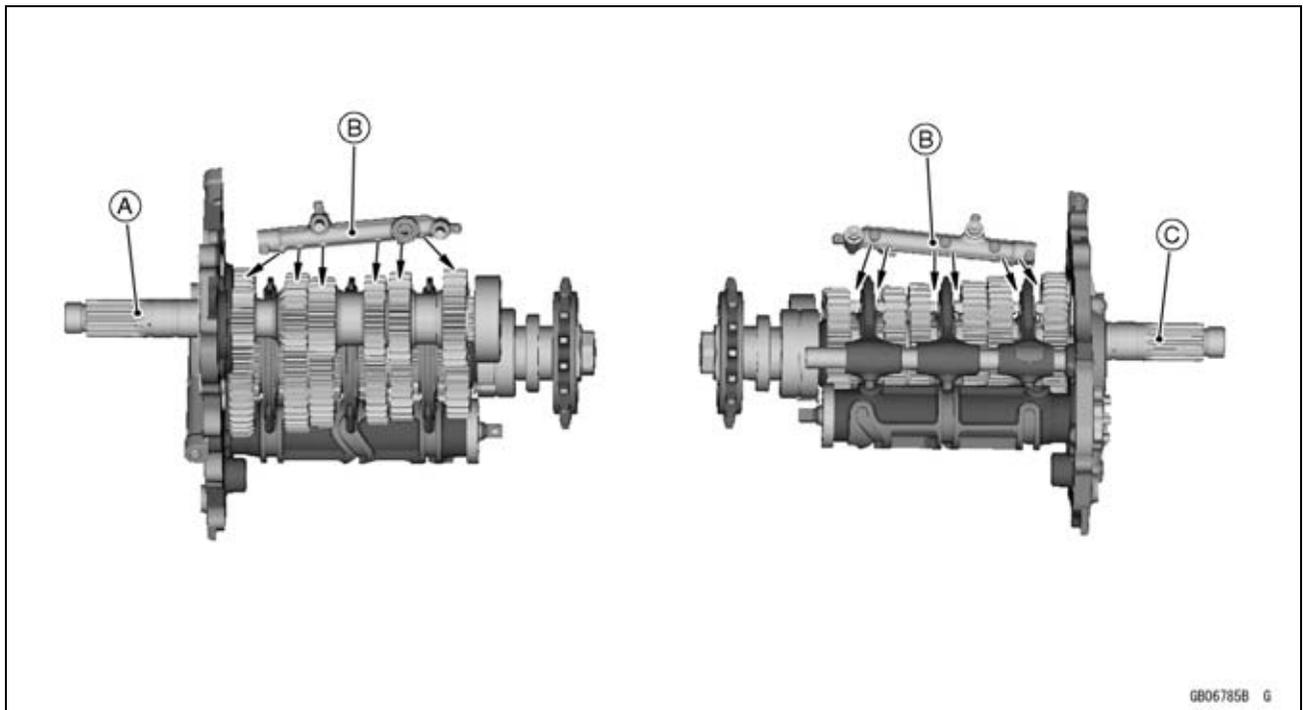
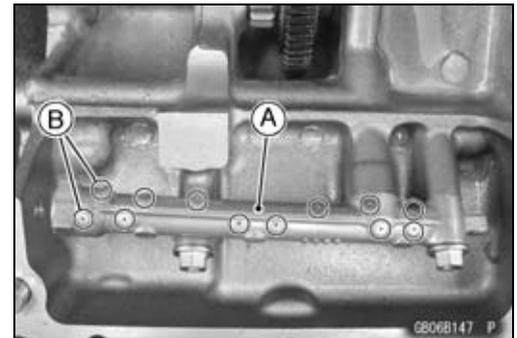
- [A] Dog Rings
- [B] Sleeves
- [C] Needle Bearings
- [D] Output Shaft
- [E] The dog rings shifting direction



**Transmission oil jets (First for Kawasaki motorcycles)**

- Jet at every gear mesh position, shift fork positions (two each): 12 jets total >> direct cooling, lubrication for transmission engagement points.

- [A] Oil Pipe
- [B] Oil Jets
- Enables compact transmission with high durability
- Compact engine contributes to short wheelbase



- [A] Input Shaft
- [B] Oil Pipe
- [C] Output Shaft

# 1-20 GENERAL INFORMATION

## 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/cm <sup>2</sup> |
| kPa | × | 0.1450  | = | psi                 |
| kPa | × | 0.7501  | = | cmHg                |

---

|                     |   |       |   |     |
|---------------------|---|-------|---|-----|
| kgf/cm <sup>2</sup> | × | 98.07 | = | kPa |
| kgf/cm <sup>2</sup> | × | 14.22 | = | psi |
| cmHg                | × | 1.333 | = | kPa |

### Units of Speed:

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

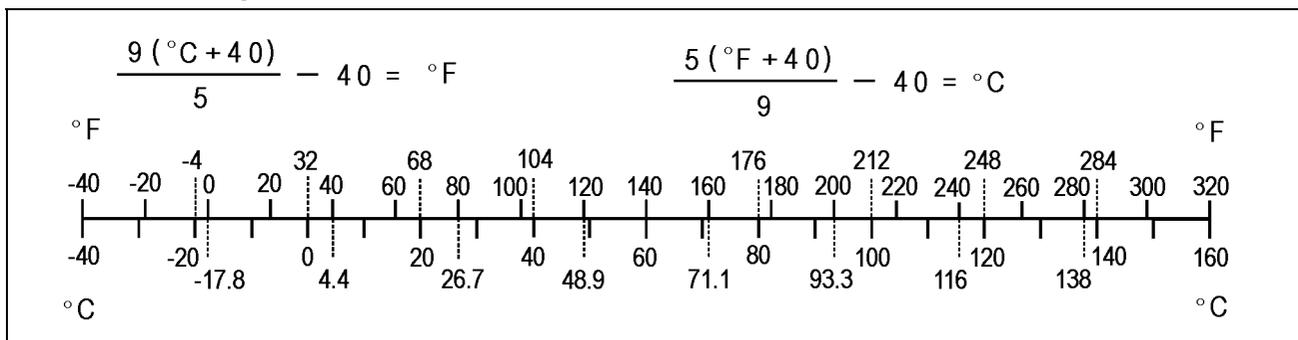
### Units of Power:

|    |   |       |   |    |
|----|---|-------|---|----|
| 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 .....  | 2-3  |
| Service Time Maintenance Chart .....                                    | 2-6  |
| Confirmation of Service Time .....                                      | 2-7  |
| KIT-ECU Odometer (KIT ODO) .....  | 2-9  |
| Torque and Locking Agent .....  | 2-11 |
| Specifications .....  | 2-18 |
| Special Tools .....   | 2-20 |
| Periodic Maintenance Procedures .....                                   | 2-21 |
| Fuel System (DFI) .....   | 2-21 |
| Idle Speed Inspection .....   | 2-21 |
| Idle Speed Adjustment .....   | 2-21 |
| Throttle Control System Inspection .....                                | 2-21 |
| Engine Vacuum Synchronization Inspection .....                          | 2-22 |
| Fuel System Inspection .....  | 2-23 |
| Fuel Filter Replacement .....   | 2-24 |
| Fuel Pump Replacement .....   | 2-26 |
| Fuel Hose Replacement .....   | 2-26 |
| Cooling System .....  | 2-28 |
| Coolant Level Inspection .....  | 2-28 |
| Cooling System Inspection .....   | 2-28 |
| Coolant Change .....  | 2-28 |
| Water Hose and O-ring Replacement .....                                 | 2-31 |
| Engine Top End .....  | 2-32 |
| Valve Clearance Inspection .....  | 2-32 |
| Valve Clearance Adjustment .....  | 2-33 |
| Clutch .....  | 2-37 |
| Clutch System Inspection .....  | 2-37 |
| Clutch Operation Inspection .....                                       | 2-37 |
| Clutch Fluid Level Inspection .....                                     | 2-38 |
| Clutch Fluid Change .....   | 2-39 |
| Clutch Hose Replacement .....   | 2-39 |
| Rubber Parts of Clutch Master Cylinder/Slave Cylinder Replacement ..... | 2-40 |
| Engine Lubrication System .....   | 2-40 |
| Engine Oil Change .....   | 2-40 |
| Oil Filter Replacement .....  | 2-41 |
| Wheels/Tires .....  | 2-42 |
| Air Pressure Inspection .....   | 2-42 |
| Wheels and Tires Inspection .....                                       | 2-43 |
| Wheel Bearing Damage Inspection .....                                   | 2-43 |
| Rear Wheel Coupling Dampers Inspection .....                            | 2-44 |
| Final Drive .....   | 2-44 |
| Drive Chain Lubrication Condition Inspection .....                      | 2-44 |
| Drive Chain Slack Inspection .....                                      | 2-45 |
| Drive Chain Slack Adjustment .....                                      | 2-45 |
| Drive Chain Replacement .....   | 2-46 |
| Chain Guide Wear Inspection .....                                       | 2-47 |
| Brakes .....  | 2-48 |
| Brake System Inspection .....   | 2-48 |
| Brake Operation Inspection .....  | 2-49 |
| Brake Fluid Level Inspection .....                                      | 2-49 |

## 2-2 PERIODIC MAINTENANCE

---

|  |      |
|--|------|
| Brake Fluid Change .....   | 2-50 |
| Brake Hose and Pipe Replacement.....                                 | 2-54 |
| Master Cylinder Rubber Parts Replacement .....                       | 2-56 |
| Caliper Rubber Parts Replacement .....                               | 2-57 |
| Brake Pad Wear Inspection .....                                      | 2-57 |
| Brake Light Switch Operation Inspection .....                        | 2-58 |
| Suspension .....   | 2-59 |
| Suspension System Inspection.....                                    | 2-59 |
| Steering .....   | 2-62 |
| Steering Play Inspection .....                                       | 2-62 |
| Steering Play Adjustment.....  | 2-62 |
| Steering Stem Bearing Lubrication .....                              | 2-64 |
| Electronic Steering Damper Oil Leak Inspection .....                 | 2-64 |
| Electrical System .....  | 2-65 |
| Lights Inspection.....   | 2-65 |
| Side Stand Switch Operation Inspection.....                          | 2-66 |
| Engine Start/Stop Switch Operation Inspection.....                   | 2-67 |
| Spark Plug Condition Inspection.....                                 | 2-67 |
| Spark Plug Replacement .....   | 2-67 |
| Supercharger .....   | 2-68 |
| Supercharger Oil Screen Replacement .....                            | 2-68 |
| Supercharger Impeller Axial Play Inspection .....                    | 2-69 |
| Others .....   | 2-71 |
| Chassis Parts Lubrication .....                                      | 2-71 |
| Condition of Bolts, Nuts and Fasteners Tightness Inspection .....    | 2-72 |
| Service Time Maintenance Procedures.....                             | 2-73 |
| Air Cleaner Element Inspection and Cleaning .....                    | 2-73 |
| Transmission Inspection .....  | 2-74 |
| Clutch Inspection .....  | 2-74 |
| Supercharger Chain and Sprocket Inspection .....                     | 2-75 |
| Supercharger Impeller Axial Play Inspection .....                    | 2-75 |
| Engine Oil Change.....   | 2-75 |
| Oil Filter Replacement .....   | 2-75 |
| Piston and Piston Rings Replacement.....                             | 2-75 |
| Piston Pins Replacement.....   | 2-75 |
| Crankshaft Inspection .....  | 2-75 |
| Crankshaft Bearing Replacement.....                                  | 2-75 |
| Connecting Rods Inspection .....                                     | 2-76 |
| Connecting Rods Replacement .....                                    | 2-76 |
| Connecting Rod Bearings Replacement.....                             | 2-76 |
| Spark Plugs Inspection .....   | 2-76 |
| Supercharger Coupling Dampers Inspection .....                       | 2-76 |
| Camshaft Chain Inspection.....                                       | 2-76 |
| Valve clearance Inspection .....                                     | 2-76 |
| Valve, Valve Seats and Valve Springs (Exhaust Side) Inspection ..... | 2-77 |
| Exhaust Valves Replacement .....                                     | 2-77 |
| Drive Chain Inspection/Replacement.....                              | 2-77 |
| Rear Wheel Coupling Inspection .....                                 | 2-77 |

**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**

\*A: Service at number of years shown or indicated odometer reading intervals, whichever comes first.

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

\*C: Service more frequently when operating in severe conditions: dusty or high speed.

: Inspection

: Change or Replace

: Lubrication

| Items   | year (*A)  | Odometer Reading (*B)<br>× 1 000 km (× 1 000 mile)   |            |   |              |   | See Page      |
|---|--|--|------------|---|--------------|---|---------------|
|   |  | 1<br>(0.6)   | 6<br>(3.8) | 12<br>(7.6)   | 18<br>(11.4) | 24<br>(15.2)  |               |
| <b>Fuel System</b>  |  |  |            |   |              |   |               |
| Idle speed  |  | Q  |            | Q   |              | Q   | 2-21          |
| Throttle control system (play, smooth return, no drag)                | Q:1  | Q  |            | Q   |              | Q   | 2-21          |
| Engine vacuum synchronization   |  |  |            | Q   |              | Q   | 2-22          |
| Fuel system   | Q:1  | Q  |            | Q   |              | Q   | 2-23          |
| Fuel filter   |  |  |            |   |              |  | 2-24          |
| Fuel pump   |  |  every 48 000 km<br>(30 000 mile) |            |   |              |   | 2-26          |
| Fuel hose   |  :5 |  |            |   |              |   | 2-26          |
| <b>Cooling System</b>   |  |  |            |   |              |   |               |
| Coolant level   |  | Q  |            | Q   |              | Q   | 2-28          |
| Cooling system  | Q:1  | Q  |            | Q   |              | Q   | 2-28          |
| Coolant, water hoses and O-rings                                      |  :3 |  every 36 000 km<br>(22 500 mile) |            |   |              |   | 2-28,<br>2-31 |
| <b>Engine Top End</b>   |  |  |            |   |              |   |               |
| Valve clearance   |  |  |            |   |              | Q   | 2-32          |
| <b>Clutch</b>   |  |  |            |   |              |   |               |
| Clutch operation (play, engagement, disengagement)                    |  | Q  |            | Q   |              | Q   | 2-37          |
| Clutch fluid level  | Q:0.5  | Q  | Q          | Q   | Q            | Q   | 2-38          |
| Clutch fluid, hose and pipe   | Q:1  | Q  | Q          | Q   | Q            | Q   | 2-37          |
| Clutch fluid  |  :2 |  |            |   |              |  | 2-39          |
| Clutch hose/rubber parts of clutch master cylinder and slave cylinder |  :4 |  every 48 000 km<br>(30 000 mile) |            |   |              |   | 2-39,<br>2-40 |
| <b>Engine Lubrication System</b>                                      |  |  |            |   |              |   |               |
| Engine oil and oil filter (*C)  |  :1 |                                     |            |  |              |  | 2-40,<br>2-41 |
| <b>Wheels and Tires</b>   |  |  |            |   |              |   |               |
| Tire air pressure   | Q:1  |  |            | Q   |              | Q   | 2-42          |

## 2-4 PERIODIC MAINTENANCE

### Periodic Maintenance Chart

| Items   | year<br>(*A) | Odometer Reading (*B)<br>× 1 000 km (× 1 000 mile) |            |             |              |              | See<br>Page |
|---|--------------|--|------------|-------------|--------------|--------------|-------------|
|   |              | 1<br>(0.6)   | 6<br>(3.8) | 12<br>(7.6) | 18<br>(11.4) | 24<br>(15.2) |             |
| Wheels and tires  | Q:1          |  |            | Q           |              | Q            | 2-43        |
| Wheel bearing damage  | Q:1          |  |            | Q           |              | Q            | 2-43        |
| Rear wheel coupling dampers   |              |  |            | Q           |              | Q            | 2-44        |
| <b>Final Drive</b>  |              |  |            |             |              |              |             |
| Drive chain lubrication condition (*C)  |              | Q: every 500 km (300 mile)                         |            |             |              |              | 2-44        |
| Drive chain slack (*C)  |              | Q: every 1 000 km (600 mile)                       |            |             |              |              | 2-45        |
| Drive chain (*C)  |              | 🔄: every 4 500 km<br>(2 800 mile)                  |            |             |              |              | 2-46        |
| Drive chain guide wear  |              |  |            | Q           |              | Q            | 2-47        |
| <b>Brakes</b>   |              |  |            |             |              |              |             |
| Brake system  | Q:1          | Q  | Q          | Q           | Q            | Q            | 2-48        |
| Brake operation (effectiveness, play, no drag)                                | Q:1          | Q  | Q          | Q           | Q            | Q            | 2-49        |
| Brake fluid level   | Q:0.5        | Q  | Q          | Q           | Q            | Q            | 2-49        |
| Brake fluid (front and rear)  | 🔄:2          |  |            |             |              | 🔄            | 2-50        |
| Brake hose  | 🔄:4          |  |            |             |              |              | 2-54        |
| Rubber parts of brake master cylinder and caliper                             | 🔄:4          | 🔄: every 48 000 km<br>(30 000 mile)                |            |             |              |              | 2-56        |
| Brake pad wear (*C)   |              |  | Q          | Q           | Q            | Q            | 2-57        |
| Brake light switch operation (unable to function in a factory shipping state) |              | Q  | Q          | Q           | Q            | Q            | 2-58        |
| <b>Suspension</b>   |              |  |            |             |              |              |             |
| Suspension system   | Q:1          |  |            | Q           |              | Q            | 2-59        |
| <b>Steering</b>   |              |  |            |             |              |              |             |
| Steering play   | Q:1          | Q  |            | Q           |              | Q            | 2-62        |
| Steering stem bearings  | 🔧:2          |  |            |             |              | 🔧            | 2-64        |
| Electronic steering damper oil leak   |              |  | Q          | Q           | Q            | Q            | 2-64        |
| <b>Electrical System</b>  |              |  |            |             |              |              |             |
| Electrical system   | Q:1          |  |            | Q           |              | Q            | 2-65        |
| Spark plugs   |              |  |            |             |              | Q            | 2-67        |
|   |              | 🔄: every 48 000 km<br>(30 000 mile)                |            |             |              |              | 2-67        |

Periodic Maintenance Chart

| Items                                  | year<br>(*A) | Odometer Reading (*B)<br>× 1 000 km (× 1 000 mile) |            |             |              |              | See<br>Page |
|--|--------------|--|------------|-------------|--------------|--------------|-------------|
|  |              | 1<br>(0.6)   | 6<br>(3.8) | 12<br>(7.6) | 18<br>(11.4) | 24<br>(15.2) |             |
| <b>Supercharger</b>                    |              |  |            |             |              |              |             |
| Supercharger oil screen                |              |  |            |             |              | 🔄            | 2-68        |
| Supercharger impeller axial play       |              | Q  |            | Q           |              | Q            | 2-69        |
| <b>Others</b>                          |              |  |            |             |              |              |             |
| Chassis parts                          | 🔧:1          |  |            | 🔧           |              | 🔧            | 2-71        |
| Condition of bolts, nuts and fasteners |              | Q  |            | Q           |              | Q            | 2-72        |

## 2-6 PERIODIC MAINTENANCE

### Service Time Maintenance Chart

In addition to the periodical inspections according to the riding distance and/or time elapsed, perform the service specified in the following table every 15 hours of engine operation above 8 000 r/min (rpm). These service intervals are monitored through the vehicle's ECU with service message displayed on the multi function meter.

Perform the service repeatedly in the same way after 30 hours.

#### Service Time Inspection

Q: Inspection

↻: Change or Replacement

| Items  | Service Time (h)  |    | See Page |
|--|-------------------|----|----------|
|  | 15                | 30 |          |
| <b>Engine</b>  |                   |    |          |
| Air cleaner element                                  | Q                 | Q  | 2-73     |
| Transmission   |                   | Q  | 2-74     |
| Clutch   | Q                 | Q  | 2-74     |
| Supercharger chain and sprocket                      | Q                 | Q  | 2-75     |
| Supercharger impeller axial play                     | Q                 | Q  | 2-69     |
| Engine oil   | ↻                 | ↻  | 2-40     |
| Engine oil filter                                    |                   | ↻  | 2-41     |
| Pistons and piston rings                             |                   | ↻  | 2-75     |
| Piston pins  |                   | ↻  | 2-75     |
| Crankshaft   |                   | Q  | 2-75     |
| Crankshaft bearings                                  |                   | ↻  | 2-75     |
| Connecting rods                                      |                   | Q  | 2-76     |
|  | ↻: every 60 hours |    | 2-76     |
| Connecting rod bearings                              |                   | ↻  | 2-76     |
| Spark plugs  |                   | Q  | 2-67     |
| Supercharger coupling dampers                        |                   | Q  | 2-76     |
| Camshaft chain                                       |                   | Q  | 2-76     |
| Valve clearance                                      | Q                 | Q  | 2-32     |
| Valves, valve seats and valve springs (exhaust side) |                   | Q  | 2-77     |
| Exhaust Valves                                       | ↻: every 60 hours |    | 2-77     |
| <b>Chassis</b>                                       |                   |    |          |
| Drive chain  | Q                 | ↻  | 2-77     |
| Rear wheel coupling dampers                          | Q                 | Q  | 2-44     |

**Service Time Maintenance Chart**

**Confirmation of Service Time**

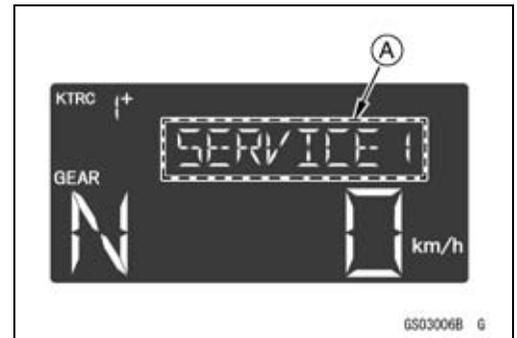
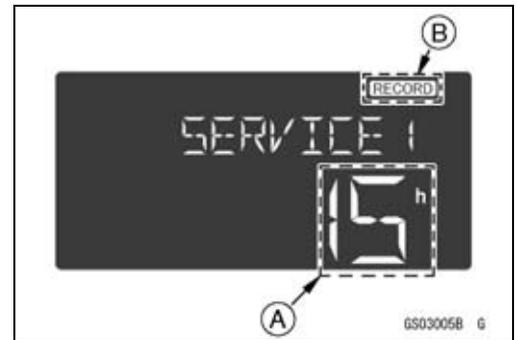
You can confirm the service time [A] in the record mode [B] of the multifunction meter.

|          | Service Time |
|----------|--------------|
| SERVICE1 | 15 (h)       |
| SERVICE2 | 30 (h)       |

**NOTE**

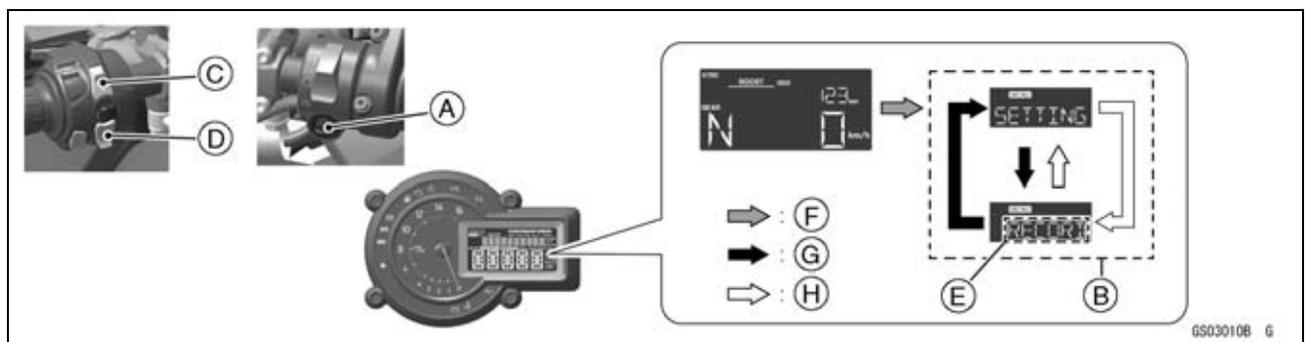
○ The service time decrease only when the engine speed is more than 8 000 r/min (rpm).

When the service time reached to “0”, the “SERVICE1” [A] or “SERVICE2” message blinks on the multifunction meter. Reset the service time, and do the maintenance of your motorcycle.



To confirm service time:

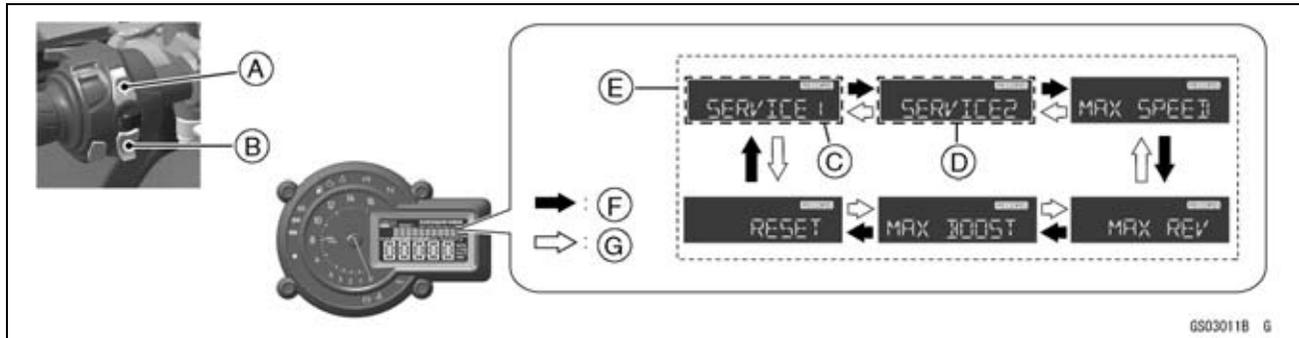
- Push and hold the mode button [A] to display the menu mode [B].
- Push the upper button [C] or lower button [D] to display the record mode “RECORD” [E].
- Push the mode button to select the record mode.
  - [F] Flow when pushing and holding mode button
  - [G] Flow when pushing upper button
  - [H] Flow when pushing lower button



## 2-8 PERIODIC MAINTENANCE

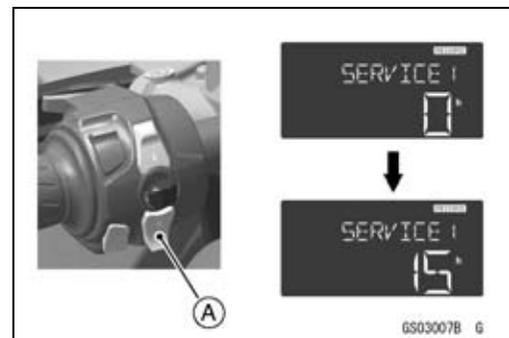
### Service Time Maintenance Chart

- Push the upper button [A] or lower button [B] to display the "SERVICE1" [C] or "SERVICE2" [D].
- Push the mode button to select the "SERVICE1" or "SERVICE2".
  - [E] Record Mode
  - [F] Flow when pushing upper button
  - [G] Flow when pushing lower button



To reset the service time:

- Select the "SERVICE1" or "SERVICE2" in the record mode.
- Push and hold the lower button [A] to reset the service time.



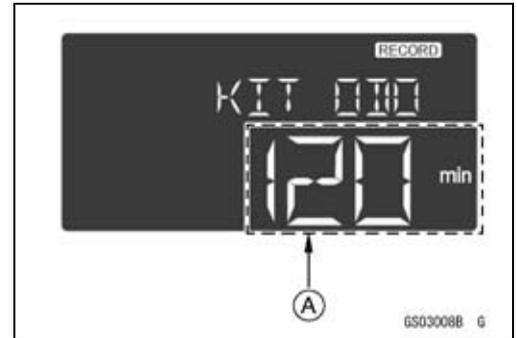
**Service Time Maintenance Chart**

**KIT-ECU Odometer (KIT ODO)**

The KIT-ECU odometer shows the total minutes that the motorcycle has been operated. You can confirm the KIT-ECU odometer [A] in the record mode of the multifunction meter.

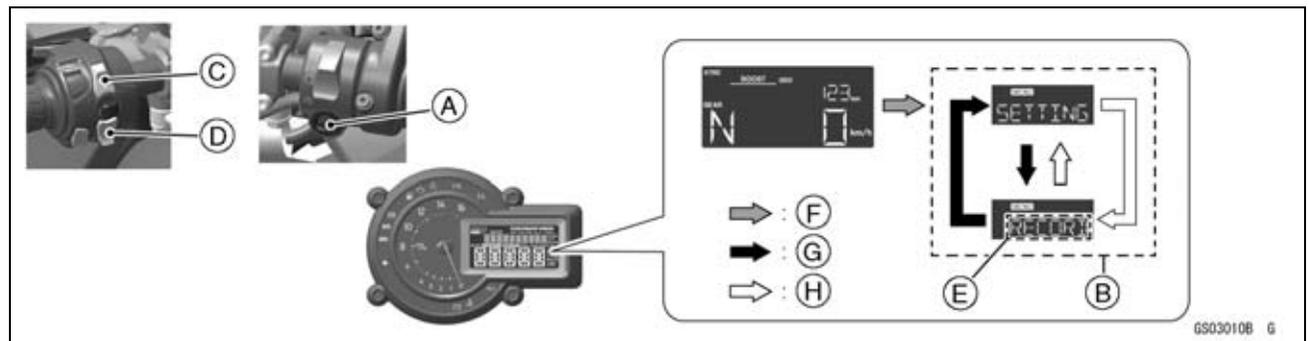
**NOTE**

- The KIT-ECU odometer increases when the engine speed is more than 8 000 r/min (rpm).
- When the figures to 6 000, the display is stopped and locked. This meter cannot be reset.



To confirm KIT-ECU odometer:

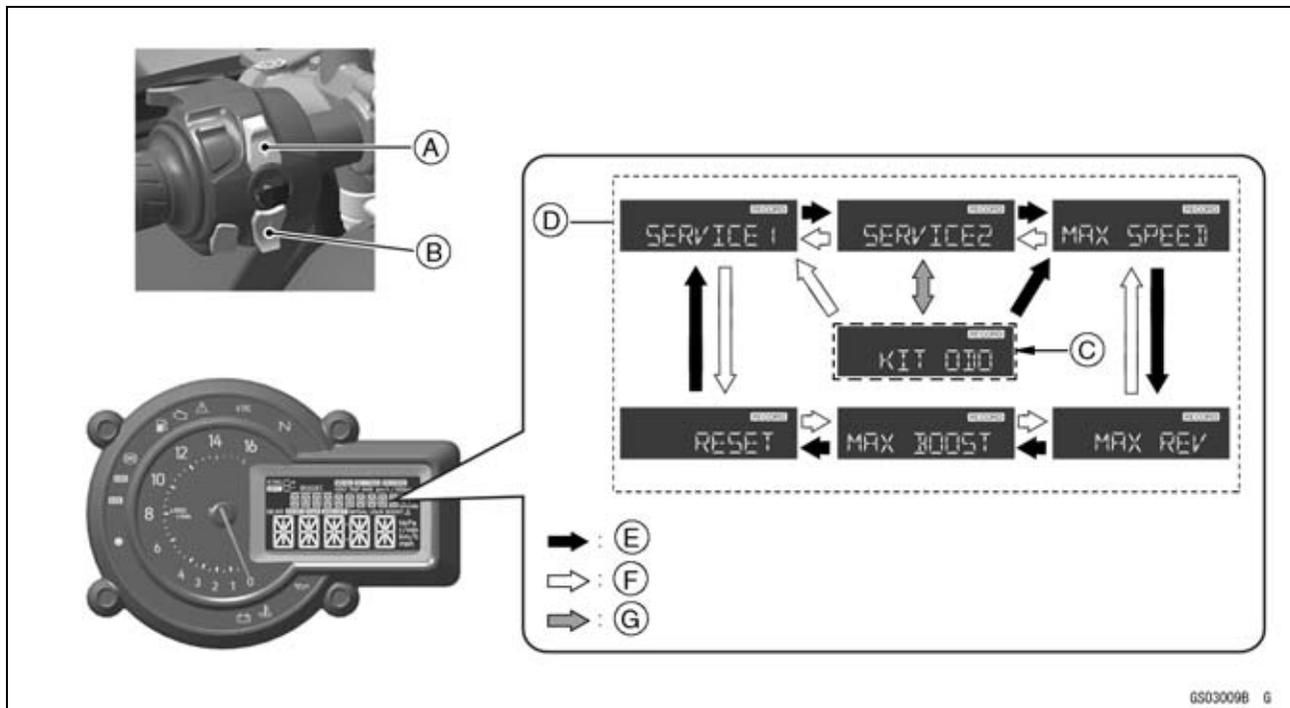
- Push and hold the mode button [A] to display the menu mode [B].
- Push the upper button [C] or lower button [D] to display the record mode “RECORD” [E].
- Push the mode button to select the record mode.
  - [F] Flow when pushing and holding mode button
  - [G] Flow when pushing upper button
  - [H] Flow when pushing lower button



## 2-10 PERIODIC MAINTENANCE

### Service Time Maintenance Chart

- Push the upper button [A] or lower button [B] to display the "SERVICE2".
  - Push and hold the upper button to display the KIT-ECU odometer "KIT ODO" [C].
- [D] Record Mode  
[E] Flow when pushing upper button  
[F] Flow when pushing lower button  
[G] Flow when pushing and holding the upper button



**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. All of the values are for use with dry solvent - cleaned threads unless otherwise indicated.

Letters used in the “Remarks” column mean:

AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.

EO: Apply engine oil.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

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.

\*: After tightening to the first torque, loosen it and tighten to the final torque.

| Fastener   | Torque |       |           | Remarks |
|--|--------|-------|-----------|---------|
|  | N·m    | kgf·m | ft·lb     |         |
| <b>Fuel System (DFI)</b>                             |        |       |           |         |
| Nozzle Assy Mounting Bolts                           | 5.0    | 0.51  | 44 in·lb  | L       |
| Purge Valve Nut                                      | 7.0    | 0.71  | 62 in·lb  |         |
| Throttle Case Bolts                                  | 3.5    | 0.36  | 31 in·lb  |         |
| Air Intake Chamber Pressure/Temperature Sensor Bolts | 5.0    | 0.51  | 44 in·lb  |         |
| Air Hose Fitting                                     | 10     | 1.0   | 89 in·lb  | L       |
| Air Intake Chamber Assy Bolts                        | 8.0    | 0.82  | 71 in·lb  |         |
| Blow-off Valve Hose Clamp Screw                      | 3.0    | 0.31  | 27 in·lb  |         |
| Blow-off Valve Bolts                                 | 25     | 2.5   | 18        |         |
| Air Intake Hose Clamp Screws                         | 3.0    | 0.31  | 27 in·lb  |         |
| Air Intake Chamber Duct Screen Bolts                 | 3.0    | 0.31  | 27 in·lb  | L       |
| Air Intake Chamber Mounting Bolts (L = 14 mm)        | 8.0    | 0.82  | 71 in·lb  | L, S    |
| Air Intake Chamber Mounting Bolts (L = 95 mm)        | 8.0    | 0.82  | 71 in·lb  | L, S    |
| Air Intake Chamber Duct Bolts                        | 6.0    | 0.61  | 53 in·lb  | L       |
| Delivery Pipe Assy Mounting Screws                   | 3.5    | 0.36  | 31 in·lb  |         |
| Throttle Body Assy Mounting Bolts                    | 10     | 1.0   | 89 in·lb  |         |
| Intake Duct Mounting Bolts (L = 20 mm)               | 1.0    | 0.10  | 8.9 in·lb |         |
| Intake Duct Mounting Bolts (L = 22 mm)               | 6.0    | 0.61  | 53 in·lb  |         |
| Intake Duct Holder Bolts                             | 10     | 1.0   | 89 in·lb  |         |
| Intake Duct Mounting Bolts (L = 12 mm)               | 6.0    | 0.61  | 53 in·lb  |         |
| Camshaft Position Sensor Bolt                        | 10     | 1.0   | 89 in·lb  |         |
| Spark Plugs  | 13     | 1.3   | 115 in·lb |         |
| Water Temperature Sensor                             | 12     | 1.2   | 106 in·lb |         |
| Supercharger Chain Tensioner Mounting Bolts          | 10     | 1.0   | 89 in·lb  | L       |
| Supercharger Housing Bolts (M8)                      | 23     | 2.3   | 17        |         |
| Supercharger Housing Bolt (M6, L = 20 mm)            | 10     | 1.0   | 89 in·lb  | L       |
| Supercharger Sprocket Cover Bolts                    | 10     | 1.0   | 89 in·lb  |         |
| Supercharger Chain Sprocket Bolts                    | 20     | 2.0   | 15        |         |
| Supercharger Outer Housing Bolts                     | 23     | 2.3   | 17        |         |

## 2-12 PERIODIC MAINTENANCE

### Torque and Locking Agent

| Fastener                                   | Torque |       |           | Remarks |
|--|--------|-------|-----------|---------|
|  | N·m    | kgf·m | ft·lb     |         |
| Supercharger Housing Bolts (M6, L = 30 mm) | 10     | 1.0   | 89 in·lb  | L       |
| Nozzle                                     | 3.0    | 0.31  | 27 in·lb  |         |
| Supercharger Oil Screen Bolt               | 20     | 2.0   | 15        | R       |
| Supercharger Housing Stay Bolts            | 10     | 1.0   | 89 in·lb  | L       |
| Supercharger Chain Guide Bolts             | 10     | 1.0   | 89 in·lb  |         |
| Knock Sensor Bolt                          | 25     | 2.5   | 18        |         |
| Fuel Pump Bolts                            | 10     | 1.0   | 89 in·lb  | L, S    |
| <b>Cooling System</b>                      |        |       |           |         |
| Coolant Reserve Tank Screws                | 1.2    | 0.12  | 11 in·lb  |         |
| Water Temperature Sensor                   | 12     | 1.2   | 106 in·lb |         |
| Water Pipe Bolt                            | 10     | 1.0   | 89 in·lb  |         |
| Thermostat Housing Bolts                   | 6.0    | 0.61  | 53 in·lb  |         |
| Water Hose Fitting Cover Bolts             | 10     | 1.0   | 89 in·lb  |         |
| Upper Radiator Mounting Bolts              | 15     | 1.5   | 11        |         |
| Radiator Cover Bolts                       | 10     | 1.0   | 89 in·lb  | L       |
| Lower Radiator Mounting Bolt               | 10     | 1.0   | 89 in·lb  |         |
| Radiator Stay Bolt                         | 10     | 1.0   | 89 in·lb  |         |
| Water Hose Fitting                         | 10     | 1.0   | 89 in·lb  | L       |
| Water Pump Impeller Bolt                   | 10     | 1.0   | 89 in·lb  |         |
| Water Pump Cover Bolts (L = 25 mm)         | 10     | 1.0   | 89 in·lb  |         |
| Water Pump Cover Bolts (L = 40 mm)         | 10     | 1.0   | 89 in·lb  |         |
| Coolant Drain Bolt                         | 10     | 1.0   | 89 in·lb  |         |
| <b>Engine Top End</b>                      |        |       |           |         |
| Cylinder Head Cap Bolts                    | 10     | 1.0   | 89 in·lb  |         |
| Sub Cover Bolts                            | 10     | 1.0   | 89 in·lb  | L       |
| Cylinder Head Cover Bolts                  | 10     | 1.0   | 89 in·lb  | S       |
| Camshaft Sprocket Bolts                    | 15     | 1.5   | 11        | L       |
| Upper Camshaft Chain Guide Bolts           | 12     | 1.2   | 106 in·lb | S       |
| Front Camshaft Chain Guide Bolt (Upper)    | 25     | 2.5   | 18        |         |
| Camshaft Chain Tensioner Mounting Bolts    | 10     | 1.0   | 89 in·lb  |         |
| Cylinder Head Bolts (M10) (First)          | 30     | 3.1   | 22        | MO, S   |
| Cylinder Head Bolts (M10) (Final)          | 67     | 6.8   | 49        | MO, S   |
| Front Camshaft Chain Guide Bolt (Lower)    | 12     | 1.2   | 106 in·lb |         |
| Rear Camshaft Chain Guide Bolt             | 25     | 2.5   | 18        |         |
| Camshaft Cap Bolts                         | 12     | 1.2   | 106 in·lb | S       |
| Cylinder Head Plugs                        | 19.6   | 2.00  | 14.5      | L       |
| Cylinder Head Bolts (M6)                   | 12     | 1.2   | 106 in·lb | S       |
| Throttle Body Assy Holder Bolts            | 10     | 1.0   | 89 in·lb  | S       |
| Exhaust Pipe Holder Nuts                   | 17     | 1.7   | 13        | S       |
| Exhaust Pipe Mounting Bolt                 | 34     | 3.5   | 25        |         |
| Muffler Body Stay Bolt                     | 17     | 1.7   | 13        | L       |
| Muffler Body Mounting Bolt                 | 25     | 2.5   | 18        |         |

**Torque and Locking Agent**

| Fastener   | Torque |       |           | Remarks  |
|--|--------|-------|-----------|----------|
|  | N·m    | kgf·m | ft·lb     |          |
| <b>Clutch</b>                                    |        |       |           |          |
| Clutch Reservoir Cap (for reference)             | 1.5    | 0.15  | 13 in·lb  |          |
| Clutch Master Cylinder Bleed Valve               | 14     | 1.4   | 10        |          |
| Clutch Reservoir Bracket Bolt                    | 6.9    | 0.70  | 61 in·lb  |          |
| Clutch Lever Pivot Bolt Locknut                  | 6.0    | 0.61  | 53 in·lb  | R        |
| Clutch Master Cylinder Clamp Bolts               | 9.0    | 0.92  | 80 in·lb  | S        |
| Clutch Cover Damper Plate Bolts                  | 10     | 1.0   | 89 in·lb  | L        |
| Clutch Cover Bolts                               | 12     | 1.2   | 106 in·lb | L (1), S |
| Oil Filler Plug                                  | 10     | 1.0   | 89 in·lb  |          |
| Crankshaft Timing Plug                           | 25     | 2.5   | 18        |          |
| Clutch Outer Cover Bolts                         | 5.0    | 0.51  | 44 in·lb  | L        |
| Water Hose Fitting Cover Bolts                   | 10     | 1.0   | 89 in·lb  |          |
| Clutch Slave Cylinder Bleed Valve                | 7.9    | 0.81  | 70 in·lb  |          |
| Clutch Hose Banjo Bolts                          | 24.5   | 2.50  | 18.1      |          |
| Clutch Slave Cylinder Mounting Bolt (L = 65 mm)  | 10     | 1.0   | 89 in·lb  | L        |
| Clutch Slave Cylinder Mounting Bolts (L = 20 mm) | 10     | 1.0   | 89 in·lb  | L        |
| Clutch Hub Nut                                   | 130    | 13.3  | 95.9      | R        |
| Sub Clutch Hub Bolts                             | 25     | 2.5   | 18        | L        |
| Clutch Spring Bolts                              | 11     | 1.1   | 97 in·lb  |          |
| <b>Engine Lubrication System</b>                 |        |       |           |          |
| Oil Filler Plug                                  | 10     | 1.0   | 89 in·lb  |          |
| Oil Pump Drive Chain Guide Bolts                 | 10     | 1.0   | 89 in·lb  | L        |
| Oil Pump Driven Gear Bolt                        | 10     | 1.0   | 89 in·lb  | L, Lh    |
| Oil Passage Plugs                                | 20     | 2.0   | 15        | L        |
| Oil Cooler Bolts                                 | 15     | 1.5   | 11        | L, S     |
| Oil Filter                                       | 17     | 1.7   | 13        | G, R     |
| Oil Filter Pipe                                  | 35     | 3.6   | 26        | L        |
| Oil Pressure Switch                              | 15     | 1.5   | 11        | LG       |
| Oil Pressure Relief Valve                        | 15     | 1.5   | 11        | L        |
| Engine Oil Drain Bolt                            | 25     | 2.5   | 18        |          |
| Oil Pan Bolts                                    | 10     | 1.0   | 89 in·lb  | S        |
| <b>Engine Removal/Installation</b>               |        |       |           |          |
| Front Engine Mounting Bolts (Rear)               | 44     | 4.5   | 32        | L, S     |
| Front Engine Mounting Bolts (Front)              | 44     | 4.5   | 32        | L, S     |
| Swingarm Mounting Plate Nut (Upper)              | 44     | 4.5   | 32        | R, S     |
| Rear Frame Front Bolts                           | 25     | 2.5   | 18        | S        |
| Swingarm Pivot Shaft Nut                         | 108    | 11.0  | 79.7      | S        |
| Swingarm Mounting Plate Bolt (Lower)             | 44     | 4.5   | 32        | L, S     |
| Side Stand Bracket Bolt (Rear)                   | 49     | 5.0   | 36        | L, S     |
| Rear Engine Mounting Bolts                       | 44     | 4.5   | 32        | S        |
| Clamp Bolts                                      | 10     | 1.0   | 89 in·lb  |          |
| Side Stand Bracket Bolts (Front)                 | 49     | 5.0   | 36        | L, S     |

## 2-14 PERIODIC MAINTENANCE

### Torque and Locking Agent

| Fastener                                  | Torque       |       |           | Remarks |
|---|--------------|-------|-----------|---------|
|   | N·m          | kgf·m | ft·lb     |         |
| <b>Crankshaft/Transmission</b>            |              |       |           |         |
| Breather Cover Bolts                      | 10           | 1.0   | 89 in·lb  |         |
| Balancer Shaft Clamp Bolts                | 10           | 1.0   | 89 in·lb  |         |
| Balancer Shaft Clamp Lever Bolts          | 25           | 2.5   | 18        | L       |
| Breather Plate Bolts                      | 10           | 1.0   | 89 in·lb  | L       |
| Oil Passage Plugs                         | 20           | 2.0   | 15        | L       |
| Oil Passage Plug (R1/8)                   | 15           | 1.5   | 11        | L       |
| Oil Nozzles (M5)                          | 3.0          | 0.31  | 27 in·lb  |         |
| Transmission Oil Nozzle Pipe Bolts        | 10           | 1.0   | 89 in·lb  | L       |
| Crankcase Oil Nozzle Bolts                | 25           | 2.5   | 18        |         |
| Bearing Holder Screws                     | 5.0          | 0.51  | 44 in·lb  | L       |
| Oil Nozzle (M8)                           | 5.0          | 0.51  | 44 in·lb  |         |
| Connecting Rod Big End Nuts               | see the text | ←     | ←         | MO, R   |
| Crankcase Bolts (M7, L = 60 mm)           | 20           | 2.0   | 15        | S       |
| Crankcase Bolts (M8)                      | 27           | 2.8   | 20        | S       |
| Crankcase Bolts (M6, L = 40 mm)           | 12           | 1.2   | 106 in·lb | S       |
| Crankcase Bolt (M6, L = 30 mm)            | 12           | 1.2   | 106 in·lb | S       |
| Crankcase Bolts (M7, L = 45 mm)           | 20           | 2.0   | 15        | S       |
| Crankcase Bolts (M10, L = 120 mm) (First) | 12           | 1.2   | 106 in·lb | MO, S   |
| Crankcase Bolts (M10, L = 120 mm) (Final) | 48           | 4.9   | 35        | MO, S   |
| Crankcase Bolts (M10, L = 100 mm) (First) | 12           | 1.2   | 106 in·lb | MO, S   |
| Crankcase Bolts (M10, L = 100 mm) (Final) | 48           | 4.9   | 35        | MO, S   |
| Crankcase Bolts (M7, L = 85 mm)           | 20           | 2.0   | 15        | S       |
| Bearing Holder Screws                     | 5.0          | 0.51  | 44 in·lb  | L       |
| Transmission Case Bolts                   | 20           | 2.0   | 15        |         |
| Shift Drum Cam Holder Bolt                | 12           | 1.2   | 106 in·lb | L       |
| Oil Nozzles (M8)                          | 5.0          | 0.51  | 44 in·lb  |         |
| Gear Positioning Lever Bolt               | 12           | 1.2   | 106 in·lb |         |
| Shift Shaft Return Spring Pin             | 29           | 3.0   | 21        | L       |
| Shift Lever Clamp Bolt                    | 9.8          | 1.0   | 87 in·lb  |         |
| <b>Wheels/Tires</b>                       |              |       |           |         |
| Front Axle Clamp Bolts                    | 20           | 2.0   | 15        | S       |
| Air Valve Nuts                            | 4.5          | 0.46  | 40 in·lb  | L       |
| Front Axle Nut                            | 127          | 13.0  | 93.7      |         |
| Rear Wheel Nuts                           | 110          | 11.2  | 81.1      | S       |
| <b>Final Drive</b>                        |              |       |           |         |
| Engine Sprocket Nut                       | 145          | 14.8  | 107       | MO      |
| Chain Guide Bolt (L = 14 mm)              | 10           | 1.0   | 89 in·lb  | L       |
| Chain Guide Bolts (L = 30 mm)             | 10           | 1.0   | 89 in·lb  |         |
| Engine Sprocket Cover Bolt                | 10           | 1.0   | 89 in·lb  | L       |
| Bearing Housing Clamp Bolts               | 33           | 3.4   | 24        | S       |
| Rear Sprocket Nuts                        | 59           | 6.0   | 44        | R, S    |

**Torque and Locking Agent**

| Fastener                                 | Torque |       |           | Remarks |
|--|--------|-------|-----------|---------|
|  | N·m    | kgf·m | ft·lb     |         |
| Rear Axle Nut, First*                    | 220    | 22.4  | 162       |         |
| Rear Axle Nut, Final*                    | 250    | 25.5  | 184       |         |
| <b>Brakes</b>                            |        |       |           |         |
| Front Brake Fluid Reservoir Cap Screws   | 0.70   | 0.07  | 6.2 in·lb |         |
| Front Master Cylinder Bleed Valve        | 5.5    | 0.56  | 49 in·lb  |         |
| Front Master Cylinder Clamp Bolts        | 9.0    | 0.92  | 80 in·lb  | S       |
| Brake Lever Pivot Bolt Locknut           | 6.0    | 0.61  | 53 in·lb  | R       |
| Front Brake Fluid Reservoir Bracket Bolt | 6.9    | 0.70  | 61 in·lb  |         |
| Brake Hose Banjo Bolts                   | 24.5   | 2.50  | 18.1      |         |
| Bleed Valves                             | 14     | 1.4   | 10        |         |
| Front Caliper Mounting Bolts             | 34     | 3.5   | 25        | S       |
| Front Brake Disc Mounting Bolts          | 27     | 2.8   | 20        | L, S    |
| Brake Pipe Joint Nuts                    | 18     | 1.8   | 13        |         |
| Rear Master Cylinder Mounting Bolts      | 25     | 2.5   | 18        | L       |
| Brake Pedal Bolt                         | 8.8    | 0.90  | 78 in·lb  |         |
| Rear Master Cylinder Push Rod Locknut    | 17     | 1.7   | 13        |         |
| Rear Axle Nut, First*                    | 220    | 22.4  | 162       |         |
| Rear Axle Nut, Final*                    | 250    | 25.5  | 184       |         |
| Rear Brake Disc Mounting Bolts           | 27     | 2.8   | 20        | L, S    |
| Rear Caliper Mounting Bolts              | 25     | 2.5   | 18        |         |
| <b>Suspension</b>                        |        |       |           |         |
| Upper Front Fork Clamp Bolts             | 20     | 2.0   | 15        |         |
| Lower Front Fork Clamp Bolts             | 23     | 2.3   | 17        | AL      |
| Front Fork Top Plugs                     | 22.5   | 2.29  | 16.6      |         |
| Piston Rod Nuts                          | 15     | 1.5   | 11        |         |
| Cylinder Unit                            | 60     | 6.1   | 44        | L       |
| Rear Shock Absorber Bracket Nuts         | 34     | 3.5   | 25        | R       |
| Upper Rear Shock Absorber Nut            | 34     | 3.5   | 25        | R       |
| Tie-Rod Nuts                             | 34     | 3.5   | 25        | R       |
| Lower Rear Shock Absorber Nut            | 34     | 3.5   | 25        | R       |
| Swingarm Pivot Shaft Nut                 | 108    | 11.0  | 79.7      |         |
| Rocker Arm Nut                           | 34     | 3.5   | 25        | R       |
| <b>Steering</b>                          |        |       |           |         |
| Switch Housing Bolts                     | 0.90   | 0.09  | 8 in·lb   |         |
| Throttle Case Bolts                      | 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       |
| Handlebar Weights                        | 30     | 3.1   | 22        | EO      |
| Steering Stem Head Nut                   | 78     | 8.0   | 58        |         |
| Upper Front Fork Clamp Bolts             | 20     | 2.0   | 15        |         |
| Steering Damper Mounting Bolts           | 11     | 1.1   | 97 in·lb  | L       |
| Steering Stem Nut                        | 20     | 2.0   | 15        |         |
| Lower Front Fork Clamp Bolts             | 23     | 2.3   | 17        | AL      |

## 2-16 PERIODIC MAINTENANCE

### Torque and Locking Agent

| Fastener                            | Torque |       |           | Remarks |
|-------------------------------------|--------|-------|-----------|---------|
|                                     | N·m    | kgf·m | ft·lb     |         |
| <b>Frame</b>                        |        |       |           |         |
| Front Fender Mounting Bolts         | 4.0    | 0.41  | 35 in·lb  | L       |
| Swingarm Mounting Plate Nut (Upper) | 44     | 4.5   | 32        | R       |
| Footpeg Bracket Bolts               | 25     | 2.5   | 18        | L       |
| Rear Master Cylinder Mounting Bolts | 25     | 2.5   | 18        | L       |
| Side Stand Bracket Bolts            | 49     | 5.0   | 36        | L       |
| Side Stand Nut                      | 36     | 3.7   | 27        | R       |
| Side Stand Switch Bolt              | 9.8    | 1.0   | 87 in·lb  | L       |
| Heel Guard Bolts                    | 9.8    | 1.0   | 87 in·lb  | L       |
| Rear Frame Front Bolts              | 25     | 2.5   | 18        |         |
| Rear Frame Rear Bolts               | 27     | 2.8   | 20        | L       |
| Clamp Screws                        | 1.2    | 0.12  | 11 in·lb  |         |
| Coolant Reserve Tank Screws         | 1.2    | 0.12  | 11 in·lb  |         |
| Middle Fairing Inner Cover Screws   | 1.2    | 0.12  | 11 in·lb  |         |
| Upper Wing Mounting Bolts           | 6.9    | 0.70  | 61 in·lb  | L       |
| Regulator/Rectifier Bracket Screws  | 1.2    | 0.12  | 11 in·lb  |         |
| Rear Fender Screws                  | 1.2    | 0.12  | 11 in·lb  |         |
| Hip Support Cover Bracket Screws    | 1.2    | 0.12  | 11 in·lb  |         |
| Rear Fender Bracket Screw           | 1.2    | 0.12  | 11 in·lb  |         |
| <b>Electrical System</b>            |        |       |           |         |
| Camshaft Position Sensor Bolt       | 10     | 1.0   | 89 in·lb  |         |
| Spark Plugs                         | 13     | 1.3   | 115 in·lb |         |
| Meter Mounting Screws               | 1.2    | 0.12  | 11 in·lb  |         |
| Water Temperature Sensor            | 12     | 1.2   | 106 in·lb |         |
| Switch Housing Bolts                | 0.90   | 0.09  | 8 in·lb   |         |
| Crankshaft Sensor Bolts             | 6.0    | 0.61  | 53 in·lb  | L       |
| Knock Sensor Bolt                   | 25     | 2.5   | 18        |         |
| Gear Position Sensor Bolt           | 10     | 1.0   | 89 in·lb  |         |
| Timing Rotor Bolt                   | 39     | 4.0   | 29        | L       |
| Stator Coil Bolts                   | 12     | 1.2   | 106 in·lb | L       |
| Alternator Rotor Bolt               | 155    | 15.8  | 114       |         |
| Alternator Lead Holding Plate Bolt  | 10     | 1.0   | 89 in·lb  | L       |
| Alternator Cover Bolts              | 10     | 1.0   | 89 in·lb  |         |
| Regulator/Rectifier Bracket Screws  | 1.2    | 0.12  | 11 in·lb  |         |
| Regulator/Rectifier Mounting Nuts   | 6.0    | 0.61  | 53 in·lb  |         |
| Rear Fender Bracket Screw           | 1.2    | 0.12  | 11 in·lb  |         |
| Engine Ground Terminal Bolt         | 10     | 1.0   | 89 in·lb  |         |
| Clamp Screws                        | 1.2    | 0.12  | 11 in·lb  |         |
| Starter Motor Through Bolts         | 5.0    | 0.51  | 44 in·lb  |         |
| Brush Holder Screw                  | 3.8    | 0.39  | 34 in·lb  |         |
| Starter Motor Mounting Bolts        | 10     | 1.0   | 89 in·lb  |         |
| Starter Motor Terminal Locknut      | 11     | 1.1   | 97 in·lb  |         |

**Torque and Locking Agent**

| Fastener                         | Torque |       |          | Remarks |
|----------------------------------|--------|-------|----------|---------|
|                                  | N·m    | kgf·m | ft·lb    |         |
| Starter Motor Cable Terminal Nut | 6.0    | 0.61  | 53 in·lb |         |
| Side Stand Switch Bolt           | 9.8    | 1.0   | 87 in·lb | L       |

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<br>(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     |

## 2-18 PERIODIC MAINTENANCE

### Specifications

| Item                             | Standard  | Service Limit |
|----------------------------------|---|---------------|
| <b>Fuel System (DFI)</b>         |   |               |
| Throttle Grip Free Play          | 2 ~ 3 mm (0.08 ~ 0.12 in.)  | ---           |
| Idle Speed                       | 1 100 ±100 r/min (rpm)  | ---           |
| Throttle Body Vacuum             | 33.3 ±2.7 kPa (250 ±20 mmHg) @75°C (167°F)<br>or more (at idle speed)                 | ---           |
| Air Cleaner Element              | Non-woven fabric filter   | ---           |
| <b>Cooling System</b>            |   |               |
| Coolant:                         |   |               |
| Type (Recommended)               | Permanent type of antifreeze  | ---           |
| Color                            | Green   | ---           |
| Mixed Ratio                      | Soft water 50%, coolant 50%   | ---           |
| Freezing Point                   | -35°C (-31°F)   | ---           |
| Total Amount                     | 2.5 L (3.6 US qt)   | ---           |
| <b>Engine Top End</b>            |   |               |
| Valve Clearance:                 |   |               |
| Exhaust                          | 0.33 ~ 0.38 mm (0.0130 ~ 0.0150 in.)  | ---           |
| Intake                           | 0.15 ~ 0.22 mm (0.0059 ~ 0.0086 in.)  | ---           |
| <b>Clutch</b>                    |   |               |
| Clutch Fluid:                    |   |               |
| Grade                            | DOT4  | ---           |
| Clutch Lever Free Play           | Non-adjustable  | ---           |
| <b>Engine Lubrication System</b> |   |               |
| Engine Oil:                      |   |               |
| Type                             | API SG, SH, SJ, SL or SM with JASO MA, MA1<br>or MA2                                  | ---           |
| Viscosity                        | SAE 10W-40  | ---           |
| Capacity                         | 3.9 L (4.1 US qt) (When filter is not removed)  | ---           |
|                                  | 4.4 L (4.7 US qt) (When filter is removed)  | ---           |
|                                  | 5.0 L (5.3 US qt) (When engine is completely<br>dry)                                  | ---           |
| Level                            | Between upper and lower level lines (Wait<br>several minutes after idling or running) | ---           |
| <b>Wheels/Tires</b>              |   |               |
| Air Pressure*1 (when Cold):      |   |               |
| Front                            | Up to 105 kg (231 lb) load:<br>190 kPa (1.94 kgf/cm <sup>2</sup> , 28 psi)            | ---           |
| Rear                             | Up to 105 kg (231 lb) load:<br>200 kPa (2.04 kgf/cm <sup>2</sup> , 29 psi)            | ---           |
| Air Pressure*2 (when<br>Warm):   |   |               |
| Front                            | Up to 105 kg (231 lb) load:<br>220 kPa (2.20 kgf/cm <sup>2</sup> , 32 psi)            | ---           |
| Rear                             | Up to 105 kg (231 lb) load:<br>260 kPa (2.60 kgf/cm <sup>2</sup> , 38 psi)            | ---           |
| <b>Final Drive</b>               |   |               |
| Drive Chain Slack                | 30 ~ 35 mm (1.2 ~ 1.4 in.)  | ---           |

**Specifications**

| Item                        | Standard  | Service Limit  |
|-----------------------------|---|--|
| Standard Chain:             |   |  |
| Make                        | ENUMA   | ---  |
| Type                        | EK525RMXZ/3D  | ---  |
| Link                        | 116 links   | ---  |
| <b>Brakes</b>               |   |  |
| Brake Fluid:                |   |  |
| Grade                       | DOT4  | ---  |
| Brake Pad Lining Thickness: |   |  |
| Front                       | 3.7 mm (0.15 in.)   | 1 mm (0.04 in.)  |
| Rear                        | 6.95 mm (0.27 in.) (Thickness of pad lining and back plate) | 4.5 mm (0.18 in.) (Thickness of pad lining and back plate) |
| Brake Light Timing:         |   |  |
| Front                       | Pulled ON   | ---  |
| Rear                        | ON after about 10 mm (0.39 in.) of pedal travel             | ---  |
| <b>Electrical System</b>    |   |  |
| Spark Plug:                 |   |  |
| Type                        | NGK SILMAR9B9   | ---  |
| Gap                         | 0.8 ~ 0.9 mm (0.032 ~ 0.035 in.)                            | ---  |
| <b>Supercharger</b>         |   |  |
| Supercharger Axial Play     | ---   | 0.5 mm (0.02 in.)  |

\*1: When servicing the motorcycle, adjust the tire pressure to this value.

\*2: When riding the motorcycle, adjust the tire air pressure to this value after warming up the tires for more than an hour using a tire warmer.

**NOTE**

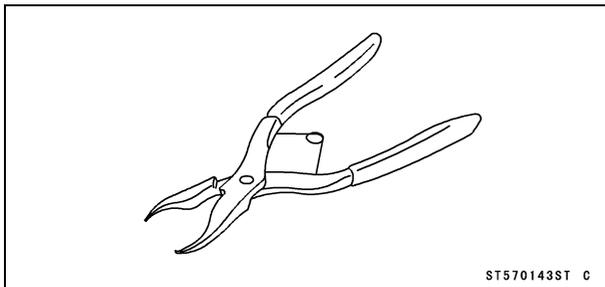
○When storing or servicing the motorcycle, set it on stands so that both wheels are raised off the ground.

## 2-20 PERIODIC MAINTENANCE

### Special Tools

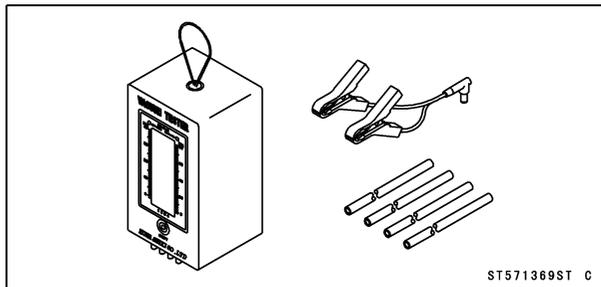
#### Inside Circlip Pliers:

57001-143



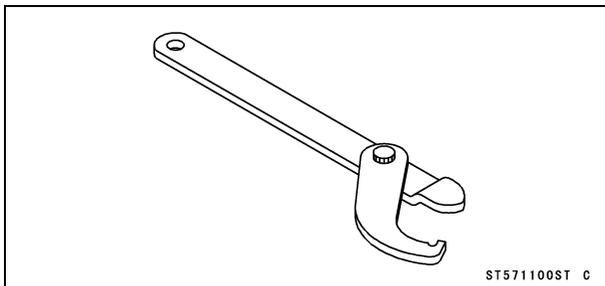
#### Vacuum Gauge:

57001-1369



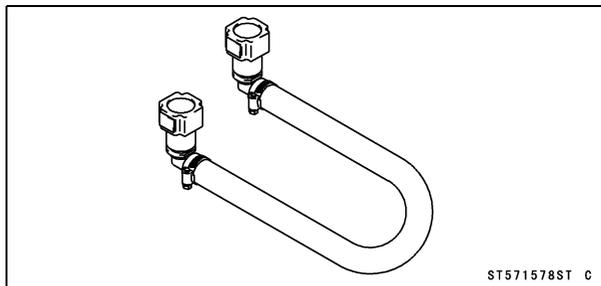
#### Steering Stem Nut Wrench:

57001-1100



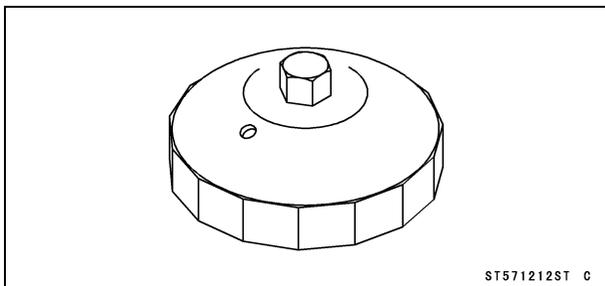
#### Extension Tube:

57001-1578



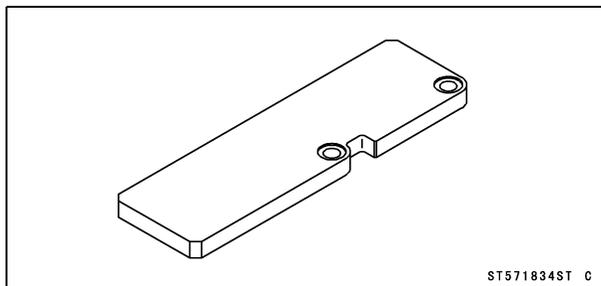
#### Oil Filter Wrench:

57001-1212



#### Dial Gauge Holder Plate:

57001-1834



Periodic Maintenance Procedures

Fuel System (DFI)

Idle Speed Inspection

- Start the engine and warm it up thoroughly.
- With the engine idling, turn the handlebars 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 Throttle Control System Inspection and 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. Follow the service manual to be make sure to correct any of these conditions.**

- Check the idle speed.

Idle Speed

Standard: 1 100 ±100 r/min (rpm)

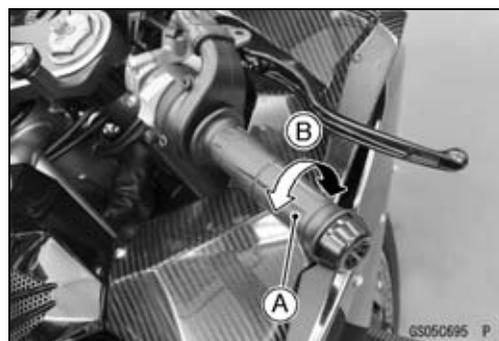
Idle Speed Adjustment

**NOTE**

○ This motorcycle is equipped with the idle speed control system. The idle speed is adjusted automatically at the specified value (1 100 r/min (rpm)) by the idle speed control system. Therefore, it is not necessary to adjust the idle speed normally.

Throttle Control System Inspection

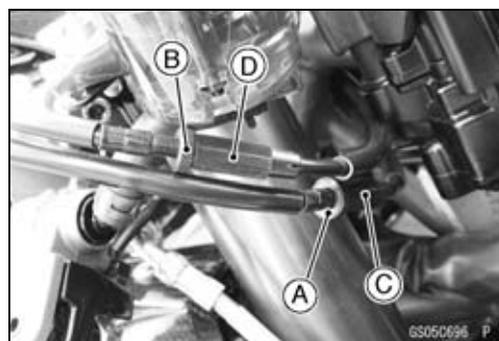
- Check that the throttle grip [A] moves smoothly from full open to close, and the throttle closes quickly and completely by the return spring in all steering positions.
- ★ If the throttle grip does not return properly, check the throttle cable routing, grip free play, and cable damage. Then lubricate the throttle cable.
- Check the throttle grip free play [B].



Throttle Grip Free Play

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

- ★ If the free play is incorrect, 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 there is no play when the throttle grip play completely closed.
- 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.



## 2-22 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Engine Vacuum Synchronization Inspection

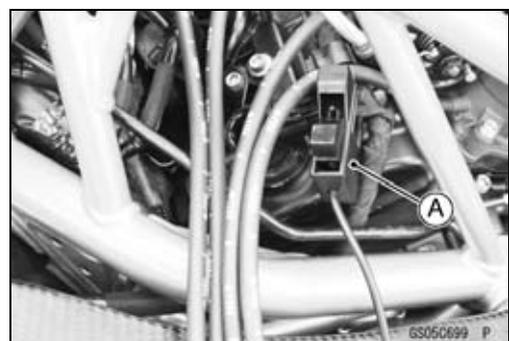
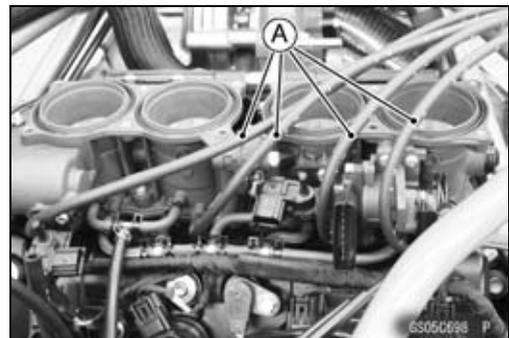
##### **⚠ WARNING**

The air intake chamber can become extremely hot during normal operation and cause severe burns. Do not remove the air intake chamber while it is hot.

##### **NOTE**

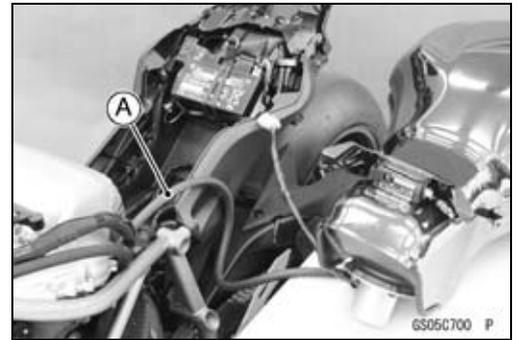
○ These procedures are explained on the assumption that the intake and exhaust systems of the engine are in good condition.

- Situate the motorcycle so that it is vertical.
  - Remove:
    - Air Intake Chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter)
  - Pull off the rubber caps [A] from the fittings of each throttle body.
  - ★ Remove the throttle body assy temporarily if the operation is difficult (see Throttle Body Assy Removal in the Fuel System (DFI) chapter).
- 
- 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 lead [A] to one of the stick coil primary leads.



**Periodic Maintenance Procedures**

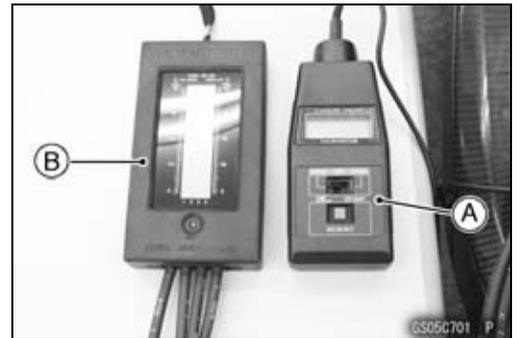
- Connect the following parts temporarily.  
Fuel Pump Lead Connector  
Extension Tube [A]
- **Special Tool - Extension Tube: 57001-1578**
- Install the air intake chamber (see Air Intake Chamber Installation in the Fuel System (DFI) chapter).



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

**Idle Speed**

**Standard: 1 100 ±100 r/min (rpm)**



**NOTICE**

**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**

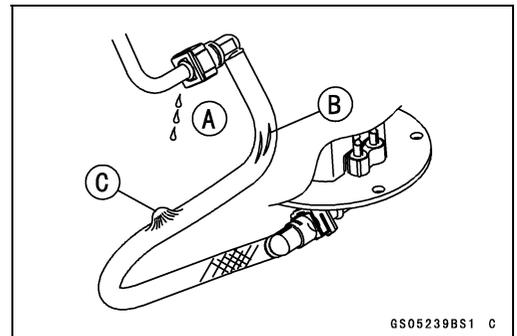
**Standard: 33.3 ±2.7 kPa (250 ±20 mmHg) @75°C (167°F) or more (at idle speed)**

- ★ If any vacuum is not within specifications, check the throttle body assy holder (see Throttle Body Assy Holder Removal in the Engine Top End chapter).
- ★ If there is any damage, replace the throttle body assy holder.
- Remove the air intake chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter).
- Remove the vacuum gauge hoses and install the rubber caps on the original position.
- Install the removed parts (see appropriate chapters).

**Fuel System Inspection**

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

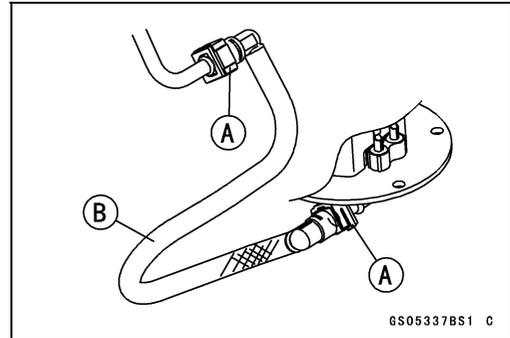
- If the motorcycle is not properly handled, the high pressure inside the fuel line can cause fuel to leak [A] or the hose to burst. Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter) and check the fuel hose.
- ★ Replace the fuel hose if any fraying, cracks [B] or bulges [C]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



## 2-24 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Check that the fuel hose is routed according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- ★ Replace the hose if it has been sharply bent or kinked.
  - Hose Joints [A]
  - Fuel Hose [B]

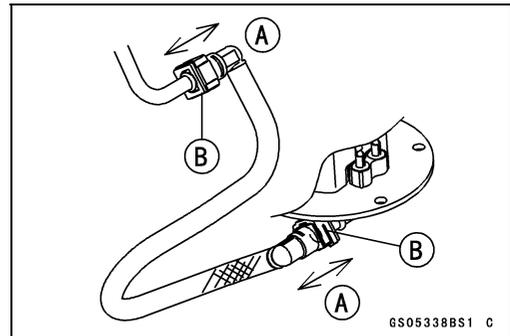


- Check that the fuel hose joints are securely connected.
- Push and pull [A] the fuel hose joint [B] back and forth more than two times, and make sure it is locked.

#### **⚠ WARNING**

**Leaking fuel can cause a fire or explosion resulting in serious burns. Make sure the hose joint is installed correctly on the delivery pipe by sliding the joint.**

- ★ If it does not lock, reinstall the hose joint.



### Fuel Filter Replacement

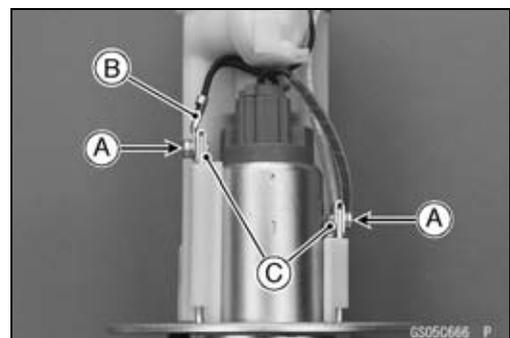
#### **⚠ WARNING**

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

#### **NOTICE**

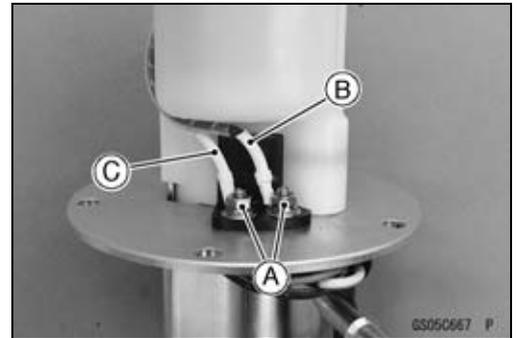
**Never drop the fuel pump especially on a hard surface. Such a shock to the pump can damage it.**

- Remove:
  - Fuel Pump (see Fuel Pump Removal in the Fuel System (DFI) chapter)
  - Screws [A]
  - Lead Terminal [B]
  - Clip Nuts [C]

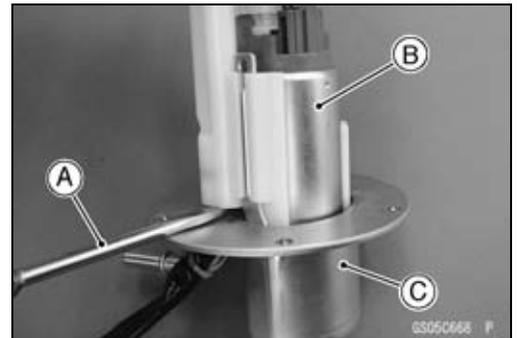


Periodic Maintenance Procedures

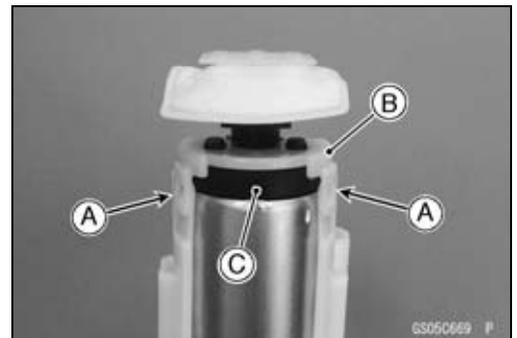
- Remove:  
Nuts [A] and Spring Washers  
Lead Terminal (Blue) [B]  
Lead Terminal (White) [C]



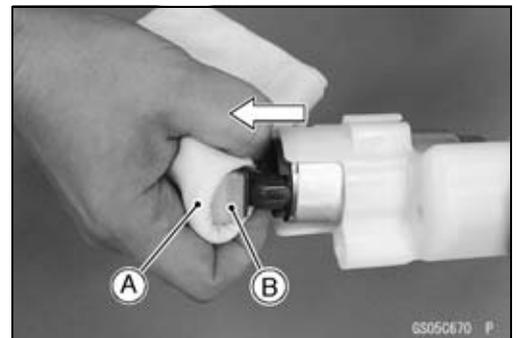
- Using the flat tip screwdriver [A], remove the fuel pump body [B] from the case [C].



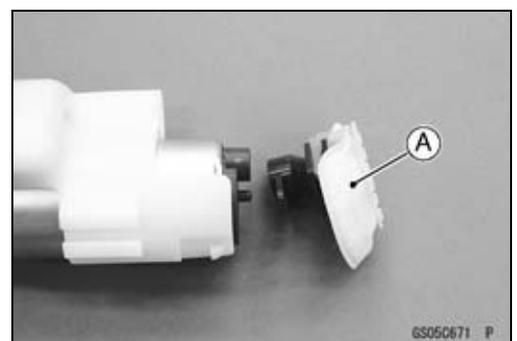
- Clear the hooks [A], and remove the fitting [B].
- Remove the rubber cover [C].



- Wrap the fuel filter [A] with the clean cloth [B], and remove the fuel filter.



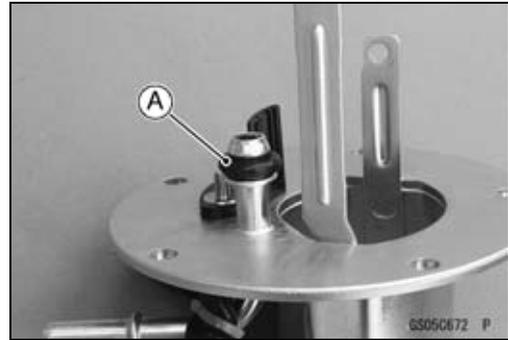
- Replace the fuel filter [A] with a new one.



## 2-26 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Replace the O-ring [A] with a new one.
- Install the removed parts in the reverse procedure.



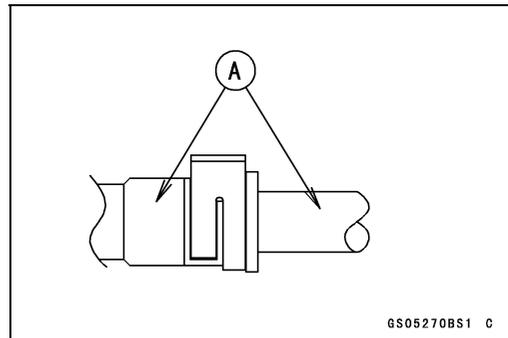
#### **Fuel Pump Replacement**

- Remove the fuel pump (see Fuel Pump Removal in the Fuel System (DFI) chapter).
- Replace the fuel pump [A] with a new one.



#### **Fuel Hose Replacement**

- Remove the air intake chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter).
- Be sure to place a piece of cloth around the fuel hose joint.
- Wipe off the dirt of the surface [A] around the connection using a cloth or a soft brush.

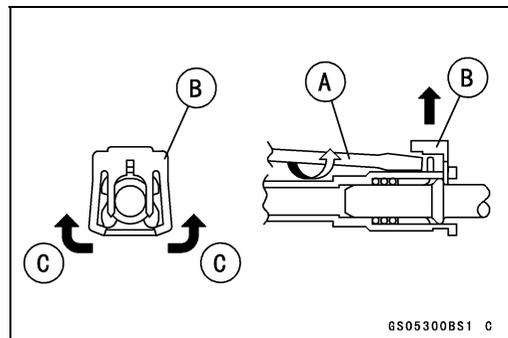


#### **When removing with flat tip screwdriver**

- Insert the flat tip screwdriver [A] into slit on the joint lock [B].
- Turn the driver to disconnect the joint lock.

#### **When removing with fingers**

- Open and push up [C] the joint lock with your fingers.



#### **NOTICE**

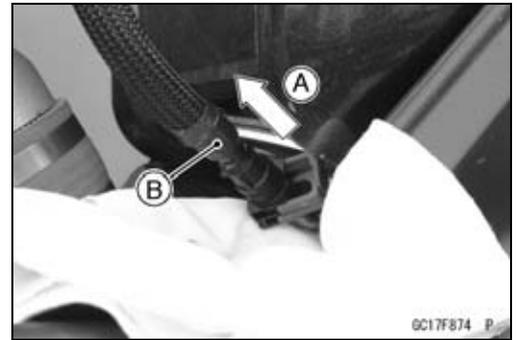
**Prying or excessively widening the joint lock ends for fuel hose removal will permanently deform the joint lock, resulting in a loose or incomplete lock that may allow fuel to leak and create the potential for a fire explosion. To prevent fire or explosion from a damaged joint lock, do not pry or excessively widen the joint lock ends when removing the fuel hose. The joint lock has a retaining edge that locks around the housing.**

Periodic Maintenance Procedures

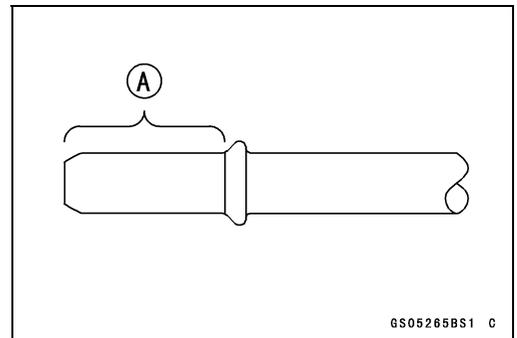
- Pull [A] the fuel hose joint [B] out of the outlet pipe.

**⚠ WARNING**

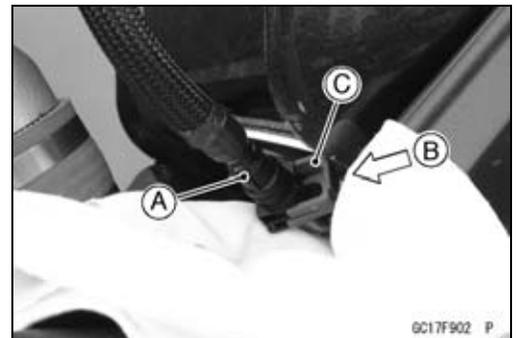
**Fuel is flammable and explosive under certain conditions and can cause severe burns. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe. Cover the hose connection with a clean shop towel to prevent fuel spillage.**



- Clean the delivery pipe.
- Cover the delivery pipe with the vinyl bag to keep it clean.
- Remove the vinyl bag on the pipe.
- Check that there are no flaws, burrs, and adhesion of foreign materials on the delivery pipe [A].



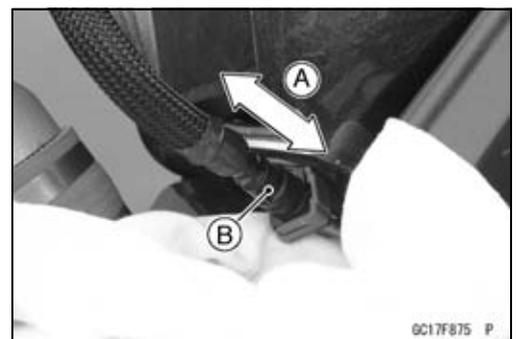
- Replace the fuel hose with a new one.
- Run the fuel hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Insert the fuel hose joint [A] straight onto the outlet pipe until the hose joint clicks.
- Push [B] the joint lock [C].



- 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**

**Leaking fuel can cause a fire or explosion resulting in severe burns. Make sure the fuel hose joint is installed correctly on the delivery pipe and that it doesn't leak.**



- ★ If it comes off, reinstall the hose joint.
- Install the removed parts (see appropriate chapters).
- Start the engine and check the fuel hose for leaks.

## 2-28 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Cooling System

##### Coolant Level Inspection

###### NOTE

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

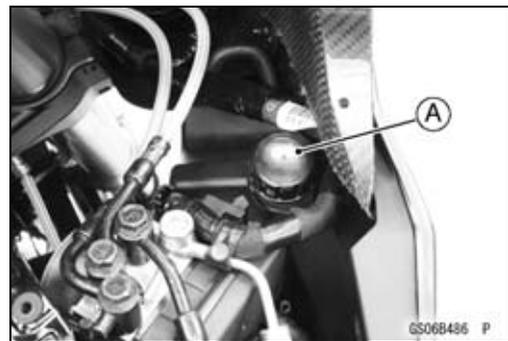
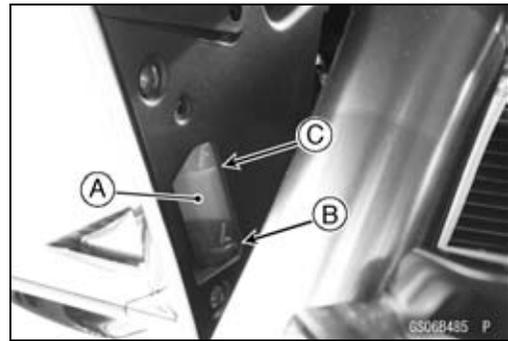
- Check the coolant level in the reserve tank [A] with the motorcycle held perpendicular (Do not use the side stand).

★ If the coolant level is lower than the “L” level line [B], unscrew the reserve tank cap and add coolant to the “F” level line [C].

“L”: Low

“F”: Full

○ Remove the right inner cover to remove the reserve tank cap [A] (see Inner Cover Removal in the Frame chapter).



###### NOTICE

**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.**

##### Cooling System Inspection

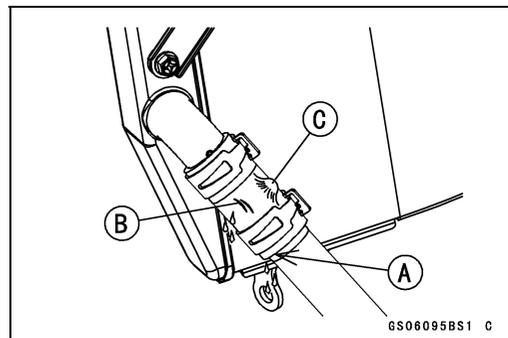
###### Water Hose and Pipe Inspection (coolant leak, damage, installation condition)

○ The high pressure inside the water 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 installed correctly.



##### Coolant Change

###### ⚠ WARNING

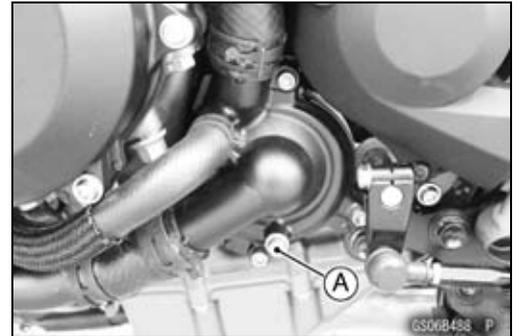
**Coolant can be extremely hot and cause severe burns, is toxic and very slippery. Do not remove the radiator cap or attempt to change the coolant when the engine is hot; allow it cool completely. Immediately wipe any spilled coolant from tires, frame, engine or other painted parts. Do not ingest coolant.**

**Periodic Maintenance Procedures**

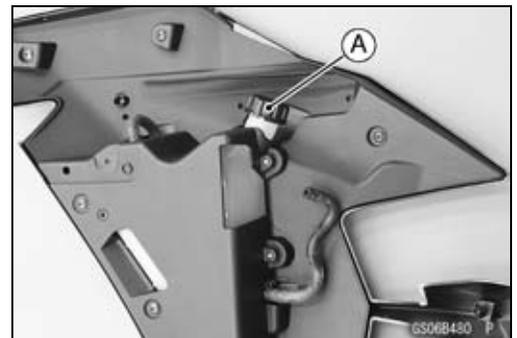
- Remove:
  - Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
  - Radiator Cap [A]
- Remove the radiator cap in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.



- 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 the cap [A] of the reserve tank on the right middle fairing.
- Pour the coolant into a container.



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

**NOTICE**

**Soft or distilled water must be used with the 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:      2.5 L (2.6 US qt)**

## 2-30 PERIODIC MAINTENANCE

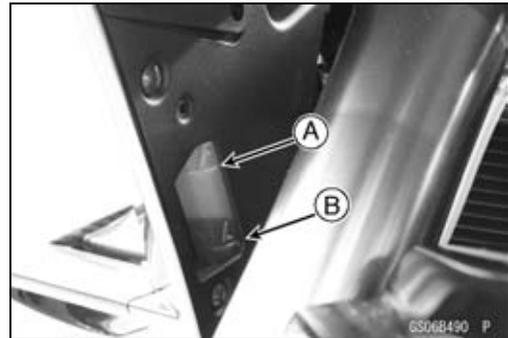
### Periodic Maintenance Procedures

- Fill the radiator up to the filler neck [A] with coolant.

#### NOTE

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

- Check the cooling system for leaks.
  - Tap the water hoses to force any air bubbles caught inside.
  - Fill the radiator up to the filler neck with coolant.
  - Install the radiator cap.
- 
- Install the right middle fairing (see Middle Fairing Installation in the Frame chapter).
  - Fill the reserve tank up to the “F” (full) level line [A] with coolant and install the reserve tank cap.
  - Start the engine, warm it up thoroughly until the radiator fans turn 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” (low) level line [B], add coolant to the “F” level line.



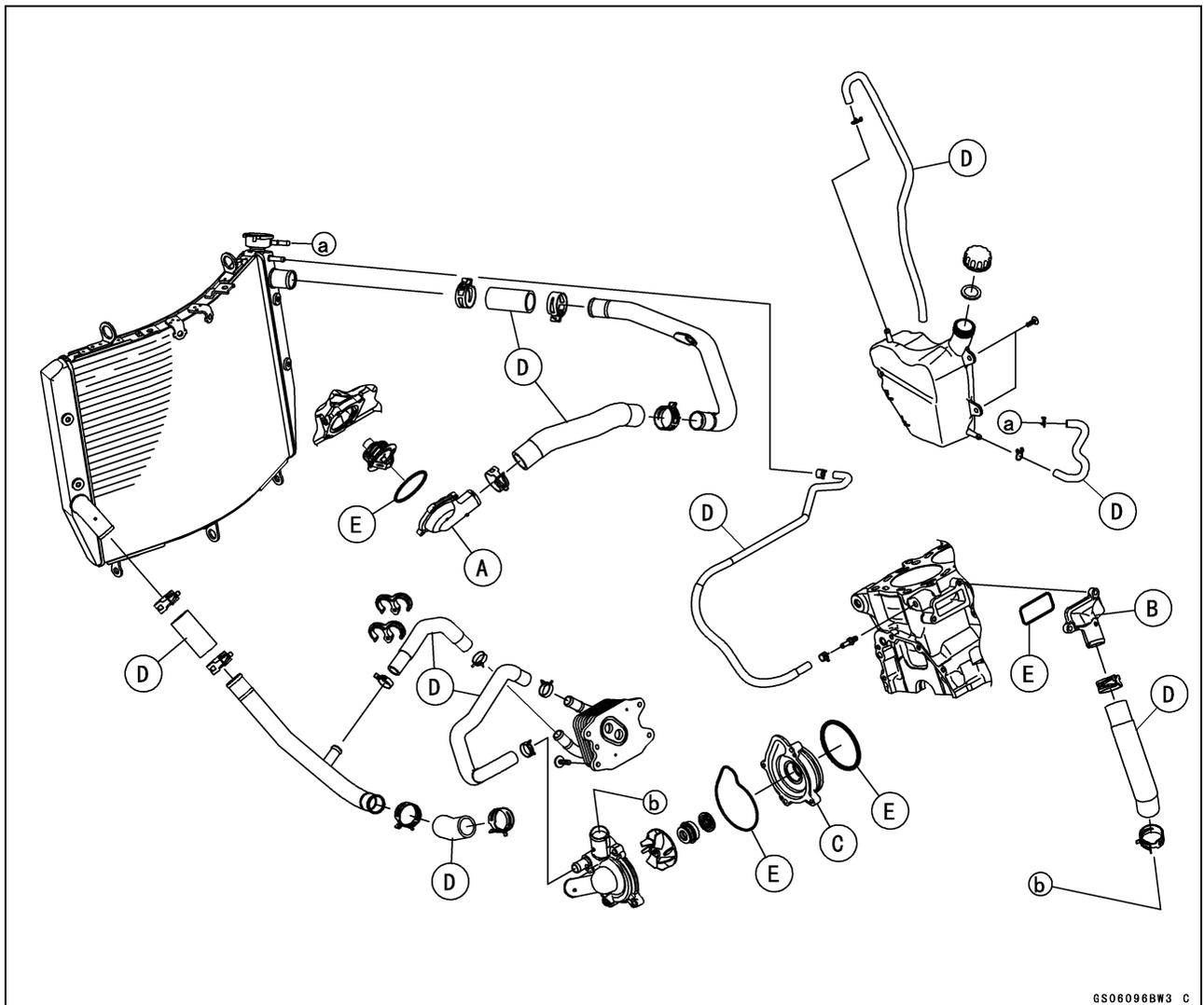
#### NOTICE

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

**Periodic Maintenance Procedures**

**Water Hose and O-ring Replacement**

- Drain the coolant (see Coolant Change).
- Remove:
  - Middle Fairings (see Middle Fairing Removal in the Frame chapter)
  - Thermostat Housing Cover [A] (see Thermostat Removal in the Cooling System chapter)
  - Water Hose Fitting Cover [B] (see Thermostat Removal in the Cooling System chapter)
  - Water Pump Housing [C] (see Water Pump Removal in the Cooling System chapter)
- Replace the hoses [D] and O-rings [E] with new ones.
- Apply grease or soap and water solution to the new O-rings.
- Run the new hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Install the removed parts (see appropriate chapters).
- Fill the coolant (see Coolant Change).
- Check the cooling system for leaks.



## 2-32 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

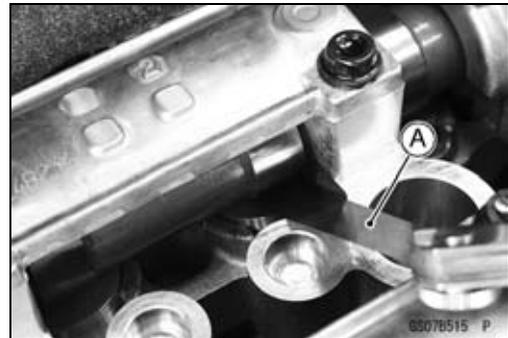
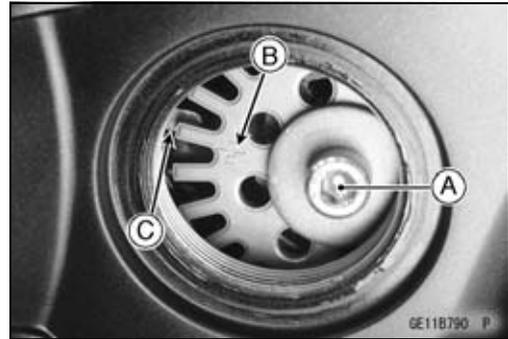
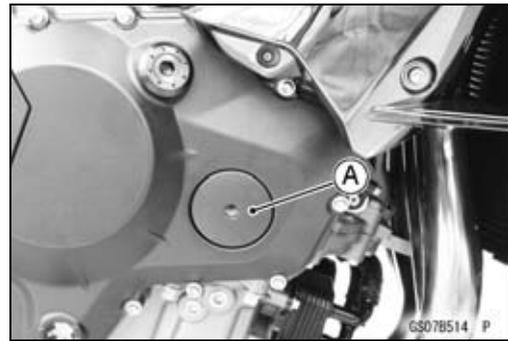
#### Engine Top End

##### Valve Clearance Inspection

###### NOTE

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

- Remove:
  - Cylinder Head Cover (see Cylinder Head Cover Removal in the Engine Top End chapter)
  - Crankshaft Timing Plug [A]
- Using a wrench on the timing rotor bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the timing rotor is aligned with the mating surface [C] of the crankcase.
- Using a thickness gauge [A], measure the valve clearance between the cam and the valve lifter.



##### Valve Clearance

###### Standard:

Exhaust 0.33 ~ 0.38 mm (0.0130 ~ 0.0150 in.)

Intake 0.15 ~ 0.22 mm (0.0059 ~ 0.0086 in.)

###### NOTE

○ Thickness gauge is horizontally inserted on the valve lifter.

Appropriateness [A]

Inadequacy [B]

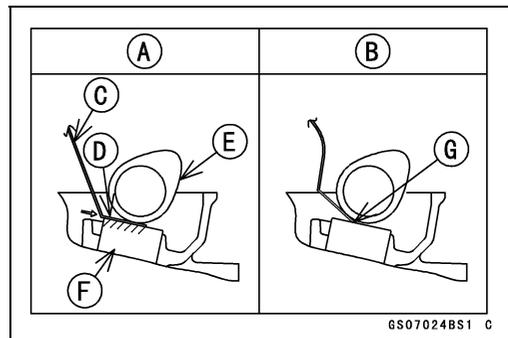
Thickness Gauge [C]

Horizontally Inserts [D]

Cam [E]

Valve Lifter [F]

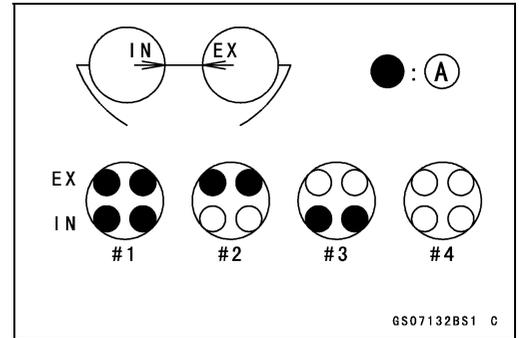
Hits the Valve Lifter Ahead [G]



**Periodic Maintenance Procedures**

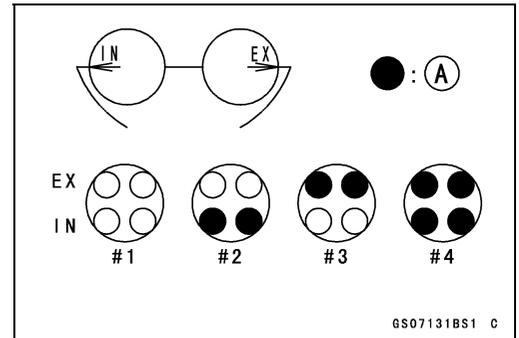
○When positioning #1 piston TDC at the end of the compression stroke:

- Intake 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:

- Intake Valve Clearance of #2 and #4 Cylinders
- Exhaust Valve Clearance of #3 and #4 Cylinders
- Measuring Valve [A]



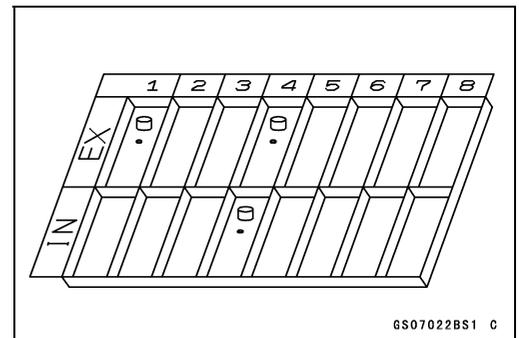
★ If the valve clearance is not within the specified range, first record the clearance, and then adjust it.

**Valve Clearance Adjustment**

- To change the valve clearance, remove the camshaft chain tensioner, camshafts 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 = 0.355 mm (Exhaust), 0.185 mm (Intake))
  - [d] Replace Shim Thickness

**Example (Intake):**

$$1.350 + 0.31 - 0.185 = 1.475 \text{ mm}$$

○Exchange the shim for the 1.475 size shim.



**NOTICE**

**Don't use the shims for another models. This could cause wear of the valve stem end, and valve stem damage.**

## 2-34 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

---

#### **NOTICE**

**Be sure to remeasure the clearance after selecting a shim according to the table. If the clearance is out of the specified range, use the additional shim.**

- 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.

#### **NOTICE**

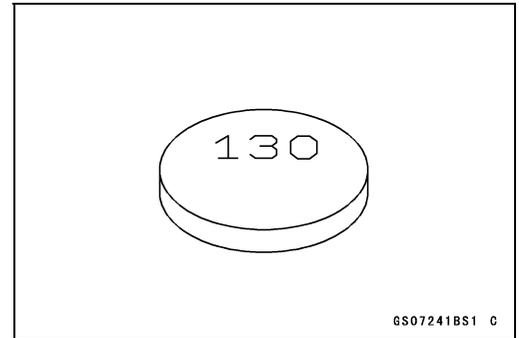
**Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.**  
**Do not grind the shim. This may cause it to fracture, causing extensive engine damage.**

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

Periodic Maintenance Procedures

Adjustment Shims

| Thickness | Part Number | Mark |
|-----------|-------------|------|
| 1.300     | 92180-0108  | 130  |
| 1.325     | 92180-0109  | 132  |
| 1.350     | 92180-0110  | 135  |
| 1.375     | 92180-0865  | 1375 |
| 1.388     | 92180-0866  | 1388 |
| 1.400     | 92180-0867  | 1400 |
| 1.413     | 92180-0868  | 1413 |
| 1.425     | 92180-0869  | 1425 |
| 1.438     | 92180-0870  | 1438 |
| 1.450     | 92180-0871  | 1450 |
| 1.463     | 92180-0872  | 1463 |
| 1.475     | 92180-0873  | 1475 |
| 1.488     | 92180-0874  | 1488 |
| 1.500     | 92180-0875  | 1500 |
| 1.513     | 92180-0876  | 1513 |
| 1.525     | 92180-0877  | 1525 |
| 1.538     | 92180-0878  | 1538 |
| 1.550     | 92180-0879  | 1550 |
| 1.563     | 92180-0880  | 1563 |
| 1.575     | 92180-0881  | 1575 |
| 1.588     | 92180-0882  | 1588 |
| 1.600     | 92180-0883  | 1600 |
| 1.613     | 92180-0884  | 1613 |
| 1.625     | 92180-0885  | 1625 |
| 1.638     | 92180-0886  | 1638 |
| 1.650     | 92180-0887  | 1650 |
| 1.663     | 92180-0888  | 1663 |
| 1.675     | 92180-0889  | 1675 |
| 1.688     | 92180-0890  | 1688 |
| 1.700     | 92180-0891  | 1700 |
| 1.713     | 92180-0892  | 1713 |
| 1.725     | 92180-0893  | 1725 |
| 1.738     | 92180-0894  | 1738 |
| 1.750     | 92180-0895  | 1750 |
| 1.763     | 92180-0896  | 1763 |
| 1.775     | 92180-0897  | 1775 |
| 1.788     | 92180-0898  | 1788 |
| 1.800     | 92180-0899  | 1800 |
| 1.813     | 92180-0900  | 1813 |
| 1.825     | 92180-0901  | 1825 |
| 1.838     | 92180-0902  | 1838 |



## 2-36 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

---

#### Adjustment Shims

| Thickness | Part Number | Mark |
|-----------|-------------|------|
| 1.850     | 92180-0903  | 1850 |
| 1.863     | 92180-0904  | 1863 |
| 1.875     | 92180-0905  | 1875 |
| 1.888     | 92180-0906  | 1888 |
| 1.900     | 92180-0907  | 1900 |
| 1.913     | 92180-0908  | 1913 |
| 1.925     | 92180-0909  | 1925 |
| 1.938     | 92180-0910  | 1938 |
| 1.950     | 92180-0911  | 1950 |
| 1.963     | 92180-0912  | 1963 |
| 1.975     | 92180-0913  | 1975 |
| 1.988     | 92180-0914  | 1988 |
| 2.000     | 92180-0915  | 2000 |
| 2.013     | 92180-0916  | 2013 |
| 2.025     | 92180-0917  | 2025 |
| 2.038     | 92180-0918  | 2038 |
| 2.050     | 92180-0919  | 2050 |
| 2.063     | 92180-0920  | 2063 |
| 2.075     | 92180-0921  | 2075 |
| 2.088     | 92180-0922  | 2088 |
| 2.100     | 92180-0923  | 2100 |
| 2.113     | 92180-0924  | 2113 |
| 2.125     | 92180-0925  | 2125 |
| 2.138     | 92180-0926  | 2138 |
| 2.150     | 92180-0927  | 2150 |
| 2.163     | 92180-0928  | 2163 |
| 2.175     | 92180-0929  | 2175 |
| 2.188     | 92180-0930  | 2188 |
| 2.200     | 92180-0931  | 2200 |
| 2.213     | 92180-0932  | 2213 |
| 2.225     | 92180-0933  | 2225 |
| 2.238     | 92180-0934  | 2238 |
| 2.250     | 92180-0935  | 2250 |
| 2.263     | 92180-0936  | 2263 |
| 2.275     | 92180-0937  | 2275 |
| 2.288     | 92180-0938  | 2288 |
| 2.300     | 92180-0939  | 2300 |

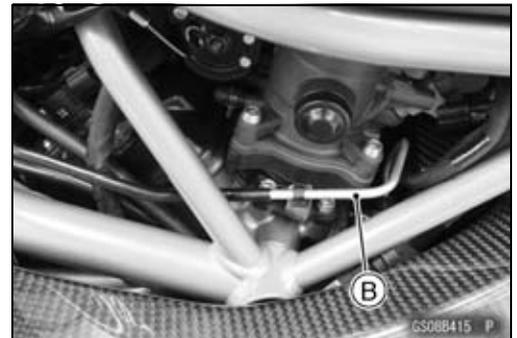
Periodic Maintenance Procedures

**Clutch**

**Clutch System Inspection**

**Clutch Fluid Leak Inspection**

- Apply the clutch lever and inspect the clutch fluid leak from the clutch hose [A], pipe [B] and fittings.
- ★ If the clutch fluid leaked from any position, inspect or replace the problem part.



**Clutch Hose Damage and Installation Condition Inspection**

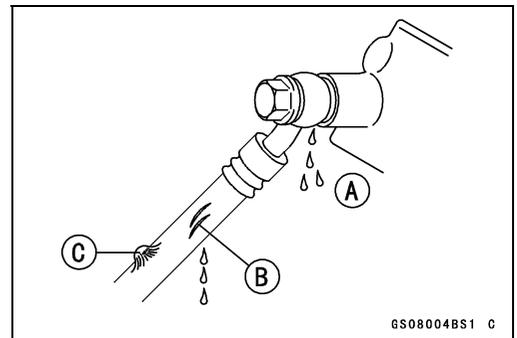
- Inspect the clutch hose and fittings for deterioration, cracks, corrosion and signs of leakage.
- The high pressure inside the clutch line can cause fluid to leak [A] or the hose to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.
- ★ Replace it if any fraying, cracks [B] or bulges [C] are noticed.
- Check that the hose is securely connected and banjo bolts are tightened correctly.

**Torque - Clutch Hose Banjo Bolts: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**

- Inspect the clutch hose routing.
- ★ If the clutch hose routing is incorrect, run the hose according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- ★ Replace the hose if the hose been sharply bent or kinked.

**Clutch Operation Inspection**

- Start the engine and check that the clutch does not slip and that it releases properly.
- ★ If the clutch operation is insufficiency, inspect the clutch system.



**⚠ WARNING**

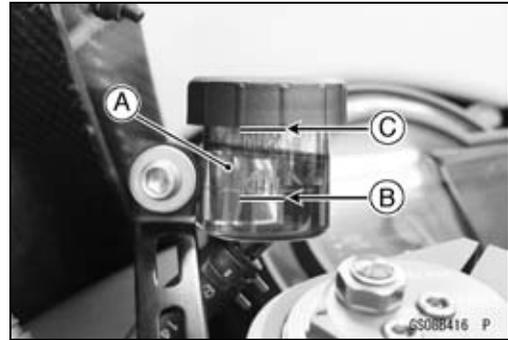
**When test riding the vehicle, be aware of surrounding traffic for your safety.**

## 2-38 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### **Clutch Fluid Level Inspection**

- Hold the clutch fluid reservoir [A] horizontal.
- Check that the clutch fluid level of the clutch reservoir is between the MIN [B] and the MAX [C] level lines.
- ★ If the fluid level is lower than the MIN level line, fill the reservoir to the MAX level line in the reservoir.
- Since the clutch fluid is the same as the brake fluid, refer to the Brake Fluid section in the Brakes chapter for further details.



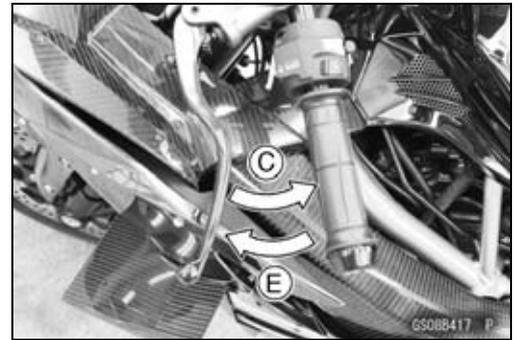
#### **⚠ WARNING**

Mixing brands and types of hydraulic fluid lowers the fluid's boiling point, cause rubber part to deteriorate and can reduce the hydraulic clutch system's effectiveness and cause an accident resulting in injury or death. Do not mix two brands of brake fluid. Change the fluid in the hydraulic clutch system completely if the fluid must be refilled but the type and brand of the hydraulic fluid that is already in the reservoir are unidentified.

**Periodic Maintenance Procedures**

**Clutch Fluid Change**

- Level the clutch fluid reservoir and remove the reservoir cap.
- Remove the rubber cap from the bleed valve on the clutch slave cylinder.
- Attach a clear plastic hose [A] to the bleed valve and run the other end of the hose into a container.
- Fill the reservoir with fresh fluid.
- Change the clutch fluid as follows.
  1. Open [B] the bleed valve, using a wrench while holding the banjo bolt.
  2. Pump the clutch lever and hold [C] it.
  3. Close [D] the bleed valve.
  4. Release [E] the clutch lever.
- Repeat this operation until fresh fluid comes out from the plastic hose or the color of the fluid changes.
- Check the fluid level in the reservoir often, replenishing it as necessary.



**NOTE**

○ If the fluid in the reservoir runs completely out any time during fluid changing, the bleeding operation must be done over again from the beginning since air will have entered the line.

**⚠ WARNING**

Mixing brands and types of hydraulic fluid lowers the fluid's boiling point, cause rubber part to deteriorate and can reduce the hydraulic clutch system's effectiveness and cause an accident resulting in injury or death. Do not mix two brands of brake fluid. Change the fluid in the hydraulic clutch system completely if the fluid must be refilled but the type and brand of the hydraulic fluid that is already in the reservoir are unidentified.

- After changing the fluid, check the clutch for good clutch power and no fluid leakage.
- ★ If necessary, bleed the air from the lines (see Clutch Line Bleeding in the Clutch chapter).
- Remove the clear plastic hose.
- Tighten the bleed valve, and install the rubber cap.
 

Torque - Clutch Slave Cylinder Bleed Valve: 7.9 N·m (0.81 kgf·m, 70 in·lb)
- Install the reservoir cap.
 

Torque - Clutch Reservoir Cap (for reference): 1.5 N·m (0.15 kgf·m, 13 in·lb)

**Clutch Hose Replacement**

**NOTICE**

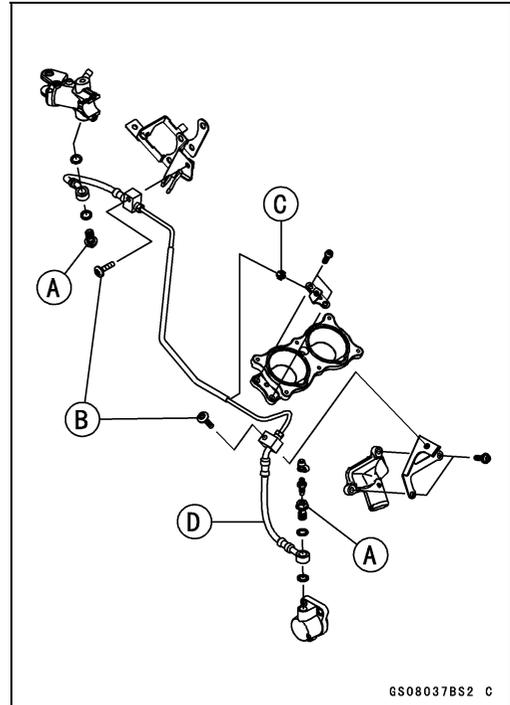
Clutch fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.

- When removing the clutch hose, take care not to spill the clutch fluid on the painted or plastic parts.

## 2-40 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Remove:
  - Rear Intake Duct (see Intake Duct Removal in the Frame chapter)
  - Clutch Hose Banjo Bolts [A]
  - Clutch Hose Fitting Bolts [B]
  - Clamp [C]
- Remove the clutch hose [D] together with the clutch pipe.
- Immediately wash away any clutch fluid that spills.
- When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and run the hose according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- There are washers on each side of the clutch hose fittings. Replace them with new ones when installing.
- Tighten:
  - Torque - Clutch Hose Banjo Bolts: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**
- Fill the clutch line after installing the clutch hose (see Clutch Fluid Change).



### **Rubber Parts of Clutch Master Cylinder/Slave Cylinder Replacement**

#### **Clutch Master Cylinder Cup and Dust Seal Replacement**

- Remove the clutch master cylinder (see Clutch Master Cylinder Removal in the Clutch chapter).
- Replace the replacement parts as an assembly of the clutch master cylinder.

#### **Clutch Slave Cylinder Piston Seal Replacement**

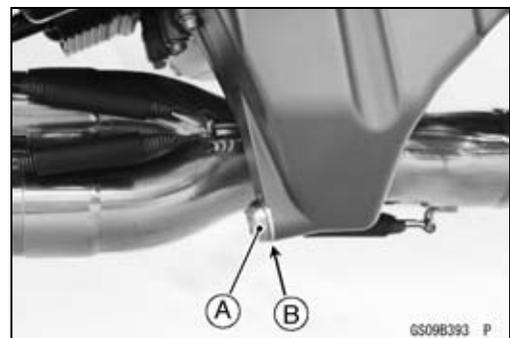
- Remove the clutch slave cylinder (see Clutch Slave Cylinder Removal in the Clutch chapter).
- Replace the replacement parts as an assembly of the clutch slave cylinder.

## Engine Lubrication System

### **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.
- Tighten the drain bolt.

**Torque - Engine Oil Drain Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**



Periodic Maintenance Procedures

- Remove the oil filler plug [A].



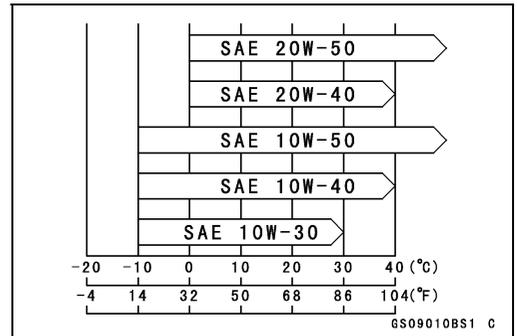
- Pour in the specified type and amount of oil.

**Recommended Engine Oil**

Type: **API SG, SH, SJ, SL or SM with JASO MA, MA1 or MA2**

Viscosity: **SAE 10W-40**

Capacity: **3.9 L (4.1 US qt) (When filter is not removed)**  
**4.4 L (4.7 US qt) (When filter is removed)**  
**5.0 L (5.3 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 grease to the new O-ring.
- Install the oil filler plug.

**Torque - Oil Filler Plug: 10 N·m (1.0 kgf·m, 89 in·lb)**

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

**Oil Filter Replacement**

- Drain the engine oil (see Engine Oil Change).
- Remove the oil filter with the oil filter wrench [A].

**Special Tool - Oil Filter Wrench: 57001-1212**



## 2-42 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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

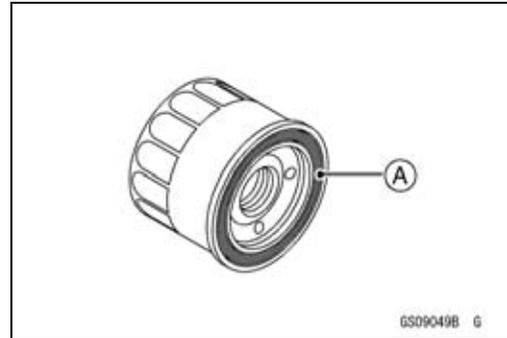
**Special Tool - Oil Filter Wrench: 57001-1212**

**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 type and capacity of oil (see Engine Oil Change).



### Wheels/Tires

#### Air Pressure Inspection

- Remove the air valve cap.

#### When Cold

- 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 105 kg (231 lb) load:  
190 kPa (1.94 kgf/cm<sup>2</sup>, 28 psi)**

**Rear: Up to 105 kg (231 lb) load:  
200 kPa (2.04 kgf/cm<sup>2</sup>, 29 psi)**

#### NOTE

○ *When servicing the motorcycle, adjust the tire pressure to this value.*

#### When Warm

- Measure the tire air pressure with an air pressure gauge when the tires are warm (that is, after using the tire warmers for an hour).
- Install the air valve cap.
- ★ Adjust the tire air pressure according to the specifications if necessary.

#### Air Pressure (when Warm)

**Front: Up to 105 kg (231 lb) load:  
220 kPa (2.20 kgf/cm<sup>2</sup>, 32 psi)**

**Rear: Up to 105 kg (231 lb) load:  
260 kPa (2.60 kgf/cm<sup>2</sup>, 38 psi)**

#### NOTE

○ *When riding the motorcycle, adjust the tire air pressure to this value after warming up the tires for more than an hour using a tire warmer.*

**Periodic Maintenance Procedures**

**Wheels and Tires Inspection**

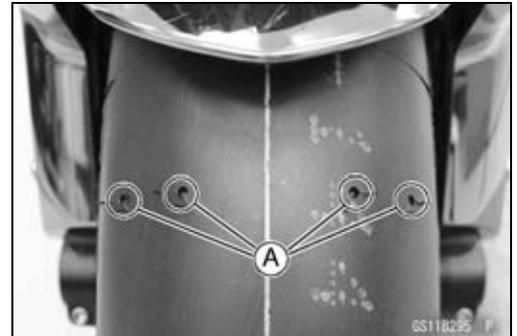
**Wheel/Tire Damage Inspection**

- 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**

Some dimples [A] in the tire tread are wear indicators. Unlike tires for highway use, the performance of racing tires may drop of considerably before reaching the wear limit. If you feel the tires are losing performance, replace them immediately.

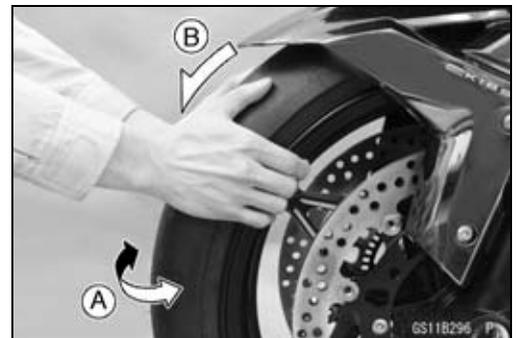
The deterioration of tires that have been used once may vary depending on the usage, environment, and storage conditions. It is recommended not to use used tires again.



|   |
|---|
| <p><b>⚠ WARNING</b></p>   |
| <p><b>Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.</b></p> |

**Wheel Bearing Damage Inspection**

- Raise the front wheel off the ground with the front stand or the webbing sling.
- Turn the handlebar all the way to the right or left.
- Inspect the roughness of the front wheel bearing by pushing and pulling [A] the wheel.
- Spin [B] the front wheel lightly, and check for smoothly turn, roughness, binding or noise.
- ★ If roughness, binding or noise is found, remove the front wheel and inspect the wheel bearing (see Front Wheel Removal, Hub Bearing Inspection in the Wheels/Tires chapter).



- Raise the rear wheel off the ground with the rear stand.
- Inspect the roughness of the rear wheel bearing by pushing and pulling [A] the wheel.
- Spin [B] the rear wheel lightly, and check for smoothly turn, roughness, binding or noise.
- ★ If roughness, binding or noise is found, remove the rear wheel and inspect the wheel bearing (see Rear Wheel Removal, Hub Bearing Inspection in the Wheels/Tires chapter) and coupling (see Coupling Bearing Inspection in the Final Drive chapter).

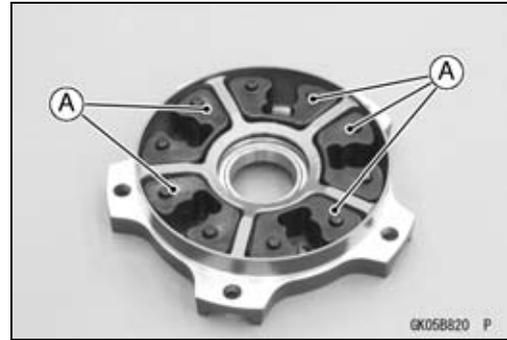


## 2-44 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### **Rear Wheel Coupling Dampers Inspection**

- Remove the outer coupling (see Coupling Bearing Removal in the Final Drive chapter).
- Visually inspect the coupling dampers [A].
- ★ If any appear damaged or deteriorated, replace them.



### Final Drive

#### **Drive Chain Lubrication Condition Inspection**

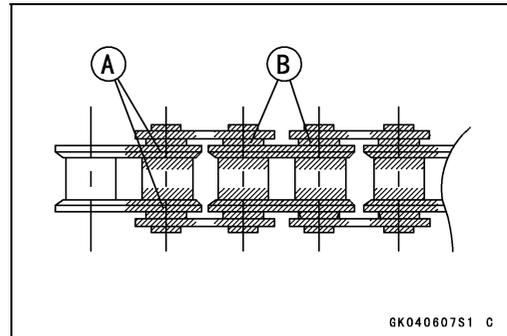
Use a lubricant for sealed chains to prevent deterioration of chain seals. If the chain is especially dirty, clean it using a cleaner for sealed chains following the instructions supplied by the chain cleaner manufacturer.

#### **NOTICE**

**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 chain cleaner for cleaning of the O-ring of the drive chain. Any other cleaning solution such as gasoline will cause deterioration and swelling of the O-ring. Immediately blow the chain dry with compressed air after cleaning. Complete cleaning and drying the chain within 10 minutes.**

- Apply chain 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]
- Wipe off lubricant that gets on the tire surface.

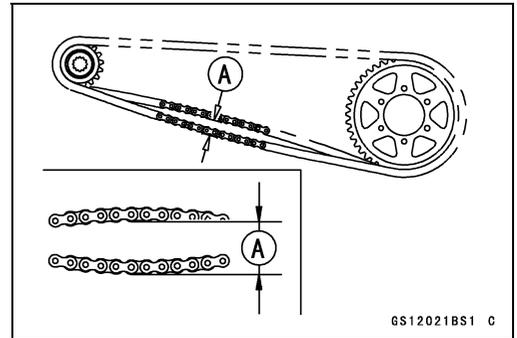


Periodic Maintenance Procedures

**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.

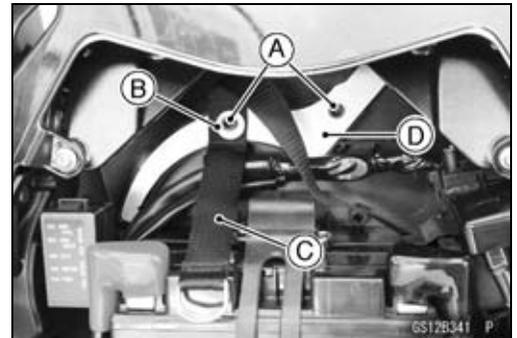


**Chain Slack**

Standard: 30 ~ 35 mm (1.2 ~ 1.4 in.)

**Drive Chain Slack Adjustment**

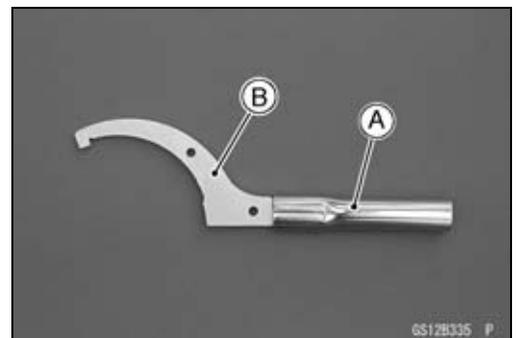
- Remove:
  - Seat (see Seat Removal in the Frame chapter)
  - Tool Kit
  - Bolts [A]
  - Washer [B]
  - Band [C]
  - Hook Wrench [D]



- Attach the adapter [A] to the hook wrench [B].

**NOTE**

○ The adapter of the hook wrench is in the tool kit bag.



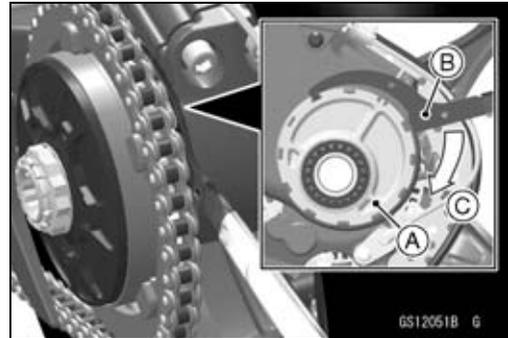
- Loosen the bearing housing clamp bolts [A] gradually and evenly.



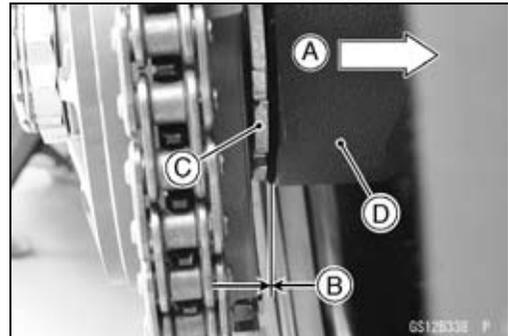
## 2-46 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Turn the chain adjuster [A] until the drive chain has correct amount of slack with the hook wrench [B].
- ★ If the chain is too loose, turn the chain adjuster counter-clockwise.
- ★ If the chain is too tight, turn the chain adjuster clockwise [C].



- Push the rear wheel to the right side [A] of the vehicle.
- Confirm that there is not a clearance [B] between the chain adjuster [C] and the swingarm [D].

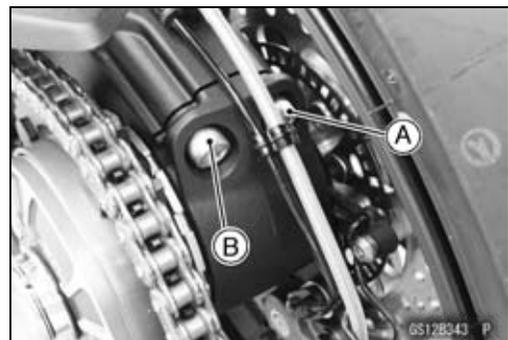


- Tighten the bearing housing clamp bolts [A] [B] following specified tightening sequence.

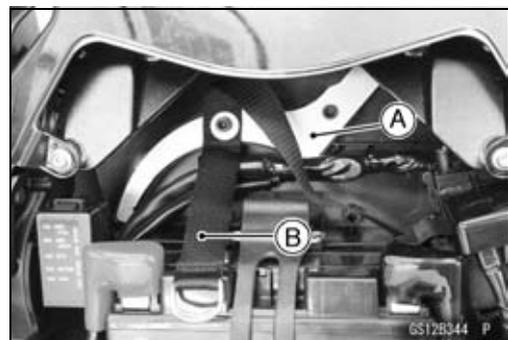
#### **Tightening Sequence:**

[A → B → A → B → A → B → A]

**Torque - Bearing Housing Clamp Bolts: 33 N·m (3.4 kgf·m, 24 ft·lb)**



- Install the hook wrench [A], band and washer, and tighten its bolt.
- Install the band [B] as shown.



#### **Drive Chain Replacement**

- Refer to the Drive Chain Replacement in the Final Drive chapter.

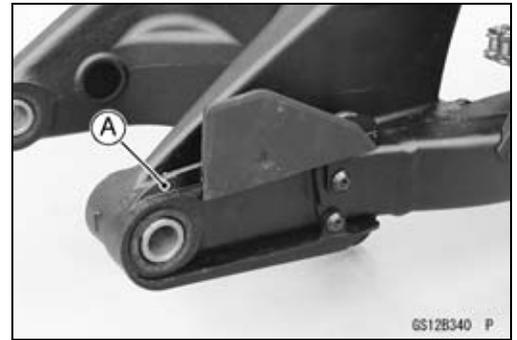
---

**Periodic Maintenance Procedures**

---

***Chain Guide Wear Inspection***

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



## 2-48 PERIODIC MAINTENANCE

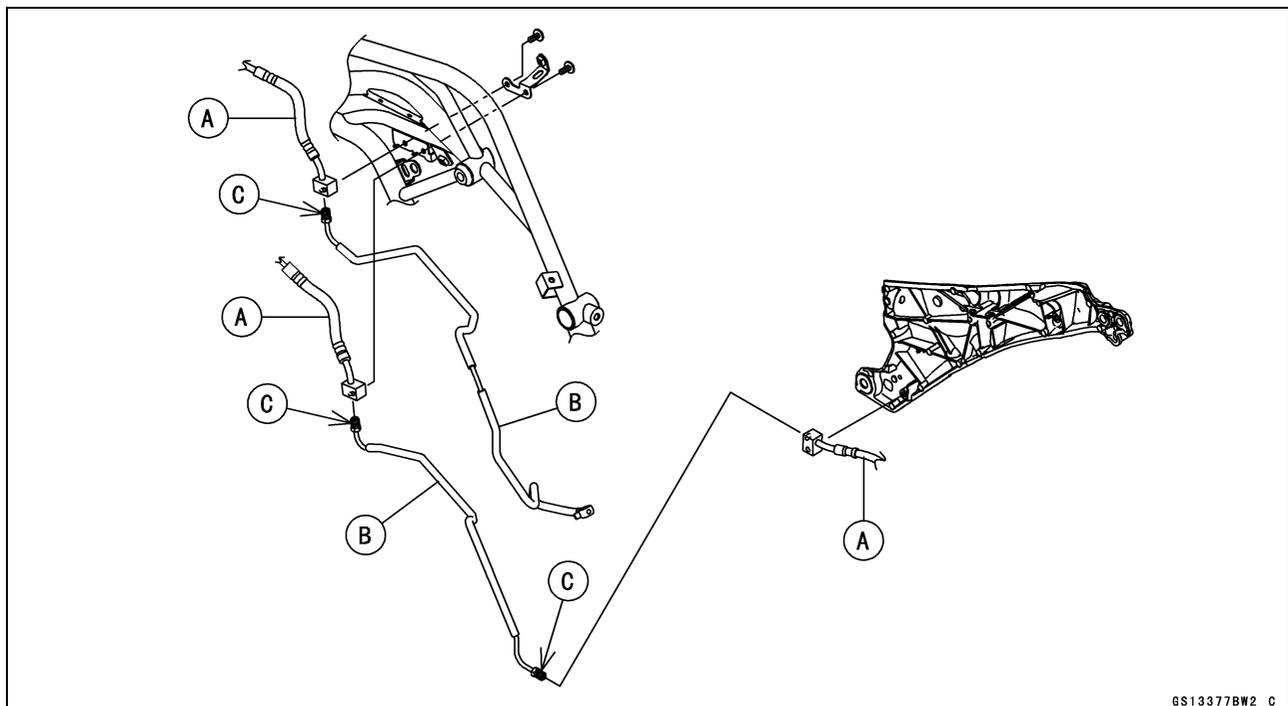
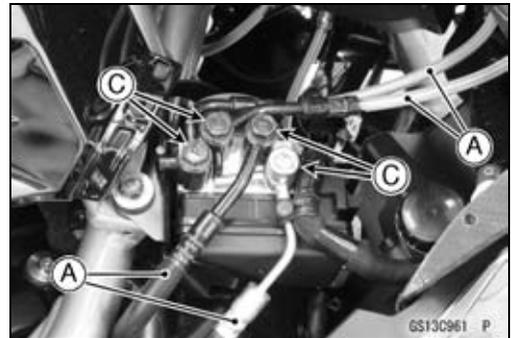
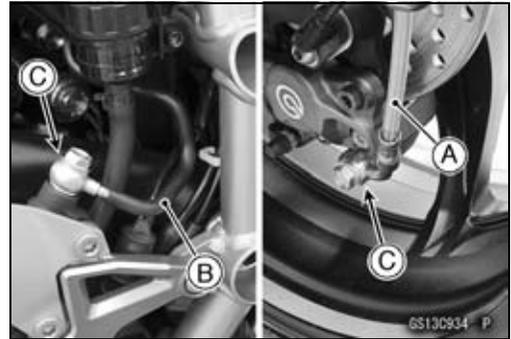
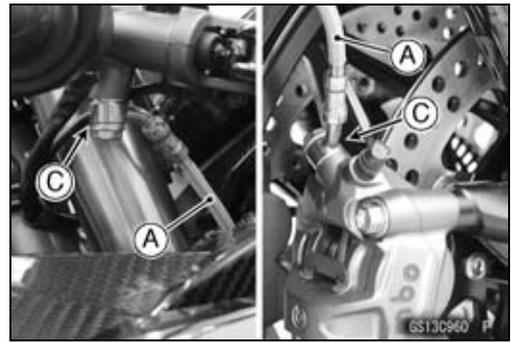
### Periodic Maintenance Procedures

#### Brakes

##### *Brake System Inspection*

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

- Remove the right inner cover (see Inner Cover Removal in the Frame chapter).
- Apply the brake lever or pedal and inspect the brake fluid leak from the brake hoses [A], pipes [B] and fittings [C].
- ★ If the brake fluid leaked from any position, inspect or replace the problem part.



## Periodic Maintenance Procedures

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

- Remove the right inner cover (see Inner Cover Removal in the Frame chapter).
- Inspect the brake hoses, pipes 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, pipe to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.
- ★ Replace the hose and pipe if any crack [B], bulge [C] or leakage is noticed.
- ★ Tighten any brake hose banjo bolts and brake pipe joint nuts.

**Torque - Brake Hose Banjo Bolts: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**

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

- Inspect the brake hose and pipe routing.
- ★ If any brake hose and pipe routing is incorrect, run the brake hose and pipe 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 test riding the vehicle, be aware of surrounding traffic for your safety.**

### Brake Fluid Level Inspection

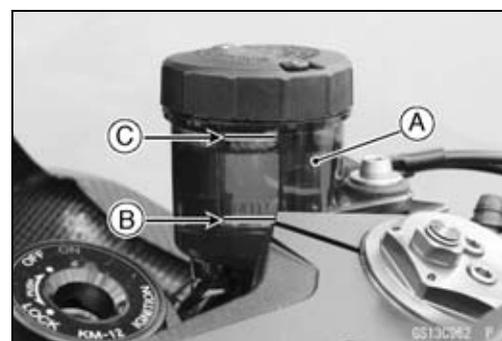
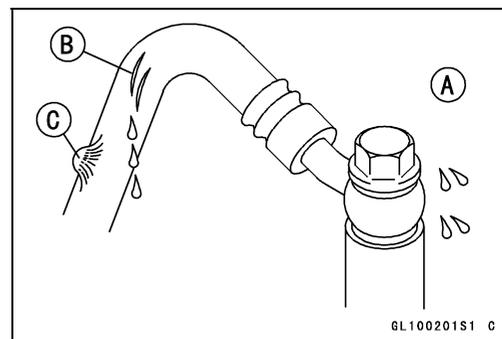
- Check that the brake fluid level in the front brake reservoir [A] is above the MIN level line [B].

#### **NOTE**

○ Hold the reservoir horizontal by turning the handlebar when checking brake fluid level.

- ★ If the fluid level is lower than the MIN level line, fill the reservoir to the MAX level line [C].
- Tighten:

**Torque - Front Brake Fluid Reservoir Cap Screws: 0.70 N·m (0.07 kgf·m, 6.2 in·lb)**



## 2-50 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Check that the brake fluid level in the rear brake reservoir [A] is above the MIN level line [B].
- ★ If the fluid level is lower than the MIN level line, fill the reservoir to the MAX level line [C].
- Remove the stopper [D].

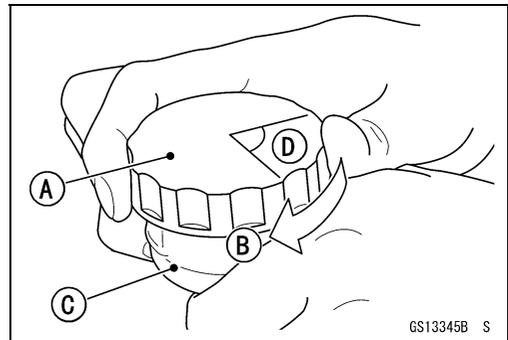
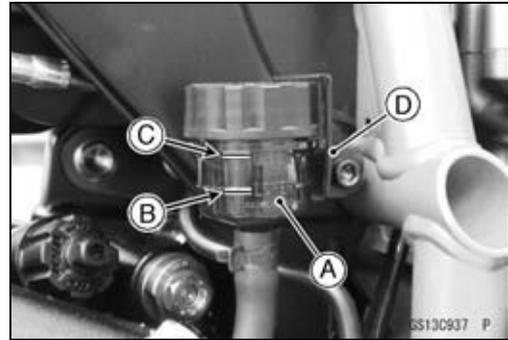
#### **⚠ WARNING**

Mixing brands and types of brake fluid can reduce the brake system's effectiveness and cause an accident resulting in injury or death. Do not mix two brands of brake fluid. Change the brake fluid in the brake line completely if the brake fluid must be re-filled but the type and brand of the brake fluid that is already in the reservoir are unidentified.

#### Recommended Disc Brake Fluid

Grade: DOT4

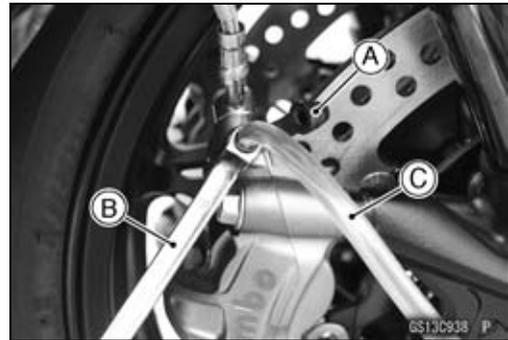
- Follow the procedure below to install the rear brake fluid reservoir cap correctly.
- First, tighten the brake fluid reservoir cap [A] clockwise [B] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body [C], then tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir body.
- Install the stopper and tighten the screw.



#### **Brake Fluid Change**

##### Front Brake

- Level the brake fluid reservoir.
- Remove the reservoir cap, diaphragm plate and diaphragm.
- Remove the rubber cap [A] from the bleed valve on the caliper.
- Attach a wrench [B] and a clear plastic hose [C] to the bleed valve, and run the other end of the hose into a container.
- Fill the reservoir with fresh specified brake fluid.



**Periodic Maintenance Procedures**

- 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.

○ Repeat the above steps for the other caliper.

- Remove the clear plastic hose.
- Install the diaphragm, diaphragm plate and reservoir cap.
- Tighten:

**Torque - Front Brake Reservoir Cap Bolts: 0.70 N·m (0.07 kgf·m, 6.2 in·lb)**

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

**Torque - Bleed Valves: 14 N·m (1.4 kgf·m, 10 in·lb)**

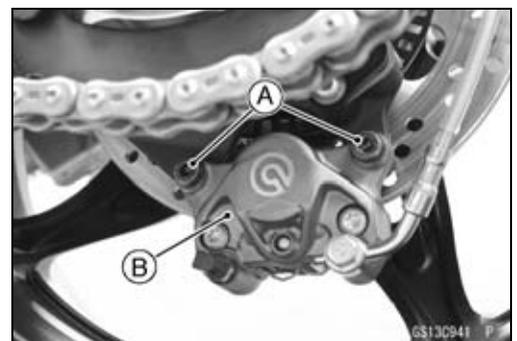
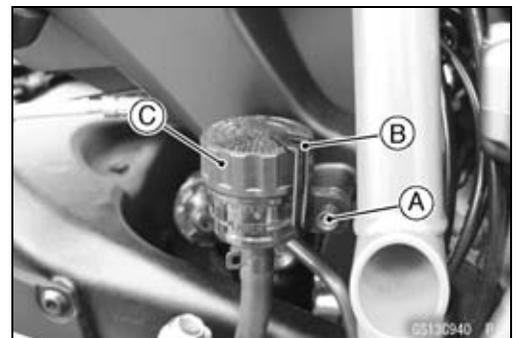
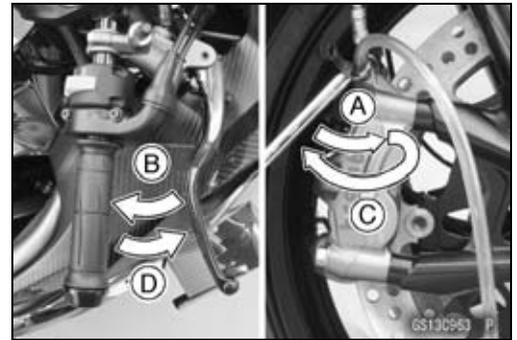
- After changing the fluid, check the brake for good braking power, no brake drag, and no fluid leakage.

★ If necessary, bleed the air from the lines.

**Rear Brake**

- Loosen the reservoir cap stopper bolt [A] to remove the reservoir cap stopper [B], reservoir cap [C], diaphragm plate, diaphragm.

- Remove:
  - Rear Caliper Mounting Bolts [A]
  - Rear Caliper [B]



## 2-52 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Face the bleed valve upward.
- Remove the rubber cap [A] from the bleed valve on the caliper.
- Attach a wrench [B] and a clear plastic hose [C] to the bleed valve, and run the other end of the hose into a container.
- Install the suitable plate [D] between the brake pads.

#### Rear Brake Disk Thickness (For Reference):

5 mm (0.2 in.)

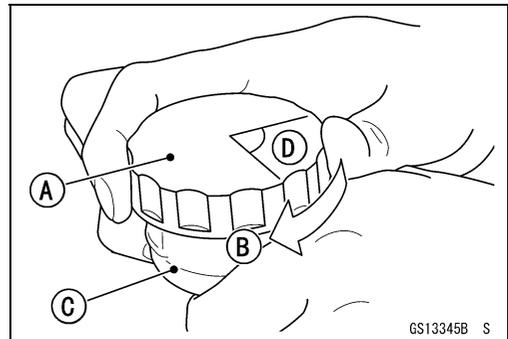
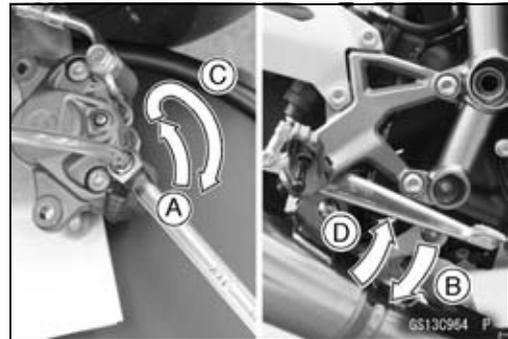
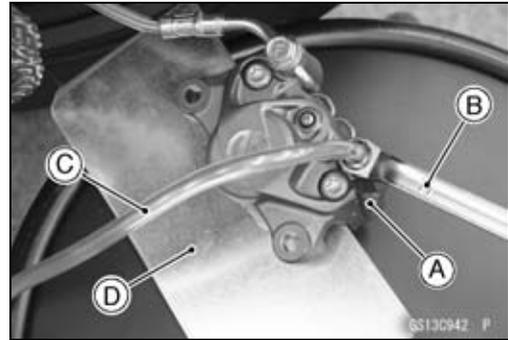
- Fill the reservoir with fresh specified brake fluid.
- Change the brake fluid.
- Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.
  1. Open the bleed valve [A].
  2. Apply the brake and hold it [B].
  3. Close the bleed valve [C].
  4. Release the brake [D].

#### NOTE

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

- Remove the clear plastic hose.
- Install the diaphragm, diaphragm plate and reservoir cap.
- Follow the procedure below to install the rear brake fluid reservoir cap correctly.
- First, tighten the rear brake fluid reservoir cap [A] clockwise [B] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body [C], then tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir body.

- Install the reservoir cap stopper, and tighten its bolt.
- Tighten the bleed valve, and install the rubber cap.
- Torque - Bleed Valves: 7.8 N·m (0.80 kgf·m, 69 in·lb)
- Install the rear caliper.
- Tighten:
  - Torque - Rear Caliper Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·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.



---

**Periodic Maintenance Procedures**

---

This page intentionally left blank.

## 2-54 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

---

#### **Brake Hose and Pipe Replacement**

##### **NOTICE**

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

##### **NOTE**

○ *When removing the brake pipes and hoses on the hydraulic unit, remove them with the flare nut wrench according to each assembly of the exploded view in the Brakes chapter.*

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Air Intake Chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter)
  - Brake Pipe Joint Nuts [A]
  - Brake Hose Banjo Bolts [B] [C]
  - Brake Hose Fitting Bolts [D]
  - Clamps
- There are washers on each side of the brake hose and pipe fitting. Replace them with new ones when installing.
- Before installing the brake pipe, check to see that there is no damage on the threads of the brake pipe joint nut.
- ★ If there is any damage, replace the damaged parts with new ones.

##### **NOTE**

○ *Tighten the brake pipe joint nut at both ends of the brake pipe temporarily and then tighten them to the specified torque.*

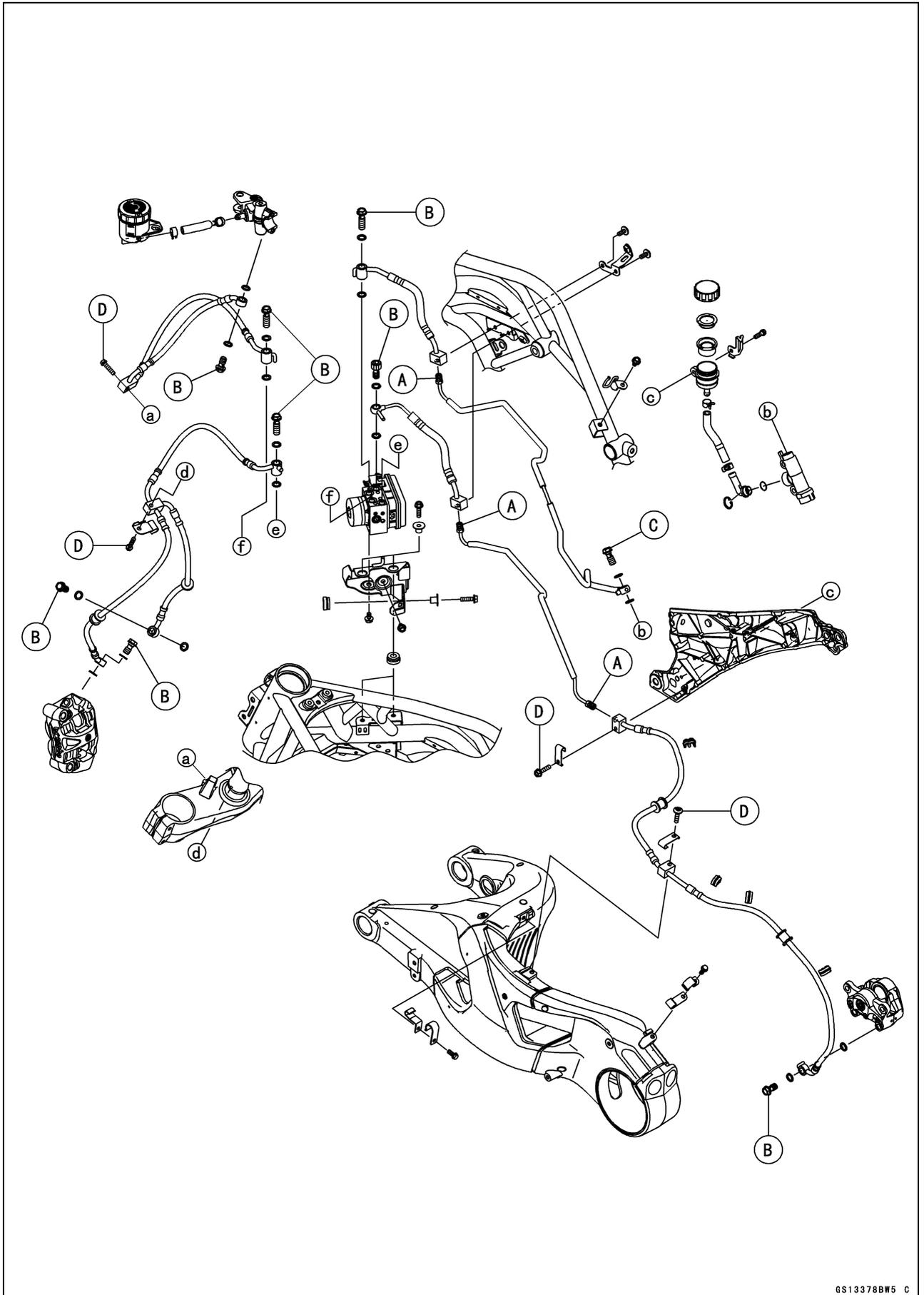
- Install the brake pipes and brake hoses to the specified angle (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten the brake pipe joint nuts with the flare nut wrench.
- Tighten:
  - Torque - Brake Hose Banjo Bolts: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**
  - Brake Pipe Joint Nuts: 18 N·m (1.8 kgf·m, 13 ft·lb)**

##### **NOTE**

○ *The thread pitch of the banjo bolt [C] for rear master cylinder differs from the other banjo bolts. Check the thread pitch before installing.*

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

Periodic Maintenance Procedures



## 2-56 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Master Cylinder Rubber Parts Replacement

##### Front Master Cylinder Disassembly

- Remove the front master cylinder (see Front Master Cylinder Removal in the Brakes chapter).
- Replace the replacement parts as an assembly of the front master cylinder.

##### 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] and return spring [H].

#### NOTICE

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

- Replace:
  - Circlip [A]
  - O-ring [C]
  - Circlip [E]
  - Push Rod Assembly [F]
  - Piston Assembly [G]
  - Diaphragm [I]

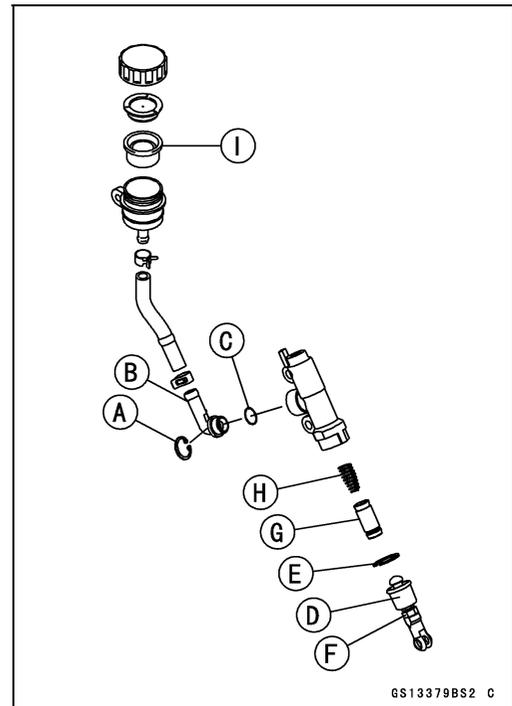
##### Rear Master Cylinder Assembly

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

#### NOTICE

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

- Apply brake fluid to the new parts and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.
- Apply silicone grease to the dust cover of the push rod assembly.
- Assemble the rear master cylinder.



**Periodic Maintenance Procedures**

**Caliper Rubber Parts Replacement**

**Front Caliper**

- Remove:
  - Front Caliper (see Front Caliper Removal in the Brakes chapter)
  - Front Brake Pads (see Front Brake Pad Removal in the Brakes chapter)
- Replace the replacement parts as an assembly of the front caliper.

**Rear Caliper**

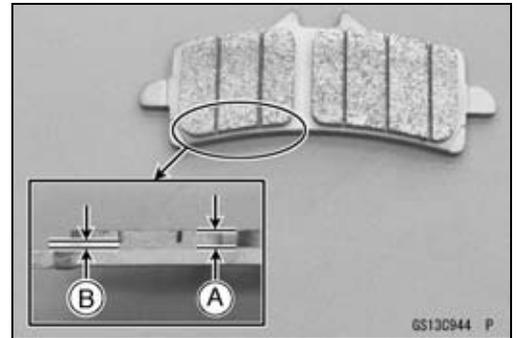
- Remove:
  - Rear Caliper (see Rear Caliper Removal in the Brakes chapter)
  - Rear Brake Pads (see Rear Brake Pad Removal in the Brakes chapter)
- Replace the replacement parts as an assembly of the rear caliper.

**Brake Pad Wear Inspection**

**Front Brake Pad**

- Remove the front brake pads (see Front 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.

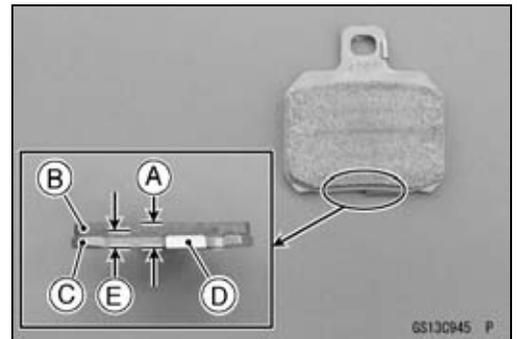
**Front Brake Pad Lining Thickness**  
**Standard:** 3.7 mm (0.15 in.)  
**Service Limit:** 1 mm (0.04 in.)



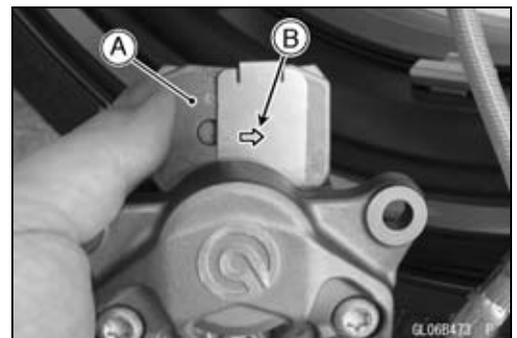
**Rear Brake Pad**

- Remove the rear brake pads (see Rear Brake Pad Removal in the Brakes chapter).
- Check the thickness [A] of the pad lining [B] and the back plate [C] without the shim [D].
- ★ If the thickness of either pad is less than the service limit [E], replace both pads in the caliper as a set.

**Rear Brake Pad Lining Thickness**  
**Standard:** 6.95 mm (0.27 in.) (Thickness of pad lining and back plate)  
**Service Limit:** 4.5 mm (0.18 in.) (Thickness of pad lining and back plate)



- When installing the rear brake pads [A], install them so that the arrow mark [B] faces the wheel rotation direction.



## 2-58 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Brake Light Switch Operation Inspection

##### NOTE

○ The tail/brake light (LED) does not illuminate in a factory shipping.

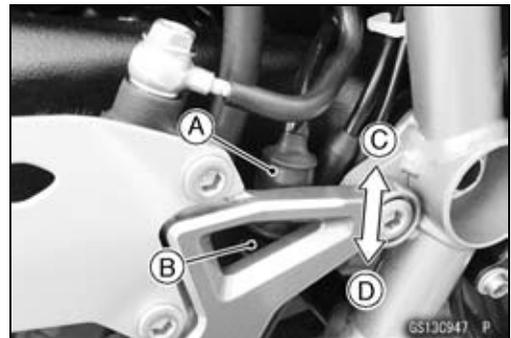
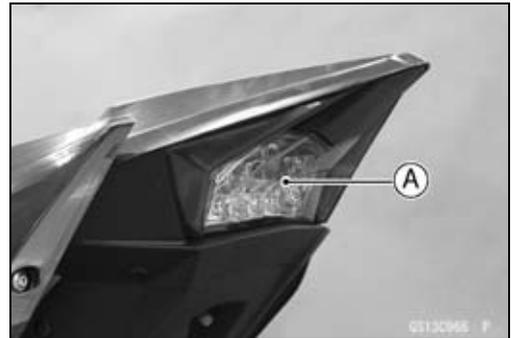
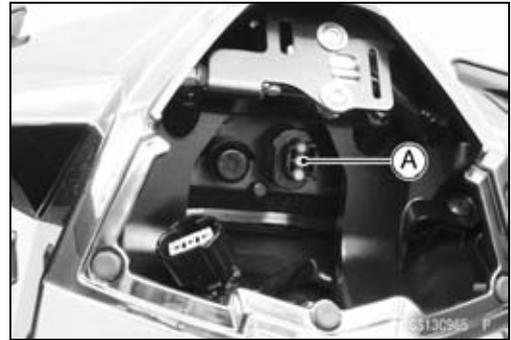
- Remove the connector cap [A], and connect the tail/brake light lead connector to inspection the tail/brake light (LED).
- Turn the ignition switch on.
- The brake light (LED) [A] should go on when the brake lever is applied or after the brake pedal is depressed about 10 mm (0.39 in.).

- ★ 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]

##### NOTICE

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

- ★ If it does not go on, inspect or replace the following parts.
  - Battery (see Charging Condition Inspection in the Electrical System chapter)
  - Brake Light (LED) (see Tail/Brake Light (LED) Removal/Installation in the Electrical System chapter)
  - Main Fuse 30 A and Brake Light 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)



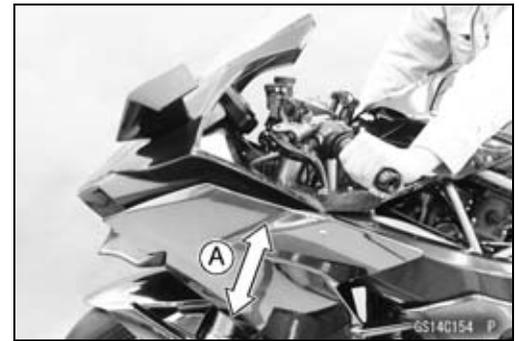
Periodic Maintenance Procedures

Suspension

**Suspension System Inspection**

**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 any defective parts, if necessary.



**Front Fork Oil Leakage Judgment Procedure**

**NOTE**

○ Inner tube of front fork of this motorcycle has been coated with diamond like carbon (DLC). For DLC coating, oil film on its surface is easily recognizable compared to general nickel chrome plating, so oil film of inner tube by normal operation can be misunderstood oil leakage.

- Pull out the dust seal [A] from the outer tube and slide down it.



## 2-60 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

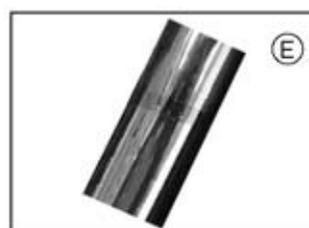
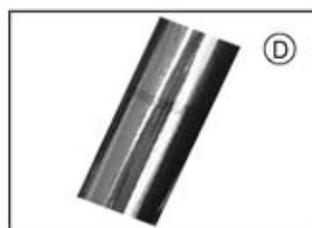
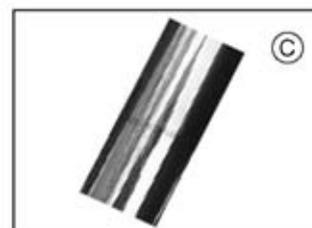
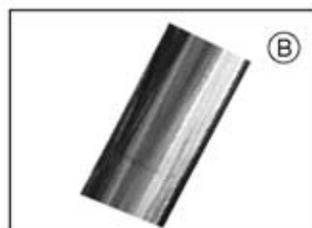
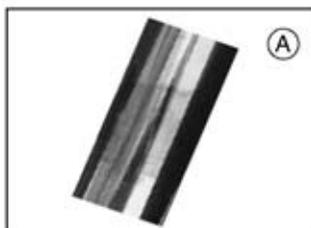
- Using a high flash-point solvent, clean off any oil or dirt from the inner tube [A]. Dry it with a clean cloth.
- Apply the front brake, pump the front forks down and up about 5 times.



- Judge the front fork oil leakage as following table.

#### Oil Leakage Judgment List

| Oil ring condition                                    | Ref.      | Oil leak or not      | Remark  |
|---|-----------|----------------------|---|
| Observed oil film.                                    | Photo [A] | (1) No oil leak      | Normal oil film<br>No repair required   |
| Observed oil not clearly.                             | Photo [B] | (1) No oil leak      | Grease is melting.<br>No repair required                                      |
| Observed oil ring.                                    | Photo [C] | (2) Need re-judgment | Need to keep investigating.   |
| Observed width oil ring is more than 3 mm (0.12 in.). | Photo [D] | (2) Need re-judgment | When oil film is glossy and oil is stick to hands as touching, oil is leaked. |
| Observed large oil ring or dripping oil.              | Photo [E] | (3) Oil leak         | Oil leak  |



GS14104B G

#### (1) No oil leak

- The oil seal is no problem. Install the dust seal.

## Periodic Maintenance Procedures

### (2) Need re-judgment

- After wiping of oil, pump the front fork down and up about 5 times.
- ★ If oil leak is suspected, pump it down and up again. If the inner tube surface shows the condition like photo 5, judge as oil leak.
- In case the grease on seal makes this mark, the condition of photo 4 continues for several months, so need to judge carefully.

### (3) Oil leak

- After inspecting the inner tube, replace the oil seal (see the Front Fork Disassembly in the Suspension chapter).
- After replacing the oil seal, conduct the judgment of the oil leak again.

#### NOTE

- *The cause of oil leak may be as follows.*
  - (1) *The oil seal is deformed due to foreign particles into the oil seal. In this case, replace the oil seal.*
  - (2) *The inner tube is damaged. In this case, replace the inner tube.*

- Before replacing the oil seal, check the inner tube surface for any scratch. Scratches can be detected by rubbing the surface with your finger nail. If there is a scratch, you can feel it by your nail.

### Rear Shock Absorber Oil Leak Inspection

- Visually inspect the rear shock absorber [A] for oil leakage.
- ★ If the oil leakage is found on it, replace the rear 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.
- ★ If the rocker arm [A] do not smoothly stroke or noise is found, inspect the fasteners and bearings (see Rocker Arm/Tie-Rod Bearing, Sleeve Inspection in the Suspension chapter).

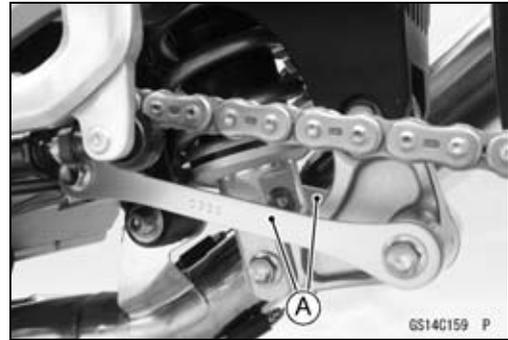


## 2-62 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Tie-Rod Operation Inspection

- Pump the seat down and up 4 or 5 times, and inspect the smooth stroke.
- ★ If the tie-rods [A] do not smoothly stroke or noise is found, inspect the fasteners and tie-rod bearings (see Rocker Arm/Tie-Rod Bearing, Sleeve Inspection in the Suspension chapter).



#### Steering

##### Steering Play Inspection

- Raise the front wheel off the ground with the front stand or the webbing sling.
- 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 leads and cables are properly routed.
- The bearings must be in good condition and properly lubricated in order for any test to be valid.

##### Steering Play Adjustment

- Remove:
  - Steering Stem Head and Handlebars (see Handlebar Removal in the Steering chapter)
  - Fuel Tank Covers (see Fuel Tank Cover Removal in the Frame chapter)
- Raise the motorcycle with the webbing sling.
- Straighten the claws [A] of the claw washer.
- Remove:
  - Steering Stem Locknut [B]
  - Claw Washer



**Periodic Maintenance Procedures**

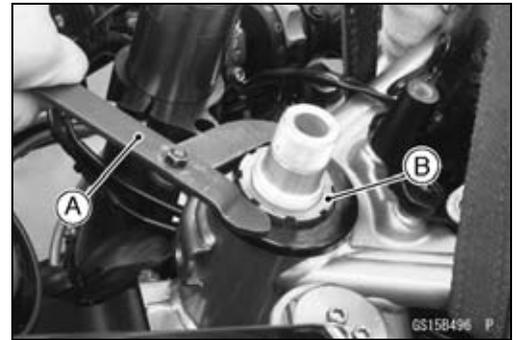
- Adjust the steering using the steering stem nut wrench [A].

**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.

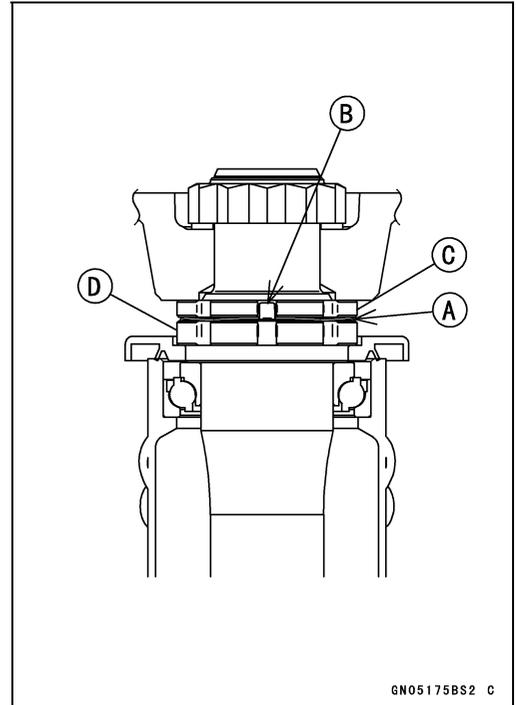


- Install the claw washer [A] so that its bent side [B] faces upward, and engage the bent claws with the grooves of stem locknut [C].
- Hand tighten the stem locknut until it touches the claw washer.
- Hand tighten the stem locknut clockwise until the claws are aligned with the second groove of stem nut [D], and bend the 2 claws downward.
- Install the stem head.
- Install the washer, and temporary tighten the stem head bolt.

**NOTE**

○ Tighten the upper front fork clamp bolts first, next the stem head bolt.

**Torque - Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**  
**Steering Stem Head Nut: 78 N·m (8.0 kgf·m, 58 ft·lb)**



|  |
|--|
| <p><b>⚠ WARNING</b></p> <p><b>If the handlebars do not turn to the steering stop, they may cause an accident resulting in injury or death. Be sure the cables, harnesses and hoses are routed properly and do not interfere with handlebar movement (see Cable, Wire, and Hose Routing section in the Appendix chapter).</b></p> |
|--|

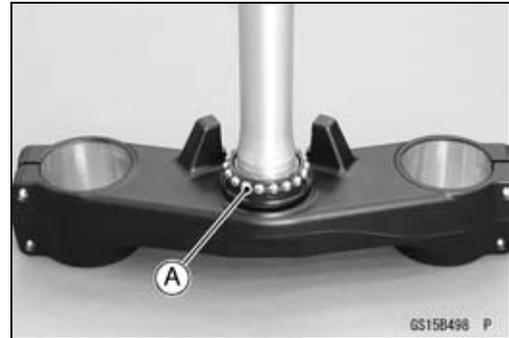
- Check the steering again.
- ★ If the steering is still too tight or too loose, repeat the adjustment.
- Install the removed parts (see appropriate chapters).

## 2-64 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### **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 [A] 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 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).



#### **Electronic 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 (see Electronic Steering Damper Removal/Installation in the Steering chapter).



**Periodic Maintenance Procedures**

**Electrical System**

**Lights Inspection**

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

|  |         |
|--|---------|
| *Taillights (LED) [A]                        | Go on   |
| Meter Panel Illumination (LED) [B]           | Goes on |
| Meter Panel LCD [C]                          | Goes on |
| Green Neutral Indicator Light (LED) [D]      | Goes on |
| Red Oil Pressure Warning Indicator Light [E] | Goes on |
| Yellow ABS Indicator Light (LED) [F]         | Goes on |

\*: When the tail/brake light lead connector is connected.

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

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

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

Green Neutral Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)

Red Oil Pressure Warning Indicator Light (LED) (see Meter Unit Inspection in the Electrical System chapter)

Meter Panel Illumination (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 Meter Fuse 10 A (see Fuse Inspection in the Electrical System chapter)

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

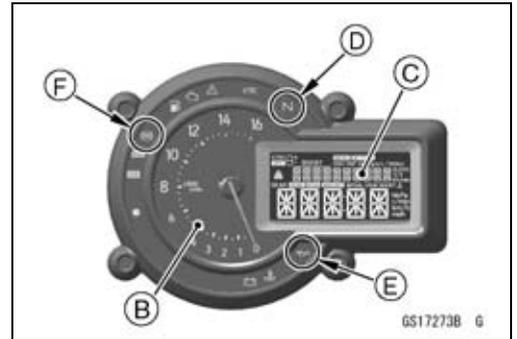
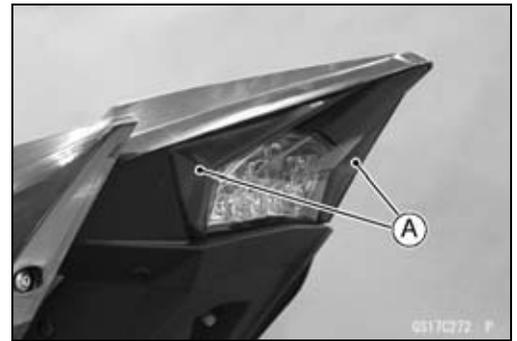
Oil Pressure Switch (see Switch Inspection in the Electrical System chapter)

Gear Position Sensor (see Gear Position Sensor Inspection in the Electrical System chapter)

Harness (see Wiring Inspection in the Electrical System chapter)

Yellow ABS Indicator Light (LED) (see Yellow ABS Indicator Light (LED) Inspection in the Brakes chapter)

- Turn the ignition switch off.
- The all lights should go off.
- ★ If the light does not go off, replace the ignition switch.



## 2-66 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Side Stand Switch Operation Inspection

- Raise the rear wheel off the ground with the stand.
- Inspect the side stand switch [A] operation accordance to below table.

#### Side Stand Switch Operation

| Side Stand | 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 side stand 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 15 A (see Fuse Inspection in the Electrical System chapter)

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

Side Stand Switch (see Switch Inspection in the Electrical System chapter)

Engine Start/Stop Switch (see Switch Inspection in the Electrical System chapter)

Gear Position Sensor (see Gear Position Sensor Inspection in the Electrical System chapter)

Starter Lockout Switch (see Switch Inspection in the Electrical System chapter)

Starter Relay (see Starter Relay Inspection in the Electrical System chapter)

Relay Box (see Relay Circuit Inspection in the Electrical System chapter)

Starter Circuit Relay (see Relay Circuit Inspection in the Electrical System chapter)

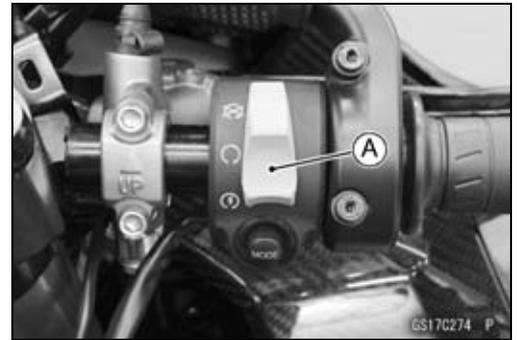
Harness (see Wiring Inspection in the Electrical System chapter)

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

**Periodic Maintenance Procedures**

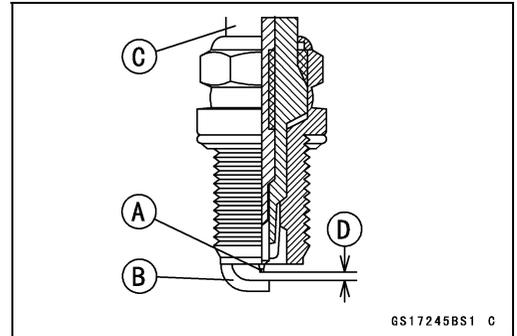
**Engine Start/Stop Switch Operation Inspection**

- Turn the ignition switch on.
- Set the gear position in the neutral position.
- Set the engine start/stop switch to run position [A].
- Slide the start/stop switch down and start the engine.
- Set the engine start/stop switch to stop position.
- Immediately the engine should be stop.
- ★ If the engine does not stop, inspect or replace the engine start/stop switch (see Switch Inspection in the Electrical System chapter).
- ★ If the engine start/stop switch is good condition, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



**Spark Plug Condition Inspection**

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



**Spark Plug Gap: 0.8 ~ 0.9 mm (0.031 ~ 0.035 in.)**

- Use the standard spark plug.

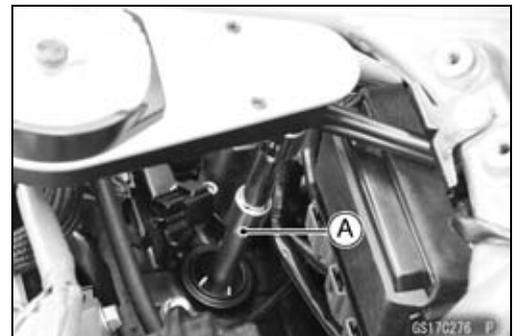
**Spark Plug Replacement**

- Remove the stick coils (see Stick Coil Removal in the Electrical System chapter).
- Remove the spark plugs using the 14 mm (0.55 in.) plug wrench [A] vertically.
- Replace the spark plugs with new ones.



**Standard Spark Plug**  
**Type: NGK SILMAR9B9**

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



**NOTICE**

**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.

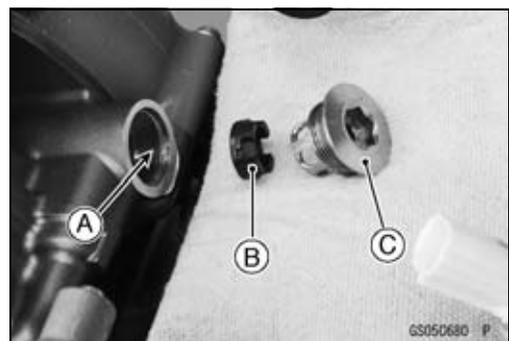
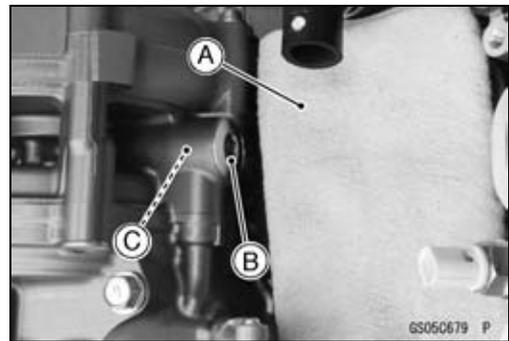
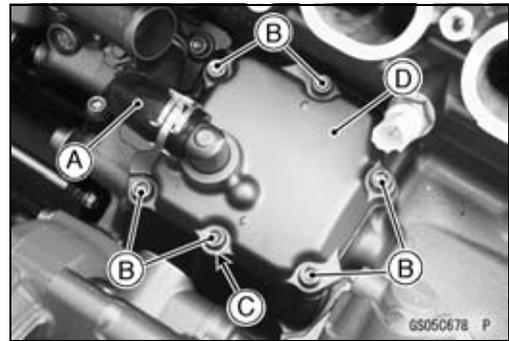
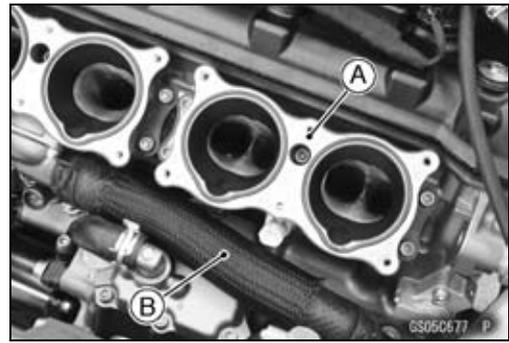
## 2-68 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Supercharger

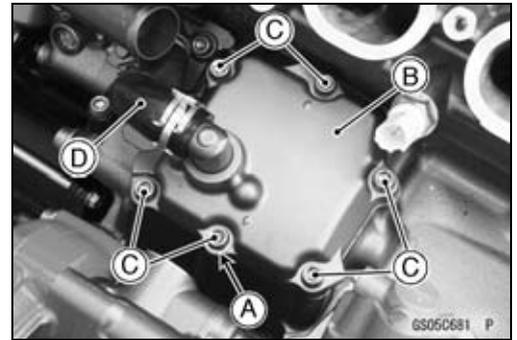
##### Supercharger Oil Screen Replacement

- Remove:
    - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
    - Blow-off Valve Hose Fitting Box (see Blow-off Valve Hose Fitting Box Removal in the Fuel System (DFI) chapter)
    - Right Throttle Body Assy Holder [A] (see Throttle Body Assy Holder Removal in the Engine Top End chapter)
  - Drain the coolant (see Coolant Change).
  - Slide the clamp and remove the water hose [B].
  - Slide the clamp and disconnect the breather hose [A].
  - Remove:
    - Breather Cover Bolts [B]
    - Washer [C]
    - Breather Cover [D]
  - Put the clean cloth [A] to prevent from dropping out the parts into the crankcase.
  - Remove:
    - Supercharger Oil Screen Bolt [B]
    - Supercharger Oil Screen [C]
  - Clean the threads [A].
  - Replace the supercharger oil screen [B] and supercharger oil screen bolt [C] with new ones.
  - Install the supercharger oil screen, and tighten the supercharger oil screen bolt.
- Torque - Supercharger Oil Screen Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**



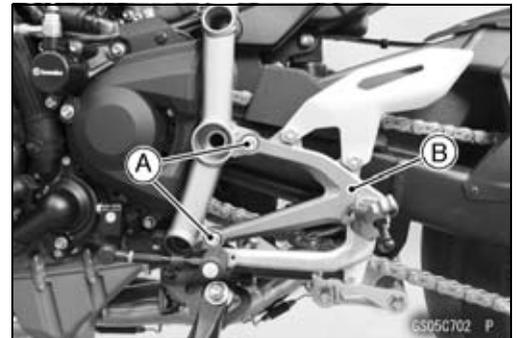
**Periodic Maintenance Procedures**

- Replace the breather cover gasket and washer [A] with new ones.
- Install:
  - Gasket
  - Breather Cover [B]
  - Washer
- Tighten:
  - Torque - Breather Cover Bolts [C]: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Connect the breather hose [D].
- Install the removed parts (see appropriate chapters).
- Fill the coolant (see Coolant Change in the Periodic Maintenance chapter).

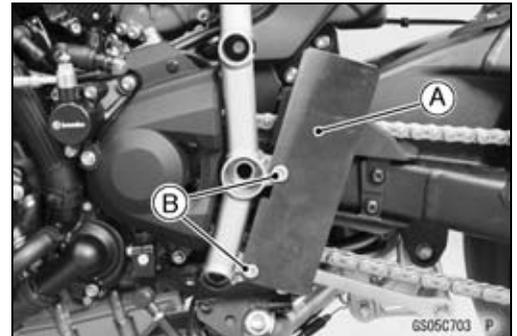


**Supercharger Impeller Axial Play Inspection**

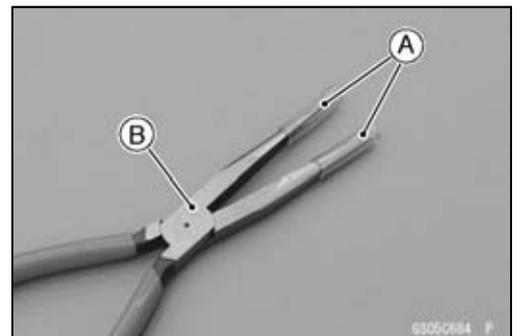
- Remove:
  - Intake Duct (see Intake Duct Removal in the Fuel System (DFI) chapter)
  - Footpeg Bracket Bolts [A]
  - Footpeg Bracket [B]



- Install the dial gauge holder plate [A] and tighten it with the removed bolts [B] securely.
- Special Tool - Dial Gauge Holder Plate: 57001-1834**



- Install the suitable rubber tubes [A] into the needle-nose pliers [B].



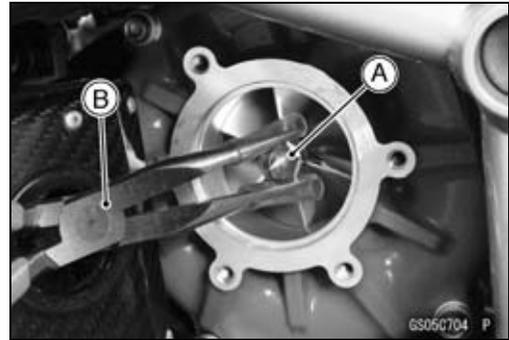
## 2-70 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

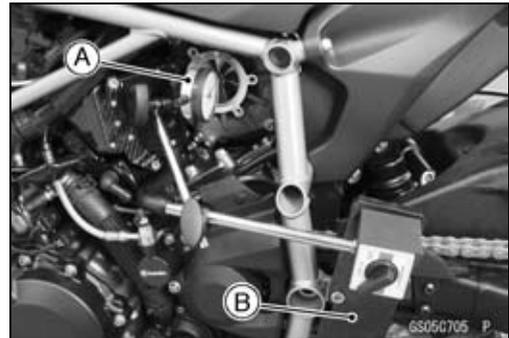
- Confirm that the impeller [A] can be held by the pliers [B] before inspecting the axial play.

#### **NOTICE**

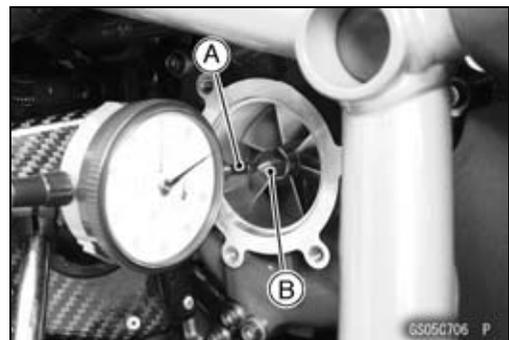
**If dirt gets into the supercharger, possible supercharger damage will occur.**



- Mount a dial gauge [A] on the dial gauge holder plate [B].



- Fit the dial gauge tip [A] to the center of the impeller [B].

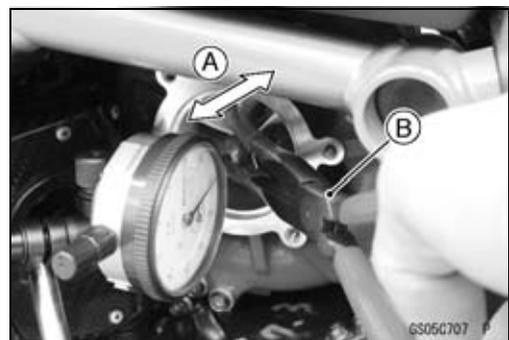


- Measure the supercharger impeller axial play [A] using the pliers [B].

#### **Supercharger Impeller Axial Play**

**Service Limit: 0.5 mm (0.02 in.)**

- ★ If the supercharger impeller axial play exceeds the service limit, replace the supercharger impeller housing assy.



Periodic Maintenance Procedures

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**

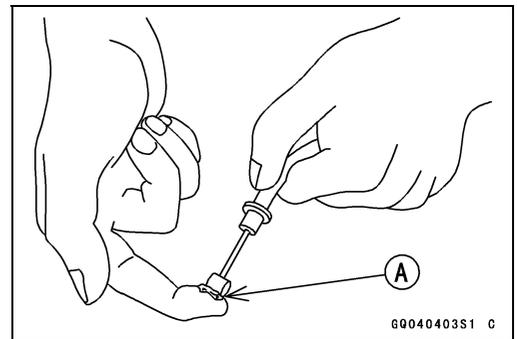
○Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.

**Pivots: Lubricate with Grease.**

- Brake Lever
- Brake Pedal
- Clutch Lever
- Rear Master Cylinder Push Rod Joint Pin
- Side Stand

**Points: Lubricate with Grease.**

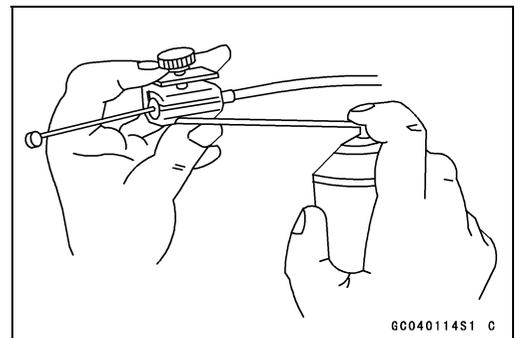
- Throttle Inner Cable Upper and Lower Ends [A]



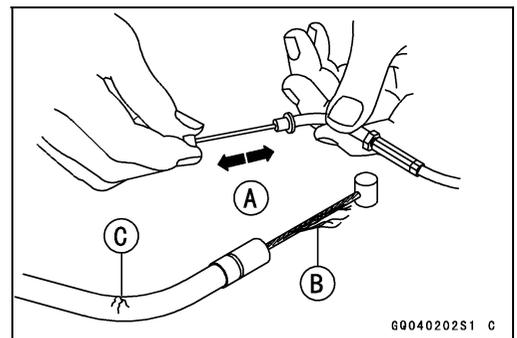
**Cables: Lubricate with Rust Inhibitor.**

- 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.



## 2-72 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

---

#### ***Condition of Bolts, Nuts and Fasteners Tightness Inspection***

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

#### **NOTE**

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

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

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

##### Engine:

Clutch Lever Pivot Bolt Locknut  
Engine Mounting Bolts and Nuts  
Exhaust Pipe Holder Nuts  
Muffler Body Clamp Bolts  
Muffler Body Mounting Bolt  
Exhaust Pipe Mounting Bolt  
Radiator Mounting Bolts

##### Wheels:

Front Axle Clamp Bolts  
Front Axle Nut  
Rear Axle Nuts  
Rear Wheel Nuts

##### Brakes:

Brake Lever Pivot Bolt Locknut  
Brake Pedal Bolt  
Caliper Mounting Bolts  
Front Master Cylinder Clamp Bolts  
Rear Master Cylinder Mounting Bolts  
Rear Master Cylinder Push Rod Joint Cotter Pin

##### Suspension:

Front Fork Clamp Bolts  
Rear Shock Absorber Nuts  
Swingarm Pivot Shaft Nut  
Tie-rod Nuts  
Rocker Arm Nut

##### Steering:

Handlebar Clamp Bolts  
Steering Stem Head Nut

##### Others:

Footpeg Bracket Bolts  
Front Fender Mounting Bolts  
Rear Frame Bolts  
Side Stand Bolt  
Side Stand Bracket Bolts

**Service Time Maintenance Procedures**

**Air Cleaner Element Inspection and Cleaning**

**NOTE**

*○In dusty areas, the element should be inspection and cleaning more frequently than the recommended interval.*

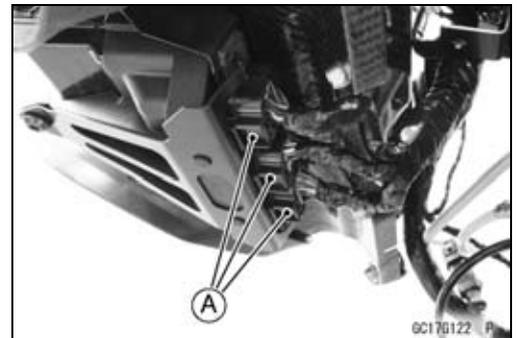
**⚠ WARNING**

**If dirt or dust is allowed to pass through into the throttle body assy, the throttle may become stuck, possibly causing accident. Replace the air cleaner element according to the maintenance chart.**

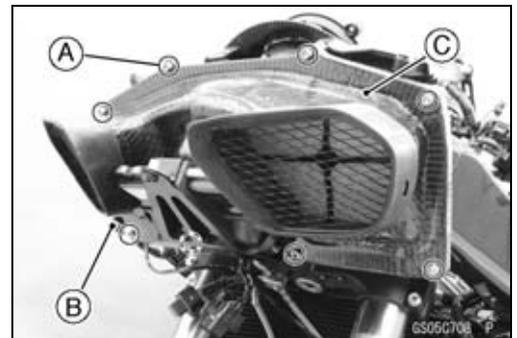
**NOTICE**

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

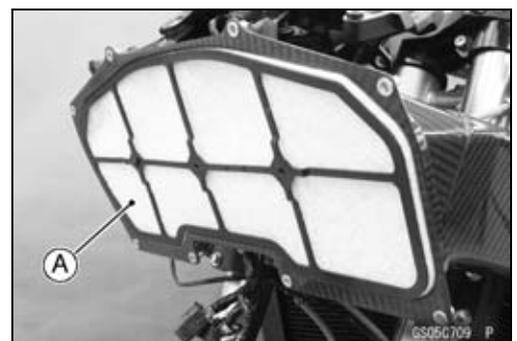
- Remove the upper fairing (see Upper Fairing Removal in the Frame chapter).
- Disconnect the ECU connectors [A].



- Remove:
  - Intake Duct Assy Bolts [A]
  - Clamp [B]
  - Front Intake Duct [C]



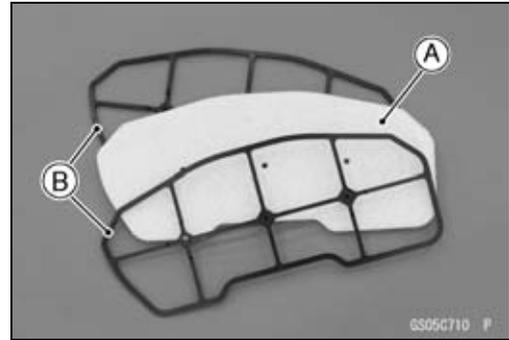
- Remove:
  - Air Cleaner Element [A]
- Stuff a clean, lint-free towel into the intake duct so no dirt is allowed to enter the supercharger and throttle body assy.
- Wipe out the inside of the intake duct with a clean damp towel.



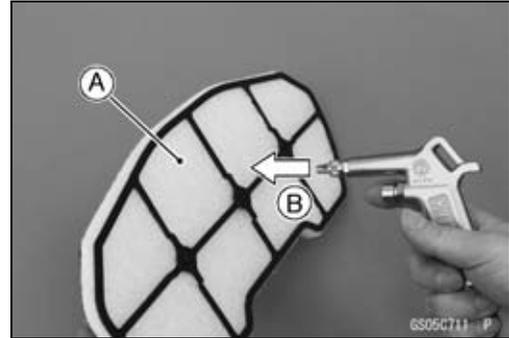
## 2-74 PERIODIC MAINTENANCE

### Service Time Maintenance Procedures

- Separate the element [A] from the frames [B].
- Inspect the element for damage.
- ★ If any damage is found, replace the element.

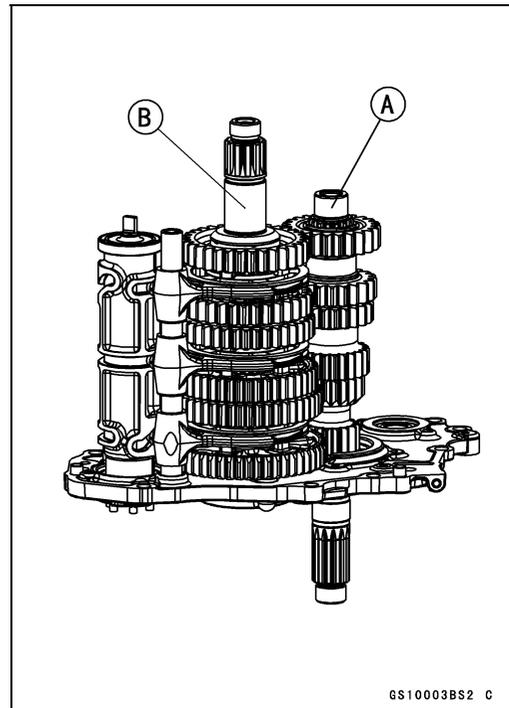


- Install the frames to the element.
- Clean the element [A].
- Blow away the contaminants by applying compressed air [B] or water from the inside to the outside (from the clean side to the dirty side).
- Install the removed parts (see appropriate chapters).



### Transmission Inspection

- Remove the transmission assy (see Transmission Assy Removal).
- Inspect the drive shaft assy [A] and output shaft assy [B] for damage.
- ★ If any damage is found, replace the corresponding part.
- Inspect the followings.
  - Shift Fork Bending (Shift Fork Bending Inspection in the Crankshaft/Transmission chapter)
  - Shift Fork/Shifter Groove Wear (Shift Fork/Shifter Groove Wear Inspection in the Crankshaft/Transmission chapter)
  - Shift Fork Guide Pin/Drum Groove Wear (Shift Fork Guide Pin/Drum Groove Wear Inspection in the Crankshaft/Transmission chapter)



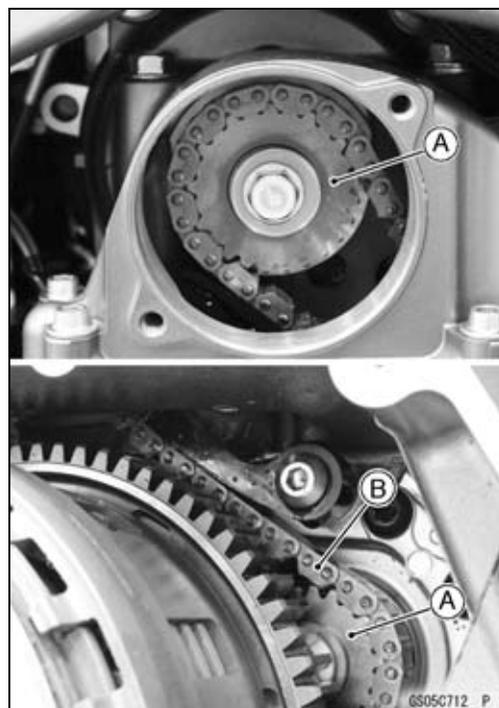
### Clutch Inspection

- Inspect the followings.
  - Clutch Plate, Wear, Damage (Clutch Plate, Wear, Damage Inspection in the Clutch chapter)
  - Clutch Plate Warp (Clutch Plate Warp Inspection in the Clutch chapter)
  - Clutch Spring Free Length (Clutch Spring Free Length Measurement in the Clutch chapter)
  - Clutch Housing Finger (Clutch Housing Finger Inspection in the Clutch chapter)
  - Clutch Housing Spline (Clutch Housing Spline Inspection in the Clutch chapter)
  - Damper Cam (Damper Cam Inspection in the Clutch chapter)

## Service Time Maintenance Procedures

### **Supercharger Chain and Sprocket Inspection**

- Remove:
  - Supercharger Chain Sprocket Cover (see Supercharger Housing Assy Removal in the Fuel System (DFI) chapter)
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
- Inspect the supercharger chain sprockets [A] and chain [B] for damage while rotating the crankshaft.
- ★ If any damage is found, replace the corresponding part.



### **Supercharger Impeller Axial Play Inspection**

- Refer to the Supercharger Impeller Axial Play Inspection in the Periodic Maintenance Procedures section of this chapter.

### **Engine Oil Change**

- Refer to the Engine Oil Change in the Periodic Maintenance Procedures section of this chapter.

### **Oil Filter Replacement**

- Refer to the Oil Filter Replacement in the Periodic Maintenance Procedures section of this chapter.

### **Piston and Piston Rings Replacement**

- Refer to the Piston Removal in the Crankshaft/Transmission chapter.

### **Piston Pins Replacement**

- Refer to the Piston Removal in the Crankshaft/Transmission chapter.

### **Crankshaft Inspection**

- Remove the crankshaft (see Crankshaft Removal in the Crankshaft/Transmission chapter)
- Inspect the crankshaft for damage.
- ★ If any damage is found, replace the crankshaft.
- Inspect the followings.
  - Crankshaft Runout (see Crankshaft Runout Inspection in the Crankshaft/Transmission chapter)
  - Crankshaft Side Clearance (see Crankshaft Side Clearance Inspection in the Crankshaft/Transmission chapter).

### **Crankshaft Bearing Replacement**

- Refer to the Crankshaft Main Bearing Insert/Journal Wear Inspection in the Crankshaft/Transmission chapter.

## 2-76 PERIODIC MAINTENANCE

### Service Time Maintenance Procedures

---

#### **Connecting Rods Inspection**

- Inspect the followings.
  - Connecting Rod Bend (see Connecting Rod Bend Inspection in the Crankshaft/Transmission chapter)
  - Connecting Rod Twist (see Connecting Rod Twist Inspection in the Crankshaft/Transmission chapter)
  - Connecting Rod Big End Side Clearance (see Connecting Rod Big End Side Clearance Inspection in the Crankshaft/Transmission chapter)

#### **Connecting Rods Replacement**

- Refer to the Connecting Rod Removal/Installation in the Crankshaft/Transmission chapter.

#### **Connecting Rod Bearings Replacement**

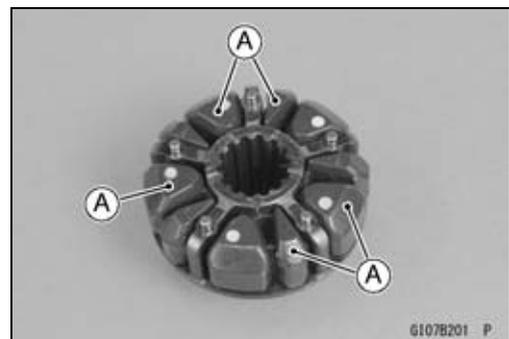
- Refer to the Connecting Rod Big End Bearing Insert/Crankpin Wear Inspection in the Crankshaft/Transmission chapter.

#### **Spark Plugs Inspection**

- Refer to the Spark Plug Condition Inspection in the Periodic Maintenance Procedures section of this chapter.

#### **Supercharger Coupling Dampers Inspection**

- Remove the supercharger coupling together with its coupling (see Starter Motor Clutch Disassembly in the Crankshaft/Transmission chapter)
- Visually inspect the coupling dampers [A].
- ★ If any appear damaged or deteriorated, replace them.



#### **Camshaft Chain Inspection**

- Remove the camshaft chain (see Camshaft Chain Removal in the Engine Top End chapter).
- Inspect the camshaft for damage.
- ★ If any damage is found, replace the camshaft chain.

#### **Valve clearance Inspection**

- Refer to the Valve Clearance Inspection in the Periodic Maintenance Procedures section of this chapter.

## Service Time Maintenance Procedures

### **Valve, Valve Seats and Valve Springs (Exhaust Side) Inspection**

- Remove the exhaust valve (see Valve Removal in the Engine Top chapter)
- Measure the free length of the exhaust valve springs [A].
- ★ If any spring is shorter than the service limit, it must be replaced.

#### **Exhaust Valve Spring Free Length**

**Standard: 37.1 mm (1.461 in.)**

**Service Limit: 35.8 mm (1.41 in.)**

- Inspect the followings.
  - Valve-to-Guide Clearance (Wobble Method) (see Valve-to-Guide Clearance Measurement (Wobble Method) in the Engine Top chapter)
  - Valve Seat (see Valve Seat Inspection in the Engine Top chapter)

### **Exhaust Valves Replacement**

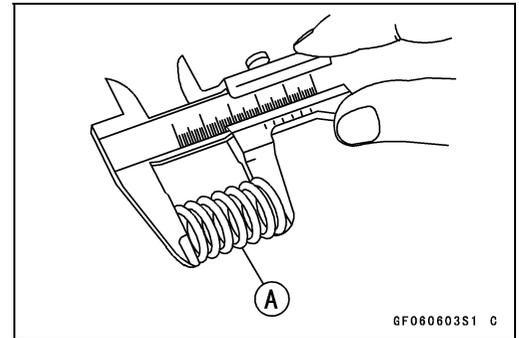
- Refer to the Valve Removal/Installation in the Engine Top End chapter.

### **Drive Chain Inspection/Replacement**

- Inspect the followings.
  - Drive Chain Slack (see the Drive Chain Slack Inspection in the Periodic Maintenance Procedures section of this chapter)
  - Drive Chain Wear (see the Drive Chain Wear Inspection in the Final Drive chapter)
- Replace the drive chain (see the Drive Chain Replacement in the Final Drive chapter).

### **Rear Wheel Coupling Inspection**

- Refer to the Rear Wheel Coupling Inspection in the Periodic Maintenance Procedures section of this chapter.





# Fuel System (DFI)

## Table of Contents

|   |      |
|---|------|
| Exploded View.....  | 3-4  |
| DFI System.....   | 3-10 |
| DFI Parts Location.....                                     | 3-16 |
| Specifications .....  | 3-20 |
| Special Tools and Sealants .....                            | 3-21 |
| DFI Servicing Precautions.....                              | 3-22 |
| DFI Servicing Precautions .....                             | 3-22 |
| Troubleshooting the DFI System.....                         | 3-24 |
| Outline .....   | 3-24 |
| Inquiries to Rider.....                                     | 3-28 |
| DFI System Troubleshooting Guide .....                      | 3-31 |
| Warning Indicator Light (LED) .....                         | 3-36 |
| Yellow Engine Warning Indicator Light (LED) Inspection..... | 3-36 |
| ECU.....  | 3-37 |
| ECU Removal .....   | 3-37 |
| ECU Installation .....                                      | 3-37 |
| ECU Power Supply Inspection.....                            | 3-38 |
| DFI Power Source .....                                      | 3-41 |
| ECU Fuse Removal .....                                      | 3-41 |
| ECU Fuse Installation .....                                 | 3-41 |
| ECU Fuse Inspection .....                                   | 3-41 |
| ECU Main Relay Removal/Installation .....                   | 3-41 |
| ECU Main Relay Inspection .....                             | 3-41 |
| Fuel Line.....  | 3-42 |
| Fuel Pressure Inspection .....                              | 3-42 |
| Fuel Flow Rate Inspection .....                             | 3-43 |
| Fuel Pump .....   | 3-45 |
| Fuel Pump Removal .....                                     | 3-45 |
| Fuel Pump Installation .....                                | 3-46 |
| Fuel Pump Operation Inspection .....                        | 3-46 |
| Fuel Pump Operating Voltage Inspection .....                | 3-47 |
| Pressure Regulator Removal.....                             | 3-48 |
| Fuel Pump Relay Removal/Installation .....                  | 3-48 |
| Fuel Pump Relay Inspection .....                            | 3-48 |
| Fuel Injectors.....   | 3-49 |
| Primary Fuel Injector Removal/Installation .....            | 3-49 |
| Secondary Fuel Injector Removal/Installation.....           | 3-49 |
| Primary Fuel Injector Audible Inspection .....              | 3-49 |
| Fuel Injector Resistance Inspection.....                    | 3-49 |
| Fuel Injector Power Source Voltage Inspection .....         | 3-49 |
| Fuel Injector Output Voltage Inspection.....                | 3-49 |
| Fuel Injector Fuel Line Inspection .....                    | 3-49 |
| Throttle Grip and Cables .....                              | 3-50 |
| Free Play Inspection .....                                  | 3-50 |
| Free Play Adjustment.....                                   | 3-50 |
| Cable Installation .....                                    | 3-50 |
| Cable Lubrication .....                                     | 3-50 |
| Air Intake Chamber.....                                     | 3-51 |
| Air Intake Chamber Removal.....                             | 3-51 |
| Air Intake Chamber Installation.....                        | 3-53 |

## 3-2 FUEL SYSTEM (DFI)

---

|   |      |
|---|------|
| Blow-off Valve Removal .....                              | 3-55 |
| Blow-off Valve Installation .....                         | 3-55 |
| Blow-off Valve Inspection .....                           | 3-55 |
| Purge Valve (for Supercharger) Removal/Installation ..... | 3-55 |
| Purge Valve (for Supercharger) Inspection .....           | 3-55 |
| Throttle Body Assy .....                                  | 3-56 |
| Idle Speed Inspection/Adjustment .....                    | 3-56 |
| Synchronization Inspection .....                          | 3-56 |
| Throttle Body Assy Removal .....                          | 3-56 |
| Throttle Body Assy Installation .....                     | 3-58 |
| Throttle Body Assy Disassembly .....                      | 3-59 |
| Throttle Body Assy Assembly .....                         | 3-60 |
| Nozzle Assy .....   | 3-62 |
| Nozzle Assy Removal .....                                 | 3-62 |
| Nozzle Assy Installation .....                            | 3-62 |
| Nozzle Assy Disassembly .....                             | 3-62 |
| Nozzle Assy Assembly .....                                | 3-63 |
| Air Cleaner .....   | 3-64 |
| Air Cleaner Element Removal/Installation .....            | 3-64 |
| Blow-off Valve Hose Fitting Box Oil Draining .....        | 3-64 |
| Intake Duct Removal .....                                 | 3-64 |
| Intake Duct Installation .....                            | 3-65 |
| Intake Duct Water Draining .....                          | 3-66 |
| Blow-off Valve Hose Fitting Box Removal .....             | 3-67 |
| Blow-off Valve Hose Fitting Box Installation .....        | 3-68 |
| Supercharger .....  | 3-69 |
| Supercharger Chain Tensioner Removal .....                | 3-69 |
| Supercharger Chain Tensioner Installation .....           | 3-69 |
| Supercharger Housing Assy Removal .....                   | 3-70 |
| Supercharger Housing Assy Installation .....              | 3-72 |
| Supercharger Outer Housing Removal .....                  | 3-74 |
| Supercharger Outer Housing Installation .....             | 3-74 |
| Fuel Tank .....   | 3-76 |
| Fuel Tank Removal .....                                   | 3-76 |
| Fuel Tank Installation .....                              | 3-78 |
| Fuel Tank and Cap Inspection .....                        | 3-80 |
| Fuel Tank Cleaning .....                                  | 3-80 |

This page intentionally left blank.



**Exploded View**

| No. | Fastener   | Torque |       |           | Remarks |
|-----|--|--------|-------|-----------|---------|
|     |  | N·m    | kgf·m | ft·lb     |         |
| 1   | Nozzle Assy Mounting Bolts                           | 5.0    | 0.51  | 44 in·lb  | L       |
| 2   | Purge Valve Nut                                      | 7.0    | 0.71  | 62 in·lb  |         |
| 3   | Throttle Case Bolts                                  | 3.5    | 0.36  | 31 in·lb  |         |
| 4   | Air Intake Chamber Pressure/Temperature Sensor Bolts | 5.0    | 0.51  | 44 in·lb  |         |
| 5   | Air Hose Fitting                                     | 10     | 1.0   | 89 in·lb  | L       |
| 6   | Air Intake Chamber Assy Bolts                        | 8.0    | 0.82  | 71 in·lb  |         |
| 7   | Blow-off Valve Hose Clamp Screw                      | 3.0    | 0.31  | 27 in·lb  |         |
| 8   | Blow-off Valve Bolts                                 | 25     | 2.5   | 18        |         |
| 9   | Air Intake Hose Clamp Screws                         | 3.0    | 0.31  | 27 in·lb  |         |
| 10  | Air Intake Chamber Duct Screen Bolts                 | 3.0    | 0.31  | 27 in·lb  | L       |
| 11  | Air Intake Chamber Mounting Bolts (L = 14 mm)        | 8.0    | 0.82  | 71 in·lb  | L, S    |
| 12  | Air Intake Chamber Mounting Bolts (L = 95 mm)        | 8.0    | 0.82  | 71 in·lb  | L, S    |
| 13  | Air Intake Chamber Duct Bolts                        | 6.0    | 0.61  | 53 in·lb  | L       |
| 14  | Delivery Pipe Assy Mounting Screws                   | 3.5    | 0.36  | 31 in·lb  |         |
| 15  | Throttle Body Assy Mounting Bolts                    | 10     | 1.0   | 89 in·lb  |         |
| 16  | Intake Duct Mounting Bolts (L = 20 mm)               | 1.0    | 0.10  | 8.9 in·lb |         |
| 17  | Intake Duct Mounting Bolts (L = 18 mm)               | 6.0    | 0.61  | 53 in·lb  |         |
| 18  | Intake Duct Holder Bolts                             | 10     | 1.0   | 89 in·lb  |         |
| 19  | Intake Duct Mounting Bolts (L = 12 mm)               | 6.0    | 0.61  | 53 in·lb  |         |

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

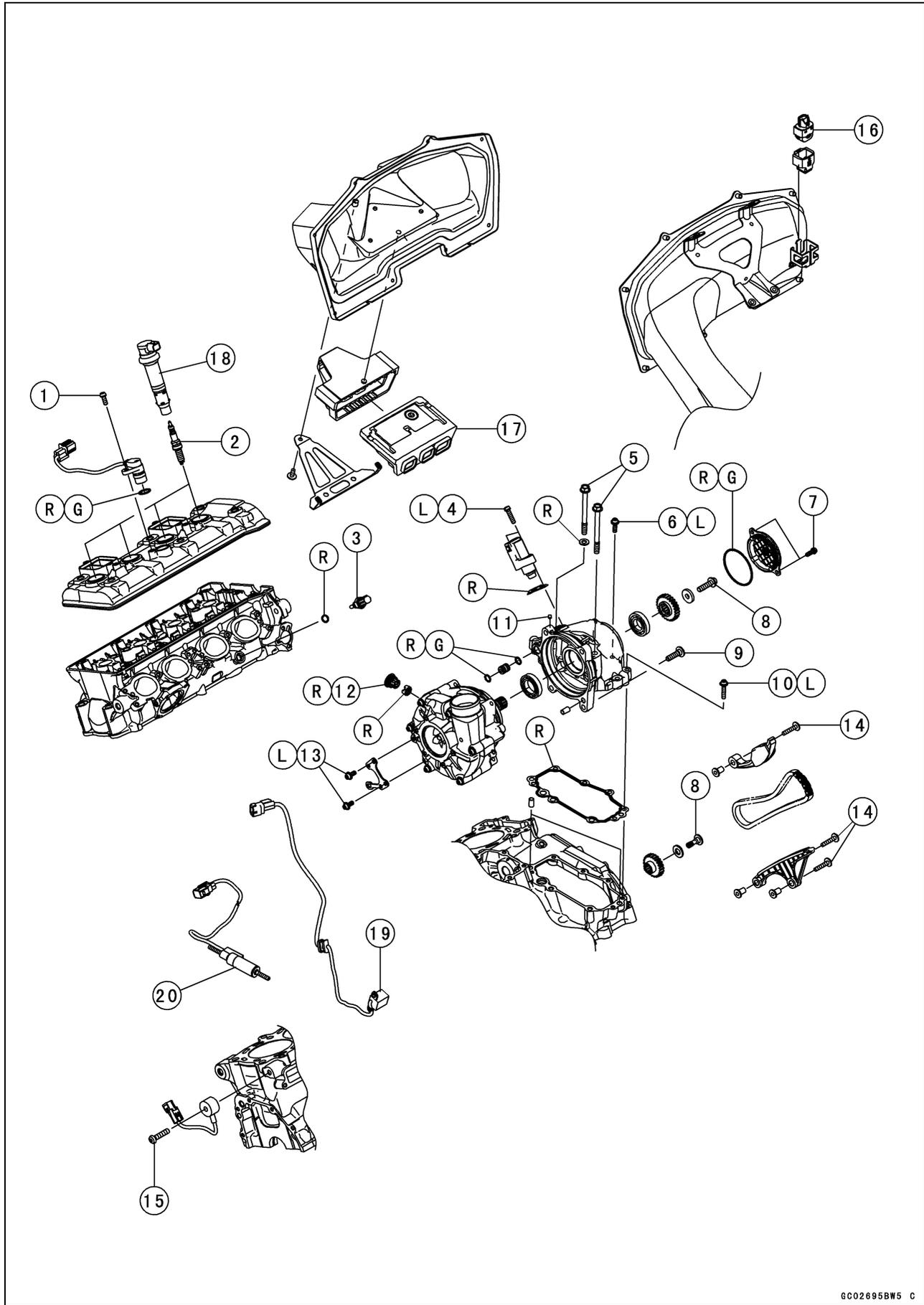
LG: Apply liquid gasket.

R: Replacement Parts

S: Follow the specified tightening sequence.

# 3-6 FUEL SYSTEM (DFI)

## 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   | Spark Plugs                                 | 13     | 1.3   | 115 in·lb |         |
| 3   | Water Temperature Sensor                    | 12     | 1.2   | 106 in·lb |         |
| 4   | Supercharger Chain Tensioner Mounting Bolts | 10     | 1.0   | 89 in·lb  | L       |
| 5   | Supercharger Housing Bolts (M8)             | 23     | 2.3   | 17        |         |
| 6   | Supercharger Housing Bolt (M6, L = 20 mm)   | 10     | 1.0   | 89 in·lb  | L       |
| 7   | Supercharger Sprocket Cover Bolts           | 10     | 1.0   | 89 in·lb  |         |
| 8   | Supercharger Chain Sprocket Bolts           | 20     | 2.0   | 15        |         |
| 9   | Supercharger Outer Housing Bolts            | 23     | 2.3   | 17        |         |
| 10  | Supercharger Housing Bolts (M6, L = 30 mm)  | 10     | 1.0   | 89 in·lb  | L       |
| 11  | Nozzle                                      | 3.0    | 0.31  | 27 in·lb  |         |
| 12  | Supercharger Oil Screen Bolt                | 20     | 2.0   | 15        | R       |
| 13  | Supercharger Housing Stay Bolts             | 10     | 1.0   | 89 in·lb  | L       |
| 14  | Supercharger Chain Guide Bolts              | 10     | 1.0   | 89 in·lb  |         |
| 15  | Knock Sensor Bolt                           | 25     | 2.5   | 18        |         |

16. Vehicle-down Sensor

17. ECU

18. Stick Coil

19. Crankshaft Sensor

20. Quick Shifter Sensor

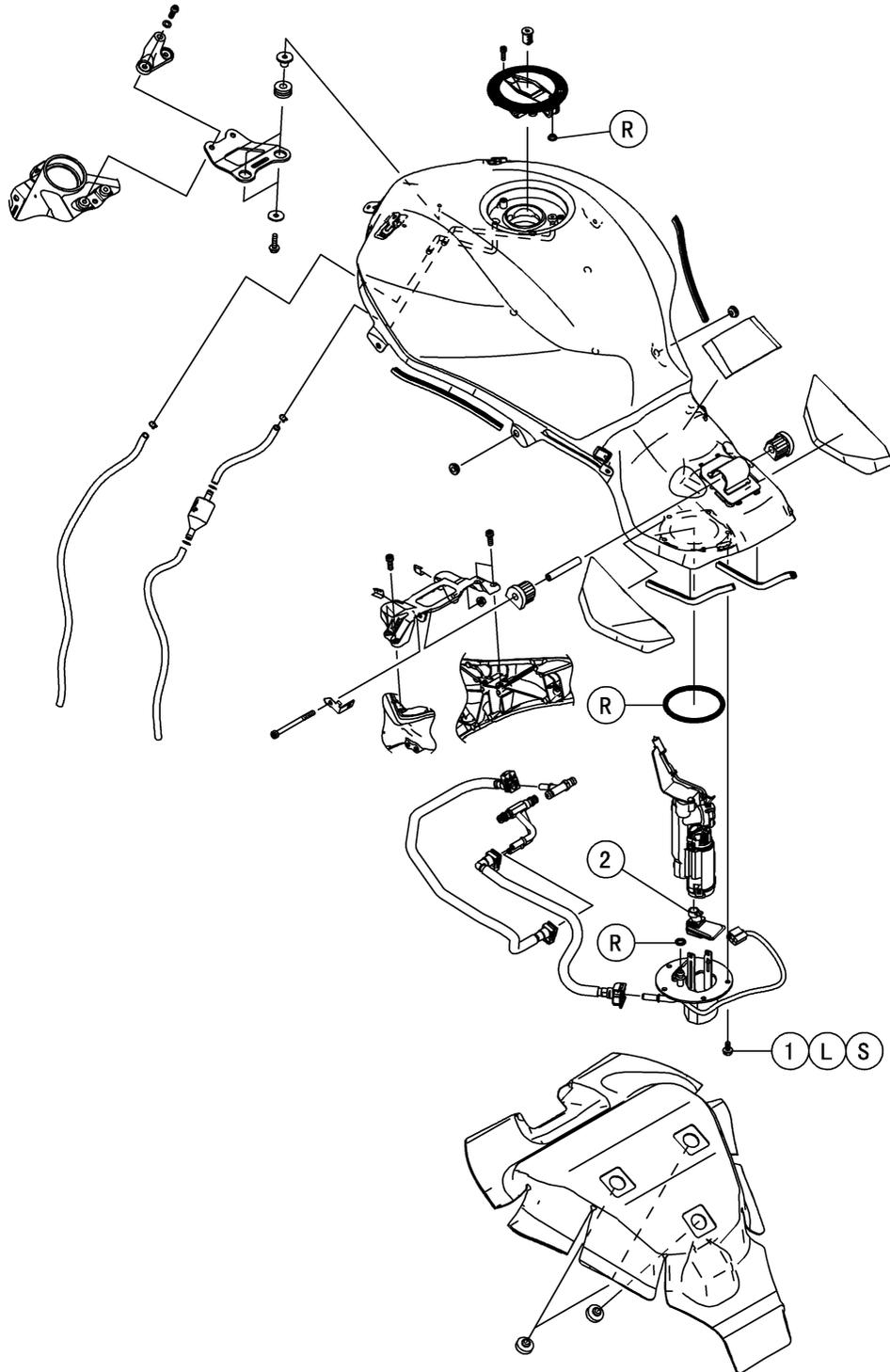
G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

# 3-8 FUEL SYSTEM (DFI)

## Exploded View



**Exploded View**

| <b>No.</b> | <b>Fastener</b> | <b>Torque</b> |              |              | <b>Remarks</b> |
|------------|-----------------|---------------|--------------|--------------|----------------|
|            |                 | <b>N·m</b>    | <b>kgf·m</b> | <b>ft·lb</b> |                |
| 1          | Fuel Pump Bolts | 10            | 1.0          | 89 in·lb     | L, S           |

2. Fuel Filter

L: Apply a non-permanent locking agent.

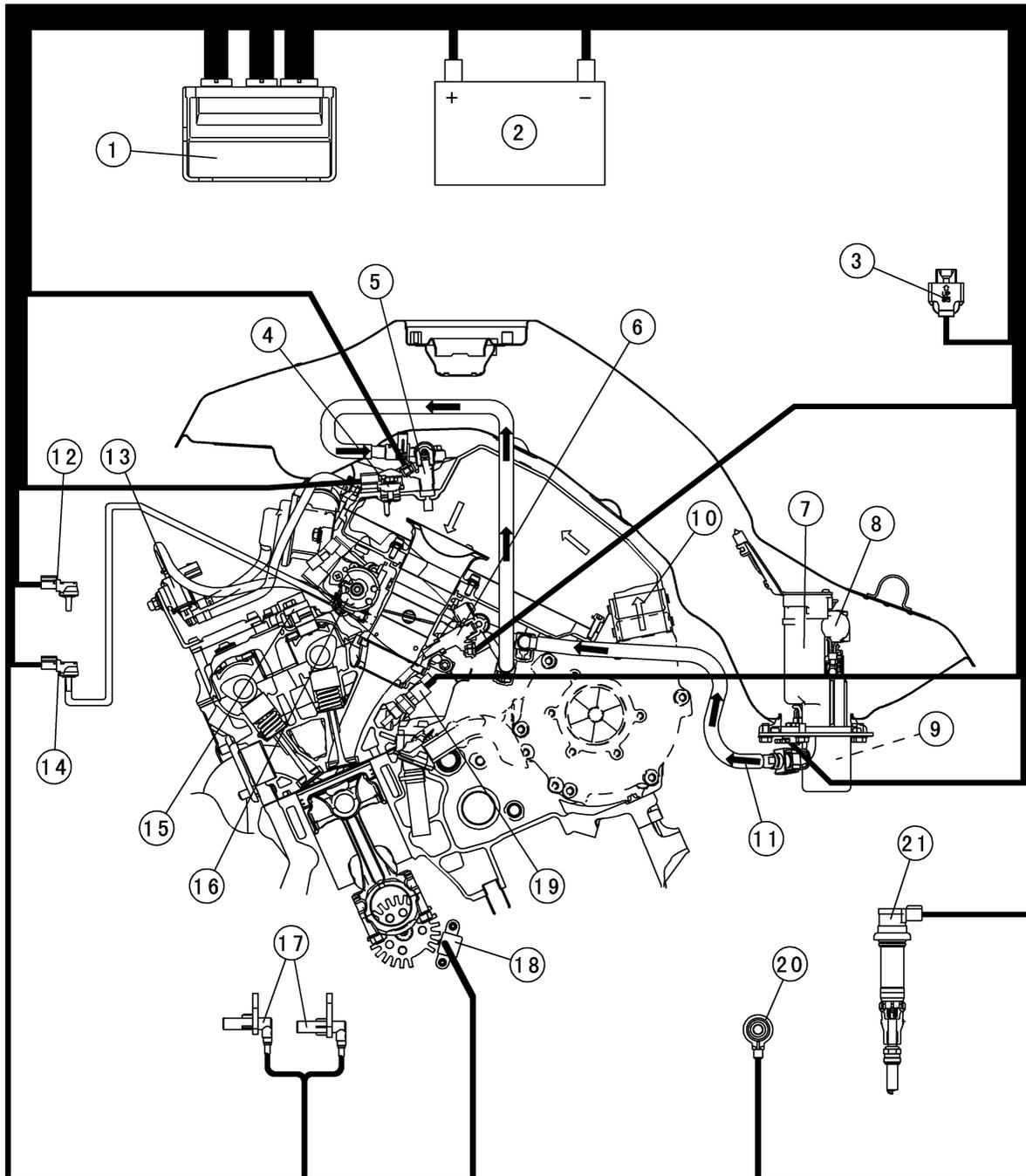
R: Replacement Parts

S: Follow the specified tightening sequence.

# 3-10 FUEL SYSTEM (DFI)

## DFI System

### DFI System



### DFI System

---

1. ECU
2. Battery 12 V 8.6 Ah
3. Vehicle-down Sensor
4. Air Intake Chamber Pressure/Temperature Sensor
5. Secondary Fuel Injectors
6. Primary Fuel Injectors
7. Fuel Pump
8. Pressure Regulator
9. Fuel Filter
10. Air Flow
11. Fuel Flow
12. Atmospheric Pressure Sensor
13. Purge Valve (for Supercharger)
14. Intake Air Pressure Sensor
15. Camshaft Position Sensor
16. Accelerator Position Sensor, Throttle Position Sensor, ETV Actuator
17. Wheel Rotation Sensors
18. Crankshaft Sensor
19. Water Temperature Sensor
20. Knock Sensor
21. Stick Coils



---

**DFI System**

---

**Part Names**

1. ECU
2. Kawasaki Diagnostic System Connector
3. Rear Wheel Rotation Sensor
4. Joint Connector D
5. Joint Connector C
6. Frame Ground 3
7. Frame Ground 2
8. Engine Ground
9. Battery 12 V 8.6 Ah
10. Starter Relay
11. Main Fuse 30 A
12. ECU Fuse 15 A
13. Fuse Box 3
14. Fuel Pump Relay Fuse 10 A
15. Fuel Pump Relay
16. Fuel Pump
17. Fuse Box 1
18. Ignition Fuse 15 A
19. Fuse Box 2
20. ETV Actuator Relay Fuse 10 A
21. KIBS Hydraulic Unit
22. Injector Relay
23. ETV Actuator Relay
24. Relay Box
25. Ignition Switch
26. Front Wheel Rotation Sensor
27. Engine Start/Stop Switch
28. Knock Sensor
29. Spark Plugs
30. Stick Coils
31. Secondary Fuel Injectors
32. Water Temperature Sensor
33. Primary Fuel Injectors
34. Throttle Position Sensor/ETV Actuator
35. Accelerator Position Sensor
36. Crankshaft Sensor
37. Camshaft Position Sensor
38. Atmospheric Pressure Sensor
39. Intake Air Pressure Sensor
40. Air Intake Chamber Pressure/Temperature Sensor
41. Purge Valve (for Supercharger)
42. Vehicle-down Sensor

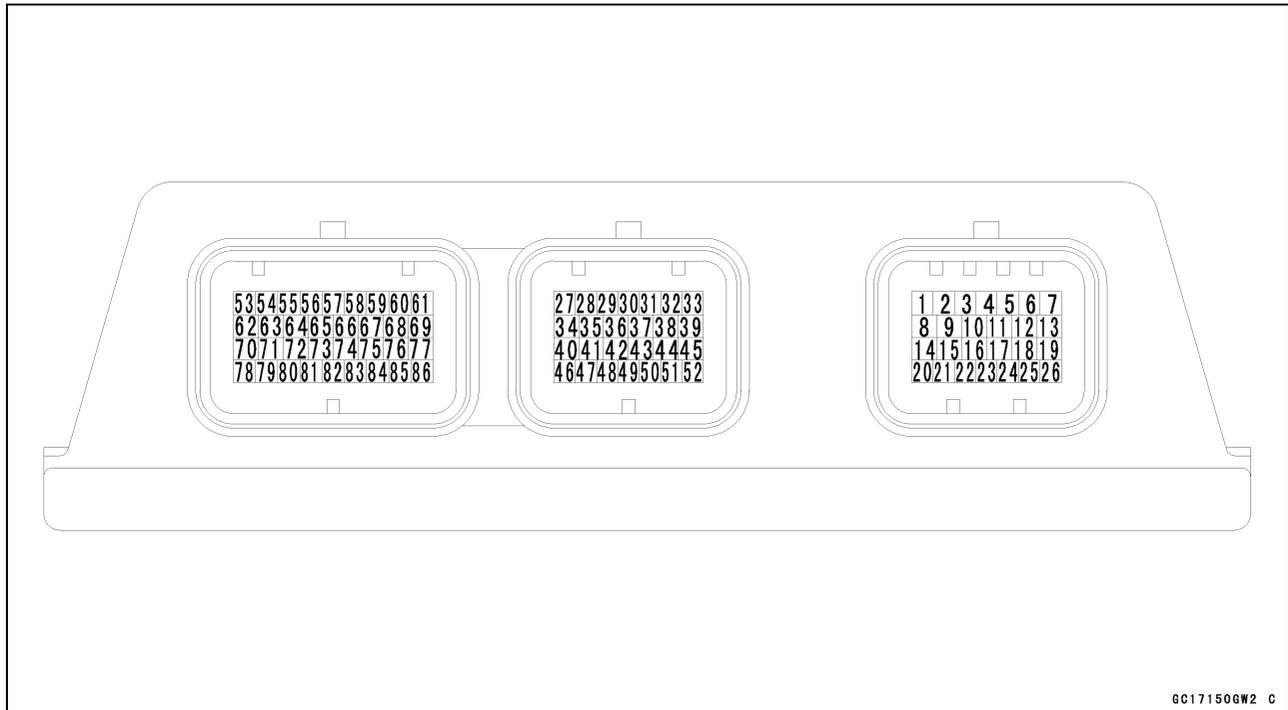
## ○Color Codes:

|                |                 |            |
|----------------|-----------------|------------|
| 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       |                 |            |

# 3-14 FUEL SYSTEM (DFI)

## DFI System

### Terminal Numbers of ECU Connectors



#### NOTE

○When inspecting for the ECU connectors in this chapter and the Self-Diagnosis System chapter, refer to this terminal numbers of ECU connectors.

