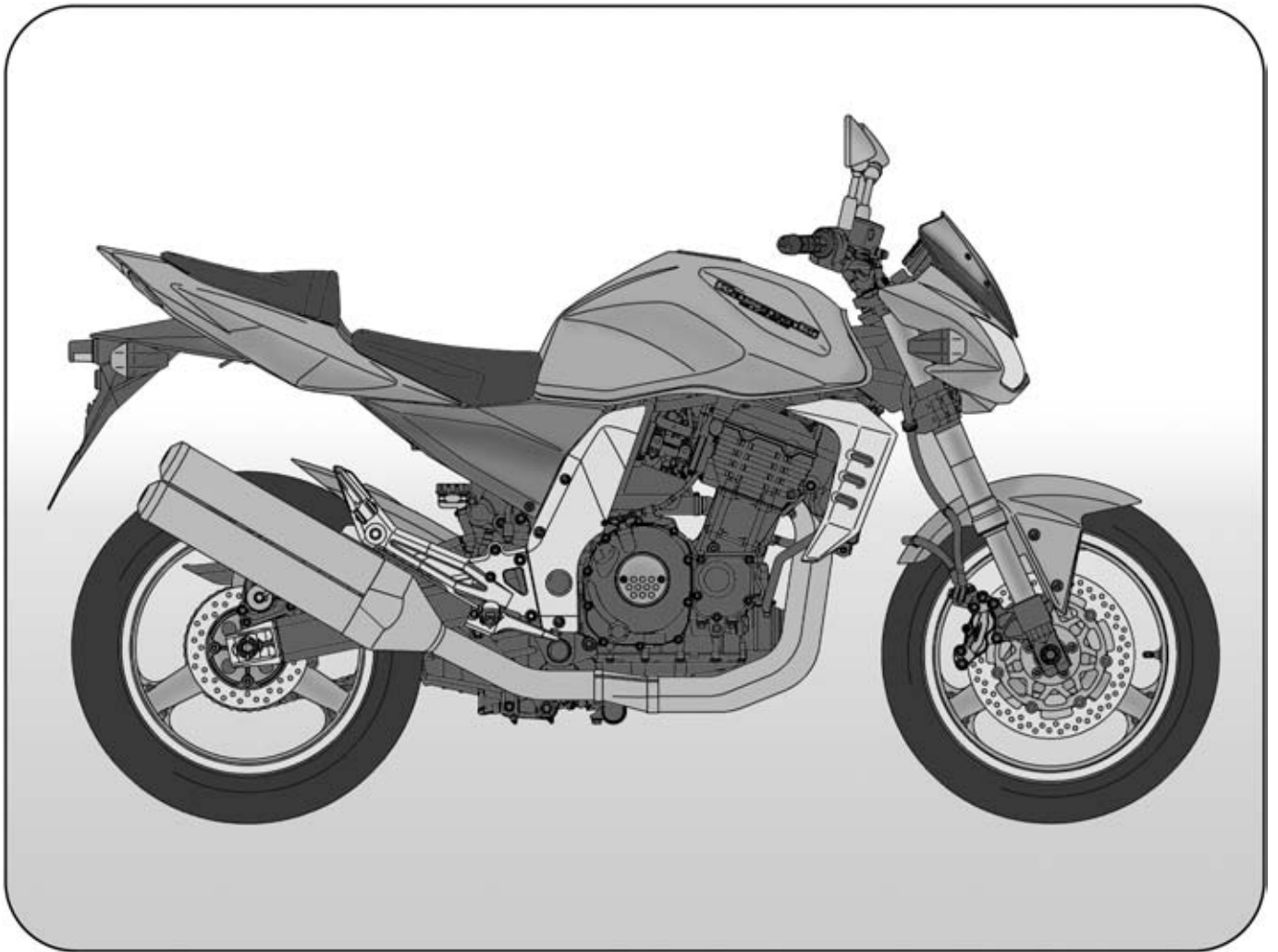


**Kawasaki**

**Z1000**



# **Motorcycle Service Manual**



# Quick Reference Guide

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

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

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







**Z1000**

# **Motorcycle Service Manual**

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

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

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

## LIST OF ABBREVIATIONS

A	ampere(s)	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

## Table of Contents

Before Servicing .....	1-2
Model Identification.....	1-7
General Specifications.....	1-8
Technical Information – Air Inlet System .....	1-11
Technical Information – New Ignition Interlock Sidestand .....	1-13
Technical Information – Tail/Brake Lights Employing LED .....	1-14
Technical Information - KLEEN (KAWASAKI LOW EXHAUST EMISSION SYSTEM) .....	1-16
Unit Conversion Table .....	1-17

## 1-2 GENERAL INFORMATION

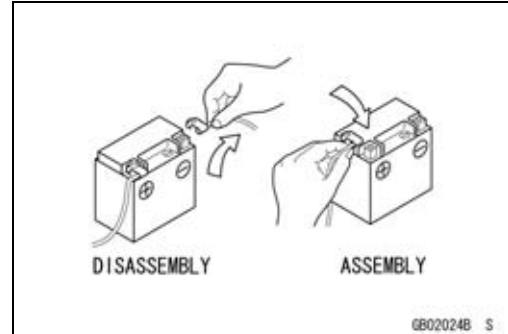
### Before Servicing

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:

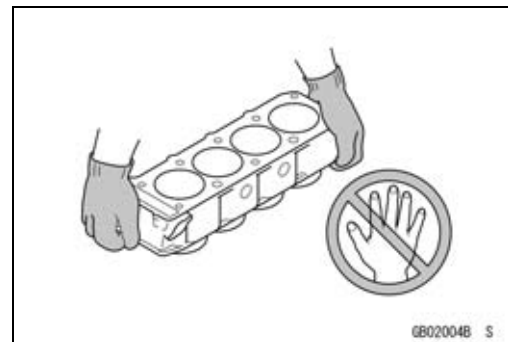
#### *Battery Ground*

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.



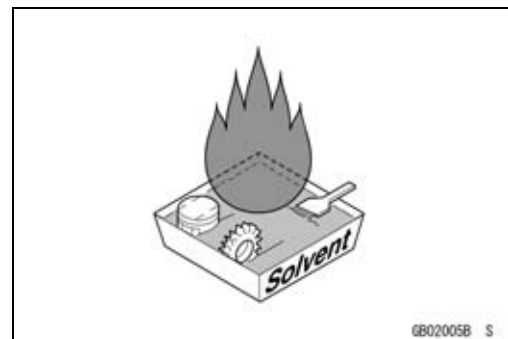
#### *Edges of Parts*

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



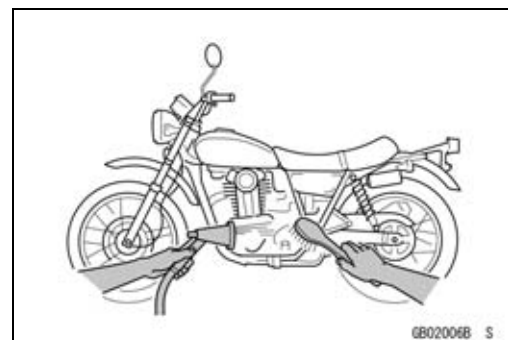
#### *Solvent*

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.

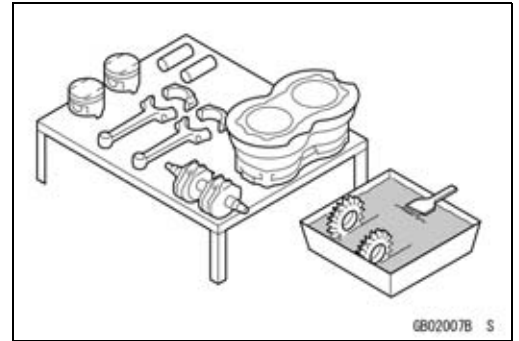




**Before Servicing**

*Arrangement and Cleaning of Removed Parts*

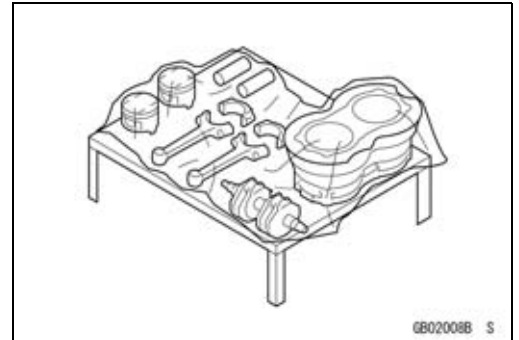
Disassembled parts are easy to confuse. Arrange the parts according to the order the parts were disassembled and clean the parts in order prior to assembly.



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*Storage of Removed Parts*

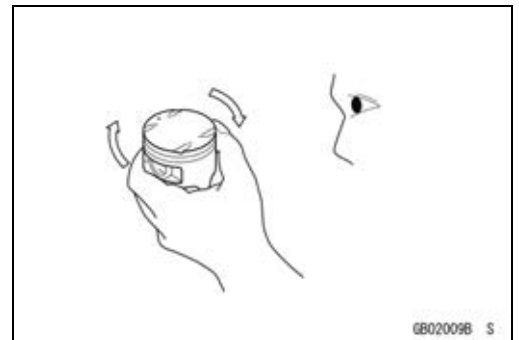
After all the parts including subassembly parts have been cleaned, store the parts in a clean area. Put a clean cloth or plastic sheet over the parts to protect from any foreign materials that may collect before re-assembly.



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*Inspection*

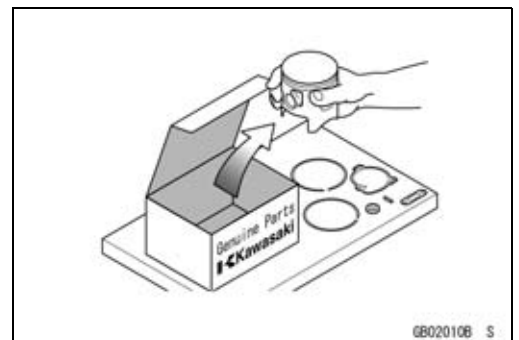
Reuse of worn or damaged parts may lead to serious accident. Visually inspect removed parts for corrosion, discoloration, or other damage. Refer to the appropriate sections of this manual for service limits on individual parts. Replace the parts if any damage has been found or if the part is beyond its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



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*Replacement Parts*

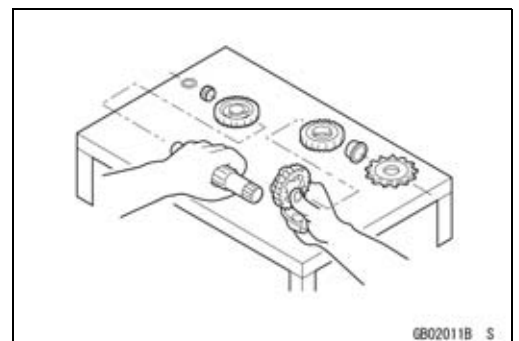
Replacement Parts must be KAWASAKI genuine or recommended by KAWASAKI. Gaskets, O rings, Oil seals, Grease seals, circlips or cotter pins must be replaced with new ones whenever disassembled.



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*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.



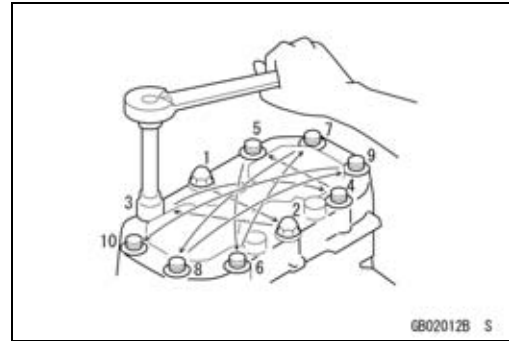
GB02011B S

# 1-4 GENERAL INFORMATION

## Before Servicing

### *Tightening Sequence*

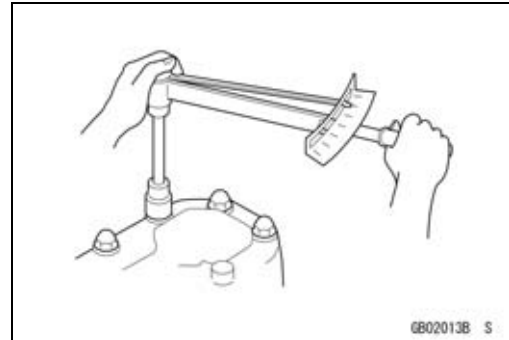
Bolts, nuts, or screws must be tightened according to the specified sequence to prevent case warpage or deformation which can lead to malfunction. If the specified tightening sequence is not indicated, tighten the fasteners alternating diagonally.



