



**Kawasaki**

**Z750S**



# **Motorcycle Service Manual**



# Quick Reference Guide

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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.





**Z750S**

# **Motorcycle Service Manual**

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

**Read OWNER'S MANUAL before operating.**

## EMISSION CONTROL INFORMATION

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

### 1. Crankcase Emission Control System

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

### 2. Exhaust Emission Control System

This system reduces the amount of pollutants discharged into the atmosphere by the exhaust of this motorcycle. The fuel, ignition, and exhaust systems of this motorcycle have been carefully designed and constructed to ensure an efficient engine with low exhaust pollutant levels. The exhaust system of this model motorcycle manufactured primarily for sale in California includes a catalytic converter system.

### 3. Evaporative Emission Control System

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

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

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

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

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

### NOTE

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

1. Tampering does not include the temporary removal or rendering inoperative of devices or elements of design in order to perform maintenance.

2. Tampering could include:

a. Maladjustment of vehicle components such that the emission standards are exceeded.

b. Use of replacement parts or accessories which adversely affect the performance or durability of the motorcycle.

c. Addition of components or accessories that result in the vehicle exceeding the standards.

d. Permanently removing, disconnecting, or rendering inoperative any component or element of design of the emission control systems.

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

## **TAMPERING WITH NOISE CONTROL SYSTEM PROHIBITED**

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

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

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



# Foreword

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

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

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

To get the longest life out of your vehicle:

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki Motorcycle parts. Special tools, gauges, and testers that are necessary when servicing Kawasaki motorcycles are introduced by the Special Tool Catalog or 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.

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## How to Use This Manual

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In preparing this manual, we divided the product into its major systems. These systems became the manual's chapters. All information for a particular system from adjustment through disassembly and inspection is located in a single chapter.

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.

The Periodic Maintenance Chart is located in the Periodic Maintenance chapter. The chart gives a time schedule for required maintenance operations.

If you want spark plug information, for example, go to the Periodic Maintenance Chart first. The chart tells you how frequently to clean and gap the plug. Next, use the Quick Reference Guide to locate the Periodic Maintenance chapter. Then, use the Table of Contents on the first page of the chapter to find the Spark Plug section.

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

### WARNING

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

### CAUTION

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

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

## **NOTE**

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

● Indicates a procedural step or work to be done.

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

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

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

# General Information

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## 1-2 GENERAL INFORMATION

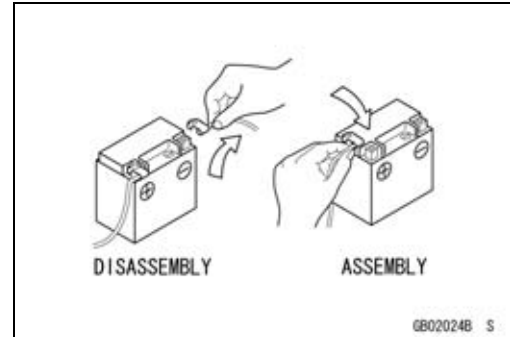
### Before Servicing

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:

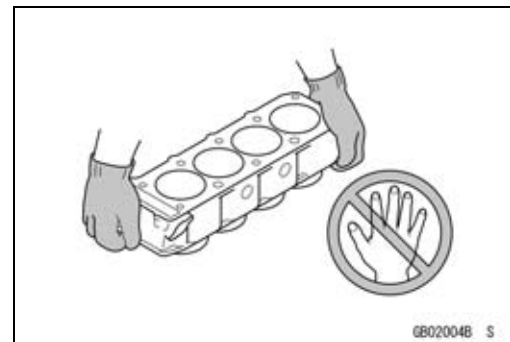
#### *Battery Ground*

Before completing any service on the motorcycle, disconnect the battery wires from the battery to prevent the engine from accidentally turning over. Disconnect the ground wire (–) first and then the positive (+). When completed with the service, first connect the positive (+) wire to the positive (+) terminal of the battery then the negative (–) wire to the negative terminal.



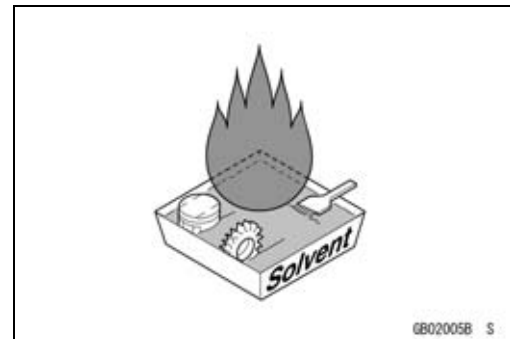
#### *Edges of Parts*

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



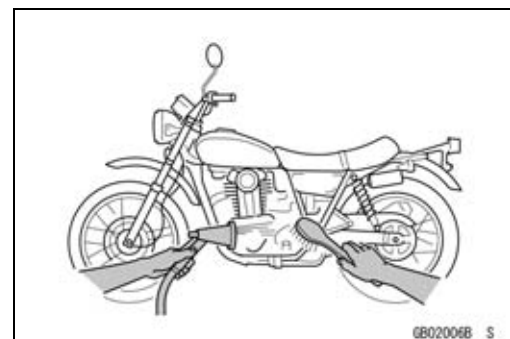
#### *Solvent*

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*

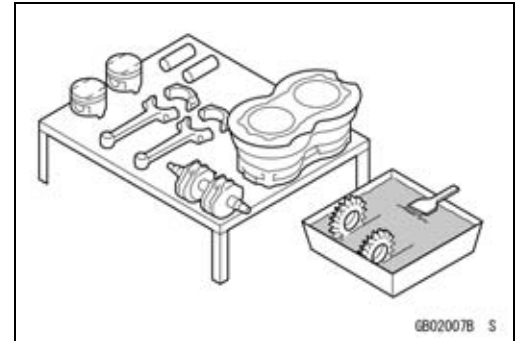
Clean the vehicle thoroughly before disassembly. Dirt or other foreign materials entering into sealed areas during vehicle disassembly can cause excessive wear and decrease performance of the vehicle.



**Before Servicing**

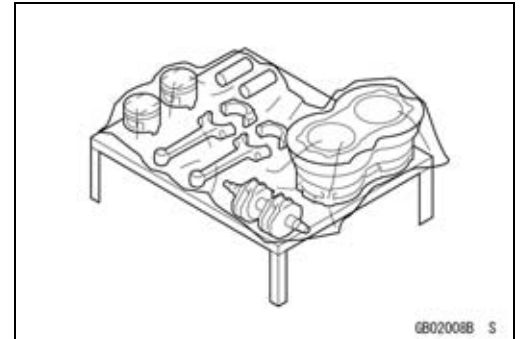
*Arrangement and Cleaning of Removed Parts*

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.



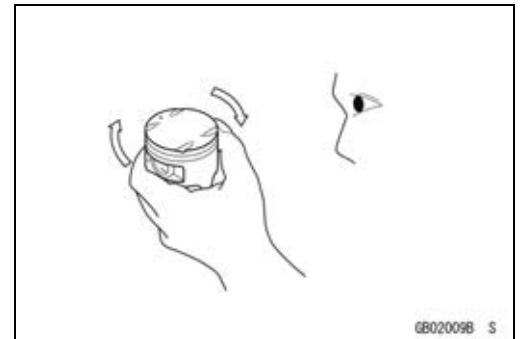
*Storage of Removed Parts*

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.



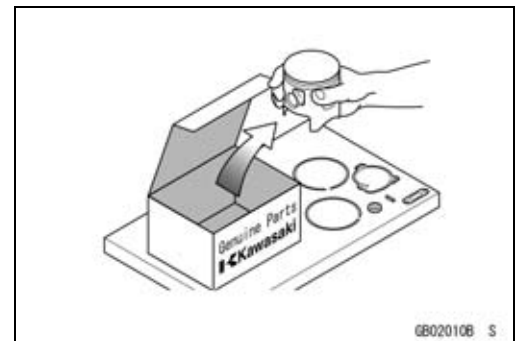
*Inspection*

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.



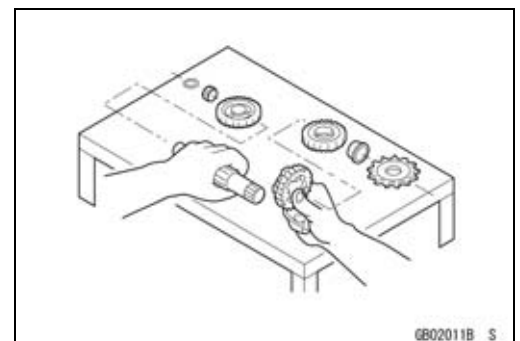
*Replacement Parts*

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



*Assembly Order*

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

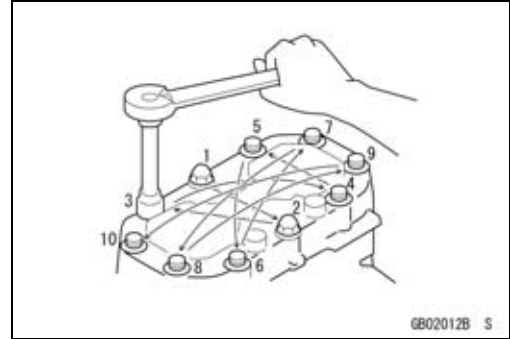


# 1-4 GENERAL INFORMATION

## Before Servicing

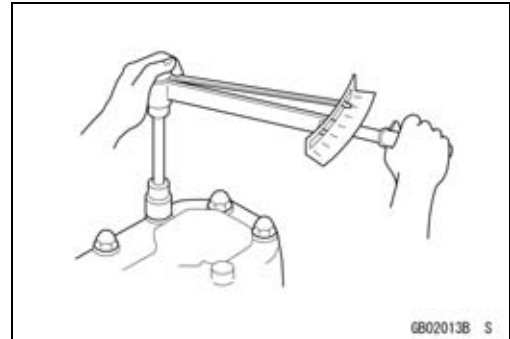
### *Tightening Sequence*

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.



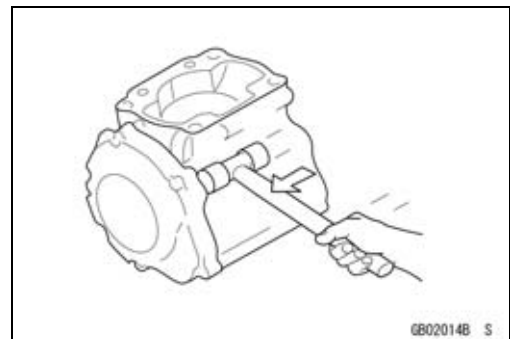
### *Tightening Torque*

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. Often, the tightening sequence is followed twice-initial tightening and final tightening with torque wrench.



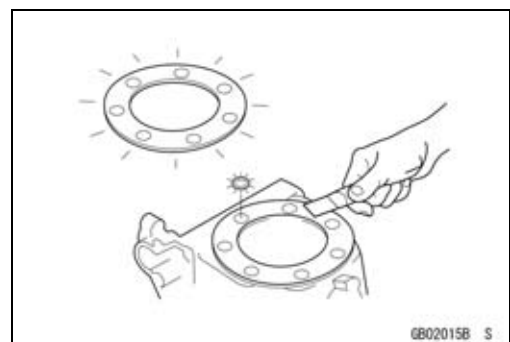
### *Force*

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



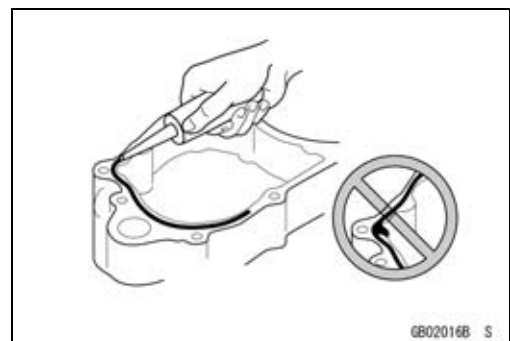
### *Gasket, O-ring*

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



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

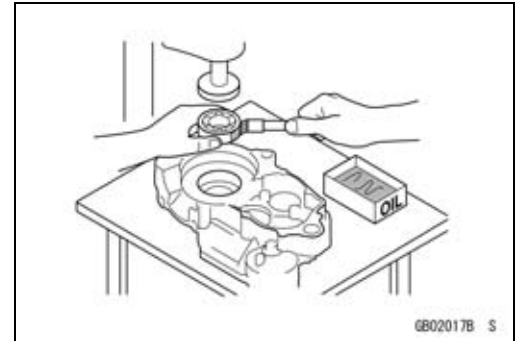
For applications that require Liquid Gasket or a Non-permanent Locking Agent, clean the surfaces so that no oil residue remains before applying liquid gasket or non-permanent locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



**Before Servicing**

*Press*

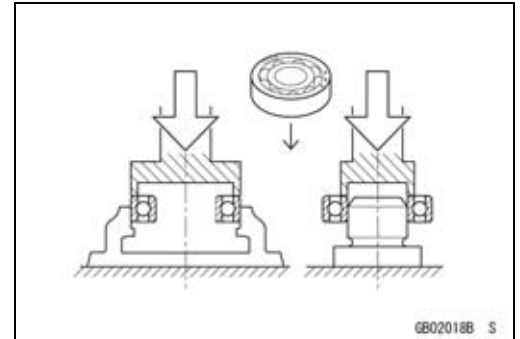
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



*Ball Bearing and Needle Bearing*

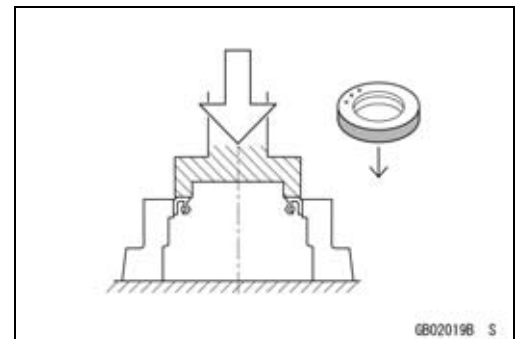
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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

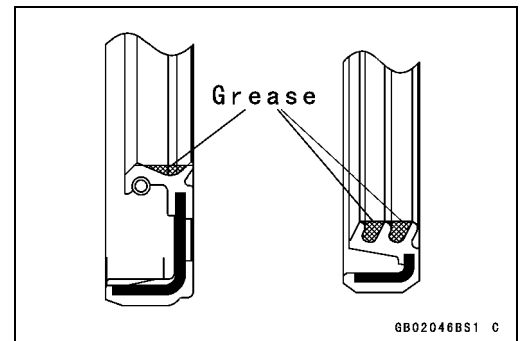


*Oil Seal, Grease Seal*

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.

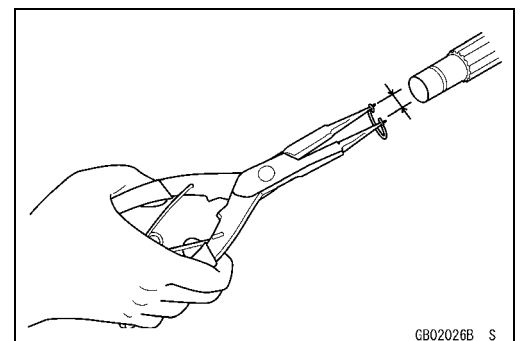


Apply specified grease to the lip of seal before installing the seal.



*Circlips, Cotter Pins*

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

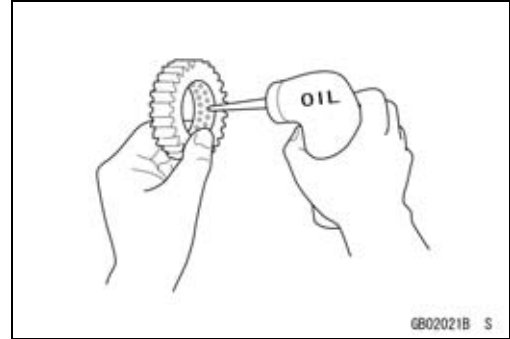


## 1-6 GENERAL INFORMATION

### Before Servicing

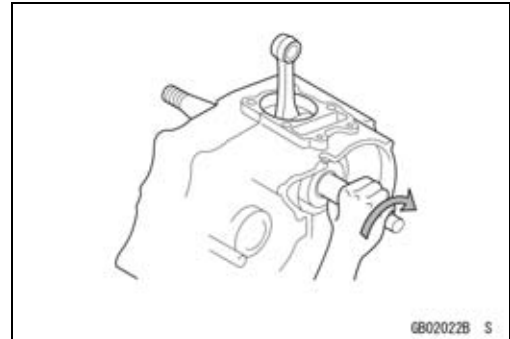
#### *Lubrication*

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.



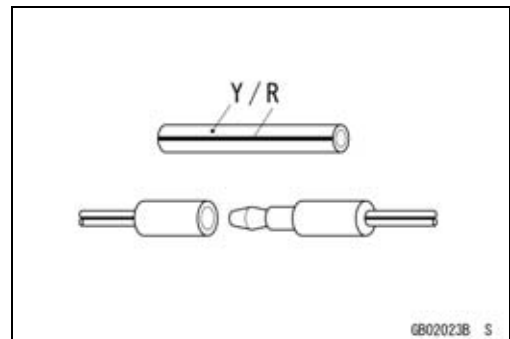
#### *Direction of Engine Rotation*

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.





Model Identification

ZR750-K1 (United States and Canada) Left Side View



ZR750-K1 (United States and Canada) Right Side View



# 1-8 GENERAL INFORMATION

## Model Identification

### ZR750-K1 (Europe) Left Side View



### ZR750-K1 (Europe) Right Side View



**General Specifications**

Items	ZR750-K1
<p><b>Dimensions</b></p> <p>Overall Length Overall Width Overall Height Wheelbase Road Clearance Seat Height Dry Mass Curb Mass:     Front     Rear Fuel Tank Capacity</p>	<p>2 080 mm (81.9 in.) 780 mm (30.7 in.) 1 180 mm (46.5 in.) 1 425 mm (56.1 in.) 165 mm (6.5 in.) 805 mm (31.7 in.) 199 kg (438.8 lb) 113 kg (249.2 lb) 109 kg (240.3 lb) 18 L (5.0 US gal.)</p>
<p><b>Performance</b></p> <p>Minimum Turning Radius</p>	<p>2.9 m (9.5 ft)</p>
<p><b>Engine</b></p> <p>Type Cooling System Bore and Stroke Displacement Compression Ratio Maximum Horsepower  Maximum Torque  Carburetion System Starting System Ignition System Timing Advance Ignition Timing  Spark Plug Cylinder Numbering Method Firing Order Valve Timing:     Inlet         Open         Close         Duration     Exhaust         Open         Close</p>	<p>4-stroke, DOHC, 4-cylinder Liquid-cooled 68.4 × 50.9 mm (2.7 × 2.0 in.) 748 mL (45.64 cu in.) 11.3 : 1 81 kW (110 PS) @11 000 r/min (rpm), (MY) 80 kW (109 PS) @11 000 r/min (rpm) (HR) 78.2 kW (106 PS) @11 000 r/min (rpm) (US, CA) – – – 75 N·m (7.6 kgf·m, 55 ft·lb) @8 200 r/min (rpm), (HR) 73 N·m (7.4 kgf·m, 54 ft·lb) @8 200 r/min (rpm) (US, CA) – – – FI (Fuel Injection) KEIHIN TTK34 × 4 Electric starter Battery and coil (transistorized) Electronically advanced (digital igniter) From 10° BTDC @1 100 r/min (rpm) to 37° BTDC @5 800 r/min (rpm) NGK CR9EK or ND U27ETR Left to right, 1-2-3-4 1-2-4-3 38° BTDC 66° ABDC 284° 57° BBDC 31° ATDC</p>

# 1-10 GENERAL INFORMATION

## General Specifications

Items	ZR750-K1
Duration Lubrication System Engine Oil: Type  Viscosity Capacity	268° Forced lubrication (wet sump)  API SE, SF or SG API SH or SJ with JASO MA  SAE 10W-40 3.8 L (4.0 US qt)
<b>Drive Train</b> Primary Reduction System: Type Reduction Ratio Clutch Type Transmission: Type Gear Ratios: 1st 2nd 3rd 4th 5th 6th Final Drive System: Type Reduction Ratio Overall Drive Ratio	 Gear 1.714 (84/49) Wet multi disc  6-speed, constant mesh, return shift  2.571 (36/14) 1.941 (33/17) 1.555 (28/18) 1.333 (28/21) 1.200 (24/20) 1.095 (23/21)  Chain drive 2.867 (43/15) 5.382 @Top gear
<b>Frame</b> Type Caster (Rake Angle) Trail Front Tire: Type Size Rear Tire: Type Size Front Suspension: Type Wheel Travel Rear Suspension: Type Wheel Travel Brake Type: Front Rear	Tubular, diamond 25° 107 mm (4.2 in.)  Tubeless 120/70 ZR17 M/C (58W)  Tubeless 180/55 ZR17 M/C (73W)  Telescopic fork 120 mm (4.7 in.)  Swingarm (uni-trak) 126 mm (5.0 in.)  Dual discs Single disc

**General Specifications**

Items	ZR750-K1
<b>Electrical Equipment</b>	
Battery	12 V 8 Ah
Headlight:	
Type	Semi-sealed beam
Bulb	12 V 55 W × 2/55 W (Hi/Lo)
Tail/Brake Light	12 V 0.5/4.1 W (LED)
Alternator:	
Type	Three-phase AC
Rated Output	24 A/14 V @5 000 r/min (rpm)

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

CA: Canada Model

US: United States

HR: With Honeycomb Catalytic Converter (Restricted Model)

MY: Malaysia Model

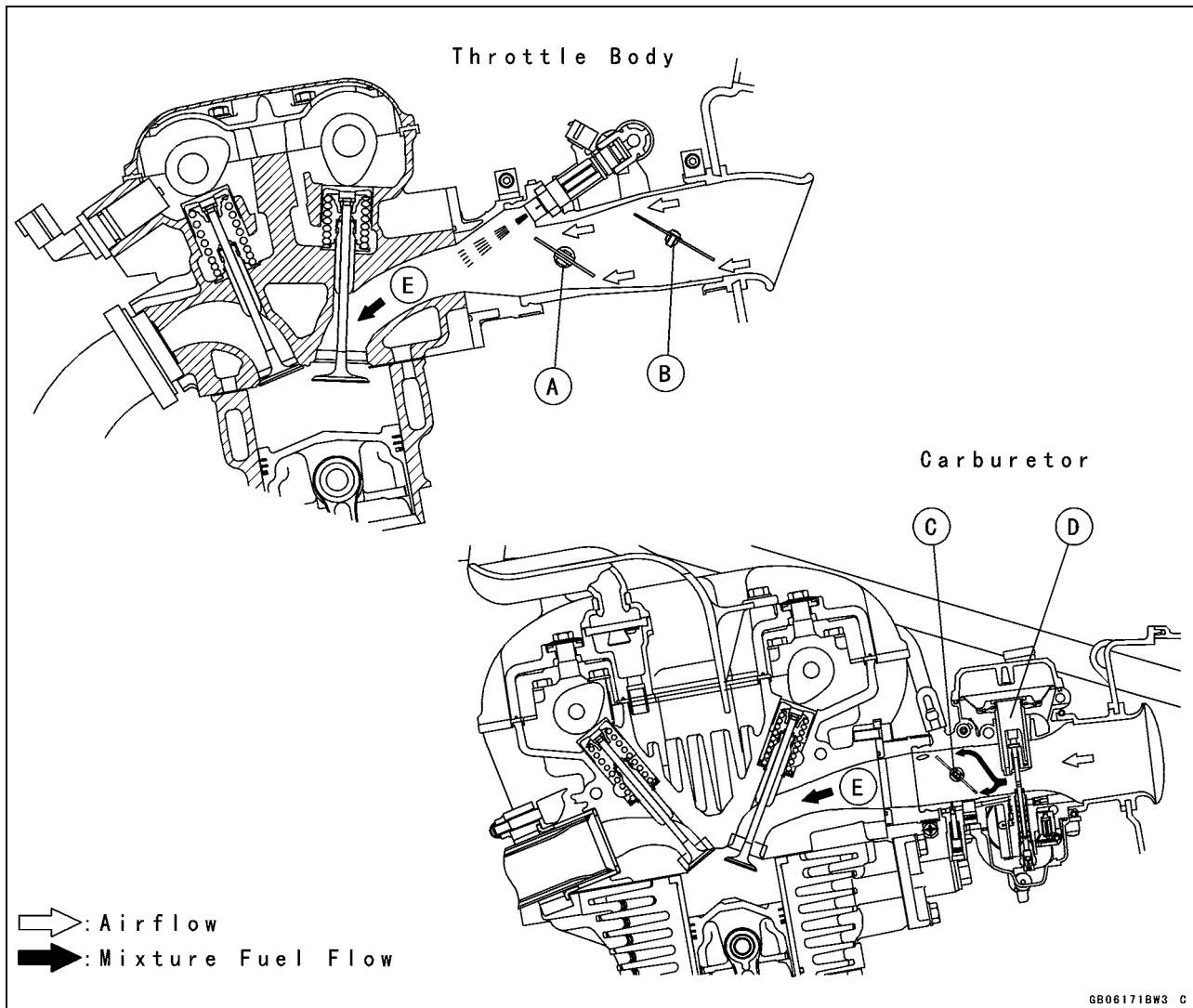
# 1-12 GENERAL INFORMATION

## Technical Information - Air Inlet System

### Subthrottle Control System

The ZR750-K models employ large bore throttle bodies to increase power output. However, sudden changes in throttle opening can cause hesitation and jerky throttle response with a single butterfly valve in a large bore. Therefore two throttle valves are placed in each inlet tract, the main throttle valve located closest to the cylinder and a subthrottle valve placed further up the inlet tract. The main throttle valve is operated by the rider when the throttle grip is turned clockwise or counterclockwise, while the subthrottle valve is operated by a stepping motor controlled by the ECU. The subthrottle valve automatically adjusts air inlet to more precisely match engine demand, so that when the main throttle is opened quickly there is no hesitation or jerky response.

The subthrottle valves allow the fuel injection system to provide smooth throttle response, similar to that of a constant velocity carburetor, no matter how quickly the throttle is opened.



- A. Main Throttle Valve
- B. Subthrottle Valve
- C. Throttle Valve
- D. Vacuum Piston
- E. Inlet Air

Technical Information - Air Inlet System

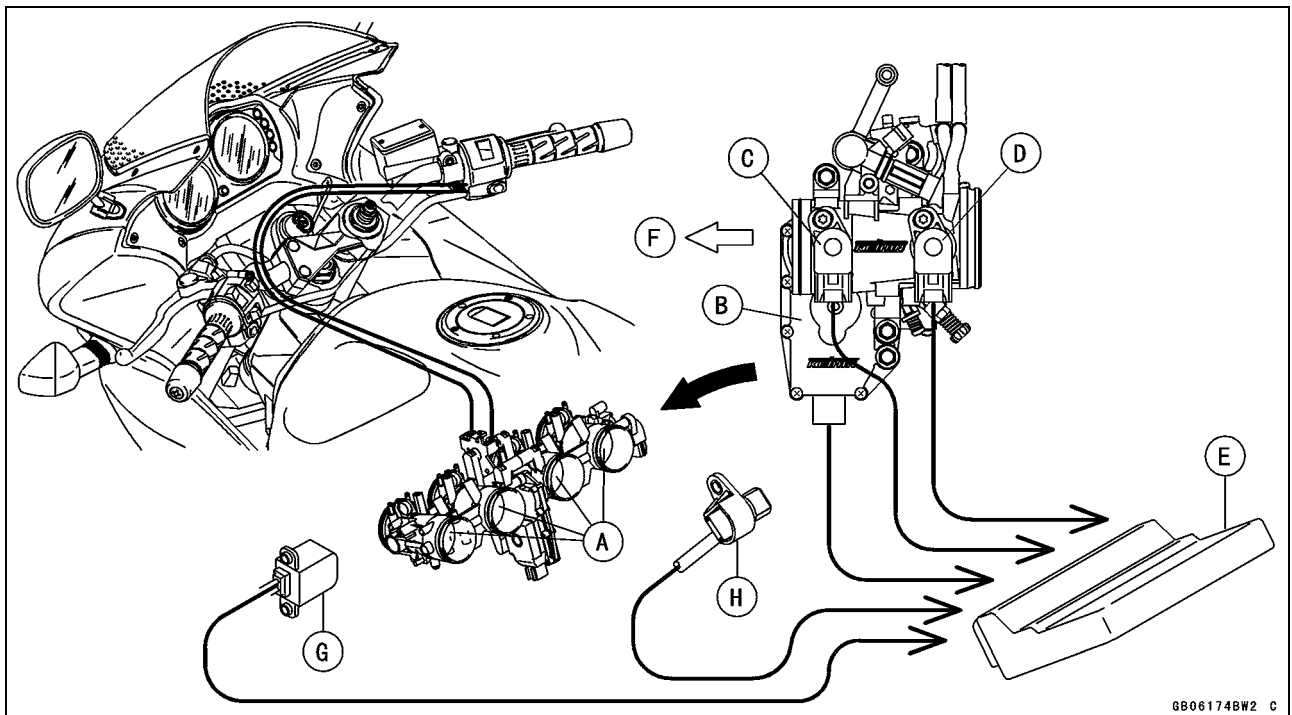
Operation

The subthrottle control system consists of the subthrottle valve, subthrottle valve actuator with a stepping motor built in it, ECU, and subthrottle sensor. The subthrottle valve is built in the each throttle body.

The subthrottle control system operates on the signal supplied from the ECU. The open/close operation of the subthrottle valve is performed by the subthrottle actuator which is controlled by the ECU to change the current direction into the motor of the subthrottle valve actuator.

The subthrottle sensor detects the subthrottle valve actuator movement by measuring voltage and the ECU determines the subthrottle valve angle based on the operation map.

When turning the ignition switch ON, every time the ECU automatically drives the subthrottle valve from fully closed position to fully opened position. The ECU memorizes these positions and turns back the subthrottle valve to the original point to confirm the subthrottle valve idling voltage.



- A. Subthrottle Valves
- B. Subthrottle Valve Actuator
- C. Subthrottle Sensor
- D. Main Throttle Sensor
- E. ECU (Electronic Control Unit)
- F. Air Cleaner Side
- G. Crankshaft Sensor
- H. Speed Sensor

# 1-14 GENERAL INFORMATION

## Technical Information - New Ignition Interlock Side Stand

### Outline

The New Ignition Interlock Side Stand System applied to ZR750-K models that cannot function if gears are engaged and/or the side stand is not lifted upward even though clutch lever pulled in, which differs from the traditional one. Refer to the tables below as to the engine starts and/or the driving at each condition.

### New Ignition Interlock Side Stand System

	Side Stand	Gear Position	Clutch Lever	Engine Start	Engine Run
A	Up	Neutral	Released	Starts	Continue running
B	Up	Neutral	Pulled in	Starts	Continue running
C	Up	In Gear	Released	Doesn't start	Continue running
D	Up	In Gear	Pulled in	Starts	Continue running
E	Down	Neutral	Released	Starts	Continue running
F	Down	Neutral	Pulled in	Starts	Continue running
G	Down	In Gear	Released	Doesn't start	Stops
H	Down	In Gear	Pulled in	<i>Doesn't start</i>	<i>Stops</i>

### Current Ignition Interlock Side Stand System

	Side Stand	Gear Position	Clutch Lever	Engine Start	Engine Run
A	Up	Neutral	Released	Starts	Continue running
B	Up	Neutral	Pulled in	Starts	Continue running
C	Up	In Gear	Released	Doesn't start	Continue running
D	Up	In Gear	Pulled in	Starts	Continue running
E	Down	Neutral	Released	Starts	Continue running
F	Down	Neutral	Pulled in	Starts	Continue running
G	Down	In Gear	Released	Doesn't start	Stops
H	Down	In Gear	Pulled in	<i>Start</i>	<i>Continue running</i>

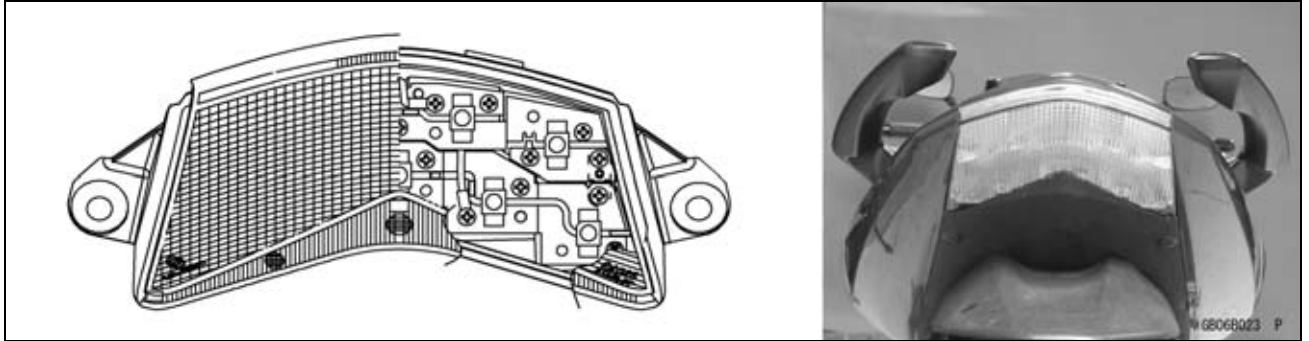


Technical Information - Tail/Brake Lights Employing LED

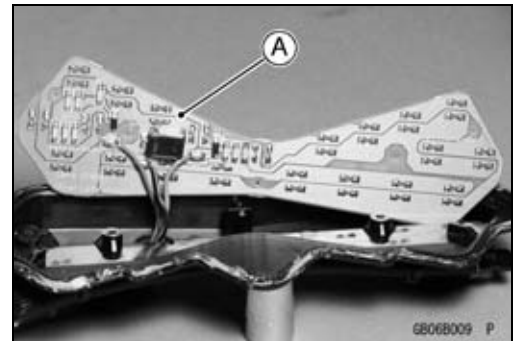
Outline

This model employs a tail/brake light containing 9 Light Emitting Diodes (LED). The LED emits luminous beams over a longer life span than those emitted from a traditional electric heated bulb (more than 5 times longer), uses lower voltage, expends lower wattage (approx. 1/5), and is quicker responding.

Due Position of LED Installation

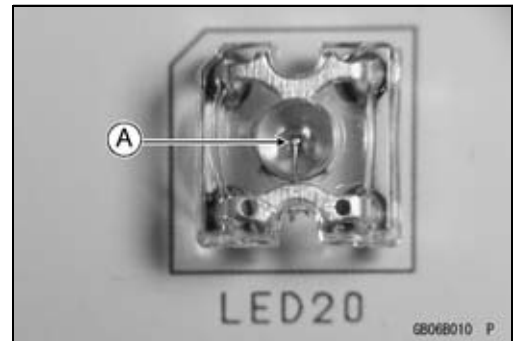


The resistors, the diodes, and the Zener diodes are mounted in the electronic circuits [A] of the LED, which supplies the steady current and voltage to the light.

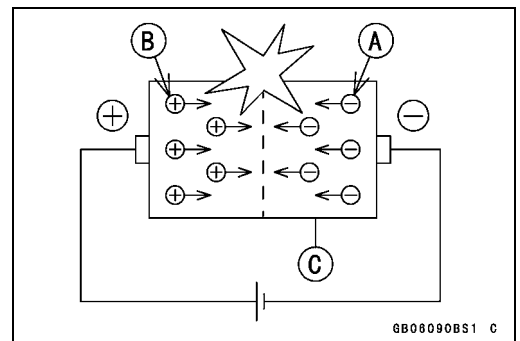


Light Emitting Diode (LED)

The Light Emitting Diode (LED) [A] is an element of semiconductor diode that converts applied voltage to light.



The LED emits luminous beams by the collision of negative charge electrons [A] and positive charge holes [B] when applied the forward voltage and current to the PN junction diode [C].



## 1-16 GENERAL INFORMATION

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### Technical Information - Tail/Brake Lights Employing LED

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The emitting color differs according to the materials of semi-conductors.

#### Materials of Semi-Conductor and Emitting Color

Materials of Semi-Conductor	Emitting Color
GaAsP, GaAlAs	Red
GaP	Green
GaN	Blue

Al: Aluminum  
As: Arsenic  
Ga: Gallium  
N: Nitrogen  
P: Phosphorus

**Technical Information - KAWASAKI LOW EXHAUST EMISSION SYSTEM**

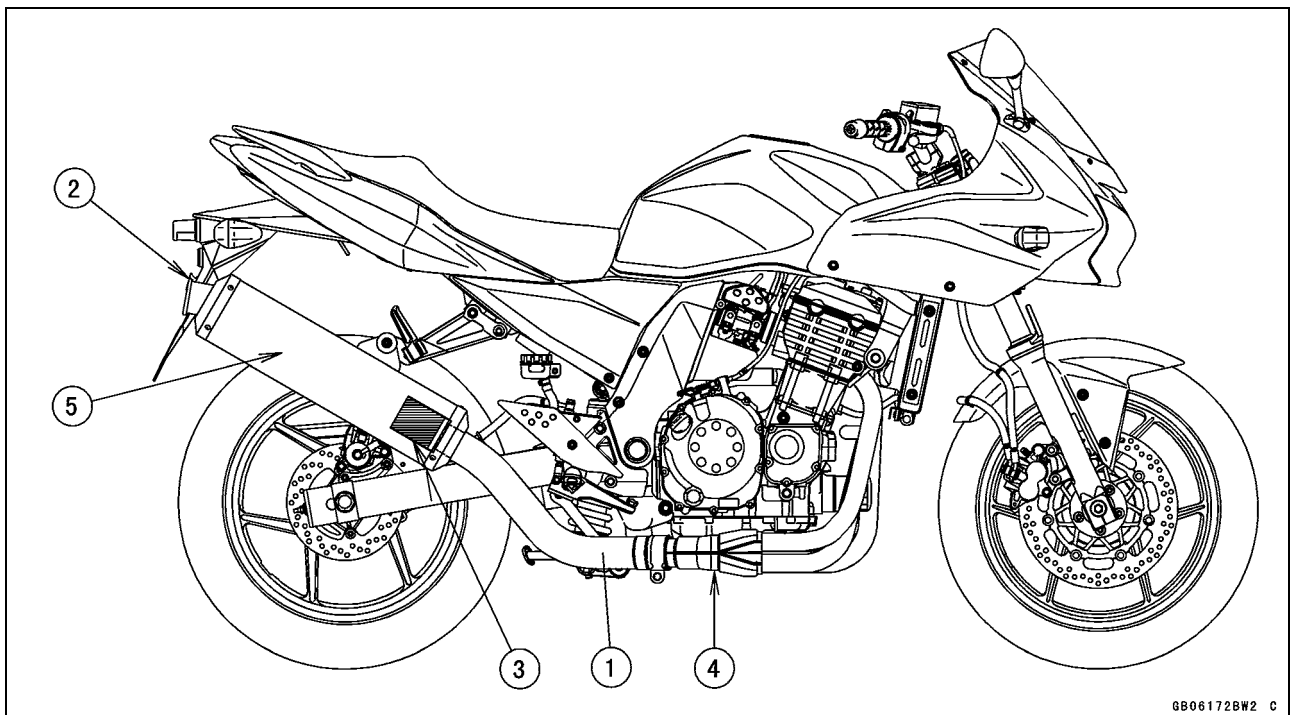
Since the emission regulations become more severe, Kawasaki has adopted a type of simplified KAWASAKI LOW EXHAUST EMISSION SYSTEM (KLEEN), which have no catalyst protection system, according to each regulation of different countries.

The muffler with built-in catalyst has the same durability as the conventional muffler, however, do not use leaded gasoline and do not coast with the ignition system OFF. Running the engine without ignition damages catalyst.

Refer to the ZX900E Service Manual (Part No. 99924-1255) for more information about the KLEEN (theory, maintenance, and handling precautions), including the secondary air injection system.

**Honeycomb Type Catalytic Converter**

- The converter is a three-way catalytic converter, and its surface is covered with alumina upon which platinum and rhodium are applied, and has a cylindrical metallic honeycomb structure made by bending a corrugated sheet and a flat sheet of stainless steel into a spiral of increasing diameter. The honeycomb structure is convenient for the catalytic converter because it has a large surface area but small size to react effectively and has low exhaust resistance. In addition, its inherent strength helps resist vibration, and has simple structure welded directly on the silencer.
- Generally, the temperature of the exhaust gas must be higher than activation temperature, so the converters are installed in the exhaust manifold rear end where the temperature of exhaust gas is still high. And, the converters will be activated even under low load conditions.
- After the exhaust gas is diluted with the secondary air injection, the catalytic converter works well because of rich oxygen to reduce CO, HC, and NO<sub>x</sub>. Accordingly, we can keep the exhaust gas emission within regulation.
- This type of converter works more efficiently as a three-way catalytic converter to reduce CO, HC, and NO<sub>x</sub> than the pipe type catalytic converter because of its more and denser catalysts.



1. Manifold
2. Silencer
3. Honeycomb Type Catalyst
4. Mark for Manifold
5. Mark for Silencer

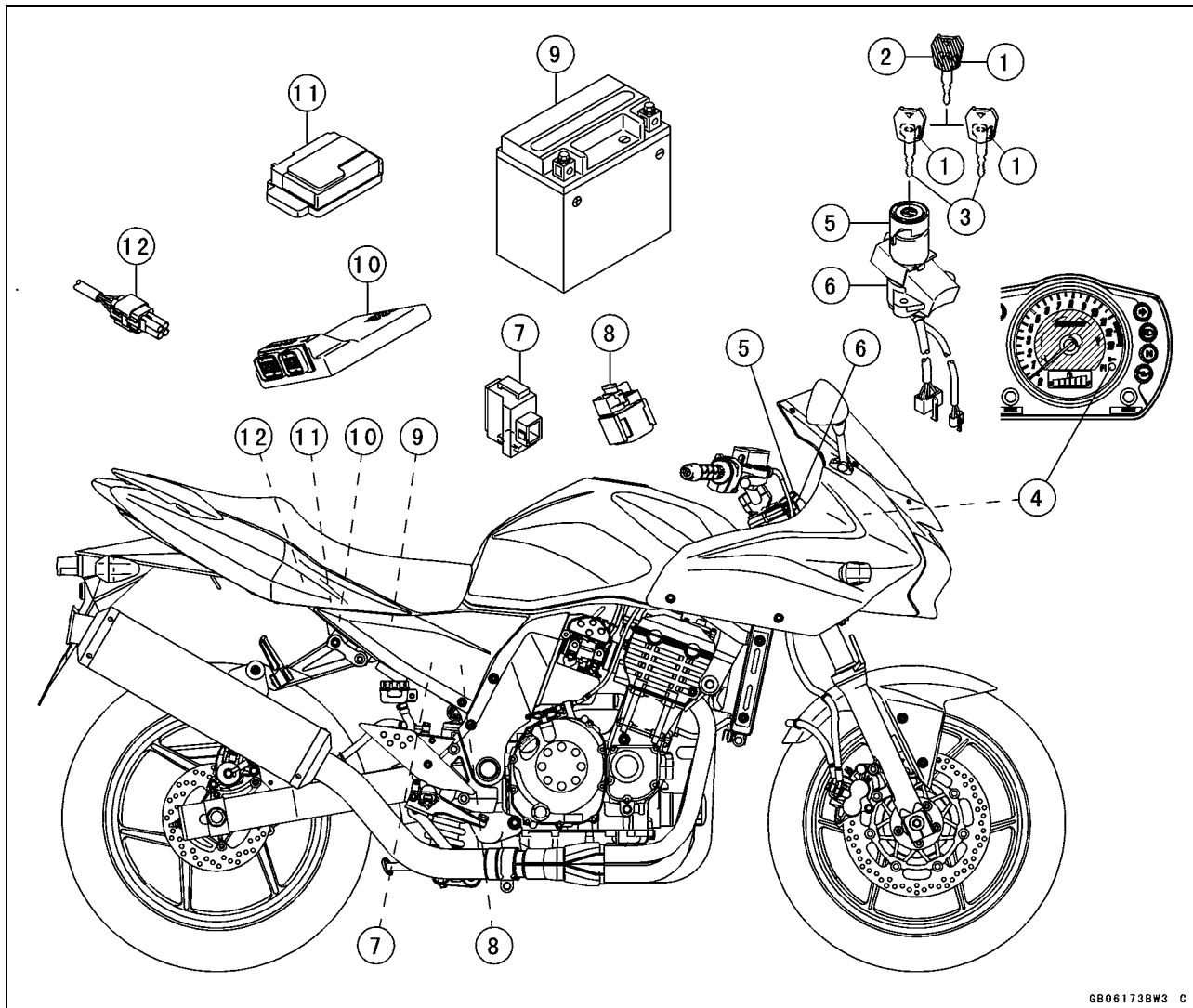
# 1-18 GENERAL INFORMATION

## Technical Information - Immobilizer System (Equipped Models)

### Overview

This system provides a theft proof device by means of matching a code between the inbuilt key transponder and the ECU (Electronic Control Unit). If this code does not match, the fuel pump, injectors, ignition system, sub-throttle valve actuator and exhaust butterfly valve actuator will not operate and the engine will not start.

### Related Parts and Function



6B06173BWS C

- |                              |  |
|------------------------------|--|
| 1. Transponder (Inside Keys) | 8. Starter Relay                                     |
| 2. Master Key                | 9. Battery   |
| 3. User Keys                 | 10. Electronic Control Unit (ECU)                    |
| 4. FI Indicator Light        | 11. Junction Box                                     |
| 5. Immobilizer Antenna       | 12. Immobilizer/Kawasaki Diagnostic System Connector |
| 6. Ignition Switch           |  |
| 7. Immobilizer Amplifier     |  |

### Master Key (1 piece)

The master key (colored red) has an inbuilt transponder, containing a master key code. These codes are unique to each key. This code and an additional two user key codes must be registered in the ECU for the system to operate. The master key is necessary when registering user keys and should not be used as the main key to start the motorcycle except in emergencies (loss or damage of user keys). It should be kept in a safe place.

---

### Technical Information - Immobilizer System (Equipped Models)

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#### **Transponder (in Keys)**

The transponder (made by Texas Instruments, Inc.) has an integrated circuit with a unique code that also calculates data sent by the ECU. When the ignition switch is turned ON, the transponder is excited by the radio wave transmitted from the antenna and then transmits a unique code to the antenna.

#### **User Key (2 pieces)**

The user keys (colored black) should be used when riding the motorcycle. These keys have unique codes which differ from the master key. Up to a maximum of five user key codes can be stored by the ECU at any one time. These codes can not be registered to the ECU without firstly registering the master key code.

#### **Antenna**

The antenna transmits a radio wave to excite the transponder, receives the code from the transponder and then transmits the code to the ECU through the amplifier.

#### **Ignition Switch**

The ignition switch turns the main circuit ON and OFF.

#### **Amplifier**

The amplifier (which is approximately the same size as a match box), amplifies signals from the antenna and the ECU.

#### **ECU**

The ECU has the capacity to store a maximum of six key code memories (one master and five user keys). The owner can have a total of five user keys at any one time. The master key memory can not be rewritten after initial registration, whereas the user key memories can be rewritten as necessary. When the ECU communicates with the transponder, a cipher generator changes the code every time it is used to avoid cloning.

#### **FI Indicator Light**

The condition or the failure of the immobilizer system is indicated by various patterns of the FI indicator light blinking.

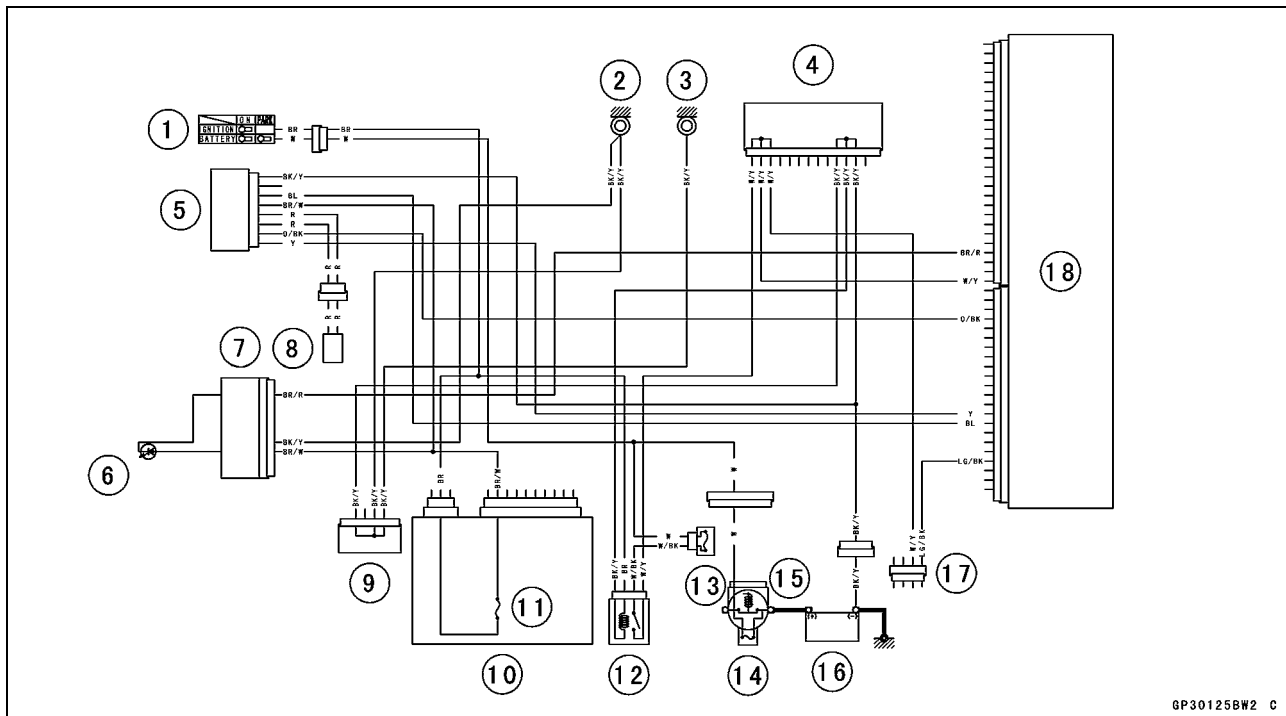
#### *Sequence of Operation*

1. Turn ON the ignition switch, the ECU, amplifier and antenna start working, and the meter assembly FI indicator lights up.
2. The transponder excited by radio waves transmitted from the antenna receives the ciphered code from the ECU.
3. The transponder transmits the calculated result from the key's unique code to the ECU.
4. The ECU compares this with its memorized code, and if they match the engine can start. At this time, the FI indicator in the meter assembly is switched off.

# 1-20 GENERAL INFORMATION

## Technical Information - Immobilizer System (Equipped Models)

### Immobilizer System Circuit



GP301258W2 C

- |                             |  |
|-----------------------------|--|
| 1. Ignition Switch          | 10. Junction Box                                     |
| 2. Meter Ground             | 11. Ignition Fuse 10 A                               |
| 3. Frame Ground             | 12. ECU Main Relay                                   |
| 4. Joint Connector B        | 13. ECU Fuse 15 A                                    |
| 5. Immobilizer Amplifier    | 14. Main Fuse 30 A                                   |
| 6. FI Indicator Light (LED) | 15. Starter Relay                                    |
| 7. Meter Unit               | 16. Battery 12 V 8 Ah                                |
| 8. Immobilizer Antenna      | 17. Immobilizer/Kawasaki Diagnostic System Connector |
| 9. Joint Connector A        | 18. Electronic Control Unit (ECU)                    |

**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

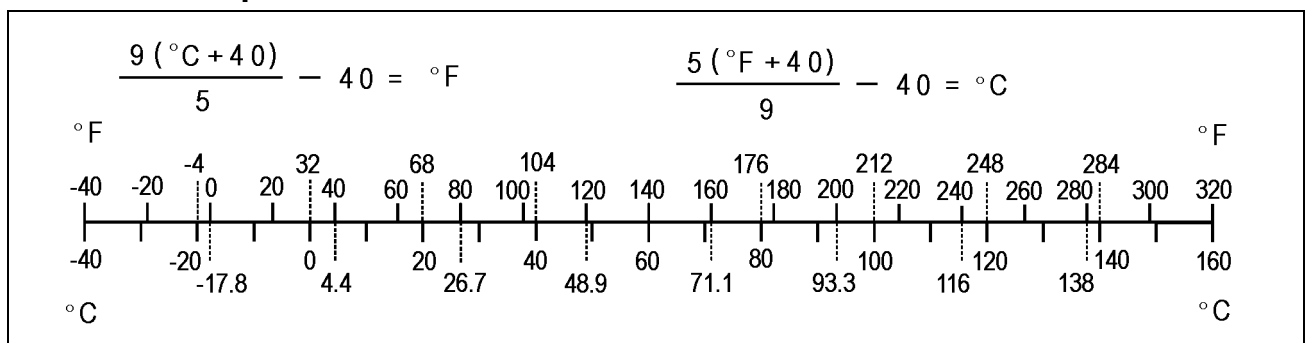
**Units of Speed:**

km/h	×	0.6214	=	mph
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**Units of Power:**

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

**Units of Temperature:**







# Periodic Maintenance

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## 2-2 PERIODIC MAINTENANCE

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**Periodic Maintenance Chart**

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

**Periodic Inspection**

INSPECTION	FREQUENCY	Whichever comes first ↓ Every	* ODOMETER READING × 1 000 km (× 1 000 mile)							See Page
			1 (0.6)	6 (4)	12 (7.5)	18 (12)	24 (15)	30 (20)	36 (24)	
<b>Fuel System</b>										
Air cleaner element - clean						•			•	2-18
Throttle control system (play, smooth return, no drag) - inspect	year	•		•			•		•	2-16
Choke operation - inspection	year	•		•			•		•	2-17
Engine vacuum synchronization - inspect				•			•		•	2-19
Idle speed - inspect		•		•			•		•	2-17
Fuel leak (fuel hose and pipe) - inspect	year	•		•			•		•	2-15
Fuel hose and pipe damage - inspect	year	•		•			•		•	2-15
Fuel hose and pipe installation condition - inspect	year	•		•			•		•	2-15
<b>Evaporative Emission Control System (CAL)</b>										
Evaporative Emission Control System function - inspect		•	•	•	•	•	•	•	•	2-22
<b>Cooling System</b>										
Coolant level - inspect		•		•			•		•	2-23
Coolant leak (radiator hose and pipe) - inspect	year	•		•			•		•	2-24
Radiator hose damage - inspect	year	•		•			•		•	2-24
Radiator hose installation condition - inspect	year	•		•			•		•	2-24
<b>Air Suction System</b>										
Air suction system damage - inspect				•			•		•	2-24
<b>Engine Top End</b>										
Valve clearance - inspect							•			2-24
<b>Clutch</b>										
Clutch operation (play, disengagement, engagement) - inspect		•		•			•		•	2-29
<b>Wheels and Tires</b>										
Tire air pressure - inspect	year			•			•		•	2-30
Wheel/tire damage - inspect				•			•		•	2-30
Tire tread wear, abnormal wear - inspect				•			•		•	2-30
Wheel bearing damage - inspect	year			•			•		•	2-31
<b>Drive Train</b>										
Drive chain lubrication condition - inspect #		Every 600 km (400 mile)								2-32
Drive chain slack - inspect #		Every 1 000 km (600 mile)								2-32

## 2-4 PERIODIC MAINTENANCE

### Periodic Maintenance Chart

FREQUENCY	Whichever comes first ↓	* ODOMETER READING × 1 000 km (× 1 000 mile)							See Page
		1 (0.6)	6 (4)	12 (7.5)	18 (12)	24 (15)	30 (20)	36 (24)	
INSPECTION	Every								
Drive chain wear - inspect #				•		•		•	2-34
Chain guide wear - inspect				•		•		•	2-35
<b>Brake System</b>									
Brake fluid leak (brake hose and pipe) - inspect	year	•	•	•	•	•	•	•	2-35
Brake hose and pipe damage - inspect	year	•	•	•	•	•	•	•	2-35
Brake hose installation condition - inspect	year	•	•	•	•	•	•	•	2-35
Brake operation (effectiveness, play, no drag) - inspect	year	•	•	•	•	•	•	•	2-36
Brake fluid level - inspect	6 months	•	•	•	•	•	•	•	2-36
Brake pad wear - inspect #			•	•	•	•	•	•	2-37
Brake light switch operation - inspect		•	•	•	•	•	•	•	2-37
<b>Suspensions</b>									
Front forks/rear shock absorber operation (damping and smooth stroke) - inspect				•		•		•	2-38
Front forks/rear shock absorber oil leak - inspect	year			•		•		•	2-38
Rocker arm operation - inspect				•		•		•	2-39
Tie-rods operation - inspect				•		•		•	2-39
<b>Steering System</b>									
Steering play - inspect	year	•		•		•		•	2-39
Steering stem bearings - lubricate	2 years					•			2-41
<b>Electrical System</b>									
Lights and switches operation - inspect	year			•		•		•	2-41
Headlight aiming - inspect	year			•		•		•	2-43
Side stand switch operation - inspect	year			•		•		•	2-44
Engine stop switch operation - inspect	year			•		•		•	2-45
<b>Others</b>									
Chassis parts - lubricate	year			•		•		•	2-45
Bolts and nuts tightness - inspect		•		•		•		•	2-47

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

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

CAL: California Model

**Periodic Maintenance Chart**

**Periodic Replacement Parts**

CHANGE/REPLACE ITEM	FREQUENCY	* ODOMETER READING × 1 000 km (× 1 000 mile)					See Page
	Whichever comes first ↓ Every	1 (0.6)	12 (7.5)	24 (15)	36 (24)	48 (30)	
Air cleaner element #					●		2-48
Engine oil #	year	●	●	●	●	●	2-48
Oil filter	year	●	●	●	●	●	2-49
Fuel hose	4 years					●	2-49
Coolant	3 years				●		2-50
Radiator hose and O-ring	3 years				●		2-52
Brake hose and pipe	4 years					●	2-52
Brake fluid	2 years			●		●	2-53
Rubber parts of master cylinder and caliper	4 years					●	2-54
Spark plug			●	●	●	●	2-58

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

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

## 2-6 PERIODIC MAINTENANCE

### Torque and Locking Agent

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

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.

**G:** Apply grease to the threads.

**L:** Apply a non-permanent locking agent to the threads.

**MO:** Apply molybdenum disulfide oil solution.

**R:** Replacement Parts

**S:** Tighten the fasteners following the specified sequence.

**Si:** Apply silicone grease (ex. PBC grease).

**SS:** Apply silicone sealant.

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
<b>Fuel System</b>				
Inlet Air Pressure Sensor Bolt	12	1.2	104 in·lb	
Water Temperature Sensor	25	2.5	18	
Vehicle-down Sensor Bolts	2.0	0.20	17 in·lb	
Camshaft Position Sensor Bolt	12	1.2	104 in·lb	
Camshaft Position Sensor Rotor Bolt	12	1.2	104 in·lb	L
Throttle Cable Plate Bolt	6.0	0.60	52 in·lb	
Throttle Body Assy Holder Clamp Bolts	2.0	0.20	17 in·lb	
Choke Link Holder Screws	2.1	0.21	18 in·lb	
Delivery Pipe Screws	3.4	0.35	30 in·lb	
Bypass Screws	0.2	0.02	1.7 in·lb	
Air Cleaner Duct Holder Screws	3.8	0.39	34 in·lb	
Air Cleaner Duct Clamp Bolts	2.0	0.20	17 in·lb	
Air Cleaner Housing Screws	1.2	0.12	10 in·lb	
Air Cleaner Housing Tapping Screws	1.2	0.12	10 in·lb	
Speed Sensor Bolt	6.9	0.70	62 in·lb	L
Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
Fuel Level Sensor Bolts	6.9	0.70	62 in·lb	L
TORX Screws	2.06	0.20	17 in·lb	
<b>Cooling System</b>				
Radiator Hose Clamp Screws	2.0	0.20	17 in·lb	
Radiator Fan Bolts	8.3	0.85	74 in·lb	
Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
Water Pump Cover Bolts	11	1.1	95 in·lb	
Coolant Drain Bolt (Water Pump)	11	1.1	95 in·lb	L
Water Pipe Bolts	11	1.1	95 in·lb	
Thermostat Housing Ground Bolt	7.0	0.70	61 in·lb	
Thermostat Bracket Bolt	7.0	0.70	61 in·lb	
Radiator Upper Bolts	7.0	0.70	61 in·lb	
Radiator Lower Bolts	7.0	0.70	61 in·lb	
Radiator Screen Bolt	7.0	0.70	61 in·lb	
Coolant Reserve Tank Screws	7.0	0.70	61 in·lb	

**PERIODIC MAINTENANCE 2-7**

**Torque and Locking Agent**

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Radiator Fan Switch	18	1.8	13	
Water Temperature Sensor	25	2.5	18	
<b>Engine Top End</b>				
Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	
Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	S
Camshaft Cap Bolts	12	1.2	104 in·lb	S
Camshaft Chain Guide Bolts	12	1.2	104 in·lb	S
Cylinder Head Bolts (M10 New Bolts)	54	5.5	40	MO, S
Cylinder Head Bolts (M10 Used Bolts)	49	5.0	36	MO, S
Cylinder Head Bolts (M6)	12	1.2	104 in·lb	S
Cylinder Head Water Jacket Plugs	22	2.2	16	L
Throttle Body Holder Bolts	13	1.3	113 in·lb	
Throttle Body Assy Holder Clamp Bolts	2.0	0.20	17 in·lb	
Camshaft Position Sensor Bolt	12	1.2	104 in·lb	
Camshaft Position Sensor Rotor Bolt	12	1.2	104 in·lb	L
Front Camshaft Chain Guide Bolt (Upper)	25	2.5	18	
Front Camshaft Chain Guide Bolt (Lower)	12	1.2	104 in·lb	
Rear Camshaft Chain Guide Bolt	25	2.5	18	
Camshaft Chain Tensioner Mounting Bolts	11	1.1	95 in·lb	
Camshaft Chain Tensioner Cap Bolt	28	2.9	21	
Spark Plugs	13	1.3	113 in·lb	
Coolant Drain Plug (Cylinder)	9.8	1.0	87 in·lb	
Exhaust Pipe Manifold Holder Nuts	17	1.7	12	
Muffler Body Clamp Bolt	17	1.7	12	
Muffler Body Mounting Bolt	30	3.0	22	
Crankshaft Sensor Cover Bolts	11	1.1	95 in·lb	
<b>Clutch</b>				
Clutch Lever Clamp Bolts	7.8	0.80	69 in·lb	
Clutch Cover Mounting Bolts	11	1.1	95 in·lb	
Oil Filler Plug	1.5	0.15	13 in·lb	
Clutch Spring Bolts	8.8	0.90	78 in·lb	
Clutch Hub Nut	135	14	100	R
<b>Engine Lubrication</b>				
Oil Filler Plug	1.5	0.15	13 in·lb	
Engine Oil Drain Bolt	29	3.0	21	
Oil Filter	31	3.2	23	EO, R
Holder Mounting Bolt	76	7.8	56	EO
Oil Pan Bolts	11	1.1	95 in·lb	
Oil Pipe Holder Bolts	13	1.3	113 in·lb	L
Oil Pressure Relief Valve	15	1.5	11	L
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	
Water Pump Cover Bolts	11	1.1	95 in·lb	

## 2-8 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
Coolant Drain Plug (Water Pump)	11	1.1	95 in·lb	
Oil Passage Plugs	20	2.0	14	L
<b>Engine Removal/Installation</b>				
Adjusting Collar Locknut	49	5.0	36	S
Engine Mounting Bolts and Nuts	44	4.5	33	S
Front Engine Bracket Bolts	44	4.5	33	S
Rear Engine Bracket Bolts	25	2.5	18	S
Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
<b>Crankshaft/Transmission</b>				
Breather Plate Bolts	9.8	1.0	87 in·lb	L
Crankcase Bolts (M9, L = 95 mm)	42	4.3	31	MO, S
Crankcase Bolts (M9, L = 81 mm)	42	4.3	31	MO, S
Crankcase Bolts (M8)	27	2.8	20	S
Crankcase Bolts (M7)	20	2.0	14	S
Crankcase Bolts (M6)	12	1.2	104 in·lb	S
Starter Motor Clutch Bolts	12	1.2	104 in·lb	L
Oil Pipe Holder Bolts	13	1.3	113 in·lb	L
Shift Drum Bearing Holder Bolt	13	1.3	113 in·lb	L
Shift Drum Bearing Holder Screw	5.4	0.55	48 in·lb	L
Connecting Rod Big End Nuts	see the text	←	←	←
Timing Rotor Bolt	39	4.0	29	
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	
Oil Passage Plugs	20	2.0	14	L
Crankshaft Sensor Cover Bolts	11	1.1	95 in·lb	
Shift Pedal Mounting Bolt	34	3.5	25	L
Gear Positioning Lever Bolt	12	1.2	104 in·lb	
Shift Shaft Return Spring pin	29	3.0	22	L
Shift Drum Cam Holder Bolt	12	1.2	104 in·lb	L
Footpeg Bracket Bolts	34	3.5	25	L
Shift Lever Bolt	6.9	0.70	61 in·lb	
Tie-rod Locknuts	6.9	0.70	61 in·lb	
Neutral Switch	15	1.5	11	
<b>Wheels/Tires</b>				
Front Axle Clamp Bolt	34	3.5	25	
Front Axle	108	11	80	
Rear Axle Nut	108	11	80	
<b>Final Drive</b>				
Engine Sprocket Nut	125	13	92	MO
Engine Sprocket Cover Bolts	9.8	1.0	87 in·lb	
Speed Sensor Cover Bolts	6.9	0.70	61 in·lb	L
Rear Sprocket Nuts	59	6.0	43	



**Torque and Locking Agent**

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Speed Sensor Bolt	6.9	0.70	61 in·lb	L
<b>Brakes</b>				
Bleed Valves	7.8	0.80	69 in·lb	
Brake Hose Banjo Bolts	34	3.5	25	
Brake Lever Pivot Bolt	1.0	0.10	9 in·lb	Si
Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
Front Brake Reservoir Cap Screws	1.5	0.15	9 in·lb	
Front Brake Light Switch Screws	1.2	0.12	10 in·lb	
Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S
Front Caliper Mounting Bolts	34	3.5	25	
Front Brake Disc Mounting Bolts	27	2.8	20	L
Rear Brake Disc Mounting Bolts	27	2.8	20	L
Rear Caliper Mounting Bolts	25	2.5	18	
Rear Master Cylinder Mounting Bolts	25	2.5	18	
Rear Master Cylinder Push Rod Locknut	18	1.8	13	
<b>Suspension</b>				
Front Fork Clamp Bolts (Upper)	20	2.0	14	
Front Fork Clamp Bolts (Lower)	20	2.0	14	AL
Front Fork Top Plugs	23	2.5	18	
Front Fork Bottom Allen Bolts	30	3.1	22	L
Front Axle Clamp Bolt	34	3.5	25	
Rear Shock Absorber Nuts (Upper and Lower)	34	3.5	25	
Swingarm Pivot Shaft Nut	108	11	80	
Swingarm Pivot Shaft Locknut	98	10	72	
Uni-trak:				
Rocker Arm Nut	34	3.5	25	
Tie-rod Nuts	59	6.0	43	
<b>Steering</b>				
Steering Stem Head Bolt	108	11	80	
Steering Stem Nut	27	2.8	20	
Handlebar Holder Bolts	25	2.5	18	S
Handlebar Lower Holder Nuts	34	3.5	25	
Switch Housing Screws	3.5	0.36	31 in·lb	
Front Fork Clamp Bolts (Upper)	20	2.0	14	
Front Fork Clamp Bolts (Lower)	20	2.0	14	AL
<b>Frame</b>				
Windshield Screws	0.4	0.04	4 in·lb	
Footpeg Bracket Bolts	34	3.5	25	
Footpeg Holder Bolts	34	3.5	25	L
Side Stand Bolt	44	4.5	33	
Frame Cover Bolts	0.3	0.03	3 in·lb	
Side Stand Switch Bolt	8.8	0.90	78 in·lb	L

## 2-10 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Front Fender Bracket Bolts	8.8	0.90	78 in·lb	L
Front Fender Bolts	3.9	0.40	35 in·lb	L
Side Stand Bracket Bolts	49	5.0	36	
<b>Electrical System</b>				
Spark Plugs	13	1.3	113 in·lb	
Alternator Rotor Bolt	110	11	81	
Stator Coil Bolts	12	1.2	104 in·lb	L
Alternator Lead Holding Plate Bolt	12	1.2	104 in·lb	L
Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	
Alternator Cover Bolts	11	1.1	95 in·lb	
Crankshaft Sensor Cover Bolts	11	1.1	95 in·lb	
Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
Camshaft Position Sensor Bolt	12	1.2	104 in·lb	L
Timing Rotor Bolt	39	4.0	29	
Starter Motor Mounting Bolts	11	1.1	95 in·lb	
Switch Housing Screws	3.5	0.36	31 in·lb	
Radiator Fan Switch	18	1.8	13	
Water Temperature Sensor	25	2.5	18	
Oil Pressure Switch	15	1.5	11	SS
Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	G
Neutral Switch	15	1.5	11	
Speed Sensor Bolt	6.9	0.70	61 in·lb	L
Fuel Level Sensor Bolts	6.9	0.70	61 in·lb	L
Front Brake Light Switch Screw	1.2	0.12	10 in·lb	
Meter Mounting Screws	1.2	0.12	10 in·lb	
Tail/Brake Light Mounting Screws	1.2	0.12	10 in·lb	
License Plate Light Mounting Screws	1.2	0.12	10 in·lb	
Turn Signal Light Screws	1.2	0.12	10 in·lb	
Headlight Mounting Bolts	5.9	0.60	52 in·lb	
Starter Lockout Switch Screws	–	–	–	L
Starter Motor Clutch Bolts	12	1.2	104 in·lb	L
Starter Relay Cable Terminal Bolts	3.9	0.40	35 in·lb	L
Regulator/Rectifier Bolts	6.9	0.70	61 in·lb	
Regulator/Rectifier Bracket Bolts	6.9	0.70	61 in·lb	
Speed Sensor Cover Bolts	6.9	0.70	61 in·lb	L
Side Stand Switch Bolt	8.8	0.90	78 in·lb	

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

### Basic Torque for General Fasteners

**Torque and Locking Agent**

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

## 2-12 PERIODIC MAINTENANCE

### Specifications

Item	Standard	Service Limit
<b>Fuel System</b>		
Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	---
Idle Speed	1 100 ±50 r/min (rpm)	---
Bypass Screws (Turn Out)	0 ~ 1 1/2 (for reference)	---
Engine Vacuum	29.7 ±1.333 kPa (225 ±10 mmHg)	---
Air Cleaner Element	Paper 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	2.9 L (3.1 US qt)	---
<b>Engine Top End</b>		
Valve Clearance:		
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	---
Inlet	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)	---
<b>Clutch</b>		
Clutch Lever Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)	---
<b>Engine Lubrication System</b>		
Engine Oil:		
Type	API SE, SF or SG API SH or SJ with JASO MA	---
Viscosity	SAE 10W-40	---
Capacity	3.1 L (3.3 US qt) (when filter is not removed) 3.3 L (3.5 US qt) (when filter is removed) 3.8 L (4.0 US qt) (when engine is completely dry)	---
Level	Between upper and lower level lines (after idling or running)	---
<b>Wheels/Tires</b>		
Tread Depth:		
Front		
BRIDGESTONE	3.4 mm (0.13 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
Rear		
BRIDGESTONE	5.8 mm (0.23 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.12 in.)
Air Pressure (When Cold):		
Front	Up to 180 kg (397 lb) load: 250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi)	---

**Specifications**

Item	Standard	Service Limit
Rear	Up to 180 kg (397 lb) load: 290 kPa (2.9 kgf/cm <sup>2</sup> , 42 psi)	- - -
<b>Final Drive</b> Drive Chain Slack Drive Chain 20-link Length	25 ~ 35 mm (1.0 ~ 1.4 in.) 317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	- - - 323 mm (12.7 in.)
<b>Brakes</b> Brake Fluid: Grade Brake Pad Lining Thickness: Front Rear Brake Light Timing: Front Rear	DOT4  4.5 mm (0.18 in.) 5.0 mm (0.20 in.)  Pulled ON ON after about 10 mm (0.39 in.) of pedal travel	- - -  1 mm (0.04 in.) 1 mm (0.04 in.)  - - - - - -
<b>Electrical System</b> Spark Plug Gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)	- - -

AT: Republic of Austria

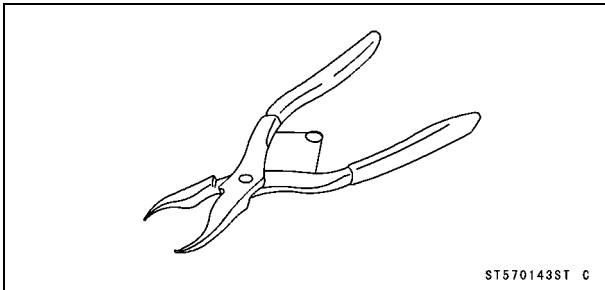
CH: Swiss Confederation

DE: Federal Republic of Germany

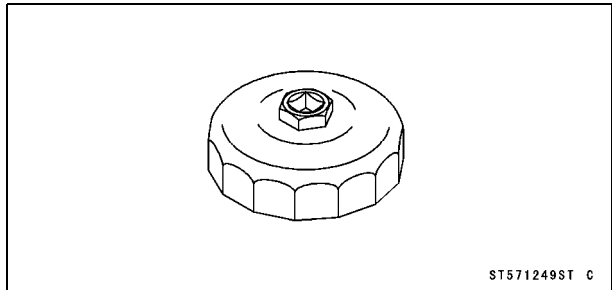
## 2-14 PERIODIC MAINTENANCE

### Special Tools

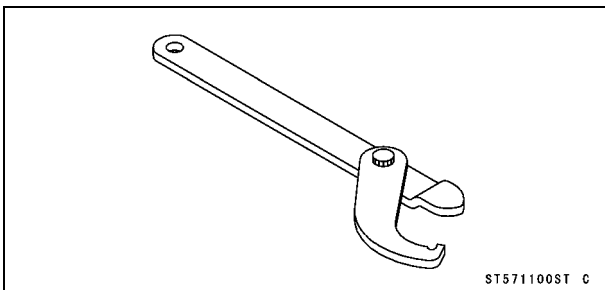
**Inside Circlip Pliers:**  
57001-143



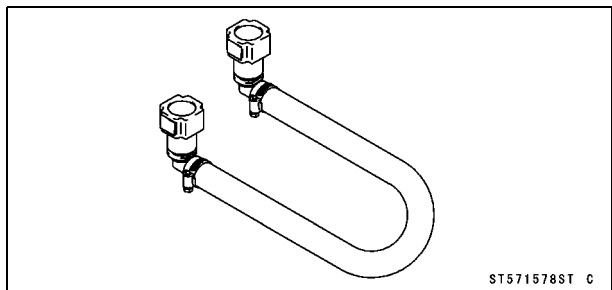
**Oil Filter Wrench:**  
57001-1249



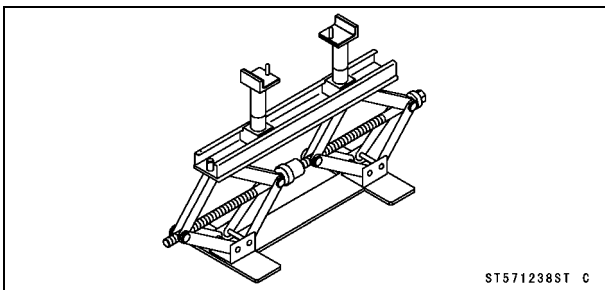
**Steering Stem Nut Wrench:**  
57001-1100



**Extension Tube:**  
57001-1578



**Jack:**  
57001-1238



**Periodic Maintenance Procedures**

**Fuel System (DFI)**

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

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

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

● Check that the hoses are routed according to Cable, Wire, and Hose Routing section in the Appendix chapter.

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

Hose Joints [A]

Pump Outlet Hose [B]

Pump Inlet Hose [C]

Front [D]

● Check that the hose joints are securely connected.

○Push and pull [A] the hose joint [B] back and forth more than two times, and make sure it is locked and doesn't come off. When the hose joint is correctly installed, it should slide on the delivery pipe about 5 mm (0.2 in.).

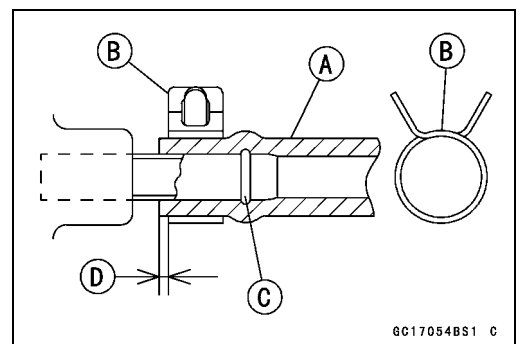
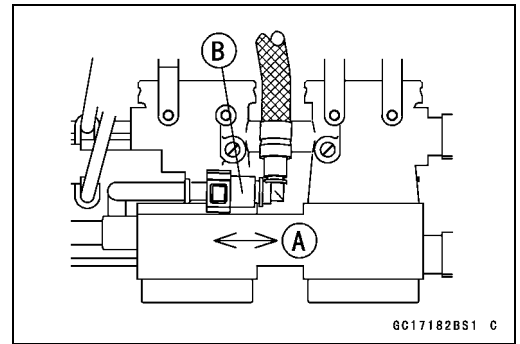
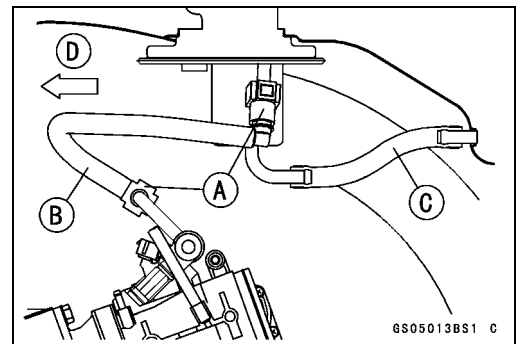
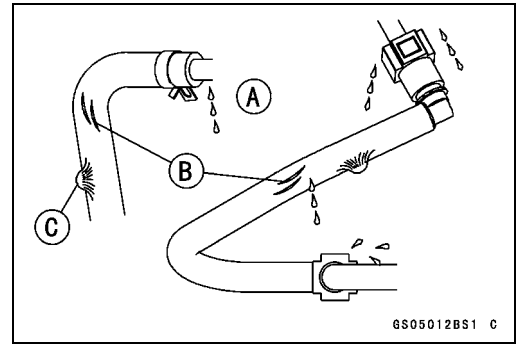
★If it does not slide, reinstall the hose joint.

**⚠ WARNING**

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

○Check that the inlet hose [A] is onto the pipe fully and the plate clamps [B] are installed beyond the raised rib [C].

1 ~ 2 mm (0.039 ~ 0.079 in.) [D]

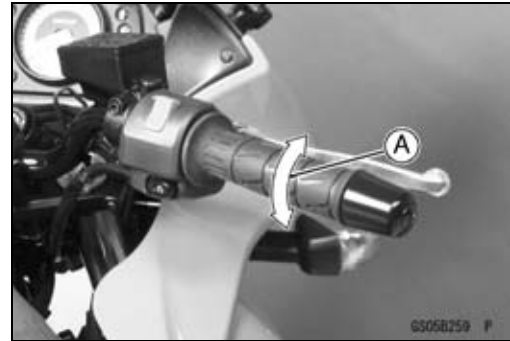


## 2-16 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Throttle Control System Inspection

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



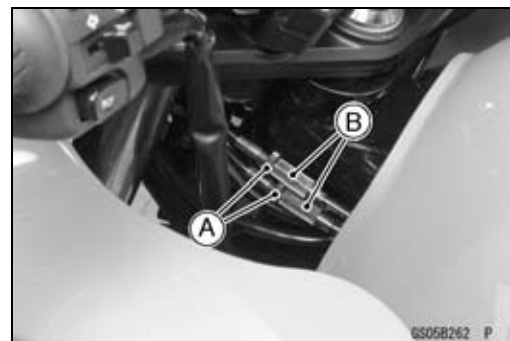
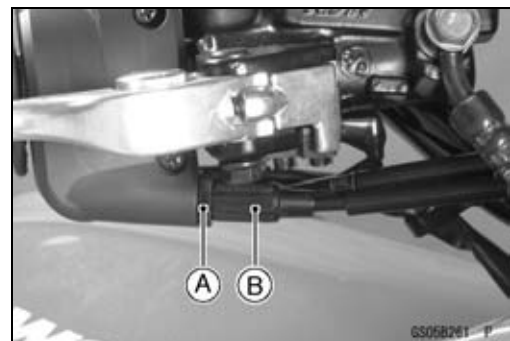
- Check the throttle grip free play [A].
- ★ If the free play is incorrect, adjust the throttle cable.

#### Throttle Grip Free Play

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



- ★ If necessary, adjust the throttle cable as follows.
- Loosen the locknut [A].
- Turn the adjuster [B] until the proper amount of free play can be obtained.
- Tighten the locknut against the adjuster securely.
- ★ If the throttle grip free play can not be adjusted with the adjuster, use the adjusters in the middle of the throttle cables.
- Loosen the locknut, and screw the adjuster at the upper end of the accelerator cable all the way in.
- Tighten the locknut against the adjuster securely.
- Loosen the locknuts [A], and turn the lower adjusters [B] until the proper amount of throttle grip free play is obtained.
- Tighten the locknuts against the adjusters securely.
- ★ If the throttle grip free play can not be adjusted with the lower adjusters, use the adjuster at the upper end of the cable again.





**Periodic Maintenance Procedures**

*Idle Speed Inspection*

- Start the engine and warm it up thoroughly.
- With the engine idling, turn the handlebar to both sides [A].
- ★ If handlebar movement changes the idle speed, the throttle cables may be improperly adjusted or incorrectly routed or damaged. Be sure to correct any of these conditions before riding (see Throttle Control System Inspection or Cable, Wire, and Hose Routing section in the Appendix chapter).



**⚠ WARNING**

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

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

**Idle Speed**

**Standard: 1 100 ±50 r/min (rpm)**

*Idle Speed Adjustment*

- Start the engine and warm it up thoroughly.
- Turn the adjusting screw [A] until the idle speed is correct.
- Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.



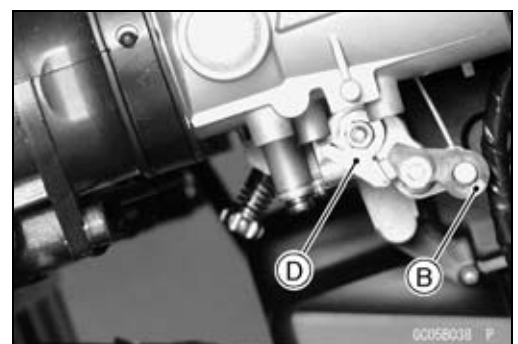
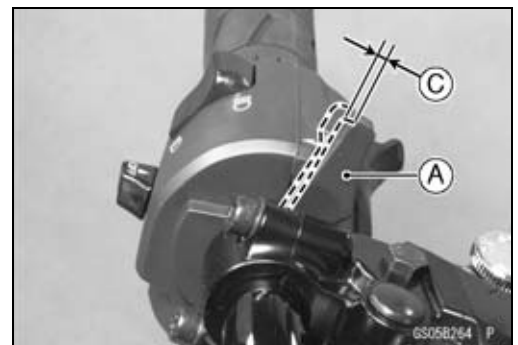
*Choke Operation Inspection*

- Push the choke lever [A] fully and ensure by your finger that the choke cam [B] has the specified play.

**Choke Lever Free Play [C]**

**Standard: 0 ~ 0.5 mm (0 ~ 0.02 in.)**

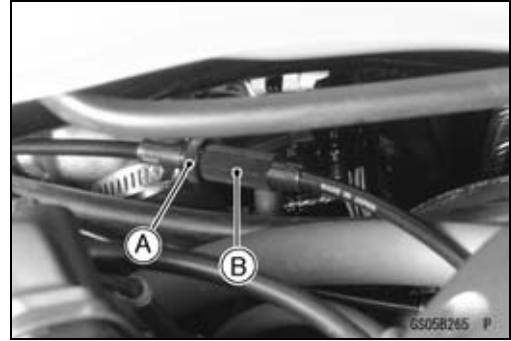
- Pull the choke lever fully and ensure that the choke cam turns the choke link [D].
- ★ If the free play is incorrect, adjust the choke cable.



## 2-18 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Loosen the locknut [A], and turn the adjuster [B] until the cable has the proper amount of free play.
- Tighten the locknut against the adjuster securely.



#### Air Cleaner Element Cleaning

##### NOTE

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

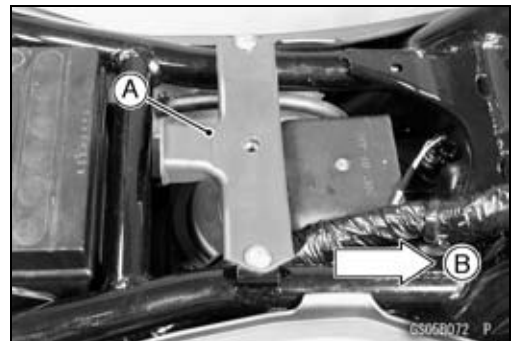
##### **⚠ WARNING**

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

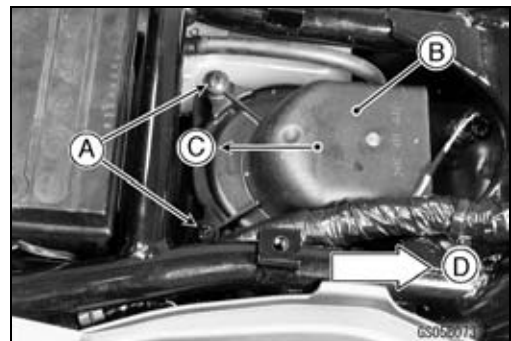
##### **CAUTION**

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

- Remove the fuel tank (see Fuel System (DFI) chapter).
- Remove the fuel tank bracket [A].  
Front [B]

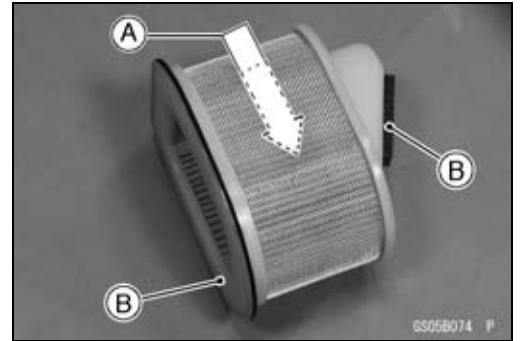


- Remove:  
Screws [A]  
Air Cleaner Duct Holder [B]
- Pull it out [C] backwards.  
Front [D]



**Periodic Maintenance Procedures**

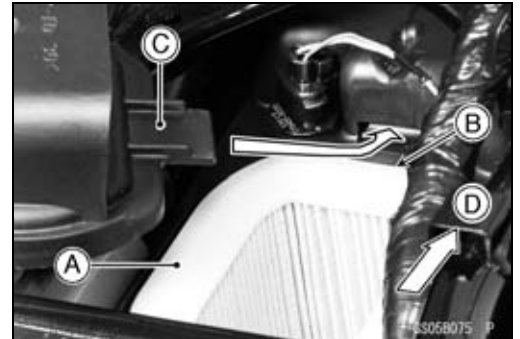
- Clean the element by tapping it lightly to loosen dust.
- Blow away the remaining dust by applying compressed air [A] from the outside to the inside (from the clean side to the dirty side).
- Visually inspect the element for no tears or no breaks and inspect the sponge gaskets [B] also.
- ★ If the element or gasket has any tears or breaks, replace the element.



- Install the element [A] with the flat side [B], facing forwards.
- Fit the tongue [C] of the air cleaner duct holder into the slot of the housing.

Front [D]

**Torque - Air Cleaner Duct Holder Screws: 3.8 N·m (0.39 kgf·m, 34 in·lb)**

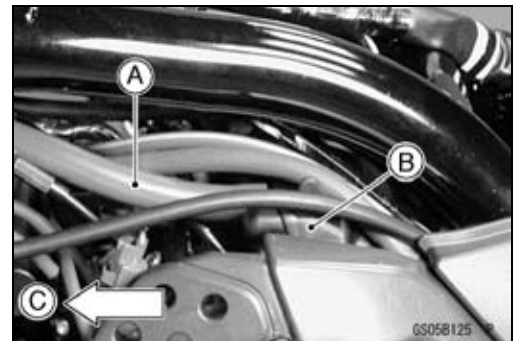


*Engine Vacuum Synchronization Inspection*

**NOTE**

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

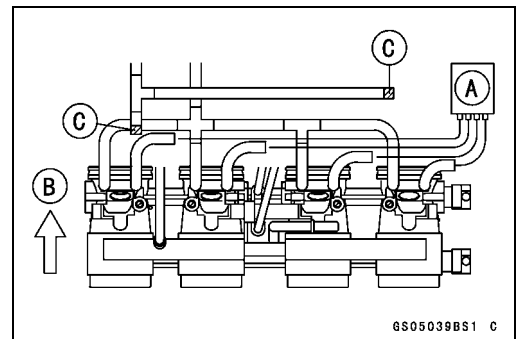
- Situate the motorcycle so that it is vertical.
  - Remove the fuel tank (see Fuel System (DFI) chapter).
  - Pull off the vacuum hoses and the rubber cap(s) from the right fitting of each throttle body.
  - Pull off the vacuum switch valve hose (thick) [A] from the air cleaner housing [B].
- Front [C]



**CAUTION**

**Do not remove the inlet air pressure sensor hoses on the left fitting of each throttle body.**

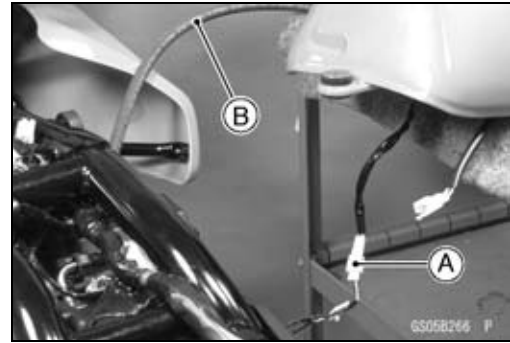
- Connect a commercially available vacuum gauge [A] to these right fittings of the throttle body as shown.
- Front [B]
- Connect a highly accurate tachometer to one of the stick coil primary leads.
- Plug:
  - Vacuum Switch Valve Hose (Thick) and its Air Cleaner Housing Hole
  - Vacuum Switch Valve Vacuum Hose Ends [C]



## 2-20 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Connect:
    - Fuel Pump Lead Connector [A]
    - Extension Tube [B]
- Special Tool - Extension Tube: 57001-1578**



- Start the engine and warm it up thoroughly.
  - Check the idle speed.
    - Tachometer [A]
  - Open and close the throttle.
- ★ If the idle speed is out of the specified range, adjust it.

#### CAUTION

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

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

#### Engine Vacuum

**Standard: 29.7 ±1.333 kPa (225 ±10 mmHg) at Idle Speed 1 100 ±50 r/min (rpm)**

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

#### Example:

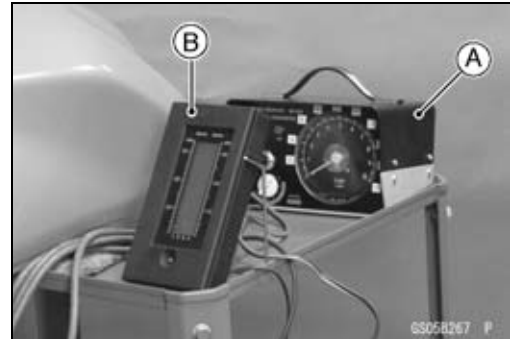
- #1: 165 mmHg
- #2: 190 mmHg
- #3: 170 mmHg
- #4: 200 mmHg

- With the engine at the correct idle speed, equalize the lower vacuum of #3 and #4 (example 170 mmHg) to the lower vacuum of #1 and #2 (example 165 mmHg) by turning the center adjusting screw [A].

#### NOTE

○ After adjustment, the final vacuum measurement between the lowest throttle valves may not be 165 mmHg (in this example). The goal is to have the lower two vacuums between the left (#1 and #2) and right (#3 and #4) banks be the same.

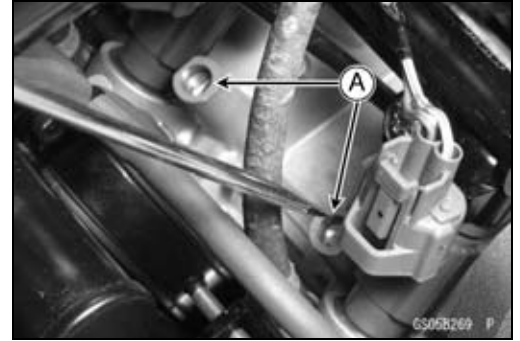
- Open and close the throttle after each measurement and adjust the idle speed as necessary.
- Once the throttle valves have been synchronized, inspect the main throttle sensor's output voltage to ensure proper operation (procedure is at the end of this section).



**Periodic Maintenance Procedures**

★ If any one vacuum measurement is out of the standard measurement after left and right synchronization, turn in the bypass screws [A] until it seats fully but not tightly.

**Torque - Bypass Screws: 0.2 N·m (0.02 kgf·m, 1.7 in·lb)**



**CAUTION**

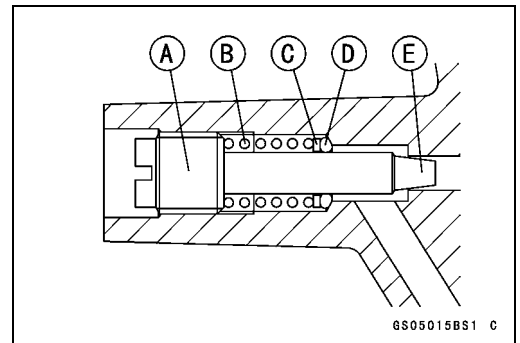
**Do not over tighten them. They could be damaged, requiring replacement.**

- Turn out the bypass screw of the higher vacuum between #1 and #2 to the lower vacuum.
- Turn out the bypass screw of the higher vacuum between #3 and #4 to the lower vacuum.
- Open and close the throttle valves after each measurement and adjust the idle speed as necessary.
- Inspect the vacuums as before.
- ★ If all vacuums are within the specification, finish the engine vacuum synchronization.
- ★ If any vacuum can not be adjusted within the specification, remove the bypass screws #1 ~ #4 and clean them.

- Remove the bypass screw [A], spring [B], washer [C] and O-ring [D].
- Check the bypass screw and its hole for carbon deposits.
- ★ If any carbon accumulates, wipe the carbon off the bypass screw and the hole, using a cotton pad penetrated with a high-flash point solvent.
- Replace the O-ring with a new one.
- Check the tapered portion [E] of the bypass screw for wear or damage.
- ★ If the bypass screw is worn or damaged, replace it.
- Turn in the bypass screw until it seats fully but not tightly.

**Torque - Bypass Screw: 0.2 N·m (0.02 kgf·m, 1.7 in·lb)**

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



**Main Throttle Sensor Output Voltage**

**Connections to ECU**

**Meter (+) → Y/W lead (terminal 2)**

**Meter (-) → BR/BK lead (terminal 14)**

**Connections to ECU (Immobilizer Equipped Models)**

**Meter (+) → Y/W lead (terminal 6)**

**Meter (-) → BR/BK lead (terminal 20)**

**Standard:**

**0.99 ~ 1.03 V DC (at idle throttle opening)**

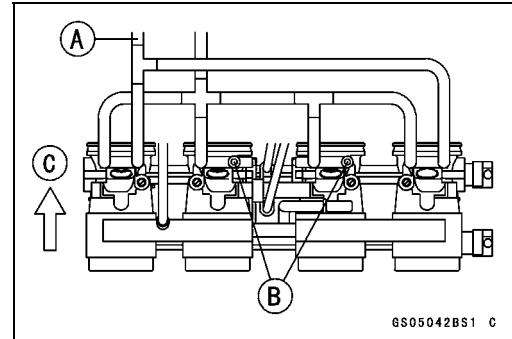
★ If the output voltage is out of the range, check the throttle input voltage (see Input Voltage Inspection of Main Throttle Sensor in the Fuel System (DFI) chapter).

## 2-22 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Remove the vacuum gauge hoses and install the vacuum hoses [A] and rubber caps [B] on the original position as shown.

Front [C]

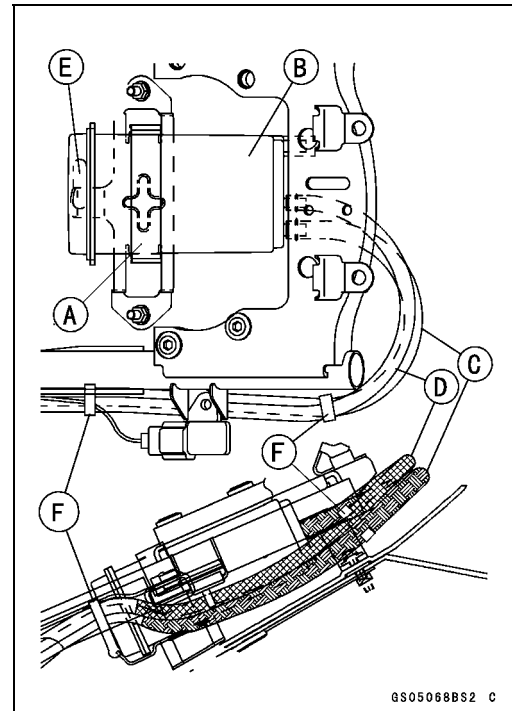


### Evaporative Emission Control System Inspection (CAL)

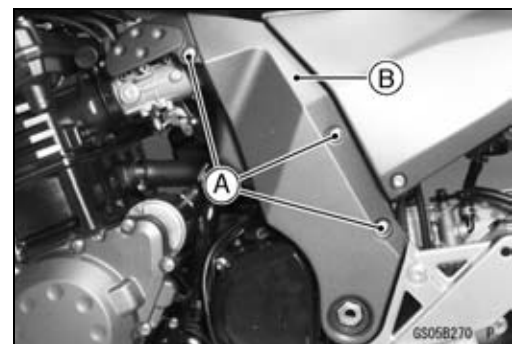
- Inspect the canister as follows:
  - Remove the seat cover (see Frame chapter).
  - Remove the band [A] and hoses and take out the canister [B].
  - Visually inspect the canister for cracks and other damage.
  - ★ If the canister has any cracks or bad damage, replace it with a new one.

#### NOTE

- The canister is designed to work well through the motorcycle's life without any maintenance if it is used under normal conditions.
- Connect the purge hose (white) [C] and the canister breather hose (blue) [D] to the canister as shown.
- Install the canister with the inlet [E] down and the seat (see Frame chapter).
  - Clamps [F]

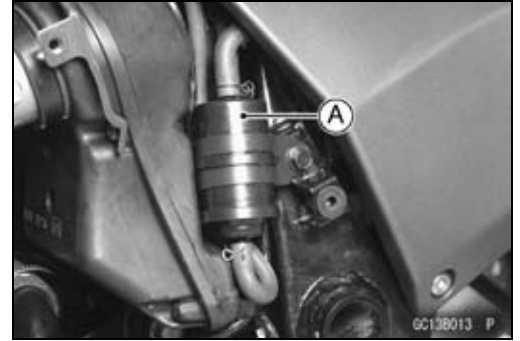


- Check the liquid/vapor separator as follows:
- Remove:
  - Bolts [A] with Washer
  - Left Frame Cover [B]



**Periodic Maintenance Procedures**

- Disconnect the hoses from the separator, and remove the separator [A] from the motorcycle left side.
- Visually inspect the separator for cracks and other damage.
- ★ If the separator has any cracks or damage, replace it with a new one.
- To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
- Check the hoses of the evaporative emission control system as follows:
  - Check that the hoses are securely connected and clips are beyond the raised rib of the pipe.
  - Replace any kinked, deteriorated or damaged hoses.
  - Route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
  - When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and route these hoses with a minimum of bending so that the emission flow will not be obstructed.

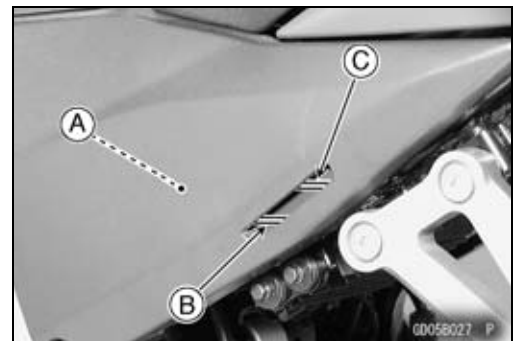


**Cooling System**

*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



**CAUTION**

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

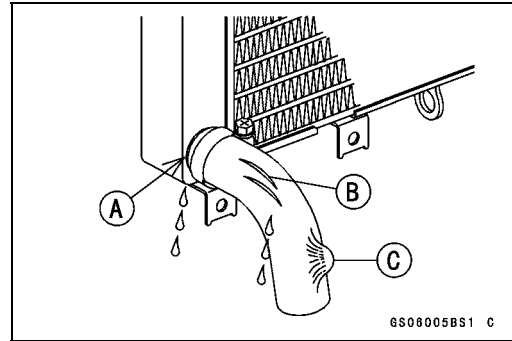
## 2-24 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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

- The high pressure inside the radiator hose and pipe can cause coolant to leak [A] or the hose to burst if the line is not properly maintained.
- Visually inspect the hoses for signs of deterioration. Squeeze the hoses. A hose should not be hard and brittle, nor should it be soft or swollen.
- ★ Replace the hose if any fraying, cracks [B] or bulges [C] are noticed.
- Check that the hoses are securely connected and clamps are tightened correctly.

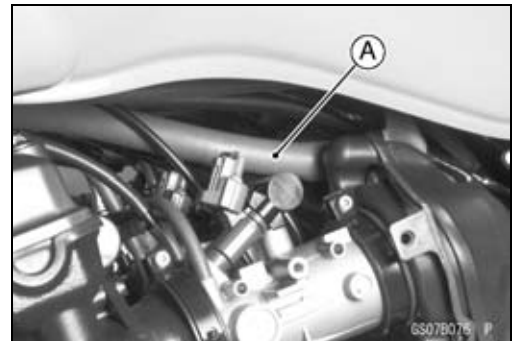
**Torque - Radiator Hose Clamp Screws: 2.0 N·m (0.20 kgf·m, 17 in·lb)**



#### **Air Suction System**

##### *Air Suction System Damage Inspection*

- Pull the vacuum switch valve hose [A] out of the air cleaner.



- Start the engine and run it at idle speed.
- Plug [A] the vacuum switch valve hose end with your finger and feel vacuum pulsing in the hose.
- ★ If there is no vacuum pulsation, check the hose line for leak. If there is no leak, check the vacuum switch valve or air suction valve (see Engine Top End chapter).



#### **Engine Top End**

##### *Valve Clearance Inspection*

#### **NOTE**

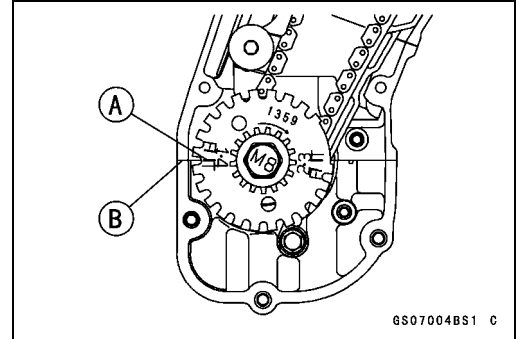
○ *Valve clearance must be checked and adjusted when the engine is cold (at room temperature).*

- Remove:
  - Crankshaft Sensor Cover (see Electrical System chapter)
  - Cylinder Head Cover (see Engine Top End chapter)



**Periodic Maintenance Procedures**

- Position the crankshaft at 1,4 piston TDC.  
 TDC Mark [A] for #1, 4 Pistons  
 Timing Mark (Crankcase halves mating surface) [B]



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

**Valve Clearance**

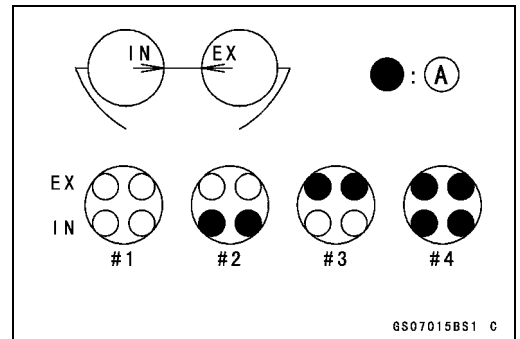
**Standard:**

<b>Exhaust</b>	<b>0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)</b>
<b>Inlet</b>	<b>0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)</b>



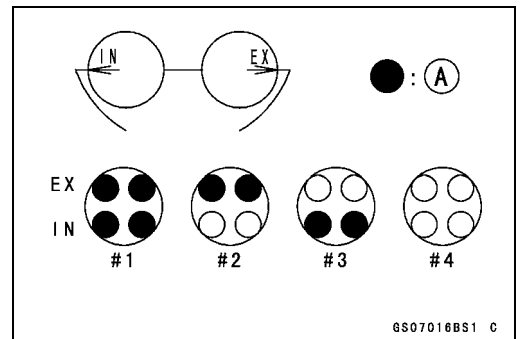
- When positioning #4 piston TDC at the end of the compression stroke:

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



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

Inlet Valve Clearance of #1 and #3 Cylinders  
 Exhaust Valve Clearance of #1 and #2 Cylinders  
 Measuring Valve [A]



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

**Valve Clearance Adjustment**

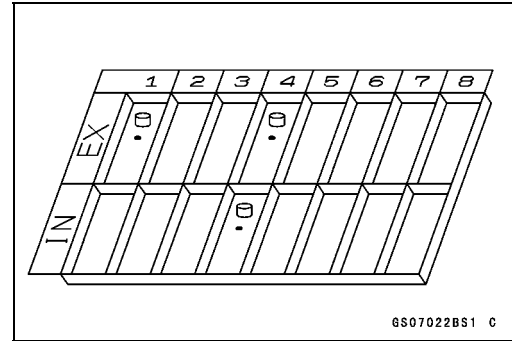
- To change the valve clearance, remove the camshaft chain tensioner, camshafts and valve lifters. Replace the shim with one of a different thickness.

## 2-26 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### NOTE

- Mark and record the valve lifter and shim locations so they can be reinstalled in their original positions.
- If there is no clearance, select a shim which is several sizes smaller and then measure the clearance.



- To select a new shim which brings the valve clearance within the specified range, refer to the Valve Clearance Adjustment Charts.
- Apply a thin coat of molybdenum disulfide grease to the valve lifters.
- Install the camshafts. Be sure to time the camshafts properly (see Engine Top End chapter).
- Remeasure any valve clearance that was adjusted. Readjust if necessary.

#### CAUTION

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

**Do not grind the shim. This may cause it to fracture, causing extensive engine damage.**

Periodic Maintenance Procedures

VALVE CLEARANCE ADJUSTMENT CHART INLET VALVE

INLET		PRESENT SHIM																				
Part No. (92180)	1014	1016	1018	1020	1022	1024	1026	1028	1030	1032	1034	1036	1038	1040	1042	1044	1046	1048	1050	1052	1054	
MARK	50	55	60	65	70	75	80	85	90	95	00	5	10	15	20	25	30	35	40	45	50	
THICKNESS (mm)	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	
VALVE CLEARANCE MEASUREMENT (mm) Example	0.00 ~ 0.02	—	—	—	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	
	0.03 ~ 0.07	—	—	—	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35
	0.08 ~ 0.12	—	—	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40
	0.13 ~ 0.14	—	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45
	0.15 ~ 0.24	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																				
	0.25 ~ 0.27	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	
	0.28 ~ 0.32	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50		
	0.33 ~ 0.37	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50			
	0.38 ~ 0.42	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50				
	0.43 ~ 0.47	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50					
	0.48 ~ 0.52	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50						
	0.53 ~ 0.57	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50							
	0.58 ~ 0.62	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50								
	0.63 ~ 0.67	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50									
	0.68 ~ 0.72	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50										
	0.73 ~ 0.77	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50											
	0.78 ~ 0.82	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50												
	0.83 ~ 0.87	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50													
	0.88 ~ 0.92	3.20	3.25	3.30	3.35	3.40	3.45	3.50														
	0.93 ~ 0.97	3.25	3.30	3.35	3.40	3.45	3.50															
0.98 ~ 1.02	3.30	3.35	3.40	3.45	3.50																	
1.03 ~ 1.07	3.35	3.40	3.45	3.50																		
1.08 ~ 1.12	3.40	3.45	3.50																			
1.13 ~ 1.17	3.45	3.50																				
1.18 ~ 1.22	3.50																					

INSTALL THE SHIM OF THIS THICKNESS (mm)

1. Measure the clearance (when engine is cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. Install the shim specified where the lines intersect. This shim will give the proper clearance.

**Example:** Present shim is **2.95 mm**  
 Measured clearance is **0.45 mm**  
 Replace **2.95 mm** shim with **3.20 mm** shim.

5. Remeasure the valve clearance and readjust if necessary.

# 2-28 PERIODIC MAINTENANCE

## Periodic Maintenance Procedures

### VALVE CLEARANCE ADJUSTMENT CHART EXHAUST VALVE

EXHAUST		PRESENT SHIM																			
Part No. (92180)	1014	1016	1018	1020	1022	1024	1026	1028	1030	1032	1034	1036	1038	1040	1042	1044	1046	1048	1050	1052	1054
MARK	50	55	60	65	70	75	80	85	90	95	00	5	10	15	20	25	30	35	40	45	50
THICKNESS (mm)	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50

VALVE CLEARANCE MEASUREMENT (mm)	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																					
	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50		
0.00 ~ 0.04	-	-	-	-	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	
0.05 ~ 0.09	-	-	-	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	
0.10 ~ 0.14	-	-	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	
0.15 ~ 0.19	-	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	
0.20 ~ 0.21	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	
0.22 ~ 0.31	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																					
0.32 ~ 0.34	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	
0.35 ~ 0.39	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	
0.40 ~ 0.44	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	
0.45 ~ 0.49	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	
0.50 ~ 0.54	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	
0.55 ~ 0.59	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.60 ~ 0.64	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.65 ~ 0.69	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.70 ~ 0.74	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.75 ~ 0.79	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.80 ~ 0.84	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.85 ~ 0.89	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.90 ~ 0.94	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
0.95 ~ 0.99	3.20	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.00 ~ 1.04	3.25	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.05 ~ 1.09	3.30	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.10 ~ 1.14	3.35	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.15 ~ 1.19	3.40	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.20 ~ 1.24	3.45	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	
1.25 ~ 1.29	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	

1. Measure the clearance (when engine is cold).
  2. Check present shim size.
  3. Match clearance in vertical column with present shim size in horizontal column.
  4. Install the shim specified where the lines intersect. This shim will give the proper clearance.
- Example:** Present shim is **2.95 mm**.  
 Measured clearance is **0.47 mm**.  
 Replace **2.95 mm** shim with **3.15 mm** shim.
5. Remeasure the valve clearance and readjust if necessary.

**Periodic Maintenance Procedures**

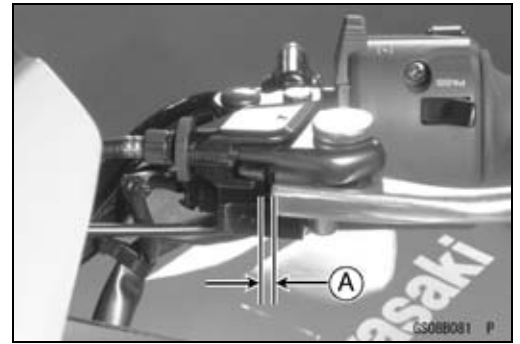
**Clutch**

*Clutch Operation Inspection*

- Pull the clutch lever just enough to take up the free play [A].
- Measure the gap between the lever and the lever holder.
- ★ If the gap is too wide, the clutch may not release fully. If the gap is too narrow, the clutch may not engage fully. In either case, adjust it.

**Clutch Lever Free Play**

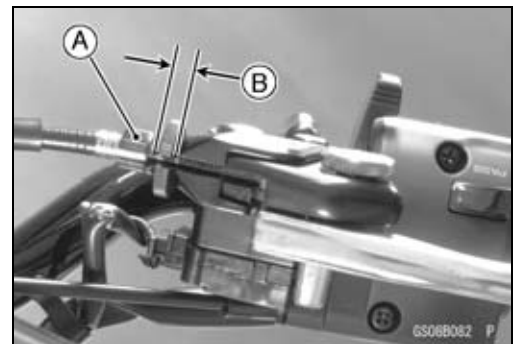
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)



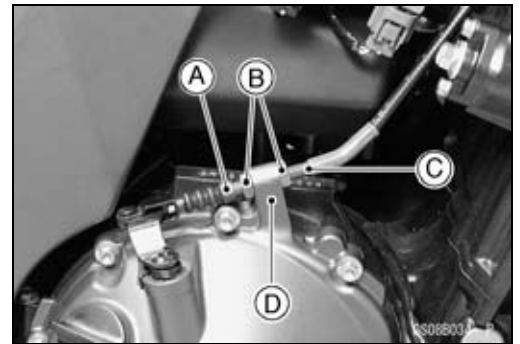
**⚠ WARNING**

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

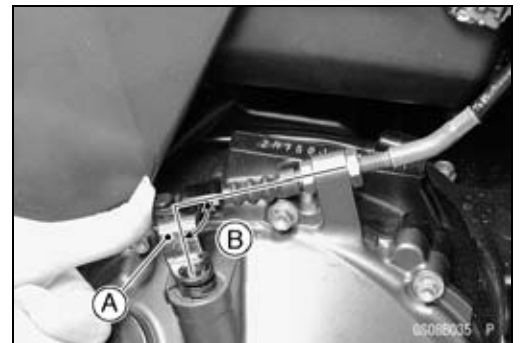
- Turn the adjuster [A] so that 5 ~ 6 mm (0.20 ~ 0.24 in.) [B] of threads are visible.



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



- Push the release lever [A] toward the front of the motorcycle until it becomes hard to turn.
- At this time, the release lever should have the proper angle shown. 60° [B]
- ★ If the angle is wrong, check the clutch and release parts for wear.



**⚠ WARNING**

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

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

## 2-30 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Wheels/Tires

##### *Air Pressure Inspection*

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

##### **Air Pressure (When Cold)**

**Front: Up to 180 kg (397 lb)  
250 kPa (2.5 kgf/cm<sup>2</sup>, 36 psi)**

**Rear: Up to 180 kg (397 lb)  
290 kPa (2.9 kgf/cm<sup>2</sup>, 42 psi)**

- Install the air valve cap certainly after air pressure inspection.

**Torque - Air Valve Cap: 0.15 N·m (0.015 kgf·m, 1.3 in·lb)**

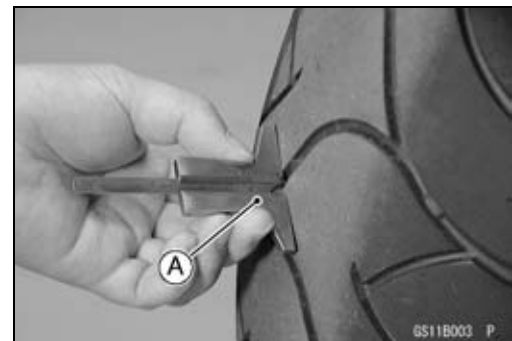
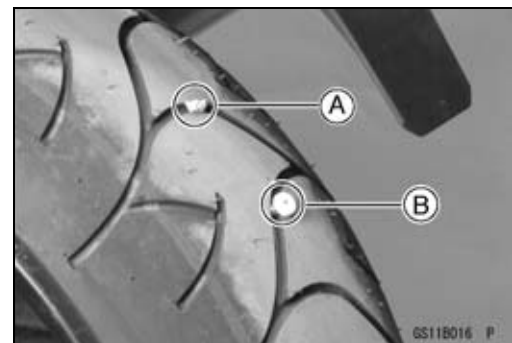
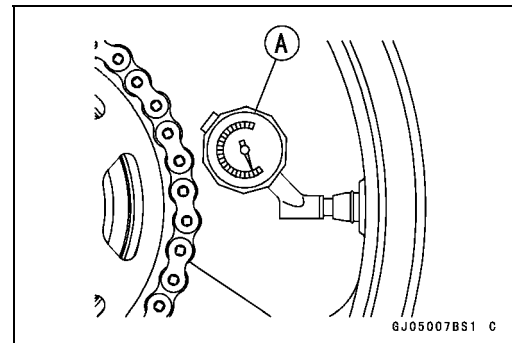
##### *Wheel/Tire Damage Inspection*

- Remove any imbedded stones [A] or other foreign particles [B] from tread.
  - Visually inspect the tire for cracks and cuts, and replace the tire if necessary. Swelling or high spots indicate internal damage, requiring tire replacement.
  - Visually inspect the wheel for cracks, cuts and dents damage.
- ★ If any damage is found, replace the wheel if necessary.

##### *Tire Tread Wear, Abnormal Wear Inspection*

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

- Measure the tread depth at the center of the tread with a depth gauge [A]. Since the tire may wear unevenly, take measurement at several places.
- ★ If any measurement is less than the service limit, replace the tire (see Wheels/Tires chapter).



**Periodic Maintenance Procedures**

**Tread Depth**

**Front:**

- Standard: 3.4 mm (0.13 in.)
- Service Limit: 1 mm (0.04 in.)
- 1.6 mm (0.06 in.) (AT, CH, DE)

**Rear:**

- Standard: 5.8 mm (0.23 in.)
- Service Limit: 2 mm (0.08 in.)  
(Up to 130 km/h (80 mph))
- 3 mm (0.12 in.)  
(Over 130 km/h (80 mph))

**⚠ WARNING**

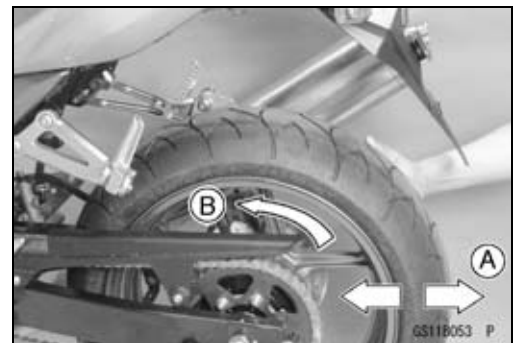
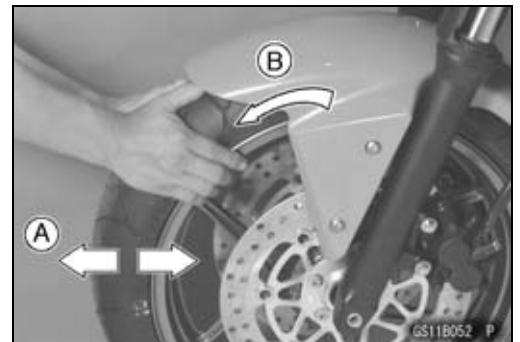
To ensure safe handling and stability, use only the recommended standard tires for replacement, inflated to the standard pressure.

**NOTE**

- Most countries may have their own regulations a minimum tire tread depth: be sure to follow them.
- Check and balance the wheel when a tire is replaced with a new one.

**Wheel Bearing Damage Inspection**

- Using a jack and attachment, raise the front wheel off the ground (see Wheels/Tires chapter).
  - Turn the handlebar all the way to the right or left.
  - Inspect the roughness of the front wheel bearing by pushing and pulling [A] the wheel.
  - Spin [B] the front wheel lightly, and check for smoothly turn, roughness, binding or noise.
  - ★ If roughness, binding or noise is found, remove the front wheel and inspect the wheel bearing (see Wheels/Tires chapter).
- Using a stand, raise the rear wheel off the ground (see Wheels/Tires chapter).
  - Inspect the roughness of the rear wheel bearing by pushing and pulling [A] the wheel.
  - Spin [B] the rear wheel lightly, and check for smoothly turn, roughness, binding or noise.
  - ★ If roughness, binding or noise is found, remove the rear wheel and inspect the wheel bearing (see Wheels/Tires chapter) and coupling (see Final Drive chapter).



## 2-32 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Drive Train

##### Drive Chain Lubrication Condition Inspection

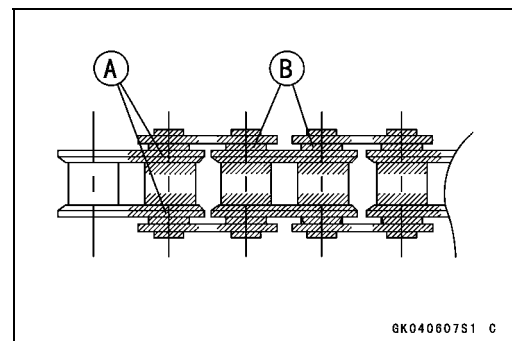
- If a special lubricant is not available, a heavy oil such as SAE 90 is preferred to a lighter oil because it will stay on the chain longer and provide better lubrication.
- If the chain appears especially dirty, clean it before lubrication.

#### CAUTION

The O-rings between the side plates seal in the lubricant between the pin and the bushing. To avoid damaging the O-rings and resultant loss of lubricant, observe the following rules.

Use only kerosene or diesel oil for cleaning an O-ring drive chain. Any other cleaning solution such as gasoline or trichloroethylene will cause deterioration and swelling of the O-ring. Immediately blow the chain dry with compressed air after cleaning. Complete cleaning and drying the chain within 10 minutes.

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



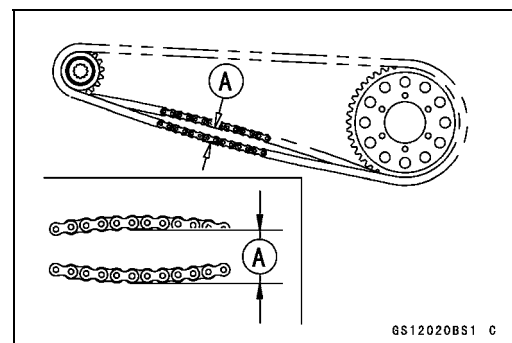
##### Drive Chain Slack Inspection

#### 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: 25 ~ 35 mm (1.0 ~ 1.4 in.)

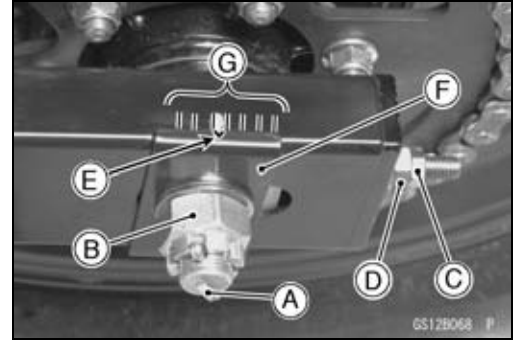




**Periodic Maintenance Procedures**

*Drive Chain Slack Adjustment*

- Remove the cotter pin [A], and loosen the axle nut [B].
- Loosen the both chain adjuster locknuts [C].
- ★ If the chain is too loose, turn out the left and right chain adjuster nut [D] evenly.
- ★ If the chain is too tight, turn in the left and right chain adjusters evenly, and kick the wheel forward.
- Turn both chain adjusters evenly until the drive chain has the correct amount of slack. To keep the chain and wheel properly aligned, the notch [E] on the left wheel alignment indicator [F] should align with the same swingarm mark [G] or position that the right indicator notch aligns with.



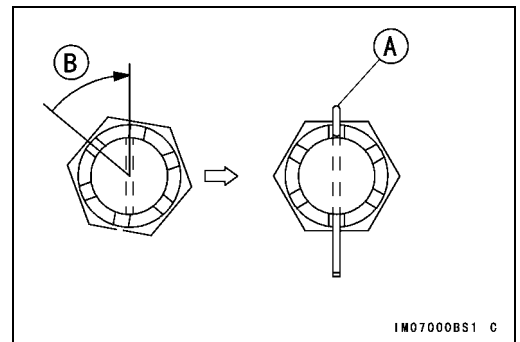
**⚠ WARNING**

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

- Tighten both chain adjuster locknuts securely.
- Tighten the axle nut.  
**Torque - Rear Axle Nut: 108 N·m (11 kgf·m, 80 ft·lb)**
- Turn the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
- Insert a new cotter pin [A].

**NOTE**

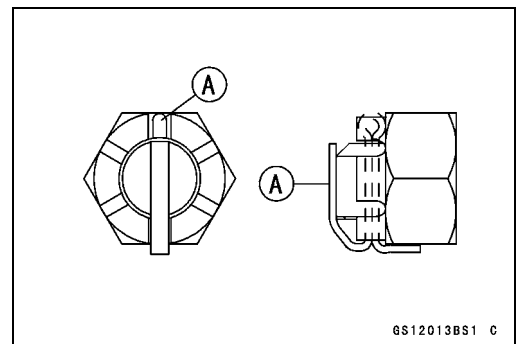
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.
- It should be within 30 degree.
- Loosen once and tighten again when the slot goes past the nearest hole.



- Bend the cotter pin [A] over the nut.

**⚠ WARNING**

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



## 2-34 PERIODIC MAINTENANCE

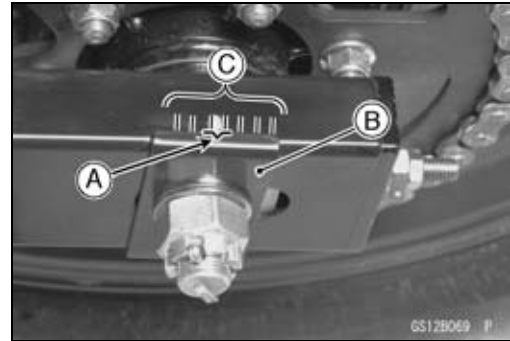
### Periodic Maintenance Procedures

#### Wheel Alignment Inspection

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

#### NOTE

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

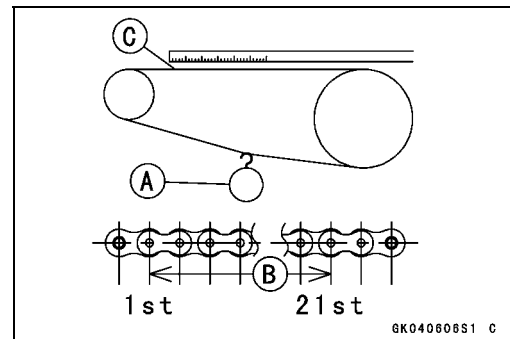
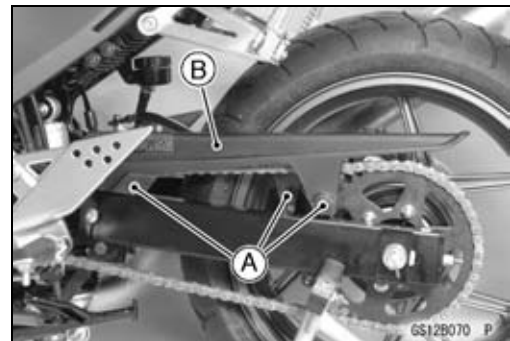


#### **⚠ WARNING**

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

#### Drive Chain Wear Inspection

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



#### Drive Chain 20-link Length

Standard: 317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)

Service Limit: 323 mm (12.7 in.)

#### **⚠ WARNING**

**If the drive chain wear exceeds the service limit, replace the chain or an unsafe riding condition may result. A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing it to go out of control.**

**For safely, use only the standard chain. It is an endless type and should not be cut for installation.**

#### Standard Chain

Make: ENUMA

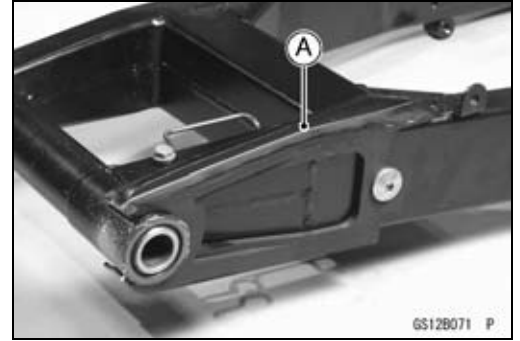
Type: EK520MVXL

Link: 112 Links

**Periodic Maintenance Procedures**

*Chain Guide Inspection*

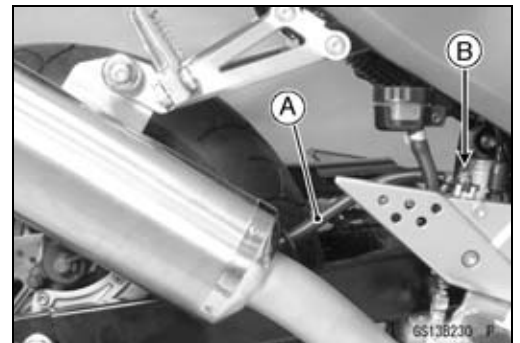
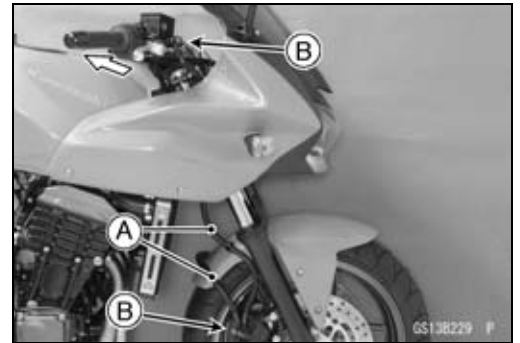
- Visually inspect the chain guide [A].
- ★ Replace the chain guide if it shows any signs of abnormal wear or damage.



**Brake System**

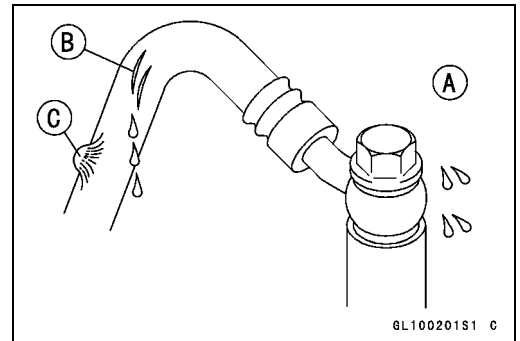
*Brake Fluid Leak (Brake Hose and Pipe) Inspection*

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



*Brake Hose Damage and Installation Condition Inspection*

- Inspect the brake hoses and fittings for deterioration, cracks and signs of leakage.
- The high pressure inside the brake line can cause fluid to leak [A] or the hose to burst if the line is not properly maintained. Bend and twist the rubber hose while examining it.
- ★ Replace the hose if any crack [B], bulge [C] or leakage is noticed.
- ★ Tighten any banjo bolts.



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

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

## 2-36 PERIODIC MAINTENANCE

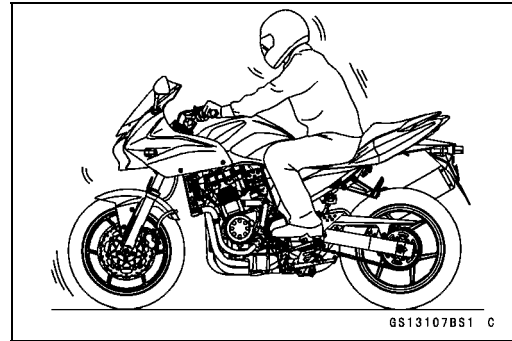
### Periodic Maintenance Procedures

#### Brake Operation Inspection

- Inspect the operation of the front and rear brake by running the vehicle on the dry road.
- ★ If the brake operation is insufficient, inspect the brake system.

#### **⚠ WARNING**

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



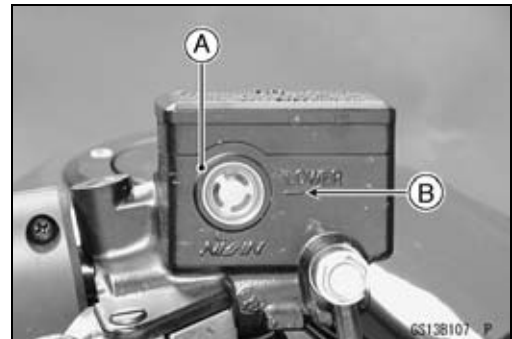
#### Brake Fluid Level Inspection

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

#### **NOTE**

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

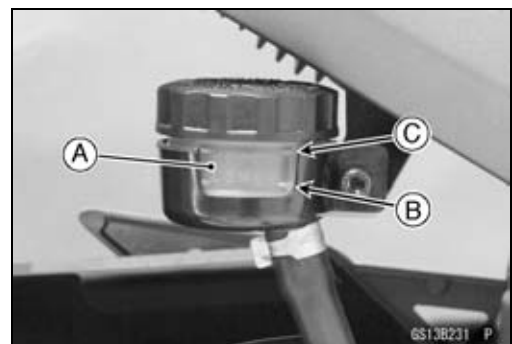
- ★ If the fluid level is lower than the lower level line, fill the reservoir to the upper level line [C] in the reservoir.



- Check that the brake fluid level in the rear brake reservoir [A] is above the lower level line [B].
- ★ If the fluid level is lower than the lower level line, remove the seats and fill the reservoir to the upper level line [C].

#### **⚠ WARNING**

Do not mix two brands of fluid. Change the brake fluid in the brake line completely if the brake fluid must be refilled but the type and brand of the brake fluid that is already in the reservoir are unidentified. After changing the fluid, use only the same type and brand of fluid thereafter.

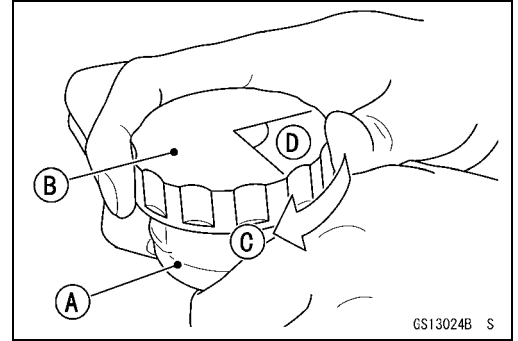


#### Recommended Disc Brake Fluid

Grade: DOT4

**Periodic Maintenance Procedures**

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



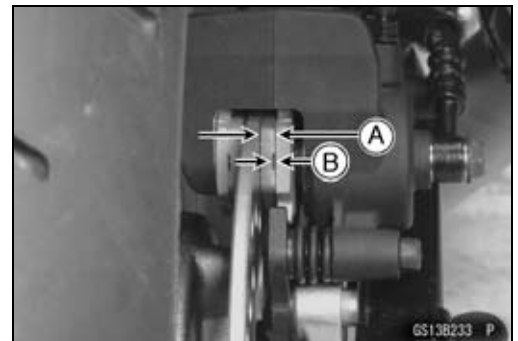
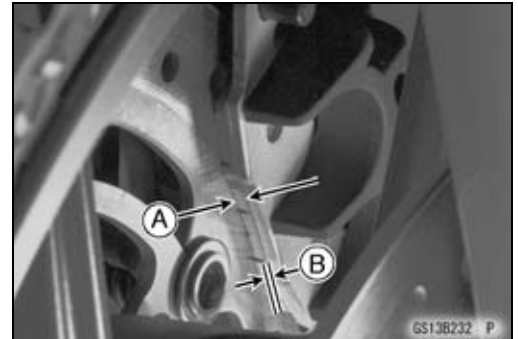
**Brake Pad Wear Inspection**

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

**Pad Lining Thickness**

**Standard:**

Front	4.5 mm (0.18 in.)
Rear	5.0 mm (0.20 in.)
<b>Service Limit:</b>	<b>1 mm (0.04 in.)</b>



**Brake Light Switch Operation Inspection**

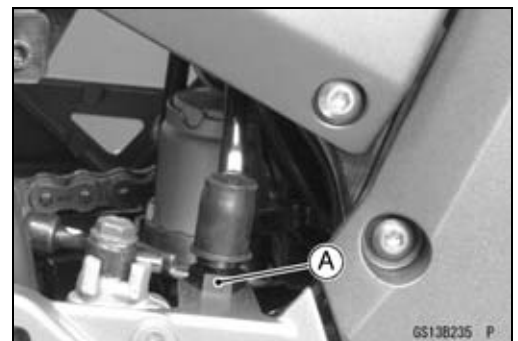
- Turn on the ignition switch.
- The brake light [A] should go on when the brake lever is applied or after the brake pedal is depressed about 10 mm (0.39 in.).



- ★ If it does not, adjust the brake light switch.
- While holding the switch body, turn the adjusting nut [A] to adjust the switch.

**CAUTION**

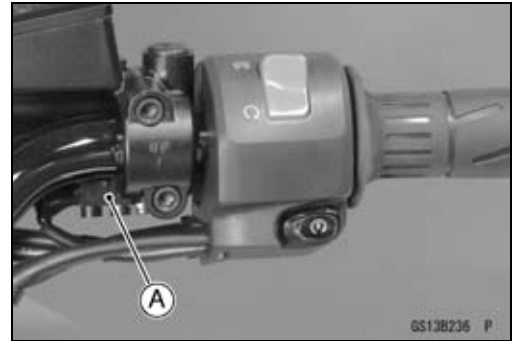
**To avoid damaging the electrical connections inside the switch, be sure that the switch body does not turn during adjustment.**



## 2-38 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

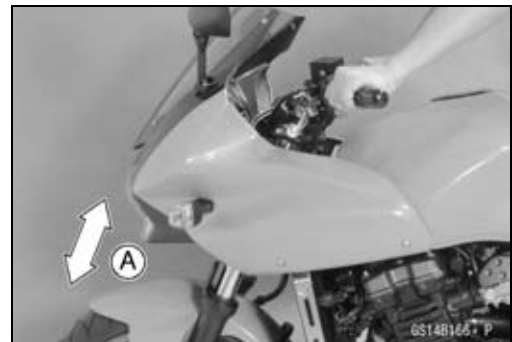
- ★ If it does not go on, inspect or replace the following items.
  - Battery (see Electrical System chapter)
  - Brake Light (see Electrical System chapter)
  - Main Fuse 30 A and Taillight Fuse 10 A (see Electrical System chapter)
  - Front Brake Light Switch [A] (see Electrical System chapter)
  -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



### Suspensions

#### Front Forks/Rear Shock Absorber Operation Inspection

- Pump the forks down and up [A] 4 or 5 times, and inspect the smooth stroke.
- ★ If the forks do not smoothly or noise is found, inspect the fork oil level or fork clamps (see Suspension chapter).



- Pump the rear portion of the motorcycle 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) or shock absorber clamps (see Suspension chapter).



#### Front Forks/Rear Shock Absorber Oil Leak Inspection

- Visually inspect the front forks [A] for oil leakage, scoring or scratches on the inner surface of the inner tubes.
- ★ Replace or repair any defective parts, if necessary.



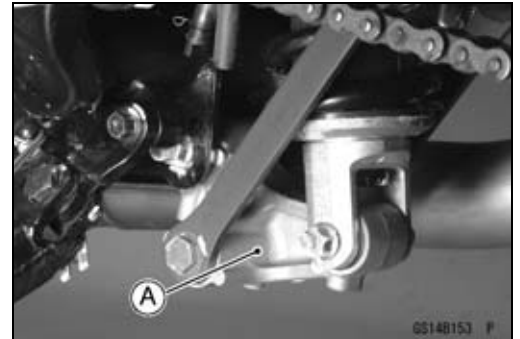
## Periodic Maintenance Procedures

- Visually inspect the shock absorber [A] for oil leakage.
- ★ If the oil leakage is found on it, replace the shock absorber with a new one.



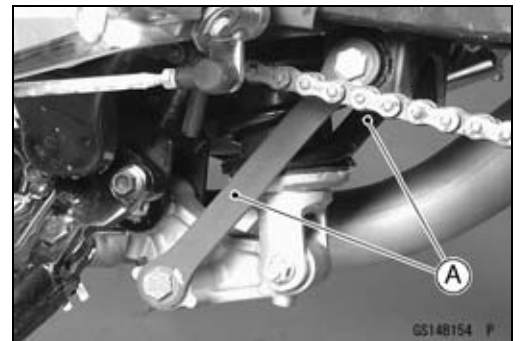
### Rocker Arm Operation Inspection

- Pump the rear portion of the motorcycle down and up 4 or 5 times, and inspect the smooth stroke.
- ★ If the rocker arm [A] does not smoothly stroke or noise is found, inspect the fasteners and bearings (see Suspension chapter).



### 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 Suspension chapter).



## Steering System

### Steering Play Inspection

- Lift the front wheel off the ground using the jack.
- **Special Tool - Jack: 5700-1238**
- With the front wheel pointing straight ahead, alternately tap each end of the handlebar. The front wheel should swing fully left and right from the force of gravity until the fork hits the stop.
- ★ If the wheel binds or catches before the stop, the steering is too tight.
- Feel for steering looseness by pushing and pulling the forks.
- ★ If you feel looseness, the steering is too loose.



### NOTE

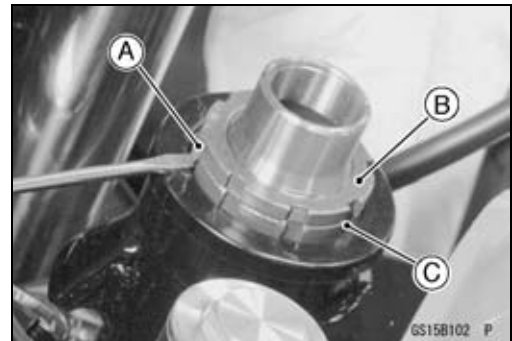
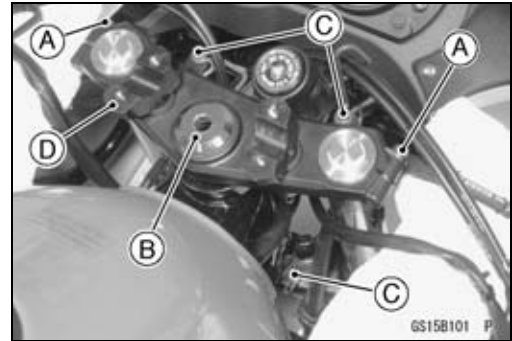
- The cables and wiring will have some effect on the motion of the fork which must be taken into account.
- Be sure the wires and cables are properly routed.
- The bearings must be in good condition and properly lubricated in order for any test to be valid.

## 2-40 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Steering Play Adjustment

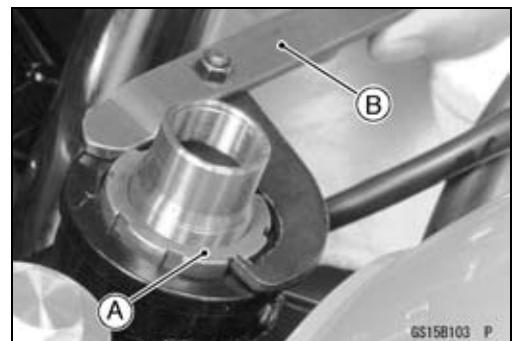
- Remove:
  - Handlebar (see Steering chapter)
  - Upper Fork Clamp Bolts [A]
  - Steering Stem Head Bolt Plug
  - Stem Head Bolt [B]
  - Clamp Bolts [C] with Clamp
- Remove the steering stem head [D].
- Straighten the claw [A] of the claw washer.
- Remove the steering stem locknut [B] and claw washer [C].



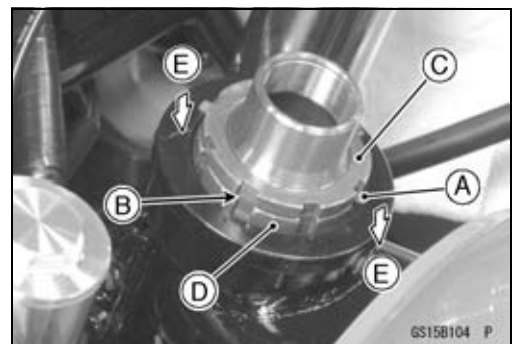
- Adjust the steering.
  - Special Tool - Steering Stem Nut Wrench: 57001-1100 [B]**
- ★ If the steering is too tight, loosen the stem nut [A] a fraction of a turn.
- ★ If the steering is too loose, tighten the stem nut a fraction of a turn.

#### 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.
- Tighten the stem locknut clockwise until the claws are aligned with the grooves (ranging from 2nd to 4th) of stem nut [D], and bend the 2 claws downward [E].



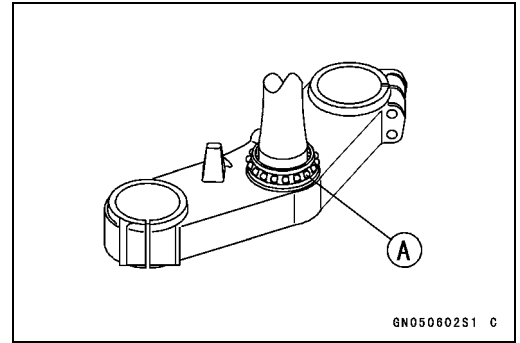
- Tighten:
  - Torque - Steering Stem Head Bolt: 108 N·m (11 kgf·m, 80 ft·lb)**
  - Front Fork Clamp Bolts (Upper): 20 N·m (2.0 kgf·m, 14 ft·lb)**
- Check the steering again.
- ★ If the steering is still too tight or too loose, repeat the adjustment.
- Install the removed parts.



**Periodic Maintenance Procedures**

**Steering Stem Bearing Lubrication**

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



**Electrical System**

**Lights and Switches Operation Inspection**

**First Step**

- Turn on the ignition switch.
- The following lights should go on according to below table.

City Light [A]	goes on
Taillight [B]	goes on
License Plate Light [C]	goes on
Meter Panel LCD [D]	goes on
Neutral Indicator Light [E]	goes on
Oil Pressure Warning Indicator Light [F]	goes on
FI Indicator Light (LED) [G]	goes on (about 2 seconds)

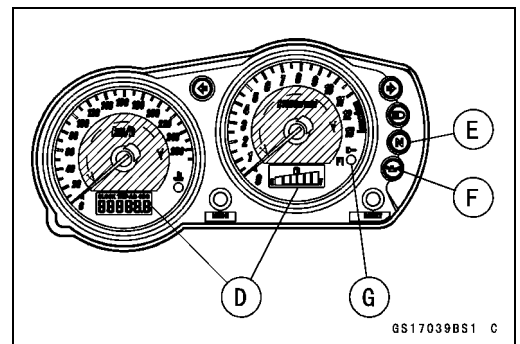
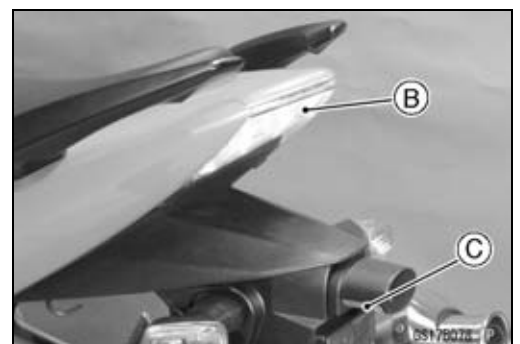
★ If the light does not go on, inspect or replace the following item.

- Battery (see Electrical System chapter)
- Applicable Bulb (see Electrical System chapter)
- Meter Unit for Meter Panel LCD (see Electrical System chapter)
- Meter Unit for Neutral Indicator Light (see Electrical System chapter)
- Meter Unit for Oil Pressure Warning Indicator Light (see Electrical System chapter)
- Meter Unit and ECU for FI Indicator Light (LED, see Electrical System chapter)
- Main Fuse 30 A and Taillight Fuse 10 A (see Electrical System chapter)
- Ignition Switch (see Electrical System chapter)
- Neutral Switch (see Electrical System chapter)
- Harness (see Electrical System chapter)

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

**Second Step**

- Turn the ignition switch to P (Park) position.
- The city light, taillight and license plate light should go on.
- ★ If the light does not go on, inspect or replace the following item.
- Ignition Switch (see Electrical System chapter)



## 2-42 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Third Step

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

★ If the each light does not flash, inspect or replace the following item.

Turn Signal Light Bulb (see Electrical System chapter)

Meter Unit for Turn Signal Indicator Light (see Electrical System chapter)

Turn Signal Relay Fuse 10 A (see Electrical System chapter)

Turn Signal Switch (see Electrical System chapter)

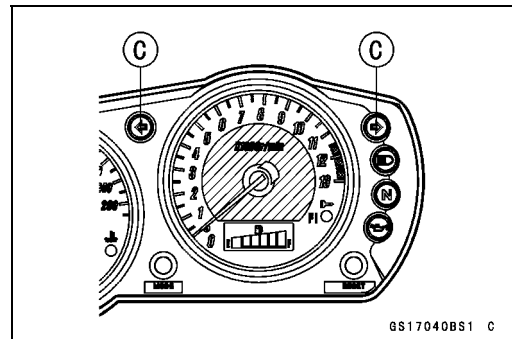
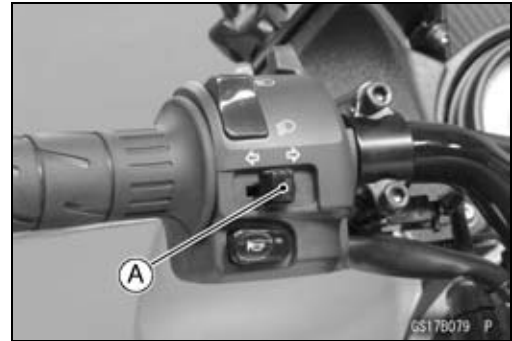
Turn Signal Relay (see Electrical System chapter)

Harness (see light Electrical System chapter)

- Push the turn signal switch.
  - The turn signal lights and indicator light should go off.
- ★ If the light does not go off, inspect or replace the following item.

Turn Signal Switch (see Electrical System chapter)

Turn Signal Relay (see Electrical System chapter)



#### Fourth Step

- Set the dimmer switch [A] to low beam position.
  - Start the engine.
  - The low beam headlight should go on.
- ★ If the low beam headlight does not go on, inspect or replace the following item.

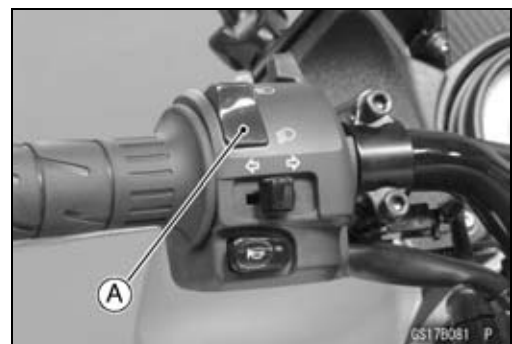
Headlight Low Beam Bulb (see Electrical System chapter)

Headlight Fuse 10 A (see Electrical System chapter)

Dimmer Switch (see Electrical System chapter)

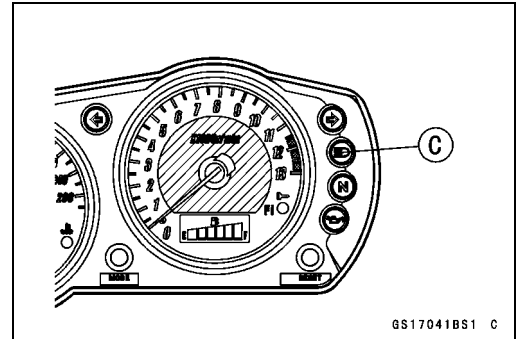
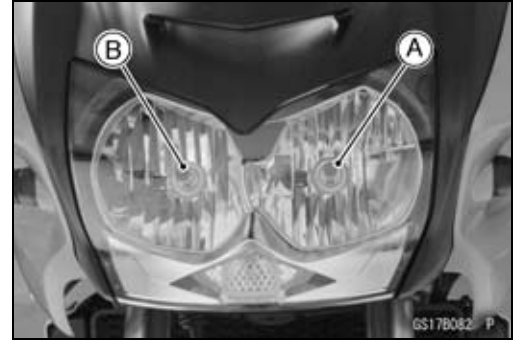
Headlight Relay in Junction Box (see Electrical System chapter)

Harness (see Electrical System chapter)



**Periodic Maintenance Procedures**

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



**Headlight Aiming Inspection**

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

**Headlight Beam Horizontal Adjustment**

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



**Headlight Beam Vertical Adjustment**

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



## 2-44 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### NOTE

- ON high beam, the brightest points should be slightly below horizontal with the motorcycle on its wheels and the rider seated. Adjust the headlight to the proper angle according to local regulations.
- For US model, the proper angle is 0.4 degrees below horizontal. This is 50 mm (2 in.) drop at 7.6 m (25 ft.) measured from the center of the headlight with the motorcycle on its wheels and the rider seated.

50 mm (2 in.) [A]

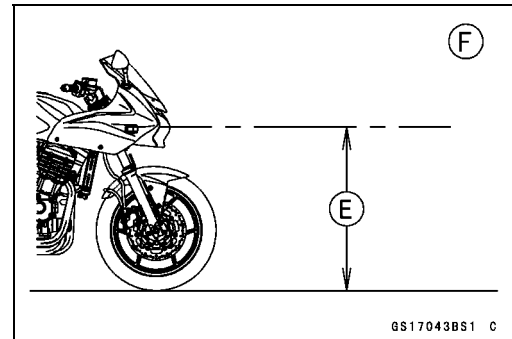
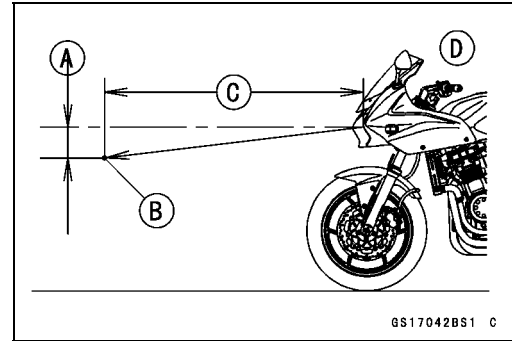
Center of Brightest Spot [B]

7.6 m (25 ft.) [C]

Low Beam [D]

Height of Headlight Center [E]

High Beam [F]

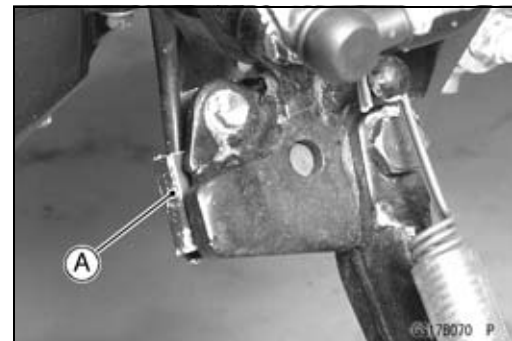


#### Side Stand Switch Operation Inspection

- 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	Doesn't 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	Doesn't start	Stops
Down	In Gear	Pulled in	Starts	Continue running



## Periodic Maintenance Procedures

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

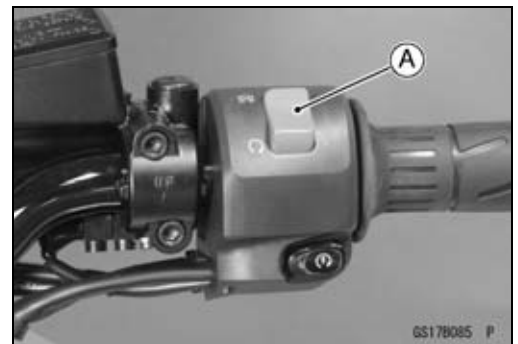
- Battery (see Electrical System chapter)
- Main Fuse 30 A (see Electrical System chapter)
- Ignition Fuse 10 A (see Electrical System chapter)
- Ignition Switch (see Electrical System chapter)
- Side Stand Switch (see Electrical System chapter)
- Engine Stop Switch (see Electrical System chapter)
- Starter Button (see Electrical System chapter)
- Neutral Switch (see Electrical System chapter)
- Starter Circuit Relay (see Electrical System chapter)
- Junction Box (see Electrical System chapter)
- Harness (see Wiring Inspection in the Electrical System chapter)

★ If the all parts are good condition, replace the ECU.

### Engine Stop Switch Operation Inspection

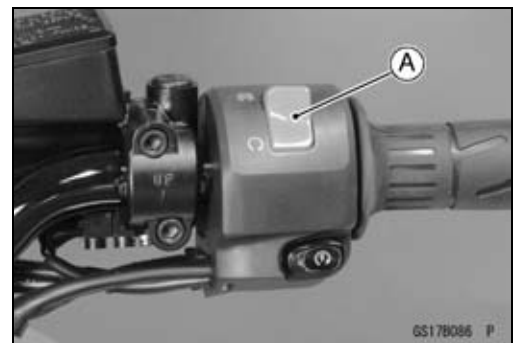
#### First Step

- Turn on the ignition switch.
  - Set the neutral position.
  - Turn the engine stop switch [A] to stop position.
  - Push the starter button.
  - The engine does not start.
- ★ If the engine starts, inspect or replace the following item.
- Engine Stop Switch (see Electrical System chapter)



#### Second Step

- Turn on the ignition switch.
  - Set the neutral position.
  - Turn the engine stop switch [A] to run position.
  - Push the starter button and run the engine.
  - Turn the engine stop switch to stop position.
  - Immediately the engine should be stop.
- ★ If the engine does not stop, inspect or replace the following item.
- Engine Stop Switch (see Electrical System chapter)
- ★ If the engine stop switch is good condition, replace the ECU.



## 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 Motor Oil

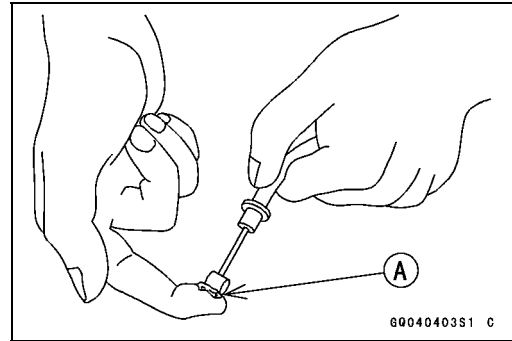
- Rear Brake Rod Joint

## 2-46 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Points: Lubricate with Grease

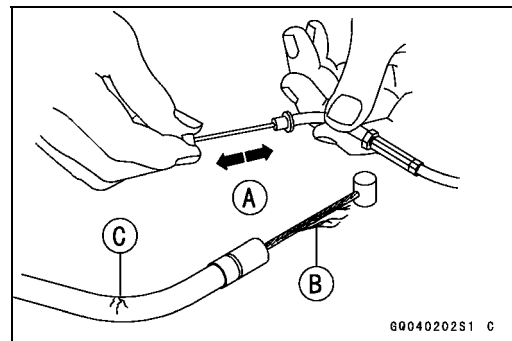
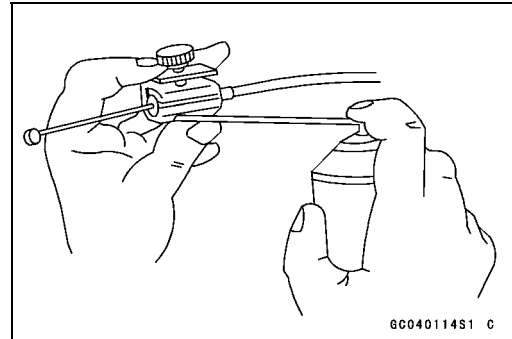
- Throttle and Choke Inner Cable Upper Ends [A]
- Clutch Lever Pivot
- Brake Lever Pivot (Apply silicone grease)
- Brake Pedal Pivot
- Side Stand



#### Cables: Lubricate with Rust Inhibitor

- Choke Cable
- Throttle Cables
- Clutch Cable

- 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 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.



## Periodic Maintenance Procedures

### *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 in this section. 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**

#### Wheels:

Front Axle  
 Front Axle Clamp Bolt  
 Rear Axle Nut  
 Rear Axle Nut Cotter Pin

#### Brakes:

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

#### Suspension:

Front Fork Clamp Bolts  
 Front Fender Mounting Bolts  
 Rear Shock Absorber Mounting Nuts  
 Swingarm Pivot Shaft Nut  
 Swingarm Pivot Shaft Lock Nut  
 Uni-trak Link Nuts

#### Steering:

Stem Head Bolt  
 Handlebar Clamp Bolts

#### Engine:

Throttle Cable Adjuster Locknuts  
 Engine Mounting Bolts and Nuts  
 Muffler Mounting Bolts  
 Exhaust Pipe Holder Nuts  
 Muffler Connecting Clamp Bolt  
 Clutch Lever Pivot Nut  
 Radiator Upper and Lower Bolts

#### Others:

Side Stand Bolt  
 Footpeg Stay Bolts

## 2-48 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

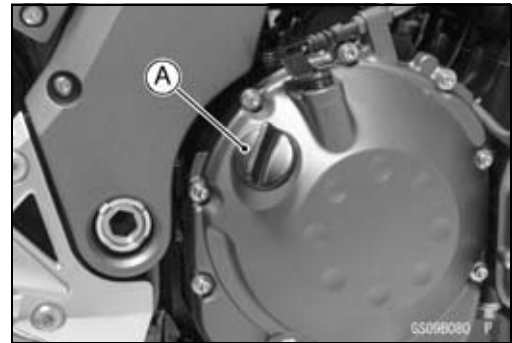
#### Replacement Parts

##### *Air Cleaner Element Replacement*

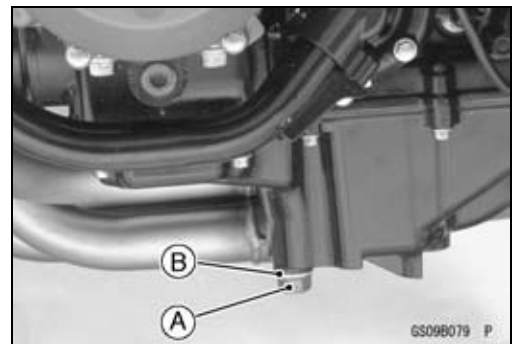
- Refer to the Air Cleaner Element Cleaning in this chapter.

##### *Engine Oil Change*

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

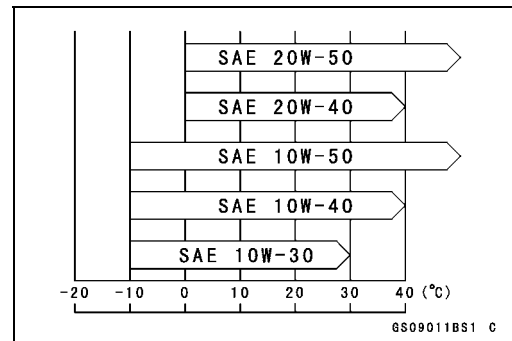


- Remove the engine oil drain bolt [A] to drain the oil.
- The oil in the oil filter can be drained by removing the filter (see Oil Filter Replacement).
- ★ Replace the drain bolt gasket [B] with a new one.
- Tighten the drain bolt.  
**Torque - Engine Oil Drain Bolt: 29 N·m (3.0 kgf·m, 21 ft·lb)**
- Pour in the specified type and amount of oil.



#### Recommended Engine Oil

- Type:** API SE, SF or SG  
API SH or SJ with JASO MA
- Viscosity:** SAE 10W-40
- Capacity:** 3.1 L (3.3 US qt) (when filter is not removed)  
3.3 L (3.5 US qt) (when filter is removed)  
3.8 L (4.0 US qt) (when engine is completely dry)



#### NOTE

○ Although 10W-40 engine oil is the recommended oil for most conditions, the oil viscosity may need to be changed to accommodate atmospheric conditions in your riding area.

- Check the oil level (see Engine Lubrication System chapter).

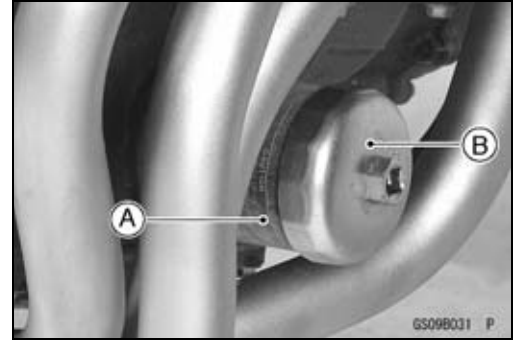


**Periodic Maintenance Procedures**

*Oil Filter Replacement*

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

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



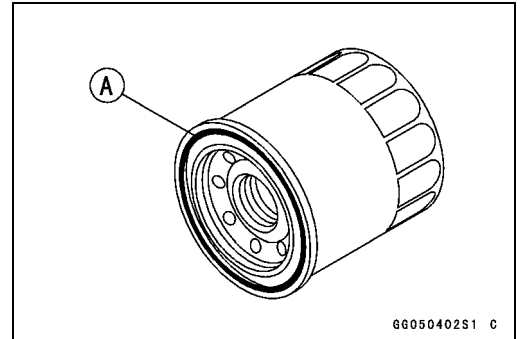
- Replace the filter with a new one.
- Apply engine oil to the gasket [A] before installation.
- Tighten the filter with the oil filter wrench.

**Torque - Oil Filter: 31 N·m (3.2 kgf·m, 23 ft·lb)**

**NOTE**

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

- Pour in the specified type and amount of oil (see Engine Oil Change).

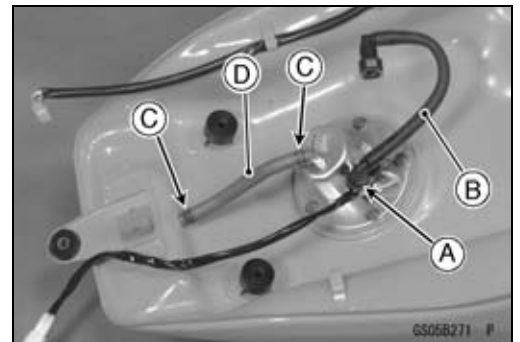


*Fuel Hose Replacement*

- Remove the fuel tank (see Fuel System (DFI) chapter).
- Be sure to place a piece of cloth around the fuel hose joint.

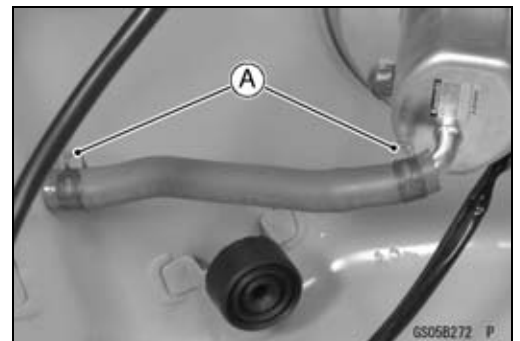
- Remove:

- Hose Joint [A]
- Fuel Hose [B]
- Clamps [C]
- Fuel Pump Inlet Hose [D]



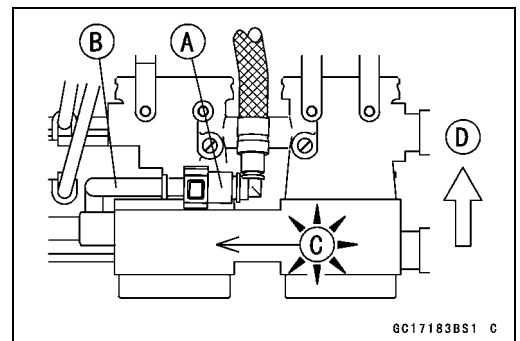
- Install the pump inlet hose clamps as shown.

○The pinch [A] direction inside.



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

Front [D]



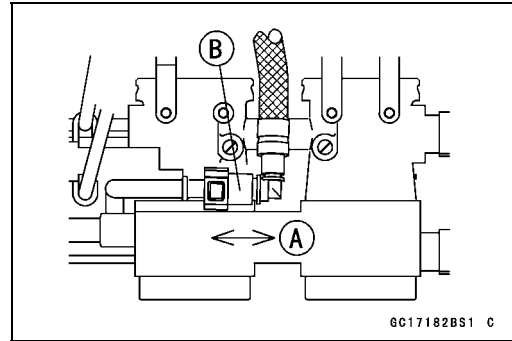
## 2-50 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Push and pull [A] the fuel hose joint [B] back and forth more than two times and make sure it is locked and doesn't come off.
- ★ If it comes off, reinstall the hose joint.

#### **⚠ WARNING**

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



- Run the fuel hose in accordance with the Cable, Wire and Hose Routing section in the Appendix chapter.
- Install the removed part.
- Start the engine and check the fuel hose for leaks.

### Coolant Change

#### **⚠ WARNING**

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

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



- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Remove the radiator cap [A] in two steps. First turn the cap counterclockwise to the first stop. Then push and turn it further in the same direction and remove the cap.
  - The coolant will drain from the radiator and engine.



**Periodic Maintenance Procedures**

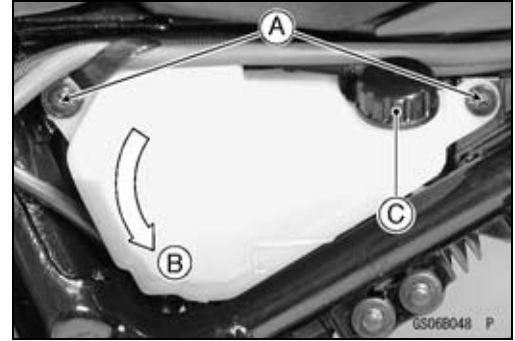
- Remove:
  - Left Side Cover (see Frame chapter)
  - Reserve Tank Screws [A]
- Turn over [B] the reserve tank, remove the cap [C], and pour the coolant into a suitable container.
- Install the reserve tank.

**Torque - Coolant Reserve Tank Screws: 7.0 N·m (0.70 kgf·m, 61 in·lb)**

- Tighten the drain bolt with the gasket.
- Replace the drain bolt gasket with a new one.

**Torque - Water Pump Drain Bolt: 11 N·m (1.1 kgf·m, 95 in·lb)**

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



**CAUTION**

**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: 2.9 L (3.1 US qt)**

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

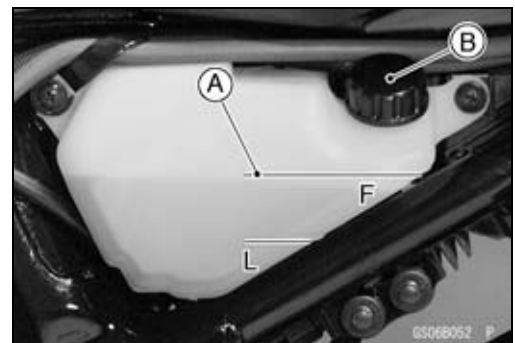
**NOTE**

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

- Check the cooling system for leaks.
- Tap the radiator hoses to force any air bubbles caught inside.
- Fill the radiator up to the filler neck with coolant.



- Fill the reserve tank up to the "F" (full) level line [A] with coolant and install the cap [B].
- Install the fuel tank (see Fuel System (DFI) chapter).
- Start the engine, warm it up thoroughly until the radiator fan turns on and then stop the engine.
- Check the coolant level in the reserve tank after the engine cools down.
- ★ If the coolant level is lower than the "L" level line, add coolant to the "F" level line.



**CAUTION**

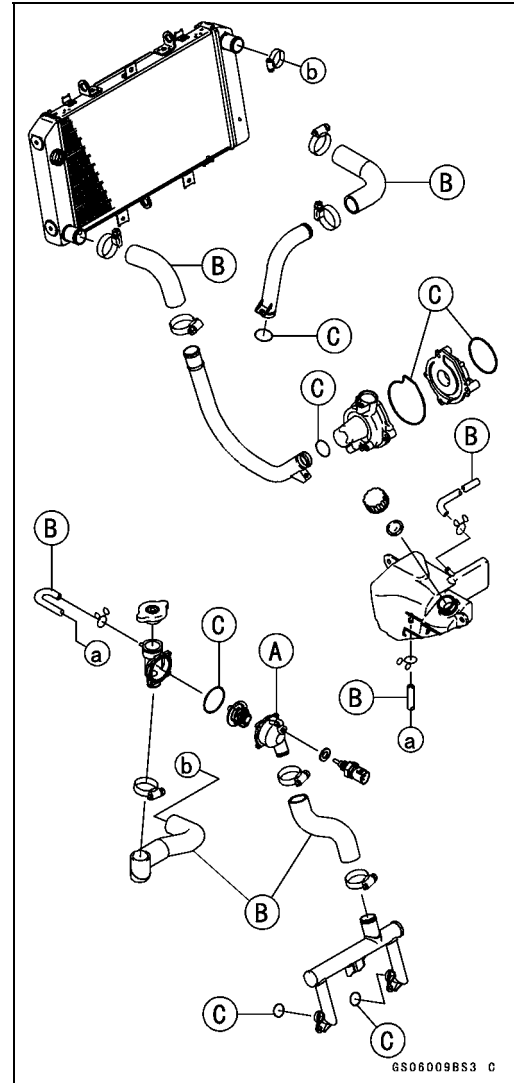
**Do not add more coolant above the "F" level line.**

## 2-52 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Radiator Hose and O-ring Replacement

- Drain the coolant (see Coolant Change).
- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Thermostat Housing [A]
  - Hoses [B]
  - O-rings [C]
- Apply grease to the new O-rings and install them.
- Install the new hoses and tighten the clamps securely.
- Fill the coolant (see Coolant Change).
- Check the cooling system for leaks.

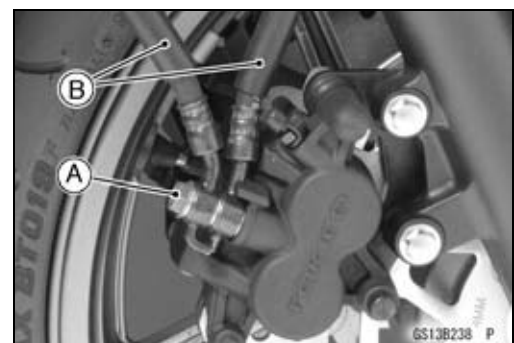
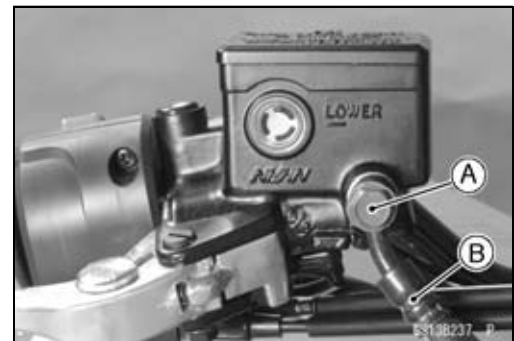


#### Brake Hose and Pipe Replacement

##### CAUTION

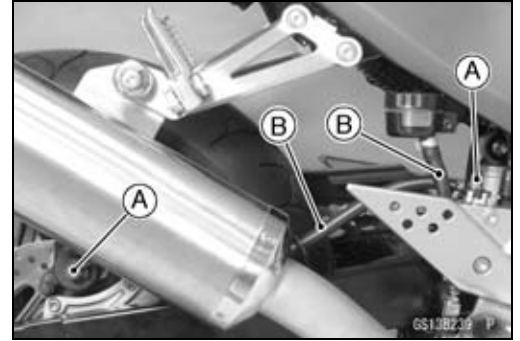
**Brake fluid quickly ruins painted plastic surfaces; any spilled fluid should be completely washed away immediately.**

- Remove:
  - Banjo Bolt [A]
- When removing the brake hose, take care not to spill the brake fluid on the painted or plastic parts.
- When removing the brake hose [B], temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
- Immediately wash away any brake fluid that spills.
- There are washers on each side of the brake hose fitting. Replace them with new ones when installing.
- Tighten:
  - Torque - Brake Hose Banjo Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)



**Periodic Maintenance Procedures**

- When installing the hoses [B], avoid sharp bending, kinking, flattening or twisting, and route the hoses according to Cable, Wire, and Hose Routing section in the Appendix chapter.
- Fill the brake line after installing the brake hose (see Brake Fluid Change).

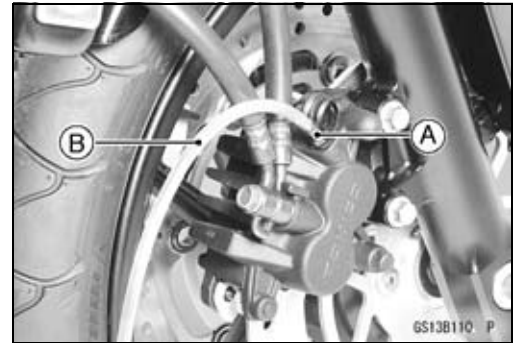


*Brake Fluid Change*

**NOTE**

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

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



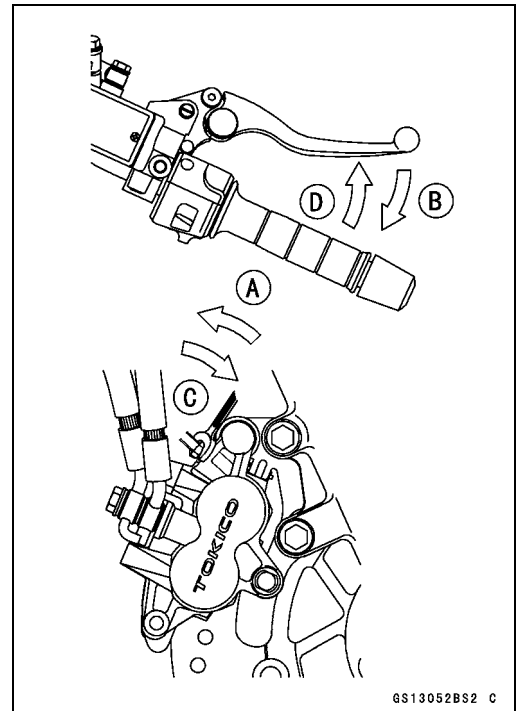
- Change the brake fluid.
- Repeat this operation until fresh brake fluid comes out from the plastic hose or the color of the fluid changes.
1. Open the bleed valve [A].
  2. Apply the brake and hold it [B].
  3. Close the bleed valve [C].
  4. Release the brake [D].

**NOTE**

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

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

○Rear Brake: Repeat the above steps for the other bleed valve.

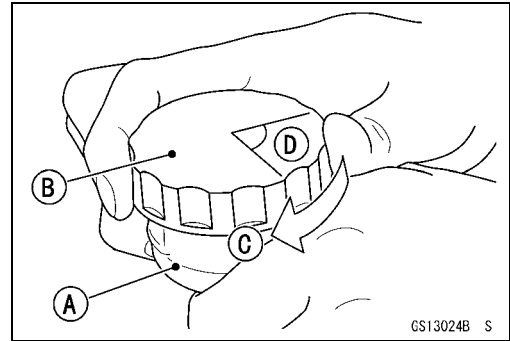


## 2-54 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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

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



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

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

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

★ If necessary, bleed the air from the lines.

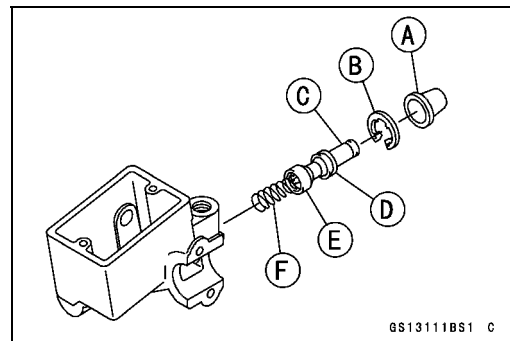
#### Master Cylinder Rubber Parts Replacement

##### Front Master Cylinder Disassembly

- Remove the front master cylinder (see Brakes chapter).
- Remove the reservoir cap and diaphragm, and pour the brake fluid into a container.
- Unscrew the locknut and pivot bolt, and remove the brake lever.
- Pull the dust cover [A] out of place, and remove the circlip [B].

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

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



#### CAUTION

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

**Periodic Maintenance Procedures**

**Rear Master Cylinder Disassembly**

**NOTE**

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

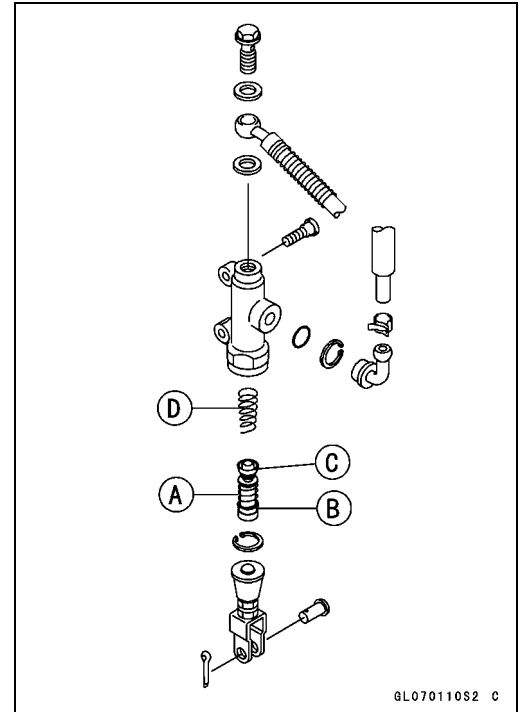
- Remove the rear master cylinder (see Brakes chapter).
- Slide the dust cover on the push rod out of place, and remove the circlip.

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

- Pull out the push rod with the piston stop.
- Take off the piston [A], secondary cup [B], primary cup [C] and return spring [D].