#### Terminal Names

1. Secondary Fuel Injector #2: O/G
2. Primary Fuel Injector #3: BL/O
3. Secondary Fuel Injector #3: O/BK
4. Primary Fuel Injector #4: BL/G
5. Secondary Fuel Injector #4: O/Y
6. Ignition Coil #2: BK/R
7. Ignition Coil #1: BK
8. Primary Fuel Injector #2: BL/R
9. ETV Actuator Relay: Y/BL
10. Unused
11. Unused
12. Unused
13. Unused
14. Secondary Fuel Injector #1: O/R
15. Fuel Pump Relay: BR/Y
16. Unused
17. Unused
18. Unused
19. Unused
20. Primary Fuel Injector #1: BL/BK
21. Green Neutral Indicator Light (LED): LG
22. Engine Ground: BK/Y
23. Engine Ground: BK/Y
24. Purge Valve (for Supercharger): R/BK
25. Ignition Coil #3: BK/O
26. Ignition Coil #4: BK/G
27. Unused
28. Unused
29. Knock Sensor (+): BL
30. Knock Sensor (-): G

**DFI System**

---

31. Unused
32. Ignition Switch: BR/W
33. Power Supply to ECU (from Battery): W/BK
34. Unused
35. Camshaft Position Sensor: Y/R
36. Crankshaft Sensor (+): Y
37. Crankshaft Sensor (-): Y/BK
38. Ground for Sensor: G
39. Power Supply to ECU (from Battery): W/BK
40. Side Stand Switch: G/BK
41. Starter Lockout Switch: R/G
42. Starter Switch: BK/R
43. Unused
44. Power Supply to Sensors: BL
45. Battery Monitor Voltage Line: W/R
46. Quick Shifter Sensor: G/W
47. Unused
48. Unused
49. Power Supply to Sensors: BL/Y
50. Unused
51. External Communication Line (\*KDS): LG
52. Ground for Control System: BK/BL
53. ETV Actuator (+): G/BL
54. Unused
55. Unused
56. Unused
57. Accelerator Position Sensor 1 (-): G
58. Unused
59. Front Wheel Rotation Sensor: GY/Y
60. CAN Communication Line (Low): LB
61. CAN Communication Line (High): GY/BL
62. ETV Actuator (-): BK/Y
63. Accelerator Position Sensor 1 (+): BL
64. Accelerator Position Sensor 2 (+): BL
65. Accelerator Position Sensor 2: Y
66. Accelerator Position Sensor 2 (-): G
67. Unused
68. Rear Wheel Rotation Sensor: W/Y
69. External Communication Line (\*KDS): LB/BK
70. ETV Actuator (-): BK/O
71. Power Supply to Throttle Position Sensor: W
72. Throttle Position Sensor 1: V
73. Unused
74. Gear Position Sensor: G/R
75. Vehicle-down Sensor: Y/G
76. Accelerator Position Sensor 1: Y/BK
77. Intake Air Temperature Sensor (Air Intake Chamber): GY/R
78. ETV Actuator (+): W/G
79. Throttle Position Sensor 2: V/W
80. Ground for Throttle Position Sensor: BK
81. Atmospheric Pressure Sensor: R/W
82. Water Temperature Sensor: O
83. Intake Air Pressure Sensor (Air Intake Chamber): R/G
84. Unused
85. Unused
86. Intake Air Pressure Sensor: R/BK

\*: KDS (Kawasaki Diagnostic System)

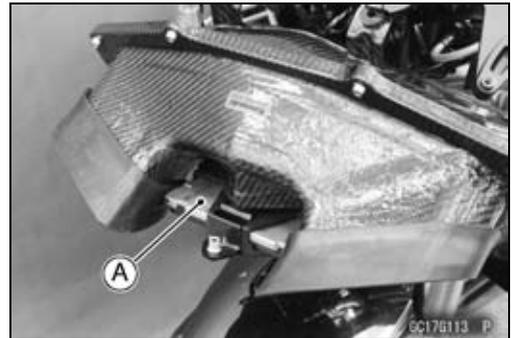
## 3-16 FUEL SYSTEM (DFI)

### DFI Parts Location

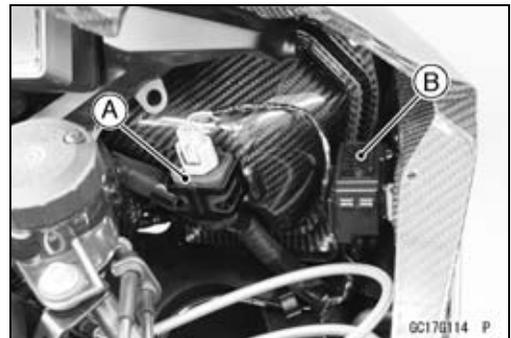
Ignition Switch [A]  
Electronic Steering Damper [B]



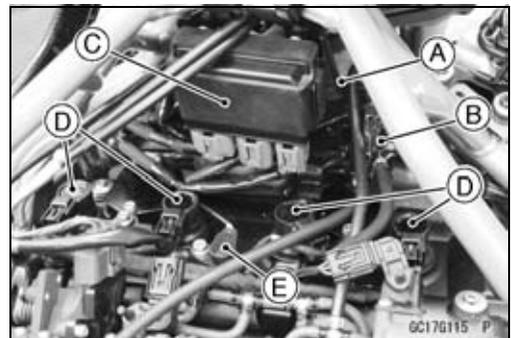
ECU [A]



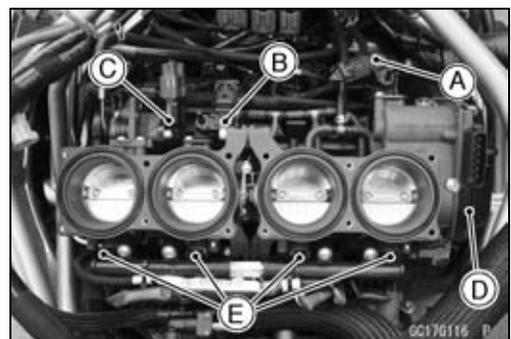
Vehicle-down Sensor [A]  
Fuse Box 1 [B]



Electronic Steering Damper ECU [A]  
Purge Valve [B] (for Supercharger)  
Relay Box [C] (ETV Actuator Relay, Injector Relay)  
Stick Coils #1, #2, #3, #4 [D]  
Camshaft Position Sensor [E]

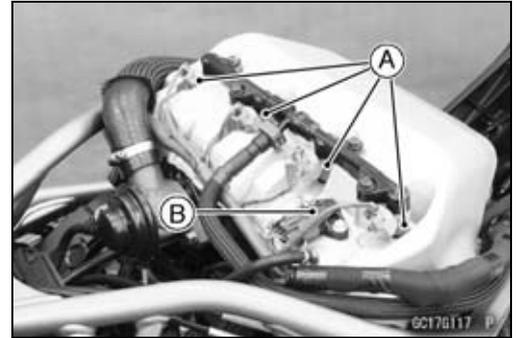


Atmospheric Pressure Sensor [A]  
Intake Air Pressure Sensor [B]  
Accelerator Position Sensor [C]  
Throttle Position Sensor/ETV Actuator [D]  
Primary Fuel Injectors #1, #2, #3, #4 [E]

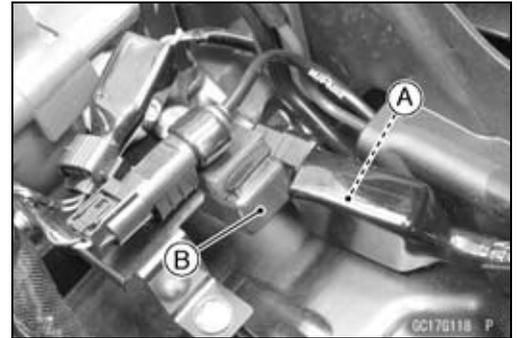


## DFI Parts Location

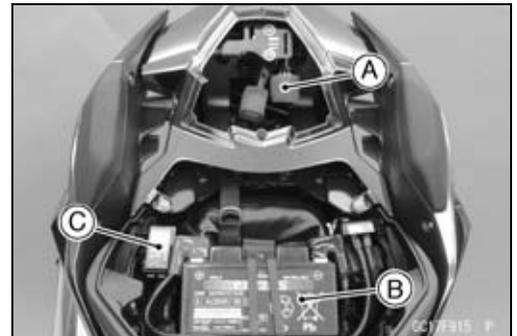
Secondary Fuel Injectors #1, #2, #3, #4 [A]  
Air Intake Chamber Pressure/Temperature Sensor [B]



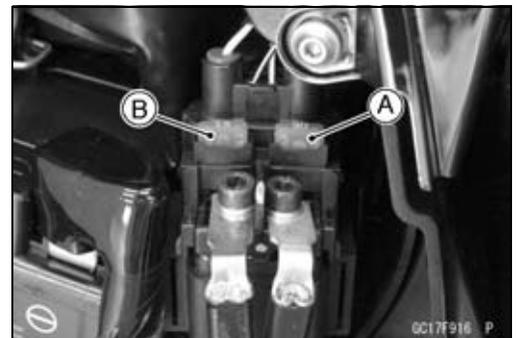
Fuse Box 3 [A]  
Fuel Pump Relay [B]



Kawasaki Diagnostic System Connector [A]  
Battery [B]  
Fuse Box 2 [C]



Main Fuse 30 A [A]  
ECU Fuse 15 A [B]



Quick Shifter Sensor [A]



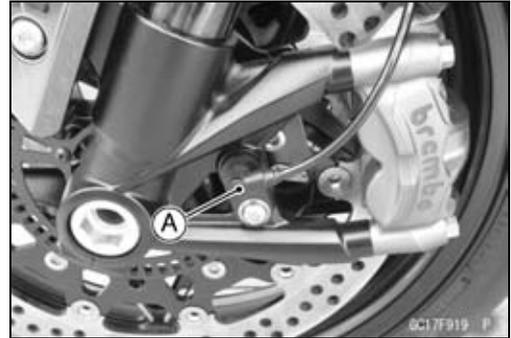
## 3-18 FUEL SYSTEM (DFI)

### DFI Parts Location

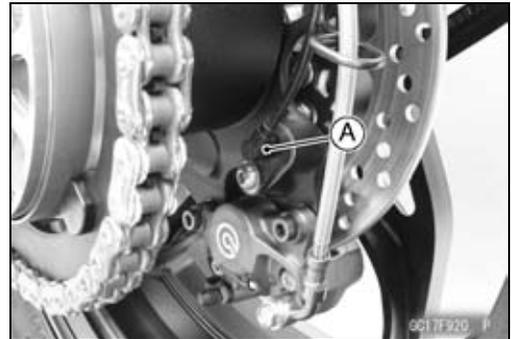
Crankshaft Sensor [A]



Front Wheel Rotation Sensor [A]



Rear Wheel Rotation Sensor [A]



Fuel Pump [A]



Water Temperature Sensor [A]

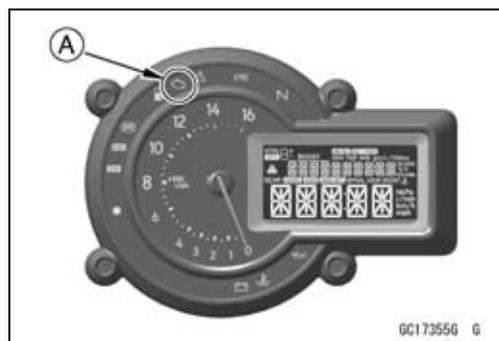


**DFI Parts Location**

Knock Sensor [A]



Yellow Engine Warning Indicator Light (LED) [A]



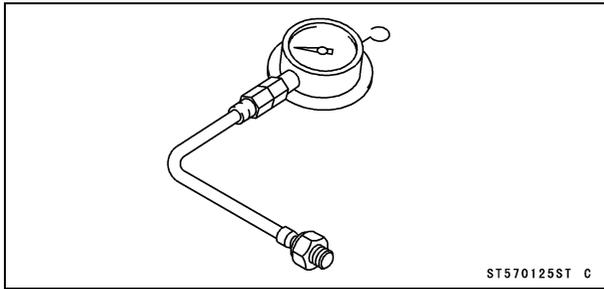
## 3-20 FUEL SYSTEM (DFI)

### Specifications

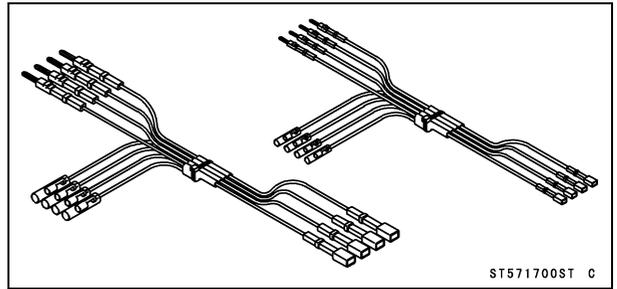
| Item                                 | Standard   |
|--------------------------------------|--|
| <b>Digital Fuel Injection System</b> |  |
| Idle Speed                           | 1 100 ±100 r/min (rpm)   |
| Throttle Body Assy:                  |  |
| Throttle Valve                       | Single throttle valve  |
| Bore                                 | φ50 mm (2.0 in.)   |
| Throttle Body Vacuum                 | 33.3 ±2.7 kPa (250 ±20 mmHg) @75°C (167°F) or more (at idle speed) |
| ECU:                                 |  |
| Make                                 | MITSUBISHI   |
| Type                                 | Digital memory type, with built in IC igniter, sealed with resin   |
| Fuel Pressure (High Pressure Line)   | 380 kPa (3.9 kgf/cm <sup>2</sup> , 55 psi) with engine idling      |
| Fuel Pump:                           |  |
| Type                                 | In-tank friction pump  |
| Discharge                            | 129 mL (4.4 US oz.) or more for 3 seconds                          |
| Fuel Injectors:                      |  |
| Type                                 | EAT816   |
| Nozzle Type                          | Fine atomizing type with 4 holes                                   |
| Resistance                           | About 11.7 ~ 12.3 Ω @20°C (68°F)                                   |
| CAN Communication Line:              |  |
| Resistance                           | 123 ~ 125 Ω at ECU connector                                       |
| <b>Throttle Grip and Cables</b>      |  |
| Throttle Grip Free Play              | 2 ~ 3 mm (0.08 ~ 0.12 in.)   |
| <b>Air Cleaner</b>                   |  |
| Element                              | Non-woven fabric filter  |

**Special Tools and Sealants**

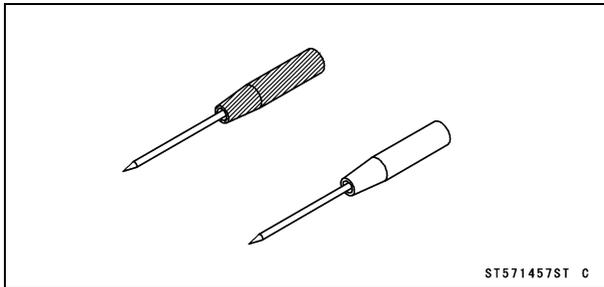
**Oil Pressure Gauge, 5 kgf/cm<sup>2</sup>:  
57001-125**



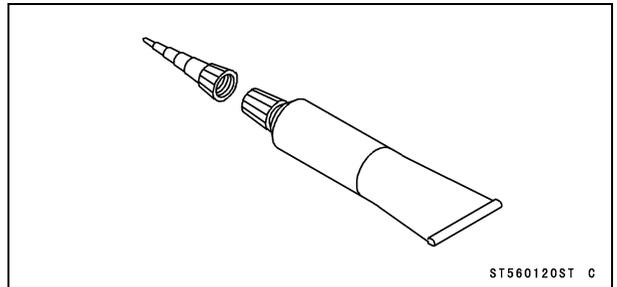
**Measuring Adapter:  
57001-1700**



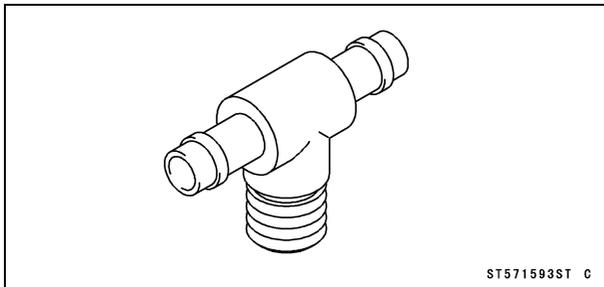
**Needle Adapter Set:  
57001-1457**



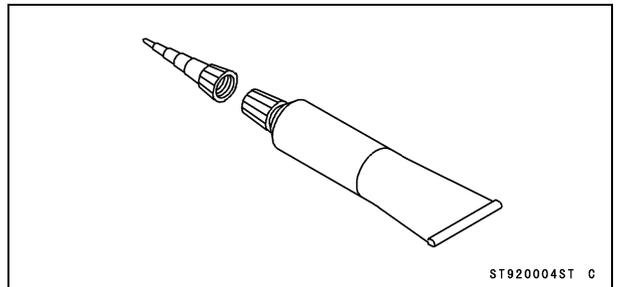
**Liquid Gasket, TB1211:  
56019-120**



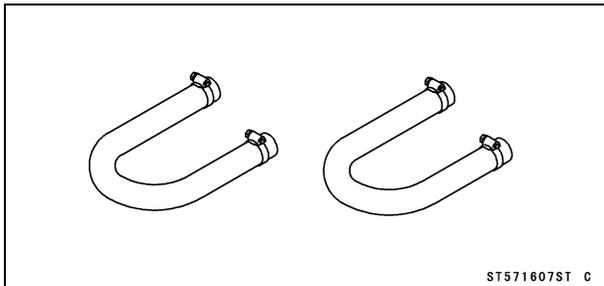
**Fuel Pressure Gauge Adapter:  
57001-1593**



**Liquid Gasket, TB1211F:  
92104-0004**



**Fuel Hose:  
57001-1607**



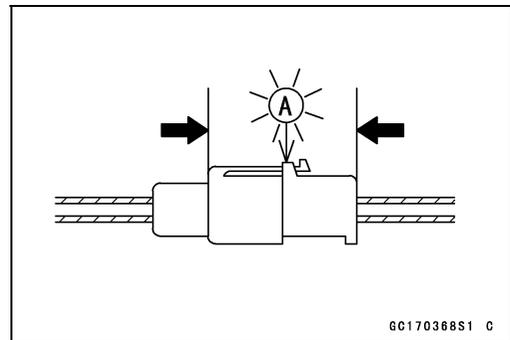
## 3-22 FUEL SYSTEM (DFI)

### 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 run 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 air intake chamber (see Air Intake Chamber Removal) and check the fuel hoses [A].

★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 intake air leaks in the DFI system. Be sure to install the oil filler plug [A] after filling the engine oil.



# 3-24 FUEL SYSTEM (DFI)

## Troubleshooting the DFI System

### Outline

When a problem occurs with DFI system, the yellow engine warning indicator light (LED) [A] goes on to alert the rider.

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.

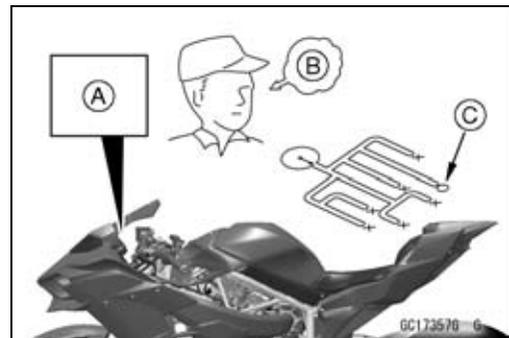
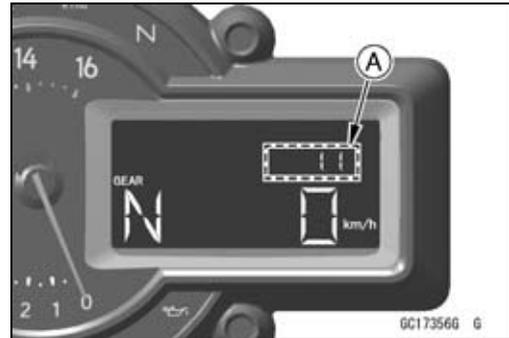
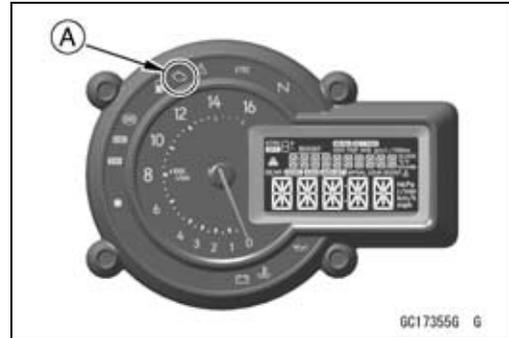
If the problem is with the following parts, the ECU can not recognize these problem. Therefore, the yellow engine warning indicator light (LED) does not go on, and service code is not displayed.

- Fuel Pump
- Stick Coil Secondary Wiring and Ground Wiring
- ECU Main Relay

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 yellow engine warning indicator light (LED).

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



## Troubleshooting the DFI System

Even when the DFI system is operating normally, the yellow engine warning indicator light (LED) goes on may be displayed under strong electrical interference. Additional measures are not required. Turn the ignition switch off to stop the indicator.

If the yellow engine warning indicator light (LED) of the motorcycle brought in for repair still goes on, check the service code.

When the repair has been done, the yellow engine warning indicator light (LED) 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 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 yellow engine warning indicator light (LED) blinks 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.

- 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**

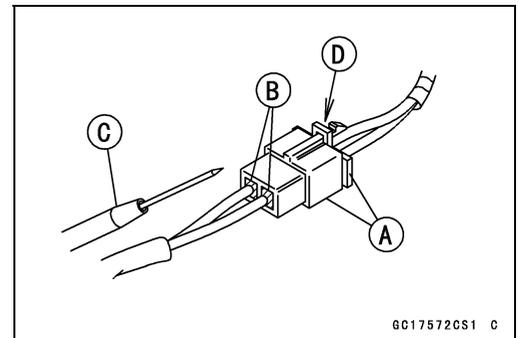
### NOTICE

**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.

### NOTICE

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



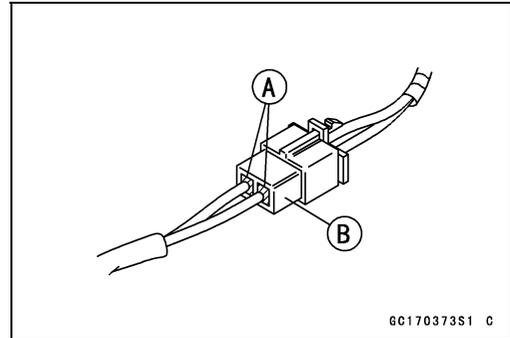
GG17572GS1 C

## 3-26 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

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

**Sealant - Liquid Gasket, TB1211: 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 leads for signs of burning, fraying, short, etc. Deteriorated leads and bad connections can cause reappearance of problems and unstable operation of the DFI system.

★ If any wiring is deteriorated, replace the wiring.

- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.

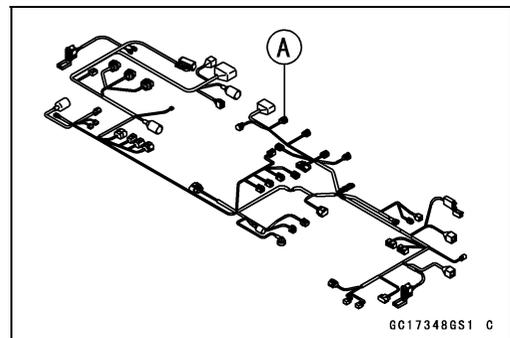
★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect the connectors securely.

- Check the wiring for continuity.

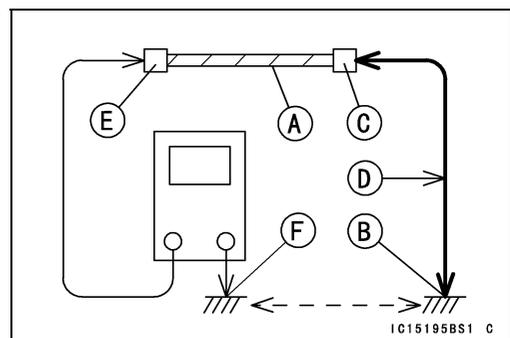
○ Use the wiring diagram to find the ends of the lead which is suspected of being a problem.

○ Connect a tester between the ends of the leads.

★ If the tester does not read about 0 Ω, the lead is defective. Replace the lead or the main harness or the subharness.

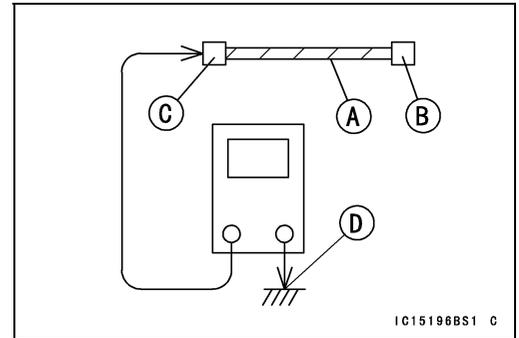


○ If both ends of a harness [A] are far apart, ground [B] the one end [C], using a jumper lead [D] and check the continuity between the end [E] and the ground [F]. This enables to check a long harness for continuity. If the harness is open, repair or replace the harness.



### Troubleshooting the DFI System

○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.

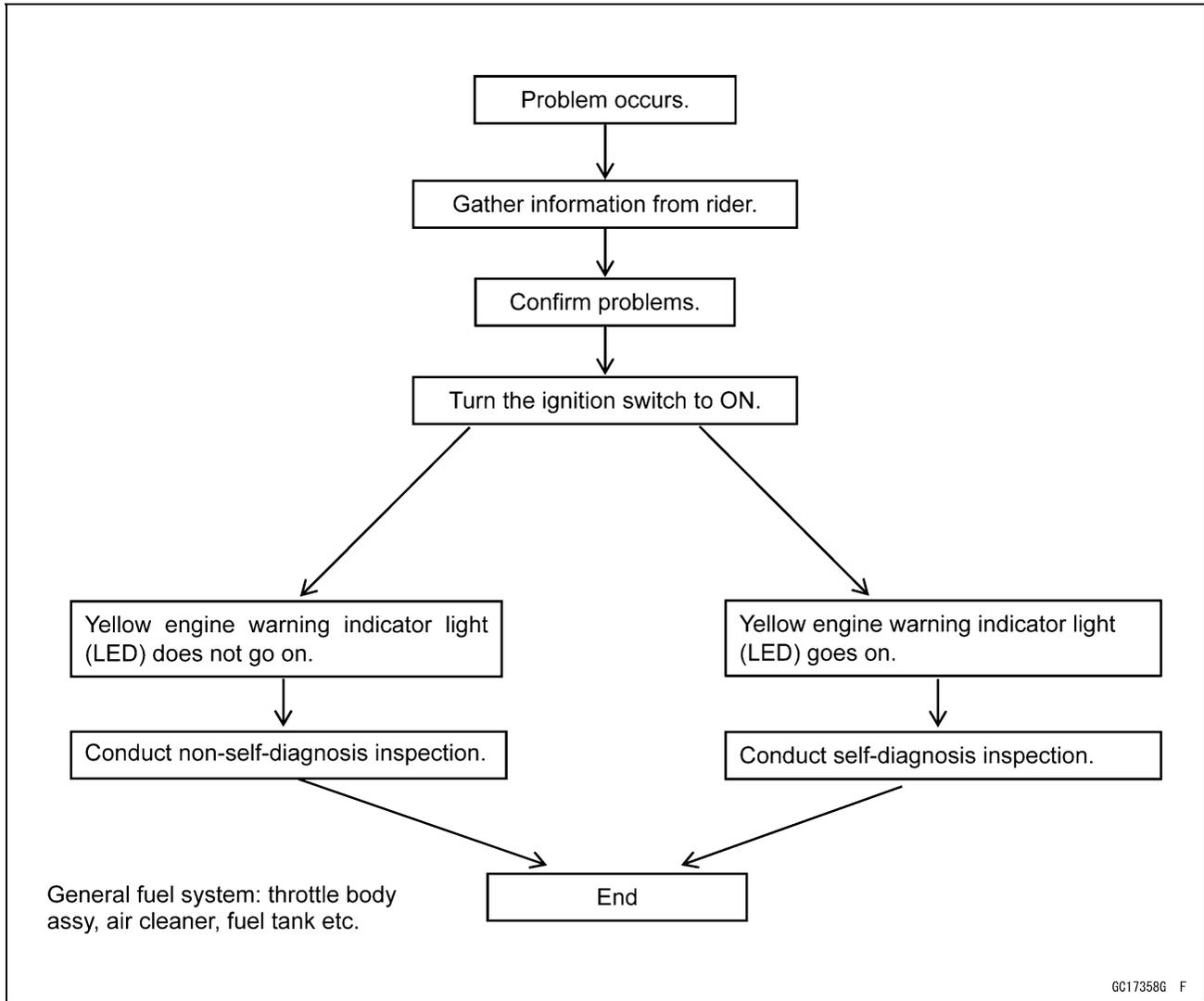


- Narrow down suspicious locations by repeating the continuity tests from the ECU connectors.
- ★ If no abnormality is found in the wiring or connectors, the DFI parts are the next likely suspects. Check the part, starting with input and output voltages. However, there is no way to check the ECU itself.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

# 3-28 FUEL SYSTEM (DFI)

## 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:   |  | Model:     |  |
| Engine No.:   |  | Frame No.: |  |
| Date problem occurred:                              |  | Mileage:   |  |
| <b>Environment when problem occurred.</b>           |  |            |  |
| Temperature   | <input type="checkbox"/> hot, <input type="checkbox"/> warm, <input type="checkbox"/> cold, <input type="checkbox"/> very cold, <input type="checkbox"/> always, <input type="checkbox"/> other: |            |  |
| Problem frequency                                   | <input type="checkbox"/> chronic, <input type="checkbox"/> often, <input type="checkbox"/> once  |            |  |
| Altitude  | <input type="checkbox"/> normal, <input type="checkbox"/> high (about 1 000 m or more)   |            |  |
| <b>Motorcycle conditions when problem occurred.</b> |  |            |  |
| Yellow engine warning indicator light (LED)         | <input type="checkbox"/> goes on immediately after turning the ignition switch on, and goes off after about 1 second (normal)  |            |  |
|   | <input type="checkbox"/> goes on immediately after turning the ignition switch on, goes off after about 1 second, and goes on again after about 5 seconds (ECU communication error)              |            |  |
|   | <input type="checkbox"/> goes on immediately after turning the ignition switch on, goes off after about 1 second, and goes on again and stays on (DFI problem)                                   |            |  |
|   | <input type="checkbox"/> does not go on after turning the ignition switch on [indicator light (LED), meter unit fault]   |            |  |
| Starting difficulty                                 | <input type="checkbox"/> starter motor not rotating.   |            |  |
|   | <input type="checkbox"/> starter motor rotating but engine do not turn over.   |            |  |
|   | <input type="checkbox"/> starter motor and engine do not turn over.  |            |  |
|   | <input type="checkbox"/> no fuel flow ( <input type="checkbox"/> no fuel in tank, <input type="checkbox"/> no fuel pump sound).  |            |  |
|   | <input type="checkbox"/> no spark.   |            |  |
|   | <input type="checkbox"/> other:  |            |  |
| Engine stalls                                       | <input type="checkbox"/> right after starting.   |            |  |
|   | <input type="checkbox"/> when opening throttle grip.   |            |  |
|   | <input type="checkbox"/> when closing throttle grip.   |            |  |
|   | <input type="checkbox"/> when moving off.  |            |  |
|   | <input type="checkbox"/> when stopping the motorcycle.   |            |  |
|   | <input type="checkbox"/> when cruising.  |            |  |
|   | <input type="checkbox"/> other:  |            |  |
| Poor running at low speed                           | <input type="checkbox"/> very low idle speed, <input type="checkbox"/> very high idle speed, <input type="checkbox"/> rough idle speed.  |            |  |
|   | <input type="checkbox"/> battery voltage is low (charge the battery).  |            |  |
|   | <input type="checkbox"/> spark plug loose (tighten it).  |            |  |
|   | <input type="checkbox"/> spark plug dirty, broken, or gap maladjusted (remedy it).   |            |  |
|   | <input type="checkbox"/> backfiring.   |            |  |
|   | <input type="checkbox"/> afterfiring.  |            |  |
|   | <input type="checkbox"/> hesitation when acceleration.   |            |  |
|   | <input type="checkbox"/> engine oil viscosity too high.  |            |  |
|   | <input type="checkbox"/> brake dragging.   |            |  |
|   | <input type="checkbox"/> engine overheating.   |            |  |
|   | <input type="checkbox"/> clutch slipping.  |            |  |
|   | <input type="checkbox"/> other:  |            |  |

### 3-30 FUEL SYSTEM (DFI)

#### Troubleshooting the DFI System

|  |   |
|--|---|
| Poor running<br>or no power at<br>high speed | <input type="checkbox"/> spark plug loose (tighten it).   |
|  | <input type="checkbox"/> spark plug dirty, broken, or gap maladjusted (remedy it).              |
|  | <input type="checkbox"/> spark plug incorrect (replace it).                                     |
|  | <input type="checkbox"/> knocking (fuel poor quality or incorrect, → use high-octane gasoline). |
|  | <input type="checkbox"/> brake dragging.  |
|  | <input type="checkbox"/> clutch slipping.   |
|  | <input type="checkbox"/> engine overheating.  |
|  | <input type="checkbox"/> engine oil level too high.   |
|  | <input type="checkbox"/> engine oil viscosity too high.   |
|  | <input type="checkbox"/> 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, ETV 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**

| <b>Symptoms or possible Causes</b>                                 | <b>Actions (chapter)</b>                                     |
|--|--|
| Gear position sensor, starter lockout or side stand switch trouble | Inspect each switch or sensor (see chapter 16).              |
| Vehicle-down sensor operated                                       | Turn ignition switch off (see chapter 17).                   |
| Vehicle-down sensor trouble  | Inspect (see chapter 17).                                    |
| 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 17).                        |
| Fuel pump not operating  | Inspect (see chapter 3).                                     |
| Fuel pump relay trouble  | Inspect and replace (see chapter 17).                        |
| Fuel filter clogged  | Replace fuel filter (see chapter 2).                         |
| 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**

| <b>Symptoms or Possible Causes</b>             | <b>Actions (chapter)</b>                          |
|--|---|
| <b>Spark weak:</b>                             |   |
| 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).                          |
| <b>Fuel/air mixture incorrect:</b>             |   |
| 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 intake chamber loose                       | Reinstall (see chapter 3).                        |
| Throttle body assy loose                       | Reinstall (see chapter 3).                        |
| Throttle body assy O-ring damage               | Replace (see chapter 3).                          |
| Fuel injector O-ring damage                    | Replace (see chapter 3).                          |
| Fuel filter clogged                            | Replace fuel filter (see chapter 2).              |

### 3-32 FUEL SYSTEM (DFI)

#### 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).                          |
| Intake air pressure sensor trouble                     | Inspect (see chapter 17).                                    |
| Water temperature sensor trouble                       | Inspect (see chapter 17).                                    |
| Air intake chamber pressure/temperature sensor trouble | Inspect (see chapter 17).                                    |
| Atmospheric pressure sensor trouble                    | Inspect (see chapter 17).                                    |
| Accelerator position sensor trouble                    | Inspect (see chapter 17).                                    |
| Throttle position sensor trouble                       | Inspect (see chapter 17).                                    |
| ETV actuator trouble                                   | Inspect (see chapter 17).                                    |
| <b>Unstable (rough) idling:</b>                        |  |
| Fuel pressure too low or too high                      | Inspect (see chapter 3).                                     |
| Fuel injector trouble                                  | Inspect (see chapter 17).                                    |
| Accelerator position sensor trouble                    | Inspect (see chapter 17).                                    |
| Throttle position sensor trouble                       | Inspect (see chapter 17).                                    |
| ETV actuator trouble                                   | Inspect (see chapter 17).                                    |
| Intake air pressure sensor trouble                     | Inspect (see chapter 17).                                    |
| Water temperature sensor trouble                       | Inspect (see chapter 17).                                    |
| Air intake chamber pressure/temperature sensor trouble | Inspect (see chapter 17).                                    |
| Atmospheric pressure sensor trouble                    | Inspect (see chapter 17).                                    |
| <b>Engine stalls easily:</b>                           |  |
| Spark plug dirty, broken or gap maladjusted            | Inspect and replace (see chapter 2).                         |
| Stick coil trouble                                     | Inspect (see chapter 16).                                    |
| Accelerator position sensor trouble                    | Inspect (see chapter 17).                                    |
| Throttle position sensor trouble                       | Inspect (see chapter 17).                                    |
| ETV actuator trouble                                   | Inspect (see chapter 17).                                    |
| Intake air pressure sensor trouble                     | Inspect (see chapter 17).                                    |
| Water temperature sensor trouble                       | Inspect (see chapter 17).                                    |
| Air intake chamber pressure/temperature sensor trouble | Inspect (see chapter 17).                                    |
| Atmospheric pressure sensor trouble                    | Inspect (see chapter 17).                                    |
| Fuel pump trouble                                      | Inspect (see chapter 3).                                     |
| Fuel injector trouble                                  | Inspect (see chapter 17).                                    |
| 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).                          |
| <b>Poor acceleration:</b>                              |  |
| 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 clogged                                    | Replace fuel filter (see chapter 2).                         |
| Fuel pump trouble                                      | Inspect (see chapter 3).                                     |

**DFI System Troubleshooting Guide**

| Symptoms or Possible Causes                            | Actions (chapter)  |
|--|--|
| Fuel injector trouble                                  | Inspect (see chapter 17).  |
| Accelerator position sensor trouble                    | Inspect (see chapter 17).  |
| Throttle position sensor trouble                       | Inspect (see chapter 17).  |
| ETV actuator trouble                                   | Inspect (see chapter 17).  |
| Intake air pressure sensor trouble                     | Inspect (see chapter 17).  |
| Water temperature sensor trouble                       | Inspect (see chapter 17).  |
| Air intake chamber pressure/temperature sensor trouble | Inspect (see chapter 17).  |
| Atmospheric pressure sensor trouble                    | Inspect (see chapter 17).  |
| Spark plug dirty, broken or gap maladjusted            | Inspect and replace (see chapter 2).   |
| Stick coil trouble                                     | Inspect (see chapter 16).  |
| <b>Stumble:</b>  |  |
| Fuel pressure too low                                  | Inspect (see chapter 3).   |
| Fuel injector trouble                                  | Inspect (see chapter 17).  |
| Accelerator position sensor trouble                    | Inspect (see chapter 17).  |
| Throttle position sensor trouble                       | Inspect (see chapter 17).  |
| ETV actuator trouble                                   | Inspect (see chapter 17).  |
| Intake air pressure sensor trouble                     | Inspect (see chapter 17).  |
| Water temperature sensor trouble                       | Inspect (see chapter 17).  |
| Air intake chamber pressure/temperature sensor trouble | Inspect (see chapter 17).  |
| Atmospheric pressure sensor trouble                    | Inspect (see chapter 17).  |
| <b>Surge:</b>  |  |
| 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 17).  |
| Water temperature sensor trouble                       | Inspect (see chapter 17).  |
| <b>Backfiring when deceleration:</b>                   |  |
| 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).   |
| Accelerator position sensor trouble                    | Inspect (see chapter 17).  |
| Throttle position sensor trouble                       | Inspect (see chapter 17).  |
| ETV actuator trouble                                   | Inspect (see chapter 17).  |
| Intake air pressure sensor trouble                     | Inspect (see chapter 17).  |
| Water temperature sensor trouble                       | Inspect (see chapter 17).  |
| Air intake chamber pressure/temperature sensor trouble | Inspect (see chapter 17).  |
| Atmospheric pressure sensor trouble                    | Inspect (see chapter 17).  |
| <b>After fire:</b>                                     |  |
| Spark plug burned or gap maladjusted                   | Replace (see chapter 2).   |
| Fuel injector trouble                                  | Inspect (see chapter 17).  |
| Intake air pressure sensor trouble                     | Inspect (see chapter 17).  |
| Water temperature sensor trouble                       | Inspect (see chapter 17).  |

### 3-34 FUEL SYSTEM (DFI)

#### DFI System Troubleshooting Guide

| Symptoms or Possible Causes                            | Actions (chapter)  |
|--|--|
| Air intake chamber pressure/temperature sensor trouble | Inspect (see chapter 17).  |
| Atmospheric pressure sensor trouble                    | Inspect (see chapter 17).  |
| <b>Other:</b>  |  |
| 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 17). |

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

| Symptoms or Possible Causes                                  | Actions (chapter)   |
|--|---|
| <b>Firing incorrect:</b>                                     |   |
| 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).  |
| <b>Fuel/air mixture incorrect:</b>                           |   |
| Air cleaner clogged, poorly sealed, or missing               | Clean element or inspect sealing (see chapter 2).                   |
| Air intake chamber loose                                     | Reinstall (see chapter 3).  |
| Throttle body assy loose                                     | Reinstall (see chapter 3).  |
| Throttle body assy O-ring 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).  |
| Intake air pressure sensor trouble                           | Inspect (see chapter 17).   |
| Cracked or obstructed intake air pressure sensor vacuum hose | Inspect and repair or replace (see chapter 17).                     |
| Water temperature sensor trouble                             | Inspect (see chapter 17).   |
| Air intake chamber pressure/temperature sensor trouble       | Inspect (see chapter 17).   |
| Atmospheric pressure sensor trouble                          | Inspect (see chapter 17).   |
| Accelerator position sensor trouble                          | Inspect (see chapter 17).   |
| Throttle position sensor trouble                             | Inspect (see chapter 17).   |
| ETV actuator trouble   | Inspect (see chapter 17).   |
| <b>Knocking:</b>   |   |
| 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).  |

**DFI System Troubleshooting Guide**

| Symptoms or Possible Causes  | Actions (chapter)  |
|--|--|
| Engine vacuum not synchronizing  | Inspect and adjust (see chapter 2).                      |
| Intake air pressure sensor trouble   | Inspect (see chapter 17).                                |
| Water temperature sensor trouble   | Inspect (see chapter 17).                                |
| Air intake chamber pressure/temperature sensor trouble                                   | Inspect (see chapter 17).                                |
| Atmospheric pressure sensor trouble  | Inspect (see chapter 17).                                |
| Knock sensor trouble   | Inspect (see chapter 17).                                |
| <b>Miscellaneous:</b>  |  |
| Throttle valves will not fully open  | Inspect throttle cables and ETV system (see chapter 17). |
| Engine overheating - Water temperature sensor, crankshaft sensor or speed sensor trouble | (see Overheating of Troubleshooting Guide in chapter 18) |
| <b>Exhaust Smokes Excessively:</b>   |  |
| <b>(Black smokes)</b>  |  |
| Air cleaner element clogged  | Clean element (see chapter 2).                           |
| Fuel pressure too high   | Inspect (see chapter 3).                                 |
| Fuel injector trouble  | Inspect (see chapter 17).                                |
| Water temperature sensor trouble   | Inspect (see chapter 17).                                |
| Air intake chamber pressure/temperature sensor trouble                                   | Inspect (see chapter 3).                                 |
| <b>(Brown smoke)</b>   |  |
| Air intake duct loose  | Reinstall (see chapter 15).                              |
| Fuel pressure too low  | Inspect (see chapter 3).                                 |
| Water temperature sensor trouble   | Inspect (see chapter 3).                                 |
| Air intake chamber pressure/temperature sensor trouble                                   | Inspect (see chapter 3).                                 |

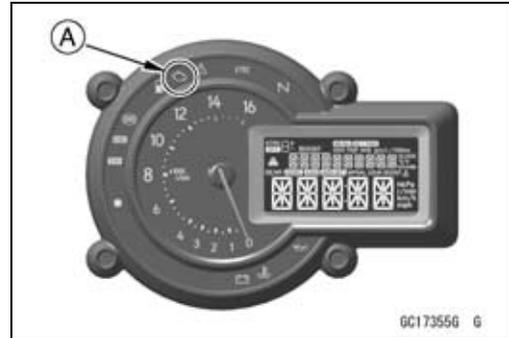
### 3-36 FUEL SYSTEM (DFI)

#### Warning Indicator Light (LED)

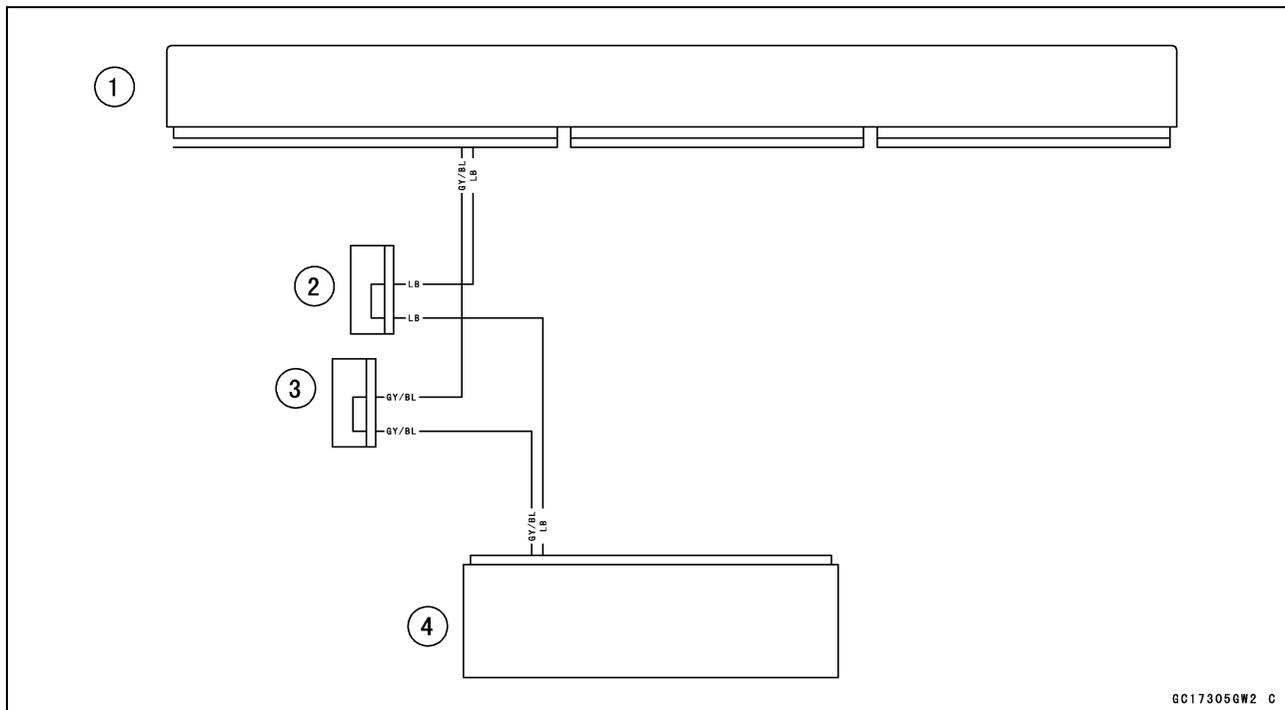
##### Yellow Engine Warning Indicator Light (LED) Inspection

Yellow Engine Warning Indicator Light (LED) [A]

- In this model, the above mentioned warning indicator light (LED) goes on or blink by the data sent from the ECU.
- Refer to the Meter Unit Inspection in the Electrical System chapter.



#### Warning Indicator (LED) Circuit



1. ECU
2. Joint Connector D
3. Joint Connector C
4. Meter Unit

**ECU**

**ECU Removal**

**NOTICE**

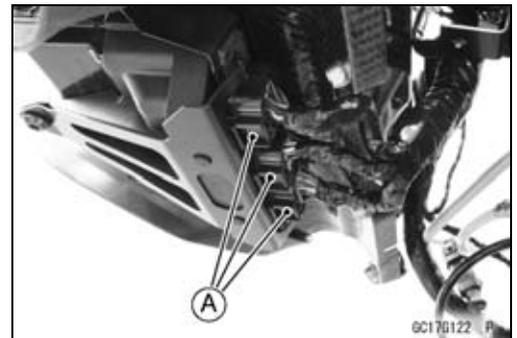
**Never drop the ECU especially on a hard surface. Such a shock to the ECU can damage it.**

**NOTE**

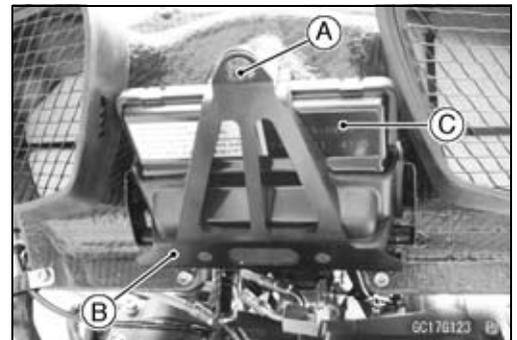
○When replace the ECU with a new one or reused one from another motorcycle, you must register the accelerator position and throttle position data of the throttle body to the ECU.

1. In the new ECU, wait the 10 seconds after the ignition switch on at the idle speed and the coolant temperature 40°C (104°F) or more to register the sensor position to the ECU.
2. In the reused ECU, erase the stored service code memory using Kawasaki Diagnostic System (KDS Ver.3), and wait the 10 seconds after the ignition switch on at the idle speed and the coolant temperature 40°C (104°F) or more to register the sensor position to the ECU.

- Remove:  
Upper Fairing (see Upper Fairing Removal in the Frame chapter)
- Disconnect the ECU connectors [A].

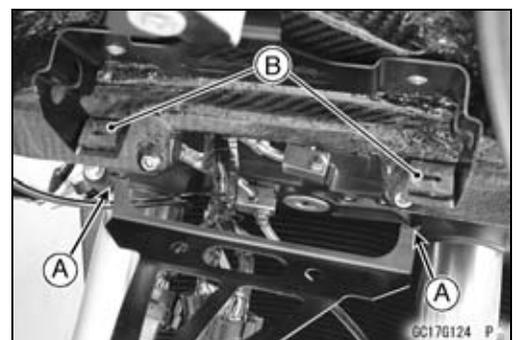


- Remove:  
Bolts [A]  
Bracket [B]  
ECU (with Rubber Projector) [C]



**ECU Installation**

- Installation is the reverse of removal.
- Insert the tabs [A] of the bracket into the slits [B] of the damper.



## 3-38 FUEL SYSTEM (DFI)

### ECU

#### **ECU Power Supply Inspection**

- 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 and main harness 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.
- 
- Turn the ignition switch off.
  - Disconnect the ECU connector [A] (see ECU Removal).
  - Set a tester [B] and check the following wiring for continuity.

#### **ECU Grounding Inspection**

##### **Connections:**

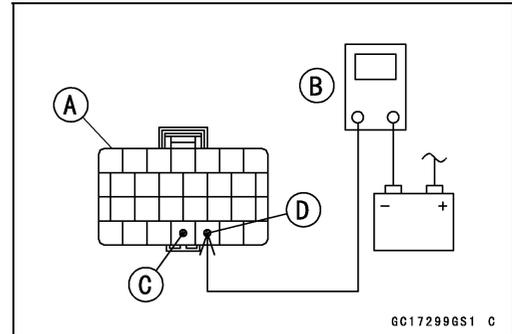
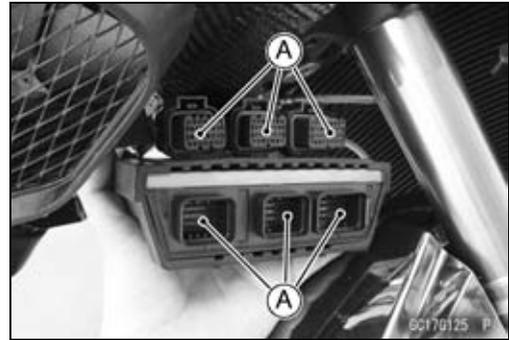
(I) BK/Y leads (ECU terminal 22 [C] or 23) ↔ Battery (-) Terminal [D]

(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.



## ECU

★ 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 (black) [B] with the needle adapter set.

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

### ECU Power Supply Inspection

#### Connections:

- (I) Digital Meter (+) → Terminal 32 (BR/W)  
Digital Meter (-) → Battery (-) Terminal
- (II) Digital Meter (+) → Terminal 33, 39 (W/BK)  
Digital Meter (-) → Battery (-) Terminal

#### Ignition Switch off:

Terminal 32 (BR/W): 0 V

Terminal 33, 39 (W/BK): Battery Voltage

#### Ignition Switch on:

Both: Battery Voltage

★ If the reading is out of the specification, check the following.

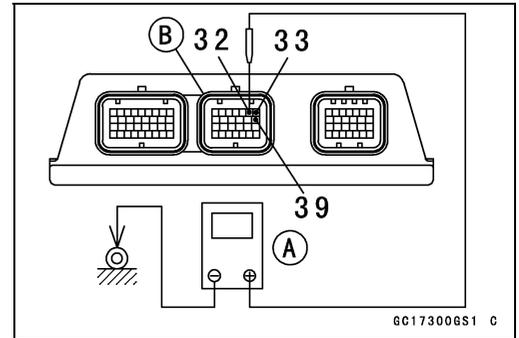
Main Fuse 30 A (see Fuse Inspection in the Electrical System chapter)

ECU Fuse 15 A (see Fuse Inspection Electrical System chapter)

ECU Main Relay (see Relay Circuit Inspection in the Electrical System chapter)

Power Source Wiring (see ECU Power Source Circuit)

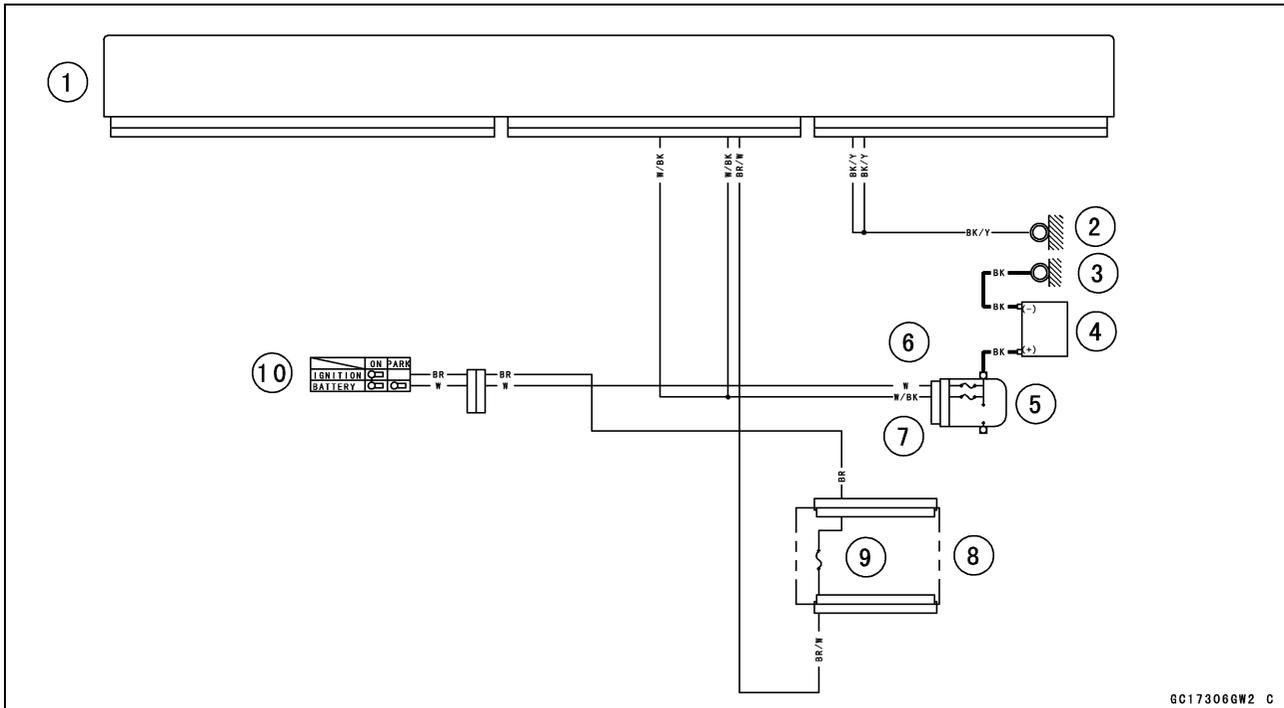
★ If the fuse, wiring and relay are good, replace the ECU (see ECU Removal/Installation).



# 3-40 FUEL SYSTEM (DFI)

## ECU

### ECU Power Source Circuit



1. ECU
2. Frame Ground 3
3. Engine Ground
4. Battery 12 V 8.6 Ah
5. Starter Relay
6. Main Fuse 30 A
7. ECU Fuse 15 A
8. Fuse Box 1
9. Ignition Fuse 15 A
10. Ignition Switch

### DFI Power Source

---

#### **ECU Fuse Removal**

- Refer to the 30 A Main/15 A ECU Fuse Removal in the Electrical System chapter.

#### **ECU Fuse Installation**

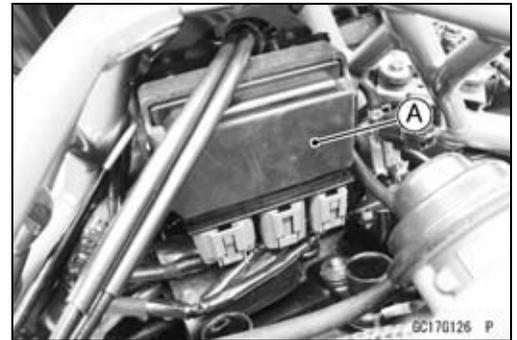
- ★ If a fuse fails during operation, inspect the DFI system to determine the cause, and then replace it with a new fuse of proper amperage.
- Refer to the Fuse Installation in the Electrical System chapter.

#### **ECU Fuse Inspection**

- Refer to the Fuse Inspection in the Electrical System chapter.

#### **ECU Main Relay Removal/Installation**

- The ECU main relay is built in the relay box [A].
- Refer to the Relay Box Removal in the Electrical System chapter.



#### **ECU Main Relay Inspection**

- Refer to the Relay Circuit Inspection in the Electrical System chapter.

## 3-42 FUEL SYSTEM (DFI)

### Fuel Line

#### Fuel Pressure Inspection

##### NOTE

○Be sure the battery is fully charged.

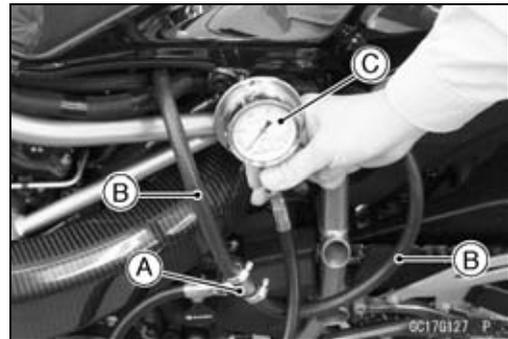
- Remove:
  - Air Intake Chamber (see Air Intake Chamber Removal)
  - Primary Fuel Hose (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Be sure to place a piece of cloth around the delivery pipe of the throttle body assy.

##### **⚠ WARNING**

**Fuel is flammable and explosive under certain conditions and can cause severe burns. 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/cm<sup>2</sup>: 57001-125**  
**Fuel Pressure Gauge Adapter: 57001-1593**  
**Fuel Hose: 57001-1607**



##### **⚠ WARNING**

**Fuel is extremely flammable and can be explosive under certain conditions resulting in serious injury or death. Do not try to start the engine with the fuel hoses disconnected.**

- Install the following parts temporarily.
  - Air Intake Chamber (see Air Intake Chamber Installation)
  - Fuel Tank (see Fuel Tank Installation)
- Turn the engine start/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 start/stop switch and ignition switch, inspect the fuel leakage from the connected portion of the special tools.

##### **NOTICE**

**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.**

## Fuel Line

- Start the engine, and let it idle.
- Measure the fuel pressure with the engine idling.

### Fuel Pressure (with Engine Idling)

**Standard:** 380 kPa (3.9 kgf/cm<sup>2</sup>, 55 psi)

### 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 in the Self-Diagnosis System chapter)
  - 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)
- Install the removed parts (see appropriate chapters).
- Start the engine and check for fuel leakage.

### Fuel Flow Rate Inspection

#### WARNING

**Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. 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**

## 3-44 FUEL SYSTEM (DFI)

### Fuel Line

- 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**

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

- Connect the 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 start/stop switch to run position.
- Turn the ignition switch on.
- The fuel pump should operate for 3 seconds, and then should stop.

#### **NOTICE**

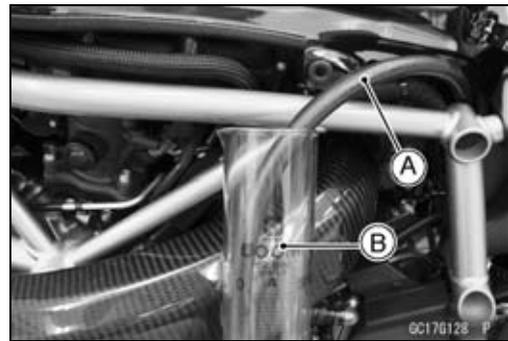
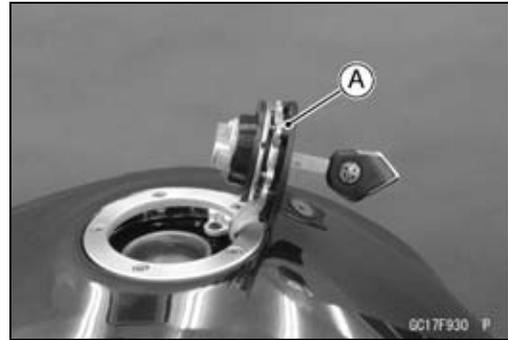
**Do not drive the fuel pump 3 seconds or more without the fuel in the fuel tank. If the fuel pump is driven without the fuel, it may be damaged.**

- Measure the discharge for 3 seconds.
- Repeat this operation several times.

#### **Amount of Fuel Flow**

**Standard: 129 mL (4.4 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, creating the potential for serious burns. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch off. Disconnect the battery (-) terminal. To avoid fuel spills, draw it from the tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

#### **NOTICE**

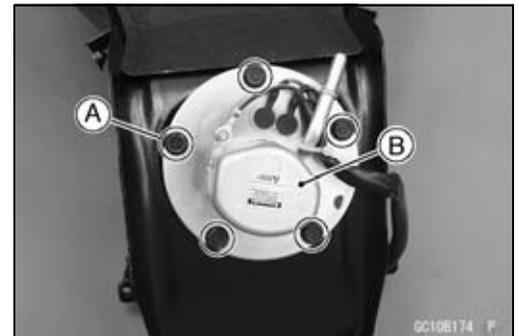
Never drop the fuel pump especially on a hard surface. Such a shock to the pump can damage it.

- 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.
- Remove the fuel pump bolts [A], and take out the fuel pump [B].

#### **NOTICE**

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].



## 3-46 FUEL SYSTEM (DFI)

### Fuel Pump

#### Fuel Pump Installation

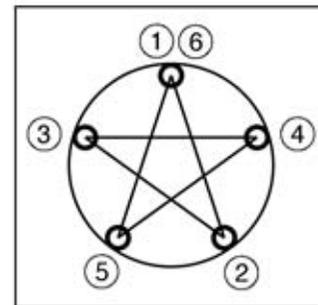
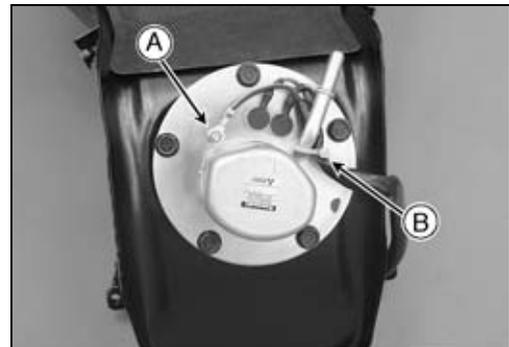
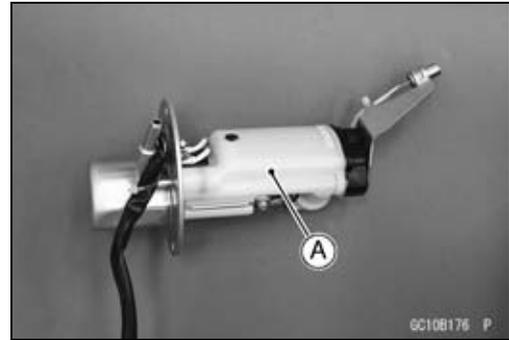
#### **⚠ WARNING**

Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch off. Disconnect the battery (-) terminal. To avoid fuel spills, draw it from the tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

- 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.
- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Tighten the fuel pump bolts following the specified tightening sequence [1 ~ 6] temporarily.
- Tighten the fuel pump bolts same tightening sequence to 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.



#### Fuel Pump Operation Inspection

#### **NOTE**

○Be sure the battery is fully charged.

- Turn the engine start/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 seat (see Seat Removal in the Frame chapter).
- Disconnect the fuel pump lead connector and connect the measuring adapter [A] between these connectors as shown.

Main Harness [B]

Fuel Pump [C]

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

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

#### Fuel Pump Operating Voltage

##### Connections to Adapter:

Digital Meter (+) → R (pump BK/Y) lead

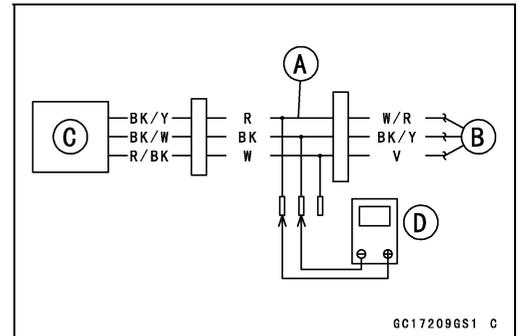
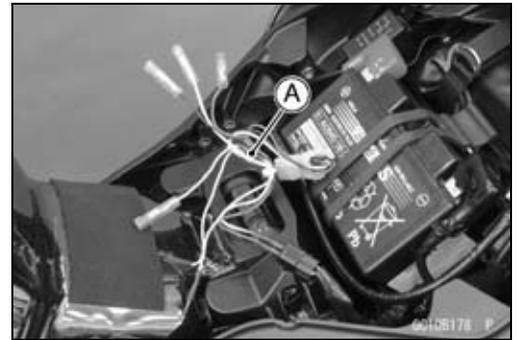
Digital Meter (-) → BK (pump BK/W) lead

- Measure the operating voltage with engine stopped and with the connector joined.
- Turn the engine start/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 Fuel Pump Circuit).
- ★ 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).



# 3-48 FUEL SYSTEM (DFI)

## Fuel Pump

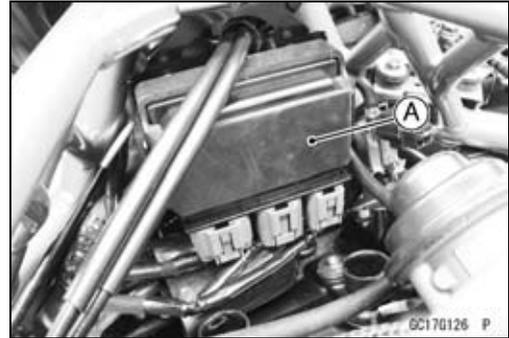
### Pressure Regulator Removal

○The pressure regulator [A] is built into the fuel pump and can not be removed.



### Fuel Pump Relay Removal/Installation

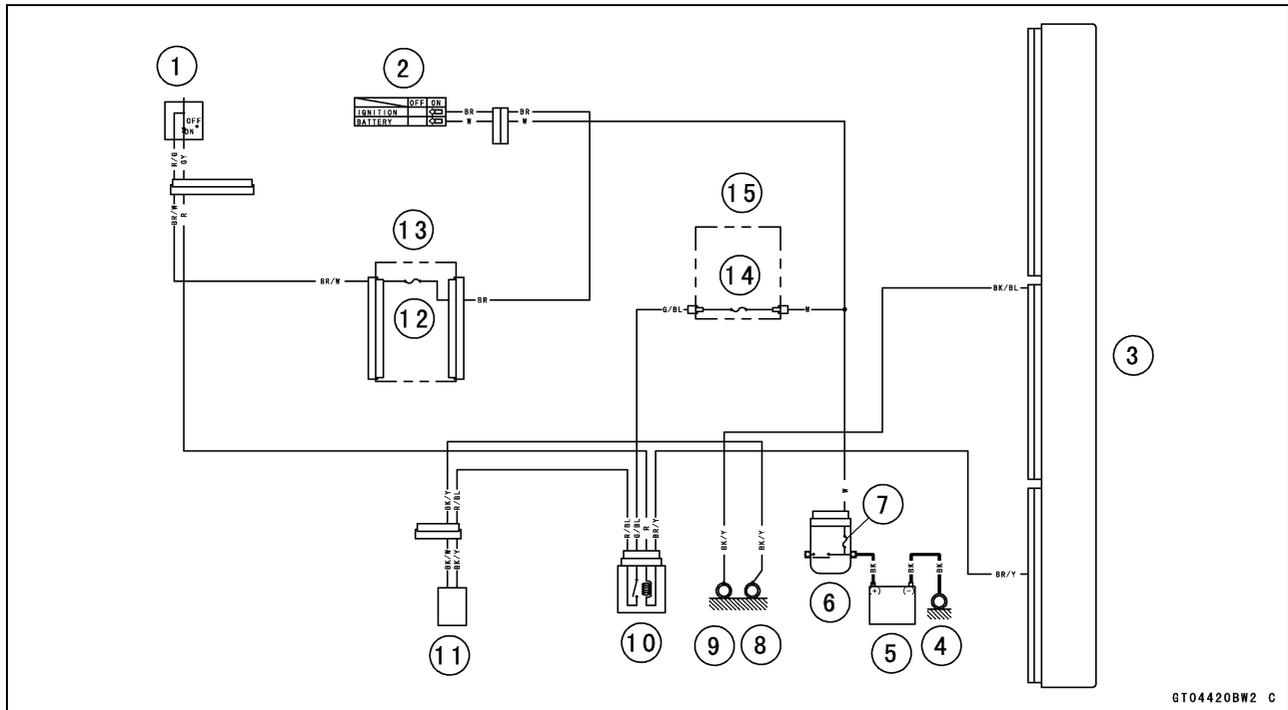
- The fuel pump relay is built in the relay box [A].
- Refer to the Relay Box Removal in the Electrical System chapter.



### Fuel Pump Relay Inspection

- Refer to the Relay Circuit Inspection in the Electrical System chapter.

## Fuel Pump Circuit



- |   |                               |
|---|-------------------------------|
| 1. Engine Start/Stop Switch (Engine Stop) | 9. Frame Ground 2             |
| 2. Ignition Switch                        | 10. Fuel Pump Relay           |
| 3. ECU                                    | 11. Fuel Pump                 |
| 4. Engine Ground                          | 12. Ignition Fuse 15 A        |
| 5. Battery 12 V 8.6 Ah                    | 13. Fuse Box 1                |
| 6. Starter Relay                          | 14. Fuel Pump Relay Fuse 10 A |
| 7. Main Fuse 30 A                         | 15. Fuse Box 3                |
| 8. Frame Ground 3                         |                               |

**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.

***Primary Fuel Injector Audible Inspection***

- Refer to the Primary Fuel Injector Audible Inspection in the Self-Diagnosis System chapter.

***Fuel Injector Resistance Inspection***

- Refer to the Fuel Injector Resistance Inspection in the Self-Diagnosis System chapter.

***Fuel Injector Power Source Voltage Inspection***

- Refer to the Fuel Injector Power Source Voltage Inspection in the Self-Diagnosis System chapter.

***Fuel Injector Output Voltage Inspection***

- Refer to the Fuel Injector Output Voltage Inspection in the Self-Diagnosis System chapter.

***Fuel Injector Fuel Line Inspection***

- Refer to the Fuel Injector Fuel Line Inspection in the Self-Diagnosis System chapter.

## 3-50 FUEL SYSTEM (DFI)

---

### 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).

|  |
|--|
|  <b>WARNING</b> |
|--|

|  |
|--|
| <p><b>Operation with incorrectly routed or improperly adjusted cables could result in an unsafe riding condition. Be sure the cables are routed correctly and properly adjusted.</b></p> |
|--|

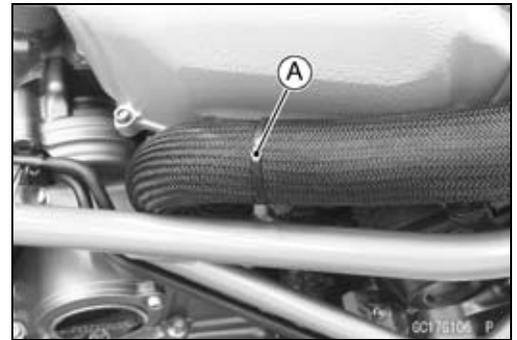
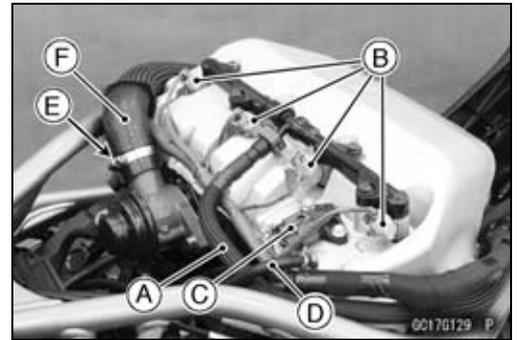
#### ***Cable Lubrication***

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

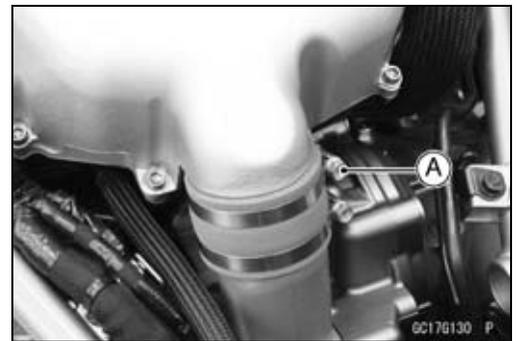
## Air Intake Chamber

### Air Intake Chamber Removal

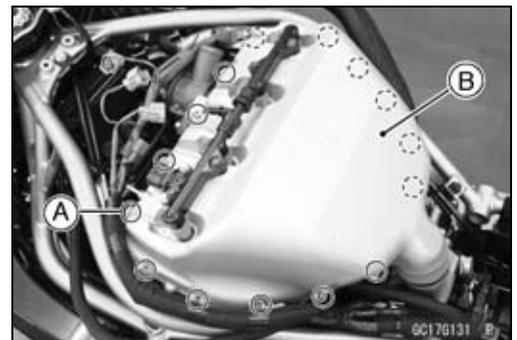
- Remove:
  - Fuel Tank (see Fuel Tank Removal)
- Disconnect:
  - Secondary Fuel Hose [A] (see Fuel Hose Replacement in the Periodic Maintenance chapter)
  - Secondary Fuel Injector Connectors [B]
  - Air Intake Chamber Pressure/Temperature Sensor Connector [C]
- Slide the clamp and disconnect the purge valve hose [D].
- Loosen the clamp screw [E] and disconnect the blow-off valve hose [F].
- Cut the band [A].



- Loosen the air intake hose clamp screw [A].



- Remove:
  - Air Intake Chamber Assy Bolts [A]
  - Air Intake Chamber Upper Housing [B]
- After removing the air intake chamber upper housing, stuff pieces of lint-free, clean cloth into the intake hose of supercharger.



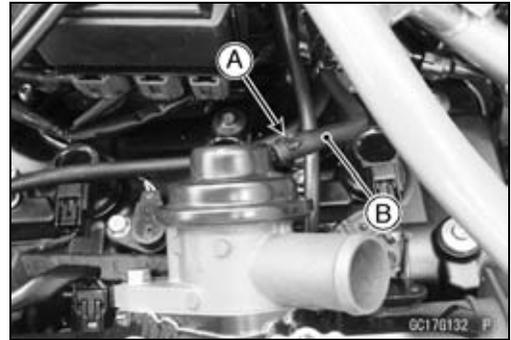
**NOTICE**

If dirt gets into the supercharger, possible supercharger damage will occur.

## 3-52 FUEL SYSTEM (DFI)

### Air Intake Chamber

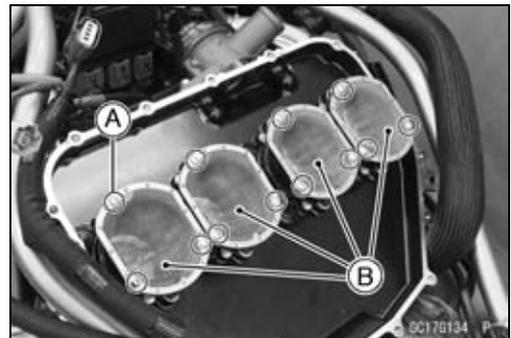
- Slide the clamp [A], and disconnect the purge valve hose [B].



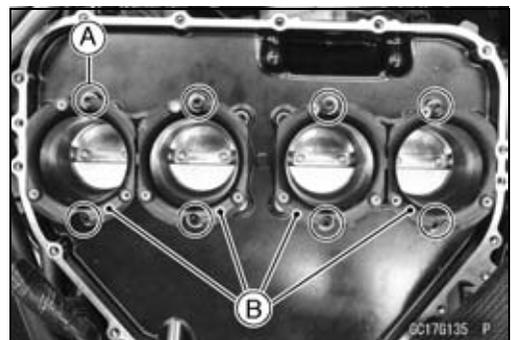
- Slide the dust cover and disconnect the throttle position sensor/ETV actuator connector [A].



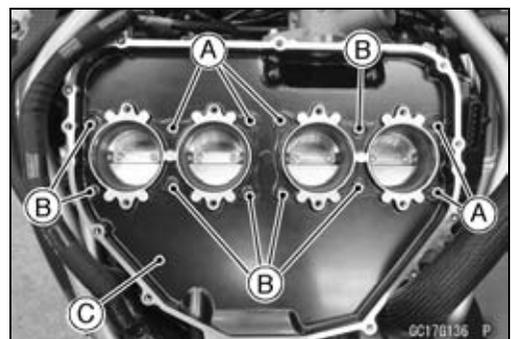
- Remove:  
Air Intake Chamber Duct Screen Bolts [A]  
Air Intake Chamber Duct Screens [B]



- Remove:  
Air Intake Chamber Duct Bolts [A]  
Air Intake Chamber Ducts [B]



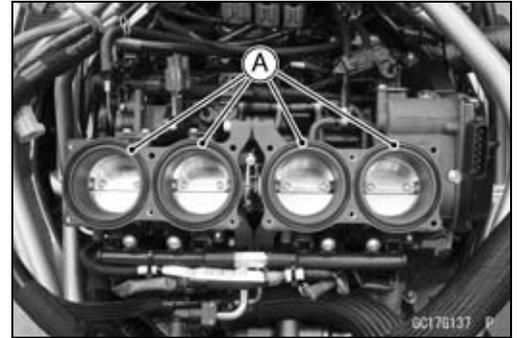
- Remove:  
Air Intake Chamber Mounting Bolts (L = 95 mm) [A] and Washers  
Air Intake Chamber Mounting Bolts (L = 14 mm) [B] and Washers  
Air Intake Chamber Lower Housing [C]



## Air Intake Chamber

### Air Intake Chamber Installation

- Replace the O-rings [A] with new ones.



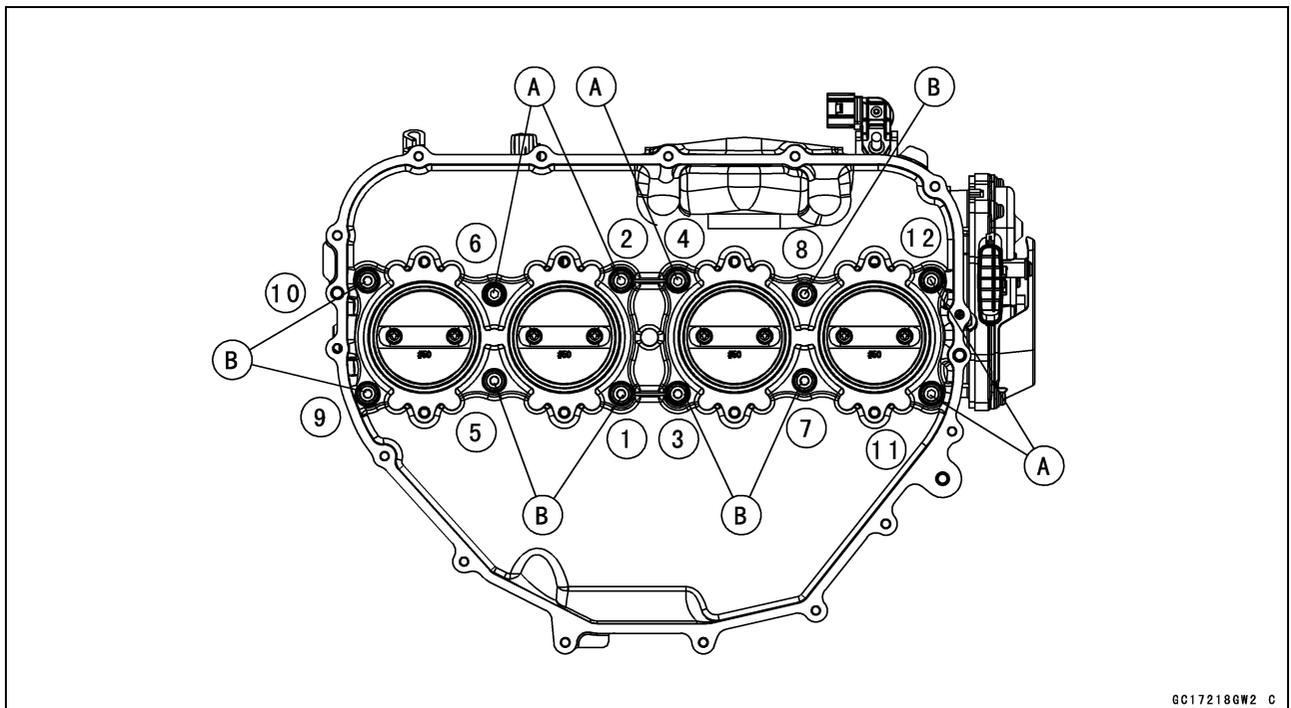
- Install the air intake chamber lower housing.
- Apply a non-permanent locking agent to the air intake chamber mounting bolts.
- Replace the washers with new ones.
- Tighten the air intake chamber mounting bolts following the specified tightening sequence [1 ~ 12].

**Torque - Air Intake Chamber Mounting Bolts (L = 95 mm)**

**[A]: 8.0 N·m (0.82 kgf·m, 71 in·lb)**

**Air Intake Chamber Mounting Bolts (L = 14 mm)**

**[B]: 8.0 N·m (0.82 kgf·m, 71 in·lb)**



- Connect the air switching valve hose, the purge valve hose and the throttle position sensor/ETV actuator connector (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## 3-54 FUEL SYSTEM (DFI)

### Air Intake Chamber

- Apply a non-permanent locking agent to the air intake chamber duct bolts.
- Install the air intake chamber ducts [A] as shown, and tighten their bolts.

Front Side [B]

**Torque - Air Intake Chamber Duct Bolts [C]: 6.0 N·m (0.61 kgf·m, 53 in·lb)**

- Apply a non-permanent locking agent to the air intake chamber duct screen bolts.
- Install the air intake chamber duct screens [D] so that the convex side faces downward, and tighten their bolts.

**Torque - Air Intake Chamber Duct Screen Bolts [E]: 3.0 N·m (0.31 kgf·m, 27 in·lb)**

#### NOTICE

**Do not use this motorcycle without the air intake chamber duct screen. It may lead to serious damage to the engine when the supercharger has trouble.**

- Connect the purge valve hose and the air switching valve hose (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Check that dowel pins [A] are in place on air intake chamber lower housing.
- Replace the air intake chamber gasket [B] with a new one.
- Install the air intake chamber upper housing, and tighten its bolts.

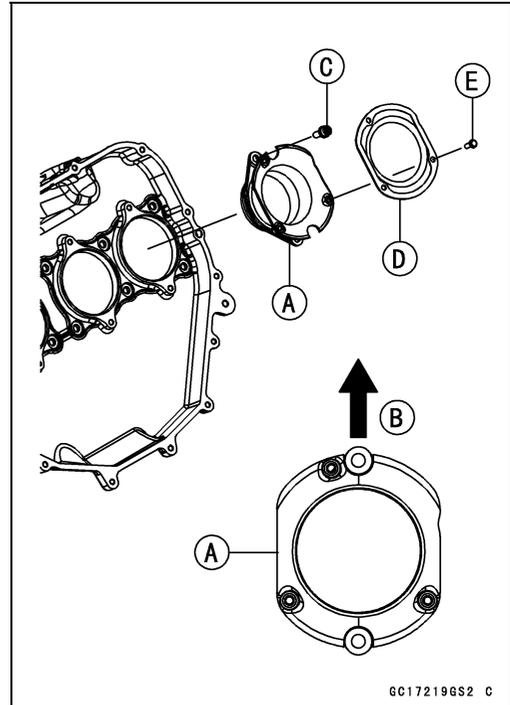
**Torque - Air Intake Chamber Assy Bolts: 8.0 N·m (0.82 kgf·m, 71 in·lb)**

**Air Intake Hose Clamp Screw: 3.0 N·m (0.31 kgf·m, 27 in·lb)**

- Connect the secondary fuel injector connectors, the air intake chamber pressure/temperature sensor connector, the blow-off valve hose and the purge valve hose (see Cable, Wire, and Hose Routing section in the Appendix chapter).

**Torque - Blow-off Valve Hose Clamp Screw: 3.0 N·m (0.31 kgf·m, 27 in·lb)**

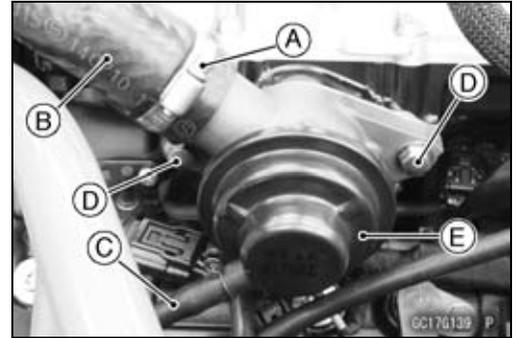
- Connect the secondary fuel hose to the delivery pipe of the nozzle assy (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Install the removed parts (see appropriate chapters).



## Air Intake Chamber

### Blow-off Valve Removal

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
- Loosen the clamp screw [A] and disconnect the blow-off valve hose [B].
- Slide the clamp and disconnect the purge valve hose [C].
- Remove:
  - Blow-off Valve Bolts [D]
  - Blow-off Valve [E]

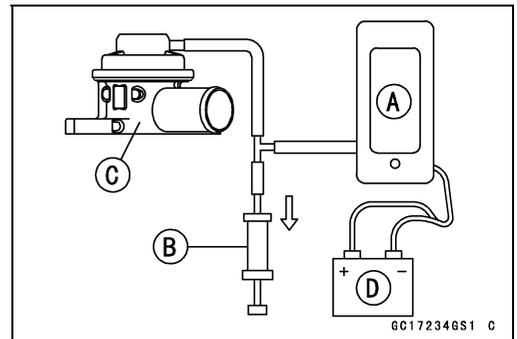


### Blow-off Valve Installation

- Replace the gasket with a new one.
- Apply a non-permanent locking agent to the blow-off valve bolts.
- Install the blow-off valve and tighten its bolts.
  - Torque - Blow-off Valve Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Connect the blow-off valve hose and purge valve hose (see Cable, Wire, and Hose Routing section in the Appendix chapter).
  - Torque - Blow-off Valve Hose Clamp Screw: 3.0 N·m (0.31 kgf·m, 27 in·lb)**
- Install the removed parts (see appropriate chapters).

### Blow-off Valve Inspection

- Remove:
  - Blow-off Valve (see Blow-off Valve Removal)
- Connect a commercially available vacuum gauge [A] and syringe [B] or vacuum pump to the blow-off valve [C] as shown.
  - Battery [D]
- Gradually raise the vacuum applied to the blow-off valve, and check the valve operation.



| Valve Opening Wide                     | Vacuum Pressure                                      |
|--|--|
| About 0.5 mm (0.02 in.)                | 62.8 ±4 kPa (0.64 kgf/cm <sup>2</sup> , 9.1 psi)     |
| About 7.5 mm (0.30 in.)<br>(Full Open) | 107.9 ±7.3 kPa (1.10 kgf/cm <sup>2</sup> , 15.6 psi) |

★If the blow-off valve does not operate, replace it with a new one.

### Purge Valve (for Supercharger) Removal/Installation

- Refer to the Purge Valve (for Supercharger) Removal/Installation in the Self-Diagnosis System chapter.

### Purge Valve (for Supercharger) Inspection

- Refer to the Purge Valve (for Supercharger) Inspection in the Self-Diagnosis System chapter.

## 3-56 FUEL SYSTEM (DFI)

### Throttle Body Assy

#### Idle Speed Inspection/Adjustment

- Refer to the Idle Speed Inspection/Adjustment in the Periodic Maintenance chapter.

#### Synchronization Inspection

- 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, creating the potential for serious burns. 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.

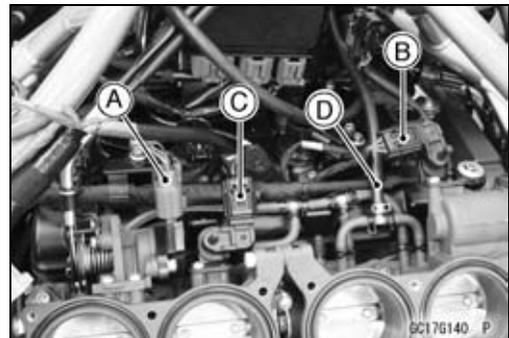
##### **NOTICE**

Never drop the throttle body assy especially on a hard surface. Such a shock to the body assy can damage it.

##### **NOTE**

○When replace the throttle body assy with a new one or reused one from another motorcycle, you must register the accelerator position and throttle position data of the throttle body to the ECU. Erase the stored service code memory using Kawasaki Diagnostic System (KDS Ver.3), and wait the 10 seconds after the ignition switch on at the idle speed and the coolant temperature 40°C (104°F) or more to register the sensor position to the ECU.

- Remove:
  - Air Intake Chamber (Air Intake Chamber Removal)
  - Fuel Hoses (see Fuel Hose Replacement in the Periodic Maintenance chapter)
- Disconnect:
  - Accelerator Position Sensor Connector [A]
  - Atmospheric Pressure Sensor Connector [B]
  - Intake Air Pressure Sensor Connector [C]
- Slide the clamp, and disconnect the purge valve hose [D].

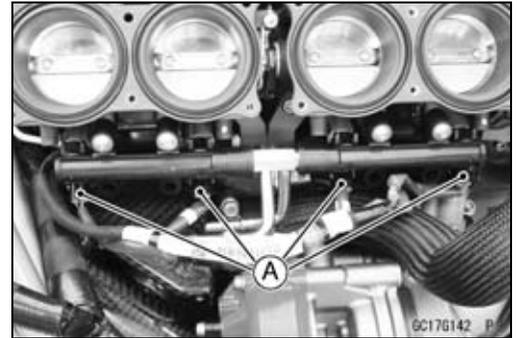


**Throttle Body Assy**

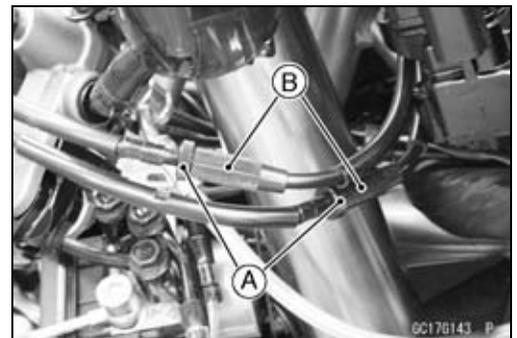
- Cut the bands [A].



- Disconnect the primary fuel injector connectors [A].



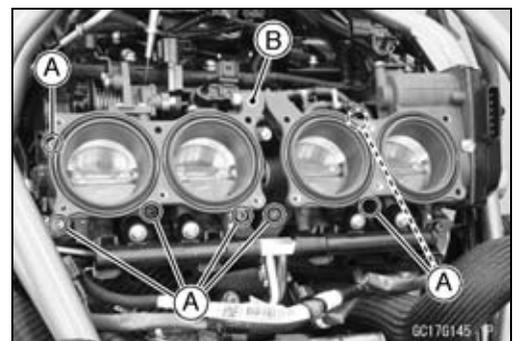
- Loosen the locknuts [A].
- Turn the adjusters [B] to give the more free play.



- Remove:  
Throttle Cable Holder Clamp [A]  
Throttle Cable Lower Ends [B]



- Remove:  
Throttle Body Assy Mounting Bolts [A]  
Throttle Body Assy [B]
- After removing the throttle body assy, stuff pieces of lint-free, clean cloth into the throttle body assy holders.



**NOTICE**

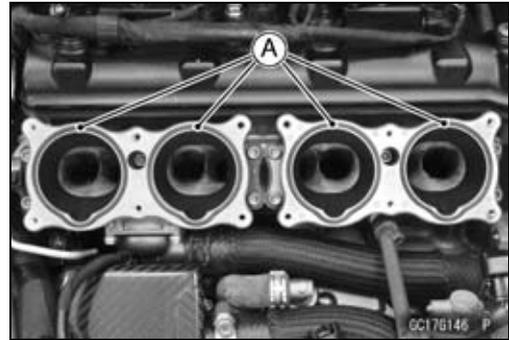
**If dirt gets into the engine, excessive engine wear and possible engine damage will occur.**

## 3-58 FUEL SYSTEM (DFI)

### Throttle Body Assy

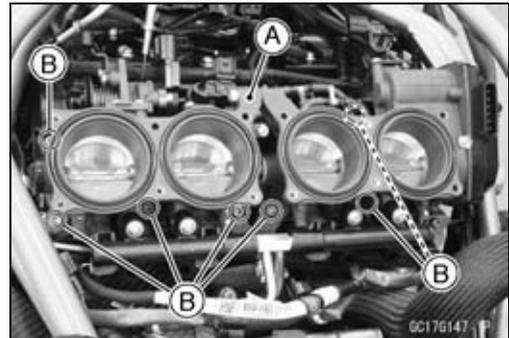
#### Throttle Body Assy Installation

- Replace the O-rings [A] with new ones.



- Install the throttle body assy [A].
- Tighten the throttle body assy mounting bolts [B] as shown.

**Torque - Throttle Body Assy Mounting Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

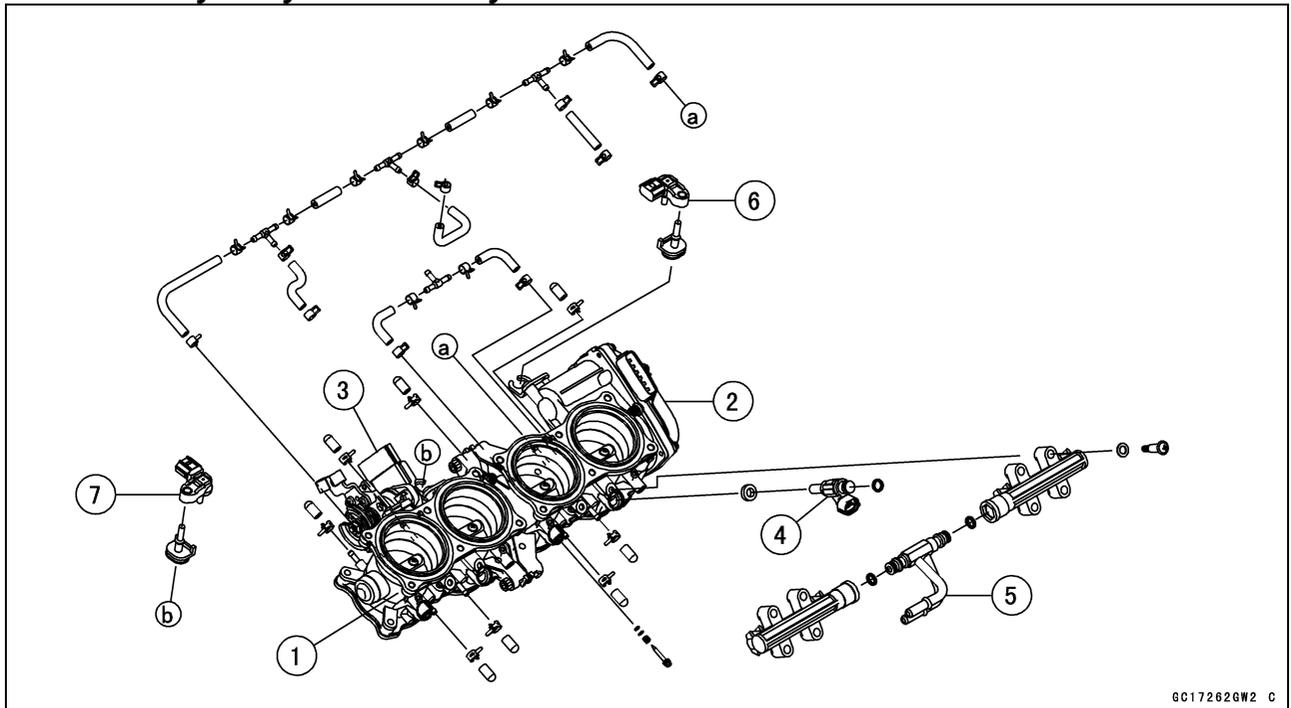


- Apply a thin coat of grease to the throttle cable lower ends.
- Fit the accelerator cable end [A] and the decelerator cable end [B] into the throttle pulley.
- Install the clamp securely.
- The accelerator cable has a clamp [C].
- Connect the primary fuel injector connectors, the atmospheric pressure sensor connector, the intake air pressure sensor connector and the purge valve hose (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Connect the fuel hoses to the throttle body assy (see Fuel Hose Replacement in the Periodic Maintenance chapter).
- Install the removed parts (see appropriate chapters).
- Adjust:  
Throttle Grip Free Play (see Throttle Control System Inspection in the Periodic Maintenance chapter)



Throttle Body Assy

Throttle Body Assy Disassembly



- 1. Throttle Body Assy
- 2. Throttle Position Sensor/ETV Actuator
- 3. Accelerator Position Sensor
- 4. Primary Fuel Injectors
- 5. Delivery Pipe Assy
- 6. Atmospheric Pressure Sensor
- 7. Intake Air Pressure Sensor

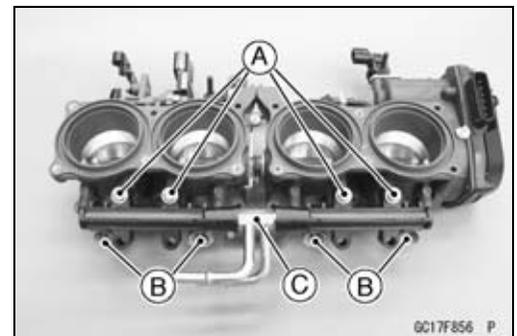
**NOTICE**

Do not remove, disassemble or adjust the throttle position sensor/ETV actuator, accelerator position sensor, 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).
- Remove the delivery pipe assy mounting screws [A] and washers 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 assy.



## 3-60 FUEL SYSTEM (DFI)

### Throttle Body Assy

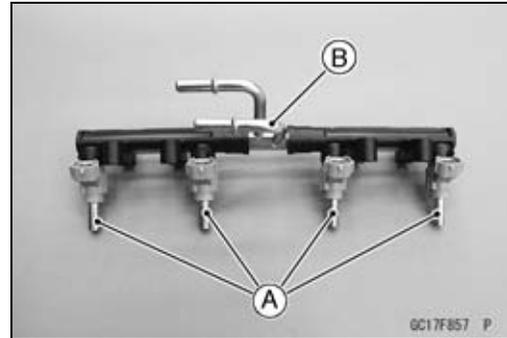
- Remove the primary fuel injectors [A] from the delivery pipe assy [B].

#### NOTE

○ Do not damage the insertion portions of the injectors when they are pulled out from the delivery pipe assy.

#### NOTICE

Never drop the primary fuel injector especially on a hard surface. Such a shock to the injector can damage it.

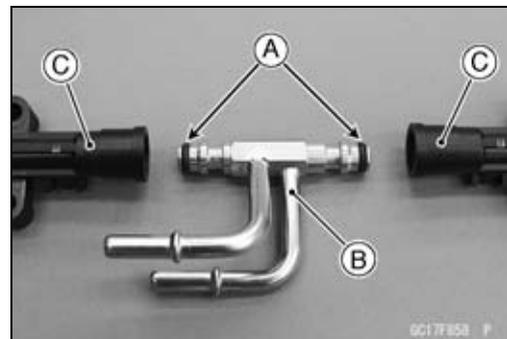


### Throttle Body Assy Assembly

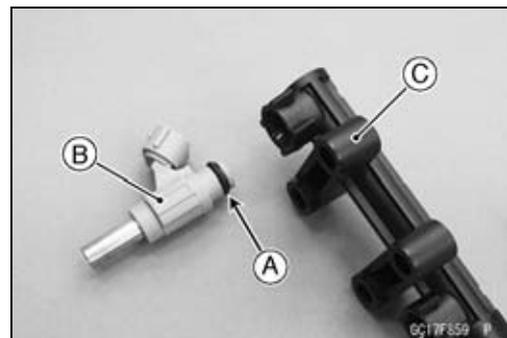
#### ⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch off. Disconnect the battery (-) terminal. To avoid fuel spills, draw it from the tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

- 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 the joint pipe [B] with new ones.
  - Apply engine oil to the new O-rings, and insert it to the delivery pipes [C].
- Left and right delivery pipes are identical.

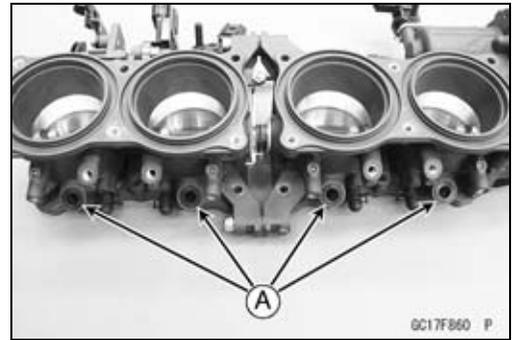


- Replace the O-ring [A] of each primary fuel injector [B] with new ones.
- Apply engine oil to the new O-rings, insert them to the delivery pipe assy [C] and confirm whether the injectors turn smoothly or not.



### 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 Assy.
- Replace the washers with new ones.
- Tighten:  
**Torque - Delivery Pipe Assy Mounting Screws: 3.5 N·m  
(0.36 kgf·m, 31 in·lb)**
- Install the throttle body Assy (see Throttle Body Assy Installation).

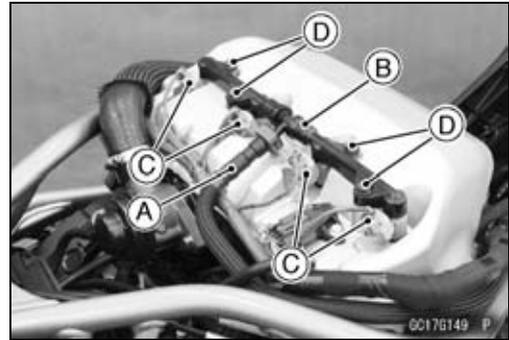


## 3-62 FUEL SYSTEM (DFI)

### Nozzle Assy

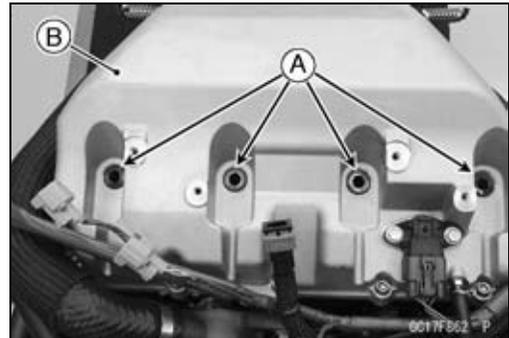
#### Nozzle Assy Removal

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the secondary fuel hose [A] from the delivery pipe assy 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

- Replace the dust seals [A] with new ones.
- Apply engine oil to the new dust seals, and install them.
- Install the nozzle assy securely.
- Push the four mounting positions of the injectors.
- Set the joint pipe parallel to the intake air chamber [B].



#### NOTICE

**When installing the nozzle assy, apply force equally to the delivery pipe assy. Pushing the fuel pipe strongly could damage it as it is made from resin.**

- Apply a non-permanent locking agent to the nozzle assy mounting bolts.
- Tighten:
  - Torque - Nozzle Assy Mounting Bolts: 5.0 N·m (0.51 kgf·m, 44 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).
- Pull out the secondary fuel injectors [A] from the delivery pipe assy [B].

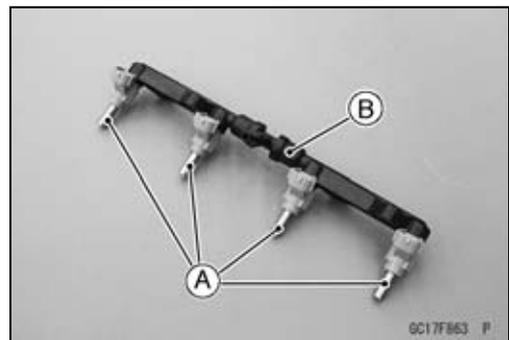
#### NOTE

○ Do not damage the insertion portions of the injectors when they are pulled out from the delivery pipe assy.

#### NOTICE

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

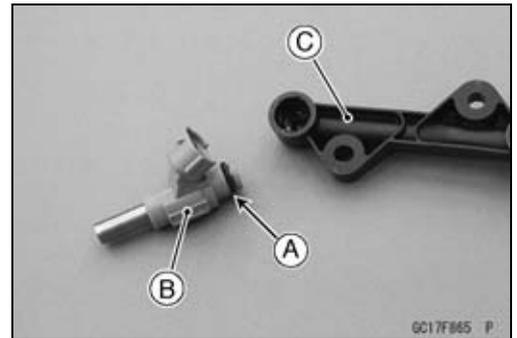
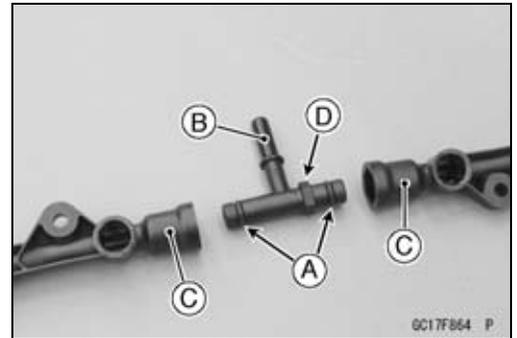
- Separate the delivery pipe assy.



## Nozzle Assy

### Nozzle Assy Assembly

- 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 right side.
  - Left and right delivery pipes are identical.
- 
- Replace the O-ring [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.
  - Install the nozzle assy (see Nozzle Assy Installation).



## 3-64 FUEL SYSTEM (DFI)

### Air Cleaner

#### **Air Cleaner Element Removal/Installation**

- Refer to the Air Cleaner Element Inspection in the Periodic Maintenance chapter.

#### **Blow-off Valve Hose Fitting Box Oil Draining**

A drain hose is connected to the bottom of the blow-off valve hose fitting box to drain oil accumulated in the cleaner part.

- Visually check the plug [A] of the drain hose, if the oil accumulates in the plug.
- ★ If any oil accumulates in the plug, remove the plug from the drain hose and drain it.

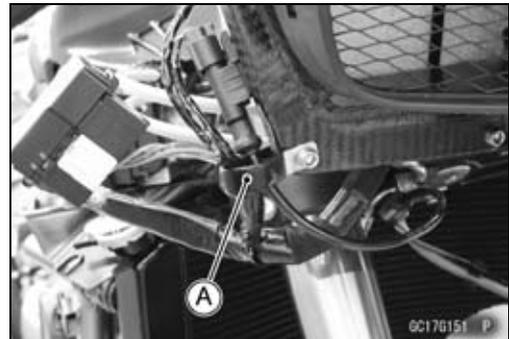
#### **⚠ WARNING**

**Oil on tires will make them slippery and can cause an accident and injury. Be sure to reinstall the plug in the drain hose after draining.**

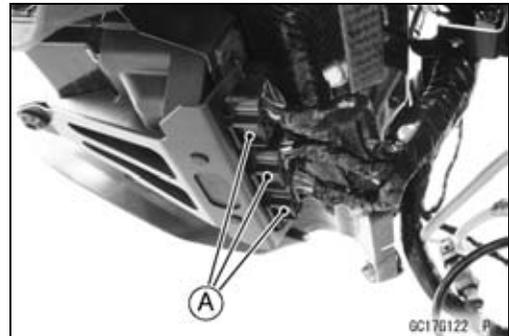


#### **Intake Duct Removal**

- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
- Open the clamp [A] and free the leads.



- Disconnect the ECU connectors [A]

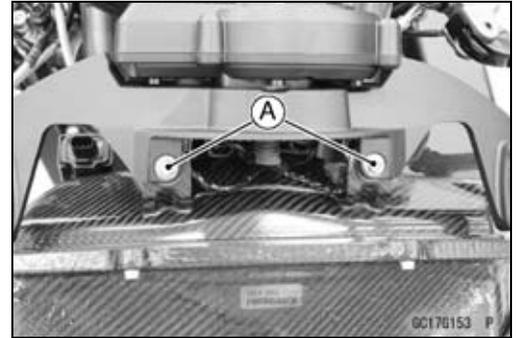


- Remove:
  - Intake Duct Mounting Bolts ( L = 18 mm) [A]
- Disconnect the vehicle-down sensor connector [B].

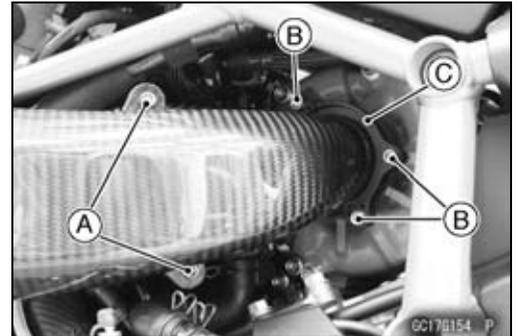


## Air Cleaner

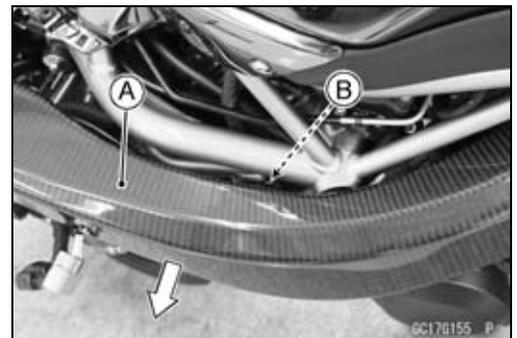
- Remove:  
Intake Duct Mounting Bolts ( L = 20 mm) [A]



- Remove:  
Intake Duct Mounting Bolts ( L = 12 mm) [A]  
Intake Duct Holder Bolts [B]  
Intake Duct Holder [C]
- The one side of the intake duct holder is removed together with the intake duct.

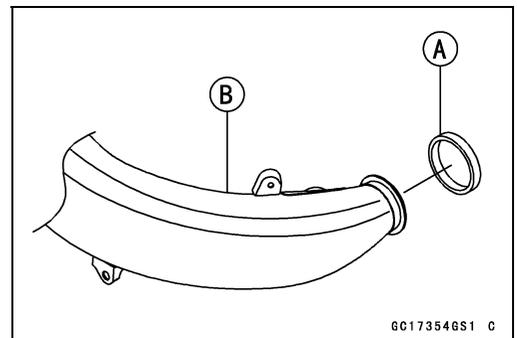


- Pull the intake duct [A] outward to clear the projection [B].
- Remove the intake duct.

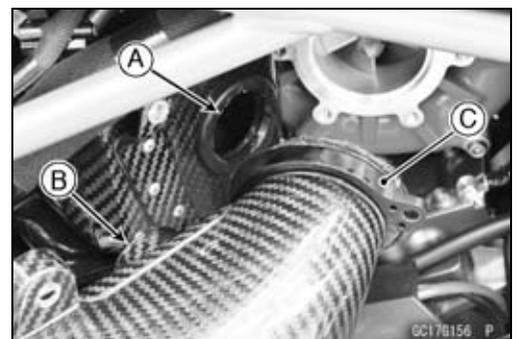


### Intake Duct Installation

- Replace the gasket [A] with a new one.
- Attach the new gasket to the intake duct [B].



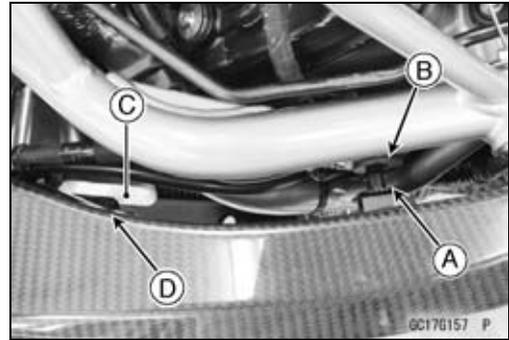
- Apply grease to the grommet [A].
- Insert the duct [B] into the grommet.
- Install the intake duct while hanging the one side of the intake duct holder [C].



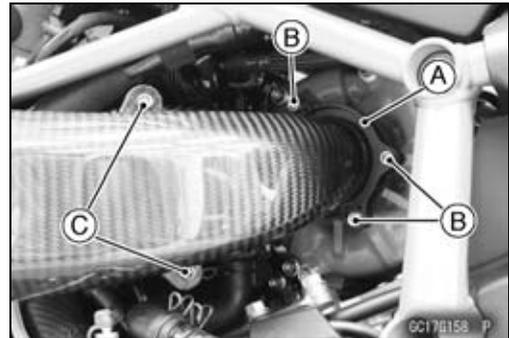
## 3-66 FUEL SYSTEM (DFI)

### Air Cleaner

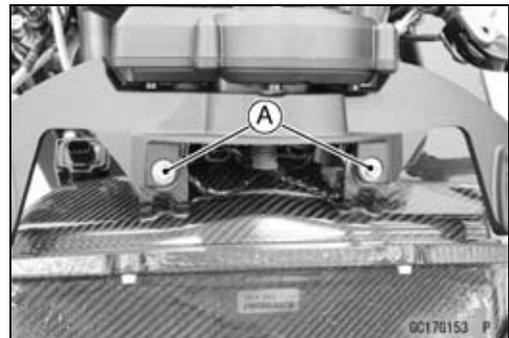
- Insert the projection [A] of the intake duct into the grommet [B] on the frame.
- Insert the radiator cover [C] into the slit [D] of the intake duct.



- Install the other side of the intake duct holder [A].
- Tighten:
  - Torque - Intake Duct Holder Bolts [B]: 10 N·m (1.0 kgf·m, 89 in·lb)**
  - Intake Duct Mounting Bolts ( L = 12 mm ) [C]: 6.0 N·m (0.61 kgf·m, 53 in·lb)**



- Tighten:
  - Torque - Intake Duct Mounting Bolts ( L = 20 mm ) [A]: 1.0 N·m (0.10 kgf·m, 8.9 in·lb)**



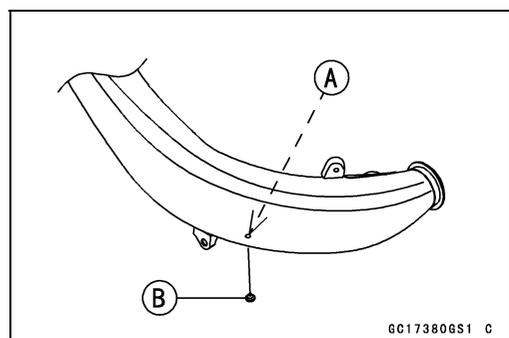
- Tighten:
  - Torque - Intake Duct Mounting Bolts ( L = 18 mm ) [A]: 6.0 N·m (0.61 kgf·m, 53 in·lb)**
- Connect:
  - Vehicle-down Sensor Connector [B]
  - ECU Connectors
- Install the removed parts (see appropriate chapters).



### **Intake Duct Water Draining**

There is a drain hole [A] on the intake duct to drain the water.

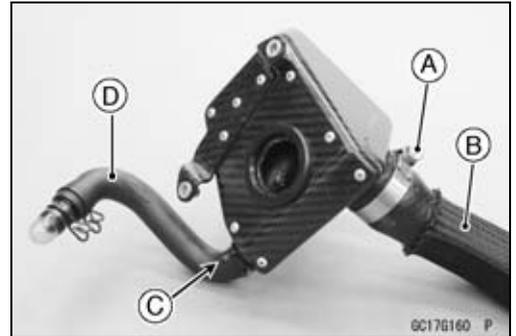
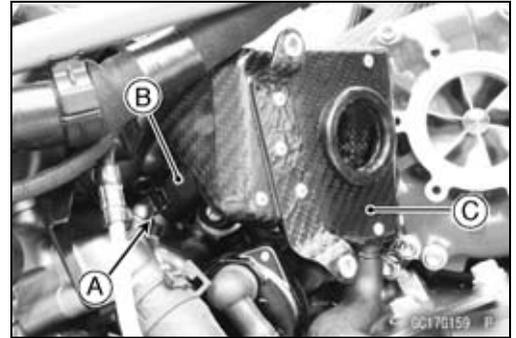
- ★ If the water enters the intake duct at washing the motorcycle, remove the plug [B] and drain the water.



### Air Cleaner

#### ***Blow-off Valve Hose Fitting Box Removal***

- Remove:
    - Throttle Body Assy (see Throttle Body Assy Removal)
    - Intake Duct (see Intake Duct Removal)
  - Slide the clamp [A] and disconnect the breather hose [B].
  - Remove the blow-off valve hose fitting box [C] together with the blow-off valve hose.
- 
- Loosen the blow-off valve hose clamp screw [A] and disconnect the blow-off valve hose [B].
  - Slide the clamp [C] and disconnect the drain hose [D].



## 3-68 FUEL SYSTEM (DFI)

### Air Cleaner

#### Blow-off Valve Hose Fitting Box Installation

- Install the blow-off valve hose [A], and tighten its clamp screw [B] (see Cable, Wire, and Hose Routing section in the Appendix chapter).

**Torque - Blow-off Valve Hose Clamp Screw: 3.0 N·m (0.31 kgf·m, 27 in·lb)**

- Install the drain hose [C] and hold it with clamps [D] (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Fitting [E]

Plug [F]

- ★ If the breather hose [G] and grommet [H] were removed, install them as following procedures.

○ Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.

○ Apply liquid gasket [I] to whole periphery of the breather hose groove.

**Sealant - Liquid Gasket, TB1211F: 92104-0004**

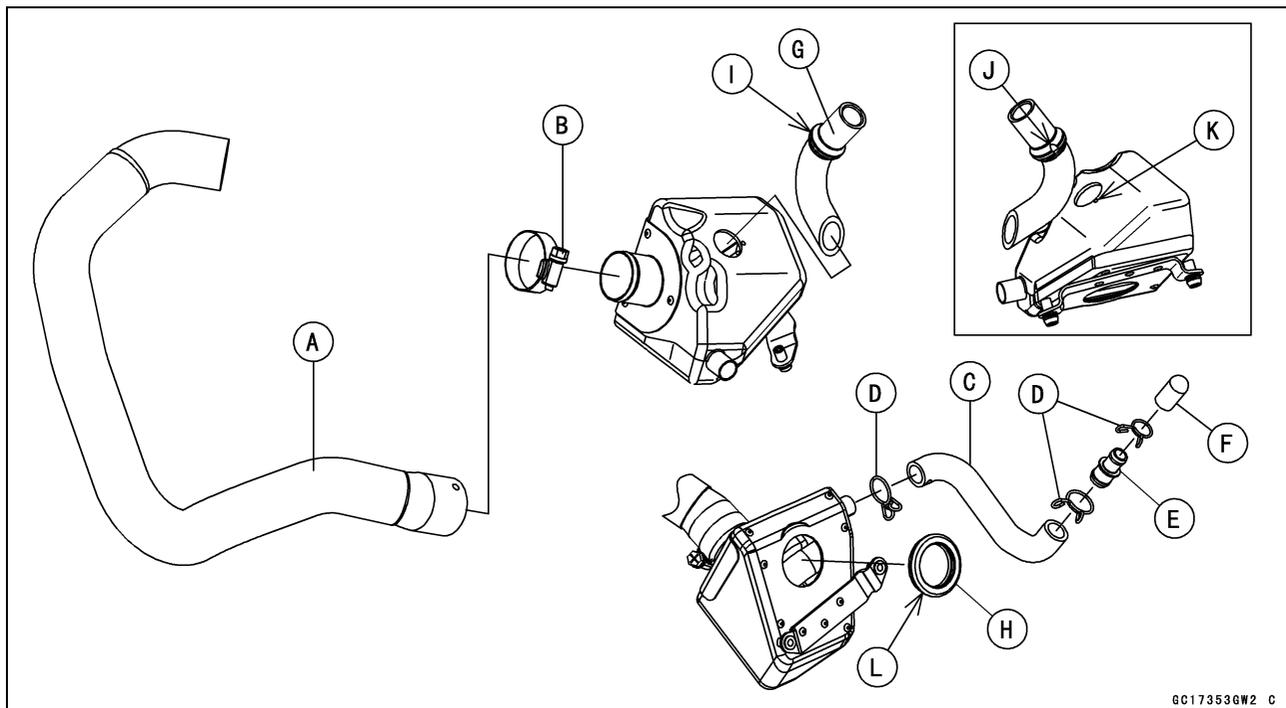
○ Install the breather hose so that the tab [J] is aligned with the cutout [K] on the blow-off valve hose fitting box.

○ Apply liquid gasket [L] to whole periphery of the grommet groove.

**Sealant - Liquid Gasket, TB1211F: 92104-0004**

○ Install the grommet so that its small diameter side faces inside.

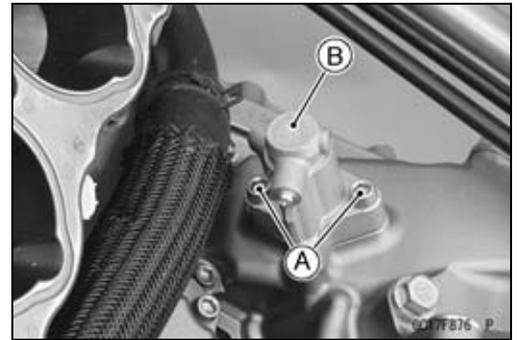
- Install the blow-off valve hose fitting box while inserting the breather hose, and hold it with clamp.



## Supercharger

### Supercharger Chain Tensioner Removal

- Remove:
  - Throttle Body Assy (see Throttle Body Assy Removal)
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  - Supercharger Chain Tensioner Mounting Bolts [A]
  - Supercharger Chain Tensioner [B]

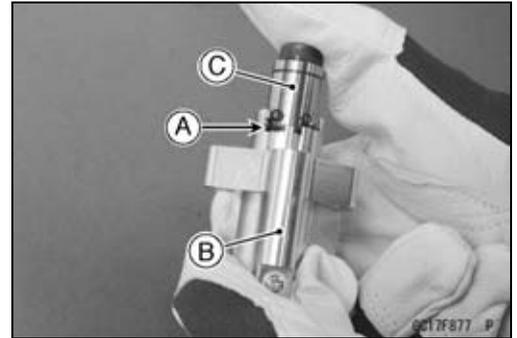


### Supercharger Chain Tensioner Installation

#### NOTE

○Some noise from the super charger tensioner may occur when replacing the tensioner or when starting vehicle after long periods of storage. This is a normal characteristic and will disappear after riding for a short period of time.

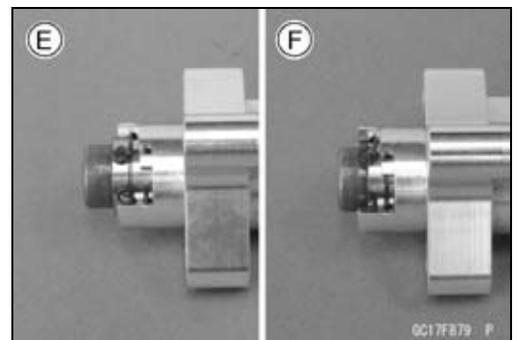
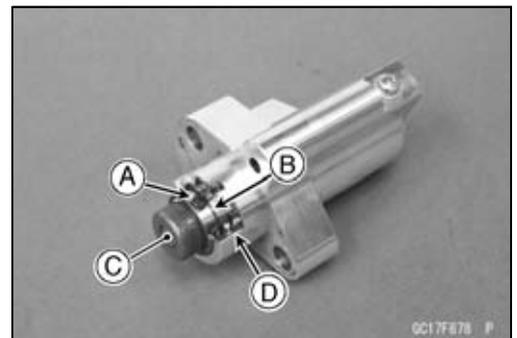
- Opening the snap ring [A], release it and turn the tensioner body [B] clockwise while holding the push rod [C].
- Turning the tensioner body clockwise, slide the stopper [A] into the groove [B] of the push rod [C].



#### NOTE

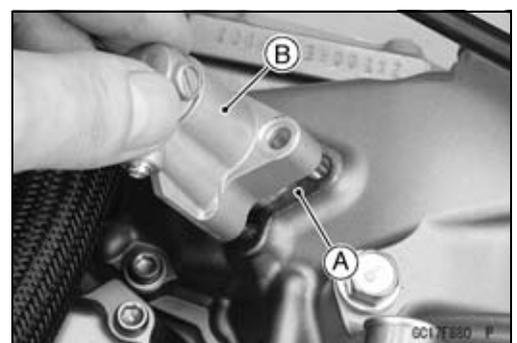
○Be careful not to fit the snap ring [D] into the groove.

- Correct [E]
- Incorrect [F]



- Replace the gasket [A] with a new one.
- Apply a non-permanent locking agent to the supercharger chain tensioner bolts.
- Install the tensioner body [B] slowly, and tighten its bolts.

**Torque - Supercharger Chain Tensioner Mounting Bolts:**  
 10 N·m (1.0 kgf·m, 89 in·lb)



## 3-70 FUEL SYSTEM (DFI)

### Supercharger

- Push the upper chain guide [A] upward to allow the tensioner to expand.

#### NOTE

- You hear the sound from which the push rod moves out.
- If you do not hear the sound, reassemble the camshaft chain tensioner.

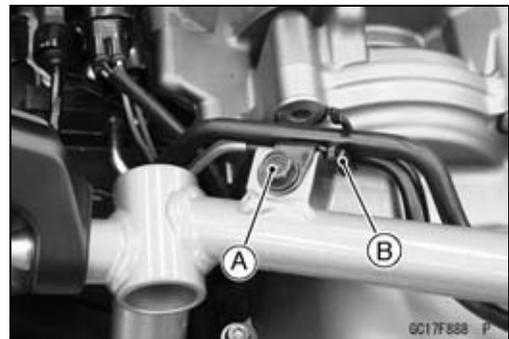
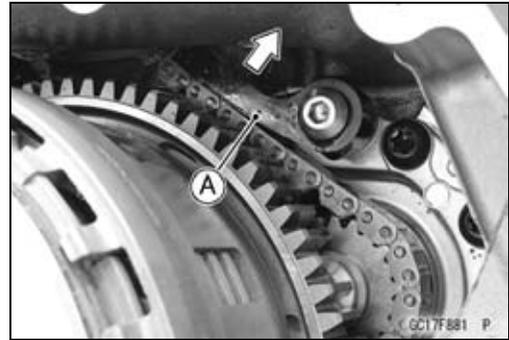
#### NOTICE

**If you start the engine in case that the sound cannot be heard, the engine may be damaged.**

- Install the removed parts (see appropriate chapters).

### Supercharger Housing Assy Removal

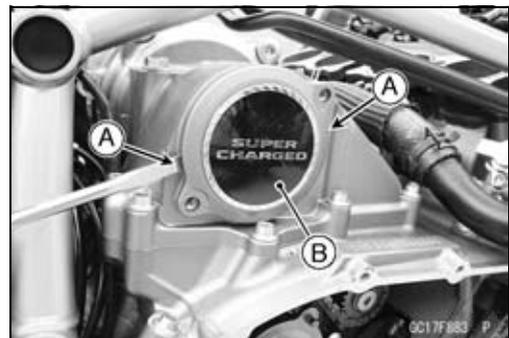
- Remove:
  - Blow-off Valve Hose Fitting Box (see Blow Gas Housing Removal)
  - Clutch (see Clutch Removal in the Clutch chapter)
- Remove:
  - Brake Pipe Clamp Bolt [A]
  - Clamp [B]



- Remove:
  - Supercharger Sprocket Cover Bolts [A]

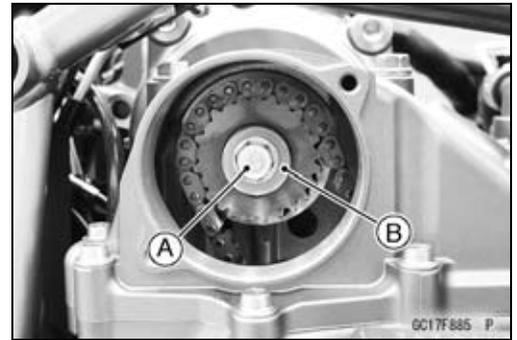


- Insert a flat tip screwdriver to the pry points [A], and remove the supercharger chain sprocket cover [B].

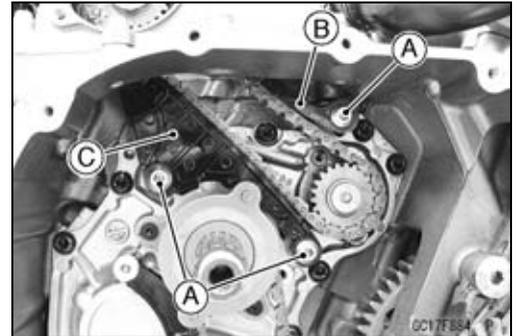


## Supercharger

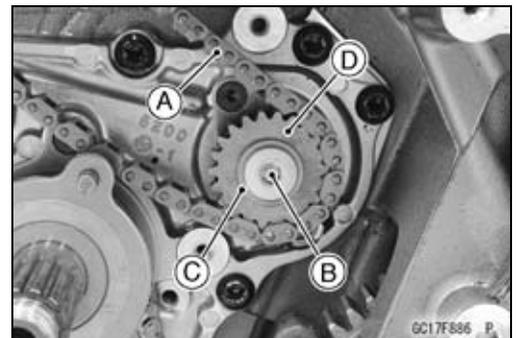
- Remove:  
Supercharger Chain Sprocket Bolt [A]  
Washer [B]



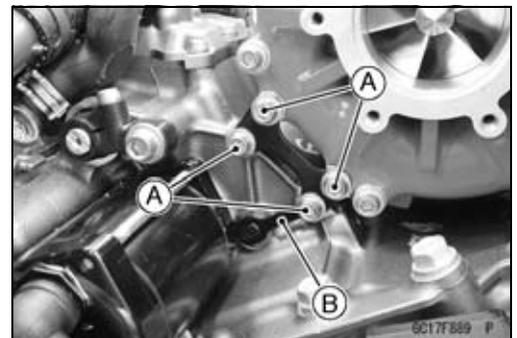
- Remove:  
Supercharger Chain Tensioner (see Supercharger Chain Tensioner Removal)  
Chain Guide Bolts [A]  
Upper Chain Guide [B] and Collar  
Lower Chain Guide [C] and Collars  
Supercharger Chain Upper Sprocket



- Remove:  
Supercharger Chain [A]  
Supercharger Chain Sprocket Bolt [B]  
Washer [C]  
Supercharger Chain Lower Sprocket [D]



- Remove:  
Supercharger Housing Stay Bolts [A]  
Supercharger Housing Stay [B]



- Remove:  
Supercharger Housing Bolt (M8) [A] and Washer  
Supercharger Housing Bolts (M6) [B]
- Loosen the supercharger housing bolt (M8) [C].



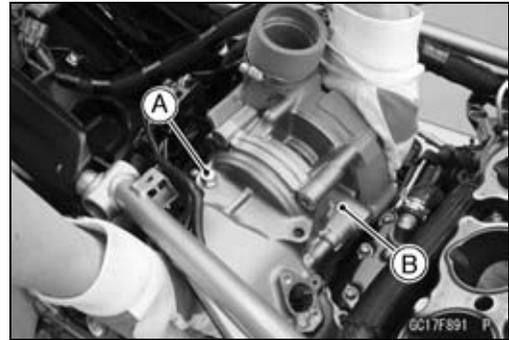
## 3-72 FUEL SYSTEM (DFI)

### Supercharger

- Remove the supercharger housing bolt (M8) [A] while moving the supercharger housing assy [B].
- Remove the supercharger housing assy.

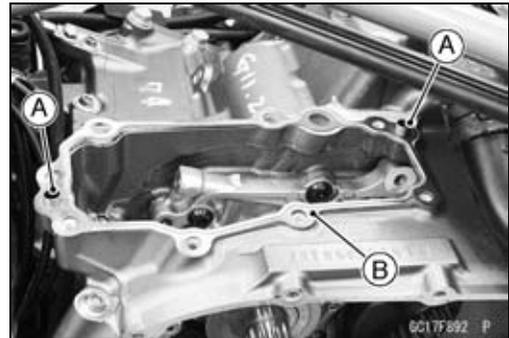
#### NOTE

○ Store the supercharger housing assy so that there are not contaminants adhering to it.



#### Supercharger Housing Assy Installation

- Check that dowel pins [A] are in place on the crankcase.
- Replace the gasket [B] with a new one.

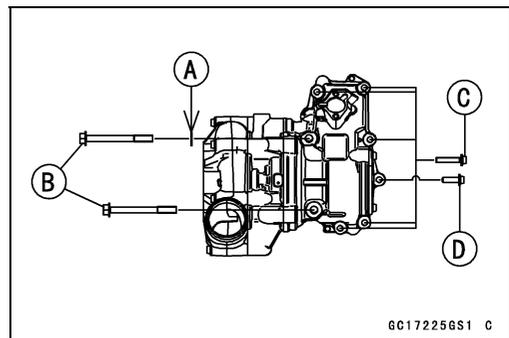


- Install the supercharger housing assy.
- Replace the washer [A] with a new one.
- Apply a non-permanent locking agent to the supercharger housing bolts (M6).
- Tighten:

**Torque - Supercharger Housing Bolts (M8) [B]: 23 N·m (2.3 kgf·m, 17 ft·lb)**

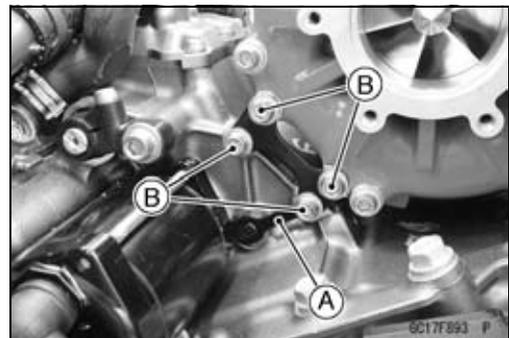
**Supercharger Housing Bolts (M6, L = 30 mm) [C]: 10 N·m (1.0 kgf·m, 89 in·lb)**

**Supercharger Housing Bolt (M6, L = 20 mm) [D]: 10 N·m (1.0 kgf·m, 89 in·lb)**



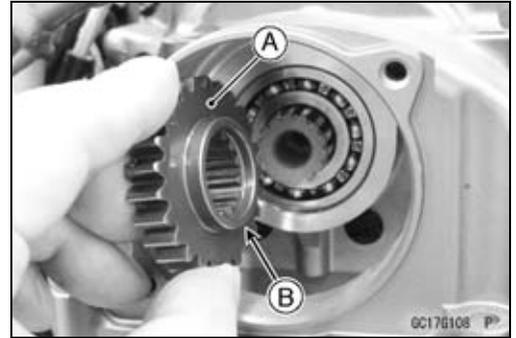
- Apply a non-permanent locking agent to the supercharger housing stay bolts.
- Install the supercharger housing stay [A], and tighten its bolts.

**Torque - Supercharger Housing Stay Bolts [B]: 10 N·m (1.0 kgf·m, 89 in·lb)**

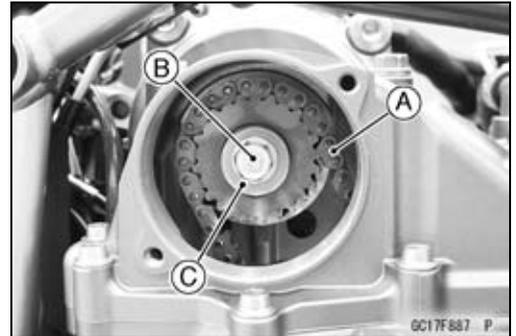


## Supercharger

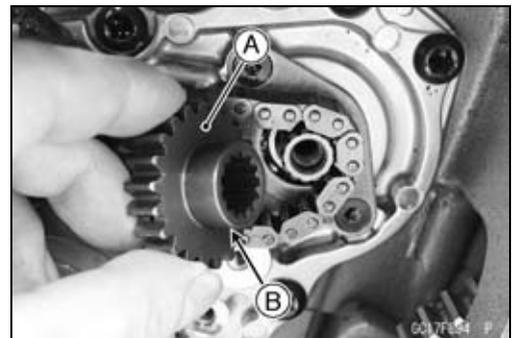
- Install the supercharger chain upper sprocket [A] so that the boss side [B] faces the supercharger side.



- Install the supercharger chain [A] to the sprocket.
- Apply a non-permanent locking agent to the supercharger chain sprocket bolt [B], and tighten it together with the washer [C] temporarily.

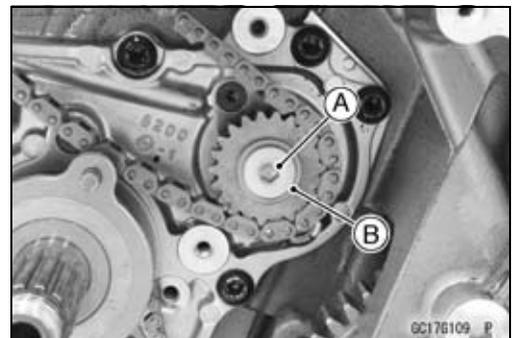


- Install the supercharger chain lower sprocket [A] so that the boss side [B] faces the engine side, and engage the supercharger chain [C] with the lower sprocket.



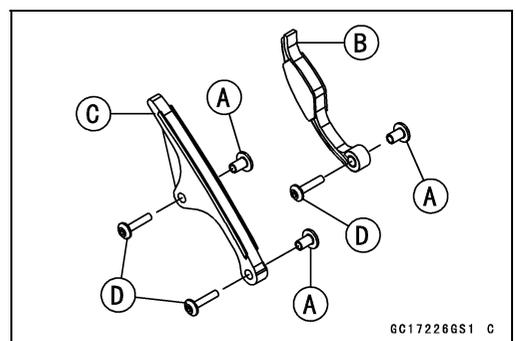
- Apply a non-permanent locking agent to the supercharger chain sprocket bolt [A], and tighten it together with the washer [B].

**Torque - Supercharger Chain Sprocket Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**



- Install:
  - Collars [A]
  - Upper Supercharger Chain Guide [B]
  - Lower Supercharger Chain Guide [C]

- Tighten:
  - Torque - Supercharger Chain Guide Bolts [D]: 10 N·m (1.0 kgf·m, 89 in·lb)**

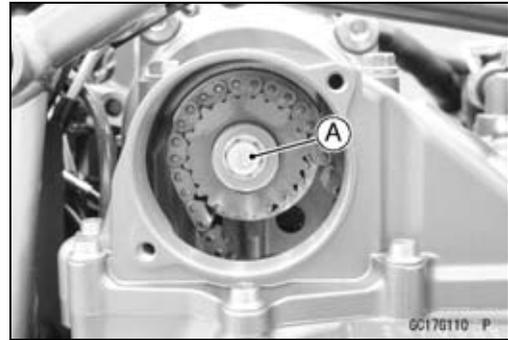


## 3-74 FUEL SYSTEM (DFI)

### Supercharger

- Install the supercharger chain tensioner (see Supercharger Chain Tensioner Installation).
- Tighten the supercharger chain sprocket bolt [A] on the upper sprocket.

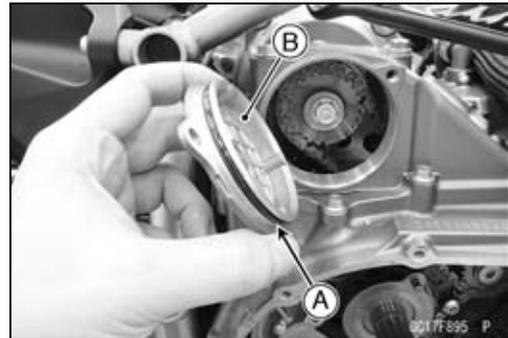
**Torque - Supercharger Chain Sprocket Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**



- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring, and install it.
- Install the supercharger sprocket cover [B], and tighten its bolts.

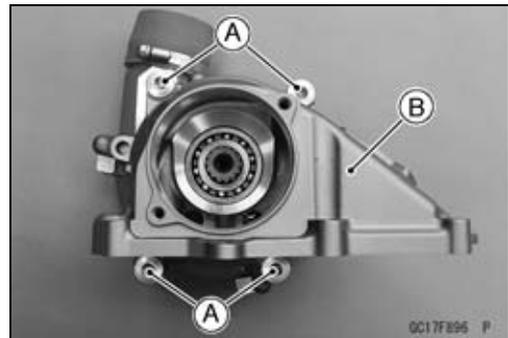
**Torque - Supercharger Sprocket Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Install the removed parts (see appropriate chapters).



### Supercharger Outer Housing Removal

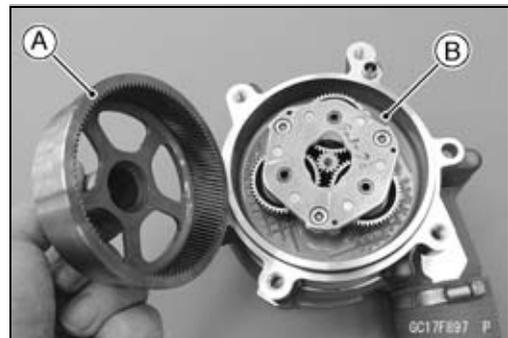
- Remove:
  - Supercharger Housing Assy (see Supercharger Housing Assy Removal)
  - Supercharger Outer Housing Bolts [A]
  - Supercharger Outer Housing [B]



- Remove:
  - Ring Gear [A]

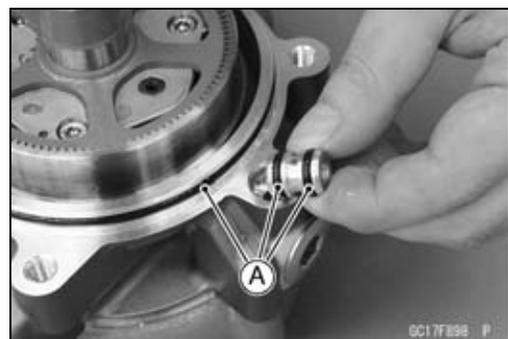
#### NOTICE

**Do not disassemble the supercharger impeller housing assy [B], because it is adjust or set surely at the manufacturer. Adjust of its parts could result in poor performance, requiring replacement of the supercharger impeller housing assy.**



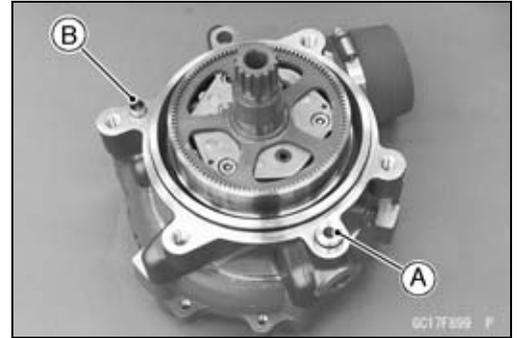
### Supercharger Outer Housing Installation

- Install the ring gear.
- Replace the O-rings [A] with new ones.
- Apply grease to the O-rings, and install them.



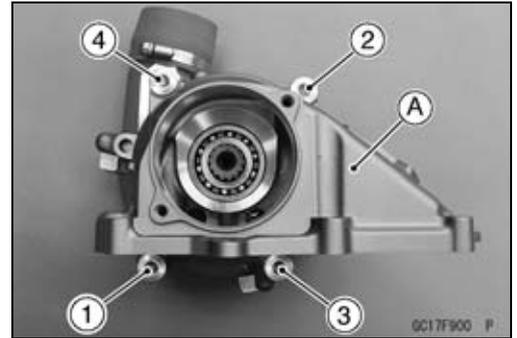
## Supercharger

- Install the fitting [A].
- Check that dowel pin [B] is in place on the supercharger impeller housing.



- Install the supercharger outer housing [A], and tighten its bolts following specified tightening sequence [1 ~ 4].

**Torque - Supercharger Outer Housing Bolts: 23 N·m (2.3 kgf·m, 17 ft·lb)**



## 3-76 FUEL SYSTEM (DFI)

### Fuel Tank

#### Fuel Tank Removal

#### **⚠ WARNING**

Gasoline is extremely flammable and can be explosive under certain conditions, creating the potential for serious burns. Make sure the area is well ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch off. Disconnect the battery (–) terminal. To avoid fuel spills, draw it from the tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

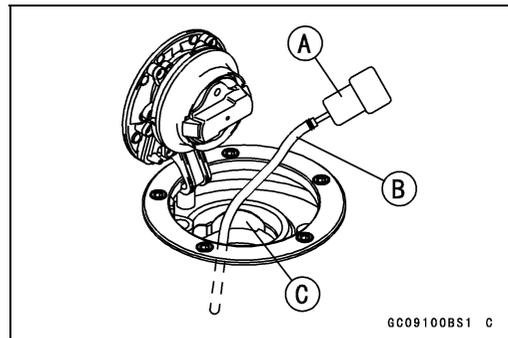
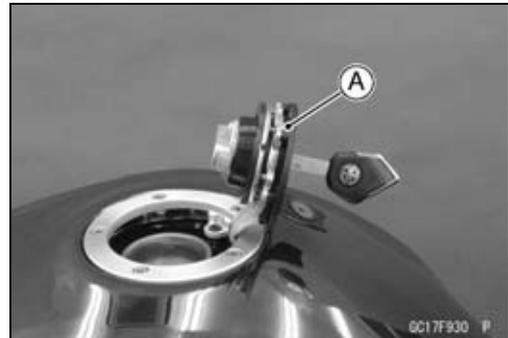
- Turn the ignition switch off.
- Wait until the engine cools down.
- Disconnect the battery (–) terminal (see Battery Removal in the Electrical System chapter).
- Open the fuel tank cap [A] to lower the pressure in the tank.
- During tank removal, keep the tank cap open to release pressure in the tank. 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 intake hose in order to insert the hose smoothly.
- Put the hose through the fill opening [C] into the tank and draw the fuel out.

#### **⚠ WARNING**

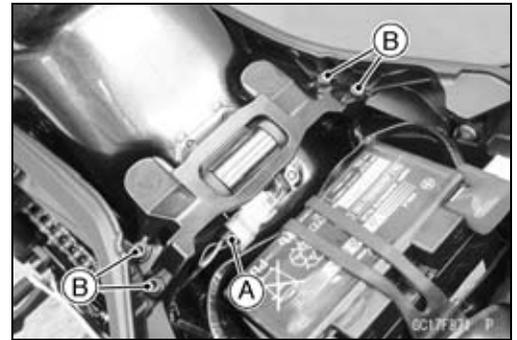
Spilled fuel is flammable and can be explosive under certain conditions. The fuel can not be removed completely from the fuel tank. Be careful for remained fuel spillage.

- Remove:
  - Inner Covers (see Inner Cover Removal in the Frame chapter)
  - Fuel Tank Covers (see Fuel Tank Cover Removal in the Frame chapter)
  - Side Covers (see Side Cover Removal in the Frame chapter)
  - Fuel Tank Bolts [A] and Washer



**Fuel Tank**

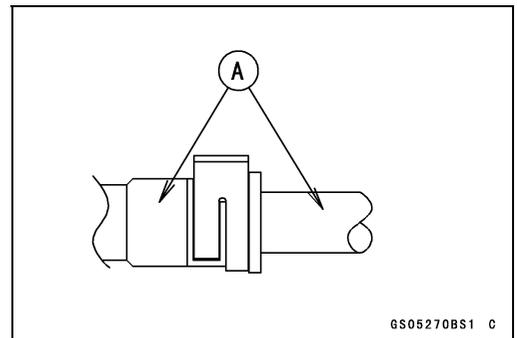
- Disconnect the fuel pump lead connector [A].
- Remove the fuel tank bolts [B].



- Slide the clamps, and disconnect the hoses [A].



- Be sure to place a piece of cloth around the fuel hose joint.
- Wipe off the dirt of the surface [A] around the connection using a cloth or a soft brush.

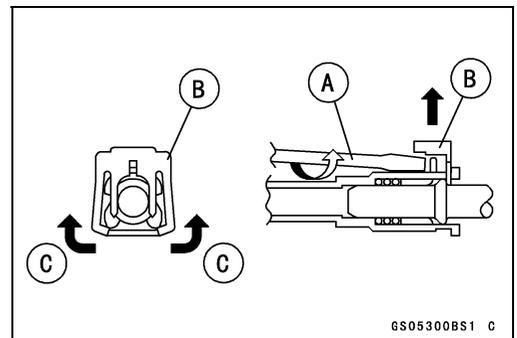


**When removing with standard tip screwdriver**

- Insert the flat tip screwdriver [A] into slit on the joint lock [B].
- Turn the driver to disconnect the joint lock.

**When removing with fingers**

- Open and push up [C] the joint lock with your fingers.



**NOTICE**

Prying or excessively widening the joint lock ends for fuel hose removal will permanently deform the joint lock, resulting in a loose or incomplete lock that may allow fuel to leak and create the potential for a fire explosion. To prevent fire or explosion from a damaged joint lock, do not pry or excessively widen the joint lock ends when removing the fuel hose. The joint lock has a retaining edge that locks around the housing.

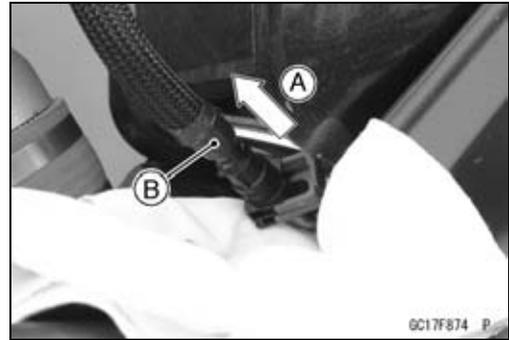
# 3-78 FUEL SYSTEM (DFI)

## Fuel Tank

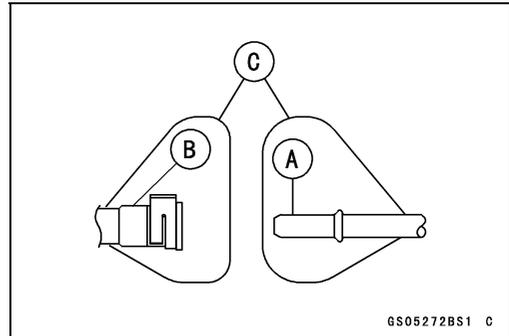
- Pull [A] the fuel hose joint [B] out of the outlet pipe.

### ⚠ WARNING

Fuel is flammable and explosive under certain conditions and can cause severe burns. 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.

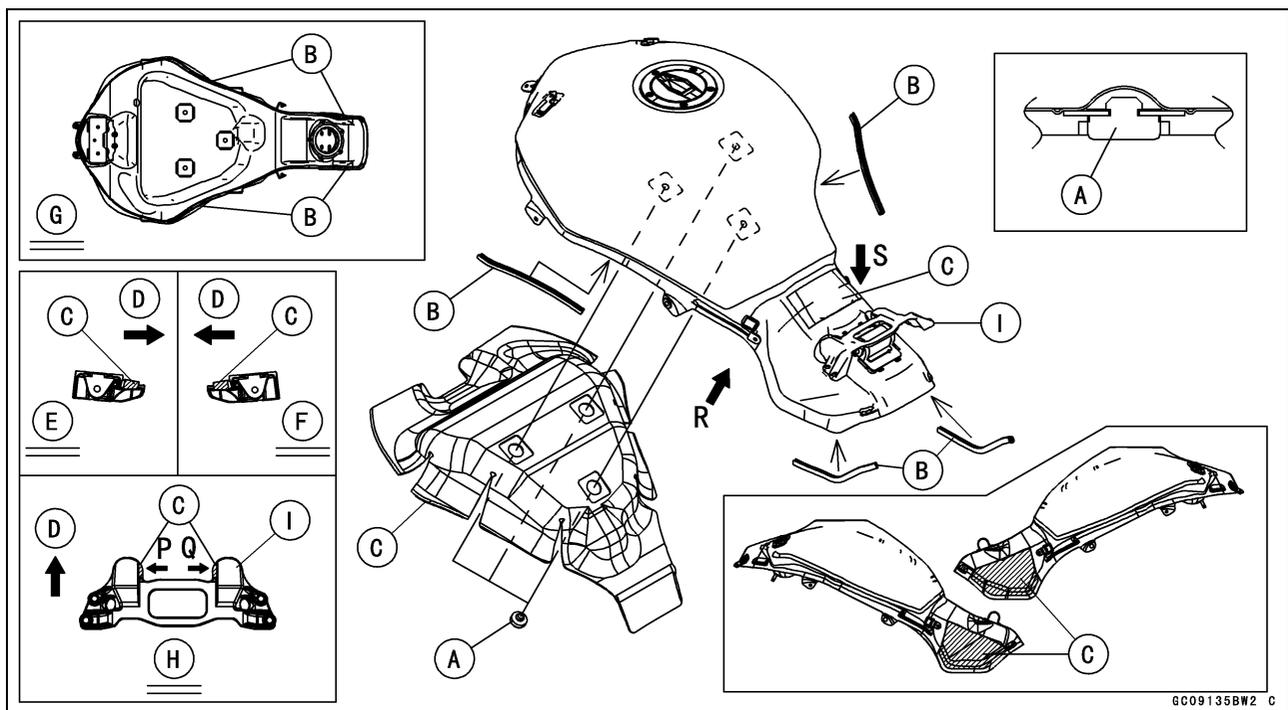


- Close the fuel tank cap.
- Remove the fuel tank, and place it on a flat surface.
- Do not apply the load to the fuel pipe of the fuel pump.
- Clean the pipe [A].
- Cover the pipe and the hose joint [B] with the vinyl bags [C] to keep it clean.



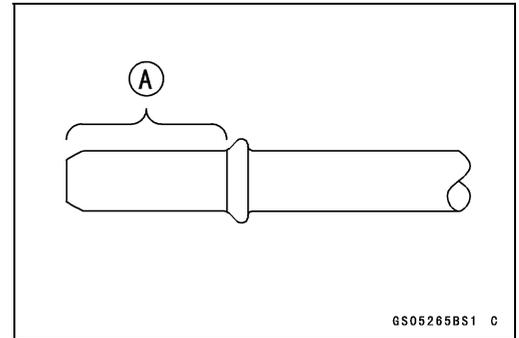
### Fuel Tank Installation

- Note the above WARNING (see Fuel Tank Removal).
  - Check that the dampers [A], trims [B] and pads [C] are in place on the frame and the fuel tank.
  - ★ If the dampers and trim are damaged or deteriorated, replace them.
- Front [D]  
Viewed from P [E]  
Viewed from Q [F]  
Viewed from R [G]  
Viewed from S [H]  
Bracket [I]

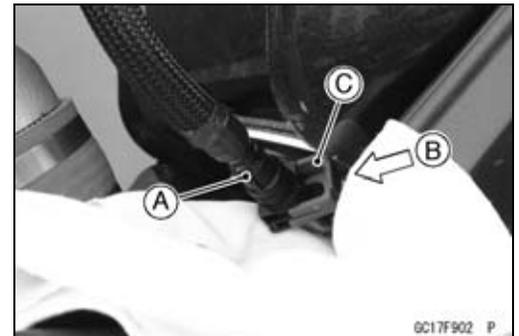


## Fuel Tank

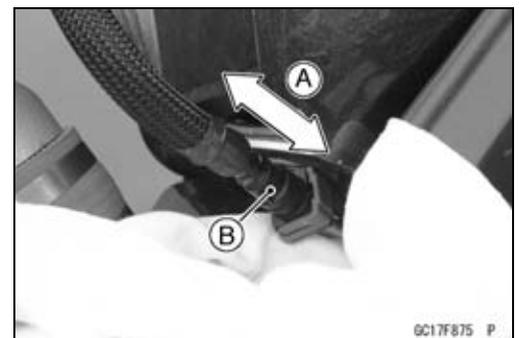
- Remove the vinyl bag on the pipe and fuel hose joint.
- Check the joint lock for deformation and wear.
- ★ If the joint lock is deformed, replace the fuel hose with a new one.
- Check that there are no flaws, burrs, and adhesion of foreign materials on the pipe [A].
- Apply engine oil to the pipe.



- Insert the fuel hose joint [A] straight onto the fuel outlet pipe until the hose joint clicks.
- Push [B] the joint lock [C] until the hose joint clicks.



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

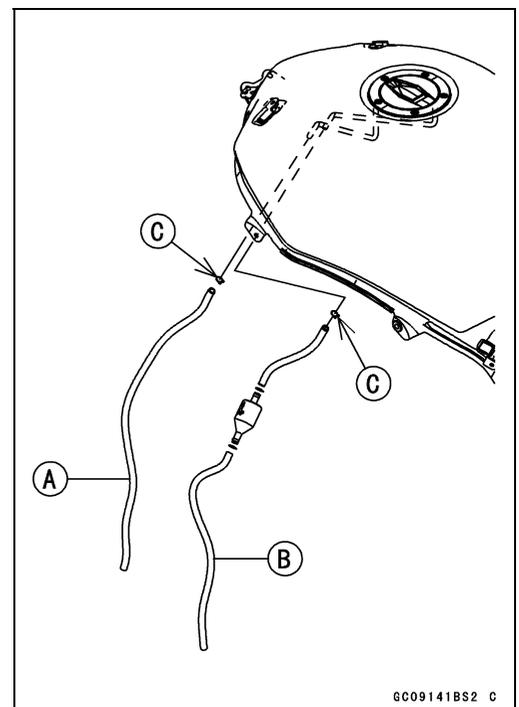


### **⚠ WARNING**

**Leaking fuel can cause a fire or explosion resulting in serious burns. Make sure the hose joint is installed correctly on the delivery pipe.**

★ If it comes off, reinstall the hose joint.

- Connect the breather hose [A] and the drain hose [B] so that the clamps [C] face rearward.
- Connect the fuel pump lead connector and the battery (-) terminal (see Battery Installation in the Electrical System chapter).
- Install the removed parts (see appropriate chapters).

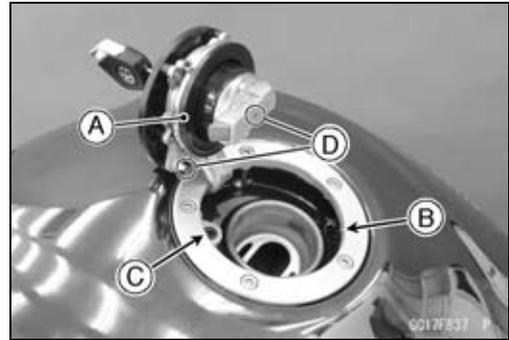


## 3-80 FUEL SYSTEM (DFI)

### Fuel Tank

#### **Fuel Tank and Cap Inspection**

- Open the tank cap.
- Visually inspect the gasket [A] on the tank cap for any damage.
- ★ Replace the tank cap if gasket is damaged.
- Check to see if the water drain pipe [B] and fuel breather pipe [C] 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.



#### **NOTICE**

**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 Cleaning**

#### **⚠ WARNING**

**Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the tank in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area. 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)

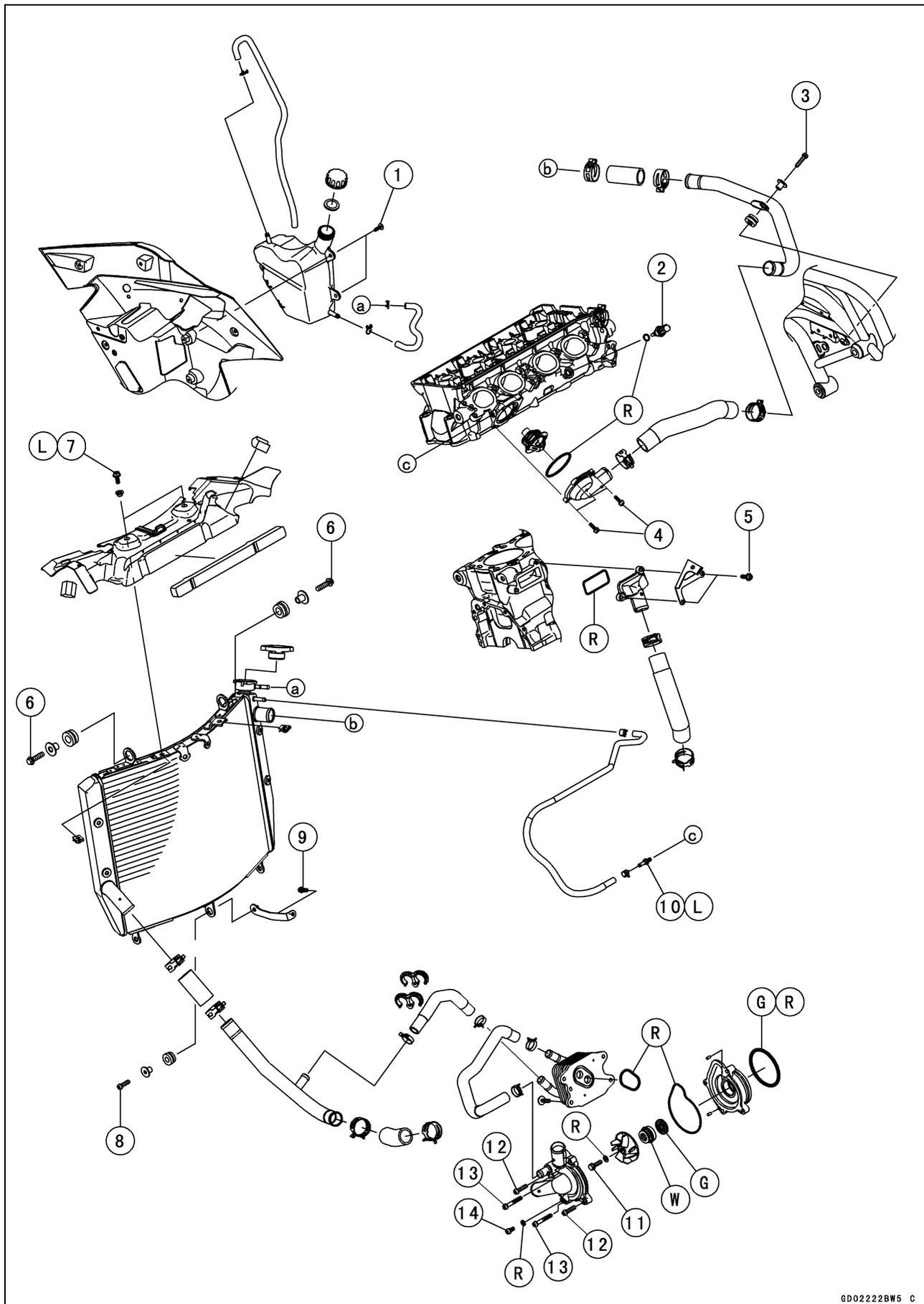
# Cooling System

## Table of Contents

|   |      |
|---|------|
| Exploded View.....                                  | 4-2  |
| Coolant Flow Chart.....                             | 4-4  |
| Specifications .....                                | 4-7  |
| Special Tools .....                                 | 4-8  |
| Coolant.....  | 4-9  |
| Coolant Deterioration Inspection.....               | 4-9  |
| Coolant Level Inspection.....                       | 4-9  |
| Coolant Draining .....                              | 4-9  |
| Coolant Filling .....                               | 4-9  |
| Pressure Testing .....                              | 4-9  |
| Cooling System Flushing .....                       | 4-10 |
| Coolant Reserve Tank Removal/Installation .....     | 4-10 |
| Water Pump.....                                     | 4-11 |
| Water Pump Removal.....                             | 4-11 |
| Water Pump Installation .....                       | 4-11 |
| Water Pump Inspection.....                          | 4-13 |
| Water Pump Impeller Disassembly/Assembly .....      | 4-13 |
| Water Pump Impeller Inspection .....                | 4-13 |
| Water Pump Housing Disassembly .....                | 4-13 |
| Water Pump Housing Assembly .....                   | 4-13 |
| Mechanical Seal Inspection .....                    | 4-14 |
| Radiator.....                                       | 4-15 |
| Radiator Removal .....                              | 4-15 |
| Radiator Installation .....                         | 4-15 |
| Radiator Inspection .....                           | 4-17 |
| Radiator Cap Inspection .....                       | 4-17 |
| Radiator Filler Neck Inspection .....               | 4-18 |
| Thermostat .....                                    | 4-19 |
| Thermostat Removal.....                             | 4-19 |
| Thermostat Installation.....                        | 4-19 |
| Thermostat Inspection .....                         | 4-20 |
| Hose and Pipes .....                                | 4-21 |
| Hose Installation .....                             | 4-21 |
| Hose Inspection .....                               | 4-21 |
| Water Temperature Sensor .....                      | 4-22 |
| Water Temperature Sensor Removal/Installation ..... | 4-22 |
| Water Temperature Sensor Inspection .....           | 4-22 |

# 4-2 COOLING SYSTEM

## Exploded View



**Exploded View**

| No. | Fastener                           | Torque |       |           | Remarks |
|-----|------------------------------------|--------|-------|-----------|---------|
|     |                                    | N·m    | kgf·m | ft·lb     |         |
| 1   | Coolant Reserve Tank Screws        | 1.2    | 0.12  | 11 in·lb  |         |
| 2   | Water Temperature Sensor           | 12     | 1.2   | 106 in·lb |         |
| 3   | Water Pipe Bolt                    | 10     | 1.0   | 89 in·lb  |         |
| 4   | Thermostat Housing Bolts           | 6.0    | 0.61  | 53 in·lb  |         |
| 5   | Water Hose Fitting Cover Bolts     | 10     | 1.0   | 89 in·lb  |         |
| 6   | Upper Radiator Mounting Bolts      | 15     | 1.5   | 11        |         |
| 7   | Radiator Cover Bolts               | 10     | 1.0   | 89 in·lb  | L       |
| 8   | Lower Radiator Mounting Bolt       | 10     | 1.0   | 89 in·lb  |         |
| 9   | Radiator Stay Bolt                 | 10     | 1.0   | 89 in·lb  |         |
| 10  | Water Hose Fitting                 | 10     | 1.0   | 89 in·lb  | L       |
| 11  | Water Pump Impeller Bolt           | 10     | 1.0   | 89 in·lb  |         |
| 12  | Water Pump Cover Bolts (L = 25 mm) | 10     | 1.0   | 89 in·lb  |         |
| 13  | Water Pump Cover Bolts (L = 40 mm) | 10     | 1.0   | 89 in·lb  |         |
| 14  | Coolant Drain Bolt                 | 10     | 1.0   | 89 in·lb  |         |

G: Apply grease.

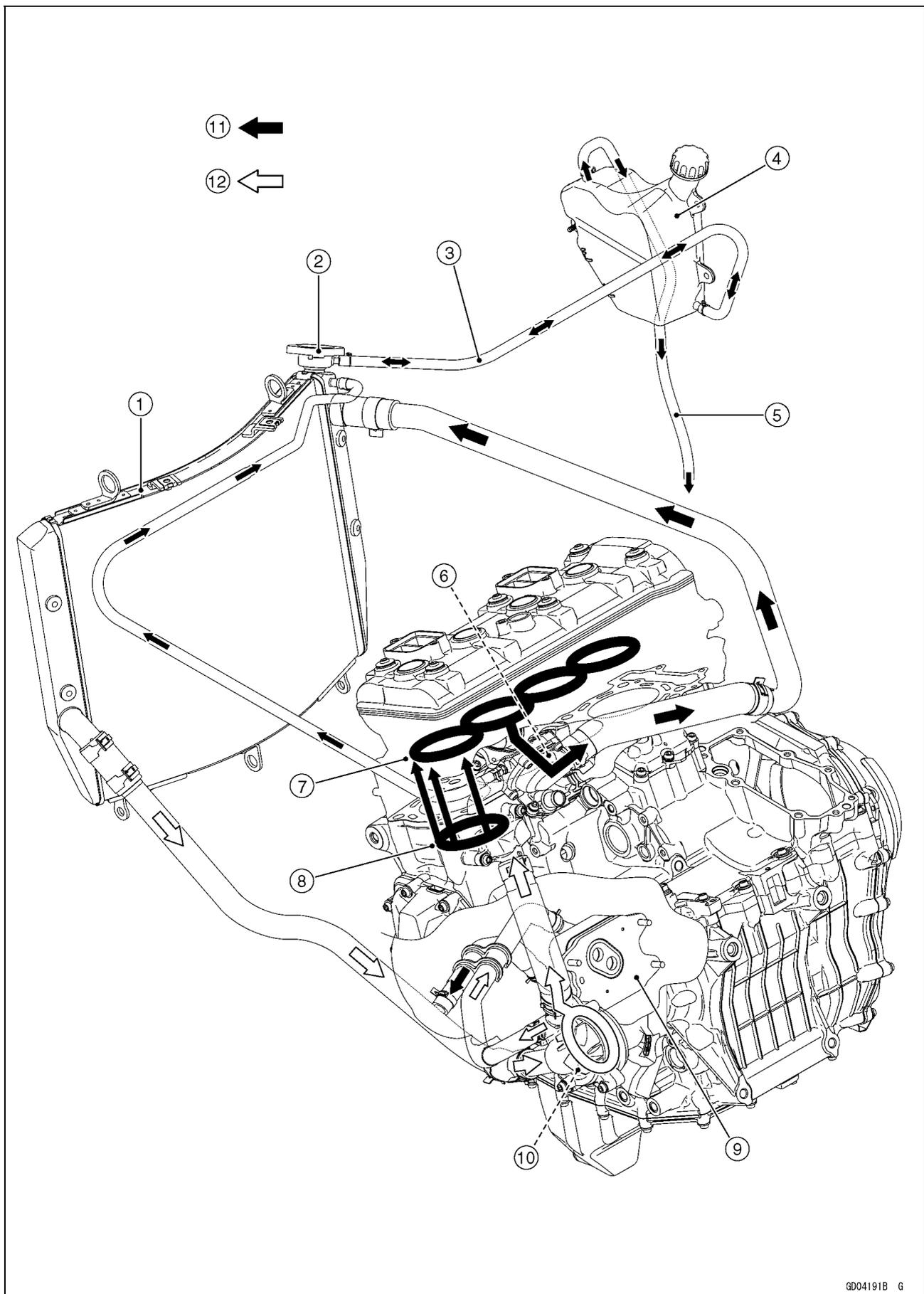
L: Apply a non-permanent locking agent.

R: Replacement Parts

W: Apply water.

# 4-4 COOLING SYSTEM

## Coolant Flow Chart



---

### Coolant Flow Chart

---

1. Radiator
2. Radiator Cap
3. Radiator Overflow Hose
4. Reserve Tank
5. Reserve Tank Overflow Hose
6. Thermostat
7. Cylinder Head Water Jacket
8. Cylinder Water Jacket
9. Oil Cooler
10. Water Pump
11. Hot Coolant
12. Cold Coolant

## 4-6 COOLING SYSTEM

---

### Coolant Flow Chart

---

Permanent type antifreeze is used as a coolant to protect the cooling system from rust and corrosion. When the engine starts, the water pump turns and the coolant circulates.

The thermostat is a wax pellet type which opens or closes with coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is 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.

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 107.9 ~ 137.3 kPa (1.10 ~ 1.40 kgf/cm<sup>2</sup>, 15.6 ~ 19.9 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 107.9 ~ 137.3 kPa (1.10 ~ 1.40 kgf/cm<sup>2</sup>, 15.6 ~ 19.9 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.

**Specifications**

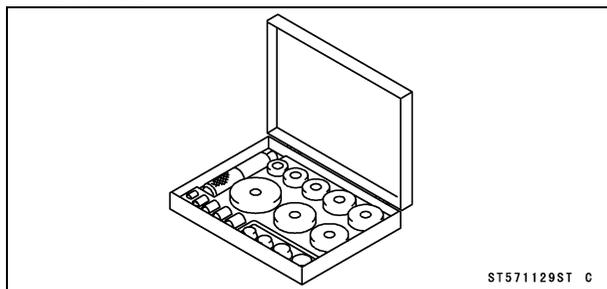
| <b>Item</b>  | <b>Standard</b>  |
|--|--|
| <p><b>Coolant Provided when Shipping</b></p> <p>Type (Recommended)</p> <p>Color</p> <p>Mixed Ratio</p> <p>Freezing Point</p> <p>Total Amount</p> | <p>Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)</p> <p>Green</p> <p>Soft water 50%, coolant 50%</p> <p>-35°C (-31°F)</p> <p>2.5 L (2.6 US qt) (Reserve tank full level, including radiator and engine)</p> |
| <p><b>Radiator Cap</b></p> <p>Relief Pressure</p>  | <p>107.9 ~ 137.3 kPa (1.10 ~ 1.40 kgf/cm<sup>2</sup>, 15.6 ~ 19.9 psi)</p>   |
| <p><b>Thermostat</b></p> <p>Valve Opening Temperature</p> <p>Valve Full Opening Lift</p>   | <p>58 ~ 62°C (136 ~ 144°F)</p> <p>8 mm (0.31 in.) or more @75°C (167°F)</p>  |

## 4-8 COOLING SYSTEM

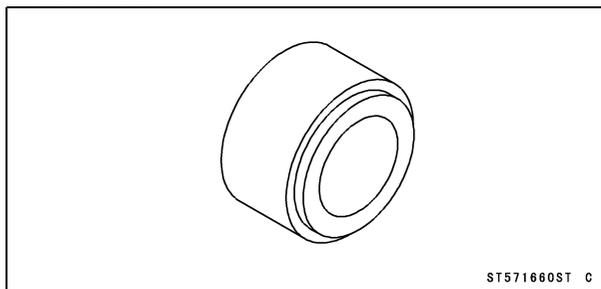
### Special Tools

---

**Bearing Driver Set:  
57001-1129**



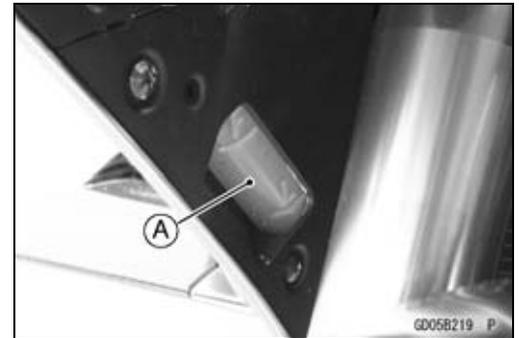
**Oil Seal Driver  $\phi 37.5$ :  
57001-1660**



## Coolant

### **Coolant Deterioration Inspection**

- 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.

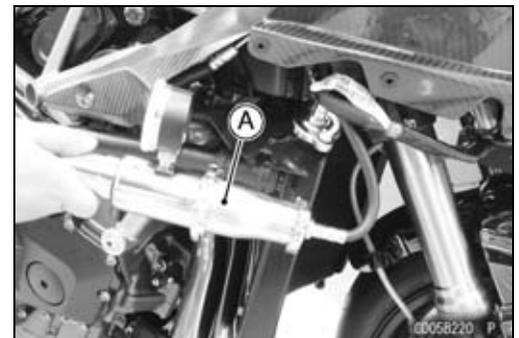
### **Pressure Testing**

- Inspect the radiator filler neck (see Radiator Filler Neck Inspection).
- Install a 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 137.3 kPa (1.40 kgf/cm<sup>2</sup>, 19.9 psi).



#### **NOTICE**

**During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 137.3 kPa (1.40 kgf/cm<sup>2</sup>, 19.9 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.
- Install the right middle fairing (see Middle Fairing Installation in the Frame chapter).

## 4-10 COOLING SYSTEM

---

### 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 considerably 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.

|                      |
|----------------------|
| <b><i>NOTICE</i></b> |
|----------------------|

|  |
|--|
| <p><b>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.</b></p> |
|--|

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

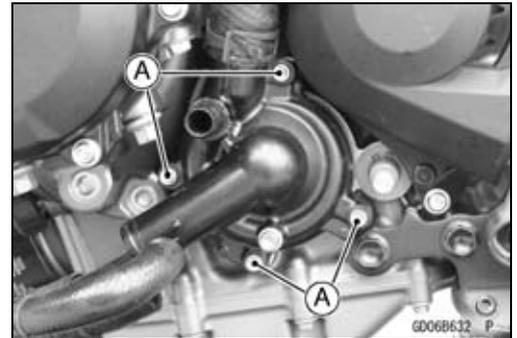
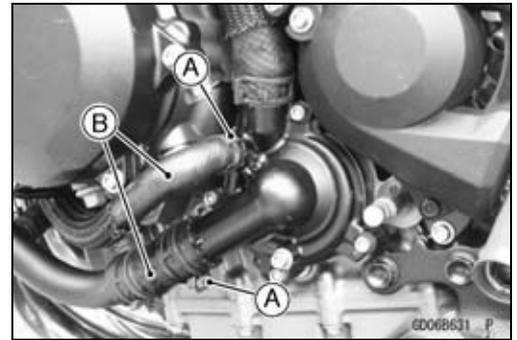
#### ***Coolant Reserve Tank Removal/Installation***

- Refer to the Middle Fairing Disassembly/Assembly in the Frame chapter.

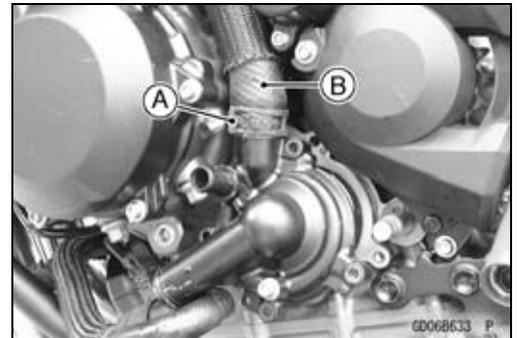
## Water Pump

### **Water Pump Removal**

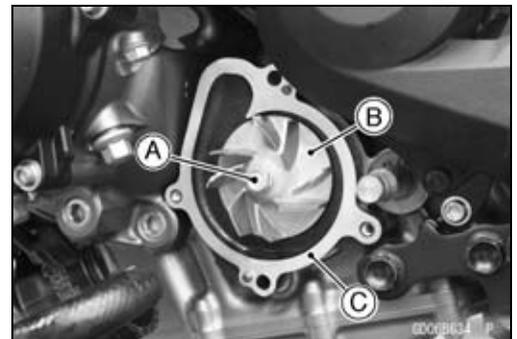
- Situate the motorcycle so that it is perpendicular to the ground to prevent from dropping out the oil pump parts.
- Drain:
  - Coolant (see Coolant Change in the Periodic Maintenance chapter)
  - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove the shift lever (see Shift Pedal Removal in the Crankshaft/Transmission chapter).
- Slide the clamps [A], and disconnect the water hoses [B].
- Remove the water pump cover bolts [A].



- Slide the clamp [A], and disconnect the water hose [B].

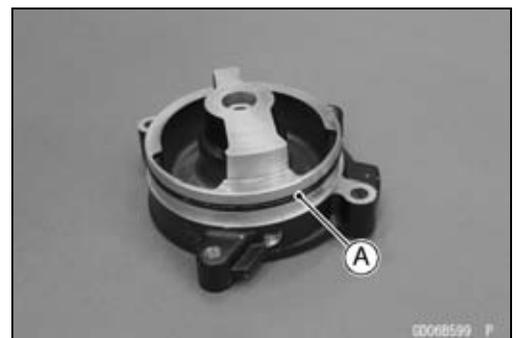


- Remove:
  - Water Pump Impeller Bolt [A] and Washer
  - Water Pump Impeller [B]
  - Water Pump Housing [C]



### **Water Pump Installation**

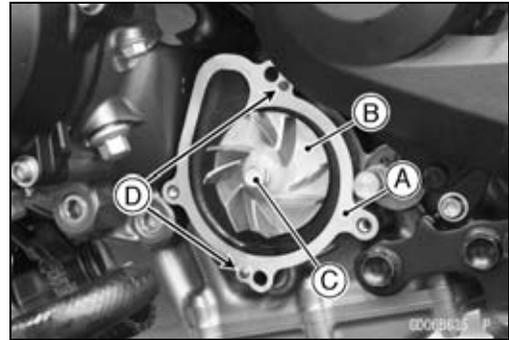
- Check that the oil pump is installed correctly.
- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring, and install it.



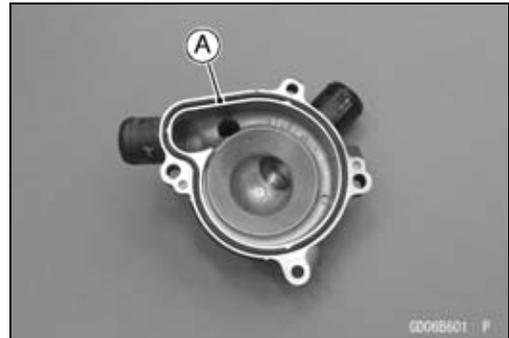
## 4-12 COOLING SYSTEM

### Water Pump

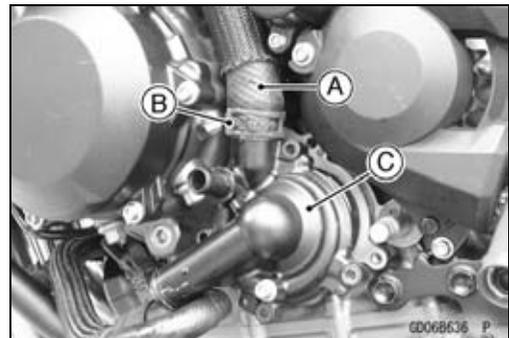
- Install:
  - Water Pump Housing [A]
  - Water Pump Impeller [B]
- Replace the washer with a new one, and install it.
- Tighten:
  - Torque - Water Pump Impeller Bolt [C]: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Be sure to install the dowel pins [D].



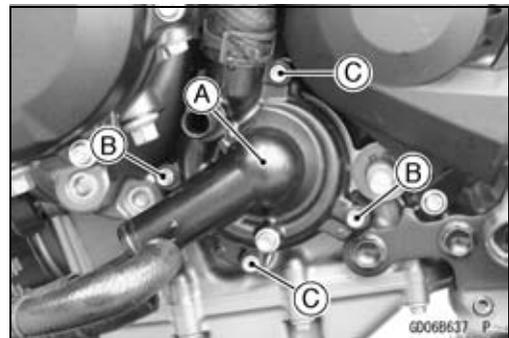
- Replace the O-ring [A] with a new one, and install it.



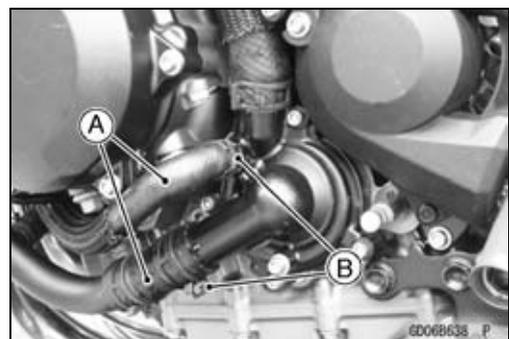
- Install the water hose [A] and clamp [B] to the water pump cover [C] (see Cable, Wire, and Hose Routing section in the Appendix chapter).



- Install:
  - Water Pump Cover [A]
  - Water Pump Cover Bolts (L = 25 mm) [B]
  - Water Pump Cover Bolts (L = 40 mm) [C]
- Tighten:
  - Torque - Water Pump Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**



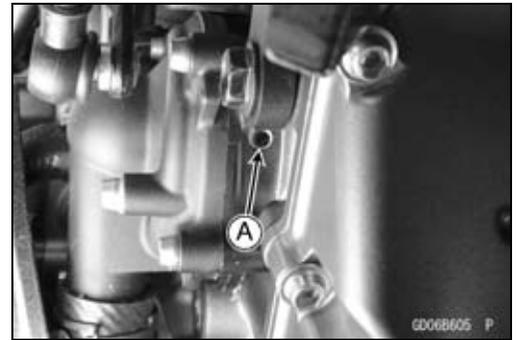
- Install the water hoses [A] and clamps [B] (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



## Water Pump

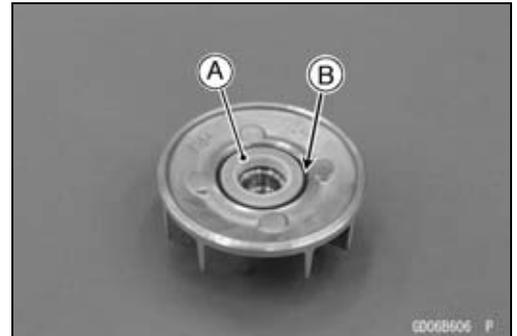
### Water Pump Inspection

- Check the drainage outlet passage [A] at the bottom of the water pump housing for coolant leaks.
- If a coolant leak or ooze is found, start the engine and check if the coolant leaks continuously.
- When coolant does not continuously leak, it is normal.
- ★ If the mechanical seal is damaged, the coolant continuously leaks through the drainage outlet passage. Replace the mechanical seal unit.
- ★ If the oil seal is damaged, engine oil leaks through the drainage outlet passage. Replace the oil seal.



### Water Pump Impeller Disassembly/Assembly

- Remove the water pump impeller (see Water Pump Removal).
- The sealing seat [A] and rubber seal [B] may be removed easily by hand.
- Apply water or coolant around the surfaces of the rubber seal and sealing seat.
- Install the rubber seal and sealing seat into the impeller by pressing them by hand until the seat stops at the bottom of the hole.
- Install the water pump impeller (see Water Pump Installation).



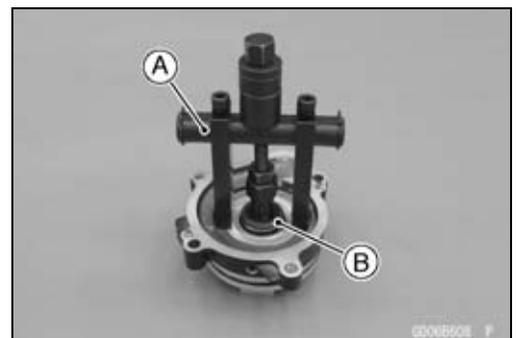
### Water Pump Impeller Inspection

- 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 impeller.



### Water Pump Housing Disassembly

- Remove the water pump housing (see Water Pump Removal).
- Using suitable tool [A], remove the mechanical seal [B] and oil seal from the water pump body.



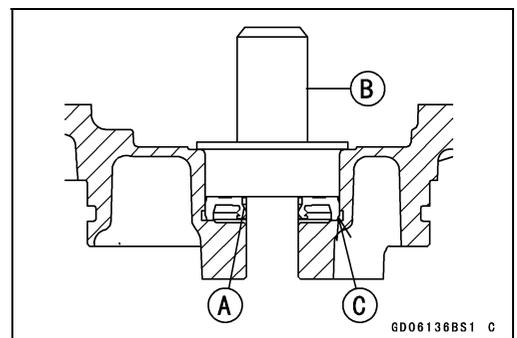
### Water Pump Housing Assembly

**NOTICE**

**Do not reuse the mechanical seal and oil seal.**

- Apply grease to the oil seal lips [A].
- Press the new oil seal into the housing with a bearing driver [B] until it stops at the bottom surface [C] of the housing.

**Special Tool - Bearing Driver Set: 57001-1129**



## 4-14 COOLING SYSTEM

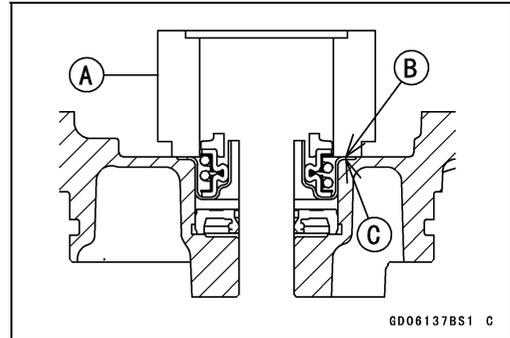
### Water Pump

#### NOTICE

Be careful not to damage the sealing surface of the mechanical seal.

- Press the new mechanical seal into the housing with the oil seal driver [A] until its flange [B] touches the surface [C] of the housing.

Special Tool - Oil Seal Driver  $\phi 37.5$ : 57001-1660



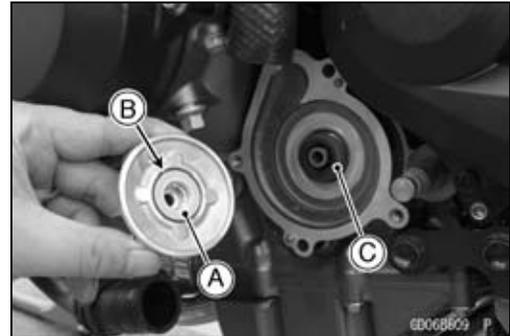
#### **Mechanical Seal Inspection**

- Remove the water pump impeller (see Water Pump Removal).
- Visually inspect the mechanical seal.
- ★ If any one of the parts is damaged, replace the mechanical seal as a unit.

Impeller Sealing Seat Surface [A]

Rubber Seal [B]

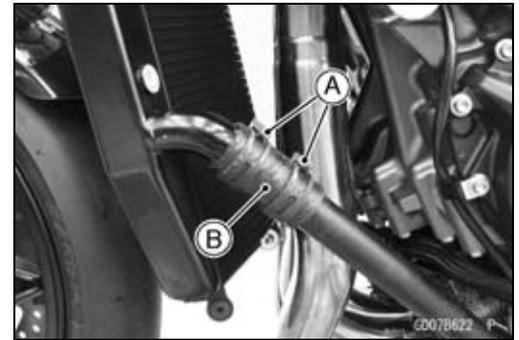
Mechanical Seal [C]



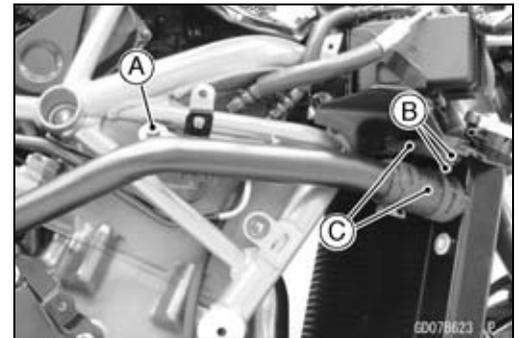
## Radiator

### Radiator Removal

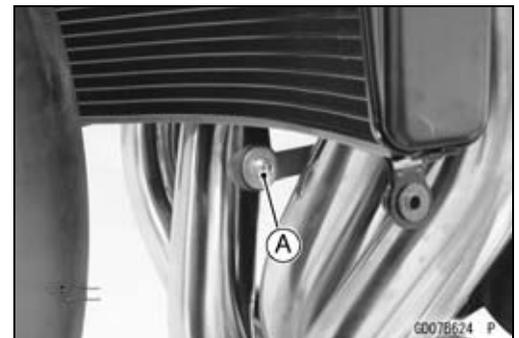
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the intake duct (see Intake Duct Removal in the Fuel System (DFI) chapter).
- Slide the clamps [A], and disconnect the water hose [B].



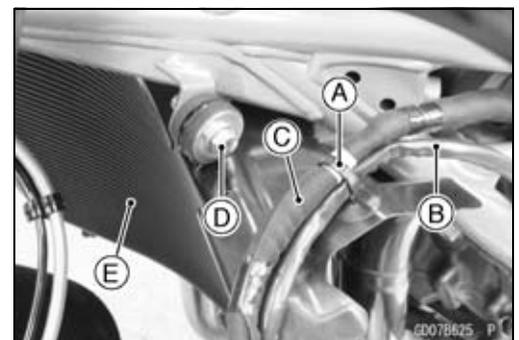
- Remove the water pipe bolt [A].
- Slide the clamps [B], and disconnect the water hoses [C].



- Remove the lower radiator mounting bolt [A].



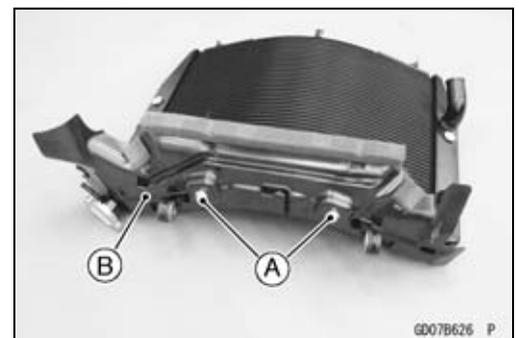
- Open the clamp [A], and clear the regulator/rectifier lead (to alternator) [B] and regulator/rectifier lead (to main harness) [C].
- Remove the upper radiator mounting bolt [D] (both sides), and remove the radiator [E].



**NOTICE**

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

- Remove:  
Radiator Cover Bolts [A]  
Collars  
Radiator Cover [B]



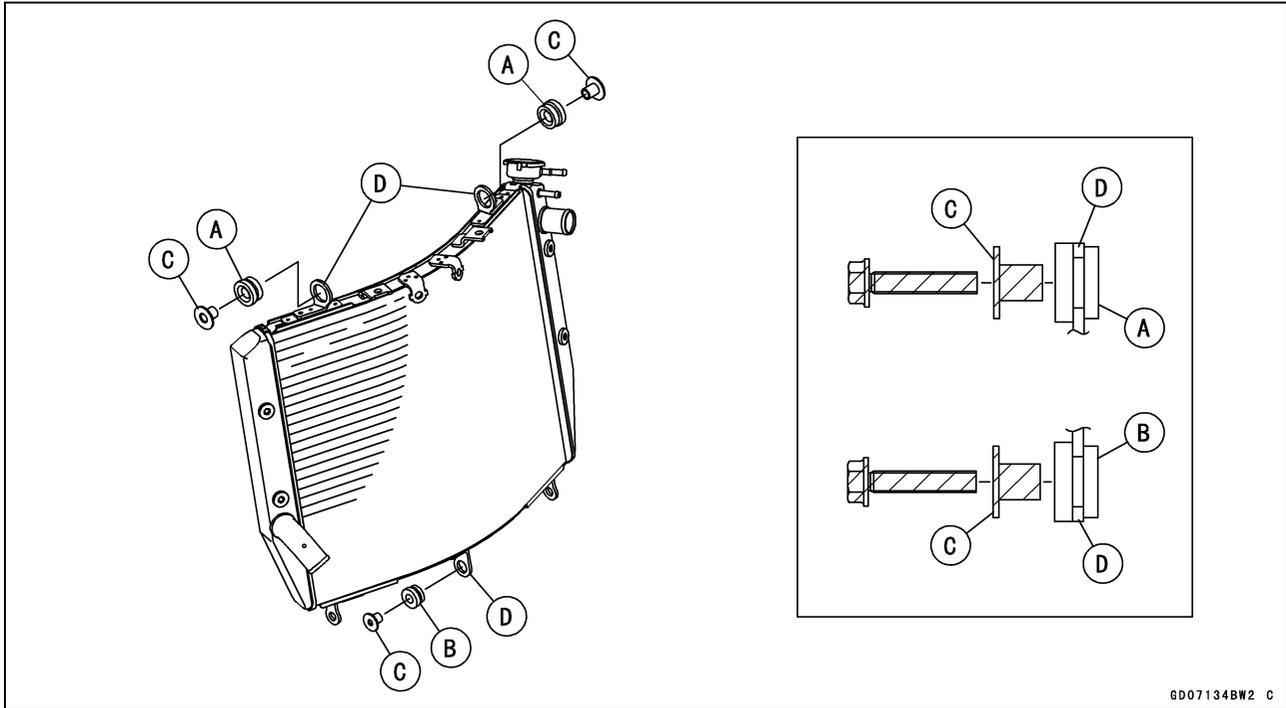
### Radiator Installation

- Installation is the reverse of removal.

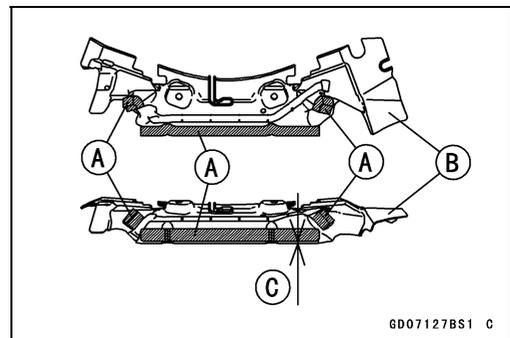
## 4-16 COOLING SYSTEM

### Radiator

- Install the rubber dampers [A], [B] and collars [C] as shown.
- Make sure that the dampers have been fitted in the brackets [D].
- Face the large diameter side of the damper to the collar.



- Check that the pads [A] are in place on the radiator cover [B].  
3 mm (0.12 in.) [C]
- ★ If the pads are damaged or deteriorated, replace them.
- Apply a non-permanent locking agent to the threads of the radiator cover bolts.
- Install the collars and tighten the radiator cover bolts.  
**Torque - Radiator Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

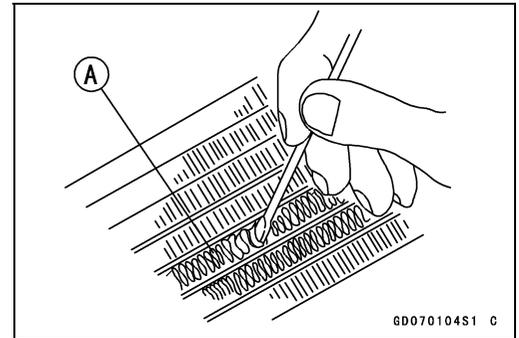


- Tighten the upper and lower radiator mounting bolts.  
**Torque - Upper Radiator Mounting Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**  
**Lower Radiator Mounting Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Run the regulator/rectifier leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the water hoses and clamps (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten the water pipe bolt.  
**Torque - Water Pipe Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Install the removed parts (see appropriate chapters).

## Radiator

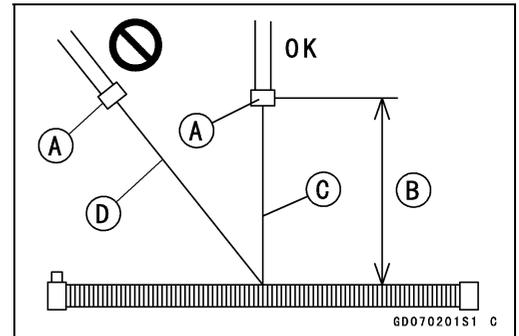
### Radiator Inspection

- 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.



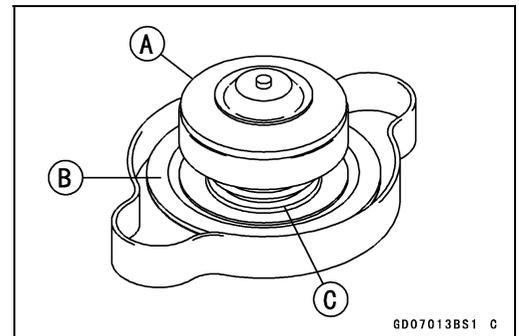
### NOTICE

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



### Radiator Cap Inspection

- Remove:
    - Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
    - Radiator Cap
  - Check the condition of the bottom [A] and top [B] valve seals and valve spring [C].
  - ★ If any one of them shows visible damage, replace the cap with a new one.
- Install the cap [A] on a cooling system pressure tester [B].



### NOTE

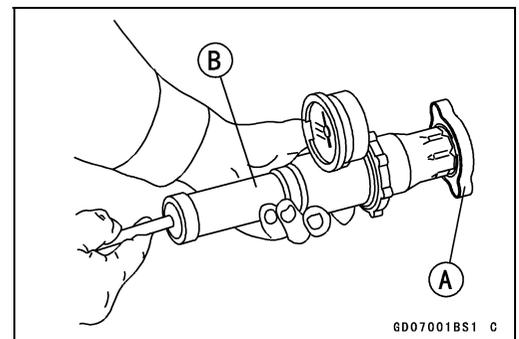
○ Wet the cap sealing surfaces with water or coolant to prevent pressure leaks.

- 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: 107.9 ~ 137.3 kPa (1.10 ~ 1.40 kgf/cm<sup>2</sup>, 15.6 ~ 19.9 psi)

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

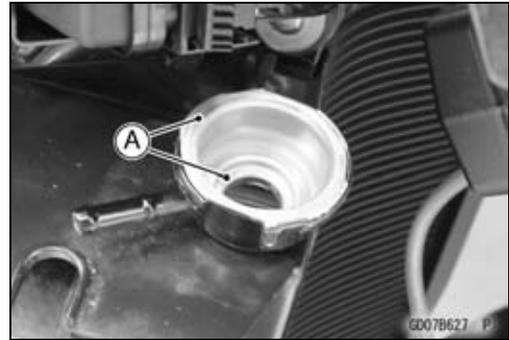


## 4-18 COOLING SYSTEM

### Radiator

#### *Radiator Filler Neck Inspection*

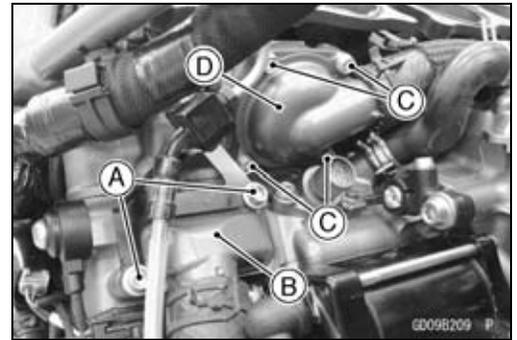
- Remove:
  - Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
  - Radiator Cap
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.



## Thermostat

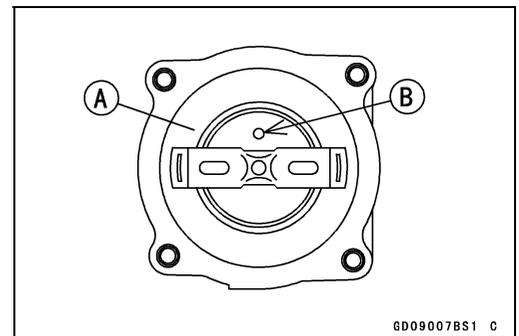
### Thermostat Removal

- Drain:  
Coolant (see Coolant Change in the Periodic Maintenance chapter)
- Remove:  
Blow-off Valve Hose Fitting Box (see Blow-off Valve Hose Fitting Box Removal in the Fuel System (DFI) chapter)  
Water Hose Fitting Cover Bolts [A]  
Water Hose Fitting Cover [B]  
Thermostat Housing Bolts [C]  
Thermostat Housing Cover [D]



### Thermostat Installation

- Install the thermostat [A] in the housing so that the air bleeder hole [B] is on top.

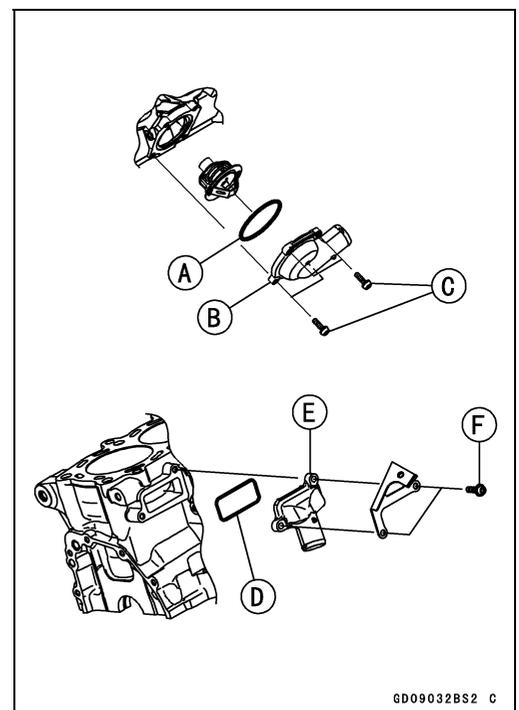


- Replace the thermostat housing cover O-ring [A] with a new one, and install it.
- Install the thermostat housing cover [B].

#### NOTE

○Note that the thermostat does not move at the place when installing the thermostat housing cover.

- Tighten:  
**Torque - Thermostat Housing Bolts [C]: 6.0 N·m (0.61 kgf·m, 53 in·lb)**
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Replace the water hose fitting cover O-ring [D] with a new one, and install it.
- Install the water hose fitting cover [E].
- Tighten:  
**Torque - Water Hose Fitting Cover Bolts [F]: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Fill the radiator with coolant (see Coolant Change in the Periodic Maintenance chapter).
- Install the removed parts (see appropriate chapters).

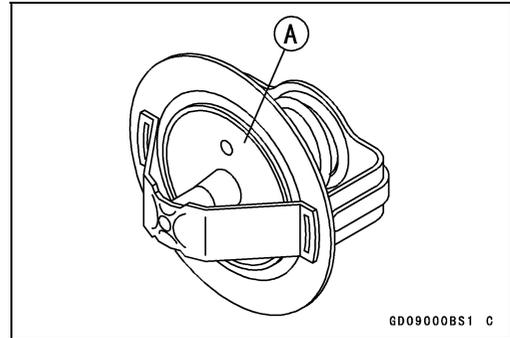


## 4-20 COOLING SYSTEM

### Thermostat

#### **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.



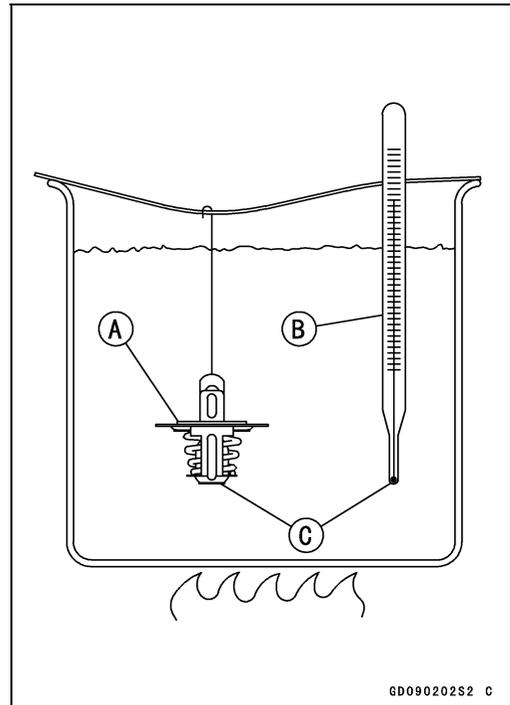
- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.
- The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water so that the heat sensitive 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**

Standard: 58 ~ 62°C (136 ~ 144°F)

#### **Valve Full Opening Lift**

Standard: 8 mm (0.31 in.) or more @75°C (167°F)



---

## Hose and Pipes

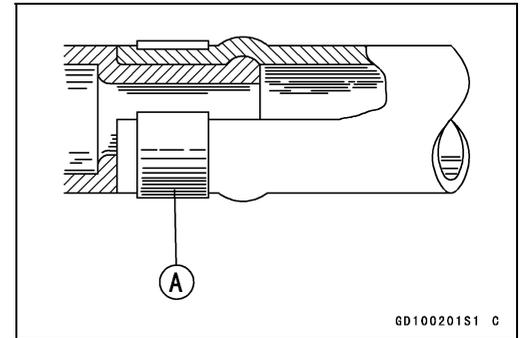
---

### ***Hose Installation***

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

### ***Hose Inspection***

- Refer to the Water Hose and Pipe Inspection in the Periodic Maintenance chapter.



## 4-22 COOLING SYSTEM

---

### Water Temperature Sensor

---

|                      |
|----------------------|
| <b><i>NOTICE</i></b> |
|----------------------|

|  |
|--|
| <p>The water temperature sensor should never be allowed to fall on a hard surface. Such a shock to the water temperature sensor can damage it.</p> |
|--|

#### ***Water Temperature Sensor Removal/Installation***

- Refer to the Water Temperature Sensor Removal/Installation in the Self-Diagnosis System chapter.

#### ***Water Temperature Sensor Inspection***

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

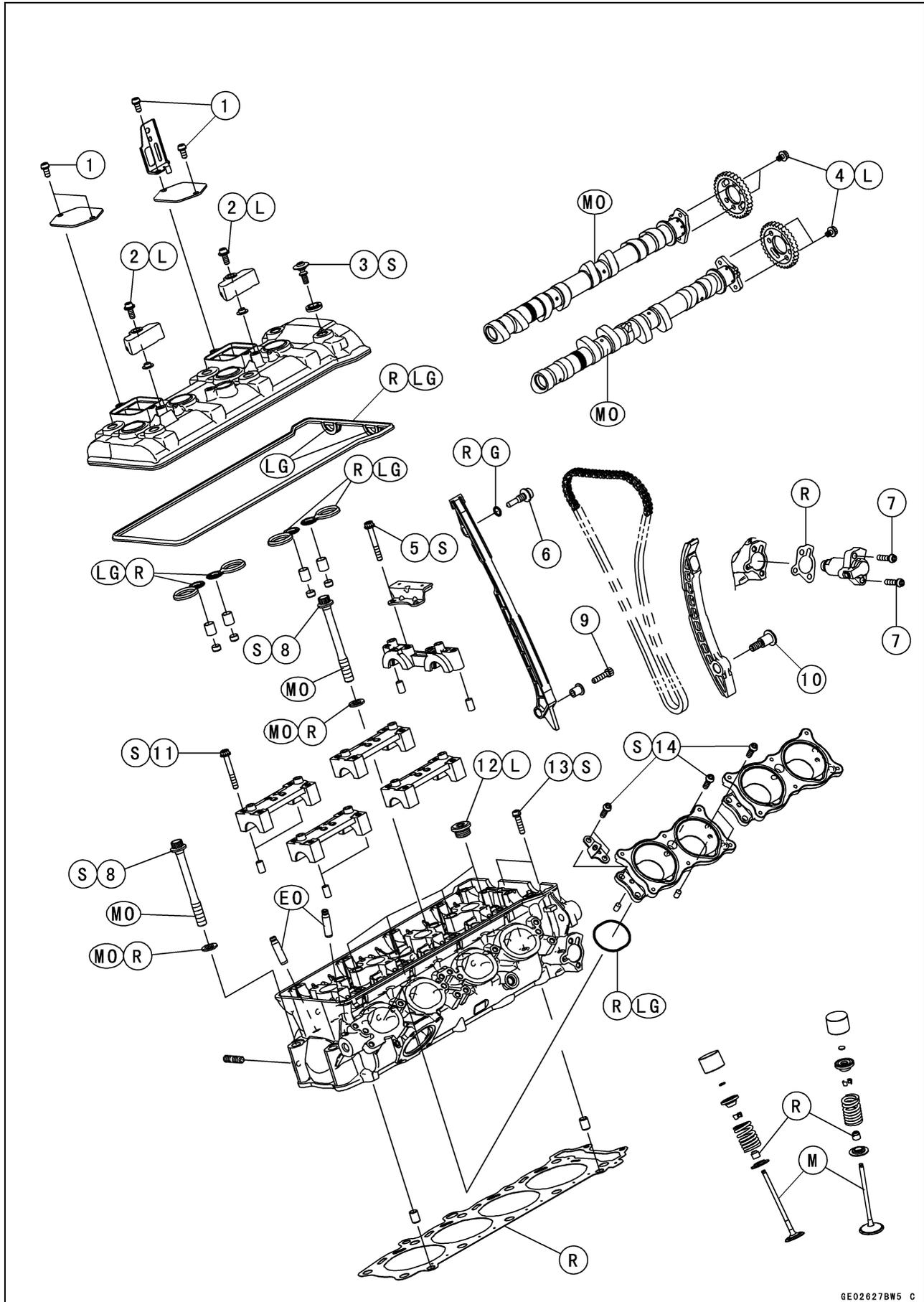
# Engine Top End

## Table of Contents

|                                    |      |                                   |      |
|------------------------------------|------|-----------------------------------|------|
| Exploded View .....                | 5-2  | Cylinder Head Warp Inspection ... | 5-23 |
| Specifications .....               | 5-6  | Valves .....                      | 5-24 |
| Special Tools and Sealants .....   | 5-7  | Valve Clearance Inspection .....  | 5-24 |
| Cylinder Head Cover .....          | 5-9  | Valve Clearance Adjustment .....  | 5-24 |
| Cylinder Head Cover Removal ...    | 5-9  | Valve Removal .....               | 5-24 |
| Cylinder Head Cover Installation . | 5-10 | Valve Installation .....          | 5-24 |
| Camshaft Chain Tensioner .....     | 5-12 | Valve Guide Removal .....         | 5-24 |
| Camshaft Chain Tensioner           |      | Valve Guide Installation .....    | 5-25 |
| Removal .....                      | 5-12 | Valve-to-Guide Clearance          |      |
| Camshaft Chain Tensioner           |      | Measurement (Wobble               |      |
| Installation .....                 | 5-12 | Method) .....                     | 5-25 |
| Camshaft, Camshaft Chain .....     | 5-14 | Valve Seat Inspection .....       | 5-26 |
| Camshaft Removal .....             | 5-14 | Valve Seat Repair .....           | 5-26 |
| Camshaft Installation .....        | 5-15 | Throttle Body Assy Holder.....    | 5-31 |
| Camshaft, Camshaft Cap Wear        |      | Throttle Body Assy Holder         |      |
| Inspection.....                    | 5-18 | Removal .....                     | 5-31 |
| Camshaft Runout Inspection.....    | 5-18 | Throttle Body Assy Holder         |      |
| Cam Wear Inspection .....          | 5-19 | Installation .....                | 5-31 |
| Camshaft Chain Removal .....       | 5-19 | Muffler.....                      | 5-32 |
| Camshaft Chain Installation .....  | 5-19 | Muffler Body Removal.....         | 5-32 |
| Cylinder Head.....                 | 5-20 | Muffler Body Installation.....    | 5-32 |
| Cylinder Compression               |      | Exhaust Pipe Removal.....         | 5-32 |
| Measurement .....                  | 5-20 | Exhaust Pipe Installation.....    | 5-33 |
| Cylinder Head Removal .....        | 5-21 | Exhaust Pipe Disassembly .....    | 5-34 |
| Cylinder Head Installation .....   | 5-21 | Exhaust Pipe Assembly .....       | 5-35 |

# 5-2 ENGINE TOP END

## Exploded View



## Exploded View

| No. | Fastener                                | Torque |       |           | Remarks |
|-----|---|--------|-------|-----------|---------|
|     |   | N·m    | kgf·m | ft·lb     |         |
| 1   | Cylinder Head Cap Bolts                 | 10     | 1.0   | 89 in·lb  |         |
| 2   | Sub Cover Bolts                         | 10     | 1.0   | 89 in·lb  | L       |
| 3   | Cylinder Head Cover Bolts               | 10     | 1.0   | 89 in·lb  | S       |
| 4   | Camshaft Sprocket Bolts                 | 15     | 1.5   | 11        | L       |
| 5   | Upper Camshaft Chain Guide Bolts        | 12     | 1.2   | 106 in·lb | S       |
| 6   | Front Camshaft Chain Guide Bolt (Upper) | 25     | 2.5   | 18        |         |
| 7   | Camshaft Chain Tensioner Mounting Bolts | 10     | 1.0   | 89 in·lb  |         |
| 8   | Cylinder Head Bolts (M10) (First)       | 30     | 3.1   | 22        | MO, S   |
|     | Cylinder Head Bolts (M10) (Final)       | 67     | 6.8   | 49        | MO, S   |
| 9   | Front Camshaft Chain Guide Bolt (Lower) | 12     | 1.2   | 106 in·lb |         |
| 10  | Rear Camshaft Chain Guide Bolt          | 25     | 2.5   | 18        |         |
| 11  | Camshaft Cap Bolts                      | 12     | 1.2   | 106 in·lb | S       |
| 12  | Cylinder Head Plugs                     | 19.6   | 2.00  | 14.5      | L       |
| 13  | Cylinder Head Bolts (M6)                | 12     | 1.2   | 106 in·lb | S       |
| 14  | Throttle Body Assy Holder Bolts         | 10     | 1.0   | 89 in·lb  | S       |

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil solution.

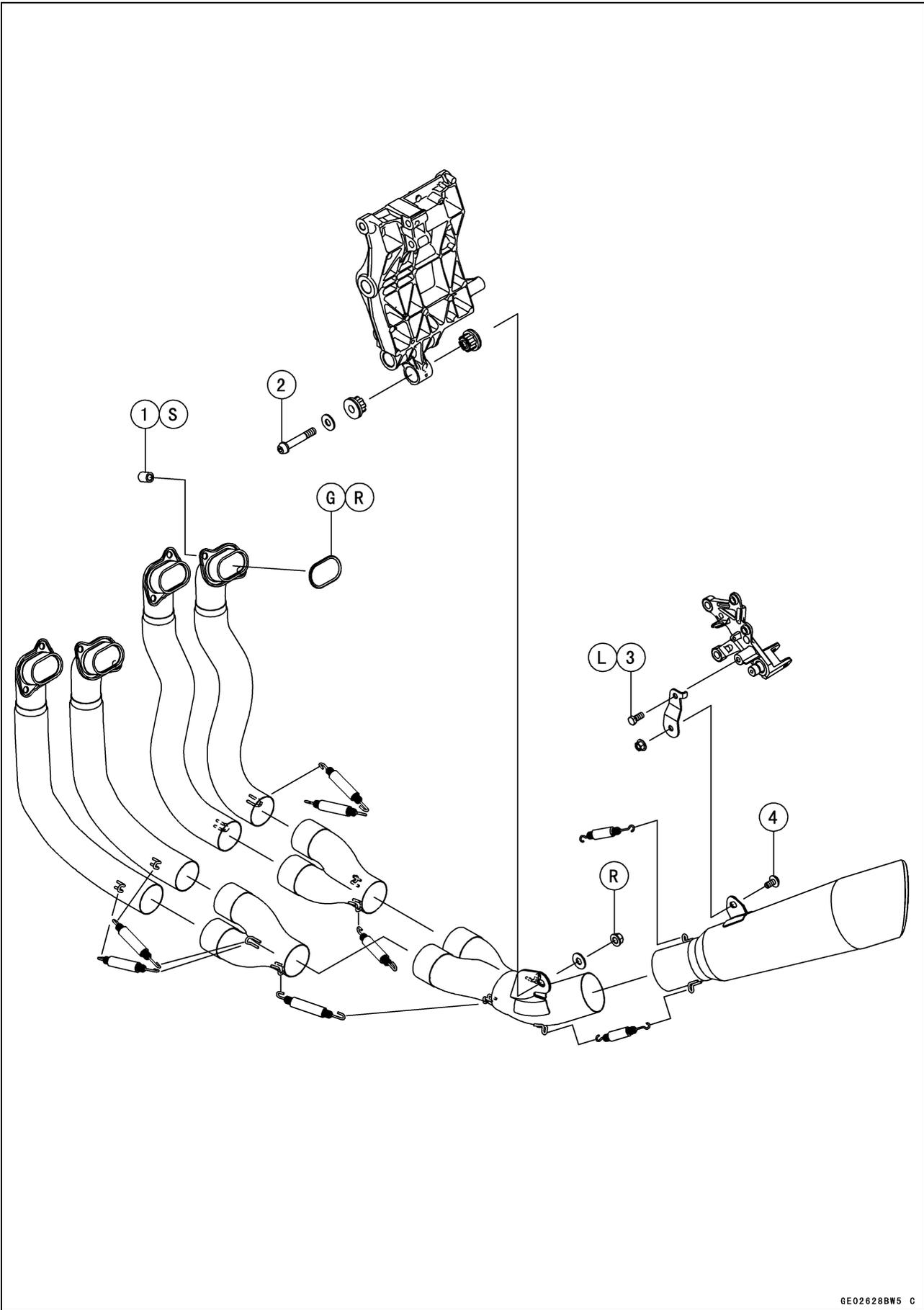
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)

R: Replacement Parts

S: Follow the specified tightening sequence.

# 5-4 ENGINE TOP END

## Exploded View



## Exploded View

| No. | Fastener                   | Torque |       |       | Remarks |
|-----|----------------------------|--------|-------|-------|---------|
|     |                            | N·m    | kgf·m | ft·lb |         |
| 1   | Exhaust Pipe Holder Nuts   | 17     | 1.7   | 13    | S       |
| 2   | Exhaust Pipe Mounting Bolt | 34     | 3.5   | 25    |         |
| 3   | Muffler Body Stay Bolt     | 17     | 1.7   | 13    | L       |
| 4   | Muffler Body Mounting Bolt | 25     | 2.5   | 18    |         |

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

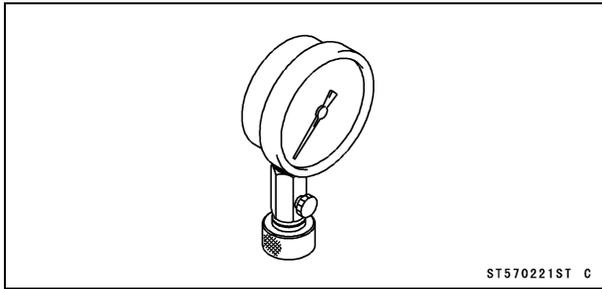
## 5-6 ENGINE TOP END

### Specifications

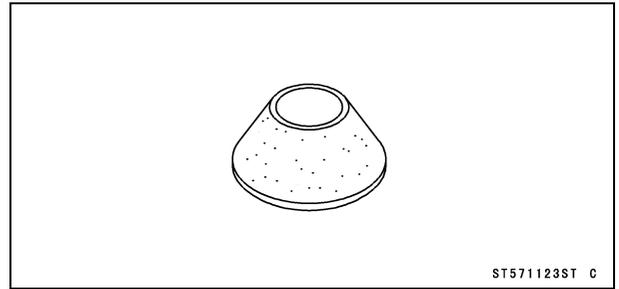
| Item   | Standard   | Service Limit           |
|--|--|-------------------------|
| <b>Camshafts</b>                             |  |                         |
| Cam Height:                                  |  |                         |
| Exhaust                                      | 34.443 ~ 34.557 mm (1.3560 ~ 1.3605 in.)   | 34.343 mm (1.3521 in.)  |
| Intake                                       | 35.443 ~ 35.557 mm (1.3954 ~ 1.3999 in.)   | 35.343 mm (1.3915 in.)  |
| Camshaft Journal/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 (0.94252 ~ 0.94338 in.)   | 23.91 mm (0.9413 in.)   |
| Camshaft Bearing Inside Diameter             | 24.000 ~ 24.021 mm (0.94488 ~ 0.94571 in.)   | 24.08 mm (0.9480 in.)   |
| Camshaft Runout                              | TIR 0.02 mm (0.0008 in.) or less   | TIR 0.1 mm (0.004 in.)  |
| <b>Cylinder Head</b>                         |  |                         |
| Cylinder Compression                         | (Usable Range) 623 ~ 988 kPa (6.35 ~ 10.1 kgf/cm <sup>2</sup> , 90.3 ~ 143 psi) @260 r/min (rpm) | — — —                   |
| Cylinder Head Warp                           | — — —  | 0.05 mm (0.002 in.)     |
| <b>Valves</b>                                |  |                         |
| Valve Clearance:                             |  |                         |
| Exhaust                                      | 0.33 ~ 0.38 mm (0.0130 ~ 0.0150 in.)   | — — —                   |
| Intake                                       | 0.15 ~ 0.22 mm (0.0059 ~ 0.0086 in.)   | — — —                   |
| Valve Head Thickness:                        |  |                         |
| Exhaust                                      | 0.8 mm (0.032 in.)   | 0.4 mm (0.02 in.)       |
| Intake                                       | 0.5 mm (0.020 in.)   | 0.3 mm (0.01 in.)       |
| Valve Stem Bend                              | TIR 0.01 mm (0.0004 in.) or less   | TIR 0.05 mm (0.002 in.) |
| Valve Stem Diameter:                         |  |                         |
| Exhaust                                      | 4.455 ~ 4.470 mm (0.1754 ~ 0.1760 in.)   | 4.44 mm (0.175 in.)     |
| Intake                                       | 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.)     |
| Intake                                       | 4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)   | 4.58 mm (0.180 in.)     |
| Valve/Valve Guide Clearance (Wobble Method): |  |                         |
| Exhaust                                      | 0.08 ~ 0.16 mm (0.0031 ~ 0.0063 in.)   | 0.35 mm (0.014 in.)     |
| Intake                                       | 0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.)   | 0.29 mm (0.011 in.)     |
| Valve Seat Cutting Angle                     | 45°, 32°, 60°  | — — —                   |
| Valve Seating Surface:                       |  |                         |
| Outside Diameter:                            |  |                         |
| Exhaust                                      | 25.2 ~ 25.4 mm (0.99 ~ 1.00 in.)   | — — —                   |
| Intake                                       | 29.4 ~ 29.6 mm (1.16 ~ 1.17 in.)   | — — —                   |
| Width:                                       |  |                         |
| Exhaust                                      | 1.6 ~ 2 mm (0.063 ~ 0.079 in.)   | — — —                   |
| Intake                                       | 0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)   | — — —                   |
| Valve Spring Free Length:                    |  |                         |
| Exhaust (Inner)                              | 37.1 mm (1.461 in.)  | 35.8 mm (1.41 in.)      |
| Intake (Inner)                               | 39.6 mm (1.559 in.)  | 38.0 mm (1.50 in.)      |

**Special Tools and Sealants**

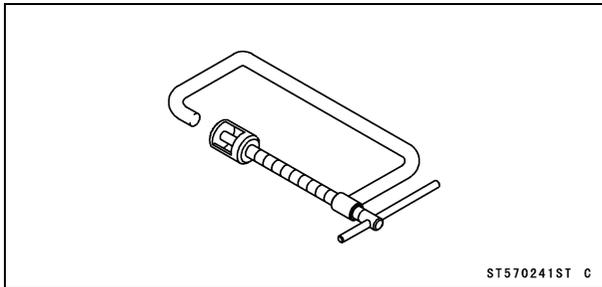
**Compression Gauge, 20 kgf/cm<sup>2</sup>:  
57001-221**



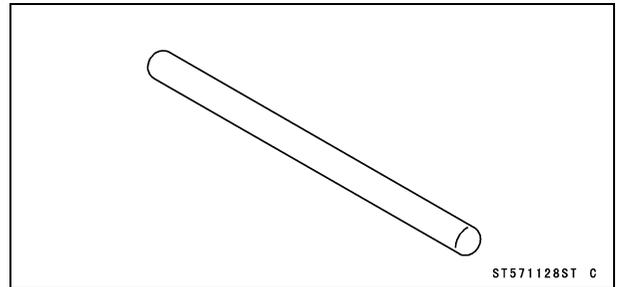
**Valve Seat Cutter, 60° - φ30:  
57001-1123**



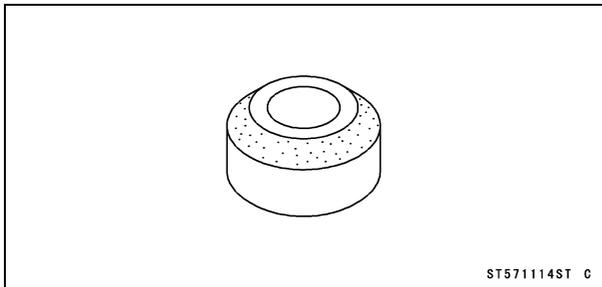
**Valve Spring Compressor Assembly:  
57001-241**



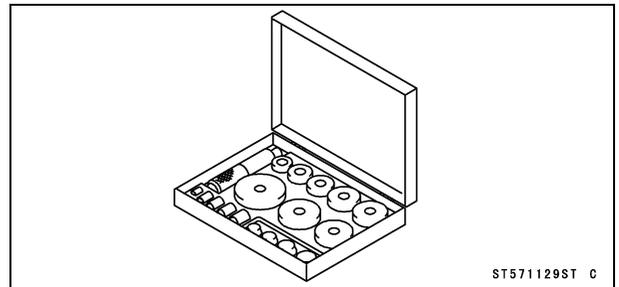
**Valve Seat Cutter Holder Bar:  
57001-1128**



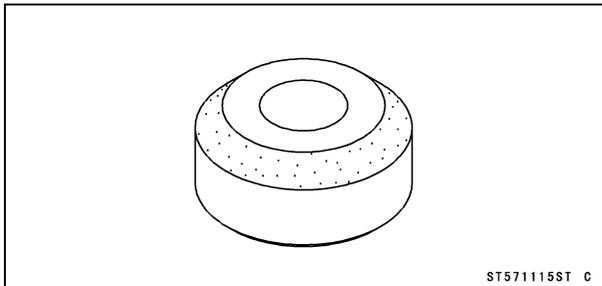
**Valve Seat Cutter, 45° - φ27.5:  
57001-1114**



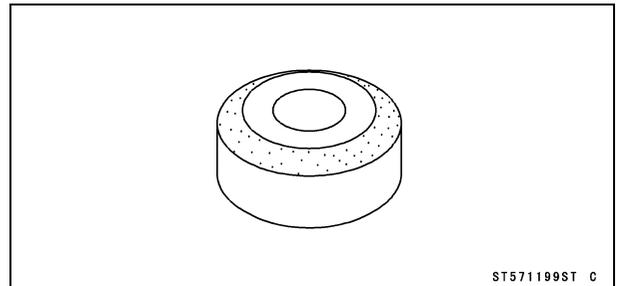
**Bearing Driver Set:  
57001-1129**



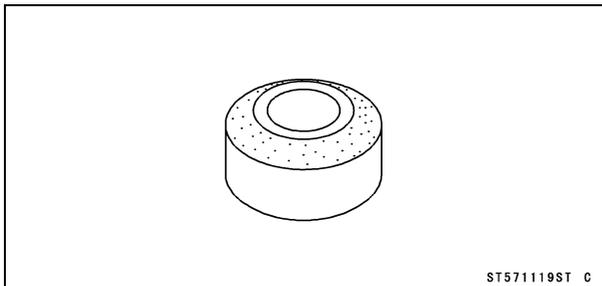
**Valve Seat Cutter, 45° - φ32:  
57001-1115**



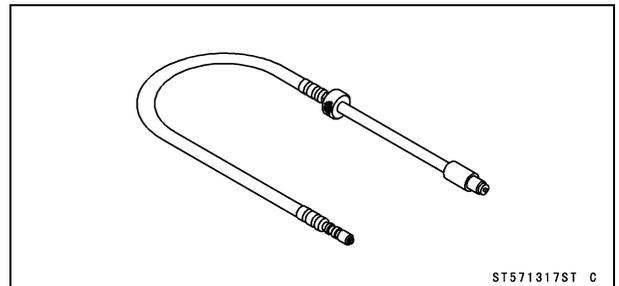
**Valve Seat Cutter, 32° - φ33:  
57001-1199**



**Valve Seat Cutter, 32° - φ28:  
57001-1119**



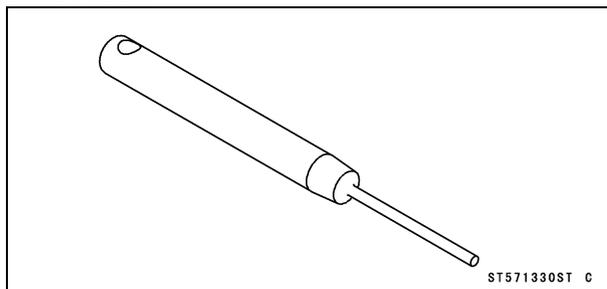
**Compression Gauge Adapter, M10 × 1.0:  
57001-1317**



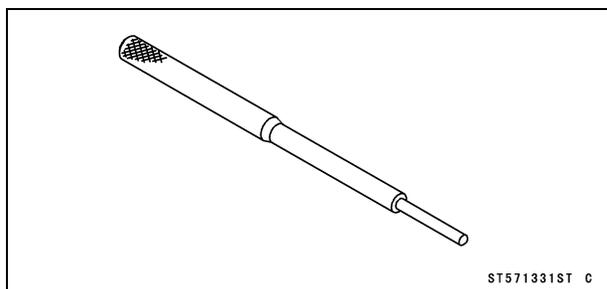
## 5-8 ENGINE TOP END

### Special Tools and Sealants

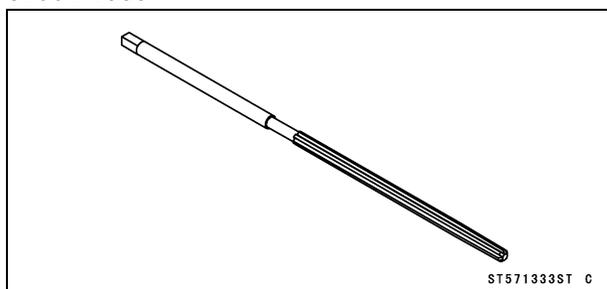
Valve Seat Cutter Holder,  $\phi 4.5$ :  
57001-1330



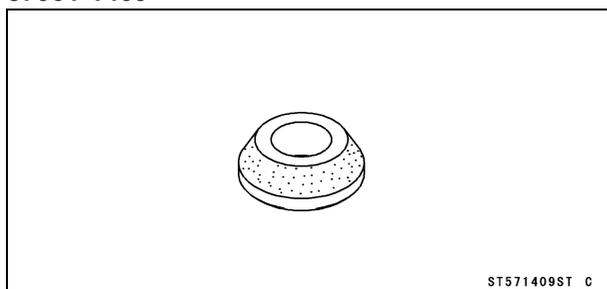
Valve Guide Arbor,  $\phi 4.5$ :  
57001-1331



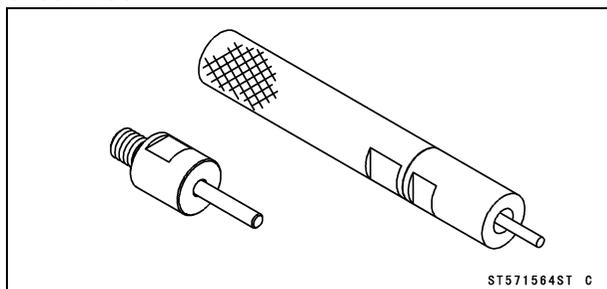
Valve Guide Reamer,  $\phi 4.5$ :  
57001-1333



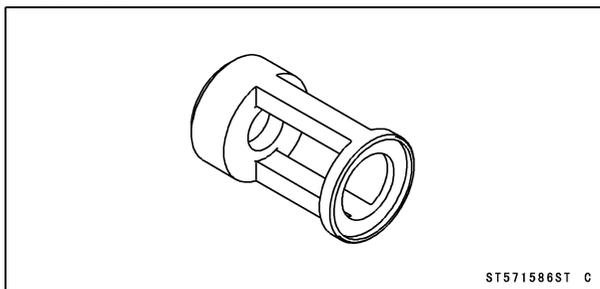
Valve Seat Cutter,  $60^\circ - \phi 27$ :  
57001-1409



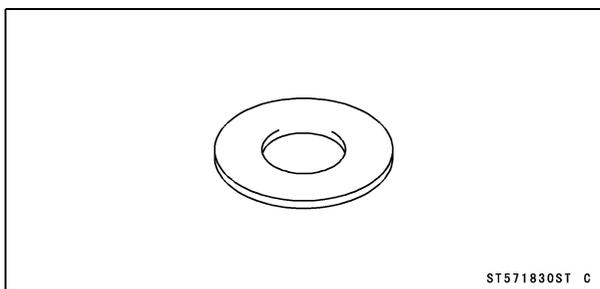
Valve Guide Driver:  
57001-1564



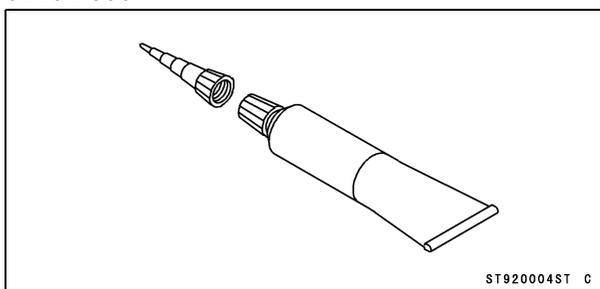
Valve Spring Compressor Adapter,  $\phi 24$ :  
57001-1586



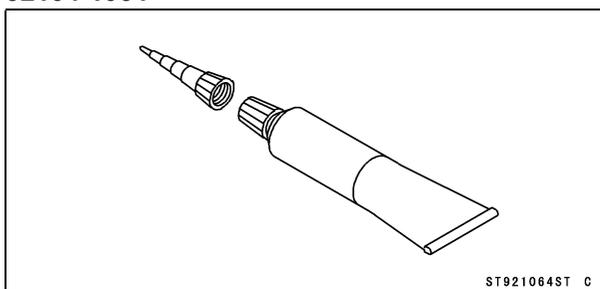
Spacer,  $\phi 9.6$ :  
57001-1830



Liquid Gasket, TB1211F:  
92104-0004



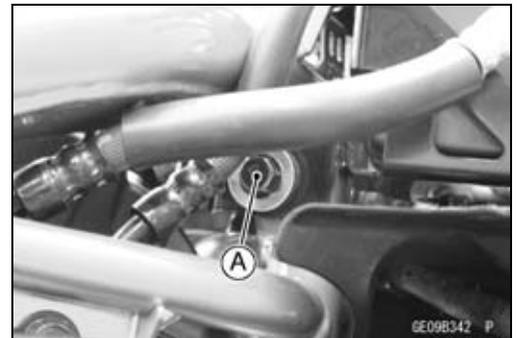
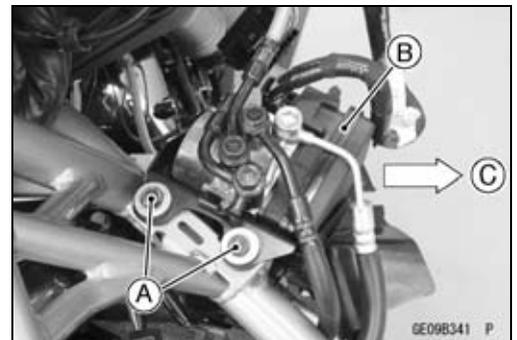
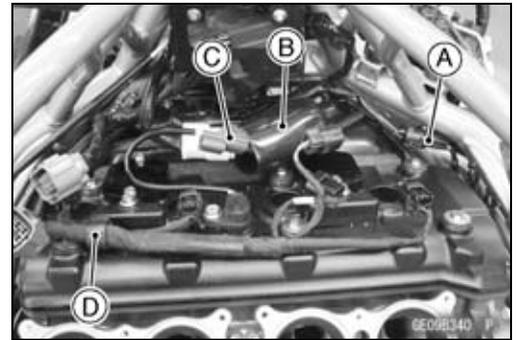
Liquid Gasket, TB1216B:  
92104-1064



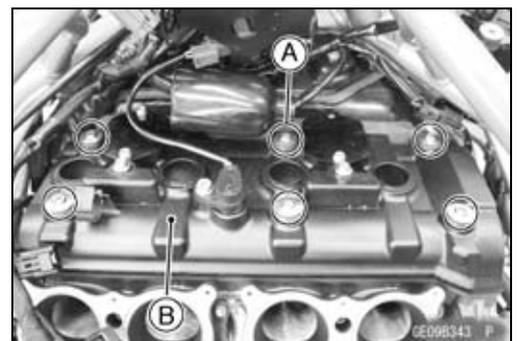
## Cylinder Head Cover

### Cylinder Head Cover Removal

- Remove:
  - Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
  - Relay Box (see Relay Box Removal in the Electrical System chapter)
  - Purge Valve (see Purge Valve (for Supercharger) Removal in the Self-Diagnosis System chapter)
  - 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 crankshaft sensor lead connector [A] from the bracket.
- Slide the dust cover [B] and disconnect the camshaft position sensor connector [C].
- Open the clamp [D].
- Remove the bolts [A] and move the KIBS hydraulic unit [B] rightward [C].