### *Tightening Torque*

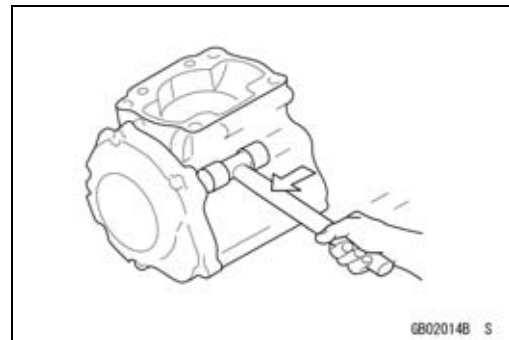
Incorrect torque applied to a bolt, nut, or screw may lead to serious damage. Tighten fasteners to the specified torque using a good quality torque wrench.

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



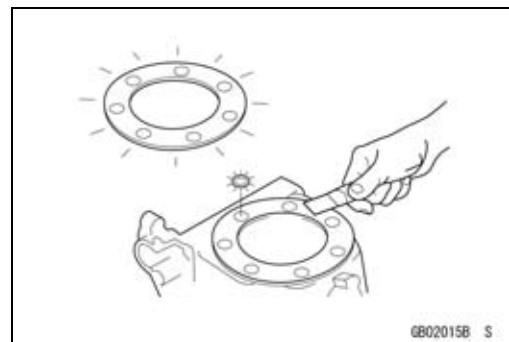
### *Force*

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, Oring*

Hardening, shrinkage, or damage of both gaskets and grease seals 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 grease seal when re-assembling.



### *Liquid Gasket, Locking Agent*

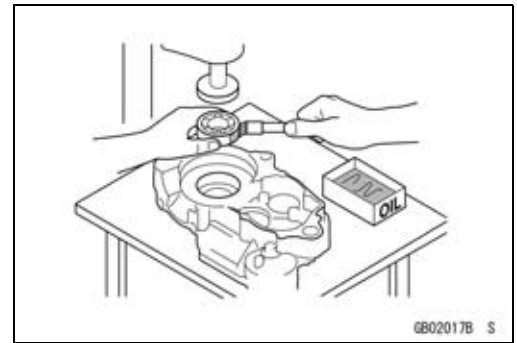
For applications that require Liquid Gasket or a Locking agent, clean the surfaces so that no oil residue remains before applying liquid gasket or locking agent. Do not apply them excessively. Excessive application can clog oil passages and cause serious damage.



**Before Servicing**

*Press*

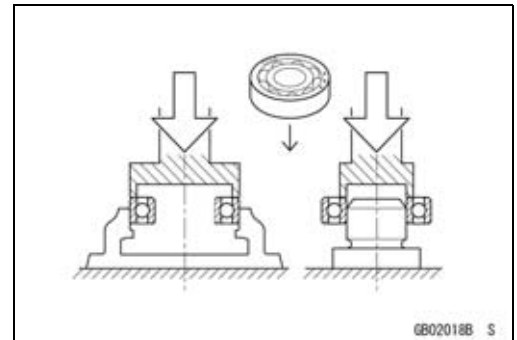
For items such as bearings or oil seals that must be pressed into place, apply small amount of oil to the contact area. Be sure to maintain proper alignment and use smooth movements when installing.



*Ball Bearing and Needle Bearing*

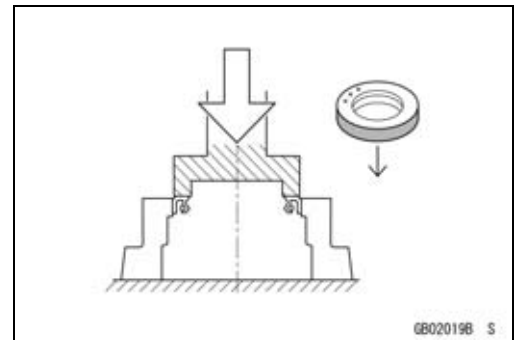
Do not remove pressed ball or needle unless removal is absolutely necessary. Replace with new ones whenever removed. Press bearings with the manufacturer and size marks facing out. Press the bearing into place by putting pressure on the correct bearing race as shown.

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



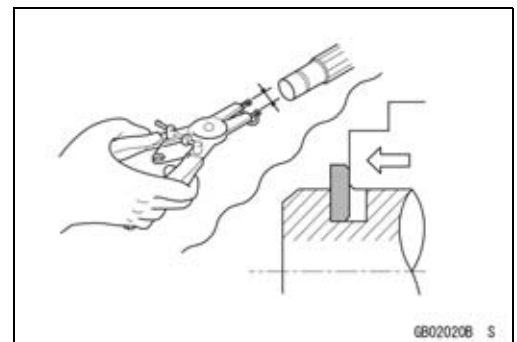
*Oil Seal, Grease Seal*

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.



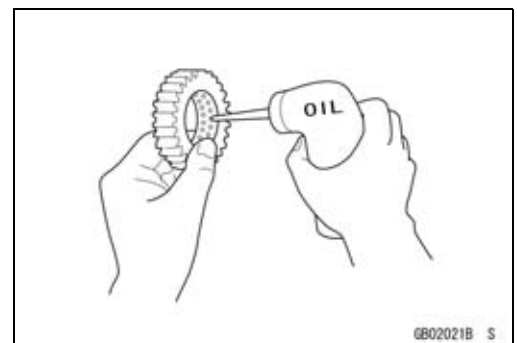
*Circlips, Cotter Pins*

Replace circlips or cotter pins that were removed with new ones. Install the circlip with its sharp edge facing outward and its chamfered side facing inward to prevent the clip from being pushed out of its groove when loaded. Take care not to open the clip excessively when installing to prevent deformation.



*Lubrication*

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

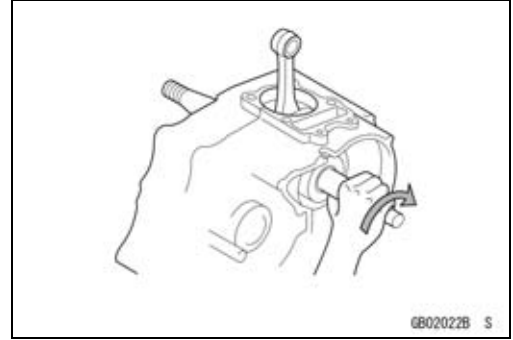


## 1-6 GENERAL INFORMATION

### Before Servicing

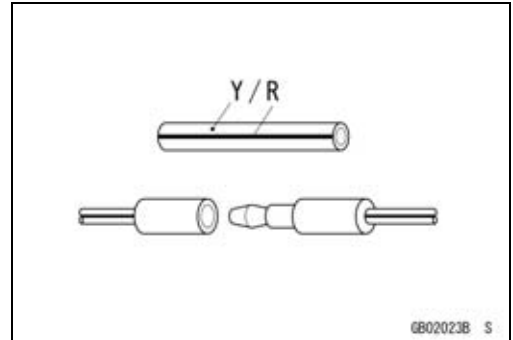
#### *Direction of Engine Rotation*

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

ZR1000-A1 Left Side View:



ZR1000-A1 Right Side View:



# 1-8 GENERAL INFORMATION

## General Specifications

Items	ZR1000-A1 ~
<b>Dimensions:</b> Overall length Overall width Overall height Wheelbase Road clearance Seat height Dry mass Curb mass:     Front Rear Fuel tank capacity	2 080 mm (81.9 in.) 770 mm (30.3 in.) 1 055 mm (41.5 in.) 1 420 mm (55.9 in.) 145 mm (5.7 in.) 820 mm (32.3 in.) 198 kg (410.1 lb) 110 kg (242.6 lb) 111 kg (244.8 lb) 18 L (5.0 US gal.)
<b>Performance:</b> Minimum turning radius	2.8 m (9.2 ft)
<b>Engine:</b> 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 Duration	4-stroke, DOHC, 4-cylinder Liquid-cooled 77.2 × 50.9 mm (3.0 × 2.0 in.) 953 mL (58.15 cu in.) 11.2 93.4 kW (127 PS) @10 000 r/min (rpm), (MY, AU) 90.5 kW (123 PS) @10 000 r/min (rpm) (HR) 78.2 kW (106 PS) @10 000 r/min (rpm) (US) - - - 95.6 N·m (9.7 kgf·m, 71 ft·lb) @8 000 r/min (rpm), (MY, AU) 92.7 N·m (9.4 kgf·m, 68 ft·lb) @8 000 r/min (rpm) (HR) 86.3 N·m (8.8 kgf·m, 64 ft·lb) @7 500 r/min (rpm) (US) - - - FI (Fuel Injection) Keihin TTK38 × 4 Electric starter Battery and coil (transistorized) Electronically advanced(digital igniter) From 10° BTDC @1 100 r/min (rpm) to 36° BTDC @7 500 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 268°



# 1-10 GENERAL INFORMATION

## General Specifications

Items	ZR1000-A1 ~
Tail/brake light	12 V 0.5/3.8 W (LED) (US, CA, Cal) 12 V 0.5/5W (LED)
Alternator:      Type Rated output	Three-phase AC 24 A/ 14 V @5 000 r/min (rpm)

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

(AU): Australia Model

(US): U.S.A. Model

(CA): Canada Model

(Cal): California Model

(MY): Malaysia Model

(HR): with Honeycomb Catalytic Converter Model (Restricted model)