**CAUTION**

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



GL070110S2 C

**Master Cylinder Assembly**

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

**CAUTION**

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

- Apply brake fluid to the new parts and to the inner wall of the cylinder.
- Take care not to scratch the piston or the inner wall of the cylinder.
- Apply silicone grease (ex. PBC grease).
  - Brake Lever Pivot Bolt
  - Brake Lever Pivot Contact
  - Push Rod Contact
  - Dust Covers

- Tighten:

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

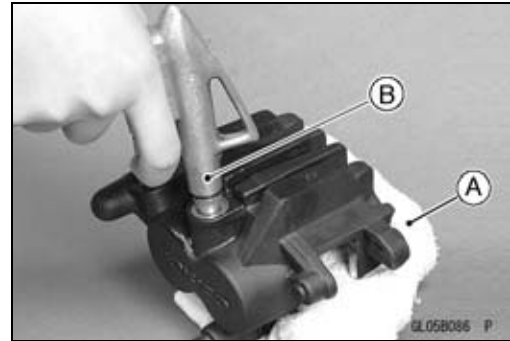
**Brake Lever Pivot Bolt Locknut: 5.9 N·m (0.60 kgf·m, 52 in·lb)**

## 2-56 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Caliper Rubber Parts Replacement Front Caliper Disassembly

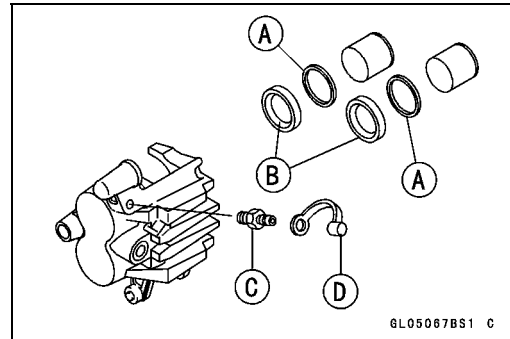
- Remove:
  - Front Caliper (see Brakes chapter)
  - Brake Pads
- Using compressed air, remove the pistons.
  - Cover the piston area with a clean, thick cloth [A].
  - Blow compressed air [B] into the hole for the banjo bolt to remove the piston.



#### **⚠ WARNING**

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

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



#### **NOTE**

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

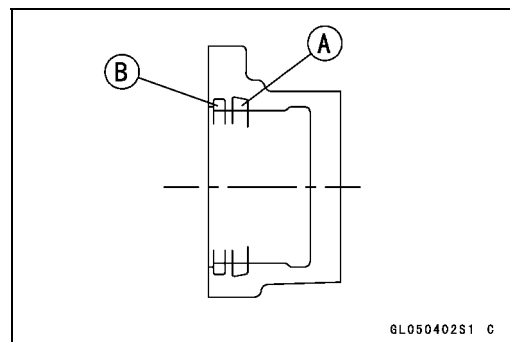
#### Front Caliper Assembly

- Clean the caliper parts except for the pads.

#### **CAUTION**

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

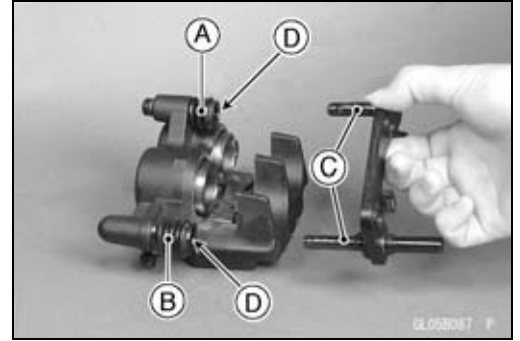
- Install the bleed valve and rubber cap.
  - Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Replace the fluid seals [A] with new ones.
  - Apply brake fluid to the fluid seals, and install them into the cylinders by hand.
- Replace the dust seals [B] with new ones if they are damaged.
  - Apply brake fluid to the dust seals, and install them into the cylinders by hand.



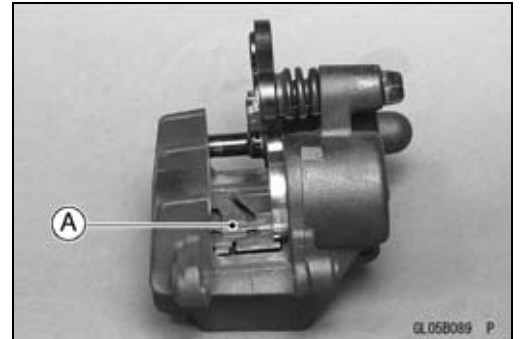


**Periodic Maintenance Procedures**

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

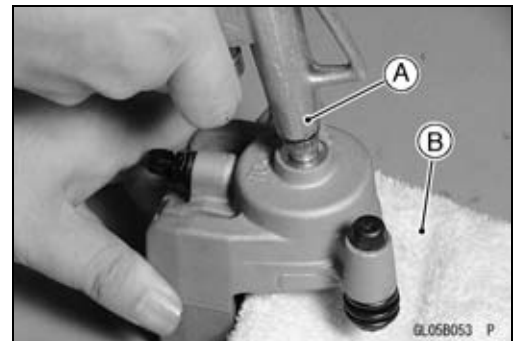


- Install the anti-rattle spring [A].
- Install the pads (see Brakes chapter).
- Wipe up any spilled brake fluid on the caliper with wet cloth.



**Rear Caliper Disassembly**

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



**⚠ WARNING**

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

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

**NOTE**

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

**Rear Caliper Assembly**

- Clean the caliper parts except for the pads.

**CAUTION**

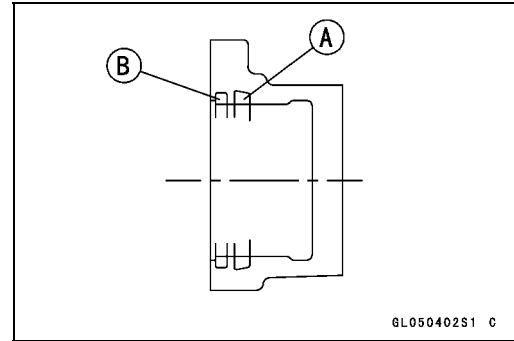
**For cleaning of the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.**

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

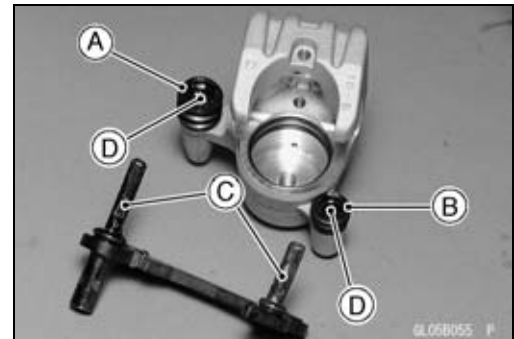
## 2-58 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

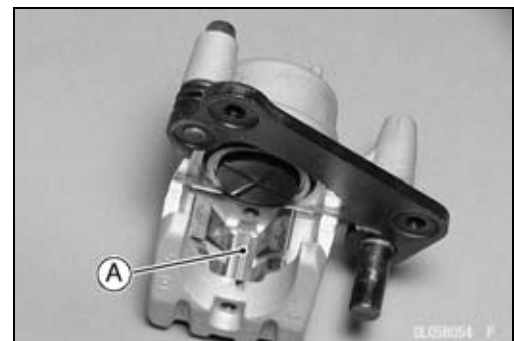
- Replace the fluid seal [A] with a new one.
- Apply brake fluid to the fluid seal, and install it into the cylinder by hand.
- Replace the dust seal [B] with a new one if it is damaged.
- Apply brake fluid to the dust seal, and install it into the cylinder by hand.



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



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

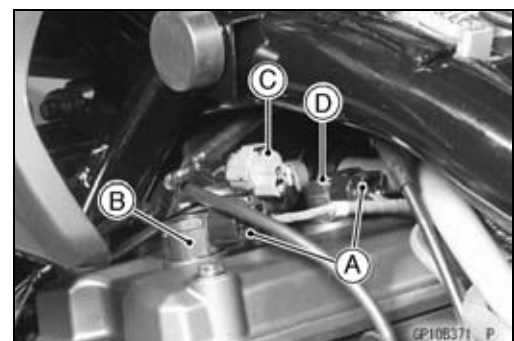


### Spark Plug Replacement

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
- If removing the spark plug #3, unscrew the thermostat bracket bolt [A].



- Disconnect:
  - Stick Coil Connectors [A]
- Pull out the stick coil #1 [B].
- Take out the camshaft position sensor connector [C] from the bracket.
- Pull out the stick coil #2 [D].

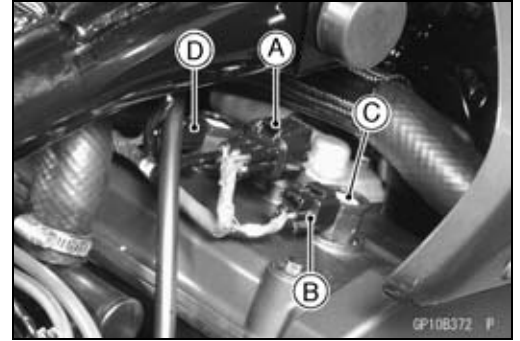


### CAUTION

Do not pry the connector part of the coil while removing the coil.

**Periodic Maintenance Procedures**

- Remove the ignition harness connector [A] from the bracket.
- Remove:
  - Stick Coil Connector #4 [B] (Disconnect)
  - Stick Coil #4 [C]
  - Stick Coil Connector #3 [D] (Disconnect)
- Pull the main harness upward and remove the stick coil #3.



- Remove the spark plugs using the 16 mm plug wrench [A].
- Owner's Tool - Spark Plug Wrench, 16 mm: 92110-1146**

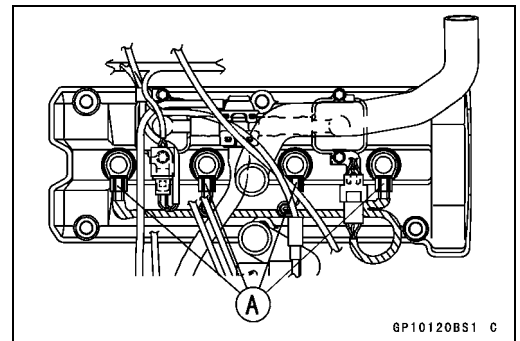


- Insert the spark plug vertically into the plug hole with the spark plug installed in the plug wrench [A].
- Owner's Tool - Spark Plug Wrench, 16 mm: 92110-1146**
- Tighten:
  - Torque - Spark Plugs: 13 N·m (1.3 kgf·m, 113 in·lb)**



- Insert the coils as shown being careful of the coil heads [A] direction.
- Fit the coils securely.

<b>CAUTION</b>
<b>Do not tap the coil head while installing the coil.</b>



- Be sure the stick coils are installed by pulling up [A] it lightly.
- Connect the connectors.
- Install:
  - Thermostat Bracket Bolt (see Cooling System chapter)
  - Fuel Tank (see Fuel System (DFI) chapter)





# Fuel System (DFI)

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## 3-2 FUEL SYSTEM (DFI)

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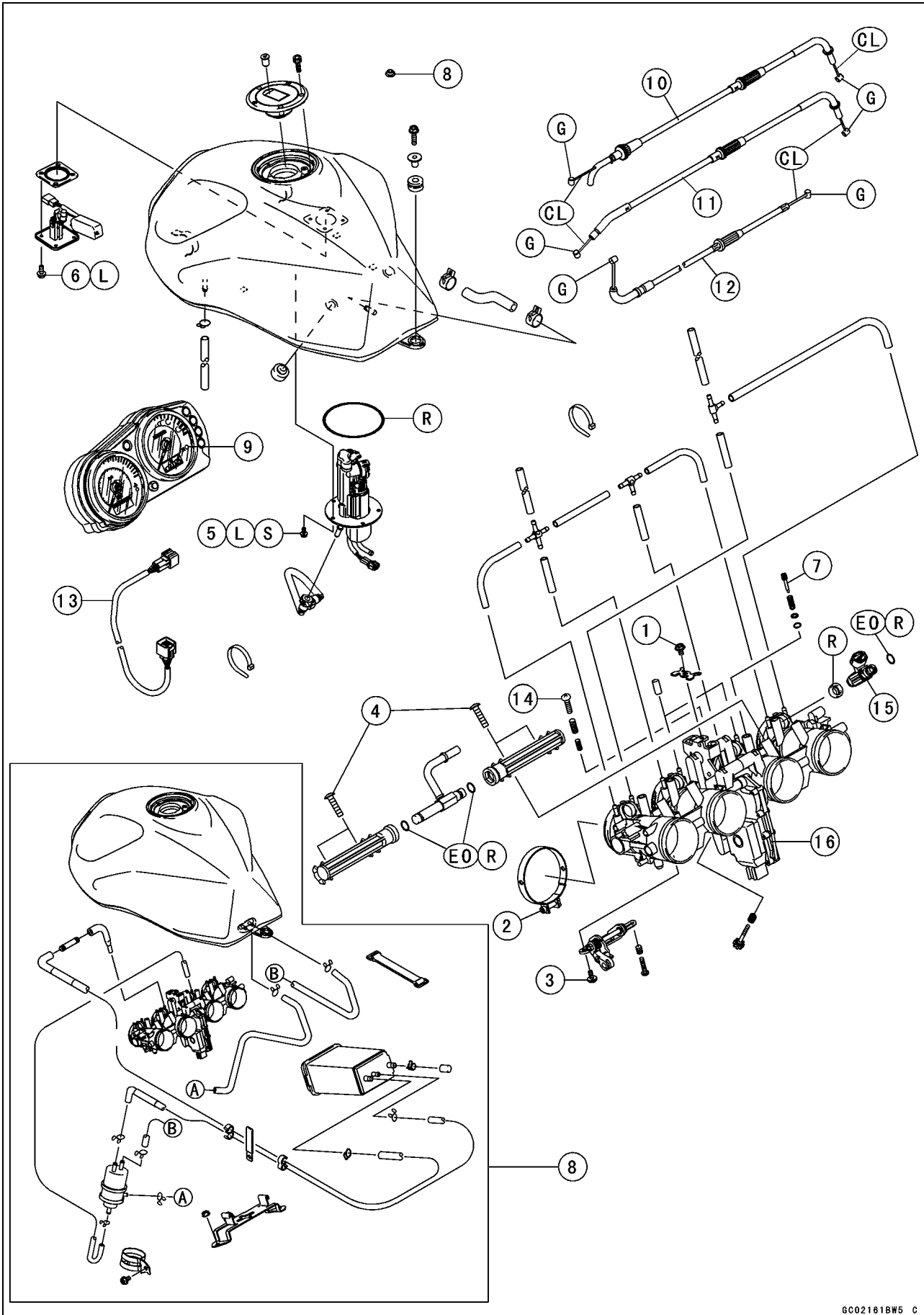
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# 3-4 FUEL SYSTEM (DFI)

## Exploded View





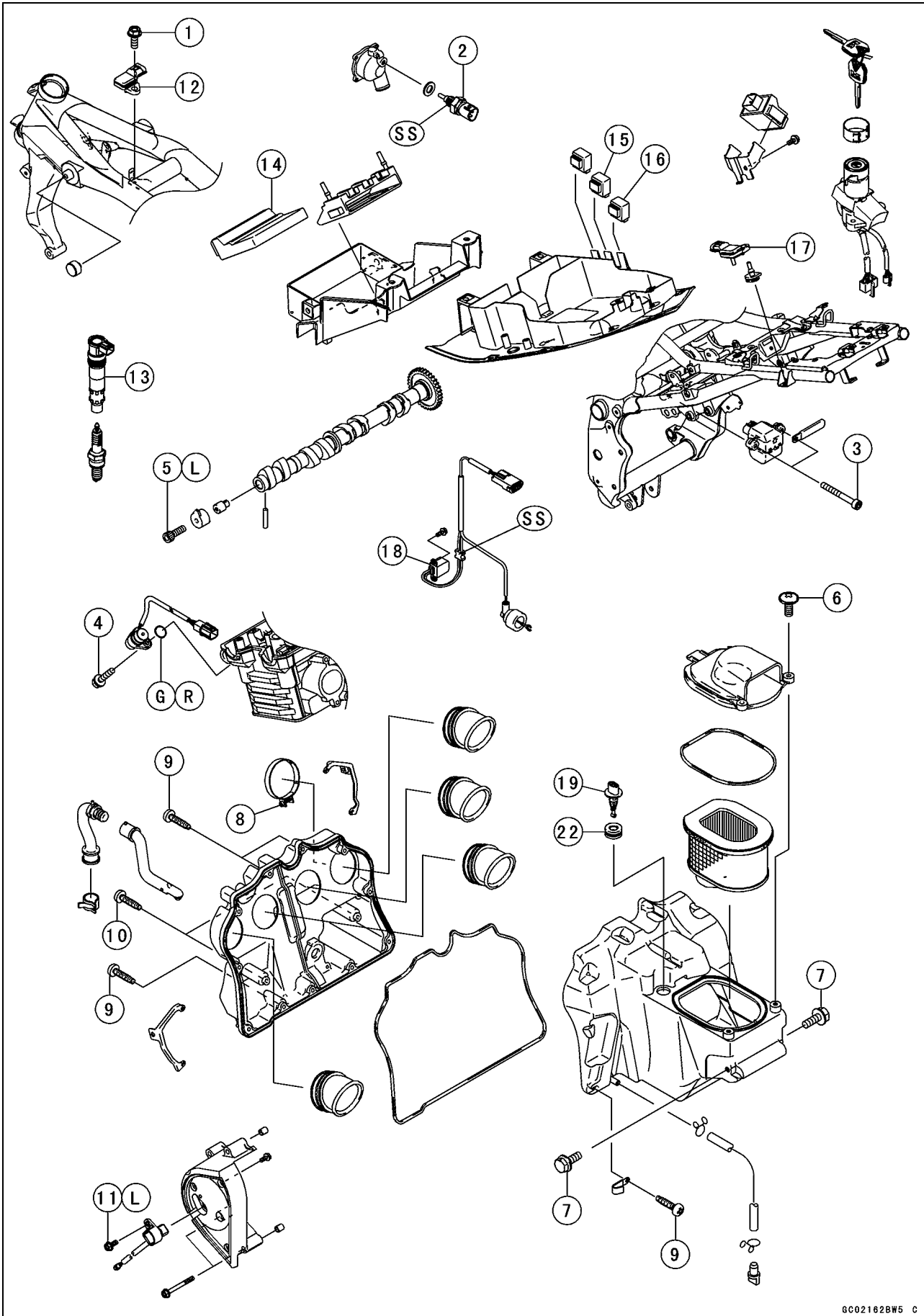
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Throttle Cable Plate Bolt	6.0	0.60	52 in·lb	
2	Throttle Body Assy Holder Clamp Bolts	2.0	0.20	17 in·lb	
3	Choke Link Holder Screws	2.1	0.21	18 in·lb	
4	Delivery Pipe Screws	3.4	0.35	30 in·lb	
5	Fuel Pump Bolts	9.8	1.0	87 in·lb	L, S
6	Fuel Level Sensor Bolts	6.9	0.70	62 in·lb	L
7	Bypass Screws	0.2	0.02	1.7 in·lb	

- 8. California Model
- 9. FI Indicator LED Light
- 10. Throttle Cable (Accelerator)
- 11. Throttle Cable (Decelerator)
- 12. Choke Cable
- 13. Subthrottle Valve Actuator Connectors
- 14. Center Adjusting Screw
- 15. Injectors
- 16. Throttle Body Assy
- CL: Apply cable lubricant.
- EO: Apply engine oil.
- G: Apply grease.
- L: Apply a non-permanent locking agent.
- R: Replacement Parts
- S: Follow the specified tightening sequence.

# 3-6 FUEL SYSTEM (DFI)

## Exploded View



**Exploded View**

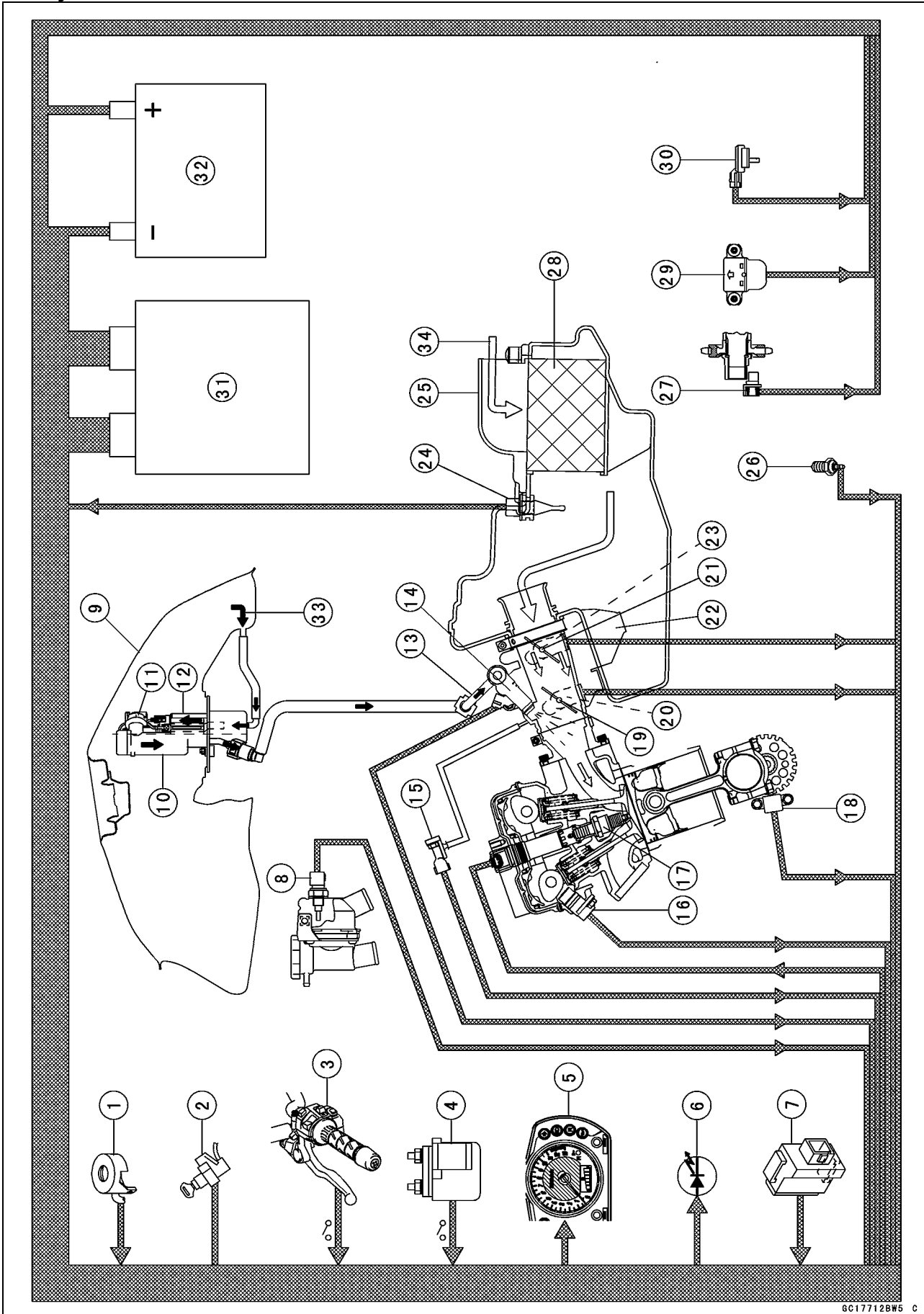
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Inlet Air Pressure Sensor Bolt	12	1.2	104 in·lb	
2	Water Temperature Sensor	25	2.5	18	
3	Vehicle Down Sensor Bolts	2.0	0.20	17 in·lb	
4	Camshaft Position Sensor Bolt	12	1.2	104 in·lb	
5	Camshaft Position Sensor Rotor Bolt	12	1.2	104 in·lb	L
6	Air Cleaner Duct Holder Screws	3.8	0.39	34 in·lb	
7	Air Cleaner Housing Mounting Bolts	9.8	1.0	87 in·lb	
8	Air Cleaner Duct Clamp Bolts	2.0	0.20	17 in·lb	
9	Air Cleaner Housing Screws	1.2	0.12	10 in·lb	
10	Air Cleaner Housing Tapping Screws	1.2	0.12	10 in·lb	
11	Speed Sensor Bolt	6.9	0.70	62 in·lb	L

- 12. Inlet Air Pressure Sensor
- 13. Stick Coils
- 14. ECU
- 15. Fuel Pump Relay
- 16. ECU Main Relay
- 17. Atmospheric Pressure Sensor
- 18. Crankshaft Sensor
- 19. Inlet Air Temperature Sensor
- 20. Grommet
- 21. Immobilizer Antenna
- 22. Immobilizer Amplifier
- L: Apply a non-permanent locking agent.
- R: Replacement Parts
- SS: Apply silicone sealant.

# 3-8 FUEL SYSTEM (DFI)

## DFI System

### DFI System



### DFI System

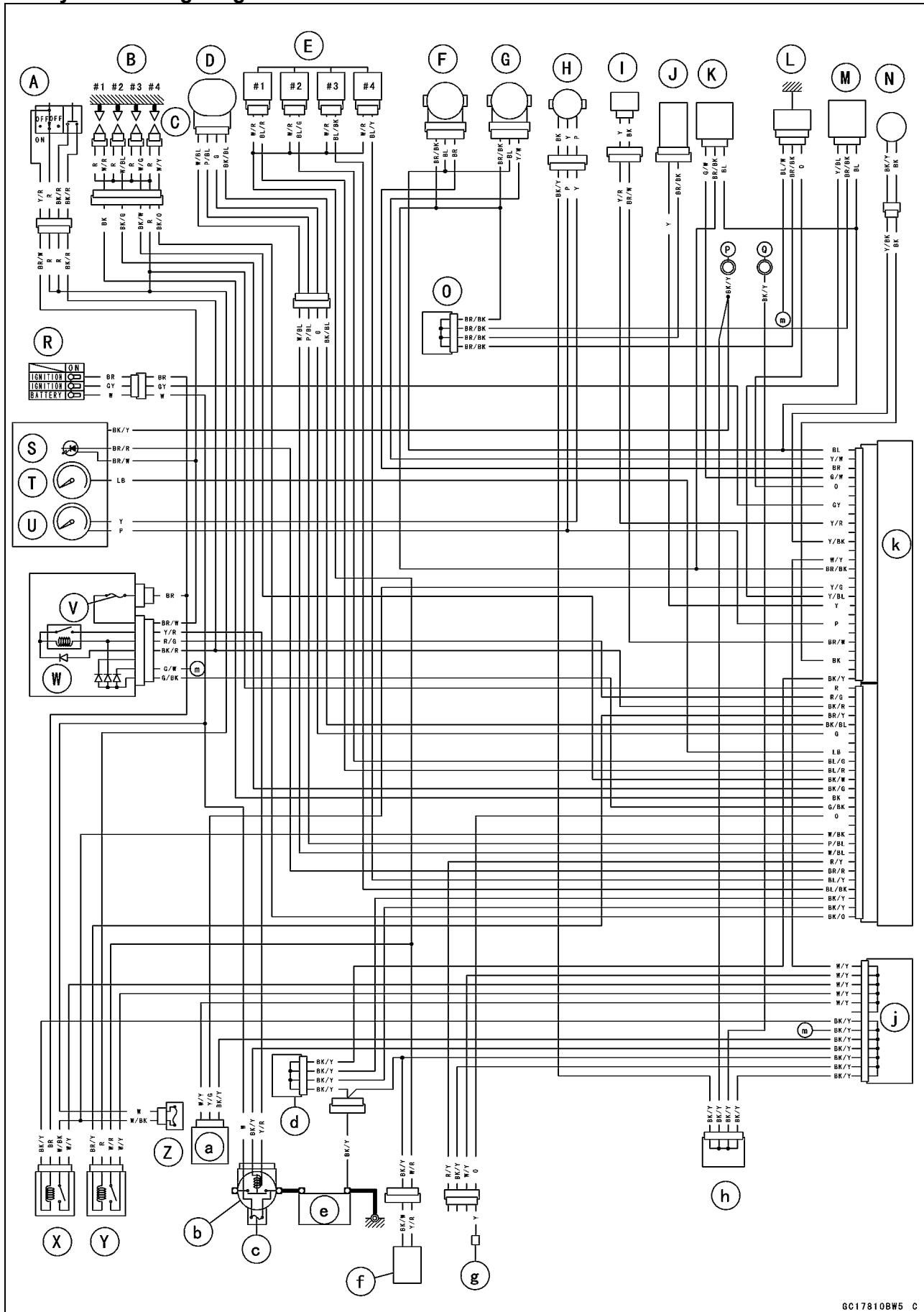
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1. Immobilizer Antenna (Equipped Models)
2. Ignition Switch
3. Starter Lockout Switch
4. Starter Relay
5. Tachometer
6. FI Indicator Light (LED)
7. Immobilizer Amplifier (Equipped Models)
8. Water Temperature Sensor
9. Fuel Tank
10. Fuel Filter
11. Pressure Regulator
12. Fuel Pump
13. Delivery Pipe
14. Fuel Injectors
15. Inlet Air Pressure Sensor
16. Camshaft position Sensor
17. Spark Plug
18. Crankshaft Sensor
19. Main Throttle Valve
20. Main Throttle Sensor
21. Subthrottle Valve
22. Subthrottle Valve Actuator
23. Subthrottle Sensor
24. Inlet Air Temperature Sensor
25. Air Cleaner Housing
26. Neutral Switch
27. Speed Sensor
28. Air Cleaner Element
29. Vehicle-down sensor
30. Atmospheric Pressure Sensor
31. ECU (Electronic Control Unit))
32. Battery 12 V 8 Ah
33. Fuel Flow
34. Air Flow

# 3-10 FUEL SYSTEM (DFI)

## DFI System

### DFI System Wiring Diagram



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**DFI System**

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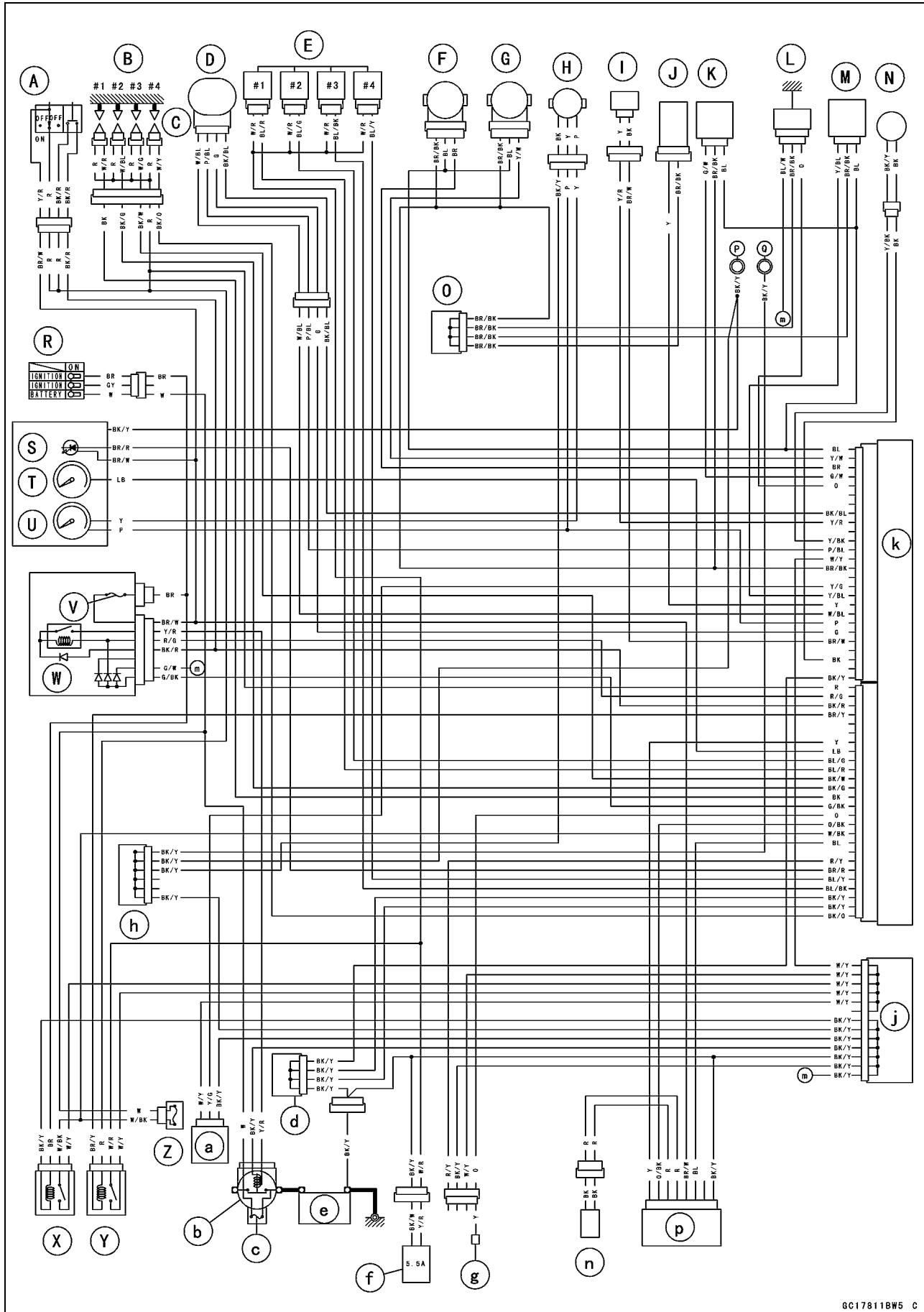
**Part Name**

- |                                  |                                  |
|----------------------------------|----------------------------------|
| A. Engine Stop Switch            | T. Tachometer                    |
| B. Stick Coils #1, #2, #3, #4    | U. Speedometer                   |
| C. Stick Coils                   | V. Ignition Fuse 10 A            |
| D. Subthrottle Valve Actuator    | W. Junction Box                  |
| E. Fuel Injectors #1, #2, #3, #4 | X. ECU Main Relay                |
| F. Subthrottle Sensor            | Y. Fuel Pump Relay               |
| G. Main Throttle Sensor          | Z. ECU Main Fuse 15 A            |
| H. Speed Sensor                  | a. Vehicle-down Sensor           |
| I. Camshaft Position Sensor      | b. Starter Relay                 |
| J. Inlet Air Temperature Sensor  | c. Main Fuse 30 A                |
| K. Atmospheric Pressure Sensor   | d. Joint Connector C             |
| L. Water Temperature Sensor      | e. Battery 12 V 8Ah              |
| N. Crankshaft Sensor             | f. Fuel Pump                     |
| M. Inlet Air Pressure Sensor     | g. Self-diagnosis Terminal       |
| O. Joint Connector D             | h. Joint Connector A             |
| P. Meter Ground Terminal         | j. Joint Connector B             |
| Q. Frame Ground Terminal         | k. ECU (Electronic Control Unit) |
| R. Ignition Switch               | m. see Electrical System chapter |
| S. FI Indicator Light (LED)      |                                  |

# 3-12 FUEL SYSTEM (DFI)

## DFI System

### DFI System Wiring Diagram (Immobilizer Equipped Models)





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**DFI System**

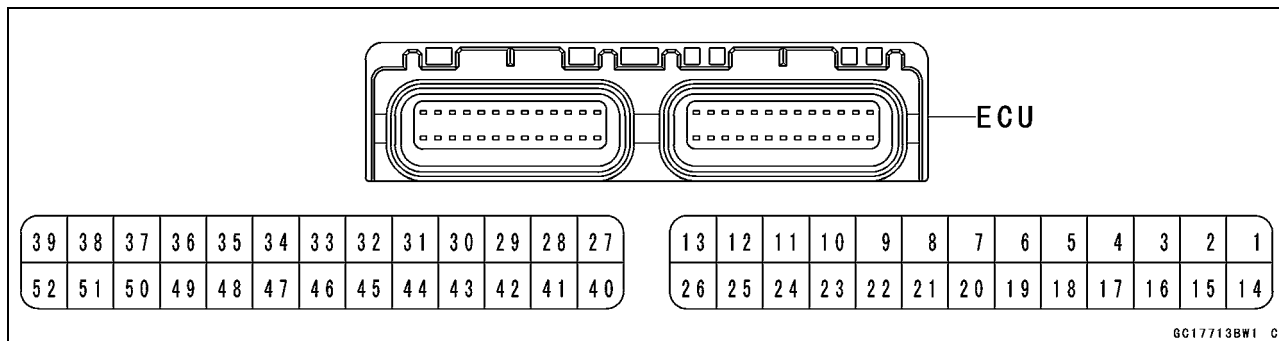
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**Part Name (Immobilizer Equipped Models)**

- A. Engine Stop Switch
- B. Ignition Coils #1, #2, #3, #4
- C. Stick Coils
- D. Subthrottle Valve Actuator
- E. Subthrottle Sensor
- F. Fuel Injectors #1, #2, #3, #4
- G. Main Throttle Sensor
- H. Speed Sensor
  - I. Camshaft Position Sensor
- J. Inlet Air Temperature Sensor
- K. Atmospheric Pressure Sensor
- L. Water Temperature Sensor
- N. Crankshaft Sensor
- M. Inlet Air Pressure Sensor
- O. Joint Connector D
- P. Meter Ground Terminal
- Q. Frame Ground Terminal
- R. Ignition Switch
- S. FI Indicator Light (LED)
- T. Tachometer
- U. Speedometer
- V. Ignition Fuse 10 A
- W. Junction Box
- X. ECU Main Relay
- Y. Fuel Pump Relay
- Z. ECU Main Fuse 15 A
  - a. Vehicle-down Sensor
  - b. Starter Relay
  - c. Main Fuse 30 A
  - d. Joint Connector C
  - e. Battery 12 V 8Ah
  - f. Fuel Pump
  - g. Self-diagnosis Terminal
  - h. Joint Connector A
  - j. Joint Connector B
  - k. ECU (Electronic Control Unit)
- m. see Electrical System chapter
- n. Immobilizer Antenna
- p. Immobilizer Amplifier

## 3-14 FUEL SYSTEM (DFI)

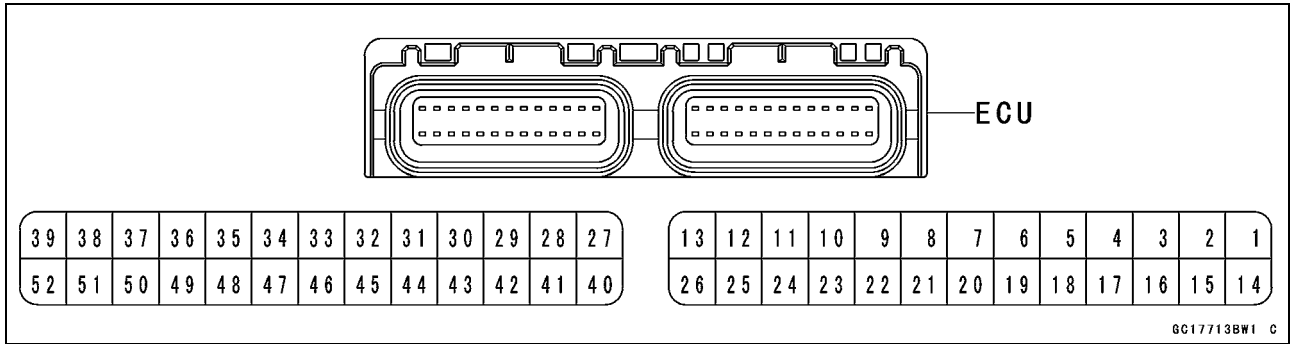
### DFI System



#### Terminal Numbers of ECU Connectors

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Power Supply to Sensors</li> <li>2. Main Throttle Sensor Signal</li> <li>3. Subthrottle Sensor Signal</li> <li>4. Atmospheric Pressure Sensor Signal</li> <li>5. Water Temperature Sensor Signal (+)</li> <li>6. Unused</li> <li>7. Ignition Switch Signal</li> <li>8. Unused</li> <li>9. Camshaft Position Sensor Signal (+)</li> <li>10. Unused</li> <li>11. Crankshaft Sensor Signal (+)</li> <li>12. Unused</li> <li>13. Power Supply to ECU, Injectors, and Fuel Pump</li> <li>14. Ground to Sensors</li> <li>15. Unused</li> <li>16. Vehicle-down Sensor Signal</li> <li>17. Inlet Air Pressure Sensor Signal</li> <li>18. Inlet Air Temperature Sensor Signal (+)</li> <li>19. Unused</li> <li>20. Speed Sensor Signal</li> <li>21. Unused</li> <li>22. Camshaft Position Sensor Signal (-)</li> <li>23. Unused</li> <li>24. Crankshaft Sensor Signal (-)</li> <li>25. Unused</li> <li>26. ECU Power Source Circuit Ground to Battery (-) Terminal</li> </ol> | <ol style="list-style-type: none"> <li>27. Engine Stop Switch Signal</li> <li>28. Starter Lockout Switch Signal</li> <li>29. Electric Starter Button Signal</li> <li>30. Fuel Pump Relay Signal</li> <li>31. Subthrottle Valve Actuator Drive Signal</li> <li>32. Subthrottle Valve Actuator Drive Signal</li> <li>33. Unused</li> <li>34. Tachometer Signal</li> <li>35. Injector #2 Signal</li> <li>36. Injector #1 Signal</li> <li>37. Stick Coil #3 Signal</li> <li>38. Stick Coil #2 Signal</li> <li>39. Stick Coil #1 Signal</li> <li>40. Interlock Circuit Signal</li> <li>41. Self-diagnosis Signal (generated by grounding this terminal and shown by FI indicator light)</li> <li>42. Unused</li> <li>43. Battery Power ON-OFF Signal</li> <li>44. Subthrottle Valve Actuator Drive Signal</li> <li>45. Subthrottle Valve Actuator Drive Signal</li> <li>46. External Diagnosis System Signal</li> <li>47. FI Indicator Light (LED) Signal</li> <li>48. Injector #4 Signal</li> <li>49. Injector #3 Signal</li> <li>50. DFI System Ground</li> <li>51. Ignition System Ground</li> <li>52. Stick Coil #4 Signal</li> </ol> |
|--|--|

DFI System

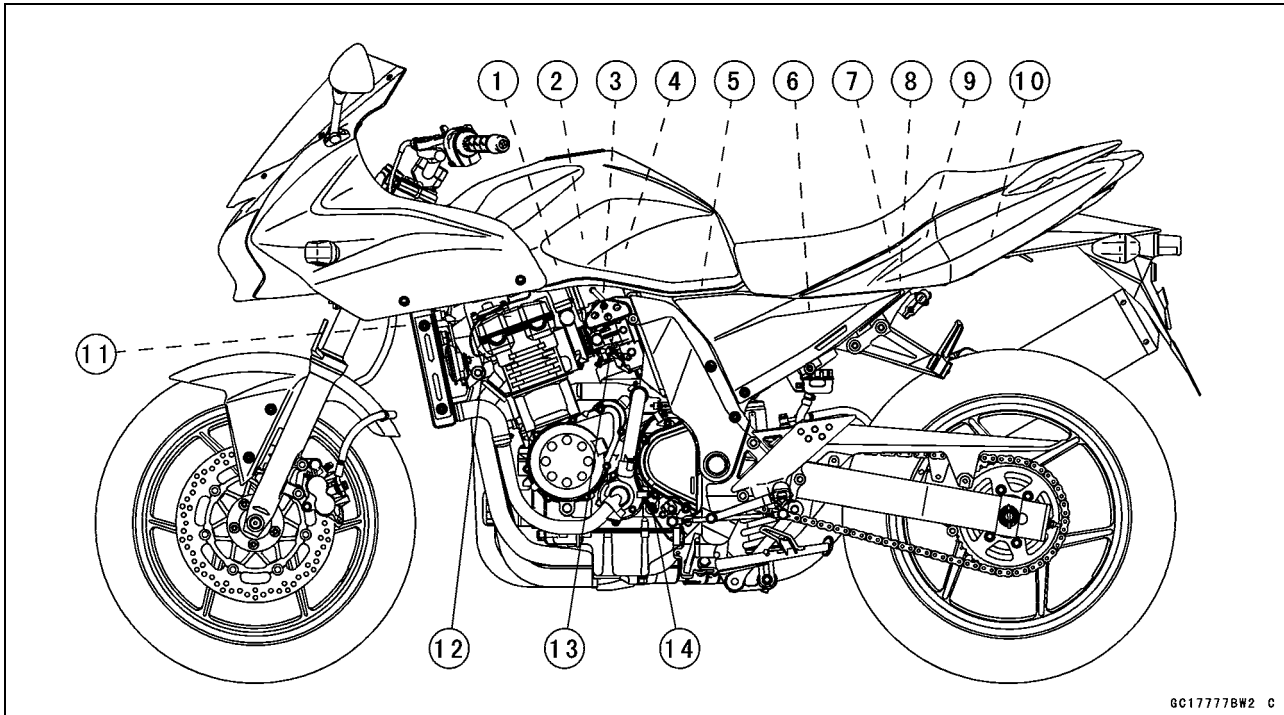


**Terminal Numbers of ECU Connectors (Immobilizer Equipped Models)**

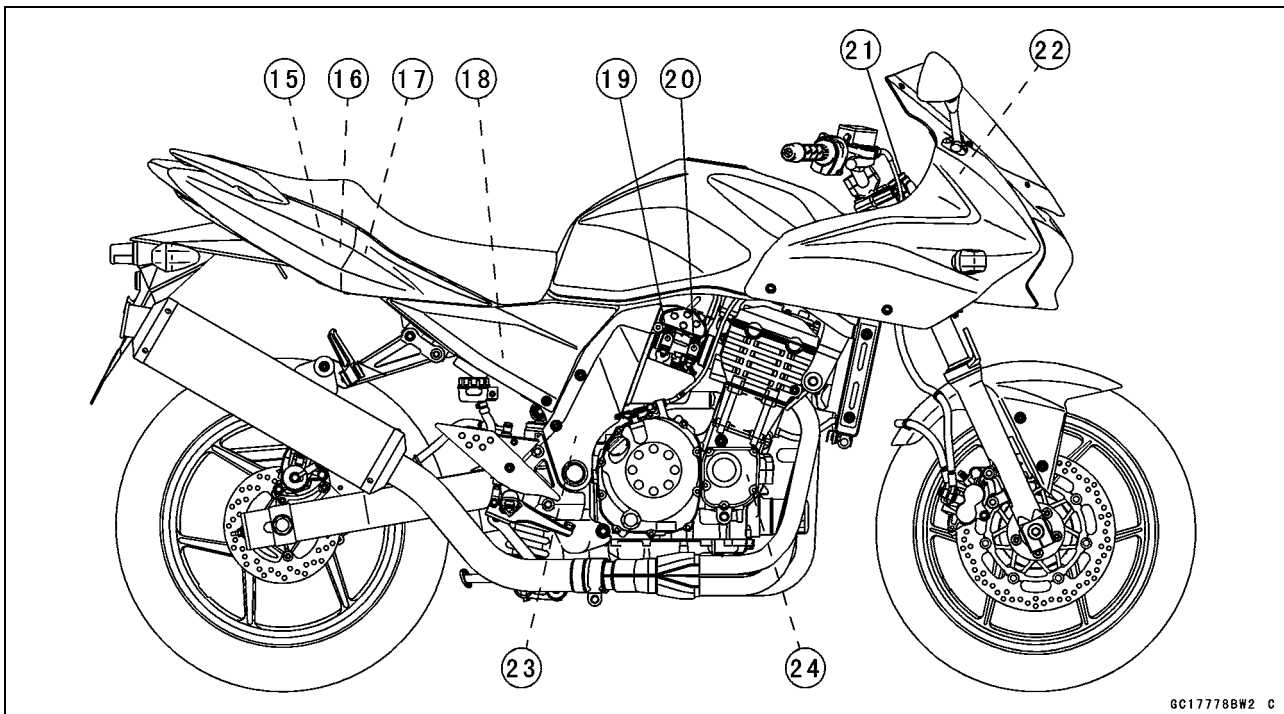
- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Subthrottle Valve Actuator Drive Signal</li> <li>2. Subthrottle Valve Actuator Drive Signal</li> <li>3. Unused</li> <li>4. Unused</li> <li>5. Unused</li> <li>6. Main Throttle Sensor Signal</li> <li>7. Power Supply to Sensor</li> <li>8. Inlet Air Pressure Sensor Signal</li> <li>9. Camshaft Position Sensor Signal (+)</li> <li>10. Inlet Air Temperature Sensor Signal (+)</li> <li>11. Power Supply to ECU, Injectors, and Fuel Pump</li> <li>12. Vehicle-Down Sensor Signal</li> <li>13. Crankshaft Sensor Signal (+)</li> <li>14. Subthrottle Valve Actuator Drive Signal</li> <li>15. Subthrottle Valve Actuator Drive Signal</li> <li>16. Unused</li> <li>17. Unused</li> <li>18. Unused</li> <li>19. Subthrottle Sensor Signal</li> <li>20. Ground to Sensor</li> <li>21. Atmospheric Pressure Sensor Signal</li> <li>22. Camshaft Position Sensor Signal (-)</li> <li>23. Water Temperature Sensor Signal (+)</li> <li>24. Speed Sensor Signal</li> <li>25. ECU Power Source Circuit Ground to Battery (-) Terminal</li> <li>26. Crankshaft Sensor Signal (-)</li> </ol> | <ol style="list-style-type: none"> <li>27. DFI System Ground</li> <li>28. Starter Lockout Switch Signal</li> <li>29. Electric Starter Button Signal</li> <li>30. Fuel Pump Relay Signal</li> <li>31. Engine Stop Switch Signal</li> <li>32. Immobilizer Communication Signal</li> <li>33. Unused</li> <li>34. Tachometer Signal</li> <li>35. Injector #2 Signal</li> <li>36. Injector #1 Signal</li> <li>37. Stick Coil #3 Signal</li> <li>38. Stick Coil #2 Signal</li> <li>39. Stick Coil #1 Signal</li> <li>40. Interlock Circuit Signal</li> <li>41. Self-diagnosis Signal (generated by grounding this terminal and shown by FI indicator LED light)</li> <li>42. Unused</li> <li>43. Battery Power ON-OFF Signal</li> <li>44. Immobilizer Communication Signal</li> <li>45. Immobilizer Communication Signal</li> <li>46. External Diagnosis System Signal</li> <li>47. FI Indicator LED Light Signal</li> <li>48. Injector #4 Signal</li> <li>49. Injector #3 Signal</li> <li>50. Unused</li> <li>51. Ignition System Ground</li> <li>52. Stick Coil #4 Signal</li> </ol> |
|--|--|

## 3-16 FUEL SYSTEM (DFI)

### DFI Parts Location



6C17778W2 C



6C17778W2 C

#### DFI: Digital Fuel Injection Parts

- |                                       |   |
|---------------------------------------|---|
| 1. Water Temperature Sensor (DFI)     | 14. Neutral Switch  |
| 2. Inlet Air Pressure Sensor (DFI)    | 15. ECU Main Relay  |
| 3. Injectors (DFI)                    | 16. Fuel Pump Relay (DFI)   |
| 4. Fuel Pump (DFI)                    | 17. Self-diagnosis Terminal   |
| 5. Inlet Air Temperature Sensor (DFI) | 18. Immobilizer Amplifier (Immobilizer Equipped Models)                   |
| 6. Sealed Battery                     | 19. Subthrottle Sensor (DFI)  |
| 7. Junction Box                       | 20. Main Throttle Sensor (DFI)  |
| 8. ECU (DFI)                          | 21. Ignition Switch and Immobilizer Antenna (Immobilizer Equipped Models) |
| 9. ECU Fuse 15 A                      | 22. FI Indicator Light LED (DFI)  |
| 10. Atmospheric Pressure Sensor (DFI) | 23. Vehicle-down Sensor (DFI)   |
| 11. Stick Coils                       | 24. Crankshaft Sensor   |
| 12. Camshaft Position Sensor          |   |
| 13. Throttle Body Assy                |   |

Specifications

Item	Standard
<b>Digital Fuel Injection System</b>	
Idle Speed	1 100 ±50 r/min (rpm)
Throttle Assy:	
Type	Four barrel type
Bore	φ34 mm (1.34 in.)
ECU (Electronic Control Unit):	
Make	Denso
Type	Digital memory type, with built in IC igniter, sealed with resin
Usable Engine Speed	100 ~ 12 240 r/min (rpm)
Fuel Pressure (High Pressure Line):	
Right after Ignition Switch ON	310 kPa (3.2 kgf/cm <sup>2</sup> , 46 psi) with fuel pump running
After 3 Seconds from Ignition Switch ON	290 kPa (2.9 kgf/cm <sup>2</sup> , 43 psi) with fuel pump stopped
With Engine Idling	310 kPa (3.2 kgf/cm <sup>2</sup> , 46 psi) with fuel pump running
Fuel Pump:	
Type	In-tank friction pump
Discharge	67 mL or more for 3 seconds
Fuel Injectors:	
Type	INP-285
Nozzle Type	One spray type with 4 holes
Resistance	about 11.7 ~ 12.3 Ω at 20°C (68°F)
Main Throttle Sensor:	Non-adjustable and non-removable
Input Voltage	4.75 ~ 5.25 V DC between BL and BR/BK leads
Output Voltage at Idle Throttle Opening	0.99 ~ 1.03 V DC between Y/W and BR/BK leads
Output Voltage at Full Throttle Opening	4.19 ~ 4.39 V DC between Y/W and BR/BK leads
Resistance	4 ~ 6 kΩ
Inlet Air Pressure Sensor or Atmospheric Pressure Sensor:	
Input Voltage	4.75 ~ 5.25 V DC between BL and BR/BK leads
Output Voltage	3.74 ~ 4.26 V DC at standard atmospheric pressure (see this text for details)
Inlet Air Temperature Sensor:	
Resistance	1.6 ~ 3.7 kΩ at 20°C (68°F)
	0.24 ~ 0.43 kΩ at 80°C (176°F)
Output Voltage at ECU	about 2.25 ~ 2.50 V @20°C (68°F)
Water Temperature Sensor:	
Resistance	see Electrical System chapter
Output Voltage at ECU	about 2.80 ~ 2.97 V @20°C (68°F)
Speed Sensor:	
Input Voltage at Sensor	about 9 ~ 11 V DC at Ignition Switch ON
Output Voltage at Sensor	about 0.05 ~ 0.07 V DC at Ignition Switch ON and 0 km/h
Vehicle-down Sensor:	
Detection Method	Magnetic flux detection method
Detection Angle	more than 60 ~ 70° for each bank

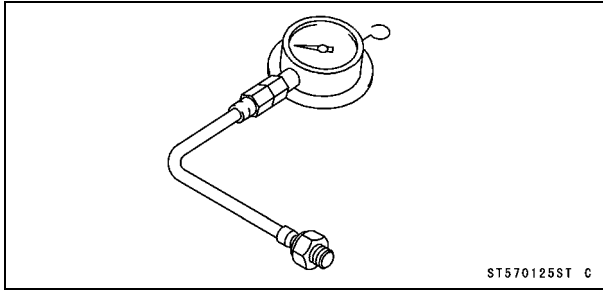
## 3-18 FUEL SYSTEM (DFI)

### Specifications

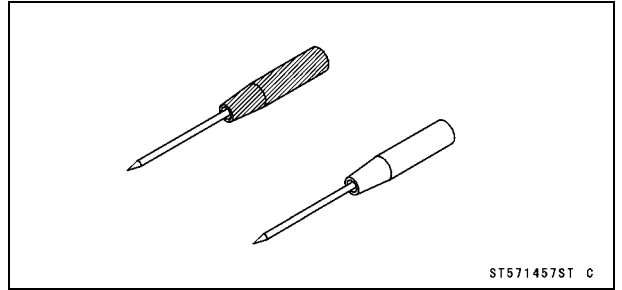
Item	Standard
Detection Time Output Voltage  Subthrottle Sensor: Input Voltage Output Voltage at Idle Throttle Opening Output Voltage at Full Throttle Opening Resistance Subthrottle Valve Actuator: Resistance Input Voltage	within 0.5 ~ 1.0 seconds with the sensor tilted 60 ~ 70° or more: 3.7 ~ 4.4 V with sensor arrow mark pointed up: 0.4 ~ 1.4 V Non-adjustable and non-removal 4.75 ~ 5.25 V DC between BL and BR/BK leads 0.48 ~ 0.52 V DC between BR and BR/BK leads 3.6 ~ 3.8 V DC between BR and BR/BK leads 4 ~ 6 kΩ about 5 ~ 7 kΩ about 8.5 ~ 10.5 V DC
<b>Throttle Grip and Cables</b> Throttle Grip Free Play	2 ~ 3 mm (0.08 ~ 0.12 in.)
<b>Choke Cable</b> Choke Cable Free Play	0 ~ 0.5 mm (0 ~ 0.02 in.)

Special Tools and Sealant

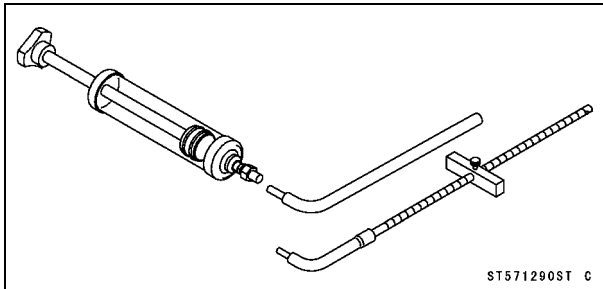
Oil Pressure Gauge, 5 kgf/cm<sup>2</sup>:  
57001-125



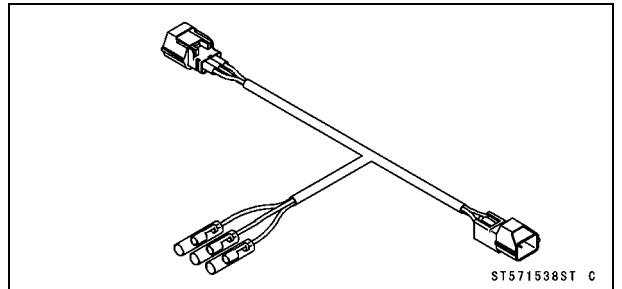
Needle Adapter Set:  
57001-1457



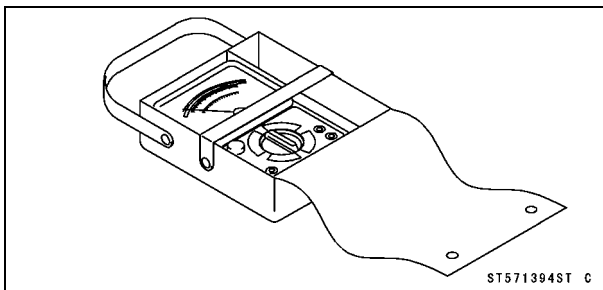
Fork Oil Level Gauge:  
57001-1290



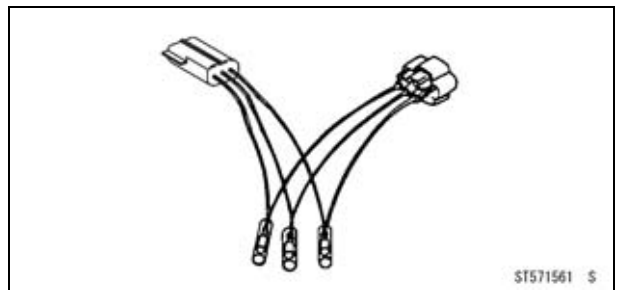
Throttle Sensor Setting Adapter:  
57001-1538



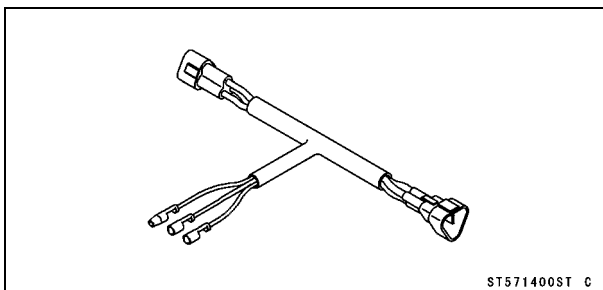
Hand Tester:  
57001-1394



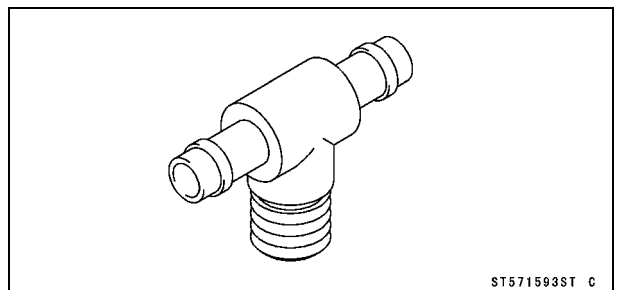
Sensor Harness Adapter:  
57001-1561



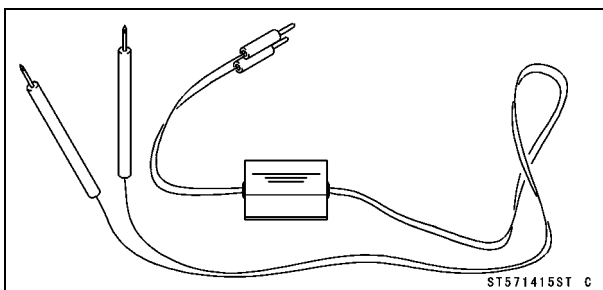
Throttle Sensor Setting Adapter #1:  
57001-1400



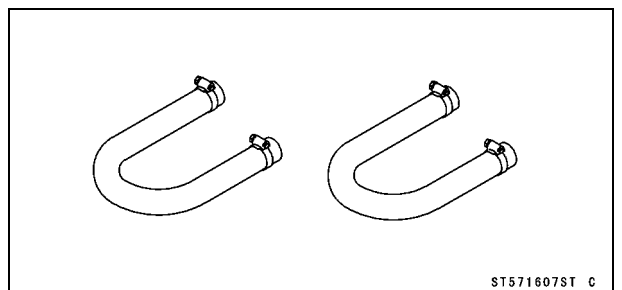
Fuel Pressure Gauge Adapter:  
57001-1593



Peak Voltage Adapter:  
57001-1415



Fuel Hose:  
57001-1607

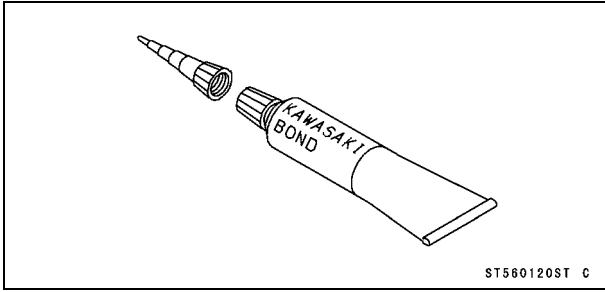


## 3-20 FUEL SYSTEM (DFI)

### Special Tools and Sealant

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Kawasaki Bond (Silicone Sealant):  
56019-120



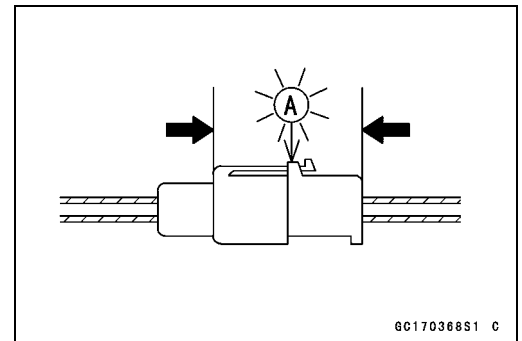


## DFI Servicing Precautions

### 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.
- 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.
- 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]
- 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, fuel may spout out by residual pressure in the fuel line. Cover the hose joint with a piece of clean cloth to prevent fuel spillage.
- When any fuel hose is disconnected, do not turn on the ignition switch. Otherwise, the fuel pump will operate and fuel will spout from the fuel hose.
- Do not operate the fuel pump if the pump is 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.
- To prevent corrosion and deposits in the fuel system, do not add to fuel any fuel antifreeze chemicals.



## 3-22 FUEL SYSTEM (DFI)

### DFI Servicing Precautions

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

Clutch Cover [B]

**Torque - Oil Filler Plug: 1.5 N·m (0.15 kgf·m, 13 in·lb)**



Troubleshooting the DFI System

Outline

Outline

When an abnormality in the system occurs, the FI indicator LED (Light Emitting Diode) light goes on to alert the rider on the meter panel. In addition, the condition of the problem is stored in the memory of the ECU (electronic control unit). With the engine stopped and turned in the self-diagnosis mode, the service code [A] is indicated by the number of times the FI indicator LED light blinks.

When due to a malfunction, the FI indicator LED light remains lit, ask the rider about the conditions [B] under which the problem occurred and try to determine the cause [C].

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

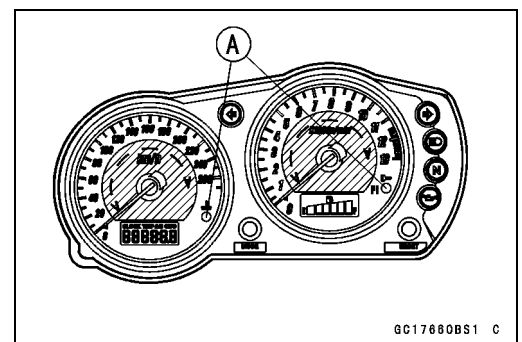
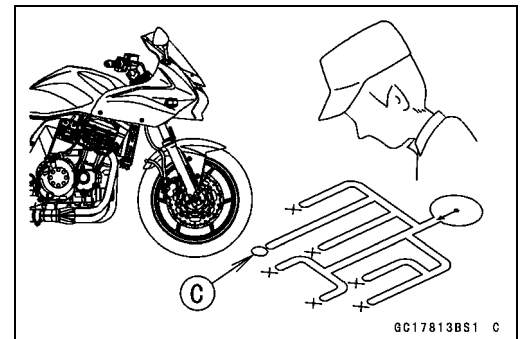
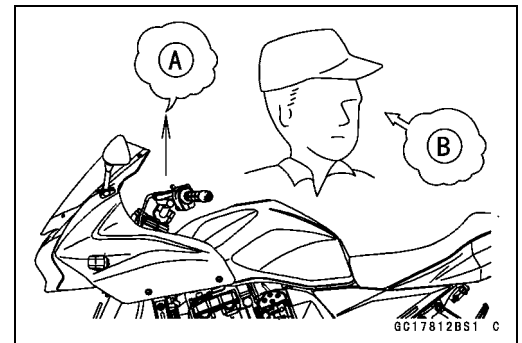
Even when the DFI system is operating normally, the FI indicator LED light [A] may light up under strong electrical interference. No repair needed. Turn the ignition switch OFF to stop the indicator light.

When the FI indicator LED light goes on and the motorcycle is brought in for repair, check the service codes.

- If the FI indicator LED light blinks when the ignition switch is turned to the ON position this shows the immobilizer system has a fault. Check the service codes.

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

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



## 3-24 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

- The DFI part connectors [A] have seals [B], including the ECU.
- Join the connector and insert the needle adapters [C] inside the seals [B] from behind the connector until the adapter reaches the terminal.

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

#### CAUTION

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

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

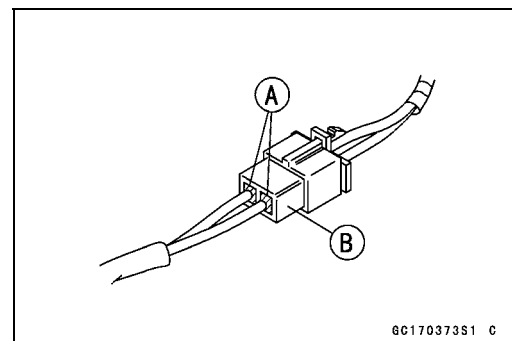
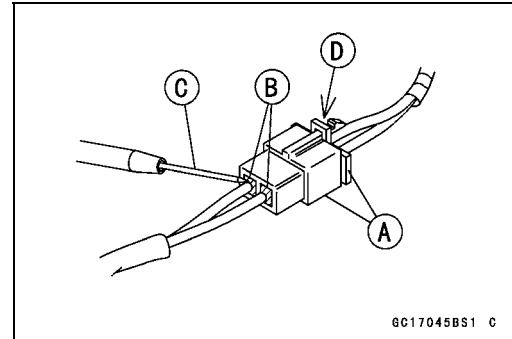
#### CAUTION

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

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

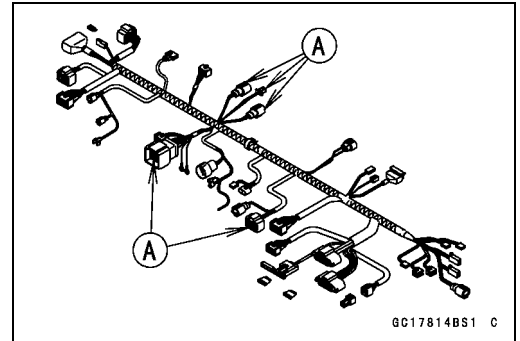
**Silicone Sealant (Kawasaki Bond: 56019-120) - Seals of Connector**

- Always check battery condition before replacing the DFI parts. A fully charged battery is a must for conducting accurate tests of the DFI system.
- Trouble may involve one or in some cases all items. Never replace a defective part without determining what CAUSED the problem. If the problem was caused by some other item or items, they too must be repaired or replaced, or the new replacement part will soon fail again.
- Measure coil winding resistance when the DFI part is cold (at room temperature).
- Make sure all connectors in the circuit are clean and tight, and examine wires for signs of burning, fraying, short, etc. Deteriorated wires and bad connections can cause reappearance of problems and unstable operation of the DFI system.
- ★ If any wiring is deteriorated, replace the wiring.

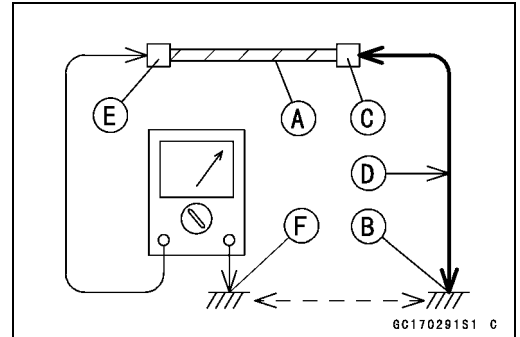


## Troubleshooting the DFI System

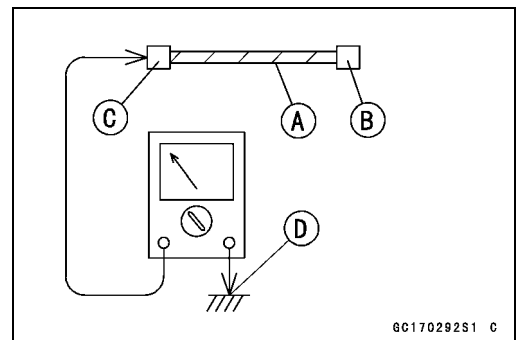
- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect the connectors securely.
- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
- Connect the hand tester between the ends of the leads.
- Set the tester to the  $\times 1 \Omega$  range, and read the tester.
- ★ If the tester does not read  $0 \Omega$ , the lead is defective. Replace the lead or the main harness or the sub harness.



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



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



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

○ Lead Color Codes:

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

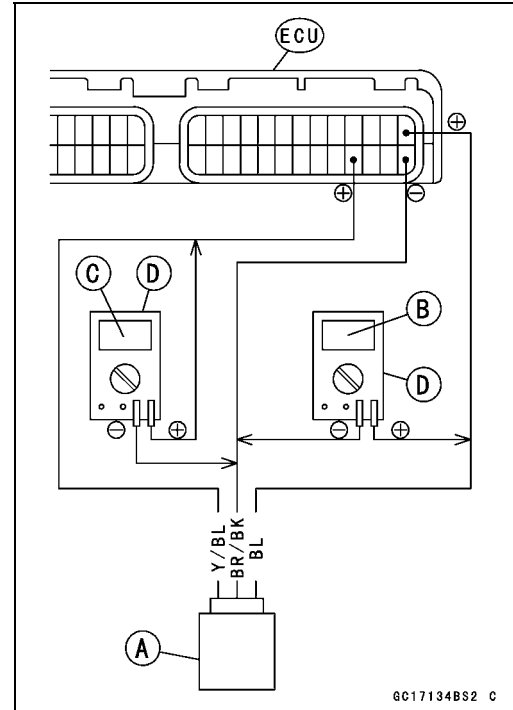
## 3-26 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

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

(Voltage Check Method)

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

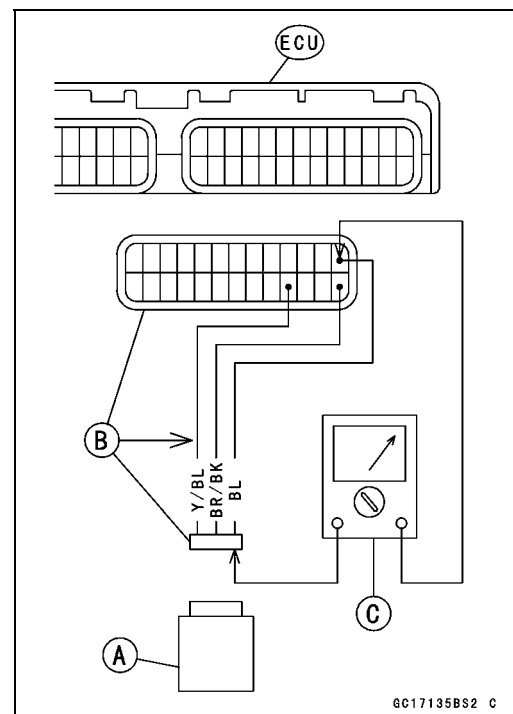


(Resistance Check Method)

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

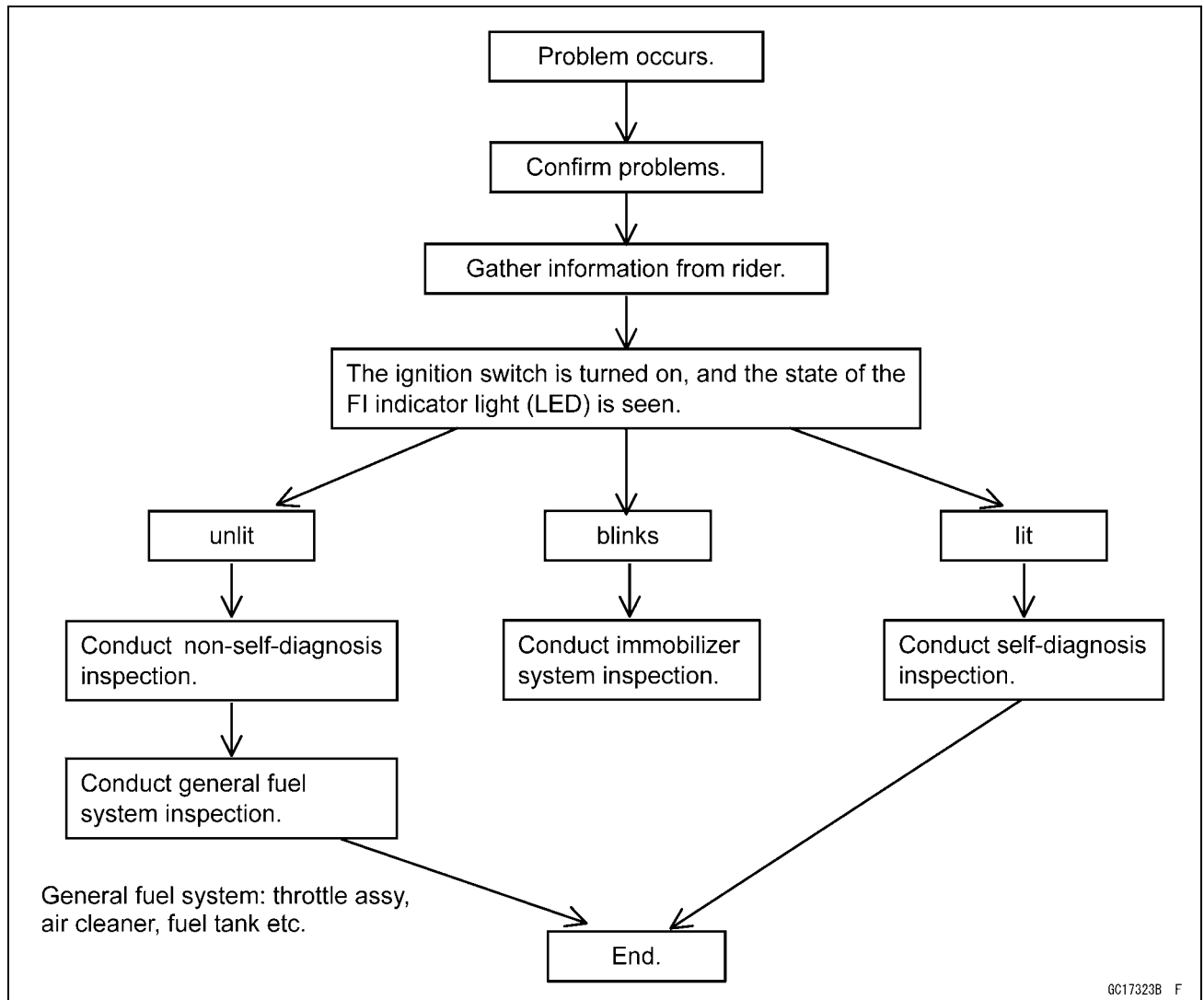
**Special Tool - Hand Tester: 57001-1394**

- ★ If the sensor, the wiring and connections are good, inspect the ECU for its ground and power supply (see this chapter). If the ground and power supply are good, the ECU is suspect. Replace the ECU.



Troubleshooting the DFI System

DFI Diagnosis Flow Chart



Inquiries to Rider

*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.

### 3-28 FUEL SYSTEM (DFI)

#### Troubleshooting the DFI System

#### Sample Diagnosis Sheet

<b>Rider name:</b>		<b>Registration No. (license plate No.):</b>
<b>Year of initial registration:</b>		<b>Model:</b>
<b>Engine No.:</b>		<b>Frame No.:</b>
<b>Date problem occurred:</b>		<b>Mileage:</b>
<b>Environment when problem occurred.</b>		
Weather	<input type="checkbox"/> fine, <input type="checkbox"/> cloudy, <input type="checkbox"/> rain, <input type="checkbox"/> snow, <input type="checkbox"/> always, <input type="checkbox"/> other:	
Temperature	<input type="checkbox"/> hot, <input type="checkbox"/> warm, <input type="checkbox"/> cold, <input type="checkbox"/> very cold, <input type="checkbox"/> always	
Problem frequency	<input type="checkbox"/> chronic, <input type="checkbox"/> often, <input type="checkbox"/> once	
Road	<input type="checkbox"/> street, <input type="checkbox"/> highway, <input type="checkbox"/> mountain road ( <input type="checkbox"/> uphill, <input type="checkbox"/> downhill), <input type="checkbox"/> bumpy, <input type="checkbox"/> pebble	
Altitude	<input type="checkbox"/> normal, <input type="checkbox"/> high (about 1 000 m or more)	
<b>Motorcycle conditions when problem occurred.</b>		
FI indicator light (LED)	<input type="checkbox"/> light up immediately after ignition switch ON, and goes off after 1 ~ 2 seconds (normal)	
	<input type="checkbox"/> lights blinks immediately after ignition switch ON, and stays on (DFI problem)	
	<input type="checkbox"/> lights up immediately after ignition switch ON, but goes off after about 10 seconds (DFI problem)	
	<input type="checkbox"/> unlights (light (LED), ECU or its wiring fault)	
	<input type="checkbox"/> sometimes lights up (probably wiring fault)	
Starting difficulty	<input type="checkbox"/> starter motor not rotating	
	<input type="checkbox"/> starter motor rotating but engine doesn't turn over	
	<input type="checkbox"/> starter motor and engine don't 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"/> engine flooded (do not crank engine with throttle opened, which promotes engine flooding)	
	<input type="checkbox"/> no spark	
	<input type="checkbox"/> choke lever is not pulled fully when using the lever (pull it fully when using)	
	<input type="checkbox"/> other	
Engine stops	<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"/> choke lever pulled out fully (push it in fully)	
	<input type="checkbox"/> very low choke speed (adjust choke cable)	
	<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	



**Troubleshooting the DFI System**

	<input type="checkbox"/> brake dragging
	<input type="checkbox"/> engine overheating
	<input type="checkbox"/> clutch slipping
	<input type="checkbox"/> other
Poor running or no power at high speed	<input type="checkbox"/> choke lever pulled out fully (push it in fully)
	<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

## 3-30 FUEL SYSTEM (DFI)

### 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.*
- *The ECU may be involved in the DFI electrical and ignition system troubles. If these parts and circuits are checked out good, be sure to check the ECU for ground and power supply. If the ground and power supply are checked good, replace the ECU.*

#### Engine Doesn't Start, Starting Difficulty

Symptoms or possible Causes	Actions (chapter)
<b>Starter motor not rotating:</b>	
Ignition and engine stop switches not ON	Turn both switches ON.
Starter lockout switch or neutral switch trouble	Inspect (see chapter 16)
Starter motor trouble	Inspect (see chapter 16).
Battery voltage low	Inspect and charge (see chapter 16).
Starter relays not contacting or operating	Inspect the starter relay (see chapter 16).
Starter button not contacting	Inspect and replace (see chapter 16).
Starter system wiring open or shorted	Inspect the wiring (see chapter 16).
Ignition switch trouble	Inspect and replace (see chapter 16).
Engine stop switch trouble	Inspect and repair or replace (see chapter 16).
Main 30A or ignition fuse blown	Inspect and replace (see chapter 16).
<b>Starter motor rotating but engine doesn't turn over:</b>	
Starter clutch trouble	Inspect (see chapter 16).
Starter idle gear trouble	Inspect (see chapter 16).
<b>Engine won't turn over:</b>	
Valve seizure	Inspect and replace (see chapter 5).
Cylinder, piston seizure	Inspect and replace (see chapter 5).
Camshaft seizure	Inspect and replace (see chapter 5).
Connecting rod small end seizure	Inspect and replace (see chapter 9).
Connecting rod big end seizure	Inspect and replace (see chapter 9).
Crankshaft seizure	Inspect and replace (see chapter 9).
Transmission gear or bearing seizure	Inspect and replace (see chapter 9).
Balancer bearing seizure	Inspect and replace (see chapter 9).
<b>No fuel flow:</b>	
No or little fuel in tank	Supply fuel (see Owner's Manual).
Fuel pump not rotating	Inspect (see chapter 3).
Fuel injector trouble	Inspect and replace (see chapter 3).
Fuel tank air vent obstructed	Inspect and repair (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).
Fuel pressure regulator clogged	Inspect and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
<b>Engine flooded:</b>	
Spark plug dirty, broken or gap maladjusted	Replace (see chapter 2).
Starting technique faulty	When flooded, don't crank engine with throttle fully opened.
<b>No spark or spark weak:</b>	
Ignition and engine stop switches not ON	Turn both switches ON .

**DFI System Troubleshooting Guide**

Symptoms or possible Causes	Actions (chapter)
Clutch lever not pulled in and gear not in neutral whether sidestand up or not	Pull the lever in and shift the gear in neutral.
Though clutch lever pulled in, sidestand up and gear not in neutral	Sidestand down and clutch lever pulled in whether gear in neutral or not
Vehicle-down-sensor coming off	Reinstall (see chapter 3).
Vehicle-down-sensor trouble	Inspect (see chapter 3) .
ECU ground or power supply trouble	Inspect (see chapter 3) .
Battery voltage low	Inspect and charge (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Replace (see chapter 2).
Spark plug cap trouble	Inspect stick coil (see chapter 16).
Spark plug cap shorted or not in good contact	Reinstall or inspect stick coil (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 16).
IC igniter in ECU trouble	Inspect (see chapter 16).
Neutral, starter lockout or sidestand switch trouble	Inspect each switch (see chapter 16).
Crankshaft sensor trouble	Inspect (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
Ignition switch shorted	Inspect and replace (see chapter 16).
Engine stop switch shorted	Inspect and repair or replace (see chapter 2) .
Starter system wiring shorted or open	Inspect and repair or replace (see chapter 16).
Main 30A or ignition fuse blown	Inspect and replace (see chapter 16).
<b>Fuel/air mixture incorrect:</b>	
Air cleaner clogged, poorly sealed or missing	Clean or reinstall (see chapter 3).
Leak from oil filler cap, crankcase breather hose or air cleaner drain hose	Inspect and repair or replace (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Fuel pressure may be low	Inspect (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Crankshaft sensor trouble	Inspect (see chapter 3).
<b>Compression low:</b>	
Spark plug loose	Reinstall (see chapter 16).
Cylinder head not sufficiently tightened down	Tighten (see chapter 5).
Cylinder, piston worn	Inspect and replace (see chapter 5).
Piston ring bad (worn, weak, broken or sticking)	Inspect and replace (see chapter 5).
Piston ring/groove clearance excessive	Inspect and replace (see chapter 5).
Cylinder head gasket damaged	Replace (see chapter 5).

## 3-32 FUEL SYSTEM (DFI)

### DFI System Troubleshooting Guide

Symptoms or possible Causes	Actions (chapter)
Cylinder head warped	Inspect and replace (see chapter 5).
No valve clearance	Adjust (see chapter 2).
Valve guide worn	Inspect and replace (see chapter 5).
Valve spring broken or weak	Inspect and replace (see chapter 5).
Valve not seating properly (valve bent, worn or carbon accumulating on seating surface)	Inspect and repair or replace (see chapter 5).

### Poor Running at Low Speed

Symptoms or Possible Causes	Actions (chapter)
<b>Spark weak:</b>	
Battery voltage low	Inspect and charge (see chapter 16).
Spark plug dirty, broken or gap maladjusted	Replace (see chapter 2).
Spark plug cap trouble	Inspect the stick coil (see chapter 16).
Spark plug cap shorted or not in good contact	Reinstall or inspect stick coil (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 16).
IC igniter in ECU trouble	Inspect (see chapter 16).
Crankshaft sensor trouble	Inspect (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
<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, 3).
Air cleaner duct loose	Reinstall (see chapter 3).
Air cleaner O-ring damaged	Replace (see chapter 3).
Fuel tank air vent obstructed	Inspect and repair (see chapter 3).
Throttle body assy loose	Reinstall (see chapter 3).
Throttle body assy O-ring damage	Replace (see chapter 3).
Fuel filter or pump screen clogged	Inspect and replace fuel pump (see chapter 3).
Fuel pressure regulator clogged	Inspect fuel pressure and replace fuel pump (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Thermostat trouble	Inspect and replace (see chapter 4).
<b>Unstable (rough) idling:</b>	
Fuel injector trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Crankshaft sensor trouble	Inspect (see chapter 3).
Throttle valves not synchronizing	Inspect (see chapter 2).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Battery voltage low	Inspect and charge (see chapter 16).

**DFI System Troubleshooting Guide**

<b>Symptoms or Possible Causes</b>	<b>Actions (chapter)</b>
<b>Incorrect idle speed:</b>	
Water temperature sensor trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
<b>Engine stalls easily:</b>	
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Camshaft position sensor trouble	Inspect (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Fuel pressure too low or too high	Inspect (see chapter 3).
Fuel pressure regulator trouble	Inspect fuel pressure and replace fuel pump (see chapter 3).
Crankshaft sensor trouble	Inspect (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
<b>Compression Low:</b>	
Spark plug loose	Reinstall (see chapter 16).
Cylinder head not sufficiently tightened down	Tighten (see chapter 5).
No valve clearance	Adjust (see chapter 2).
Cylinder, piston worn	Inspect and replace (see chapter 5).
Piston ring bad (worn, weak, broken or sticking )	Inspect and replace (see chapter 5).
Piston ring/groove clearance excessive	Inspect and replace (see chapter 5).
Cylinder head gasket damaged	Replace (see chapter 5).
Cylinder head warped	Inspect and replace (see chapter 5).
Valve guide worn or stem seal damaged	Inspect and replace (see chapter 5).
Valve spring broken or weak	Inspect and replace (see chapter 5).
Valve not seating properly (valve bent, worn or carbon accumulating on seating surface)	Inspect and repair or replace (see chapter 5).
Camshaft cam worn	Inspect and replace (see chapter 5).
<b>Hesitation:</b>	
Too low fuel pressure	Inspect (see chapter 3).
Clogged fuel line	Inspect and repair (see chapter 3).
Cracked or obstructed inlet air pressure sensor hose	Inspect and repair or replace (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Fuel injector trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).

### 3-34 FUEL SYSTEM (DFI)

#### DFI System Troubleshooting Guide

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

**DFI System Troubleshooting Guide**

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

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

Symptoms or Possible Causes	Actions (chapter)
<b>Firing incorrect:</b>	
Spark plug dirty, broken or maladjusted	Replace (see chapter 2).
Spark plug cap trouble	Inspect stick coil (see chapter 16).
Spark plug cap shorted or not in good contact	Reinstall or inspect stick coil (see chapter 16).
Spark plug incorrect	Replace it with the correct plug (see chapter 16).
IC igniter in ECU trouble	Inspect (see chapter 16).
Crankshaft sensor trouble	Inspect (see chapter 16).

### 3-36 FUEL SYSTEM (DFI)

#### DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
Stick coil trouble	Inspect (see chapter 16).
<b>Fuel/air mixture incorrect:</b>	
Air cleaner clogged, poorly sealed, or missing	Clean element or inspect sealing (see chapter 3).
Air cleaner duct loose	Reinstall (see chapter 3).
Air cleaner O-ring damaged	Replace (see chapter 3).
Water or foreign matter in fuel	Change fuel. Inspect and clean fuel system (see chapter 3).
Throttle body assy loose	Reinstall (see chapter 3).
Throttle body assy O-ring damaged	Replace (see chapter 3).
Fuel tank air vent obstructed	Inspect and repair (see chapter 3).
Fuel line clogged	Inspect and repair (see chapter 3).
Fuel pump operates intermittently and often DFI fuse blows.	Pump bearings may wear. Replace the pump (see chapter 3).
Fuel pump trouble	Inspect (see chapter 3).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Main throttle sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
Inlet air pressure sensor trouble	Inspect (see chapter 3).
Cracked or obstructed inlet air pressure sensor hose	Inspect and repair or replace (see chapter 3).
Injector clogged	Visually inspect and replace (see chapter 3).
<b>Compression low:</b>	
Spark plug loose	Reinstall (see chapter 16).
Cylinder head not sufficiently tightened down	Tighten (see chapter 5).
No valve clearance	Adjust (see chapter 2).
Cylinder, piston worn	Inspect and replace (see chapter 5).
Piston ring bad (worn, weak, broken or sticking)	Inspect and replace (see chapter 5).
Piston ring /groove clearance excessive	Inspect and replace (see chapter 5).
Cylinder head gasket damaged	Replace (see chapter 5) .
Cylinder head warped	Inspect and replace (see chapter 5).
Valve spring broken or weak	Inspect and replace (see chapter 5).
Valve not seating properly (valve bent , worn or carbon accumulating on the seating surface)	Inspect and repair or replace (see chapter 5).
<b>Knocking:</b>	
Carbon built up in combustion chamber	Repair (see chapter 5).
Fuel poor quality or incorrect (Use the gasoline recommended in the Owner's Manual)	Change fuel (see chapter 3).
Spark plug incorrect	Replace it with the correct plug (see chapter 16).
Stick coil trouble	Inspect (see chapter 16).
IC igniter in ECU trouble	Inspect (see chapter 16).
Inlet air temperature sensor trouble	Inspect (see chapter 3).
Atmospheric pressure sensor trouble	Inspect (see chapter 3).
<b>Miscellaneous:</b>	
Subthrottle sensor trouble	Inspect (see chapter 3).
Subthrottle valve actuator trouble	Inspect (see chapter 3).



**DFI System Troubleshooting Guide**

<b>Symptoms or Possible Causes</b>	<b>Actions (chapter)</b>
Speed sensor trouble	Inspect (see chapter 3).
Throttle valves won't fully open	Inspect throttle cable and lever linkage (see chapter 3).
Brake dragging	Inspect caliper fluid seal damage or clogging of master cylinder relief and supply ports (see chapter 12).
Clutch slipping	Inspect friction plates for wear (see chapter 6).
Engine overheating - Water temperature sensor, crankshaft sensor or speed sensor trouble	(see Overheating of Troubleshooting Guide in chapter 17).
Engine oil level too high	Repair (see chapter 7).
Engine oil viscosity too high	Change (see chapter 2).
Drive train trouble	Inspect drive chain (see chapter 2) and sprockets (see chapter 11).
Camshaft cam worn	Inspect and replace (see chapter 5).
Vacuum switch valve trouble	Inspect and replace (see chapter 5).
Air suction valve trouble	Inspect and replace (see chapter 5).
Catalytic converters melt down due to muffler overheating (KLEEN)	Replace muffler (see chapter 5).
<b>Exhaust Smokes Excessively:</b>	
<b>(White smokes)</b>	
Piston oil ring worn	Inspect and replace (see chapter 5).
Cylinder worn	Inspect and replace (see chapter 5).
Valve oil seal damaged	Replace (see chapter 5).
Valve guide worn	Replace the guide (see chapter 5).
Engine oil level too high	Repair (see chapter 7).
<b>(Black smoke)</b>	
Air cleaner clogged	Clean (see chapter 3).
Too high fuel pressure	Inspect (see chapter 3) .
Injector stuck open	Inspect (see chapter 3).
Water temperature sensor trouble	Inspect and replace (see chapter 3).
Inlet air temperature sensor trouble	Inspect and replace (see chapter 3).
<b>(Brown smoke)</b>	
Air cleaner duct loose	Reinstall (see chapter 3).
Air cleaner O-ring damaged	Replace (see chapter 3).
Too low fuel pressure	Inspect fuel line and fuel pump (see chapter 3).
Water temperature sensor trouble	Inspect and replace (see chapter 3).
Inlet air temperature sensor trouble	Inspect and replace (see chapter 3)

## 3-38 FUEL SYSTEM (DFI)

### Self-Diagnosis

#### Self-diagnosis Outline

##### Self-diagnosis Outline

The self-diagnosis system has three modes and can be switched to another mode by grounding the self-diagnosis terminal.

##### User Mode

The ECU notifies the rider of troubles in DFI system and ignition system by lighting the FI indicator when DFI system and ignition system parts are faulty, and initiates fail-safe function. In case of serious troubles, the ECU stops the injection/ignition/starter motor operation.

##### Dealer Mode 1

The FI indicator light (LED) emits service code(s) to show the problem(s) which the DFI system, Immobilizer system and ignition system has at the moment of diagnosis.

##### Dealer Mode 2

The FI indicator light (LED) emits service code(s) to show the problem(s) which the DFI system, Immobilizer system and ignition system had in the past.

#### Self-diagnosis Procedures

##### Self-diagnosis Procedures

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

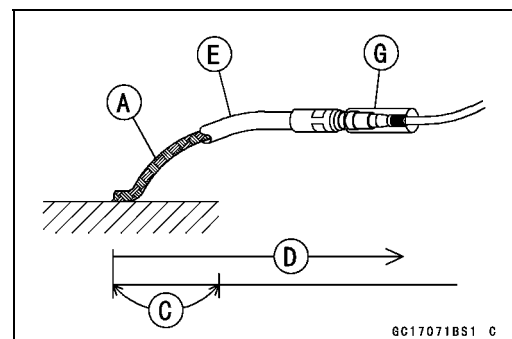
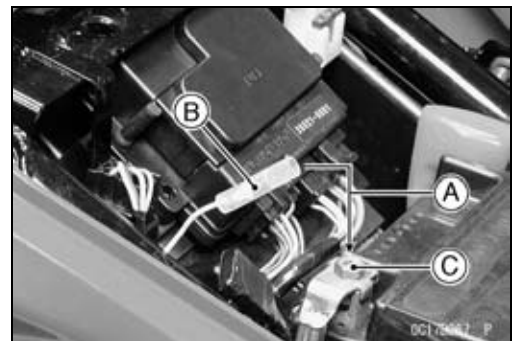
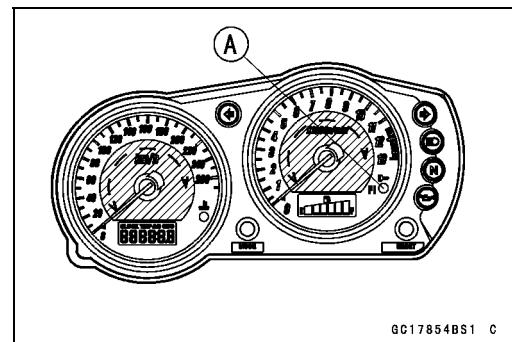
##### NOTE

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

○Keep the self-diagnosis terminal grounded during self-diagnosis, with an auxiliary lead.

- Remove the seat (see Frame chapter).
- Ground [A] the self-diagnosis terminal [B] (yellow lead) to the battery (-) terminal [C] or battery (-) lead connector, using a wire.

- Turn on the ignition switch.
  - Connect an auxiliary lead [E] to the self-diagnosis terminal [G] for grounding.
  - To enter the self-diagnosis dealer mode 1, ground [A] the self-diagnosis indicator terminal to the battery (-) terminal for more than 2 seconds [C], and then keep it grounded continuously [D].
- Count the blinks of the light (LED) to read the service code. Keep the auxiliary lead ground until you finish reading the service code.

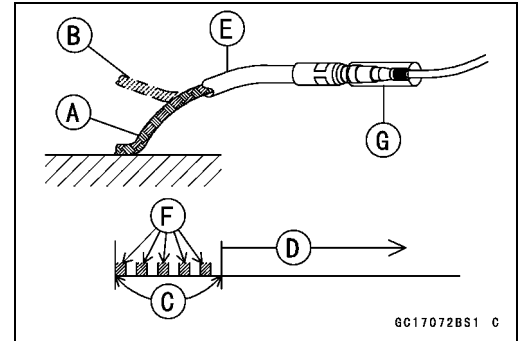


## Self-Diagnosis

- To enter the self-diagnosis dealer mode 2, open [B] and ground [A] the lead more than five times [F] within 2 seconds [C] after the lead is first grounded, and then keep it grounded continuously [D] for more than 2 seconds.
  - Count the blinks of the light (LED) to read the service code. Keep the auxiliary lead ground until you finish reading the service code.
- Auxiliary Lead [E]  
Self-diagnosis Terminal [G]

### NOTE

- To enter the dealer mode 2 from the dealer mode 1, turn off the ignition switch once.



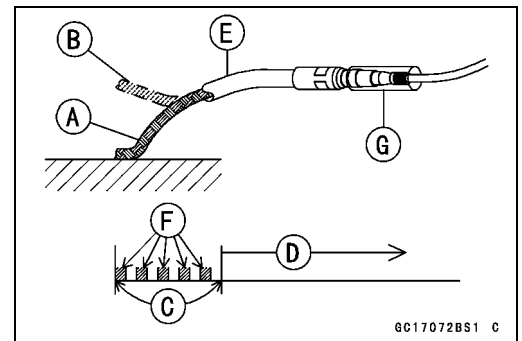
## Service Code Clearing Procedures

### Service Code Clearing Procedures

- Enter the self-diagnosis dealer mode 2 (see Self-diagnosis Procedures in this chapter).

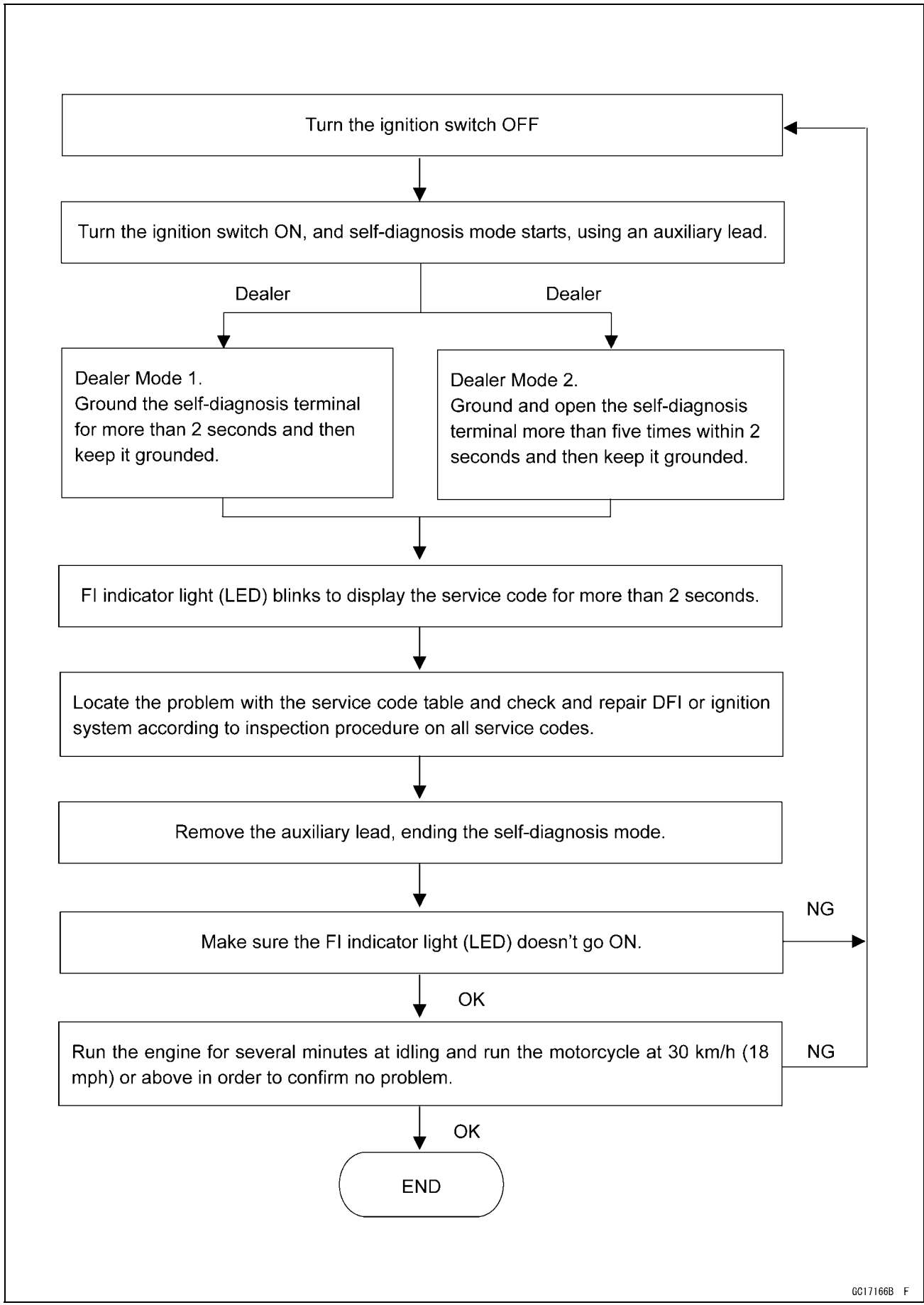
### NOTE

- Make sure to keep the grounding until the following opening and grounding starts.
  - Pull the clutch lever in more than 5 seconds, and then release it.
  - Repeat opening [B] and grounding [A] the lead (self-diagnosis terminal) more than five times [F] within 2 seconds [C] after the lead is grounded, and then keep it grounded continuously [D] for more than 2 seconds.
- Auxiliary Lead [E]  
Self-diagnosis Terminal [G]



# 3-40 FUEL SYSTEM (DFI)

## Self-Diagnosis

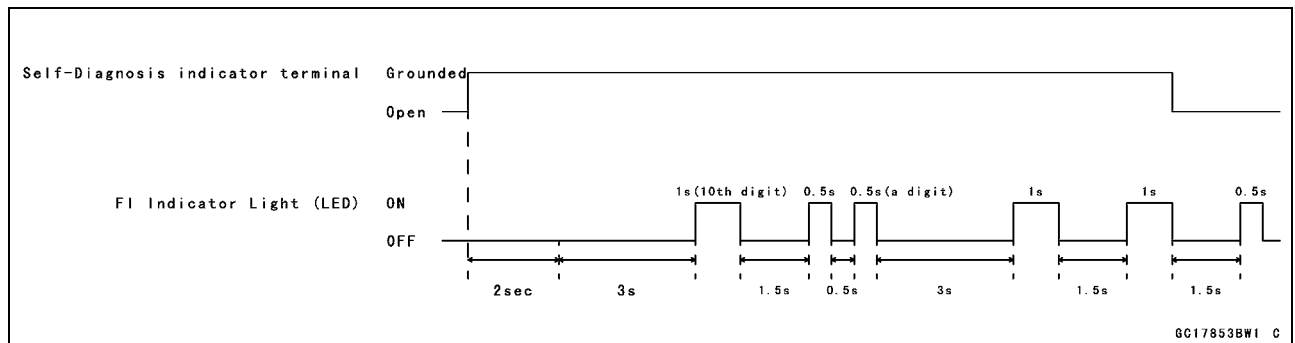


## Self-Diagnosis

### How to Read Service Codes

#### How to Read Service Codes

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



- If the problem is with the following parts, the ECU cannot memorize these problems, the FI indicator light (LED) doesn't go on, and no service codes can be displayed.
  - FI Indicator Light (LED)
  - Fuel Pump
  - Fuel Pump Relay
  - DFI Main Relay
  - ECU Power Source Wiring and Ground Wiring (see ECU Inspection in the this chapter)
  - Fuel Injectors

### How to Erase Service Codes

#### How to Erase Service Codes



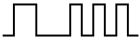


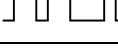
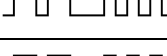
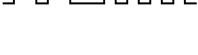

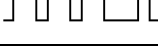
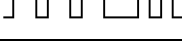





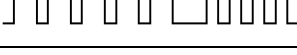

- Even if the ignition switch is turned OFF, the battery or the ECU are disconnected or the problem is solved, all service codes remain in the ECU.
- Refer to the Service Code Clearing Procedure for the service code erasure.

## 3-42 FUEL SYSTEM (DFI)

### Self-Diagnosis

#### Service Code Table

##### Service Code Table

Service Code	FI Indicator LED Light	Problems
11	 ON OFF	Main throttle sensor malfunction, wiring open or short
12		Inlet air pressure sensor malfunction, wiring open or short
13		Inlet air temperature sensor malfunction, wiring open or short
14		Water temperature sensor malfunction, wiring open or short
15		Atmospheric pressure sensor malfunction, wiring open or short
21		Crankshaft sensor malfunction, wiring open or short
23		Camshaft position sensor malfunction, wiring open or short
24 and 25	 + 	Speed sensor malfunction, wiring open or short First 24 is displayed and then 25, repeatedly
31		Vehicle-down sensor, malfunction, wiring open or short
32		Subthrottle sensor malfunction, wiring open or short
35		Immobilizer amplifier malfunction
36		Key collation error
51		Stick (Ignition) coil #1 malfunction, wiring open or short
52		Stick (Ignition) coil #2 malfunction, wiring open or short
53		Stick (Ignition) coil #3 malfunction, wiring open or short
54		Stick (Ignition) coil #4 malfunction, wiring open or short
62		Subthrottle valve actuator malfunction, wiring open or short

#### Notes:

- The ECU may be involved in these problems. If all the parts and circuits checked out good, be sure to check the ECU for ground and power supply. If the ground and power supply are checked good, replace the ECU.
- When no service code is displayed, the electrical parts of the DFI system has no fault, and the mechanical parts of the DFI system and the engine are suspect.

**Self-Diagnosis**

**Backups**

*Backups*

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

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
11	Main Throttle Sensor	Main Throttle Sensor Output Voltage 0.20 ~ 4.79 V	If the main throttle sensor system fails (the signal is out of the usable range, wiring short or open), the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the D-J method. Also, the main throttle sensor system and inlet air pressure fails, the ECU locks ignition timing into the ignition timing at closed throttle position and sets the DFI in the α-N method.
12	Inlet Air Pressure Sensor	Inlet Air Pressure (absolute) Pv = 100 mmHg ~ 900 mmHg	If the inlet air pressure sensor system fails (the signal Pv is out of the usable range, wiring short or open), the ECU sets the DFI in the α - N method.
13	Inlet Air Temperature Sensor	Inlet Air Temperature Ta = -47°C ~ +178°C	If the inlet air temperature sensor fails (the signal is out of the usable range, wiring short or open), the ECU sets Ta at 40°C.
14	Water Temperature Sensor	Water Temperature Tw = -30°C ~ +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	Absolute Atmospheric Pressure Pa = 100 mmHg ~ 900 mmHg	If the atmospheric pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets Pa at 760 mmHg (the standard atmospheric pressure).
21	Crankshaft Sensor	Crankshaft sensor must send 23 signals (output signal) to the ECU at the one cranking.	If crankshaft sensor generates other than 23 signals, the engine stops by itself.
23	Camshaft Position Sensor	Cam sensor must send one signal (output signal) to the ECU at the two cranking	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.
24 and 25	Speed Sensor	Speed sensor must send 4 signals (output signal) to the ECU at the one rotation of the engine sprocket. The gear position is decided by the signal of the speed sensor.	If the speed sensor system fails (no signal, wiring short or open), the speedometer shows 0, and the ECU sets the top (6) gear position.
31	Vehicle-down Sensor	Vehicle-down Sensor Output Voltage (signal) Vd = 0.4 V ~ 4.4 V	If the vehicle-down sensor system has failures (the output voltage Vd is more than usable range, wiring open), the ECU shuts off the fuel pump, the fuel injectors and the ignition system.

## 3-44 FUEL SYSTEM (DFI)

### Self-Diagnosis

Service Codes	Parts	Output Signal Usable Range or Criteria	Backups by ECU
32	Subthrottle Sensor	Subthrottle Sensor Output Voltage 0.15 ~ 4.85 V	If the subthrottle sensor system fails (the signal is out of the usable range, wiring short or open), the actuator locks sub throttle valve at full open position.
35	Immobilizer Amplifier	—	If the immobilizer system fails (no signal, wiring short or open), the vehicle is no start and run.
36	Master or User Key	The user or master key must use register key.	If the blank key or broken key is used, the vehicles is no start and run.
51	Stick Coil #1 (Ignition Coil)*	The stick coil primary winding must send signals (output voltage) continuously to the ECU.	If the ignition primary winding #1 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 (Ignition Coil)*	The stick coil primary winding must send signals (output voltage) continuously to the ECU.	If the ignition primary winding #2 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 (Ignition Coil)*	The stick coil primary winding must send signals (output voltage) continuously to the ECU.	If the ignition primary winding #3 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 (Ignition Coil)*	The stick coil primary winding must send signals (output voltage) continuously to the ECU.	If the ignition primary winding #4 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.
62	Subthrottle Valve Actuator	The actuator operates open and close of the subthrottle valve by the pulse signal from the ECU.	If the subthrottle valve actuator fails (the signal is out of the usable range, wiring short or open), the ECU stops the current to the actuator.

#### Note:

(1) D-J Method and  $\alpha$  - N 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 (inlet air pressure sensor output voltage) and engine speed (crankshaft sensor output voltage). This method is called D-J method (low-speed mode). 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 sensor output voltage) and the engine speed. This method is called  $\alpha$  - N method (high-speed mode).

(\*) This depends on the number of stopped cylinders.



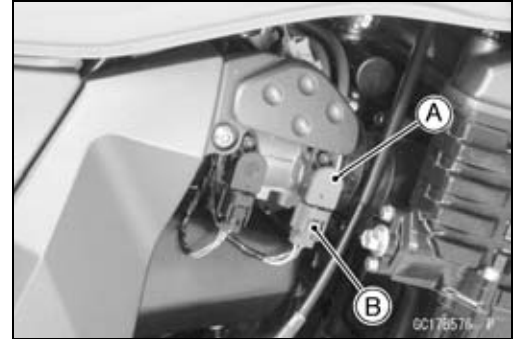
**Main Throttle Sensor (Service Code 11)**

*Main Throttle Sensor Removal/Adjustment*

**CAUTION**

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

Main Throttle Sensor Connector (Gray) [B]



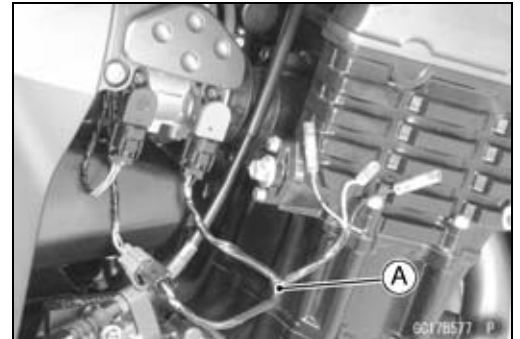
*Input Voltage Inspection*

**NOTE**

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the main throttle sensor (gray) Connector and connect the harness adapter [A] between these connectors.
- Connect a digital meter to the harness adapter lead.

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



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

**Main Throttle Sensor Input Voltage Connections to Adapter**

**Meter (+) → R (sensor BL) lead**

**Meter (-) → BK (sensor BR/BK) lead**

**Standard: 4.75 ~ 5.25 V DC**

- Turn the ignition switch OFF.
- ★ If the input voltage is normal, check the sensor output voltage.
- ★ If the input voltage is less than the standard, remove the ECU and check the wiring between these connectors.
- Disconnect the ECU and sensor connectors.

**Wiring Connection**

**ECU Connector [A] ↔ Throttle Sensor Connector [B]**

**BL lead (ECU terminal 1)**

**BR/BK lead (ECU terminal 14)**

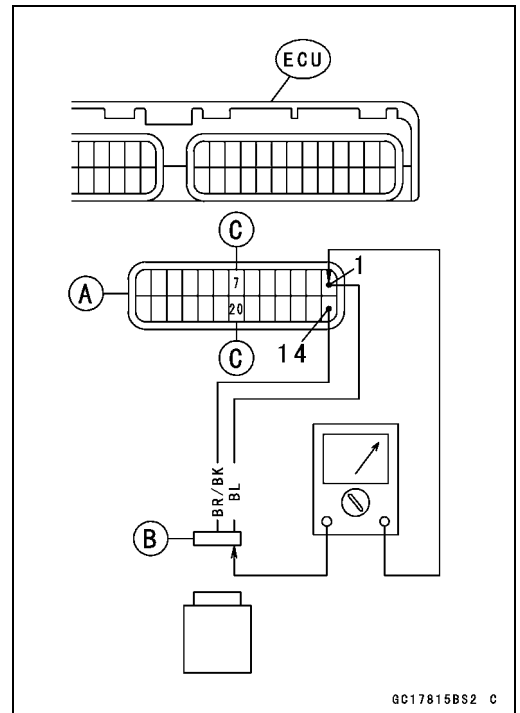
**ECU Connector [A] ↔ Throttle Sensor Connector [B]**

**(Immobilizer Equipped Models) [C]**

**BL lead (ECU terminal 17)**

**BR/BK lead (ECU terminal 20)**

- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU section).



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## 3-46 FUEL SYSTEM (DFI)

### Main Throttle Sensor (Service Code 11)

#### Output Voltage Inspection

- Measure the output voltage at the main throttle sensor in the same way as input voltage inspection, Note the following.
- Disconnect the main throttle sensor (gray) Connector and connect the harness adapter [A] between these connectors.

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

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

#### Idle Speed

**Standard: 1 100 ±50 r/min (rpm)**

- ★ If the idle speed is out of the specified range, adjust it (see Idle Speed Inspection in the Periodic Maintenance chapter).
- Turn off the ignition switch.
- Measure the output voltage of the sensor with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.

#### Main Throttle Sensor Output Voltage Connections to Adapter

**Meter (+) → R (sensor Y/W) lead**

**Meter (-) → W (sensor BR/BK) lead**

#### Standard:

**0.99 ~ 1.03 V DC (at idle throttle opening)**

**4.19 ~ 4.39 V DC (at full throttle opening)**

- ★ If the output voltage is out of the standard, inspect the main throttle sensor resistance.
- ★ If the output voltage is normal, check the wiring for continuity.

#### Wiring Connection

**ECU Connector [A] ↔ Throttle Sensor Connector [B]**

**Y/W lead (ECU terminal 2)**

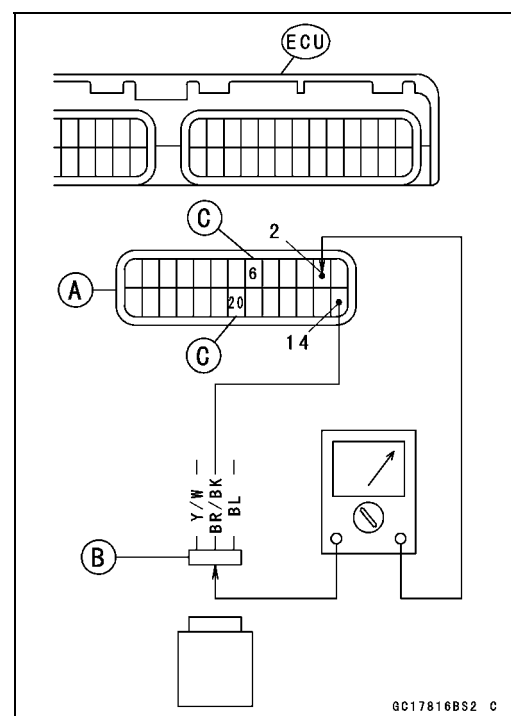
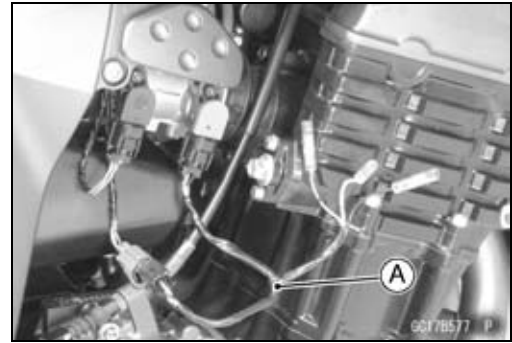
**BR/BK lead (ECU terminal 14)**

**ECU Connector [A] ↔ Throttle Sensor Connector [B]  
(Immobilizer Equipped Models [C])**

**Y/W lead (ECU terminal 6)**

**BR/BK lead (ECU terminal 20)**

- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU section).



**Main Throttle Sensor (Service Code 11)**

*Resistance Inspection*

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

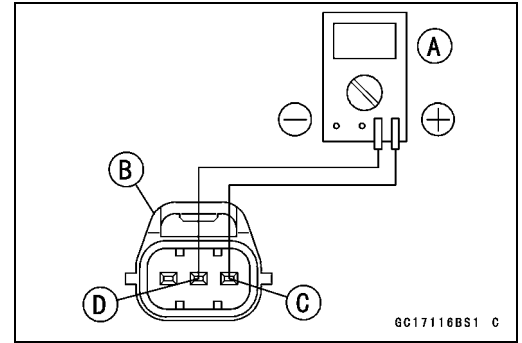
**Main Throttle Sensor Resistance**

**Connections:** BL lead [C] ↔ BR/BK lead [D]

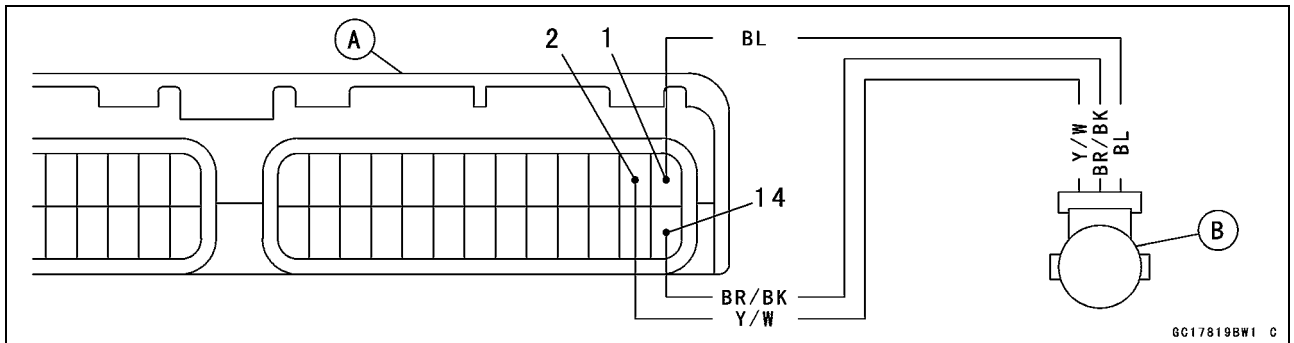
**Standard:** 4 ~ 6 kΩ

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

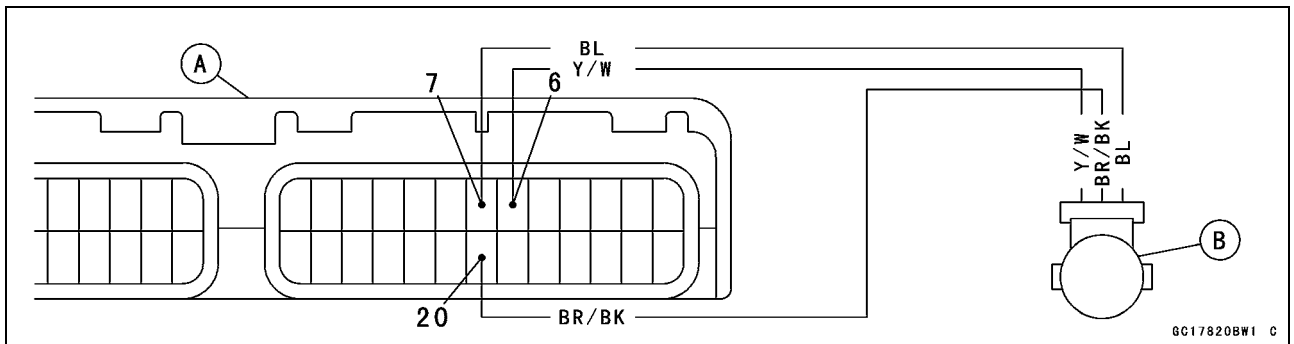
★ If the reading is within the range, but the problem still exists, replace the ECU (see this chapter).



**Main Throttle Sensor Circuit**



**Main Throttle Sensor Circuit (immobilizer Equipped Models)**



A. ECU

B. Main Throttle Sensor

## 3-48 FUEL SYSTEM (DFI)

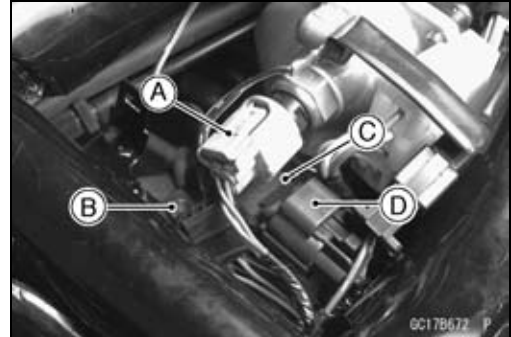
### Inlet Air Pressure Sensor (Service Code 12)

#### CAUTION

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

#### Removal

- Remove:
  - Fuel Tank (see Fuel Tank Removal in the this chapter)
  - Water Temperature Sensor Connector [A]
  - Inlet Air Pressure Sensor Bolt [B]
- Raise the inlet air pressure sensor [C] and disconnect the inlet air pressure sensor connector [D] and the vacuum hose.



#### Installation

#### NOTE

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

- Install:
    - Vacuum Hose
    - Inlet Air Pressure Sensor
- Torque - Inlet Air Pressure Sensor Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)**

#### Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

○The inspection is the same as "Input Voltage Inspection" of the main throttle sensor or the atmospheric pressure sensor.

**Inlet Air Pressure Sensor (Service Code 12)**

- Turn the ignition switch OFF.
- Remove the ECU (see this chapter). Do not disconnect the ECU connectors.
- Connect a digital voltmeter [A] to the connector [B] with the needle adapter set.

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

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

**Inlet Air Pressure Sensor Input Voltage**

**Connections to ECU**

Meter (+) → BL lead (terminal 1)

Meter (-) → BR/BK lead (terminal 14)

**Connections to ECU**

(Immobilizer Equipped Models [C])

Meter (+) → BL lead (terminal 7)

Meter (-) → BR/BK lead (terminal 20)

**Standard: 4.75 ~ 5.25 V DC**

- ★ If the reading is within the standard range, check the sensor output voltage.
- ★ If the reading is less than the standard range, remove the ECU and check the wiring between these connectors.
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU section).

**Output Voltage Inspection**

**NOTE**

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

- Measure the output voltage at the ECU in the same way as input voltage inspection. Note the following.

**Inlet Air Pressure Sensor Output Voltage**

**Connections to ECU**

Meter (+) → Y/BL lead (terminal 17)

Meter (-) → BR/BK lead (terminal 14)

**Connections to ECU**

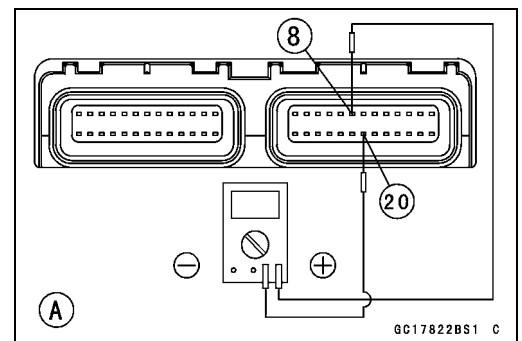
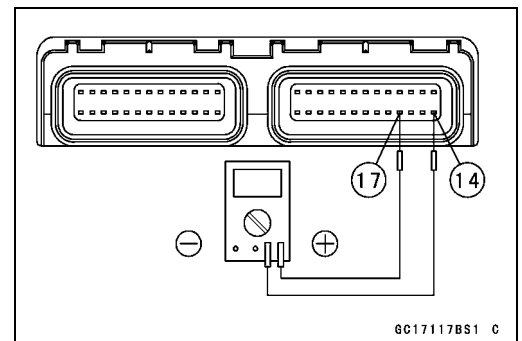
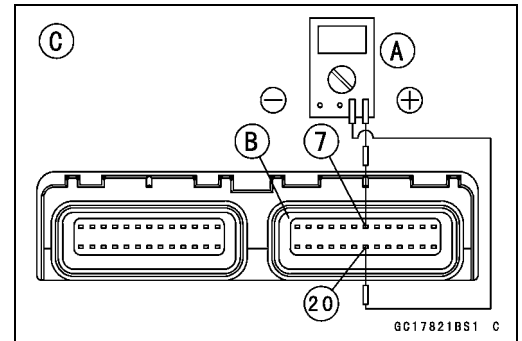
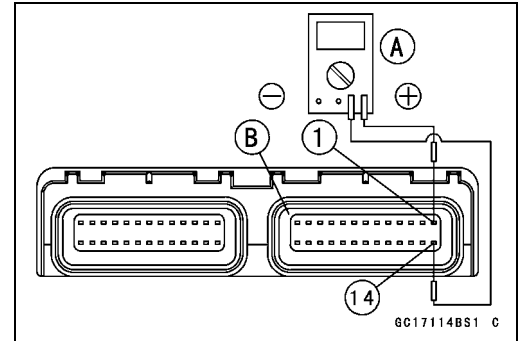
(Immobilizer Equipped Models [A])

Meter (+) → Y/BL lead (terminal 8)

Meter (-) → BR/BK lead (terminal 20)

**Usable Range: 3.74 ~ 4.26 V DC at the standard atmospheric pressure (101.32 kPa, 76 cmHg abs.)**

- Turn the ignition switch OFF.
- ★ If the output voltage is within the usable range, check the ECU for its ground, and power supply (see this chapter).
- ★ If the output voltage is out of the usable range, remove the fuel tank and check the wiring. If the output voltage is 4.8 V, the ECU is normal.



## 3-50 FUEL SYSTEM (DFI)

### Inlet Air Pressure Sensor (Service Code 12)

- ★ If the wiring is good, check the sensor for various vacuum.
- ★ If the output voltage for various vacuum is normal check the ECU for its ground, and power supply (see ECU section).
- Remove the inlet air pressure sensor [A] and disconnect the vacuum hose from the sensor.
- Do not disconnect the sensor connector.
- Connect an auxiliary hose [B] to the inlet air pressure sensor.
- Temporarily install the inlet air pressure sensor.
- Connect a commercially available digital meter [C], vacuum gauge [D], the fork oil level gauge [E] and the harness adapter to the inlet air pressure sensor.

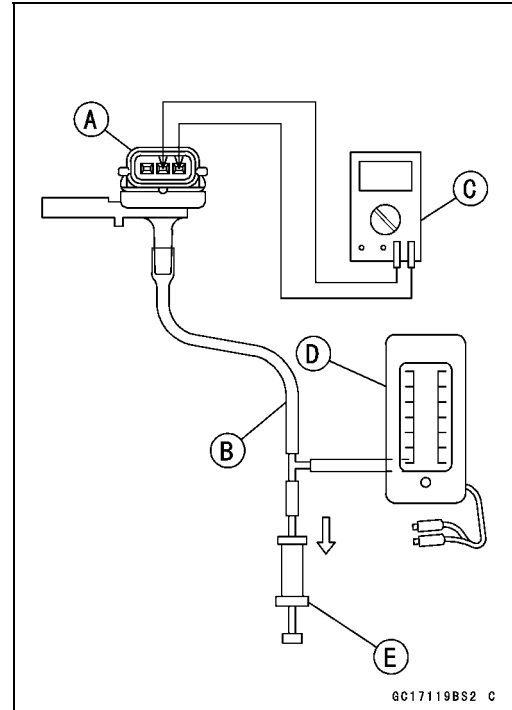
**Special Tools - Fork Oil Level Gauge: 57001-1290**  
**Sensor Harness Adapter: 57001-1561**

#### Inlet Air Pressure Sensor Output Voltage

##### Connection to Adapter

**Meter (+) → BL (sensor Y/BL) lead**

**Meter (-) → Y/W (sensor BR/BK) lead**



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

Suppose:

Pg: Vacuum Pressure (gauge) to Sensor

PI: Local Atmospheric Pressure (absolute) measured by a barometer

Pv: Vacuum Pressure (absolute) to Sensor

Vv: Sensor Output Voltage (v)

then

$$Pv = PI - Pg$$

For example, suppose the following data is obtained:

Pg = 8 cmHg (Vacuum gauge reading)

PI = 70 cmHg (Varometer reading)

Vv = 3.2 V (Digital volt meter reading)

then

$$Pv = 70 - 8 = 62 \text{ cmHg (Abs)}$$

Plot this Pv (62 cmHg) at a point [1] on the chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.

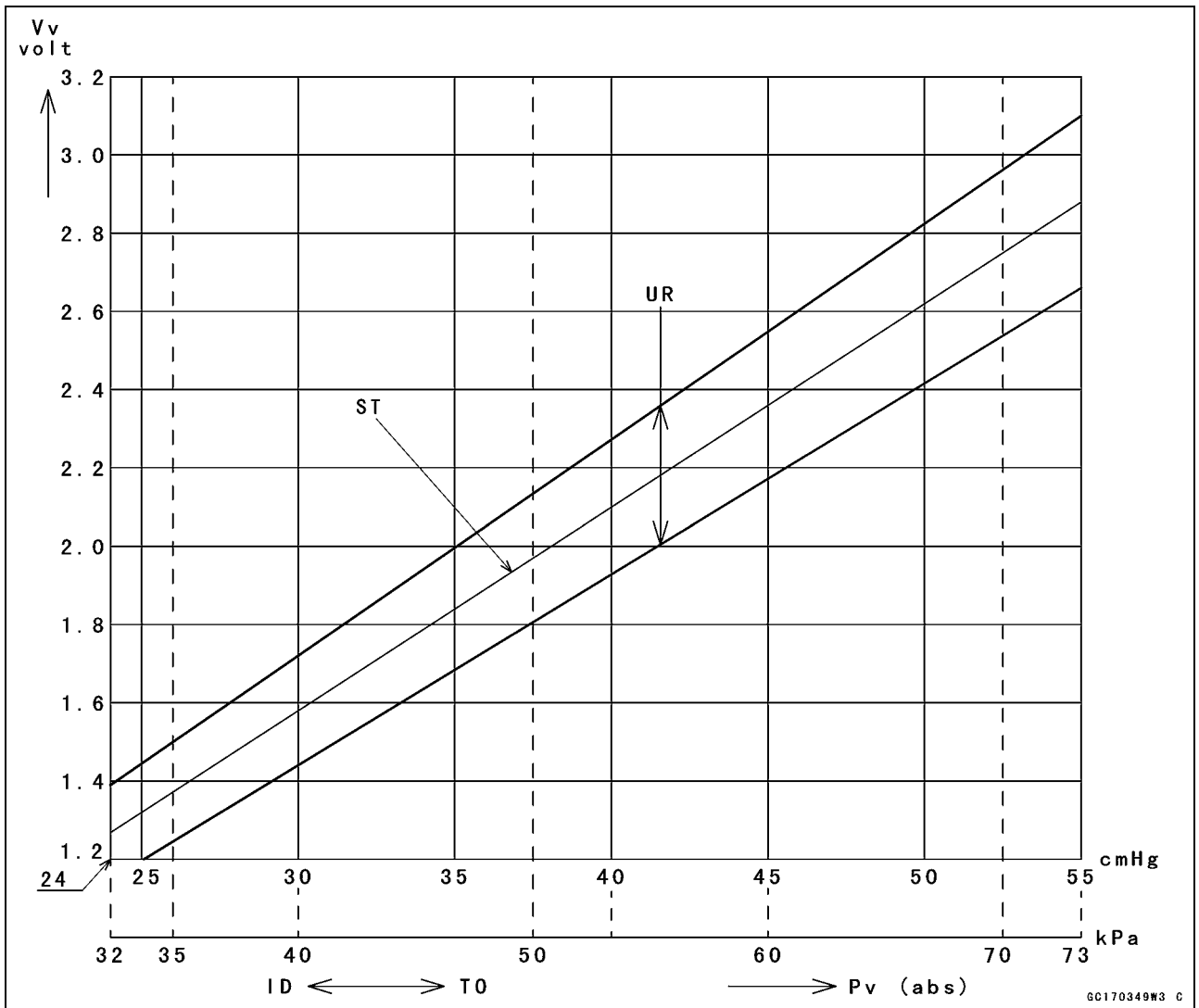
$$\text{Usable range} = 3.04 \sim 3.49 \text{ V}$$

Plot Vv (3.2 V) on the vertical line. → Point [3].

**Results: In the chart, Vv is within the usable range and the sensor is normal.**

Inlet Air Pressure Sensor (Service Code 12)

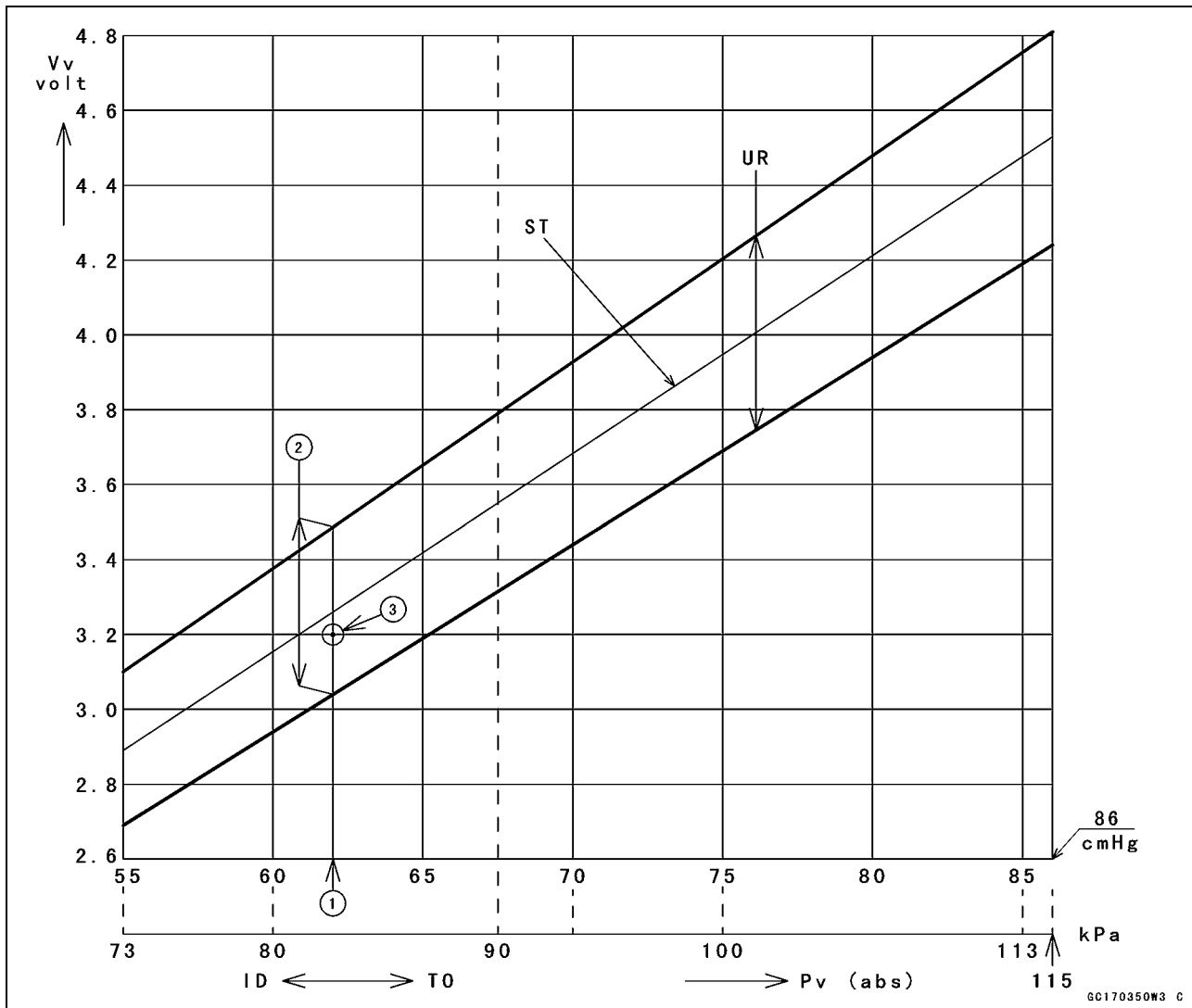
Pv = 24 ~ 55 cmHg



### 3-52 FUEL SYSTEM (DFI)

#### Inlet Air Pressure Sensor (Service Code 12)

Pv = 55 ~ 86 cmHg



GC170350W3 C

Vv: Inlet Air Pressure Sensor Output Voltage (V) (Digital Meter Reading)

Pv: Throttle Vacuum Pressure (Absolute)

Ps: Standard Atmospheric Pressure (Absolute)

ID: Idling

TO: Throttle Full Open

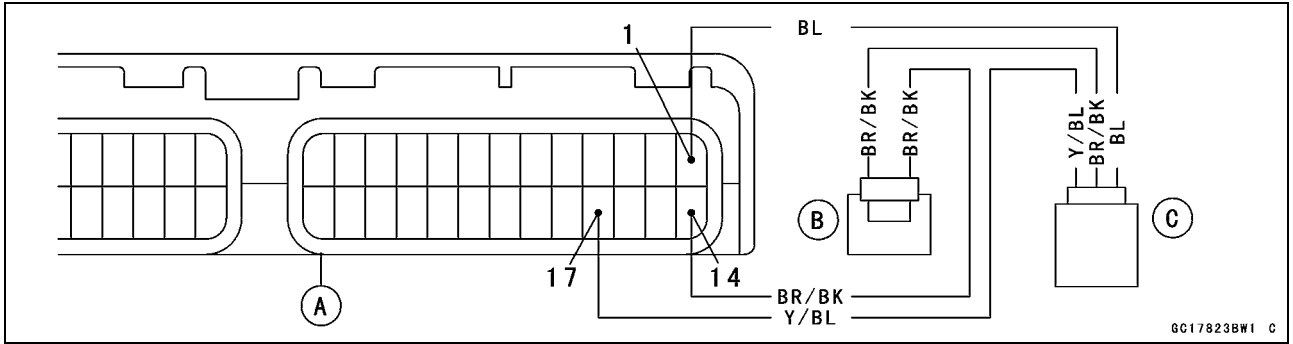
ST: Standard of Sensor Output Voltage (v)

UR: Usable Range of Sensor Output Voltage (v)

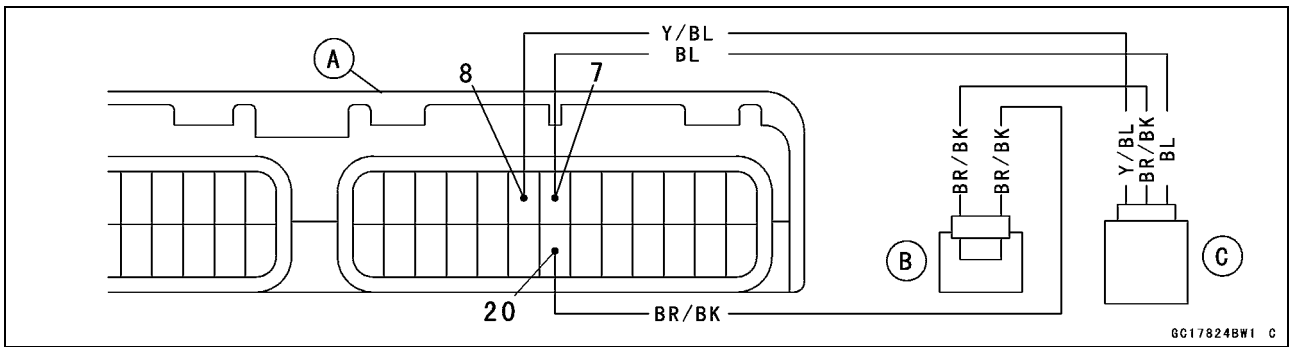


Inlet Air Pressure Sensor (Service Code 12)

Inlet Air Pressure Sensor Circuit



Inlet Air Pressure Sensor Circuit (Immobilizer Equipped Models)



A. ECU

B. Joint Connector D

C. Inlet Air Pressure Sensor

## 3-54 FUEL SYSTEM (DFI)

### Inlet Air Temperature Sensor (Service Code 13)

#### Removal/Installation

#### CAUTION

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).
- Disconnect the connector [A] from the inlet air temperature sensor.
- Pull out the inlet air temperature sensor.
- Put the inlet air temperature sensor into the grommet.



#### Output Voltage Inspection

#### NOTE

- Be sure the battery is fully charged.
- The output voltage changes according to the inlet air temperature.

- Remove the ECU (see this chapter). Do not disconnect the ECU connectors.
- Connect a digital voltmeter to the ECU connector, using needle adapter set.

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

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

#### Inlet Air Temperature Sensor Output Voltage Connections to ECU Connector

Meter (+) → Y lead (terminal 18)

Meter (-) → BR/BK lead (terminal 14)

#### Connections to ECU Connector (Immobilizer Equipped Models [A])

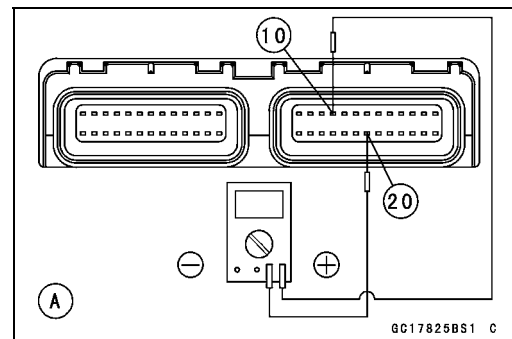
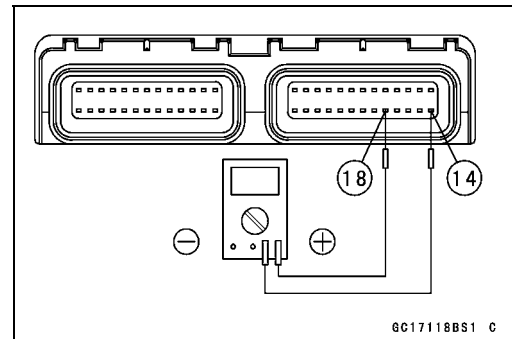
Meter (+) → Y lead (terminal 10)

Meter (-) → BR/BK lead (terminal 20)

Standard: about 2.25 ~ 2.50 V at inlet air temperature 20°C (68°F)

- Turn the ignition switch OFF.
- ★ If the output voltage is out of the standard, remove the fuel tank and check the wiring. And if the output voltage is 4.8 V, the ECU is normal.
- ★ If the output voltage is within the standard, check the ECU for its ground, and power supply (see ECU section in this chapter).
- ★ If the wiring is good, check the sensor resistance.
- Remove the needle adapter set, and apply silicone sealant to the seals of the connector for waterproofing.

**Silicone Sealant (Kawasaki Bond: 56019-120) - Seals of ECU Connectors**



**Inlet Air Temperature Sensor (Service Code 13)**

*Sensor Resistance Inspection*

- Remove the inlet air temperature sensor.
- Suspend the sensor [A] in a container of machine oil so that the heat-sensitive portion is submerged.
- Suspend a thermometer [B] with the heat-sensitive portion [C] located in almost the same depth with the sensor.

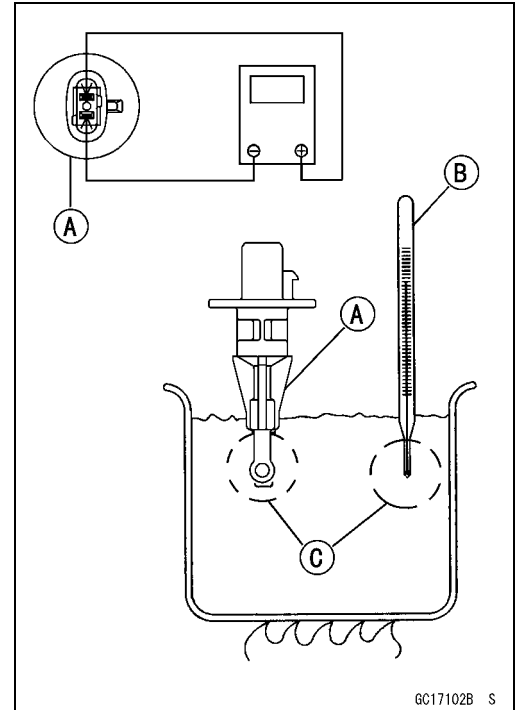
**NOTE**

- *The sensor and thermometer must not touch the container side or bottom.*
- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the terminals at the temperatures shown in the table.

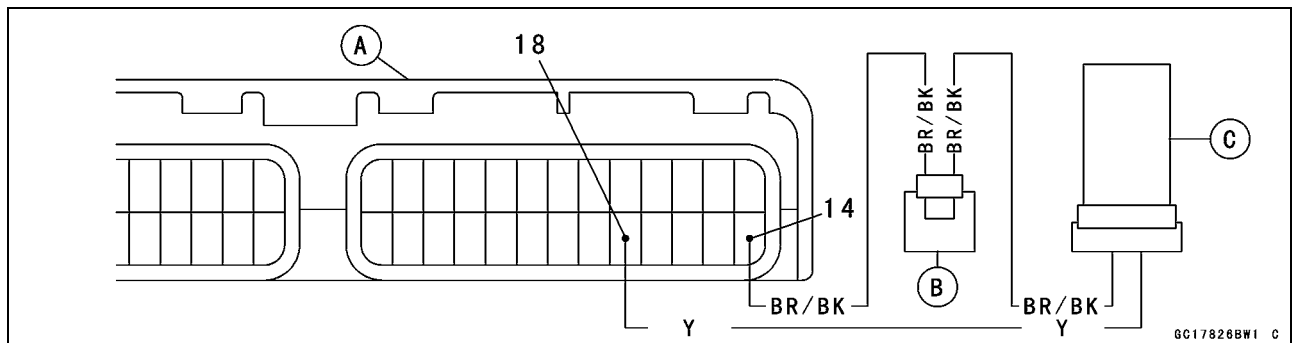
**Inlet Air Temperature Sensor Resistance**

**Standard:**      **1.6 ~ 3.7 kΩ at 20°C (68°F)**  
                          **0.24 ~ 0.43 kΩ at 80°C (176°F)**

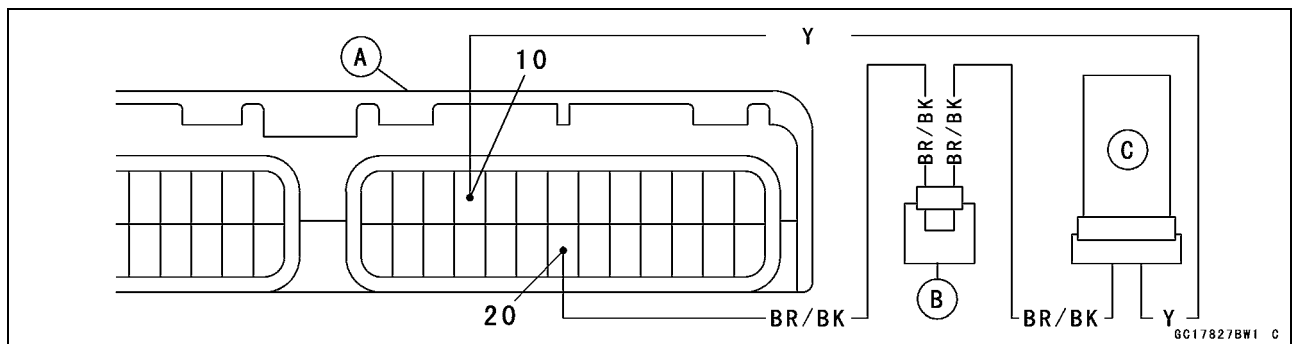
- ★ If the measurement is out of the range, replace the sensor.
- ★ If the measurement is within the specified, replace the ECU.



**Inlet Air Temperature Sensor Circuit**



**Inlet Air Temperature Sensor Circuit (Immobilizer Equipped Models)**



- A. ECU
- B. Joint Connector D
- C. Inlet Air Temperature Sensor

## 3-56 FUEL SYSTEM (DFI)

### Water Temperature Sensor (Service Code 14)

#### Removal/Installation

#### CAUTION

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).
- Drain the coolant in the thermostat housing.
- Remove:
  - Meter Ground Bolt [A]
- Disconnect the sensor connector [B], and unscrew the water temperature sensor [C].

**Silicone Sealant (Kawasaki Bond: 56019-120) - Threads of Water Temperature Sensor**

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

- Fill the engine with coolant and bleed the air from the cooling system (see Coolant Change in the Periodic Maintenance chapter).

#### Output Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

- Remove the ECU (see ECU Removal). Do not disconnect the connectors.
  - Connect a digital voltmeter [A] to the ECU connector [B] with the needle adapter set.
- Special Tool - Needle Adapter Set: 57001-1457**
- Measure the sensor output voltage with the engine stopped and the connector joined.
  - Turn the ignition switch ON.

#### Water Temperature Sensor Output Voltage Connections to ECU

Meter (+) → O lead (terminal 5)

Meter (-) → BR/BK lead (terminal 14)

#### Connections to ECU

(Immobilizer Equipped Models [C])

Meter (+) → O lead (terminal 23)

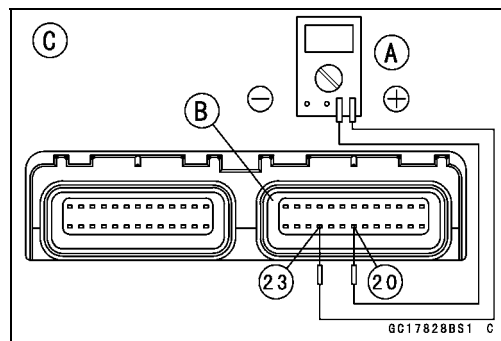
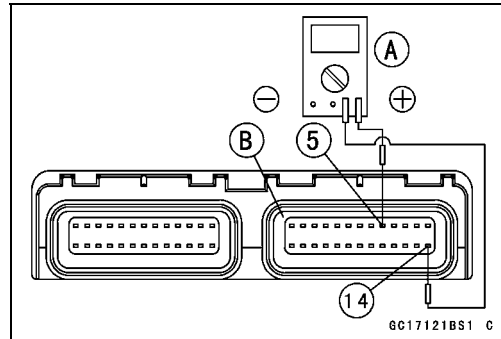
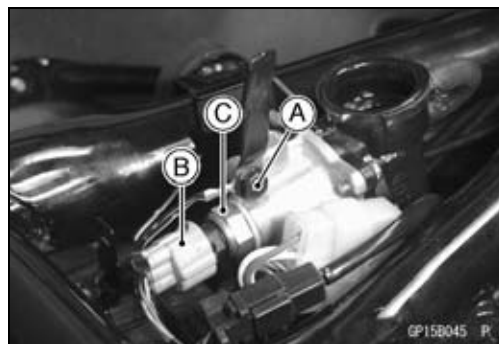
Meter (-) → BR/BK lead (terminal 20)

**Standard: about 2.80 ~ 2.97 V at 20°C (68°F)**

#### NOTE

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

- Turn the ignition switch OFF.
- ★If the output voltage is within the standard, check the ECU for its ground, and power supply (see ECU section).
- ★If the output voltage is out of the standard, remove the fuel tank and check the wiring. And if the output voltage is 4.8 V, the ECU is normal.

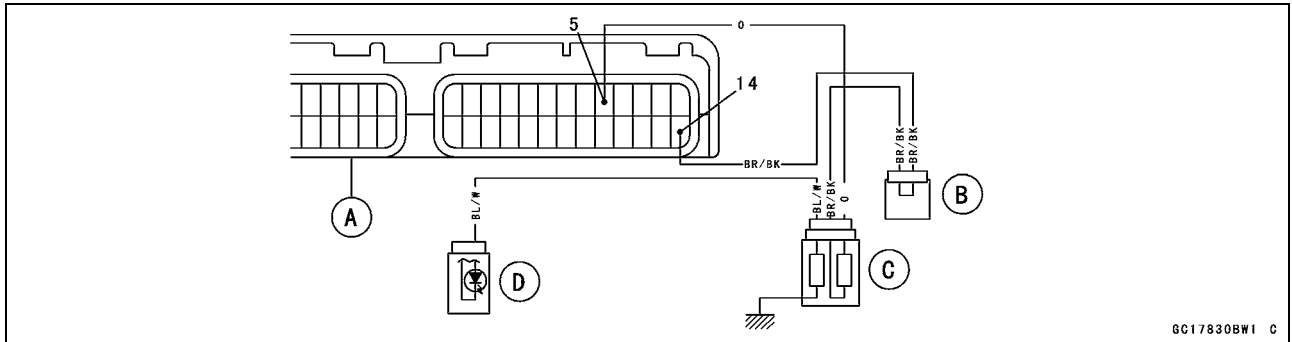


**Water Temperature Sensor (Service Code 14)**

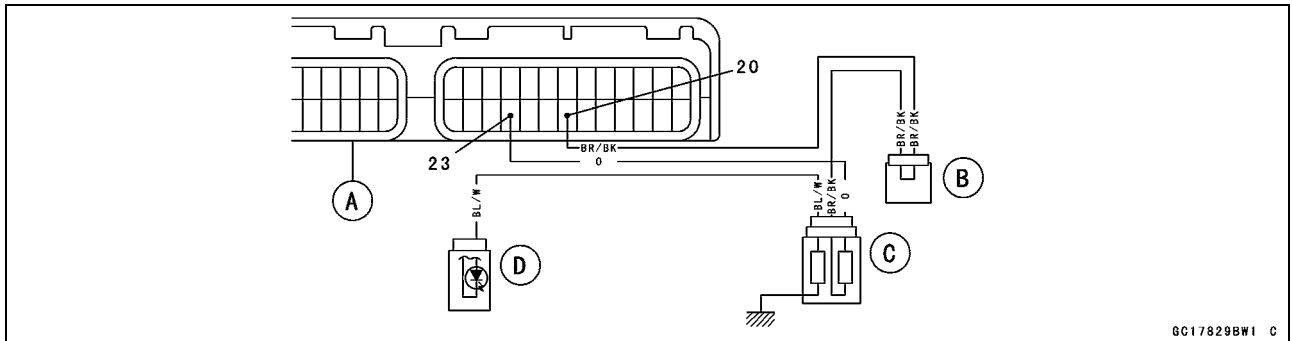
- ★ If the wiring is good, check the water temperature sensor resistance.
- Remove the needle adapter set, and apply silicone sealant to the seals of the connector for waterproofing.

**Silicone Sealant (Kawasaki Bond: 56019-120) - Seals of ECU Connectors**

**Water Temperature Sensor Circuit**



**Water Temperature Sensor Circuit (Immobilizer Models)**



- A. ECU
- B. Joint Connector D
- C. Water Temperature Sensor
- D. Water Temperature Warning Light (LED)

**Sensor Resistance Inspection**

- Remove the water temperature sensor (see this section).
- Refer to the Electrical System chapter for water temperature sensor inspection.

## 3-58 FUEL SYSTEM (DFI)

### Atmospheric Pressure Sensor (Service Code 15)

#### CAUTION

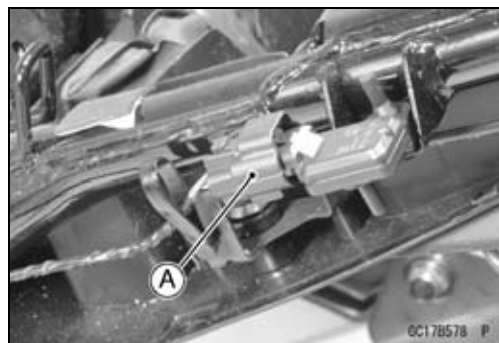
Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.

#### NOTE

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

#### Removal

- Turn the ignition switch off.
- Remove the seat cover (see Frame chapter).
- Remove the atmospheric pressure sensor [A] from the rubber damper in the frame.
- Disconnect the sensor connector.



#### Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.  
○The inspection is the same as "Input Voltage Inspection" of the throttle sensor and the inlet air pressure sensor.

- Turn the ignition switch OFF.
- Remove the ECU (see ECU Removal). Do not disconnect the ECU connectors.
- Connect a digital voltmeter [A] to the connector [B], with the needle adapter set.

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

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

#### Atmospheric Pressure Sensor Input Voltage

##### Connections to ECU

Meter (+) → BL lead (terminal 1)

Meter (-) → BR/BK lead (terminal 14)

##### Connections to ECU

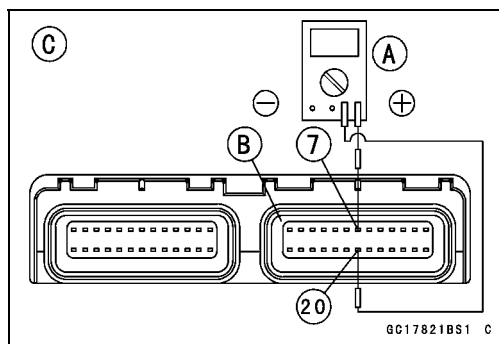
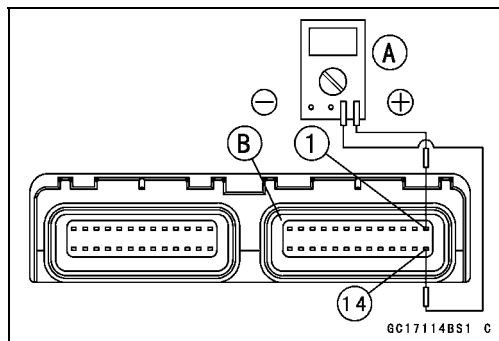
(Immobilizer Equipped Models [C])

Meter (+) → BL lead (terminal 7)

Meter (-) → BR/BK lead (terminal 20)

Standard: 4.75 ~ 5.25 V DC

- ★ If the reading is within the standard range, check the sensor output voltage.
- ★ If the reading of input voltage is less than the standard range, remove the ECU and check the wiring between these connections.
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU section).



**Atmospheric Pressure Sensor (Service Code 15)**

*Output Voltage Inspection*

- Measure the output voltage at the ECU in the same way as input voltage inspection. Note the following.

Digital Meter [A]

ECU Connector [B]

**Atmospheric Pressure Sensor Output Voltage Connections to ECU**

Meter (+) → G/W lead (terminal 4)

Meter (-) → BR/BK lead (terminal 14)

**Connections to ECU**

(Immobilizer Equipped Models [C])

Meter (+) → G/W lead (terminal 21)

Meter (-) → BR/BK lead (terminal 20)

**Usable Range: 3.74 ~ 4.26 V DC at the standard atmospheric pressure (101.32 kPa, 76 cmHg abs.)**

**NOTE**

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

- Turn the ignition switch OFF.
- ★ If the output voltage is within the usable range, check the ECU for its ground, and power supply (see ECU section).
- ★ If the output voltage is out of the standard, remove the seat cover and check the wiring. And if the output voltage is 4.8 V, the ECU is normal.
- ★ If the wiring is good, check the sensor for various vacuum.
- ★ If the output voltage for various vacuum is normal, check the ECU for its ground, and power supply (see ECU section).
- Determine the local altitude (elevation).
- ★ If you know the local atmospheric pressure using a barometer, substitute the atmospheric pressure for Pv (throttle vacuum) in the vacuum sensor chart (see Inlet Air Pressure Sensor section).
- Get the usable range of the atmospheric pressure sensor output voltage in the same way as Output Voltage Inspection of the inlet air pressure sensor and check if Va (output voltage) is within the usable range or not.
- ★ If you know the local altitude, use the following chart.

For example:

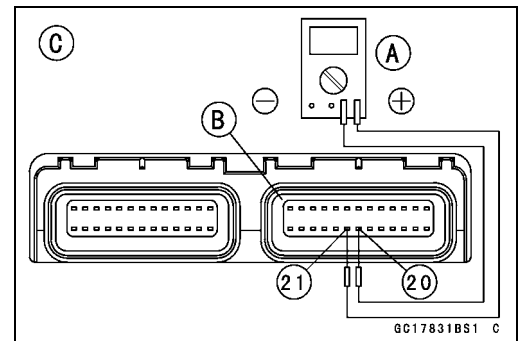
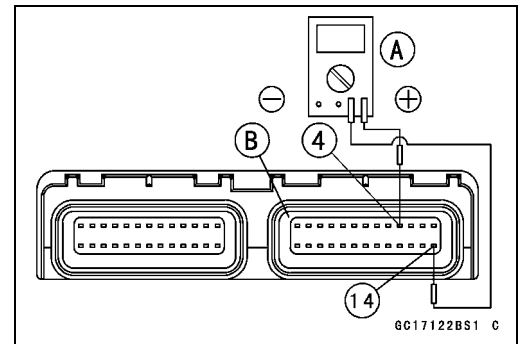
Suppose the local altitude is 1 300 m (4 200 ft) and the sensor output voltage Va is 3.3 V.

Plot this H (1 300 m) at a point [1] on the following chart and draw a vertical line through the point. Then, you can get the usable range [2] of the sensor output voltage.

Usable Range = 3.2 ~ 3.64 V

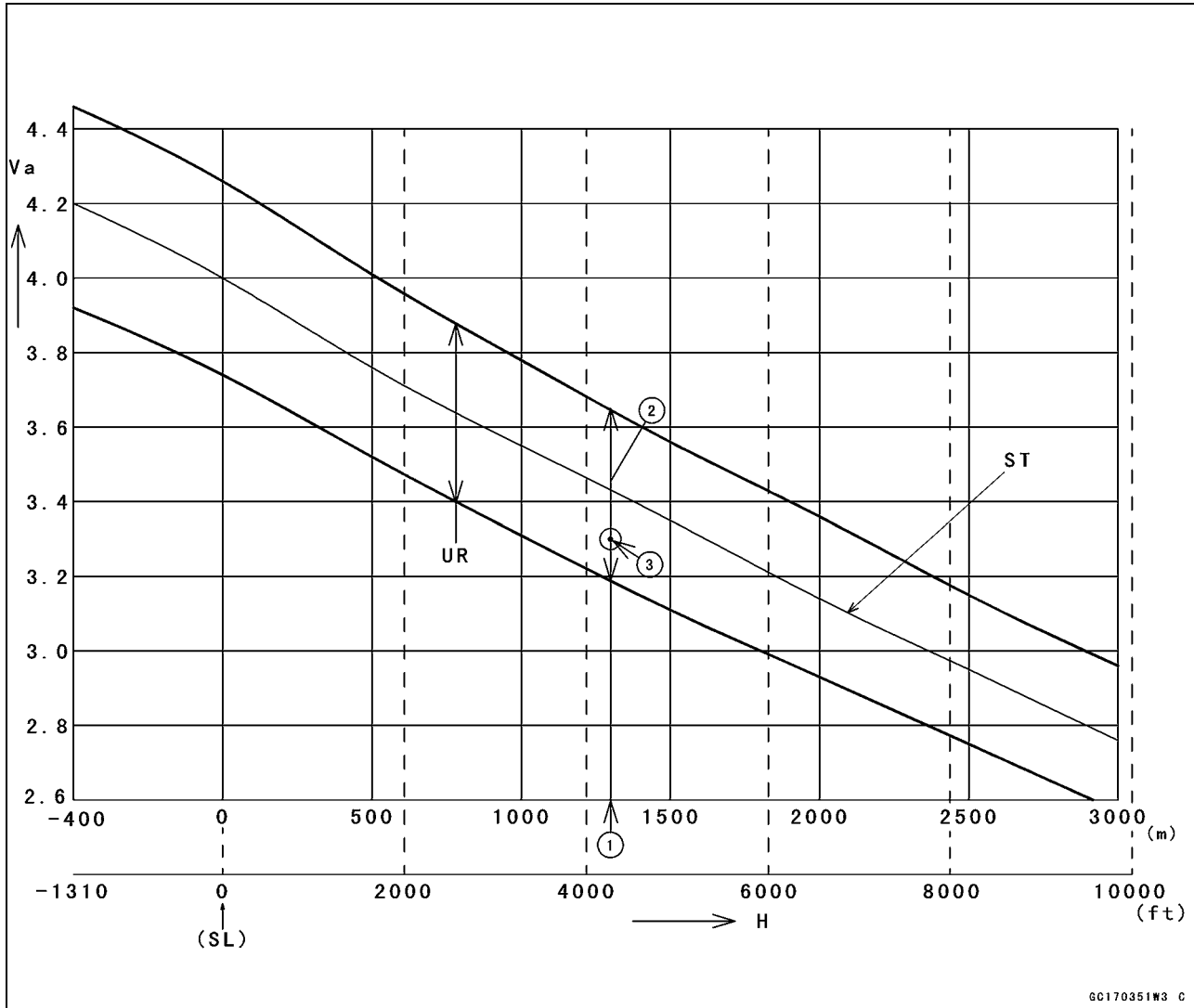
Plot Va (3.3 V) on the vertical line → Point [3]

**Results: In the chart, Va is within the usable range and the sensor is normal.**



### 3-60 FUEL SYSTEM (DFI)

#### Atmospheric Pressure Sensor (Service Code 15)



GC170351W3 C

$V_a$ : Atmospheric Pressure Sensor Output Voltage (v)

$H$ : Altitude (m or feet)

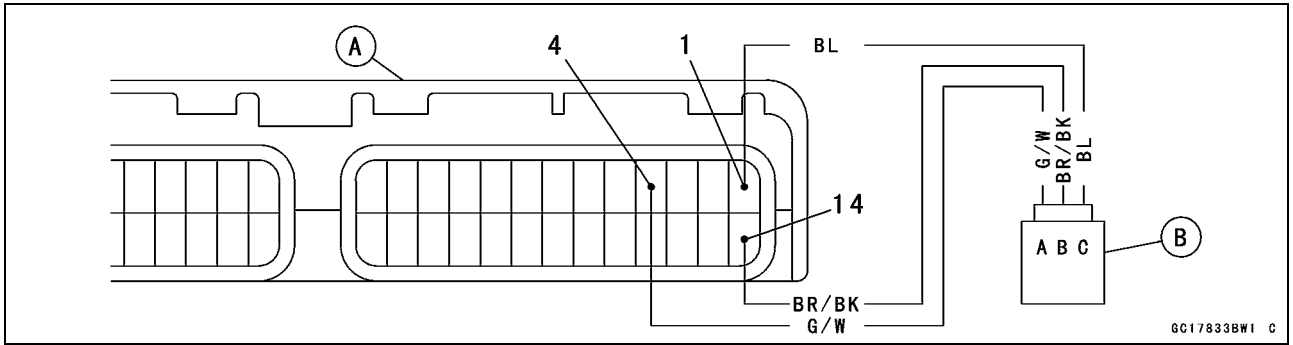
ST: Standard of Sensor Output Voltage (v)

UR: Usable Range of Sensor Output Voltage (v)

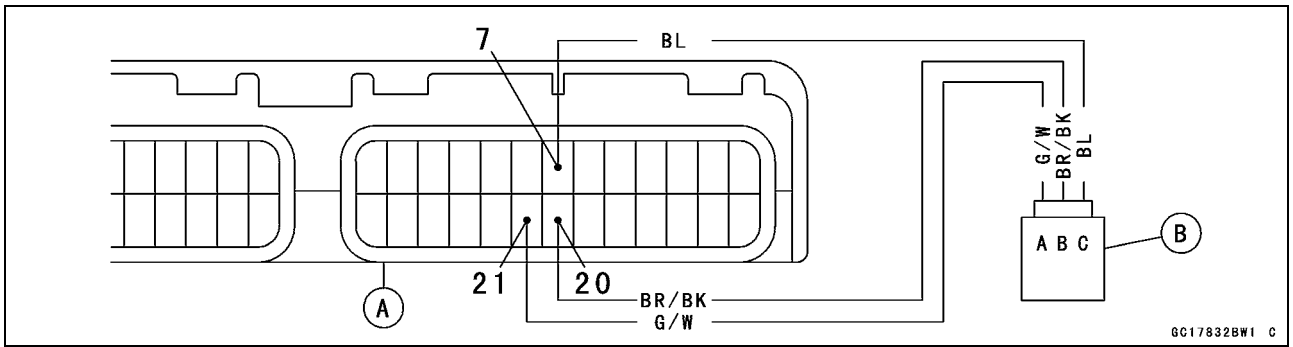


Atmospheric Pressure Sensor (Service Code 15)

Atmospheric Pressure Sensor Circuit



Atmospheric Pressure Sensor Circuit (Immobilizer Equipped Models)



A. ECU

B. Atmospheric Pressure Sensor

## 3-62 FUEL SYSTEM (DFI)

### Crankshaft Sensor (Service Code 21)

Start the engine and switch the diagnosis mode to Dealer 1 mode to know all the problem that the DFI system has at the time of self-diagnosis. If the engine cannot be started, the self-diagnosis system does not detect dynamic condition of the crankshaft sensor. In this case, turn off the ignition switch and turn it on again to enter the Dealer 2 mode. In this mode, the system tells all the troubles which the DFI system had in both static and dynamic conditions.

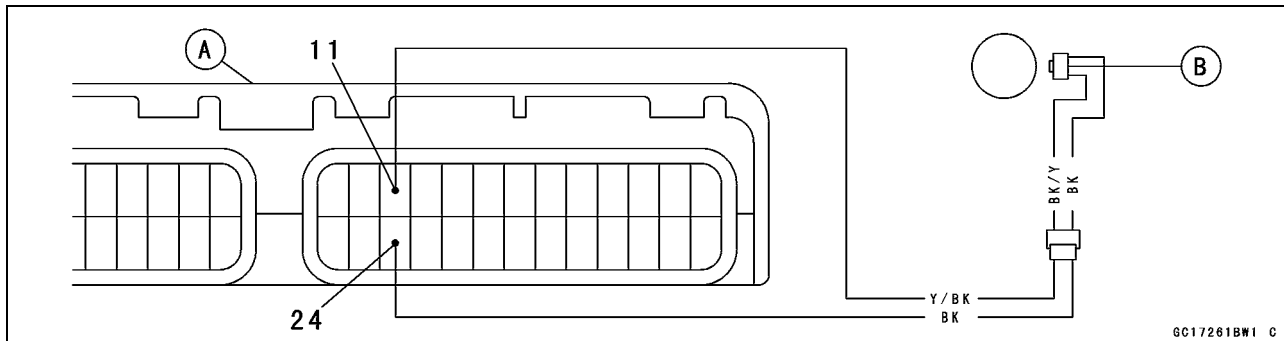
#### *Crankshaft Sensor Removal/Installation*

- See the Ignition System section in the Electrical System chapter.

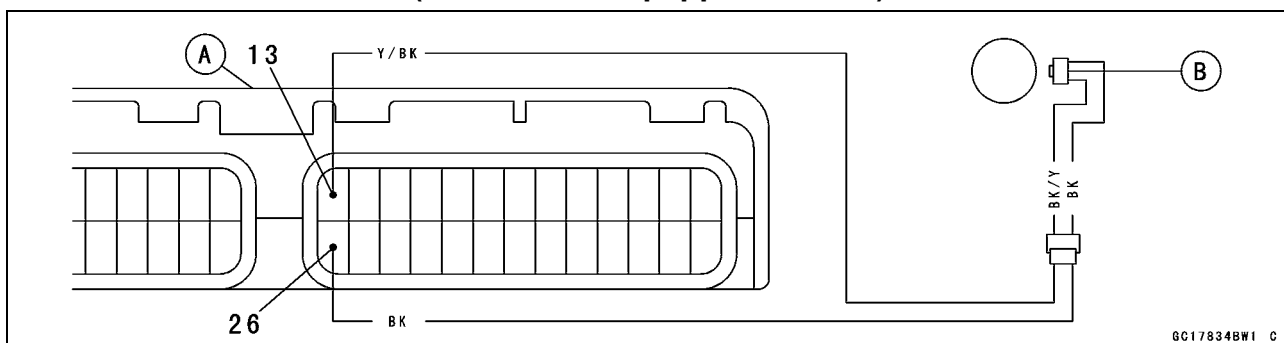
#### *Crankshaft Sensor Inspection*

- The crankshaft sensor has no power source, and when the engine stops, the crankshaft sensor generates no signals.
- Crank the engine and measure the peak voltage of the crankshaft sensor (see Electrical System chapter) in order to check the sensor.
- Check the wiring for continuity, using the following diagram.

#### Crankshaft Sensor Circuit



#### Crankshaft Sensor Circuit (Immobilizer Equipped Models)



A. ECU

B. Crankshaft Sensor

## Camshaft Position Sensor (Service Code 23)

Start the engine and switch the diagnosis mode to Dealer 1 mode to know all the problem that the DFI system has at the time of self-diagnosis. If the engine cannot be started, the self-diagnosis system does not detect dynamic condition of the camshaft position sensor. In this case, turn off the ignition switch and turn it on again to enter the Dealer 2 mode. In this mode, the system tells all the troubles which the DFI system had in both static and dynamic conditions.

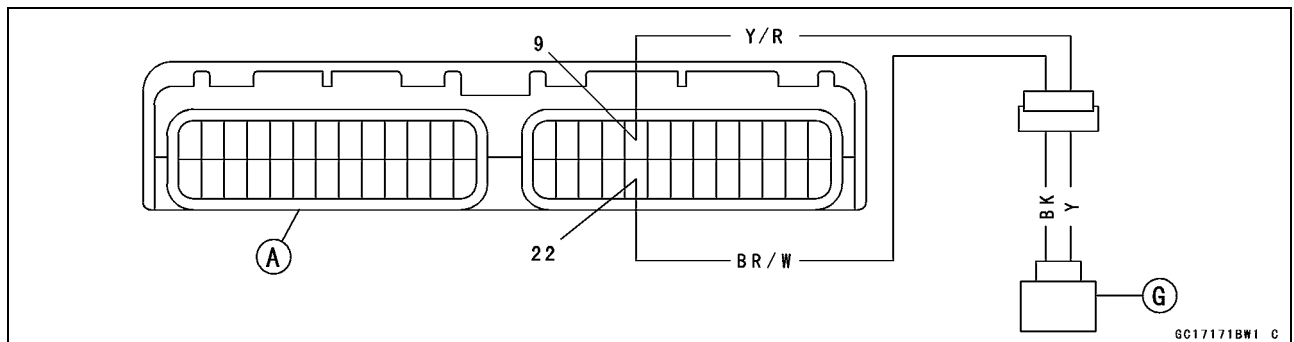
### Camshaft Position Sensor Removal/Installation

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

- See the Ignition system section in the Electric System chapter.

### Camshaft Position Sensor Inspection

- The camshaft position sensor has no power source, and when the engine stops, the camshaft position sensor generates no signal.
- Crank the engine and measure the peak voltage of the camshaft position sensor (see Electrical System chapter) in order to check the sensor.
- Check the wiring for continuity, using the following diagram.



A. ECU

G. Camshaft Position Sensor

## 3-64 FUEL SYSTEM (DFI)

### Speed Sensor (Service Code 24, 25)

#### Speed Sensor Removal/Installation

- See the Switches and Sensors section in the Electrical System chapter.

#### Speed Sensor Inspection

- See the Switches and Sensors section in the Electrical System chapter.

#### Input Voltage Inspection

##### NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the speed sensor connector [A] and connect the harness adapter [B] between the harness connector and speed sensor connector.  
Engine Sprocket Cover [C]
- Connect a digital meter to the harness adapter leads.

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

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

#### Speed Sensor Input Voltage Connection to Adapter

Meter (+) → BL (sensor P) lead [C]

Meter (-) → BK/BL (sensor BK) lead [D]

**Standard: About 9 ~ 11 V DC at Ignition Switch ON**

- ★ If the reading is out of the range, check the wiring (see wiring diagram in this section), and meter (see Electrical System chapter).
- ★ If the reading is good, check the output voltage.
- Turn the ignition switch OFF.

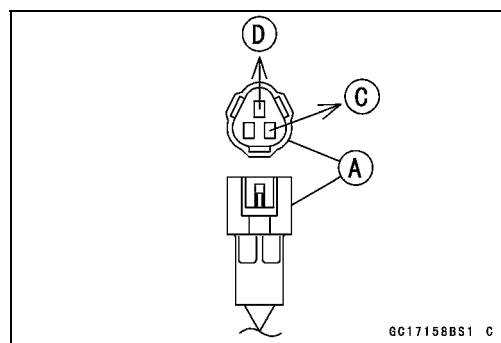
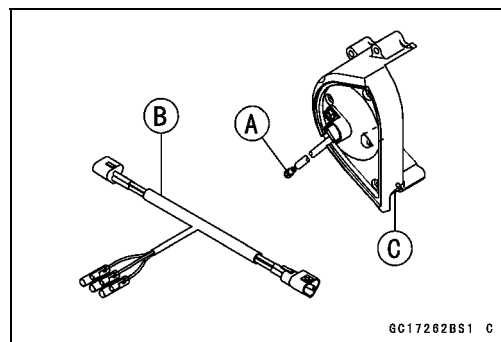
#### Output Voltage Inspection

- Before this inspection, inspect the input voltage (see Input Voltage Inspection).

##### NOTE

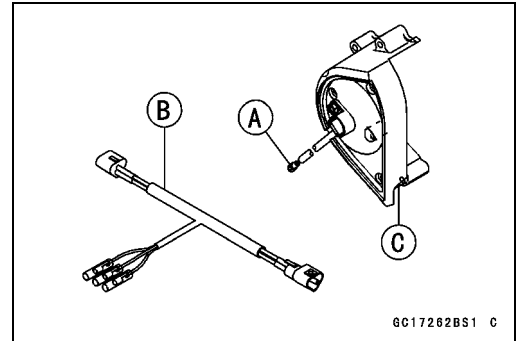
○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.



**Speed Sensor (Service Code 24, 25)**

- Disconnect the speed sensor connector [A] and connect the harness adapter [B] between the harness connector and speed sensor connector.  
Engine Sprocket Cover [C]
- Connect a digital meter to the harness adapter leads.  
**Special Tool - Throttle Sensor Setting Adapter #1: 57001-1400**
- Measure the sensor output voltage with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.



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

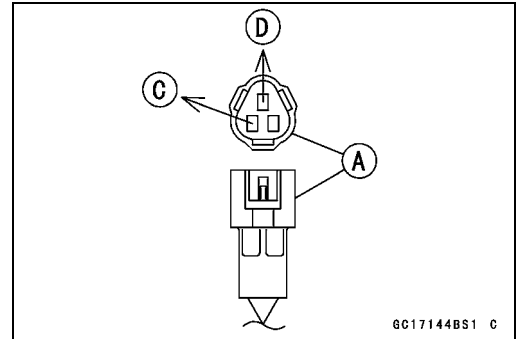
Meter (+) → Y/W (sensor Y) lead [C]

Meter (-) → BK/BL (sensor BK) lead [D]

Standard: About 0.05 ~ 0.07 V DC

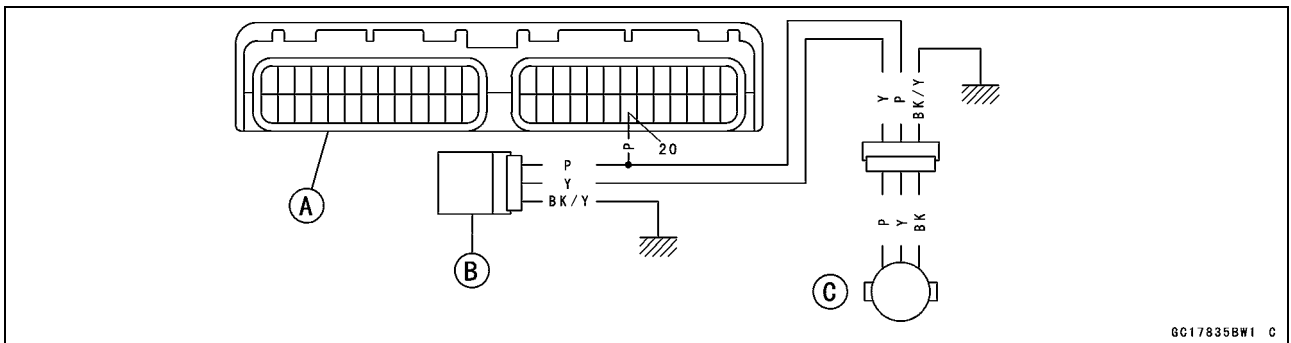
**NOTE**

○If you rotate the engine sprocket, the output voltage will be increased.