- Remove:
  - Cylinder Head Cover Bolts [A] with Rubber Washers
  - Cylinder Head Cover [B]

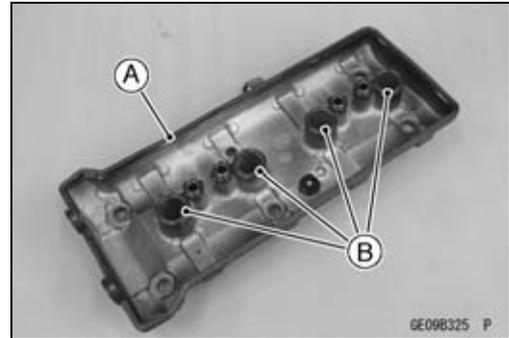


## 5-10 ENGINE TOP END

### Cylinder Head Cover

#### Cylinder Head Cover Installation

- Replace the cylinder head cover gasket [A] and plug hole gaskets [B] with new ones.
- Using a high flash-point solvent, clean off any oil or dirt that may be on the mating surface. Dry them with a clean cloth.

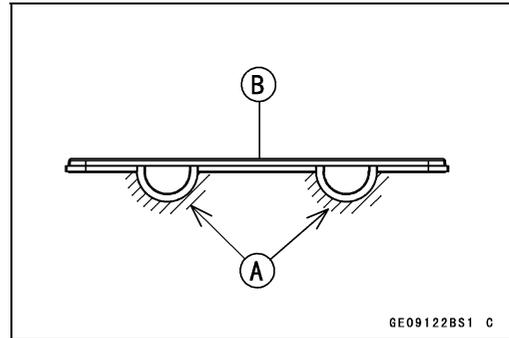


- Apply liquid gasket [A] to the cylinder head cover gasket [B] as shown.

Sealant - Liquid Gasket, TB1216B: 92104-1064

#### NOTE

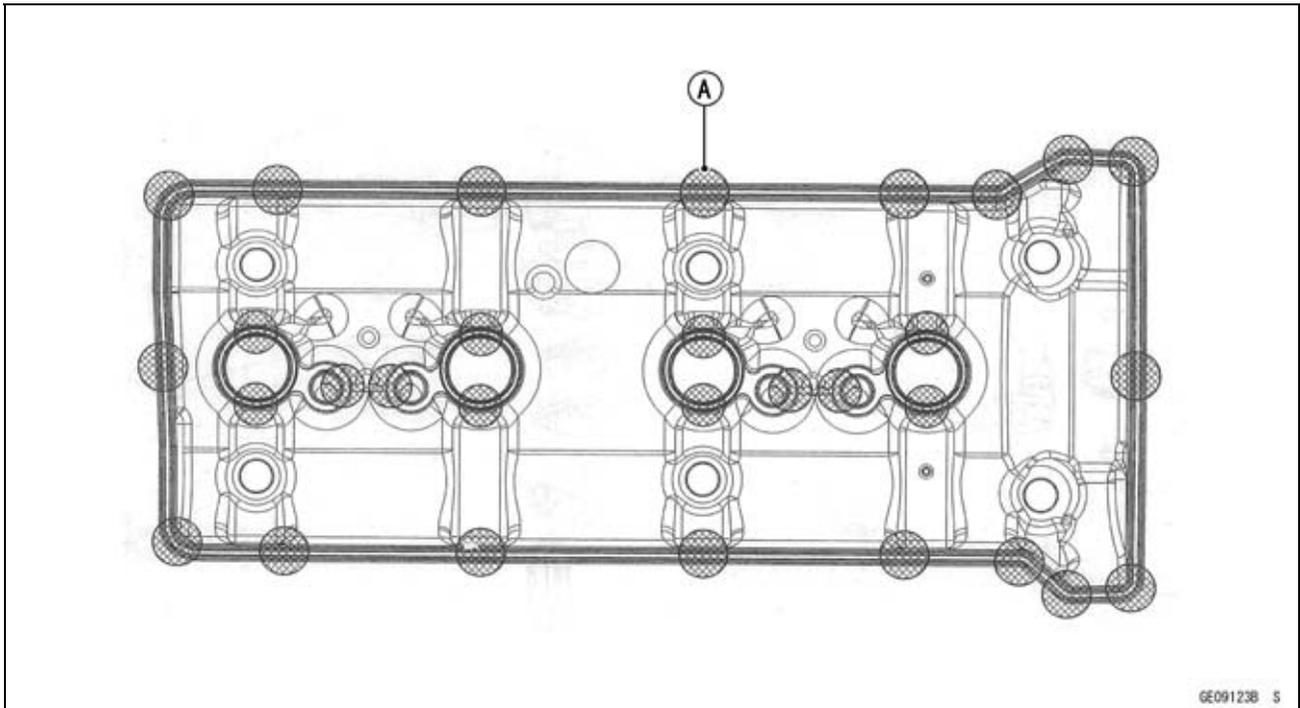
○When the liquid gasket is applied to the parts, finish the part assembling before the liquid gasket starts curing (within 20 minutes after the liquid gasket is applied).



- Apply liquid gasket [A] to the cylinder head cover.

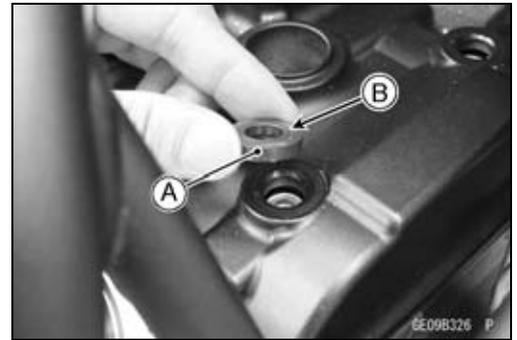
Sealant - Liquid Gasket, TB1211F: 92104-0004

- Install the gaskets to the cylinder head cover.



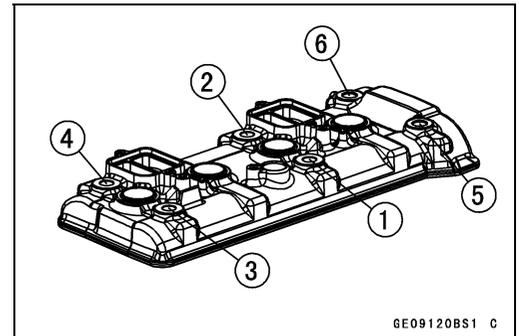
## Cylinder Head Cover

- Install the cylinder head cover with the gaskets.
- Install the rubber washers [A] with the metal side [B] faces upward.



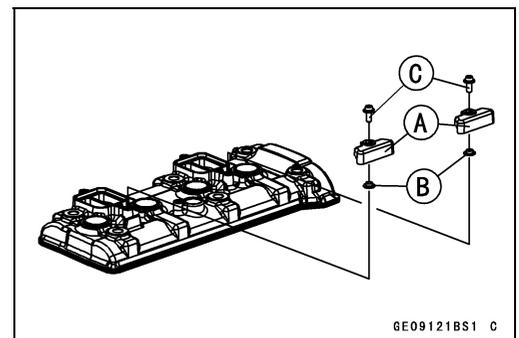
- Tighten the cover bolts following the specified tightening sequence [1 ~ 6].

**Torque - Cylinder Head Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**



- When installing the sub covers [A], note the following.
- Install:
  - Collars [B]
  - Sub Covers
- Apply a non-permanent locking agent to the threads of the sub cover bolts [C], and tighten it.

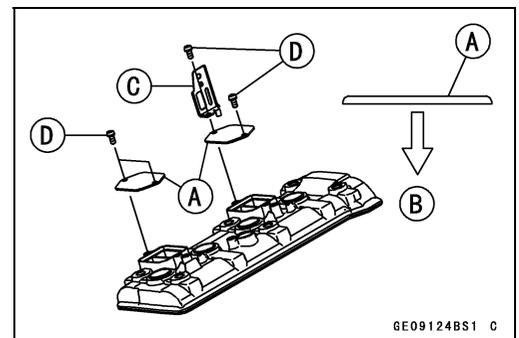
**Torque - Sub Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**



- When installing the cylinder head caps [A], note the following.
- Install:
  - Cylinder Head Cover Side [B]

- Install:
  - Cylinder Head Caps
  - Bracket [C]
- Tighten:

**Torque - Cylinder Head Cap Bolts [D]: 10 N·m (1.0 kgf·m, 89 in·lb)**



- Install the removed parts (see appropriate chapters).

## 5-12 ENGINE TOP END

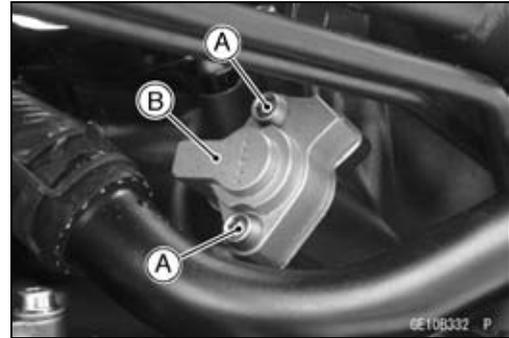
### Camshaft Chain Tensioner

#### Camshaft Chain Tensioner Removal

##### NOTICE

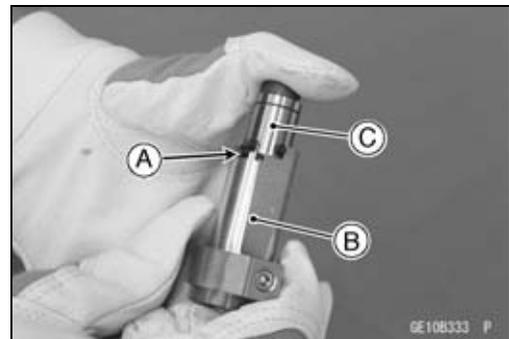
Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing, and damage the valves.

- Remove:
  - Camshaft Chain Tensioner Mounting Bolts [A]
  - Camshaft Chain Tensioner [B]



#### Camshaft Chain Tensioner Installation

- Opening the snap ring [A], release it and turn the tensioner body [B] clockwise while holding the push rod [C].

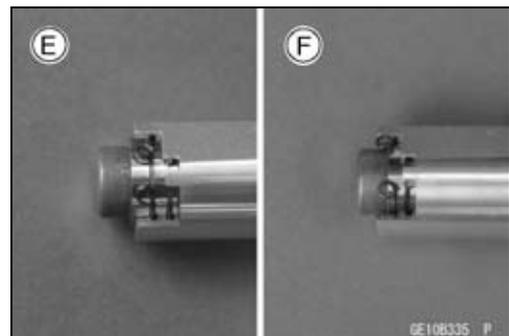
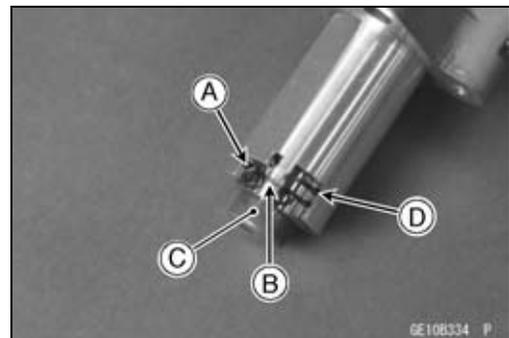


- Turning the tensioner body clockwise, slide the stopper [A] into the groove [B] of the push rod [C].

##### NOTE

○ Be careful not to fit the snap ring [D] into the groove.

- Correct [E]
- Incorrect [F]

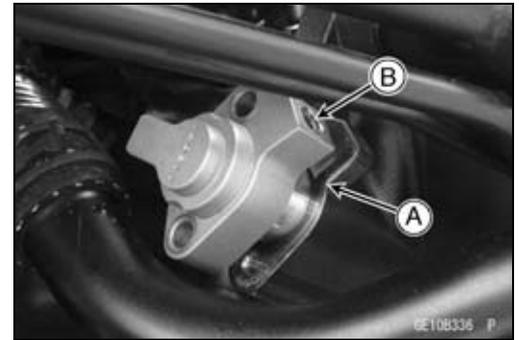


## Camshaft Chain Tensioner

- Replace the gasket [A] with a new one.
- Install the tensioner body so that the plug [B] faces upward.
- Tighten:  
**Torque - Camshaft Chain Tensioner Mounting Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.

### NOTE

- *You hear the sound from which the push rod moves out.*
- *If you do not hear the sound, reassemble the camshaft chain tensioner.*



### NOTICE

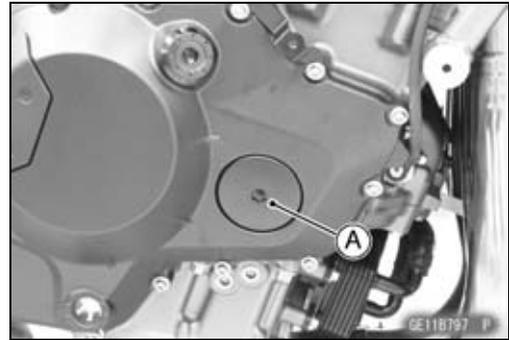
**If you start the engine in case that the sound can not be heard, the engine may be damaged.**

## 5-14 ENGINE TOP END

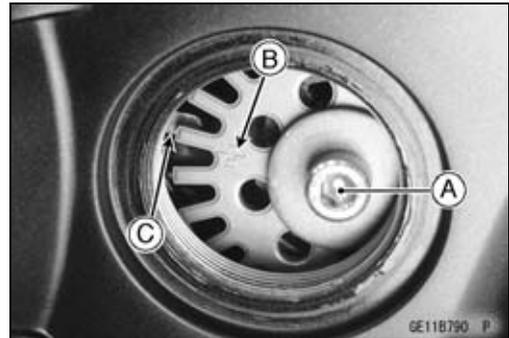
### Camshaft, Camshaft Chain

#### Camshaft Removal

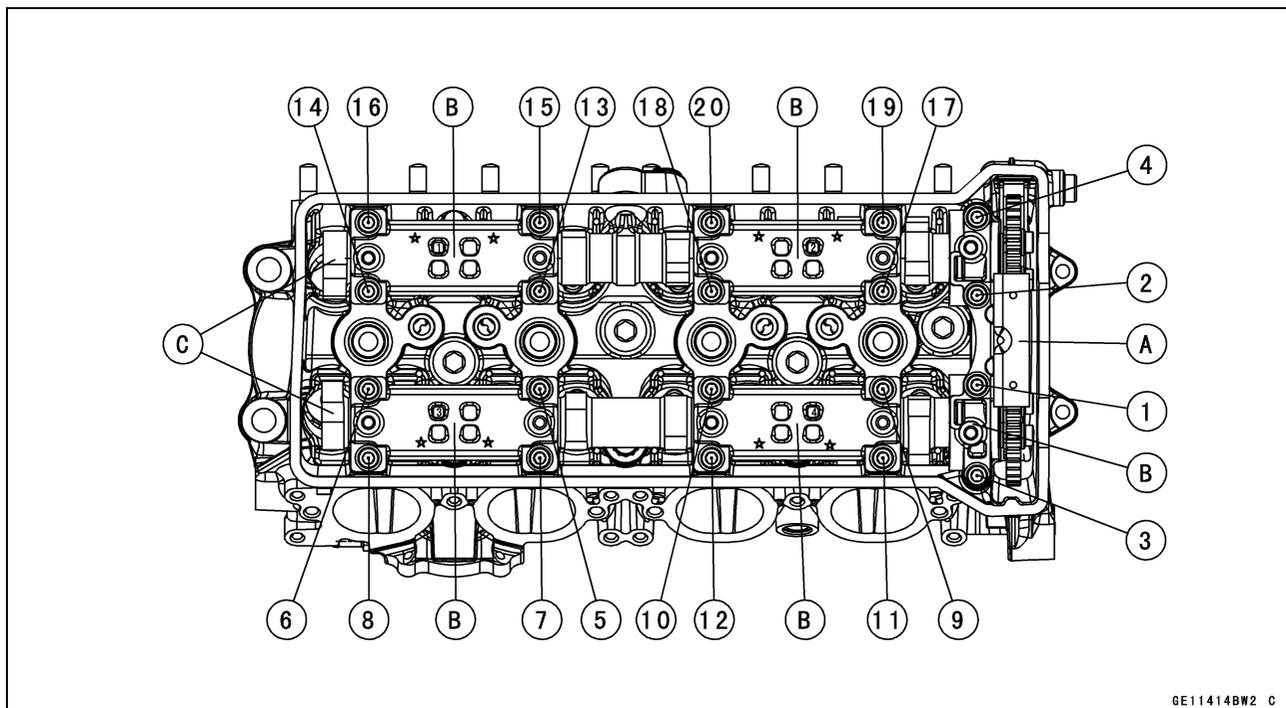
- Remove the cylinder head cover (see Cylinder Head Cover Removal).
- Remove the crankshaft timing plug [A] on the clutch cover.



- Using a wrench on the timing rotor bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the timing rotor is aligned with the mating surface [C] of the crankcase.



- Remove the camshaft chain tensioner (see Camshaft Chain Tensioner Removal).
- Loosen the upper camshaft chain guide bolts and camshaft cap bolts gradually and evenly as shown sequence [1 ~ 20], and remove them.
- Remove:
  - Upper Camshaft Chain Guide [A]
  - Camshaft Caps [B]
  - Camshafts [C]

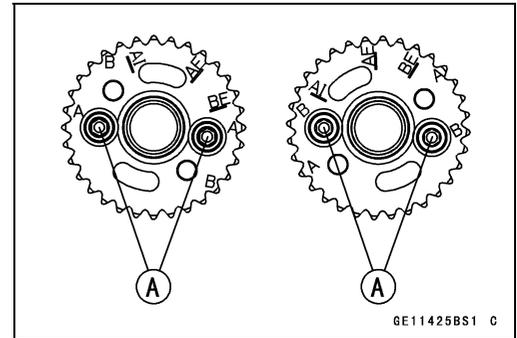


## Camshaft, Camshaft Chain

- Remove:
  - Camshaft Sprocket Bolts [A]
  - Camshaft Sprockets

### NOTICE

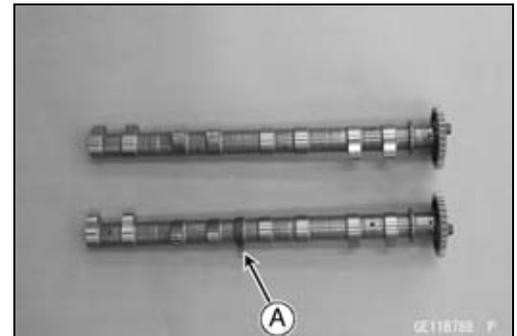
The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.



### Camshaft Installation

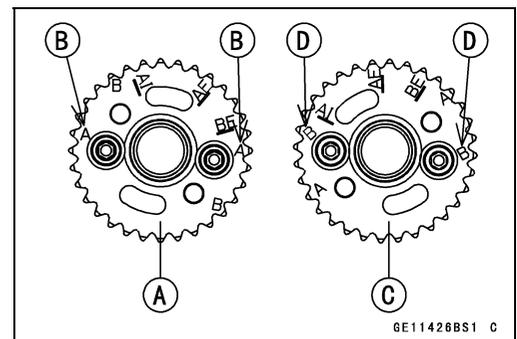
#### NOTE

- The intake camshaft has the projection [A] for camshaft position sensor.



- Install the intake camshaft sprocket [A] as shown. "A" Marks [B]
- Install the exhaust camshaft sprocket [C] as shown. "B" Marks [D]
- The intake camshaft sprocket and exhaust camshaft sprocket are identical.
- Apply a non-permanent locking agent to the threads of the camshaft sprocket bolts and tighten them.

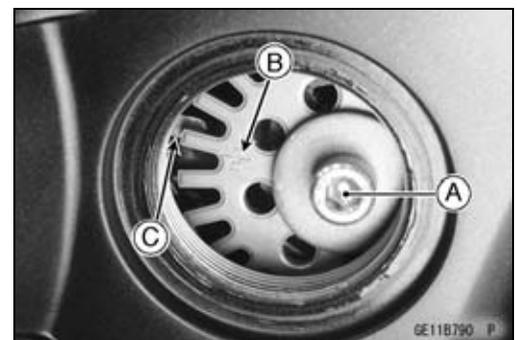
**Torque - Camshaft Sprocket Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**



- Apply molybdenum disulfide oil solution to all cam parts, journals and tappets.
- ★ 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 timing rotor bolt [A], turn the crankshaft clockwise until the line [B] (TDC mark for #1,4 pistons) on the timing rotor is aligned with the mating surface [C] of the crankcase.

### NOTICE

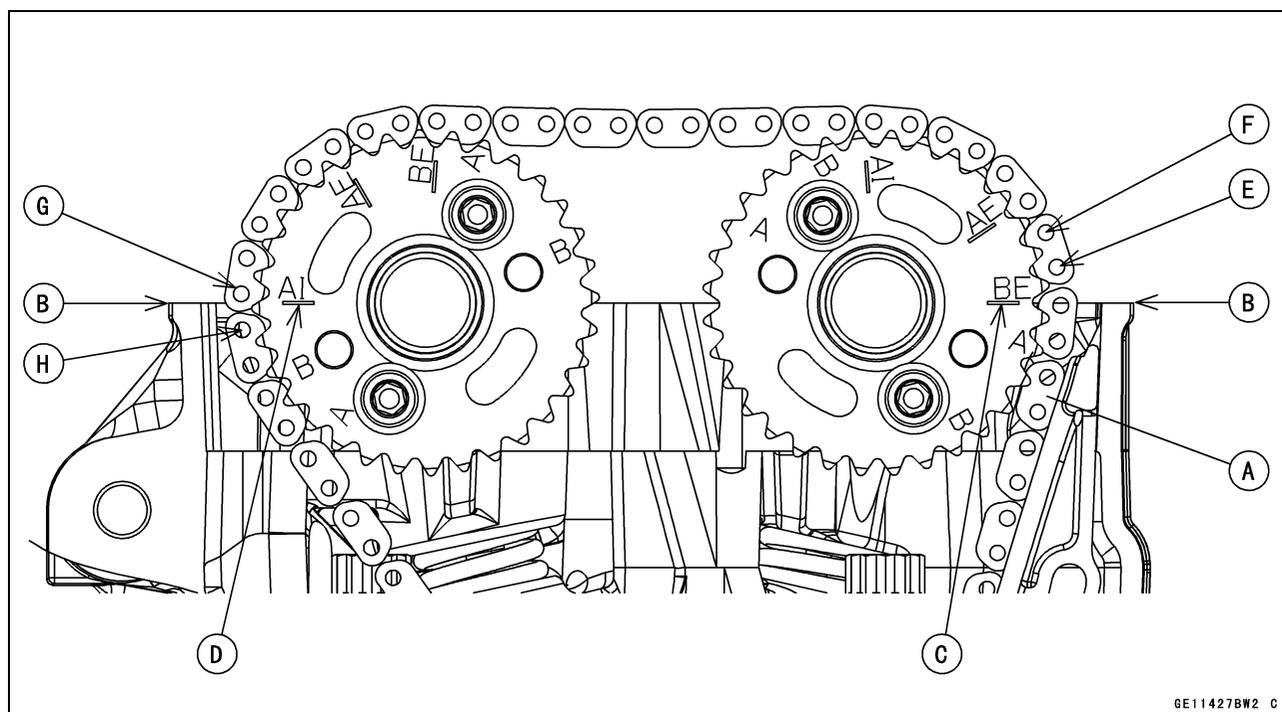
The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower sprocket. A kinked chain could damage both the chain and the sprocket.



## 5-16 ENGINE TOP END

### Camshaft, Camshaft Chain

- 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.
- The timing marks must be aligned with the cylinder head upper surface [B].
  - “BE” Mark [C]
  - “AI” Mark [D]
  - #1 Pin [E]
  - #2 Pin [F]
  - #28 Pin [G]
  - #29 Pin [H]



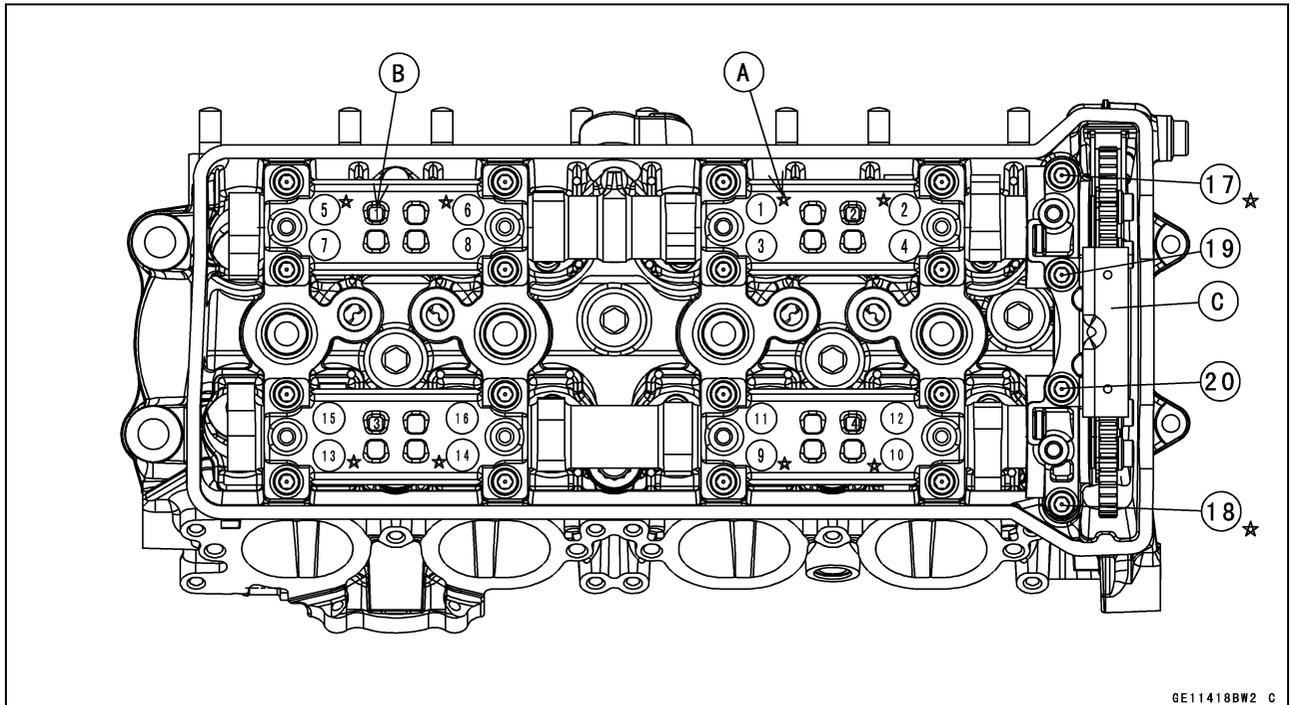
- Apply molybdenum disulfide oil solution to all cam lobes, journals and thrust journals.

## Camshaft, Camshaft Chain

- Install the ten dowel pins on the ★ marks [A].
- Install the camshaft cap, following the identification No. [B] and upper camshaft chain guide [C].
- First tighten the all camshaft cap bolts evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence [1 ~ 20].

**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)**



GE11418BW2 C

- 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 on the crankshaft timing plug with a new one.
- Apply grease to the O-ring.
- Tighten:
  - Torque - Crankshaft Timing Plug: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Install the removed parts (see appropriate chapters).

## 5-18 ENGINE TOP END

### Camshaft, Camshaft Chain

#### Camshaft, Camshaft Cap Wear Inspection

- Remove the camshaft caps (see Camshaft Removal).
- Cut the strips of plastigage (press gauge) 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 camshaft 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 [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 (0.94252 ~ 0.94338 in.)

**Service Limit:** 23.91 mm (0.9413 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 service limit, replace the cylinder head unit.

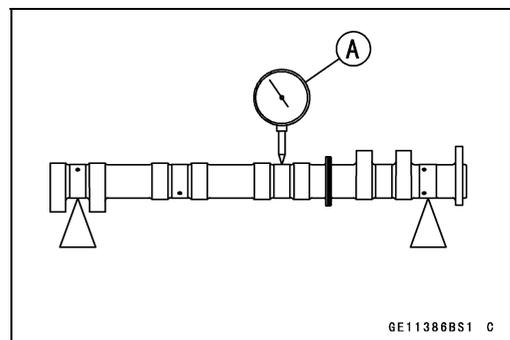
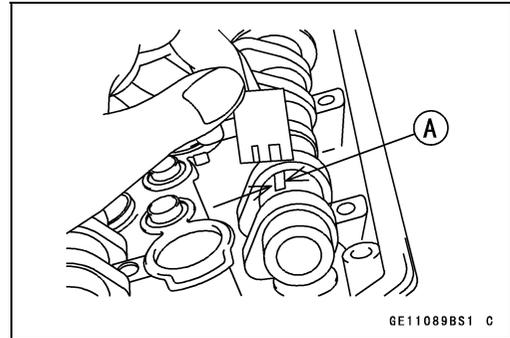
#### Camshaft Runout Inspection

- Remove the camshafts (see Camshaft Removal).
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure the runout with a dial gauge [A] at the specified place as shown.
- ★ If the runout exceeds the service limit, replace the camshaft.

#### Camshaft Runout

**Standard:** TIR 0.02 mm (0.0008 in.) or less

**Service Limit:** TIR 0.1 mm (0.004 in.)



## Camshaft, Camshaft Chain

### Cam Wear Inspection

- Remove the camshafts (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:

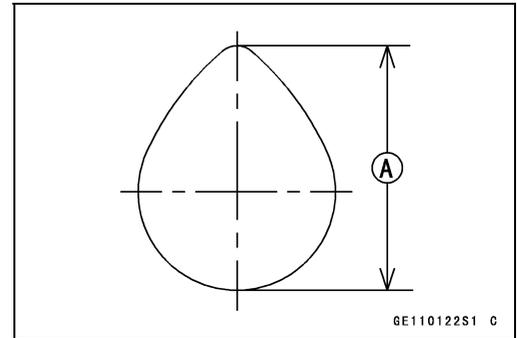
Exhaust 34.443 ~ 34.557 mm (1.3560 ~ 1.3605 in.)

Intake 35.443 ~ 35.557 mm (1.3954 ~ 1.3999 in.)

##### Service Limit:

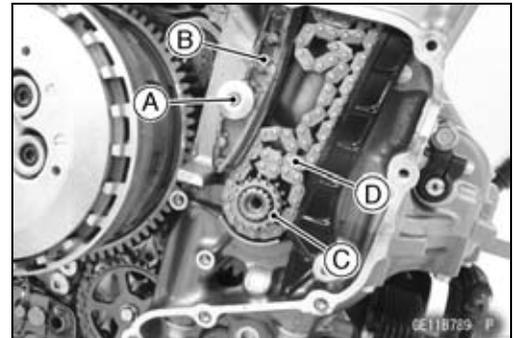
Exhaust 34.343 mm (1.3521 in.)

Intake 35.343 mm (1.3915 in.)



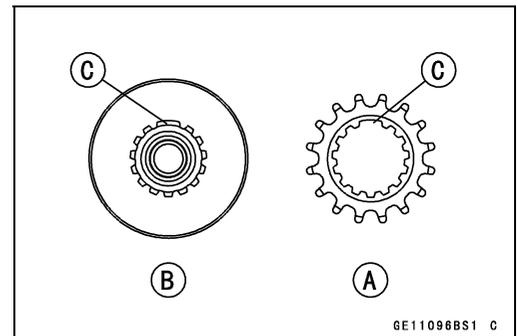
### Camshaft Chain Removal

- Remove:
  - Camshaft (see Camshaft Removal)
  - Timing Rotor (see Timing Rotor Removal in the Electrical System chapter)
  - Rear Camshaft Chain Guide Bolt [A]
  - Rear Camshaft Chain Guide [B]
  - Crankshaft Sprocket [C]
  - Camshaft Chain [D]



### Camshaft Chain Installation

- Install the camshaft chain from head side.
- Engage the camshaft chain with the crankshaft sprocket.
- Install the crankshaft sprocket [A] on the crankshaft [B] with their teeth [C] aligned.
- Install the removed parts (see appropriate chapters).



## 5-20 ENGINE TOP END

### Cylinder Head

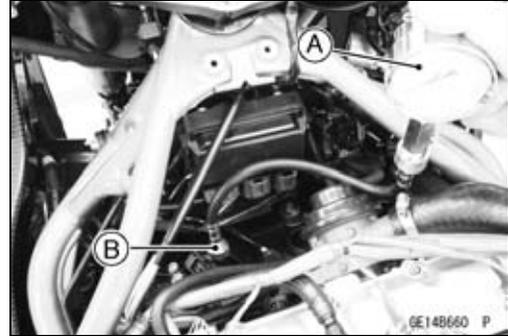
#### Cylinder Compression Measurement

##### NOTE

○ Use the battery which is fully charged.

- Warm up the engine thoroughly.
- Stop the engine.
- Remove the 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/cm<sup>2</sup>: 57001-221**  
**Compression Gauge Adapter, M10 × 1.0: 57001-1317**



##### Cylinder Compression

**Usable Range: 623 ~ 988 kPa (6.35 ~ 10.1 kgf/cm<sup>2</sup>, 90.3 ~ 143 psi) @260 r/min (rpm)**

- Repeat the measurement for the other cylinders.
- Install the spark plugs (see Spark Plug Replacement in the Periodic Maintenance chapter).

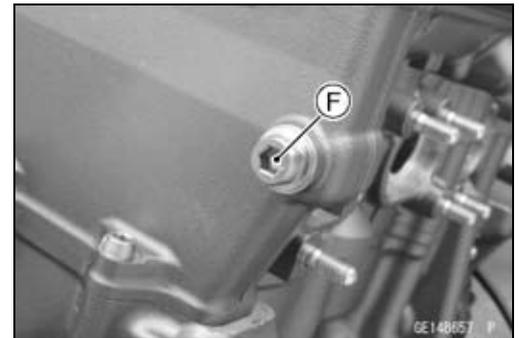
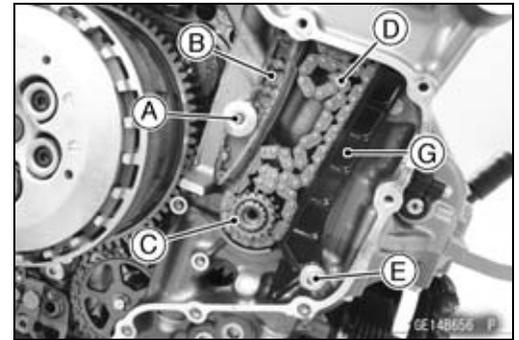
○ The following table should be consulted if the obtainable compression reading is not within the usable range.

| 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 gasket and check the 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

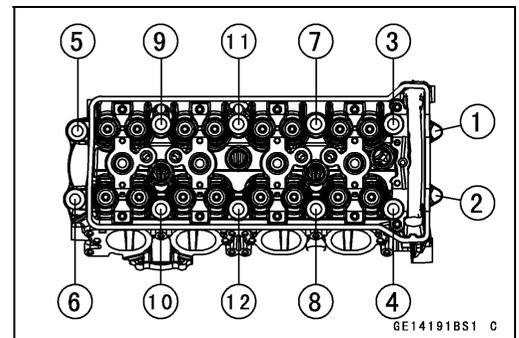
### Cylinder Head Removal

- 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:
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
  - Camshafts (see Camshaft Removal)
  - Timing Rotor (see Timing Rotor Removal in the Electrical System chapter)
  - Rear Camshaft Chain Guide Bolt [A]
  - Rear Camshaft Chain Guide [B]
  - Crankshaft Sprocket [C]
  - Camshaft Chain [D]
  - Front Camshaft Chain Guide Bolt (Lower) [E]
  - Front Camshaft Chain Guide Bolt (Upper) [F]
  - Front Camshaft Chain Guide [G]



- Remove:
  - Coolant Drain Bolt (Cylinder) [A]
  - Washer
- Drain the coolant.

- Loosen the M6 and M10 cylinder head bolts as shown sequence [1 ~ 12], and remove them and washers.
- Remove the cylinder head.



### Cylinder Head Installation

#### NOTE

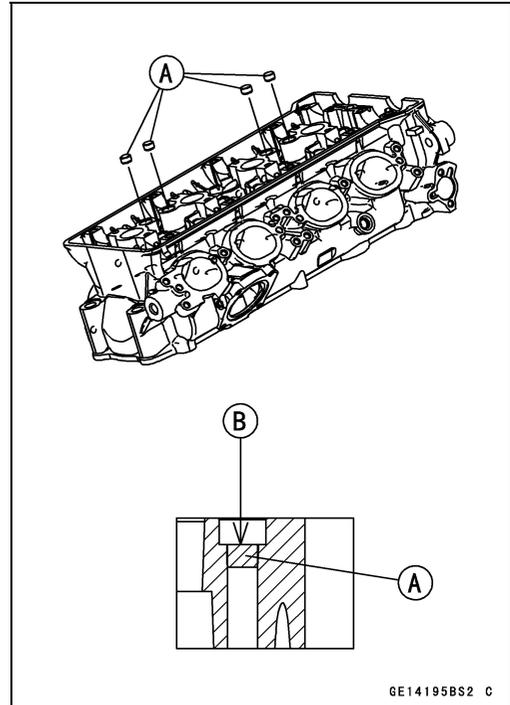
○The camshaft cap is machined with the cylinder head, so if a new cylinder head is installed, use the cap that is supplied with the new head.

## 5-22 ENGINE TOP END

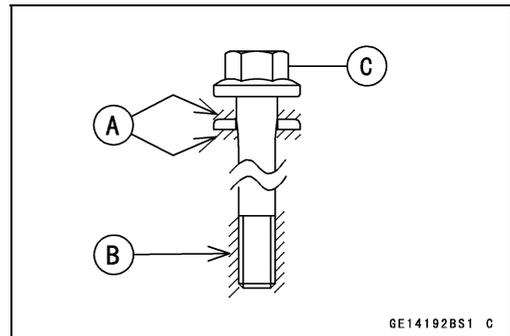
### Cylinder Head

- When installing the plugs [A], note the following.
- Press the plug so that the plug surface [B] is flush with the end of the hole.

**Special Tool - Bearing Driver Set: 57001-1129**



- Install the dowel pins.
- Replace the cylinder head gasket with a new one.
- Install the cylinder head.
- Replace the cylinder head bolt washers with new ones.
- Apply molybdenum disulfide oil solution to both sides [A] of the cylinder head bolt washers and the threads [B] of the M10 cylinder head bolts [C].



- Tighten the M10 cylinder head bolts following the tightening sequence [1 ~10].

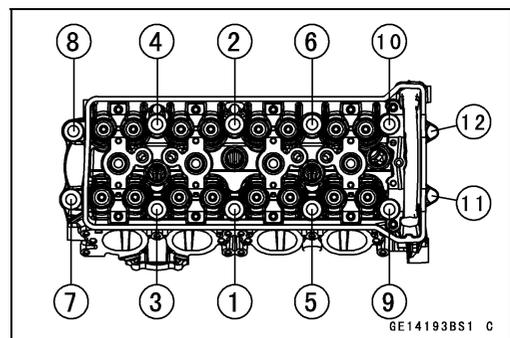
**Torque - Cylinder Head Bolts (M10):**

**First: 30 N·m (3.1 kgf·m, 22 ft·lb)**

**Final: 67 N·m (6.8 kgf·m, 49 ft·lb)**

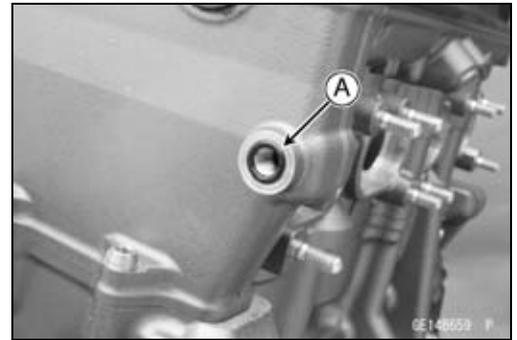
- Tighten the M6 cylinder head bolts as shown sequence [11, 12].

**Torque - Cylinder Head Bolts (M6): 12 N·m (1.2 kgf·m, 106 in·lb)**

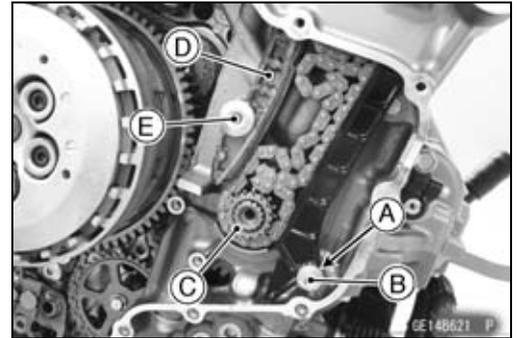


## Cylinder Head

- Replace the O-ring [A].
- Apply grease to the O-ring.
- Install the front camshaft chain guide.
- Tighten:
  - Torque - Front Camshaft Chain Guide Bolt (Upper): 25 N·m (2.5 kgf·m, 18 ft·lb)**

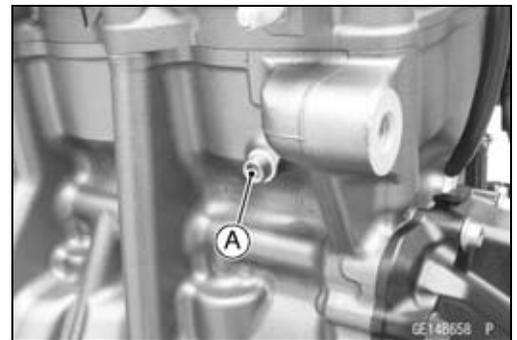


- Install the collar [A].
- Tighten:
  - Torque - Front Camshaft Chain Guide Bolt (Lower) [B]: 12 N·m (1.2 kgf·m, 106 in·lb)**



- Install:
  - Camshaft Chain and Crankshaft Sprocket [C] (see Camshaft Chain Installation)
  - Rear Camshaft Chain Guide [D]
- Tighten:
  - Torque - Rear Camshaft Chain Guide Bolt [E]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Replace the washer with a new one.
- Tighten the coolant drain bolt (cylinder) [A] with washer.
- Install the removed parts (see appropriate chapters).



### Cylinder Head Warp Inspection

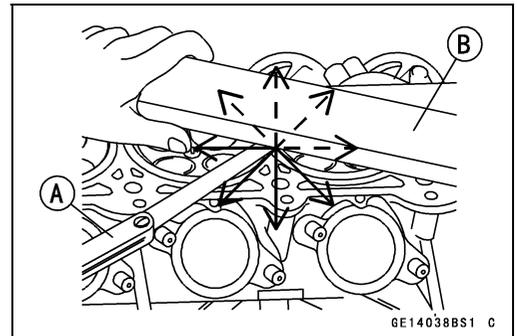
- Clean the cylinder head.
- Lay a straightedge across the lower surface of the cylinder head at several positions.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

#### 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).



## 5-24 ENGINE TOP END

### Valves

#### Valve Clearance Inspection

- Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

#### Valve Clearance Adjustment

- Refer to the Valve Clearance Adjustment in the Periodic Maintenance chapter.

#### Valve Removal

- Remove the cylinder head (see Cylinder Head Removal).
- Remove the valve lifter and shim.

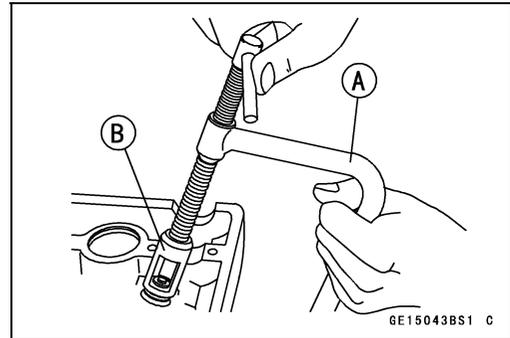
#### NOTE

○ 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

- Replace the oil seal with a new one.
- Apply a thin coat of molybdenum disulfide grease to the valve stem before valve installation.
- Install the springs so that the closed coil end faces downwards.

Valve Stem [A]

Oil Seal [B]

Spring Seat [C]

Closed Coil End [D]

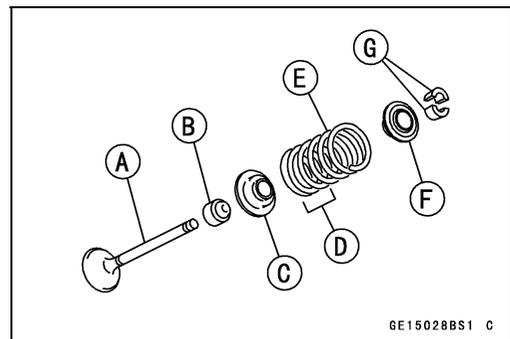
Valve Spring [E]:

EX - Pink Paint

IN - Green Paint

Retainer [F]

Split Keepers [G]



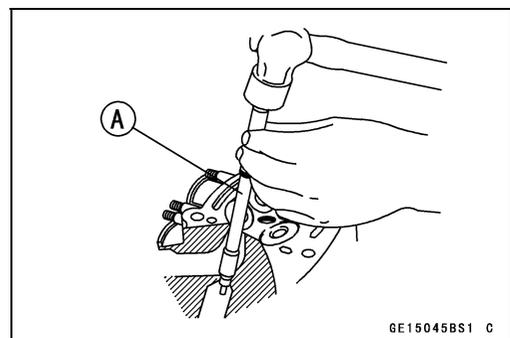
#### Valve Guide Removal

- 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.

#### NOTICE

**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 engine oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F).

#### NOTICE

**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 spacer [B], press and insert the valve guide in until the attachment surface [C] touches the head surface.

13.3 ~ 13.5 mm (0.524 ~ 0.531 in.) [D]

**Special Tools - Valve Guide Driver: 57001-1564**

**Spacer  $\phi$ 9.6: 57001-1830**

- When removing the valve guide driver and spacer. Make sure to remove the spacer.

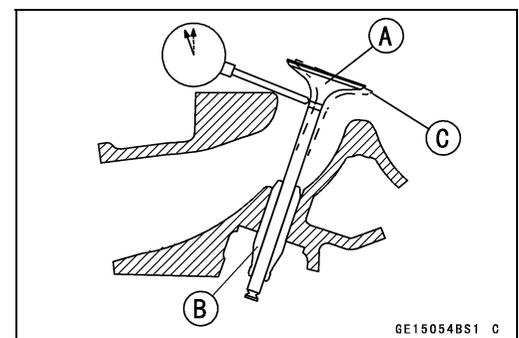
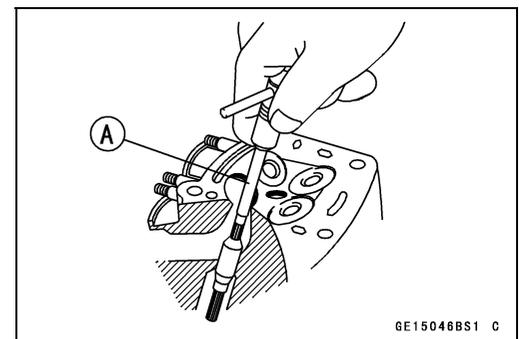
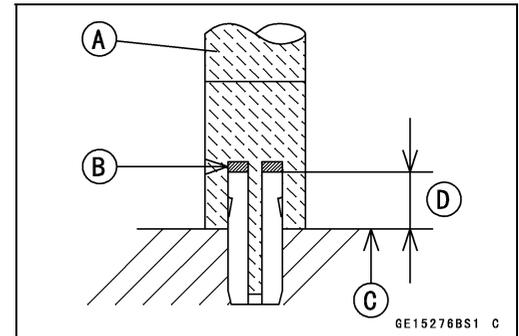
- Ream the valve guide with valve guide reamer [A], even if the old guide is reused.

**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.



## 5-26 ENGINE TOP END

### 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 | 0.08 ~ 0.16 mm (0.0031 ~ 0.0063 in.) |
| Intake  | 0.03 ~ 0.10 mm (0.0012 ~ 0.0039 in.) |

##### Service Limit:

|         |                     |
|---------|---------------------|
| Exhaust | 0.35 mm (0.014 in.) |
| Intake  | 0.29 mm (0.011 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 Valve Seat Repair).

#### Valve Seating Surface Outside Diameter

##### Standard:

|         |                                  |
|---------|----------------------------------|
| Exhaust | 25.2 ~ 25.4 mm (0.99 ~ 1.00 in.) |
| Intake  | 29.4 ~ 29.6 mm (1.16 ~ 1.17 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 | 1.6 ~ 2 mm (0.063 ~ 0.079 in.)   |
| Intake  | 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 [B]: 57001-1128

Valve Seat Cutter Holder,  $\phi$ 4.5 [C]: 57001-1330

##### [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° -  $\phi$ 27: 57001-1409

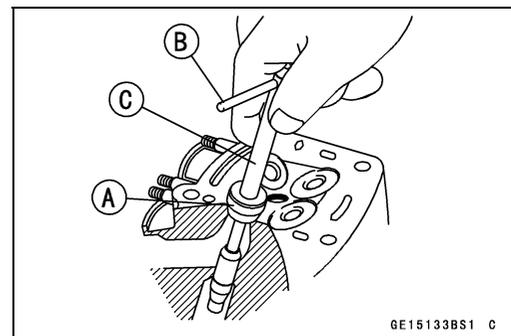
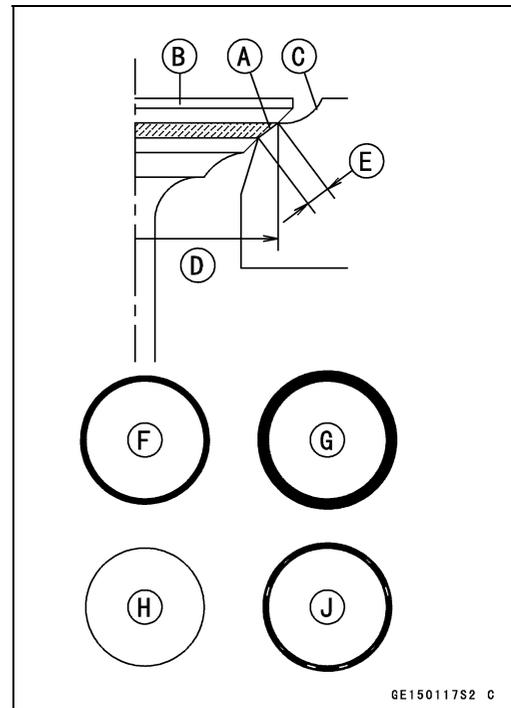
##### [For Intake Valve Seat]

Valve Seat Cutter, 45° -  $\phi$ 32: 57001-1115

Valve Seat Cutter, 32° -  $\phi$ 33: 57001-1199

Valve Seat Cutter, 60° -  $\phi$ 30: 57001-1123

- ★ 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.

**NOTICE**

**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**

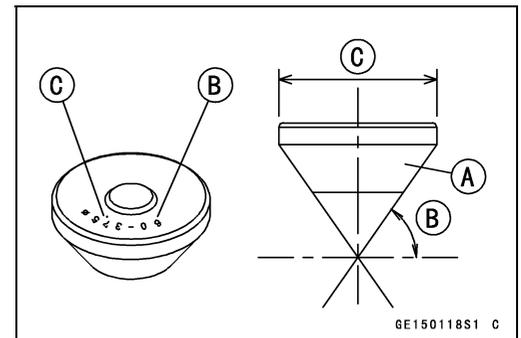
*○Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.*

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]  
 37.5φ ..... 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.

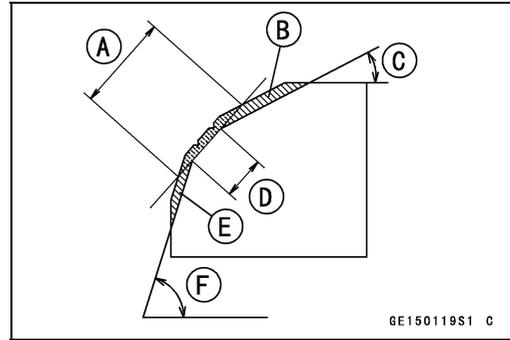
**NOTICE**

**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.**

## 5-28 ENGINE TOP END

### Valves

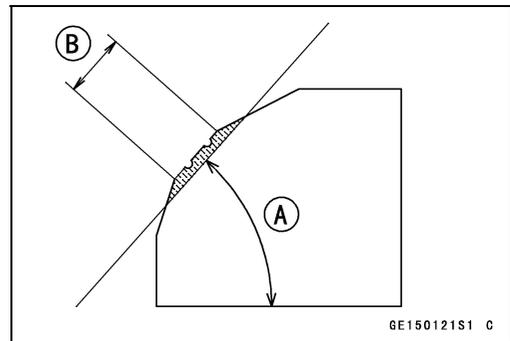
- Measure the outside diameter of the seating surface with a vernier caliper.
- ★ If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.
  - Widened Width [A] of engagement by machining with 45° cutter
  - Ground Volume [B] by 32° cutter
  - 32° [C]
  - Correct Width [D]
  - Ground Volume [E] by 60° cutter
  - 60° [F]



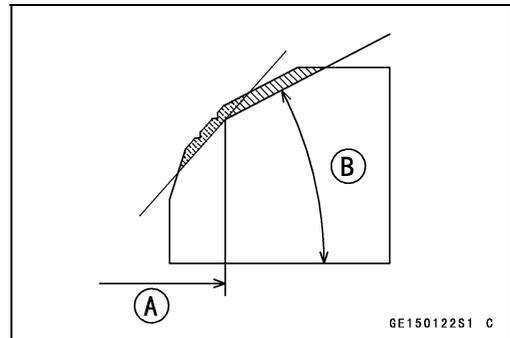
- Measure the outside diameter of the seating surface with a vernier caliper.
- ★ If the outside diameter of the seating surface is too small, repeat the 45° [A] grind until the diameter is within the specified range.
  - Original Seating Surface [B]

#### 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° [B] 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 until the seat outside diameter 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.



#### NOTICE

**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 outside diameter 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 outside diameter 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]

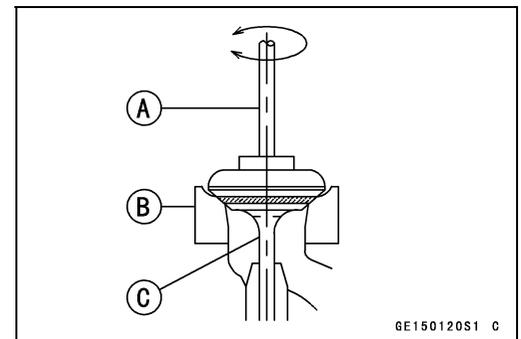
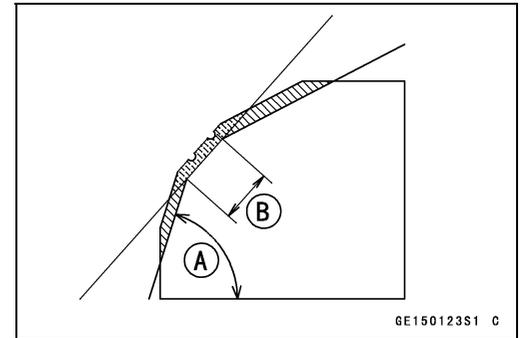
- Lap the valve to the valve seat, once the seat width and outside diameter are within the ranges specified above.
- Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
- Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
- Repeat the process with a fine grinding compound.

Lapper [A]

Valve Seat [B]

Valve [C]

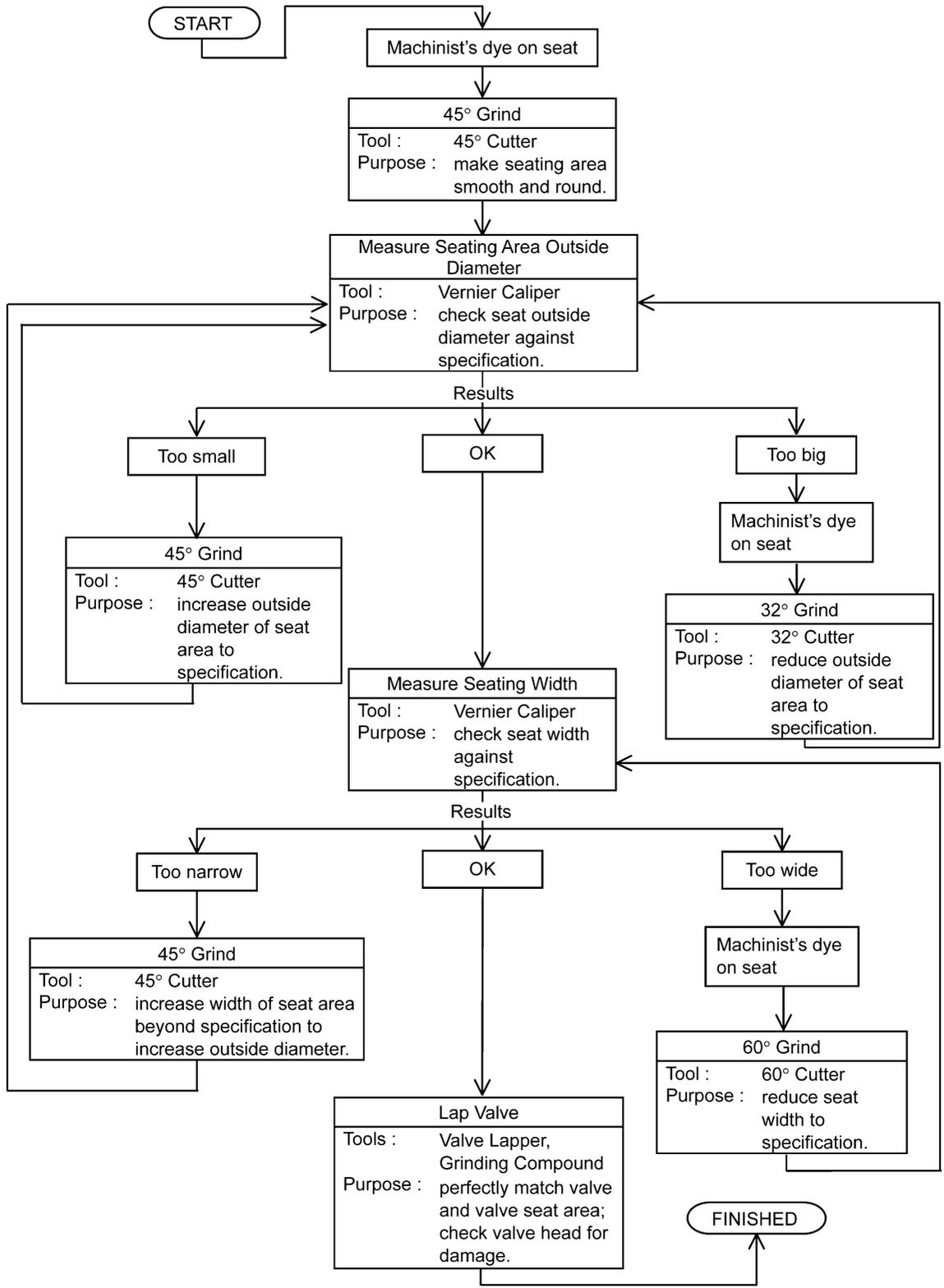
- The seating area should be marked about in the middle of the valve face.
- ★ If the seat area is not in the right place on the valve, check to be sure the valve is the correct part. If it is, it may have been refaced too much; replace it.
- Be sure to remove all grinding compound before assembly.
- When the engine is assembled, be sure to adjust the valve clearance (see Valve Clearance Inspection in the Periodic Maintenance chapter).



# 5-30 ENGINE TOP END

## Valves

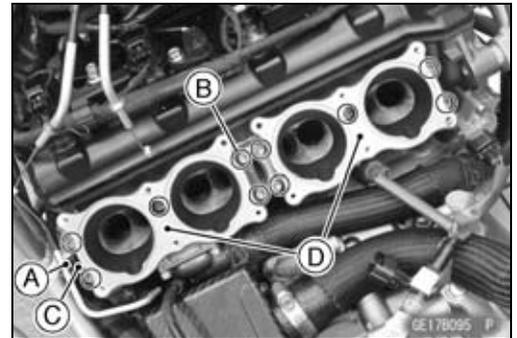
### Valve Seat Repair



## Throttle Body Assy Holder

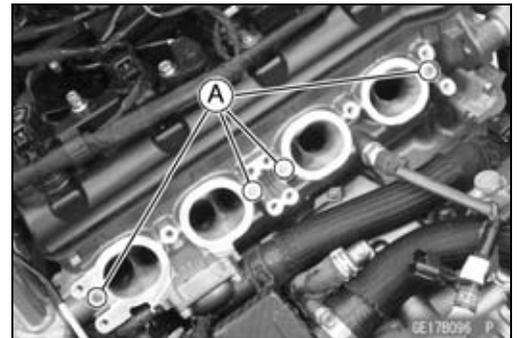
### Throttle Body Assy Holder Removal

- Remove:
  - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  - Clamp [A]
  - Throttle Body Assy Holder Bolts [B]
  - Bracket [C]
  - Throttle Body Assy Holders [D]



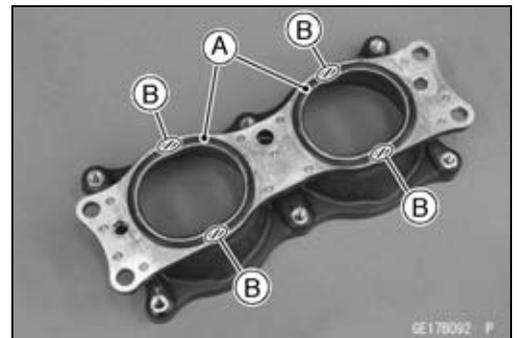
### Throttle Body Assy Holder Installation

- Install the dowel pins [A].



- Replace the O-rings [A] with new ones.
- Apply liquid gasket to any two positions [B] of the O-rings to prevent it from coming off, and install them.

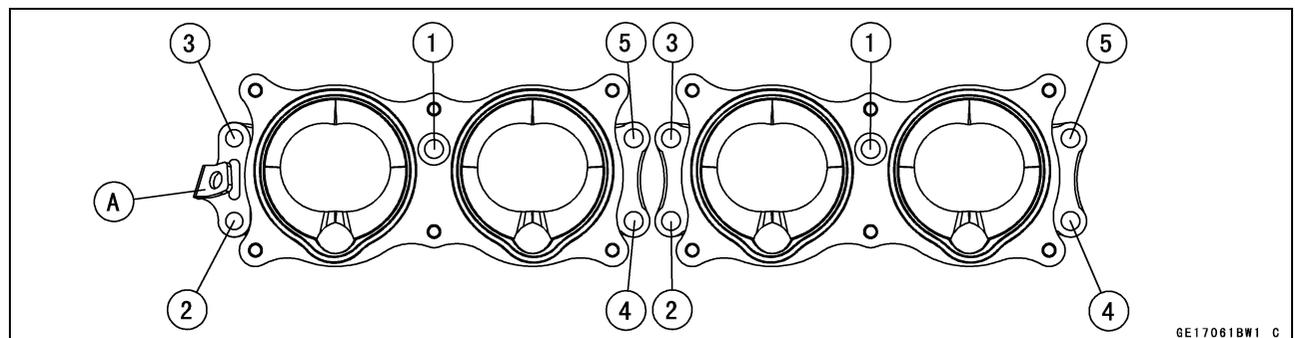
**Sealant - Liquid Gasket, TB1211F: 92104-0004**



- Install:
  - Throttle Body Assy Holders
  - Bracket [A]
- Tighten the throttle body assy holder bolts following the specified tightening sequence [1 ~ 5].

**Torque - Throttle Body Assy Holder Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Wipe of any excess liquid gasket.
- Install the removed parts (see appropriate chapters).



## 5-32 ENGINE TOP END

### Muffler

#### **⚠ WARNING**

The muffler can become extremely hot during normal operation and cause severe burns. Do not remove the muffler while it is hot.

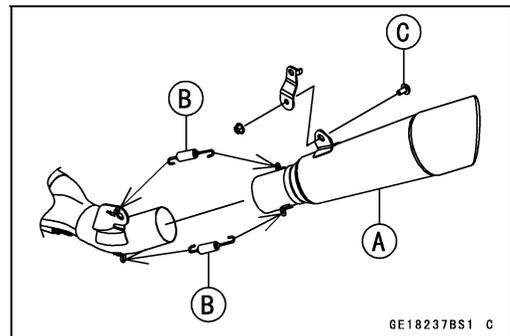
#### **Muffler Body Removal**

- Remove:
  - Springs [A]
  - Muffler Body Mounting Bolt [B] and Nut
- Remove the muffler body [C] backward.



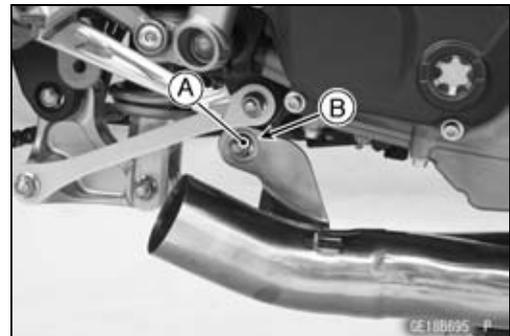
#### **Muffler Body Installation**

- Install:
  - Muffler Body [A]
  - Springs [B]
- Hook the spring so that the long spring end faces muffler body.
- Tighten the muffler body mounting bolt [C].
  - Torque - Muffler Body Mounting Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)

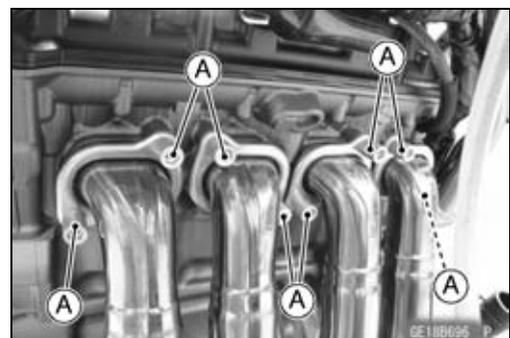


#### **Exhaust Pipe Removal**

- Remove:
  - Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  - Exhaust Pipe Mounting Nut [A]
  - Washer [B]
  - Exhaust Pipe Mounting Bolt and Washer



- Remove:
  - Exhaust Pipe Holder Nuts [A]
  - Exhaust Pipe



## Muffler

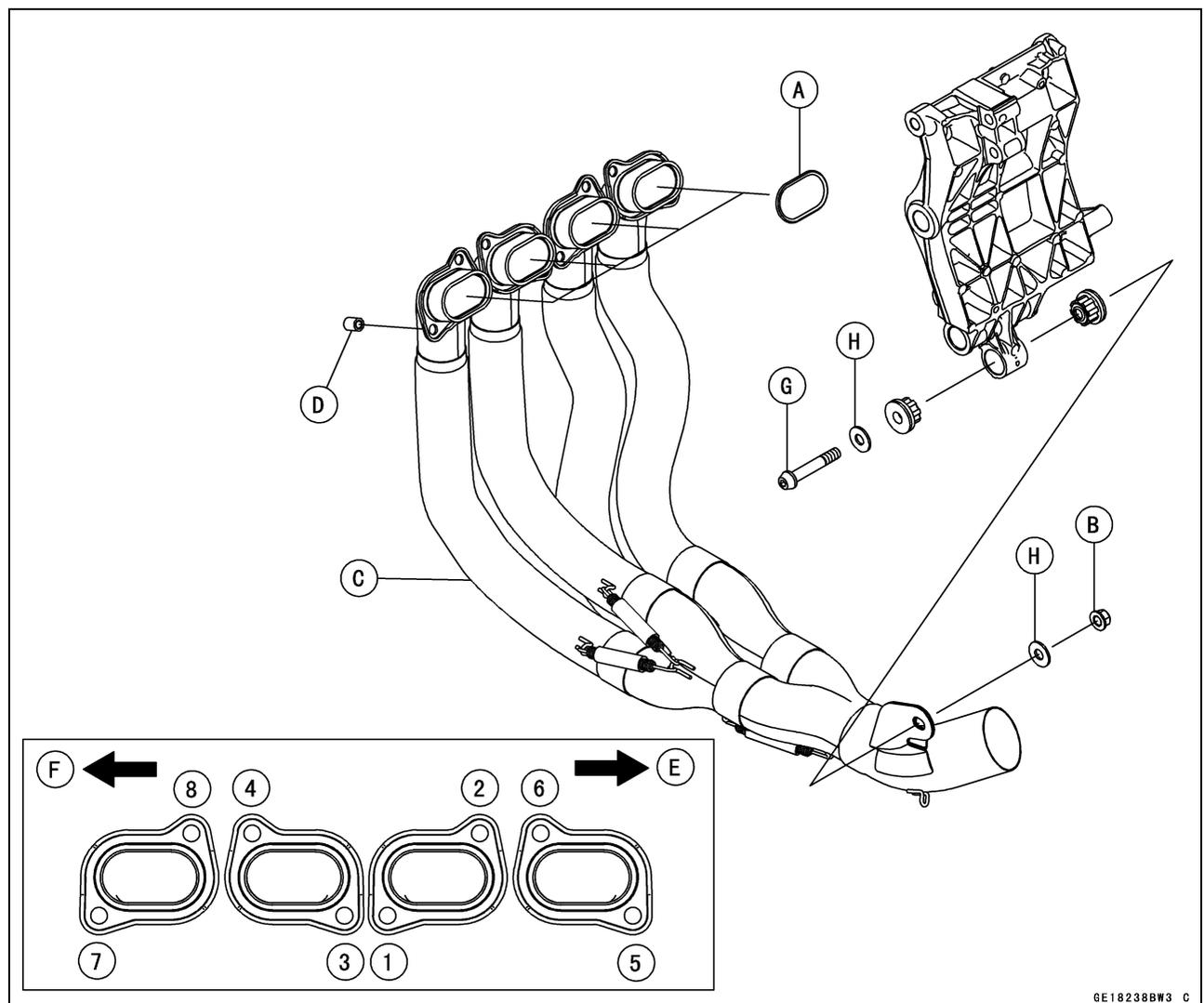
### Exhaust Pipe Installation

- Replace the exhaust pipe gaskets [A] and exhaust pipe mounting nut [B] with new ones.
- Apply grease to the exhaust pipe gasket, and install them to engine.
- Install the exhaust pipe [C].
- Tighten the exhaust pipe holder nuts [D] following the tightening sequence [1 ~ 8].  
Right Side [E]  
Left Side [F]

**Torque - Exhaust Pipe Holder Nuts: 17 N·m (1.7 kgf·m, 13 ft·lb)**

- Install the exhaust pipe mounting bolt [G] with washers [H].
- Tighten:

**Torque - Exhaust Pipe Mounting Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)**



GE18238BW3 C

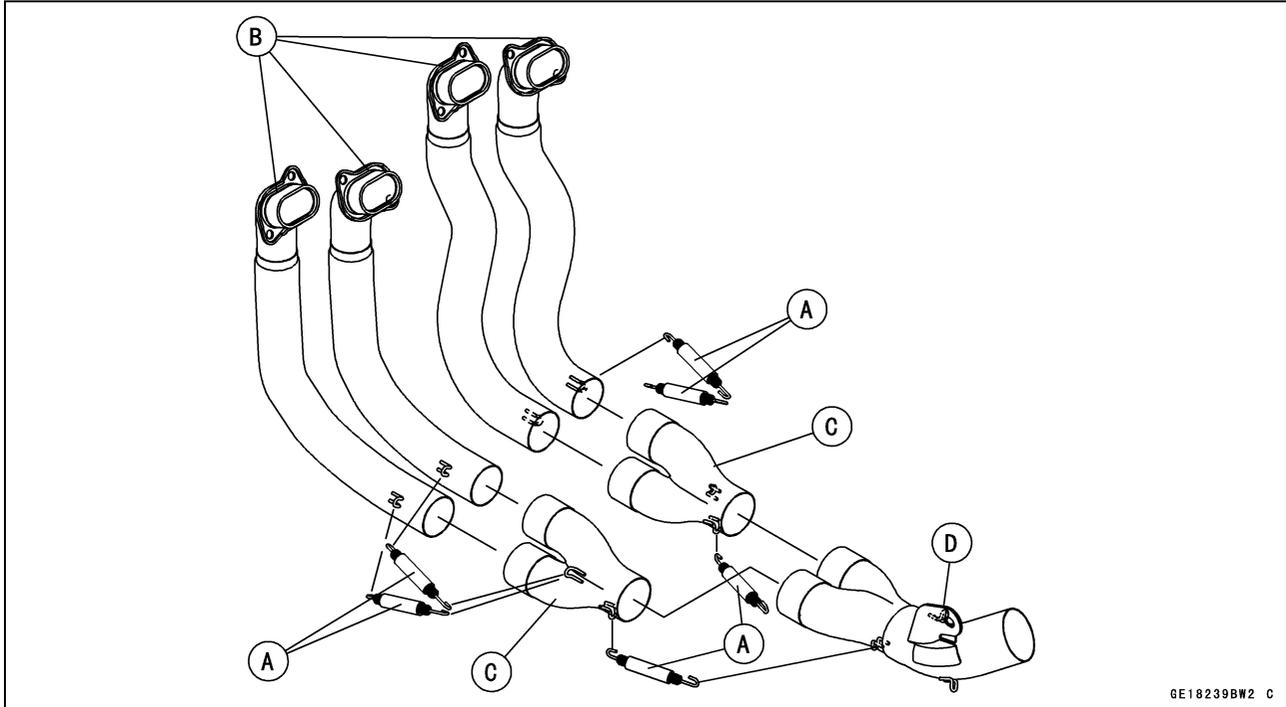
- Install the removed parts (see appropriate chapters).
- Thoroughly warm up the engine, wait until the engine cools down, retighten all the bolts and nuts.

## 5-34 ENGINE TOP END

### Muffler

#### *Exhaust Pipe Disassembly*

- Remove:
  - Springs [A]
  - Front Exhaust Pipes [B]
  - Middle Exhaust Pipes [C]
  - Rear Exhaust Pipe [D]

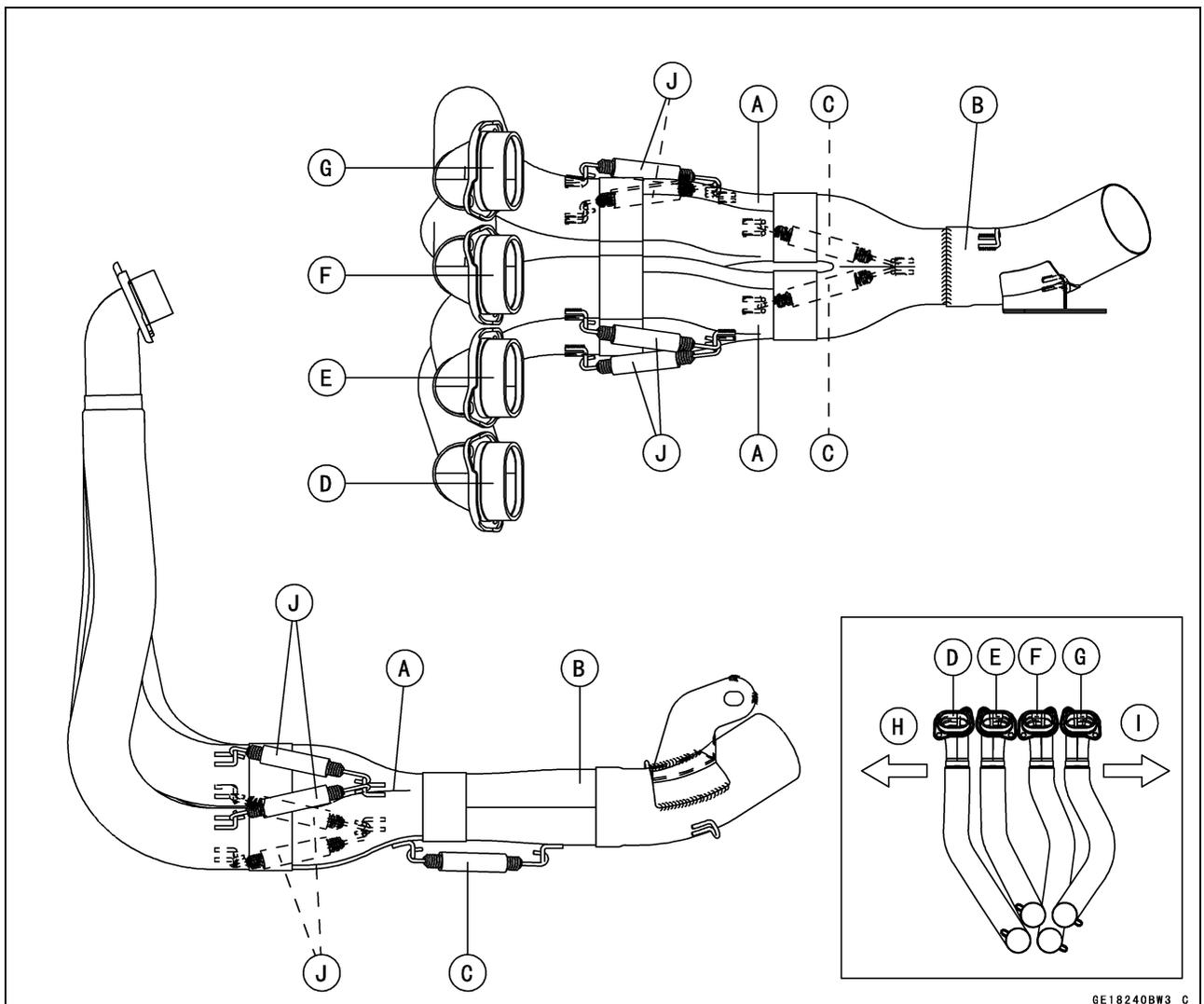


GE18239BW2 C

## Muffler

### Exhaust Pipe Assembly

- Install the middle exhaust pipes [A] to the rear exhaust pipe [B].
- Face the spring hook portion of the middle and rear exhaust pipes to the lower side.
- Hook the springs [C] so that the long spring end faces rear side.
- Install the front exhaust pipes as shown.
  - Front Exhaust Pipe (#1) [D]
  - Front Exhaust Pipe (#2) [E]
  - Front Exhaust Pipe (#3) [F]
  - Front Exhaust Pipe (#4) [G]
  - Left Side [H]
  - Right Side [I]
- Hook the springs [J] so that the long spring end faces rear side.





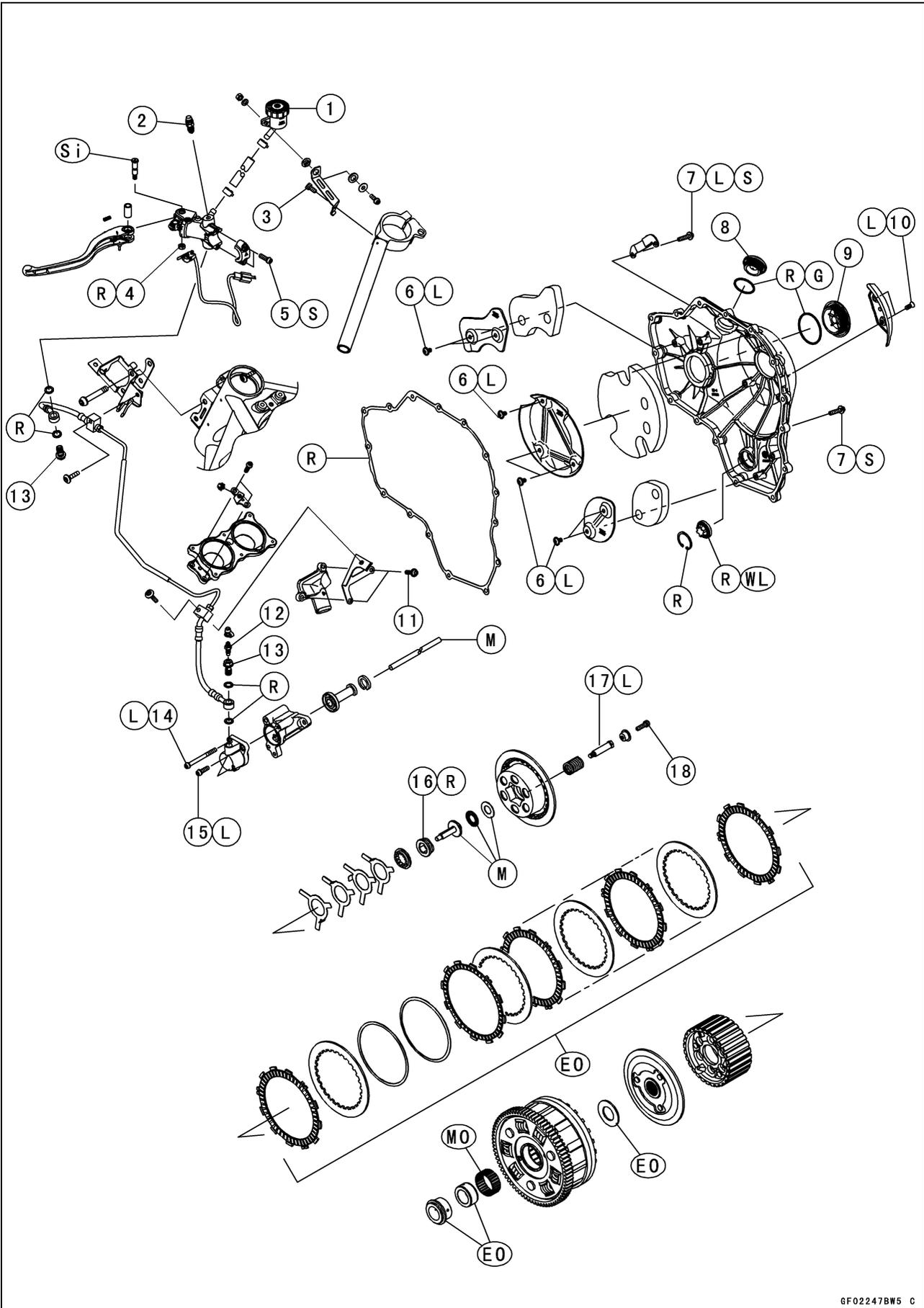
# Clutch

## Table of Contents

|   |      |
|---|------|
| Exploded View .....   | 6-2  |
| Specifications .....  | 6-4  |
| Special Tools and Sealant .....                                       | 6-5  |
| Clutch Lever .....  | 6-6  |
| Clutch Lever Removal/Installation .....                               | 6-6  |
| Clutch Lever Position Adjustment .....                                | 6-8  |
| Clutch Master Cylinder .....  | 6-9  |
| Clutch Master Cylinder Removal .....                                  | 6-9  |
| Clutch Master Cylinder Installation .....                             | 6-9  |
| Clutch Master Cylinder Disassembly/Assembly .....                     | 6-10 |
| Clutch Master Cylinder Inspection .....                               | 6-10 |
| Clutch Slave Cylinder .....   | 6-11 |
| Clutch Slave Cylinder Removal .....                                   | 6-11 |
| Clutch Slave Cylinder Installation .....                              | 6-11 |
| Clutch Fluid .....  | 6-13 |
| Clutch Fluid Level Inspection .....                                   | 6-13 |
| Clutch Fluid Change .....   | 6-13 |
| Bleeding the Clutch Line .....  | 6-13 |
| Clutch Hose Removal/Installation .....                                | 6-15 |
| Clutch Hose Inspection .....  | 6-15 |
| Clutch Cover .....  | 6-16 |
| Clutch Cover Removal .....  | 6-16 |
| Clutch Cover Installation .....                                       | 6-16 |
| Clutch Cover Disassembly .....  | 6-16 |
| Clutch Cover Assembly .....   | 6-17 |
| Clutch .....  | 6-18 |
| Clutch Removal .....  | 6-18 |
| Clutch Installation .....   | 6-19 |
| Spring Plate Free Play Measurement .....                              | 6-22 |
| Spring Plate Free Play Adjustment .....                               | 6-23 |
| Clutch Plate Assembly Length (Reference Information) Inspection ..... | 6-23 |
| Clutch Plate, Wear, Damage Inspection .....                           | 6-24 |
| Clutch Plate Warp Inspection .....                                    | 6-24 |
| Clutch Spring Free Length Measurement .....                           | 6-24 |
| Clutch Housing Finger Inspection .....                                | 6-24 |
| Clutch Housing Spline Inspection .....                                | 6-25 |
| Damper Cam Inspection .....   | 6-25 |

# 6-2 CLUTCH

## Exploded View



## Exploded View

| No. | Fastener   | N·m  | kgf·m | ft·lb     | Remarks  |
|-----|--|------|-------|-----------|----------|
| 1   | Clutch Reservoir Cap (for reference)             | 1.5  | 0.15  | 13 in·lb  |          |
| 2   | Clutch Master Cylinder Bleed Valve               | 14   | 1.4   | 10        |          |
| 3   | Clutch Reservoir Bracket Bolt                    | 6.9  | 0.70  | 61 in·lb  |          |
| 4   | Clutch Lever Pivot Bolt Locknut                  | 6.0  | 0.61  | 53 in·lb  | R        |
| 5   | Clutch Master Cylinder Clamp Bolts               | 9.0  | 0.92  | 80 in·lb  | S        |
| 6   | Clutch Cover Damper Plate Bolts                  | 10   | 1.0   | 89 in·lb  | L        |
| 7   | Clutch Cover Bolts                               | 12   | 1.2   | 106 in·lb | L (1), S |
| 8   | Oil Filler Plug                                  | 10   | 1.0   | 89 in·lb  |          |
| 9   | Crankshaft Timing Plug                           | 25   | 2.5   | 18        |          |
| 10  | Clutch Outer Cover Bolts                         | 5.0  | 0.51  | 44 in·lb  | L        |
| 11  | Water Hose Fitting Cover Bolts                   | 10   | 1.0   | 89 in·lb  |          |
| 12  | Clutch Slave Cylinder Bleed Valve                | 7.9  | 0.81  | 70 in·lb  |          |
| 13  | Clutch Hose Banjo Bolts                          | 24.5 | 2.50  | 18.1      |          |
| 14  | Clutch Slave Cylinder Mounting Bolt (L = 65 mm)  | 10   | 1.0   | 89 in·lb  | L        |
| 15  | Clutch Slave Cylinder Mounting Bolts (L = 20 mm) | 10   | 1.0   | 89 in·lb  | L        |
| 16  | Clutch Hub Nut                                   | 130  | 13.3  | 95.9      | R        |
| 17  | Sub Clutch Hub Bolts                             | 25   | 2.5   | 18        | L        |
| 18  | Clutch Spring Bolts                              | 11   | 1.1   | 97 in·lb  |          |

EO: Apply engine oil.

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.

Si: Apply silicone grease.

WL: Apply soap and water solution or rubber lubricant.

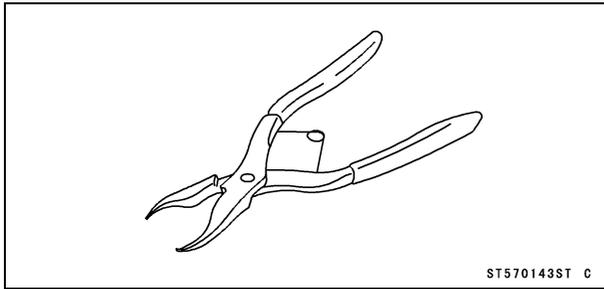
## 6-4 CLUTCH

### Specifications

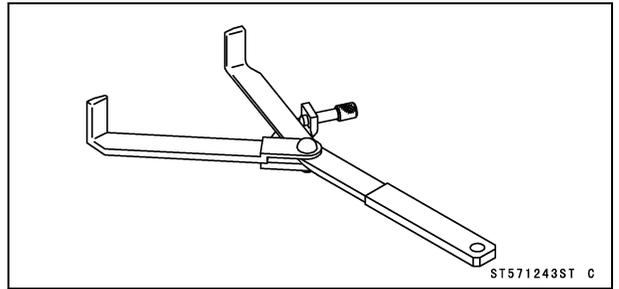
| Item                          | Standard   | Service Limit      |
|-------------------------------|--|--------------------|
| <b>Clutch Lever</b>           |  |                    |
| Clutch Lever Position         | Adjustable type (to suit rider)                      | ---                |
| Clutch Lever Free Play        | Non-adjustable                                       | ---                |
| <b>Clutch Fluid</b>           |  |                    |
| Grade                         | DOT4   | ---                |
| <b>Clutch</b>                 |  |                    |
| Spring Plate Free Play        | (Usable Range)<br>0.05 ~ 0.70 mm (0.002 ~ 0.028 in.) | ---                |
| Clutch Plate Assembly Length  | (Reference)<br>50.7 mm (2.00 in.)                    | ---                |
| Friction Plate Thickness      | 2.92 ~ 3.08 mm (0.115 ~ 0.121 in.)                   | 2.7 mm (0.11 in.)  |
| Friction and Steel Plate Warp | 0.15 mm (0.0059 in.) or less                         | 0.3 mm (0.01 in.)  |
| Clutch Spring Free Length     | 43.5 mm (1.71 in.)                                   | 42.1 mm (1.66 in.) |

**Special Tools and Sealant**

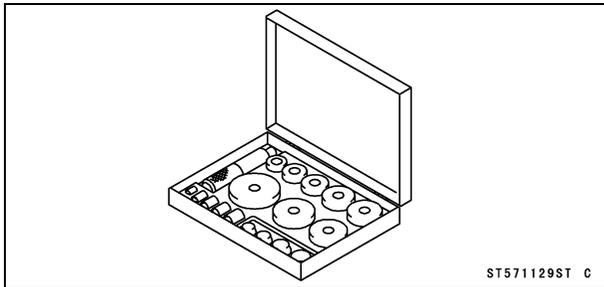
**Inside Circlip Pliers:**  
**57001-143**



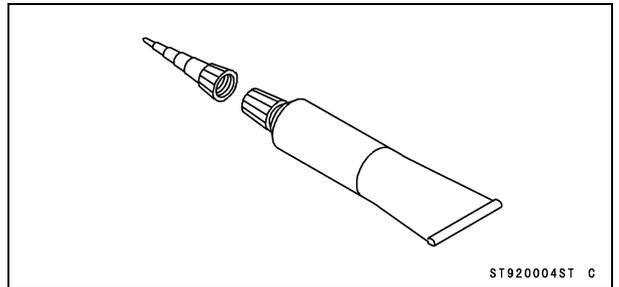
**Clutch Holder:**  
**57001-1243**



**Bearing Driver Set:**  
**57001-1129**



**Liquid Gasket, TB1211F:**  
**92104-0004**



## 6-6 CLUTCH

### Clutch Lever

#### Clutch Lever Removal/Installation

#### **⚠ WARNING**

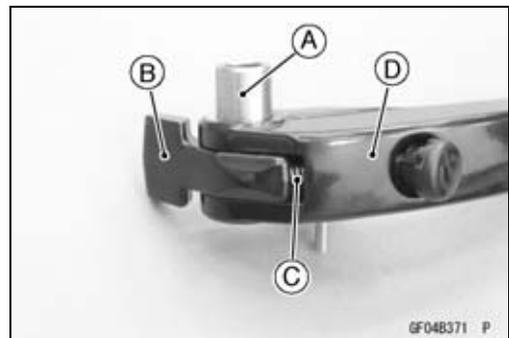
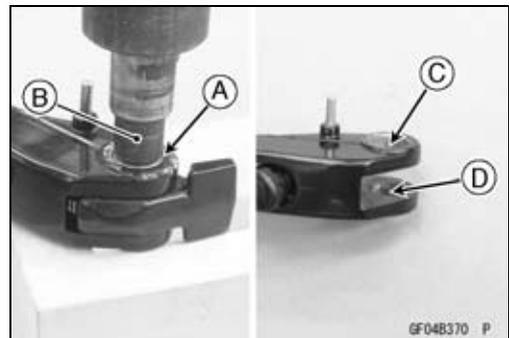
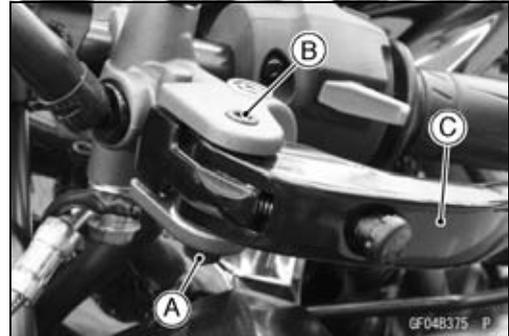
If the starter lockout switch pin has been damaged the starter lockout system will not work properly. This allows the motorcycle to be started in gear with the clutch lever released (clutch engaged), creating sudden forward movement that can result in an accident or injury. Check that the starter lockout switch operates properly when installing the clutch lever.

- Remove:
  - Clutch Lever Pivot Bolt Locknut [A]
  - Clutch Lever Pivot Bolt [B]
  - Clutch Lever Assembly [C]
  
- Press the lever collar [A] with the bearing driver set [B] from the lower side of the lever.
  - Crimping Point [C]
  - No Crimping [D]

**Special Tool - Bearing Driver Set: 57001-1129**
  
- Remove:
  - Lever Collar [A]
  - Knocker [B] with Push Rod Assembly
  - Lever Spring [C]
  - Clutch Lever [D]

#### **NOTE**

○ Be careful not to pop out the lever spring when removing the lever collar.



## Clutch Lever

**NOTICE**

**Do not adjust the adjuster [A]. That has a bad affect the clutch feeling. If turn the adjuster, the clutch master cylinder assembly must be replaced.**

- Install:  
Lever Spring [A]  
Push Rod Assembly [B]  
Knocker [C]

- Press the lever collar [A] with the bearing driver set [B] from the upper side of the lever.
- Install the collar so that the end of the collar is flush with the end of the hole.

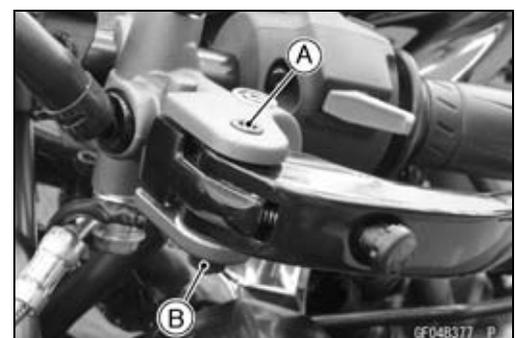
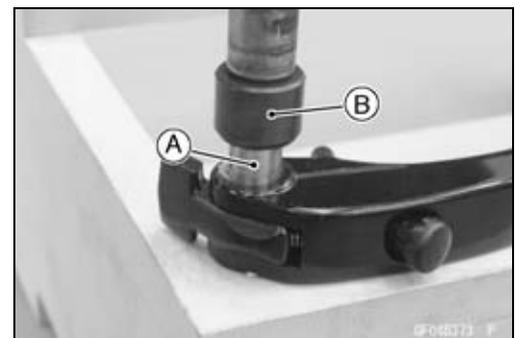
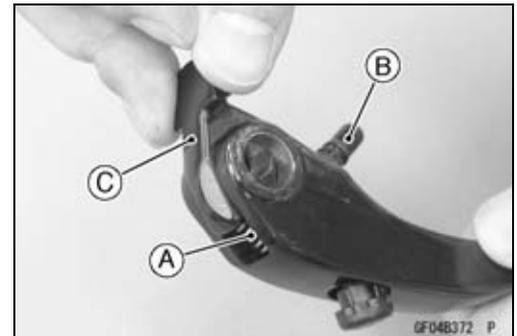
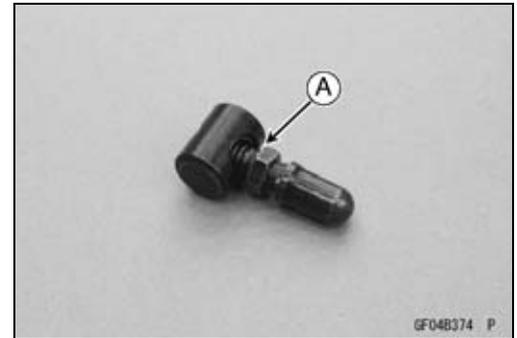
**Special Tool - Bearing Driver Set: 57001-1129**

- Insert the push rod [A] of the clutch lever to the hole [B] of the master cylinder.
- Check that the push rod is inserted correctly.

- Apply silicone grease to the sliding surface of the clutch lever pivot bolt [A].
- Replace the clutch lever pivot bolt locknut [B] with a new one.
- Tighten the clutch lever pivot bolt and clutch lever pivot bolt locknut.

**Torque - Clutch Lever Pivot Bolt Locknut: 6.0 N·m (0.61 kgf·m, 53 in·lb)**

- Check that the pin of the starter lockout switch moves smoothly.



## 6-8 CLUTCH

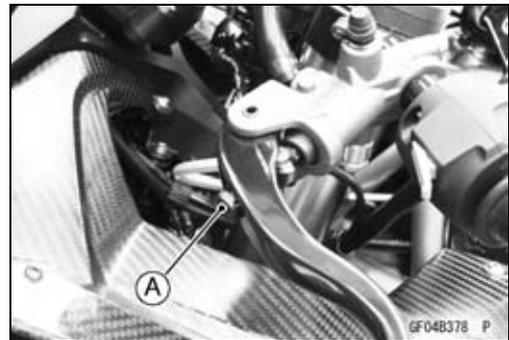
### Clutch Lever

#### **Clutch Lever Position Adjustment**

The clutch lever position can be adjusted to suit the operator's hand.

- Push the lever forward, turn the adjuster [A] and choose a suitable lever position.

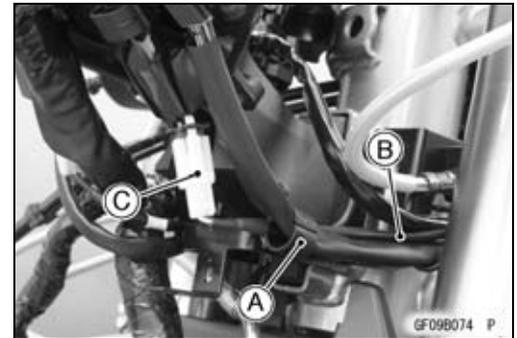
|                |         |   |   |          |
|----------------|---------|---|---|----------|
| Adjuster       | Turn in | ← | → | Turn out |
| Lever Position | Far     | ← | → | Near     |



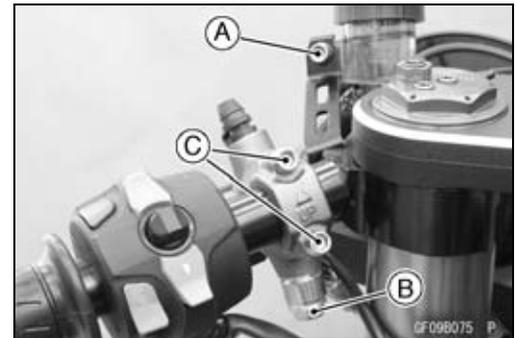
## Clutch Master Cylinder

### Clutch Master Cylinder Removal

- Remove the intake duct (see Intake Duct Removal in the Fuel System (DFI) chapter).
- Drain the clutch fluid from the reservoir (see Clutch Fluid Change in the Periodic Maintenance chapter).
- Open the clamp [A] and clear the starter lockout switch lead [B].
- Disconnect the starter lockout switch lead connector [C].



- Remove:
  - Clutch Reservoir Bolt [A]
  - Clutch Reservoir Nut
  - Dumper
  - Collar
  - Washers
- Remove the banjo bolt [B] to disconnect the clutch hose from the master cylinder.
- Remove the clamp bolts [C], and take off the master cylinder as an assembly with the clutch reservoir, clutch lever and starter lockout switch installed.

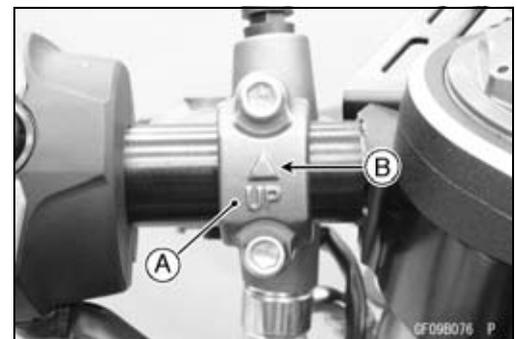


### NOTICE

**Clutch fluid quickly ruins painted surface; any spilled fluid should be completely washed away immediately.**

### Clutch Master Cylinder Installation

- Install the master cylinder clamp [A] with the arrow mark [B] upward.



## 6-10 CLUTCH

### Clutch Master Cylinder

- Align the punch mark [A] on the handlebar with the mating surface [B] of the master cylinder clamp.
- 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 Master Cylinder Clamp Bolts: 9.0 N·m (0.92 kgf·m, 80 in·lb)**

- Replace the washers that are on each side of the hose fitting with new ones.
- Install the clutch hose (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

**Torque - Clutch Hose Banjo Bolt: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**

- Replenish the clutch fluid into the reservoir and bleed the clutch line (see Bleeding the Clutch Line).
- Check that the clutch line has proper fluid pressure and no fluid leakage.
- Connect the starter lockout switch lead connector and install the clamp and band (see Cable, Wire, and Hose Routing Section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

#### **Clutch Master Cylinder Disassembly/Assembly**

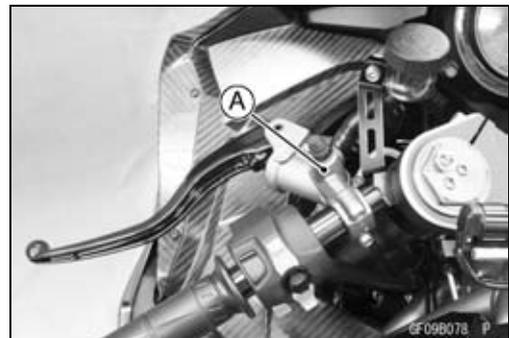
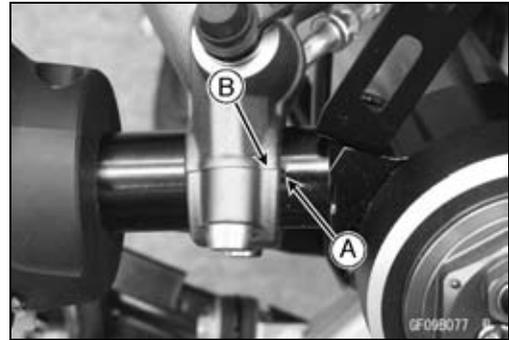
- The clutch master cylinder cannot disassemble. If a internal components replacement are required, replace the clutch master cylinder as an assembly.

#### **Clutch Master Cylinder Inspection**

- Remove the clutch master cylinder [A] (see Clutch Master Cylinder Removal).
- Check the clutch master cylinder for leakage, and replace the clutch master cylinder assembly if necessary.
- Check the clutch master cylinder for damage, deformation or crack and replace the clutch master cylinder assembly if necessary.

#### **NOTE**

○Do not try to disassemble the clutch master cylinder.



## Clutch Slave Cylinder

### Clutch Slave Cylinder Removal

- Drain the clutch fluid (see Clutch Fluid Change in the Periodic Maintenance chapter).
- Remove:
  - Banjo Bolt [A]
  - Clutch Slave Cylinder Bolts [B]
  - Slave Cylinder [C]

#### NOTICE

**Immediately wash away any clutch fluid that spills. It may damage painted surfaces.**

- Perform the following if the clutch slave cylinder is to be removed but not disassembled.

#### NOTICE

**If the clutch slave cylinder is removed and left alone, the piston will be pushed out by spring force and the clutch fluid will drain out.**

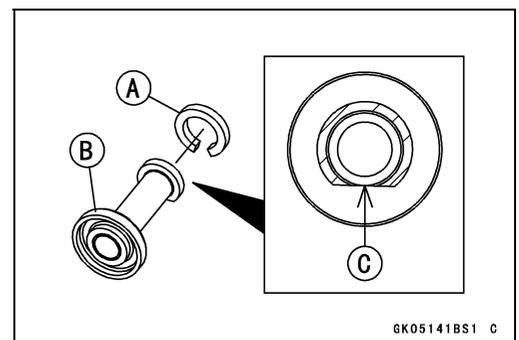
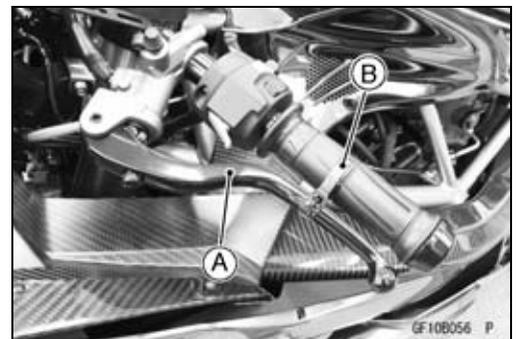
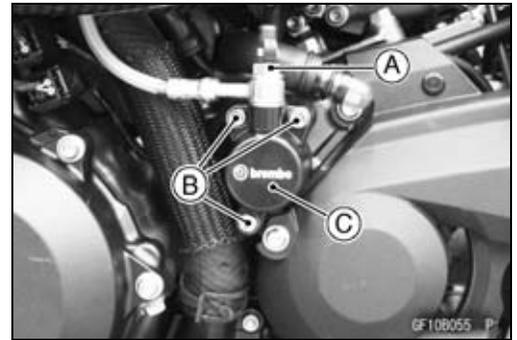
- Remove the clutch slave cylinder from the engine with the pipe installed. Push [A] the piston into the cylinder as far as it will go.
- Apply the clutch lever [A] slowly and hold it with a band [B].

#### NOTE

- *Holding the clutch lever keeps the piston from coming out.*

### Clutch Slave Cylinder Installation

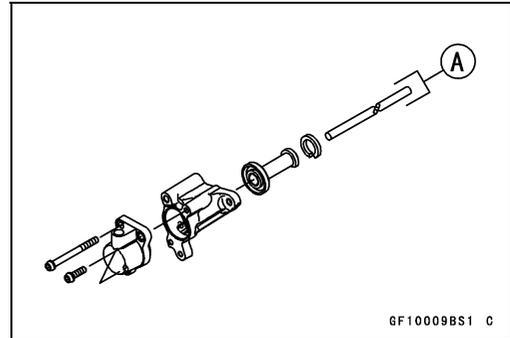
- Stick the damper [A] to the push rod cover [B], if removed.
- Face the damper ends toward the flat portion [C] of the push rod cover.



## 6-12 CLUTCH

### Clutch Slave Cylinder

- Apply molybdenum disulfide grease to either end [A] of the push rod, and install the push rod so that the greased end faces in.



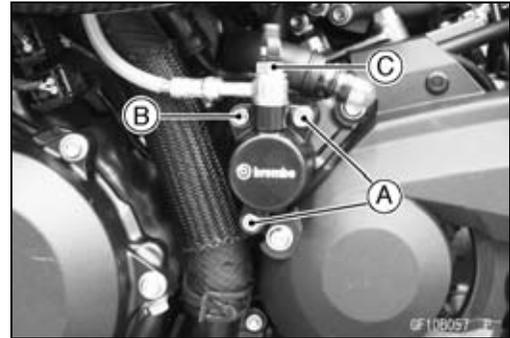
- Apply a non-permanent locking agent to the threads of the slave cylinder mounting bolts.  
Clutch Slave Cylinder Mounting Bolts (L = 20 mm ) [A]  
Clutch Slave Cylinder Mounting Bolt (L = 65 mm ) [B]
- Finger tighten all the clutch slave cylinder mounting bolts.
- Remove the band from the clutch lever and release the clutch lever.
- Tighten the clutch slave cylinder mounting bolts.

**Torque - Clutch Slave Cylinder Mounting Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Replace the washers that are on each side of the hose fitting with new ones.
- Install the clutch hose (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

**Torque - Clutch Hose Banjo Bolt [C]: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**

- Check the fluid level in the clutch master cylinder reservoir, and bleed the air in the clutch line.
- Check the clutch operation.



## Clutch Fluid

### Clutch Fluid Level Inspection

- Refer to the Clutch Fluid Level Inspection in the Periodic Maintenance chapter.

### Clutch Fluid Change

- Refer to the Clutch Fluid Change in the Periodic Maintenance chapter.

### Bleeding the Clutch Line

#### **⚠ WARNING**

Air in the clutch lines diminish clutch performance and can cause an accident resulting in injury or death. If the clutch lever has a soft or "spongy" feeling mushy when it is applied, there might be air in the clutch lines or the clutch may be defective. Do not operate the vehicle and service the clutch system immediately.

#### **NOTICE**

Clutch fluid quickly ruins painted or plastic surfaces; any spilled fluid should be completely wiped up immediately with wet cloth.

- Remove:
  - Clutch Reservoir Cap [A]
  - Diaphragm Plate
  - Diaphragm
- Fill the reservoir with fresh clutch fluid to the upper level line in the reservoir.

#### **NOTE**

○ Tap the clutch hose lightly going from the lower end to upper end and bleed the air off the reservoir.

- Slowly pump the clutch lever several times until no air bubbles can be seen rising up through the fluid from the hole at the bottom of the reservoir.
- Remove the rubber cap from the bleed valve on the clutch master cylinder.
- Attach a clear plastic hose [A] to the bleed valve, and run the other end of the hose into a container.



## 6-14 CLUTCH

### Clutch Fluid

- Bleed the clutch line and the master cylinder.
- Repeat this operation until no more air can be seen coming out into the plastic hose.
- 1. Pump the clutch lever until it becomes hard, and apply the clutch lever and hold it [A].
- 2. Quickly open and close [B] the bleed valve while holding the clutch lever applied.
- 3. Release the clutch lever [C].

#### NOTE

○ *The fluid level must be checked often during the bleeding operation and replenished with fresh clutch 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.

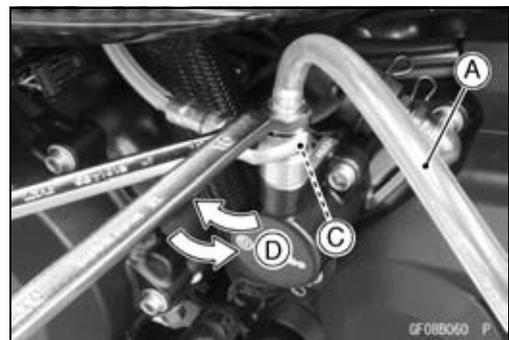
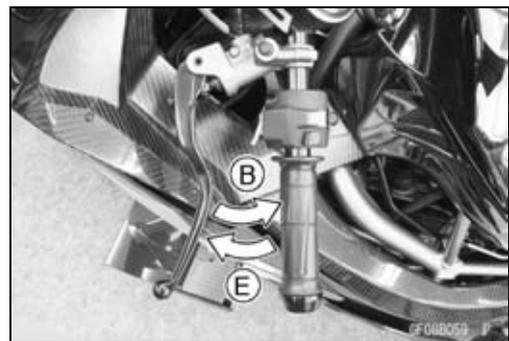
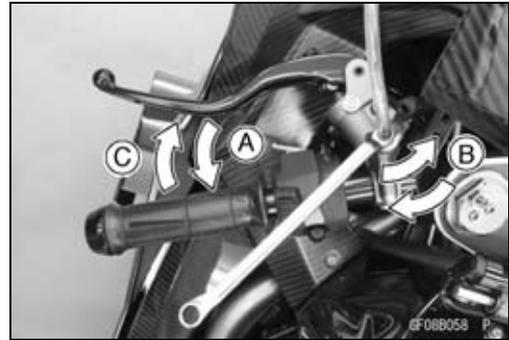
**Torque - Clutch Master Cylinder Bleed Valve: 14 N·m (1.4 kgf·m, 10 ft·lb)**

- Remove the rubber cap from the bleed valve.
- Attach a clear plastic hose [A] to the bleed valve on the clutch slave cylinder, and run the other end of the hose into a container.
- Bleed the clutch line as follows.
- Repeat this operation until no more air can be seen coming out into the plastic hose.
- 1. Pump the clutch lever until it becomes hard, and apply the clutch lever and hold it [B].
- 2. Hold the banjo bolt [C], and quickly open and close [D] the bleed valve while holding the clutch lever applied.
- 3. Release the clutch lever [E].

#### NOTE

○ *Check the fluid level in the reservoir often, replenishing it 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.*



---

## Clutch Fluid

---

** WARNING**

Mixing brands and types of hydraulic fluid lowers the fluid's boiling point, cause rubber part to deteriorate and can reduce the hydraulic clutch system's effectiveness and cause an accident resulting in injury or death. Do not mix two brands of brake fluid. Change the fluid in the hydraulic clutch system completely if the fluid must be refilled but the type and brand of the hydraulic fluid that is already in the reservoir are unidentified.

- Remove the clear plastic hose.
- Tighten the bleed valve, and install the rubber cap.  
Torque - Clutch Slave Cylinder Bleed Valve: 7.9 N·m (0.81 kgf·m, 70 in·lb)
- Install:
  - Diaphragm
  - Diaphragm Plate
- Tighten:  
Torque - Clutch Reservoir Cap (for reference): 1.5 N·m (0.15 kgf·m, 13 in·lb)
- After bleeding the clutch line, check the clutch for good clutching effectiveness and no fluid leakage.
- ★ If necessary, bleed the air from the line again.

***Clutch Hose Removal/Installation***

- Refer to the Clutch Hose and Pipe Replacement in the Periodic Maintenance chapter.

***Clutch Hose Inspection***

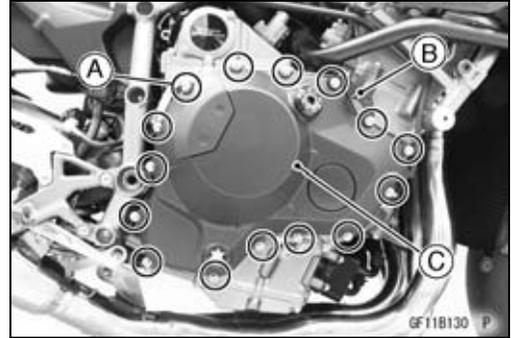
- Refer to the Clutch Hose and Pipe Damage and Installation Condition Inspection in the Periodic Maintenance chapter.

## 6-16 CLUTCH

### Clutch Cover

#### Clutch Cover Removal

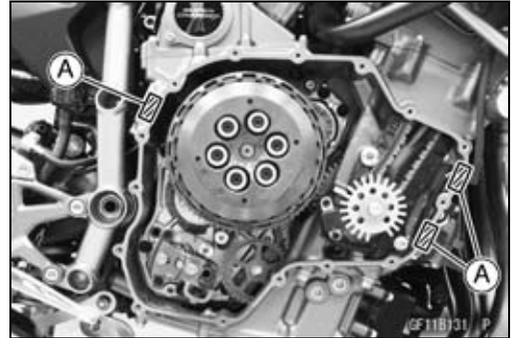
- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  - Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
  - Clutch Cover Bolts [A]
  - Bracket [B]
  - Clutch Cover [C]



#### Clutch Cover Installation

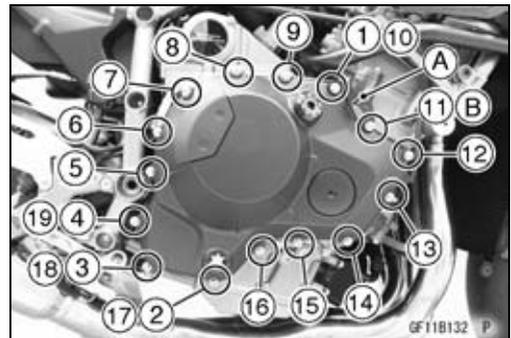
- Using a cleaning fluid, clean off any oil or dirt that may be on the mating surface. Dry them with a clean cloth.
- Apply liquid gasket to the area [A] where the mating surface of the crankcase touches the clutch cover gasket and circumference of the crankshaft sensor grommet.

**Sealant - Liquid Gasket, TB1211F: 92104-0004**



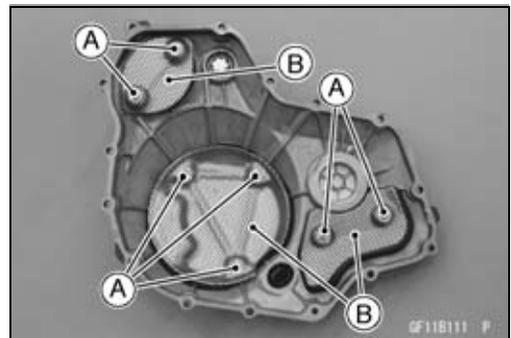
- Replace the clutch cover gasket with a new one.
- Install the bracket [A].
- Apply a non-permanent locking agent to only one clutch cover bolt [B] shown in figure.
- Tighten the clutch cover bolts following the specified tightening sequence [1 ~ 19].
- Tighten the clutch cover bolts while pushing the clutch cover rearward.

**Torque - Clutch Cover Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)**

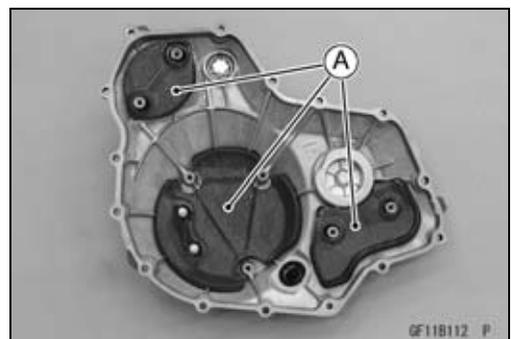


#### Clutch Cover Disassembly

- Remove:
  - Clutch Cover (see Clutch Cover Removal)
  - Clutch Cover Damper Plate Bolts [A]
  - Clutch Cover Damper Plates [B]

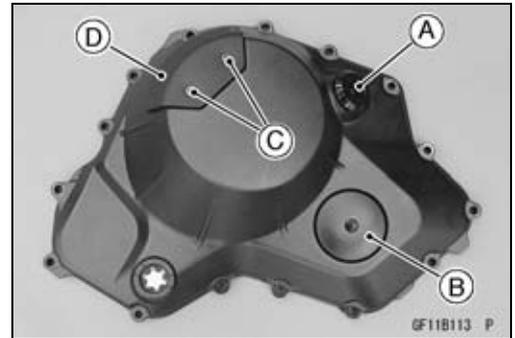


- Remove the dampers [A].

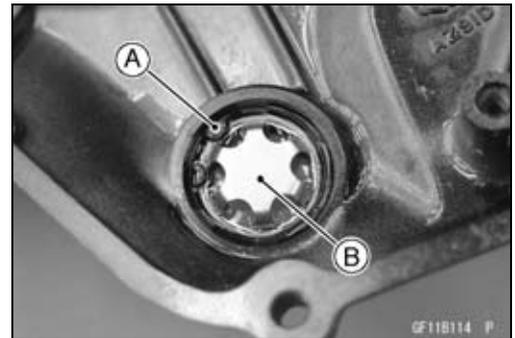


## Clutch Cover

- Remove:
  - Oil Filler Plug [A]
  - Crankshaft Timing Plug [B]
  - Clutch Outer Cover Bolts [C]
  - Clutch Outer Cover [D]

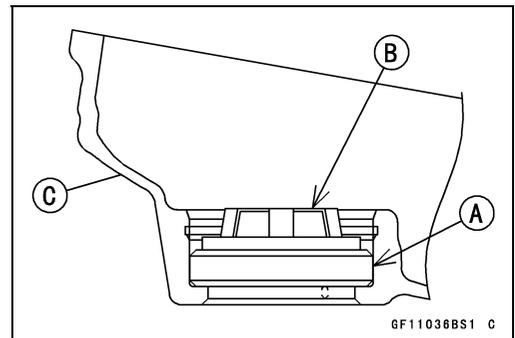


- Remove:
  - Circlip [A]
  - Oil Level Inspection Window [B]
- Special Tool - Inside Circlip Pillars: 57001-143**



### Clutch Cover Assembly

- Replace the circlip and oil level inspection window with new ones.
- Apply soap and water solution to the rubber portion [A] of the oil level inspection window.
- Press the oil level inspection window until the bottom so that its projection [B] faces inside of the clutch cover [C].
- Install the circlip.



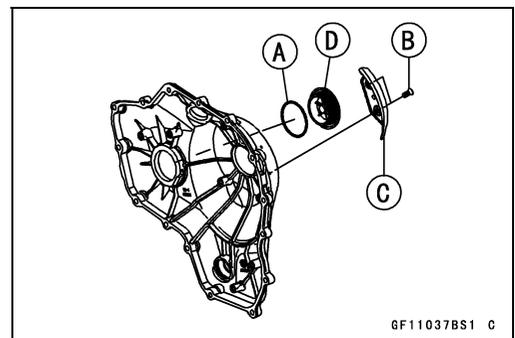
**Special Tool - Inside Circlip Pillars: 57001-143**

- Fit the circlip into the groove of the clutch cover securely.

- Replace the O-ring [A] with new one.
- Apply grease to the O-ring.
- Apply a non-permanent locking agent to the threads of the clutch outer cover bolts [B].
- Install the clutch outer cover [C].
- Tighten:

**Torque - Crankshaft Timing Plug [D]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

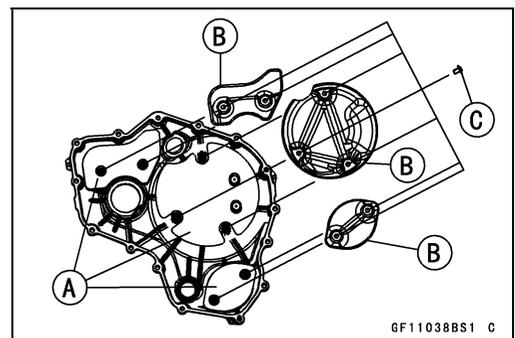
**Clutch Outer Cover Bolts: 5.0 N·m (0.51 kgf·m, 44 in·lb)**



- Install:
  - Dampers [A]
  - Clutch Cover Damper Plates [B]
- Apply a non-permanent locking agent to the threads of the clutch cover damper plate bolts [C].
- Tighten:

**Torque - Clutch Cover Damper Plate Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Pour in the specified type and amount of oil (see Engine Oil Change in the Periodic Maintenance chapter).

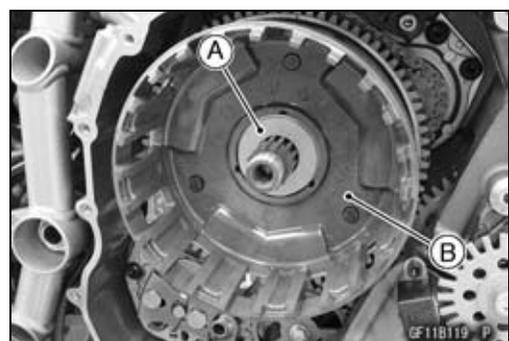
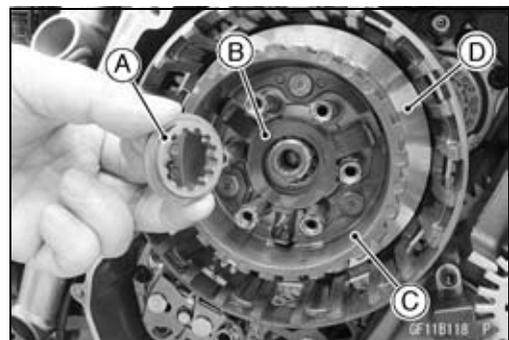
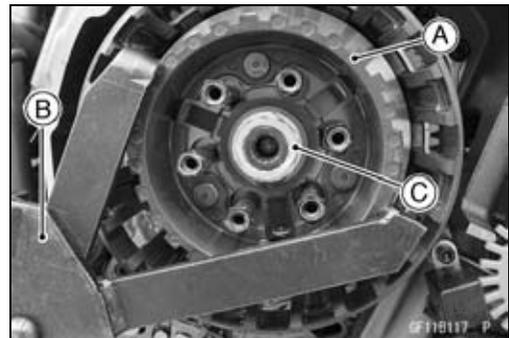
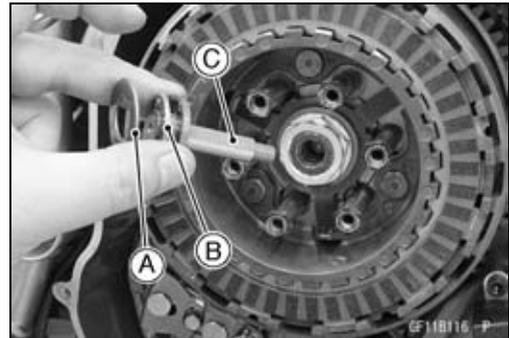
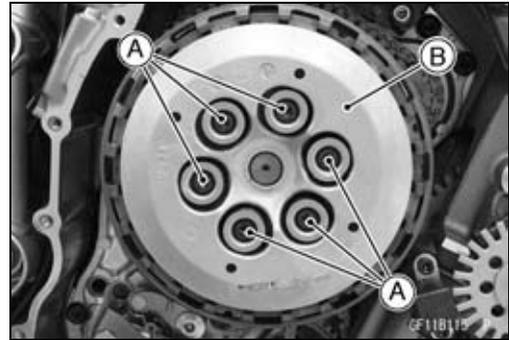


## 6-18 CLUTCH

### Clutch

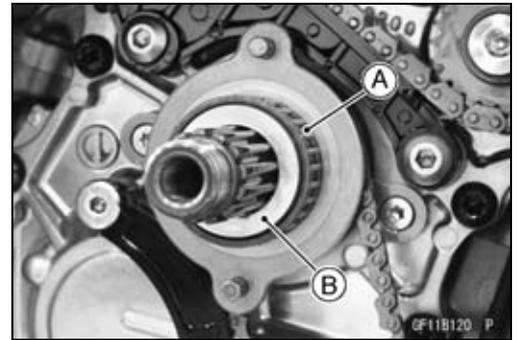
#### Clutch Removal

- Remove:
  - Clutch Cover (see Clutch Cover Removal)
  - Clutch Spring Bolts [A] with Spring Holders
  - Clutch Springs
  - Clutch Spring Plate [B]
  
- Remove:
  - Washer [A]
  - Thrust Bearing [B]
  - Pusher [C]
  - Friction Plates and Steel Plates
  
- Hold the sub clutch hub [A] steady with the clutch holder [B], and remove the nut [C].  
**Special Tool - Clutch Holder: 57001-1243**
  
- Remove:
  - Toothed Washer [A]
  - Torque Limiter Springs [B]
  - Sub Clutch Hub [C]
  - Clutch Hub [D]
  
- Remove:
  - Spacer [A]
  - Clutch Housing [B]



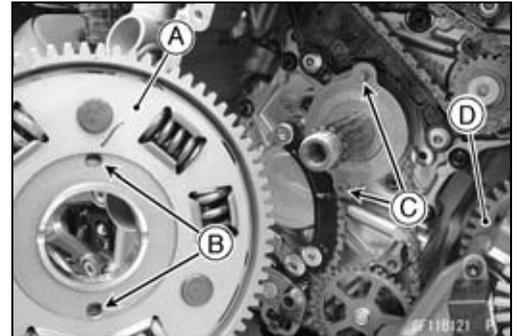
## Clutch

- Remove:
  - Needle Bearing [A]
  - Sleeve [B]

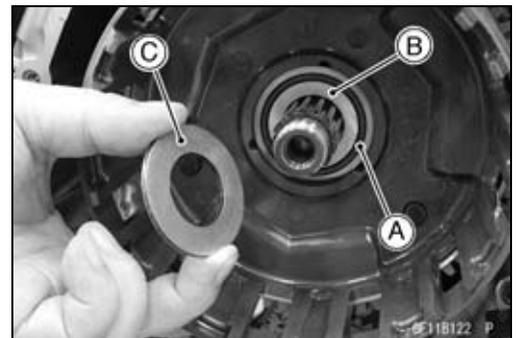


### Clutch Installation

- Install the clutch housing [A].
- Fit the holes [B] to the projections [C].
- Engage the clutch housing gear with the crankshaft primary gear [D].



- Apply molybdenum disulfide oil solution to the needle bearing [A].
- Apply engine oil to the sleeve [B] and spacer [C].
- Install:
  - Needle Bearing
  - Sleeve
  - Spacer

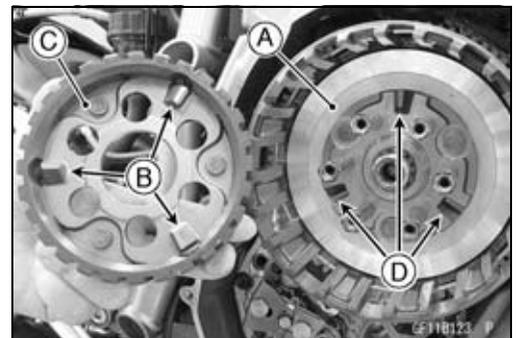


★ If the sub clutch hub bolts were removed, install them as follows.

- 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)**

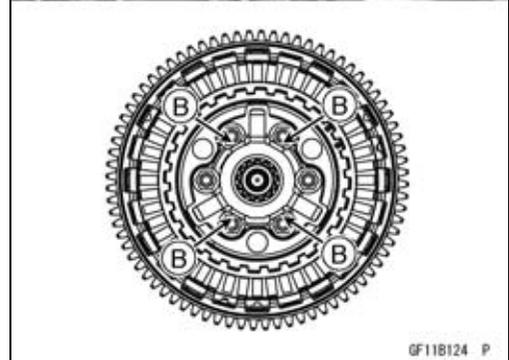
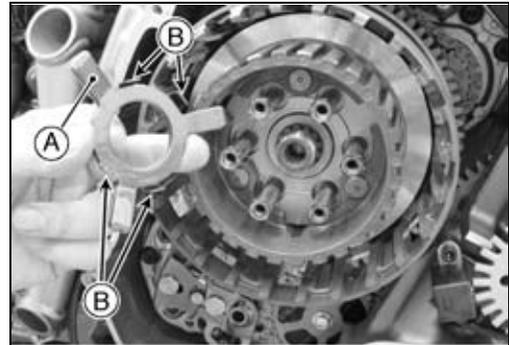
- Install the clutch hub [A] on the drive shaft.
- Align the damper cams [B] of the sub clutch hub [C] to the cam followers [D] of the clutch hub.



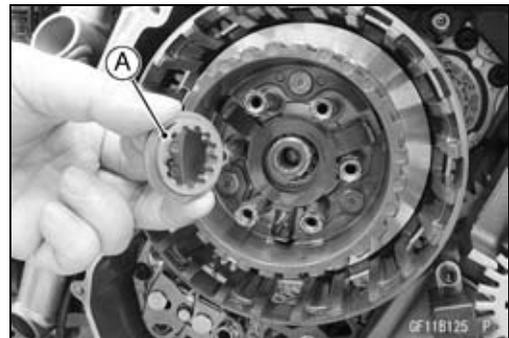
## 6-20 CLUTCH

### Clutch

- Install the four torque limiter springs [A] as shown.  
Tangs [B]
- Do not over lap the tang of the springs.



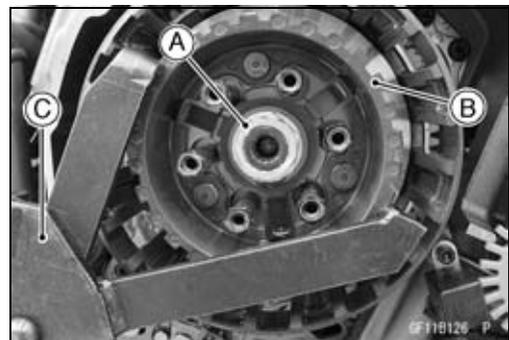
- Install the toothed washer [A].



- 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, 95.9 ft·lb)**



Clutch

- Install the following as shown in the figure.
  - Friction Plates [A] [B]
  - Steel Plates [C]
  - Spring Seat [D]
  - Spring [E]
  - Clutch Hub [F]

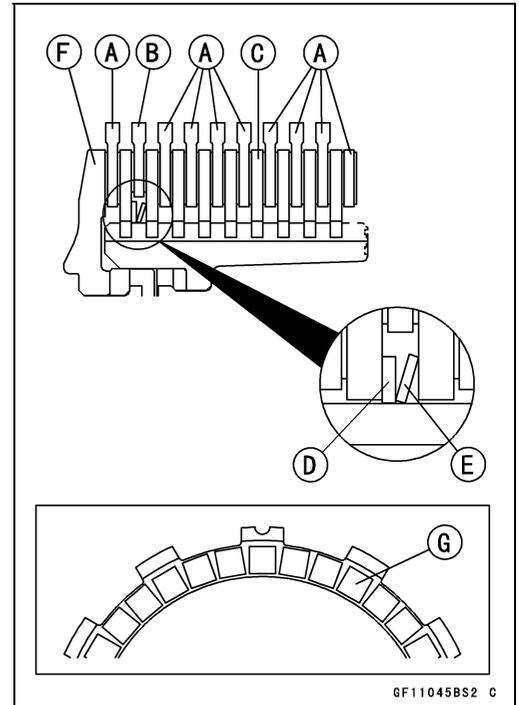
**NOTE**

- The lining blocks [G] of the friction plate [B] are larger than them of the friction plates [A].
- Install the spring seat and spring between first steel plate and second steel plate.
- The inside diameter of second friction plate [B] is larger than the others because the spring seat and spring are equipped to decrease the judder noise as shown in the figure.

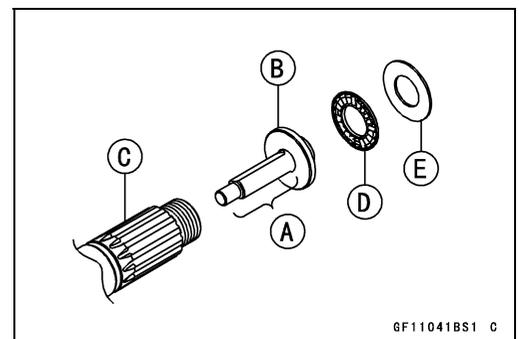
**NOTICE**

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 [A] fitting the tangs in the grooves in the housing as shown.



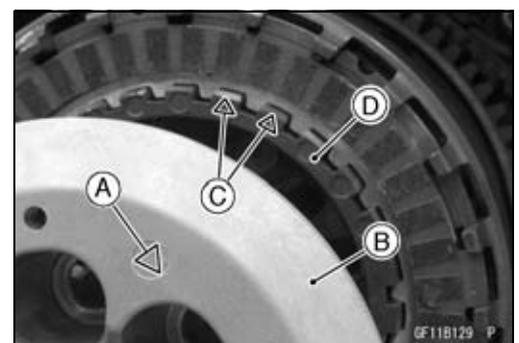
- Apply molybdenum disulfide grease to the outside surface [A] of the pusher [B].
- Install the pusher into the drive shaft [C].
- Apply molybdenum disulfide grease to the needle bearing [D] and washer [E].
- Install:
  - Needle Bearing
  - Washer



- Align the mark [A] of the spring plate [B] with the range between marks [C] of the sub clutch hub [D] to install the spring plate on the sub clutch hub.
- Install the clutch springs, 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).



## 6-22 CLUTCH

### Clutch

#### 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).

Collar [A]  
Sleeve [B]  
Needle Bearing [C]  
Clutch Housing [D]  
Spacer [E]  
Clutch Hub [F]  
Sub Clutch Hub [G]  
Friction Plates [H] [I]  
Steel Plates [J]  
Spring Seat [K]  
Spring [L]  
Spring Plate [M]

#### NOTE

○When the parts of the clutch are replaced, measure the spring plate free play as necessary.

- 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.

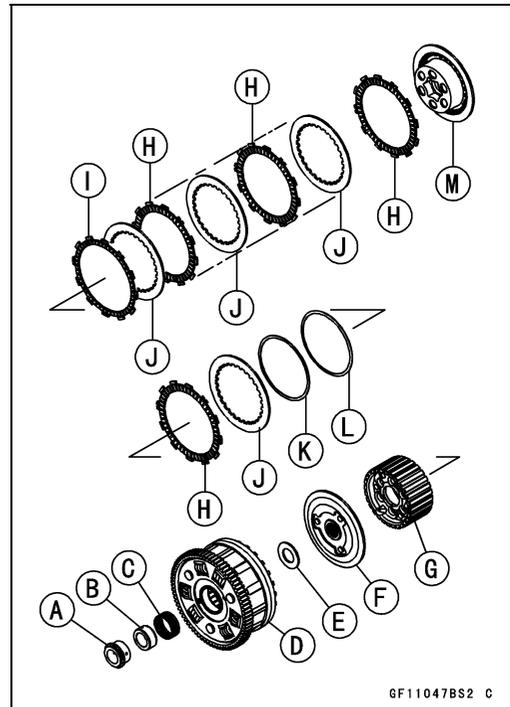
Drive Shaft [D]

- Measure the spring plate free play.

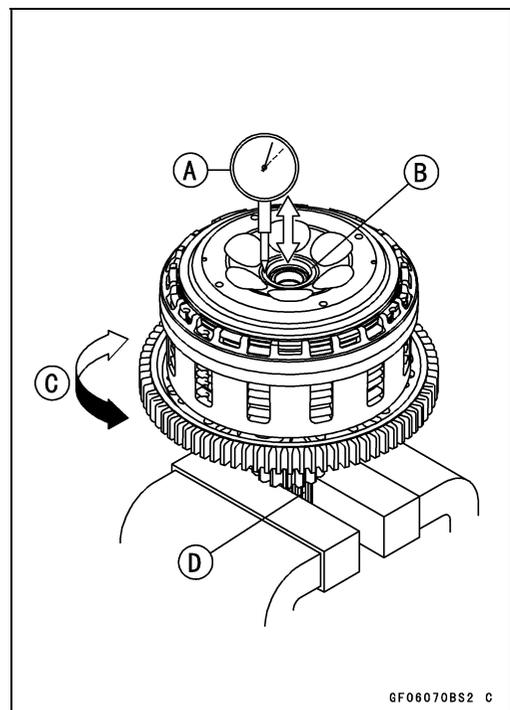
#### Spring Plate Free Play

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 within the usable range, adjust the free play (see Spring Plate Free Play Adjustment).



GF11047BS2 C



GF06070BS2 C

## Clutch

### Spring Plate Free Play Adjustment

#### NOTE

○The free play adjustment is performed by replacing the steel plate(s).

- 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 |
|--------------------------|-------------|
| 2.0 mm (0.079 in.)       | 13089-0021  |
| 2.3 mm (0.091 in.) (STD) | 13089-0027  |
| 2.6 mm (0.102 in.)       | 13089-0028  |

#### NOTE

○Do not use the steel plate of 2.0 mm (0.079 in.) and 2.6 mm (0.102 in.) thickness at the same time.

### Clutch Plate Assembly Length (Reference Information) Inspection

- Inspect the friction plate thickness (see Clutch Plate, Wear, Damage Inspection).
- Assemble:
  - Clutch Hub [A]
  - Friction Plates [B]
  - Spring Seat [C]
  - Spring [D]
  - Steel Plates [E]
  - Sub Clutch Hub [F]
  - Spring Plate [G]
  - Clutch Springs [H]
  - Clutch Spring Holder [I]
  - Clutch Spring Bolts [J]
  - Clutch Hub Bolts [K]

**Torque - Clutch Spring Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**

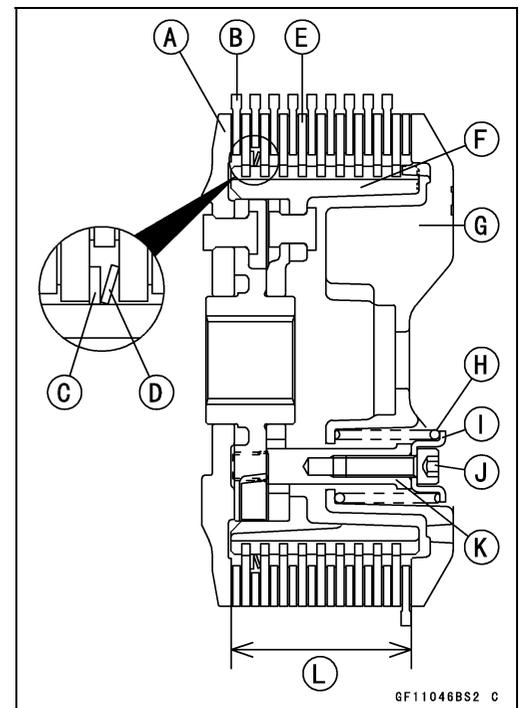
- Measure the clutch plate assembly length [L].

#### Clutch Plate Assembly Length (Reference)

Standard: 50.7 mm (2.00 in.)

#### NOTE

○The length of the clutch plate assembly changes by the steel plate thickness.



## 6-24 CLUTCH

### Clutch

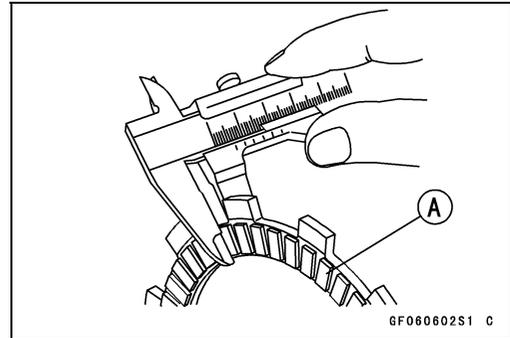
#### **Clutch Plate, Wear, Damage Inspection**

- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of each friction plate [A] at several points.
- ★ If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

#### **Friction Plate Thickness**

**Standard:** 2.92 ~ 3.08 mm (0.115 ~ 0.121 in.)

**Service Limit:** 2.7 mm (0.11 in.)



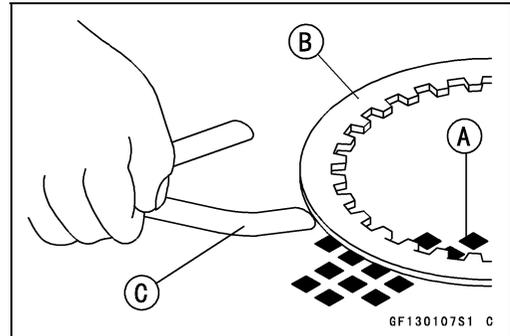
#### **Clutch Plate Warp Inspection**

- 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 (0.01 in.)



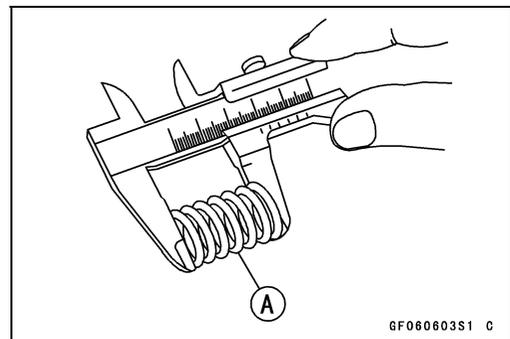
#### **Clutch Spring Free Length Measurement**

- 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**

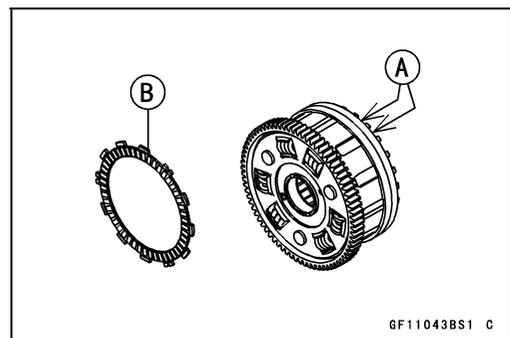
**Standard:** 43.5 mm (1.71 in.)

**Service Limit:** 42.1 mm (1.66 in.)



#### **Clutch Housing Finger Inspection**

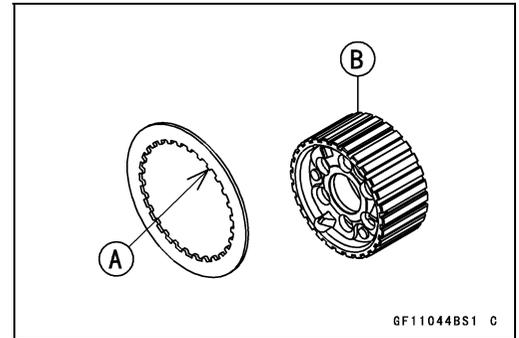
- Visually inspect the clutch housing fingers [A] where the friction plate tangs [B] hit them.
- ★ If they are badly worn or if there are groove cuts where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.



## Clutch

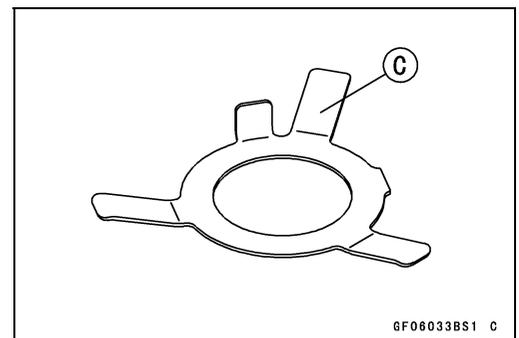
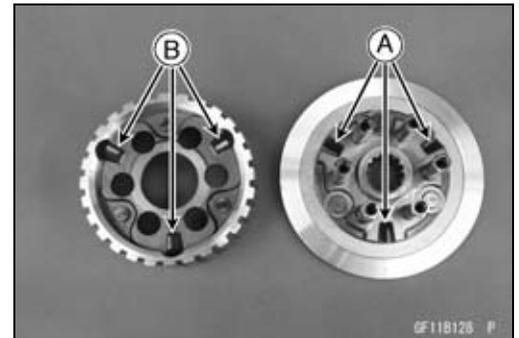
### **Clutch Housing Spline Inspection**

- 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 is damaged.





# Engine Lubrication System

## Table of Contents

|   |      |
|---|------|
| Exploded View.....                            | 7-2  |
| Engine Oil Flow Chart.....                    | 7-4  |
| Specifications .....                          | 7-6  |
| Special Tools and Sealants .....              | 7-7  |
| Engine Oil and Oil Filter.....                | 7-8  |
| Oil Level Inspection.....                     | 7-8  |
| Engine Oil Change.....                        | 7-8  |
| Oil Filter Replacement .....                  | 7-8  |
| Oil Pan.....                                  | 7-9  |
| Oil Pan Removal .....                         | 7-9  |
| Oil Pan Installation .....                    | 7-9  |
| Oil Screen.....                               | 7-10 |
| Oil Screen Removal .....                      | 7-10 |
| Oil Screen Installation .....                 | 7-10 |
| Oil Screen Cleaning.....                      | 7-11 |
| Oil Pressure Relief Valve.....                | 7-12 |
| Oil Pressure Relief Valve Removal .....       | 7-12 |
| Oil Pressure Relief Valve Installation .....  | 7-12 |
| Oil Pressure Relief Valve Inspection.....     | 7-12 |
| Oil Pump.....                                 | 7-13 |
| Oil Pump Removal .....                        | 7-13 |
| Oil Pump Installation .....                   | 7-13 |
| Oil Pump Driven Gear Removal.....             | 7-13 |
| Oil Pump Driven Gear Installation.....        | 7-14 |
| Oil Pump Driven Gear Shaft Removal .....      | 7-14 |
| Oil Pump Driven Gear Shaft Installation ..... | 7-15 |
| Oil Cooler.....                               | 7-16 |
| Oil Cooler Removal.....                       | 7-16 |
| Oil Cooler Installation.....                  | 7-16 |
| Oil Pressure Measurement.....                 | 7-17 |
| Oil Pressure Measurement .....                | 7-17 |
| Oil Pressure Switch .....                     | 7-18 |
| Oil Pressure Switch Removal .....             | 7-18 |
| Oil Pressure Switch Installation .....        | 7-18 |



## ENGINE LUBRICATION SYSTEM 7-3

### Exploded View

| No. | Fastener                         | Torque |       |          | Remarks |
|-----|----------------------------------|--------|-------|----------|---------|
|     |                                  | N·m    | kgf·m | ft·lb    |         |
| 1   | Oil Filler Plug                  | 10     | 1.0   | 89 in·lb |         |
| 2   | Oil Pump Drive Chain Guide Bolts | 10     | 1.0   | 89 in·lb | L       |
| 3   | Oil Pump Driven Gear Bolt        | 10     | 1.0   | 89 in·lb | L, Lh   |
| 4   | Oil Passage Plugs                | 20     | 2.0   | 15       | L       |
| 5   | Oil Cooler Bolts                 | 15     | 1.5   | 11       | L, S    |
| 6   | Oil Filter                       | 17     | 1.7   | 13       | G, R    |
| 7   | Oil Filter Pipe                  | 35     | 3.6   | 26       | L       |
| 8   | Oil Pressure Switch              | 15     | 1.5   | 11       | LG      |
| 9   | Oil Pressure Relief Valve        | 15     | 1.5   | 11       | L       |
| 10  | Engine Oil Drain Bolt            | 25     | 2.5   | 18       |         |
| 11  | Oil Pan Bolts                    | 10     | 1.0   | 89 in·lb | S       |

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

Lh: Left-hand Threads.

MO: Apply molybdenum disulfide oil solution.

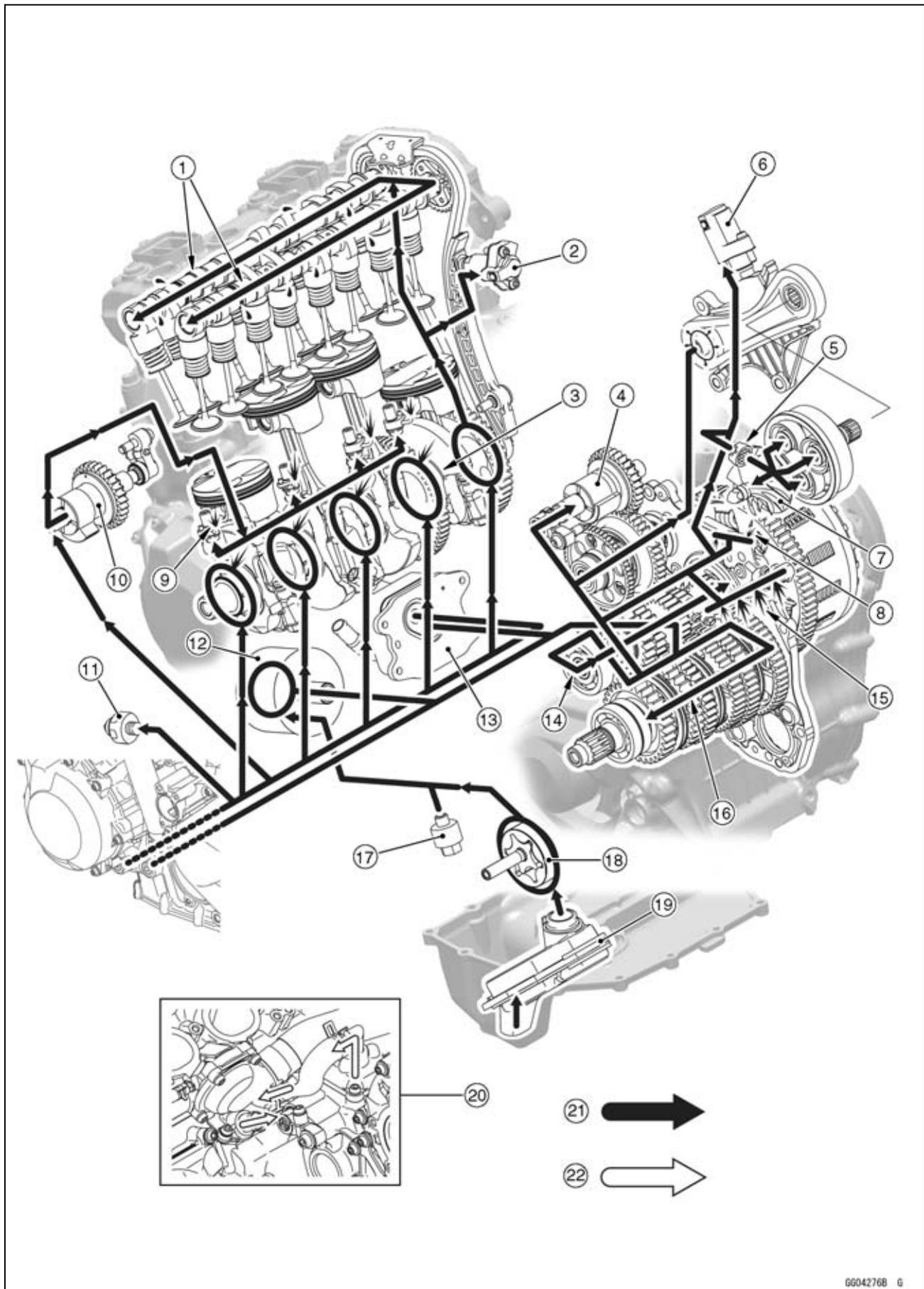
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)

R: Replacement Parts

S: Follow the specified tightening sequence.

# 7-4 ENGINE LUBRICATION SYSTEM

## Engine Oil Flow Chart



### Engine Oil Flow Chart

---

1. Camshaft Oil Passage
2. Camshaft Chain Tensioner
3. Crankshaft Oil Passage
4. Rear Balancer
5. Supercharger Oil Filter
6. Supercharger Chain Tensioner
7. Supercharger Impeller
8. Supercharger Chain Oil Jet
9. Piston Oil Jet
10. Front Balancer
11. Oil Pressure Switch
12. Oil Filter
13. Oil Cooler
14. Input Shaft Oil Passage
15. Transmission Oil Jet
16. Output Shaft Oil Passage
17. Oil Pressure Relief Valve
18. Oil Pump
19. Oil Screen
20. Blowby Gas Flow
21. Engine Oil
22. Blowby Gas

## 7-6 ENGINE LUBRICATION SYSTEM

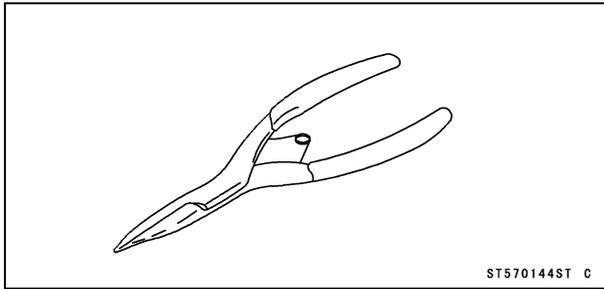
### Specifications

| Item   | Standard  |
|--|---|
| <b>Engine Oil</b><br>Type<br>Viscosity<br>Capacity:<br><br>Level | API SG, SH, SJ, SL, or SM with JASO MA, MA1 or MA2<br>SAE 10W-40<br>3.9 L (4.1 US qt) (When filter is not removed)<br>4.4 L (4.7 US qt) (When filter is removed)<br>5.0 L (5.3 US qt) (When engine is completely dry)<br>Between upper and lower level lines (Wait 2 ~ 3 minutes after idling or running) |
| <b>Oil Pressure Measurement</b><br>Oil Pressure                  | 156.8 ~ 205.8 kPa (1.60 ~ 2.10 kgf/cm <sup>2</sup> , 22.74 ~ 29.84 psi) @4 000 r/min (rpm), Oil Temperature 50°C (122°F)  |

**Special Tools and Sealants**

**Outside Circlip Pliers:**

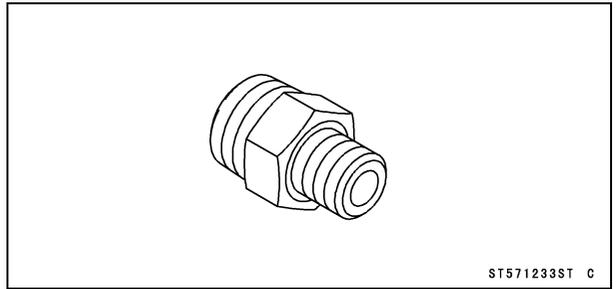
**57001-144**



ST570144ST C

**Oil Pressure Gauge Adapter, PT3/8:**

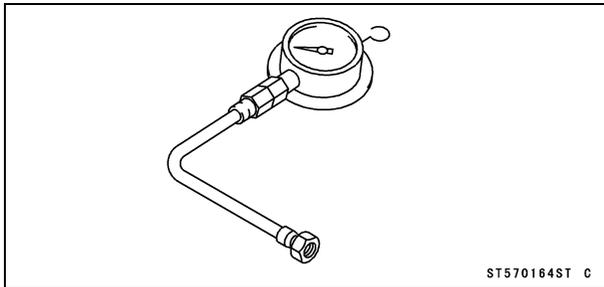
**57001-1233**



ST571233ST C

**Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>:**

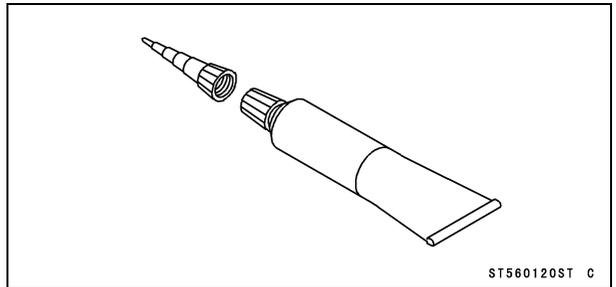
**57001-164**



ST570164ST C

**Liquid Gasket, TB1211:**

**56019-120**



ST560120ST C

## 7-8 ENGINE LUBRICATION SYSTEM

### Engine Oil and Oil Filter

#### **⚠ WARNING**

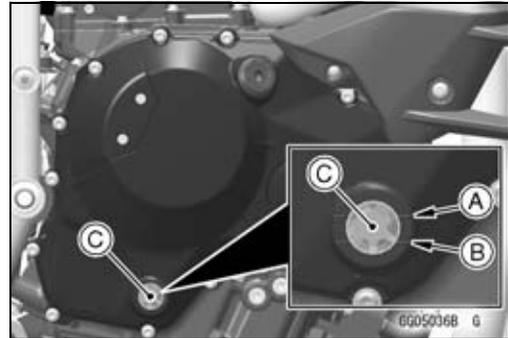
Vehicle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine seizure, accident, and injury. Check the oil level before each use and change the oil and filter according to the periodic maintenance chart.

#### **Oil Level Inspection**

- Check that the engine oil level is between the upper [A] and lower [B] levels in the oil level inspection window [C].

#### **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.



#### **NOTICE**

Racing the engine before the oil reaches every part can cause engine seizure.

If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the oil pressure warning indicator will light. If it 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 syringe 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.

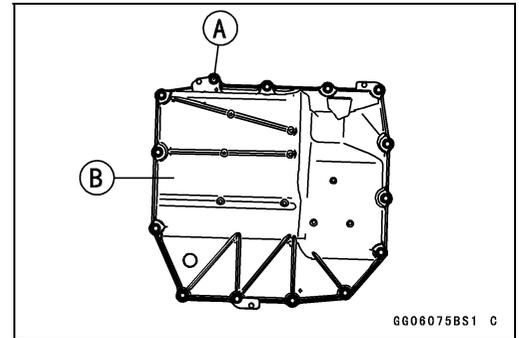
#### **Oil Filter Replacement**

- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.

## Oil Pan

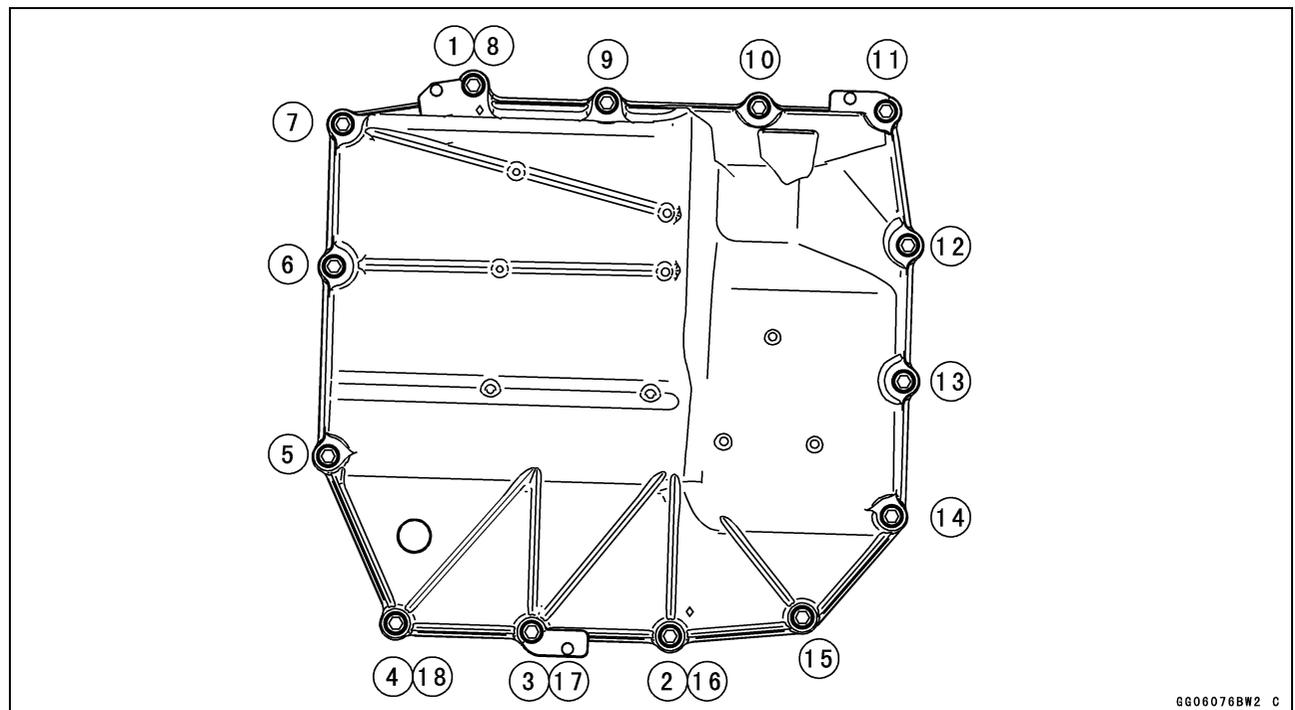
### Oil Pan Removal

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Remove:
  - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
  - Oil Pan Bolts [A]
  - Oil Pan [B]
  - Oil Pan Gasket
- Remove the following parts if necessary.
  - Oil Screen (see Oil Screen Removal)
  - Oil Pressure Relief Valve (see Oil Pressure Relief Valve Removal)



### Oil Pan Installation

- Install the following parts if removed.
  - Oil Pressure Relief Valve (see Oil Pressure Relief Valve Installation)
  - Oil Screen (see Oil Screen Installation)
- Replace the oil pan gasket with a new one.
- Install:
  - Oil Pan Gasket
  - Oil Pan
- Tighten the oil pan bolts following sequence [1 ~ 18].  
**Torque - Oil Pan Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**



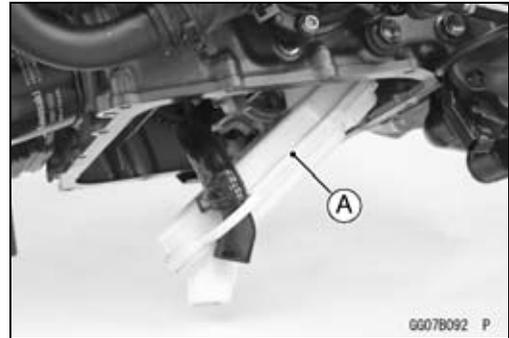
- Install the removed parts (see appropriate chapters).

## 7-10 ENGINE LUBRICATION SYSTEM

### Oil Screen

#### **Oil Screen Removal**

- Remove:
  - Oil Pan (see Oil Pan Removal)
  - Oil Screen [A]

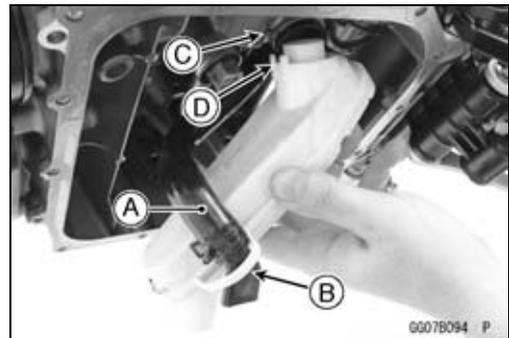


#### **Oil Screen Installation**

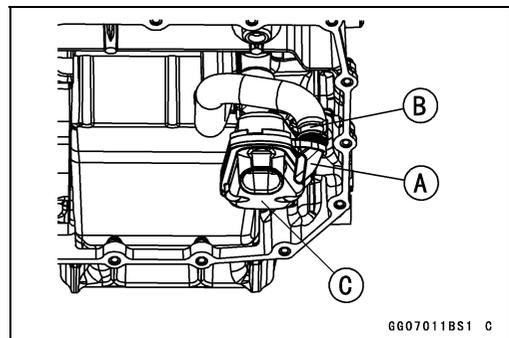
- Clean the oil screen (see Oil Screen Cleaning).
- Replace the O-ring [A] with a new one, and install it.
- Apply grease to the O-ring.



- Run the breather hose [A] in to the hole [B]
- Install the oil screen so that the crankcase rib [C] fits the notch [D] of the oil screen.



- When installing the oil pipe [A], install it and clamp [B] as shown.
  - Oil Screen [C]
- Install the removed parts (see appropriate chapters).



## Oil Screen

### Oil Screen Cleaning

- Remove the oil screen (see Oil Screen Removal).
- Clean the oil screen with a high flash-point solvent from the inside [A] to the outside (from the clean side to the dirty side), and remove the particles stuck.
- Blow away the particles by applying compressed air from the inside to the outside (from the clean side to the dirty side).

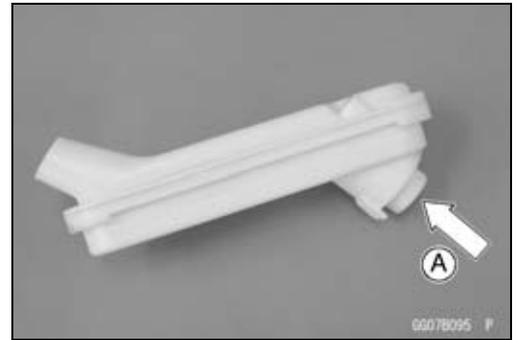
### **⚠ WARNING**

**Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the screen in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean the screen.**

### **NOTE**

○ *While cleaning the screen, check for any metal particles that might indicate internal engine damage.*

- Check the screens carefully for any damage.
- ★ If the screen is damaged, replace the oil screen.

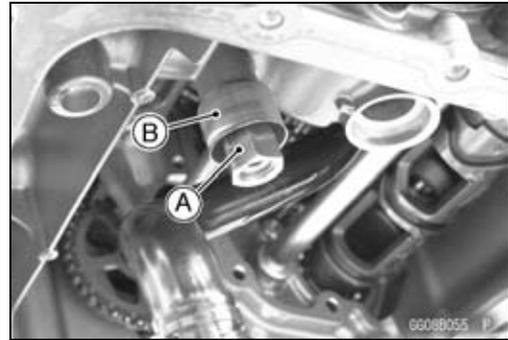


## 7-12 ENGINE LUBRICATION SYSTEM

### Oil Pressure Relief Valve

#### Oil Pressure Relief Valve Removal

- Remove:
  - Oil Screen (see Oil Screen Removal)
  - Oil Pressure Relief Valve [A]
  - Oil Pressure Relief Valve Cover [B]



#### Oil Pressure Relief Valve Installation

- Apply a non-permanent locking agent to the threads of the oil pressure relief valve.
- Install the oil pressure relief valve cover.
- Tighten:
  - Torque - Oil Pressure Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)
- Install the oil screen (see Oil Screen Installation).

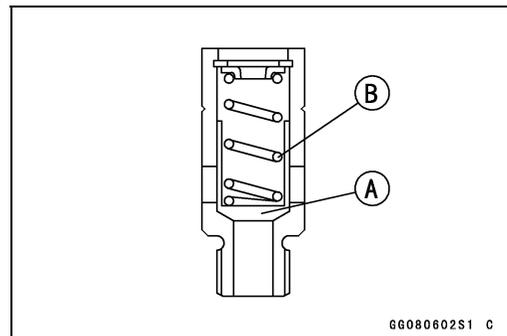
#### Oil Pressure Relief Valve Inspection

- Check to see if the valve [A] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [B] pressure.

#### NOTE

○ Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.

- ★ If any rough spots are found during above inspection, wash the valve clean with a high flash-point solvent and blow out any foreign particles that may be in the valve with compressed air.



#### **⚠ WARNING**

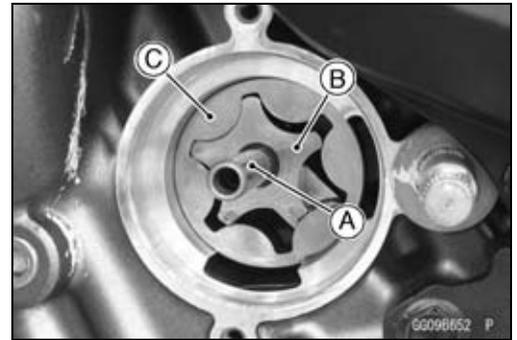
Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the oil pressure relief valve in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean the oil pressure relief valve.

- ★ 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

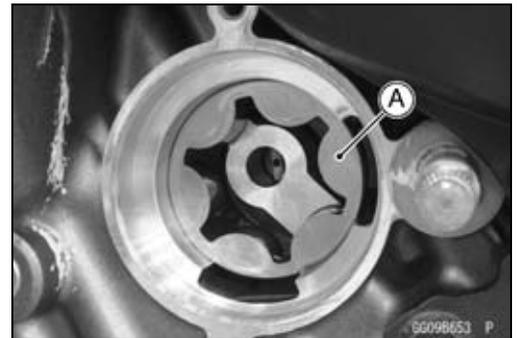
### Oil Pump Removal

- Remove:
  - Water Pump (see Water Pump Removal in the Cooling System chapter)
  - Oil (Water) Pump Shaft [A] with Inner Rotor [B] and Pin Outer Rotor [C]

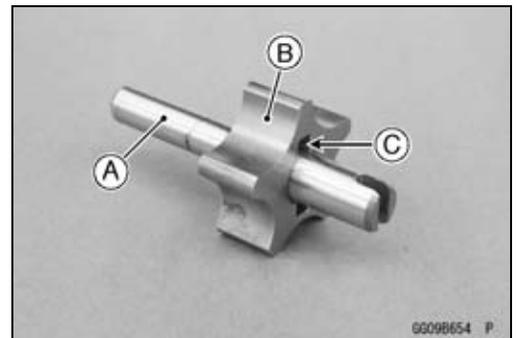


### Oil Pump Installation

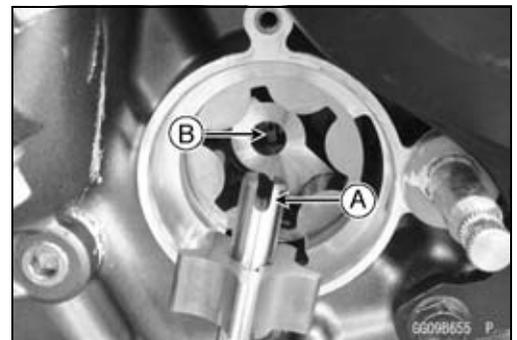
- Apply molybdenum disulfide oil solution to the outer rotor [A].
- Install the outer rotor into the crankcase.



- Apply molybdenum disulfide oil solution to the following parts:
  - Oil (Water) Pump Shaft [A]
  - Inner Rotor [B]
  - Pin [C]
- Assemble the pin, inner rotor and oil (water) pump shaft.



- Turn the pump shaft so that the slot [A] in its shaft fits onto the projection [B] of the oil pump driven gear shaft.
- Install the removed parts (see appropriate chapters).



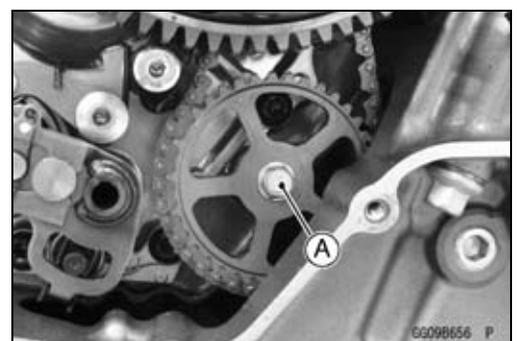
### Oil Pump Driven Gear Removal

- Remove the clutch cover (see Clutch Cover Removal in the Clutch chapter).
- Loosen the oil pump driven gear bolt [A]

**NOTE**

○ The oil pump driven gear bolt has a left-hand threads.

- Remove the clutch (see Clutch Removal in the Clutch chapter).



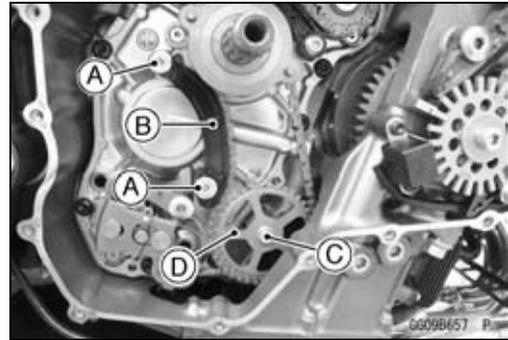
## 7-14 ENGINE LUBRICATION SYSTEM

### Oil Pump

- Remove:
  - Oil Pump Drive Chain Guide Bolts [A]
  - Oil Pump Drive Chain Guide [B]
  - Oil Pump Driven Gear Bolt [C]
  - Oil Pump Driven Gear [D]
  - Spacer

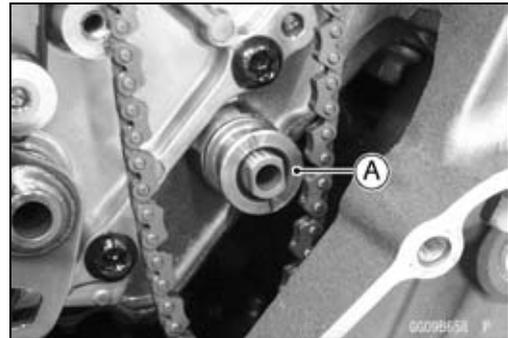
#### NOTE

○The oil pump driven gear bolt has a left-hand threads.



### Oil Pump Driven Gear Installation

- Install the spacer [A].



- Align the groove [A] of the oil pump driven gear to the oil pump driven gear shaft to install the oil pump driven gear so that "OUT" letters [B] face outward.
- Apply a non-permanent locking agent to the threads of the oil pump driven gear bolt and temporarily tighten it.

#### NOTE

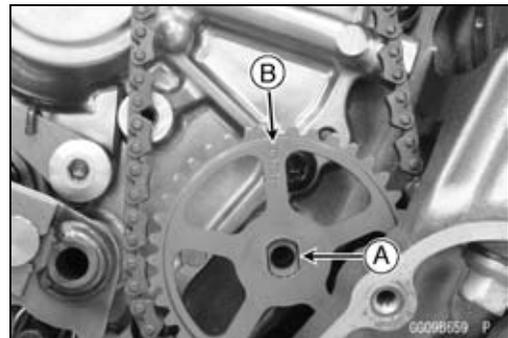
○The oil pump driven gear bolt has a left-hand threads.

- Apply a non-permanent locking agent to the threads of the oil pump drive chain guide bolts.
- Install the oil drive pump chain guide.
- Tighten:

**Torque - Oil Pump Drive Chain Guide Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Install the clutch (see Clutch Installation in the Clutch chapter).
- Tighten:

**Torque - Oil Pump Driven Gear Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**



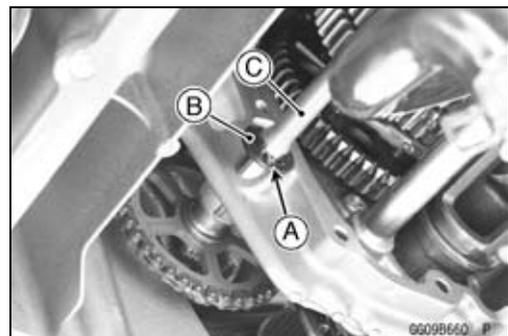
#### NOTE

○The oil pump driven gear bolt has a left-hand threads.

### Oil Pump Driven Gear Shaft Removal

- Remove:
  - Oil Pump Driven Gear (see Oil Pump Driven Gear Removal)
  - Oil Pan (see Oil Pan Removal)
  - Oil Screen (see Oil Pressure Relief Valve Removal)
  - Circlip [A]
  - Washer [B]
  - Oil Pump Driven Gear Shaft [C]

**Special Tool - Outside Circlip Pliers: 57001-144**

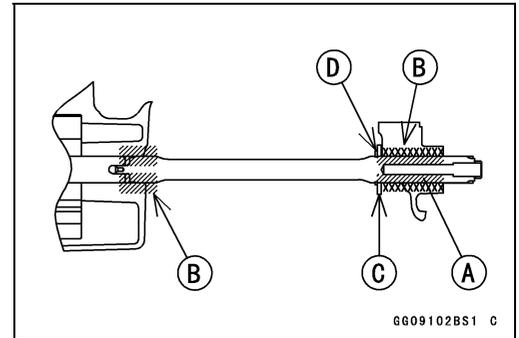


## Oil Pump

### ***Oil Pump Driven Gear Shaft Installation***

- Apply molybdenum disulfide grease [A] to the oil pump driven gear shaft.
- Apply molybdenum disulfide oil solution [B] to the crankcase.
- Install the oil pump driven gear shaft and washer [C].
- Install the new circlip [D] into the groove of the oil pump driven gear shaft.

**Special Tool - Outside Circlip Pliers: 57001-144**

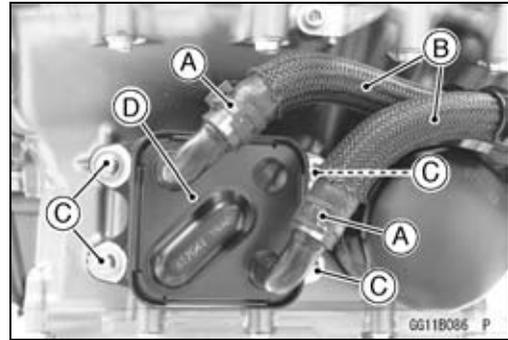


## 7-16 ENGINE LUBRICATION SYSTEM

### Oil Cooler

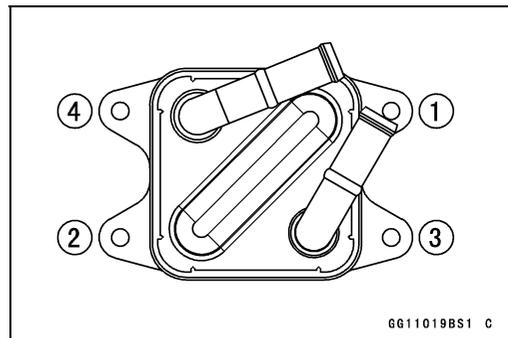
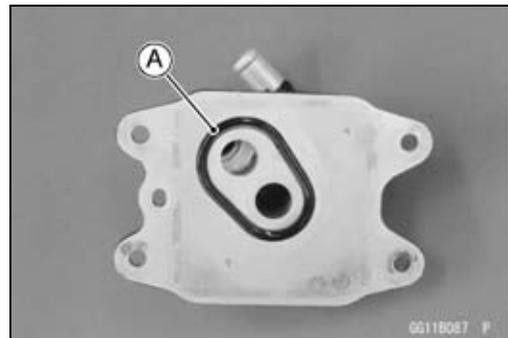
#### Oil Cooler Removal

- Drain:
  - Coolant (see Coolant Change in the Periodic Maintenance chapter)
  - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:
  - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
- Slide the clamps [A].
- Disconnect the water hoses [B].
- Remove:
  - Oil Cooler Bolts [C]
  - Oil Cooler [D]



#### Oil Cooler Installation

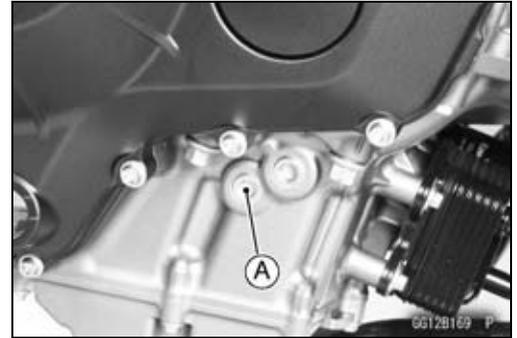
- Replace the O-ring [A] with a new one.
  - Apply grease to the O-ring and install it.
- 
- Install the oil cooler.
  - Apply a non-permanent locking agent to the threads of the oil cooler bolts.
  - Tighten the oil cooler bolts following sequence [1 ~ 4].
    - **Torque - Oil Cooler Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**
  - Run the water hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
  - Install the removed parts (see appropriate chapters).



## Oil Pressure Measurement

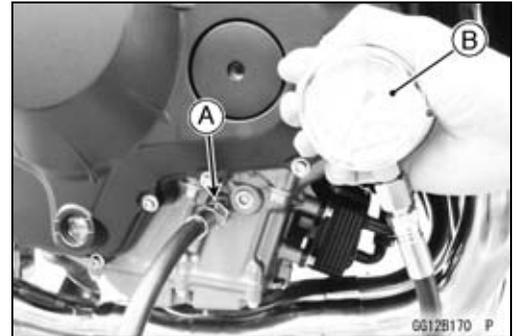
### Oil Pressure Measurement

- Remove:  
Oil Passage Plug [A]



- Attach the adapter [A] and gauge [B] to the plug hole.

**Special Tools - Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>: 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: 156.8 ~ 205.8 kPa (1.60 ~ 2.10 kgf/cm<sup>2</sup>,  
 22.74 ~ 29.84 psi) @4 000 r/min (rpm), Oil  
 temperature 50°C (122°F)**

- ★ If the oil pressure is much lower than the standard, check the oil pump, relief valve, and/or crankshaft bearing insert wear immediately.
- ★ If the reading is much higher than the standard, check the oil passages for clogging.
- Stop the engine.
- Remove the oil pressure gauge and adapter.

### **⚠ WARNING**

**Hot oil can cause severe burns. Beware of 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 tighten it.

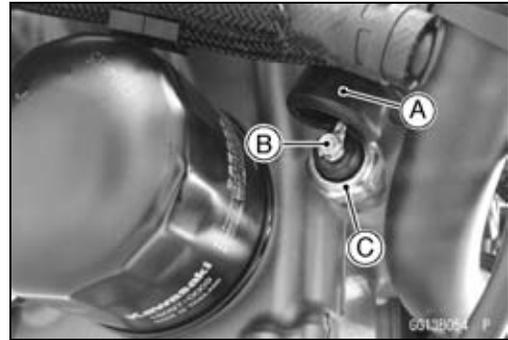
**Torque - Oil Passage Plug: 20 N·m (2.0 kgf·m, 15 ft·lb)**

## 7-18 ENGINE LUBRICATION SYSTEM

### Oil Pressure Switch

#### **Oil Pressure Switch Removal**

- Drain the engine oil (see Engine Oil Change in the Periodic Maintenance chapter).
- Slide the switch cover [A].
- Remove:
  - Switch Terminal Bolt [B]
  - Oil Pressure Switch [C]



#### **Oil Pressure Switch Installation**

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket to the threads of the oil pressure switch and tighten it.

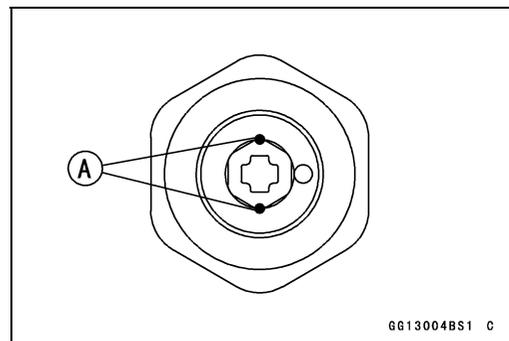
**Sealant - Liquid Gasket, TB1211: 56019-120**

**Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)**

- Install the switch lead (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Apply grease to the terminal.

#### **NOTE**

○ Apply a small amount grease to the terminal so that grease should not close two breather holes [A] for switch diaphragm.



- Install the switch cover.
- Install the removed parts (see appropriate chapters).

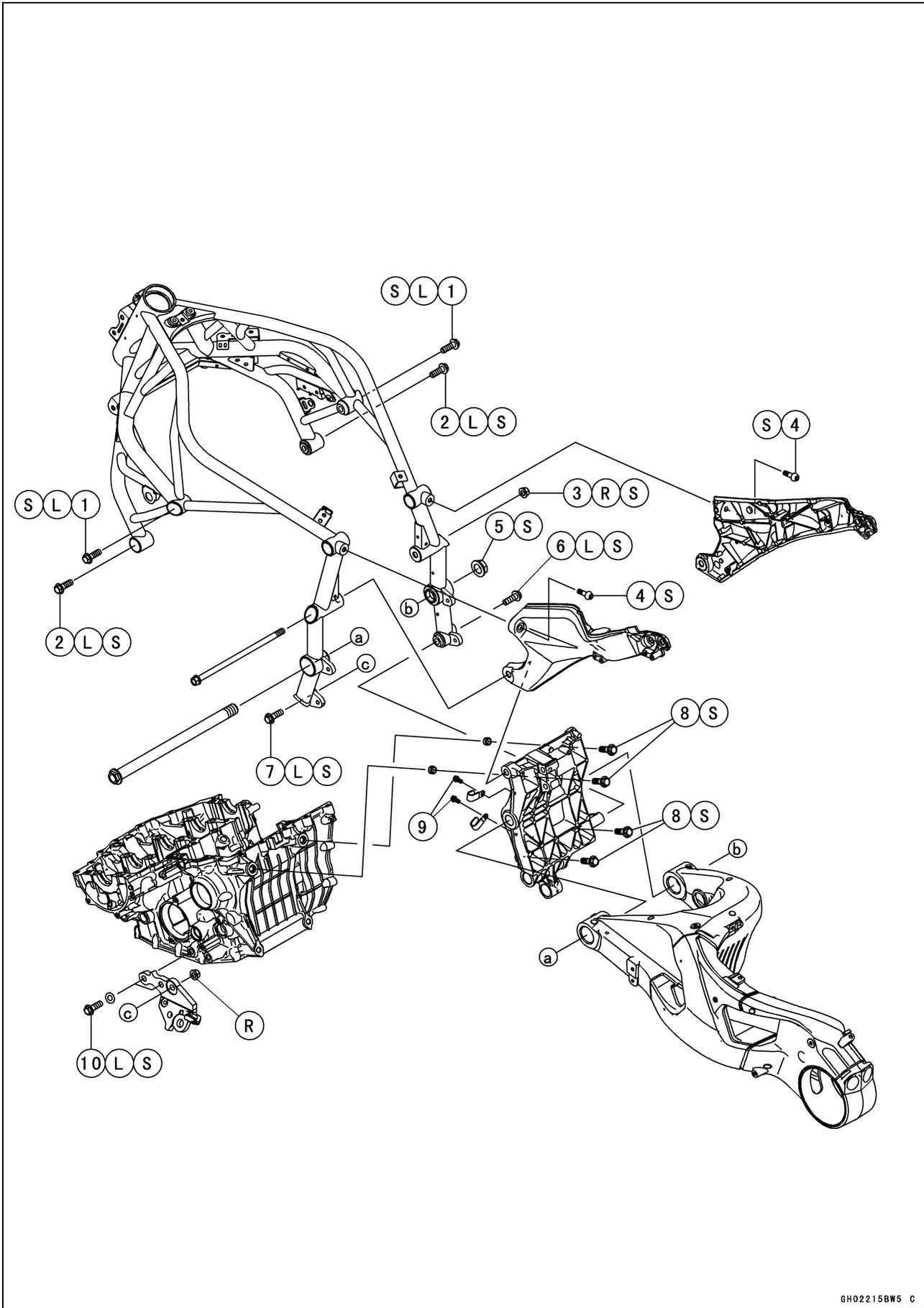
# Engine Removal/Installation

## Table of Contents

|   |      |
|---|------|
| Exploded View.....                        | 8-2  |
| Engine Removal/Installation .....         | 8-4  |
| Engine Removal.....                       | 8-4  |
| Engine Installation.....                  | 8-10 |
| Swingarm Mounting Plate Removal.....      | 8-12 |
| Swingarm Mounting Plate Installation..... | 8-12 |

# 8-2 ENGINE REMOVAL/INSTALLATION

## Exploded View



## ENGINE REMOVAL/INSTALLATION 8-3

### Exploded View

| No. | Fastener                             | Torque |       |          | Remarks |
|-----|--------------------------------------|--------|-------|----------|---------|
|     |                                      | N·m    | kgf·m | ft·lb    |         |
| 1   | Front Engine Mounting Bolts (Rear)   | 44     | 4.5   | 32       | L, S    |
| 2   | Front Engine Mounting Bolts (Front)  | 44     | 4.5   | 32       | L, S    |
| 3   | Swingarm Mounting Plate Nut (Upper)  | 44     | 4.5   | 32       | R, S    |
| 4   | Rear Frame Front Bolts               | 25     | 2.5   | 18       | S       |
| 5   | Swingarm Pivot Shaft Nut             | 108    | 11.0  | 79.7     | S       |
| 6   | Swingarm Mounting Plate Bolt (Lower) | 44     | 4.5   | 32       | L, S    |
| 7   | Side Stand Bracket Bolt (Rear)       | 49     | 5.0   | 36       | L, S    |
| 8   | Rear Engine Mounting Bolts           | 44     | 4.5   | 32       | S       |
| 9   | Clamp Bolts                          | 10     | 1.0   | 89 in·lb |         |
| 10  | Side Stand Bracket Bolts (Front)     | 49     | 5.0   | 36       | L, S    |

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

## 8-4 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

---

#### *Engine Removal*

- Support the front and rear of the motorcycle with the stands.

|                  |
|------------------|
| <b>⚠ WARNING</b> |
|------------------|

|   |
|---|
| <b>Motorcycle may fall over unexpectedly resulting in an accident or injury. Be sure to use the front and rear stands when removing the engine.</b> |
|---|

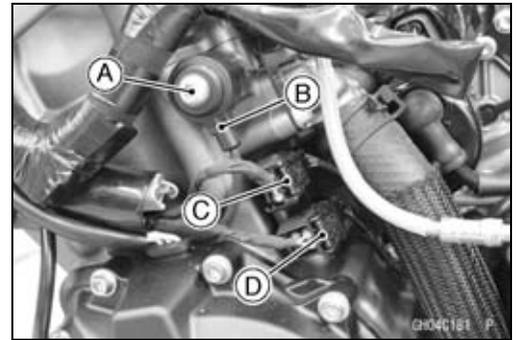
|               |
|---------------|
| <b>NOTICE</b> |
|---------------|

|   |
|---|
| <b>Be sure to use the front and rear stands when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.</b> |
|---|

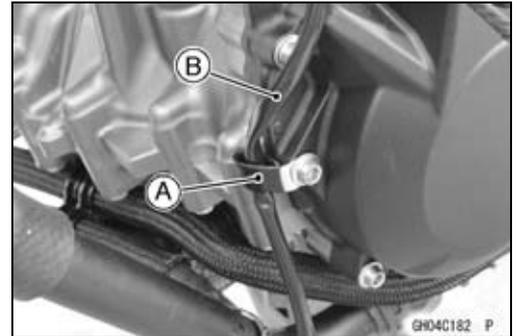
- Drain:
  - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
  - Coolant (see Coolant Change in the Periodic Maintenance chapter)
- Remove:
  - Middle Fairings (see Middle Fairing Removal in the Frame chapter)
  - Intake Duct (see Intake Duct Removal in the Fuel System (DFI) chapter)
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Air Intake Chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter)
  - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  - Blow-off Valve Hose Fitting Box (see Blow-off Valve Hose Fitting Box Removal in the Fuel System (DFI) chapter)
  - Radiator (see Radiator and Radiator Fan Removal in the Cooling System chapter)
  - Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
  - Exhaust Pipe (see Exhaust Pipe Removal in the Engine Top End chapter)
  - Clutch Slave Cylinder (see Clutch Slave Cylinder Removal in the Clutch chapter)
  - Brake Pedal Bracket (see Brake Pedal Removal in the Brakes chapter)
  - Shift Lever (see Shift Pedal Removal in the Crankshaft/Transmission chapter)
  - Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
  - Oil Pressure Switch Terminal (see Oil Pressure Switch Removal in the Engine Lubrication System chapter)
- Disconnect
  - Camshaft Position Sensor Connector (see Camshaft Position Sensor Removal in the Electrical System chapter)
  - Stic Coil Connectors (Stic Coil Removal in the Electrical System chapter)

## Engine Removal/Installation

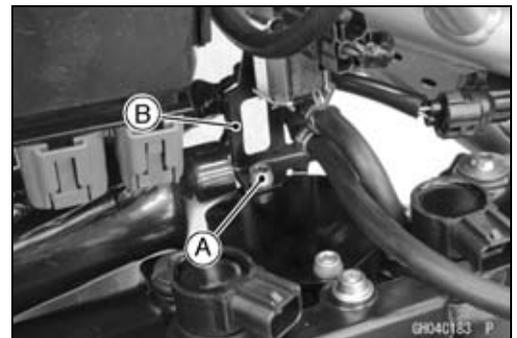
- Remove:
  - Knock Sensor Bolt [A]
  - Knock Sensor [B]
- Disconnect:
  - Gear Position Sensor Lead Connector [C]
  - Quick Shifter Sensor Lead Connector [D]



- Open the clamp [A] and free the oil pressure switch lead [B].



- Remove:
  - Cylinder Head Cap Bolt [A]
  - Bracket [B]



- Disconnect the crankshaft sensor lead connector [A], and remove the connector from the bracket.



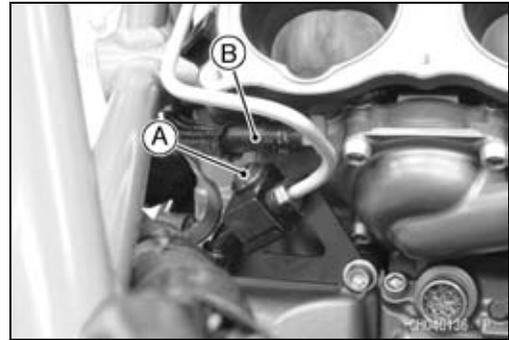
- Remove the clamp [A] and free the clutch pipe.
- Open the clamp [B] and free the main harness.



## 8-6 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

- Remove:
  - Brake Pipe Fitting Bolt [A]
- Slide the clamp and disconnect the water hose [B].



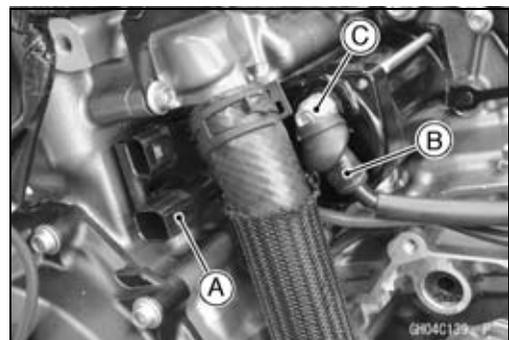
- Remove the water hose fitting [A] to prevent damage to the fitting.



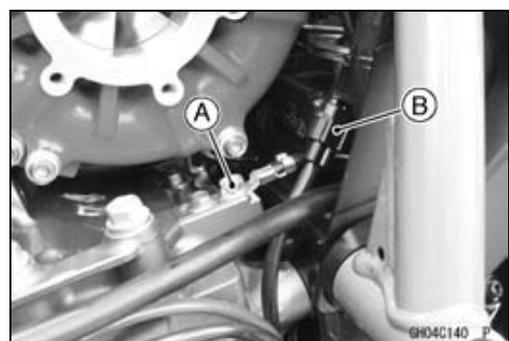
- Disconnect:
  - Water Temperature Sensor Connector [A].



- Remove the connector [A] from the bracket.
- Slide out the rubber cap [B].
- Remove the starter motor cable terminal nut [C].



- Remove:
  - Engine Ground Cable Terminal Bolt [A]
- Disconnect:
  - Side Stand Switch Lead Connector [B]

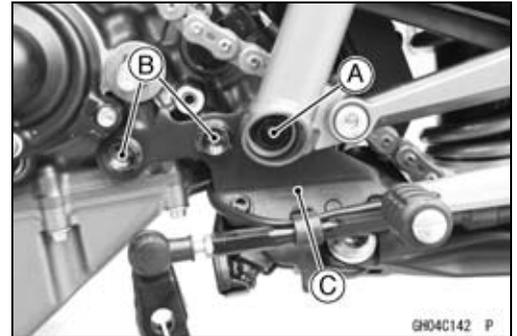


## Engine Removal/Installation

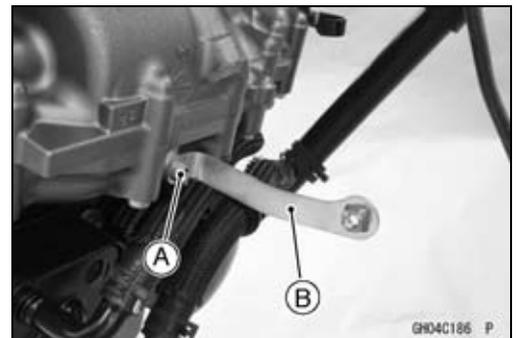
- Open the clamps [A] and free the leads.



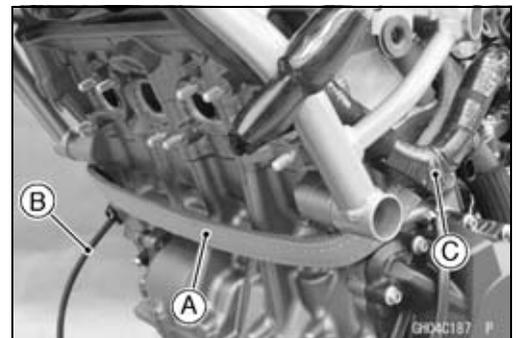
- Remove:  
Side Stand Bracket Bolt (Rear) [A] and Nut  
Side Stand Bracket Bolts (Front) [B] and Washers  
Side Stand Bracket [C]



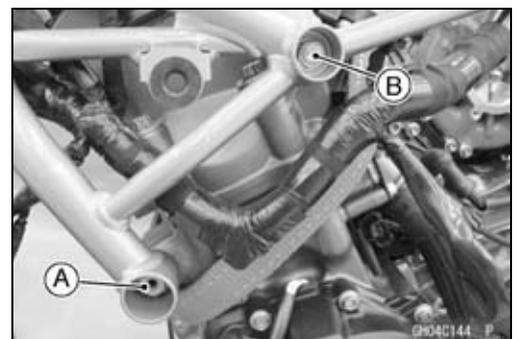
- Remove:  
Radiator Stay Bolt [A]  
Radiator Stay [B]



- Install the webbing sling [A] as shown.  
○ Do not hold the crankshaft sensor lead [B] and main harness [C] with the webbing sling.



- Remove (Both Sides):  
Front Engine Mounting Bolt (Front) [A]  
Front Engine Mounting Bolt (Rear) [B]



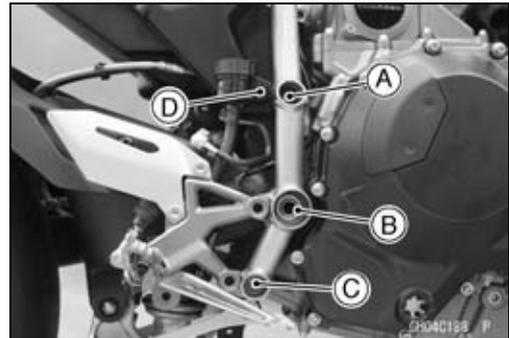
## 8-8 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

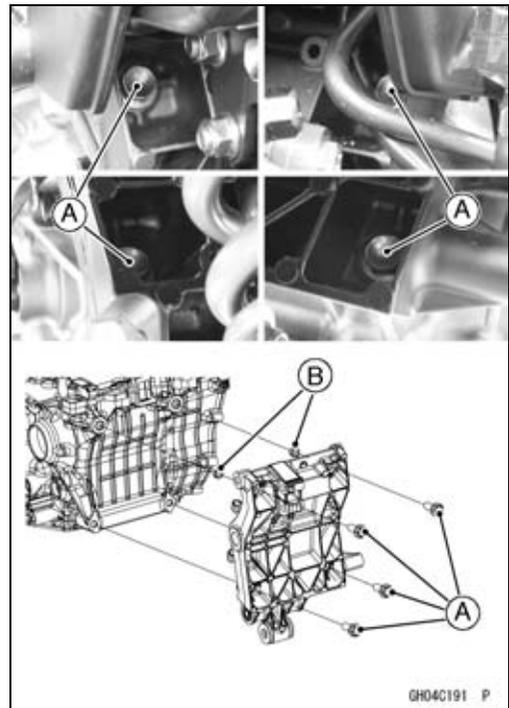
- Loosen (Both Sides):  
Rear Frame Front Bolt [A]



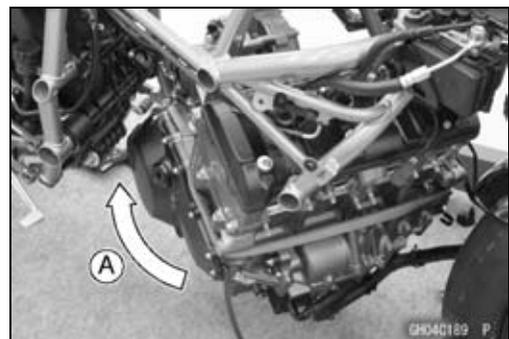
- Loosen:  
Swingarm Mounting Plate Nut (Upper) [A]  
Swingarm Pivot Shaft Nut [B]  
Swingarm Mounting Plate Bolt (Lower) [C]
- Remove :  
Rear Brake Reservoir Bolt [D]



- Remove:  
Rear Engine Mounting Bolts [A]  
Dowel Pins [B]

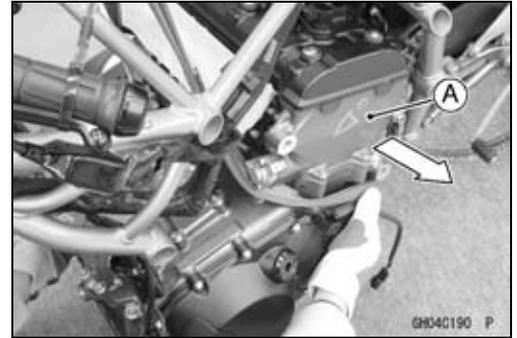


- Turn the engine by 180 degrees [A] to remove it.

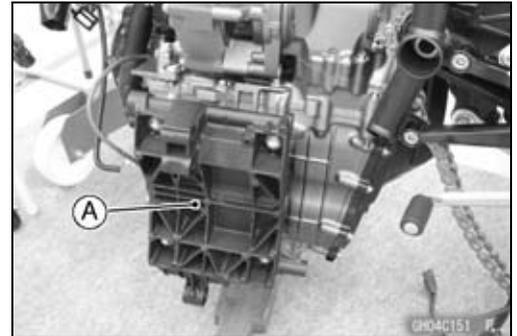


### Engine Removal/Installation

- Remove the engine [A] from the frame.



- If necessary, prepare a new swingarm mounting plate [A] to hold the engine with the engine stand.  
Swingarm Mounting Plate (Part Number: 32036-0353)



## 8-10 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

---

#### **Engine Installation**

- Support the front and rear of the motorcycle with the stands.
- Install the dowel pins [A].
- Install the engine to the swingarm mounting plate [B] on the frame.
- Hang the drive chain to the output shaft.

#### **NOTE**

○ After installing the engine, the drive chain cannot be hung to the output shaft.

- Tighten:

**Torque - Rear Engine Mounting Bolts [C]: 44 N·m (4.5 kgf·m, 32 ft·lb)**

- Replace the following nuts with new ones.
  - Swingarm Mounting Plate Nut (Upper) [D]
  - Side Stand Bracket Nut [E]
- Apply a non-permanent locking agent to the following bolts.
  - Front Engine Mounting Bolts (Front) [F]
  - Front Engine Mounting Bolts (Rear) [G]
  - Swingarm Mounting Plate Bolt (Lower) [H]
  - Side Stand Bracket Bolts (Front) [I]
  - Side Stand Bracket Bolt (Rear) [J]
- Install the bolts and nuts, following the specified tightening sequence.

○ First, tighten the front engine mounting bolts (front) loosely.

○ Second, tighten the front engine mounting bolts (rear) loosely.

○ Third, tighten the swingarm mounting plate bolt (lower) loosely.

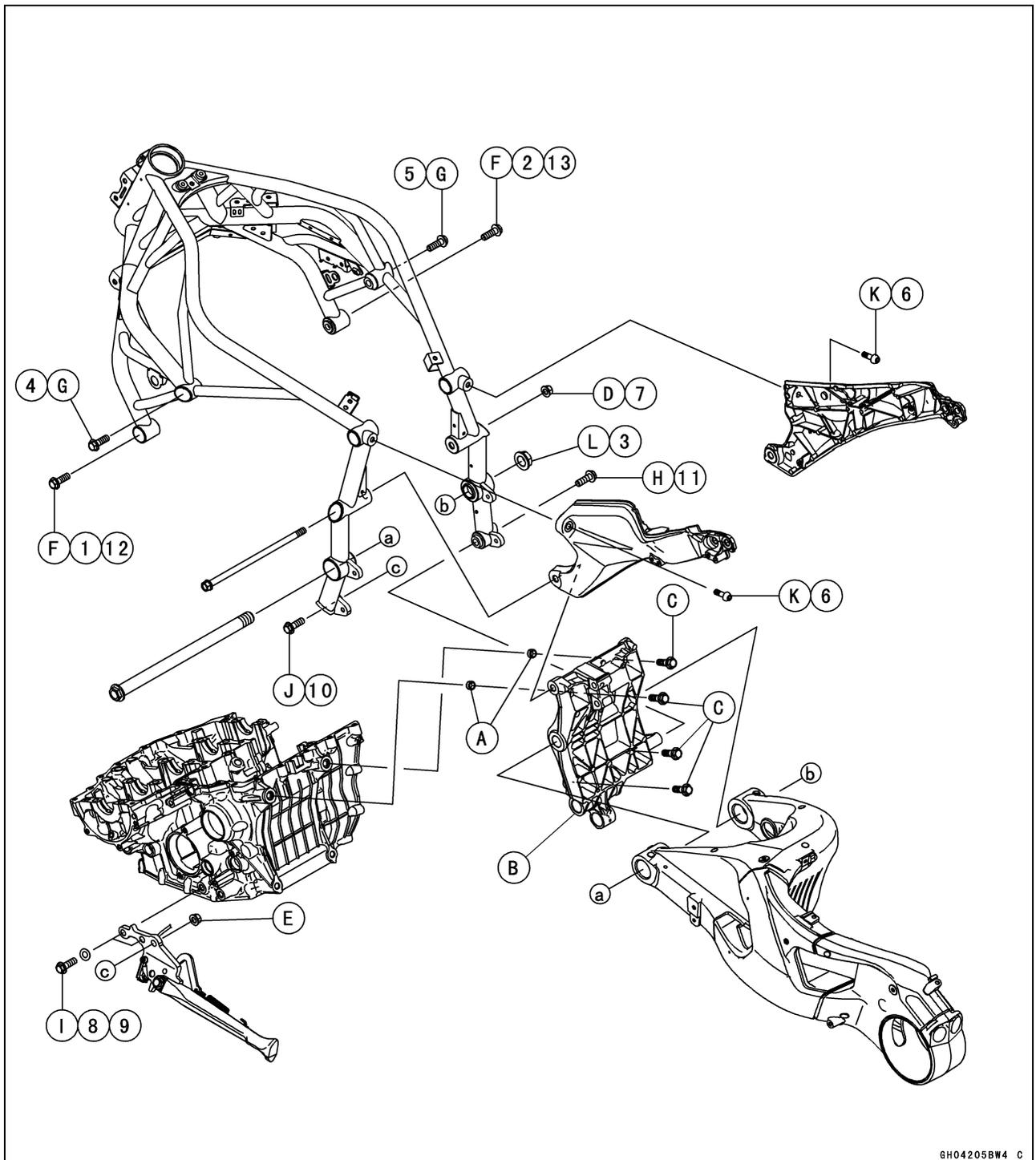
○ Fourth, tighten the following bolts and nuts temporarily.

- Front Engine Mounting Bolts (Front)
- Front Engine Mounting Bolts (Rear)
- Swingarm Mounting Plate Nut (Upper)
- Swingarm Mounting Plate Bolt (Lower)
- Side Stand Bracket Bolt (Rear)
- Rear Frame Front Bolts [K]
- Side Stand Bracket Bolts (Front) with Washers
- Swingarm Pivot Shaft Nut [L]

○ Fifth, tighten the bolts and nuts to specified torque in the following order.

- Torque -**
1. Front Engine Mounting Bolt (Front, Left): 44 N·m (4.5 kgf·m, 32 ft·lb)
  2. Front Engine Mounting Bolt (Front, Right): 44 N·m (4.5 kgf·m, 32 ft·lb)
  3. Swingarm Pivot Shaft Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)
  4. Front Engine Mounting Bolt (Rear Left): 44 N·m (4.5 kgf·m, 32 ft·lb)
  5. Front Engine Mounting Bolt (Rear Right): 44 N·m (4.5 kgf·m, 32 ft·lb)
  6. Rear Frame Front Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
  7. Swingarm Mounting Plate Nut (Upper): 44 N·m (4.5 kgf·m, 32 ft·lb)
  8. Side Stand Bracket Bolt (Front, Front Side Bolt): 49 N·m (5.0 kgf·m, 36 ft·lb)
  9. Side Stand Bracket Bolt (Front, Rear Side Bolt): 49 N·m (5.0 kgf·m, 36 ft·lb)
  10. Side Stand Bracket Bolt (Rear): 49 N·m (5.0 kgf·m, 36 ft·lb)
  11. Swingarm Mounting Plate Bolt (Lower): 44 N·m (4.5 kgf·m, 32 ft·lb)
  12. Front Engine Mounting Bolt (Front, Left): 44 N·m (4.5 kgf·m, 32 ft·lb)
  13. Front Engine Mounting Bolt (Front, Right): 44 N·m (4.5 kgf·m, 32 ft·lb)

## Engine Removal/Installation



GH04205BW4 C

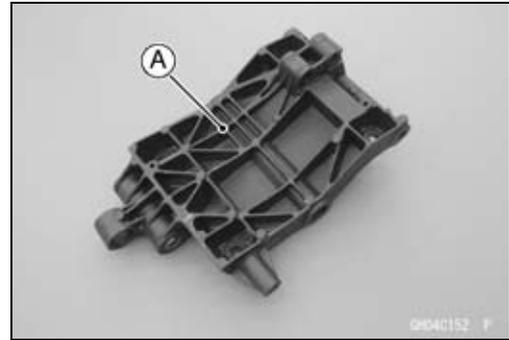
- Run the leads, cables and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).
- Adjust:
  - Throttle Cables (see Throttle Control System Inspection in the Periodic Maintenance chapter)
  - Drive Chain (see Drive Chain Slack Inspection 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 (see Coolant Change in the Periodic Maintenance chapter).

## 8-12 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

#### ***Swingarm Mounting Plate Removal***

- Remove:
  - Engine (see Engine Removal)
  - Swingarm (see Swingarm Removal in the Suspension chapter)
- Remove the swingarm mounting plate [A] from the frame.



#### ***Swingarm Mounting Plate Installation***

- Install the swingarm mounting plate, and tighten its bolts and nuts temporarily.
- Install the swingarm (see Swingarm Installation in the Suspension chapter).
- Tighten the swingarm pivot shaft nut temporarily.
- Install the engine (see Engine Installation).

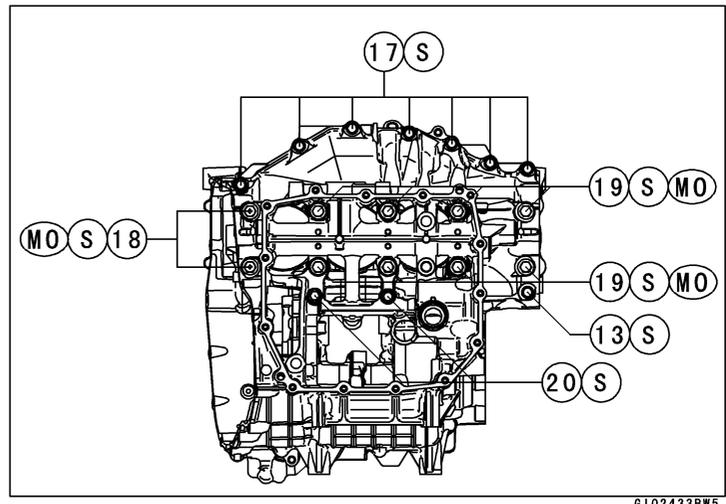
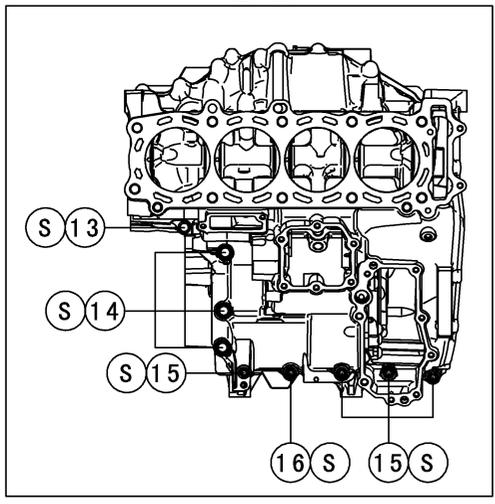
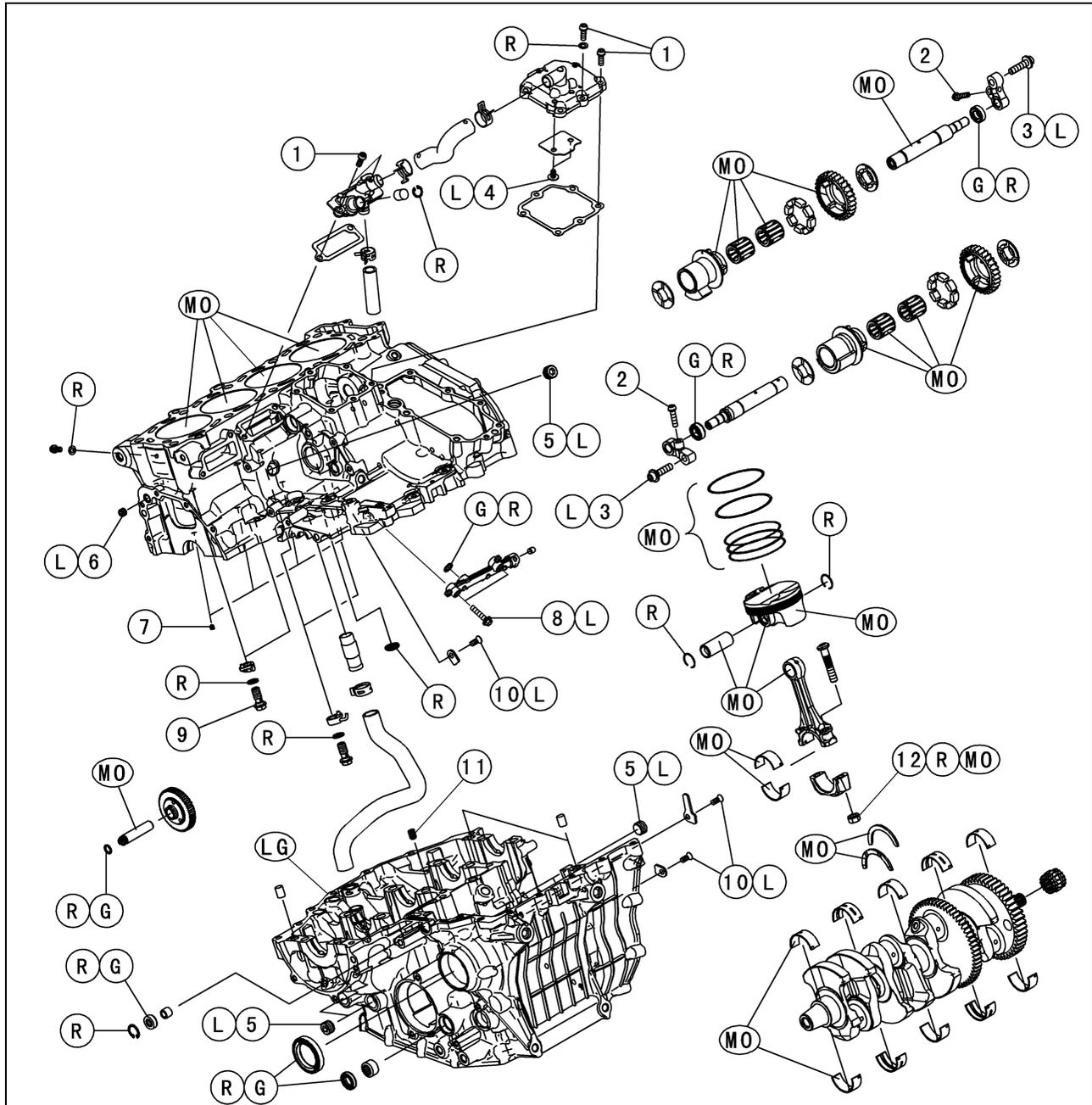
# Crankshaft/Transmission

## Table of Contents

|   |      |   |      |
|---|------|---|------|
| Exploded View.....  | 9-2  | Rear Balancer Installation.....                           | 9-34 |
| Specifications .....  | 9-6  | Balancer Adjustment.....                                  | 9-37 |
| Special Tools and Sealants .....  | 9-9  | Balancer Damper Inspection.....                           | 9-38 |
| Crankcase .....   | 9-10 | Starter Motor Clutch and Torque<br>Limiter .....          | 9-39 |
| Crankcase Splitting .....   | 9-10 | Starter Motor Clutch Removal.....                         | 9-39 |
| Crankcase Assembly .....  | 9-11 | Starter Motor Clutch Installation...                      | 9-39 |
| Crankshaft and Connecting Rods.....                                       | 9-17 | Starter Motor Clutch Disassembly                          | 9-39 |
| Crankshaft Removal .....  | 9-17 | Starter Motor Clutch Assembly ....                        | 9-40 |
| Crankshaft Installation .....   | 9-17 | Supercharger Coupling Dampers<br>Inspection.....          | 9-40 |
| Connecting Rod Removal .....  | 9-18 | Starter Clutch Inspection.....                            | 9-41 |
| Connecting Rod Installation .....   | 9-19 | Torque Limiter Removal .....                              | 9-41 |
| Crankshaft/Connecting Rod<br>Cleaning .....                               | 9-22 | Torque Limiter Installation .....                         | 9-41 |
| Connecting Rod Bend Inspection  | 9-22 | Transmission .....  | 9-42 |
| Connecting Rod Twist Inspection.  | 9-23 | Transmission Assy Removal.....                            | 9-42 |
| Connecting Rod Big End Side<br>Clearance Inspection .....                 | 9-23 | Transmission Assy Disassembly .                           | 9-43 |
| Connecting Rod Big End<br>Bearing Insert/Crankpin Wear<br>Inspection..... | 9-23 | Transmission Assy Assembly .....                          | 9-44 |
| Crankshaft Side Clearance<br>Inspection.....                              | 9-25 | Transmission Assy Installation.....                       | 9-46 |
| Crankshaft Runout Inspection.....   | 9-25 | Transmission Shaft Removal .....                          | 9-46 |
| Crankshaft Main Bearing<br>Insert/Journal Wear Inspection .               | 9-26 | Transmission Shaft Installation ...                       | 9-46 |
| Pistons.....  | 9-28 | Transmission Shaft Disassembly .                          | 9-47 |
| Piston Removal.....   | 9-28 | Shift Drum and Fork Removal.....                          | 9-47 |
| Piston Installation.....  | 9-29 | Shift Drum and Fork Installation...                       | 9-47 |
| Cylinder (Upper Crankcase) Wear<br>Inspection.....                        | 9-30 | Shift Drum Disassembly/Assem-<br>bly.....                 | 9-47 |
| Piston Wear Inspection .....  | 9-30 | Shift Fork Bending Inspection .....                       | 9-47 |
| Piston Ring, Piston Ring Groove<br>Wear Inspection .....                  | 9-30 | Shift Fork/Shifter Groove Wear<br>Inspection.....         | 9-48 |
| Piston Ring Groove Width<br>Inspection.....                               | 9-31 | Shift Fork Guide Pin/Drum<br>Groove Wear Inspection ..... | 9-48 |
| Piston Ring Thickness Inspection  | 9-31 | External Shift Mechanism.....                             | 9-49 |
| Piston Ring End Gap Inspection ..   | 9-31 | Shift Pedal Removal .....                                 | 9-49 |
| Balancer .....  | 9-32 | Shift Pedal Installation .....                            | 9-50 |
| Front Balancer Removal .....  | 9-32 | External Shift Mechanism<br>Removal .....                 | 9-52 |
| Front Balancer Installation .....   | 9-32 | External Shift Mechanism<br>Installation.....             | 9-52 |
| Rear Balancer Removal.....  | 9-34 | External Shift Mechanism<br>Inspection.....               | 9-53 |

# 9-2 CRANKSHAFT/TRANSMISSION

## Exploded View



## CRANKSHAFT/TRANSMISSION 9-3

### Exploded View

| No. | Fastener                                     | Torque       |       |           | Remarks |
|-----|--|--------------|-------|-----------|---------|
|     |  | N·m          | kgf·m | ft·lb     |         |
| 1   | Breather Cover Bolts                         | 10           | 1.0   | 89 in·lb  |         |
| 2   | Balancer Shaft Clamp Bolts                   | 10           | 1.0   | 89 in·lb  |         |
| 3   | Balancer Shaft Clamp Lever Bolts             | 25           | 2.5   | 18        | L       |
| 4   | Breather Plate Bolts                         | 10           | 1.0   | 89 in·lb  | L       |
| 5   | Oil Passage Plugs                            | 20           | 2.0   | 15        | L       |
| 6   | Oil Passage Plug (R1/8)                      | 15           | 1.5   | 11        | L       |
| 7   | Oil Nozzles (M5)                             | 3.0          | 0.31  | 27 in·lb  |         |
| 8   | Transmission Oil Nozzle Pipe Bolts           | 10           | 1.0   | 89 in·lb  | L       |
| 9   | Crankcase Oil Nozzle Bolts                   | 25           | 2.5   | 18        |         |
| 10  | Bearing Holder Screws                        | 5.0          | 0.51  | 44 in·lb  | L       |
| 11  | Oil Nozzle (M8)                              | 5.0          | 0.51  | 44 in·lb  |         |
| 12  | Connecting Rod Big End Nuts                  | see the text | ←     | ←         | MO, R   |
| 13  | Crankcase Bolts (M7, L = 60 mm)              | 20           | 2.0   | 15        | S       |
| 14  | Crankcase Bolts (M8)                         | 27           | 2.8   | 20        | S       |
| 15  | Crankcase Bolts (M6, L = 40 mm)              | 12           | 1.2   | 106 in·lb | S       |
| 16  | Crankcase Bolt (M6, L = 30 mm)               | 12           | 1.2   | 106 in·lb | S       |
| 17  | Crankcase Bolts (M7, L = 45 mm)              | 20           | 2.0   | 15        | S       |
| 18  | Crankcase Bolts (M10, L = 120 mm)<br>(First) | 12           | 1.2   | 106 in·lb | MO, S   |
|     | Crankcase Bolts (M10, L = 120 mm)<br>(Final) | 48           | 4.9   | 35        | MO, S   |
| 19  | Crankcase Bolts (M10, L = 100 mm)<br>(First) | 12           | 1.2   | 106 in·lb | MO, S   |
|     | Crankcase Bolts (M10, L = 100 mm)<br>(Final) | 48           | 4.9   | 35        | MO, S   |
| 20  | Crankcase Bolts (M7, L = 85 mm)              | 20           | 2.0   | 15        | S       |

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

MO: Apply molybdenum disulfide oil solution.