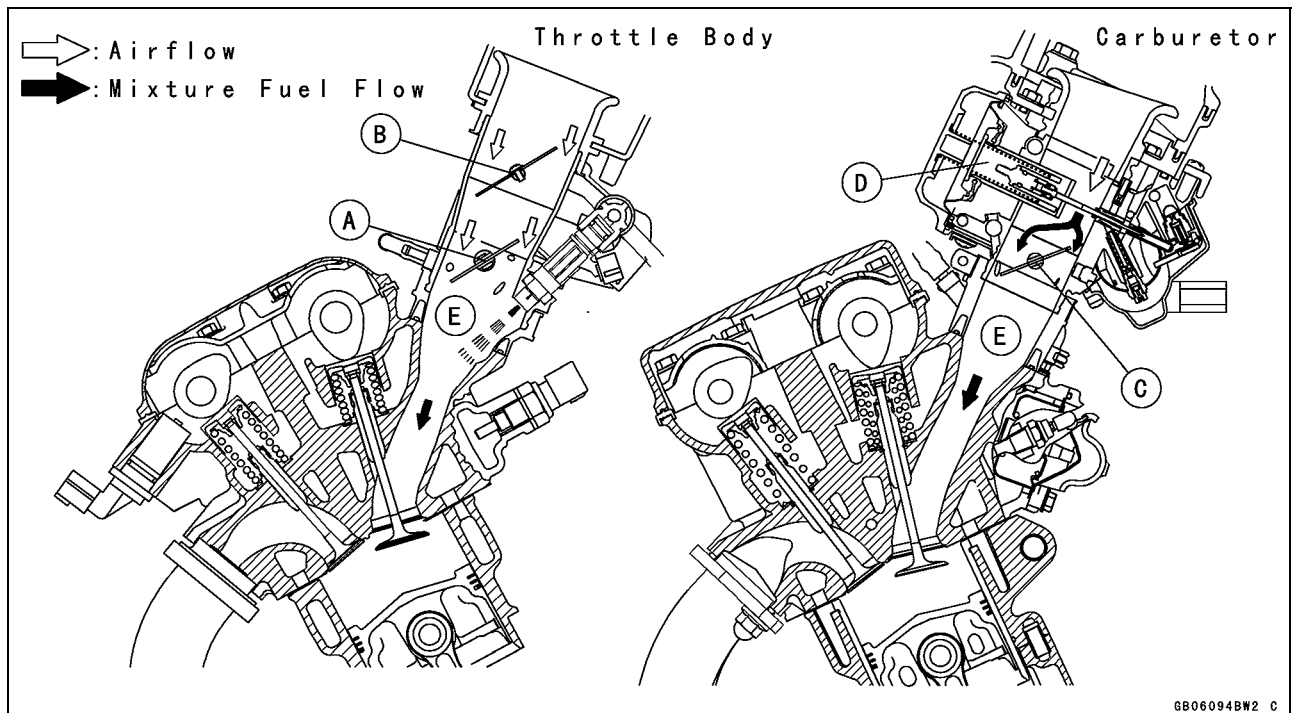


Technical Information – Air Inlet System

**Subthrottle Control System**

The ZR1000-A1 ~ employs 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

# 1-12 GENERAL INFORMATION

## Technical Information – Air Inlet System

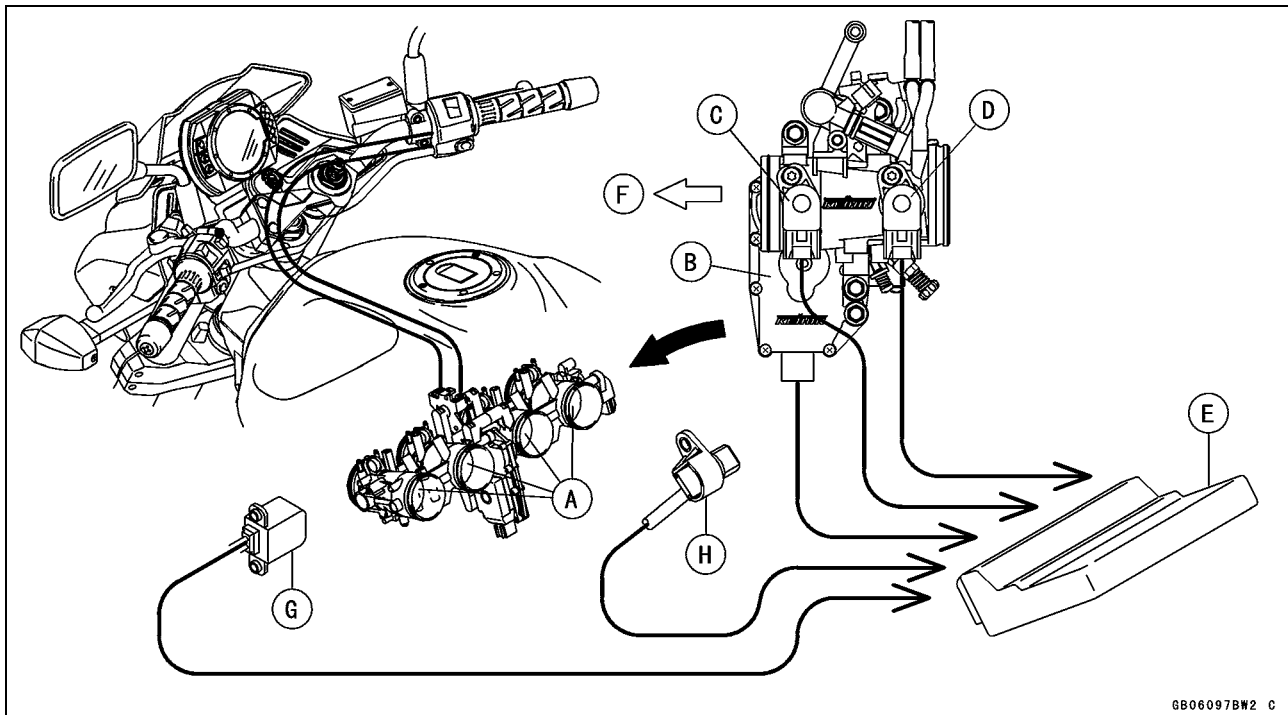
### Operation

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 (Electric Control Unit)
- F. Air Cleaner Side
- G. Crankshaft Sensor
- H. Speed Sensor

**Technical Information – New Ignition Interlock Sidestand**

**Outline**

The New Ignition Interlock Sidestand System applied to ZR1000–A1 models that cannot function if gears are engaged and/or the sidestand 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 Sidestand System**

	<b>Side Stand</b>	<b>Gear Position</b>	<b>Clutch Lever</b>	<b>Engine Start</b>	<b>Engine Run</b>
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 Sidestand System**

	<b>Side Stand</b>	<b>Gear Position</b>	<b>Clutch Lever</b>	<b>Engine Start</b>	<b>Engine Run</b>
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>

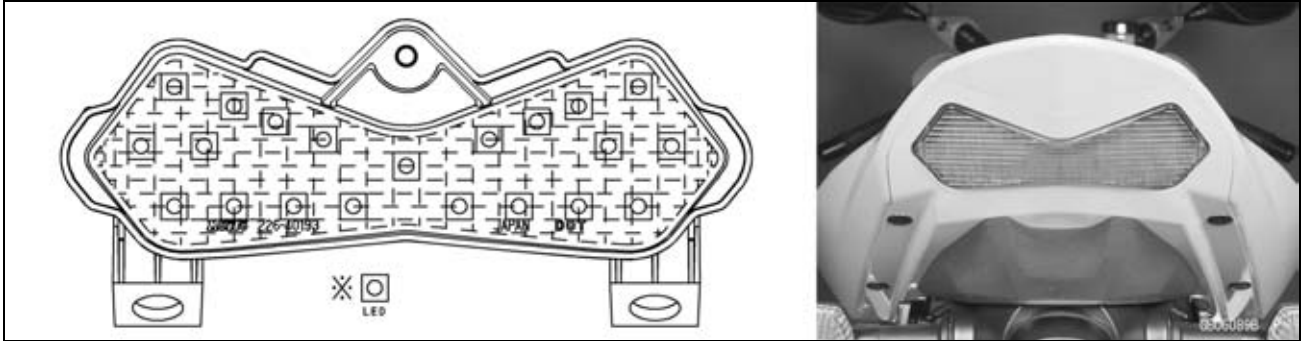
# 1-14 GENERAL INFORMATION

## Technical Information – Tail/Brake Lights Employing LED

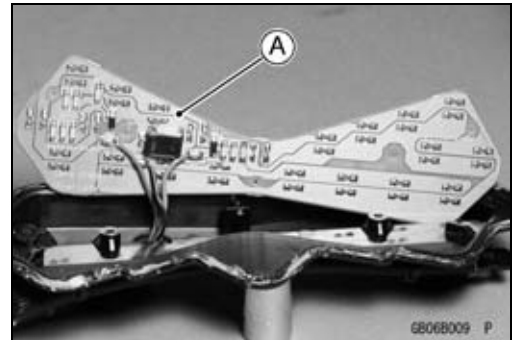
### Outline

This model employs a tail/brake light containing 21 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

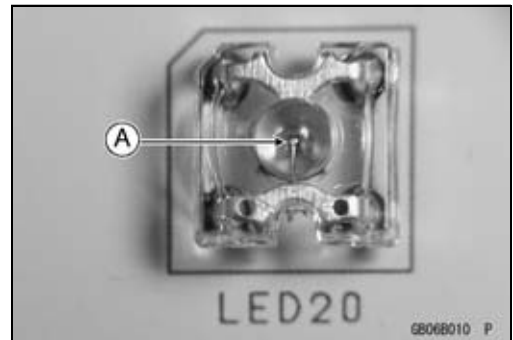


The resistors, the diodes, and the Zener diodes are mounted in the electronic circuits [A] of the LED, which supplies the steady current and voltage to the light.

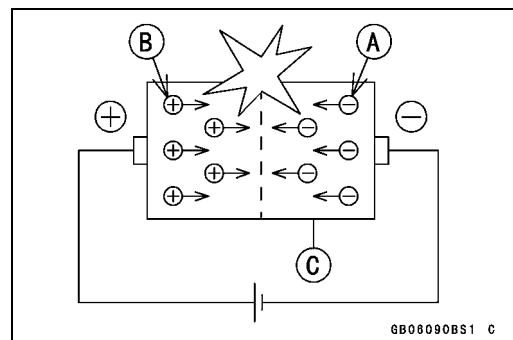


### Light Emitting Diode (LED)

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].



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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

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

## 1-16 GENERAL INFORMATION

### Technical Information - KLEEN (KAWASAKI LOW EXHAUST EMISSION SYSTEM)

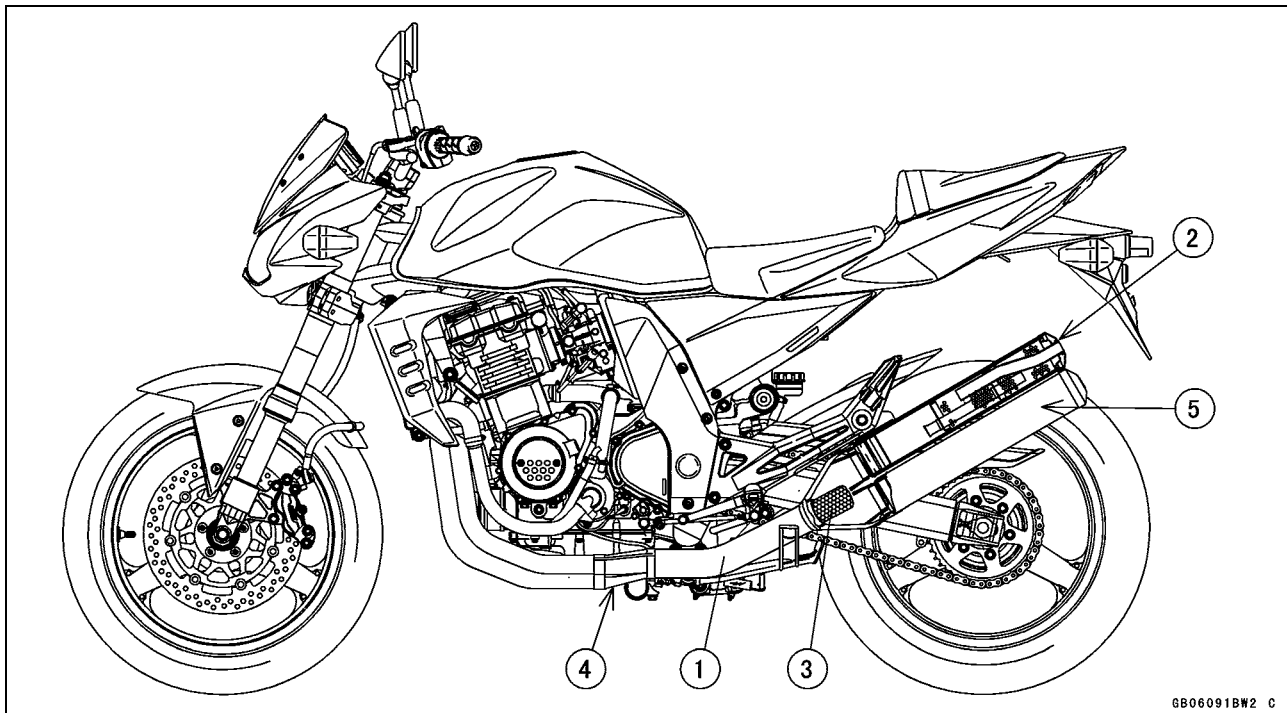
Since the emission regulations become more severe, Kawasaki has adopted a type of simplified KLEEN, which have no catalyst protection system, according to each regulation of different countries.