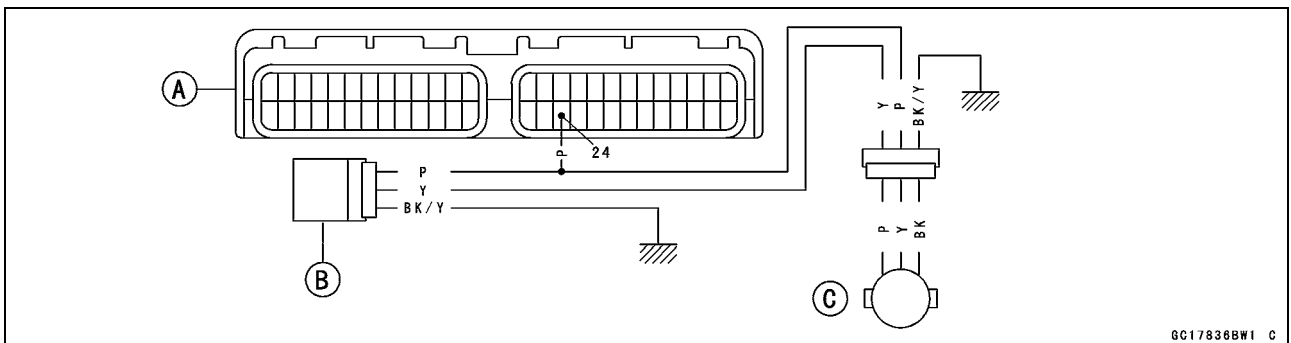


- ★ If the reading is out of the range, check the speed sensor operation (see Electrical System chapter) and the wiring to ECU (see wiring diagram in this section).
- ★ If the reading, speed sensor operation and wiring are good, check the ECU for its ground, and power supply (see ECU section).

**Speed Sensor Circuit**



**Speed Sensor Circuit (Immobilizer Equipped Models)**



A. ECU

B. Speed Sensor

C. Speedometer Unit

## 3-66 FUEL SYSTEM (DFI)

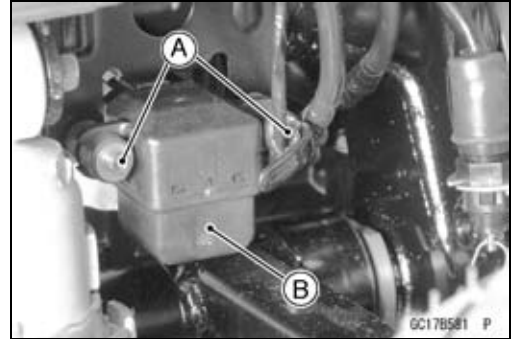
### Vehicle-down Sensor (Service Code 31)

#### Removal

#### CAUTION

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

- Remove:  
Bolts [A]  
Connection and Vehicle-down Sensor [B]

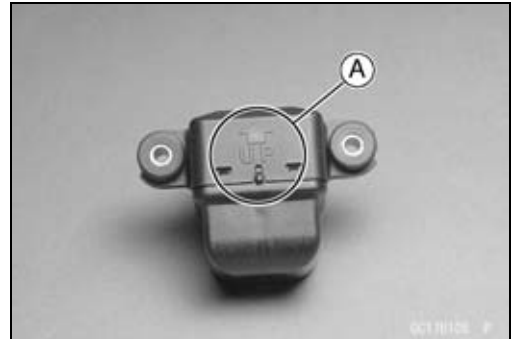


#### Installation

- The UP mark [A] of the sensor should face upward.  
Torque - Vehicle-down Sensor Bolts: 2.0 N·m (0.20 kgf·m, 17 in·lb)

#### ⚠ WARNING

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



#### Inspection

#### NOTE

○ Be sure the battery is fully charged.

- Connect a digital volt meter [A] to the connector of the vehicle-down sensor [B] with the needle adapter set [C].

#### Vehicle-down Sensor Power Source Voltage

##### Connections to Sensor

Meter (+) → W/Y lead [D]

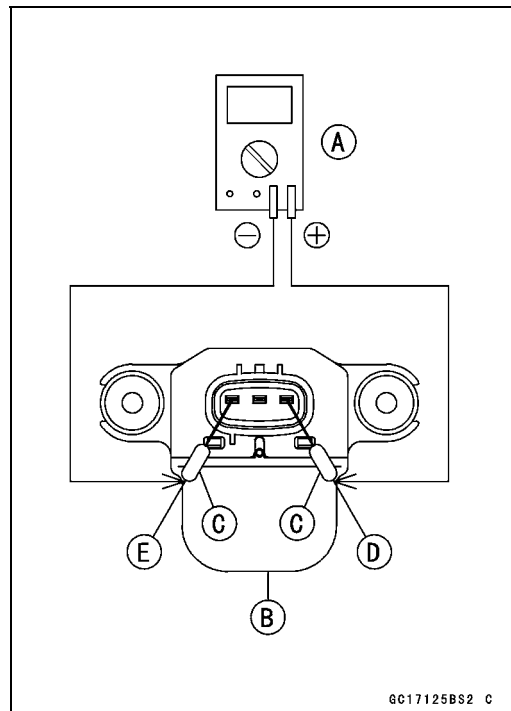
Meter (-) → BK/Y lead [E]

- Turn the ignition switch ON, and measure the power source voltage with the connector joined.

##### Power Source Voltage at Sensor

Standard: Battery Voltage (12.6 V or more)

- Turn the ignition switch OFF.
- ★ If there is no battery voltage, check the following:  
Battery (see Electrical System chapter)  
ECU Main Fuse 15 A  
Wiring for Vehicle-down Sensor Power Source (see next wiring diagram)
- ★ If the power source is normal, check the output voltage.



GC17125BS2 C

**Vehicle-down Sensor (Service Code 31)**

- Turn the ignition switch OFF.
- Remove the sensor.
- Connect a digital volt meter [A] to the connector with needle adapter set [B].

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

**Vehicle-down Sensor Output Voltage**

**Connections to Sensor**

**Meter (+) → Y/G lead [D]**

**Meter (-) → BK/Y lead [E]**

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

**Output Voltage at Sensor**

**Standard:**           with sensor tilted 60 ~ 70° or more right or left: 3.7 ~ 4.4 V  
                               with sensor arrow mark pointed up: 0.4 ~ 1.4 V

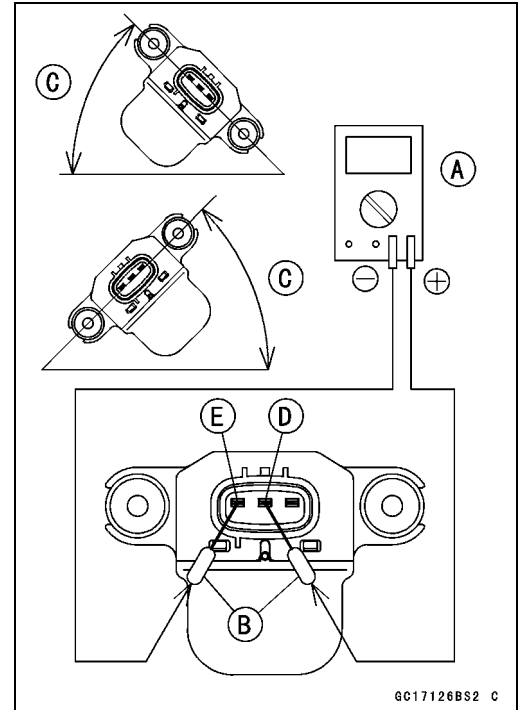
**NOTE**

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

- Turn the ignition switch OFF.
- Remove the needle adapter set, and apply silicone sealant to the seals of the connector for waterproofing.

**Silicone Sealant (Kawasaki Bond: 56019-120) - Seals of Vehicle-down Sensor Connector**

- ★ If the output voltage is normal, the wiring is suspect. Check the wiring.
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU section).
- ★ If the output voltage is out of the specified, replace the vehicle-down sensor.

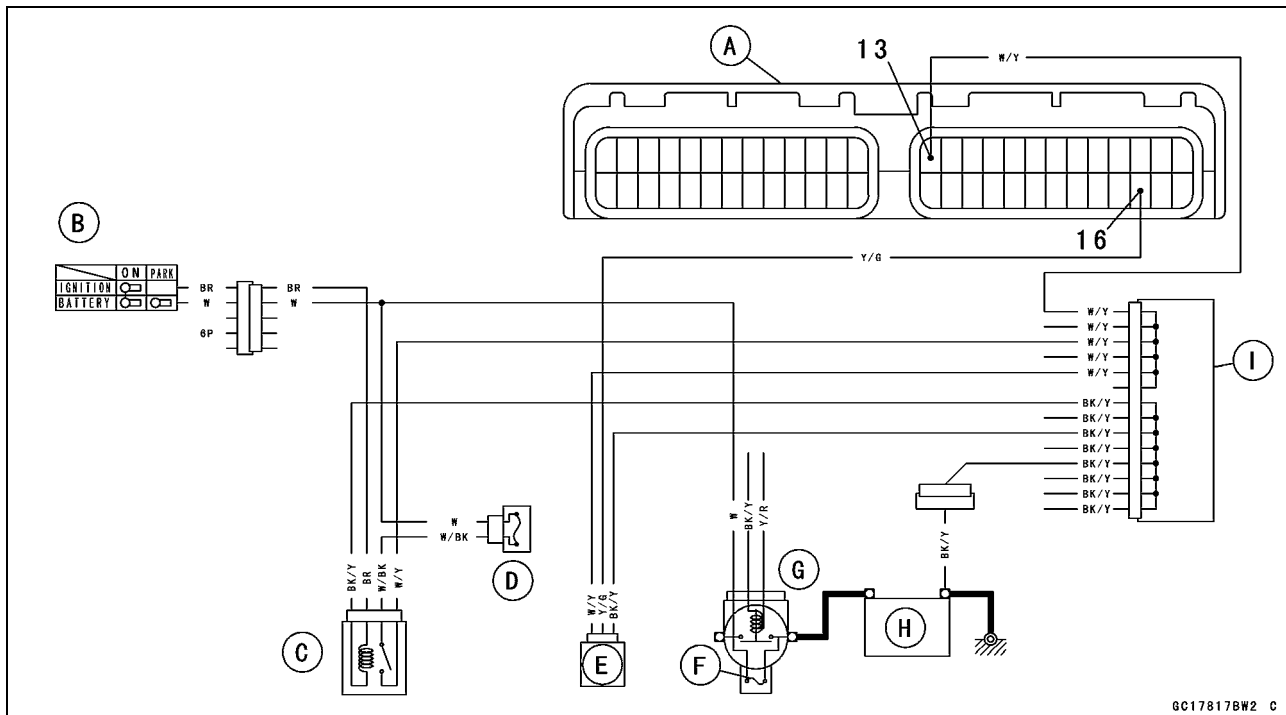


GC17126BS2 C

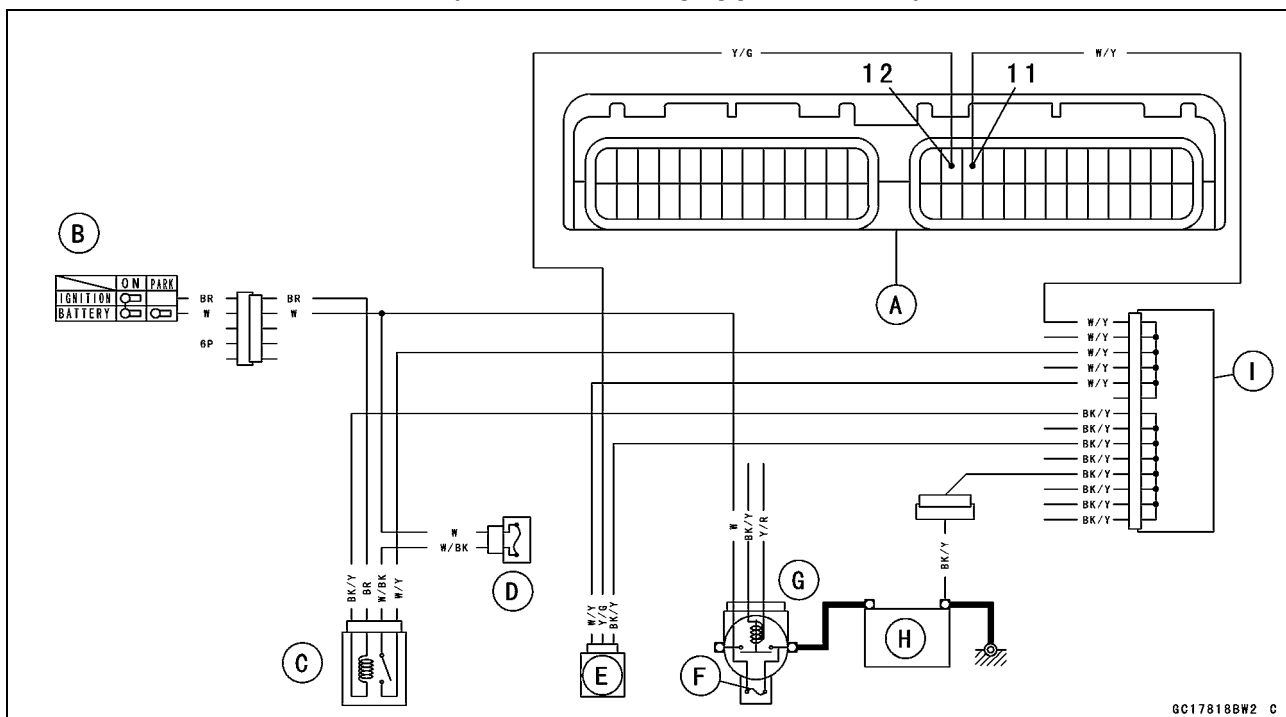
# 3-68 FUEL SYSTEM (DFI)

## Vehicle-down Sensor (Service Code 31)

### Vehicle-down Sensor Circuit



### Vehicle-down Sensor Circuit (Immobilizer Equipped Models)



- A. ECU
- B. Ignition Switch
- C. ECU Main Relay
- D. ECU Main Fuse 15 A
- E. Vehicle-down Sensor
- F. Main Fuse 30 A
- G. Starter Relay
- H. Battery 12 V 8 Ah
- I. Joint Connector B



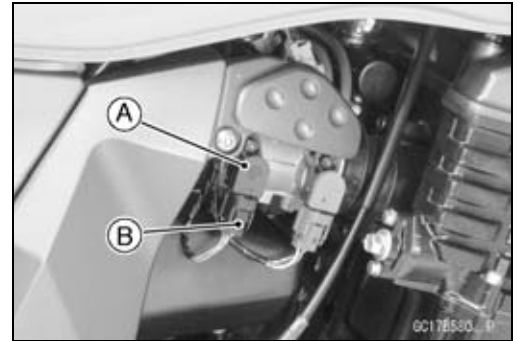
## Subthrottle Sensor (Service Code 32)

### Subthrottle Sensor Removal/Adjustment

#### CAUTION

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

Subthrottle Sensor Connector (Black) [B]



### Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Disconnect the subthrottle sensor (black) connector and connect the harness adapter [A] between these connectors.
- Connect a digital meter to the harness adapter lead.

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

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

#### Subthrottle Sensor Input Voltage Connections to Adapter

Meter (+) → R (sensor BL) lead

Meter (-) → BK (sensor BR/BK) lead

Standard: 4.75 ~ 5.25 V DC

- Turn the ignition switch OFF.
- ★ If the input voltage is normal, check the sensor output voltage.
- ★ If the input voltage is less than the standard, remove the ECU and check the wiring between these connectors.
- Disconnect the ECU and sensor connectors.

#### Wiring Connection

ECU Connector [A] ↔

Subthrottle Sensor Connector [B]

BL lead ( terminal 1)

BR/BK lead ( terminal 14)

ECU Connector [A] ↔

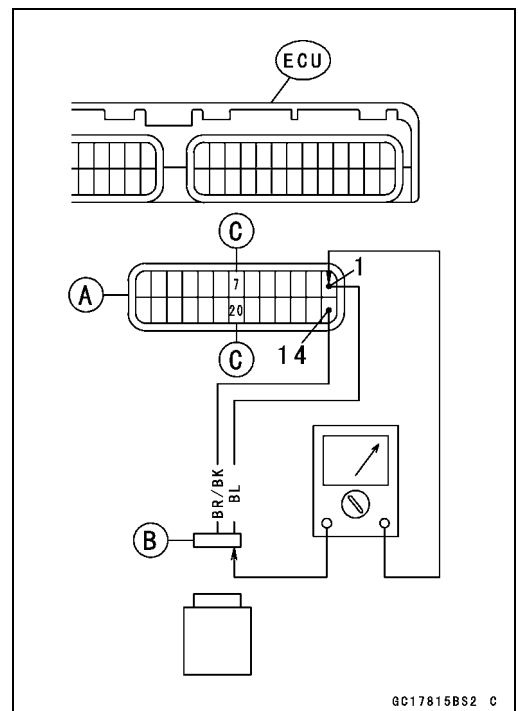
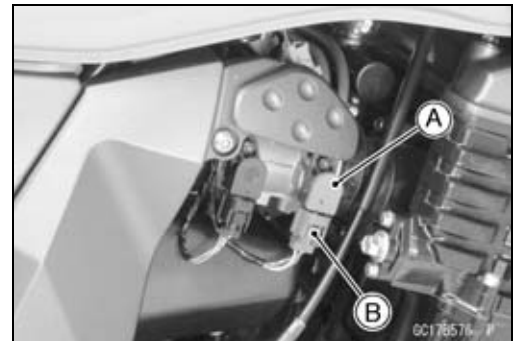
Subthrottle Sensor Connector [B]

(Immobilizer Equipped Models [C])

BL lead (ECU terminal 7)

BR/BK lead (ECU terminal 20)

- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU section).



## 3-70 FUEL SYSTEM (DFI)

### Subthrottle Sensor (Service Code 32)

#### Output Voltage Inspection

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Measure the output voltage at the subthrottle sensor in the same way as input voltage inspection. Note the following.
- Disconnect the subthrottle sensor (black) connector and (black) connect the harness adapter [A] between these connectors.

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

- Measure the output voltage of the sensor with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.
- Measure the output voltage when the subthrottle valve is fully opened or completely closed by hand.

#### Main Throttle Sensor Output Voltage

##### Connections to Adapter

Meter (+) → W (sensor BR) lead

Meter (-) → BK (sensor BR/BK) lead

##### Standard:

0.48 ~ 0.52 V DC (at idle throttle opening)

3.6 ~ 3.8 V DC (at full throttle opening)

- ★ If the output voltage is out of the standard, inspect the subthrottle sensor resistance.
- ★ If the output voltage is normal, check the wiring for continuity.

#### Wiring Connection

ECU Connector [A] ↔

Subthrottle Sensor Connector [B]

BR lead (terminal 3)

BR/BK lead (terminal 14)

ECU Connector [A] ↔

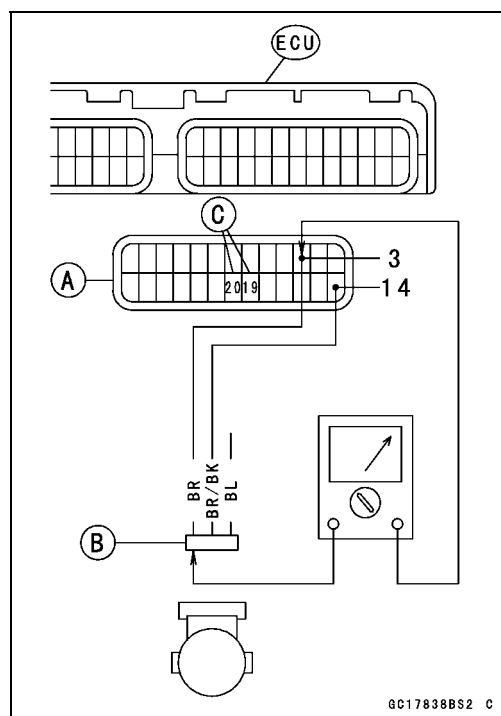
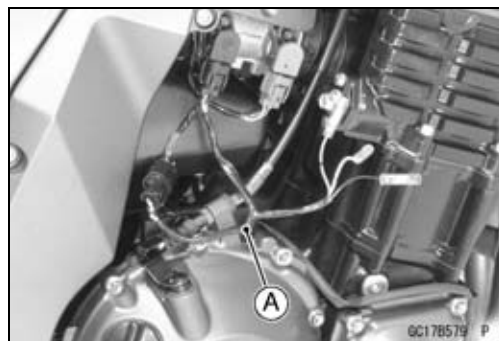
Subthrottle Sensor Connector [B]

For Immobilizer Models [C]

BR lead (terminal 19)

BR/BK lead (terminal 20)

- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU section).



**Subthrottle Sensor (Service Code 32)**

*Resistance Inspection*

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

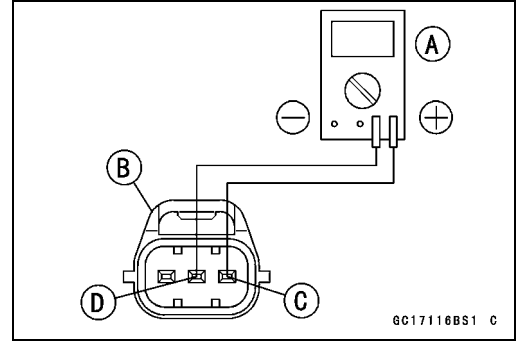
**Throttle Sensor Resistance**

**Connections:** BL lead [C] ↔ BR/BK lead [D]

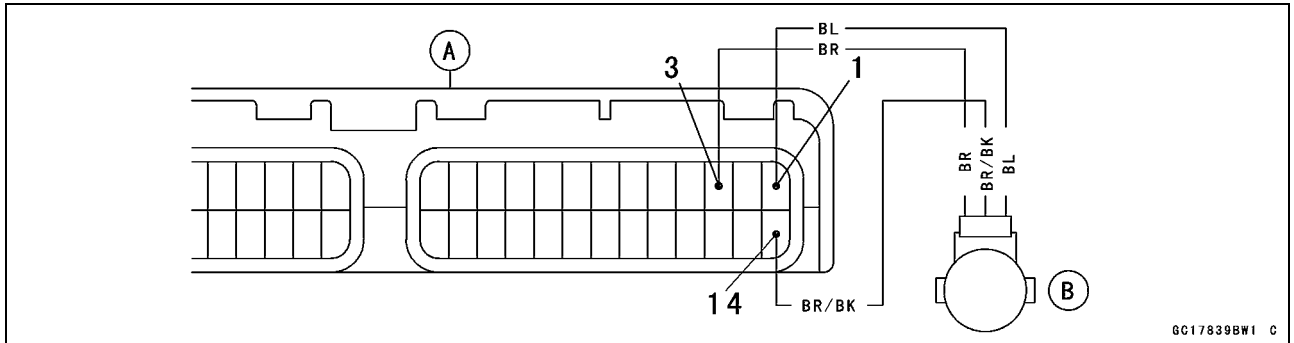
**Standard:** 4 ~ 6 kΩ

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

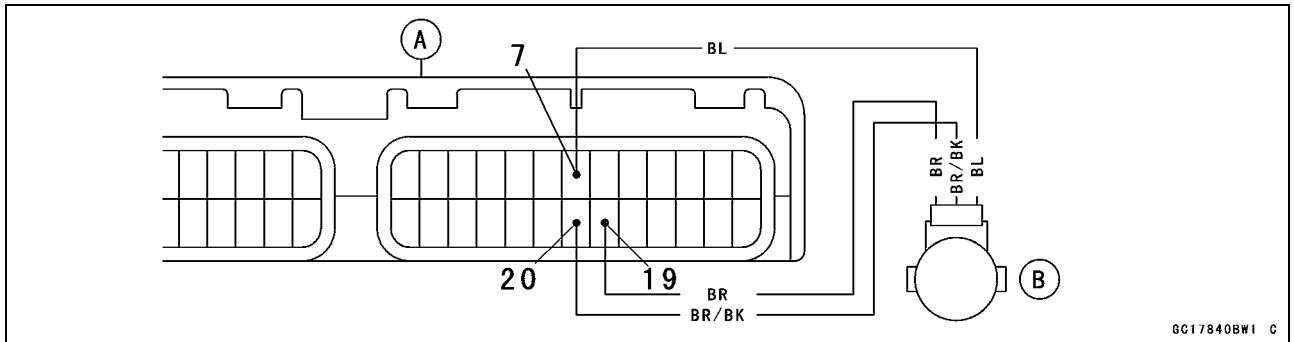
★ If the reading is within the range, but the problem still exists, replace the ECU (see this chapter).



**Subthrottle Sensor Circuit**



**Subthrottle Sensor Circuit (Immobilizer Wquipped Models)**



A. ECU

B. Subthrottle Sensor

## 3-72 FUEL SYSTEM (DFI)

### Immobilizer Amplifier (Immobilizer Equipped Models, Service Code 35)

#### Antenna Resistance Inspection

- Remove:
  - Fuel Tank (see this chapter)
- Disconnect:
  - Antenna Lead Connector [A]
- Measure the resistance of the antenna coil in the ignition switch as follows.

#### Antenna Resistance

##### Connections to Antenna

Meter → Black Lead

Meter → Black Lead

Standard: About 0.6 ~ 0.9 Ω

- ★ If the resistance is out of the standard range, replace the ignition switch.

#### Amplifier Input Voltage Inspection

#### NOTE

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove:
  - Right Side Cover (see Frame chapter)
  - Amplifier [A]

- Connect a digital voltmeter to the connectors, using the needle adapter set.

Special Tool - Needle Adapter Set: 57001-1457

#### Amplifier Input Voltage

##### Connections to Connectors

Meter (+) → BR/W Lead

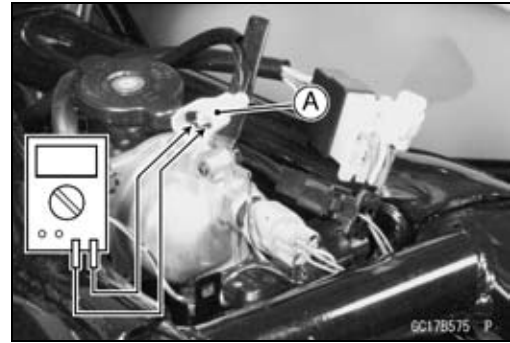
Meter (-) → BK/Y Lead

- Measure the input voltage DC with the connectors joined.
- Turn the ignition switch ON.

#### Input Voltage

Standard: Battery Voltage

- Turn the ignition Switch OFF.
- ★ If the reading is out of the range, check the wiring (see wiring diagram in next section).
- ★ If the reading and antenna resistance are good, replace the amplifier.



**Blank Key Detection (Immobilizer Equipped Models, Service Code 36)**

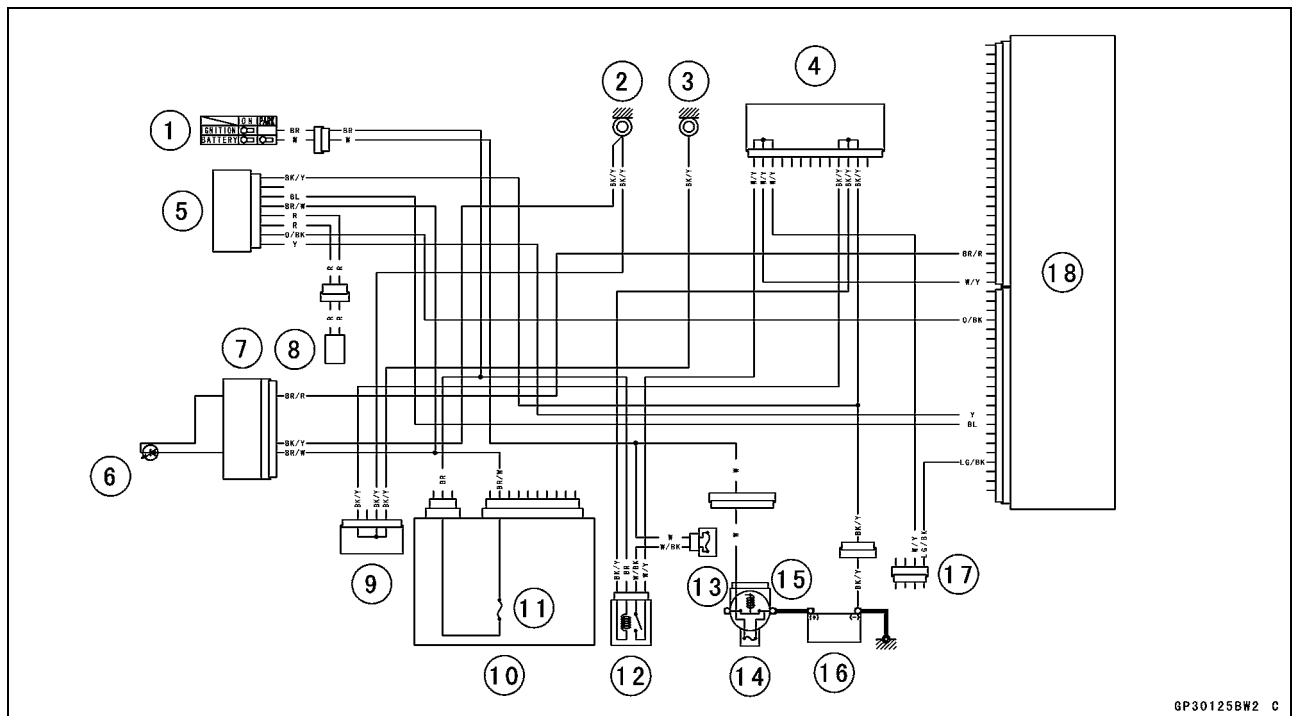
This code appears in the following conditions.

- The transponder [A] in the master and/or user key is malfunction.
- When the spare key of unregistration is used.
- When the master key is registered in the registered ECU. Therefore, the service code 36 will disappear when the above issue is solved.



**User Key Inspection**

- Register the user key correctly (see Electrical System chapter).
- ★ If the service code 36 appears again, the transponder in the key is malfunction, replace it.



- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Ignition Switch</li> <li>2. Meter Ground</li> <li>3. Frame Ground</li> <li>4. Joint Connector B</li> <li>5. Immobilizer Amplifier</li> <li>6. FI Indicator Light (LED)</li> <li>7. Meter Unit</li> <li>8. Immobilizer Antenna</li> <li>9. Joint Connector A</li> <li>10. Junction Box</li> </ul> | <ul style="list-style-type: none"> <li>11. Ignition Fuse 10 A</li> <li>12. ECU Main Relay</li> <li>13. ECU Main Fuse 15 A</li> <li>14. Main Fuse 30 A</li> <li>15. Starter Relay</li> <li>16. Battery 12 V 8 Ah</li> <li>17. Immobilizer/Kawasaki Diagnostic System Connector</li> <li>18. ECU</li> </ul> |
|--|---|

## 3-74 FUEL SYSTEM (DFI)

### Stick Coils (#1, #2, #3, #4: Service Code 51, 52, 53, 54)

- Stick Coil #1: Ignition Coil (Service Code 51)
- Stick Coil #2: Ignition Coil (Service Code 52)
- Stick Coil #3: Ignition Coil (Service Code 53)
- Stick Coil #4: Ignition Coil (Service Code 54)

#### Removal/Installation

#### CAUTION

**Never drop the stick coils, especially on a hard surface. Such a shock to the stick coil can damage it.**

- See the Ignition System section in the Electrical System chapter.

#### Input Voltage Inspection

#### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the ECU (see this chapter). Do not disconnect the ECU connector.
- Connect a digital voltmeter [A] as shown, with the needle adapter set [B].
- Measure the input voltage to each primary winding of the ignition coils with the engine stopped, and with the connectors joined.
- Turn the ignition switch ON.

#### Stick Coil Input Voltage at ECU

##### Connections for Stick Coil #1

Meter (+) → BK lead (terminal 39)

Meter (-) → BK/Y lead (terminal 51)

##### Connections for Stick Coil #2

Meter (+) → BK/G lead (terminal 38)

Meter (-) → BK/Y lead (terminal 51)

##### Connections for Stick Coil #3

Meter (+) → BK/W lead (terminal 37)

Meter (-) → BK/Y lead (terminal 51)

##### Connections for Stick Coil #4

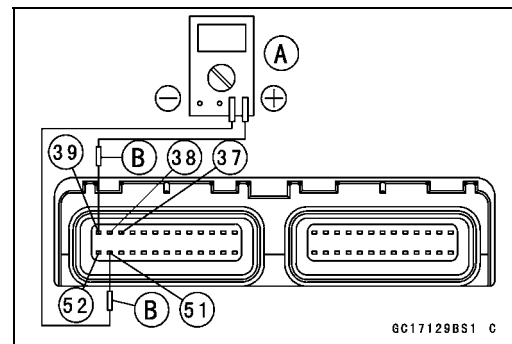
Meter (+) → BK/O lead (terminal 52)

Meter (-) → BK/Y lead (terminal 51)

#### Input Voltage at ECU

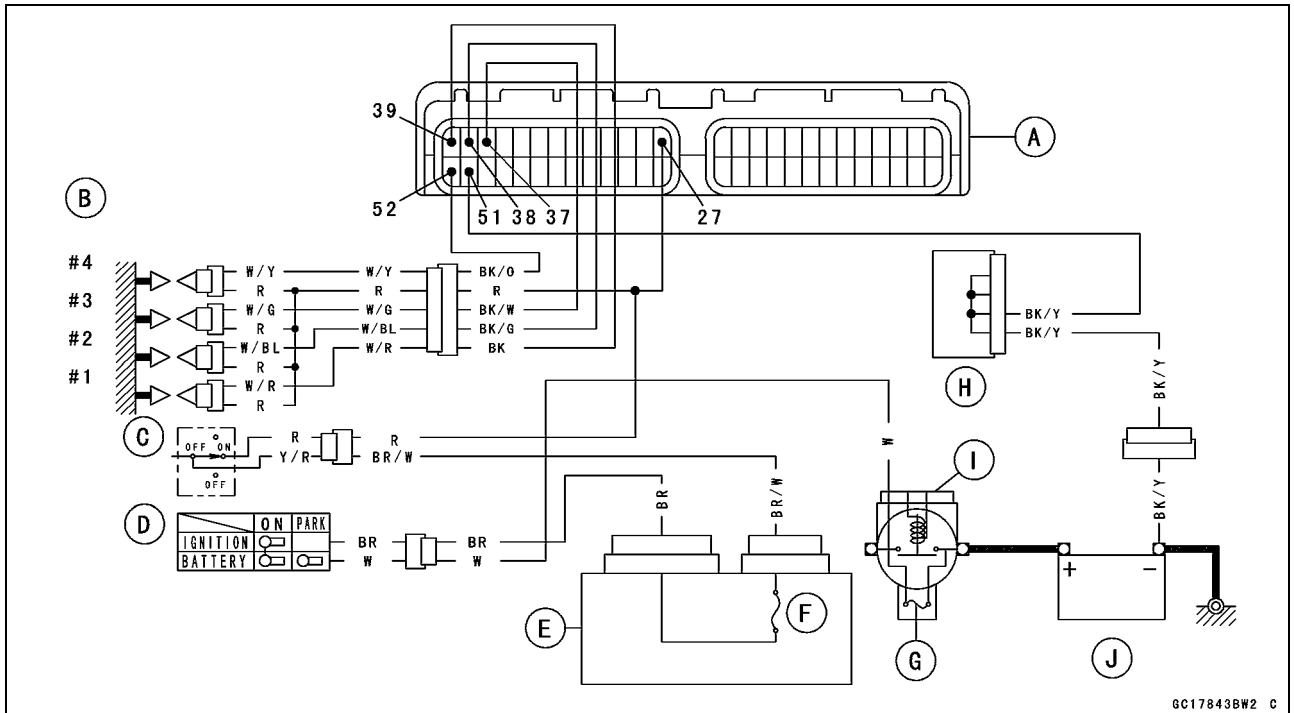
Standard: Battery Voltage (12.6 V or more)

- ★ If the reading is out of the standard, check the wiring (see next wiring diagram).
- ★ If the reading is good, the input voltage is normal. Crank the engine, and check the peak voltage of the stick coils (see Electrical System chapter) in order to check the primary coils.



Stick Coils (#1, #2, #3, #4: Service Code 51, 52, 53, 54)

Stick Coil Circuit



GC17843BW2 C

- A. ECU
- B. Stick Coils
- C. Engine Stop Switch
- D. Ignition Switch
- E. Junction Box
- F. Ignition Fuse 10 A
- G. Main Fuse 30 A
- H. Joint Connector C
- I. Starter Relay
- J. Battery 12 V 8 Ah

## 3-76 FUEL SYSTEM (DFI)

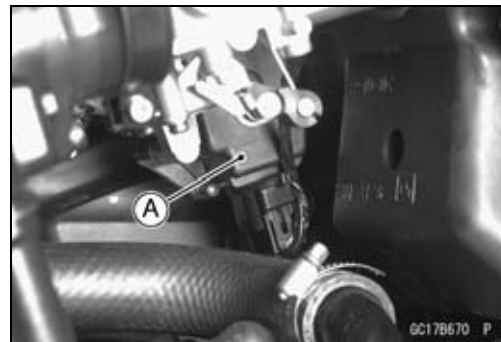
### Subthrottle Valve Actuator (Service Code 62)

#### Subthrottle Valve Actuator Removal

##### CAUTION

Do not remove the subthrottle valve actuator [A] since it has been adjusted and set with precision at the factory.

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



#### Audible Inspection

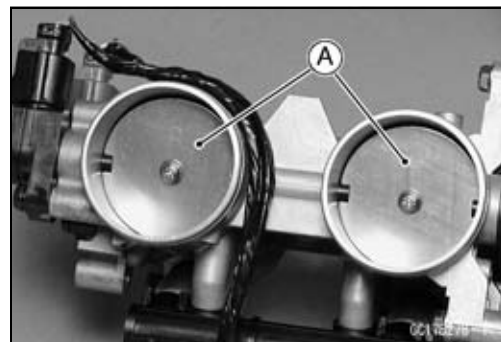
##### NOTE

○Be sure the battery is fully charged.

- Turn the ignition switch ON and ensure that the actuator valves open and close (make light sounds) several times within seconds, and then close at the idle throttle opening position.
- Turn the ignition switch OFF.
- ★ If the actuator does not work as described above, do the visual inspection.

#### Visual Inspection

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Turn the ignition switch ON.
- Check to see that all the subthrottle valves [A] open and close smoothly.
- ★ If the subthrottle valves do not operate, check the actuator internal resistance (see Resistance Inspection).



#### Resistance Inspection

- Turn the ignition switch OFF.
- Remove the throttle body assy (see Throttle Body Assy Removal).
- Disconnect the subthrottle valve actuator connector [A].



- Connect a digital meter to the subthrottle valve actuator connector [A].
- Measure the subthrottle valve actuator resistance.

##### Subthrottle Valve Actuator Resistance

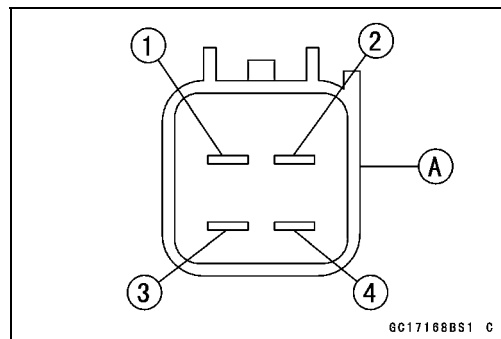
Connections: BK/BL lead [1] ↔ P/BL lead [2]

G lead [3] ↔ W/BL lead [4]

Standard: About 5 ~ 7 kΩ

Special Tool - Hand Tester: 57001-1394

- ★ If the reading is out of the range, replace the actuator along with the throttle body assy.
- ★ If the reading is within the range, check the input voltage (see Input Voltage Inspection).





**Subthrottle Valve Actuator (Service Code 62)**

*Input Voltage Inspection*

**NOTE**

○Be sure the battery is fully charged.

- Turn the ignition switch OFF.
- Remove the throttle body assy (see Throttle Body Assy Removal).
- Connect the peak voltage adapter [A] and a digital meter [B] to the connector [C], using the needle adapter set [D].

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

**Type: KEK-54-9-B**

**Brand: KOWA SEIKI**

**Needle Adapter Set: 57001-1457**

**Subthrottle Valve Actuator Input Voltage Connections to Harness Connector**

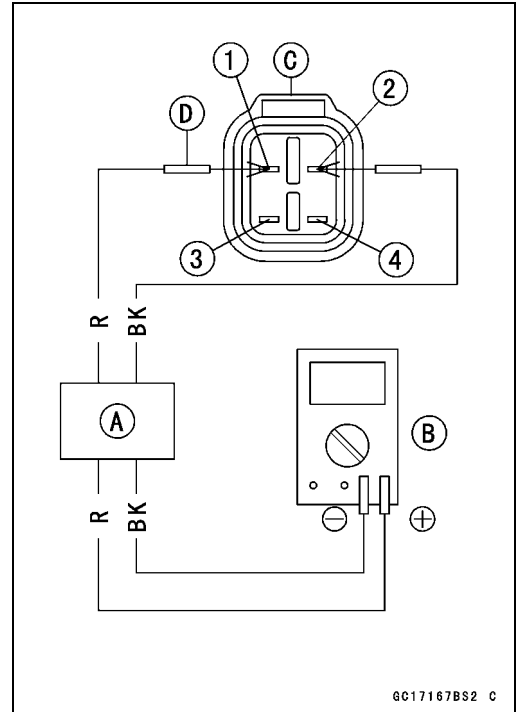
- (I) **Meter (+)** → **BK/BL lead [1]**  
**Meter (-)** → **P/BL lead [2]**
- (II) **Meter (+)** → **G lead [3]**  
**Meter (-)** → **W/BL lead [4]**

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

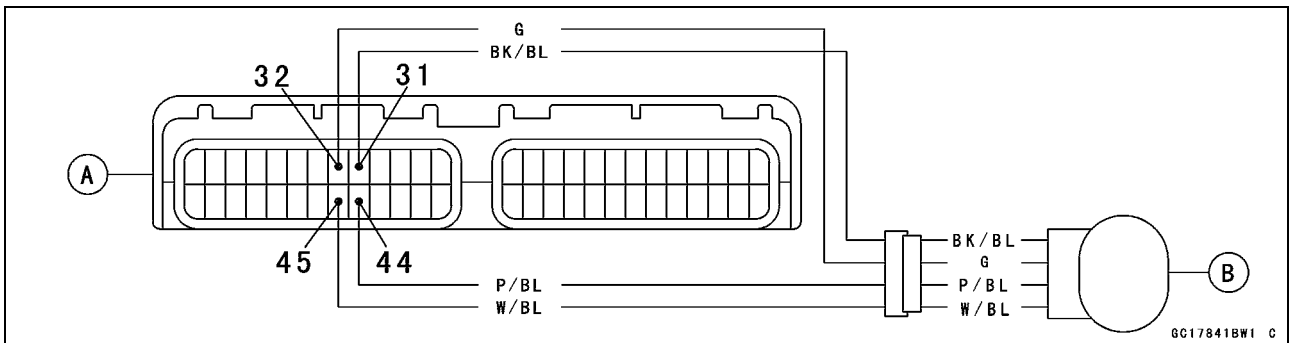
**Input Voltage at Actuator**

**Standard: about 8.5 ~ 10.5 V DC**

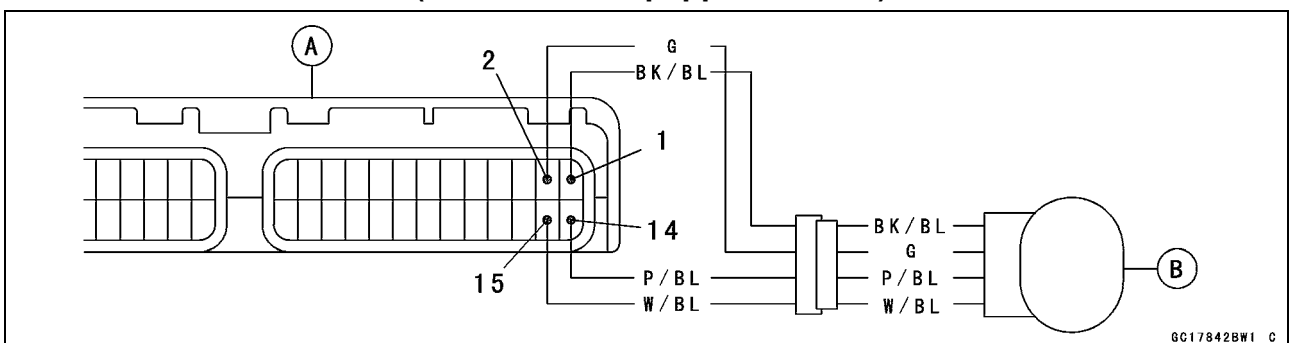
- ★ If the reading is within the standard but the actuator doesn't operate, replace it.
- ★ If the reading is out of the range, check the wiring to ECU (see wiring diagram in this section).
- ★ If the wiring is good, check the ECU for its ground and power supply (see ECU section).



**Subthrottle Sensor Circuit**



**Subthrottle Sensor Circuit (Immobilizer Equipped Models)**



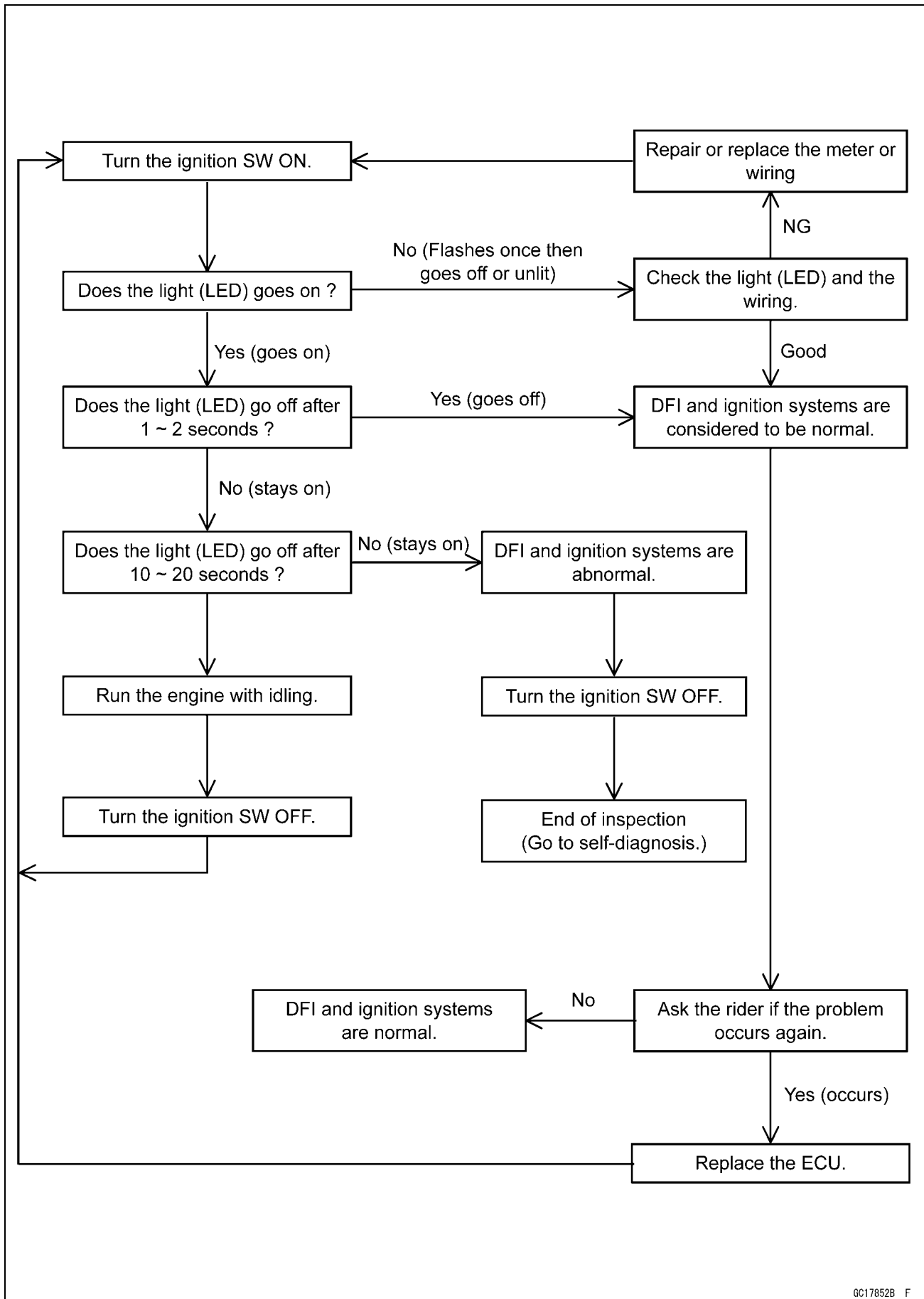
A. ECU

B. Subthrottle Valve Actuator

# 3-78 FUEL SYSTEM (DFI)

## FI Indicator Light (LED)

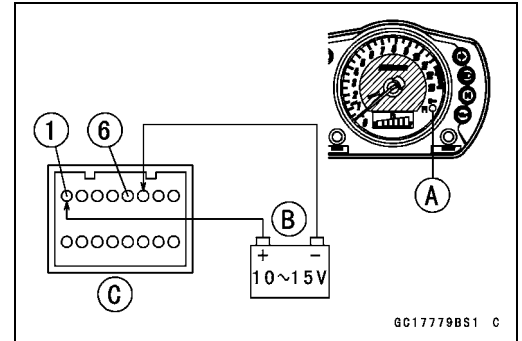
### Inspection Flow Chart



## FI Indicator Light (LED)

### FI Indicator Light (LED) Inspection

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



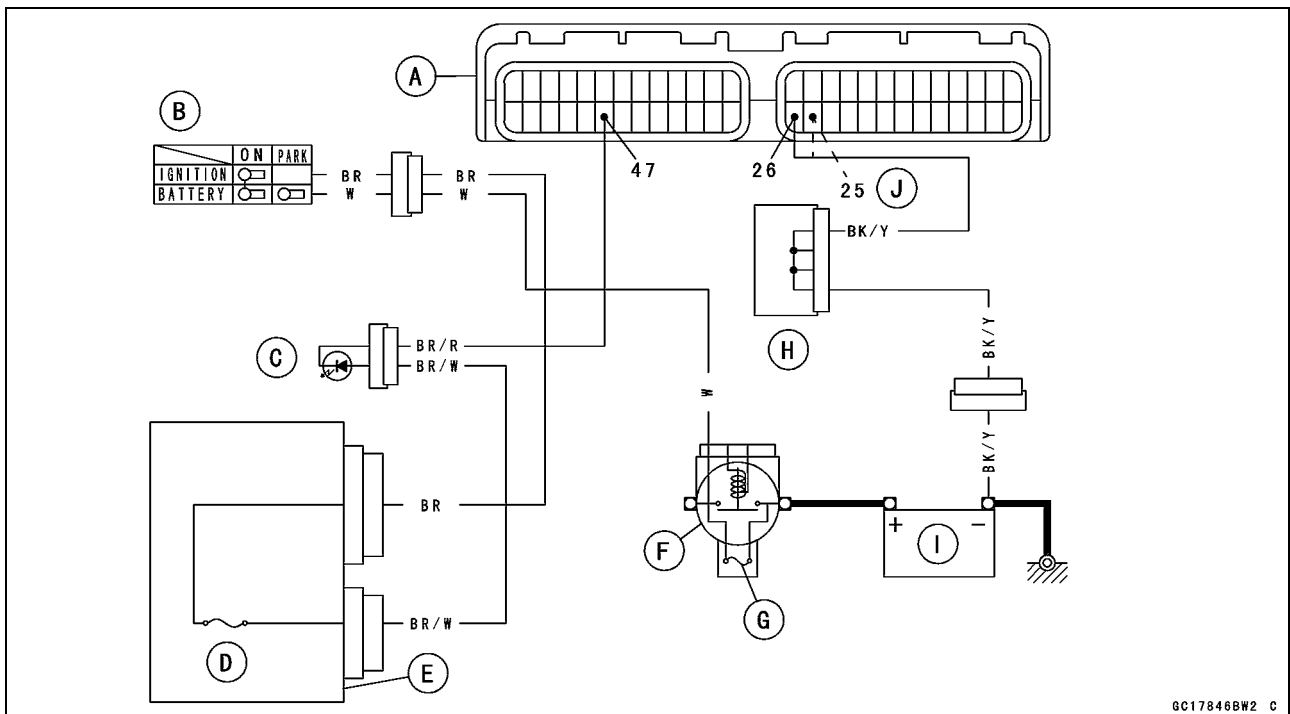
### FI Indicator Light (LED) Check

- Connector:** Meter Connector [C] (disconnected)
- Connection:** BR/W Lead Terminal [1] of the Meter → Battery (+) Terminal  
BR/R Lead Terminal [6] of the Meter → Battery (-) Terminal

**Criterion:** The light (LED) should light.

★ If the light (LED) does not go on, replace the meter unit.

### FI Indicator light (LED) Circuit



- A. ECU
- B. Ignition Switch
- C. FI Indicator LED Light
- D. Ignition Fuse 10 A
- E. Junction Box
- F. Starter Relay
- G. Main Fuse 30 A
- H. Joint Connector C
- I. Battery 12 V 8 Ah
- J. Terminal 25 (Immobilizer Equipped Models ECU Power Source Circuit Ground).

## 3-80 FUEL SYSTEM (DFI)

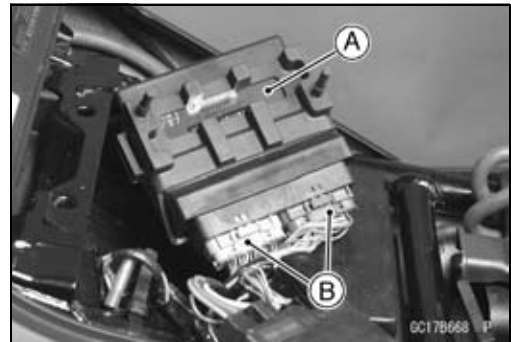
### ECU

#### CAUTION

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

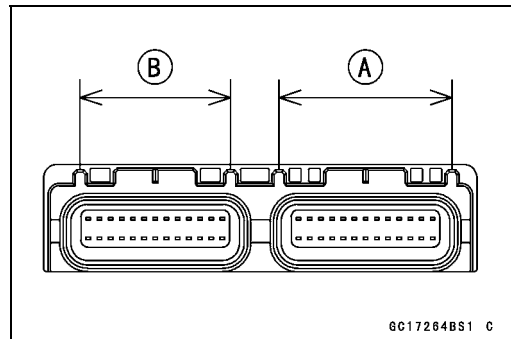
#### ECU Removal

- Remove:
  - Seat (see Frame chapter)
  - Junction Box [A]
- Take the ECU [A] out along with the harness.
- For immobilizer equipped models, refer to the ECU Removal in the Electrical System chapter.
- Disconnect the ECU lead connectors [B].



#### ECU Installation

- Connect the ECU connectors, noting the length of the locks.
  - Longer Lock [A]
  - Shorter Lock [B]
- For immobilizer equipped models, refer to the ECU Installation in the Electrical System chapter.



#### ECU Power Supply Inspection

- Visually inspect the terminals [A] of the ECU connectors.
- ★ If the connector is clogged with mud or dust, blow it off with compressed air.
- ★ Replace the main harness if the terminals of the main harness connectors are cracked, bent, or otherwise damaged.
- ★ Replace the ECU if the terminals of the ECU connectors are cracked, bent, or otherwise damaged.



**ECU**

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

Battery [B]  
Tester [C]

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

**ECU Grounding Inspection**

26, 50, or 51 (BK/Y) ↔ Battery (-) Terminal: 0 Ω  
Terminal

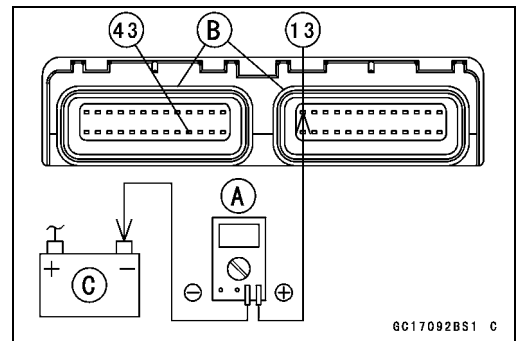
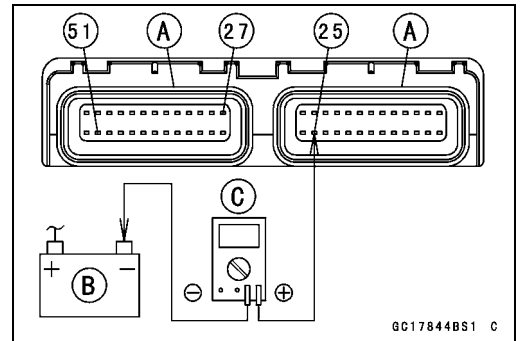
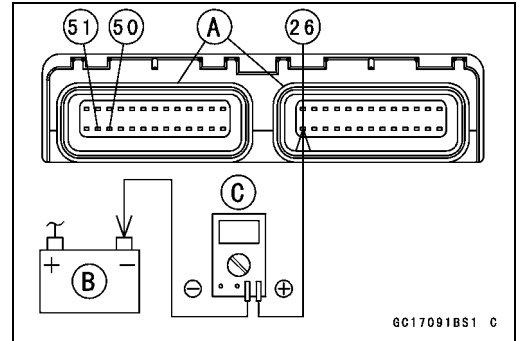
Engine Ground ↔ Battery (-) Terminal: 0 Ω

(Immobilizer Equipped Models)

25, 27, or 51 (BK/Y) ↔ Battery (-) Terminal: 0 Ω

Engine Ground ↔ Battery (-) Terminal: 0 Ω

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



- Check the ECU power source voltage with a digital meter [A].

- Position the terminal in accordance with terminal numbers of ECU connectors [B] in this chapter figure.

Battery [C]

**ECU Power Source Inspection**

**Meter Connections:**

Between Terminal 13 (W/Y) and Battery (-) Terminal

Between Terminal 43 (W/BK) and Battery (-) Terminal

**Ignition Switch OFF:**

Terminal 13 (W/Y): 0 V

Terminal 43 (W/BK): Battery Voltage (12.6 V or more)

**Ignition Switch ON:**

Both: Battery Voltage (12.6 V or more)

**Meter Connections (Immobilizer Equipped Models):**

Between Terminal 11 (W/Y) and Battery (-) Terminal

Between Terminal 43 (W/BK) and Battery (-) Terminal

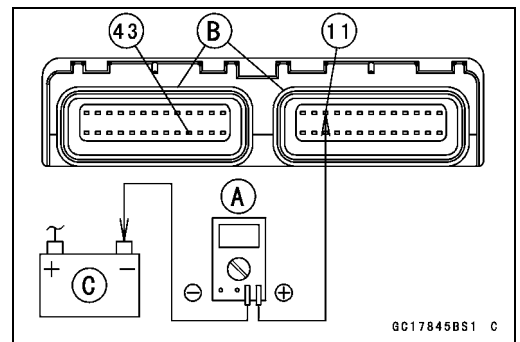
**Ignition Switch OFF:**

Terminal 11 (W/Y): 0 V,

Terminal 43 (W/BK): (Battery Voltage 12.6 V or more)

**Ignition Switch ON:**

Both: Battery Voltage (12.6 V or more)



- ★ If the meter does not read as specified, check the following:

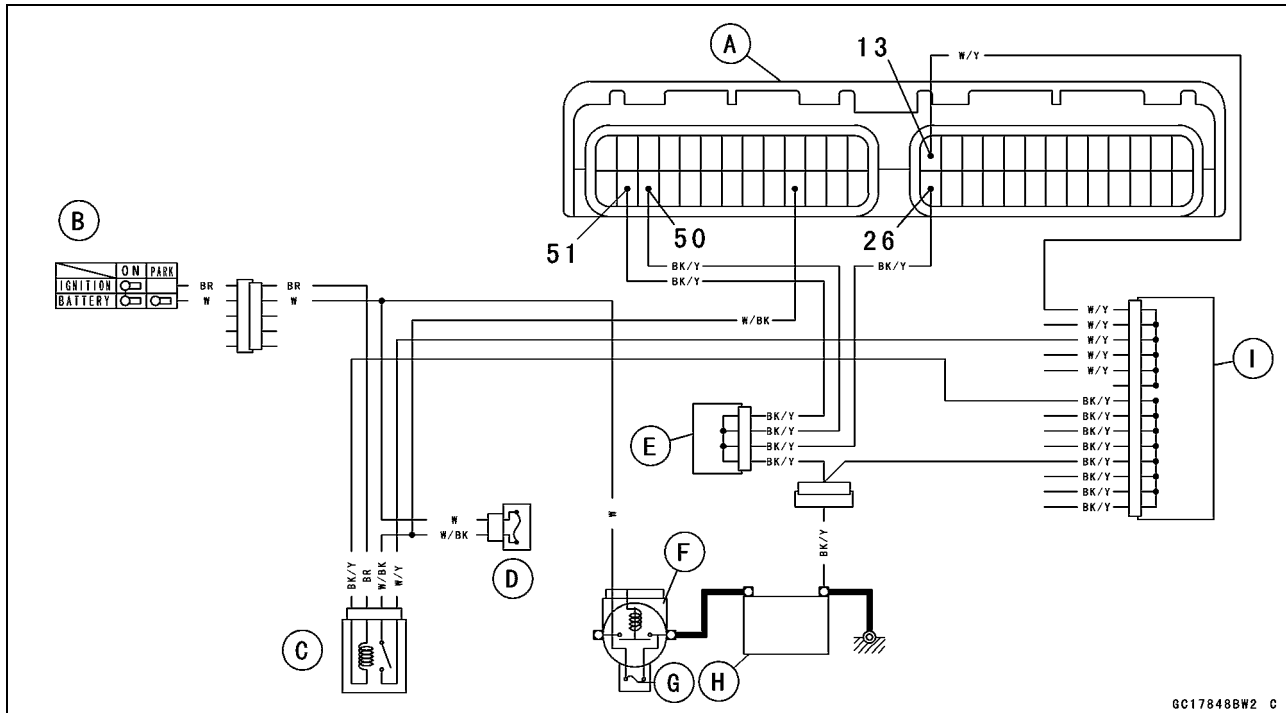
- Main Fuse 30 A (see Electrical System chapter)
- ECU Fuse 15 A (see DFI Power Source section)
- ECU Main Relay (see DFI Power Source section)
- Power Source Wiring (see wiring diagram below)

- ★ If the inspection checks good, the ECU is damaged. Replace the ECU. The ECU itself cannot be checked or serviced.

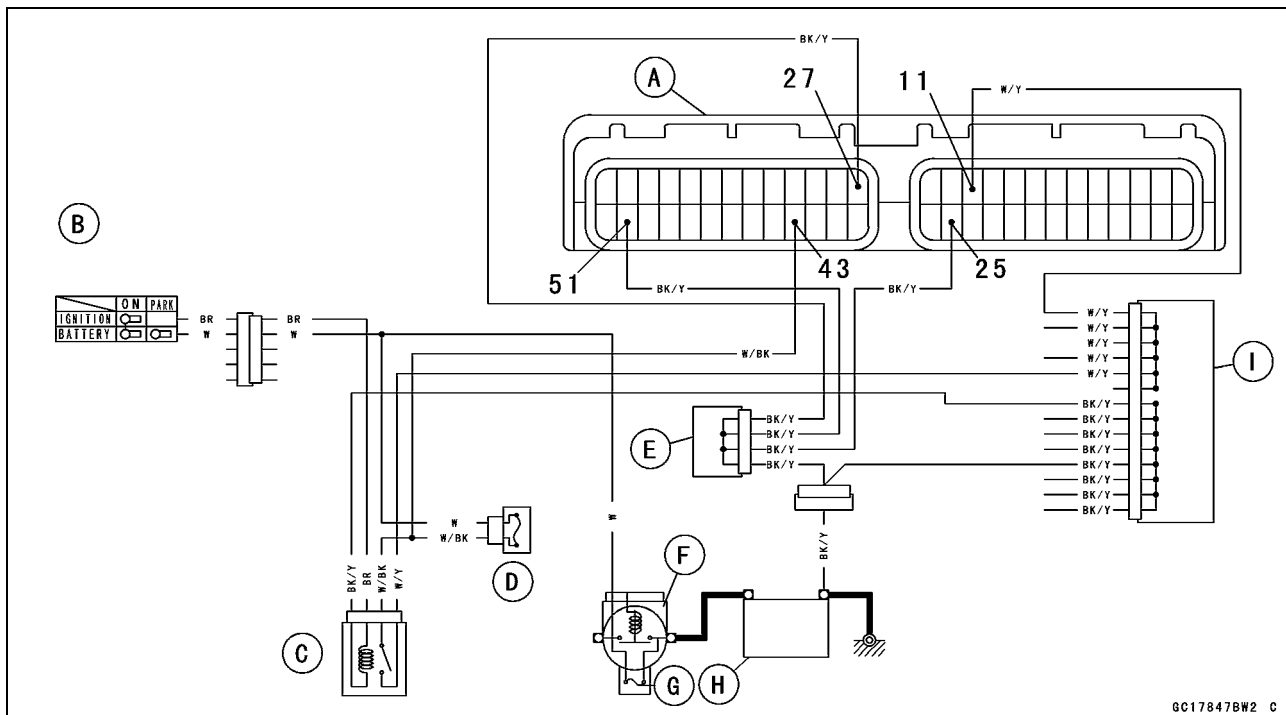
# 3-82 FUEL SYSTEM (DFI)

## ECU

### ECU Power Source Circuit



### ECU Power Source Circuit (Immobilizer Equipped Models)



- A. ECU
- B. Ignition Switch
- C. ECU Main Relay

- D. ECU Main Fuse 15 A
- E. Joint Connector C
- F. Starter Relay

- G. Main Fuse 30 A
- H. Battery 12 V 8 Ah
- I. Joint Connector B

**DFI Power Source**

*ECU Fuse Removal*

- Refer to the Electrical System chapter for the ECU fuse removal.

*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 Electrical System chapter for the ECU fuse installation.

*ECU Fuse Inspection*

- Refer to the Electrical System chapter for the ECU fuse inspection.

*ECU Main Relay Removal*

<b>CAUTION</b>
<b>Never drop the relay, especially on a hard surface. Such a shock to the relay can damage it.</b>

- Remove the seat cover (see Frame chapter).
- Remove the ECU main relay [A] and disconnect the connector.



*ECU Main Relay Inspection*

- Remove the ECU main relay (see above).
- Connect the hand tester [A] and one 12 V battery [B] to the relay connector [C] as shown.

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

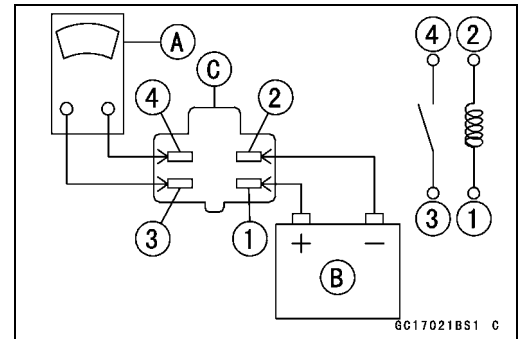
- Relay Coil Terminals [1] and [2]
- Relay Switch Terminals [3] and [4]

**Testing Relay**

**Tester Range: 1 Ω range**

- Criteria: When battery is connected → 0 Ω**
- When battery is disconnected → ∞ Ω**

★ If the relay does not work as specified, replace the relay.



## 3-84 FUEL SYSTEM (DFI)

### Fuel Line

#### Fuel Pressure Inspection

#### NOTE

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

- Remove the fuel tank (see Fuel Tank Removal).
- Be sure to place a piece of cloth around the pump outlet pipe and the delivery pipe.
- Remove the fuel pump outlet hose [A].  
Front [B]

#### ⚠ WARNING

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

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

**Special Tools** - Oil Pressure Gauge, 5 kgf/cm<sup>2</sup>: 57001-125  
Fuel Pressure Gauge Adapter: 57001-1593  
Fuel Hose: 57001-1607

#### ⚠ WARNING

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

- Temporarily, install the fuel tank [E].  
Clamps [F]
- Turn the ignition switch ON. The fuel pump will turn for 3 seconds, and then stop.

#### CAUTION

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

- Measure the fuel pressure with the engine stopped.

#### Fuel Pressure

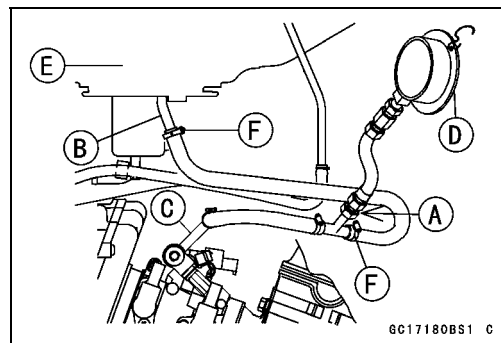
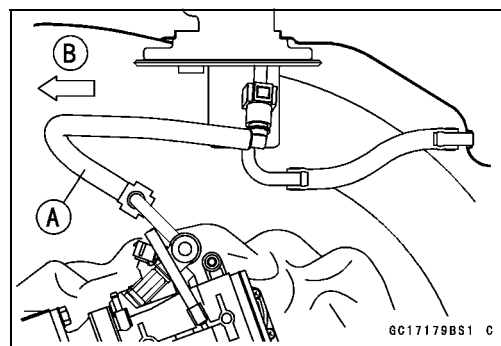
Right after Ignition Switch ON, with pump running:

Standard: 310 kPa (3.2 kgf/cm<sup>2</sup>, 44 psi)

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

Standard: 290 kPa (3.0 kgf/cm<sup>2</sup>, 43 psi) (residual fuel pressure)

The system should hold the residual pressure about 30 seconds.





## Fuel Line

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

### Fuel Pressure (Idling)

Standard: 310 kPa (3.2 kgf/cm<sup>2</sup>, 46 psi)

### NOTE

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

- ★ If the fuel pressure is normal, the fuel circulation system (fuel pump, pressure regulator, and fuel passage) is no faults. Check the DFI electronic control system (injectors, sensors, crankshaft sensor, and ECU).
- ★ If the fuel pressure is much lower than specified, check the following:
  - Fuel Pump Inlet Hose Clogging
  - Fuel Line Leakage
  - Fuel Pump Operation (check the sound of the pump)
  - Amount of Fuel Flow (see Fuel Flow Rate Inspection)
- ★ If the fuel pressure is much higher than specified, check the following:
  - Delivery Pipe Clogging
  - Injector Clogging
- Remove the fuel pressure gauge and adapter.
- Install the fuel tank (see Fuel Tank Installation).

### Fuel Flow Rate Inspection

### NOTE

○ *Be sure the battery is fully charged.*

### WARNING

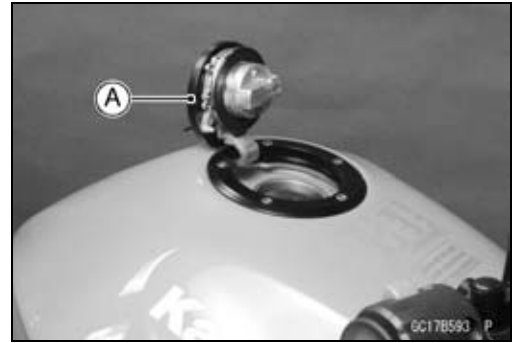
**Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch OFF. Be prepared for fuel spillage; any spilled fuel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

- Turn the ignition switch, and engine stop switch OFF.
- Wait until the engine cools down.
- Prepare a plastic hose of the inside diameter 7.5 mm (0.30 in.) and a measuring cylinder.
- Remove the fuel tank bolt (see Fuel Tank Removal).

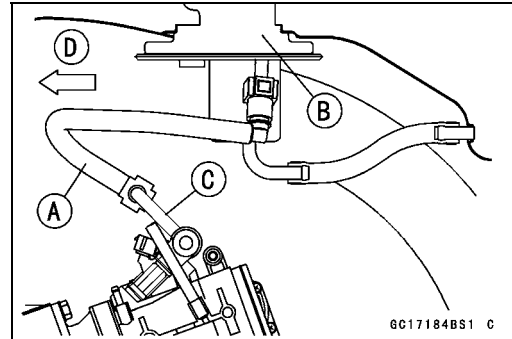
## 3-86 FUEL SYSTEM (DFI)

### Fuel Line

- Open the fuel tank cap [A] to lower the pressure in the tank.



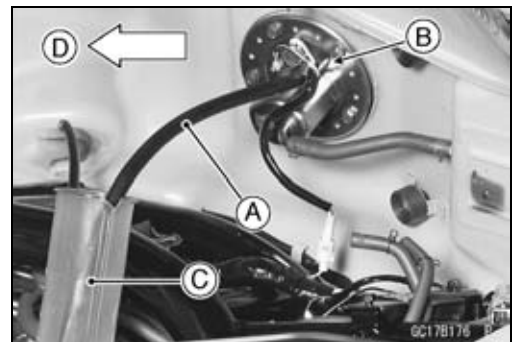
- Be sure to place a piece of cloth around the fuel pump outlet hose.
- Remove the fuel pump outlet hose [A] from the fuel pump [B] and the delivery pipe [C] (see Fuel Pump Removal).  
Front [D]



#### **⚠ WARNING**

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

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



#### **⚠ WARNING**

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

- Temporarily install the fuel tank and close the fuel tank cap.
- With the engine stopped, turn the ignition switch ON. The fuel pump should operate for 3 seconds, and then should stop. Repeat this several times until the plastic hose is filled with fuel.

#### **CAUTION**

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

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

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

**Standard: 67 mL or more for 3 seconds**

- ★ If the fuel flow is much less than the specified, check the battery condition (see Electrical System chapter). If the battery is good, replace the fuel pump.
- After inspection, install the fuel tank. (see Fuel Tank Installation).
- Start the engine and check for fuel leakage.

## Fuel Pump

### Fuel Pump Removal

#### CAUTION

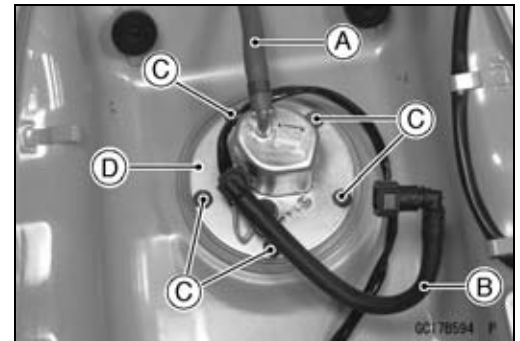
Never drop the fuel pump, especially on a hard surface. Such a shock to the pump can damage it.

#### ⚠ WARNING

Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch OFF. Disconnect the battery (-) terminal.

To make fuel spillage minimum, draw the fuel out from the fuel tank when the engine is cold. Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately.

- Draw the fuel out from the fuel tank with a commercially available electric pump.
- Remove the fuel tank (see 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:
  - Fuel Pump Inlet Hose [A]
  - Fuel Hose [B]
  - Fuel Pump Bolts [C]
  - Fuel Pump [D] and gasket
- Discard the fuel pump gasket.



#### CAUTION

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

### Fuel Pump Installation

- Remove dirt or dust from the fuel pump [A] by lightly applying compressed air.



## 3-88 FUEL SYSTEM (DFI)

### Fuel Pump

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



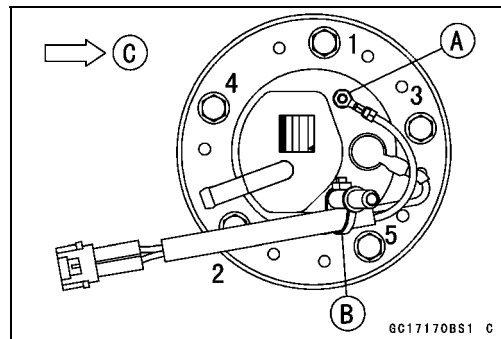
- Check that the fuel pump (-) terminal [A] and band [B] are in place.

Front [C]

- Apply a non-permanent locking agent to the threads of the fuel pump bolts.
- Tighten the fuel pump bolts to a snug fit, following the tightening sequence shown.
- Following the tightening sequence, tighten the fuel pump bolts to the specified torque.

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

- Tighten the pump bolts again to check the tightness in the order shown.



#### Operation Inspection

##### NOTE

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

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

#### Operating Voltage Inspection

##### NOTE

- Be sure the battery is fully charged.
- Turn the ignition switch OFF.
- Remove the frame cover bolts and frame cover.

## Fuel Pump

- Connect the hand tester (25 V DC) to the fuel pump connector [A] with needle adapter set.

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

**Needle Adapter Set: 57001-1457**

- Measure the operating voltage with the engine stopped, and with the connector joined.
- Turn the ignition switch ON.
- The tester needle should indicate battery voltage for 3 seconds, and then 0 V.

### Pump Operating Voltage at Pump

#### Connections to Pump Connectors

Tester (+) → Y/R Lead

Tester (-) → BK/W Lead

#### Operating Voltage at Pump Connector

**Standard: Battery Voltage (12.6 V or more) for 3 seconds, and then 0 V.**

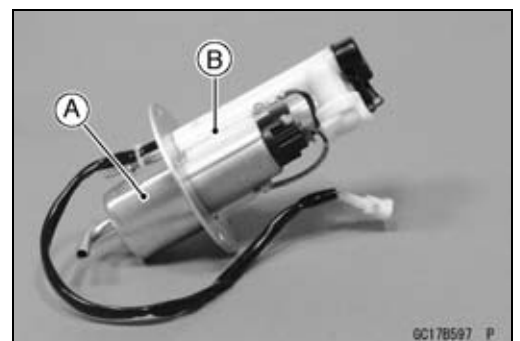
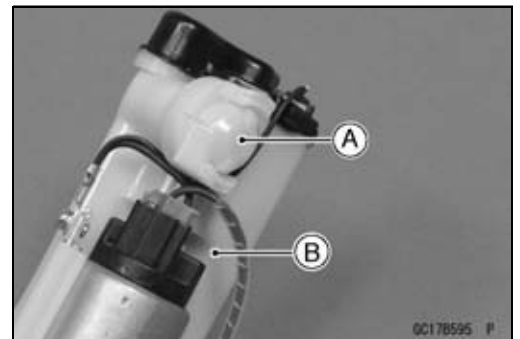
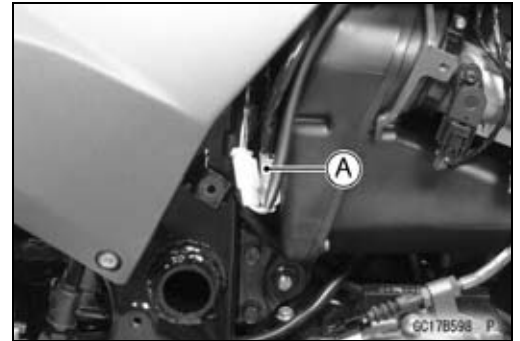
- ★ If the reading stays on battery voltage, and never shows 0 V. Check the ECU and fuel pump relay.
- ★ If the voltage is in specification, but the pump doesn't work, replace the pump.
- ★ If there is still no battery voltage, check the pump relay (see this chapter).

### Pressure Regulator Removal

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

### Pump Screen, Fuel Filter Cleaning

- The pump screen [A] and fuel filter [B] are built into the pump and cannot be cleaned or checked.
- ★ If the pump screen or fuel filter is suspected of clogging or being damaged, replace it with the fuel pump as a set.



## 3-90 FUEL SYSTEM (DFI)

### Fuel Pump Relay

#### Fuel Pump Relay Removal

#### CAUTION

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

- Remove the seat cover (see Frame chapter).
- Remove the fuel pump relay [A] from the tongue of the storage compartment.
- Disconnect the connector.



#### Fuel Pump Relay Inspection

- Remove the fuel pump relay (see above).
- Connect the hand tester [A] and one 12 V battery [B] to the relay connector [C] as shown.

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

Relay Coil Terminals [1] and [2]

Relay Switch Terminals [3] and [4]

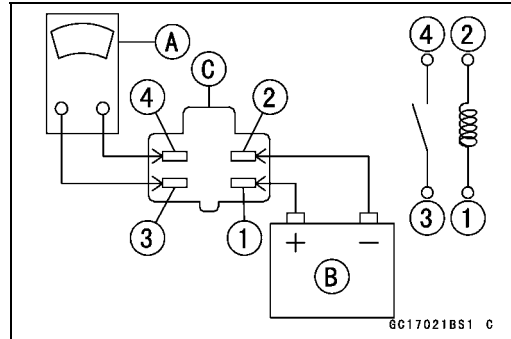
#### Testing Relay

Tester range: 1  $\Omega$  range

Criteria: When battery is connected  $\rightarrow 0 \Omega$

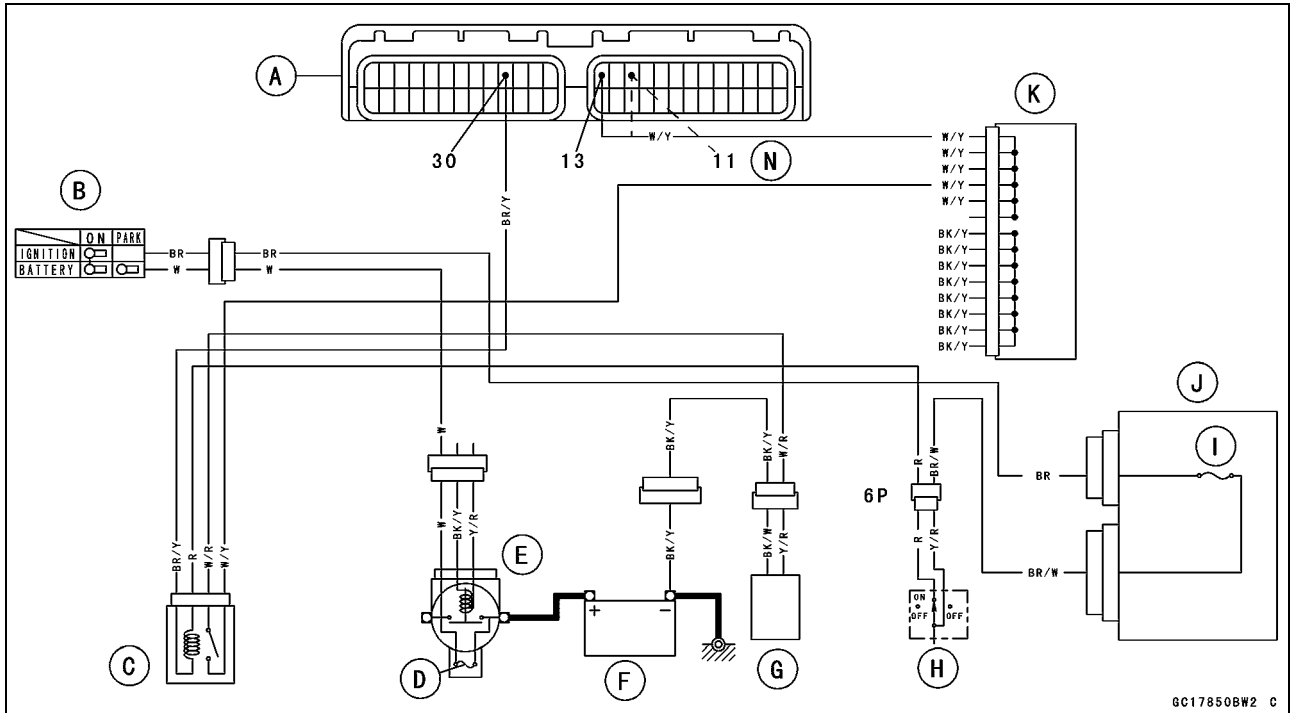
When battery is disconnected  $\rightarrow \infty \Omega$

★ If the relay does not work as specified, replace the relay.



Fuel Pump Relay

Fuel Pump Circuit



- A. ECU
- B. Ignition Switch
- C. Fuel Pump Relay (for fuel pump and injectors)
- D. Main Fuse 30 A
- E. Starter Relay
- F. Battery 12 V 8 Ah
- G. Fuel Pump
- H. Engine Stop Switch
- I. Ignition Fuse 10 A
- J. Junction Box
- K. Joint Connector B
- N. Terminal 11 (immobilizer Equipped Models power Supply).

## 3-92 FUEL SYSTEM (DFI)

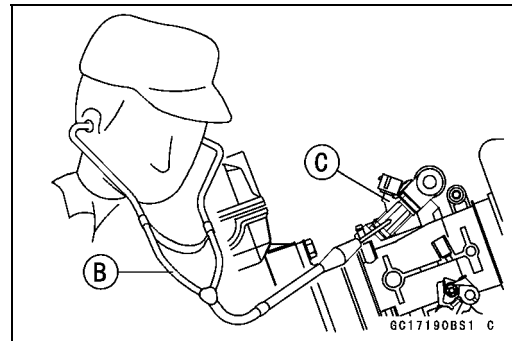
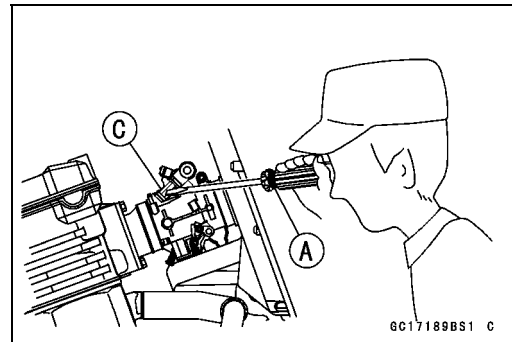
### Fuel Injectors

#### Removal/Installation

- Refer to the Throttle Body Assy Disassembly/Assembly.

#### Audible Inspection

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

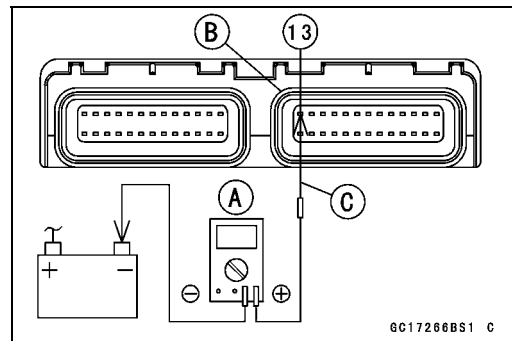


#### Power Source Voltage Inspection

- Remove the ECU (see ECU section).
- Do not disconnect the ECU connector.
- Connect a digital meter [A] to the ECU connector [B], using the needle adapter [C].

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

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



#### Injector Power Source Voltage at ECU

**Connections: Meter (+) → W/Y (terminal 13)**

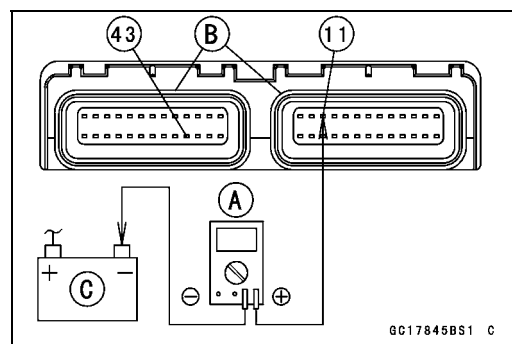
**Meter (-) → Battery (-) Terminal**

**Connections (Immobilizer Equipped Models)**

**Meter (+) → W/Y (terminal 11)**

**Meter (-) → Battery (-) Terminal**

**Service Limit: Voltage (12.6 V or more)**



- ★ If the meter doesn't read as specified, check the following.
  - Main Fuse 30 A (see Electrical System chapter)
  - Fuel Pump Relay (see DFI Power Source section)
  - Power Source Wiring (see Wiring Diagram below)
- To check the W/R leads between the injector connector and the fuel pump relay, remove the fuel tank (see Fuel Tank Removal) and the seat cover (see Frame chapter).
- ★ If the power source voltage is normal, check the output voltage of the injectors.



## Fuel Injectors

### Output Voltage Inspection

- Turn the ignition switch OFF.
- Remove the ECU (see ECU section).
- Connect a digital voltmeter [A] to the ECU connector [B] with the needle adapter set [C].

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

### Injector Output Voltage

#### Connections to Injector #1

Meter (+) → BL/R lead (terminal 36)

Meter (-) → Battery (-) Terminal

#### Connections to Injector #2

Meter (+) → BL/G lead (terminal 35)

Meter (-) → Battery (-) Terminal

#### Connections to Injector #3

Meter (+) → BL/BK lead (terminal 49)

Meter (-) → Battery (-) Terminal

#### Connections to Injector #4

Meter (+) → BL/Y lead (terminal 48)

Meter (-) → Battery (-) Terminal

- Turn the ignition switch ON.

### Output Voltage at Injector Connector

**Standard: Battery Voltage (12.6 V or more)**

★ If the output voltage is normal, perform "Injector Signal Test".

★ If the output voltage is out of the standard, turn the ignition switch OFF, remove the fuel tank, and check the injector wiring for continuity.

### Injector Wiring Inspection

#### ECU Connector

#### Injector Connectors

Terminal 36 → Injector #1 Terminal (BL/R)

Terminal 35 → Injector #2 Terminal (BL/G)

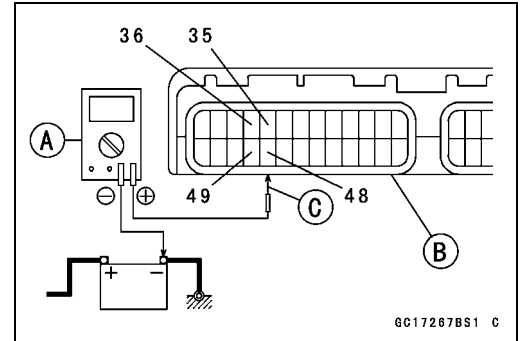
Terminal 49 → Injector #3 Terminal (BL/BK)

Terminal 48 → Injector #4 Terminal (BL/Y)

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

- Remove the needle adapter.
- Apply silicone sealant to the seals of the ECU connector for waterproofing.

**Silicone Sealant (Kawasaki Bond: 56019-120) - Seals of ECU Connectors**



## 3-94 FUEL SYSTEM (DFI)

### Fuel Injectors

#### Injector Signal Test

- Prepare two test light sets with male terminals as shown.
  - Rating of Bulb [A]: 12 V × 3 ~ 3.4 W
  - Terminal Width [B]: 1.8 mm (0.071 in.)
  - Terminal Thickness [C]: 0.8 mm (0.031 in.)

#### CAUTION

**Do not use larger terminals than specified above. A larger terminal could damage the injector main harness connector (female), leading to harness repair or replacement.**

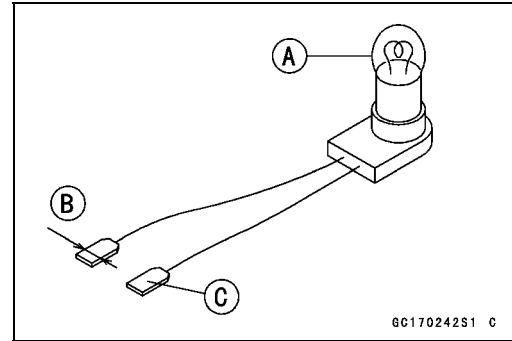
**Be sure to connect bulbs in series. The bulb works as a current limiter to protect the solenoid in the injector from excessive current.**

- Remove the fuel tank (see Fuel Tank Removal).
- Remove connectors for injector [A].
- Connect each test light set [B] to the injector sub harness connector [C].
- Turn the ignition switch ON.
- While cranking the engine with the starter motor, watch the test lights.
- ★ If the test lights flicker at regular intervals, the injector circuit in the ECU, and the wiring are good. Perform the "Injector Resistance Inspection".

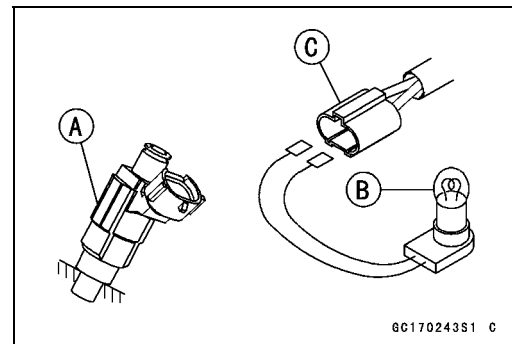
○ Injector signals can be also confirmed by connecting the hand tester (× 10 V AC) instead of the test light set to the injector main harness (female) connector. Crank the engine with the starter motor, and check to see if the hand oscillates at regular intervals.

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

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



6G170242S1 C



6G170243S1 C

## Fuel Injectors

### Injector Resistance Inspection

- Remove the fuel tank (see Fuel Tank Removal).
- Disconnect the connector from the injector [A] (see Throttle Body Assy Disassembly/Assembly).
- Measure the injector resistance with the hand tester [B].

Special Tool - Hand Tester: 57001-1394

### Injector Resistance

#### Connections to Injector

	Meter (+)	Meter (-)
#1:	W/R	BL/R Terminal
#2:	W/R	BL/G Terminal
#3:	W/R	BL/BK Terminal
#4:	W/R	BL/Y Terminal

Standard: about 11.7 ~ 12.3 Ω @20°C (68°F)

- ★ If the reading is out of the range, perform the “Injector Unit Test”.
- ★ If the reading is normal, perform the “Injector Unit Test” for confirmation.

### Injector Unit Test

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

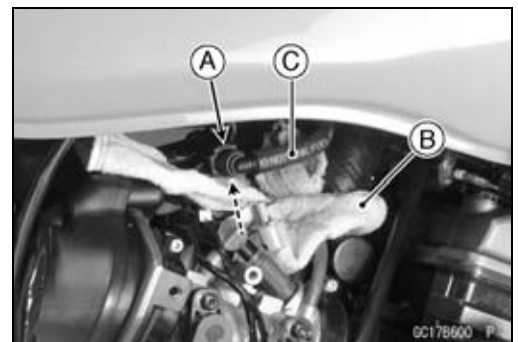
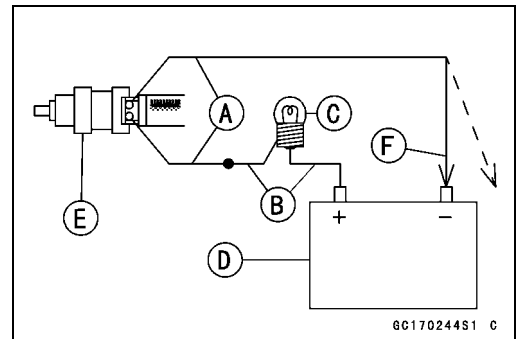
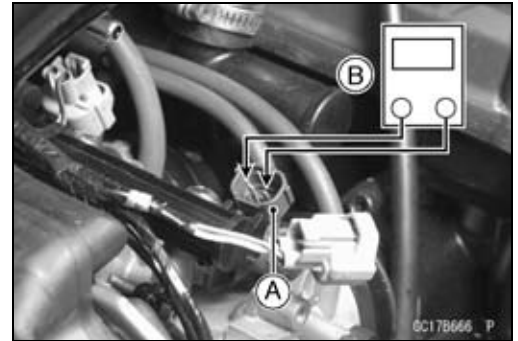
#### CAUTION

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

- Connect the test light set to the injector [E] as shown.
- Open and connect [F] the end of the lead to the battery (-) terminal repeatedly. The injector should click.
- ★ If the injector does not click, replace the injector.
- ★ If the injector clicks, check the wiring again. If the wiring is good, replace the injector (may be clogged) or ECU.

### Injector Fuel Line Inspection

- Remove:
  - Fuel Tank (see Fuel Removal in the this chapter)
- While pinching the fuel pump outlet hose joint locks [A] with fingers, pull the joint out along the delivery pipe (see Fuel Tank Removal).
- Cloth [B]
- Pump Outlet Hose Joint [C]



## 3-96 FUEL SYSTEM (DFI)

### Fuel Injectors

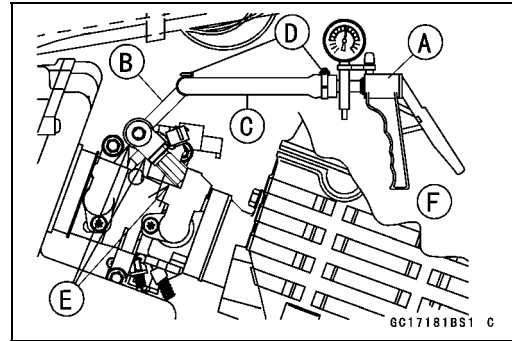
- Check the injector fuel line for leakage as follows:
  - Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with a high-pressure fuel hose [C] (both ends connected with the clamps [D]) as shown.

**Torque - Fuel Hose Clamp Screws: 1.5 N·m (0.15 kgf·m, 13 in·lb)**

- Apply soap and water solution to the areas [E] as shown.
- Watching the pressure gauge, squeeze the pump lever [F], and build up the pressure until the pressure reaches the maximum pressure.

#### Injector Fuel Line Maximum Pressure

**Standard: 300 kPa (3.06 kgf/cm<sup>2</sup>, 43 psi)**

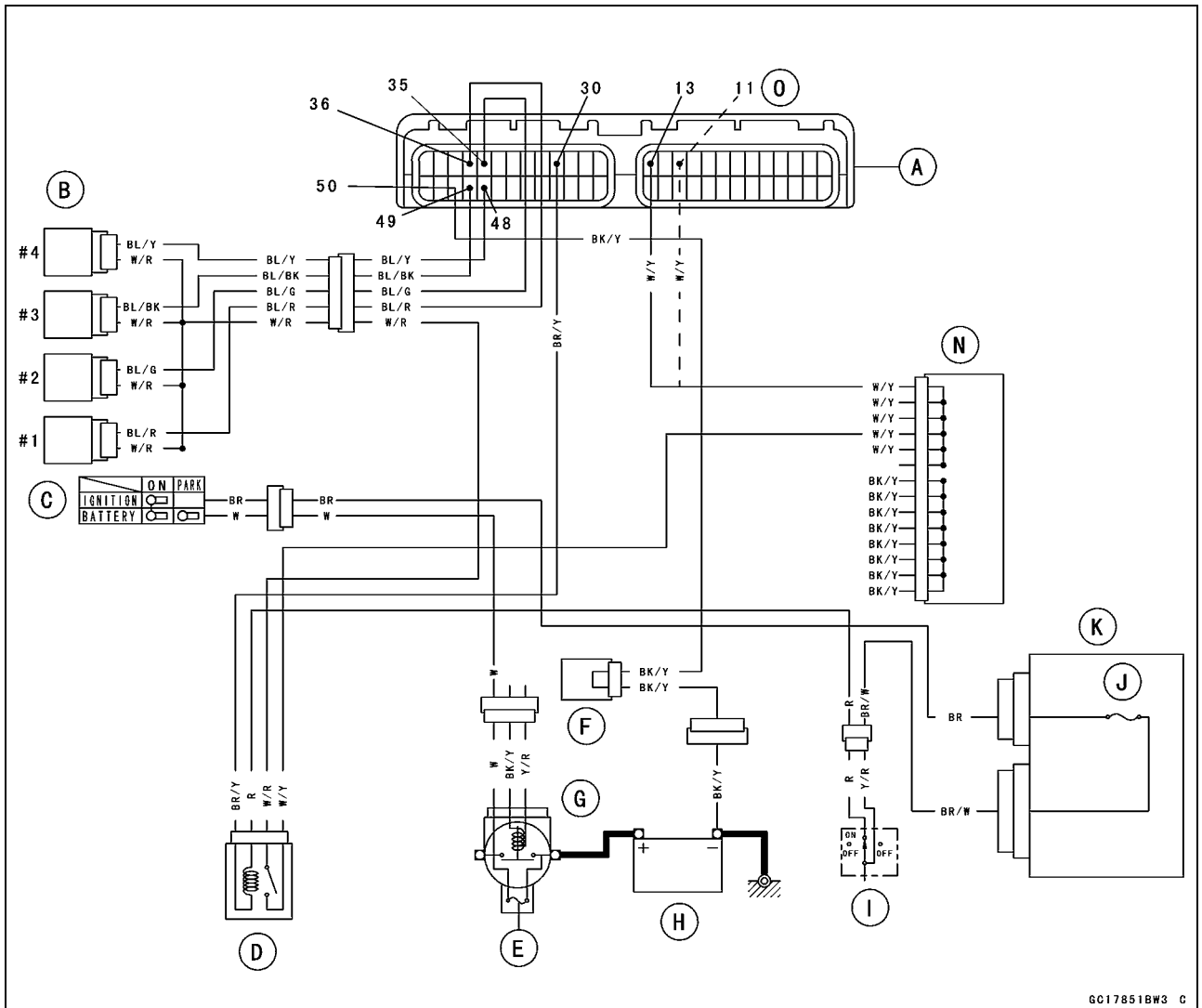


### CAUTION

**During pressure testing, do not exceed the maximum pressure for which the system is designed.**

- Watch the gauge for at least 6 seconds.
- ★ If the pressure holds steady, the system is good.
- ★ If the pressure drops at once or if bubbles are found in the area, the line is leaking. Replace the delivery pipe, injectors and related parts.
- Repeat the leak test, and check the fuel line for no leakage.
- Install the pump outlet hose (see Fuel Tank Installation).
- Run the hoses correctly (see Cable, Wire, and Hose Routing section in the Appendix chapter).

Fuel Injectors



GC17851BW3 C

- A. ECU
- B. Fuel Injectors
- C. Ignition Switch
- D. Fuel Pump Relay (for fuel pump an injectors)
- E. Main Fuse 30 A
- F. Joint Connector C
- G. Starter Relay
- H. Battery 12 V 8 Ah
- I. Engine Stop Switch
- J. Ignition Fuse 10 A
- K. Junction Box
- N. Joint Connector B
- O. Terminal 11 (Immobilizer Equipped Models Power Supply).

## 3-98 FUEL SYSTEM (DFI)

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### Throttle Grip and Cables

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#### *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 cable bracket on the throttle assy after installing the upper ends of the throttle cables in the grip.
- After installation, adjust each cable properly.

#### **⚠ WARNING**

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

#### *Cable Lubrication*

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

---

**Choke Cable**

---

*Free Play Inspection*

- Refer to the Choke Operation Inspection in the Periodic Maintenance chapter.

*Free Play Adjustment*

- Refer to the Choke Operation Inspection in the Periodic Maintenance chapter.

*Choke Cable Installation*

- Install the choke cable in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
- After installation, adjust the cable properly.

**⚠ WARNING**

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

*Cable Lubrication*

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

## 3-100 FUEL SYSTEM (DFI)

### Throttle Body Assy

#### Idle Speed Inspection

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

#### Engine Vacuum Synchronization Inspection/Adjustment

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

#### High Altitude Performance Adjustment

- Any modification is not necessary in this model since the atmospheric pressure sensor senses atmospheric pressure change due to high altitude and the ECU compensates the change.

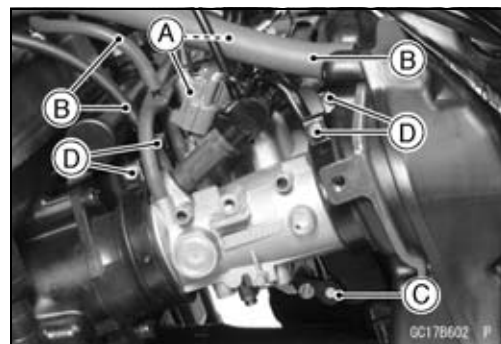
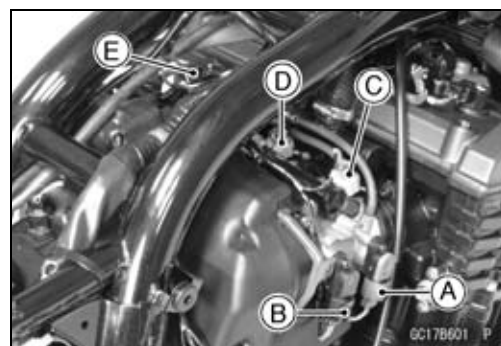
#### Throttle Body Assy Removal

### **⚠ WARNING**

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

**Be prepared for fuel spillage: any spilled fuel must be completely wiped up immediately.**

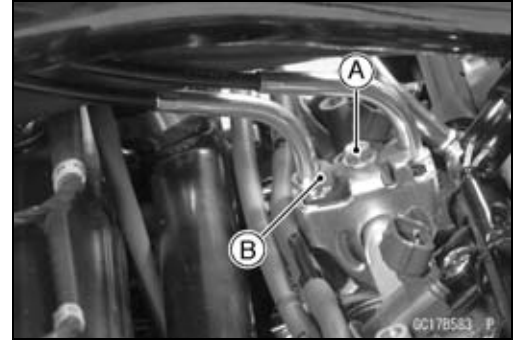
- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Left Frame Cover (see Frame chapter)
  - Left and Right Side Covers (see Frame chapter)
- Disconnect:
  - Main Throttle Sensor Connector [A]
  - Subthrottle Sensor Connector [B]
  - #4 Injector Connector [C]
  - #3 Injector Connector [D]
  - Subthrottle Sensor Actuator Connector [E]
- Disconnect:
  - #1. #2 Injector Connector [A]
- Remove the vacuum switch valve vacuum hose and vacuum hoses from the positions [B] shown.
- Remove:
  - Choke Cable Lower End [C]
- loosen:
  - Holder and Duct Clamp Bolts [D]



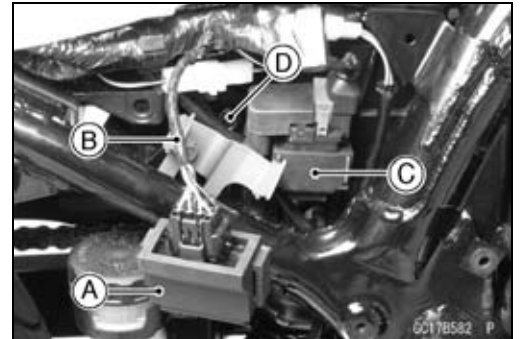


## Throttle Body Assy

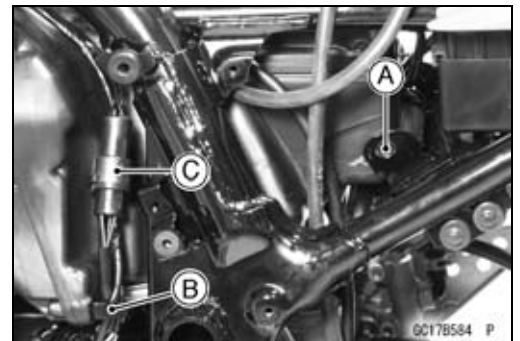
- Remove:  
Bolts [A]  
Throttle Cable Plate [B]



- Remove:  
Immobilizer Amplifier [A] (Immobilizer Equipped Models)  
Bolt and Bracket [B] (Immobilizer Equipped Models)  
Starter Relay [C]  
Bolt [D]



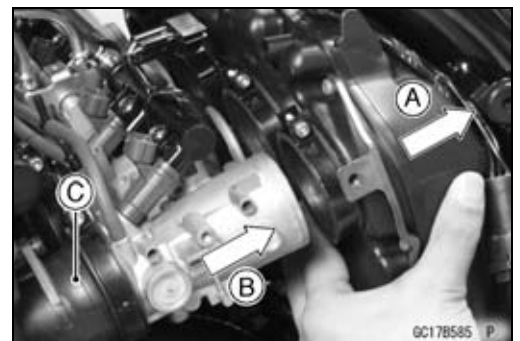
- Remove:  
Coolant Reserve Tank (see Coolant Change in the Periodic Maintenance chapter)  
Crankcase Breather Hose (see Engine Removal in the Engine Removal/Installation chapter)  
Left Air Cleaner Housing Mounting Bolts [A]  
Clamp [B] (Open)  
Alternator Connector [C] (Free)



○For California model, free the separator .



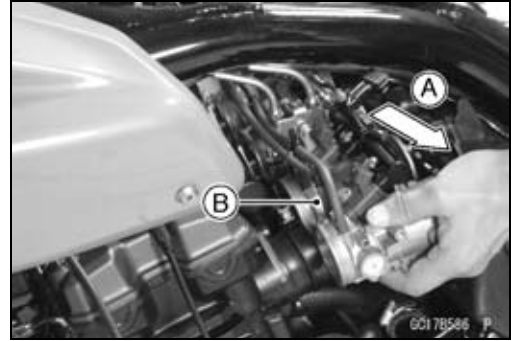
- Move [A] the air cleaner housing backwards.
- Pull [B] the throttle body assy out of the holders [C].



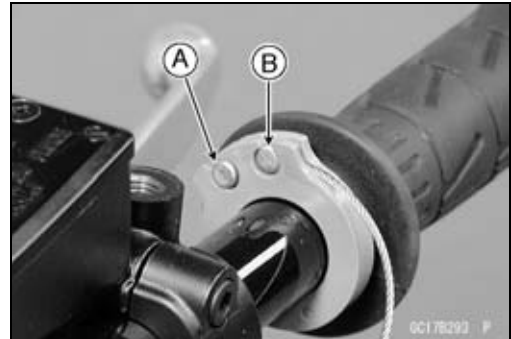
## 3-102 FUEL SYSTEM (DFI)

### Throttle Body Assy

- Slide [A] the throttle body assy [B] leftside and remove it.



- Loosen the locknut and screw in the throttle cable adjuster fully to give the cables plenty of play.
- Remove the right handlebar switch housing and take out the accelerator cable upper end [A] and the decelerator cable upper end [B].



- Remove the throttle cable lower ends [A] from the throttle pulley.



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

#### CAUTION

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

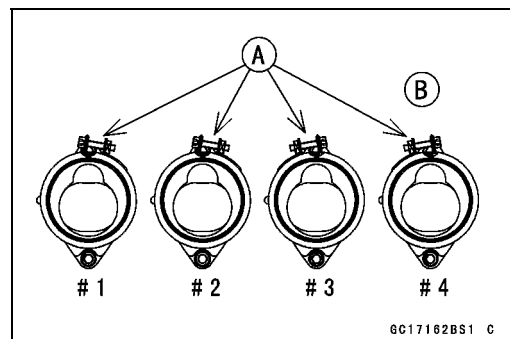
#### *Throttle Body Assy Installation*

- Install the holder clamp bolts [A] in the direction shown with each bolt heads, facing outwards.

Cylinder Head [B]

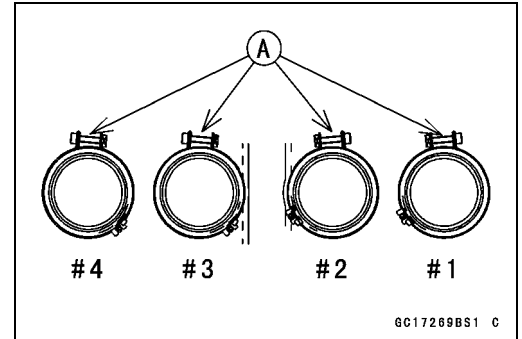
- Tighten:

**Torque - Throttle Body Assy Holder Clamp Bolts: 2.0 N·m  
(0.20 kgf·m, 17 in·lb)**

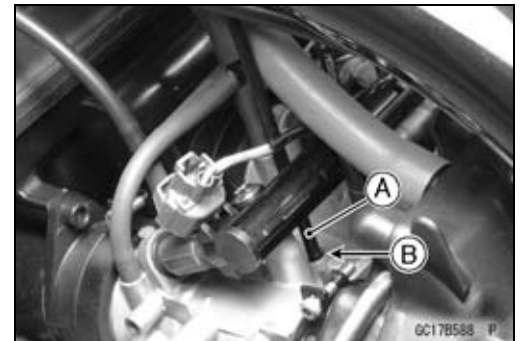


## Throttle Body Assy

- Tighten:  
**Torque - Air Cleaner Duct Clamp Bolts [A]: 2.0 N·m (0.20 kgf·m, 17 in·lb)**
- Run the vacuum hoses ( see Cable, Wire, and Hose Routing section in the Appendix chapter).



- Connect the injector and subthrottle valve actuator connectors.
- Run the choke cable [A] into the hole [B] of the throttle body.



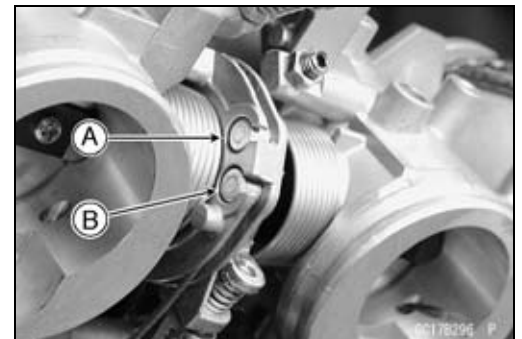
- Fit the accelerator cable end [A] and the decelerator cable end [B] into the throttle pulley.
- Tighten the throttle cable plate bolt.

**Torque - Throttle Cable Plate Bolt: 6.0 N·m (0.60 kgf·m, 52 in·lb)**

- Check fuel leakage from the throttle body assy.

**⚠ WARNING**

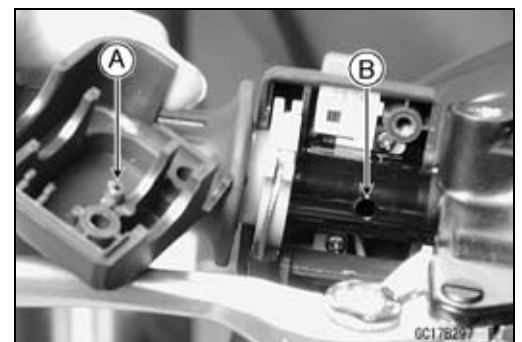
**Fuel spilled from the carburetors is hazardous.**



- Apply a thin coating of grease to the throttle cable upper ends.
- Install the upper ends of the throttle cables in the grip.
- Fit the projection [A] of the right switch housing into the hole [B] of the handlebar.
- Turn the throttle grip and make sure that the throttle valves move smoothly and return by spring force.
- Check the throttle grip free play (see Periodic Maintenance chapter).

**⚠ WARNING**

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



- Adjust:  
 Throttle Grip Free Play  
 Choke Lever Free Play  
 Idle Speed

## 3-104 FUEL SYSTEM (DFI)

### Throttle Body Assy

#### Throttle Body Assy Disassembly

##### CAUTION

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

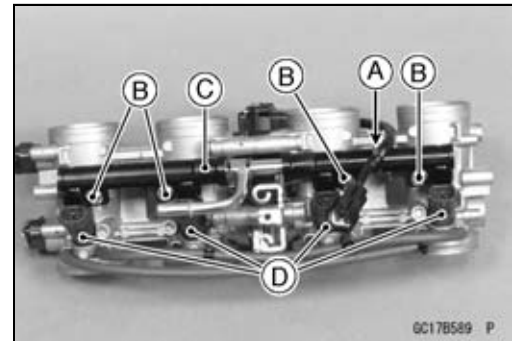
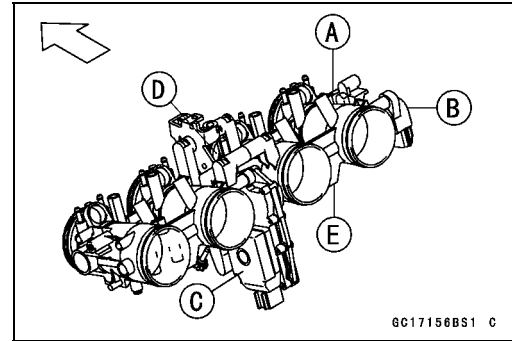
- Remove the throttle body assy (see Throttle Body Assy Removal).
- Push the lock and disconnect:

##### CAUTION

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

- Remove:
  - Band [A] (cut)
  - Screws [B]
  - Delivery Pipe [C] Injectors [D]
  - Fuel Injectors [D]

- ★ If necessary, cut the straps [A] and take the harness [B] off the subthrottle valve actuator.

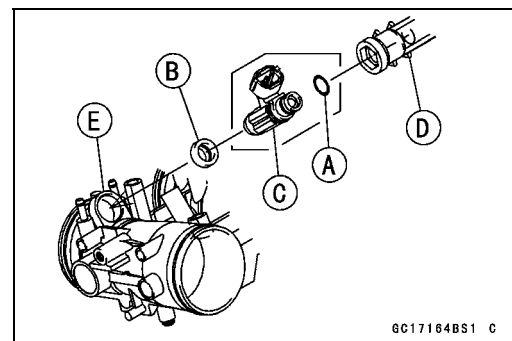


#### Throttle Body Assy Assembly

- Replace the O-rings [A] and seals [B] with the new ones.
- Before assembling, blow away dirt or dust from the throttle body and delivery pipe by applying compressed air.
- Apply engine oil to the new O-rings of each injector [C], insert them into the delivery pipe [D] and confirm whether the injectors turn smoothly or not.
- Install the injectors along with the delivery pipe assy into the throttle bodies [E].

**Torque - Delivery Pipe Screws: 3.4 N·m (0.35 kgf·m, 30 in·lb)**

- Insert the each hoses onto the throttle body fittings.
- Install the throttle body assy (see Throttle Body Assy Installation in the this chapter).



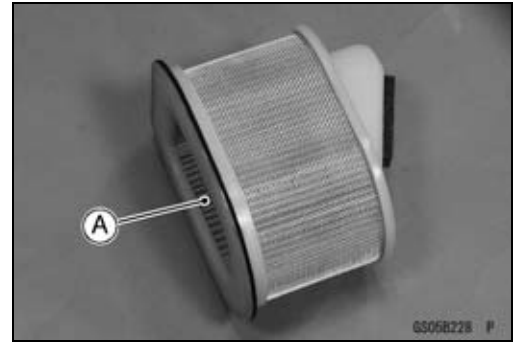
## Air Cleaner

### Element Removal/Installation

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

### Air Cleaner Element Inspection

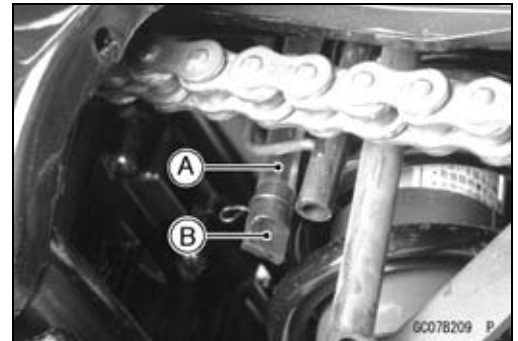
- Remove the air cleaner element (see Air Cleaner Element Replacement in the Periodic Maintenance chapter).
- Visually check the element [A] for tears or breaks.
- ★ If the element has any tears or breaks, replace the element.



### Air Cleaner Oil Draining

A drain hose is connected to the bottom of the air cleaner to drain water or oil accumulated in the cleaner part.

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

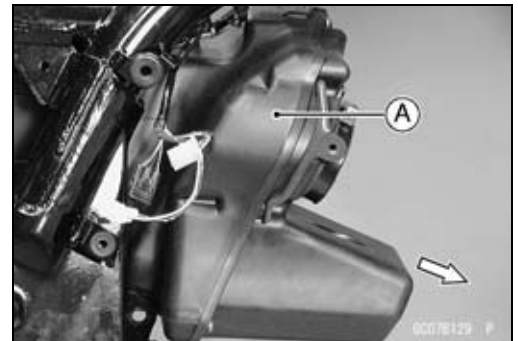


### **⚠ WARNING**

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

### Air Cleaner Housing Removal

- Remove the engine (see Engine Removal/Installation chapter).
- The throttle body assy is removed during engine removal.
- Remove the right and left air cleaner housing bolts.
- Move the air cleaner housing [A] forwards and remove it from the right side of the frame.



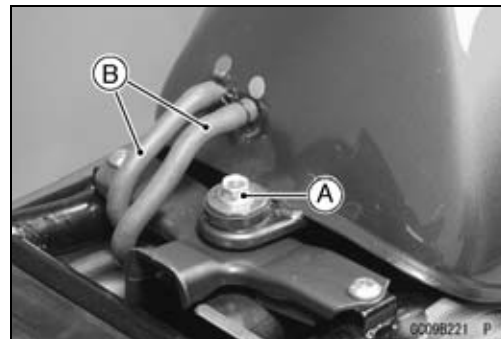
## 3-106 FUEL SYSTEM (DFI)

### Fuel Tank

#### Fuel Tank Removal

#### **⚠ WARNING**

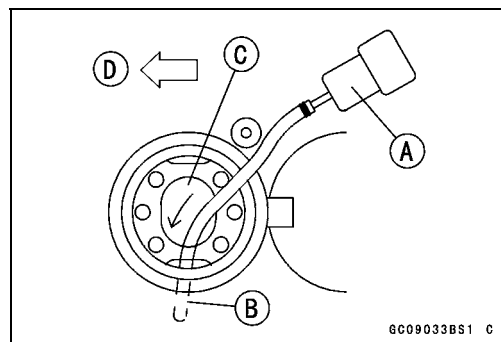
**Gasoline is extremely flammable and can be explosive under certain conditions. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light. Do not smoke. Turn the ignition switch OFF. Be prepared for fuel spillage; any spilled fuel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



- Remove:
  - Seat (see Seat Removal in the Frame chapter)
  - Fuel Tank Bolt [A]
  - Fuel Tank Drain Hose
  - Tubes [B] (california Model)
- Turn the ignition switch, and engine stop switch OFF.
- Wait until the engine cools down.
- Open the fuel tank cap [A] to lower the pressure in the tank.
- During tank removal, keep the tank cap open to release pressure in the tank. This makes fuel spillage less.



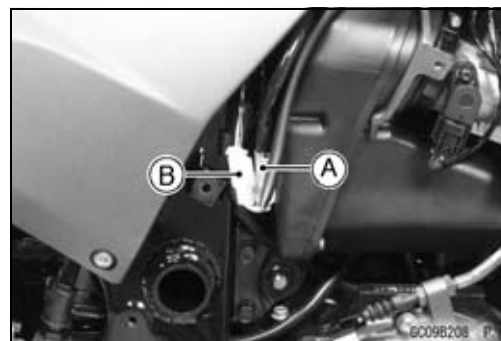
- Draw the fuel out from the fuel tank with a commercially available pump [A].
- Use a soft plastic hose [B] as a pump inlet hose in order to insert the hose smoothly.
- Put the hose through the fill opening [C] into the tank and draw the fuel out. Front [D]



#### **⚠ WARNING**

**The fuel could not be removed completely from the fuel tank. Be careful for remained fuel spillage.**

- Remove:
  - Right Frame Cover (see this chapter)
- Disconnect the fuel pump lead connector [A] and fuel level sensor lead connector [B].

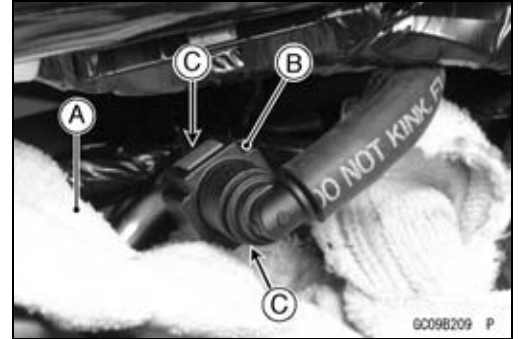


**Fuel Tank**

- Be sure to place a piece of cloth [A] around the fuel hose pump outlet joint [B].
- While pinching the hose joint locks [C] with fingers, pull the joint out along the delivery pipe.

**⚠ WARNING**

**Be prepared for fuel spillage; any spilled fuel must be completely wiped up immediately. When the fuel hose is disconnected, fuel spills out from the hose and the pipe 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 remove the pump inlet hose [A].

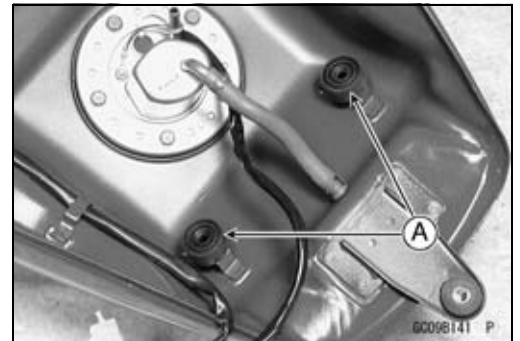


*Fuel Tank Installation*

- Note the above WARNING (see Fuel Tank Removal).
- Route the hoses correctly (see Appendix chapter).
- Check that the rubber dampers [A] are on the frame and the fuel tank.



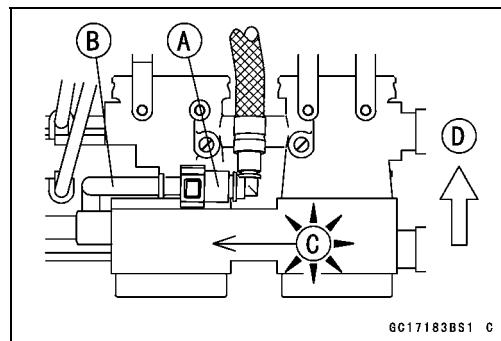
- Check that the dampers [A] are in place on the fuel tank as well.
- ★ If the dampers are damaged or deteriorated, replace them.



## 3-108 FUEL SYSTEM (DFI)

### Fuel Tank

- Insert the pump outlet hose joint [A] straight onto the delivery pipe [B] until the hose joint clicks [C].  
Front [D]



- Push and pull [A] the hose joint [B] back and forth more than two times and make sure it is locked and doesn't come off. When the hose joint is correctly installed, it should slide on the delivery pipe about 5 mm (0.20 in.).

#### **⚠ WARNING**

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

- ★ If it does not slide, reinstall the hose joint.
- Connect the fuel pump and the fuel level sensor connectors and the battery (-) lead terminal.
- For California Model, note the following:

#### **CAUTION**

**For California model, if gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.**

- Be sure to plug the evaporative fuel return hose to prevent fuel spilling before fuel tank removal.

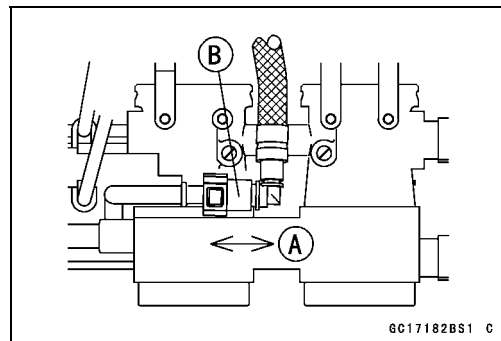
#### **⚠ WARNING**

**For California model, be careful not to spill the gasoline through the return hose. Spilled fuel is hazardous.**

- ★ If liquid or gasoline flows into the breather hose, remove the hose and blow it clean with compressed air (California model).
- Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump.

#### **⚠ WARNING**

**Store the fuel tank in an area which is well-ventilated and free from any source of flame or sparks. Do not smoke in this area. Place the fuel tank on a flat surface and plug the fuel pipes to prevent fuel leakage.**

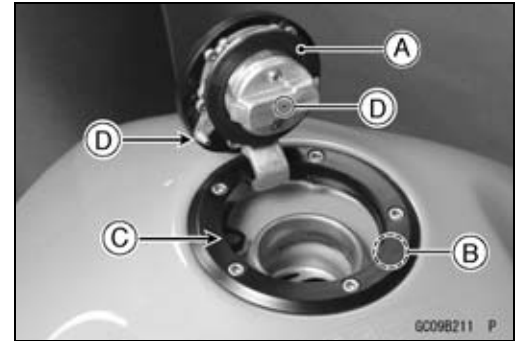




## Fuel Tank

### *Fuel Tank and Cap Inspection*

- Visually inspect the gasket [A] on the tank cap for any damage.
- ★ Replace the gasket if it is damaged.
- Check to see if the water drain pipe [B] and fuel breather pipe [C] (California Model) in the tank are not clogged. Check the tank cap breather also.
- ★ If they are clogged, remove the tank and drain it, and then blow the breather free with compressed air.



### CAUTION

**Do not apply compressed air to the air vent holes [D] in the tank cap. This could cause damage and clogging of the labyrinth in the cap.**

### *Fuel Tank Cleaning*

#### **⚠ WARNING**

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

- Remove the fuel tank (see Fuel Tank Removal).
- Remove the fuel pump inlet hose and the fuel pump (see Fuel Pump section in this chapter).
- 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 the fuel pump (see Fuel Pump Installation).
- Install the fuel tank (see Fuel Tank Installation).

## 3-110 FUEL SYSTEM (DFI)

### Evaporative Emission Control System (California Model)

The Evaporative Emission Control System routes fuel vapors from the fuel system into the running engine or stores the vapors in a canister when the engine is stopped. Although no adjustments are required, a thorough visual inspection must be made at the intervals specified by the Periodic Maintenance Chart.

#### Parts Removal/Installation

#### **⚠ WARNING**

**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**

#### **CAUTION**

**If gasoline, solvent, water or any other liquid enters the canister, the canister's vapor absorbing capacity is greatly reduced. If the canister does become contaminated, replace it with a new one.**

- To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.
- Connect the hoses according to the diagram of the system. Make sure they do not get pinched or kinked.

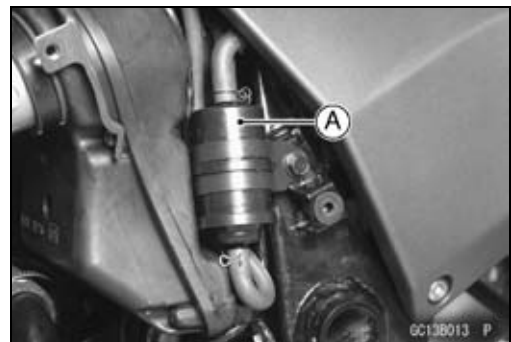
#### Hose Inspection

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

#### Separator Inspection

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

[A] Separator



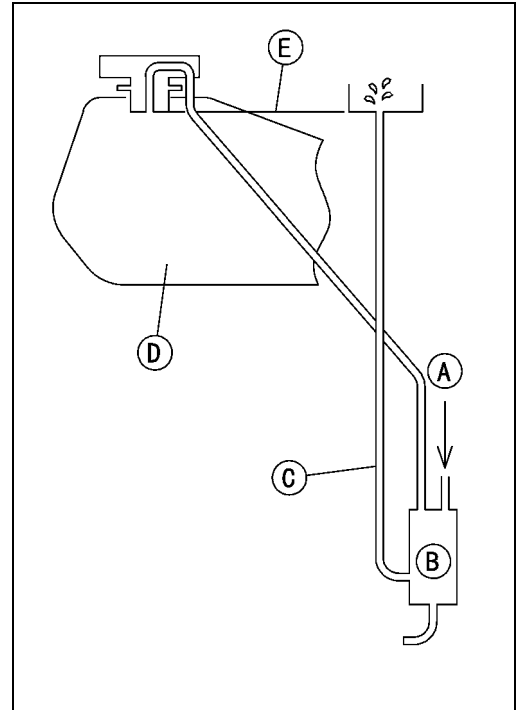
Evaporative Emission Control System (California Model)

Separator Operation Test

**⚠ WARNING**

**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**

- Connect the hoses to the separator, and install the separator on the motorcycle.
- Disconnect the breather hose from the separator, and inject about 20 mL of gasoline [A] into the separator [B] through the hose fitting.
- Disconnect the fuel return hose [C] from the fuel tank [D].
- Run the open end of the return hose into the container and hold it level with the tank top [E].
- Start the engine, and let it idle.
- ★ If the gasoline in the separator comes out of the hose, the separator works well. If it does not, replace the separator with a new one.



Canister Inspection

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

**NOTE**

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





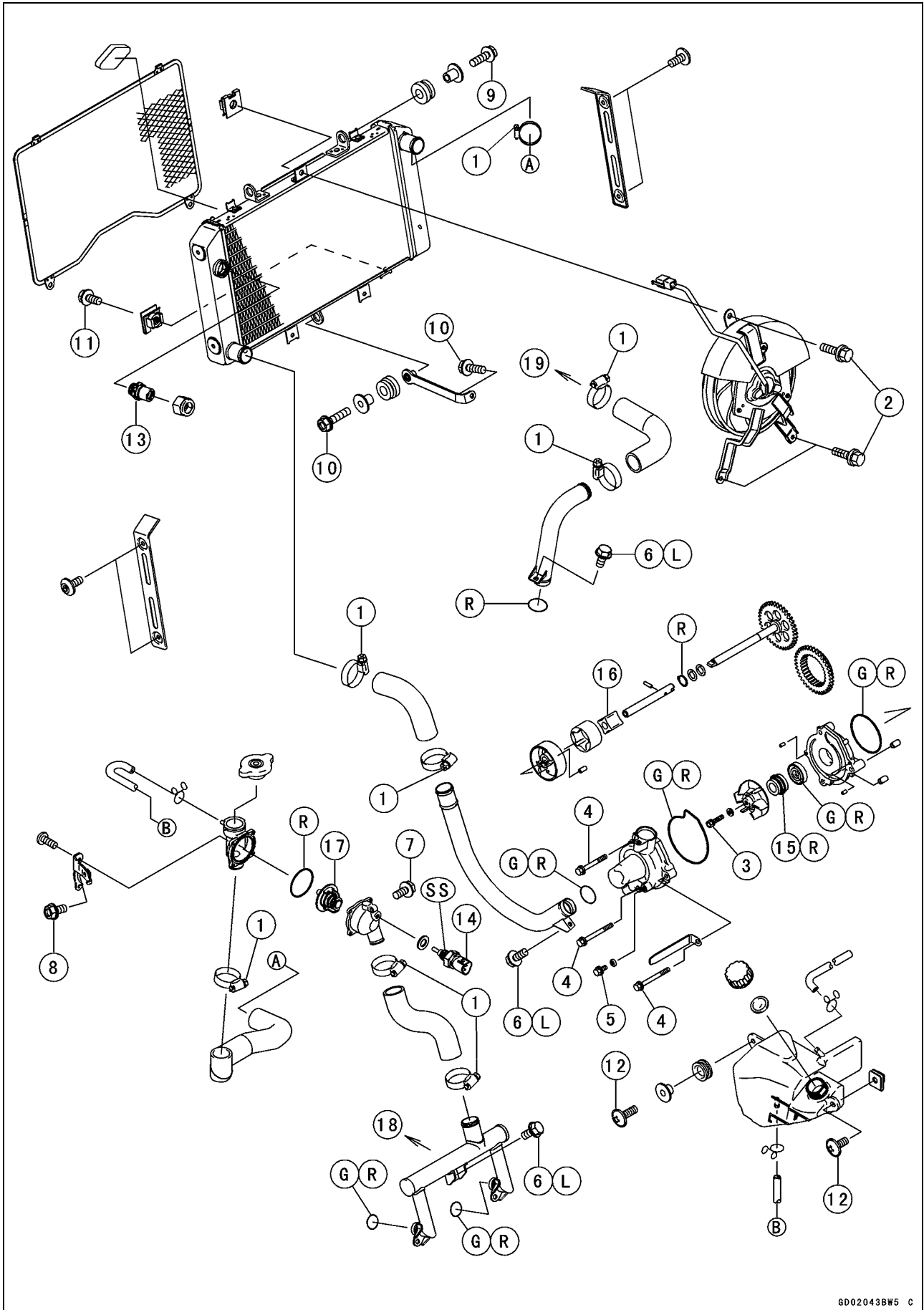
# Cooling System

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# 4-2 COOLING SYSTEM

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Radiator Hose Clamp Screws	2.0	0.20	17 in·lb	
2	Radiator Fan Bolts	8.3	0.85	74 in·lb	
3	Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
4	Water Pump Cover Bolts	11	1.1	95 in·lb	
5	Water Pump Drain Bolt	11	1.1	95 in·lb	
6	Water Pipe Bolts	11	1.1	95 in·lb	L
7	Thermostat Housing Ground Bolt	7.0	0.70	61 in·lb	
8	Thermostat Bracket Bolt	7.0	0.70	61 in·lb	
9	Radiator Upper Bolts	7.0	0.70	61 in·lb	
10	Radiator Lower Bolts	7.0	0.70	61 in·lb	
11	Radiator Screen Bolt	7.0	0.70	61 in·lb	
12	Coolant Reserve Tank Screws	7.0	0.70	61 in·lb	
13	Radiator Fan Switch	18	1.8	13	
14	Water Temperature Sensor	25	2.5	18	

15. Mechanical Seal

16. Oil Pump Rotor

17. Thermostat

18. To Cylinder Head

19. To Cylinder

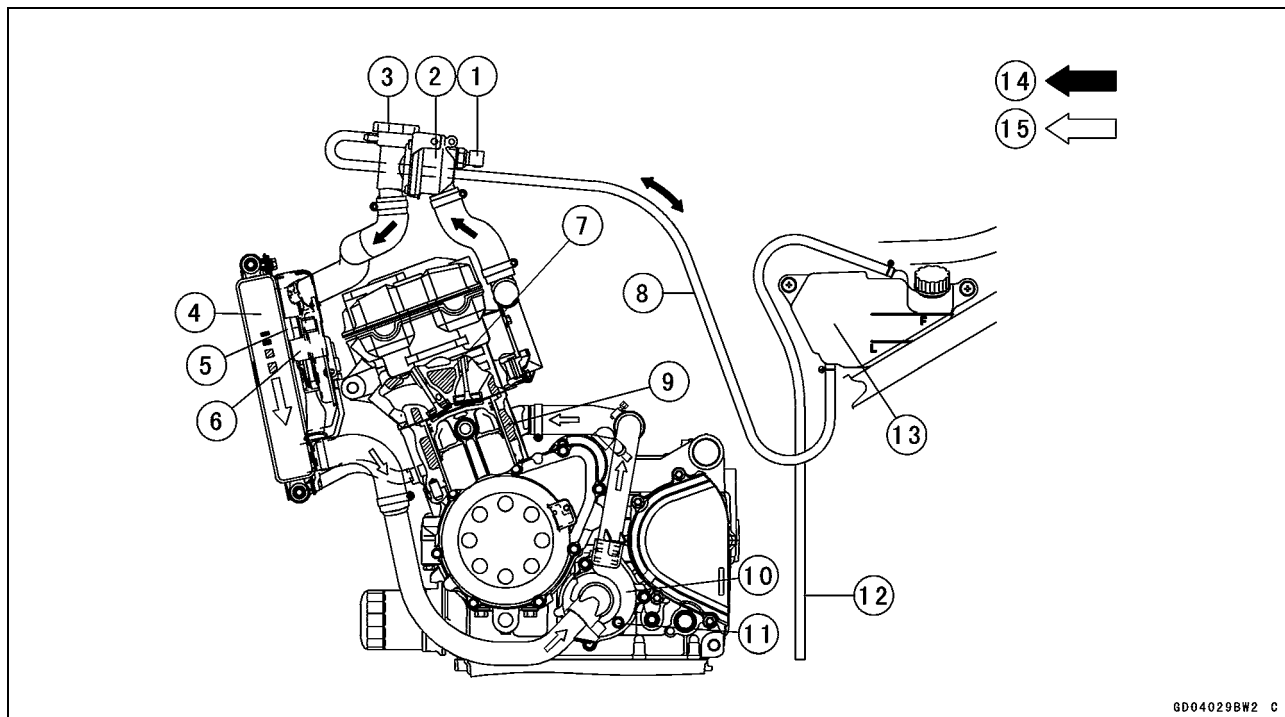
G: Apply grease.

R: Replacement Parts

SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

## 4-4 COOLING SYSTEM

### Coolant Flow Chart



1. Water Temperature Sensor
2. Thermostat Housing
3. Radiator Cap
4. Radiator
5. Radiator Fan Switch
6. Radiator Fan
7. Cylinder Head Jacket

8. Reserve Tank Hose
9. Cylinder Jacket
10. Water Pump
11. Drain Bolt
12. Reserve Tank Overflow Hose
13. Reserve Tank
14. Hot Coolant
15. Cold Coolant

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

The thermostat is a wax pellet type which opens or closes with coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is 55°C (131°F) or more, the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is more than 58 ~ 62°C (136 ~ 144°F), the thermostat opens and the coolant flows.

When the coolant temperature goes up beyond 95 ~ 101°C (203 ~ 214°F), the radiator fan switch conducts to operate the radiator fan. The radiator fan draws air through the radiator core when there is not sufficient air flow such as at low speeds. This increases up the cooling action of the radiator. When the coolant temperature goes down from the operation temperature by 3 ~ 8°C (37 ~ 46°F), the fan switch opens and the radiator fan stops.

In this way, this system controls the engine temperature within narrow limits where the engine operates most efficiently even if the engine load varies.

The system is pressurized by the radiator cap to suppress boiling and the resultant air bubbles which can cause engine overheating. As the engine warms up, the coolant in the radiator and the water jacket expands. The excess coolant flows through the radiator cap and hose to the reserve tank to be stored there temporarily. Conversely, as the engine cools down, the coolant in the radiator and the water jacket contracts, and the stored coolant flows back to the radiator from the reserve tank.

The radiator cap has two valves. One is a pressure valve which holds the pressure in the system when the engine is running. When the pressure exceeds 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 14 ~ 17.8 psi), the pressure valve opens and releases the pressure to the reserve tank. As soon as pressure escapes, the valve closes, and keeps the pressure at 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 14 ~ 17.8 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**

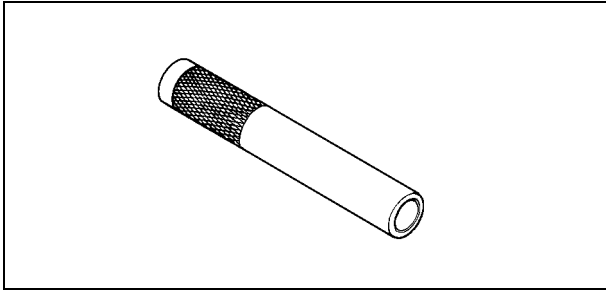
Item	Standard
<p><b>Coolant Provided when Shipping</b></p> <p>Type (Recommended)</p> <p>Color</p> <p>Mixed Ratio</p> <p>Freezing Point</p> <p>Total Amount</p>	<p>Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)</p> <p>Green</p> <p>Soft water 50%, coolant 50%</p> <p>-35°C (-31°F)</p> <p>2.9 L (3.1 US qt) (reserve tank full level, including radiator and engine)</p>
<p><b>Radiator Cap</b></p> <p>Relief Pressure</p>	<p>93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 14 ~ 17.8 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>

## 4-6 COOLING SYSTEM

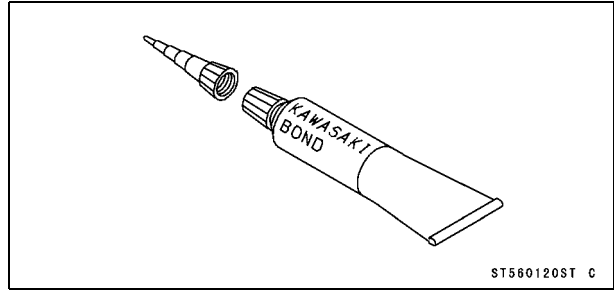
### Special Tools and Sealant

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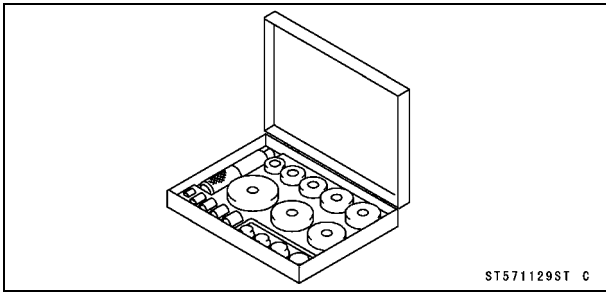
**Bearing Driver,  $\phi 32$ :**  
**57001-382**



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



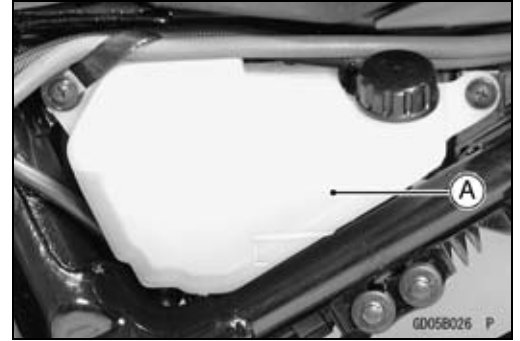
**Bearing Driver Set:**  
**57001-1129**



## Coolant

### Coolant Deterioration Inspection

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



### Coolant Level Inspection

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

### Coolant Draining

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

### Coolant Filling

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

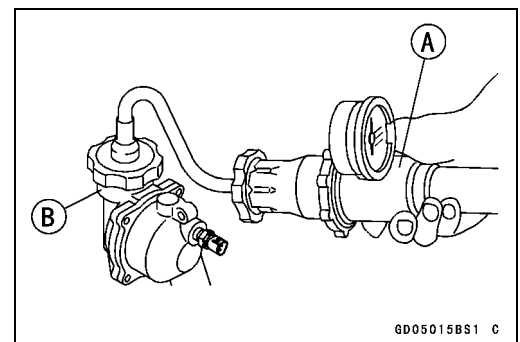
### Pressure Testing

- Remove the fuel tank (see Fuel System (DFI) chapter).
- Remove the radiator cap, and install a cooling system pressure tester [A] on the filler neck [B].

#### NOTE

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

- Build up pressure in the system carefully until the pressure reaches 123 kPa (1.25 kgf/cm<sup>2</sup>, 17.8 psi).



#### CAUTION

**During pressure testing, do not exceed the pressure for which the system is designed. The maximum pressure is 123 kPa (1.25 kgf/cm<sup>2</sup>, 17.8 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.

## 4-8 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.

CAUTION
<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>

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

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

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

## Water Pump

### Water Pump Removal

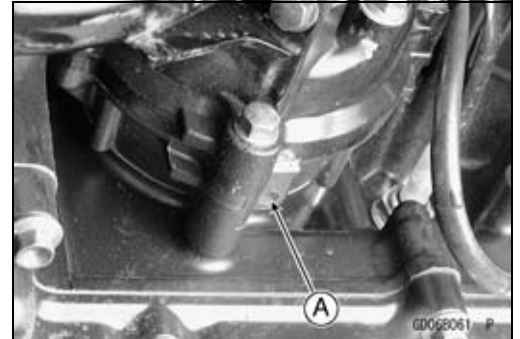
- Refer to the Oil Pump Removal in the Engine Lubrication System chapter.

### Water Pump Installation

- Refer to the Oil Pump Installation in the Engine Lubrication System chapter.

### Water Pump Inspection

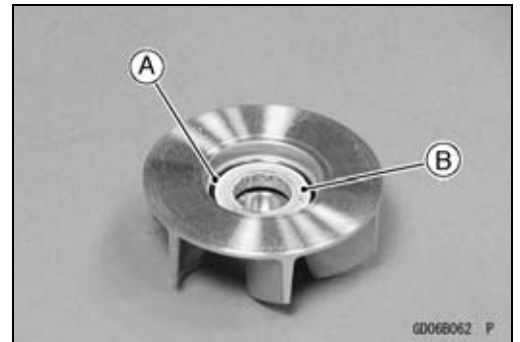
- Check the drainage outlet passage [A] at the bottom of the water pump body for coolant leaks.
- ★ If the mechanical seal is damaged, the coolant leaks through the seal and drains through the passage. Replace the mechanical seal unit.



### Water Pump Impeller Disassembly/Assembly

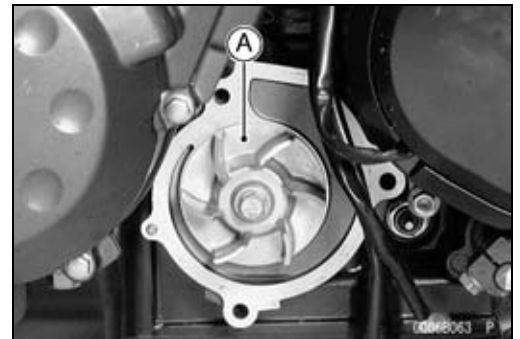
- The sealing seat and rubber seal may be removed easily by hand.
- Apply coolant around the surfaces of the rubber seal and sealing seat.
- Install the rubber seal [A] and sealing seat [B] into the impeller by pressing them by hand until the seat stops at the bottom of the hole.
- Tighten the water pump impeller bolt by special torque.

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



### Water Pump Impeller Inspection

- Visually inspect the water pump impeller [A].
- ★ If the surface is corroded or if the blades are damaged, replace the impeller.

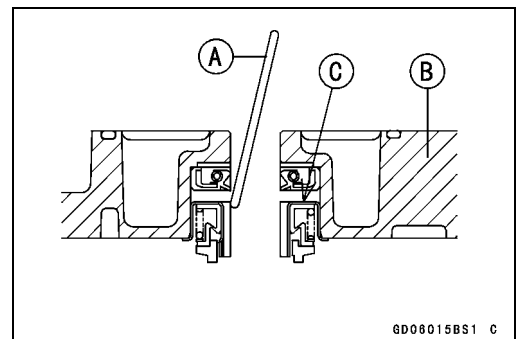


### Water Pump Housing Disassembly

#### CAUTION

**Do not damage the hole wall of the water pump housing.**

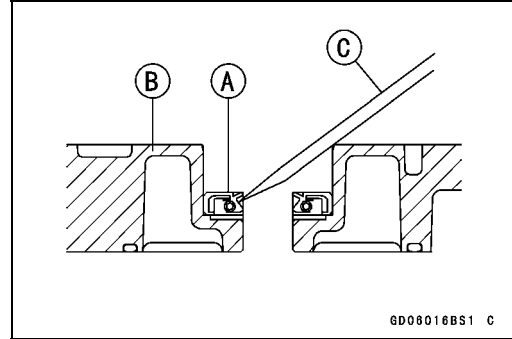
- Insert a bar [A] into the pump housing [B], and hammer evenly around the circumference of the mechanical seal bottom [C].



## 4-10 COOLING SYSTEM

### Water Pump

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



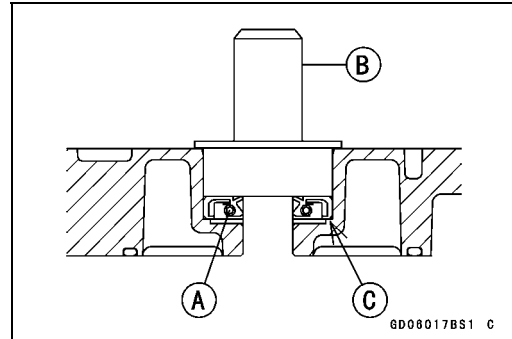
#### Water Pump Housing Assembly

##### CAUTION

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

- Apply high temperature 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**

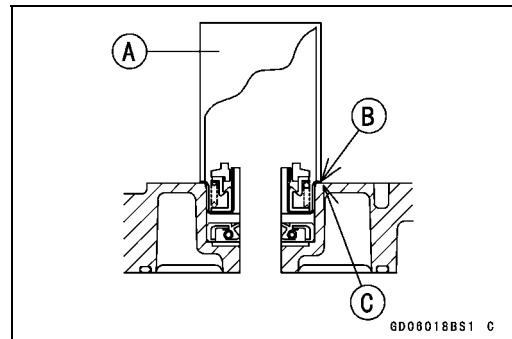


##### CAUTION

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

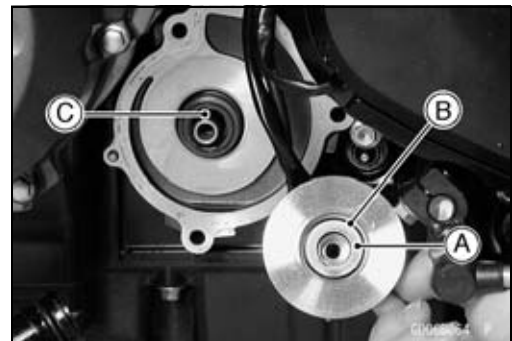
- Press the new mechanical seal into the housing with bearing driver [A] until its flange [B] touches the surface [C] of the housing.

**Special Tool - Bearing Driver,  $\phi$ 32: 57001-382**



#### Mechanical Seal Inspection

- 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 and Radiator Fan Removal*

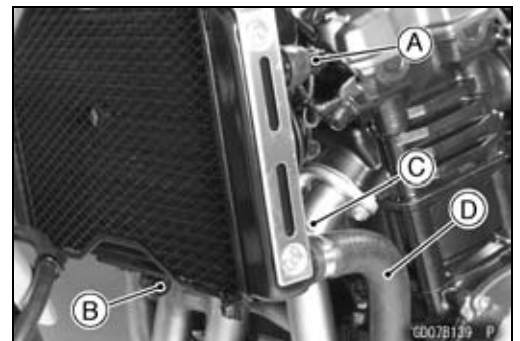
**⚠ WARNING**

The radiator fan is connected directly to the battery. The radiator fan may start even if the ignition switch is off. **NEVER TOUCH THE RADIATOR FAN UNTIL THE RADIATOR FAN CONNECTOR IS DISCONNECTED. TOUCHING THE FAN BEFORE THE CONNECTOR IS DISCONNECTED COULD CAUSE INJURY FROM THE FAN BLADES.**

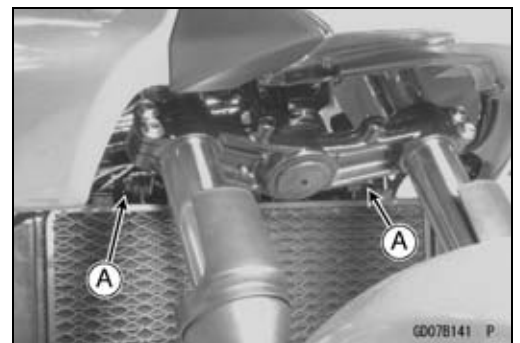
- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Radiator Fan Motor Connector [A] (Disconnect)



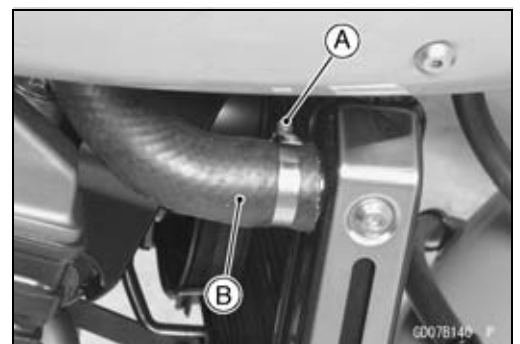
- Remove:
  - Fan Switch Lead Connector [A]
  - Radiator Lower Bolt [B]
  - Hose Clamp Screw [C] (Loosen)
  - Left Radiator Hose [D]



- Remove:
  - Hose Clamp [A] (Loosen)
  - Right Radiator Hose [B]



- Remove:
  - Radiator Bolts [A]
- Remove the radiator.



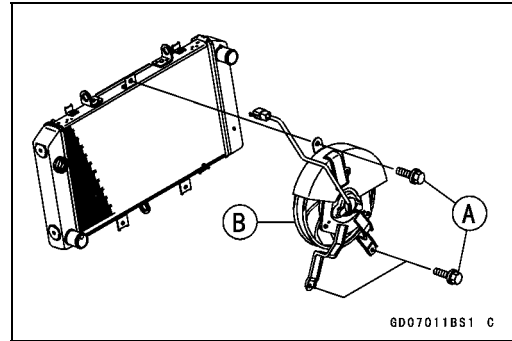
**CAUTION**

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

## 4-12 COOLING SYSTEM

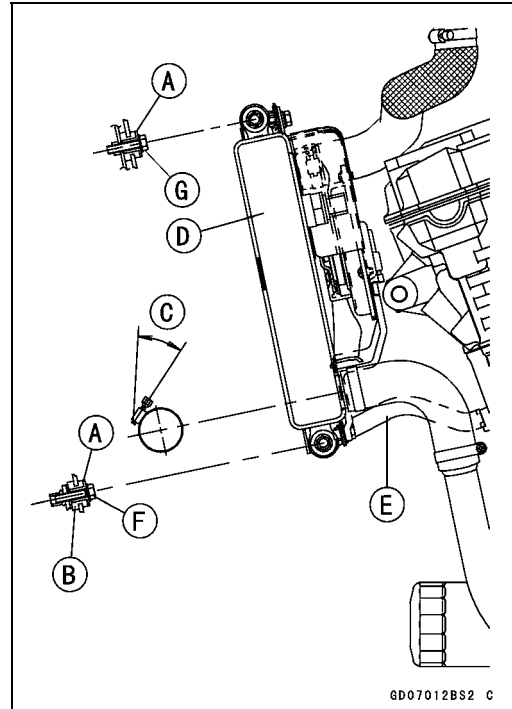
### Radiator

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



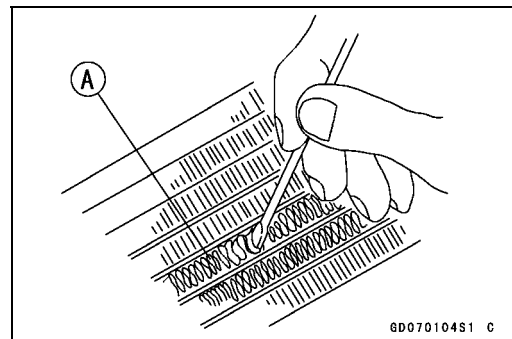
#### Radiator and Radiator Fan Installation

- Installation is the reverse of removal.
- Install the radiator bracket collars [A] as shown.
  - Rubber Damper [B]
  - 30 ~ 40° [C]
  - Radiator [D]
  - Bracket [E]
- Tighten:
  - Torque - Radiator Lower Bolts [F]: 7.0 N·m (0.70 kgf·m, 61 in·lb)
  - Radiator Upper Bolts [G]: 7.0 N·m (0.70 kgf·m, 61 in·lb)



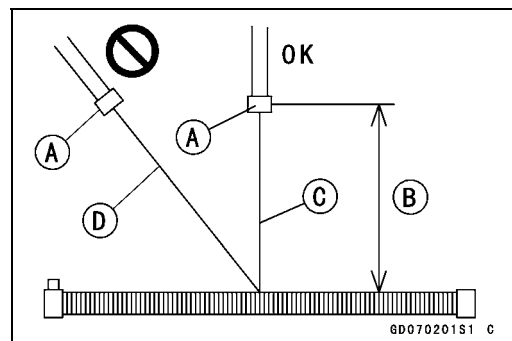
#### Radiator Inspection

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



### CAUTION

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

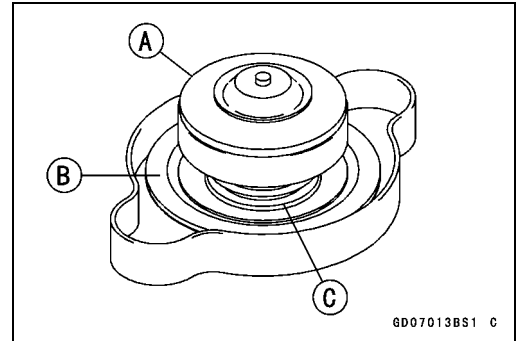




## Radiator

### Radiator Cap Inspection

- Remove:
  - Fuel Tank (see Fuel System (DFI) 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.

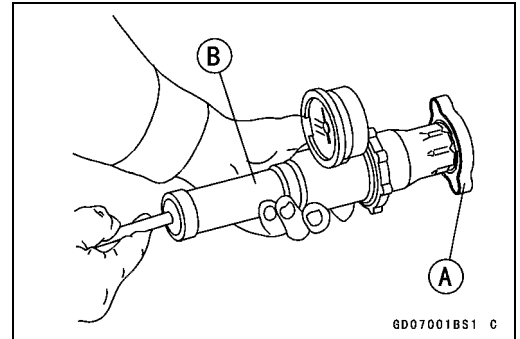


- Install the cap [A] on a cooling system pressure tester [B].

### 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.



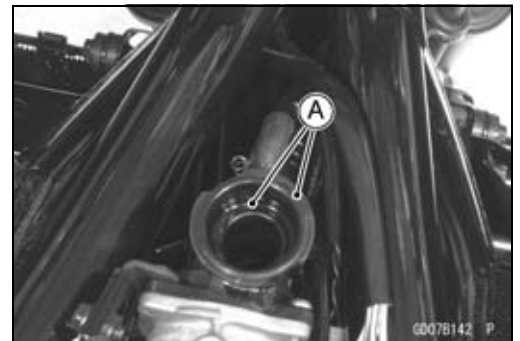
### Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm<sup>2</sup>, 14 ~ 17.8 psi)

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

### Radiator Filler Neck Inspection

- Remove the fuel tank (see Fuel System (DFI) chapter).
- Remove the radiator cap.
- Check the radiator filler neck for signs of damage.
- Check the condition of the top and bottom sealing seats [A] in the filler neck. They must be smooth and clean for the radiator cap to function properly.

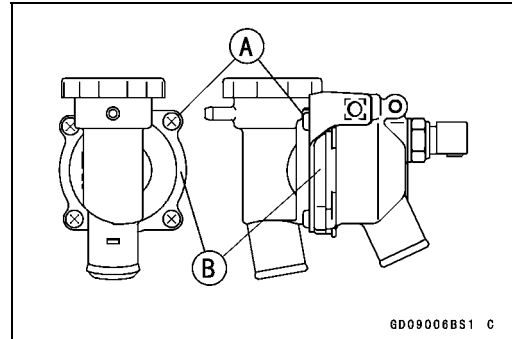
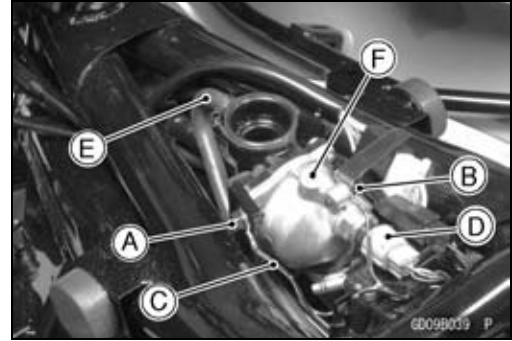


## 4-14 COOLING SYSTEM

### Thermostat

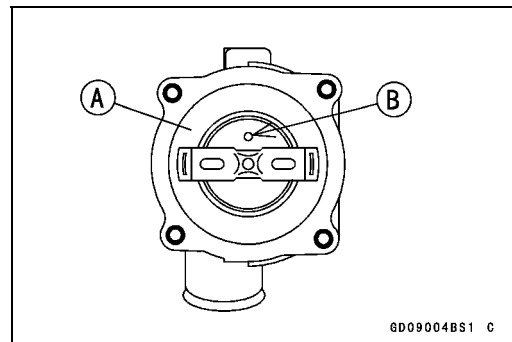
#### *Thermostat Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Thermostat Bracket Bolt [A]
  - Clamp Bolt [B]
  - Ground Lead [C]
  - Water Temperature Sensor Connector [D]
  - Water Hoses [E]
- Remove the thermostat housing [F].
- Remove the screws [A], take off the cap [B], and take out the thermostat.



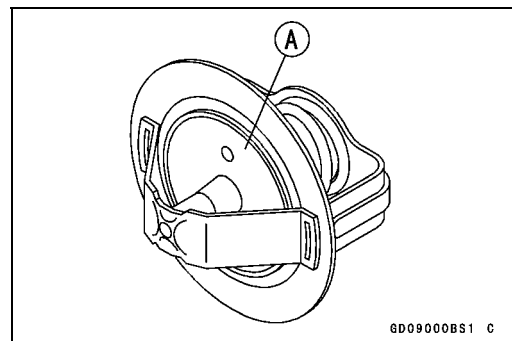
#### *Thermostat Installation*

- Install the thermostat [A] in the housing so that the air bleeder hole [B] is on top.
- Install a new O-ring into the housing.
- Fill the radiator with coolant (see Cooling System in the Periodic Maintenance chapter).



#### *Thermostat Inspection*

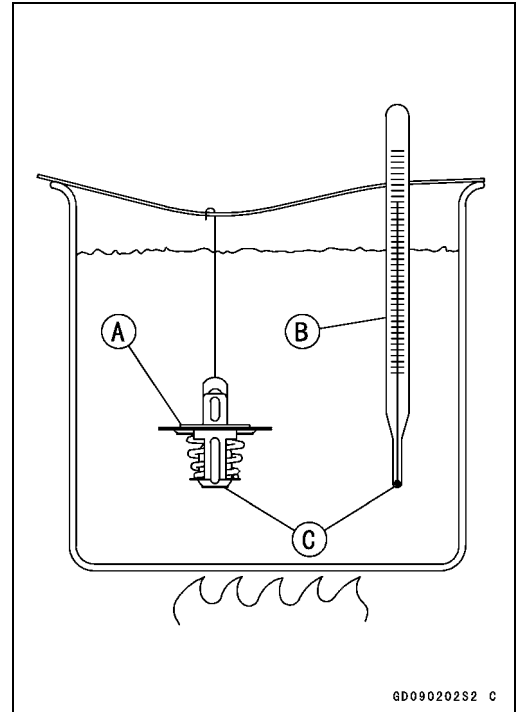
- Remove the thermostat, and inspect the thermostat valve [A] at room temperature.
- ★ If the valve is open, replace the thermostat with a new one.



**Thermostat**

- To check valve opening temperature, suspend the thermostat [A] in a container of water and raise the temperature of the water.
- The thermostat must be completely submerged and must not touch the container sides or bottom. Suspend an accurate thermometer [B] in the water so that the heat sensitive portions [C] are located in almost the same depth. It must not touch the container, either.
- ★ If the measurement is out of the specified range, replace the thermostat with a new one.

**Thermostat Valve Opening Temperature**  
 58 ~ 62°C (136 ~ 144°F)



GD090202S2 C

## 4-16 COOLING SYSTEM

### Hose and Pipes

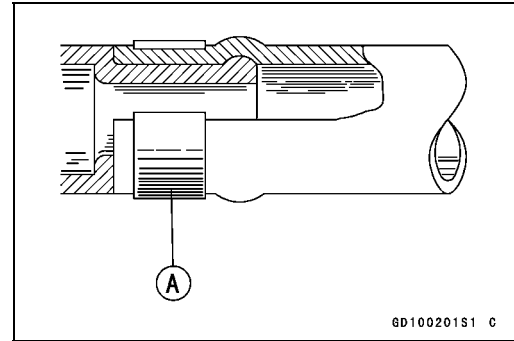
#### *Hose Installation*

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

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

#### *Hose Inspection*

- Refer to the Cooling Hose and Connection Inspection in the Periodic Maintenance chapter.



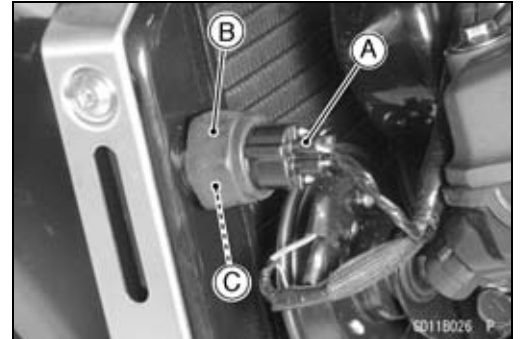
**Radiator Fan Switch, Water Temperature Sensor**

**CAUTION**

The fan switch or the water temperature sensor should never be allowed to fall on a hard surface. Such a shock to their parts can damage them.

*Radiator Fan Switch Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  - Radiator Fan Switch Lead Connector [A]
  - Rubber Cap [B]
  - Radiator Fan Switch [C]



*Radiator Fan Switch Installation*

- Tighten:
  - Torque - Radiator Fan Switch: 18 N·m (1.8 kgf·m, 13 ft·lb)**
- Fill the coolant (see Coolant Change in the Periodic Maintenance chapter).

*Radiator Fan Switch Inspection*

- Refer to the Electrical System chapter for the Radiator Fan Switch Inspection.

*Water Temperature Sensor Removal/Installation*

- Refer to the Fuel System (DFI) chapter.
  - Water Temperature Sensor [A]



*Water Temperature Sensor Inspection*

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



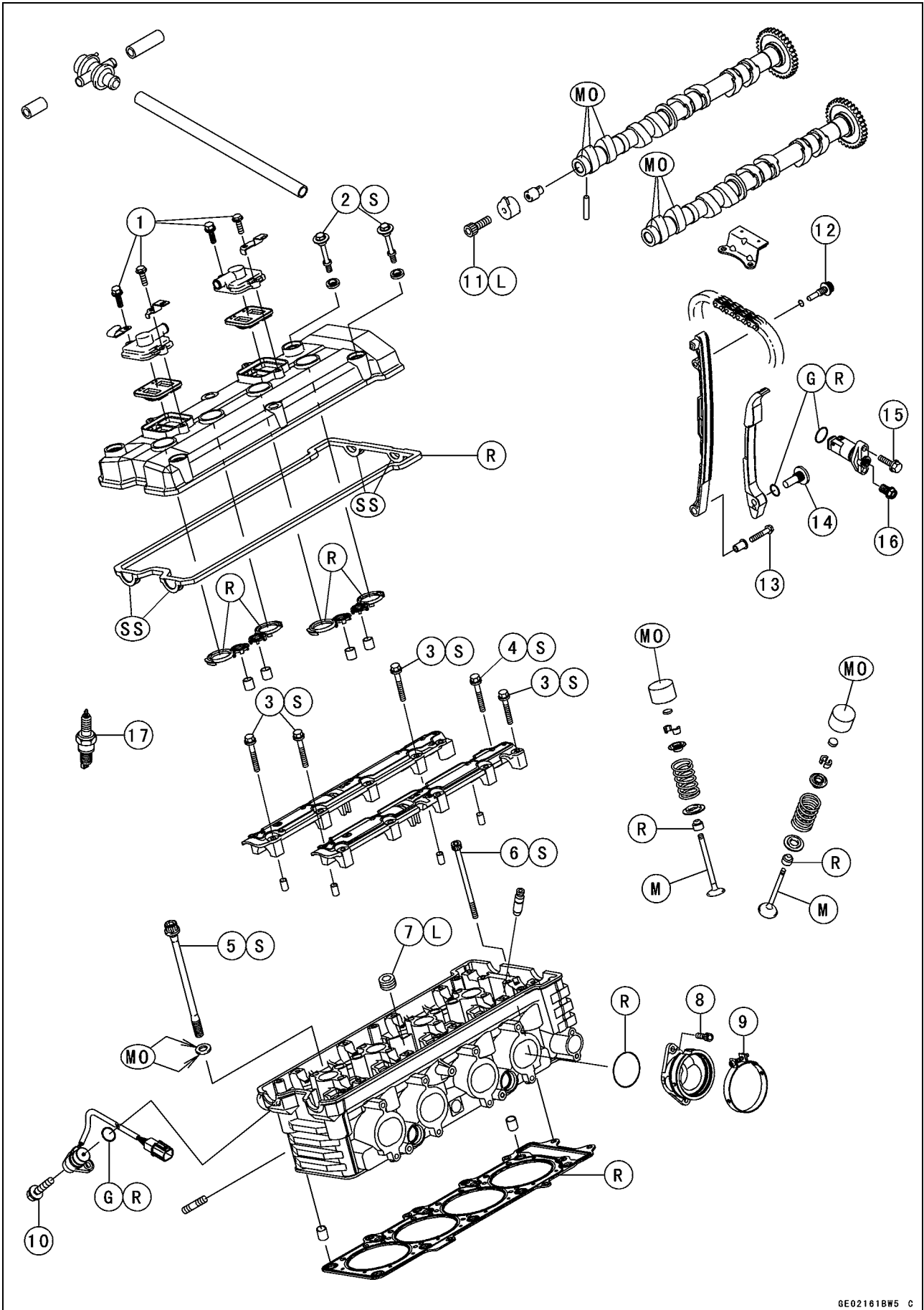
# Engine Top End

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# 5-2 ENGINE TOP END

## Exploded View





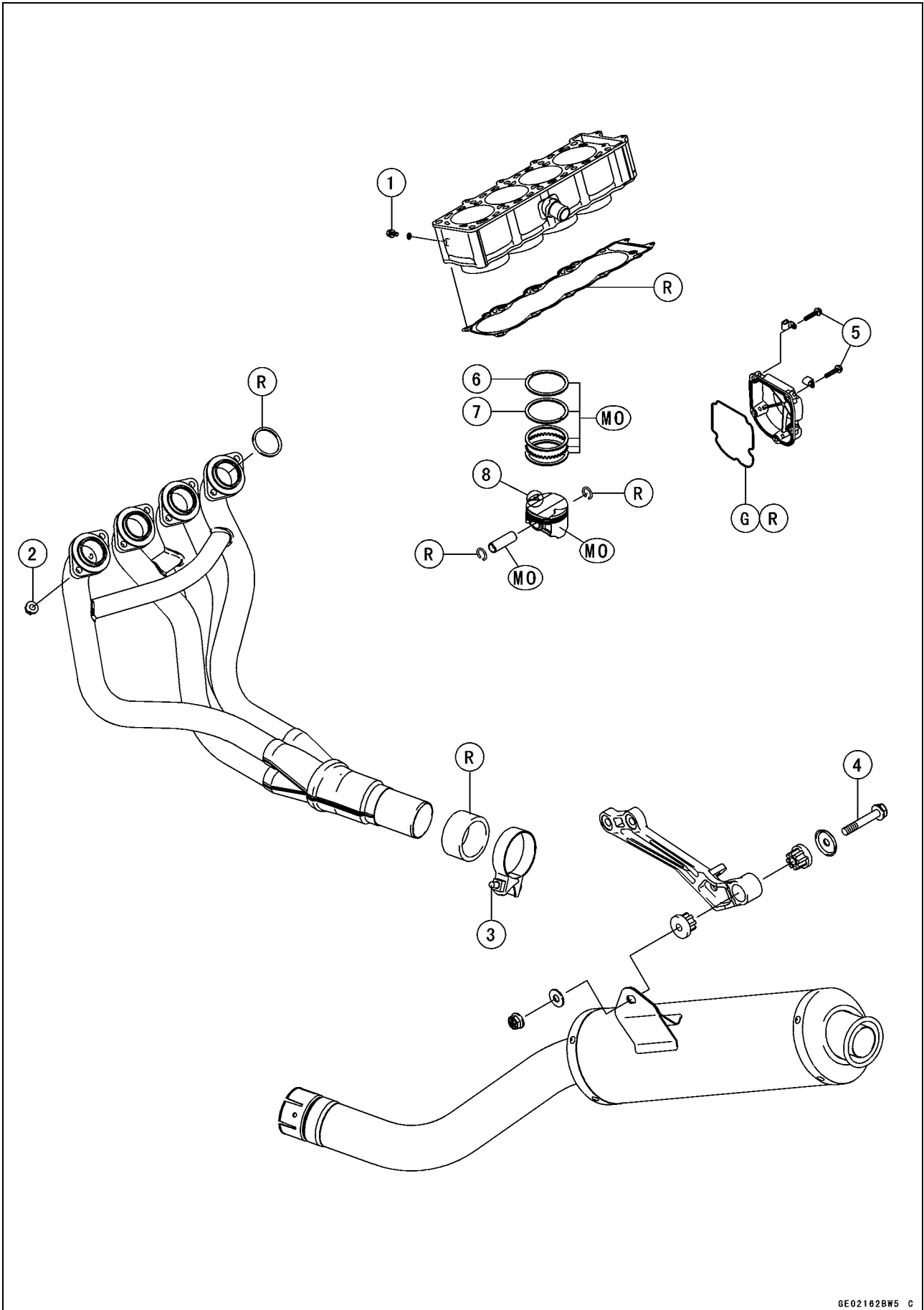
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Air Suction Valve Cover Bolts	9.8	1.0	87 in·lb	
2	Cylinder Head Cover Bolts	9.8	1.0	87 in·lb	S
3	Camshaft Cap Bolts	12	1.2	104 in·lb	S
4	Camshaft Chain Guide Bolts	12	1.2	104 in·lb	S
5	Cylinder Head Bolts (M10 New Bolts)	54	5.5	40	MO, S
	Cylinder Head Bolts (M10 Used Bolts)	49	5.0	36	MO, S
6	Cylinder Head Bolts (M6)	12	1.2	104 in·lb	S
7	Cylinder Head Jacket Plugs	22	2.2	16	L
8	Throttle Body Holder Bolts	13	1.3	113 in·lb	
9	Throttle Body Assy Holder Clamp Bolts	2.0	0.20	17 in·lb	
10	Camshaft Position Sensor Bolt	12	1.2	104 in·lb	
11	Camshaft Position Sensor Rotor Bolt	12	1.2	104 in·lb	L
12	Front Camshaft Chain Guide Bolt (Upper)	25	2.5	18	
13	Front Camshaft Chain Guide Bolt (Lower)	12	1.2	104 in·lb	
14	Rear Camshaft Chain Guide Bolts	25	2.5	18	
15	Camshaft Chain Tensioner Mounting Bolts	11	1.1	95 in·lb	
16	Camshaft Chain Tensioner Cap Bolt	28	2.9	21	
17	Spark Plugs	13	1.3	113 in·lb	

- L: Apply a non-permanent locking agent.
- M: Apply molybdenum disulfide grease.
- MO: Apply molybdenum disulfide oil solution.  
(mixture of the engine oil and molybdenum disulfide grease in a weight ratio 10 : 1)
- R: Replacement Parts
- S: Follow the specific tightening sequence.
- SS: Apply silicone sealant.

# 5-4 ENGINE TOP END

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Coolant Drain Plug (Cylinder)	9.8	1.0	87 in·lb	
2	Exhaust Pipe Manifold Holder Nuts	17	1.7	12	
3	Muffler Body Clamp Bolt	17	1.7	12	
4	Muffler Body Mounting Bolt	30	3.0	22	
5	Crankshaft Sensor Cover Bolts	11	1.1	95 in·lb	

6. "1T" marked side faces up.

7. "2T" marked side faces up.

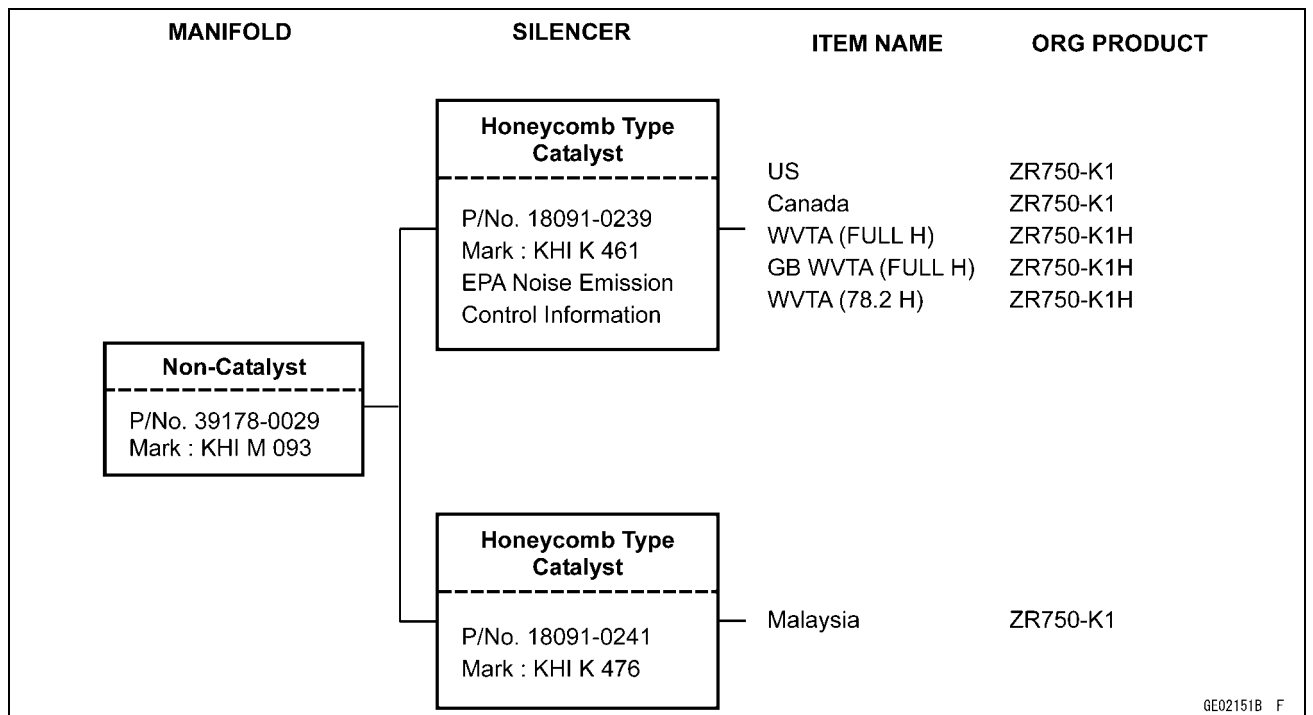
8. Hollow mark faces forward.