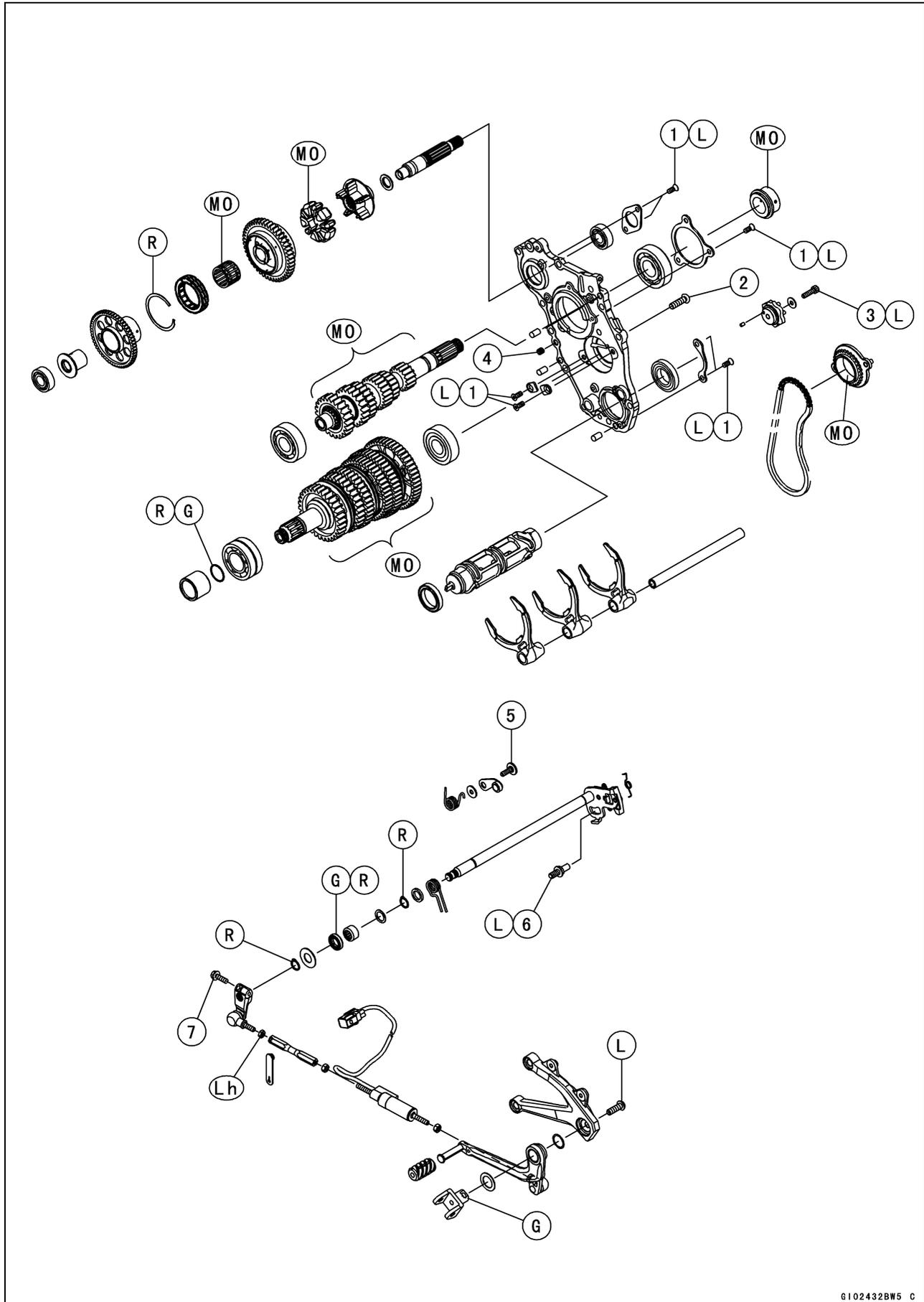
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10:1)

R: Replacement Parts

S: Follow the specified tightening sequence.

# 9-4 CRANKSHAFT/TRANSMISSION

## Exploded View



## CRANKSHAFT/TRANSMISSION 9-5

### Exploded View

| No. | Fastener                      | Torque |       |           | Remarks |
|-----|-------------------------------|--------|-------|-----------|---------|
|     |                               | N·m    | kgf·m | ft·lb     |         |
| 1   | Bearing Holder Screws         | 5.0    | 0.51  | 44 in·lb  | L       |
| 2   | Transmission Case Bolts       | 20     | 2.0   | 15        |         |
| 3   | Shift Drum Cam Holder Bolt    | 12     | 1.2   | 106 in·lb | L       |
| 4   | Oil Nozzles (M8)              | 5.0    | 0.51  | 44 in·lb  |         |
| 5   | Gear Positioning Lever Bolt   | 12     | 1.2   | 106 in·lb |         |
| 6   | Shift Shaft Return Spring Pin | 29     | 3.0   | 21        | L       |
| 7   | Shift Lever Clamp Bolt        | 9.8    | 1.0   | 87 in·lb  |         |

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

## 9-6 CRANKSHAFT/TRANSMISSION

### Specifications

| Item   | Standard   | Service Limit                      |
|--|--|------------------------------------|
| <b>Crankcase, Crankshaft/Connecting Rods</b>             |  |                                    |
| Connecting Rod Bend                                      | — — —  | TIR 0.2/100 mm<br>(0.008/3.94 in.) |
| Connecting Rod Twist                                     | — — —  | TIR 0.2/100 mm<br>(0.008/3.94 in.) |
| Connecting Rod Big End Side Clearance                    | 0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)                   | 0.6 mm (0.02 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 (1.357 in.)               |
| Marking:   |  |                                    |
| None   | 34.484 ~ 34.492 mm (1.3576 ~ 1.35795 in.)              | — — —                              |
| ○  | 34.493 ~ 34.500 mm (1.35799 ~ 1.3583 in.)              | — — —                              |
| Connecting Rod Big End Inside Diameter:                  | 37.500 ~ 37.516 mm (1.4764 ~ 1.4770 in.)               | 37.54 mm (1.478 in.)               |
| Marking:   |  |                                    |
| None   | 37.500 ~ 37.508 mm (1.4764 ~ 1.47669 in.)              | — — —                              |
| ○  | 37.509 ~ 37.516 mm (1.47673 ~ 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)<br>0.28 ~ 0.38 mm (0.0110 ~ 0.0150 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 (0.925 ~ 0.927 in.)                   | — — —                              |
| Crankshaft Runout  | TIR 0.03 mm (0.001 in.) or less                        | TIR 0.08 mm<br>(0.003 in.)         |
| Crankshaft Main Bearing Insert/Journal Clearance         | 0.014 ~ 0.038 mm (0.0006 ~ 0.0015 in.)                 | 0.07 mm (0.0028 in.)               |
| Crankshaft Main Journal Diameter                         | 37.984 ~ 38.000 mm (1.4954 ~ 1.4961 in.)               | 37.96 mm (1.4945 in.)              |
| Marking:   |  |                                    |
| None   | 37.984 ~ 37.992 mm (1.4954 ~ 1.49575 in.)              | — — —                              |
| 1  | 37.993 ~ 38.000 mm (1.49578 ~ 1.4961 in.)              | — — —                              |
| Crankcase Main Bearing Inside Diameter:                  | 41.000 ~ 41.016 mm (1.6142 ~ 1.6148 in.)               | — — —                              |
| Marking  |  |                                    |
| ○  | 41.000 ~ 41.008 mm (1.6142 ~ 1.61448 in.)              | — — —                              |
| None   | 41.009 ~ 41.016 mm (1.61452 ~ 1.6148 in.)              | — — —                              |

## CRANKSHAFT/TRANSMISSION 9-7

### Specifications

| Item                                      | Standard                                 | Service Limit        |
|---|--|----------------------|
| Crankshaft Main Bearing Insert Thickness: |  |                      |
| Brown                                     | 1.491 ~ 1.495 mm (0.05870 ~ 0.05886 in.) | — — —                |
| Black                                     | 1.495 ~ 1.499 mm (0.05886 ~ 0.05902 in.) | — — —                |
| Blue                                      | 1.499 ~ 1.503 mm (0.05902 ~ 0.05917 in.) | — — —                |
| <b>Cylinders, Pistons</b>                 |  |                      |
| Cylinder Inside Diameter                  | 75.994 ~ 76.006 mm (2.9919 ~ 2.9924 in.) | 76.09 mm (2.996 in.) |
| Piston Diameter                           | 75.939 ~ 75.954 mm (2.9897 ~ 2.9903 in.) | 75.79 mm (2.984 in.) |
| Piston/Cylinder Clearance                 | 0.040 ~ 0.067 mm (0.0016 ~ 0.0026 in.)   | — — —                |
| Piston Ring/Groove Clearance:             |  |                      |
| Top                                       | 0.030 ~ 0.070 mm (0.00118 ~ 0.00276 in.) | 0.17 mm (0.0067 in.) |
| Second                                    | 0.030 ~ 0.070 mm (0.00118 ~ 0.00276 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 (0.0362 in.) |
| Second                                    | 0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)     | 0.92 mm (0.0362 in.) |
| Piston Ring Thickness:                    |  |                      |
| Top                                       | 0.770 ~ 0.790 mm (0.0303 ~ 0.0311 in.)   | 0.70 mm (0.028 in.)  |
| Second                                    | 0.770 ~ 0.790 mm (0.0303 ~ 0.0311 in.)   | 0.70 mm (0.028 in.)  |
| Piston Ring End Gap:                      |  |                      |
| Top                                       | 0.175 ~ 0.275 mm (0.0069 ~ 0.0108 in.)   | 0.6 mm (0.02 in.)    |
| Second                                    | 0.325 ~ 0.425 mm (0.0128 ~ 0.0167 in.)   | 0.7 mm (0.03 in.)    |
| <b>Transmission</b>                       |  |                      |
| Shift Fork Ear Thickness                  | 3.3 ~ 3.9 mm (0.13 ~ 0.15 in.)           | 3.2 mm (0.13 in.)    |
| Shifter Groove Width                      | 3.55 ~ 3.65 mm (0.140 ~ 0.144 in.)       | 3.8 mm (0.15 in.)    |
| Shift Fork Guide Pin Diameter             | 6.9 ~ 7.0 mm (0.27 ~ 0.28 in.)           | 6.8 mm (0.27 in.)    |
| Shift Drum Groove Width                   | 7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)       | 7.3 mm (0.29 in.)    |

## 9-8 CRANKSHAFT/TRANSMISSION

### Specifications

#### Connecting Rod Big End Bearing Insert Selection

| Con-rod Big End Inside Diameter Marking | Crankpin Diameter Marking | Bearing Insert |             |
|---|---------------------------|----------------|-------------|
|   |                           | Size Color     | Part Number |
| None                                    | ○                         | Brown          | 92139-0820  |
| None                                    | None                      | Black          | 92139-0819  |
| ○                                       | ○                         |                |             |
| ○                                       | None                      | Blue           | 92139-0818  |

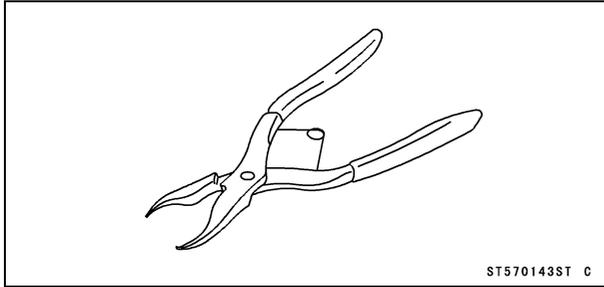
#### Crankshaft Main Bearing Insert Selection

| Crankcase Main Bearing Inside Diameter Marking | Crankshaft Main Journal Diameter Marking | Bearing Insert* |             |              |
|--|--|-----------------|-------------|--------------|
|  |  | Size Color      | Part Number | Journal Nos. |
| ○  | 1  | Brown           | 92139-0823  | 1, 3, 5      |
|  |  |                 | 92139-0826  | 2, 4         |
| None   | 1  | Black           | 92139-0822  | 1, 3, 5      |
|  |  |                 | 92139-0825  | 2, 4         |
| ○  | None                                     | Black           | 92139-0822  | 1, 3, 5      |
|  |  |                 | 92139-0825  | 2, 4         |
| None   | None                                     | Blue            | 92139-0821  | 1, 3, 5      |
|  |  |                 | 92139-0824  | 2, 4         |

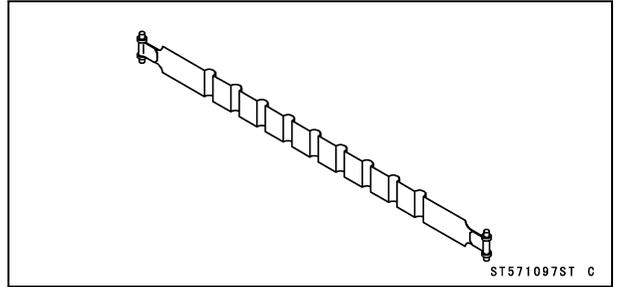
\*: The bearing inserts for Nos. 2 and 4 journals have an oil groove, respectively.

**Special Tools and Sealants**

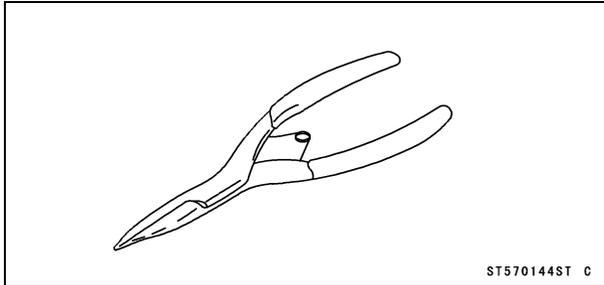
**Inside Circlip Pliers:**  
**57001-143**



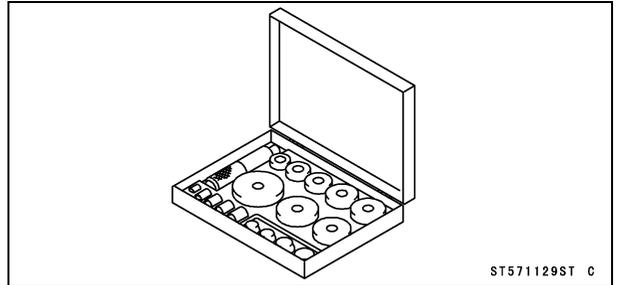
**Piston Ring Compressor Belt,  $\phi 67 \sim \phi 79$ :**  
**57001-1097**



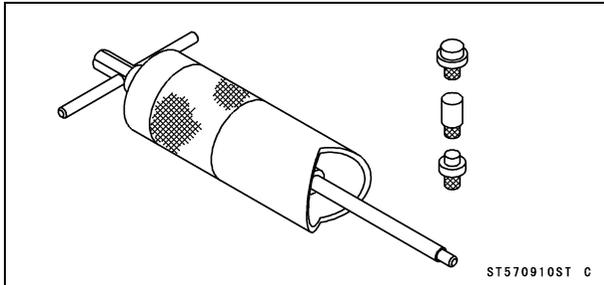
**Outside Circlip Pliers:**  
**57001-144**



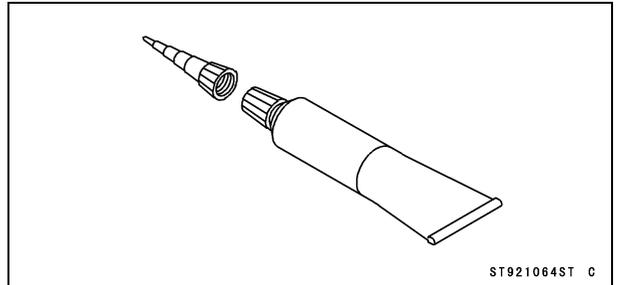
**Bearing Driver Set:**  
**57001-1129**



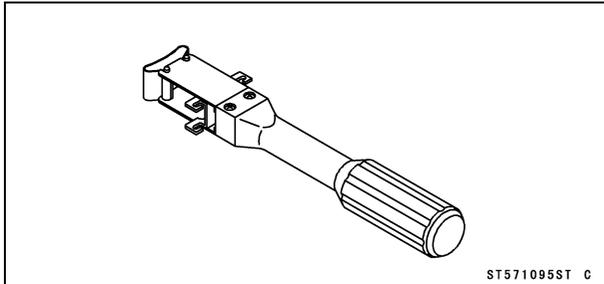
**Piston Pin Puller Assembly:**  
**57001-910**



**Liquid Gasket, TB1216B:**  
**92104-1064**



**Piston Ring Compressor Grip:**  
**57001-1095**

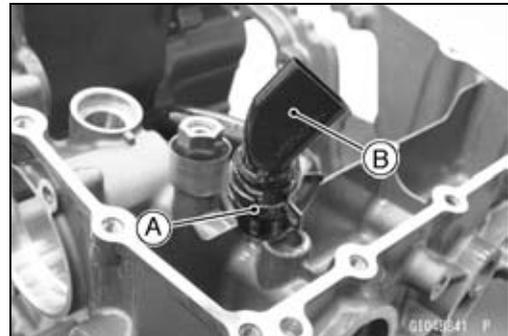


## 9-10 CRANKSHAFT/TRANSMISSION

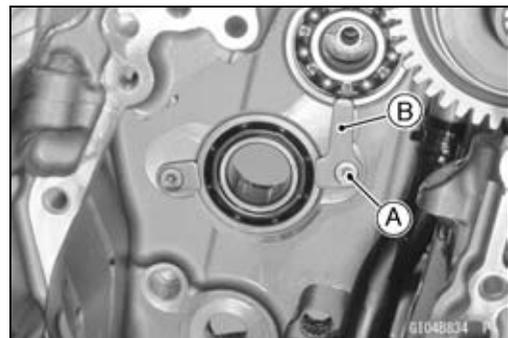
### Crankcase

#### **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:
  - Cylinder Head (see Cylinder Head Removal in the Engine Top End chapter)
  - Clutch (see Clutch Removal in the Clutch chapter)
  - Supercharger (see Supercharger Removal in the Fuel System (DFI) chapter)
  - Rear Balancer (see Rear Balancer Removal)
  - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
  - Transmission Assy (see Transmission Assy Removal)
  - Alternator Rotor (see Alternator Rotor Removal in the Electrical System chapter)
  - Oil Pump (see Oil Pump Removal in the Engine Lubrication System chapter)
  - Oil Cooler (see Oil Cooler Removal in the Engine Lubrication System chapter)
  - Oil Filter (see Oil Filter Replacement in the Periodic Maintenance chapter)
  - Oil Pan (see Oil Pan Removal in the Engine Lubrication System chapter)
  - Oil Screen (see Oil Screen Removal in the Engine Lubrication System chapter)
- Side the clamp [A].
- Remove the oil pipe [B].

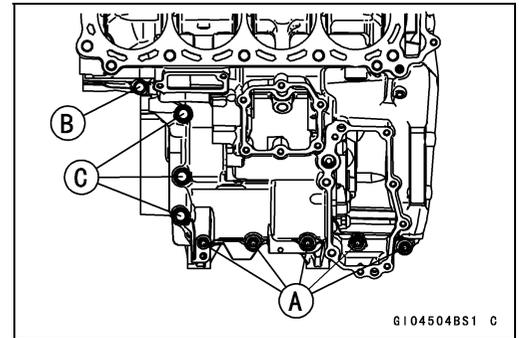


- Remove:
  - Bearing Holder Bolt [A]
  - Bearing Holder [B]

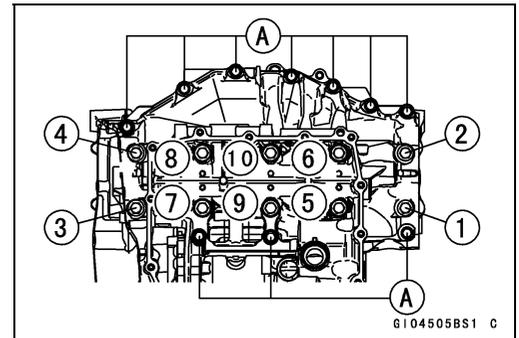


## Crankcase

- Remove the upper crankcase bolts, following the specified sequence.
  - Firstly, loosen the M6 bolts [A].
  - Secondly, loosen the M7 bolt [B].
  - Lastly, loosen the M8 bolts [C].



- Remove the lower crankcase bolts, following the specified sequence.
  - Firstly, loosen the M7 bolts [A].
  - Lastly, loosen the M10 bolts as shown sequence [1 ~ 10].
- Tap lightly around the crankcase mating surface with a plastic mallet, and split the crankcase.
  - Take care not to damage the crankcase.



## Crankcase Assembly

### NOTICE

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.

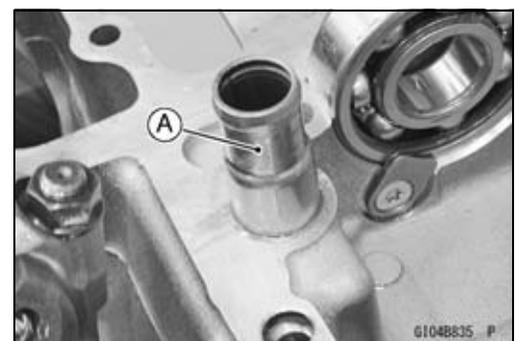
### ⚠ WARNING

Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the crankcase in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean the crankcase.

- Using compressed air, blow out the oil passages in the crankcase halves.

### Upper Crankcase Assembly

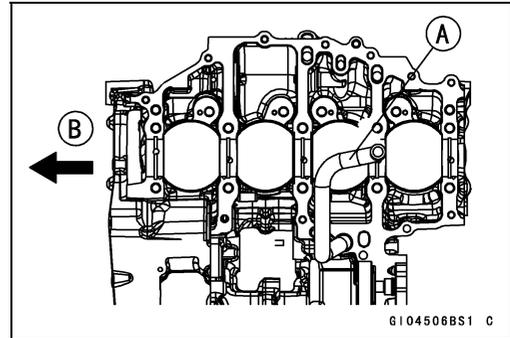
- Press the fitting [A] until it is bottomed.
  - Special Tool - Bearing Driver Set: 57001-1129



## 9-12 CRANKSHAFT/TRANSMISSION

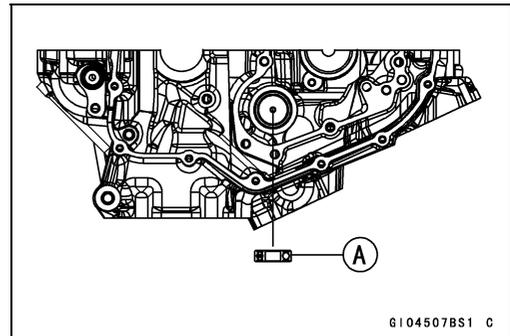
### Crankcase

- Install the clamp and breather hose [A] as shown.
- Face the knob of the clamp to the left side [B].



- Press the new ball bearing [A] until it is bottomed.
- Face the oil seal side of the bearing to the bottom.

**Special Tool - Bearing Driver Set: 57001-1129**



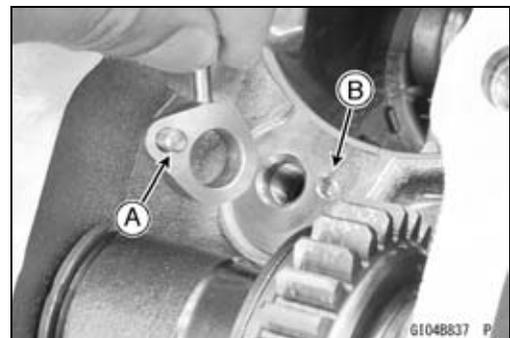
- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Apply a small amount of grease to the O-ring so that grease should not close the oil hole of the transmission oil nozzle pipe.
- Apply a non-permanent locking agent to the threads of the transmission oil nozzle pipe bolts.
- Tighten:

**Torque - Transmission Oil Nozzle Pipe Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**



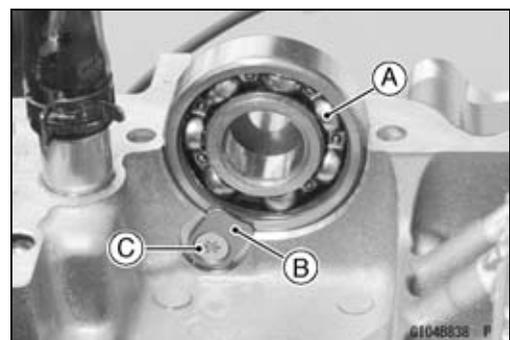
- Replace the washers with new ones.
- Insert the pin [A] to the hole [B].
- Tighten the crankcase oil nozzle bolt with the washer.

**Torque - Crankcase Oil Nozzle Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**



- Install the bearing [A].
- Face the oil seal side of the bearing to the outside of the engine.
- Install the bearing holder [B] so that the tapered side faces outside.
- Apply a non-permanent locking agent to the threads of the bearing holder screw [C].
- Tighten:

**Torque - Bearing Holder Screw: 5.0 N·m (0.51 kgf·m, 44 in·lb)**



- Install the removed parts from the upper crankcase (see appropriate chapters).

## Crankcase

### Lower Crankcase Assembly

- Press the new ball bearing [A] until it is bottomed.
- Face the marked side of the bearing to the engine inside.

**Special Tool - Bearing Driver Set: 57001-1129**

- Install the bearing holder [B] so that the tapered side faces engine inside.
- Apply a non-permanent locking agent to the threads of the bearing holder screw [C].
- Tighten:

**Torque - Bearing Holder Screw: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

- Install the new oil seal [A] so that its surface [B] is flush with the end of the hole.

**Special Tool - Bearing Driver Set: 57001-1129**

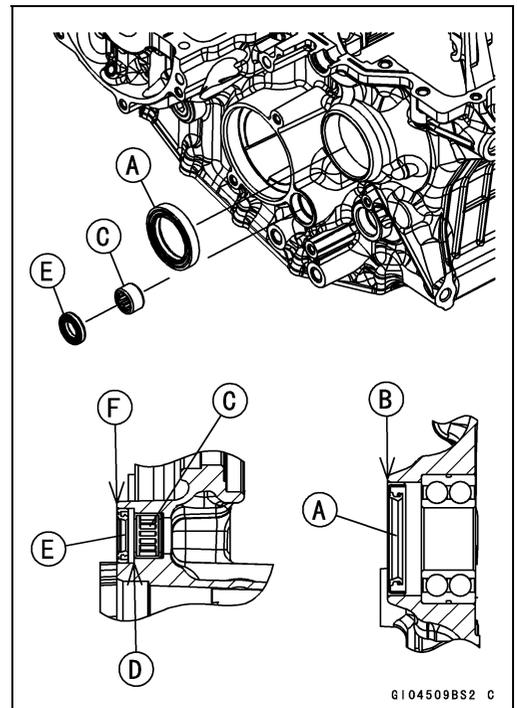
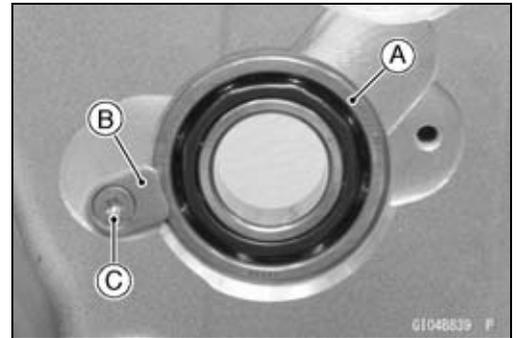
- Apply grease to the oil seal lips.
- Press the new needle bearing [C] for the shift shaft so that its marked side faces outside and its surface [D] are flush with the end of the hole.

**Special Tool - Bearing Driver Set: 57001-1129**

- Install the new oil seal [E] so that its surface [F] is flush with the end of the hole.

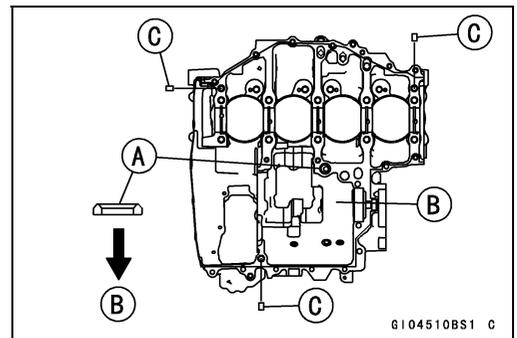
**Special Tool - Bearing Driver Set: 57001-1129**

- Apply grease to the oil seal lips.



### Crankcase Halves Assembly

- Replace the O-ring [A] with a new one.
- Install the O-ring to the upper crankcase [B] as shown.
- Install the dowel pins [C].



## 9-14 CRANKSHAFT/TRANSMISSION

### Crankcase

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to the mating surface of the lower crankcase half.

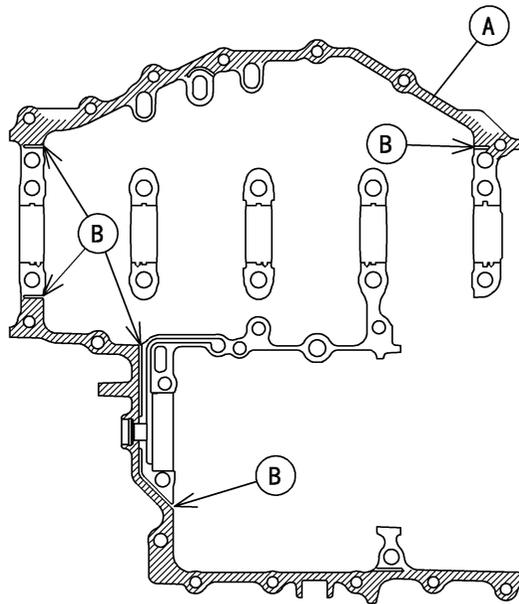
Sealant - Liquid Gasket, TB1216B: 92104-1064

#### NOTE

- Do not apply liquid gasket to the inside of the grooves [B].
- When the liquid gasket is applied to the parts, finish the part assembling before the liquid gasket starts curing (within 20 minutes after the liquid gasket is applied).
- Moreover fit the case and tighten the bolts just after application of the liquid gasket.

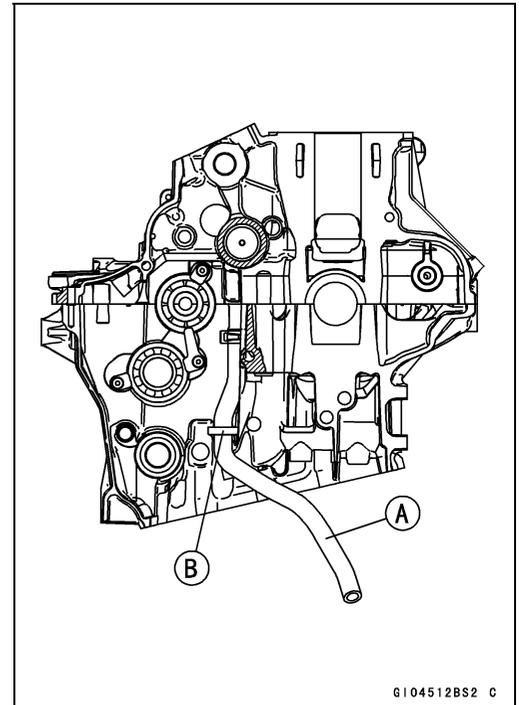
#### NOTICE

Do not apply liquid gasket around the crankshaft main bearing inserts and oil passage.

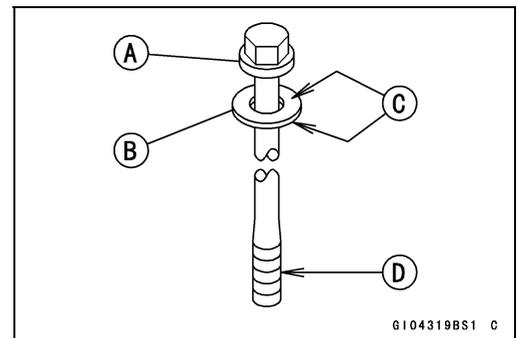


**Crankcase**

- Run the breather hose [A] in to the hole [B] of the lower crankcase.
- Fit the lower crankcase half to the upper crankcase half.



- The M10 bolts [A] has a copper plated washers [B], replace them with new ones.
- Apply molybdenum disulfide oil solution to both sides [C] of the washers and threads [D] of M10 bolts.



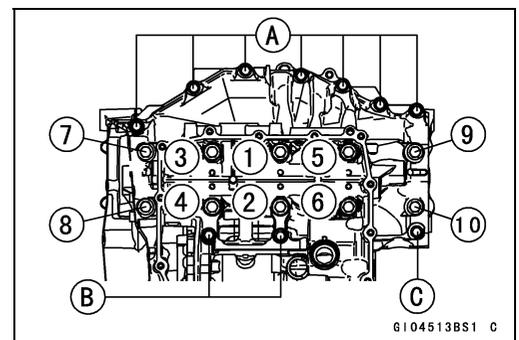
- Tighten the lower crankcase bolts using the following steps.
- Following the sequence numbers on the lower crankcase half, tighten M10 bolts [1 ~ 10] with copper plated washers.

- L = 100 mm (3.9 in.) [1 ~ 6, 9, 10]
- L = 120 mm (4.7 in.) [7 ~ 8]

**Torque - Crankcase Bolts (M10):**  
**First: 12 N·m (1.2 kgf·m, 106 in·lb)**  
**Final: 48 N·m (4.9 kgf·m, 35 ft·lb)**

- Tighten the M7 bolts.
- L = 45 mm (1.8 in.) [A]
- L = 85 mm (1.8 in.) [B]
- L = 60 mm (2.4 in.) [C]

**Torque - Crankcase Bolts (M7): 20 N·m (2.0 kgf·m, 15 ft·lb)**



## 9-16 CRANKSHAFT/TRANSMISSION

### Crankcase

- Tighten the upper crankcase bolts using the following steps.

○ Replace the M8 bolt washers [A] with new ones.

○ Tighten the M8 bolts with washers.

**Torque - Crankcase Bolts (M8): 27 N·m (2.8 kgf·m, 20 ft·lb)**

○ Tighten the M7 bolt [B].

L = 60 mm (2.4 in.)

**Torque - Crankcase Bolt (M7): 20 N·m (2.0 kgf·m, 15 ft·lb)**

○ Tighten the M6 bolts.

L = 40 mm (1.6 in.) [C]

L = 30 mm (1.2 in.) [D]

**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 turns freely.

- Install the bearing holder [A] so that the tapered side faces engine inside.

- Tighten:

**Torque - Bearing Holder Screw [B]: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

- Press the bushing [A] into crankcase so that its surface is flush [B] with the end of hole.

**Special Tool - Bearing Driver Set: 57001-1129**

- Replace the oil seal [C] with a new one.

- Press the oil seal so that its marked side faces outside.

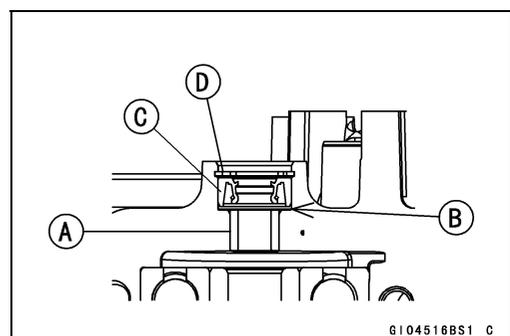
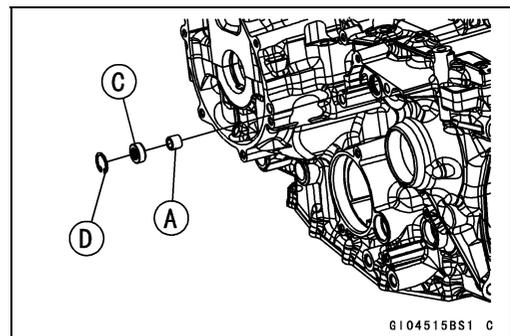
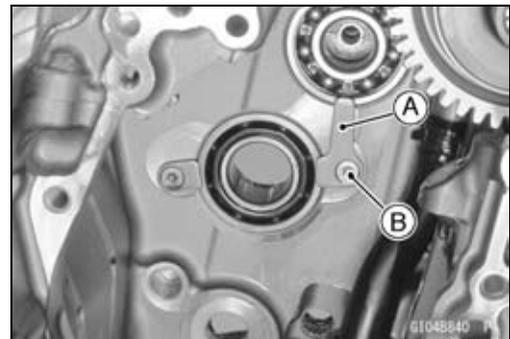
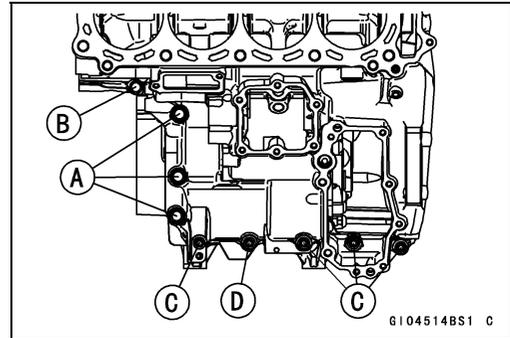
**Special Tool - Bearing Driver Set: 57001-1129**

- Apply grease to the oil seal lips.

- Replace the circlip [D] with a new one.

- Install the circlip.

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



- Install the removed parts (see appropriate chapters).

**Crankshaft and Connecting Rods**

**Crankshaft Removal**

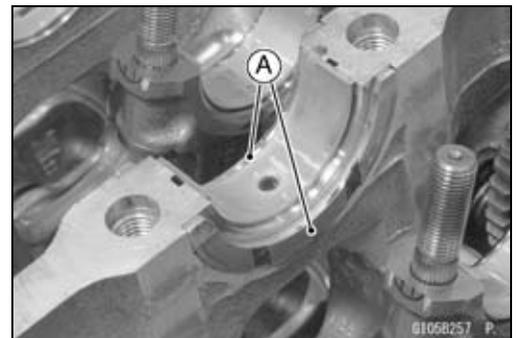
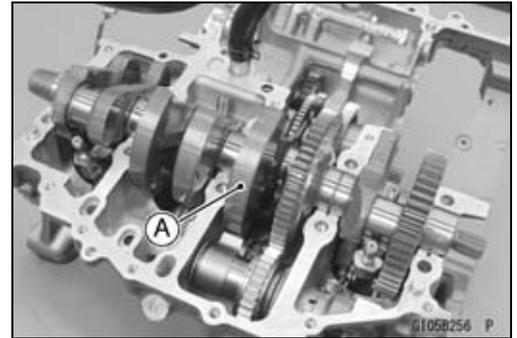
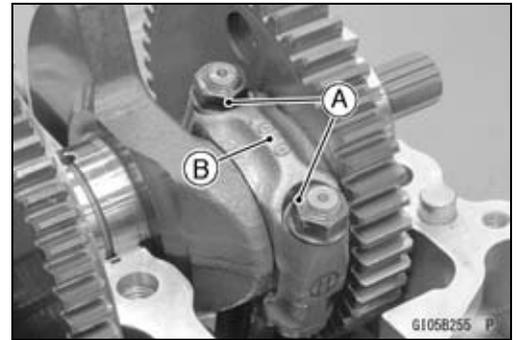
- Split the crankcase (see Crankcase Splitting).
- Remove:
  - Connecting Rod Big End Nuts [A]
  - Connecting Rod Big End Caps [B]

**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 the crankshaft [A].

- Remove the thrust washers [A] from the #3 main journal of the upper crankcase half as follows.
  - Slide 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.

| <b>NOTICE</b>   |
|---|
| <p><b>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.</b></p> |

## 9-18 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

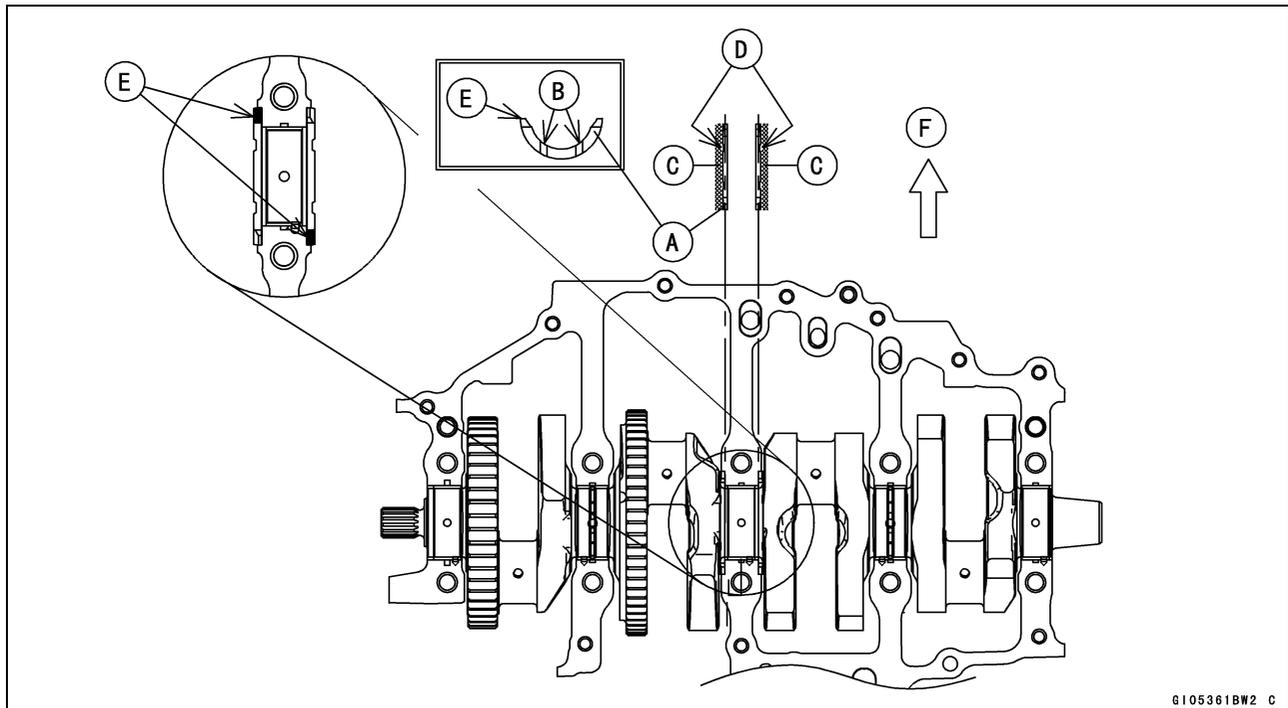
- Apply molybdenum disulfide oil solution to the crankshaft main bearing inserts.

#### 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 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 red-painted edges [E] of the thrust washers are positioned as shown.

Front [F]

- Install the connecting rod big end caps (see Connecting Rod Installation).



G105361B2 C

#### Connecting Rod Removal

- Refer to the Piston Removal.

**Crankshaft and Connecting Rods**

**Connecting Rod Installation**

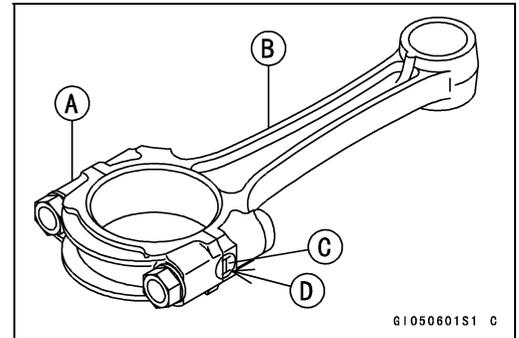
**NOTE**

○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.

**NOTICE**

**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



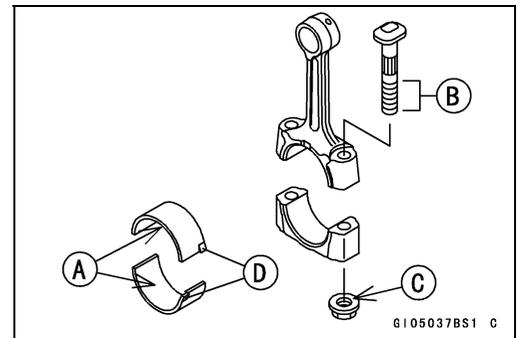
**NOTICE**

**If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plasti-gage (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.

**NOTICE**

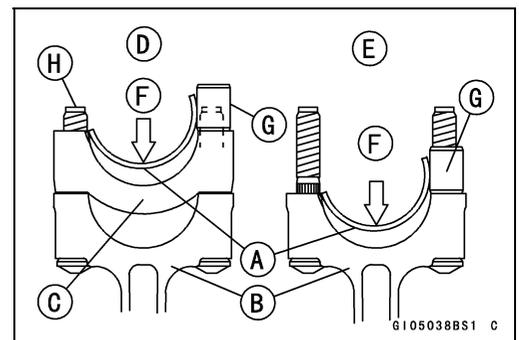
**Wrong application of oil and grease could cause bearing damage.**



○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.



## 9-20 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

---

- Install the crankshaft (see Crankshaft Installation).
- 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.

|               |
|---------------|
| <b>NOTICE</b> |
|---------------|

|  |
|--|
| <p><b>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.</b></p> |
|--|

|               |
|---------------|
| <b>NOTICE</b> |
|---------------|

|   |
|---|
| <p><b>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.</b></p> |
|---|

(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.

|  |
|--|
| <b> WARNING</b> |
|--|

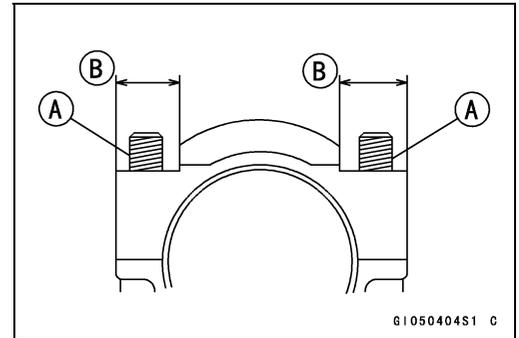
|   |
|---|
| <p><b>Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the bolts, nuts, and connecting rods in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean them.</b></p> |
|---|

|               |
|---------------|
| <b>NOTICE</b> |
|---------------|

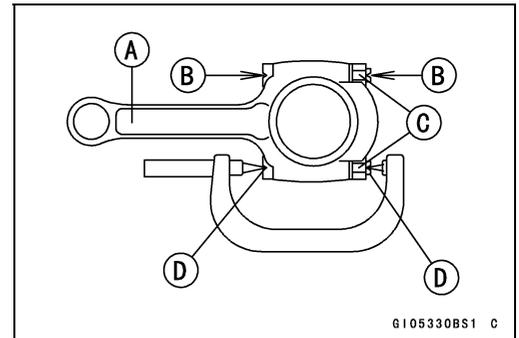
|   |
|---|
| <p><b>Immediately dry the bolts and nuts with compressed air after cleaning. Clean and dry the bolts and nuts completely.</b></p> |
|---|

**Crankshaft and Connecting Rods**

- Install new bolts and nuts in reused connecting rod.
- ★ If the connecting rod assembly was replaced, use the bolts and nuts attached to the new connecting rod assembly.
- 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.
- 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.



$$\text{Bolt Length after tightening} - \text{Bolt Length before tightening} = \text{Bolt Stretch}$$

**Connecting Rod Bolt Stretch**

**Usable Range: 0.28 ~ 0.38 mm (0.0110 ~ 0.0150 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 don't 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.

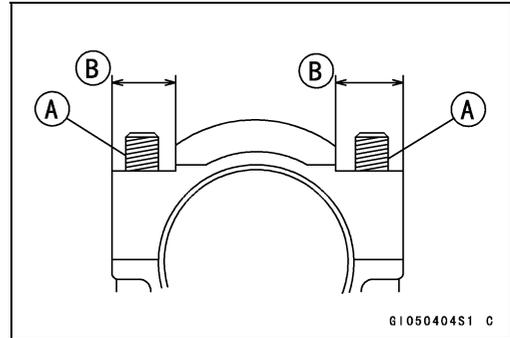
|   |
|---|
| <b>⚠ WARNING</b>  |
| <p><b>Gasoline and low flash-point solvents can be flammable and/or explosive and cause severe burns. Clean the bolts, nuts, and connecting rods in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light. Do not use gasoline or a low flash-point solvent to clean them.</b></p> |

|   |
|---|
| <b>NOTICE</b>   |
| <p><b>Immediately dry the bolts and nuts with compressed air after cleaning. Clean and dry the bolts and nuts completely.</b></p> |

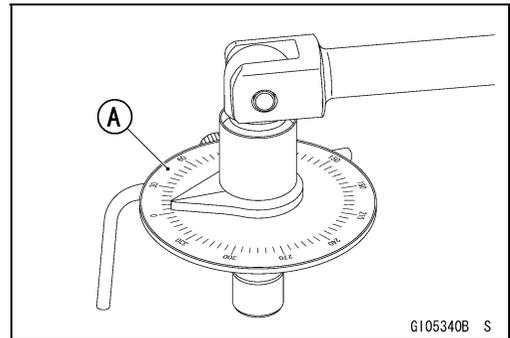
## 9-22 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

- Install new bolts and nuts in reused connecting rod.
- ★ If the connecting rod assembly was replaced, use the bolts and nuts attached to the new connecting rod assembly.
- 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 **26 N·m (2.7 kgf·m, 19 ft·lb)** of torque.
- Next, tighten the nuts **135°**.
- Using a torque angle gauge [A], tighten the nuts specified angle.



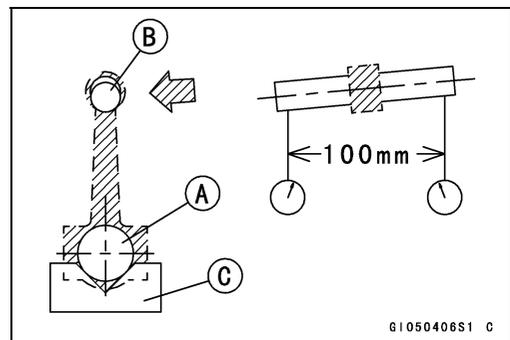
| Connecting Rod Assy | Bolt                            | Nut                            | Torque + Angle<br>N·m (kgf·m, ft·lb) |
|---------------------|---------------------------------|--------------------------------|--------------------------------------|
| New                 | Attached to new con-rod         | Attached to new con-rod        | 26 (2.7, 19) + 135°                  |
|                     | New                             | New                            |                                      |
| Used                | Replace the bolts with new ones | Replace the nuts with new ones | 26 (2.7, 19) + 135°                  |

### 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 Inspection

- 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 the 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.)

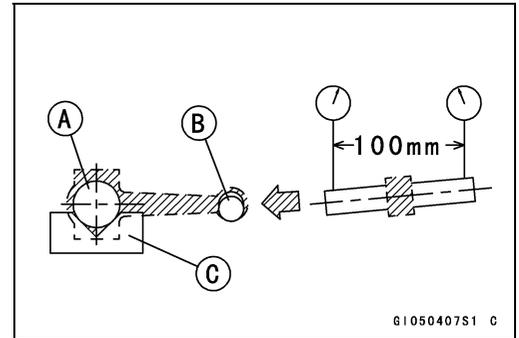
**Crankshaft and Connecting Rods**

**Connecting Rod Twist Inspection**

- 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 the 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 Inspection**

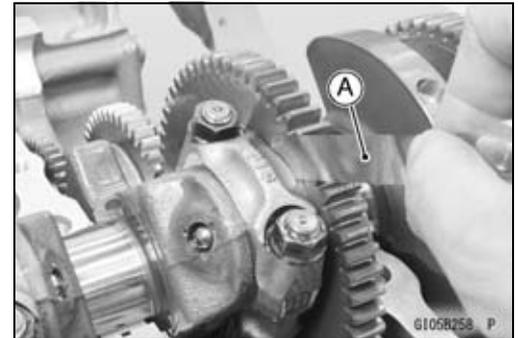
- Measure the connecting rod big end side clearance.
- Insert a thickness gauge [A] between the big end and either crank web to determine clearance.

**Connecting Rod Big End Side Clearance**

**Standard: 0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)**

**Service Limit: 0.6 mm (0.02 in.)**

- ★ If the clearance exceeds the service limit, replace the connecting rod with new one and then check clearance again. If the clearance is too large after connecting rod replacement, the crankshaft also must be replaced.



**Connecting Rod Big End Bearing Insert/Crankpin Wear Inspection**

- Remove the connecting rod big end (see Connecting Rod Removal).
- Cut strips of plastigage (press gauge) 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 [A] using plastigage (press gauge) [B].

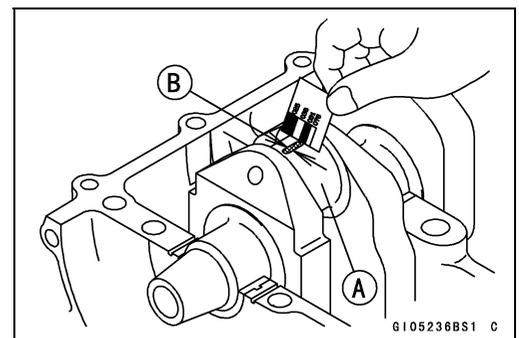
**NOTICE**

**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.)**



## 9-24 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

- ★ If the clearance is within the standard, no bearing replacement is required.
- ★ If the clearance is between 0.082 mm (0.0032 in.) and the service limit (0.11 mm, 0.0043 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 (1.357 in.)

- ★ If any crankpin has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured crankpin diameters [A] are not less than the service limit, but do not coincide with the original diameter markings [B] on the crankshaft, make new markings on it.

#### Crankpin Diameter Markings

**None** 34.484 ~ 34.492 mm (1.3576 ~ 1.35795 in.)

○ 34.493 ~ 34.500 mm (1.35799 ~ 1.3583 in.)

△: Crankpin Diameter Markings, “○” 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 marking already on the big end should almost coincide with the measurement.*

#### Connecting Rod Big End Inside Diameter Markings

**None** 37.500 ~ 37.508 mm (1.4764 ~ 1.47669 in.)

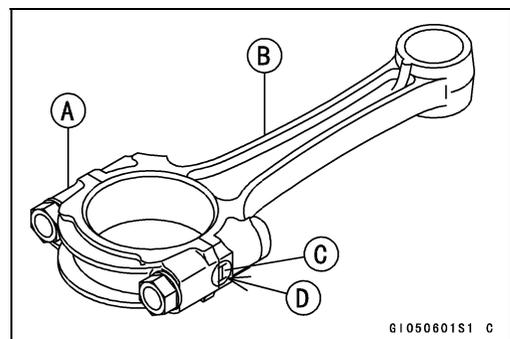
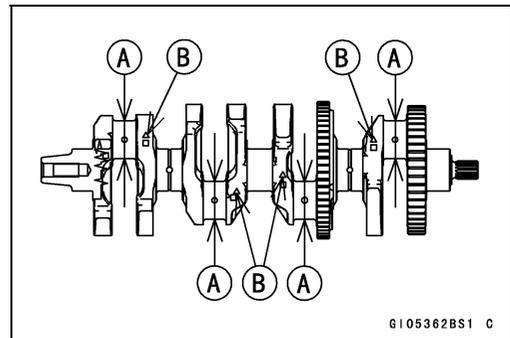
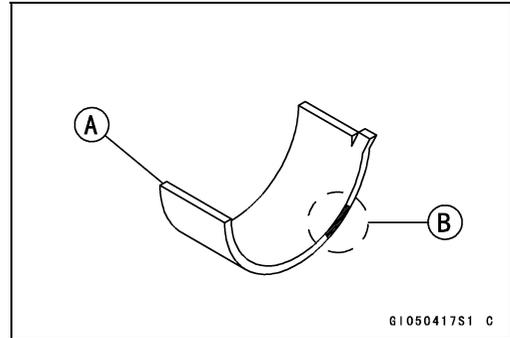
○ 37.509 ~ 37.516 mm (1.47673 ~ 1.4770 in.)

Big End Cap [A]

Connecting Rod [B]

Weight Marking, Alphabet [C]

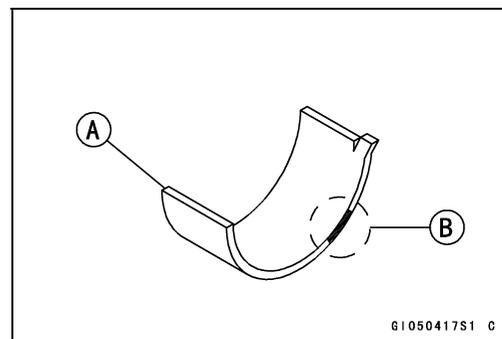
Diameter Marking (Around Weight Marking) [D]: “○” or no mark



**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]

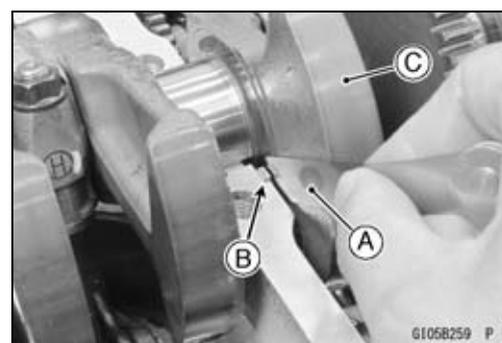
| Con-rod Big End Inside Diameter Marking | Crankpin Diameter Marking | Bearing Insert |             |
|---|---------------------------|----------------|-------------|
|   |                           | Size Color     | Part Number |
| None                                    | ○                         | Brown          | 92139-820   |
| None                                    | None                      | Black          | 92139-819   |
| ○                                       | ○                         |                |             |
| ○                                       | None                      | Blue           | 92139-818   |



- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.

**Crankshaft Side Clearance Inspection**

- 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**

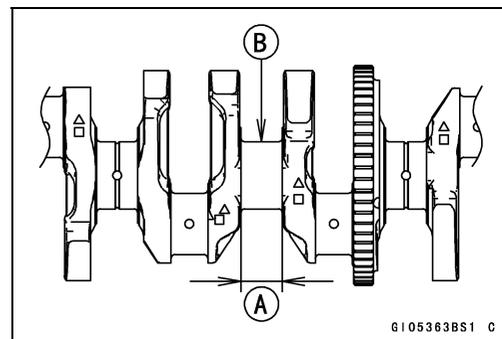
**Standard:** 0.05 ~ 0.25 mm (0.0020 ~ 0.0098 in.)

**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 (0.925 ~ 0.927 in.)



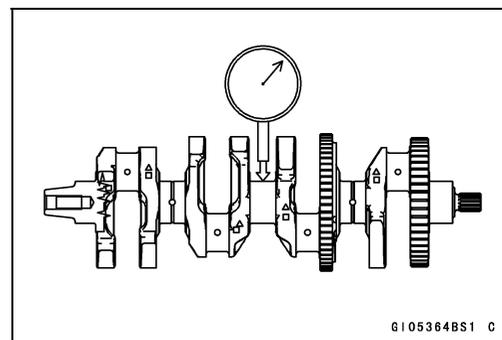
**Crankshaft Runout Inspection**

- Measure the crankshaft runout.
- ★ If the measurement exceeds the service limit, replace the crankshaft.

**Crankshaft Runout**

**Standard:** TIR 0.03 mm (0.001 in.) or less

**Service Limit:** TIR 0.08 mm (0.003 in.)



## 9-26 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

#### Crankshaft Main Bearing Insert/Journal Wear Inspection

- Split the crankcase (see Crankcase Splitting).
- Cut strips of plastigage (press gauge) 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 [A], 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).

#### Crankshaft Main Bearing Insert/Journal Clearance

Standard: 0.014 ~ 0.038 mm (0.0006 ~ 0.0015 in.)

Service Limit: 0.07 mm (0.0028 in.)

- ★ 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 (0.09 mm, 0.0035 in.), replace the bearing inserts [A] with inserts painted blue and purple [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 [A]

Standard: 37.984 ~ 38.000 mm (1.4954 ~ 1.4961 in.)

Service Limit: 37.96 mm (1.4945 in.)

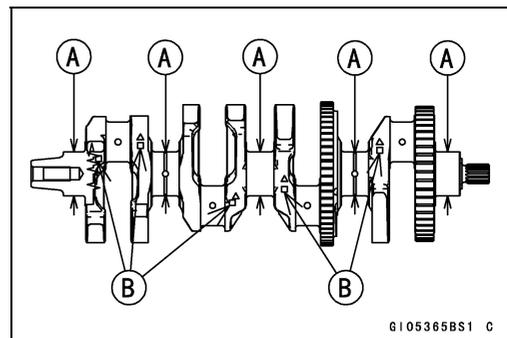
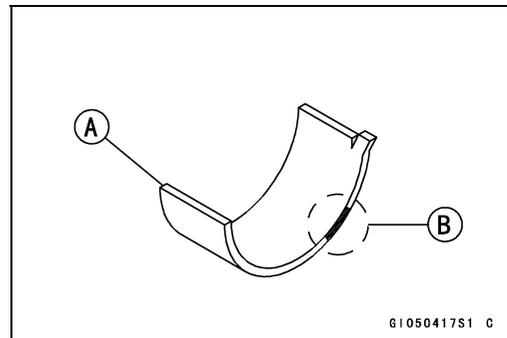
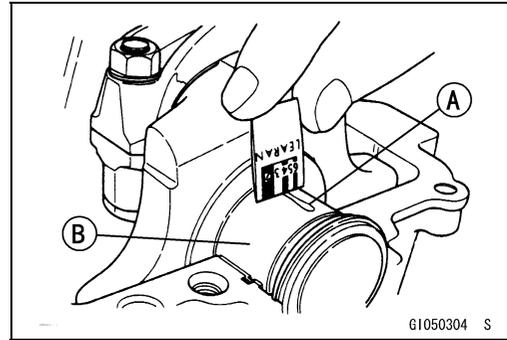
- ★ If any journal has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured journal diameters are not less than the service limit, but do not coincide with the original diameter markings [B] on the crankshaft, make new markings on it.

#### Crankshaft Main Journal Diameter Markings

None 37.984 ~ 37.992 mm (1.4954 ~ 1.49575 in.)

1 37.993 ~ 38.000 mm (1.49578 ~ 1.4961 in.)

- : Crankshaft Main Journal Diameter Markings, "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 Markings, "○" or no mark.

- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).

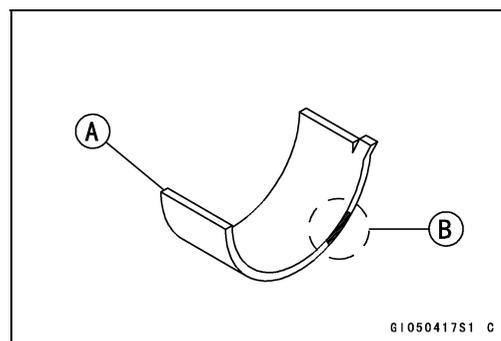
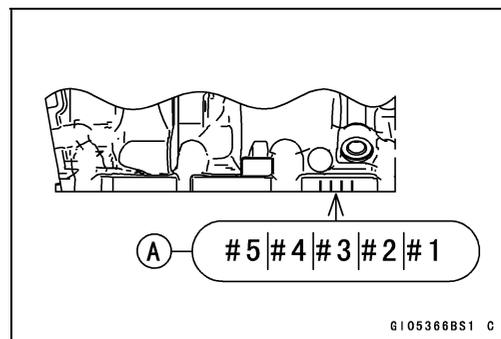
**NOTE**

○ The marking already on the upper crankcase half should almost coincide with the measurement.

**Crankcase Main Bearing Inside Diameter Markings**

- 41.000 ~ 41.008 mm (1.6142 ~ 1.61448 in.)
- None 41.009 ~ 41.016 mm (1.61452 ~ 1.6148 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           | 92139-0823  | 1, 3, 5      |
|  |  |                 | 92139-0826  | 2, 4         |
| None   | 1  | Black           | 92139-0822  | 1, 3, 5      |
|  |  |                 | 92139-0825  | 2, 4         |
| ○  | None                                     | Black           | 92139-0822  | 1, 3, 5      |
|  |  |                 | 92139-0825  | 2, 4         |
| None   | None                                     | Blue            | 92139-0821  | 1, 3, 5      |
|  |  |                 | 92139-0824  | 2, 4         |

\*: 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.

## 9-28 CRANKSHAFT/TRANSMISSION

### Pistons

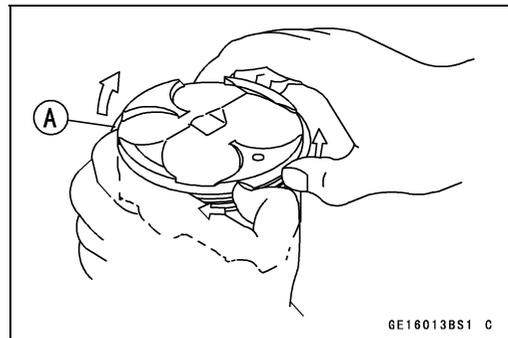
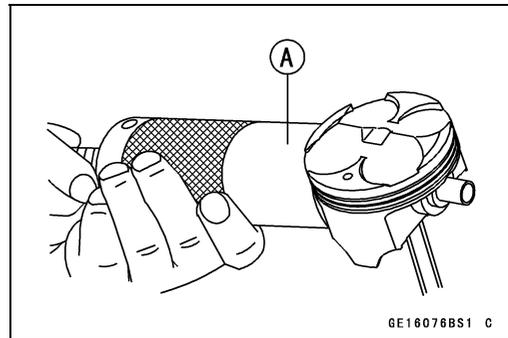
#### *Piston Removal*

- Remove:
  - Crankshaft (see Crankshaft Removal)
- Remove the piston together with the connecting rod to the cylinder head side.

#### **NOTICE**

**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.**

- Remove the piston pin snap ring [A] (Both Sides).
- Using the piston pin puller assembly [A], remove the piston pin.
  - **Special Tool - Piston Pin Puller Assembly: 57001-910**
- Remove the piston from the connecting rod.
- Remove the piston rings if necessary.
- 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.



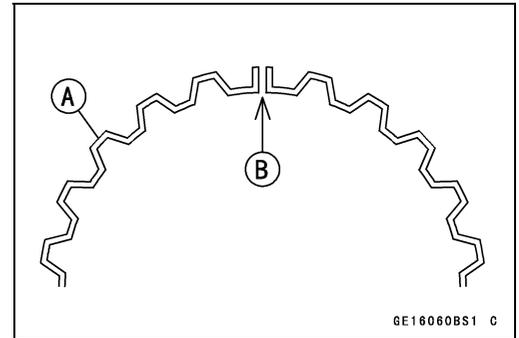
**Pistons**

**Piston Installation**

**NOTE**

○If a new piston is used, use new piston ring.

- 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] not 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**

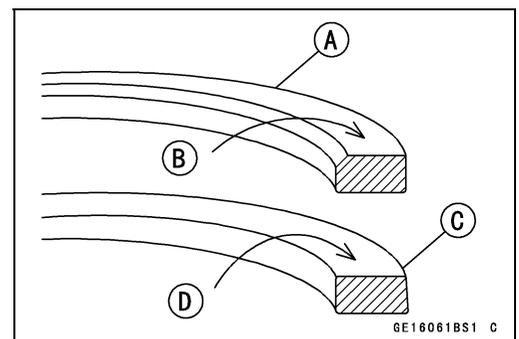
○The oil ring rails have no “top” or “bottom”.

- Apply molybdenum disulfide oil solution to the piston rings.

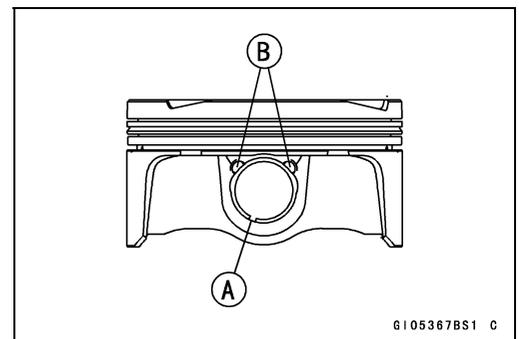
**NOTE**

○Do not mix up the top and second ring.

- Install the top ring [A] so that the “1T” mark [B] faces up.
- Install the second ring [C] so that the “T2” mark [D] faces up.



- Apply molybdenum disulfide oil solution to the piston pins and piston journals.
- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slits [B] of the piston pin hole.
- When installing the piston pin snap ring, compress it only enough to install it and no more.

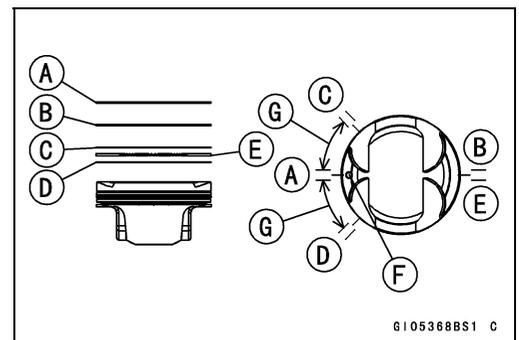


**NOTICE**

**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. The openings of the oil ring steel rails must be about 45° of angle from the opening of the top ring.

- Top Ring [A]
- Second Ring [B]
- Upper Oil Ring Steel Rail [C]
- Lower Oil Ring Steel Rail [D]
- Oil Ring Expander [E]
- Dent [F]
- 45° [G]



# 9-30 CRANKSHAFT/TRANSMISSION

## Pistons

- Apply molybdenum disulfide oil solution to the cylinder bore and piston skirt.
- Install the piston with its dent mark [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,  $\phi 67 \sim \phi 79$ : 57001-1097**

- Install:
  - Crankshaft (see Crankshaft Installation)
  - Connecting Rod Big End Caps (see Connecting Rod Installation)

### Cylinder (Upper Crankcase) Wear Inspection

- 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.
- ★ 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 (Upper Crankcase) Inside Diameter**  
**Standard: 75.994 ~ 76.006 mm (2.9919 ~ 2.9924 in.)**  
**Service Limit: 76.09 mm (2.996 in.)**

### Piston Wear Inspection

- Measure the outside diameter [A] of each piston 5 mm (0.20 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: 75.939 ~ 75.954 mm (2.9897 ~ 2.9903 in.)**  
**Service Limit: 75.79 mm (2.984 in.)**

### Piston Ring, Piston Ring Groove Wear Inspection

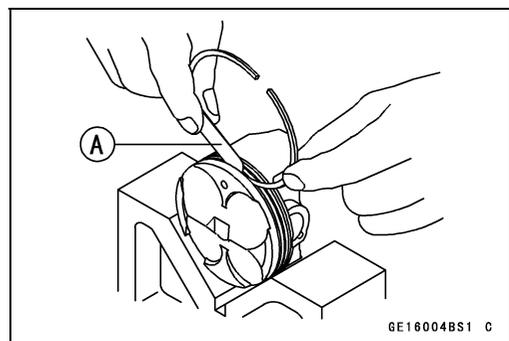
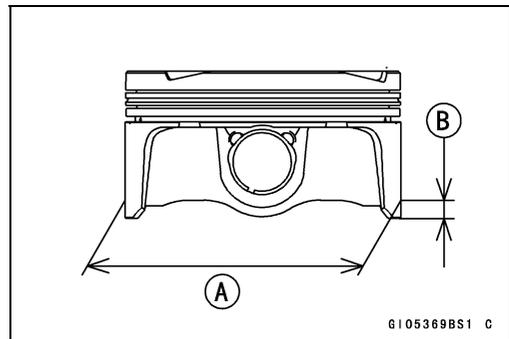
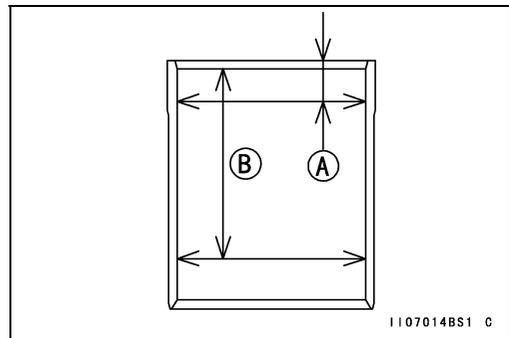
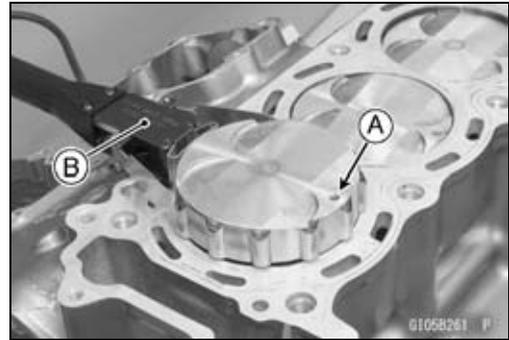
- Check for uneven groove wear by inspecting the ring seating.
- ★ The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.
- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.

**Piston Ring/Groove Clearance**  
**Standard:**

- Top 0.030 ~ 0.070 mm (0.00118 ~ 0.00276 in.)
- Second 0.030 ~ 0.070 mm (0.00118 ~ 0.00276 in.)

**Service Limit:**

- Top 0.17 mm (0.0067 in.)
- Second 0.17 mm (0.0067 in.)



**Pistons**

**Piston Ring Groove Width Inspection**

- 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.)

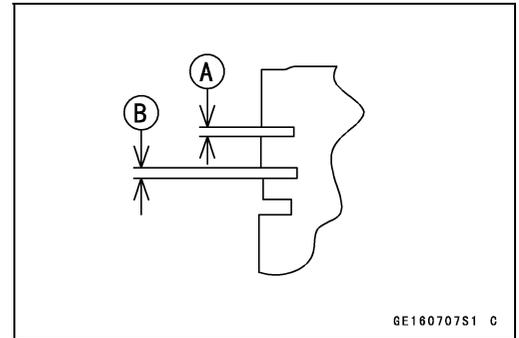
Second [B]   0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)

**Service Limit:**

Top            0.92 mm (0.0362 in.)

Second       0.92 mm (0.0362 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 Inspection**

- Measure the piston ring thickness.
- Use the micrometer to measure at several points around the ring.

**Piston Ring Thickness**

**Standard:**

Top [A]      0.770 ~ 0.790 mm (0.0303 ~ 0.0311 in.)

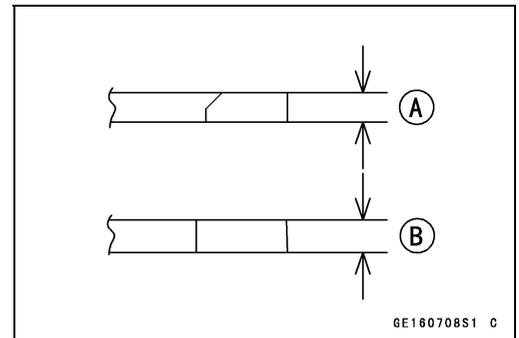
Second [B]   0.770 ~ 0.790 mm (0.0303 ~ 0.0311 in.)

**Service Limit:**

Top            0.70 mm (0.028 in.)

Second       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 Inspection**

- 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            0.175 ~ 0.275 mm (0.0069 ~ 0.0108 in.)

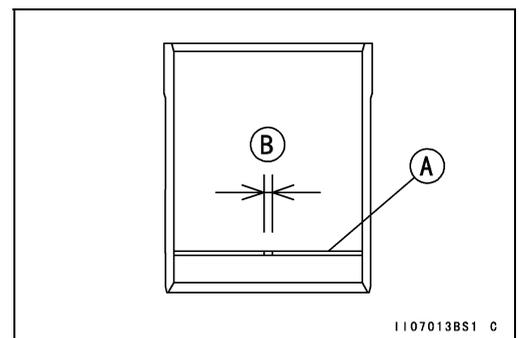
Second       0.325 ~ 0.425 mm (0.0128 ~ 0.0167 in.)

**Service Limit:**

Top            0.6 mm (0.02 in.)

Second       0.7 mm (0.03 in.)

- ★ If the end gap of either ring is greater than the service limit, replace all the rings.

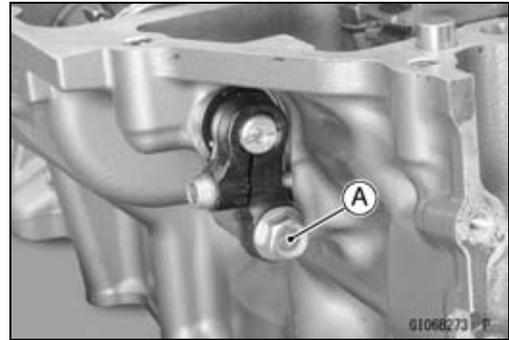


## 9-32 CRANKSHAFT/TRANSMISSION

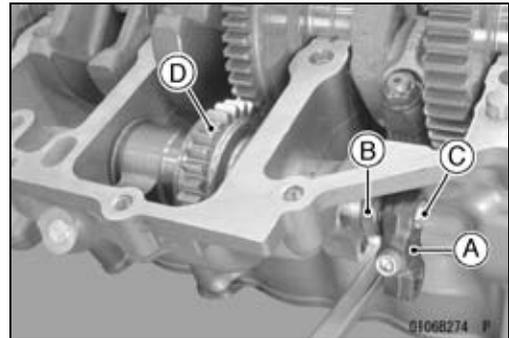
### Balancer

#### Front Balancer Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the balancer shaft clamp lever bolt [A].

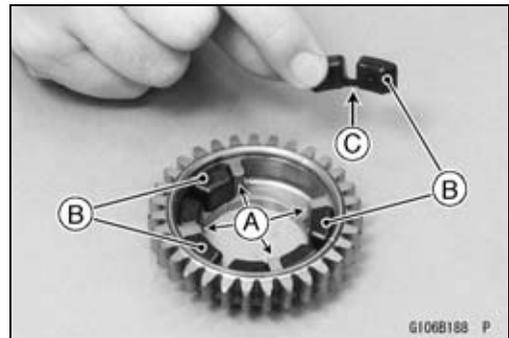


- Pry off the clamp lever [A] until the oil seal [B] is removed.
- Pull the balancer shaft [C] out of the crankcase. The balancer weight and gear assembly [D] come off with needle bearings and washers.
- Remove the balancer shaft clamp bolt, and remove the balancer shaft clamp lever and oil seal from the balancer shaft.

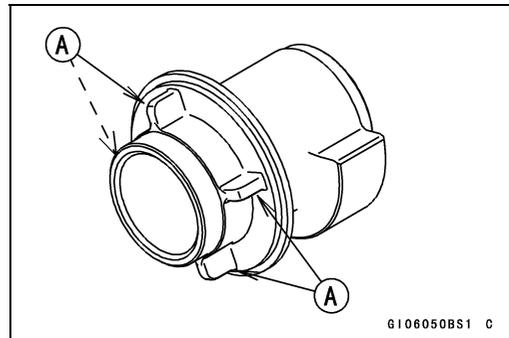


#### Front Balancer Installation

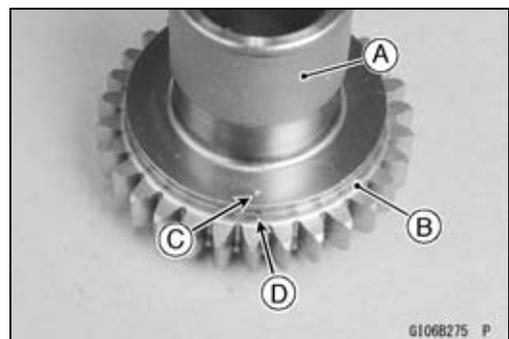
- Apply molybdenum disulfide oil solution to the ribs [A] of the balancer gear.
- Check that the rubber dampers [B] are in place.
- Face the linked portion [C] to the bottom.



- Apply molybdenum disulfide oil solution to the ribs [A] of the balancer weight.

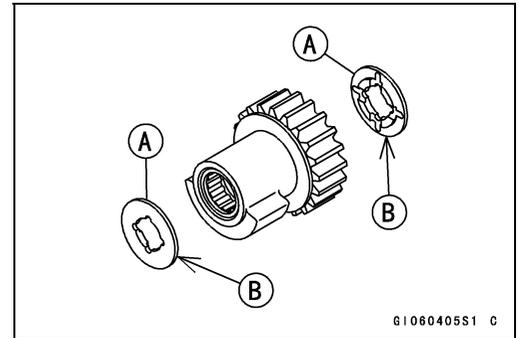


- Install the balancer weight [A] into the gear [B].
- Align the punch mark [C] of the balancer weight to the groove [D] of the gear.

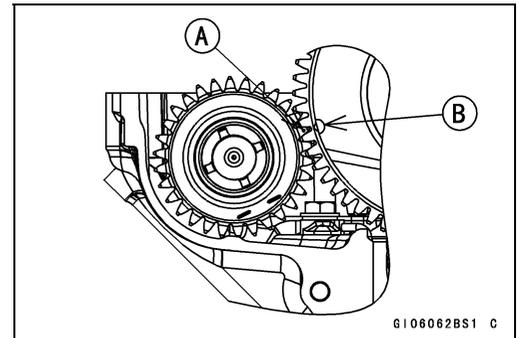


**Balancer**

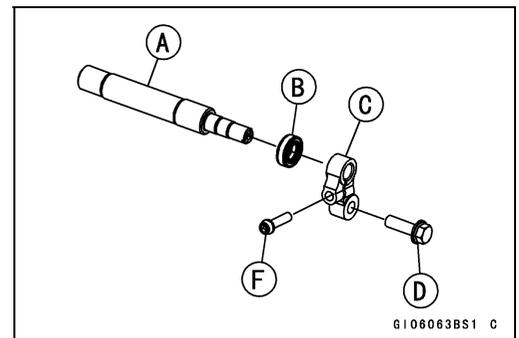
- Apply molybdenum disulfide oil solution to the needle bearings. Install the needle bearings.
- Fit the washers [A] on both ends of the weight and gear assembly.
- The projected sides [B] face inward.



- Position the crankshaft at #2, 3 position TDC.
- Set the front balancer on the upper crankcase half.
- Align the punch mark [A] on the balancer gear with the mark [B] on the balancer drive gear of crankshaft.



- Apply molybdenum disulfide oil solution to the balancer shaft [A].
- Install the balancer shaft to the crankcase until it is bottomed.
- Install the new oil seal [B] as shown.
- Fill the oil seal lips with grease.
- Install the balancer shaft clamp lever [C].
- Apply a non-permanent locking agent to the threads of the balancer shaft clamp lever bolt [D].
- Tighten:

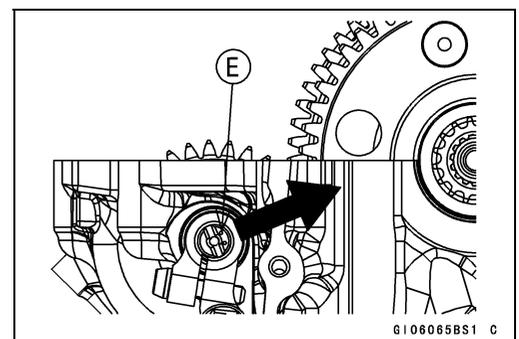
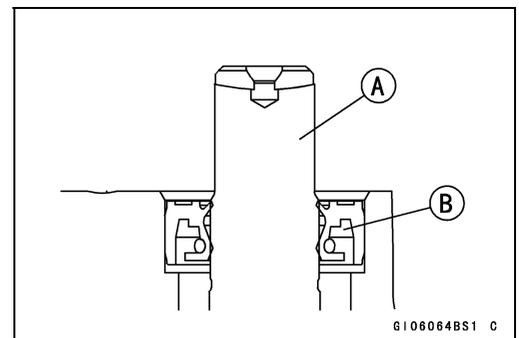


**Torque - Balancer Shaft Clamp Lever Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Turn the balancer shaft so that its marks [E] is in position as shown.
- Check that the lever is in contact with the crankcase.
- Tighten:

**Torque - Balancer Shaft Clamp Bolt [F]: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Install the removed parts (see appropriate chapters).

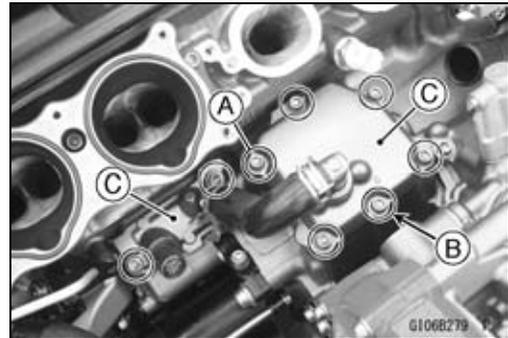
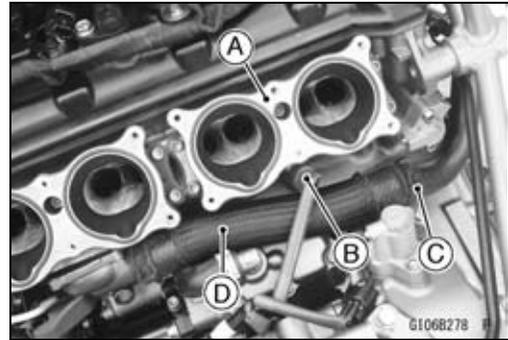


## 9-34 CRANKSHAFT/TRANSMISSION

### Balancer

#### Rear Balancer Removal

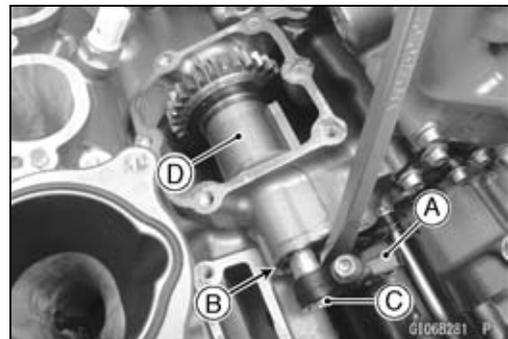
- Remove:
  - Thermostat (see Thermostat Removal in the Cooling system chapter)
  - Right Throttle Body Assy Holder [A] (see Throttle Body Assy Holder Removal in the Engine Top End chapter)
- Disconnect the water temperature sensor lead connector [B].
- Slide the clamp [C].
- Remove the water hose [D] with the thermostat housing cover.
  
- Remove:
  - Breather Cover Bolts [A]
  - Breather Cover Bolt and Washer [B]
  - Breather Covers [C]
  - Breather Cover Gaskets



- Remove the balancer shaft clamp lever bolt [A].

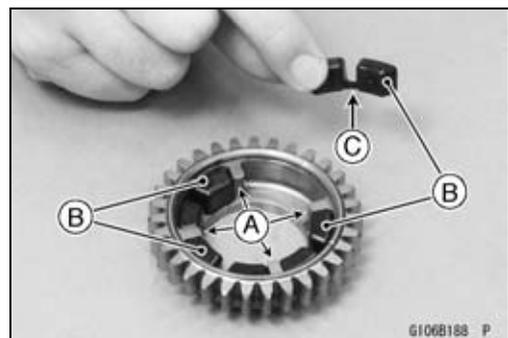


- Pry off the clamp lever [A] until the oil seal [B] is removed.
- Pull the balancer shaft [C] out of the crankcase. The balancer weight and gear assembly [D] come off with needle bearings and washers.
- Remove the balancer shaft clamp bolt, and remove the balancer shaft clamp lever and oil seal from the balancer shaft.



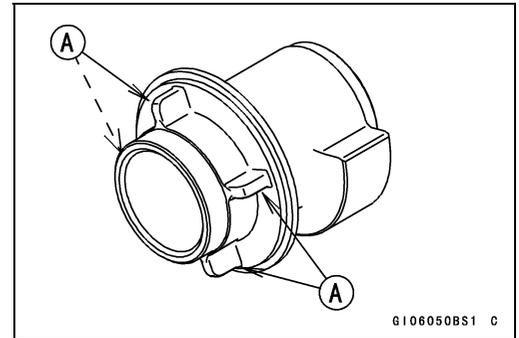
#### Rear Balancer Installation

- Apply molybdenum disulfide oil solution to the ribs [A] of the balancer gear.
- Check that the rubber dampers [B] are in place.
- Face the linked portion [C] to the bottom.

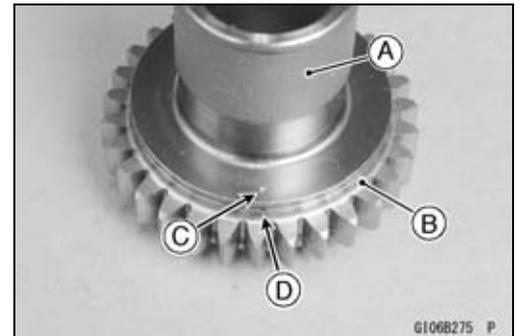


**Balancer**

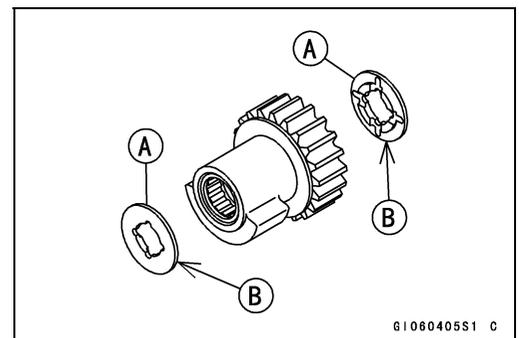
- Apply molybdenum disulfide oil solution to the ribs [A] of the balancer weight.



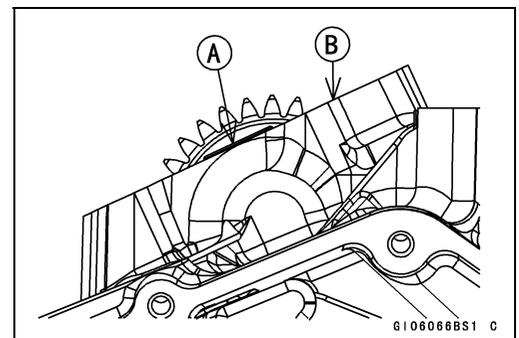
- Install the balancer weight [A] into the gear [B].
- Align the punch mark [C] of the balancer weight to the groove [D] of the gear.



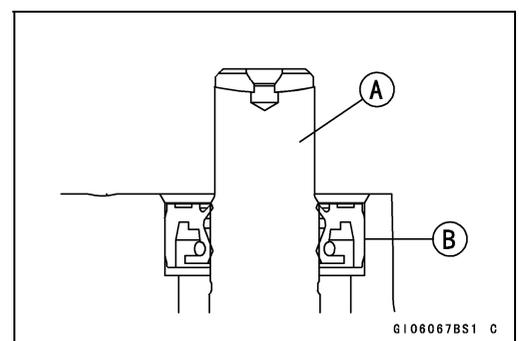
- Apply molybdenum disulfide oil solution to the needle bearings. Insert the needle bearings.
- Fit the washers [A] on both ends of the weight and gear assembly.
- The projected sides [B] face inward.



- Position the crankshaft at # 2, 3 position TDC or at # 1, 4 position TDC.
- Align the line mark [A] on the balancer gear with the mating surface [B] of the breather cover.



- Install the balancer shaft [A].
- Install the new oil seal [B] as shown.
- Fill the oil seal lips with grease.



## 9-36 CRANKSHAFT/TRANSMISSION

### Balancer

- Install the balancer shaft clamp lever [A].
- Apply a non-permanent locking agent to the threads of the balancer shaft clamp lever bolt [B].
- Tighten:

**Torque - Balancer Shaft Clamp Lever Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**

- Turn the balancer shaft so that its mark [C] is in position as shown.
- Check that the lever is in contact with the crankcase.
- Tighten:

**Torque - Balancer Shaft Clamp Bolt [D]: 10 N·m (1.0 kgf·m, 89 in·lb)**

- When installing the breather plate [A], note the following.
- Install the breather plate.
- Apply a non-permanent locking agent to the threads of the breather plate bolts [B].
- Tighten:

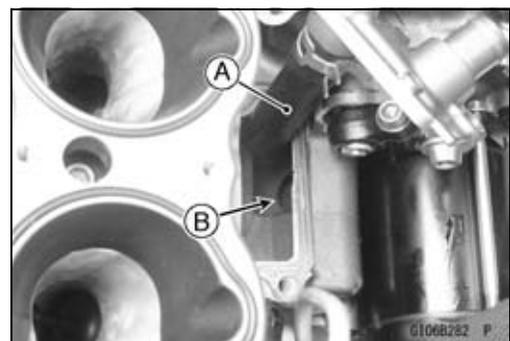
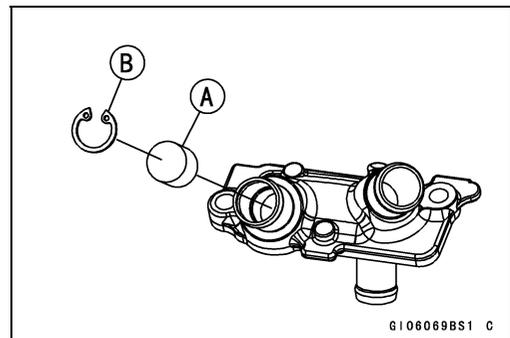
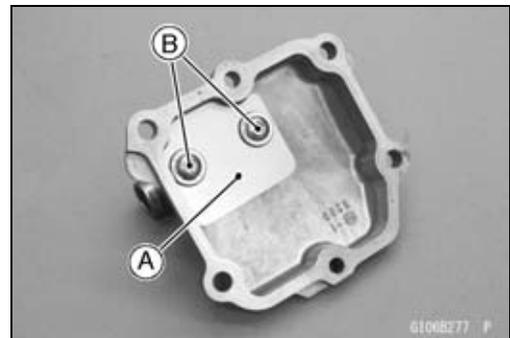
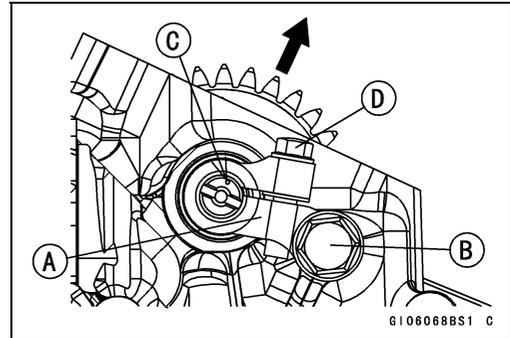
**Torque - Breather Plate Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**

- When installing the separator [A], note the following.
- Visually inspect the separator.
- ★ If the separator is damaged, replace it.
- Install the separator and new snap ring [B].

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

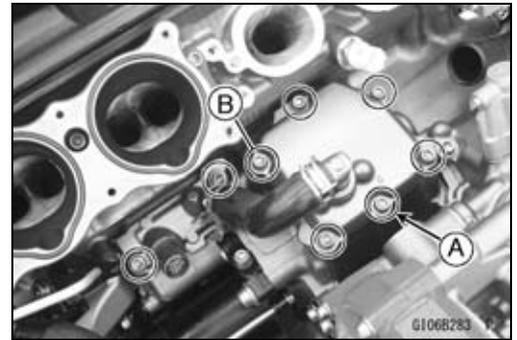
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

- Replace the breather cover gaskets with new ones.
- Insert the breather hose [A] to the hole [B] of the crankcase.



## Balancer

- Replace the washer [A] with a new one.
- Tighten:
  - Torque - Breather Cover Bolts [B]: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Install the removed parts (see appropriate chapters).

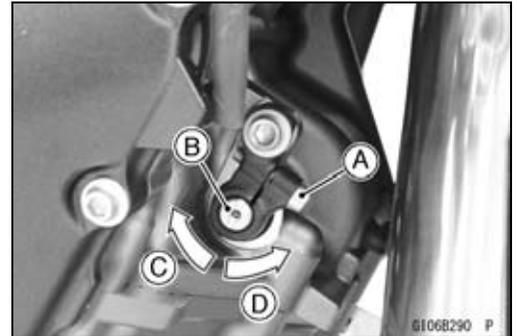


## Balancer Adjustment

### NOTE

○First, adjust the front balancer, next the rear balancer.

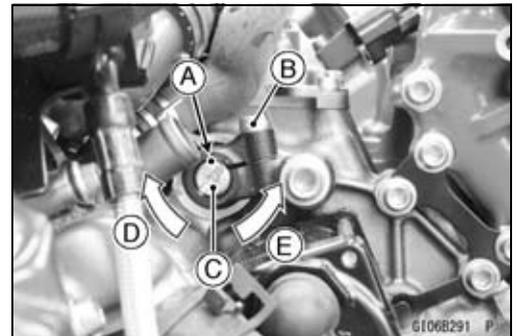
- Start the engine and warm it up thoroughly.
- Adjust the front balancer gear backlash with the engine idling.
- The amount of backlash can be changed by turning the front balancer shaft which has eccentric journals.
- Start the engine and let it idle.
- Loosen the clamp bolt [A] and turn the front balancer shaft [B] clockwise [C] until the front balancer gear makes a whining sound.
- Hold the front balancer shaft to until tightening clamp bolt.
- Turn the shaft counterclockwise [D] until the front balancer gear whining sound disappears and tighten the clamp bolt.



**Torque - Balancer Shaft Clamp Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Confirm the whining sound from the rear balancer.
- ★ If there is the whining sound from the rear balancer, adjust the rear balancer.
- Remove:
  - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  - Blow-off Valve Hose Fitting Box (see Blow-off Valve Hose Fitting Box Removal in the Fuel System (DFI) chapter)
- The amount of backlash can be changed by turning the rear balancer shaft which has eccentric journals.
- Mark the balancer shaft and lever to confirm the original position.
  - Mark [A]
- Loosen the clamp bolt [B] and turn the rear balancer shaft [C] clockwise [D] or counterclockwise [E] a little.
- Tighten:

**Torque - Balancer Shaft Clamp Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**



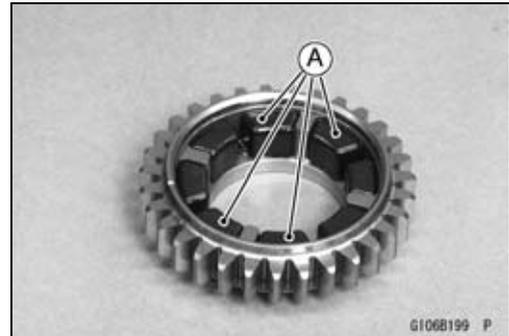
## 9-38 CRANKSHAFT/TRANSMISSION

### Balancer

- Install the removed parts (see appropriate chapters).
- Start the engine and warm it up thoroughly.
- Confirm the whining sound from the rear balancer.
- ★ If there is the whining sound from the rear balancer, adjust the rear balancer again in the same procedure.
- ★ If the whining sound becomes large, turn the rear balancer shaft in the inverted direction.
- ★ If the whining sound becomes small, turn the rear balancer shaft in the same direction.
- Repeat the above procedures until the whining sound disappears.

#### ***Balancer Damper Inspection***

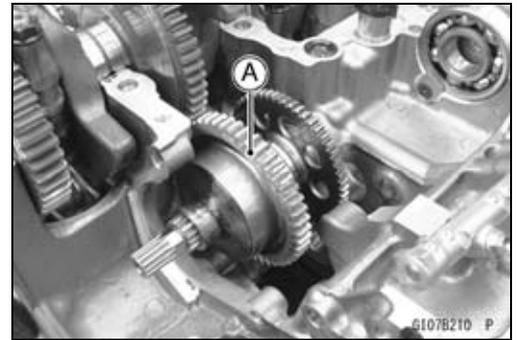
- Remove the balancer and disassemble the weight and gear assembly.
- Visually inspect the rubber dampers [A].
- ★ If they appear damaged or deteriorated, replace them.



**Starter Motor Clutch and Torque Limiter**

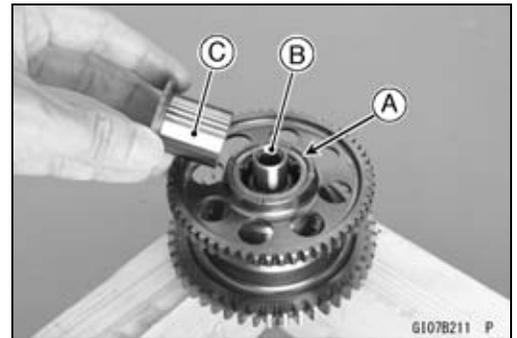
**Starter Motor Clutch Removal**

- Split the crankcase (see Crankcase Splitting).
- Remove:
  - Torque Limiter (see Torque Limiter Removal)
  - Starter Motor Clutch Assy [A]



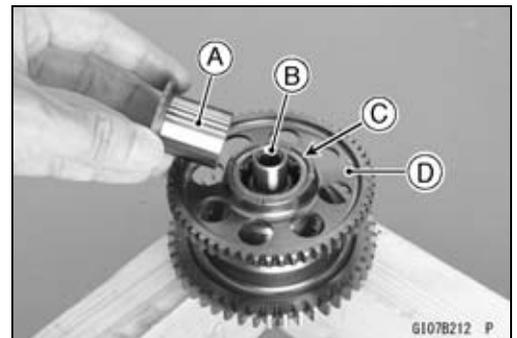
**Starter Motor Clutch Installation**

- Apply molybdenum disulfide grease to the needle bearing [A].
- Install:
  - Starter Motor Clutch Shaft [B]
  - Needle Bearing
  - Collar [C]
- Installation is the reverse of removal.

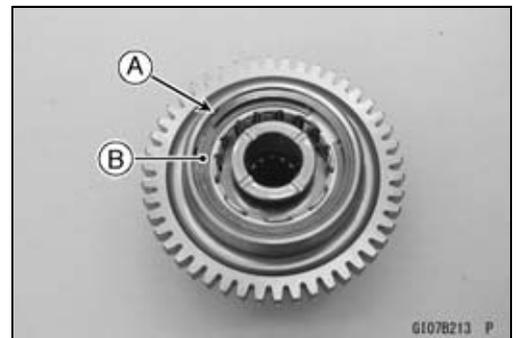


**Starter Motor Clutch Disassembly**

- Remove:
  - Starter Motor Clutch Assy (see Starter Motor Clutch Removal)
  - Collar [A]
  - Starter Motor Clutch Shaft [B]
  - Needle Bearing [C]
  - Driven Gear [D]



- Remove the snap ring [A].
- Holding the drive gear with a hand, remove the one-way clutch [B] from the gear using the flat tip screwdriver.



- Remove:
  - Coupling [A]
  - Supercharger Coupling Dampers

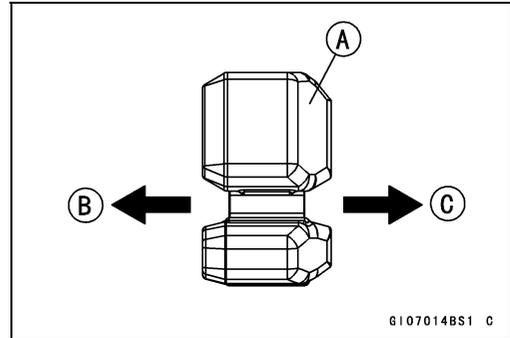


## 9-40 CRANKSHAFT/TRANSMISSION

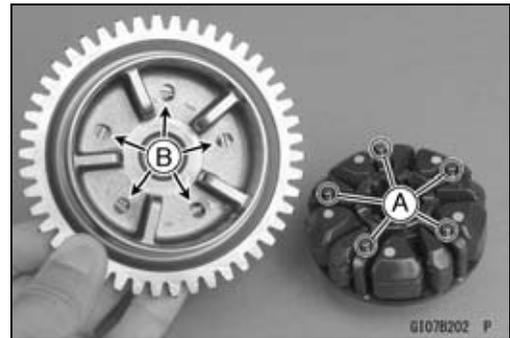
### Starter Motor Clutch and Torque Limiter

#### Starter Motor Clutch Assembly

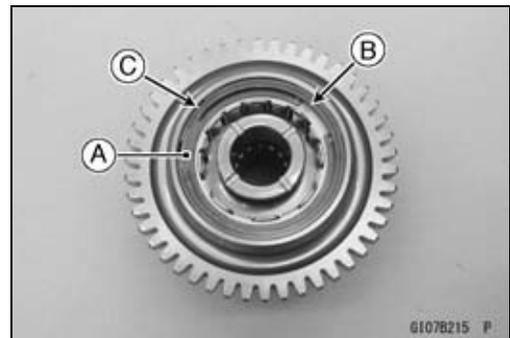
- Install the supercharger coupling dampers [A] as shown.  
Coupling Side [B]  
Drive Gear Side [C]
- Apply molybdenum disulfide oil solution to the dampers.



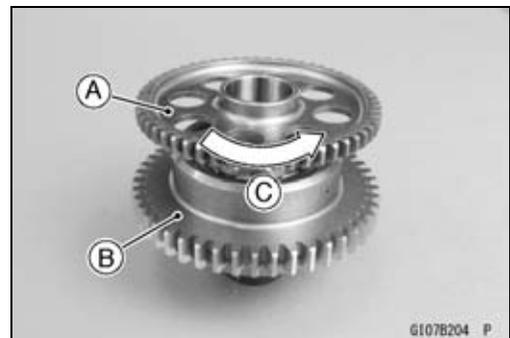
- Insert the pins [A] into the hole [B].



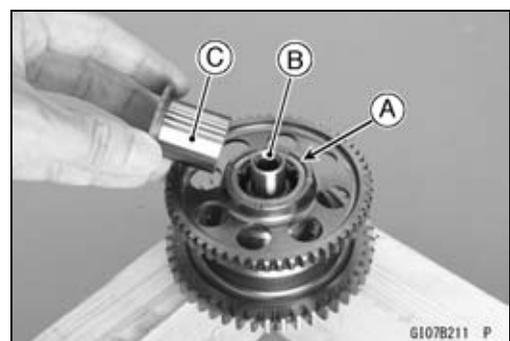
- Be sure to install the one-way clutch [A] so that its blue paint [B] faces to the snap ring [C].
- Install the new snap ring to the one-way clutch.



- Install in the driven gear [A] to the drive gear [B] while turning the driven gear counterclockwise [C].



- Apply molybdenum disulfide grease to the needle bearing [A].
- Install:  
Starter Motor Clutch Shaft [B]  
Needle Bearing  
Collar [C]



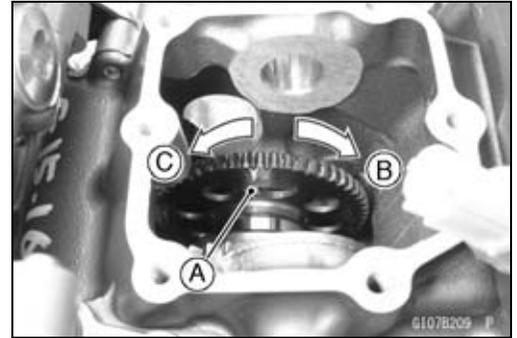
#### Supercharger Coupling Dampers Inspection

- Refer to the Supercharger Coupling Dampers Inspection in the Periodic Maintenance chapter.

## Starter Motor Clutch and Torque Limiter

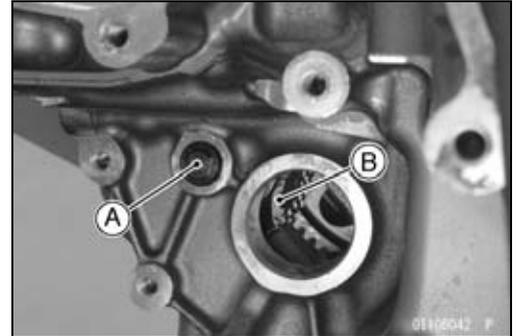
### Starter Clutch Inspection

- Remove:
  - Rear Balancer (see Rear Balancer Removal)
  - Starter Motor (see Starter Motor Removal in the Electrical System chapter)
- Turn the starter idle gear [A] by hand. The starter idle gear should turn forward [B] freely, but should not turn backward [C].
- ★ If the clutch does not operate as it should or if it makes noise, disassemble the starter clutch, examine each part visually, and replace any worn or damaged parts.



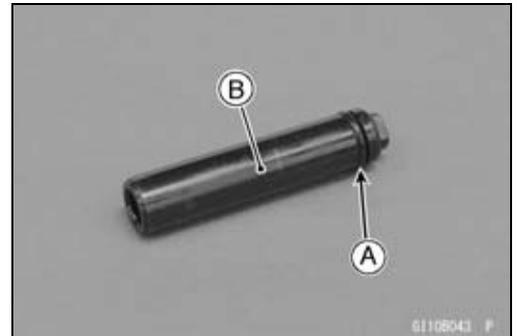
### Torque Limiter Removal

- Split the crankcase (see Crankcase Splitting).
- Remove:
  - Torque Limiter Shaft [A]
  - Torque Limiter [B]



### Torque Limiter Installation

- Replace the O-ring [A] with a new one.
- Apply a grease to the O-ring and install it.
- Apply molybdenum disulfide grease to the torque limiter shaft [B].
- Install the torque limiter and shaft.

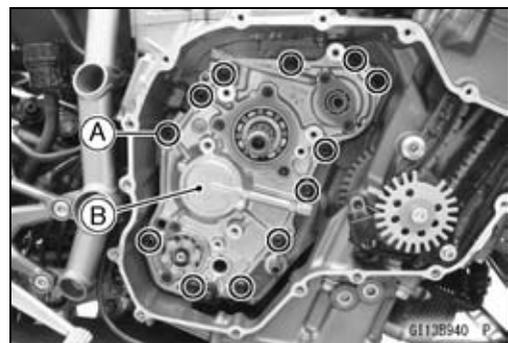
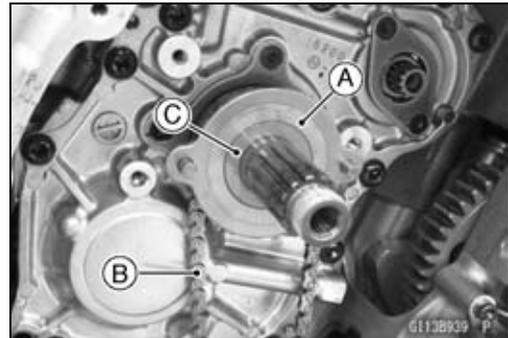
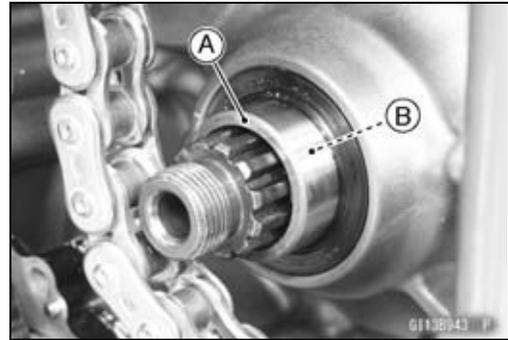


## 9-42 CRANKSHAFT/TRANSMISSION

### Transmission

#### **Transmission Assy Removal**

- Remove:
  - Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
  - Gear Position Switch (see Gear Position Switch Removal in the Electrical System chapter)
  - Collar [A]
  - O-ring [B]
  
- Remove:
  - Clutch (see Clutch Removal in the Clutch chapter)
  - Shift Shaft Assembly (see External Shift Mechanism Removal)
  - Supercharger Chain (see Supercharger Housing Assy Removal in the Fuel System (DFI) chapter)
  - Oil Pump Driven Gear (see Oil Pump Driven Gear Removal in the Engine Lubrication System chapter)
  - Oil Pump Drive Gear [A]
  - Oil Pump Chain [B]
  - Collar [C]
- ★ If the transmission assy is to be disassembled, remove the following.
  - Gear Positioning Lever (see External Shift Mechanism Removal)
  
- Remove:
  - Transmission Case Bolts [A]
  - Transmission Assy [B]



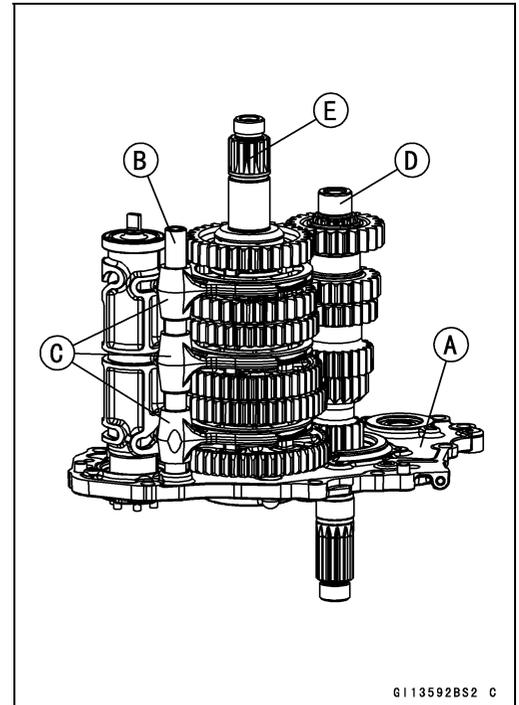
**Transmission**

**Transmission Assy Disassembly**

- Remove the transmission assy (see Transmission Assy Removal).
- Remove the following parts from the transmission case [A].
  - Shift Rod [B]
  - Shift Forks [C]
  - Drive Shaft Assy [D]
  - Output Shaft Assy [E]

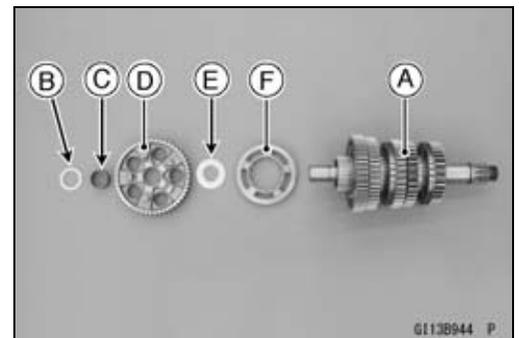
**NOTE**

- Remove each drive shaft and the output shaft as an assembly.

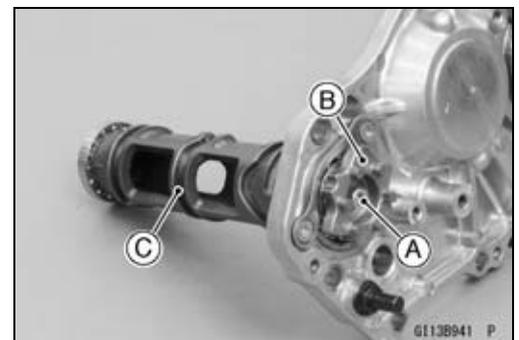


- When removing the output shaft assy [A], the following parts come off together.

- Shim [B]
- Needle Bearing [C]
- 1st Gear [D]
- Washer [E]
- Shifter [F]



- Remove:
  - Shift Drum Cam Holder Bolt [A]
  - Washer
  - Shift Drum Cam [B]
  - Shift Drum [C]



## 9-44 CRANKSHAFT/TRANSMISSION

### Transmission

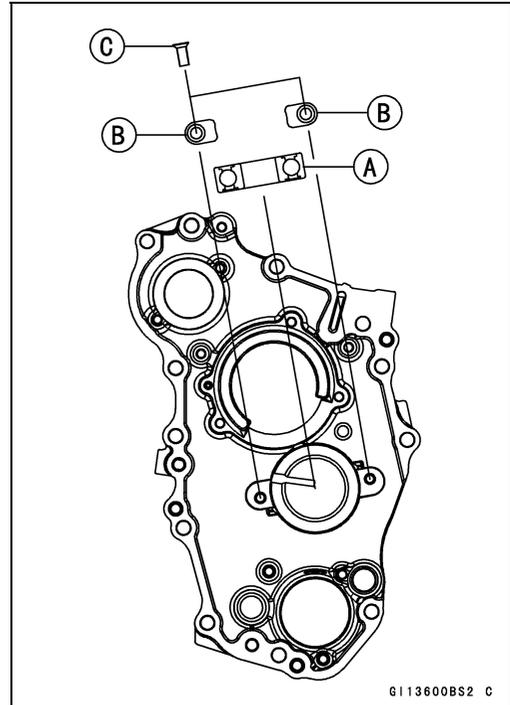
#### Transmission Assy Assembly

- Press the new ball bearing [A] until it is bottomed.
- Face the oil seal side of the bearing to the bottom.

**Special Tool - Bearing Driver Set: 57001-1129**

- Install the bearing holders [B] so that the taper side faces outside.
- Apply a non-permanent locking agent to the threads of the bearing holder screws [C].
- Tighten:

**Torque - Bearing Holder Screws: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

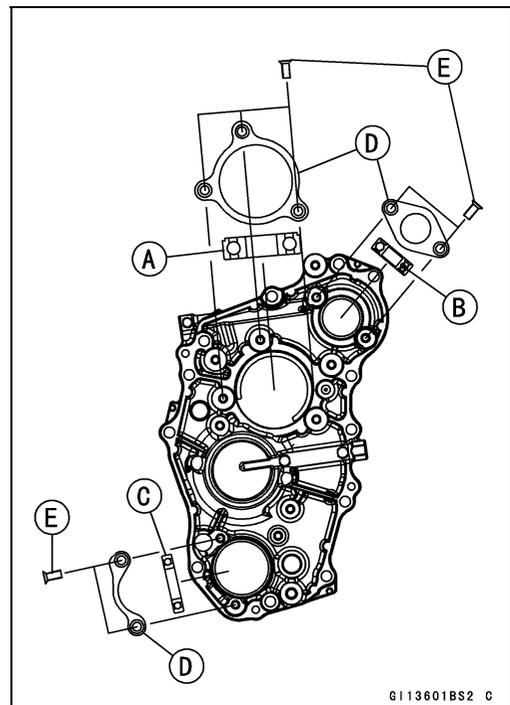


- Press the new ball bearings until they are bottomed.
- Face the stepped side of the bearing [A] to the bearing holder side.
- Face the oil seal side of the bearing [B] to the bottom.
- Face the marked side of the bearing [C] to the bearing holder side.

**Special Tool - Bearing Driver Set: 57001-1129**

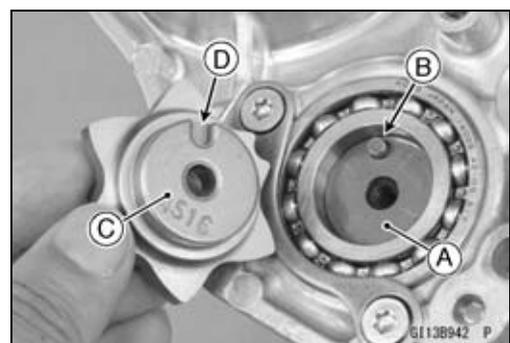
- Install the bearing holders [D] so that the tapered side faces outside.
- Apply a non-permanent locking agent to the threads of the bearing holder screws [E].
- Tighten:

**Torque - Bearing Holder Screws: 5.0 N·m (0.51 kgf·m, 44 in·lb)**



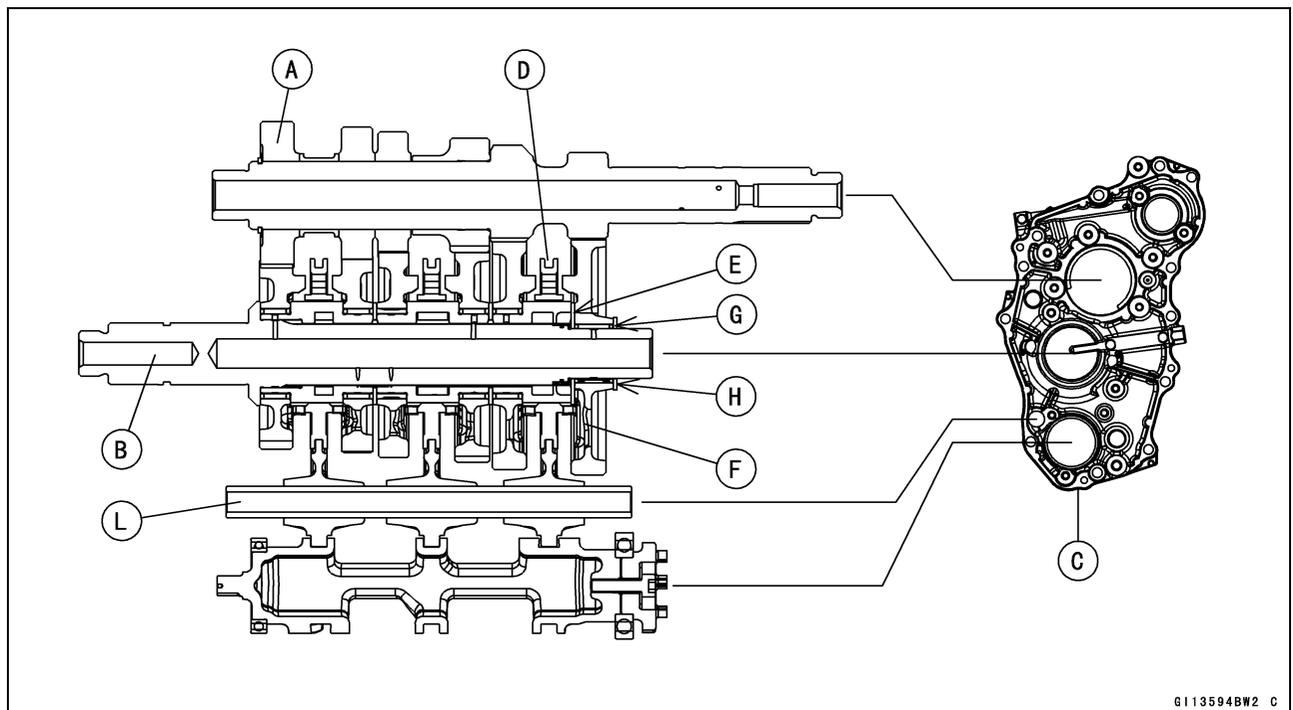
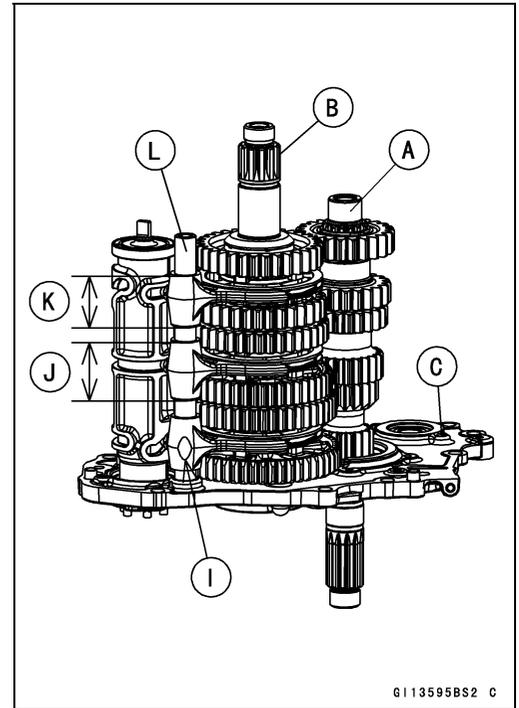
- Install:
  - Shift Drum Assembly [A]
  - Pin [B]
  - Shift Drum Cam [C]
- Align the pin with the recess [D].
- Apply a non-permanent locking agent to the threads of the shift drum cam holder bolt, and tighten it with washer.

**Torque - Shift Drum Cam Holder Bolt: 12 N·m (1.2 kgf·m, 106 in·lb)**



**Transmission**

- Install the drive shaft assy [A] and output shaft assy [B] as a set in the transmission case [C].
- Install the together following parts when removing the output shaft assy.
  - Shifter [D]
  - Washer [E]
  - 1st Gear [F]
  - Needle Bearing [G]
  - Shim [H]
- Install the shift forks as shown.
  - Mark [I]
  - Long [J]
  - Short [K]
- Install the shift rod [L].
- Apply molybdenum disulfide oil solution to the transmission gears.

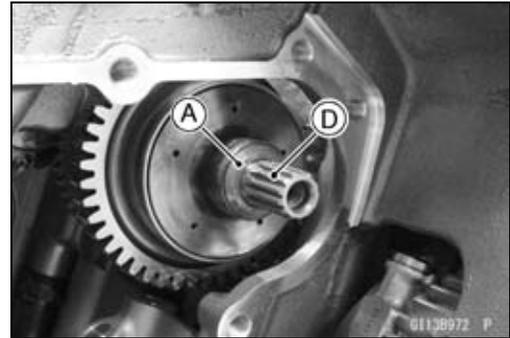
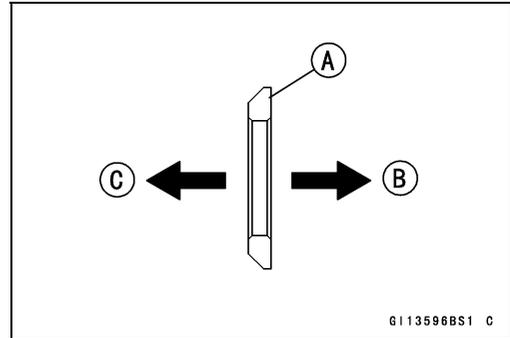


## 9-46 CRANKSHAFT/TRANSMISSION

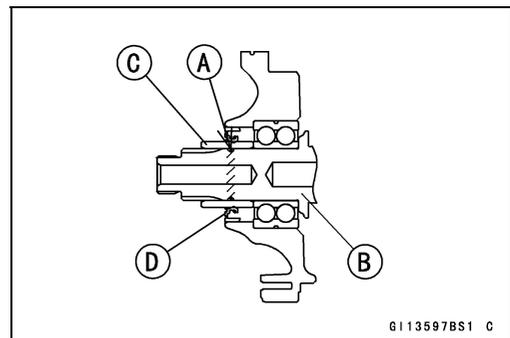
### Transmission

#### **Transmission Assy Installation**

- Be sure that the dowel pins and washer [A] are in position.
  - Engine Inside [B]
  - Engine Outside [C]
  - Starter Motor Clutch Shaft [D]
- Install the transmission assy on the crankcase.
- Tighten:
  - Torque - Transmission Case Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**



- Install the gear positioning lever (see External Shift Mechanism Installation).
- Set the gear positioning lever to the neutral position.
- Check that the drive and output shaft turn freely.
- Apply grease to the new O-ring [A] and install it to its position on the output shaft [B].
- Install the collar [C].
- When installing the oil seal [D], install it as follows.
  - Apply grease to the oil seal lips.
  - Apply soap and water solution to the outer circumference of the oil seal so that it will go into place smoothly.
  - Press the oil seal to the crankcase so that the surface of the oil seal is flush with the surface of the crankcase as shown.
- Install the removed parts (see appropriate chapters).



#### **Transmission Shaft Removal**

- Refer to the Transmission Assy Disassembly.

#### **Transmission Shaft Installation**

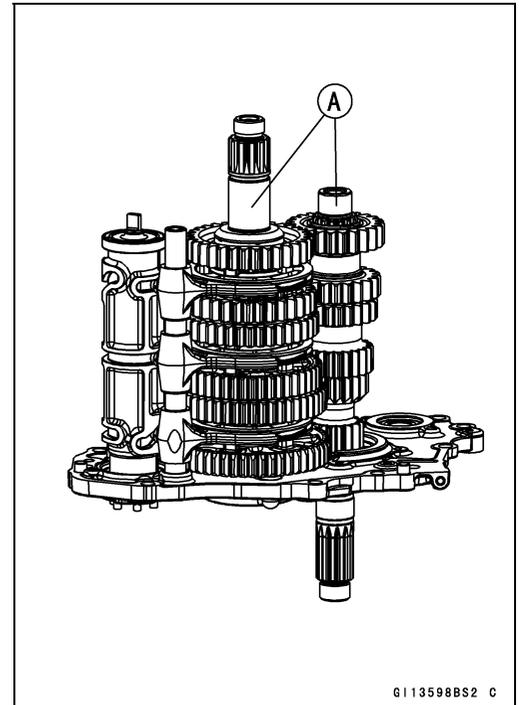
- Refer to the Transmission Assy Assembly.

## Transmission

### Transmission Shaft Disassembly

#### NOTICE

Do not disassemble or adjust the transmission shafts [A], because they are adjusted or set at the manufacturer. Adjustment of these parts could result in poor performance, requiring replacement of the transmission shafts.



### Shift Drum and Fork Removal

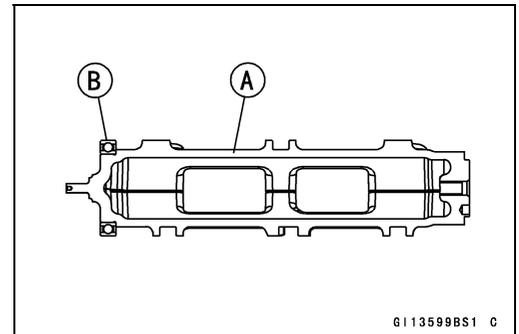
- Refer to the Transmission Assy Disassembly.

### Shift Drum and Fork Installation

- Refer to the Transmission Assy Assembly.

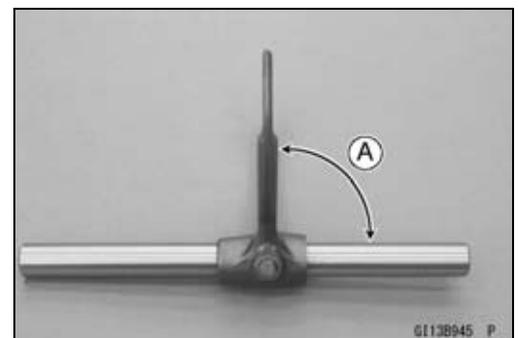
### Shift Drum Disassembly/Assembly

- Remove:
  - Shift Drum [A] (see Transmission Assy Disassembly)
  - Ball Bearing [B]
- Press the ball bearing on the shift drum until it is bottomed.
- Install the removed parts (see appropriate chapters).



### Shift Fork Bending Inspection

- 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]



## 9-48 CRANKSHAFT/TRANSMISSION

### Transmission

#### **Shift Fork/Shifter Groove Wear Inspection**

- Measure the thickness of the shift fork ears [A], and measure the width [B] of the shifters of the output shaft.
- ★ 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:** 3.3 ~ 3.9 mm (0.13 ~ 0.15 in.)

**Service Limit:** 3.2 mm (0.13 in.)

- ★ If the shifter groove is worn over the service limit, the output shaft must be replaced.

##### **Shifter Groove Width**

**Standard:** 3.55 ~ 3.65 mm (0.140 ~ 0.144 in.)

**Service Limit:** 3.8 mm (0.15 in.)

#### **Shift Fork Guide Pin/Drum Groove Wear Inspection**

- Measure the diameter of each shift fork guide pin [A], and measure the width of each shift drum groove [B].
- ★ If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

##### **Shift Fork Guide Pin Diameter**

**Standard:** 6.9 ~ 7.0 mm (0.27 ~ 0.28 in.)

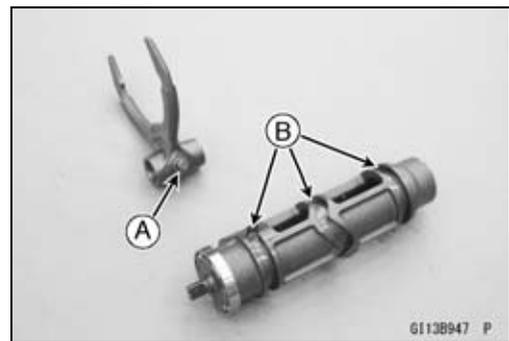
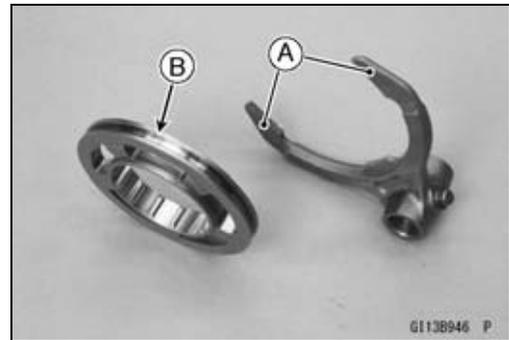
**Service Limit:** 6.8 mm (0.27 in.)

- ★ If any shift drum groove is worn over the service limit, the drum must be replaced.

##### **Shift Drum Groove Width**

**Standard:** 7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)

**Service Limit:** 7.3 mm (0.29 in.)



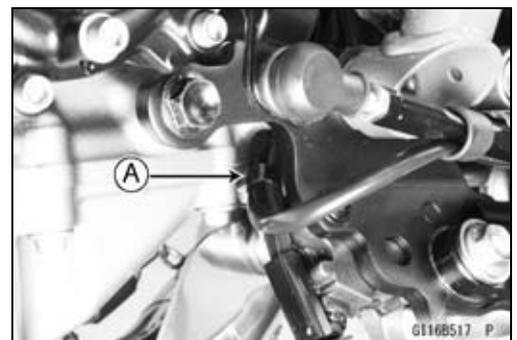
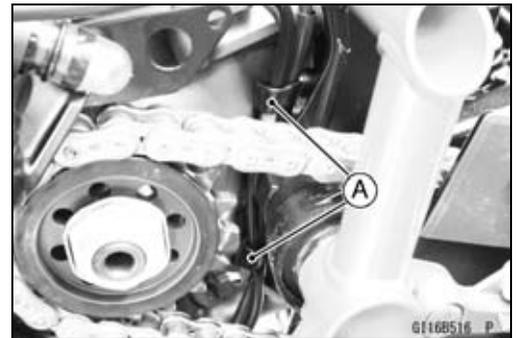
External Shift Mechanism

**Shift Pedal Removal**

- Remove the engine sprocket cover (see Engine Sprocket Removal in the Final Drive chapter).
- Remove the quick shifter sensor connector [A] from the bracket.
- Disconnect the quick shifter sensor connector.

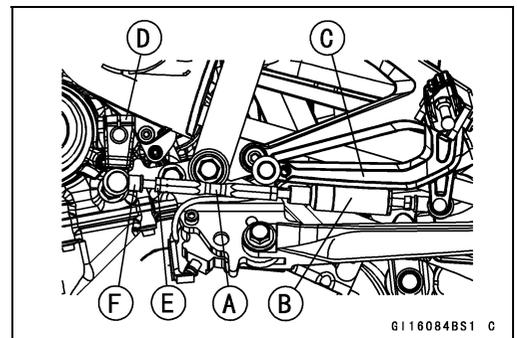


- Open the clamps [A].



★ If the tie-rod [A] and quick shifter sensor [B] is removed from the shift pedal [C] and shift lever [D], note the following.

- The following portions have left-hand threads.
  - Shift Lever Side of Tie-Rod Locknut [E]
  - Ball Joint [F] of Shift Lever



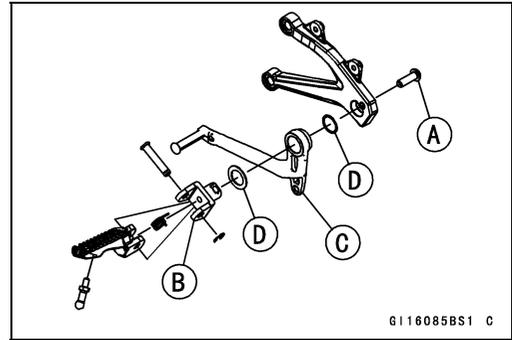
- Remove:
  - Shift Lever Clamp Bolt [A]
  - Shift Lever [B]
  - Footpeg Bracket Bolts [C]
  - Footpeg Bracket with Shift Pedal [D]



# 9-50 CRANKSHAFT/TRANSMISSION

## External Shift Mechanism

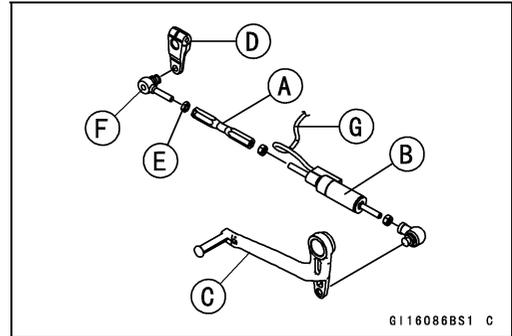
- Remove:
  - Shift Pedal Mounting Bolt [A]
  - Footpeg [B]
  - Shift Pedal [C]
  - Washers [D]



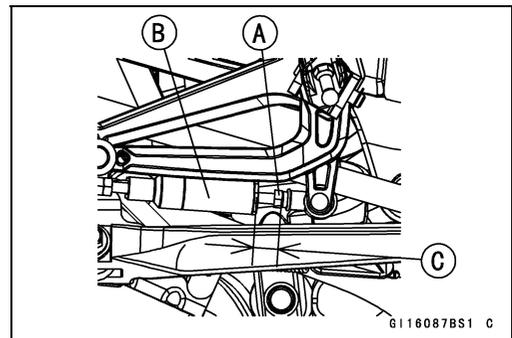
### Shift Pedal Installation

★When installing the tie-rod [A] and quick shifter sensor [B] to the shift pedal [C] and shift lever clamp [D], note the following.

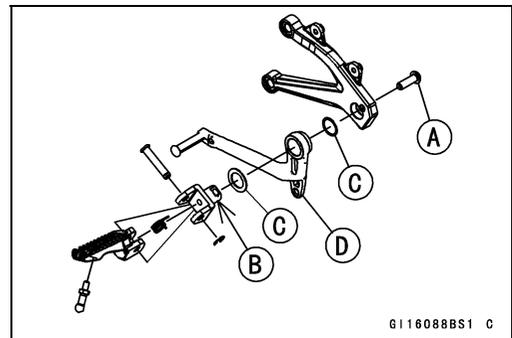
- The following portions have left-hand threads.
  - Shift Lever Side of Tie-Rod Locknut [E]
  - Ball Joint [F] of Shift Lever
- The quick shifter sensor lead [G] faces to the inside.



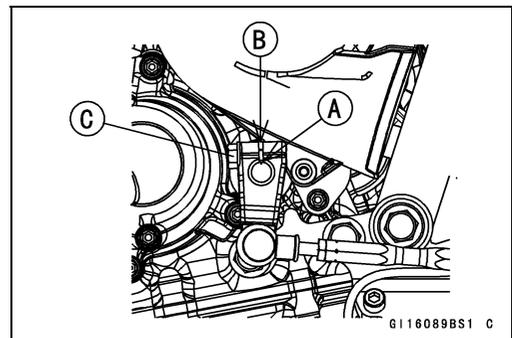
- Measure the length.
  - Quick Shifter Sensor Locknut [A]
  - Quick Shifter Sensor [B]
  - About 11 mm (0.43 in.) [C]
- Tighten the quick shifter sensor locknut.



- Apply a non-permanent locking agent to the threads of the shift pedal mounting bolt [A].
- Apply grease to the sliding surface [B] of the footpeg.
- Install:
  - Washers [C]
  - Shift Pedal [D]
  - Footpeg
- Tighten the shift pedal mounting bolt.

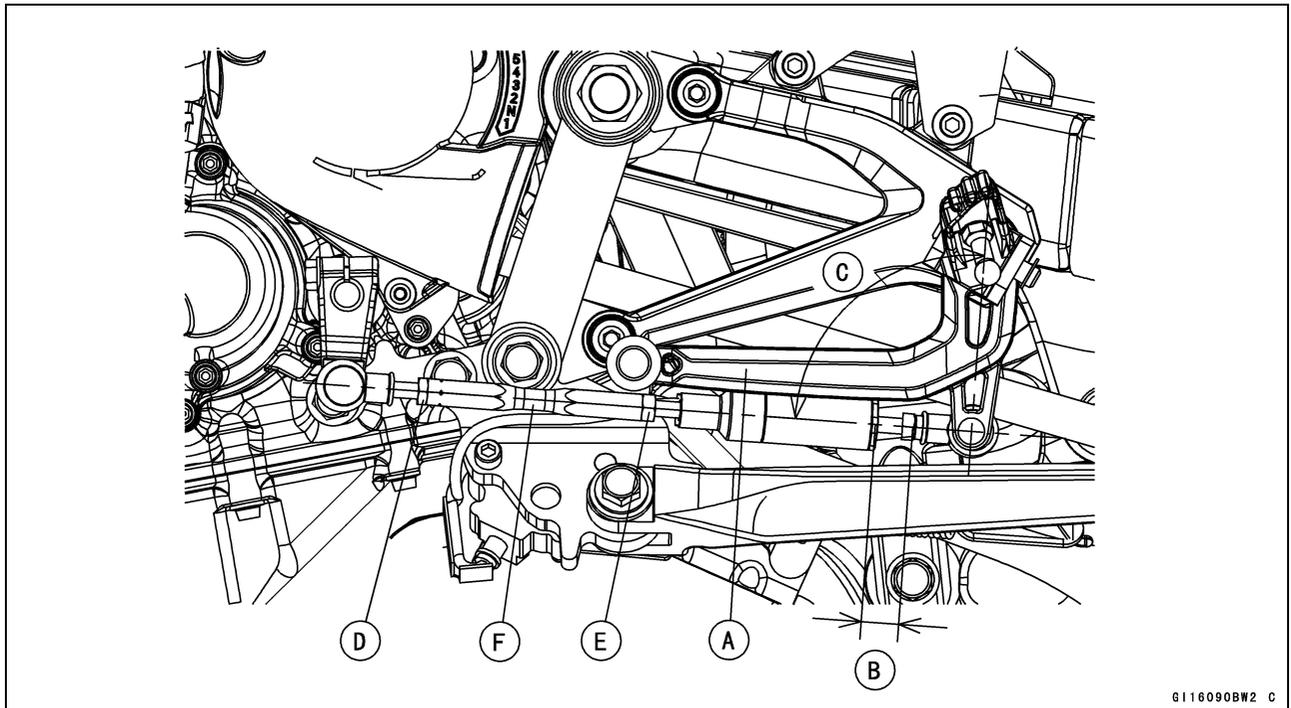


- Align the punch mark [A] on the shift shaft with the slit [B] of the shift lever clamp.
- Tighten:
  - Torque - Shift Lever Clamp Bolt [C]: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



## External Shift Mechanism

- After installation, confirm that the shift pedal [A] is positioned as shown.
  - About 11 mm (0.43 in.) [B]
  - About 90° [C]
- ★ If the pedal position is different, adjust it as follows.
  - To adjust the pedal position, loosen the front locknut [D] (left-hand threads) and rear locknut [E], and then turn the tie-rod [F].
- Tighten the shift lever locknuts.
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the clamp to hold the quick shifter lead.
  - Position the clamp to the constricted part of the tie-rod.
  - Face the knob of the clamp to the inward.



- Install the removed parts (see appropriate chapters).

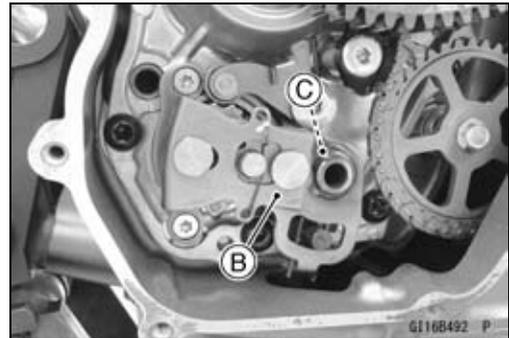
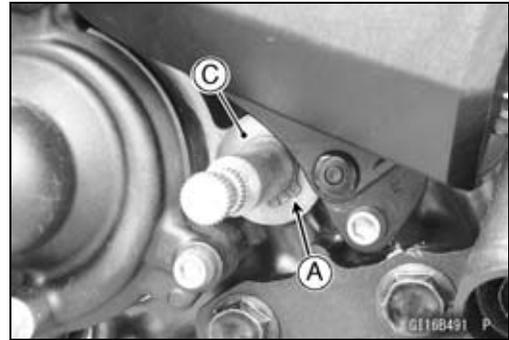
## 9-52 CRANKSHAFT/TRANSMISSION

### External Shift Mechanism

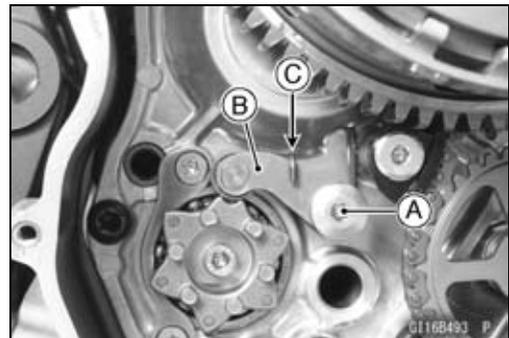
#### External Shift Mechanism Removal

- Remove:
  - Shift Lever (see Shift Pedal Removal)
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  - Circlip [A]
  - Shift Shaft Assembly [B]
  - Washers [C]

**Special Tool - Outside Circlip Pliers: 57001-144**

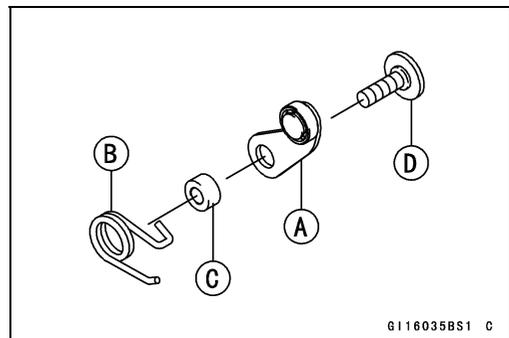


- Remove:
  - Gear Positioning Lever Bolt [A]
  - Gear Positioning Lever [B]
  - Washer and Spring [C]



#### External Shift Mechanism Installation

- Install the gear positioning lever [A] as shown.
- Install:
  - Spring [B]
  - Washer [C]
- Tighten:
  - Torque - Gear Positioning Lever Bolt [D]: 12 N·m (1.2 kgf·m, 106 in·lb)**

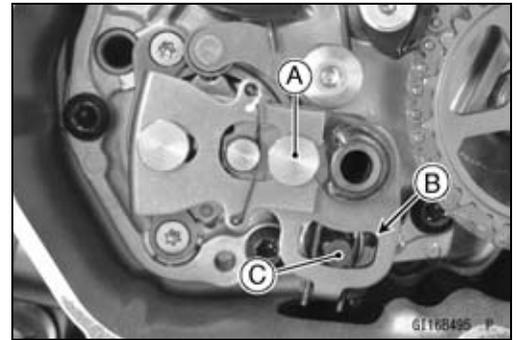


- Replace the oil seal [A] with a new one.
- Apply grease to the lips of the grease seal.



**External Shift Mechanism**

- Install:  
Shift Shaft Assembly [A] and Washers
- Fit the hole [B] and return spring pin [C].

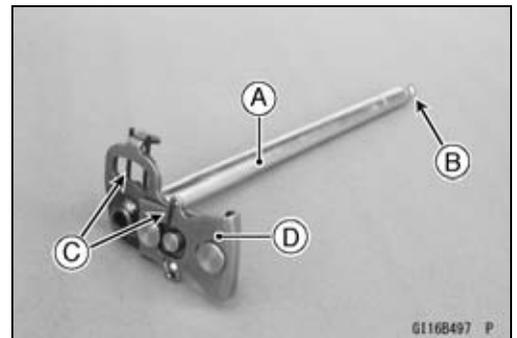


- Replace the circlip [A] with a new one.
- Install:  
Circlip
- Special Tool - Outside Circlip Pliers: 57001-144**
- Fit the circlip into the groove of the shift shaft securely.
- Install the removed parts (see appropriate chapters).



**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] is damaged, replace the shaft.
- ★ If the springs [C] are damaged in any way, replace them.
- ★ If the shift mechanism arm [D] is damaged in any way, replace the shaft.



- Measure the smallest clearance [A] between the shim [B] and return spring [C].

**Return Spring, Shim Clearance**

**Standard: 0.1 ~ 0.5 mm (0.004 ~ 0.020 in.)**

- ★ If any clearance exceeds the standard, note the following.

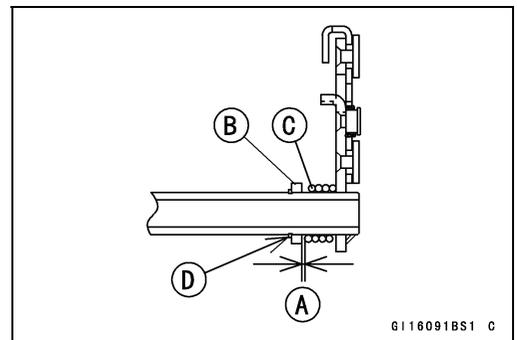
- Remove the snap ring [D] and shim.

**Special Tool - Outside Circlip Pliers: 57001-144**

- Select a new shim thickness calculation as follows.

$$a + b - c = d$$

- [a] Present Shim Thickness
- [b] Measured Clearance
- [c] Specified Clearance
- [d] Replace Shim Thickness



| Thickness         | Parts Number |
|-------------------|--------------|
| 2.6 mm (0.10 in.) | 92180-0963   |
| 2.8 mm (0.11 in.) | 92180-0964   |
| 3.0 mm (0.12 in.) | 92180-0965   |
| 3.2 mm (0.13 in.) | 92180-0966   |
| 3.4 mm (0.13 in.) | 92180-0967   |

- Install the shim and new snap ring.

**Special Tool - Outside Circlip Pliers: 57001-144**

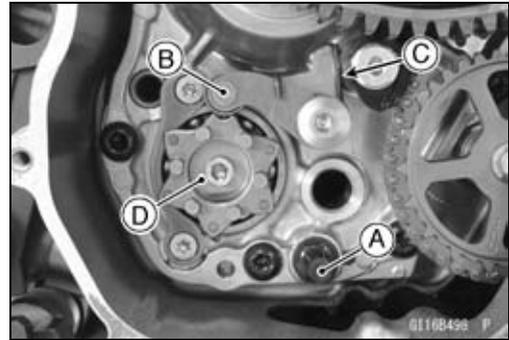
## 9-54 CRANKSHAFT/TRANSMISSION

### External Shift Mechanism

- Check the return spring pin [A] is not loose.
- ★ If it is loose, remove 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 spring [C] for breaks or distortion.
- ★ If the lever or spring are damaged in any way, replace them.
- Visually inspect the shift drum cam [D].
- ★ If they are badly worn or if they show any damage, replace it.



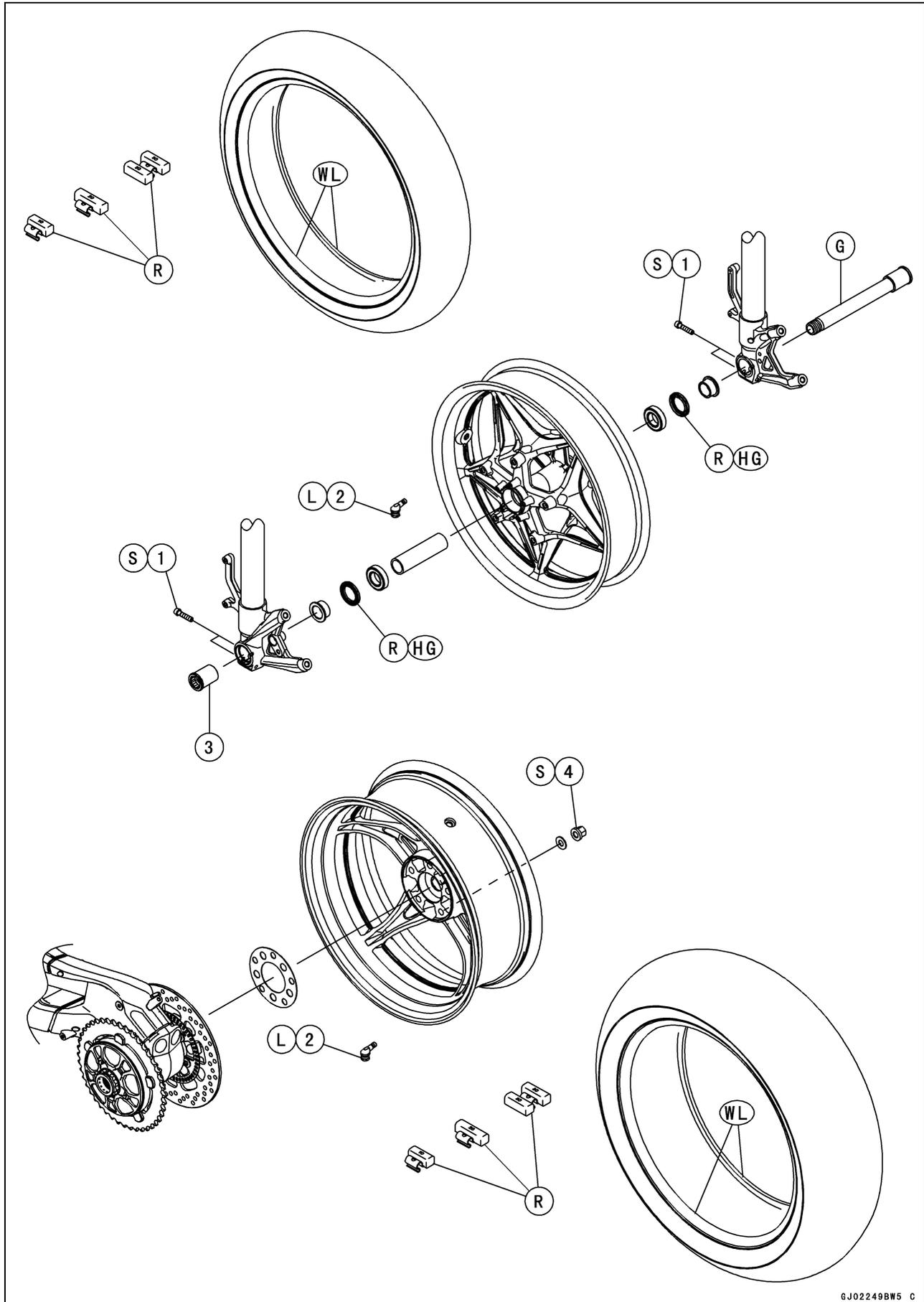
# Wheels/Tires

## Table of Contents

|  |       |
|--|-------|
| Exploded View .....                      | 10-2  |
| Specifications .....                     | 10-4  |
| Special Tools .....                      | 10-5  |
| Wheels (Rims) .....                      | 10-6  |
| Front Wheel Removal .....                | 10-6  |
| Front Wheel Installation .....           | 10-6  |
| Front Wheel Inspection .....             | 10-8  |
| Rear Wheel Removal .....                 | 10-8  |
| Rear Wheel Installation .....            | 10-9  |
| Rear Wheel Inspection .....              | 10-9  |
| Axle Inspection .....                    | 10-10 |
| Balance Inspection .....                 | 10-11 |
| Balance Adjustment .....                 | 10-11 |
| Balance Weight Removal .....             | 10-12 |
| Balance Weight Installation .....        | 10-12 |
| Tires .....                              | 10-14 |
| Air Pressure Inspection/Adjustment ..... | 10-14 |
| Tire Inspection .....                    | 10-14 |
| Tire Removal .....                       | 10-14 |
| Tire Installation .....                  | 10-14 |
| Hub Bearing .....                        | 10-17 |
| Front Hub Bearing Removal .....          | 10-17 |
| Front Hub Bearing Installation .....     | 10-17 |
| Front Hub Bearing Inspection .....       | 10-18 |
| Front Hub Bearing Lubrication .....      | 10-18 |

# 10-2 WHEELS/TIRES

## Exploded View



**Exploded View**

| No. | Fastener               | Torque |       |          | Remarks |
|-----|------------------------|--------|-------|----------|---------|
|     |                        | N·m    | kgf·m | ft·lb    |         |
| 1   | Front Axle Clamp Bolts | 20     | 2.0   | 15       | S       |
| 2   | Air Valve Nuts         | 4.5    | 0.46  | 40 in·lb | L       |
| 3   | Front Axle Nut         | 127    | 13.0  | 93.7     |         |
| 4   | Rear Wheel Nuts        | 110    | 11.2  | 81.1     | S       |

G: Apply grease.

HG: Apply high-temperature grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

WL: Apply soap and water solution or rubber lubricant.

## 10-4 WHEELS/TIRES

### Specifications

| Item                                    | Standard   | Service Limit          |
|---|--|------------------------|
| <b>Wheels (Rims)</b>                    |  |                        |
| Rim Runout:                             |  |                        |
| Front:                                  |  |                        |
| 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.)  |
| Rear:                                   |  |                        |
| Axial                                   | TIR 0.3 mm (0.01 in.) or less  | TIR 1.0 mm (0.04 in.)  |
| Radial                                  | TIR 0.5 mm (0.02 in.) or less  | TIR 1.0 mm (0.04 in.)  |
| Axle Runout/100 mm (3.94 in.):          |  |                        |
| Front                                   | TIR 0.03 mm (0.001 in.) or less  | TIR 0.2 mm (0.008 in.) |
| Wheel Balance                           | 10 g (0.35 oz.) or less  | — — —                  |
| Balance Weights                         | 10 g (0.35 oz.), 20 g (0.71 oz.),<br>30 g (1.06 oz.)                       | — — —                  |
| Rim Size:                               |  |                        |
| Front                                   | J17M/C × MT3.50  | — — —                  |
| Rear                                    | J17M/C × MT6.00  | — — —                  |
| <b>Tires</b>                            |  |                        |
| Air Pressure* <sup>1</sup> (when Cold): |  |                        |
| Front                                   | Up to 105 kg (231 lb) load: 190 kPa<br>(1.94 kgf/cm <sup>2</sup> , 28 psi) | — — —                  |
| Rear                                    | Up to 105 kg (231 lb) load: 200 kPa<br>(2.04 kgf/cm <sup>2</sup> , 29 psi) | — — —                  |
| Air Pressure* <sup>2</sup> (when Warm): |  |                        |
| Front                                   | Up to 105 kg (231 lb) load: 220 kPa<br>(2.20 kgf/cm <sup>2</sup> , 32 psi) | — — —                  |
| Rear                                    | Up to 105 kg (231 lb) load: 260 kPa<br>(2.60 kgf/cm <sup>2</sup> , 38 psi) | — — —                  |
| Standard Tires:                         | Make, Type   | Size                   |
| Front                                   | BRIDGESTONE, RACING BATTLEAX,<br>V01F SOFT                                 | 120/600 R17            |
| Rear                                    | BRIDGESTONE, RACING BATTLEAX,<br>V01R MEDIUM                               | 190/650 R17            |

\*1: When servicing the motorcycle, adjust the tire pressure to this value.

\*2: When riding the motorcycle, adjust the tire air pressure to this value after warming up the tires for more than an hour using a tire warmer.

#### NOTE

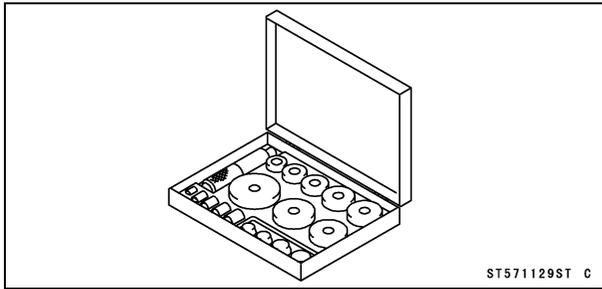
○When storing the motorcycle, set it on stands so that both wheels are raised off the ground.

#### WARNING

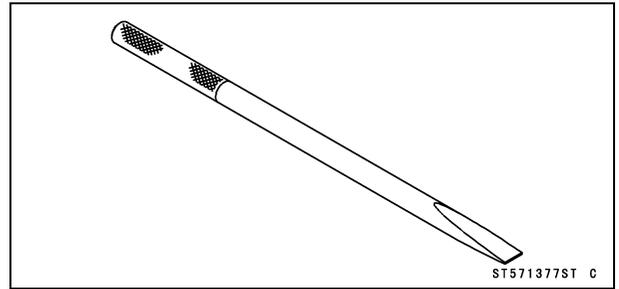
**Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.**

Special Tools

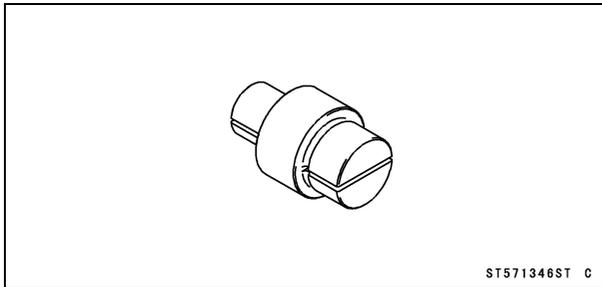
Bearing Driver Set:  
57001-1129



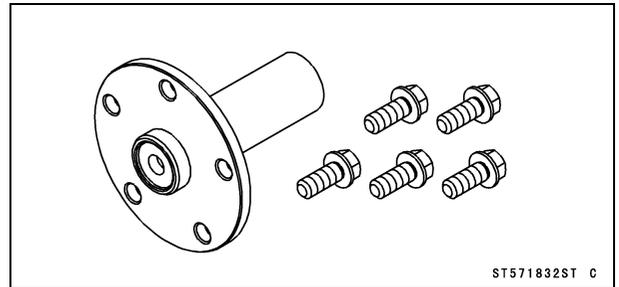
Bearing Remover Shaft,  $\phi 13$ :  
57001-1377



Bearing Remover Head,  $\phi 25 \times \phi 28$ :  
57001-1346



Wheel Balance Adjustment Tool:  
57001-1832

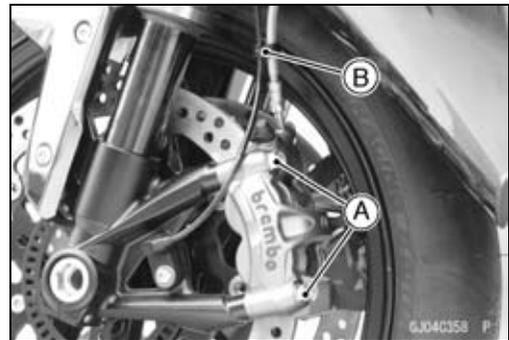


## 10-6 WHEELS/TIRES

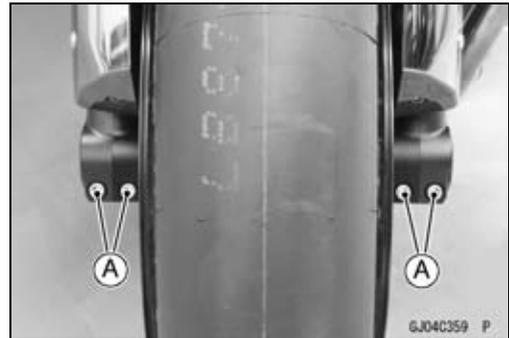
### Wheels (Rims)

#### Front Wheel Removal

- Remove the front caliper mounting bolts [A] on both sides.
- Remove the clamp [B] to free the brake hose.
- Take the front calipers off the fork legs.



- Loosen:
  - Front Axle Clamp Bolts [A]



- Loosen:
  - Front Axle Nut [A]
- Raise the front wheel off the ground with a suitable stand.
- Remove:
  - Front Axle
  - Front Axle Nut
  - Front Wheel

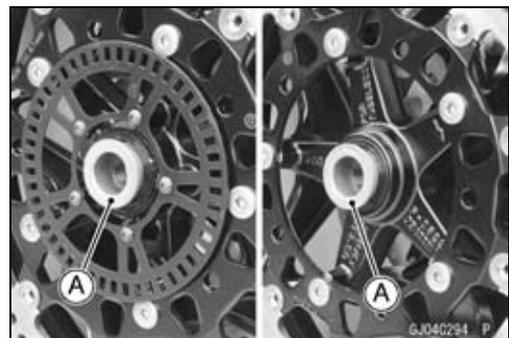


#### NOTICE

**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.**

#### Front Wheel Installation

- Apply high-temperature grease to the grease seal lips.
  - Fit the collars [A] on both sides of the hub.
- The collars are identical.

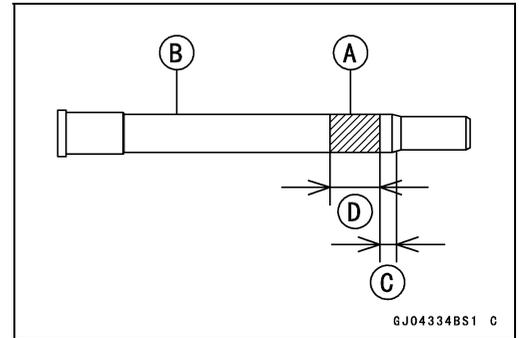


## Wheels (Rims)

- Apply a thin coat of grease [A] to the front axle [B] for rust prevention.
  - About 10 mm (0.4 in.) [C]
  - About 30 mm (1.2 in.) [D]

### NOTE

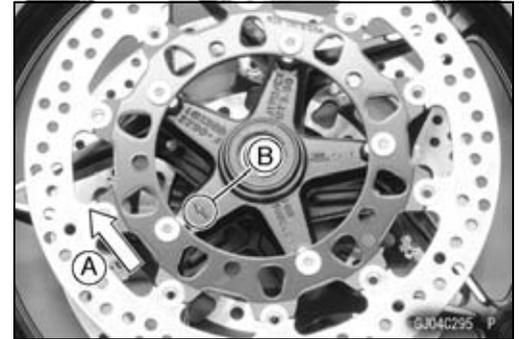
- Do not apply grease to the threads of the axle.



### NOTE

- The wheel rotation direction [A] is shown by an arrow [B] on the wheel spoke.

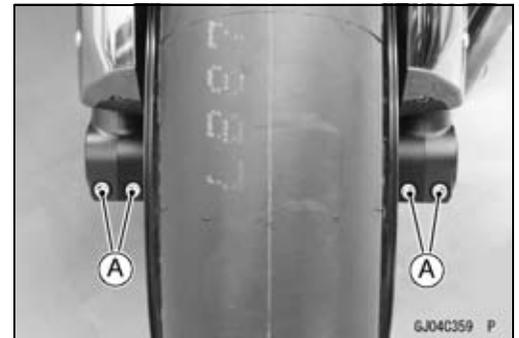
- Check the wheel rotation mark on the front wheel and install it.
- Insert the front axle from the right side.
- Tighten:
  - Torque - Front Axle Nut: 127 N·m (13.0 kgf·m, 93.7 ft·lb)**
- Check that the wheel rotates smoothly.
- Install the brake calipers temporarily.
- Before tightening the front axle clamp bolts [A] on the front fork legs, pump the front fork up and down 4 or 5 times to allow the front fork legs to seat on the front axle.



### NOTE

- Put a block in front of the front wheel to stop moving.

- Tighten:
  - Torque - Front Axle Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**
- Tighten the inside clamp bolts first.
- After tightening the outside clamp bolts, tighten the inside clamp bolts again.
- There will be a gap at the slit of the front fork legs after tightening.
- Install the removed parts (see appropriate chapters).



### NOTE

- Install the front calipers following the specified procedures (see *Front Caliper Installation in the Brakes chapter*).

- Check the front brake effectiveness (see Brake Operation Inspection in the Periodic Maintenance chapter).

## ⚠ WARNING

**After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.**

## 10-8 WHEELS/TIRES

### Wheels (Rims)

#### Front Wheel Inspection

- Raise the front wheel off the ground with a suitable stand.
- Spin the front wheel lightly, and check for roughness or binding.
- ★ If roughness or binding is found, replace the front hub bearings (see Front Hub Bearing Removal/Installation).
- Inspect the front wheel for small cracks, dents, bending, or warp.
- ★ If there is any damage on the front wheel, replace it with a new one.
  
- Remove the front wheel with the tire, and support it by the axle.
- Measure the rim runout, axial [A] and radial [B], with a dial gauge.

#### Front 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.)

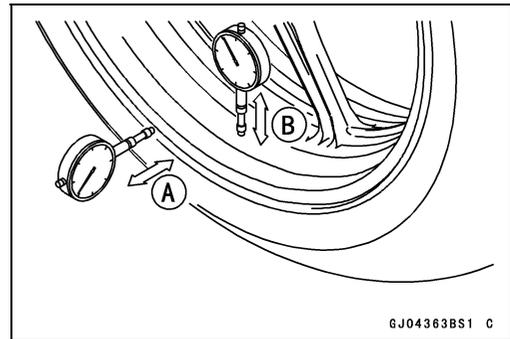
- ★ If the rim runout exceeds the service limit, check the hub bearings (see Hub Bearing Inspection).
- ★ If the problem is not due to the bearings, replace the wheel.

#### **⚠ WARNING**

**Damaged wheel parts may fail and cause an accident resulting in serious injury or death. Never attempt to repair a damaged wheel part. If the wheel part is damaged, it must be replaced with a new one.**

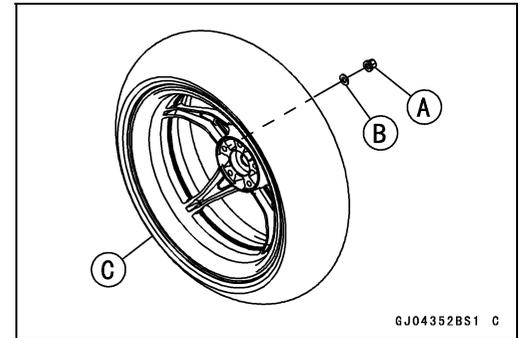
#### Rear Wheel Removal

- Loosen the rear wheel nuts [A].
- Raise the rear wheel off the ground with the stand.



## Wheels (Rims)

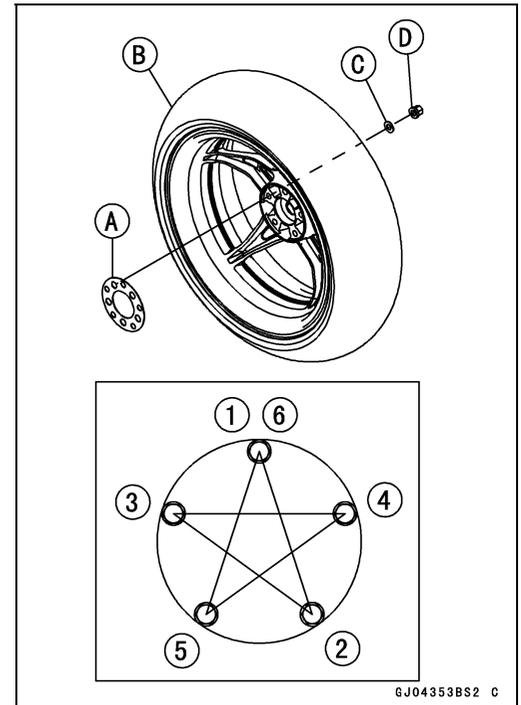
- Remove:
  - Rear Wheel Nuts [A]
  - Washers [B]
  - Rear Wheel [C]



### Rear Wheel Installation

- Be sure to install the plate [A].
- Install:
  - Rear Wheel [B]
  - Washers [C]
- Tighten the rear wheel nuts [D] to a snug fit following the specified sequence [1 ~ 6].
- Tighten the rear wheel nuts to the specified torque with the same sequence.

**Torque - Rear Wheel Nuts: 110 N·m (11.2 kgf·m, 81.1 ft·lb)**



### Rear Wheel Inspection

- Raise the rear wheel off the ground with the stand.
- Spin the rear wheel lightly, and check for roughness or binding.
- ★ If roughness or binding is found, replace the following parts.
  - Coupling Bearing (see Coupling Bearing Removal/Installation in the Final Drive chapter)
  - Bearing Housing Bearings (see Bearing Housing Bearing Removal/Installation in the Final Drive chapter)
- Inspect the rear wheel for small cracks, dents, bending, or warp.
- ★ If there is any damage to the rear wheel, replace it with a new one.

# 10-10 WHEELS/TIRES

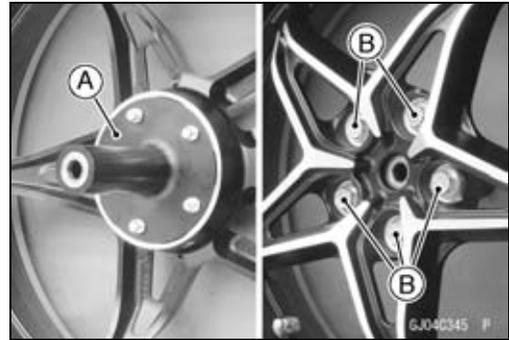
## Wheels (Rims)

- Remove the rear wheel with the tire, and support it using the special tool.

**Special Tool - Wheel Balance Adjustment Tool: 57001-1832**

- Install the tool [A] to the left side.
- Install the washers of the rear wheel nuts, and tighten the wheel hub mounting bolts [B] of the special tool.

**Torque - Wheel Hub Mounting Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**



- Measure the rim runout, axial [A] and radial [B], with a dial gauge.

### Rear Wheel Rim Runout (with tire installed)

**Standard:**

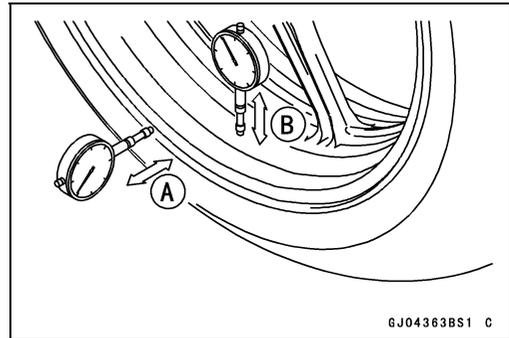
**Axial TIR 0.3 mm (0.01 in.) or less**

**Radial TIR 0.5 mm (0.02 in.) or less**

**Service Limit:**

**Axial TIR 1.0 mm (0.04 in.)**

**Radial TIR 1.0 mm (0.04 in.)**



- ★ If the rim runout exceeds the service limit, replace the wheel with a new one.

### **⚠ WARNING**

**Damaged wheel parts may fail and cause an accident resulting in serious injury or death. Never attempt to repair a damaged wheel part. If the wheel part is damaged, it must be replaced with a new one.**

### **Axle Inspection**

- Remove:
  - Front Axle (see Front Wheel Removal)
  - Rear Axle (see Bearing Housing Removal in the Final Drive chapter)

- ★ If the front or rear axle is damaged or bent, replace it with a new one.

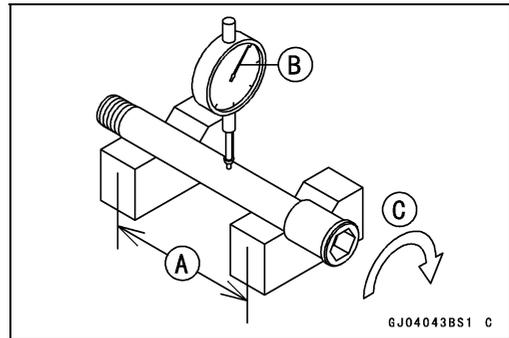
- Place the front axle in V blocks that are 100 mm (3.94 in.) [A] apart, and set a dial gauge [B] on the front axle at a point halfway between the blocks. Turn [C] the front axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.

### **Front Axle Runout/100 mm (3.94 in.)**

**Standard: TIR 0.03 mm (0.001 in.) or less**

**Service Limit: TIR 0.2 mm (0.008 in.)**

- ★ If the front axle runout exceeds the service limit, replace it with a new one.

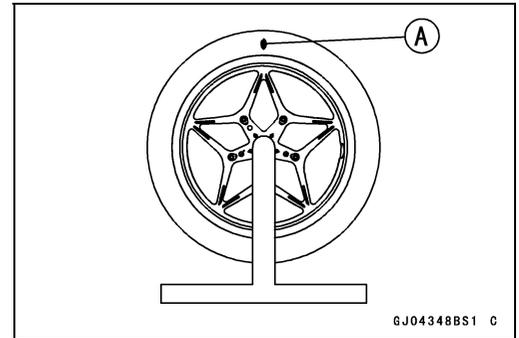


**Wheels (Rims)**

**Balance Inspection**

**Front Wheel**

- Remove the front wheel (see Front Wheel Removal).
- Support the front wheel so that it can be spun freely.
- Spin the front wheel lightly, and mark [A] the front 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 front wheel always stops in one position, adjust the wheel balance (see Balance Adjustment).



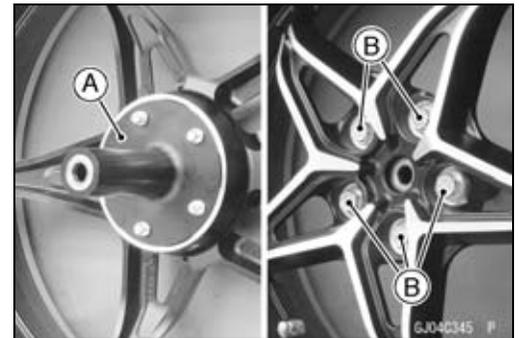
**Rear Wheel**

- Remove the rear wheel (see Rear Wheel Removal).
- Support the rear wheel so that it can be spun freely.

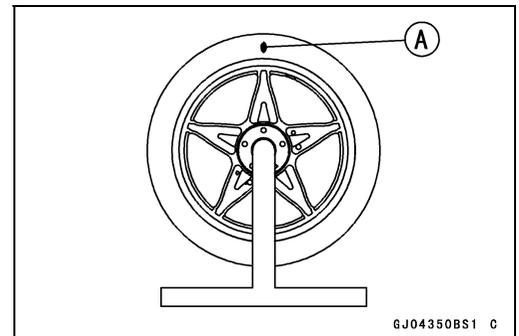
**Special Tool - Wheel Balance Adjustment Tool: 57001-1832**

- Install the tool [A] to the left side.
- Install the washers of the rear wheel nuts, and tighten the wheel hub mounting bolts [B] of the special tool.

**Torque - Wheel Hub Mounting Bolts: 15 N·m (1.5 kgf·m, 11 ft·lb)**



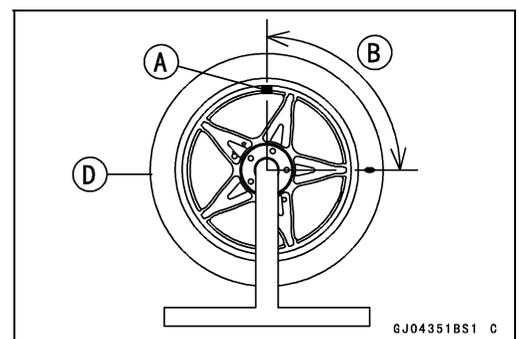
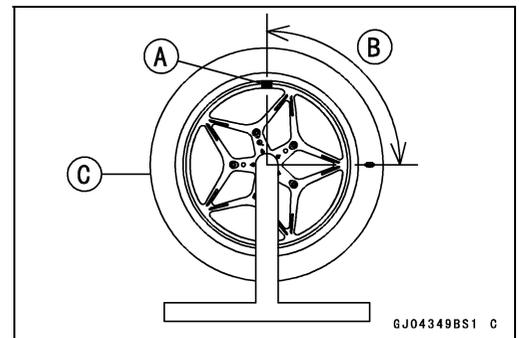
- Spin the rear wheel lightly, and mark [A] the rear wheel at the top when the wheel stops.
- Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.
- ★ If the rear wheel always stops in one position, adjust the wheel balance (see Balance 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.  
Front Wheel [C]  
Rear Wheel [D]

- ★ 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.

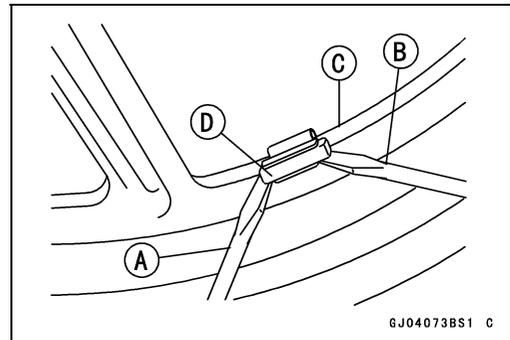


# 10-12 WHEELS/TIRES

## Wheels (Rims)

### Balance Weight Removal

- Insert a flat tip screwdrivers [A] [B] between the rib [C] and weight [D] as shown.
- Pry the balance weight with two screwdrivers and remove the balance weight.
- Discard the used balance weight.

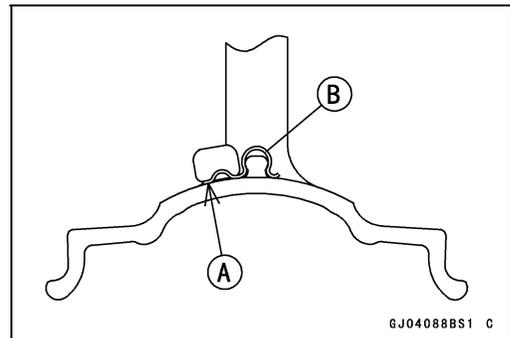


### NOTICE

**Do not tap the screwdrivers. The rim could be damaged.**

### Balance Weight Installation

- Check if the weight portion has any play on the blade [A] and clip [B].
- ★ If it does, discard it.



### WARNING

**Unbalanced wheels can create an unsafe riding condition. 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.**

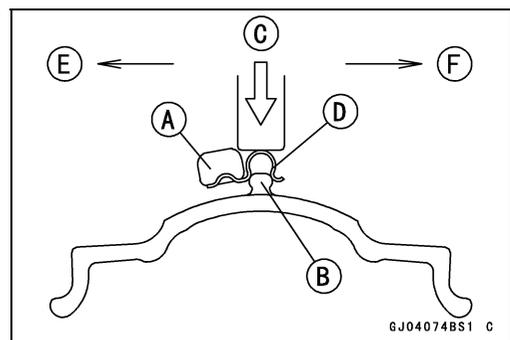
### Balance Weight

| Part Number | Weight          |
|-------------|-----------------|
| 41075-0007  | 10 g (0.35 oz.) |
| 41075-0008  | 20 g (0.71 oz.) |
| 41075-0017  | 30 g (1.06 oz.) |

### NOTE

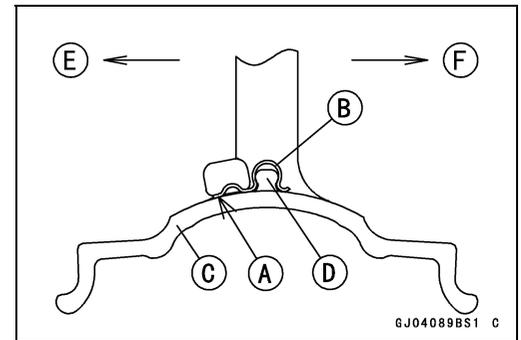
- Balance weights are available from Kawasaki dealers in 10, 20 and 30 grams (0.35, 0.71 and 1.06 oz.) sizes. An imbalance of less than 10 grams (0.35 oz.) will not usually affect running stability.
- Do not use four or more balance weights (more than 90 grams, 3.2 oz.). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.

- Slip the balance weight [A] onto the rib [B] by pushing or lightly hammering [C] the clip [D].  
Left Side [E]  
Right Side [F]



**Wheels (Rims)**

- Be sure to install the balance weight.
- Check that the blade [A] and clip [B] are fully seated on the rim [C] and that the clip is hooked over the rib [D].
  - Left Side [E]
  - Right Side [F]



## 10-14 WHEELS/TIRES

### Tires

#### **Air Pressure Inspection/Adjustment**

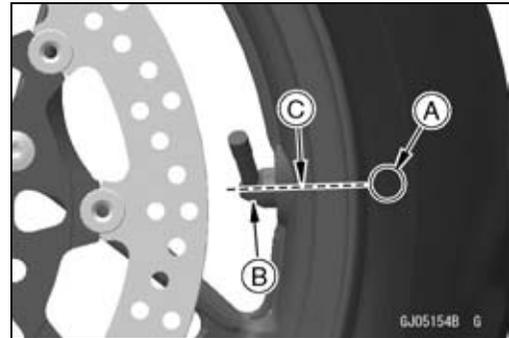
- Refer to the Air Pressure Inspection in the Periodic Maintenance chapter.

#### **Tire Inspection**

- Refer to the Wheels and Tires Inspection in the Periodic Maintenance chapter.

#### **Tire Removal**

- Remove:
  - Wheels (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.



#### **NOTICE**

**Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.**

- Remove the tire from the rim using a suitable commercially available tire changer.

#### **NOTE**

- *The tires cannot be removed with hand tools because they fit the rims too tightly.*

#### **Tire Installation**

#### **⚠ WARNING**

**Some replacement tires may adversely affect handling and cause an accident resulting in serious injury or death. To ensure proper handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.**

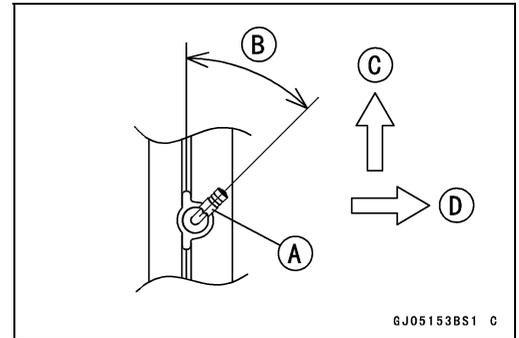
- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Remove the air valve and discard it.

#### **NOTICE**

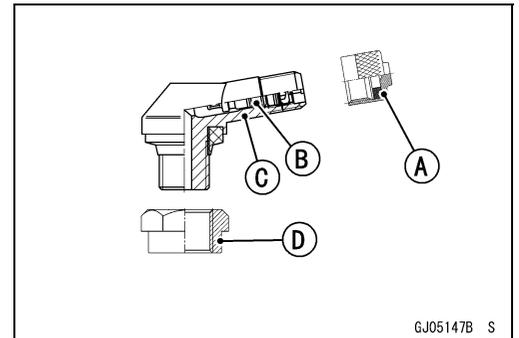
**Replace the air valve whenever the tire is replaced. Do not reuse the air valve.**

## Tires

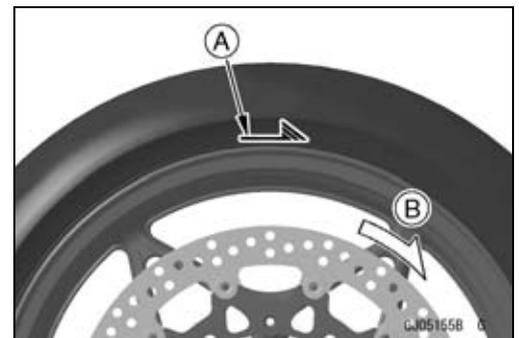
- Install a new valve [A] in the rim.  
45° [B]  
Front [C]  
Right [D]
- Apply a non-permanent locking agent to the threads of air valve nut.
- Tighten the valve nut.  
**Torque - Air Valve Nuts: 4.5 N·m (0.46 kgf·m, 40 in·lb)**



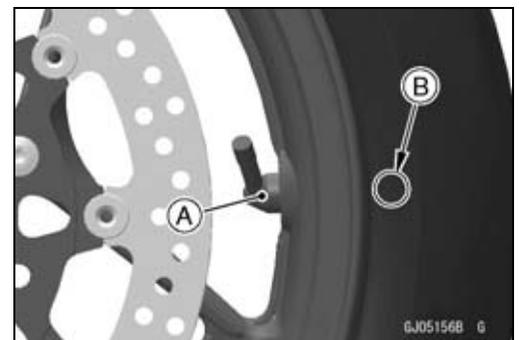
- The air valve is as shown.  
Valve Cap [A]  
Valve Core [B]  
Valve Stem [C]  
Valve Nut [D]



- Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.  
Tire Rotation Mark [A]  
Rotating Direction [B]



- Position the tire on the rim so that the valve [A] align with the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
- Install the tire bead over the rim flange using a suitable commercially available tire changer.
- Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
- Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.



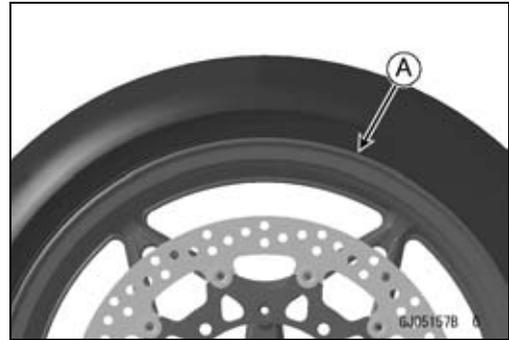
### **⚠ WARNING**

**Overinflating a tire can cause it to explode, causing serious injury or death. 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/cm<sup>2</sup>, 57 psi).**

## 10-16 WHEELS/TIRES

### Tires

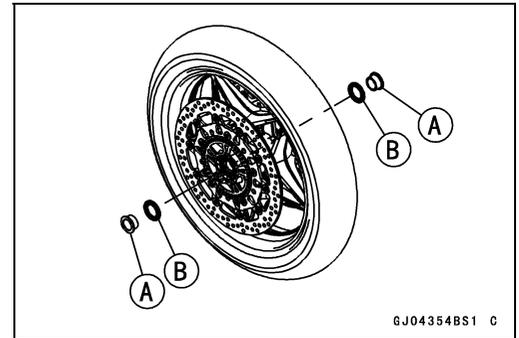
- Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.
- ★ If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core.
- Lubricate the rim flanges and tire beads.
- Install the valve core and inflate the tire again.
- After 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).



## Hub Bearing

### Front Hub Bearing Removal

- Remove the front wheel (see Front Wheel Removal), and take out the following.
  - Collars [A]
  - Grease Seals [B]

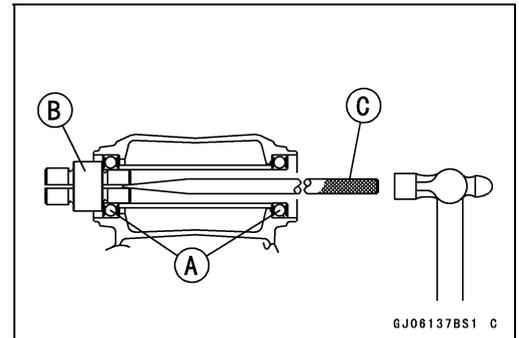


- Use the bearing remover to remove the hub bearings [A].

### NOTICE

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,  $\phi 25 \times \phi 28$  [B]: 57001-1346  
 Bearing Remover Shaft,  $\phi 13$  [C]: 57001-1377



### Front Hub Bearing Installation

- Before installing the hub bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.
- Install the bearings by using the bearing driver set which does not contact the bearing inner race.

### NOTE

○ Install the bearings so that the marked side faces out.

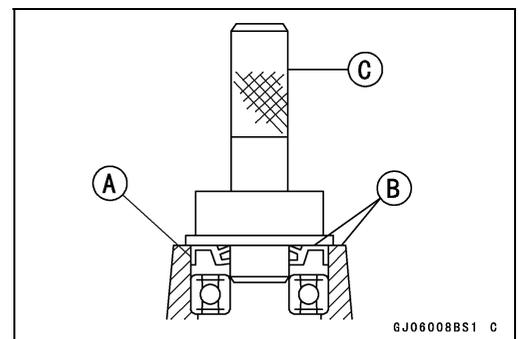
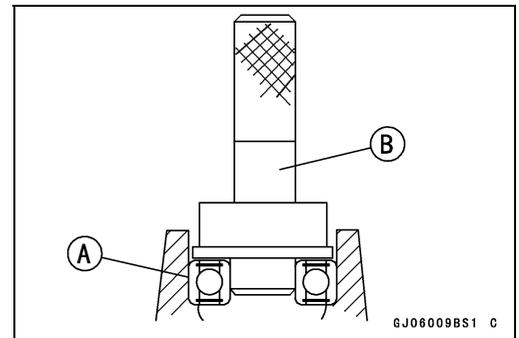
- Press in the right bearing [A] until it is bottomed.

Special Tool - Bearing Driver Set [B]: 57001-1129

- 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

- Install the removed parts (see appropriate chapters).



## 10-18 WHEELS/TIRES

### Hub Bearing

#### **Front Hub Bearing Inspection**

Since the hub bearings are made to extremely close tolerances, the clearance can not normally be measured.

#### **NOTE**

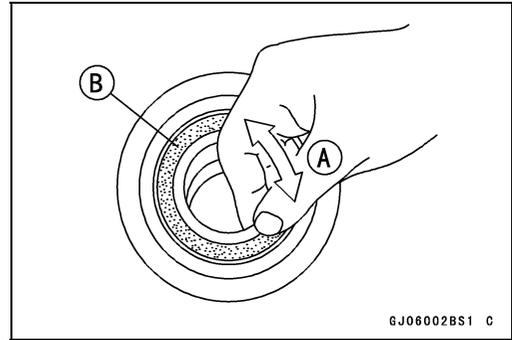
○Do not remove any bearings for inspection. If any bearings are removed, they will need to be replaced with new ones.

- 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.

#### **Front Hub Bearing Lubrication**

#### **NOTE**

○Since the hub bearings are packed with grease and sealed, lubrication is not required.



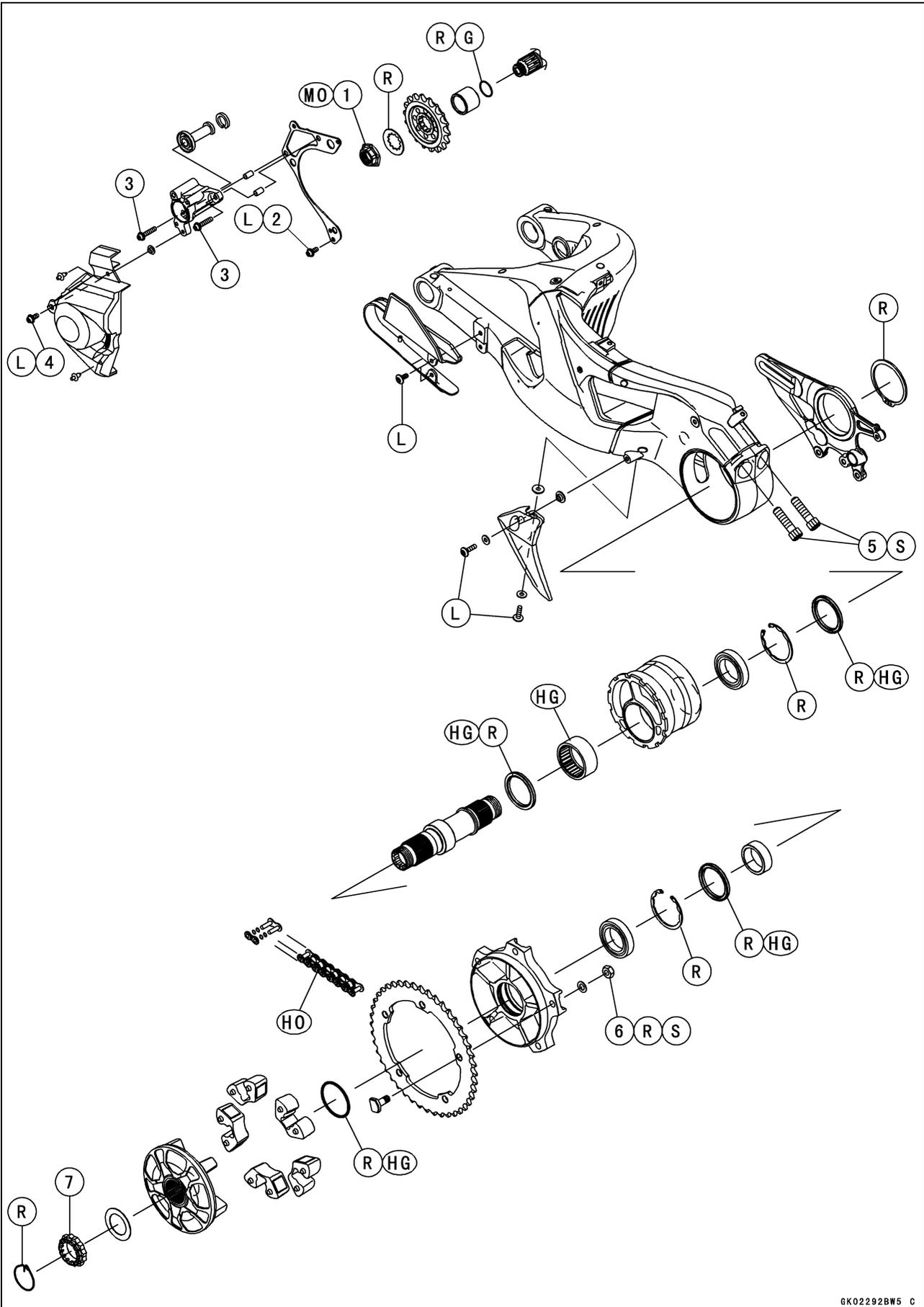
# Final Drive

## Table of Contents

|  |       |
|--|-------|
| Exploded View .....                        | 11-2  |
| Specifications .....                       | 11-4  |
| Special Tools .....                        | 11-5  |
| Drive Chain .....                          | 11-6  |
| Drive Chain Slack Inspection .....         | 11-6  |
| Drive Chain Slack Adjustment .....         | 11-6  |
| Drive Chain Wear Inspection .....          | 11-6  |
| Drive Chain Lubrication .....              | 11-6  |
| Drive Chain Removal .....                  | 11-6  |
| Drive Chain Installation .....             | 11-6  |
| Drive Chain Replacement .....              | 11-7  |
| Sprocket, Coupling .....                   | 11-10 |
| Engine Sprocket Removal .....              | 11-10 |
| Engine Sprocket Installation .....         | 11-11 |
| Rear Sprocket Removal .....                | 11-12 |
| Rear Sprocket Installation .....           | 11-12 |
| Coupling Removal .....                     | 11-13 |
| Coupling Installation .....                | 11-13 |
| Coupling Bearing Removal .....             | 11-14 |
| Coupling Bearing Installation .....        | 11-15 |
| Coupling Bearing Inspection .....          | 11-15 |
| Coupling Bearing Lubrication .....         | 11-15 |
| Coupling Damper Inspection .....           | 11-15 |
| Bearing Housing Removal .....              | 11-16 |
| Bearing Housing Installation .....         | 11-16 |
| Bearing Housing Bearing Removal .....      | 11-16 |
| Bearing Housing Bearing Installation ..... | 11-17 |
| Bearing Housing Bearing Inspection .....   | 11-17 |
| Sprocket Wear Inspection .....             | 11-18 |
| Rear Sprocket Warp Inspection .....        | 11-18 |

# 11-2 FINAL DRIVE

## Exploded View



**Exploded View**

| No. | Fastener                      | Torque |       |          | Remarks |
|-----|-------------------------------|--------|-------|----------|---------|
|     |                               | N·m    | kgf·m | ft·lb    |         |
| 1   | Engine Sprocket Nut           | 145    | 14.8  | 107      | MO      |
| 2   | Chain Guide Bolt (L = 14 mm)  | 10     | 1.0   | 89 in·lb | L       |
| 3   | Chain Guide Bolts (L = 30 mm) | 10     | 1.0   | 89 in·lb |         |
| 4   | Engine Sprocket Cover Bolt    | 10     | 1.0   | 89 in·lb | L       |
| 5   | Bearing Housing Clamp Bolts   | 33     | 3.4   | 24       | S       |
| 6   | Rear Sprocket Nuts            | 59     | 6.0   | 44       | R, S    |
| 7*  | Rear Axle Nut, First          | 220    | 22.4  | 162      |         |
|     | Rear Axle Nut, Final          | 250    | 25.5  | 184      |         |

G: Apply grease.

HG: Apply high-temperature grease.

HO: Apply heavy oil (for seal chain).

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.

\*: After tightening to the first torque, loosen it and tighten to the final torque.

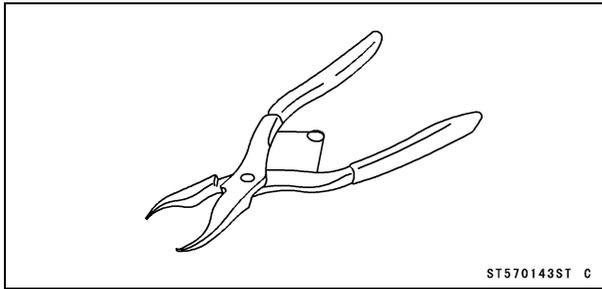
## 11-4 FINAL DRIVE

### Specifications

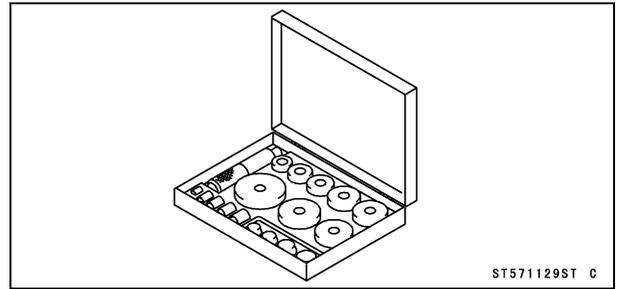
| Item  | Standard                               | Service Limit          |
|---|--|------------------------|
| <b>Drive Chain</b>  |  |                        |
| Drive Chain Slack   | 30 ~ 35 mm (1.2 ~ 1.4 in.)             | ---                    |
| Drive Chain Wear (20-link Length)                         | 317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)   | 319 mm (12.6 in.)      |
| Standard Chain:   |  |                        |
| Make  | ENUMA                                  | ---                    |
| Type  | EK525RMXZ/3D                           | ---                    |
| Link  | 116 links                              | ---                    |
| Link Pin Outside Diameter<br>(When drive chain replacing) | 5.9 ~ 6.2 mm (0.23 ~ 0.24 in.)         | ---                    |
| Link Plates Outside Width<br>(When drive chain replacing) | 20.75 ~ 20.90 mm (0.8169 ~ 0.8228 in.) | ---                    |
| <b>Sprockets</b>  |  |                        |
| Rear Sprocket Warp  | TIR 0.4 mm (0.016 in.) or less         | TIR 0.5 mm (0.020 in.) |

**Special Tools**

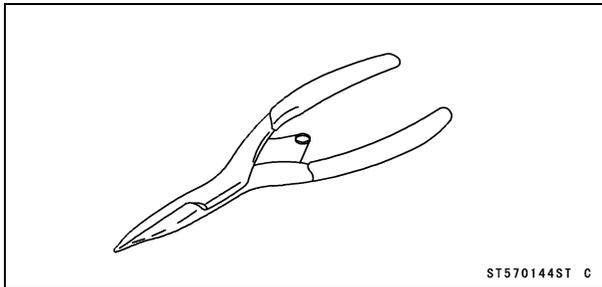
**Inside Circlip Pliers:**  
**57001-143**



**Bearing Driver Set:**  
**57001-1129**



**Outside Circlip Pliers:**  
**57001-144**



## 11-6 FINAL DRIVE

### Drive Chain

#### **Drive Chain Slack Inspection**

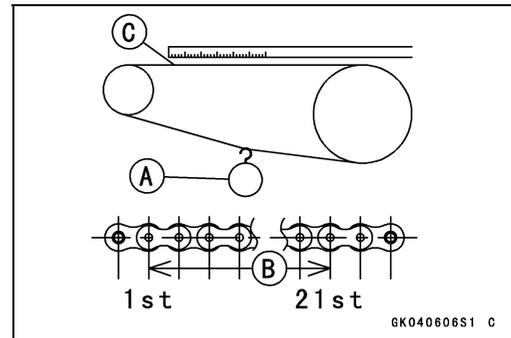
- Refer to the Drive Chain Slack Inspection in the Periodic Maintenance chapter.

#### **Drive Chain Slack Adjustment**

- Refer to the Drive Chain Slack Adjustment in the Periodic Maintenance chapter.

#### **Drive Chain Wear Inspection**

- Remove the mud guard (see Mud Guard Removal in the Frame 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 10 kg (22 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: 319 mm (12.6 in.)

### **⚠ WARNING**

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. Inspect the chain for damage and proper adjustment before each ride. If chain wear exceeds the service limit, replace it with the standard chain.

#### **Standard Chain**

Make: ENUMA

Type: EK525RMXZ/3D

Link: 116 links

#### **Drive Chain Lubrication**

- Refer to the Drive Chain Lubrication Condition Inspection in the Periodic Maintenance chapter.

#### **Drive Chain Removal**

- Refer to the Drive Chain Replacement.

#### **Drive Chain Installation**

- Refer to the Drive Chain Replacement.

Drive Chain

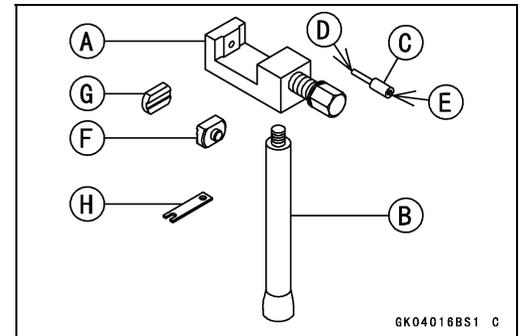
Drive Chain Replacement

**NOTICE**

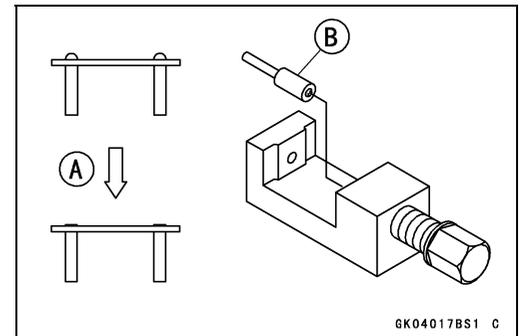
For safety, if the drive chain shall be replaced, replace it using a recommended tool.

Recommended Tool - Type: EK Joint Tool #50  
Brand: ENUMA

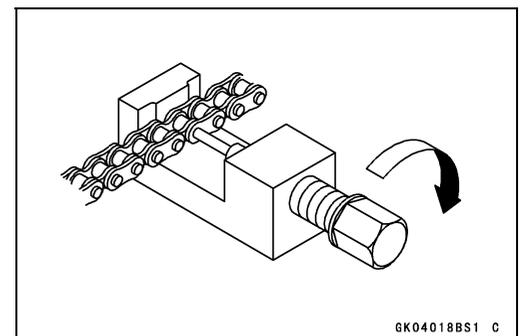
- Body [A]
- Handlebar [B]
- Cutting and Riveting Pin [C]
- For Cutting [D]
- For Riveting [E]
- Plate Holder (A) [F]
- Plate Holder (B) [G]
- Gauge [H]



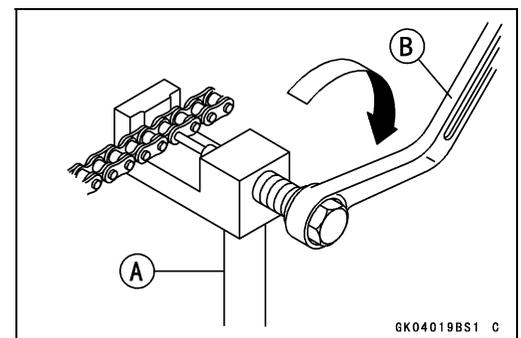
- Grind [A] the pin head to make it flat.
- Set the cutting and riveting pin [B] as shown.



- Screw the pin holder until it touches the chain pin.
- Be sure that the cutting pin hits center of the chain pin.



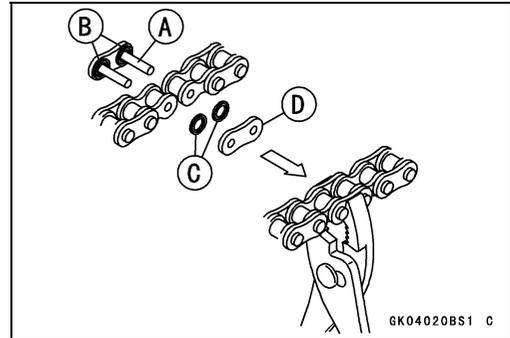
- Screw the handlebar [A] into the body.
- Turn the pin holder with the wrench [B] clockwise to extract the chain pin.



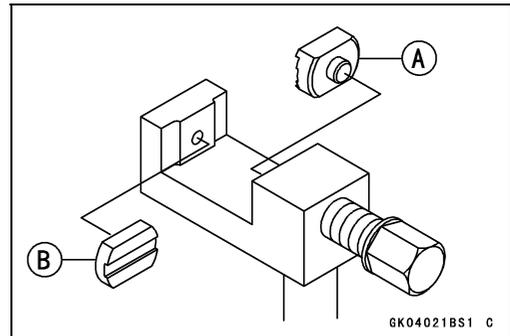
## 11-8 FINAL DRIVE

### Drive Chain

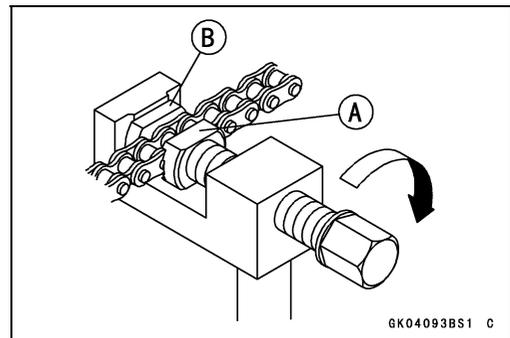
- Replace the link pin, link plate and grease seals.
- Apply grease to the link pins [A] and grease seals [B] [C].
- Engage the drive chain on the engine and rear sprockets.
- Insert the link pins in the drive chain ends.
- Install the grease seals.
- Install the link plate [D] so that the mark faces out.
- Push the link plate by hand or plier to fix it.
- Be sure to set the grease seals correctly.



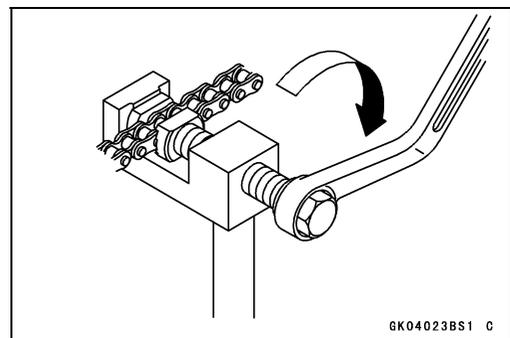
- Set the plate holder (A) [A] and plate holder (B) [B] on the body.



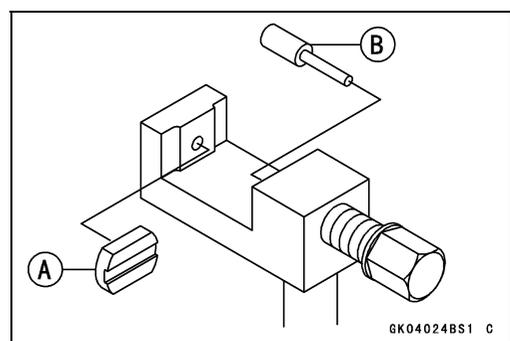
- Fit the plate holder (A) [A] to the link plate.
- Turn the pin holder by hand until the plate holder (B) [B] touches the other link plate.



- Turn the pin holder by a wrench clockwise until two pins of link come into groove of the plate holder (A).
- Take off the plate holder.

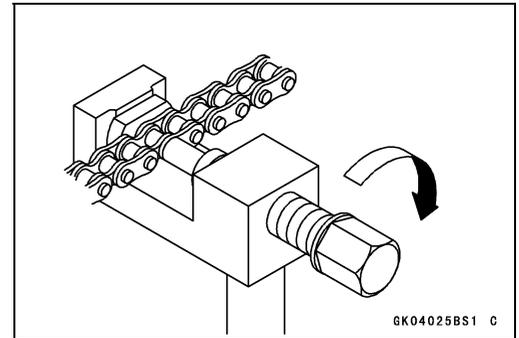


- Set the plate holder (B) [A] and cutting and riveting pin [B] as shown.

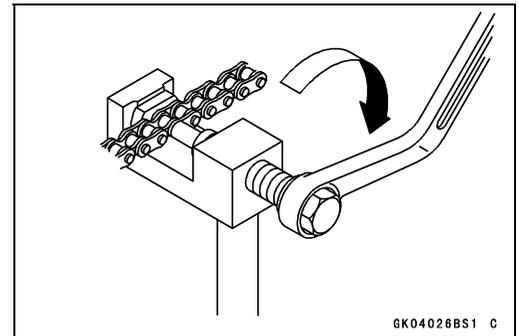


## Drive Chain

- Turn the pin holder until the riveting pin touches the link pin.



- Turn the wrench clockwise until the tip of riveting pin hits to the link pin.
- Rivet it.
- Same work for the other link pin.



- After staking, check the staked area of the link pin for cracks.
- Measure the outside diameter [A] of the link pin and link plates width [B].

**Link Pin Outside Diameter**

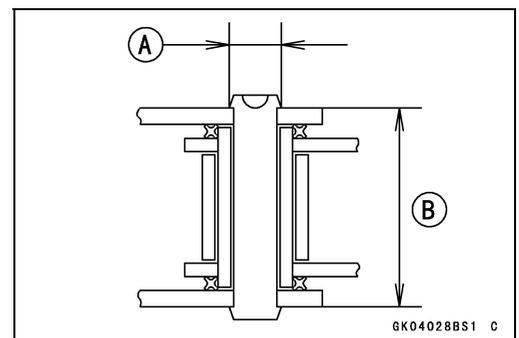
**Standard: 5.9 ~ 6.2 mm (0.23 ~ 0.24 in.)**

**Link Plates Outside Width**

**Standard: 20.75 ~ 20.90 mm (0.8169 ~ 0.8228 in.)**

- ★ If the reading exceeds the specified length, cut and rejoin the chain again.

- Check:
  - Movement of the Rollers
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).

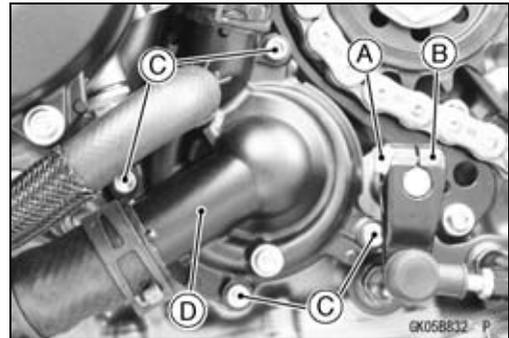
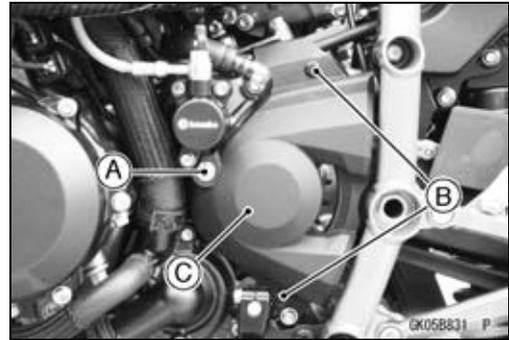


## 11-10 FINAL DRIVE

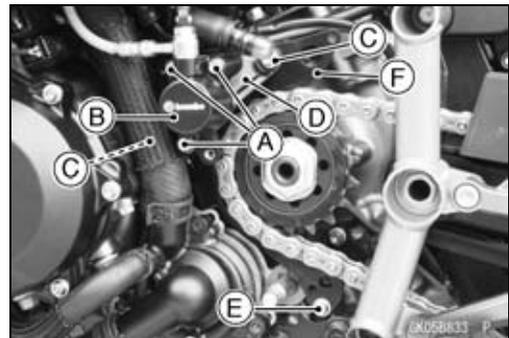
### Sprocket, Coupling

#### Engine Sprocket Removal

- Loosen the drive chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Remove:
  - Engine Sprocket Cover Bolt [A]
  - Quick Rivets [B]
  - Engine Sprocket Cover [C]
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the shift lever bolt [A], and take the shift lever [B] off the shift shaft.
- Remove the water pump cover bolts [C] to free the water pump cover [D].



- Remove the clutch slave cylinder mounting bolts [A] to free the clutch slave cylinder [B].
- Remove:
  - Chain Guide Bolts (L = 30 mm) [C]
  - Clutch Slave Cylinder Holder [D] and Push Rod Cover
  - Chain Guide Bolt (L = 14 mm) [E]
  - Chain Guide [F]
  - Dowel Pins



#### NOTICE

If the clutch slave cylinder is removed and left alone, the piston will be pushed out by spring force and the clutch fluid will drain out.

- Push [A] the piston into the cylinder as far as it will go.

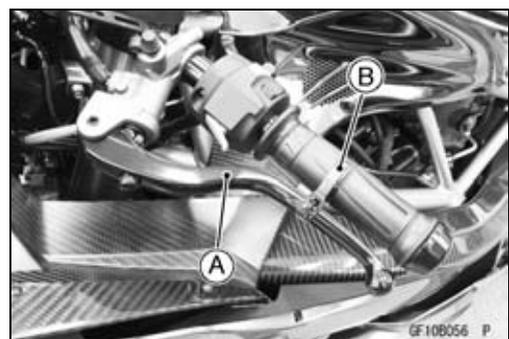
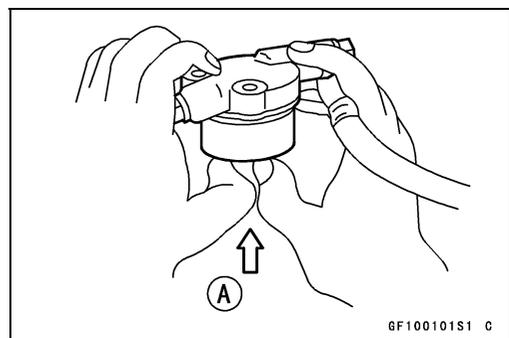
#### NOTICE

Immediately wash away any clutch fluid that spills. It may damage painted surfaces.

- Apply the clutch lever [A] slowly and hold it with a band [B].

#### NOTE

- Holding the clutch lever keeps the piston from coming out.



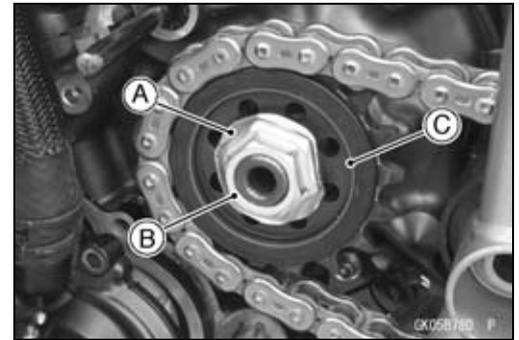
## Sprocket, Coupling

- 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.

- Pull the engine sprocket [C] and drive chain off the output shaft.
- Disengage the drive chain from the engine sprocket.



### Engine Sprocket Installation

- Replace the sprocket washer with a new one.
- Engage the drive chain and engine sprocket.
- Install the engine sprocket to the output shaft.
- Apply molybdenum disulfide oil solution to the threads and the seating surface of the engine sprocket nut.

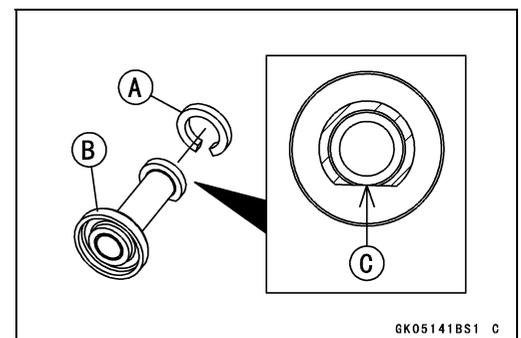
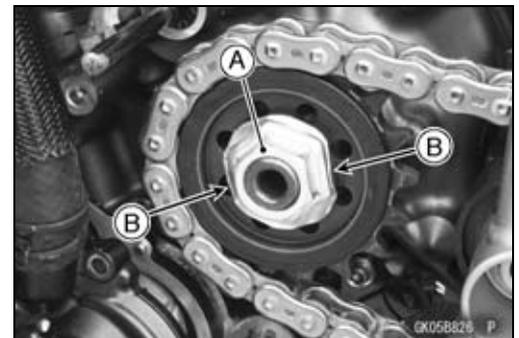
- Tighten:

**Torque - Engine Sprocket Nut [A]: 145 N·m (14.8 kgf·m, 107 ft·lb)**

### NOTE

○Tighten the engine sprocket nut while applying the rear brake.

- Bend the two sides [B] on a straight line of the washer.
- Adjust the drive chain slack (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Stick the damper [A] to the push rod cover [B].
- Face the damper ends toward the flat portion [C] of the push rod cover.



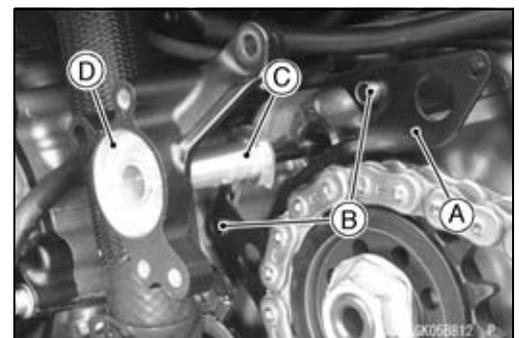
- Install:
  - Chain Guide [A]
  - Dowel Pins [B]
  - Push Rod Cover [C]
  - Clutch Slave Cylinder Holder [D]

- Apply a non-permanent locking agent to the threads of chain guide bolt, L = 14 mm (0.6 in.).

- Tighten:

**Torque - Chain Guide Bolt (L = 14 mm): 10 N·m (1.0 kgf·m, 89 in·lb)**

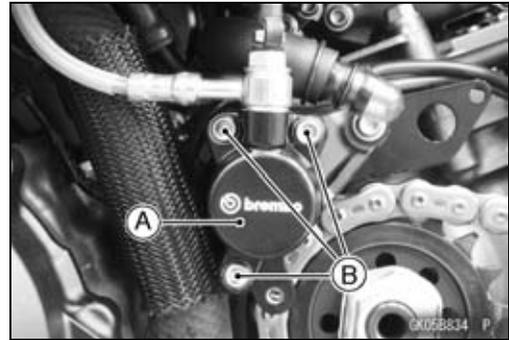
**Chain Guide Bolts (L = 30 mm): 10 N·m (1.0 kgf·m, 89 in·lb)**



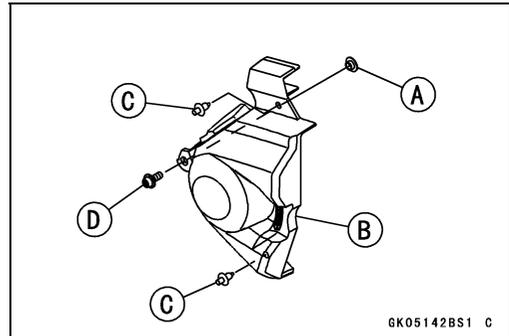
## 11-12 FINAL DRIVE

### Sprocket, Coupling

- Install:  
Clutch Slave Cylinder [A]
- Apply a non-permanent locking agent to the threads of clutch slave cylinder mounting bolts [B].
- Tighten:  
**Torque - Clutch Slave Cylinder Mounting Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Install the water pump cover (see Water Pump Installation in the Cooling System chapter).

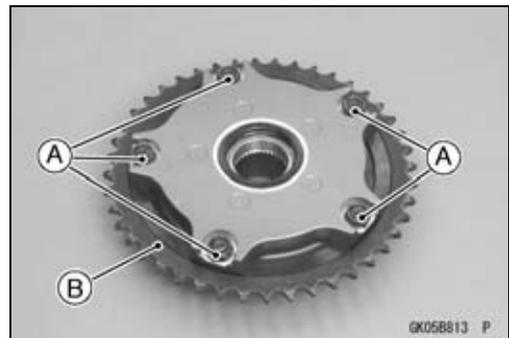


- Install:  
Collar [A]  
Engine Sprocket Cover [B]  
Quick Rivets [C]
- Apply a non-permanent locking agent to the threads of engine sprocket cover bolt [D].
- Tighten:  
**Torque - Engine Sprocket Cover Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**



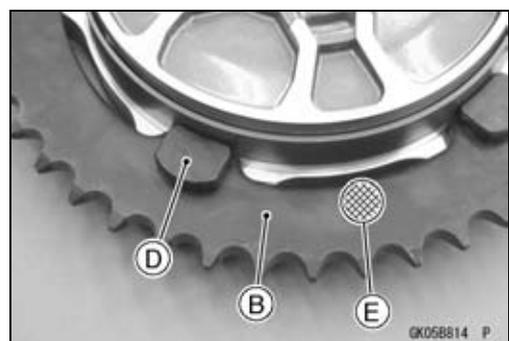
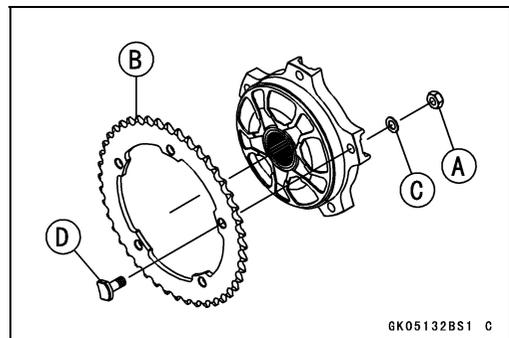
### Rear Sprocket Removal

- Remove:  
Coupling (see Coupling Removal)  
Rear Sprocket Bolts and Nuts [A]  
Washers  
Rear Sprocket [B]



### Rear Sprocket Installation

- Replace the rear sprocket nuts [A] with new ones.
- Install:  
Rear Sprocket [B]  
Washers [C]  
Rear Sprocket Bolts [D]
- The tooth number marking [E] faces to the outside of the vehicle.

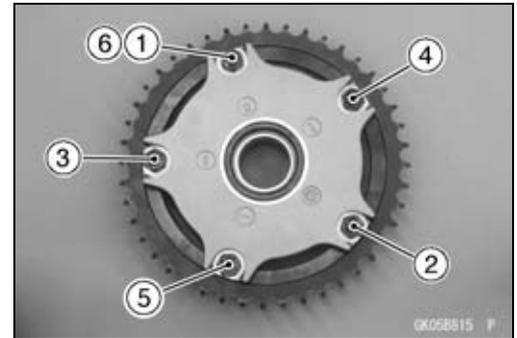


## Sprocket, Coupling

- Tighten the rear sprocket nuts to a snug fit following the specified sequence.
- Tighten the rear sprocket nuts to the specified torque with the same sequence.

**Torque - Rear Sprocket Nuts: 59 N·m (6.0 kgf·m, 44 ft·lb)**

- After tightening, check that the bolt ends protrude from the nuts.
- Install the coupling (see Coupling Installation).



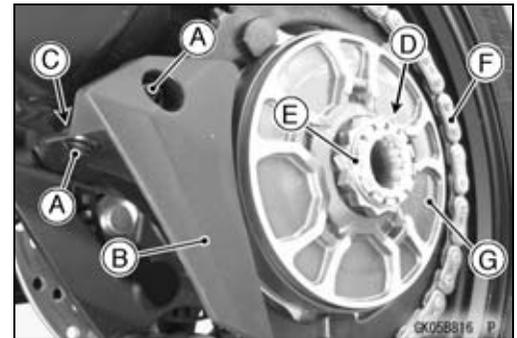
### Coupling Removal

- Loosen the drive chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Remove:
  - Bolts [A] and Washers
  - Guard [B]
  - Collar [C]
  - Snap Ring [D]
  - Rear Axle Nut [E] and Washer

#### NOTE

○ Use the 35 mm wrench (12 pt.) while holding the right side of the rear axle with the Allen wrench.

- Disengage the drive chain [F] and remove the coupling [G].



### Coupling Installation

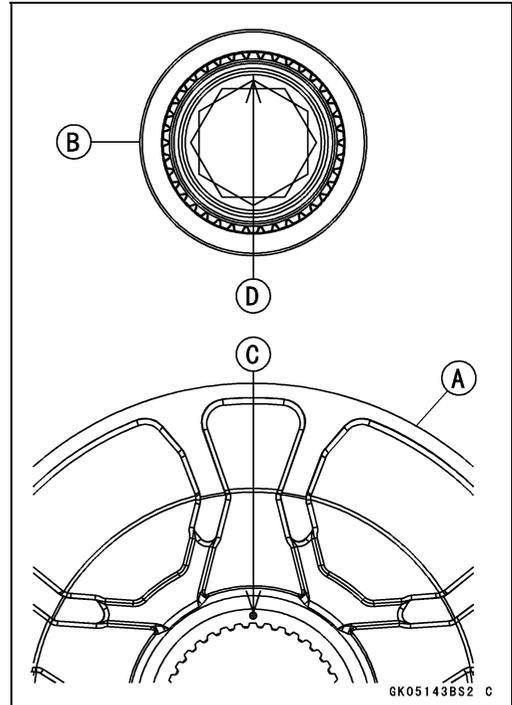
- Be sure to install the collar [A].



## 11-14 FINAL DRIVE

### Sprocket, Coupling

- Engage the drive chain and install the coupling [A] to the rear axle [B].
- Align the paint mark [C] with the line [D].
- Install the washer.