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

**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	=	cm Hg
kgf/cm <sup>2</sup>	×	98.07	=	kPa
kgf/cm <sup>2</sup>	×	14.22	=	psi
cm Hg	×	1.333	=	kPa

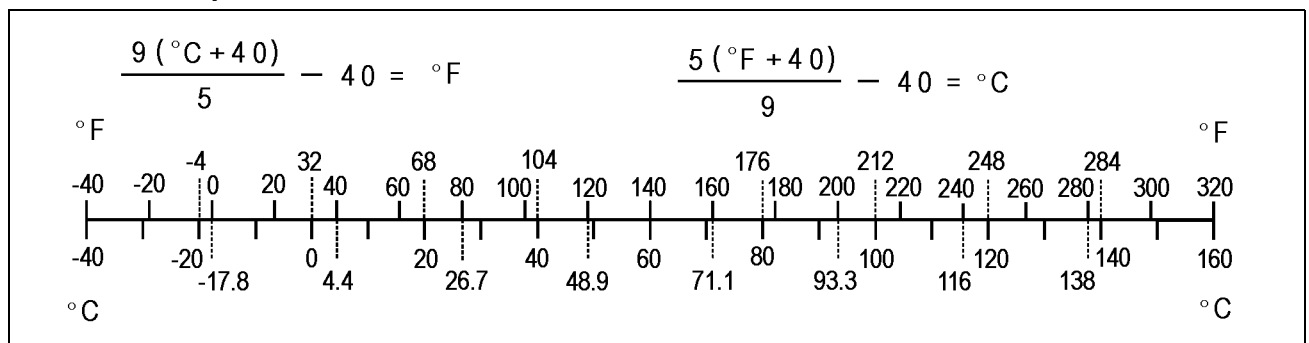
**Units of Speed:**

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

## Table of Contents

Periodic Maintenance Chart .....	2-2	Drive Chain Slack Adjustment .....	2-31
Torque and Locking Agent.....	2-4	Wheel Alignment	
Specifications .....	2-9	Inspection/Adjustment.....	2-32
Special Tools .....	2-11	Drive Chain Wear Inspection .....	2-32
Periodic Maintenance Procedures.....	2-12	Drive Chain Lubrication.....	2-33
Fuel System (DFI).....	2-12	Brakes.....	2-34
Fuel Hose and Connection		Brake Pad Wear Inspection .....	2-34
Inspection.....	2-12	Rear Brake Light Switch	
Throttle Control System		Inspection/Adjustment.....	2-34
Inspection.....	2-13	Caliper Fluid Seal Damage.....	2-35
Idle Speed Inspection .....	2-14	Caliper Dust Seal/Friction Boot	
Idle Speed Adjustment.....	2-14	Damage.....	2-35
Engine Vacuum Synchronization		Master Cylinder Inspection (Visual	
Inspection.....	2-15	Inspection).....	2-36
Air Cleaner Element Cleaning.....	2-19	Level Inspection .....	2-37
Evaporative Emission Control		Brake Fluid Change .....	2-37
System Inspection (CAL) .....	2-20	Brake Line Bleeding.....	2-39
Cooling System.....	2-21	Brake Hoses and Connections	
Radiator Hose and Connection		Inspection.....	2-41
Inspection.....	2-21	Suspension .....	2-42
Coolant Change .....	2-21	Front Fork Oil Leak Check .....	2-42
Engine Top End .....	2-23	Rear Shock Absorber Oil Leak	
Air Suction Valve Inspection .....	2-23	Check .....	2-42
Valve Clearance Inspection .....	2-24	Swingarm Pivot Lubrication .....	2-42
Valve Clearance Adjustment.....	2-25	Uni-trak Linkage Lubrication .....	2-42
Clutch.....	2-28	Steering .....	2-43
Clutch Adjust Inspection .....	2-28	Steering Inspection .....	2-43
Engine Lubrication System.....	2-29	Steering Adjustment.....	2-43
Engine Oil Change.....	2-29	Stem Bearing Lubrication.....	2-44
Oil Filter Change .....	2-29	Electrical System .....	2-44
Wheels/Tires.....	2-30	Spark Plug Cleaning and	
Tire Inspection .....	2-30	Inspection.....	2-44
Air Pressure		General Lubrication .....	2-47
Inspection/Adjustment.....	2-31	Lubrication .....	2-47
Final Drive.....	2-31	Nut, Bolt, and Fastener Tightness ..	2-48
Drive Chain Slack Inspection .....	2-31	Tightness Inspection .....	2-48



## PERIODIC MAINTENANCE 2-3

### Periodic Maintenance Chart

OPERATION	FREQUENCY	Whichever comes first → ↓	* ODOMETER READING							
	Every		1 000 km (600 mile)	6 000 km (4 000 mile)	12 000 km (7 500 mile)	18 000 km (12 000 mile)	24 000 km (15 000 mile)	30 000 km (20 000 mile)	36 000 km (24 000 mile)	
Clutch-adjust †			•	•	•	•	•	•	•	
Radiator hoses, connections - inspect †			•							
Brake fluid - change	2 years						•			
Brake master cylinder cup and dust seal - replace	4 years									
Coolant - change	2 years						•			
Caliper piston seal and dust seal - replace	4 years									
Steering stem bearing - lubricate	2 years						•			

# : 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.

† : Replace, add, adjust, clean, or torque if necessary.

Throttle control system inspection: Inspection of throttle grip play and main throttle bore cleanliness  
 (CAL): California Model only  
 (e): Emission Related Items

## 2-4 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:

- L:** Apply a non-permanent locking agent to the threads.
- G:** Apply grease to the threads.
- MO:** Apply molybdenum disulfide grease oil solution.
- EO:** Apply oil to the threads and seating surface.
- S:** Tighten the fasteners following the specified sequence.
- SS:** Apply silicone sealant.
- Si:** Apply silicone grease (ex. PBC grease).
- R:** Replacement parts
- AL:** Tighten the two clamp bolts alternately two times to ensure even tightening torque.

The table on the right lists the basic torque for the bolts and nuts, which are determined by their thread diameter. Use this table for the bolts and nuts that are not listed in the table below according to their thread diameter. All of the tightening torque values are for use with dry threads that have been cleaned with solvent.

#### Basic Torque for General Fasteners

Threads dia. (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 ~ 33	165 ~ 240

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 downsensor bolts	2	0.2	17 in·lb	
Cam shaft position sensor bolt	12	1.2	104 in·lb	
Cam shaft position sensor rotor bolt	12	1.2	104 in·lb	L
Throttle cable plate bolt	6	0.6	52 in·lb	
Throttle body cover bolts	7	0.7	61 in·lb	
Throttle body assy holder clamp bolts	2	0.2	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 housing mounting bolts	9.8	1.0	87 in·lb	
Air cleaner duct clamp bolts	2	0.2	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	0.7	62 in·lb	L
Fuel pump bolts	9.8	1.0	87 in·lb	S, L
Fuel level sensor bolts	6.9	0.7	62 in·lb	
<b>Cooling System:</b>				
Radiator hose clamp screws	2	0.2	17 in·lb	
Thermostat air bleeder bolt	7.8	0.80	69 in·lb	
Radiator fan bolts	8.3	0.85	74 in·lb	
Water pump impeller bolt	10	1.0	87 in·lb	
Water pump cover bolts	11	1.1	95 in·lb	

## PERIODIC MAINTENANCE 2-5

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Water pump drain bolt	11	1.1	95 in·lb	
Water pipe bolts	11	1.1	95 in·lb	in/outlet
Thermostat housing ground bolt	7	0.7	61 in·lb	
Thermostat bracket bolt	7	0.7	61 in·lb	
Radiator upper bolts	7	0.7	61 in·lb	
Radiator lower bolts	7	0.7	61 in·lb	
Radiator screen bolt	7	0.7	61 in·lb	
Coolant reserve tank screws	7	0.7	61 in·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	10	1.0	87 in·lb	
Cylinder head cover bolts	10	1.0	87 in·lb	
Camshaft cap bolts (L=45 mm)	12	1.2	104 in·lb	
Camshaft cap bolts (L=40 mm)	12	1.2	104 in·lb	
Cylinder head bolts (M10 new bolts)	54	5.5	40	S, EO (Washer)
Cylinder head bolts (M10 used bolts)	49	5.0	36	S, EO (Washer)
Cylinder head bolts (M6)	12	1.2	104 in·lb	S
Cylinder head jacket plugs	22	2.2	16	L
Throttle body holder bolts	13	1.3	113 in·lb	
Throttle body holder clamp screws	2.0	0.2	17 in·lb	
Camshaft sensor bolt	12	1.2	104 in·lb	
Camshaft 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)	10	1.0	87 in·lb	
Exhaust pipe manifold holder nuts	17	1.7	12	
Muffler body clamp bolts	17	1.7	12	
Muffler body mounting bolts	34	3.5	25	
Crankshaft sensor cover bolts	11	1.1	95 in·lb	
<b>Clutch:</b>				
Clutch lever clamp bolts	7.9	0.8	69 in·lb	S
Clutch cover bolts (L=32 mm)	11	1.1	95 in·lb	
Clutch cover bolts (L=45 mm)	11	1.1	95 in·lb	
Clutch cover bolts (L=30 mm)	11	1.1	95 in·lb	
Clutch cover bolts	11	1.1	95 in·lb	
Oil filler plug	1.5	0.15	13 in·lb	
Clutch spring bolts	8.8	0.9	78 in·lb	
Clutch hub nut	135	14	100	R

## 2-6 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
<b>Engine Lubrication:</b>				
Oil filler plug	1.5	0.15	13 in·lb	
Engine drain plug	20	2.0	14.5	
Oil filter (cartridge type, P/No.16097–1070)	26	2.7	20	R, EO
Oil filter (cartridge type, P/No.16097–0002)	31	3.2	23	R, EO
Oil cooler 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	
Impeller bolt	10	1.0	87 in·lb	
Coolant drain plug (water pump)	11	1.1	95 in·lb	
Water hose clamp screws	2.0	0.2	17 in·lb	
Oil passage plugs	20	2.0	14.5	L
<b>Engine Removal/Installation:</b>				
Adjusting collar locknut	49	5.0	36 in·lb	S
Engine mounting bolts and nuts	44	4.5	32	S
Front engine bracket bolts	44	4.5	32	S
Rear engine bracket bolts	25	2.5	18	S
<b>Crankshaft/Transmission:</b>				
Breather plate bolts	10	1.0	87 in·lb	L
Crankcase bolts (M9, L=81 mm)	42	4.3	31	MO,S
Crankcase bolts (M9, L=95 mm)	49	5.0	36	MO,S
Crankcase bolts (M8)	27	2.8	20	S
Crankcase bolts (M7)	20	2.0	14.5	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	←	←	←
Crankshaft position rotor bolt	40	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	14.5	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	0.7	61 in·lb	
Tie-rod locknuts	6.9	0.7	61 in·lb	
Neutral switch	15	1.5	11	

**Torque and Locking Agent**

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
<b>Wheels/Tires:</b>				
Front axle clamp bolt	34	3.5	25	
Front axle	127	13	94	
Rear axle nut	127	13	94	
<b>Final Drive:</b>				
Engine sprocket nut	127	13	94	MO
Engine sprocket cover bolts	9.8	1.0	87 in·lb	
Engine sprocket cover damper bolt	6.9	0.7	61 in·lb	L
Rear sprocket nuts	59	6.0	43	
Speed sensor bolt	6.9	0.7	61 in·lb	L
<b>Brakes:</b>				
Bleed valves	7.8	0.80	69 in·lb	
Front brake hose joint bracket bolts	6.9	0.7	61	
Brake hose banjo bolts	25	2.5	18	
Brake lever pivot bolt	1.0	0.10	9 in·lb	
Brake lever pivot bolt locknut	5.9	0.60	52 in·lb	
Front brake reservoir cap screws	1.5	0.15	13 in·lb	
Front brake light switch screws	1.2	0.12	11 in·lb	
Front master cylinder clamp bolts	8.8	0.9	78 in·lb	S
Pad pin bolts (Front caliper)	17	1.7	12	
Caliper mounting bolts (Front)	25	2.5	18	
Caliper assembly bolts (Front)	22	2.2	16	L
Front brake disc mounting bolts	27	2.8	20	L
Rear brake disc mounting bolts	27	2.8	20	L
Caliper mounting bolts (Rear)	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)	8.8	0.90	78 in·lb	AL
Front fork clamp bolts (Upper): ZR1000-A2 ~	13	1.3	113 in·lb	
Front fork clamp bolts (Lower)	20	2.0	15	AL
Front fork clamp bolts (Lower): ZR1000-A2 ~	30	3.1	22	
Front fork top plugs	35	3.6	26	
Piston rod nuts	20	2.0	15	
Front fork bottom Allen bolts	20	2.0	15	
Front axle clamp bolt	20	2.0	15	
Rear shock absorber nuts (Upper and lower)	34	3.5	25	
Swingarm pivot shaft nut	127	13	94	
Swingarm pivot shaft locknut	98	10	72	
<b>Uni-trak</b>				
Rocker arm bolt	34	3.5	25	
Tie-rod nuts	59	6.0	43	
<b>Steering:</b>				
Steering stem head bolt	108	11	80	
Steering stem nut	20	2.0	14.5	
Handlebar clamp bolts	25	2.5	18	S