MO: Apply molybdenum disulfide oil solution.

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

R: Replacement Parts

**Exhaust System ZR750-K1**



78.2: Horsepower 78.2 kW (106.3 ps)

Full: Full Power

H: Honeycomb Type Catalyst

GB: United Kingdom Model

US: United States Model

## 5-6 ENGINE TOP END

### Specifications

Item	Standard	Service Limit
<b>Clean Air System</b>		
Vacuum Switch Valve Closing Pressure	Open → Close 41 ~ 49 kPa (310 ~ 370 mmHg, 6.0 ~ 7.1 psi)	---
<b>Camshafts</b>		
Cam Height		
Exhaust	36.146 ~ 36.254 mm (1.4231 ~ 1.4273 in.)	36.05 mm (1.419 in.)
Inlet	36.746 ~ 36.854 mm (1.4467 ~ 1.4509 in.)	36.65 mm (1.443 in.)
Camshaft Journal, Camshaft Cap Clearance	0.028 ~ 0.071 mm (0.0011 ~ 0.0028 in.)	0.16 mm (0.0063 in.)
Camshaft Journal Diameter	23.950 ~ 23.972 mm (0.9429 ~ 0.9438 in.)	23.92 mm (0.942 in.)
Camshaft Bearing Inside Diameter	24.000 ~ 24.021 mm (0.9449 ~ 0.9457 in.)	24.08 mm (0.948 in.)
Camshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.1 mm (0.004 in.)
<b>Cylinder Head</b>		
Cylinder Compression	(Usable Range) 1 110 ~ 1 590 kPa (11.3 ~ 16.2 kgf/cm <sup>2</sup> , 161 ~ 230 psi) @300 r/min (rpm)	---
Cylinder Head Warp	---	0.05 mm (0.002 in.)
<b>Valves</b>		
Valve Clearance:		
Exhaust	0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	---
Inlet	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)	---
Valve Head Thickness:		
Exhaust	1.0 mm (0.039 in.)	0.5 mm (0.020 in.)
Inlet	0.5 mm (0.020 in.)	0.25 mm (0.0098 in.)
Valve Stem Bend	TIR 0.01 mm (0.0004 in.) or less	TIR 0.05 mm (0.002 in.)
Valve Stem Diameter:		
Exhaust	3.955 ~ 3.970 mm (0.1557 ~ 0.1563 in.)	3.94 mm (0.155 in.)
Inlet	3.975 ~ 3.990 mm (0.1565 ~ 0.1571 in.)	3.96 mm (0.156 in.)
Valve Guide Inside Diameter:		
Exhaust	4.000 ~ 4.012 mm (0.1575 ~ 0.1580 in.)	4.08 mm (0.161 in.)
Inlet	4.000 ~ 4.012 mm (0.1575 ~ 0.1580 in.)	4.08 mm (0.161 in.)
Valve/Valve Guide Clearance (Wobble Method):		
Exhaust	0.09 ~ 0.18 mm (0.0035 ~ 0.0071 in.)	0.40 mm (0.016 in.)
Inlet	0.03 ~ 0.12 mm (0.0012 ~ 0.0047 in.)	0.33 mm (0.013 in.)
Valve Seat Cutting Angle	45°, 32°, 60°	---
Valve Seating Surface:		
Width:		
Exhaust	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	---
Inlet	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	---
Outside Diameter:		
Exhaust	21.6 ~ 21.8 mm (0.850 ~ 0.858 in.)	---
Inlet	26.4 ~ 26.6 mm (1.0276 ~ 1.0472 in.)	---

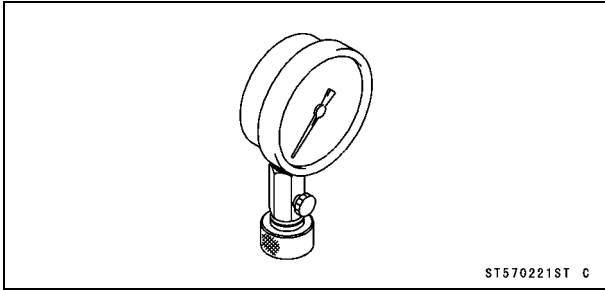
**Specifications**

Item	Standard	Service Limit
Valve Spring Free Length:		
Exhaust	40.7 mm (1.602 in.)	38.9 mm (1.531 in.)
Inlet	40.7 mm (1.602 in.)	38.9 mm (1.531 in.)
<b>Cylinder, Pistons</b>		
Cylinder Inside Diameter	68.400 ~ 68.412 mm (2.6929 ~ 2.6934 in.)	68.50 mm (2.6969 in.)
Piston Diameter	68.345 ~ 68.360 mm (2.6907 ~ 2.6913 in.)	68.21 mm (2.6854 in.)
Piston/Cylinder Clearance	0.040 ~ 0.067 mm (0.0016 ~ 0.0026 in.)	- - -
Piston Ring/Groove Clearance:		
Top	0.04 ~ 0.10 mm (0.0016 ~ 0.0031 in.)	0.20 mm (0.0071 in.)
Second	0.02 ~ 0.08 mm (0.0008 ~ 0.0024 in.)	0.18 mm (0.0063 in.)
Piston Ring Groove Width:		
Top	0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)	0.93 mm (0.037 in.)
Second	0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)	0.91 mm (0.036 in.)
Piston Ring Thickness:		
Top	0.75 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Second	0.75 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Piston Ring End Gap:		
Top	0.30 ~ 0.40 mm (0.0118 ~ 0.0157 in.)	0.7 mm (0.028 in.)
Second	0.45 ~ 0.55 mm (0.0177 ~ 0.0217 in.)	0.8 mm (0.031 in.)

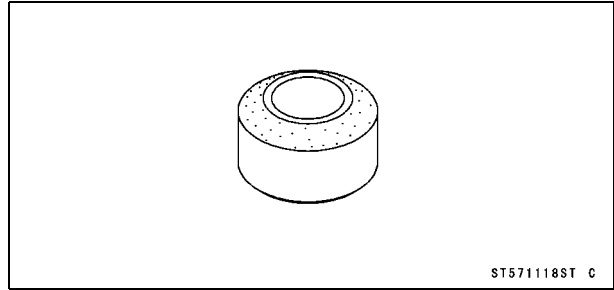
# 5-8 ENGINE TOP END

## Special Tools and Sealant

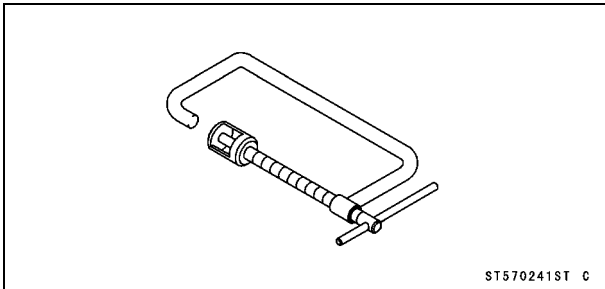
Compression Gauge, 20 kgf/cm<sup>2</sup>:  
57001-221



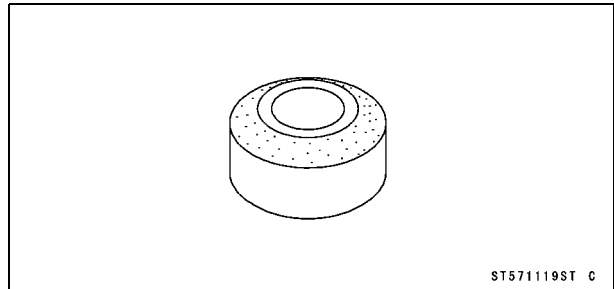
Valve Seat Cutter, 32° -  $\phi$ 25:  
57001-1118



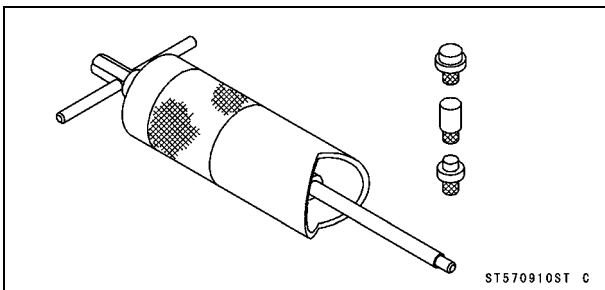
Valve Spring Compressor Assembly:  
57001-241



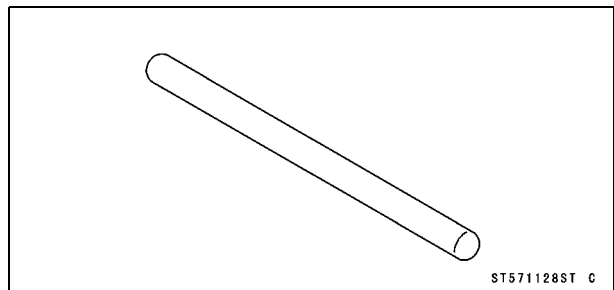
Valve Seat Cutter, 32° -  $\phi$ 28:  
57001-1119



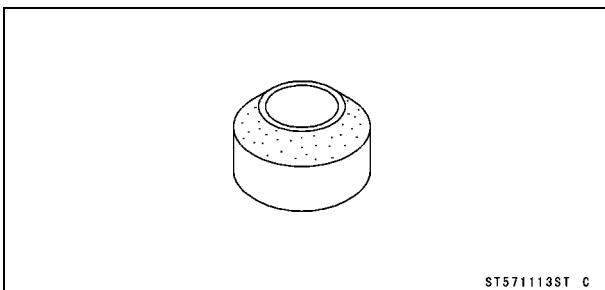
Piston Pin Puller Assembly:  
57001-910



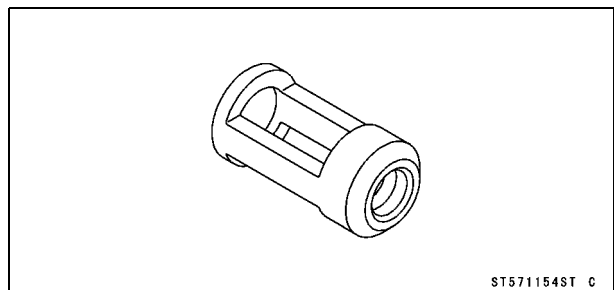
Valve Seat Cutter Holder Bar:  
57001-1128



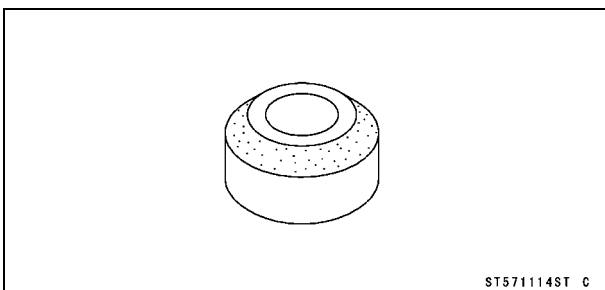
Valve Seat Cutter, 45° -  $\phi$ 24.5:  
57001-1113



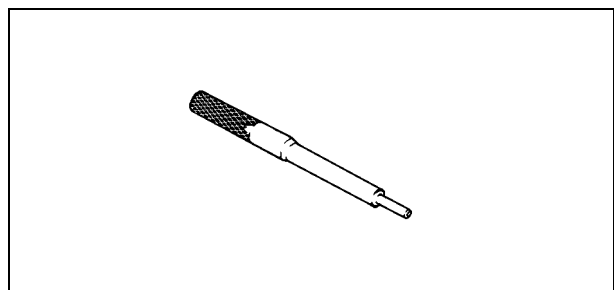
Valve Spring Compressor Adapter,  $\phi$ 20:  
57001-1154



Valve Seat Cutter, 45° -  $\phi$ 27.5:  
57001-1114

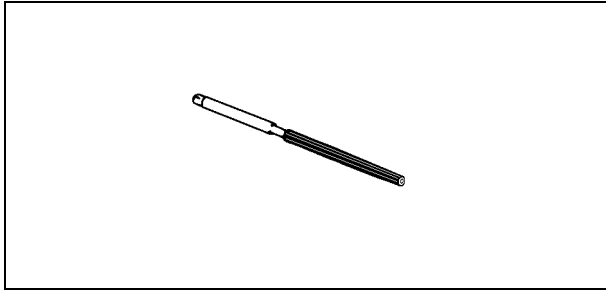


Valve Guide Arbor,  $\phi$ 4:  
57001-1273

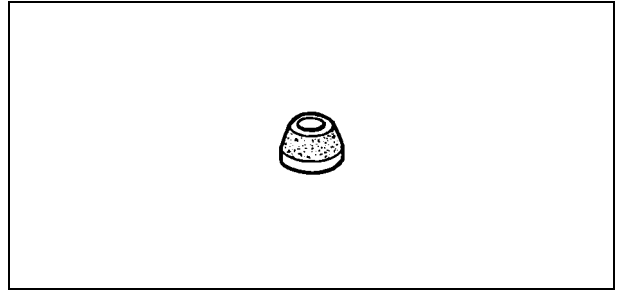


Special Tools and Sealant

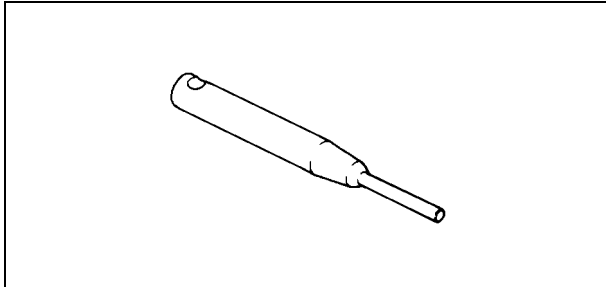
Valve Guide Reamer,  $\phi 4$ :  
57001-1274



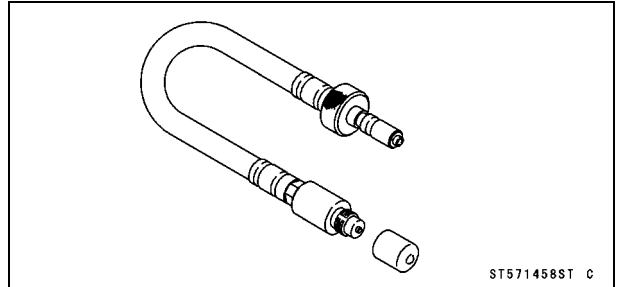
Valve Seat Cutter, 60° -  $\phi 27$ :  
57001-1409



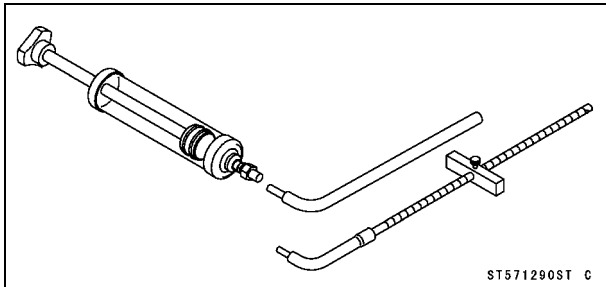
Valve Seat Cutter Holder,  $\phi 4$ :  
57001-1275



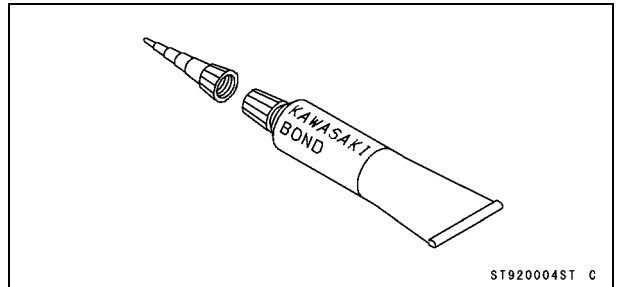
Compression Gauge Adapter, M10 × 1.0:  
57001-1458



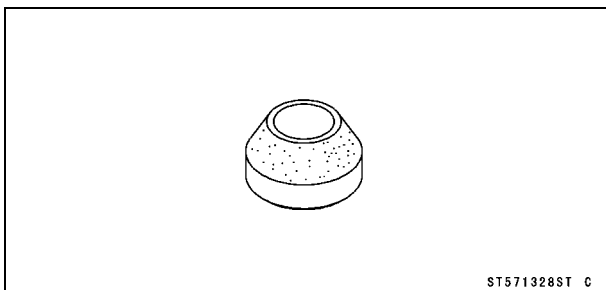
Fork Oil Level Gauge:  
57001-1290



Kawasaki Bond (Silicone Sealant):  
92104-0004



Valve Seat Cutter, 60° -  $\phi 25$ :  
57001-1328

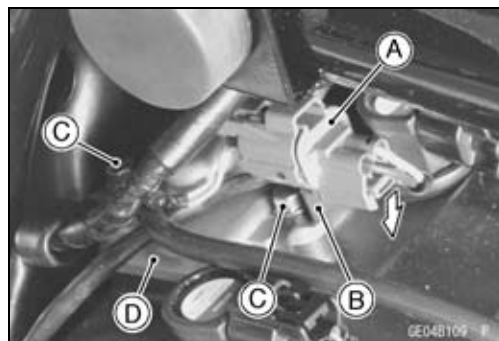


## 5-10 ENGINE TOP END

### Clean Air System

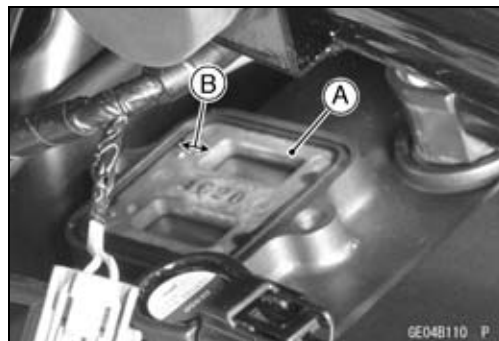
#### Air Suction Valve Removal

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Connector [A] (from Clamp [B])
  - Air Suction Valve Cover Bolts [C] and Clamp
  - Air Suction Valve Cover [D]
  - Air Suction Valve



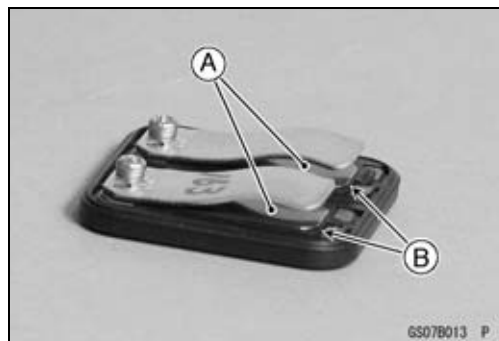
#### Air Suction Valve Installation

- Install the air suction valve [A] so that its wider side [B] of the reed valve case faces the front.
- Tighten:
  - Torque - Air Suction Valve Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



#### Air Suction Valve Inspection

- Remove the air suction valve (see Engine Top End chapter).
- Visually inspect the reeds for cracks, folds, warps, heat damage or other damage.
- ★ If there is any doubt as to the condition of the reeds [A], replace the air suction valve as an assembly.
- Check the reed contact areas [B] of the valve holder for grooves, scratches, any signs of separation from the holder or heat damage.
- If there is any doubt as to the condition of the reed contact areas, replace the air suction valve as an assembly.
- If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high-flash point solvent.

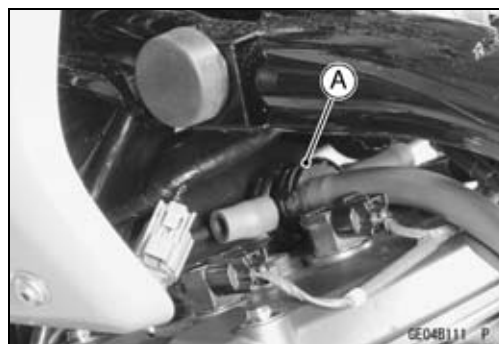


#### CAUTION

**Do not scrape off the deposits with a scraper as this could damage the rubber, requiring replacement of the suction valve assembly.**

#### Vacuum Switch Valve Removal

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Left Air Suction Valve Cover (see Air Suction Valve Removal)
  - Vacuum Switch Valve [A]

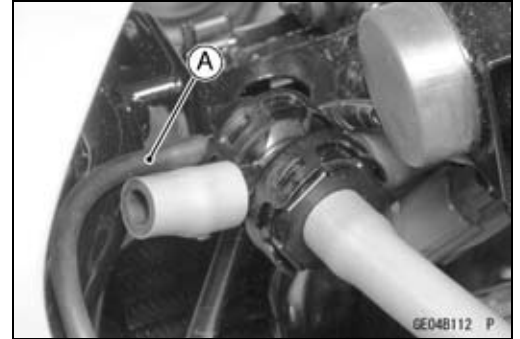




**Clean Air System**

*Vacuum Switch Valve Installation*

- Install the vacuum switch valve so that the vacuum fitting [A] faces left side.
- Route the hoses correctly (see Appendix chapter).

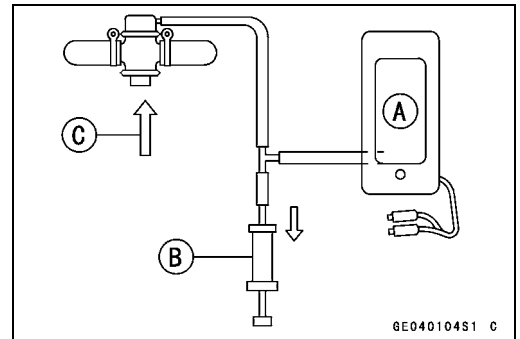


*Vacuum Switch Valve Test*

- Remove:  
Vacuum Switch Valve (see Vacuum Switch Valve Removal)
- Connect a vacuum gauge [A] and syringe [B] or fork oil level gauge to the vacuum hoses as shown.

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

Air Flow [C]



- Gradually raise the vacuum (lower the pressure) applied to the vacuum switch valve, and check the valve operation. When the vacuum is low, the vacuum switch valve should permit air to flow. When the vacuum raises to valve closing pressure, it should stop air flow.

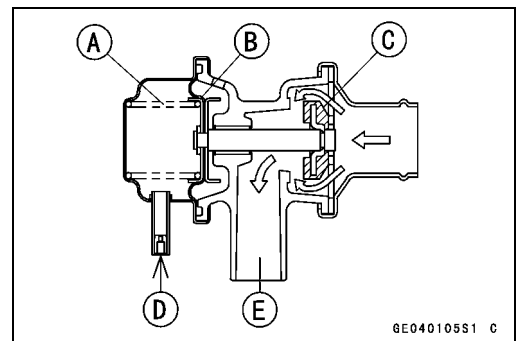
Spring [A]

Diaphragm [B]

Valve [C]

Low Vacuum [D]

Secondary Air Flow [E]



- ★ If the vacuum switch valve does not operate as described, replace it with a new one.

**NOTE**

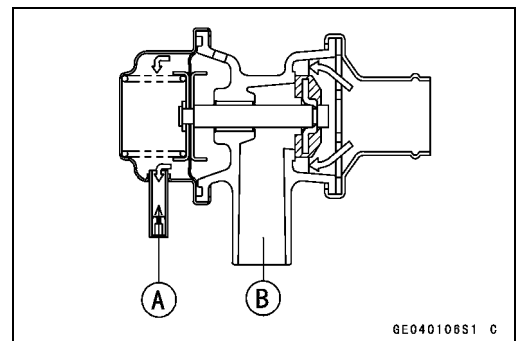
○ To check air flow through the vacuum switch valve, just blow through the air cleaner hose.

**Vacuum Switch Valve Closing Pressure (Open → Close)**

**Standard: 41 ~ 49 kPa (310 ~ 370 mmHg, 6.0 ~ 7.1 psi)**

High Vacuum [A]

Secondary air cannot flow [B]



*Clean Air System Hose Inspection*

- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, vacuum switch valve, #1 and #4 carburetor holders and air suction valve covers.
- ★ If they are not, correct them. Replace them if they are damaged.

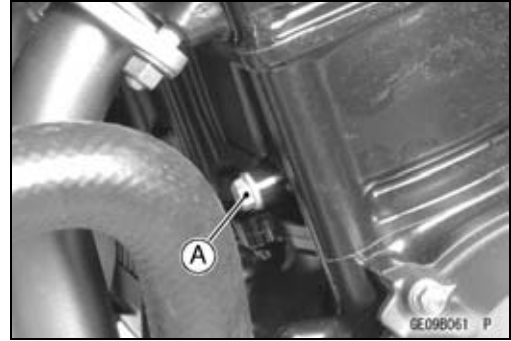
## 5-12 ENGINE TOP END

### Cylinder Head Cover

#### Cylinder Head Cover Removal

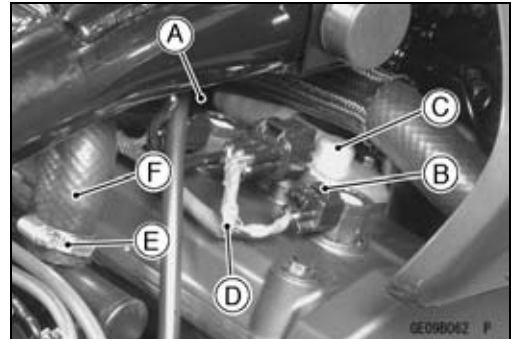
- Remove:

- Drain the coolant in the cylinder.  
Drain Bolt [A]

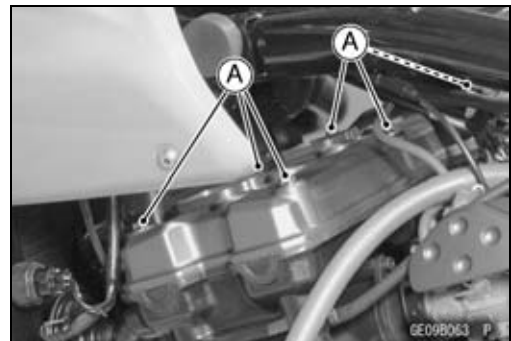


- Remove:

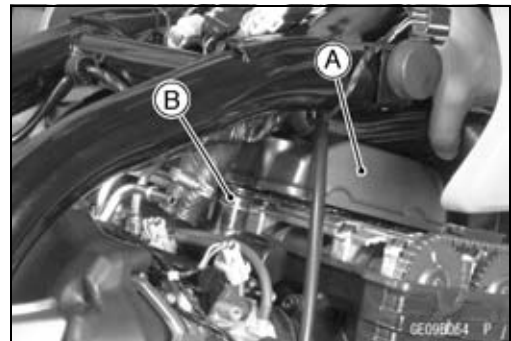
- Fuel Tank (see Fuel System (DFI) chapter)
- Vacuum Switch Valve and Hoses [A]
- Stick Coils [B] (see Electrical System chapter)
- Air Suction Valve Covers [C]
- Ignition Harness [D]
- Clamp Screw [E] (Loosen)
- Radiator Hose [F] (Pullout)



- Remove the cylinder head cover bolts [A].

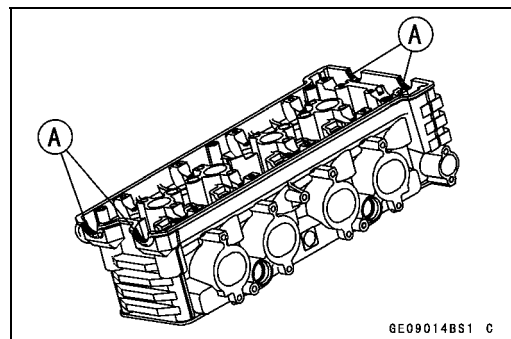


- Clear the cylinder head cover [A] to the coolant pipe [B].  
○ Remove the head cover to left side.



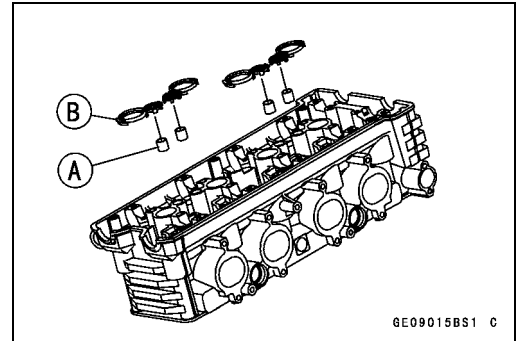
#### Cylinder Head Cover Installation

- Replace the head cover gasket with a new one.
- Apply silicone sealant [A] to the cylinder head as shown.  
**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

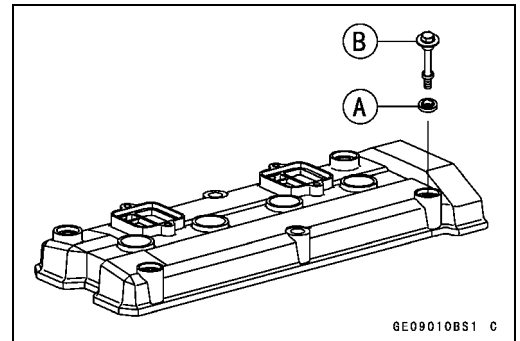


**Cylinder Head Cover**

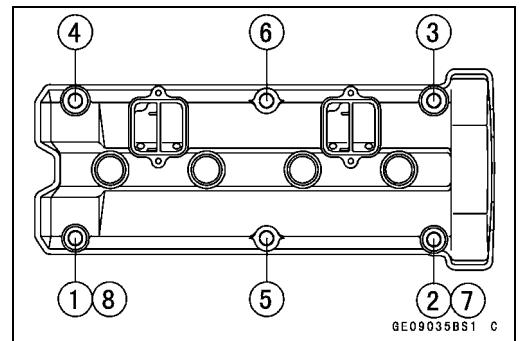
- Install:
  - Dowel Pins [A]
  - Plug Hole Gaskets [B]



- Install:
  - Washer [A]
  - Bolts [B]
- Install the washer with the metal side faces upward.



- Tighten the cover bolts following the specified tightening sequence.
- Retighten the two cover bolts (7) (8) as shown.
- Torque - Cylinder Head Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Install the removed parts (see appropriate chapters).



## 5-14 ENGINE TOP END

### Camshaft Chain Tensioner

#### Camshaft Chain Tensioner Removal

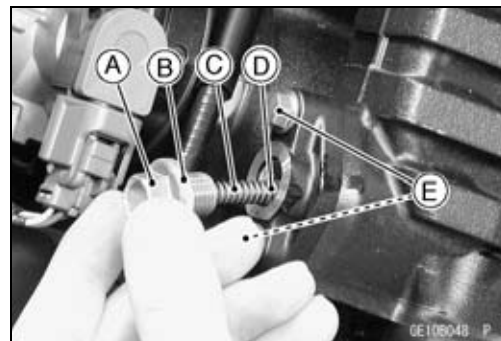
#### CAUTION

This is a non-return type camshaft chain tensioner. The push rod does not return to its original position once it moves out to take up camshaft chain slack. Observe all the rules listed below:

When removing the tensioner, do not take out the mounting bolts only halfway. Retightening the mounting bolts from this position could damage the tensioner and the camshaft chain. Once the bolts are loosened, the tensioner must be removed and reset as described in "Camshaft Chain Tensioner Installation."

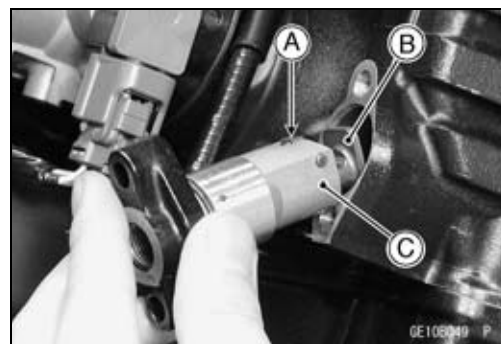
Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing, and damage the valves.

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

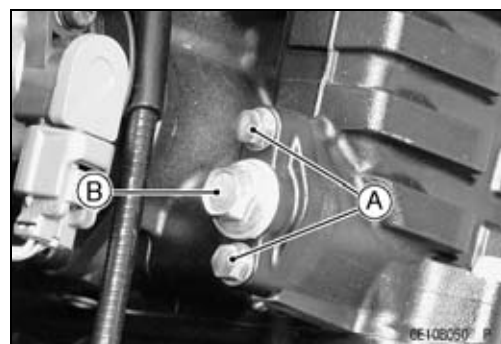


#### Camshaft Chain Tensioner Installation

- Release the stopper [A] and push the push rod [B] into the tensioner [C].
- Insert the push rod so that the push rod teeth are leaved five (5) notches.
- Install the tensioner so that the stopper faces upward.



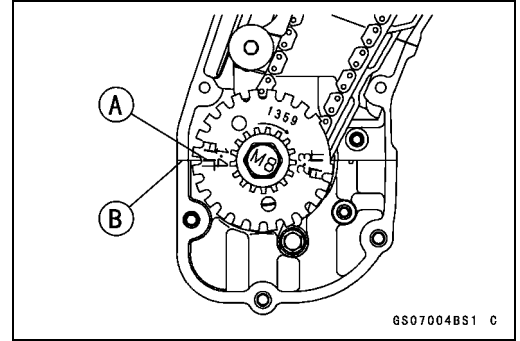
- Tighten the tensioner mounting bolts [A].  
**Torque - Camshaft Chain Tensioner Mounting Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**
- Install the rod, spring and washer.
- Tighten the cap bolt [B].  
**Torque - Camshaft Chain Tensioner Cap Bolt: 28 N·m (2.9 kgf·m, 21 ft·lb)**
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.



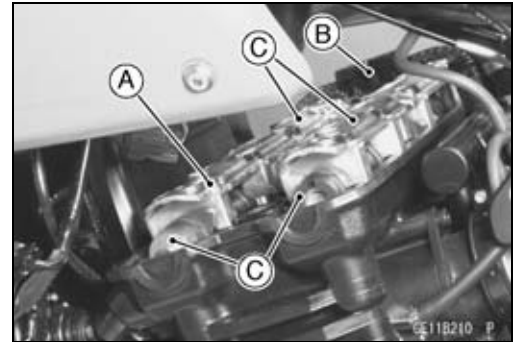
**Camshaft, Camshaft Chain**

*Camshaft Removal*

- Remove:
  - Cylinder Head Cover (see this chapter)
  - Crankshaft Sensor Cover (see Electrical System chapter)
- Position the crankshaft at #1, 4 piston TDC.
  - TDC mark [A] for #1, 4 Pistons
  - Timing Mark (Crankcase halves mating surface) [B]



- Remove:
  - Camshaft Chain Tensioner (see this chapter)
  - Camshaft Cap Bolts [A]
  - Chain Guide [B]
  - Camshaft Caps [C]
  - Camshafts [D]

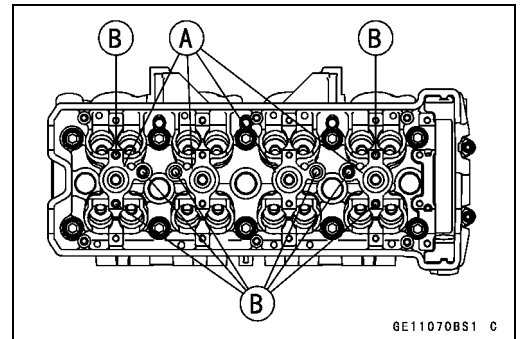


**CAUTION**

The crankshaft may be turned while the camshafts are removed. Always pull the chain taut while turning the crankshaft. This avoids kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.

*Camshaft Installation*

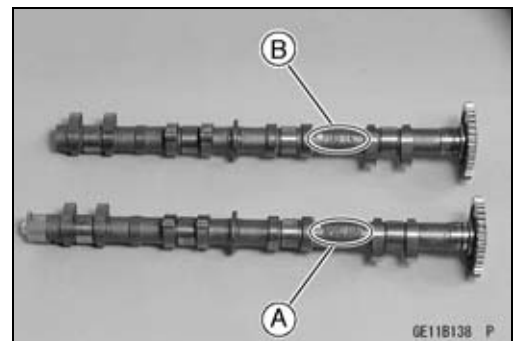
- Be sure to install the following parts.
  - Plug Hole Gaskets [A]
  - Dowel Pins [B]



- Apply molybdenum disulfide oil solution to all cam parts and journals.
- If a new camshaft is to be used, apply a thin coat of molybdenum disulfide grease to the cam surfaces.

**NOTE**

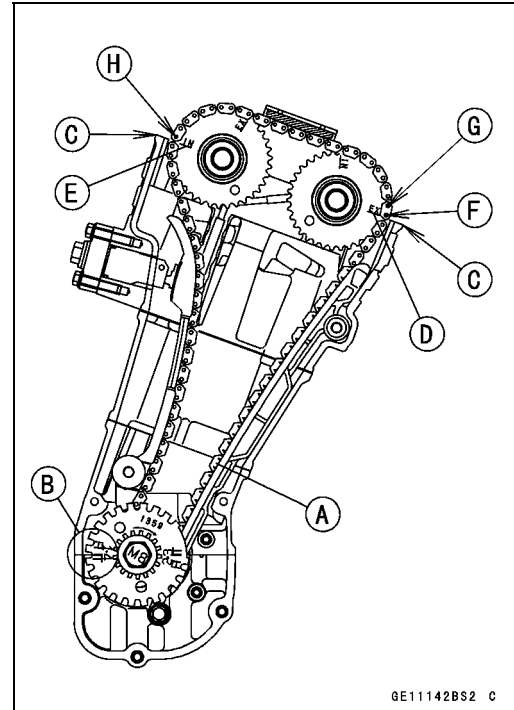
○ The exhaust camshaft has a 1 182 EX mark [A] and the inlet camshaft has a 1 182 IN mark [B]. Be careful not to mix up these shafts.



## 5-16 ENGINE TOP END

### Camshaft, Camshaft Chain

- Position the crankshaft at #1, 4 piston TDC.
- Pull the tension side (exhaust side) [A] of the chain taut to install the chain.
- Engage the camshaft chain with the camshaft sprockets so that the timing marks on the sprockets are positioned as shown.
- The timing marks of #1, 4T must be aligned with the lower surface of crankcase of rear side [B].
- The timing marks must be aligned with the cylinder head upper surface [C].
  - EX mark [D]
  - IN mark [E]
  - #1 Pin [F]
  - #2 Pin [G]
  - #30 Pin [H]

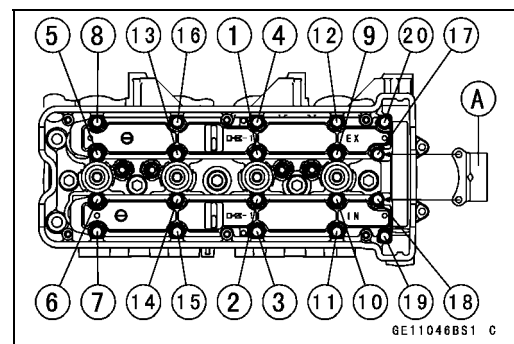


- Install the camshaft cap and chain guide [A], while pushing the camshaft chain, tighten all camshaft bolts and chain guide bolts.
- First tighten the all camshaft cap and all chain guide bolts evenly to seat the camshaft in place, then tighten all bolts following the specified tightening sequence.

**Torque - Camshaft Cap Bolts (1 ~ 16, 19, 20): 12 N·m (1.2 kgf·m, 104 in·lb)**

**Camshaft Chain Guide Bolts (17, 18): 12 N·m (1.2 kgf·m, 104 in·lb)**

- Install:
  - Camshaft Chain Tensioner (see this chapter)
  - Cylinder Head Cover (see this chapter)

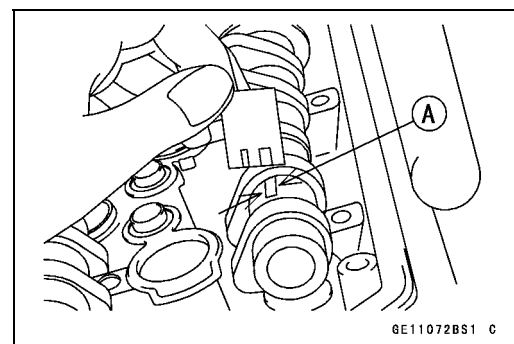


### Camshaft, Camshaft Cap Wear

- Remove:
  - Camshaft Chain Guide
  - Camshaft Cap
- Cut strips of plastigage to journal width. Place a strip on each journal parallel to the camshaft installed in the correct position.
- Measure each clearance between the camshaft journal and the camshaft cap using plastigage (press gauge) [A].
- Tighten:

**Torque - Camshaft Cap Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)**

**Camshaft Chain Guide Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)**



### NOTE

- Do not turn the camshaft when the plastigage is between the journal and camshaft cap.

### Camshaft Journal, Camshaft Cap Clearance

**Standard: 0.028 ~ 0.071 mm (0.0011 ~ 0.0028 in.)**

**Service Limit: 0.16 mm (0.0063 in.)**

## Camshaft, Camshaft Chain

- ★ If any clearance exceeds the service limit, measure the diameter of each camshaft journal with a micrometer.

### Camshaft Journal Diameter

**Standard:** 23.950 ~ 23.972 mm (0.9429 ~ 0.9438 in.)

**Service Limit:** 23.92 mm (0.942 in.)

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

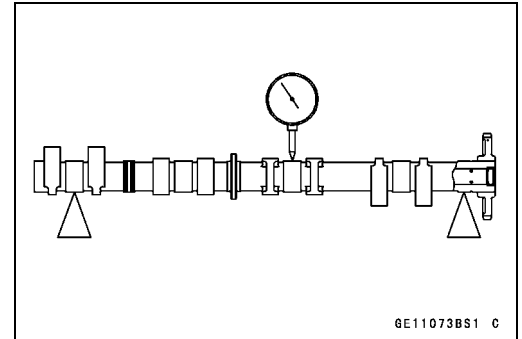
### Camshaft Runout

- Remove the camshaft (see Camshaft Removal).
- Set the camshaft in a camshaft alignment jig or on V blocks.
- Measure runout with a dial gauge at the specified place as shown.
- ★ If the runout exceeds the service limit, replace the shaft.

### Camshaft Runout

**Standard:** TIR 0.02 mm (0.0008 in.) or less

**Service Limit:** TIR 0.1 mm (0.004 in.)



### Cam Wear

- Remove the camshaft (see Camshaft Removal).
- Measure the height [A] of each cam with a micrometer.
- ★ If the cams are worn down past the service limit, replace the camshaft.

### Cam Height

**Standard:**

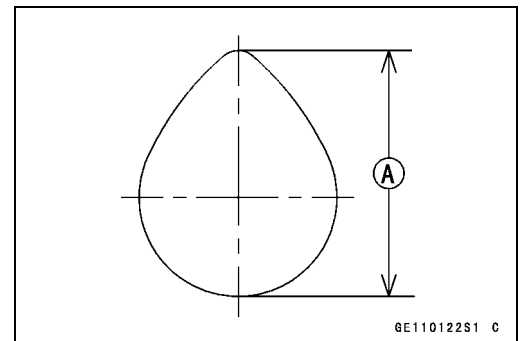
**Exhaust** 36.146 ~ 36.254 mm (1.4231 ~ 1.4273 in.)

**Inlet** 36.746 ~ 36.854 mm (1.4467 ~ 1.4509 in.)

**Service Limit:**

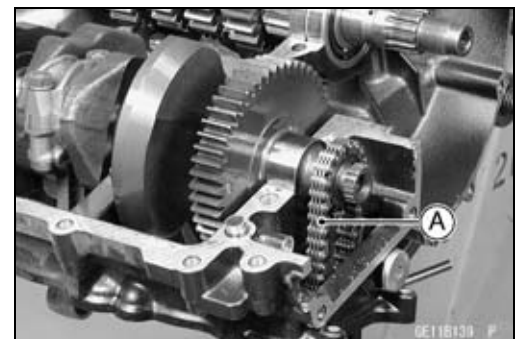
**Exhaust** 36.05 mm (1.419 in.)

**Inlet** 36.65 mm (1.443 in.)



### Camshaft Chain Removal

- Split the crankcase (see Crankshaft/Transmission chapter).
- Remove the camshaft chain [A] from the crankshaft sprocket.



## 5-18 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:
  - Seats (see Frame chapter)
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Stick Coils (see Electrical System chapter)
  - Spark Plugs (see Electrical System chapter)

**Owner's Tool - Spark Plug Wrench, 16 mm: 92110-1146**

- 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.

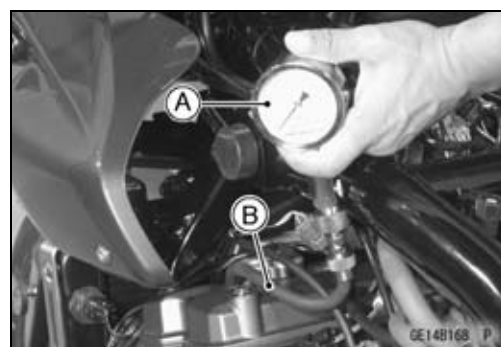
**Special Tools - Compression Gauge, 20 kgf/cm<sup>2</sup>: 57001-221**  
**Compression Gauge Adapter, M10 × 1.0: 57001-1458**

#### Cylinder Compression

**Usable Range: 1 110 ~ 1 590 kPa (11.3 ~ 16.2 kgf/cm<sup>2</sup>, 161 ~ 230 psi) @300 r/min (rpm)**

- Repeat the measurement for the other cylinders.
- Install the spark plugs.

**Torque - Spark Plugs: 13 N·m (1.3 kgf·m, 113 in·lb)**



The following table should be consulted if the obtainable compression reading is not within the usable range.

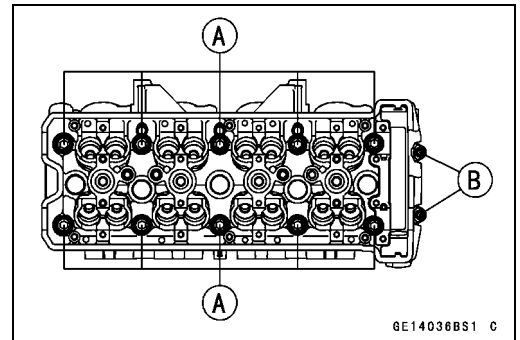
Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace 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 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:
  - Exhaust Pipes (see Exhaust Pipe Removal)
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
  - Camshaft Position Sensor (see Electrical System chapter)
  - Camshafts (see Camshaft Removal)
  - Throttle Body Assy (see Fuel System (DFI) chapter)
  - Water Hose
  - Upper Engine Mounting Bolts (both side) [A]
  - Front Camshaft Chain Guide
- Remove the M6 cylinder head bolts [B], and then the M10 cylinder head bolts [A].
- Take off 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.

- Install a new cylinder head gasket and dowel pins.
- Apply molybdenum disulfide oil solution to both sides [A] of the cylinder head bolt washers [B] and the thread of M10 head bolts [C].
- Tighten the M10 cylinder head bolts following the tightening sequence [1 ~ 10].

#### Torque - Cylinder Head Bolts (M10):

First: 20 N·m (2.0 kgf·m, 14.5 ft·lb)

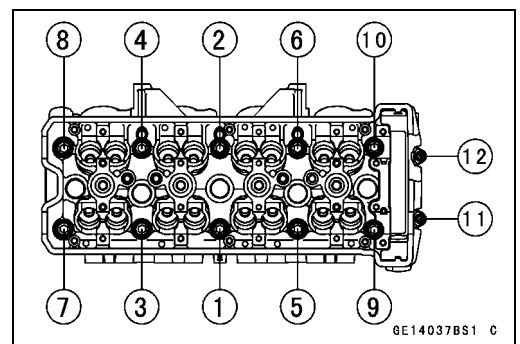
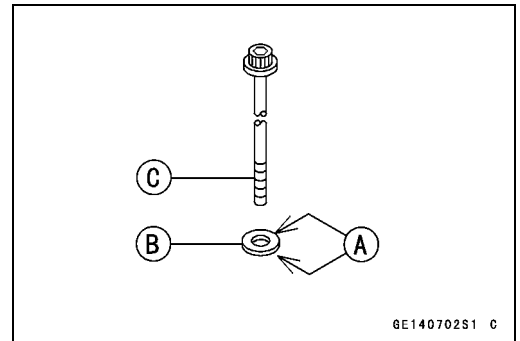
Final:

Used Bolts 49 N·m (5.0 kgf·m, 36 ft·lb)

New Bolts 54 N·m (5.5 kgf·m, 40 ft·lb)

- Tighten the M6 cylinder head bolts [11 ~ 12].

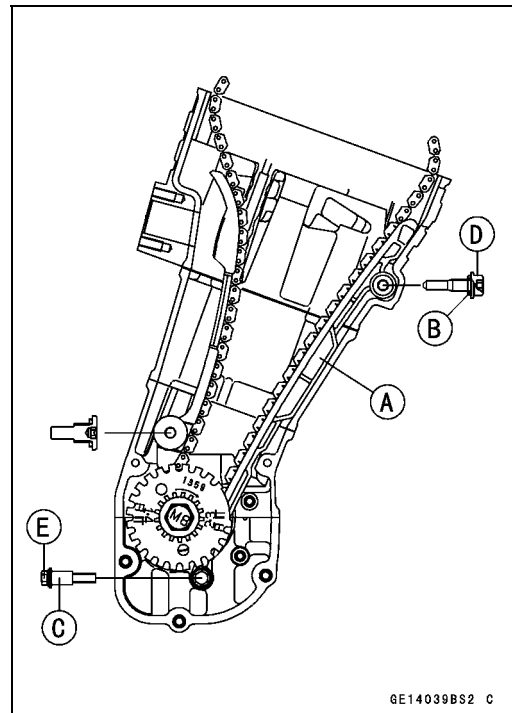
Torque - Cylinder Head Bolts (M6): 12 N·m (1.2 kgf·m, 104 in·lb)



## 5-20 ENGINE TOP END

### Cylinder Head

- Install:
  - Front Camshaft Chain Guide [A]
  - O-ring [B]
  - Collar [C]
- Tighten:
  - Torque - Front Camshaft Chain Guide Bolt (Upper) [D]: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Front Camshaft Chain Guide Bolt (Lower) [E]: 12 N·m (1.2 kgf·m, 104 in·lb)**
- Install the removed parts (see appropriate chapters).



#### Cylinder Head Warp

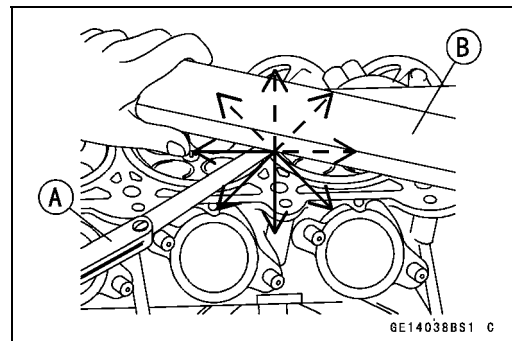
- Clean the cylinder head.
- Lay a straightedge across the lower surface of the cylinder head at several positions.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

#### Cylinder Head Warp

**Standard:** ---

**Service Limit: 0.05 mm (0.002 in.)**

- ★ If the cylinder head is warped more than the service limit, replace it.
- ★ If the cylinder head is warped less than the service limit, repair the head by rubbing the lower surface on emery paper secured to a surface plate (first No. 200, then No. 400).



**Valves**

*Valve Clearance Inspection*

- Refer to the Valve Clearance Inspection in the Periodic Maintenance chapter.

*Valve Clearance Adjustment*

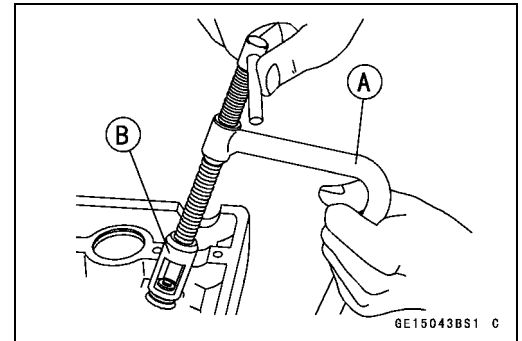
- Refer to the Valve Clearance Adjustment in the Periodic Maintenance chapter.

*Valve Removal*

- Remove the cylinder head (see Cylinder Head Removal).
- Remove the valve lifter and shim.
- 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: 57001-241 [A]**

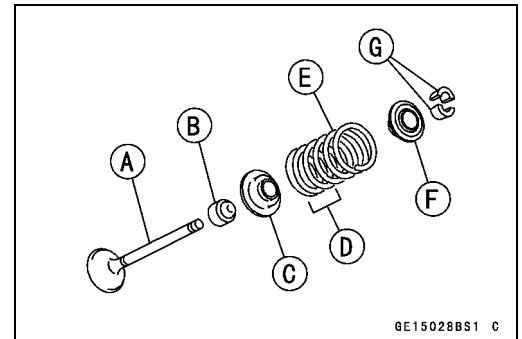
**Valve Spring Compressor Adapter,  $\phi 20$ : 57001-1154 [B]**



*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 (White) [E]
- Retainer [F]
- Split Keepers [G]

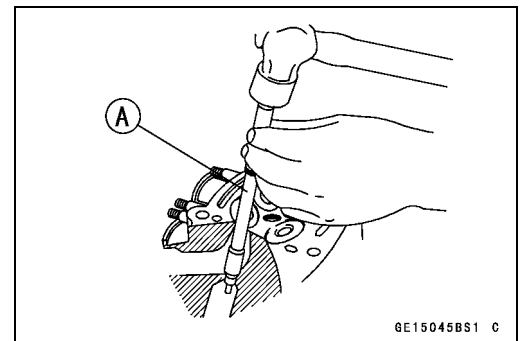


*Valve Guide Removal*

- Remove:
  - Valve (see Valve Removal)
  - Oil Seal
  - Spring Seat
- Heat the area around the valve guide to 120 ~ 150°C (248 ~ 302°F), and hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

**CAUTION**

**Do not heat the cylinder head with a torch. This will warp the cylinder head. Soak the cylinder head in oil and heat the oil.**



**Special Tool - Valve Guide Arbor,  $\phi 4$ : 57001-1273**

## 5-22 ENGINE TOP END

### Valves

#### Valve Guide Installation

- Apply oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150°C (248 ~ 302°F).
- Drive the valve guide in from the top of the head using the valve guide arbor. The flange stops the guide from going in too far.

#### Special Tool - Valve Guide Arbor, $\phi 4$ : 57001-1273

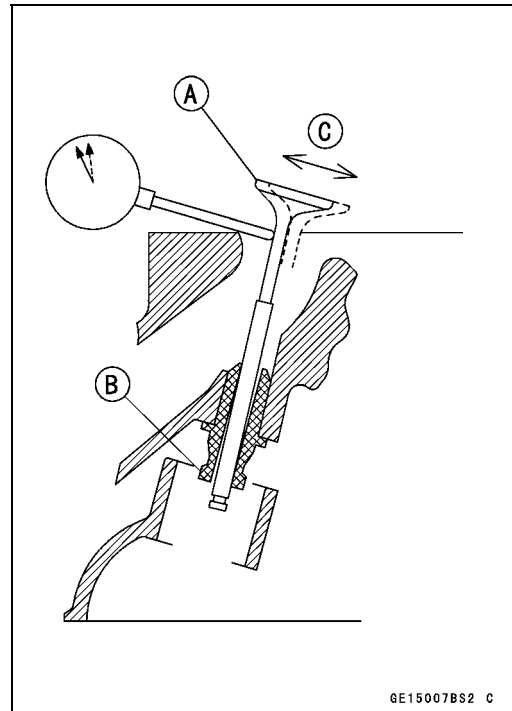
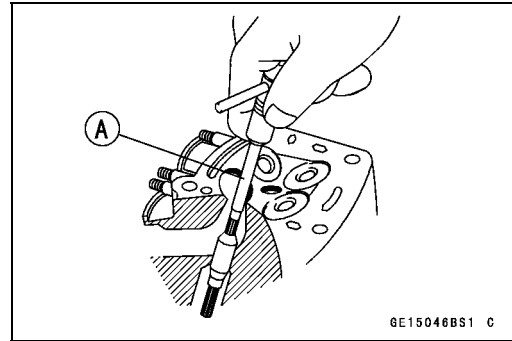
- Wait until the cylinder head cools down and then ream the valve guide with the valve guide reamer [A] even if the old guide is reused.
- Turn the reamer in a clockwise direction until the reamer turns freely in the guide. Never turn the reamer counter-clockwise or it will be dulled.
- Once the guides are reamed they must be cleaned thoroughly.

#### Special Tool - Valve Guide Reamer, $\phi 4$ : 57001-1274

#### 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.



#### 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	0.09 ~ 0.18 mm (0.0035 ~ 0.0071 in.)
Inlet	0.03 ~ 0.12 mm (0.0012 ~ 0.0047 in.)

##### Service Limit:

Exhaust	0.40 mm (0.016 in.)
Inlet	0.33 mm (0.013 in.)

## Valves

### Valve Seat Inspection

- Remove the valve (see Valve Removal).
- Check the valve seating surface [A] between the valve [B] and valve seat [C].
- Measure the outside diameter [D] of the seating pattern on the valve seat.
- ★ If the outside diameter is too large or too small, repair the seat (see Seat Repair).

#### Valve Seating Surface Outside Diameter

##### Standard:

Exhaust	21.6 ~ 21.8 mm (0.850 ~ 0.858 in.)
Inlet	26.4 ~ 26.6 mm (1.0276 ~ 1.0472 in.)

- Measure the seat width [E] of the portion where there is no build-up carbon (white portion) of the valve seat with a vernier caliper.

Good [F]

- ★ If the width is too wide [G], too narrow [H] or uneven [J], repair the seat (see Valve Seat Repair).

#### Valve Seating Surface Width

##### Standard:

Exhaust	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)
Inlet	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)

### Valve Seat Repair

- Repair the valve seat with the valve seat cutters [A].
- Special Tools - Valve Seat Cutter Holder Bar: 57001-1128 [C]**
- Valve Seat Cutter Holder,  $\phi$ 4: 57001-1275 [B]**

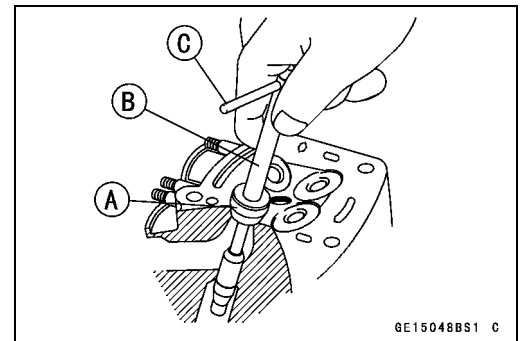
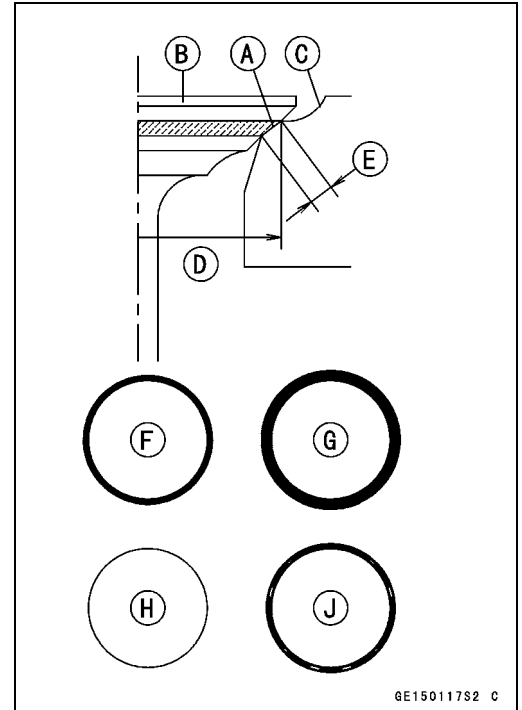
#### For Exhaust Valve Seat

- Valve Seat Cutter, 45° -  $\phi$ 24.5: 57001-1113
- Valve Seat Cutter, 32° -  $\phi$ 25: 57001-1118
- Valve Seat Cutter, 60° -  $\phi$ 25: 57001-1328

#### For Inlet 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

- ★ If the manufacturer's instructions are not available, use the following procedure.



## 5-24 ENGINE TOP END

### Valves

#### Seat Cutter Operation Care

1. This valve seat cutter is developed to grind the valve for repair. Therefore the cutter must not be used for other purposes than seat repair.
2. Do not drop or shock the valve seat cutter, or the diamond particles may fall off.
3. Do not fail to apply engine oil to the valve seat cutter before grinding the seat surface. Also wash off ground particles sticking to the cutter with washing oil.

#### NOTE

○Do not use a wire brush to remove the metal particles from the cutter. It will take off the diamond particles.

4. Setting the valve seat cutter holder in position, operate the cutter in one hand. Do not apply too much force to the diamond portion.

#### NOTE

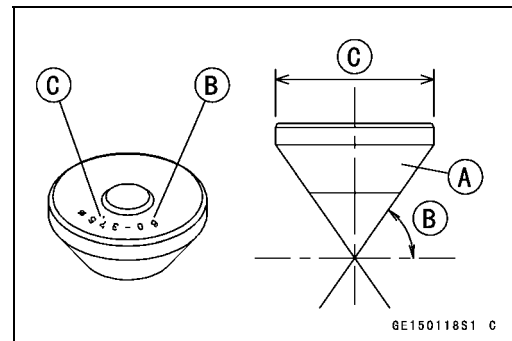
○Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.

5. After use, wash it with washing oil and apply thin layer of engine oil before storing.

#### Marks Stamped on the Cutter

The marks stamped on the back of the cutter [A] represent the following.

- 60° ..... Cutter angle [B]  
φ37.5 ..... Outer diameter of cutter [C]



#### Operating Procedures

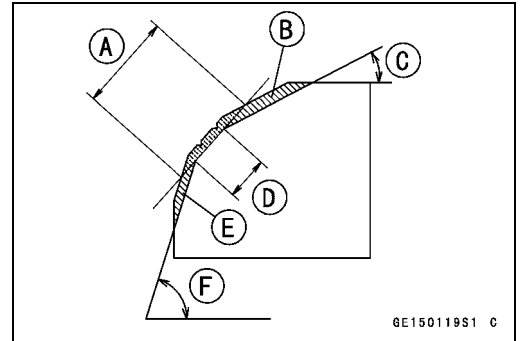
- Clean the seat area carefully.
- Coat the seat with machinist's dye.
- Fit a 45° cutter into the holder and slide it into the valve guide.
- Press down lightly on the handle and turn it right or left. Grind the seating surface only until it is smooth.

#### CAUTION

**Do not grind the seat too much. Overgrinding will reduce valve clearance by sinking the valve into the head. If the valve sinks too far into the head, it will be impossible to adjust the clearance, and the cylinder head must be replaced.**

## Valves

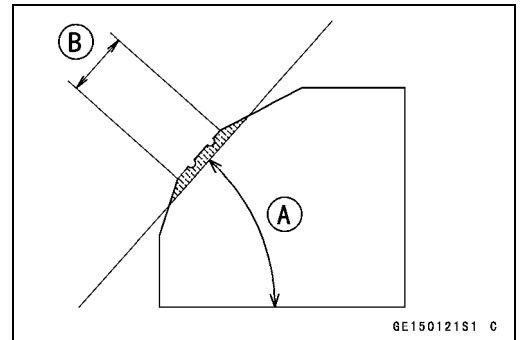
- Measure the outside diameter of the seating surface with a vernier caliper.
- ★ If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.
  - Widened Width [A] of engagement by machining with 45° cutter
  - Ground Volume [B] by 32° cutter
  - 32° [C]
  - Correct Width [D]
  - Ground Volume [E] by 60° cutter
  - 60° [F]



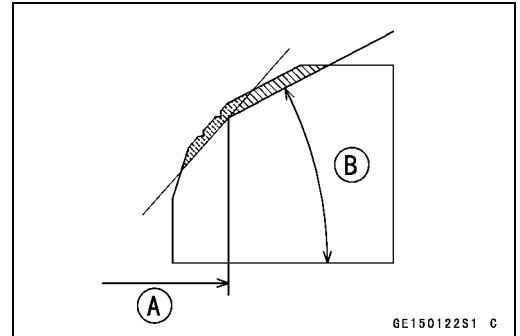
- Measure the outside diameter of the seating surface with a vernier caliper.
- ★ If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.
  - Original Seating Surface [B]

### NOTE

- Remove all pittings or flaws from 45° ground surface.
- After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° grinding operation easier.
- When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.



- ★ If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.
- ★ If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.
- Grind the seat at a 32° angle [B] until the seat 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.



### CAUTION

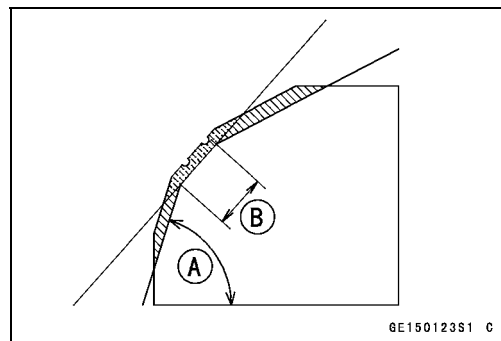
**The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.**

- After making the 32° grind, return to the seat 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.

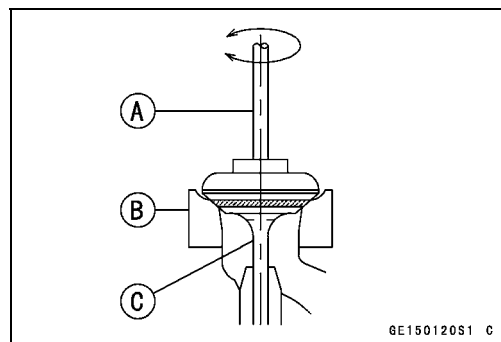
## 5-26 ENGINE TOP END

### 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]

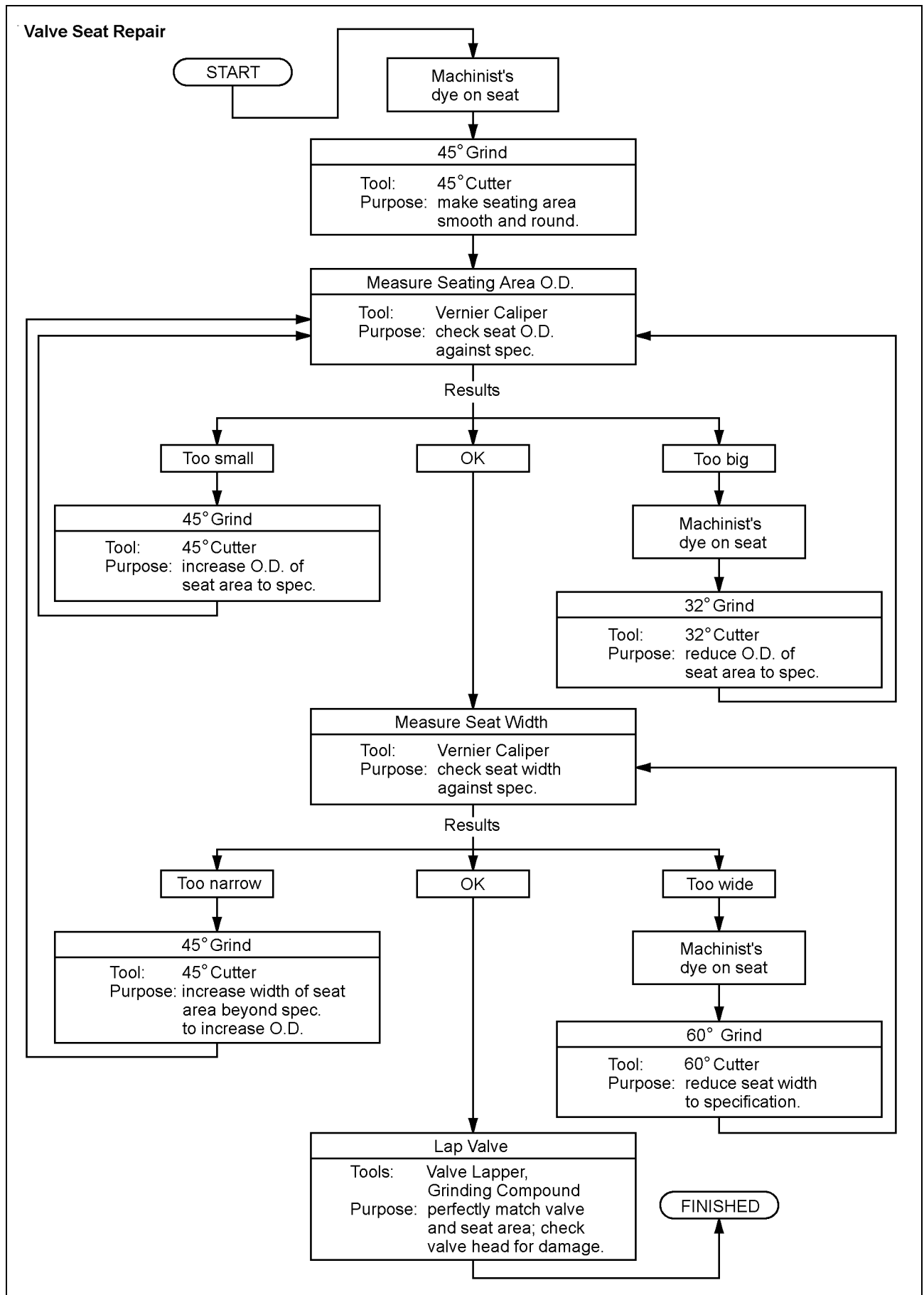


- Lap the valve to the seat, once the seat width and outside diameter are within the ranges specified above.
- Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
- Spin the valve against the seat until the grinding compound produces a smooth, matched 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 Adjustment in the Periodic Maintenance chapter).





Valves

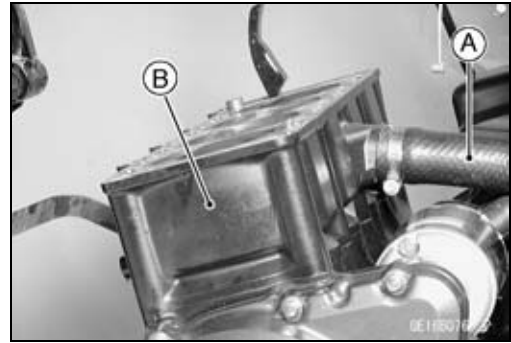


## 5-28 ENGINE TOP END

### Cylinder, Pistons

#### Cylinder Removal

- Remove:
  - Cylinder Head (see Cylinder Head Removal)
  - Water Hose [A]
- Remove the cylinder [B].

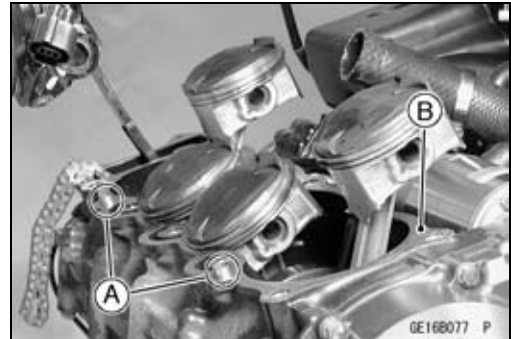


#### Cylinder Installation

##### NOTE

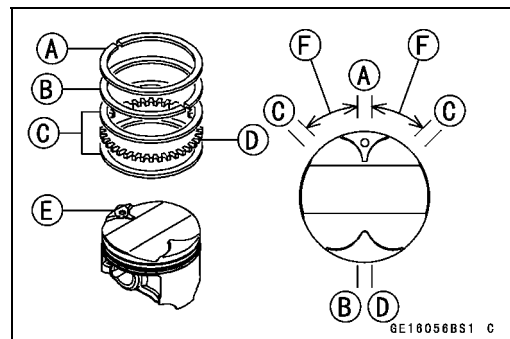
○ If a new cylinder is used, use new piston ring.

- Install the dowel pins [A] and new cylinder gasket [B].

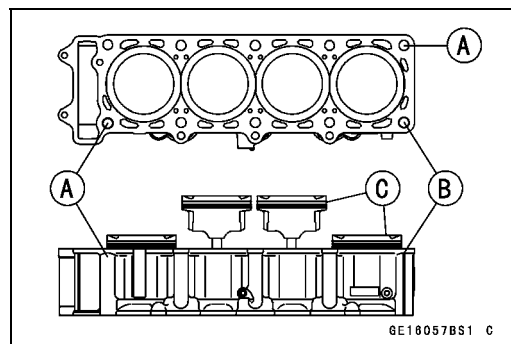


- The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 30 ~ 40° of angle from the opening of the top ring.

Top Ring [A]  
Second Ring [B]  
Oil Ring Steel Rails [C]  
Oil Ring Expander [D]  
Hollow [E]  
30 ~ 40° [F]



- Apply molybdenum disulfide oil solution to the cylinder bore, piston rings and piston.
- Position the crankshaft at #2, #3 piston TDC.
- Prepare two auxiliary head bolts with their head cut.
- Install the two cylinder head bolts [A] diagonally in the crankcase.
- Install the cylinder block [B].
  - Pistons [C]
- First insert the #2, #3 pistons, and then rotate the crankshaft at 90° angle.
- Insert the piston rings with your thumbs or the thin (-) screwdriver.



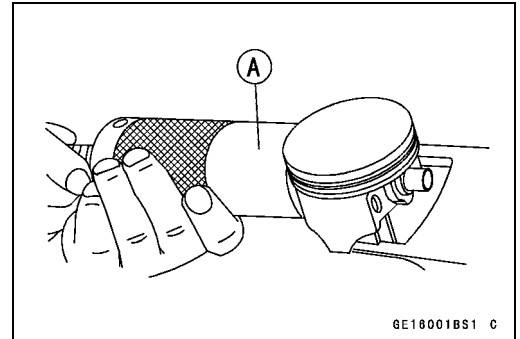
**Cylinder, Pistons**

*Piston Removal*

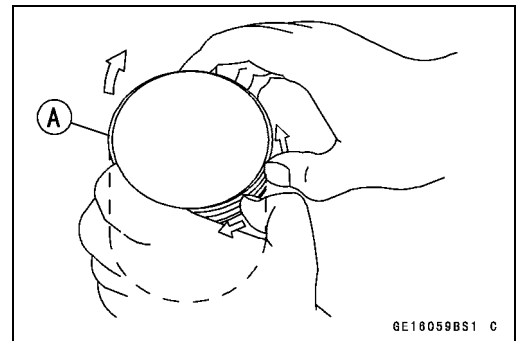
- Remove the cylinder (see Cylinder Removal).
- Place a clean cloth under the pistons and remove the piston pin snap ring [A] from the outside of each piston.



- Remove the piston pins.  
**Special Tool - Piston Pin Puller Assembly: 57001-910 [A]**
- Remove the pistons.

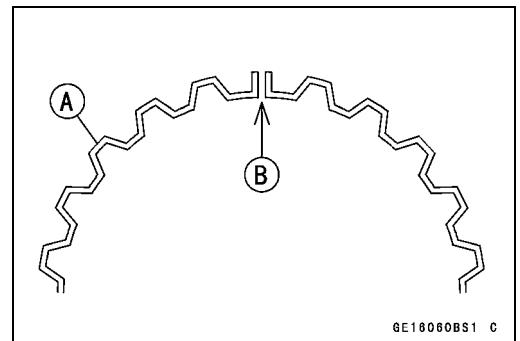


- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



*Piston Installation*

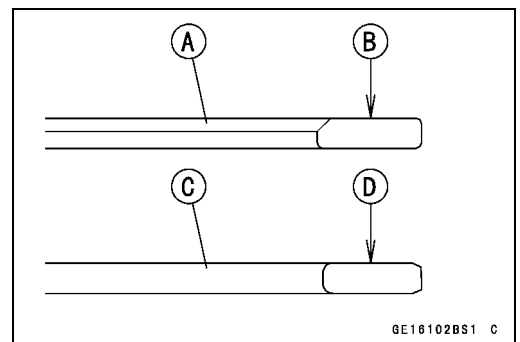
- Install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
- Install the oil ring steel rails, one above the expander and one below it.
- Spread the rail with your thumbs, but only enough to fit the rail over the piston.
- Release the rail into the bottom piston ring groove.



**NOTE**

○The oil ring rails have no "top" or "bottom".

- 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 "2T" mark [D] faces up.



## 5-30 ENGINE TOP END

### Cylinder, Pistons

#### NOTE

○ If a new piston is used, use new piston ring.

- Install the piston with its marking hollow facing forward.
- Fit a new piston pin snap ring into the side of the piston so that the ring opening [A] does not coincide with the slit [B] of the piston pin hole.
- Apply molybdenum disulfide oil solution to the piston pins and piston journals.
- When installing the piston pin snap ring, compress it only enough to install it and no more.

#### CAUTION

**Do not reuse snap rings, as removal weakens and deforms them. They could fall out and score the cylinder wall.**

- Install the cylinder (see Cylinder Installation).

#### Cylinder Wear

- Since there is a difference in cylinder wear in different directions, take a side-to-side and a front-to-back measurement at each of the two locations (total of four measurements) shown in the figure.
- ★ If any of the cylinder inside diameter measurements exceeds the service limit, replace the cylinder.

10 mm (0.39 in.) [A]

60 mm (2.36 in.) [B]

#### Cylinder Inside Diameter

**Standard:** 68.400 ~ 68.412 mm (2.6929 ~ 2.6934 in.)

**Service Limit:** 68.50 mm (2.6969 in.)

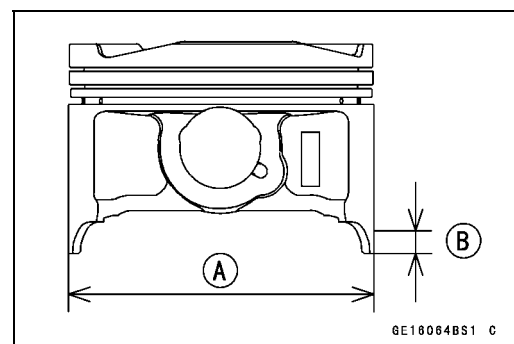
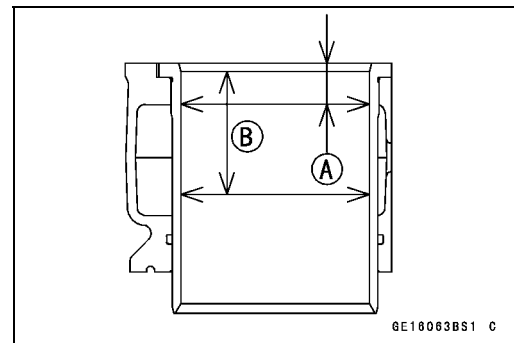
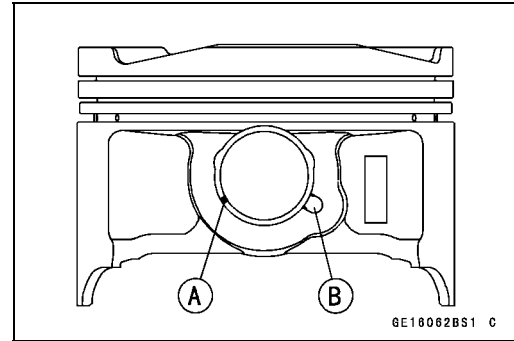
#### Piston Wear

- 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:** 68.345 ~ 68.360 mm (2.6907 ~ 2.6913 in.)

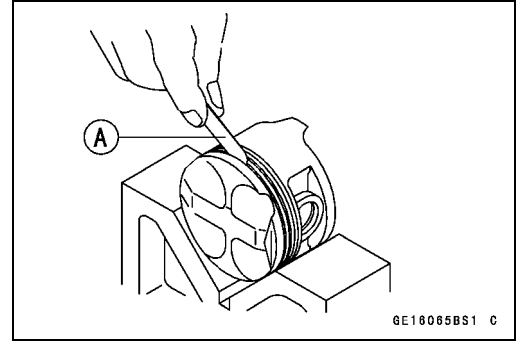
**Service Limit:** 68.21 mm (2.6854 in.)



**Cylinder, Pistons**

*Piston Ring, Piston Ring Groove Wear*

- Check for uneven groove wear by inspecting the ring seating.
- ★ The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.
- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.



**Piston Ring/Groove Clearance**

**Top**

- Standard:** 0.04 ~ 0.10 mm (0.0016 ~ 0.0031 in.)
- Service Limit:** 0.20 mm (0.0071 in.)

**Second**

- Standard:** 0.02 ~ 0.08 mm (0.0008 ~ 0.0024 in.)
- Service Limit:** 0.08 mm (0.0063 in.)

*Piston Ring Groove Width*

- Measure the piston ring groove width.
- Use a vernier caliper at several points around the piston.

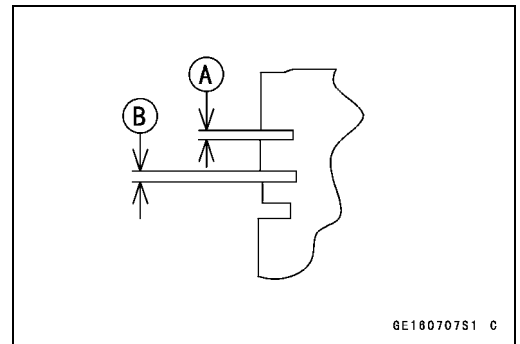
**Piston Ring Groove Width**

**Top [A]**

- Standard:** 0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)
- Service Limit:** 0.93 mm (0.037 in.)

**Second [B]**

- Standard:** 0.81 ~ 0.83 mm (0.0319 ~ 0.0327 in.)
- Service Limit:** 0.91 mm (0.036 in.)



- ★ If the width of any of the two grooves is wider than the service limit at any point, replace the piston.

*Piston Ring Thickness*

- Measure the piston ring thickness.
- Use the micrometer to measure at several points around the ring.

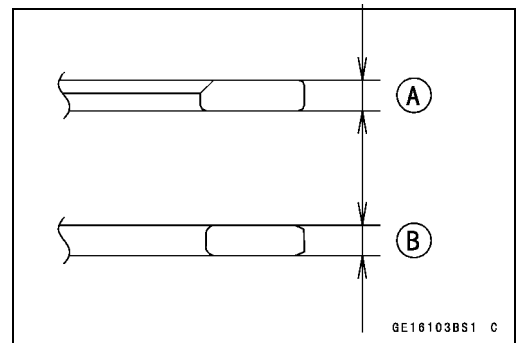
**Piston Ring Thickness**

**Top [A]**

- Standard:** 0.75 ~ 0.79 mm (0.0303 ~ 0.0311 in.)
- Service Limit:** 0.70 mm (0.028 in.)

**Second [B]**

- Standard:** 0.75 ~ 0.79 mm (0.0303 ~ 0.0311 in.)
- Service Limit:** 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.

## 5-32 ENGINE TOP END

### Cylinder, Pistons

#### *Piston Ring End Gap*

- Place the piston ring [A] inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.
- Measure the gap [B] between the ends of the ring with a thickness gauge.

#### **Piston Ring End Gap**

##### **Top**

**Standard:** 0.30 ~ 0.40 mm (0.0118 ~ 0.0157 in.)

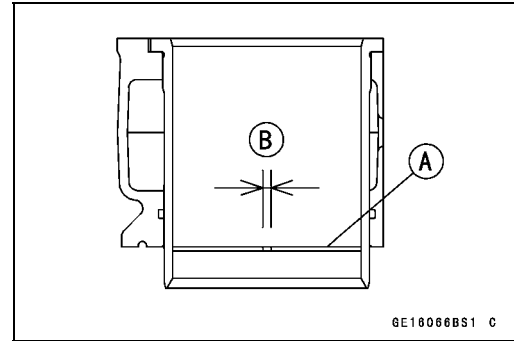
**Service Limit:** 0.7 mm (0.028 in.)

##### **Second**

**Standard:** 0.45 ~ 0.55 mm (0.0177 ~ 0.0217 in.)

**Service Limit:** 0.8 mm (0.031 in.)

- ★ If the end gap of either ring is greater than the service limit, replace all the rings.



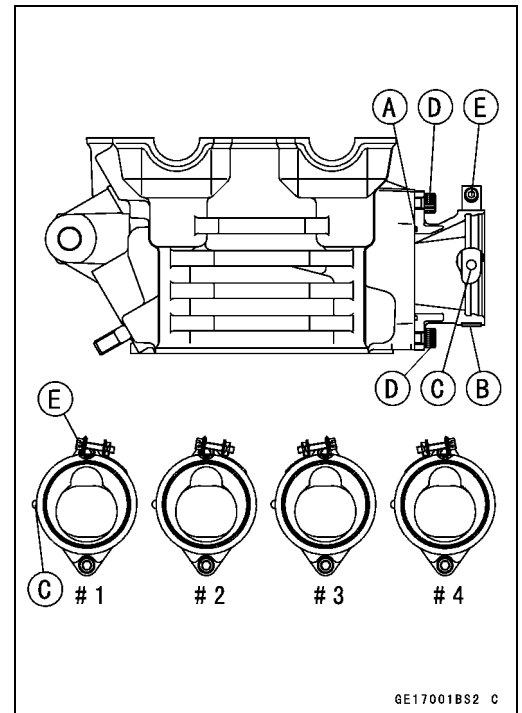
## Throttle Body Holder

### *Throttle Body Holder Installation*

- Be sure to install the O-rings [A].
- Install the clamps [B] as shown and so that its hole fit on the projection [C] of the holder.
- Tighten:

**Torque - Throttle Body Holder Bolts [D]: 13 N·m (1.3 kgf·m, 113 in·lb)**

**Throttle Body Assy Holder Clamp Bolts [E]: 2.0 N·m (0.20 kgf·m, 17 in·lb)**



## 5-34 ENGINE TOP END

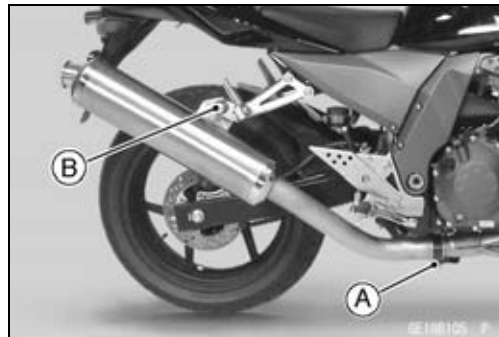
### Muffler

#### **⚠ WARNING**

To avoid a serious burn, do not remove the muffler when the engine is still hot. Wait until the muffler cool down.

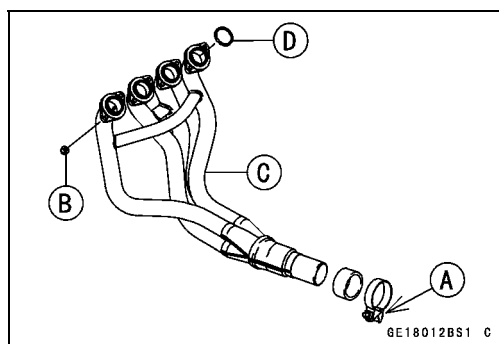
#### *Muffler Body Removal*

- Remove:
  - Muffler Body Clamp Bolt [A]
  - Muffler Body Mounting Bolt [B]
- Pull the muffler body backward.



#### *Exhaust Pipe Removal*

- Remove:
  - Radiator Lower Bolt (see Cooling System chapter)
  - Muffler Body Clamp Bolt [A]
  - Exhaust Pipe Manifold Holder Nuts [B]
  - Exhaust Pipe [C]
  - Gaskets [D]



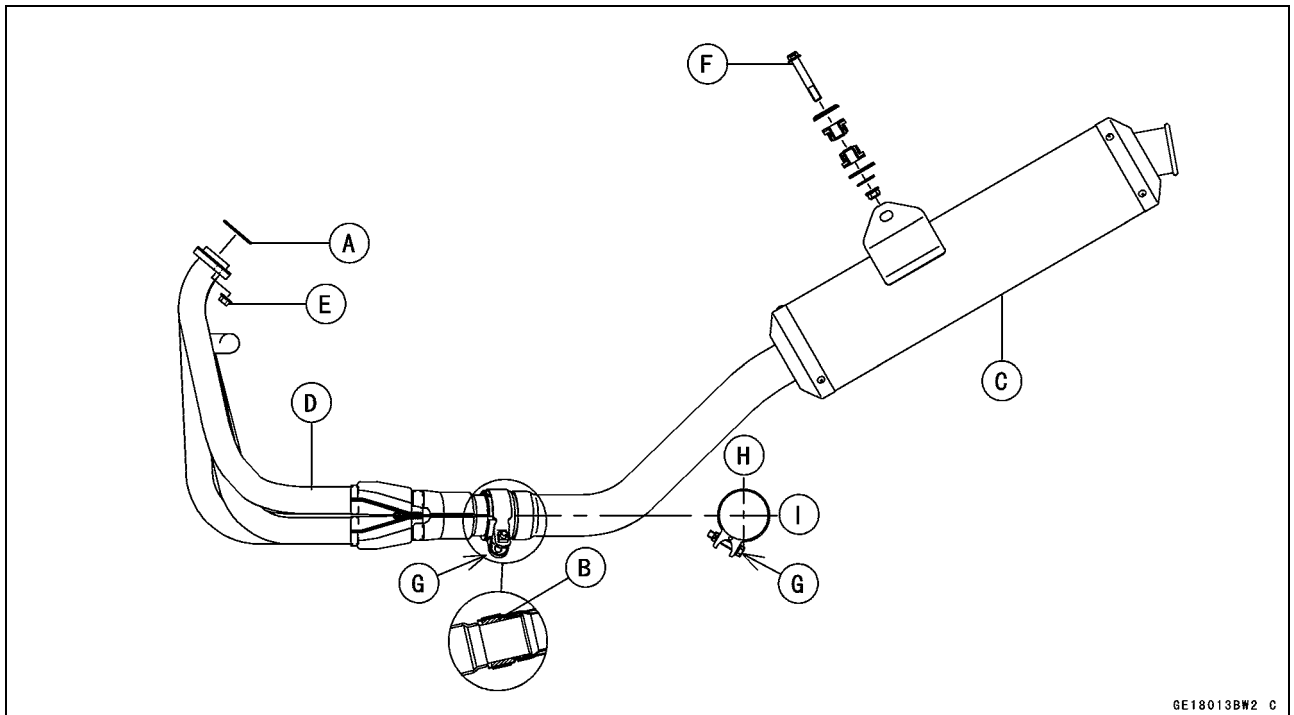
#### *Muffler Body and Exhaust Pipe Installation*

- Replace the exhaust pipe gaskets [A] and muffler body connection gasket [B] with new ones and install them.
- Install the muffler body connection gasket until it is bottomed so that the chamfer side faces muffler body [C].
- Install:
  - Muffler Body
  - Exhaust Pipe [D]
- Tighten:
  - Torque - Exhaust Pipe Manifold Holder Nuts [E]: 17 N·m (1.7 kgf·m, 12 ft·lb)**
  - Muffler Body Mounting Bolt [F]: 30 N·m (3.0 kgf·m, 22 ft·lb)**
  - Muffler Body Clamp Bolt [G]: 17 N·m (1.7 kgf·m, 12 ft·lb)**



**Muffler**

- Install the muffler body clamp bolt as shown.  
Upper Side [H]  
Outside [I]



- Thoroughly warm up the engine, wait until the engine cools down, and retighten all the bolts and nuts.



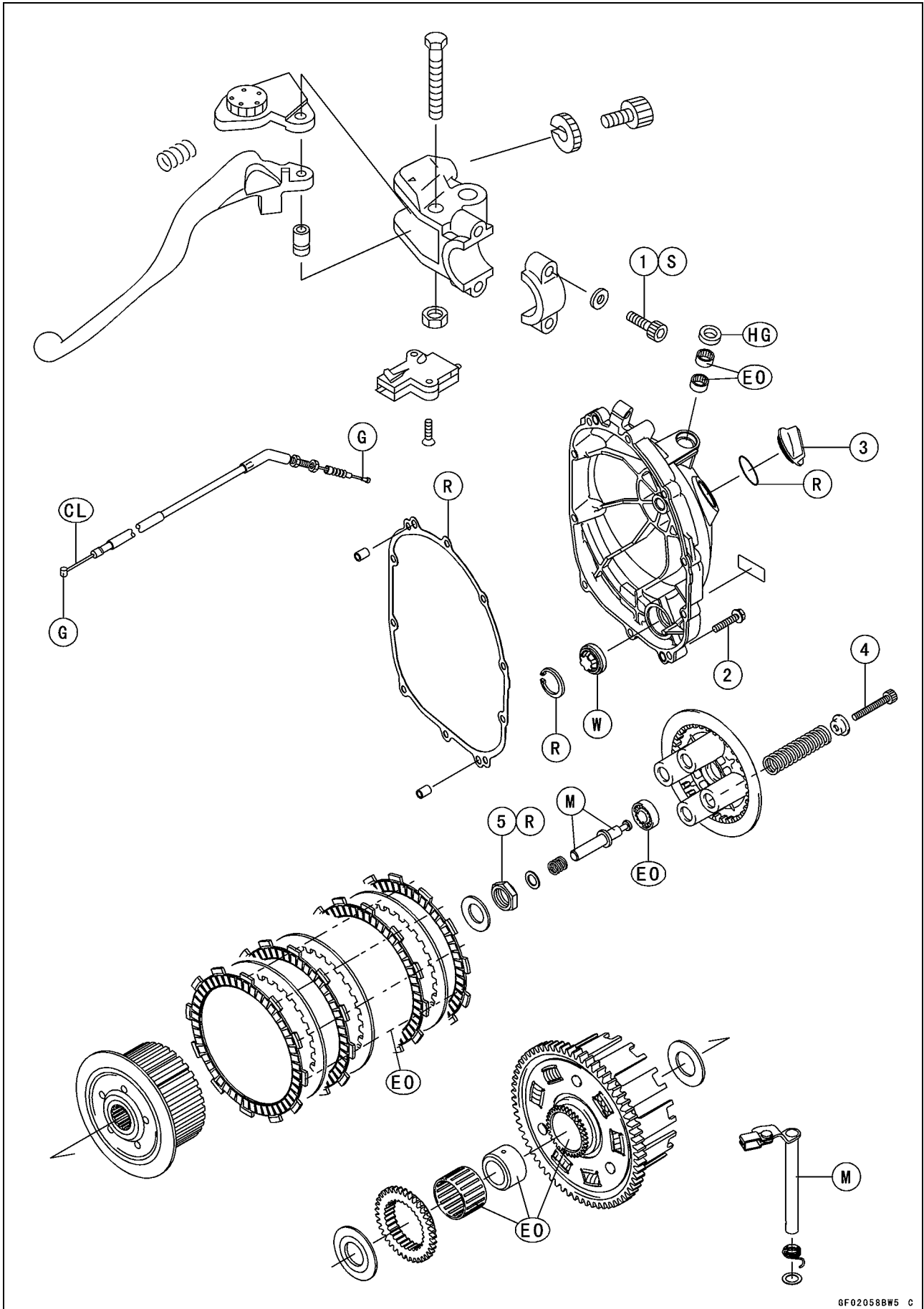
# Clutch

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# 6-2 CLUTCH

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch Lever Clamp Bolts	7.8	0.80	69 in·lb	S
2	Clutch Cover Mounting Bolts	11	1.1	95 in·lb	
3	Oil Filler Plug	1.5	0.15	13 in·lb	
4	Clutch Spring Bolts	8.8	0.90	78 in·lb	
5	Clutch Hub Nut	135	14	100	R

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

HG: Apply high-temperature grease.

M: Apply molybdenum disulfide grease.

R: Replacement Parts

S: Follow the specific tightening sequence.

W: Apply water.

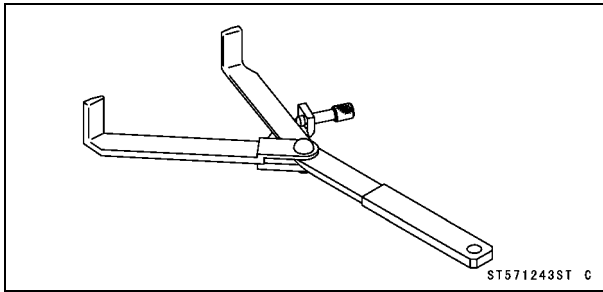
## 6-4 CLUTCH

### Specifications

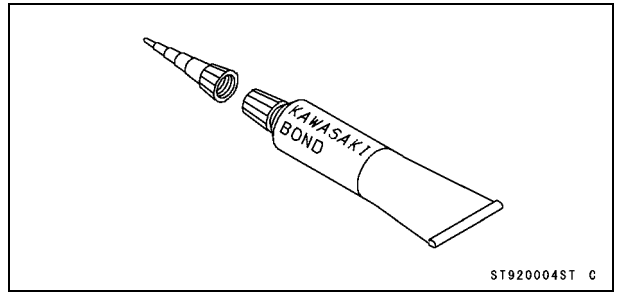
Item	Standard	Service Limit
<b>Clutch Lever Free Play</b>	2 ~ 3 mm (0.08 ~ 0.12 in.)	— — —
<b>Clutch</b>		
Clutch Plate Assembly	37.7 ~ 38.3 mm (1.48 ~ 1.51 in.)	— — —
Friction Plate Thickness	2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)	2.4 mm (0.094 in.)
Friction and Steel Plate Warp	0.2 mm (0.008 in.) or less	0.3 mm (0.012 in.)
Clutch Spring Free Length	80.6 mm (3.17 in.)	76.6 mm (3.02 in.)

**Special Tool**

**Clutch Holder:  
57001-1243**



**Kawasaki Bond (Silicone Sealant):  
92104-0004**



## 6-6 CLUTCH

### Clutch Lever and Cable

#### Clutch Lever Free Play Inspection

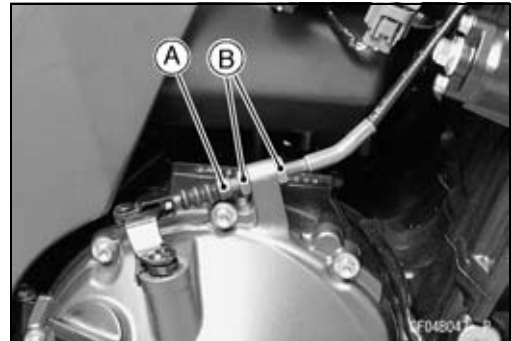
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

#### Clutch Lever Free Play Adjustment

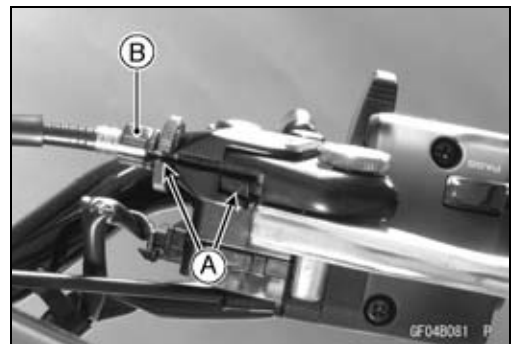
- Refer to the Clutch Operation Inspection in the Periodic Maintenance chapter.

#### Cable Removal

- Slide the dust cover [A] at the clutch cable lower end out of place.
- Loosen the nuts [B], and slide the lower end of the clutch cable to give the cable plenty of play.



- Screw in the adjuster.
- Line up the slots [A] in the clutch lever and adjuster [B], and then free the cable from the lever.
- Free the clutch inner cable tip from the clutch release lever.
- Push the release lever toward the front of the motorcycle and tape the release lever to the clutch cover to prevent the release shaft from falling out.
- Pull the clutch cable out of the frame.



#### Cable Installation

- Run the clutch cable correctly (see Appendix chapter).
- Adjust the clutch cable (see Clutch Operation Inspection in the Periodic Maintenance chapter).

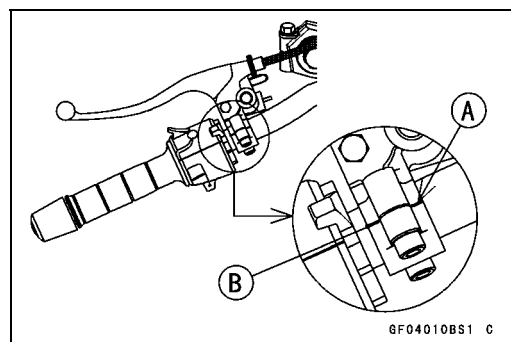
#### Cable Lubrication

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

#### Clutch Lever Installation

- Install the clutch lever so that the mating surface [A] of the clutch lever clamp is aligned with the punch mark [B].
- Tighten the upper clamp bolt first, and then the lower clamp bolt. There will be a gap at the lower part of the clamp after tightening.

**Torque - Clutch Lever Clamp Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)**



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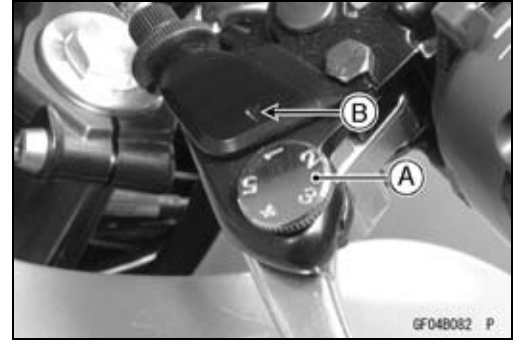
## Clutch Lever and Cable

---

### *Clutch Lever Adjustment*

The adjuster has 5 positions so that the clutch lever position can be adjusted to suit the operator's hand.

- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.
- The distance from the grip to the lever is minimum at number 5 and maximum at number 1.

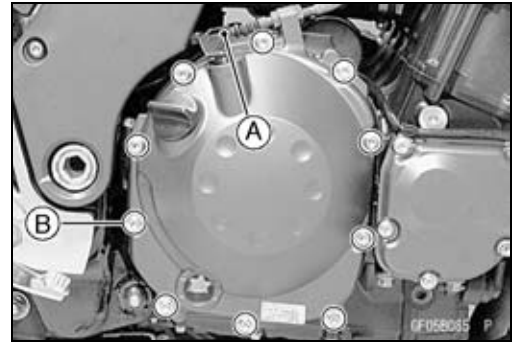


## 6-8 CLUTCH

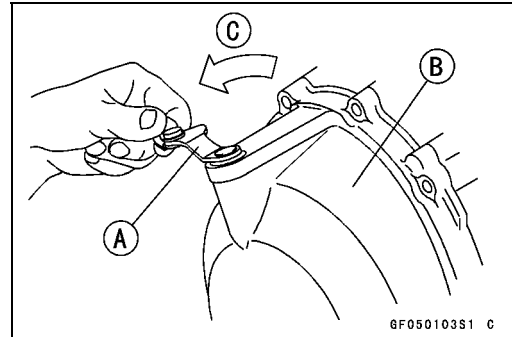
### Clutch Cover

#### Clutch Cover Removal

- Remove:
  - Engine Oil (drain, see Engine Oil Change in the Periodic Maintenance chapter)
  - Clutch Cable Lower End [A]
  - Clutch Cover Mounting Bolts [B]

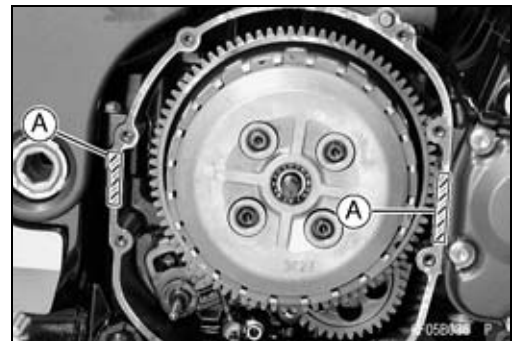


- Turn the release lever [A] toward the rear as shown, and remove the clutch cover [B].
  - About 90° [C]



#### Clutch Cover Installation

- Apply silicone sealant to the area [A] where the mating surface of the crankcase touches the clutch cover gasket.
  - Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**
- Replace the clutch cover gasket with a new one.
- Tighten the clutch cover mounting bolts.
  - Torque - Clutch Cover Mounting Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**



#### Release Shaft Removal

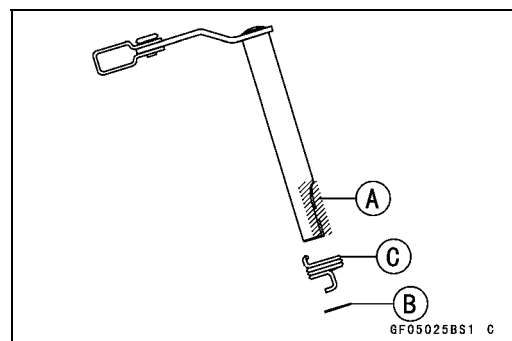
##### CAUTION

**Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.**

- Remove the clutch cover (see Clutch Cover Removal).
- Pull the lever and shaft assembly straight out of the clutch cover.

#### Release Shaft Installation

- Apply high-temperature grease to the oil seal lips on the upper ridge of the clutch cover.
- Apply engine oil to the needle bearings in the hole of the clutch cover.
- Apply molybdenum disulfide grease to the pusher-holding portion [A] on the release shaft.
- Install the washer [B] and spring [C].
- Insert the release shaft straight into the upper hole of the clutch cover.

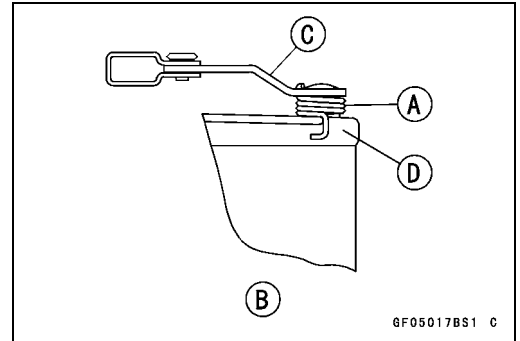


##### CAUTION

**When inserting the release shaft, be careful not to remove the spring of the oil seal.**

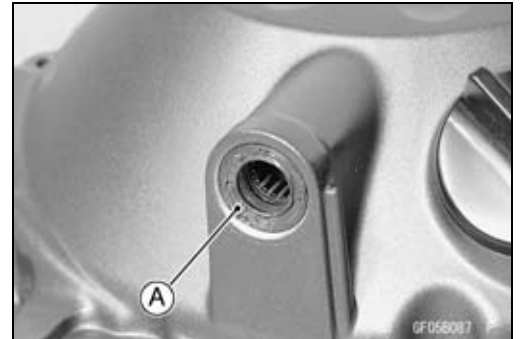
**Clutch Cover**

- Fit the spring [A] as shown.  
Viewed from Rear [B]  
Release Shaft [C]  
Clutch Cover [D]

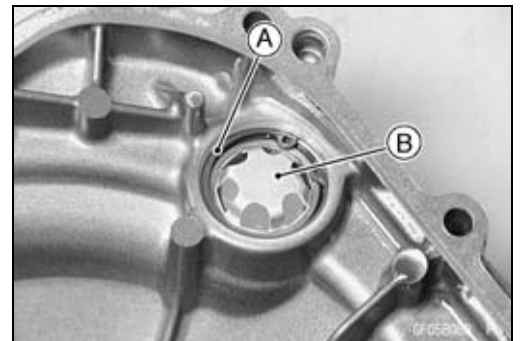


*Clutch Cover Disassembly*

- Remove:  
Oil Seal [A]  
Needle Bearings



- Remove:  
Circlip [A]  
Oil Level Gauge [B]



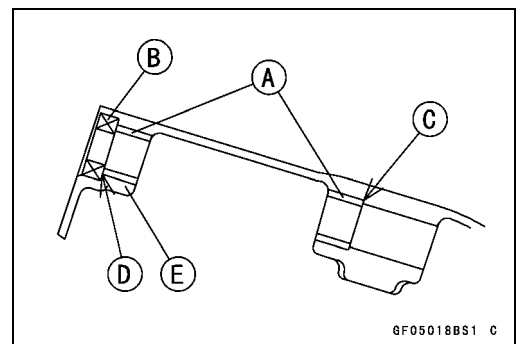
*Clutch Cover Assembly*

- Replace the needle bearings and oil seal with new ones.

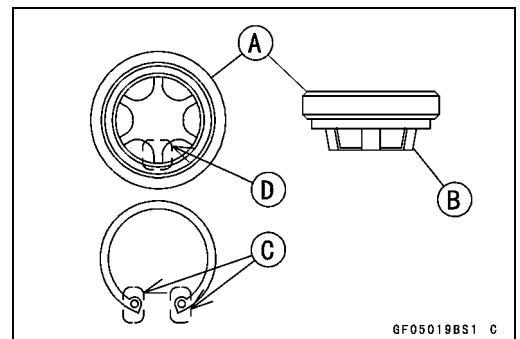
**NOTE**

○ Install the needle bearings so that the manufacturer's mark face out.

- Install the needle bearings [A] and oil seal [B] position as shown.  
Press the bearing until the bottom [C].  
Press the bearing so that the bearing surface [D] is flush with the housing end of clutch cover [E].



- Apply water to the rubber of the oil gauge [A] and press it so that the projections [B] face inside.
- Install a new circlip so that the circlip ends [C] do not warp over the projection [D].

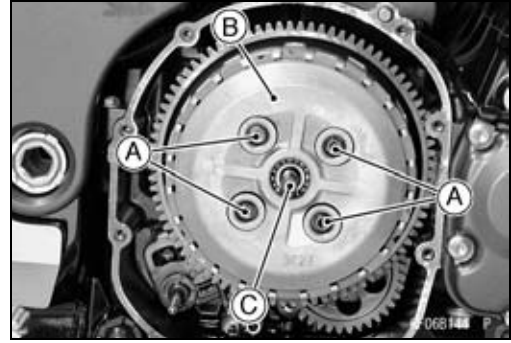


## 6-10 CLUTCH

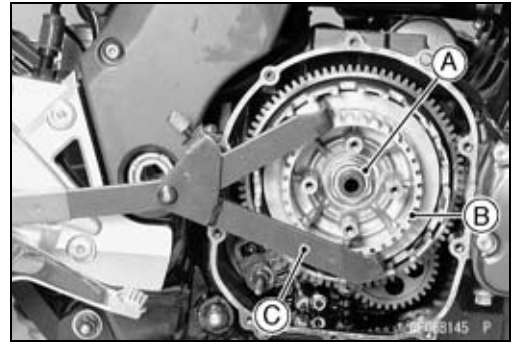
### Clutch

#### Clutch Removal

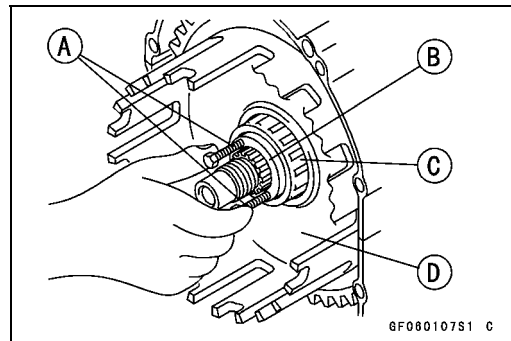
- Remove:
  - Engine Oil (drain, see Engine Oil Change in the Periodic Maintenance chapter)
  - Clutch Cover (see Clutch Cover Removal)
  - Clutch Spring Bolts [A]
  - Clutch Springs
  - Clutch Spring Plate [B] (with thrust bearing and pusher [C], spring and washer)



- Remove:
  - Friction Plates, Steel Plates
  - Clutch Hub Nut [A]
- Holding the clutch hub [B], remove the nut and washer.
  - Special Tool - Clutch Holder [C]: 57001-1243**

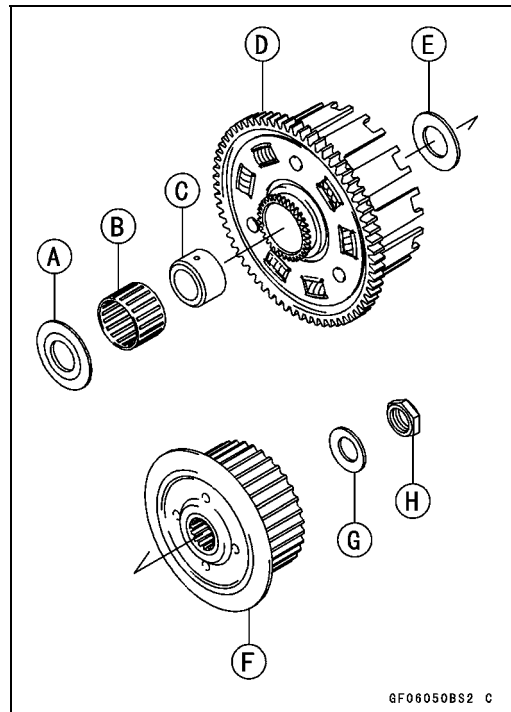


- Remove:
  - Clutch Hub
  - Spacer
- Using the two 4 mm (0.16 in.) screws [A], pull out the sleeve [B], needle bearing [C] and clutch housing [D].
- Remove the spacer.



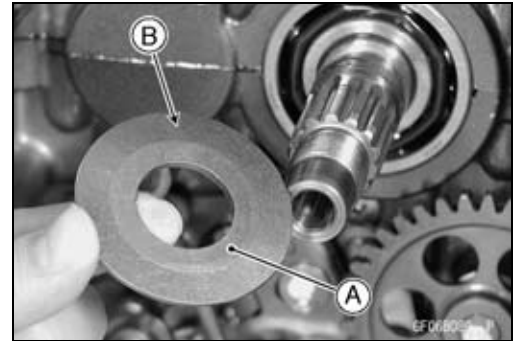
#### Clutch Installation

- Install the following parts on the drive shaft.
  - Spacer [A]
  - Needle Bearing [B]
  - Sleeve [C]
  - Clutch Housing [D]
  - Spacer [E]
  - Clutch Hub [F]
  - Washer [G]
  - Nut [H]



**Clutch**

○ Install the spacer [A] so that the tapered side [B] faces inward.



○ Install the washer [A] so that the OUTSIDE mark faces outward.



○ Replace the clutch hub nut with a new one.  
 ○ Holding the clutch hub, tighten the clutch hub nut.

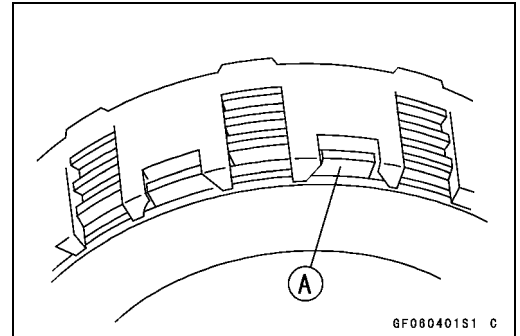
**Special Tool - Clutch Holder: 57001-1243**

**Torque - Clutch Hub Nut: 135 N·m (14 kgf·m, 100 ft·lb)**

● Install the friction plates and steel plates, starting with a friction plate and alternating them.

**CAUTION**

**If new dry friction plates and steel plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**



○ Install the last friction plate [A] fitting the tangs in the grooves in the housing as shown.

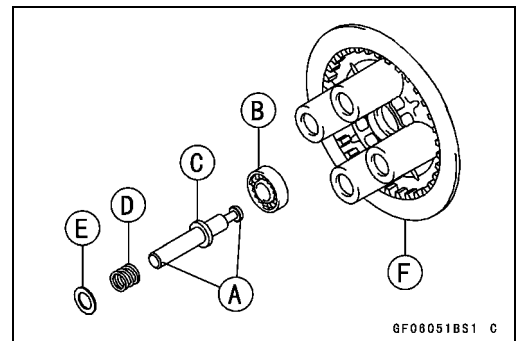
● Apply molybdenum disulfide grease to the pusher ends [A] and install the bearing [B], pusher [C], spring [D] and washer [E] in the clutch spring plate [F].

○ Apply engine oil to the bearing.

● Install the clutch spring plate, springs and spring holders, and tighten the clutch spring bolts.

**Torque - Clutch Spring Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

● Install the clutch cover (see Clutch Cover Installation).



## 6-12 CLUTCH

### Clutch

#### Clutch Plate Assembly Inspection

- Inspect the friction plate thickness (see Clutch Plate, Wear, Damage Inspection).
- Measure the length [A] of the clutch plate assembly as shown.

○ Assemble:

- Clutch Hub [B]
- Spring Seat [C]
- Spring [D]
- Friction Plates [E]
- Steel Plates [F]
- Spring Plate [G]
- Springs [H]
- Spring Holders [I]
- Spring Bolts [J]

**Torque - Clutch Spring Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

#### Clutch Plate Assembly

**Standard: 37.7 ~ 38.3 mm (1.48 ~ 1.51 in.)**

- ★ If the length is not within the specified range, adjust the length (see Clutch Plate Assembly Adjustment).

#### Clutch Plate Assembly Adjustment

- Inspect the clutch plate assembly length, and then replace the steel plate(s) which brings the length within the specified range.
- Remove:
  - Spring Bolts
  - Spring Holders
  - Springs
  - Spring Plate
- Replace the following steel plate(s).

Part No.	Thickness
13089-1126	1.4 mm (0.055 in.)
13089-013	1.6 mm (0.063 in.) (STD)
13089-1073	2.0 mm (0.079 in.)

#### NOTE

○ Do not use the steel plate of 1.4 mm (0.055 in.) and 2.0 mm (0.079 in.) thickness at the same time.

- Install the removed parts, and inspect the clutch plate assembly length.

**Torque - Clutch Spring Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

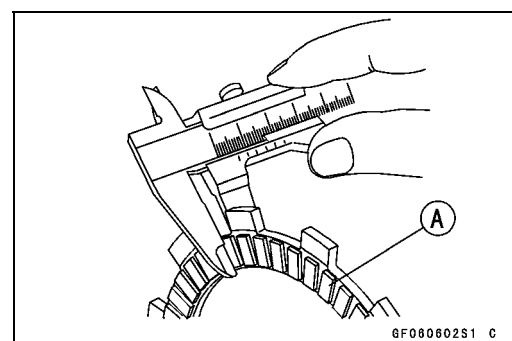
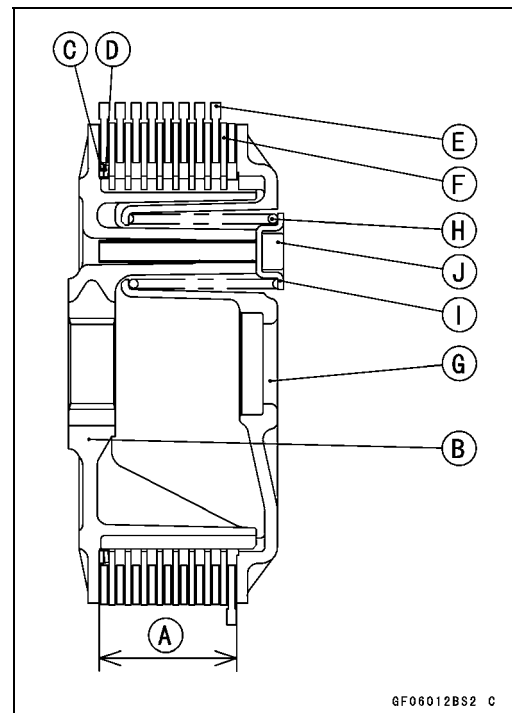
#### Clutch Plate, Wear, Damage Inspection

- Visually inspect the friction and steel plates for signs of seizure, overheating (discoloration), or uneven wear.
- Measure the thickness of each friction plate [A] at several points.
- ★ If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

#### Friction Plate Thickness

**Standard: 2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)**

**Service Limit: 2.4 mm (0.094 in.)**



## Clutch

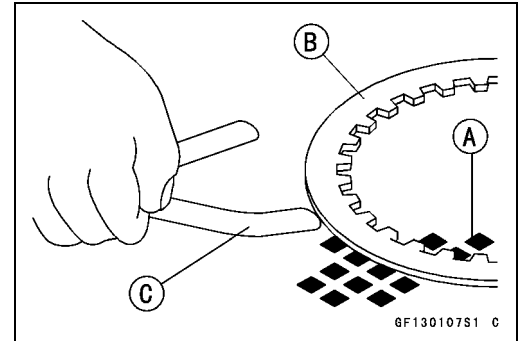
### Clutch Plate Warp Inspection

- 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:** 0.2 mm (0.008 in.) or less

**Service Limit:** 0.3 mm (0.012 in.)



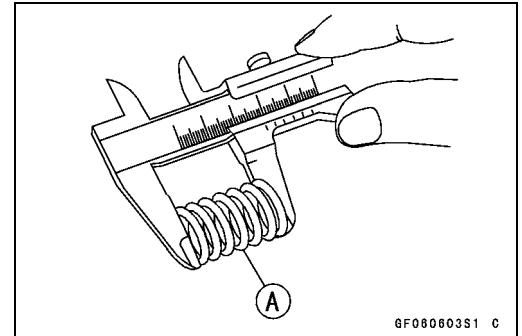
### Clutch Spring Free Length Measurement

- 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

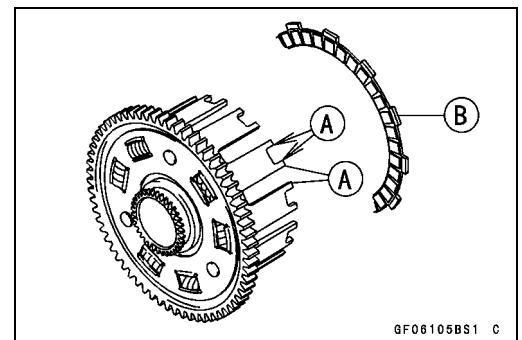
**Standard:** 80.6 mm (3.17 in.)

**Service Limit:** 76.6 mm (3.02 in.)



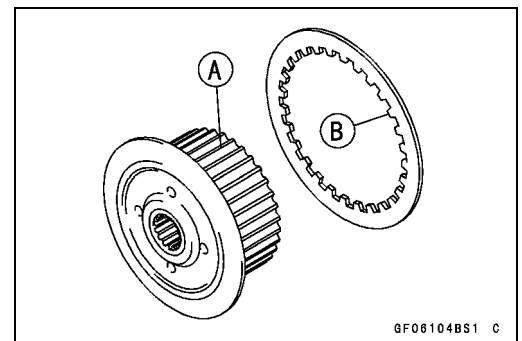
### Clutch Housing Finger Inspection

- Visually inspect the clutch housing fingers [A] where the friction plate tangs [B] hit them.
- ★ If they are badly worn or if there are groove cuts where the tangs hit, replace the housing. Also, replace the friction plates if their tangs are damaged.



### Clutch Housing Spline Inspection

- Visually inspect where the teeth [B] on the steel plates wear against the clutch hub splines [A].
- ★ If there are notches worn into the splines, replace the clutch hub. Also, replace the steel plates if their teeth are damaged.







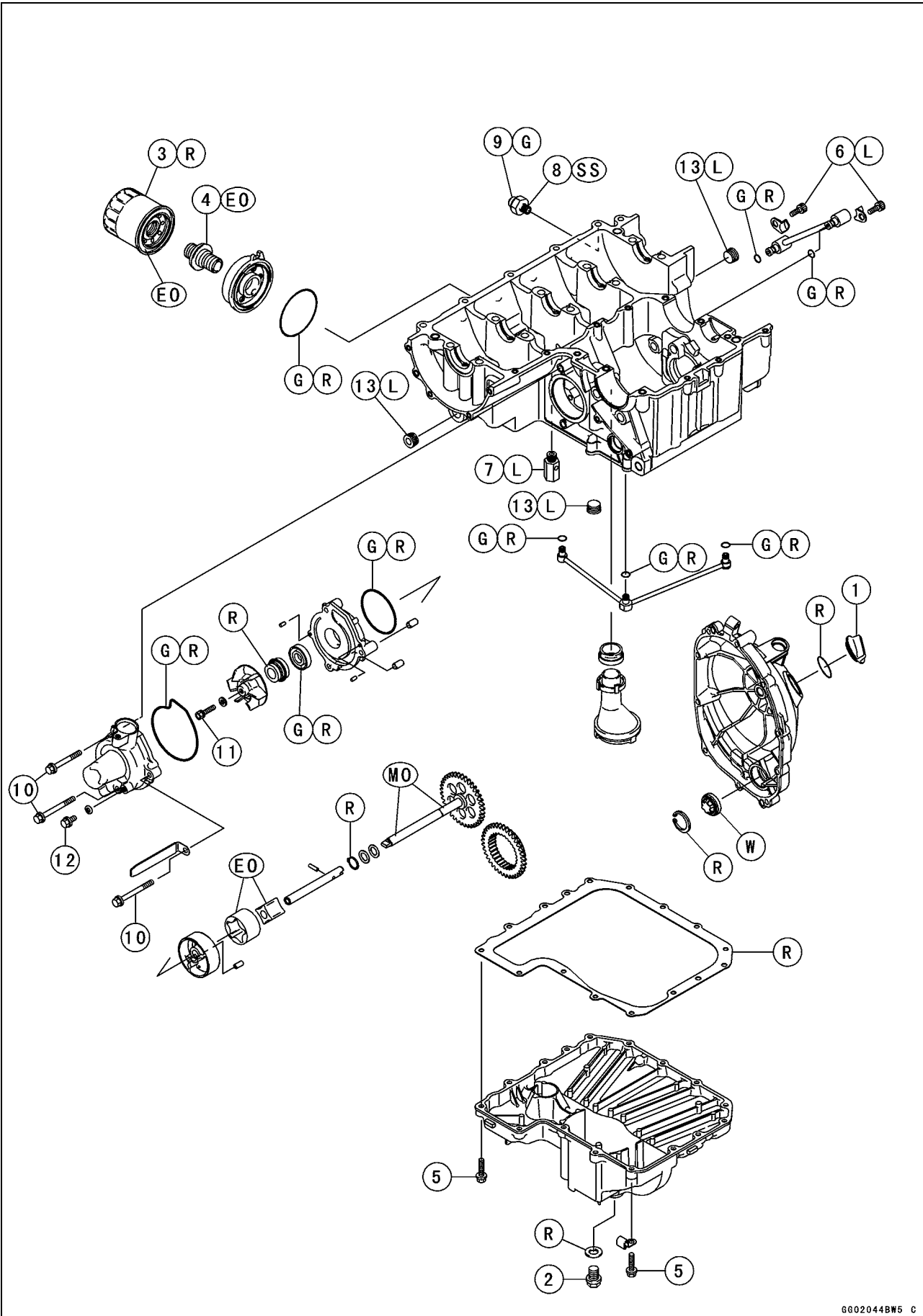
# Engine Lubrication System

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# 7-2 ENGINE LUBRICATION SYSTEM

## Exploded View



## ENGINE LUBRICATION SYSTEM 7-3

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Oil Filler Plug	1.5	0.15	13 in·lb	
2	Engine Oil Drain Bolt	29	3.0	21	
3	Oil Filter	31	3.2	23	EO, R
4	Holder Mounting Bolt	76	7.8	56	EO
5	Oil Pan Bolts	11	1.1	95 in·lb	
6	Oil Pipe Holder Bolts	13	1.3	113 in·lb	L
7	Oil Pressure Relief Valve	15	1.5	11	L
8	Oil Pressure Switch	15	1.5	11	SS
9	Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	G
10	Water Pump Cover Bolts	11	1.1	95 in·lb	
11	Water Pump Impeller Bolt	9.8	1.0	87 in·lb	
12	Coolant Drain Plug (Water Pump)	11	1.1	95 in·lb	
13	Oil Passage Plugs	20	2.0	14	L

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil solution.

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

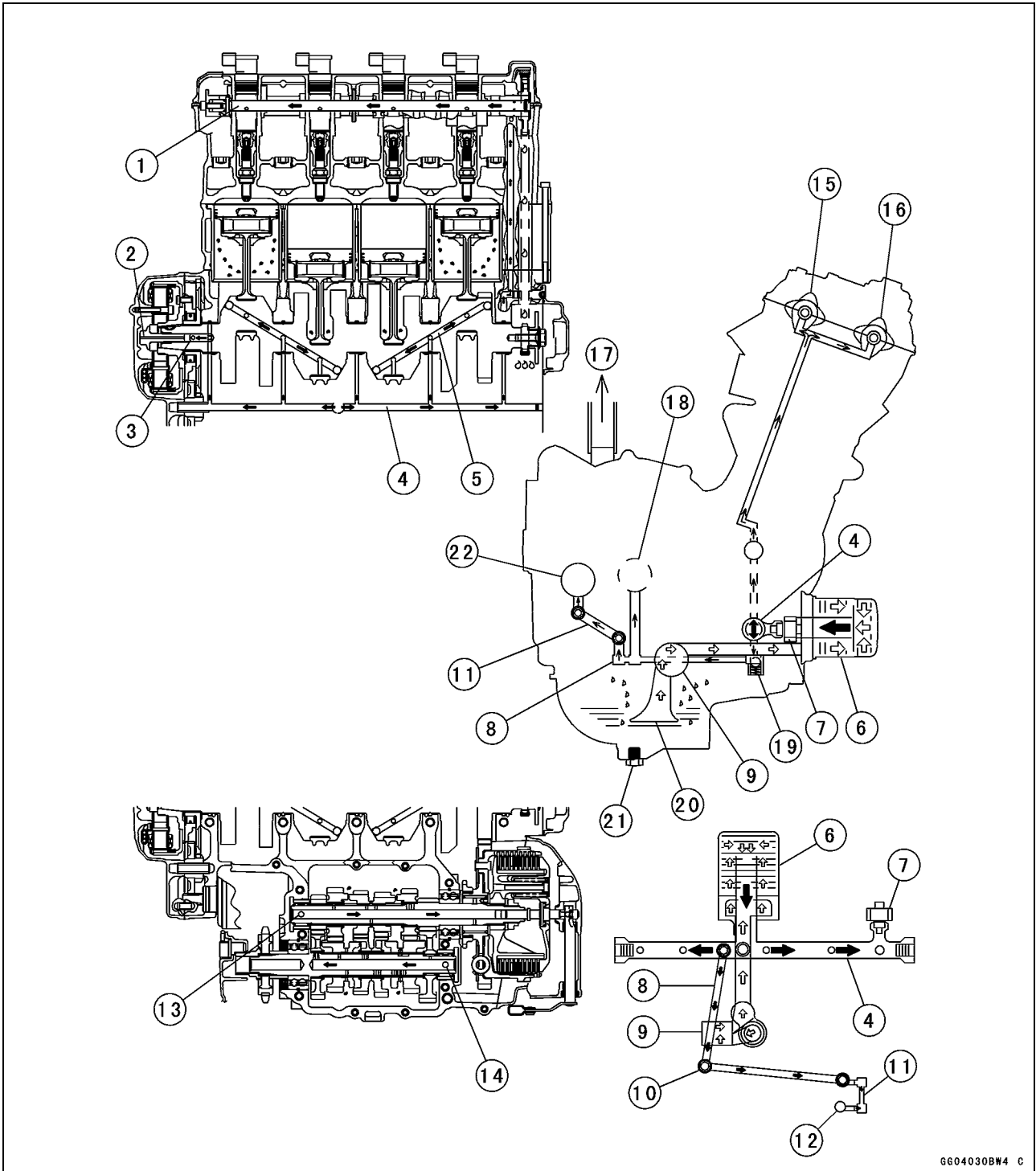
R: Replacement Parts

SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

W: Apply water.

# 7-4 ENGINE LUBRICATION SYSTEM

## Engine Oil Flow Chart



### Engine Oil Flow Chart

---

1. Camshaft Oil Passage
2. Oil Passage Hole in Alternator Rotor Bolt
3. Starter Clutch Oil Passage Hole
4. Main Oil Passage
5. Crankshaft Oil Passage
6. Oil Filter
7. Oil Pressure Switch
8. Oil Pipe
9. Oil Pump
10. To Drive Shaft
11. Oil Pipe
12. To Output Shaft
13. Drive Shaft Oil Passage Hole
14. Output Shaft Oil Passage Hole
15. Inlet Camshaft
16. Exhaust Camshaft
17. To Air Cleaner
18. Drive Shaft
19. Relief Valve
20. Oil Screen
21. Engine Oil Drain Bolt
22. Output Shaft

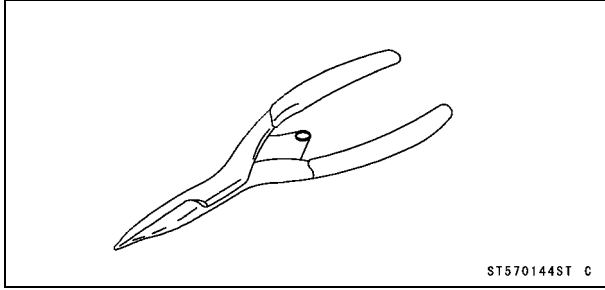
## 7-6 ENGINE LUBRICATION SYSTEM

### Specifications

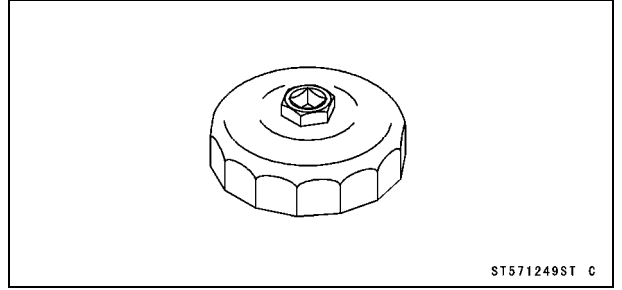
Item	Standard
<b>Engine Oil</b> Type Viscosity Capacity: Level	API SE, SF or SG API SH or SJ with JASO MA SAE 10W-40 3.1 L (3.3 US qt) (when filter is not removed) 3.3 L (3.5 US qt) (when filter is removed) 3.8 L (4.0 US qt) (when engine is completely dry) Between upper and lower level lines
<b>Oil Pressure Measurement</b> Oil Pressure @4 000 r/min (rpm), Oil Temperature. 90°C (194°F)	255 ~ 314 kPa (2.6 ~ 3.2 kgf/cm <sup>2</sup> , 37 ~ 46 psi)

## Special Tools and Sealant

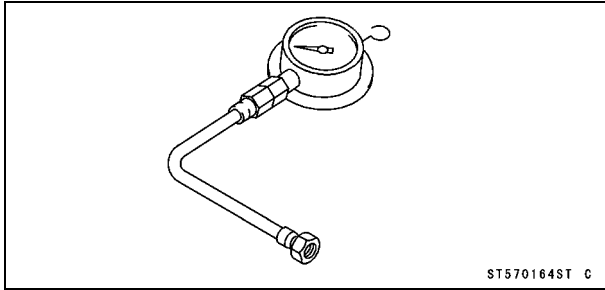
**Outside Circlip Pliers:**  
**57001-144**



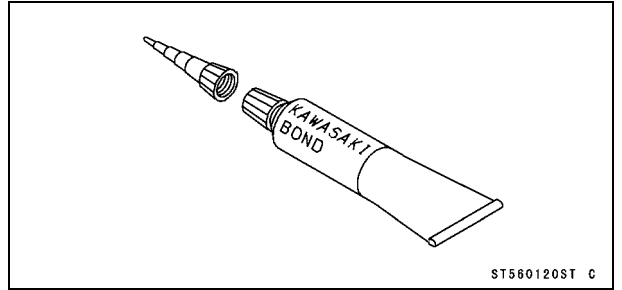
**Oil Filter Wrench:**  
**57001-1249**



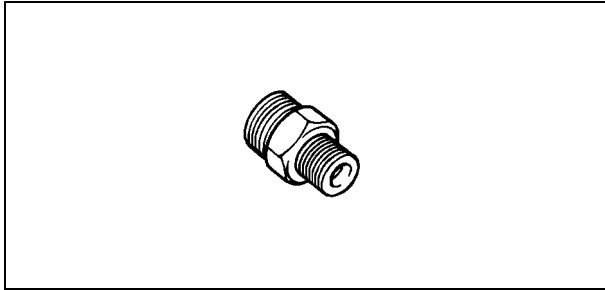
**Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>:**  
**57001-164**



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



**Oil Pressure Gauge Adapter, PT3/8 × 19/in.:**  
**57001-1233**



## 7-8 ENGINE LUBRICATION SYSTEM

### Engine Oil and Oil Filter

#### **⚠ WARNING**

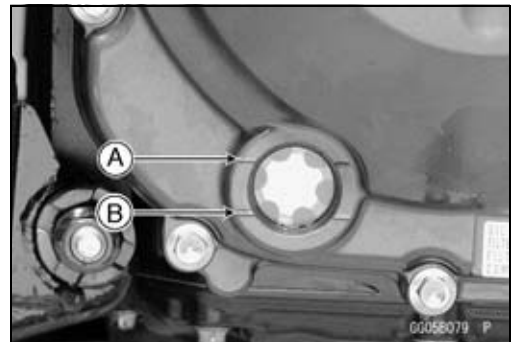
Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.

#### *Oil Level Inspection*

- Check that the engine oil level is between the upper [A] and lower [B] levels in the gauge.

#### **NOTE**

- Situate the motorcycle so that it is perpendicular to the ground.
- If the motorcycle has just been used, wait several minutes for all the oil to drain down.
- If the oil has just been changed, start the engine and run it for several minutes at idle speed. This fills the oil filter with oil. Stop the engine, then wait several minutes until the oil settles.



#### **CAUTION**

Racing the engine before the oil reaches every part can cause engine seizure.

If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the oil pressure warning light will light. If this light stays on when the engine is running above idle speed, stop the engine immediately and find the cause.

- ★ 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 filter opening. Use the same type and make of oil that is already in the engine.

#### **NOTE**

- If the engine oil type and make are unknown, use any brand of the specified oil to top off the level in preference to running the engine with the oil level low. Then at your earliest convenience, change the oil completely.

#### *Engine Oil Change*

- Refer to the Engine Oil Change in the Periodic Maintenance chapter.

#### *Oil Filter Replacement*

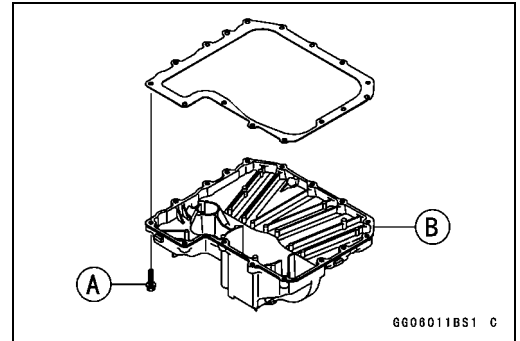
- Refer to the Oil Filter Replacement in the Periodic Maintenance chapter.



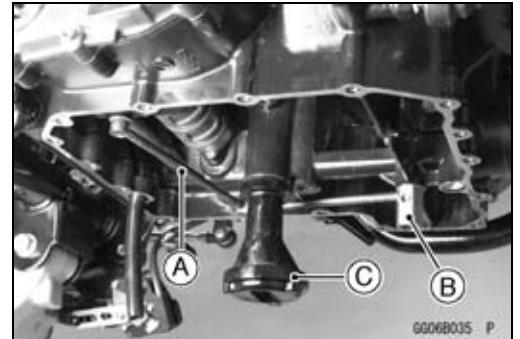
## Oil Pan

### Oil Pan Removal

- Remove:
  - Engine Oil (drain, see Periodic Maintenance chapter)
  - Muffler Assy (see Engine Top End chapter)
  - Oil Pan Bolts [A]
  - Oil Pan [B]

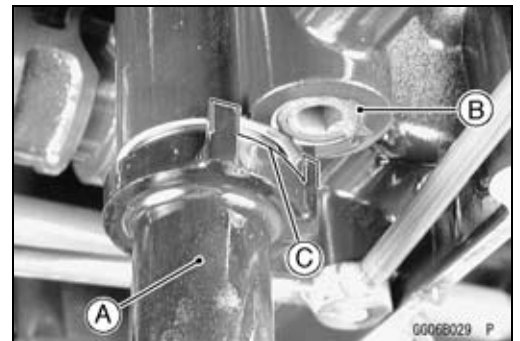


- Remove the oil pipe [A], oil pressure relief valve [B] and oil screen [C] as necessary.

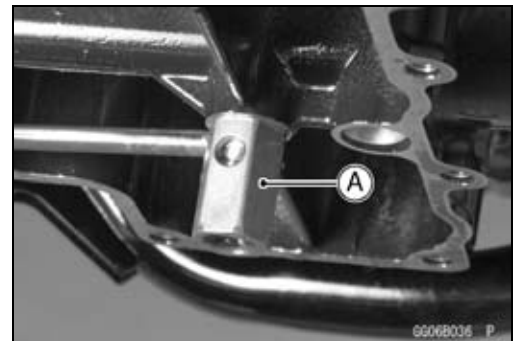


### Oil Pan Installation

- Clean the oil screen [A].
- Install the oil screen so that the crankcase rib [B] fits the slot [C] of the oil screen.
- Apply engine oil to the O-rings on the oil pipe.



- ★ If the oil pressure relief valve [A] was removed, install it.
- Apply a non-permanent locking agent to the threads of the oil pressure relief valve, and tighten it.



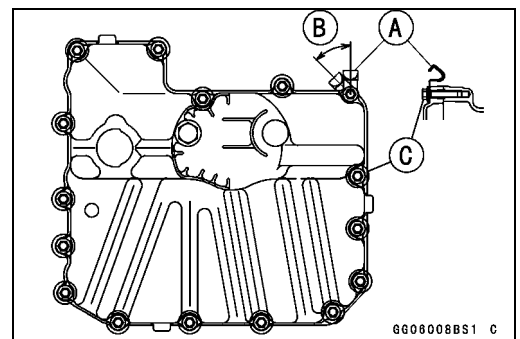
### CAUTION

**Do not apply too much non-permanent locking agent to the threads. This may block the oil passage.**

**Torque - Oil Pressure Relief Valve: 15 N·m (1.5 kgf·m, 11 ft·lb)**

- Install the clamp [A] at an angle of within 45° [B] as shown.
- Replace the oil pan gasket with a new one.
- Tighten:

**Torque - Oil Pan Bolts [C]: 11 N·m (1.1 kgf·m, 95 in·lb)**



## 7-10 ENGINE LUBRICATION SYSTEM

### Oil Pressure Relief Valve

#### *Oil Pressure Relief Valve Removal*

- See Oil Pan Removal.

#### *Oil Pressure Relief Valve Installation*

- See Oil Pan Installation.

#### *Oil Pressure Relief Valve Inspection*

- Check to see if the valve [A] slides smoothly when pushing it in with a wooden or other soft rod, and see if it comes back to its seat by spring [B] pressure.

#### **NOTE**

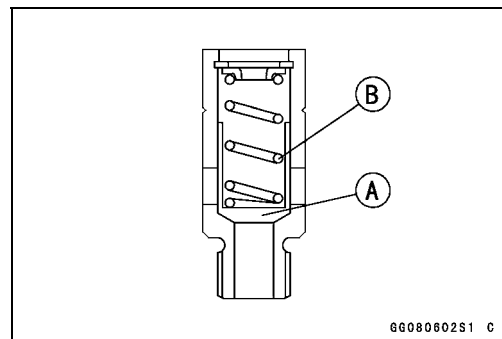
○ *Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.*

- ★ If any rough spots are found during above inspection, wash the valve clean with a high-flash point solvent and blow out any foreign particles that may be in the valve with compressed air.

#### **⚠ WARNING**

**Clean the oil pressure relief valve in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvent.**

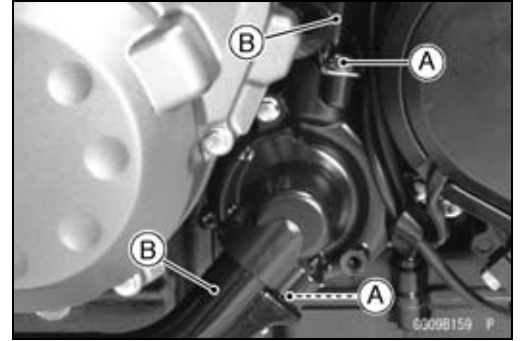
- ★ If cleaning does not solve the problem, replace the oil pressure relief valve as an assembly. The oil pressure relief valve is precision made with no allowance for replacement of individual parts.



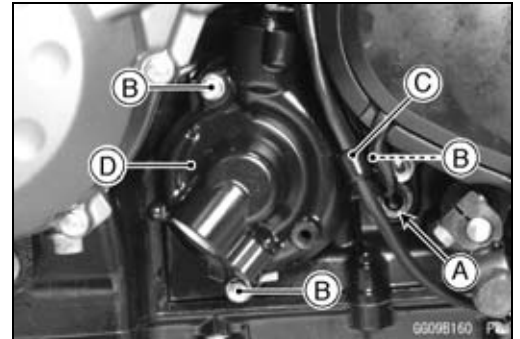
## Oil Pump

### Oil Pump Removal

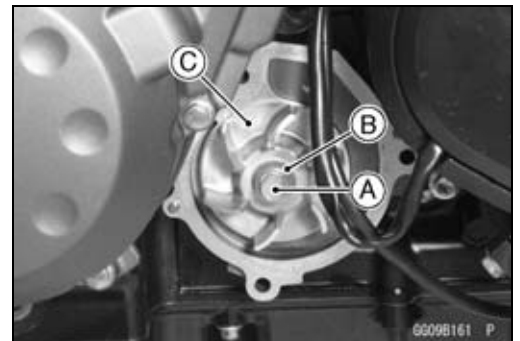
- Drain:
  - Coolant (see Periodic Maintenance chapter)
  - Engine Oil (see Periodic Maintenance chapter)
- Remove:
  - Water Pipe Bolts [A]
  - Water Pipes [B] (pull out)



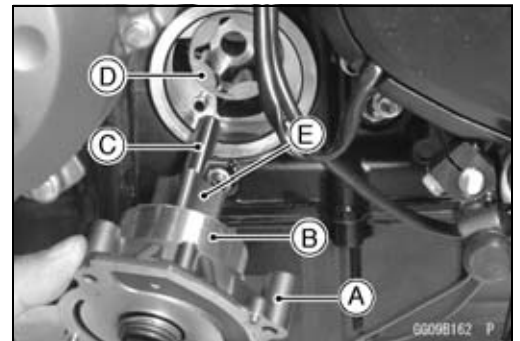
- Remove:
  - Neutral Switch Lead [A]
  - Water Pump Cover Bolts [B]
  - Clamp [C]
  - Water Pump Cover [D]



- Remove:
  - Impeller Bolt [A]
  - Washer [B]
  - Impeller [C]

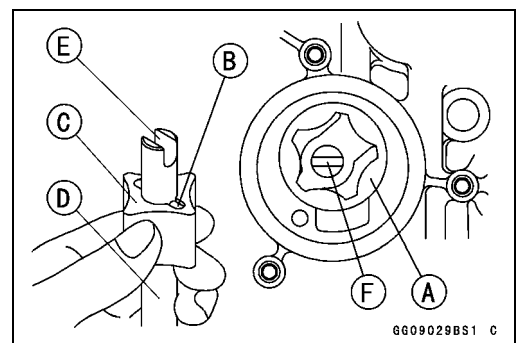


- Remove:
  - Water Pump Body [A]
  - Oil Pump Cover [B]
  - Oil (Water) Pump Shaft [C]
  - Outer Rotor [D]
  - Inner Rotor [E]



### Oil Pump Installation

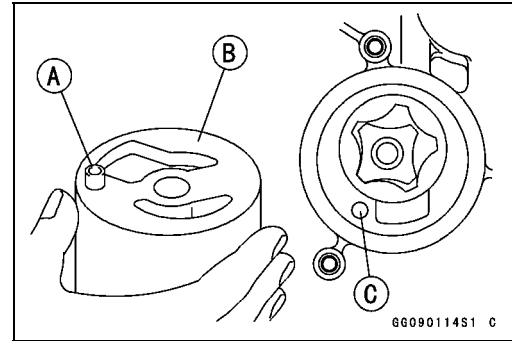
- Apply engine oil:
  - Inner Rotor
  - Outer Rotor
  - Oil (water) Pump Shaft
- Install the outer rotor [A] into the crankcase.
- Install the pin [B], inner rotor [C] and oil (water) pump shaft [D].
- Turn the pump shaft so that the slot [E] in its shaft fits onto the projection [F] of the pump drive gear shaft.



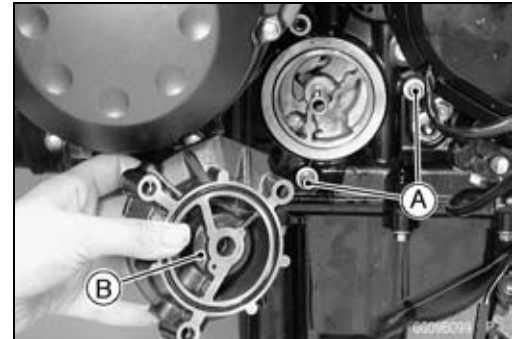
## 7-12 ENGINE LUBRICATION SYSTEM

### Oil Pump

- Fit the pin [A] of the oil pump cover [B] into the hole [C] in the crankcase.

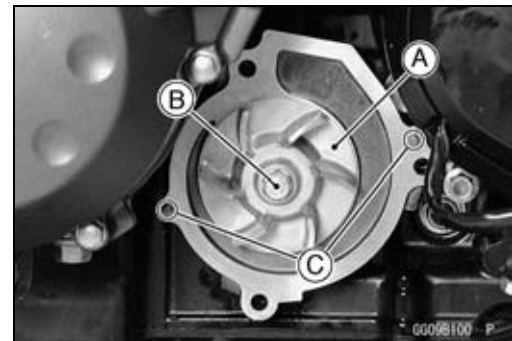


- Apply Grease:
  - O-ring
- Install:
  - Pins [A]
  - Water Pump Body [B]



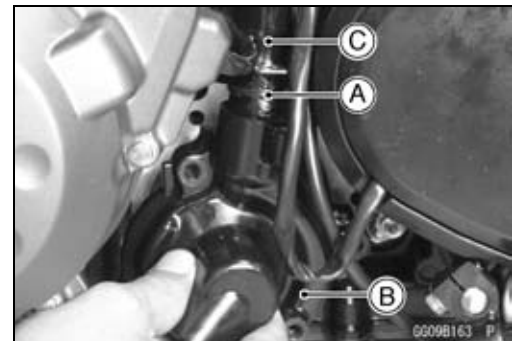
- Apply Coolant:
  - Mechanical Seal Surface
  - Sealing Seat Surface
- Install:
  - Impeller [A], Washer and Bolt [B]
  - Pins [C]

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

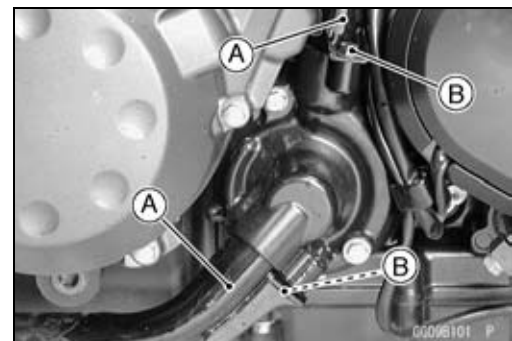


- Apply grease to the O-ring [A].
- Insert the water pump cover [B] to the water pipe [C].
- Tighten the water pump cover bolts.

**Torque - Water Pump Cover Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**



- Install:
    - Water Pipes [A]
  - Apply a non-permanent locking agent.
- Torque - Water Pipe Bolts [B]: 11 N·m (1.1 kgf·m, 95 in·lb)**

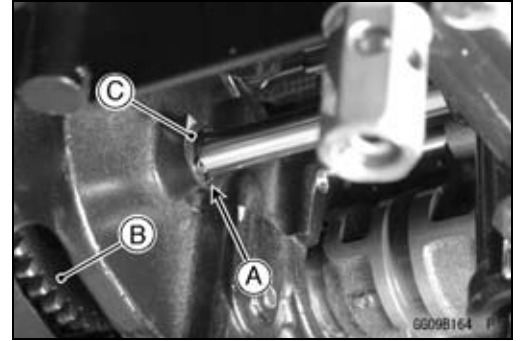


## Oil Pump

### *Oil Pump Drive Gear Removal*

- Remove:
  - Clutch (see Clutch chapter)
  - Oil Pan (see Oil Pan Removal)
  - Circlip [A]
  - Oil Pump Drive Gear [B] and Washer [C]

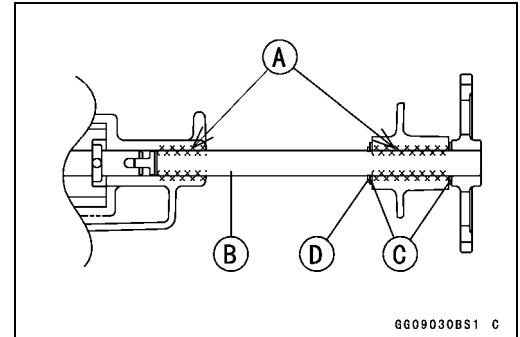
**Special Tool - Outside Circlip Pliers: 57001-144**



### *Oil Pump Drive Gear Installation*

- Apply molybdenum disulfide oil solution to the journal portions [A] on the oil pump gear shaft [B].
- Install:
  - Washers [C]
- Install the new circlip [D] into the groove of the oil pump drive gear shaft.

**Special Tool - Outside Circlip Pliers: 57001-144**



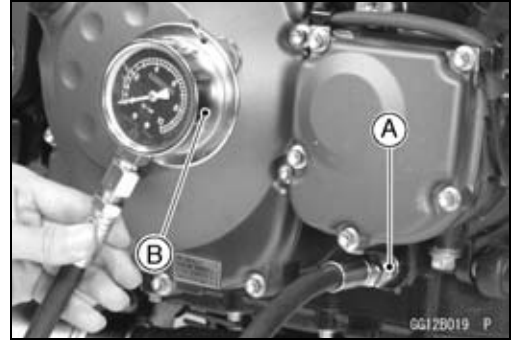
## 7-14 ENGINE LUBRICATION SYSTEM

### Oil Pressure Measurement

#### Oil Pressure Measurement

- Remove the oil passage plug, and 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 × 19/in.: 57001-1233**



- Start the engine and warm up the engine.
- Run the engine at the specified speed, and read the oil pressure gauge.
- ★ If the oil pressure is much lower than the standard, check the oil pump, relief valve, and/or crankshaft bearing insert wear immediately.
- ★ If the reading is much higher than the standard, check the oil passages for clogging.

#### Oil Pressure

**Standard: 255 ~ 314 kPa (2.6 ~ 3.2 kgf/cm<sup>2</sup>, 37 ~ 46 psi) @ 4 000 r/min (rpm), oil temperature. 90°C (194°F)**

- Stop the engine.
- Remove the oil pressure gauge and adapter.

#### **⚠ WARNING**

**Take care against burns from hot engine oil that will drain through the oil passage when the gauge adapter is removed.**

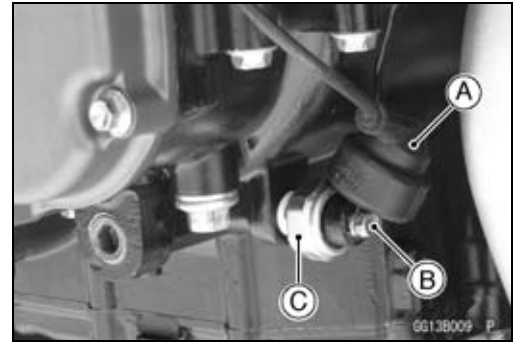
- Apply a non-permanent locking agent to the oil passage plug, and install it.

**Torque - Oil Passage Plug (Right): 20 N·m (2.0 kgf·m, 14 ft·lb)**

## Oil Pressure Switch

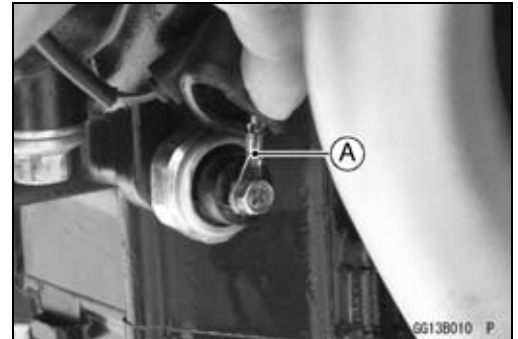
### *Oil Pressure Switch Removal*

- Remove:
  - Engine Oil (drain, Periodic Maintenance chapter)
  - Switch Cover [A]
  - Switch Terminal Bolt [B]
  - Oil Pressure Switch [C]



### *Oil Pressure Switch Installation*

- Apply silicone sealant to the threads of the oil pressure switch and tighten it.
  - Sealant - Kawasaki Bond (Silicone Sealant): 56019-120**
  - Torque - Oil Pressure Switch: 15 N·m (1.5 kgf·m, 11 ft·lb)**
- Install the switch lead [A] direction upward.
- Tighten the terminal bolt.
  - Torque - Oil Pressure Switch Terminal Bolt: 1.5 N·m (0.15 kgf·m, 13 in·lb)**
- Apply grease to the terminal.







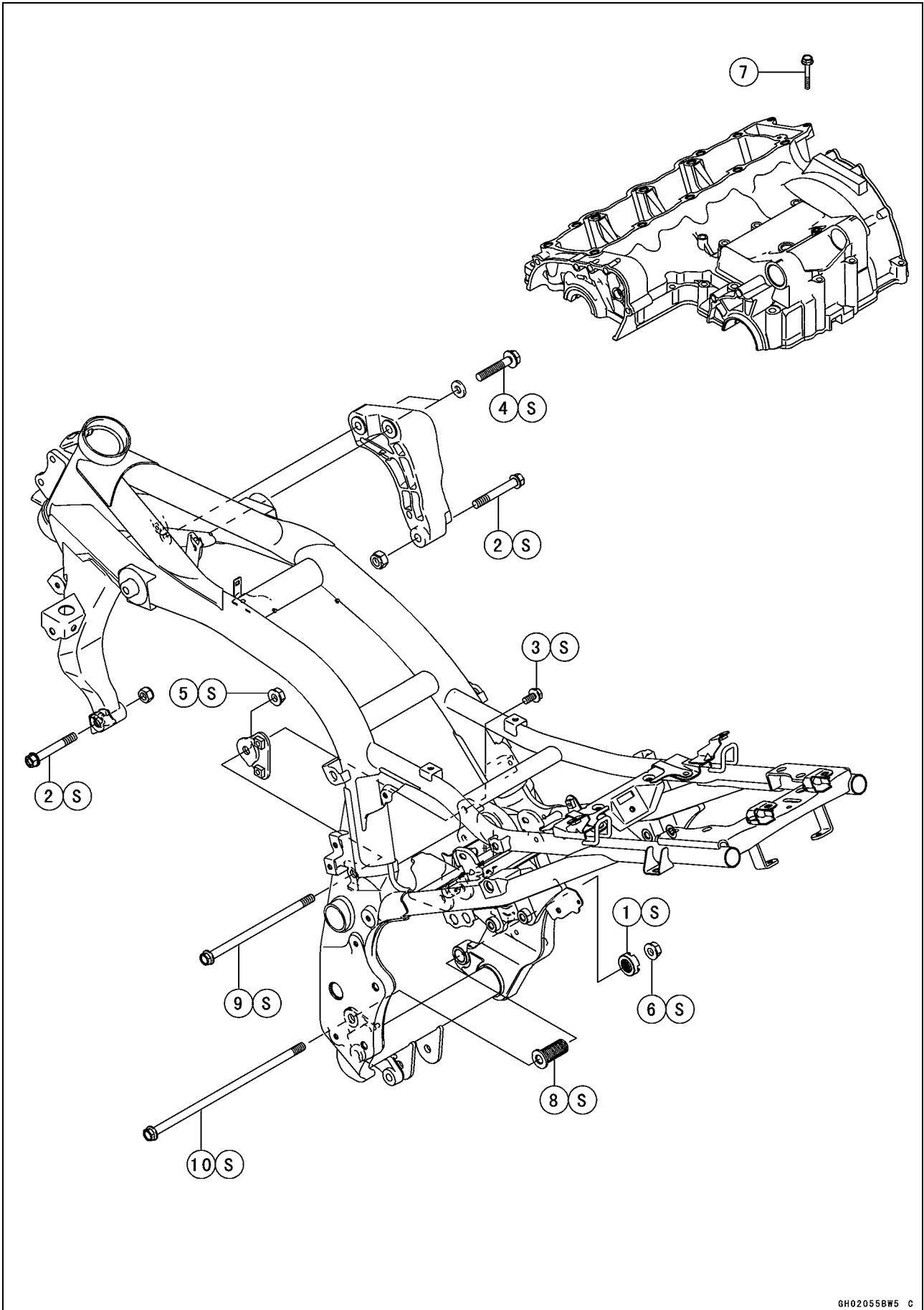
# Engine Removal/Installation

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Engine Removal.....	8-5
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# 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	Adjusting Collar Locknut	49	5.0	36	S
2	Upper Engine Mounting Bolts	44	4.5	33	S
3	Rear Engine Bracket Bolts	25	2.5	18	S
4	Front Engine Bracket Bolts	44	4.5	33	S
5	Middle Engine Mounting Nut	44	4.5	33	S
6	Lower Engine Mounting Nut	44	4.5	33	S
7	Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	

8. Adjusting Collar

9. Middle Engine Mounting Bolt

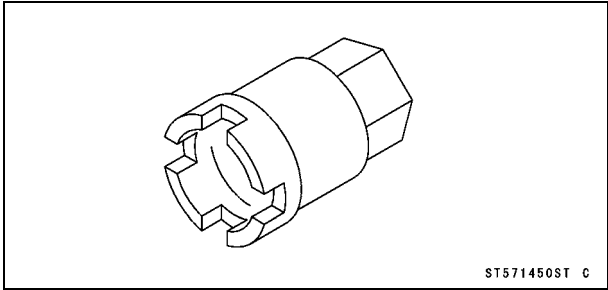
10. Lower Engine Mounting Bolt

S: Follow the specific tightening sequence.

# 8-4 ENGINE REMOVAL/INSTALLATION

## Special Tool

Engine Mount Nut Wrench:  
57001-1450



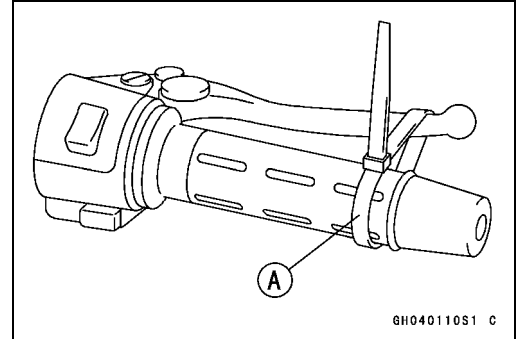
## Engine Removal/Installation

### Engine Removal

- Support the rear part of the swingarm with a stand.
- Squeeze the brake lever slowly and hold it with a band [A].

### **⚠ WARNING**

**Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. It could cause an accident and injury.**

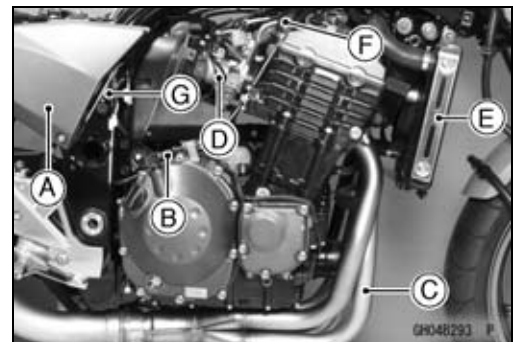


### **CAUTION**

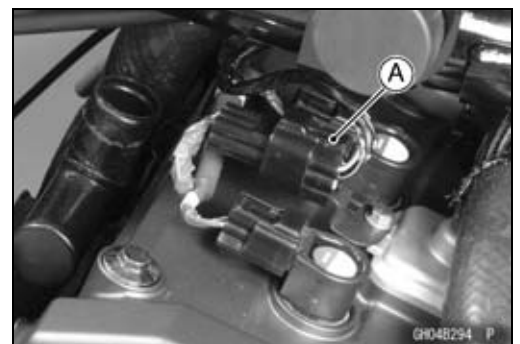
**Be sure to hold the front brake when removing the engine, or the motorcycle may fall over. The engine or the motorcycle could be damaged.**

- Drain:
  - Engine Oil (see Engine Oil Change in the Periodic Maintenance chapter)
  - Coolant (see Coolant Change in the Periodic Maintenance chapter)

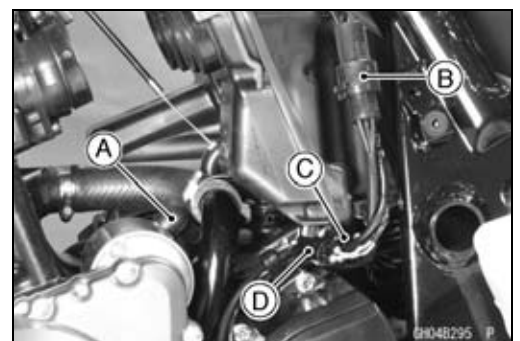
- Remove:
  - Fairing Bracket with Fairing (see Frame chapter)
  - Seat (see Frame chapter)
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Right Side Cover [A] (see Frame chapter)
  - Clutch Cable Lower End [B] (see Clutch chapter)
  - Exhaust Pipe Assy [C] and Muffler Body (see Engine Top End chapter)
  - Throttle Body Assy [D] (see Fuel System (DFI) chapter)
  - Radiator [E] (see Cooling System chapter)
  - Radiator Hose [F]
  - Crankshaft Sensor Lead Connector [G] (Disconnect)



- Disconnect:
  - Ignition Harness Connector [A]



- Disconnect:
  - Starter Motor Lead [A] (see Electrical System chapter)
  - Alternator Lead Connector [B] (see Electrical System chapter)
  - Neutral Switch Lead Connector (see Electrical system chapter)
  - Side Stand Switch Lead Connector [C]
  - Speed Sensor Connector [D]

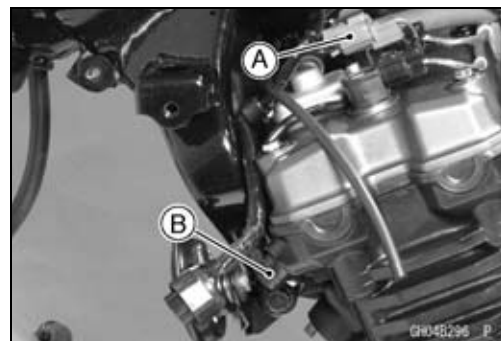


- Remove:
  - Engine Sprocket (see Final Drive chapter)

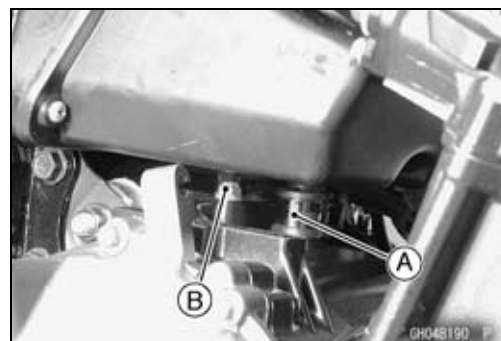
## 8-6 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

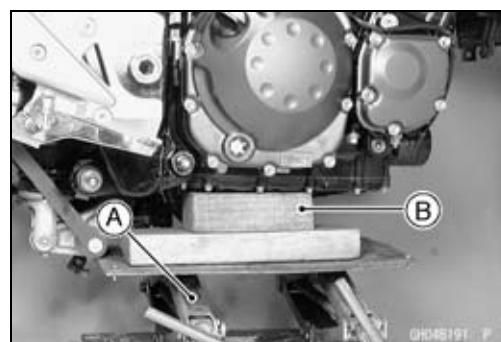
- Remove:
  - Camshaft Position Sensor Connector [A]
  - Camshaft Position Sensor [B]
- Remove the vacuum switch valve hose from the air cleaner housing.



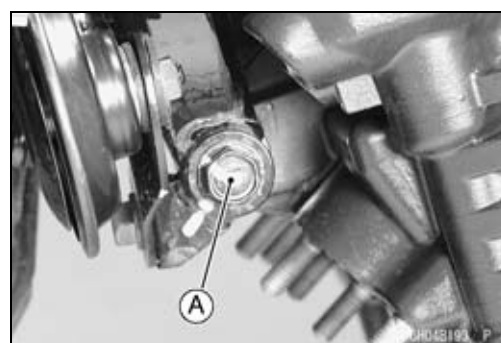
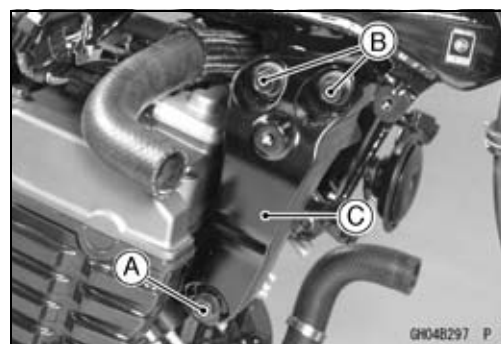
- Remove:
  - Breather Hose End [A]
  - Engine Ground Cable Terminal Bolt [B]



- Support the engine with a suitable stand [A].
  - Put a plank [B] onto the suitable stand for engine balance.

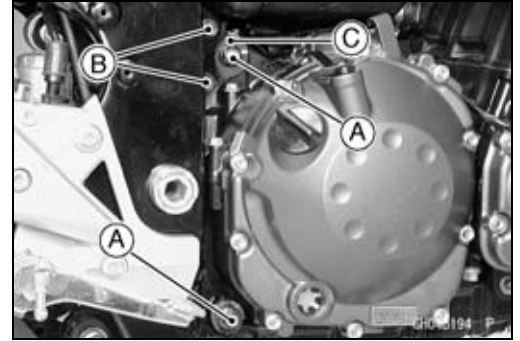


- Remove:
  - Right and Left Upper Engine Mounting Bolts [A]
  - Front Engine Bracket Bolts [B]
  - Front Engine Bracket [C]
  - Heat Insulation Plate

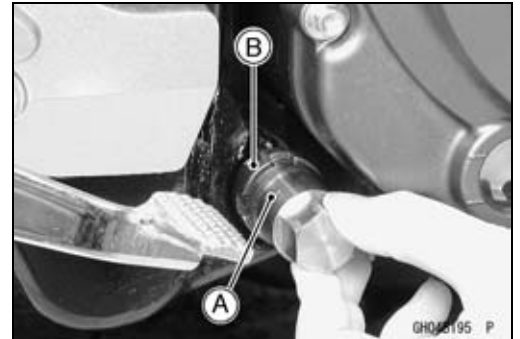


## Engine Removal/Installation

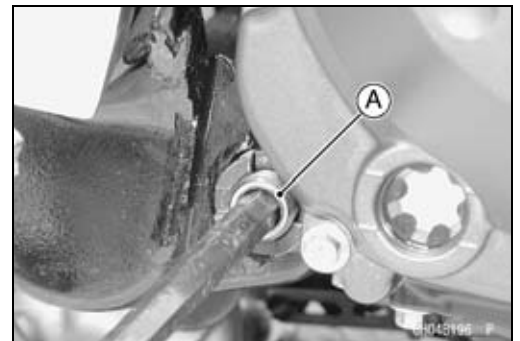
- Remove the middle and lower engine mounting nuts [A] and bolts.
- Remove:
  - Rear Engine Bracket Bolts [B]
  - Rear Engine Bracket [C]



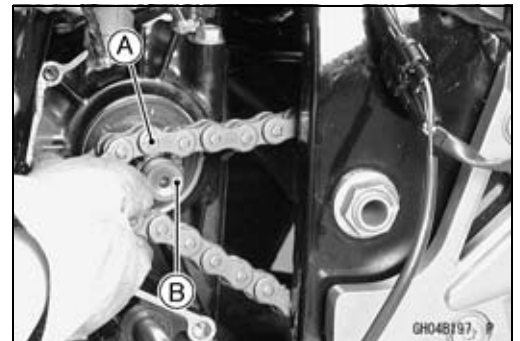
- Using the nut wrench [A], loosen the locknut [B].  
**Special Tool - Engine Mount Nut Wrench: 57001-1450**



- Using the Hexagon Wrench, turn the adjusting collar [A] counter-clockwise to make the gap between the engine and adjusting collar.

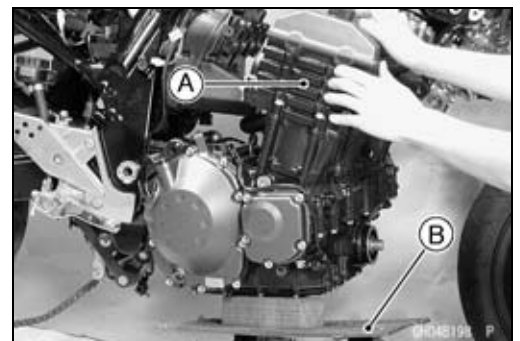


- Remove the drive chain [A] from the output shaft [B].
- Using the stand, take out the engine.



### Engine Installation

- Support the engine [A] with a suitable stand [B].
- Put a plank onto the suitable stand for engine balance.

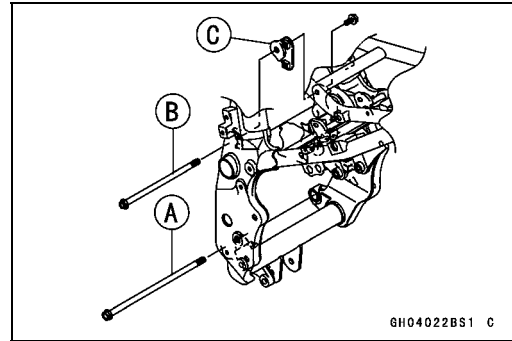


- Screw the adjusting collar fully by hand.
- Install the engine ground cable.  
**Torque - Engine Ground Cable Terminal Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**

## 8-8 ENGINE REMOVAL/INSTALLATION

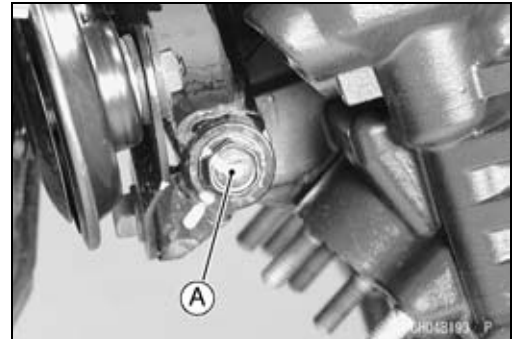
### Engine Removal/Installation

- Install the engine mounting bolts and nuts, following the specified installing sequence.
- First, hang the drive chain over the output shaft just before moving the engine into its final position in the frame.
- Secondly, insert the lower engine mounting bolt [A].
- Thirdly, insert the middle engine mounting bolt [B].
- Fourthly, install the rear engine bracket [C] temporarily.



- Fifthly, install the left upper engine mounting bolt [A] and tighten it.

**Torque - Left Upper Engine Mounting Bolt: 44 N·m (4.5 kgf·m, 33 ft·lb)**

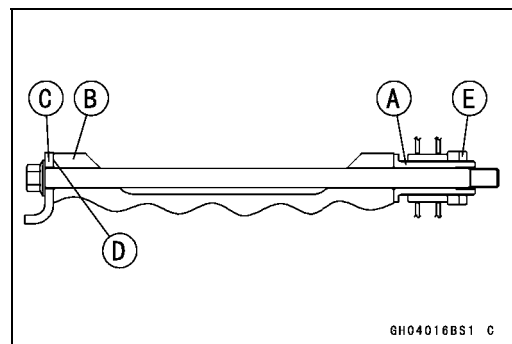
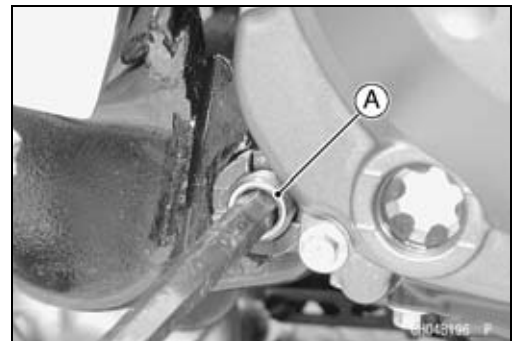


- Sixthly, tighten the adjusting collar [A] until the clearance between the crankcase [B] and frame bracket [C] comes to 0 mm [D].

- Seventhly, tighten the collar locknut [E].

**Torque - Adjusting Collar Locknut: 49 N·m (5.0 kgf·m, 36 ft·lb)**

**Special Tool - Engine Mount Nut Wrench: 57001-1450**



- Eighthly, tighten the rear bracket bolts.

**Torque - Rear Engine Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

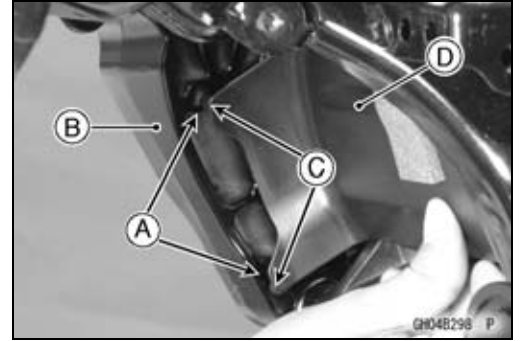
- Ninthly, tighten securely:
  - Middle Engine Mounting Nut
  - Lower Engine Mounting Nut

**Torque - Engine Mounting Nuts: 44 N·m (4.5 kgf·m, 33 ft·lb)**

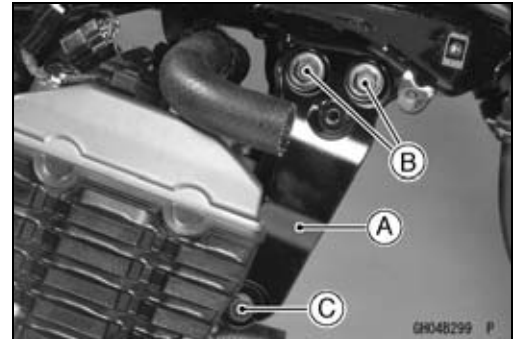


## Engine Removal/Installation

- Fit the holes [A] of the bracket [B] onto the projections [C] of the heat insulation plate [D].



- Tently, temporarily install:
  - Right Upper Engine Mounting Bolt [A]
  - Front Engine Bracket Bolts [B]
  - Front Engine Bracket [C]



- Eleventhly, tighten the right upper engine mounting bolt.
- Lastly, tighten the front engine bracket bolts.

**Torque - Right Upper Engine Mounting Bolt: 44 N·m (4.5 kgf·m, 33 ft·lb)**

**Front Engine Bracket Bolts: 44 N·m (4.5 kgf·m, 33 ft·lb)**

- Run the leads, cables and hoses correctly (see Cable, Wire and Hose Routing section in Appendix chapter).
- Install the removed parts (see appropriate chapters).
- Adjust:
  - Throttle Cables (see Fuel System (DFI) chapter)
  - Choke Cable (see Fuel System (DFI) chapter)
  - Clutch Cable (see Clutch chapter)
  - Drive Chain (see Final Drive 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).



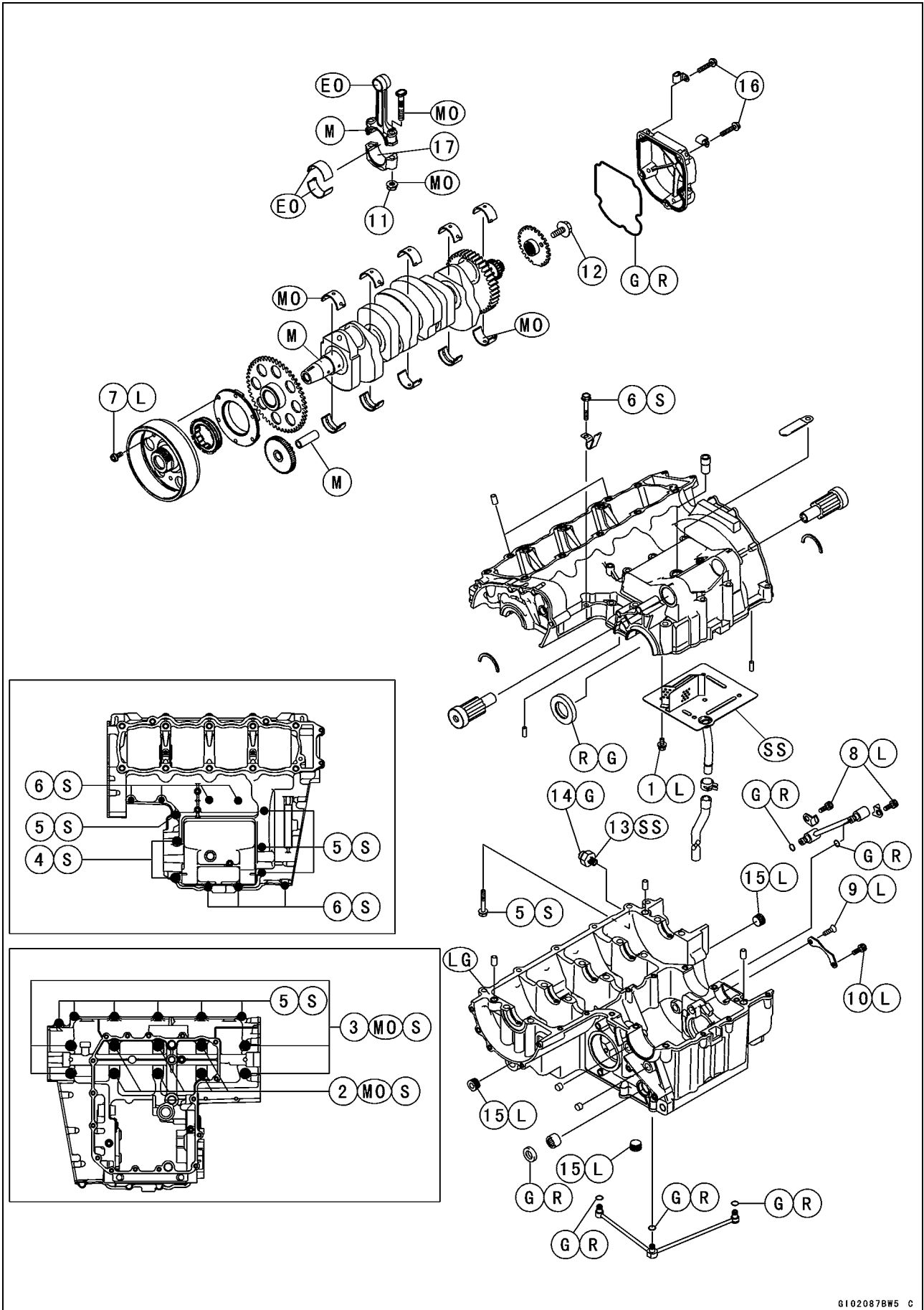
# Crankshaft/Transmission

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# 9-2 CRANKSHAFT/TRANSMISSION

## Exploded View



## CRANKSHAFT/TRANSMISSION 9-3

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Breather Plate Bolts	9.8	1.0	87 in·lb	L
2	Crankcase Bolts (M9, L = 81 mm)	42	4.3	31	MO, S
3	Crankcase Bolts (M9, L = 95 mm)	42	4.3	31	MO, S
4	Crankcase Bolts (M8)	27	2.8	20	S
5	Crankcase Bolts (M7)	20	2.0	14	S
6	Crankcase Bolts (M6)	12	1.2	104 in·lb	S
7	Starter Motor Clutch Bolts	12	1.2	104 in·lb	L
8	Oil Pipe Holder Bolts	13	1.3	113 in·lb	L
9	Shift Drum Bearing Holder Screw	5.4	0.55	48 in·lb	L
10	Shift Drum Bearing Holder Bolt	13	1.3	113 in·lb	L
11	Connecting Rod Big End Nuts	see the text	←	←	←
12	Crankshaft Position Rotor Bolt	40	4.1	30	
13	Oil Pressure Switch	15	1.5	11	SS
14	Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	
15	Oil Passage Plugs	20	2.0	14	L
16	Crankshaft Sensor Cover Bolts	11	1.1	95 in·lb	

17. Do not apply any grease or oil.

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

LG: Apply liquid gasket (Kawasaki Bond: 92104-1062).