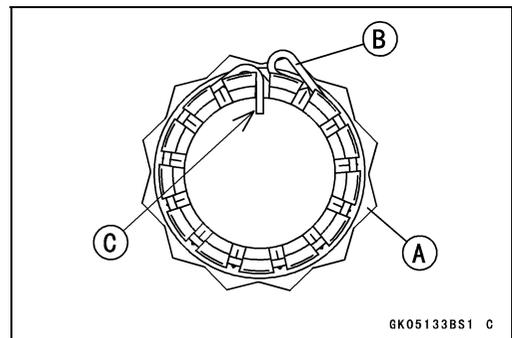
- Tighten:  
**Torque - Rear Axle Nut [A], First: 220 N·m (22.4 kgf·m, 162 ft·lb)**

#### NOTE

○ Use the 35 mm wrench (12 pt.) while holding the right side of the rear axle with the Allen wrench.

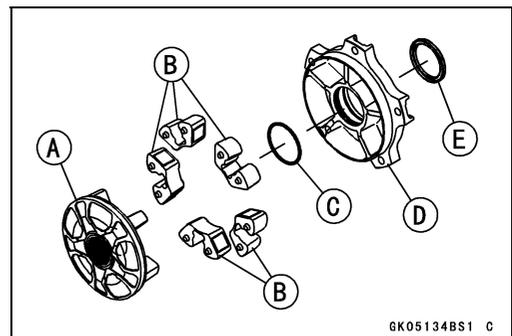
- Loosen the rear axle nut, and tighten it again.  
**Torque - Rear Axle Nut, Final: 250 N·m (25.5 kgf·m, 184 ft·lb)**

- Replace the snap ring [B] with a new one.
- Insert the snap ring end [C] to the hole of the rear axle as shown.
- Adjust the drive chain slack (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Install the removed parts (see appropriate chapters).



### Coupling Bearing Removal

- Remove:  
Coupling (see Coupling Removal)  
Rear Sprocket (see Rear Sprocket Removal)  
Outer Coupling [A]  
Coupling Dampers [B]  
O-ring [C]  
Inner Coupling [D]  
Grease Seal [E]

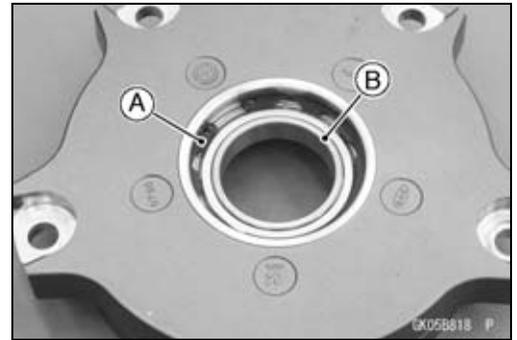


## Sprocket, Coupling

- Remove:
  - Snap Ring [A]
  - Ball Bearing [B]

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

**Bearing Driver Set: 57001-1129**



### Coupling Bearing Installation

- Replace the O-ring, grease seal, snap ring and ball bearing with new ones.
- Press the ball bearing [A] until it is bottomed.

**Special Tool - Bearing Driver Set: 57001-1129**

- Install the snap ring [B].

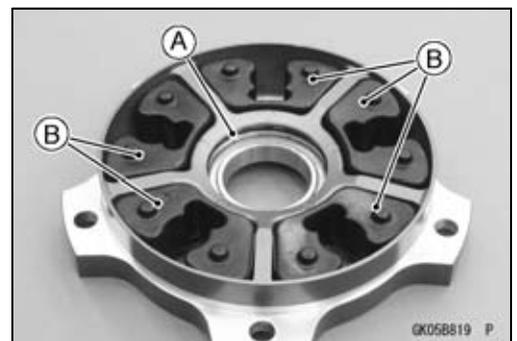
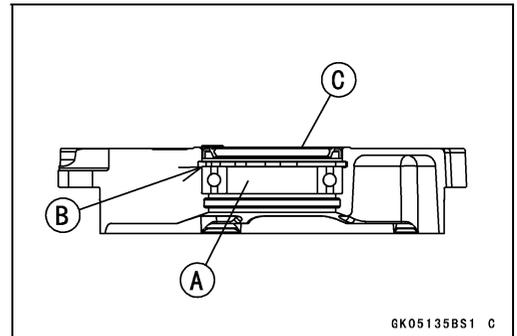
**Special Tool - Inside Circlip Pliers: 57001-143**

- Press the grease seal [C] so that the seal surface is flush with the end of the hole.

**Special Tool - Bearing Driver Set: 57001-1129**

- Apply grease to the grease seal lips.

- Apply grease to the O-ring [A] and install it.
- Install the coupling dampers [B] so that its projections facing upward.
- Install the outer coupling to the inner coupling.
- Install the removed parts (see appropriate chapters).



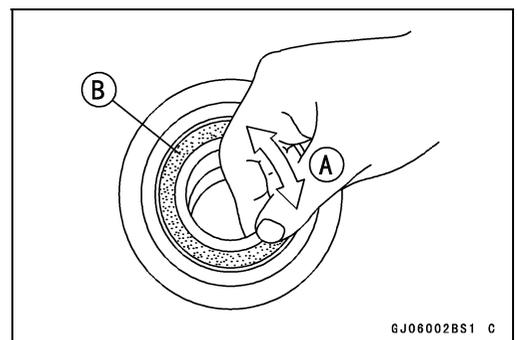
### Coupling Bearing Inspection

Since the coupling bearing is made to extremely close tolerances, the clearance can not normally be measured.

#### NOTE

○It is not necessary to remove the coupling bearing for inspection. If the bearing is removed, it will need to be replaced with a new one.

- Turn the bearing in the coupling back and forth [A] while checking for plays, roughness or binding.
- ★ If the bearing play, roughness or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.



### Coupling Bearing Lubrication

#### NOTE

○Since the coupling bearing is packed with grease and sealed, lubrication is not required.

### Coupling Damper Inspection

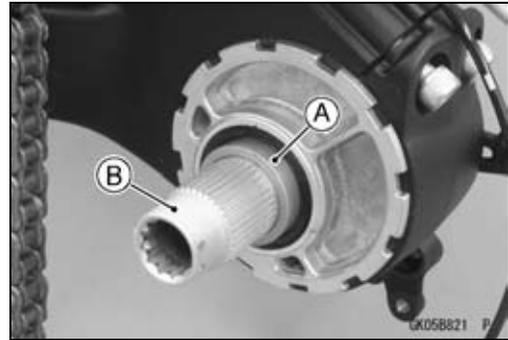
- Refer to the Rear Wheel Coupling Dampers Inspection in the Periodic Maintenance chapter.

# 11-16 FINAL DRIVE

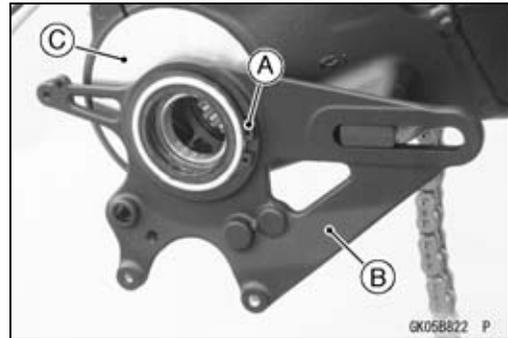
## Sprocket, Coupling

### Bearing Housing Removal

- Remove:
  - Coupling (see Coupling Removal)
  - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
  - Rear Brake Disc (see Rear Brake Disc Removal in the Brakes chapter)
  - Collar [A]
  - Rear Axle [B]

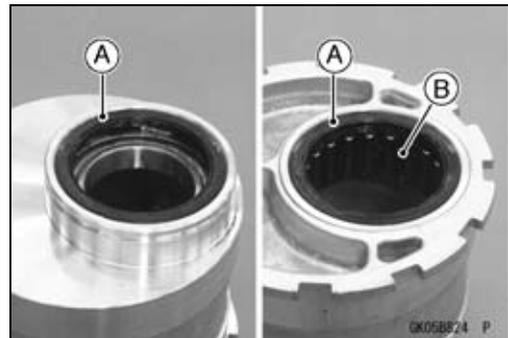


- Remove:
    - Circlip [A]
    - Rear Caliper Holder [B]
    - Bearing Housing [C]
- Special Tool - Outside Circlip Pliers: 57001-144**



### Bearing Housing Installation

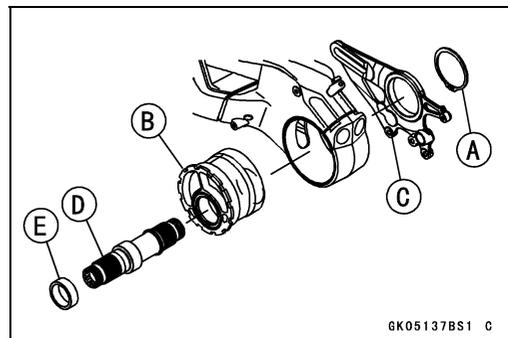
- Apply high-temperature grease to the lips of grease seals [A] and needle bearing [B].



- Replace the circlip [A] with a new one.
- Install:
  - Bearing Housing [B]
  - Rear Caliper Holder [C]
  - Circlip
  - Rear Axle [D]
  - Collar [E]

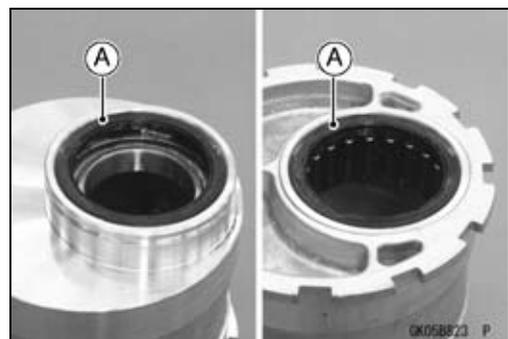
**Special Tool - Outside Circlip Pliers: 57001-144**

- Install the removed parts (see appropriate chapters).



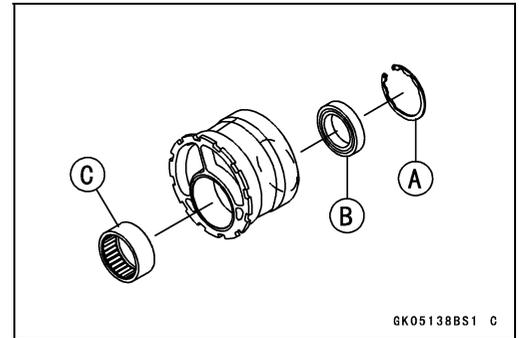
### Bearing Housing Bearing Removal

- Remove:
  - Bearing Housing (see Bearing Housing Removal)
  - Grease Seals [A]



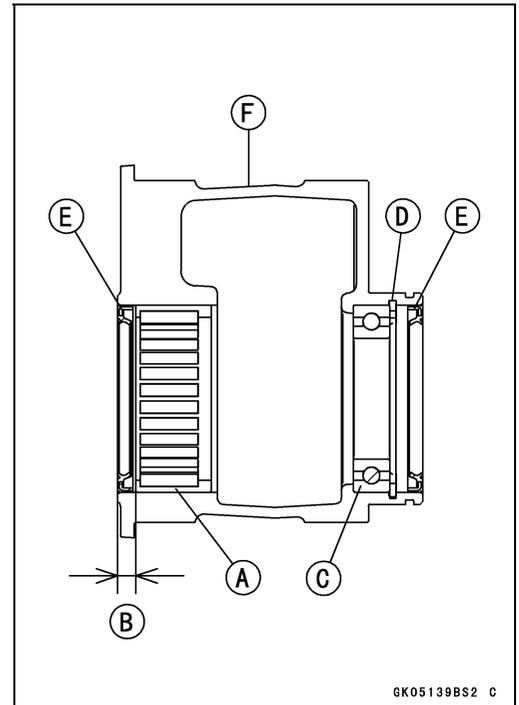
## Sprocket, Coupling

- Remove:  
Circlip [A]
- **Special Tool - Inside Circlip Pliers: 57001-143**
- Remove the ball bearing [B] and needle bearing [C] using a suitable tool.



### **Bearing Housing Bearing Installation**

- Replace the needle bearing, ball bearing, circlip and grease seals with new ones.
- Press in the needle bearing [A].  
6.0 ±0.4 mm (0.24 ±0.02 in.) [B]
- **Special Tool - Bearing Driver Set: 57001-1129**
- Apply high-temperature grease to the needle bearing.
- Press in the ball bearing [C] until it is bottomed.
- **Special Tool - Bearing Driver Set: 57001-1129**
- Install the circlip [D].
- **Special Tool - Inside Circlip Pliers: 57001-143**
- Install the grease seals [E] so that their surfaces are flush with the bearing housing [F].
- Apply high-temperature grease to the grease seal lips.

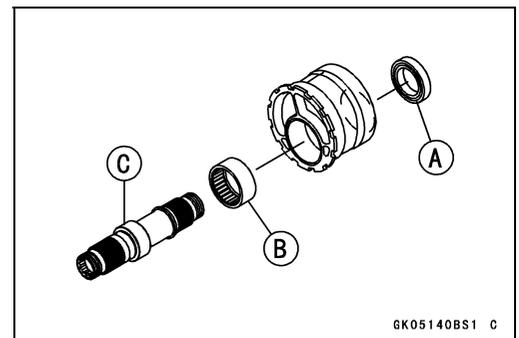


### **Bearing Housing Bearing Inspection**

#### **NOTICE**

**Do not remove the bearings for inspection. Removal may damage them.**

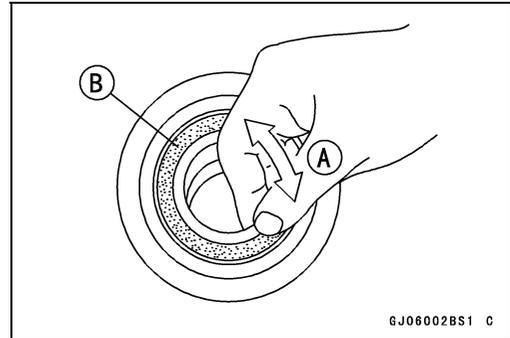
- Inspect the ball bearing [A] and needle bearing [B] installed in the bearing housing.
- The rollers and balls in a bearing normally wear very little, and wear is difficult to measure. Instead of measuring, visually inspect the bearing for abrasion, discoloration, or other damage.
- ★ If the needle bearing and rear axle [C] show any signs of abnormal wear, discoloration, or damage, replace them as a set.



## 11-18 FINAL DRIVE

### Sprocket, Coupling

- Turn the ball bearing in the bearing housing back and forth 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.



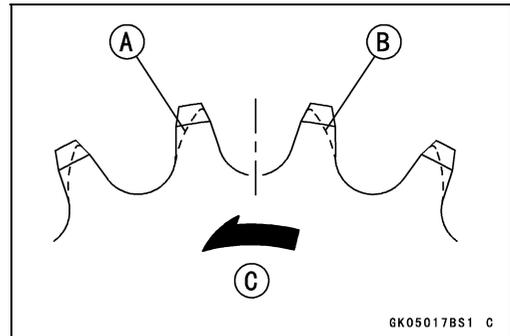
### Sprocket Wear Inspection

- 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]

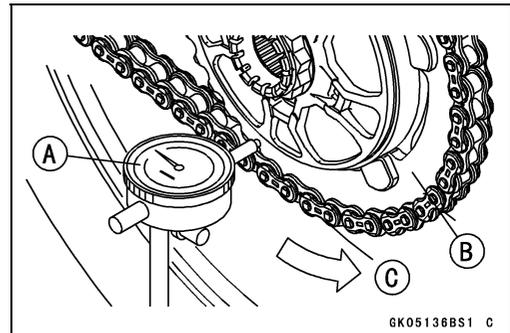


### NOTE

- If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.

### Rear Sprocket Warp Inspection

- Raise the rear wheel off the ground with the 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: TIR 0.4 mm (0.016 in.) or less

Service Limit: TIR 0.5 mm (0.020 in.)

# Brakes

## Table of Contents

|  |       |
|--|-------|
| Exploded View .....                                  | 12-3  |
| Specifications .....                                 | 12-8  |
| Brake Lever, Brake Pedal .....                       | 12-9  |
| Brake Lever Removal .....                            | 12-9  |
| Brake Lever Installation .....                       | 12-9  |
| Brake Lever Position Adjustment .....                | 12-9  |
| Brake Pedal Position Inspection .....                | 12-9  |
| Brake Pedal Position Adjustment .....                | 12-9  |
| Brake Pedal Removal .....                            | 12-10 |
| Brake Pedal Installation .....                       | 12-10 |
| Calipers .....                                       | 12-11 |
| Front Caliper Removal .....                          | 12-11 |
| Front Caliper Installation .....                     | 12-11 |
| Rear Caliper Removal .....                           | 12-12 |
| Rear Caliper Installation .....                      | 12-13 |
| Brake Pads .....                                     | 12-14 |
| Front Brake Pad Removal .....                        | 12-14 |
| Front Brake Pad Installation .....                   | 12-14 |
| Rear Brake Pad Removal .....                         | 12-14 |
| Rear Brake Pad Installation .....                    | 12-14 |
| Brake Pad Wear Inspection .....                      | 12-15 |
| Master Cylinder .....                                | 12-16 |
| Front Master Cylinder Removal .....                  | 12-16 |
| Front Master Cylinder Installation .....             | 12-17 |
| Rear Master Cylinder Removal .....                   | 12-17 |
| Rear Master Cylinder Installation .....              | 12-18 |
| Brake Disc .....                                     | 12-19 |
| Front Brake Disc Removal .....                       | 12-19 |
| Front Brake Disc Installation .....                  | 12-19 |
| Rear Brake Disc Removal .....                        | 12-19 |
| Rear Brake Disc Installation .....                   | 12-20 |
| Brake Disc Wear Inspection .....                     | 12-21 |
| Brake Disc Warp Inspection .....                     | 12-21 |
| Brake Fluid .....                                    | 12-22 |
| Brake Fluid Level Inspection .....                   | 12-22 |
| Brake Fluid Change .....                             | 12-22 |
| Brake Line Bleeding .....                            | 12-22 |
| Brake Hose .....                                     | 12-27 |
| Brake Hose Removal/Installation .....                | 12-27 |
| Brake Hose and Pipe Inspection .....                 | 12-27 |
| KIBS .....   | 12-28 |
| Parts Location .....                                 | 12-28 |
| KIBS Servicing Precautions .....                     | 12-32 |
| KIBS Troubleshooting Outline .....                   | 12-34 |
| Inquiries to Rider .....                             | 12-37 |
| Self-diagnosis Outline .....                         | 12-39 |
| ABS and KIBS Indicator Lights (LED) Inspection ..... | 12-40 |
| KIBS Hydraulic Unit Removal .....                    | 12-40 |
| KIBS Hydraulic Unit Installation .....               | 12-41 |
| KIBS Hydraulic Unit Inspection .....                 | 12-42 |

## 12-2 BRAKES

---

|  |       |
|--|-------|
| Front Wheel Rotation Sensor Removal .....          | 12-42 |
| Front Wheel Rotation Sensor Installation .....     | 12-43 |
| Rear Wheel Rotation Sensor Removal .....           | 12-43 |
| Rear Wheel Rotation Sensor Installation .....      | 12-44 |
| Wheel Rotation Sensor Inspection.....              | 12-45 |
| Wheel Rotation Sensor Air Gap Inspection .....     | 12-45 |
| Wheel Rotation Sensor Rotor Inspection.....        | 12-46 |
| KIBS Solenoid Valve Relay Fuse (15 A) Removal..... | 12-46 |
| KIBS Motor Relay Fuse (25 A) Removal .....         | 12-47 |
| Fuse Installation.....                             | 12-47 |
| Fuse Inspection.....                               | 12-47 |

---

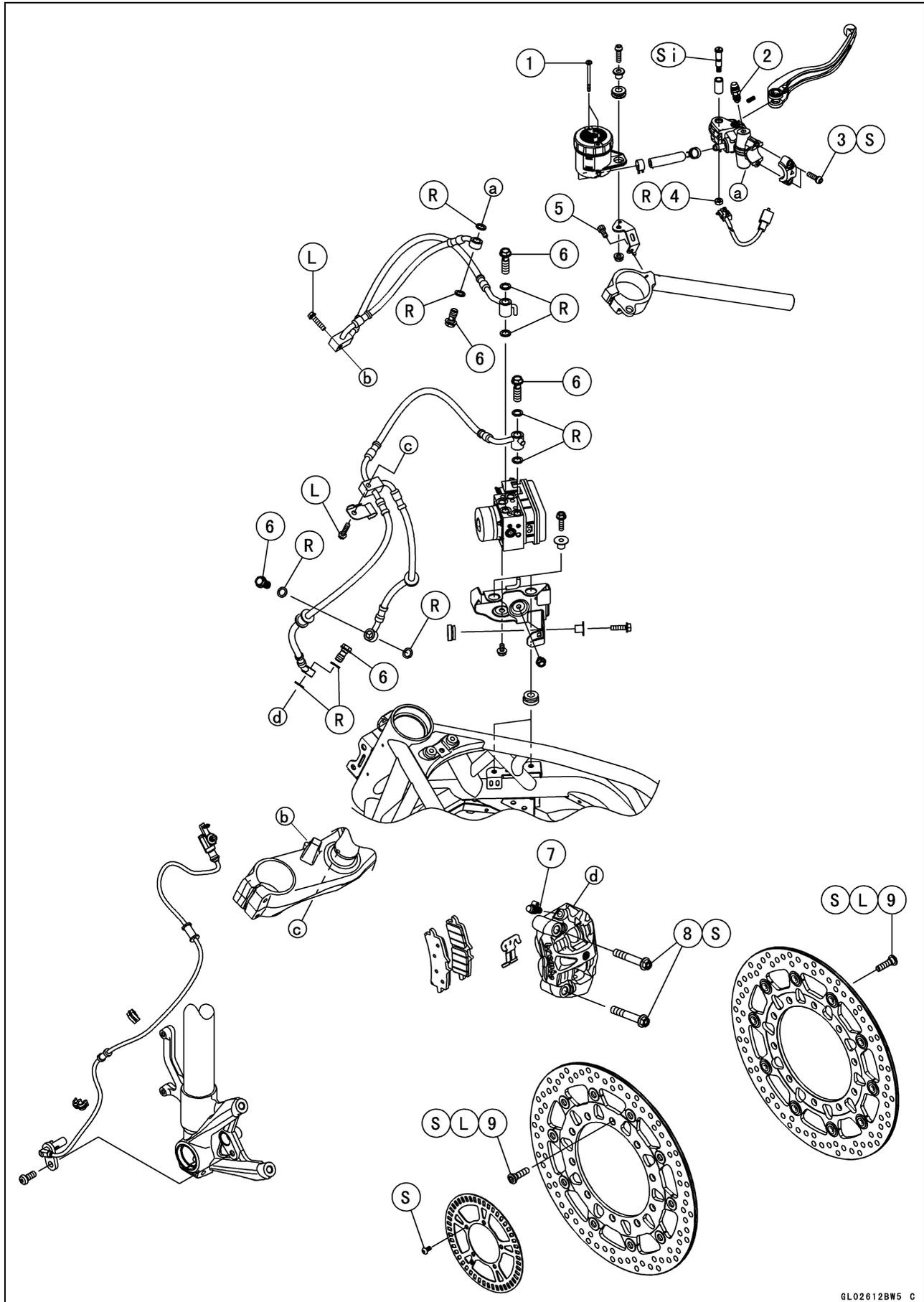
**Exploded View**

---

This page intentionally left blank.

# 12-4 BRAKES

## Exploded View



## Exploded View

| No. | Fastener                                 | Torque |       |           | Remarks |
|-----|--|--------|-------|-----------|---------|
|     |  | N·m    | kgf·m | ft·lb     |         |
| 1   | Front Brake Fluid Reservoir Cap Screws   | 0.70   | 0.07  | 6.2 in·lb |         |
| 2   | Front Master Cylinder Bleed Valve        | 5.5    | 0.56  | 49 in·lb  |         |
| 3   | Front Master Cylinder Clamp Bolts        | 9.0    | 0.92  | 80 in·lb  | S       |
| 4   | Brake Lever Pivot Bolt Locknut           | 6.0    | 0.61  | 53 in·lb  | R       |
| 5   | Front Brake Fluid Reservoir Bracket Bolt | 6.9    | 0.70  | 61 in·lb  |         |
| 6   | Brake Hose Banjo Bolts                   | 24.5   | 2.50  | 18.1      |         |
| 7   | Bleed Valves                             | 14     | 1.4   | 10        |         |
| 8   | Front Caliper Mounting Bolts             | 34     | 3.5   | 25        | S       |
| 9   | Front Brake Disc Mounting Bolts          | 27     | 2.8   | 20        | L, S    |

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

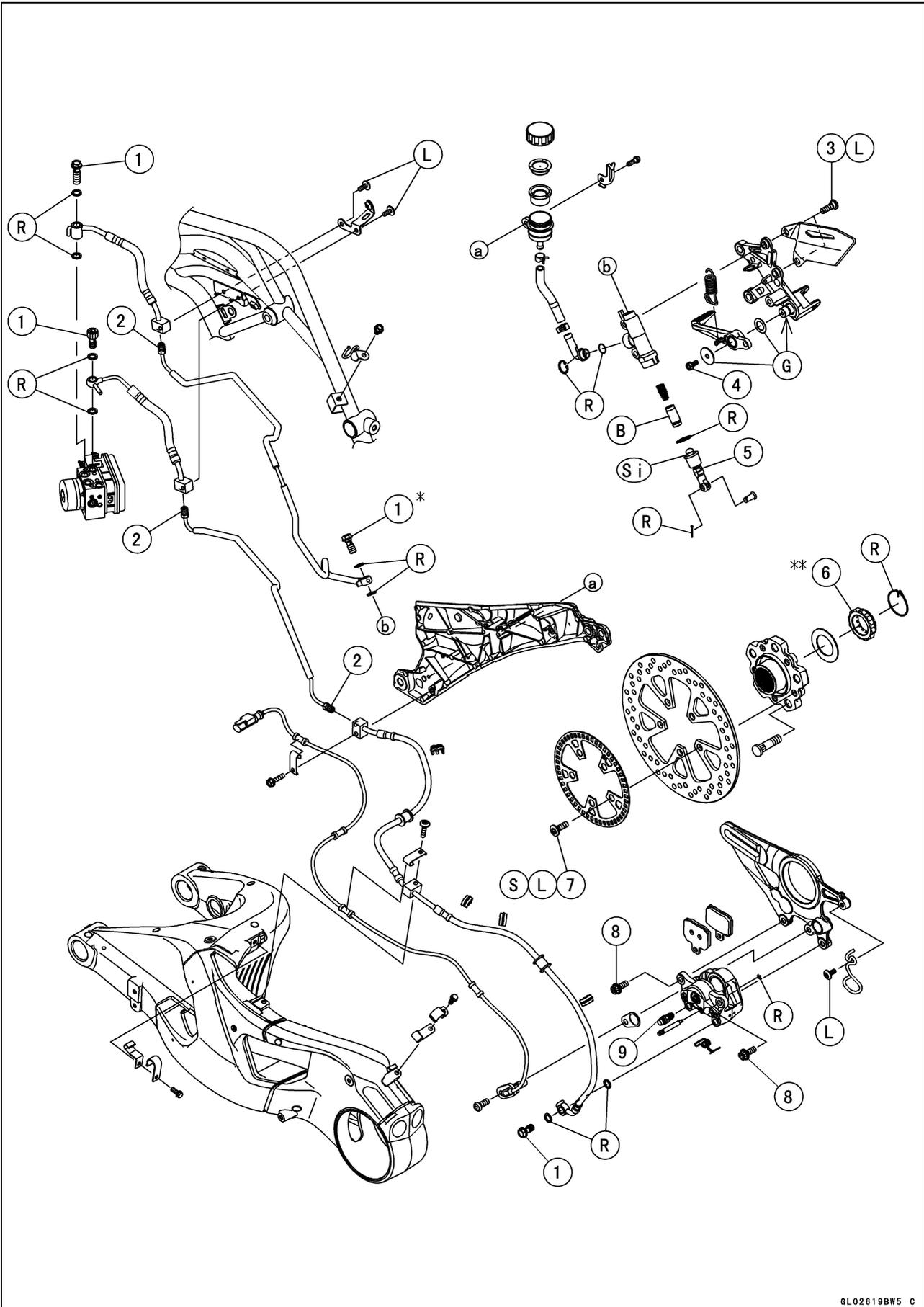
Si: Apply silicone grease.

**NOTE**

○When disassembling the brake hose and pipe, disassemble them by the unit as shown in the exploded view.

# 12-6 BRAKES

## Exploded View



## Exploded View

| No. | Fastener                              | Torque |       |          | Remarks |
|-----|---------------------------------------|--------|-------|----------|---------|
|     |                                       | N·m    | kgf·m | ft·lb    |         |
| 1   | Brake Hose Banjo Bolts                | 24.5   | 2.50  | 18.1     |         |
| 2   | Brake Pipe Joint Nuts                 | 18     | 1.8   | 13       |         |
| 3   | Rear Master Cylinder Mounting Bolts   | 25     | 2.5   | 18       | L       |
| 4   | Brake Pedal Bolt                      | 8.8    | 0.90  | 78 in·lb |         |
| 5   | Rear Master Cylinder Push Rod Locknut | 17     | 1.7   | 13       |         |
| 6** | Rear Axle Nut, First                  | 220    | 22.4  | 162      |         |
|     | Rear Axle Nut, Final                  | 250    | 25.5  | 184      |         |
| 7   | Rear Brake Disc Mounting Bolts        | 27     | 2.8   | 20       | L, S    |
| 8   | Rear Caliper Mounting Bolts           | 25     | 2.5   | 18       |         |
| 9   | Bleed Valve                           | 14     | 1.4   | 10       |         |

B: Apply brake fluid.

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specified tightening sequence.

Si: Apply silicone grease.

\*: The thread pitch of the banjo bolt for rear master cylinder differs from the other banjo bolts.  
Check the thread pitch before installing.

\*\* : After tightening to the first torque, loosen it and tighten to the final torque.

**NOTE**

○When disassembling the brake hose and pipe, disassemble them by the unit as shown in the exploded view.

## 12-8 BRAKES

### Specifications

| Item                            | Standard  | Service Limit   |
|---------------------------------|---|---|
| <b>Brake Lever, Brake Pedal</b> |   |   |
| Brake Lever Position            | Adjustable type (to suit rider)                             | — — —   |
| Brake Lever Free Play           | Non-adjustable  | — — —   |
| Pedal Free Play                 | Non-adjustable  | — — —   |
| Pedal Position                  | About 68 mm (2.68 in.) below top of footpeg                 | — — —   |
| <b>Brake Pads</b>               |   |   |
| Lining Thickness:               |   |   |
| Front                           | 3.7 mm (0.15 in.)   | 1 mm (0.04 in.)   |
| Rear                            | 6.95 mm (0.27 in.) (Thickness of pad lining and back plate) | 4.5 mm (0.18 in.)<br>(Thickness of pad lining and back plate) |
| <b>Brake Discs</b>              |   |   |
| 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:                         |   |   |
| Front                           | TIR 0.15 mm (0.0059 in.) or less                            | TIR 0.3 mm (0.013 in.)  |
| Rear                            | TIR 0.10 mm (0.0039 in.) or less                            | TIR 0.3 mm (0.013 in.)  |
| <b>Brake Fluid</b>              |   |   |
| Grade                           | DOT4  | — — —   |
| <b>KIBS</b>                     |   |   |
| KIBS Hydraulic Unit:            |   |   |
| Make                            | BOSCH   | — — —   |
| Wheel Rotation Sensor           |   |   |
| Air Gap:                        |   |   |
| Front                           | 0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)                              | — — —   |
| Rear                            | 0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)                              | — — —   |

## Brake Lever, Brake Pedal

### Brake Lever Removal

- Remove the brake lever in the same way as clutch lever removal (see Clutch Lever Removal/Installation in the Clutch chapter).

### Brake Lever Installation

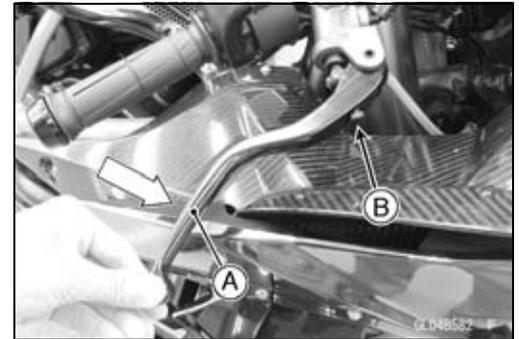
- Install the brake lever in the same way as clutch lever installation (see Clutch Lever Removal/Installation in the Clutch chapter).

### Brake Lever Position Adjustment

The brake lever position can be adjusted to suit the operator's hand.

- Push the brake lever [A] forward and turn the adjuster [B] and choose a suitable brake lever position.

|                |         |     |          |
|----------------|---------|-----|----------|
| Adjuster       | Turn in | ← → | Turn out |
| Lever Position | Far     | ← → | Near     |



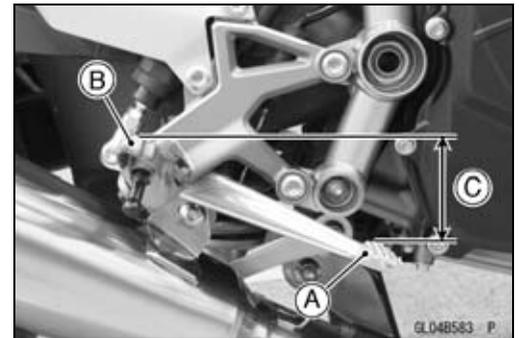
### Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position. Footpeg [B]

#### Pedal Position

Standard: About 68 mm (2.68 in.) [C] below top of footpeg

- ★ If it is incorrect, adjust the brake pedal position.



### Brake Pedal Position Adjustment

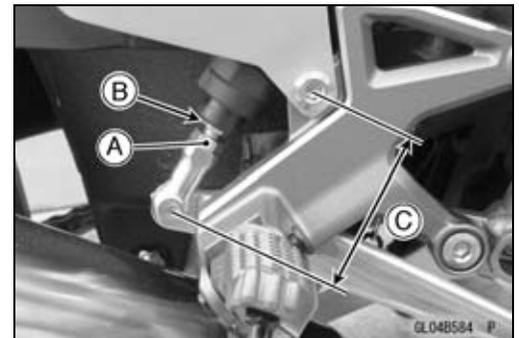
#### NOTE

○ Usually it is not necessary to adjust the pedal position, but always adjust it when the push rod locknut has been loosened.

- 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  $68 \pm 1$  mm ( $2.68 \pm 0.04$  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 brake light switch operation (see Brake Light Switch Operation Inspection in the Periodic Maintenance chapter).

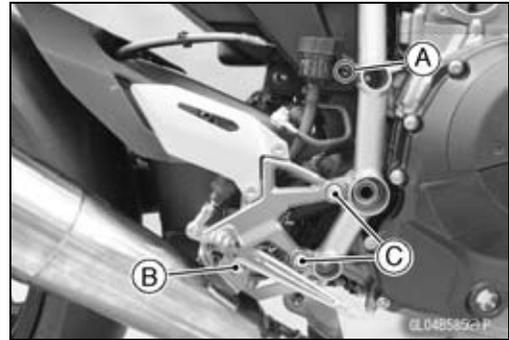


## 12-10 BRAKES

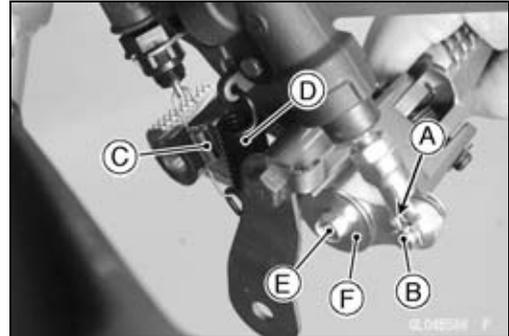
### Brake Lever, Brake Pedal

#### Brake Pedal Removal

- Remove:
  - Bolt [A] and Stopper
  - Muffler Body Mounting Bolt [B] and Nut
  - Right Footpeg Bracket Bolts [C]

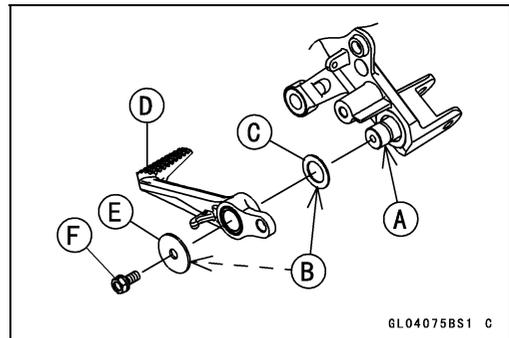


- Remove:
  - Cotter Pin [A]
  - Joint Pin [B]
  - Rear Brake Light Switch Spring [C]
  - Return Spring [D]
  - Brake Pedal Bolt [E] and Washer [F]
  - Brake Pedal

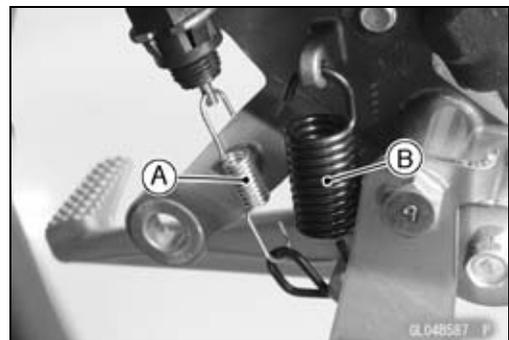


#### Brake Pedal Installation

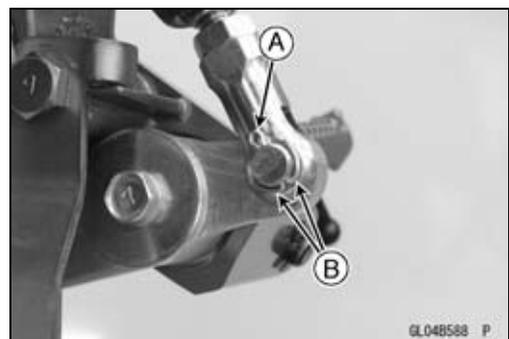
- Apply grease to the footpeg pivot shaft [A] and brake pedal side [B] of washers.
- Install:
  - Washer [C]
  - Brake Pedal [D]
  - Washer [E]
- Tighten:
  - **Torque - Brake Pedal Bolt [F]: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



- Hook the rear brake light switch spring [A] on the brake light switch and return spring [B].
  - Face the spring ends to the outside of the vehicle.
- Hook the return spring.
  - Face the spring ends forward.
  - Hook the shorter end to the footpeg bracket.
  - Hook the longer end to the brake pedal.



- Replace the cotter pin [A] with a new one.
- Insert the cotter pin and bend the pin ends [B].
- Install the footpeg bracket.
- Apply a non-permanent locking agent to the threads of the footpeg bracket bolts.
- Tighten:
  - **Torque - Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - **Muffler Body Mounting Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)**

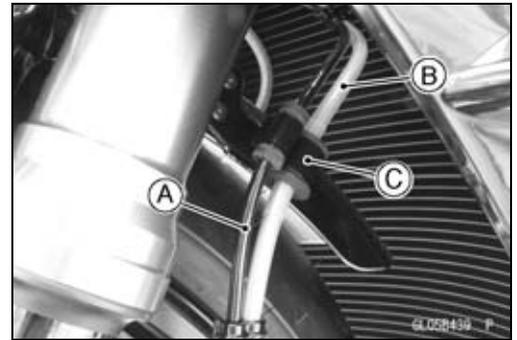


- Check the brake pedal position (see Brake Pedal Position Inspection).

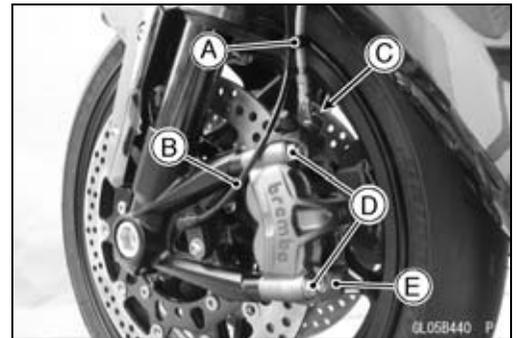
## Calipers

### Front Caliper Removal

- Free the front wheel rotation sensor lead [A] and front brake hose [B] from the clamp [C].



- Remove the clamp [A] to free the front wheel rotation sensor lead [B].
- Loosen the banjo bolt [C] and tighten it loosely to prevent the fluid spillage.
- Remove the caliper mounting bolts [D], and detach the caliper [E] from the disc.
- Remove the banjo bolt and disconnect the brake hose from the caliper.



### NOTICE

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

- 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.

### Front Caliper Installation

- Replace the washers that are on each side of the hose fitting with new ones.
- Install the front caliper mounting bolts so that the seating surface of the bolt do not contact the caliper.
- Run the brake hoses and front wheel rotation sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Avoid sharp bending, kinking, flattening or twisting.
- Tighten:
  - Torque - Brake Hose Banjo Bolts: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**
- Check the fluid level in the brake fluid reservoir.
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

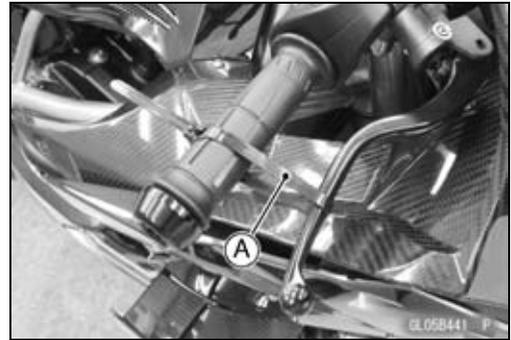
### ⚠ WARNING

**After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.**

## 12-12 BRAKES

### Calipers

- Squeeze the brake lever slowly and hold it with a band [A].

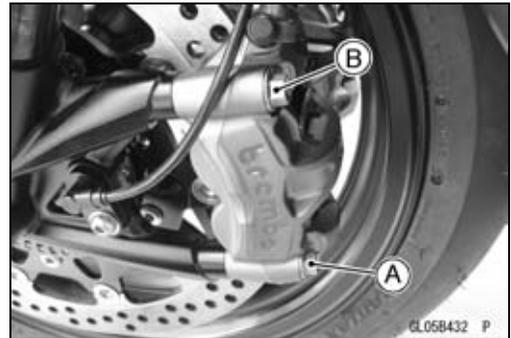


- Tighten the front caliper mounting bolt [A] [B] following specified tightening sequence.

Tightening Sequence:

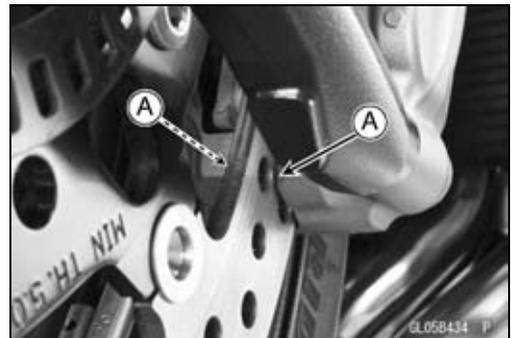
[A → B → A]

**Torque - Front Caliper Mounting Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)**



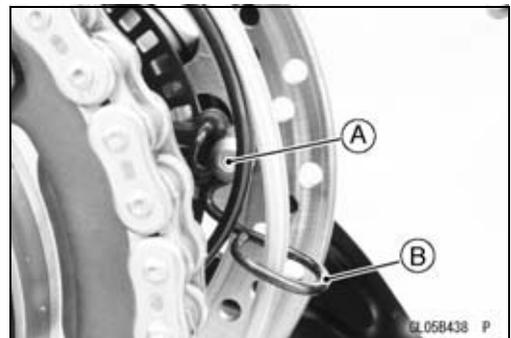
- Check the clearance [A] 0.5 mm (0.020 in.) or more between the caliper and disc at the lower position.

★ If there is no clearance, reinstall the caliper.



### **Rear Caliper Removal**

- Remove the clamp bolt [A] and clamp [B] to free the rear brake hose.



## Calipers

- Loosen the banjo bolt [A] and tighten it loosely to prevent the fluid spillage.
- Remove the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Remove the banjo bolt and disconnect the brake hose from the caliper.

### NOTICE

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

- 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.

### Rear Caliper Installation

- Replace the washers that are on each side of the hose fitting with new ones.
- Install the caliper temporarily.
- Install the brake hose.
- Avoid sharp bending, kinking, flattening or twisting.
- Touch the stopper [A] of the hose fitting to the caliper.
- Tighten:

**Torque - Brake Hose Banjo Bolt: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**

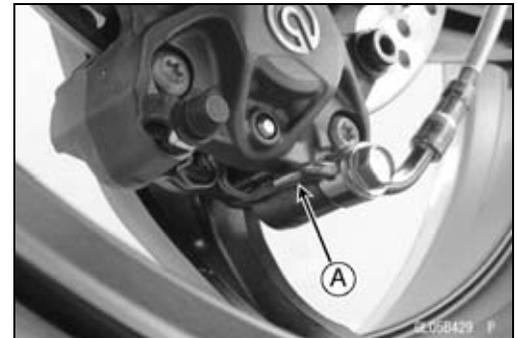
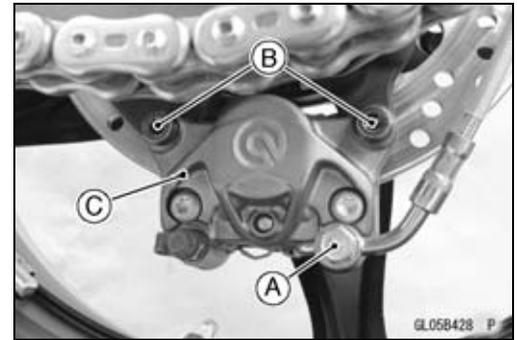
- Remove the caliper.
- Check the fluid level in the brake fluid reservoir.
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

### ⚠ WARNING

**After servicing, it takes several applications of the brake pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake pedal is obtained by pumping the pedal until the pads are against the disc.**

- Install the caliper.
- Run the brake hose and rear wheel rotation sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:
 

**Torque - Rear Caliper Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Install the clamp.
- Apply a non-permanent locking agent to the threads of the clamp bolt, and tighten it securely.

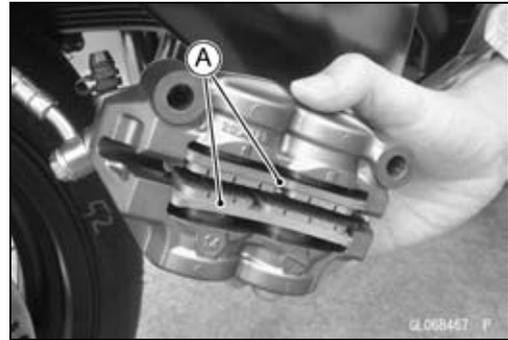


## 12-14 BRAKES

### Brake Pads

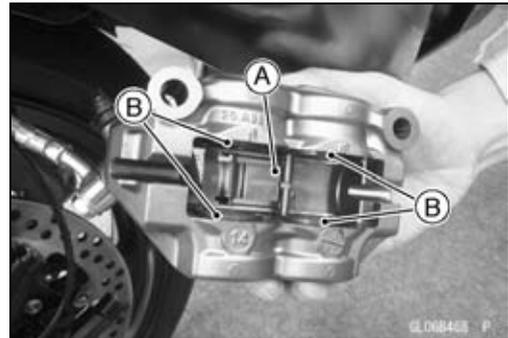
#### Front Brake Pad Removal

- Remove the front caliper with the hose installed (see Front Caliper Removal).
- Remove:
  - Brake Pads [A]



#### Front Brake Pad Installation

- Check that the pad spring [A] is in place on the caliper.
- Push the caliper pistons [B] in by hand as far as they will go.
- Install the brake pads on the pad spring correctly.
- Install the front caliper (see Front Caliper Installation).

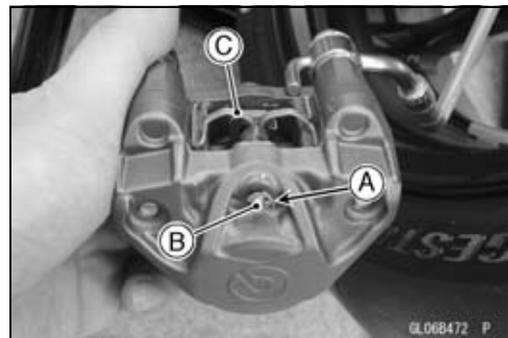


#### **⚠ WARNING**

After servicing, it takes several applications of the brake lever before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake lever is obtained by pumping the lever until the pads are against the disc.

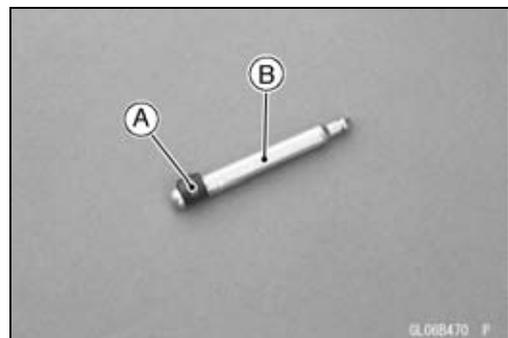
#### Rear Brake Pad Removal

- Remove the rear caliper with the hose installed (see Rear Caliper Removal).
- Remove:
  - Clip [A]
  - Pad Pin [B]
  - Pad Spring [C]
  - Brake Pads



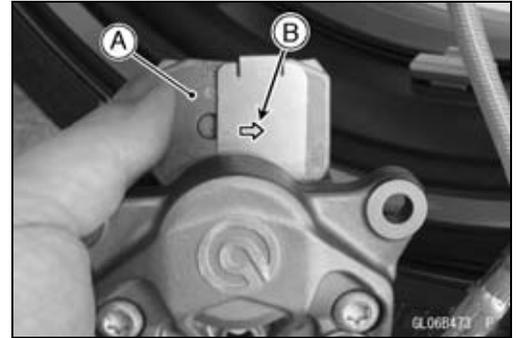
#### Rear Brake Pad Installation

- Push the caliper pistons in by hand as far as it will go.
- Replace the clip with a new one.
- Check that the ring [A] is in place on the pad pin [B].

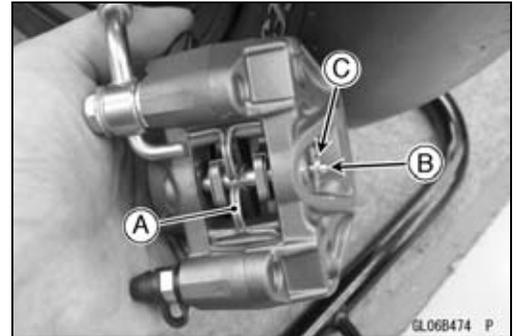


## Brake Pads

- Install the brake pads [A] so that the arrow mark [B] faces the wheel rotation direction.



- Install:
  - Pad Spring [A]
  - The pad spring can install in both directions.
  - While pushing down the pad spring, insert the pad pin [B].
  - Install the clip [C] onto the pad pin groove.



- Install the rear caliper (see Rear Caliper Installation).

### **⚠ WARNING**

**After servicing, it takes several applications of the brake pedal before the brake pads contact the disc, which could result in increased stopping distance and cause an accident resulting in injury or death. Do not attempt to ride the motorcycle until a firm brake pedal is obtained by pumping the pedal until the pads are against the disc.**

### ***Brake Pad Wear Inspection***

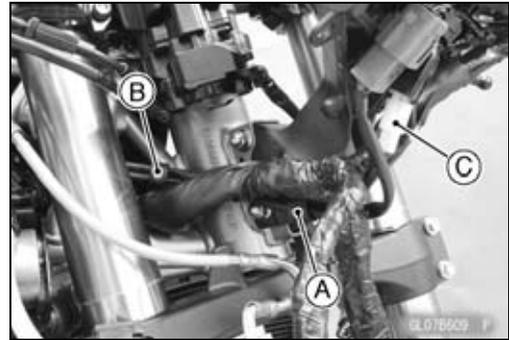
- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

## 12-16 BRAKES

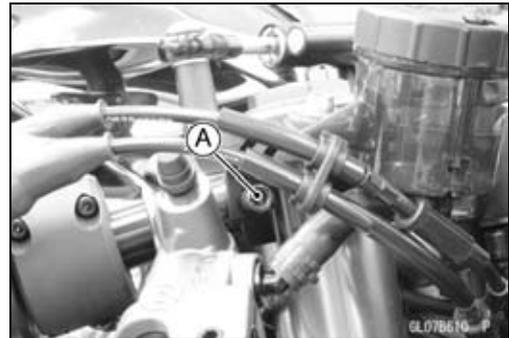
### Master Cylinder

#### Front Master Cylinder Removal

- Remove the intake duct (see Intake Duct Removal in the Fuel System (DFI) chapter).
- Open the clamp [A].
- Remove the band [B], and clear the front brake light switch lead.
- Disconnect the front brake light switch lead connector [C].



- Remove:
  - Front Brake Fluid Reservoir Bracket Bolt [A]

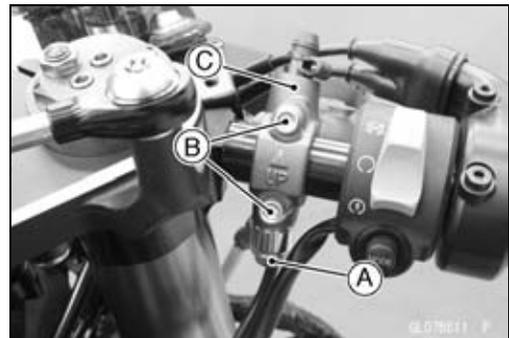


- Remove the banjo bolt [A] to disconnect the brake hose from the master cylinder.

#### **NOTICE**

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

- 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.
- Remove the clamp bolts [B], and take off the master cylinder [C] as an assembly with the reservoir, brake lever, and brake light switch installed.



## Master Cylinder

### Front Master Cylinder Installation

- Install the master cylinder clamp so that the arrow mark [A] faces upward.
- Set the front master cylinder to match its mating surface [B] to the punch mark [C] of the handlebar.
- Tighten the upper clamp bolt first, and then the lower clamp bolt.

**Torque - Front Master Cylinder Clamp Bolts: 9.0 N·m (0.92 kgf·m, 80 in·lb)**

- Replace the washers that are on each side of the hose fitting with new ones.
- Install the brake hose (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

**Torque - Brake Hose Banjo Bolt: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**

**Front Brake Fluid Reservoir Bracket Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)**

- Run the front brake light switch lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Connect the front brake light switch lead connector.
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.
- Install the removed parts (see appropriate chapters).

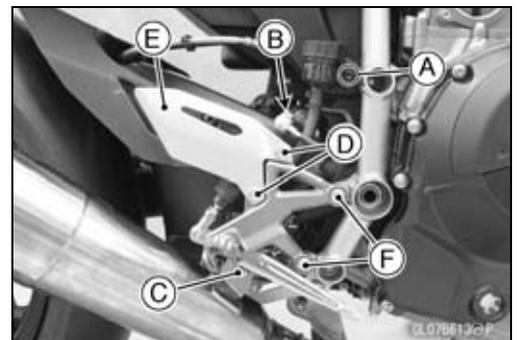
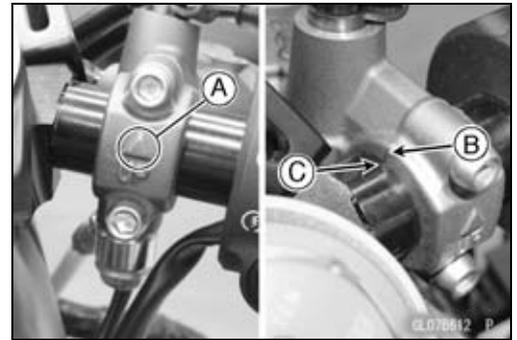
### Rear Master Cylinder Removal

- Remove the bolt [A] and stopper.
- Remove the brake hose banjo bolt [B] and disconnect the brake hose.

#### NOTICE

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

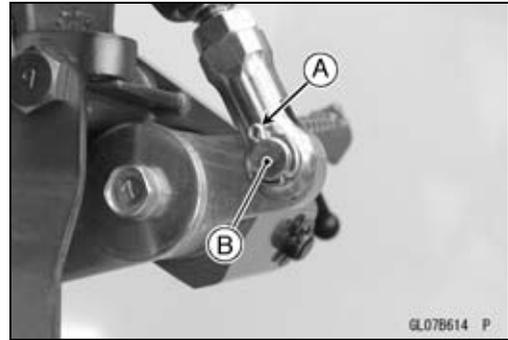
- Take care not to spill the brake fluid on the painted or plastic parts.
- Temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
- Immediately wash away any brake fluid that spills.
- Remove:
  - Muffler Body Mounting Bolt [C] and Nut
  - Rear Master Cylinder Mounting Bolts [D]
  - Heel Guard [E]
  - Footpeg Bracket Bolts [F]



## 12-18 BRAKES

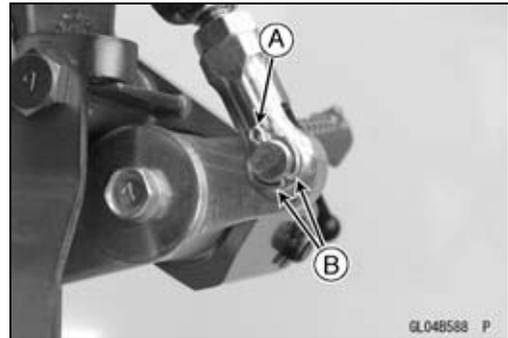
### Master Cylinder

- Remove:
  - Cotter Pin [A]
  - Joint Pin [B]
- Drain the brake fluid from the rear brake fluid reservoir.

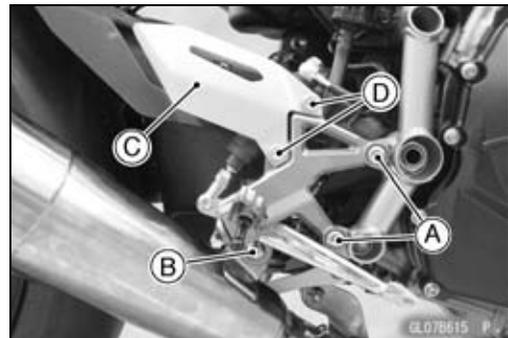


#### **Rear Master Cylinder Installation**

- Replace the cotter pin [A] with a new one.
- Insert the cotter pin and bend the pin ends [B].



- Apply a non-permanent locking agent to the threads of the footpeg bracket bolts [A].
- Tighten:
  - Torque - Footpeg Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)
  - Muffler Body Mounting Bolt [B]: 25 N·m (2.5 kgf·m, 18 ft·lb)
- Install the heel guard [C].
- Apply a non-permanent locking agent to the threads of the rear master cylinder mounting bolts [D].
- Tighten:
  - Torque - Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)



#### **NOTE**

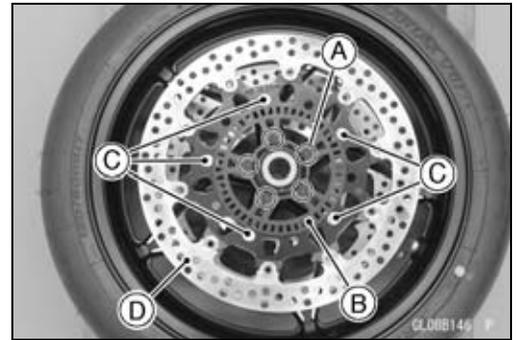
○ After installation, check that the rear brake light switch spring is hooked on the return spring.

- Replace the washers that are on each side of hose fitting with new ones.
- Install the brake hose.
- Touch the brake hose to the stopper of the rear master cylinder.
- Tighten:
  - Torque - Brake Hose Banjo Bolt: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

## Brake Disc

### Front Brake Disc Removal

- Remove:
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Bolts [A]
  - Front Wheel Rotation Sensor Rotor [B]
  - Front Brake Disc Mounting Bolts [C]
  - Front Brake Disc [D]

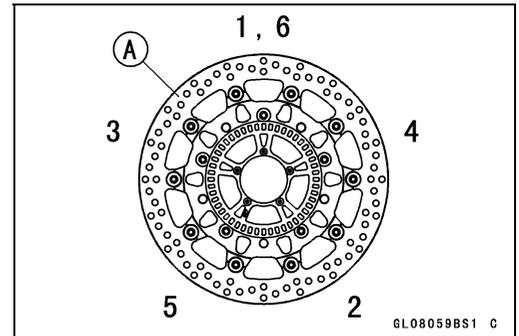


### Front Brake Disc Installation

- Install the front brake disc [A] so that chamfer side faces out.
- Apply a non-permanent locking agent to the threads of the front brake disc mounting bolts.
- Tighten the front brake disc mounting bolts following the specified tightening sequence [1 ~ 6].

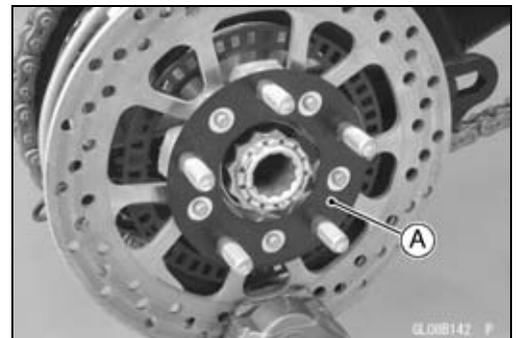
**Torque - Front Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)**

- Install the front wheel rotation sensor rotor so that chamfer side faces out.
- Tighten the bolts following the specified tightening sequence [1 ~ 6].
- Install the front wheel (see Front Wheel Installation in the Wheels/Tires chapter).



### Rear Brake Disc Removal

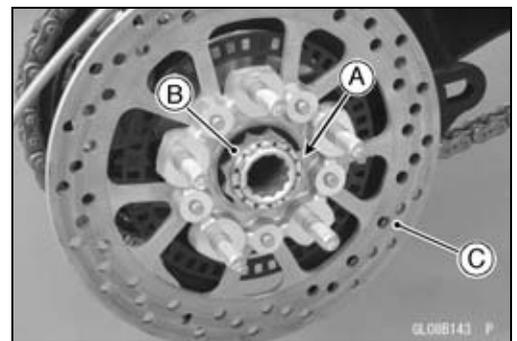
- Remove:
  - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
  - Plate [A]
- Remove the rear caliper from the rear caliper holder.



- Remove:
  - Snap Ring [A]
  - Rear Axle Nut [B] and Washer
  - Rear Brake Disc Assembly [C]

#### NOTE

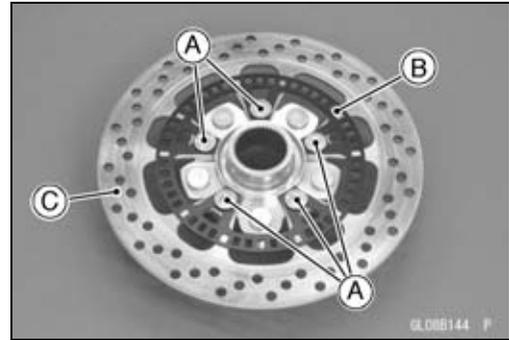
○Use the 35 mm wrench (12 pt.) while holding the left side of the rear axle with the Allen wrench.



## 12-20 BRAKES

### Brake Disc

- Remove:
  - Rear Brake Disc Mounting Bolts [A]
  - Rear Wheel Rotation Sensor Rotor [B]
  - Rear Brake Disc [C]

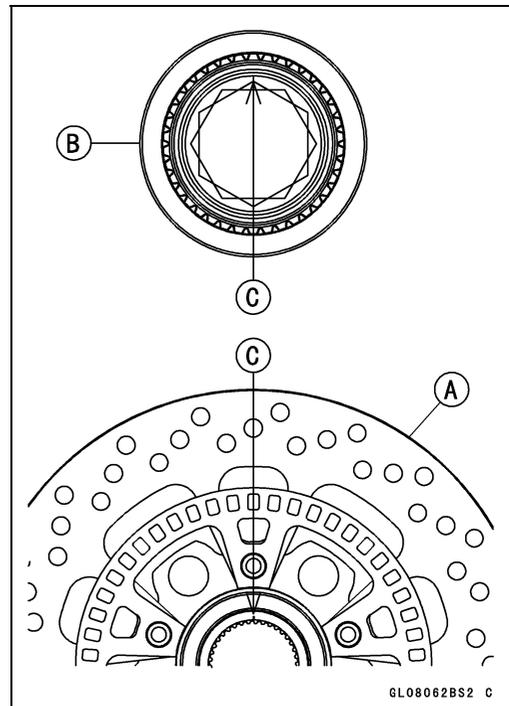
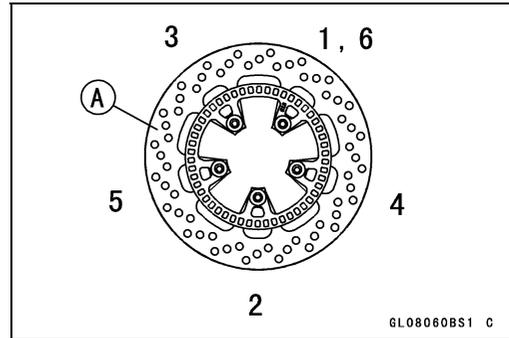


### Rear Brake Disc Installation

- Install the rear brake disc [A] so that chamfer side faces out.
- Install the rear wheel rotation sensor rotor so that the marked side faces brake disc side.
- Apply a non-permanent locking agent to the threads of the rear brake disc mounting bolts.
- Tighten the rear brake disc mounting bolts following the specified tightening sequence [1 ~ 6].

**Torque - Rear Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)**

- Install the rear brake disc assembly [A] to the rear axle [B].
- Align the lines [C].



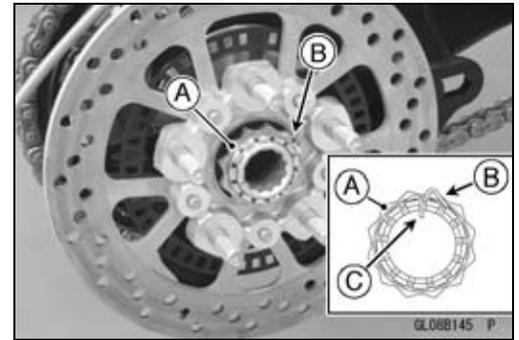
## Brake Disc

- Install:  
Washer
- Tighten:  
Torque - Rear Axle Nut [A], First: 220 N·m (22.4 kgf·m, 162 ft·lb)

### NOTE

○ Use the 35 mm wrench (12 pt.) while holding the left side of the rear axle with the Allen wrench.

- Loosen the rear axle nut, and tighten it again.  
Torque - Rear Axle Nut, Final: 250 N·m (25.5 kgf·m, 184 ft·lb)
- Replace the snap ring [B] with a new one.
- Insert the snap ring end [C] to the hole of the rear axle as shown.
- Install the removed parts (see appropriate chapters).



### Brake Disc Wear Inspection

- 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]

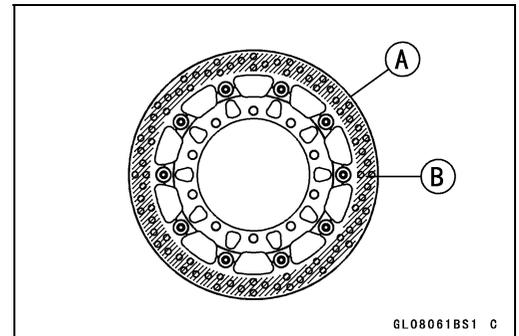
#### Brake Discs Thickness

##### 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 Warp Inspection

- Raise the front/rear wheel off the ground a suitable stand.
- For front disc inspection, turn the handlebars fully to one side.
- Set up a dial gauge against the disc [A] as shown and measure disc runout, while turning [B] the wheel by hand.
- ★ If runout exceeds the service limit, replace the disc.

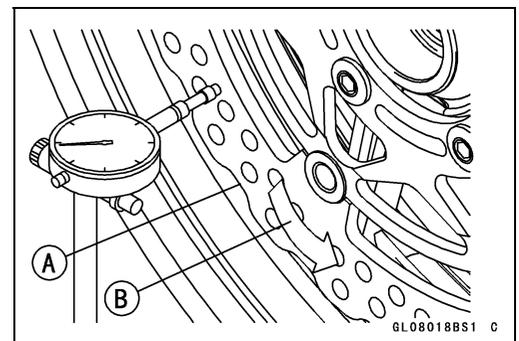
#### Disc Runout

##### Standard:

|       |                                  |
|-------|----------------------------------|
| Front | TIR 0.15 mm (0.0059 in.) or less |
| Rear  | TIR 0.10 mm (0.0039 in.) or less |

##### Service Limit:

|       |                        |
|-------|------------------------|
| Front | TIR 0.3 mm (0.013 in.) |
| Rear  | TIR 0.3 mm (0.013 in.) |



## 12-22 BRAKES

### 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**

**Air in the brake lines diminish braking performance and can cause an accident resulting in injury or death. If the brake lever or pedal has a soft or "spongy" feeling mushy when it is applied, there might be air in the brake lines or the brake may be defective. Do not operate the vehicle and service the brake system immediately.**

#### **⚠ WARNING**

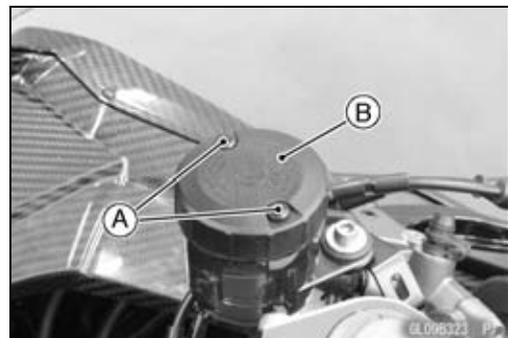
**Mixing brands and types of brake fluid can reduce the brake system's effectiveness and cause an accident resulting in injury or death. Do not mix two brands of brake fluid. Change the brake fluid in the brake line completely if the brake fluid must be re-filled but the type and brand of the brake fluid that is already in the reservoir are unidentified.**

#### **Recommended Brake Fluid**

Grade: DOT4

#### **Front Brake Line**

- Remove:
  - Front Brake Fluid Reservoir Cap Screws [A]
  - Front Brake Fluid Reservoir Cap [B]
  - Diaphragm
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- Slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the hole at the bottom of the reservoir.

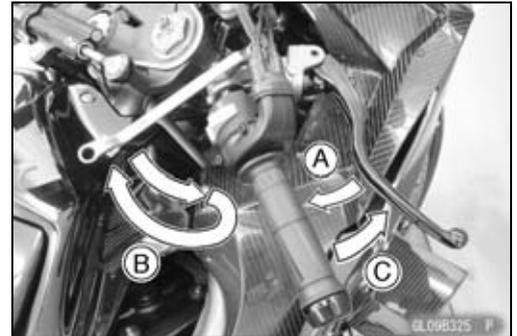


## Brake Fluid

- Remove the rubber cap from the bleed valve on the front master cylinder.
- Attach a clear plastic hose [A] 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].



### NOTICE

**After pumping the brake lever several times, releasing it without opening and closing of the bleed valve may cause brake fluid to be blown back from the master cylinder reservoir. Brake fluid spilt on painted surfaces and plastic parts will quickly damage them. Be sure to open and close the bleed valve.**

### 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: 5.5 N·m (0.56 kgf·m, 49 in·lb)**

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



## 12-24 BRAKES

### Brake Fluid

- 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.
  - First bleeding the right caliper then repeat the above steps for the left caliper.
- Remove the clear plastic hose.
  - Tighten the bleed valve, and install the rubber cap.

**Torque - Bleed Valves: 14 N·m (1.4 kgf·m, 10 ft·lb)**

- Install:
  - Diaphragm
  - Front Brake Fluid Reservoir Cap
- Tighten:

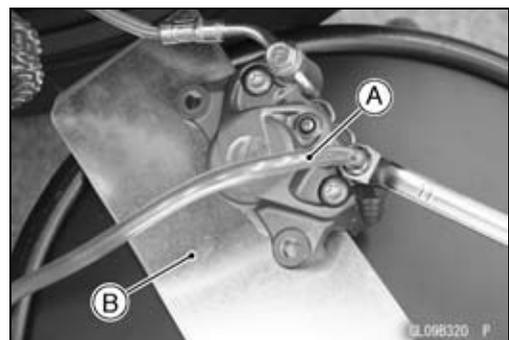
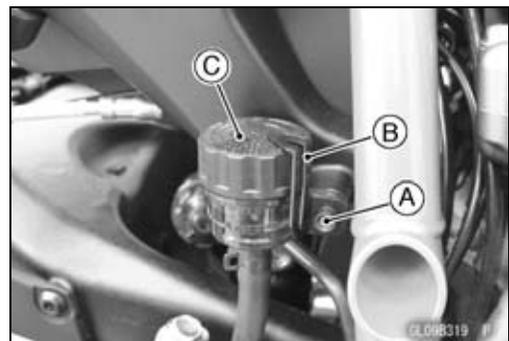
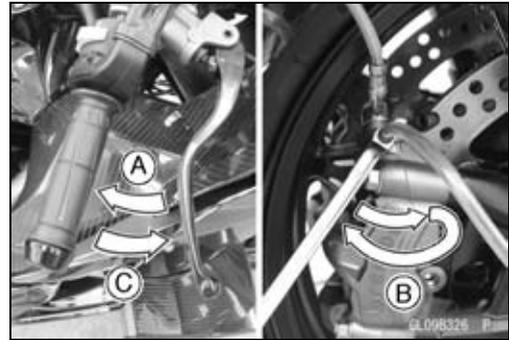
**Torque - Front Brake Fluid Reservoir Cap Screws: 0.70 N·m (0.07 kgf·m, 6.2 in·lb)**

### Rear Brake Line

- Remove:
  - Bolt [A]
  - Stopper [B]
  - Rear Brake Fluid Reservoir Cap [C]
  - Diaphragm Plate
  - Diaphragm
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- Slowly pump the brake pedal several times until no air bubbles can be seen rising up through the fluid from the hole at the bottom of the reservoir.
- Remove the rear caliper with the hose installed (see Rear Caliper Removal).
- Face the bleed valve upward.
- Remove the rubber cap from the bleed valve on the rear caliper.
- Attach a clear plastic hose [A] to the bleed valve, and run the other end of the hose into a container.
- Install the suitable plate [B] between the brake pads.

**Rear Brake Disc Thickness (For Reference):**

**5 mm (0.2 in.)**

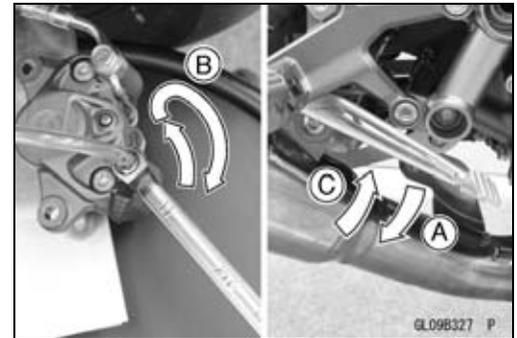


## Brake Fluid

- 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 pedal 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].

### NOTICE

**After pumping the brake pedal several times, releasing it without opening and closing of the bleed valve may cause brake fluid to be blown back from the master cylinder reservoir. Brake fluid spilt on painted surface and plastic parts will quickly damage them. Be sure to open and close the bleed valve.**



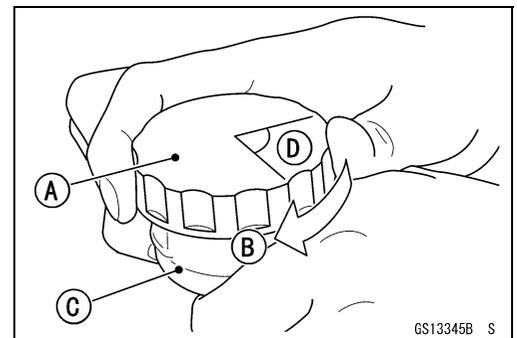
### NOTE

- 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.

- Remove the clear plastic hose.
- Tighten the bleed valve, and install the rubber cap.

**Torque - Bleed Valve: 14 N·m (1.4 kgf·m, 10 ft·lb)**

- Install:
  - Diaphragm
  - Diaphragm Plate
  - Rear Brake Fluid Cap
- Follow the procedure below to install the rear brake fluid reservoir cap correctly.
  - First, tighten the brake fluid reservoir cap [A] clockwise [B] by hand until slight resistance is felt indicating that the cap is seated on the reservoir body [C], then tighten the cap an additional 1/6 turn [D] while holding the brake fluid reservoir body.



- Install the stopper, and tighten the bolt securely.
- Install the rear caliper (see Rear Caliper Installation).
- 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.

## 12-26 BRAKES

### Brake Fluid

#### **WARNING**

When working with the disc brake, observe the precautions listed below.

- Never reuse old brake fluid.
- Do not use fluid from a container that has been left unsealed or that has been open for a long time.
- 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.
- Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
- Don't change the fluid in the rain or when a strong wind is blowing.
- 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.
- 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.
- Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
- 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 and Pipe Inspection***

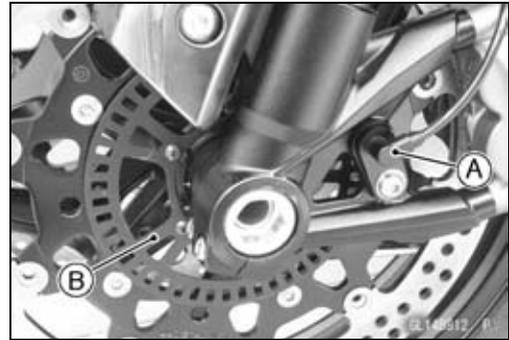
- Refer to the Brake System Inspection in the Periodic Maintenance chapter.

# 12-28 BRAKES

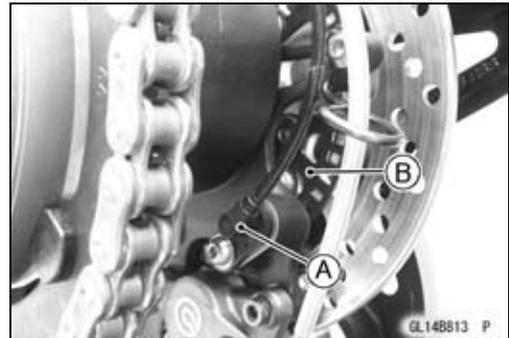
## KIBS

### Parts Location

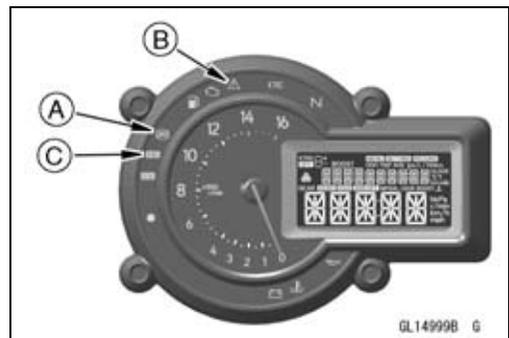
- Front Wheel Rotation Sensor [A]
- Front Wheel Rotation Sensor Rotor [B]



- Rear Wheel Rotation Sensor [A]
- Rear Wheel Rotation Sensor Rotor [B]



- Yellow ABS Indicator Light (LED) [A]
- Yellow Warning Indicator Light (LED) [B]
- White KIBS Indicator Light (LED) [C]



- KIBS Hydraulic Unit [A]

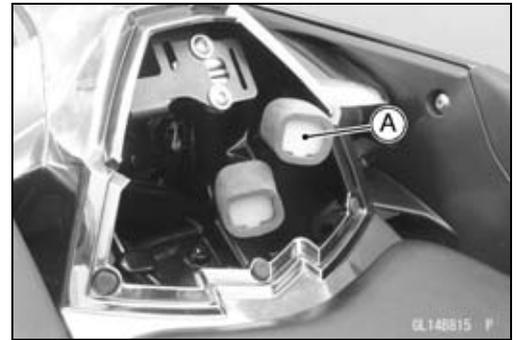


- Fuse Box 2 [A]



**KIBS**

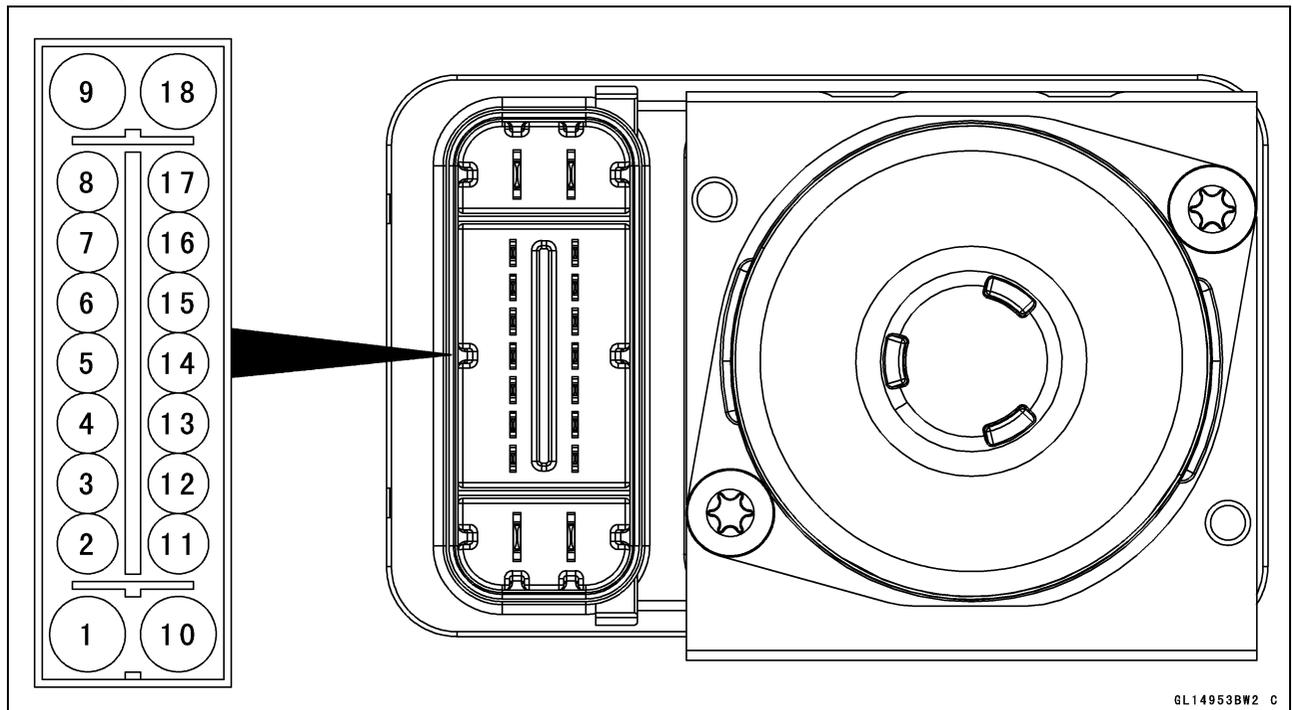
KIBS Kawasaki Diagnosis System Connector [A]





## KIBS

## KIBS Hydraulic Unit Terminal Names



1. Ground: BK/BL
2. CAN Communication Line (High): GY/BL
3. Front Wheel Rotation Sensor Signal Input: BK/W
4. Power Supply: BR/W
5. KIBS Kawasaki Diagnosis System Terminal: P
6. Front and Rear Brake Light Switch Signal: BL
7. Unused
8. Front Wheel Rotation Sensor Signal Output: GY/Y
9. Power Supply to KIBS Solenoid Valve Relay: R/BK
10. Ground to Motor: BK
11. CAN Communication Line (Low): LB
12. Power Supply to Front Wheel Rotation Sensor: W/BK
13. Power Supply to Rear Wheel Rotation Sensor: W/G
14. Rear Wheel Rotation Sensor Signal Input: BK/O
15. Unused
16. Rear Wheel Rotation Sensor Signal Output: W/Y
17. Unused
18. Power Supply to KIBS Motor Relay: R/W

## 12-32 BRAKES

### KIBS

#### ***KIBS Servicing Precautions***

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

- This KIBS 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 KIBS hydraulic unit.
- To prevent damage to the KIBS 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.
- Do not turn the ignition switch on while any of the KIBS electrical connectors are disconnected. The KIBS hydraulic unit memorizes service codes.
- Do not spray water on the electrical parts, KIBS parts, connectors, leads and wiring.
- If a transceiver is installed on the motorcycle, make sure that the operation of the KIBS is not influenced by electric wave radiated from the antenna. Locate the antenna as far as possible away from the KIBS hydraulic unit.
- Whenever the KIBS electrical connections are to be disconnected, first turn off the ignition switch.
- The KIBS 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.
- The KIBS parts cannot be disassembled. Even if a fault is found, do not try to disassemble and repair the KIBS parts, replace it.
- The KIBS has many brake lines, pipes, and leads. And the KIBS cannot detect problems with the conventional braking system (brake disc wear, unevenly worn brake pad, and other mechanical faults). To prevent trouble, check the brake lines and pipes for correct routing and connection, the wiring for correct routing, and the brakes for proper braking power. Be sure to check for fluid leakage, and bleed the brake line thoroughly.

#### **WARNING**

**Air in the brake lines diminish braking performance and can cause an accident resulting in injury or death. If any of the brake line fittings, including the KIBS hydraulic unit joint bolts, or the bleed valve is opened at any time, the air must be bled completely from the brake line. If the brake lever has a soft or “spongy” feeling mushy when it is applied, there might be air in the brake lines or the brake may be defective. Do not operate the vehicle and service the brake system immediately.**

#### **NOTICE**

**Do not ride the motorcycle with air in the brake line, or the KIBS could malfunction.**

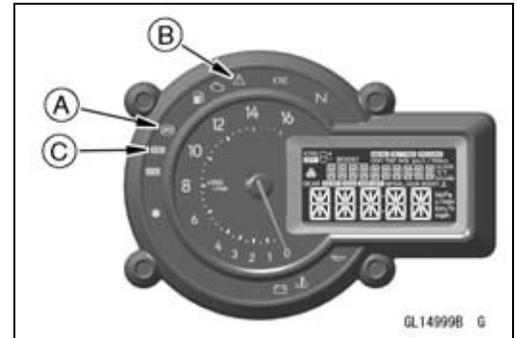
## KIBS

- The yellow ABS indicator light (LED) [A] and yellow warning indicator light (LED) [B]/white KIBS indicator light (LED) [C] may go on or blink if the tire pressure is incorrect, a non-recommended tire is installed, or the wheel is deformed. If the indicator light (LED) goes on or blinks, remedy the problem and clear the service code.

### **⚠ WARNING**

**Use of non-recommended tires may cause malfunctioning of KIBS and can lead to extended braking distance resulting in an accident causing serious injury or death. Always use recommended standard tires for this motorcycle.**

- The yellow ABS indicator light (LED) may come on if the engine is run with the motorcycle on a stand and the transmission in gear. If the indicator light comes on, just turn the ignition switch off, then clear service code B42, which indicates a “Faulty front wheel rotation sensor.”
- When the KIBS operates, the KIBS makes noise and the rider feels the reaction force on the brake lever and brake pedal. This is a normal condition. It informs the rider that the KIBS is operating normally.
- Service codes detected once by the KIBS hydraulic unit will be memorized in the KIBS hydraulic unit.
- A fully charged battery is a must for conducting reliable self-diagnosis. Test run the motorcycle at a speed of more than 20 km/h (12 mph) to see that the yellow ABS indicator light (LED) and yellow warning indicator light (LED)/white KIBS indicator light (LED) do not go on or blink. Finally, test run the motorcycle at a speed of more than 30 km/h (20 mph) and brake suddenly to see that the motorcycle stops without loss of steering control and the KIBS operates normally (The reaction force generated is felt in the brake lever and pedal.). This completes the final inspection.



## 12-34 BRAKES

### KIBS

#### **KIBS Troubleshooting Outline**

When an abnormality in the system occurs, the yellow ABS indicator light (LED) goes on and/or yellow warning indicator light (LED) goes on and white KIBS indicator light (LED) blinks to alert the rider. In addition, the nature of the fault is stored in the memory of the KIBS hydraulic unit and FI ECU, and when in the self-diagnosis mode, the service code [A] is displayed on the LCD by the "B" and the number of two digits. When repair has been done, the indicator lights (LED) go off and service codes are not displayed. But the service codes stored in memory of the KIBS hydraulic unit ECU and FI ECU are not erased to preserve the problem history.

When, due to a malfunction, the yellow ABS indicator light (LED), yellow warning indicator light (LED) and white KIBS indicator light (LED) remain lit or blink, get a thorough understanding of the background before starting the repair work. Ask the rider about the conditions [B] under which the problem occurred and try to determine the cause [C]. Do not rely solely on the KIBS and DFI self-diagnosis function, use common sense; check the brakes for proper braking power, and brake fluid level, search for leaks, etc.

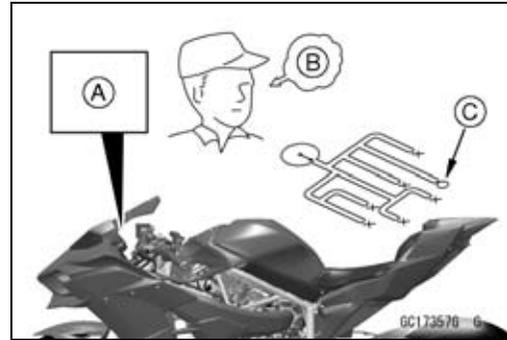
Even when the KIBS and DFI are operating normally, the yellow ABS indicator light (LED) goes on and/or yellow warning indicator light (LED) goes on and white KIBS indicator light (LED) blinks under the conditions listed below. Turn the ignition switch off to go off the indicator lights (LED).

- After continuous riding on a rough road.
- When the engine is started with the stand raised and the transmission engaged, and the rear wheel turns.
- When accelerating so abruptly that the front wheel leaves the ground.
- When the KIBS has been subjected to strong electrical interference.
- When tire pressure is abnormal. Adjust tire pressure.
- When a tire different in size from the standard size is being used. Replace with standard size.
- When the wheel is deformed. Replace the wheel.

Much of the KIBS troubleshooting work consists of confirming continuity of the wiring. The KIBS parts are assembled and adjusted by the manufacturer, so there is no need to disassemble or repair them. Replace the KIBS hydraulic unit.

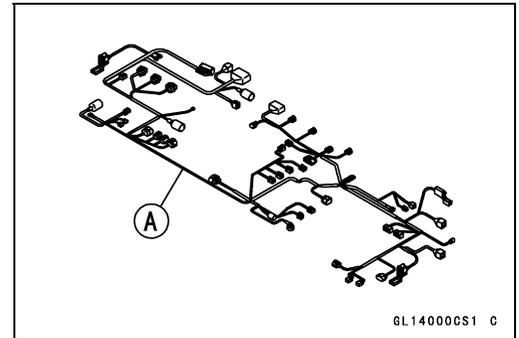
The basic troubleshooting procedures are listed below.

- Carry out pre-diagnosis inspections as a preliminary inspection.
- Determine the fault using the self-diagnosis function.
- Check wiring and connections from the KIBS hydraulic unit connector to the suspected faulty KIBS part, using a digital meter.



**KIBS**

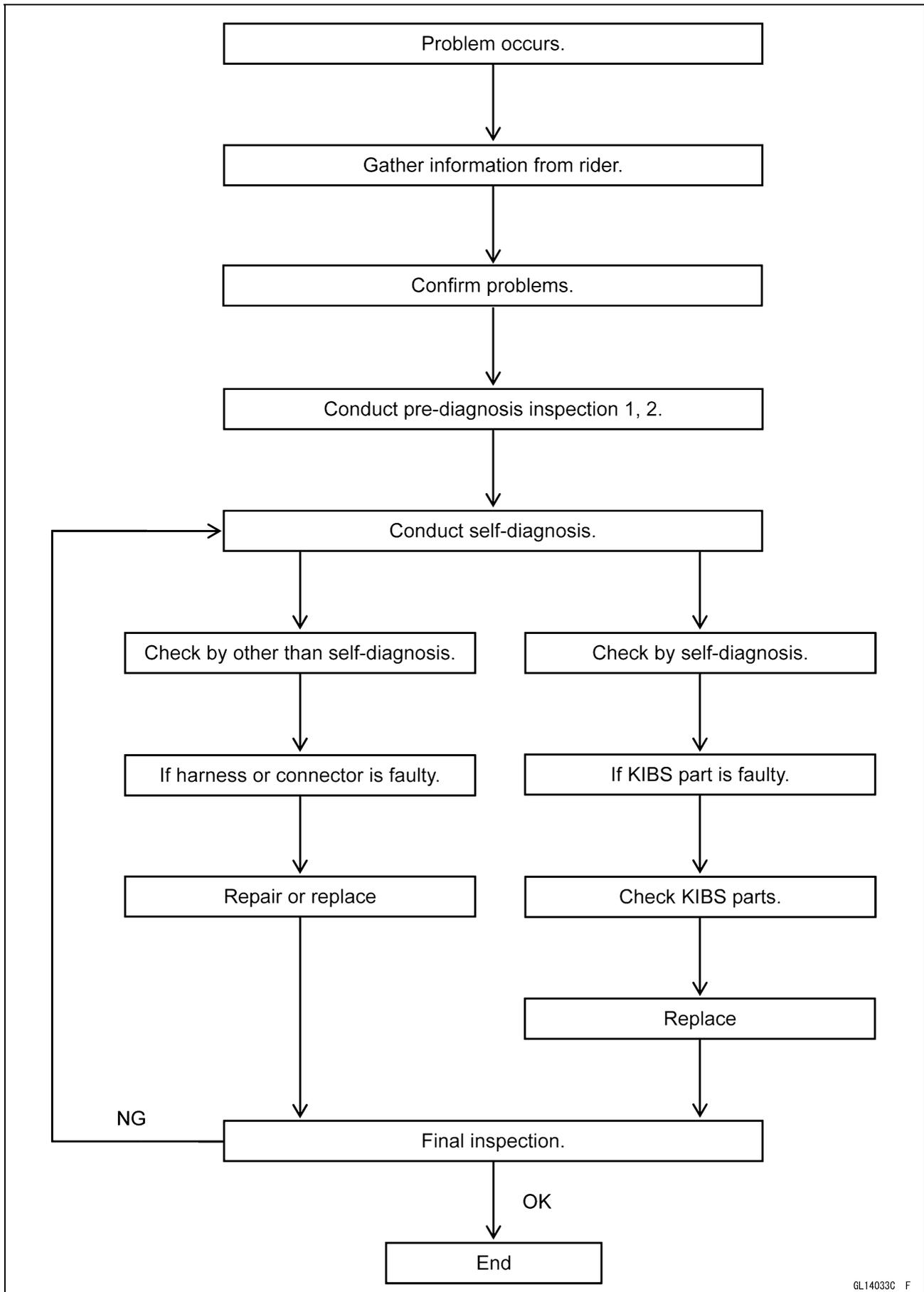
- Visually inspect the wiring for signs of burning or fraying.
- ★ If any wiring is poor, replace the damaged wiring.
- Pull each connector apart and inspect it for corrosion, dirt and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.
- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
- Connect the digital meter between the ends of the leads.
- ★ If the digital meter does not read about 0  $\Omega$ , the lead is defective. Replace the main harness [A] if necessary.
  
- Narrow down suspicious parts and close in on the faulty KIBS part by repeating the continuity tests.
- ★ If no abnormality is found in the wiring or connectors, the KIBS parts are the next likely suspects. Check each part one by one.
- ★ If an abnormality is found, replace the affected KIBS part.



# 12-36 BRAKES

## KIBS

### KIBS Diagnosis Flow Chart



---

**KIBS**


---

***Inquiries to Rider***

- Each rider reacts to problems in different ways, so it is important to confirm what kind of condition the rider is dissatisfied with.
- Try to find out exactly what problem occurs under exactly what conditions by asking the rider; knowing this information may help you reproduce the problem in the shop.
- The diagnosis sheet will help prevent you from overlooking any keys, so always use it.

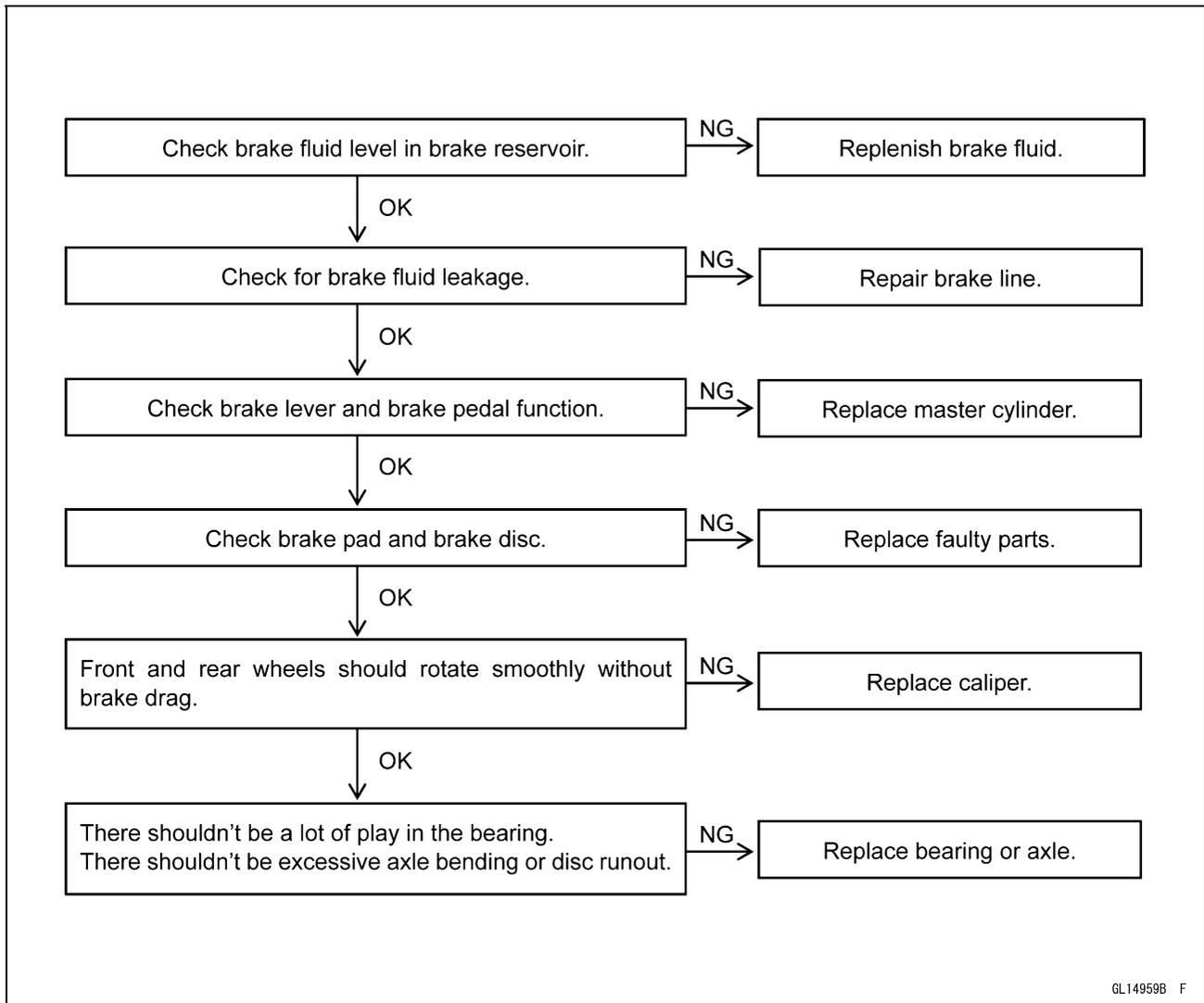
**Sample Diagnosis Sheet**

|                              |  |
|------------------------------|--|
| Rider name:                  | Model:   |
| Engine No.:                  | Frame No.:   |
| Date problem occurred:       | Frequency:   |
| Mileage:                     |  |
| Phenomenon                   | <input type="checkbox"/> Brake lever vibration or noise  |
|                              | <input type="checkbox"/> Pedal vibration or noise  |
|                              | <input type="checkbox"/> Indicator light blinks  |
|                              | <input type="checkbox"/> Indicator light remains lit up  |
|                              | <input type="checkbox"/> Braking distance too long   |
|                              | <input type="checkbox"/> Abnormal brake lever movement   |
|                              | <input type="checkbox"/> Abnormal pedal movement   |
|                              | <input type="checkbox"/> KIBS not working  |
| Engine conditions at problem | <input type="checkbox"/> KIBS works but indicator light doesn't light up   |
|                              | <input type="checkbox"/> KIBS operating too frequently   |
|                              | <input type="checkbox"/> At start-up <input type="checkbox"/> After starting <input type="checkbox"/> At 5 000 r/min (rpm) or more |
| Driving conditions           | <input type="checkbox"/> High-speed cornering  |
|                              | <input type="checkbox"/> Driving 10 km/h (6 mph) or above  |
|                              | <input type="checkbox"/> Driving below 10 km/h (6 mph)   |
|                              | <input type="checkbox"/> When stopping   |
|                              | <input type="checkbox"/> When turning  |
| Brake application            | <input type="checkbox"/> Gradual   |
|                              | <input type="checkbox"/> Abrupt  |
| Other conditions             | <input type="checkbox"/> Large brake lever stroke  |
|                              | <input type="checkbox"/> Large pedal stroke  |

# 12-38 BRAKES

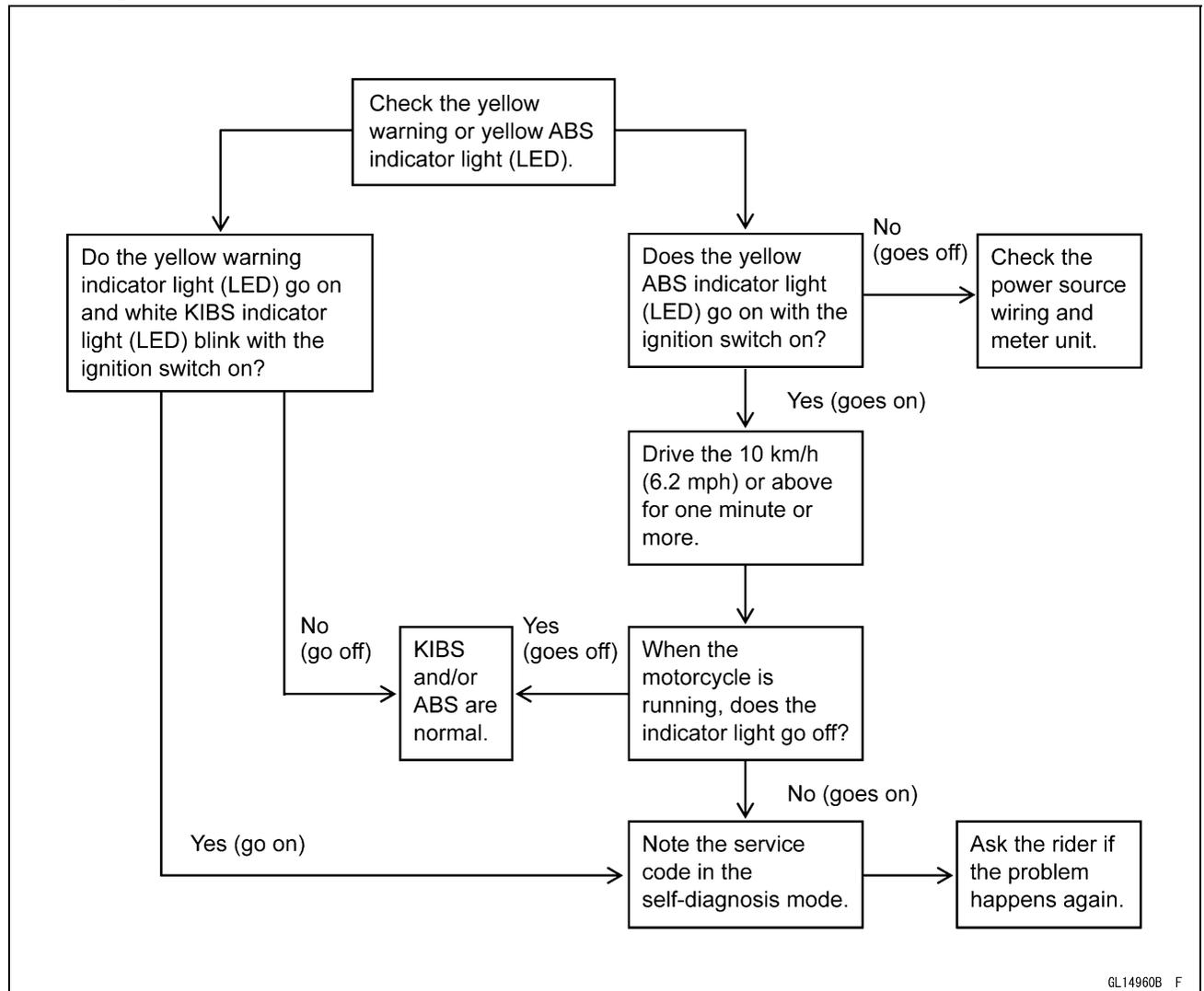
## KIBS

### Pre-Diagnosis Inspection 1



## KIBS

## Pre-Diagnosis Inspection 2

**Self-diagnosis Outline**

Refer to the Self-Diagnosis System chapter for the self-diagnosis or service code.

## 12-40 BRAKES

### KIBS

#### ABS and KIBS Indicator Lights (LED) Inspection

○ In this model, the yellow ABS indicator light (LED) [A], yellow warning indicator light (LED) [B] and white KIBS indicator light (LED) [C] go on or blink by the data sent from the KIBS hydraulic unit.

- Refer to the Meter Unit Inspection in the Electrical System chapter.

#### Yellow ABS Indicator Light (LED), Yellow Warning Indicator Light (LED) and White KIBS Indicator Light (LED) Function

| Status                                 | Brake Condition  | Yellow ABS Indicator Light (LED) | Yellow Warning Indicator Light (LED) | White KIBS Indicator Light (LED) |
|--|------------------|----------------------------------|--------------------------------------|----------------------------------|
| Normal                                 | KIBS             | Goes off                         | Goes off                             | Goes off                         |
| Engine information communication error | ABS              | Goes on                          | Goes on                              | Blinks                           |
| Battery voltage decreases              | Low voltage ABS* | Blinks                           | Goes off                             | Goes off                         |
| ABS error                              | Normal brake     | Goes on                          | Goes off                             | Goes off                         |

\*: The mode of "Low voltage ABS" controls ABS while reducing the load to the battery.

#### NOTE

○ When the yellow ABS indicator light (LED) is blinking, the ABS has been in the low voltage mode (insufficient battery voltage). When it is in the low voltage mode, the KIBS system does not function, but the ABS functions. To recover the KIBS system, charge the battery (see Refreshing Charge in the Electrical System chapter).

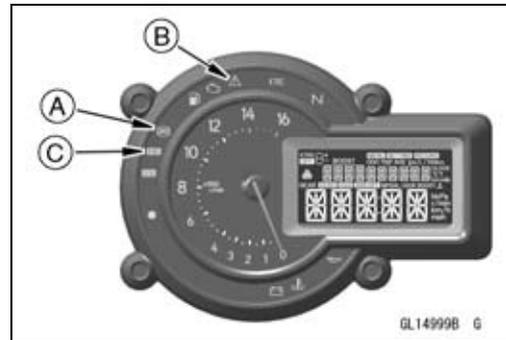
#### KIBS Hydraulic Unit Removal

##### NOTICE

The KIBS hydraulic unit [A] has been adjusted and set with precision at the factory. Therefore, it should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface.

Be careful not to get water or mud on the KIBS hydraulic unit.

- Drain the brake fluid from the front and rear brake lines.
- Drain the brake fluid through the bleed valve by pumping the brake lever and pedal.
- Remove:
  - Right Inner Cover (see Inner Cover Removal in the Frame chapter)
  - Right Fuel Tank Cover (see Fuel Tank Cover Removal in the Frame chapter)
  - Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)



## KIBS

- Clean the KIBS hydraulic unit.

**NOTICE**

Clean all fittings on the KIBS hydraulic unit and the rear master cylinder because dirt around the banjo bolts could contaminate the brake fluid in the line during removal/installation.

Spread over a shop towel around the KIBS hydraulic unit before removing the brake line so that brake fluid does not leak on the parts.

- Remove the crankshaft sensor lead connector from the bracket.
- Remove:
  - Brake Hose Banjo Bolts (L = 32.3 mm, 1.27 in.) [A]
  - Brake Hose Banjo Bolt (L = 20.8 mm, 0.82 in.) [B]

**NOTICE**

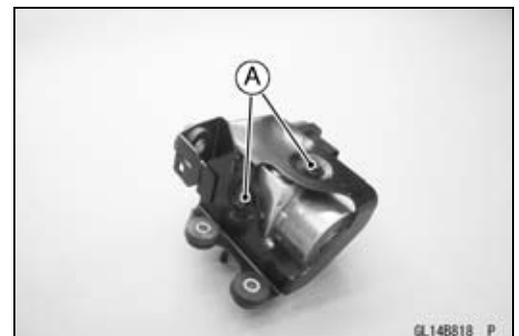
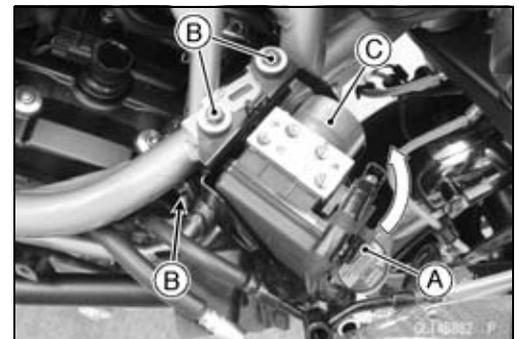
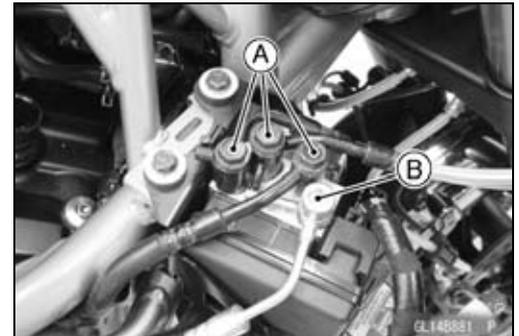
Brake fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.

- Pull the lever [A] to disconnect the KIBS hydraulic unit connector.
- Remove the bolts [B].
- Remove the KIBS hydraulic unit [C] together with the bracket.

- Remove the bolts [A] and bracket.

**NOTICE**

The KIBS hydraulic unit has been adjusted and set with precision at the factory. Do not try to disassemble and repair the KIBS hydraulic unit.

**KIBS Hydraulic Unit Installation****NOTICE**

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

## 12-42 BRAKES

### KIBS

- Install the KIBS hydraulic unit together with the bracket, and tighten the bolts.
- Pull the lever [A] to connect the KIBS hydraulic unit connector [B].
- Replace the washers that are on each side of pipe fitting with new ones.
- Install the brake hoses (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Tighten:

**Torque - Brake Hose Banjo Bolts: 24.5 N·m (2.50 kgf·m, 18.1 ft·lb)**

- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.
- Install the removed parts (see appropriate chapters).

#### ***KIBS Hydraulic Unit Inspection***

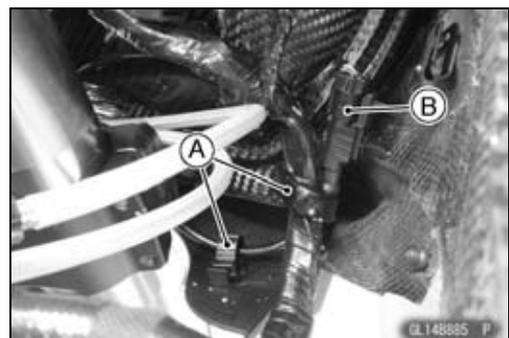
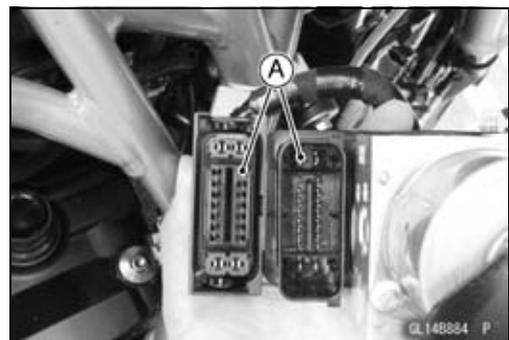
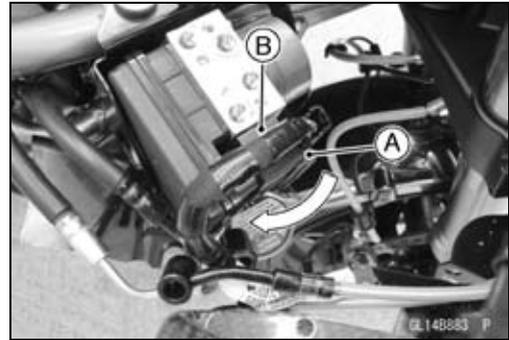
- Remove the KIBS hydraulic unit (see KIBS Hydraulic Unit Removal).
- Visually inspect the connector terminals [A].
- ★ Replace the KIBS hydraulic unit or main harness if either of the terminals are cracked, bent, or otherwise damaged.
- ★ If the KIBS hydraulic unit connector is clogged with mud or dust, blow it off with compressed air.
- Visually inspect the KIBS hydraulic unit.
- ★ Replace the KIBS hydraulic unit if any of them are cracked, or otherwise damaged.

#### ***Front Wheel Rotation Sensor Removal***

##### **NOTICE**

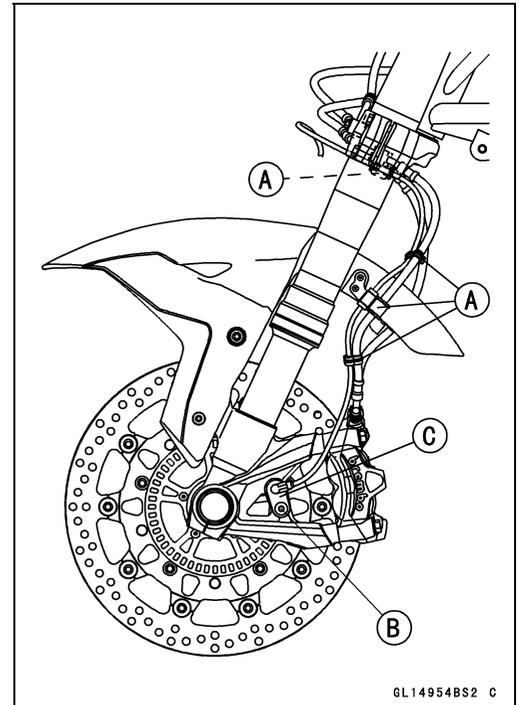
**The wheel rotation sensor should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface since the wheel rotation sensor is precision made. Be careful not to get water or mud on the wheel rotation sensor. Do not try to disassemble or repair the wheel rotation sensor.**

- Remove:
  - Right Middle Fairing (see Middle Fairing Removal in the Frame chapter)
- Open the clamps [A].
- Disconnect the front wheel rotation sensor lead connector [B].



## KIBS

- Clear the sensor lead from the clamps [A].
- Remove:
  - Bolt [B]
  - Front Wheel Rotation Sensor [C]

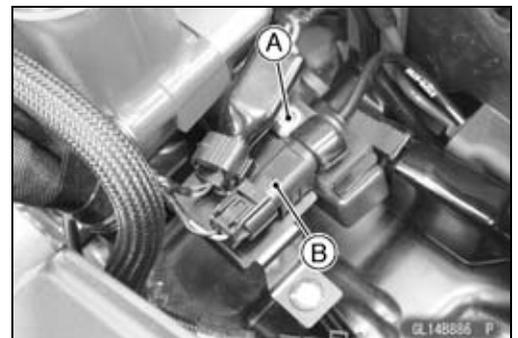
**Front Wheel Rotation Sensor Installation**

- Installation is the reverse of removal.
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

**Rear Wheel Rotation Sensor Removal****NOTICE**

The wheel rotation sensor should be handled carefully, never struck sharply, as with a hammer, or allowed to fall on a hard surface since the wheel rotation sensor is precision made. Be careful not to get water or mud on the wheel rotation sensor. Do not try to disassemble or repair the wheel rotation sensor.

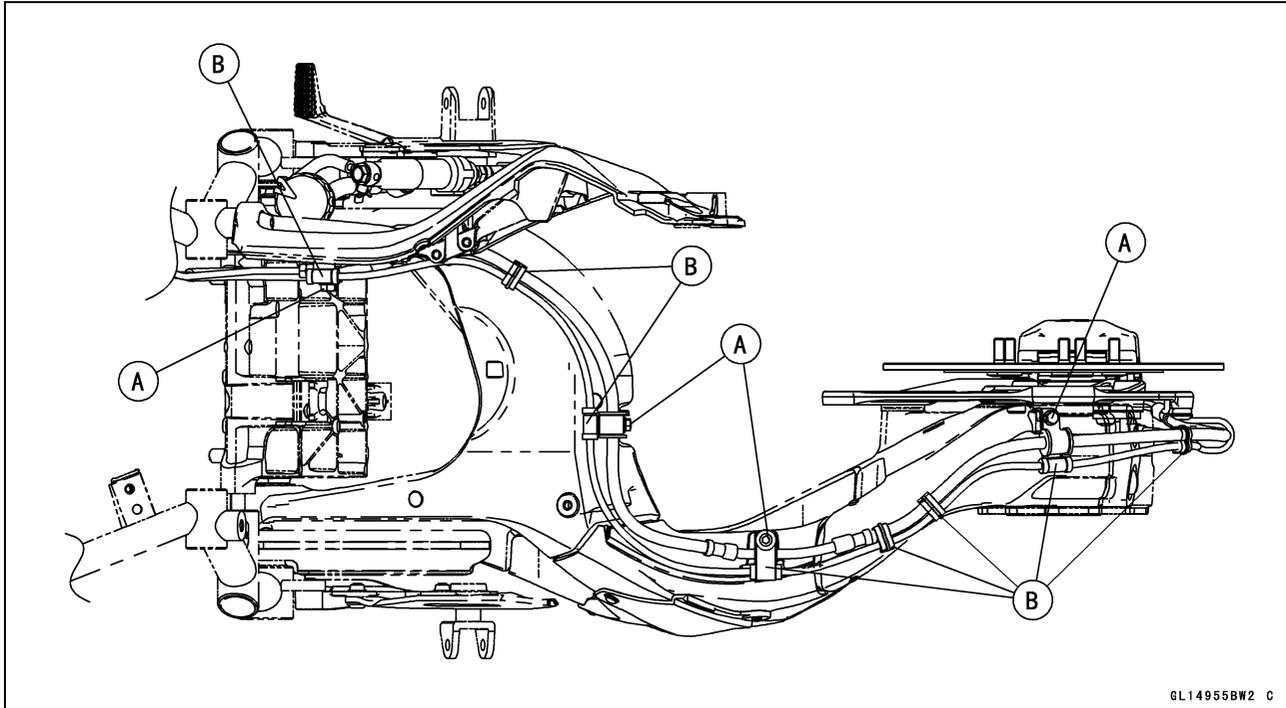
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Remove the bolt [A].
- Disconnect the rear wheel rotation sensor lead connector [B].



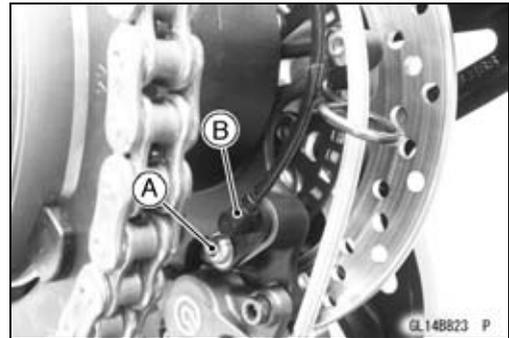
## 12-44 BRAKES

### KIBS

- Remove:
  - Mud Guard (see Mud Guard Removal in the Frame chapter)
  - Rear Fender (see Rear Fender Removal in the Frame chapter)
  - Bolts [A]
- Clear the sensor lead from the clamps [B].



- Remove:
  - Bolt [A]
  - Rear Wheel Rotation Sensor [B]
  - Spacer



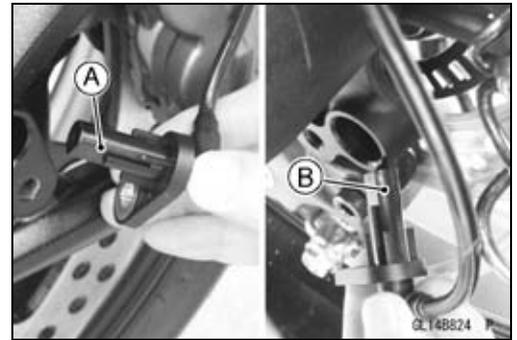
### **Rear Wheel Rotation Sensor Installation**

- Installation is the reverse of removal.
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## KIBS

**Wheel Rotation Sensor Inspection**

- Remove the front wheel rotation sensor [A] from the left front fork.
- Remove the rear wheel rotation sensor [B] from the rear caliper holder.
- Visually inspect the wheel rotation sensors.
- ★ Replace the wheel rotation sensor if it is cracked, bent, or otherwise damaged.

**Wheel Rotation Sensor Air Gap Inspection**

- Raise the front/rear wheel off the ground (see Front/Rear Wheel Removal in the Wheels/Tires chapter).
- Measure the air gap between the sensor and sensor rotor at several points by turning the wheel slowly.  
Thickness Gauge [A]

**Wheel Rotation Sensor Air Gap****Standard:**

|       |                                |
|-------|--------------------------------|
| Front | 0.4 ~ 1.6 mm (0.02 ~ 0.06 in.) |
| Rear  | 0.4 ~ 1.6 mm (0.02 ~ 0.06 in.) |

**NOTE**

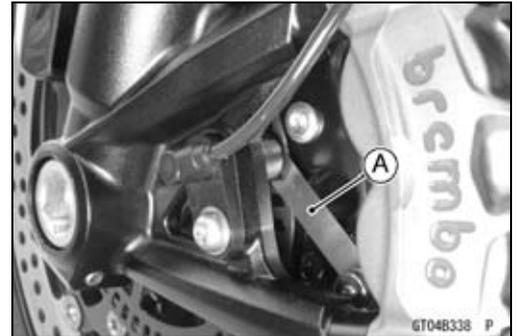
○ The front wheel rotation sensor air gap cannot be adjusted.

- ★ For front wheel rotation sensor, if the air gap is not within the specification, inspect the front hub bearing (see Front Hub Bearing Inspection in the Wheels/Tires chapter), sensor installation condition and sensor (see Wheel Rotation Sensor Inspection).
- ★ For rear wheel rotation sensor, if the air gap is not within the specification, adjust the air gap with the spacer.

**Adjustment Spacers**

| Thickness                | Part Number |
|--------------------------|-------------|
| 0.5 mm (0.020 in.)       | 92026-0789  |
| 1.0 mm (0.039 in.) (STD) | 92026-0790  |
| 1.5 mm (0.059 in.)       | 92026-0791  |

- ★ For rear wheel rotation sensor, if the air gap can not be adjusted by spacer, inspect the bearing housing bearing (see Bearing Housing Bearing Inspection in the Final Drive chapter), sensor installation condition and sensor (see Wheel Rotation Sensor Inspection).



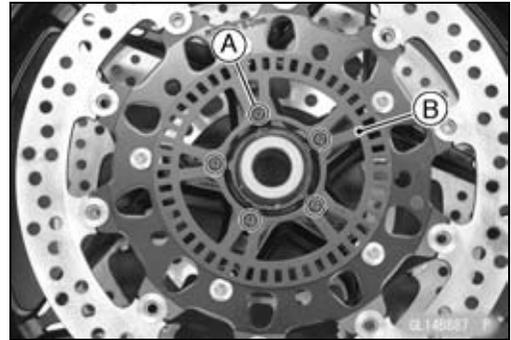
## 12-46 BRAKES

### KIBS

#### Wheel Rotation Sensor Rotor Inspection

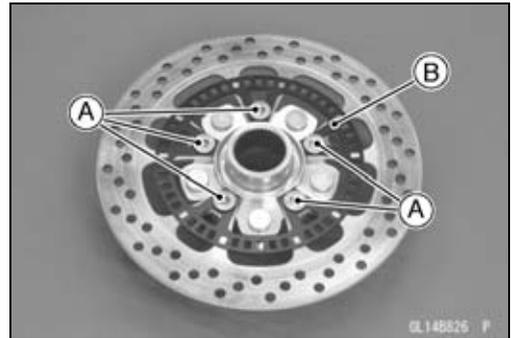
##### Front Wheel Rotation Sensor

- Remove:
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Bolts [A]
  - Front Wheel Rotation Sensor Rotor [B]

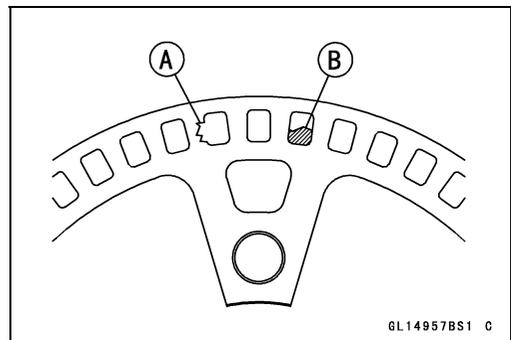
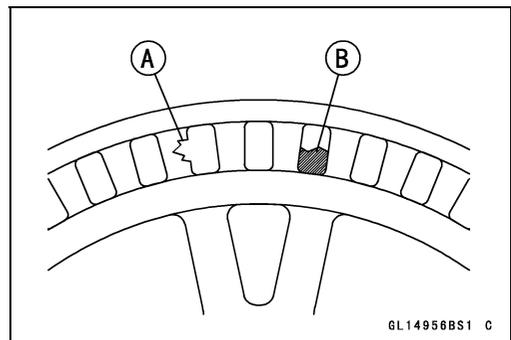


##### Rear Wheel Rotation Sensor

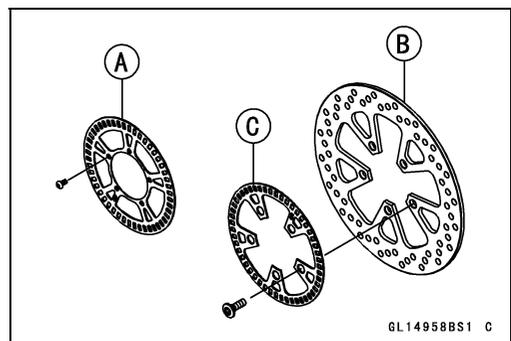
- Remove:
  - Rear Brake Disc Assembly (see Rear Brake Disc Removal)
  - Rear Brake Disc Mounting Bolts [A]
  - Rear Wheel Rotation Sensor Rotor [B]



- Visually inspect the wheel rotation sensor rotor.
  - ★ If the rotor is deformed or damaged (chipped teeth [A]), replace the sensor rotor with a new one.
  - ★ If there is iron or other magnetic deposits [B], remove the deposits.



- Install:
  - Front Wheel Rotation Sensor Rotor [A]
  - Rear Brake Disc [B]
  - Rear Wheel Rotation Sensor Rotor [C]
- Install the front wheel rotation sensor rotor so that chamfer side faces out.
- Install the rear wheel rotation sensor rotor so that the marked side faces brake disc side.
- Install the removed parts (see appropriate chapters).



#### KIBS Solenoid Valve Relay Fuse (15 A) Removal

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

---

## KIBS

---

### ***KIBS Motor Relay Fuse (25 A) Removal***

- Refer to the Fuse Box Fuse Removal in the Electrical System chapter.

### ***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 (see Fuse Installation in the Electrical System chapter).

### ***Fuse Inspection***

- Remove the fuses (see KIBS Solenoid Valve Relay Fuse (15 A)/KIBS Motor Relay Fuse (25 A) Removal).
- Refer to the Fuse Inspection in the Electrical System chapter.



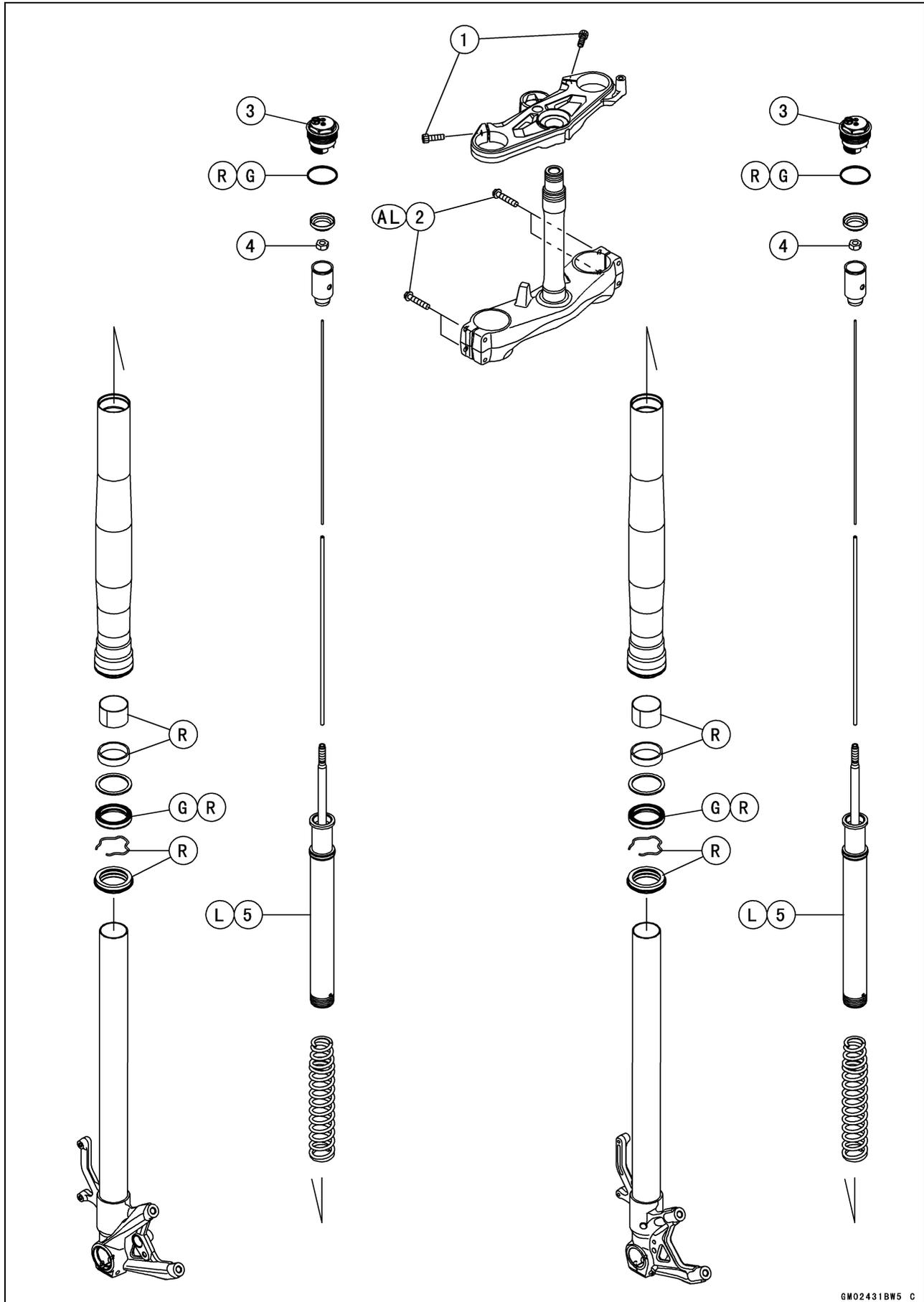
# Suspension

## Table of Contents

|   |       |
|---|-------|
| Exploded View .....                                 | 13-2  |
| Specifications .....                                | 13-6  |
| Special Tools .....                                 | 13-7  |
| Front Fork .....                                    | 13-9  |
| Rebound Damping Force Adjustment .....              | 13-9  |
| Compression Damping Force Adjustment .....          | 13-9  |
| Spring Preload Adjustment .....                     | 13-10 |
| Front Fork Removal (Each Fork Leg) .....            | 13-11 |
| Front Fork Installation (Each Fork Leg) .....       | 13-12 |
| Front Fork Oil Change .....                         | 13-13 |
| Front Fork Disassembly .....                        | 13-16 |
| Front Fork Assembly .....                           | 13-17 |
| Inner Tube Inspection .....                         | 13-18 |
| Dust Seal Inspection .....                          | 13-19 |
| Spring Tension Inspection .....                     | 13-19 |
| Rear Shock Absorber .....                           | 13-20 |
| Rebound Damping Force Adjustment .....              | 13-20 |
| Compression Damping Force Adjustment .....          | 13-20 |
| Spring Preload Adjustment .....                     | 13-21 |
| Rear Shock Absorber Removal .....                   | 13-21 |
| Rear Shock Absorber Installation .....              | 13-22 |
| Rear Shock Absorber Inspection .....                | 13-22 |
| Rear Shock Absorber Scrapping .....                 | 13-22 |
| Swingarm .....                                      | 13-23 |
| Swingarm Removal .....                              | 13-23 |
| Swingarm Installation .....                         | 13-23 |
| Swingarm Bearing Removal .....                      | 13-24 |
| Swingarm Bearing Installation .....                 | 13-25 |
| Swingarm Bearing, Sleeve Inspection .....           | 13-26 |
| Swingarm Bearing Lubrication .....                  | 13-26 |
| Chain Guide Inspection .....                        | 13-26 |
| Tie-Rod, Rocker Arm .....                           | 13-27 |
| Tie-Rod Removal .....                               | 13-27 |
| Tie-Rod Installation .....                          | 13-27 |
| Rocker Arm Removal .....                            | 13-28 |
| Rocker Arm Installation .....                       | 13-29 |
| Tie-Rod and Rocker Arm Bearing Removal .....        | 13-30 |
| Tie-Rod and Rocker Arm Bearing Installation .....   | 13-30 |
| Rocker Arm/Tie-Rod Bearing, Sleeve Inspection ..... | 13-31 |
| Rocker Arm/Tie-Rod Bearing Lubrication .....        | 13-32 |

# 13-2 SUSPENSION

## Exploded View



**Exploded View**

| No. | Fastener                     | Torque |       |       | Remarks |
|-----|------------------------------|--------|-------|-------|---------|
|     |                              | N·m    | kgf·m | ft·lb |         |
| 1   | Upper Front Fork Clamp Bolts | 20     | 2.0   | 15    |         |
| 2   | Lower Front Fork Clamp Bolts | 23     | 2.3   | 17    | AL      |
| 3   | Front Fork Top Plugs         | 22.5   | 2.29  | 16.6  |         |
| 4   | Piston Rod Nuts              | 15     | 1.5   | 11    |         |
| 5   | Cylinder Unit                | 60     | 6.1   | 44    | L       |

AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.

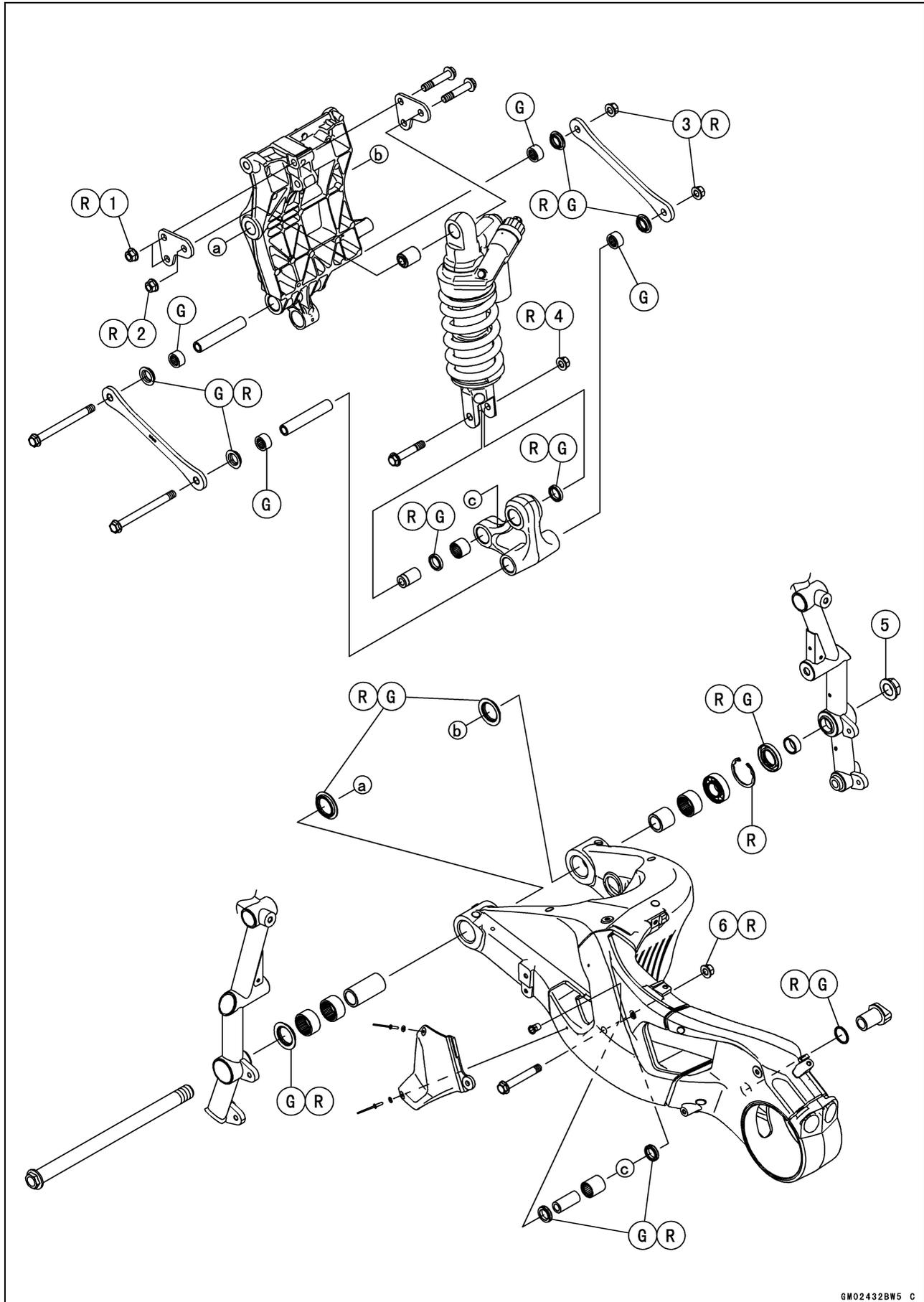
G: Apply grease.

L: Apply a non-permanent locking agent (TB1344N or equivalent).

R: Replacement Parts

# 13-4 SUSPENSION

## Exploded View



**Exploded View**

| No. | Fastener                         | Torque |       |       | Remarks |
|-----|----------------------------------|--------|-------|-------|---------|
|     |                                  | N·m    | kgf·m | ft·lb |         |
| 1   | Rear Shock Absorber Bracket Nuts | 34     | 3.5   | 25    | R       |
| 2   | Upper Rear Shock Absorber Nut    | 34     | 3.5   | 25    | R       |
| 3   | Tie-Rod Nuts                     | 34     | 3.5   | 25    | R       |
| 4   | Lower Rear Shock Absorber Nut    | 34     | 3.5   | 25    | R       |
| 5   | Swingarm Pivot Shaft Nut         | 108    | 11.0  | 79.7  |         |
| 6   | Rocker Arm Nut                   | 34     | 3.5   | 25    | R       |

G: Apply grease.

R: Replacement Parts

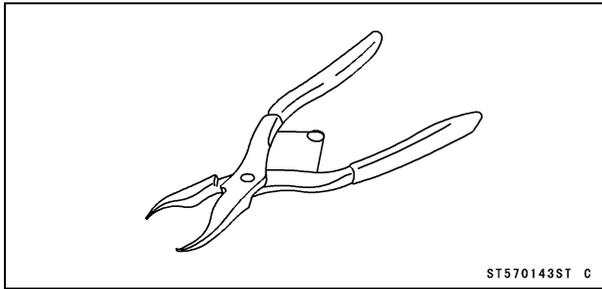
## 13-6 SUSPENSION

### Specifications

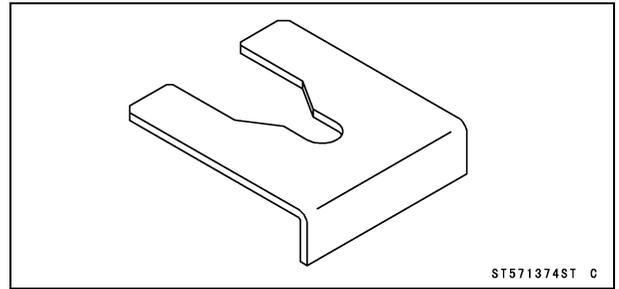
| Item   | Standard   |
|--|--|
| <b>Front Fork (Per One Unit)</b><br>Fork Inner Tube Diameter<br>Air Pressure<br>Rebound Damper Setting<br>Compression Damper Setting<br>Fork Spring Preload Setting<br>Suspension Oil<br>Amount:<br>Oil Level<br>Fork Spring Free Length | $\phi 43$ mm (1.7 in.)<br>Atmospheric pressure (Non-adjustable)<br>13 clicks from the fully clockwise position<br>(Usable Range: 0 $\longleftrightarrow$ 24 clicks)<br>10 clicks from the fully clockwise position<br>(Usable Range: 0 $\longleftrightarrow$ 24 clicks)<br>6 turns in from the fully counterclockwise position<br>(Usable Range: 0 $\longleftrightarrow$ 15 turns in)<br>Kawasaki KHL15-10 or equivalent<br>370 $\pm$ 4 mL (12.5 $\pm$ 0.135 US oz.) (after disassembly and completely dry)<br>Approx. 315 mL (10.7 US oz.) (when changing oil)<br>128 $\pm$ 2 mm (5.0 $\pm$ 0.08 in.) (fully compressed, without spring, below from the top of outer tube)<br>213 mm (8.39 in.)<br>(Service Limit: 209 mm (8.23 in.)) |
| <b>Rear Shock Absorber</b><br>Rebound Damper Setting<br>Compression Damper Setting:<br>High Speed<br>Low Speed<br>Spring Preload Setting<br>Gas Pressure   | 1 1/4 turns out from the fully clockwise position<br>(Usable Range: 0 $\longleftrightarrow$ 2 1/2 turns out)<br>1 turn out from the fully clockwise position<br>(Usable Range: 0 $\longleftrightarrow$ 2 turns out)<br>6 clicks from the fully clockwise position<br>(Usable Range: 0 $\longleftrightarrow$ 18 clicks)<br>9 clicks from the fully counterclockwise position<br>(Usable Range: 0 $\longleftrightarrow$ 37 clicks)<br>1 270 kPa (12.95 kgf/cm <sup>2</sup> , 184.1 psi, Non-adjustable)  |

Special Tools

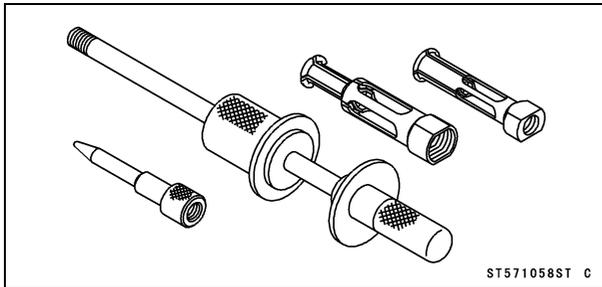
Inside Circlip Pliers:  
57001-143



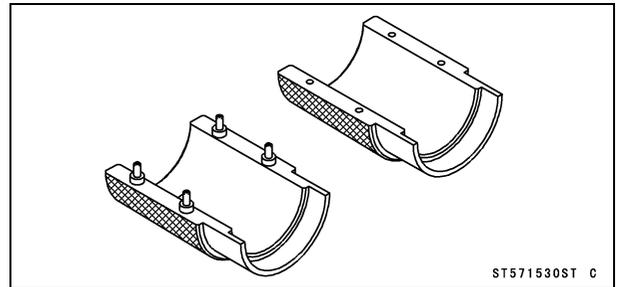
Fork Spring Stopper:  
57001-1374



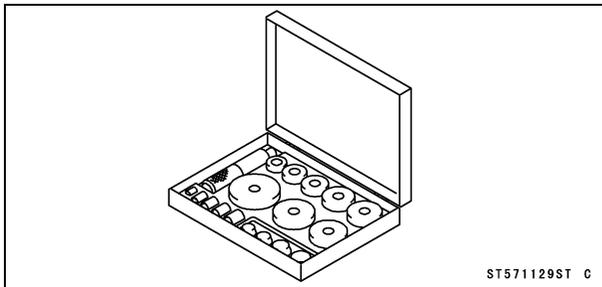
Oil Seal & Bearing Remover:  
57001-1058



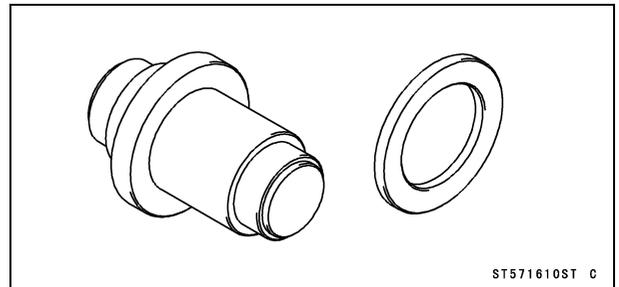
Fork Oil Seal Driver,  $\phi 43$ :  
57001-1530



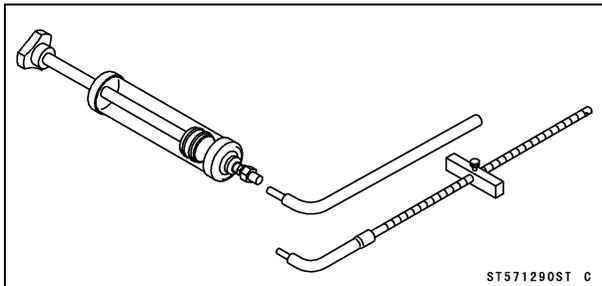
Bearing Driver Set:  
57001-1129



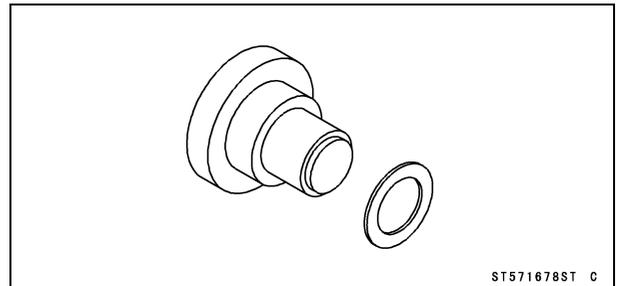
Needle Bearing Driver,  $\phi 28$ :  
57001-1610



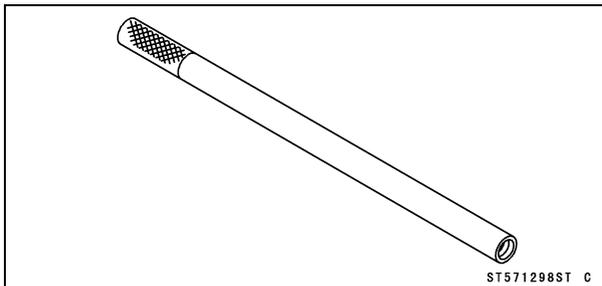
Fork Oil Level Gauge:  
57001-1290



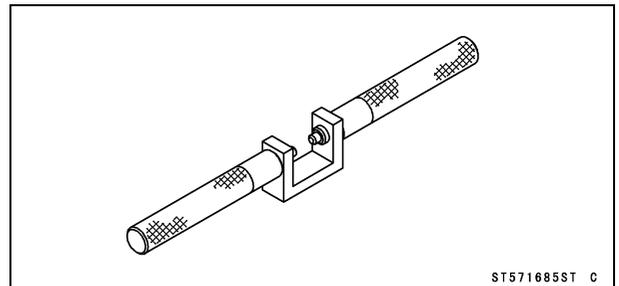
Needle Bearing Driver,  $\phi 20$  & Spacer,  $\phi 28$ :  
57001-1678



Fork Piston Rod Puller, M10  $\times$  1.0:  
57001-1298



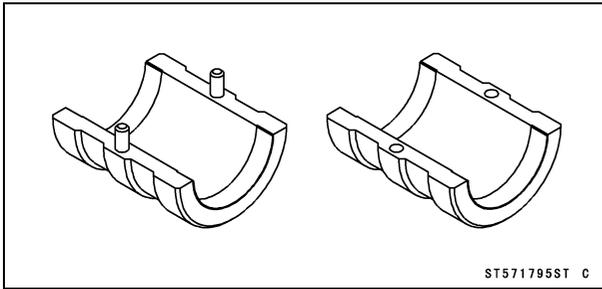
Fork Spring Compressor:  
57001-1685



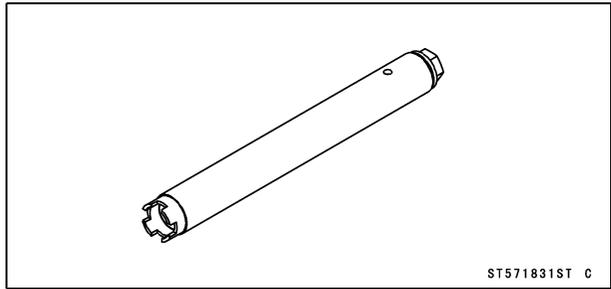
# 13-8 SUSPENSION

## Special Tools

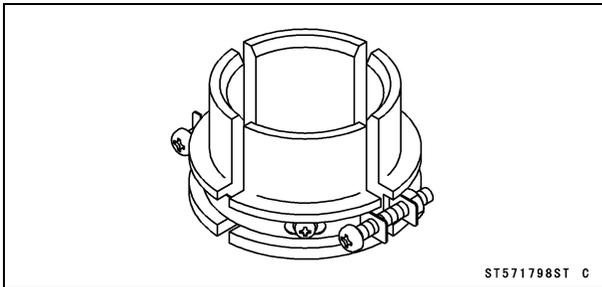
Fork Oil Seal Driver Weight,  $\phi 26 \sim \phi 46$ :  
57001-1795



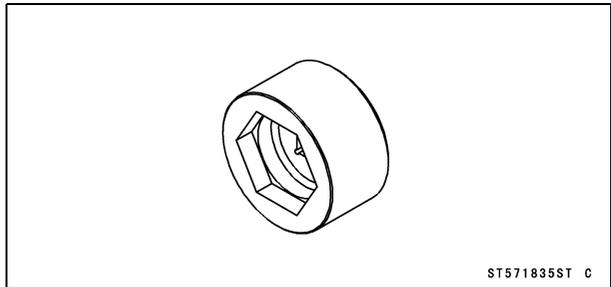
Fork Cylinder Wrench:  
57001-1831



Fork Oil Seal Driver Attachment,  $\phi 36 \sim \phi 46$ :  
57001-1798



Top Plug Wrench, 37 mm:  
57001-1835



**Front Fork**

**Rebound Damping Force Adjustment**

- To adjust the rebound damping force, turn the rebound damping force adjuster [A].
- The standard adjuster setting is the **13 clicks** from the fully clockwise position.

**⚠ WARNING**

**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result. Be sure the adjusters are set equally.**

- 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 |
|-------------------|---------------|---------|-------|------|-------|
| 24                | Weak          | Soft    | Light | Good | Low   |
| ↑                 | ↑             | ↑       | ↑     | ↑    | ↑     |
| ↓                 | ↓             | ↓       | ↓     | ↓    | ↓     |
| 0                 | Strong        | Hard    | Heavy | Bad  | High  |

**NOTICE**

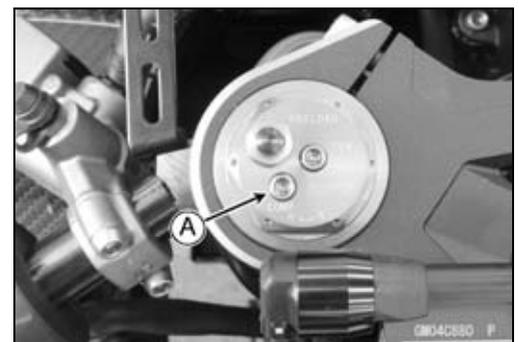
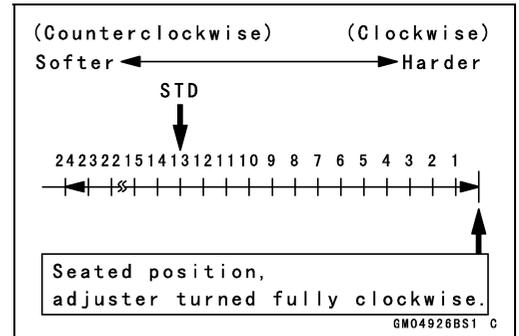
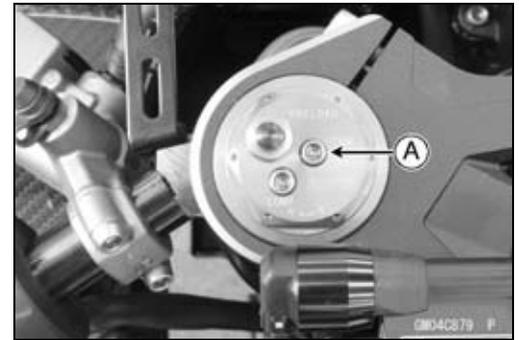
**Do not force the rebound damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.**

**Compression Damping Force Adjustment**

- To adjust the compression damping force, turn the compression damping force adjuster [A].
- The standard adjuster setting is the **10 clicks** from the fully clockwise position.

**⚠ WARNING**

**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result. Be sure the adjusters are set equally.**



# 13-10 SUSPENSION

## Front Fork

○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 |
|-------------------|---------------|---------|-------|------|-------|
| 24                | Weak          | Soft    | Light | Good | Low   |
| ↑                 | ↑             | ↑       | ↑     | ↑    | ↑     |
| ↓                 | ↓             | ↓       | ↓     | ↓    | ↓     |
| 0                 | Strong        | Hard    | Heavy | Bad  | High  |

### NOTICE

**Do not force the compression damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.**

### Spring Preload Adjustment

- To adjust the spring preload, turn the spring preload adjuster [A].
- The standard adjuster setting is the **6 turns in** from the fully counterclockwise position.

### ⚠ WARNING

**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result. Be sure the adjusters are set equally.**

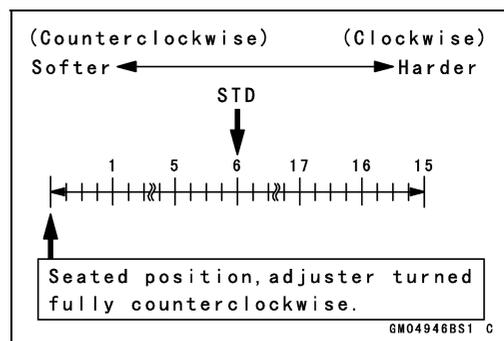
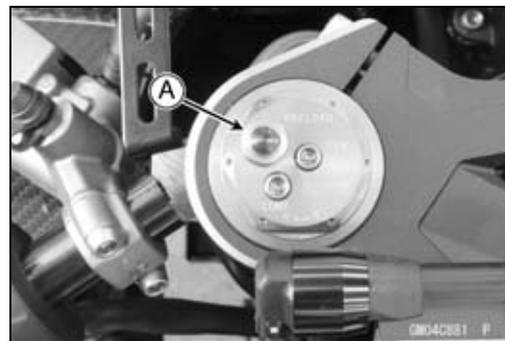
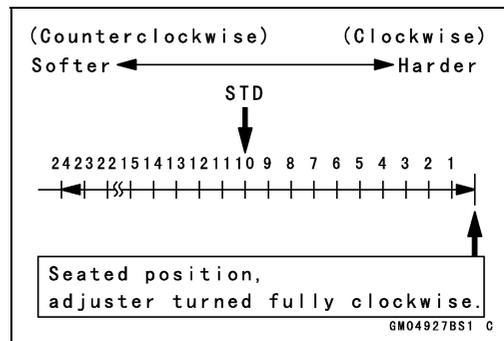
○The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

### Spring Action

| Adjuster Position | Damping Force | Setting | Load  | Road | Speed |
|-------------------|---------------|---------|-------|------|-------|
| 0                 | Weak          | Soft    | Light | Good | Low   |
| ↑                 | ↑             | ↑       | ↑     | ↑    | ↑     |
| ↓                 | ↓             | ↓       | ↓     | ↓    | ↓     |
| 15 turns in       | Strong        | Hard    | Heavy | Bad  | High  |

### NOTICE

**Do not force the spring preload adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.**



## Front Fork

### Front Fork Removal (Each Fork Leg)

- Adjust the damping force and spring preload to weakest point.
- ★ Loosen the front fork top plug [A] beforehand if the fork leg is to be disassembled.

**Special Tool - Top Plug Wrench, 37 mm: 57001-1835**

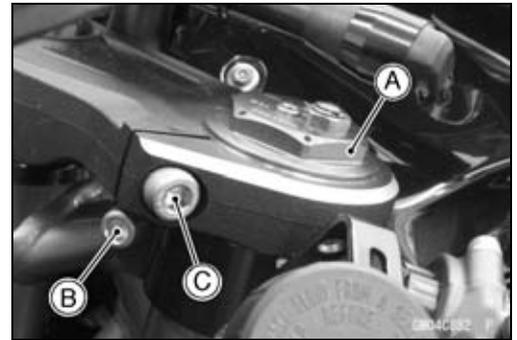
#### NOTE

○ Loosen the top plug after loosening the handlebar clamp bolt [B] and upper front fork clamp bolt [C].

- Remove:
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Front Fender (see Front Fender Removal in the Frame chapter)

#### Left Side

- Remove the clutch fluid reservoir bracket bolt [A] to free the clutch fluid reservoir [B].



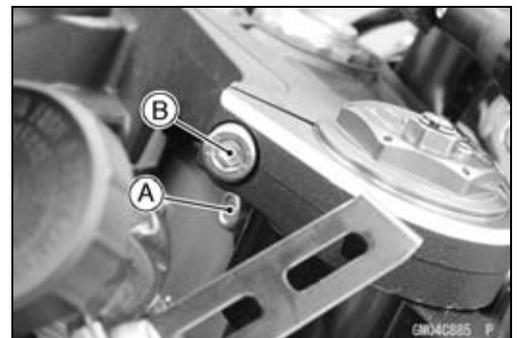
#### Right Side

- Remove the front brake fluid reservoir bracket bolt [A] to free the front brake fluid reservoir [B].



#### Each Fork Leg

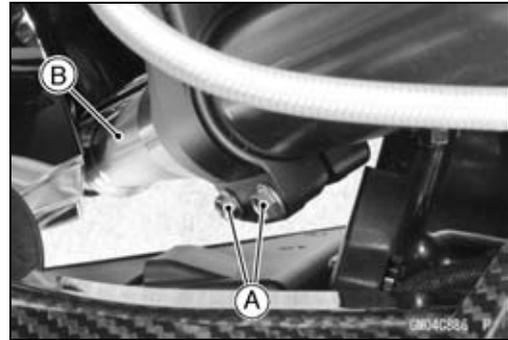
- Loosen:
  - Handlebar Clamp Bolt [A]
  - Upper Front Fork Clamp Bolt [B]



## 13-12 SUSPENSION

### Front Fork

- Loosen:
  - Lower Front Fork Clamp Bolts [A]
- With a twisting motion, work the fork leg [B] down and out.



#### **Front Fork Installation (Each Fork Leg)**

- Install the front fork so that the top end [A] of the outer tube protrudes from the steering stem head [B].
  - 0.5 mm (0.02 in.) [C]
- Tighten:
  - Torque - Lower Front Fork Clamp Bolts: 23 N·m (2.3 kgf·m, 17 ft·lb)**

#### **NOTE**

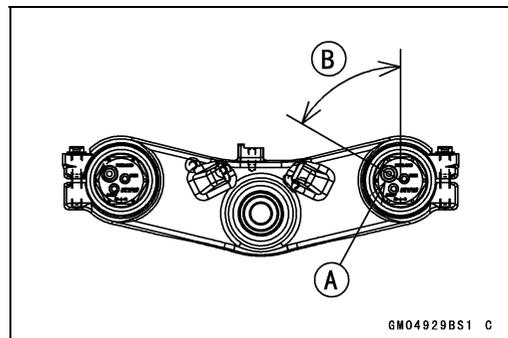
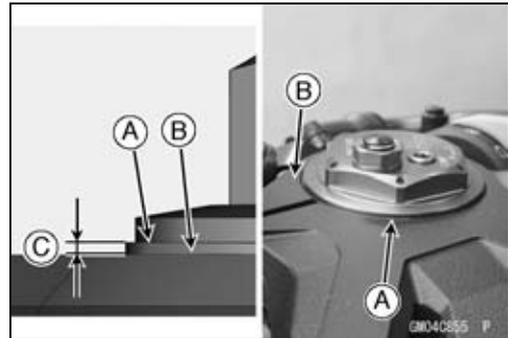
○ Tighten the two lower front fork clamp bolts alternately two times to ensure even tightening torque.

- Tighten the front fork top plug if necessary.
  - Special Tool - Top Plug Wrench, 37 mm: 57001-1835**
  - Torque - Front Fork Top Plug: 22.5 N·m (2.29 kgf·m, 16.6 ft·lb)**

#### **NOTE**

○ Tighten the front fork top plug before tightening the handlebar clamp bolt and upper front fork clamp bolt.

- Loosen the lower front fork clamp bolt, and adjust the front fork installing position.
  - Spring Preload Adjuster [A]
  - 60° [B]



- Tighten:
  - Torque - Lower Front Fork Clamp Bolts: 23 N·m (2.3 kgf·m, 17 ft·lb)**
  - 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)**

#### **NOTE**

○ Tighten the lower front fork clamp bolts first, next the upper front fork clamp bolts, last the handlebar clamp bolts.

○ Tighten the two lower front fork clamp bolts alternately two times to ensure even tightening torque.

## Front Fork

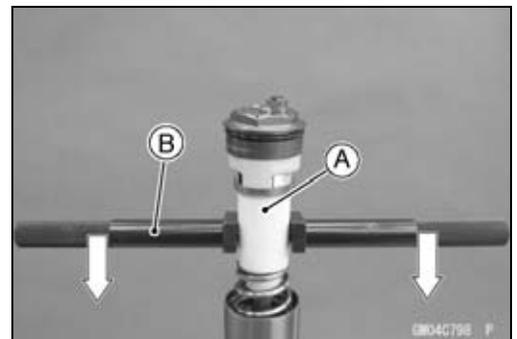
- Install the removed parts (see appropriate chapters).
- Adjust:
  - Spring Preload (see Spring Preload Adjustment)
  - Rebound Damping Force (see Rebound Damping Force Adjustment)
  - Compression Damping Force (see Compression Damping Force Adjustment)

### Front Fork Oil Change

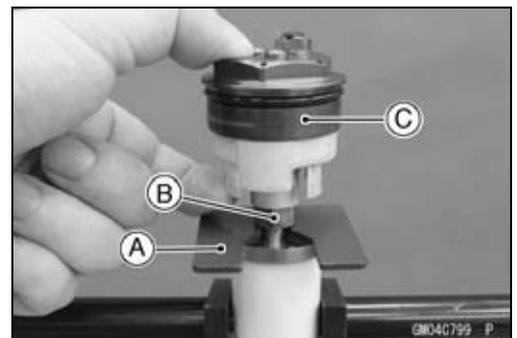
- Remove the steering damper mounting bolt (right side) to free the electronic steering damper (see Electronic Steering Damper Removal in the Steering chapter).
- Put a clean cloth under the electronic steering damper.
- Remove the clutch or front brake fluid reservoir bracket bolt to free the clutch or front brake fluid reservoir.
- Loosen the handlebar clamp bolt and upper front fork clamp bolt (see Front Fork Removal (Each Fork Leg)).
- Using the top plug wrench [A], loosen the top plug.
  - Special Tool - Top Plug Wrench, 37 mm: 57001-1835**
- Remove the front fork (see Front Fork Removal (Each Fork Leg)).



- Hold the inner tube lower end in a vise.
- Holding the spacer [A] with the fork spring compressor [B], compress the fork spring.
  - Special Tool - Fork Spring Compressor: 57001-1685**



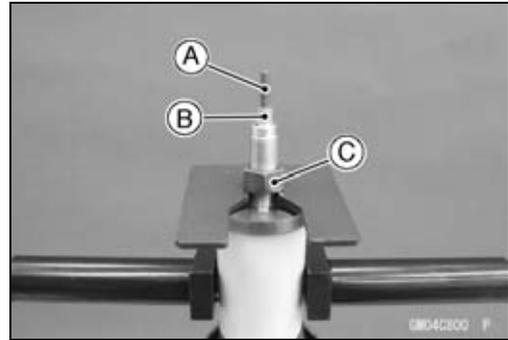
- Insert the fork spring stopper [A] under the piston rod nut [B].
  - Special Tool - Fork Spring Stopper: 57001-1374**
- Loosen the piston rod nut and remove the top plug assembly [C].



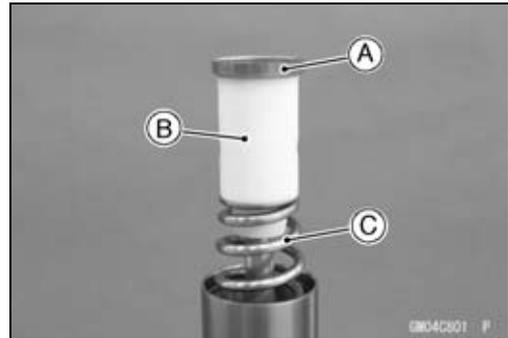
# 13-14 SUSPENSION

## Front Fork

- Remove:
  - Rebound Damping Adjuster Rod (Inside) [A]
  - Compression Damping Adjuster Rod (Outside) [B]
  - Piston Rod Nut [C]

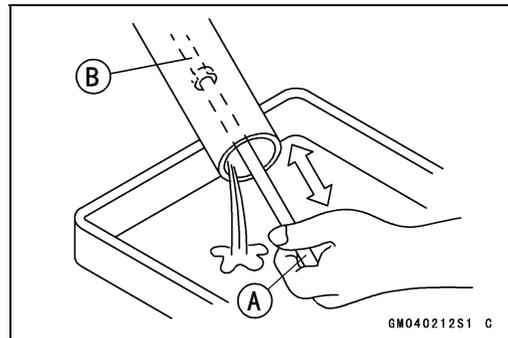


- Remove:
  - Special Tools
  - Guide [A]
  - Spacer [B]
  - Fork Spring [C]



- Drain the fork oil into a suitable container.
- Using the piston rod puller [A], pump the piston rod [B] up and down at least ten times to expel the oil from the fork.

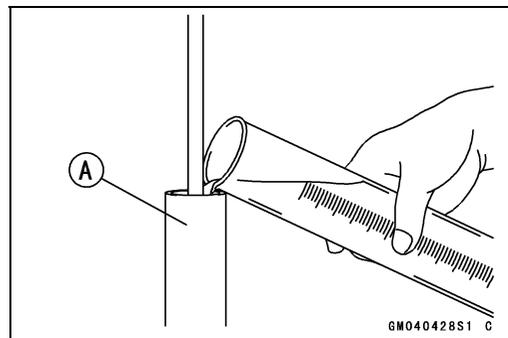
**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001-1298**



- 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.
- Pour the fork oil to near the top end of the inner tube.

**Suspension Oil - KHL15-10 (1 L): 44091-0004**  
**KHL15-10 (4 L): 44091-0013**

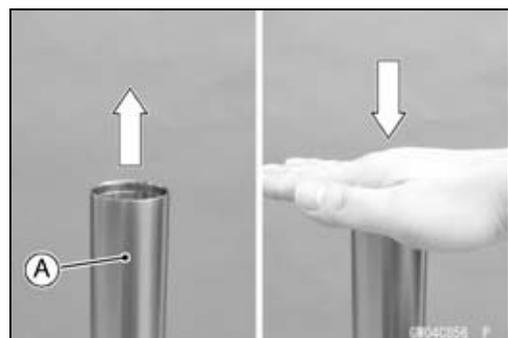
**Amount (Per Side):**  
**When changing oil: Approx. 315 mL (10.7 US oz.)**  
**After disassembly and completely dry:**  
**370 ±4 mL (12.5 ±0.135 US oz.)**



- Remove the piston rod puller.
- Raise the outer tube [A] about 130 mm (5.12 in.), and press the outer tube down slowly while covering the top end of the outer tube with a hand.
- Take the hand off slowly, and raise the outer tube again.
- Repeat the above procedure 2 ~ 3 times.

### NOTE

○ Do not lift the outer tube 230 mm (9.06 in.) or more. The fork oil may spill out from the hole of the inner tube.

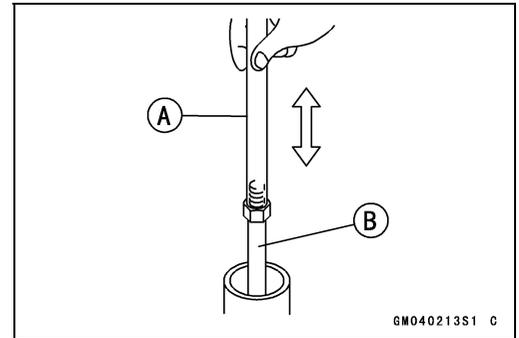


**Front Fork**

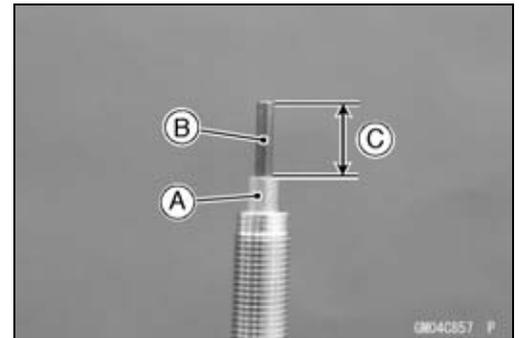
- Using the piston rod puller [A], move the piston rod [B] up and down more than ten times in order to expel all the air from the fork oil.

**Special Tool - Fork Piston Rod Puller, M10 × 1.0: 57001-1298**

- Remove the piston rod puller.



- Install:
  - Compression Damping Adjuster Rod (Outside) [A]
  - Rebound Damping Adjuster Rod (Inside) [B]
- Check that the length of rebound damping adjuster rod is about 12.6 mm (0.50 in.) [C].
- ★ If the length is not correct, reinstall the compression damping adjuster rod and rebound damping adjuster rod.



- Wait until the oil level settles.
- With the fork fully compressed, insert a tape measure or rod into the piston rod guide case [A], and measure the distance [B] from the top [C] of the outer tube [D] to the oil.

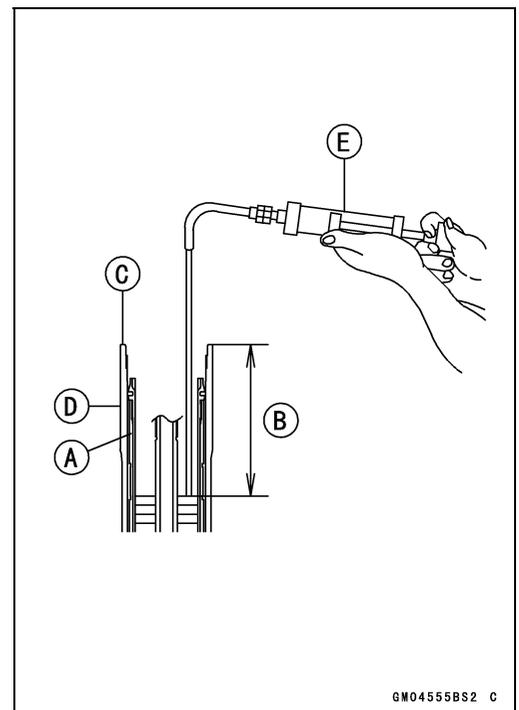
**Oil Level (fully compressed)**  
**Standard: 128 ±2 mm (5.0 ±0.08 in.)**

**NOTE**

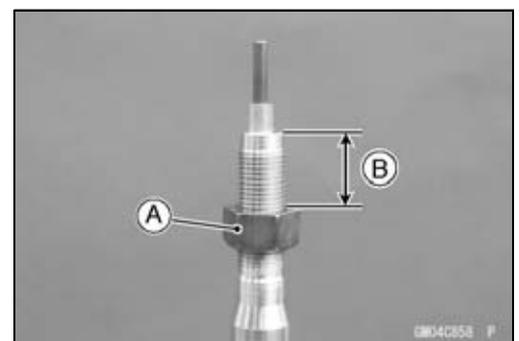
○ Fork oil level may also be measured using the fork oil level gauge [E].

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

- 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.



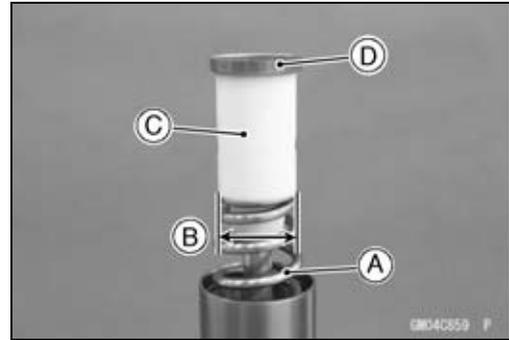
- Install the piston rod nut [A] so that the length from the rod end threads is 15 mm (0.59 in.) [B] or more.



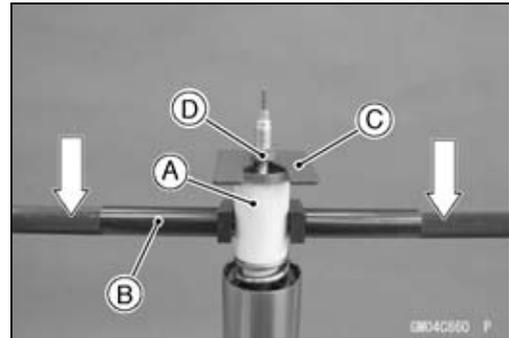
## 13-16 SUSPENSION

### Front Fork

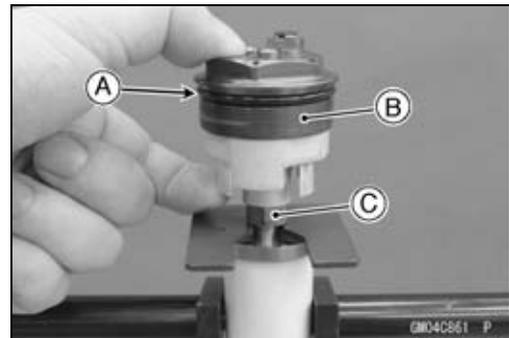
- Install the fork spring [A] with the smaller end [B] facing upward.
- Install:
  - Spacer [C]
  - Guide [D]



- Holding the spacer [A] with the fork spring compressor [B], compress the fork spring.
- **Special Tool - Fork Spring Compressor: 57001-1685**
- Insert the fork spring stopper [C] under the piston rod nut [D].
- **Special Tool - Fork Spring Stopper: 57001-1374**



- Replace the O-ring [A] on the top plug with a new one.
- Apply grease to the O-ring.
- Screw in the top plug [B] until it stops onto the piston rod.
- Holding the top plug, tighten the piston rod nut [C] against the top plug.
- **Torque - Piston Rod Nut: 15 N·m (1.5 kgf·m, 11 ft·lb)**
- Remove the special tools.
- Raise the outer tube and screw the top plug into it.
- Install the front fork (see Front Fork Installation).

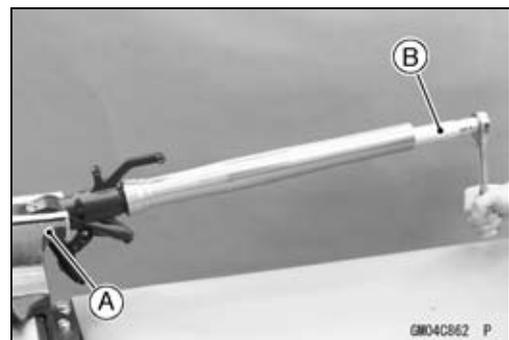


#### NOTE

○After installing the front fork, adjust the spring preload and damping force correctly.

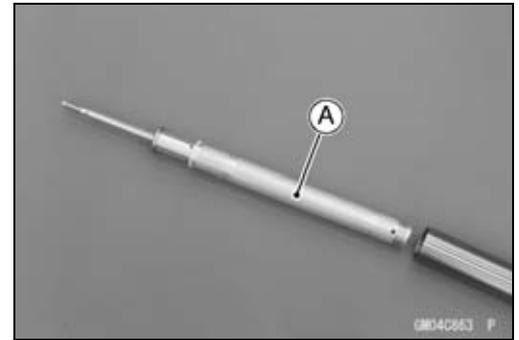
#### Front Fork Disassembly

- Remove the front fork (see Front Fork Removal).
- Drain the fork oil (see Front Fork Oil Change).
- Hold the axle portion of the front fork in a vise [A].
- Unscrew the cylinder unit by using the fork cylinder wrench [B].
- **Special Tool - Fork Cylinder Wrench: 57001-1831**



## Front Fork

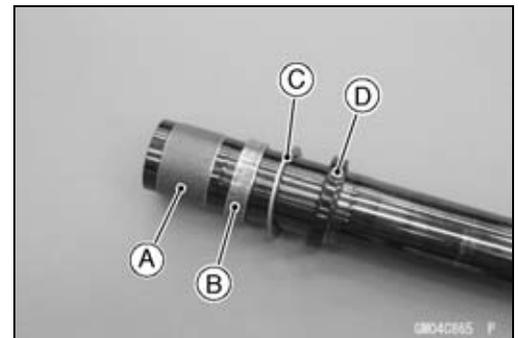
- Remove the cylinder unit [A] from the inner tube.
- Do not disassemble the cylinder unit.



- Remove the dust seal [A] from the outer tube.
- Remove the circlip [B].
- Separate the outer tube from the inner tube.

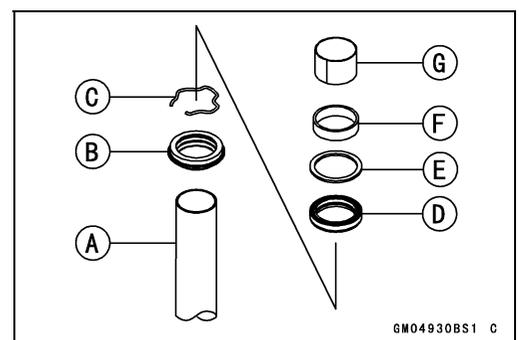


- Remove the following parts from the inner tube.
  - Slide Bushing [A]
  - Guide Bushing [B]
  - Washer [C]
  - Oil Seal [D]
  - Circlip
  - Dust Seal



### Front Fork Assembly

- Replace the following parts with new ones.
  - Slide Bushing
  - Guide Bushing
  - Oil Seal
  - Circlip
  - Dust Seal
- Apply grease to the oil seal lips.
- Install the following parts to the inner tube [A].
  - Dust Seal [B]
  - Circlip [C]
  - Oil Seal [D]
  - Washer [E]
  - Guide Bushing [F]
  - Slide Bushing [G]



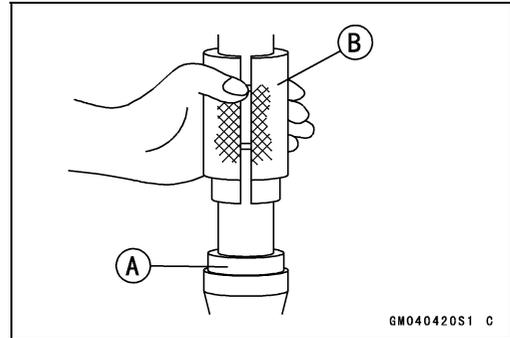
# 13-18 SUSPENSION

## Front Fork

- 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 Tools - Fork Oil Seal Driver,  $\phi 43$ : 57001-1530**  
**or Fork Oil Seal Driver Weight,  $\phi 26 \sim \phi 46$ : 57001-1795**  
**Fork Oil Seal Driver Attachment,  $\phi 36 \sim \phi 46$ : 57001-1798**

- Install the circlip and dust seal.
- Apply a non-permanent locking agent (TB1344N or equivalent) to the threads of the cylinder unit [A].
- Install the cylinder unit into the inner tube.

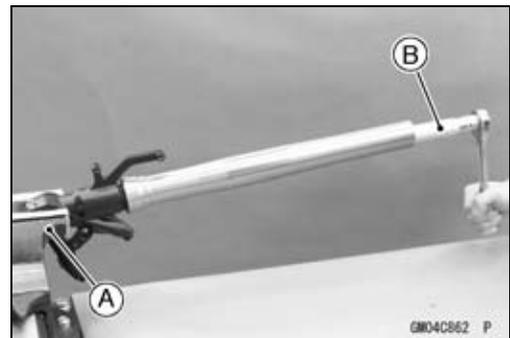


- Hold the axle portion of the front fork in a vise [A].
- Tighten the cylinder unit by using the fork cylinder wrench [B].

**Special Tool - Fork Cylinder Wrench: 57001-1831**

**Torque - Cylinder Unit: 60 N·m (6.1 kgf·m, 44 ft·lb)**

- Pour in the specified type of oil (see Front Fork Oil Change).



### Inner Tube Inspection

- Visually inspect the inner tube [A].
- ★ If there is any damage, replace the inner tube. Since damage to the inner tube damages the oil seal and dust seal, replace the oil seal and dust seal whenever the inner tube is replaced.

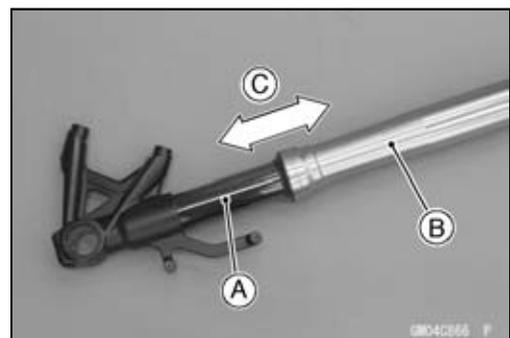
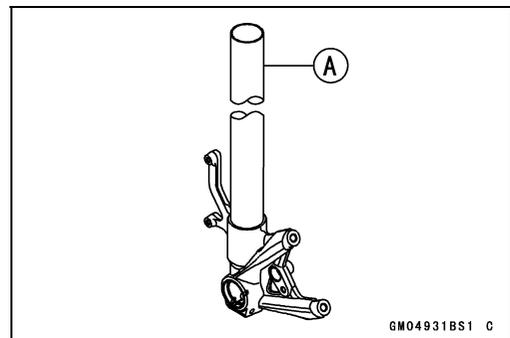
### NOTICE

**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

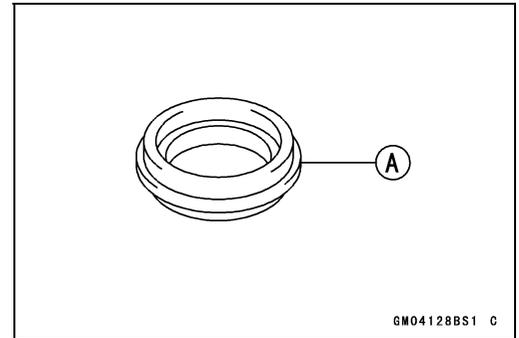
**A straightened inner or outer fork tube may fall in use, possibly causing an accident resulting in serious injury or death. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.**



## Front Fork

### **Dust Seal Inspection**

- Inspect the dust seals [A] for any signs of deterioration or damage.
- ★ Replace it if necessary.



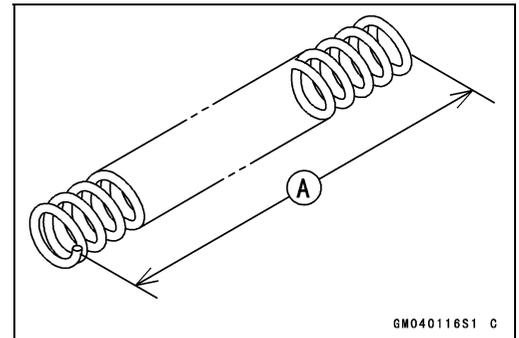
### **Spring Tension Inspection**

- 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:** 213 mm (8.39 in.)

**Service Limit:** 209 mm (8.23 in.)



# 13-20 SUSPENSION

## Rear Shock Absorber

### Rebound Damping Force Adjustment

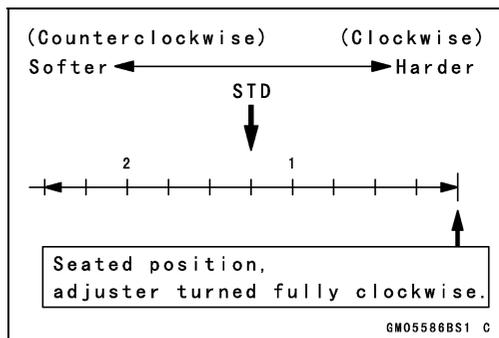
- To adjust the rebound damping force, turn the rebound damping force adjuster [A] to the desired position.
- The standard adjuster setting is the **1 1/4 turns out** from the fully clockwise position.

### 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  |

### NOTICE

**Do not force the rebound damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.**

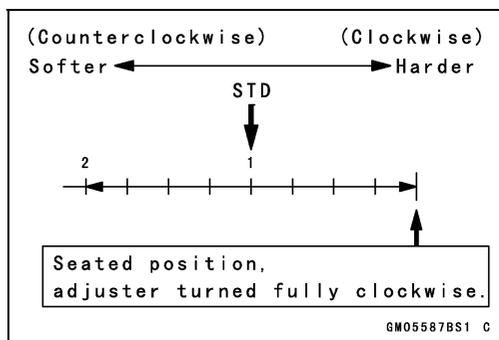
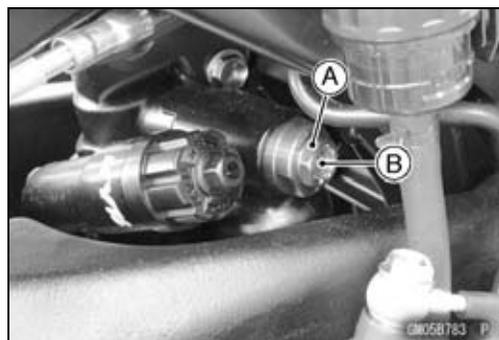


### Compression Damping Force Adjustment

- There are two adjustments you can make to the compression damping force.
  - High Speed Compression Damping Adjuster [A]
  - Low Speed Compression Damping Adjuster [B]

### NOTICE

**Do not force the compression damping adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.**



- To adjust the high speed compression damping force, turn the outside damping adjuster with a wrench to the desired position.
- The standard adjuster setting is the **1 turn out** from the fully clockwise position.

### High Speed Compression Damping Force Adjustment

| Adjuster Position | Damping Force | Setting | Load  | Road |
|-------------------|---------------|---------|-------|------|
| 2 turns out       | Weak          | Soft    | Light | Good |
| ↑                 | ↑             | ↑       | ↑     | ↑    |
| ↓                 | ↓             | ↓       | ↓     | ↓    |
| 0                 | Strong        | Hard    | Heavy | Bad  |

### NOTE

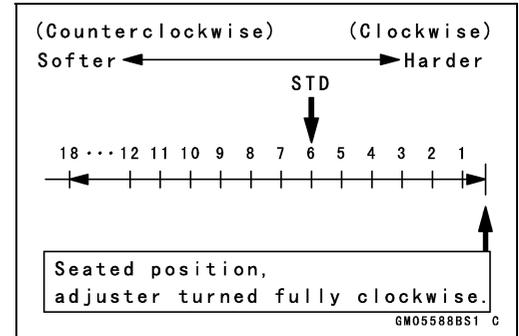
- When turning the high speed compression damping force adjuster (outside), the low speed compression damping force adjuster (inside) turns too. But, the low speed compression damping force (setting position) does not change.

## Rear Shock Absorber

- To adjust the low speed compression damping force, turn the inside damping adjuster with a flat tip screwdriver to the desired position.
- The standard adjuster setting is the **6 clicks** from the fully clockwise position.

### Low Speed Compression Damping Force Adjustment

| Adjuster Position | Damping Force | Setting | Load  | Road |
|-------------------|---------------|---------|-------|------|
| 18 clicks         | Weak          | Soft    | Light | Good |
| ↑                 | ↑             | ↑       | ↑     | ↑    |
| ↓                 | ↓             | ↓       | ↓     | ↓    |
| 0                 | Strong        | Hard    | Heavy | Bad  |

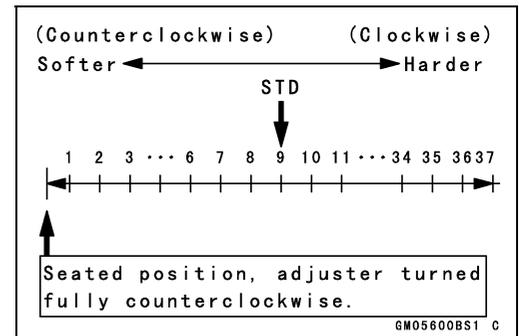


### Spring Preload Adjustment

- To adjust the spring preload, turn in the adjuster [A] until you feel a click to the desired position.
- The standard adjuster setting is the **9 clicks** from the fully counterclockwise position.
- ★ If the spring action feels too soft, adjust it.

### Spring Preload Adjustment

| Adjuster Position | Damping Force | Setting | Load  | Road | Speed |
|-------------------|---------------|---------|-------|------|-------|
| 0                 | Weak          | Soft    | Light | Good | Low   |
| ↑                 | ↑             | ↑       | ↑     | ↑    | ↑     |
| ↓                 | ↓             | ↓       | ↓     | ↓    | ↓     |
| 37 clicks         | Strong        | Hard    | Heavy | Bad  | High  |

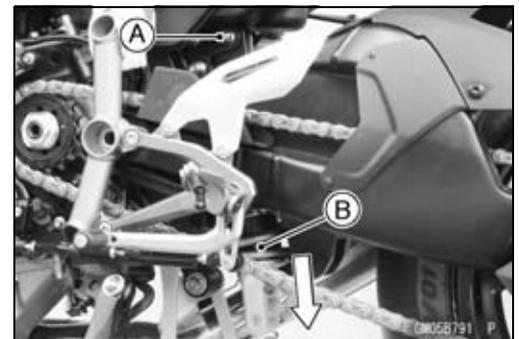


### NOTICE

**Do not force the spring preload adjuster beyond the fully seated position, or the adjusting mechanism may be damaged.**

### Rear Shock Absorber Removal

- Loosen:  
Upper Rear Shock Absorber Bolt [A] and Nut
- Remove:  
Rocker Arm (see Rocker Arm Removal)  
Upper Rear Shock Absorber Bolt and Nut
- Remove the rear shock absorber [B] downward.



## 13-22 SUSPENSION

### Rear Shock Absorber

#### NOTICE

Do not loosen the reservoir tank bolt [A]. The shock absorber could be damaged.



#### Rear Shock Absorber Installation

- Replace the rear shock absorber nuts with new ones.
- Install the rear shock absorber, bolts and nuts temporarily.
- Face the gas reservoir rightward.
- Install the rocker arm and tighten the nuts and bolts (see Rocker Arm Installation).

#### Rear Shock Absorber Inspection

- Remove the rear shock absorber (see Rear Shock Absorber Removal).
- Visually inspect the following items.
  - Oil Leakage
  - Crack or Dent
- ★ If there is any damage to the rear shock absorber, replace it.
- Visually inspect the rubber bushing.
- ★ If it show any signs of damage, replace it.

#### Rear Shock Absorber Scrapping

#### ⚠ WARNING

Since the rear shock absorber contains nitrogen gas, do not incinerate the rear shock absorber without first releasing the gas or it may explode. Before a rear shock absorber is scrapped, drill a hole at the point [A] shown to release the nitrogen gas completely. Wear safety glasses when drilling the hole, as the gas may blow out bits of drilled metal when the hole opens.



## Swingarm

### Swingarm Removal

- Loosen:
    - Swingarm Mounting Plate Nut (Upper) [A]
    - Swingarm Mounting Plate Bolt (Lower) [B]
    - Swingarm Pivot Shaft Nut [C]
  - Remove:
    - Footpeg Bracket Bolts [D]
- 
- Remove:
    - Muffler Body (see Muffler Body Removal in the Engine Top End chapter)
    - Engine Sprocket (see Engine Sprocket Removal in the Final Drive chapter)
    - Coupling (see Coupling Removal in the Final Drive chapter)
    - Rear Wheel (see Rear Wheel Removal in the Wheels/Tires chapter)
    - Rear Brake Disc (see Rear Brake Disc Removal in the Brakes chapter)
    - Rocker Arm (see Rocker Arm Removal)
    - Mud Guard (see Mud Guard Removal in the Frame chapter)
    - Rear Axle and Bearing Housing (see Bearing Housing in the Final Drive chapter)
  - Remove the bolts [A] to free the brake hose and rear wheel rotation sensor lead.
  - Remove:
    - Swingarm Pivot Shaft and Nut
    - Swingarm [B]

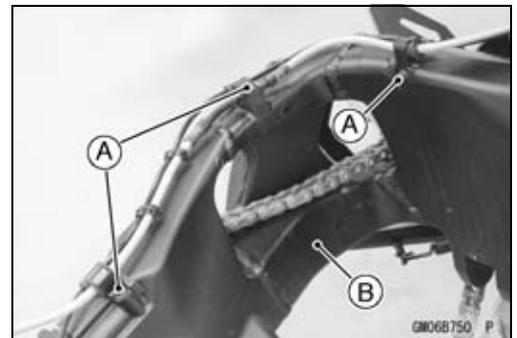
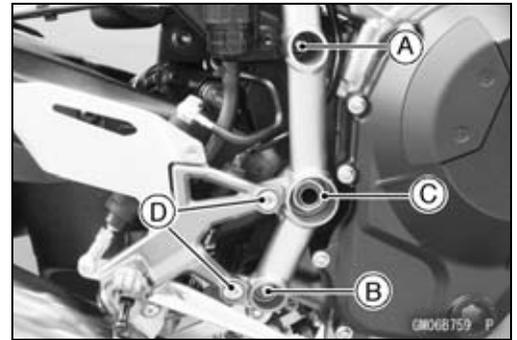
#### NOTE

- Since the swingarm bearings are packed with grease, cleaning is not required. The bearing that was cleaned should be replacing.

### Swingarm Installation

#### NOTE

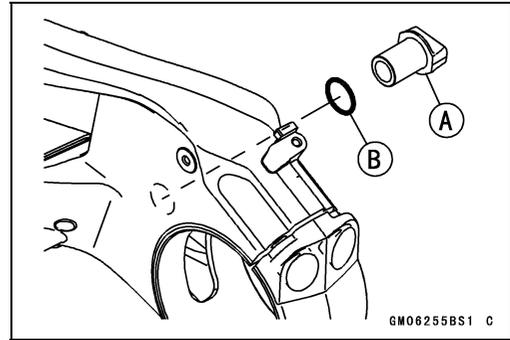
- Since the swingarm bearings are packed with grease, cleaning is not required. The bearing that was cleaned should be replacing.
- Visually inspect the chain guide [A].
- ★ Replace the chain guide if it shows any signs of abnormal wear or damage.



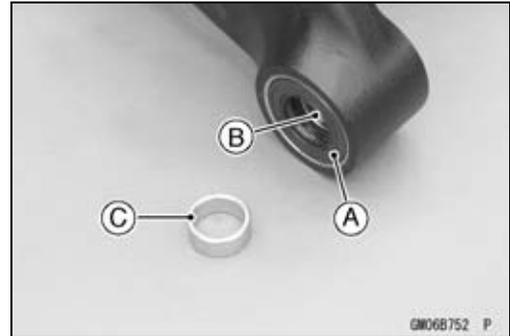
## 13-24 SUSPENSION

### Swingarm

- Visually inspect the caliper holder guide [A].
- ★ Replace the caliper holder guide and O-ring [B] if the guide shows any signs of abnormal wear or damage.
- Apply grease to the O-ring.
- Insert the caliper holder guide until it clicks.



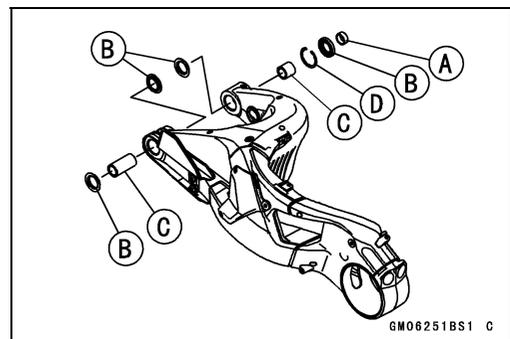
- Apply grease to the lips of the grease seals [A].
- Be sure to install the grease seals and sleeve [B] to the swingarm.
- Fit the collar [C] on the grease seal of the left side.



- Install the swingarm.
- Insert the swingarm pivot shaft and swingarm mounting plate bolt (upper) from the left side.
- Tighten:
  - Torque - Swingarm Pivot Shaft Nut: 108 N·m (11.0 kgf·m, 79.7 ft·lb)**
  - Swingarm Mounting Plate Nut (Upper): 44 N·m (4.5 kgf·m, 32 ft·lb)**
  - Swingarm Mounting Plate Bolt (Lower): 44 N·m (4.5 kgf·m, 32 ft·lb)**
- Move the swingarm up and down to check for abnormal friction.
- Install the removed parts (see appropriate chapters).

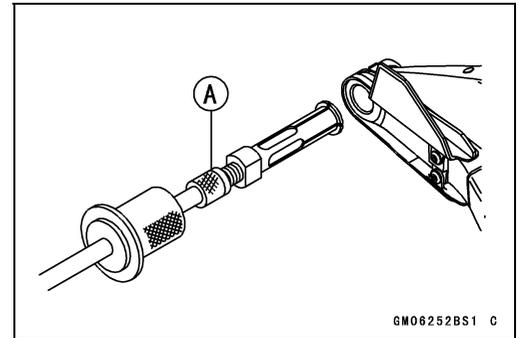
### **Swingarm Bearing Removal**

- Remove:
    - Swingarm (see Swingarm Removal)
    - Collar [A]
    - Grease Seals [B]
    - Sleeve [C]
    - Circlip [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.

#### NOTE

○ Install the needle and ball bearings so that their marked sides face outward.

- On the right side [A], press in the ball bearing [B] until it is bottomed.

**Special Tool - Bearing Driver Set: 57001-1129**

Left Side [C]

- On both sides, press in the needle bearings [D] as shown.  
 $5.6 \pm 0.4$  mm ( $0.22 \pm 0.02$  in.) [E]

**Special Tools - Needle Bearing Driver,  $\phi 28$ : 57001-1610**

**Needle Bearing Driver,  $\phi 20$  & Spacer,  $\phi 28$ :  
 57001-1678**

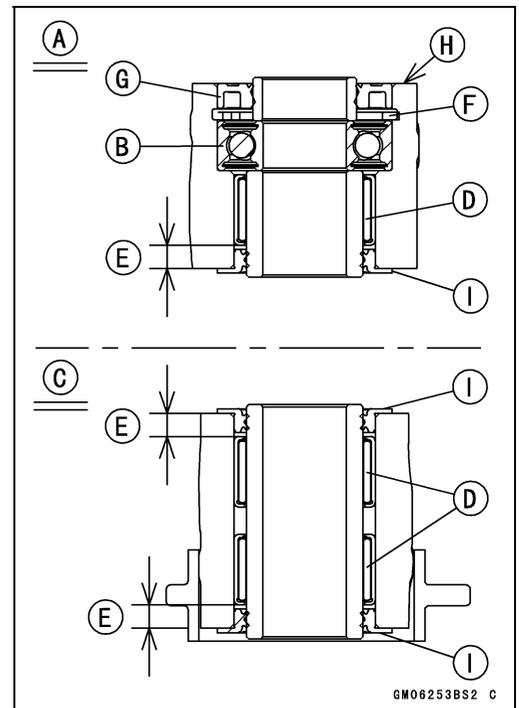
- On the right side, install the circlip [F].

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

- On the right side, press in the grease seal [G] so that its surface is flush with the swingarm [H].
- On both sides, press in the grease seals [I] until they are bottomed.

**Special Tool - Bearing Driver Set: 57001-1129**

- Apply grease to the grease seal lips.



## 13-26 SUSPENSION

### Swingarm

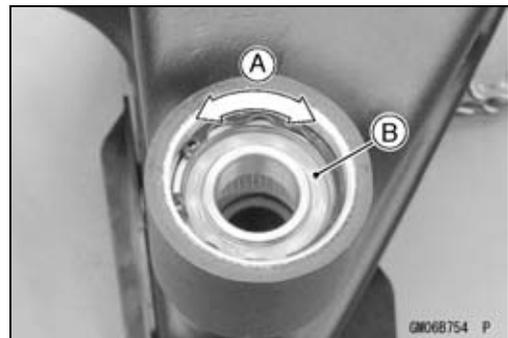
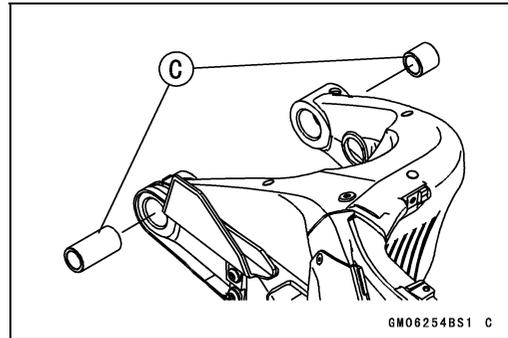
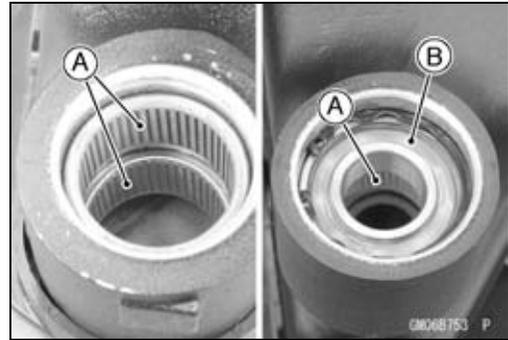
#### Swingarm Bearing, Sleeve Inspection

##### NOTICE

Do not remove the bearings for inspection. Removal may damage them.

##### NOTE

- Since the swingarm bearings are packed with grease, cleaning is not required. The bearing that was cleaned should be replacing.
- Inspect the needle bearings [A] and ball bearing [B] that are installed in the swingarm.
- The rollers and balls 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 [C] show any signs of abnormal wear, discoloration, or damage, replace them as a set.
  
- Turn the bearing in the swingarm back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.



#### Swingarm Bearing Lubrication

##### NOTE

- Since the bearings are packed with grease and sealed, lubrication is not required.

#### Chain Guide Inspection

- Refer to the Chain Guide Wear Inspection in the Periodic Maintenance chapter.

## Tie-Rod, Rocker Arm

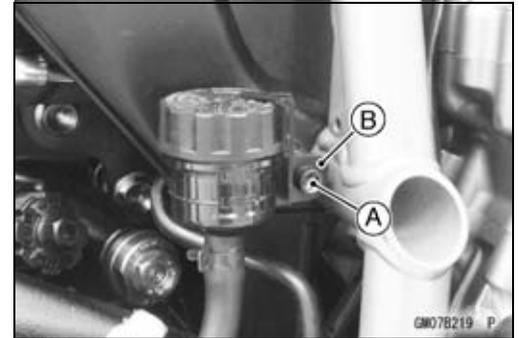
### Tie-Rod Removal

- Support the front of the motorcycle with the stand.

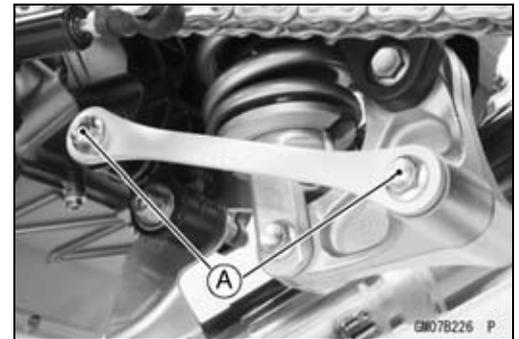
#### **⚠ WARNING**

**When raising the rear wheel off the ground and removing part(s) from the motorcycle, be sure to support the front of the motorcycle, or the motorcycle may fall over. It could cause an accident and injury.**

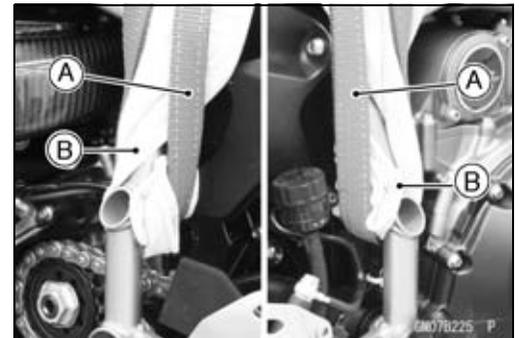
- Remove:
  - Side Stand Bracket (see Side Stand Removal in the Frame chapter)
  - Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  - Bolt [A]
  - Stopper [B]



- Loosen:
  - Tie-Rod Bolts [A] and Nuts



- Raise the rear wheel off the ground with webbing slings [A].
  - Hang the webbing slings to the frame as shown.
  - Protect the vehicle using suitable clothes [B].
- Remove:
  - Tie-Rod Bolts and Nuts
  - Tie-Rods



### Tie-Rod Installation

- Replace the tie-rod nuts with new ones.
- Install the tie-rod, bolts and nuts temporarily.
  - Insert the bolts from the left side.
- Remove the webbing slings.

#### **NOTE**

○When tightening the tie-rod nuts, lower the rear wheel to the ground.

- Tighten:
  - Torque - Tie-Rod Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)**
- After tightening, check that the bolt ends protrude from the nuts.
- Install the removed parts (see appropriate chapters).

## 13-28 SUSPENSION

### Tie-Rod, Rocker Arm

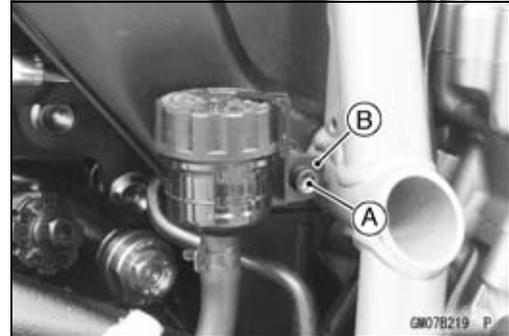
#### Rocker Arm Removal

- Support the front of the motorcycle with the stand.

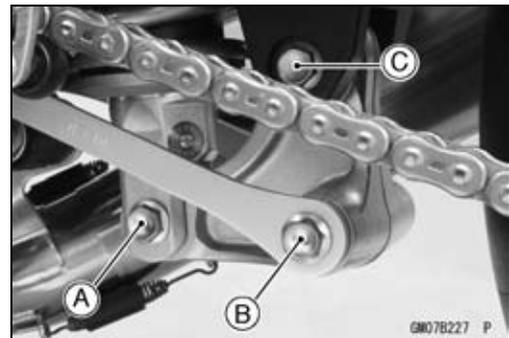
#### **⚠ WARNING**

**When raising the rear wheel off the ground and removing part(s) from the motorcycle, be sure to support the front of the motorcycle, or the motorcycle may fall over. It could cause an accident and injury.**

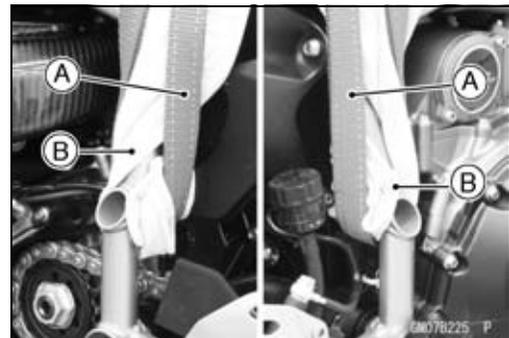
- Remove:
  - Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
  - Bolt [A]
  - Stopper [B]



- Loosen:
  - Lower Rear Shock Absorber Bolt [A] and Nut
  - Rear Tie-Rod Bolt [B] and Nut
  - Rocker Arm Bolt [C] and Nut



- Raise the rear wheel off the ground with webbing slings [A].
- Hang the webbing slings to the frame as shown.
- Protect the vehicle using suitable clothes [B].
- Remove:
  - Lower Rear Shock Absorber Bolt and Nut
  - Rear Tie-Rod Bolt and Nut
  - Rocker Arm Bolt and Nut
  - Rocker Arm



#### **NOTE**

- Since the rocker arm bearings are packed with grease, cleaning is not required. The bearing that was cleaned should be replacing.

## Tie-Rod, Rocker Arm

### Rocker Arm Installation

#### NOTE

○ Since the rocker arm bearings are packed with grease, cleaning is not required. The bearing that was cleaned should be replaced.

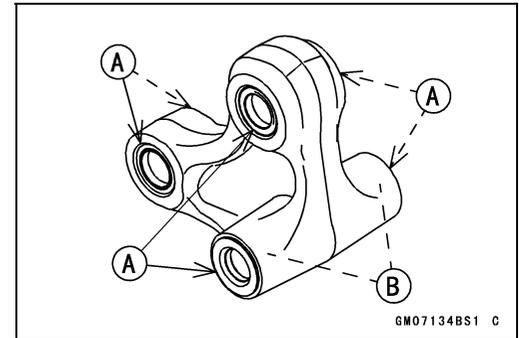
- Apply grease to the grease seal lips [A].
- Apply grease to the needle bearings [B] for the tie-rod bolt.
- Replace the following nuts with new ones.
  - Rocker Arm Nut
  - Rear Tie-Rod Nut
  - Lower Rear Shock Absorber Nut

- Install the rocker arm, bolts and nuts temporarily.
- Insert the bolts from the left side.
- Remove the webbing slings.

#### NOTE

○ When tightening the nuts, lower the rear wheel to the ground.

- Tighten:
  - Torque - Rocker Arm Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)
  - Tie-Rod Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)
  - Rear Shock Absorber Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)
- After tightening, check that the bolt ends protrude from the nuts.
- Install the removed parts (see appropriate chapters).

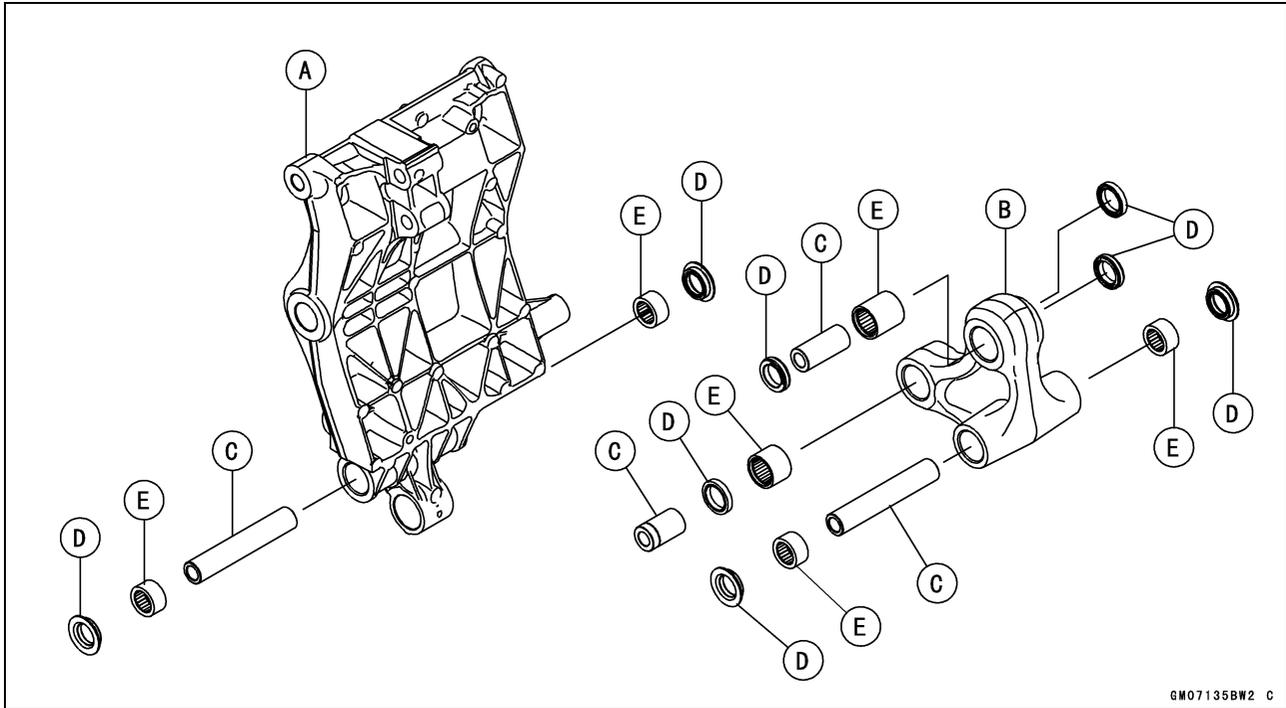


## 13-30 SUSPENSION

### Tie-Rod, Rocker Arm

#### ***Tie-Rod and Rocker Arm Bearing Removal***

- Remove:
  - Swingarm Mounting Plate [A] (see Engine Removal in the Engine Removal/Installation chapter)
  - Rocker Arm [B] (see Rocker Arm Removal)
  - Sleeves [C]
  - Grease Seals [D]
- Remove the needle bearings [E] using a suitable tool.



#### ***Tie-Rod and Rocker Arm Bearing Installation***

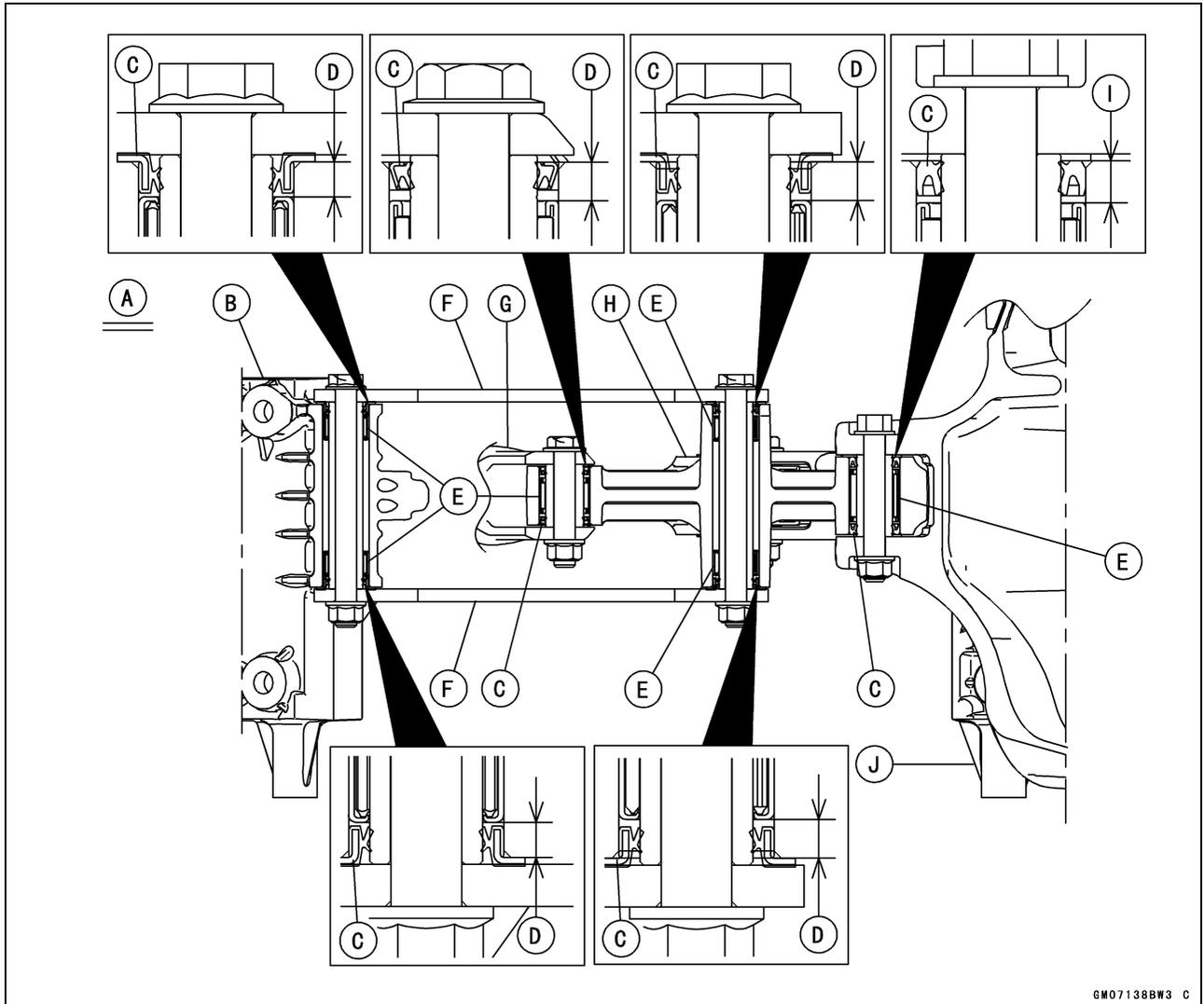
- Replace the needle bearing and grease seals with new ones.
  - Install the needle bearings.
    - The installing positions are as shown.
    - Install the needle bearings for the rear shock absorber portion and swingarm portion from the marked side of the rocker arm.
- Special Tool - Bearing Driver Set: 57001-1129**
- Apply grease to the needle bearing for the tie-rod portion.

#### **NOTE**

○ Install the needle bearings so that the marked side faces outward.

- Apply plenty of grease to the lips of the grease seals.
- Install the grease seals.

Tie-Rod, Rocker Arm



GM07138BW3 C

Viewed from Bottom [A]  
 Swingarm Mounting Plate [B]  
 Grease Seals [C]  
 $5.5 \pm 0.4 \text{ mm}$  ( $0.22 \pm 0.02 \text{ in.}$ ) [D]  
 Needle Bearings [E]

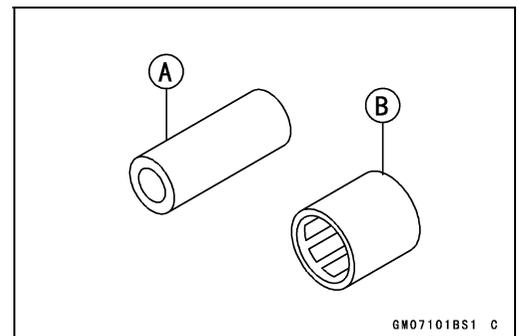
Tie-Rods [F]  
 Rear Shock Absorber [G]  
 Rocker Arm [H]  
 $6.0 \pm 0.4 \text{ mm}$  ( $0.24 \pm 0.02 \text{ in.}$ ) [I]  
 Swingarm [J]

**Rocker Arm/Tie-Rod Bearing, Sleeve Inspection**

**NOTICE**

**Do not remove the bearings for inspection. Removal may damage them.**

- Visually inspect the rocker arm, 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 sleeve, replace the sleeve and needle bearings as a set.



GM07101BS1 C

## 13-32 SUSPENSION

---

### Tie-Rod, Rocker Arm

---

#### *Rocker Arm/Tie-Rod Bearing Lubrication*

##### **NOTE**

○ *Since the bearings are packed with grease, lubrication is not required.*

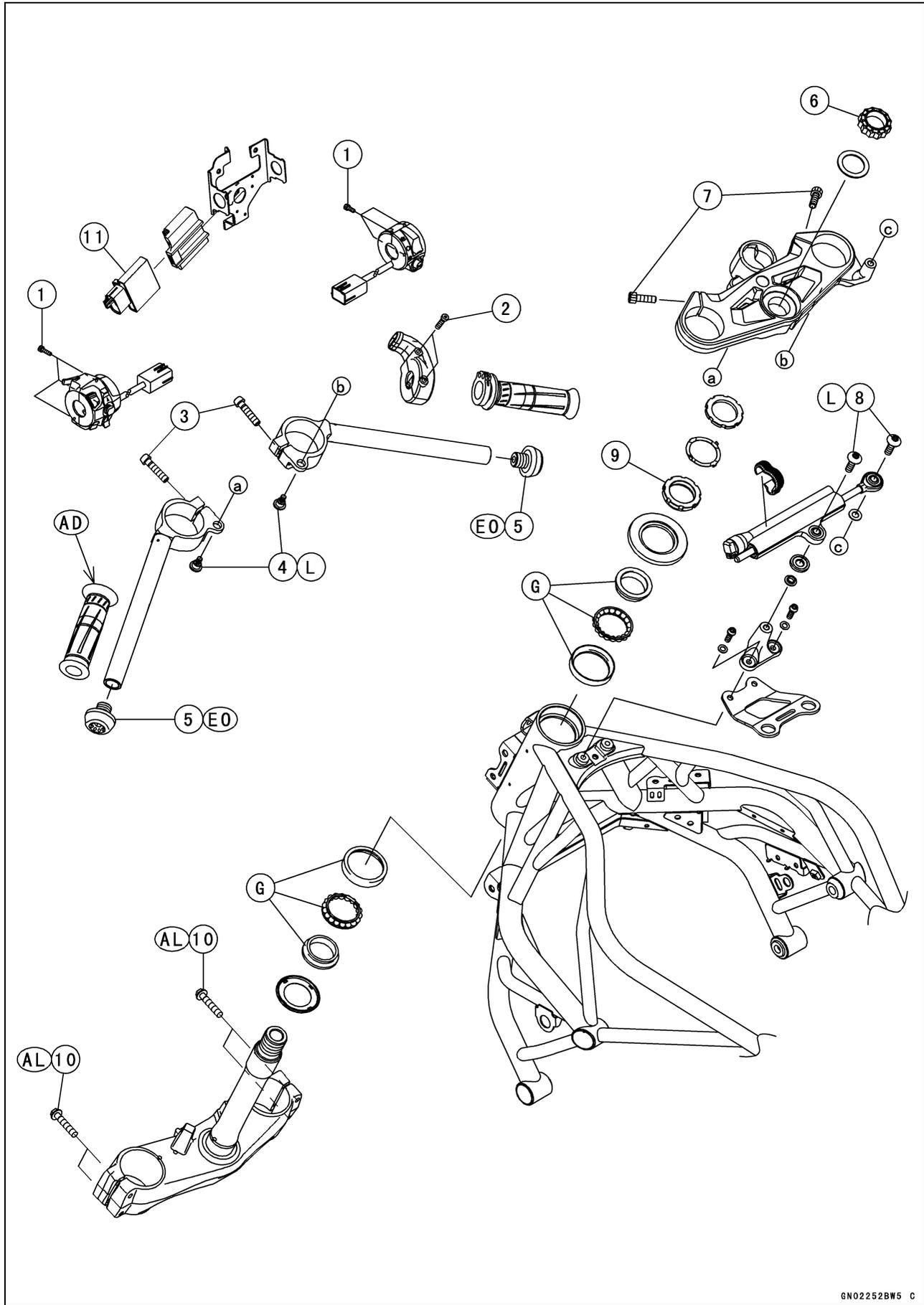
# Steering

## Table of Contents

|  |       |
|--|-------|
| Exploded View.....                                   | 14-2  |
| Special Tools .....                                  | 14-4  |
| Steering .....                                       | 14-5  |
| Steering Inspection .....                            | 14-5  |
| Steering Adjustment.....                             | 14-5  |
| Electronic Steering Damper (ESD).....                | 14-6  |
| Electronic Steering Damper Removal.....              | 14-6  |
| Electronic Steering Damper Installation.....         | 14-6  |
| Electronic Steering Damper Oil Leak Inspection ..... | 14-6  |
| Electronic Steering Damper Inspection.....           | 14-6  |
| ESD ECU Removal.....                                 | 14-7  |
| ESD ECU Installation.....                            | 14-7  |
| ESD ECU Inspection.....                              | 14-7  |
| Steering Stem.....                                   | 14-8  |
| Stem, Stem Bearing Removal.....                      | 14-8  |
| Stem, Stem Bearing Installation.....                 | 14-9  |
| Steering Stem Bearing Lubrication .....              | 14-11 |
| Steering Stem Warp Inspection .....                  | 14-12 |
| Stem Cap Deterioration, Damage Inspection .....      | 14-12 |
| Handlebar .....                                      | 14-13 |
| Handlebar Removal .....                              | 14-13 |
| Handlebar Installation .....                         | 14-14 |

# 14-2 STEERING

## Exploded View



## Exploded View

| No. | Fastener                       | Torque |       |          | Remarks |
|-----|--------------------------------|--------|-------|----------|---------|
|     |                                | N·m    | kgf·m | ft·lb    |         |
| 1   | Switch Housing Bolts           | 0.90   | 0.09  | 8 in·lb  |         |
| 2   | Throttle Case Bolts            | 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   | Handlebar Weights              | 30     | 3.1   | 22       | EO      |
| 6   | Steering Stem Head Nut         | 78     | 8.0   | 58       |         |
| 7   | Upper Front Fork Clamp Bolts   | 20     | 2.0   | 15       |         |
| 8   | Steering Damper Mounting Bolts | 11     | 1.1   | 97 in·lb | L       |
| 9   | Steering Stem Nut              | 20     | 2.0   | 15       |         |
| 10  | Lower Front Fork Clamp Bolts   | 23     | 2.3   | 17       | AL      |

11. ESD (Electronic Steering Damper) ECU

AD: Apply adhesive.

AL: Tighten the two clamp bolts alternately two times to ensure even tightening torque.

EO: Apply engine oil.

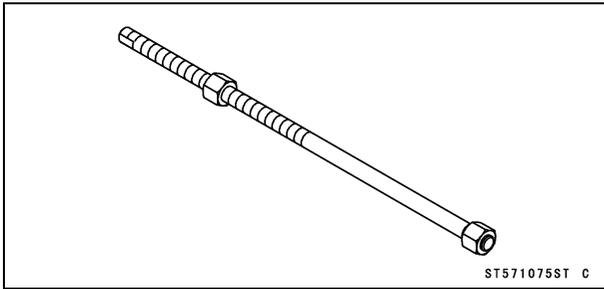
G: Apply grease.

L: Apply a non-permanent locking agent.

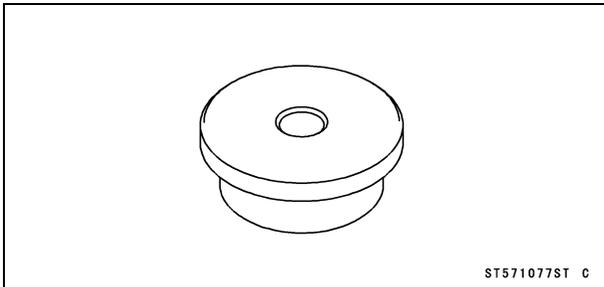
# 14-4 STEERING

## Special Tools

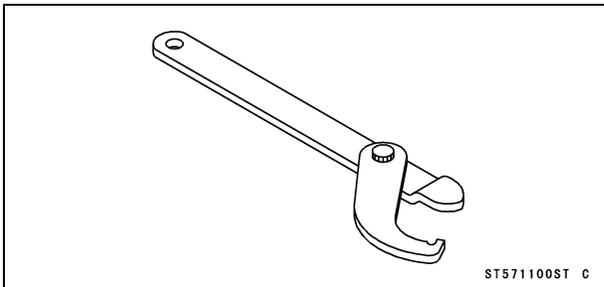
**Head Pipe Outer Race Press Shaft:**  
57001-1075



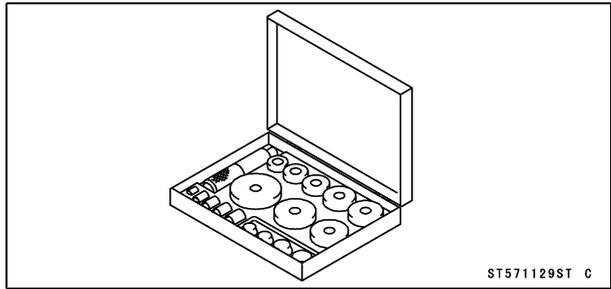
**Head Pipe Outer Race Driver,  $\phi$ 54.5:**  
57001-1077



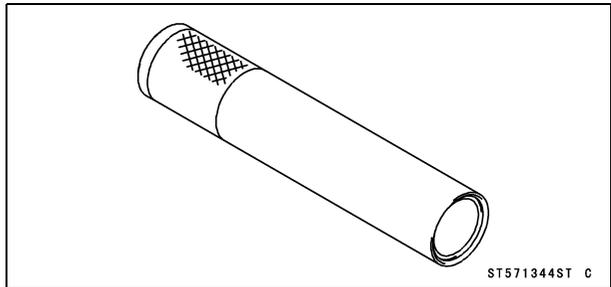
**Steering Stem Nut Wrench:**  
57001-1100



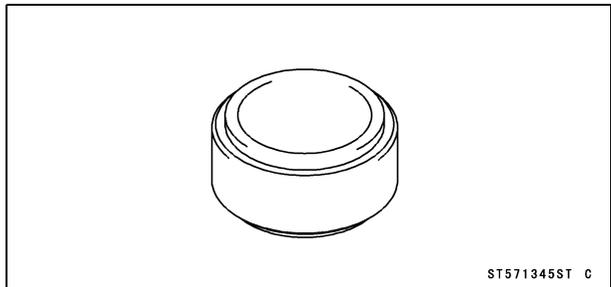
**Bearing Driver Set:**  
57001-1129



**Steering Stem Bearing Driver,  $\phi$ 42.5:**  
57001-1344



**Steering Stem Bearing Driver Adapter,  $\phi$ 41.5:**  
57001-1345



---

## Steering

---

### ***Steering Inspection***

- Refer to the Steering Play Inspection in the Periodic Maintenance chapter.