## 2-8 PERIODIC MAINTENANCE

### Torque and Locking Agent

Fastener	Torque			Remarks
	N·m	kgf·m	ft·lb	
Handlebar lower clamp nuts	34	3.5	25	
Handlebar switch housing screws	3.4	0.35	30 in·lb	
<b>Frame:</b>				
Footpeg holder bolts	34	3.5	25	
Muffler mounting bolts	29	3.0	22	
Side stand bolt	44	4.5	33	
Side stand switch bolt	8.8	0.9	78 in·lb	
Windshield screws	0.35 ~ 0.50	0.035 ~ 0.050	3 ~ 4 in·lb	
Front fender bolts	3.9	0.4	34.7 in·lb	L
<b>Electrical System:</b>				
Spark plugs	13	1.3	115 in·lb	
Alternator rotor bolt	110	11	81	
Stator coil bolts	11	1.1	95 in·lb	
Alternator lead holding plate bolt	11	1.1	95 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	0.6	53 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	3.4	0.35	30 in·lb	
Radiator fan switch	18	1.8	13	
Water temperature sensor	25	2.5	18	SS
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	0.7	62 in·lb	
Fuel level sensor bolts	6.9	0.7	62 in·lb	
Front brake light switch screw	1.2	0.12	11 in·lb	
Meter mounting screws	1.2	0.12	11 in·lb	
Tail/brake light mounting screws	1.2	0.12	11 in·lb	
License plate light mounting screws	1.2	0.12	11 in·lb	
Headlight mounting bolts	5.9	0.6	53 in·lb	
Starter lockout switch screw	-	-	-	L
Starter motor clutch bolts	12	1.2	104 in·lb	L
Starter relay cable terminal bolts	3.9	0.4	35 in·lb	L
Regulator/rectifier bolts	6.9	0.7	62 in·lb	
Regulator/rectifier bracket bolts	6.9	0.7	62 in·lb	
Speed sensor cover bolts	6.9	0.7	62 in·lb	L



## PERIODIC MAINTENANCE 2-9

### Specifications

Item	Standard	Service Limit
<b>Fuel System:</b> Throttle grip free play Idle speed Bypass screws (turn out) Engine vacuum Air cleaner element	2 ~ 3 mm (0.08 ~ 0.12 in.) 1 100 ± 50 r/min (rpm) 2 ± 1/4 (for reference) 32.7 ± 1.333 kPa (245 ± 10 mm Hg) Paper filter	- - -
<b>Cooling System:</b> Coolant: Type (recommended) Color Mixed ratio Freezing point Total amount	Permanent type of antifreeze Green Soft water 50%, Coolant 50% - 35°C (- 31°F) 2.9 L (3.1 US qt)	
<b>Engine Top End:</b> Valve clearance Inlet Exhaust	0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.) 0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)	
<b>Clutch:</b> Clutch lever free play	2 ~ 3 mm (0.08 ~ 0.12 in.)	- - -
<b>Engine Lubrication System:</b> Engine Oil: 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 disassembled and dry) Between upper and lower level lines (after idling or running)	
<b>Tires:</b> Tread depth: Front BRIDGESTONE  Rear BRIDGESTONE	3.4 mm (0.13 in.)  5.8 mm (0.23 in.)	1 mm (0.04 in.) 1.6 mm (0.063 in.) (DE, AT, CH)  Up to 130 km/h (80 mph): 2 mm (0.08 in.) Over 130 km/h (80 mph): 3 mm (0.12 in.)

## 2-10 PERIODIC MAINTENANCE

### Specifications

Item	Standard	Service Limit
Air pressure: (when cold)		
Front	Up to 180 kg (396 lb) load: 250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi)	---
Rear	Up to 180 kg (396 lb) load: 290 kPa (2.9 kgf/cm <sup>2</sup> , 41 psi)	---
<b>Final Drive:</b>		
Drive chain slack	20 ~ 30 mm (0.8 ~ 1.2 in.)	---
Drive chain (20-link length)	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
<b>Brakes:</b>		
Brake fluid:		
Grade	DOT4	---
Brake pad lining thickness:		
Front	4 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5 mm (0.20 in.)	1 mm (0.04 in.)
Brake light timing:		
Front	Pulled ON	---
Rear	ON after about 10 mm (0.39 in.) of pedal travel	---
<b>Electrical System:</b>		
Spark plug gap	0.7 ~ 0.8 mm (0.028 ~ 0.031 mm)	---

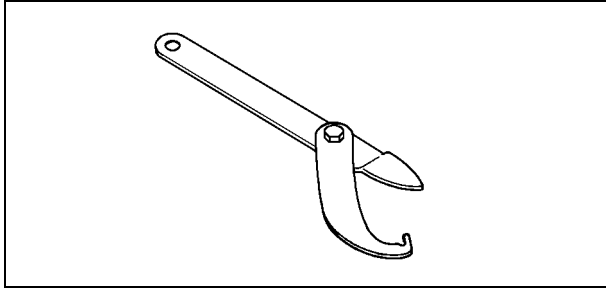
AT: Republic of Austria

CH: Swiss Confederation

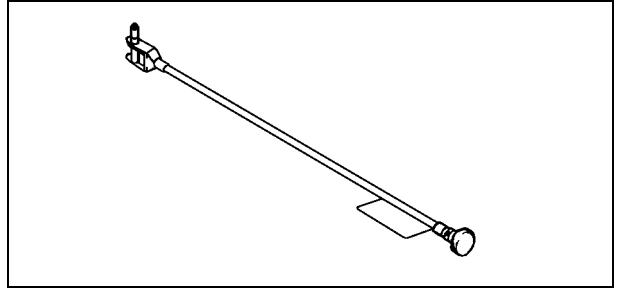
DE: Federal Republic of Germany

Special Tools

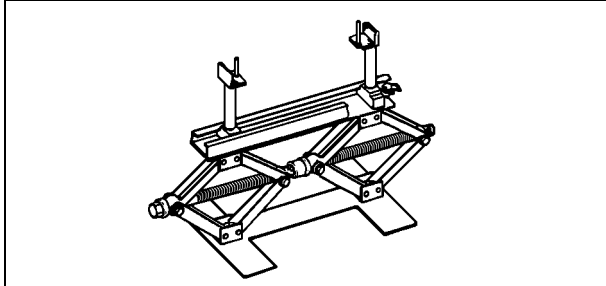
Steering Stem Nut Wrench:  
57001-1100



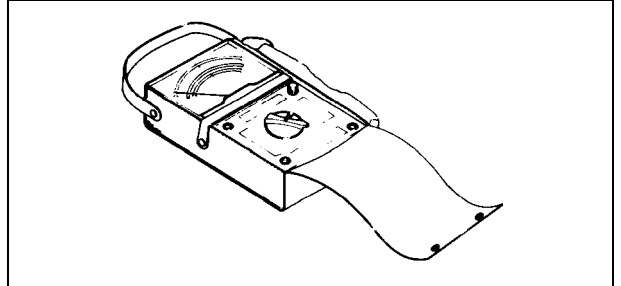
Pilot Screw Adjuster, C:  
57001-1292



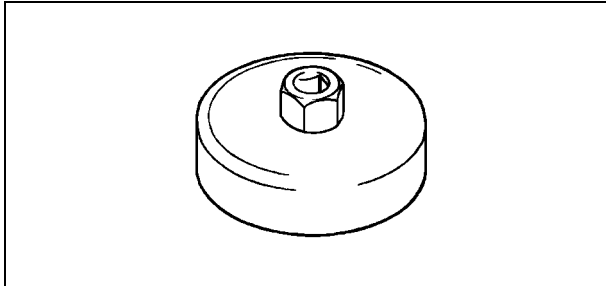
Jack:  
57001-1238



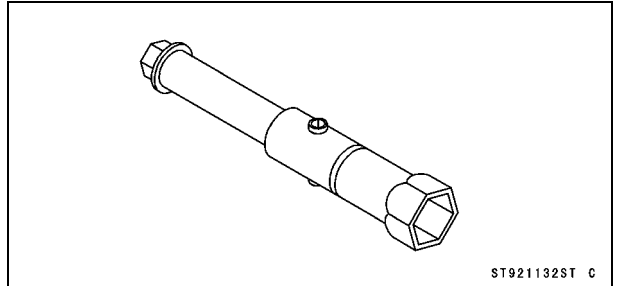
Hand Tester:  
57001-1394



Oil Filter Wrench:  
57001-1249



Spark Plug Wrench (Owner's Tool):  
92110-1132



## 2-12 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Fuel System (DFI)

##### Fuel Hose and Connection Inspection

○The fuel hoses are 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 hoses.

★Replace the 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]

● 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.).

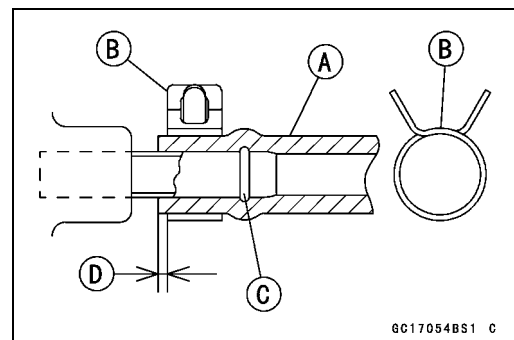
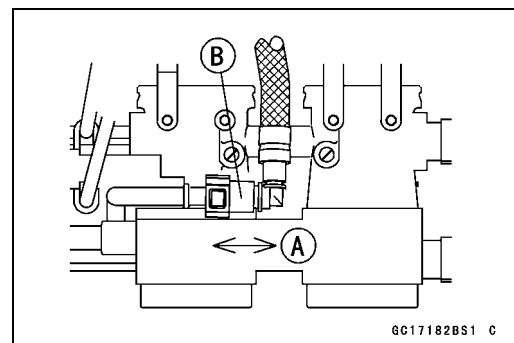
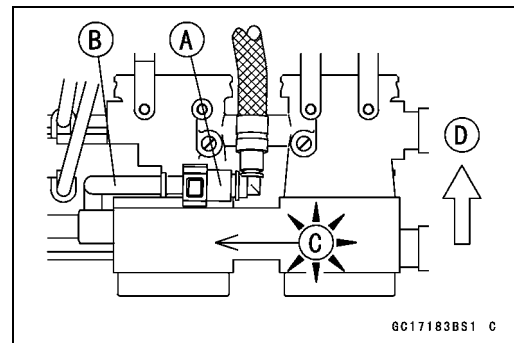
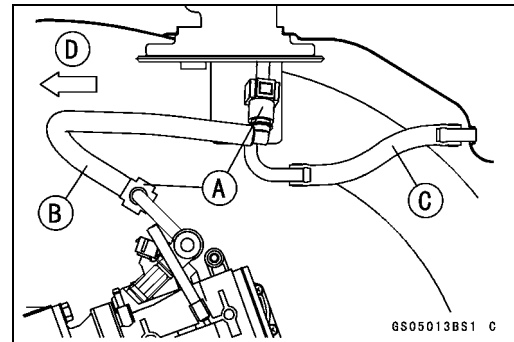
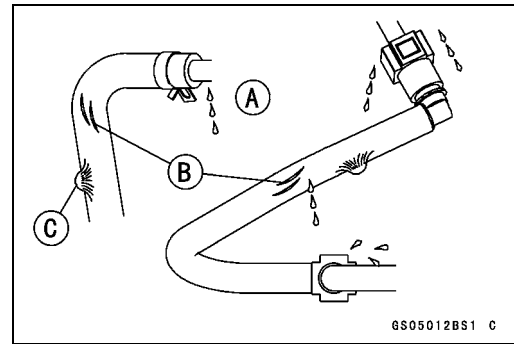
★If it does not slide, reinstall the hose joint.