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)

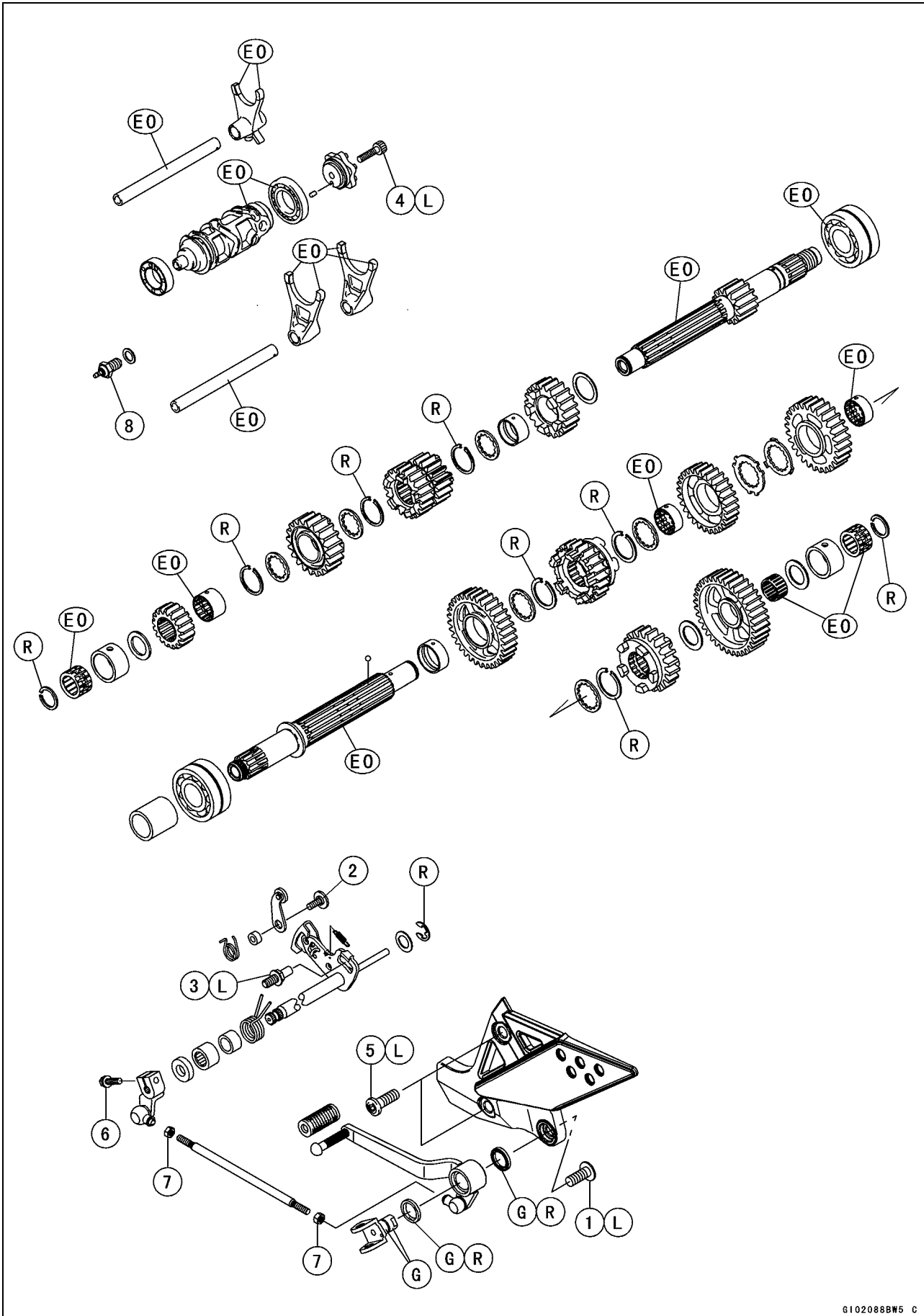
R: Replacement Parts

S: Tightening the fasteners following the specified sequence.

SS: Apply silicone sealant.

# 9-4 CRANKSHAFT/TRANSMISSION

## Exploded View



## CRANKSHAFT/TRANSMISSION 9-5

### Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Shift Pedal Mounting Bolt	34	3.5	25	L
2	Gear Positioning Lever Bolt	12	1.2	104 in·lb	
3	Shift Shaft Return Spring Pin	29	3.0	22	L
4	Shift Drum Cam Holder Bolt	12	1.2	104 in·lb	L
5	Footpeg Bracket Bolts	34	3.5	25	L
6	Shift Lever Bolt	6.9	0.70	61 in·lb	
7	Tie-rod Locknuts	6.9	0.70	61 in·lb	
8	Neutral Switch	15	1.5	11	

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

## 9-6 CRANKSHAFT/TRANSMISSION

### Specifications

Item	Standard	Service Limit																					
<b>Crankshaft, Connecting Rods</b>																							
Connecting Rod Bend	— — —	TIR 0.2/100 mm (0.008/3.94 in.)																					
Connecting Rod Twist	— — —	TIR 0.2/100 mm (0.008/3.94 in.)																					
Connecting Rod Big End Side Clearance	0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)	0.58 mm (0.023 in.)																					
Connecting Rod Big End Bearing Insert/crankpin Clearance	0.041 ~ 0.071 mm (0.0016 ~ 0.0028 in.)	0.11 mm (0.0043 in.)																					
Crankpin Diameter:	34.984 ~ 35.000 mm (1.3773 ~ 1.3780 in.)	34.97 mm (1.3768 in.)																					
Marking:																							
None	34.984 ~ 34.992 mm (1.3773 ~ 1.3776 in.)	— — —																					
○	34.993 ~ 35.000 mm (1.3777 ~ 1.3780 in.)	— — —																					
Connecting Rod Big End Inside Diameter:	38.000 ~ 38.016 mm (1.4961 ~ 1.4967 in.)	— — —																					
Marking:																							
None	38.000 ~ 38.008 mm (1.4961 ~ 1.4964 in.)	— — —																					
○	38.009 ~ 38.016 mm (1.4964 ~ 1.4967 in.)	— — —																					
Connecting Rod Big End Bearing Insert Thickness:																							
Brown	1.475 ~ 1.480 mm (0.05807 ~ 0.05827 in.)	— — —																					
Black	1.480 ~ 1.485 mm (0.05827 ~ 0.05846 in.)	— — —																					
Blue	1.485 ~ 1.490 mm (0.05846 ~ 0.05866 in.)	— — —																					
Connecting Rod Big End Bearing Insert Selection:																							
<table border="1"> <thead> <tr> <th rowspan="2">Con-rod Big End Bore Diameter Marking</th> <th rowspan="2">Crankpin Diameter Marking</th> <th colspan="2">Bearing Insert</th> </tr> <tr> <th>Size Color</th> <th>Part Number</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>○</td> <td>Brown</td> <td>92139-1110</td> </tr> <tr> <td>None</td> <td>None</td> <td rowspan="2">Black</td> <td rowspan="2">92139-1109</td> </tr> <tr> <td>○</td> <td>○</td> </tr> <tr> <td>○</td> <td>None</td> <td>Blue</td> <td>92139-1108</td> </tr> </tbody> </table>				Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert		Size Color	Part Number	None	○	Brown	92139-1110	None	None	Black	92139-1109	○	○	○	None	Blue	92139-1108
Con-rod Big End Bore Diameter Marking	Crankpin Diameter Marking	Bearing Insert																					
		Size Color	Part Number																				
None	○	Brown	92139-1110																				
None	None	Black	92139-1109																				
○	○																						
○	None	Blue	92139-1108																				
Connecting Rod Bolt Stretch: (Usable Range)																							
New Connecting Rod	0.24 ~ 0.36 mm (0.0094 ~ 0.0142 in.)	— — —																					
Used Connecting Rod	0.20 ~ 0.32 mm (0.0079 ~ 0.0126 in.)	— — —																					
Crankshaft Side Clearance	0.05 ~ 0.20 mm (0.0020 ~ 0.0079 in.)	0.40 mm (0.0157 in.)																					



## CRANKSHAFT/TRANSMISSION 9-7

### Specifications

Item	Standard	Service Limit
Crankshaft Runout	TIR 0.02 mm (0.0008 in.) or less	TIR 0.05 mm (0.0020 in.)
Crankshaft Main Bearing Insert/Journal Clearance	0.020 ~ 0.044 mm (0.0008 ~ 0.0017 in.)	0.07 mm (0.0028 in.)
Crankshaft Main Journal Diameter:	32.984 ~ 33.000 mm (1.2986 ~ 1.2992 in.)	32.96 mm (1.2976 in.)
Marking:		
None	32.984 ~ 32.992 mm (1.2986 ~ 1.2989 in.)	---
1	32.993 ~ 33.000 mm (1.2989 ~ 1.2992 in.)	---
Crankcase Main Bearing Inside Diameter:	36.000 ~ 36.016 mm (1.4173 ~ 1.4179 in.)	---
Marking:		
○	36.000 ~ 36.008 mm (1.4173 ~ 1.4176 in.)	---
None	36.009 ~ 36.016 mm (1.4177 ~ 1.4179 in.)	---
Crankshaft Main Bearing Insert Thickness:		
Brown	1.490 ~ 1.494 mm (0.0587 ~ 0.0588 in.)	---
Black	1.494 ~ 1.498 mm (0.0588 ~ 0.0590 in.)	---
Blue	1.498 ~ 1.502 mm (0.0590 ~ 0.0591 in.)	---

#### 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	92028-1868	3, 5
			92028-1829	1, 2, 4
None	1	Black	92028-1867	3, 5
○	None		92028-1828	1, 2, 4
None	None	Blue	92028-1866	3, 5
			92028-1827	1, 2, 4

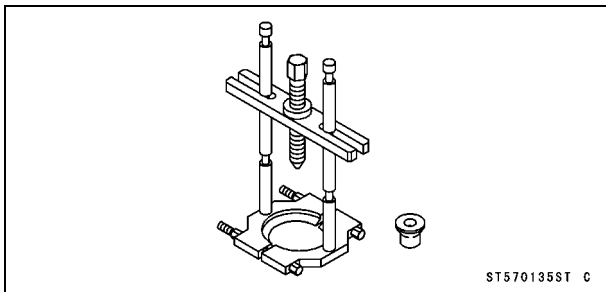
\*The bearing inserts for Nos. 1, 2 and 4 journals have an oil groove, respectively.

<b>Transmission</b>		
Shift Fork Ear Thickness	5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)	5.8 mm (0.228 in.)
Gear Groove Width	6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)	6.25 mm (0.246 in.)
Shift Fork Guide Pin Diameter	6.9 ~ 7.0 mm (0.272 ~ 0.276 in.)	6.8 mm (0.268 in.)
Shift Drum Groove Width	7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)	7.3 mm (0.287 in.)

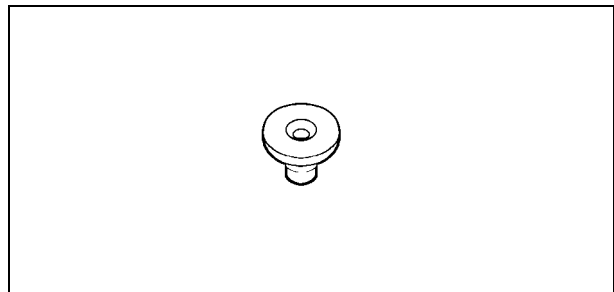
# 9-8 CRANKSHAFT/TRANSMISSION

## Special Tools and Sealant

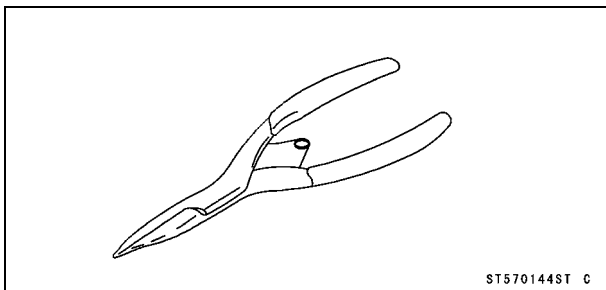
**Bearing Puller:**  
57001-135



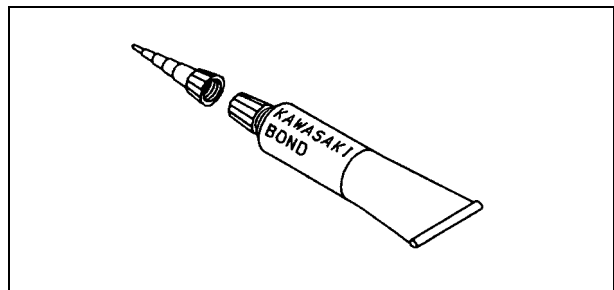
**Bearing Puller Adapter:**  
57001-317



**Outside Circlip Pliers:**  
57001-144



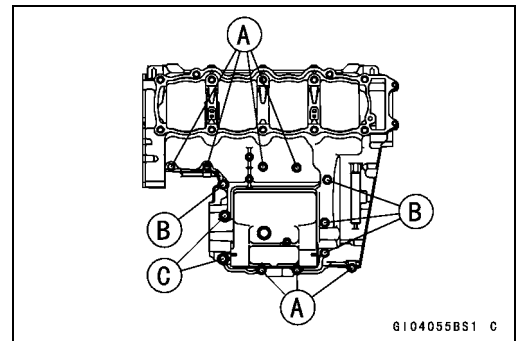
**Kawasaki Bond (Liquid Gasket - Black) :**  
92104-1062



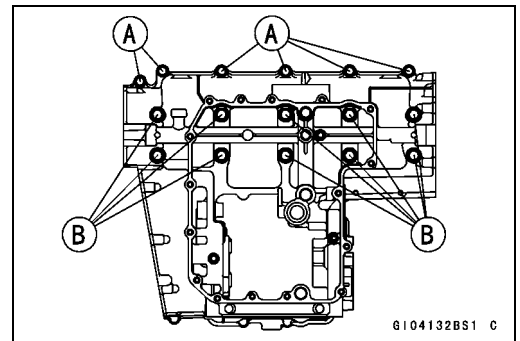
## Crankcase Splitting

### Crankcase Splitting

- Remove the engine (see Engine Removal/Installation chapter).
- Set the engine on a clean surface and hold the engine steady while parts are being removed.
- Remove:
  - Crankshaft Sensor (see Electrical System chapter)
  - Clutch (see Clutch chapter)
  - External Shift Mechanism (see External Shift Mechanism Removal)
  - Starter Motor (see Electrical System chapter)
  - Oil Pump (see Engine Lubrication System chapter)
  - Alternator Rotor (see Electrical System chapter)
  - Oil Filter (see Engine Lubrication System chapter)
- ★ If the crankshaft is to be removed, remove the pistons (see Engine Top End chapter).
- Remove the upper crankcase bolts.
  - First loosen the M6 bolts.
  - M6 Bolts [A]
  - M7 Bolts [B]
  - M8 Bolts [C]



- Remove the oil pan, relief valve, oil screen and oil pipes (see Engine Lubrication System chapter).
- Remove the lower crankcase bolts.
  - First loosen the M7 bolts.
  - M7 Bolts [A]
  - M9 Bolts [B]
- Tap lightly around the crankcase mating surface with a plastic mallet, and split the crankcase. Take care not to damage the crankcase.



### Crankcase Assembly

#### CAUTION

**The upper and lower crankcase halves are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.**

- With a high-flash point solvent, clean off the mating surfaces of the crankcases halves and wipe dry.
- Using compressed air, blow out the oil passages in the crankcase halves.

## 9-10 CRANKSHAFT/TRANSMISSION

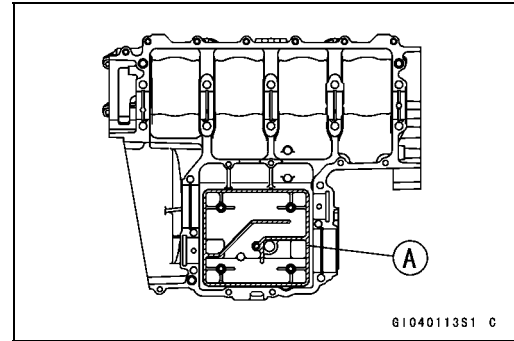
### Crankcase Splitting

- Apply liquid gasket to the breather plate mating surface [A] 1 to 1.5 mm (0.04 to 0.06 in.) thick, and then install the breather plate.

Sealant - Three Bond 1207B

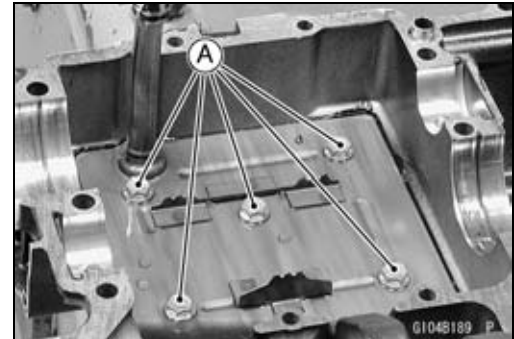
#### NOTE

○Moreover fit the plate and tighten the bolts just after application of the silicone sealant.

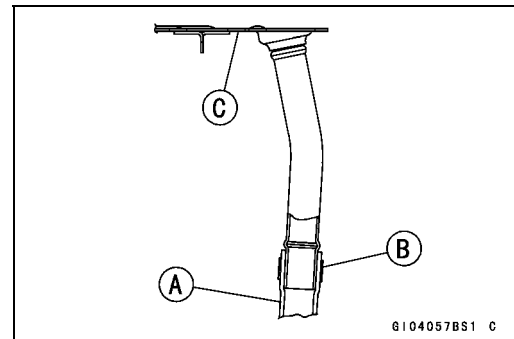


- Apply a non-permanent locking agent to the threads and tighten the bolts [A].

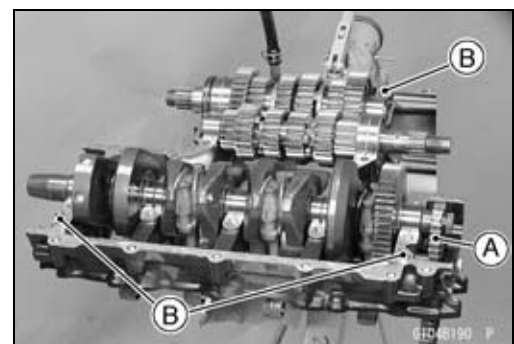
Torque - Breather Plate Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)



- Install the breather hose [A].
- Align the white mark on the hose with the white mark on the pipe.
- Install the clamp [B] so that its head faces to clutch side. Breather Plate [C]



- Install:
  - Crankshaft and Connecting Rods
  - Camshaft Chain [A]
  - Transmission Shafts and Gears
  - Dowel Pins [B]
  - Shift Drum
  - Shift Forks and Shift Rods
- Before fitting the lower case on the upper case, check the following.
  - Be sure to hang the camshaft chain on the crankshaft.
  - Check to see that the shift drum and transmission gears are in the neutral position.



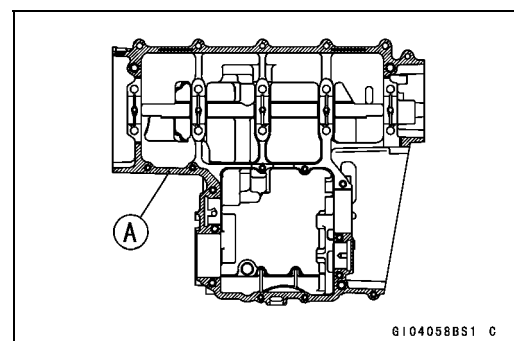
- Apply liquid gasket [A] to the mating surface of the lower crankcase half.

Sealant - Kawasaki Bond (Liquid Gasket - Black): 92104-1062

#### CAUTION

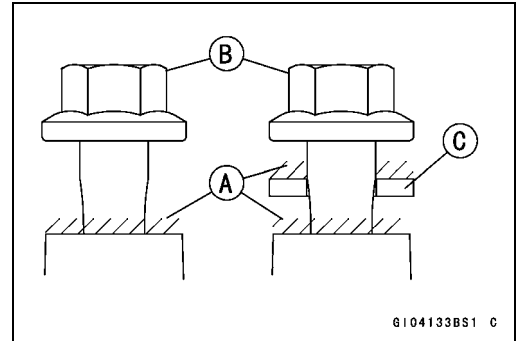
Do not apply liquid gasket around the crankshaft main bearing inserts, and oil passage holes.

- Fit the lower crankcase to the upper crankcase.



## Crankcase Splitting

- Apply molybdenum disulfide oil solution to the seating surface [A] on the lower crankcase for the M9 bolts [B]. Washer [C]



- Tighten the lower crankcase bolts using the following steps.

- Following the sequence numbers on the lower crankcase half, tighten the M9 bolts [1 ~ 6] L= 81 mm (3.19 in.).

**Torque - Crankcase Bolts (M9): 42 N·m (4.3 kgf·m, 31 ft·lb)**

- Tighten the M9 bolts [7 ~ 10] L= 95 mm (3.74 in.) with washers.

**Torque - Crankcase Bolts (M9): 42 N·m (4.3 kgf·m, 31 ft·lb)**

- Tighten the M7 bolts [A].

**Torque - Crankcase Bolts (M7): 20 N·m (2.0 kgf·m, 14 ft·lb)**

- Tighten the upper crankcase bolts in the order listed.

**Torque - Crankcase Bolts (M8) [A]: 27 N·m (2.8 kgf·m, 20 ft·lb)**

**Crankcase Bolts (M7): 20 N·m (2.0 kgf·m, 14 ft·lb)**

L= 85 mm (3.35 in.) [B]

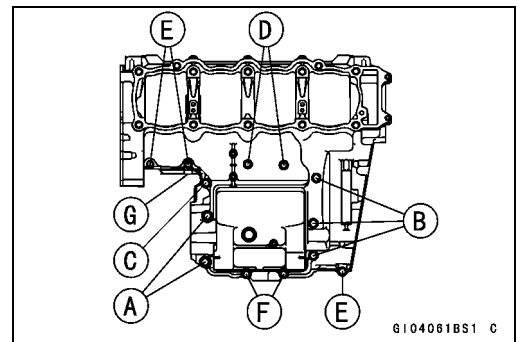
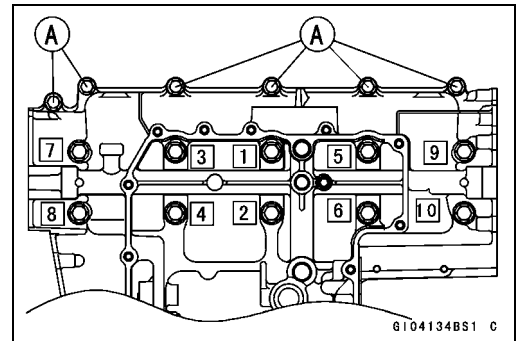
L= 50 mm (1.97 in.) [C]

**Crankcase Bolts (M6): 12 N·m (1.2 kgf·m, 104 in·lb)**

L= 60 mm (2.36 in.) [D]

L= 40 mm (1.57 in.) [E]

L= 90 mm (3.54 in.) [F]



Clamp [G]

- After tightening all crankcase bolts, check the following items.

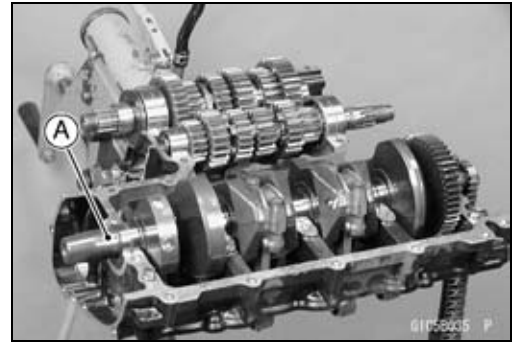
- Crankshaft and transmission shafts turn freely.
- While spinning the output shaft, gears shift smoothly from the 1st to 6th gear, and 6th to 1st.
- When the output shaft stays still, the gear can not be shifted to 2nd gear or other higher gear positions.

## 9-12 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

#### Crankshaft Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the crankshaft [A].

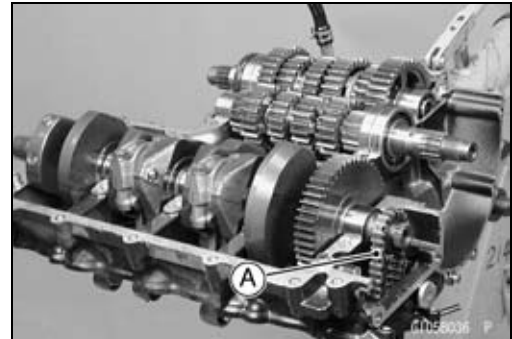


#### Crankshaft Installation

##### CAUTION

If the crankshaft, bearing inserts, or crankcase halves are replaced with new ones, select the bearing inserts and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

- Apply molybdenum disulfide oil solution to the crankshaft main bearing inserts.
- Install the crankshaft with the camshaft chain [A] hanging on it.



#### Connecting Rod Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the connecting rod nuts [A].
- Remove the crankshaft.

##### 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 connecting rods from the crankshaft.



##### CAUTION

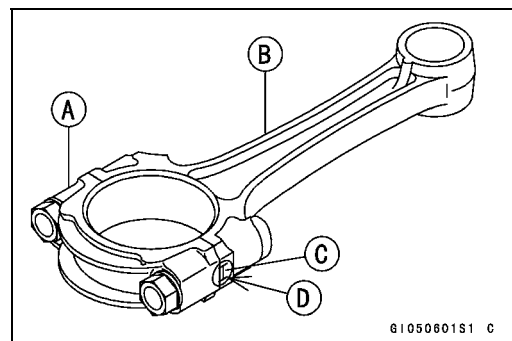
Discard the connecting rod bolts. To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.

#### Connecting Rod Installation

##### CAUTION

To minimize vibration, the connecting rods should have the same weight mark.

- Big End Cap [A]
- Connecting Rod [B]
- Weight Mark, Alphabet [C]
- Diameter Mark [D]: "O" or no mark

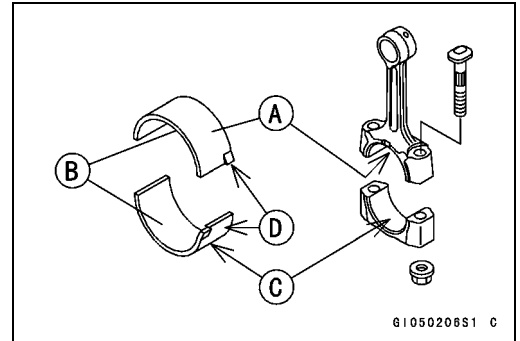


##### CAUTION

If the connecting rods, big end bearing inserts, or crankshaft are replaced with new ones, select the bearing insert and check clearance with a plastigage (press gauge) before assembling engine to be sure the correct bearing inserts are installed.

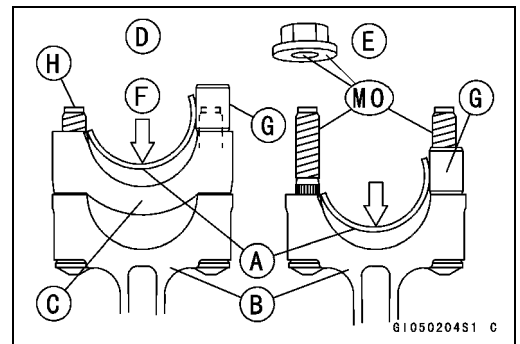
**Crankshaft and Connecting Rods**

- Apply molybdenum disulfide grease [A] to the outer surface of the upper insert and the inner surface of the connecting rod big end.
- Apply molybdenum disulfide oil [B] to the inner surfaces of upper and lower bearing inserts.
- The molybdenum disulfide oil is a mixture of engine oil and molybdenum disulfide grease with a weight ratio (10:1).
- Do not apply any grease or oil [C] to the cap inside and cap insert outside.
- 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.



<b>CAUTION</b>
<b>Wrong application of oil and grease could cause bearing damage.</b>

- 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]
- Install the cap on the connecting rod, aligning the weight and diameter marks.
- Remove debris and clean the surface of inserts.
- Apply molybdenum disulfide oil solution [MO] to the threads and seating surfaces of the big end nuts and bolts.



## 9-14 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.

CAUTION
<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>

CAUTION
<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>

#### (1) Bolt Length Measurement Method

- Be sure to clean the bolts, nuts, and connecting rods thoroughly with a high-flash point solvent, because the new connecting rods, bolts, and nuts are treated with an anti-rust solution.

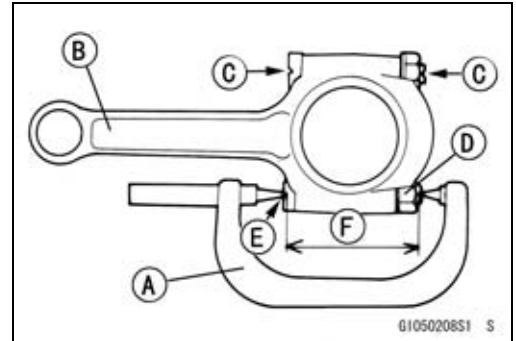
 WARNING
<b>Clean the bolts, nuts, and connecting rods in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. This includes any appliance with a pilot light. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents to clean them.</b>

CAUTION
<b>Immediately dry the bolts and nuts with compressed air after cleaning. Clean and dry the bolts and nuts completely.</b>



**Crankshaft and Connecting Rods**

- Install new bolts in reused connecting rods.
- Dent both bolt head and bolt tip with a punch as shown.
- Before tightening, use a point micrometer [A] to measure the length of new connecting rod bolts and record the values to find the bolt stretch.  
 Connecting Rod [B]  
 Mark here with a punch [C].  
 Nuts [D]  
 Fit micrometer pins into punch marks [E].
- Apply a small amount of molybdenum disulfide oil to the following:  
 Threads of Nuts and Bolts  
 Seating Surfaces of Nuts and Con-rods
- Tighten the big end nuts until the bolt elongation reaches the length specified in the table.
- Check the length [F] 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.



$$\text{Bolt Length after tightening} - \text{Bolt Length before tightening} = \text{Bolt Stretch}$$

Connect- ing Rod Assy	Bolt	Nut	Usable Range of Connecting Rod Bolt Stretch
New	Use the bolts attached to new con-rod.	Attached to new con-rod	0.24 ~ 0.36 mm (0.0094 ~ 0.0142 in.)
		New	
Used	Replace the bolts with new ones.	Used	0.20 ~ 0.32 mm (0.0079 ~ 0.0126 in.)
		New	

(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 and nuts thoroughly with a high-flash point solvent, because the new bolts and nuts are treated with an anti-rust solution.

**⚠ WARNING**

**Clean the bolts and nuts in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. This includes any appliance with a pilot light. Because of the danger or highly flammable liquids, do not use gasoline or low-flash point solvents to clean them.**

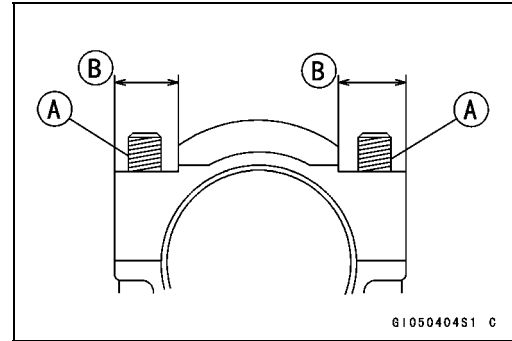
**CAUTION**

**Immediately dry the bolts and nuts with compressed air after cleaning. Clean and dry the bolts and nuts completely.**

## 9-16 CRANKSHAFT/TRANSMISSION

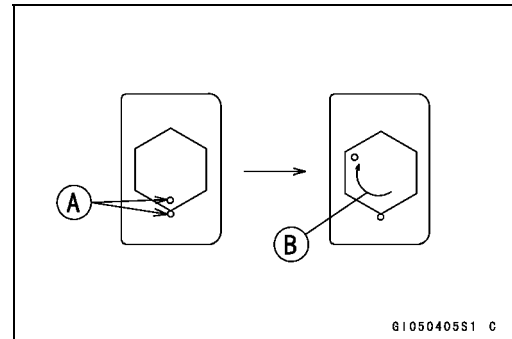
### Crankshaft and Connecting Rods

- Install new bolts in reused connecting rods.
- Apply a small amount of molybdenum disulfide oil to the following:
  - Threads [A] of Nuts and Bolts
  - Seating Surfaces [B] of Nuts and Con-rods



- First, tighten the nuts to the specified torque. See the table below.
- Next, tighten the nuts  $120^\circ \pm 5^\circ$ .
- Mark [A] the connecting rod big end caps and nuts so that nuts can be turned  $120^\circ$  [B] properly.
- Tighten the hexagon nut by 2 corners.

Connecting Rod Assy	Bolt	Nut	Torque + Angle N·m (kgf·m, ft·lb)
New	Use the bolts attached to new con-rod.	Attached to new con-rod	18 (1.8, 13.0) + $120^\circ$
		New	20 (2.0, 14.5) + $120^\circ$
Used	Replace the bolts with new ones.	Used	24 (2.4, 17.4) + $120^\circ$
		New	25 (2.6, 18.8) + $120^\circ$

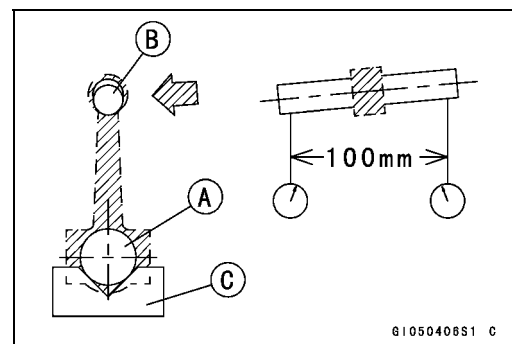


#### Crankshaft/Connecting Rod Cleaning

- After removing the connecting rods from the crankshaft, clean them with a high-flash point solvent.
- Blow the crankshaft oil passages with compressed air to remove any foreign particles or residue that may have accumulated in the passages.

#### Connecting Rod Bend

- Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
- Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
- Select an arbor of the same diameter as the piston pin and at least 100 mm (3.94 in.) long, and insert the arbor [B] through the connecting rod small end.
- On a surface plate, set the big-end arbor on V block [C].
- With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.94 in.) length to determine the amount of connecting rod bend.
- ★ If connecting rod bend exceeds the service limit, the connecting rod must be replaced.



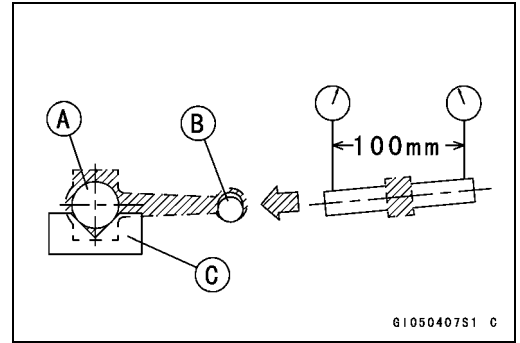
#### Connecting Rod Bend

**Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)**

**Crankshaft and Connecting Rods**

**Connecting Rod Twist**

- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being paralleled with the surface plate over a 100 mm (3.94 in.) length of the arbor to determine the amount of connecting rod twist.
- ★ If connecting rod twist exceeds the service limit, the connecting rod must be replaced.

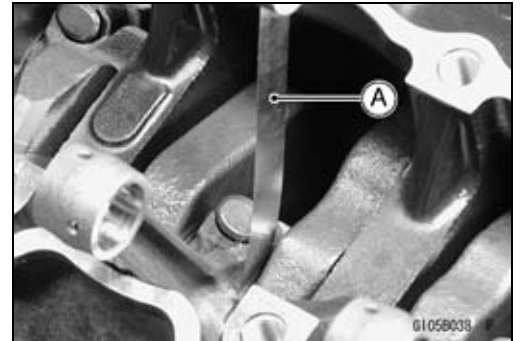


**Connecting Rod Twist**

**Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)**

**Connecting Rod Big End Side Clearance**

- Measure connecting rod big end side clearance.
- Insert a thickness gauge [A] between the big end and either crank web to determine clearance.



**Connecting Rod Big End Side Clearance**

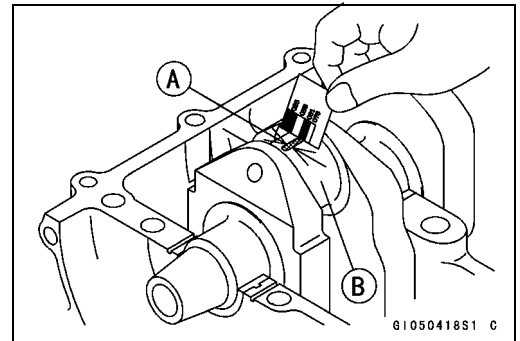
**Standard: 0.13 ~ 0.38 mm (0.0051 ~ 0.0150 in.)**

**Service Limit: 0.58 mm (0.023 in.)**

- ★ If the clearance exceeds the service limit, replace the connecting rod with new one and then check clearance again. If clearance is too large after connecting rod replacement, the crankshaft also must be replaced.

**Connecting Rod Big End Bearing Insert/Crankpin Wear**

- Measure the bearing insert/crankpin [B] clearance with plastigage [A].
- Tighten the big end nuts to the specified torque (see Connecting Rod Installation).



**NOTE**

- Do not move the connecting rod and crankshaft during clearance measurement.

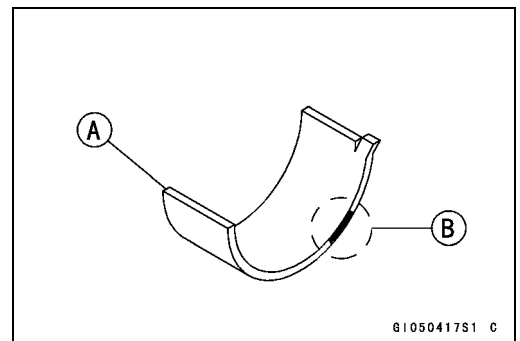
<b>CAUTION</b>
<b>After measurement, replace the connecting rod bolts.</b>

**Connecting Rod Big End Bearing Insert/Crankpin Clearance**

**Standard: 0.041 ~ 0.071 mm (0.0016 ~ 0.0028 in.)**

**Service Limit: 0.11 mm (0.0043 in.)**

- ★ If the clearance is within the standard, no bearing replacement is required.
- ★ If the clearance is between 0.072 mm (0.00284 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: 34.984 ~ 35.000 mm (1.3773 ~ 1.3780 in.)**

**Service Limit: 34.97 mm (1.3768 in.)**

## 9-18 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

- ★ If any crankpin has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

#### Crankpin Diameter Marks

None 34.984 ~ 34.992 mm (1.3773 ~ 1.3776 in.)

○ 34.993 ~ 35.000 mm (1.3777 ~ 1.3780 in.)

△: Crankpin Diameter Marks, “○” or no mark.

- Measure the connecting rod big end inside diameter, and mark each connecting rod big end in accordance with the inside diameter.
- Tighten the connecting rod big end nuts to the specified torque (see Connecting Rod Installation).

#### NOTE

○ The mark already on the big end should almost coincide with the measurement.

#### Connecting Rod Big End Inside Diameter Marks

None 38.000 ~ 38.008 mm (1.4961 ~ 1.4964 in.)

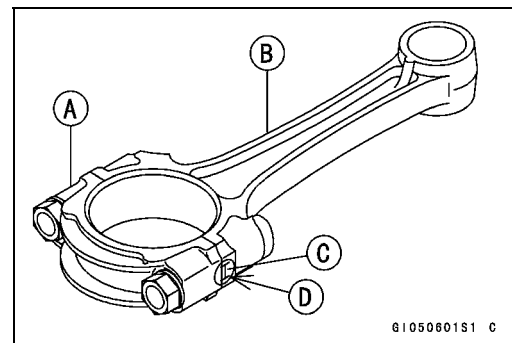
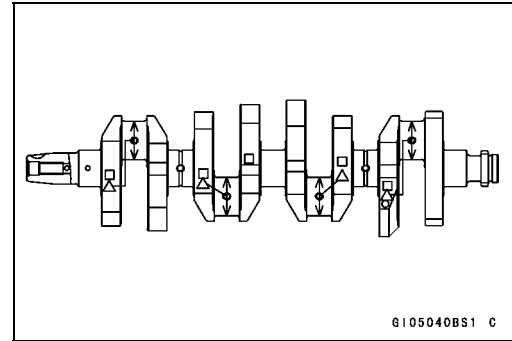
○ 38.009 ~ 38.016 mm (1.4964 ~ 1.4967 in.)

Big End Cap [A]

Connecting Rod [B]

Weight Mark, Alphabet [C]

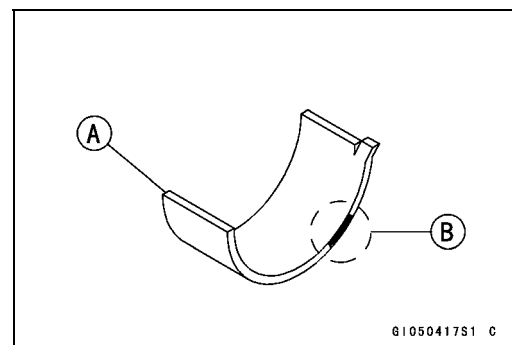
Diameter Mark (Around Weight Mark) [D]: “○” or no mark



- 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	92139-1110
None	None	Black	92139-1109
○	○		
○	None	Blue	92139-1108

- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.



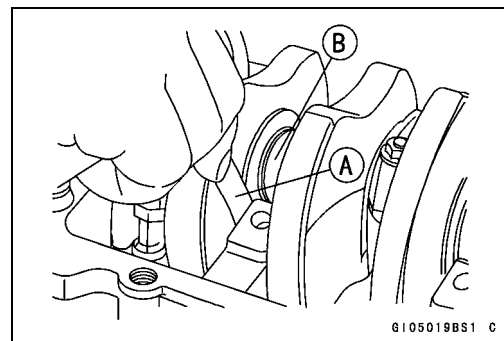
## Crankshaft and Connecting Rods

### Crankshaft Side Clearance

- Insert a thickness gauge [A] between the crankcase main bearing and the crank web at the No. 2 journal [B] to determine clearance.
- ★ If the clearance exceeds the service limit, replace the crankcase halves as a set.

#### NOTE

- 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.



### Crankshaft Side Clearance

**Standard:** 0.05 ~ 0.20 mm (0.0020 ~ 0.0079 in.)

**Service Limit:** 0.40 mm (0.0157 in.)

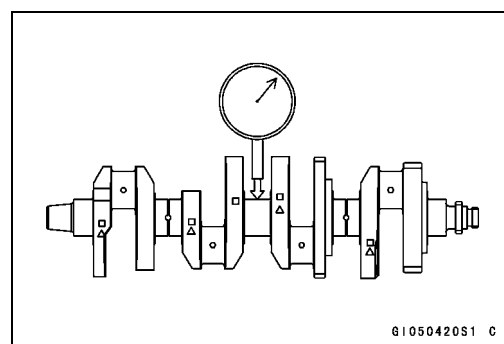
### Crankshaft Runout

- Measure the crankshaft runout.
- ★ If the measurement exceeds the service limit, replace the crankshaft.

### Crankshaft Runout

**Standard:** TIR 0.02 mm (0.0008 in.) or less

**Service Limit:** TIR 0.05 mm (0.0020 in.)

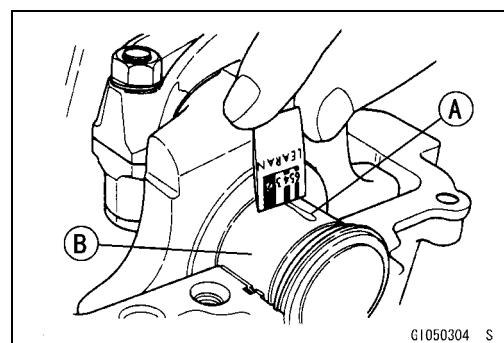


### Crankshaft Main Bearing Insert/Journal Wear

- Using a plastigage (press gauge) [A], measure the bearing insert/journal [B] clearance.

#### NOTE

- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).
- Do not turn the crankshaft during clearance measurement.
- Journal clearance less than 0.025 mm (0.00098 in.) can not be measured by plastigage, however, using genuine parts maintains the minimum standard clearance.

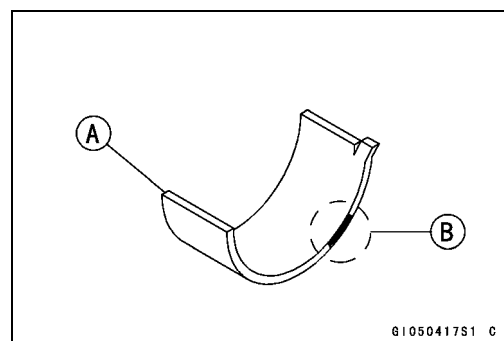


### Crankshaft Main Bearing Insert/Journal Clearance

**Standard:** 0.020 ~ 0.044 mm (0.0008 ~ 0.0017 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 0.045 mm (0.0018 in.) and the service limit (0.07 mm, 0.0028 in.), replace the bearing inserts [A] with inserts painted blue [B]. Check insert/journal clearance with the plastigage. The clearance may exceed the standard slightly, but it must not be less than the minimum in order to avoid bearing seizure.
- ★ If the clearance exceeds the service limit, measure the diameter of the crankshaft main journal.



## 9-20 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

#### Crankshaft Main Journal Diameter

**Standard:** 32.984 ~ 33.000 mm (1.2986 ~ 1.2992 in.)

**Service Limit:** 32.96 mm (1.2976 in.)

- ★ If any journal has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured journal diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

#### Crankshaft Main Journal Diameter Marks

**None** 32.984 ~ 32.992 mm (1.2986 ~ 1.2989 in.)

**1** 32.993 ~ 33.000 mm (1.2989 ~ 1.2992 in.)

□: Crankshaft Main Journal Diameter Marks, "1" or no mark.

- Measure the main bearing inside diameter, and mark the upper crankcase half in accordance with the inside diameter.  
Crankcase Main Bearing Inside Diameter Marks: "○" or no mark.
- Tighten the crankcase bolts to the specified torque (see Crankcase Assembly).

#### NOTE

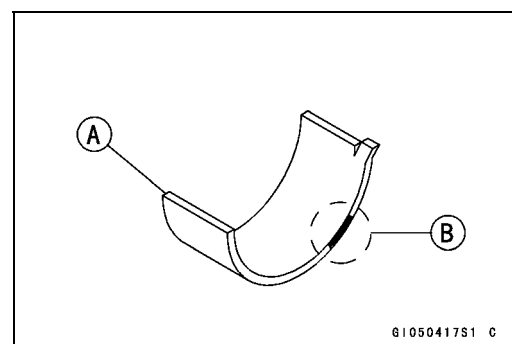
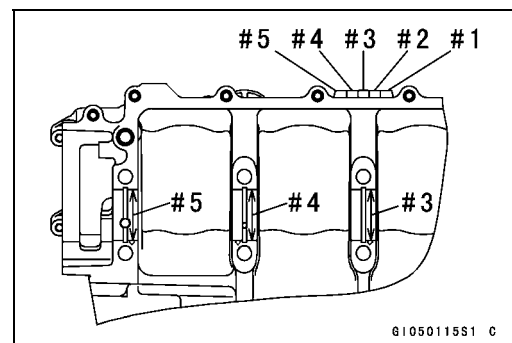
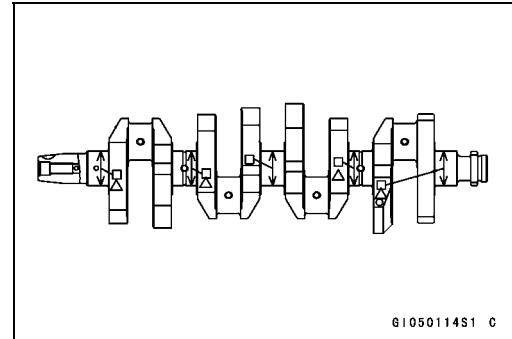
○ The mark already on the upper crankcase half should almost coincide with the measurement.

#### Crankcase Main Bearing Inside Diameter Marks

○ 36.000 ~ 36.008 mm (1.4173 ~ 1.4176 in.)

**None** 36.009 ~ 36.016 mm (1.4177 ~ 1.4179 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	92028-1868	3, 5
			92028-1829	1, 2, 4
None	1	Black	92028-1867	3, 5
○	None		92028-1828	1, 2, 4
None	None	Blue	92028-1866	3, 5
			92028-1827	1, 2, 4

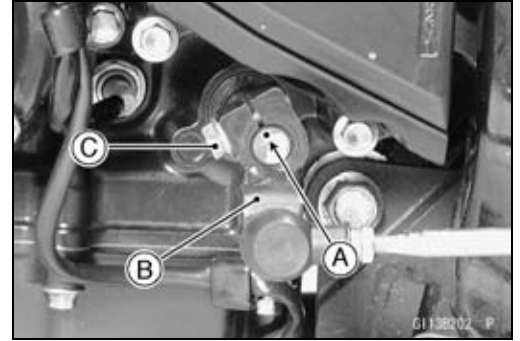
\* The bearing inserts for Nos. 1, 2 and 4 journals have an oil groove, respectively.

- Install the new inserts in the crankcase halves and check insert/journal clearance with the plastigage.

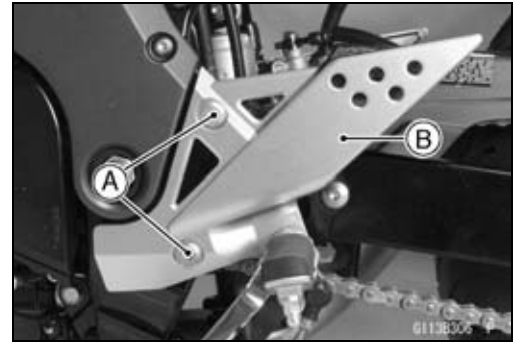
**Transmission**

*Shift Pedal Removal*

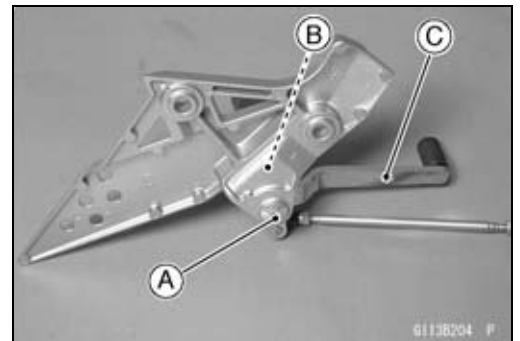
- Mark [A] the position of the shift lever [B] on the shift shaft so that it can be installed later in the same position.
- Remove:
  - Shift Lever Bolt [C]
  - Shift Lever



- Remove:
  - Footpeg Bracket Bolts [A]
  - Footpeg Bracket [B]

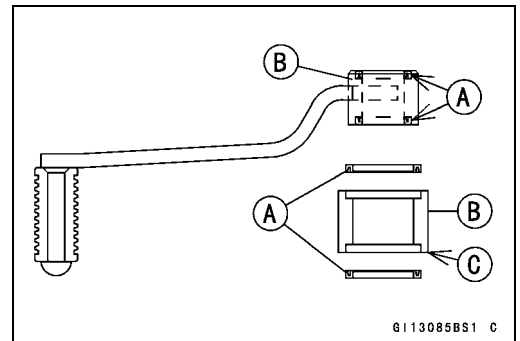


- Remove the bolt [A], footpeg [B] and shift pedal [C].



*Shift Pedal Installation*

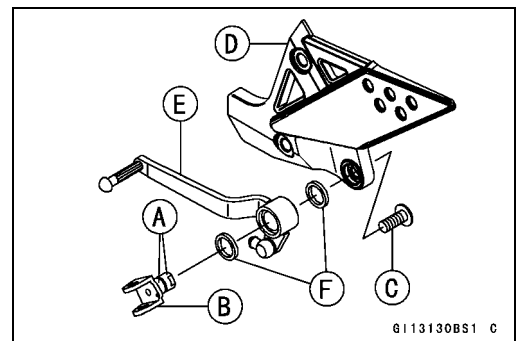
- Apply grease to the oil seal lip.
- Press the oil seals [A] in the shift pedal housing [B] so that the oil seal surfaces are flush with the housing end [C] as shown.



- Apply grease to the sliding surfaces [A] on the footpeg holder [B].
- Apply a non-permanent locking agent to the shift pedal mounting bolt [C].
- Tighten:

**Torque - Shift Pedal Mounting Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)**

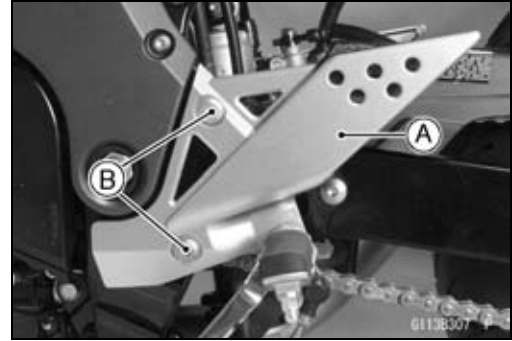
- Footpeg Bracket [D]
- Shift Pedal [E]
- Oil Seals [F]



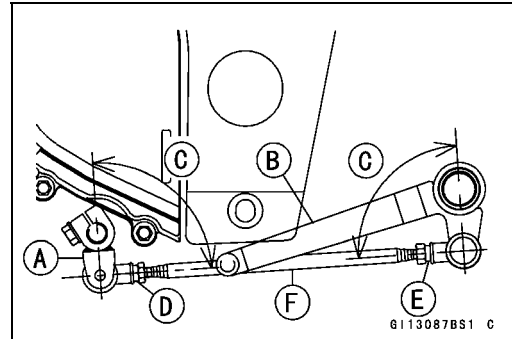
## 9-22 CRANKSHAFT/TRANSMISSION

### Transmission

- Install the footpeg bracket [A].
- Tighten:  
Torque - Footpeg Bracket Bolts [B]: 34 N·m (3.5 kgf·m, 25 ft·lb)

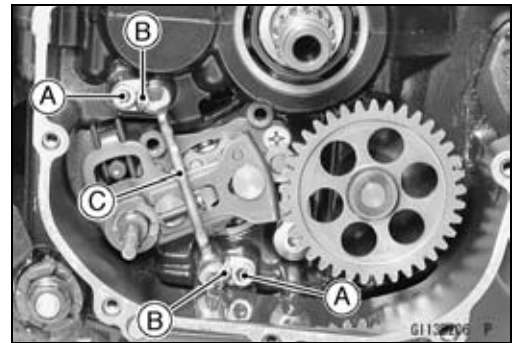


- Install the shift lever [A], aligning the mark (previously marked).
- Tighten:  
Torque - Shift Lever Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)
- Install the shift pedal [B] as shown.  
About 90° [C]
- To adjust the pedal position, loosen the front locknut [D] (left-hand threads) and rear locknut [E] and then turn the tie-rod [F].
- Tighten:  
Torque - Tie-rod Locknuts: 6.9 N·m (0.70 kgf·m, 61 in·lb)

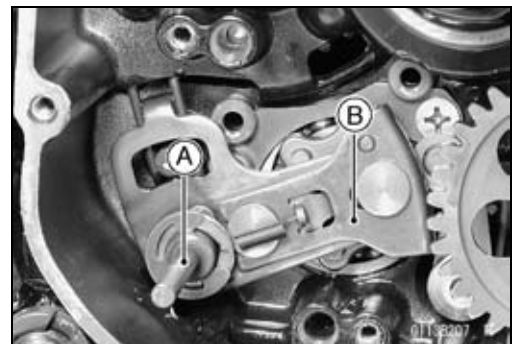


### External Shift Mechanism Removal

- Remove:  
Engine Oil (drain, see Engine Oil Change in the Periodic Maintenance chapter)  
Shift Pedal (see Shift Pedal Removal)  
Clutch (see Clutch chapter)  
Oil Pipe Holder Bolts [A]  
Oil Pipe Holders [B], Oil Pipe [C] and O-rings



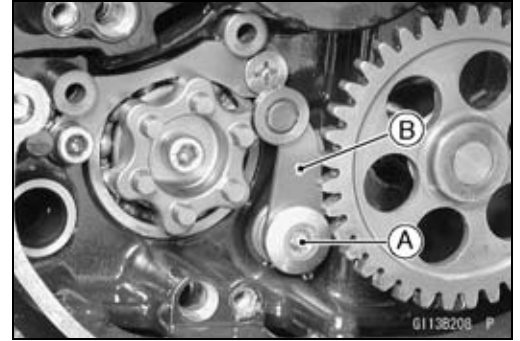
- Remove the shift shaft assembly [A] while pulling the shift mechanism arm [B] to the direction of the arrow.





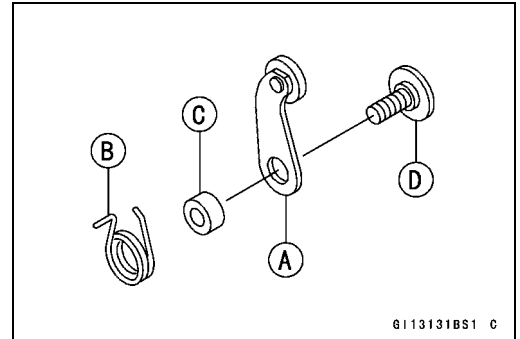
**Transmission**

- Remove:
  - Gear Positioning Lever Bolt [A]
  - Gear Positioning Lever [B], Collar and Spring



**External Shift Mechanism Installation**

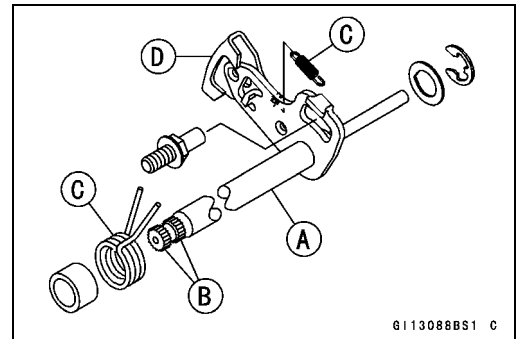
- Install the gear positioning lever [A] as shown.
  - Spring [B]
  - Collar [C]
  - Bolt [D]
- Tighten:
  - Torque - Gear Positioning Lever Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)**
- Apply grease to the O-rings on the oil pipe ends.
- Apply a non-permanent locking agent to the oil pipe holder bolts and tighten them.



**Torque - Oil Pipe Holder Bolts: 13 N·m (1.3 kgf·m, 113 in·lb)**

**External Shift Mechanism Inspection**

- Examine the shift shaft [A] for any damage.
  - ★ If the shaft is bent, straighten or replace it.
  - ★ If the serration [B] are damaged, replace the shaft.
  - ★ If the springs [C] are damaged in any way, replace them.
  - ★ If the shift mechanism arm [D] is damaged in any way, replace the arm.



- Check the return spring pin [A] is not loose.
  - ★ If it is loose, unscrew it, apply a non-permanent locking agent to the threads, and tighten it.

**Torque - Shift Shaft Return Spring Pin: 29 N·m (3.0 kgf·m, 22 ft·lb)**

- Check the gear positioning lever [B] and its spring for breaks or distortion.
  - ★ If the lever or spring are damaged in any way, replace them.
- Visually inspect the shift drum cam [C].
  - ★ If they are badly worn or if they show any damage, replace it.

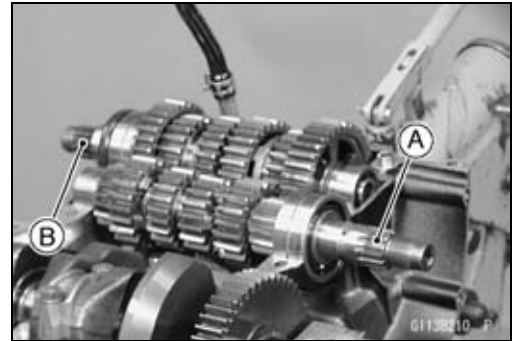


## 9-24 CRANKSHAFT/TRANSMISSION

### Transmission

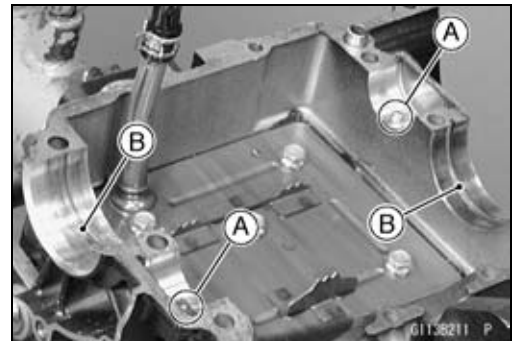
#### Transmission Shaft Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the drive shaft [A] and output shaft [B].

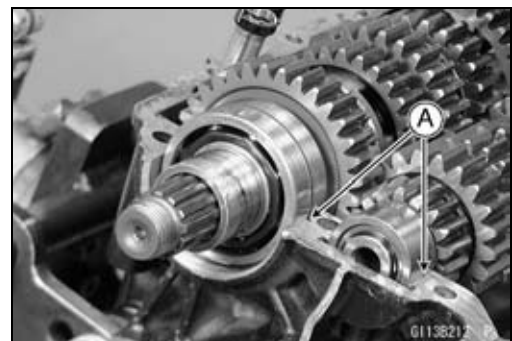


#### Transmission Shaft Installation

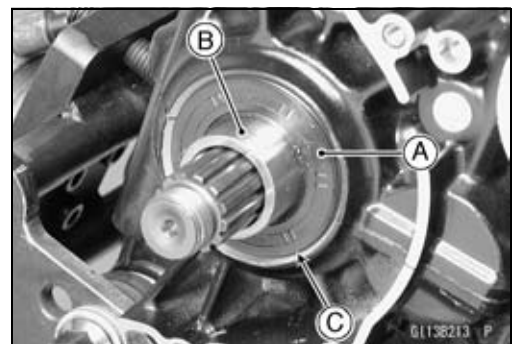
- Check to see that the set pins [A] and set rings [B] are in place.



- Install the drive shaft and output shaft into the upper crankcase half.
- Apply engine oil to the bearings.
- The bearing set pins and rings must match properly with the holes or grooves in the bearing outer races. When they are properly matched, there is no clearance [A] between the crankcase and the bearing outer races.



- Assemble the crankcase.
- Press in the oil seal [A] onto collar [B] so that the surface of the oil seal is flush with the counterbore bottom surface [C] of the crankcase.

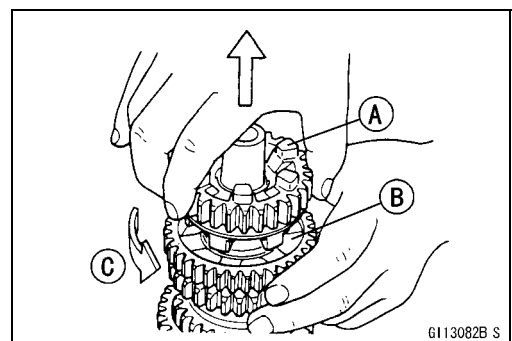


#### Transmission Shaft Disassembly

- Remove the transmission shafts (see Transmission Shaft Removal).
- Remove the circlips, disassemble the transmission shafts.

#### Special Tool - Outside Circlip Pliers: 57001-144

- The 5th gear [A] on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism. Remove the 5th gear.
- Set the output shaft in a vertical position holding the 3rd gear [B].
- Spin the 5th gear quickly [C] and pull it off upward.



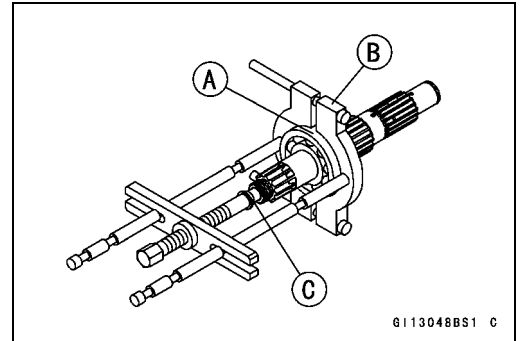
**Transmission**

- Remove the ball bearing [A] from each shafts.

**Special Tools - Bearing Puller: 57001-135 [B]**

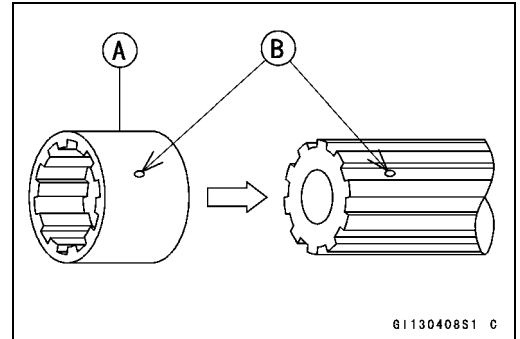
**Bearing Puller Adapter: 57001-317 [C]**

- Discard the bearing.

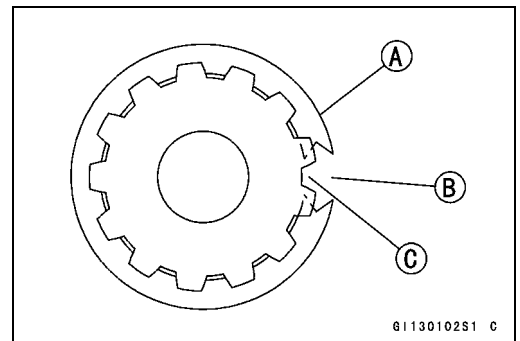


*Transmission Shaft Assembly*

- Apply engine oil to the bushings, ball bearings and shafts.
- Install the gear bushings [A] on the shaft with their holes [B] aligned.



- Replace any circlips removed with new ones.
- Install the circlips [A] so that the opening [B] is aligned with a spline groove [C].



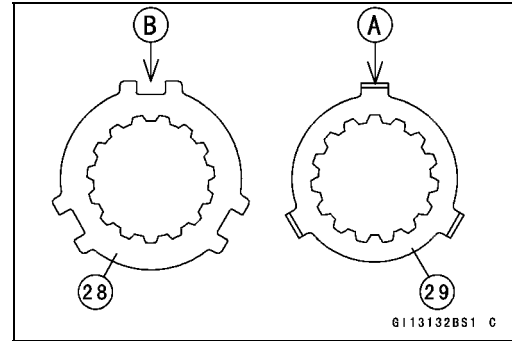
- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 3rd/4th gear onto the drive shaft with their oil holes aligned.
- Install the 6th gear bushing onto the drive shaft with their oil holes aligned.
- The output shaft gears can be recognized by size: the gear with the largest diameter is 1st gear, and the smallest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place.
- Install the 5th and 6th gears onto the output shaft with their oil holes aligned.
- Install the 3rd/4th gear bushings onto the output shaft with their oil holes aligned.

## 9-26 CRANKSHAFT/TRANSMISSION

### Transmission

#### NOTE

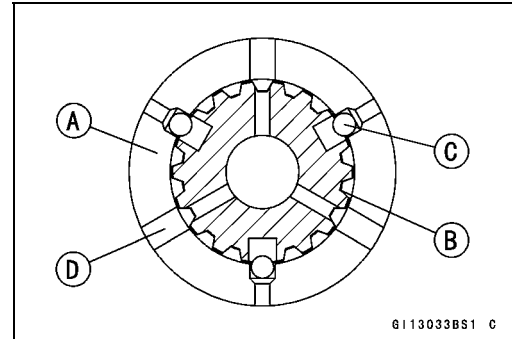
- When the toothed washers [28] [29] are assembled onto the output shaft, note the following.
- When the tangs [A] of the toothed washer [29] shall be assembled, they should be installed into the notch [B] of the toothed washer [28] (see Page 9-29).



- Fit the steel balls into the 5th gear holes in the output shaft, aligning three oil holes [D].  
5th Gear [A]  
Output Shaft [B]  
Steel Balls [C]

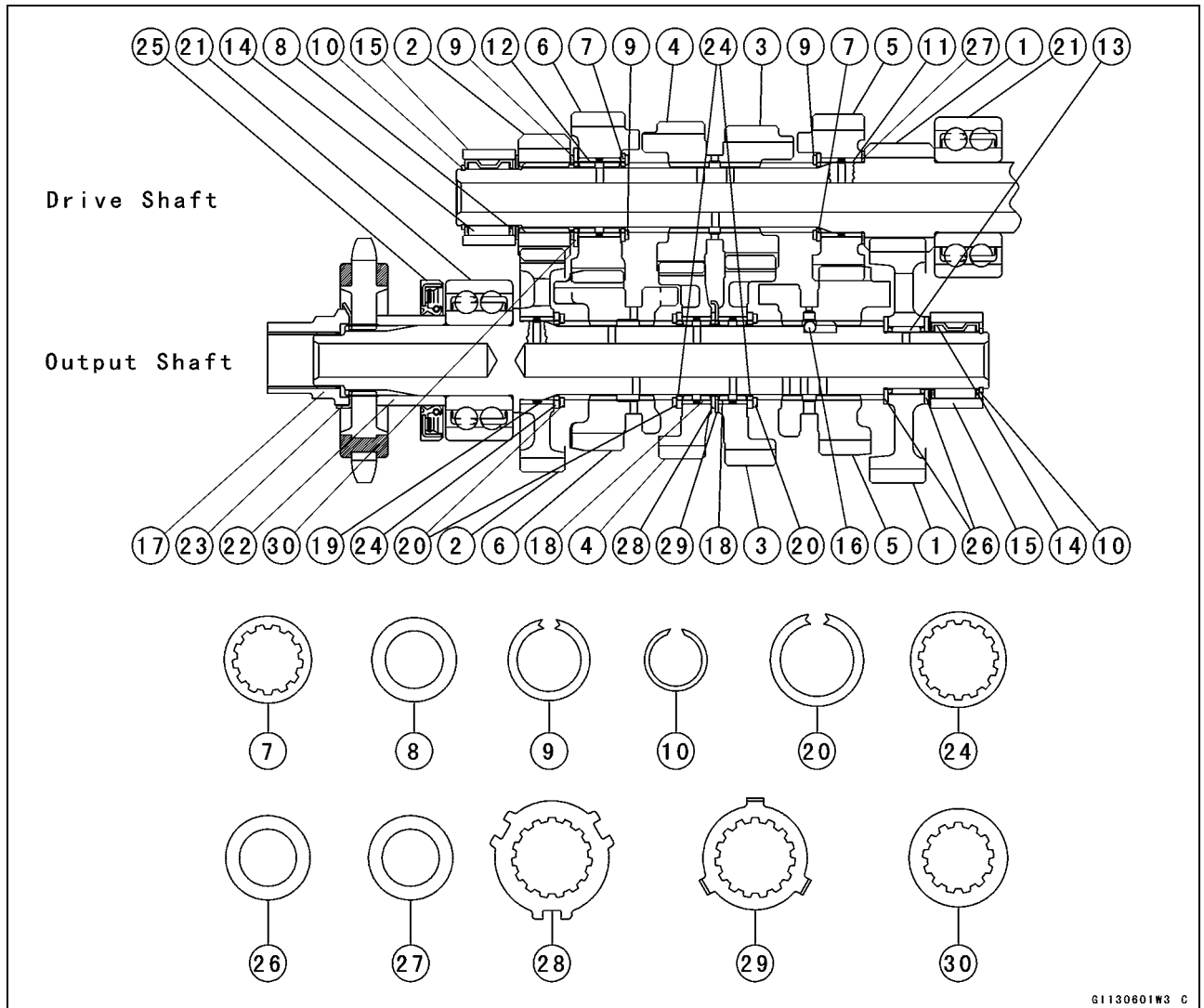
#### CAUTION

**Do not apply grease to the balls to hold them in place. This will cause the positive neutral finder mechanism to malfunction.**



- After assembling the 5th gear with steel balls in place on the output shaft, check the ball-locking effect that the 5th gear doesn't come out of the output shaft when moving it up and down by hand.
- Check that each gear spins or slides freely on the transmission shafts without binding after assembly.

Transmission



61130601W3 C

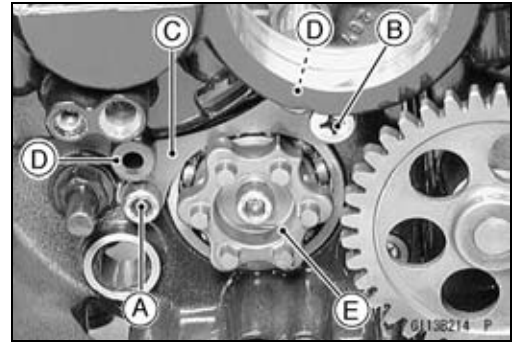
- |  |   |
|--|---|
| 1. 1st Gear                                | 16. Steel Ball                              |
| 2. 2nd Gear                                | 17. Nut                                     |
| 3. 3rd Gear                                | 18. Bushing                                 |
| 4. 4th Gear                                | 19. Bushing                                 |
| 5. 5th Gear                                | 20. Circlip                                 |
| 6. 6th (Top) Gear                          | 21. Ball Bearing                            |
| 7. Toothed Washer, $\phi 31$ mm (1.22 in.) | 22. Collar                                  |
| 8. Thrust Washer, $\phi 30$ mm (1.18 in.)  | 23. Washer                                  |
| 9. Circlip                                 | 24. Toothed Washer                          |
| 10. Circlip                                | 25. Oil Seal                                |
| 11. Bushing                                | 26. Thrust Washer, $\phi 31$ mm (1.22 in.)  |
| 12. Bushing                                | 27. Thrust Washer, $\phi 33$ mm (1.30 in.)  |
| 13. Needle Bearing                         | 28. Toothed Washer                          |
| 14. Needle Bearing                         | 29. Toothed Washer                          |
| 15. Bearing Outer Race                     | 30. Toothed Washer, $\phi 35$ mm (1.38 in.) |

## 9-28 CRANKSHAFT/TRANSMISSION

### Transmission

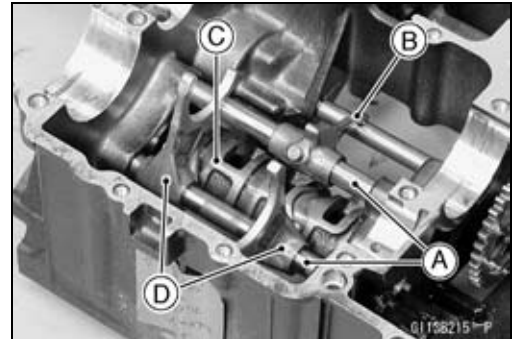
#### Shift Drum and Fork Removal

- Remove:
  - Lower Crankcase Half (see Crankcase Splitting)
  - External Shift Mechanism (see External Shift Mechanism Removal)
  - Bolt [A] and Screw [B]
  - Shift Drum Bearing Holder [C]
- Pull out the shift rods [D], and take off the shift forks.
- Pull out the shift drum [E].



#### Shift Drum and Fork Installation

- Install the shift rods [A], noting the groove position. The rods are identical.
- Position the one with shortest ears [B] on the drive shaft and place the pin in the center groove in the shift drum [C].
- The two forks [D] on the output shaft are identical.
- Install the forks so that its "266" and "267" side faces clutch side.
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder bolt and screw, and tighten them.

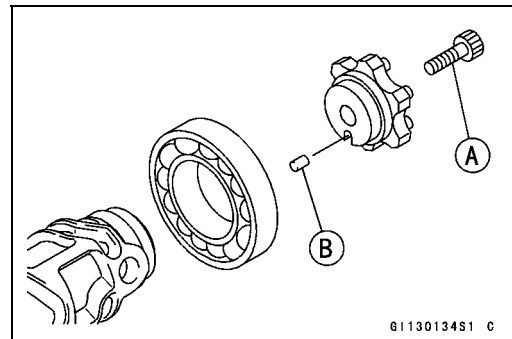


**Torque - Shift Drum Bearing Holder Bolt: 13 N·m (1.3 kgf·m, 113 in·lb)**

**Shift Drum Bearing Holder Screw: 5.4 N·m (0.55 kgf·m, 48 in·lb)**

#### Shift Drum Disassembly

- Remove the shift drum (see Shift Drum and Fork Removal).
- While holding the shift drum with a vise, remove the shift drum cam holder bolt.
  - Shift Drum Cam Holder Bolt [A]
  - Dowel Pin [B]



#### Shift Drum Assembly

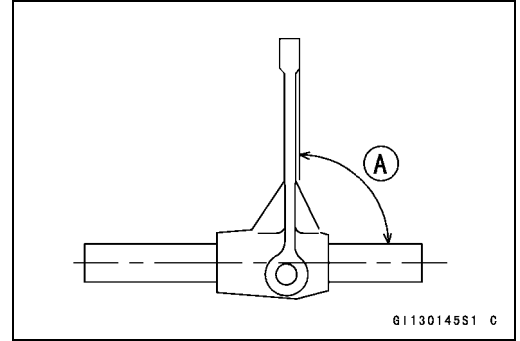
- Be sure to install the dowel pin.
- Apply a non-permanent locking agent to the threads of the shift drum cam holder bolt, and tighten it.

**Torque - Shift Drum Cam Holder Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)**

**Transmission**

*Shift Fork Bending*

- Visually inspect the shift forks, and replace any fork that is bent. A bent fork could cause difficulty in shifting, or allow the transmission to jump out of gear when under power.
- 90° [A]



*Shift Fork/Gear Groove Wear*

- Measure the thickness of the shift fork ears [A], and measure the width [B] of the gear grooves.
- ★ If the thickness of a shift fork ear is less than the service limit, the shift fork must be replaced.

**Shift Fork Ear Thickness**

**Standard:** 5.9 ~ 6.0 mm (0.232 ~ 0.236 in.)

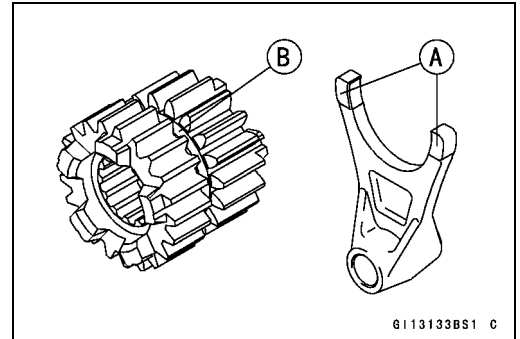
**Service Limit:** 5.8 mm (0.228 in.)

- ★ If the gear groove is worn over the service limit, the gear must be replaced.

**Gear Groove Width**

**Standard:** 6.05 ~ 6.15 mm (0.238 ~ 0.242 in.)

**Service Limit:** 6.25 mm (0.246 in.)



*Shift Fork Guide Pin/Drum Groove Wear*

- Measure the diameter of each shift fork guide pin [A], and measure the width [B] of each shift drum groove.
- ★ If the guide pin on any shift fork is less than the service limit, the fork must be replaced.

**Shift Fork Guide Pin Diameter**

**Standard:** 6.9 ~ 7.0 mm (0.272 ~ 0.276 in.)

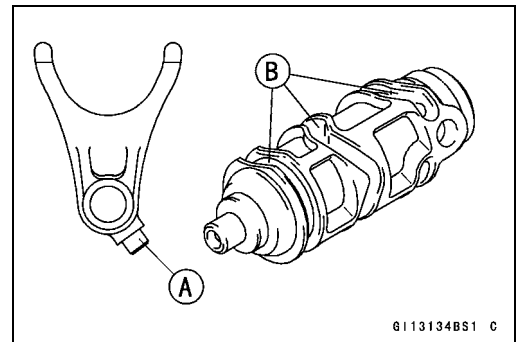
**Service Limit:** 6.8 mm (0.268 in.)

- ★ If any shift drum groove is worn over the service limit, the drum must be replaced.

**Shift Drum Groove Width**

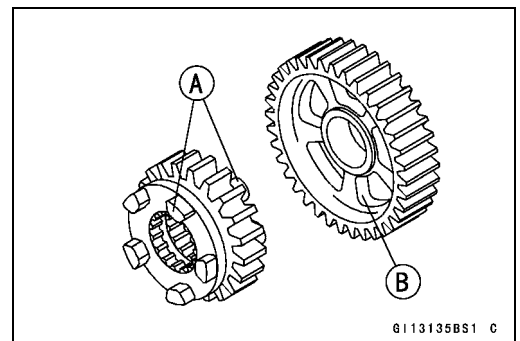
**Standard:** 7.05 ~ 7.20 mm (0.278 ~ 0.283 in.)

**Service Limit:** 7.3 mm (0.287 in.)



*Gear Dog and Gear Dog Hole Damage*

- Visually inspect the gear dogs [A] and gear dog holes [B].
- ★ Replace any damaged gears or gears with excessively worn dogs or dog holes.







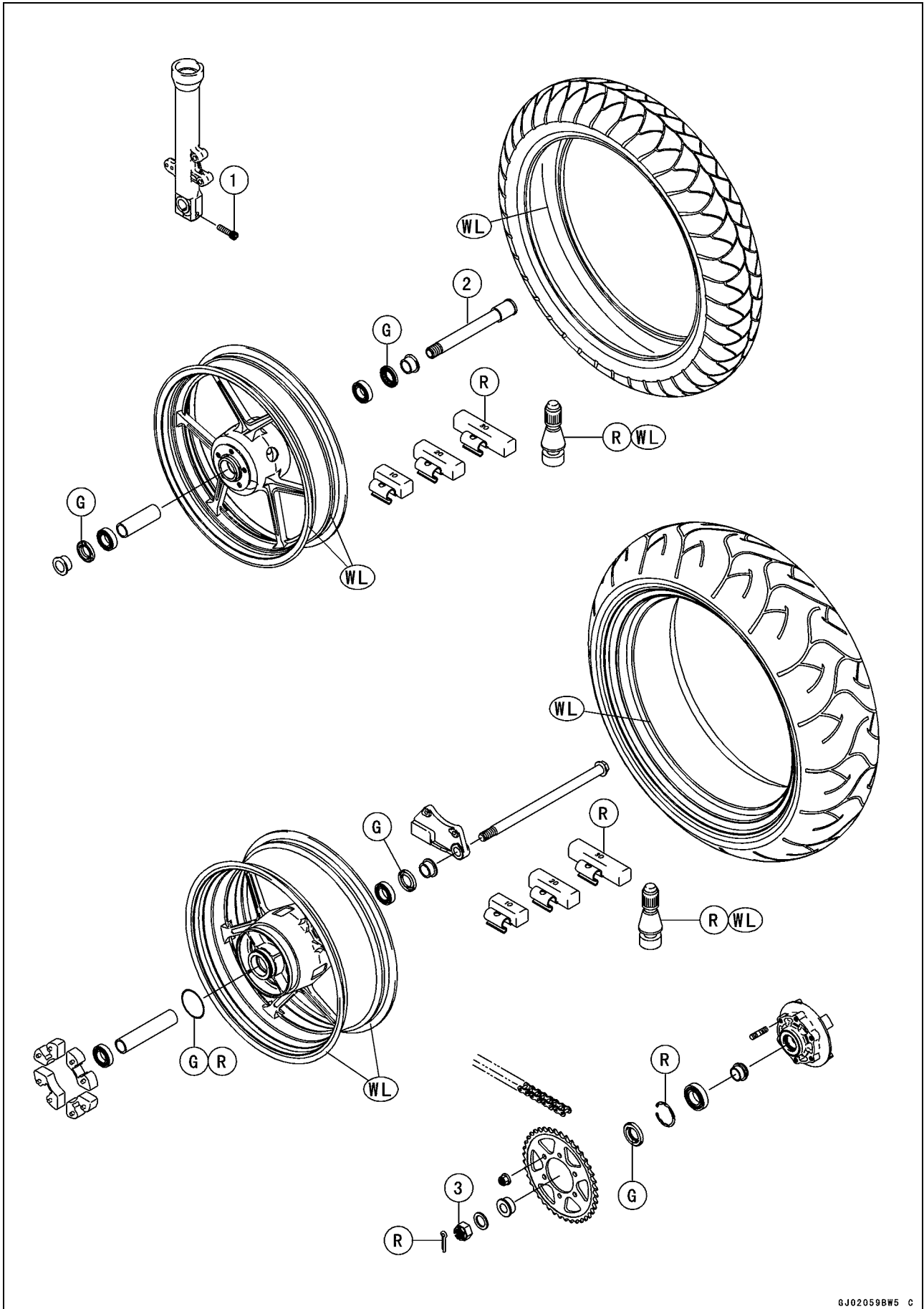
# Wheels/Tires

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# 10-2 WHEELS/TIRES

## 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	Front Axle Clamp Bolt	34	3.5	25	
2	Front Axle	108	11	80	
3	Rear Axle Nut	108	11	80	

G: Apply grease.

R: Replacement Parts

WL: Apply soap and water solution or rubber lubricant.

## 10-4 WHEELS/TIRES

### Specifications

Item		Standard		Service Limit
<b>Wheels (Rims)</b>				
Rim Runout:				
Axial		---		TIR 0.5 mm (0.020 in.)
Radial		---		TIR 0.8 mm (0.031 in.)
Axle Runout/100 mm (3.94 in.)		TIR 0.05 mm (0.0020 in.) or less		TIR 0.2 mm (0.008 in.)
Wheel Balance		10 g (0.35 oz) or less		---
Balance Weights		10 g (0.35 oz), 20 g (0.71 oz), 30 g (1.06 oz)		---
Tires: Air Pressure (when Cold)	Front	Up to 180 kg (397 lb) load	250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi)	---
	Rear		290 kPa (2.9 kgf/cm <sup>2</sup> , 42 psi)	---
Tread Depth	Front	BRIDGESTONE	3.4 mm (0.13 in.)	1 mm (0.04 in.) (AT, CH, DE) 1.6 mm (0.06 in.)
	Rear	BRIDGESTONE	5.8 mm (0.23 in.)	Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.12 in.)
Standard Tires		Make, Type		Size
	Front	BRIDGESTONE, BATTLEAX BT019F RADIAL N		120/70 ZR17 M/C (58 W)
	Rear	BRIDGESTONE, BATTLEAX BT012R RADIAL E		180/55 ZR17 M/C (73 W)

### WARNING

**Use the same manufacturer's tires on both front and rear wheels.**

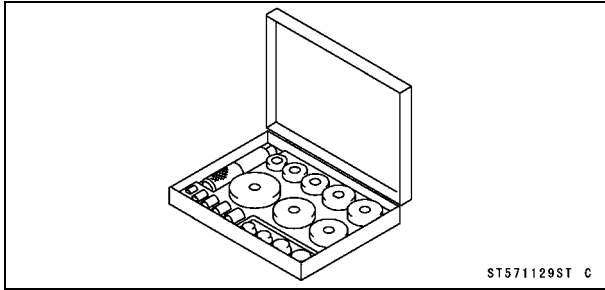
AT: Republic of Austria

CH: Swiss Confederation

DE: Federal Republic of Germany

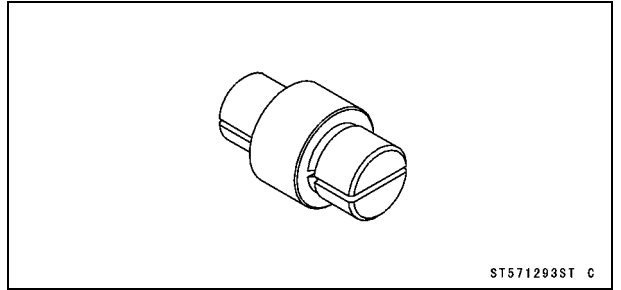
Special Tools

Bearing Driver Set:  
57001-1129



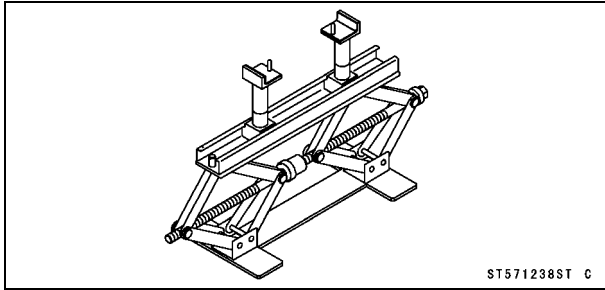
ST571129ST C

Bearing Remover Head,  $\phi 20 \times \phi 22$ :  
57001-1293



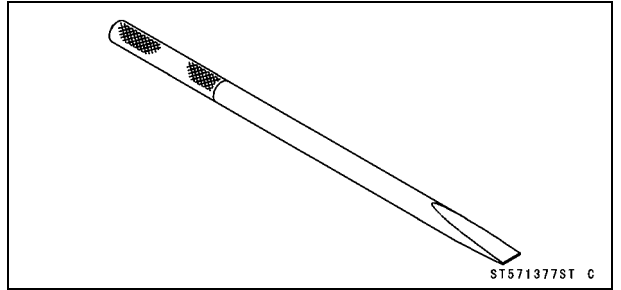
ST571293ST C

Jack:  
57001-1238



ST571238ST C

Bearing Remover Shaft,  $\phi 13$ :  
57001-1377



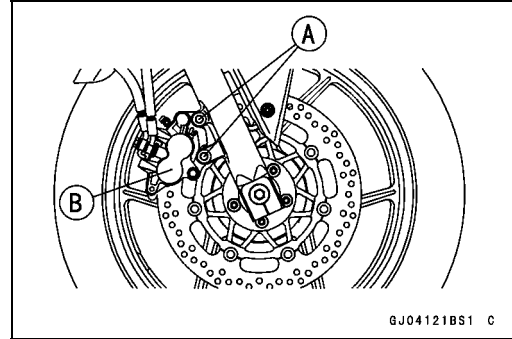
ST571377ST C

## 10-6 WHEELS/TIRES

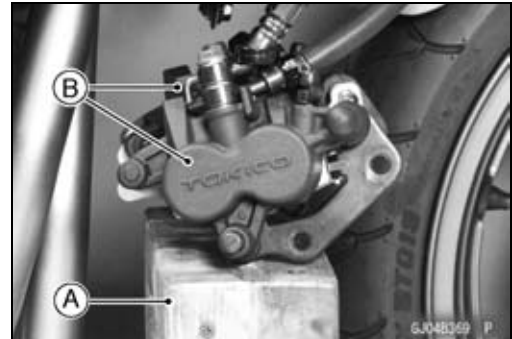
### Wheels (Rims)

#### Front Wheel Removal

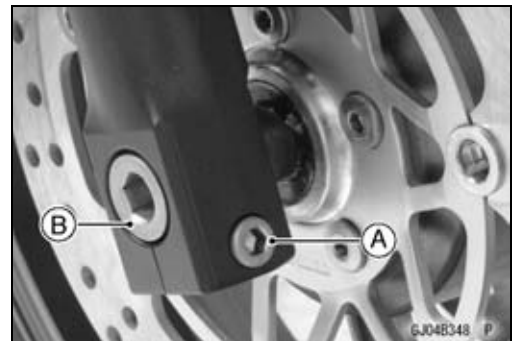
- Remove:
  - Brake Caliper Mounting Bolts [A]
  - Front Brake Caliper [B]



- Using the stand [A], stay on the calipers [B]



- Loosen the front axle clamp bolt [A].
- Unscrew the front axle [B].



- Raise the front wheel off the ground.
  - Special Tool - Jack: 57001-1238**
- Pull out the axle to the right and drop the front wheel out of the forks.

#### CAUTION

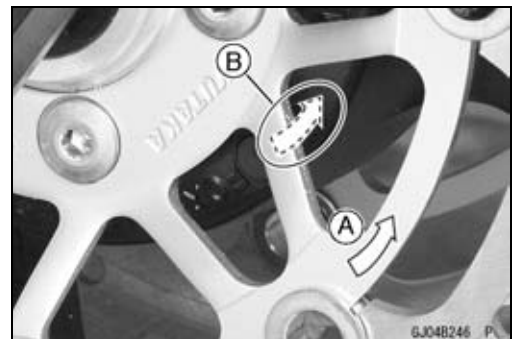
**Do not lay the wheel down on one of the discs. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.**

#### Front Wheel Installation

##### NOTE

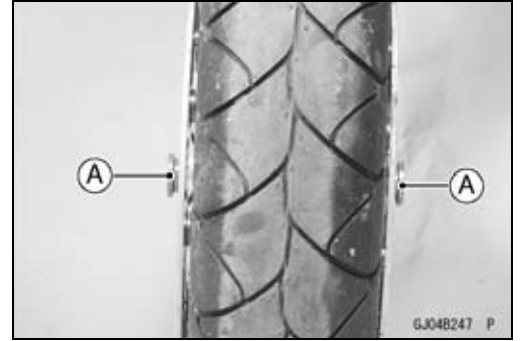
○The direction of the wheel rotation [A] is shown by an arrow [B] on the wheel hub.

- Check the wheel rotation mark on the front wheel and install it.



**Wheels (Rims)**

- Fit the collars [A] on the both sides of the hub.

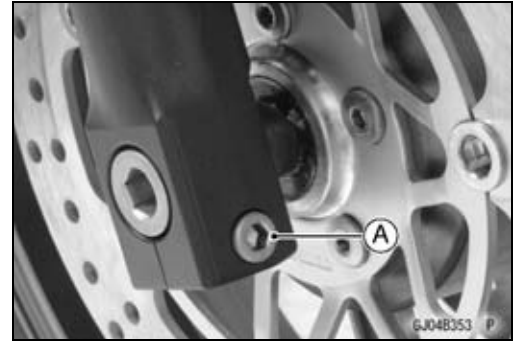


- Tighten the front axle.
  - Torque - Front Axle: 108 N·m (11 kgf·m, 80 ft·lb)**
- Before tightening the clamp bolt on the right front fork leg, pump the front fork up and down 4 or 5 times to allow the right front fork leg to seat on the front axle.

**NOTE**

○Put a block in front of the front wheel to stop moving.

- Tighten the axle clamp bolt [A].
  - Torque - Front Axle Clamp Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)**



- Install the front brake calipers (see Brakes chapter).
- Check the front brake effectiveness (see Brakes chapter).

**⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

*Rear Wheel Removal*

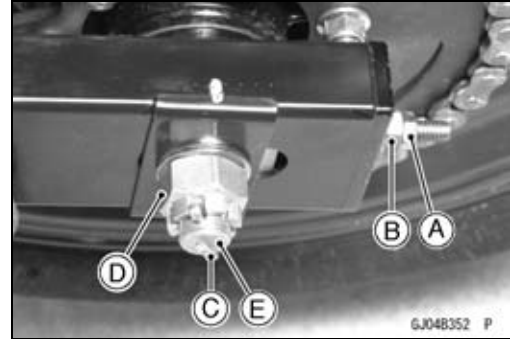
- Using the stand [A], raise the rear wheel off the ground.



## 10-8 WHEELS/TIRES

### Wheels (Rims)

- Loosen:
  - Chain Adjuster lock nut [A]
  - Chain Adjuster Nut [B]
- Remove:
  - Cotter Pin [C]
  - Axle Nut [D]
  - Axle [E]
  
- Remove the drive chain [A] from the rear sprocket toward the left.



- Move the rear wheel back and remove the rear caliper [A] from the wheel.
- Remove the rear wheel.



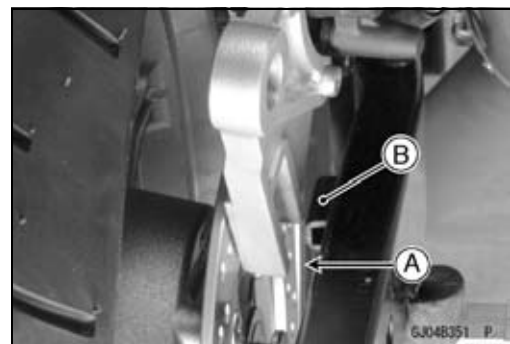
#### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

#### Rear Wheel Installation

- Install the groove [A] of the caliper bracket onto the swingarm stop [B].
- Engage the drive chain with the rear sprocket.
- Insert the axle from the right side of the wheel, and tighten the axle nut.

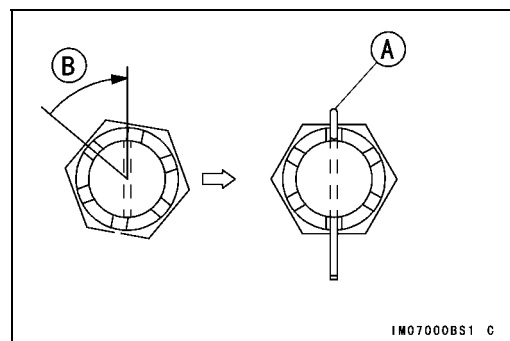
**Torque - Rear Axle Nut: 108 N·m (11 kgf·m, 80 ft·lb)**



- Insert a new cotter pin [A].

#### NOTE

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

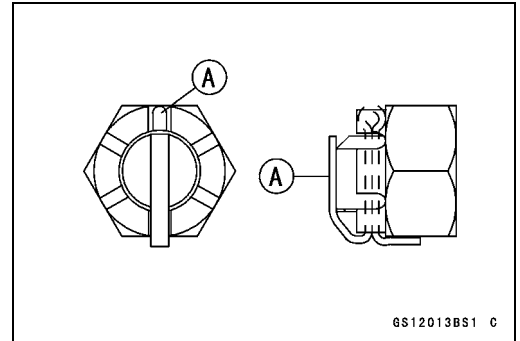




**Wheels (Rims)**

- Bend the cotter pin [A] over the nut.

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



- Adjust the drive chain slack after installation (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).
- Check the rear brake effectiveness.

**⚠ WARNING**  
**Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.**

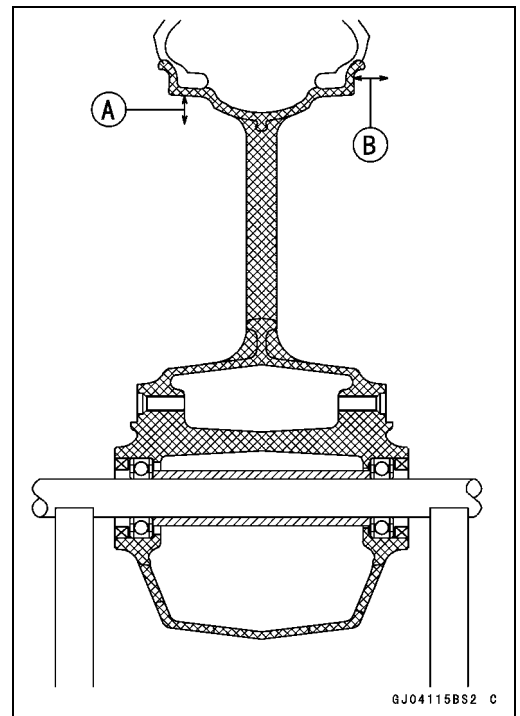
*Wheel Inspection*

- Raise the front/rear wheel off the ground.  
**Special Tool - Jack: 57001-1238**
- Spin the wheel lightly, and check for roughness or binding.
- ★ If roughness or binding is found, replace the hub bearings.
- Inspect the wheel for small cracks, dents, bending, or warp.
- ★ If there is any damage to the wheel, replace the wheel.
- Remove the wheel, and support it without the tire by the axle.
- Measure the rim runout, radial [A] and axial [B], with a dial gauge.
- ★ If rim runout exceeds the service limit, check the hub bearings.
- ★ If the problem is not due to the bearings, replace the wheel.

**Rim Runout**

**Service Limit:**

Axial	TIR 0.5 mm (0.020 in.)
Radial	TIR 0.8 mm (0.031 in.)



**⚠ WARNING**  
**Never attempt to repair a damaged wheel. If there is any damage besides wheel bearings, the wheel must be replaced to insure safe operational condition.**

## 10-10 WHEELS/TIRES

### Wheels (Rims)

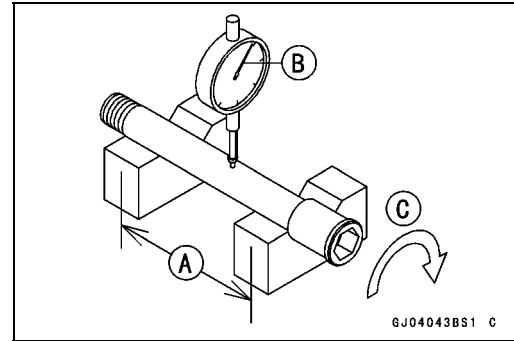
#### Axle Inspection

- Remove the front and rear axles.
- Visually inspect the front and rear axle for damages.
- ★ If the axle is damaged or bent, replace it.
- Place the axle in V blocks that are 100 mm (3.94 in.) [A] apart, and set a dial gauge [B] on the axle at a point halfway between the blocks. Turn [C] the axle to measure the runout. The difference between the highest and lowest dial readings is the amount of runout.
- ★ If axle runout exceeds the service limit, replace the axle.

#### Axle Runout/100 mm (3.94 in.)

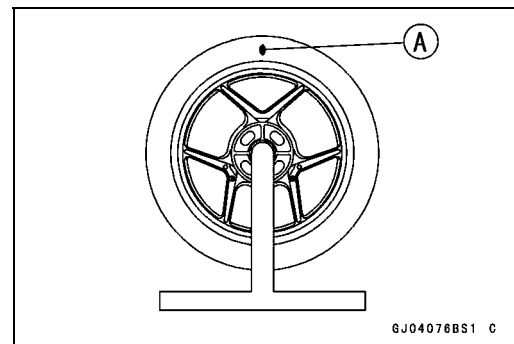
**Standard:** TIR 0.05 mm (0.0020 in.) or less

**Service Limit:** TIR 0.2 mm (0.008 in.)



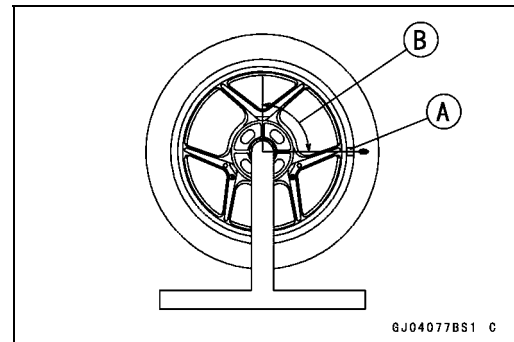
#### Balance Inspection

- Remove the wheel.
- Support the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark [A] the wheel at the top when the wheel stops.
- Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.
- ★ If the wheel always stops in one position, adjust the wheel balance.



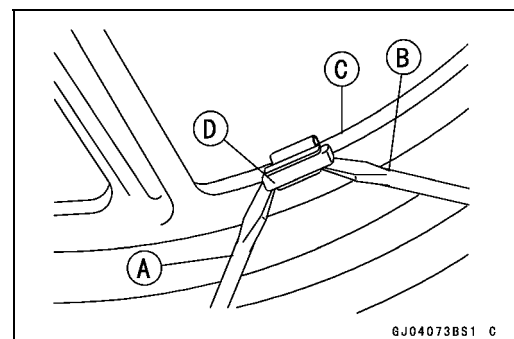
#### Balance Adjustment

- If the wheel always stops in one position, provisionally attach a balance weight [A] on the rim at the marking using adhesive tape.
- Rotate the wheel 1/4 turn [B], and see whether or not the wheel stops in this position. If it does, the correct balance weight is being used.
- ★ If the wheel rotates and the weight goes up, replace the weight with the next heavier size. If the wheel rotates and the weight goes down, replace the weight with the next lighter size. Repeat these steps until the wheel remains at rest after being rotated 1/4 turn.
- Rotate the wheel another 1/4 turn and then another 1/4 turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance.
- Permanently install the balance weight.



#### Balance Weight Removal

- Insert a standard screwdriver [A] [B] between the rib [C] and the weight [D] as shown.
- Pry the weight with two screwdrivers and remove the balance weight.



**Wheels (Rims)**

**CAUTION**

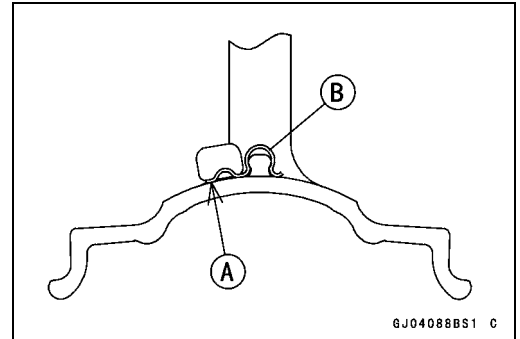
When removing the balance weight, do not touch the brake disc. The disc could be damaged. Do not tap the screwdrivers. The rim could be damaged.

*Balance Weight Installation*

- Check if the weight portion has any play on the blade [A] and clip [B].
- ★ If it does, discard it.

**⚠ WARNING**

If the balance weight has any play on the rim, the clip of the weight have been stretched. Replace the loose balance weight. Do not reuse used balance weight. Unbalanced wheels can create an unsafe riding condition.



**Balance Weight**

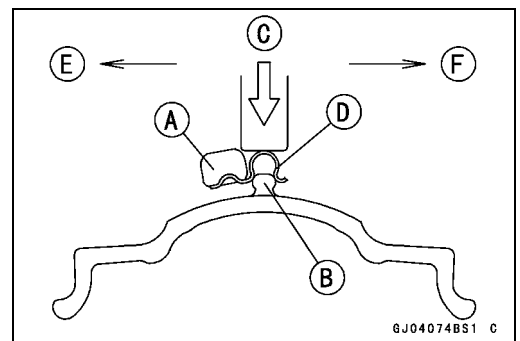
Part Number	Weight
41075-0007	10 g (0.35 oz)
41075-0008	20 g (0.71 oz)
41075-0009	30 g (1.06 oz)

**NOTE**

- Balance weights are available from Kawasaki dealers in 10, 20, and 30 grams (0.35, 0.71, and 1.06 oz) sizes. An imbalance of less than 10 grams (0.35 oz) will not usually affect running stability.
- Do not use four or more balance weight (more than 90 gram, 3.17 oz). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.
- Slip the balance weight [A] onto the rib [B] by pushing or lightly hammering [C] the clip [D].  
 Left Side [E]  
 Right Side [F]

**CAUTION**

When installing the balance weight, do not touch the brake disc. The disc could be damaged.



## 10-12 WHEELS/TIRES

### Wheels (Rims)

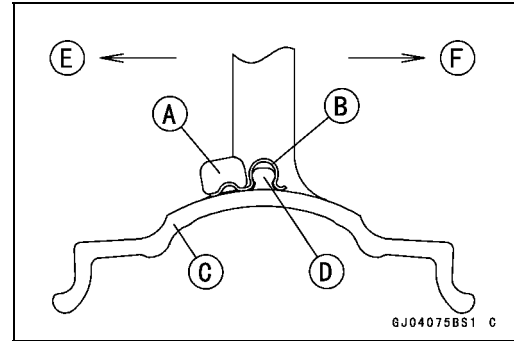
- Check that the weight [A] and clip [B] are fully seated on the rim [C] and that the clip is hooked over the rib [D].  
Left Side [E]  
Right Side [F]

#### **⚠ WARNING**

If the balance weight has any play on the rim, the clip of the weight has been stretched. Replace the loose balance weight.

**Do not reuse balance weight.**

**Unbalanced wheels can create an unsafe riding condition.**



**Tires**

*Air Pressure Inspection*

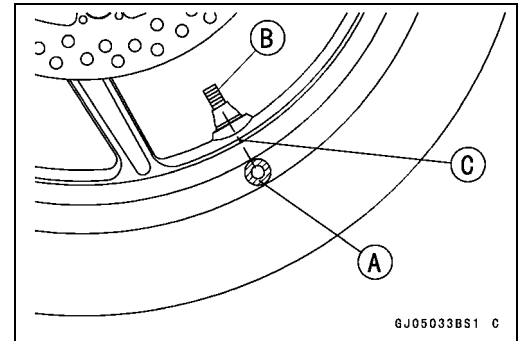
- Refer to the Air Pressure Inspection in the Periodic Maintenance chapter.

*Tire Inspection*

- Refer to the Wheels/Tires Damage and Tire Tread Wear Inspection in the Periodic Maintenance chapter.

*Tire Removal*

- Remove:
  - Wheel (see Front/Rear Wheel Removal)
  - Valve Core (let out the air)
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire can be reinstalled in the same position.
  - Chalk Mark or Yellow Mark [A]
  - Air Valve [B]
  - Align [C]



- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

**CAUTION**

**Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.**

- Remove the tire from the rim using a suitable commercially available tire changer.

**NOTE**

○ *The tires cannot be removed with hand tools because they fit the rims too tightly.*

*Tire Installation*

**⚠ WARNING**

**Use the same manufacturer's tires on both front and rear wheels.**

- Inspect the rim and tire, and replace them if necessary.
- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Remove the air valve and discard it.

**CAUTION**

**Replace the air valve whenever the tire is replaced. Do not reuse the air valve.**

## 10-14 WHEELS/TIRES

### Tires

- Install a new valve in the rim.
- Remove the valve cap, lubricate the stem seal with a soap and water solution or rubber lubricant, and pull [B] the valve stem [A] through the rim from the inside out until it snaps into place.

#### CAUTION

**Do not use engine oil or petroleum distillates to lubricate the stem because they will deteriorate the rubber.**

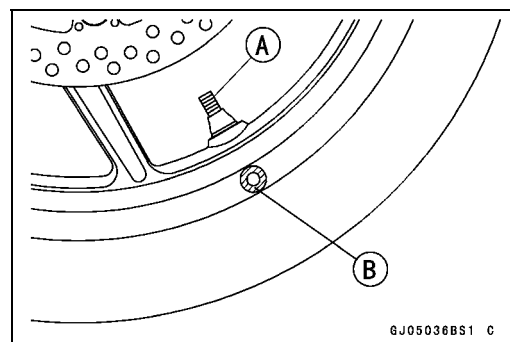
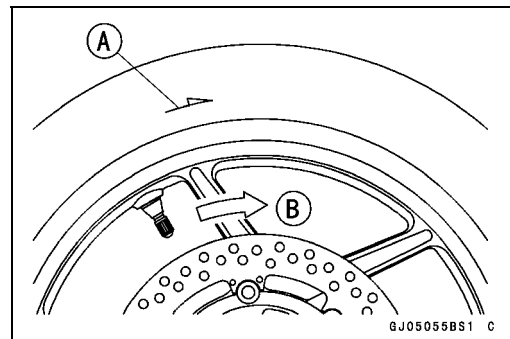
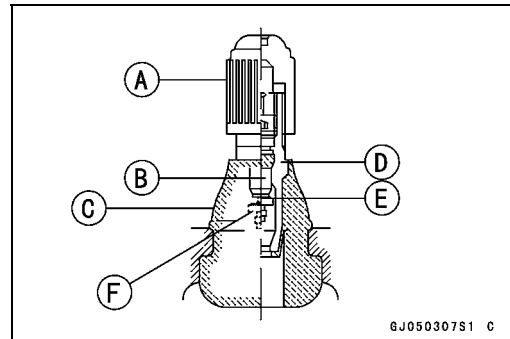
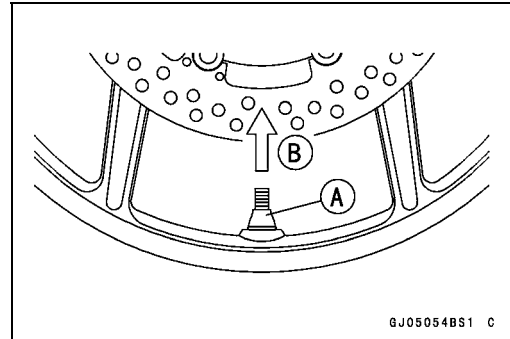
- The air valve is shown in the figure.

Valve Cap [A]  
Valve Core [B]  
Stem Seal [C]  
Valve Stem [D]  
Valve Seat [E]  
Valve Opened [F]

- Check the tire rotation mark on the front and rear tires and install them on the rim accordingly.

Tire Rotation Mark [A]  
Rotation 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 using a suitable commercially available tire changer.
- Lubricate the tire beads and rim flanges with a soap and water solution or rubber lubricant to help seat the tire beads in the sealing surfaces of the rim while inflating the tire.
- Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the sealing surfaces.

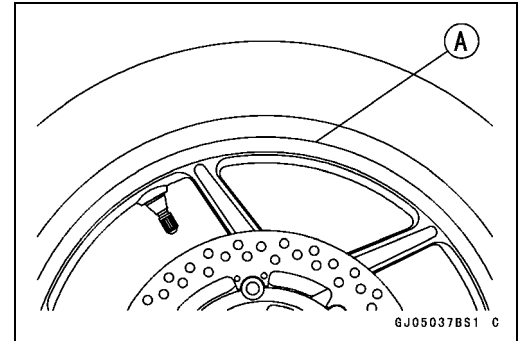


#### **⚠ WARNING**

**Be sure to install the valve core whenever inflating the tire, and do not inflate the tire to more than 400 kPa (4.0 kgf/cm<sup>2</sup>, 57 psi). Overinflation can explode the tire with possibility of injury and loss of life.**

## Tires

- Check to see that the rim lines [A] on both sides of the tire sidewalls are parallel with the rim flanges.
- ★ If the rim flanges and tire sidewall rim lines are not parallel, remove the valve core.
- Lubricate the rim flanges and tire beads.
- Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leakage.
- Inflate the tire slightly above standard inflation.
- Use a soap and water solution or submerge the tire, and check for bubbles that would indicate leakage.
- Adjust the air pressure to the specified pressure (see Tire Inspection).
- Adjust the wheel balance (see Balance Adjustment).
- Install the air valve cap.



### *Tire Repair*

Currently two types of repair for tubeless tires have come into wide use. One type is called a temporary (external) repair which can be carried out without removing the tire from the rim, and the other type is called permanent (internal) repair which requires tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended. Repair methods may vary slightly from make to make. Follow the repair methods indicated by the manufacturer of the repair tools and materials so that safe results can be obtained.

## 10-16 WHEELS/TIRES

### Hub Bearing

#### Hub Bearing Removal

- Remove the wheel, and take out the following.
  - Collars
  - Coupling (out of rear hub)
  - Grease Seals
- Use the bearing remover to remove the hub bearings [A].

#### CAUTION

Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Please blocks under the wheel so that the disc does not touch the ground.

- Special Tools - Bearing Remover Head,  $\phi 20 \times \phi 22$ : 57001-1293 [C]  
Bearing Remover Shaft,  $\phi 13$ : 57001-1377 [B]

#### Hub Bearing Installation

- Before installing the wheel bearings, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
- Replace the bearings with new ones.

#### NOTE

○Install the bearings so that the marked side faces out.

- Install the bearings by using the bearing driver set which does not contact the bearing inner race.
- Press in each bearing [A] right until they are bottomed.

Special Tool - Bearing Driver Set: 57001-1129 [B]

- Replace the grease seals with new ones.
  - Press in the grease seals [A] so that the seal surface flush [B] with the end of the hole.
- Apply high temperature grease to the grease seal lips.

Special Tool - Bearing Driver Set: 57001-1129 [C]

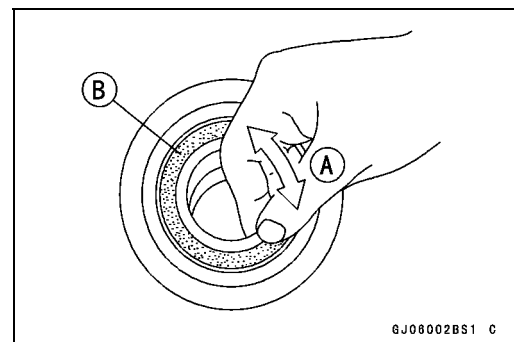
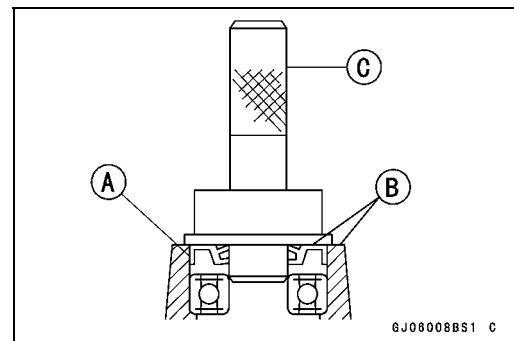
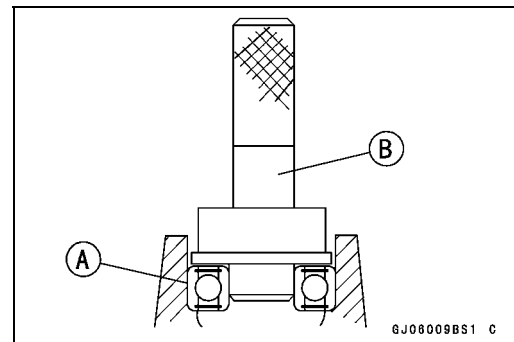
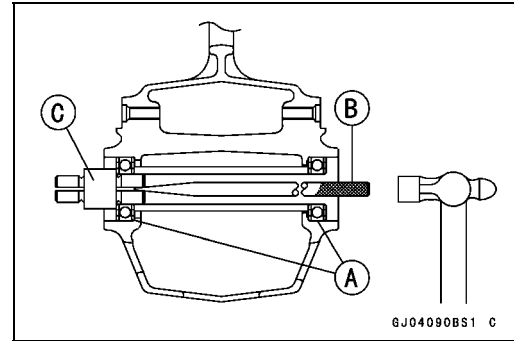
#### Hub Bearing Inspection

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.





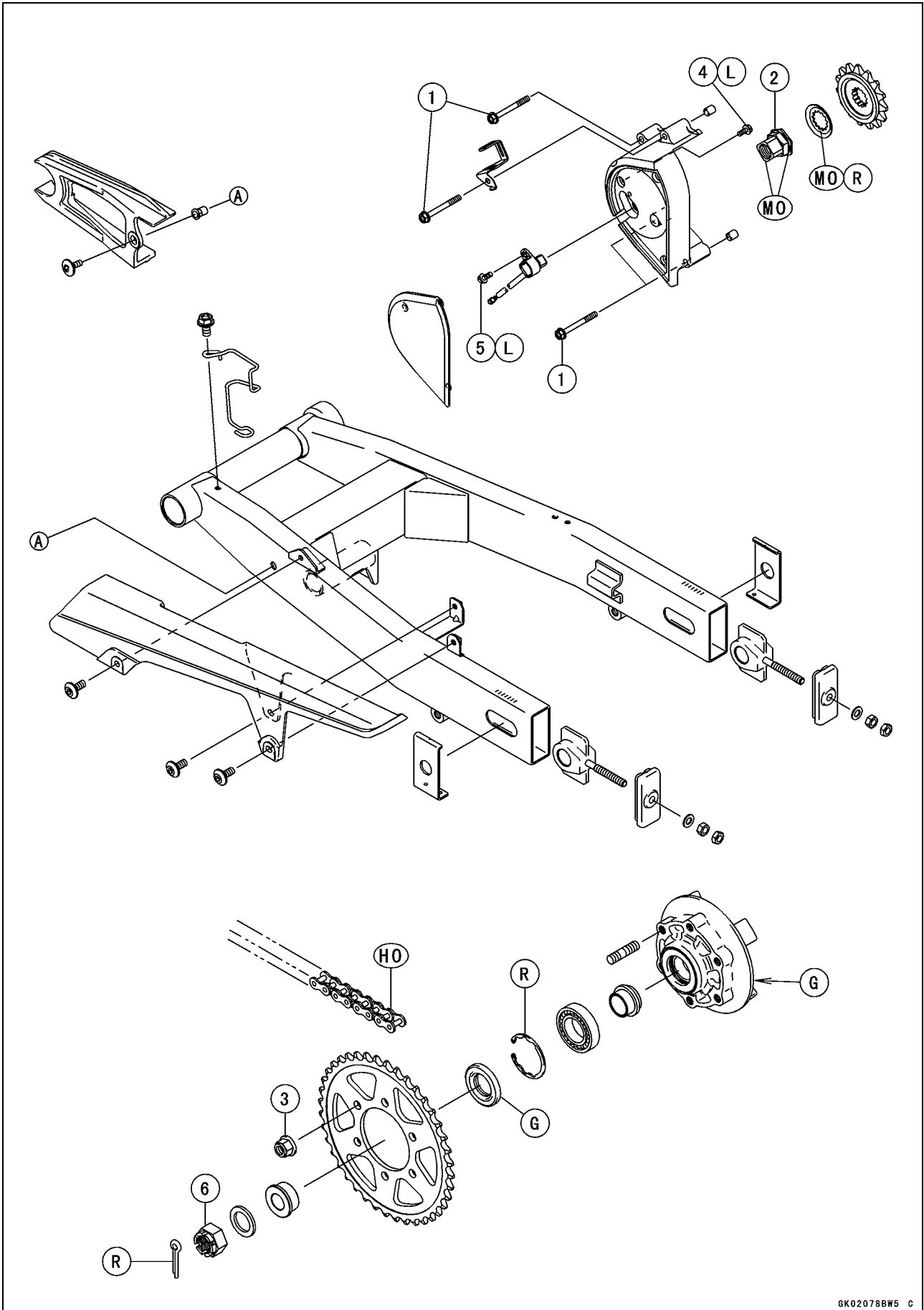
# Final Drive

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# 11-2 FINAL DRIVE

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Engine Sprocket Cover Bolts	9.8	1.0	87 in·lb	
2	Engine Sprocket Nut	125	13	92	MO
3	Rear Sprocket Nuts	59	6.0	43	
4	Speed Sensor Cover Bolts	6.9	0.70	61 in·lb	L
5	Speed Sensor Bolt	6.9	0.70	61 in·lb	L
6	Rear Axle Nut	108	11	80	

G: Apply grease.

HO: Apply heavy oil.

L: Apply a non-permanent locking agent.

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

R: Replacement Parts

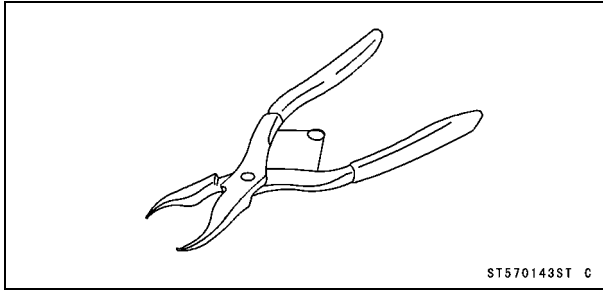
## 11-4 FINAL DRIVE

### Specifications

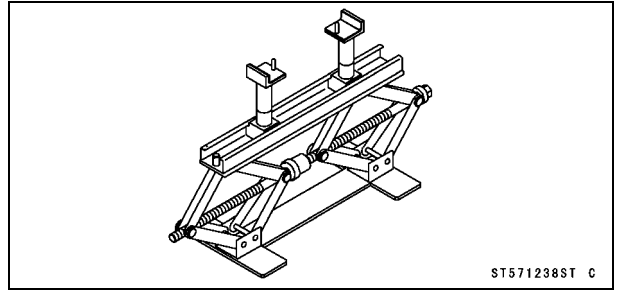
Item	Standard	Service Limit
<b>Drive Chain</b>		
Chain Slack	25 ~ 35 mm (1.0 ~ 1.4 in.)	---
20-link Length	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard Chain:		
Make	ENUMA	---
Type	EK520MVXL	---
Link	112 links	---
<b>Sprockets</b>		
Rear Sprocket Warp	0.4 mm (0.016 in.) or less	0.5 mm (0.020 in.)

**Special Tools**

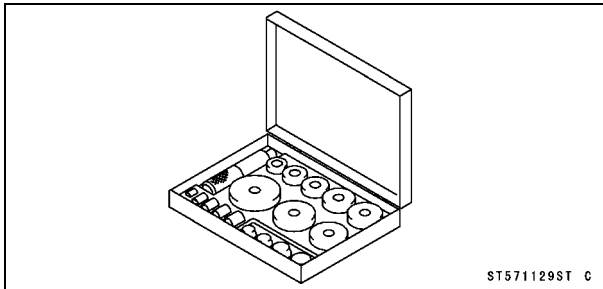
**Inside Circlip Pliers:**  
**57001-143**



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



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



## 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.

#### *Wheel Alignment Inspection/Adjustment*

- Refer to the Wheel Alignment Inspection in the Periodic Maintenance chapter.

#### *Drive Chain Wear Inspection*

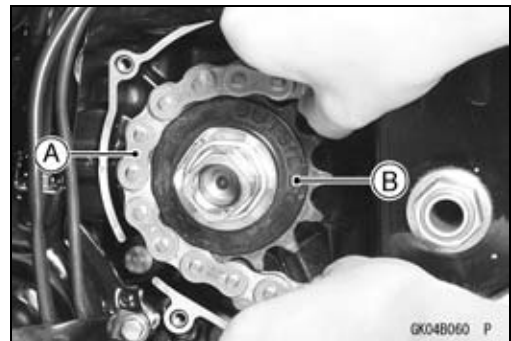
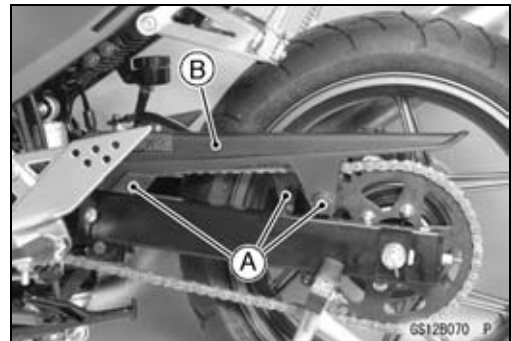
- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

#### *Drive Chain Lubrication*

- Refer to the Drive Chain Lubrication Condition Inspection in the Periodic Maintenance chapter.

#### *Drive Chain Removal*

- Remove:
  - Rear Wheel (see Wheels/Tires chapter)
  - Chain Cover Screws [A]
  - Chain Cover [B]
  - Swingarm (see Suspension chapter)
  - Engine Sprocket Cover (see this chapter)
- Disengage the drive chain [A] from the engine sprocket [B], and take it off the chassis.



#### *Drive Chain Installation*

- Engage the drive chain to the engine sprocket.
- Install:
  - Swingarm (see Suspension chapter)
  - Rear Wheel (see Wheels/Tires chapter)
  - Engine Sprocket Cover (see this chapter)
  - Chain Cover
- Adjust the chain slack after installing the chain (see Periodic Maintenance chapter).

## Drive Chain

### Drive Chain Replacement

○ Since the drive chain is installed through the swingarm, the chain cannot be removed other than by cutting it. Prepare the new link pin, link plate grease seals, and tools for rejoining the chain.

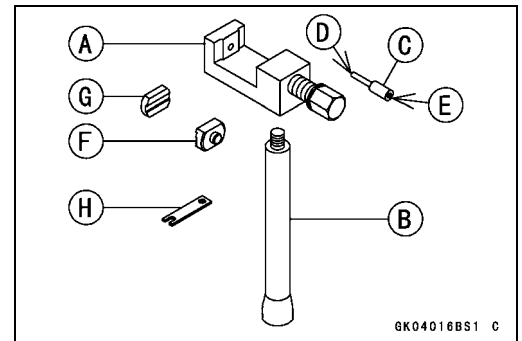
- Using a suitable tool, cut the drive chain by removing the link pins.

**Recommended Tool: EK JOINT TOOL #50**

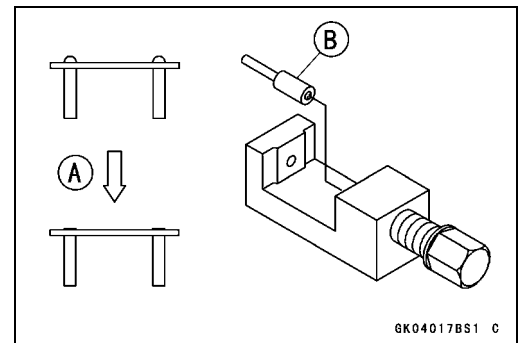
### CAUTION

**Read the Tool Manual before removing.**

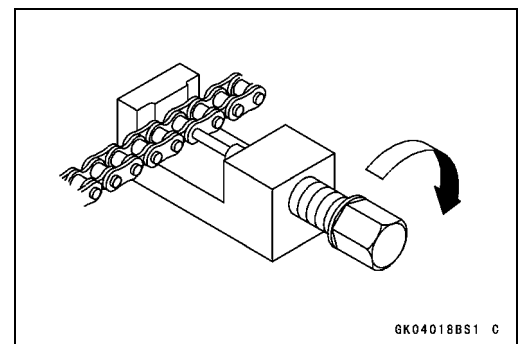
Body [A]  
 Handlebar [B]  
 Cutting & Riveting Pin [C]  
 For Cutting [D]  
 For Riveting [E]  
 Plate Holder (A) [F]  
 Plate Holder (B) [G]  
 Gauge [H]



- Grind [A] the pin head to make it flat.
- Set the cutting & riveting pin [B] as shown.



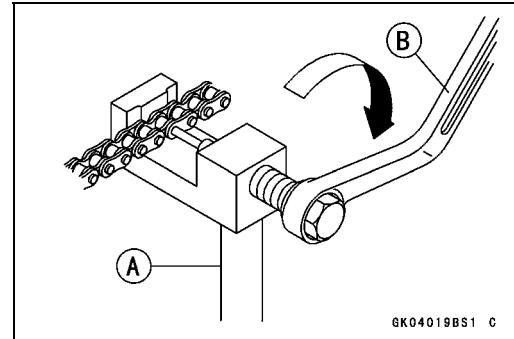
- Screw the pin holder until it touches the chain pin.
- Be sure that the cutting pin hits center of the chain pin.



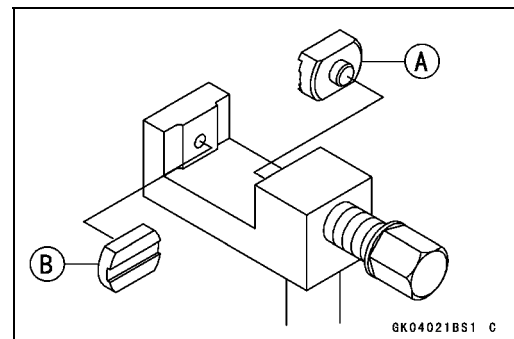
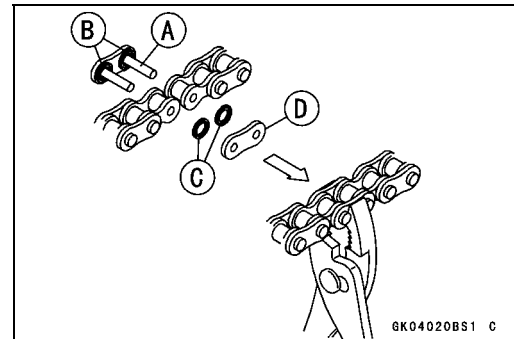
## 11-8 FINAL DRIVE

### Drive Chain

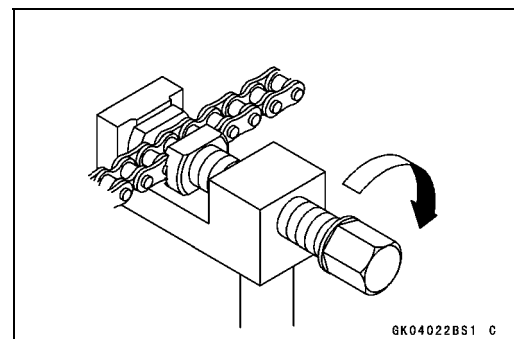
- Screw the handlebar [A] into body.
- Turn the pin holder with the wrench [B] clockwise to the extract chain pin.



- Engage the new drive chain to the old drive chain and pull the end of the old drive chain until they are changing the position.
  - Remove the old drive chain from the new drive chain.
  - Apply grease to the new link pins [A] and new O-rings [B] [C].
  - Engage the drive chain on the engine and rear sprockets.
  - Insert the link pins in the drive chain ends.
  - Install the O-rings [C].
  - Install the link plate so that the mark [D] faces out.
  - Push the link plate by hand or plier to fix it.
  - In case of the O-ring chain, be sure to set the O-rings correctly.
- Set the plate holder (A) [A] and plate holder (B) [B] on the body.



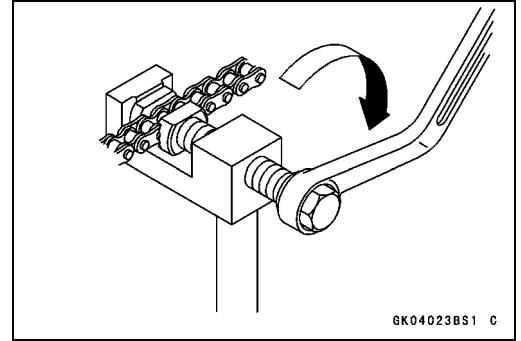
- Fit the plate holder (A) to the link plate.
- Turn the pin holder by hand until the plate holder (B) touches the other link plate.



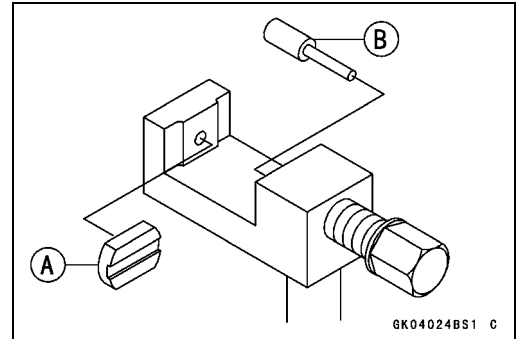


**Drive Chain**

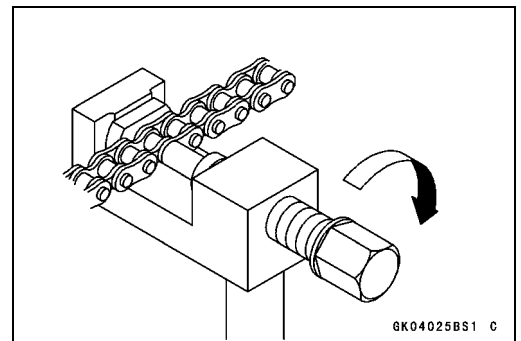
- Turn the pin holder by wrench clockwise until two pins of the link come into the groove of the plate holder (A).
- Take off the plate holder.



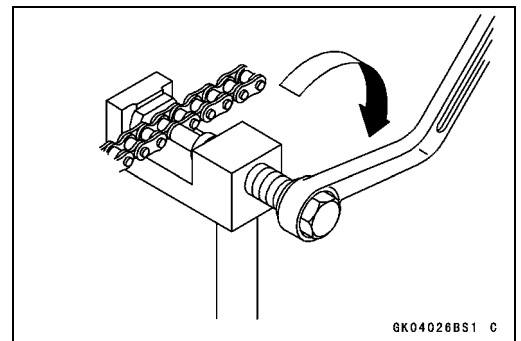
- Set the plate holder (B) [A] and cutting & riveting pin [B] as shown.



- Turn the pin holder until the riveting pin touches the link pin.



- Turn the wrench clockwise until the tip of the riveting pin hits of the link pin.
- Rivet it.
- Some work for the other link pin.



## 11-10 FINAL DRIVE

### Drive Chain

- After staking, check the staked area of the link pin for cracks.
- Measure the outside diameter [A] of the link pin and link plates width [B].

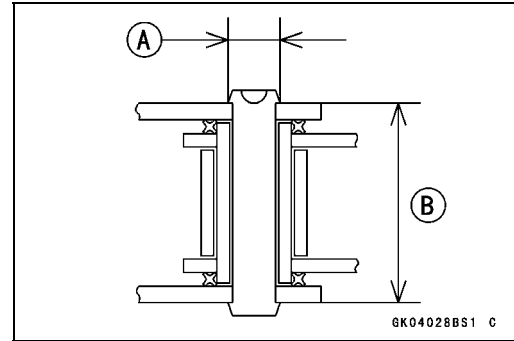
#### Link Pin Outside Diameter

Standard: 5.6 ~ 6.0 mm (0.22 ~ 0.24 in.)

#### Link Plates Outside Width

Standard: 17.45 ~ 17.60 mm (0.687 ~ 0.693 in.)

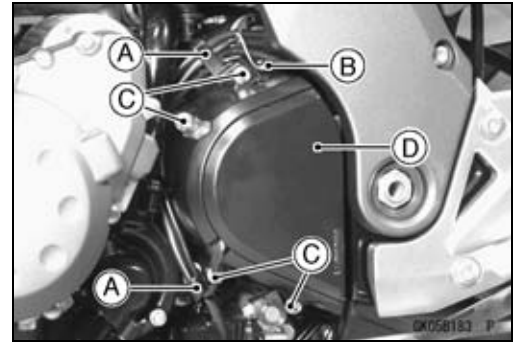
- ★ If the reading exceeds the specified length, cut and rejoin the chain again.
- Check:
  - Movement of the Rollers
- Adjust the drive chain slack after installing the chain (see Periodic Maintenance chapter).



## Sprocket, Coupling

### Engine Sprocket Removal

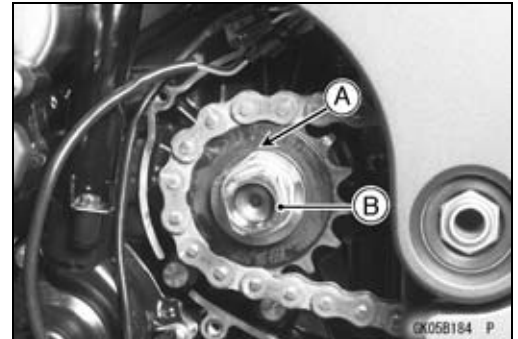
- Remove:
  - Clamps [A] (Open)
  - Speed Sensor Connector [B]
  - Engine Sprocket Cover Bolts [C]
  - Engine Sprocket Cover [D] with Speed Sensor



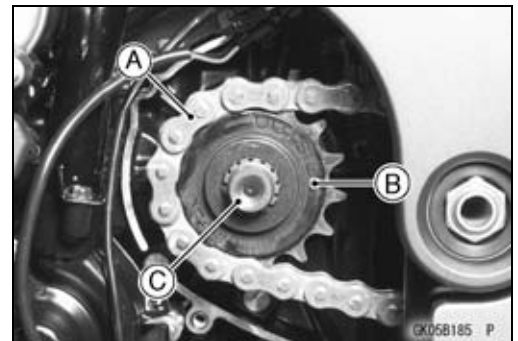
- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

#### NOTE

○When loosening the engine sprocket nut, hold the rear brake on.



- Using the stand, raise the rear wheel off the ground.
- Loosen the drive chain (see Periodic Maintenance chapter).
- Remove the drive chain from the rear sprocket toward the right.
- Disengage the drive chain [A] from the engine sprocket [B].
- Pull the engine sprocket off the output shaft [C].



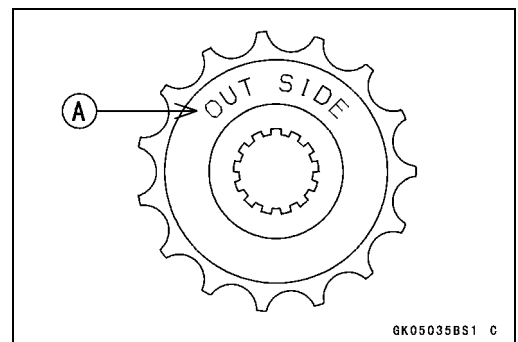
### Engine Sprocket Installation

- Replace the sprocket washer and axle cotter pin.
- Install the engine sprocket so that "OUTSIDE" letters [A] face outward.
- Apply molybdenum disulfide oil solution to the threads of the output shaft and the seating surface of the engine sprocket nut.
- After torquing the engine sprocket nut, bend the one side of the washer over the nut.

#### NOTE

○Tighten the nut while applying the rear brake.

- Tighten:
  - Torque - Engine Sprocket Nut: 125 N·m (13 kgf·m, 92 ft·lb)**
  - Engine Sprocket Cover Bolts: 9.8 N·m (1.0 kgf·m, 87 in·lb)**
- Adjust the drive chain slack after installing the sprocket (see Periodic Maintenance chapter).



## 11-12 FINAL DRIVE

### Sprocket, Coupling

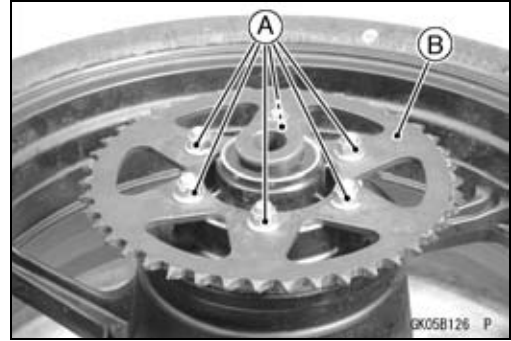
#### Rear Sprocket Removal

- Remove the rear wheel (see Wheels/Tires chapter).

#### CAUTION

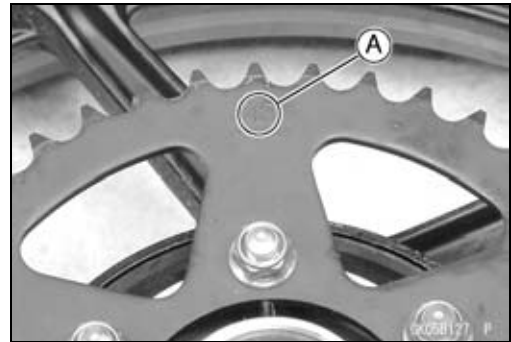
Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

- Remove the rear sprocket nuts [A].
- Remove the rear sprocket [B].



#### Rear Sprocket Installation

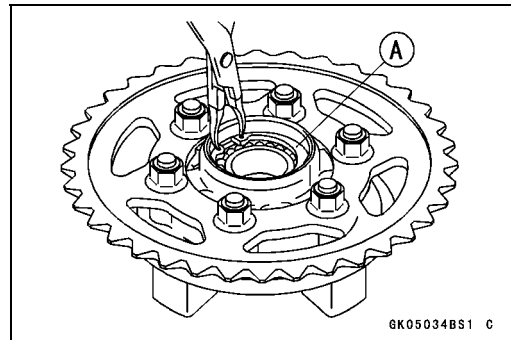
- Install the sprocket facing the tooth number marking [A] outward.
- Tighten the rear sprocket nuts.
- Torque - Rear Sprocket Nuts: 59 N·m (6.0 kgf·m, 43 ft·lb)**
- Install the rear wheel (see Wheels/Tires chapter).



#### Coupling Bearing Removal

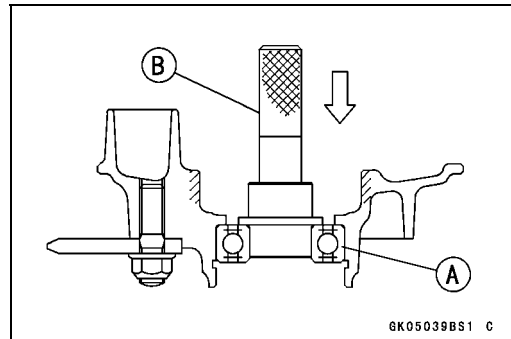
- Remove:
  - Coupling
  - Grease Seal
  - Circlip [A]

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



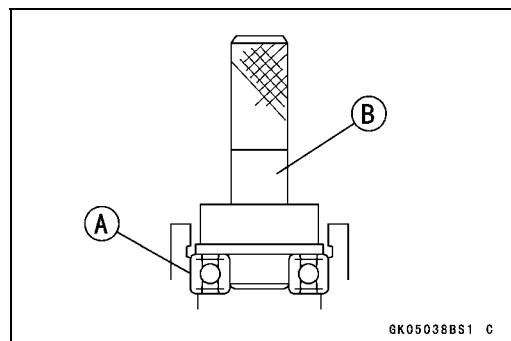
- Remove the bearing [A] by tapping from the wheel side.

**Special Tool - Bearing Driver Set: 57001-1129 [B]**



#### Coupling Bearing Installation

- Replace the bearing with a new one.
- Press in the bearing [A] until it is bottomed.
- Special Tool - Bearing Driver Set: 57001-1129 [B]**
- Replace the circlip with a new one.
- Special Tool - Inside Circlip Pliers: 57001-143**



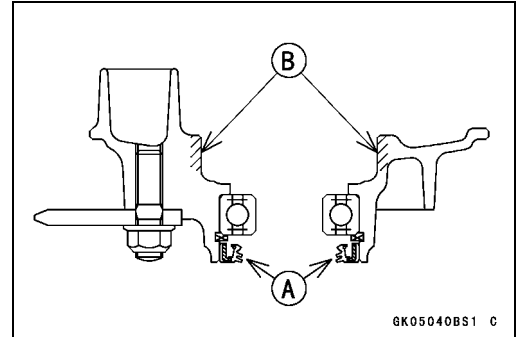
## Sprocket, Coupling

- Replace the grease seal with a new one.
- Press in the grease seal so that the seal surface is flush with the end of the hole.
- Apply high temperature grease to the grease seal lips.

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

### Coupling Installation

- Grease the following and install the coupling.
  - Coupling Grease Seal [A]
  - Coupling Internal Surface [B]
- Install the collar.



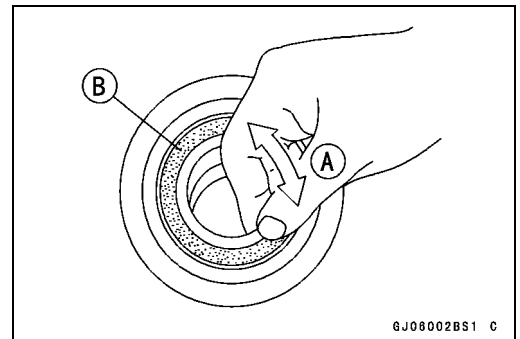
### Coupling Bearing Inspection

Since the coupling bearing is made to extremely close tolerances, the clearance can not normally be measured.

#### NOTE

○ It is not necessary to remove the coupling bearing for inspection. If the bearing is removed, it will need to be replaced with a new one.

- Turn the bearing in the coupling back and forth [A] while checking for plays, roughness, or binding.
- ★ If bearing play, roughness, or binding is found, replace the bearing.
- Examine the bearing seal [B] for tears or leakage.
- ★ If the seal is torn or is leaking, replace the bearing.

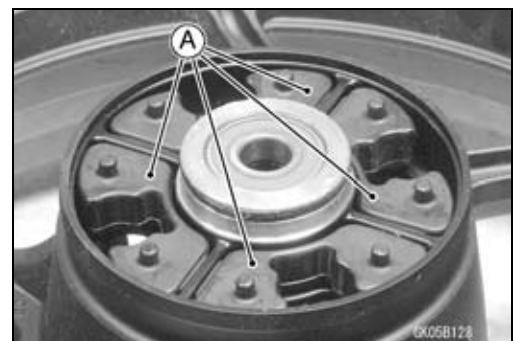


### Coupling Bearing Lubrication

○ Since the coupling bearing is packed with grease and sealed, lubrication is not required.

### Coupling Damper Inspection

- Remove the rear wheel coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.



## 11-14 FINAL DRIVE

### Sprocket, Coupling

#### 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 Periodic Maintenance chapter).
  - Worn Tooth (Engine Sprocket) [A]
  - Worn Tooth (Rear Sprocket) [B]
  - Direction of Rotation [C]

#### NOTE

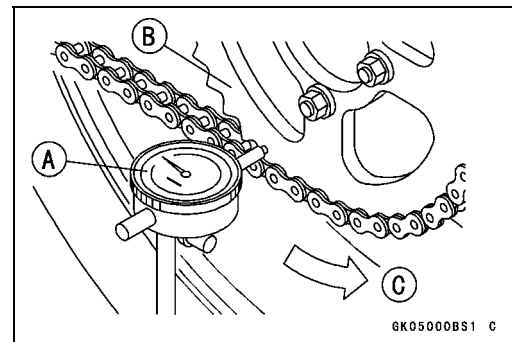
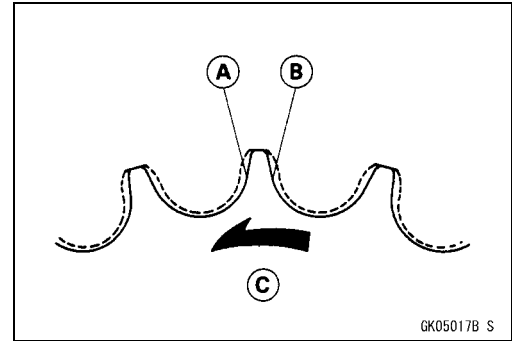
○ If a sprocket requires replacement, the chain is probably worn also. When replacing a sprocket, inspect the chain.

#### Rear Sprocket Warp Inspection

- Raise the rear wheel off the ground so that it will turn freely (see Wheels/Tires chapter).
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).
- ★ If the runout exceeds the service limit, replace the rear sprocket.

#### Rear Sprocket Warp

- Standard:** 0.4 mm (0.016 in.) or less  
**Service Limit:** 0.5 mm (0.020 in.)



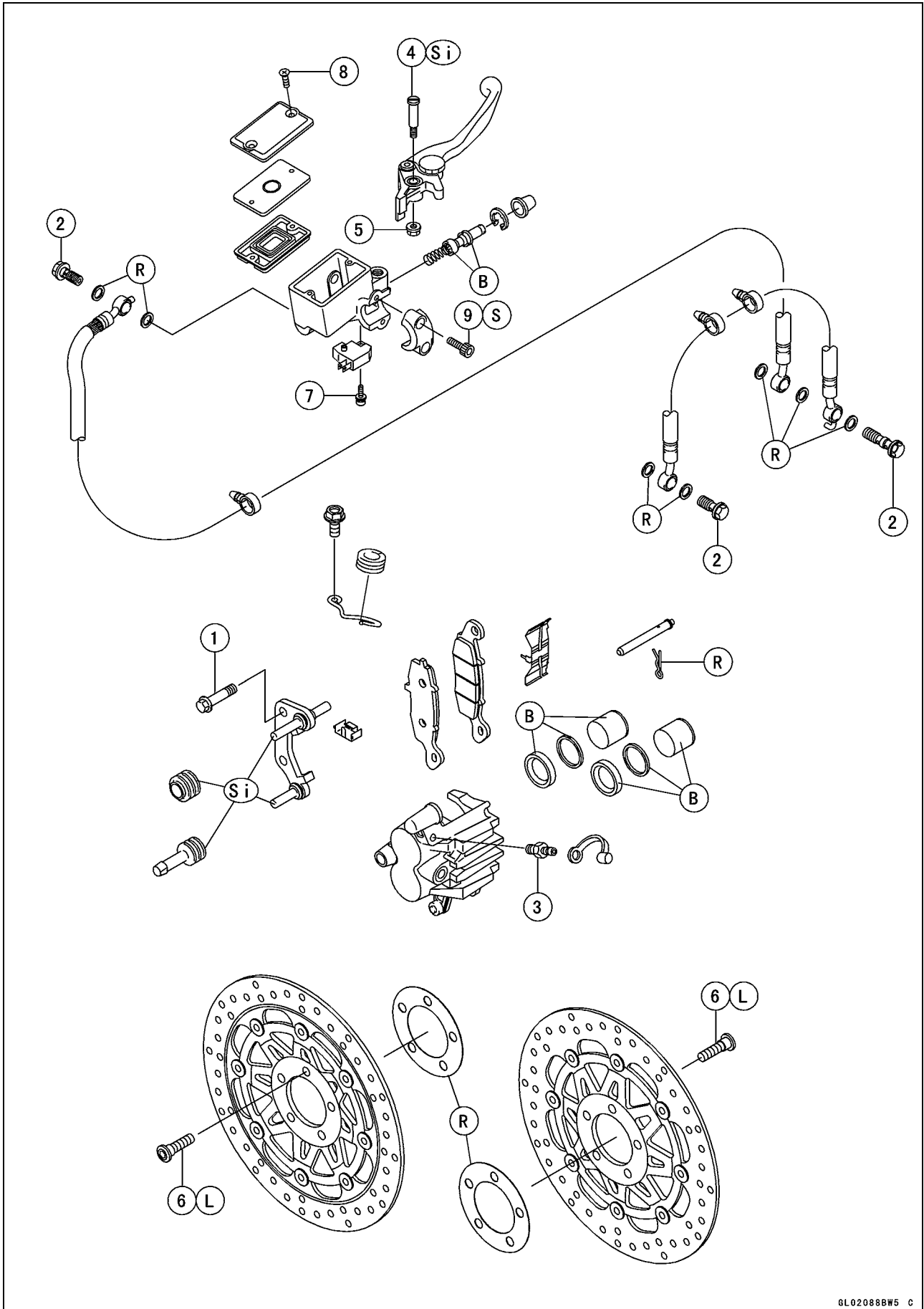
# Brakes

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# 12-2 BRAKES

## Exploded View





## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Caliper Mounting Bolts	34	3.5	25	
2	Brake Hose Banjo Bolts	34	3.5	25	
3	Bleed Valve	7.8	0.80	69 in·lb	
4	Brake Lever Pivot Bolt	1.0	0.10	9 in·lb	Si
5	Brake Lever Pivot Bolt Locknut	5.9	0.60	52 in·lb	
6	Front Brake Disc Mounting Bolts	27	2.8	20	L
7	Front Brake Light Switch Screws	1.0	0.10	9 in·lb	
8	Front Brake Reservoir Cap Screws	1.0	0.10	9 in·lb	
9	Front Master Cylinder Clamp Bolts	8.8	0.90	78 in·lb	S

B: Apply brake fluid.

L: Apply a non-permanent locking agent.

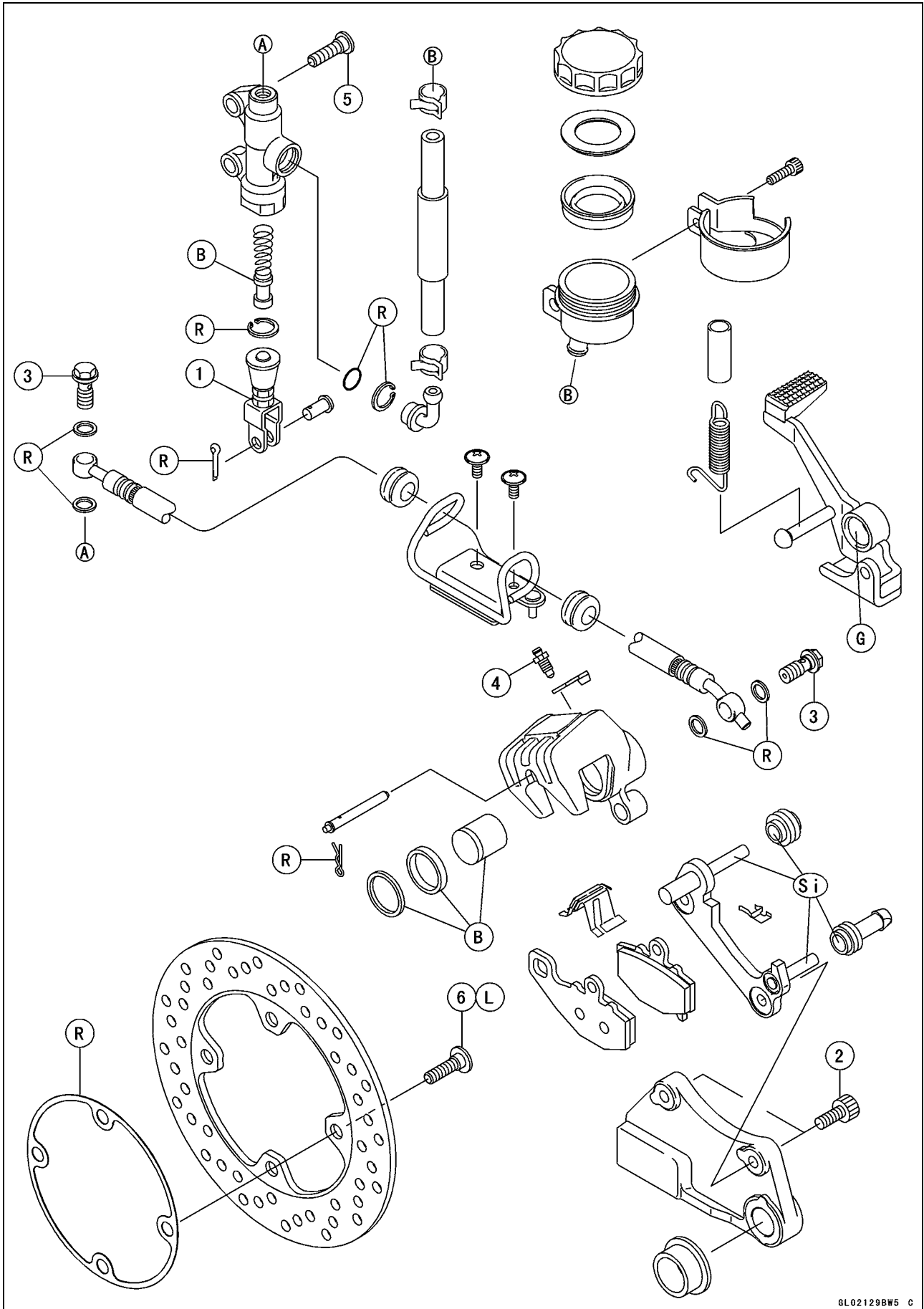
R: Replacement Parts

S: Follow the specific tightening sequence.

Si: Apply silicone grease (ex. PBC grease).

# 12-4 BRAKES

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Master Cylinder Push Rod Locknut	18	1.8	13	
2	Rear Caliper Mounting Bolts	25	2.5	18	
3	Brake Hose Banjo Bolts	34	3.5	25	
4	Bleed Valve	7.8	0.80	69 in·lb	
5	Rear Master Cylinder Mounting Bolts	25	2.5	18	
6	Rear Brake Disc Mounting Bolts	27	2.8	20	L

B: Apply brake fluid.

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

Si: Apply silicone grease (ex. PBC grease).

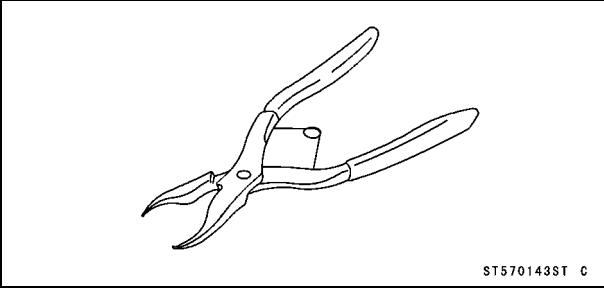
## 12-6 BRAKES

### Specifications

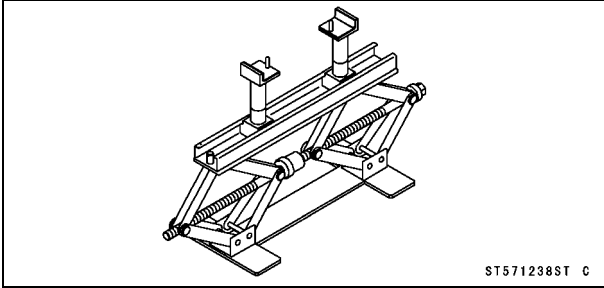
Item	Standard	Service Limit
<b>Brake Lever, Brake Pedal</b>		
Brake Lever Position	5-way adjustable (to suit rider)	---
Brake Lever Free Play	Non-adjustable	---
Pedal Free Play	Non-adjustable	---
Pedal Position	About 47 mm (1.85 in.) below footpeg top	---
<b>Brake Fluid</b>		
Grade	DOT4	---
<b>Brake Pads</b>		
Lining Thickness:		
Front	4.5 mm (0.18 in.)	1 mm (0.04 in.)
Rear	5.0 mm (0.20 in.)	1 mm (0.04 in.)
<b>Brake Discs</b>		
Thickness:		
Front	4.3 ~ 4.5 mm (0.17 ~ 0.18 in.)	4.0 mm (0.16 in.)
Rear	4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)	4.5 mm (0.18 in.)
Runout	Not more than 0.2 mm (0.008 in.)	0.3 mm (0.012 in.)

**Special Tools**

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



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



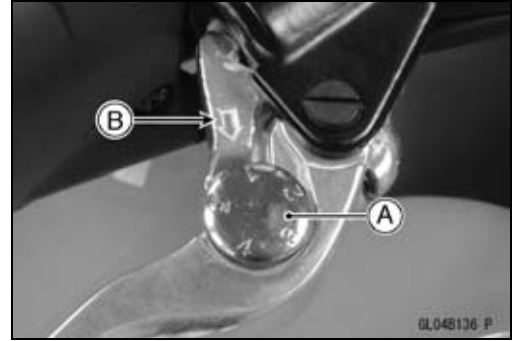
## 12-8 BRAKES

### Brake Lever, Brake Pedal

#### Brake Lever Position Adjustment

The brake lever adjuster has 5 positions so that the brake lever position can be adjusted to suit the operator's hand.

- Push the lever forward and turn the adjuster [A] to align the number with the arrow mark [B] on the lever holder.
- The distance from the grip to the lever is minimum at number 5 and maximum at number 1.



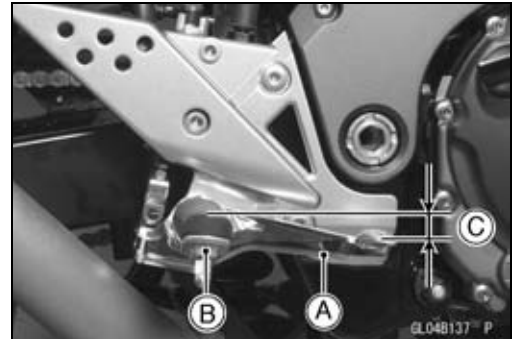
#### Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position. Footpeg [B]

##### Pedal Position

**Standard: About 47 mm (1.85 in.) [C] below top of footpeg**

- ★ If it is incorrect, adjust the brake pedal position.

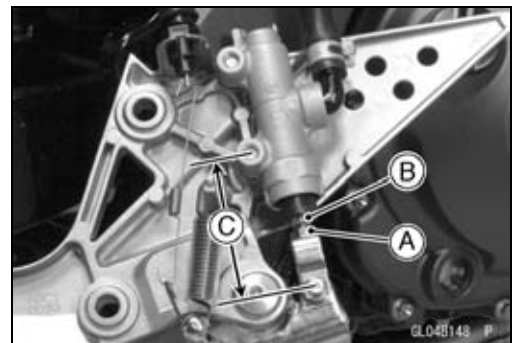
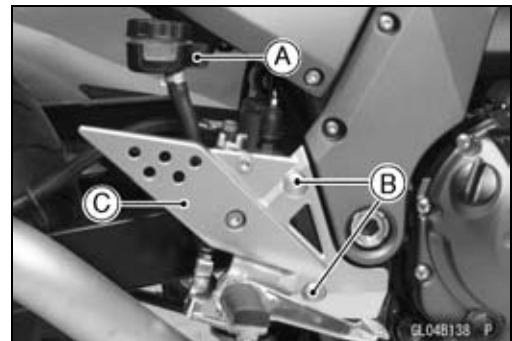


#### Brake Pedal Position Adjustment

##### NOTE

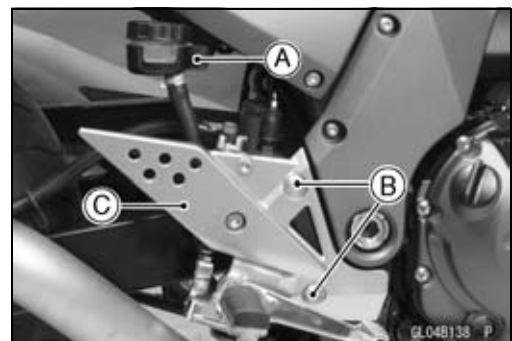
○ Usually it is not necessary to adjust the pedal position, but always adjust it when the push rod locknut has been loosened.

- Remove:
  - Reservoir Tank Bolt [A]
  - Guard Bracket Bolts [B]
  - Guard Bracket [C]
- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.
- ★ If the length [C] shown is  $70 \pm 1 \text{ mm}$  ( $2.76 \pm 0.04 \text{ in.}$ ), the pedal position will be within the standard range.
- Tighten:
  - Torque - Rear Master Cylinder Push Rod Locknut: 18 N·m (1.8 kgf·m, 13 ft·lb)**
- Check the brake light switch operation (see Periodic Maintenance chapter).



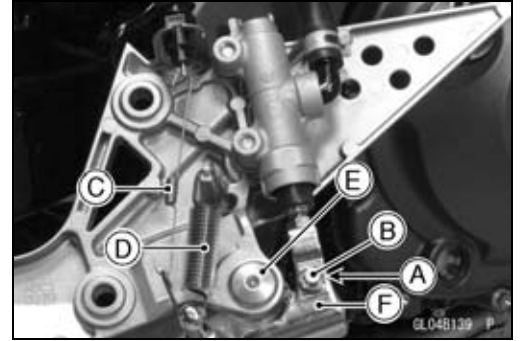
#### Brake Pedal Removal

- Remove:
  - Reservoir Tank Bolt [A]
  - Guard Bracket Bolts [B]
  - Guard Bracket [C]



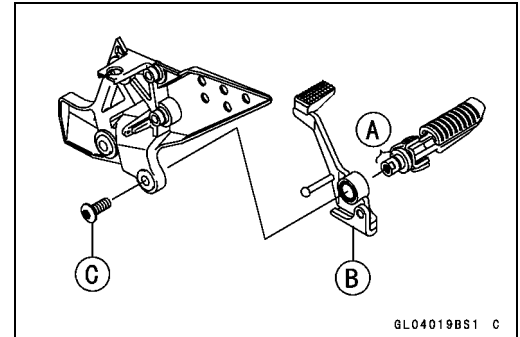
## Brake Lever, Brake Pedal

- Remove:
  - Cotter Pin [A]
  - Joint Pin [B]
  - Rear Brake Light Switch Spring [C]
  - Return Spring [D]
- Remove the mounting bolt [E] and take out the brake pedal [F] with the front footpeg assy.

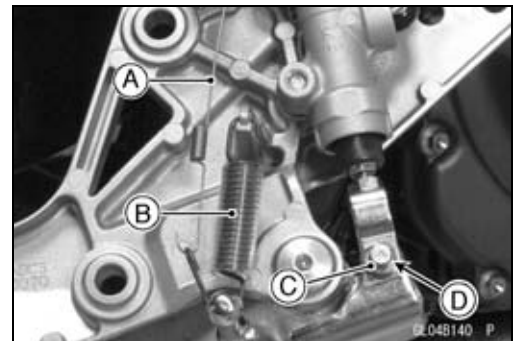


### Brake Pedal Installation

- Apply high-temperature grease to the footpeg pivot shaft [A].
  - Install:
    - Brake Pedal [B]
    - Brake Pedal Bolt [C]
- Torque - Brake Pedal Bolt: 34 N·m (3.5 kgf·m, 25 in·lb)**



- Hook the lower end of the rear brake light switch spring [A] on the pedal hook.
- Hook the upper end of the return spring [B] on the pedal hook.
- Replace the cotter pin with a new one.
- Insert the cotter pin [C] and bend the pin ends [D].



- Check the brake pedal position (see Brake Pedal Position Inspection).

## 12-10 BRAKES

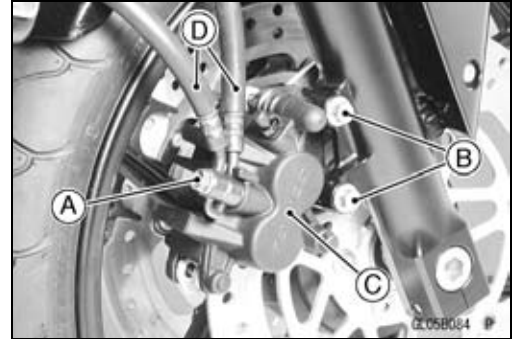
### Calipers

#### Front Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hoses [D] from the caliper (see Brake Hose Removal/Installation).

#### CAUTION

Immediately wash away any brake fluid that spills.



#### NOTE

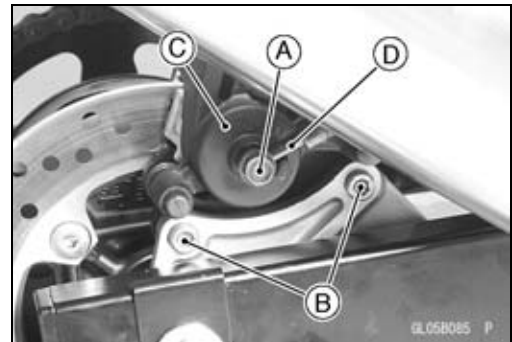
- After the caliper removal, if compressed air will not be available for disassembling the caliper, remove the piston before detaching the brake hose (see Front Caliper Disassembly).

#### Rear Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hose [D] from the caliper (see Brake Hose Removal/Installation).

#### CAUTION

Immediately wash away any brake fluid that spills.



#### NOTE

- After the caliper removal, if compressed air will not be available for disassembling the caliper, remove the piston before detaching the brake hose (see Rear Caliper Disassembly).

#### Caliper Installation

- Install the caliper and brake hose lower end.
- Replace the washers on each side of hose fitting with new ones.
- Tighten:

**Torque - Caliper Mounting Bolts (Front): 34 N·m (3.5 kgf·m, 25 ft·lb)**

**Caliper Mounting Bolts (Rear): 25 N·m (2.5 kgf·m, 18 ft·lb)**

**Brake Hose Banjo Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)**

- Check the fluid level in the brake reservoirs.
- Bleed the brake line (see Bleeding the Brake Line).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

#### ⚠ WARNING

Do not attempt to drive the motorcycle until a full brake lever or pedal is obtained by pumping the brake lever or pedal until the pads are against the disc. The brakes will not function on the first application of the lever or pedal if this is not done.



## Calipers

### Front Caliper Disassembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

### Front Caliper Assembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

### Rear Caliper Disassembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

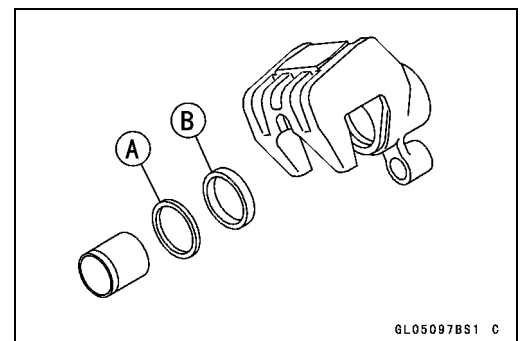
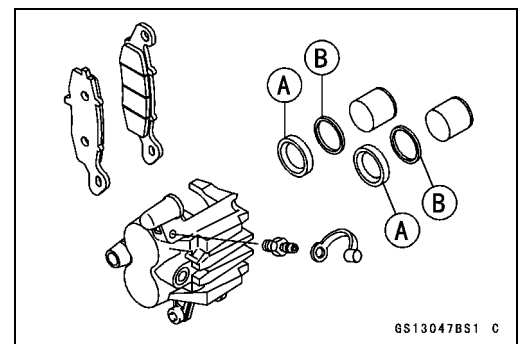
### Rear Caliper Assembly

- Refer to the Caliper Rubber Parts Replacement in the Periodic Maintenance chapter.

### Caliper Fluid Seal Damage

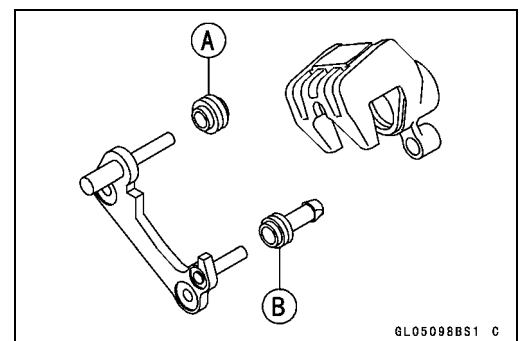
The fluid seal (piston seal) [A] is placed around the piston to maintain clearance between the pad and the disc. If the seal is in a poor condition, it could lead the pad to wear excessively or the brake to drag, which may cause the temperature of the discs or the brake fluid to increase.

- Replace the fluid seal if it exhibits any of the conditions listed below.
  - Brake fluid leakage around the pad.
  - Brakes overheat.
  - Considerable difference in inner and outer pad wear.
  - Seal and piston are stuck together.
- ★ If the fluid seal is replaced, replace the dust seal [B] as well. Also, replace all seals every other time the pads are changed.



### Rear Caliper Dust Boot and Friction Boot Damage

- Remove the calipers (see Front/Rear Caliper Removal).
- Check that the dust boot [A] and friction boot [B] are not cracked, worn, swollen, or otherwise damaged.
- If they show any damage, replace them.

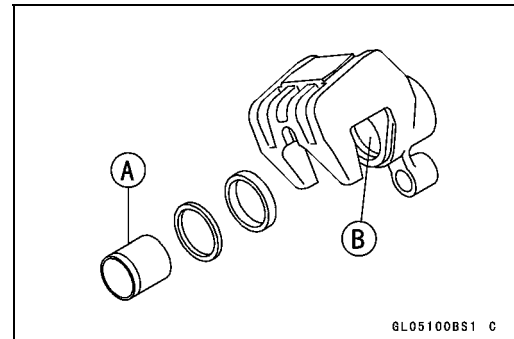
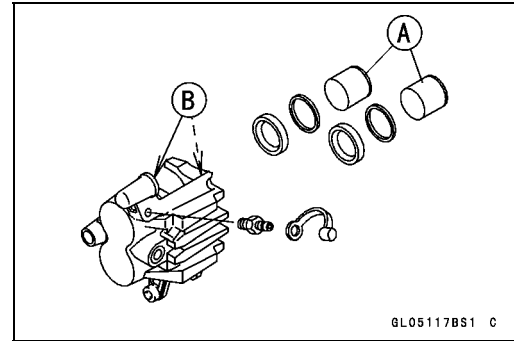


## 12-12 BRAKES

### Calipers

#### *Caliper Piston and Cylinder Damage*

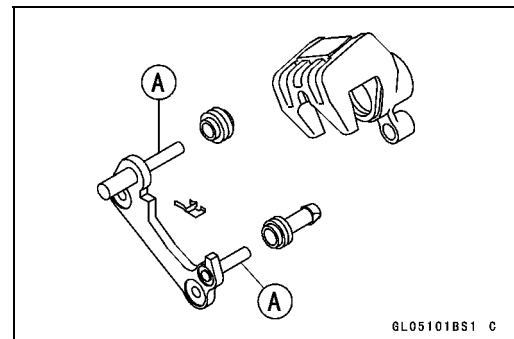
- Visually inspect the piston [A] and cylinder surfaces [B].
- ★ Replace the caliper if the cylinder and piston are badly scored or rusty.



#### *Caliper Holder Shaft Wear*

The caliper body must slide smoothly on the caliper holder shaft [A]. If the body does not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

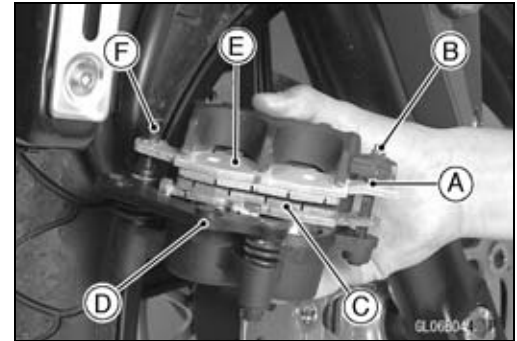
- Check to see that the caliper holder shaft are not badly worn or stepped, and that the dust and friction boots are not damaged.
- ★ If the dust and friction boot are damaged, replace them. To replace the friction boot, remove the pads and the caliper bracket.
- ★ If the caliper holder shaft is damage, replace the caliper bracket.



## Brake Pads

### Front Brake Pad Removal

- Remove the caliper from the disc.
- Draw out the clip [A], and take off the pad pin [B].
- Remove the pad [C] on the piston side.
- Push the holder [D] towards the piston, and remove the pad of the other side [E] from the holder shaft [F].



### Front Brake Pad Installation

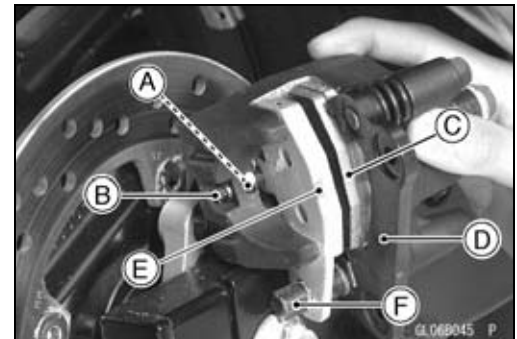
- Push the caliper pistons in by hand as far as they will go.
- Install the anti-rattle spring in its correct position.
- Install the pad on the piston side first, then install the other pad on the holder.
- Install the caliper (see Caliper Installation).

### **⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

### Rear Brake Pad Removal

- Remove the caliper with the hose installed.
- Draw out the clip [A], and take off the pad pin [B].
- Remove the pad [C] on the piston side.
- Push the holder [D] towards the piston, and remove the pad of the other side [E] from the holder shaft [F].



### Rear Brake Pad Installation

- Push the caliper piston in by hand as far as it will go.
- Install the anti-rattle spring in its correct position.
- Install the pad on the piston side first, then install the other pad on the holder.
- Install the caliper (see Caliper Installation).

### **⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brake will not function on the first application of the pedal if this is not done.**

### Brake Pad Wear Inspection

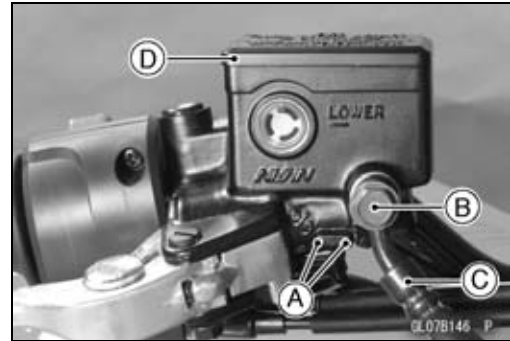
- Refer to the Brake Pad Wear in the Periodic Maintenance chapter.

## 12-14 BRAKES

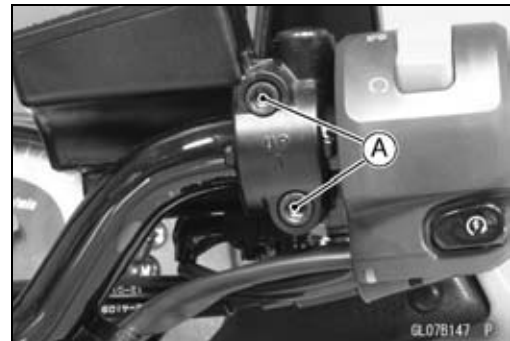
### Master Cylinder

#### Front Master Cylinder Removal

- Disconnect the front brake light switch connectors [A].
- Remove the banjo bolt [B] to disconnect the brake hose [C] from the master cylinder [D] (see Brake Hose Removal/Installation).

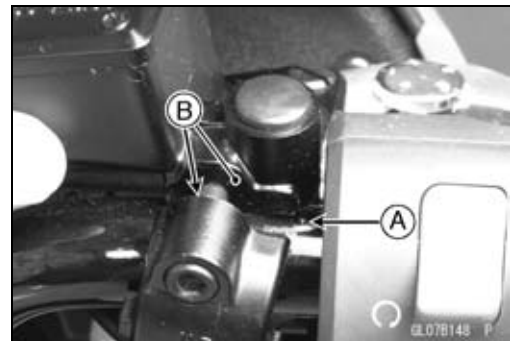


- Unscrew the clamp bolts [A], and take off the master cylinder as an assembly with the reservoir, brake lever, and brake switch installed.