### ***Steering Adjustment***

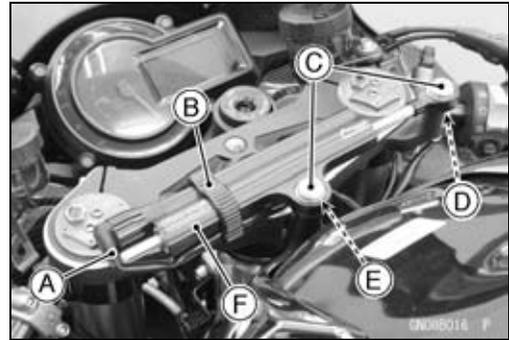
- Refer to the Steering Play Adjustment in the Periodic Maintenance chapter.

## 14-6 STEERING

### Electronic Steering Damper (ESD)

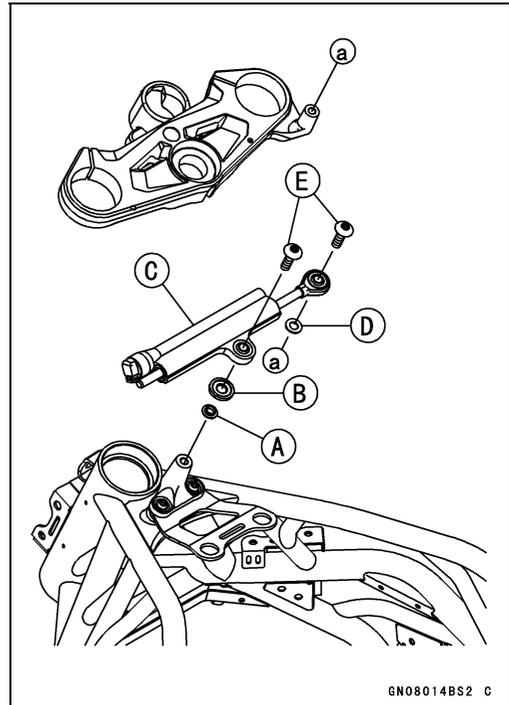
#### **Electronic Steering Damper Removal**

- Disconnect the connector [A].
- Remove:
  - Clamp [B]
  - Steering Damper Mounting Bolts [C]
  - Metal Washer [D]
  - Plastic Washer and Flanged Collar [E]
  - Electronic Steering Damper [F]

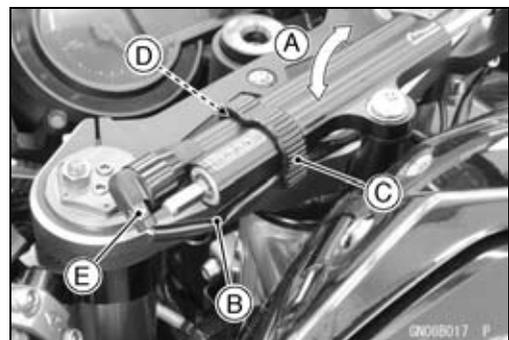


#### **Electronic Steering Damper Installation**

- Install:
  - Flanged Collar [A]
  - Plastic Washer [B]
  - Electronic Steering Damper [C]
  - Metal Washer [D]
- Apply a non-permanent locking agent to the threads of the steering damper mounting bolts [E].
- Tighten:
  - Torque - Steering Damper Mounting Bolts: 11 N·m (1.1 kgf·m, 97 in·lb)**



- After tightening the steering damper mounting bolts, check that the electronic steering damper has a free play [A].
- Run the electronic steering damper lead [B] correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Hold the electronic steering damper lead with the clamp [C].
- Fit the projection [D] of the clamp to the hole in front of the electronic steering damper.
- Connect the connector [E].



#### **Electronic Steering Damper Oil Leak Inspection**

- Refer to the Electronic Steering Damper Oil Leak Inspection in the Periodic Maintenance chapter.

#### **Electronic Steering Damper Inspection**

- Refer to the ESD Actuator Resistance Inspection in the Self-diagnosis System chapter.

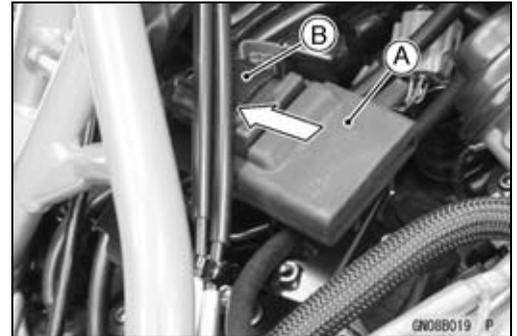
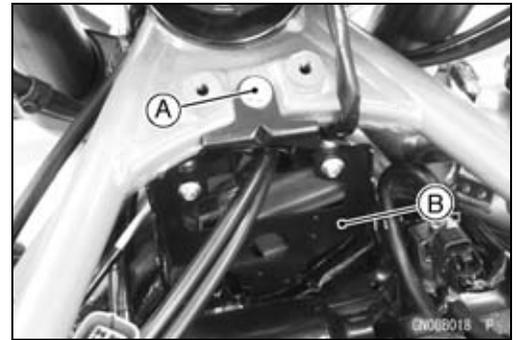
## Electronic Steering Damper (ESD)

### ESD ECU Removal

#### NOTICE

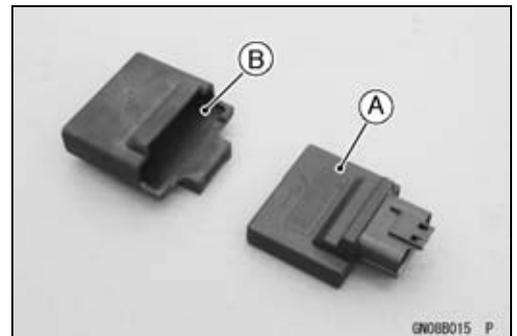
**Never drop the ECU especially on a hard surface. Such a shock to the ECU can damage it.**

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Remove the bolt [A] to free the bracket [B].
- Slide the ESD ECU with the rubber protector [A] forward to clear the hook of the bracket.
- Disconnect the ESD ECU connector [B].

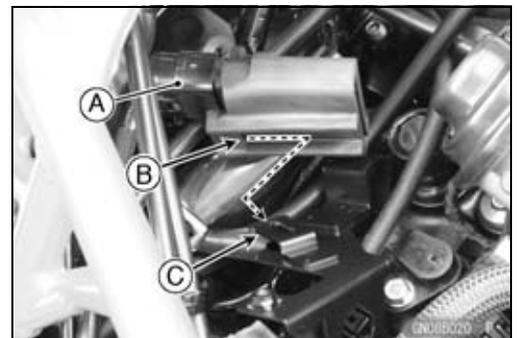


### ESD ECU Installation

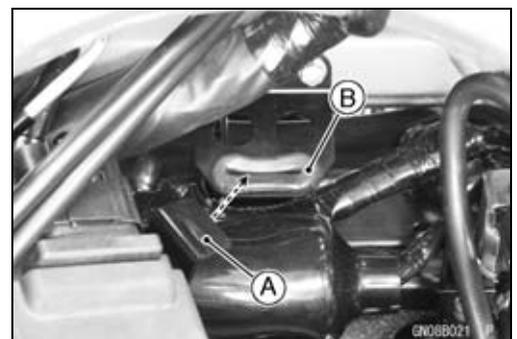
- Install the ESD ECU [A] in the rubber protector [B].



- Connect the ESD ECU connector [A].
- Install the ESD ECU.
- Insert the slot [B] of the rubber protector to the hook [C] of the bracket.



- Insert the tab [A] of the bracket into the grommet [B].
- Tighten the bolt.
- Install the removed parts (see appropriate chapters).



### ESD ECU Inspection

- Refer to the ESD ECU Power Supply Inspection in the Self-diagnosis System chapter.

## 14-8 STEERING

### Steering Stem

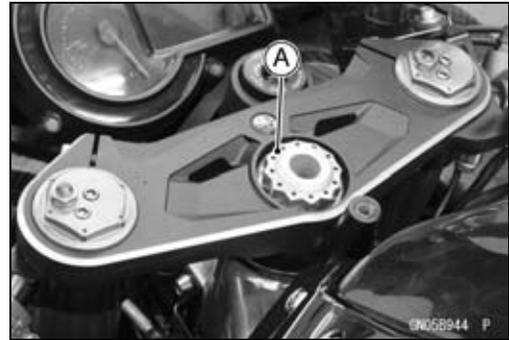
#### Stem, Stem Bearing Removal

- Remove:
  - Electronic Steering Damper (see Electronic Steering Damper Removal)
- Loosen the steering stem head nut [A].

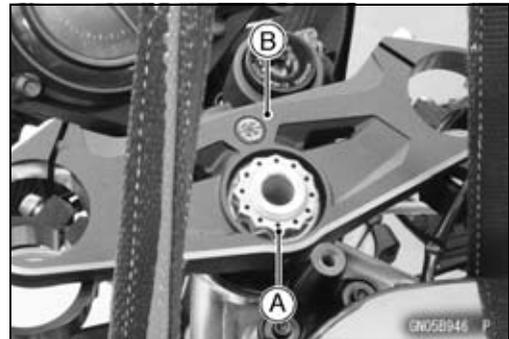
#### NOTE

○ Use the 28 mm wrench (12 pt.).

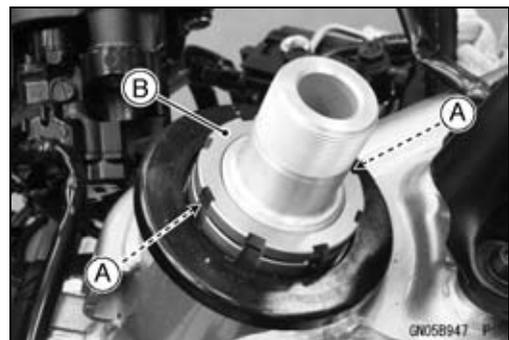
- Remove:
  - Upper Fairing (see Upper Fairing Removal in the Frame chapter)
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Front Fender (see Front Fender Removal in the Frame chapter)
  - Front Forks (see Front Fork Removal (Each Fork Leg) in the Suspension chapter)
- Remove:
  - Brake Hose Fitting Bolts [A]



- Remove the steering stem head nut [A] and washer.
- Take the steering stem head [B] off the steering stem.



- Straighten the claws [A] of the claw washer.
  - Remove the steering stem locknut [B].
- Special Tool - Steering Stem Nut Wrench: 57001-1100**
- Remove the claw washer.

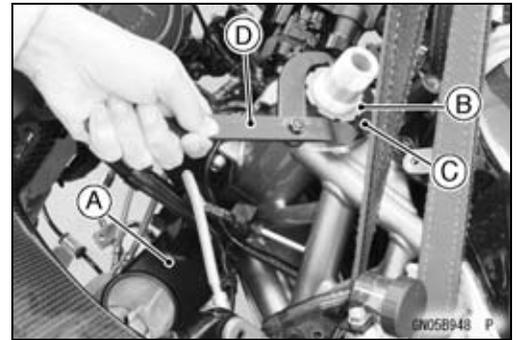


## Steering Stem

- While pushing up the stem base [A], remove the steering stem nut [B] and stem cap [C].

**Special Tool - Steering Stem Nut Wrench [D]: 57001-1100**

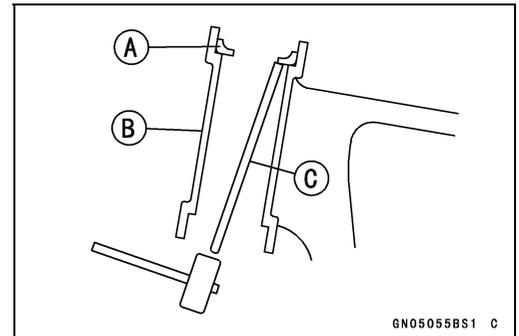
- Remove:
  - Steering Stem
  - Upper Ball Bearing Inner Race
  - Upper Ball Bearing



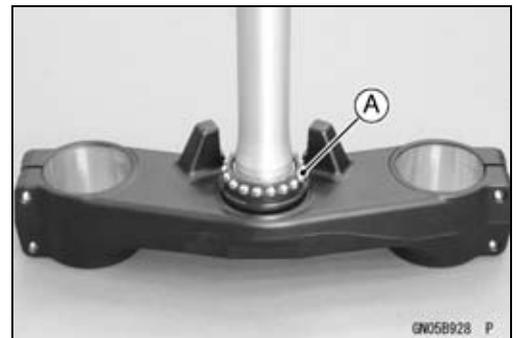
- To remove the ball bearing outer races [A] pressed into the head pipe [B], insert a bar [C] into the recesses of head pipe, and applying it to both recess alternately hammer it to drive the race out.

### NOTE

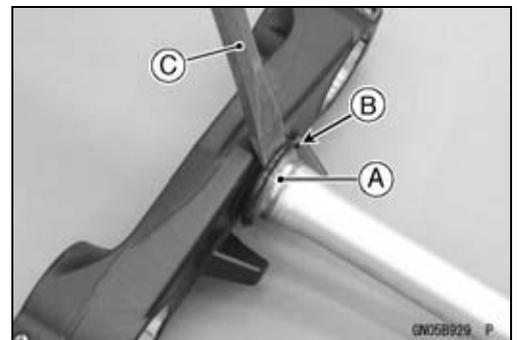
○If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.



- Remove the lower ball bearing [A] from the steering stem.



- Remove the lower bearing inner race [A] and grease seal [B] with a suitable commercially available chisel [C].



### Stem, Stem Bearing Installation

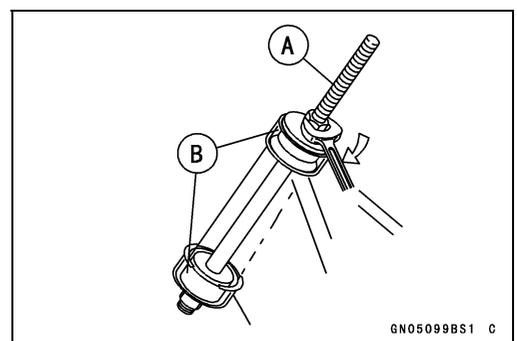
- Replace the bearing outer races with new ones.
- Drive them into the head pipe at the same time.

**Special Tools - Head Pipe Outer Race Press Shaft [A]: 57001-1075**

**Head Pipe Outer Race Driver,  $\phi 54.5$  [B]: 57001-1077**

**or Bearing Driver Set: 57001-1129**

- Apply grease to the outer races.

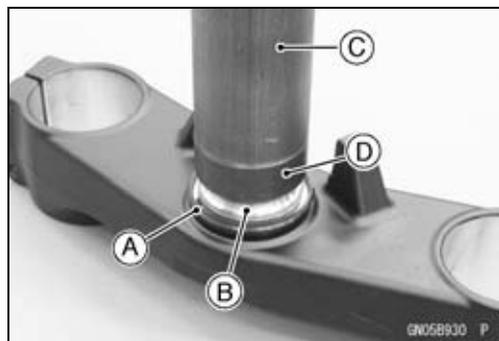


## 14-10 STEERING

### Steering Stem

- Replace the bearing inner races and grease seals with new ones.
- Install the lower grease seal [A] on the steering stem, and press the lower ball bearing inner race [B] applied the grease onto the stem.

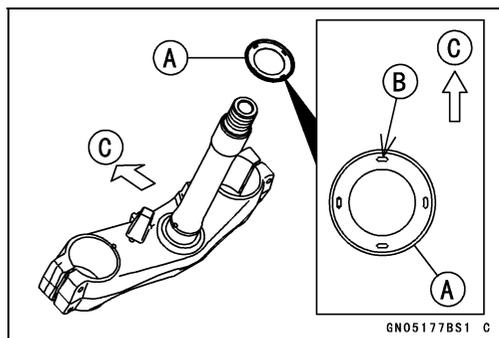
**Special Tools - Steering Stem Bearing Driver,  $\phi 42.5$  [C]: 57001-1344**  
**Steering Stem Bearing Driver Adapter,  $\phi 41.5$  [D]: 57001-1345**



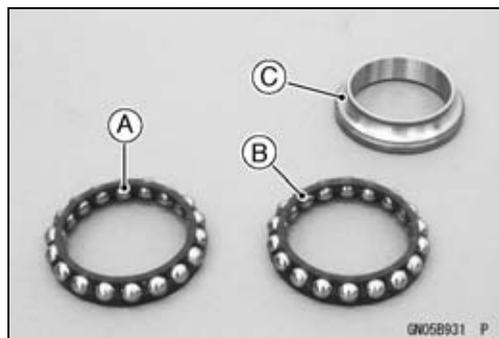
- Install the lower grease seal [A] so that the one of drain hole [B] faces forward [C].

#### NOTE

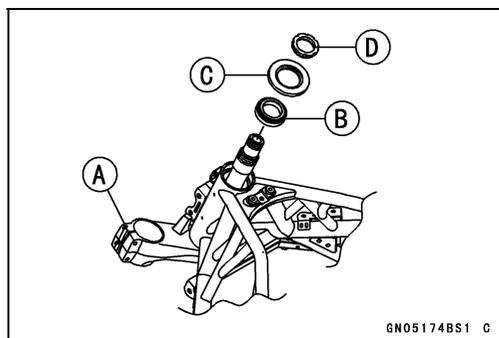
- Do not apply grease to the drain holes of the grease seal to prevent clogging.



- Apply grease to the lower ball bearing [A], and install it onto the steering stem.
- The lower and upper ball bearings are identical.
- Apply grease to the upper ball bearing [B] and inner race [C].



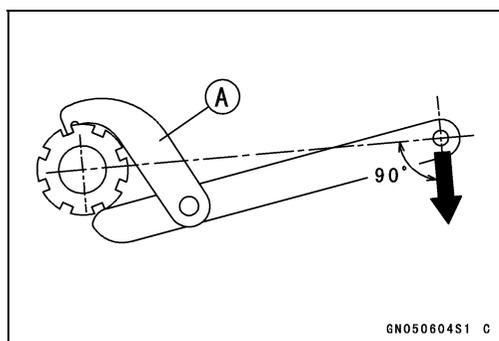
- Install:
  - Steering Stem [A]
  - Upper Ball Bearing and Inner Race [B]
  - Stem Cap [C]
  - Steering Stem Nut [D]



- Settle the bearings in place as follows.
  - Tighten the steering stem nut with **65 N·m (6.6 kgf·m, 48 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 steering stem nut wrench [A].
  - Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings may be damaged.

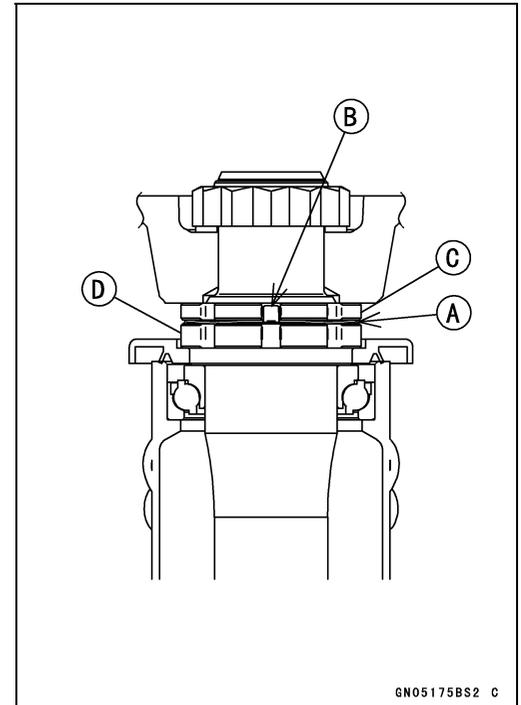
**Special Tool - Steering Stem Nut Wrench: 57001-1100**

**Torque - Steering Stem Nut: 20 N·m (2.0 kgf·m, 15 ft·lb)**



## Steering Stem

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



- Install the stem head.
- Install the washer, and temporary tighten the stem head nut.
- Install the front forks (see Front Fork Installation (Each Fork Leg) in the Suspension chapter).

### NOTE

- Tighten the upper front fork clamp bolts first, next the stem head nut, last the lower front fork 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 Nut: 78 N·m (8.0 kgf·m, 58 ft·lb)**

**Lower Front Fork Clamp Bolts: 23 N·m (2.3 kgf·m, 17 ft·lb)**

**Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

### **⚠ WARNING**

**If the handlebar does not turn to the steering stop it may cause an accident resulting in injury or death. Be sure the cables, harnesses and hoses are routed properly and do not interfere with handlebar movement (see Cable, Wire, and Hose Routing section in the Appendix chapter).**

- Install the removed parts (see appropriate chapters).

### **Steering Stem Bearing Lubrication**

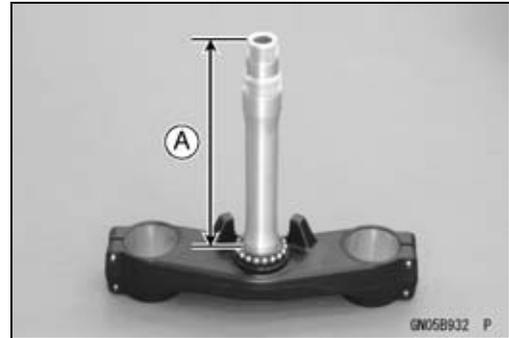
- Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.

## 14-12 STEERING

### Steering Stem

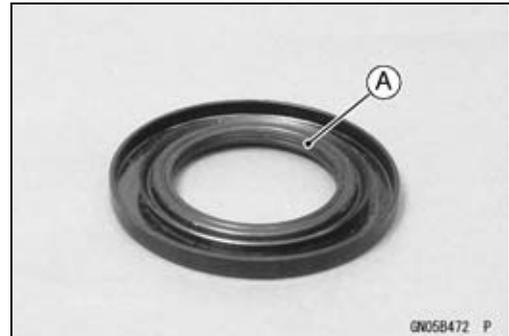
#### ***Steering Stem Warp Inspection***

- 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 Inspection***

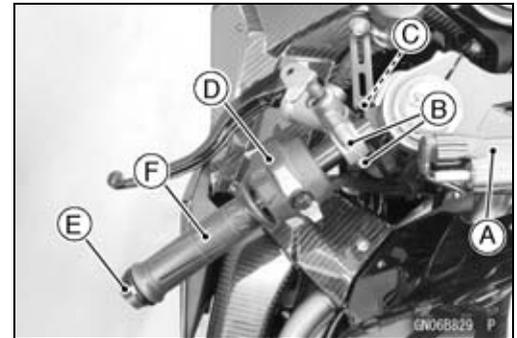
- ★ Replace the stem cap if its oil seal [A] shows damage.



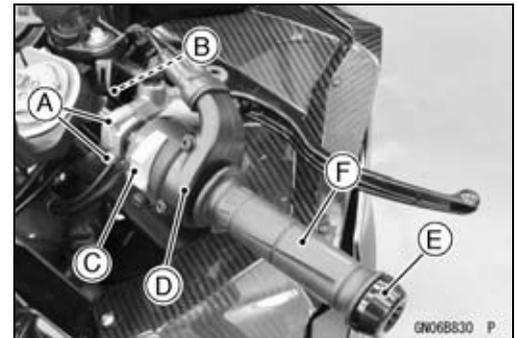
## Handlebar

### Handlebar Removal

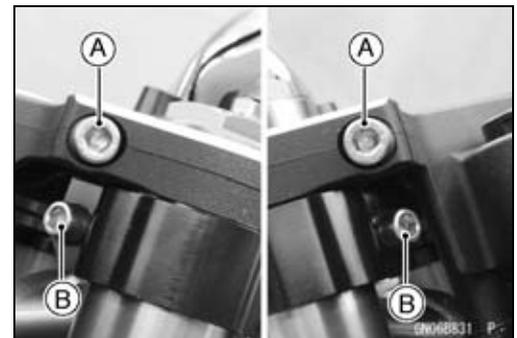
- Remove:
  - Steering Damper [A] (see Steering Damper Removal)
  - Clutch Lever Clamp Bolts [B]
  - Clutch Reservoir Bracket Bolt [C]
  - Left Switch Housing [D]
  - Handlebar Weight [E]
  - Left Handlebar Grip [F]



- Remove:
  - Front Master Cylinder Clamp Bolts [A]
  - Front Brake Reservoir Bracket Bolt [B]
  - Right Switch Housing [C]
  - Throttle Case [D]
  - Handlebar Weight [E]
  - Throttle Grip [F]



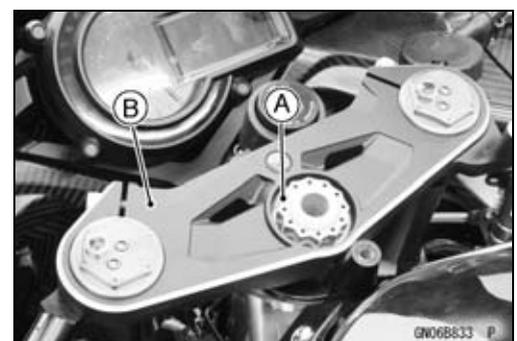
- Loosen:
  - Upper Front Fork Clamp Bolts [A]
  - Handlebar Clamp Bolts [B]



- Remove:
  - Handlebar Positioning Bolts [A]



- Remove:
  - Steering Stem Head Nut [A] and Washer
  - Steering Stem Head [B]
  - Handlebars



## 14-14 STEERING

### Handlebar

#### Handlebar Installation

- Insert the handlebar to the front fork.
- Install the steering stem head and washer.
- Tighten the steering stem head nut temporarily.
- Tighten:

**Torque - Steering Stem Head Nut: 78 N·m (8.0 kgf·m, 58 ft·lb)**

**Upper Front Fork Clamp Bolts: 20 N·m (2.0 kgf·m, 15 ft·lb)**

#### NOTE

- Tighten the steering stem head nut before tightening the upper front fork clamp bolts.

#### **⚠ WARNING**

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

- Apply a non-permanent locking agent to the threads of the handlebar positioning bolts [A].
- Tighten:

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

**Handlebar Clamp Bolts [B]: 25 N·m (2.5 kgf·m, 18 ft·lb)**

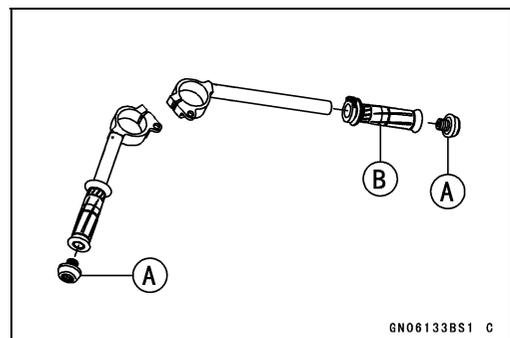
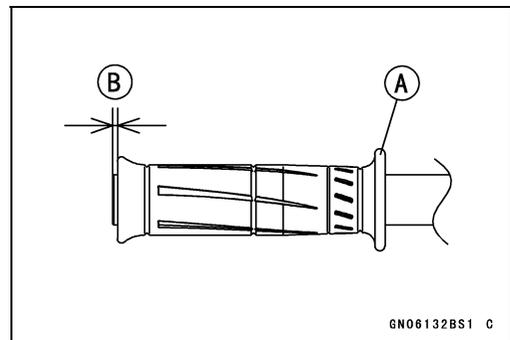
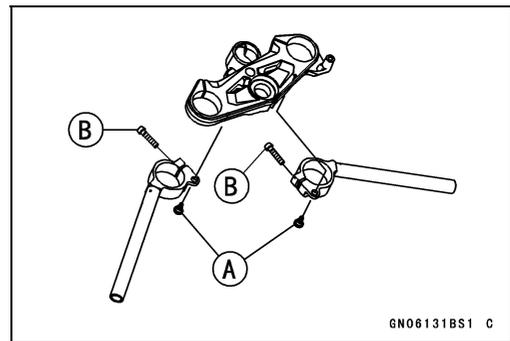
#### NOTE

- Tighten the handlebar positioning bolts before tightening the handlebar clamp bolts.

- Apply adhesive to the inside of the left handlebar grip [A].
- Install the left handlebar grip.  
1.5 ±0.5 mm (0.059 ±0.020 in.) [B]
- Wipe off the excessive adhesive.

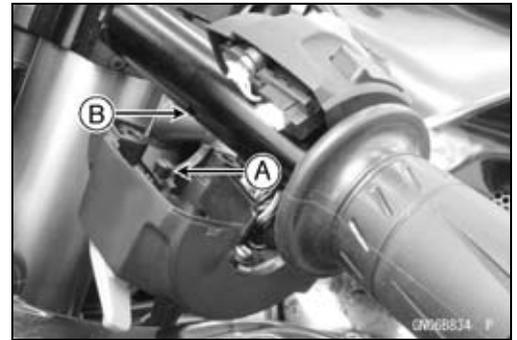
- Apply engine oil to the threads of the handlebar weights [A].
- Install the throttle grip [B].
- Tighten:

**Torque - Handlebar Weights: 30 N·m (3.1 kgf·m, 22 ft·lb)**

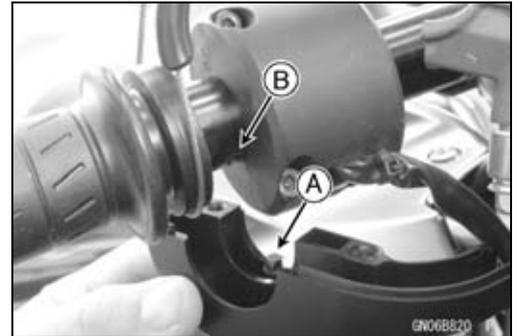


## Handlebar

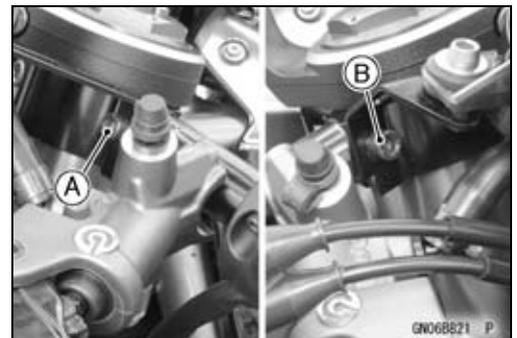
- Install the left and right switch housings.
- Fit the projection [A] into a hole [B] in the handlebars.
- Tighten:
  - Torque - Switch Housing Bolts: 0.90 N·m (0.09 kgf·m, 8 in·lb)**



- Install the throttle cable tips to the throttle grip.
- Install the throttle case.
- Fit the projection [A] into a hole [B] in the handlebar.
- Tighten:
  - Torque - Throttle Case Bolts: 3.5 N·m (0.36 kgf·m, 31 in·lb)**



- Tighten:
  - Torque - Clutch Reservoir Bracket Bolt [A]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
  - Front Brake Fluid Reservoir Bracket Bolt [B]: 6.9 N·m (0.70 kgf·m, 61 in·lb)**
- Install the removed parts (see appropriate chapters).





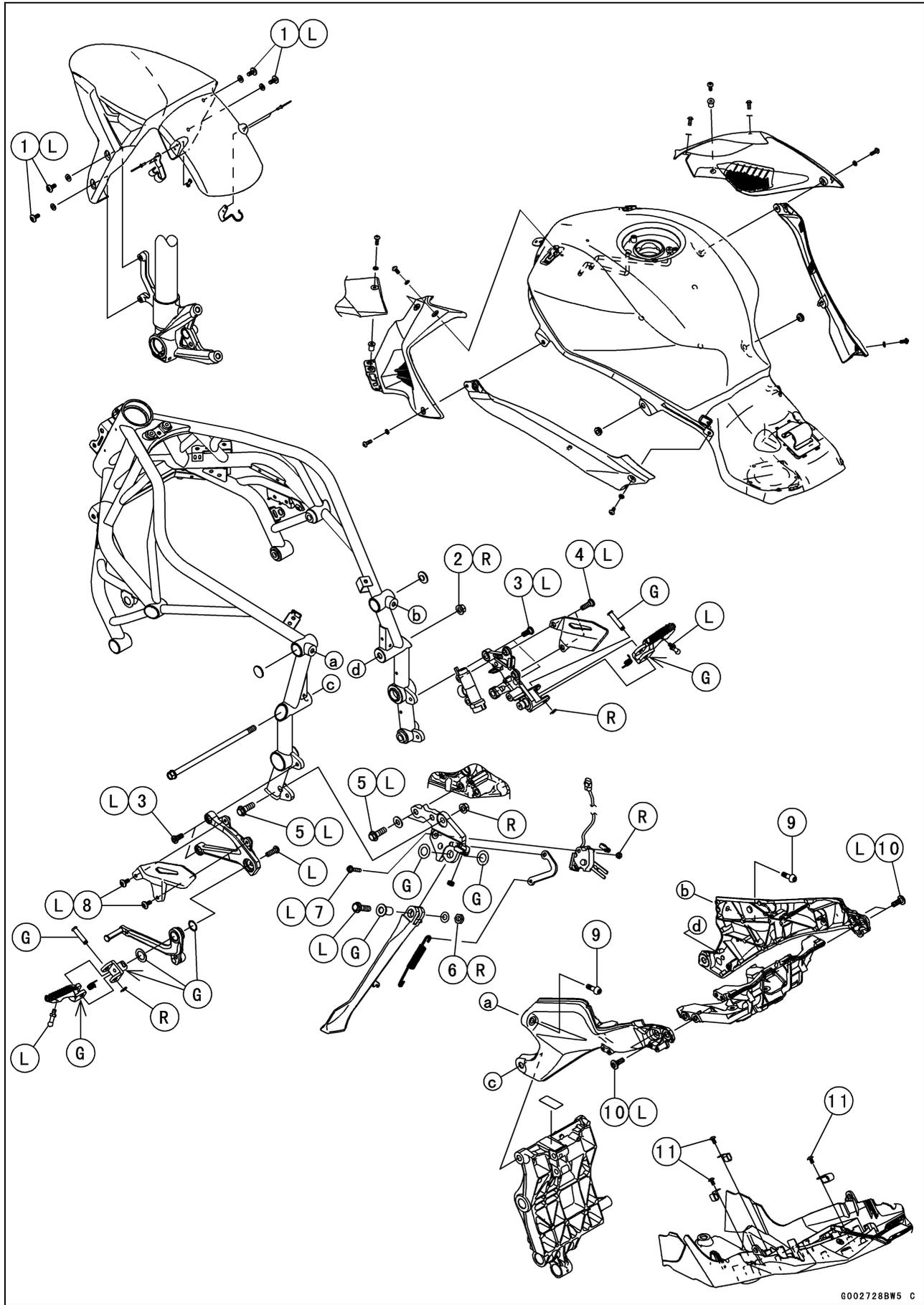
# Frame

## Table of Contents

|                                   |       |                                      |       |
|-----------------------------------|-------|--------------------------------------|-------|
| Exploded View.....                | 15-2  | Hip Support Cover Removal .....      | 15-21 |
| Seat .....                        | 15-8  | Hip Support Cover Installation ..... | 15-22 |
| Seat Pad Removal .....            | 15-8  | Hip Support Cover Disassembly ..     | 15-22 |
| Seat Pad Installation .....       | 15-8  | Hip Support Cover Assembly.....      | 15-23 |
| Seat Pad Disassembly.....         | 15-9  | Seat Cover Removal.....              | 15-23 |
| Seat Pad Assembly.....            | 15-9  | Seat Cover Installation.....         | 15-24 |
| Seat Removal .....                | 15-10 | Fenders .....                        | 15-25 |
| Seat Installation .....           | 15-10 | Front Fender Removal.....            | 15-25 |
| Fairings.....                     | 15-11 | Front Fender Installation.....       | 15-25 |
| Middle Fairing Removal .....      | 15-11 | Rear Fender Removal.....             | 15-25 |
| Middle Fairing Installation ..... | 15-12 | Rear Fender Installation.....        | 15-27 |
| Middle Fairing Disassembly.....   | 15-14 | Frame .....                          | 15-28 |
| Middle Fairing Assembly.....      | 15-15 | Frame Inspection .....               | 15-28 |
| Inner Cover Removal .....         | 15-16 | Rear Frame Rear Removal.....         | 15-28 |
| Inner Cover Installation .....    | 15-16 | Rear Frame Rear Installation.....    | 15-28 |
| Upper Fairing Removal .....       | 15-17 | Rear Frame Front Removal .....       | 15-29 |
| Upper Fairing Installation .....  | 15-17 | Rear Frame Front Installation .....  | 15-29 |
| Upper Wing Removal/Installation.  | 15-17 | Windshield .....                     | 15-30 |
| Middle Wing Removal .....         | 15-18 | Windshield Removal .....             | 15-30 |
| Middle Wing Installation .....    | 15-18 | Windshield Installation .....        | 15-30 |
| Side Covers.....                  | 15-19 | Guard.....                           | 15-31 |
| Fuel Tank Cover Removal.....      | 15-19 | Mud Guard Removal.....               | 15-31 |
| Fuel Tank Cover Installation..... | 15-19 | Mud Guard Installation.....          | 15-31 |
| Side Cover Removal .....          | 15-19 | Side Stand .....                     | 15-32 |
| Side Cover Installation .....     | 15-19 | Side Stand Removal .....             | 15-32 |
| Seat Covers.....                  | 15-21 | Side Stand Installation .....        | 15-32 |
| Hip Support Cover Position        |       |                                      |       |
| Adjustment .....                  | 15-21 |                                      |       |

# 15-2 FRAME

## Exploded View



**Exploded View**

| No. | Fastener                            | Torque |       |          | Remarks |
|-----|-------------------------------------|--------|-------|----------|---------|
|     |                                     | N·m    | kgf·m | ft·lb    |         |
| 1   | Front Fender Mounting Bolts         | 4.0    | 0.41  | 35 in·lb | L       |
| 2   | Swingarm Mounting Plate Nut (Upper) | 44     | 4.5   | 32       | R       |
| 3   | Footpeg Bracket Bolts               | 25     | 2.5   | 18       | L       |
| 4   | Rear Master Cylinder Mounting Bolts | 25     | 2.5   | 18       | L       |
| 5   | Side Stand Bracket Bolts            | 49     | 5.0   | 36       | L       |
| 6   | Side Stand Nut                      | 36     | 3.7   | 27       | R       |
| 7   | Side Stand Switch Bolt              | 9.8    | 1.0   | 87 in·lb | L       |
| 8   | Heel Guard Bolts                    | 9.8    | 1.0   | 87 in·lb | L       |
| 9   | Rear Frame Front Bolts              | 25     | 2.5   | 18       |         |
| 10  | Rear Frame Rear Bolts               | 27     | 2.8   | 20       | L       |
| 11  | Clamp Screws                        | 1.2    | 0.12  | 11 in·lb |         |

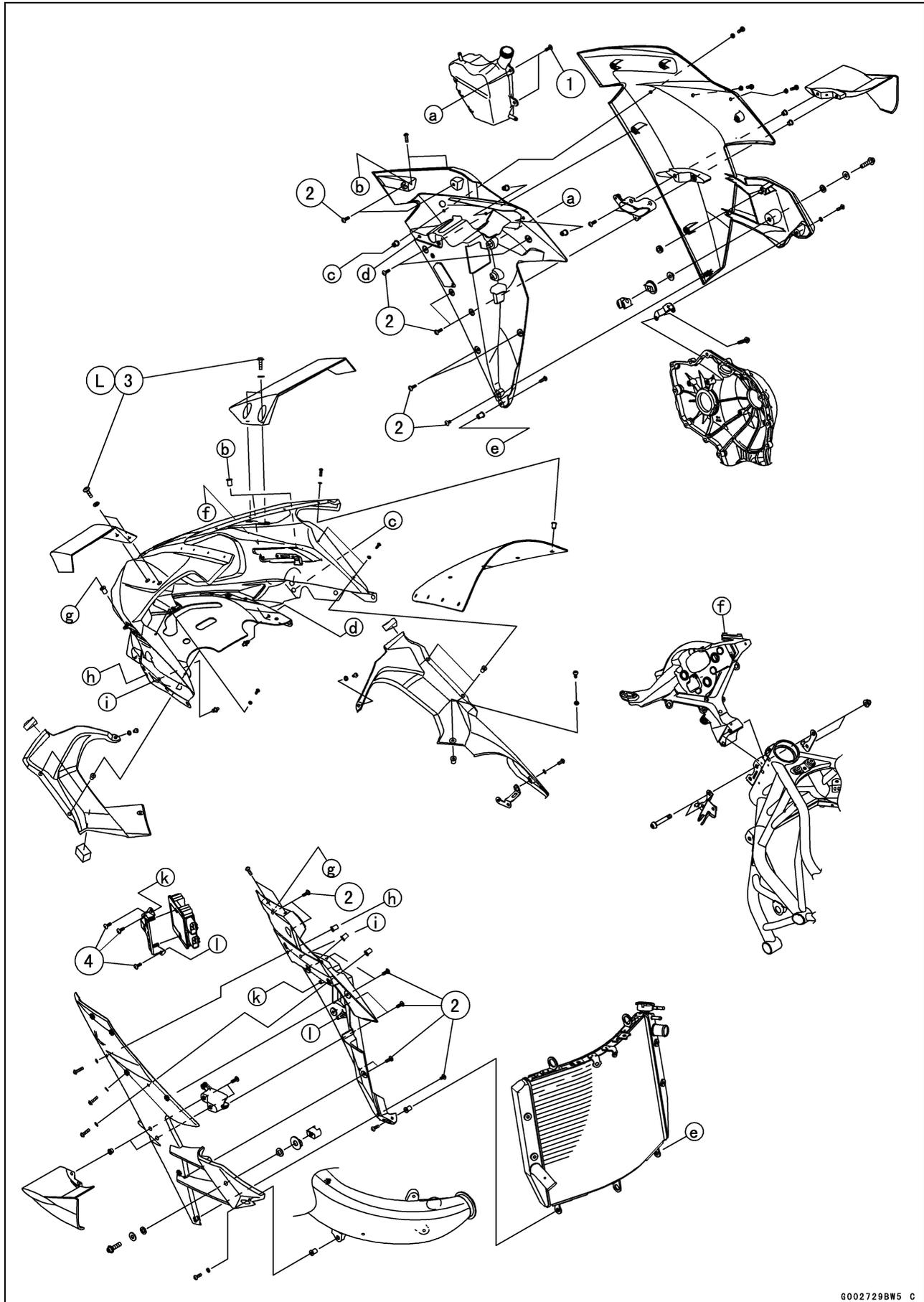
G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

# 15-4 FRAME

## Exploded View



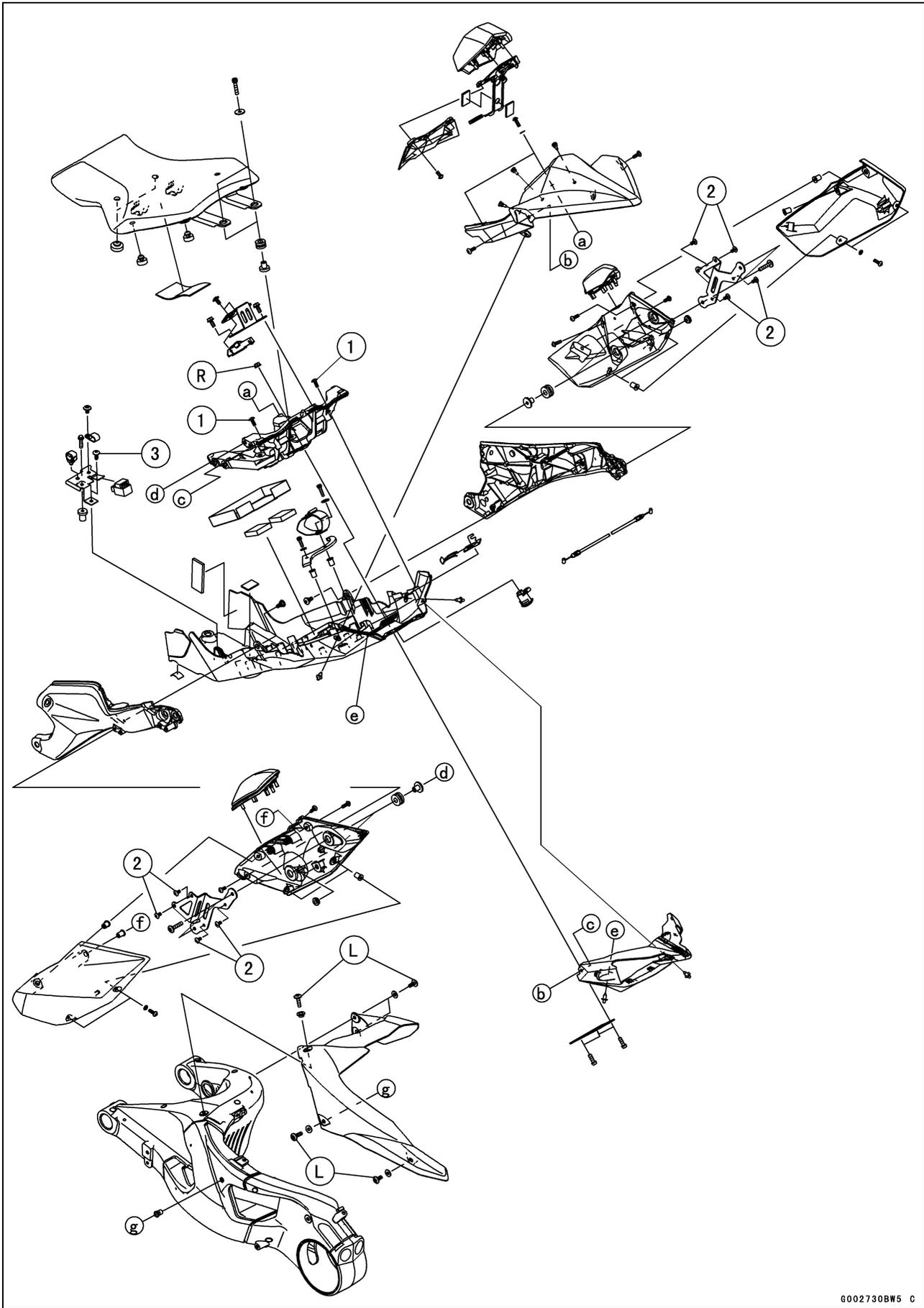
**Exploded View**

| No. | Fastener                           | Torque |       |          | Remarks |
|-----|------------------------------------|--------|-------|----------|---------|
|     |                                    | N·m    | kgf·m | ft·lb    |         |
| 1   | Coolant Reserve Tank Screws        | 1.2    | 0.12  | 11 in·lb |         |
| 2   | Middle Fairing Inner Cover Screws  | 1.2    | 0.12  | 11 in·lb |         |
| 3   | Upper Wing Mounting Bolts          | 6.9    | 0.70  | 61 in·lb | L       |
| 4   | Regulator/Rectifier Bracket Screws | 1.2    | 0.12  | 11 in·lb |         |

L: Apply a non-permanent locking agent.

# 15-6 FRAME

## Exploded View



**Exploded View**

| No. | Fastener                         | Torque |       |          | Remarks |
|-----|----------------------------------|--------|-------|----------|---------|
|     |                                  | N·m    | kgf·m | ft·lb    |         |
| 1   | Rear Fender Screws               | 1.2    | 0.12  | 11 in·lb |         |
| 2   | Hip Support Cover Bracket Screws | 1.2    | 0.12  | 11 in·lb |         |
| 3   | Rear Fender Bracket Screw        | 1.2    | 0.12  | 11 in·lb |         |

L: Apply a non-permanent locking agent.

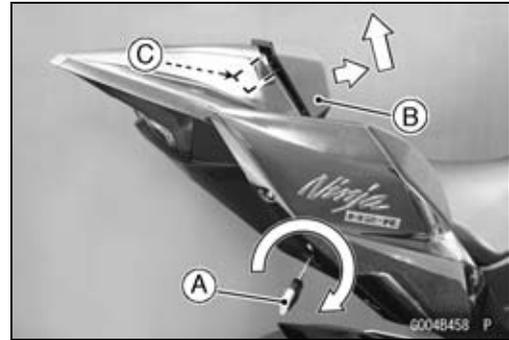
R: Replacement Parts

## 15-8 FRAME

### Seat

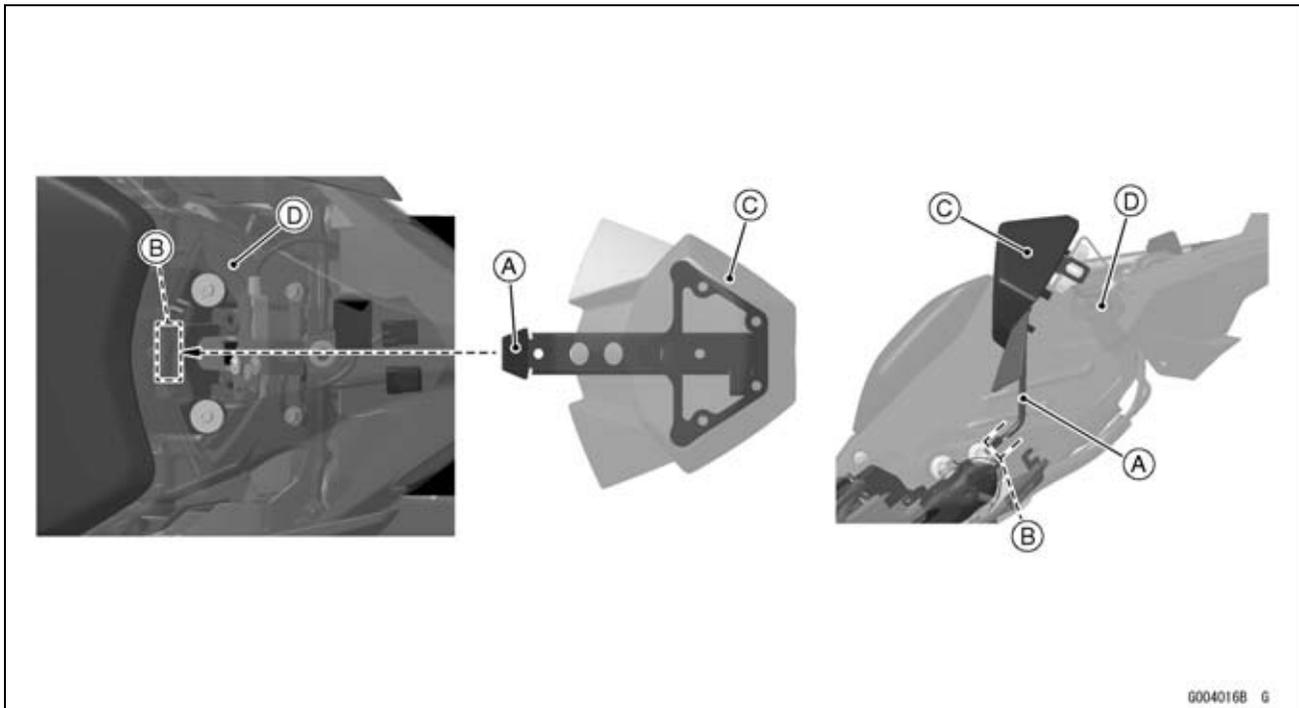
#### Seat Pad Removal

- Insert the ignition key [A] into the seat lock.
- While turning the key clockwise and swaying the seat pad [B] a little to the right and left, pull the seat pad forward to clear the hook [C] from the latch.
- Remove the seat pad upward.

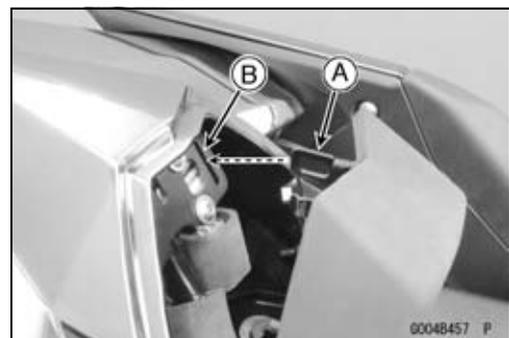


#### Seat Pad Installation

- Insert the bracket [A] of the seat pad into the hollow [B] of the rear frame rear.  
Seat Pad [C]  
Rear Frame Rear [D]



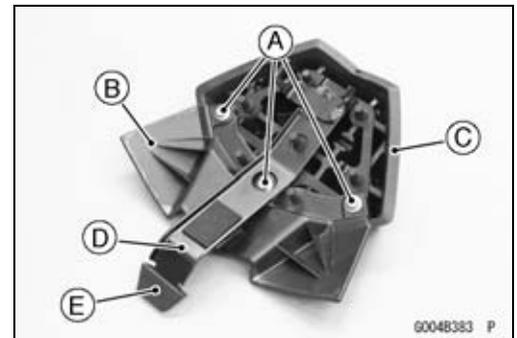
- Insert the hook [A] into the latch hole [B].
- Push down the seat pad until the lock clicks.



**Seat**

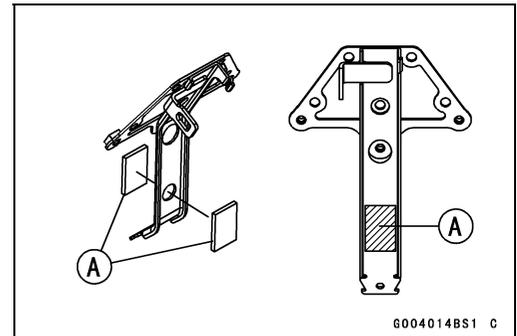
**Seat Pad Disassembly**

- Remove:
  - Seat Pad (see Seat Pad Removal)
  - Bolts [A]
  - Cover [B]
  - Seat Pad [C]
  - Bracket [D]
  - Damper [E]

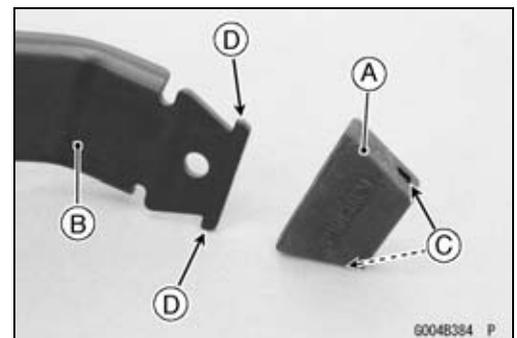


**Seat Pad Assembly**

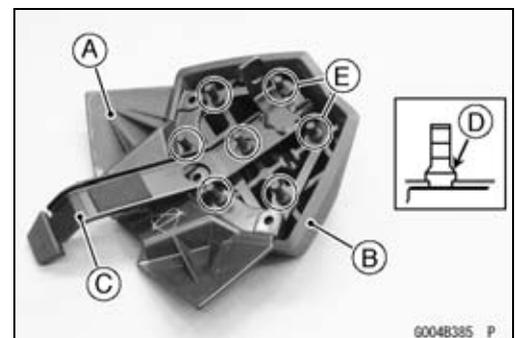
- When installing the dampers [A], position them as shown.



- Install the damper [A] to the bracket [B].
- Fit the holes [C] to the projections [D].



- Install:
  - Cover [A]
  - Seat Pad [B]
  - Bracket [C]
- Be sure to install the flange [D] of the projections [E] fully as shown.
- Tighten the bolts.



- Install the owner's tool [A] (hex wrench, 5 mm).

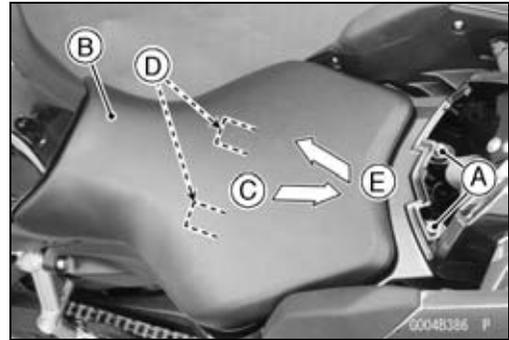


## 15-10 FRAME

### Seat

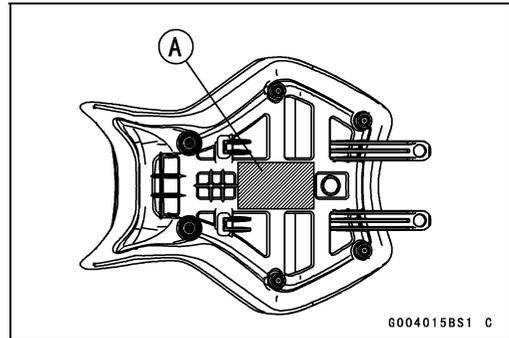
#### Seat Removal

- Remove:
  - Seat Pad (see Seat Pad Removal)
  - Bolts [A] and Washers
- Slide the seat [B] rearward [C] to clear the seat hooks [D].
- Remove the seat forward [E].

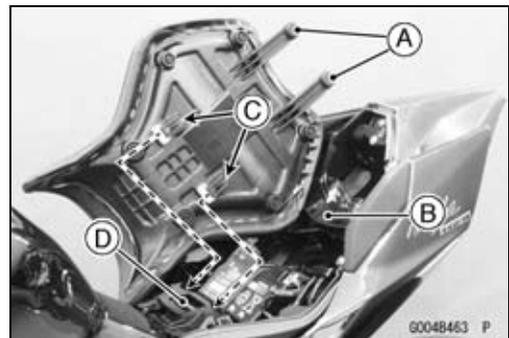


#### Seat Installation

- Be sure to install the pad [A].



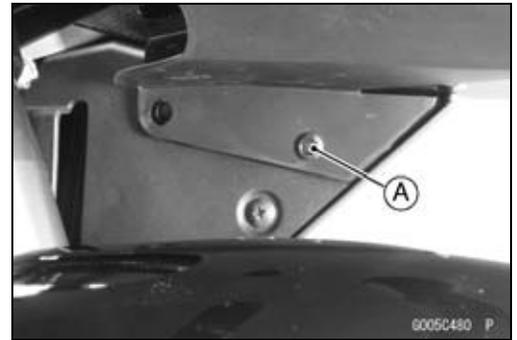
- Install the dampers and collars [A].
  - Face the flange of the collar to the bottom.
- Insert the rear part of the seat under the seat cover [B].
- Insert the seat hooks [C] under the fuel tank bracket [D].
- Tighten the bolts.
- Install the seat pad (see Seat Pad Installation).



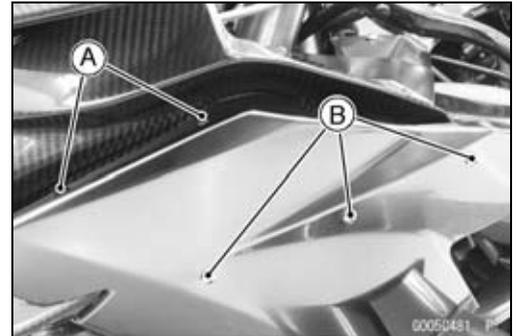
## Fairings

### Middle Fairing Removal Right and Left Side

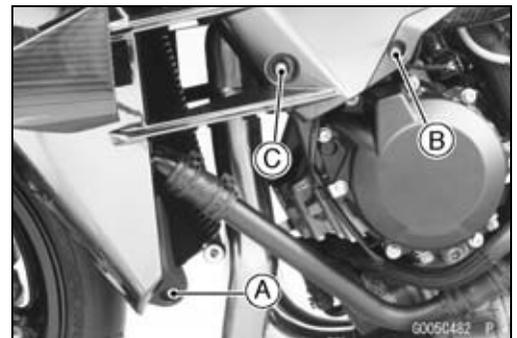
- Remove the quick rivet [A].



- Remove:  
M5 Bolts [A]  
M5 Bolts [B] and Washers

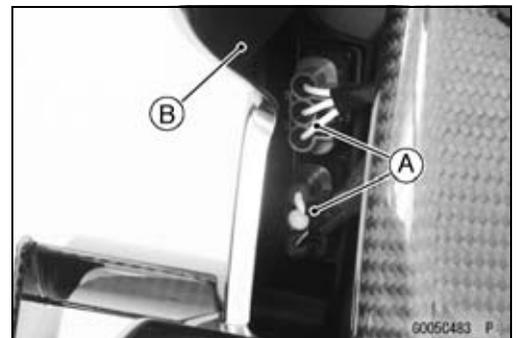


- Remove:  
M5 Bolt [A]  
M5 Bolt [B] and Washer  
M6 Bolt [C] and Washer



### Left Side

- Disconnect the regulator/rectifier connectors [A].
- Remove the left middle fairing [B].



### Right Side

- Pull the right middle fairing outward to clear the projection [A].



## 15-12 FRAME

### Fairings

#### Right Side

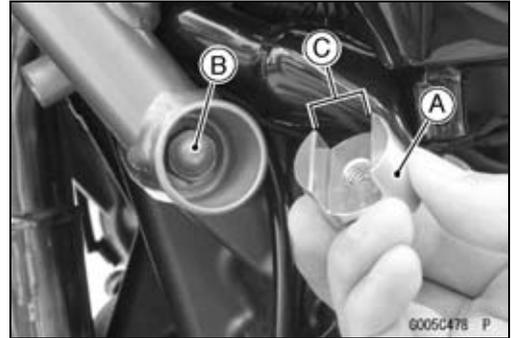
- Disconnect the radiator overflow hose [A].
- Remove the right middle fairing [B].
- Drain the coolant to a container.



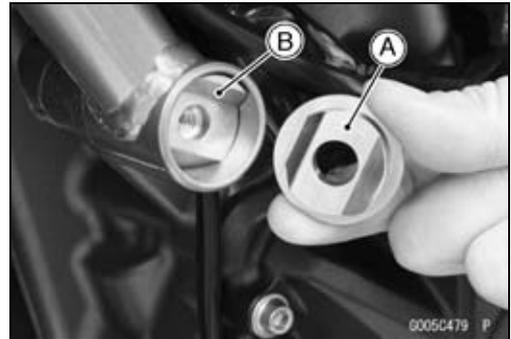
#### Middle Fairing Installation

##### Right and Left Side

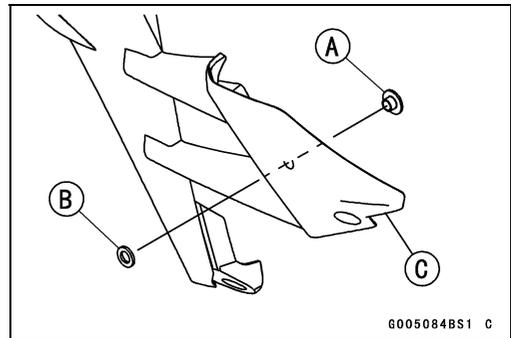
- Install the nut [A] over the front engine mounting bolt [B].
- Fit the groove [C] of nut to the bolt head.



- Install the sleeve [A] onto the nut [B].



- Install the collar [A] and rubber damper [B] to the middle fairing [C].



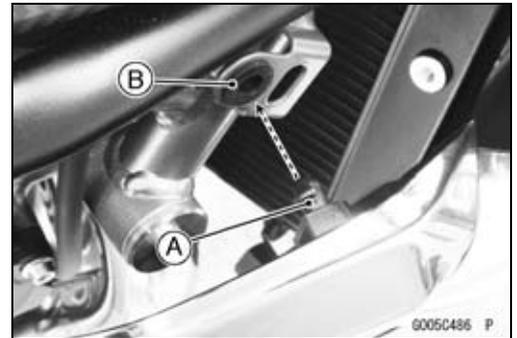
#### Left Side

- Run the regulator/rectifier lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter), and connect it to the regulator/rectifier.

## Fairings

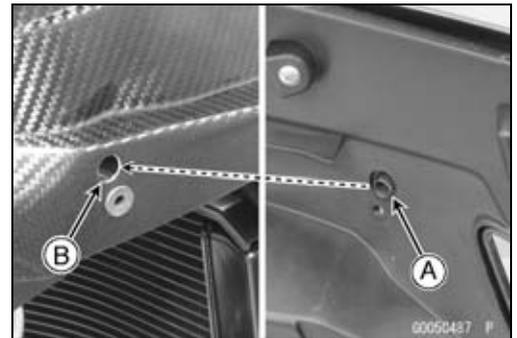
### Right Side

- Run the radiator overflow hose correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter), and add coolant to the coolant reserve tank.
- Insert the projection [A] of the middle fairing into the grommet [B] on the frame.

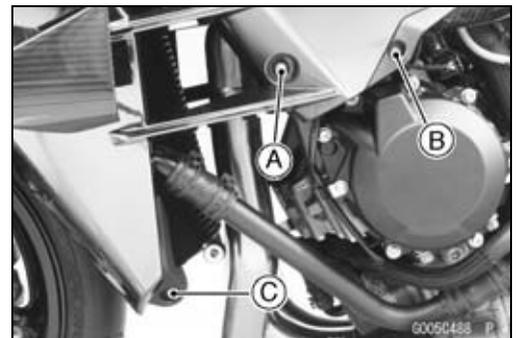


### Right and Left Side

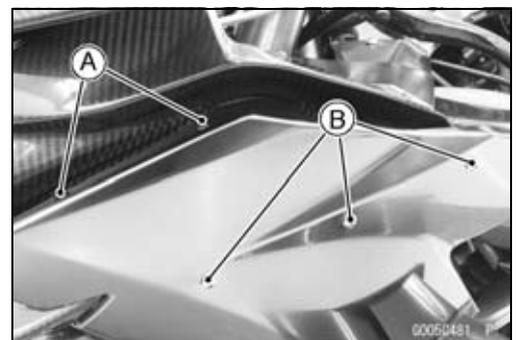
- Fit the boss [A] of the middle fairing to the hole [B] on the upper fairing.



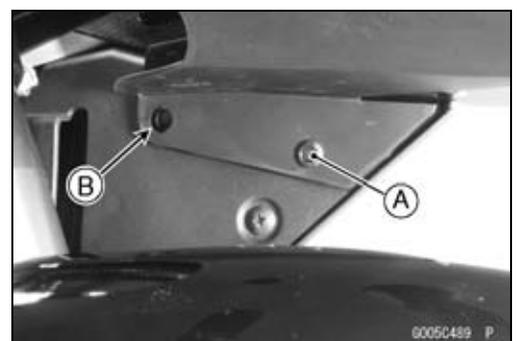
- Tighten:  
M6 Bolt [A] and Washer  
M5 Bolt [B] and Washer  
M5 Bolt [C]



- Tighten:  
M5 Bolts [A]  
M5 Bolts [B] and Washers



- Install the quick rivet [A].
- Fit the boss [B] of the fairing inner cover to the hole on the inner fairing.



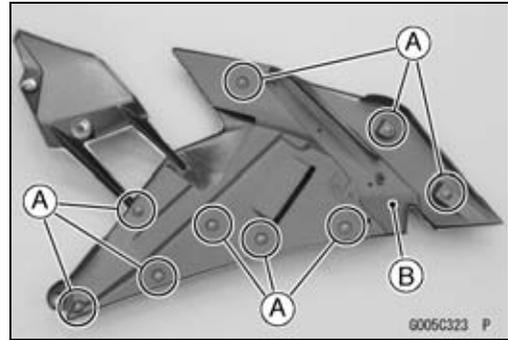
# 15-14 FRAME

## Fairings

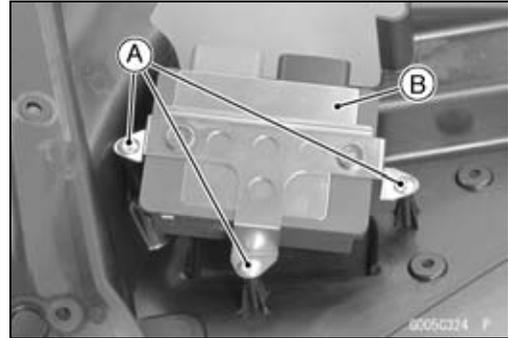
### Middle Fairing Disassembly

#### Left Middle Fairing

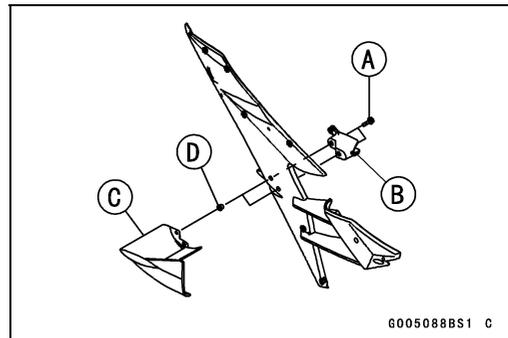
- Remove:
  - Left Middle Fairing (see Middle Fairing Removal)
  - Screws [A]
  - Left Middle Fairing Inner Cover [B]



- Remove:
  - Regulator/Rectifier Screws [A]
  - Regulator/Rectifier and Bracket [B]

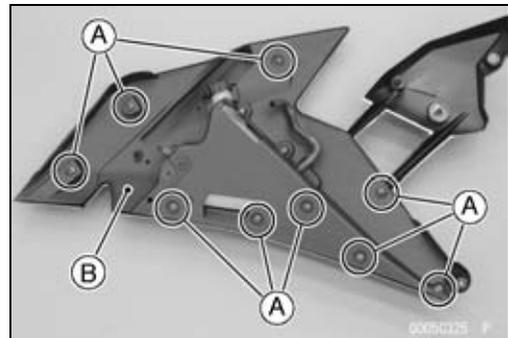


- Remove:
  - Bolts [A]
  - Bracket [B]
  - Middle Wing [C]
  - Collars [D]

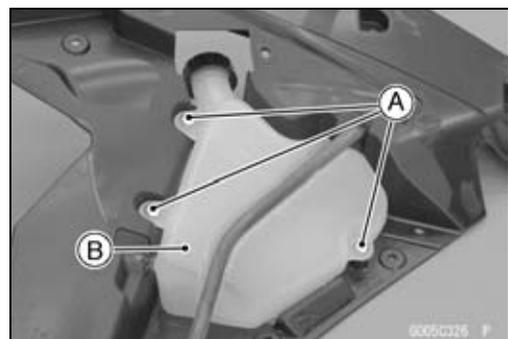


#### Right Middle Fairing

- Remove:
  - Right Middle Fairing (see Middle Fairing Removal)
  - Screws [A]
  - Right Middle Fairing Inner Cover [B]

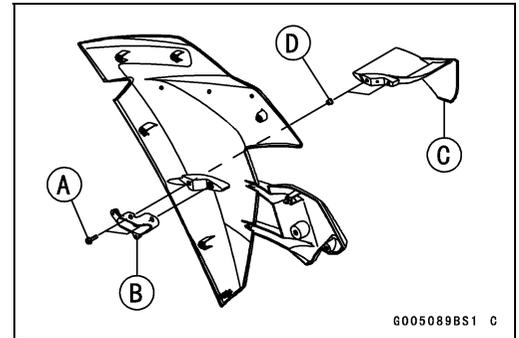


- Remove:
  - Screws [A]
  - Coolant Reserve Tank [B]



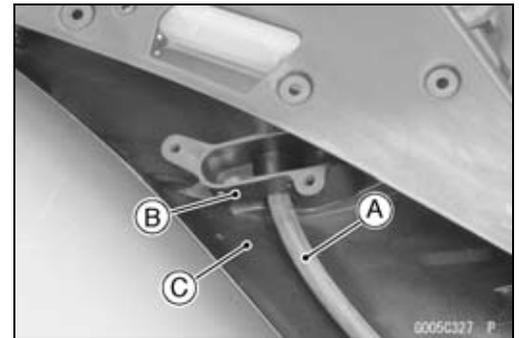
## Fairings

- Remove:
  - Bolts [A]
  - Bracket [B]
  - Middle Wing [C]
  - Collars [D]

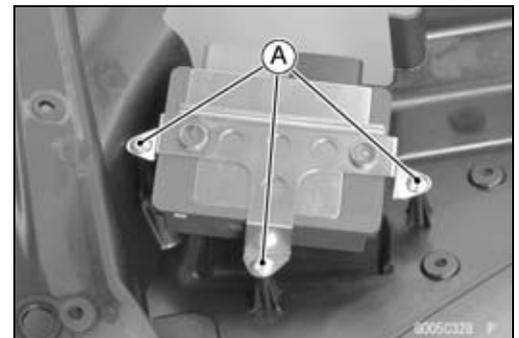


### **Middle Fairing Assembly**

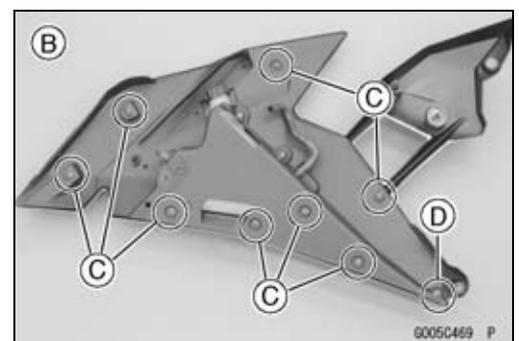
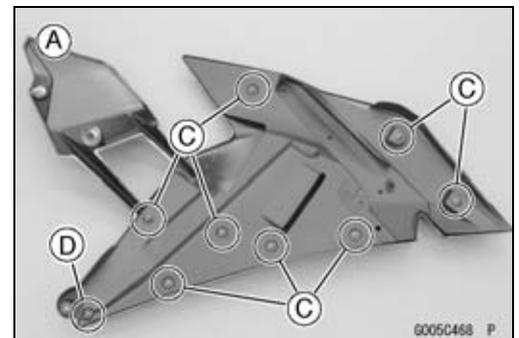
- Assembly is the reverse of disassembly.
- Run the reserve tank overflow hose [A] between the cap [B] and right middle fairing [C].



- Install the regulator/rectifier and bracket to the left middle fairing.
- Tighten:
  - Torque - Regulator/Rectifier Bracket Screws [A]: 1.2 N·m (0.12 kgf·m, 11 in·lb)**



- Install the middle fairing inner covers, and tighten the screws.
  - Left Middle Fairing [A]
  - Right Middle Fairing [B]
  - Screws, L = 16 mm (0.6 in.) [C]
  - Screw, L = 10 mm (0.4 in.) [D]



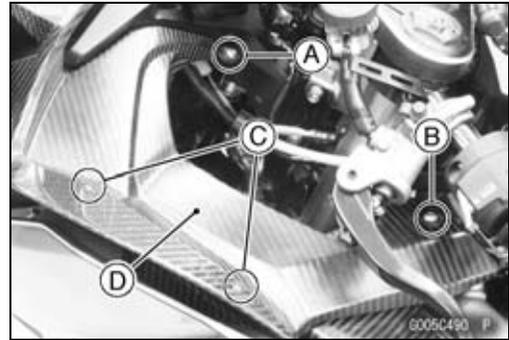
# 15-16 FRAME

## Fairings

### Inner Cover Removal

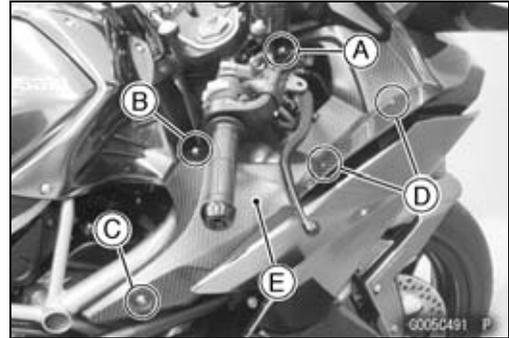
#### Left Inner Cover

- Remove the bolts and washers.
  - M5 Bolt, L = 10 mm (0.39 in.) [A] and Washer
  - M5 Bolt, L = 16 mm (0.63 in.) [B] and Washer
  - M4 Bolts, L = 15 mm (0.59 in.) [C] and Washers
- Remove the left inner cover [D].



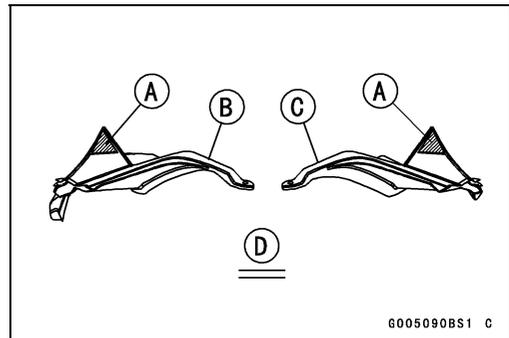
#### Right Inner Cover

- Remove the bolts and Washers.
  - M5 Bolt, L = 10 mm (0.39 in.) [A] and Washer
  - M5 Bolt, L = 16 mm (0.63 in.) [B] and Washer
  - M5 Bolt, L = 12 mm (0.47 in.) [C] and Washer
  - M4 Bolts, L = 15 mm (0.59 in.) [D] and Washers
- Remove the right inner cover [E].

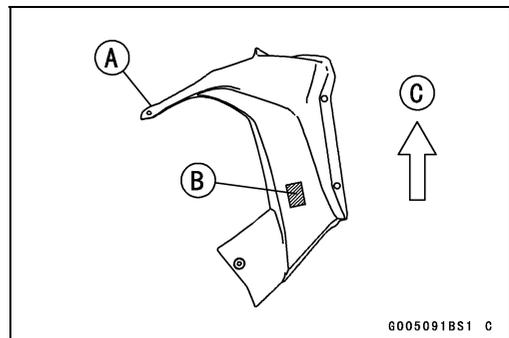


### Inner Cover Installation

- On the back side of the inner covers, be sure to install the pads [A] as shown.
  - Right Inner Cover [B]
  - Left Inner Cover [C]
  - Viewed from Front [D]



- On the back side of the left inner cover [A], be sure to install the pad [B] as shown.
  - Front [C]

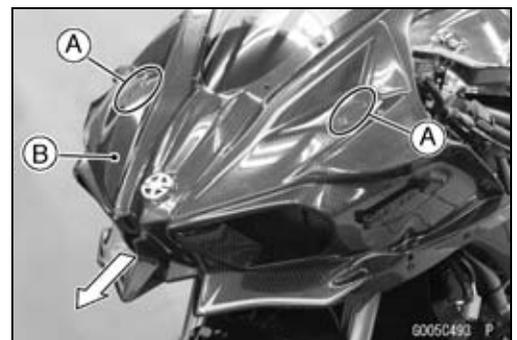
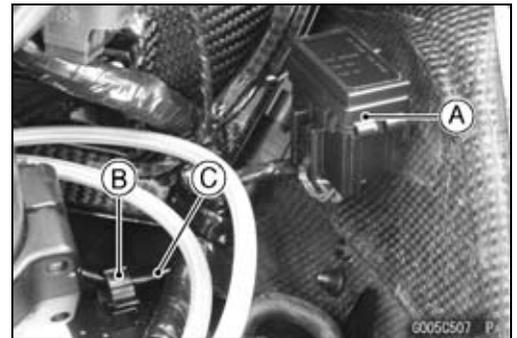
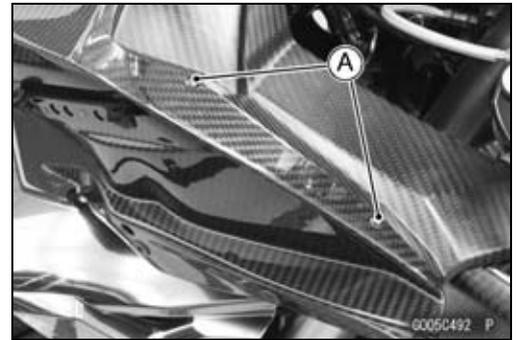


- Install the washers and tighten the bolts.

## Fairings

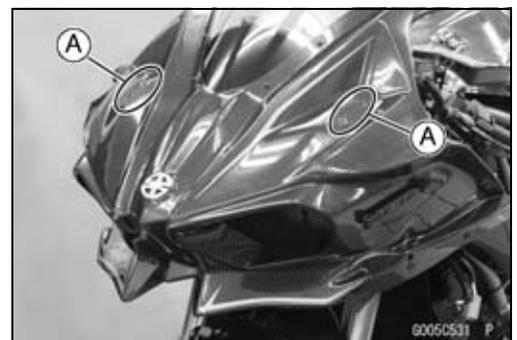
### Upper Fairing Removal

- Remove:
  - Upper Wings (see Upper Wing Removal)
  - Middle Fairings (see Middle Fairing Removal)
  - Inner Covers (see Inner Cover Removal)
  - M4 Bolts [A] and Washers (Both Sides)
  
- Take the fuse box 1 [A] off the upper fairing.
- Open the clamp [B] to free the front wheel rotation sensor lead [C].
  
- Clear the holes [A] of the upper fairing from the upper wing mounting portion.
- Remove the upper fairing [B] with the inner fairing forward.



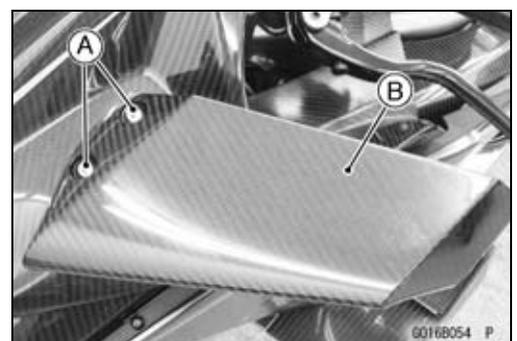
### Upper Fairing Installation

- Run the cables, leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the upper fairing.
- Fit the holes [A] of the upper fairing to the upper wing mounting portion.
- Install the removed parts (see appropriate chapters).



### Upper Wing Removal/Installation

- Remove:
  - Upper Wing Mounting Bolts [A]
  - Upper Wing [B]



## 15-18 FRAME

---

### Fairings

---

- Apply a non-permanent locking agent to the threads of the upper wing mounting bolts.
- Tighten:  
    **Torque - Upper Wing Mounting Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)**

#### ***Middle Wing Removal***

- Refer to the Middle Fairing Disassembly.

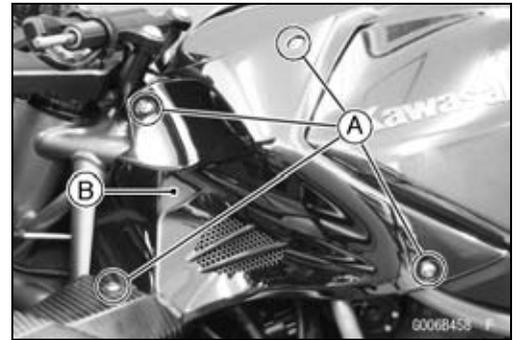
#### ***Middle Wing Installation***

- Refer to the Middle Fairing Assembly.

## Side Covers

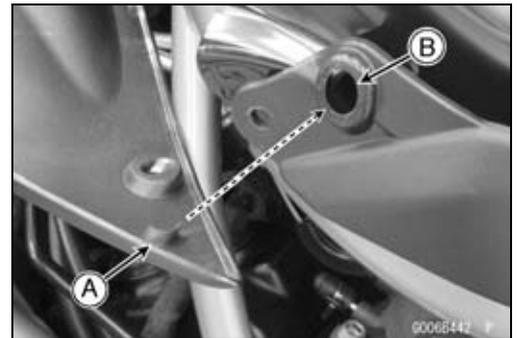
### Fuel Tank Cover Removal

- Remove:
  - Bolts [A] and Washers
  - Remove the fuel tank cover [B].

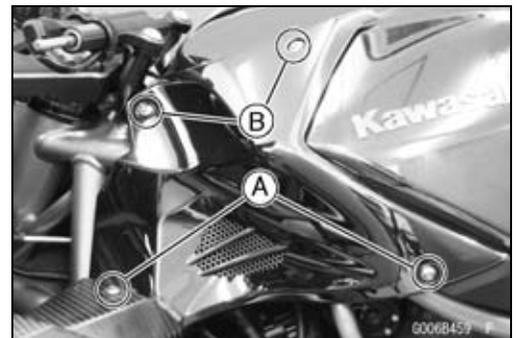


### Fuel Tank Cover Installation

- Fit the boss [A] of the fuel tank cover to the hole [B] of the side cover.

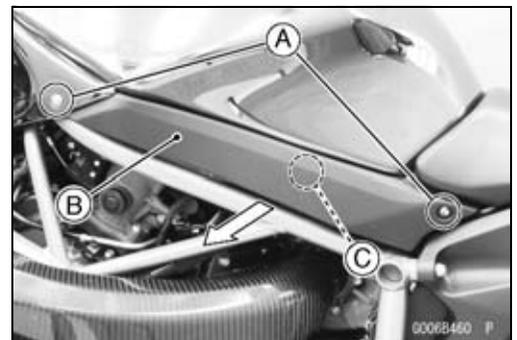


- Tighten the bolts.
  - Bolts, L = 16 mm (0.5 in.) [A] and Washers
  - Bolts, L = 12 mm (0.4 in.) [B] and Washers



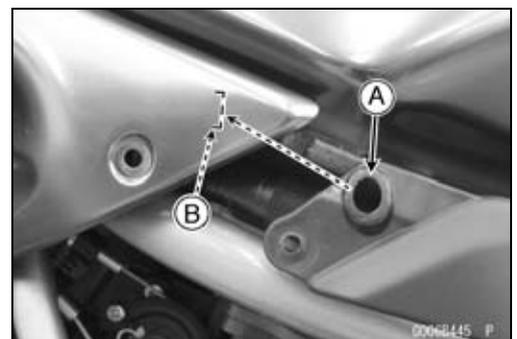
### Side Cover Removal

- Remove:
  - Bolts [A] and Washers
- Pull the side cover [B] outward to clear the projection [C].



### Side Cover Installation

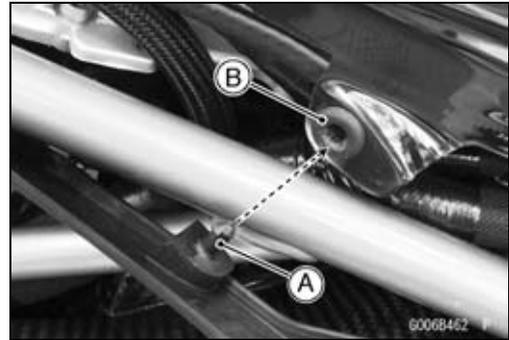
- Fit the hole [A] of the side cover to the boss [B] of the fuel tank cover.



## 15-20 FRAME

### Side Covers

- Fit the projection [A] of the side cover into the grommet [B] on the fuel tank.



- Install the washers and tighten the bolts.  
Bolt, L = 16 mm (0.5 in.) [A]  
Bolt, L = 12 mm (0.4 in.) [B]



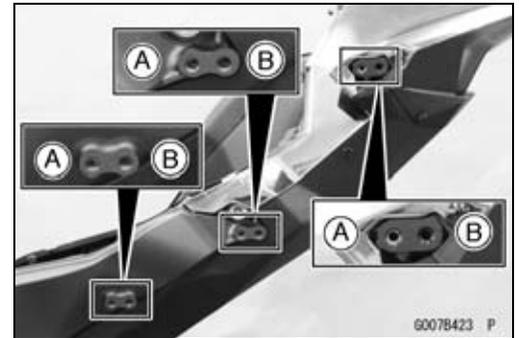
## Seat Covers

### Hip Support Cover Position Adjustment

○The hip support cover can be adjusted within 2 positions to suit the rider's preference.

Bolt Holes for Position 1 [A]

Bolt Holes for Position 2 [B]

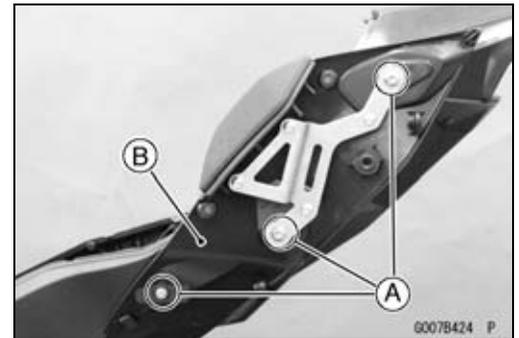


- Remove the hip support cover outer (see Hip Support Cover Removal).
- Remove the bolts [A] and hip support cover inner [B].
- Adjust the hip support cover position.

### NOTE

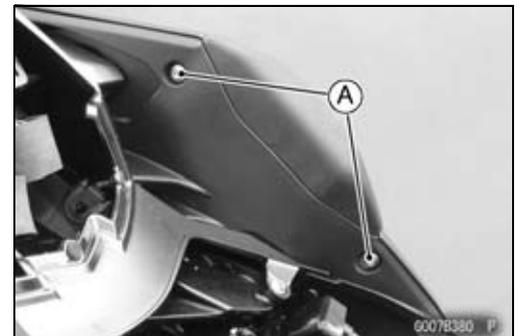
○Install the hip support covers with same position on both sides.

- Tighten the bolts.
- Install the hip support cover outer (see Hip Support Cover Installation).

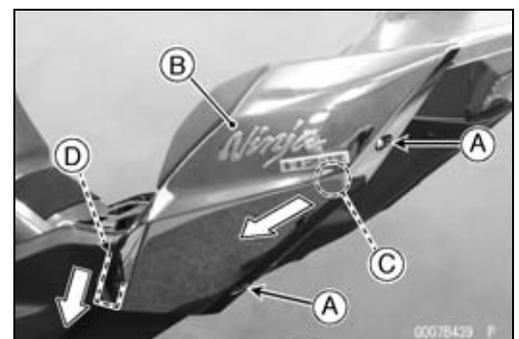


### Hip Support Cover Removal

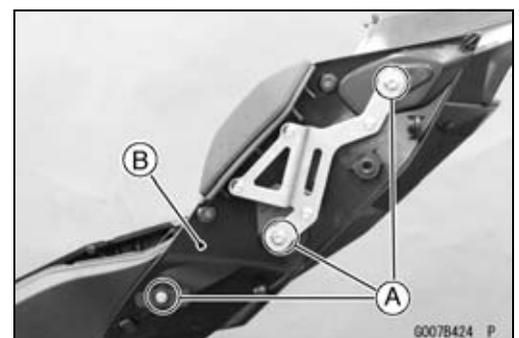
- Remove:
  - Seat Pad (see Seat Pad Removal)
  - Seat (see Seat Removal)
  - Bolts [A]



- Remove the bolts [A] and Washers.
- Pull the rear part of the hip support cover outer [B] outward to clear the projection [C].
- Pull the front part of the hip support cover outer downward to clear the hook [D].
- Remove the hip support cover outer.



- Remove the bolts [A].
- Remove the hip support cover inner [B].

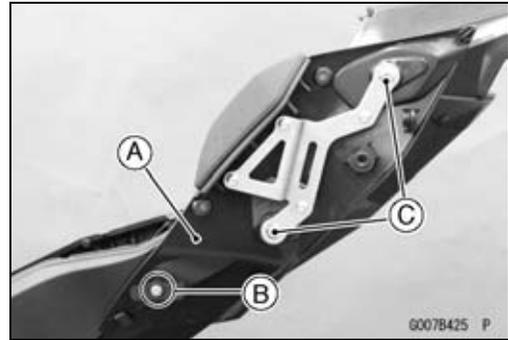


# 15-22 FRAME

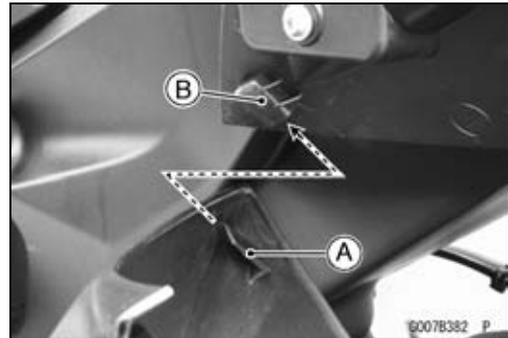
## Seat Covers

### Hip Support Cover Installation

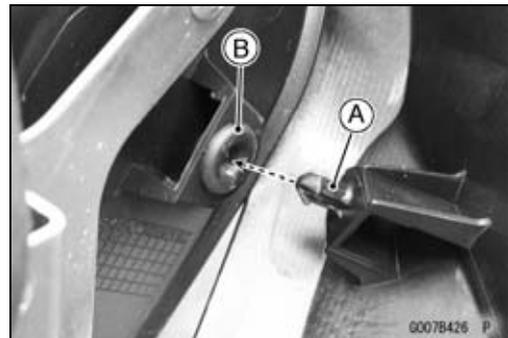
- Install the hip support cover inner [A] and tighten the bolts.  
M5 Bolt [B]  
M6 Bolts [C]



- Insert the hook [A] of the hip support cover outer into the hook [B] of the hip support cover inner.

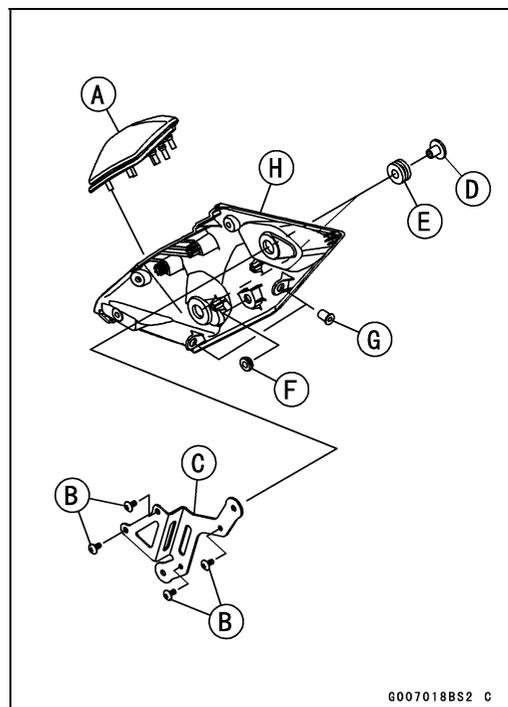


- Insert the projection [A] of the hip support cover outer into the grommet [B] on the hip support cover inner.
- Install the washers and tighten the bolts.
- Install the removed parts (see appropriate chapters).



### Hip Support Cover Disassembly

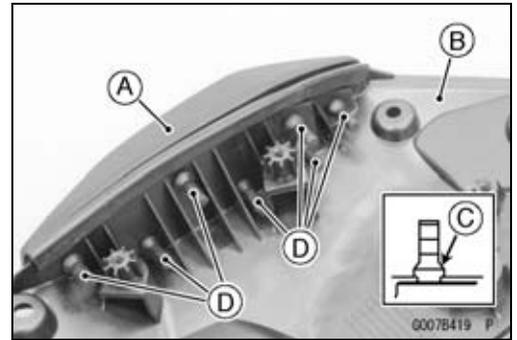
- Remove:
  - Hip Support Cover (see Hip Support Cover Removal)
  - Hip Support [A]
  - Screws [B]
  - Bracket [C]
  - Collars [D]
  - Dampers [E]
  - Grommet [F]
  - Wellnuts [G]
  - Hip Support Cover Inner [H]



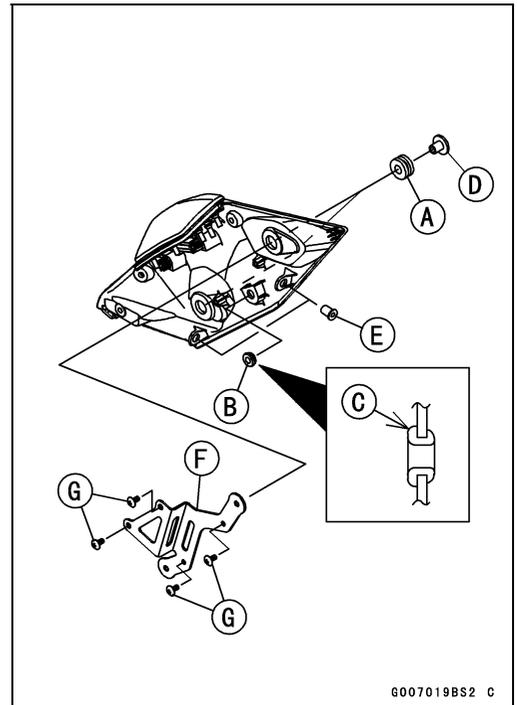
## Seat Covers

### Hip Support Cover Assembly

- Install:
  - Hip Support [A]
  - Hip Support Cover Inner [B]
- Be sure to install the flange [C] of the projections [D] fully as shown.

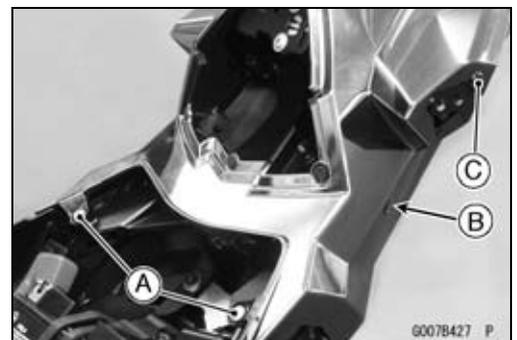


- Install:
  - Dampers [A]
  - Grommet [B]
- Face the large diameter side [C] of grommet toward the hip support cover outer.
- Install:
  - Collars [D]
  - Wellnuts [E]
  - Bracket [F]
- Tighten:
  - Torque - Hip Support Cover Bracket Screws [G]: 1.2 N·m (0.12 kgf·m, 11 in·lb)**

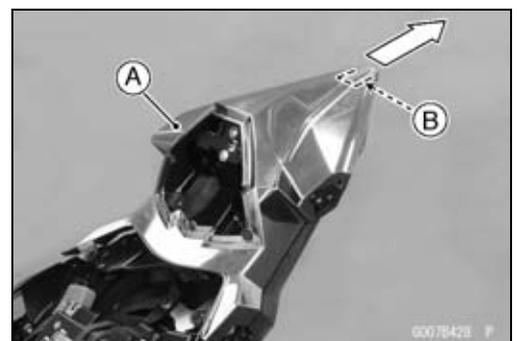


### Seat Cover Removal

- Remove:
  - Seat Pad (see Seat Pad Removal)
  - Seat (see Seat Removal)
  - Hip Support Covers (see Hip Support Cover Removal)
  - Bolts [A] and Washers
  - Quick Rivet [B] (Both Sides)
  - Screw [C] (Both Sides)



- Slide the seat cover [A] rearward to clear the hook [B].

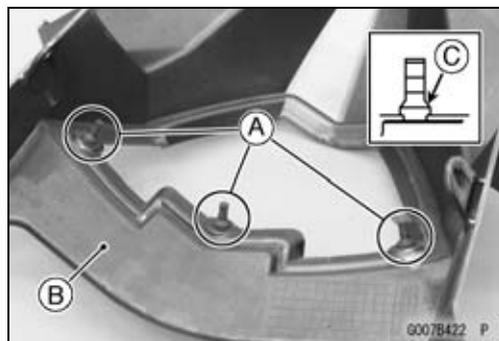


## 15-24 FRAME

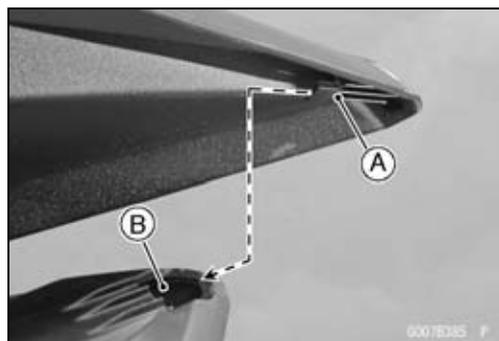
### Seat Covers

#### **Seat Cover Installation**

- Install the dampers [A] to the seat cover [B].
- Be sure to install the flange [C] of the dampers fully as shown.



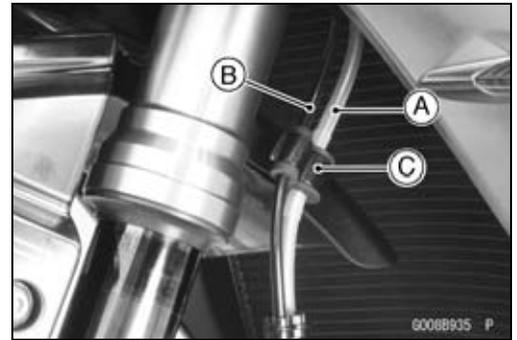
- Insert the hook [A] of the seat cover into the hole [B] of the tail/brake light cover.
- Install:
  - Screws
  - Quick Rivets
  - Bolts and Washers
- Install the removed parts (see appropriate chapters).



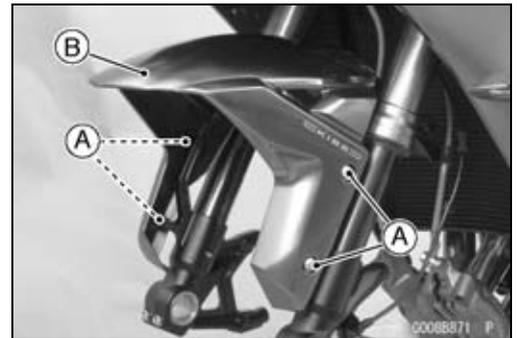
## Fenders

### Front Fender Removal

- Remove:
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
- Free the brake hose [A] and the front wheel rotation sensor lead [B] from the clamp [C] on both sides.



- Remove the following parts.
  - Bolts [A] and Washers
- Remove the front fender [B].

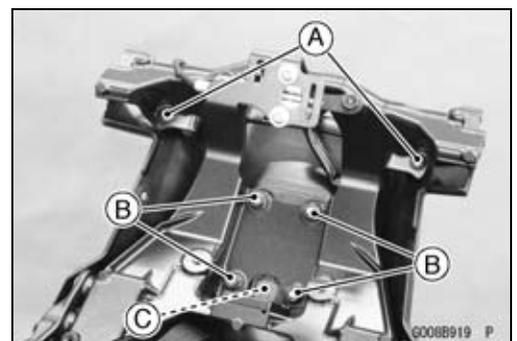


### Front Fender Installation

- Installation is the reverse of removal.
- Apply a non-permanent locking agent to the front fender bolts.
- Tighten:
  - Torque - Front Fender Mounting Bolts: 4.0 N·m (0.41 kgf·m, 35 in·lb)**
- Run the leads and hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

### Rear Fender Removal

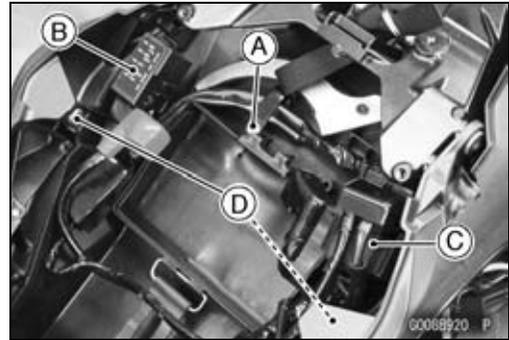
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Tail/Brake Light (LED) (see Tail/Brake Light (LED) Removal in the Electrical System chapter)
  - Battery (see Battery Removal in the Electrical System chapter)
- Remove:
  - Screws [A]
  - Bolts and Nuts [B]
  - Rear Fender Cover Plate [C]



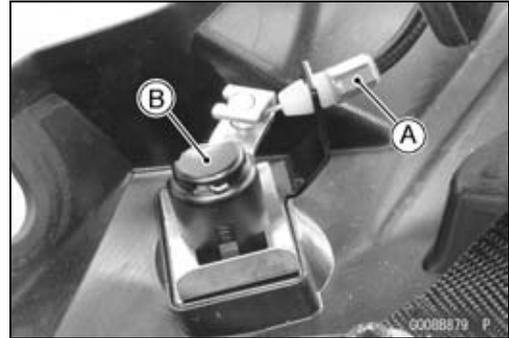
## 15-26 FRAME

### Fenders

- Remove the screw [A] to free the clamp.
- Free the fuse box 2 [B] and the starter relay [C] from the rear fender.
- Remove the bolts [D].



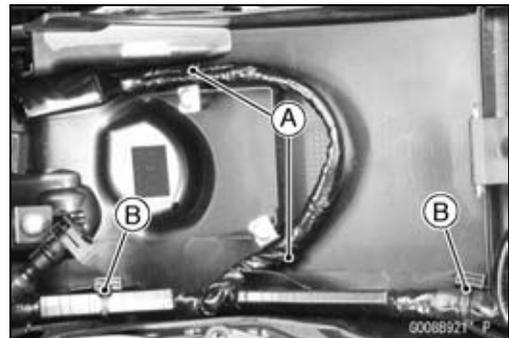
- Free the seat lock cable [A] from the seat lock [B].



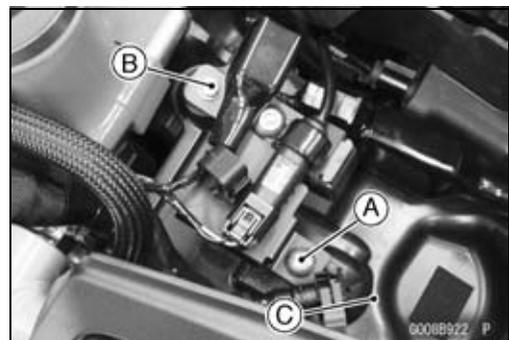
- Open the clamps [A].
- Cut the band of clamps [B].

#### NOTE

○The clip of the clamp cannot reuse. Do not remove the clip if it is not necessary.



- Remove:
  - Rear Fender Bracket Screw [A]
  - Bolt [B]
  - Rear Fender [C]

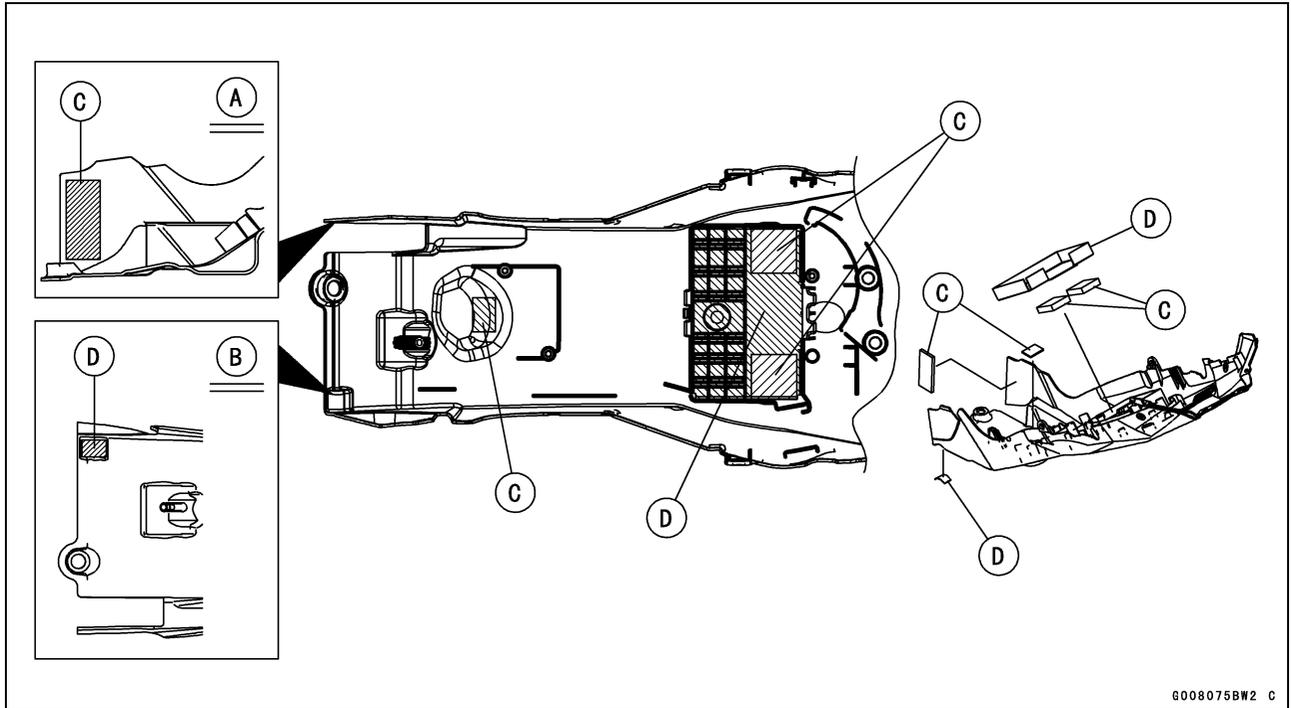


Fenders

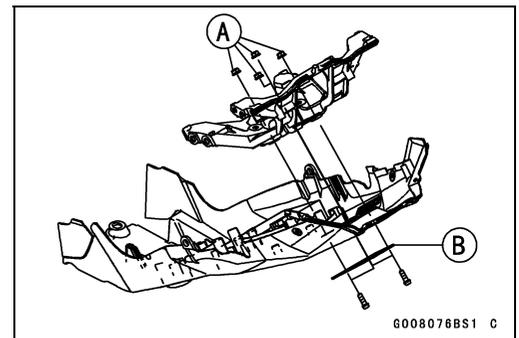
**Rear Fender Installation**

- When installing the pads and dampers, position them as shown.

- Viewed from Inside [A]
- Viewed from Bottom [B]
- Dampers [C]
- Pads [D]



- Installation is the reverse of removal.
- Replace the nuts [A] with new ones.  
Rear Fender Cover Plate [B]



- Tighten:  
Torque - Rear Fender Bracket Screw [A]: 1.2 N·m (0.12 kgf·m, 11 in·lb)
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



## 15-28 FRAME

### Frame

#### Frame Inspection

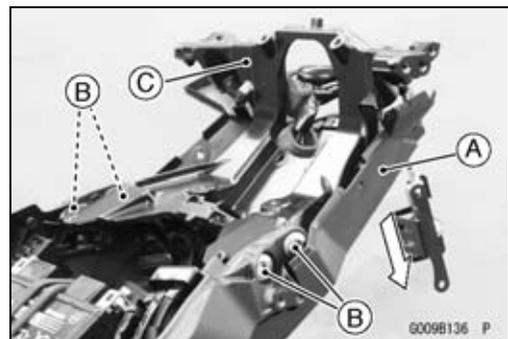
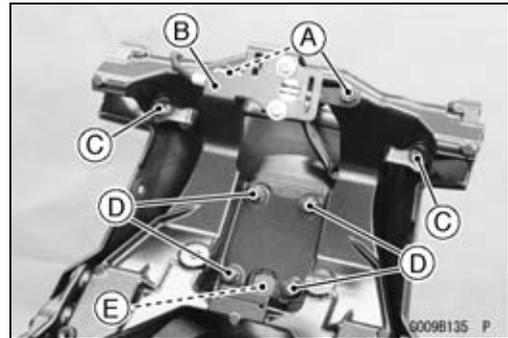
- Visually inspect the frame for cracks, dents, bending, or warp.
- ★ If there is any damage to the frame, replace it.

#### **⚠ WARNING**

**A repaired frame may fail in use, possibly causing an accident resulting in injury or death. If the frame is bent, dented, cracked, or warped, replace it.**

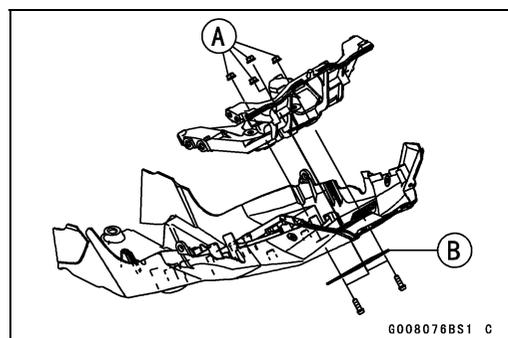
#### Rear Frame Rear Removal

- Remove:
  - Seat Pad (see Seat Pad Removal)
  - Seat (see Seat Removal)
  - Hip Support Covers (see Hip Support Cover Removal)
  - Seat Cover (see Seat Cover Removal)
  - Flap (see Flap Removal)
  - Tail/Brake Light (see Tail/Brake Light Removal in the Electrical System chapter)
- Remove the bolts [A] to free the seat latch bracket [B].
- Remove:
  - Screws [C]
  - Bolts and Nuts [D]
  - Rear Fender Cover Plate [E]
- While pushing down the rear fender [A] slightly, remove the rear frame rear bolts [B].
- Remove:
  - Rear Frame Rear [C]



#### Rear Frame Rear Installation

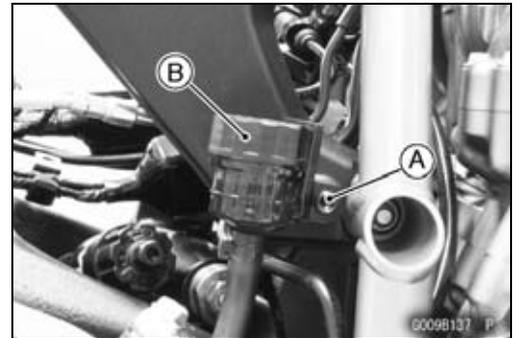
- Installation is the reverse of removal.
- Replace the nuts [A] with new ones.
  - Rear Fender Cover Plate [B]
- Apply a non-permanent locking agent to the rear frame rear bolts.
- Tighten:
  - Torque - Rear Frame Rear Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)



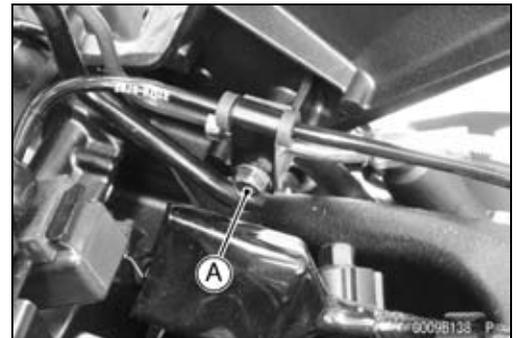
Frame

**Rear Frame Front Removal**

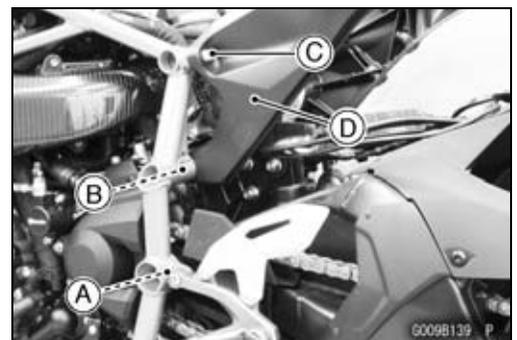
- Remove:
  - Rear Fender (see Rear Fender Removal)
  - Rear Frame Rear (see Rear Frame Rear Removal)
- Remove the bolt [A] to free the rear brake fluid reservoir [B] from the rear frame front.



- On the right side, remove the rear brake pipe fitting bolt [A].

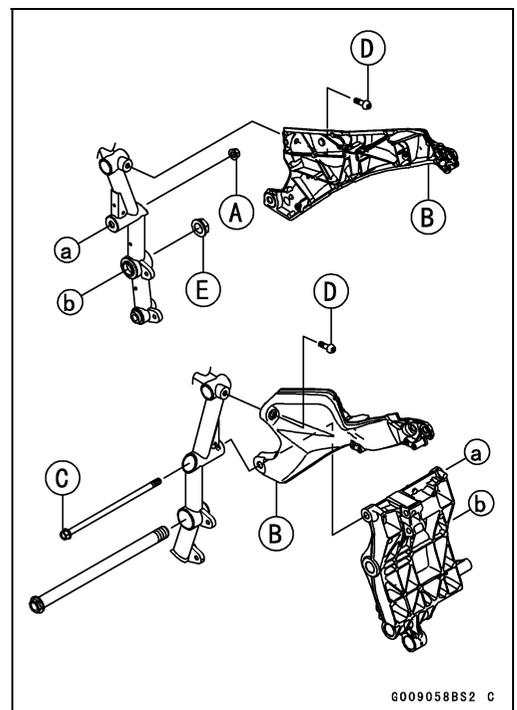


- Loosen the swingarm pivot shaft [A] and nut.
- Remove:
  - Swingarm Mounting Plate Bolt [B] and Nut (Upper)
  - Rear Frame Front Bolt [C]
  - Rear Frame Front [D]



**Rear Frame Front Installation**

- Replace the swingarm mounting plate nut (upper) [A] with a new one.
- Install:
  - Rear Frame Front [B]
  - Swingarm Mounting Plate Bolt (Upper) [C]
- Tighten:
  - Torque - Rear Frame Front Bolts [D]: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Swingarm Mounting Plate Nut (Upper): 44 N·m (4.5 kgf·m, 32 ft·lb)**
  - Swingarm Pivot Shaft Nut [E]: 108 N·m (11.0 kgf·m, 79.7 ft·lb)**
- Install the removed parts (see appropriate chapters).



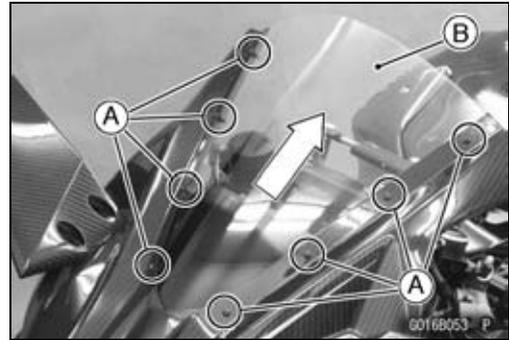
## 15-30 FRAME

### Windshield

---

#### **Windshield Removal**

- Remove the bolts [A] and washers.
- Remove the windshield [B] upward.



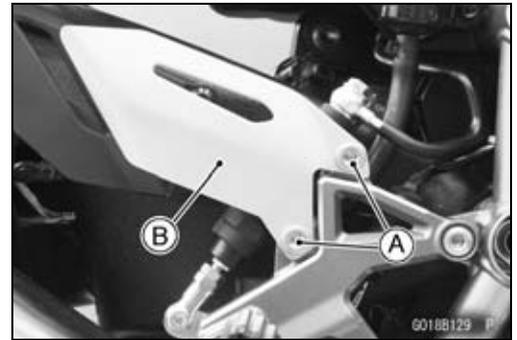
#### **Windshield Installation**

- Install the windshield.
- Install the washers and tighten the bolts.

**Guard**

**Mud Guard Removal**

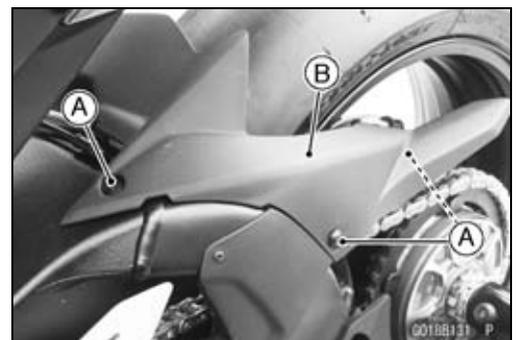
- Remove:
  - Rear Master Cylinder Mounting Bolts [A]
  - Heel Guard [B]



- Remove:
  - Bolts [A] and Washers

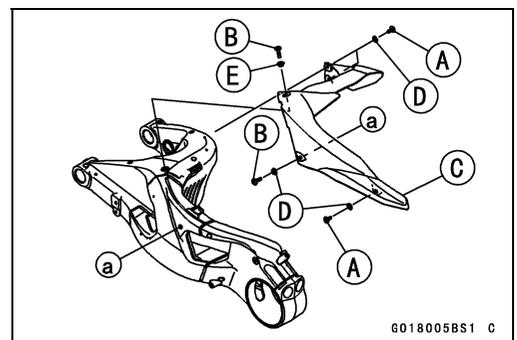


- Remove:
  - Bolts [A], Collar and Washers
  - Mud Guard [B]



**Mud Guard Installation**

- Apply a non-permanent locking agent to the following bolts.
  - Bolts, L = 14 mm (0.55 in.) [A]
  - Bolts, L = 22 mm (0.87 in.) [B]
- Install the mud guard [C], washers [D] and collar [E].
- Tighten the bolts.



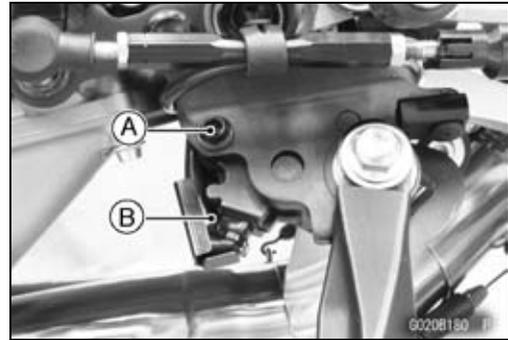
6018005BS1 C

## 15-32 FRAME

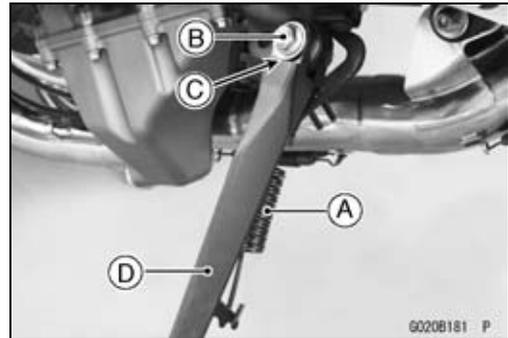
### Side Stand

#### Side Stand Removal

- Remove the side stand switch bolt [A] to free the side stand switch [B].

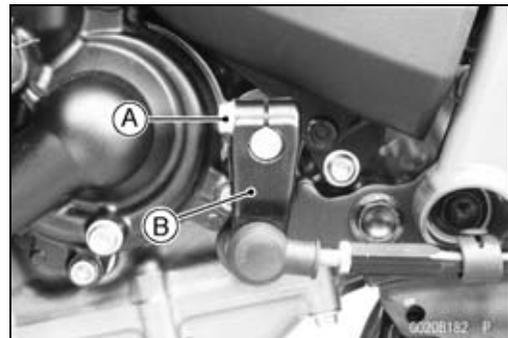


- Remove:
  - Spring [A]
  - Side Stand Bolt [B] and Nut
  - Collar [C]
  - Washer
  - Shims
  - Side Stand [D]

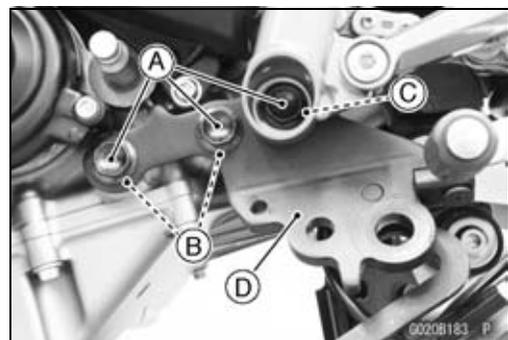


- ★ If the side stand bracket removal is necessary, follow the below procedures.

- Remove the shift lever bolt [A].
- Take the shift lever [B] off the shift shaft.

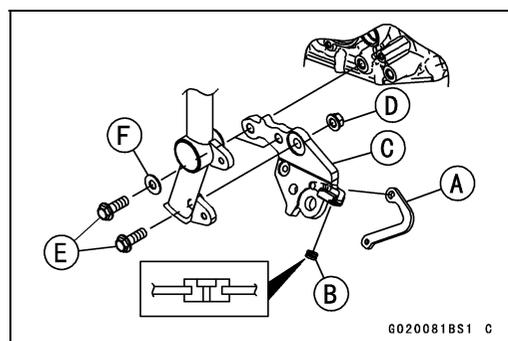


- Remove:
  - Side Stand Bracket Bolts [A] and Washers [B]
  - Side Stand Bracket Nut [C]
  - Side Stand Bracket [D]



#### Side Stand Installation

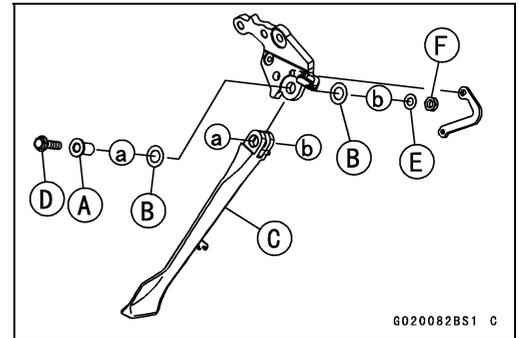
- When installing the side stand bracket, be sure to install the link arm [A] and grommet [B] to the side stand bracket [C].
- Face the small hole of the grommet to the bottom as shown.
- Replace the side stand bracket nut [D] with a new one.
- Apply a non-permanent locking agent to the side stand bracket bolts [E].
- Install the side stand bracket to the engine and frame.
- Install the washers [F].
- Tighten:



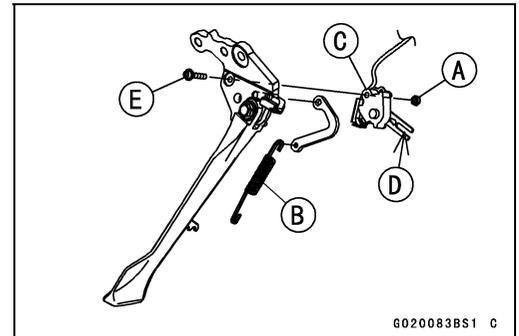
**Torque - Side Stand Bracket Bolts: 49 N·m (5.0 kgf·m, 36 ft·lb)**

## Side Stand

- Apply grease to the outside of the collar [A] and the both sides of the shims [B].
- Install:
  - Shims
  - Side Stand [C]
  - Collar
  - Side Stand Bolt [D]
  - Washer [E]
- Replace the side stand nut [F] with a new one.
- Tighten:
  - Torque - Side Stand Nut: 36 N·m (3.7 kgf·m, 27 ft·lb)**



- Replace the side stand switch nut [A] with a new one.
- Install the spring [B].
  - Face the spring ends as shown.
- Install the side stand switch [C].
- Insert the side stand switch arm [D] to the pin on the side stand.
- Run the side stand switch lead and quick shifter lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the side stand switch bolt [E].
- Tighten:
  - Torque - Side Stand Switch Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**





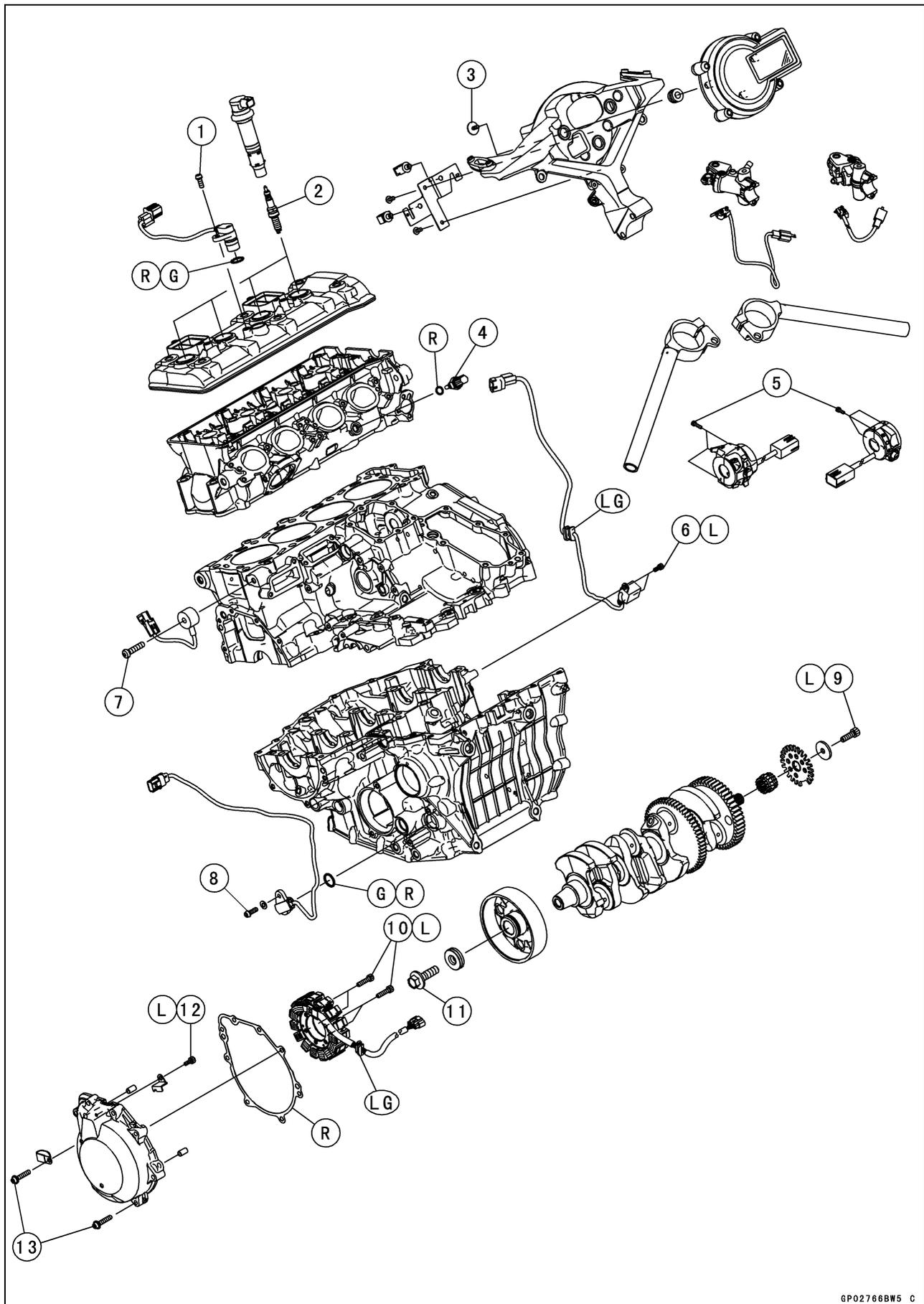
# Electrical System

## Table of Contents

|                                       |       |                                     |       |
|---------------------------------------|-------|-------------------------------------|-------|
| Exploded View.....                    | 16-2  | Spark Plug Removal.....             | 16-34 |
| Specifications.....                   | 16-6  | Spark Plug Installation.....        | 16-34 |
| Special Tools and Sealant.....        | 16-7  | Spark Plug Condition Inspection..   | 16-34 |
| Parts Location.....                   | 16-8  | Interlock Operation Inspection..... | 16-35 |
| Wiring Diagram.....                   | 16-11 | IC Igniter Inspection.....          | 16-36 |
| Precautions.....                      | 16-14 | Electric Starter System.....        | 16-39 |
| Electrical Wiring.....                | 16-15 | Starter Motor Removal.....          | 16-39 |
| Wiring Inspection.....                | 16-15 | Starter Motor Installation.....     | 16-39 |
| Battery.....                          | 16-16 | Starter Motor Disassembly.....      | 16-40 |
| Battery Removal.....                  | 16-16 | Starter Motor Assembly.....         | 16-40 |
| Battery Installation.....             | 16-16 | Brush Inspection.....               | 16-42 |
| Precautions.....                      | 16-17 | Commutator Cleaning and             |       |
| Interchange.....                      | 16-17 | Inspection.....                     | 16-42 |
| Charging Condition Inspection.....    | 16-18 | Armature Inspection.....            | 16-43 |
| Refreshing Charge.....                | 16-18 | Brush Lead Inspection.....          | 16-43 |
| Charging System.....                  | 16-20 | Left-hand End Cover Inspection..    | 16-43 |
| Alternator Cover Removal.....         | 16-20 | Starter Relay Inspection.....       | 16-43 |
| Alternator Cover Installation.....    | 16-20 | Lighting System.....                | 16-46 |
| Stator Coil Removal.....              | 16-21 | Tail/Brake Light (LED) Removal...   | 16-46 |
| Stator Coil Installation.....         | 16-21 | Tail/Brake Light (LED) Installation | 16-46 |
| Alternator Rotor Removal.....         | 16-21 | Meter, Gauge, Indicator Unit.....   | 16-48 |
| Alternator Rotor Installation.....    | 16-22 | Meter Unit Removal.....             | 16-48 |
| Charging Voltage Inspection.....      | 16-23 | Meter Unit Installation.....        | 16-48 |
| Alternator Inspection.....            | 16-23 | Meter Operation Inspection.....     | 16-49 |
| Regulator/Rectifier Removal.....      | 16-24 | Meter Operation Inspection.....     | 16-51 |
| Regulator/Rectifier Installation..... | 16-25 | Meter Unit Inspection.....          | 16-52 |
| Regulator/Rectifier Inspection.....   | 16-26 | Switches and Sensors.....           | 16-56 |
| Ignition System.....                  | 16-29 | Brake Light Timing Inspection.....  | 16-56 |
| Crankshaft Sensor Removal.....        | 16-29 | Brake Light Timing Adjustment....   | 16-56 |
| Crankshaft Sensor Installation.....   | 16-29 | Switch Inspection.....              | 16-56 |
| Crankshaft Sensor Inspection.....     | 16-30 | Water Temperature Sensor            |       |
| Crankshaft Sensor Peak Voltage        |       | Inspection.....                     | 16-57 |
| Inspection.....                       | 16-30 | Gear Position Sensor Removal....    | 16-57 |
| Camshaft Position Sensor              |       | Gear Position Sensor Installation.. | 16-58 |
| Removal.....                          | 16-31 | Gear Position Sensor Inspection..   | 16-58 |
| Camshaft Position Sensor              |       | Relay Box.....                      | 16-59 |
| Installation.....                     | 16-31 | Relay Box Removal.....              | 16-59 |
| Camshaft Position Sensor              |       | Relay Circuit Inspection.....       | 16-59 |
| Inspection.....                       | 16-31 | Diode Circuit Inspection.....       | 16-60 |
| Camshaft Position Sensor Peak         |       | Fuse.....                           | 16-62 |
| Voltage Inspection.....               | 16-32 | 30 A Main/15 A ECU Fuse             |       |
| Timing Rotor Removal.....             | 16-32 | Removal.....                        | 16-62 |
| Timing Rotor Installation.....        | 16-32 | Fuse Box Fuse Removal.....          | 16-62 |
| Stick Coil Removal.....               | 16-33 | Fuse Installation.....              | 16-63 |
| Stick Coil Installation.....          | 16-33 | Fuse Inspection.....                | 16-63 |
| Stick Coil Inspection.....            | 16-33 |                                     |       |
| Stick Coil Primary Peak Voltage       |       |                                     |       |
| Inspection.....                       | 16-33 |                                     |       |

# 16-2 ELECTRICAL SYSTEM

## 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   | Spark Plugs                        | 13     | 1.3   | 115 in·lb |         |
| 3   | Meter Mounting Screws              | 1.2    | 0.12  | 11 in·lb  |         |
| 4   | Water Temperature Sensor           | 12     | 1.2   | 106 in·lb |         |
| 5   | Switch Housing Bolts               | 0.90   | 0.09  | 8 in·lb   |         |
| 6   | Crankshaft Sensor Bolts            | 6.0    | 0.61  | 53 in·lb  | L       |
| 7   | Knock Sensor Bolt                  | 25     | 2.5   | 18        |         |
| 8   | Gear Position Sensor Bolt          | 10     | 1.0   | 89 in·lb  |         |
| 9   | Timing Rotor Bolt                  | 39     | 4.0   | 29        | L       |
| 10  | Stator Coil Bolts                  | 12     | 1.2   | 106 in·lb | L       |
| 11  | Alternator Rotor Bolt              | 155    | 15.8  | 114       |         |
| 12  | Alternator Lead Holding Plate Bolt | 10     | 1.0   | 89 in·lb  | L       |
| 13  | Alternator Cover Bolts             | 10     | 1.0   | 89 in·lb  |         |

G: Apply grease.

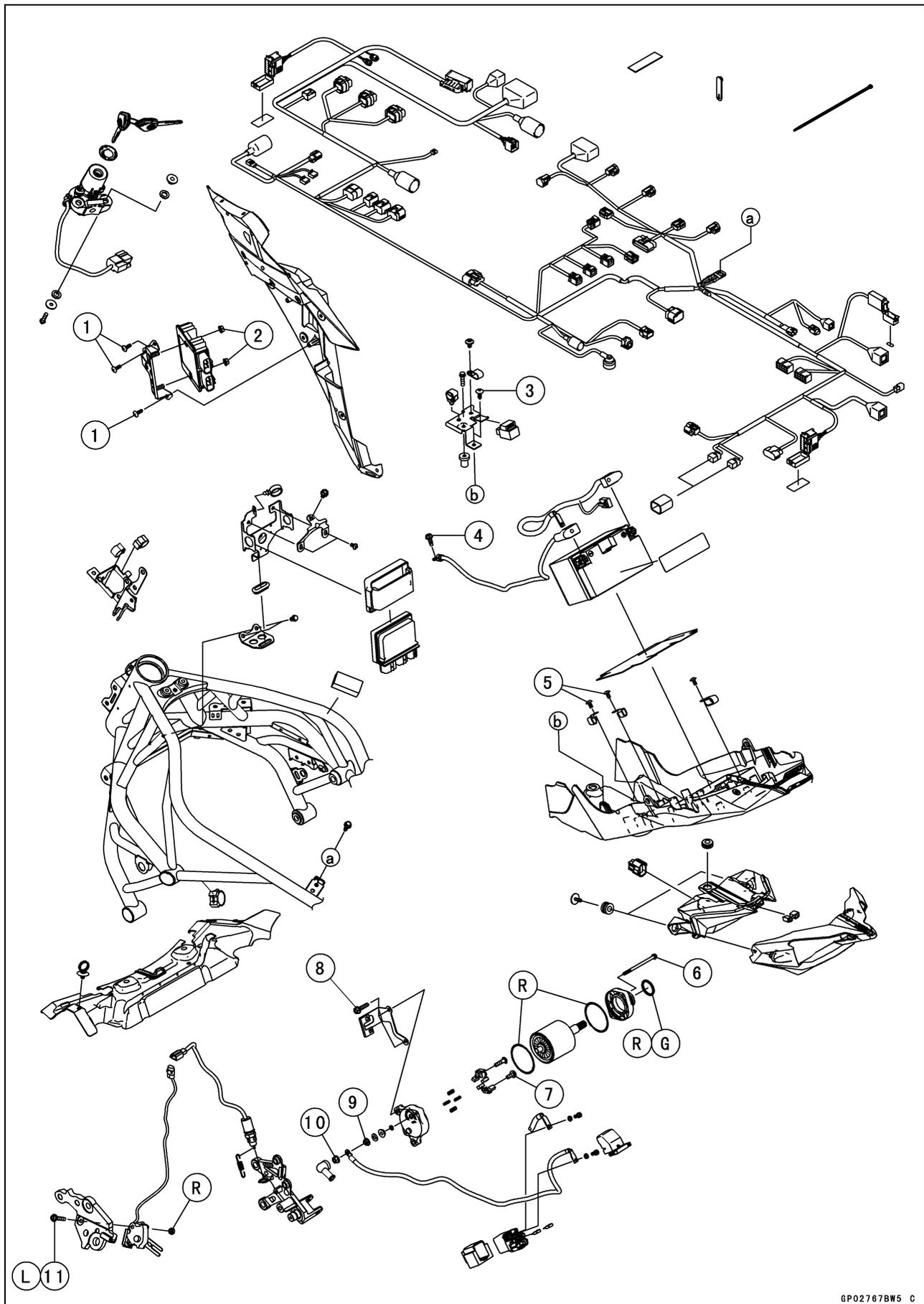
L: Apply a non-permanent locking agent.

LG: Apply liquid gasket.

R: Replacement Parts

# 16-4 ELECTRICAL SYSTEM

## Exploded View



## Exploded View

| No. | Fastener                           | Torque |       |          | Remarks |
|-----|------------------------------------|--------|-------|----------|---------|
|     |                                    | N·m    | kgf·m | ft·lb    |         |
| 1   | Regulator/Rectifier Bracket Screws | 1.2    | 0.12  | 11 in·lb |         |
| 2   | Regulator/Rectifier Mounting Nuts  | 6.0    | 0.61  | 53 in·lb |         |
| 3   | Rear Fender Bracket Screw          | 1.2    | 0.12  | 11 in·lb |         |
| 4   | Engine Ground Terminal Bolt        | 10     | 1.0   | 89 in·lb |         |
| 5   | Clamp Screws                       | 1.2    | 0.12  | 11 in·lb |         |
| 6   | Starter Motor Through Bolts        | 5.0    | 0.51  | 44 in·lb |         |
| 7   | Brush Holder Screw                 | 3.8    | 0.39  | 34 in·lb |         |
| 8   | Starter Motor Mounting Bolts       | 10     | 1.0   | 89 in·lb |         |
| 9   | Starter Motor Terminal Locknut     | 11     | 1.1   | 97 in·lb |         |
| 10  | Starter Motor Cable Terminal Nut   | 6.0    | 0.61  | 53 in·lb |         |
| 11  | Side Stand Switch Bolt             | 9.8    | 1.0   | 87 in·lb | L       |

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

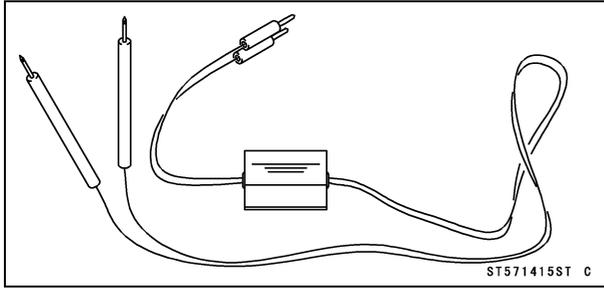
## 16-6 ELECTRICAL SYSTEM

### Specifications

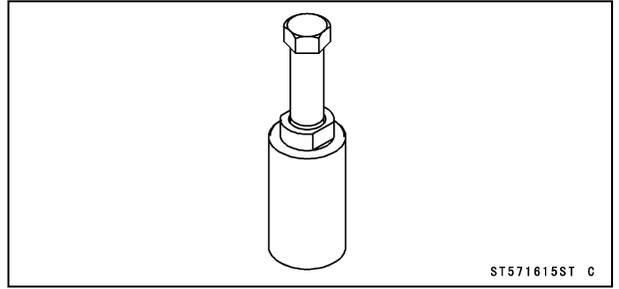
| Item  | Standard   |
|---|--|
| <b>Battery</b><br>Type<br>Model Name<br>Capacity<br>Voltage<br>Gross Weight<br>Electrolyte Volume   | Sealed Battery<br>YTZ10S<br>12 V 8.6 Ah<br>12.8 V or more<br>3.2 kg (7.1 lb)<br>0.45 L (27 cu in.)   |
| <b>Charging System</b><br>Type<br>Alternator Output Voltage<br>Stator Coil Resistance<br>Charging Voltage<br>(Regulator/Rectifier Output Voltage)   | Three-phase AC<br>47.2 ~ 70.8 V @4 000 r/min (rpm)<br>0.114 ~ 0.170 Ω @20°C (68°F)<br>14.6 ~ 15 V @25°C (77°F)   |
| <b>Ignition System</b><br>Crankshaft Sensor Resistance<br>Crankshaft Sensor Peak Voltage<br>Stick Coil:<br>Primary Winding Resistance<br>Secondary Winding Resistance<br>Primary Peak Voltage<br>Spark Plug:<br>Type<br>Gap | 376 ~ 564 Ω @20°C (68°F)<br>3 V or more<br>1.19 ~ 1.61 Ω @20°C (68°F)<br>10.2 ~ 13.8 kΩ @20°C (68°F)<br>100 V or more<br>NGK SILMAR9B9<br>0.8 ~ 0.9 mm (0.031 ~ 0.035 in.) |
| <b>Electric Starter System</b><br>Starter Motor:<br>Brush Length  | 12.0 mm (0.47 in.) [Service Limit: 6.5 mm (0.26 in.)]  |
| <b>Meter Unit</b><br>Can Communication Line Resistance  | 123 ~ 125 Ω at Meter Unit  |
| <b>Switches and Sensors</b><br>Rear Brake Light Switch Timing (Tail/brake light (LED) does not illuminate in a factory shipping state.)<br>Engine Oil Pressure Switch Connections<br>Water Temperature Sensor Resistance    | ON after about 10 mm (0.39 in.) of pedal travel<br>When engine is stopped: ON<br>When engine is running: OFF<br>in the text  |

**Special Tools and Sealant**

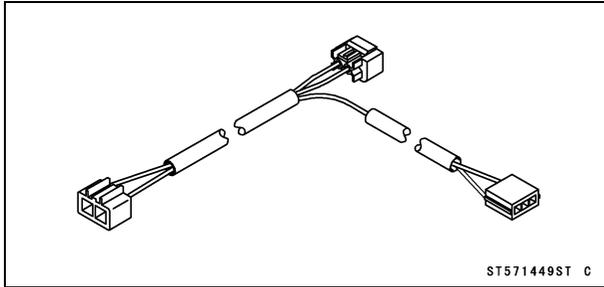
**Peak Voltage Adapter:  
57001-1415**



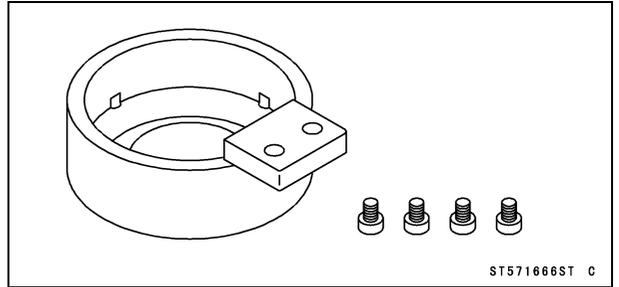
**Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5:  
57001-1615**



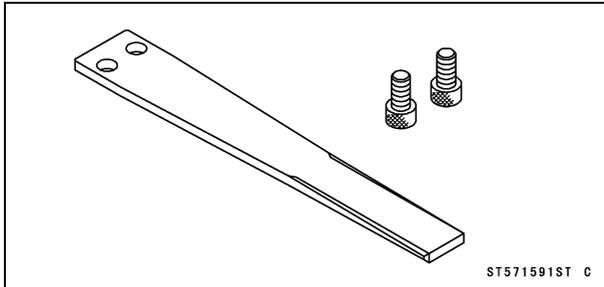
**Lead Wire - Peak Voltage Adapter:  
57001-1449**



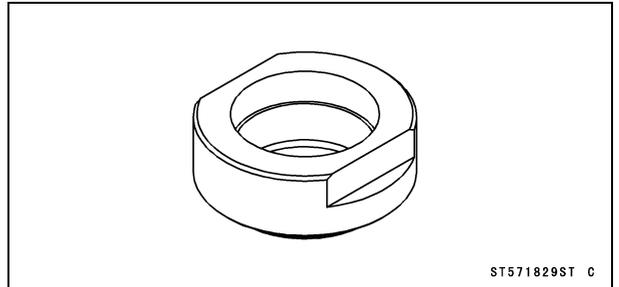
**Rotor Holder:  
57001-1666**



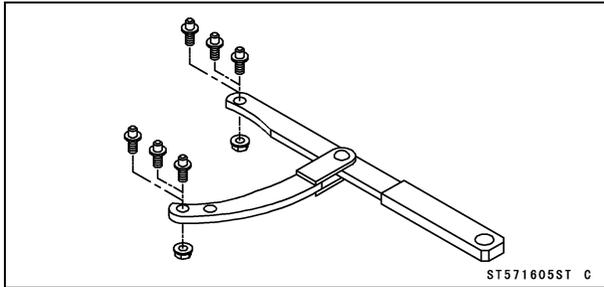
**Grip:  
57001-1591**



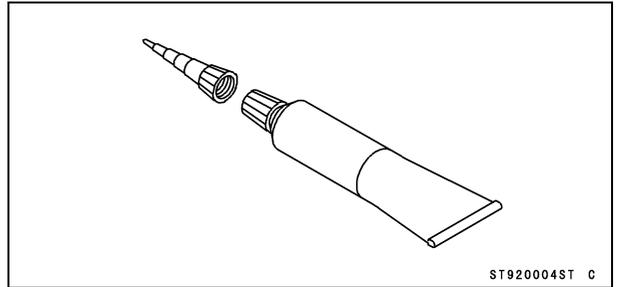
**Stopper:  
57001-1829**



**Flywheel & Pulley Holder:  
57001-1605**



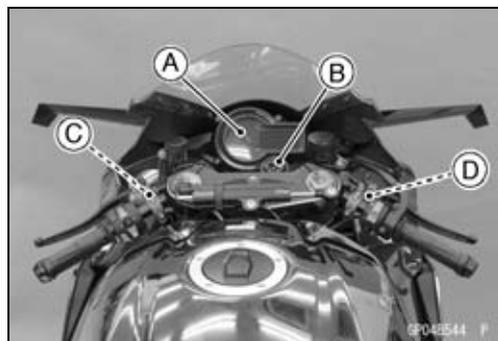
**Liquid Gasket, TB1211F:  
92104-0004**



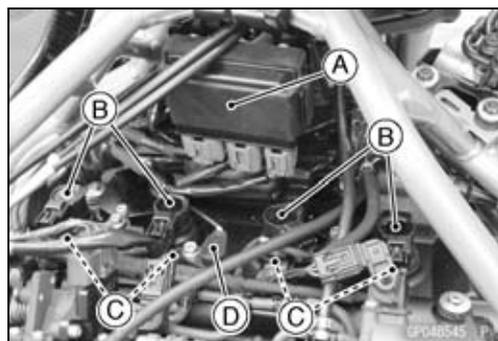
## 16-8 ELECTRICAL SYSTEM

### Parts Location

Meter Unit [A]  
Ignition Switch [B]  
Starter Lockout Switch [C]  
Front Brake Light Switch [D]



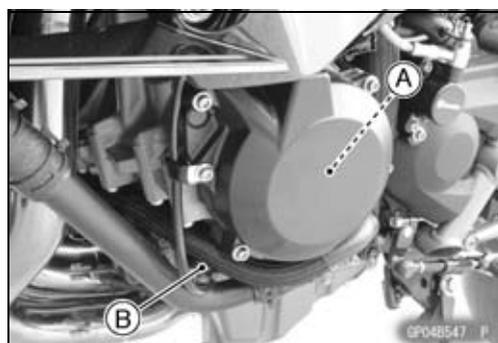
Relay Box [A]  
Stick Coils [B]  
Spark Plugs [C]  
Camshaft Position Sensor [D]



Regulator/Rectifier [A]



Alternator [A]  
Oil Pressure Switch [B]



Fuse Box 1 [A]

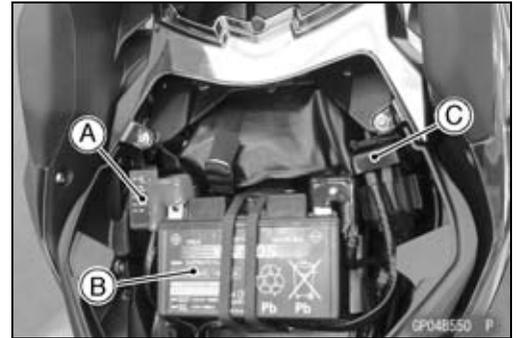


Parts Location

Fuse Box 3 [A]



Fuse Box 2 [A]  
Battery 12 V 8.6 Ah [B]  
Starter Relay [C]



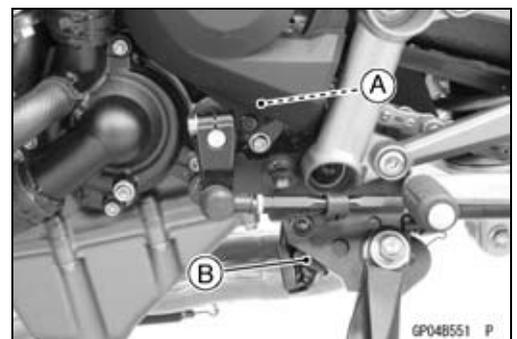
Crankshaft Sensor [A]



Water Temperature Sensor [A]



Gear Position Sensor [A]  
Side Stand Switch [B]



## 16-10 ELECTRICAL SYSTEM

### Parts Location

---

Rear Brake Light Switch [A]



---

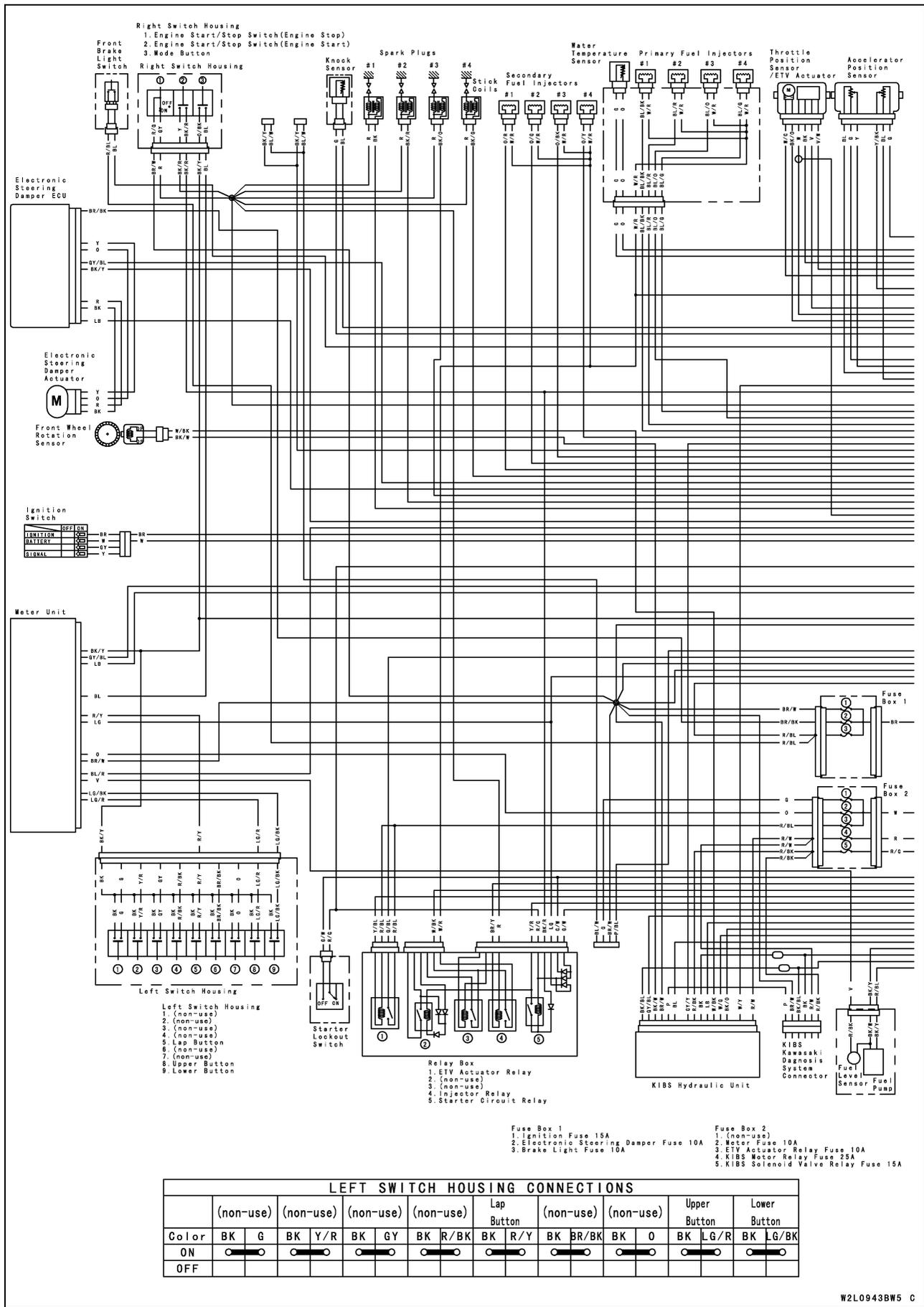
**Wiring Diagram**

---

This page intentionally left blank.

# 16-12 ELECTRICAL SYSTEM

## Wiring Diagram



|       | (non-use) | (non-use) | (non-use) | (non-use) | Lap Button | (non-use) | (non-use) | Upper Button | Lower Button |          |
|-------|-----------|-----------|-----------|-----------|------------|-----------|-----------|--------------|--------------|----------|
| Color | BK        | G         | BK Y/R    | BK G/Y    | BK R/BK    | BK R/Y    | BK BR/BK  | BK O         | BK LG/R      | BK LG/BK |
| ON    | ○         | ○         | ○         | ○         | ○          | ○         | ○         | ○            | ○            | ○        |
| OFF   | ○         | ○         | ○         | ○         | ○          | ○         | ○         | ○            | ○            | ○        |



## 16-14 ELECTRICAL SYSTEM

---

### Precautions

---

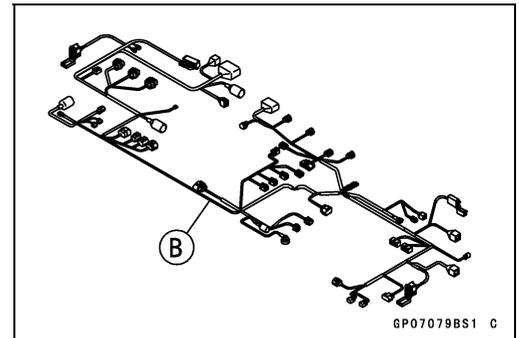
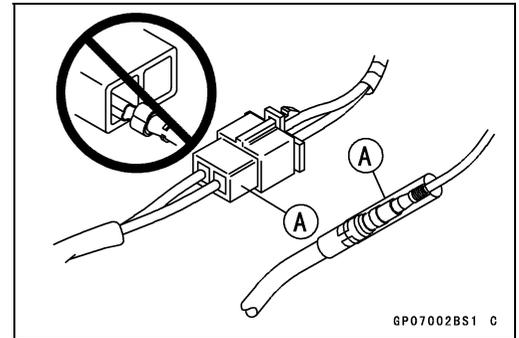
There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

- Do not reverse the battery cable connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the parts can damage them.
- To prevent damage to electrical parts, do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the engine start/stop switch slid 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 wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation.
- Measure coil and winding resistance when the part is cold (at room temperature).

## 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 a tester between the ends of the leads.
- ★ If the tester does not read about  $0 \Omega$ , the lead is defective. Replace the lead or the wiring harness [B] if necessary.



## 16-16 ELECTRICAL SYSTEM

### Battery

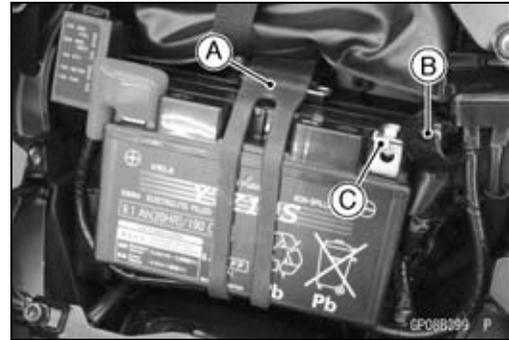
#### Battery Removal

- Turn the ignition switch off.
- Remove:
  - Seat (see Seat Removal in the Frame chapter)
- Remove the upper side of the band [A] from the hook.
- Slide out the black cap [B].
- Disconnect the negative (-) cable [C].

#### NOTICE

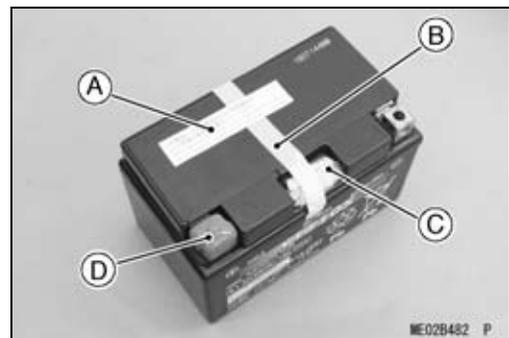
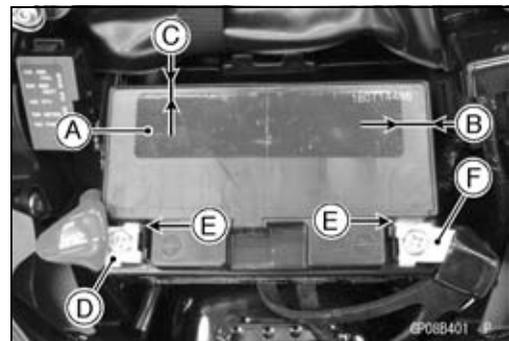
**Be sure to disconnect the negative (-) cable first.**

- Slide out the red cap [A] and disconnect the positive (+) cable [B].
- Remove the battery.



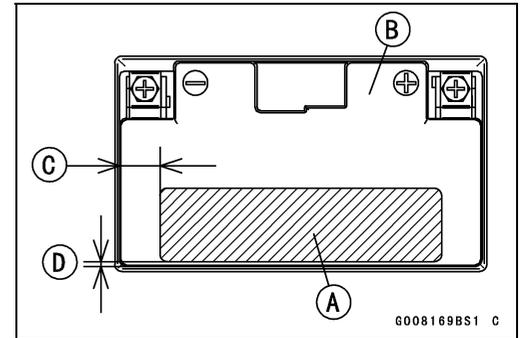
#### Battery Installation

- Turn the ignition switch off.
  - Put the battery into the battery case.
  - Check that the pad [A] is in place on the battery.
    - 16.5 mm (0.65 in.) [B]
    - 2 mm (0.08 in.) [C]
  - Install the positive (+) cable [D] first.
  - When installing the terminals, make the gaps [E] between the terminals and battery.
  - Install the negative (-) cable [F].
  - Apply a light coat of grease on the terminals to prevent corrosion.
  - Cover the both terminals with each cap.
  - Install the band.
  - Install the seat (see Seat Installation in the Frame chapter).
- ★ When installing the new battery, follow the below procedures.
- Remove the charging label [A], tape [B], terminal bolts and nuts [C], and cap [D].
  - Wipe off any dirt of the battery.



## Battery

- Install the new pad [A] to the battery [B] as shown.  
[C] About 16.5 mm (0.65 in.)  
[D] About 2 mm (0.08 in.)
- Inspect the battery voltage (see Charging Condition Inspection).



### 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.  
Give refresh charge for 5 to 10 hours with charge current shown in the text (see Refreshing Charge).  
When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

### NOTICE

**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).

### ⚠ DANGER

**Batteries produce an explosive gas mixture of hydrogen and oxygen that can cause serious injury and burns if ignited. Keep the battery away from sparks and open flames during charging. 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. 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 and seek medical attention for more severe burns.**

### 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.

# 16-18 ELECTRICAL SYSTEM

## Battery

### Charging Condition Inspection

○ Battery charging condition can be checked by measuring battery terminal voltage with a digital meter [A].

- Remove:  
Battery (see Battery Removal)
- 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

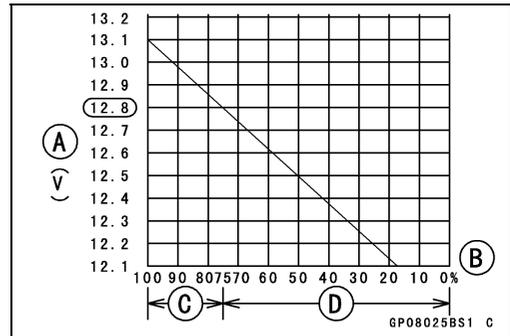
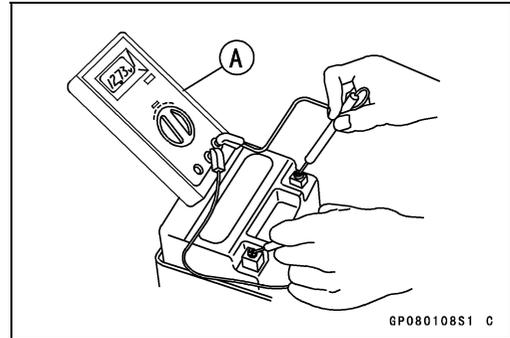
Standard: 12.8 V or more

Terminal Voltage (V) [A]

Battery Charge Rate (%) [B]

Good [C]

Refresh charge is required [D]



### Refreshing Charge

- Remove the battery (see Battery Removal).
- Do refresh charge by following method according to the battery terminal voltage.

#### **⚠ WARNING**

**This battery is sealed type. Charge with current and time as stated below.**

**Battery**

Terminal Voltage: 12.0 ~ 12.7 V  
 Standard Charge: 0.9 A × 5 ~ 10 h (see following chart)  
 Quick Charge: 4.5 A × 1 h

**NOTICE**

**If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.**

Terminal Voltage: 12 V or lower  
 Charging Method: 0.6 A × 20 h

Kawasaki-recommended chargers:  
 Battery Mate 150-9  
 OptiMate PRO 4-S/PRO S/PRO2  
 Yuasa MB-2040/2060  
 Christie C10122S

★ If the above chargers are not available, use equivalent one.

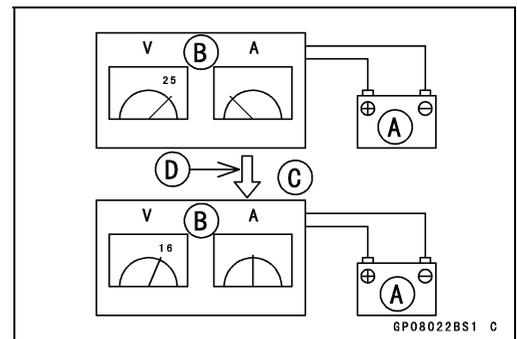
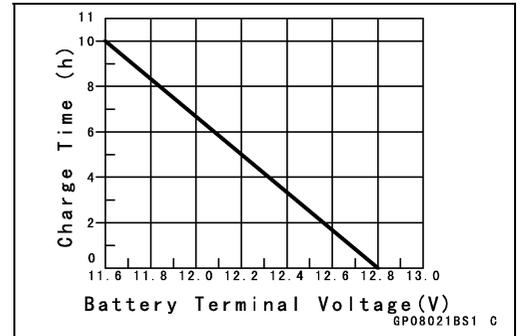
**NOTE**

○ 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        |

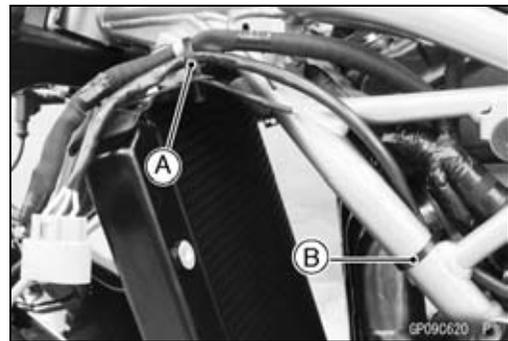


## 16-20 ELECTRICAL SYSTEM

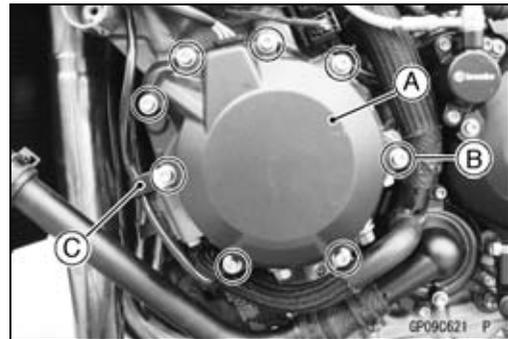
### Charging System

#### Alternator Cover Removal

- Drain:  
Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
- Remove:  
Left Middle Fairing (see Middle Fairing Removal in the Frame chapter)  
Intake Duct (see Intake Duct Removal in the Fuel System (DFI) chapter)
- Open the clamp [A].
- Cut the band [B].



- Place a suitable container under the alternator cover [A].
- Remove:  
Alternator Cover Bolts [B]  
Clamp [C]  
Alternator Cover

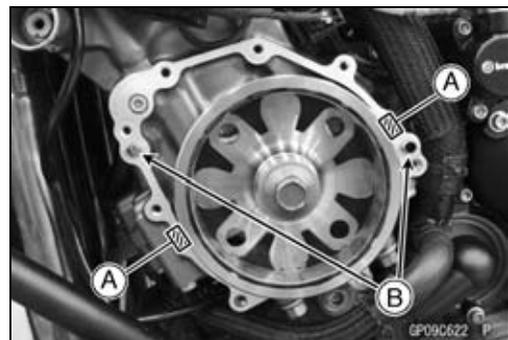


#### Alternator Cover Installation

- Using a high flash-point solvent, clean off any oil or dirt that may be on the mating surface. Dry them with a clean cloth.
- Apply liquid gasket to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.

**Sealant - Liquid Gasket, TB1211F: 92104-0004**

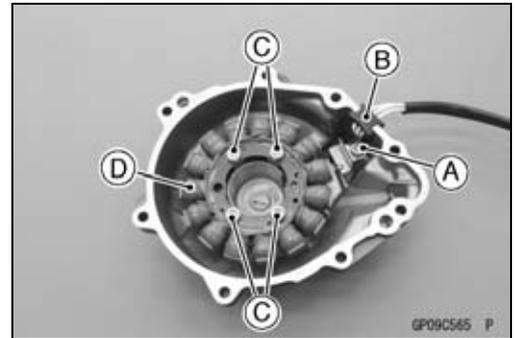
- Check that dowel pins [B] are in place on the crankcase.
- Replace the alternator cover gasket with a new one.
- Tighten:  
**Torque - Alternator Cover Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Run the alternator lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



## Charging System

### Stator Coil Removal

- Remove:
  - Alternator Cover (see Alternator Cover Removal)
  - Alternator Lead Holding Plate Bolt [A] and Plate Alternator Lead Grommet [B]
  - Stator Coil Bolts [C]
- Remove the stator coil [D] from the alternator cover.



### Stator Coil Installation

- Apply a non-permanent locking agent to the threads of the stator coil bolts and tighten them.

**Torque - Stator Coil Bolts: 12 N·m (1.2 kgf·m, 106 in·lb)**

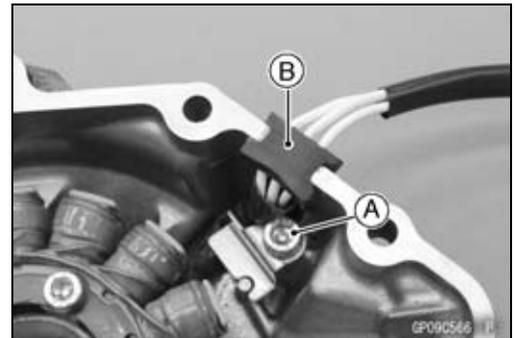
- Secure the alternator lead with a holding plate.
- Apply a non-permanent locking agent to the threads of the plate bolt [A] and tighten it.

**Torque - Alternator Lead Holding Plate Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**

- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket to the circumference of the alternator lead grommet [B], and fit the grommet into the notch of the cover securely.

**Sealant - Liquid Gasket, TB1211F: 92104-0004**

- Install the alternator cover (see Alternator Cover Installation).



### Alternator Rotor Removal

- Remove:
  - Alternator Cover (see Alternator Cover Removal)
- Hold the alternator rotor steadily with the rotor holder [A] and stopper [B].
- Remove the rotor bolt [C] and washer.

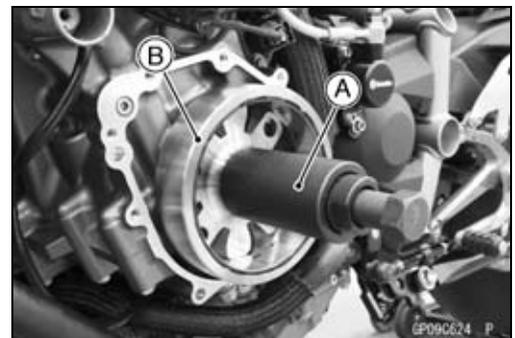
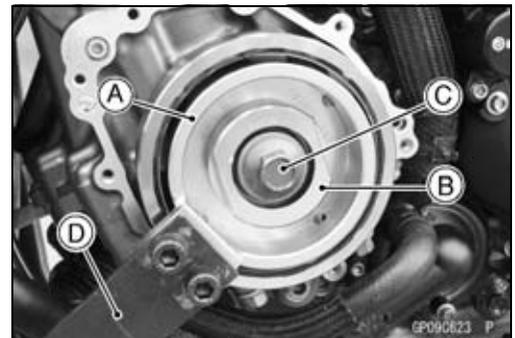
**Special Tools - Grip [D]: 57001-1591**

**Rotor Holder: 57001-1666**

**Stopper: 57001-1829**

- Using the flywheel puller [A], remove the alternator rotor [B] from the crankshaft.

**Special Tool - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1615**



### NOTICE

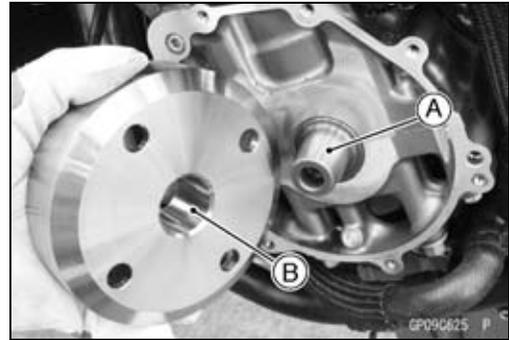
**Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.**

## 16-22 ELECTRICAL SYSTEM

### Charging System

#### Alternator Rotor Installation

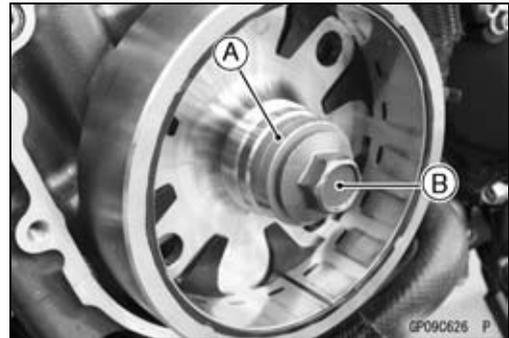
- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
  - Crankshaft Tapered Portion [A]
  - Alternator Rotor Tapered Portion [B]



- Using a cleaning fluid, clean off any oil or dirt on the washer [A] and dry it with a clean cloth.
- Install the washer and alternator bolt [B].

#### NOTE

○ Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.

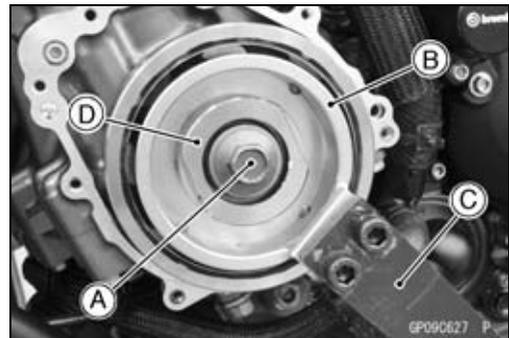


- Tighten the alternator the rotor bolt [A] with 70 N·m (7.0 kgf·m, 52 ft·lb) of torque while holding the alternator rotor steadily with the holder [B].

**Special Tools - Grip [C]: 57001-1591**

**Rotor Holder: 57001-1666**

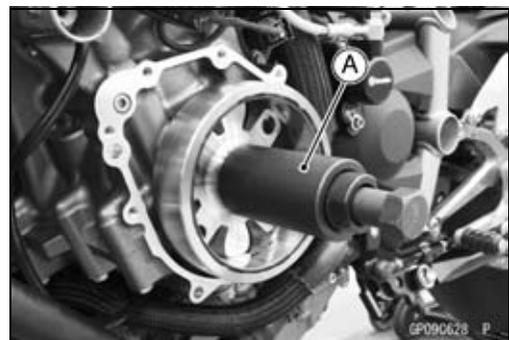
**Stopper [D]: 57001-1829**



- 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: 57001-1615**

- ★ 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 washer and rotor bolt.
- Tighten the alternator rotor bolt [A] while holding the alternator rotor steadily with the holder [B].

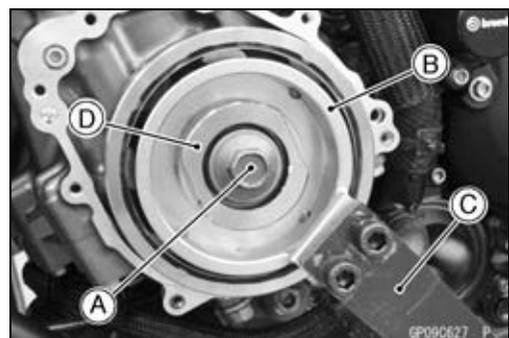
**Special Tools - Grip [C]: 57001-1591**

**Rotor Holder: 57001-1666**

**Stopper [D]: 57001-1829**

**Torque - Alternator Rotor Bolt: 155 N·m (15.8 kgf·m, 114 ft·lb)**

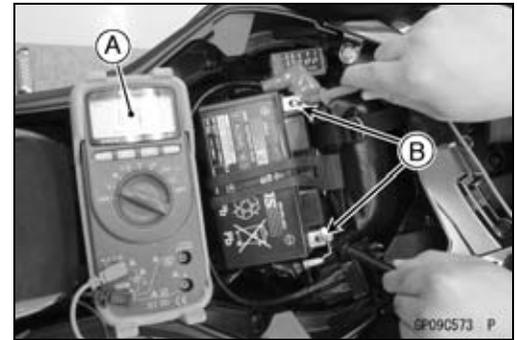
- Install the alternator cover (see Alternator Cover Installation).



## Charging System

### Charging Voltage Inspection

- Check the battery condition (see Charging Condition Inspection).
- Warm up the engine to obtain actual alternator operating conditions.
- Check that the ignition switch is turned off, and connect a tester [A] to the battery terminals [B].
- 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 on the headlight unit.). 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

@25°C (77°F)

| Connections   |               | Reading        |
|---------------|---------------|----------------|
| Tester (+) to | Tester (-) to |                |
| Battery (+)   | Battery (-)   | DC 14.6 ~ 15 V |

- Turn off the ignition switch to stop the engine, and disconnect the 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.

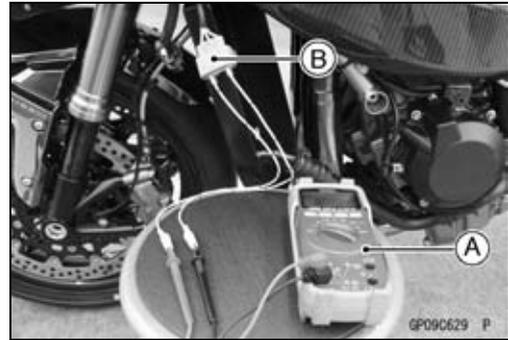
### Alternator Inspection

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.

## 16-24 ELECTRICAL SYSTEM

### Charging System

- To check the alternator output voltage, do the following procedures.
  - Turn the ignition switch off.
  - Remove the left middle fairing (see Middle Fairing Removal in the Frame chapter).
  - Connect a tester [A] as shown in the table 1.
    - Alternator Lead Connector [B]
  - 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 @4 000 r/min (rpm)**

| Connections    |                    | Reading          |
|----------------|--------------------|------------------|
| Tester (+) to  | Tester (-) to      |                  |
| One White lead | Another White lead | AC 47.2 ~ 70.8 V |

- ★ If the output voltage shows the value in the table, the alternator operates properly.
- ★ If the output voltage shows a much lower reading than that given in the table, stop the engine and inspect the stator coil resistance.
- Check the stator coil resistance as follows.
  - Stop the engine.
  - Connect the tester as shown in the table 2.
  - Note the readings (total 3 measurement).

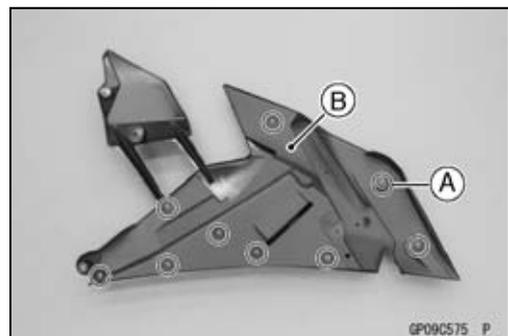
**Table 2 Stator Coil Resistance @20°C (68°F)**

| Connections    |                    | Reading         |
|----------------|--------------------|-----------------|
| Tester (+) to  | Tester (-) to      |                 |
| One White lead | Another White lead | 0.114 ~ 0.170 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.
- Measure the resistance between each of the white leads and chassis ground.
- ★ Any tester reading less than infinity ( $\infty$ ) indicates a short, necessitating stator replacement.
- ★ If the stator coils have normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

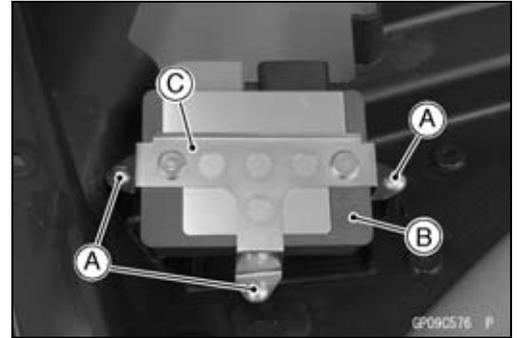
### Regulator/Rectifier Removal

- Remove:
  - Left Middle Fairing (see Middle Fairing Removal in the Frame chapter)
  - Screws [A]
  - Inner Cover [B]

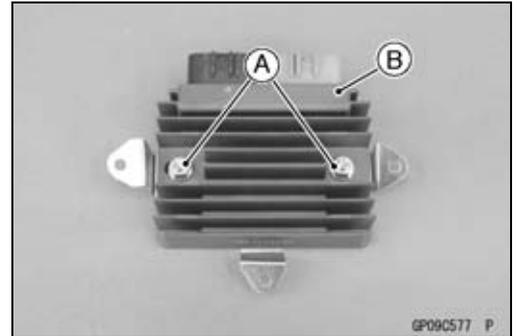


## Charging System

- Remove:
  - Screws [A]
  - Regulator/Rectifier [B] with Bracket [C]

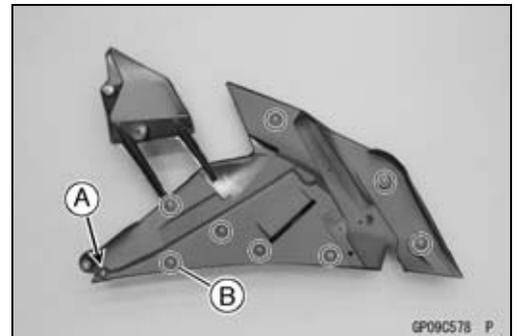


- Remove:
  - Regulator/Rectifier Mounting Nuts [A]
  - Regulator/Rectifier [B]



### **Regulator/Rectifier Installation**

- Installation is the reverse of removal.
- Tighten:
  - Torque - Regulator/Rectifier Mounting Nuts: 6.0 N·m (0.61 kgf·m, 53 in·lb)**
- When installing the inner cover, install the following screws.
  - Screw [A]: Length 10 mm (0.39 in.)
  - Screws [B]: Length 16 mm (0.63 in.)



## 16-26 ELECTRICAL SYSTEM

---

### Charging System

---

#### **Regulator/Rectifier Inspection**

- Refer to the Charging System Troubleshooting for the Regulator/Rectifier Inspection.

#### **Charging System Troubleshooting**

- Before inspection, remove all accessories that consume electrical power.

#### **NOTE**

○ *Even when the charging system is working properly, the battery may discharge if the motorcycle is equipped with too many accessories.*

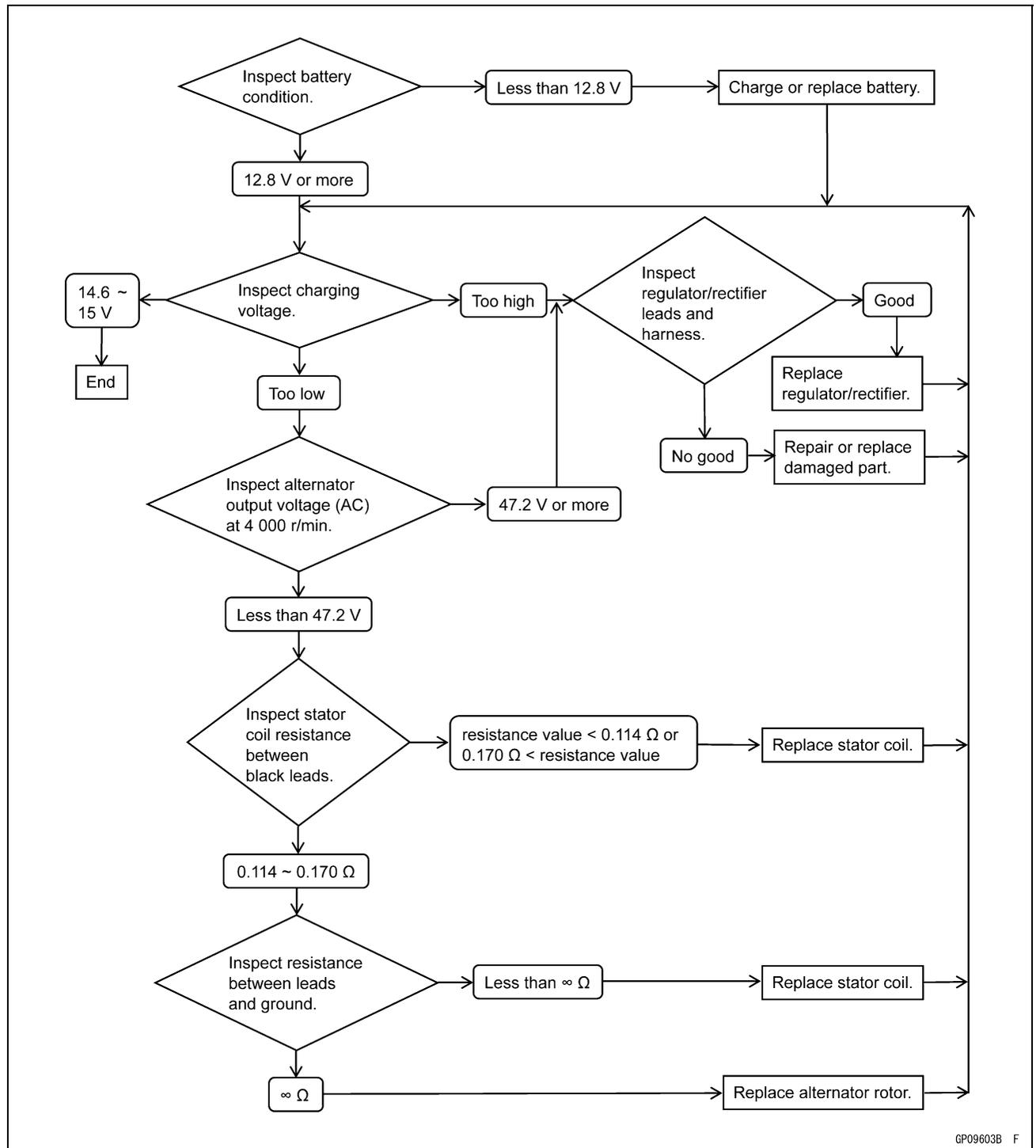
- Pay attention to riding conditions and the customer's riding habits which could affect the charging system such as:

Frequent use at low engine speed

Frequent and unnecessary brake pedal dragging → Battery Discharged

- Recharge the battery if it is discharged.

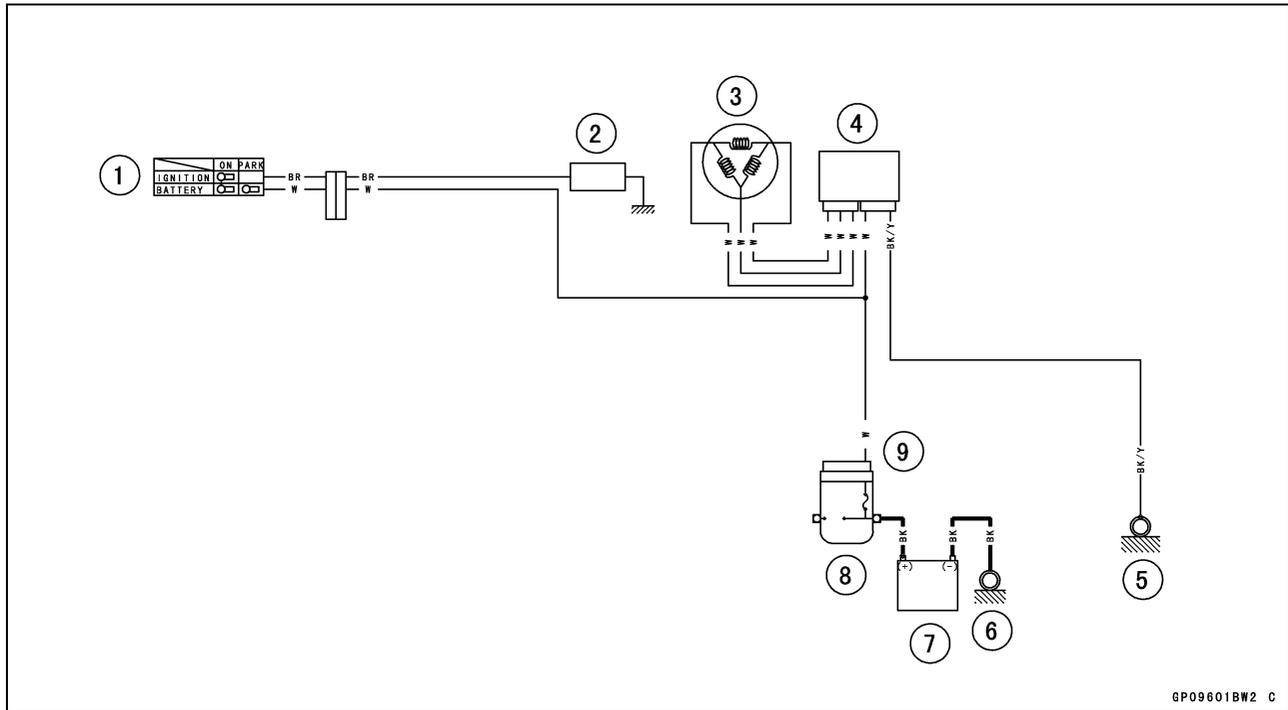
Charging System



# 16-28 ELECTRICAL SYSTEM

## Charging System

### Charging System Circuit



GP09601BW2 C

1. Ignition Switch
2. Load
3. Alternator
4. Regulator/Rectifier
5. Frame Ground 1
6. Engine Ground
7. Battery
8. Starter Relay
9. Main Fuse 30 A

## Ignition System

### **⚠ WARNING**

The ignition system produces extremely high voltage. Do not touch the spark plug, stick coil or stick coil lead while the engine is running, or you could receive a severe electrical shock.

### **NOTICE**

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.

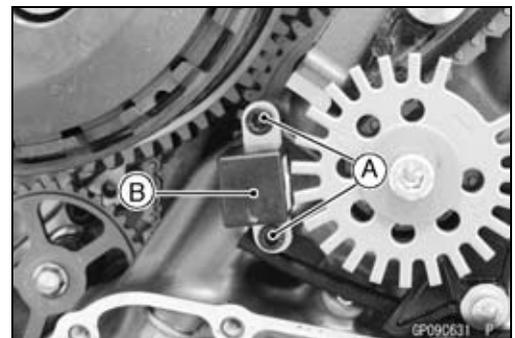
Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the ECU.

### **Crankshaft Sensor Removal**

#### **NOTICE**

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

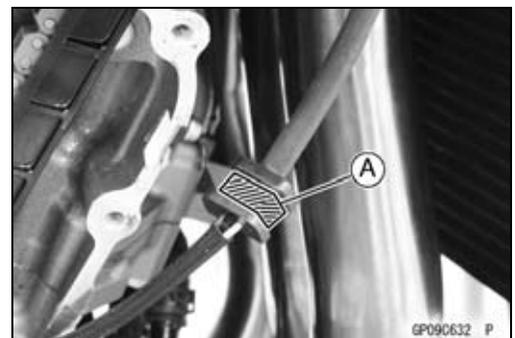
- Remove:
  - Clutch Cover (see Clutch Cover Removal in the Clutch chapter)
  - Right Fuel Tank Cover (see Fuel Tank Cover Removal in the Frame chapter)
  - Right Inner Cover (see Inner Cover Removal in the Frame chapter)
- Remove the crankshaft sensor lead connector [A] from the bracket to outside, and disconnect it.
- Remove:
  - Crankshaft Sensor Bolts [A]
  - Crankshaft Sensor [B]



### **Crankshaft Sensor Installation**

- Tighten:
  - Torque - Crankshaft Sensor Bolts: 6.0 N·m (0.61 kgf·m, 53 in·lb)
- Using a high flash-point solvent, clean off any oil or dirt that may be on the liquid gasket coating area. Dry them with a clean cloth.
- Apply liquid gasket [A] to whole periphery of the crankshaft sensor lead grommet groove.

Sealant - Liquid Gasket, TB1211F: 92104-0004



## 16-30 ELECTRICAL SYSTEM

### Ignition System

- Install:
  - Clutch Cover (see Clutch Cover Installation in the Clutch chapter)
- Run the crankshaft sensor lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

#### **Crankshaft Sensor Inspection**

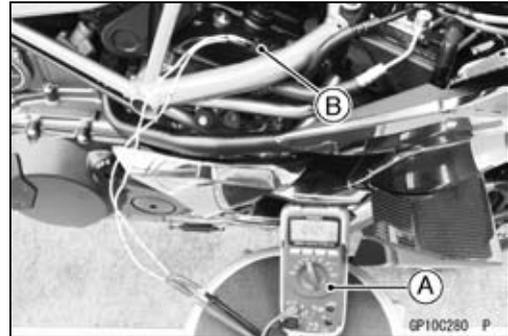
- Disconnect the crankshaft sensor lead connector (see Crankshaft Sensor Removal).
- Set a tester [A], and connect it to the crankshaft sensor lead connector [B].

##### **Crankshaft Sensor Resistance**

**Connections:** Y lead ← → BK lead

**Standard:** 376 ~ 564  $\Omega$  @20°C (68°F)

- ★ 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.
- Measure the resistance between the crankshaft sensor leads and chassis ground.
- ★ Any tester reading less than infinity ( $\infty$ ) 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 [B] (see Crankshaft Sensor Removal).
- Set a tester [C], and connect it to the peak voltage adapter.

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

**Type: KEK-54-9-B**

- Connect the adapter to the terminals of the crankshaft sensor lead connector.

##### **Connections:**

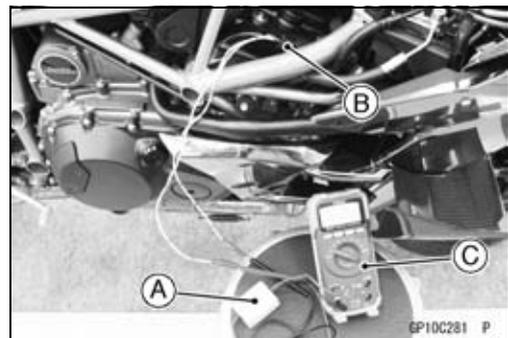
| Crankshaft Sensor Lead |   | Peak Voltage Adapter |   | Tester |
|------------------------|---|----------------------|---|--------|
| Y lead                 | ← | R lead               | → | (+)    |
| BK lead                | ← | BK lead              | → | (-)    |

- Turn the ignition switch on.
- Slide the engine start/stop switch, turn the engine 4 ~ 5 seconds with the transmission gear in neutral to measure the crankshaft sensor peak voltage.
- Repeat the measurement 5 or more times.

##### **Crankshaft Sensor Peak Voltage**

**Standard:** 3 V or more

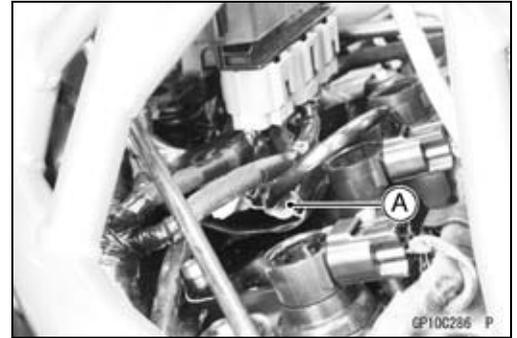
- ★ If the reading is less than the standard, inspect the crankshaft sensor (see Crankshaft Sensor Inspection).



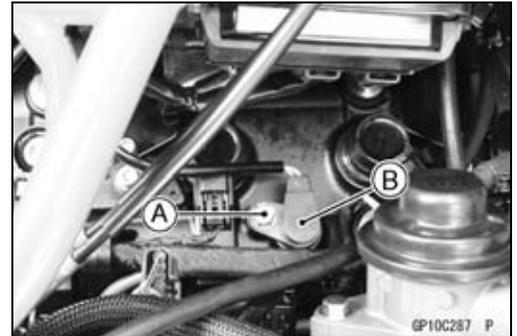
## Ignition System

### Camshaft Position Sensor Removal

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the camshaft position sensor lead connector [A].

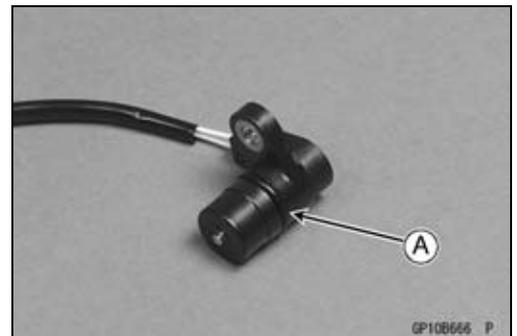


- Remove:
  - Camshaft Position Sensor Bolt [A]
  - Camshaft Position Sensor [B]



### Camshaft Position Sensor Installation

- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring and install it.
- 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).
- Install the removed parts (see appropriate chapters).



### Camshaft Position Sensor Inspection

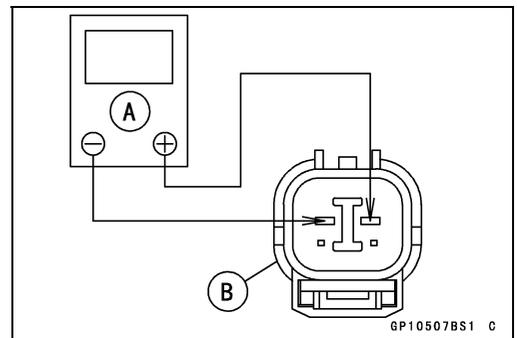
- Disconnect the camshaft position sensor lead connector (see Camshaft Position Sensor Removal).
- Set a tester [A] and connect it to the camshaft position sensor lead connector [B].

#### Camshaft Position Sensor Resistance

Connections: W/Y lead ↔ Y lead

Standard: 400 ~ 460 Ω @20°C (68°F)

- ★ 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.
- 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.



## 16-32 ELECTRICAL SYSTEM

### Ignition System

#### Camshaft Position Sensor Peak Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Disconnect the camshaft position sensor lead connector (see Camshaft Position Sensor Removal).
- Set a tester [A] and connect it to the peak voltage adapter [B].

**Special Tool - 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 | Tester |
|---|----------------------|--------|
| Y lead [D]                              | ← R lead →           | (+)    |
| W/Y lead [E]                            | ← BK lead →          | (-)    |

- Turn the ignition switch on.
- Slide the engine start/stop switch, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the camshaft position sensor peak voltage.
- Repeat the measurements 5 or more times.

**Camshaft Position Sensor Peak Voltage**  
**Standard: 0.6 V or more**

- ★ If the reading is less than the standard, inspect the camshaft position sensor (see Camshaft Position Sensor Inspection).

#### Timing Rotor Removal

- Remove the crankshaft sensor (see Crankshaft Sensor Removal).
- Holding the timing rotor with the flywheel & pulley holder [A] and remove the timing rotor bolt [B].

**Special Tool - Flywheel & Pulley Holder: 57001-1605**

- Remove the timing rotor [C].

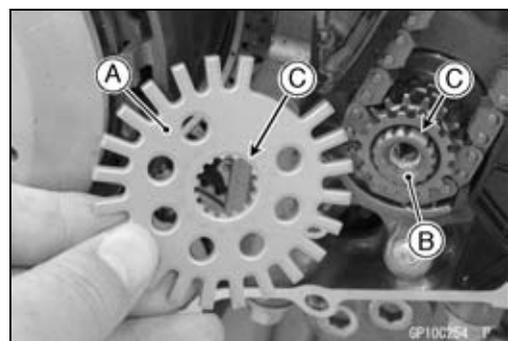
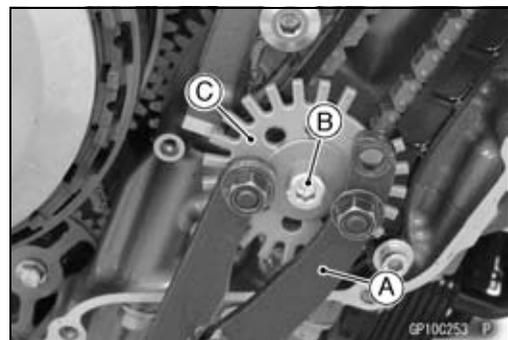
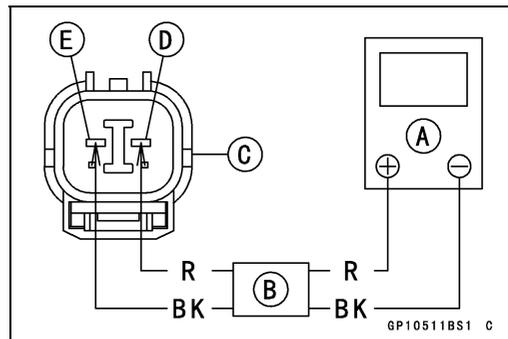
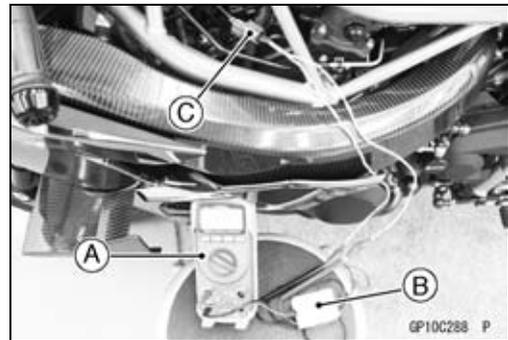
#### Timing Rotor Installation

- Install the timing rotor [A] on the crankshaft [B] with their teeth [C] aligned.
- Apply a non-permanent locking agent to the threads of the timing rotor bolt.
- Holding the timing rotor with the flywheel & pulley holder and tighten the timing rotor bolt.

**Torque - Timing Rotor Bolt: 39 N·m (4.0 kgf·m, 29 ft·lb)**

**Special Tool - Flywheel & Pulley Holder: 57001-1605**

- Install the crankshaft sensor (see Crankshaft Sensor Installation).



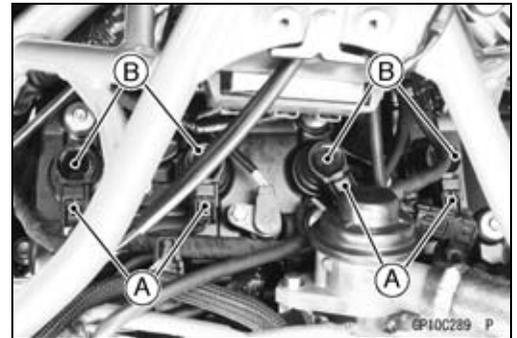
## Ignition System

### Stick Coil Removal

#### NOTICE

Never drop the stick coils, especially on a hard surface.  
Such a shock to the stick coils can damage it.

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Disconnect the stick coil connectors [A].
- Remove the stick coils [B].



#### NOTICE

Do not pry the connector part of the coil while removing the coil.

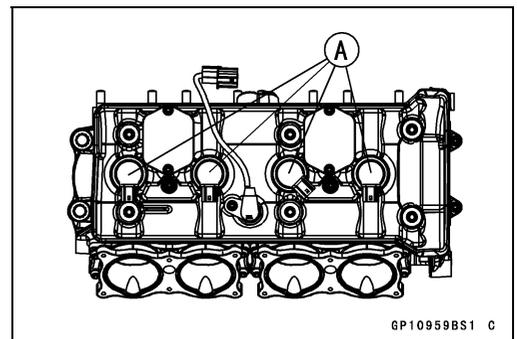
### Stick Coil Installation

- Insert the stick coils [A] so that the coil heads face as shown.

#### NOTICE

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 the Appendix chapter).
- Install the removed parts (see appropriate chapters).



### Stick Coil Inspection

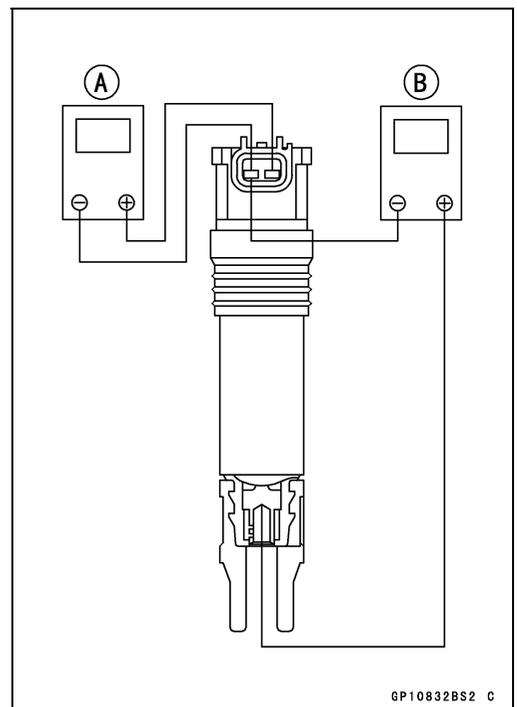
- Remove the stick coils (see Stick Coil Removal).
- Measure the primary winding resistance [A] as follows.
  - Connect a tester between the coil terminals.
- Measure the secondary winding resistance [B] as follows.
  - Connect the tester between the plug terminal and (-) coil terminal.

#### Stick Coil Winding Resistance

Primary Windings: 1.19 ~ 1.61  $\Omega$  @20°C (68°F)

Secondary Windings: 10.2 ~ 13.8 k $\Omega$  @20°C (68°F)

- ★ If the tester does not read as specified, replace the coil.



### Stick Coil Primary Peak Voltage Inspection

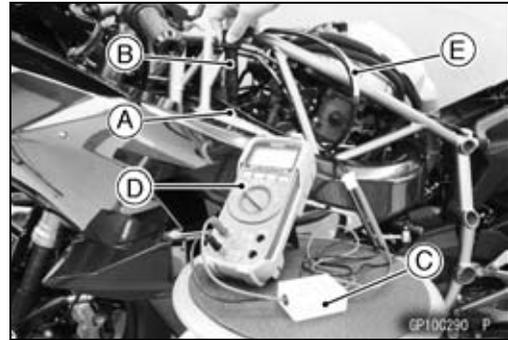
#### NOTE

- Be sure the battery is fully charged.

## 16-34 ELECTRICAL SYSTEM

### Ignition System

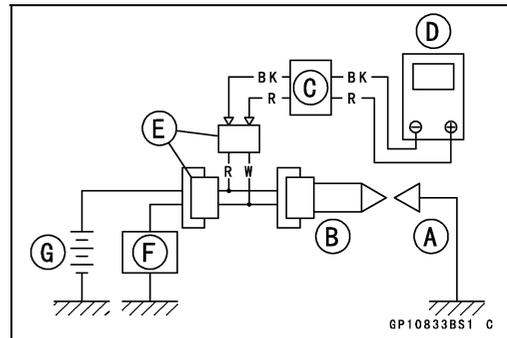
- Remove the stick coils (see Stick Coil Removal), but do not remove the spark plugs.
- Measure the primary peak voltage as follows.
- Install the new spark plug [A] into each stick coil [B], and ground them onto the engine.
- Connect the peak voltage adapter [C] into a tester [D].
- Connect the adapter 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 - Peak Voltage Adapter: 57001-1415**  
**Type: KEK-54-9-B**  
**Lead Wire - Peak Voltage Adapter: 57001-1449**

#### Primary Lead Connection

- Adapter (R, +) to lead wire-peak voltage adapter (W)
- Adapter (BK, -) to lead wire-peak voltage adapter (R)



### **⚠ WARNING**

**To avoid extremely high voltage shocks, do not touch the spark plugs or tester connections.**

- Slide the engine start/stop switch to run position.
- Turn the ignition switch on.
- Slide the engine start/stop switch, 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: 100 V or more**

- Repeat the test for the other stick coil.
- ★ 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.

#### **Spark Plug Condition Inspection**

- Refer to the Spark Plug Condition Inspection in the Periodic Maintenance chapter.

---

## Ignition System

---

### ***Interlock Operation Inspection***

- Raise the rear wheel off the ground with the stand.

#### **1st Check**

- Start the engine to the following conditions.

##### **Condition:**

**Transmission Gear → 1st Position**

**Clutch Lever → Release**

**Side Stand → Down or Up**

- Turn the ignition switch on and slide the engine start/stop switch.
- 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 sensor and relay box.

#### **2nd Check**

- Start the engine to the following conditions.

##### **Condition:**

**Transmission Gear → 1st Position**

**Clutch Lever → Pulled in**

**Side Stand → Up**

- Turn the ignition switch on and slide the engine start/stop switch.
- 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, side stand switch, relay box and starter relay.

#### **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**

**Side Stand → Up**

- Set the side stand on the ground, then the engine will stop.
- ★ If the engine does not stop, inspect the gear position sensor, side stand switch and relay box.
- ★ If their parts are normality, replace the ECU.

## 16-36 ELECTRICAL SYSTEM

### Ignition System

#### ***IC Igniter Inspection***

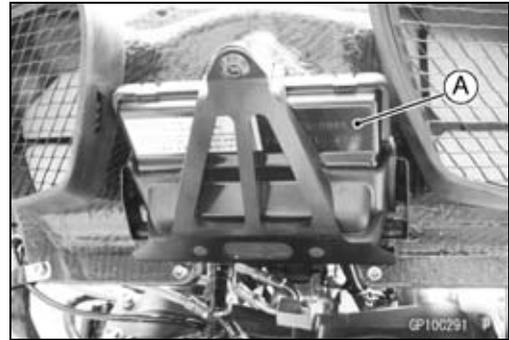
○The IC igniter is built in the ECU [A].

●Refer to the following items.

Interlock Operation Inspection (see Interlock Operation Inspection)

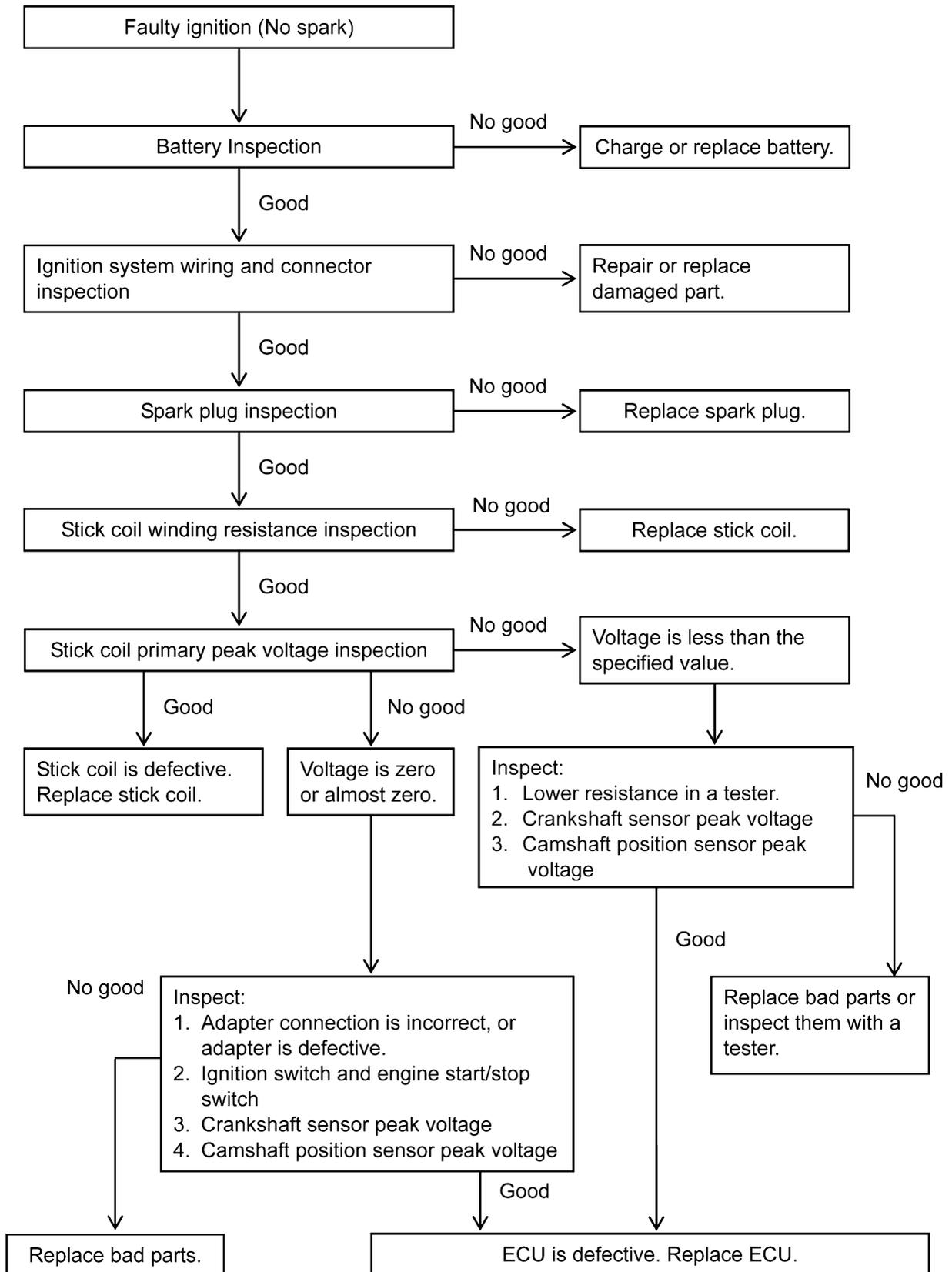
Ignition System Troubleshooting (see Ignition System section)

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



Ignition System

Ignition System Troubleshooting

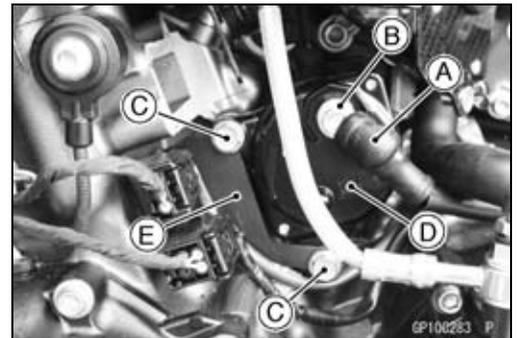
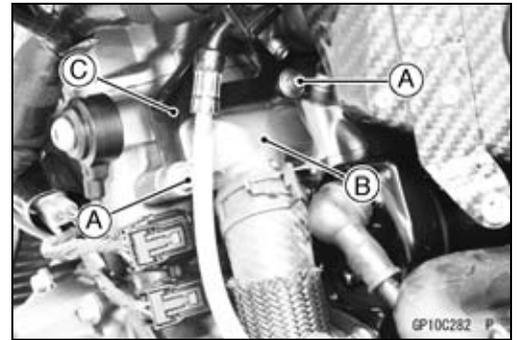




## Electric Starter System

### Starter Motor Removal

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  - Air Cleaner Housing Cover (see Air Cleaner Housing Removal in the Fuel System (DFI) chapter)
  - Water Hose Fitting Bolts [A]
  - Water Hose Fitting [B] and Bracket [C]
- Slide out the rubber cap [A].
- Remove:
  - Starter Motor Cable Terminal Nut [B]
  - Starter Motor Mounting Bolts [C]
  - Starter Motor [D] and Bracket [E]

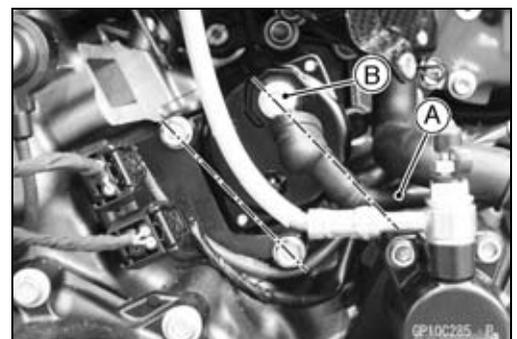
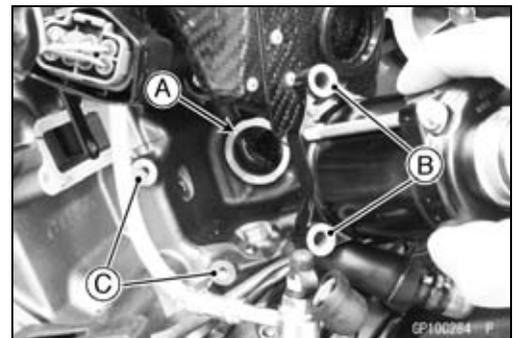


### Starter Motor Installation

#### NOTICE

**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- Clean the starter motor installing hole [A].
- Clean the starter motor legs [B] and crankcase [C] where the starter motor is ground.
- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Install the bracket.
- Tighten:
  - Torque - Starter Motor Mounting Bolts: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Install the starter motor cable [A] as shown.
- The starter motor cable should be parallel with the straight line that links the starter motor mounting bolts.
- Tighten:
  - Torque - Starter Motor Cable Terminal Nut [B]: 6.0 N·m (0.61 kgf·m, 53 in·lb)**
- Slide back the rubber cap to the original position.
- Install the removed parts (see appropriate chapters).

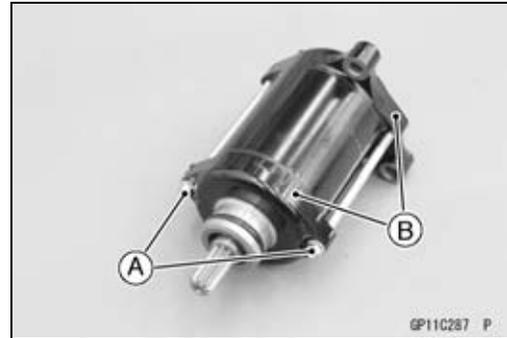


# 16-40 ELECTRICAL SYSTEM

## Electric Starter System

### Starter Motor Disassembly

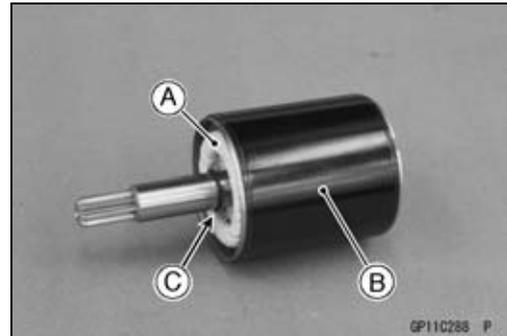
- Remove the starter motor (see Starter Motor Removal).
- Take off the starter motor through bolts [A] and remove the both end covers [B].



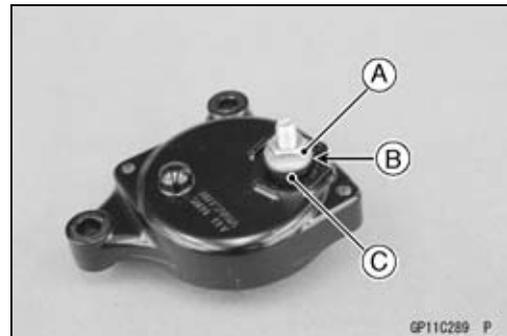
- Pull out the armature [A] out of the yoke [B].

#### NOTE

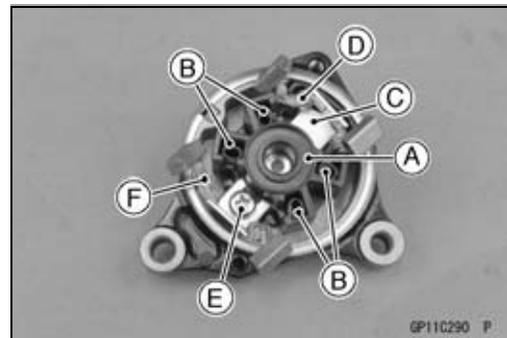
○ Do not remove the circlip [C] from the shaft.



- Remove:
  - Starter Motor Terminal Locknut [A]
  - Washer [B]
  - Collar [C]

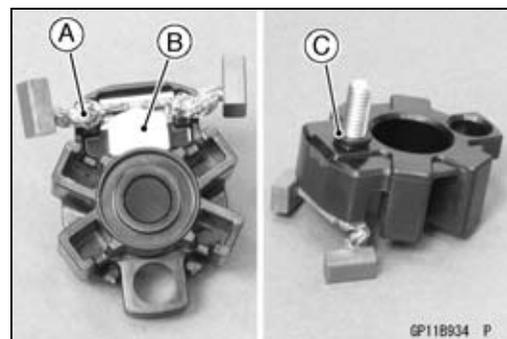


- Pull out the brushes from the brush holder [A].
- Remove:
  - Brush Springs [B]
  - Starter Motor Terminal [C] and O-ring
  - Positive Brush Assy [D]
  - Screw [E]
  - Negative Brush Assy [F]
  - Brush Holder



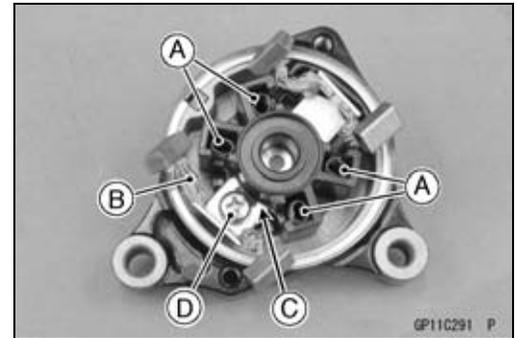
### Starter Motor Assembly

- Install the positive brush assy [A] and the starter motor terminal [B] as shown.
- Replace the O-ring [C] with a new one, and install it.

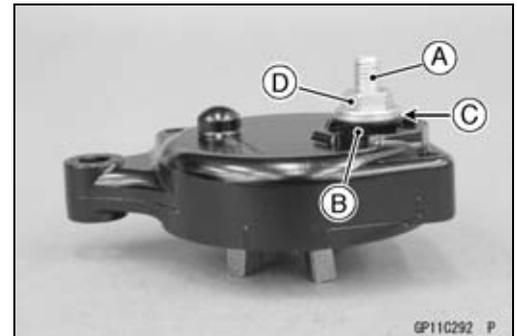


## Electric Starter System

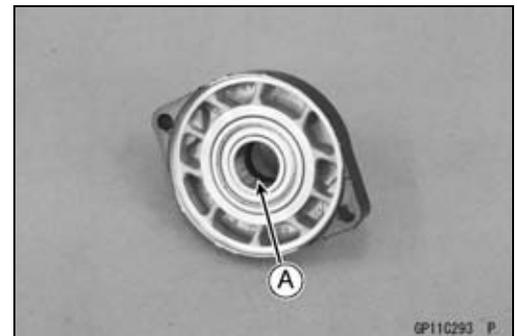
- Install:
  - Brush Springs [A]
  - Negative Brush Assy [B]
- Turn the stopper side [C] to inside.
- Tighten:
  - Torque - Brush Holder Screw [D]: 3.8 N·m (0.39 kgf·m, 34 in·lb)**
- Install the brushes onto the brush springs.



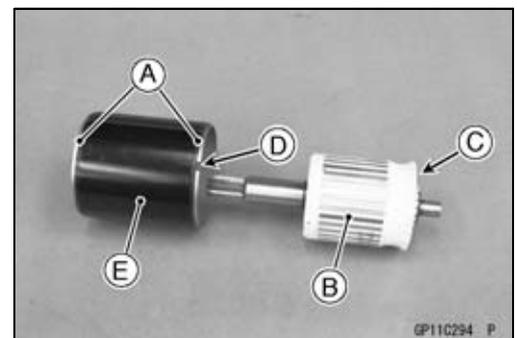
- Install the following parts to the starter motor terminal [A].
  - Collar [B]
  - Washer [C]
  - Starter Motor Terminal Locknut [D]
- Turn the flange of the collar to the locknut as shown.
- Tighten:
  - Torque - Starter Motor Terminal Locknut: 11 N·m (1.1 kgf·m, 97 in·lb)**



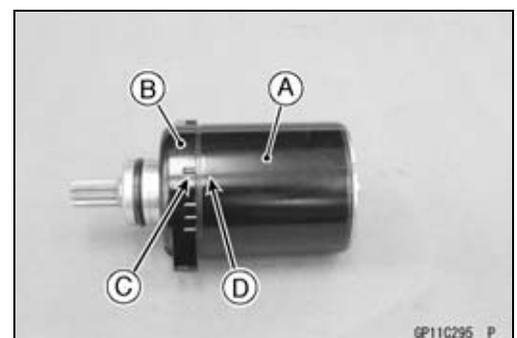
- Apply thin coat of grease to the oil seal [A].



- Replace the O-rings [A] with new ones.
- Insert the armature [B] so that commutator side [C] faces hollow side [D] of the yoke [E].



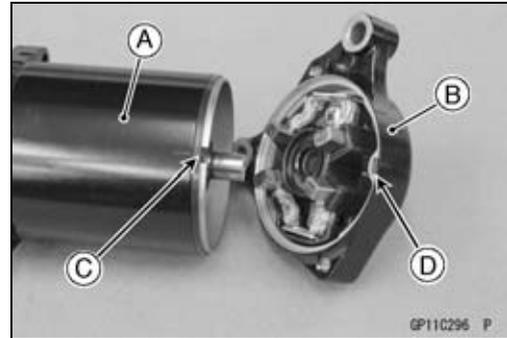
- Assemble the yoke [A] and the end cover [B] as shown.
  - Mark [C]
  - Mark [D]



## 16-42 ELECTRICAL SYSTEM

### Electric Starter System

- Assemble the yoke [A] and the end cover [B] so that the hollow [C] of the yoke fits the projection [D] of the end cover.



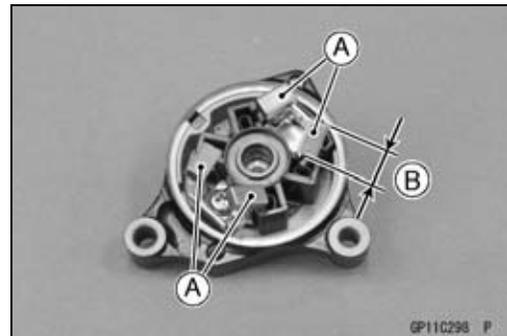
- Tighten:  
Torque - Starter Motor Through Bolts [A]: 5.0 N·m (0.51 kgf·m, 44 in·lb)



#### **Brush Inspection**

- Measure the length of each brush [A].
- ★ If any is worn down to the service limit, replace the brush assy.

**Starter Motor Brush Length [B]**  
Standard: 12.0 mm (0.47 in.)  
Service Limit: 6.5 mm (0.26 in.)



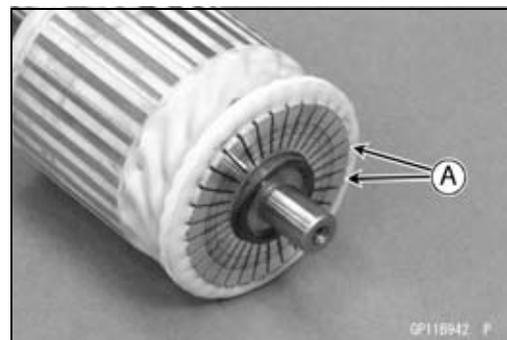
#### **Commutator Cleaning and Inspection**

- Clean the metallic debris off the between commutator segments [A].

#### **NOTE**

○ Do not use emery or sand paper on the commutator.

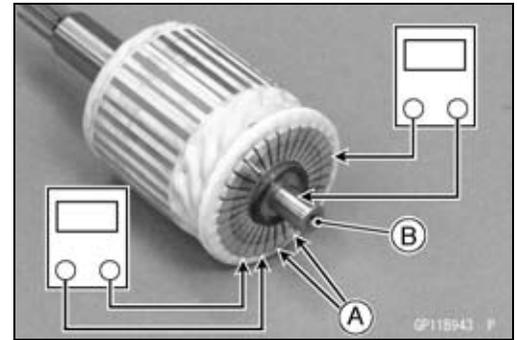
- Check the commutator for damage or abnormal wear.
- ★ Replace the starter motor with a new one if there is any damage or wear.
- Visually inspect the commutator segments for discoloration.
- ★ Replace the starter motor with a new one if discoloration is noticed.



## Electric Starter System

### Armature Inspection

- Measure the resistance between any two commutator segments [A].
- ★ If there is a high resistance or no reading ( $\infty$ ) between any two segments, a winding is open and the starter motor must be replaced.
- 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.

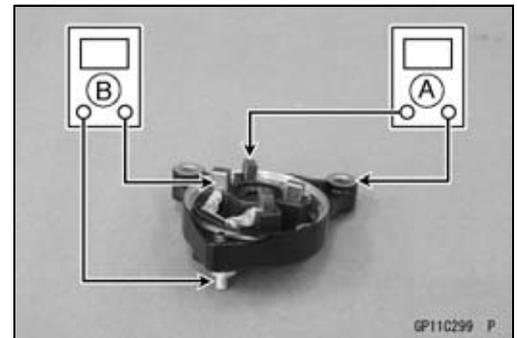


### NOTE

○ Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the 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.

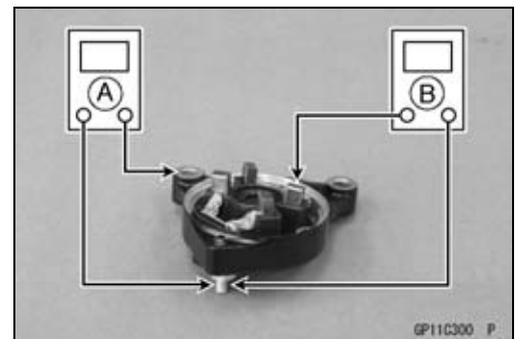
### Brush Lead Inspection

- Measure the resistance as shown.
  - End Cover and Negative Brushes [A]
  - Terminal Bolt and Positive Brushes [B]
- ★ If there is not close to zero ohms, the brush lead has an open. Replace the brush assy.



### Left-hand End Cover Inspection

- Measure the resistance as shown.
  - Terminal Bolt and End Cover [A]
  - Terminal Bolt and Negative Brushes [B]
- ★ If there is any reading, the brush assy and/or terminal bolt assy have a short. Replace the brush assy.