#### **⚠ 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]



**Periodic Maintenance Procedures**

*Throttle Control System Inspection*

**Throttle Grip Play Inspection**

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

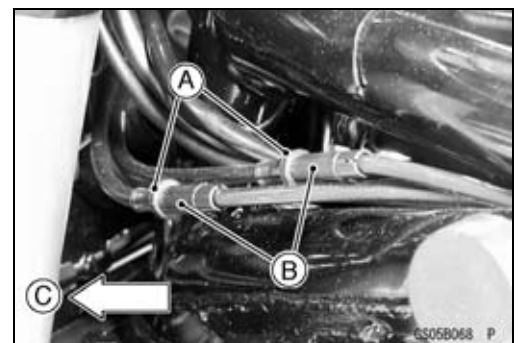
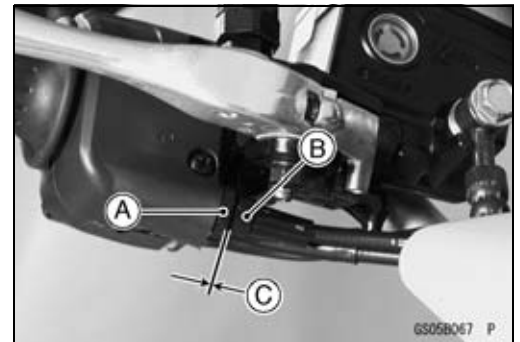
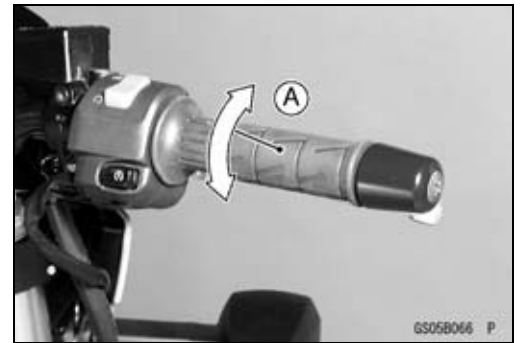
**Throttle Grip Free Play**

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

- Check that the throttle grip moves smoothly from close to full open, and the throttle closes quickly and completely in all steering positions by the return spring.
- ★ If the throttle grip doesn't return properly, check the throttle cable routing, grip free play, and cable damage. Then lubricate the throttle cable.
- Run the engine at the idle speed, and turn the handlebar all the way to the right and left to ensure that the idle speed doesn't change.
- ★ If the idle speed increases, check the throttle grip free play and the cable routing.
- ★ If necessary, adjust the throttle cable as follows.
  - Loosen the locknut [A] (right-front view).
  - Turn the adjuster [B] until the proper amount of free play can be obtained.
  - Tighten [C] the locknut against the adjuster securely.
- ★ If the throttle grip free play cannot 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.
  - Remove the fuel tank (see Fuel System (DFI) chapter).
  - 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.

Front [C]

- ★ If the throttle grip free play cannot be adjusted with the lower adjusters, use the adjuster at the upper end of the cable again.



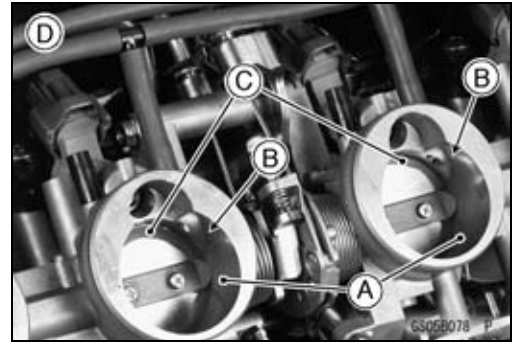
## 2-14 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Throttle Bore Cleaning

- Check the throttle bore for cleanliness as follows:
  - Remove the throttle body assy (see Fuel System (DFI) chapter).
  - Check the main throttle valves and throttle bores [A] for carbon deposits by opening the main valves.
  - ★ If any carbon accumulates, wipe the carbon off the throttle bores and throttle valves, using a cotton pad [B] penetrated with a high-flash point solvent. Be careful not to remove molybdenum disulfide coat (black) [C] from the throttle valves and the bores.

Front of Throttle Body [D]



#### CAUTION

**Do not rub these surfaces hard and do not use a carburetor cleaning solution, which damage molybdenum disulfide coat; instead, use a high-flash point cleaning solution and wipe slowly.**

#### Idle Speed Inspection

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

#### ⚠ WARNING

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

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

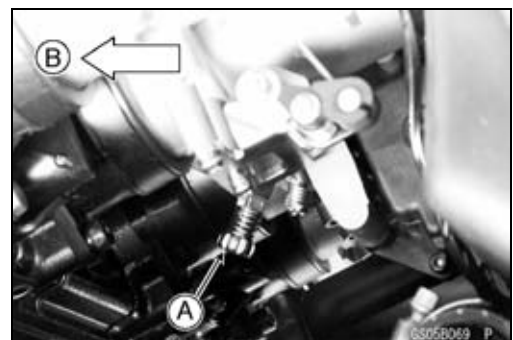
#### Idle Speed

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.

Front [B]



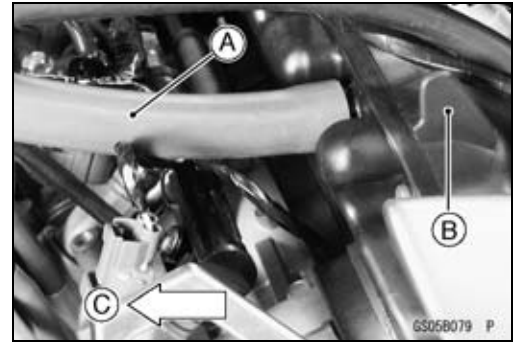
**Periodic Maintenance Procedures**

*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.

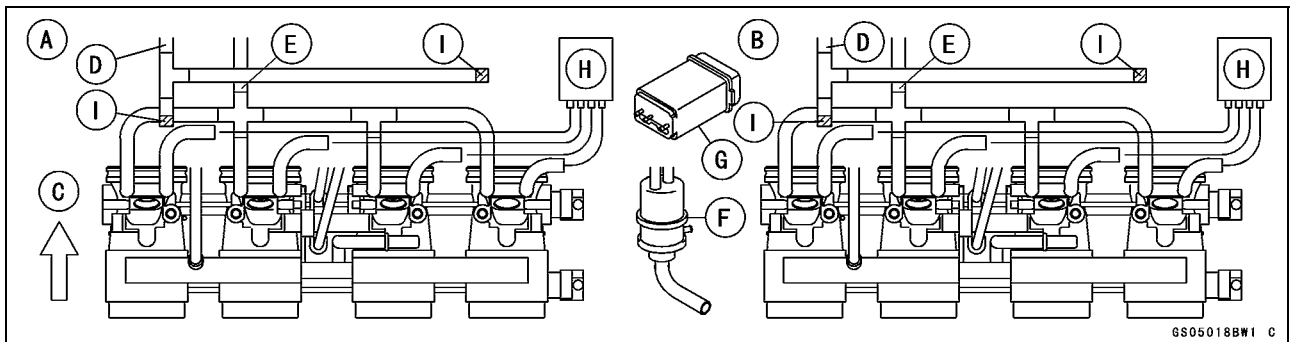
- Situate the motorcycle so that it is vertical.
- Remove the fuel tank (see Fuel System (DFI) chapter).
- Pull off the vacuum hoses and the rubber cap (s) from the right fitting of each throttle body.
- Pull off the vacuum switch valve hose (thick) [A] from the air cleaner housing [B].  
Front [C]



**CAUTION**

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

- Connect a commercially available vacuum gauge to these right fittings of the throttle body as shown.
- 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 Hoses of Throttle Assy (see the next figure)



- |                      |                                     |                 |
|----------------------|-------------------------------------|-----------------|
| A. Except California | D. Vacuum Switch Valve Hose (small) | G. Canister     |
| B. California        | E. Inlet Air Pressure Sensor Hose   | H. Vacuum Gauge |
| C. Front             | F. Separator                        | I. Plugs        |

## 2-16 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Install the fuel tank (see Fuel System (DFI) chapter).
- Start the engine and warm it up thoroughly.
- Check the idle speed.  
Tachometer [A]
- ★ 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].  
Front [C]

#### Engine Vacuum

**Standard:  $32.7 \pm 1.333$  kPa ( $245 \pm 10$  mmHg) at Idle Speed  $1100 \pm 50$  r/min (rpm)**

- ★ If any vacuum is not within the specifications, first synchronize the #3 and #4 throttle valves to the #1 and #2 throttle valves by using the center adjusting screw [A].

**Special Tool - Pilot Screw Adjuster, C: 57001-1292 [B]**

Front [C]

#### Example:

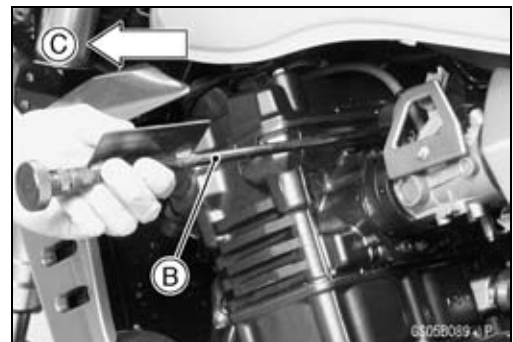
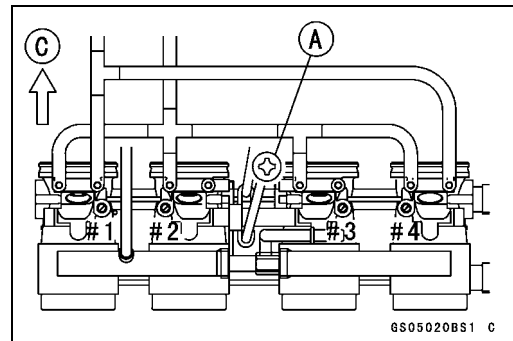
- #1: 165 mmHg
- #2: 190 mmHg
- #3: 170 mmHg
- #4: 200 mmHg

- With the engine at the correct idle speed, equalize the highest vacuum of #3 and #4 (example 200 mmHg) to the highest vacuum of #1 and #2 (example 190 mmHg) by turning the center adjusting screw.

#### NOTE

○ After adjustment, the final vacuum measurement between the highest throttle valves may not be 200 mmHg (in this example). The goal is to have the highest two vacuums between the left (1 and 2) and right (3 and 4) banks be the same.

- Open and close the throttle after each measurement and adjust the idle speed as necessary.
- 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 synchronization, adjust the bypass screws [A].

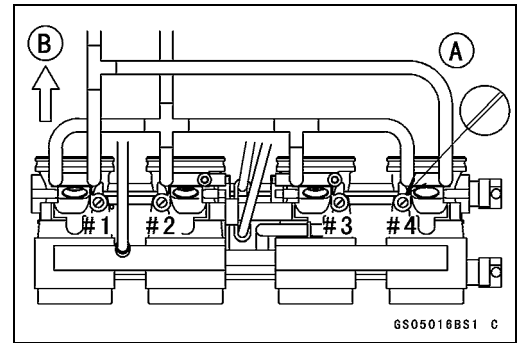
Front [B]

**Special Tool - Pilot Screw Adjuster, C: 57001-1292**

- Adjust the lowest vacuum between #1 and #2 to the highest of #1 and #2.
- Adjust the lowest vacuum between #3 and #4 to the highest of #3 and #4.
- Open and close the throttle 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 cannot be adjusted within the specification, remove the bypass screws #1 ~ #4 and clean them.

○Turn in the bypass screw and count the number of turns until it seats fully but not tightly. Record the number of turns.

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



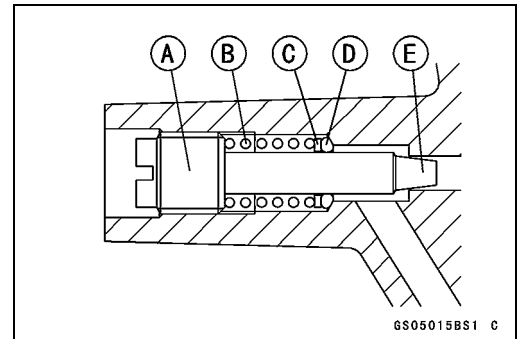
**CAUTION**

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

- 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)**



## 2-18 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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

#### NOTE

○A throttle body has different “turns out” of the bypass screw for each individual unit. When setting the bypass screw, use the “turns out” determined during disassembly. Use the specifications in this manual only if the original number is unknown.