#### Front Master Cylinder Installation

- Install the front master cylinder so that the punch mark [A] of the handlebar is aligned with the mating surface [B] of the master cylinder clamp to level the reservoir.



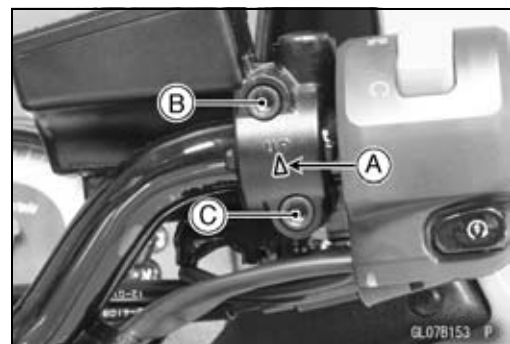
- The master cylinder clamp must be installed with the arrow mark [A] upward.
- Tighten the upper clamp bolt [B] first, and then the lower clamp bolt [C]. There will be a gap at the lower part of the clamp after tightening.

**Torque - Front Master Cylinder Clamp Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**

- Replace the washers on each side of the hose fitting with new ones.
- Tighten the brake hose banjo bolt.

**Torque - Brake Hose Banjo Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)**

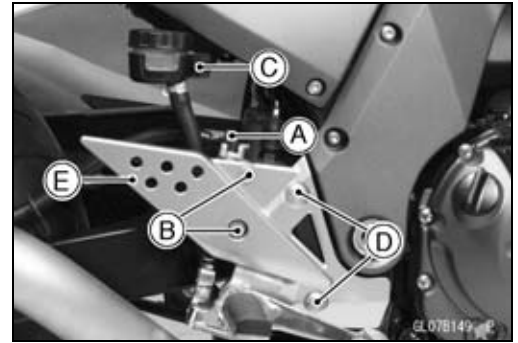
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.



## Master Cylinder

### Rear Master Cylinder Removal

- Unscrew the brake hose banjo bolt [A].
- Drain the brake fluid into a container.
- Loosen the master cylinder mounting bolts [B] lightly.
- Remove:
  - Reservoir Tank Bolt [C]
  - Guard Bracket Bolts [D]
  - Guard Bracket [E]

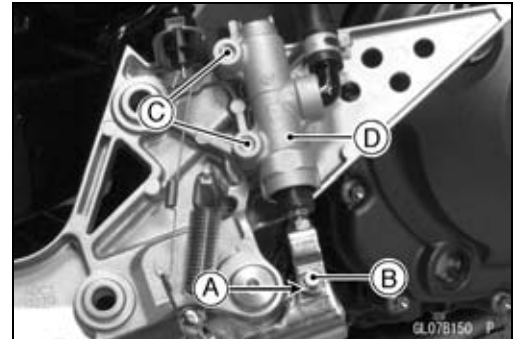


- Remove:
  - Cotter Pin [A]
  - Joint Pin [B]

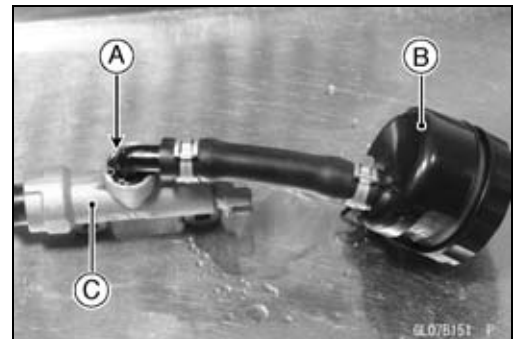
### NOTE

○ Pull off the joint pin while pressing down the brake pedal.

- Unscrew the master cylinder mounting bolts [C], and remove the master cylinder [D] with the reservoir tank.



- Remove:
  - Cotter Pin [A]
  - Reservoir With Hose [B]
  - Master Cylinder [C]



### Rear Master Cylinder Installation

- Replace:
  - Circlip
  - Cotter Pin
- Insert the cotter pin [A] and bend the pin end [B].



- Replace the washers on each side of hose fitting with new ones.
- Tighten the following bolts.
  - Torque - Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Brake Hose Banjo Bolt: 34 N·m (3.5 kgf·m, 25 ft·lb)**
- Bleed the brake line (see Brake Line Bleeding).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

### Front Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

## 12-16 BRAKES

### Master Cylinder

#### Rear Master Cylinder Disassembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

#### Master Cylinder Assembly

- Refer to the Master Cylinder Rubber Parts Replacement in the Periodic Maintenance chapter.

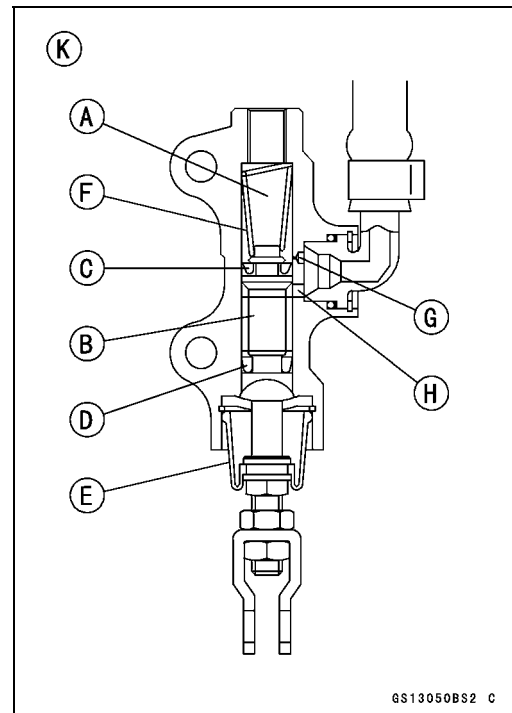
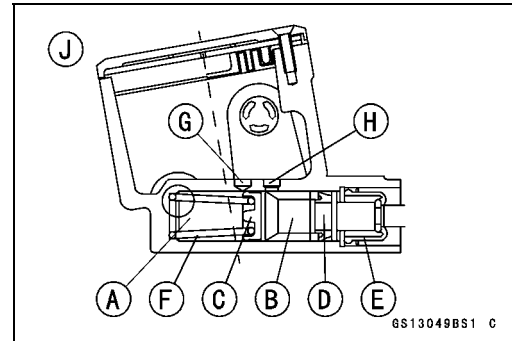
#### Master Cylinder Inspection

- Remove the master cylinders (see Front/Rear Master Cylinder Removal).
- Disassemble the front and rear master cylinders.
- Check that there are no scratches, rust or pitting on the inner wall [A] of each master cylinder and on the outside of each piston [B].
- ★ If a master cylinder or piston shows any damage, replace them.
- Inspect the primary cup [C] and secondary cup [D].
- ★ If a cup is worn, damaged softened (rotted), or swollen, the piston assembly should be replaced to renew the cups.
- ★ If fluid leakage is noted at the brake lever, the piston assembly should be replaced to renew the cups.

#### Front Master Cylinder [J]

- Check the dust covers [E] for damage.
- ★ If they are damaged, replace them.
- Check the piston return springs [F] for any damage.
- ★ If the springs are damaged, replace them.
- Check that relief port [G] and supply port [H] are not plugged.
- ★ If the relief port becomes plugged, the brake pads will drag on the disc. Blow the ports clean with compressed air.

#### Rear Master Cylinder [K]



## Brake Disc

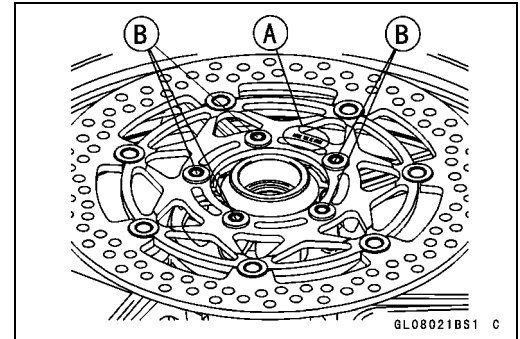
### Brake Disc Removal

- Remove the wheel (see Wheels/Tires chapter).
- Unscrew the mounting bolts, and take off the disc.
- Remove the gaskets.

### Brake Disc Installation

- Replace the gasket with new ones.
- Install the brake disc on the wheel so that the marked side [A] faces out.
- Apply a non-permanent locking agent to the threads of the front and rear brake disc mounting bolts [B].
- Tighten:

**Torque - Brake Disc Mounting Bolts: 27 N·m (2.8 kgf·m, 20 ft·lb)**



### Brake Disc Wear

- Measure the thickness of each disc [A] at the point where it has worn the most.
  - ★ If the disk has worn past the service limit, replace it.
- Measuring Area [B]

#### Front Disc Thickness

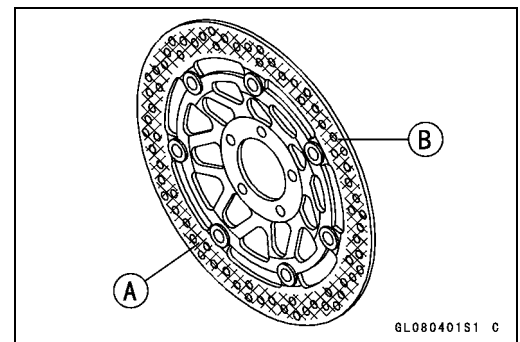
**Standard: 4.3 ~ 4.5 mm (0.17 ~ 0.18 in.)**

**Service Limit: 4.0 mm (0.16 in.)**

#### Rear Disc Thickness

**Standard: 4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)**

**Service Limit: 4.5 mm (0.18 in.)**

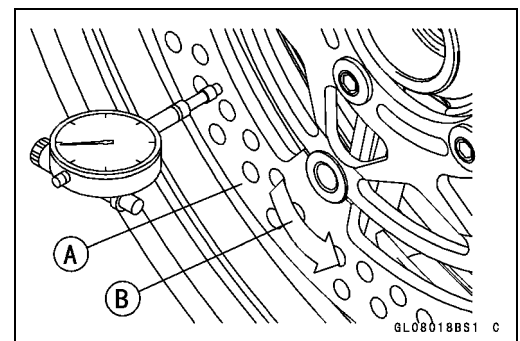


### Brake Disc Warp

- Jack up the motorcycle so that the wheel is off the ground (see Wheels/Tires chapter).

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

- For front disc inspection, turn the handlebar fully to one side.
- Set up a dial gauge against the disc [A] as shown and measure disc runout, while turning [B] the wheel by hand.
- ★ If runout exceeds the service limit, replace the disc.



#### Disc Runout

**Standard: Not more than 0.2 mm (0.008 in.)**

**Service Limit: 0.3 mm (0.012 in.)**

## 12-18 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.

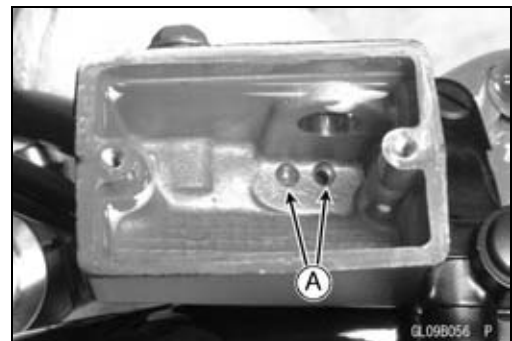
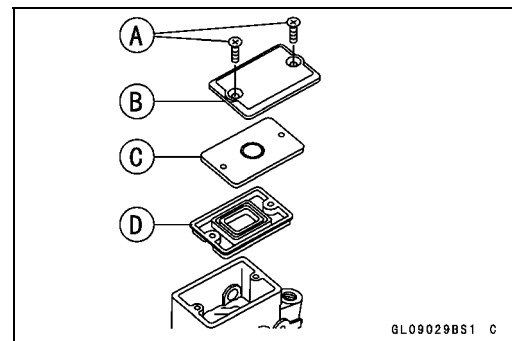
### **⚠ WARNING**

**Be sure to bleed the air from the brake line whenever brake lever or pedal action feels soft or spongy after the brake fluid is changed, or whenever a brake line fitting has been loosened for any reason.**

### **NOTE**

○ *The procedure to bleed the front brake line is as follows. Bleeding the rear brake line is the same as for the front brake.*

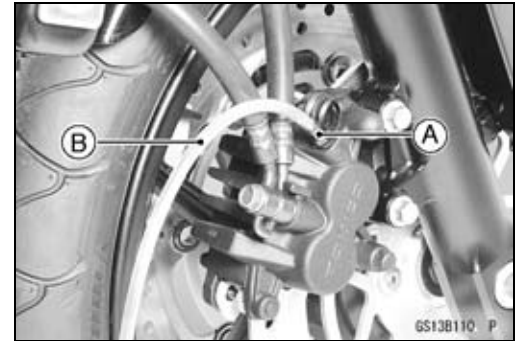
- Remove:
  - Screws [A]
  - Reservoir Cap [B]
  - Diaphragm Plate [C]
  - Diaphragm [D]
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- Slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes [A] at the bottom of the reservoir.
- Bleed the air completely from the master cylinder by this operation.





## Brake Fluid

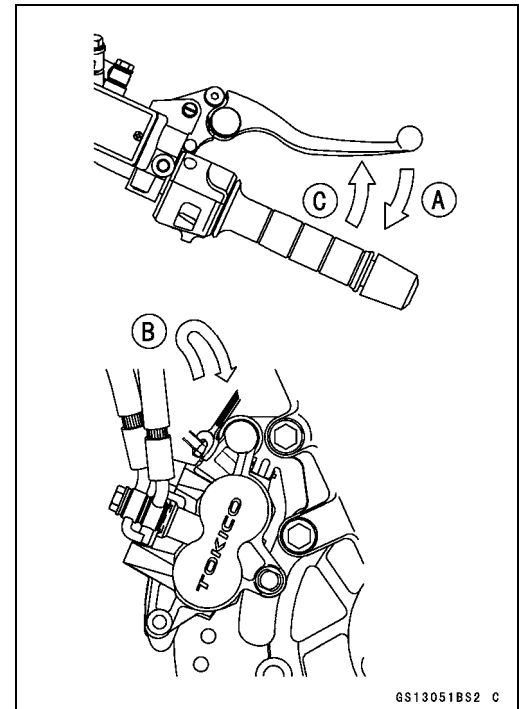
- Remove the rubber cap from the bleed valve [A].
- Attach a clear plastic hose [B] to the bleed valve, and run the other end of the hose into a container.



- Bleed the brake line and the caliper.
- Repeat this operation until no more air can be seen coming out into the plastic hose.
  1. Pump the brake lever until it becomes hard, and apply the brake and hold it [A].
  2. Quickly open and close [B] the bleed valve while holding the brake applied.
  3. Release the brake [C].

### NOTE

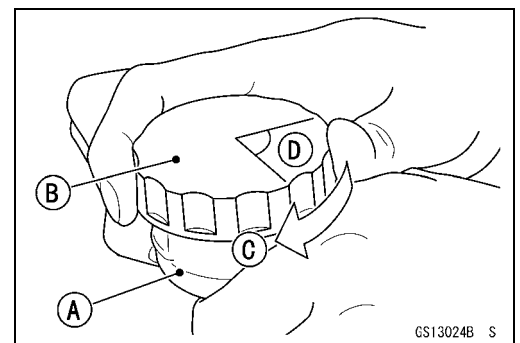
- *The fluid level must be checked often during the bleeding operation and replenished with fresh brake fluid as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.*
- *Tap the brake hose lightly from the caliper to the reservoir for more complete bleeding.*
- *Front Brake: Repeat the above steps for the other caliper.*



- Remove the clear plastic hose.
- Install the reservoir cap.
- Tighten:

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

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



- Tighten the bleed valve, and install the rubber cap.
- Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Check the fluid level.
- After bleeding is done, check the brake for good braking power, no brake drag, and no fluid leakage.

## 12-20 BRAKES

### Brake Fluid

#### **WARNING**

**When working with the disc brake, observe the precautions listed below.**

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning of the brake parts. Do not use any other fluid for cleaning these parts. Gasoline, engine oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually deteriorate the rubber used in the disc brake.
7. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high-flash point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE LINE.**

**Brake Hose**

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*Brake Hose Removal/Installation*

- Refer to the Brake Hose and Pipe Replacement in the Periodic Maintenance chapter.

*Brake Hose Inspection*

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



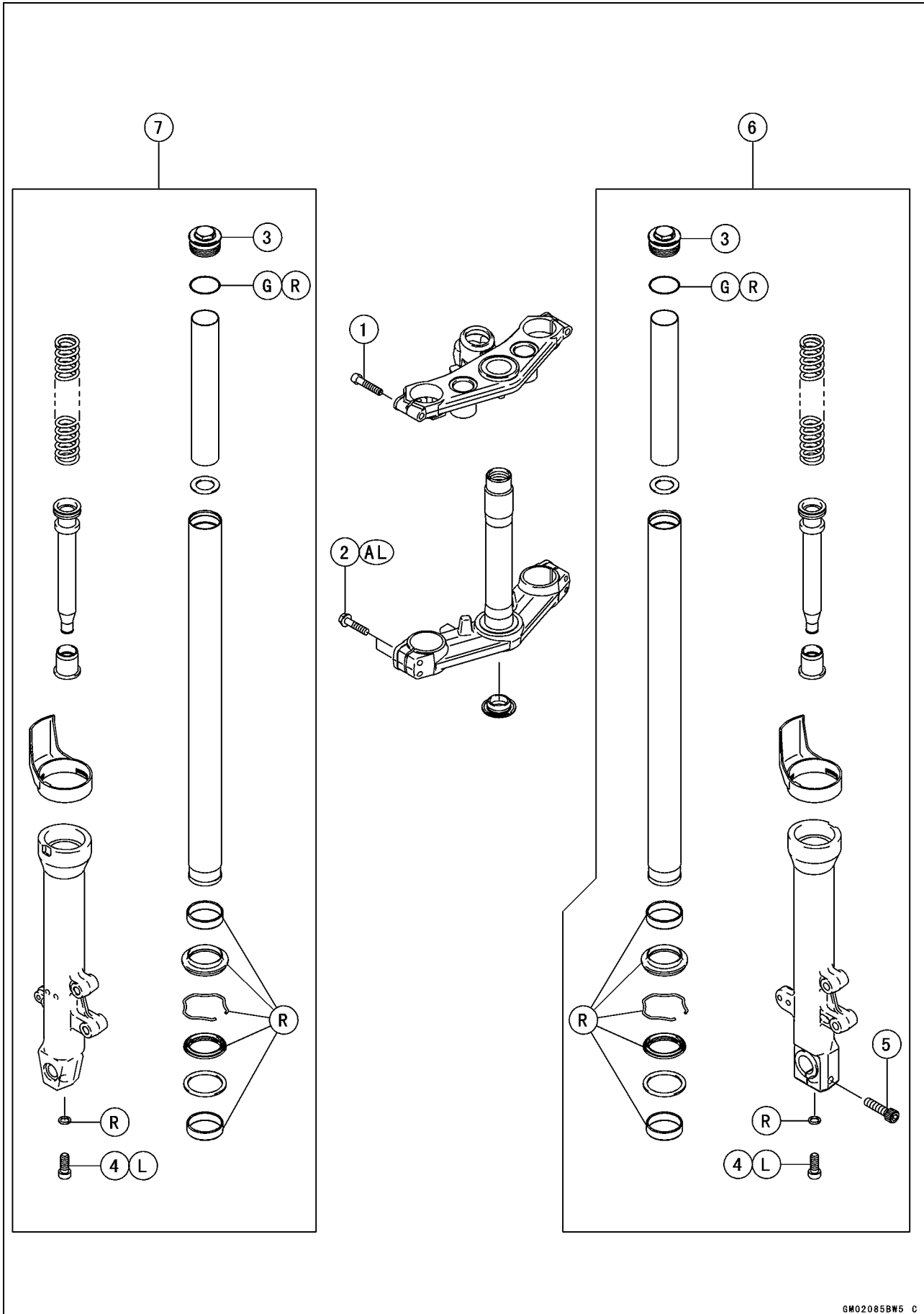
# Suspension

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# 13-2 SUSPENSION

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front Fork Clamp Bolts (Upper)	20	2.0	14	
2	Front Fork Clamp Bolts (Lower)	20	2.0	14	AL
3	Front Fork Top Plugs	25	2.5	18	
4	Front Fork Bottom Allen Bolts	30	3.1	22	L
5	Front Axle Clamp Bolt	34	3.5	25	

6. Right Fork Leg

7. Left Fork Leg

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

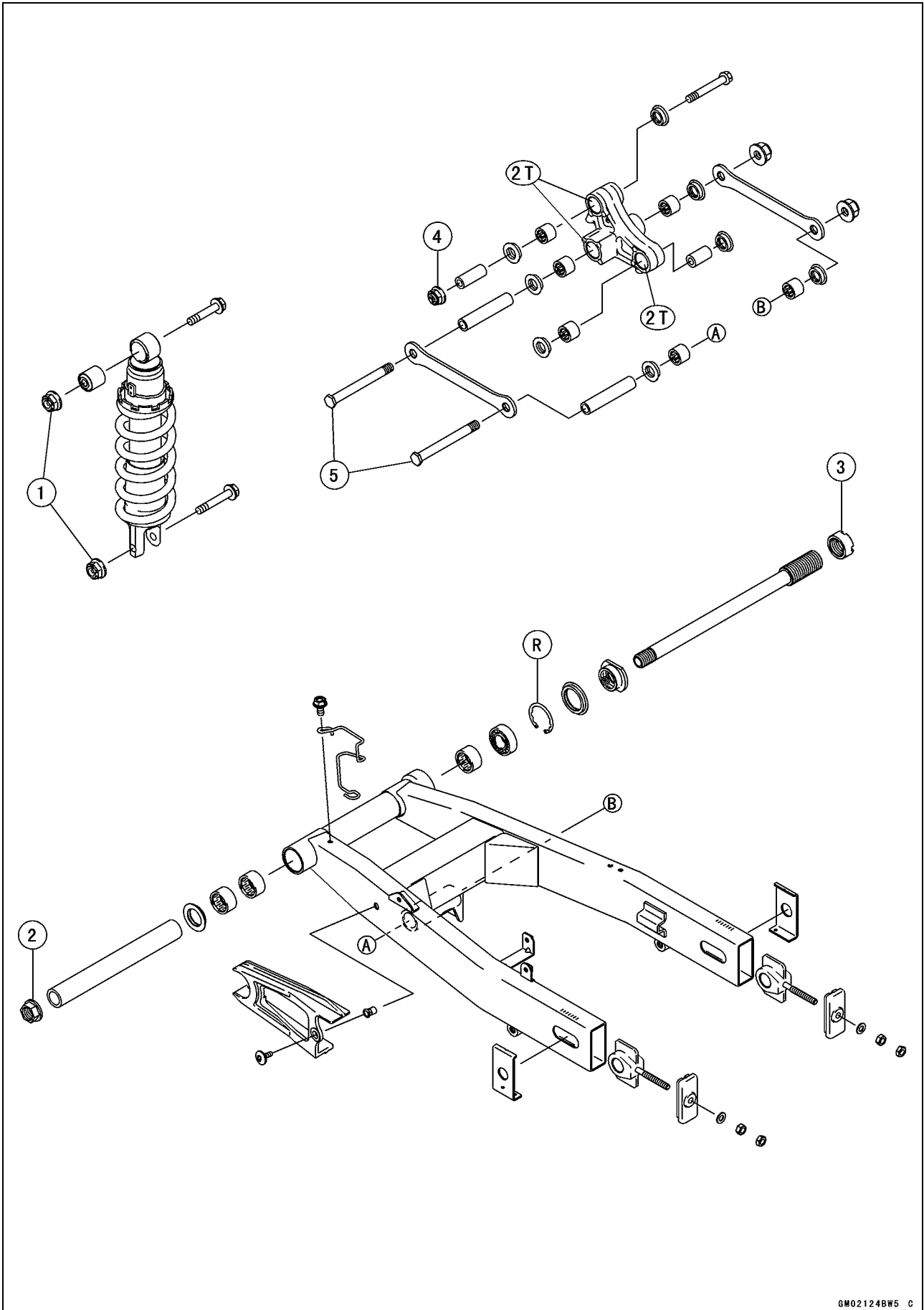
G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

# 13-4 SUSPENSION

## Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Rear Shock Absorber Nuts (Upper and Lower)	34	3.5	25	
2	Swingarm Pivot Shaft Nut	108	11	80	
3	Swingarm Pivot Shaft Locknut	98	10	72	
4	Rocker Arm Nut	34	3.5	25	
5	Tie-rod Bolts	59	6.0	43	

R: Replacement Parts

2T: Apply 2cycle Oil.

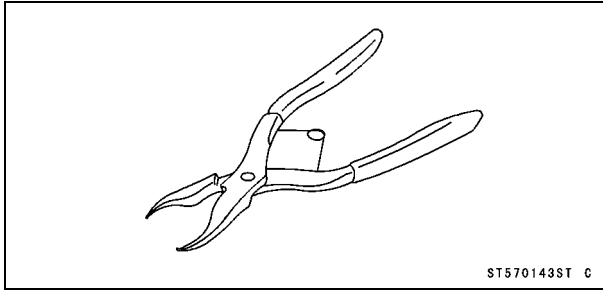
## 13-6 SUSPENSION

### Specifications

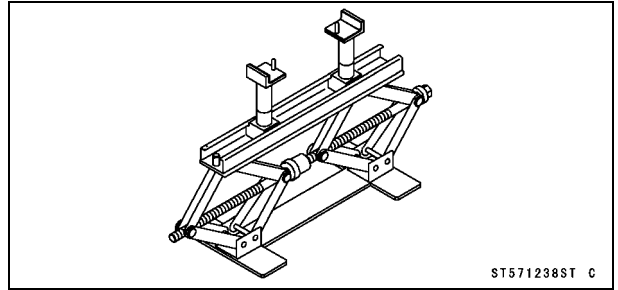
Item	Standard
<b>Front Fork (Per One Unit)</b>	
Fork Inner Tube Outside Diameter	41 mm (1.61 in.)
Air Pressure	Atmospheric pressure (Non-adjustable)
Fork Spring Setting	Non-adjustable
Damper Setting	Non-adjustable
Fork Oil Viscosity	KAYABA KHL34-G10 or equivalent
Fork Oil Capacity	465 ±4 mL (15.7 ±0.135 US oz) (Completely dry)
Fork Oil Level	approx. 395 mL (13.4 US oz) (when changing oil)
Fork Oil Level	105 ±2 mm (4.13 ±0.08 in.) below from inner tube top with fully compressed, without fork spring
Fork Spring Free Length	319.2 mm (12.57 in.) (Service limit 313 mm (12.3 in.))
<b>Rear Shock Absorber</b>	
Rebound Damping Force	Number 2 (Adjustable Range: Number 1 ~ 4)
Spring Preload	4th position (Adjustable Range: 1st ~ 7th position)
Gas Pressure	980 kPa (10 kgf/cm <sup>2</sup> , 142 psi, Non-adjustable)

**Special Tools**

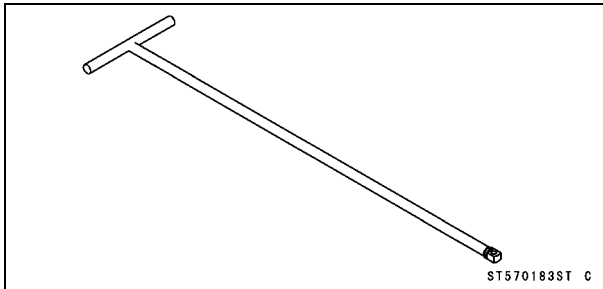
**Inside Circlip Pliers:**  
57001-143



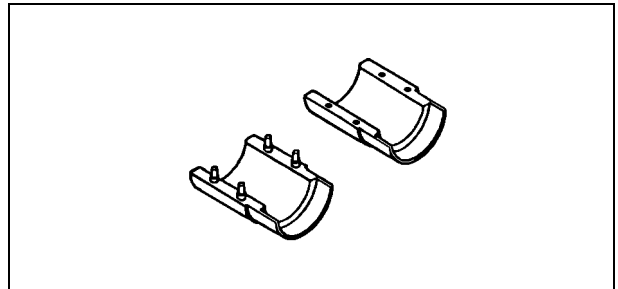
**Jack:**  
57001-1238



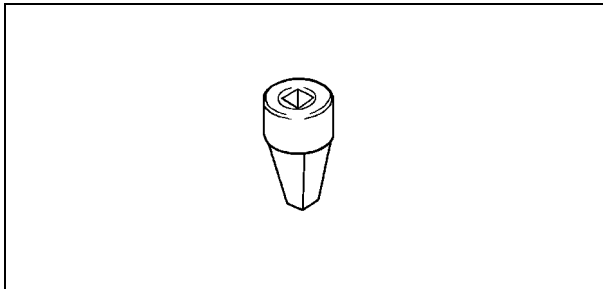
**Fork Cylinder Holder Handle:**  
57001-183



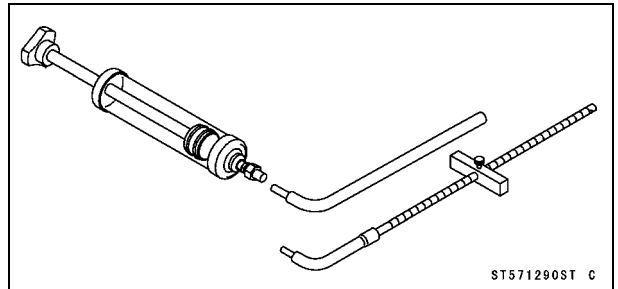
**Fork Oil Seal Driver,  $\phi 41$ :**  
57001-1288



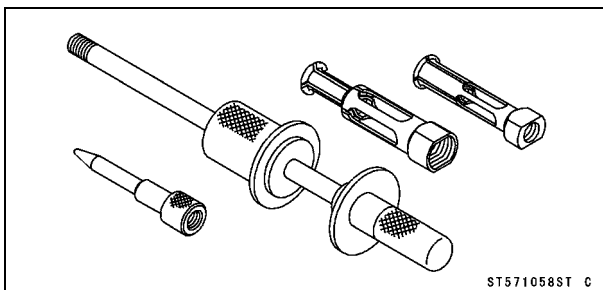
**Fork Cylinder Holder Adapter:**  
57001-1057



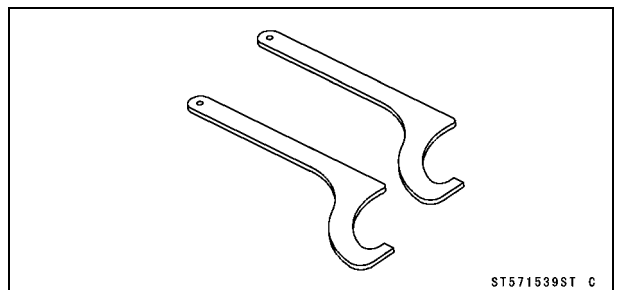
**Fork Oil Level Gauge:**  
57001-1290



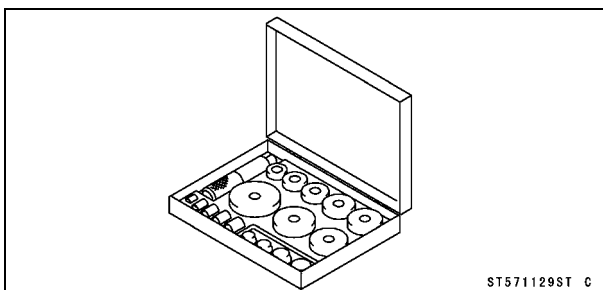
**Oil Seal & Bearing Remover:**  
57001-1058



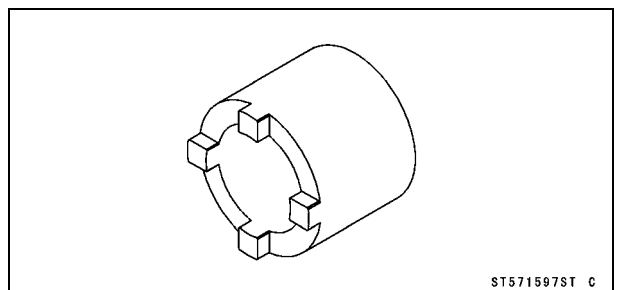
**Hook Wrench T=3.2 R37:**  
57001-1539



**Bearing Driver Set:**  
57001-1129



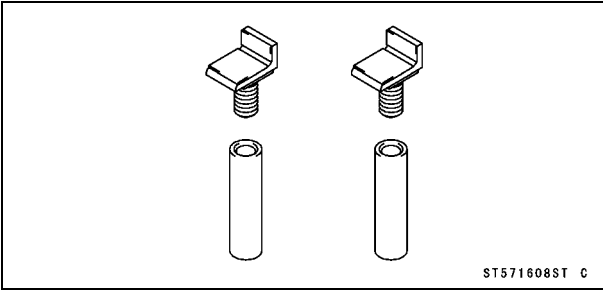
**Swingarm Pivot Nut Wrench:**  
57001-1597



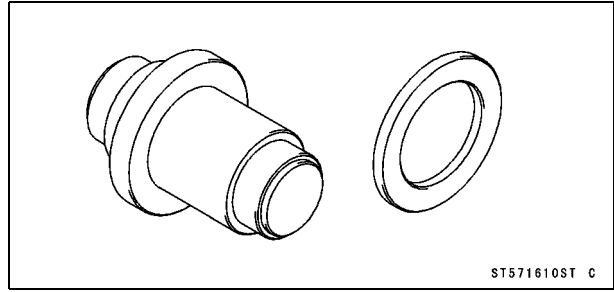
# 13-8 SUSPENSION

## Special Tools

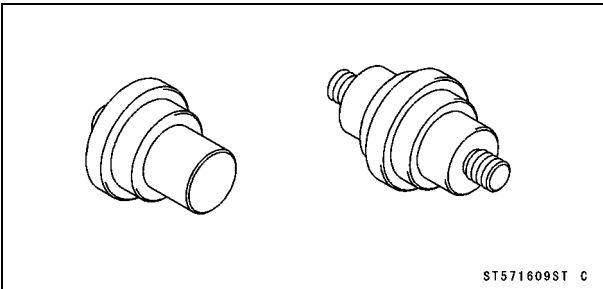
**Jack Attachment:**  
**57001-1608**



**Stem Bearing Driver,  $\phi 28$ :**  
**57001-1610**



**Needle Bearing Driver,  $\phi 17/\phi 18$ :**  
**57001-1609**



## Front Fork

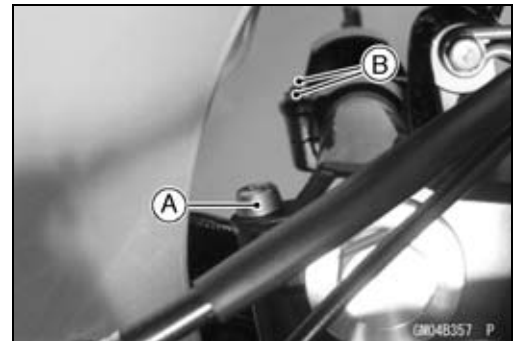
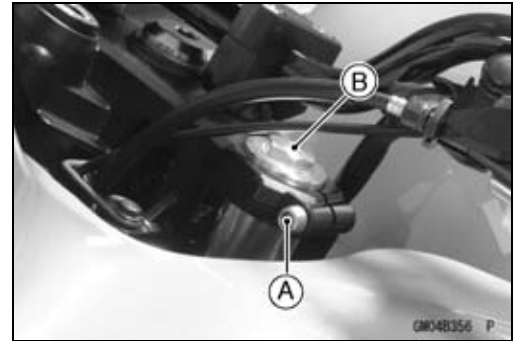
### Front Fork Removal

- Remove:
  - Front Wheel (see Tires/Wheels chapter)
  - Front Fender (see Frame chapter)
- ★ Loosen the upper fork clamp bolt [A] and fork top plug before-hand if the fork leg is to be disassembled.

#### NOTE

- Loosen the top plug [B] after loosening the upper fork clamp bolt.

- Loosen the upper fork clamp bolt [A] and lower fork clamp bolts [B].
- With a twisting motion, work the fork leg down and out.



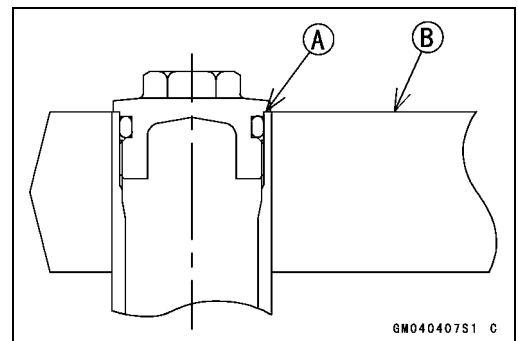
### Front Fork Installation

- Install the fork with the upper end of the inner tube flush [A] against the top surface of the stem head [B].
- Tighten:
  - Torque - Front Fork Clamp Bolts (Lower): 20 N·m (2.0 kgf·m, 14 ft·lb)**
  - Front Fork Top Plug: 25 N·m (2.5 kgf·m, 18 ft·lb)**

#### NOTE

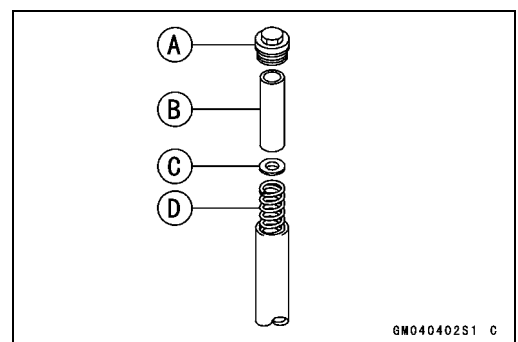
- Tighten the top plug before tightening the upper fork clamp bolt.
- Tighten the two clamp bolts alternately two times to ensure even tightening torque.

- Tighten:
  - Torque - Front Fork Clamp Bolt (Upper): 20 N·m (2.0 kgf·m, 14 ft·lb)**
- Install the removed parts (see appropriate chapters).



### Front Fork Oil Change

- Remove the front fork (see Front Fork Removal).
- Remove:
  - Top Plug [A]
  - Collar [B]
  - Fork Spring Seat [C]
  - Fork Spring [D]



## 13-10 SUSPENSION

### Front Fork

- Compress [B] the fork [A] upside down to draw out the oil into the suitable container [C].
- Pour in the specified amount of oil.

**Fork Oil Viscosity:** KAYABA KHL34-G10 or equivalent

**Capacity (when changing oil):** 395 mL (13.4 US oz.)

#### NOTE

○ Move the outer tube up and down a few times to remove the air that is trapped in the fork oil in order to stabilize the oil level.

- Hold the outer tube vertically in a vise and compress the fork completely.
- Wait until the oil level stabilizes.
- Use the fork oil level gauge [A] to measure the distance between the top of the inner tube to the oil level.

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

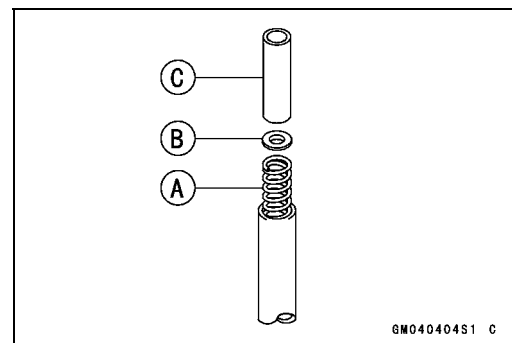
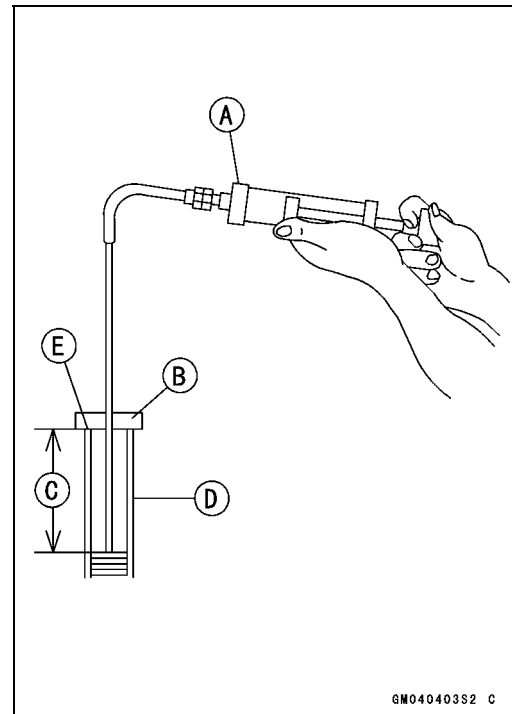
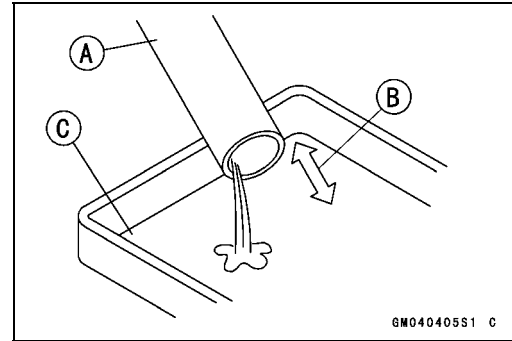
- Set the oil level gauge stopper [B] so that the distance [C] from the bottom of the stopper to the lower end of the pipe is the standard oil level distance.
- A correct measurement can not be obtained unless the level gauge pipe is placed in the center of the inner tube.

**Oil Level (fully compressed, without spring)**

**Standard:** 105 ±2 mm (4.13 ±0.08 in.)

- Place the stopper of the level gauge at the top [E] of the inner tube [D] and pull the handle slowly to draw out the excess oil from fork into the gauge, thus attaining the standard level.
- If not oil is drawn out, there is not enough oil in the fork. Pour in some more oil and measure again.

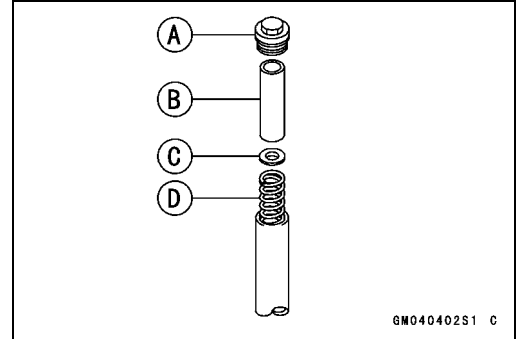
- Repeat the same procedure for adjusting the other fork.
- Install the fork spring [A], fork spring seat [B] and collar [C].
- Inspect the top plug O-ring and replace it with a new one.
- Install the front fork (see Front Fork Installation).



**Front Fork**

*Front Fork Disassembly*

- Remove the front fork (see Front Fork Removal).
- Remove the top plug [A] with O-ring, take out the collar [B], spring seat [C], and spring [D].
- Drain the fork oil (see Front Fork Oil Change).

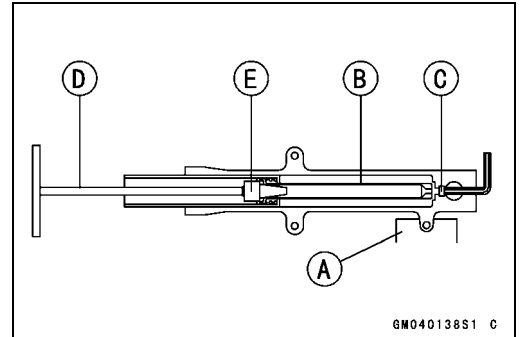


- Remove the Allen bolt [C] from the bottom of the fork.

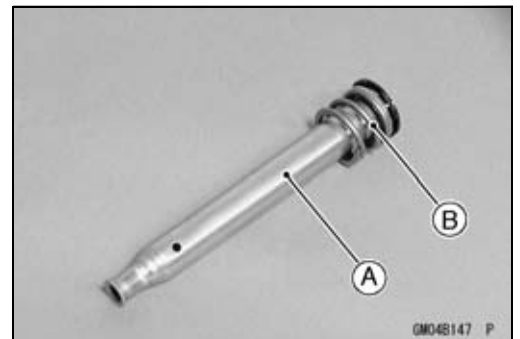
**Special Tools - Fork Cylinder Holder Handle: 57001-183 [D]  
Fork Cylinder Holder Adapter: 57001-1057 [E]**

**NOTE**

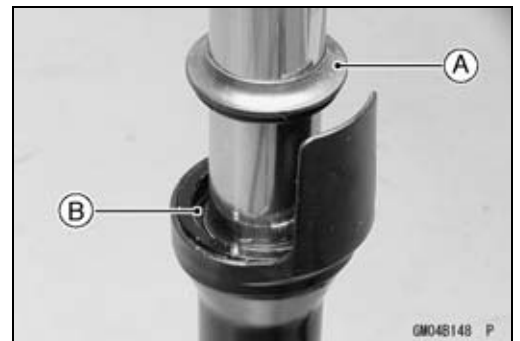
○ Hold the outer tube in a vise [A], stop the cylinder unit [B] from turning by using the special tools, and unscrew the Allen bolt.



- Remove the cylinder unit [A], washer, and the spring [B] from the inner tube.



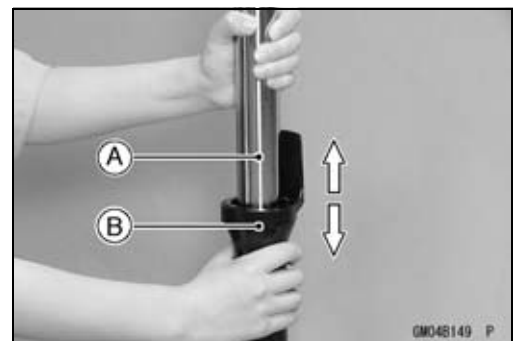
- Remove the following from the top of the outer tube:  
Dust Seal [A]  
Retaining Ring [B]



- Separate the inner tube [A] from the outer tube [B].

**NOTE**

○ From the compressed state, firmly pull down the outer tube a few times towards the direction of elongation.

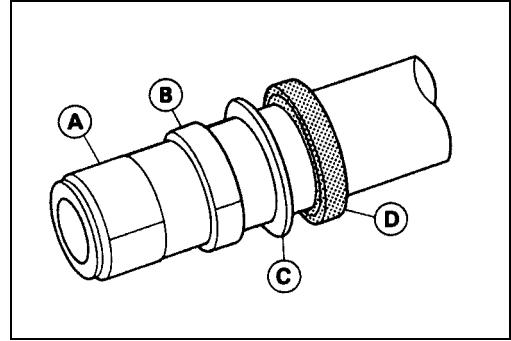


## 13-12 SUSPENSION

### Front Fork

- Remove the following from the inner tube:

- Guide Bushing (inner) [A]
- Guide Bushing (outer) [B]
- Washer [C]
- Oil Seal [D]

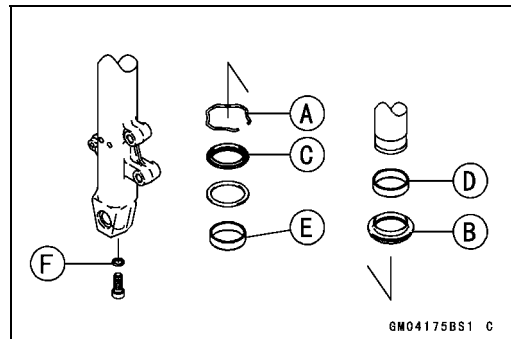


- Remove the cylinder base [A] from the bottom of the outer tube.

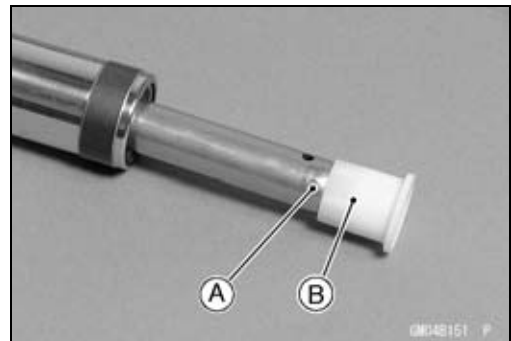


#### Front Fork Assembly

- Check the top plug O-ring and replace it with a new one.
- Replace the following parts with new ones:
  - Retaining Ring [A]
  - Dust Seal [B]
  - Oil Seal [C]
  - Inner Guide Bushing [D]
  - Outer Guide Bushing [E]
  - Fork Bottom Allen Bolt Gasket [F]

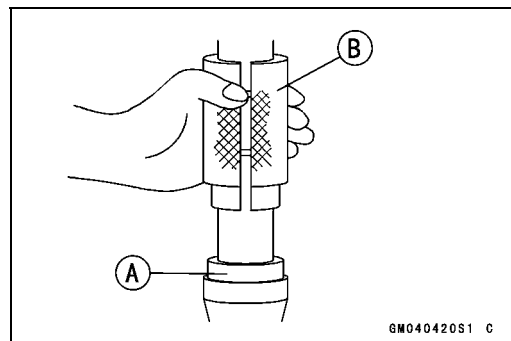


- Install the guide bushing on the end of the inner tube.
- Insert the cylinder unit and the spring into the inner tube, and install the cylinder base [B] onto the cylinder end [A] that protrudes from the bottom.
- Install the cylinder base starting with its stepped end.
- Insert the inner tube, cylinder unit, washer, spring, and cylinder base as a set into the outer tube.



- Install the guide bushing into the outer tube.
- After installing the washer, install the oil seal [A] by using the fork oil seal driver [B].

**Special Tool - Fork Oil Seal Driver,  $\phi 41$ : 57001-1288**



- Apply high-temperature grease to the oil seal lips.
- Install the retaining ring into the outer tube.
- Install the dust seal by hand.



## Front Fork

- Apply non-permanent locking agent to the threads of the bottom Allen bolt [C].
- Hold the front fork horizontally in a vise [A].
- Hold the cylinder unit [B] with the special tools and tighten the bottom Allen bolt to secure the cylinder in place.

**Torque - Front Fork Bottom Allen Bolt: 30 N·m (3.1 kgf·m, 22 ft·lb)**

**Special Tools - Fork Cylinder Holder Handle: 57001-183 [D]  
Fork Cylinder Holder Adapter: 57001-1057 [E]**

- Pour in the specified type of oil (see Front Fork Oil Change).

### Inner Tube/Outer Tube Inspection

- Visually inspect the inner tube [A] and repair any nicks or rust by using an oil stone.
- ★ If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal slip, replace the oil seal whenever the inner tube is repaired or replaced.

### CAUTION

**If the inner tube is badly nicked or bent, replace it. Excessive bending, followed by subsequent straightening, can weaken the inner tube.**

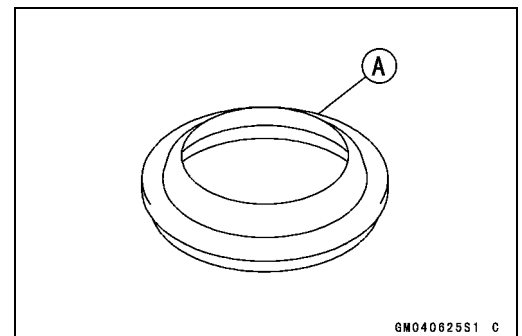
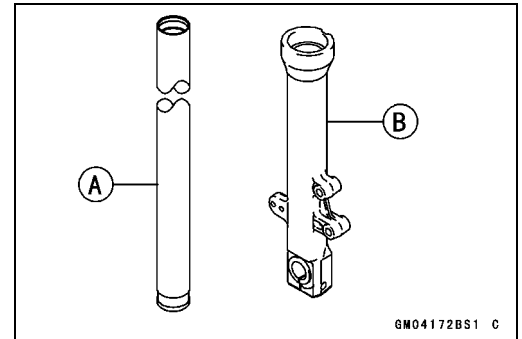
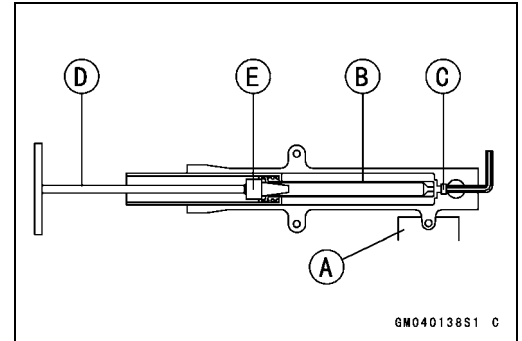
- Place the inner tube in the outer tube [B] and pump them back and forth manually to check for smooth operation.
- ★ If the movement is not smooth, replace both the inner tube and the outer tube.

### ⚠ WARNING

**Replace the inner and outer tubes with new ones if they are bent because it is dangerous to use them by repairing them.  
Make sure to inspect the inner and outer tubes of the other side.**

### Dust Seal Inspection

- Inspect the dust seal [A] for any signs of deterioration or damage.
- ★ Replace it if necessary.



## 13-14 SUSPENSION

### Front Fork

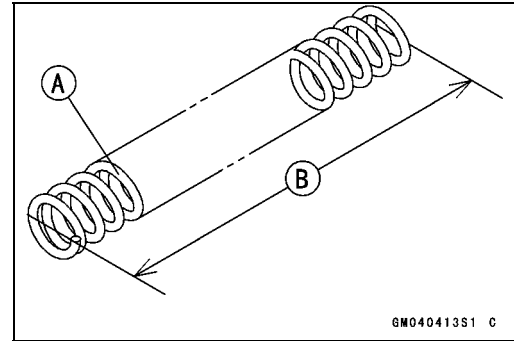
#### *Fork Spring Inspection*

- Measure the free length [B] of the fork spring [A].
- ★ If the measured length is shorter than the service limit, the spring must be replaced. If the free length of the replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced to ensure stability.

#### **Fork Spring Free Length**

**Standard:** 319.2 mm (12.57 in.)

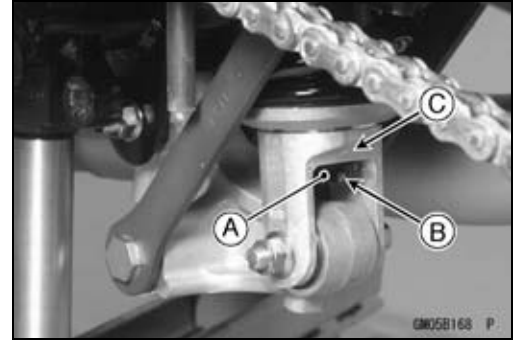
**Service Limit:** 313 mm (12.3 in.)



**Rear Shock Absorber**

*Rebound Damping Force Adjustment*

- Turn the damper adjuster [A] to adjust the rebound damping.
- Align the numbered mark [B] of the adjuster to the position mark [C].
- The standard adjuster setting for average-build rider of 68 kg (150 lb) with no passenger and no accessories is position "2".
- ★ If the damper's effectiveness is not suited to the operating conditions, adjust it to an appropriate position by referring to the table below.



**Rebound Damping Adjustment**

Adjuster Position	Damping Force	Shock Absorber Hardness	Load	Road Conditions	Driving Speed
1	Weak	Soft	Light	Good	Street
2	↑	↑	↑	↑	↑
3	↓	↓	↓	↓	↓
4	Strong	Hard	Heavy	Bad	Highway

*Spring Preload Adjustment*

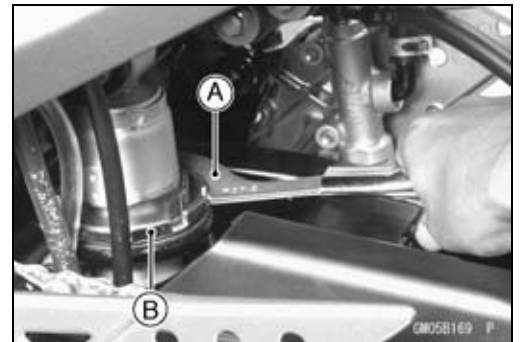
- Using the hook wrench [A], turn the adjusting nut [B] to adjust the spring preload.
- The standard adjuster setting for average-build rider of 68 kg (150 lb) with no passenger and no accessories is 4th position.

**Spring Preload Setting**

**Standard Position: 4th position**

**Adjustable Range: 1st to 7th position**

- If the compression of the spring is not suited to the operating conditions, adjust it to an appropriate position by referring to the table below.



**Spring Preload Adjustment**

Adjuster Position	Damping Force	Shock Absorber Hardness	Load	Road Conditions	Driving Speed
1st	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
↓	↓	↓	↓	↓	↓
7th	Strong	Hard	Heavy	Bad	Highway

## 13-16 SUSPENSION

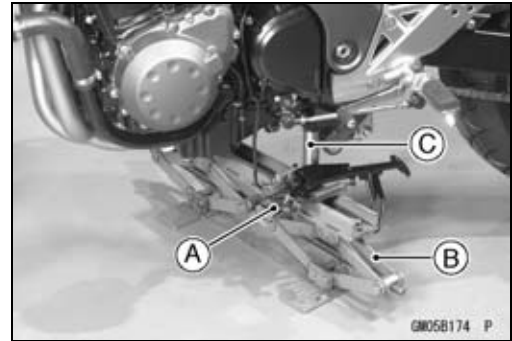
### Rear Shock Absorber

#### Rear Shock Absorber Removal

- Remove the side stand bracket [A].
- Using the jack [B] and attachment [C], raise the rear wheel off the ground.

Special Tool - Jack: 57001-1238

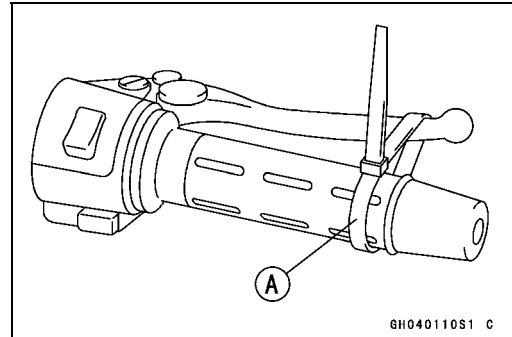
Jack Attachment: 57001-1608



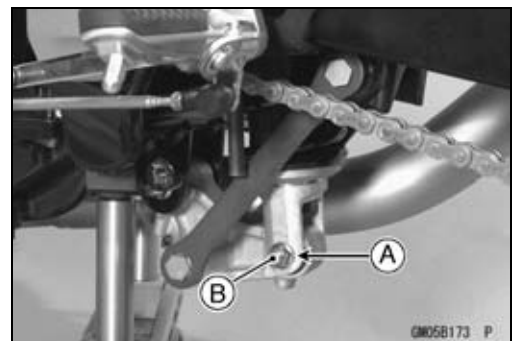
- Squeeze the brake lever slowly and hold it with a band [A].

#### **⚠ WARNING**

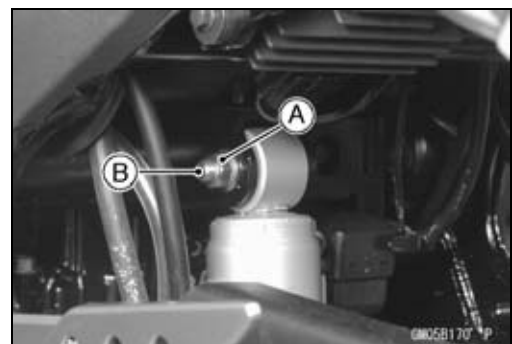
Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. It could cause an accident and injury.



- Remove:  
Lower Shock Absorber Nut [A]  
Lower Shock Absorber Bolt [B]



- Remove:  
Upper Shock Absorber Nut [A]  
Upper Shock Absorber Bolt [B]



- Remove the shock absorber [A] from upside.

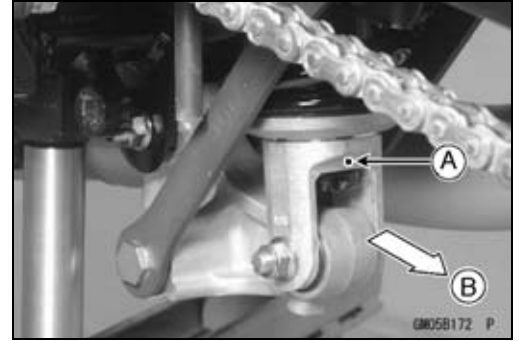


## Rear Shock Absorber

### *Rear Shock Absorber Installation*

- Install the rear shock absorber so that the warning label and position marked [A] side faces backward [B].
- Tighten:
  - Temporary install the bolts and nuts.
  - Touch the rear wheel on the ground.
  - Tighten the nuts.

**Torque - Rear Shock Absorber Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)**



### *Rear Shock Absorber Inspection*

- Remove the rear shock absorber.
- Visually inspect the following items.
  - Smooth Stroke
  - Oil Leakage
  - Crack or Dent
- ★ If there is any damage to the rear shock absorber, replace it.
- Visually inspect the rubber bushing.
- ★ If it show any signs of damage, replace it.

## 13-18 SUSPENSION

### Swingarm

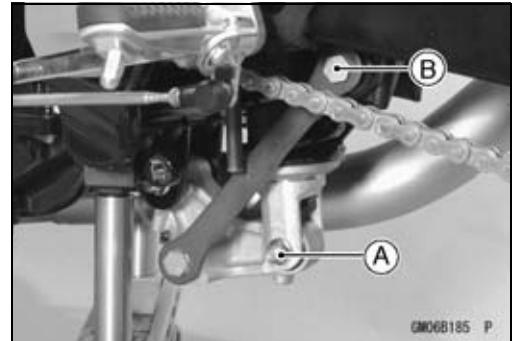
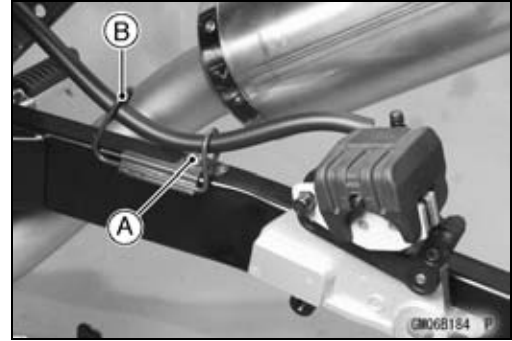
#### Swingarm Removal

- Raise the rear wheel off the ground with jack (see Rear Shock Absorber Removal).

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

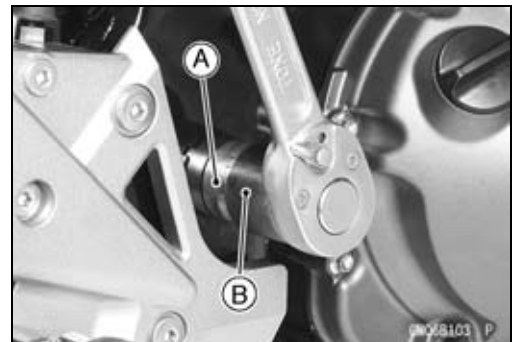
**Jack Attachment: 57001-1608**

- Remove:
  - Chain Cover (see Final Drive chapter)
  - Brake Hose Clamp Screw [A]
  - Brake Hose Clamp [B]
  - Rear Wheel (see Wheels/Tires chapter)
- Remove:
  - Lower Shock Absorber Nut and Bolt [A]
  - Upper Tie-rod Nut and Bolt [B]

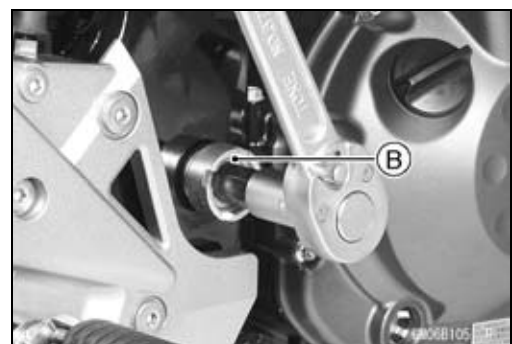
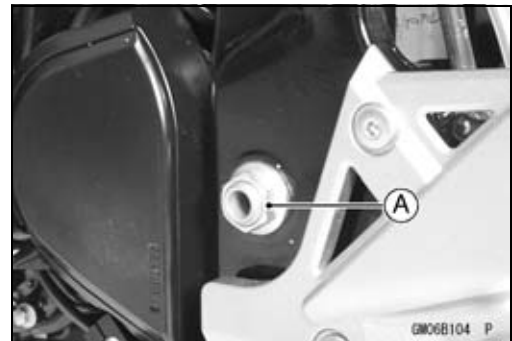


- Remove the both frame cover (see Frame chapter).
- Unscrew the swingarm pivot locknut [A], using the nut wrench [B].

**Special Tool - Swingarm Pivot Nut Wrench: 57001-1597**



- Unscrew the swingarm pivot nut [A] and loosen the swingarm pivot shaft [B].
- Pull off the pivot shaft and remove the swingarm.



## Swingarm

### Swingarm Installation

- Place the collar [A] on the stopper [B] inside the frame [C].
- Insert the pivot shaft into the frame from the right side.
- Tighten the pivot shaft so that the clearance [D] between the collar and the frame comes to 0 mm.

- Tighten:

**Torque - Swingarm Pivot Shaft Nut: 108 N·m (11 kgf·m, 80 ft·lb)**

- Tighten the pivot locknut, using the socket wrench.

**Special Tool - Swingarm Pivot Nut Wrench: 57001-1597**

**Torque - Swingarm Pivot Shaft Locknut: 98 N·m (10 kgf·m, 72 ft·lb)**

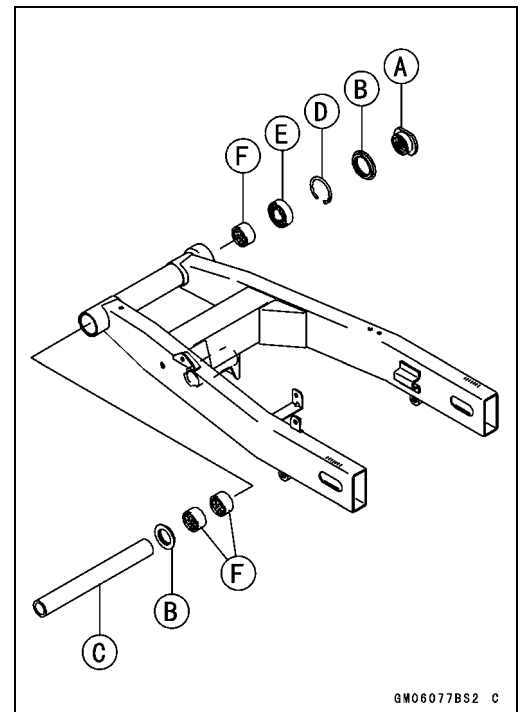
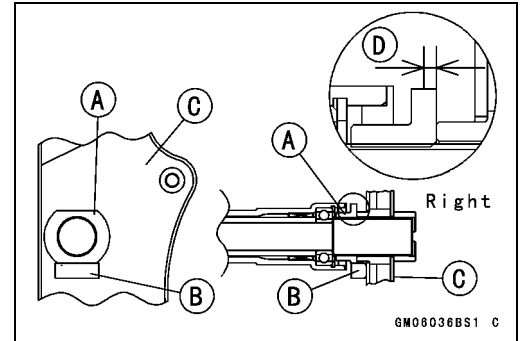
- Install the removed parts (see appropriate chapters).

### Swingarm Bearing Removal

- Remove:

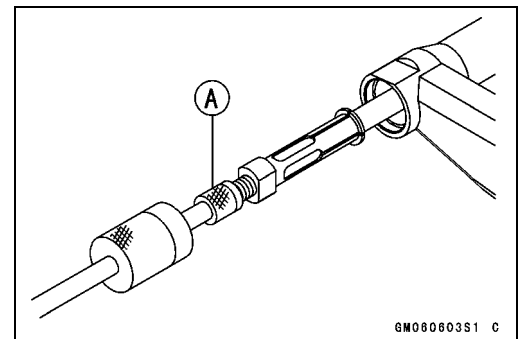
- Swingarm
- Collar [A]
- Grease Seals [B]
- Sleeve [C]
- Circlip (right side) [D]
- Ball Bearing [E]
- Needle Bearings [F]

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



- Remove the ball bearing and needle bearings.

**Special Tool - Oil Seal & Bearing Remover: 57001-1058 [A]**

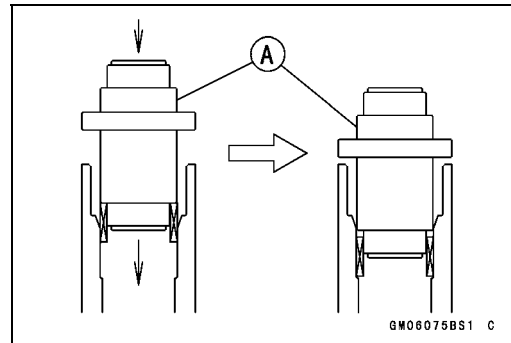


## 13-20 SUSPENSION

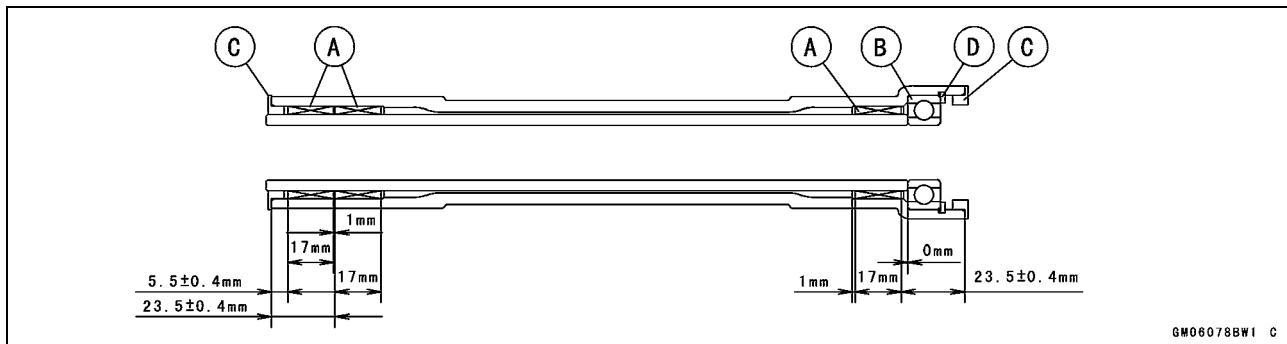
### Swingarm

#### Swingarm Bearing Installation

- Replace the ball and needle bearings with new ones.
  - Install the needle bearings so that the manufacturer's marks face out.
  - Install the ball bearing so that the manufacturer's marks faces out.
  - Apply Grease:  
Grease Seal Lip
- Special Tool - Bearing Driver Set: 57001-1129**  
**Needle Bearing Driver,  $\phi 28$ : 57001-1610 [A]**



- Install the needle bearings [A], ball bearing [B] and grease seals [C] position as shown.  
Circlip [D]

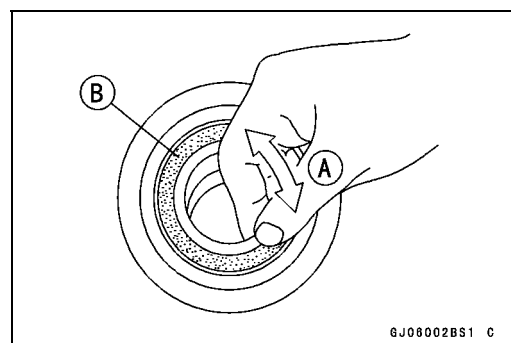
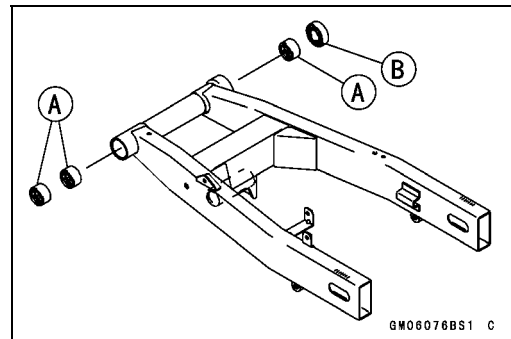


#### Swingarm Bearing, Sleeve Inspection

##### CAUTION

**Do not remove the bearings for inspection. Remove may damage them.**

- Inspect the needle bearings [A] and ball bearing [B] installed in the swingarm.
- The rollers and ball in 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 bearings, and sleeve show any signs of abnormal wear, discoloration, or damage. replace them as a set.
- Turn the ball bearing in the swingarm back and forth [A] while checking for plays, roughness, or binding.
- ★ If the ball 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.



#### Chain Guide Inspection

- Refer to the Chain Guide Wear Inspection in the Periodic Maintenance chapter.



## Swingarm

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### *Swingarm Bearing Lubrication*

**NOTE**

- *Since the bearings are packed with grease, lubrication is not required.*

## 13-22 SUSPENSION

### Tie-rod, Rocker Arm

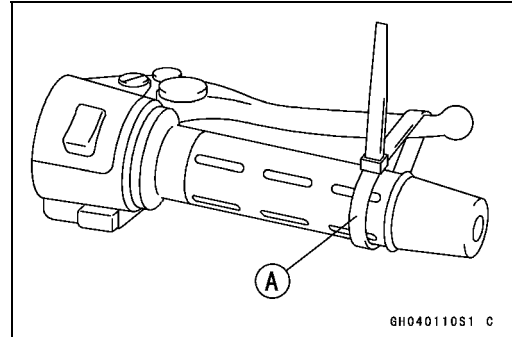
#### *Tie-rod Removal*

- Using the jack and attachment, raise the rear wheel off the ground (see Rear Shock Absorber Removal).

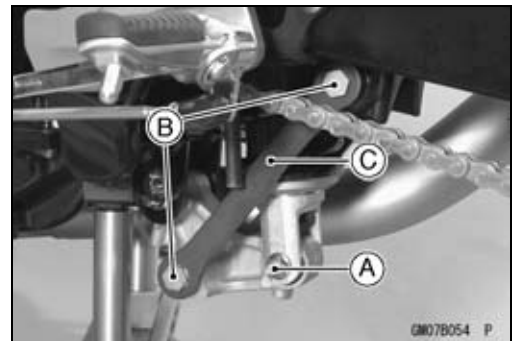
**Special Tool - Jack: 57001-1238**

**Jack Attachment: 57001-1608**

- Squeeze the brake lever slowly and hold it with a band [A].



- Remove:
  - Lower Rear Shock Absorber Bolt and Nut [A]
  - Upper and Lower Tie-rod Nuts and Bolts [B]
  - Tie-rods [C]

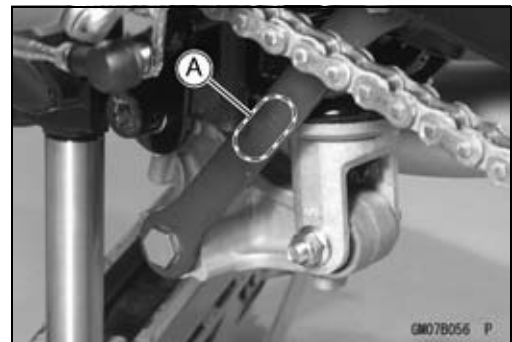


#### *Tie-rod Installation*

- Install the tie-rods so that the marked [A] side faces the bolts and nuts.
- Tighten:
  - Temporary install each bolts and nuts.
  - Touch the rear wheel on the ground.
  - Tighten the nuts.

**Torque - Tie-rod Nuts: 59 N·m (6.0 kgf·m, 43 ft·lb)**

**Rear Shock Absorber Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)**



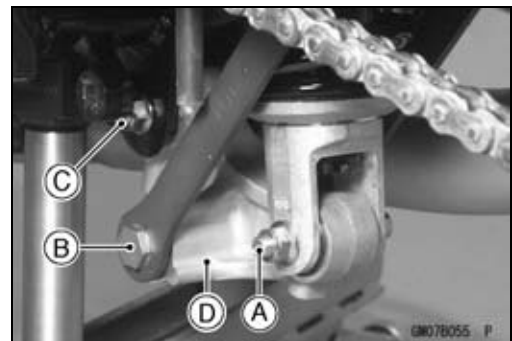
#### *Rocker Arm Removal*

- Using the jack and attachment, raise the rear wheel off the ground (see Rear Shock Absorber Removal).

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

**Jack Attachment: 57001-1608**

- Squeeze the brake lever slowly and hold it with a band.
- Remove:
  - Lower Rear Shock Absorber Nut and Bolt [A]
  - Lower Tie-rod Nut and Bolt [B]
  - Rocker Arm Nut [C] and Bolt
  - Rocker Arm [D]



## Tie-rod, Rocker Arm

### Rocker Arm Installation

- Tighten:
  - Temporary install each bolts and nuts.
  - Touch the rear wheel on the ground.
  - Tighten the nuts.

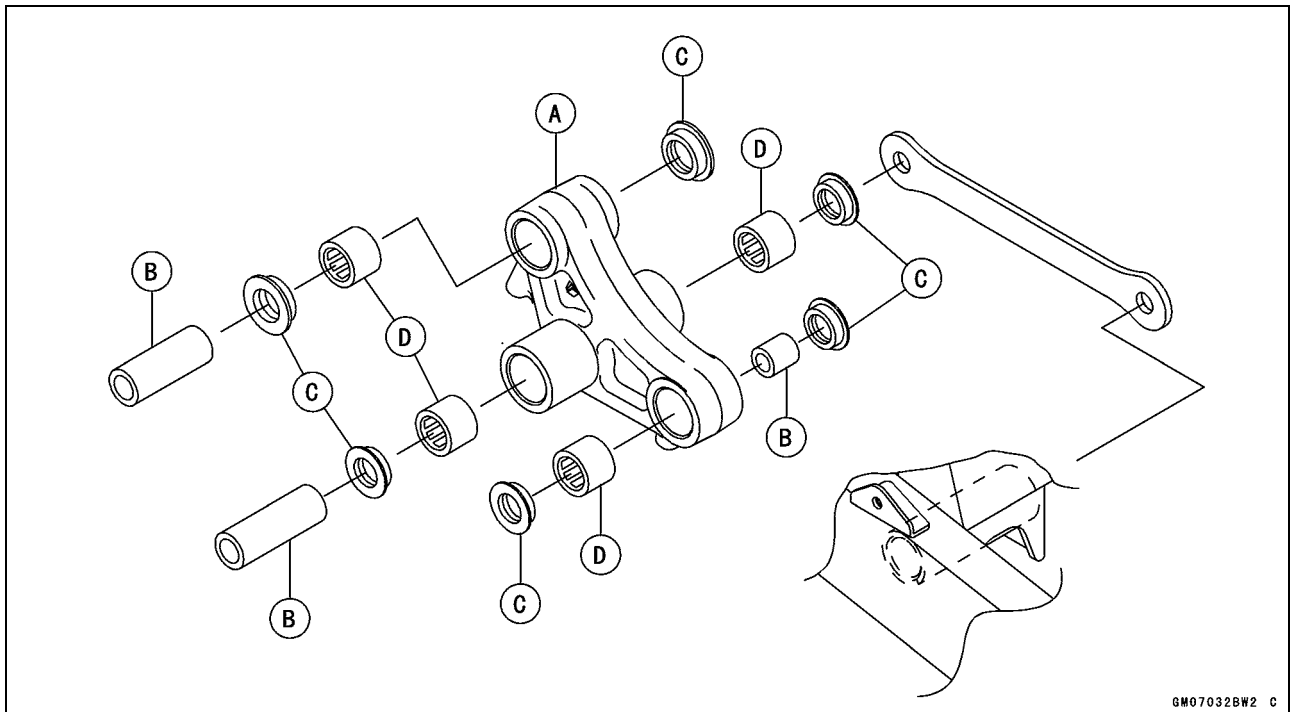
**Torque - Rocker Arm Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)**

**Tie-rod Nut: 59 N·m (6.0 kgf·m, 43 ft·lb)**

**Rear Shock Absorber Nut: 34 N·m (3.5 kgf·m, 25 ft·lb)**

### Tie-rod and Rocker Arm Bearing Removal

- Remove:
  - Tie-rods (see Tie-rod Removal)
  - Rocker Arm [A] (see Rocker Arm Removal)
  - Sleeves [B]
  - Oil Seal [C]
- Remove the needle bearings [D], using the bearing remover head and bearing remover shaft.



GM07032BW2 C

### Tie-rod and Rocker Arm Bearing Installation

- Replace the needle bearing, and oil seals with new ones.
- Apply plenty of grease to the lips of the oil seals.
- Install the needle bearings, and oil seals position as shown.

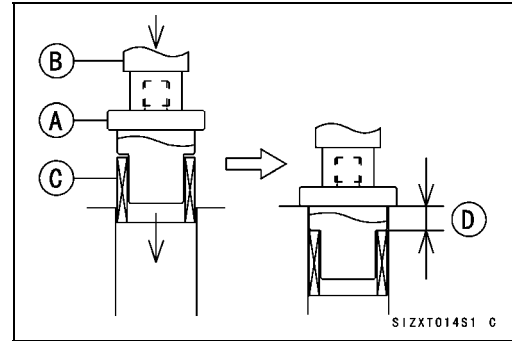
# 13-24 SUSPENSION

## Tie-rod, Rocker Arm

- Screw the needle bearing driver [A] into the driver holder [B].
- Insert the needle bearing driver into the needle bearing [C] and press the needle bearing into the housing until the driver contacts the end surface of the housing.  
Bearing's Pressing Depth [D]

### NOTE

- For a bearing of inner diameter  $\phi 18$ , select the pressing side of the needle bearing driver according to its pressing depth.



Special Tools - Bearing Driver Set: 57001-1129

Needle Bearing Driver,  $\phi 17/\phi 18$ : 57001-1609

### NOTE

- Install the needle bearings so that the marked side faces out.

Needle Bearing [A]

Oil Seals [B]

Front [C]

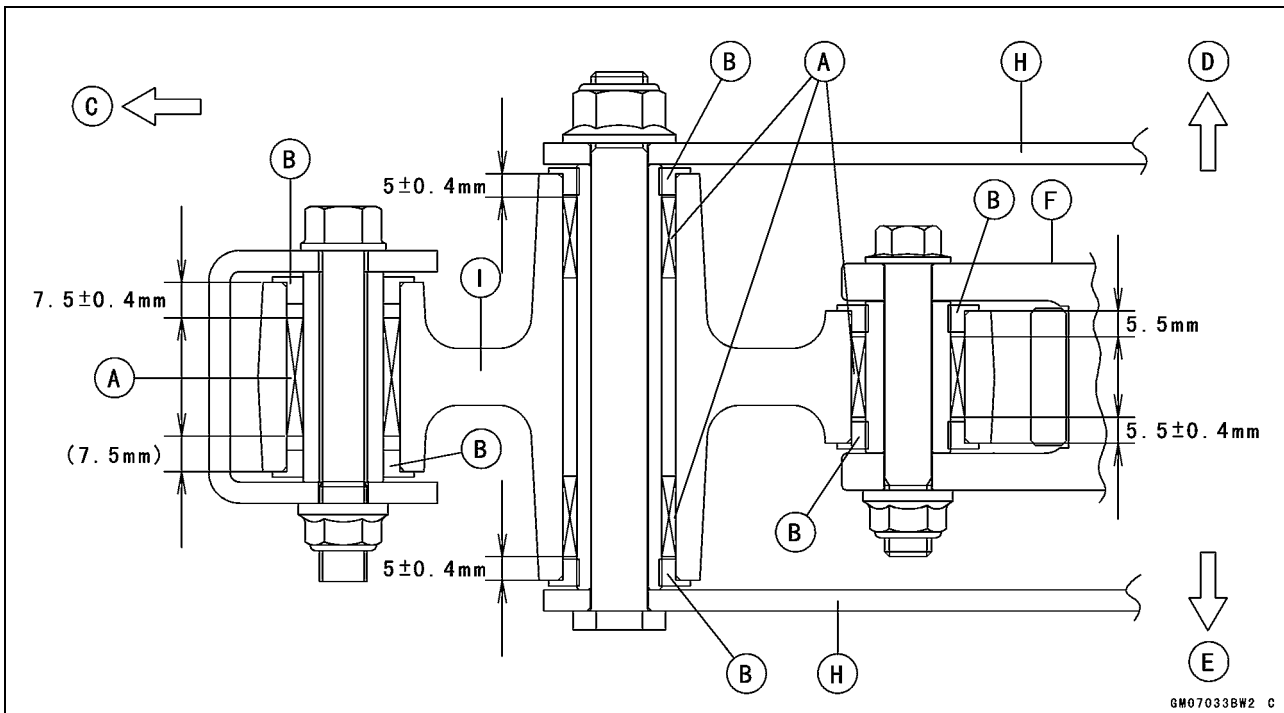
Right Side [D]

Left Side [E]

Rear Shock Absorber [F]

Tie-rod [H]

Rocker Arm [I]



## Tie-rod, Rocker Arm

### *Rocker Arm/Tie-rod Bearing, Sleeve Inspection*

#### **CAUTION**

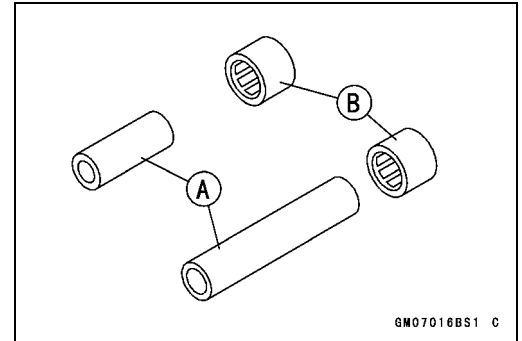
**Do not remove the bearings for inspection. Removal may damage them.**

- Visually inspect the locker arm, or tie-rod sleeves [A] and needle bearings [B].
- The rollers in a needle bearing normally wear very little, and wear is difficult to measure. Instead of measuring, inspect the bearing for abrasion, color change, or other damage.
- ★ If there is any doubt as to the condition of any of the needle bearings or sleeve, replace the sleeve, and needle bearings as a set.

### *Rocker Arm/Tie-rod Bearing Lubrication*

#### **NOTE**

- Since the bearings are packed with grease, lubrication is not required.





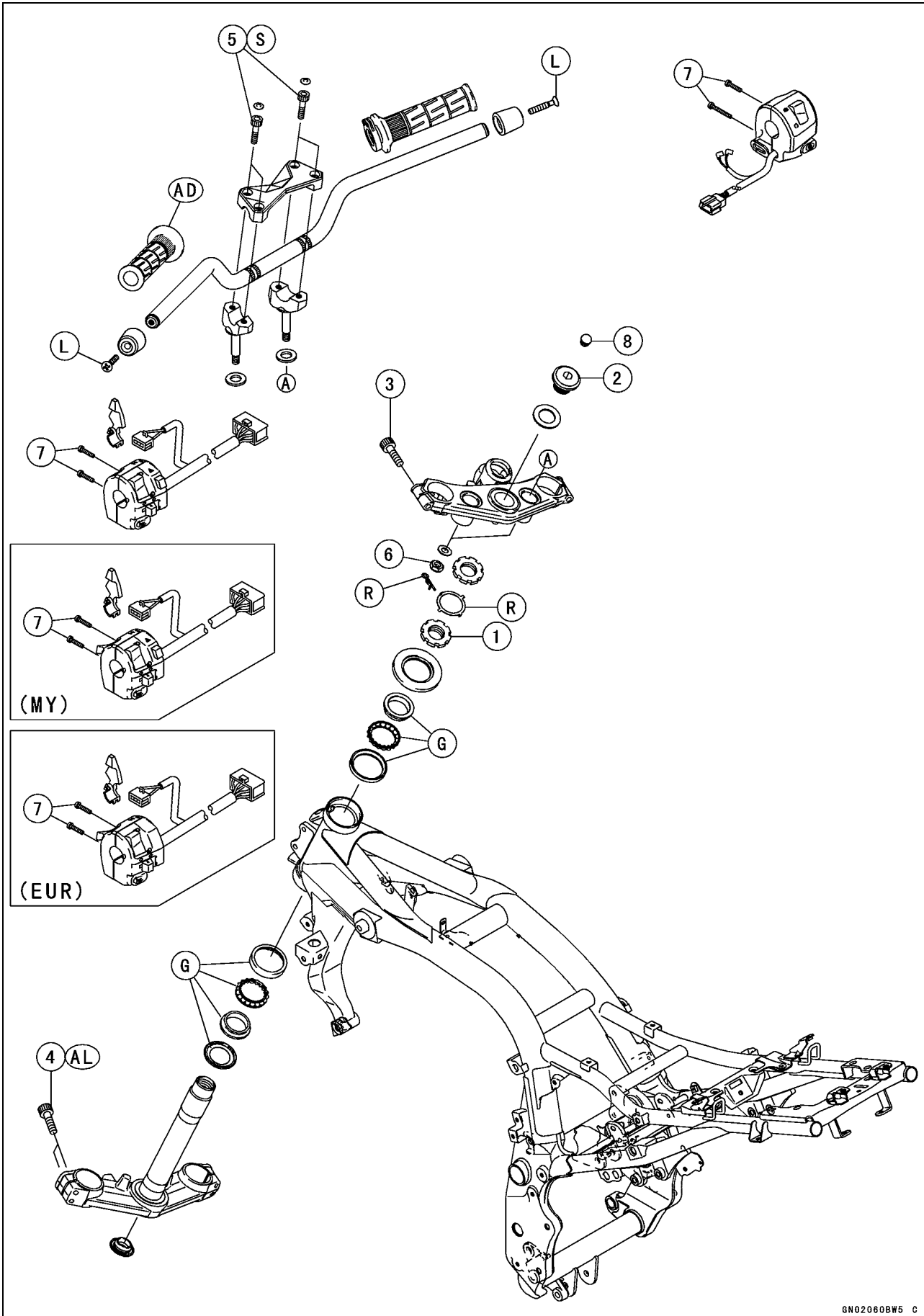
# Steering

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# 14-2 STEERING

## Exploded View





**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Steering Stem Nut	27	2.8	20	
2	Steering Stem Head Bolt	108	11	80	
3	Front Fork Clamp Bolts (Upper)	20	2.0	14	
4	Front Fork Clamp Bolts (Lower)	20	2.0	14	AL
5	Handlebar Clamp Bolts	25	2.5	18	S
6	Handlebar Lower Clamp Nuts	34	3.5	25	
7	Switch Housing Screws	3.5	0.36	31 in·lb	

8. Steering Stem Head Bolt Plug

AD: Apply adhesive.

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

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

S: Follow the specific tightening sequence.

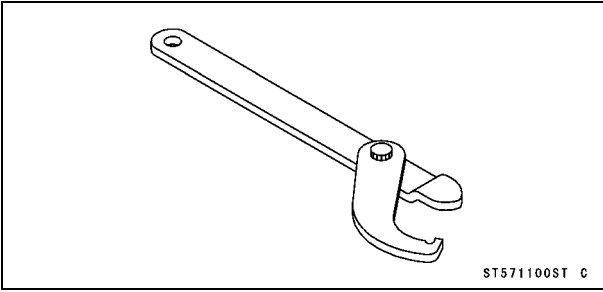
EUR: Europe Model

MY: Malaysia Model

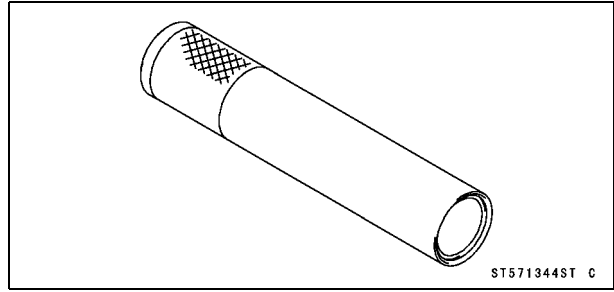
# 14-4 STEERING

## Special Tools

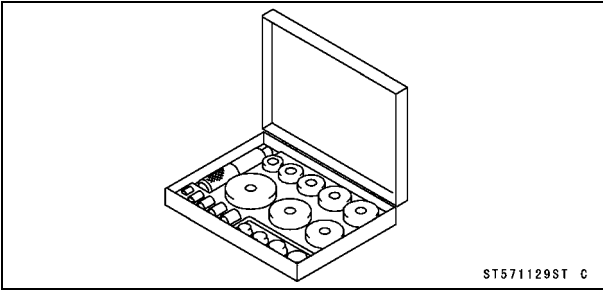
**Steering Stem Nut Wrench:**  
57001-1100



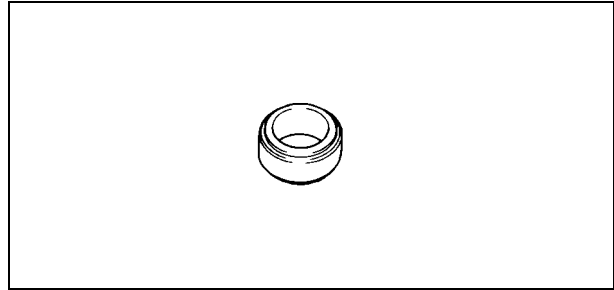
**Steering Stem Bearing Driver,  $\phi 42.5$ :**  
57001-1344



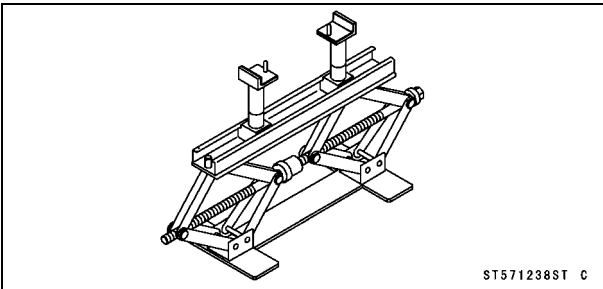
**Bearing Driver Set:**  
57001-1129



**Steering Stem Bearing Driver Adapter,  $\phi 41.5$ :**  
57001-1345



**Jack:**  
57001-1238



**Steering**

---

*Steering Inspection*

- Refer to the Steering Play Inspection in the Periodic Maintenance chapter.

*Steering Adjustment*

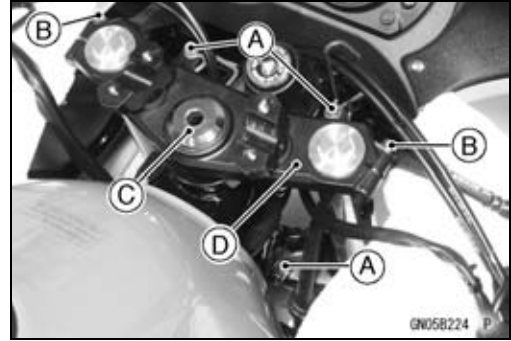
- Refer to the Steering Play Adjustment in the Periodic Maintenance chapter.

## 14-6 STEERING

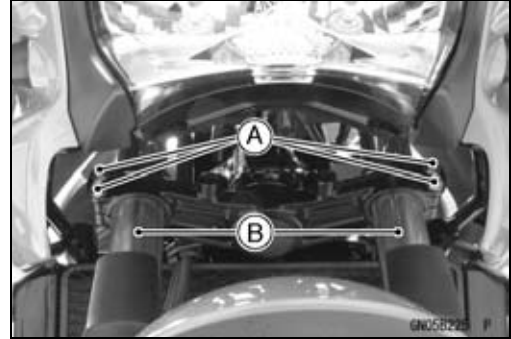
### Steering Stem

#### Stem, Stem Bearing Removal

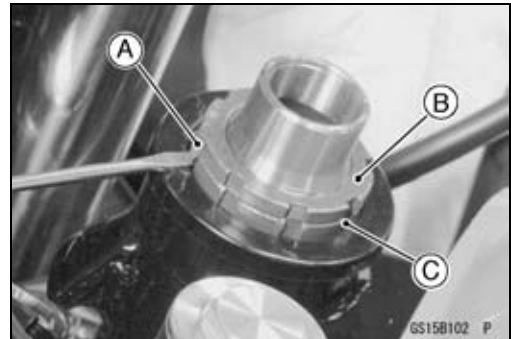
- Remove:
  - Front Wheel (see Front Wheel Removal in the Wheels/Tires chapter)
  - Handlebar (see Handlebar Removal in the this chapter)
  - Steering Stem Head Bolt Plug.
  - Clamp Bolts [A]
  - Upper Front Fork Clamp Bolts [B] (Loosen)
  - Steering Stem Head Bolt [C] and Washer
  - Steering Stem Head [D]



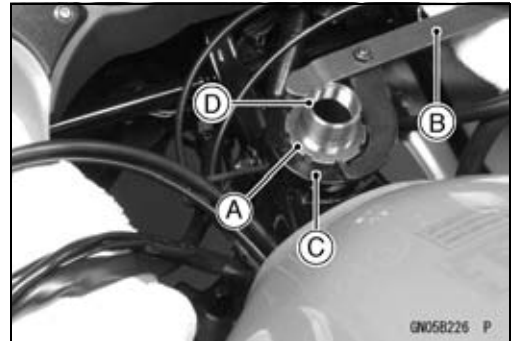
- Remove:
  - Lower Front Fork Clamp Bolts [A] (Loosen)
  - Front Fork [B] with Front Fender



- Straighten the claws [A] of the claw washer.
- Remove the steering stem locknut [B] and claw washer [C].



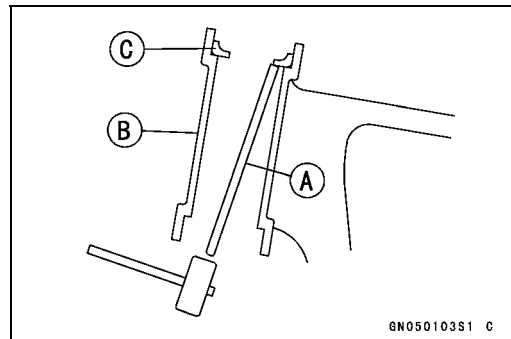
- Pushing up the stem base, and remove the steering stem nut [A] with stem cap [C].
  - Special Tool - Steering Stem Nut Wrench: 57001-1100 [B]**
- Remove the steering stem [D] under side.
- Remove the upper stem bearing inner race and bearing.



- To remove the bearing outer races [C] pressed into the head pipe [B], insert a bar [A] into the recesses of head pipe, and applying it to both recess alternately hammer it to drive the race out.

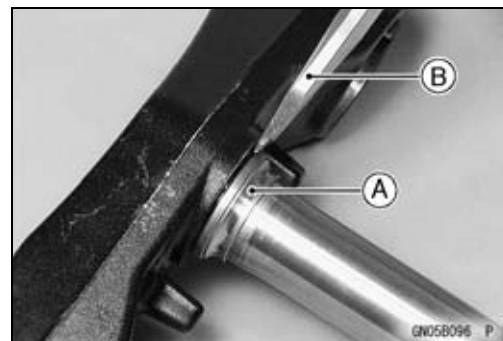
#### NOTE

*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.*



## Steering Stem

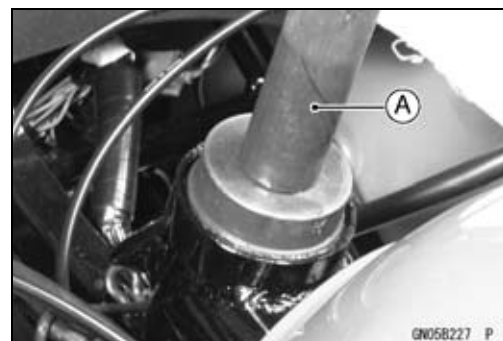
- Remove the lower bearing inner race [A] which is pressed onto the steering stem with a suitable commercially available chisel [B].



### Stem, Stem Bearing Installation

- Replace the bearing outer races with new ones.
- Apply grease to the outer races, and drive them into the head pipe at the same time.

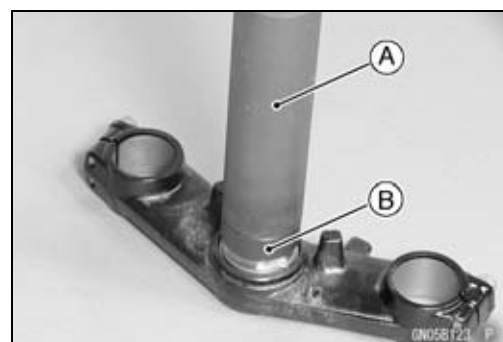
**Special Tool - Bearing Driver Set: 57001-1129 [A]**



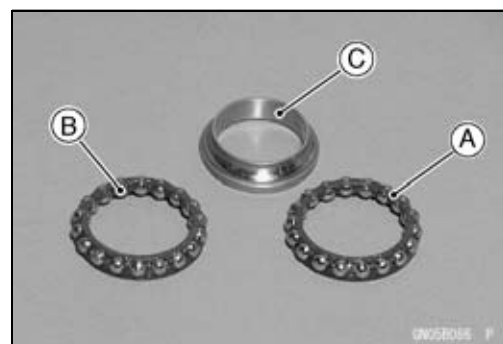
- Replace the bearing inner races and oil seal with new ones.
- Apply grease to the oil seal.
- Drive the lower ball bearing inner race applied the grease onto the stem.

**Special Tools - Steering Stem Bearing Driver,  $\phi 42.5$ : 57001-1344 [A]**

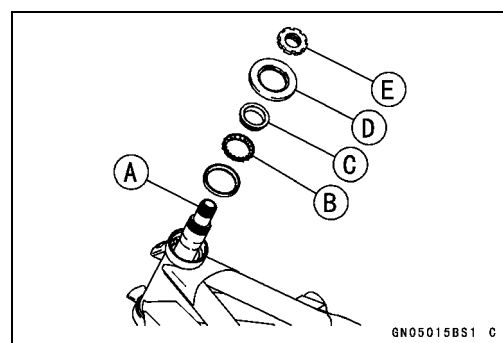
**Steering Stem Bearing Driver Adapter,  $\phi 41.5$ : 57001-1345 [B]**



- Apply grease the lower ball bearing [A] and install it onto the stem.
- Apply grease to the upper ball bearing [B] and inner race [C].



- Install the stem [A] through the head pipe and install the ball bearing [B] and inner race [C] on it.
- Install the stem cap [D] and steering stem nut [E].



## 14-8 STEERING

### Steering Stem

- Settle the inner races in place as follows:
  - Tighten the steering stem nut with 39 N·m (4.0 kgf·m, 29 ft·lb) of torque first, and loosen it a fraction of a turn until it turns lightly. Afterward tighten it again with specified torque using a stem nut wrench [A] in the direction shown.
  - Check that there is no play and the steering stem turns smoothly without rattles. If not, the steering stem bearings may be damaged.

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

**Torque - Steering Stem Nut: 27 N·m (2.8 kgf·m, 20 ft·lb)**

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

- Install:
  - Front Fork [A] (temporarily)
  - Stem Head [B]
- Install the fork so that the top end [C] of the outer tube is flush with the upper surface [D] of the steering stem head bracket.
- Install the washer [E], and tighten the stem head bolt [F] with specified torque.

#### NOTE

- Tighten the fork upper clamp bolts first, next the stem head nut, last the fork lower clamp bolts.
- Tighten the two clamp bolts alternately two times to ensure even tightening torque.

**Torque - Steering Stem Head Bolt: 108 N·m (11 kgf·m, 80 ft·lb)**

**Front Fork Clamp Bolts (Upper): 20 N·m (2.0 kgf·m, 14 ft·lb)**

**Front Fork Clamp Bolts (Lower): 20 N·m (2.0 kgf·m, 14 ft·lb)**

- Install the steering stem head bolt plug.

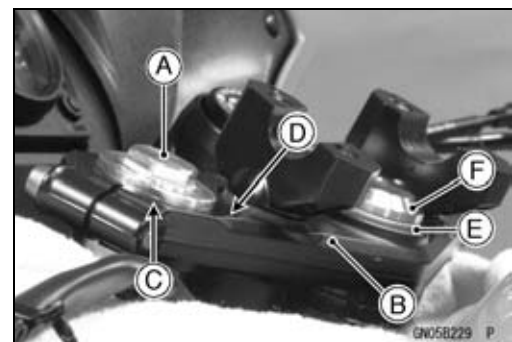
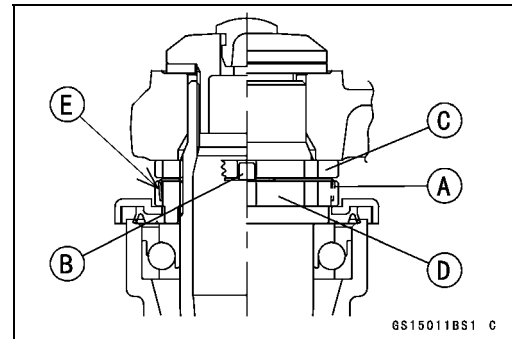
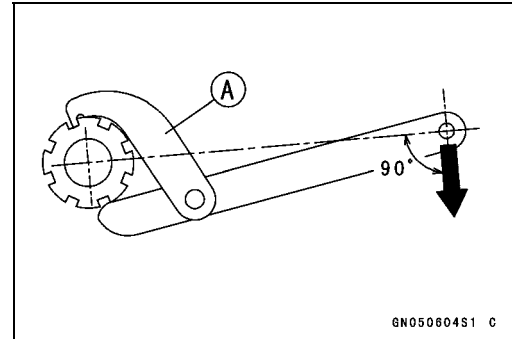
#### **⚠ WARNING**

**Do not impede the handlebar turning by routing the cables, harnesses and hoses improperly (see Appendix chapter).**

- Install the removed parts (see appropriate chapters).

#### *Stem Bearing Lubrication*

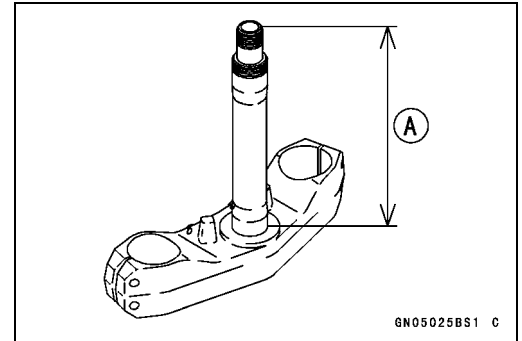
- Refer to the Steering Stem Bearing Lubrication in the Periodic Maintenance chapter.



## Steering Stem

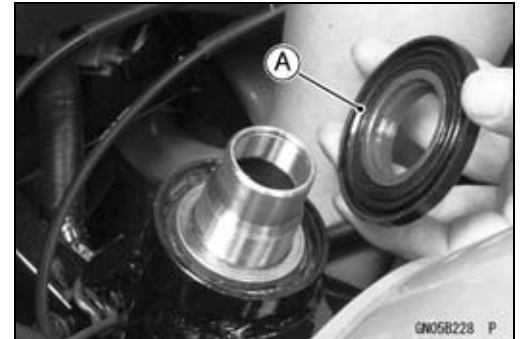
### *Steering Stem Warp*

- Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem for straightness.
- ★ If the steering stem [A] is bent, replace the steering stem.



### *Stem Cap Deterioration, Damage*

- ★ Replace the stem cap if its grease seal [A] shows damage.

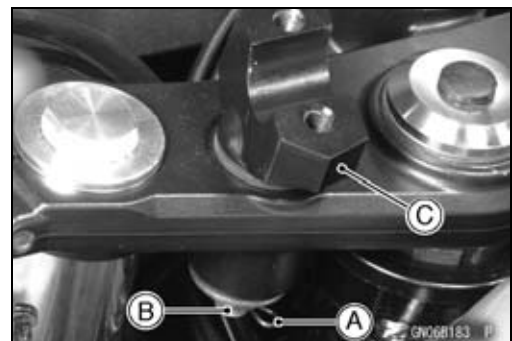
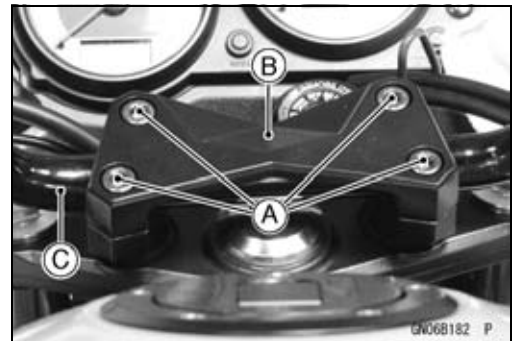
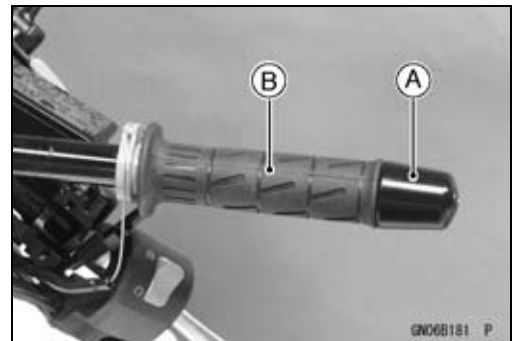
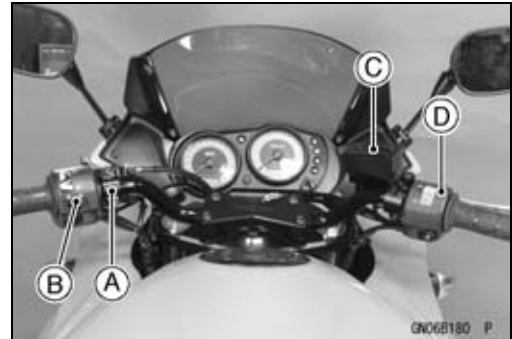


## 14-10 STEERING

### Handlebar

#### Handlebar Removal

- Remove:
  - Handlebar Holder Plugs [A]
  - Clamps [B]
  
- Remove:
  - Clutch Lever Assembly [A]
  - Left Switch Housing [B]
  - Front Brake Master Cylinder [C]
  - Right Switch Housing [D]
  
- Remove:
  - Left and Right Handlebar Weights [A]
  - Throttle Grip [B]
  
- Remove:
  - Handlebar Holder Bolts [A]
  - Handlebar Holder [B]
  - Handlebar [C]
  
- Remove the cotter pins [A].
- Remove the mounting nuts [B], washers and handlebar lower holders [C].



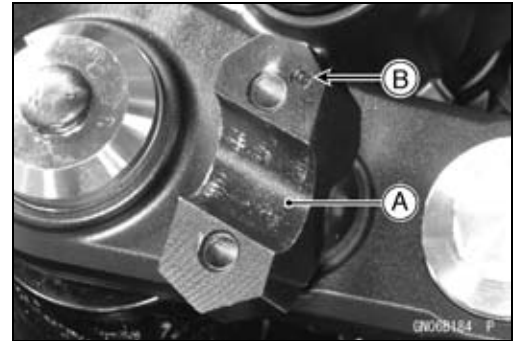


## Handlebar

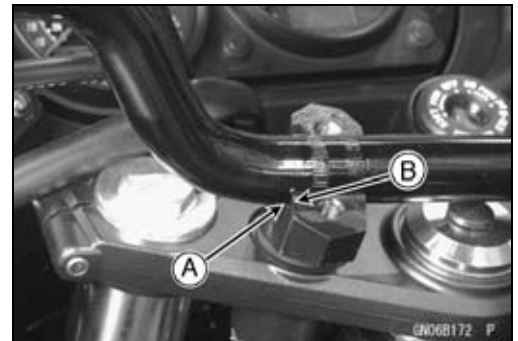
### Handlebar Installation

- Install the handlebar lower holder [A], noting the letters “L” and “R” [B].
- Tighten:

**Torque - Handlebar Lower Holder Nuts: 34 N·m (3.5 kgf·m, 25 ft·lb)**

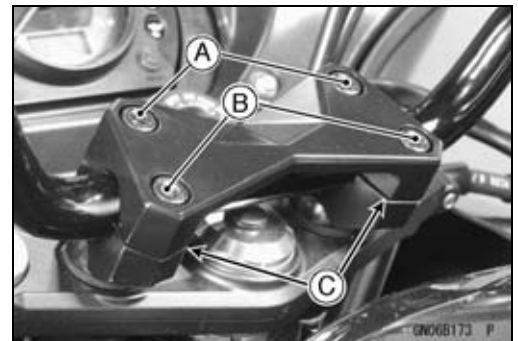


- Align the punch mark [A] on the handlebar and the corner edge [B] on the lower holder.



- Tighten the front holder bolts [A] first, and then the rear holder bolts [B]. There will be a gap [C] at the rear part of the holder after tightening.

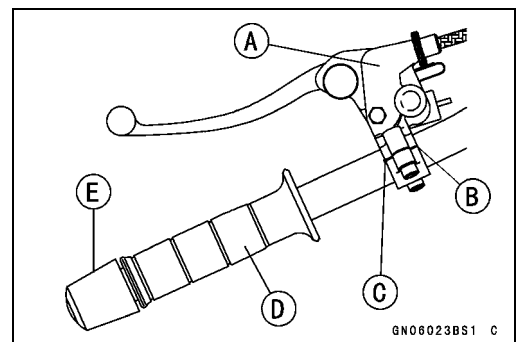
**Torque - Handlebar Holder Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**



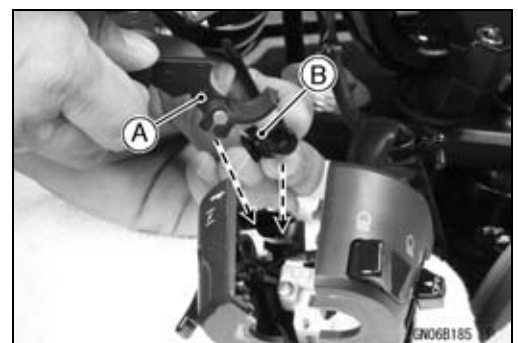
- Install the clutch lever [A] so that the mating surface [B] of the clutch lever clamps with punch mark [C] on the handlebar.

**Torque - Clutch Lever Clamp Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

- Apply adhesive cement to the inside of the left handlebar grip [D].
- Apply a non-permanent locking agent to the left handlebar weight [E].



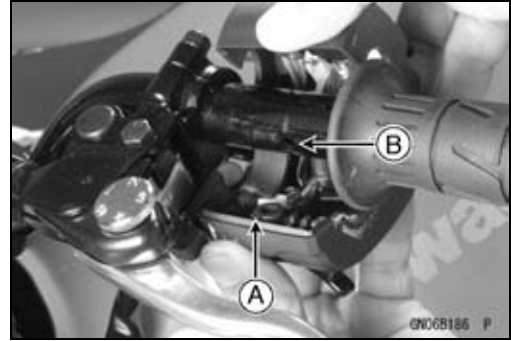
- Fit the choke lever [A] and choke cable end [B] into the switch housing.



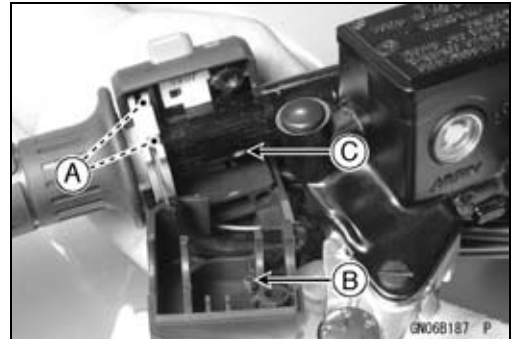
## 14-12 STEERING

### Handlebar

- Install the left handlebar switch housings.
- Fit the projection [A] into a small hole [B] in the handlebar.  
**Torque - Handlebar Switch Housing Screws: 3.5 N·m (0.36 kgf·m, 31 in·lb)**



- Install:
  - Throttle Grip
  - Throttle Cable Tips [A]
  - Right Handlebar Switch Housing
- Fit the projection [B] into a small hole [C] in the handlebar.



- Install:
  - Front Brake Master Cylinder (see Brakes chapter)
- Tighten:
  - Right Handlebar Weight
- Install the removed parts (see appropriate chapters).

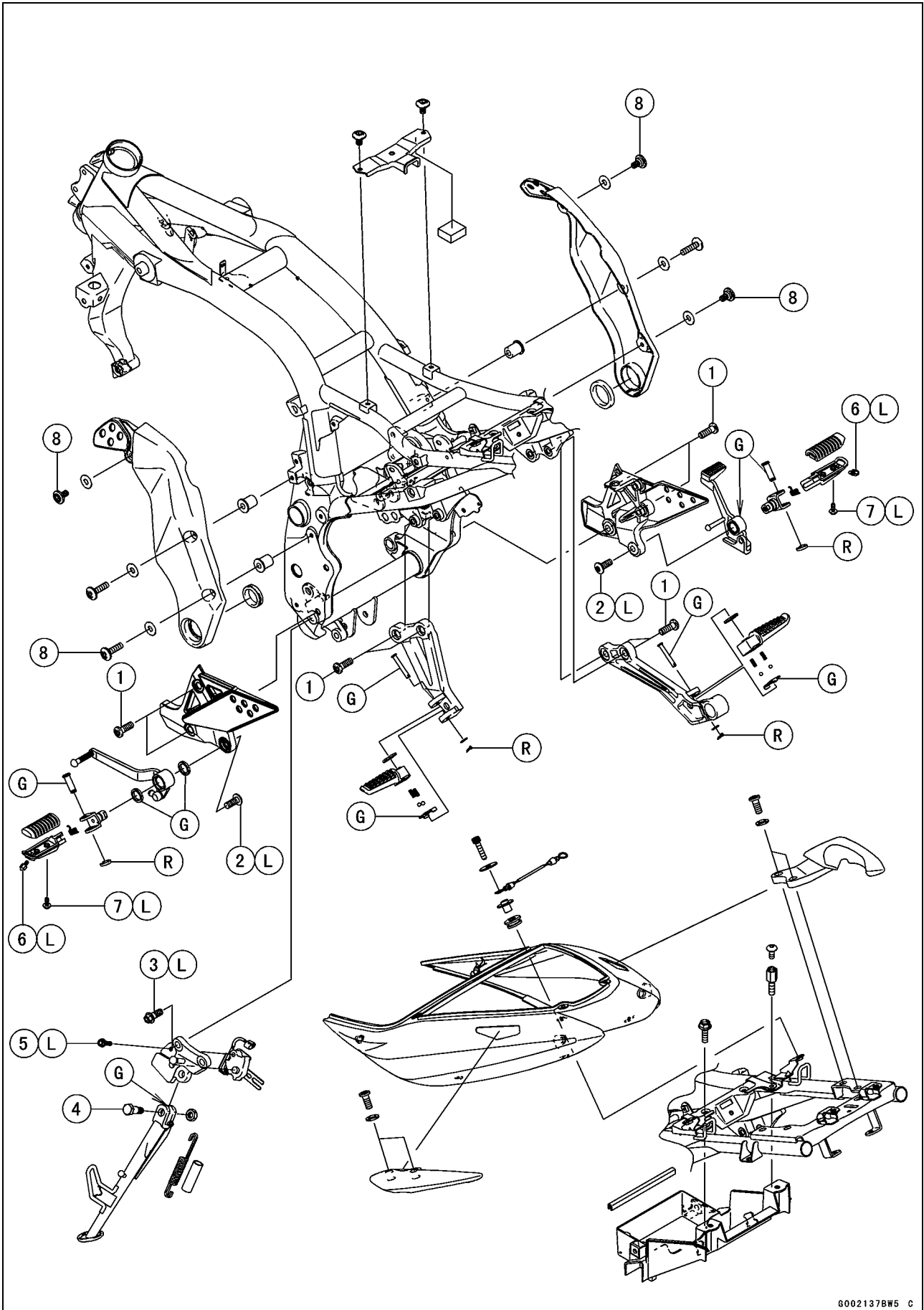
# Frame

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# 15-2 FRAME

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Footpeg Bracket Bolts	34	3.5	25	
2	Footpeg Holder Bolts	34	3.5	25	L
3	Side Stand Bracket Bolts	49	5.0	36	L
4	Side Stand Bolt	44	4.5	33	
5	Side Stand Switch Bolt	8.8	0.90	78 in·lb	L
6	Bank Sensor Bolts	–	–	–	L
7	Footpeg Rubber Mounting Bolts	–	–	–	L
8	Frame Cover Bolts	0.3	0.03	3 in·lb	

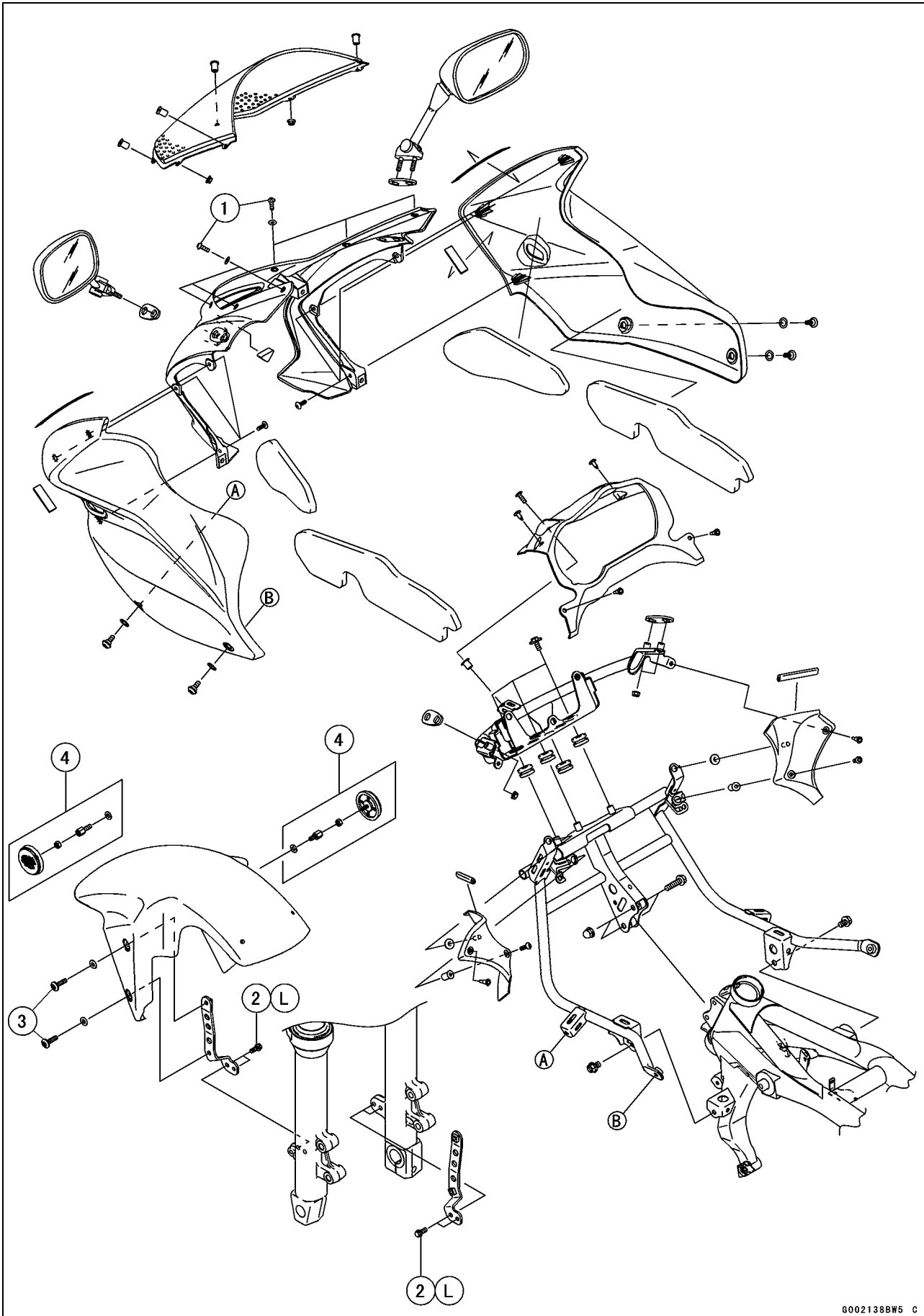
G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement Parts

# 15-4 FRAME

## Exploded View



**Exploded View**

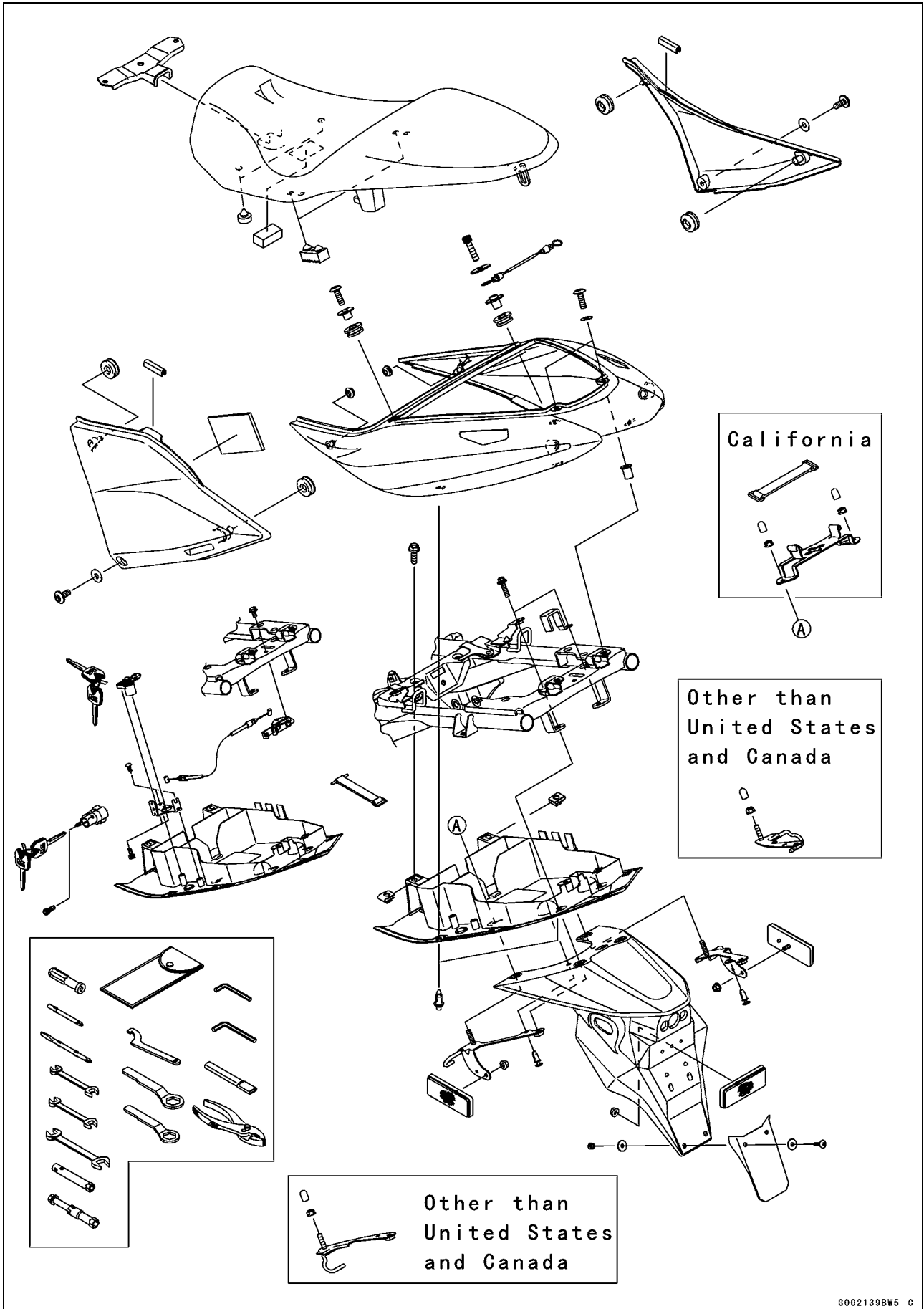
No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Windshield Bolts	0.4	0.04	4 in·lb	
2	Front Fender Bracket Bolts	8.8	0.90	78 in·lb	L
3	Front Fender Bolts	3.9	0.40	35 in·lb	

4. United States and Canadian Models.

L: Apply a non-permanent locking agent.

# 15-6 FRAME

## Exploded View

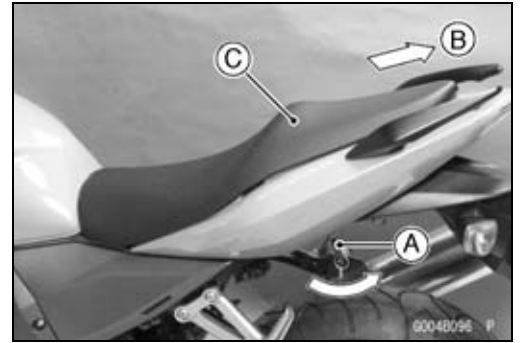




## Seat

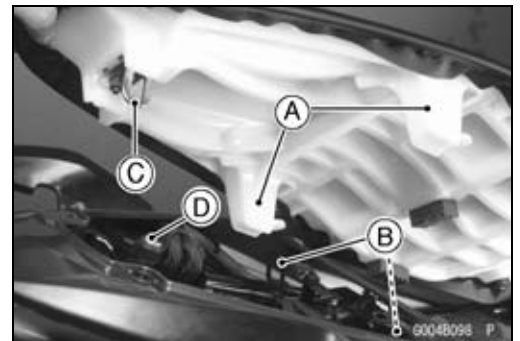
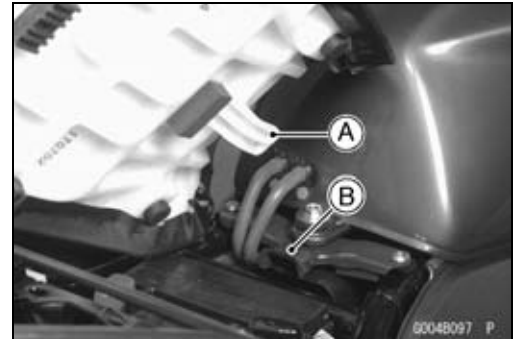
### Seat Removal

- Insert the ignition switch key into the seat lock [A], turning the key clockwise, pulling up [B] on the rear of the seat [C], and pulling the seat backward.



### Seat Installation

- Slip the front seat hooks [A] under the braces [B] on the fuel tank bracket and frame.
- Insert the seat latch [C] into the latch hole [D].
- Push down the rear part of the seat until the lock clicks.

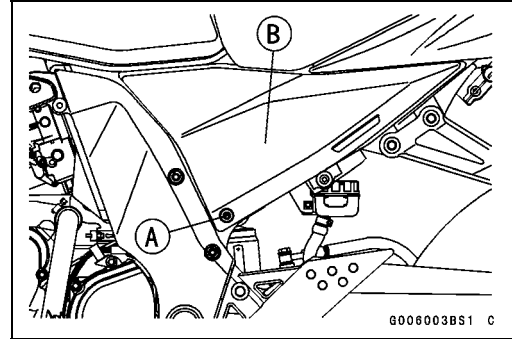


## 15-8 FRAME

### Side Covers

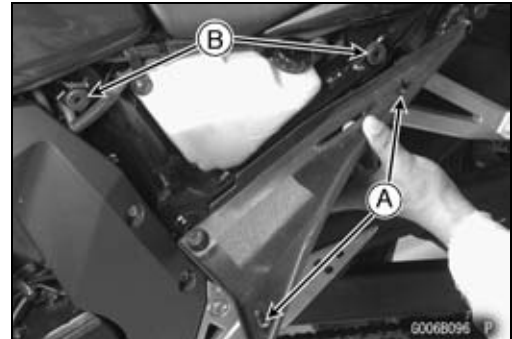
#### *Side Cover Removal*

- Remove the bolt [A].
- Pull the side cover [B] evenly outward to clear the stoppers.



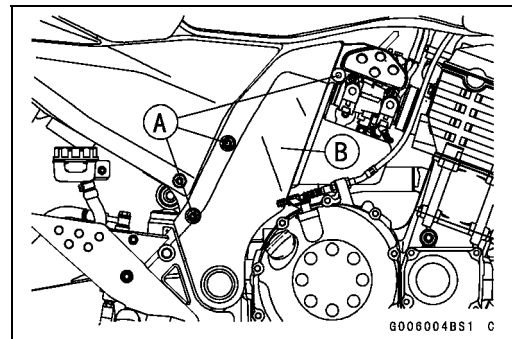
#### *Side Cover Installation*

- Insert the tabs [A] into the holes [B].
- Install the bolt.



#### *Frame Cover Removal*

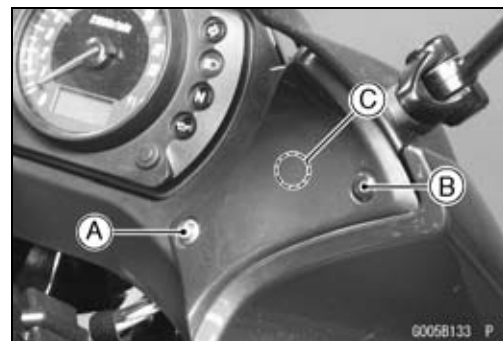
- Remove:
  - Bolts [A]
  - Frame Cover [B] (both side)



## Fairings

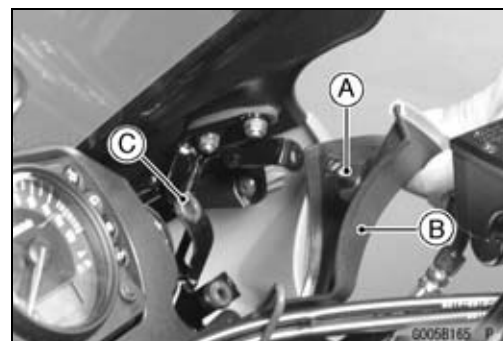
### Inner Cover Removal

- Remove:
  - Inner Cover Screw [A] and Washers
- Push the central pin, and then remove the quick rivet [B].
- Pull the cover evenly outward to clear the stopper [C].



### Inner Cover Installation

- Fit the projection [A] on the inner cover [B] into the grommet [C] in the bracket.

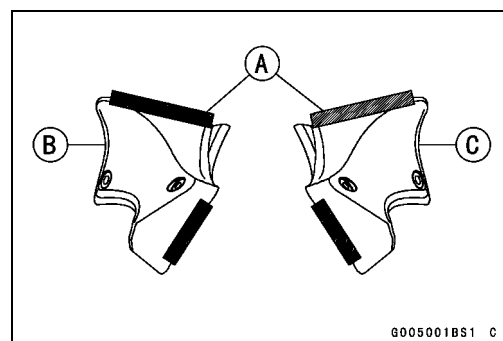


- Reset the quick rivet [A] before installation it as shown.
- Temporary install the rivet and screw, then install them.
- Push the central pin of the rivet.



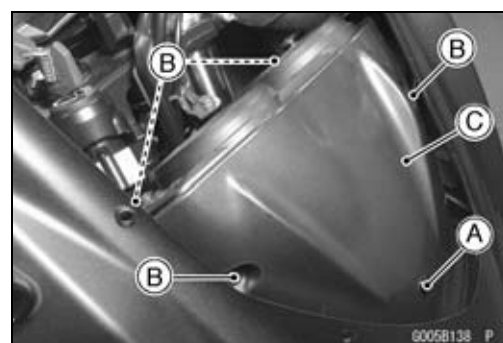
### Inner Cover Installation

- Install the trim [A] as shown illustration.
  - Left Inner Cover [B]
  - Right Inner Cover [C]



### Meter Cover Removal

- Remove:
  - Right and Left Inner Cover
  - Screw with Washer [A]
- Push the central pin, and then remove the quick rivets [B].
- Remove the meter cover [C].

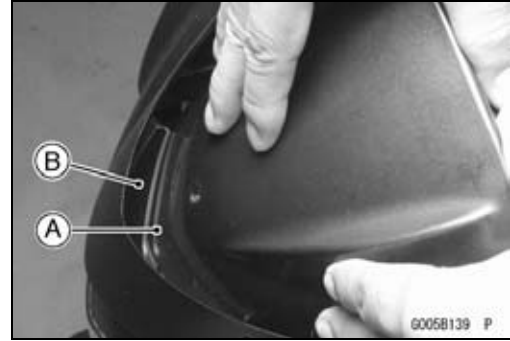


## 15-10 FRAME

### Fairings

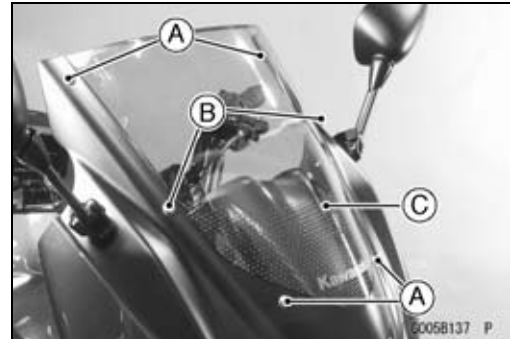
#### *Meter Cover Installation*

- Install the lower portion [A] of the meter cover under the air duct [B] of the fairing.
- Reset the quick rivets (see Inner Cover Installation).
- Temporary install the screws and quick rivets and then install them.



#### *Windshield Removal*

- Remove:
  - Bolts with Washers [A]
  - Bolts with Washers and Nuts with Washers [B]
  - Windshield [C]

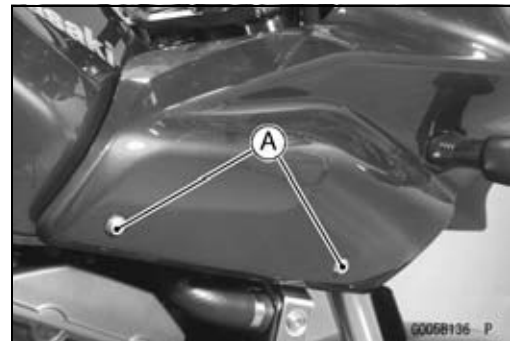


#### *Windshield Installation*

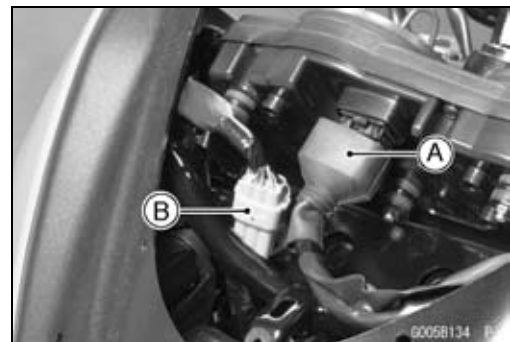
- Tighten:
  - Torque - Windshield Bolts: 0.4 N·m (0.04 kgf·m, 4 in·lb)**

#### *Fairing Removal*

- Remove:
  - Fairing Mounting Bolts [A] (both side)

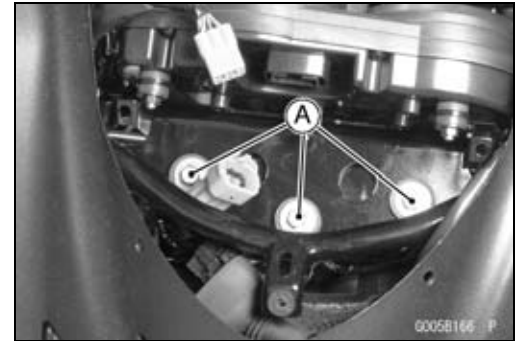


- Remove:
  - Windshield (see Windshield Removal)
  - Inner Covers (see Inner Cover Removal)
  - Meter Cover (see Meter Cover Removal)
  - Meter Connector [A] (disconnect)
  - Headlight Harness Connector [B] (disconnect)



## Fairings

- Remove:  
Bolts [A]
- Pull out the fairing forward.

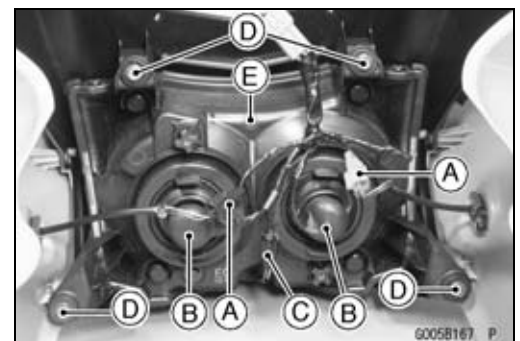
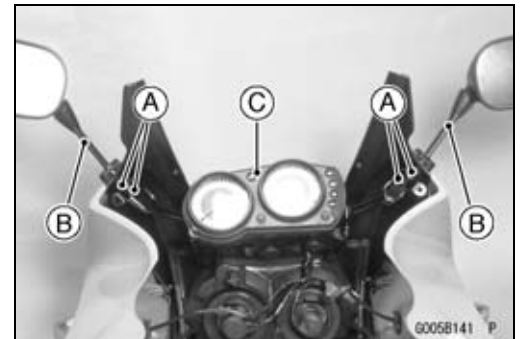


### Fairing Installation

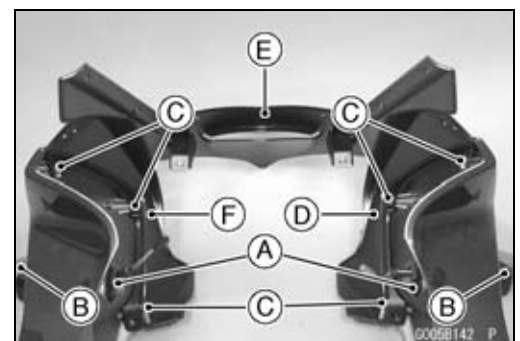
- Temporary install all fairing mounting bolts and tighten them.

### Fairing Disassembly

- Remove:  
Fairing (see Fairing Removal)  
Nuts [A]  
Right and Left Rear View Mirrors [B]  
Meter Bracket with Meter Unit [C]
- Disconnect:  
Front Turn Signal Light Connectors [A]  
Headlight Connector [B]  
City Light Connector [C]
- Remove:  
Bolts [D]  
Headlight Assy [E]



- Remove:  
Screws [A]  
Front Turn Signal Lights [B]  
Screws [C]  
Right Fairing [D]  
Middle Fairing [E]  
Left Fairing [F]

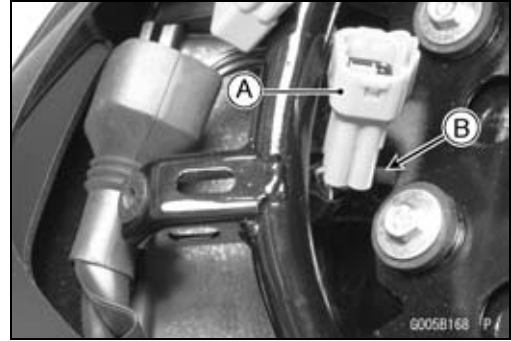


## 15-12 FRAME

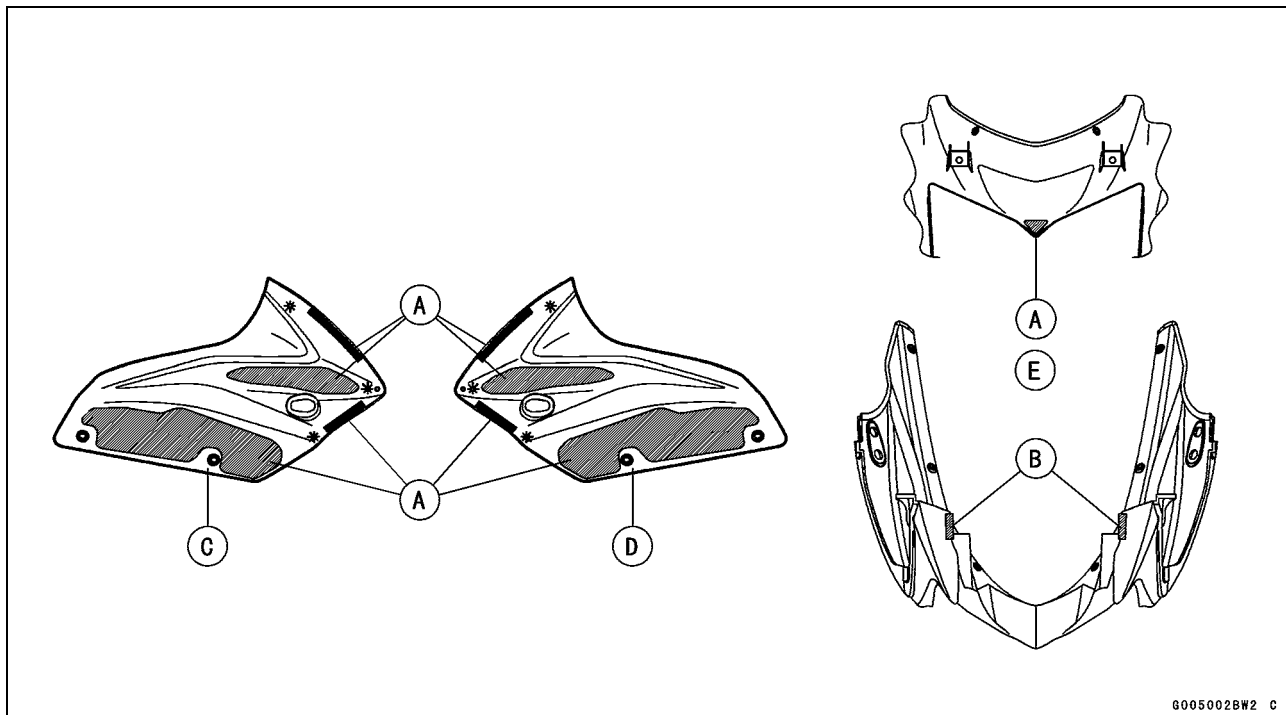
### Fairings

#### Fairing Assembly

- Temporary install all fairing mounting screws and then tighten them.
- Run the headlight harness connector [A] through the bracket hole [B].

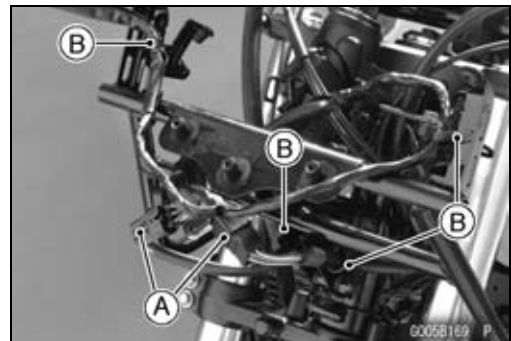


- Install the pad [A] and trim [B] as shown illustration.  
Left Fairing [C]  
Right Fairing [D]  
Upside Down [E]



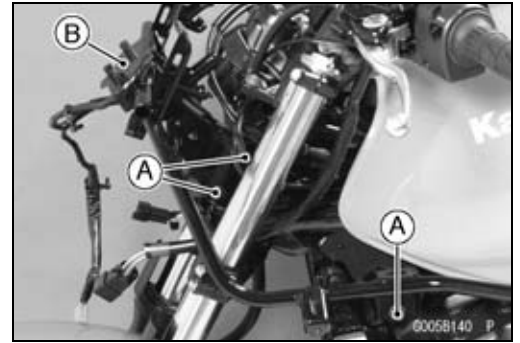
#### Fairing Bracket Removal

- Remove:  
Fairing (see Fairing Removal)
- Disconnect:  
Right and Left Switch Housing Connectors [A]
- Remove:  
Clamps [B]



## Fairings

- Remove:  
Bolts [A]  
Fairing Bracket [B]

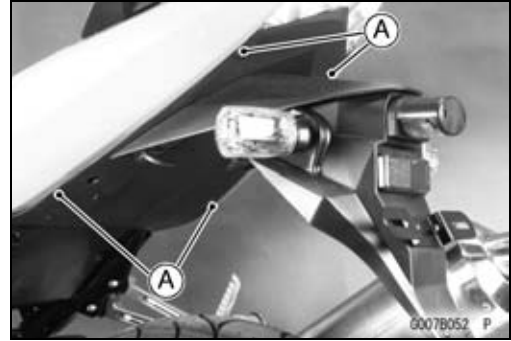


## 15-14 FRAME

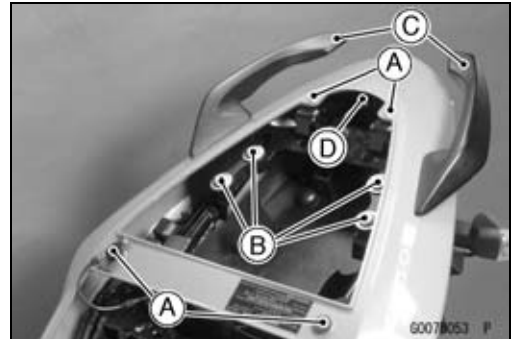
### Seat Covers

#### Seat Cover Removal

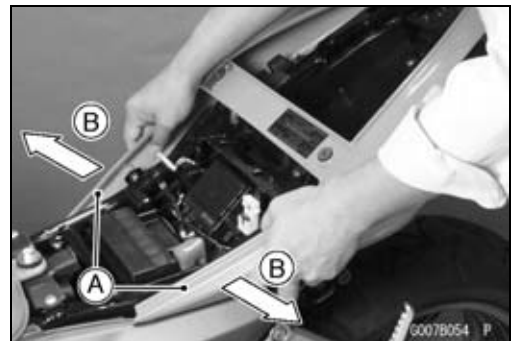
- Remove:
  - Seat (see Seat Removal)
- Push the central pin, and then remove the quick rivets [A].



- Remove:
  - Screws with Washers [A]
  - Bolts [B]
  - Grab Rails [C]
  - Tail/Brake Light Connector [D]

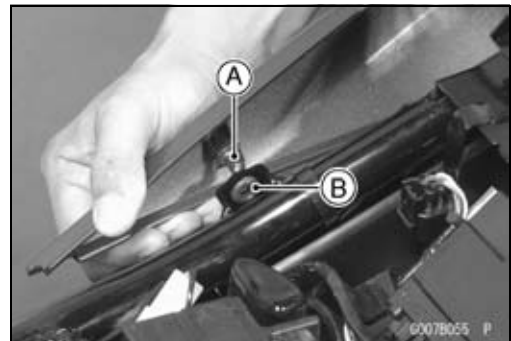


- Pull the front portions [A] of the seat cover outside [B], and then remove the seat cover backward.

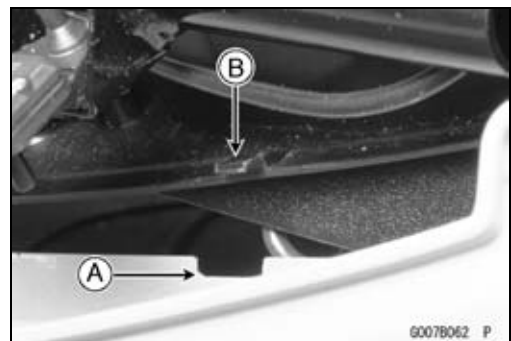


#### Seat Cover Installation

- Installation is reverse of removal.
- Put the projections [A] into the grommets [B] on the frame.



- Fit the recess [A] of the cover under the tab [B] of the fender.





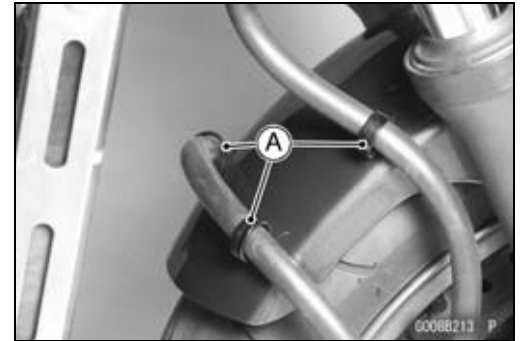
## Fenders

### Front Fender Removal

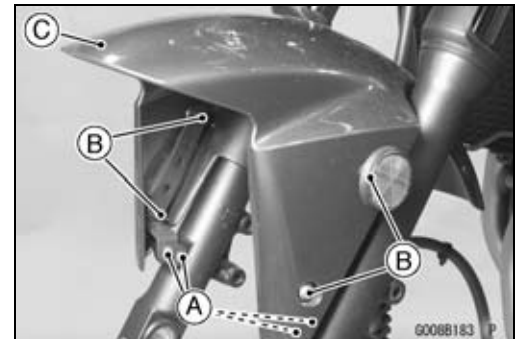
- Remove:
  - Front Wheel (see Wheels/Tires chapter)
  - Brake Hose Clamps [A]

#### NOTE

○ Rest the caliper on some kind of stand so that it doesn't dangle.



- Remove:
  - Front Fender Bracket Bolts [A] (both side)
  - Bolts [B] (both side)
- Remove the front fender [C].

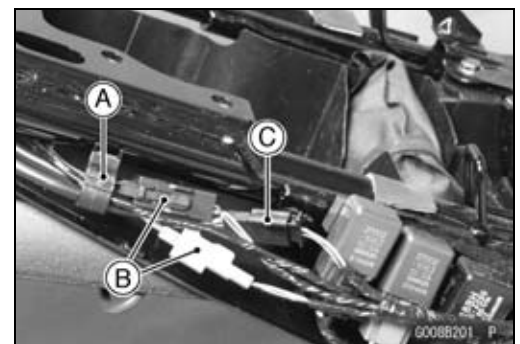


### Front Fender Installation

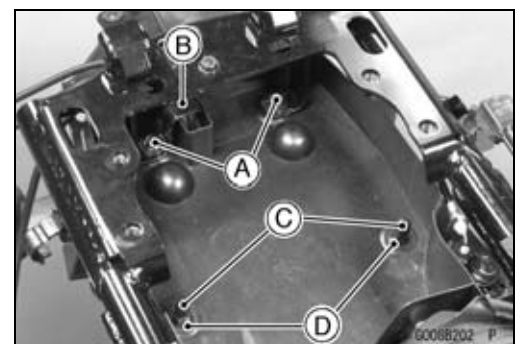
- Apply a non-permanent locking agent to the threads of the bracket bolts.
- Tighten:
  - Torque - Front Fender Bracket Bolts: 8.8 N·m (0.90 kgf·m, 78 in·lb)**
  - Front Fender Bolts: 3.9 N·m (0.40 kgf·m, 35 in·lb)**
- Install the brake hose clamps to the front fender holes.
- Install the front wheel (see Wheels/Tires chapter).

### Rear Fender Flap Removal

- Remove:
  - Seat (see Seat Removal)
  - Seat Cover (see Seat Cover Removal)
- Disconnect:
  - Clamp [A] (open)
  - Turn Signal Light Lead Connectors [B]
  - License Plate Light Lead Connector [C]



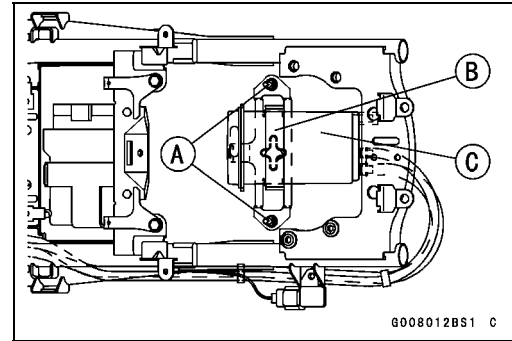
- Remove:
  - Bolts [A] with clamp [B]
  - Caps [C]
  - Nuts [D]
  - Rear Fender Flap



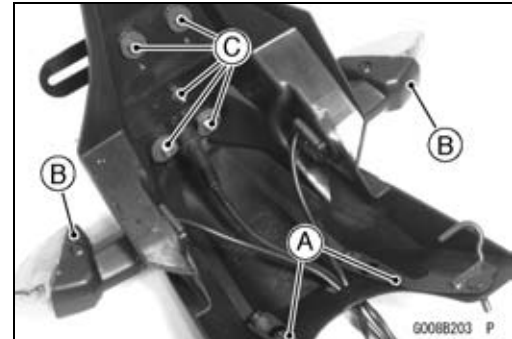
# 15-16 FRAME

## Fenders

- For California Model:
  - Caps
  - Nuts [A]
  - Canister Holding Plate [B]
  - Canister [C]

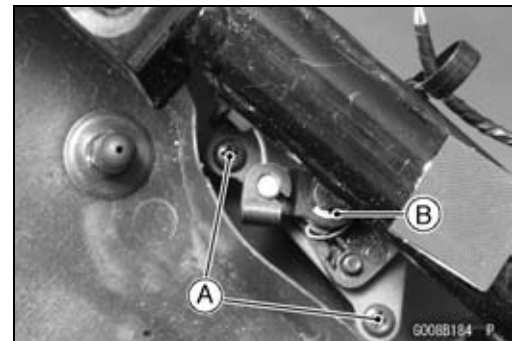


- Remove:
  - Flap Brackets [A]
  - Left and Right Turn Signal Light [B]
  - Bolts [C]
  - License Plate Light
  - License Plate
  - Reflector

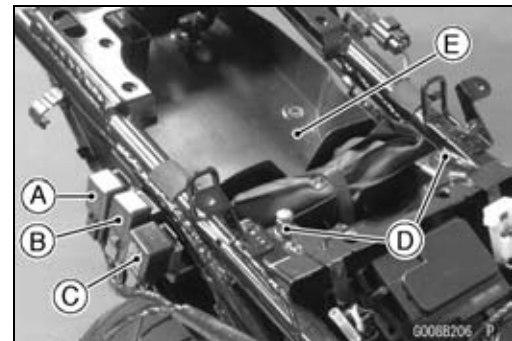


### Rear Fender Removal

- Remove:
  - Seat (see Seat Removal)
  - Seat Cover (see Seat Cover Removal)
  - Screws [A]
  - Seat Lock, Bracket with Cable [B]
  - Rear Fender Flap (see Rear Fender Flap Removal)

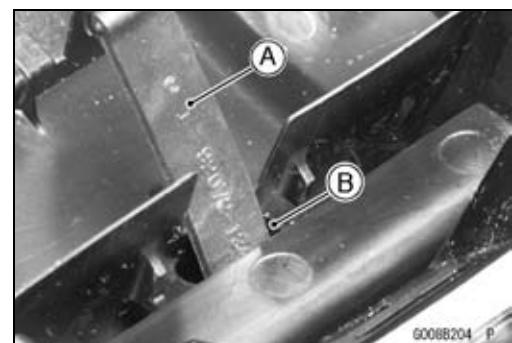


- Remove:
  - ECU Main Relay [A]
  - Fuel Pump Relay [B]
  - Turn Signal Light Relay [C]
  - Mounting Bolts [D]
  - Rear Fender Rear [E]



### Rear Fender installation

- Insert the band [A] into the slot [B] of the rear fender.



## Fenders

### *Battery Case Removal*

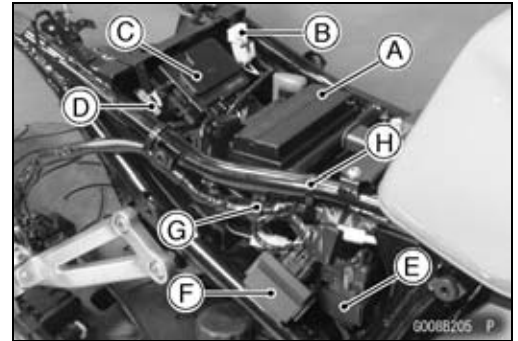
- Remove:

- Seats (see Seat Removal)
- Seat Cover (see Removal)
- Side Covers (see Side Cover Removal)
- Rear Fender (see Rear Fender Removal)
- Battery [A]
- ECU Main Fuse 15 A [B]
- Fuse Box [C] with ECU
- Kawasaki Diagnostic System Connector [D]
- Starter Relay with Main Fuse [E]
- Immobilizer Amplifier [F] (Equipped Model)
- Clamp [G]
- Band [H]

- Pull out the battery case backward.

### *Battery Case Installation*

- Put the battery case attachments [A] at the projections [B] on the frame.

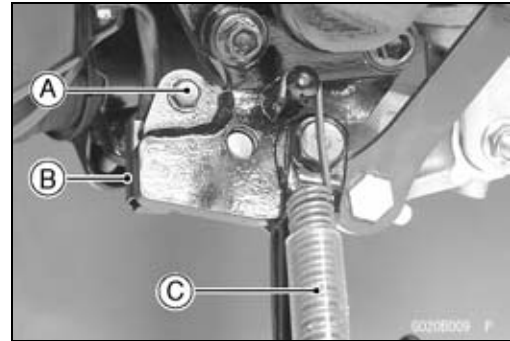


## 15-18 FRAME

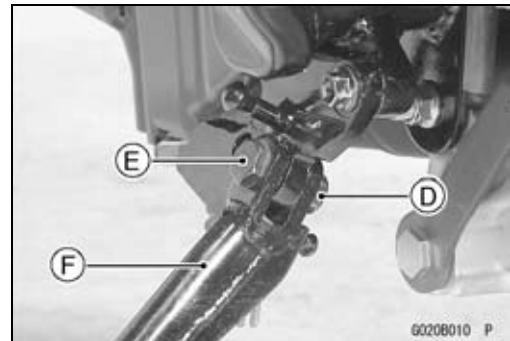
### Side Stand

#### Side Stand Removal

- Raise the rear wheel off the ground with the stand.
- Remove:
  - Side Stand Switch Bolt [A]
  - Side Stand Switch [B]
  - Spring [C]



- Side Stand Nut [D]
- Side Stand Bolt [E]
- Side Stand [F]



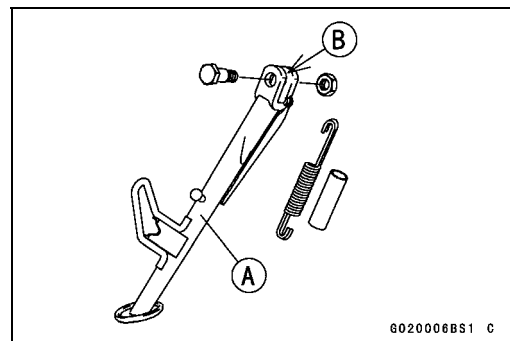
#### Side Stand Installation

- Apply grease to the sliding area [B] of the side stand [A].
- Tighten the bolt and lock them with the nut.

**Torque - Side Stand Bolt: 44 N·m (4.5 kgf·m, 33 ft·lb)**

- Hook the spring
- Install the side stand switch.
- Apply a non-permanent locking agent to the thread of the switch bolt.

**Torque - Side Stand Switch Bolt: 8.8 N·m (0.90 kgf·m, 78 in·lb)**



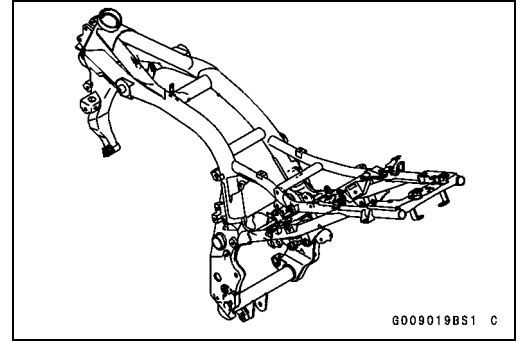
## Frame

### *Frame Inspection*

- Visually inspect the frame for cracks, dents, bending, or warp.
- If there is any damage to the frame, replace it.

### **⚠ WARNING**

**A repaired frame may fail in use, possibly causing an accident. If the frame is bent, dented, cracked, or warped, replace it.**





# Electrical System

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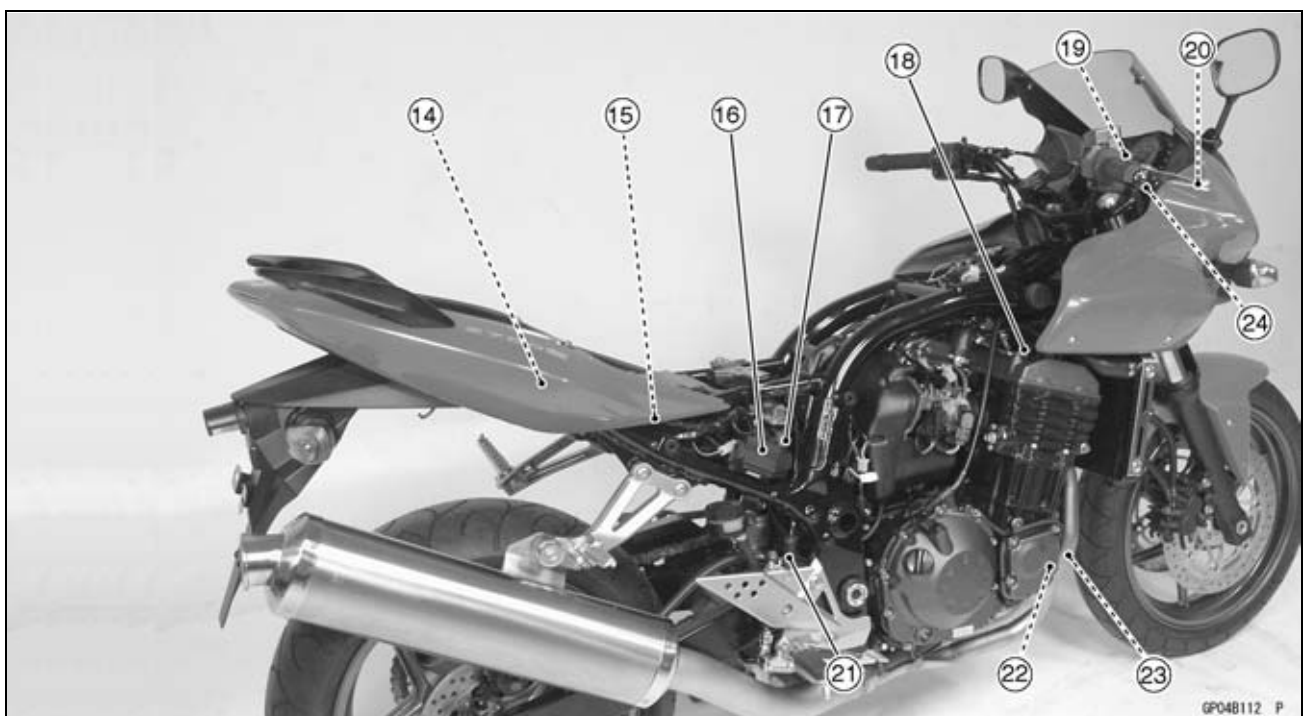
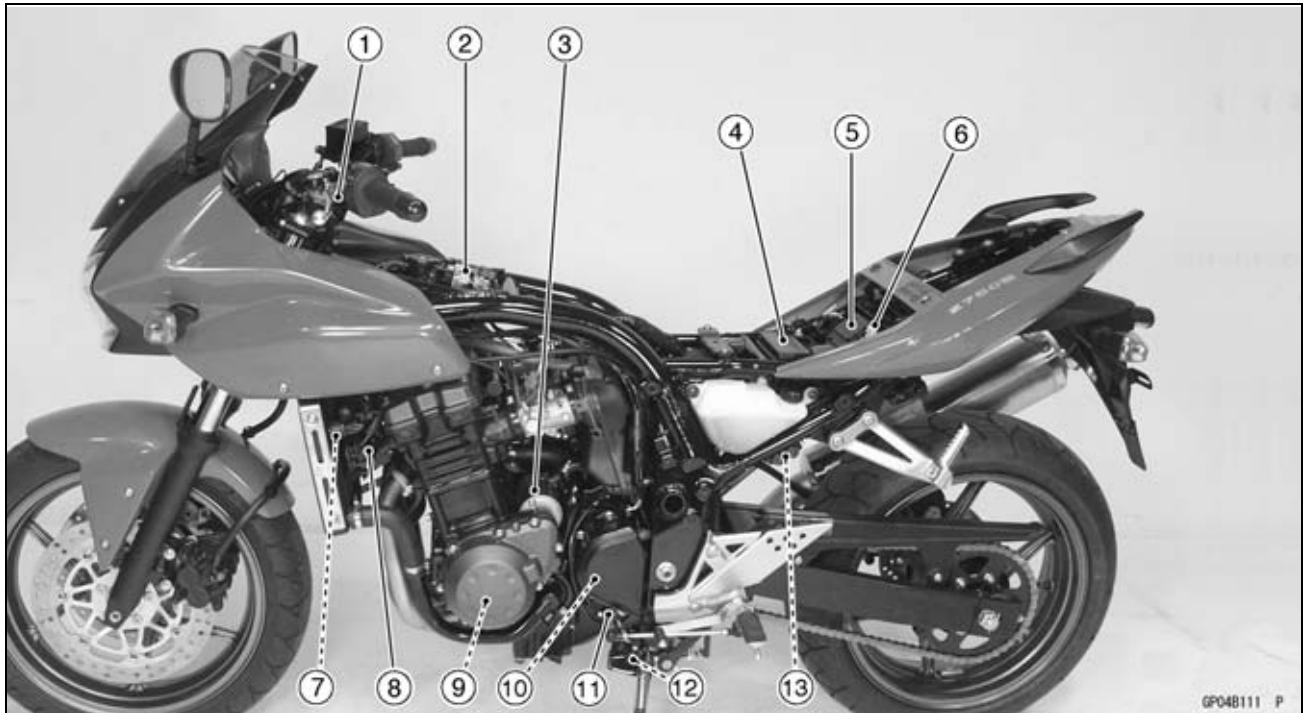
## 16-2 ELECTRICAL SYSTEM

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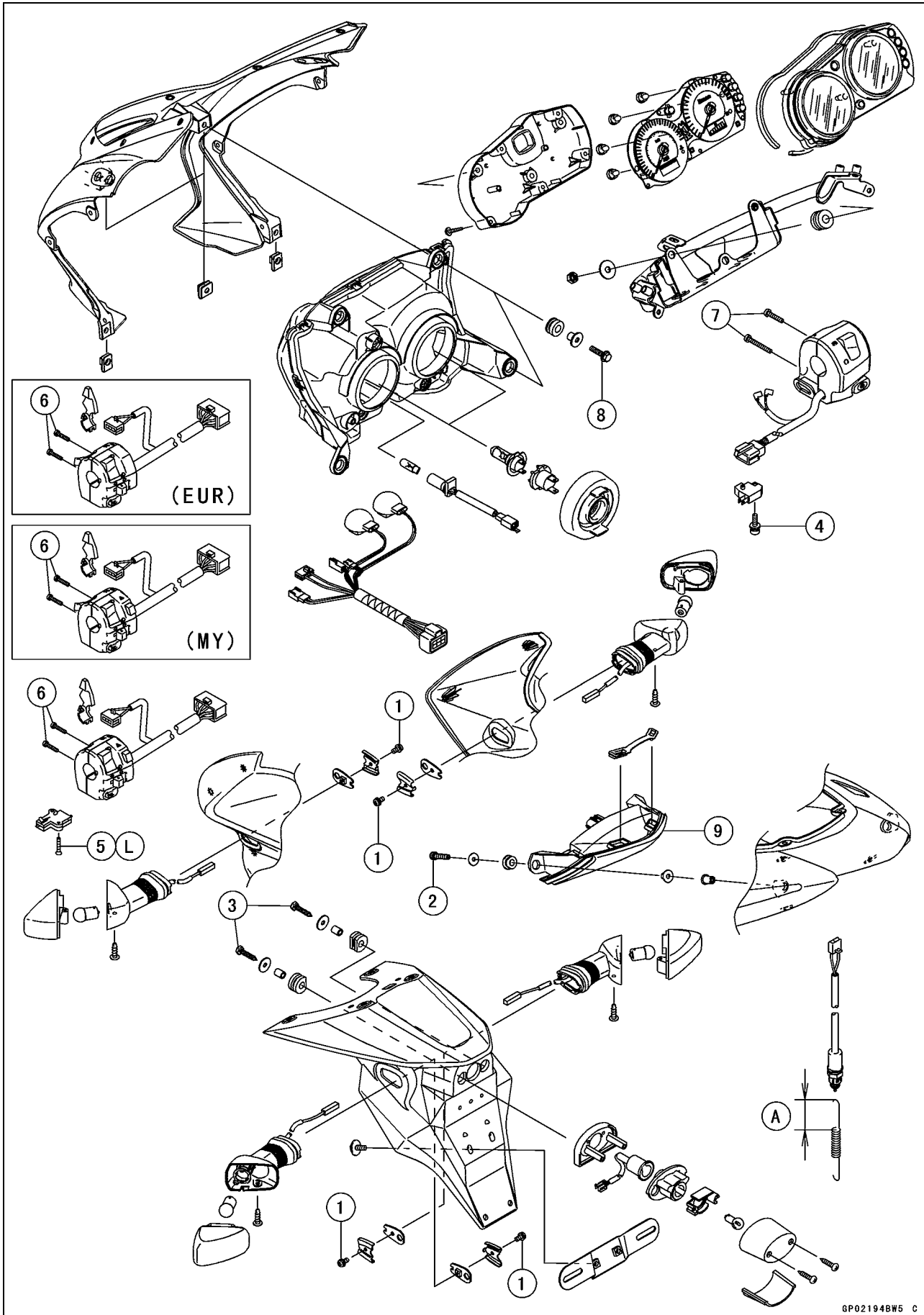
Parts Location



- |                             |   |  |
|-----------------------------|---|--|
| 1. Starter Lockout Switch   | 11. Neutral Switch                          | 19. Ignition Switch with Immobilizer Antenna (Equipped Models) |
| 2. Water Temperature Sensor | 12. Side Stand Switch                       | 20. Diode (Rectifier)  |
| 3. Starter Motor            | 13. Regulator/Rectifier                     | 21. Rear Brake Light Switch                                    |
| 4. Battery 12 V 8 Ah        | 14. Turn Signal Relay                       | 22. Crankshaft Sensor  |
| 5. Junction Box             | 15. ECU (Electronic Control Unit)           | 23. Oil Pressure Switch  |
| 6. ECU Main Fuse 15 A       | 16. Immobilizer Amplifier (Equipped Models) | 24. Front Brake Light Switch                                   |
| 7. Radiator Fan Switch      | 17. Starter Relay and Main Fuse 30 A        |  |
| 8. Radiator Fan             | 18. Stick Coils                             |  |
| 9. Alternator               |   |  |
| 10. Speed Sensor            |   |  |

# 16-4 ELECTRICAL SYSTEM

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Turn Signal Light Screws	1.2	0.12	10 in·lb	
2	Tail/Brake Light Mounting Screws	1.2	0.12	10 in·lb	
3	License Plate Light Mounting Screws	1.2	0.12	10 in·lb	
4	Front Brake Light Switch Screw	1.0	0.10	9 in·lb	
5	Starter Locknut Switch Screws	–	–	–	L
6	Left Switch Housing Screws	3.5	0.36	31 in·lb	
7	Right Switch Housing Screws	3.5	0.36	31 in·lb	
8	Headlight Mounting Bolts	5.9	0.60	52 in·lb	

9. Tail/Brake Lights (LED)

10. Install the rear brake spring as shown.  
Longer Side [A]

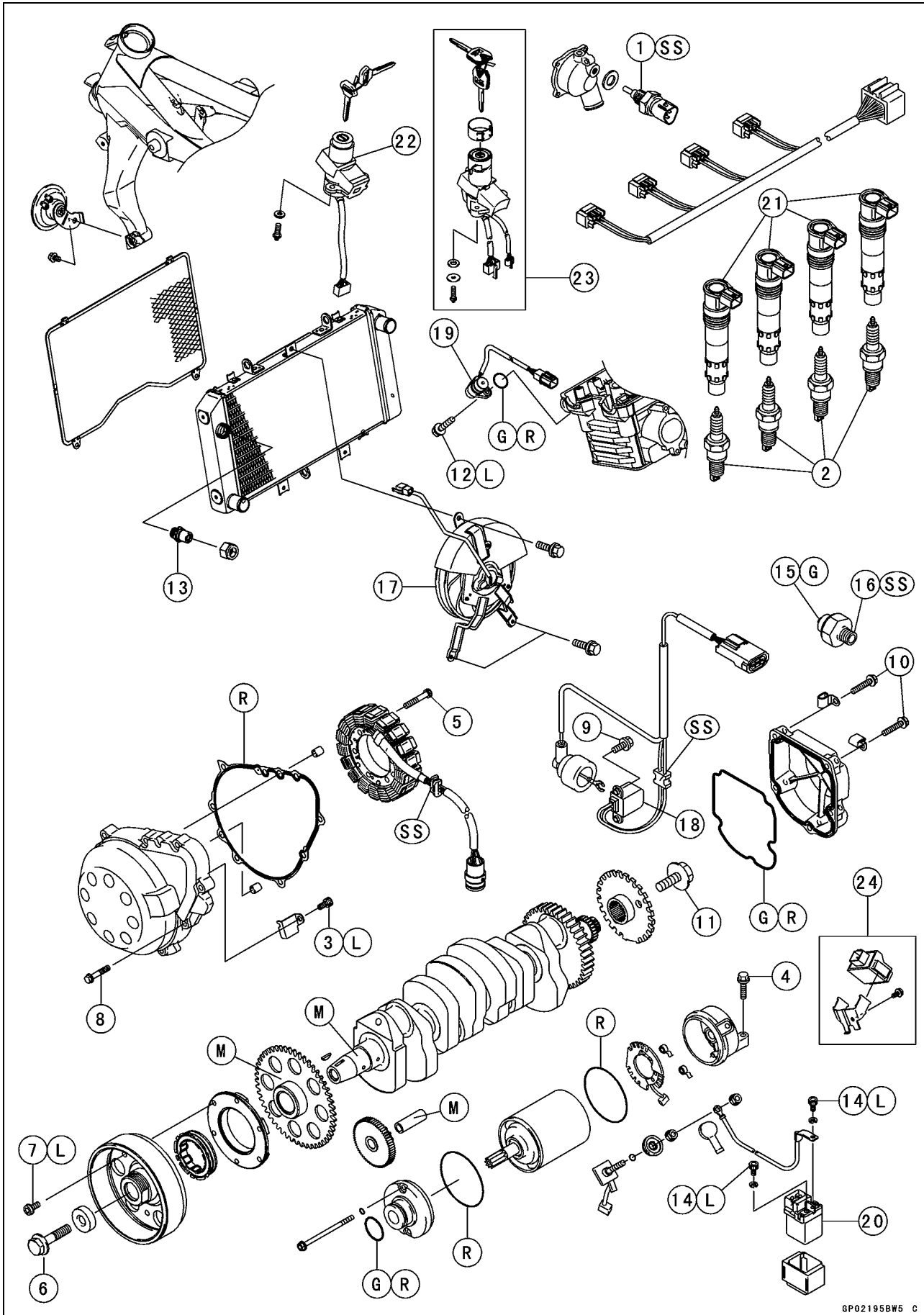
L: Apply a non-permanent locking agent.

EUR: Europe

MY: Malaysia Model

# 16-6 ELECTRICAL SYSTEM

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Water Temperature Sensor	25	2.5	18	SS
2	Spark Plugs	13	1.3	113 in·lb	
3	Alternator Lead Holding Plate Bolt	11	1.1	95 in·lb	L
4	Starter Motor Mounting Bolts	11	1.1	95 in·lb	
5	Stator Coil Bolts	11	1.1	95 in·lb	
6	Alternator Rotor Bolt	110	11	81	
7	Starter Motor Clutch Bolts	12	1.2	104 in·lb	L
8	Alternator Cover Bolts	11	1.1	95 in·lb	
9	Crankshaft Sensor Bolts	5.9	0.60	52 in·lb	
10	Crankshaft Sensor Cover Bolts	11	1.1	95 in·lb	
11	Timing Rotor Bolt	39	4.0	29	
12	Camshaft Position Sensor Bolt	12	1.2	104 in·lb	L
13	Radiator Fan Switch	18	1.8	13	
14	Starter Relay Cable Terminal Bolts	3.9	0.40	35 in·lb	L
15	Oil Pressure Switch Terminal Bolt	1.5	0.15	13 in·lb	G
16	Oil Pressure Switch	15	1.5	11	SS

17. Radiator Fan

18. Crankshaft Sensor

19. Camshaft Position Sensor

20. Starter Relay/Main Fuse

21. Stick Coils

22. Ignition Switch

23. Ignition Switch (Immobilizer Models)

24. Amplifier (Immobilizer Models)

G: Apply Grease.

L: Apply a non-permanent locking agent.