### Starter Relay Inspection

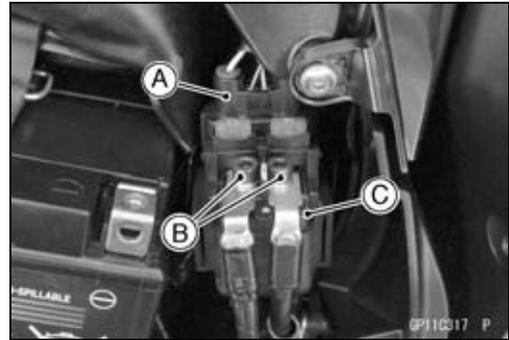
- Remove:
  - Battery Negative (-) Cable (see Battery Removal)
- Take the starter relay [A] off the rear fender.
- Remove:
  - Starter Relay Cover [B]



## 16-44 ELECTRICAL SYSTEM

### Electric Starter System

- Disconnect:  
Connector [A]
- Remove:  
Cable Terminal Bolts [B] and Washers  
Starter Relay [C]

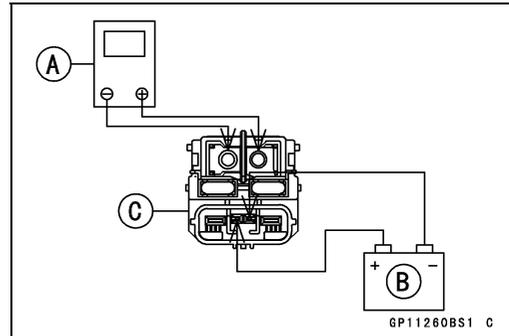


- Connect a tester [A] and 12 V battery [B] to the starter relay [C] as shown.
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.

#### Testing Relay

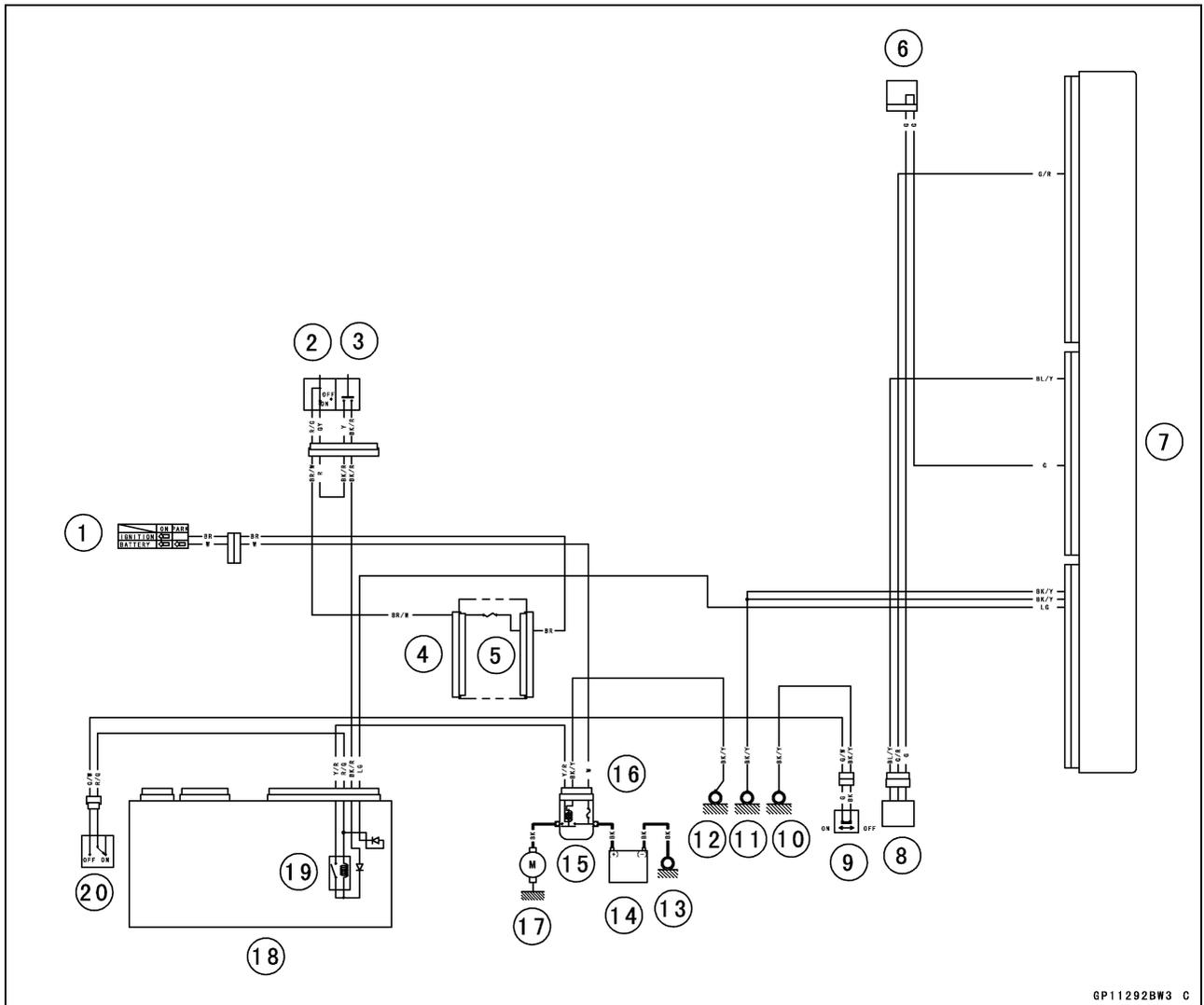
Criteria: When battery is connected →  $0 \Omega$

When battery is disconnected →  $\infty \Omega$



Electric Starter System

Electric Starter Circuit



GP11292BW3 C

- |  |                            |
|--|----------------------------|
| 1. Ignition Switch                         | 11. Frame Ground 3         |
| 2. Engine Start/Stop Switch (Engine Stop)  | 12. Frame Ground 5         |
| 3. Engine Start/Stop Switch (Engine Start) | 13. Engine Ground          |
| 4. Fuse Box 1                              | 14. Battery 12 V 8.6 Ah    |
| 5. Ignition Fuse 15 A                      | 15. Starter Relay          |
| 6. Joint Connector G                       | 16. Main Fuse 30 A         |
| 7. ECU                                     | 17. Starter Motor          |
| 8. Gear Position Sensor                    | 18. Relay Box              |
| 9. Side Stand Switch                       | 19. Starter Circuit Relay  |
| 10. Frame Ground 2                         | 20. Starter Lockout Switch |

## 16-46 ELECTRICAL SYSTEM

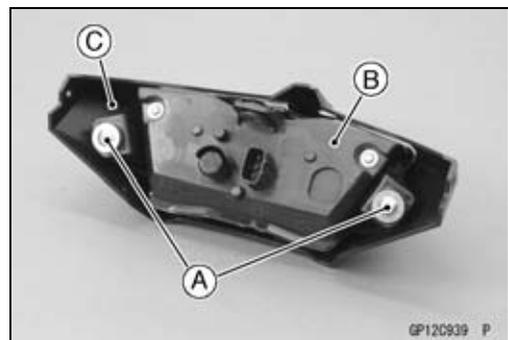
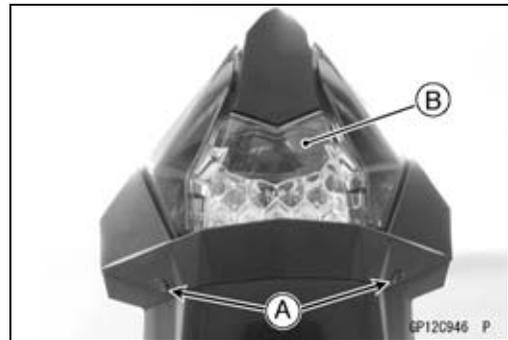
### Lighting System

#### Tail/Brake Light (LED) Removal

##### NOTE

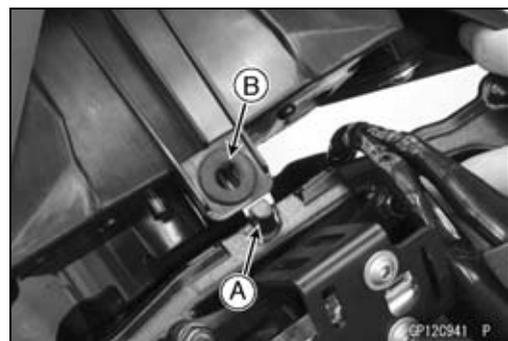
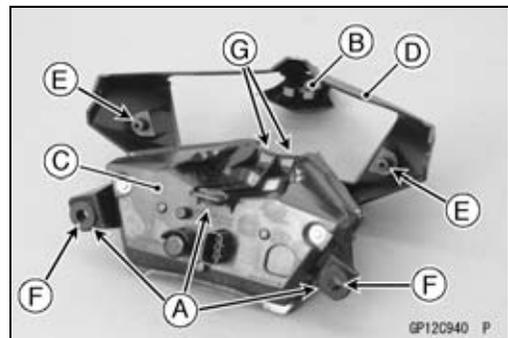
○ The tail/brake light (LED) does not illuminate so that the connector cap is connected to the tail/brake light (LED) connector in a factory shipping state.

- Remove:
  - Seat Cover (see Seat Cover Removal in the Frame chapter)
  - Quick Rivets [A]
- Pull up on the rear of tail/brake light (LED) [B], and remove it.
- Remove the screws [A].
- Remove the tail/brake light (LED) [B] from the tail/brake light cover [C].

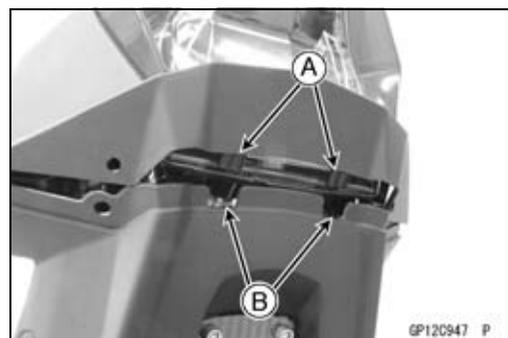


#### Tail/Brake Light (LED) Installation

- Check that the grommets [A] and damper [B] are in place on the tail/brake light (LED) [C] and cover [D].
  - Install the tail/brake light (LED) to the cover.
  - Insert the projections [E] into the holes [F] of the grommets.
  - Insert the projections of the damper into the holes [G].
  - Tighten the screws.
- 
- Install the tail/brake light (LED) to the frame.
  - Insert the projection [A] into the hole [B] of the grommet.

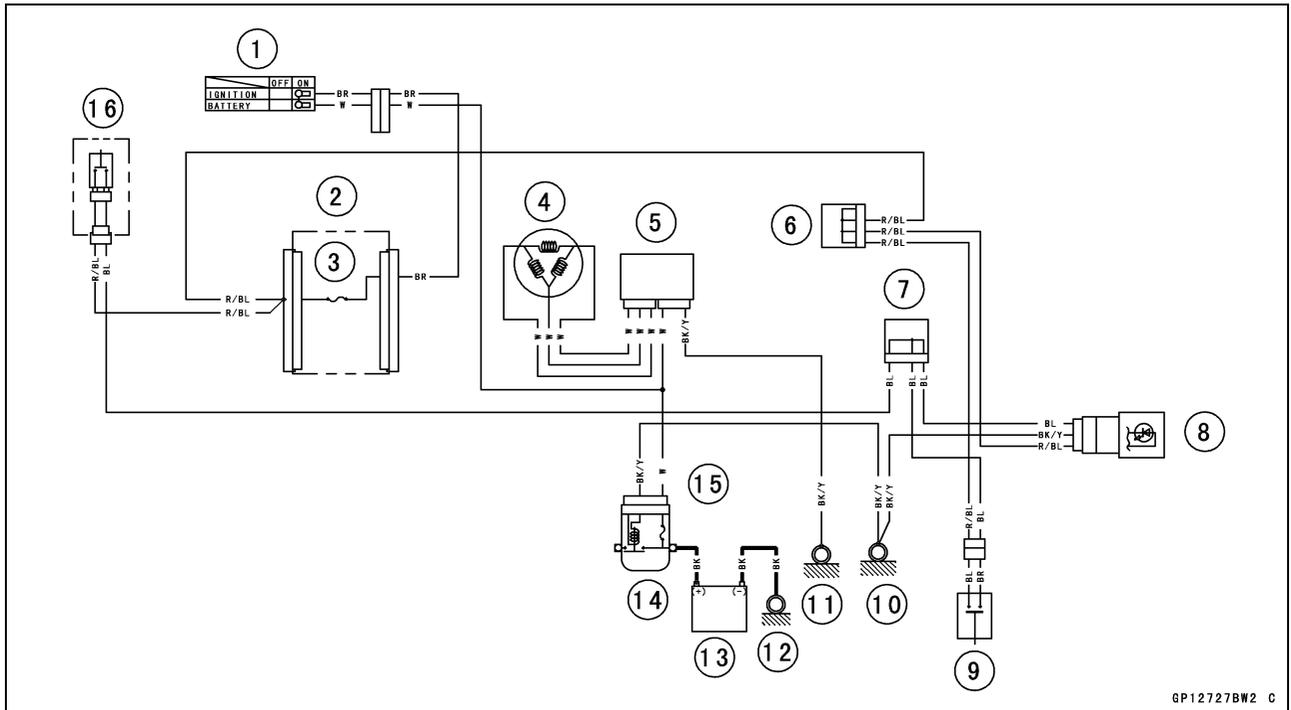


- Fit the tabs [A] of the cover to the slots [B].
- Install the quick rivets.
- Run the lead correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).



Lighting System

Tail/Brake Light Circuit



GP12727BW2 C

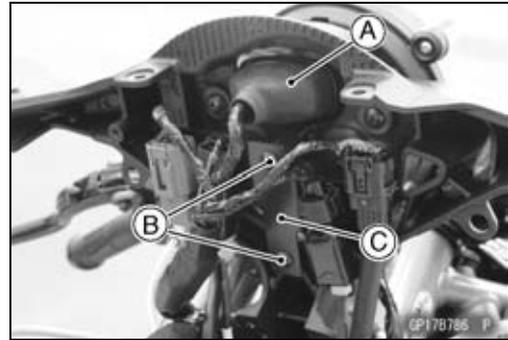
- |                           |                              |
|---------------------------|------------------------------|
| 1. Ignition Switch        | 9. Rear Brake Light Switch   |
| 2. Fuse Box 1             | 10. Frame Ground 5           |
| 3. Brake Light Fuse 10 A  | 11. Frame Ground 1           |
| 4. Alternator             | 12. Engine Ground            |
| 5. Regulator/Rectifier    | 13. Battery 12 V 8.6 Ah      |
| 6. Joint Connector C      | 14. Starter Relay            |
| 7. Joint Connector D      | 15. Main Fuse 30 A           |
| 8. Tail/Brake Light (LED) | 16. Front Brake Light Switch |

## 16-48 ELECTRICAL SYSTEM

### Meter, Gauge, Indicator Unit

#### **Meter Unit Removal**

- Remove the intake duct (see Intake Duct Removal in the Fuel System (DFI) chapter).
- Slide the dust cover [A], and disconnect the meter connector.
- Remove:
  - Bolts [B]
  - Bracket [C]



- Remove:
  - Meter Mounting Screws [A]
  - Meter Unit [B]



#### **Meter Unit Installation**

- Installation is the reverse of removal.
  - Torque - Meter Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)**
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

## Meter, Gauge, Indicator Unit

### Meter Operation Inspection

#### Check 1-1: Switching Inspection

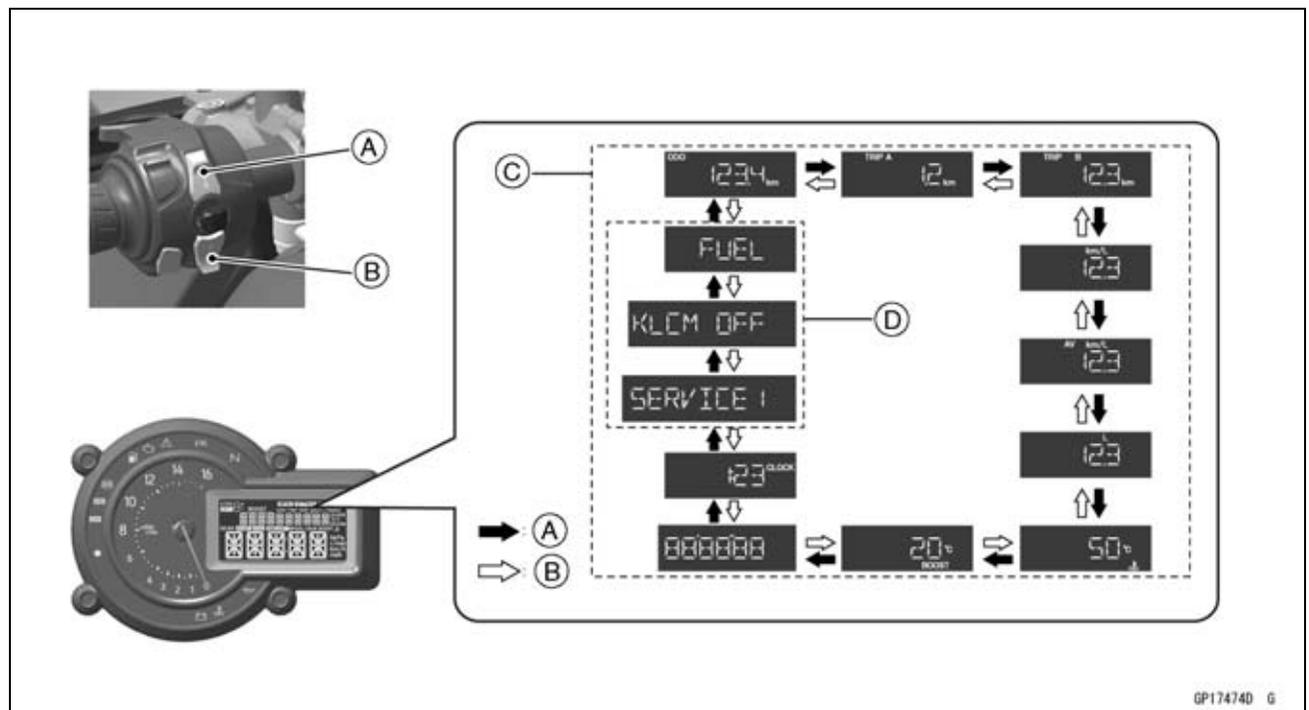
- Turn the ignition switch on and check the following.

#### Inspection of Short Press

- By pushing the upper button [A] or lower button [B] each time, check that the multifunction display [C] changes as shown.

Warning Messages [D]

- This display is ordinary indication.



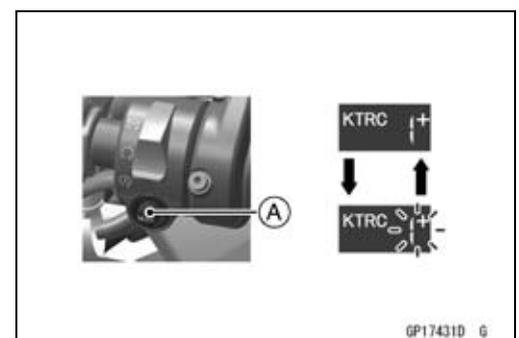
- ★ If the meter does not work, check the left switch housing and the wiring for continuity (see Meter Unit Circuit).

- ★ If the left switch housing and the wiring are good, replace the meter unit.

- By pushing the mode button [A] each time, check that the KTRC mode display changes as shown.

- ★ If the meter does not work, check the right switch housing and the wiring for continuity (see Meter Unit Circuit).

- ★ If the right switch housing and the wiring are good, replace the meter unit.

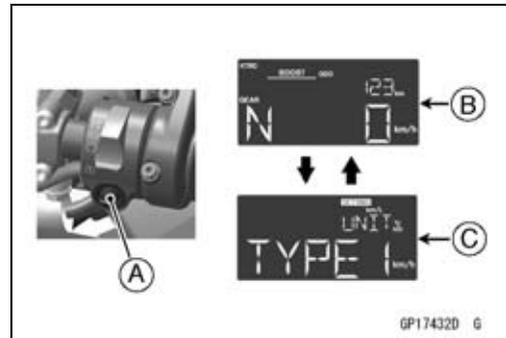


## 16-50 ELECTRICAL SYSTEM

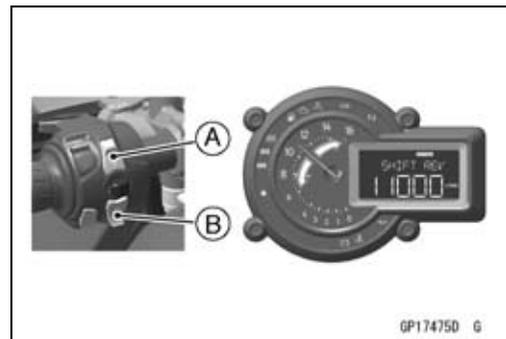
### Meter, Gauge, Indicator Unit

#### Inspection of Long Press

- By continue to push the mode button [A], check that the multifunction display [B] as shown.  
Setting Mode [C]
- ★ If the meter does not work, check the right switch housing and the wiring for continuity (see Meter Unit Circuit).
- ★ If the right switch housing and the wiring are good, replace the meter unit.

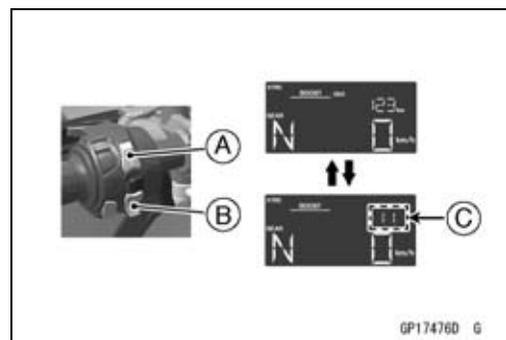


- Change the multifunction display to the shift-up engine speed setting display.
- By continue to push the upper button [A] or lower button [B], check that the moving of the tachometer needle continuously as shown.
- ★ If the meter does not work, check the left switch housing and the wiring for continuity (see Meter Unit Circuit).
- ★ If the left switch housing and the wiring are good, replace the meter unit.



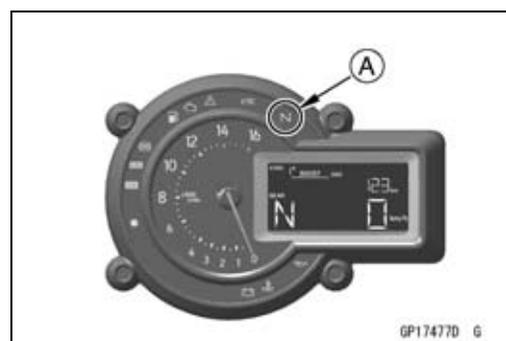
#### Inspection of Simultaneous Press

- Change the multifunction display to the odometer.
- By continue to push the upper button [A] and the lower button [B] simultaneously, check that the multifunction display as shown.  
Service Code [C]
- The service code does not display when the service code is not stored.
- ★ If the meter does not work, check the left switch housing and the wiring for continuity (see Meter Unit Circuit).
- ★ If the left switch housing and the wiring are good, replace the meter unit.



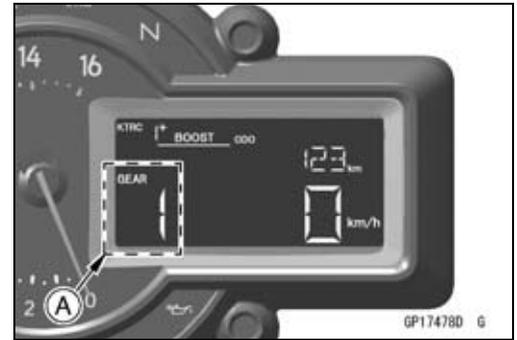
#### Check 1-2: Gear Position Indicator Inspection

- Turn the ignition switch on.
- The green neutral indicator light (LED) [A] goes on when the transmission gear is neutral position.



## Meter, Gauge, Indicator Unit

- Set the low gear position, and check that the display changes to 1 mark [A] and the green neutral indicator light (LED) goes off.
- Using the rear stand, raise the rear wheel off the ground.
- Rotate the rear wheel by hand or start the engine, and change the gear position.
- Check that the display corresponding to each gear position (1, 2, 3, 4, 5 or 6) appears.
- ★ If the display function does not work, check the following parts.
  - Gear Position Sensor (see Gear Position Sensor Inspection)
  - Wiring (see Meter Unit Circuit)
- ★ If the above parts are good, replace the meter unit and/or ECU.



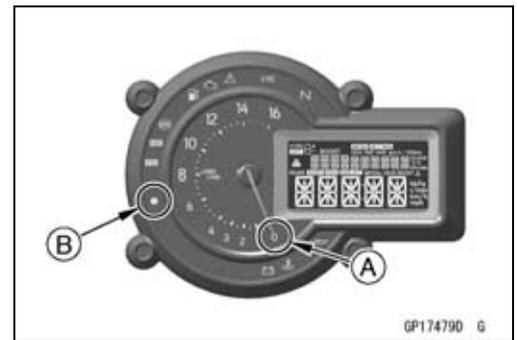
### Meter Operation Inspection

#### Check 2-1: Ambient Brightness Sensor Inspection

##### NOTE

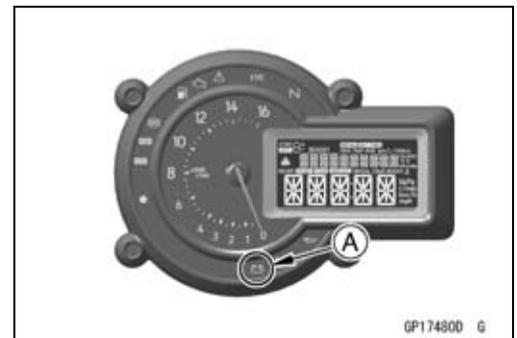
○ This meter unit has the automatically engine speed indicator light brightness function by the sensor in addition to the manual brightness setting.

- Turn the ignition switch on.
- Check if the engine speed indicator light brightness [A] is changed by shining a light on the sensor [B] with the penlight.
- ★ If the meter does not work, replace the meter unit.



#### Check 2-2: Red Battery Warning Indicator Light (LED) Inspection

- When the battery condition is low voltage (10.8 ~ 11.2 V or less) or high voltage (15.5 ~ 16.5 V or more), the red battery warning indicator light (LED) [A] goes on.
- ★ If the red battery warning indicator light (LED) goes on, inspect the charging voltage (see Charging Voltage Inspection).
- ★ If the charging voltage is good, replace the meter unit.



#### Check 2-3: Clock Inspection

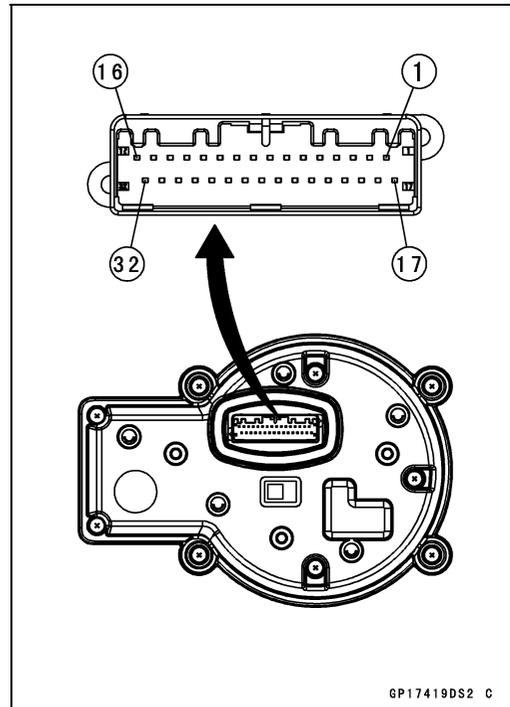
- Turn the ignition switch on.
- Change the multifunction display to the clock.
- Record the time.
- Turn the ignition switch off, and then turn the ignition switch on after a few minutes.
- Check that the clock was counting time while turning the ignition switch off.
- ★ If the meter does not work, replace the meter unit.

## 16-52 ELECTRICAL SYSTEM

### Meter, Gauge, Indicator Unit

#### Meter Unit Inspection

- Remove the meter unit (see Meter Unit Removal).
  - [1] Horn Output (non-use)
  - [2] Horn Output (non-use)
  - [3] Horn Output (non-use)
  - [4] Horn Output (non-use)
  - [5] Ground (-)
  - [6] CAN Communication Line (High)
  - [7] CAN Communication Line (Low)
  - [8] Front Right Turn Signal Light Output (non-use)
  - [9] Front Left Turn Signal Light Output (non-use)
  - [10] Rear Right Turn Signal Light Output (non-use)
  - [11] Rear Left Turn Signal Light Output (non-use)
  - [12] Mode Button
  - [13] Green Right Turn Signal Light (LED) (-) (non-use)
  - [14] Hazard (non-use)
  - [15] Passing (-)
  - [16] Neutral Indicator Light (LED) (-)
  - [17] Ignition (+) (non-use)
  - [18] Ignition (+) (non-use)
  - [19] Ignition (+) (non-use)
  - [20] Ignition (+) (non-use)
  - [21] Battery (+)
  - [22] Ignition (+)
  - [23] Blue High Beam Indicator Light (LED) (-) (non-use)
  - [24] Red Oil Pressure Warning Indicator Light (LED) (-)
  - [25] Fuel Level Sensor
  - [26] Parking (non-use)
  - [27] Lower Button
  - [28] Upper Button
  - [29] Horn (non-use)
  - [30] Green Left Turn Signal Light (LED) (-) (non-use)
  - [31] Turn Signal Light Cancel (non-use)
  - [32] Blue High Beam Indicator Light (LED) (-) (non-use)



GP17419DS2 C

#### NOTICE

**Do not drop the meter unit. Place the meter unit so that it faces upward. If the meter unit is left upside down or sideways for a long time or dropped, it will malfunction. Do not short each terminal.**

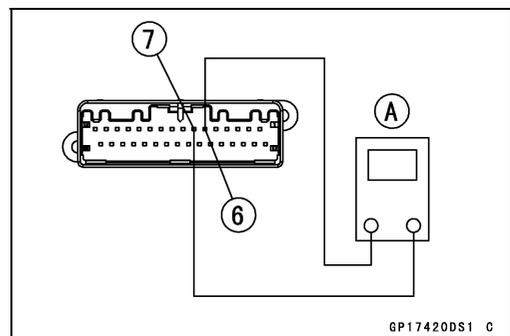
#### Check 3-1: CAN Communication Line Resistance Inspection

- Connect a tester [A] to the terminal [6] and [7] in the meter unit.

##### CAN Communication Line Resistance (at Meter Unit)

Standard: 123 ~ 125  $\Omega$

- ★ If the tester reading is not specified, replace the meter unit.

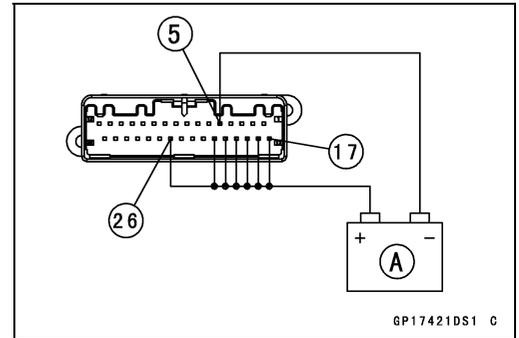


GP17420DS1 C

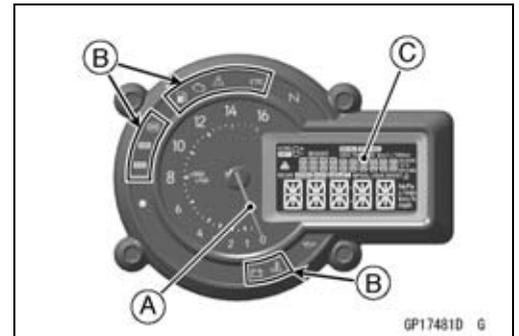
## Meter, Gauge, Indicator Unit

### Check 3-2: Meter Unit Power Supply Check

- Using the auxiliary leads, the 12 V battery [A] to the meter unit connector as follows.
- Connect the battery positive (+) terminal to the terminal [17] ~ [22] and [26].
- Connect the battery negative (-) terminal to the terminal [5].

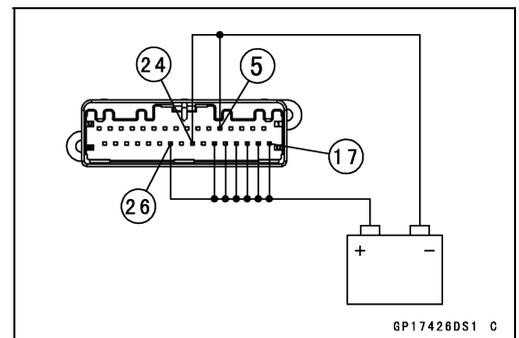


- Check the following items.
- The tachometer needle [A] momentarily points their last readings and back to the minimum position.
- The engine speed indicator light goes on synchronously with the movement of the tachometer needle.
- The indicator lights (LED) [B] and all LCD segments [C] goes on for a few seconds.
- ★ If the meter unit does not work, replace the meter unit.



### Check 3-3: Red Oil Pressure Warning Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 3-2.
- Connect the terminal [24] to the battery (-) terminal.

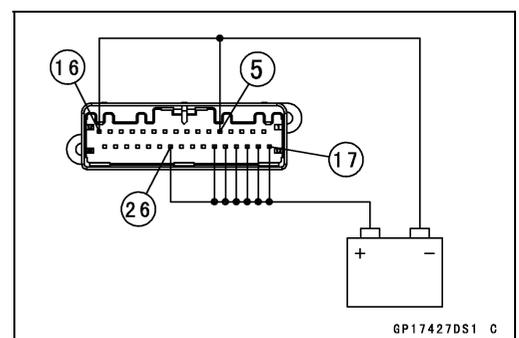


- Check that the red oil pressure warning indicator light (LED) [A] goes on.
- ★ If the indicator light does not go on, replace the meter unit.



### Check 3-4: Green Neutral Indicator Light (LED) Inspection

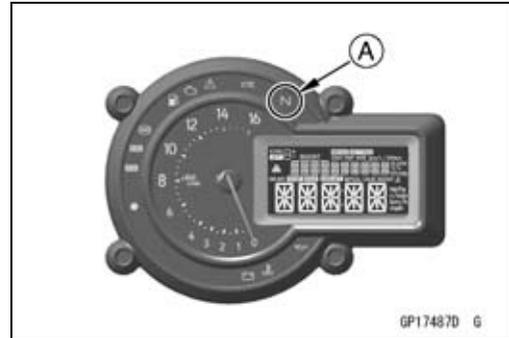
- Connect the leads in the same circuit as Check 3-2.
- Connect the terminal [16] to the battery (-) terminal.



## 16-54 ELECTRICAL SYSTEM

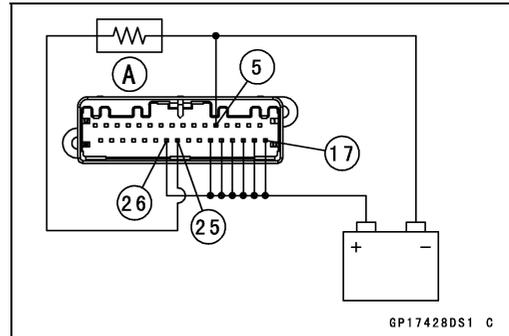
### Meter, Gauge, Indicator Unit

- Check that the green neutral indicator light (LED) [A] goes on.
- ★ If the indicator light does not go on, replace the meter unit.

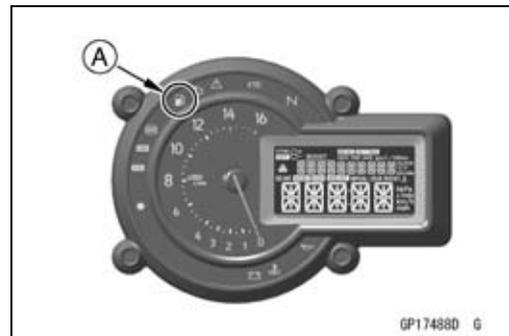


#### Check 3-5: Amber Fuel Level Warning Indicator Light (LED) Inspection

- Connect the leads in the same circuit as Check 3-2.
- Connect the resistor (about 10  $\Omega$ ) [A] between the terminal [5] and the terminal [25].



- Check that the amber fuel level warning indicator light (LED) [A] goes on.
- ★ If the indicator light does not go on, replace the meter unit.

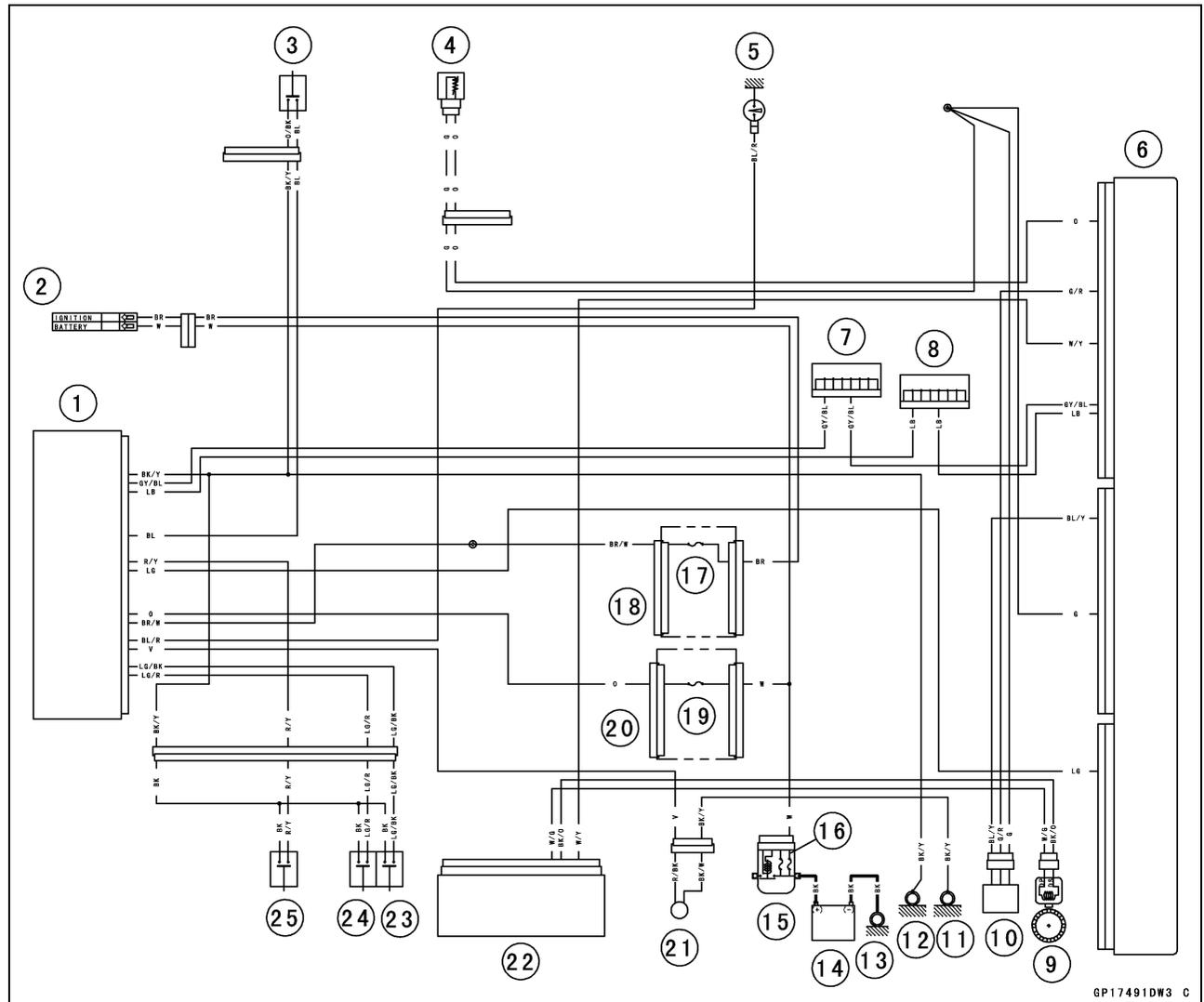


#### Check 3-6: Other Inspection

- Other items of the meter unit are related to the CAN communication line.
- When the other items are faulty indication, check the followings.
  - Wiring (see Wiring Inspection)
  - Fuel Injectors (see Fuel Injectors section in the Fuel System (DFI) chapter)
  - Each Sensor (see appropriate chapters)
- ★ If the above items are good, replace the meter unit and/or ECU.

Meter, Gauge, Indicator Unit

Meter Circuit



- |                               |                         |
|-------------------------------|-------------------------|
| 1. Meter Unit                 | 14. Battery 12 V 8.6 Ah |
| 2. Ignition Switch            | 15. Starter Relay       |
| 3. Mode Button                | 16. Main Fuse 30 A      |
| 4. Water Temperature Sensor   | 17. Ignition Fuse 15 A  |
| 5. Oil Pressure Switch        | 18. Fuse Box 1          |
| 6. ECU                        | 19. Meter Fuse 10 A     |
| 7. Joint Connector C          | 20. Fuse Box 2          |
| 8. Joint Connector D          | 21. Fuel Level Sensor   |
| 9. Rear Wheel Rotation Sensor | 22. KIBS Hydraulic Unit |
| 10. Gear Position Sensor      | 23. Lower Button        |
| 11. Frame Ground 3            | 24. Upper Button        |
| 12. Frame Ground 1            | 25. Lap Button          |
| 13. Engine Ground             |                         |

## 16-56 ELECTRICAL SYSTEM

### Switches and Sensors

#### **Brake Light Timing Inspection**

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.
- Perform this inspection when the tail/brake light (LED) is used.

#### **Brake Light Timing Adjustment**

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.
- Perform this adjustment when the tail/brake light (LED) is used.

#### **Switch Inspection**

- Using a tester, check to see that only the connections shown in the table have continuity (about zero ohms).
- 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        |     |     |

- Perform this inspection when the tail/brake light (LED) is used.

#### **Side Stand Switch Connections**

| Side Stand Switch Connections |     |     |
|-------------------------------|-----|-----|
| Color                         | BK  | G   |
| When side stand is down       |     |     |
| When side stand 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 Self-Diagnosis System 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 a digital meter, measure the internal resistance of the sensor.
- ★ If the digital meter does not show the specified values, replace the sensor.

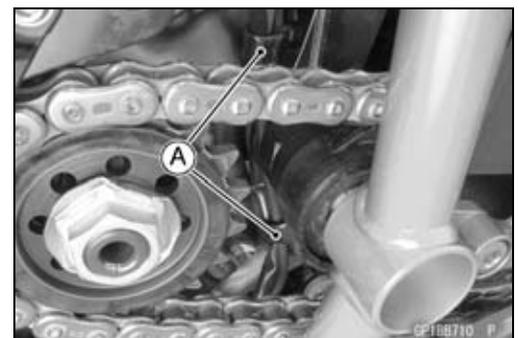
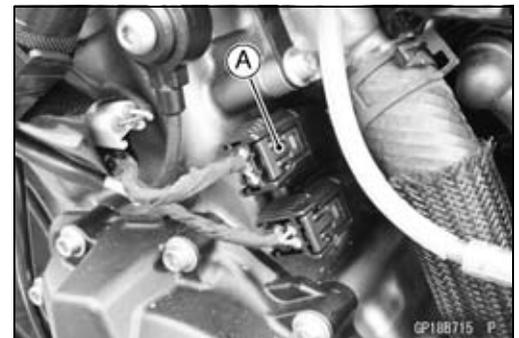
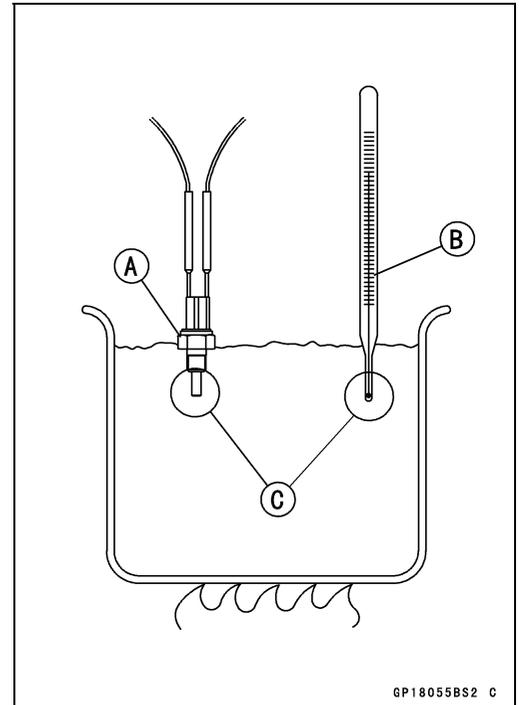
### Water Temperature Sensor Resistance

| Temperature   | Resistance (kΩ) |
|---------------|-----------------|
| -20°C (-4°F)  | *18.80 ±2.37    |
| 0°C (32°F)    | *(about 6.544)  |
| 40°C (104°F)  | 1.136 ±0.095    |
| 100°C (212°F) | 0.1553 ±0.0070  |

\*: Reference Information

### Gear Position Sensor Removal

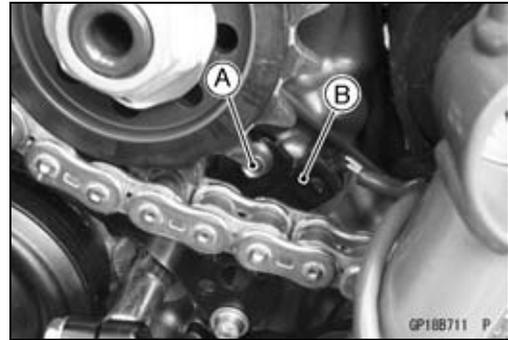
- Remove:
  - Air Intake Duct (see Air Intake Duct Removal in the Fuel System (DFI) chapter)
  - Engine Sprocket Cover (see Engine Sprocket Removal in the Final Drive chapter)
- Disconnect the gear position sensor connector [A].
- Open the clamps [A] to clear the gear position sensor harness.



## 16-58 ELECTRICAL SYSTEM

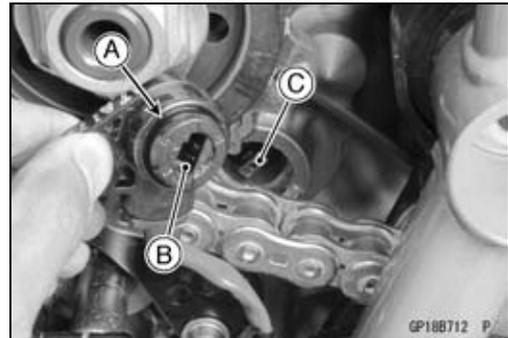
### Switches and Sensors

- Remove:
  - Gear Position Sensor Bolt [A]
  - Gear Position Sensor [B]



#### ***Gear Position Sensor Installation***

- Replace the O-ring [A] with a new one.
- Apply grease to the new O-ring.
- Install the gear position sensor so that the slit [B] fits to the projection [C] on the shift drum.
- Tighten:
  - **Torque - Gear Position Sensor Bolt: 10 N·m (1.0 kgf·m, 89 in·lb)**
- Run the leads correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).
- Install the removed parts (see appropriate chapters).

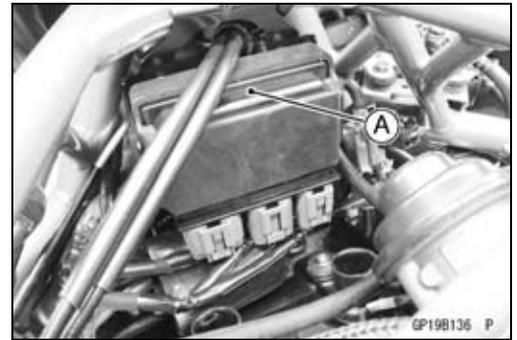


#### ***Gear Position Sensor Inspection***

- Refer to the Gear Position Sensor Output Voltage Inspection in the Self-Diagnosis System chapter.

## Relay Box

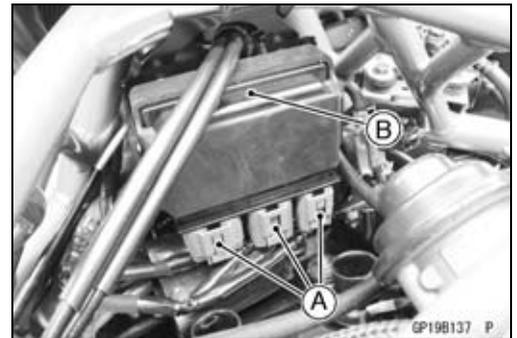
The relay box [A] has relays and diodes. The relays and diodes can not be removed.



### Relay Box Removal

| <b>NOTICE</b>   |
|---|
| <p><b>Never drop the relay box especially on a hard surface.</b><br/> <b>Such a shock to the relay box can damage it.</b></p> |

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect:  
Connectors [A]
- Remove:  
Relay Box [B]



### Relay Circuit Inspection

- Remove the relay box (see Relay Box Removal).
  - Check conductivity of the following numbered terminals by connecting a tester and one 12 V battery to the relay box as shown (see Relay Box Internal Circuit in this section).
- ★ If the tester does not read as specified, replace the relay box.

#### Relay Circuit Inspection (with the battery disconnected)

|                       | Tester Connection | Tester Reading ( $\Omega$ ) |
|-----------------------|-------------------|-----------------------------|
| non-use               | 1-3               | $\infty$                    |
| non-use               | 7-6               | $\infty$                    |
|                       | 4-5               | Not $\infty^*$              |
| Injector Relay        | 7-8               | $\infty$                    |
|                       | 9-10              | Not $\infty^*$              |
| Starter Circuit Relay | 11-16             | $\infty$                    |
|                       | 11-12             | $\infty$                    |
| ETV Actuator Relay    | 17-20             | $\infty$                    |
|                       | 18-19             | Not $\infty^*$              |

\*: The actual reading varies with the tester used.

# 16-60 ELECTRICAL SYSTEM

## Relay Box

### Relay Circuit Inspection (with the battery connected)

|                    | Battery Connection<br>(+) (-) | Tester Connection | Tester Reading ( $\Omega$ ) |
|--------------------|-------------------------------|-------------------|-----------------------------|
| non-use            | 2-11                          | 1-3               | 0                           |
| non-use            | 4-5                           | 7-6               | 0                           |
| Injector Relay     | 9-10                          | 7-8               | 0                           |
| ETV Actuator Relay | 18-19                         | 17-20             | 0                           |

|                       | Battery Connection<br>(+) (-) | Tester Connection<br>(+) (-) | Tester Reading (V) |
|-----------------------|-------------------------------|------------------------------|--------------------|
| Starter Circuit Relay | 16-12                         | 11-12                        | Battery Voltage    |

(+): Apply positive lead.

(-): Apply negative lead.

### Diode Circuit Inspection

- Remove the relay box (see Relay Box Removal).
- Check conductivity of the following pairs of terminals (see Relay Box Internal Circuit in this section).

### Diode Circuit Inspection

|                   |   |
|-------------------|---|
| Tester Connection | 1-11, 2-11, 12-13, 12-15, 12-16, 13-14, 13-15 |
|-------------------|---|

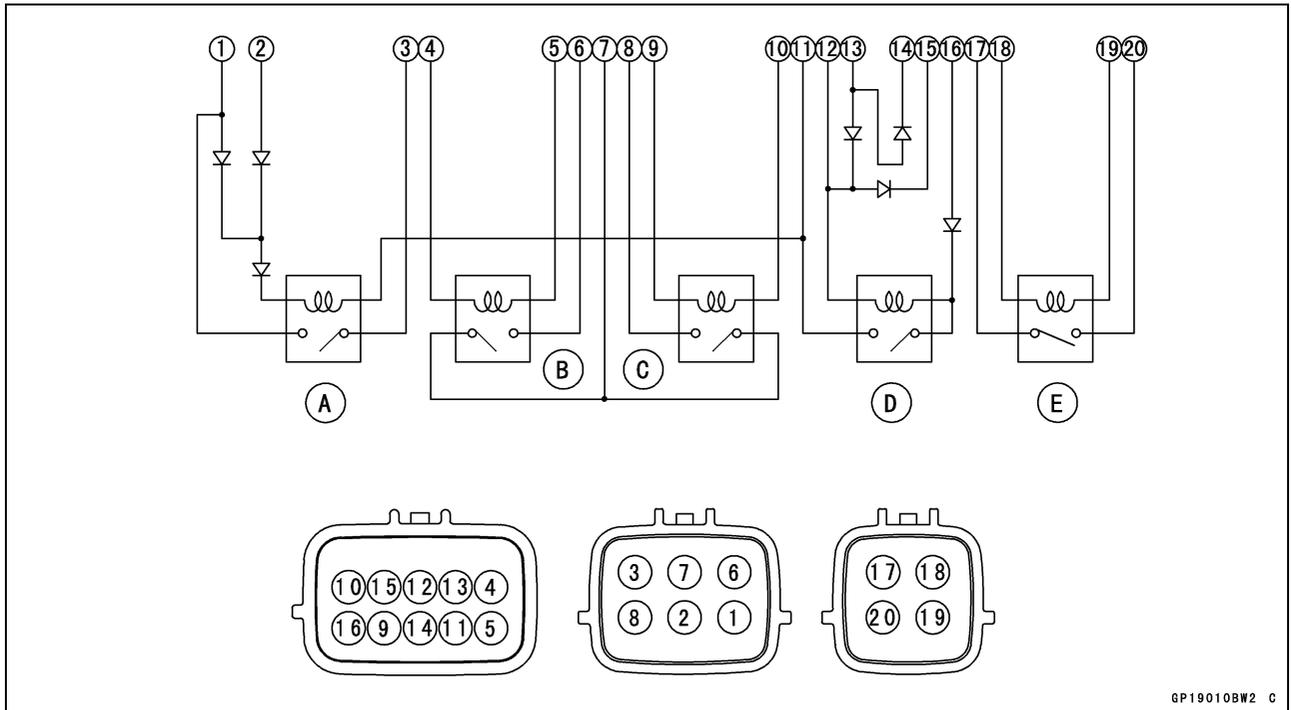
- ★ The resistance should be low in one direction and more than 10 times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the relay box must be replaced.

### 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

Relay Box Internal Circuit



GP19010BW2 C

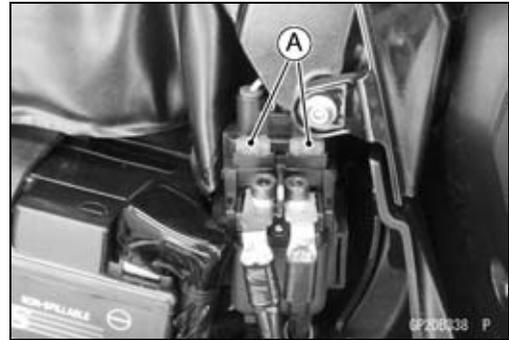
- A: non-use
- B: non-use
- C: Injector Relay
- D: Starter Circuit Relay
- E: ETV Actuator Relay

## 16-62 ELECTRICAL SYSTEM

### Fuse

#### 30 A Main/15 A ECU Fuse Removal

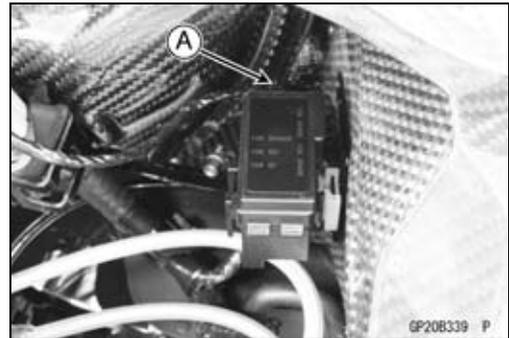
- Remove:
  - Starter Relay Cover (see Starter Relay Inspection)
- Pull out the fuses [A] from the starter relay with needle nose pliers.



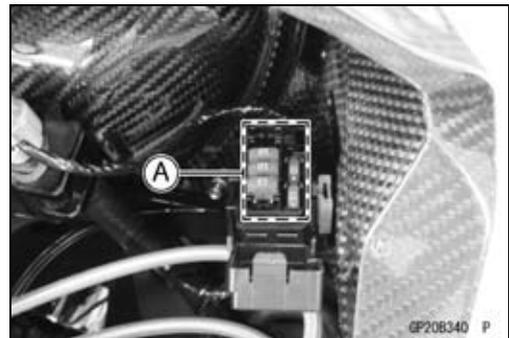
#### Fuse Box Fuse Removal

##### Fuse Box 1

- Remove:
  - Right Inner Cover (see Inner Cover Removal in the Frame chapter)
- Unlock the hook [A] to lift up the lid.



- Pull the fuses [A] straight out of the fuse box with needle nose pliers.



##### Fuse Box 2

- Remove:
  - Seat (see Seat Removal in the Frame chapter)
- Unlock the hook [A] to lift up the lid.



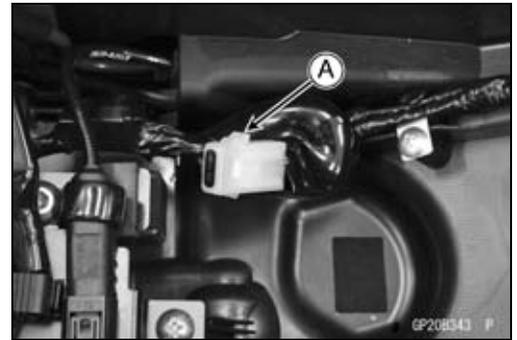
- Pull the fuses [A] straight out of the fuse box with needle nose pliers.



## Fuse

### Fuse Box 3

- Remove:
    - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Unlock the hook [A] to lift up the lid.
- 
- Pull the fuse [A] straight out of the fuse box with needle nose pliers.

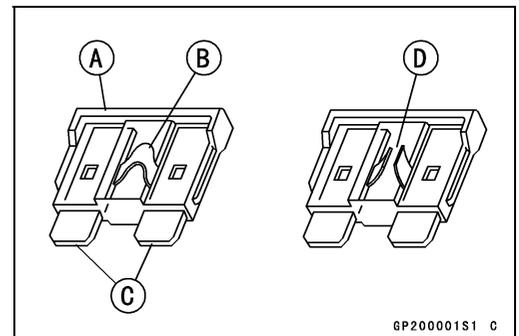


### Fuse Installation

- ★ 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 (see 30 A Main/15 A ECU/Fuse Box Fuse Removal).
- 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]



### NOTICE

**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.**



# Self-Diagnosis System

## Table of Contents

|  |       |
|--|-------|
| Specifications .....   | 17-4  |
| Special Tools .....  | 17-6  |
| Self-Diagnosis .....   | 17-7  |
| Self-Diagnosis Outline .....                                     | 17-7  |
| Self-Diagnosis Procedures .....                                  | 17-8  |
| Service Code Reading .....                                       | 17-10 |
| Service Code Erasing .....                                       | 17-10 |
| Backups .....  | 17-12 |
| Throttle Position Sensor (Service Code 11) .....                 | 17-17 |
| Throttle Position Sensor Removal .....                           | 17-17 |
| Throttle Position Sensor Input Voltage Inspection .....          | 17-17 |
| Throttle Position Sensor Output Voltage Inspection .....         | 17-18 |
| Intake Air Pressure Sensor (Service Code 12).....                | 17-20 |
| Intake Air Pressure Sensor Removal.....                          | 17-20 |
| Intake Air Pressure Sensor Installation.....                     | 17-20 |
| Intake Air Pressure Sensor Input Voltage Inspection.....         | 17-21 |
| Intake Air Pressure Sensor Output Voltage Inspection.....        | 17-22 |
| Intake Air Temperature Sensor (Service Code 13).....             | 17-26 |
| Air Intake Chamber Pressure/Temperature Sensor Removal.....      | 17-26 |
| Air Intake Chamber Pressure/Temperature Sensor Installation..... | 17-26 |
| Intake Air Temperature Sensor Output Voltage Inspection.....     | 17-27 |
| Intake Air Temperature Sensor Resistance Inspection.....         | 17-28 |
| Water Temperature Sensor (Service Code 14) .....                 | 17-29 |
| Water Temperature Sensor Removal/Installation .....              | 17-29 |
| Water Temperature Sensor Output Voltage Inspection.....          | 17-30 |
| Water Temperature Sensor Resistance Inspection.....              | 17-31 |
| Atmospheric Pressure Sensor (Service Code 15).....               | 17-32 |
| Atmospheric Pressure Sensor Removal.....                         | 17-32 |
| Atmospheric Pressure Sensor Installation .....                   | 17-32 |
| Atmospheric Pressure Sensor Input Voltage Inspection.....        | 17-33 |
| Atmospheric Pressure Sensor Output Voltage Inspection.....       | 17-34 |
| Accelerator Position Sensor (Service Code 18) .....              | 17-38 |
| Accelerator Position Sensor Removal .....                        | 17-38 |
| Accelerator Position Sensor Input Voltage Inspection .....       | 17-38 |
| Accelerator Position Sensor Output Voltage Inspection .....      | 17-39 |
| Accelerator Position Sensor Resistance Inspection .....          | 17-40 |
| Crankshaft Sensor (Service Code 21).....                         | 17-42 |
| Crankshaft Sensor Removal/Installation.....                      | 17-42 |
| Crankshaft Sensor Resistance Inspection .....                    | 17-42 |
| Crankshaft Sensor Peak Voltage Inspection.....                   | 17-42 |
| Camshaft Position Sensor (Service Code 23).....                  | 17-43 |
| Camshaft Position Sensor Removal/Installation .....              | 17-43 |
| Camshaft Position Sensor Resistance Inspection .....             | 17-43 |
| Camshaft Position Sensor Peak Voltage Inspection.....            | 17-43 |
| Rear Wheel Rotation Sensor Signal (Service Code 24).....         | 17-45 |
| Rear Wheel Rotation Sensor Signal Inspection.....                | 17-45 |
| Gear Position Sensor (Service Code 25) .....                     | 17-47 |
| Gear Position Sensor Removal/Installation .....                  | 17-47 |
| Gear Position Sensor Input Voltage Inspection .....              | 17-47 |
| Gear Position Sensor Output Voltage Inspection.....              | 17-48 |

## 17-2 SELF-DIAGNOSIS SYSTEM

---

|  |       |
|--|-------|
| Front Wheel Rotation Sensor Signal (Service Code 27) .....                       | 17-50 |
| Front Wheel Rotation Sensor Signal Inspection .....                              | 17-50 |
| Vehicle-down Sensor (Service Code 31) .....                                      | 17-52 |
| Vehicle-down Sensor Removal .....  | 17-52 |
| Vehicle-down Sensor Installation .....   | 17-52 |
| Vehicle-down Sensor Input Voltage Inspection .....                               | 17-53 |
| Vehicle-down Sensor Output Voltage Inspection .....                              | 17-54 |
| ECU Communication Error (Service Code 39) .....                                  | 17-56 |
| ECU Communication Line Inspection .....  | 17-56 |
| Primary Fuel Injectors (Service Code 41, 42, 43, 44) .....                       | 17-58 |
| Primary Fuel Injector Removal/Installation .....                                 | 17-58 |
| Primary Fuel Injector Audible Inspection .....                                   | 17-58 |
| Primary Fuel Injector Resistance Inspection .....                                | 17-58 |
| Primary Fuel Injector Power Source Voltage Inspection .....                      | 17-59 |
| Primary Fuel Injector Output Voltage Inspection .....                            | 17-60 |
| Primary Fuel Injector Fuel Line Inspection .....                                 | 17-62 |
| Fuel Pump Relay (Service Code 46) .....  | 17-64 |
| Fuel Pump Relay Removal/Installation .....                                       | 17-64 |
| Fuel Pump Relay Inspection .....   | 17-64 |
| Return Spring (Service Code 49) .....  | 17-65 |
| Return Spring Removal .....  | 17-65 |
| Return Spring Inspection .....   | 17-65 |
| Stick Coils #1, #2, #3, #4 (Service Code 51, 52, 53, 54) .....                   | 17-66 |
| Stick Coil Removal/Installation .....  | 17-66 |
| Stick Coil Primary Winding Resistance Inspection .....                           | 17-66 |
| Stick Coil Input Voltage Inspection .....  | 17-66 |
| ETV Actuator (Service Code 58) .....   | 17-68 |
| ETV Actuator Removal .....   | 17-68 |
| ETV Actuator Input Voltage Inspection .....                                      | 17-68 |
| ETV Actuator Relay Inspection .....  | 17-68 |
| Knock Sensor (Service Code 69) .....   | 17-70 |
| Knock Sensor Removal .....   | 17-70 |
| Knock Sensor Installation .....  | 17-70 |
| Knock Sensor Resistance Inspection .....   | 17-70 |
| Battery Voltage (Service Code 97) .....  | 17-72 |
| Battery Voltage Inspection .....   | 17-72 |
| ETV Control Circuit (Service Code 98) .....                                      | 17-73 |
| ETV Control Circuit Inspection .....   | 17-73 |
| KIBS Hydraulic Unit Communication Error (Service Code 1B) .....                  | 17-74 |
| KIBS Hydraulic Unit Communication Line Inspection .....                          | 17-74 |
| ESD (Electronic Steering Damper) ECU Communication Error (Service Code 3C) ..... | 17-76 |
| ESD ECU Communication Line Inspection .....                                      | 17-76 |
| Quick Shifter Sensor (Service Code 3E) .....                                     | 17-78 |
| Quick Shifter Sensor Removal/Installation .....                                  | 17-78 |
| Quick Shifter Sensor Input Voltage Inspection .....                              | 17-78 |
| Quick Shifter Sensor Output Voltage Inspection .....                             | 17-79 |
| Quick Shifter Sensor Resistance Inspection .....                                 | 17-80 |
| Secondary Fuel Injectors (Service Code 4A, 4B, 4C, 4D) .....                     | 17-81 |
| Secondary Fuel Injector Removal/Installation .....                               | 17-81 |
| Secondary Fuel Injector Resistance Inspection .....                              | 17-81 |
| Secondary Fuel Injector Power Source Voltage Inspection .....                    | 17-82 |
| Secondary Fuel Injector Output Voltage Inspection .....                          | 17-83 |
| Secondary Fuel Injector Fuel Line Inspection .....                               | 17-84 |
| Purge Valve (for Supercharger) (Service Code 6A) .....                           | 17-86 |
| Purge Valve (for Supercharger) Removal/Installation .....                        | 17-86 |
| Purge Valve (for Supercharger) Inspection .....                                  | 17-86 |
| Air Intake Chamber Pressure Sensor (Service Code 7E) .....                       | 17-88 |

|   |        |
|---|--------|
| Air Intake Chamber Pressure/Temperature Sensor Removal.....   | 17-88  |
| Air Intake Chamber Pressure/Temperature Sensor Installation.....  | 17-88  |
| Air Intake Chamber Pressure Sensor Input Voltage Inspection.....  | 17-89  |
| Air Intake Chamber Pressure Sensor Output Voltage Inspection.....   | 17-90  |
| ESD (Electronic Steering Damper) Actuator Error (Service Code E2E).....   | 17-92  |
| ESD Actuator Removal.....   | 17-92  |
| ESD Actuator Installation.....  | 17-92  |
| ESD Actuator Resistance Inspection.....   | 17-92  |
| ESD Actuator Input Voltage Inspection.....  | 17-93  |
| ESD (Electronic Steering Damper) ECU Error (Service Code E3B).....  | 17-95  |
| ESD ECU Removal.....  | 17-95  |
| ESD ECU Installation.....   | 17-95  |
| ESD ECU Power Supply Inspection.....  | 17-95  |
| KIBS Service Codes.....   | 17-98  |
| Solenoid Valve Inspection (Service Code B13, B14, B17, B18).....  | 17-98  |
| KIBS Solenoid Valve Relay Inspection (Service Code B19).....  | 17-98  |
| Front, Rear Wheel Rotation Difference Abnormal Inspection (Service Code B25).....   | 17-98  |
| KIBS Motor Relay Inspection (Service Code B35).....   | 17-98  |
| Front Wheel Rotation Sensor Signal Abnormal (Service Code B42).....   | 17-99  |
| Front Wheel Rotation Sensor Wiring Inspection (Service Code B43).....   | 17-100 |
| Rear Wheel Rotation Sensor Signal Abnormal (Service Code B44).....  | 17-100 |
| Rear Wheel Rotation Sensor Wiring Inspection (Service Code B45).....  | 17-101 |
| Power Supply Voltage Inspection (Low-Voltage) (Service Code B52).....   | 17-102 |
| Power Supply Voltage Inspection (Over-Voltage) (Service Code B53).....  | 17-102 |
| ECU Inspection (Service Code B55).....  | 17-102 |
| CAN Communication (Transmission)/CAN Bus OFF Monitor Inspection (Service Code B57) CAN Communication (Reception) Monitor Inspection (Service Code B58)..... | 17-102 |
| Output Fluid Pressure Sensor (Front Brake) Wiring Inspection (Service Code B83).....  | 17-103 |
| Output Fluid Pressure Sensor (Front Brake) Offset Abnormal (Service Code B84).....  | 17-103 |
| Fluid Pressure Sensor Supply Voltage Inspection (Service Code B89).....   | 17-103 |

## 17-4 SELF-DIAGNOSIS SYSTEM

### Specifications

| Item                                 | Standard  |
|--------------------------------------|---|
| <b>Digital Fuel Injection System</b> |   |
| Throttle Position Sensor:            |   |
| Input Voltage                        | DC 4.75 ~ 5.25 V  |
| Output Voltage (1)                   | DC 3.50 ~ 3.90 V at full throttle opening (for reference)               |
| Output Voltage (2)                   | DC 4.50 ~ 4.80 V at full throttle opening (for reference)               |
| Intake Air Pressure                  |   |
| Sensor/Atmospheric Pressure          |   |
| Sensor:                              |   |
| Input Voltage                        | DC 4.75 ~ 5.25 V  |
| Output Voltage                       | DC 1.43 ~ 1.55 V at standard atmospheric pressure (101.32 kPa, 76 cmHg) |
| Intake Air Temperature Sensor:       |   |
| Output Voltage                       | About DC 2.50 ~ 3.00 V @20°C (68°F)                                     |
| Resistance                           | 5.4 ~ 6.6 kΩ @0°C (32°F)  |
|                                      | 0.29 ~ 0.39 kΩ @80°C (176°F)  |
| Water Temperature Sensor:            |   |
| Output Voltage                       | About DC 2.80 ~ 2.97 V @20°C (68°F)                                     |
| Accelerator Position Sensor:         |   |
| Input Voltage                        | DC 4.75 ~ 5.25 V  |
| Output Voltage (1)                   | DC 0.50 ~ 0.90 V at ordinary throttle position                          |
| Output Voltage (2)                   | DC 0.35 ~ 1.00 V at ordinary throttle position                          |
| Resistance                           | 4.5 ~ 6.5 kΩ  |
| Gear Position Sensor:                |   |
| Input Voltage                        | DC 4.75 ~ 5.25 V  |
| Output Voltage                       | In the text   |
| 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                     |
| Primary/Secondary Fuel Injectors:    |   |
| Type                                 | EAT816  |
| Nozzle Type                          | Fine atomizing type with 4 holes  |
| Resistance                           | About 11.7 ~ 12.3 Ω @20°C (68°F)  |
| ETV Actuator:                        |   |
| Input Voltage                        | About DC 1 ~ 2 V  |
| Knock Sensor:                        |   |
| Resistance                           | 504 ~ 616 kΩ  |
| Quick Shifter Sensor:                |   |
| Input Voltage                        | DC 4.75 ~ 5.25 V  |
| Output Voltage                       | DC 2.45 ~ 4.65 V  |
| Resistance                           | 209 ~ 231 kΩ  |
| Purge Valve (for Supercharger):      |   |
| Resistance                           | 22 ~ 26 Ω @20°C (68°F)  |

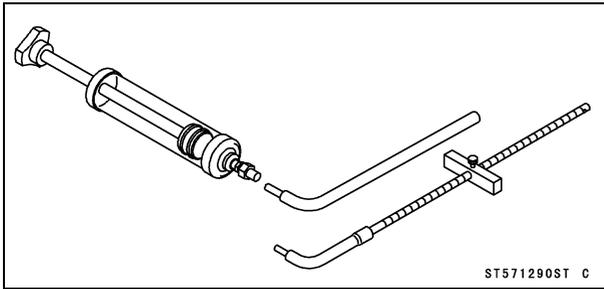
**Specifications**

| <b>Item</b>   | <b>Standard</b>   |
|---|---|
| Air Intake Chamber Pressure Sensor:<br>Input Voltage<br>Output Voltage  | DC 4.75 ~ 5.25 V<br>DC 1.43 ~ 1.55 V at standard atmospheric pressure (101.32 kPa, 76 cmHg)         |
| <b>Electronic Steering Damper System</b><br>ESD Actuator:<br>Input Voltage<br>Resistance  | About DC 9 ~ 11 V and then 0.1 V or About DC 9 ~ 11 V<br>About 23 ~ 29 Ω                            |
| <b>KIBS</b><br>KIBS Hydraulic Unit:<br>Make<br>Wheel Rotation Sensor Air Gap:<br>Front<br>Rear<br>CAN Communication Line Resistance<br>CAN Communication Line/Ground Resistance | BOSCH<br>0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)<br>0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)<br>30 ~ 70 Ω<br>4 ~ 30 kΩ |

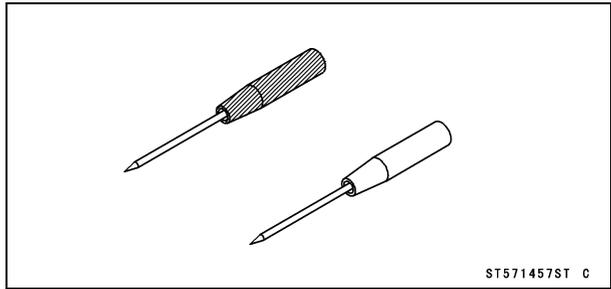
# 17-6 SELF-DIAGNOSIS SYSTEM

## Special Tools

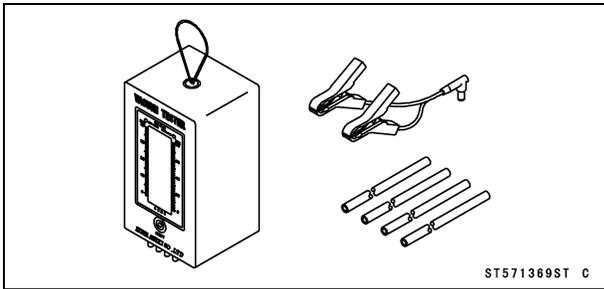
**Fork Oil Level Gauge:**  
57001-1290



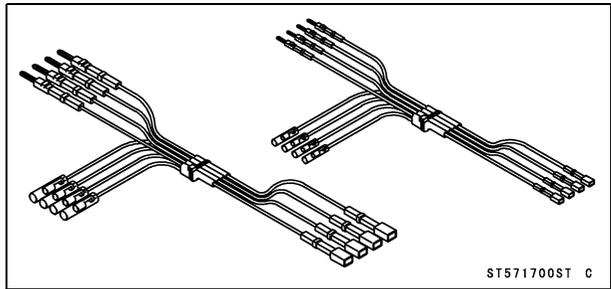
**Needle Adapter Set:**  
57001-1457



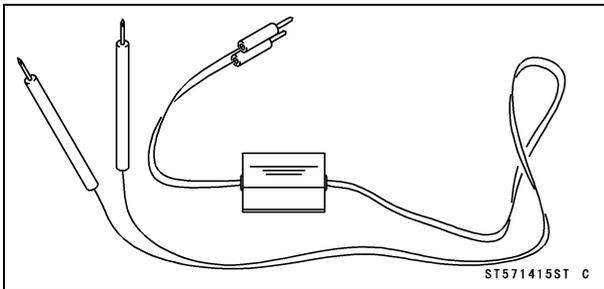
**Vacuum Gauge:**  
57001-1369



**Measuring Adapter:**  
57001-1700



**Peak Voltage Adapter:**  
57001-1415



**Self-Diagnosis**

**Self-Diagnosis Outline**

The self-diagnosis system is monitoring the following mechanism.

- DFI System and Ignition System
- KTRC System
- KEBC System
- KQS System
- KLCM System
- KIBS and ABS
- ESD System

The following indicator lights (LED) are used for symbols of below table.

| LED Color  | Warning Indicators |
|------------|--------------------|
| Yellow [A] | FI                 |
| Yellow [B] | KTRC               |
|            | KEBC               |
|            | KQS                |
|            | KLCM               |
|            | KIBS               |
| ESD        |                    |
| Yellow [C] | ABS                |
| White [D]  | KIBS               |
| White [E]  | ESD                |

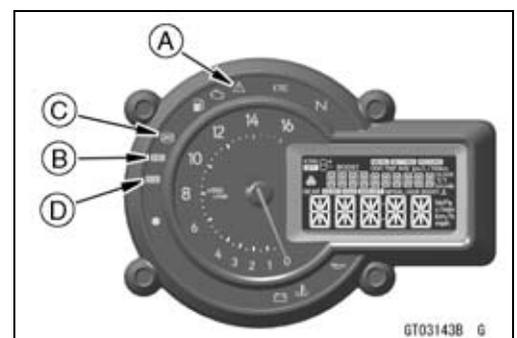
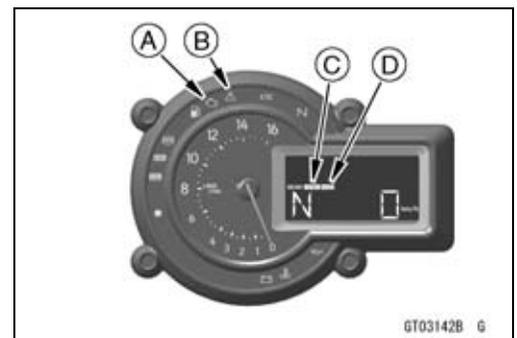
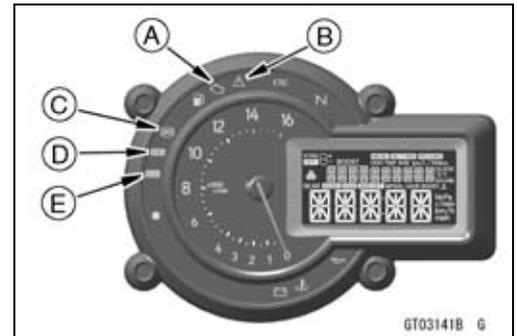
The self-diagnosis system has two modes and can be switched to another mode by operating the upper and lower buttons on the left switch housing.

**User Mode**

The ECU notifies the rider of troubles in DFI system, ignition system, KTRC system, KEBC system, KQS system and KLCM system by lighting or blinking the yellow engine warning indicator light (LED) [A], yellow warning indicator light (LED) [B], KEBC indicator [C] and KQS indicator [D] when DFI, ignition, KTRC, KEBC, KQS and KLCM system parts are faulty, and initiates fail-safe function. In case of serious troubles, ECU stops the injection and ignition operation.

For KIBS and ABS system, the KIBS hydraulic unit notifies the rider of troubles in KIBS and ABS system by lighting or blinking the yellow warning indicator light (LED) [A], white KIBS indicator light (LED) [B] and yellow ABS indicator light (LED) [C] when KIBS and ABS parts are faulty, and initiates fail-safe function.

For ESD system, the ESD ECU notifies the rider of troubles in ESD system by lighting or blinking the yellow warning indicator light (LED) and white ESD indicator light (LED) [D] when ESD parts are faulty, and initiates fail-safe function.

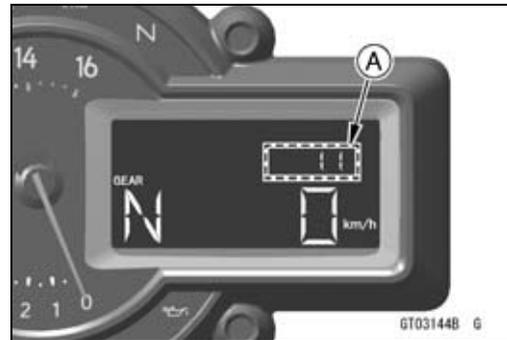


## 17-8 SELF-DIAGNOSIS SYSTEM

### Self-Diagnosis

#### Dealer Mode

The LCD (Liquid Crystal Display) displays the service code(s) [A] to show the problem(s) which the above system has at the moment of diagnosis.

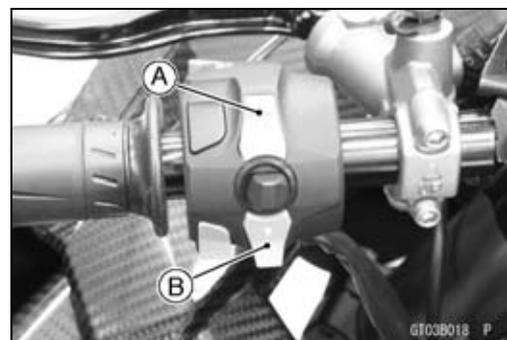
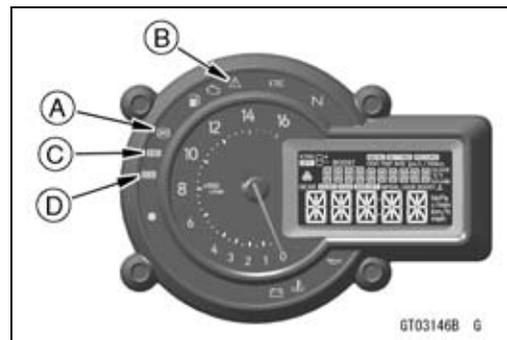
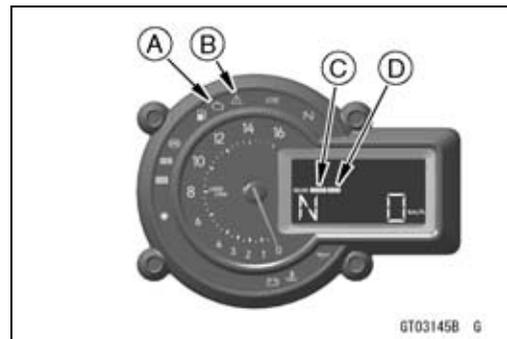


#### Self-Diagnosis Procedures

##### NOTE

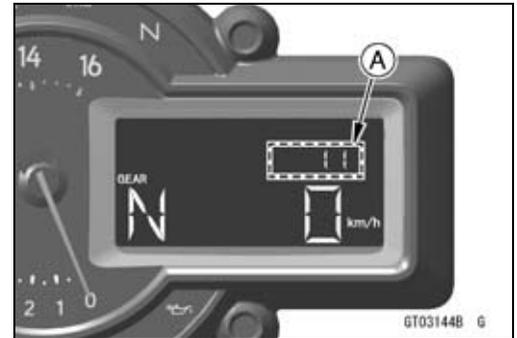
○Use a fully charged battery when conducting self-diagnosis. Otherwise, the indicator light (LED) and indicator do not light or blink.

- Turn the ignition switch on.
- When a problem occurs with DFI system and ignition system, the yellow engine warning indicator light (LED) [A] goes on to alert the rider.
- When a problem occurs with KTRC system, KEBC system, KQS system and KLCM system the yellow warning indicator light (LED) [B] goes on, and the KEBC indicator [C] or KQS indicator [D] blink.
- When a problem occurs with ABS system, the yellow ABS indicator light (LED) [A] goes on. However, when the yellow ABS indicator light (LED) goes off after the motorcycle runs at approx. 5 km/h (3.1 mph) or above, the ABS is normal.
- When a problem occurs with KIBS system, the yellow warning indicator light (LED) [B] goes on and white KIBS indicator light (LED) [C] blinks.
- When a problem occurs with ESD system, the yellow warning indicator light (LED) goes on and white ESD indicator light (LED) [D] blinks.
- Push the upper button [A] or lower button [B] to display the odometer.



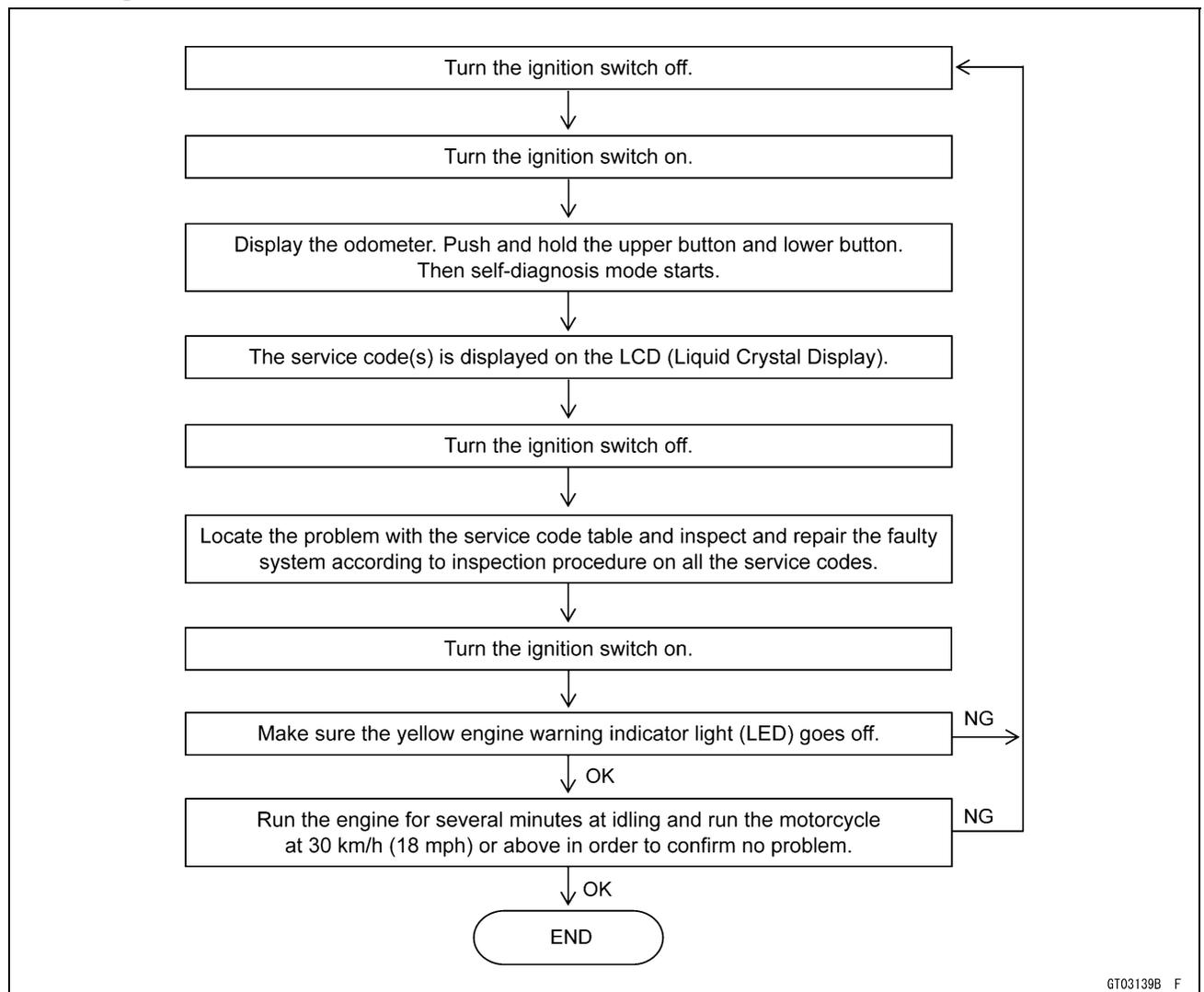
**Self-Diagnosis**

- Push and hold the upper button and lower button.
- The service code [A] is displayed on the LCD by the number of two digits.
- The service code of the KIBS and ABS adds “B” at the left side of the code.
- The service code of the ESD adds “E” at the left side of the code.



- Any of the following procedures ends self-diagnosis.
- When the service code is displayed on the LCD, push and hold the upper button and lower button.
- When the ignition switch is turned off.

**Self-Diagnosis Flow Chart**



## 17-10 SELF-DIAGNOSIS SYSTEM

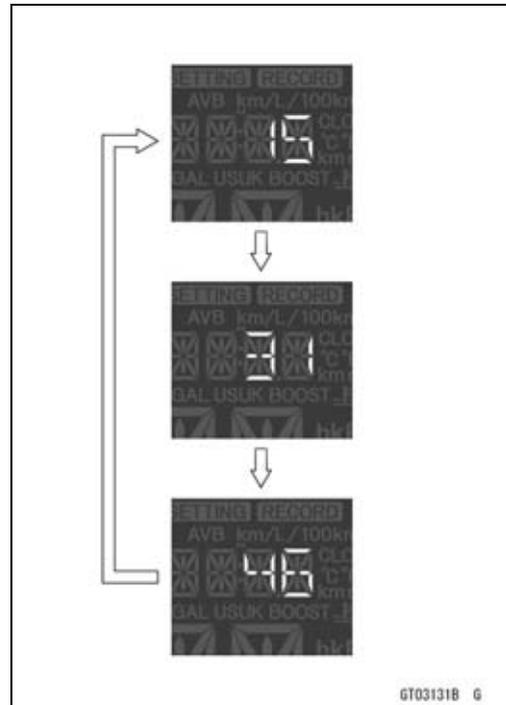
### Self-Diagnosis

#### Service Code Reading

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

#### NOTE

- The service code of the KIBS and ABS adds "B" at the left side of the code.
  - The service code of the ESD adds "E" at the left side of the code.
  - For DFI system and ESD system, 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.
  - For KIBS and ABS, the service codes display at random.
  - Then after completing all codes, the display is repeated until the ignition switch is turned off or push and hold the upper button and lower button.
  - The order of the system's appearing is the order of DFI system, KIBS and ABS, and ESD system.
  - For example, if three problems occurred in the order of 46, 15, 31, the service codes are displayed (each two seconds) from the lowest number in the order listed as shown below.
- (15 → 31 → 46) → (15 → 31 → 46) → … (repeated)
- If the no problem or when the repair has been done, indicator light (LED) and indicator go off and service code is not displayed.



#### Service Code Erasing

- When repair has been done, indicator light (LED) and indicator go off and service code is not displayed.
- ★The service codes stored in memory of the ECU can be erased using Kawasaki Diagnostic System (KDS Ver.3).

#### NOTE

- When erase the stored service code memory, you must register the accelerator position and throttle position data of the throttle body to the ECU. Wait the 10 seconds after the ignition switch on at the idle speed and the coolant temperature 40°C (104°F) or more to register the sensor position to the ECU.

#### Service Code Table

| Service Code | System | Problems  |
|--------------|--------|---|
| 11           | ETV    | Throttle position sensor malfunction, wiring open or short  |
| 12           | FI     | Intake air pressure sensor malfunction, wiring open or short  |
| 13           | FI     | Intake air temperature sensor malfunction, wiring open or short   |
| 14           | FI     | Water temperature sensor malfunction, wiring open or short  |
| 15           | FI     | Atmospheric pressure sensor malfunction, wiring open or short   |
| 18           | ETV    | Accelerator position sensor malfunction, wiring open or short   |
| 21           | FI     | Crankshaft sensor malfunction, wiring open or short   |
| 23           | FI     | Camshaft sensor malfunction, wiring open or short   |
| 24           | FI     | Rear wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing, wiring open) |
| 25           | FI     | Gear position sensor malfunction, wiring open or short  |

**Self-Diagnosis**

| <b>Service Code</b> | <b>System</b> | <b>Problems</b>  |
|---------------------|---------------|--|
| <b>27</b>           | FI            | Front wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing, wiring open) |
| <b>31</b>           | FI            | Vehicle-down sensor malfunction, wiring open or short  |
| <b>39</b>           | FI            | ECU communication error  |
| <b>41</b>           | FI            | Primary fuel injector #1 malfunction, wiring open or short   |
| <b>42</b>           | FI            | Primary fuel injector #2 malfunction, wiring open or short   |
| <b>43</b>           | FI            | Primary fuel injector #3 malfunction, wiring open or short   |
| <b>44</b>           | FI            | Primary fuel injector #4 malfunction, wiring open or short   |
| <b>46</b>           | FI            | Fuel pump relay malfunction, relay is stuck  |
| <b>49</b>           | ETV           | Return spring malfunction  |
| <b>51</b>           | FI            | Stick coil #1 malfunction, wiring open or short  |
| <b>52</b>           | FI            | Stick coil #2 malfunction, wiring open or short  |
| <b>53</b>           | FI            | Stick coil #3 malfunction, wiring open or short  |
| <b>54</b>           | FI            | Stick coil #4 malfunction, wiring open or short  |
| <b>58</b>           | ETV           | ETV actuator malfunction, wiring open or short   |
| <b>69</b>           | FI            | Knock sensor malfunction, wiring open or short   |
| <b>97</b>           | ETV           | Battery monitor voltage is low   |
| <b>98</b>           | ETV           | ECU/ETV circuit malfunction, wiring open or short  |
| <b>1B</b>           | KIBS          | KIBS hydraulic unit communication error  |
| <b>3C</b>           | ESD           | ESD ECU communication error  |
| <b>3E</b>           | FI            | Quick shifter sensor malfunction, wiring open or short   |
| <b>4A</b>           | FI            | Secondary fuel injector #1 malfunction, wiring open or short   |
| <b>4B</b>           | FI            | Secondary fuel injector #2 malfunction, wiring open or short   |
| <b>4C</b>           | FI            | Secondary fuel injector #3 malfunction, wiring open or short   |
| <b>4D</b>           | FI            | Secondary fuel injector #4 malfunction, wiring open or short   |
| <b>6A</b>           | FI            | Purge valve (for supercharger) malfunction, wiring open or short   |
| <b>7E</b>           | FI            | Air intake chamber pressure sensor malfunction, wiring open or short   |
| <b>B13</b>          | ABS           | Rear intake solenoid valve trouble (open, temperature abnormal)  |
| <b>B14</b>          | ABS           | Rear outlet solenoid valve trouble (open, temperature abnormal)  |
| <b>B17</b>          | ABS           | Front intake solenoid valve trouble (open, temperature abnormal)   |
| <b>B18</b>          | ABS           | Front outlet solenoid valve trouble (open, temperature abnormal)   |
| <b>B19</b>          | ABS           | KIBS solenoid valve relay trouble [wiring shorted or open, stuck relay (ON or OFF) or dropout]                                       |
| <b>B25</b>          | ABS           | Front, rear wheel rotation difference abnormal (substandard tire, sensor rotor teeth number wrong)                                   |
| <b>B35</b>          | ABS           | KIBS motor relay trouble [wiring shorted or open, stuck relay (ON or OFF)]   |
| <b>B42</b>          | ABS           | Front wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing)              |
| <b>B43</b>          | ABS           | Front wheel rotation sensor wiring (wiring shorted or open, connector bad connection)  |
| <b>B44</b>          | ABS           | Rear wheel rotation sensor signal abnormal (sensor or rotor missing, too large clearance, rotor tooth worn or missing)               |
| <b>B45</b>          | ABS           | Rear wheel rotation sensor wiring (wiring shorted or open, connector bad connection)   |

## 17-12 SELF-DIAGNOSIS SYSTEM

### Self-Diagnosis

| Service Code | System | Problems   |
|--------------|--------|--|
| <b>B52</b>   | ABS    | Power supply voltage abnormal (low-voltage)  |
| <b>B53</b>   | ABS    | Power supply voltage abnormal (over-voltage)   |
| <b>B55</b>   | ABS    | ECU trouble (ECU operation abnormal)   |
| <b>B57</b>   | KIBS   | CAN communication (transmission)/CAN bus monitor malfunction   |
| <b>B58</b>   | KIBS   | CAN communication (reception) monitor malfunction  |
| <b>B83</b>   | ABS    | Output fluid pressure sensor (front brake) trouble (voltage abnormal, wiring shorted or open)  |
| <b>B84</b>   | ABS    | Output fluid pressure sensor (front brake) trouble (offset abnormal)   |
| <b>B89</b>   | ABS    | Fluid pressure sensor supply voltage abnormal  |
| <b>E2E</b>   | ESD    | ESD actuator malfunction, wiring open or short   |
| <b>E3B*</b>  | ESD    | ESD ECU trouble (ESD ECU operation abnormal)<br>ESD ECU - FI ECU communication error<br>Input signals for ESD trouble<br>Low voltage |

Some DFI error has an effect on the KTRC, KEBC, KLCM and KQS function.

\*: White ESD indicator light (LED) may blink and yellow warning indicator light (LED) may go on when the ignition switch is turned on with the motorcycle moving. If this happens, first turn the ignition switch off, and then back on with the motorcycle completely stopped. The white ESD indicator light (LED) and yellow warning indicator light (LED) should then go off. The white ESD indicator light (LED) may blink and yellow warning indicator light (LED) may light up by a slight movement of the handlebar depending on the positions of the wheel rotation sensor and the wheel rotation sensor rotor.

#### 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.

#### Backups

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

| Service Codes | Parts or Function        | Output Signal Usable Range or Criteria   | Backups by ECU   |
|---------------|--------------------------|--|--|
| <b>11</b>     | Throttle Position Sensor | Output Voltage (full throttle opening)<br>(1) 4.40 ~ 4.60 V<br>(2) 0.40 ~ 0.60 V | If one of the throttle position sensor 1 or 2 fails (the signal is out of usable range, wiring short or open), the ECU uses the other sensor as throttle position input and set Limp Home Mode (*1).<br>If both throttle position sensor 1 and 2 fail, the ECU stops current to the throttle actuator and set Limp Home Mode (*1).<br>No matter which failure situation is, following two methods are set when failure occurs;<br>1. The ECU sets the DFI in the D-J method (*2)<br>2. ECU uses the learned middle position value of the throttle position sensor 1 as a throttle sensor output. |

Self-Diagnosis

| Service Codes | Parts or Function             | Output Signal Usable Range or Criteria  | Backups by ECU  |
|---------------|-------------------------------|---|---|
| 12            | Intake Air Pressure Sensor    | Intake Air Pressure (Absolute)<br>Pv = 150 ~ 2556 mmHg                                      | If the intake air pressure sensor system fails (the signal is out of the usable range, wiring short or open), two methods will be used.<br>1. The ECU sets the DFI in the $\alpha$ -N method (*3).<br>2. The ECU sets MP at 760 mmHg.   |
| 13            | Intake Air Temperature Sensor | Intake Air Temperature<br>Ta = -30 ~ +120°C   | If the intake air temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Ta at 60°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.  |
| 15            | Atmospheric Pressure Sensor   | Atmospheric Pressure (Absolute)<br>Pa = 150 ~ 2556 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).   |
| 18            | Accelerator Position Sensor   | Output Voltage at Idle<br>(1) 0.50 ~ 0.90 V<br>(2) 0.35 ~ 1.00 V                            | If accelerator position sensor 1 or 2 fails (the signal is out of usable range, wiring short or open), the ECU sets Limp Home Mode (*1).<br>If both accelerator position sensor 1 and 2 fail (the signal is out of usable range, wiring short or open), the ECU sets Limp Home Mode (*1). |
| 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            | Rear Wheel Rotation Sensor    | Rear wheel rotation sensor must send 50 signals to the ECU at the 1 rotation of the wheel.  | If the rear wheel rotation sensor system fails (the signal is missing, wiring open), the ECU stops the KTRC and regards gear position sensor output as internal gear position value.  |
| 25            | Gear Position Sensor          | Output Voltage<br>0.2 ~ 4.8 V   | If the gear position sensor system fails (no signal, wiring short or open), the ECU set the internal gear position value for the top (6th).   |
| 27            | Front Wheel Rotation Sensor   | Front wheel rotation sensor must send 48 signals to the ECU at the 1 rotation of the wheel. | If the front wheel rotation sensor system fails (the signal is missing, wiring open), the ECU stops the KTRC.   |
| 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.  |
| 39            | ECU Communication Line        | The ECU sends the data to the meter unit through the CAN communication line.                | -   |

## 17-14 SELF-DIAGNOSIS SYSTEM

### Self-Diagnosis

| Service Codes | Parts or Function         | Output Signal Usable Range or Criteria  | Backups by ECU   |
|---------------|---------------------------|---|--|
| 41            | Primary Fuel Injector #1* | The injector must send signals continuously to the ECU.   | If the primary fuel injector #1 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #1, though the engine keeps running. |
| 42            | Primary Fuel Injector #2* | The injector must send signals continuously to the ECU.   | If the primary fuel injector #2 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #2, though the engine keeps running. |
| 43            | Primary Fuel Injector #3* | The injector must send signals continuously to the ECU.   | If the primary fuel injector #3 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #3, though the engine keeps running. |
| 44            | Primary Fuel Injector #4* | The injector must send signals continuously to the ECU.   | If the primary fuel injector #4 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #4, though the engine keeps running. |
| 46            | Fuel Pump Relay           | (1) When the relay ON condition, battery monitor voltage 5 V or more.<br>(2) When the relay OFF condition, battery monitor voltage less than 5 V. | -  |
| 49            | Return Spring             | TPS Output Voltage (default position of the throttle valve by learning function) 4 V or more  | -  |
| 51            | Stick Coil #1*            | The ECU sends signals (output voltage) continuously to the stick coil.  | 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 ECU sends signals (output voltage) continuously to the stick coil.  | 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 ECU sends signals (output voltage) continuously to the stick coil.  | 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 ECU sends signals (output voltage) continuously to the stick coil.  | 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.         |
| 58            | ETV Actuator              | The actuator operates open and close of the throttle valve by the pulse signal from the ECU.  | If the ETV actuator fails (the signal is out to the usable range, wiring short or open), the ECU stops the current to the actuator, and sets to the Limp Home Mode (*1).                         |
| 69            | Knock Sensor              | The knock sensor send signals (output voltage) continuously to the ECU.   | -  |

**Self-Diagnosis**

| <b>Service Codes</b> | <b>Parts or Function</b>           | <b>Output Signal Usable Range or Criteria</b>  | <b>Backups by ECU</b>   |
|----------------------|------------------------------------|--|---|
| <b>97</b>            | Battery                            | The ECU monitors the battery voltage when the fuel pump operates.<br>Detection Voltage: less than 6.3 V                                  | If the ECU senses a battery failure (e.g. low battery voltage), the ECU sets to the Limp Home Mode (*1).  |
| <b>98</b>            | ETV Control Circuit                | –  | If the ETV control circuit fails (circuit voltage low or high), the ECU sets to the Limp Home Mode (*1).  |
| <b>1B</b>            | KIBS                               | The KIBS hydraulic unit sends the data (for status of KIBS hydraulic unit) to the meter unit and ECU through the CAN communication line. | If the communication data is not sent, the ECU stops the KTRC.  |
| <b>3C</b>            | ESD ECU                            | The ESD ECU sends the data (for status of ESD) to the meter unit through the CAN communication line.                                     | If the communication data is not sent, the ESD system maintains the last damping force setting.   |
| <b>3E</b>            | Quick Shifter Sensor               | Output Voltage<br>0.2 ~ 4.8 V  | –   |
| <b>4A</b>            | Secondary Fuel Injector #1*        | The injector must send signals continuously to the ECU.  | If the secondary fuel injector #1 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #1, though the engine keeps running.                    |
| <b>4B</b>            | Secondary Fuel Injector #2*        | The injector must send signals continuously to the ECU.  | If the secondary fuel injector #2 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #2, though the engine keeps running.                    |
| <b>4C</b>            | Secondary Fuel Injector #3*        | The injector must send signals continuously to the ECU.  | If the secondary fuel injector #3 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #3, though the engine keeps running.                    |
| <b>4D</b>            | Secondary Fuel Injector #4*        | The injector must send signals continuously to the ECU.  | If the secondary fuel injector #4 fails (no signal, wiring short or open), the ECU shuts off the signal to the injector. Fuel is not supplied to the cylinder #4, though the engine keeps running.                    |
| <b>6A</b>            | Purge Valve (for Supercharger)     | The purge valve (for supercharger) controls the flow of the vacuum air for the blow-off valve and shutting the solenoid valve.           | If the purge valve (for supercharger) fails (the ECU recognize the purge valve (for supercharger) ON without activation signal from the ECU), the ECU sets internal control to Actuator Malfunction Backup Mode (*4). |
| <b>7E</b>            | Air Intake Chamber Pressure Sensor | Intake Air Pressure (Absolute)<br>Pv = 150 ~ 2556 mmHg   | If the air intake chamber pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Pv at 760 mmHg.  |

# 17-16 SELF-DIAGNOSIS SYSTEM

## Self-Diagnosis

| Service Codes | Parts or Function | Output Signal Usable Range or Criteria   | Backups by ECU   |
|---------------|-------------------|--|--|
| E2E           | ESD Actuator      | The actuator operates open and close of the oil passage of ESD by the pulse signal from the ESD ECU. | If the ESD actuator fails (the signal is out to the usable range, wiring short or open), the ESD ECU stops the current to the actuator. The ESD system maintains the last damping force setting. |
| E3B           | ESD ECU           | —  | If the ESD ECU fails, the charging system troubles, the input signals troubles or CAN communication line troubles, the ESD system maintains the last damping force setting.                      |

**Note:**

(\*1): Limp Home Mode: when parts related the ETV malfunctioned, backup methods are used in ECU control.

These methods called Limp Home Mode is following;

Stops ETV control

Controls output power by the ignition timing

Restricts throttle position reference value

(\*2): D-J Method: When the engine load is light like at idling or low speed, the ECU determines the injection quantity by calculating from the throttle vacuum (intake air pressure sensor output voltage) and engine speed (crankshaft sensor output voltage). This method is called D-J method.

(\*3):  $\alpha$ -N 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 (throttle position sensor output voltage) and the engine speed. This method is called  $\alpha$ -N method.

(\*4): Actuator Malfunction Backup Mode: When certain parts (the parts indicated in the table above) malfunctioned, the ECU set the special failsafe control; fuel cut, fuel quantity correction, ignition cut, ignition timing correction electric throttle valve specification correction.

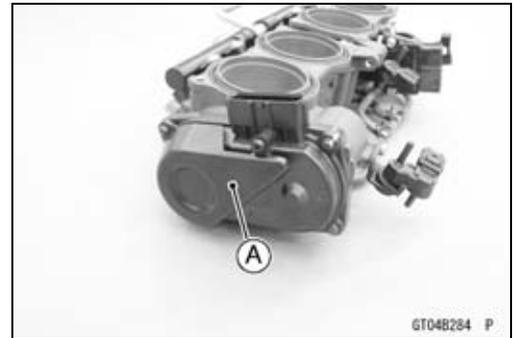
\*: This depends on the number of stopped cylinders.

**Throttle Position Sensor (Service Code 11)**

**Throttle Position Sensor Removal**

**NOTICE**

Do not remove the throttle position sensor in the gear case [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 throttle sensor can damage it.

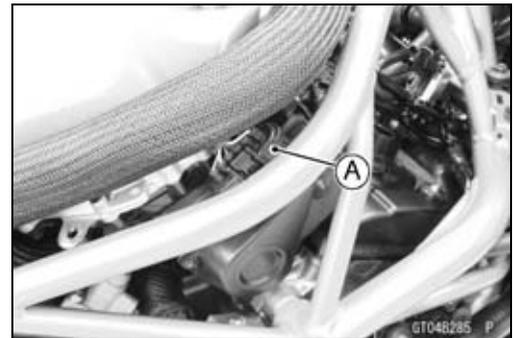


**Throttle Position Sensor Input Voltage Inspection**

**NOTE**

○Be sure the battery is fully charged.

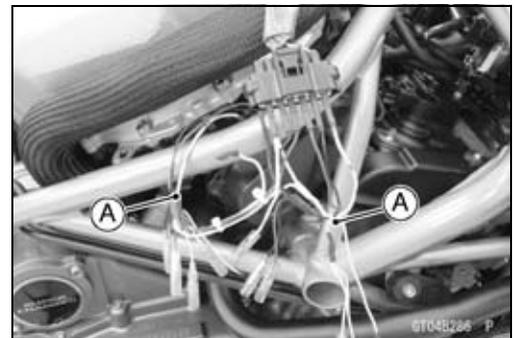
- Turn the ignition switch off.
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Slide the dust cover.
- Disconnect:
  - Throttle Position Sensor Connector [A]



- Connect the measuring adapters [A] between the main harness connector and throttle position sensor connector.
  - Main Harness [B]
  - Throttle Position Sensor [C]

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

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



**Throttle Position Sensor Input Voltage**

**Connections to Adapters:**

**Digital Meter (+) → R (sensor W) lead**

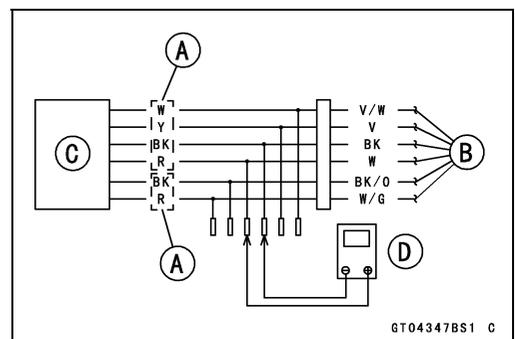
**Digital Meter (-) → BK (sensor BK) lead**

- 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 Throttle Position Sensor Output Voltage Inspection).



## 17-18 SELF-DIAGNOSIS SYSTEM

### Throttle Position 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.

○ Disconnect the ECU and sensor connectors.

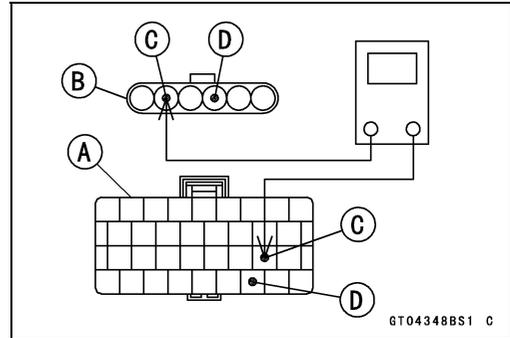
#### Wiring Continuity Inspection

ECU Connector [A] ←→

Throttle Position Sensor Connector [B]

W lead (ECU terminal 71) [C]

BK lead (ECU terminal 80) [D]



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

★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

#### Throttle Position Sensor Output Voltage Inspection

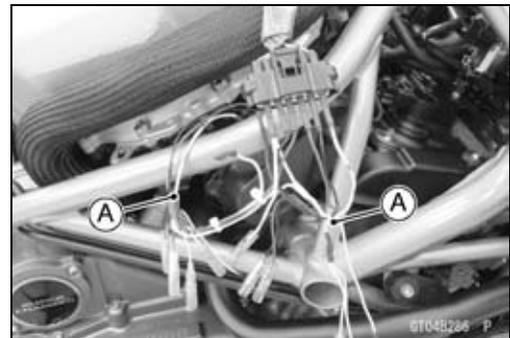
● Measure the output voltage at the throttle position sensor in the same way as input voltage inspection, note the following.

○ Disconnect the throttle position sensor connector and connect the measuring adapters [A] between these connectors.

Main Harness [B]

Throttle Position Sensor [C]

Digital Meter [D]



Special Tool - Measuring Adapter: 57001-1700

#### Throttle Position Sensor Output Voltage

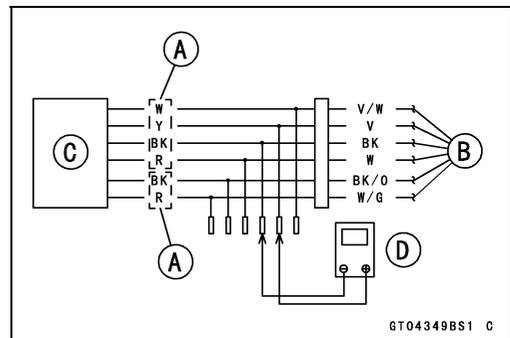
Connections to Adapters:

(1) Digital Meter (+) → Y (sensor V) lead

Digital Meter (-) → BK (sensor BK) lead

(2) Digital Meter (+) → W (sensor V/W) lead

Digital Meter (-) → BK (sensor BK) lead



● Measure the output voltage with the engine stopped and with the connector joined.

● Turn the ignition switch on.

#### Output Voltage

Standard: (1) DC 3.50 ~ 3.90 V at full throttle opening (for reference)

(2) DC 4.50 ~ 4.80 V at full throttle opening (for reference)

#### NOTE

○ Open the throttle, confirm the output voltage will be raise.

○ When the throttle is ordinary position, the standard value is not determined because there is some uncertain elements, e.g. water temperature, throttle valve initial opening, etc.

● Turn the ignition switch off.

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

**Throttle Position Sensor (Service Code 11)**

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

○ Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**

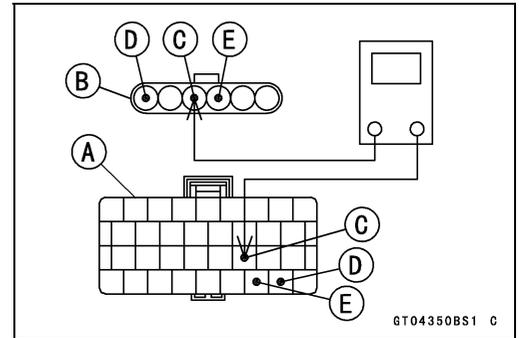
**ECU Connector [A]** ←→

**Throttle Position Sensor Connector [B]**

**V lead (ECU terminal 72) [C]**

**V/W lead (ECU terminal 79) [D]**

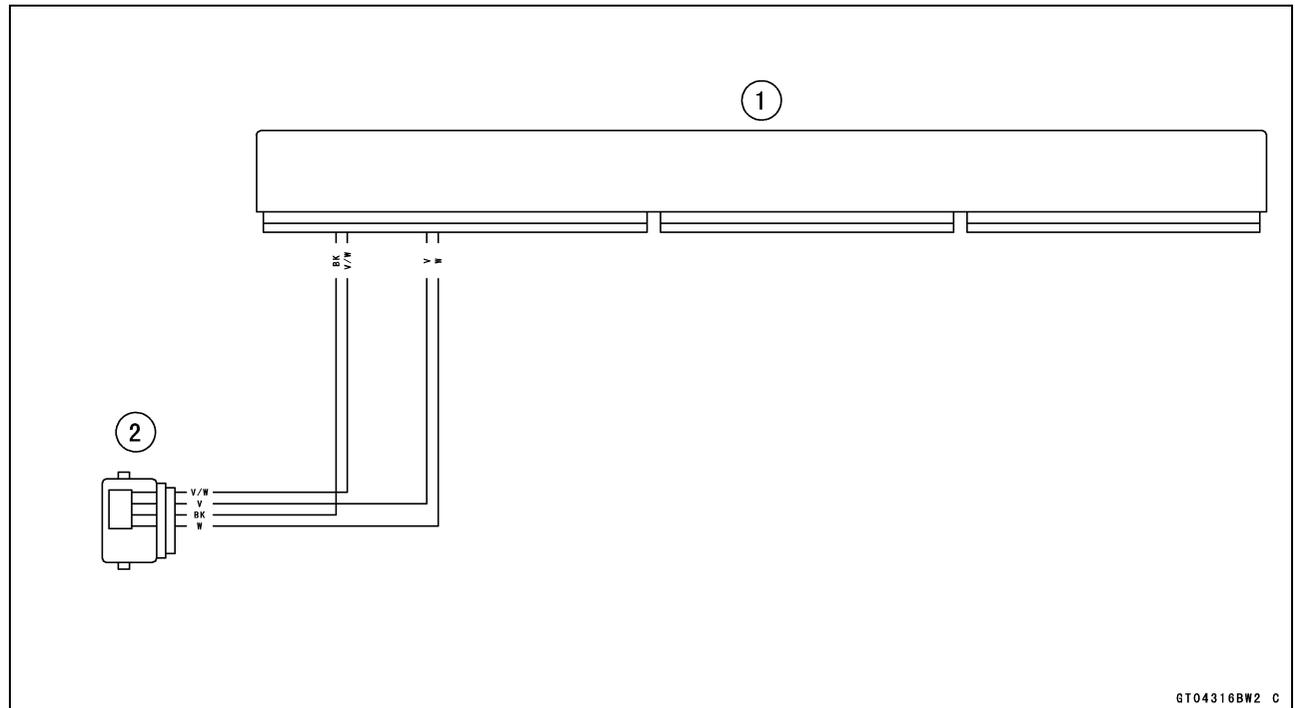
**BK lead (ECU terminal 80) [E]**



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

★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

**Throttle Position Sensor Circuit**



- 1. ECU
- 2. Throttle Position Sensor/ETV Actuator

## 17-20 SELF-DIAGNOSIS SYSTEM

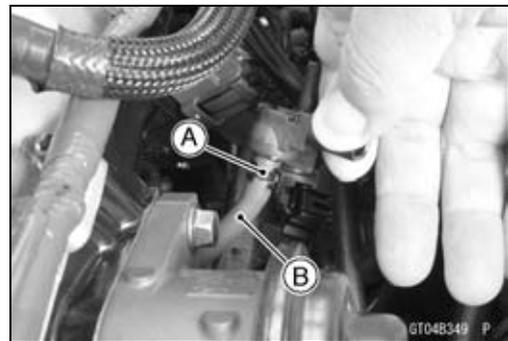
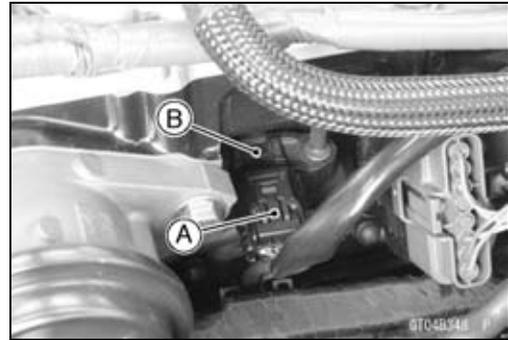
### Intake Air Pressure Sensor (Service Code 12)

#### Intake Air Pressure Sensor Removal

##### NOTICE

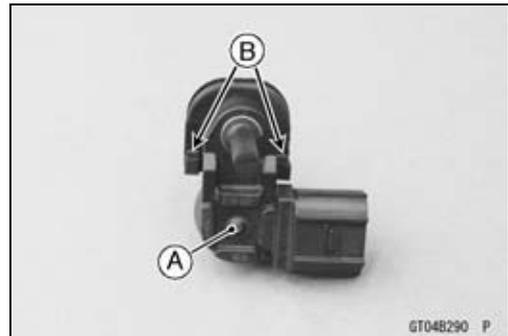
Never drop the intake air pressure sensor especially on a hard surface. Such a shock to the sensor can damage it.

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Disconnect:
  - Intake Air Pressure Sensor Connector [A]
- Disconnect the intake air pressure sensor [B] from the bracket.
- Slide the clamp [A].
- Disconnect the vacuum hose [B].
- Remove the rubber damper from the intake air pressure sensor.

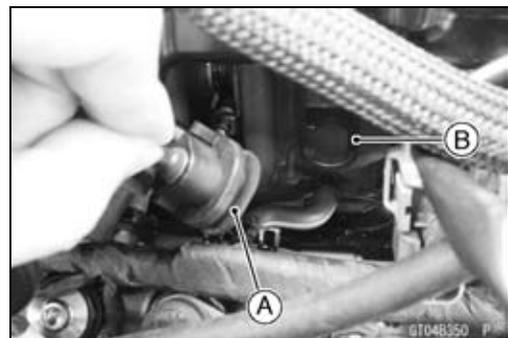


#### Intake Air Pressure Sensor Installation

- Installation is the reverse of removal.
- Position the intake air pressure sensor [A] between the projections [B] on the rubber damper.



- Install the rubber damper [A] on the bracket [B].



**Intake Air Pressure Sensor (Service Code 12)**

**Intake 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 in the Fuel System (DFI) chapter).
- Disconnect the intake air pressure sensor connector and connect the measuring adapter [A] between these connectors.

Main Harness [B]

Intake Air Pressure Sensor [C]

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

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

**Intake Air Pressure Sensor Input Voltage Connections to Adapter:**

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

**Digital Meter (-) → BK (sensor G) 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 Intake Air Pressure 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.

**Wiring Continuity Inspection**

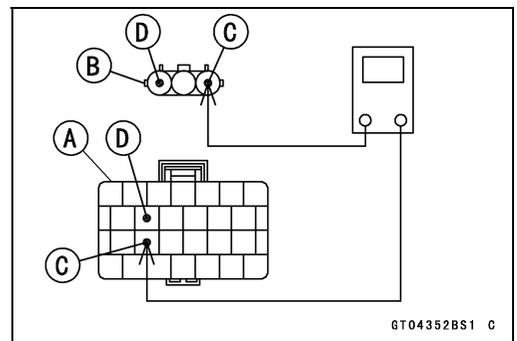
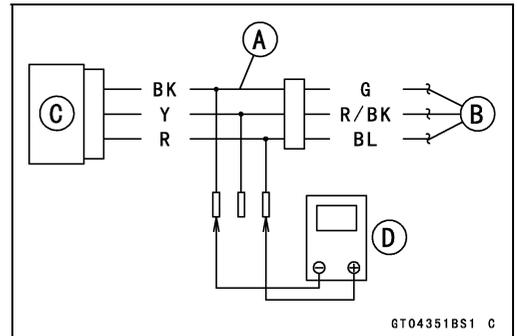
**ECU Connector [A] ↔**

**Intake Air Pressure Sensor Connector [B]**

**BL lead (ECU terminal 44) [C]**

**G lead (ECU terminal 38) [D]**

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



# 17-22 SELF-DIAGNOSIS SYSTEM

## Intake Air Pressure Sensor (Service Code 12)

### Intake Air Pressure Sensor Output Voltage Inspection

- Measure the output voltage at the intake air pressure sensor in the same way as input voltage inspection, note the following.
- Disconnect the intake air pressure sensor connector and connect the measuring adapter [A] between these connectors.
  - Main Harness [B]
  - Intake Air Pressure Sensor [C]
  - Digital Meter [D]

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

### Intake Air Pressure Sensor Output Voltage Connections to Adapter:

- Digital Meter (+) → Y (sensor R/BK) lead
- Digital Meter (-) → BK (sensor G) lead

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

### Output Voltage

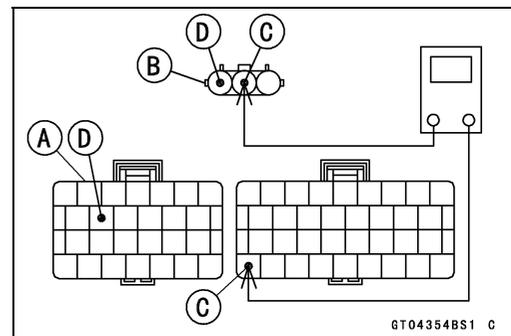
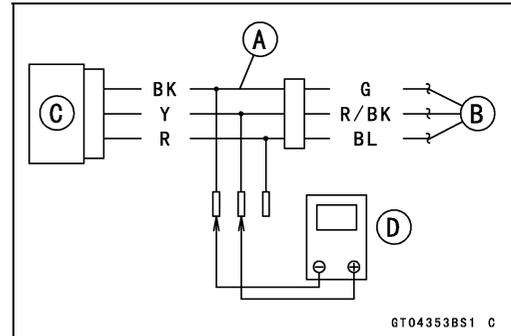
**Usable Range:** DC 1.43 ~ 1.55 V at standard atmospheric pressure (101.32 kPa, 76 cmHg)

### 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.
- ★ If the reading is within the usable range, remove the ECU and check the wiring for continuity between main harness connectors.
- Disconnect the ECU and sensor connectors.

### Wiring Continuity Inspection

- ECU Connector [A] ←→
- Intake Air Pressure Sensor Connector [B]
- R/BK lead (ECU terminal 86) [C]
- G lead (ECU terminal 38) [D]



**Intake Air Pressure Sensor (Service Code 12)**

- ★ If the wiring is good, check the sensor for various vacuum.
- Remove the intake air pressure sensor [A] and disconnect the vacuum hose from the sensor.
- Connect an auxiliary hose [B] to the intake air pressure sensor.
- Temporarily install the intake air pressure sensor.
- Connect a digital meter [C], vacuum gauge [D], the fork oil level gauge [E] and the measuring adapter to the intake air pressure sensor.

**Special Tools - Fork Oil Level Gauge: 57001-1290**  
**Vacuum Gauge: 57001-1369**  
**Measuring Adapter: 57001-1700**

**Intake Air Pressure Sensor Output Voltage Connections to Adapter:**

- Digital Meter (+) → Y (sensor R/BK) lead**
- Digital Meter (-) → BK (sensor G) lead**

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

Suppose:

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

then

$$Pv = PI + Pg$$

For example, suppose the following data is obtained:

- Pg = 151.95 kPa (Vacuum Gauge Reading)
- PI = 101.32 kPa (Barometer Reading)
- Vv = 3.8 V (Digital Meter Reading)

then

$$Pv = 101.32 + 151.95 = 253.27 \text{ kPa (Absolute)}$$

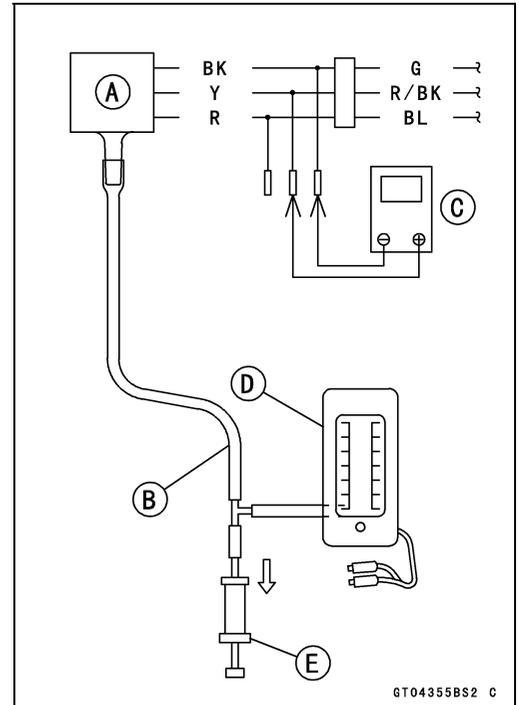
Plot this Pv (253.27 kPa) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.

$$\text{Usable range} = 3.6 \sim 4.0 \text{ V}$$

Plot Vv (3.8 V) on the vertical line. → Point [3].

**Results: In the chart, Vv is within the usable range and the sensor is normal.**

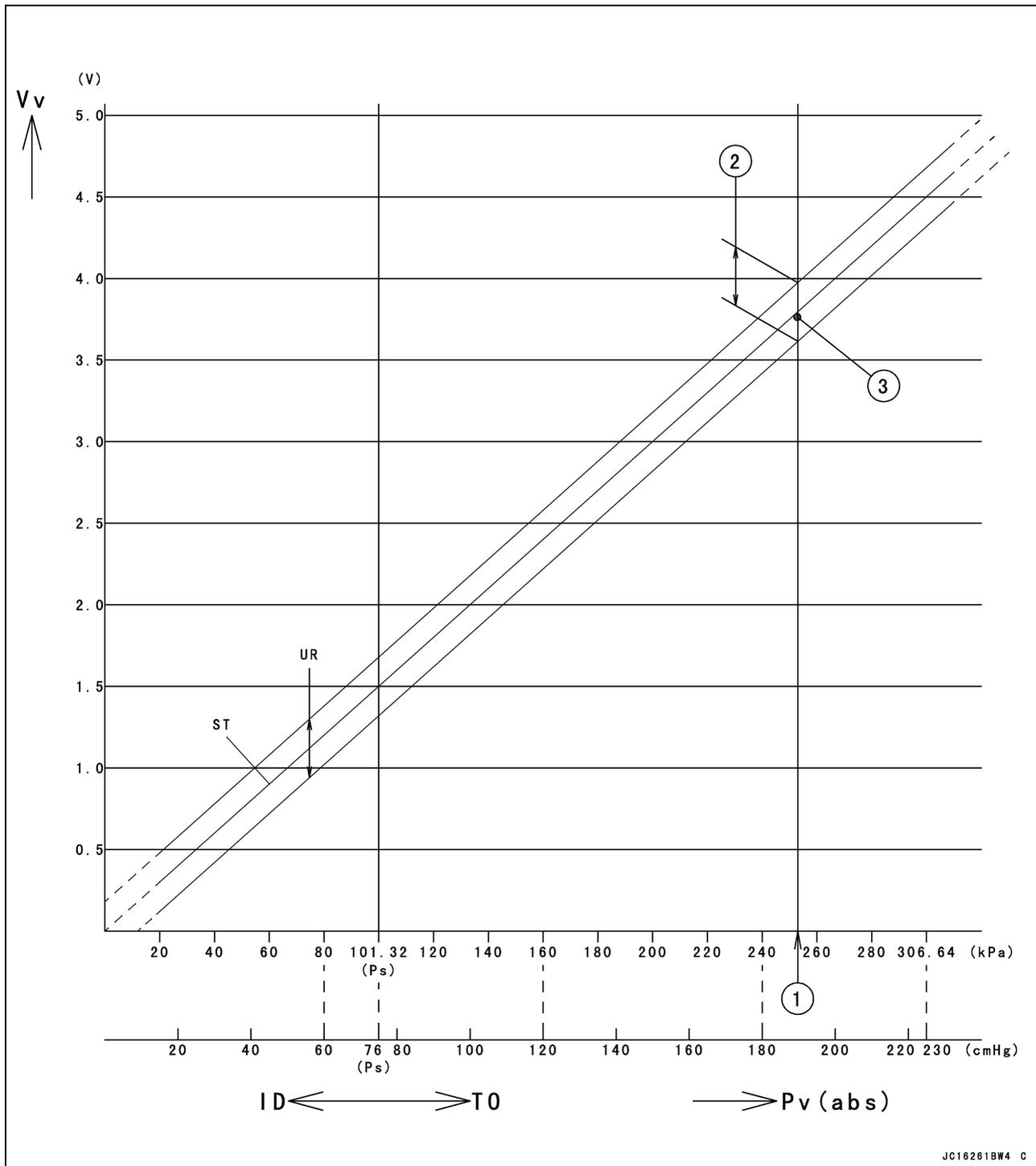
- ★ If the reading is out of the usable range, replace the sensor.
- ★ If the reading is within the usable range, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



GT04355BS2 C

# 17-24 SELF-DIAGNOSIS SYSTEM

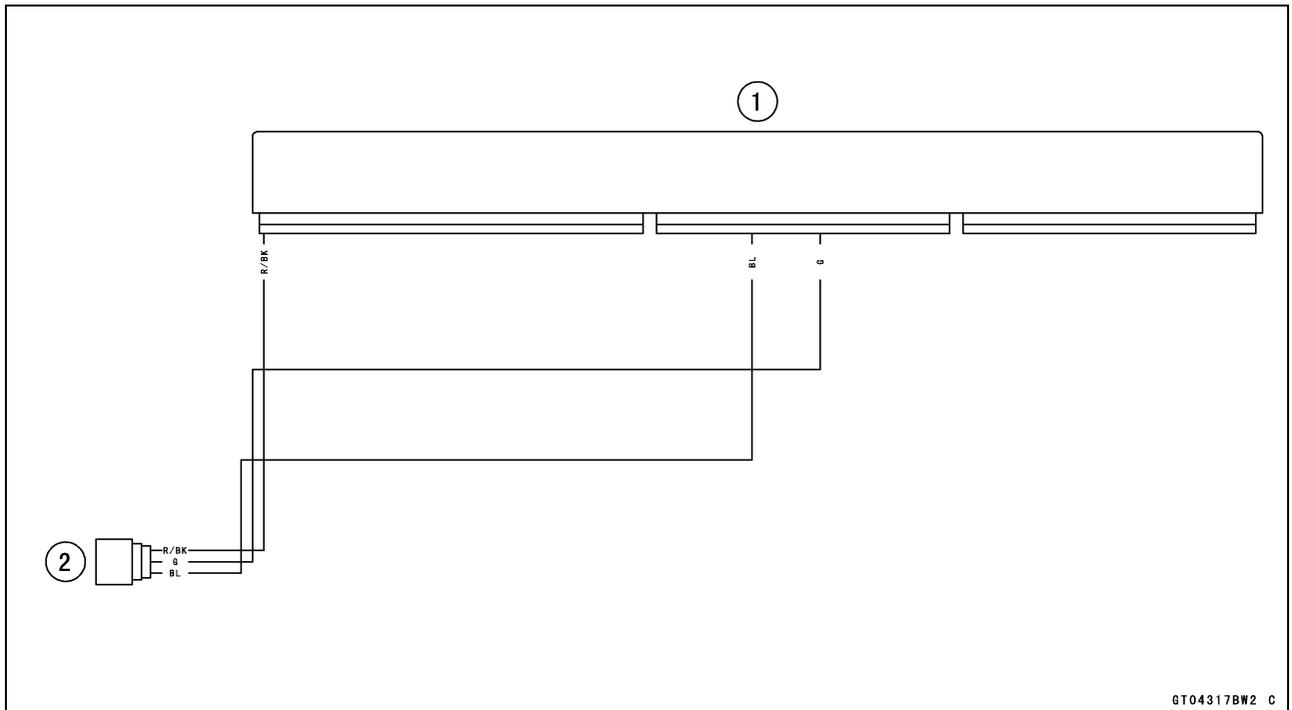
## Intake Air Pressure Sensor (Service Code 12)



- 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: Intake Air Pressure Sensor Output Voltage (V) (Digital Meter Reading)

Intake Air Pressure Sensor (Service Code 12)

Intake Air Pressure Sensor Circuit



- 1. ECU
- 2. Intake Air Pressure Sensor

## 17-26 SELF-DIAGNOSIS SYSTEM

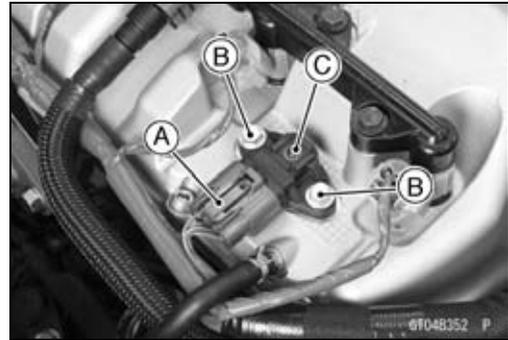
### Intake Air Temperature Sensor (Service Code 13)

#### Air Intake Chamber Pressure/Temperature Sensor Removal

##### NOTICE

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

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the air intake chamber pressure/temperature sensor connector [A].
- Remove:
  - Air Intake Chamber Pressure/Temperature Sensor Bolts [B]
  - Air Intake Chamber Pressure/Temperature Sensor [C]



#### Air Intake Chamber Pressure/Temperature Sensor Installation

- Be sure to install the O-ring [A].
- Apply engine oil to the O-ring.

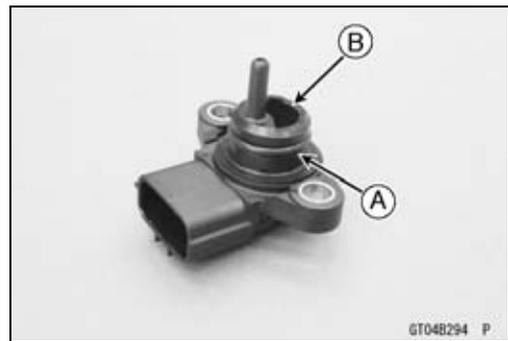
##### NOTE

○ Do not apply engine oil into the hole [B] that senses the pressure.

- Install the air intake chamber pressure/temperature sensor to the air intake chamber.
- Tighten:

**Torque - Air Intake Chamber Pressure/Temperature Sensor Bolts: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

- Connect the air intake chamber pressure/temperature sensor connector.
- Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).



**Intake Air Temperature Sensor (Service Code 13)**

**Intake 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 in the Fuel System (DFI) chapter).
- Disconnect the air intake chamber pressure/temperature sensor connector and connect the measuring adapter [A] between these connectors as shown.

Main Harness [B]

Air Intake Chamber Pressure/Temperature Sensor [C]

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

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

**Intake Air Temperature Sensor Output Voltage**

**Connections to Adapter:**

**Digital Meter (+) → W (sensor GY/R) lead**

**Digital Meter (-) → BK (sensor G) lead**

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

**Output Voltage**

**Standard: About DC 2.50 ~ 3.00 V @20°C (68°F)**

**NOTE**

○The output voltage changes according to the intake 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 in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

- ★ 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.

**Wiring Continuity Inspection**

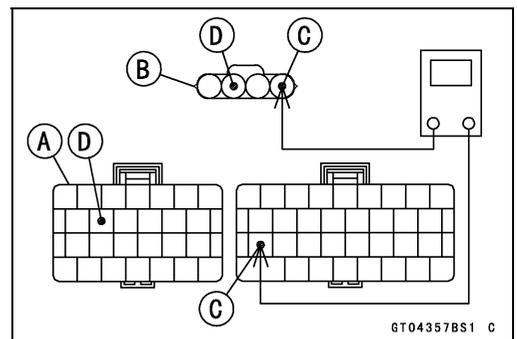
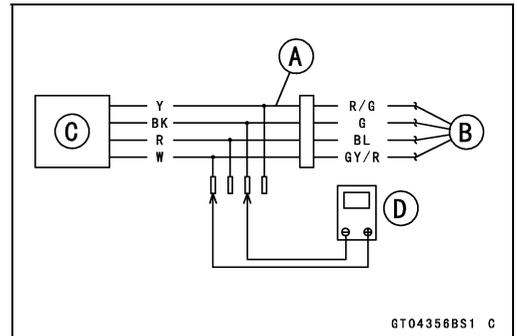
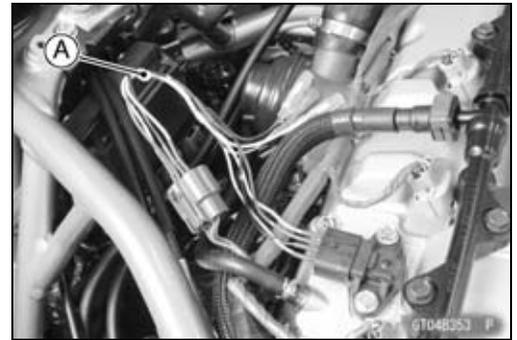
**ECU Connector [A] ↔**

**Air Intake Chamber Pressure/Temperature Sensor Connector [B]**

**GY/R lead (ECU terminal 77) [C]**

**G lead (ECU terminal 38) [D]**

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



## 17-28 SELF-DIAGNOSIS SYSTEM

### Intake Air Temperature Sensor (Service Code 13)

#### Intake Air Temperature Sensor Resistance Inspection

- Remove the air intake chamber pressure/temperature sensor (see Air Intake Chamber Pressure/Temperature Sensor Removal).
- 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

- Do not submerge the hole [D] that senses the pressure.
- The sensor and thermometer must not touch the container side or bottom.

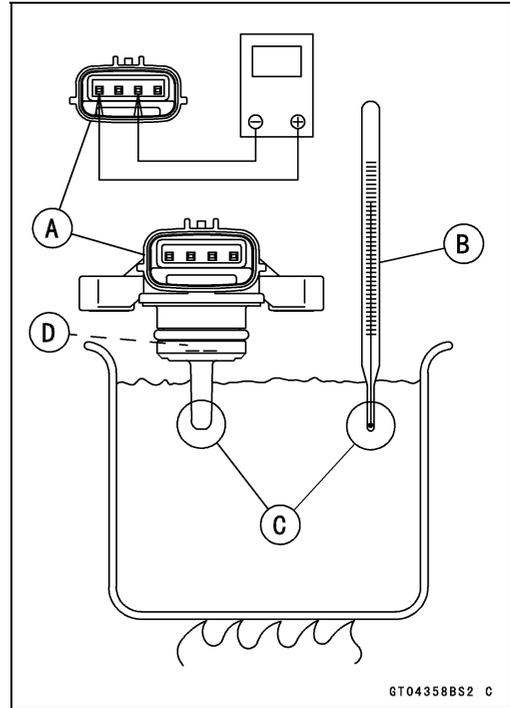
- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the terminals at the temperatures shown in the following.

#### Intake Air Temperature Sensor Resistance

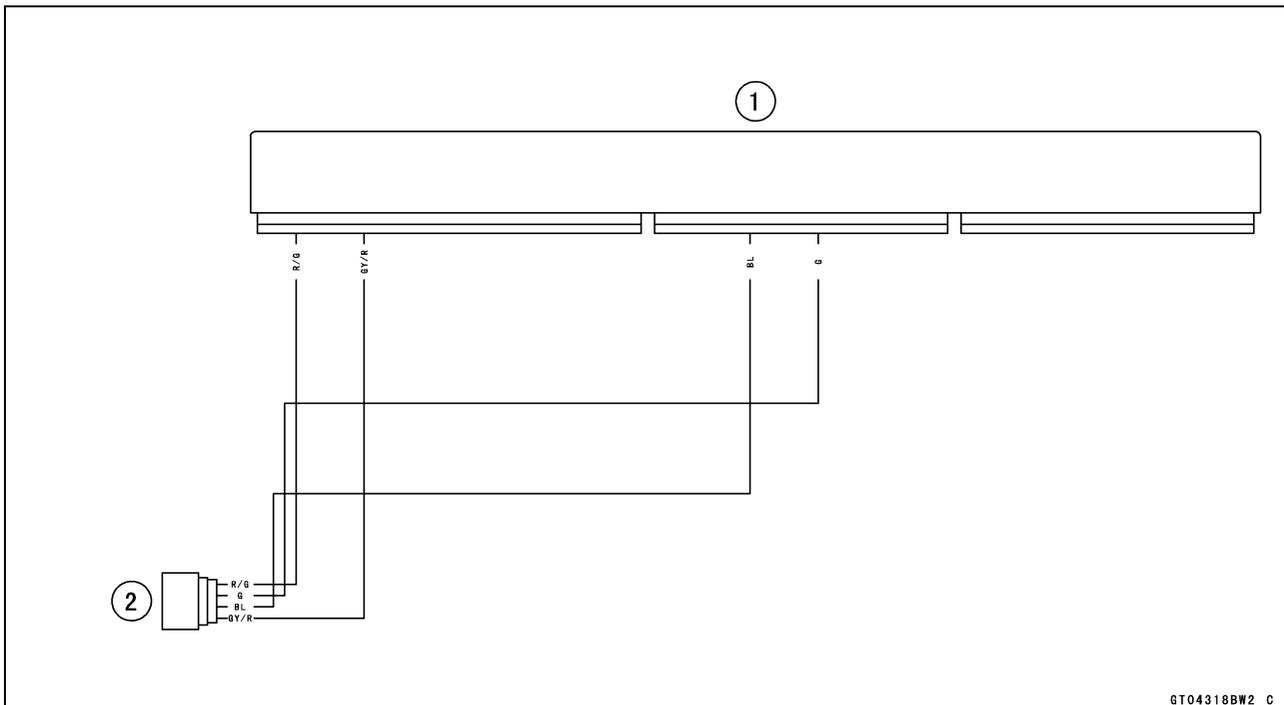
Standard: 5.4 ~ 6.6 kΩ @0°C (32°F)

0.29 ~ 0.39 kΩ @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 in the Fuel System (DFI) chapter).



#### Intake Air Temperature Sensor Circuit

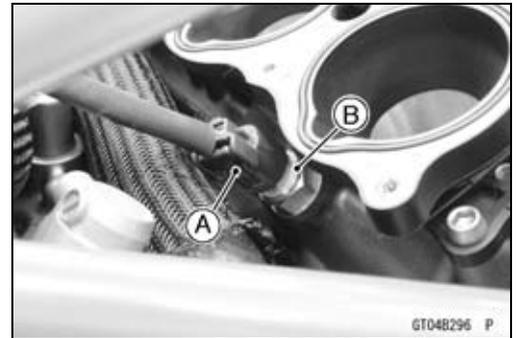


1. ECU
2. Air Intake Chamber Pressure/Temperature Sensor

**Water Temperature Sensor (Service Code 14)****Water Temperature Sensor Removal/Installation****NOTICE**

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

- 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)
- Disconnect:
  - Water Temperature Sensor Connector [A]
- Remove:
  - Water Temperature Sensor [B] with O-ring
- Replace the O-ring with a new one.
- Tighten:
  - Torque - Water Temperature Sensor: 12 N·m (1.2 kgf·m, 106 in·lb)**
- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).



## 17-30 SELF-DIAGNOSIS SYSTEM

### Water Temperature Sensor (Service Code 14)

#### Water Temperature Sensor Output Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove:
  - Throttle Body Assy (see Throttle Body Assy Removal in the Fuel System (DFI) chapter)
  - Disconnect the water temperature sensor connector and connect the measuring adapter [A] between these connectors as shown.
- Subharness [B]
- Water Temperature Sensor [C]

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

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

##### Water Temperature Sensor Output Voltage Connections to Adapter:

Digital Meter (+) → R (sensor O) lead

Digital Meter (-) → BK (sensor G) lead

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

##### Output Voltage

Standard: About DC 2.80 ~ 2.97 V @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 in the Fuel System (DFI) chapter).
  - ★If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).
  - ★If the reading is out of the standard, remove the ECU and check the wiring for continuity between main and sub harness connectors.
- Disconnect the ECU and sensor connectors.

##### Wiring Continuity Inspection

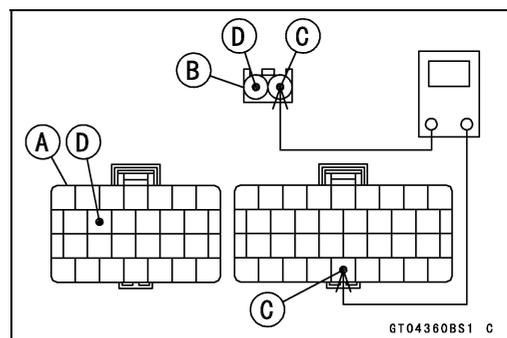
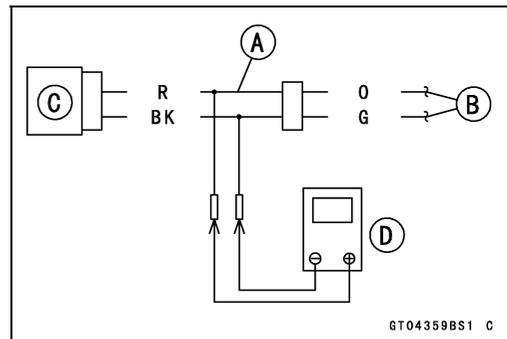
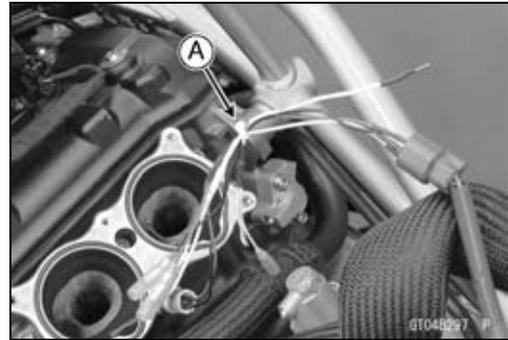
ECU Connector [A] ←→

Water Temperature Sensor Connector [B]

O lead (ECU terminal 82) [C]

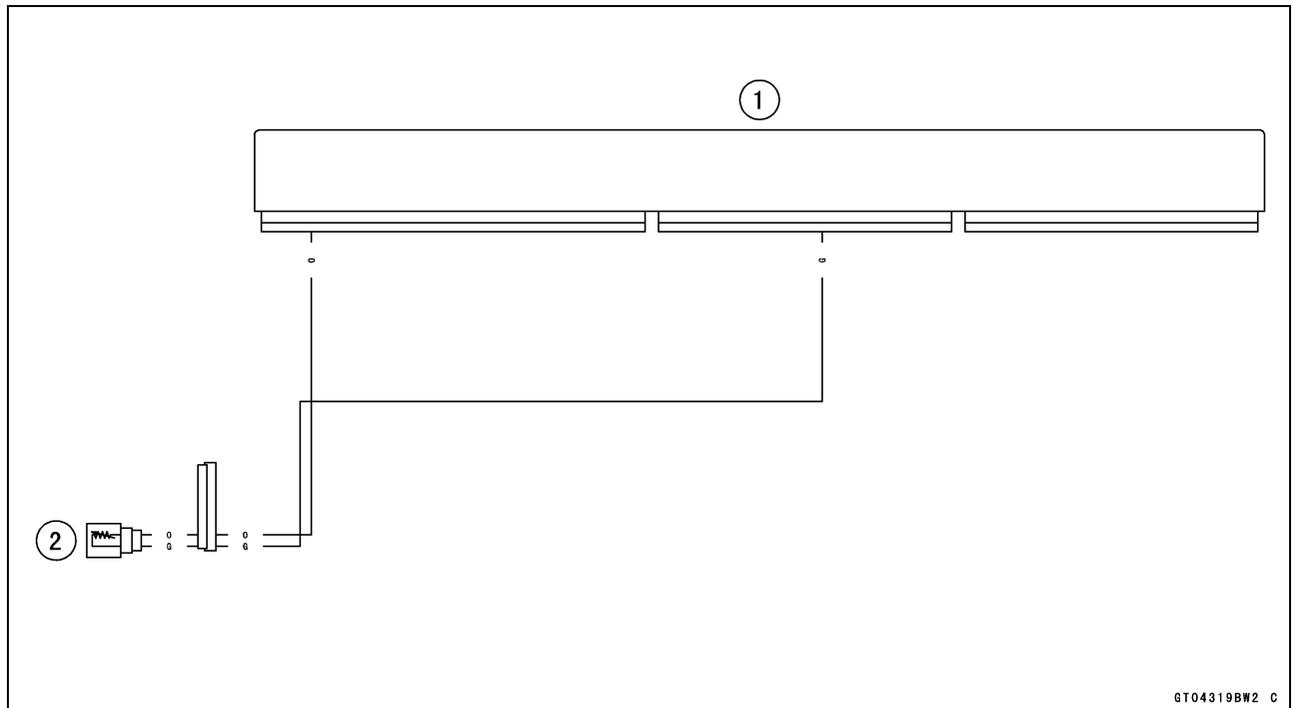
G lead (ECU terminal 38) [D]

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



**Water Temperature Sensor (Service Code 14)****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 in the Fuel System (DFI) chapter).

**Water Temperature Sensor Circuit**

1. ECU
2. Water Temperature Sensor

## 17-32 SELF-DIAGNOSIS SYSTEM

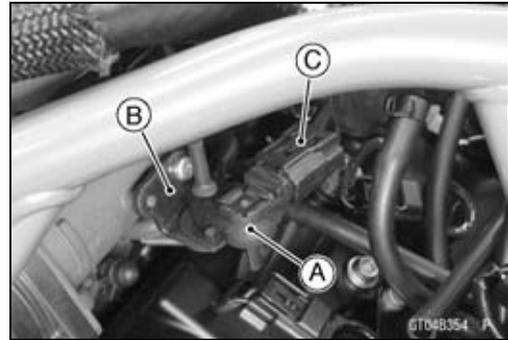
### Atmospheric Pressure Sensor (Service Code 15)

#### Atmospheric Pressure Sensor Removal

##### NOTICE

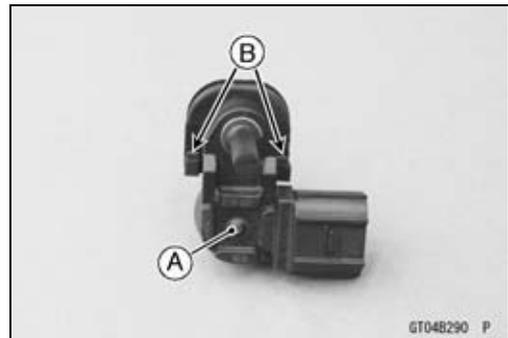
Never drop the atmospheric pressure sensor especially on a hard surface. Such a shock to the sensor can damage it.

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Remove the atmospheric pressure sensor [A] from the bracket [B].
- Disconnect:
  - Atmospheric Pressure Sensor Connector [C]
- Remove the rubber damper from the atmospheric pressure sensor.

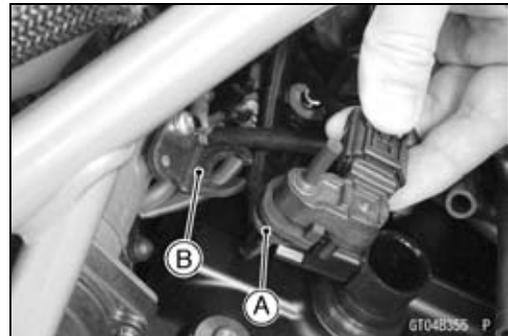


#### Atmospheric Pressure Sensor Installation

- Position the atmospheric pressure sensor [A] between the projections [B] on the rubber damper.



- Connect the atmospheric pressure sensor connector.
- Install the rubber damper [A] on the bracket [B].
- Install:
  - Fuel Tank (see Fuel Tank Installation in the Fuel System (DFI) chapter)



**Atmospheric Pressure Sensor (Service Code 15)**

**Atmospheric Pressure Sensor Input Voltage Inspection**

**NOTE**

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove the atmospheric pressure sensor from the bracket (see Atmospheric Pressure Sensor Removal).
- Disconnect the atmospheric pressure sensor connector and connect the measuring adapter [A] between these connectors.

Main Harness [B]  
Atmospheric Pressure Sensor [C]

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

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

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

Digital Meter (+) → R (sensor BL) lead  
Digital Meter (-) → BK (sensor G) lead

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

**Input Voltage**

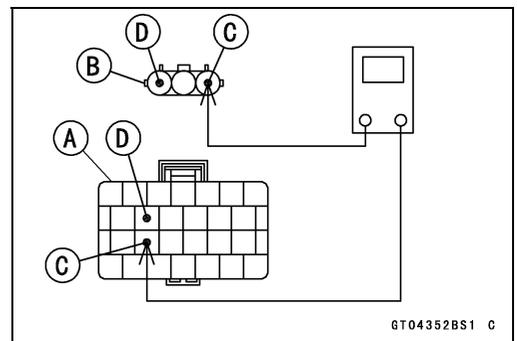
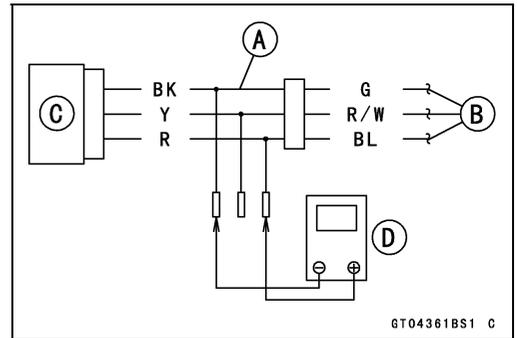
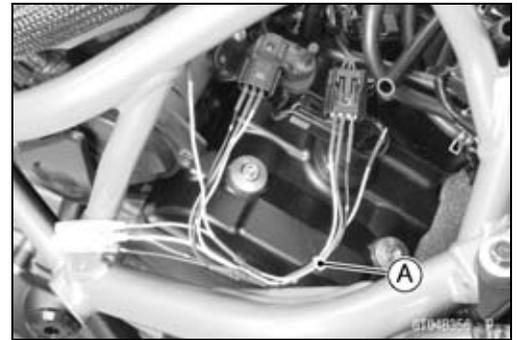
Standard: DC 4.75 ~ 5.25 V

- Turn the ignition switch off.
- ★ If the reading is within the standard, check the output voltage (see Atmospheric Pressure 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.

**Wiring Continuity Inspection**

ECU Connector [A] ↔ Atmospheric Pressure Sensor Connector [B]  
BL lead (ECU terminal 44) [C]  
G lead (ECU terminal 38) [D]

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



# 17-34 SELF-DIAGNOSIS SYSTEM

## Atmospheric Pressure Sensor (Service Code 15)

### 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 measuring adapter [A] between these connectors.
  - Main Harness [B]
  - Atmospheric Pressure Sensor [C]
  - Digital Meter [D]

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

### Atmospheric Pressure Sensor Output Voltage Connections to Adapter:

- Digital Meter (+) → Y (sensor R/W) lead
- Digital Meter (-) → BK (sensor G) lead

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

### Output Voltage

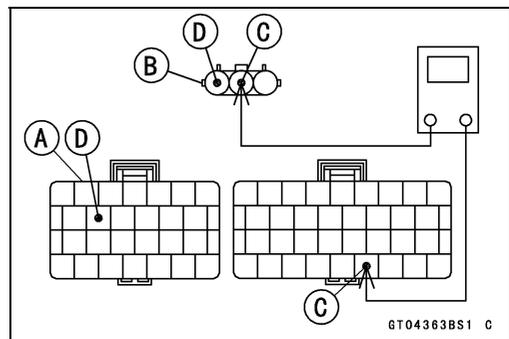
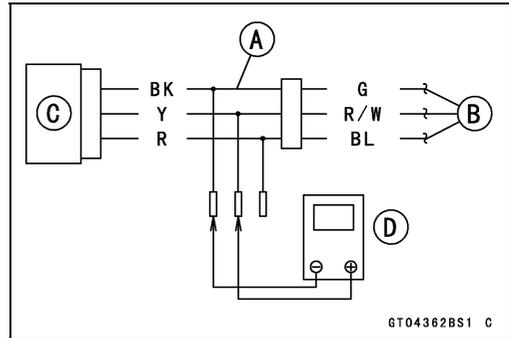
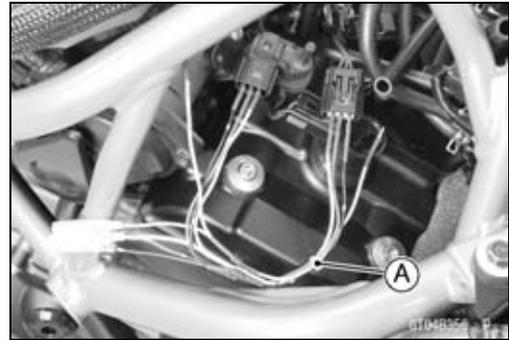
**Usable Range: DC 1.43 ~ 1.55 V at standard atmospheric pressure (101.32 kPa, 76 cmHg absolute)**

### 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.
- ★ If the reading is within the usable range, remove the ECU and check the wiring for continuity between main harness connectors.
- Disconnect the ECU and sensor connectors.

### Wiring Continuity Inspection

- ECU Connector [A] ←→
- Atmospheric Pressure Sensor Connector [B]
  - R/W lead (ECU terminal 81) [C]
  - G lead (ECU terminal 38) [D]



---

**Atmospheric Pressure Sensor (Service Code 15)**

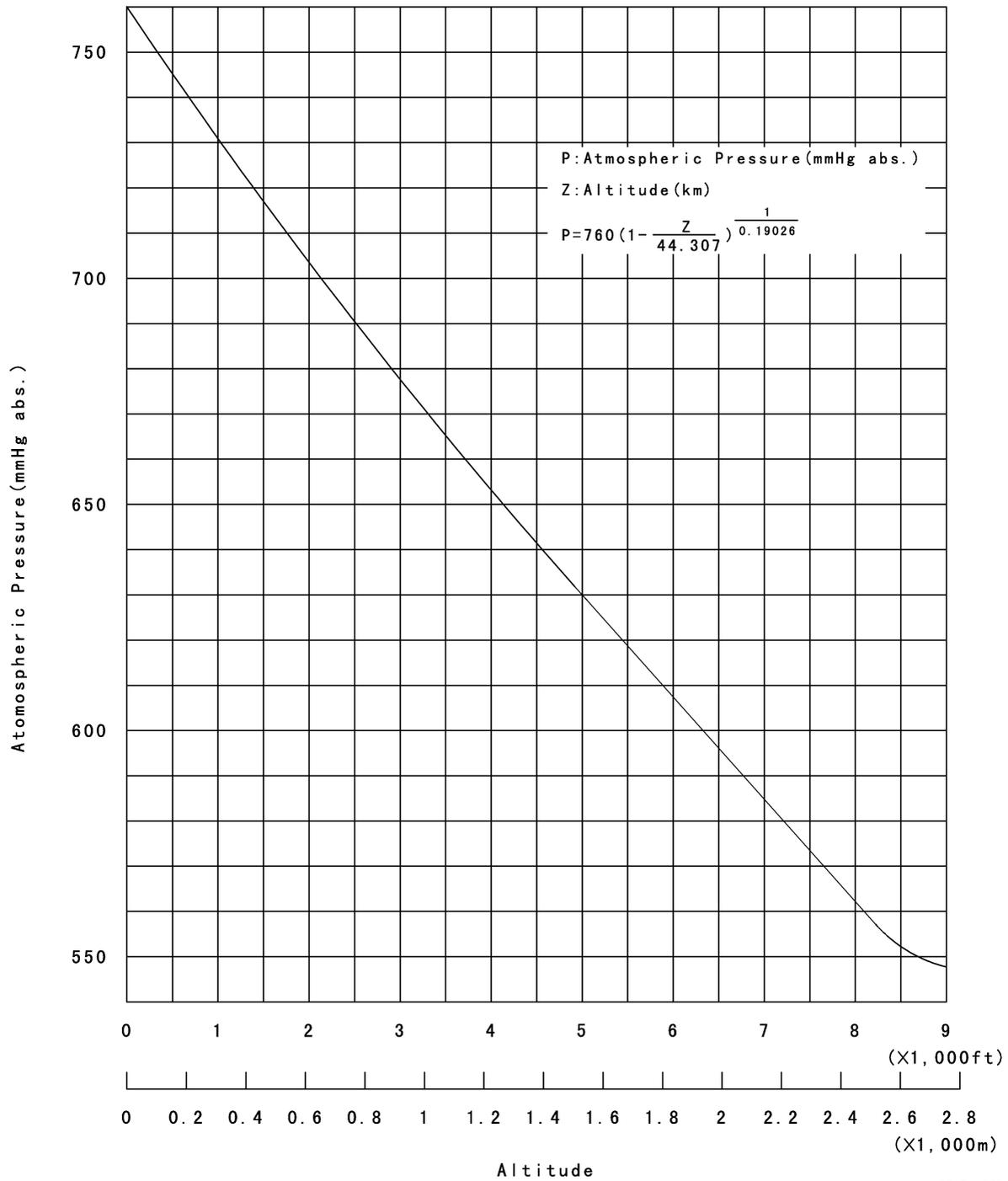
---

- ★ 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 intake air pressure sensor chart (see Intake 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 intake 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 in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

# 17-36 SELF-DIAGNOSIS SYSTEM

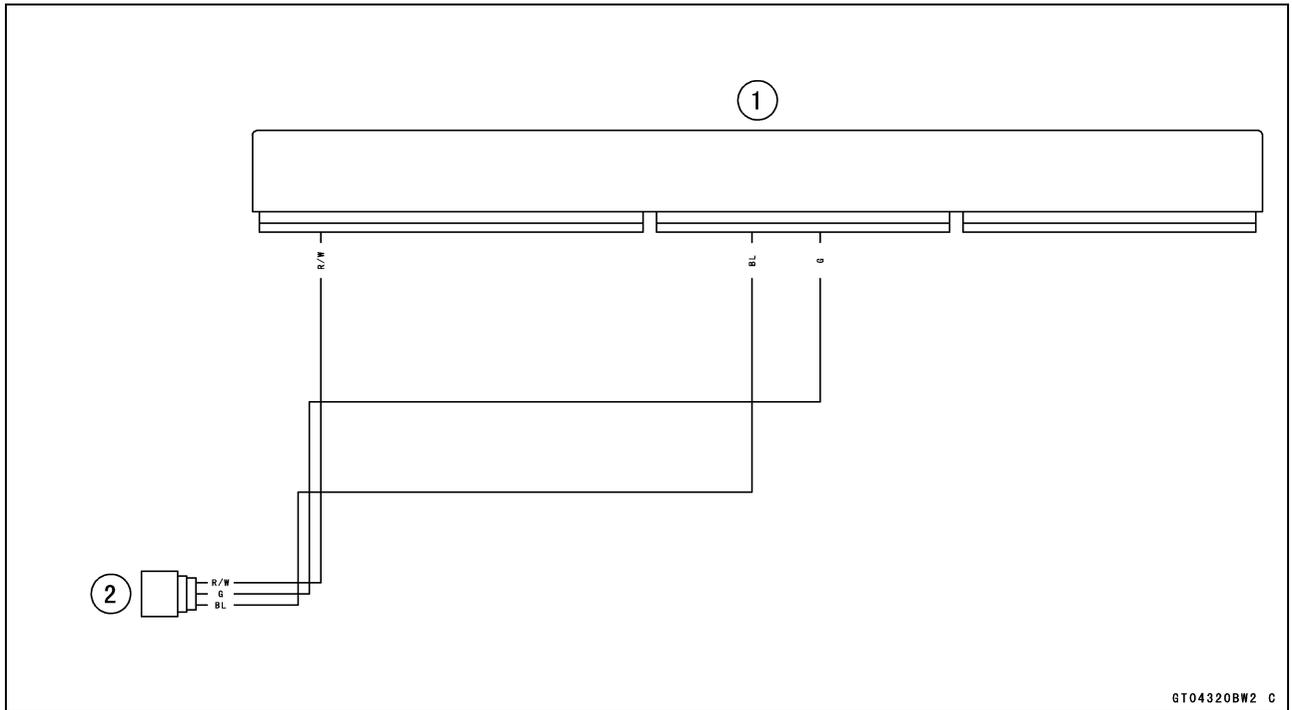
## Atmospheric Pressure Sensor (Service Code 15)

### Atmospheric Pressure/Altitude Relationship



Atmospheric Pressure Sensor (Service Code 15)

Atmospheric Pressure Sensor Circuit



GT04320BW2 C

- 1. ECU
- 2. Atmospheric Pressure Sensor

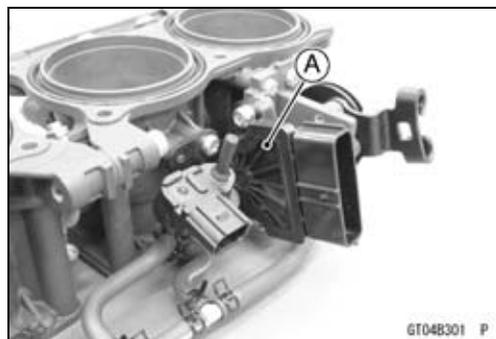
## 17-38 SELF-DIAGNOSIS SYSTEM

### Accelerator Position Sensor (Service Code 18)

#### Accelerator Position Sensor Removal

##### NOTICE

Do not remove the accelerator position sensor [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 throttle sensor can damage it.

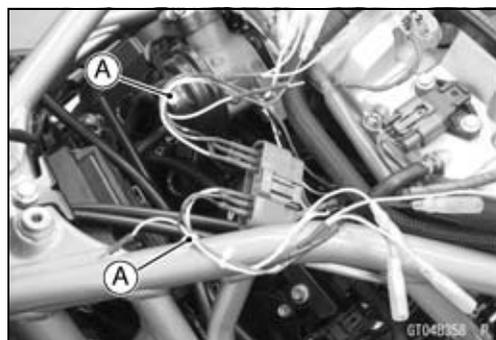


#### Accelerator Position Sensor Input Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch off.
  - Remove:
    - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Disconnect:
    - Accelerator Position Sensor Connector [A]
  - Connect the measuring adapters [A] between the main harness connector and accelerator position sensor connector.
    - Main Harness [B]
    - Accelerator Position Sensor [C]
- Special Tool - Measuring Adapter: 57001-1700**
- Connect a digital meter [D] to the measuring adapter leads.



#### Accelerator Position Sensor Input Voltage

##### Connections to Adapters:

(1) Digital Meter (+) → R (sensor BL) lead

Digital Meter (-) → BK (sensor G) lead

(2) Digital Meter (+) → R (sensor BL) lead

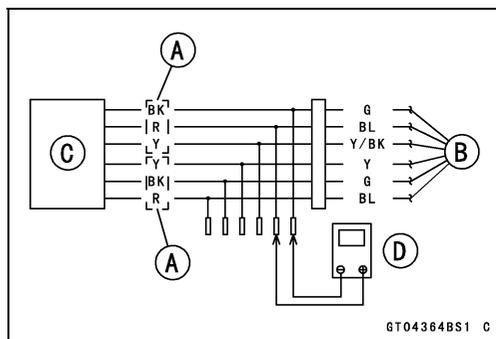
Digital Meter (+) → BK (sensor G) lead

- 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 Accelerator Position Sensor Output Voltage Inspection).



**Accelerator Position Sensor (Service Code 18)**

★ 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.

**Wiring Continuity Inspection**

**ECU Connector [A] ↔**

**Accelerator Position Sensor Connector [B]**

(1) BL lead (ECU terminal 63) [C]

G lead (ECU terminal 57) [D]

(2) BL lead (ECU terminal 64) [E]

G lead (ECU terminal 66) [F]

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

★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

**Accelerator Position Sensor Output Voltage Inspection**

● Measure the output voltage at the accelerator position sensor in the same way as input voltage inspection, note the following.

○ Disconnect the accelerator position sensor connector and connect the measuring adapters [A] between these connectors.

Main Harness [B]

Accelerator Position Sensor [C]

Digital Meter [D]

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

**Accelerator Position Sensor Output Voltage Connections to Adapters:**

(1) Digital Meter (+) → Y (sensor Y/BK) lead

Digital Meter (-) → BK (sensor G) lead

(2) Digital Meter (+) → Y (sensor Y) lead

Digital Meter (-) → BK (sensor G) lead

● Measure the output voltage with the engine stopped and with the connector joined.

● Turn the ignition switch on.

**Output Voltage**

**Standard:** (1) DC 0.50 ~ 0.90 V at ordinary throttle position

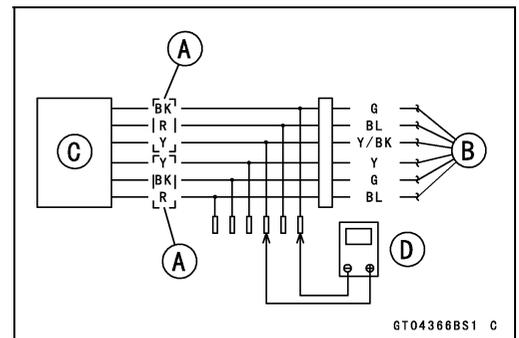
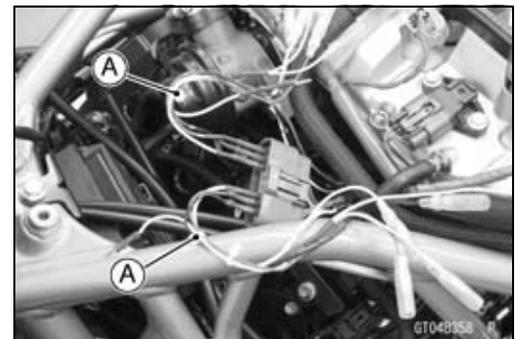
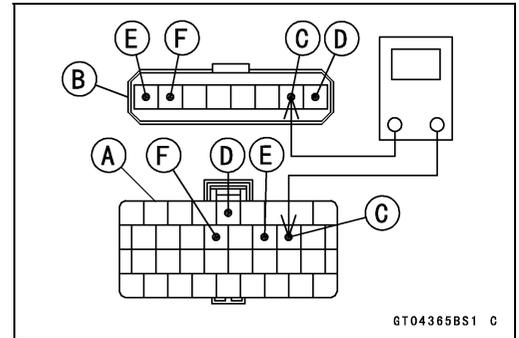
(2) DC 0.35 ~ 1.00 V at ordinary throttle position

**NOTE**

○ Open the throttle, confirm the output voltage will be raise.

● Turn the ignition switch off.

★ If the reading is out of the standard, check the accelerator position sensor resistance (see Accelerator Position Sensor Resistance Inspection).



## 17-40 SELF-DIAGNOSIS SYSTEM

### Accelerator Position Sensor (Service Code 18)

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

○ Disconnect the ECU and sensor connectors.

#### Wiring Continuity Inspection

ECU Connector [A] ↔

Accelerator Position Sensor Connector [B]

(1) Y/BK lead (ECU terminal 76) [C]

G lead (ECU terminal 57) [D]

(2) Y lead (ECU terminal 65) [E]

G lead (ECU terminal 66) [F]

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

★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

#### Accelerator Position Sensor Resistance Inspection

● Turn the ignition switch off.

● Disconnect:

Accelerator Position Sensor Connector (see Accelerator Position Sensor Input Voltage Inspection)

● Connect a digital meter [A] to the terminals of the accelerator position sensor connector [B].

#### Accelerator Position Sensor Input Voltage Connection:

(1) BL lead terminal ↔ G lead terminal

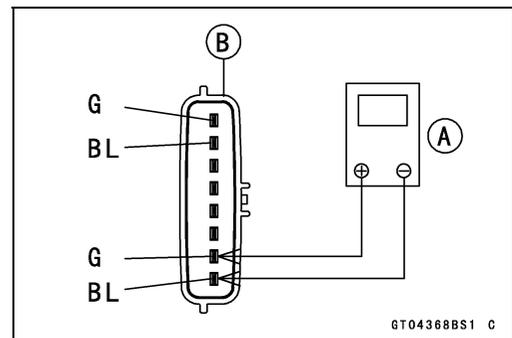
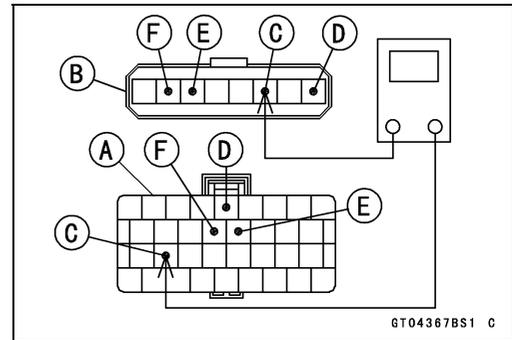
(2) BL lead terminal ↔ G lead terminal

● Measure the accelerator position sensor resistance.

#### Accelerator Position Sensor Resistance

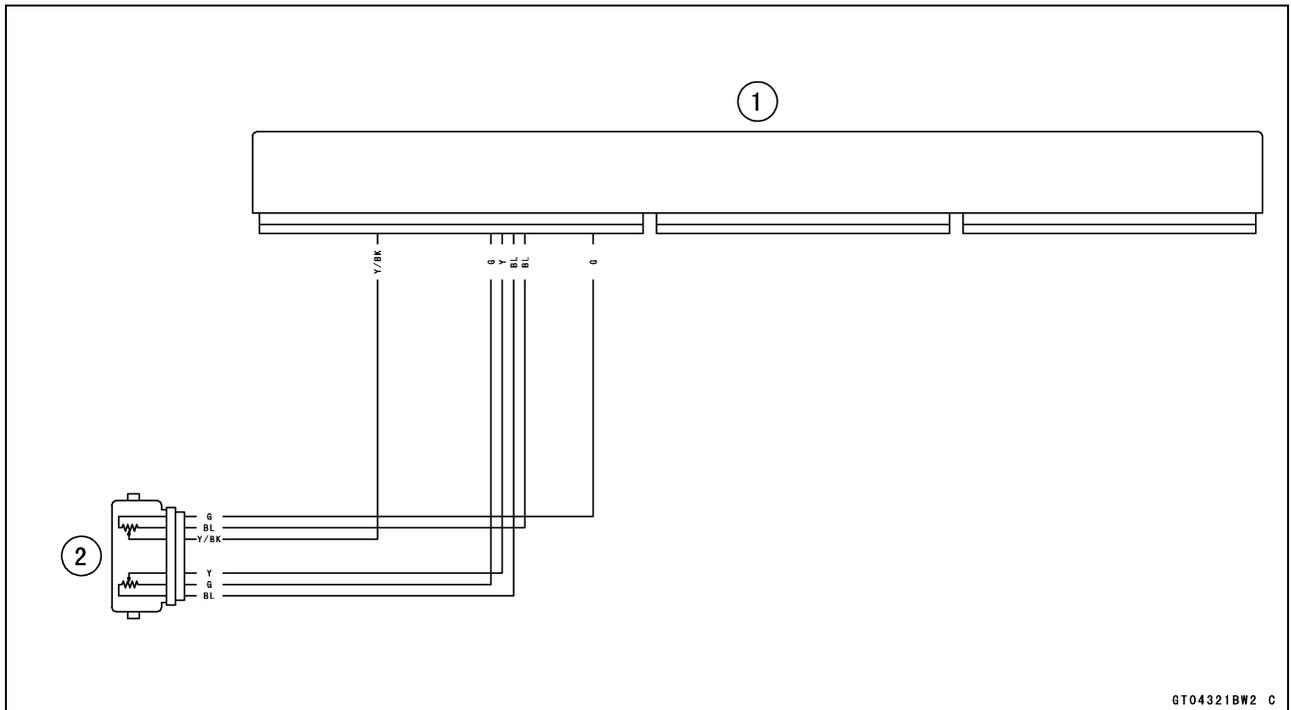
Standard: 4.5 ~ 6.5 kΩ

★ If the reading is out of the standard, replace the throttle body assy (see Throttle Body Assy Removal/Installation in the Fuel System (DFI) chapter).



Accelerator Position Sensor (Service Code 18)

Accelerator Position Sensor Circuit



GT04321BW2 C

- 1. ECU
- 2. Accelerator Position Sensor

# 17-42 SELF-DIAGNOSIS SYSTEM

## 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.
- Disconnect the ECU and sensor connectors.

#### Wiring Continuity Inspection

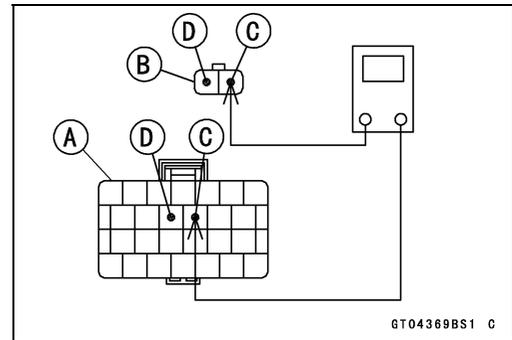
ECU Connector [A] ←→

Crankshaft Sensor Connector [B]

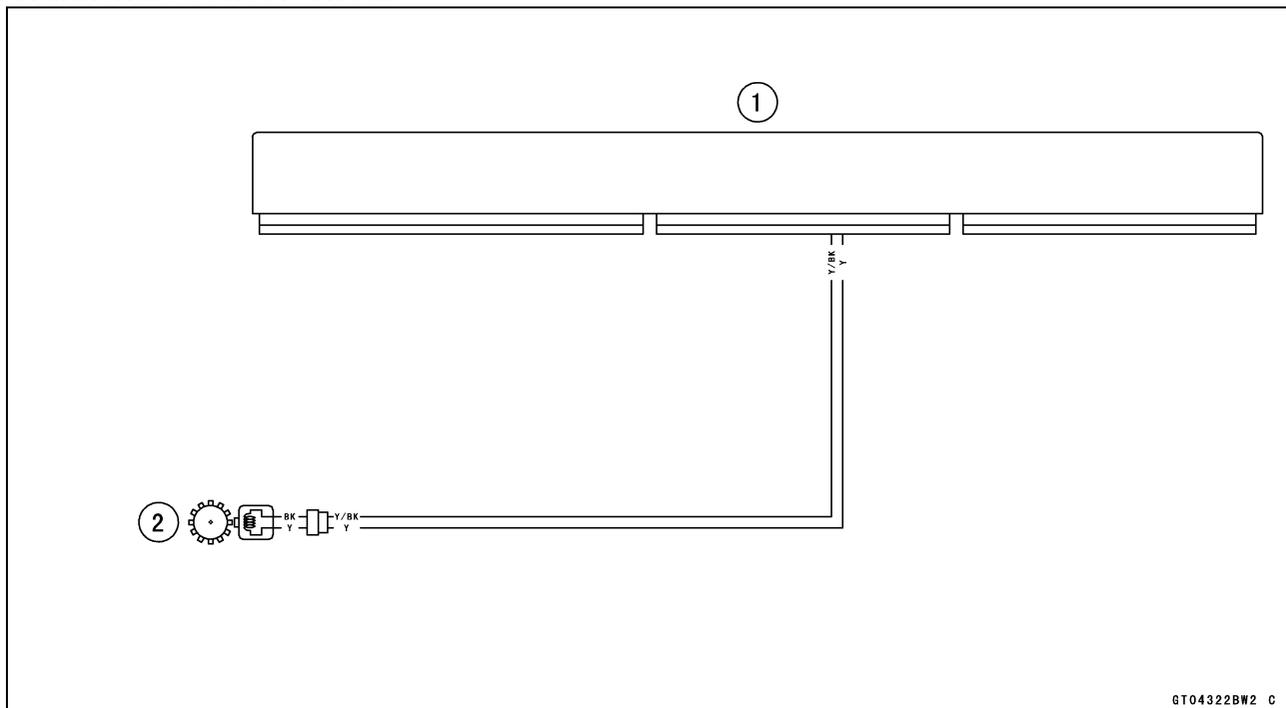
Y lead (ECU terminal 36) [C]

Y/BK lead (ECU terminal 37) [D]

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



### 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.
- Disconnect the ECU and sensor connectors.

#### **Wiring Continuity Inspection**

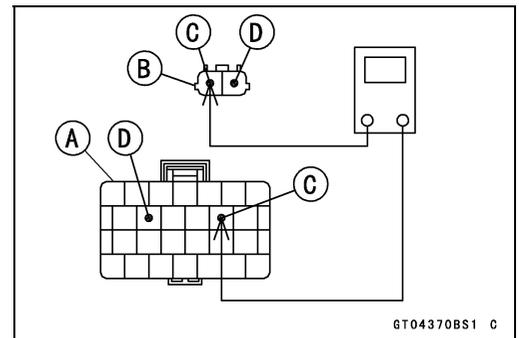
**ECU Connector [A] ←→**

**Camshaft Position Sensor Connector [B]**

**Y/R lead (ECU terminal 35) [C]**

**G lead (ECU terminal 38) [D]**

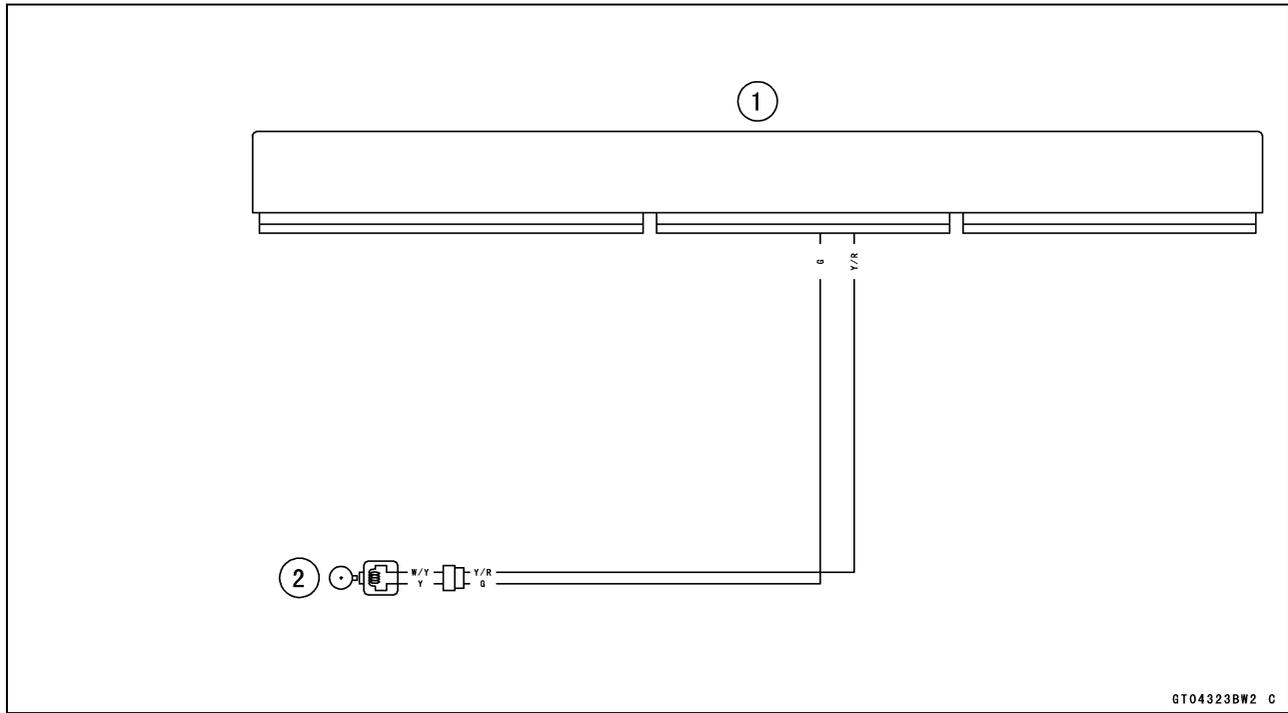
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



# 17-44 SELF-DIAGNOSIS SYSTEM

## Camshaft Position Sensor (Service Code 23)

### Camshaft Position Sensor Circuit



GT04323BW2 C

- 1. ECU
- 2. Camshaft Position Sensor

**Rear Wheel Rotation Sensor Signal (Service Code 24)**

**Rear Wheel Rotation Sensor Signal Inspection**

- The rear wheel rotation sensor sends the signal to the ECU through the KIBS hydraulic unit.
- The ECU uses the rear wheel rotation sensor signal for motorcycle speed and KTRC.
- The service code 24 is detected with the ECU.
- Inspect the wheel rotation sensor air gap (see Wheel Rotation Sensor Air Gap Inspection in the Brakes chapter).
- Inspect the wheel rotation sensor rotor (see Wheel Rotation Sensor Rotor Inspection in the Brakes chapter).
- When the service code 24 and following service codes (for KIBS) are displayed at the same time, inspect the rear wheel rotation sensor.
  - Service Code B44 (see Rear Wheel Rotation Sensor Signal Abnormal)
  - Service Code B45 (see Rear Wheel Rotation Sensor Wiring Inspection)

- When only service code 24 is displayed, do the following inspection procedures.
- Disconnect:
  - ECU Connectors (see ECU Removal in the Fuel System (DFI) chapter)
  - Rear Wheel Rotation Sensor Lead Connector (see Rear Wheel Rotation Sensor Removal in the Brakes chapter)
  - KIBS Hydraulic Unit Connector (see KIBS Hydraulic Unit Removal in the Brakes chapter)

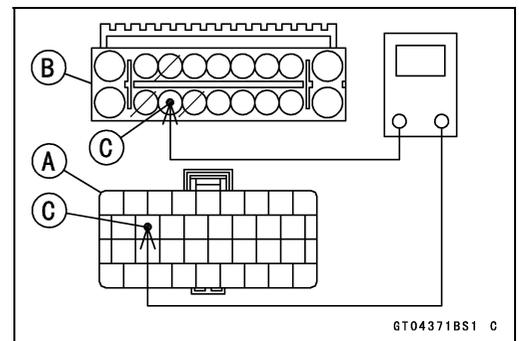
- Check the wiring for continuity between harness connectors.

**Wiring Continuity Inspection**

**ECU Connector [A] ↔**

**KIBS Hydraulic Unit Connector [B]**

**W/Y lead (ECU terminal 68, KIBS Hydraulic Unit terminal 16) [C]**



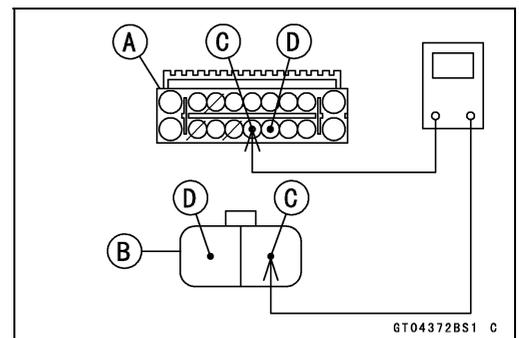
**Wiring Continuity Inspection**

**KIBS Hydraulic Unit Connector [A] ↔**

**Rear Wheel Rotation Sensor Connector [B]**

**BK/O lead (KIBS Hydraulic Unit Connector terminal 14) [C]**

**W/G lead (KIBS Hydraulic Unit Connector terminal 13) [D]**

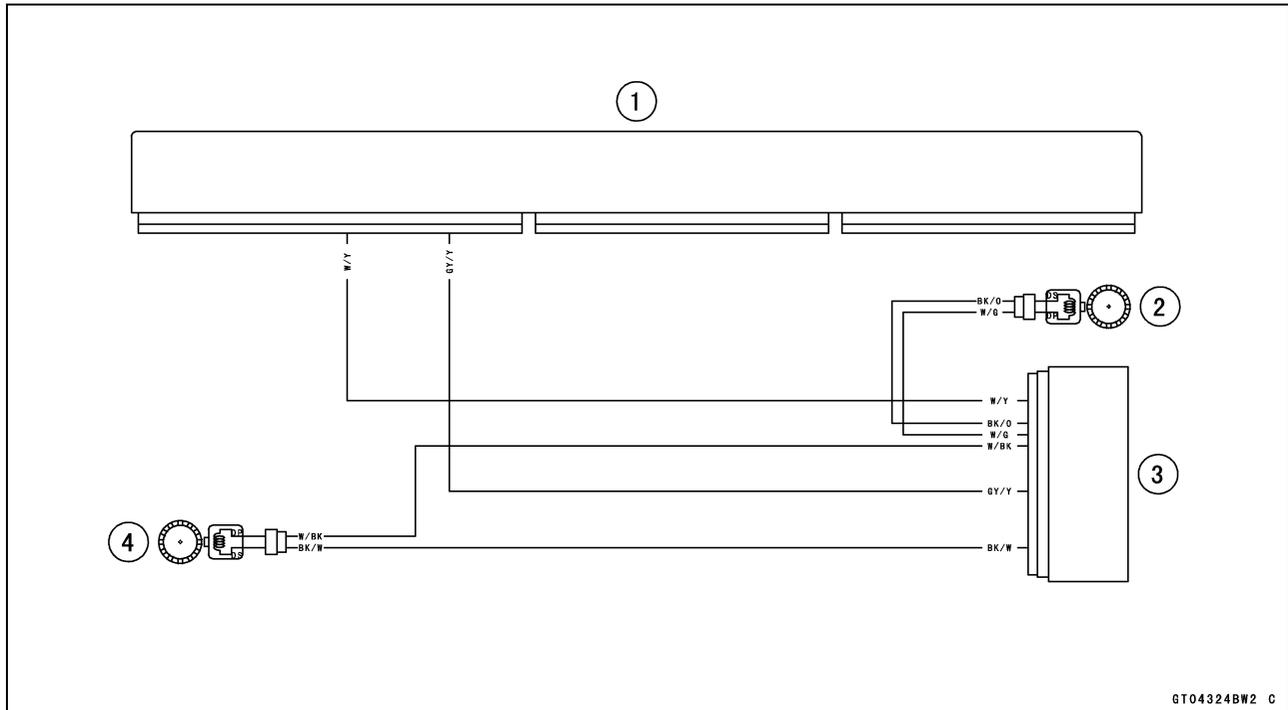


- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

# 17-46 SELF-DIAGNOSIS SYSTEM

## Rear Wheel Rotation Sensor Signal (Service Code 24)

### Wheel Rotation Sensor Circuit



GT04324BW2 C

1. ECU
2. Rear Wheel Rotation Sensor
3. KIBS Hydraulic Unit
4. Front Wheel Rotation Sensor

**Gear Position Sensor (Service Code 25)**

**Gear Position Sensor Removal/Installation**

- Refer to the Gear Position Sensor Removal/Installation in the Electrical System chapter.

**Gear Position Sensor Input Voltage Inspection**

**NOTE**

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Disconnect:
  - Gear Position Sensor Connector [A]
- Connect the measuring adapter [A] between the main harness connector and gear position sensor connector.
  - Main Harness [B]
  - Gear Position Sensor [C]
- **Special Tool - Measuring Adapter: 57001-1700**
- Connect a digital meter [D] to the measuring adapter leads.

**Gear Position Sensor Input Voltage**

**Connections to Adapter:**

**Digital Meter (+) → R (sensor BL/Y) lead**

**Digital Meter (-) → BK (sensor G) 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 Gear Position 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.

**Wiring Continuity Inspection**

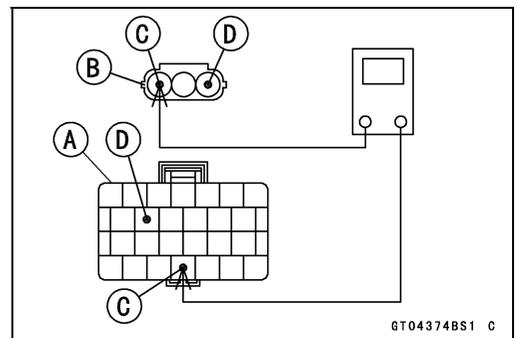
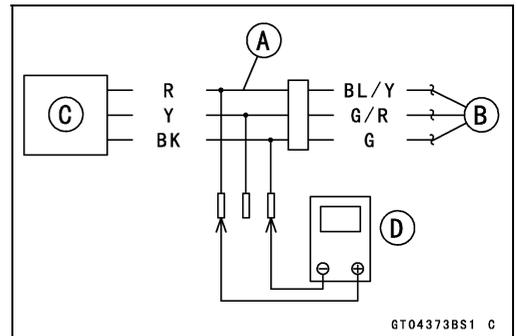
**ECU Connector [A] ↔**

**Gear Position Sensor Connector [B]**

**BL/Y lead (ECU terminal 49) [C]**

**G lead (ECU terminal 38) [D]**

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



# 17-48 SELF-DIAGNOSIS SYSTEM

## Gear Position Sensor (Service Code 25)

### Gear Position Sensor Output Voltage Inspection

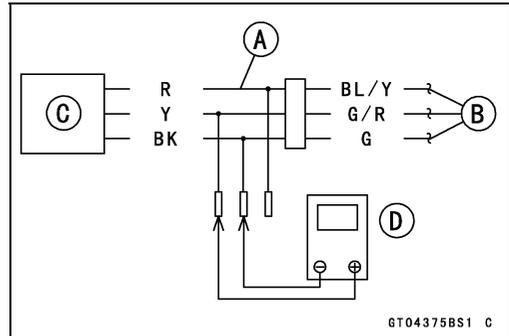
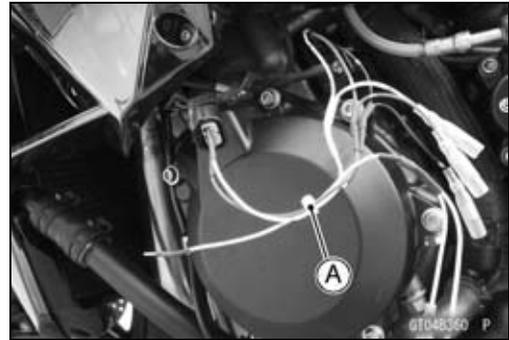
- Remove the gear position sensor (see Gear Position Sensor Removal in the Electrical System chapter).
  - Measure the output voltage at the gear position sensor in the same way as input voltage inspection, note the following.
- Connect the measuring adapter [A] between these connectors.

- Main Harness [B]
- Gear Position Sensor [C]
- Digital Meter [D]

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

### Gear Position Sensor Output Voltage Connections to Adapter:

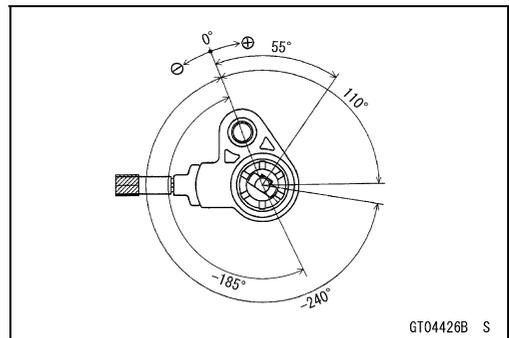
- Digital Meter (+) → Y (sensor G/R) lead
- Digital Meter (-) → BK (sensor G) lead



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

### Output Voltage

| Angle | Output Voltage (V) |
|-------|--------------------|
| -240° | 0.40 ~ 0.60        |
| -185° | 1.03 ~ 1.23        |
| +55°  | 3.82 ~ 3.42        |
| +110° | 4.40 ~ 4.60        |



### NOTE

○ Rotate the gear position sensor, confirm the output voltage will be raise or lower.

- Turn the ignition switch off.
  - ★ If the reading is out of the standard, replace the gear position sensor.
  - ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.
- Disconnect the ECU and sensor connectors.

### Wiring Continuity Inspection

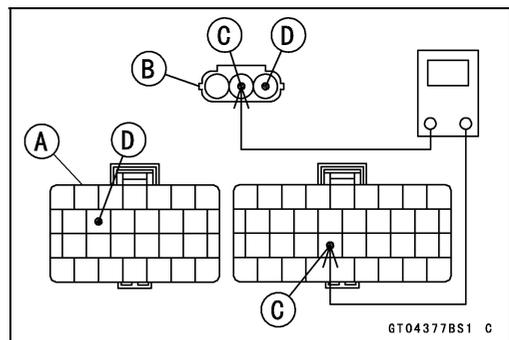
**ECU Connector [A] ←→**

**Gear Position Sensor Connector [B]**

**G/R lead (ECU terminal 74) [C]**

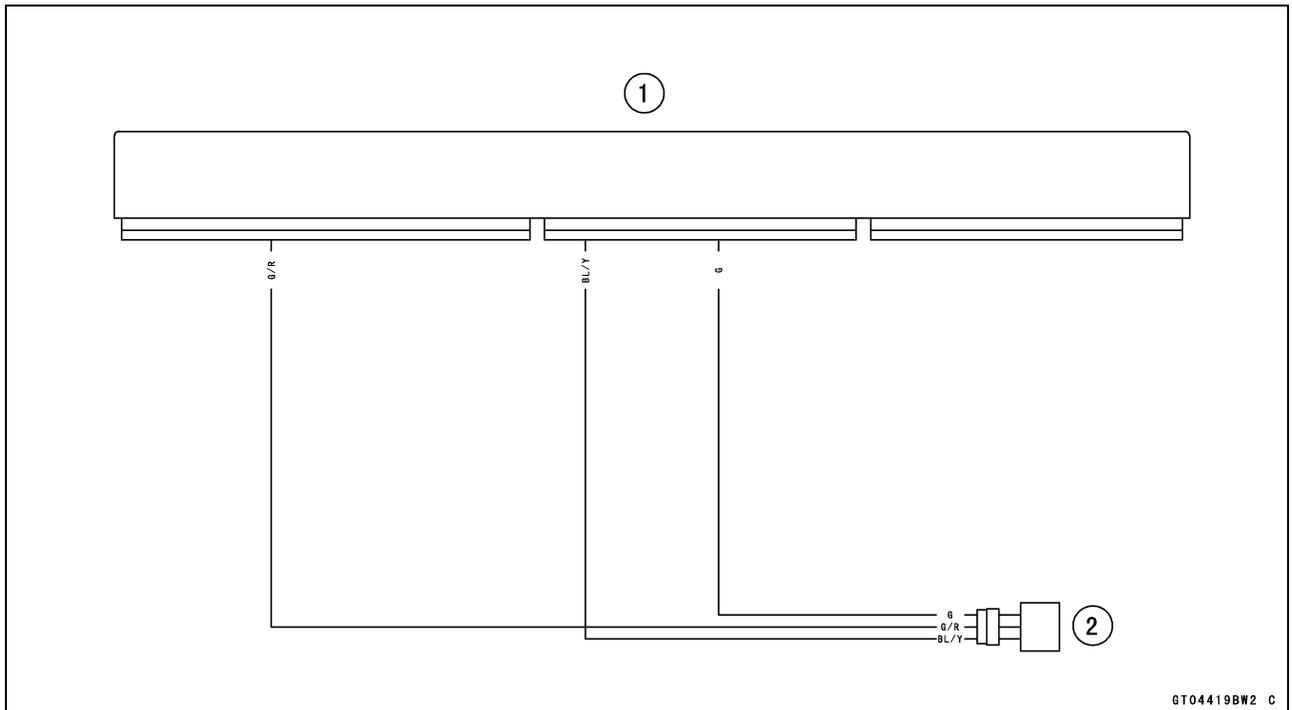
**G lead (ECU terminal 38) [D]**

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



Gear Position Sensor (Service Code 25)

Gear Position Sensor Circuit



GT04419BW2 C

- 1. ECU
- 2. Gear Position Sensor

# 17-50 SELF-DIAGNOSIS SYSTEM

## Front Wheel Rotation Sensor Signal (Service Code 27)

### Front Wheel Rotation Sensor Signal Inspection

- The front wheel rotation sensor sends the signal to the ECU through the KIBS hydraulic unit.
- The ECU uses the wheel rotation sensor signal for KTRC.
- The service code 27 is detected with the ECU.
- Inspect the wheel rotation sensor air gap (see Wheel Rotation Sensor Air Gap Inspection in the Brakes chapter).
- Inspect the wheel rotation sensor rotor (see Wheel Rotation Sensor Rotor Inspection in the Brakes chapter).
- When the service code 27 and following service codes (for KIBS) are displayed at the same time, inspect the front wheel rotation sensor.
  - Service Code B42 (see Front Wheel Rotation Sensor Signal Abnormal)
  - Service Code B43 (see Front Wheel Rotation Sensor Wiring Inspection)

- When only service code 27 is displayed, do the following inspection procedures.
- Disconnect:
  - ECU Connectors (see ECU Removal in the Fuel System (DFI) chapter)
  - Front Wheel Rotation Sensor Lead Connector (see Front Wheel Rotation Sensor Removal in the Brakes chapter)
  - KIBS Hydraulic Unit Connector (see KIBS Hydraulic Unit Removal in the Brakes chapter)

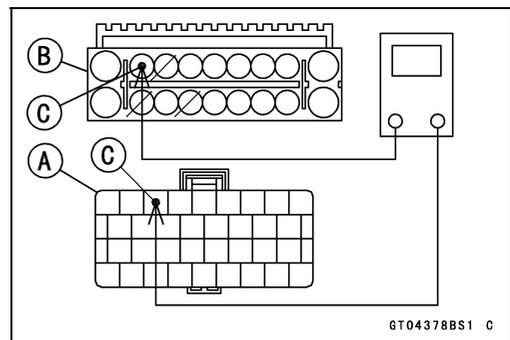
- Check the wiring for continuity between harness connectors.

### Wiring Continuity Inspection

ECU Connector [A] ←→

KIBS Hydraulic Unit Connector [B]

GY/Y lead (ECU terminal 59, KIBS Hydraulic Unit terminal 8) [C]



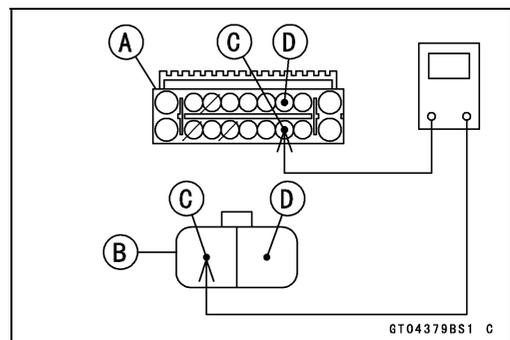
### Wiring Continuity Inspection

KIBS Hydraulic Unit Connector [A] ←→

Front Wheel Rotation Sensor Connector [B]

W/BK lead (KIBS Hydraulic Unit Connector terminal 12) [C]

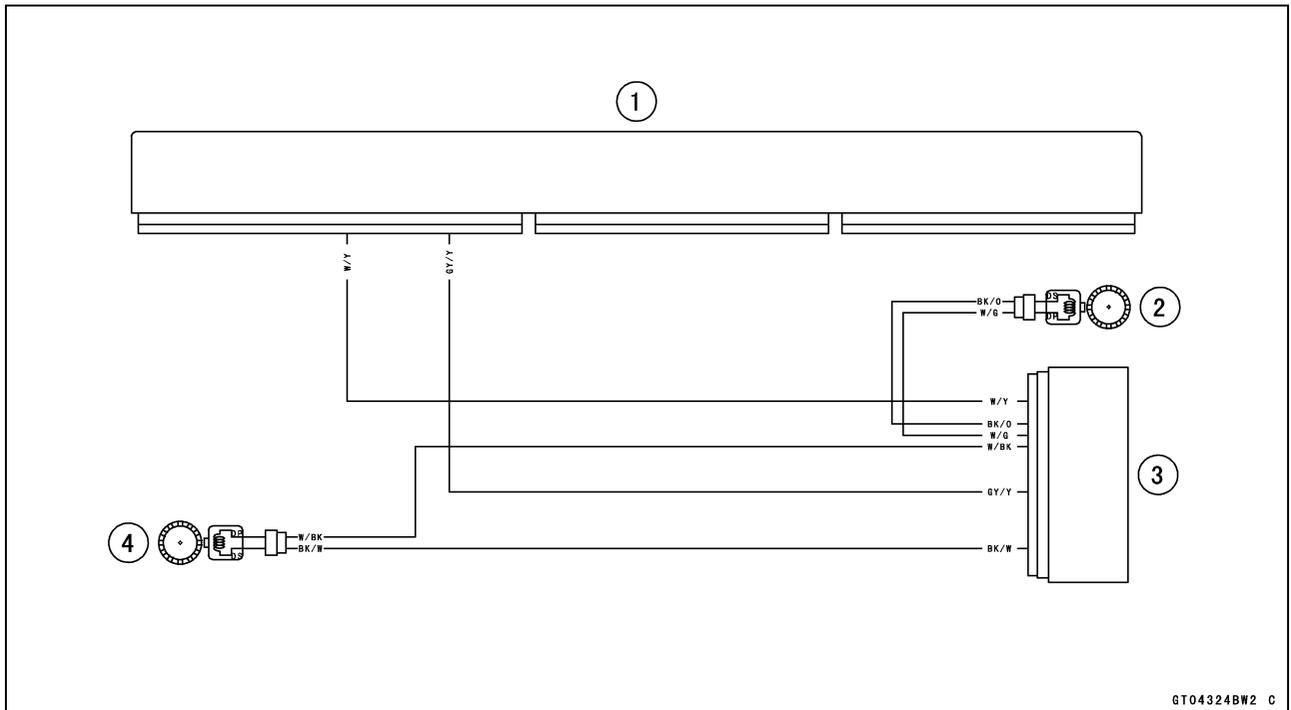
BK/W lead (KIBS Hydraulic Unit Connector terminal 3) [D]



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

Front Wheel Rotation Sensor Signal (Service Code 27)

Wheel Rotation Sensor Circuit



1. ECU
2. Rear Wheel Rotation Sensor
3. KIBS Hydraulic Unit
4. Front Wheel Rotation Sensor

## 17-52 SELF-DIAGNOSIS SYSTEM

### 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 and the ignition system.

Hall IC [B]

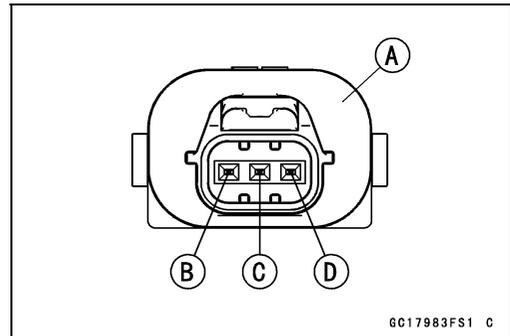
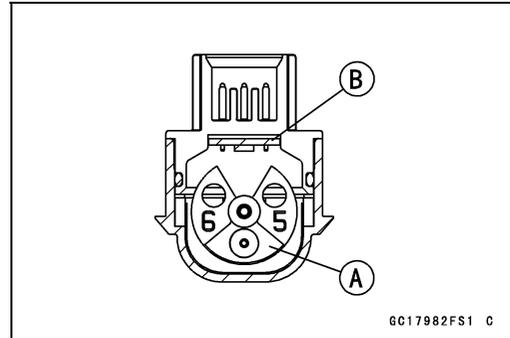
When the motorcycle is down, the ignition switch is left on. If the engine start/stop switch is slid, the electric starter turns but the engine does not start. To start the engine again, raise the motorcycle, turn the ignition switch off, and then turn it on.

Vehicle-down Sensor [A]

Ground Terminal [B]: G

Output Terminal [C]: Y/G

Power Source Terminal [D]: BL

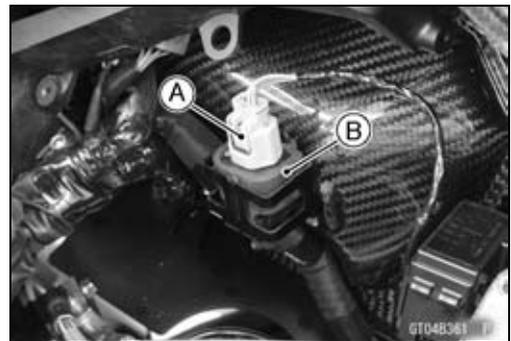


### Vehicle-down Sensor Removal

#### NOTICE

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

- Remove:  
Right Inner Cover (see Inner Cover Removal in the Frame chapter)
- Disconnect:  
Vehicle-down Sensor Connector [A]
- Remove:  
Vehicle-down Sensor [B]



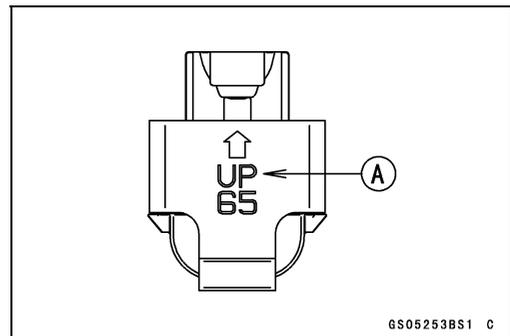
### Vehicle-down Sensor Installation

- The UP mark [A] of the sensor should face upward.

#### ⚠ WARNING

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

- Connect the vehicle-down sensor connector.
- Install:  
Right Inner Cover (see Inner Cover Installation in the Frame chapter)



**Vehicle-down Sensor (Service Code 31)**

**Vehicle-down Sensor Input Voltage Inspection**

**NOTE**

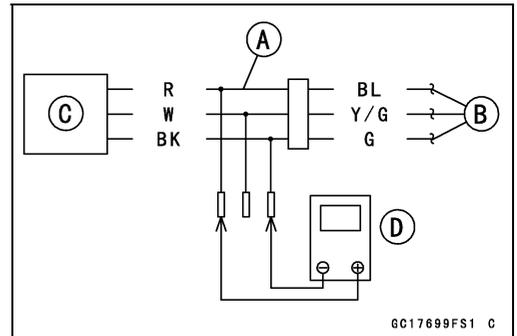
○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove:
  - Right Inner Cover (see Inner Cover Removal in the Frame chapter)
- Disconnect the vehicle-down sensor connector and connect the measuring adapter [A] between these connectors as shown.
  - Main Harness [B]
  - Vehicle-down Sensor [C]



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

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



**Vehicle-down Sensor Input Voltage Connections to Adapter:**

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

**Digital Meter (-) → BK (sensor G) 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.
- Disconnect the ECU and sensor connectors.

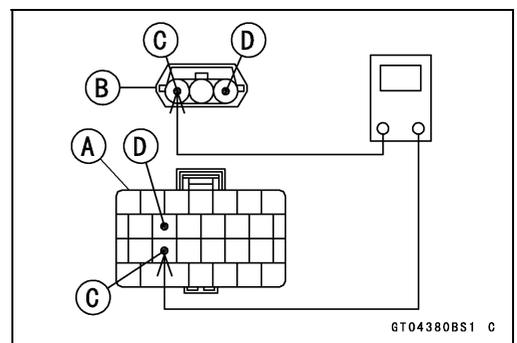
**Wiring Continuity Inspection**

**ECU Connector [A] ↔**

**Vehicle-down Sensor Connector [B]**

**BL lead (ECU terminal 44) [C]**

**G lead (ECU terminal 38) [D]**



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

# 17-54 SELF-DIAGNOSIS SYSTEM

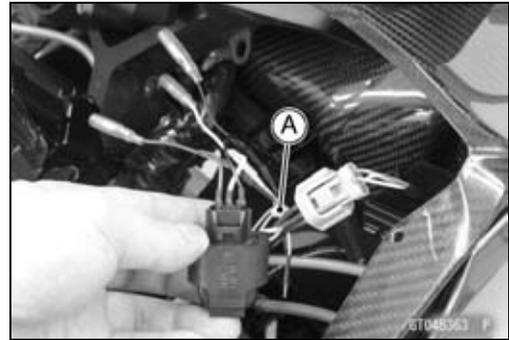
## Vehicle-down Sensor (Service Code 31)

### Vehicle-down Sensor Output Voltage Inspection

- Remove the vehicle-down sensor (see Vehicle-down Sensor Removal).
- Connect the measuring adapter [A] to the vehicle-down sensor connectors as shown.
  - Main Harness [B]
  - Vehicle-down Sensor [C]

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

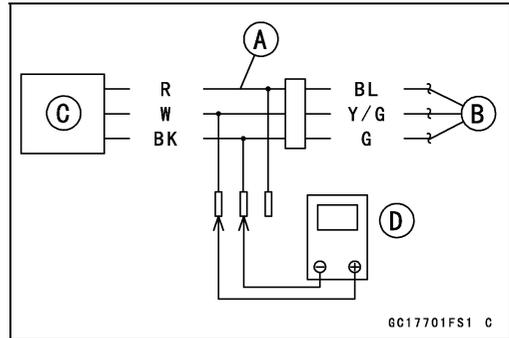
- Connect a digital meter [D] to the measuring adapter leads.



### Vehicle-down Sensor Output Voltage Connections to Adapter:

**Digital Meter (+) → W (sensor Y/G) lead**

**Digital Meter (-) → BK (sensor G) lead**



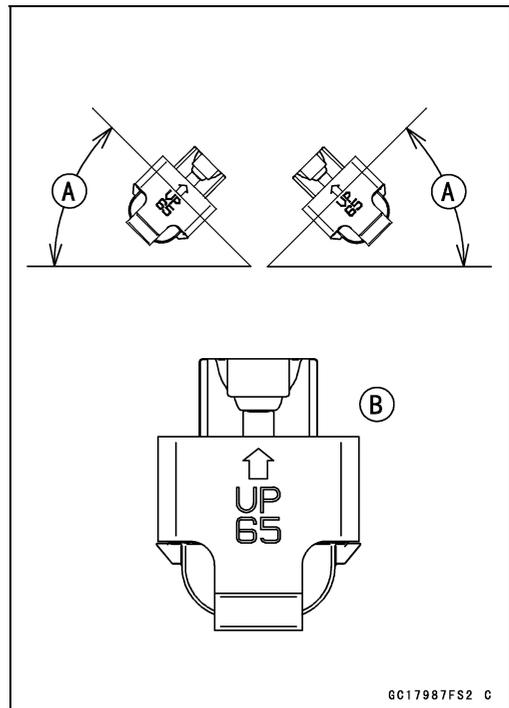
- Hold the sensor vertically.
- Measure the output voltage with the engine stopped and with the connector joined.
- Turn the ignition switch on.
- Tilt the sensor 60 ~ 70° or more [A] right or left, then hold the sensor almost vertical with the arrow mark pointed up [B], and measure the output voltage.

### 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**

- 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.

○ Disconnect the ECU and sensor connectors.

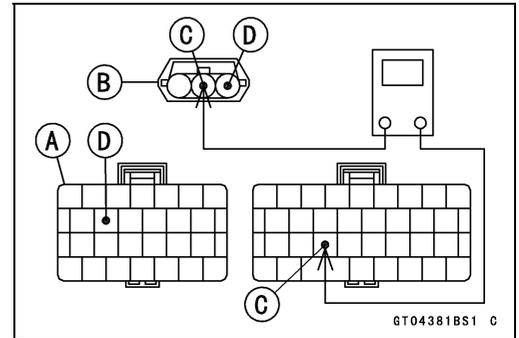
**Wiring Continuity Inspection**

**ECU Connector [A]** ←→

**Vehicle-down Sensor Connector [B]**

**Y/G lead (ECU terminal 75) [C]**

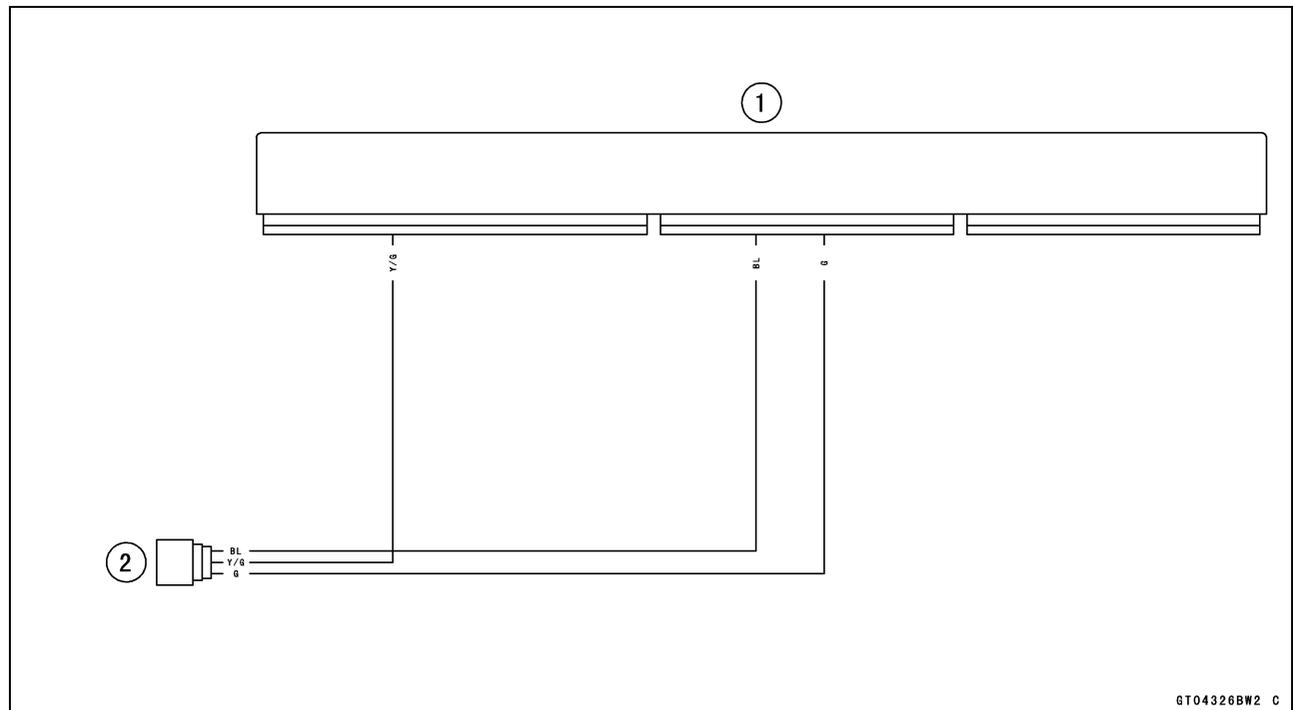
**G lead (ECU terminal 38) [D]**



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

★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

**Vehicle-down Sensor Circuit**



- 1. ECU
- 2. Vehicle-down Sensor

## 17-56 SELF-DIAGNOSIS SYSTEM

### ECU Communication Error (Service Code 39)

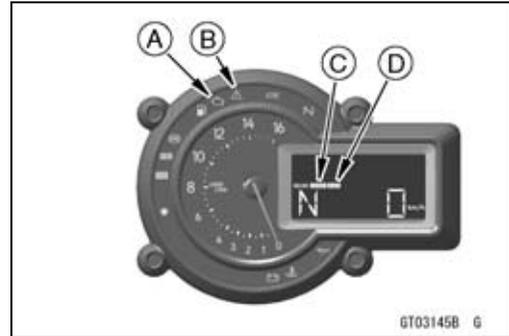
#### ECU Communication Line Inspection

○When the data is not sent from the ECU to the meter unit for more than about 5 seconds, the service code 39 is displayed.

- The data is sent through the CAN communication line.
- The service code 39 is detected with the meter unit.

○When the user mode, this communication error go on or blink the following items.

- Yellow Engine Warning Indicator Light (LED) [A]
- Yellow Warning Indicator Light (LED) [B]
- KEBC Indicator [C]
- KQS Indicator [D]



- Inspect the CAN communication line resistance (see CAN Communication Line Resistance Inspection in the Fuel System (DFI) chapter).
- ★ If the CAN communication line resistance is normal, check the wiring according following procedure.
- Remove the ECU and meter unit, check the wiring for continuity between main harness connectors.
- Disconnect the ECU and meter unit connectors.

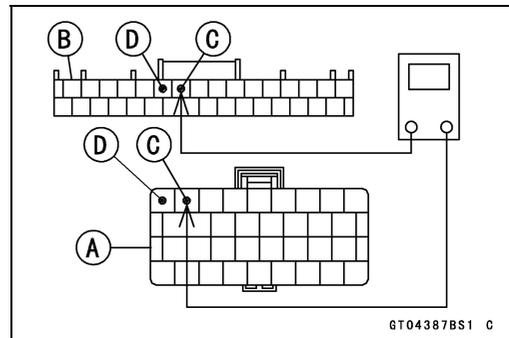
#### Wiring Continuity Inspection

ECU Connector [A] ↔ Meter Unit Connector [B]

LB lead (ECU terminal 60) [C]

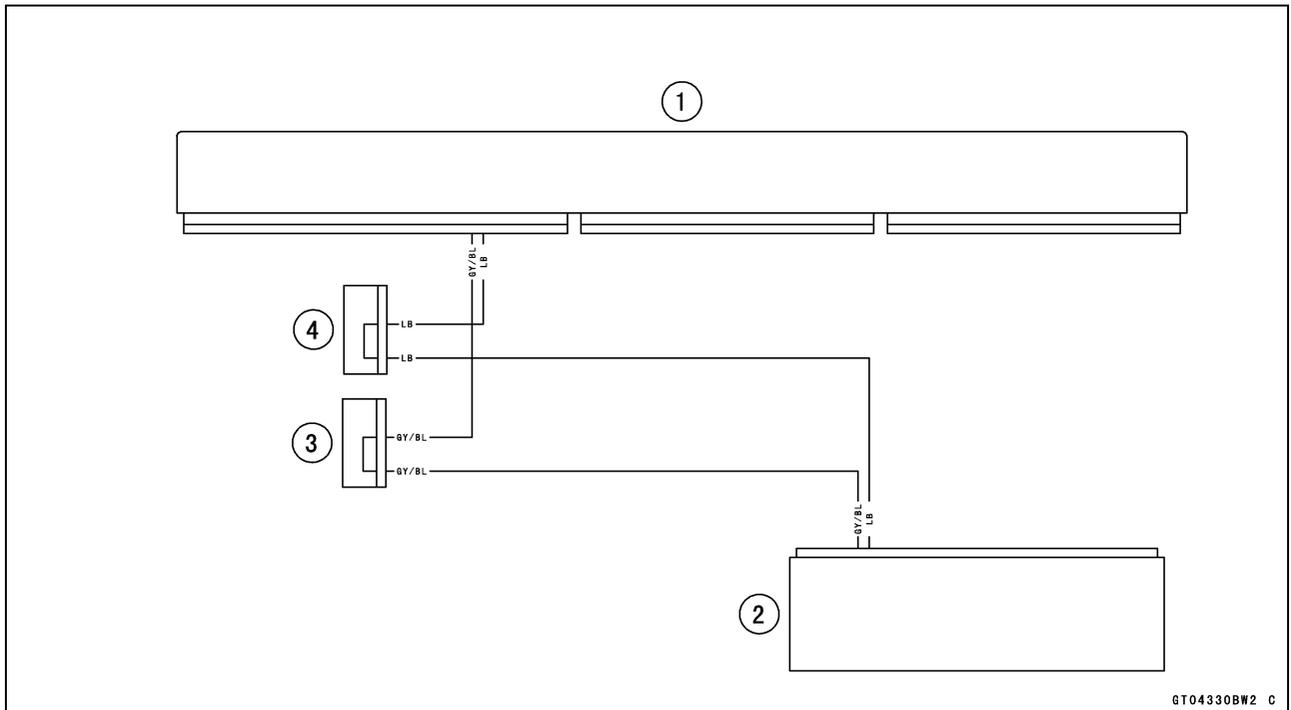
GY/BL lead (ECU terminal 61) [D]

- ★ 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 in the Fuel System (DFI) chapter).



ECU Communication Error (Service Code 39)

ECU Communication Line Circuit



- 1. ECU
- 2. Meter Unit
- 3. Joint Connector C
- 4. Joint Connector D

## 17-58 SELF-DIAGNOSIS SYSTEM

### Primary Fuel Injectors (Service Code 41, 42, 43, 44)

#### Primary Fuel Injector Removal/Installation

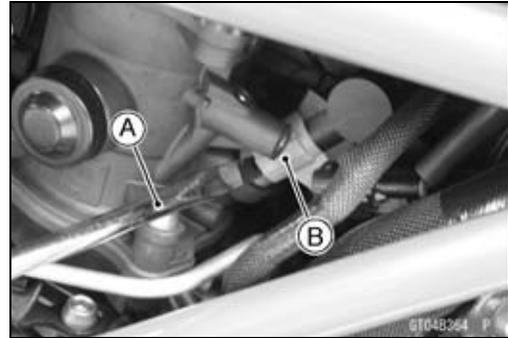
- Refer to the Throttle Body Assy Disassembly/Assembly in the Fuel System (DFI) chapter.

#### Primary Fuel Injector Audible Inspection

##### NOTE

○ Be sure the battery is fully charged.

- Start the engine, and let it idle.
- Apply the flat tip screwdriver [A] to the primary fuel injector [B]. Put the grip end onto your ear, and listen whether the primary fuel injector is clicking or not.
- A sound scope can also be used.
- The click interval becomes shorter as the engine speed rises.
- Do the same for the other primary fuel injectors.
- ★ If all the primary fuel injectors click at a regular intervals, the fuel injectors are normal.
- Turn the ignition switch off.
- ★ If any primary fuel injector does not click, check the primary fuel injector resistance (see Primary Fuel Injector Resistance Inspection).



#### Primary Fuel Injector Resistance Inspection

- Remove:
  - Air Intake Chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter)
- Disconnect:
  - Primary Fuel Injector Connector [A]



- Connect a digital meter to the terminals in each primary fuel injector [A].
- If necessary, use the measuring adapter.

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

- Measure the primary fuel injector resistance.

##### Primary Fuel Injector Resistance

**Standard: About 11.7 ~ 12.3  $\Omega$  @20°C (68°F)**

- ★ If the reading is out of the standard, replace the primary fuel injector.
- ★ If the reading is within the standard, check the power source voltage (see Primary Fuel Injector Power Source Voltage Inspection).



**Primary Fuel Injectors (Service Code 41, 42, 43, 44)**

**Primary Fuel Injector Power Source Voltage Inspection**

**NOTE**

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove:
  - Air Intake Chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter)
- Disconnect the primary fuel injector connector and connect the measuring adapter [A] between these connectors as shown.
  - Subharness [B]
  - Primary Fuel Injector #1 [C]

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

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

**Primary Fuel Injector Power Source Voltage Connections to Adapter:**

**For Primary Fuel Injector #1, #2, #3, #4**

**Digital Meter (+) → R (injector W/R) lead**

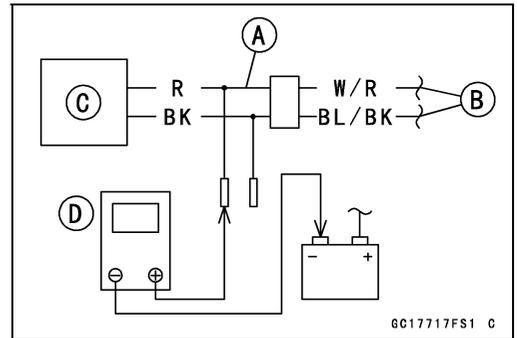
**Digital Meter (-) → Battery (-) Terminal**

- Measure the power source voltage with the engine stopped.
- Slide the engine start/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 injector relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the injector relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).
- ★ If there is still no battery voltage, check the injector relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the injector relay is normal, check the power source wiring (see Fuel Injector Circuit).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).
- ★ If the reading is in specification, check the output voltage (see Primary Fuel Injector Output Voltage Inspection).



6C17717FS1 C

## 17-60 SELF-DIAGNOSIS SYSTEM

### Primary Fuel Injectors (Service Code 41, 42, 43, 44)

#### Primary Fuel Injector Output Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove:
  - ECU (see ECU Removal in the Fuel System (DFI) chapter)
- 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**

#### Primary Fuel Injector Output Voltage

##### Connections to ECU Connector:

##### For Primary Fuel Injector #1

Digital Meter (+) → BL/BK lead (ECU terminal 20)

Digital Meter (-) → Frame Ground Terminal

##### For Primary Fuel Injector #2

Digital Meter (+) → BL/R lead (ECU terminal 8)

Digital Meter (-) → Frame Ground Terminal

##### For Primary Fuel Injector #3

Digital Meter (+) → BL/O lead (ECU terminal 2)

Digital Meter (-) → Frame Ground Terminal

##### For Primary Fuel Injector #4

Digital Meter (+) → BL/G lead (ECU terminal 4)

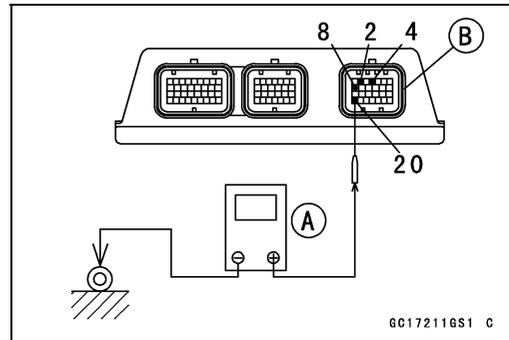
Digital Meter (-) → Frame Ground Terminal

- Measure the output voltage with the engine stopped and with the connector joined.
- Slide the engine start/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 in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



**Primary Fuel Injectors (Service Code 41, 42, 43, 44)**

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

○ Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**

**ECU Connector [A] ↔ Primary Fuel Injector Connector [B]**

**For Primary Fuel Injector #1 [C]**

**BL/BK lead (ECU terminal 20) [D]**

**For Primary Fuel Injector #2**

**BL/R lead (ECU terminal 8)**

**For Primary Fuel Injector #3**

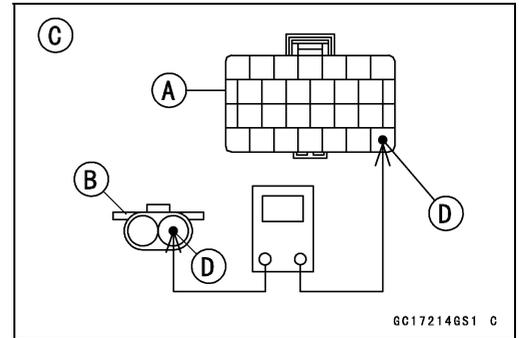
**BL/O lead (ECU terminal 2)**

**For Primary Fuel Injector #4**

**BL/G lead (ECU terminal 4)**

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

★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



## 17-62 SELF-DIAGNOSIS SYSTEM

### Primary Fuel Injectors (Service Code 41, 42, 43, 44)

#### Primary Fuel Injector Fuel Line Inspection

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Air Intake Chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter)
- Disconnect:
  - Primary and Secondary Fuel Hoses (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**

**Fuel is flammable and explosive under certain conditions and can cause severe burns. 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.**

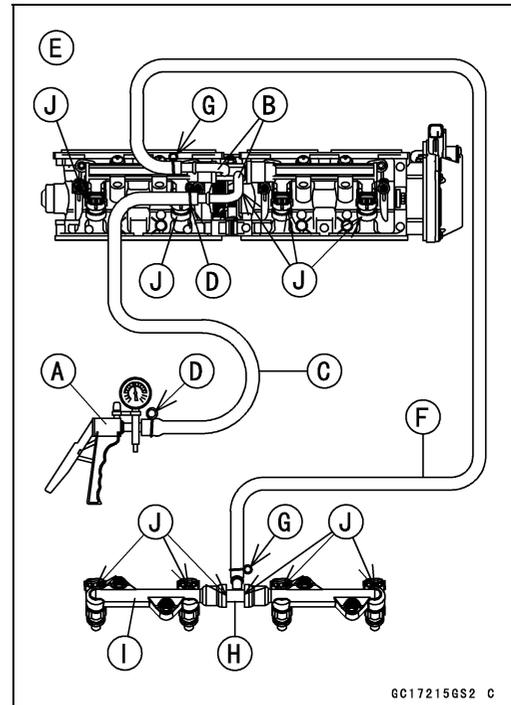
- Check the fuel injector fuel line for leakage as follows.
- Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with the fuel hose [C] (both ends with the clamps [D]) as shown.
  - Rear View [E]
- Connect the fuel hose [F] (both ends with the clamps [G]) between the delivery pipes [H] of the throttle body assy and nozzle assy [I] as shown.
- Apply soap and water solution to the areas [J] as shown.
- Watching the pressure gauge, squeeze the pump lever, and build up the pressure until the pressure reaches the maximum pressure.