- 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

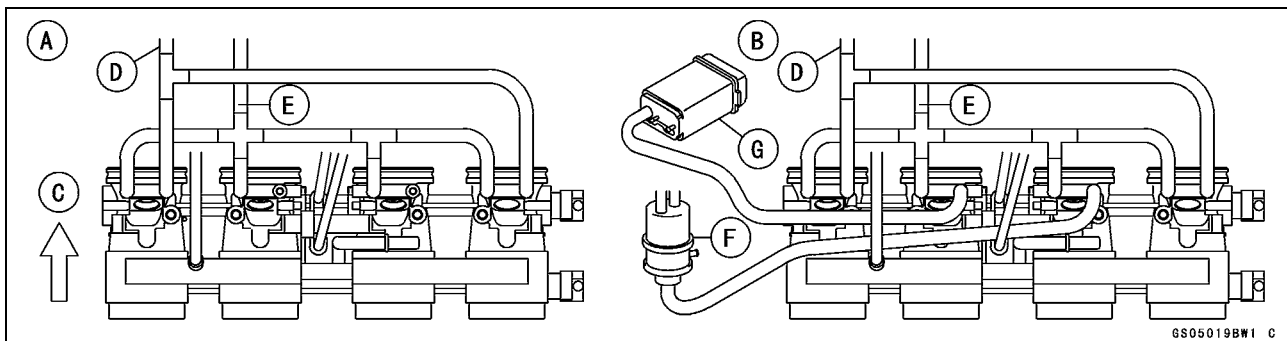
Meter (+) → Y/W lead (terminal 2)

Meter (–) → BR/BK lead (terminal 14)

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).
- Remove the vacuum gauge hoses and install the vacuum hoses and rubber caps on the original position as shown.



A. Except California

B. California

C. Front

D. Vacuum Switch Valve Hose (small)

E. Inlet Air Pressure Sensor Hose

F. Separator

G. Canister

**Periodic Maintenance Procedures**

*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.**

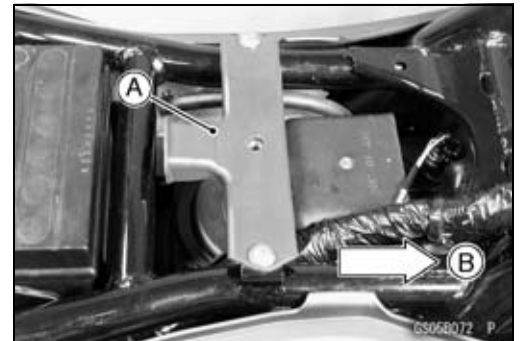
**CAUTION**

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

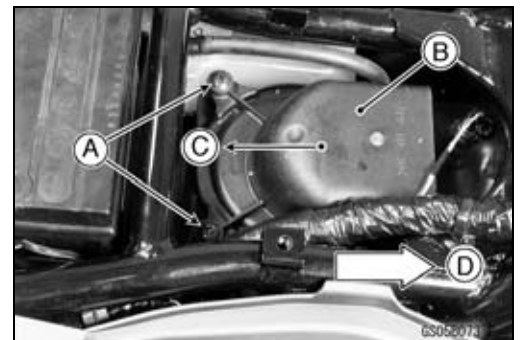
**⚠ WARNING**

**Clean the element in a well-ventilated area, and take care that there are no sparks or flame anywhere near the working area; this includes any appliance with a pilot light.**  
**Because of the danger of highly flammable liquids, do not use gasoline or a low flash-point solvent to clean the element.**

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



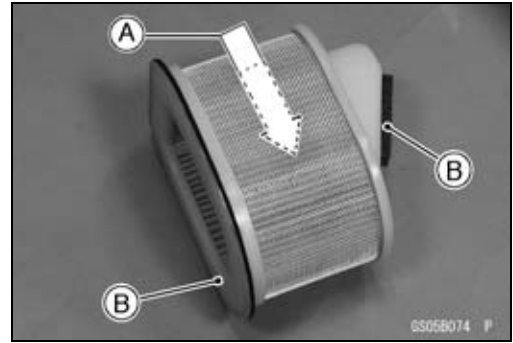
- Remove:  
Screw [A] and Air Cleaner Duct Holder [B]  
Pull it out [C] backwards.  
Front [D]



## 2-20 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

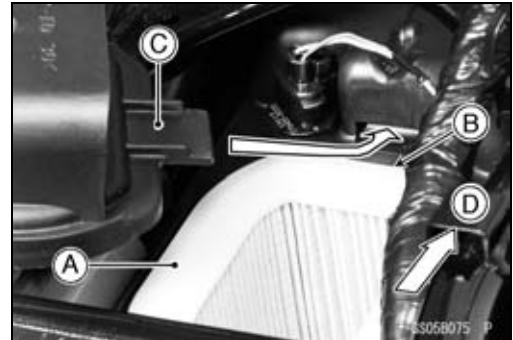
- Clean the element by tapping it lightly to loosen dust.
- Blow away the remaining dust by applying compressed air [A] from the outside to the inside (from the clean side to the dirty side).
- Visually inspect the element for no tears or no breaks and inspect the sponge gaskets [B] also.
- ★ If the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

Front [D]

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



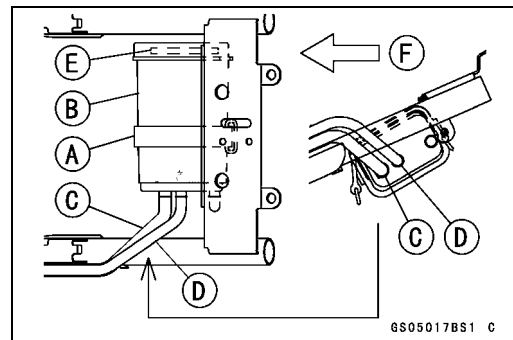
### Evaporative Emission Control System Inspection (CAL)

- Inspect the canister as follows:
  - Remove the rear seat (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 (green) [C] and the canister breather hose (blue) [D] to the canister as shown.
- Install the canister with the inlet [E] down and the rear seat Front [F]

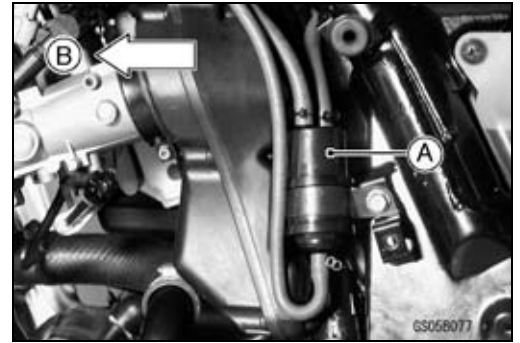


- Check the liquid/vapor separator as follows:
  - Remove the left frame cover [A].



**Periodic Maintenance Procedures**

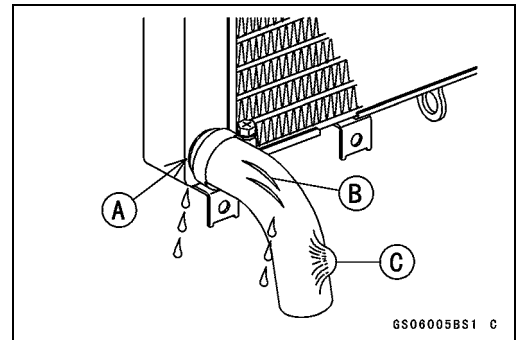
- Disconnect the hoses from the separator, and remove the separator [A] from the motorcycle left side.  
Front [B]
- Visually inspect the separator for cracks and other damage.
- ★ If the separator has any cracks or damage, replace it with a new one.
- To prevent the gasoline from flowing into or out 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**

*Radiator Hose and Connection Inspection*

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



**Torque - Radiator Hose Clamp Screws: 2 N·m (0.2 kgf·m, 17 in·lb)**

*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. 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.  
Front [B]

## 2-22 PERIODIC MAINTENANCE

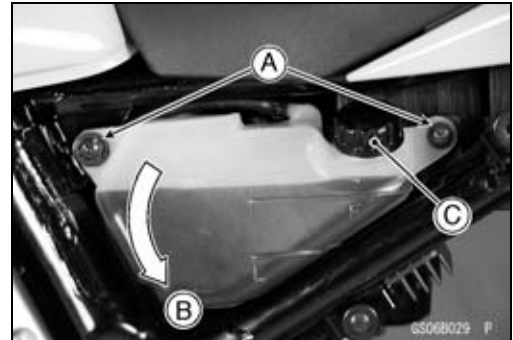
### Periodic Maintenance Procedures

- Remove the 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.  
Front [B]



- 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 N·m ( 0.7 kgf·m, 61 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 scale accumulation in the water passages, and considerably reduces the efficiency of the cooling system.**

#### Water and Coolant Mixture Ratio (when shipping)

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

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

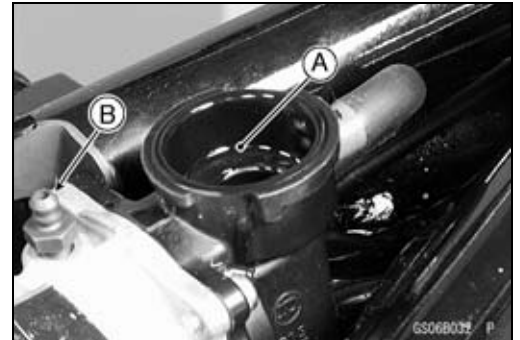


**Periodic Maintenance Procedures**

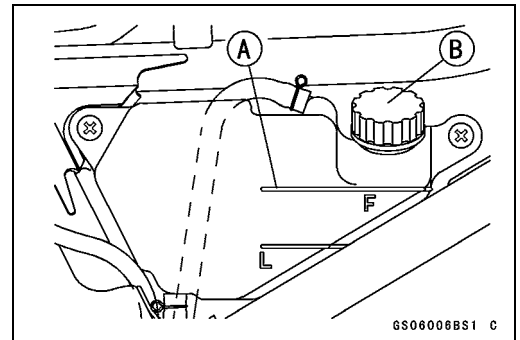
- Loosen the air bleeder bolt [A] on the thermostat housing. Front [B]
- Replenish the coolant into the radiator until the coolant begins to flow out the air bleeder bolt hole (that is, all the remaining air is forced out).
- Tap the radiator hoses to force any air bubbles caught inside.



- Fill the radiator up to the filler neck [A] with coolant.
  - Tighten the air bleeder bolt [B].
- Torque - Thermostat Air Bleeder Bolt: 7.8 N·m (0.80 kgf·m, 69 in·lb)**



- 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 and warm it up thoroughly until the radiator fan turns on and then stop the engine.
  - Check the coolant level in the reserve tank several times while the engine is cooling down, and replenish as necessary.
- ★ If the coolant level is lower than the “L” level line, add coolant to the “F” level line.

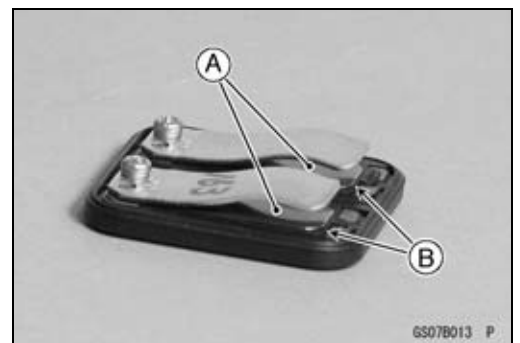


<b>CAUTION</b>
<b>Do not add more coolant above the “F” level line.</b>

**Engine Top End**

*Air Suction Valve Inspection*

- Remove the air suction valve (see Air Suction Valve Removal in the 5. 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.