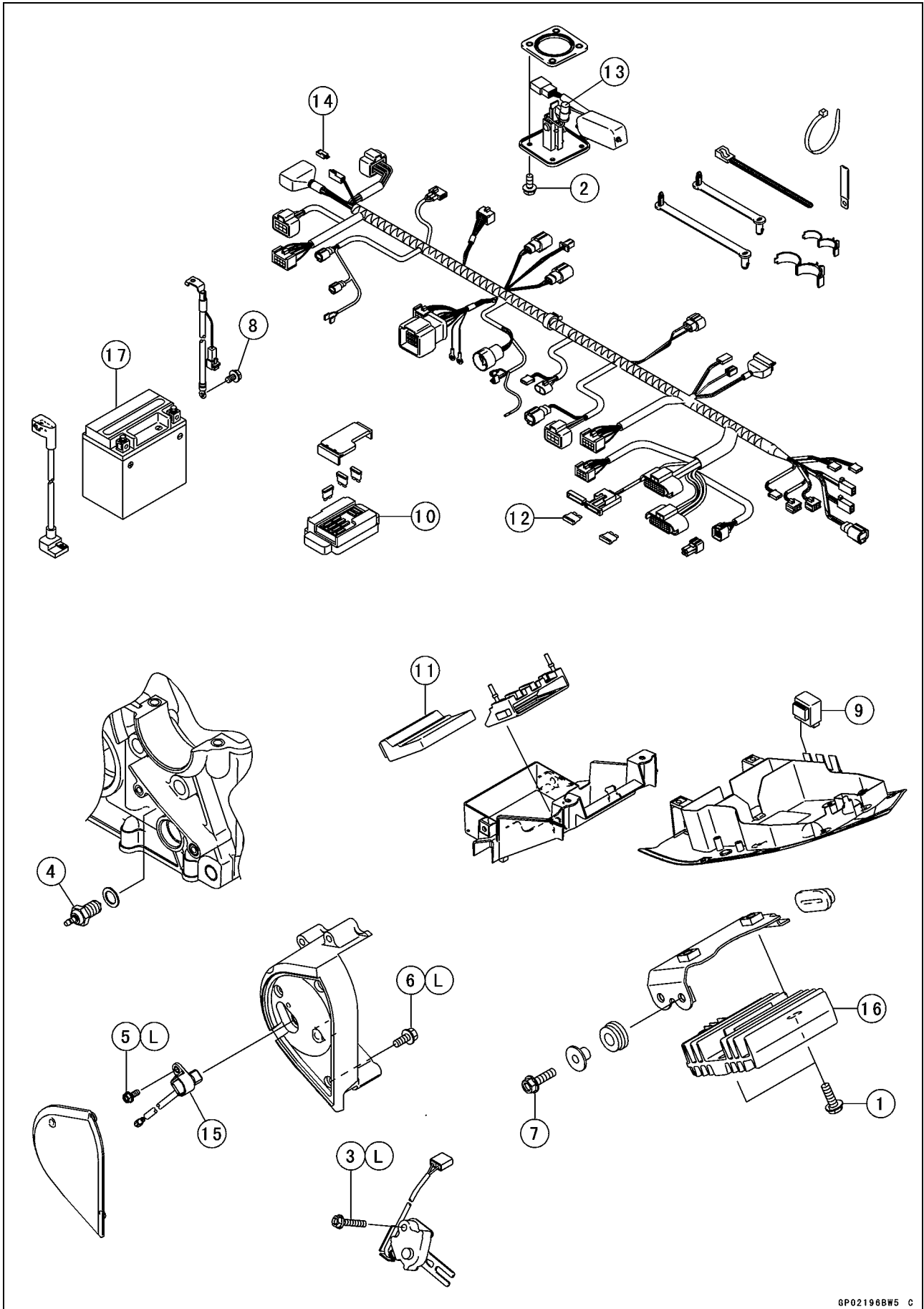
M: Apply molybdenum disulfide grease.

R: Replacement Parts

SS: Apply silicone sealant.

# 16-8 ELECTRICAL SYSTEM

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Regulator/Rectifier Bolts	6.9	0.70	61 in·lb	
2	Fuel Level Sensor Bolts	6.9	0.70	61 in·lb	
3	Side Stand Switch Bolt	8.8	0.90	78 in·lb	L
4	Neutral Switch	15	1.5	11	
5	Speed Sensor Bolt	6.9	0.70	61 in·lb	L
6	Speed Sensor Cover Bolts	6.9	0.70	61 in·lb	L
7	Regulator/Rectifier Bracket Bolts	6.9	0.70	61 in·lb	
8	Engine Ground Cable Terminal Bolt	9.8	1.0	87 in·lb	

- 9. Turn Signal Relay
  - 10. Junction Box
  - 11. ECU (Electronic Unit Control)
  - 12. 15 A ECU Fuse
  - 13. Fuel Reserve Switch
  - 14. Diode (Rectifier)
  - 15. Speed Sensor
  - 16. Regulator/Rectifier
  - 17. Battery 12 V 8 Ah
- L: Apply a non-permanent locking agent.

## 16-10 ELECTRICAL SYSTEM

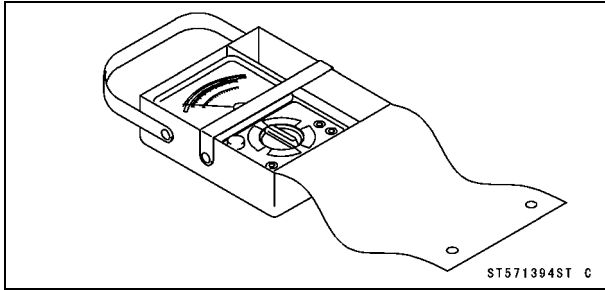
### Specifications

Item	Standard
<b>Battery</b> Type Capacity Voltage	Sealed Battery 12 V 8 Ah 12.6 V or more
<b>Charging System</b> Type Alternator Output Voltage Stator Coil Resistance Charging Voltage (regulator/rectifier output voltage)	Three-phase AC 42 V or more 0.3 ~ 0.4 $\Omega$ 14.7 $\pm$ 0.5 V
<b>Ignition System</b> Crankshaft Sensor Resistance Crankshaft Sensor Peak Voltage Camshaft Position Sensor Resistance Camshaft Position Sensor Peak Voltage Interlock Operation Voltage Stick Coil: Primary Winding Resistance Secondary Winding Resistance Primary Peak Voltage Spark Plug: Spark Plug Gap	376 ~ 564 $\Omega$ 1.9 V or more 400 ~ 460 $\Omega$ 0.2 V or more 4 V or more 1.04 ~ 1.56 $\Omega$ 10.8 ~ 16.2 k $\Omega$ 88 V or more 0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)
<b>Electric Starter System</b> Starter Motor: Brush Length Commutator Diameter	12 mm (0.47 in.) (Service limit: 8.5 mm, 0.33 in.) 28 mm (1.10 in.) (Service limit: 27 mm, 1.06 in.)
<b>Switch and Sensor</b> Rear Brake Light Switch Timing Engine Oil Pressure Switch Connections Fan Switch Connections: Rising Temperature Falling Temperature Water Temperature Sensor Resistance Fuel Level Sensor Resistance: Fuel Position Empty Position	ON after about 10 mm pedal travel When engine is stopped: ON When engine is running: OFF From OFF to ON @93 ~ 103°C (199 ~ 217°F) Fan stops with the temperature 3 ~ 8°C (38 ~ 46°F) lower than the operation temperature range. ON: Less than 0.5 $\Omega$ OFF: More than 10 M $\Omega$ in the text 4 ~ 10 $\Omega$ 90 ~ 100 $\Omega$

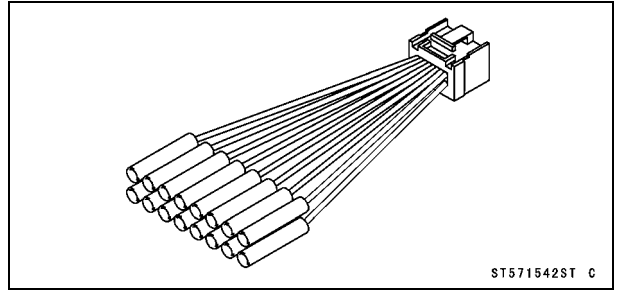


Special Tools and Sealant

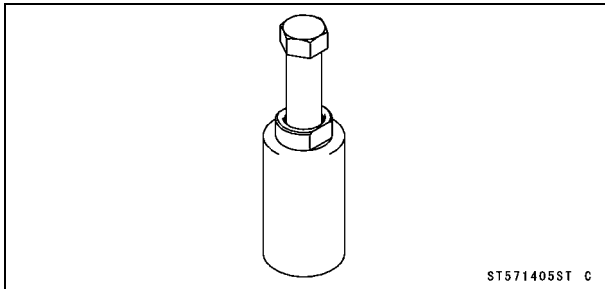
Hand Tester:  
57001-1394



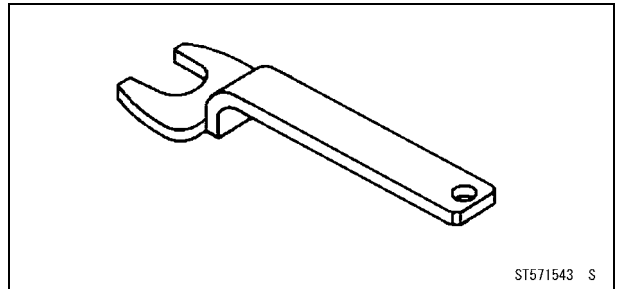
Harness Adapter:  
57001-1542



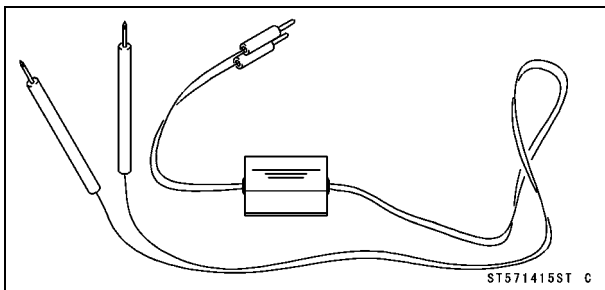
Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5:  
57001-1405



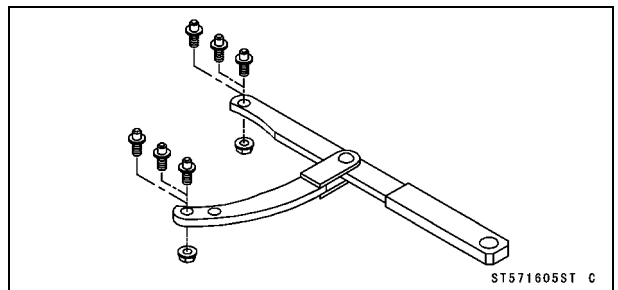
Rotor Holder, Hex 34:  
57001-1543



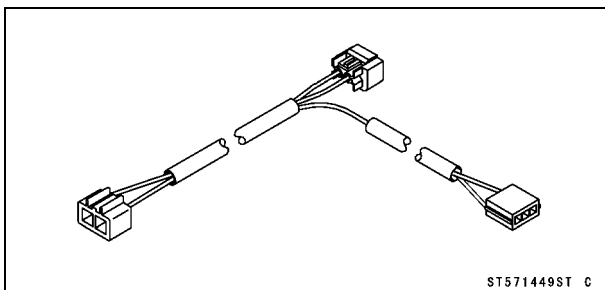
Peak Voltage Adapter:  
57001-1415



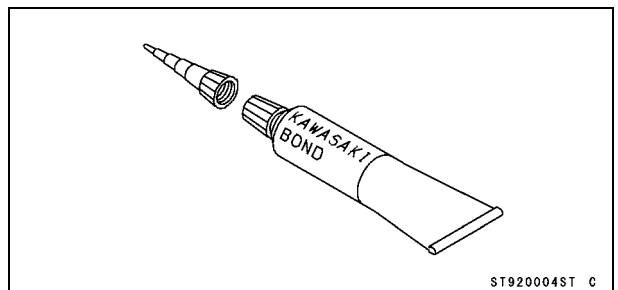
Flywheel & Pulley Holder:  
57001-1605



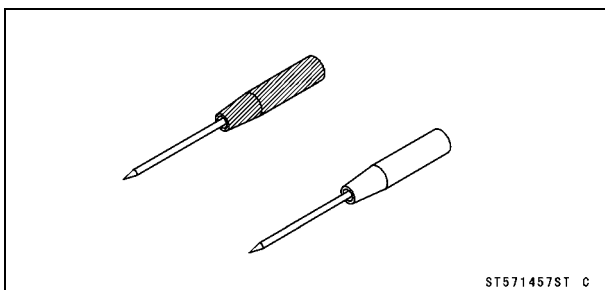
Lead Wire - Peak Voltage Adapter:  
57001-1449



Kawasaki Bond (Silicone Sealant):  
92104-0004

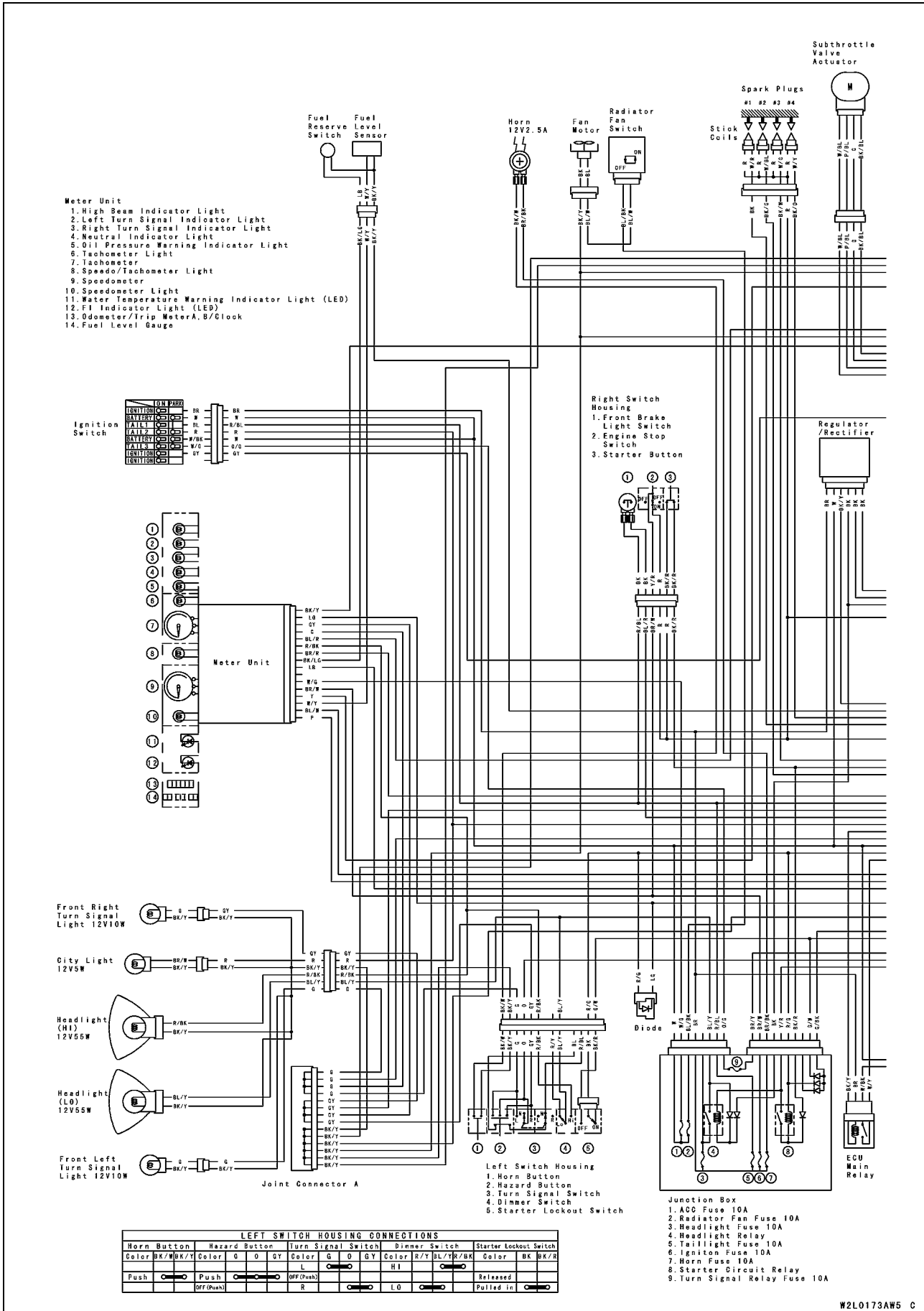


Needle Adapter Set:  
57001-1457



# 16-12 ELECTRICAL SYSTEM

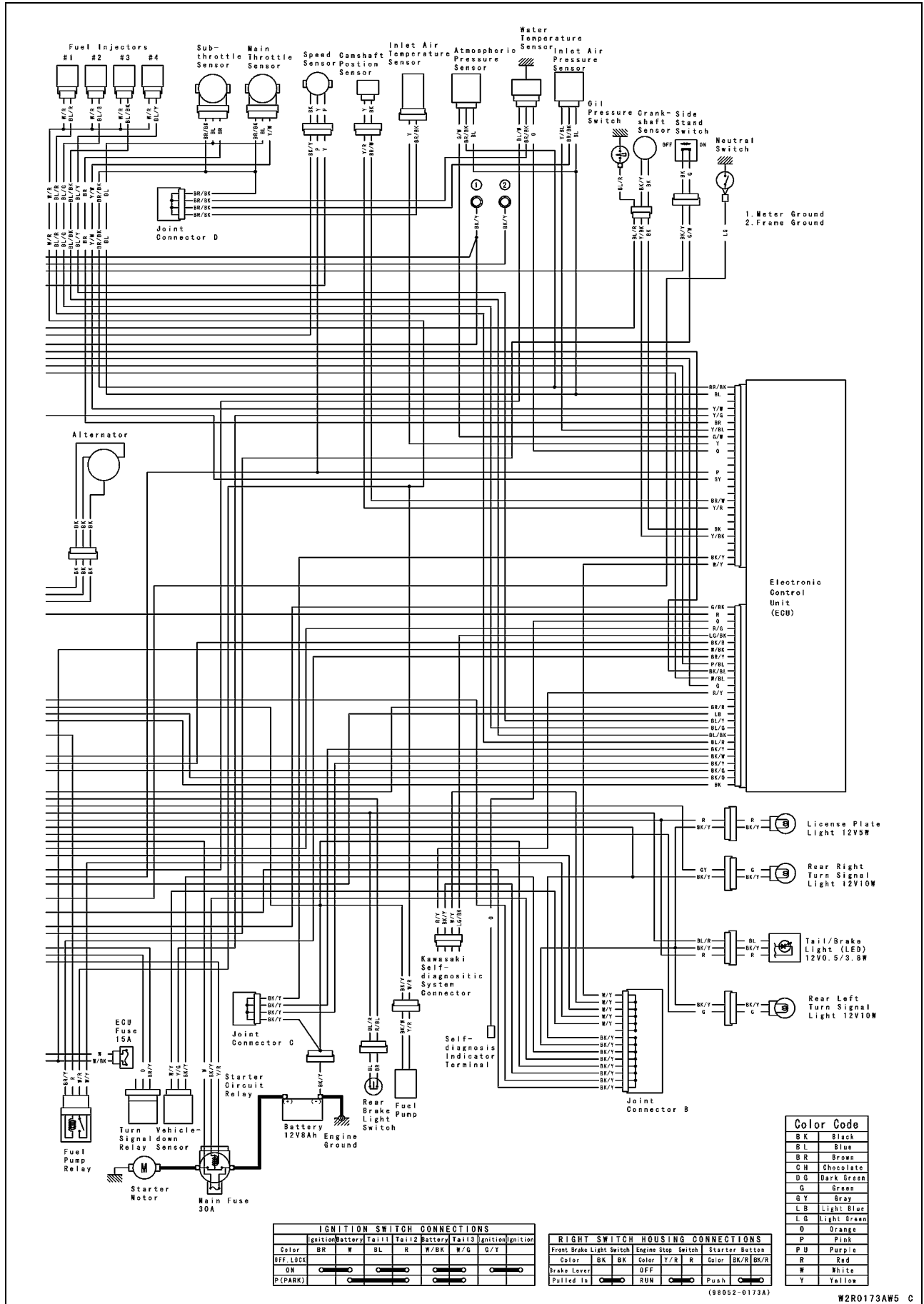
## Wiring Diagram (United States and Canada)



**LEFT SWITCH HOUSING CONNECTIONS**

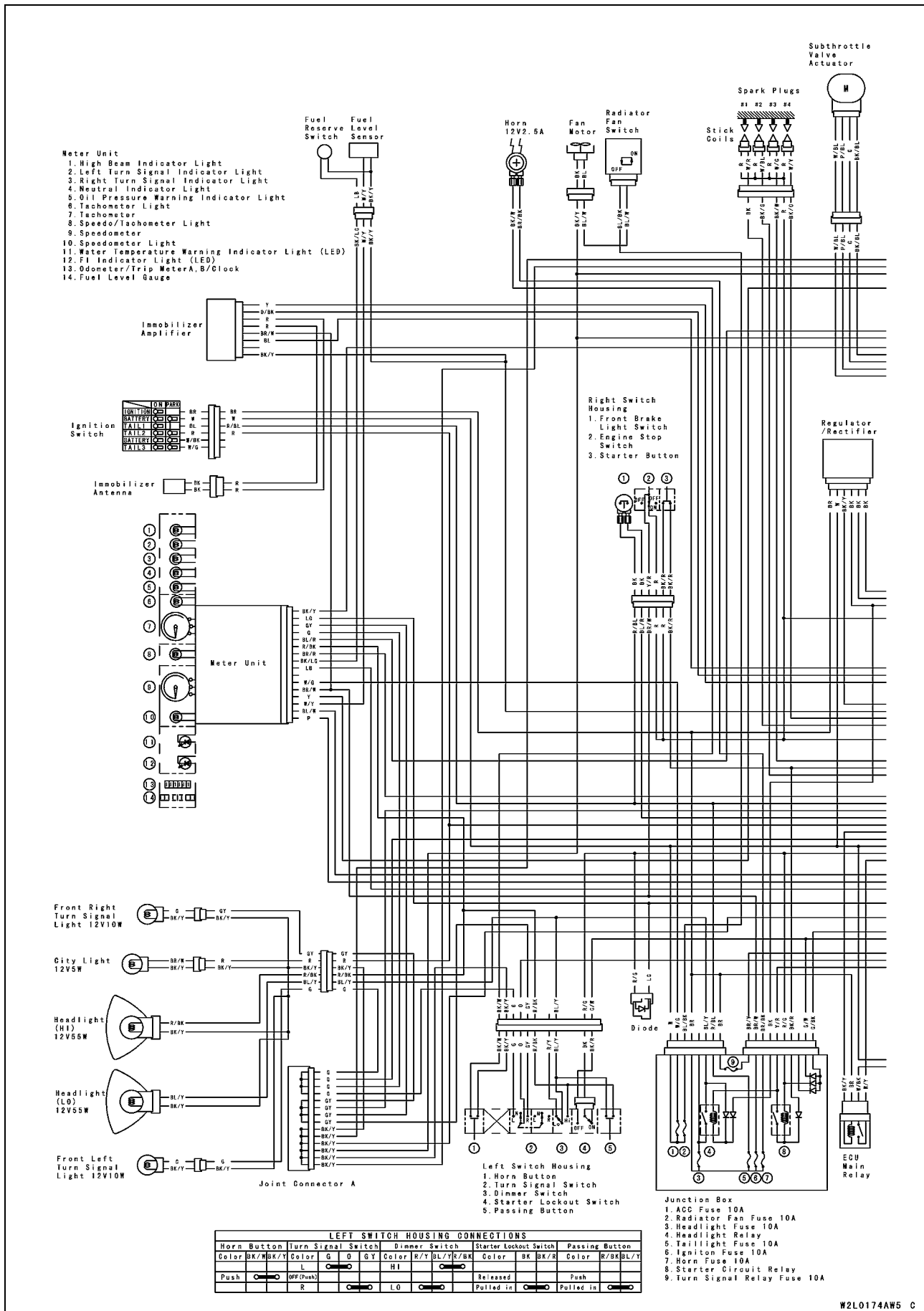
Horn Button	Hazard Button	Turn Signal Switch	Dimmer Switch	Starter Lockout Switch
Color BK/WK/Y	Color G	Color G	Color R/Y	Color BK/BK/R
Push	Push	OFF (Push)	Released	Released
	OFF (Push)	R	LO	Pulled in

## Wiring Diagram (United States and Canada)



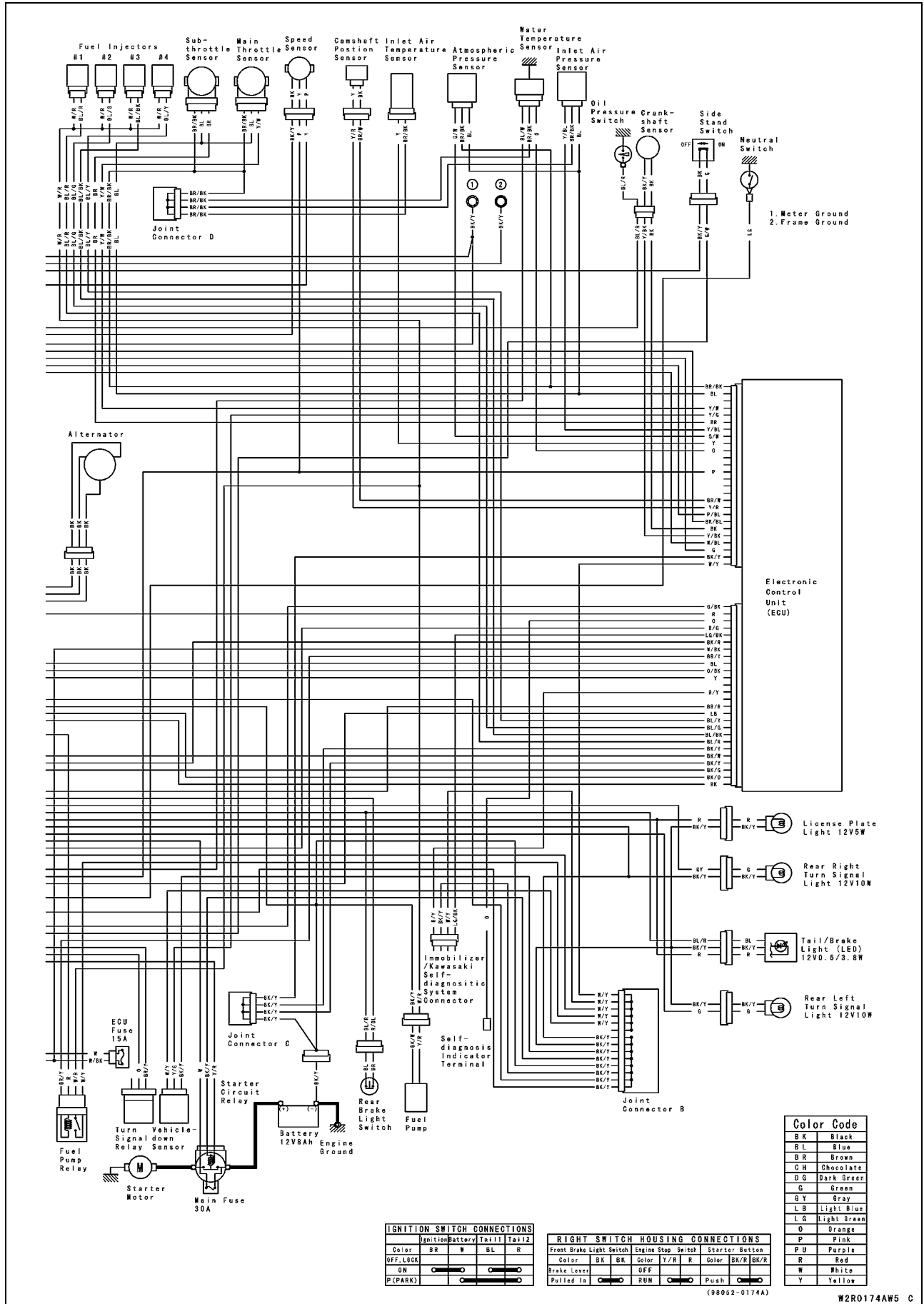
# 16-14 ELECTRICAL SYSTEM

## Wiring Diagram (Other than United States Canada, and Malaysia)



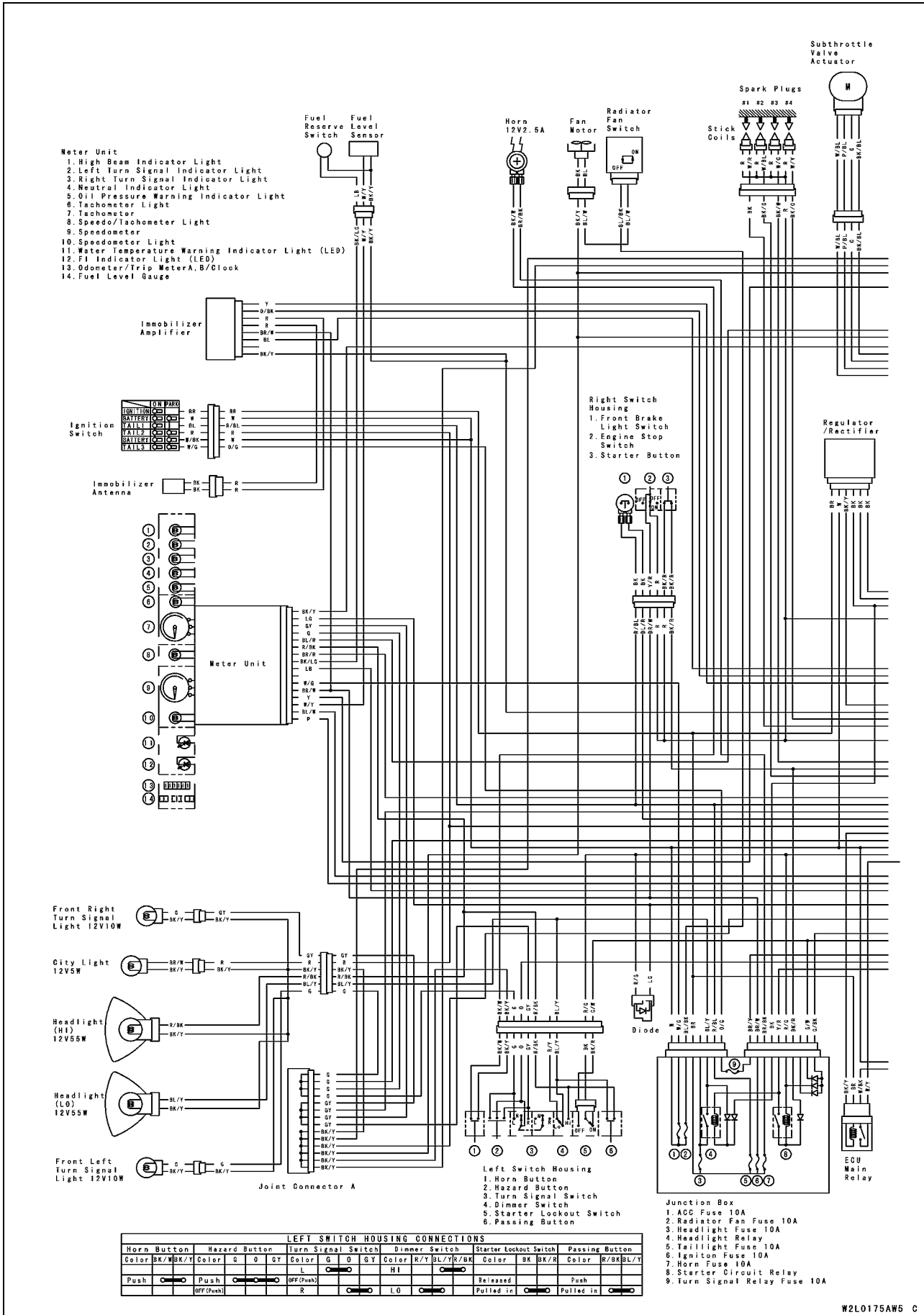
# ELECTRICAL SYSTEM 16-15

## Wiring Diagram (Other than United States Canada, and Malaysia)

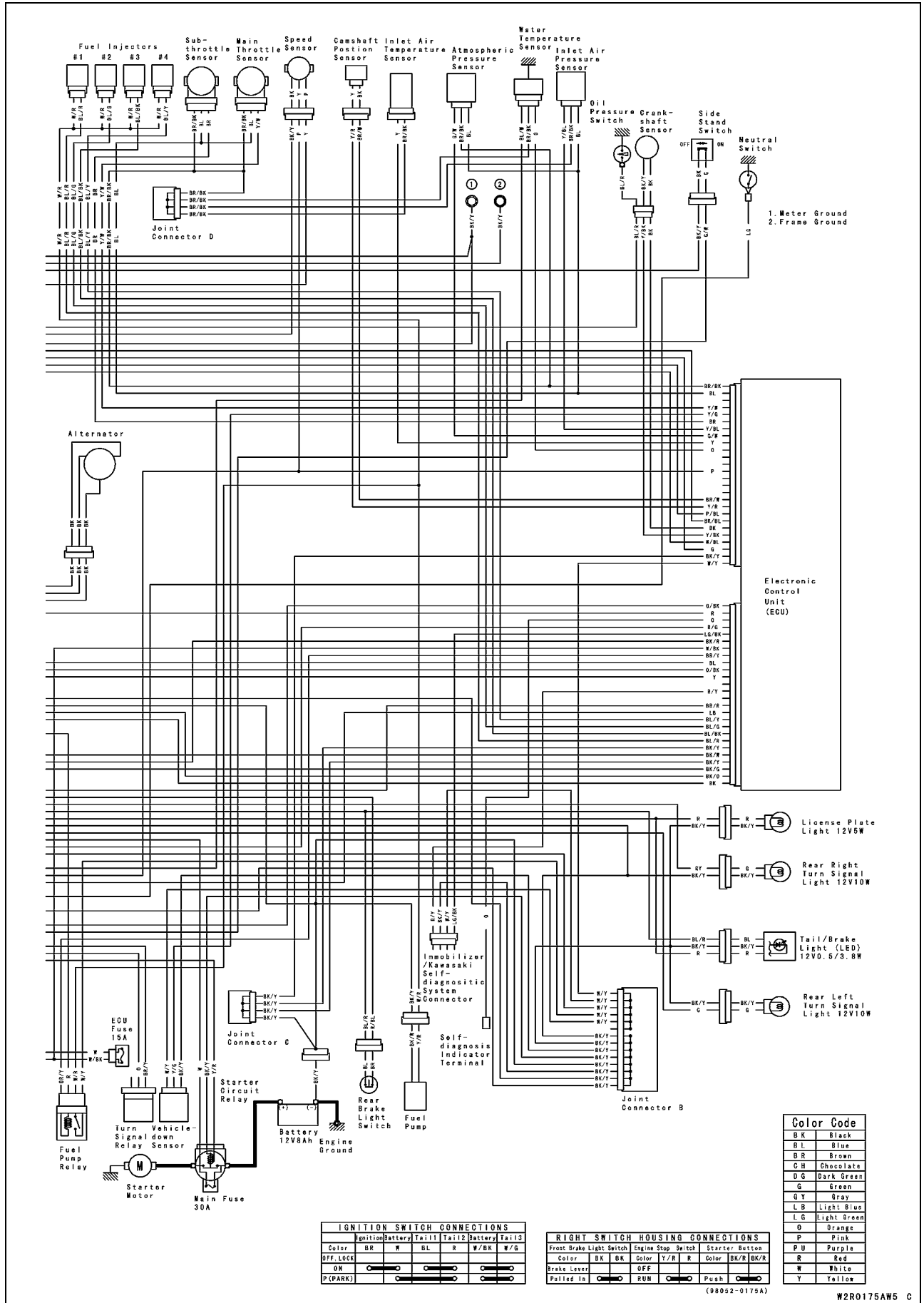


# 16-16 ELECTRICAL SYSTEM

## Wiring Diagram (Malaysia)



## Wiring Diagram (Malaysia)



# 16-18 ELECTRICAL SYSTEM

## Precautions

There are a number of important precautions that are musts when servicing electrical systems. Learn and observe all the rules below.

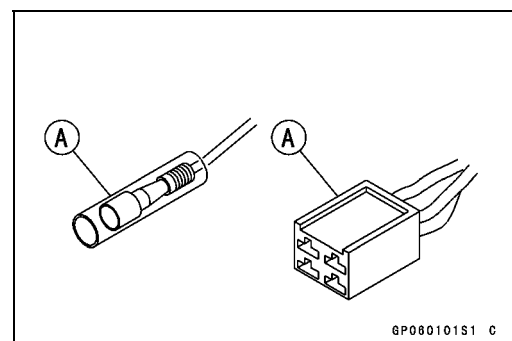
- Do not reverse the battery lead connections. This will burn out the diodes on the electrical parts.
- Always check battery condition before condemning other parts of an electrical system. A fully charged battery is a must for conducting accurate electrical system tests.
- The electrical parts should 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 leads or any other electrical connections when the ignition switch is on, or while the engine is running.
- Because of the large amount of current, never keep the starter button pushed when the starter motor will not turn over, or the current may burn out the starter motor windings.
- Take care not to short the leads 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).

○ Color Codes:

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

○ Electrical Connectors

Female Connectors [A]

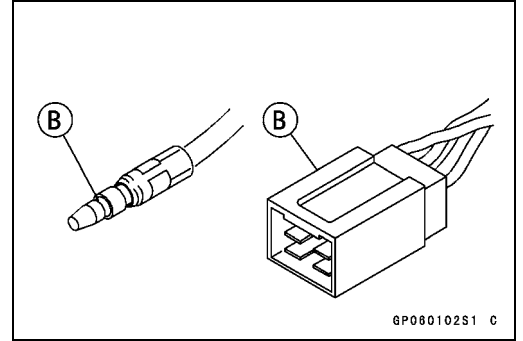


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**Precautions**

Male Connectors [B]

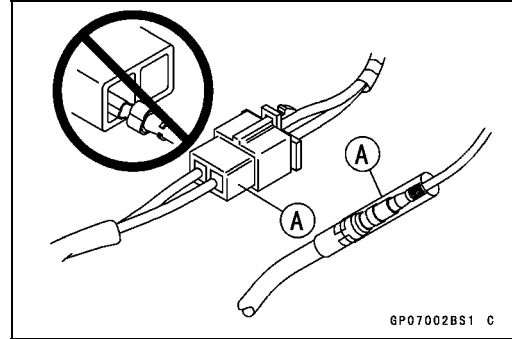


## 16-20 ELECTRICAL SYSTEM

### Electrical Wiring

#### Wiring Inspection

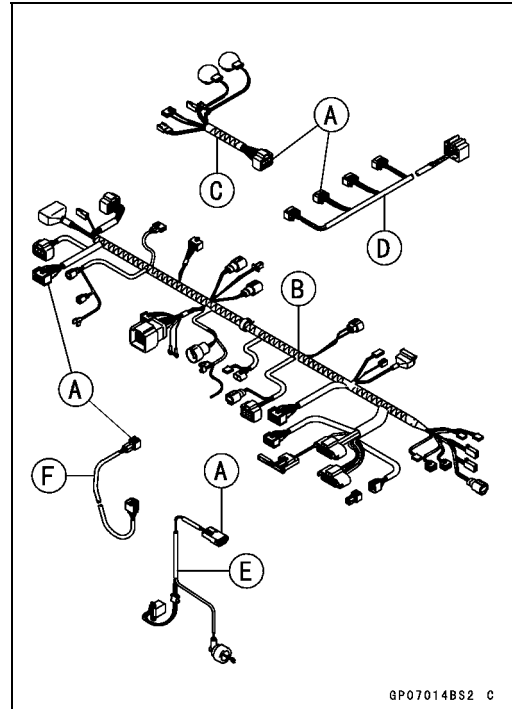
- Visually inspect the wiring for signs of burning, fraying, etc.
- ★ If any wiring is poor, replace the damaged wiring.
- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it.



- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which is suspected of being a problem.
- Connect the hand tester between the ends of the leads.

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

- Set the tester to the  $\times 1 \Omega$  range, and read the tester.
- ★ If the tester does not read  $0 \Omega$ , the lead is defective. Replace the lead or the wiring harness [B], [C], [D], [E], [F], if necessary.



## Battery

### Battery Removal

#### CAUTION

Do not disconnect the battery cables or any other electrical connections when the ignition switch is ON, as this could damage the ECU (Electronic Control Unit).  
Never reverse the connections of the battery, this could damage the ECU.

- Remove:  
Seats (see Frame Chapter)
- Disconnect the negative (–) cable [A].
- Slide out the positive (+) terminal cap [B] and then disconnect the positive (+) cable.

#### CAUTION

Be sure to disconnect the negative (–) cable first.

- Remove the battery.

### Battery Installation

- Apply a light coat of grease on the terminals to prevent corrosion.
- Install the positive (+) cable [A] first.
- Cover the (+) terminal with the cap [B].
- Install the negative (–) cable [C].

### Battery Activation

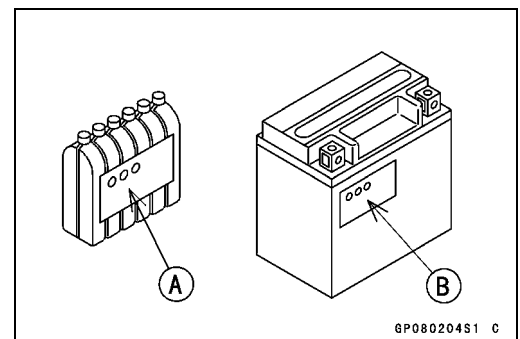
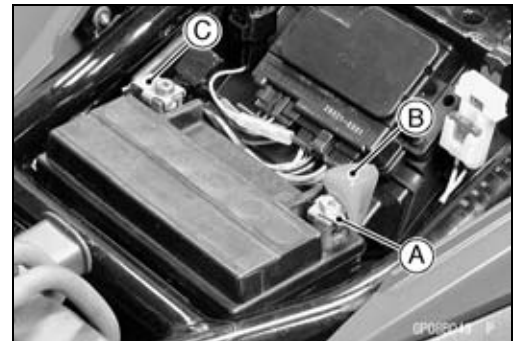
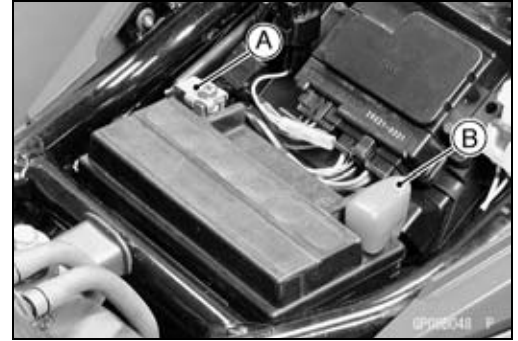
#### Electrolyte Filling

- Make sure that the model name [A] of the electrolyte container matches the model name [B] of the battery. These names must be the same.

Battery Model Name for ZR750-K1: YTX9-BS

#### CAUTION

Be sure to use the electrolyte container with the same model name as the battery since the electrolyte volume and specific gravity vary with the battery type. This is to prevent overfilling of the electrolyte, shorting the battery life, and deterioration of the battery performance.



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# 16-22 ELECTRICAL SYSTEM

## Battery

### CAUTION

Do not remove the aluminum sealing sheet [A] from the filler ports [B] until just prior to use. Be sure to use the dedicated electrolyte container for correct electrolyte volume.

- Place the battery on a level surface.
- Check to see that the sealing sheet has no peeling, tears, or holes in it.
- Remove the sealing sheet.

### NOTE

○The battery is vacuum sealed. If the sealing sheet has leaked air into the battery, it may require a longer initial charge.

- Remove the electrolyte container from the vinyl bag.
- Detach the strip of caps [A] from the container and set aside, these will be used later to seal the battery.

### NOTE

○Do not pierce or otherwise open the sealed cells [B] of the electrolyte container. Do not attempt to separate individual cells.

- Place the electrolyte container upside down with the six sealed cells into the filler ports of the battery. Hold the container level, push down to break the seals of all six cells. You will see air bubbles rising into each cell as the ports fill.

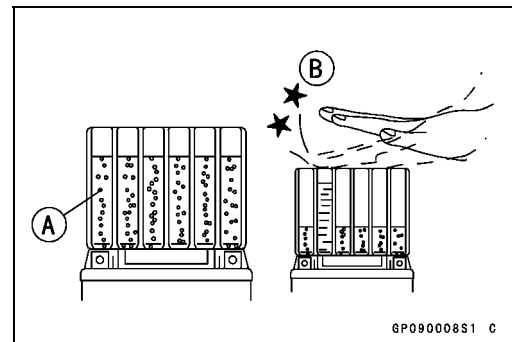
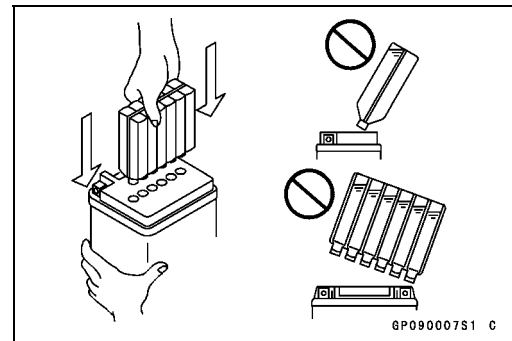
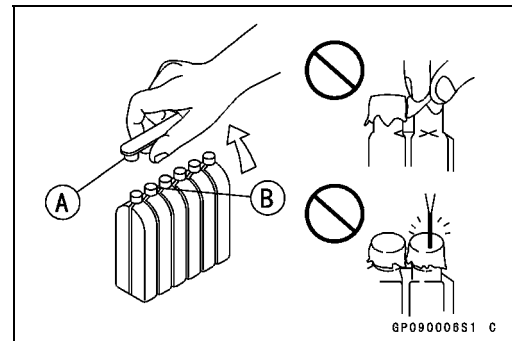
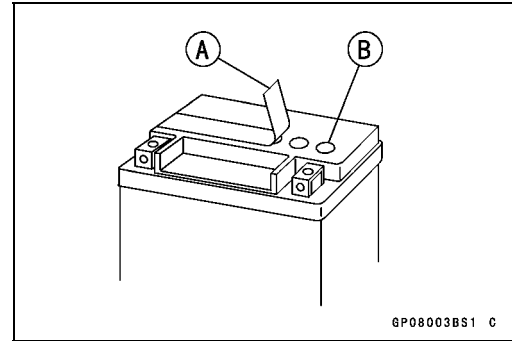
### NOTE

○Do not tilt the electrolyte container

- Check the electrolyte flow.
- ★If no air bubbles [A] are coming up from the filler ports, or if the container cells have not emptied completely, tap the container [B] a few times.
- Keep the container in place for **30** minutes or more. Don't remove the container from the battery until it's empty, the battery requires all the electrolyte from the container for proper operation.

### CAUTION

Removal of the container before it is completely empty can shorten the service life of the battery. Do not remove the electrolyte container until it is completely empty and 20 minutes have elapsed.



**Battery**

- Gently remove the container from the battery.
- Let the battery sit for **60** minutes prior to charging to allow the electrolyte to permeate into the plates for optimum performance.

**NOTE**

○Charging the battery immediately after filling can shorten service life. Let the battery sit for at least **60** minutes after filling.

**Initial Charge**

- Place the strip [A] of caps loosely over the filler ports.
- Newly activated sealed batteries require an initial charge.

**Standard Charge: 0.9 A × 5 ~ 10 hours**

★If using a recommended battery charger, follow the charger's instructions for newly activated sealed battery.

**Kawasaki-recommended chargers:**

**Optimate III**

**Yuasa 1.5 Amp Automatic Charger**

**Battery Mate 150-9**

★If the above chargers are not available, use equivalent one.

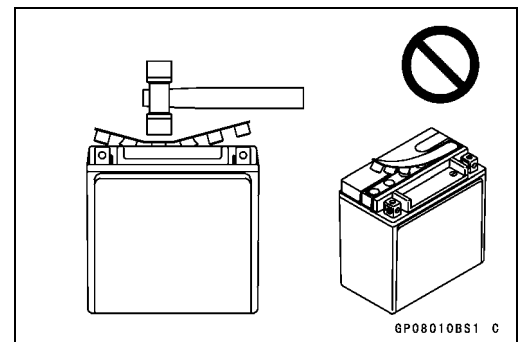
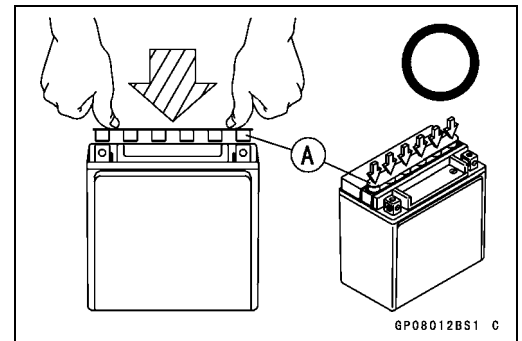
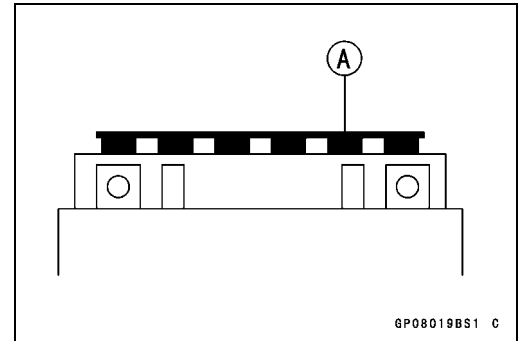
**NOTE**

○Charging rates will vary depending on how long the battery has been stored, temperature, and the type of charger used. Let battery sit 30 minutes after initial charge, then check voltage using a voltmeter. If it is not at least 12.6 volts, repeat charging cycle.

- After charging is completed, press down firmly with both hands to seat the strip of caps [A] into the battery (don't pound or hammer). When properly installed, the strip of the caps will be level with the top of the battery.

**CAUTION**

**Once the strip of the caps [A] is installed onto the battery, never remove the caps, nor add water or electrolyte to the battery.**



## 16-24 ELECTRICAL SYSTEM

### Battery

#### NOTE

○ To ensure maximum battery life and customer satisfaction, it is recommended the battery be load tested at three times its amp-hour rating for 15 seconds.

Re-check voltage and if less than 12.6 volts repeat the charging cycle and load test. If still below 12.6 volts the battery is defective.

#### Precautions

- 1) No need of topping-up

No topping-up is necessary in this battery until it ends its life under normal use. Forcibly prying off the seal cap to add water is very dangerous. Never do that.

- 2) Refreshing charge

If an engine will not start, a horn sounds weak, or lamps are dim, it indicates the battery has been discharged. Give refresh charge for 5 to 10 hours with charge current shown in the specification (see this chapter).

When a fast charge is inevitably required, do it following precisely the maximum charge current and time conditions indicated on the battery.

#### CAUTION

**This battery is designed to sustain no unusual deterioration if refresh-charged according to the method specified above. However, the battery's performance may be reduced noticeably if charged under conditions other than given above. Never remove the seal cap during refresh charge.**

**If by chance an excessive amount of gas is generated due to overcharging, the relief valve releases the gas to keep the battery normal.**

- 3) When you do not use the motorcycle for months:

Give a refresh charge before you store the motorcycle and store it with the negative cable removed. Give a refresh charge **once a month** during storage.

- 4) Battery life:

If the battery will not start the engine even after several refresh charges, the battery has exceeded its useful life. Replace it (Provided, however, the vehicle's starting system has no problem).

#### ⚠ WARNING

**Keep the battery away from sparks and open flames during charging, since the battery gives off an explosive gas mixture of hydrogen and oxygen. When using a battery charger, connect the battery to the charger before turning on the charger.**

**This procedure prevents sparks at the battery terminals which could ignite any battery gases.**

**No fire should be drawn near the battery, or no terminals should have the tightening loosened.**

**The electrolyte contains sulfuric acid. Be careful not to have it touch your skin or eyes. If touched, wash it off with liberal amount of water. Get medical attention if severe.**

#### Interchange

A sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace a sealed battery only on a motorcycle which was originally equipped with a sealed battery.

Be careful, if a sealed battery is installed on a motorcycle which had an ordinary battery as original equipment, the sealed battery's life will be shortened.

**Battery**

*Charging Condition Inspection*

- Battery charging condition can be checked by measuring battery terminal voltage with a digital voltmeter [A].
- Remove:
  - Seats (see Frame chapter)
  - Battery Cable Caps (see this chapter)
- Disconnect the battery terminals.

**CAUTION**

**Be sure to disconnect the negative (-) cable first.**

- Measure the battery terminal voltage.

**NOTE**

○ Measure with a digital voltmeter which can be read one decimal place voltage.

- ★ If the reading is 12.6 V or more, no refresh charge is required, however, if the read is below the specified, refresh charge is required.

**Battery Terminal Voltage**

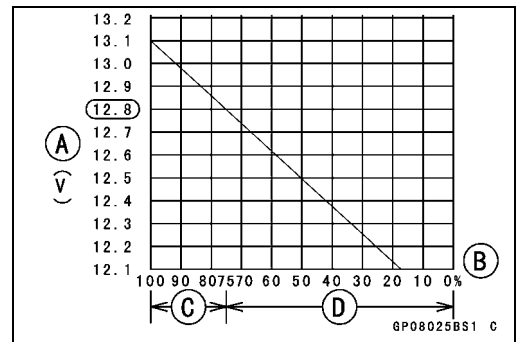
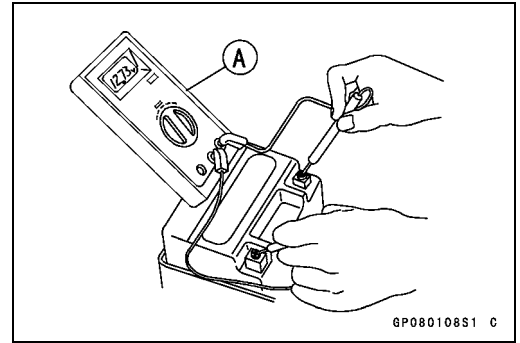
**Standard: 12.8 V or more**

Terminal Voltage (V) [A]

Battery Charge Rate (%) [B]

Good [C]

Refresh charge is required [D]

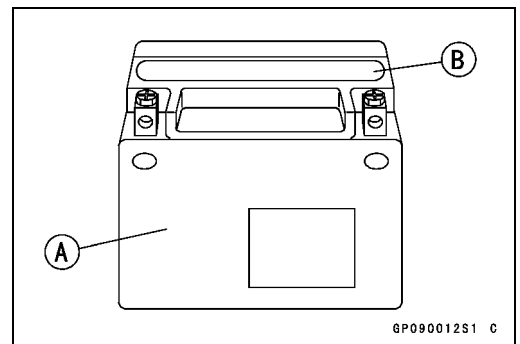


*Refreshing Charge*

- Remove the battery [A] (see Battery Removal).
- Do refresh charge by following method according to the battery terminal voltage.

**⚠ WARNING**

**This battery is sealed type. Never remove sealing cap [B] even at charging. Never add water. Charge with current and time as stated below.**



# 16-26 ELECTRICAL SYSTEM

## Battery

Terminal Voltage: 11.5 ~ less than 12.8 V  
 Standard Charge 0.9 A × 5 ~ 10 h (see following chart)  
 Quick Charge 4 A × 1 h

### CAUTION

If possible, do not quick charge. If quick charge is done unavoidably, do standard charge later on.

Terminal Voltage: less than 11.5 V  
 Charging Method: 0.9 A × 20 h

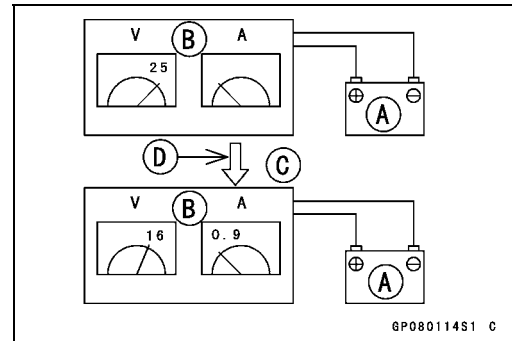
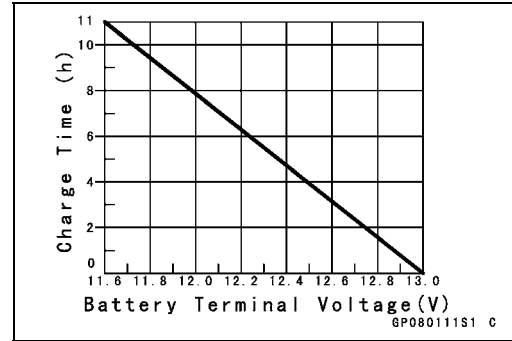
### NOTE

○ Increase the charging voltage to a maximum voltage of 25 V if the battery will not accept current initially. Charge for no more than 5 minutes at the increased voltage then check if the battery is drawing current. If the battery will accept current decrease the voltage and charge by the standard charging method described on the battery case. If the battery will not accept current after 5 minutes, replace the battery.

Battery [A]  
 Battery Charger [B]  
 Standard Value [C]  
 Current starts to flow [D]

- Determine the battery condition after refresh charge.
- Determine the condition of the battery left for 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

Criteria	Judgement
12.8 V or higher	Good
12.0 ~ lower than 12.8 V	Charge insufficient → Recharge
lower than 12.0 V	Unserviceable → Replace

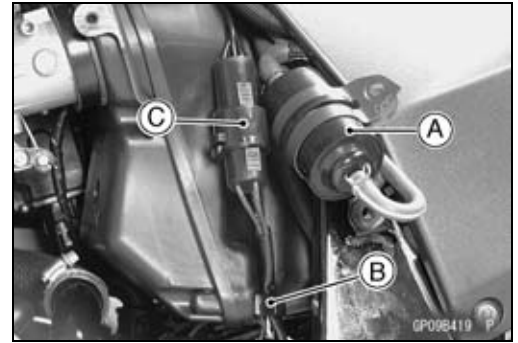




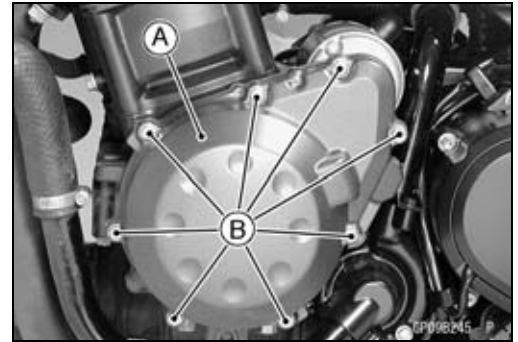
## Charging System

### Alternator Cover Removal

- Remove:
  - Left Frame Cover (see Frame chapter)
  - Separator [A] (California Model)
  - Clamp (Open) [B]
  - Alternator Lead Connector [C]



- Place a suitable container under the alternator cover [A], and remove the cover bolts [B].
- Pull the alternator cover outside.



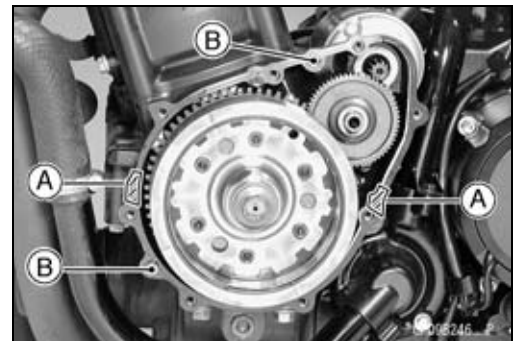
### Alternator Cover Installation

- Apply silicone sealant to the alternator lead grommet and crankcase halves mating surface [A] on the front and rear sides of the cover mount.

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

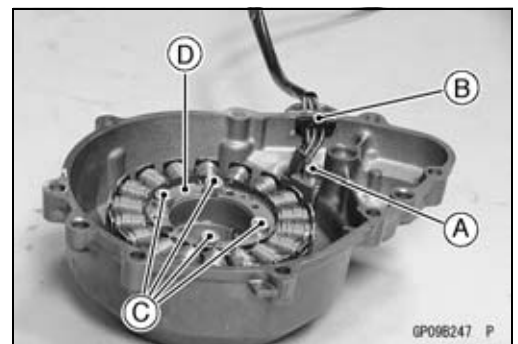
- Check that knock pins [B] are in place on the crankcase.
- Install a new gasket and the alternator cover.
- Tighten:

**Torque - Alternator Cover Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**



### Stator Coil Removal

- Remove:
  - Alternator Cover (see Alternator Cover Removal)
  - Holding Plate Bolt [A] and Plate
  - Alternator Lead Grommet [B]
  - Stator Coil Bolts [C]
- Remove the stator coil [D] from the alternator cover.



# 16-28 ELECTRICAL SYSTEM

## Charging System

### Stator Coil Installation

- Apply a non-permanent locking agent to the threads of the stator coil bolts and tighten them.

**Torque - Stator Coil Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**

- Secure the alternator lead with a holding plate, and tighten the bolt.
- Apply a non-permanent locking agent to the threads of the plate bolt.

**Torque - Alternator Lead Holding Plate Bolt: 11 N·m (1.1 kgf·m, 95 in·lb)**

- Apply silicone sealant to the circumference of the alternator lead grommet, and fit the grommet into the notch of the cover securely.

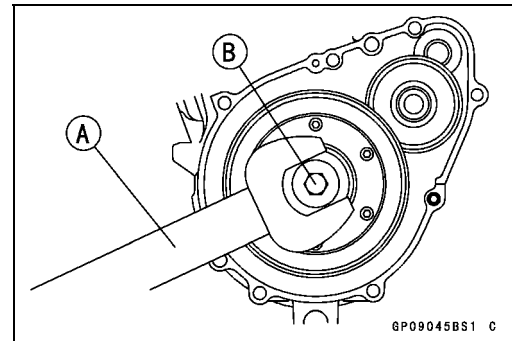
**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Install the alternator cover (see Alternator Cover Installation).

### Alternator Rotor Removal

- Remove:
  - Alternator Cover (see Alternator Cover Removal)
- Wipe oil off the outer circumference of the rotor.
- Hold the alternator rotor steady with the rotor holder [A], and remove the rotor bolt [B] and washer.

**Special Tool - Rotor Holder: 57001-1543**

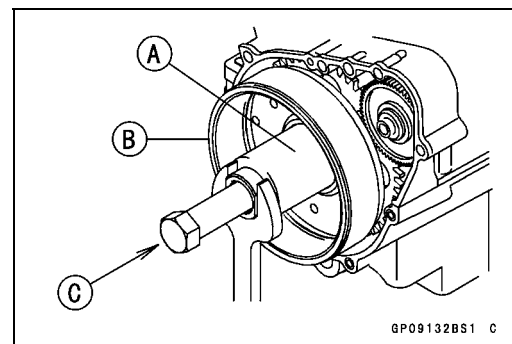


- Using the flywheel puller [A], remove the alternator rotor [B] from the crankshaft.

**Special Tools - Flywheel Puller Assembly, M38 × 1.5/M35 × 1.5: 57001-1405**

### NOTE

- Screw in the puller while tapping the head [C] of the puller with a hammer.

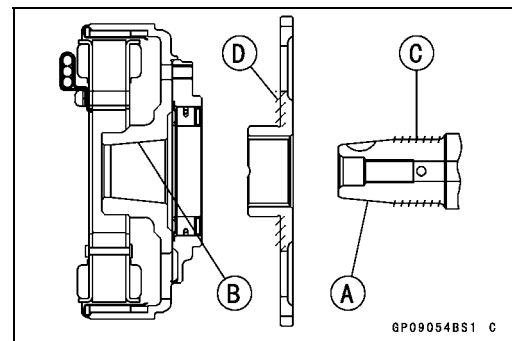


### CAUTION

**Do not attempt to strike the alternator rotor itself. Striking the rotor can cause the magnets to lose their magnetism.**

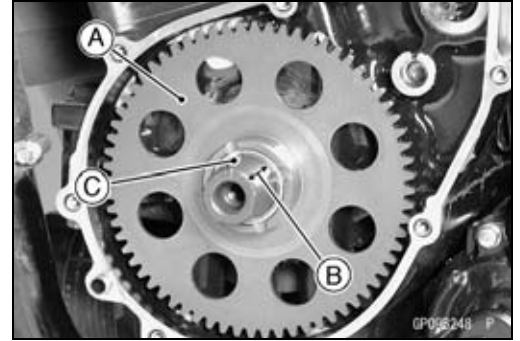
### Alternator Rotor Installation

- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.
  - Crankshaft Tapered Portion [A]
  - Alternator Rotor Tapered Portion [B]
- Apply a thin coat of molybdenum disulfide grease to the crankshaft [C] and the face [D] of the starter clutch gear.

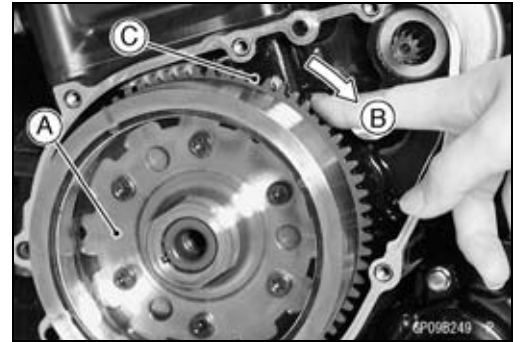


## Charging System

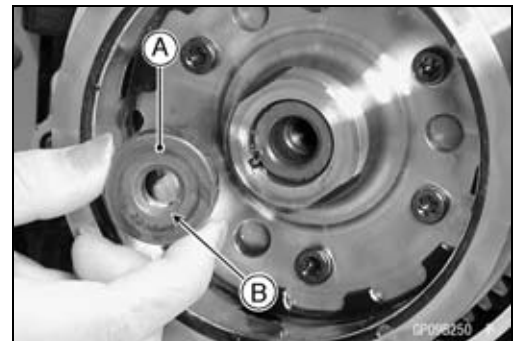
- Install the starter gear [A].
- Again, clean the crankshaft tapered portion [B] and dry there.
- Fit the woodruff key [C] securely in the slot of the crankshaft before installing the alternator rotor.



- Install the alternator rotor [A] while turning [B] the starter clutch gear [C].



- Install the washer [A] so that the chamfer side [B] faces outward.



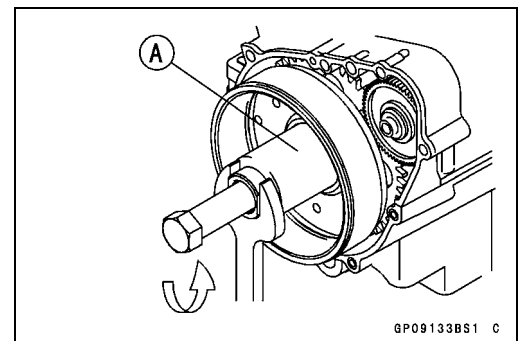
### NOTE

- Confirm the alternator rotor fit or not to the crankshaft before tightening it with specified torque.
- Install the rotor and tighten it with 70 N·m (7.0 kgf·m, 52 ft·lb) of torque.
- Remove the washer and rotor bolt.
- Check the tightening torque with rotor puller [A].
- ★ If the rotor is not pulled out with 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly.
- ★ If the rotor is pulled out with under 20 N·m (2.0 kgf·m, 15 ft·lb) of drawing torque, clean off any oil dirt or flaw of the crankshaft and rotor tapered portion, and dry them with a clean cloth. Then, confirm that it is not pulled out with above torque.

- Tighten the alternator rotor bolt while holding the alternator rotor steady with the rotor holder.

**Special Tool - Rotor Holder: 57001-1543**

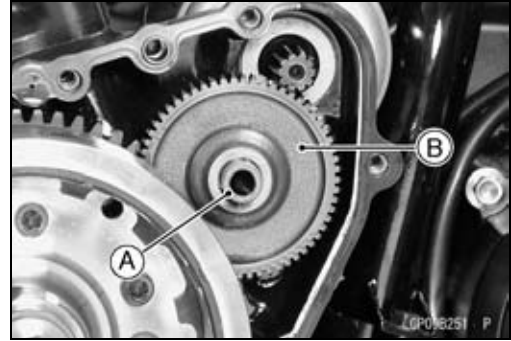
**Torque - Alternator Rotor Bolt: 110 N·m (11 kgf·m, 81 ft·lb)**



## 16-30 ELECTRICAL SYSTEM

### Charging System

- Apply a thin coat of molybdenum disulfide grease to the shaft [A], and install it and starter idle gear [B].
- Install the alternator cover (see Alternator Cover Installation).

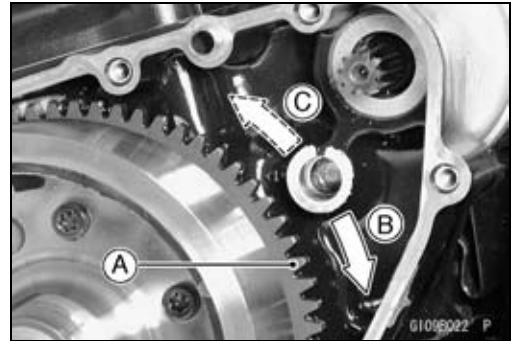


#### Starter Motor Clutch Removal/Installation

- Refer to the Alternator Rotor Removal and Installation in the Electrical System chapter.

#### Starter Motor Clutch Inspection

- Remove:
  - Alternator Cover (see Electrical System chapter)
  - Starter Idle Gear
- Turn the starter motor clutch gear [A] by hand. The starter motor clutch gear should turn clockwise [B] freely, but should not turn counterclockwise [C].
- ★ If the clutch does not operate as it should or if it makes noise, go to the next step.
- Remove and disassemble the starter motor clutch, and visually inspect the clutch parts.
- ★ If there is any worn or damaged part, replace it.



#### NOTE

○ Examine the starter motor clutch gear as well. Replace it if it is worn or damaged.

#### Starter Motor Clutch Disassembly

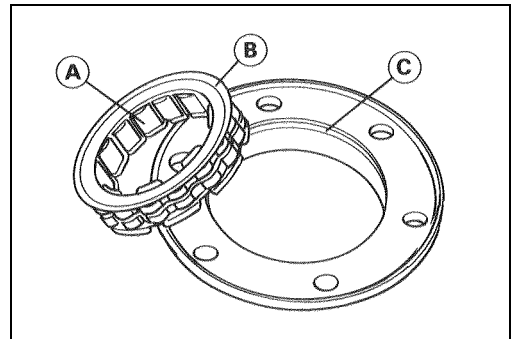
- Remove:
  - Alternator Rotor (see Electrical System chapter)
  - Starter Motor Clutch Bolts [A] and Starter Motor Clutch



#### Starter Motor Clutch Assembly

- Be sure to install the one-way clutch [A] so that its flange [B] fits in the holder recess [C].
- Apply a non-permanent locking agent to the threads of the starter motor clutch bolts, and tighten them.

**Torque - Starter Motor Clutch Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)**



## Charging System

### Alternator Inspection

There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the alternator, by leaving it near an electromagnetic field, or just by aging, will result in low output.

- To check the alternator output voltage, do the following procedures.

○ Turn off the ignition switch.

○ Remove:

- Left Frame Cover (see Alternator Cover Removal)
- Separator (California Model)

- Disconnect the alternator lead connector [A].
- Connect the hand tester as shown in the table 1.
- Start the engine.
- Run it at the rpm given in the table 1.
- Note the voltage readings (total 3 measurements).

**Table 1 Alternator Output Voltage**

Tester Range	Connections		Reading @4 000 rpm
	Tester (+) to	Tester (-) to	
250 V AC	One Black lead	Another Black lead	42 V or more

★ If the output voltage shows the value in the table, the alternator operates properly.

★ If the output voltage shows a much higher than the value in the table, the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the alternator is defective.

- Check the stator coil resistance as follows.

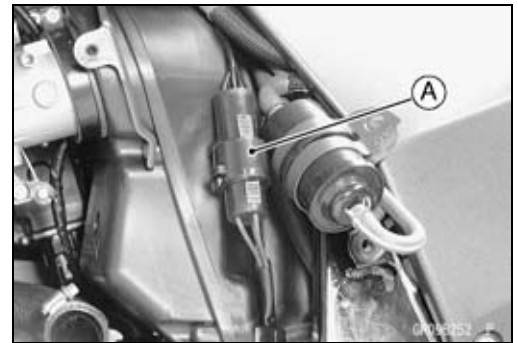
○ Stop the engine.

○ Connect the hand tester as shown in the table 2.

○ Note the readings (total 3 measurement).

**Table 2 Stator Coil Resistance**

Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
$\times 1 \Omega$	One Black lead	Another Black lead	$0.3 \sim 0.4 \Omega$



## 16-32 ELECTRICAL SYSTEM

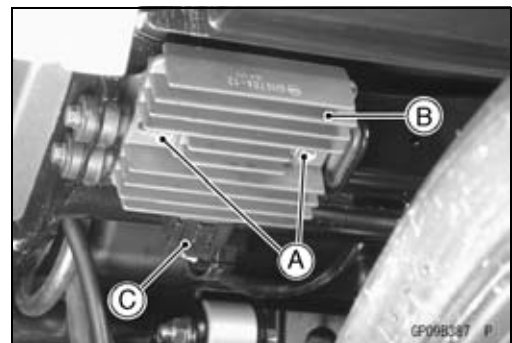
### Charging System

- ★ If there is more resistance than shown in the table, or no hand tester reading (infinity) for any two leads, the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.
- Using the highest resistance range of the hand tester, measure the resistance between each of the black leads and chassis ground.
- ★ Any hand tester reading less than infinity ( $\infty$ ) 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.

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

#### Regulator/Rectifier Inspection

- Remove:
  - Bolts [A]
  - Regulator/Rectifier [B]
  - Connector [C] (disconnect)



#### Rectifier Circuit Check

- Check conductivity of the following pair of terminals.

#### Rectifier Circuit Inspection

Tester connection	W-BK1,	W-BK2,	W-BK3
	BK/Y-BK1,	BK/Y-BK2,	BK/Y-BK3

- ★ The resistance should be low in one direction and more than ten times as much in the other direction. If any two leads are low or high in both directions, the rectifier is defective and must be replaced.

#### NOTE

○ The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking the lower reading should be from zero to one half the scale.

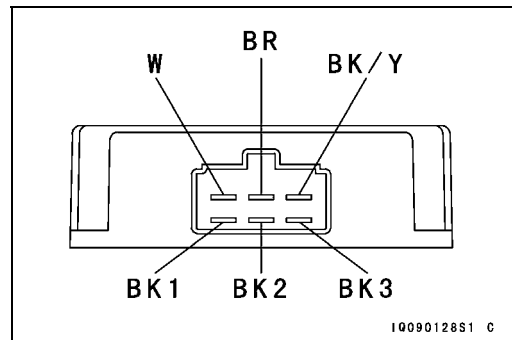
#### Regulator Circuit Check

To test the regulator out of circuit, use three 12 V batteries and a test light (12 V 3 ~ 6 W bulb in a socket with leads).

#### CAUTION

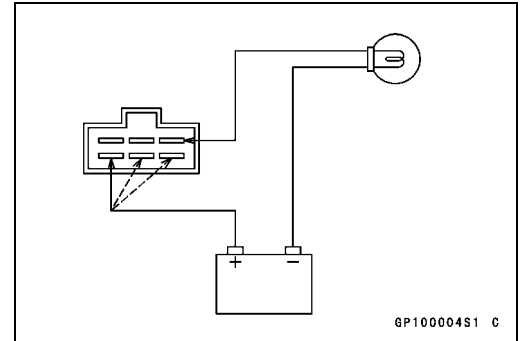
**The test light works as an indicator and also a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.**

- Check to be sure the rectifier circuit is normal before continuing.

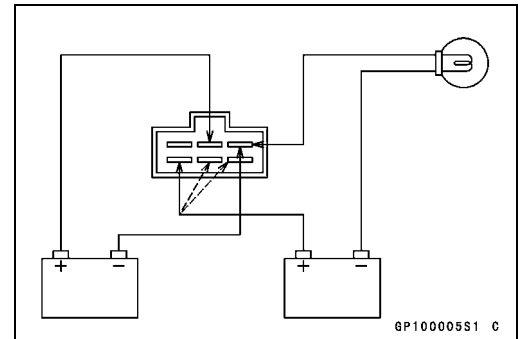


## Charging System

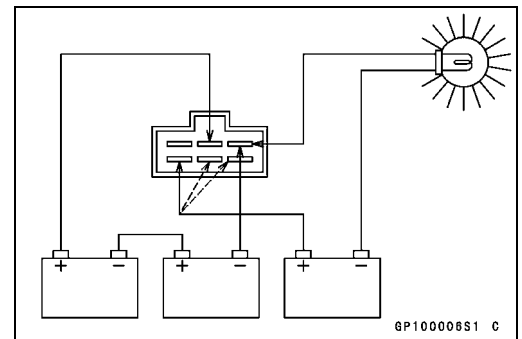
- Do the 1st step regulator circuit test:
  - Connect the test light and the 12 V battery to the regulator/rectifier as shown.
  - Check BK1, BK2, and BK3 terminal respectively.
  - ★ If the test light turns on, the regulator/rectifier is defective. Replace it.
  - ★ If the test light does not turn on, continue the test.



- Do the 2nd step regulator circuit test:
  - Connect the test light and the 12 V battery in the same manner as specified in the "Regulator Circuit Test-1st Step".
  - Apply 12 V to the voltage BR terminal.
  - Check BK1, BK2, and BK3 terminal respectively.
  - ★ If the test light turns on, the regulator/rectifier is defective. Replace it.
  - ★ If the test light does not turn on, continue the test.



- Do the 3rd step regulator circuit test:
  - Connect the test light and the 12 V battery in the same manner as specified in the "Regulator Circuit Test-1st Step".
  - Momentarily apply 24 V to the voltage BR terminal by adding a 12 V battery.
  - Check BK1, BK2, and BK3 terminals respectively.



### CAUTION

**Do not apply more than 24 volts. If more than 24 volts is applied, the regulator/rectifier may be damaged. Do not apply 24 V more than a few seconds. If 24 volts is applied for more than a few seconds, the regulator/rectifier may be damaged.**

- ★ If the test light did not light when the 24 V was applied momentarily to the voltage monitoring terminal, the regulator/rectifier is defective. Replace it.
- ★ If the regulator/rectifier passes all of the tests described, it may still be defective. If the charging system still does not work properly after checking all of the components and the battery, test the regulator/rectifier by replacing it with a known good unit.

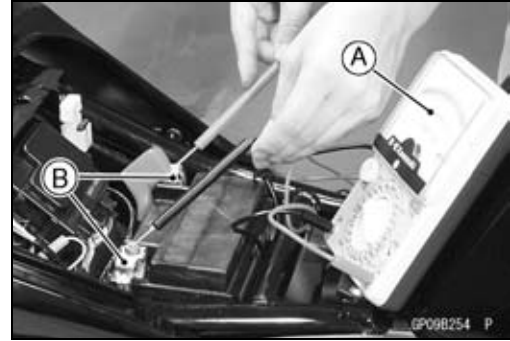
## 16-34 ELECTRICAL SYSTEM

### Charging System

#### Charging Voltage Inspection

- Check the battery condition (see Battery section).
- Warm up the engine to obtain actual alternator operating conditions.
- Remove the seat (see Frame chapter).
- Check that the ignition switch is turned off, and connect the hand tester [A] to the battery terminals [B].

**Special Tool - Hand Tester: 57001-1394 [A]**



- 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

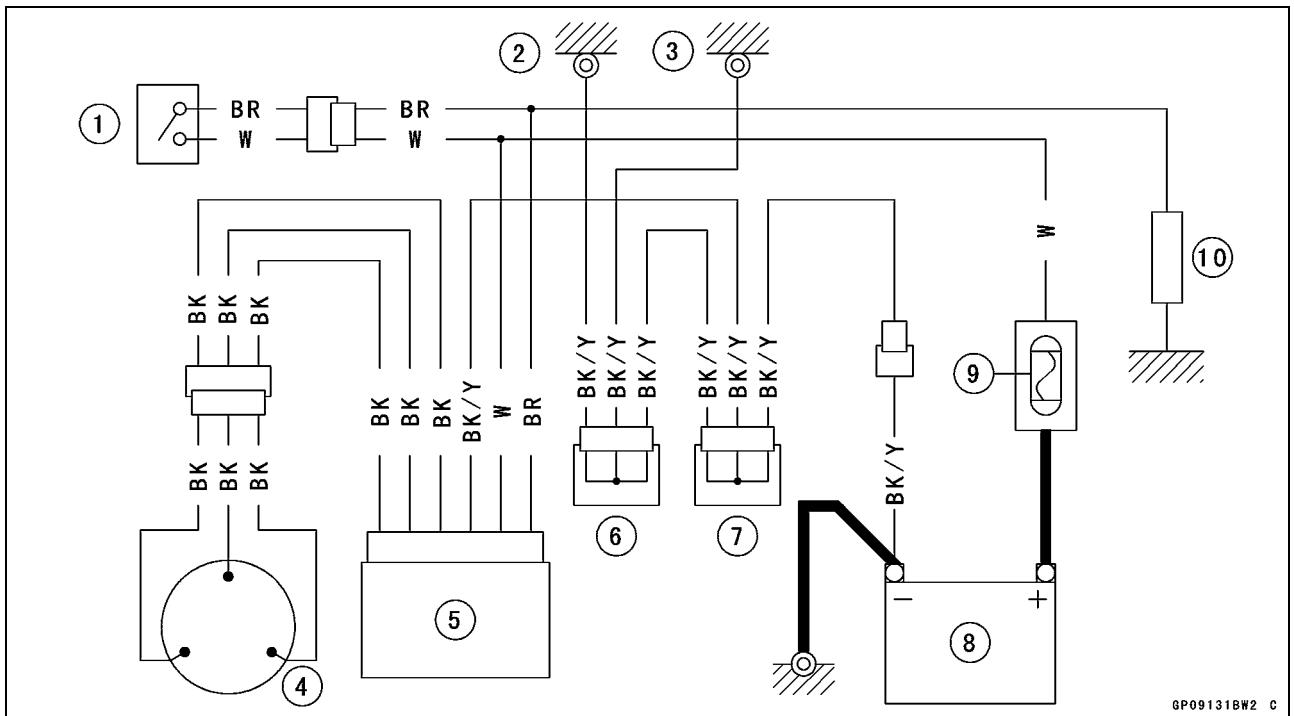
Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
25 V DC	Battery (+)	Battery (-)	14.2 ~ 15.2 V

- Turn off the ignition switch to stop the engine, and disconnect the hand tester.
- ★ If the charging voltage is kept between the values given in the table, the charging system is considered to be working normally.
- ★ If the charging voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.
- ★ If the charging voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the alternator output is insufficient for the loads. Check the alternator and regulator/rectifier to determine which part is defective.



Charging System

Charging System Circuit



1. Ignition Switch
2. Meter Ground
3. Frame Ground
4. Alternator
5. Regulator/Rectifier
6. Joint Connector A
7. Joint Connector B
8. Battery 12 V 8 Ah
9. Main Fuse 30 A
10. Load

## 16-36 ELECTRICAL SYSTEM

### Ignition System

#### **⚠ WARNING**

The ignition system produces extremely high voltage. Do not touch the spark plugs or stick coils while the engine is running, or you could receive a severe electrical shock.

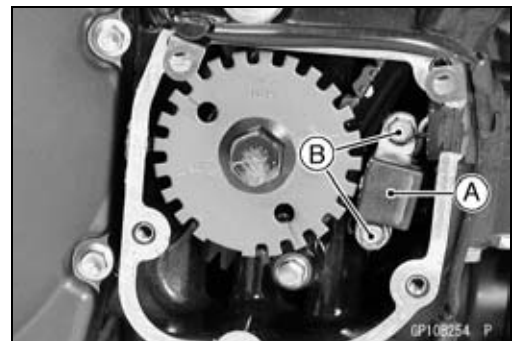
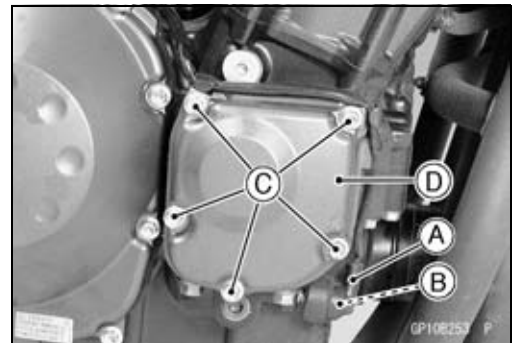
#### **CAUTION**

Do not disconnect the battery cables or any other electrical connections when the ignition switch is on, or while the engine is running. This is to prevent ECU (Electronic Control Unit) damage.

Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes and ECU.

#### *Crankshaft Sensor Removal*

- Remove:
  - Right Frame Cover (see Frame chapter)
  - Crankshaft Sensor Lead Connector [A]
  
- Remove:
  - Rubber Boot (Slide Out) [A]
  - Oil Pressure Switch Lead Terminal [B]
  - Crankshaft Sensor Cover Bolts [C] with Clamps
  - Crankshaft Sensor Cover [D]
  
- Remove the crankshaft sensor [A] by taking off the crankshaft sensor bolts [B].



## Ignition System

### Crankshaft Sensor Installation

- Route the crankshaft sensor lead correctly (see Cable, Wire, and Hose Routing in Appendix chapter).
- Tighten:

**Torque - Crankshaft Sensor Bolts: 5.9 N·m (0.60 kgf·m, 52 in·lb)**

- Apply silicone sealant [A] to the crankshaft sensor lead grommet and crankcase halves mating surface on the front and rear sides of the crankshaft sensor cover mount.

**Sealant - Kawasaki Bond (Silicone Sealant): 92104-0004**

- Install the clamps [A] direction as shown.
- Tighten:

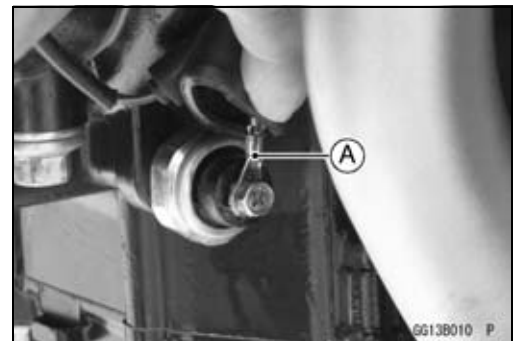
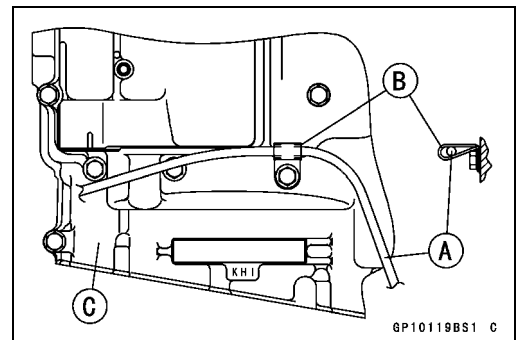
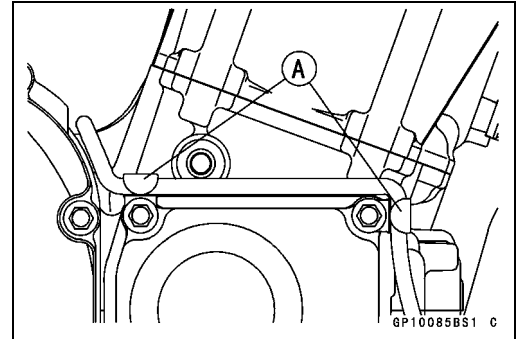
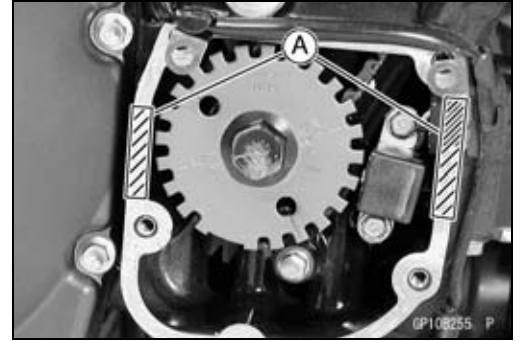
**Torque - Crankshaft Sensor Cover Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**

- Hold the sensor lead [A] with the clamp [B].  
Upper Crankcase [C]

- Install oil pressure switch lead terminal [A] securely.
- Install the lead terminal direction upward.

**Torque - Oil Pressure Switch Terminal Bolt: 1.5 N·m (0.15 kgf·m, 13 in·lb)**

- Install the removed parts (see appropriate chapters).



## 16-38 ELECTRICAL SYSTEM

### Ignition System

#### Crankshaft Sensor Inspection

- Remove:
  - Right Frame Cover (see Frame chapter)
  - Crankshaft Sensor Lead Connector [A]
- Set the hand tester to the  $\times 100 \Omega$  range and connect (+) lead to the yellow/black lead and (-) lead to the black lead in the connector.

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

- ★ 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.

**Crankshaft Sensor Resistance: 376 ~ 564  $\Omega$**

- Using the highest resistance range of the tester, measure the resistance between the crankshaft sensor leads and chassis ground.
- ★ Any tester reading less than infinity ( $\infty$ ) indicates a short, necessitating replacement of the crankshaft sensor assembly.

#### Crankshaft Sensor Peak Voltage Inspection

##### NOTE

- Be sure the battery is fully charged.
- Using the peak voltage adapter is a more reliable way to determine the condition of the crankshaft sensor than crankshaft sensor internal resistance measurements.

- Remove:
  - Right Frame Cover (see Frame chapter)
  - Crankshaft Sensor Lead Connector (see Crankshaft Sensor Removal)
- Set the hand tester [B] to the  $\times 10 \text{ V DC}$  range, and connect it the peak voltage adapter [A] as shown in the diagram.
- Connect the black lead of the adapter to black lead and red lead to yellow lead in the crankshaft sensor connector.
- Turn the ignition switch and engine stop switch on.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission gear in neutral to measure the crankshaft sensor peak voltage.
- Repeat the measurement 5 or more times.

**Crankshaft Sensor Peak Voltage**

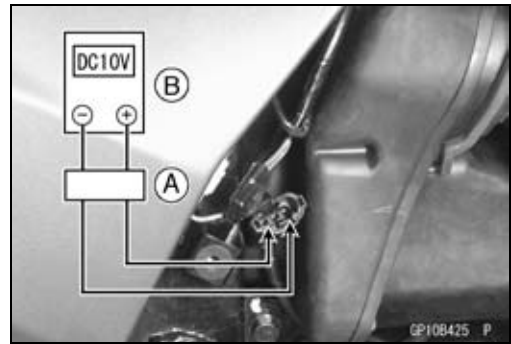
**Standard: 1.9 V or more**

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

**Peak Voltage Adapter: 57001-1415**

**Type: KEK-54-9-B**

- ★ If the tester reading is not specified one, check the crankshaft sensor.



## Ignition System

### Timing Rotor Removal

- Remove the crankshaft sensor cover (see Crankshaft Sensor Removal)
- Remove the timing rotor [A].
- Holding the timing rotor with the flywheel and pulley holder [B] and remove the bolt [C].

**Special Tool - Flywheel and Pulley Holder: 57001-1605**



### Timing Rotor Installation

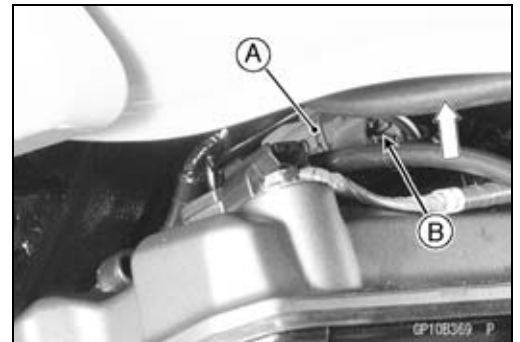
- Fit the rotor to the crankshaft.
- Tighten the rotor bolt.

**Torque - Timing Rotor Bolt: 39 N·m (4.0 kgf·m, 29 ft·lb)**

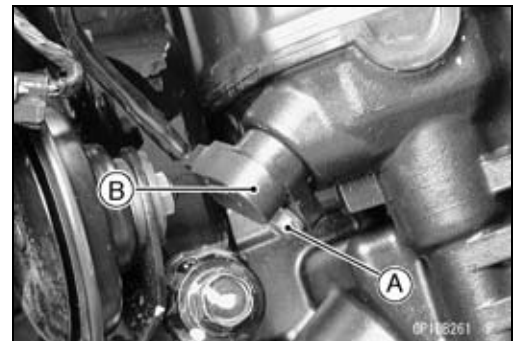
- Install the crankshaft sensor cover (see Crankshaft Sensor Installation).

### Camshaft Position Sensor Removal

- Remove:
  - Camshaft Position Sensor Lead Connector [A] (Disconnect)
- Push the tongue [B] upside and take out the connector from the bracket.



- Remove:
  - Camshaft Position Sensor Bolt [A]
  - Camshaft Position Sensor [B]



### Camshaft Position Sensor Installation

- Apply grease or engine oil to the O-ring on the camshaft position sensor.
- Apply a non-permanent locking agent to the sensor bolt.
- Tighten:

**Torque - Camshaft Position Sensor Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)**

## 16-40 ELECTRICAL SYSTEM

### Ignition System

#### Camshaft Position Sensor Inspection

- Remove:
  - Camshaft Position Sensor Lead Connector [A] (Disconnect)
- Set the hand tester to the  $\times 10 \Omega$  range and connect it to the yellow and black leads in the connector.

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

- ★ 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.

**Camshaft Position Sensor Resistance: 400 ~ 460  $\Omega$**

- Using the highest resistance range of the tester, measure the resistance between the camshaft position sensor leads and chassis ground.
- ★ Any tester reading less than infinity ( $\infty$ ) indicates a short, necessitating replacement of the camshaft position sensor.

#### Camshaft Position Sensor Peak Voltage Inspection

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Camshaft Position Sensor Lead Connector [A] (Disconnect)
- Set the hand tester [B] to the 10 V DC range.
- Connect the peak voltage adapter [C] to the hand tester and camshaft position sensor leads in the connector.

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

**Peak Voltage Adapter: 57001-1415**

**Type: KEK-54-9-B**

#### Connections:

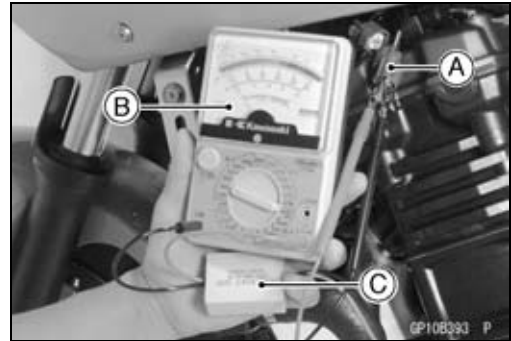
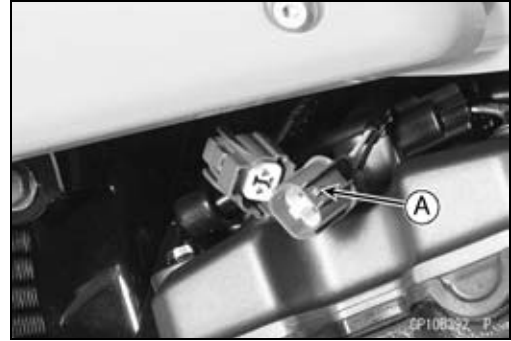
Camshaft Position Sensor Lead		Adapter		Hand Tester
Black	←	Red	→	(+)
Yellow	←	Black	→	(-)

- Turn the ignition switch and engine stop switch on.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission gear in neutral to measure the camshaft position sensor peak voltage.
- Repeat the measurement 5 or more times.

#### Camshaft Position Sensor Peak Voltage

**Standard: 0.2 V or more**

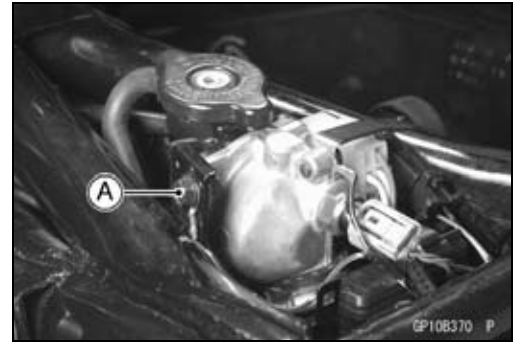
- ★ If the peak voltage is lower than the standard, inspect the camshaft position sensor.



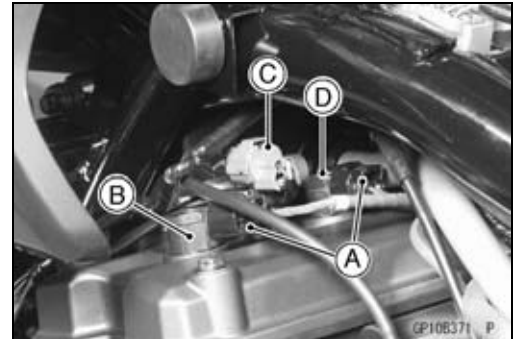
## Ignition System

### Stick Coil (Ignition Coil together with Spark Plug Cap) Removal

- Remove the fuel tank (see Fuel System (DFI) chapter).
  - Remove the thermostat bracket bolt [A].
- If removing the stick coil #3.



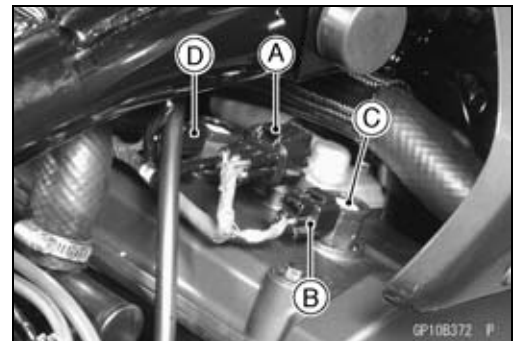
- Disconnect the stick coil, #1 and #2 connectors [A].
- Pull the stick coil #1 [B] off the spark plug.
- Take out the camshaft position sensor connector [C] from the bracket (see Camshaft Position Sensor Removal).
- Pull the stick coil #2 [D] off the spark plug.



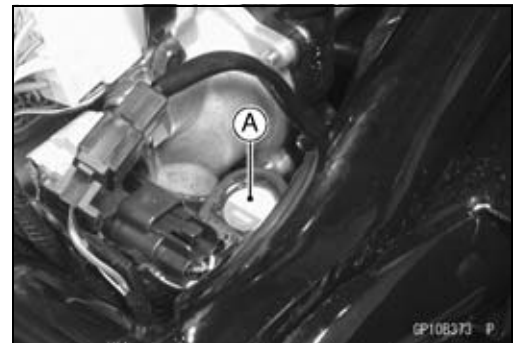
### CAUTION

**Do not pry the connector part of the coil while removing the coil.**

- Remove the ignition harness [A] from the bracket.
- Remove:
  - Stick Coil Connector #4 [B] (Disconnect)
  - Stick Coil #4 [C]
  - Stick Coil Connector #3 [D] (Disconnect)

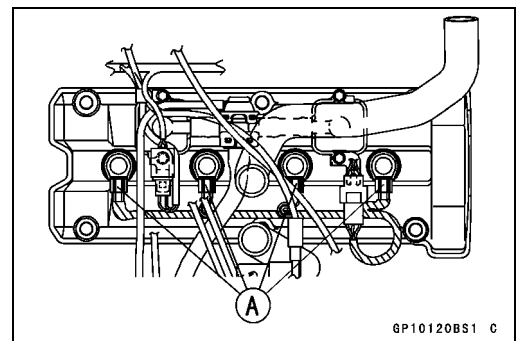


- Pull the stick coil #3 [A] upward and take out the lower end from the plug hole.



### Stick Coil (Ignition Coil together with Spark Plug Cap) Installation

- Install the coil using the following steps.
- Insert the coil as shown being careful of the coil heads [A] direction.



## 16-42 ELECTRICAL SYSTEM

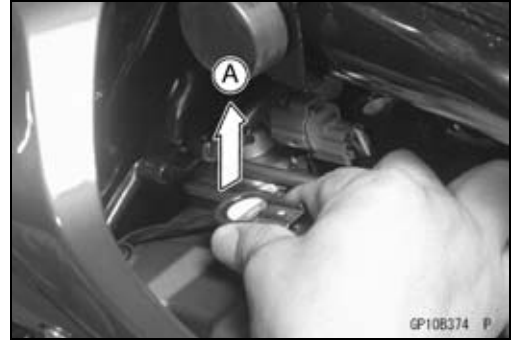
### Ignition System

- Be sure the stick coils are installed by pulling up [A] it lightly.
- Connect the connectors.

<b>CAUTION</b>
----------------

<b>Do not tap the coil head while installing the coil.</b>
--

- Install the removed parts (see appropriate chapters).



#### *Stick Coil (Ignition Coil together with Spark Plug Cap) Inspection*

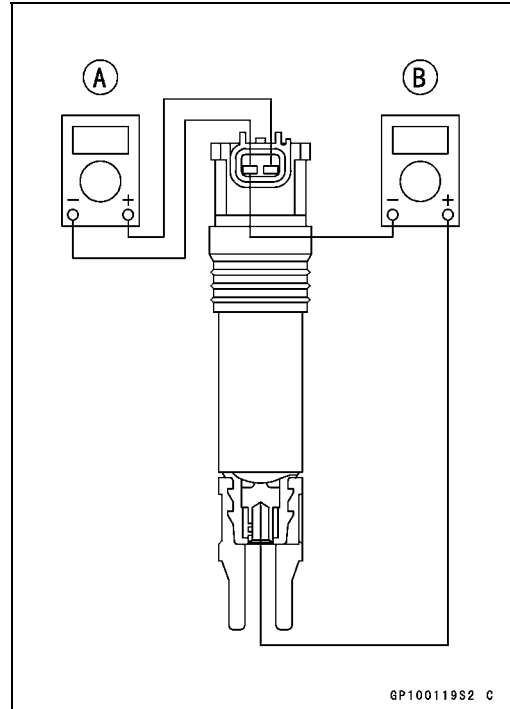
- Remove the stick coils (see this chapter).
- Measure the primary winding resistance [A] as follows.
  - Connect the hand tester between the coil terminals.
  - Set the tester to the  $\times 1 \Omega$  range, and read the tester.
- Measure the secondary winding resistance [B] as follows.
  - Connect the tester between the plug terminal and (-) coil terminal.
  - Set the tester to the  $\times 1 \text{ k}\Omega$  range and read the tester.

#### **Ignition Coil Winding Resistance**

**Primary Windings:**            **1.04 ~ 1.56  $\Omega$**

**Secondary Windings:**        **10.8 ~ 16.2  $\text{k}\Omega$**

- ★ If the tester does not read as specified, replace the coil.



#### *Stick Coil Primary Peak Voltage*

#### **NOTE**

- Be sure the battery is fully charged.



## Ignition System

- Remove the stick coils (see this chapter), but do not remove the spark plugs.
- Measure the primary peak voltage as follows.
  - Connect a commercially peak voltage adapter [B] into the hand tester [C] which is set to the x 250 V DC range.
  - Connect the adapter to the lead wire-peak voltage adapter [A] which is connected between the stick coil connector and stick coil.
  - Install the new spark plug [D] into each stick coil [E], and ground them onto the engine.

ECU [F]  
Battery [G]

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

**Peak Voltage Adapter: 57001-1415**

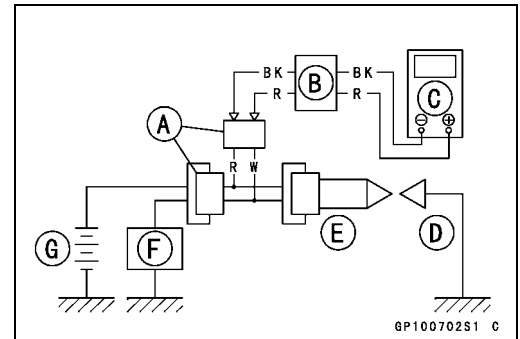
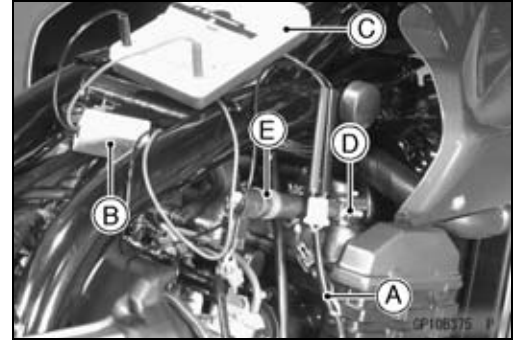
**Type: KEK-54-9-B**

**Lead Wire-Peak Voltage Adapter: 57001-1449**

### 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.**

- Turn the ignition switch and the engine stop switch ON.
- Pushing the starter button, turn the engine 4 ~ 5 seconds with the transmission in neutral to measure the primary peak voltage.
- Repeat the measurements 5 times for one stick coil.

### Stick Coil Primary Peak Voltage

**Standard: 88 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)
- ★ If the stick coils, and crankshaft sensor are normal, check the ECU (see 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.

## 16-44 ELECTRICAL SYSTEM

### Ignition System

#### Spark Plug Cleaning and Inspection

- Remove the spark plug (see Periodic Maintenance chapter)
- Clean the spark plug, preferably in a sandblasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high-flash point solvent and a wire brush or other suitable tool.
- ★ If the spark plug center electrode [A] and/or side electrode [B] are corrected or damaged, or if the insulator [C] is cracked, replace the plug. Use the standard spark plug or its equivalent.
- Measure the gaps [D] with a wire-type thickness gauge.
- ★ If the gap is incorrect, carefully bend the side electrode with a tool to obtain the correct gap.

**Spark Plug Gap: 0.7 ~ 0.8 mm (0.028 ~ 0.031 in.)**

- Install the spark plug (see Periodic Maintenance chapter)

#### Interlock Operation Inspection

- Remove:
  - Seat (see Frame chapter)
  - Junction Box (see this chapter)
- Do not disconnect the connectors.

#### 1st Check

- Measure the terminal voltage of the G/BK lead in the junction box connector [A] in accordance with the following procedure.
- Insert the tester probe [B] in the Green/Black lead terminal.
- Set the tester [C] to the 25 V DC range, connect it to the frame ground [D].

#### Connection:

**Tester (+) Terminal → G/BK Lead Terminal**

**Tester (-) Terminal → Frame Ground**

#### Condition:

**Transmission Gear → 1st Position**

**Clutch Lever → Release or Pulled In**

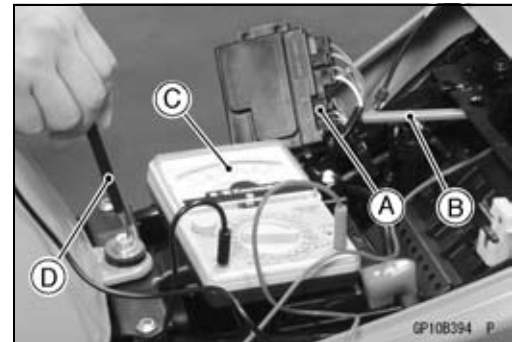
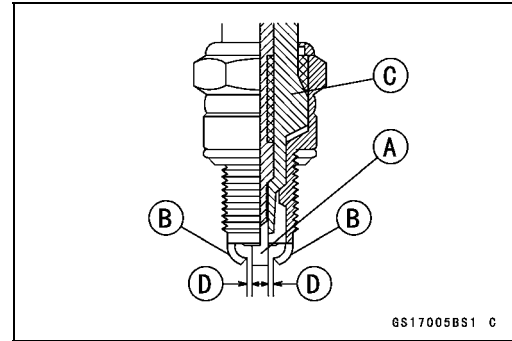
**Side Stand → Down**

- Turn the ignition switch on.
- Read the voltage.

#### Interlock Operation Voltage

**Standard: 4 V or more**

- ★ If the voltage is lower than the standard, inspect the side stand switch, starter lockout switch, and junction box. And their parts are normality, replace the ECU.
- ★ If the voltage is standard, push the starter button to check as follows.
- If the starter motor does not turn, the ECU is good, and check the starter system circuit.
- If the starter motor turned, ECU is defective. Replace the ECU.



---

**Ignition System**

---

**2nd Check**

- Raise the rear wheel off the ground with a stand.
- 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 to the down position, then the engine will stop.
- ★ If whichever may not be stopped, inspect the starter lock-out switch, side stand switch and junction box.
- ★ If their parts are normality, replace the ECU.

**IC Igniter Inspection**

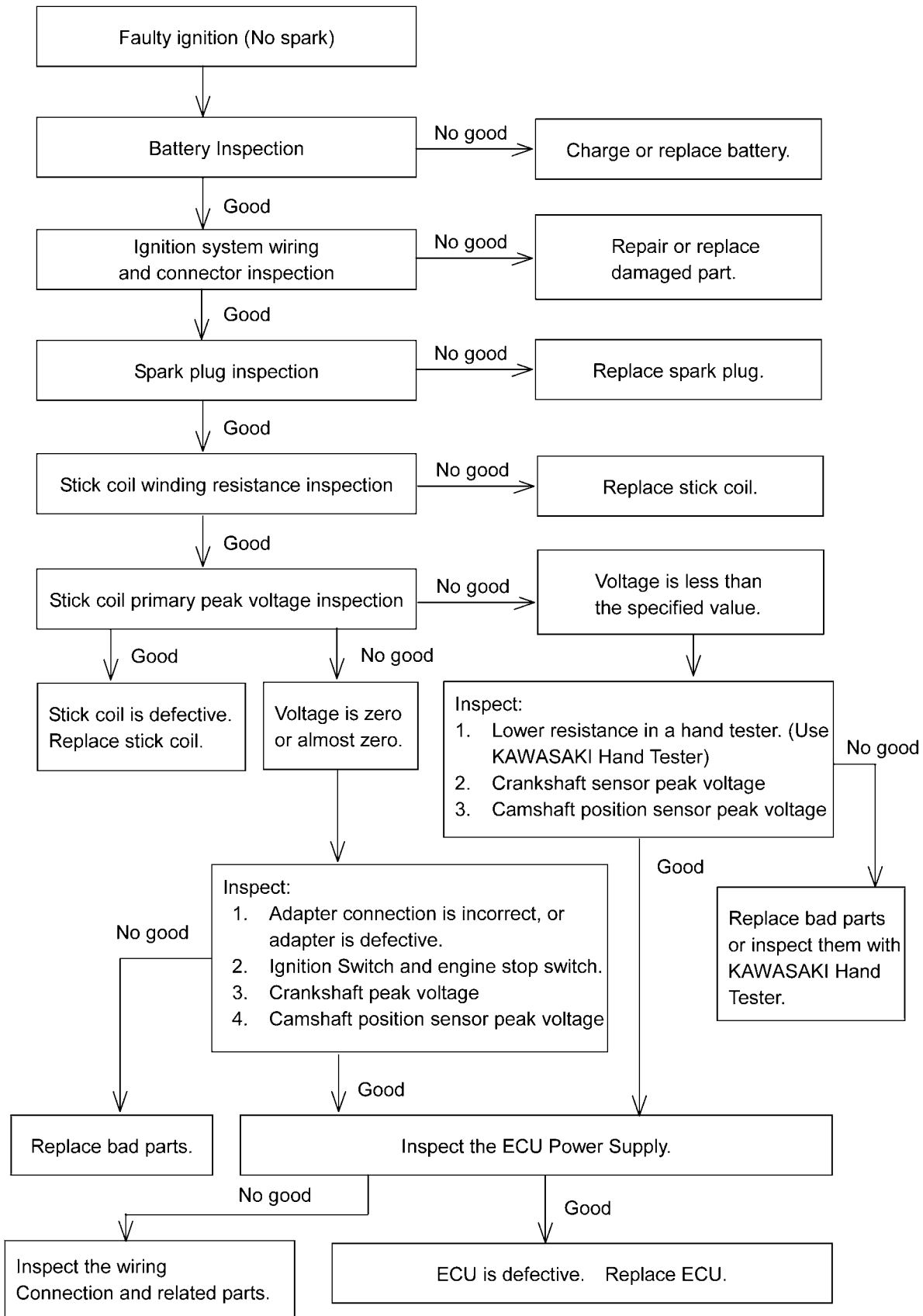
- The IC Igniter is built in the ECU [A].
- Refer to the Interlock Operation Inspection, Ignition System Troubleshooting table and Fuel System (DFI) chapter for ECU Inspection.



# 16-46 ELECTRICAL SYSTEM

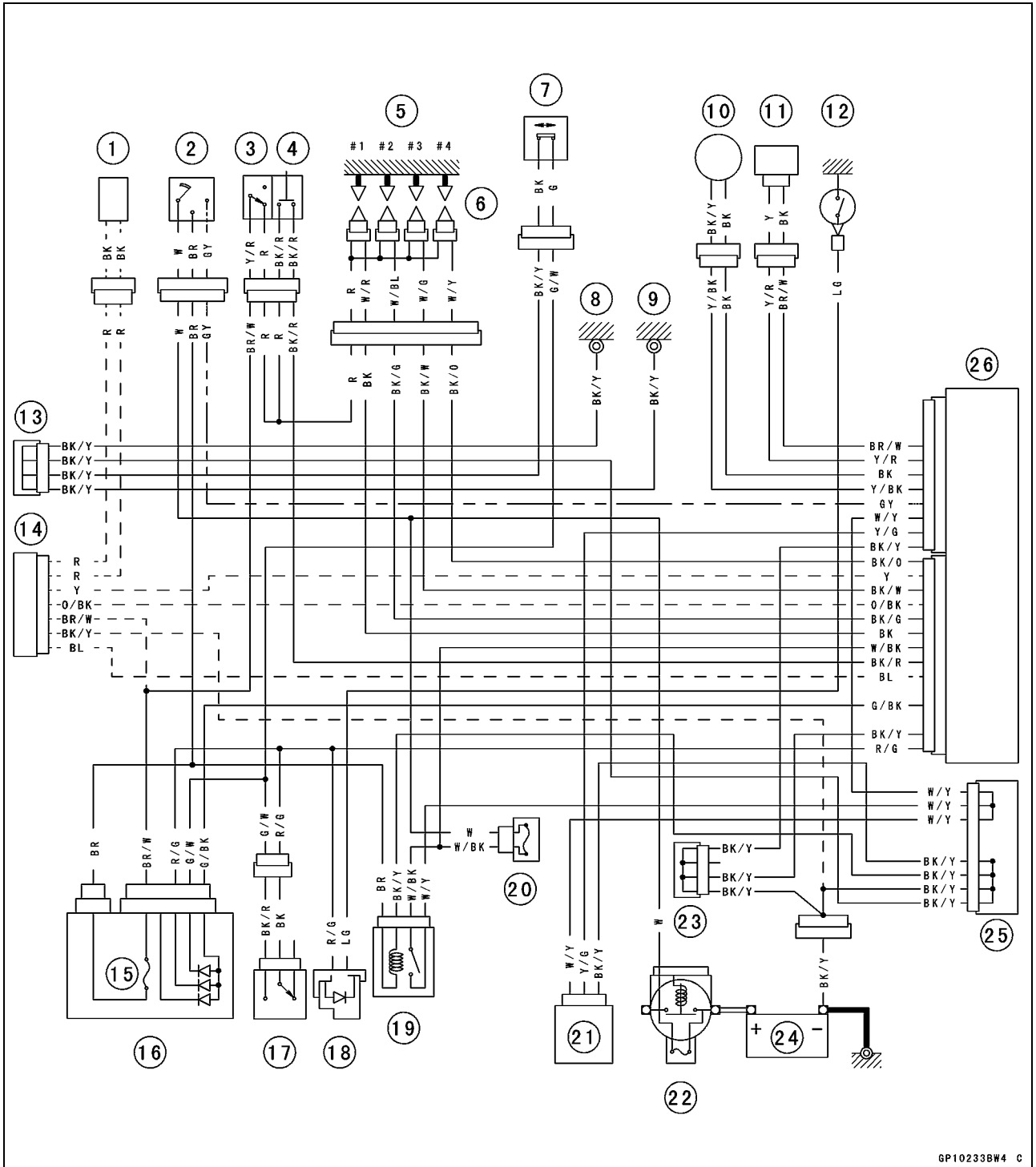
## Ignition System

### Ignition System Troubleshooting



Ignition System

Ignition System Circuit



GP10233BW4 C

-----: United States and Canada  
 - - - - -: Immobilizer Models

- 1. Immobilizer Antenna
- 2. Ignition Switch
- 3. Engine Stop Switch
- 4. Starter Button
- 5. Spark Plugs
- 6. Stick Coils
- 7. Side Stand Switch
- 8. Meter Ground

- 9. Frame Ground
- 10. Crankshaft Sensor
- 11. Camshaft Position Sensor
- 12. Neutral Switch
- 13. Joint Connector A
- 14. Immobilizer Amplifier
- 15. Ignition Fuse 10 A
- 16. Junction Box
- 17. Starter Lockout Switch

- 18. Diode
- 19. ECU Main Relay
- 20. ECU Fuse 15 A
- 21. Vehicle-down Sensor
- 22. Main Fuse 30 A
- 23. Joint Connector C
- 24. Battery 12 V 8 Ah
- 25. Joint Connector B
- 26. ECU  
(Electronic Control Unit)

# 16-48 ELECTRICAL SYSTEM

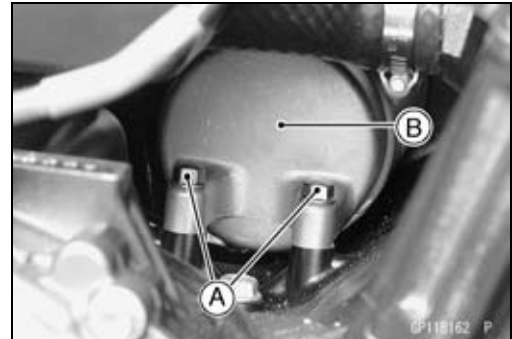
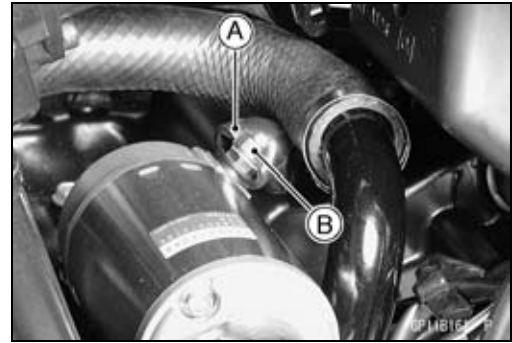
## Electric Starter System

### Starter Motor Removal

#### CAUTION

**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- Slide back the rubber cap [A].
- Remove the starter motor terminal nut [B].
  
- Remove the mounting bolts [A].
- Pull out the starter motor [B].

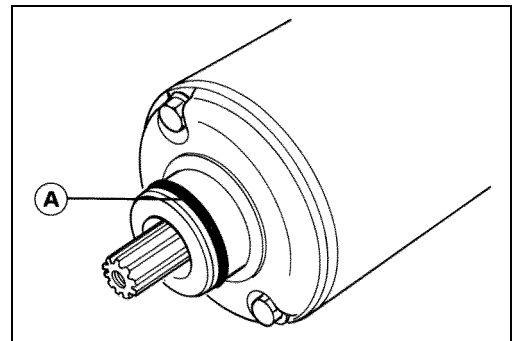


### Starter Motor Installation

#### CAUTION

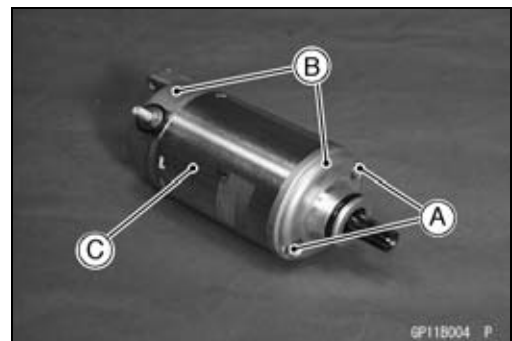
**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- When installing the starter motor, clean the starter motor legs [A] and crankcase [B] where the starter motor is grounded.
  
- Replace the O-ring [A] with a new one.
- Apply grease to the O-ring.
- Tighten:  
**Torque - Starter Motor Mounting Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**



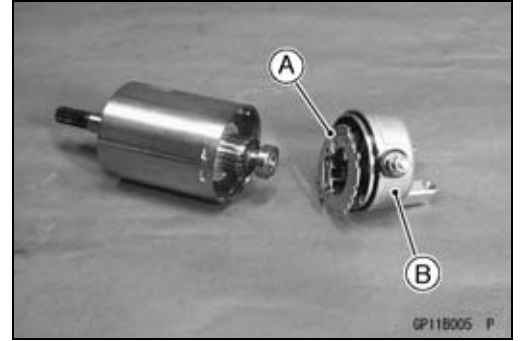
### Starter Motor Disassembly

- Take off the starter motor through bolts [A] and remove both end covers [B] and pull the armature out of the yoke [C].

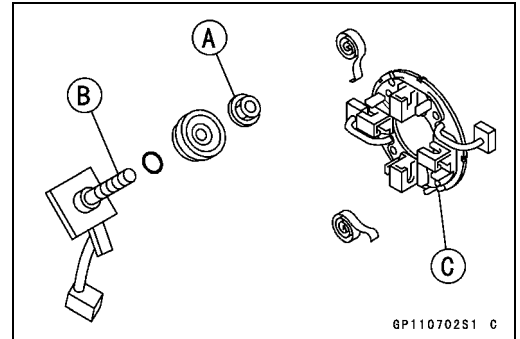


**Electric Starter System**

○The brush plate [A] and brushes come off with the right-hand end cover [B].

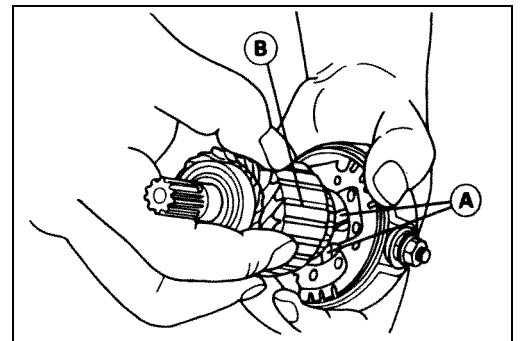


● Remove the terminal locknut [A] and terminal bolt [B], and then remove the brush with the brush plate [C] from the right-hand end cover.

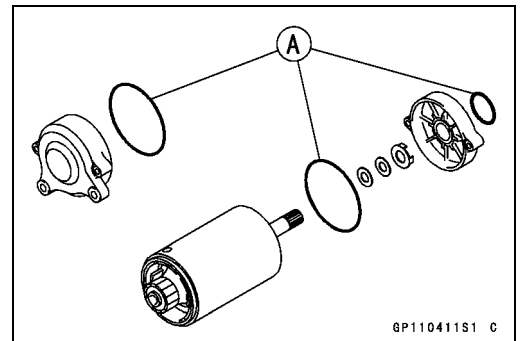


**Starter Motor Assembly**

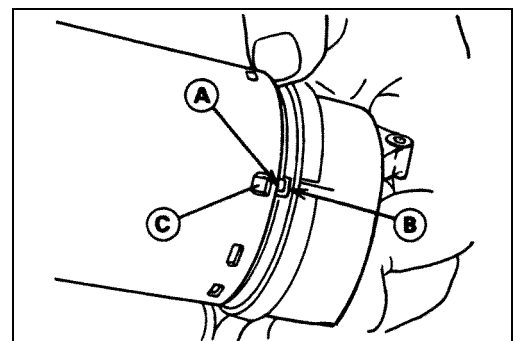
● Install the brush plate and brushes [A], and then put the armature [B] among the brushes.



● Install the O-rings [A] as shown.



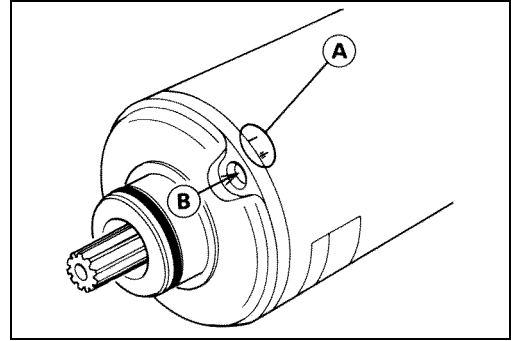
● Align the notch [A] in the brush plate with the end cover notch [B] and the mark [C] on the yoke.



# 16-50 ELECTRICAL SYSTEM

## Electric Starter System

- Align the line [A] marked on the yoke with the through bolt hole [B].



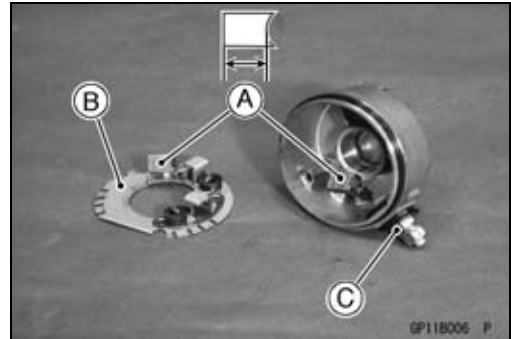
### Brush Inspection

- Measure the length [A] of each brush.
- ★ If any is worn down to the service limit, replace the carbon brush holder assembly [B] and the terminal bolt assembly [C].

#### Starter Motor Brush Length

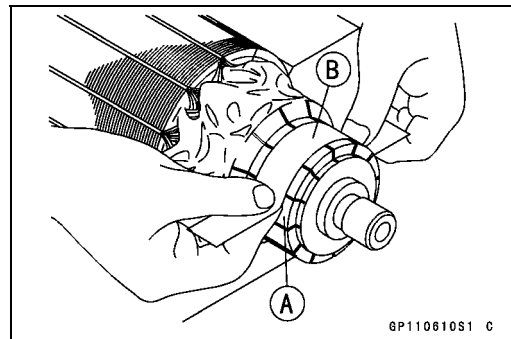
Standard: 12 mm (0.47 in.)

Service Limit: 8.5 mm (0.33 in.)



### Commutator Cleaning and Inspection

- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.

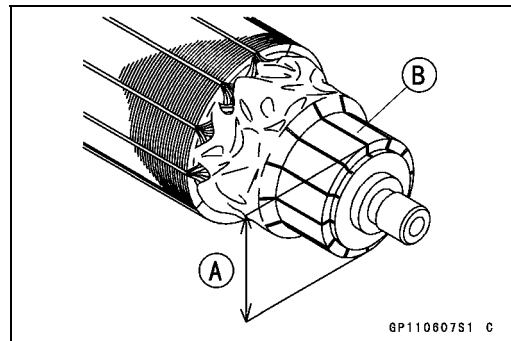


- Measure the diameter [A] of the commutator [B].
- ★ If the commutator diameter is less than the service limit, replace the starter motor with a new one .

#### Commutator Diameter

Standard: 28 mm (1.10 in.)

Service Limit: 27 mm (1.06 in.)

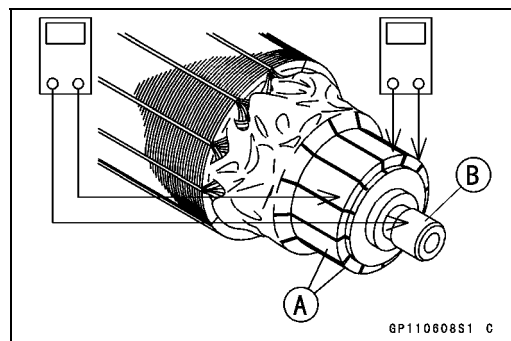


### Armature Inspection

- Using the  $\times 1 \Omega$  hand tester range, measure the resistance between any two commutator segments [A].

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

- ★ If there is a high resistance or no reading ( $\infty$ ) between any two segments, a winding is open and the starter motor must be replaced.
- Using the highest hand tester range, measure the resistance between the segments and the shaft [B].
- ★ If there is any reading at all, the armature has a short and the starter motor must be replaced.





## Electric Starter System

### NOTE

○ Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with the hand tester. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.

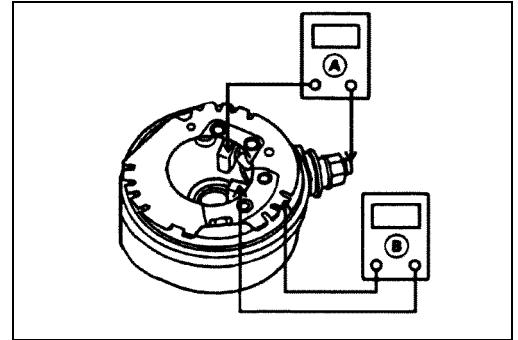
### Brush Lead Inspection

- Using the  $\times 1 \Omega$  hand tester range, measure the resistance as shown.

Terminal Bolt and Positive Brush [A]  
Brush Plate and Negative Brush [B]

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

- ★ If there is not close to 0 ohms, the brush lead has an open. Replace the terminal bolt assembly and/or the brush holder assembly.



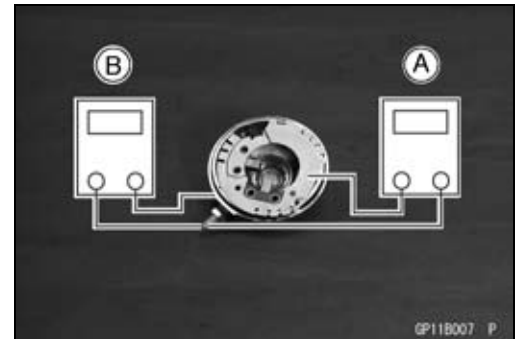
### Brush Plate and Terminal Bolt Inspection

- Using the highest hand tester range, measure the resistance as shown.

Terminal Bolt and Brush Plate [A]  
Terminal Bolt and Right-hand End Cover [B]

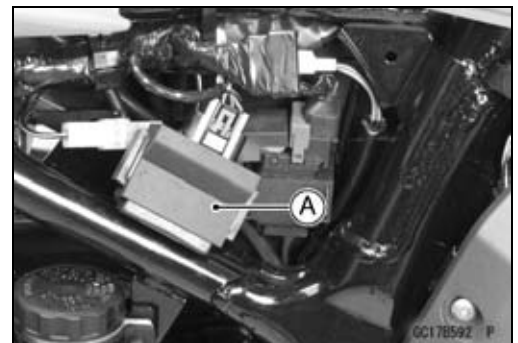
**Special Tool - Hand Tester: 57001-1394**

- ★ If there is any reading, the brush holder assembly and/or terminal bolt assembly have a short. Replace the brush holder assembly and the terminal bolt assembly.

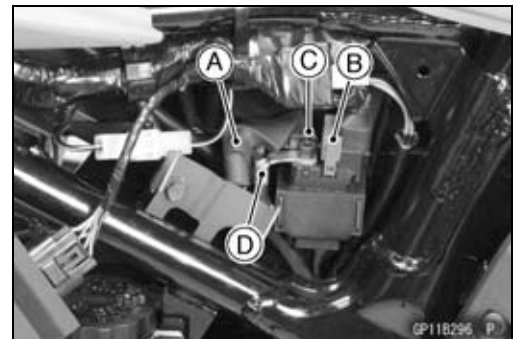


### Starter Relay Inspection

- Remove the battery negative (-) cable from the battery negative (-) terminal (see Battery Removal).
- Remove the right side cover.
- For immobilizer equipped model, pull out the immobilizer amplifier [A].



- Pull out the rubber cap [A].
- Disconnect the connector [B].
- Disconnect the starter motor cable [C] and battery positive (+) cable from the starter relay [D].



### CAUTION

The battery positive (+) cable with the rubber cap is connected directly to the battery positive (+) terminal even when the ignition switch off, so take care not to short the removed cable to chassis ground.

# 16-52 ELECTRICAL SYSTEM

## Electric Starter System

- Connect the hand tester [A] and 12 V battery [B] to the starter relay [C] as shown.

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

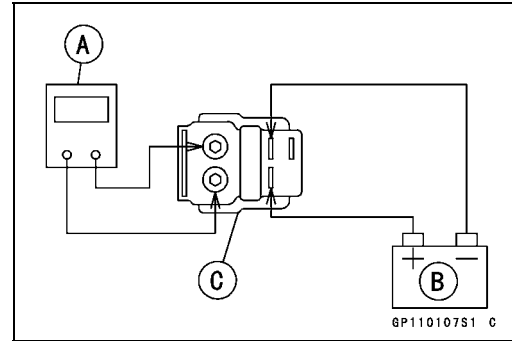
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.

### Testing Relay

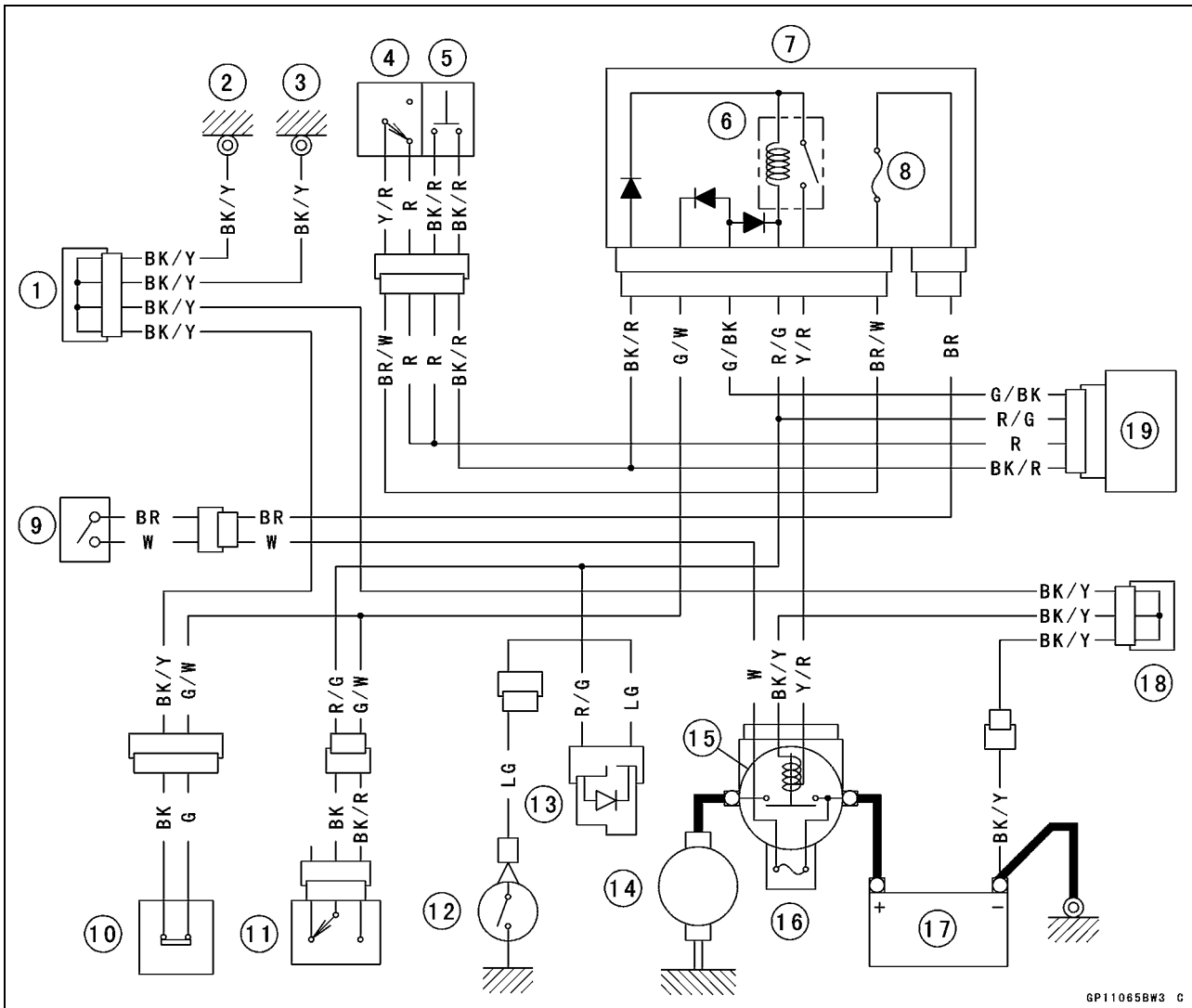
**Tester Range:** × 1 Ω range

**Criteria:** When battery is connected → 0 Ω

When battery is disconnected → ∞ Ω



## Electric Starter Circuit



1. Joint Connector A

2. Meter Ground

3. Frame Ground

4. Engine Stop Switch

5. Starter Button

6. Starter Circuit Relay

7. Junction Box

8. Ignition Fuse 10 A

9. Ignition Switch

10. Side Stand Switch

11. Starter Lockout Switch

12. Neutral Switch

13. Diode

14. Starter Motor

15. Starter Relay

16. Main Fuse 30 A

17. Battery 12 V 8 Ah

18. Joint Connector B

19. ECU

## Lighting System

This models adopt the daylight system and have a headlight relay in the junction box. In these models, the headlight does not go on when the ignition switch and the engine stop switch are first turned on. The headlight comes on after the starter button is released and stays on until the ignition switch is turned off. The headlight will go out momentarily whenever the starter button is pressed and come back on when the button is released.

### Headlight Beam Horizontal Adjustment

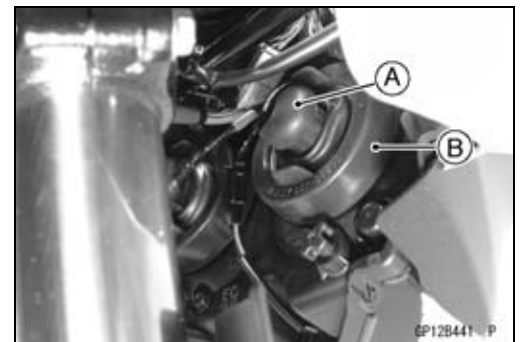
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

### Headlight Beam Vertical Adjustment

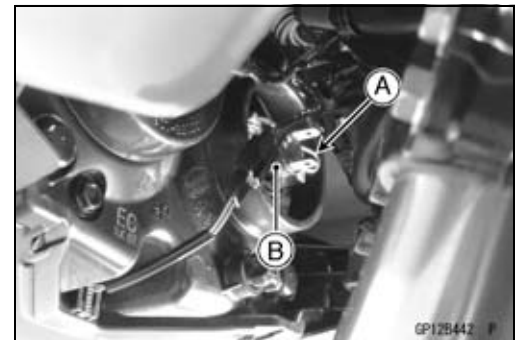
- Refer to the Headlight Aiming Inspection in the Periodic Maintenance chapter.

### Headlight Bulb Replacement

- Remove:
  - Headlight Connector [A]
  - Headlight Bulb Dust Cover [B]



- Remove:
  - Hook [A]
  - Headlight Bulb [B]



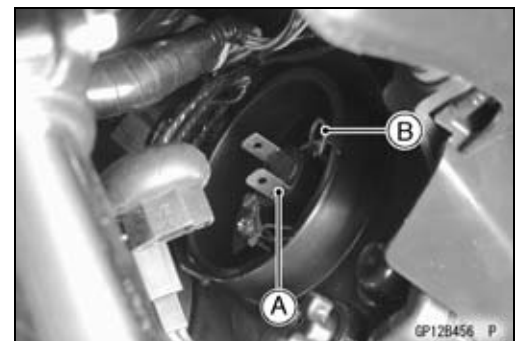
### CAUTION

**When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.**

### NOTE

○Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.

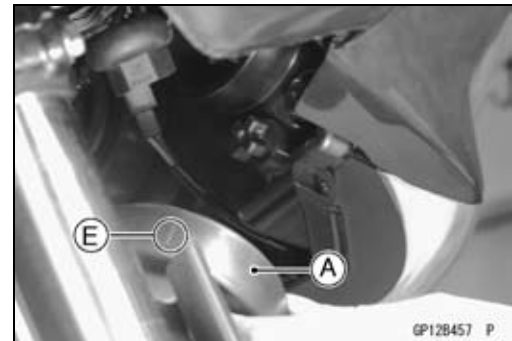
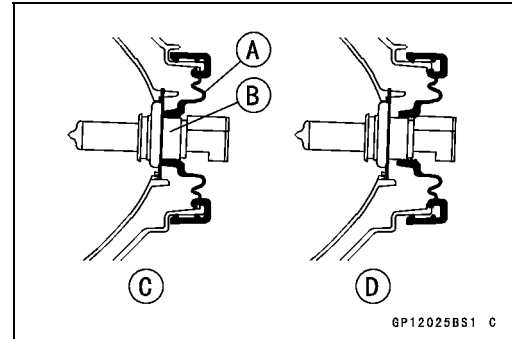
- Replace the headlight bulb.
- Fit the projection of the bulb [A] in the hollow of the headlight.
- Install the hook [B].



## 16-54 ELECTRICAL SYSTEM

### Lighting System

- Fit the dust cover [A] with the arrow mark upward onto the bulb [B] firmly as shown.
  - Good [C]
  - Bad [D]
  - Arrow Mark [E]
- After installation, adjust the headlight aim (see Periodic Maintenance chapter).

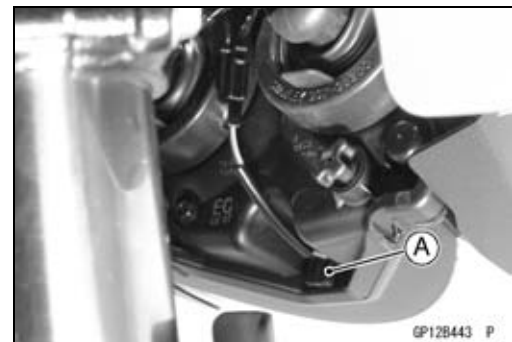


#### Headlight Removal/Installation

- Refer to the Fairing Disassembly and Fairing Assembly in the Frame chapter.

#### City Light Bulb Replacement

- Pull out the socket [A] together with the bulb.

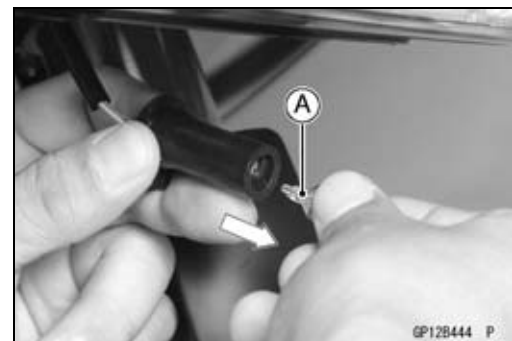


- Pull the bulb [A] out of the socket.

#### CAUTION

**Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified value.**

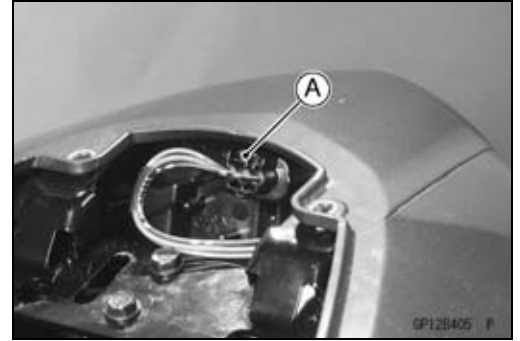
- Replace the bulb with a new one.



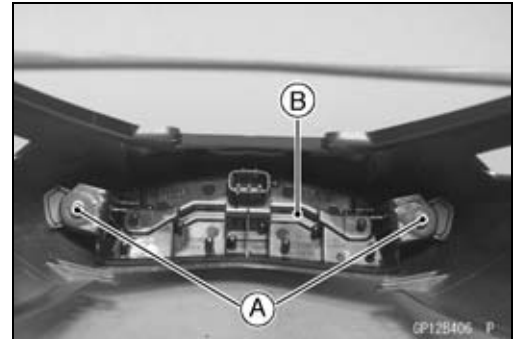
## Lighting System

### *Tail/Brake Light (LED) Removal*

- Remove:
  - Seat (see Frame chapter)
- Disconnect the tail/brake light (LED) connector [A].

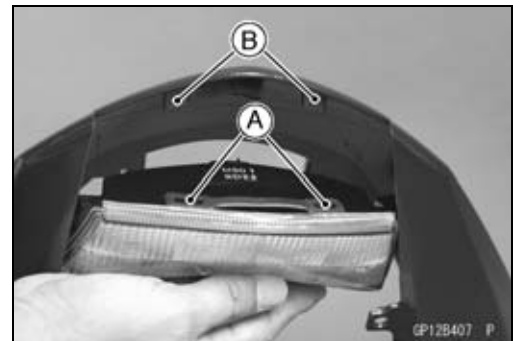


- Remove the seat cover (see Frame chapter).
- Unscrew the bolts [A].
- Remove the tail/brake light (LED) [B].



### *Tail/Brake Light (LED) Installation*

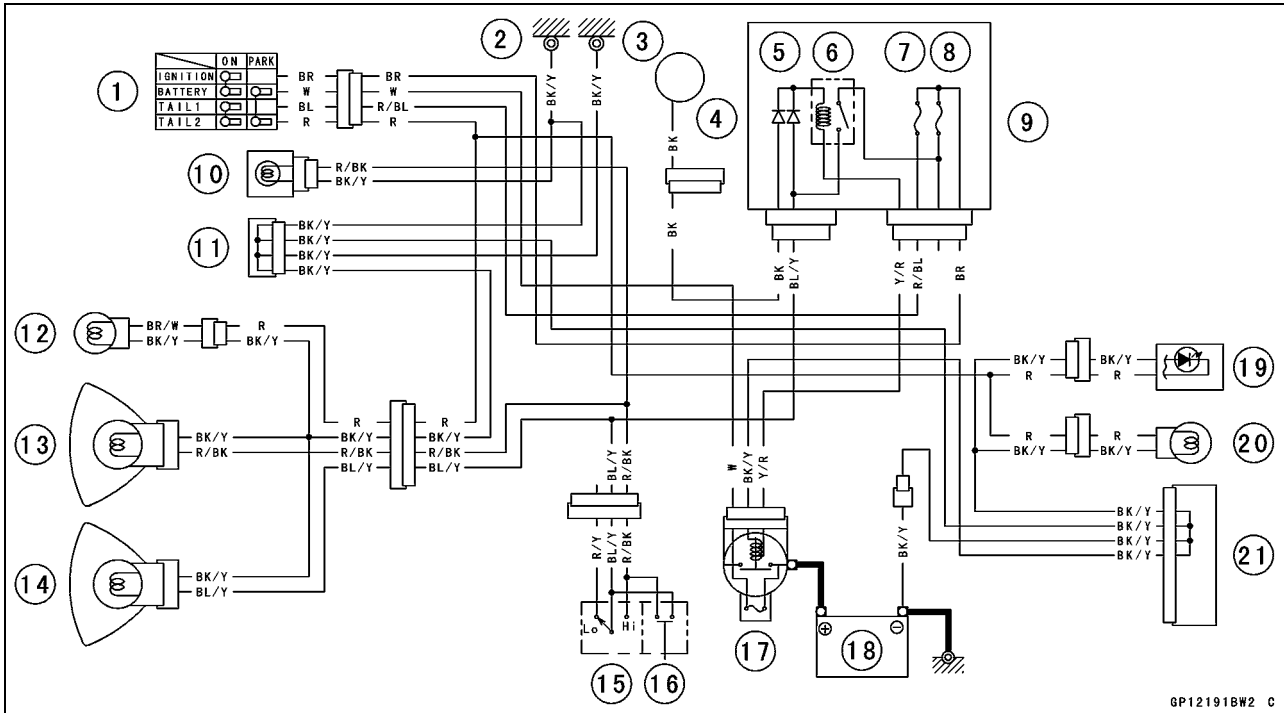
- Insert the slots [A] into the tongues [B]
- Tighten the tail/brake light mounting bolts.
  - Torque - Tail/Brake Light Mounting Bolts: 1.2 N·m (0.12 kgf·m, 10 in·lb)**
- Install:
  - Seat Cover (see Frame chapter)



# 16-56 ELECTRICAL SYSTEM

## Lighting System

### Headlight/Tail Light Circuit

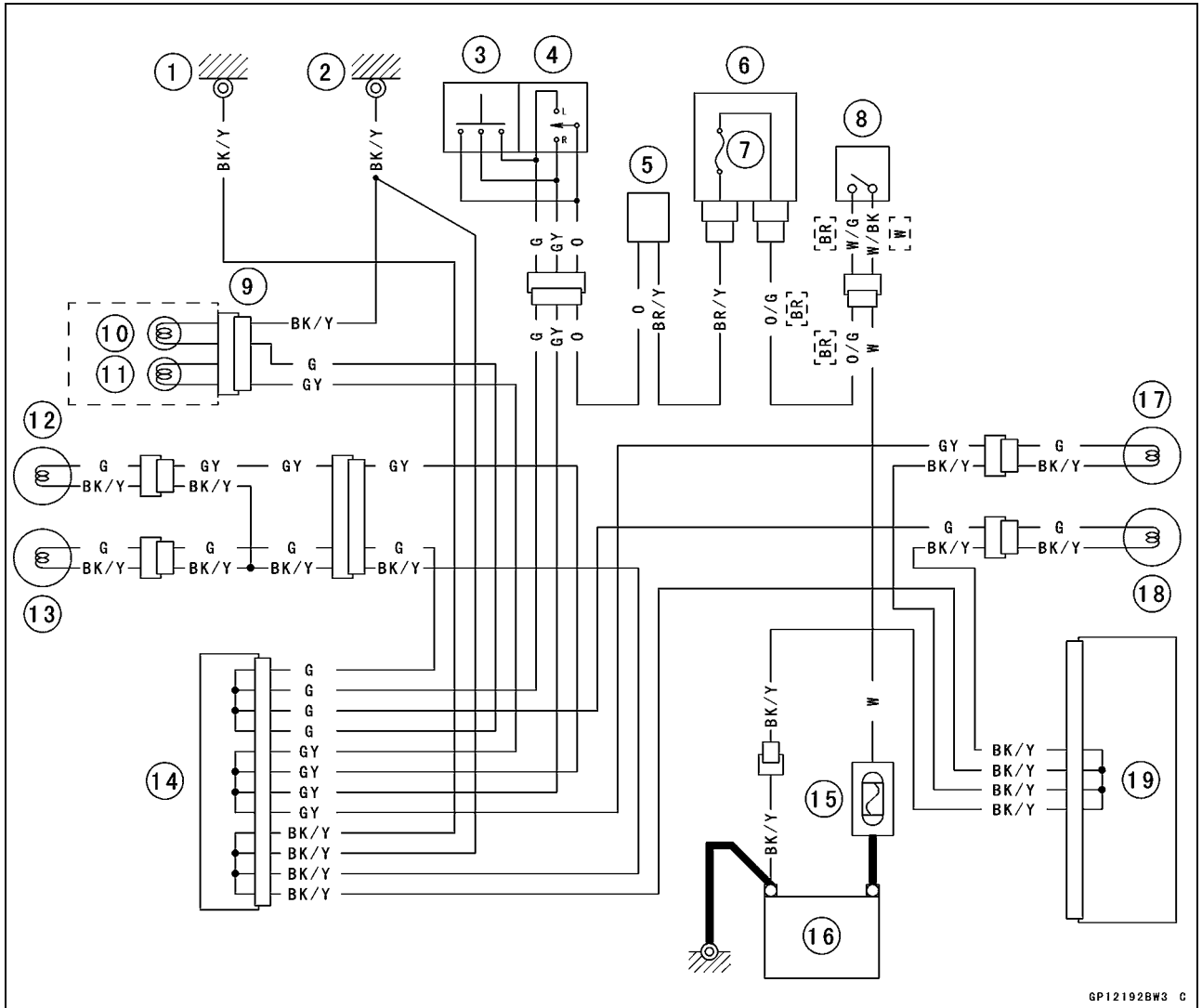


GP121918W2 C

- |                            |                               |  |
|----------------------------|-------------------------------|--|
| 1. Ignition Switch         | 9. Junction Box               | 16. Passing Button (other than United States and Canada) |
| 2. Meter Ground            | 10. High Beam Indicator Light | 17. Main Fuse 30 A                                       |
| 3. Frame Ground            | 11. Joint Connector A         | 18. Battery 12 V 8 Ah                                    |
| 4. Alternator              | 12. City Light                | 19. Taillight (LED)                                      |
| 5. Headlight Diodes        | 13. Headlight (High)          | 20. License Plate Light                                  |
| 6. Headlight Circuit Relay | 14. Headlight (Low)           | 21. Joint Connector B                                    |
| 7. Taillight Fuse 10 A     | 15. Dimmer Switch             |  |
| 8. Headlight Fuse 10 A     |                               |  |

Lighting System

Turn Signal Light Circuit

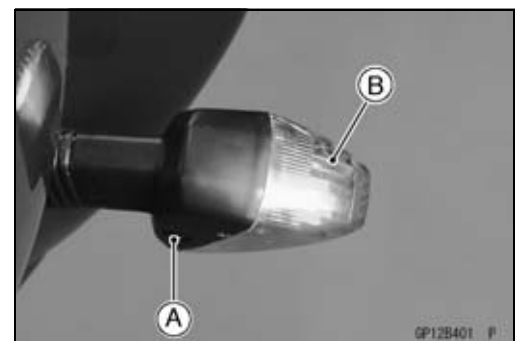


GP12192BW3 C

- |   |   |   |
|---|---|---|
| <p>: other than United States, Canada and Malaysia</p> <p>1. Frame Ground</p> <p>2. Meter Ground</p> <p>3. Hazard Button (United States, Canada and Malaysia only)</p> <p>4. Turn Signal Switch</p> <p>5. Turn Signal Relay</p> | <p>6. Junction Box</p> <p>7. Turn Signal Fuse 10 A</p> <p>8. Ignition Switch</p> <p>9. Meter Unit</p> <p>10. Left Turn Signal Indicator Light</p> <p>11. Right Turn Signal Indicator Light</p> <p>12. Front Right Turn Signal Light</p> | <p>13. Front Left Turn Signal Light</p> <p>14. Joint Connector A</p> <p>15. Main Fuse 30 A</p> <p>16. Battery 12 V 8 Ah</p> <p>17. Rear Right Turn Signal Light</p> <p>18. Rear Left Turn Signal Light</p> <p>19. Joint Connector B</p> |
|---|---|---|

Turn Signal Light Bulb Replacement

- Unscrew the screw [A] and remove the lens [B].



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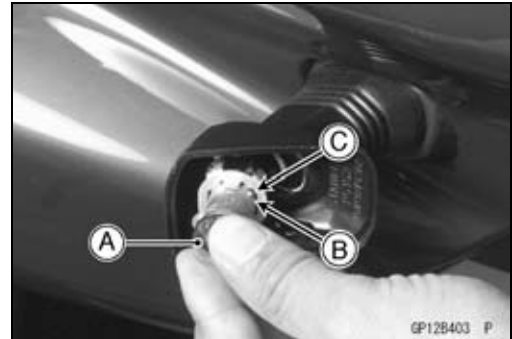
# 16-58 ELECTRICAL SYSTEM

## Lighting System

- Push and turn the bulb [A] counterclockwise and remove it.

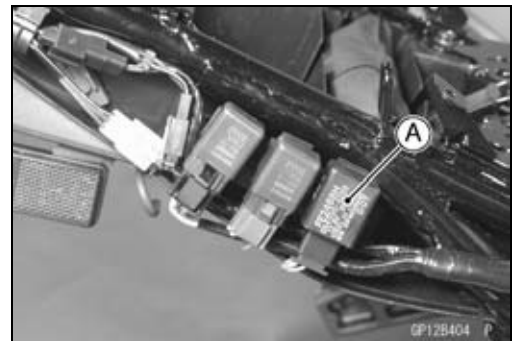


- Insert the new bulb [A] by aligning its upper and lower pins [B] with the upper and lower grooves [C] in the socket, and turn the bulb clockwise.
- Turn the bulb about 15°.



### Turn Signal Relay Inspection

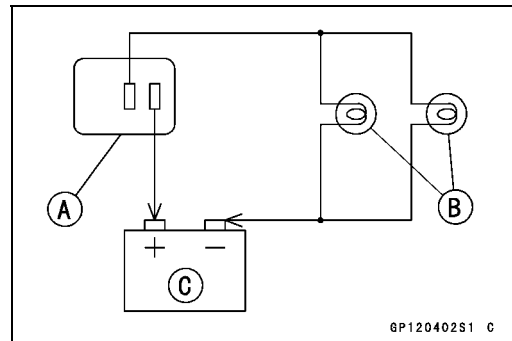
- Remove:
  - Seat (see Frame chapter)
  - Seat Cover (see Frame chapter)
  - Turn Signal Relay [A]



- Connect one 12 V battery and turn signal lights as indicated in the figure, and count how many times the lights flash for one minute.

- Turn Signal Relay [A]
- Turn Signal Lights [B]
- 12 V Battery [C]

- ★ If the lights do not flash as specified, replace the turn signal relay.



### Testing Turn Signal Relay

Load		Flashing Times (c/m*)
The Number of Turn Signal Lights	Wattage (W)	
1**	21 or 23	140-250
2	42 or 46	75-95

(\*): Cycle(s) per minute

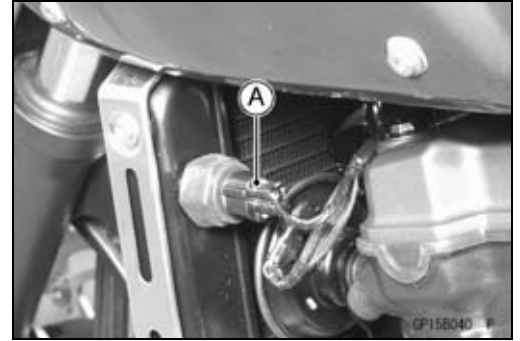
(\*\*): Corrected to "one light burned out".



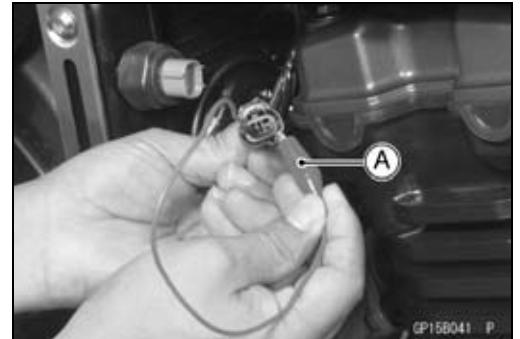
## Radiator Fan System

### Fan System Circuit Inspection

- Disconnect the lead connector [A] from the radiator fan switch.



- Using an auxiliary wire [A], connect the radiator fan switch leads.
- ★ If the fan rotates, inspect the fan switch.
- ★ If the fan does not rotate, inspect the following.
  - Leads and Connectors
  - Main Fuse and Fan Fuse
  - Fan Motor

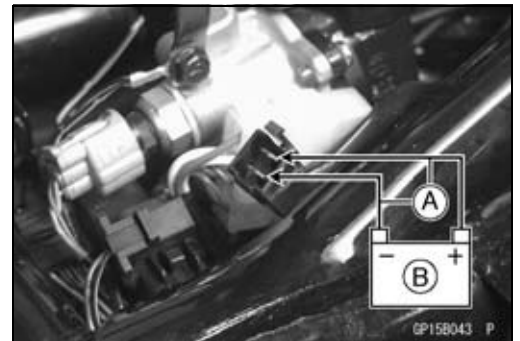


### Fan Motor Inspection

- Remove the fuel tank (see Fuel System (DFI) chapter).
- Disconnect the 2-pin connector [A] in the fan motor leads.
- Pull the lead until come out the connector.

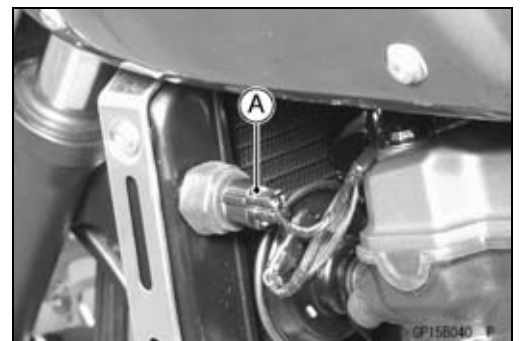


- Using two auxiliary wires [A], supply battery [B] power to the fan motor.
- ★ If the fan does not rotate, the fan motor is defective and must be replaced.



### Radiator Fan Switch Inspection

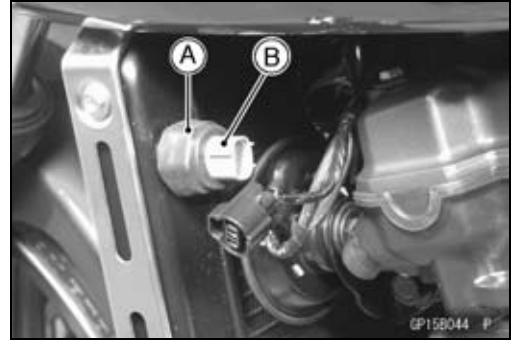
- Disconnect the connector [A].



# 16-60 ELECTRICAL SYSTEM

## Radiator Fan System

- Slide out the dust cover [A].
- Remove the fan switch [B].



- Suspend the switch [A] in a container of coolant so that the temperature-sensing projection and threaded portion are submerged.
- Suspend an accurate thermometer [B] in the coolant so that the sensitive portions are located in almost the same depth.

### NOTE

○ *The switch and thermometer must not touch the container sides or bottom.*

- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the switch across the terminals at the temperatures shown in the table.

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

- ★ If the hand tester does not show the specified values, replace the switch.

### Fan Switch Resistance

**Rising temperature:**

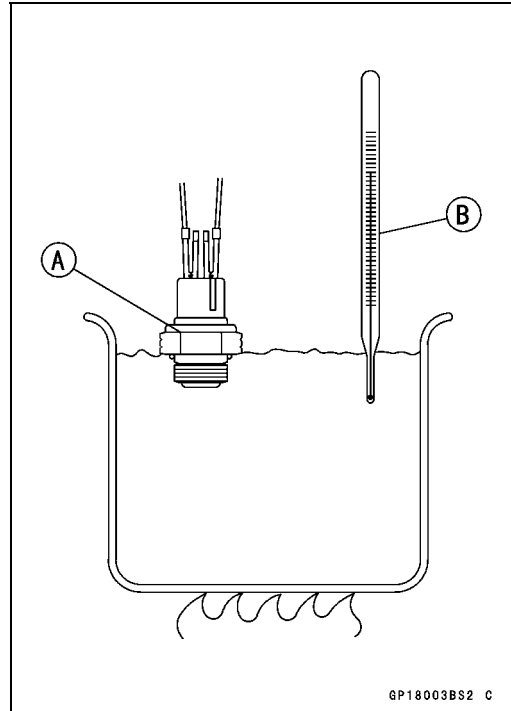
**From OFF to ON at 93 ~ 103°C (199 ~ 217°F)**

**Falling temperature:**

**Fan stops with the temperature 3 ~ 8°C (38 ~ 46°F) lower than the operation temperature range.**

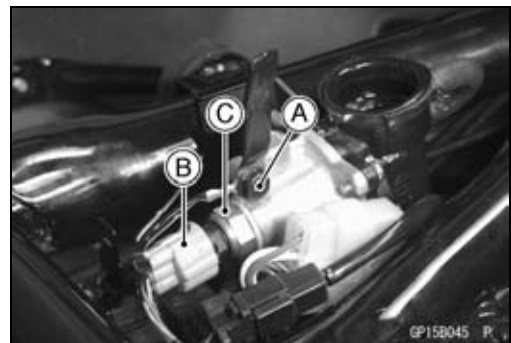
**ON: Less than 0.5 Ω**

**OFF: More than 10 MΩ**



### Water Temperature Sensor Inspection

- Remove:
  - Fuel Tank (see Fuel chapter)
  - Meter Ground Bolt [A]
- Disconnect the water temperature sensor connector [B].
- Remove the water temperature sensor [C] (see Fuel System (DFI) chapter).



## Radiator Fan System

- Suspend the sensor [A] in a container of coolant so that the temperature-sensing projection [E] and threaded portion [E] are submerged.
- Suspend an accurate thermometer [B] in the coolant.

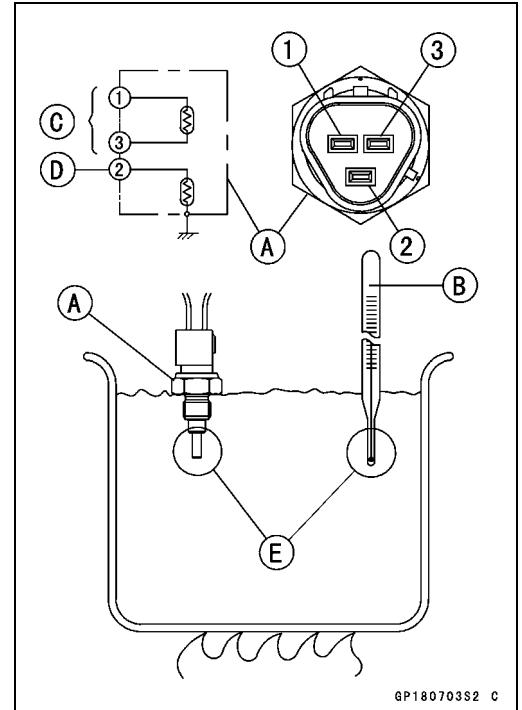
### NOTE

- The sensor and thermometer must not touch the container side or bottom.
- Place the container over a source of heat and gradually raise the temperature of the coolant while stirring the coolant gently.
- Using the hand tester, measure the internal resistance of the sensor.
- The sensor sends electric signals to the ECU (Electronic Control Unit) and coolant temperature gauge in the meter unit.
- Measure the resistance across the terminals and the body (for the gauge) at the temperatures shown in the table.
- ★ If the hand tester does not show the specified values, replace the sensor.

### Water Temperature Sensor

Resistance for ECU [C]	
Temperature	Resistance (kΩ) (Terminal [1]-[3])
20°C (68°F)	2.46 + 0.155 - 0.143
80°C (176°F)	0.32 ±0.011
110°C (230°F)	0.1426 ±0.0041

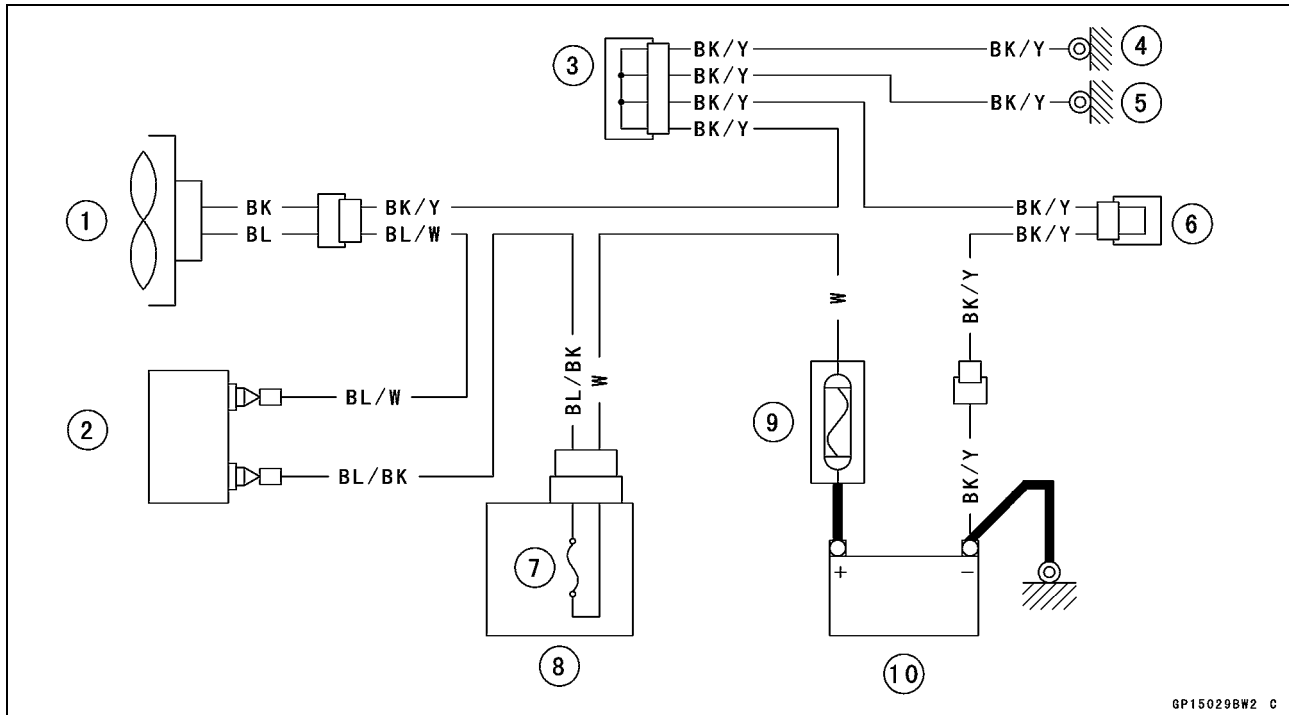
Resistance for Water Temperature Gauge [D]	
Temperature	Resistance (Ω) (Terminal [2]-Body)
50°C (122°F)	210 ±40
120°C (248°F)	21.2 ±1.5



# 16-62 ELECTRICAL SYSTEM

## Radiator Fan System

### Radiator Fan Circuit



GP150298W2 C

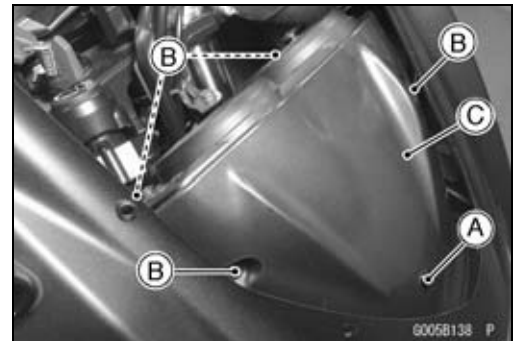
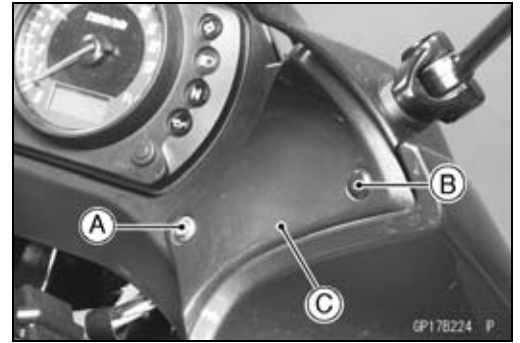
1. Radiator Fan
2. Radiator Fan Switch
3. Joint Connector A
4. Meter Ground
5. Frame Ground
6. Joint Connector B
7. Fan Fuse 10 A
8. Junction Box
9. Main Fuse 30 A
10. Battery 12 V 8 Ah

**Meter, Gauge, Indicator Unit**

*Meter Unit Removal*

- Remove:
  - Windshield (see Frame chapter)
  - Screws [A]
  - Quick Rivets [B]
- Pull out the right and left inner cover [C]

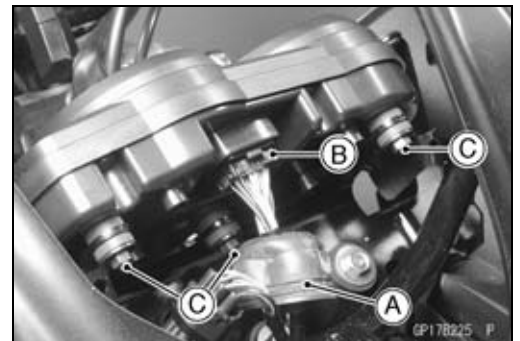
Screw [A]  
 Quick Rivets [B]  
 Meter Cover [C]



- Slide the dust cover [A] and remove the wiring connector [B].
- Remove:
  - Nuts with the Washers [C]
  - Meter Unit

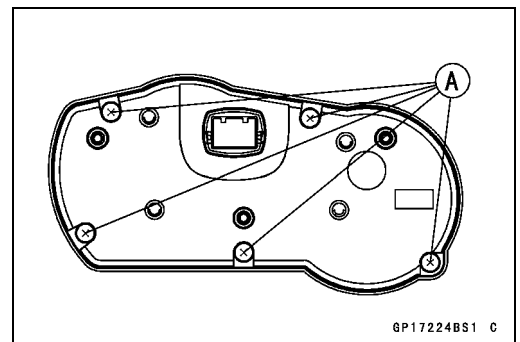
**CAUTION**

**Place the meter unit so that the face is up. If a meter unit is left upside down or sideways for any length of time, it will malfunction.**

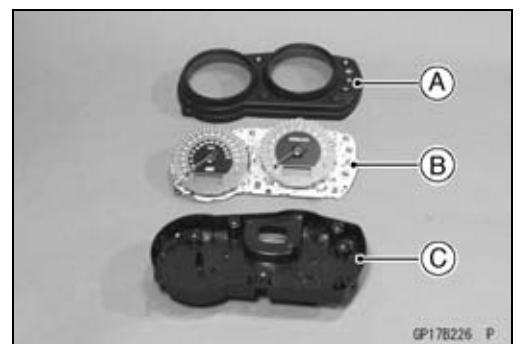


*Meter Unit Disassembly*

- Remove:
  - Meter Unit (see Meter Unit Removal)
  - Screws [A]



- Separate the upper meter cover [A], meter assembly [B], and lower meter cover [C].



# 16-64 ELECTRICAL SYSTEM

## Meter, Gauge, Indicator Unit

### Bulb Replacement

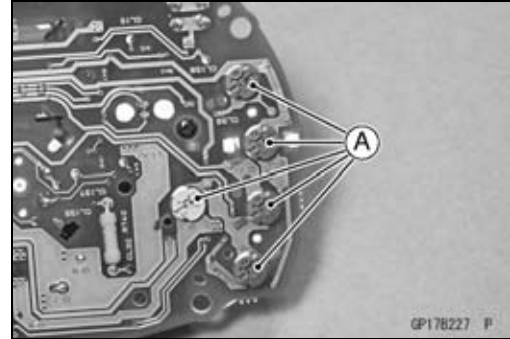
- Disassembly:
  - Meter Unit (see Meter Unit Disassembly)
- Turn the bulb socket [A] counterclockwise to remove.

### NOTE

- The water temperature warning indicator light (LED) and FI indicator light (LED) and can not be exchanged.

### CAUTION

Do not use bulb rated for greater wattage than the specified value (refer to the wiring diagram).

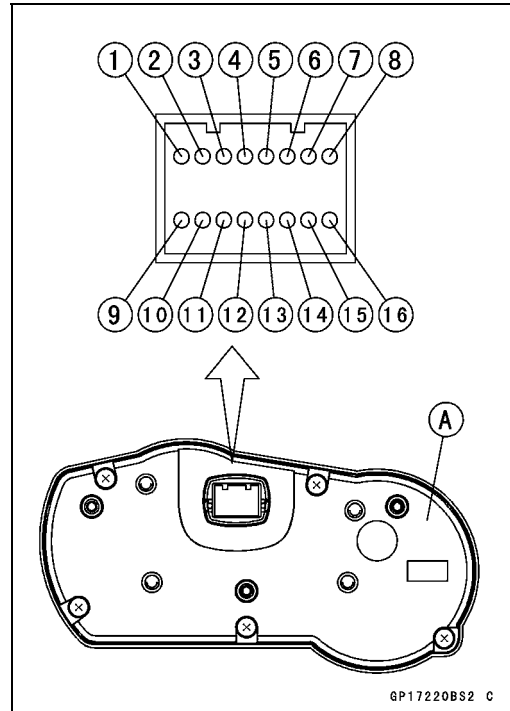


### Electronic Combination Meter Unit Inspection

- Remove the meter unit [A].
  - [1] Ignition
  - [2] Fuel Reserve Switch
  - [3] Unused
  - [4] Fuel Level Sensor
  - [5] Neutral Indicator Light Ground (-)
  - [6] FI Indicator Light (LED) Ground (-)
  - [7] Tachometer Pulse
  - [8] Water Temperature Warning Indicator Light (LED) Ground (-)
  - [9] Ground (-)
  - [10] Battery (+)
  - [11] Oil Pressure Warning Indicator Light Ground (-)
  - [12] Speed Sensor Supply Voltage
  - [13] Right Turn Signal Light (+)
  - [14] Left Turn Signal Indicator Light (+)
  - [15] High Beam Indicator (+)
  - [16] Speed Sensor Pulse

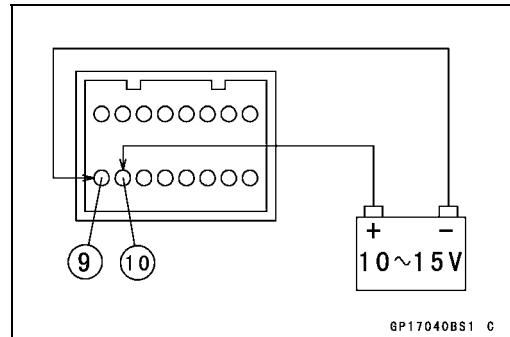
### CAUTION

Do not drop the meter unit. Place the meter unit so that it faces upward. If the meter unit is left upside down or sideways for a long time or dropped, it will malfunction. Do not short each terminals.



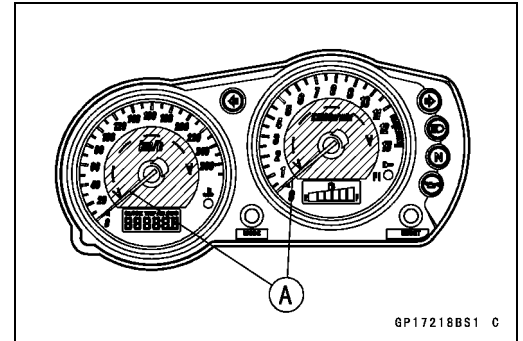
### Liquid Crystal Display (LCD) Segments Check

- Use the harness adapter for meter inspection.
  - Special Tool - Harness Adapter: 57001-1542
- Using the auxiliary wires, connect the 12 V battery to the meter unit connector as follows.
  - Connect the battery positive terminal to the terminal [10].
  - Connect the battery negative terminal to the terminal [9].

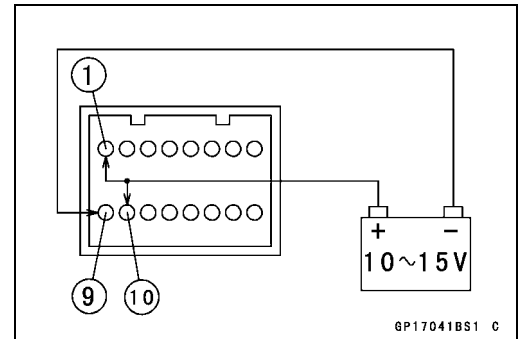


## Meter, Gauge, Indicator Unit

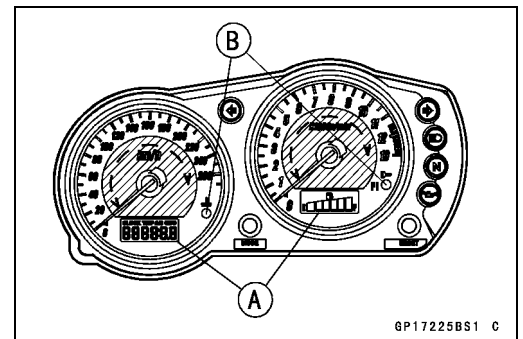
- The speedometer and tachometer needles [A] momentarily point their last readings.
- ★If the meters do not work, replace the meter assembly.



- Connect the terminal [1] to the terminal [10].



- The speedometer and tachometer needles momentarily point to their last readings.
- When the terminals are connected, all the LCD segments [A] and LED warning lights [B] appear for three seconds.
- ★If the meter needles do not work, replace the meter assembly.
- ★If the LCD segments and LED warning light will not appear, replace the meter assembly.
- Disconnect the terminal [1].
- All the LCD segments and LED warning light disappear.
- ★If the segments do not disappear, replace the meter assembly.

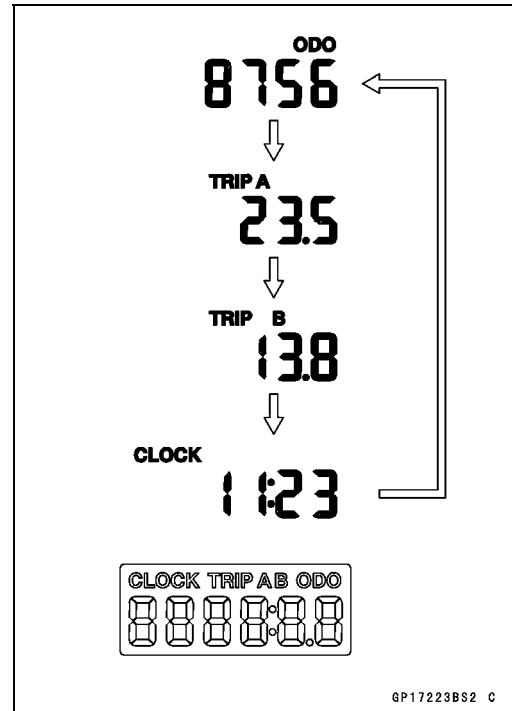
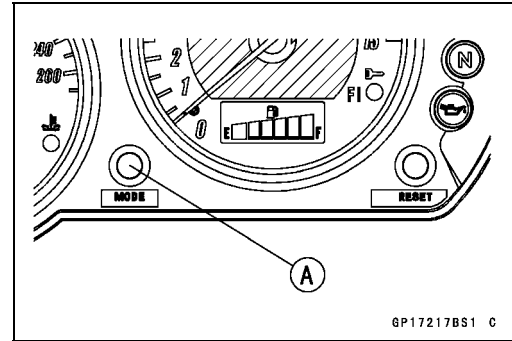


## 16-66 ELECTRICAL SYSTEM

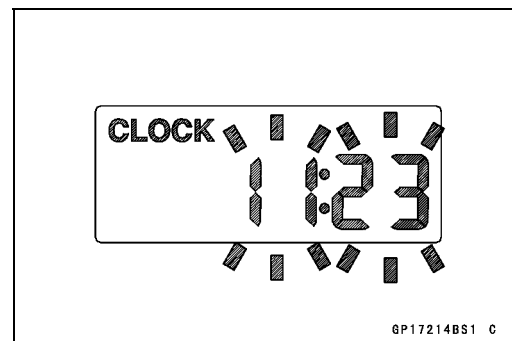
### Meter, Gauge, Indicator Unit

#### MODE AND RESET BUTTON Operation Check

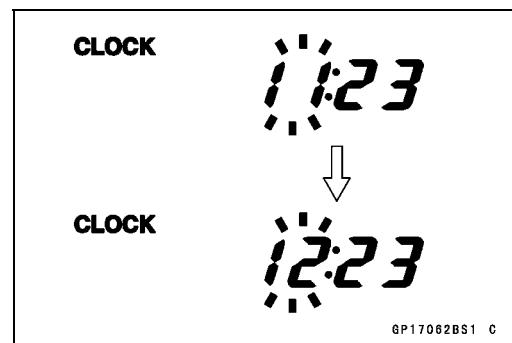
- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Check that the display change to the ODO, TRIP A, TRIP B, and CLOCK displays each time the MODE button [A] is pressed.
- ★ If the display function does not work, replace the meter assembly.