**Fuel Injector Fuel Line Maximum Pressure**  
Standard: 380 kPa (3.9 kgf/cm<sup>2</sup>, 55 psi)

#### **NOTICE**

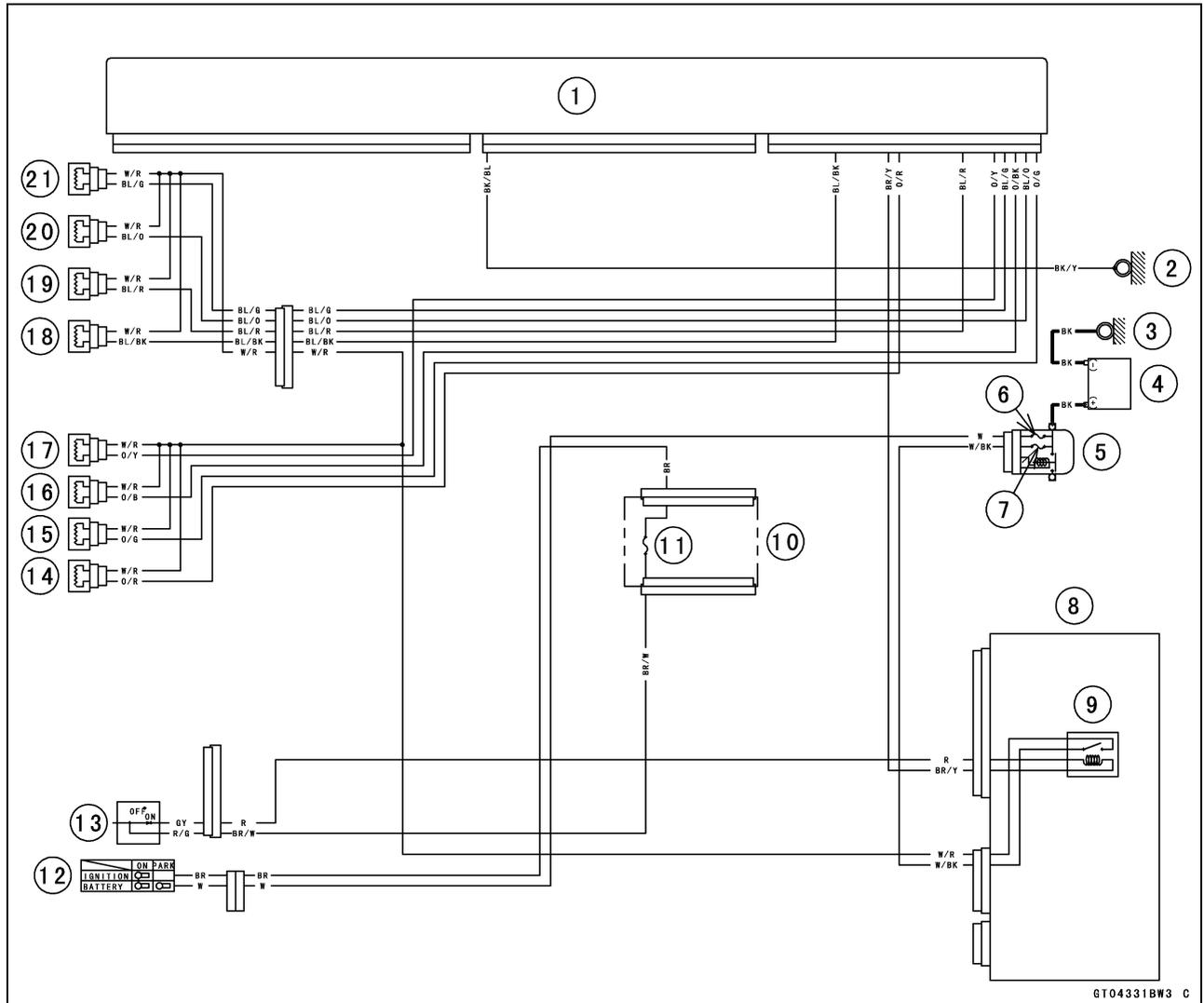
**During pressure testing, do not exceed the maximum pressure for which the system is designed.**

- 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 the removed parts (see appropriate chapters).
- Start the engine and check for fuel leakage.



Primary Fuel Injectors (Service Code 41, 42, 43, 44)

Fuel Injector Circuit



GT04331BW3 C

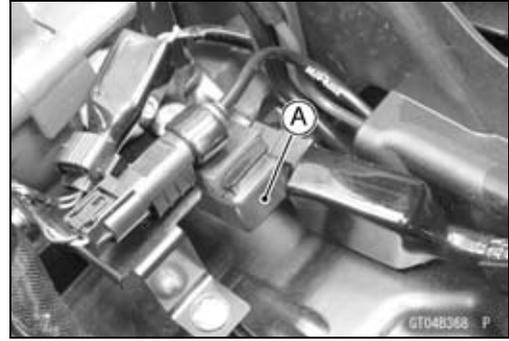
1. ECU
2. Frame Ground 2
3. Engine Ground
4. Battery 12 V 8.6 Ah
5. Starter Relay
6. Main Fuse 30 A
7. ECU Fuse 15 A
8. Relay Box
9. Injector Relay
10. Fuse Box 1
11. Ignition Fuse 15 A
12. Ignition Switch
13. Engine Start/Stop Switch (Engine Stop)
14. Secondary Fuel Injector #1
15. Secondary Fuel Injector #2
16. Secondary Fuel Injector #3
17. Secondary Fuel Injector #4
18. Primary Fuel Injector #1
19. Primary Fuel Injector #2
20. Primary Fuel Injector #3
21. Primary Fuel Injector #4

# 17-64 SELF-DIAGNOSIS SYSTEM

## Fuel Pump Relay (Service Code 46)

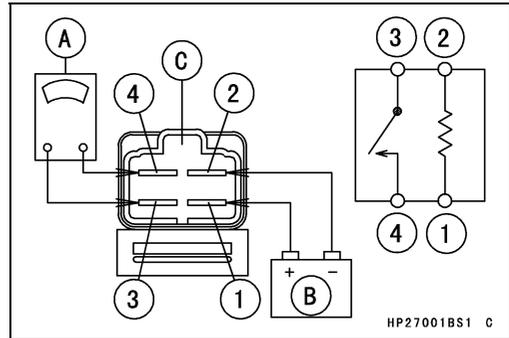
### Fuel Pump Relay Removal/Installation

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Fuel Pump Relay [A]
- Installation is the reverse of removal.



### Fuel Pump Relay Inspection

- Remove:
  - Fuel Pump Relay (see Fuel Pump Relay Removal/Installation)
- Connect a tester [A] and a 12 V battery [B] to the relay [C] as shown.
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.



HP27001BS1 C

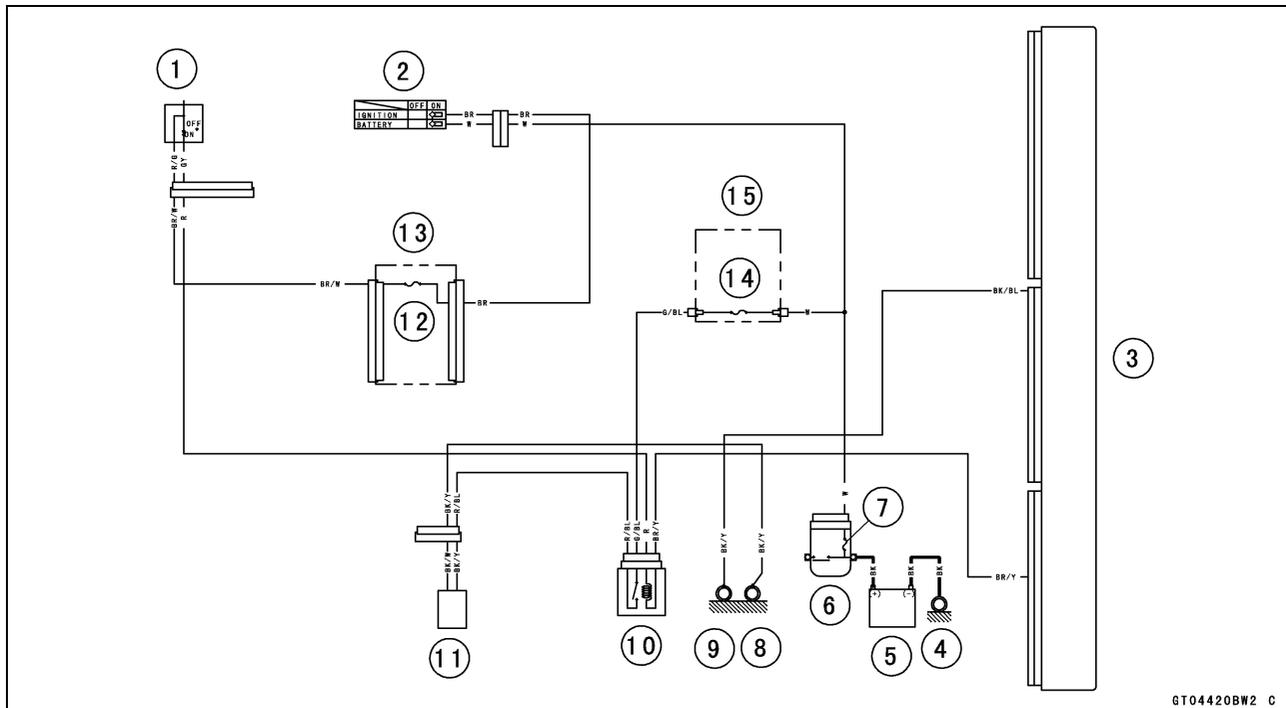
#### Testing Relay

- Criteria: When battery is connected  $\Rightarrow 0 \Omega$
- When battery is disconnected  $\Rightarrow \infty \Omega$

Relay Coil Terminals: [1] and [2]

Relay Switch Terminals: [3] and [4]

### Fuel Pump Relay Circuit



GT04420BW2 C

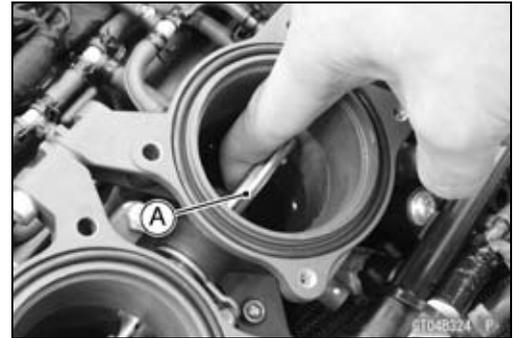
- |   |                               |
|---|-------------------------------|
| 1. Engine Start/Stop Switch (Engine Stop) | 9. Frame Ground 2             |
| 2. Ignition Switch                        | 10. Fuel Pump Relay           |
| 3. ECU                                    | 11. Fuel Pump                 |
| 4. Engine Ground                          | 12. Ignition Fuse 15 A        |
| 5. Battery 12 V 8.6 Ah                    | 13. Fuse Box 1                |
| 6. Starter Relay                          | 14. Fuel Pump Relay Fuse 10 A |
| 7. Main Fuse 30 A                         | 15. Fuse Box 3                |
| 8. Frame Ground 3                         |                               |

**Return Spring (Service Code 49)****Return Spring Removal****NOTICE**

Do not remove return spring in the gear case [A] since it has been set with precision at the factory.

**Return Spring Inspection**

- Turn the ignition switch off.
- Remove  
Air Intake Chamber (see Air Intake Chamber Removal in the Fuel System (DFI) chapter)
- Check that the throttle valves [A] move lightly by pushing finger without the spring force.
- ★ If the throttle valves move lightly, the return spring is broken, replace the throttle body assy.
- ★ If the throttle valves move hardly and return them by the return spring, check the output voltage of the throttle position sensor (see Throttle Position Sensor Output Voltage Inspection).
- ★ If the output voltage is good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



## 17-66 SELF-DIAGNOSIS SYSTEM

### 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 in the Fuel System (DFI) chapter).
- 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 7)
- Digital Meter (-) → Frame Ground Terminal

##### For Stick Coil #2

- Digital Meter (+) → BK/R lead (terminal 6)
- Digital Meter (-) → Frame Ground Terminal

##### For Stick Coil #3

- Digital Meter (+) → BK/O lead (terminal 25)
- Digital Meter (-) → Frame Ground Terminal

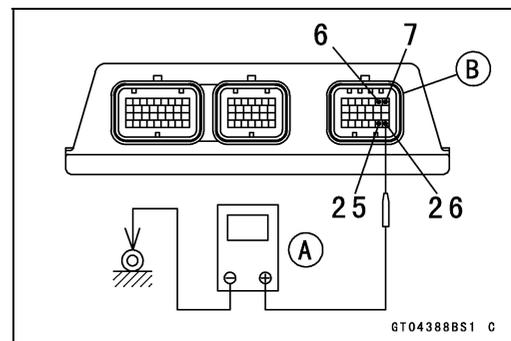
##### For Stick Coil #4

- Digital Meter (+) → BK/G lead (terminal 26)
- Digital Meter (-) → Frame Ground Terminal

- Measure the input voltage to each primary winding of the stick coils with the engine stopped and with the connectors joined.
- Slide the engine start/stop switch to run position.
- Turn the ignition switch on.

#### Input Voltage

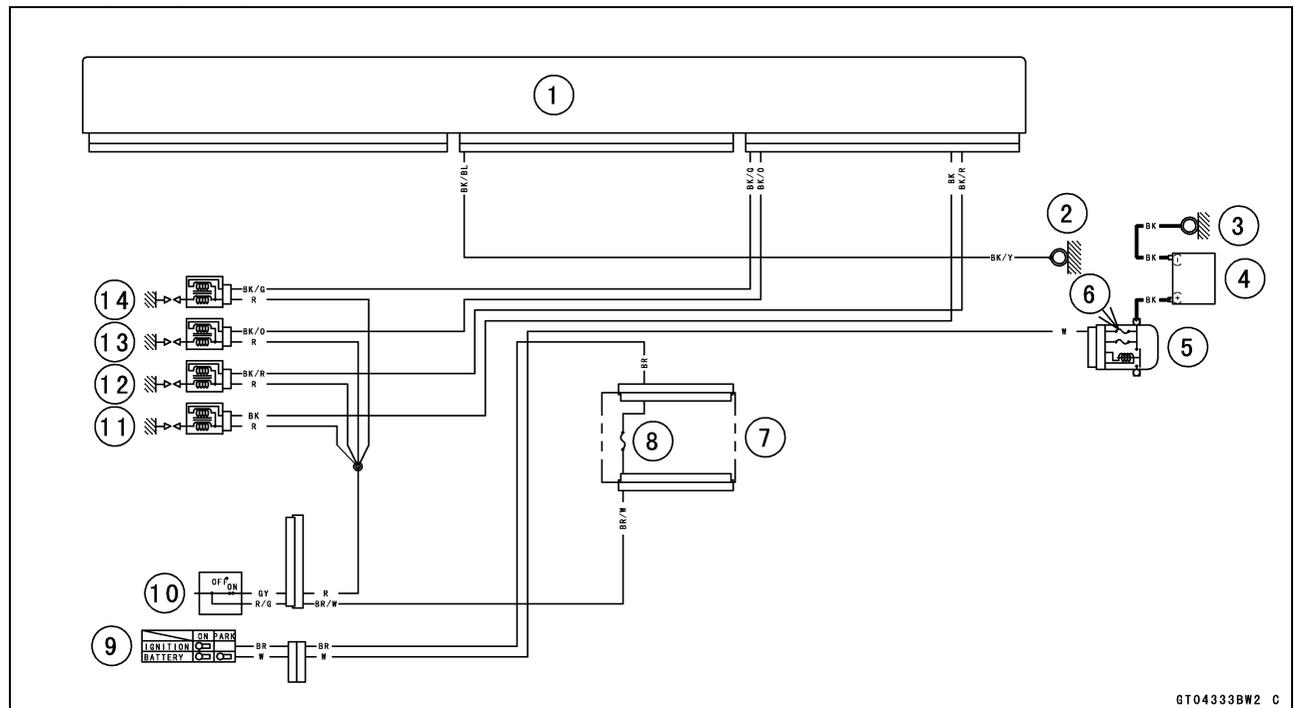
**Standard: Battery Voltage**



**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 Stick Coil Circuit).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).
- ★ If the input voltage is within the standard, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

**Stick Coil Circuit**



1. ECU
2. Frame Ground 2
3. Engine Ground
4. Battery 12 V 8.6 Ah
5. Starter Relay
6. Main Fuse 30 A
7. Fuse Box 1
8. Ignition Fuse 15 A
9. Ignition Switch
10. Engine Start/Stop Switch (Engine Stop)
11. Stick Coil #1
12. Stick Coil #2
13. Stick Coil #3
14. Stick Coil #4

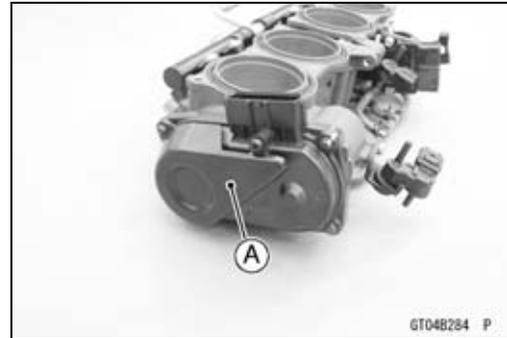
## 17-68 SELF-DIAGNOSIS SYSTEM

### ETV Actuator (Service Code 58)

#### ETV Actuator Removal

##### NOTICE

Do not remove ETV actuator in the gear case [A] since it has been set with precision at the factory.



#### ETV Actuator Input Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove the ECU (see ECU Removal in the Fuel System (DFI) chapter)
- Do not disconnect the ECU connectors.
- Connect the digital meter [A] to the connector [B] with the needle adapter set.

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

##### ETV Actuator Input Voltage

###### Connection:

**Digital Meter (+)** → W/G lead (ECU terminal 78)

**Digital Meter (-)** → BK/O lead (ECU terminal 70)

- Turn the ignition switch on.
- Measure the input voltage.

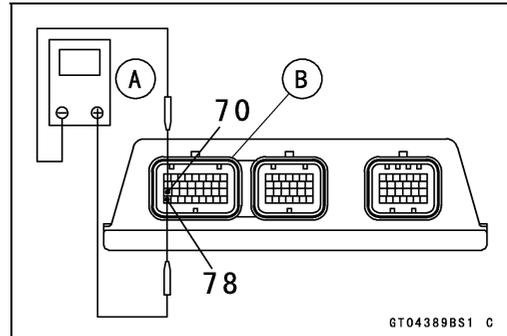
##### Input Voltage

**Standard: About DC 1 ~ 2 V**

- Turn the ignition switch off.
- ★ If the reading is out of the standard, check the following items.
  - ETV Actuator Relay (see ETV Actuator Relay Inspection)
  - Wiring (see ETV Actuator Circuit)
- ★ If the above items are good, replace the throttle body assy (see Throttle Body Assy Removal/Installation in the Fuel System (DFI) chapter) and/or the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

#### ETV Actuator Relay Inspection

- Refer to the Relay Circuit Inspection in the Electrical System chapter.
- ★ If the ETV actuator relay is normal, check the wiring for continuity (see ETV Actuator Circuit).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).





## 17-70 SELF-DIAGNOSIS SYSTEM

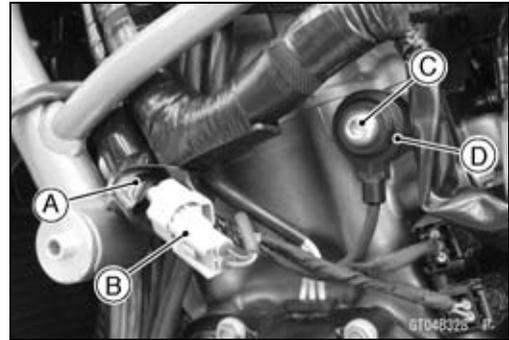
### Knock Sensor (Service Code 69)

#### Knock Sensor Removal

##### NOTICE

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

- Remove:
  - Intake Duct Removal (see Intake Duct Removal in the Fuel System (DFI) chapter)
- Slide the dust cover [A].
- Disconnect the knock sensor lead connector [B].
- Remove:
  - Knock Sensor Bolt [C]
  - Knock Sensor [D]



#### Knock Sensor Installation

- Installation is the reverse of removal.
- Tighten:
  - Torque - Knock Sensor Bolt: 25 N·m (2.5 kgf·m, 18 ft·lb)

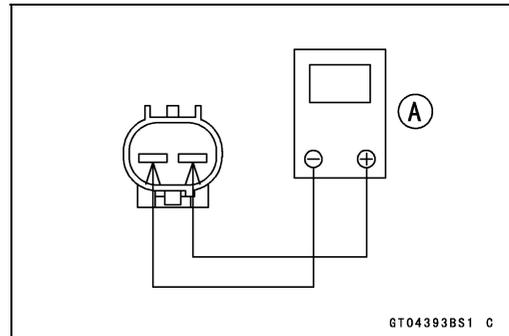
#### Knock Sensor Resistance Inspection

- Turn the ignition switch off.
- Remove:
  - Intake Duct Removal (see Intake Duct Removal in the Fuel System (DFI) chapter)
- Slide the dust cover.
- Disconnect the knock sensor lead connector.
- Connect a digital meter [A] to the terminals of the knock sensor.
- Measure the knock sensor resistance.

##### Knock Sensor Resistance

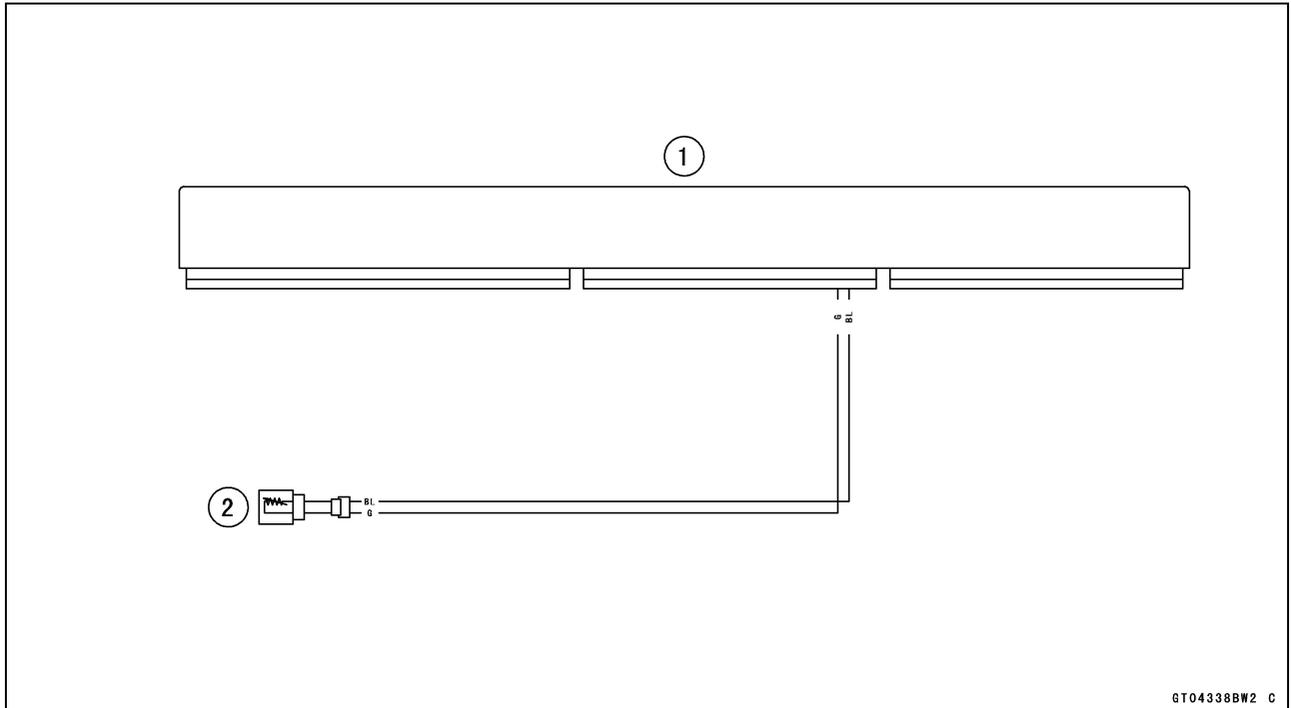
Standard: 504 ~ 616 kΩ

- ★ If the reading is out of the standard, replace the knock sensor.
- ★ If the reading is within the standard, check the wiring for continuity (see Knock Sensor Circuit).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



Knock Sensor (Service Code 69)

Knock Sensor Circuit



GT04338BW2 C

- 1. ECU
- 2. Knock Sensor

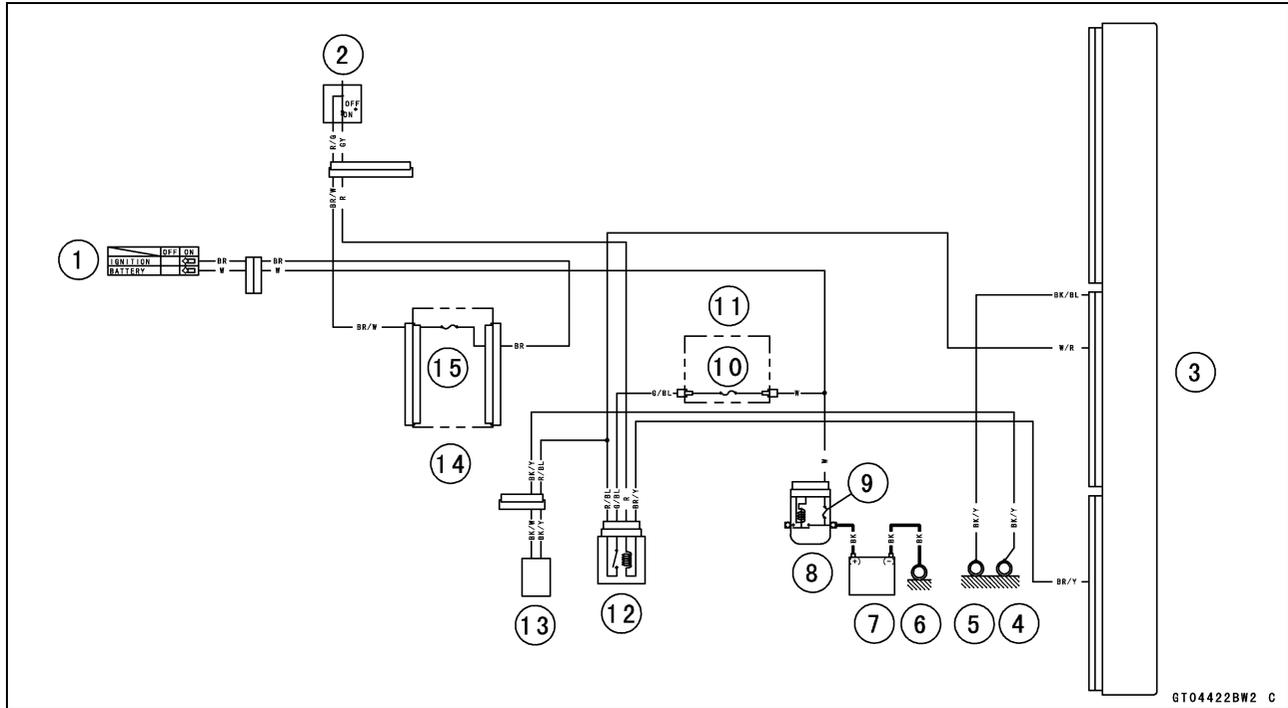
# 17-72 SELF-DIAGNOSIS SYSTEM

## Battery Voltage (Service Code 97)

### Battery Voltage Inspection

- Refer to the Charging Condition Inspection in the Electrical System chapter for battery voltage inspection.
- ★ If the battery voltage is good condition, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

### Battery Monitor Circuit

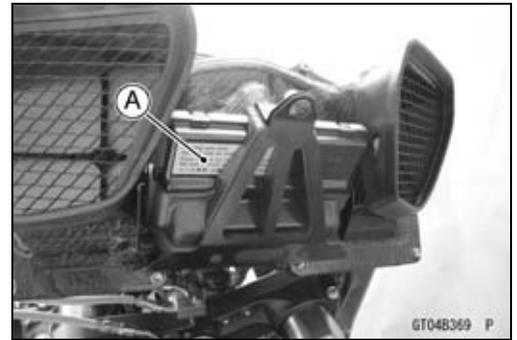


- |   |                               |
|---|-------------------------------|
| 1. Ignition Switch                        | 9. Main Fuse 30 A             |
| 2. Engine Start/Stop Switch (Engine Stop) | 10. Fuel Pump Relay Fuse 10 A |
| 3. ECU                                    | 11. Fuse Box 3                |
| 4. Frame Ground 3                         | 12. Fuel Pump Relay           |
| 5. Frame Ground 2                         | 13. Fuel Pump                 |
| 6. Engine Ground                          | 14. Fuse Box 1                |
| 7. Battery 12 V 8.6 Ah                    | 15. Ignition Fuse 15 A        |
| 8. Starter Relay                          |                               |

### ETV Control Circuit (Service Code 98)

#### ***ETV Control Circuit Inspection***

- The ETV control circuit is controlled in the ECU [A].  
So, the ETV control circuit cannot be inspected.
- When the service code 98 is displayed on the LCD, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

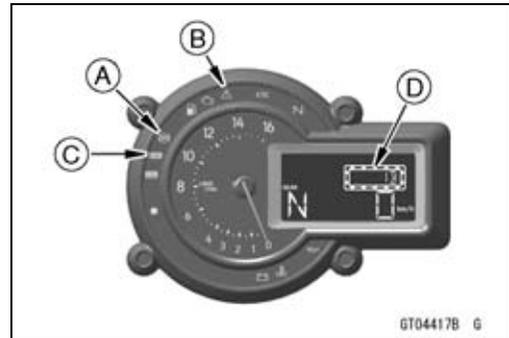


# 17-74 SELF-DIAGNOSIS SYSTEM

## KIBS Hydraulic Unit Communication Error (Service Code 1B)

### KIBS Hydraulic Unit Communication Line Inspection

- When the data (for status of KIBS hydraulic unit) is not sent from the KIBS hydraulic unit to the meter unit and ECU, the service code 1B is displayed.
- The data is sent through the CAN communication line.
- The service code 1B is detected with the meter unit.
  
- When the service code 1B is detected, the yellow ABS indicator light (LED) [A] and yellow warning indicator light (LED) [B] go on, white KIBS indicator light (LED) [C] blinks and the code of 1B [D] displayed on the LCD.



- Check the wiring for continuity between main harness connectors.
- Disconnect:
  - KIBS Hydraulic Unit Connector (see KIBS Hydraulic Unit Removal in the Brakes chapter)
  - Meter Unit Connector (see Meter Unit Removal in the Electrical System chapter)

#### Wiring Continuity Inspection

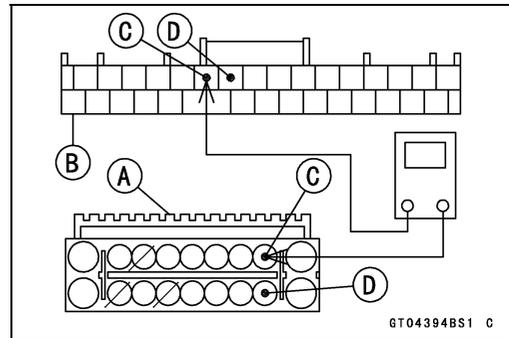
**KIBS Hydraulic Unit Connector [A] ↔**

**Meter Unit Connector [B]**

**GY/BL lead (KIBS Hydraulic Unit terminal 2) [C]**

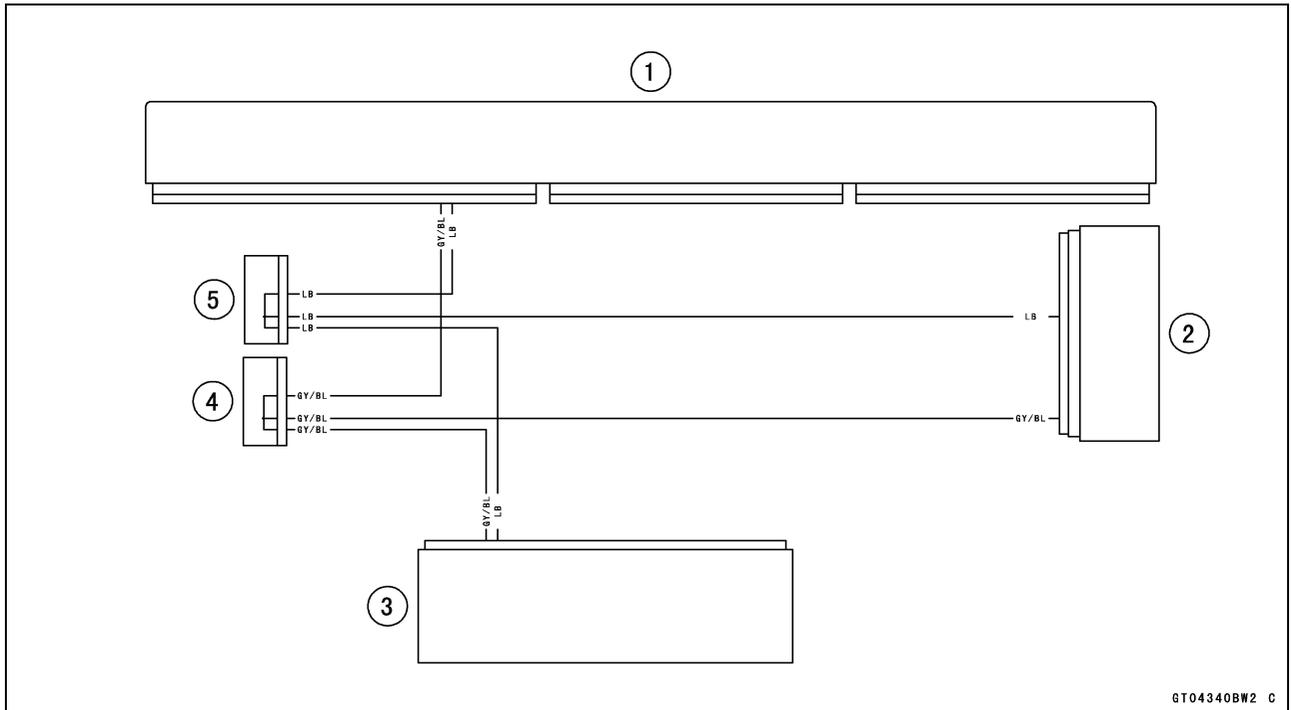
**LB lead (KIBS Hydraulic Unit terminal 11) [D]**

- ★ If the wiring is good, replace the KIBS hydraulic unit (see KIBS Hydraulic Unit Removal/Installation in the Brakes chapter).



KIBS Hydraulic Unit Communication Error (Service Code 1B)

KIBS Hydraulic Unit Communication Line Circuit



1. ECU
2. KIBS Hydraulic Unit
3. Meter Unit
4. Joint Connector C
5. Joint Connector D

## 17-76 SELF-DIAGNOSIS SYSTEM

### ESD (Electronic Steering Damper) ECU Communication Error (Service Code 3C)

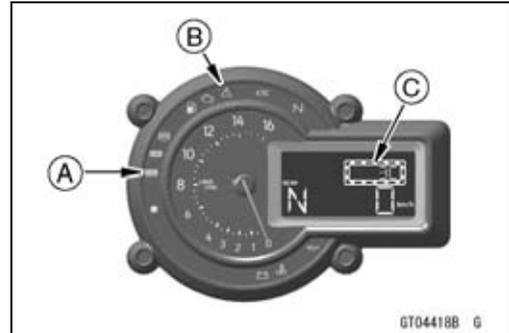
#### **ESD ECU Communication Line Inspection**

○When the data (for status of ESD system) is not sent from the ESD ECU to the meter unit and ECU, the service code 3C is displayed.

○The data is sent through the CAN communication line.

○The service code 3C is detected with the meter unit.

○When the service code 3C is detected, the white ESD indicator light (LED) [A] blinks, yellow warning indicator light (LED) [B] goes on and code of 3C [C] displayed on the LCD.



● Check the wiring for continuity between main harness connectors.

● Disconnect:

ESD ECU Connector (see ESD (Electronic Steering Damper) ECU Removal in the Steering chapter)

Meter Unit Connector (see Meter Unit Removal in the Electrical System chapter)

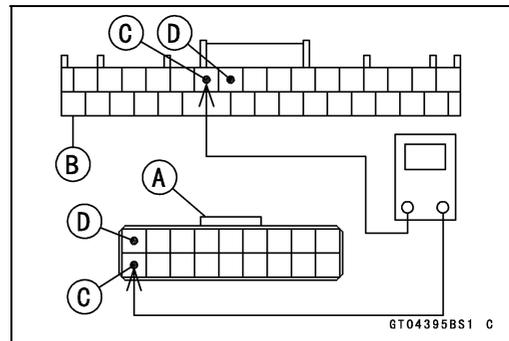
#### **Wiring Continuity Inspection**

**ESD ECU Connector [A] ↔ Meter Unit Connector [B]**

**GY/BL lead (ESD ECU terminal 10) [C]**

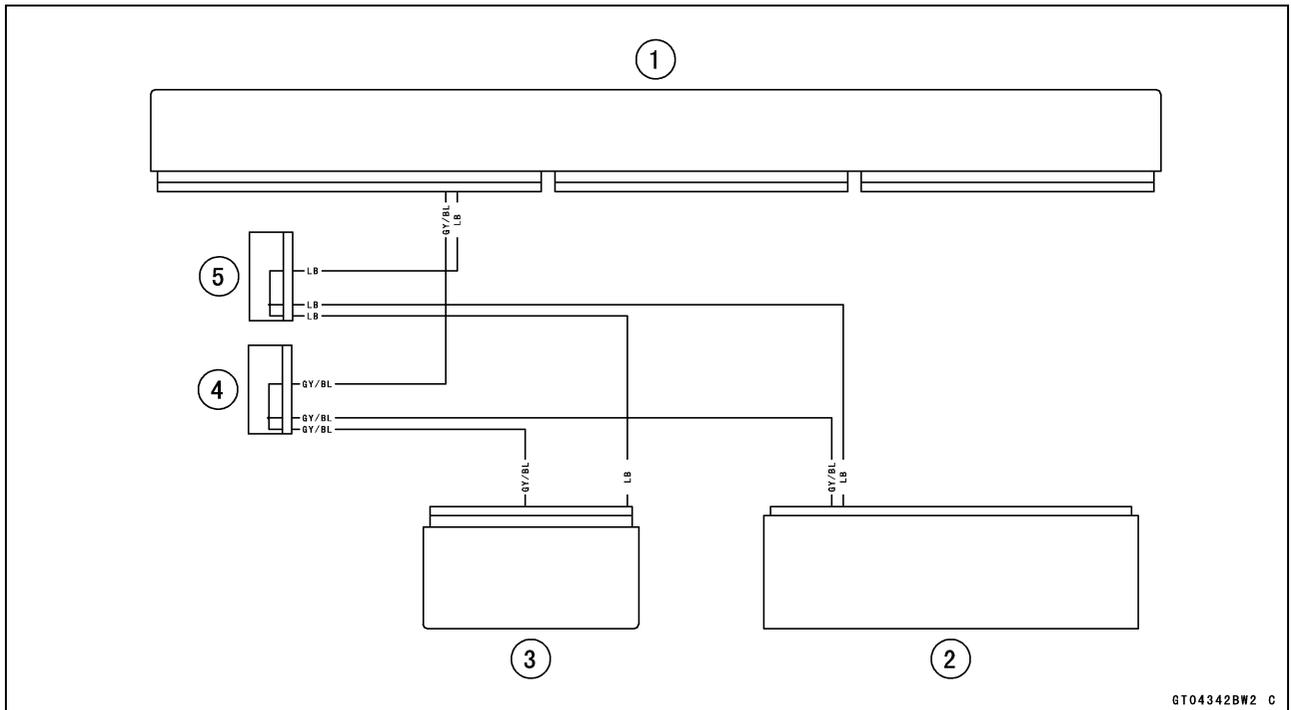
**LB lead (ESD ECU terminal 1) [D]**

★If the wiring is good, replace the ESD ECU (see ESD (Electronic Steering Damper) ECU Removal/Installation in the Steering chapter).



ESD (Electronic Steering Damper) ECU Communication Error (Service Code 3C)

ESD ECU Communication Line Circuit



GT04342BW2 C

- 1. ECU
- 2. Meter Unit
- 3. ESD ECU
- 4. Joint Connector C
- 5. Joint Connector D

# 17-78 SELF-DIAGNOSIS SYSTEM

## Quick Shifter Sensor (Service Code 3E)

### Quick Shifter Sensor Removal/Installation

- Refer to the Quick Shifter Sensor Removal/Installation in the Crankshaft/Transmission chapter.

### Quick Shifter Sensor Input Voltage Inspection

#### NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch off.
- Disconnect:
  - Quick Shifter Sensor Lead Connector [A]
  
- Connect the measuring adapter [A] between the main harness connector and quick shifter sensor connector.
  - Main Harness [B]
  - Quick Shifter Sensor [C]
- Special Tool - Measuring Adapter: 57001-1700**
- Connect a digital meter [D] to the measuring adapter leads.

#### Quick Shifter Sensor Input Voltage Connections to Adapter:

Digital Meter (+) → R (sensor BL/Y) lead

Digital Meter (-) → BK (sensor G) 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 standard, check the output voltage (see Quick Shifter 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.

#### Wiring Continuity Inspection

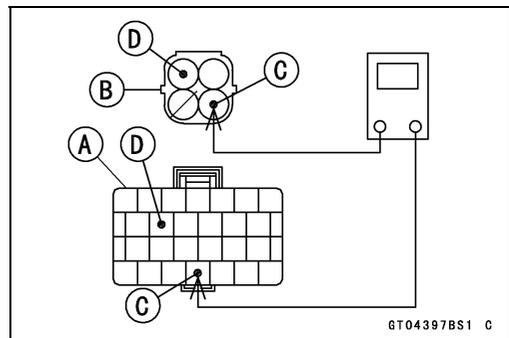
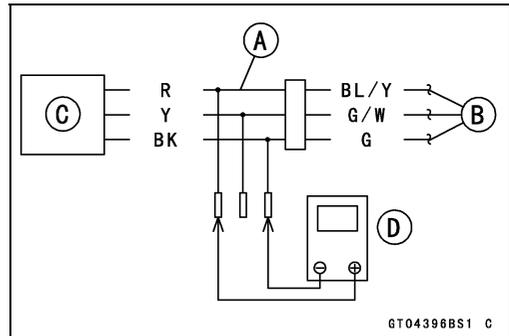
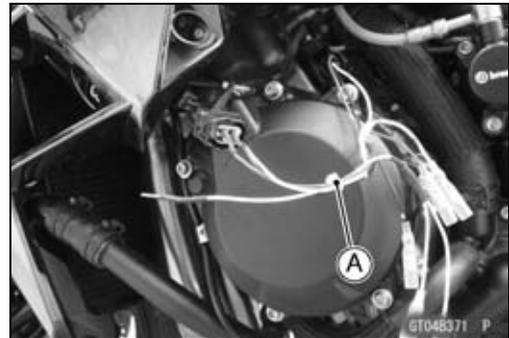
ECU Connector [A] ↔

Quick Shifter Sensor Connector [B]

BL/Y lead (ECU terminal 49) [C]

G lead (ECU terminal 38) [D]

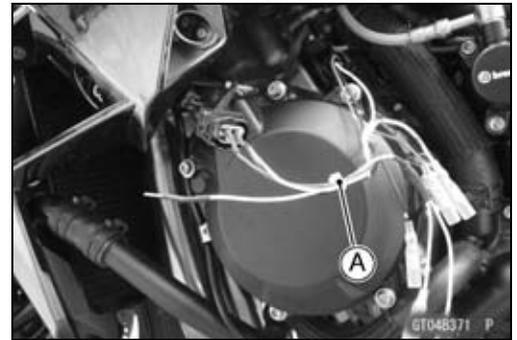
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



**Quick Shifter Sensor (Service Code 3E)**

**Quick Shifter Sensor Output Voltage Inspection**

- Measure the output voltage at the quick shifter sensor in the same way as input voltage inspection, note the following.
- Disconnect the quick shifter sensor lead connector and connect the measuring adapter [A] between these connectors.
  - Main Harness [B]
  - Quick Shifter Sensor [C]
  - Digital Meter [D]



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

**Quick Shifter Sensor Output Voltage**

**Connections to Adapter:**

**Digital Meter (+) → Y (sensor G/W) lead**

**Digital Meter (-) → BK (sensor G) lead**

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

**Output Voltage**

**Standard: DC 2.45 ~ 4.65 V**

**NOTE**

○ By shifting up the gear, confirm the output voltage will be raise.

- Turn the ignition switch off.
- ★ If the reading is out of the standard, check the quick shifter sensor resistance (see Quick Shifter Sensor Resistance Inspection).
- ★ If the reading is within the standard, remove the ECU and check the wiring for continuity between main harness connectors.
- Disconnect the ECU and sensor connectors.

**Wiring Continuity Inspection**

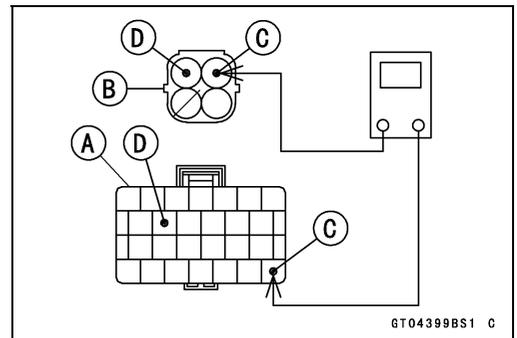
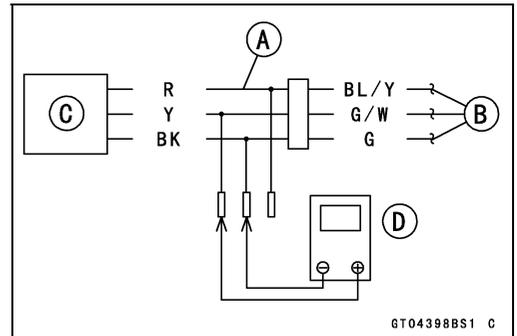
**ECU Connector [A] ↔**

**Quick Shifter Sensor Connector [B]**

**G/W lead (ECU terminal 46) [C]**

**G lead (ECU terminal 38) [D]**

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



# 17-80 SELF-DIAGNOSIS SYSTEM

## Quick Shifter Sensor (Service Code 3E)

### Quick Shifter Sensor Resistance Inspection

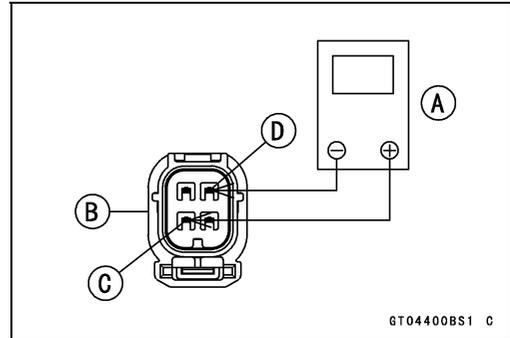
- Disconnect the quick shifter sensor lead connector.
- Connect a digital meter [A] to the quick shifter sensor lead connector [B].
- Measure the quick shifter sensor resistance.

### Quick Shifter Sensor Resistance

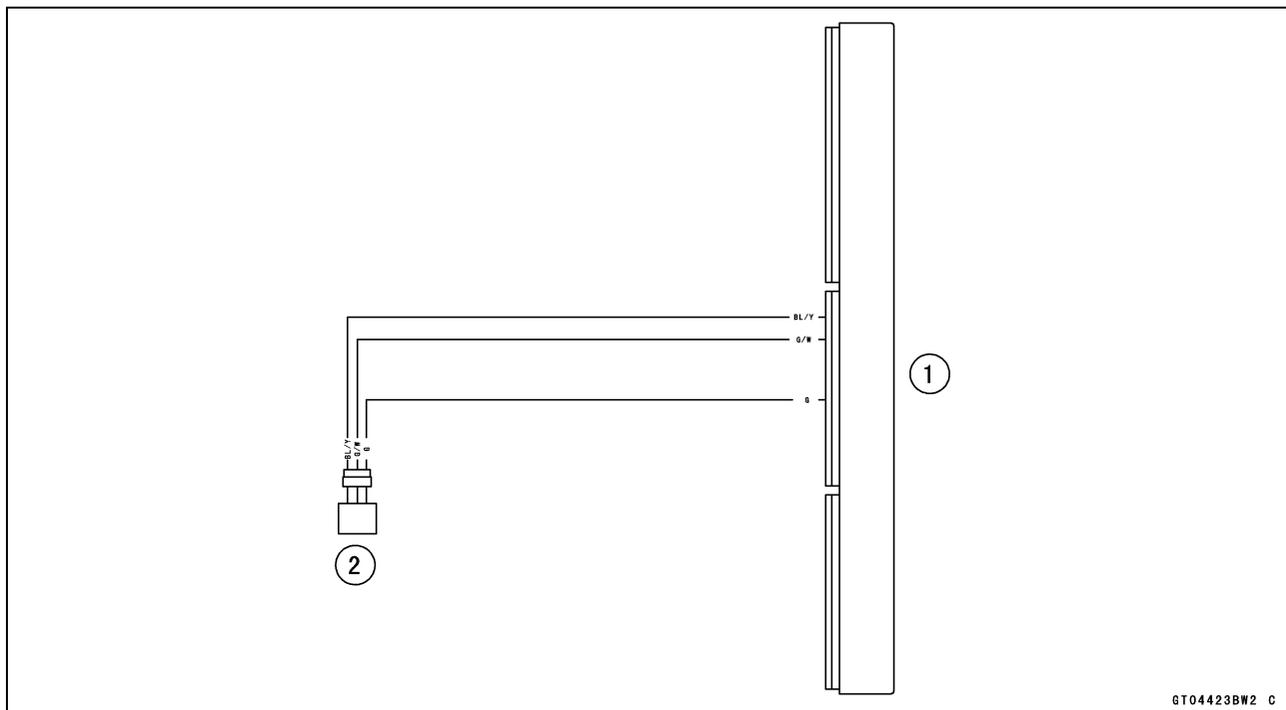
Connections: BL/Y lead [C] ↔ G lead [D]

Standard: 209 ~ 231 kΩ

- ★ 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 in the Fuel System (DFI) chapter).



### Quick Shifter Sensor Circuit



1. ECU
2. Quick Shifter Sensor

**Secondary Fuel Injectors (Service Code 4A, 4B, 4C, 4D)**

**Secondary Fuel Injector Removal/Installation**

- Refer to the Nozzle Assy Disassembly/Assembly in the Fuel System (DFI) chapter.

**Secondary Fuel Injector Resistance Inspection**

- Remove:  
Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Disconnect:  
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 11.7 ~ 12.3  $\Omega$  @20°C (68°F)**

- ★ If the reading is out of the standard, replace the secondary fuel injector.
- ★ If the reading is within the standard, check the power source voltage (see Secondary Fuel Injector Power Source Voltage Inspection).



## 17-82 SELF-DIAGNOSIS SYSTEM

### Secondary Fuel Injectors (Service Code 4A, 4B, 4C, 4D)

#### Secondary Fuel Injector Power Source Voltage Inspection

##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
- Disconnect the secondary fuel injector connector and connect the measuring adapter [A] between these connectors as shown.
  - Main Harness [B]
  - Secondary Fuel Injector #1 [C]

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

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

#### Secondary Fuel Injector Power Source Voltage Connections to Adapter:

**For Secondary Fuel Injector #1, #2, #3, #4**

**Digital Meter (+) → R (injector W/R) lead**

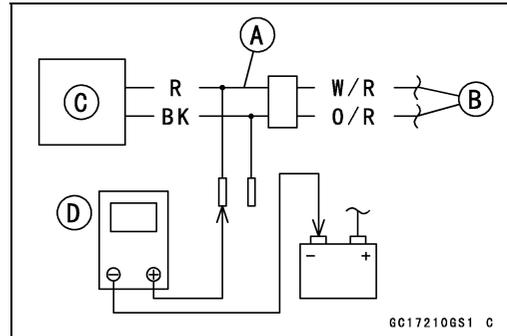
**Digital Meter (-) → Battery (-) Terminal**

- Measure the power source voltage with the engine stopped.
- Slide the engine start/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 injector relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the injector relay is normal, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).
- ★ If there is still no battery voltage, check the injector relay (see Relay Circuit Inspection in the Electrical System chapter).
- ★ If the injector relay is normal, check the power source wiring (see Fuel Injector Circuit).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).
- ★ If the reading is in specification, check the output voltage (see Secondary Fuel Injector Output Voltage Inspection).



**Secondary Fuel Injectors (Service Code 4A, 4B, 4C, 4D)**

**Secondary Fuel Injector Output Voltage Inspection**

**NOTE**

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove:  
ECU (see ECU Removal in the Fuel System (DFI) chapter)
- 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**

**Secondary Fuel Injector Output Voltage**

**Connections to ECU Connector:**

**For Secondary Fuel Injector #1**

Digital Meter (+) → O/R lead (ECU terminal 14)

Digital Meter (-) → Frame Ground Terminal

**For Secondary Fuel Injector #2**

Digital Meter (+) → O/G lead (ECU terminal 1)

Digital Meter (-) → Frame Ground Terminal

**For Secondary Fuel Injector #3**

Digital Meter (+) → O/BK lead (ECU terminal 3)

Digital Meter (-) → Frame Ground Terminal

**For Secondary Fuel Injector #4**

Digital Meter (+) → O/Y lead (ECU terminal 5)

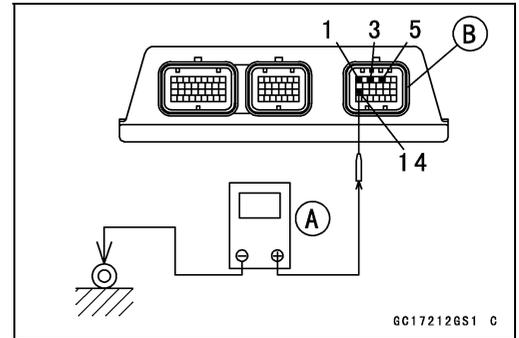
Digital Meter (-) → Frame Ground Terminal

- Measure the output voltage with the engine stopped and with the connector joined.
- Slide the engine start/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 in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



## 17-84 SELF-DIAGNOSIS SYSTEM

### Secondary Fuel Injectors (Service Code 4A, 4B, 4C, 4D)

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

○ Disconnect the ECU and sensor connectors.

#### Wiring Continuity Inspection

ECU Connector [A] ↔ Secondary Fuel Injector Connector [B]

For Secondary Fuel Injector #1 [C]

O/R lead (ECU terminal 14) [D]

For Secondary Fuel Injector #2

O/G lead (ECU terminal 1)

For Secondary Fuel Injector #3

O/BK lead (ECU terminal 3)

For Secondary Fuel Injector #4

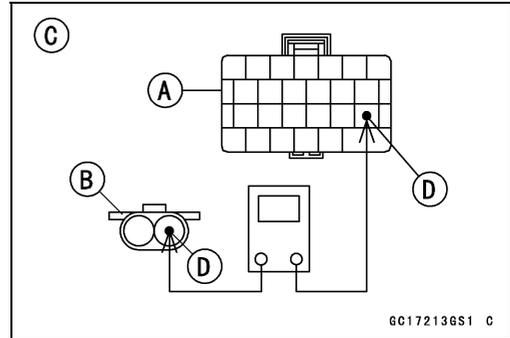
O/Y lead (ECU terminal 5)

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

★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).

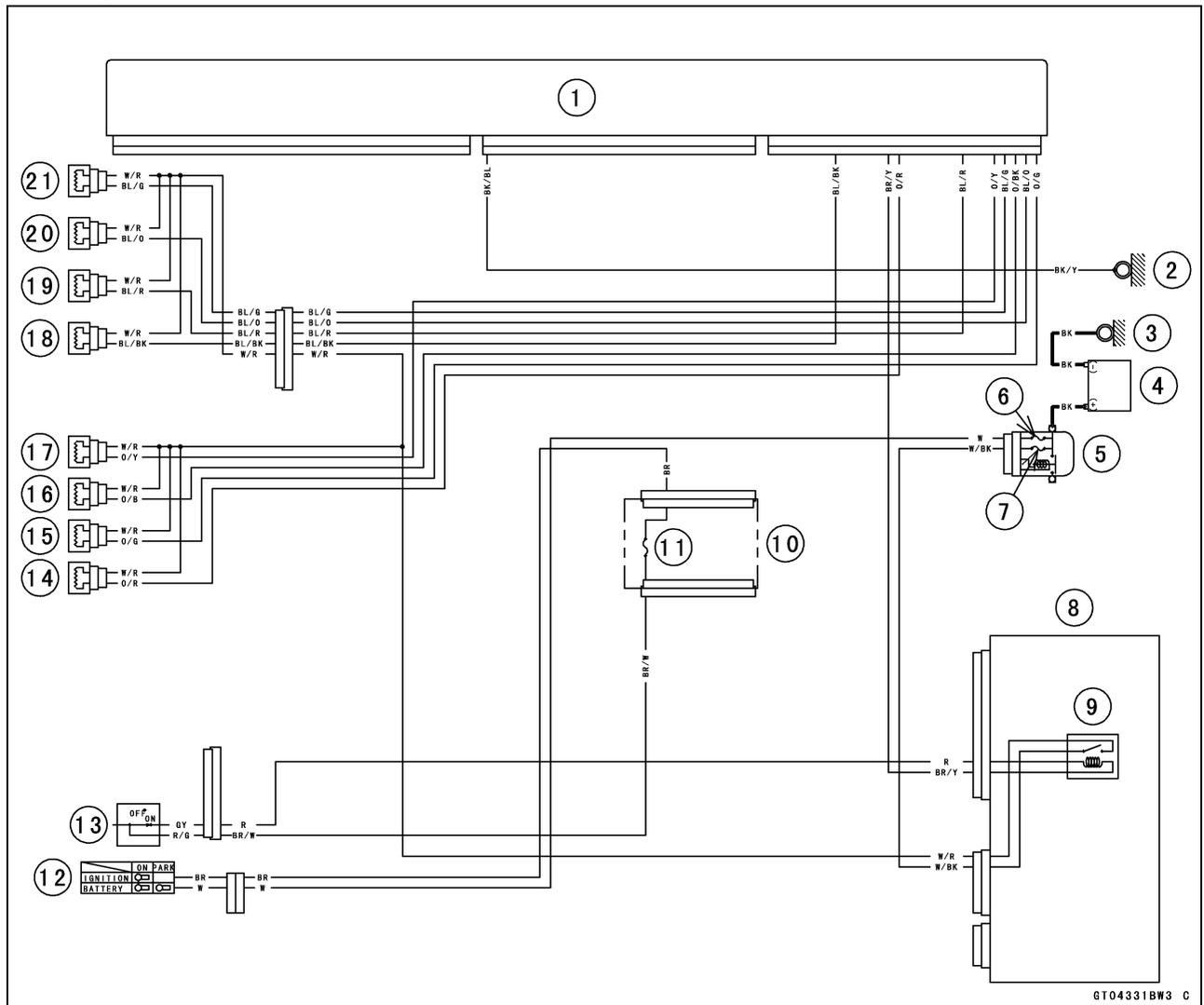
#### Secondary Fuel Injector Fuel Line Inspection

● Refer to the Primary Fuel Injector Fuel Line Inspection.



Secondary Fuel Injectors (Service Code 4A, 4B, 4C, 4D)

Fuel Injector Circuit



GT04331BW3 C

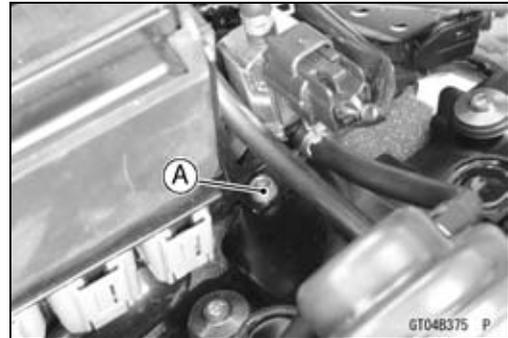
1. ECU
2. Frame Ground 2
3. Engine Ground
4. Battery 12 V 8.6 Ah
5. Starter Relay
6. Main Fuse 30 A
7. ECU Fuse 15 A
8. Relay Box
9. Injector Relay
10. Fuse Box 1
11. Ignition Fuse 15 A
12. Ignition Switch
13. Engine Start/Stop Switch (Engine Stop)
14. Secondary Fuel Injector #1
15. Secondary Fuel Injector #2
16. Secondary Fuel Injector #3
17. Secondary Fuel Injector #4
18. Primary Fuel Injector #1
19. Primary Fuel Injector #2
20. Primary Fuel Injector #3
21. Primary Fuel Injector #4

## 17-86 SELF-DIAGNOSIS SYSTEM

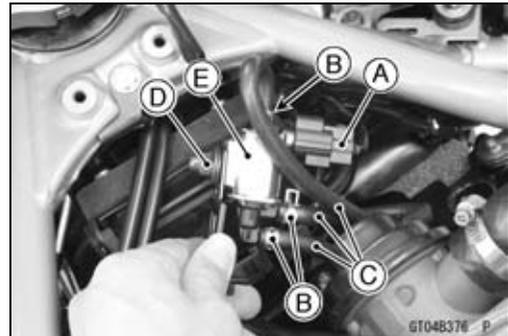
### Purge Valve (for Supercharger) (Service Code 6A)

#### **Purge Valve (for Supercharger) Removal/Installation**

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the Fuel System (DFI) chapter)
  - Remove the cylinder head cap bolt [A].



- Disconnect the purge valve connector [A].
- Slide the clamps [B].
- Disconnect the hoses [C].
- Remove:
  - Nut [D]
  - Purge Valve [E]
- Installation is the reverse of removal.
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).



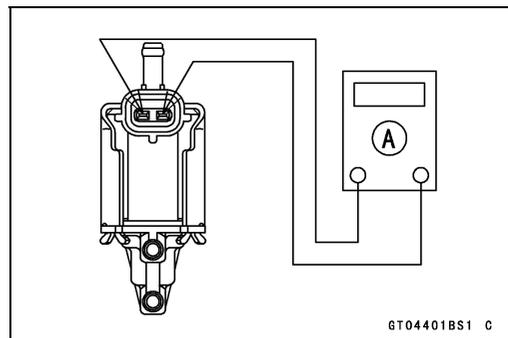
#### **Purge Valve (for Supercharger) Inspection**

- Remove the purge valve (see Purge Valve (for Supercharger) Removal/Installation).
- Connect a digital meter [A] to the purge valve terminals as shown.

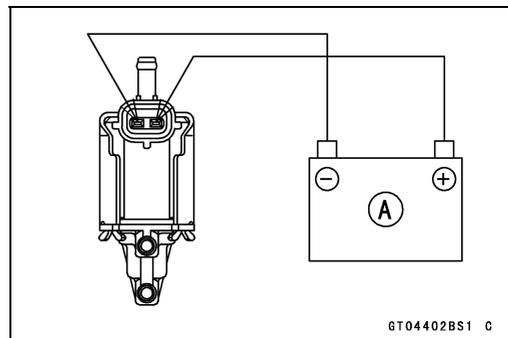
##### **Purge Valve Resistance**

**Standard:** 22 ~ 26  $\Omega$  @20°C (68°F)

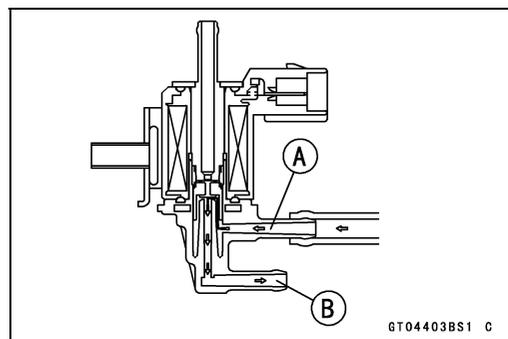
- ★ If the resistance reading is out of the specified value, replace it with a new one.



- Connect the 12 V battery [A] to the purge valve terminals as shown.

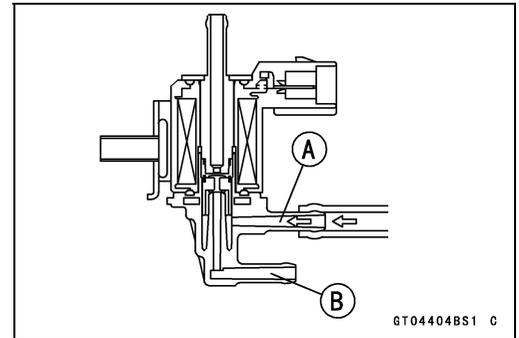


- Blow the air to the intake air duct [A], and make sure that the air flows from the outlet air duct [B].

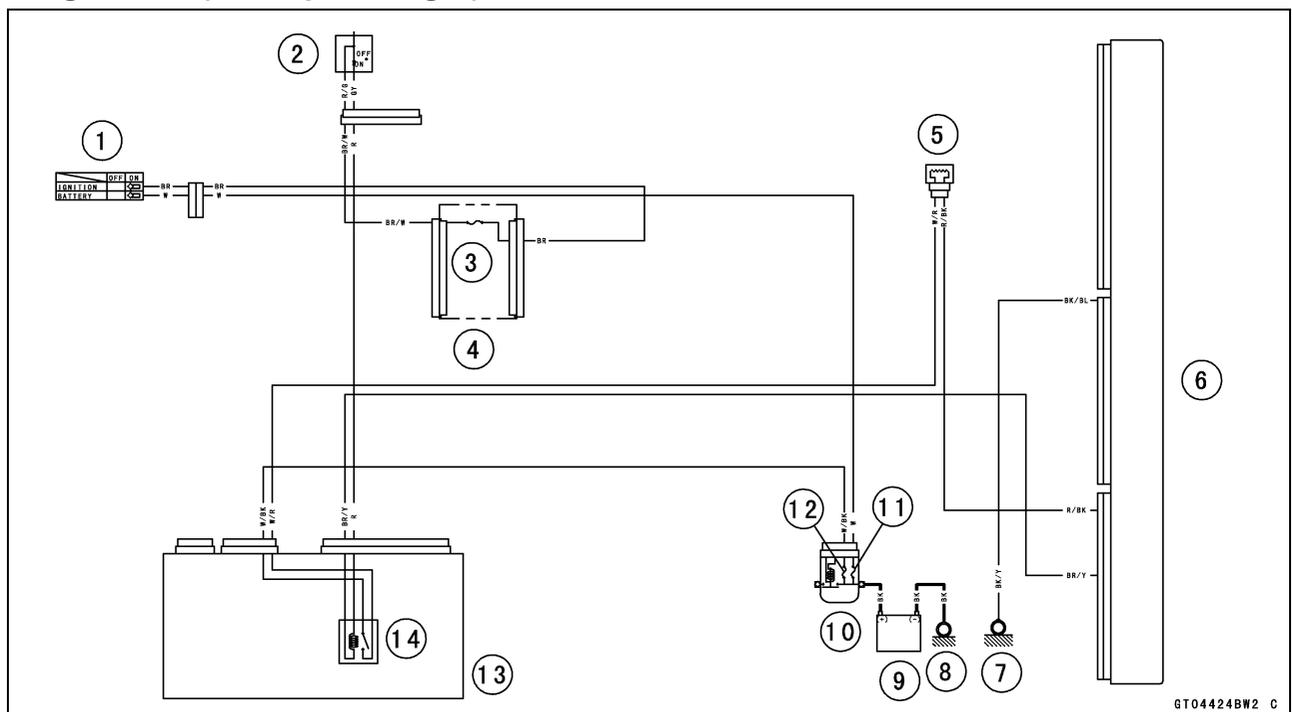


**Purge Valve (for Supercharger) (Service Code 6A)**

- Disconnect the 12 V battery.
- Blow the air to the intake air duct [A] again, and make sure that the air does not flow from the outlet air duct [B].
- ★ If the purge valve does not operate as described, replace it with a new one.
- ★ If the purge valve is good, check the wiring for continuity (see Purge Valve (for Supercharger) Circuit).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU Power Supply Inspection in the Fuel System (DFI) chapter).
- ★ If the ground and power supply are good, replace the ECU (see ECU Removal/Installation in the Fuel System (DFI) chapter).



**Purge Valve (for Supercharger) Circuit**



1. Ignition Switch
2. Engine Start/Stop Switch (Engine Stop)
3. Ignition Fuse 15 A
4. Fuse Box 1
5. Purge Valve (for Supercharger)
6. ECU
7. Frame Ground 2
8. Engine Ground
9. Battery 12 V 8.6 Ah
10. Starter Relay
11. Main Fuse 30 A
12. ECU Fuse 15 A
13. Relay Box
14. Injector Relay

## 17-88 SELF-DIAGNOSIS SYSTEM

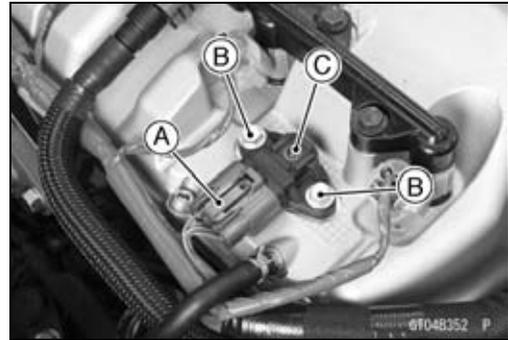
### Air Intake Chamber Pressure Sensor (Service Code 7E)

#### Air Intake Chamber Pressure/Temperature Sensor Removal

##### NOTICE

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

- Remove the fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the air intake chamber pressure/temperature sensor connector [A].
- Remove:
  - Air Intake Chamber Pressure/Temperature Sensor Bolts [B]
  - Air Intake Chamber Pressure/Temperature Sensor [C]



#### Air Intake Chamber Pressure/Temperature Sensor Installation

- Be sure to install the O-ring [A].
- Apply engine oil to the O-ring.

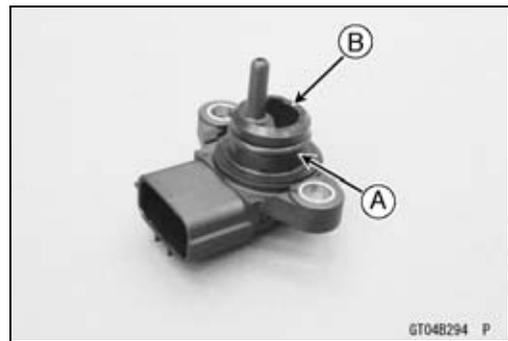
##### NOTE

○ Do not apply engine oil into the hole [B] that senses the pressure.

- Install the air intake chamber pressure/temperature sensor to the air intake chamber.
- Tighten:

**Torque - Air Intake Chamber Pressure/Temperature Sensor Bolts: 5.0 N·m (0.51 kgf·m, 44 in·lb)**

- Connect the air intake chamber pressure/temperature sensor connector.
- Install the fuel tank (see Fuel Tank Installation in the Fuel System (DFI) chapter).



**Air Intake Chamber Pressure Sensor (Service Code 7E)**

**Air Intake Chamber Pressure Sensor Input Voltage Inspection**

**NOTE**

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Remove fuel tank (see Fuel Tank Removal in the Fuel System (DFI) chapter).
- Disconnect the air intake chamber pressure/temperature sensor connector and connect the measuring adapter [A] between these connectors as shown.

Main Harness [B]

Air Intake Chamber Pressure/Temperature Sensor [C]

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

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

**Air Intake Chamber Pressure Sensor Input Voltage**

**Connections to Adapter:**

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

**Digital Meter (-) → BK (sensor G) 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 standard, check the output voltage (see Air Intake Chamber Pressure 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.

**Wiring Continuity Inspection**

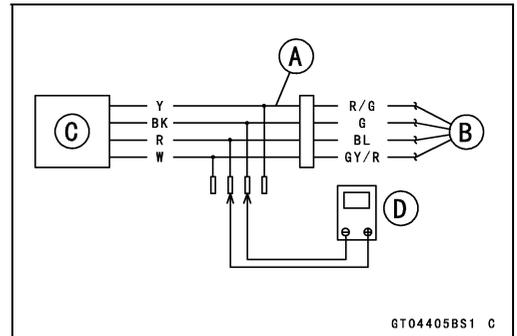
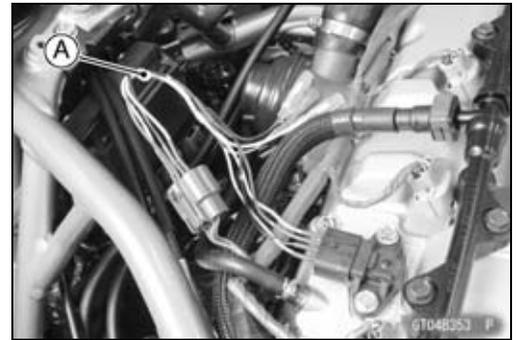
**ECU Connector [A] ↔**

**Air Intake Chamber Pressure/Temperature Sensor Connector [B]**

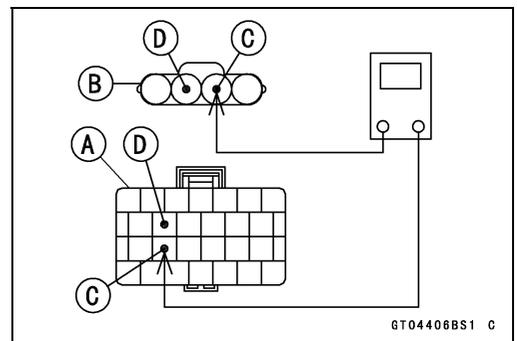
**BL lead (ECU terminal 44) [C]**

**G lead (ECU terminal 38) [D]**

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



GT04405BS1 C



GT04406BS1 C

## 17-90 SELF-DIAGNOSIS SYSTEM

### Air Intake Chamber Pressure Sensor (Service Code 7E)

#### Air Intake Chamber Pressure Sensor Output Voltage Inspection

- Measure the output voltage at the air intake chamber pressure sensor in the same way as input voltage inspection, note the following.
- Disconnect the air intake chamber pressure sensor connector and connect the measuring adapter [A] between these connectors.
  - Main Harness [B]
  - Air Intake Chamber Pressure/Temperature Sensor [C]
  - Digital Meter [D]

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

#### Air Intake Chamber Pressure Sensor Output Voltage Connections to Adapter:

**Digital Meter (+) → Y (sensor R/G) lead**

**Digital Meter (-) → BK (sensor G) lead**

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

#### Output Voltage

**Usable Range:** DC 1.43 ~ 1.55 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.
- ★ If the reading is within the usable range, remove the ECU and check the wiring for continuity between main harness connectors.
- Disconnect the ECU and sensor connectors.

#### Wiring Continuity Inspection

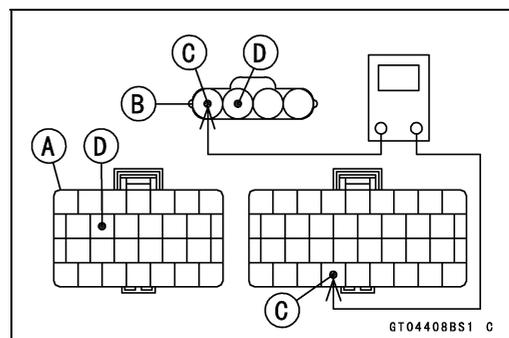
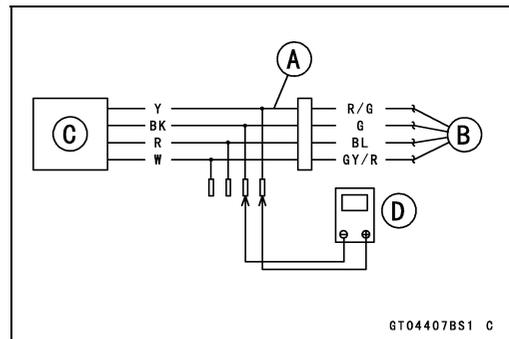
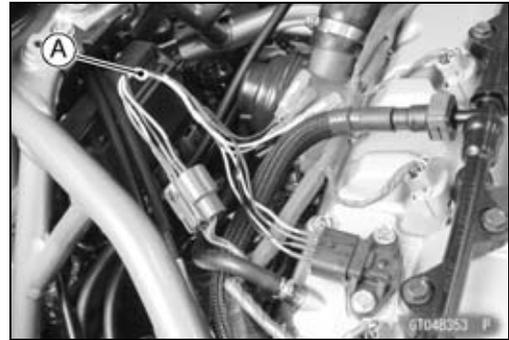
**ECU Connector [A] ←→**

**Air Intake Chamber Pressure/Temperature Sensor Connector [B]**

**R/G lead (ECU terminal 83) [C]**

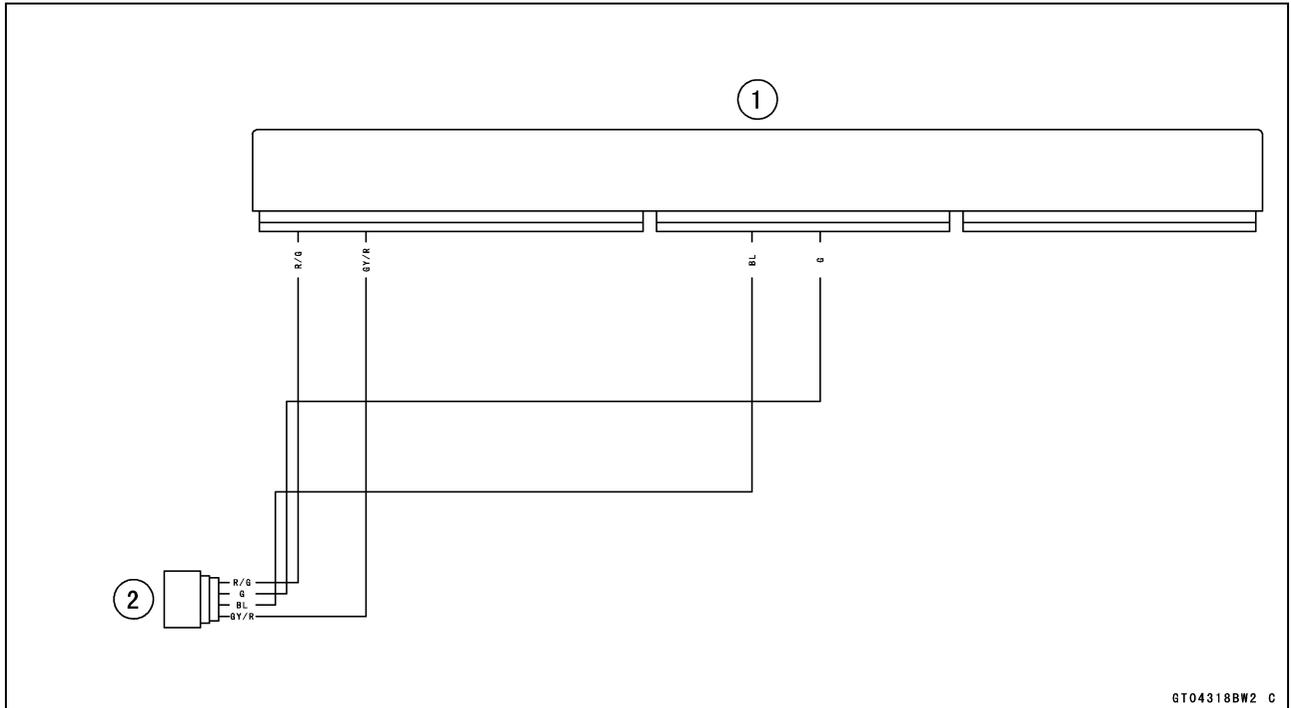
**G lead (ECU terminal 38) [D]**

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



Air Intake Chamber Pressure Sensor (Service Code 7E)

Air Intake Chamber Pressure Sensor Circuit



- 1. ECU
- 2. Air Intake Chamber Pressure/Temperature Sensor

## 17-92 SELF-DIAGNOSIS SYSTEM

### ESD (Electronic Steering Damper) Actuator Error (Service Code E2E)

#### **ESD Actuator Removal**

○ In this model, ESD actuator is built in the electronic steering damper unit.

- Refer to the Electronic Steering Damper Removal in the Steering chapter.

#### **ESD Actuator Installation**

- Refer to the Electronic Steering Damper Installation in the Steering chapter.

#### **ESD Actuator Resistance Inspection**

- Turn the ignition switch off.
- Remove the electronic steering damper unit (see Electronic Steering Damper Removal in the Steering chapter).
- Connect a digital meter to the ESD actuator connector [A].
- Measure the ESD actuator resistance.

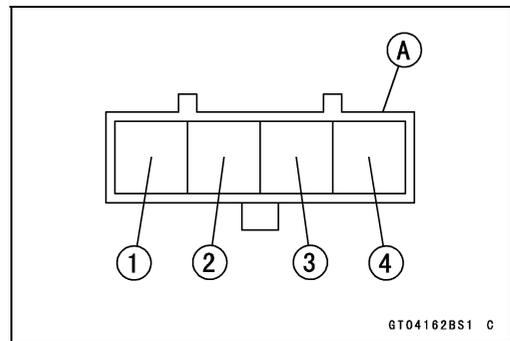
##### **ESD Actuator Resistance**

**Connections:** BK lead [1] ↔ O lead [3]

R lead [2] ↔ Y lead [4]

**Standard:** About 23 ~ 29 Ω

- ★ If the reading is out of the standard, replace the electronic steering damper unit.
- ★ If the reading is within the standard, check the input voltage (see ESD Actuator Input Voltage Inspection).



**ESD (Electronic Steering Damper) Actuator Error (Service Code E2E)**

**ESD Actuator Input Voltage Inspection**

**NOTE**

○Be sure the battery is fully charged.

- Turn the ignition switch off.
- Disconnect the ESD actuator connector and connect a suitable measuring leads [A] between these connectors as shown.  
Main Harness [B]  
ESD Actuator [C]
- Connect the peak voltage adapter [D] and a digital meter [E] to the measuring adapter leads.

**Special Tool - Peak Voltage Adapter: 57001-1415  
Type: KEK-54-9-B**

**ESD Actuator Input Voltage  
Connections to Adapter:**

- (I) Digital Meter (+) → BK (actuator BK) lead  
Digital Meter (-) → Battery (-) Terminal
- (II) Digital Meter (+) → R (actuator R) lead  
Digital Meter (-) → Battery (-) Terminal
- (III) Digital Meter (+) → W (actuator O) lead  
Digital Meter (-) → Battery (-) Terminal
- (IV) Digital Meter (+) → Y (actuator Y) 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 9 ~ 11 V and then 0.1 V or  
About DC 9 ~ 11 V**

- Turn the ignition switch off.

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

○ Disconnect the ESD ECU and actuator connectors.

**Wiring Continuity Inspection**

**ESD ECU Connector [A] ↔**

**ESD Actuator Connector [B]**

**BK lead (ESD ECU terminal 3) [C]**

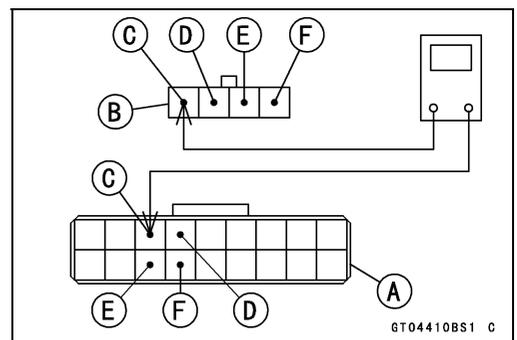
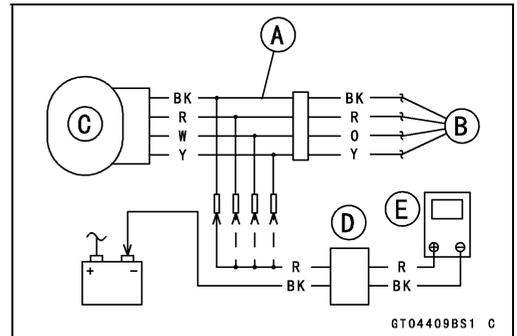
**R lead (ESD ECU terminal 4) [D]**

**O lead (ESD ECU terminal 12) [E]**

**Y lead (ESD ECU terminal 13) [F]**

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

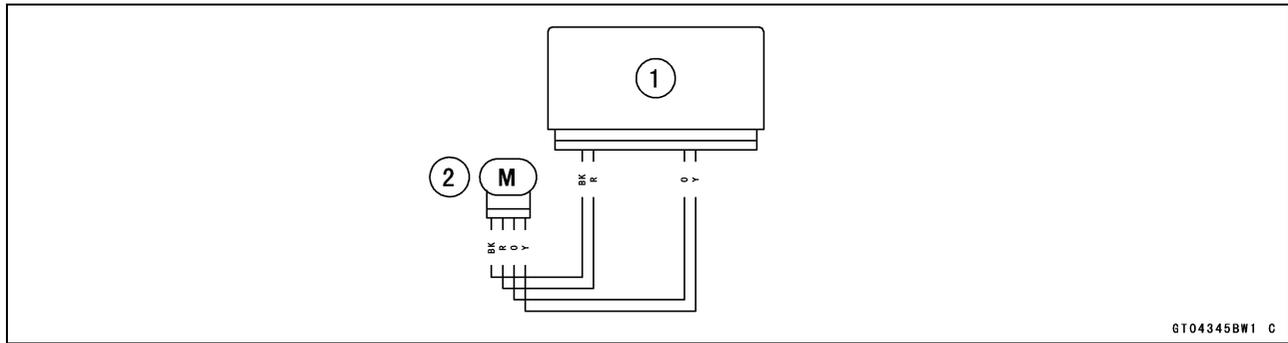
★ If the ground and power supply are good, replace the ESD ECU (see ESD (Electronic Steering Damper) ECU Removal/Installation in the Steering chapter).



# 17-94 SELF-DIAGNOSIS SYSTEM

## ESD (Electronic Steering Damper) Actuator Error (Service Code E2E)

### ESD Actuator Circuit



GT04345BW1 C

- 1. ESD ECU
- 2. ESD Actuator

**ESD (Electronic Steering Damper) ECU Error (Service Code E3B)**

The white ESD indicator light (LED) may blink and yellow warning indicator light (LED) may go on when the ignition switch is turned on with the motorcycle moving. If this happens, first turn the ignition switch off, and then back on with the motorcycle completely stopped. The white ESD indicator light (LED) and yellow warning indicator light (LED) should then go off. If they does not go off, check the following.

- ★ If this service code appears, check that the following parts are correctly.
  - Crankshaft Sensor
  - Gear Position Sensor
  - Starter Lockout Switch
  - Throttle Position Sensor
  - Rear Wheel Rotation Sensor
- ★ If these parts are normal, check the ESD ECU for its ground and power supply (see ESD ECU Power Supply Inspection).

**ESD ECU Removal**

- Refer to the ESD (Electronic Steering Damper) ECU Removal in the Steering chapter.

**ESD ECU Installation**

- Refer to the ESD (Electronic Steering Damper) ECU Installation in the Steering chapter.

**ESD ECU Power Supply Inspection**

- Remove the ESD ECU from the bracket (see ESD (Electronic Steering Damper) ECU Removal in the Steering chapter).
- Visually inspect the ESD ECU connectors.
- ★ If the connector is clogged with mud or dust, blow it off with compressed air.
- Disconnect the ESD ECU connector.
- Visually inspect the terminals [A] of the ESD ECU and main harness connectors.
- ★ If the terminals of the main harness connector are damaged, replace the main harness.
- ★ If the terminals of the ESD ECU connector are damaged, replace the ESD ECU.
- Turn the ignition switch off.
- Disconnect the ESD ECU connector [A].
- Set a tester [B] and check the following wiring for continuity.

**ESD ECU Grounding Inspection**

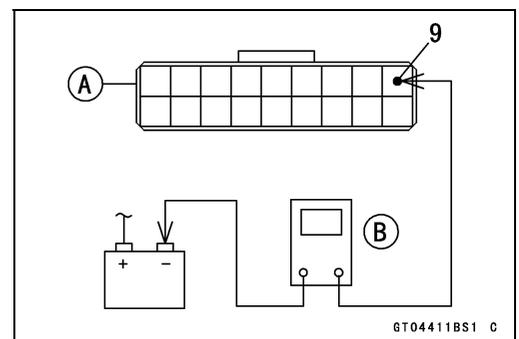
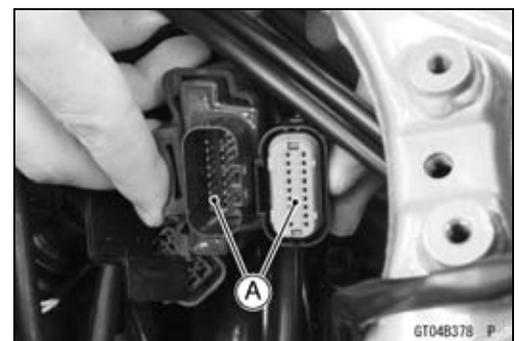
Connections:

- (I) BK/Y lead (ESD ECU terminal 9) ↔ Battery (-) Terminal
- (II) Engine Ground ↔ Battery (-) Terminal

Criteria:

Both: 0 Ω

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



## 17-96 SELF-DIAGNOSIS SYSTEM

### ESD (Electronic Steering Damper) ECU Error (Service Code E3B)

★ If the wiring is good, check the power source voltage of the ESD ECU.

#### NOTE

○ Be sure the battery is fully charged.

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

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

#### ESD ECU Power Supply Inspection

##### Connections:

**Digital Meter (+) → Terminal 18 (BR/BK)**

**Digital Meter (-) → Battery (-) Terminal**

**Ignition Switch OFF: 0 V**

**Ignition Switch ON: Battery Voltage**

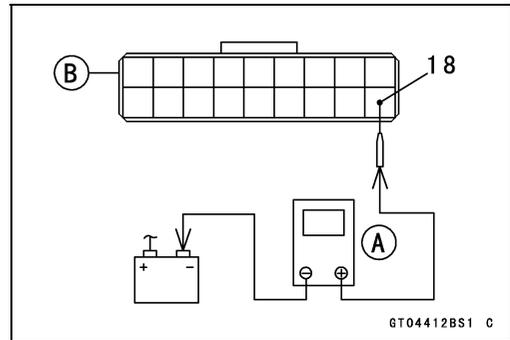
★ If the reading is out of the specification, check the following.

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

Electronic Steering Damper Fuse 10 A (see Fuse Inspection in the Electrical System chapter)

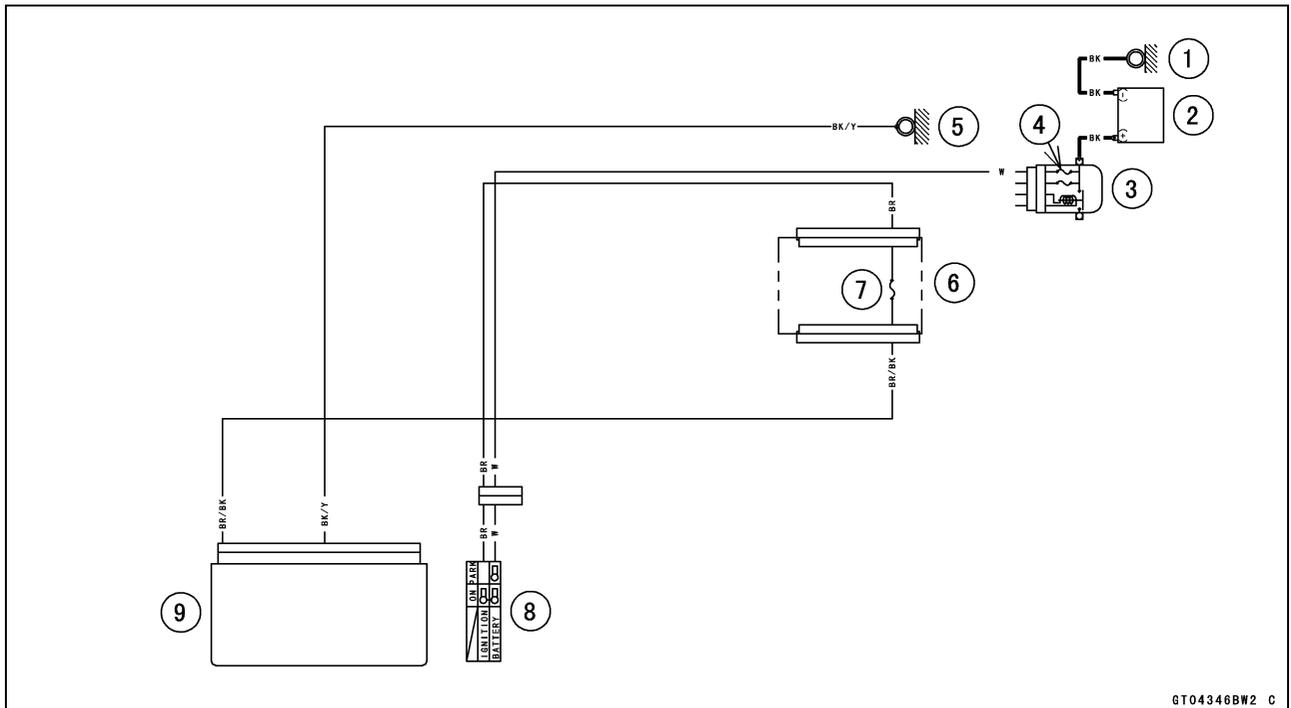
Power Source Wiring (see ESD ECU Power Source Circuit)

★ If the fuse and wiring are good, replace the ESD ECU (see ESD (Electronic Steering Damper) ECU Removal/Installation in the Steering chapter).



ESD (Electronic Steering Damper) ECU Error (Service Code E3B)

ESD ECU Power Source Circuit



GT04346BW2 C

1. Engine Ground
2. Battery 12 V 8.6 Ah
3. Starter Relay
4. Main Fuse 30 A
5. Frame Ground 3
6. Fuse Box 1
7. Electronic Steering Damper Fuse 10 A
8. Ignition Switch
9. ESD ECU

## 17-98 SELF-DIAGNOSIS SYSTEM

### KIBS Service Codes

#### **Solenoid Valve Inspection (Service Code B13, B14, B17, B18)**

- The solenoid valve is built in the KIBS hydraulic unit [A]. Therefore the solenoid valve cannot be checked directly.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If any of these service codes appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).



#### **KIBS Solenoid Valve Relay Inspection (Service Code B19)**

- The KIBS solenoid valve relay is built in the KIBS hydraulic unit. Therefore the relay cannot be checked directly.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

#### **Front, Rear Wheel Rotation Difference Abnormal Inspection (Service Code B25)**

- Check the following and correct the faulty part.
  - Incorrect Tire Pressure
  - Tires not recommended for the motorcycle were installed (incorrect tire size).
  - Deformation of Wheel or Tire
  - Missing Teeth or Clogging with Foreign Matter of Sensor Rotor (see Wheel Rotation Sensor Rotor Inspection in the Brakes chapter)
- ★ If the all parts corrected, go to next step.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

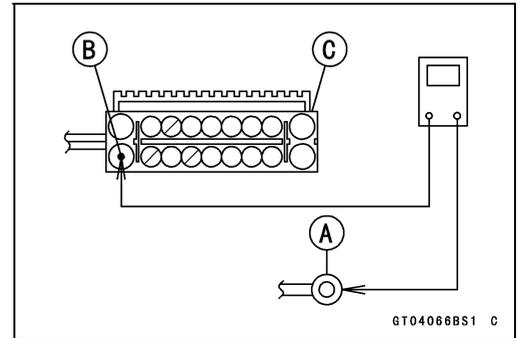
#### **KIBS Motor Relay Inspection (Service Code B35)**

- Check the KIBS motor relay fuse (25 A) [A] (see Fuse Inspection in the Electrical System chapter).
- ★ If the fuse is good, check the wiring continuity as follows.
- Disconnect:
  - Battery Positive Cable (see Battery Removal in the Electrical System chapter)
  - KIBS Hydraulic Unit Connector (see KIBS Hydraulic Unit Removal in the Brakes chapter)



**KIBS Service Codes**

- Check the wiring continuity between the positive cable terminal [A] of the battery and R/W lead terminal [B] in the KIBS hydraulic unit connector [C].
- ★ If the wiring is open, replace or repair the harness (see KIBS System Circuit in the Brakes chapter).
- ★ If the wiring is good, go to next step.



- The KIBS motor relay is built in the KIBS hydraulic unit. Therefore the relay cannot be checked directly.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

**Front Wheel Rotation Sensor Signal Abnormal (Service Code B42)**

- Measure the air gap between the front wheel rotation sensor and sensor rotor.  
Thickness Gauge [A]

**Air Gap**

**Standard: 0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)**

- ★ If the measurement is not the standard, check each part for deformation and looseness and correct accordingly.
- ★ If the measurement is the standard, go to next step.
- Check that there is iron or other magnetic deposits between the sensor and sensor rotor, and the sensor rotor slots for obstructions.
- Check the installation condition of the sensor for looseness.
- Check the sensor and sensor rotor tip for deformation or damage (e.g., chipped sensor rotor teeth).
- ★ If the sensor and sensor rotor in bad condition, remove the any deposits. Install the proper part or replace faulty part.
- ★ If the all items are good, go to next step.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

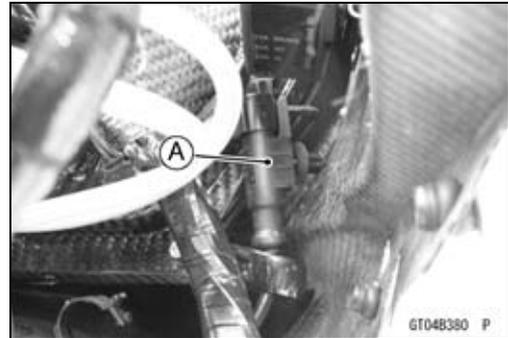


# 17-100 SELF-DIAGNOSIS SYSTEM

## KIBS Service Codes

### Front Wheel Rotation Sensor Wiring Inspection (Service Code B43)

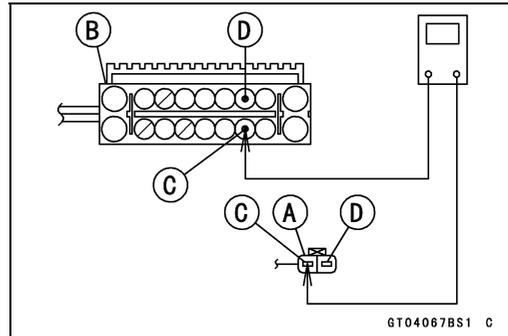
- Disconnect the front wheel rotation sensor lead connector [A] (see Front Wheel Rotation Sensor Removal in the Brakes chapter).



- Disconnect the KIBS hydraulic unit connector (see KIBS Hydraulic Unit Removal in the Brakes chapter).
- Check the wiring continuity of the W/BK lead and BK/W lead.

Front Wheel Rotation Sensor Lead Connector [A]  
 KIBS Hydraulic Unit Connector [B]  
 W/BK Lead Terminals [C]  
 BK/W Lead terminals [D]

- ★ If the wiring is open, replace or repair the harness (see KIBS System Circuit in the Brakes chapter).
- ★ If the wiring is good, go to next step.



- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the front wheel rotation sensor (see Front Wheel Rotation Sensor Removal in the Brakes chapter).
- Still, when it is not good, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

### Rear Wheel Rotation Sensor Signal Abnormal (Service Code B44)

- Measure the air gap between the rear wheel rotation sensor and sensor rotor.  
 Thickness Gauge [A]

#### Air Gap

Standard: 0.4 ~ 1.6 mm (0.02 ~ 0.06 in.)

- ★ If the measurement is not the standard, adjust the air gap with the spacer.



| Spacer Thickness         | Part Number |
|--------------------------|-------------|
| 0.5 mm (0.020 in.)       | 92026-0789  |
| 1.0 mm (0.039 in.) (STD) | 92026-0790  |
| 1.5 mm (0.059 in.)       | 92026-0791  |

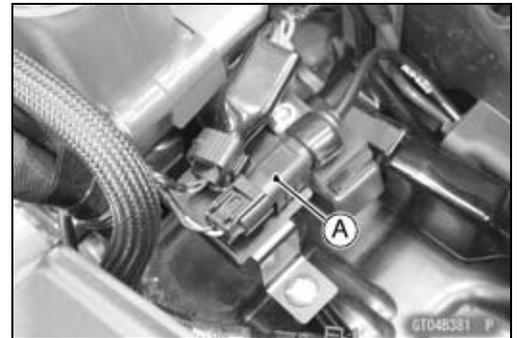
- ★ If the air gap can not be adjusted by spacer, check each part for deformation and looseness and correct accordingly.
- ★ If the measurement is the standard, go to next step.

**KIBS Service Codes**

- Check that there is iron or other magnetic deposits between the sensor and sensor rotor, and the sensor rotor slots for obstructions.
- Check the installation condition of the sensor for looseness.
- Check the sensor and sensor rotor tip for deformation or damage (e.g., chipped sensor rotor teeth).
- ★ If the sensor and sensor rotor in bad condition, remove the any deposits. Install the proper part or replace faulty part.
- ★ If the all items are good, go to next step.
  
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

**Rear Wheel Rotation Sensor Wiring Inspection (Service Code B45)**

- Disconnect the rear wheel rotation sensor lead connector [A] (see Rear Wheel Rotation Sensor Removal in the Brakes chapter).



- Disconnect the KIBS hydraulic unit connector (see KIBS Hydraulic Unit Removal in the Brakes chapter).
- Check the wiring continuity of the BK/O lead and W/G lead.

Rear Wheel Rotation Sensor Lead Connector [A]  
 KIBS Hydraulic Unit Connector [B]  
 BK/O Lead Terminals [C]  
 W/G Lead terminals [D]

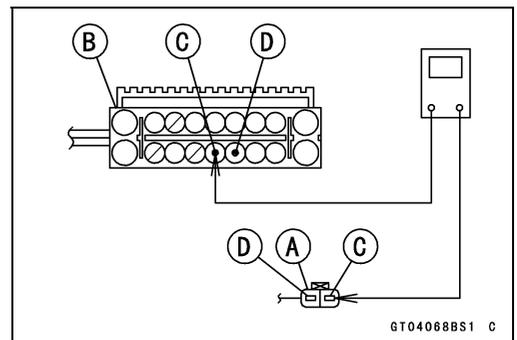
- ★ If the wiring is open, replace or repair the harness (see KIBS System Circuit in the Brakes chapter).
- ★ If the wiring is good, go to next step.

- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).

- ★ If this service code appears even if all checks are ended, replace the rear wheel rotation sensor (see Rear Wheel Rotation Sensor Removal in the Brakes chapter).

- Still, when it is not good, replace the KIBS hydraulic unit.

- ★ If the service code does not appear, the KIBS system normal (temporary failure).



# 17-102 SELF-DIAGNOSIS SYSTEM

## KIBS Service Codes

### **Power Supply Voltage Inspection (Low-Voltage) (Service Code B52)**

- Check the battery condition (see Charging Condition Inspection in the Electrical System chapter).
- ★ If the battery is good condition, perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

### **Power Supply Voltage Inspection (Over-Voltage) (Service Code B53)**

- Check the charging voltage (see Charging Voltage Inspection in the Electrical System chapter).
- ★ If the charging voltage is good, perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

### **ECU Inspection (Service Code B55)**

- This ECU is built in the KIBS hydraulic unit. Therefore the ECU cannot be checked directly.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

### **CAN Communication (Transmission)/CAN Bus OFF Monitor Inspection (Service Code B57)**

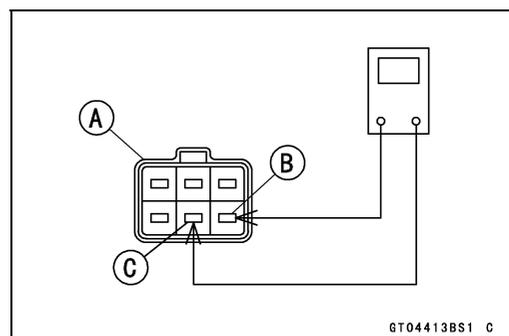
#### **CAN Communication (Reception) Monitor Inspection (Service Code B58)**

- Remove:
  - Seat Pad (see Seat Pad Removal in the Frame chapter)
  - Kawasaki Diagnostic System Connector Cap [A]
- Measure the CAN communication line resistance.
  - Kawasaki Diagnostic System Connector [A]
  - GY/BL Terminal [B]
  - LB Terminal [C]

#### **CAN Communication Line Resistance**

**Standard: 30 ~ 70 Ω**

- ★ If the reading is out of the standard, go to Check 1.
- ★ If the reading is the standard, go to Check 2.



**KIBS Service Codes**

**Check 1**

- Check the CAN communication line resistance of following parts.
  - Meter Unit (see Meter Unit Inspection in the Electrical System chapter)
  - ECU (see CAN Communication Line Resistance Inspection in the Fuel System (DFI) chapter)

**Check 2**

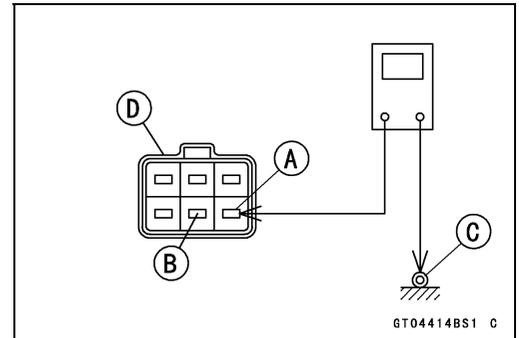
- Measure the resistance between the GY/BL [A] or LB [B] terminal and ground [C].
  - Kawasaki Diagnostic System Connector [D]

**CAN Communication Line/Ground Resistance**

**Standard: 4 ~ 30 kΩ**

- ★ If the reading is out of the standard, replace or repair the main harness.
- ★ If the reading is the standard, go to next step.

- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).



**Output Fluid Pressure Sensor (Front Brake) Wiring Inspection (Service Code B83)**

- The output fluid pressure sensor is built in the KIBS hydraulic unit. Therefore the sensor cannot be checked directly.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.

**Output Fluid Pressure Sensor (Front Brake) Offset Abnormal (Service Code B84)**

- The output fluid pressure sensor is built in the KIBS hydraulic unit. Therefore the sensor cannot be checked directly.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).

**Fluid Pressure Sensor Supply Voltage Inspection (Service Code B89)**

- The fluid pressure sensors are built in the KIBS hydraulic unit. Therefore the voltage cannot be checked directly.
- Perform the Pre-Diagnosis Inspection 1 and 2 (see Inquiries to Rider in the Brakes chapter).
- ★ If this service code appears even if all checks are ended, replace the KIBS hydraulic unit.
- ★ If the service code does not appear, the KIBS system normal (temporary failure).



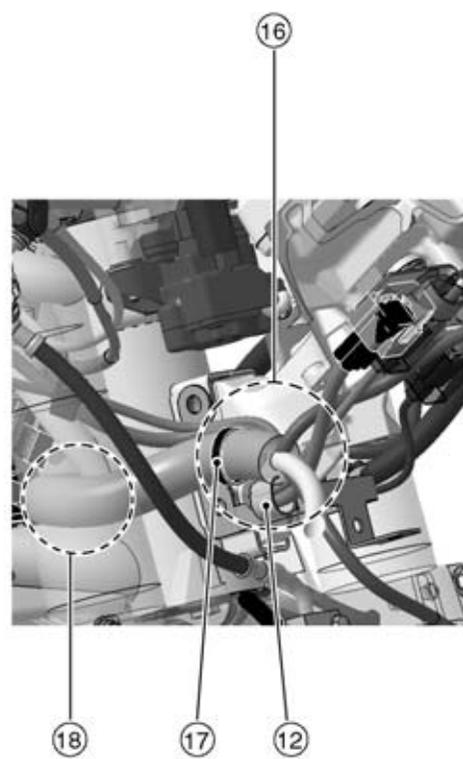
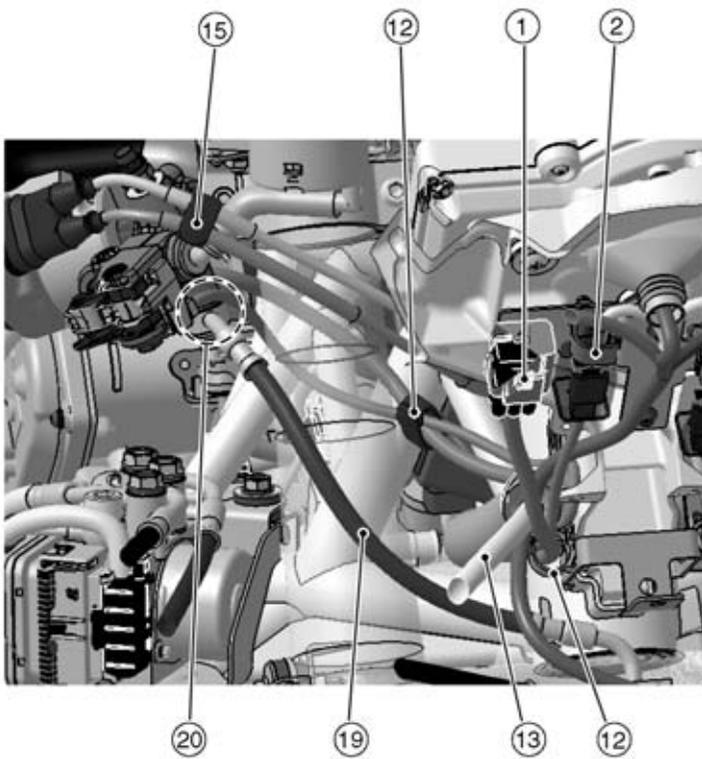
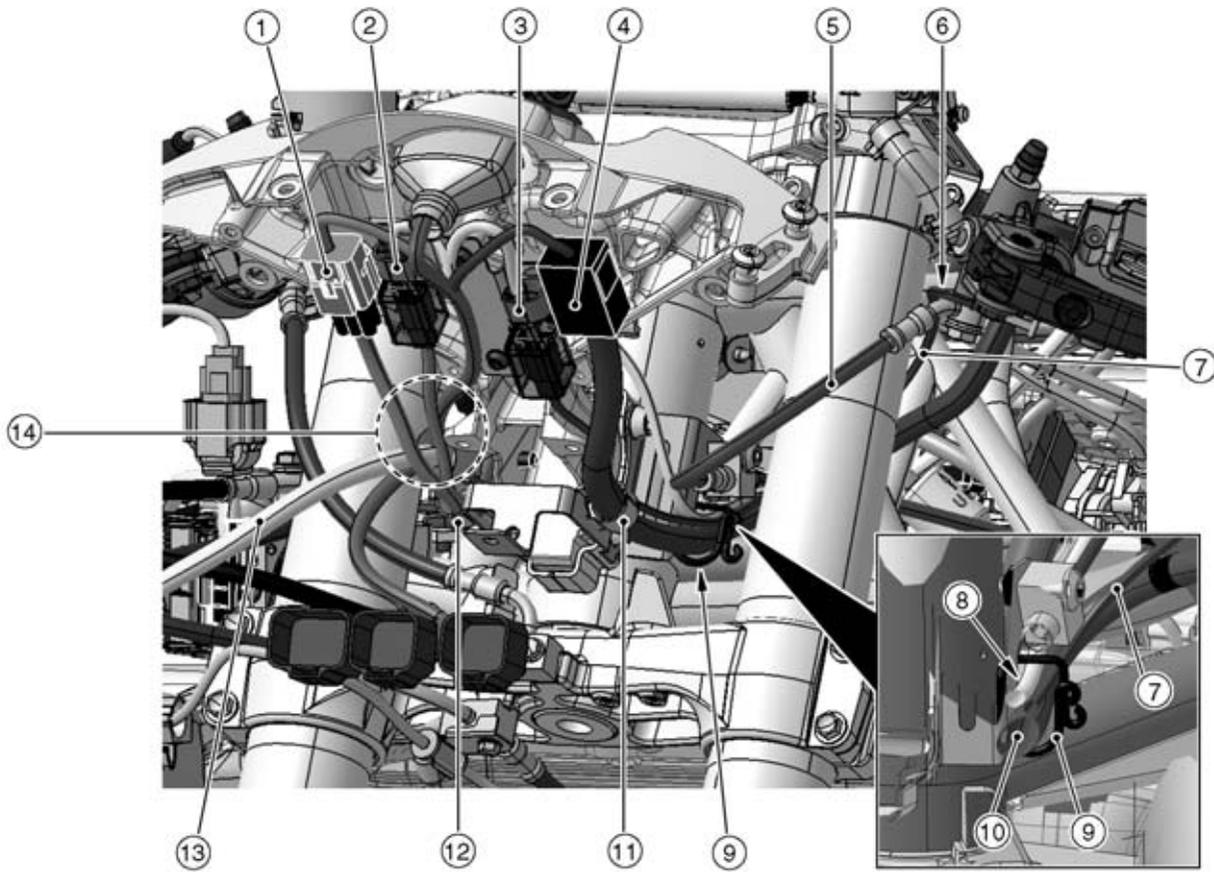
# Appendix

## Table of Contents

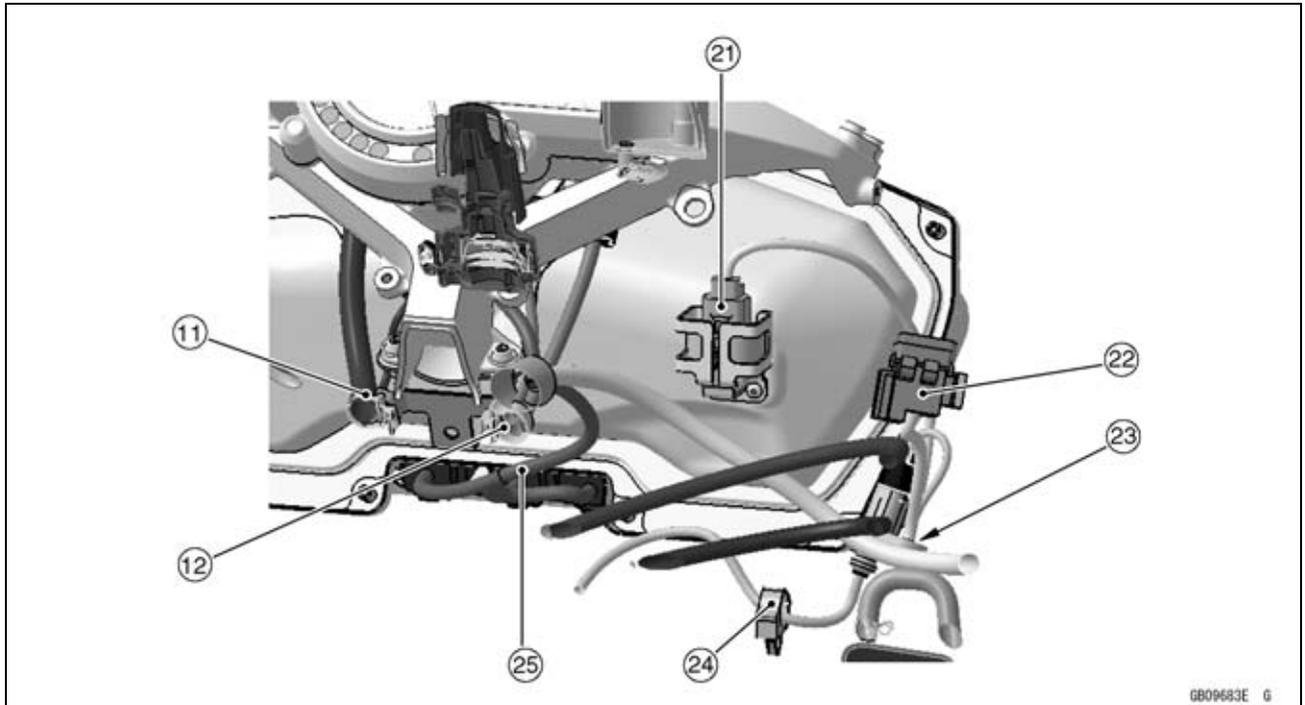
|                                     |       |
|-------------------------------------|-------|
| Cable, Wire, and Hose Routing ..... | 18-2  |
| Troubleshooting Guide .....         | 18-37 |

# 18-2 APPENDIX

## Cable, Wire, and Hose Routing



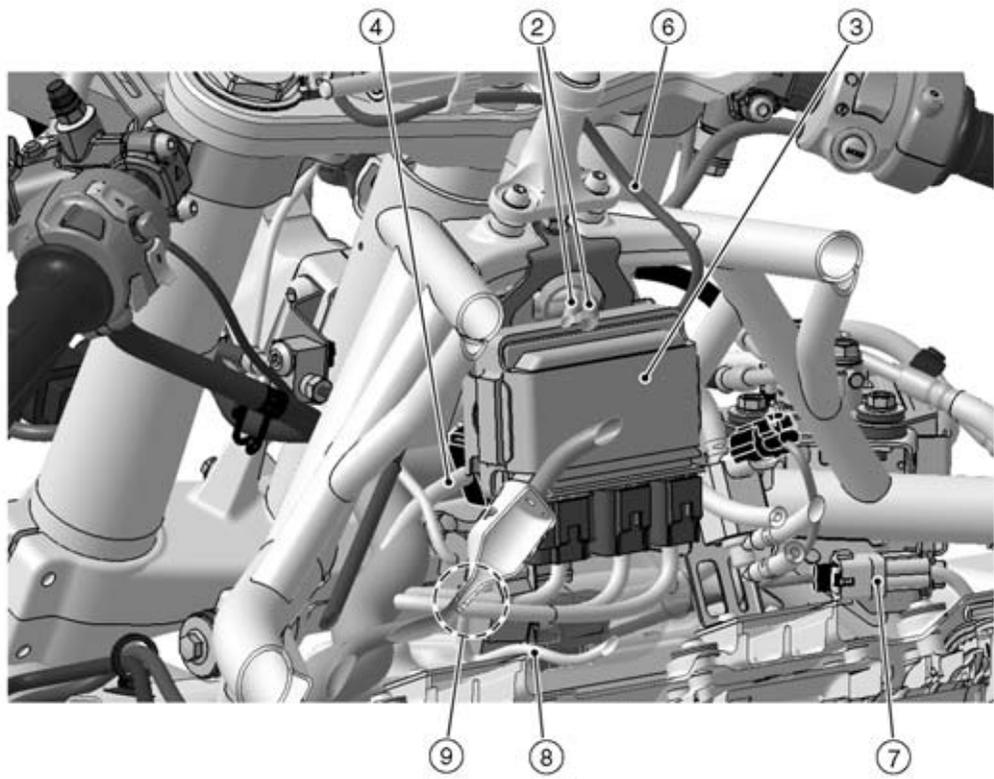
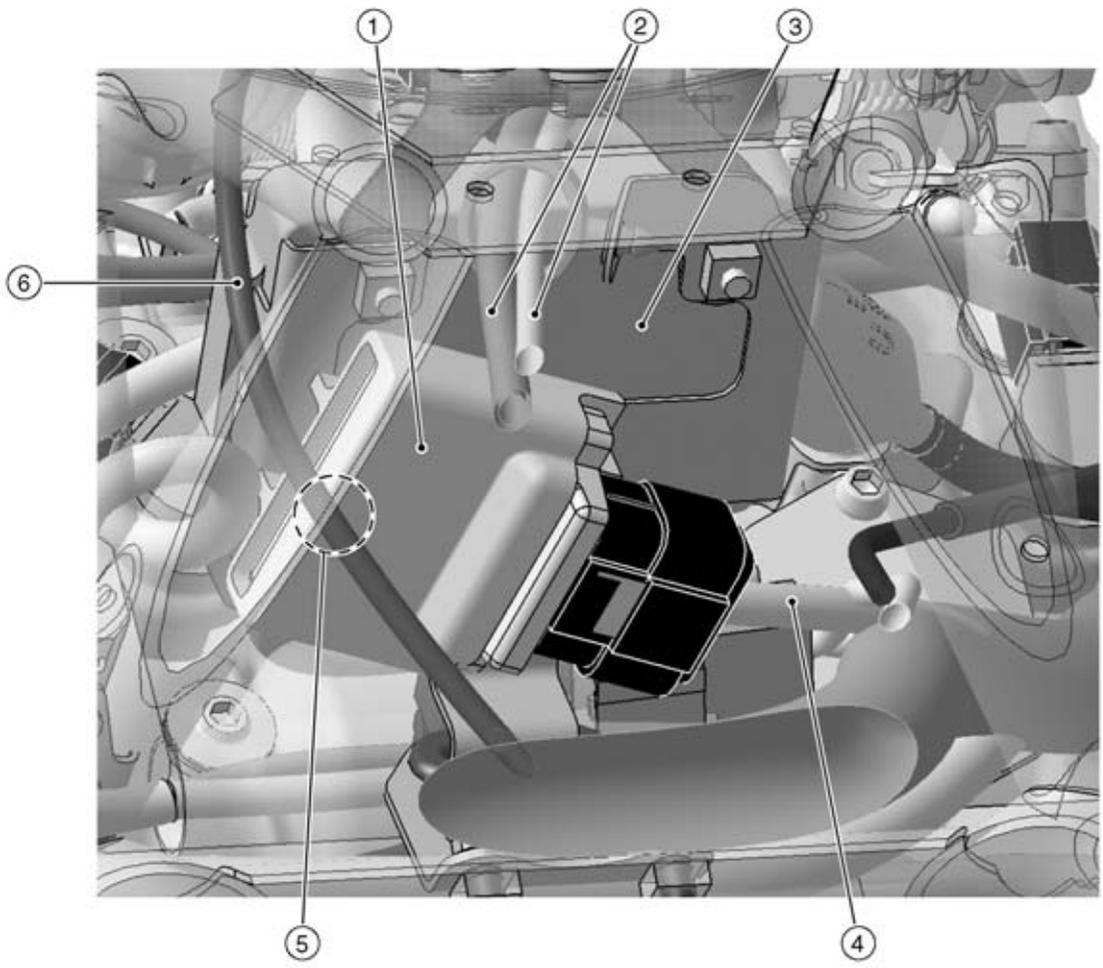
## Cable, Wire, and Hose Routing



1. Right Switch Housing Lead Connector
2. Clamp (Hold the small end side of the dust cover.)  
Dust Cover (Cover the front brake light switch lead connector.)
3. Clamp (Hold the small end side of the dust cover.)  
Dust Cover (Cover the starter lockout switch lead connector.)
4. Left Switch Housing Lead Connector
5. Clutch Hose
6. Run the starter lockout switch lead to the upside of the clutch hose.
7. Starter Lockout Switch Lead
8. Ignition Switch Lead
9. Clamp (Run the ignition switch lead, left switch housing lead and starter lockout switch lead.  
Run the left switch housing lead to the downside of the other leads. Run the ignition switch lead to the inside of the starter lockout switch lead.)
10. Left Switch Housing Lead
11. Clamp (Hold the left switch housing lead and starter lockout switch lead.)
12. Clamps (Hold the right switch housing lead and front brake light switch lead.)
13. KIBS Hydraulic Unit Lead
14. Run the main harness to the rear side of the right switch housing lead and front brake light switch lead.
15. Clamp (Hold the protective tube part of the throttle cables. Align the clamp edge with the metal part edge of the throttle cable (accelerator). Face the knob of the clamp to the rear side.)
16. Run the right switch housing lead and front brake light switch lead to the inside and front side of the main harness holding clamp.
17. Clamp (Hold the main harness.)
18. Run the main harness to the outside of the frame in this position.
19. Brake Hose
20. Run the front brake light switch lead to the upside of the brake hose.
21. Vehicle-down Sensor
22. Fuse Box
23. Clamp (Hold the fuse box lead, vehicle-down sensor lead and constricted part of the front wheel rotation sensor lead connector.)
24. Clamp (Hold the front wheel rotation sensor lead.)
25. ECU Lead

# 18-4 APPENDIX

## Cable, Wire, and Hose Routing



---

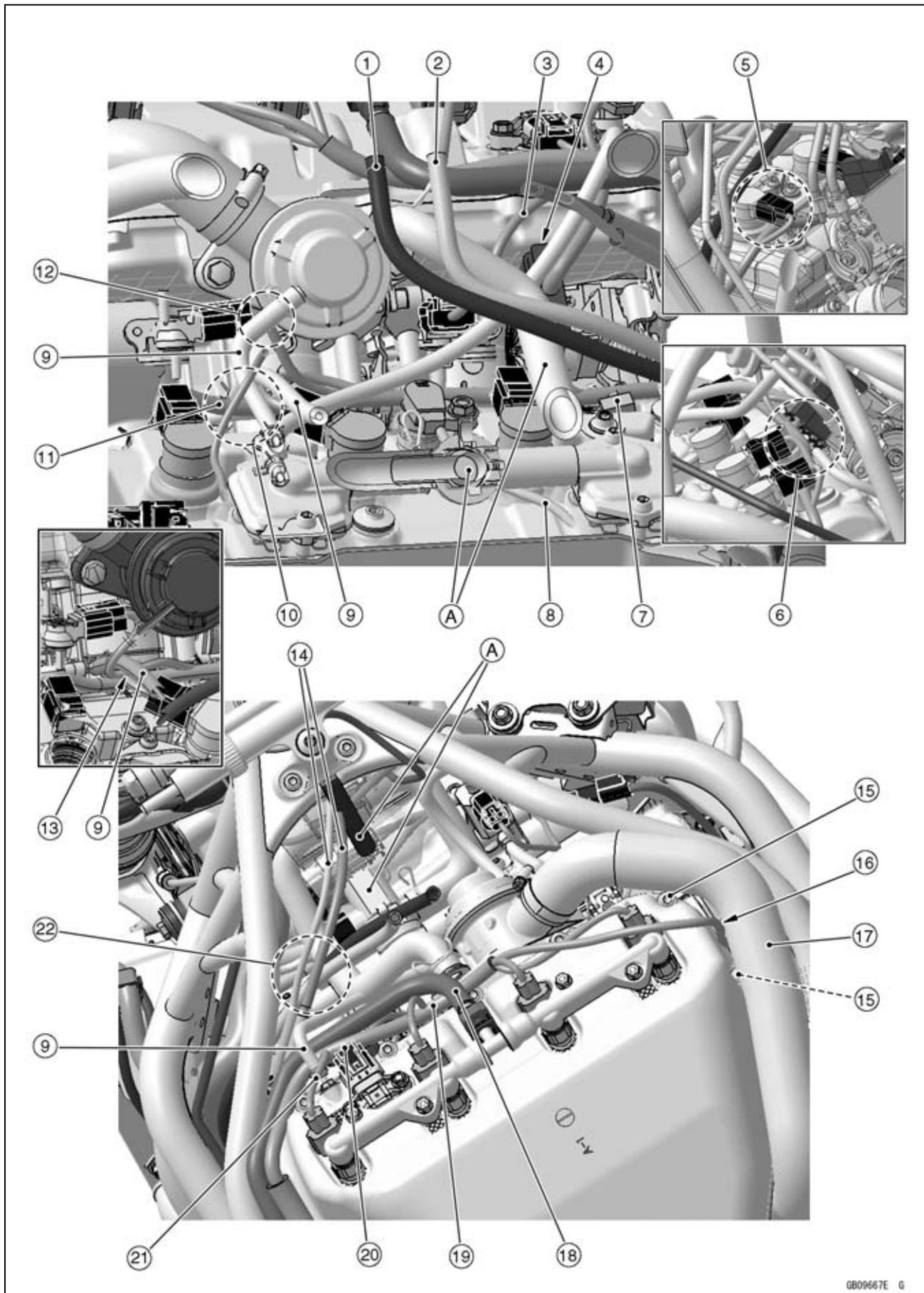
**Cable, Wire, and Hose Routing**

---

1. ESD ECU
2. Throttle Cables
3. Relay Box
4. ESD ECU Lead
5. Run the ESD lead to the front side of the ESD ECU.
6. ESD Lead
7. Crankshaft Sensor Lead Connector
8. Camshaft Position Sensor Lead
9. Run the relay box lead to the upside of the camshaft position sensor lead.

# 18-6 APPENDIX

## Cable, Wire, and Hose Routing



---

**Cable, Wire, and Hose Routing**

---

**NOTE**

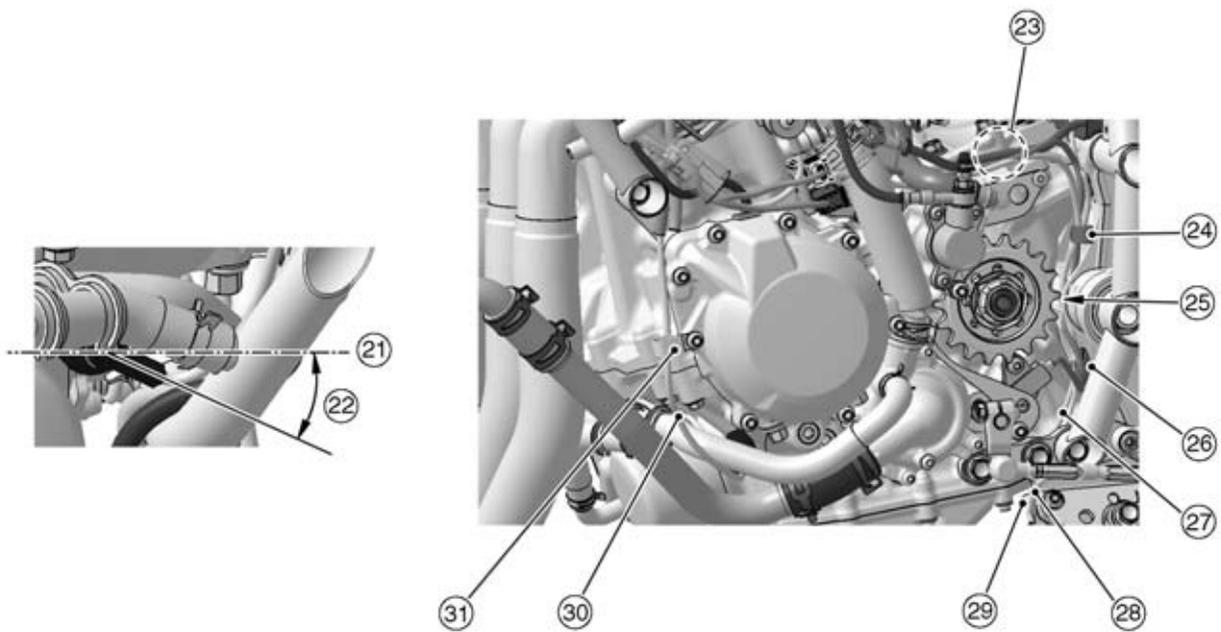
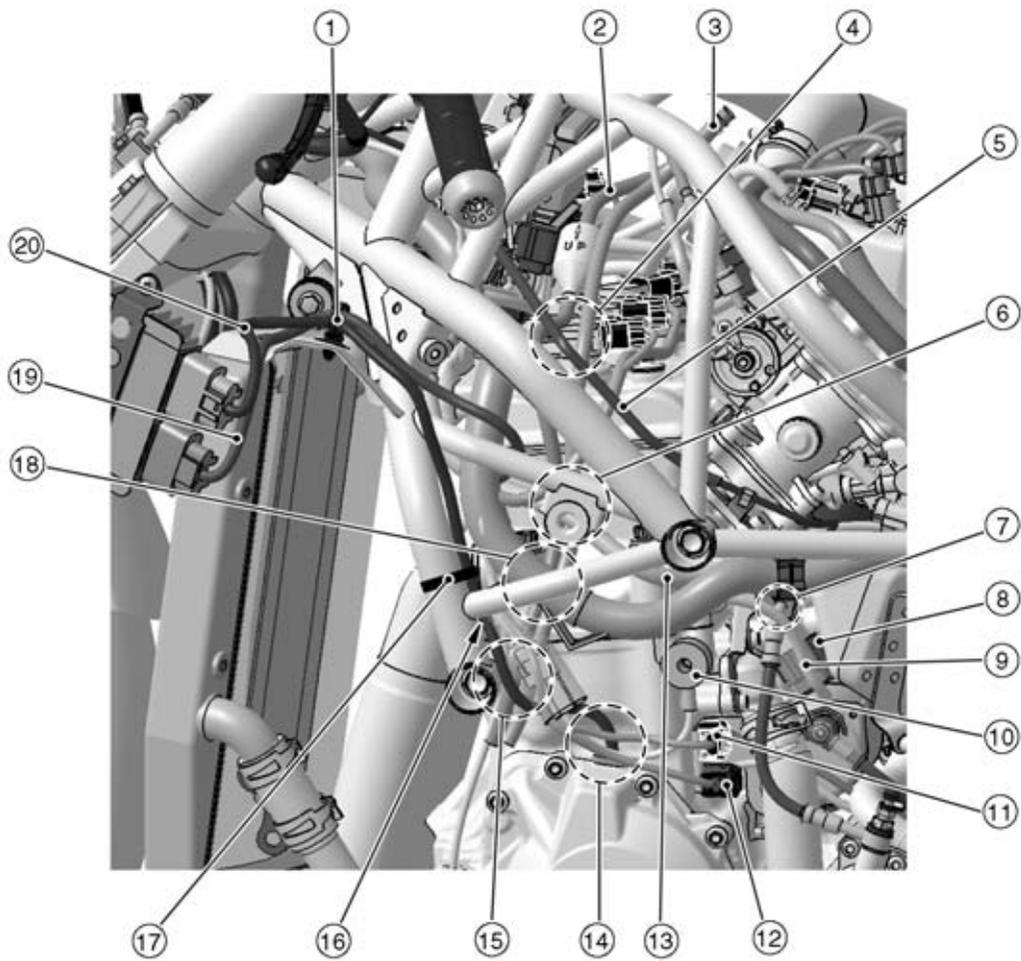
○The routing on ZX1000P is shown using the figure of ZX1000N.

A: ZX1000P is not equipped these parts.

1. Fuel Tank Breather Hose
2. Fuel Tank Drain Hose
3. Air Intake Chamber Pressure/Temperature Sensor Lead
4. Accelerator Position Sensor Connector
5. Run the stick coil lead between the stick coil (#1) and cylinder head cover bolt.  
Run the stick coil lead under the stick coil connector.
6. Do not pinch the vacuum hose.
7. Clamp (Hold the stick coil lead.)
8. Camshaft Position Sensor Lead
9. Purge Valve Hoses
10. Run the stick coil lead (#4) under the purge valve hoses.
11. Run the stick coil lead (#4) to the front side of the vacuum hose.
12. Run the atmospheric pressure sensor lead to the rear side of the purge valve hose.
13. Run the atmospheric pressure sensor lead to the downside of the purge valve hose.
14. Throttle Cables
15. Air Intake Chamber Assy Bolts
16. Run the ETV actuator lead between the air intake chamber assy bolts.  
Run the ETV actuator lead under the blow-off valve hose.
17. Blow-off Valve Hose
18. Run the secondary fuel hose above the secondary fuel injector lead.
19. Secondary Fuel Injector Lead
20. Run the air intake chamber pressure/temperature sensor lead to the inside of the purge valve hose.
21. Run the secondary fuel injector lead to the inside of the purge valve hose.
22. Run the throttle cables above the other hoses and harness.

# 18-8 APPENDIX

## Cable, Wire, and Hose Routing



---

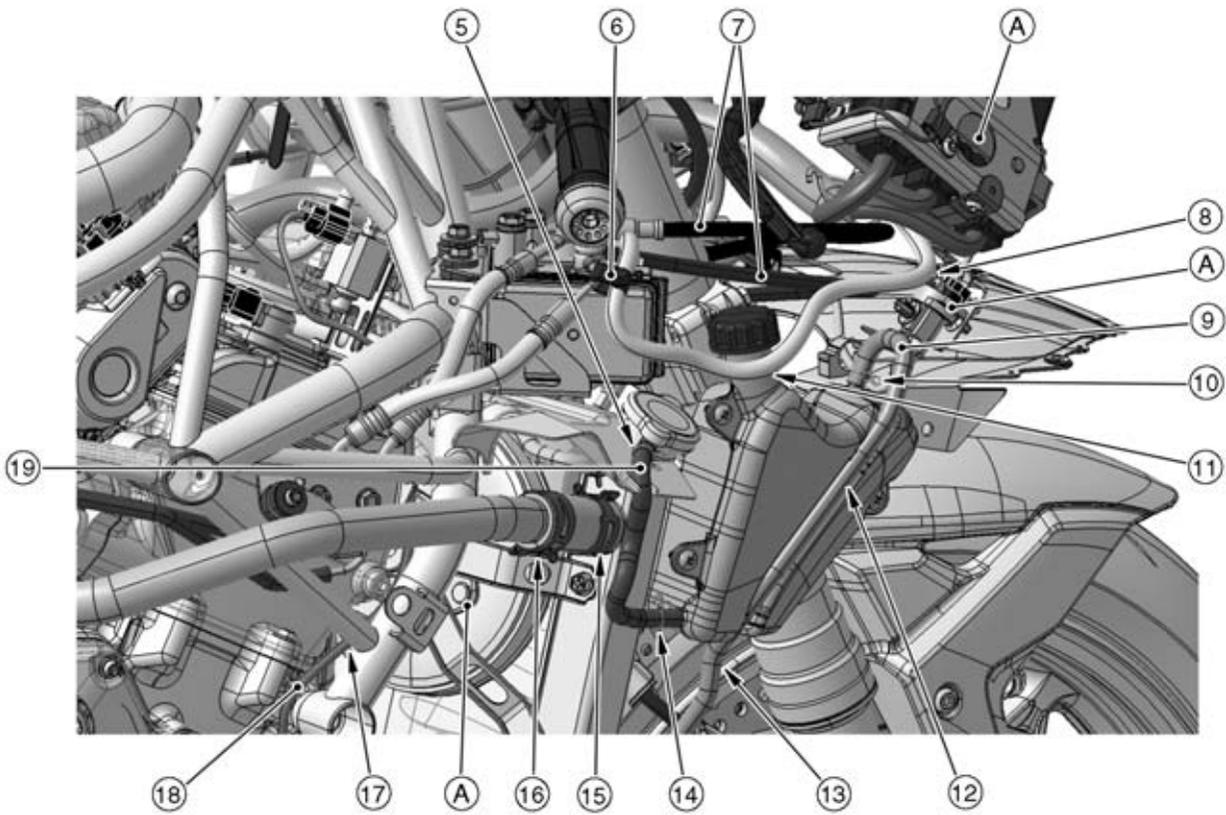
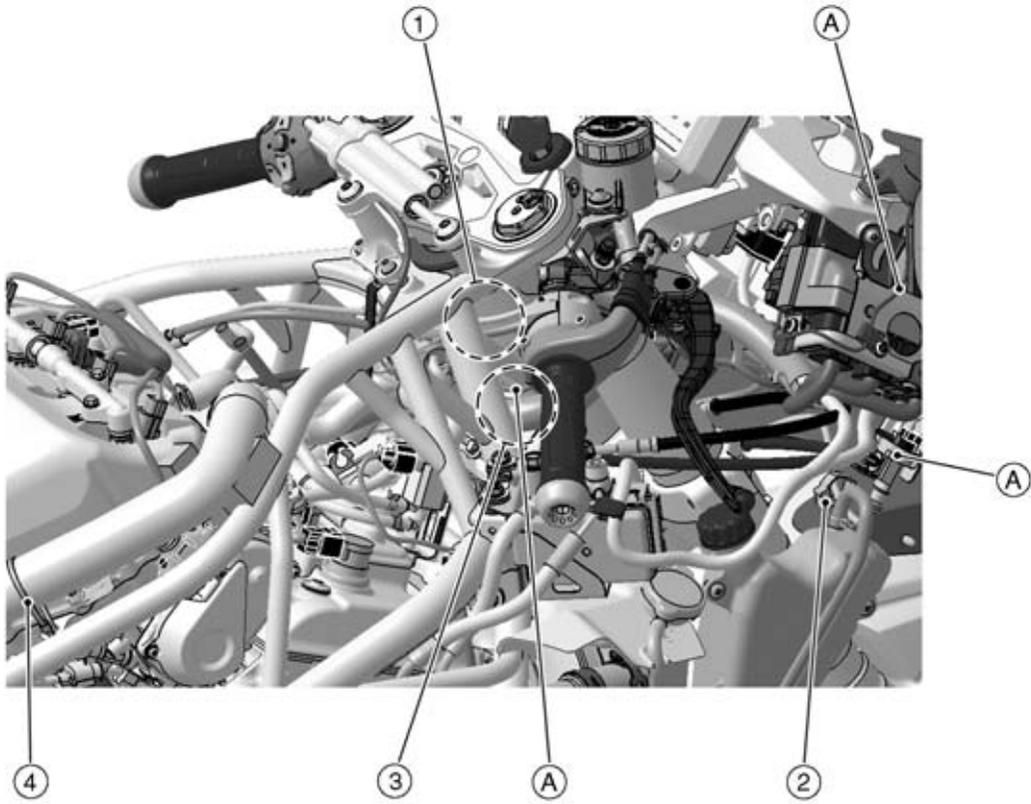
**Cable, Wire, and Hose Routing**

---

1. Clamp (Hold the regulator/rectifier lead (to alternator) and tape portion of the regulator/rectifier lead (to main harness).)
2. Fuel Tank Breather Hose
3. Fuel Tank Drain Hose
4. Run the clutch hose to the outside of the fuel tank drain hose and fuel tank breather hose.
5. Clutch Pipe
6. Run the air bleeder hose between the main harness and fuel tank breather/drain hoses.
7. Run the main harness (to subharness) to the outside of the clutch hose fitting.
8. Put the subharness connector to the inside of the clutch hose fitting.
9. Main Harness (to Subharness)
10. Knock Sensor
11. Gear Position Sensor Lead Connector
12. Quick Shifter Sensor Lead Connector
13. Air Bleeder Hose
14. Run the regulator/rectifier lead (to alternator) to the inside of the gear position sensor lead and quick shifter sensor lead.
15. Run the fuel tank breather and drain hoses to the inside of the other leads.
16. Run the gear position sensor lead, quick shifter sensor lead and oil pressure switch lead to the inside of the frame pipe.
17. Clamp (Hold the regulator/rectifier lead (to alternator). Face the clamp end to the inside of the frame.)
18. Align the tape portion of the main harness with the frame pipe in this position.
19. Regulator/Rectifier Lead (to Main Harness)
20. Regulator/Rectifier Lead (to Alternator)
21. Horizontal
22. Installation angle of the oil pressure switch lead is 0 ~ 60°
23. Run the starter motor cable, gear position sensor lead and quick shifter sensor lead between the ribs of the engine sprocket cover.  
Run the starter motor cable to inside of the other leads.
24. Clamp (Hold the gear position sensor lead, side stand switch lead and tape portion of the quick shifter sensor lead.)
25. Run the gear position sensor lead, side stand switch lead and quick shifter sensor lead to the inside of the rib of the swingarm mounting plate.
26. Clamp (Hold the gear position sensor lead, side stand switch lead and quick shifter sensor lead.)
27. Side Stand Switch Lead
28. Quick Shifter Sensor Lead
29. Clamp (Hold the side stand switch lead and quick shifter sensor lead.)
30. Oil Pressure Switch Lead
31. Clamp (Hold the oil pressure switch lead.)

# 18-10 APPENDIX

## Cable, Wire, and Hose Routing



---

**Cable, Wire, and Hose Routing**

---

**NOTE**

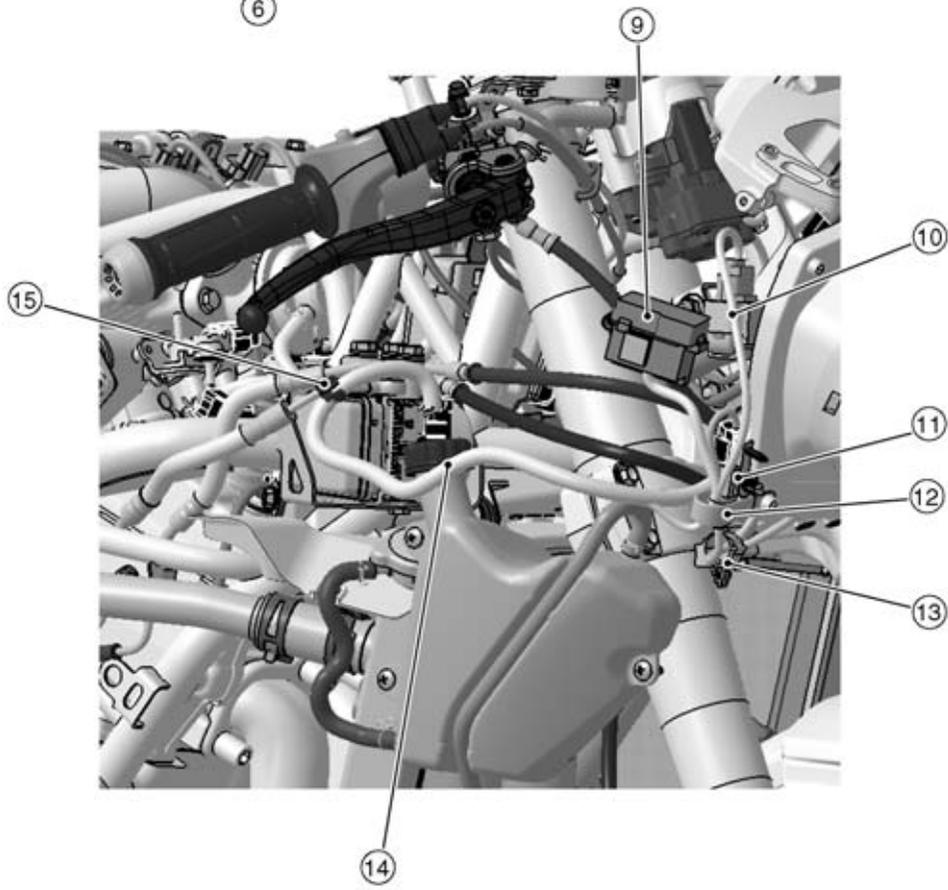
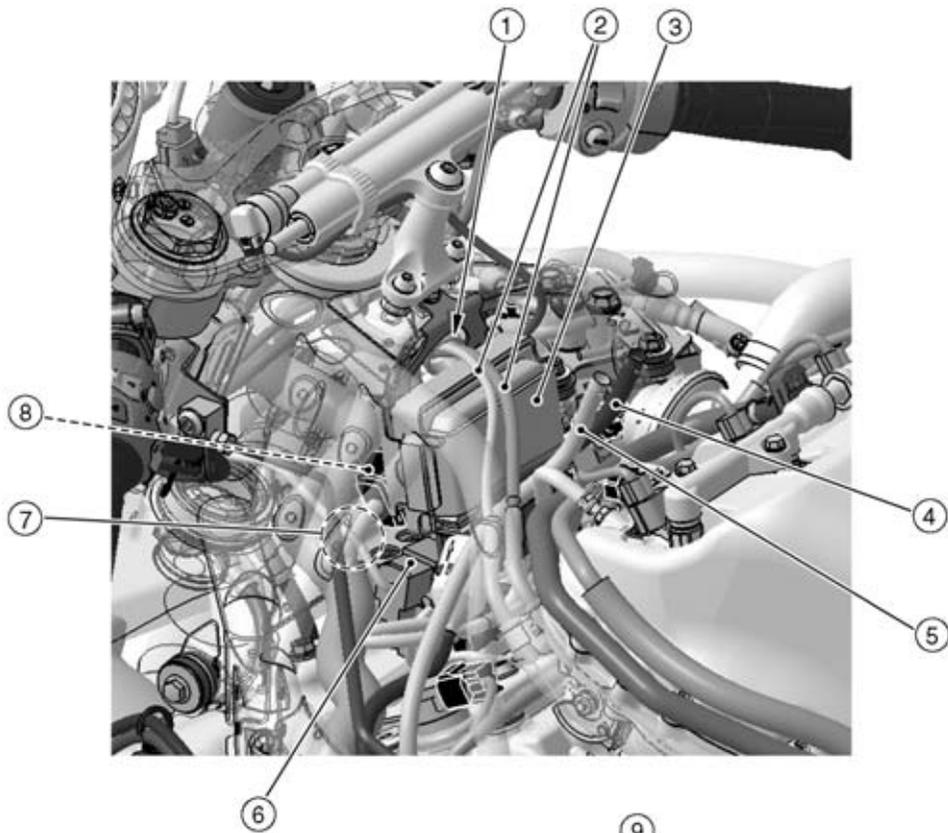
○The routing on ZX1000P is shown using the figure of ZX1000N.

A: ZX1000P is not equipped these parts.

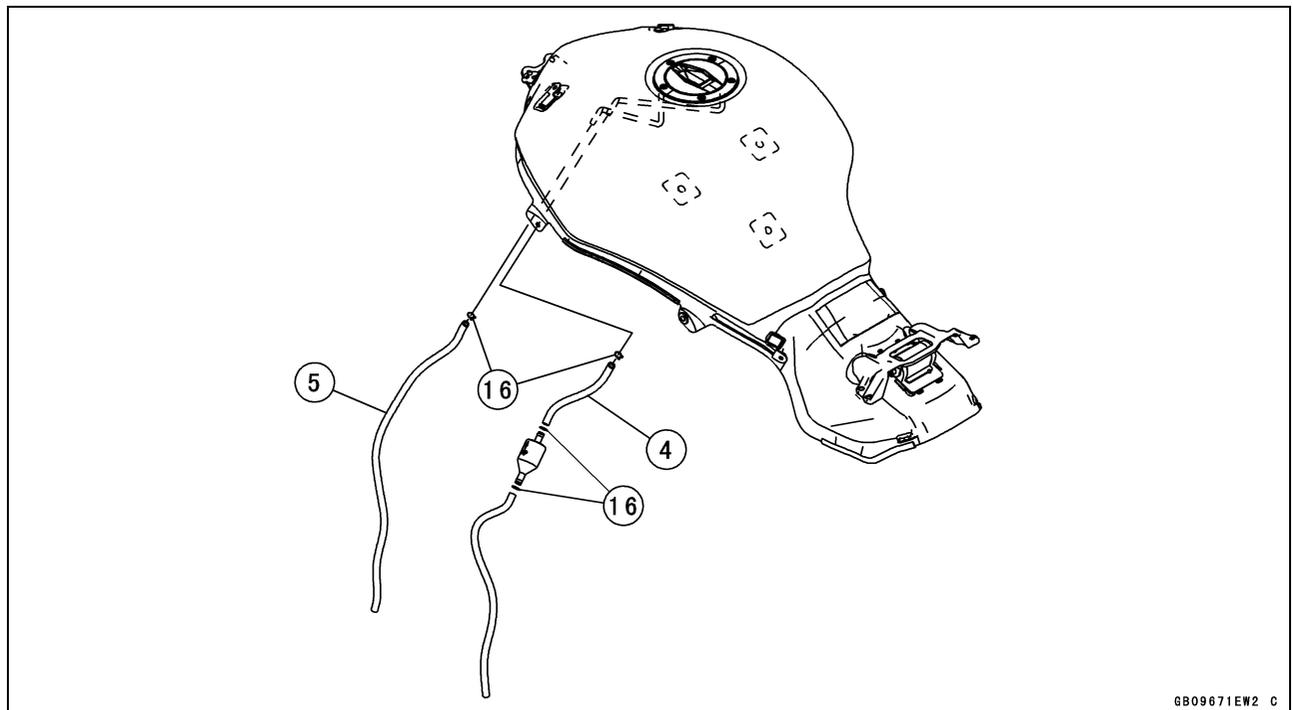
1. Run the throttle cables to the outside of the frame in this position.
2. Clamp (Hold the front wheel rotation sensor lead.)
3. Run the main harness to the outside of the frame in this position.
4. Clamp (Hold the blow-off valve hose.)
5. Clamp (Hold the radiator overflow hose so that the knob faces to the outside.)
6. Clamp (Hold the brake hose and KIBS hydraulic unit lead.)
7. Brake Hoses
8. Run the KIBS hydraulic unit lead to the outside of the brake hoses.
9. Reserve Tank Overflow Hose
10. Clamp (Hold the reserve tank overflow hose so that the knob faces to the outside.)
11. Run the KIBS hydraulic unit lead to the outside of the reserve tank.
12. Fit the reserve tank overflow hose into the groove on the reserve tank.
13. Run the reserve tank overflow hose to the hole of the right middle fairing.
14. Clamp (Hold the radiator overflow hose so that the clamp faces to upside.)
15. Clamp (Hold the water hose so that the knob faces to upside.)
16. Clamp (Hold the water hose so that the knob faces to downside.)
17. Run the crankshaft sensor lead to the inside of the frame in this position.
18. Crankshaft Sensor Lead
19. Radiator Overflow Hose

# 18-12 APPENDIX

## Cable, Wire, and Hose Routing



## Cable, Wire, and Hose Routing

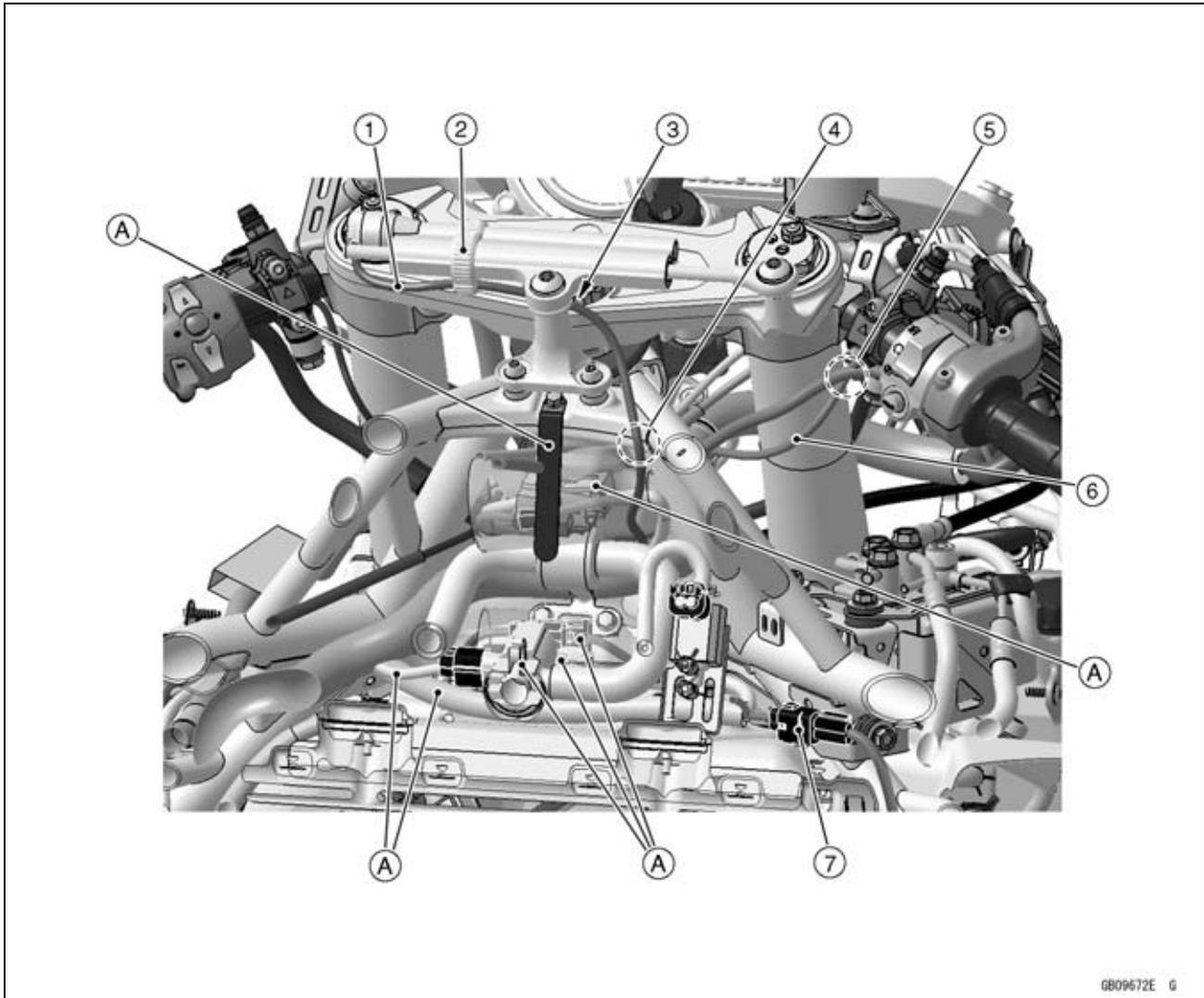


GB09671EW2 C

1. Clamp (Hold the throttle cables.)
2. Run the throttle cables to the upside of the relay box.
3. Relay Box
4. Fuel Tank Breather Hose
5. Fuel Tank Drain Hose
6. Ignition Switch Lead Connector
7. Run the ignition switch lead to the upside of the ESD ECU lead.
8. ESD ECU Lead Connector
9. Fuse Box
10. Vehicle-down Sensor Lead
11. Front Wheel Rotation Sensor Lead Connector (Face the tabs to the front side.)
12. Clamp (Hold the fuse box lead, vehicle-down sensor lead and constricted part of the front wheel rotation sensor lead connector.)
13. Clamp (Hold the front wheel rotation sensor lead.)
14. KIBS Hydraulic Unit Lead
15. Clamp (Hold the brake hose and KIBS hydraulic unit lead.)
16. Clamps (Hold the hoses so that the clamps face to the rear side.)

## 18-14 APPENDIX

### Cable, Wire, and Hose Routing



GB09672E G

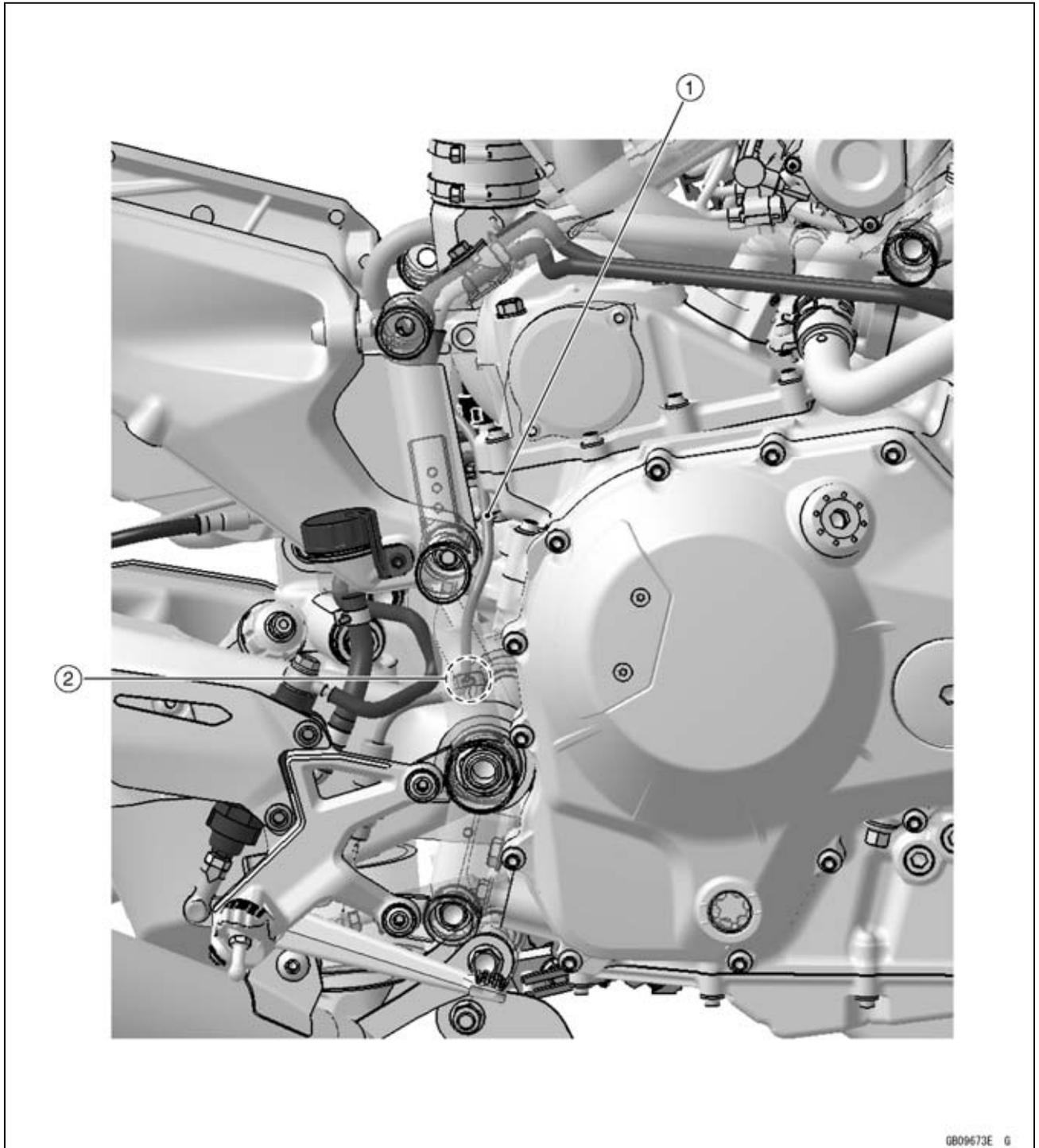
#### NOTE

○The routing on ZX1000P is shown using the figure of ZX1000N.

A: ZX1000P is not equipped these parts.

1. ESD Lead
2. Clamp (Hold the ESD lead.)
3. Run the ESD lead to the front side of the steering damper mounting bolt.
4. Run the ESD lead to the inside of the frame in this position.
5. Run the front brake light switch lead to the upside of the right switch housing lead.
6. Front Brake Light Switch Lead
7. Crankshaft Sensor Lead Connector

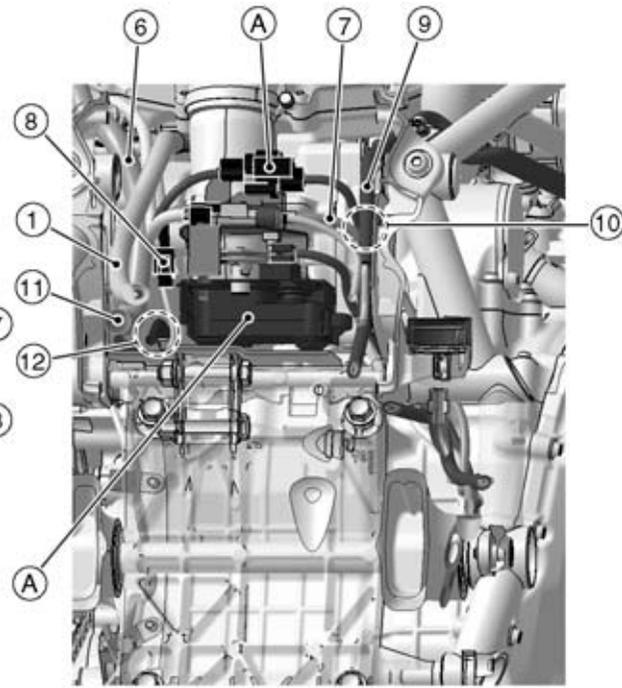
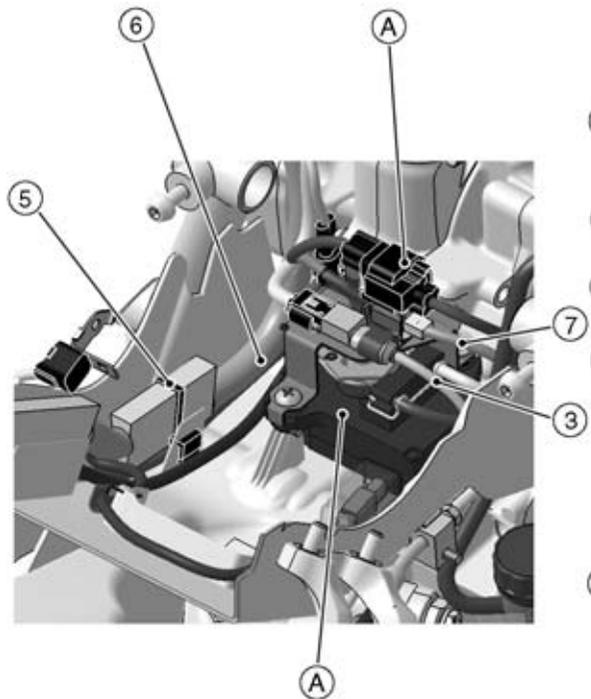
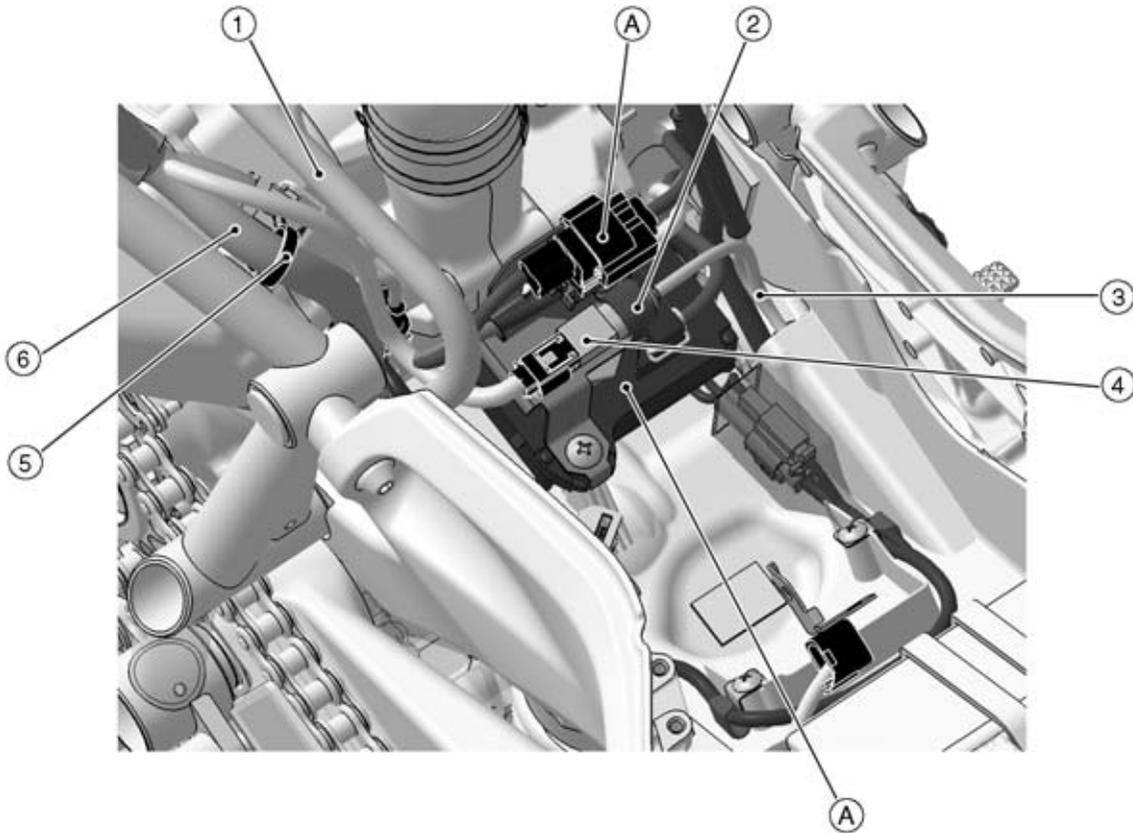
## Cable, Wire, and Hose Routing



1. Rear Brake Light Switch Lead
2. Clamp (Hold the rear brake light switch lead.)

# 18-16 APPENDIX

## Cable, Wire, and Hose Routing



---

**Cable, Wire, and Hose Routing**

---

**NOTE**

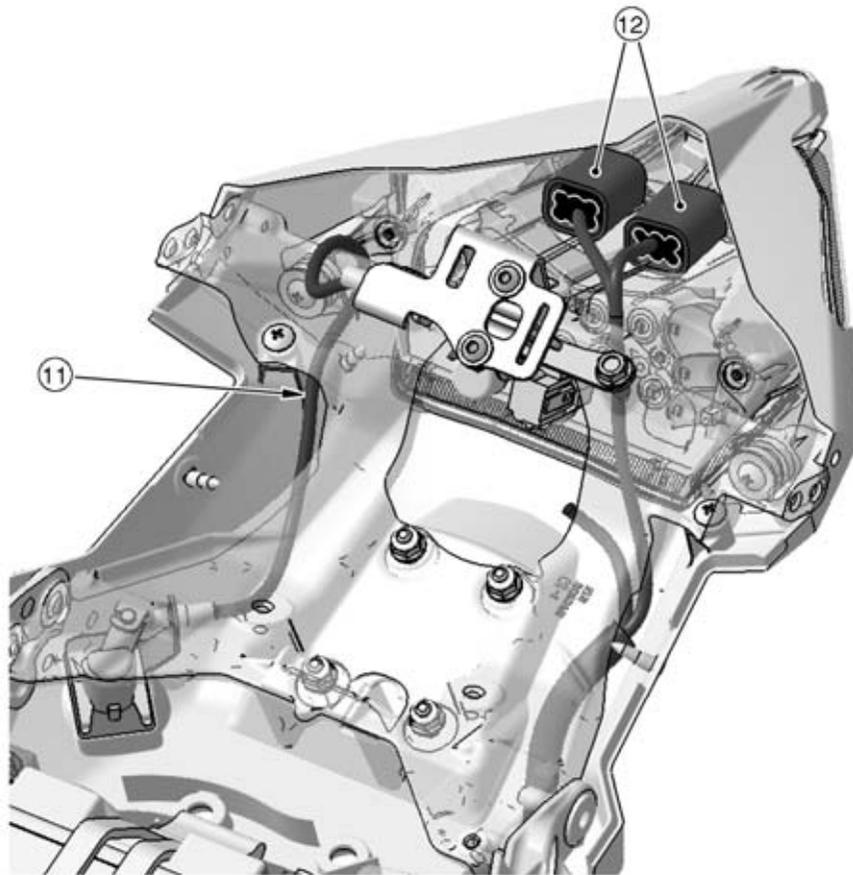
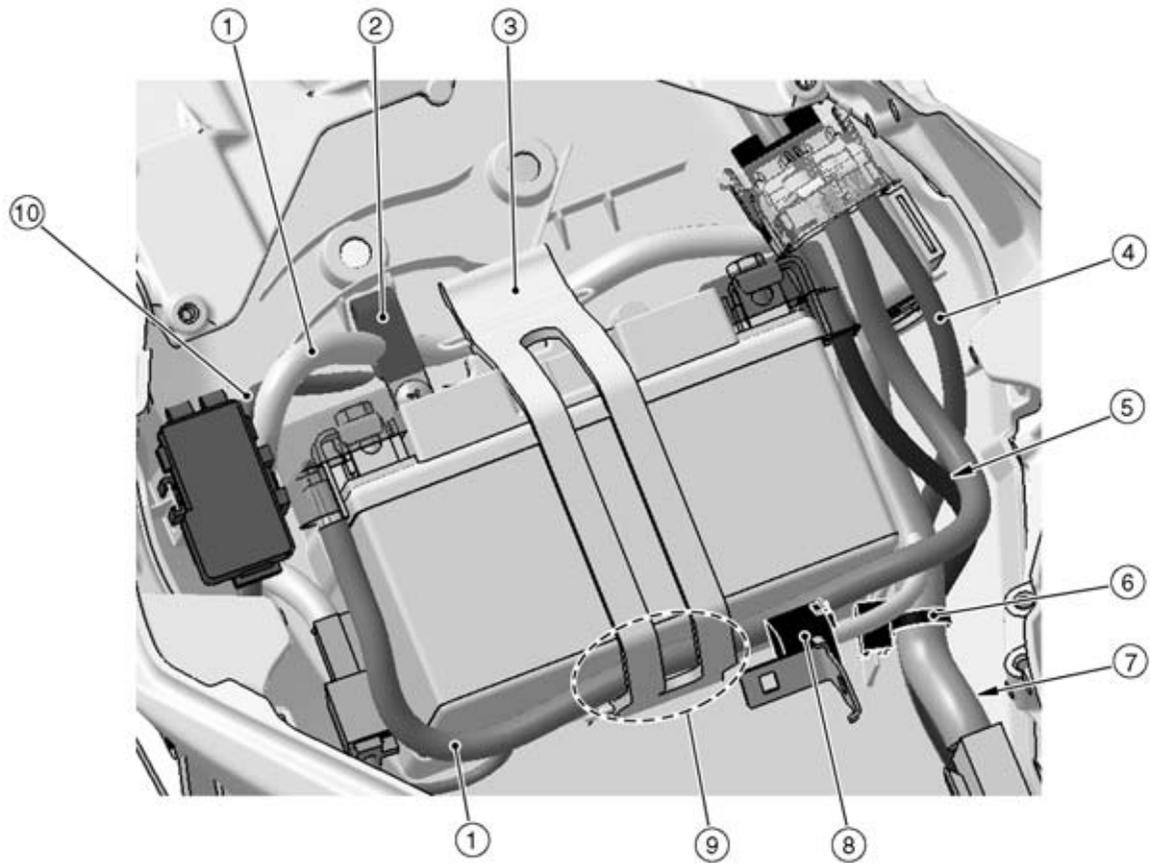
○The routing on ZX1000P is shown using the figure of ZX1000N.

A: ZX1000P is not equipped these parts.

1. Primary Fuel Hose
2. Clamp (Hold the constricted part of the rear wheel rotation sensor lead connector.)
3. Rear Wheel Rotation Sensor Lead
4. Rear Wheel Rotation Sensor Lead Connector
5. Clamps (Hold the main harness.)
6. Main Harness
7. Rear Brake Light Switch Lead
8. Run the side stand switch lead to the inside of the main harness and primary fuel hose.
9. Brake Pipe
10. Run the rear brake light switch lead under the brake pipe.
11. Run the main harness under the primary fuel hose.
12. Run the side stand switch lead to the inside of the battery negative (–) cable (engine ground lead).

# 18-18 APPENDIX

## Cable, Wire, and Hose Routing



---

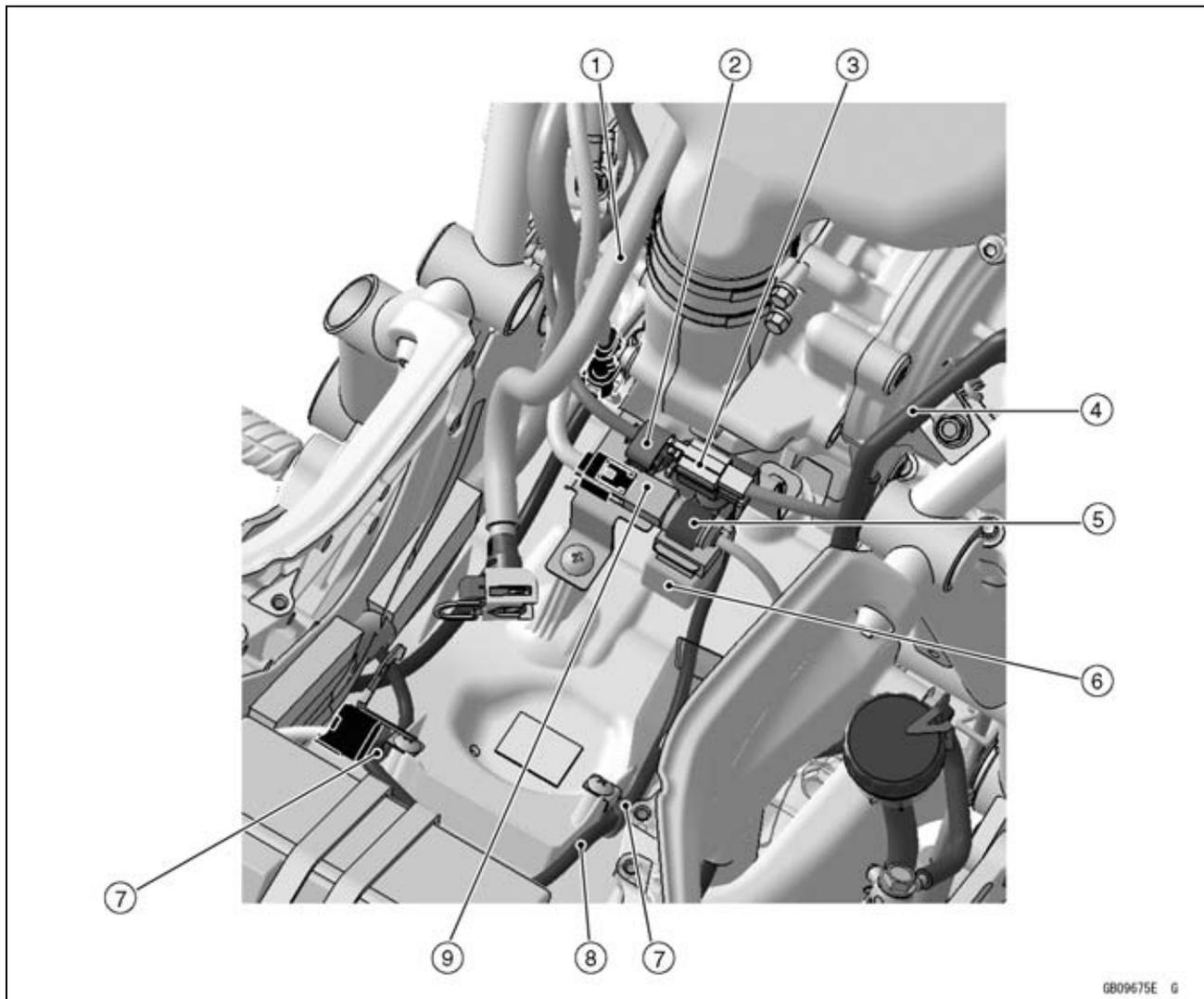
**Cable, Wire, and Hose Routing**

---

1. Battery Positive (+) Cable
2. Clamp (Hold the battery positive (+) cable and fuse box lead.)
3. Band
4. Starter Motor Cable
5. Run the battery negative (–) cable (engine ground lead) over the starter motor cable.
6. Clamp (Hold the main harness.)
7. Run the main harness over the battery negative (–) cable (engine ground lead) and starter motor cable.
8. Hold the fuel pump lead connector to the bracket.
9. Run the battery positive (+) cable to the inside of the band.
10. Fuse Box Lead
11. Run the seat lock cable under the rear frame.
12. KIBS Kawasaki Diagnosis System Connector and Immobilizer/Kawasaki Diagnostic System Connector

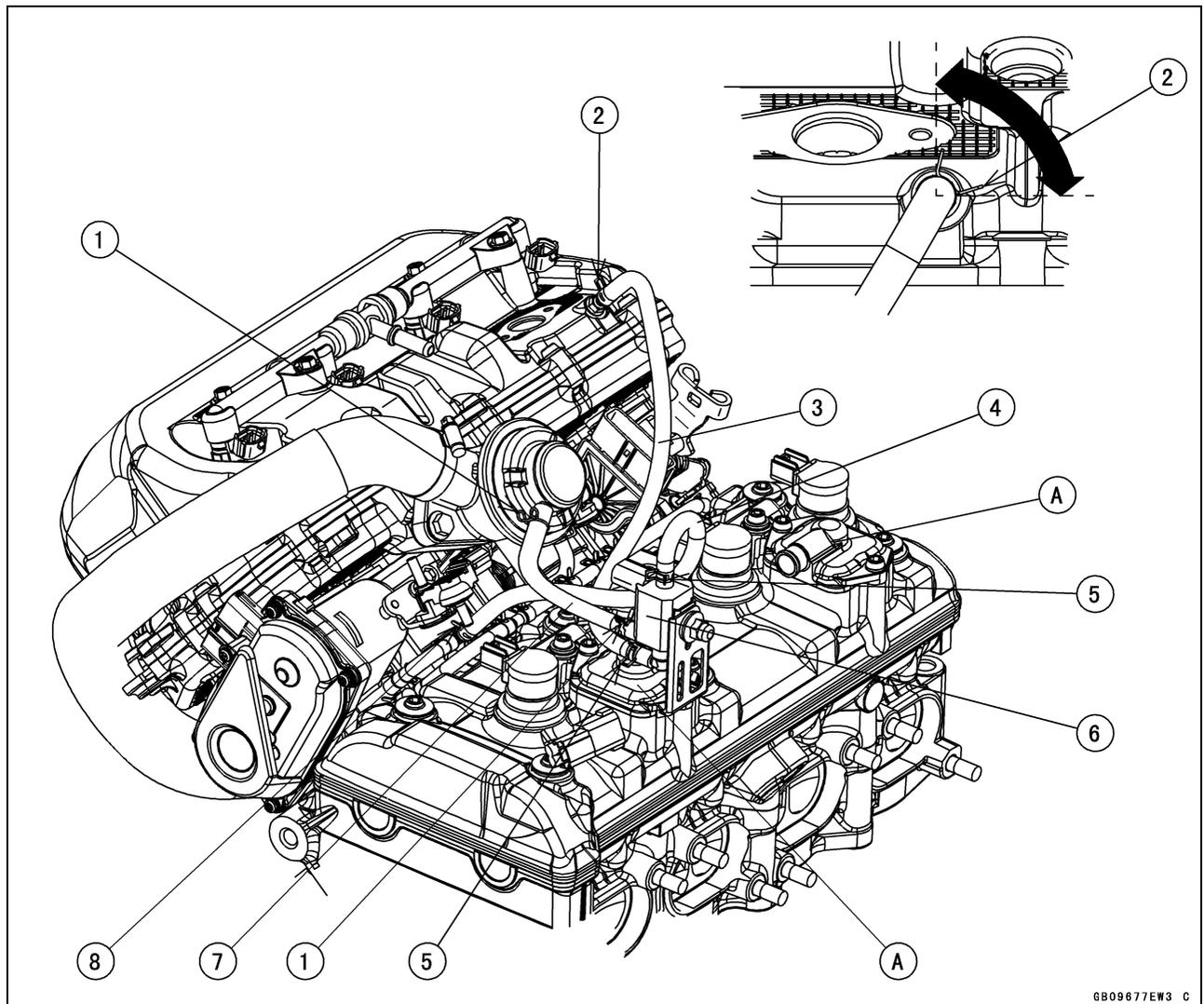
## 18-20 APPENDIX

### Cable, Wire, and Hose Routing



1. Primary Fuel Hose
2. Clamp (Hold the main harness (to rear brake light switch).)
3. Rear Brake Light Switch Lead Connector
4. Brake Pipe
5. Clamp (Hold the constricted part of the rear wheel rotation sensor lead connector.)
6. Fuel Pump Relay
7. Clamps (Hold the fuel pump relay lead.)
8. Fuel Pump Relay Lead
9. Rear Wheel Rotation Sensor Lead Connector

## Cable, Wire, and Hose Routing



GB09677EW3 C

**NOTE**

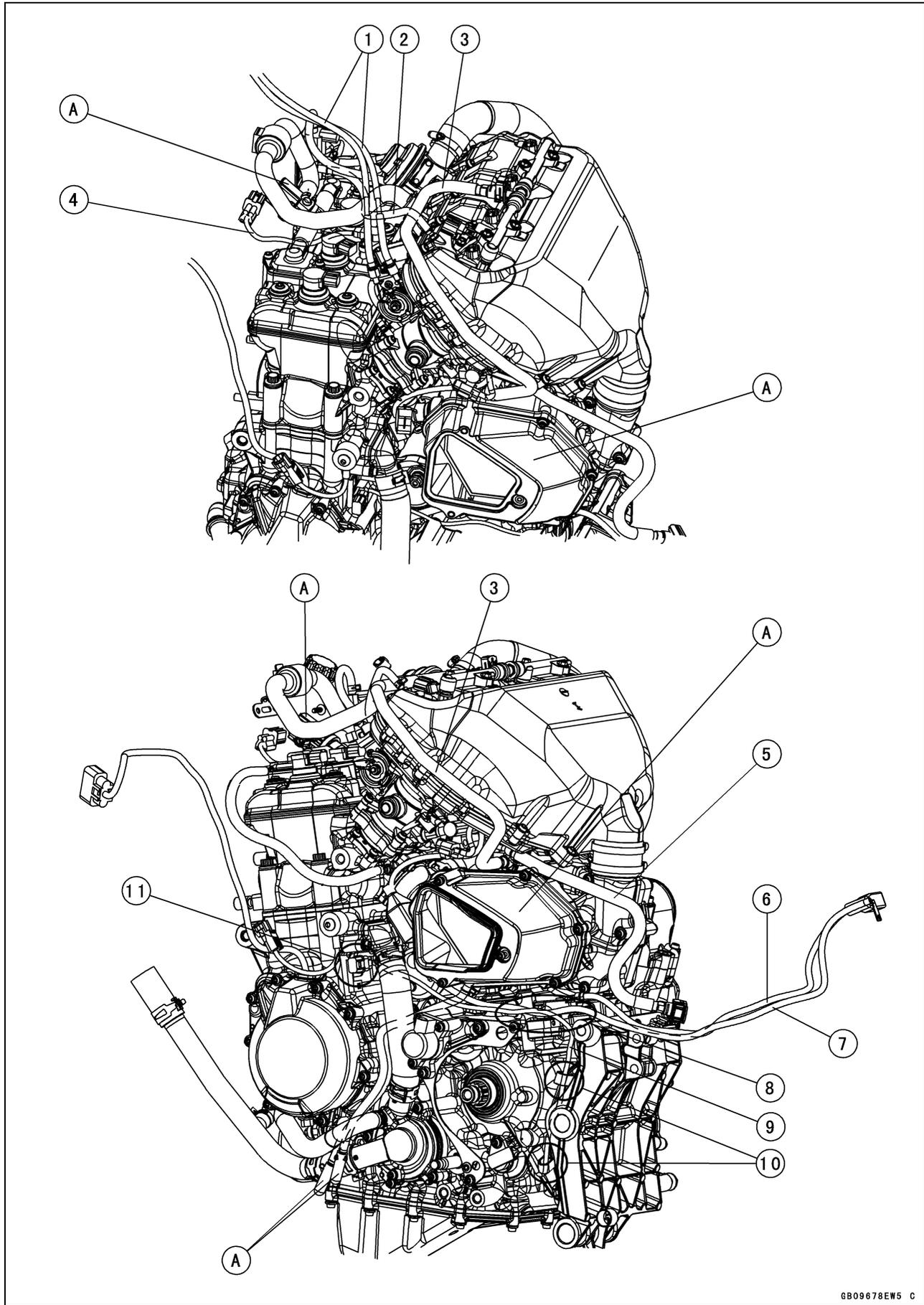
○The routing on ZX1000P is shown using the figure of ZX1000N.

A: ZX1000P is not equipped these parts.

1. Clamps (Hold the purge valve hose so that the knob faces to upside.)
2. Clamp (Hold the purge valve hose as shown.)
3. Purge Valve Hose (to Air Intake Chamber)  
Install the purge valve hose so that the paint mark faces to air intake chamber side and right side.
4. Purge Valve Hose (to Throttle Body Assy)  
Install the purge valve hose so that the paint mark faces to throttle body assy side and rear side.
5. Clamps (Hold the purge valve hose so that the knob faces to right side.)
6. Purge Valve (for Supercharger)
7. Purge Valve Hose (to Blow-off Valve)  
Install the purge valve hose so that the paint mark faces to blow-off valve side.
8. Clamp (Hold the purge valve hose so that the clamp faces to rear side.)

# 18-22 APPENDIX

## Cable, Wire, and Hose Routing



---

**Cable, Wire, and Hose Routing**

---

**NOTE**

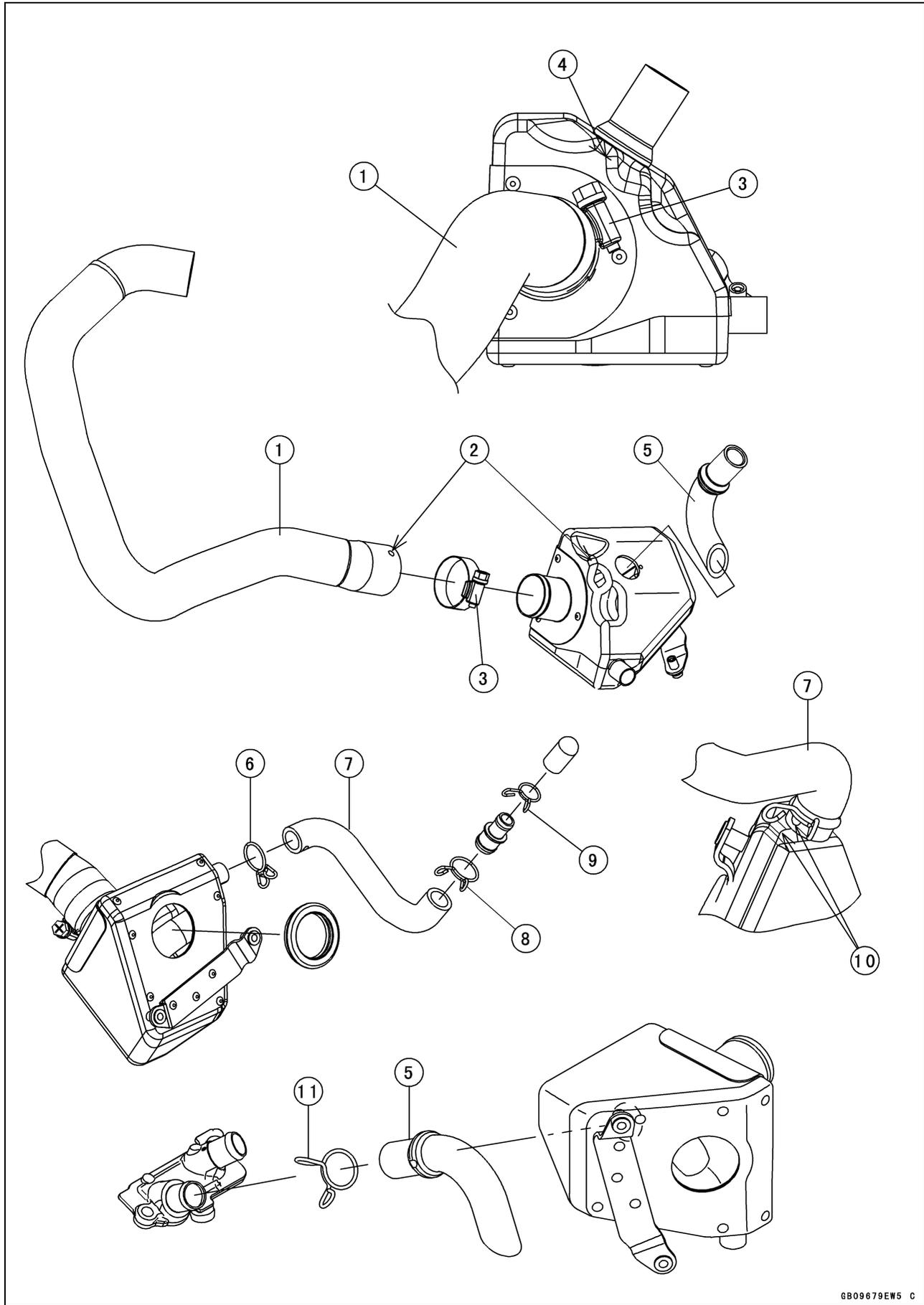
○The routing on ZX1000P is shown using the figure of ZX1000N.

A: ZX1000P is not equipped these parts.

1. Throttle Cables
2. Purge Valve Hose
3. Secondary Fuel Hose
4. Camshaft Position Sensor Lead
5. Primary Fuel Hose
6. Battery Negative (–) Cable (Engine Ground Lead)
7. Starter Motor Cable
8. Run the starter motor cable to the inside of the other leads.
9. Gear Position Sensor Lead
10. Clamps (Hold the gear position sensor lead.)
11. Hold the gear position sensor lead connector to the upper side of the bracket.

# 18-24 APPENDIX

## Cable, Wire, and Hose Routing



---

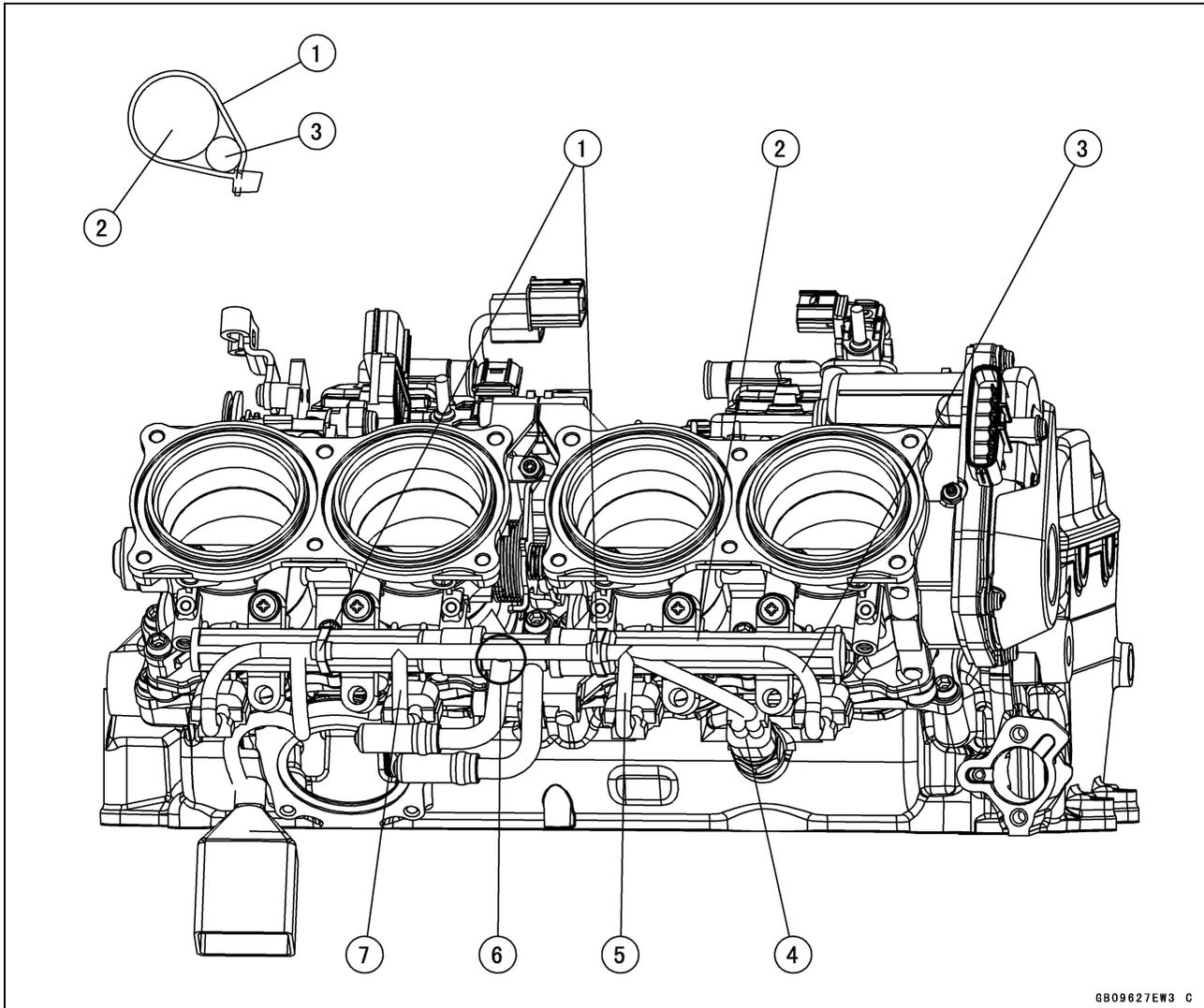
**Cable, Wire, and Hose Routing**

---

1. Blow-off Valve Hose
2. Align the paint mark with the projection part of the blow-off valve hose fitting box.
3. Clamp (Hold the blow-off valve hose as shown.)
4. Projection part of the blow-off valve hose fitting box.
5. Breather Hose
6. Clamp (Hold the blow-off valve hose fitting box drain hose so that the knob faces to left side.)
7. Blow-off Valve Hose Fitting Box Drain Hose
8. Clamp (Hold the fitting so that the knob faces to upside.)
9. Clamp (Hold the blow-off valve hose fitting box drain hose cap so that the knob faces to upside.)
10. Align the paint mark with the mating surface of the blow-off valve hose fitting box.
11. Clamp (Hold the breather hose so that the knob faces to left side.)

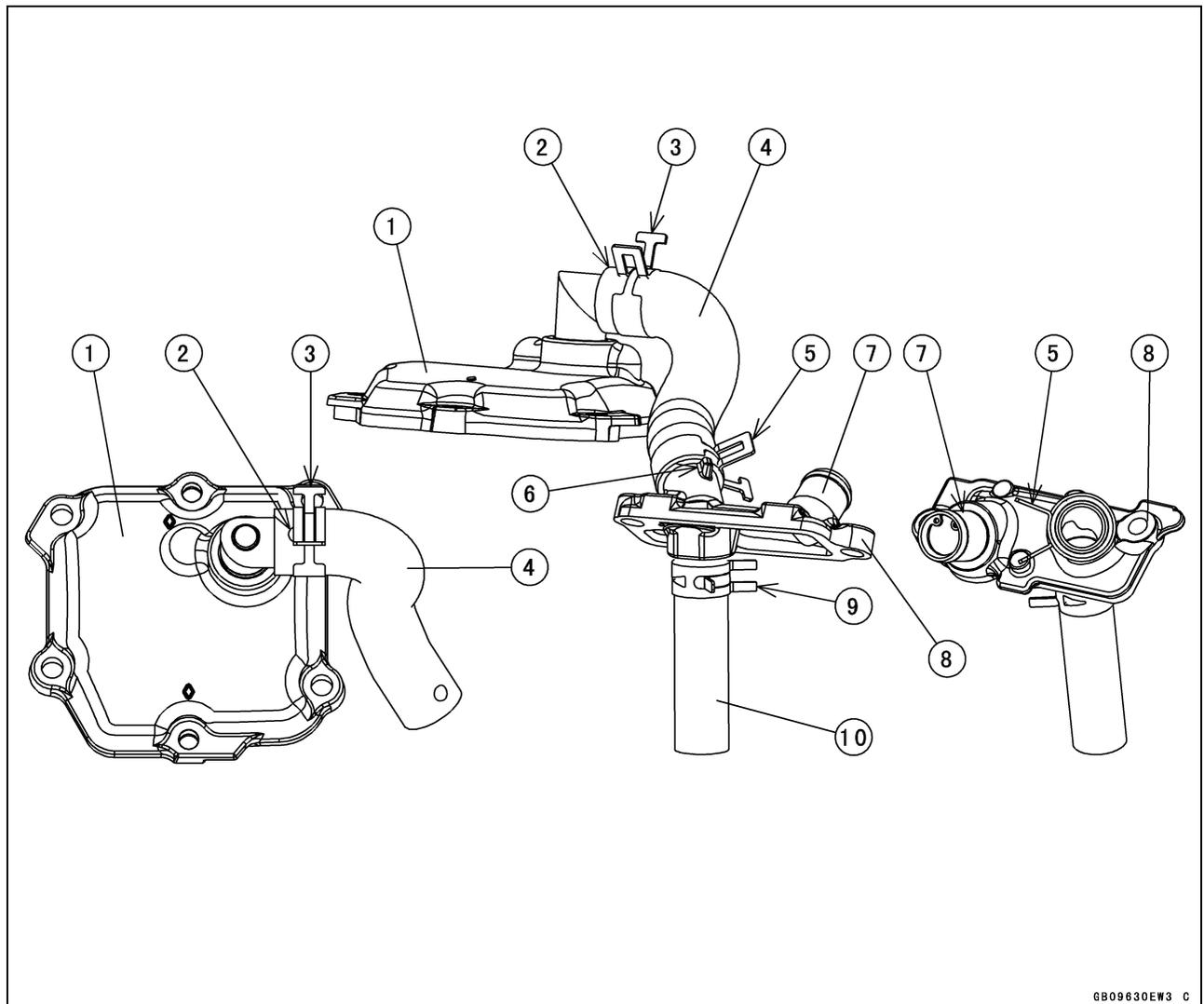
## 18-26 APPENDIX

### Cable, Wire, and Hose Routing



1. Bands (Hold the delivery pipe and subharness. Install them to the tape positions.)
2. Delivery Pipe
3. Subharness
4. Water Temperature Sensor Lead Connector
5. Subharness with the "3" Mark (to Primary Fuel Injector #3)
6. Touch the subharness to the delivery pipe.
7. Subharness with the "2" Mark (to Primary Fuel Injector #2)

## Cable, Wire, and Hose Routing

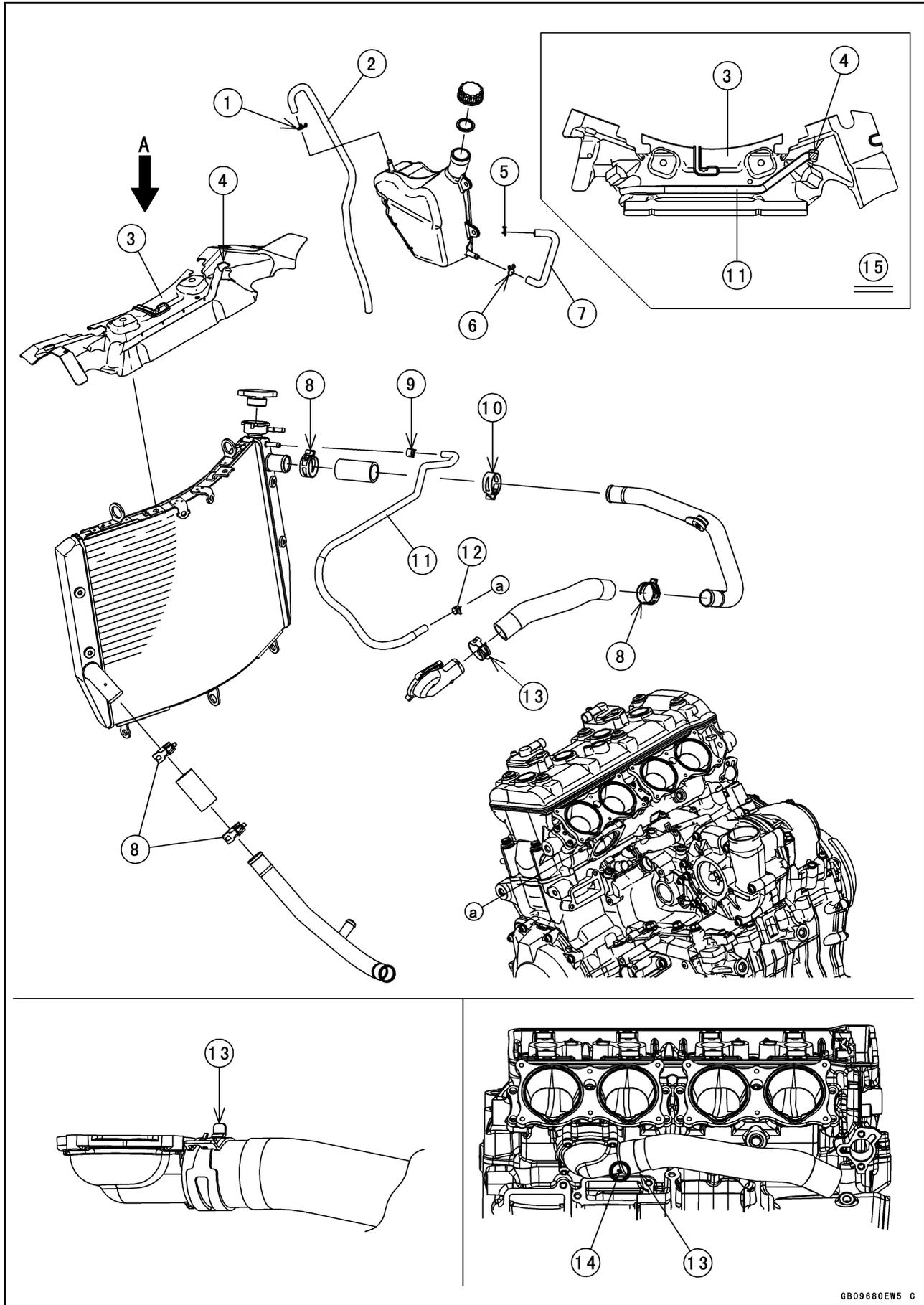


GB09630EW3 C

1. Right Breather Cover
2. Install the breather hose so that the paint mark faces vertically to the mating surface.
3. Clamp (Hold the breather hose as shown.)
4. Breather Hose (to Left Breather Cover)
5. Clamp (Hold the breather hose so that the knob faces to the hose fitting.)
6. Align the paint mark with the projection of the left breather cover.
7. Hose Fitting
8. Left Breather Cover
9. Clamp (Hold the breather hose so that the knob faces to the left side.)
10. Breather Hose (to Crankcase)

# 18-28 APPENDIX

## Cable, Wire, and Hose Routing



---

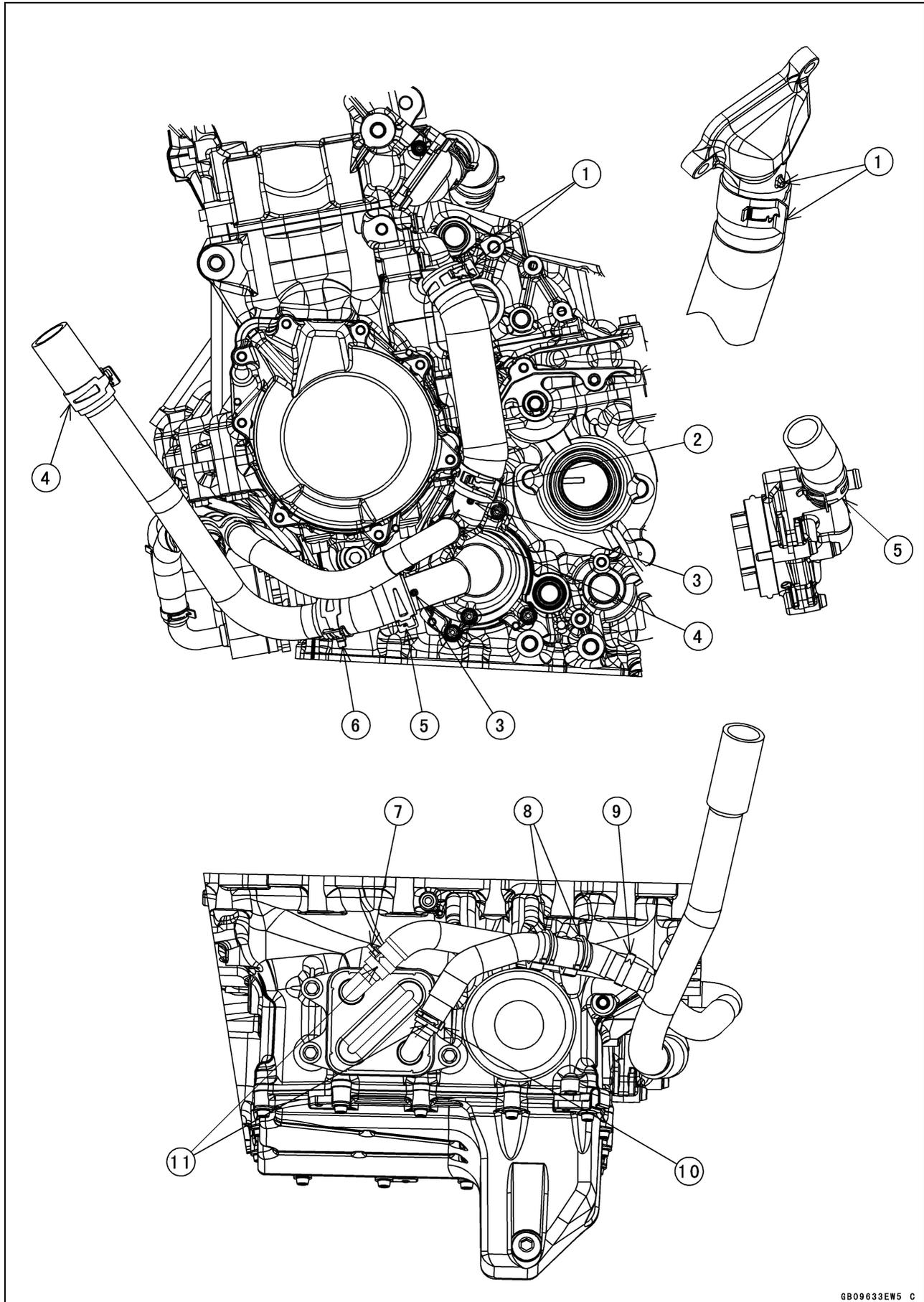
**Cable, Wire, and Hose Routing**

---

1. Clamp (Hold the reserve tank overflow hose.)
2. Install the reserve tank overflow hose so that the paint mark faces to reserve tank side and rear side.
3. Radiator Cover
4. Run the air bleeder hose into the hole of the radiator cover.  
Align the tape portion of the air bleeder hose to the hole.
5. Clamp (Hold the reserve tank hose so that the knob faces to right side.)
6. Clamp (Hold the reserve tank hose.)
7. Install the radiator overflow hose so that the paint mark faces to reserve tank side and outside.
8. Clamps (Hold the water hose so that the knob faces to upside.)
9. Clamp (Hold the air bleeder hose so that the knob faces to right side.)
10. Clamp (Hold the water hose so that the knob faces to downside.)
11. Air Bleeder Hose
12. Clamp (Hold the air bleeder hose so that the knob faces to rear side.)
13. Clamp (Hold the water hose as shown.)
14. Align the paint mark of the water hose with the projection of the thermostat housing cover.
15. Viewed from A

# 18-30 APPENDIX

## Cable, Wire, and Hose Routing



---

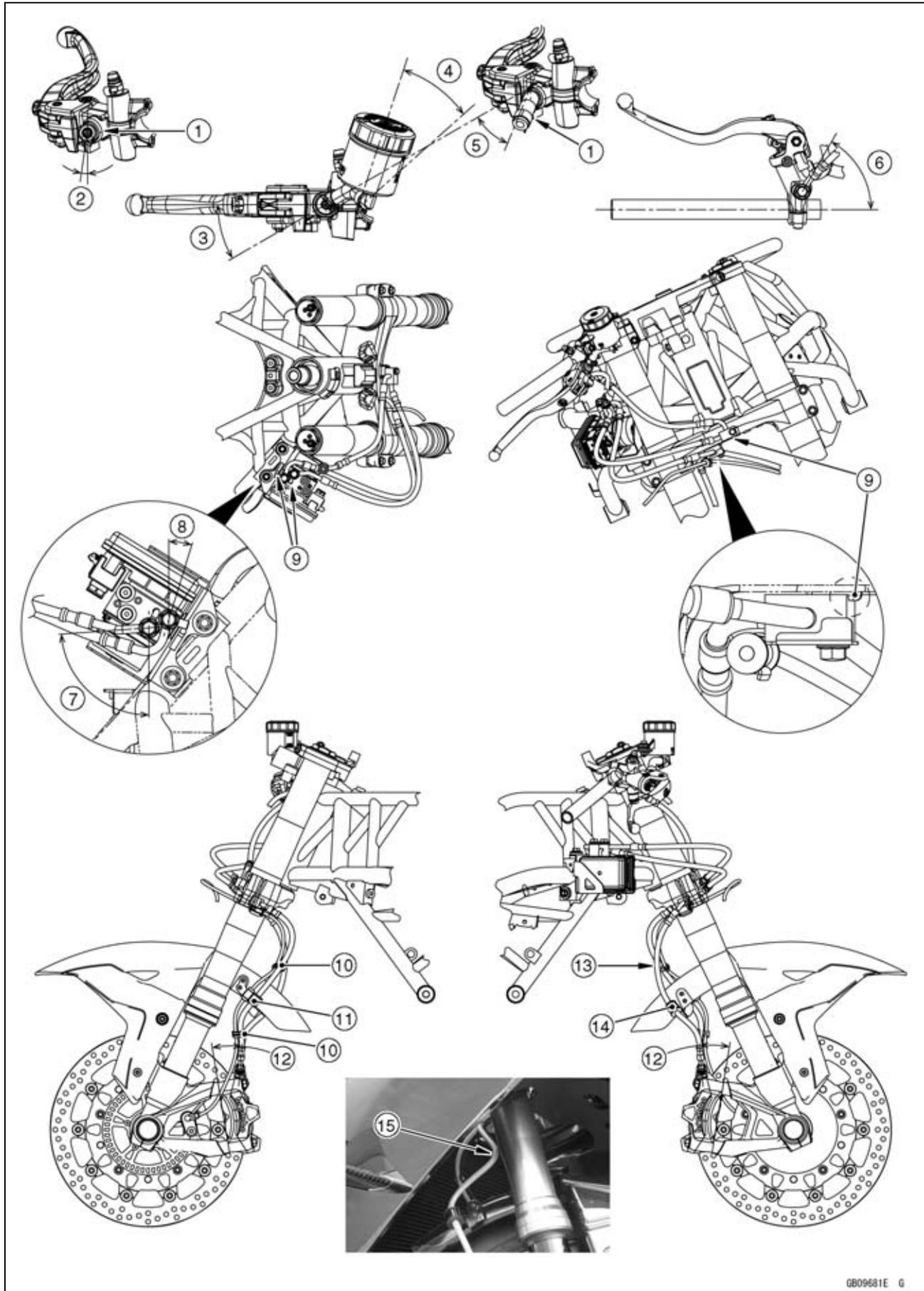
**Cable, Wire, and Hose Routing**

---

1. Clamp (Hold the water hose. Align the knob of the clamp with the projection of the water hose fitting cover.)
2. Clamp (Hold the water hose so that the knob faces to left side.)
3. Align the paint mark of the water hose with the projection of the water pump cover.
4. Clamps (Hold the water hose so that the knob faces to rear side.)
5. Clamp (Hold the water hose so that the outside knob of the clamp faces to downside.)
6. Clamp (Hold the water hose so that the center of the knobs faces to downside.)
7. Clamp (Hold the water hose so that the knob faces to upside.)
8. Install the clamps from the upside to hold the water hoses.
9. Clamp (Hold the water hose so that the knob faces to upside.)
10. Clamp (Hold the water hose so that the knob faces to front side.)
11. Install the water hoses so that the paint mark faces to front side.

# 18-32 APPENDIX

## Cable, Wire, and Hose Routing



---

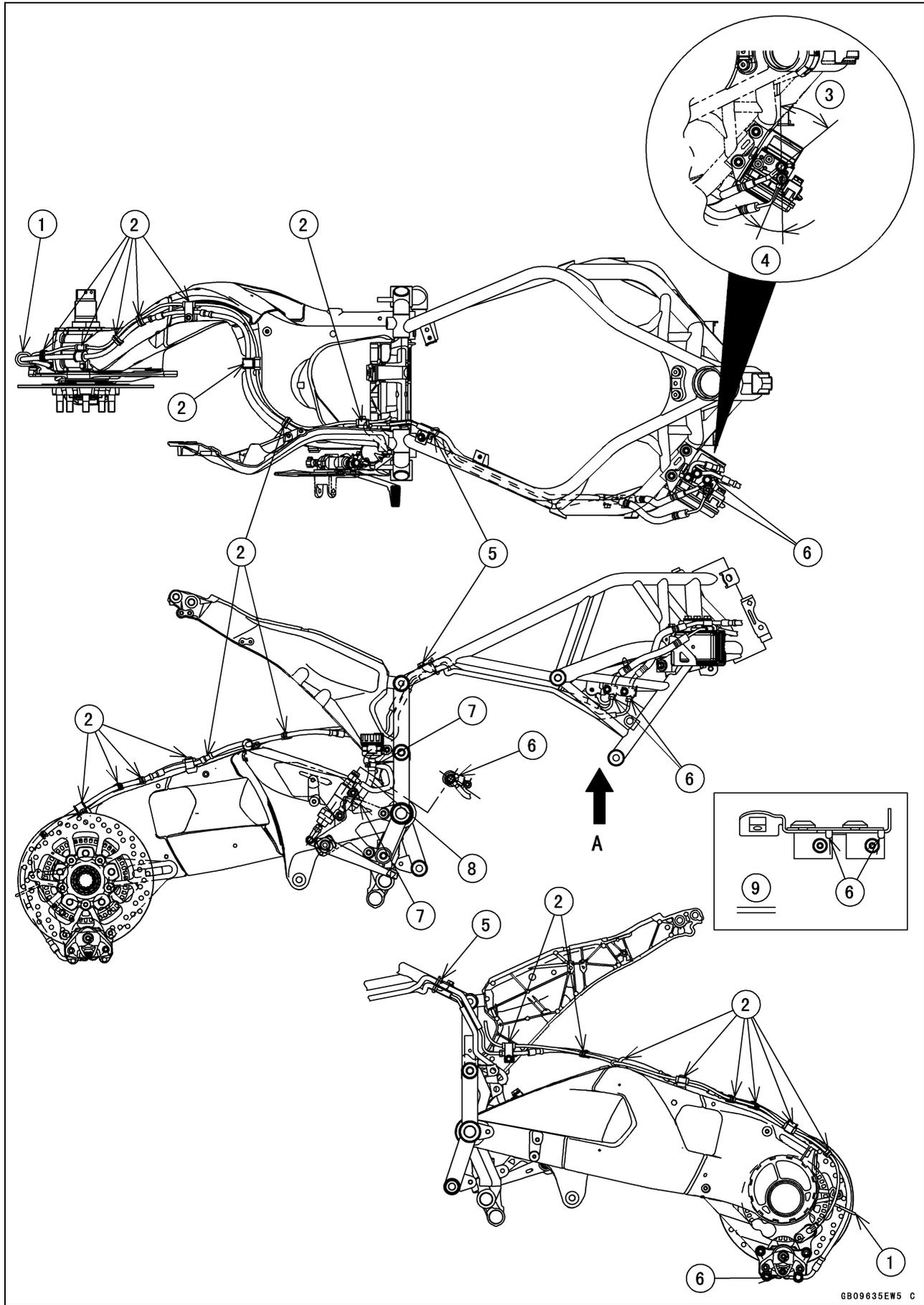
**Cable, Wire, and Hose Routing**

---

1. Clamp (Hold the brake hose.)
2. Installation angle of the clamp knob is about 8°.
3. Installation angle of the brake hose is 30°.
4. Installation angle of the front master cylinder reservoir tank is 30°.
5. Installation angle of the brake hose is 40°.
6. Installation angle of the brake hose is 60°.
7. About 86°
8. About 17°
9. Touch the brake hose fitting to the stopper.
10. Clamps (Hold the brake hose and tape portion of the front wheel rotation sensor lead.)
11. Clamp (Hold the brake hose and front wheel rotation sensor lead.)
12. Installation angle of the brake hose is 14°
13. Correct
14. Clamp (Hold the brake hose.)
15. Incorrect (Run the brake hose correctly.)

# 18-34 APPENDIX

## Cable, Wire, and Hose Routing



---

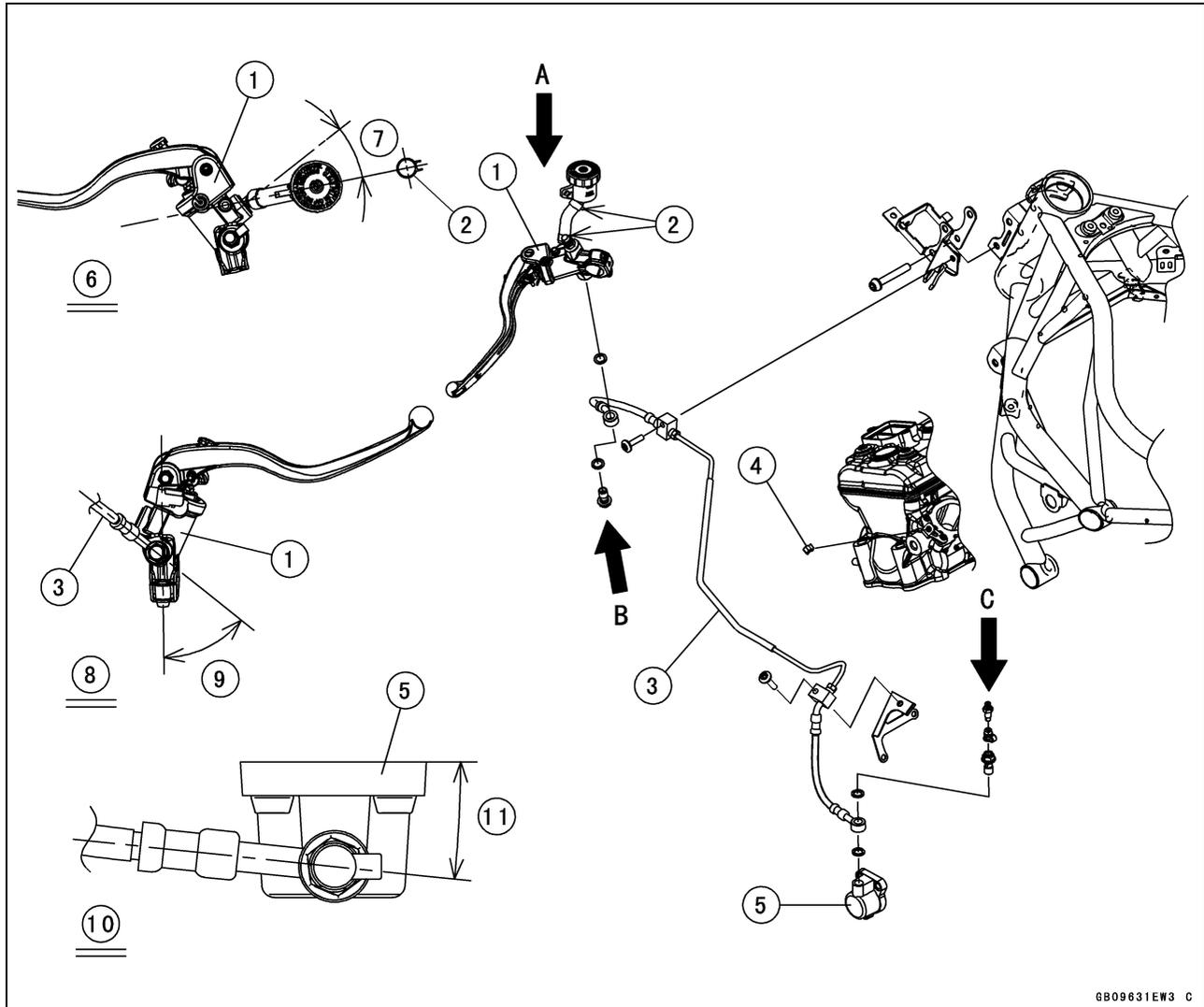
**Cable, Wire, and Hose Routing**

---

1. Clamp (Hold the brake hose.)
2. Clamps (Hold the brake hose and rear wheel rotation sensor lead.)
3. About 50°
4. About 23°
5. Clamp (Hold the brake hoses.)
6. Touch the brake hose fitting to the stopper.
7. Clamps (Hold the brake hose so that the knob faces to rear side.)
8. Install the brake hose so that the paint mark faces to rear master cylinder side and inside of the frame.
9. Viewed from A

# 18-36 APPENDIX

## Cable, Wire, and Hose Routing



- 1. Clutch Master Cylinder
- 2. Clamps (Hold the clutch hose as shown.)
- 3. Clutch Hose
- 4. Clamp (Hold the clutch hose.)
- 5. Clutch Slave Cylinder
- 6. Viewed from A
- 7. 26°
- 8. Viewed from B
- 9. About 50.5°
- 10. Viewed from C
- 11. About 6°

## Troubleshooting Guide

### NOTE

- Refer to the *Fuel System* 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 switch not on and engine start/stop switch to engine stop position
- Starter lockout switch or gear position sensor trouble
- Starter motor trouble
- Battery voltage low
- Starter circuit relay not contacting or operating
- Engine start/stop switch not contacting
- Starter system wiring shorted or open
- Ignition switch trouble
- Engine start/stop switch trouble
- Main or ignition fuse blown

#### Starter motor rotating but engine doesn't turn over:

- Vehicle-down sensor (DFI) coming off
- 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
- Balancer bearing 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
- Clutch lever not pulled in or gear not in neutral
- Battery voltage low
- 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 sensor, starter lockout switch, or side stand switch trouble
- Crankshaft sensor trouble
- Ignition switch or engine start/stop switch shorted
- Starter system wiring shorted or open
- Main or ignition fuse blown

#### Fuel/air mixture incorrect:

- Air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Leak from oil filler plug, crankcase breather hose or blow-off valve hose fitting box 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
- 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:

- Air passage clogged
- Air bleed pipe bleed holes clogged
- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble
- Fuel to injector insufficient
- Supercharger malfunction
- Fuel line clogged
- Throttle body assy holder loose
- Throttle body assy loose
- Air intake chamber loose
- Intake duct loose

## 18-38 APPENDIX

### Troubleshooting Guide

---

#### **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 start/stop switch trouble
- Fuel injector trouble
- Carbon accumulating on valve seating surface
- Engine overheating

#### **Other:**

- ECU trouble
- Engine oil viscosity too high
- Drive train trouble
- Brake dragging
- Clutch slipping
- Engine overheating

#### **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
- Intake duct loose
- Water or foreign matter in fuel
- Throttle body assy holder loose
- Throttle body assy loose
- Air intake chamber loose
- Fuel to injector insufficient
- Fuel tank air vent obstructed
- Fuel line clogged
- Fuel pump trouble
- Supercharger malfunction

##### **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

#### **Overheating:**

##### **Firing incorrect:**

- Spark plug dirty, broken, or maladjusted
- Spark plug incorrect
- ECU trouble

##### **Fuel/air mixture incorrect:**

- Throttle body assy holder loose
- Throttle body assy loose
- Air intake chamber loose
- Intake duct 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

## Troubleshooting Guide

Wrong coolant mixed ratio

### Cooling system component incorrect:

Radiator fin damaged  
Radiator clogged  
Thermostat trouble  
Radiator cap trouble  
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  
Clutch master cylinder trouble  
Clutch slave cylinder 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  
Clutch hub spline damaged  
Clutch friction plate installed wrong  
Clutch slave cylinder trouble  
Clutch fluid deteriorated  
Clutch fluid leakage  
Air in clutch fluid line  
Clutch master cylinder primary or secondary cup damage  
Clutch master cylinder scratched inside

### Gear Shifting Faulty:

#### Doesn't go into gear; shift pedal doesn't return:

Clutch not disengaging  
Shift fork bent or seized  
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

#### Jumps out of gear:

Shift fork ear worn, bent  
Shifter 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 spring 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 mount loose  
Crankshaft bearing worn  
Primary gear worn or chipped  
Camshaft chain tensioner trouble  
Camshaft chain, sprocket, guide worn  
Alternator rotor loose  
Balancer gear worn or chipped  
Balancer shaft position maladjusted  
Balancer bearing worn  
Balancer rubber damper damaged  
Supercharger chain tensioner noise (Refer to the Supercharger Chain Tensioner Installation in the Fuel System (DFI) chapter)

## 18-40 APPENDIX

### Troubleshooting Guide

---

#### 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

#### Red Oil Pressure Warning Indicator Light (LED) 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:

- Intake duct loose
- Air cleaner poorly sealed or missing

#### Handling and/or Stability Unsatisfactory:

##### Handlebars 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

##### Handlebars shakes or excessively vibrates:

- Tire worn
- Swingarm pivot bearing worn
- Rim warped, or not balanced
- Wheel bearing worn
- Handlebar clamp bolt loose
- Steering stem nut loose
- Front, rear axle runout excessive
- Engine mounting bolt loose

##### Handlebars 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
- 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

---

**Troubleshooting Guide**

---

Brake fluid deteriorated  
Master cylinder trouble

**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.                    |
|------|----------|--|
| 2015 | ZX1000PF | JKAZXCPC□FA000001<br>JKAZXT00PPA000001 |

□:This digit in the frame number changes from one machine to another.