- Indicate the clock mode.
- Check that when the RESET button in CLOCK mode is pushed for more than two seconds, the meter display turns to the clock set mode.
- Both the hour and minute display start flashing.



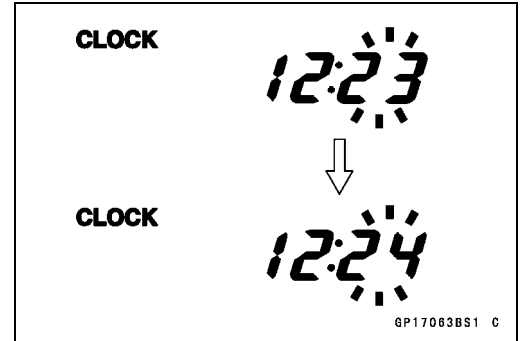
- In the HOUR/MINUTE setting mode, press the RESET button again to effect the HOUR setting mode.
- The hour display flashes on the display.
- Press the MODE button to set the hour.



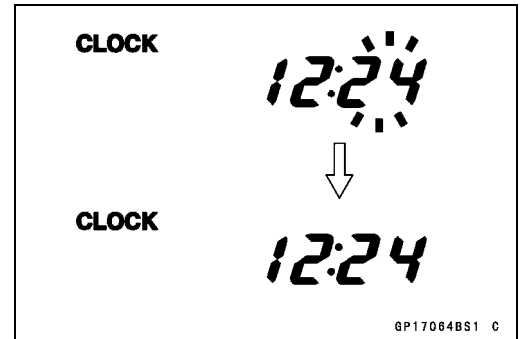


## Meter, Gauge, Indicator Unit

- In the HOUR setting mode, press the RESET button to effect the MINUTE setting mode.
- The minute display flashes on the display.
- Press the MODE button to set the minute.



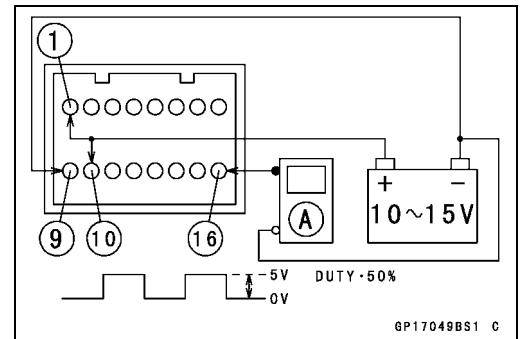
- In the MINUTE setting mode, press the RESET button to return to the HOUR/MINUTE setting mode.
- Press the MODE button to complete the time setting process.
- The clock starts counting the seconds as soon as the MODE button is pressed.



★ If the display function does not work and adjust, replace the meter assembly.

### Speedometer Check

- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- The speed equivalent to the input frequency is indicated in the oscillator [A], if the square wave (illustrated as shown) would be input into the terminal [16].
- Indicates approximately 60 mph in case the input frequency would be approximately 56 Hz.
- Indicates approximately 60 km/h in case the input frequency would be approximately 97 Hz.
- If the oscillator is not available, the speedometer can be checked as follows.
  - Install the meter unit.
  - Raise the rear wheel off the ground, using the jack.
  - Turn on the ignition switch.
  - Rotate the rear wheel by hand.
  - Check that the speedometer shows the speed.
- ★ If the speedometer does not work, check the speed sensor electric source voltage and speed sensor.
- ★ The electric source voltage and speed sensor are normal, replace the meter assembly.

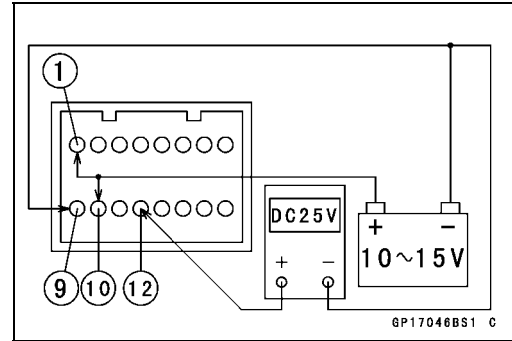


# 16-68 ELECTRICAL SYSTEM

## Meter, Gauge, Indicator Unit

### Speed Sensor Electric Source Check

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- Set the hand tester to the DC 25 V range and connect it to the terminals [12] and [9].
- ★ If the voltage is less than 8 V, replace the meter assembly.

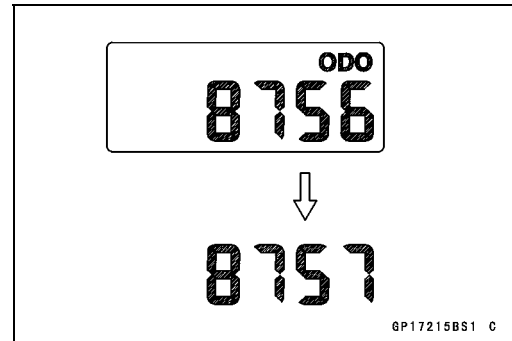


### Odometer Check

- Check the odometer with the speedometer in the same way.
- ★ If value indicated in the odometer is not added, replace the meter assembly.

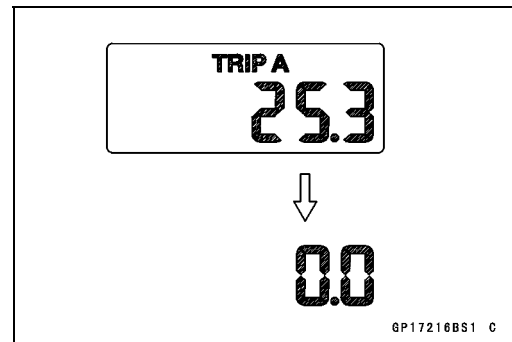
#### NOTE

- The data is maintained even if the battery is disconnected.
- When the figures come to 999999, they are stopped and locked.



### Trip A B Meter Check

- Check the trip A B meters with the speedometer in the same way.
- ★ If value indicated in the trip A B meters are not added, replace the meter assembly.
- Check that when the RESET button is pushed for more than two seconds, the figure display turns to 0.0.
- ★ If the figure display does not indicate 0.0, replace the meter assembly.

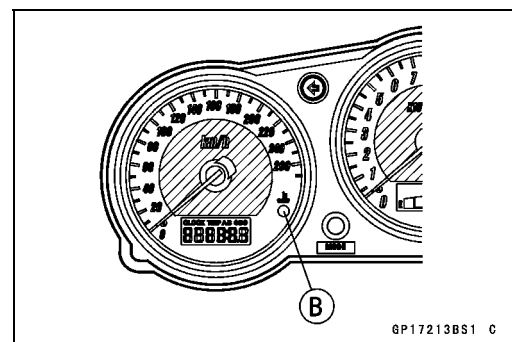
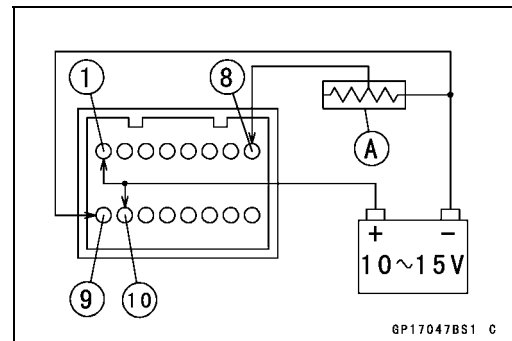


### Water Temperature Warning Indicator Light (LED) Meter Check

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- Connect the variable rheostat [A] to the terminal [8] as shown.
- Check that the on or flash of warning indicator light [B] matches the resistance value of the variable rheostat.

Resistance Value ( $\Omega$ )	Warning Indicate
21.2 ~ 28.2	ON
15.2 ~ 21.2	Flash

- If any display function does not work, replace the meter assembly.



**Meter, Gauge, Indicator Unit**

**Fuel Level Gauge Inspection**

- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- Connect a variable rheostat [A] to terminal [4] and [9] as shown.
- Check that the number of segment [B] matches the resistance value of the variable rheostat.

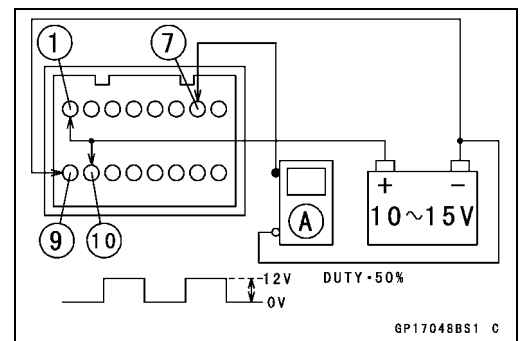
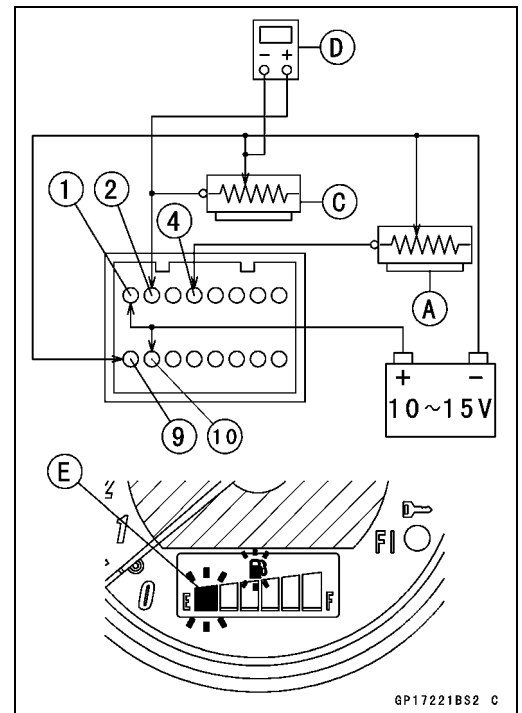
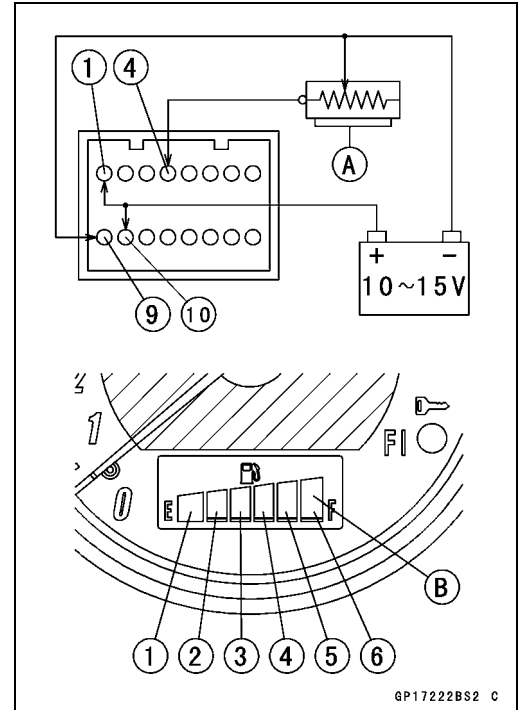
Resistance (Ω)	Number of Segments
0 ~ 16.5	F 6
11.5 ~ 34.5	5
26.5 ~ 52.5	4
41.5 ~ 70.5	3
56.5 ~ 88.5	2
71.5 ~ above	E 1

★ If this display function does not work, replace the meter assembly.

- Connect an other variable rheostat [C] to terminal [2] and [9] as shown.
- Set the hand tester [D] to the DC 10 V range and connect it to terminals of the variable rheostat as shown.
- When the 1 segment [E] appears, adjust the variable rheostat [C] so that the terminal voltage is less than 5.2 V.
- Then the 1 and FUEL symbol segments should flush.
- ★ If this display function does not flush, replace the meter assembly.

**Tachometer Check**

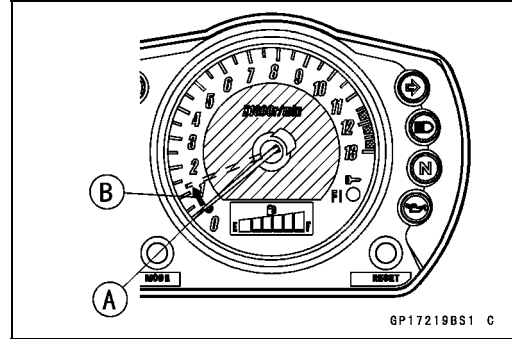
- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
- The revolutions per minute (rpm) equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown) would be input into the terminal [7].
- Indicates approximately 6 000 rpm in case the input frequency would be approximately 200 Hz.



# 16-70 ELECTRICAL SYSTEM

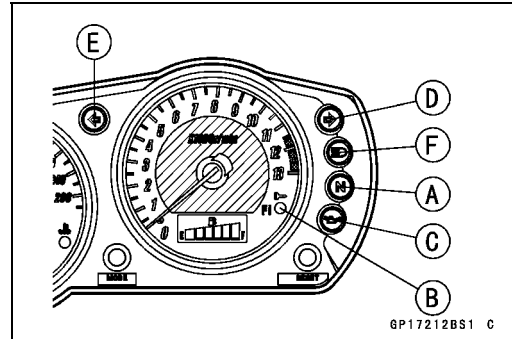
## Meter, Gauge, Indicator Unit

- If the oscillator is not available, the tachometer can be checked as follows.
  - Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments Check”.
  - Using an auxiliary wire, quick open and connect the terminal [1] to the terminal [7] repeatedly.
  - Then the tachometer needle [A] should flick [B].
  - ★ If the needle does not flick, replace the meter assembly.



### Indicator Lights Inspection

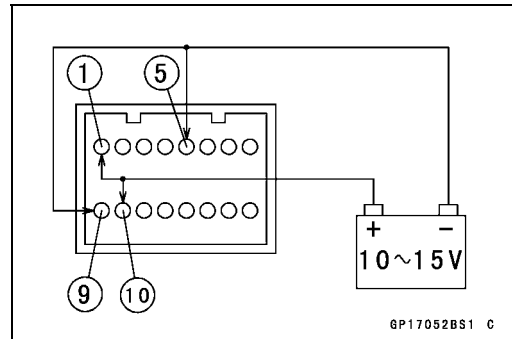
- Connect the 12 V battery and terminals in the same manner as specified in the “Liquid Crystal Display (LCD) Segments check”.
  - Neutral Indicator Light [A]
  - FI Indicator Light (LED) [B]
  - Oil Pressure Warning Indicator Light [C]
  - Right Turn Signal Indicator Light [D]
  - Left Turn Signal Indicator Light [E]
  - High Beam Indicator Light [F]



- Using the auxiliary leads, connect a 12 V battery to the meter unit connector as follows.

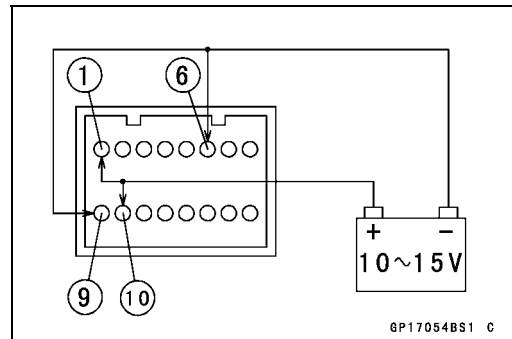
### Neutral Indicator Light

Battery Negative (–) Terminal To Terminal [5]



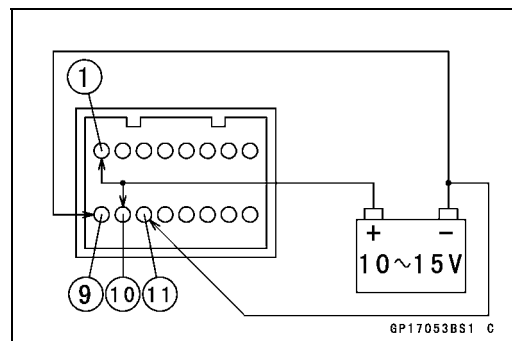
### FI Indicator Light (LED)

Battery Negative (–) Terminal To Terminal [6]



### Oil Pressure Warning Indicator Light

Battery Negative (–) Terminal To Terminal [11]

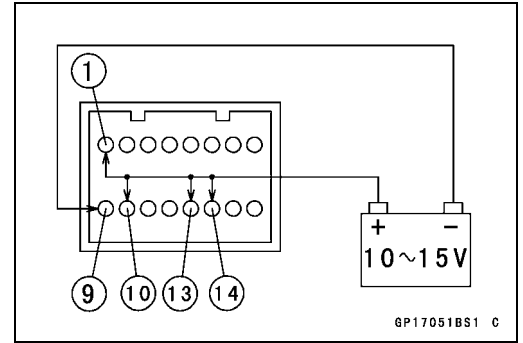


**Meter, Gauge, Indicator Unit**

**Right and Left Turn Signal Indicator Light**

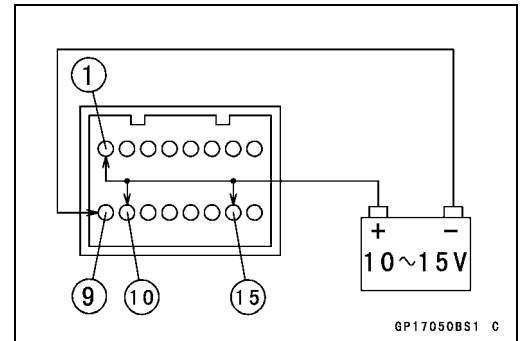
For Right Turn Signal Indicator Light  
 Battery Positive (+) Terminal to Terminal [13]

For Left Turn Signal Indicator Light  
 Battery Positive (+) Terminal to Terminal [14]



**High Beam Indicator Light**

Battery Positive (+) Terminal to Terminal [15]



- If each indicator lights does not go on, replace the bulb.

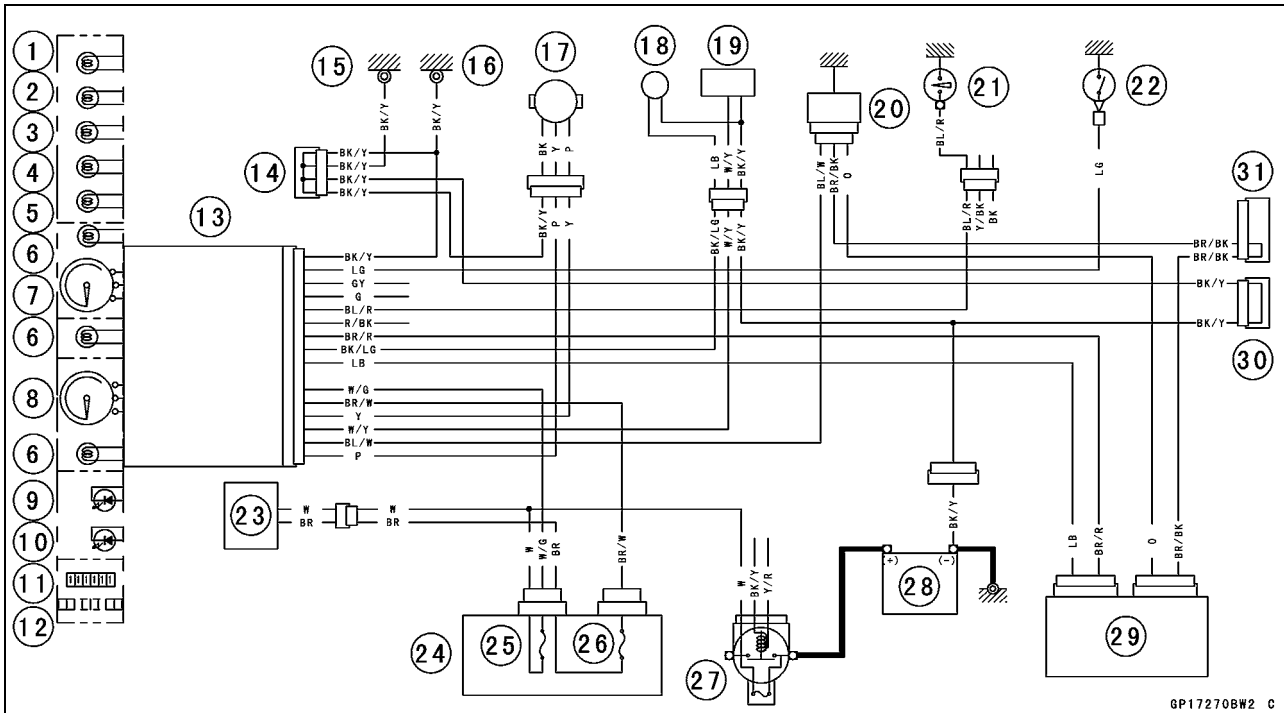
**NOTE**

○The FI indicator light (LED) does not go on, replace the meter assembly.

# 16-72 ELECTRICAL SYSTEM

## Meter, Gauge, Indicator Unit

### Meter Circuit



GP17270BW2 C

- |  |                              |
|--|------------------------------|
| 1. High Beam Indicator Light                       | 14. Joint Connector A        |
| 2. Left Turn Signal Indicator Light                | 15. Frame Ground             |
| 3. Right Turn Signal Indicator Light               | 16. Meter Ground             |
| 4. Neutral Indicator Light                         | 17. Speed Sensor             |
| 5. Oil Pressure Warning Indicator Light            | 18. Fuel Reserve Switch      |
| 6. Meter Light                                     | 19. Fuel Level Sensor        |
| 7. Tachometer                                      | 20. Water Temperature Sensor |
| 8. Speedometer                                     | 21. Oil Pressure Switch      |
| 9. Water Temperature Warning Indicator Light (LED) | 22. Neutral Switch           |
| 10. FI Indicator Light (LED)                       | 23. Ignition Switch          |
| 11. Odometer/Trip A, B Meters/Clock/Fuel Indicator | 24. Junction Box             |
| 12. Fuel Level Gauge                               | 25. ACC Fuse 10 A            |
| 13. Meter Unit                                     | 26. Ignition Fuse 10 A       |
|  | 27. Main Fuse 30 A           |
|  | 28. Battery 12 V 8 Ah        |
|  | 29. ECU                      |
|  | 30. Joint Connector B        |
|  | 31. Joint Connector D        |

## Immobilizer System (Equipped Models)

This motorcycle is equipped with an immobilizer system to protect the motorcycle from theft. This system provides a theft proof device by means of matching a code between the inbuilt key transponder and ECU (Electronic Control Unit). If the code does not match, ignition system, injectors and sub-throttle valve actuator will not operate and the engine will not start.

### Abstract

- Do not keep more than one immobilizer key of any system on a key ring. Jamming of the key code signal may occur and the operation of the system may be affected.
- The FI indicator light illuminates for two seconds and then extinguishes when the ignition is first switched on. This shows the system is operating correctly.
- If the FI indicator light illuminates when the ignition switch is turned to the ON position and stays illuminated this shows a fault in the DFI system.
- If the FI indicator light flashes when the ignition switch is turned to the ON position this shows the immobilizer system has a fault. Refer to service code to identify the faulty component.
- The FI indicator light will flash for a period of 24 hours once the ignition switch has been switched off and the key removed. This flashing can be set to on or off as desired by holding the Mode and Reset buttons down for two seconds within twenty seconds of switching the ignition off.
- If all coded keys (master key and user keys) are lost the ECU and ignition switch will have to be replaced.
- The immobilizer system can not function until the master key code is registered in the ECU.
- A total of six keys can be registered in the ECU at any one time (one master key and five user keys).
- If the master key is lost it is not possible to register new user keys.

### Operational Cautions

1. Do not put two keys of any immobilizer system on the same key ring.
2. Do not submerge any key in water.
3. Do not expose any key to excessively high temperature.
4. Do not place any key close to magnet.
5. Do not place a heavy item on any key.
6. Do not grind any key or alter its shape.
7. Do not disassemble the plastic part of any key.
8. Do not drop the key and/or apply any shocks to the key.
9. When a user key is lost, the user should go to his dealer to invalidate the lost key registration in the electronic control unit (ECU).
10. When the master key is lost, the user should go to his dealer and have a new ECU installed and register a new master key and user keys.

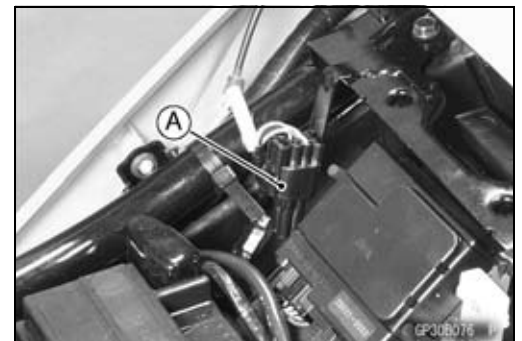
### NOTE

○ No.9 and 10 are strongly recommended to the customer to ensure security of the motorcycle.

### Key Registration

#### Case 1: When the user key has been lost or additional spare user key is required.

- Prepare a new spare user key.
- Cut the key in accordance with the shape of the current user key.
- Remove:
  - Seat (see Frame chapter)
- Disconnect the immobilizer/Kawasaki self-diagnosis system connector [A].



# 16-74 ELECTRICAL SYSTEM

## Immobilizer System (Equipped Models)

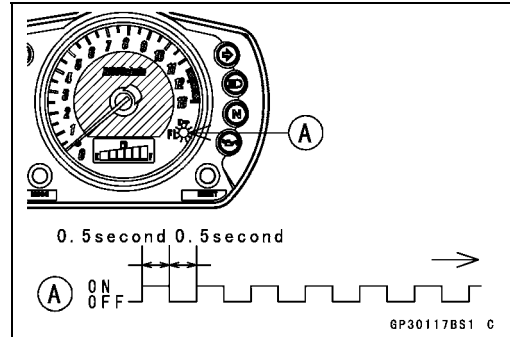
- Connect the key registration unit [A].  
Special Tool - Key Registration Unit: 57001-1582



- Insert the master key to the ignition switch and turn it ON.

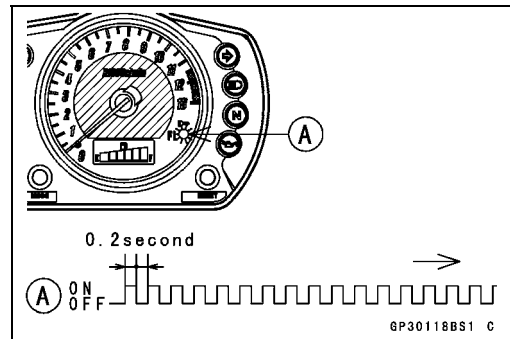
### Verified

- The FI indicator light [A] blinks to display the registration mode (go to the next step).

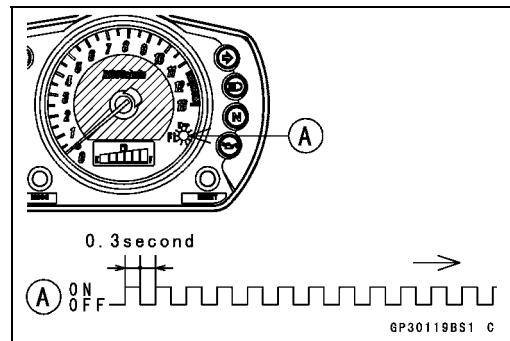


### Not Verified

- The FI indicator light [A] blinks to display the collation error (refer to the following failure illustrations).  
Immobilizer Amplifier Failure



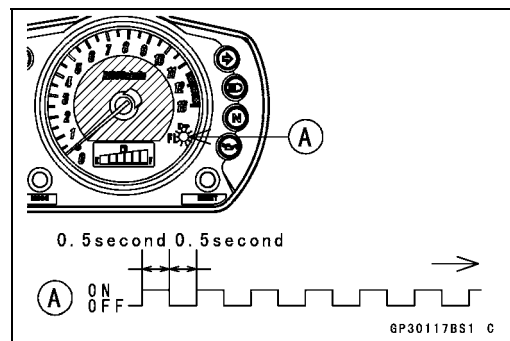
### Master Key Collation Error



- Turn the master key OFF and remove the master key.
- The FI indicator light [A] blinks continuously to display that the ECU is in the registration mode for 15 seconds.

### NOTE

- Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the FI indicator light stops flashing.
- To return to the registration mode start the master key verification procedure. This applies to all user key registration.





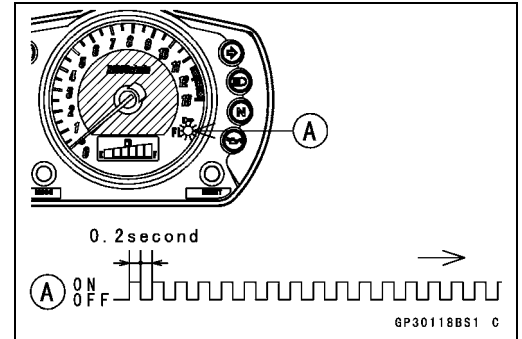
**Immobilizer System (Equipped Models)**

- Insert the user key 1 to the ignition switch and turn it ON.

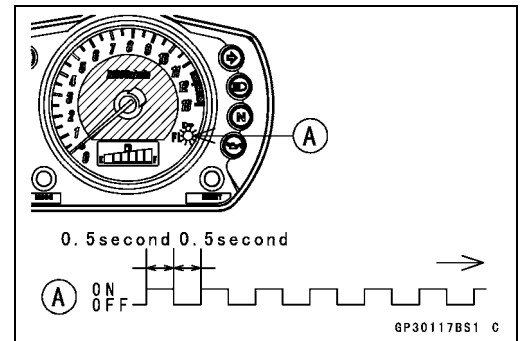
**NOTE**

○Keep the other user key away from the immobilizer antenna.

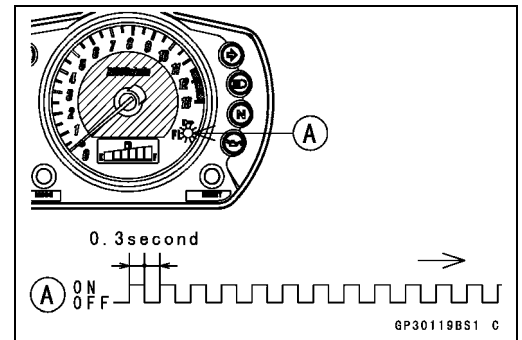
- If there is any problem in the registration, the FI indicator light [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



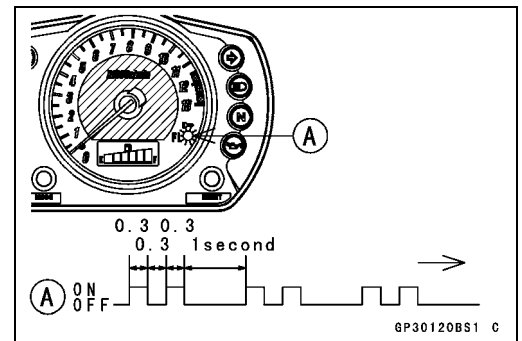
When Registered User Key is Inserted.



User Key Collation Error



- The user key 1 is successfully registered in the ECU.
- The FI indicator light [A] blinks 2 times and stops for 1 second and then repeats this cycle.



# 16-76 ELECTRICAL SYSTEM

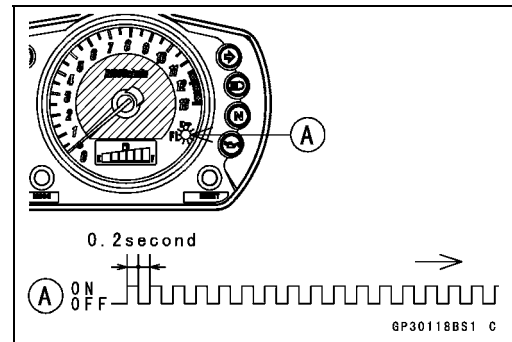
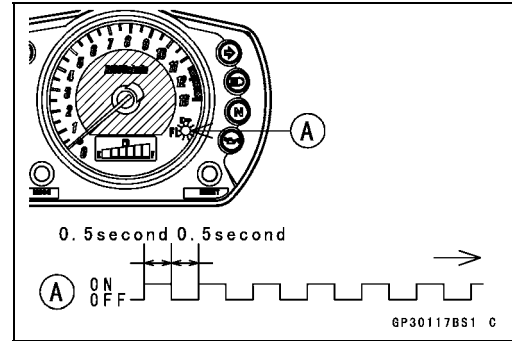
## Immobilizer System (Equipped Models)

- Turn the user key 1 OFF and remove off the user key 1.
- The FI indicator light [A] blinks to display the registration mode.

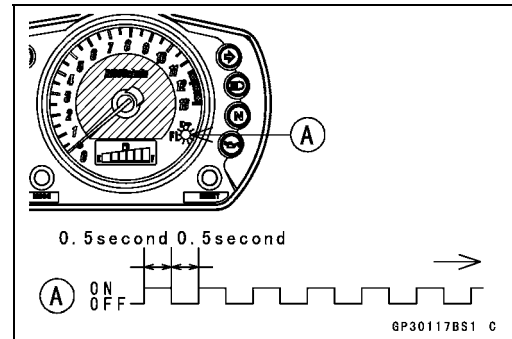
### NOTE

- Turn off the ignition switch and wait for the period of 15 seconds or more. The registration mode automatically finishes and the FI indicator light will switch off.
  - This procedure registered the master key and one user key.
  - Continue with the procedure to register the second and later keys before the 15 seconds period has elapsed.
- Insert the user key 2 to the ignition switch and turn it ON.

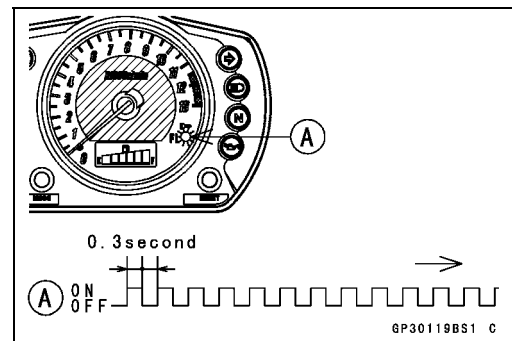
- If there is any problem in the registration, the FI indicator light [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



When Registered User Key is Inserted.



User Key Collation Error

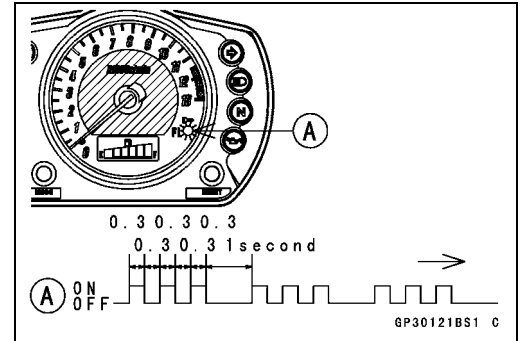


## Immobilizer System (Equipped Models)

- The user key 2 is registered in the ECU.
- The FI indicator light [A] blinks 3 times and stops for 1 second and then repeats this cycle.
- This procedure has registered the master key and 2 user keys.
- Continue with the procedure to register an additional 3 user keys.

### NOTE

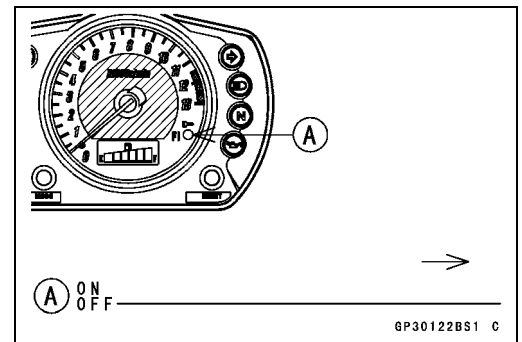
- The ECU can store up the six key codes (master key × 1 and user key × 5).



### User Key Indicator Flashes

	FI Indicator Light Blinks	FI Indicator Light Stop	Remarks
<b>User Key 3</b>	4 times	1 seconds	Repeat
<b>User Key 4</b>	5 times	1 seconds	Repeat
<b>User Key 5</b>	6 times	1 seconds	Repeat

- Turn OFF the ignition switch and wait for period of more than 15 seconds.
- The registration mode automatically ends.
- FI indicator light goes off [A].



- Remove the key registration unit and connect the immobilizer Kawasaki self-diagnostic system connector.

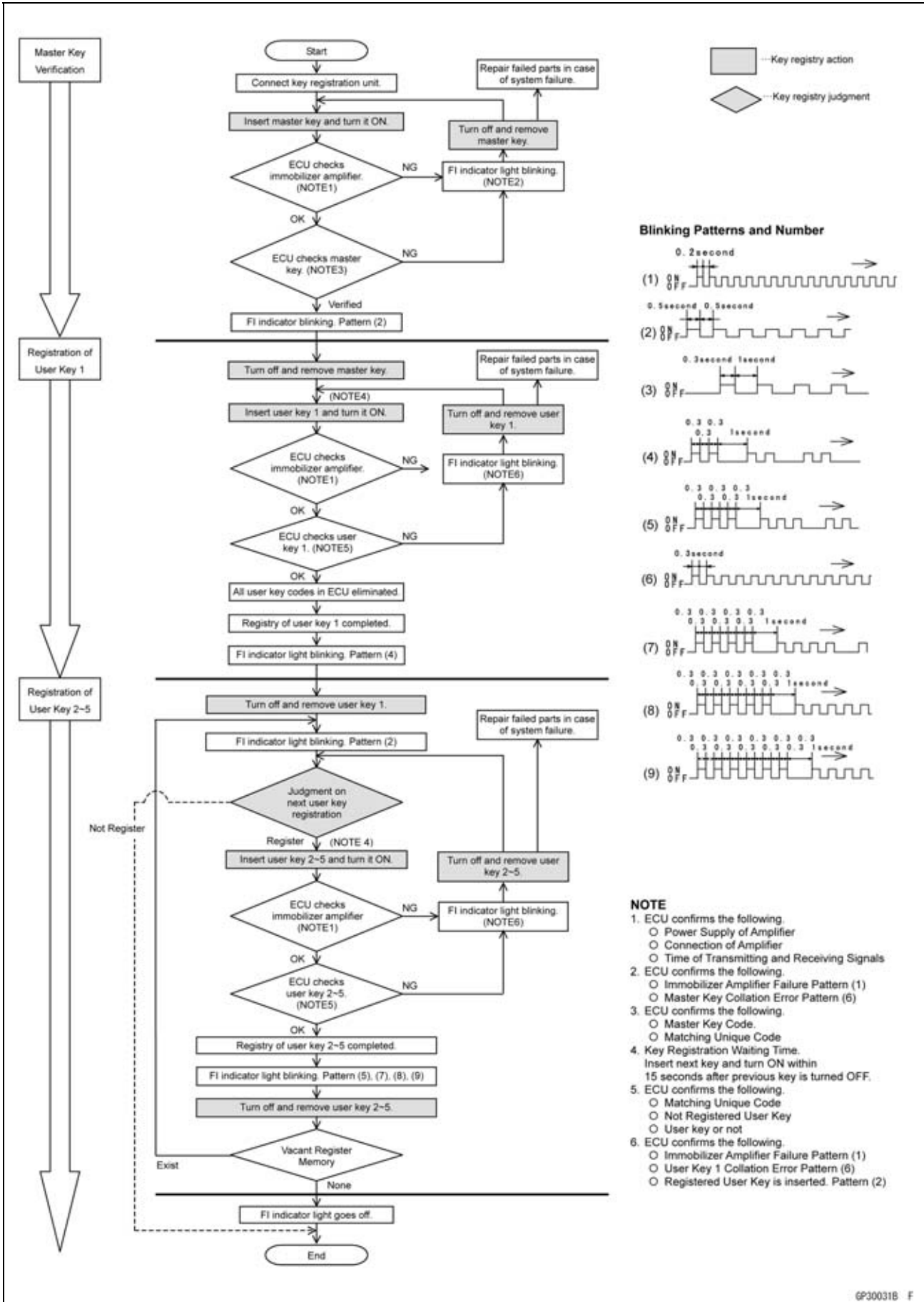
### NOTE

- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

# 16-78 ELECTRICAL SYSTEM

## Immobilizer System (Equipped Models)

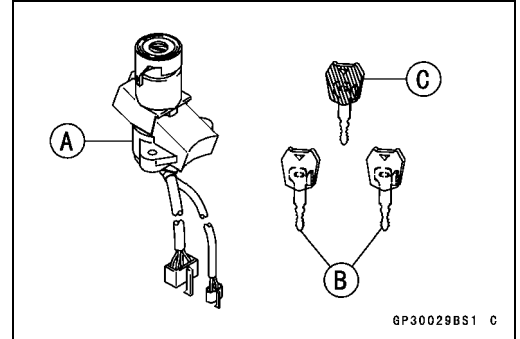
### Spare User Key Registration Flow Chart



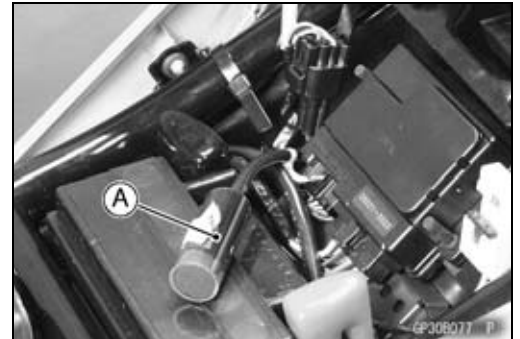
**Immobilizer System (Equipped Models)**

**Case 2: When the ignition switch is faulty and to be replaced.**

- Prepare a new ignition switch [A] and two new user keys [B].
- These parts are available as a set. Prepare the current master key [C].



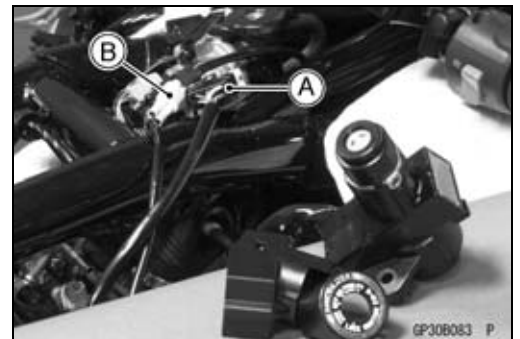
- Remove:
    - Ignition Switch and Immobilizer Antenna (see Immobilizer System Parts Replacement)
    - Seat (see Frame chapter)
  - Disconnect the immobilizer/Kawasaki self-diagnostic system connector.
  - Connect the key registration unit [A].
- Special Tool - Key Registration Unit: 57001-1582**



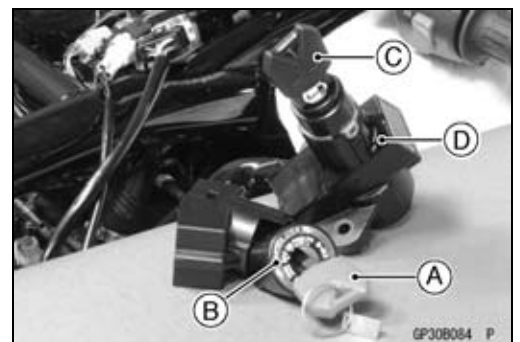
- Connect:
  - New Ignition Switch Lead Connector [A]
  - Immobilizer Antenna Lead Connector [B]

**NOTE**

○ Keep the antenna more than 15 cm from the ignition switch.

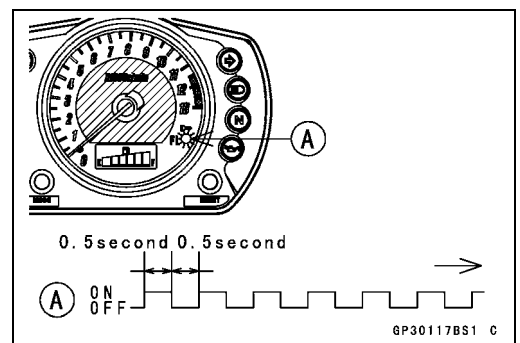


- Put the current master key [A] at the antenna [B]. Insert the new user key 1 [C] to the new ignition switch [D] and turn it ON.



**Verified**

○ The FI indicator light [A] blinks to display the ECU is in the registration mode (go to the next step).



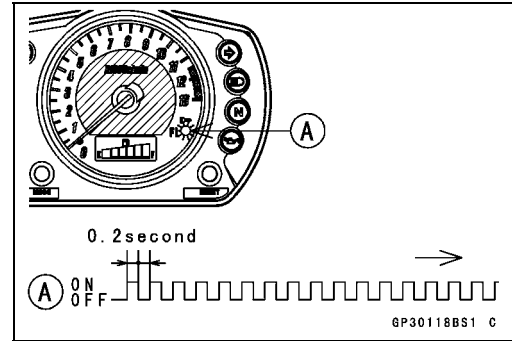
# 16-80 ELECTRICAL SYSTEM

## Immobilizer System (Equipped Models)

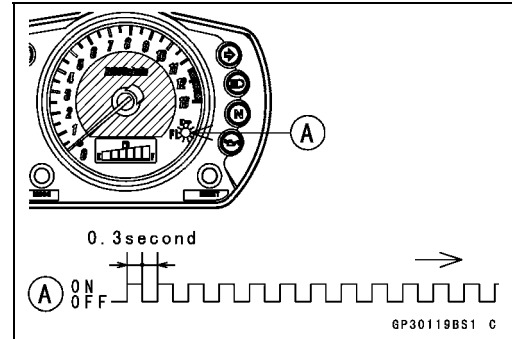
### Not Verified

○The FI indicator light [A] blinks to display the collation error.

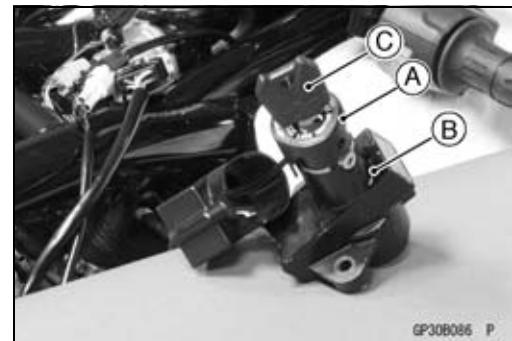
Immobilizer Amplifier Failure



Master Key Collation Error

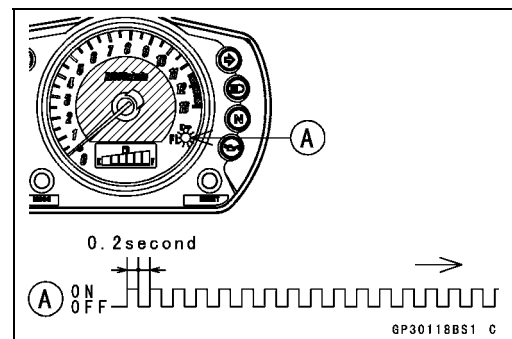


- Turn off and remove the new user key 1.
- Temporarily place the antenna [A] on the new ignition switch [B].
- Insert the user key 1 [C] again into the new ignition switch and turn it ON.



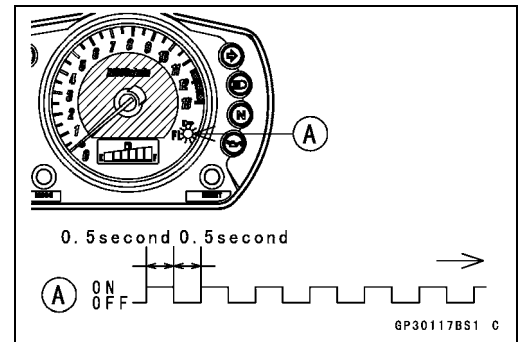
### NOTE

- Place the antenna on the ignition switch, insert the next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the FI indicator light stops flashing.
  - To return to the registration mode start the master key verification procedure. This applies to all user key registration.
  - Keep other user keys away from the immobilizer antenna.
- If there is any problem in the registration, the FI indicator light [A] blinks to display the collation error.
- Immobilizer Amplifier Failure

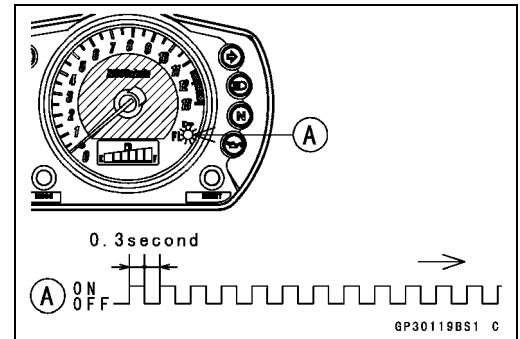


## Immobilizer System (Equipped Models)

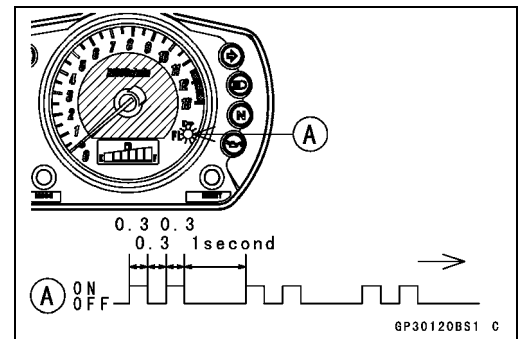
When Registered User Key is Inserted.



User Key Collation Error



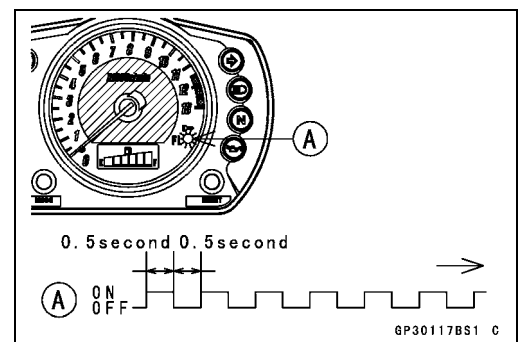
- The user key 1 is successfully registered in the ECU.
- The FI indicator light [A] blinks 2 times and stops for 1 second and then repeats this cycle to indicate successful registering of user key 1.



- Turn off and remove user key 1.
- The FI indicator light [A] blinks to display the registration mode.

### NOTE

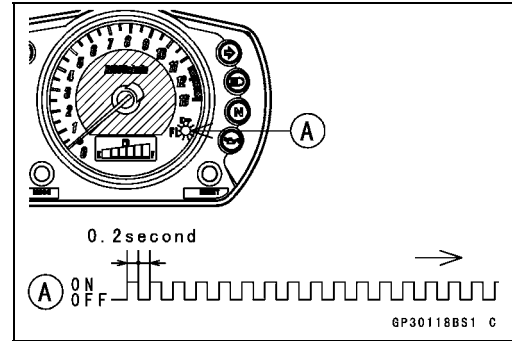
- Turn off the ignition switch and wait for the period more than 15 seconds. The registration mode automatically ends and FI indicator light goes off.
  - This procedure has , registered the master key and one user key.
  - Continue the procedure to program the second and later keys.
- Insert the user key 2 to the ignition switch and turn it ON.



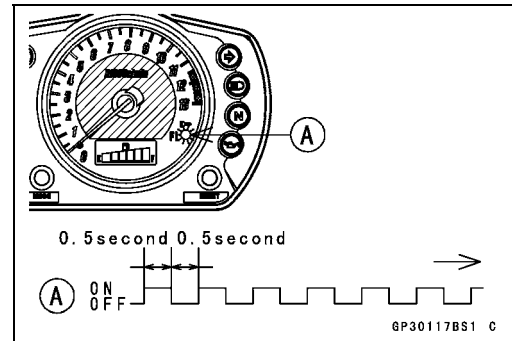
# 16-82 ELECTRICAL SYSTEM

## Immobilizer System (Equipped Models)

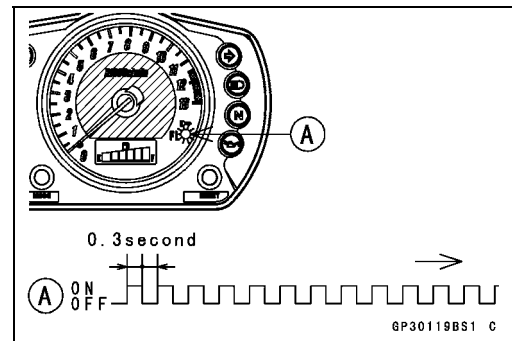
- If there is any problem in the registration, the FI indicator light [A] blinks to display the collation error.  
Immobilizer Amplifier Failure



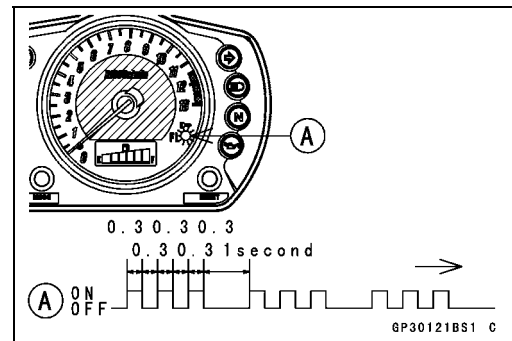
When Registered User Key is Inserted.



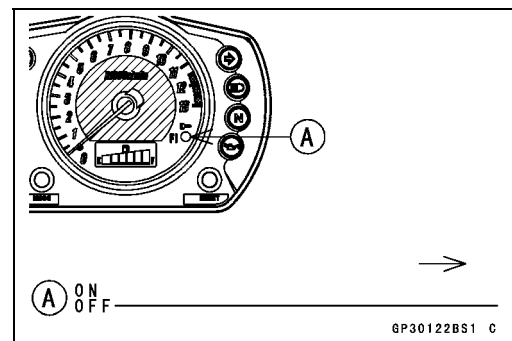
User Key Collation Error



- The user key 2 is successfully registered in the ECU.
- The FI indicator light [A] blinks 3 times and stops for 1 second and then repeat this cycle to indicate successful programming of user key 2.
- Turn OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.



- FI indicator light goes off [A].





## Immobilizer System (Equipped Models)

- Remove the key registration unit and connect the immobilizer/Kawasaki self-diagnostic system connector.

### NOTE

- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

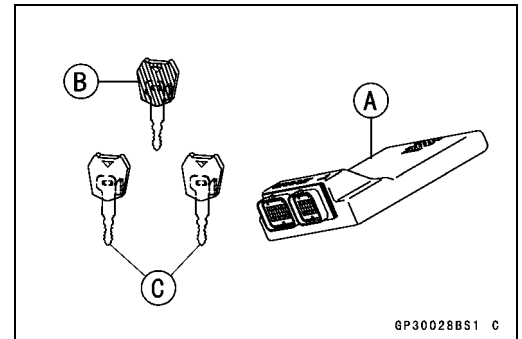
- Install the new ignition switch and antenna.

### Case 3: When the electric control unit (ECU) is faulty and has to be replaced.

- Prepare a new ECU [A], current master key [B] and current user keys [C].

### NOTE

- The key registration unit is not required.

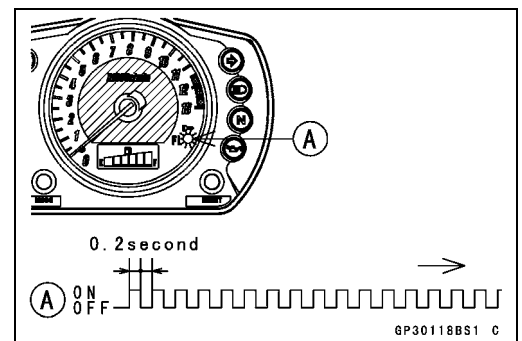


- Replace:
  - ECU [A] (see Immobilizer System Parts Replacement)

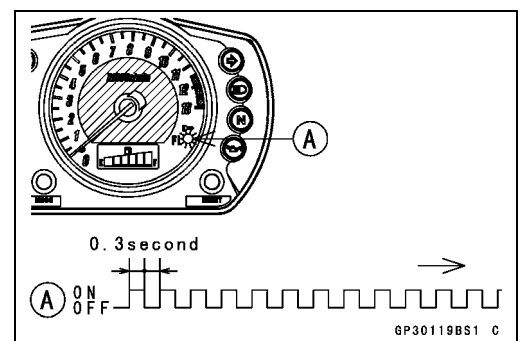


- Insert the current master key into the ignition switch and turn it ON.

- If there is any problem in the registration, the FI indicator light [A] blinks to display the collation error.
  - Immobilizer Amplifier Failure



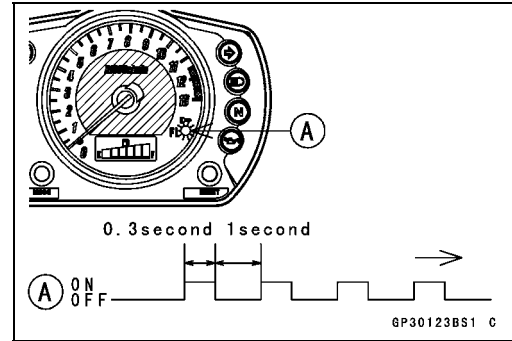
### Master Key Collation Error



# 16-84 ELECTRICAL SYSTEM

## Immobilizer System (Equipped Models)

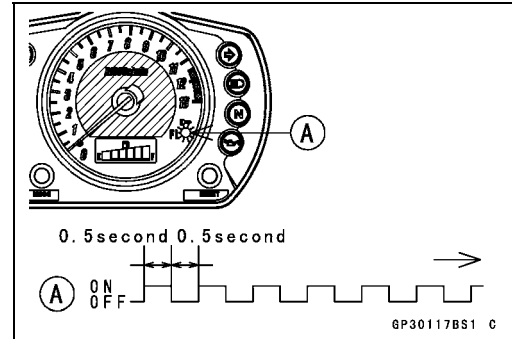
- The master key is registered in the ECU.
- The FI indicator light [A] blinks 1 time and stops for 1 second and the repeats this cycle to indicate successful registration of the master key.



- Turn of the master key and remove it.
- The FI indicator light [A] blinks to display the registration mode.

### NOTE

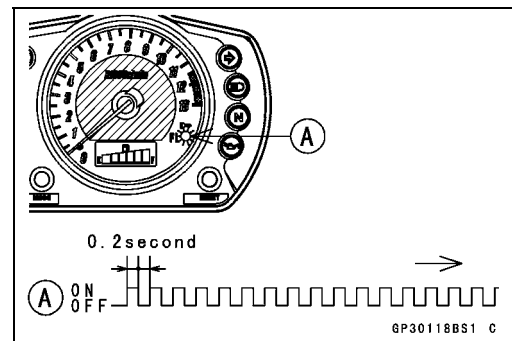
- Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the FI indicator light goes off.
- To return to the registration mode start the master key verification procedure. This applies to all user key registration.



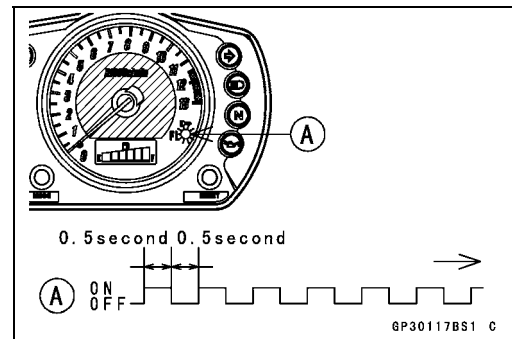
- Insert the user key 1 to the ignition switch and turn it ON.

### NOTE

- Keep the other user keys away from the immobilizer antenna.
- If there is any problem in the registration, the FI indicator light [A] blinks to display the collation error.  
Immobilizer Amplifier Failure

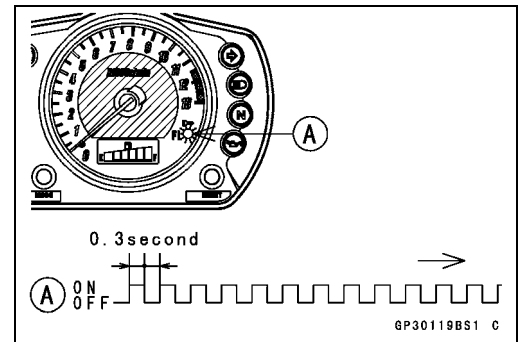


When Registered User Key is Inserted.

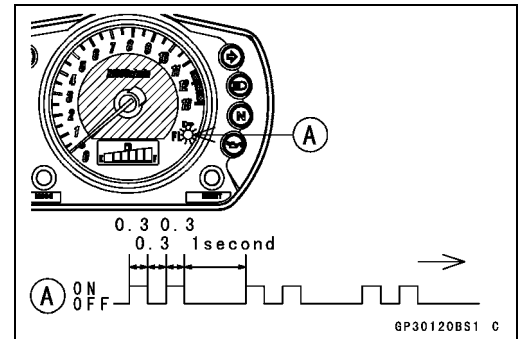


## Immobilizer System (Equipped Models)

### User Key Collation Error



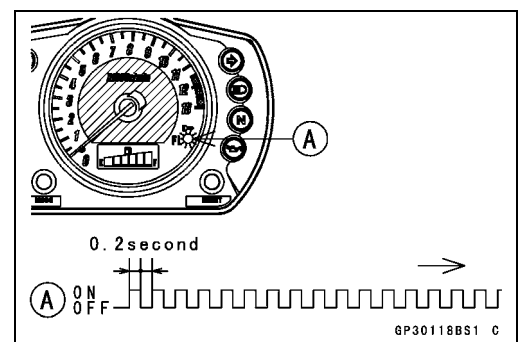
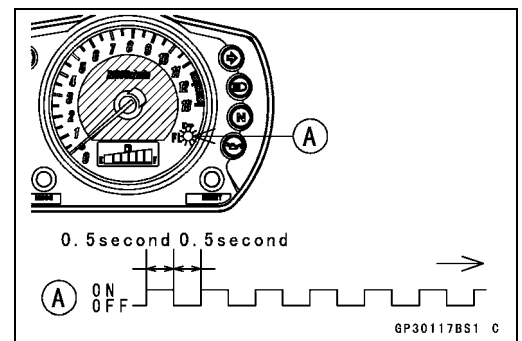
- The user key 1 is registered in the ECU.
- The FI indicator light [A] blinks 2 times and stops for 1 second and then repeats this cycle to indicate successful registration of user key.



- Turn off and remove the user key 1.
- The FI indicator light [A] blinks to display the registration mode codes.

#### NOTE

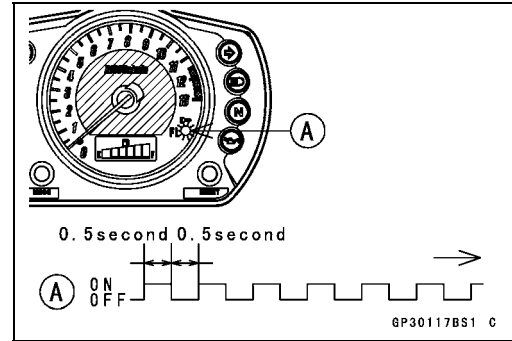
- Insert next key and turn ON within 15 seconds after previous key is turned off and removed otherwise registration mode will be ended and the FI indicator light goes off.
  - To return to the registration mode start the master key verification procedure. This applies to all user key registration.
- Insert the user key 2 to the ignition switch and turn it ON.
  - If there is any problem in the registration, the FI indicator light [A] blinks to display the collation error code.  
Immobilizer Amplifier Failure



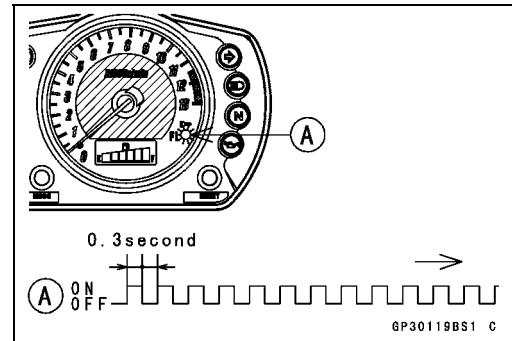
# 16-86 ELECTRICAL SYSTEM

## Immobilizer System (Equipped Models)

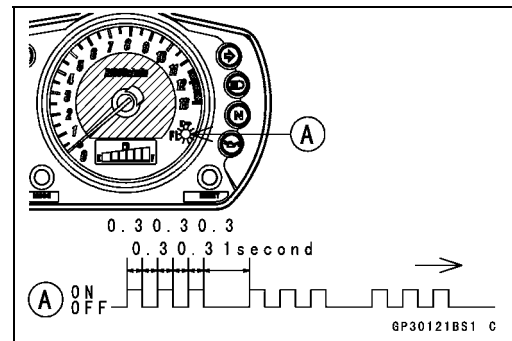
When Registered User Key is Inserted.



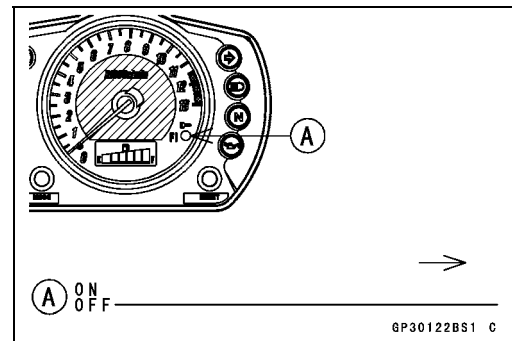
User Key Collation Error



- The user key 2 is registered in the ECU.
- The FI indicator light [A] blinks 3 times and stops for 1 second and then repeats this cycle to indicate successful registration of user key 2.
- Turn OFF the ignition switch and wait for period more than 15 seconds.
- The registration mode automatically ends.



- FI indicator light goes off [A].



### NOTE

- Turn the ignition switch ON with the registered user key.
- Check that the engine can be started using all registered user keys.

### Case 4: When master key is faulty or lost.

The master key replacement is considered very rare case. However if it is required, the following is necessary.

### NOTE

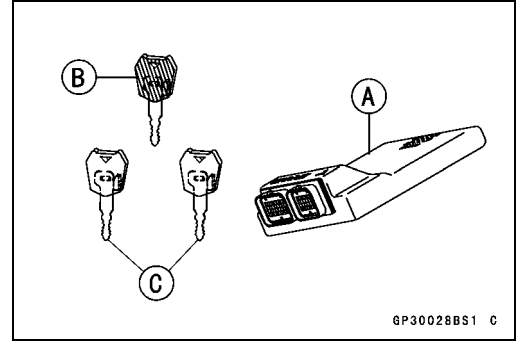
- The ECU must be replaced with a new one because the master key code that is registered in the current ECU can not be rewritten.

**Immobilizer System (Equipped Models)**

- Prepare a new ECU [A], new master key [B] and current user keys [C].

**NOTE**

- *The key registration unit is not required.*
- *The key registration process is same as the electric control unit replacement.*



**Case 5: When replacing the antenna.**

- Prepare a new antenna.
- Refer to the Immobilizer System Parts Replacement.

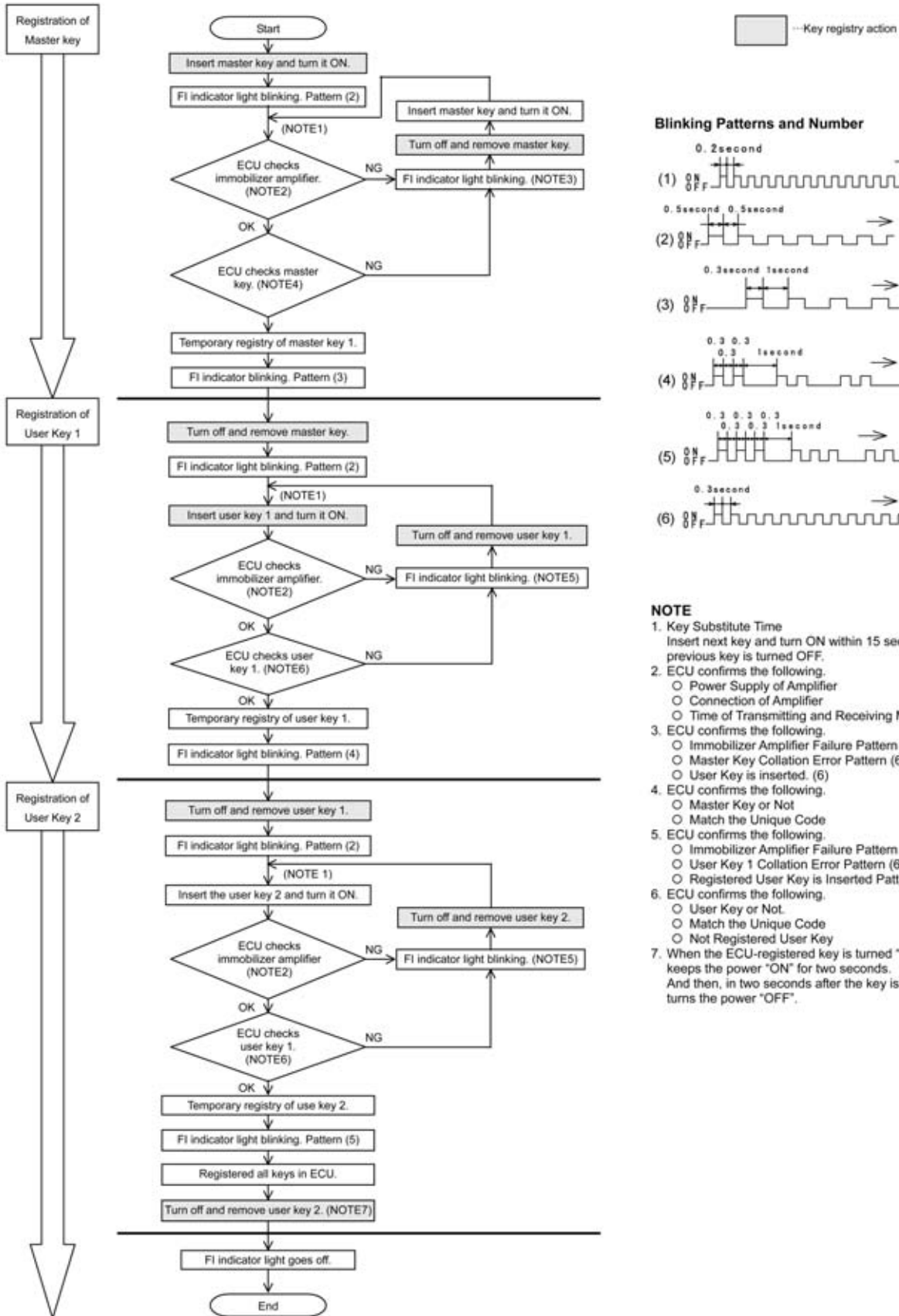
**NOTE**

- *No key registration is required.*

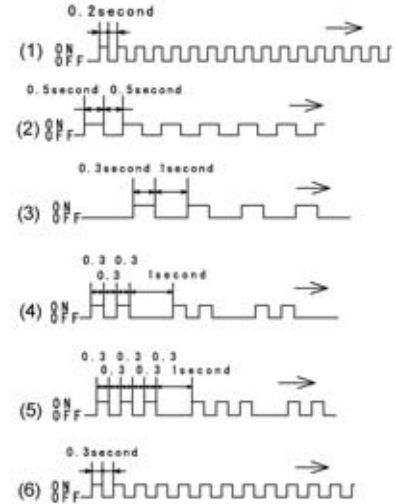
# 16-88 ELECTRICAL SYSTEM

## Immobilizer System (Equipped Models)

### All Keys Initial Registration Flow Chart



#### Blinking Patterns and Number



#### NOTE

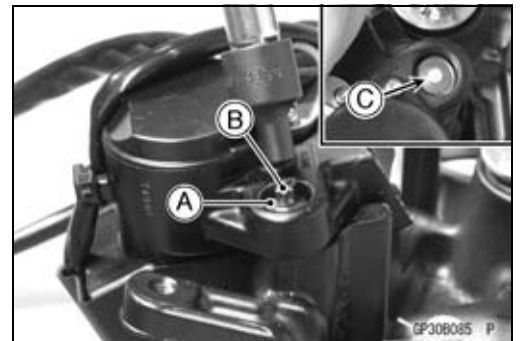
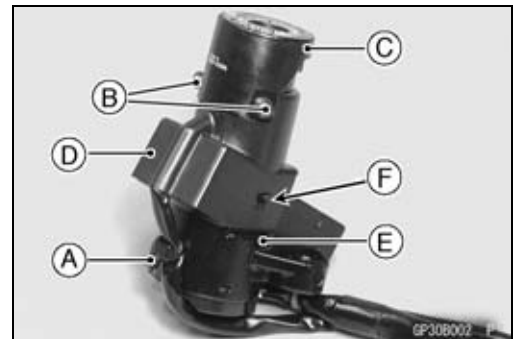
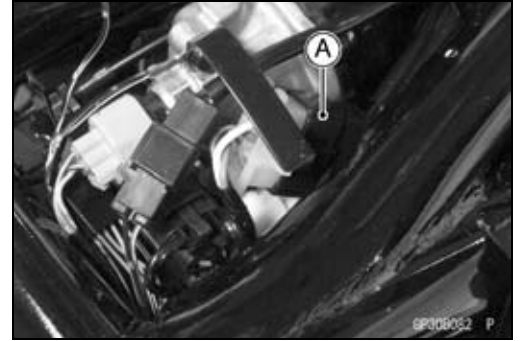
- Key Substitute Time  
Insert next key and turn ON within 15 seconds after previous key is turned OFF.
- ECU confirms the following.
  - Power Supply of Amplifier
  - Connection of Amplifier
  - Time of Transmitting and Receiving Messages.
- ECU confirms the following.
  - Immobilizer Amplifier Failure Pattern (1)
  - Master Key Collision Error Pattern (6)
  - User Key is inserted. (6)
- ECU confirms the following.
  - Master Key or Not
  - Match the Unique Code
- ECU confirms the following.
  - Immobilizer Amplifier Failure Pattern (1)
  - User Key 1 Collision Error Pattern (6)
  - Registered User Key is Inserted Pattern (2)
- ECU confirms the following.
  - User Key or Not.
  - Match the Unique Code
  - Not Registered User Key
- When the ECU-registered key is turned "OFF", ECU keeps the power "ON" for two seconds. And then, in two seconds after the key is "OFF", ECU turns the power "OFF".

## Immobilizer System (Equipped Models)

### Immobilizer System Parts Replacement

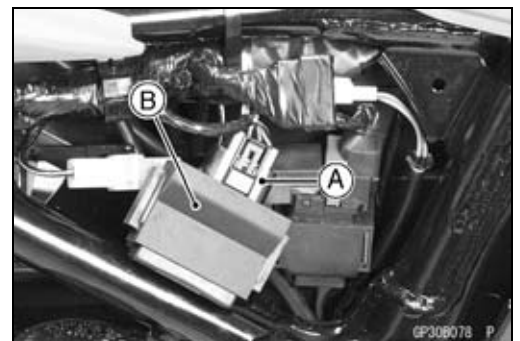
#### Immobilizer Antenna

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Disconnect the lead connectors [A].
  
- Remove:
  - Handlebar (see Steering chapter)
  - Steering Stem Head (see Steering chapter)
- Using a small chisel or punch [A], turn out the Torx bolts.
  
- Cut the band [A].
- Remove the screw [B].
- Remove the antenna [C] with the cover [D].
- Pull the lower parts [E] of the cover outside to clear the projection [F] of the ignition switch.
  
- Tighten a new Torx bolt [A] until the bolt head [B] is broken [C].
- Run the leads correctly (see General Information chapter).



#### Immobilizer Amplifier Replacement

- Remove:
  - Right Side Cover (see Frame chapter)
- Disconnect the connector [A].
- Pullout the amplifier [B] from the bracket.



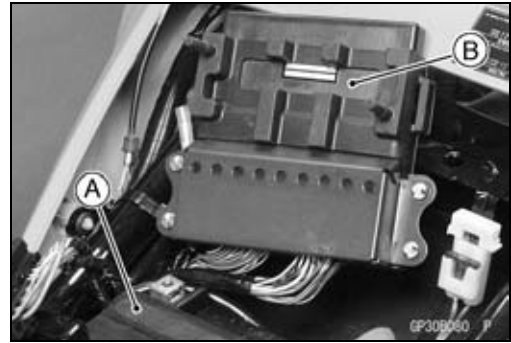
## 16-90 ELECTRICAL SYSTEM

### Immobilizer System (Equipped Models)

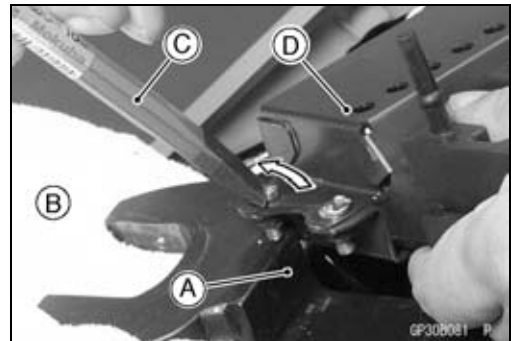
#### ECU (Electronic Control Unit) Replacement (for European Model)

- Remove:

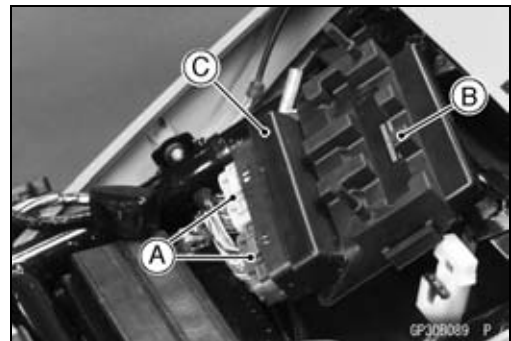
- Seat (see Frame chapter)
- Junction Box (see this chapter)
- Battery (see this chapter)
- ECU [A]



- Set the hard stand [A] onto the frame.
- Be sure to place a piece of cloth [B] under the hard stand.
- Using a small chisel [C] or other suitable tool, turn the screw head and remove the upper [D] and lower bracket.
- Disconnect the connectors.



- Connect the connectors [A].
- Install the damper [B] to the ECU [C].
- Set the under guard bracket to the ECU.

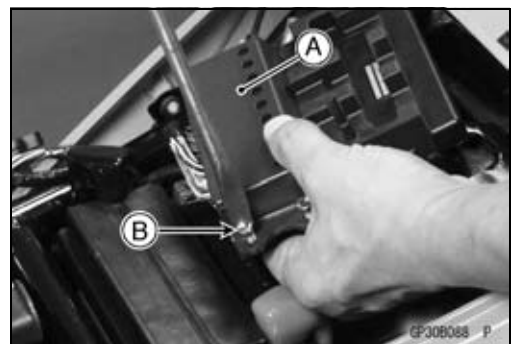


- Install:  
Upper Guard Bracket [A]

<b>CAUTION</b>
----------------

<b>Do not pinch the leads.</b>
--------------------------------

- Apply a non-permanent locking agent to the threads and tighten the screws [B].





## Immobilizer System (Equipped Models)

### Immobilizer Relational Parts Replacement Chart

		Failed or Lost Part					ECU
		Master Key (Red)	User Key (Black)	Ignition Switch	Antenna	Amplifier	
*	Master Key (Red)	●					
	User Key (Black)		●	○			
	Ignition Switch			●			
	Antenna				●		
	Amplifier					●	
	ECU	○					●
*	Replacement Part						
●	Main Replacement Part						
○	Additional Replacement Part						

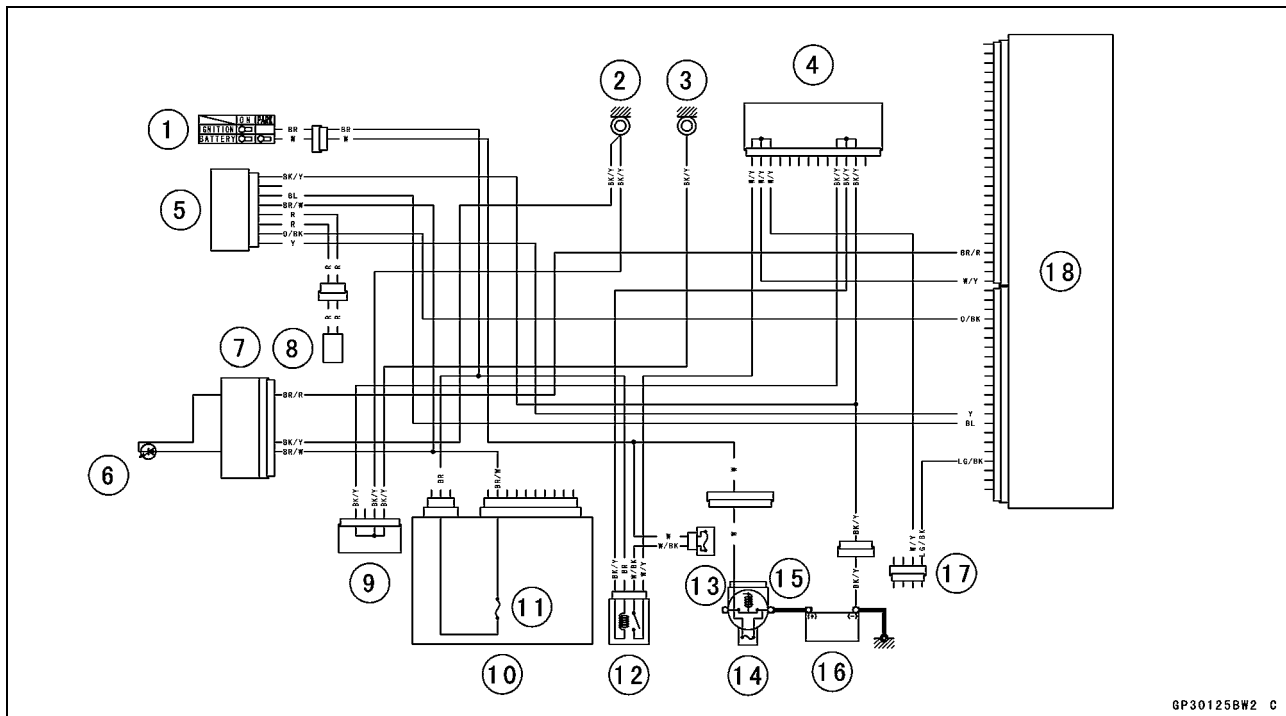
### Immobilizer System Inspection

- Refer to the Immobilizer Amplifier and Blank Key Detection section in the Fuel System (DFI) chapter.

# 16-92 ELECTRICAL SYSTEM

## Immobilizer System (Equipped Models)

### Immobilizer System Circuit



GP301258W2 C

- |                             |                        |  |
|-----------------------------|------------------------|--|
| 1. Ignition Switch          | 7. Meter Unit          | 14. Main Fuse 30 A                                   |
| 2. Meter Ground             | 8. Immobilizer Antenna | 15. Starter Relay                                    |
| 3. Frame Ground             | 9. Joint Connector A   | 16. Battery 12 V 8 Ah                                |
| 4. Joint Connector B        | 10. Junction Box       | 17. Immobilizer/Kawasaki Diagnostic System Connector |
| 5. Immobilizer Amplifier    | 11. Ignition Fuse 10 A | 18. ECU  |
| 6. FI Indicator Light (LED) | 12. ECU Main Relay     |  |
|                             | 13. ECU Fuse 15 A      |  |

**Switches and Sensors**

*Brake Light Timing Inspection*

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

*Brake Light Timing Adjustment*

- Refer to the Brake Light Switch Operation Inspection in the Periodic Maintenance chapter.

*Switch Inspection*

- Using a hand tester, check to see that only the connections shown in the table have continuity (about 0 ohms).
- For the handlebar switches 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.

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

**Rear Brake Light Switch Connections**

	BR	BL
When brake pedal is pushed down	○ — ○	
When brake pedal is released		

**Side Stand Switch Connections**

	G/W	BK/Y
When side stand is up	○ — ○	
When side stand is down		

**Neutral Switch Connections**

	SW. Terminal	TTT
When transmission is in neutral	○ — ○	
When transmission is not in neutral		

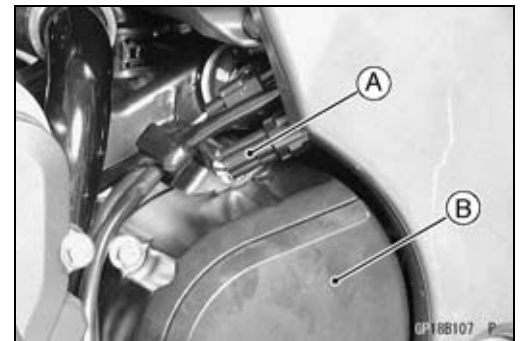
**Oil Pressure Switch Connections\***

	SW. Terminal	TTT
When engine is stopped	○ — ○	
When engine is running		

\*: Engine lubrication system is in good condition

*Speed Sensor Inspection*

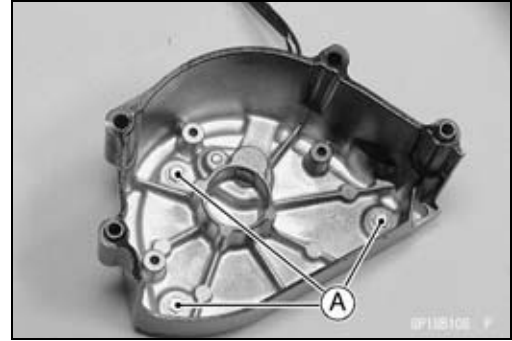
- Disconnect:  
Speed Sensor Connector [A]
- Remove:  
Engine Sprocket Cover [B] (see Final Drive chapter)



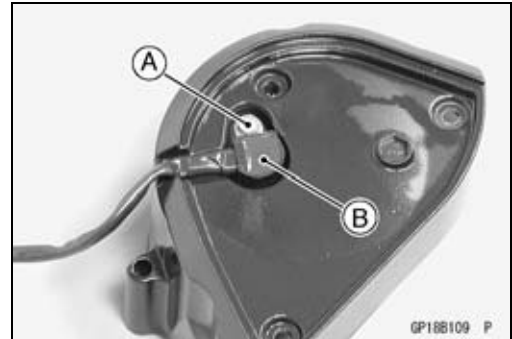
# 16-94 ELECTRICAL SYSTEM

## Switches and Sensors

- Remove:
  - Bolts [A]
  - Speed Sensor Cover

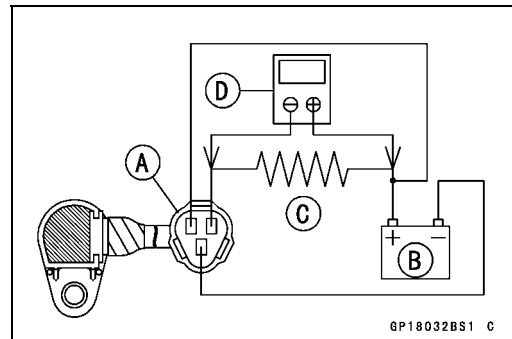


- Remove:
  - Bolt [A]
- Take out the speed sensor [B].

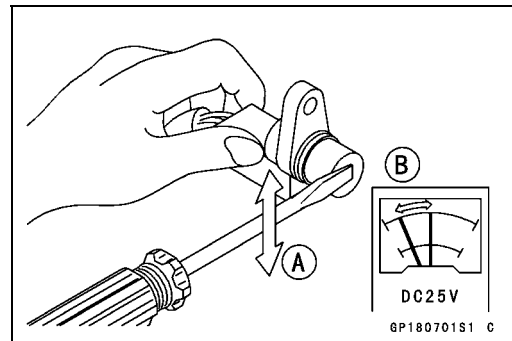


- Connect the speed sensor connector [A] with the battery [B], 10 kΩ resistor [C] and hand tester [D] as shown.
- Set the tester to the DC 25 V range.

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



- Trace [A] each side of the speed sensor surface with the screw driver.
- Then the tester indicator should flick [B].
- ★ If the tester indicator does not flick, replace the speed sensor.



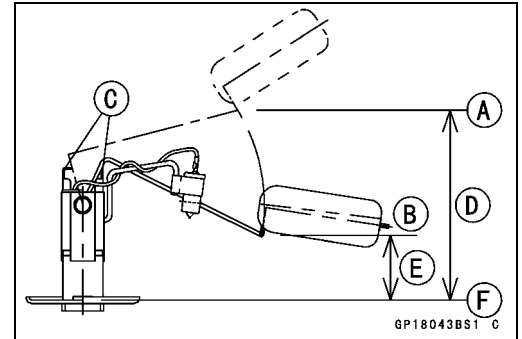
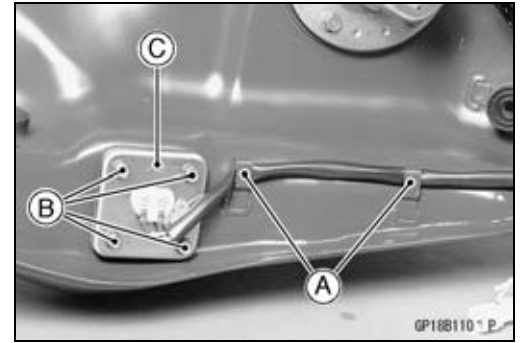
- Apply a non-permanent locking agent to the sensor bolt and sensor cover bolts.

**Torque - Speed Sensor Bolt: 6.9 N·m (0.70 kgf·m, 61 in·lb)**  
**Speed Sensor Cover Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)**

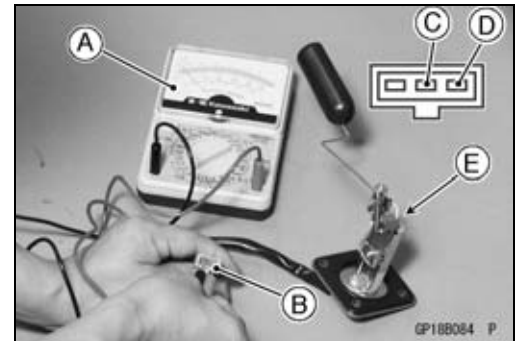
## Switches and Sensors

### Fuel Level Sensor Inspection

- Remove:
    - Fuel Tank (see Fuel System (DFI) chapter)
  - Open the clamps [A].
  - Remove:
    - Bolts [B]
    - Fuel Level Sensor [C]
- 
- Check that the float moves up and down smoothly without binding. It should go down under its own weight.
  - ★ If the float does not move smoothly, replace the sensor.
    - Float in Full Position [A]
    - Float in Empty Position [B]
    - Float Arm Stoppers [C]
    - 105.2 ~ 112.2 mm (4.142 ~ 4.417 in.) from the Sensor Base Line [D]
    - 33.6 ~ 40.6 mm (1.32 ~ 1.60 in.) from the Sensor Base Line [E]
    - Sensor Base Line [F]



- Using the hand tester [A], measure the resistance across the terminals in the fuel level sensor lead connector [B].
    - Black/Yellow [C]
    - White/Yellow [D]
- Special Tool - Hand Tester: 57001-1394**
- ★ If the tester readings are not as specified, or do not change smoothly according as the float moves up and down, replace the sensor.



### Fuel Level Sensor Resistance

**Standard: Full position: 4 ~ 10  $\Omega$**

**Empty position [E]: 90 ~ 100  $\Omega$**

- Apply a non-permanent locking agent to the threads of the level sensor mounting bolts and tighten it.
- Torque - Fuel Level Sensor Bolts: 6.9 N·m (0.70 kgf·m, 61 in·lb)**

### Fuel Reserve Switch Inspection

- Fill the fuel tank with fuel.
- Close the fuel tank cap surely.
- Remove:
  - Right Frame Cover (see Frame chapter)
- Disconnect the fuel level sensor connector [A].



# 16-96 ELECTRICAL SYSTEM

## Switches and Sensors

- Connect the test light [A] (12 V 3.4 W bulb a socket with leads) and the 12 V battery [B] to the fuel level sensor connector [C].

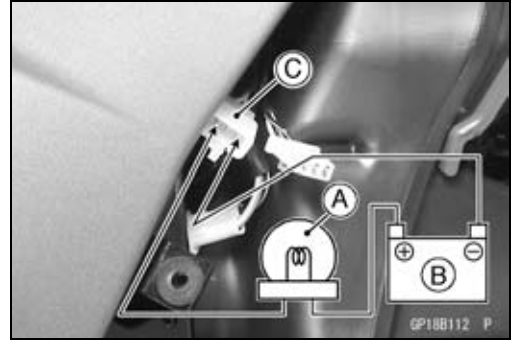
### Connections:

**Battery (+) → 12 V 3.4 W Bulb (one side)**

**12 V 3.4 W Bulb (other side) → Blue Lead Terminal**

**Battery (-) → BK/Y Lead Terminal**

- ★ If the test light turn on, the reverse switch is defective. Replace the fuel level sensor.



- Remove:
  - Fuel Level Sensor (see Fuel Level Sensor Inspection)
- Connect the test light (12 V 3.4 W bulb in a socket with leads) and the 12 V battery to the fuel pump connector as shown.

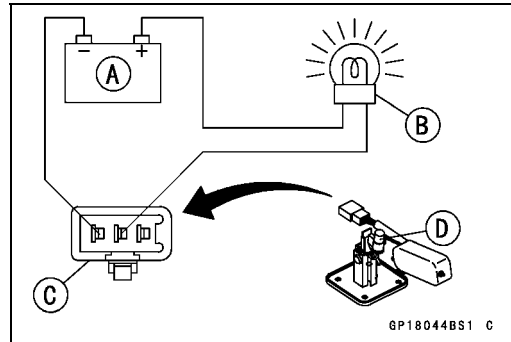
12 V Battery [A]

Test Light [B]

Fuel Pump Connector [C]

Fuel Reserve Switch [D]

- ★ If the test light doesn't light, replace the fuel level sensor.

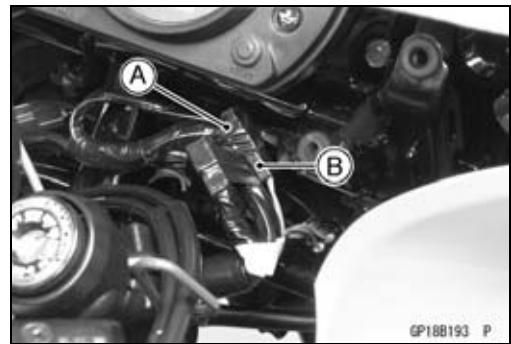


### NOTE

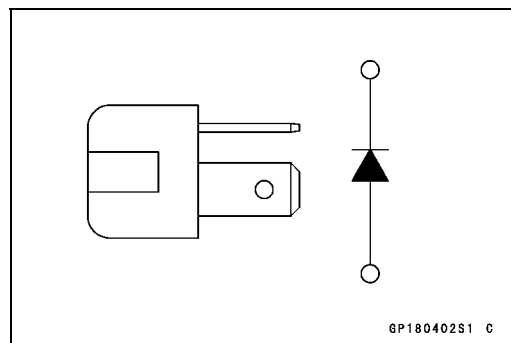
○ It may take a long time to turn on the test light in case that the fuel reserve switch is inspected just after the fuel level sensor is removed. Leave the fuel reserve switch with leads for inspection connected for ten (10) minute.

### Diode (Rectifier) Inspection

- Remove the meter cover (see Meter Removal)
- Cut the vinyl tape [A].
- Disconnect the diode [B].



- Set the hand tester to the  $\times 100 \Omega$  range.
  - Special Tool - Hand Tester: 57001-1394**
- Check the continuity between the diode terminals in both directions.
- ★ If there is continuity in one direction (forward direction) but no continuity (infinity) in the reverse direction, the diode is normal.
- ★ The diode is defective if there is continuity after changing the direction, or it if remains with no continuity.

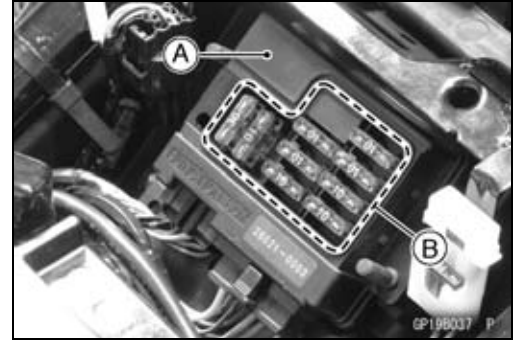


### NOTE

○ The actual resistance measurement in the forward direction varies with the tester used and the individual diodes. Generally speaking, it is acceptable if the tester's indicator swings approximately halfway.

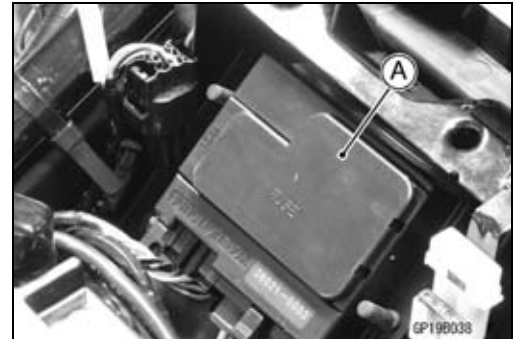
## Junction Box

The junction box [A] has fuses [B], relays, and diodes. The relays and diodes can not be removed.

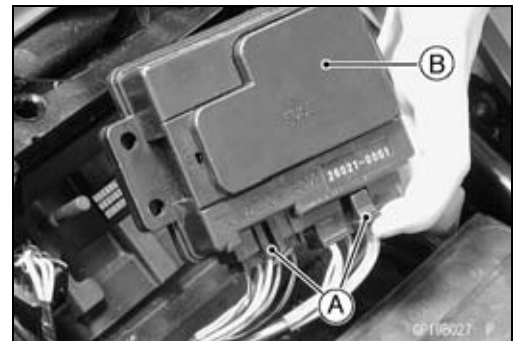


### Junction Box Fuse Circuit Inspection

- Remove the seats (see Frame chapter).
- Remove the junction box [A].



- Pull off the connectors [A] from the junction box [B].
- Make sure all connector terminals are clean and tight, and none of them have been bent.
- ★ Clean the dirty terminals, and straighten slightly-bent terminals.
- Check conductivity of the numbered terminals with the hand tester.
- Refer to the Junction Box Internal Circuit.
- ★ If the tester does not read as specified, replace the junction box.



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

### Fuse Circuit Inspection

Tester Connection	Tester Reading ( $\Omega$ )	Tester Connection	Tester Reading ( $\Omega$ )
1-1A	0	1A-8	$\infty$
1-2	0	2-8	$\infty$
3A-4	0	3A-8	$\infty$
6-5	0	6-2	$\infty$
6-10	0	6-3A	$\infty$
6-7	0	17-3A	$\infty$
6-17	0		

# 16-98 ELECTRICAL SYSTEM

## Junction Box

### Starter Circuit/Headlight Relay Inspection

- Remove the junction box (see Junction Box Fuse Circuit Inspection).
- Check conductivity of the following numbered terminals by connecting the hand tester and one 12 V battery to the junction box as shown.
- Refer to the Junction Box Internal Circuit.
- ★ If the tester does not read as specified, replace the junction box.

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

### Relay Circuit Inspection (with the battery disconnected)

	Tester Connection	Tester Reading ( $\Omega$ )
Headlight Relay	7-8	$\infty$
	7-13	$\infty$
	(+) (-) 13-9	Not $\infty$ *
Starter Circuit Relay	9-11	$\infty$
	12-13	$\infty$
	(+) (-) 13-11	$\infty$
	(+) (-) 12-11	Not $\infty$ *

- (\*): The actual reading varies with the hand tester used.  
(+): Apply tester positive lead.  
(-): Apply tester negative lead.

### Relay Circuit Inspection (with the battery connected)

	Battery Connection (+) (-)	Tester Connection	Tester Reading ( $\Omega$ )
Headlight Relay	9-13	7-8	0
Starter Circuit Relay	11-12	(+) (-) 13-11	Not $\infty$ *

- (\*): The actual reading varies with the hand tester used.  
(+): Apply tester positive lead.  
(-): Apply tester negative lead.



## Junction Box

### Diode Circuit Inspection

- Remove the junction box.
- Check conductivity of the following pairs of terminals.

### Diode Circuit Inspection

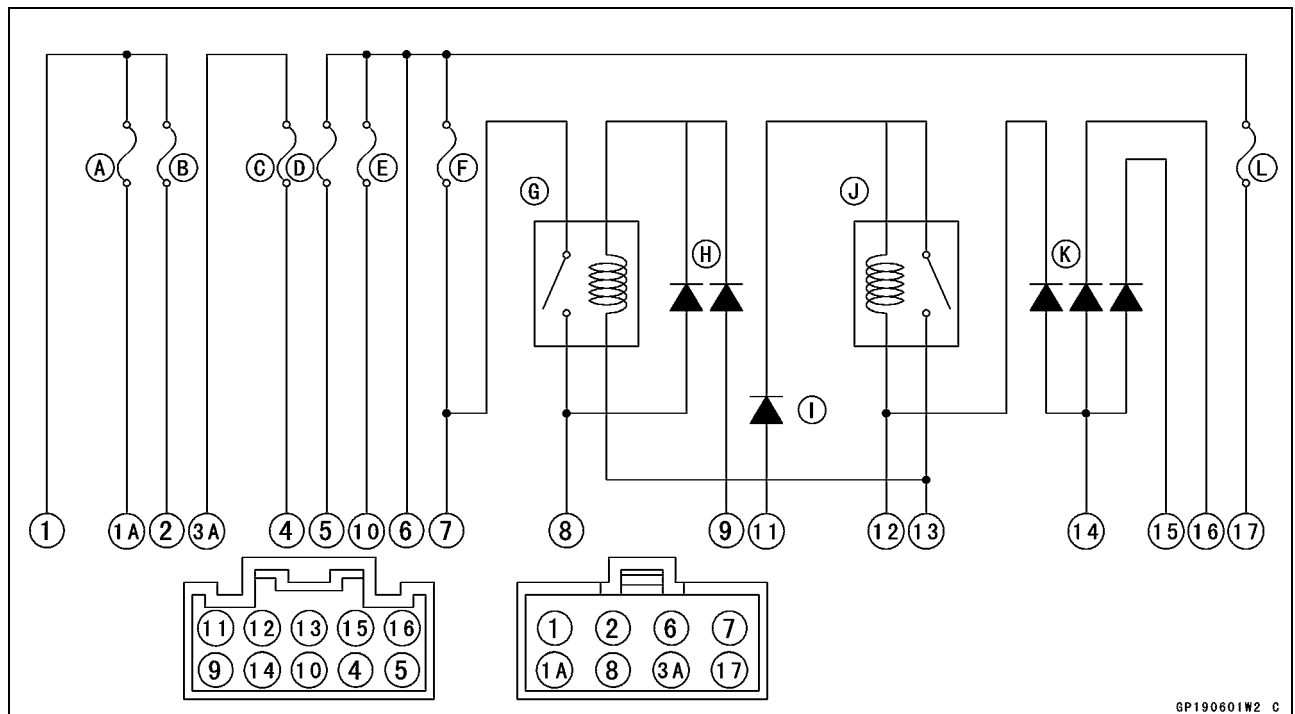
Tester Connection	13-8, 13-9, 12-11, 12-14, 15-14, 16-14
-------------------	--

- ★ The resistance should be low in one direction and more than ten times as much in the other direction. If any diode shows low or high in both directions, the diode is defective and the junction box must be replaced.

### NOTE

- The actual meter reading varies with the meter used and the individual diodes, but, generally speaking, the lower reading should be from zero to one half the scale.

### Junction Box Internal Circuit



GP190601W2 C

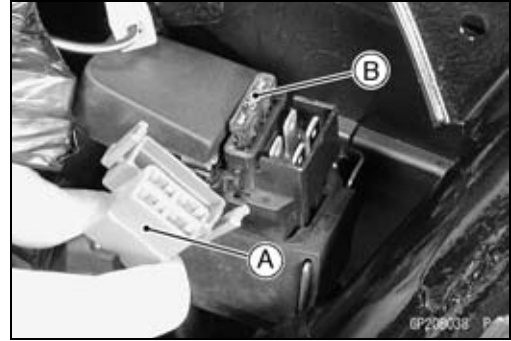
- A. Accessory Fuse 10 A
- B. Fan Fuse 10 A
- C. Turn Signal Relay Fuse 10 A
- D. Horn Fuse 10 A
- E. Ignition Fuse 10 A
- F. Headlight Fuse 10 A
- G. Headlight Relay
- H. Headlight Diodes
- I. Starter Diode
- J. Starter Circuit Relay
- K. Interlock Diodes
- L. Taillight Fuse 10 A

# 16-100 ELECTRICAL SYSTEM

## Fuse

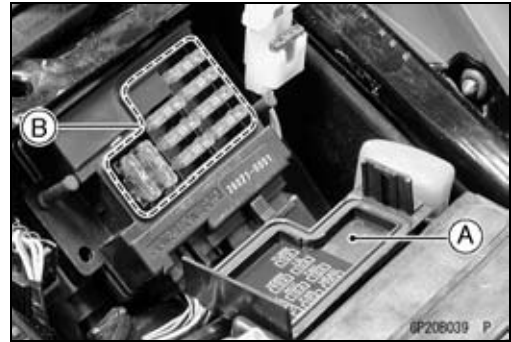
### 30 A Main Fuse Removal

- Remove:
  - Right Side Cover (see Frame chapter)
  - 30 A Main Fuse Connector [A]
- Pull out the main fuse [B] from the starter relay with needle nose pliers.



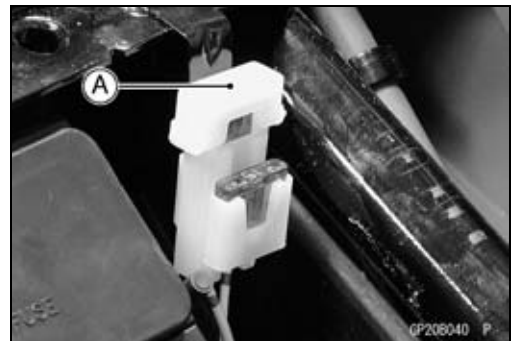
### Junction Box Fuse Removal

- Remove the seat (see Frame chapter).
- Unlock the hook to lift up the lid [A].
- Pull the fuses [B] straight out of the junction box with needle nose pliers.



### 15 A ECU Fuse Removal

- Remove:
  - Seat (see Frame chapter)
- Unlock the hook to pull the lid [A].
- Pull out the ECU Fuse from the fuse box.



### 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 junction box fuses on the original position as specified on the lid.

## Fuse

### Fuse Inspection

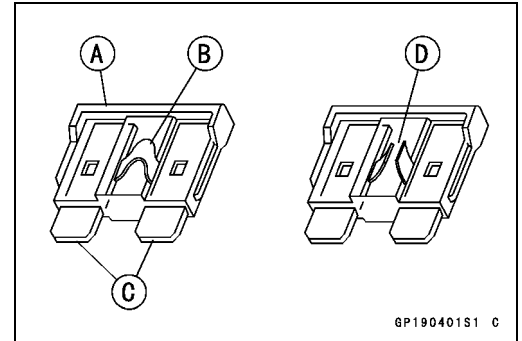
- Remove the fuse (see Fuse Removal).
- Inspect the fuse element.
- ★ If it is blown out, replace the fuse. Before replacing a blown fuse, always check the amperage in the affected circuit. If the amperage is equal to or greater than the fuse rating, check the wiring and related components for a short circuit.

Housing [A]

Fuse Element [B]

Terminals [C]

Blown Element [D]



### NOTE

- A mass current flows to the battery according to the state of the battery which needs refreshing charge when the engine is turned causing main fuse blown out.

### CAUTION

**When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.**



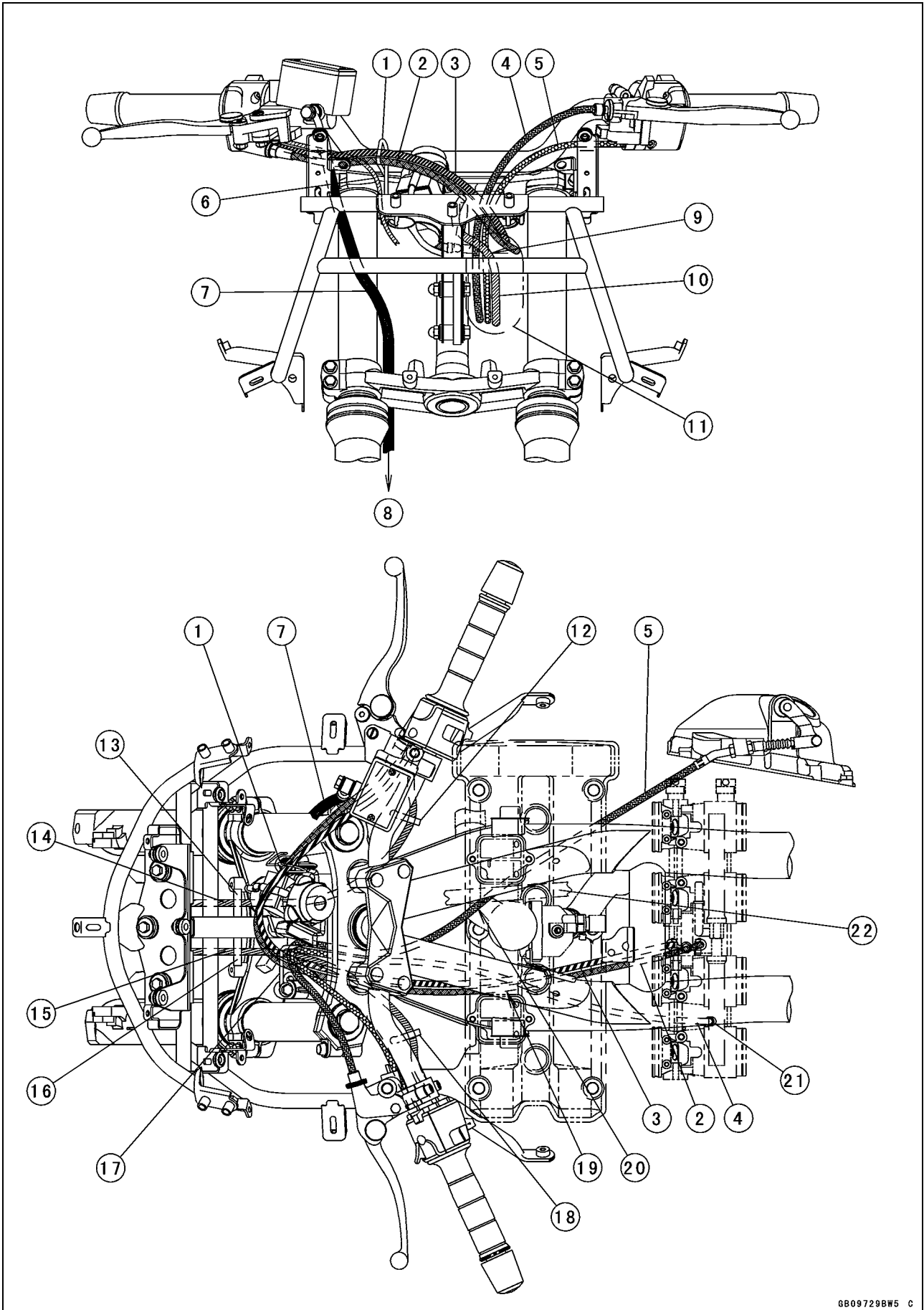
# Appendix

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Troubleshooting Guide ..... 17-26

# 17-2 APPENDIX

## Cable, Wire, and Hose Routing



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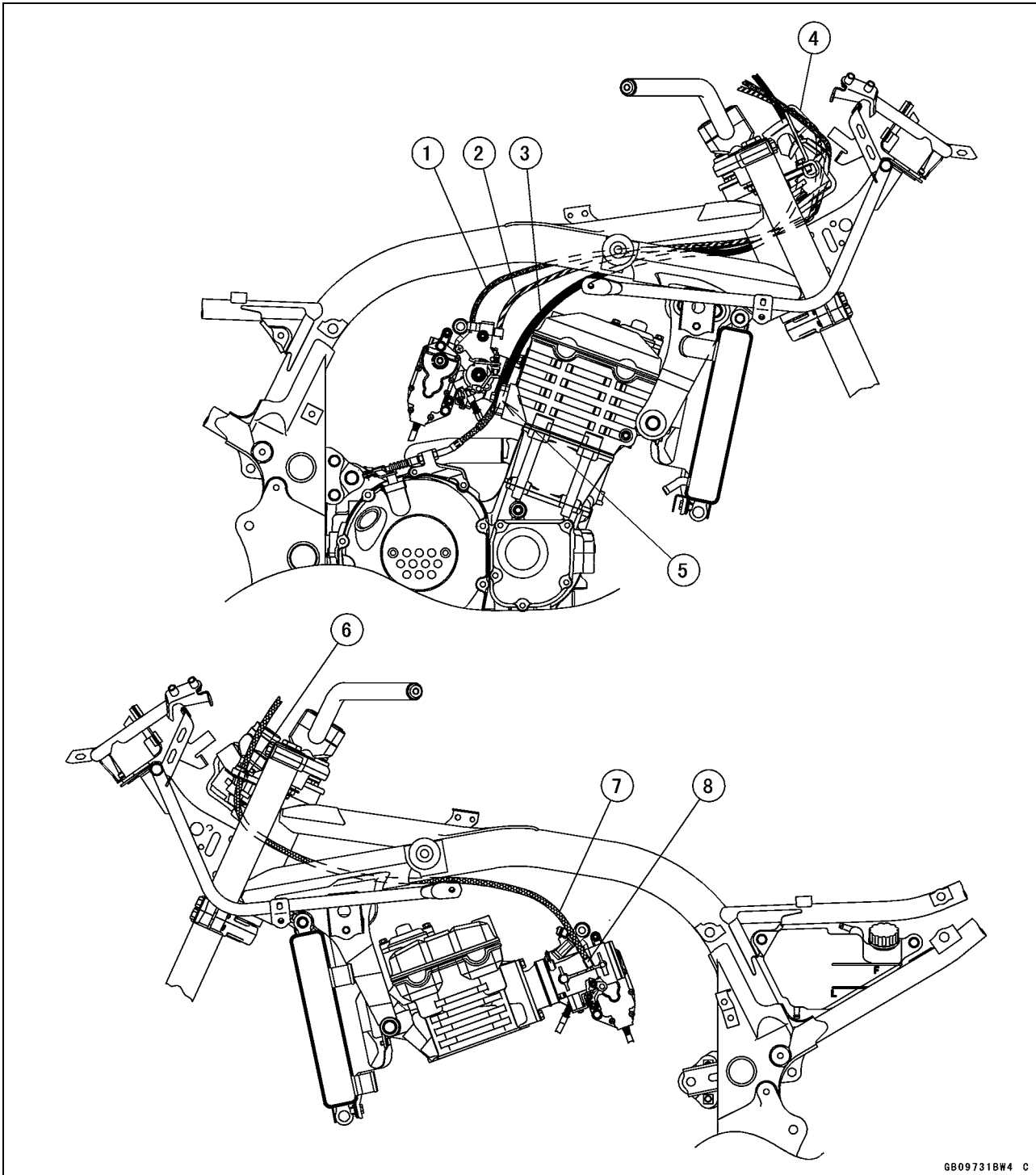
**Cable, Wire, and Hose Routing**

---

1. Clamp (Through the Throttle Cables)
2. Throttle Cable (Accelerator)
3. Throttle Cable (Decelerator)
4. Choke Cable
5. Clutch Cable
6. Right Switch Housing Lead
7. Brake Hose
8. To Right Front Caliper
9. Run the ignition switch lead in front of clutch and starter cable.
10. Ignition Switch Lead
11. Run the leads for the clutch, starter and the ignition switch in order from the head pipe and in front of these, run the both throttle cables with accelerating one placed outside.
12. Clamp (Through the right switch housing lead.)
13. Clamp
14. Right Switch Housing Lead
15. Left Switch Housing Lead
16. Clamp
17. Run the Clutch Cable and the Starter Cable through of the Clamp.
18. Clamp (Through the left switch housing lead.)
19. Run the starter cable through under the throttle cables.
20. Run the clutch cable between the water hose and the main harness.
21. Throttle Cable Holder
22. Main Harness

## 17-4 APPENDIX

### Cable, Wire, and Hose Routing

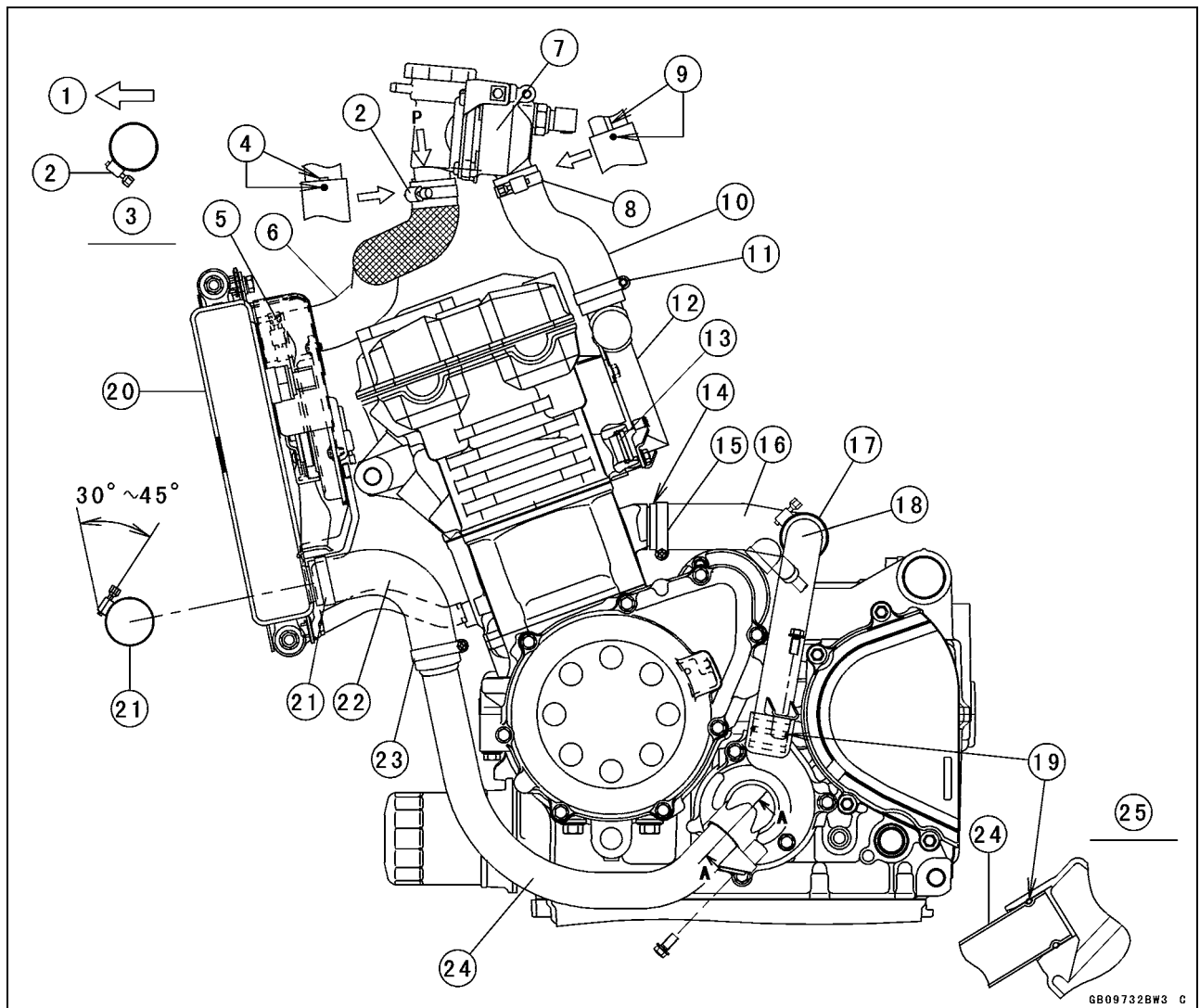


GB09731B#4 C

1. Throttle Cable (Accelerator)
2. Throttle Cable (Decelerator)
3. Clutch Cable
4. Clamp (Through the throttle cables.)
5. Run the clutch cable inside the chain tensioner.
6. Clamp (Through the chock and clutch cables.)
7. Chock Cable
8. Insert the chock cable in the hole of the throttle body.



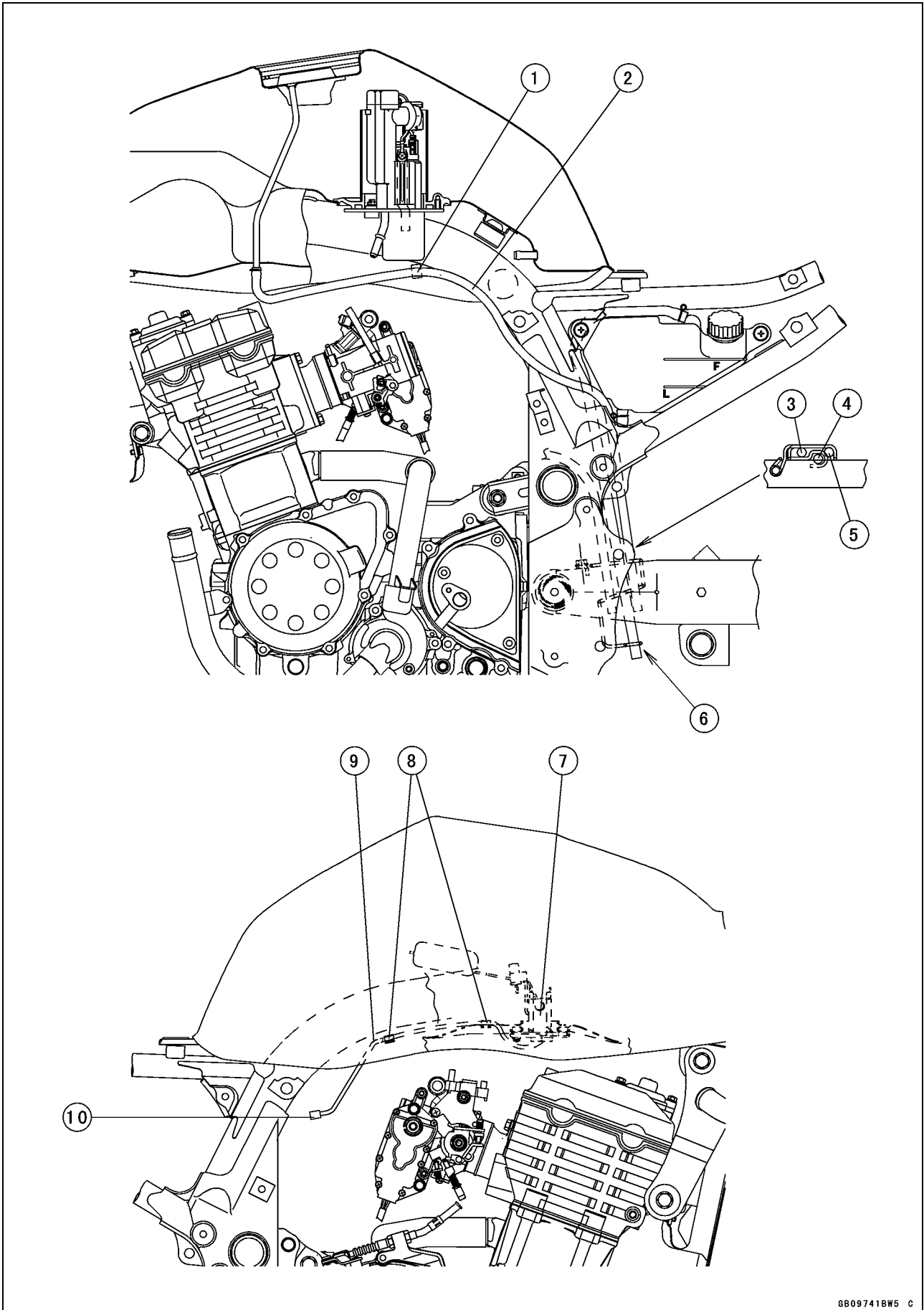
## Cable, Wire, and Hose Routing



1. Front
2. Clamp (Bolt head direction as shown.)
3. Viewed A
4. Align the paint mark with the projection.
5. Clamp (Bolt head direction upward.)
6. Radiator Hose
7. Thermostat Housing
8. Clamp (Bolt head direction forward.)
9. Align the pain mark with the rib.
10. Coolant Hose
11. Clamp (Bolt head direction right side)
12. Coolant Pipe
13. O-ring
14. Paint mark side upper.
15. Clamp
16. Coolant Hose
17. Clamp
18. Coolant Pipe
19. O-rings
20. Radiator
21. Clamp
22. Radiator Hose
23. Clamp
24. Coolant Pipe
25. Viewed Section A-A

# 17-6 APPENDIX

## Cable, Wire, and Hose Routing



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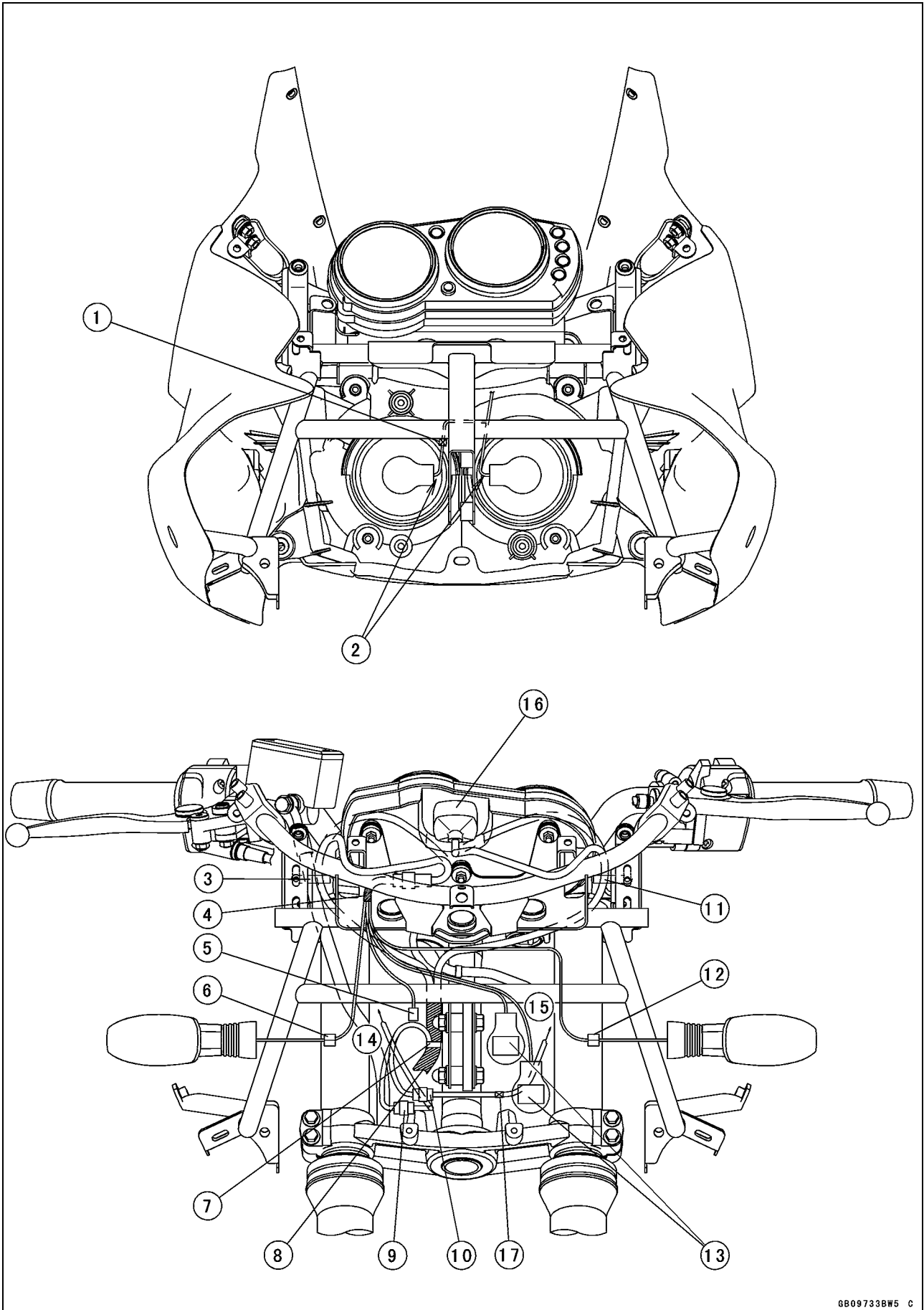
**Cable, Wire, and Hose Routing**

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1. Fixes by the left side clamp of the tank.
2. Run the tank drain hose under the bracket for the side cover.
3. Air Cleaner Drain Hose
4. Cooling Reserve Tank Hose (Run the hose inside the under ring.)
5. Fuel Tank Drain Hose
6. Fixes by the swingarm clamp.
7. Fuel Level Sensor
8. Fixes by the right side clamps two places of the tank.
9. Run the lead outside the frame.
10. Fuel Level Sensor Lead

# 17-8 APPENDIX

## Cable, Wire, and Hose Routing



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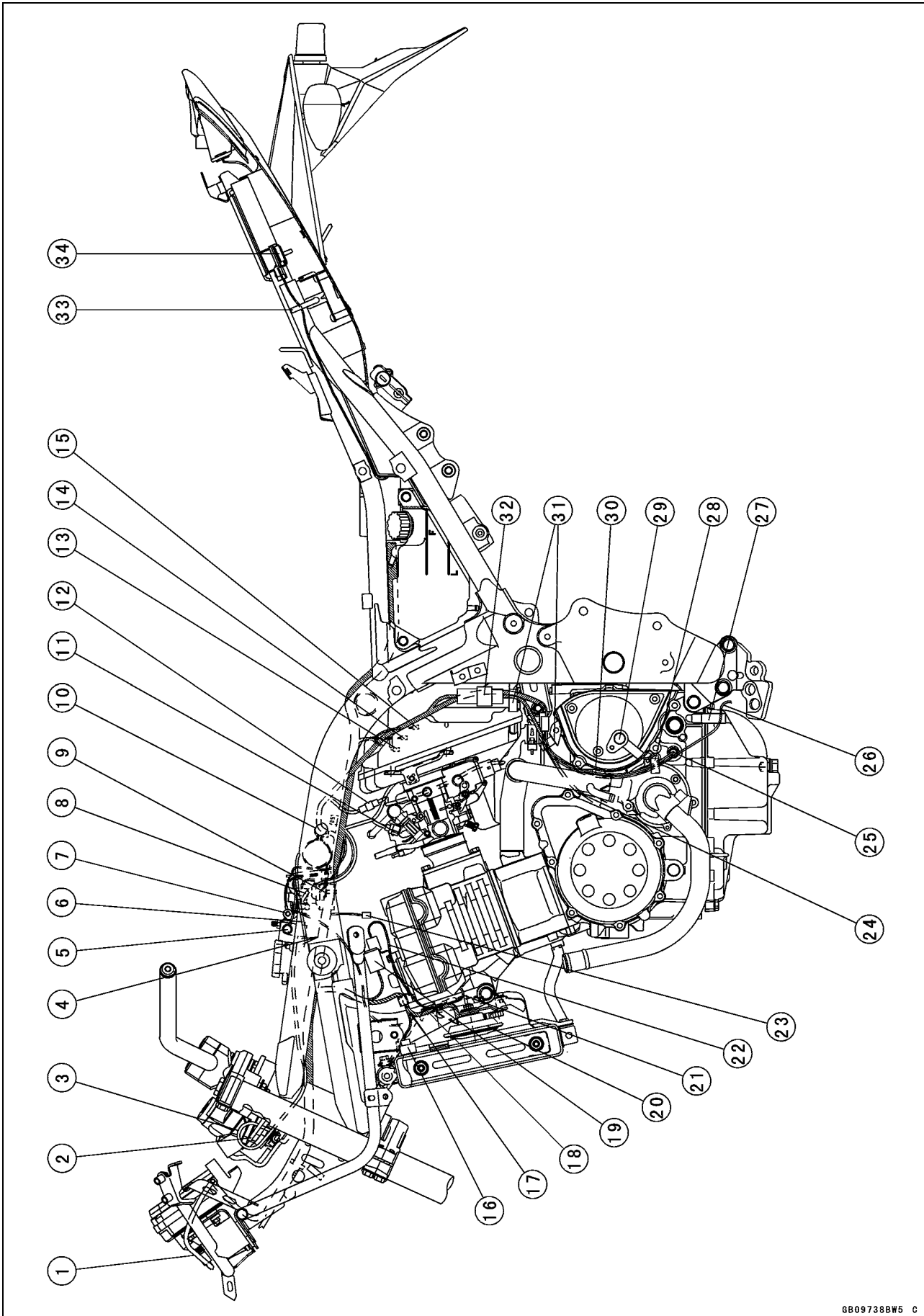
**Cable, Wire, and Hose Routing**

---

1. Discrimination Tape (Connect green tape side to left head lamp.)  
Green (United Kingdom)  
White (other)
2. Install the connector with its lead side facing inward.
3. Clamp
4. Headlight Harness
5. City Light Connector
6. Right Turn Signal Light Connector
7. White Tape
8. Main Harness
9. Right Switch Housing Connector
10. Left Switch Housing Connector
11. Clamp
12. Left Turn Signal Light Connector
13. Headlight Connector (High and Low)
14. To Right Switch Housing
15. To Left Switch Housing
16. Meter Connector
17. Discrimination Tape  
Green (U.S.A, Canada) Red (Malaysia) Blue (other)

# 17-10 APPENDIX

## Cable, Wire, and Hose Routing



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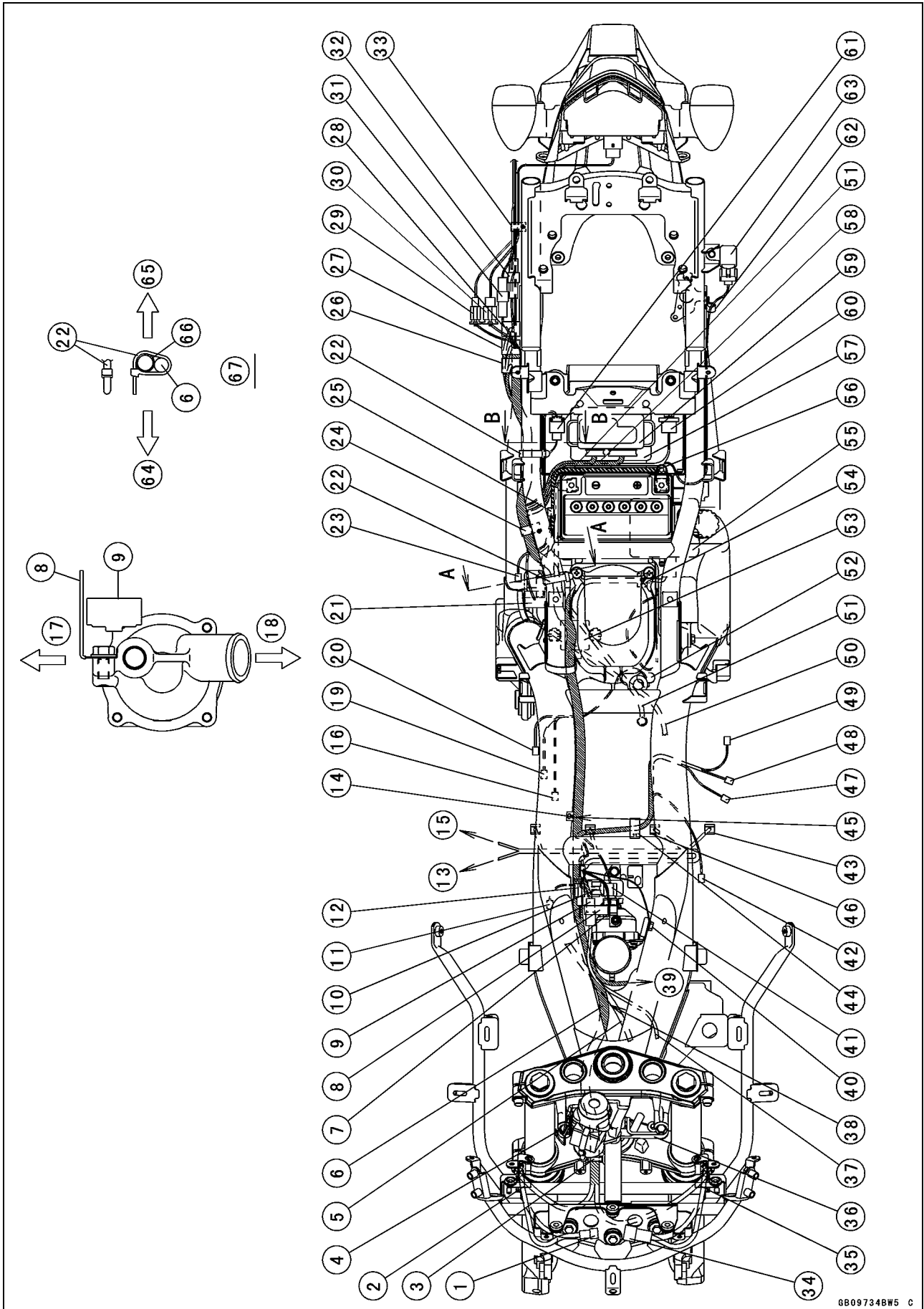
**Cable, Wire, and Hose Routing**

---

1. Meter Lead
2. Band (Hold the ignition switch lead to the upper bracket.)
3. Ignition Switch Lead
4. Run the main harness under and right side of the thermostat.
5. Frame Ground (with Thermostat Bracket)
6. Ignition Switch Connector
7. Meter Ground
8. Water Temperature Sensor
9. Inlet Air Pressure Sensor
10. Clamp
11. Fuel Injector Connector #1
12. Subthrottle Valve Actuator
13. Crankshaft Sensor and Oil Pressure Switch Connector
14. Fuel Level Sensor and Fuel Reserve Switch Connector
15. Fuel Pump Connector
16. Radiator Fan Switch
17. Clamp (Hold the fan switch lead.)
18. Run the camshaft position sensor lead between the engine bracket and heat insulation plate.
19. Camshaft Position Sensor Lead Connector
20. Horn
21. Run the camshaft position sensor lead inside the horn lead.
22. Run the camshaft position sensor lead inside the connector bracket.
23. Ignition Harness Connector
24. Alternator Lead
25. Neutral Switch
26. Side Stand Switch Lead
27. Clamp
28. Clamp (Hold the side stand, neutral switch and speed sensor leads.)
29. Speed Sensor
30. Run the sidestand, neutral switch and speedsensor leads inside the coolant pipe.
31. Clamps
32. Alternator Lead Connector
33. Clamp
34. Atmospheric Pressure Sensor

# 17-12 APPENDIX

## Cable, Wire, and Hose Routing





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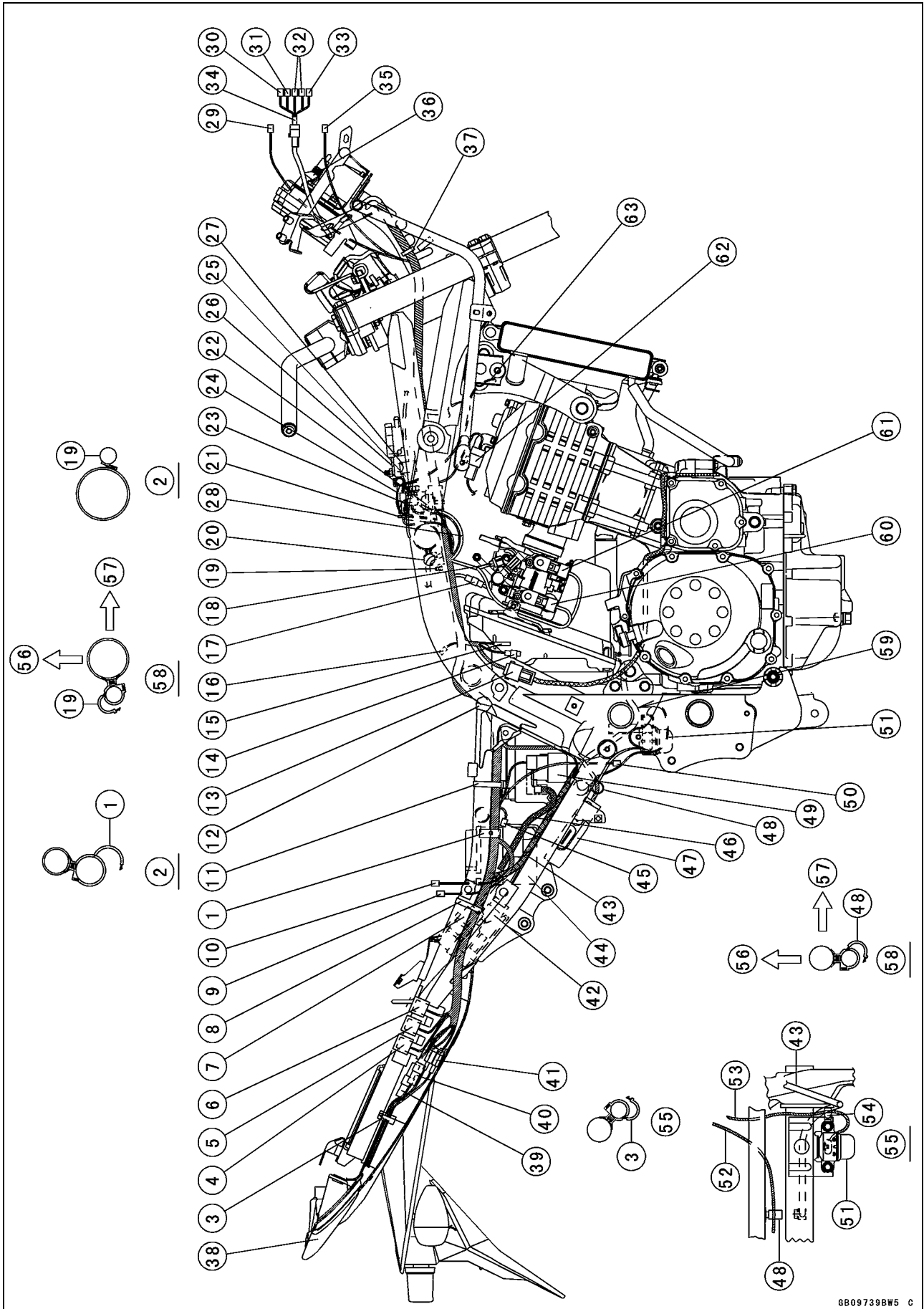
**Cable, Wire, and Hose Routing**


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1. Headlight Harness Connector
2. Clamp (Through the headlight harness of the main harness.)
3. Clamp (Through the main harness.)
4. Clamp
5. Clutch Cable
6. Main Harness
7. Meter Ground
8. Clamp (Hold the ignition switch connector.)
9. Ignition Switch Lead Connector
10. Inlet Air Pressure Sensor
11. To Ignition Harness Connector
12. Fan Motor Connector (Connect the connector on the inlet air pressure sensor.)
13. To the main throttle sensor.
14. Clamp
15. To the subthrottle sensor.
16. To Fuel Pump Lead Connector
17. Upper
18. Lower
19. To Fuel Level Gauge and Fuel Reserve Switch Connector
20. To Crankshaft Sensor and Oil Pressure Switch Connector
21. Starter Relay
22. Band
23. Rear Brake Switch Lead Connector
24. Clamp (Through the main harness.)
25. Battery Negative Lead Connector
26. Turn Signal Relay
27. Fuel Pump Relay
28. ECU Main Relay
29. License Plate Light Lead Connector
30. Tail Light Lead Connector
31. Rear Right turn Signal Light Lead Connector (Gray)
32. Rear Left Turn Signal Light Lead Connector (Black)
33. Clamp (All Leads of this part)
34. Meter Connector
35. Clamp (Through the meter lead.)
36. Clamp
37. Ignition Switch Lead
38. Run the main harness over the clutch cable.
39. To Camshaft Position Sensor, Fan Switch, Horn
40. Frame Ground
41. Water Temperature Sensor Connector
42. Alternator Lead Connector
43. Fuel Injector #4
44. Clamp
45. Positioning Point of Main Harness
46. Subthrottle Valve Actuator Connector
47. Speed Sensor Lead Connector
48. Neutral Switch Lead Connector
49. Side Stand Switch Lead Connector
50. Starter Motor Cable
51. Battery Negative Cable
52. Inlet Air Temperature Sensor
53. Vehicle-down Sensor
54. Clamp
55. Regulator/Rectifier
56. Battery Positive Cable
57. ECU
58. Run the lead of ECU under the upper surface of battery case.
59. Junction Box
60. ECU Fuse
61. Immobilizer/Kawasaki Self-diagnostic System Connector
62. Clamp
63. Atmospheric Pressure Sensor
64. Inside of Frame
65. Outside of Frame
66. Frame Pipe
67. Viewed Section A-A and B-B

# 17-14 APPENDIX

## Cable, Wire, and Hose Routing



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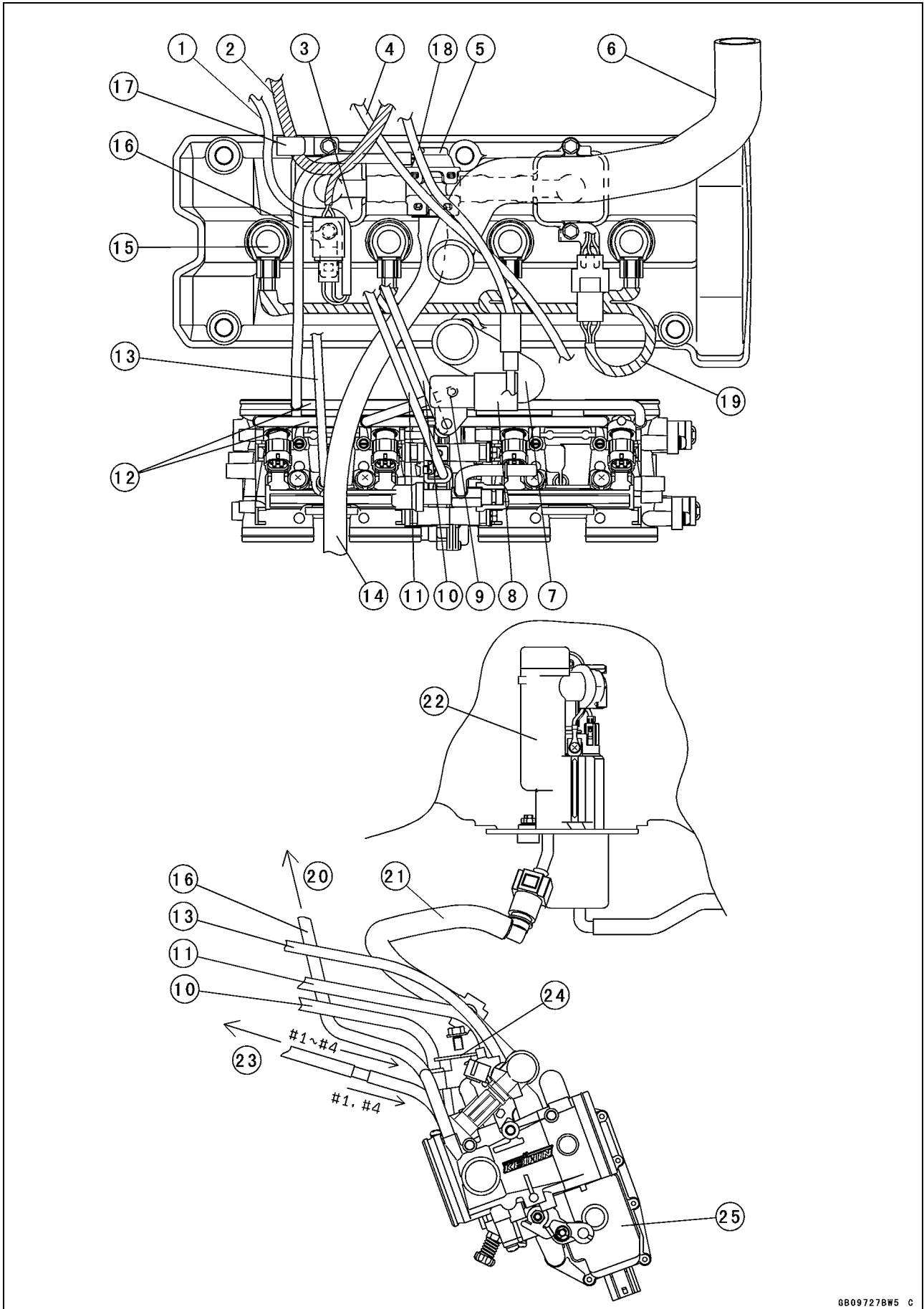
**Cable, Wire, and Hose Routing**

---

1. Clamp
2. Viewed Front of Frame
3. Clamp (All Leads of this part)
4. ECU Main Relay
5. Fuel Pump Relay
6. Turn Signal Light Relay
7. Junction Box
8. Band (Clamp the band near the bracket.)
9. ECU Fuse
10. Immobilizer/Kawasaki Self-diagnostic System Connector
11. Band
12. Band (Insert the band into the hole between the pipe and gusset.)
13. Crankshaft Sensor and Oil Pressure Switch Lead Connector
14. Fuel Pump Lead Connector
15. Fuel Level Gauge and Fuel Reserve Switch Lead Connector
16. To Inlet Air Temperature Sensor Connector (Run the lead under the cross pipe.)
17. Subthrottle Valve Actuator Connector
17. Frame Ground (with Thermostat)
18. Fuel Injector Connector #4
19. Clamp
20. Clamp
21. Fan Motor Connector
22. Inlet Air Pressure Sensor
23. Water Temperature Sensor
24. Meter Ground (Run the ground lead backward.)
25. Ignition Switch Lead Connector
26. Frame Ground
28. Ignition Switch Lead of Main Harness
29. Left Switch Housing Lead Connector
30. Front Left Turn Signal Light Connector
31. City Light Lead Connector
32. Headlight Lead Connectors
33. Front Right Turn Signal Light Lead Connector
34. Headlight Harness
35. Right Switch Housing Lead Connector
36. Meter Connector
37. Clamp
38. Tail/Brake Light
39. Rear Left Turn Signal Light Connector (Black)
40. Rear Right Turn Signal Light Connector (Gray)
41. License Plate Light Connector
42. ECU
43. Battery Negative Cable
44. Battery
45. Battery Negative Lead Connector
46. Battery Positive Cable
47. Regulator/Rectifier
48. Clamp
49. Starter Relay
50. Rear Brake Switch Lead Connector
51. Vehicle-down Sensor
52. Regulator/Rectifier Lead
53. Vehicle-down Sensor Lead
54. Clamp
55. Viewed Back of Frame
56. Upper
57. Front
58. Viewed from Right of Frame
59. Battery Negative Cable (Run the cable under the cross pipe.)
60. Subthrottle Sensor Connector
61. Main Throttle Sensor Connector
62. Ignition Harness Connector
63. To Fun Motor

# 17-16 APPENDIX

## Cable, Wire, and Hose Routing



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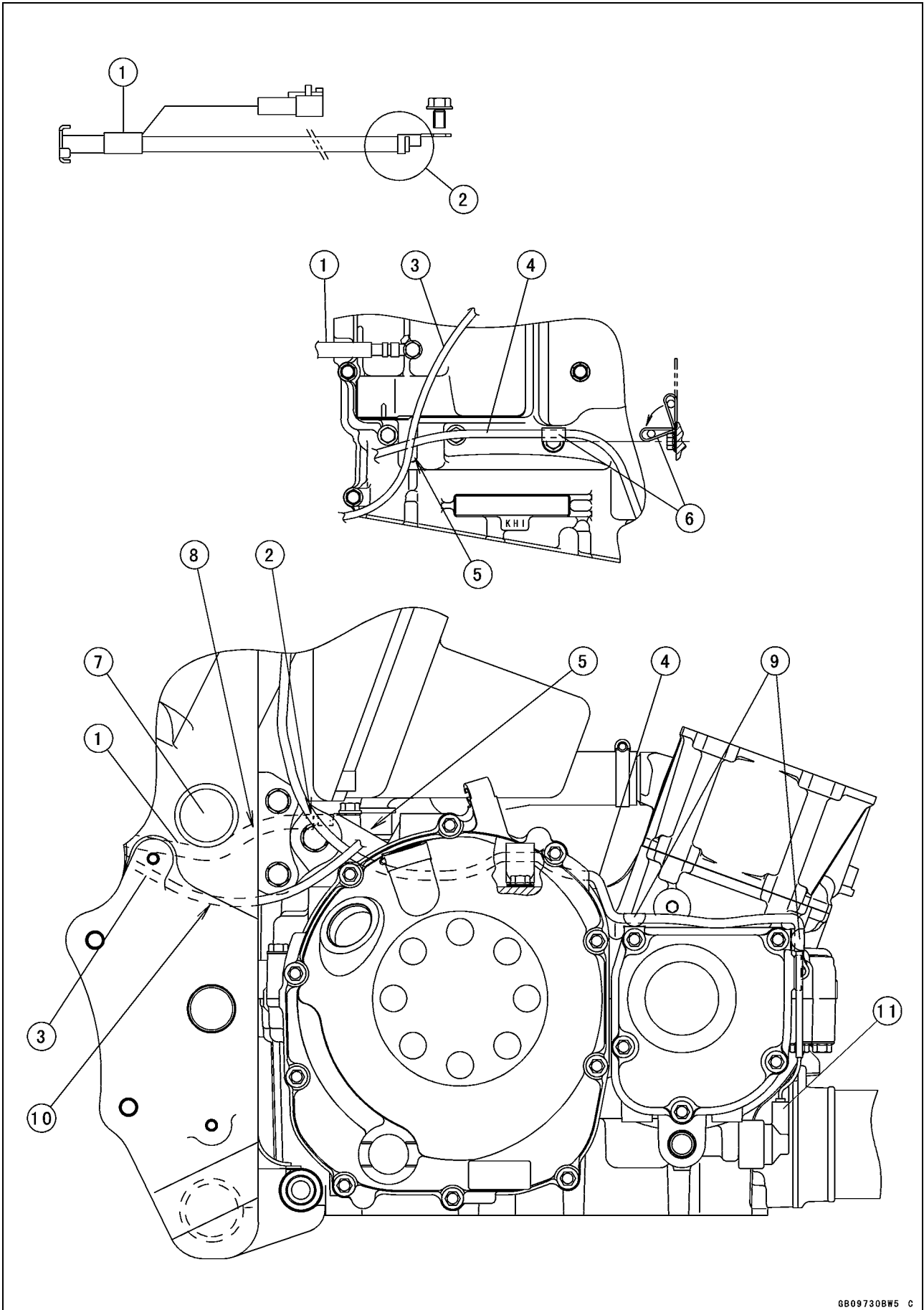
**Cable, Wire, and Hose Routing**

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1. Camshaft Position Sensor Lead (Run the lead between the convex area of cap center and bolt head to secure the coupler.)
2. Fan Switch and Horn Lead
3. Air Suction Valve Cap
4. Clutch Cable (Run the cable through forward the water hose.)
5. Vacuum Switch Valve
6. Radiator Hose (Thermostat Housing-Radiator)
7. Coolant Hose (Head-Thermostat Housing )
8. Inlet Air Pressure Sensor
9. Vacuum Hose (Run the vacuum hose under the throttle cables to connect with the inlet air pressure sensor.)
10. Throttle Cable (Decelerator)
11. Throttle Cable (Accelerator)
12. Vacuum Balance Tube
13. Choke Cable (Run the cable through left side of vacuum switch valve hose.)
14. Hose (Vacuum Switch Valve-Air Cleaner)
15. Stick Coil
16. Vacuum Switch Valve Tube
17. Clamp
18. Radiator Fan Lead (Run the lead through forward the coolant hose and over the air pressure sensor connector.)
19. Ignition Harness
20. To inlet air pressure sensor.
21. Fuel Hose
22. Fuel Pump
23. To vacuum switch valve.
24. Throttle Cable Holder
25. Subthrottle Valve actuator

# 17-18 APPENDIX

## Cable, Wire, and Hose Routing



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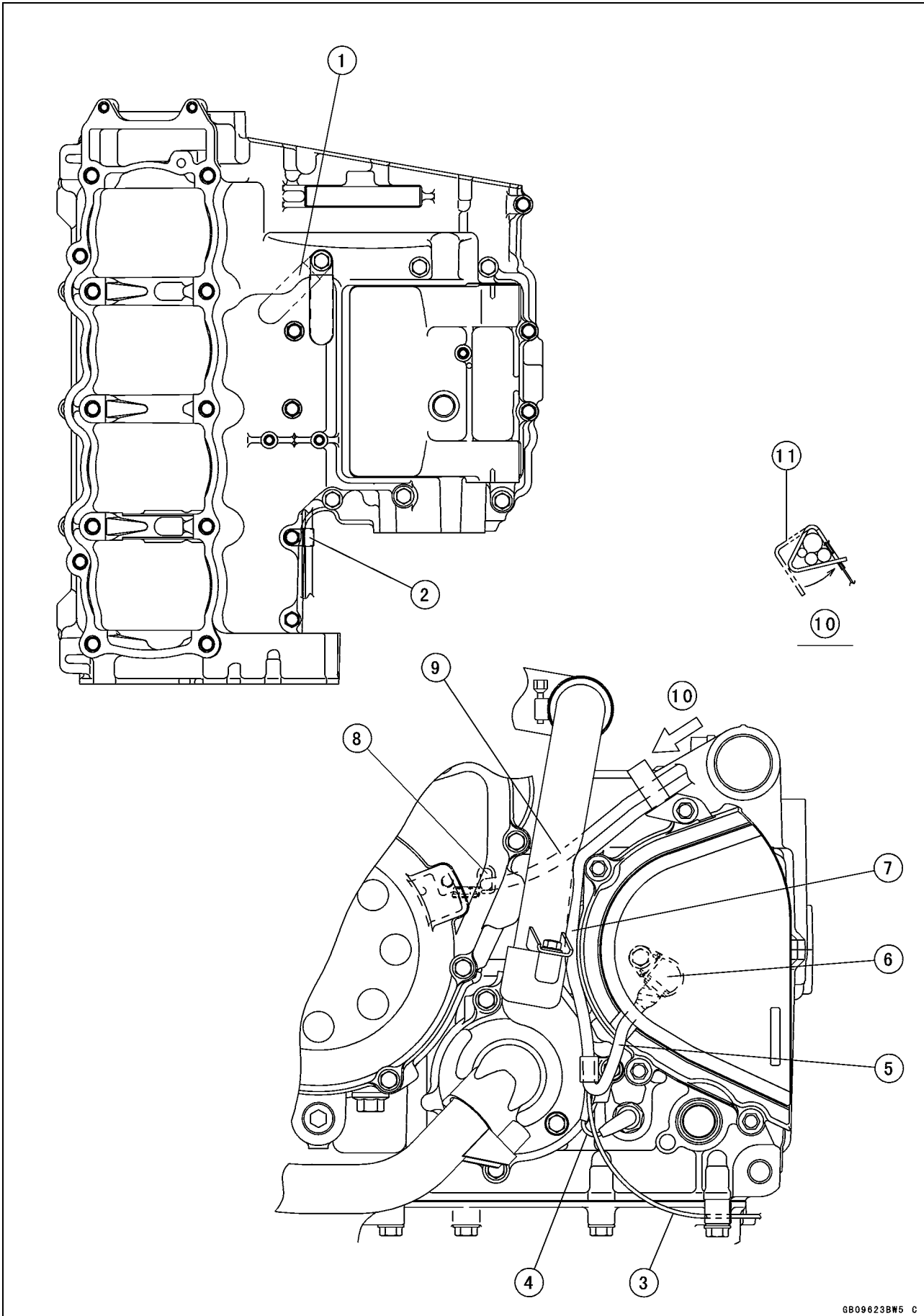
**Cable, Wire, and Hose Routing**

---

1. Battery Negative Cable
2. Install the exterior of the cable with staking area facing downward.
3. Starter Motor Cable
4. Crankshaft Sensor and Oil Pressure Switch Lead (Run the lead inner side the starter lead.)
5. Run the starter motor cable on the crankshaft sensor and oil pressure switch lead.
6. Clamp (Clamp the lead, then bend the bracket as shown to secure the lead.)
7. Cross Pipe
8. Run the cable under the cross pipe.
9. Clamps (Bend the claw.)
10. Run the lead outside of engine bracket and under the cross pipe.
11. Install the oil pressure switch lead terminal upward.

# 17-20 APPENDIX

## Cable, Wire, and Hose Routing





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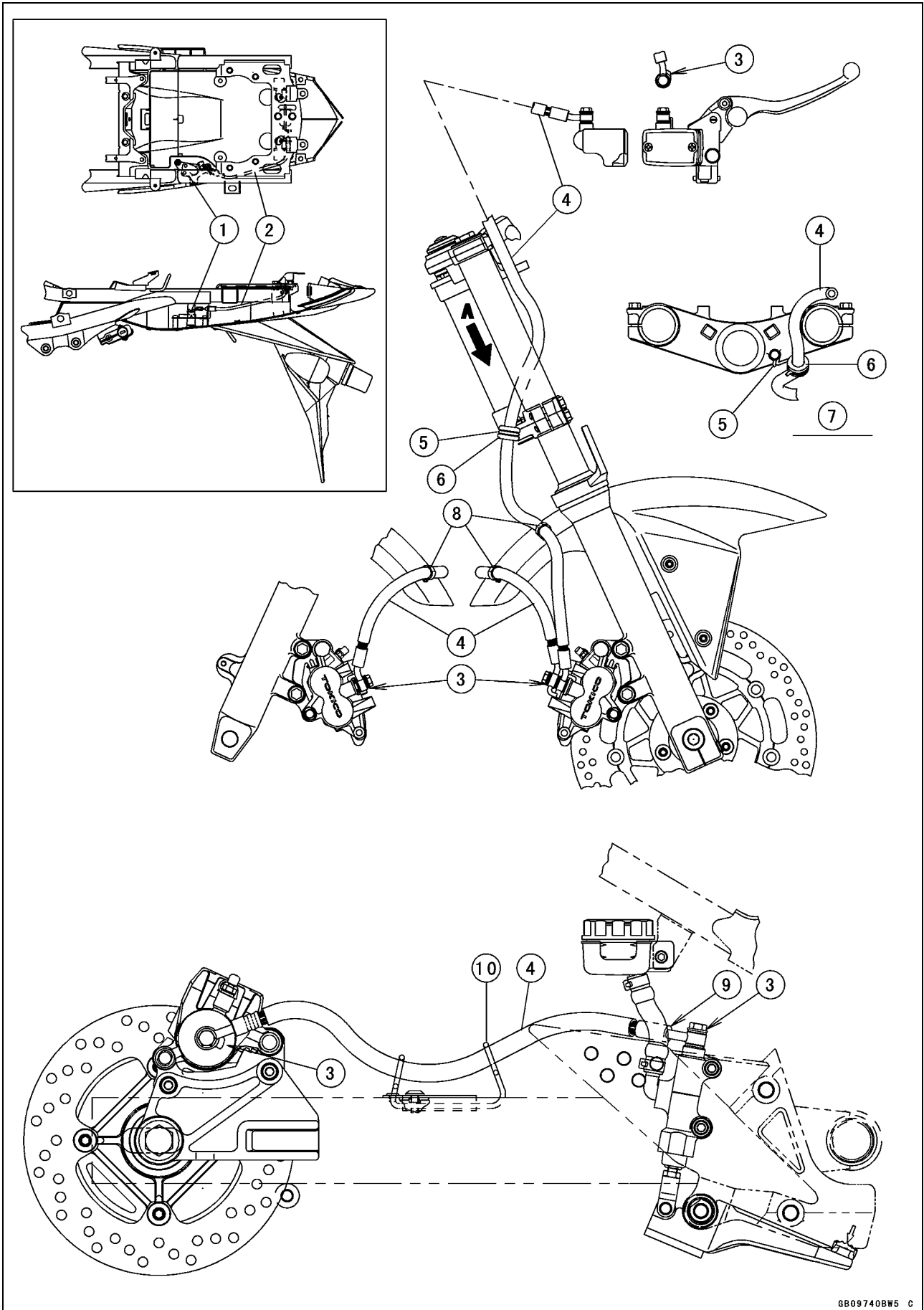
**Cable, Wire, and Hose Routing**

---

1. Clamp
2. Clamp the alternator lead.
3. Side Stand Switch Lead
4. Neutral Switch Lead
5. Speed Sensor Lead
6. Speed Sensor
7. Push the speed sensor lead to the inside of pipe.
8. Bend the clamp securely.
9. Run the alternator lead inside of pipe.
10. Viewed Back of Frame
11. Run the alternator lead, speed sensor lead, neutral switch lead and side stand switch lead through the clamp. Bend the clamp, and insert the clamp to the hole.

# 17-22 APPENDIX

## Cable, Wire, and Hose Routing



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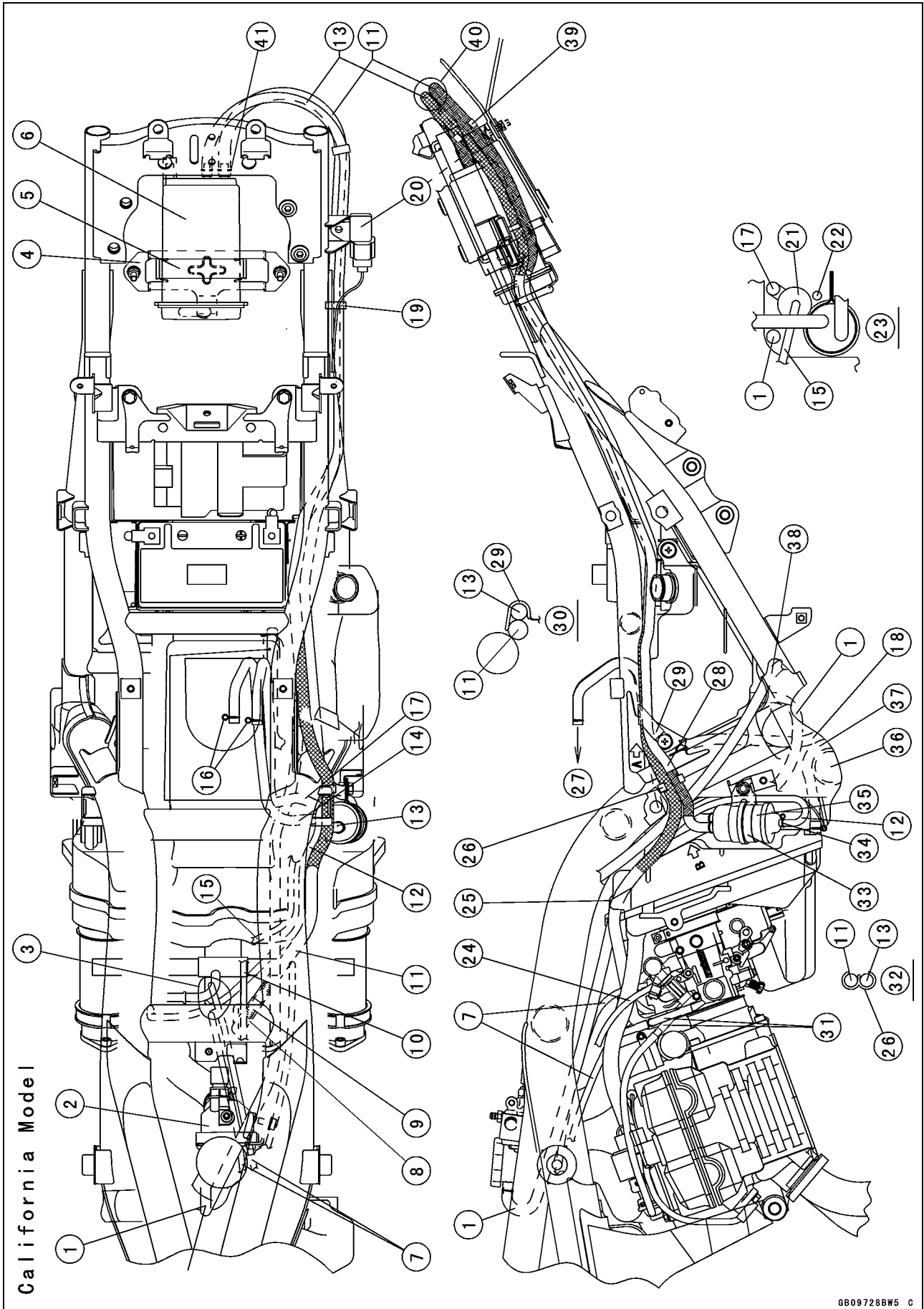
**Cable, Wire, and Hose Routing**

---

1. Seat Lock
2. Seat Lock Cable
3. Tighten the bolt to the specified torque with the stopper (for turning prevention) applied.
4. Brake Hose
5. Clamp
6. Grommet
7. Viewed A
8. Clamps
9. Run the brake hose inside of the reservoir hose.
10. Clamp

# 17-24 APPENDIX

## Cable, Wire, and Hose Routing



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**Cable, Wire, and Hose Routing**

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**California Model**

1. Coolant Breather Hose (Radiator Cap-Coolant Reservoir)
2. Thermostat Housing
3. Run the tube (White) between the throttle cables.
4. Canister Holder
5. Band
6. Canister
7. Throttle Cables
8. Canister Purge Joint Tube (Fitting-Throttle Body #2 Right Vacuum Pipe)
9. Fitting
10. Subthrottle Valve Actuator Lead (Main Harness Side)
11. Canister Purge Tube (Green)
12. Tube (White. Separator-Throttle Body #3 Right Vacuum Pipe)
13. Separate Tube (Blue. Separator-Canister)
14. Tube (Blue. Separator-Fuel Tank)
15. Alternator Lead (Main Harness Side)
16. Clips
17. Tube (Red. Separator-Fuel Tank)
18. Coolant Reservoir Over Flow Tube (Run the tube backward the cross pipe.)
19. Clamp (Hold the sensor lead and tubes.)
20. Atmospheric Pressure Sensor
21. Alternator Connector
22. Tube (12) (Run the tube inside the separator bracket.)
23. Viewed Over the Separator
24. Chock Cable (Run the cable into the hole of the throttle body.)
25. Run the tubes inside the rib.
26. Clamp (Install the clamp inside the tubes.)
27. To the fuel tank.
28. Run the tubes (11) (13) outside the frame.
29. Clamp (Holding the tubes near the frame.)
30. Viewed A
31. Vacuum Balance Tubes (Run the tubes forward the tubes (8), (12))
32. Viewed B
33. Separator Bracket
34. Clip
35. Separator
36. Cross Pipe
37. Air Cleaner Housing Drain Hose (Run the hose backward the cross pipe.)
38. Fuel Tank Drain Hose
39. Clamp
40. Install the purge tube (11) under the separate tube (13).
41. Clip

## 17-26 APPENDIX

### Troubleshooting Guide

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#### 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:

- Starter lockout switch or neutral switch trouble
- Starter motor trouble
- Battery voltage low
- Starter relay not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch trouble
- Engine stop switch trouble
- Fuse blown

##### Starter motor rotating but engine doesn't turn over:

- Starter clutch trouble
- Starter idle gear trouble
- Vehicle-down sensor (DFI) coming off
- Immobilizer system trouble

##### Engine won't turn over:

- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Starter idle gear seizure

##### No fuel flow:

- No fuel in tank
- Fuel pump trouble
- Fuel tank air vent obstructed
- Fuel filter clogged
- Fuel line clogged

##### Engine flooded:

- Clean spark plug and adjust plug gap
- Starting technique faulty  
(When flooded, do not crank the engine with the throttle fully opened. This promotes engine flood because more fuel is supplied automatically by DFI.)

##### No spark; spark weak:

- Vehicle-down sensor (DFI) coming off
- Ignition switch not ON
- Engine stop switch turned OFF
- Clutch lever not pulled in or gear not in neutral

- Battery voltage low
- Spark plug dirty, broken, or gap maladjusted
- Stick coil shorted or not in good contact
- Stick coil trouble
- Spark plug incorrect
- IC igniter in ECU trouble
- Camshaft position sensor trouble
- Neutral, starter lockout, or side stand switch trouble
- Crankshaft sensor trouble
- Ignition switch or engine stop switch shorted
- Wiring shorted or open
- Fuse blown

##### Fuel/air mixture incorrect:

- Bypass screw and/or idle adjusting screw maladjusted
- Air passage clogged
- Air cleaner clogged, poorly sealed, or missing

##### 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)

#### Poor Running at Low Speed:

##### Spark weak:

- Battery voltage low
- Spark plug dirty, broken, or maladjusted
- Stick coil wiring trouble
- Stick coil not in good contact
- Spark plug incorrect
- IC igniter in ECU trouble
- Camshaft position sensor trouble
- Crankshaft sensor trouble
- Stick coil trouble

##### Fuel/air mixture incorrect:

- Bypass screw maladjusted
- Air passage clogged
- Air bleed pipe bleed holes clogged
- Pilot passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Fuel tank air vent obstructed
- Fuel pump trouble

## Troubleshooting Guide

Throttle body assy holder loose  
Air cleaner duct loose

### Compression low:

Spark plug loose  
Cylinder head not sufficiently tightened down  
No valve clearance  
Cylinder, piston worn  
Piston ring bad (worn, weak, broken, or sticking)  
Piston ring/groove clearance excessive  
Cylinder head warped  
Cylinder head gasket damaged  
Valve spring broken or weak  
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

### Other:

IC igniter in ECU trouble  
Throttle body assy not synchronizing  
Engine oil viscosity too high  
Drive train trouble  
Brake dragging  
Air suction valve trouble  
Vacuum switch valve trouble  
Engine overheating  
Clutch slipping

## Poor Running or No Power at High Speed:

### Firing incorrect:

Spark plug dirty, broken, or maladjusted  
Stick coil wiring trouble  
Stick coil not in good contact  
Spark plug incorrect  
Camshaft position trouble  
IC igniter in ECU trouble  
Crankshaft sensor trouble  
Stick coil trouble

### Fuel/air mixture incorrect:

Air cleaner clogged, poorly sealed, or missing  
Air cleaner O-ring damaged  
Air cleaner duct loose  
Water or foreign matter in fuel  
Throttle body assy holder loose  
Fuel to injector insufficient (DFI)  
Fuel tank air vent obstructed  
Fuel line clogged  
Fuel pump trouble (DFI)

### 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  
IC igniter in ECU trouble  
Camshaft position sensor trouble  
Crankshaft sensor 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  
Air suction valve trouble  
Vacuum switch valve trouble  
Catalytic converter melt down due to muffler overheating (KLEEN)

## Overheating:

### Firing incorrect:

Spark plug dirty, broken, or maladjusted  
Spark plug incorrect  
IC igniter in ECU trouble

### Muffler overheating:

For KLEEN, do not run the engine even if with only one cylinder misfiring or poor running (Request the nearest service facility to correct it)

For KLEEN, do not push-start with a dead battery (Connect another full-charged battery with jumper cables, and start the engine using the electric starter)

For KLEEN, do not start the engine under misfire due to spark plug fouling or poor connection of the stick coil

For KLEEN, do not coast the motorcycle with the ignition switch off (Turn the ignition switch ON and run the engine)

IC igniter in ECU trouble

### Fuel/air mixture incorrect:

Throttle body assy holder loose  
Air cleaner duct loose  
Air cleaner poorly sealed, or missing  
Air cleaner O-ring damaged  
Air cleaner clogged

## 17-28 APPENDIX

### Troubleshooting Guide

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#### **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

#### **Gauge incorrect:**

Water temperature gauge broken  
Water temperature sensor broken

#### **Coolant incorrect:**

Coolant level too low  
Coolant deteriorated  
Wrong coolant mixed ratio

#### **Cooling system component incorrect:**

Radiator fin damaged  
Radiator clogged  
Thermostat trouble  
Radiator cap trouble  
Radiator fan switch trouble  
Radiator fan relay trouble  
Fan motor broken  
Fan blade damaged  
Water pump not turning  
Water pump impeller damaged

#### **Over Cooling:**

##### **Gauge incorrect:**

Water temperature gauge broken  
Water temperature sensor broken

##### **Cooling system component incorrect:**

Radiator fan switch trouble  
Thermostat trouble

#### **Clutch Operation Faulty:**

##### **Clutch slipping:**

Friction plate worn or warped  
Steel plate worn or warped  
Clutch spring broken or weak  
Clutch hub or housing unevenly worn  
No clutch lever play  
Clutch inner cable trouble  
Clutch release mechanism trouble

##### **Clutch not disengaging properly:**

Clutch plate warped or too rough  
Clutch spring compression uneven  
Engine oil deteriorated  
Engine oil viscosity too high  
Engine oil level too high  
Clutch housing frozen on drive shaft  
Clutch hub nut loose  
Clutch hub spline damaged  
Clutch friction plate installed wrong

Clutch lever play excessive

Clutch release mechanism trouble

#### **Gear Shifting Faulty:**

##### **Doesn't go into gear; shift pedal doesn't return:**

Clutch not disengaging  
Shift fork bent or seized  
Gear stuck on the shaft  
Gear positioning lever binding  
Shift return spring weak or broken  
Shift return spring pin loose  
Shift mechanism arm spring broken  
Shift mechanism arm broken  
Shift pawl broken

##### **Jumps out of gear:**

Shift fork ear worn, bent  
Gear groove worn  
Gear dogs and/or dog holes worn  
Shift drum groove worn  
Gear positioning lever spring weak or broken  
Shift fork guide pin worn  
Drive shaft, output shaft, and/or gear splines worn

##### **Overshifts:**

Gear positioning lever spring weak or broken  
Shift mechanism arm spring broken

#### **Abnormal Engine Noise:**

##### **Knocking:**

IC igniter in 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



## Troubleshooting Guide

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  
 Air suction valve damaged  
 Vacuum switch valve damaged  
 Alternator rotor loose  
 Catalytic converter melt down due to muffler overheating (KLEEN)

### Abnormal Drive Train Noise:

#### Clutch noise:

Clutch damper weak or damaged  
 Clutch housing/friction plate clearance excessive  
 Clutch housing gear worn  
 Wrong installation of outside friction plate

#### Transmission noise:

Bearings worn  
 Transmission gear worn or chipped  
 Metal chips jammed in gear teeth  
 Engine oil insufficient

#### Drive line noise:

Drive chain adjusted improperly  
 Drive chain worn  
 Rear and/or engine sprocket worn  
 Chain lubrication insufficient  
 Rear wheel misaligned

### Abnormal Frame Noise:

#### Front fork noise:

Oil insufficient or too thin  
 Spring weak or broken

#### Rear shock absorber noise:

Shock absorber damaged

#### Disc brake noise:

Pad installed incorrectly  
 Pad surface glazed  
 Disc warped  
 Caliper trouble

#### Other noise:

Bracket, nut, bolt, etc. not properly mounted or tightened

### Oil Pressure Warning Light Goes On:

Engine oil pump damaged  
 Engine oil screen clogged  
 Engine oil filter clogged  
 Engine oil level too low  
 Engine oil viscosity too low  
 Camshaft bearing worn  
 Crankshaft bearing worn

Oil pressure switch damaged  
 Wiring faulty  
 Relief valve stuck open  
 O-ring at the oil passage in the crankcase damaged

### Exhaust Smokes Excessively:

#### White smoke:

Piston oil ring worn  
 Cylinder worn  
 Valve oil seal damaged  
 Valve guide worn  
 Engine oil level too high

#### Black smoke:

Air cleaner clogged

#### Brown smoke:

Air cleaner duct loose  
 Air cleaner O-ring damaged  
 Air cleaner poorly sealed or missing

### Handling and/or Stability Unsatisfactory:

#### Handlebar hard to turn:

Cable routing incorrect  
 Hose routing incorrect  
 Wiring routing incorrect  
 Steering stem nut too tight  
 Steering stem bearing damaged  
 Steering stem bearing lubrication inadequate  
 Steering stem bent  
 Tire air pressure too low

#### Handlebar shakes or excessively vibrates:

Tire worn  
 Swingarm pivot bearing worn  
 Rim warped, or not balanced  
 Wheel bearing worn  
 Handlebar clamp bolt loose  
 Steering stem nut loose  
 Front, rear axle runout excessive  
 Engine mounting bolt loose

#### Handlebar pulls to one side:

Frame bent  
 Wheel misalignment  
 Swingarm bent or twisted  
 Swingarm pivot shaft runout excessive  
 Steering maladjusted  
 Front fork bent  
 Right and left front fork oil level uneven

#### Shock absorption unsatisfactory:

(Too hard)  
 Front fork oil excessive  
 Front fork oil viscosity too high  
 Rear shock absorber adjustment too hard  
 Tire air pressure too high  
 Front fork bent  
 (Too soft)

## 17-30 APPENDIX

### Troubleshooting Guide

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- Tire air pressure too low
- Front fork oil insufficient and/or leaking
- Front fork oil viscosity too low
- Rear shock adjustment too soft
- Front fork, rear shock absorber spring weak
- Rear shock absorber oil leaking

#### **Brake Doesn't Hold:**

- Air in the brake line
- Pad or disc worn
- Brake fluid leakage
- Disc warped
- Contaminated pad
- Brake fluid deteriorated
- Primary or secondary cup damaged in master cylinder
- Master cylinder scratched inside

#### **Battery Trouble:**

##### **Battery discharged:**

- Charge insufficient
- Battery faulty (too low terminal voltage)
- Battery lead 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.
2005	ZR750-K1	JKAZRDK1□5A025001 ZR750K-000001 JKAZR750JKA025001

□:This digit in the frame number changes from one machine to another.



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