<b>CAUTION</b>
<b>Do not scrape off the deposits with a scraper as this could damage the rubber, requiring replacement of the suction valve assembly.</b>

## 2-24 PERIODIC MAINTENANCE

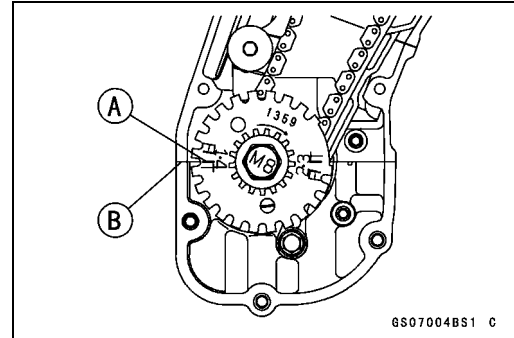
### Periodic Maintenance Procedures

#### Valve Clearance Inspection

##### NOTE

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

- Remove:
  - Lower Fairings (see Frame chapter)
  - Pickup Coil Cover
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
- Position the crankshaft at 1,4 piston TDC.
  - TDC Mark [A] for #1, 4 Pistons
  - Timing Mark [B]



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

##### Valve Clearance

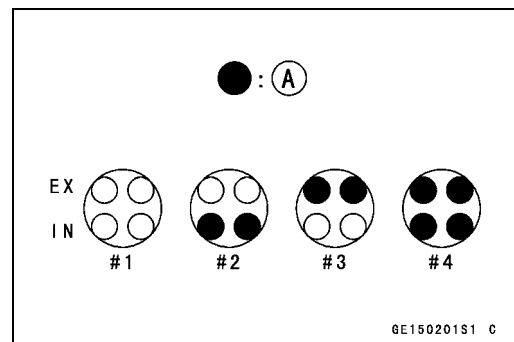
Standard: IN: 0.15 ~ 0.24 mm (0.0059 ~ 0.0094 in.)

EX: 0.22 ~ 0.31 mm (0.0087 ~ 0.0122 in.)



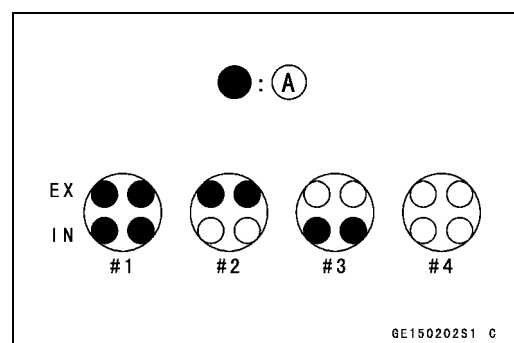
- When positioning #4 piston TDC at the end of the compression stroke:

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.



---

## Periodic Maintenance Procedures

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### *Valve Clearance Adjustment*

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

#### **NOTE**

○ *Mark and record the 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 Camshaft Installation).
- Remeasure any valve clearance that was adjusted. Readjust if necessary.

<b>CAUTION</b>
<p><b>Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.</b></p> <p><b>Do not grind the shim. This may cause it to fracture, causing extensive engine damage.</b></p>

# 2-26 PERIODIC MAINTENANCE

## Periodic Maintenance Procedures

### VALVE CLEARANCE ADJUSTMENT CHART INLET VALVE

INLET																					
Part No. (92180)	PRESENT SHIM																				
	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
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	2.85	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																				

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.

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
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	
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	
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		
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			
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				
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					
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						
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							
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								
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									
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										
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											
0.80 ~ 0.84	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50												
0.85 ~ 0.89	3.10	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50													
0.90 ~ 0.94	3.15	3.20	3.25	3.30	3.35	3.40	3.45	3.50														
0.95 ~ 0.99	3.20	3.25	3.30	3.35	3.40	3.45	3.50															
1.00 ~ 1.04	3.25	3.30	3.35	3.40	3.45	3.50																
1.05 ~ 1.09	3.30	3.35	3.40	3.45	3.50																	
1.10 ~ 1.14	3.35	3.40	3.45	3.50																		
1.15 ~ 1.19	3.40	3.45	3.50																			
1.20 ~ 1.24	3.45	3.50																				
1.25 ~ 1.29	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.

## 2-28 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

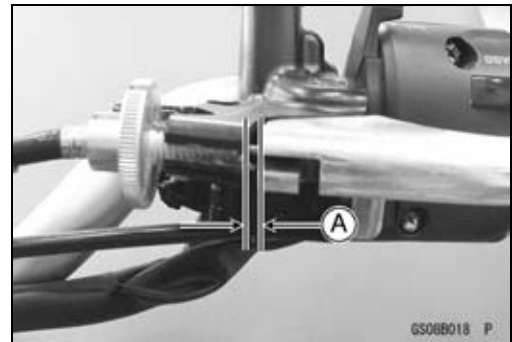
#### Clutch

##### Clutch Adjust 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

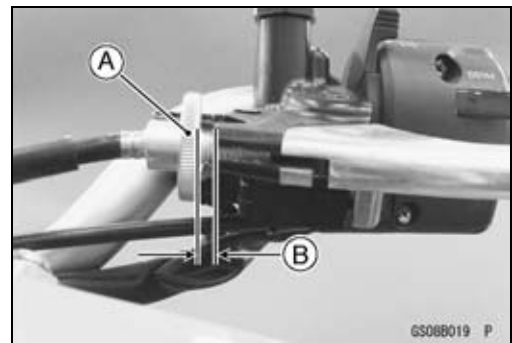
Standard: 2 ~ 3 mm (0.08 ~ 0.12 in.)



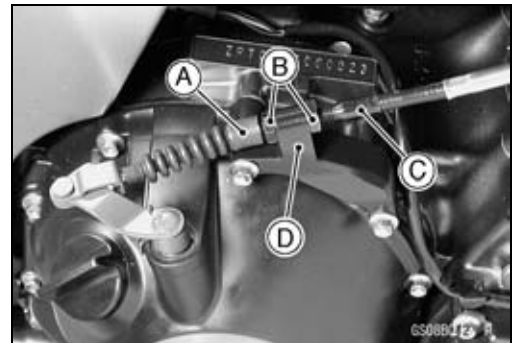
#### **⚠ WARNING**

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 bracket [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.
- ★ 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.

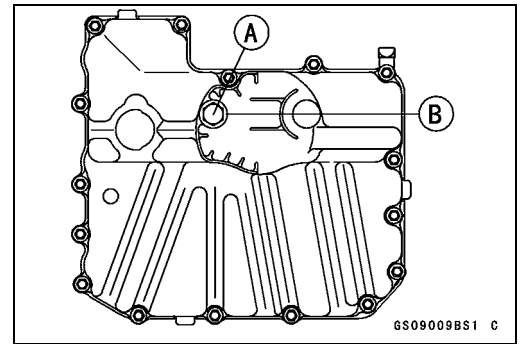


Periodic Maintenance Procedures

Engine Lubrication System

Engine Oil Change

- Situate the motorcycle so that it is vertical after warming up the engine.
  - Remove the engine drain plug [A] to drain the oil.
  - The oil in the oil filter can be drained by removing the filter (see Oil Filter Change).
  - ★ Replace the drain plug gasket [B] with a new one if it is damaged.
  - Tighten the drain plug.
- Torque - Engine Drain Plug: 20 N·m (2.0 kgf·m, 14.5 ft·lb)**
- Pour in the specified type and amount of oil.

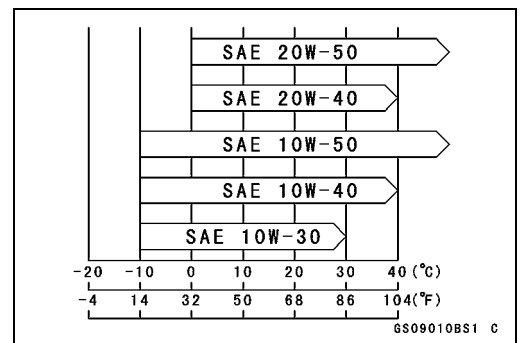


Engine Oil

- Grade: API SE, SF or SG  
API SH or SJ with JASO MA
- Viscosity: SAE 10W-40
- Amount: 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)

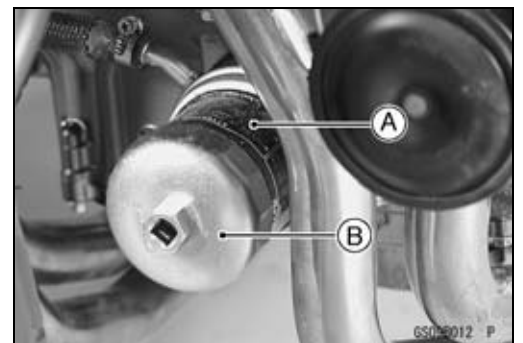
NOTE

○ Depending on the atmospheric temperature of your riding area, the engine oil viscosity should be changed according to the chart.



Oil Filter Change

- Drain the engine oil (see Engine Oil Change).
  - Remove:
    - Lower Fairing (see Frame chapter)
  - Remove the oil filter [A] with the oil filter wrench [B].
- Special Tool - Oil Filter Wrench: 57001-1249**

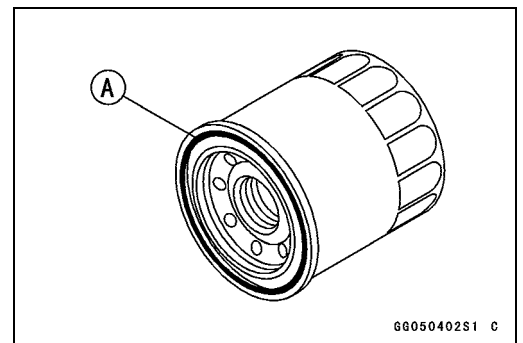


- Replace the filter with a new one.
- Apply engine oil to the gasket [A] before installation.
- Tighten the filter with the oil filter wrench.

- Torque - Oil Filter (P/No. 16097-1070): 27 N·m (2.8 kgf·m, 20 ft·lb)**
- Oil Filter (P/No. 16097-0002): 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).

## 2-30 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

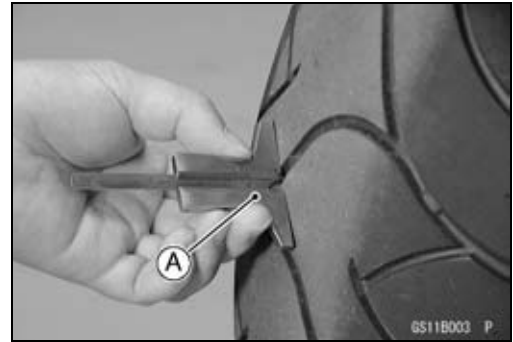
#### Wheels/Tires

##### *Tire 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.

- Remove any imbedded stones or other foreign particles from the tread.
- Visually inspect the tire for cracks and cuts, replacing the tire in case of damage. Swelling or high spots indicate internal damage, requiring tire replacement.
- 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.



#### Tread Depth

##### Front:

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

##### 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.

**Periodic Maintenance Procedures**

*Air Pressure Inspection/Adjustment*

- 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 (396 lb)	250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi)
Rear		290 kPa (2.9 kgf/cm <sup>2</sup> , 41 psi)

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

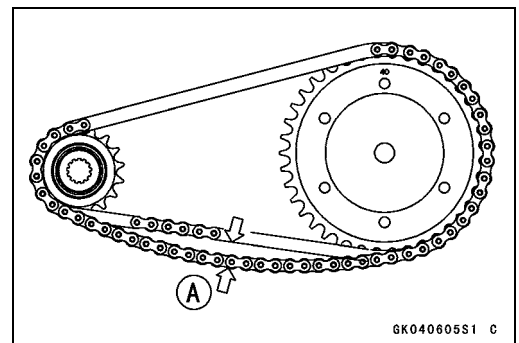
**Torque - Air Valve Cap: 0.15 N·m (0.015 kgf·m, 1.3 in·lb)**

**Final Drive**

*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.

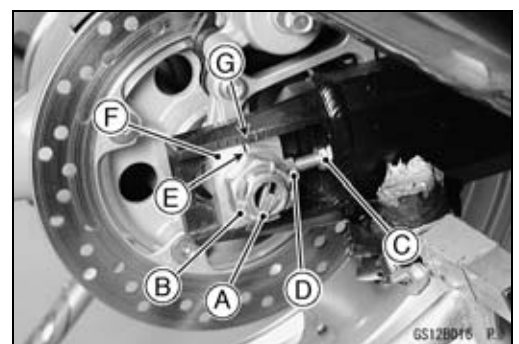


**Chain Slack**

**Standard: 20 ~ 30 mm (0.8 ~ 1.2 in.)**

*Drive Chain Slack Adjustment*

- Remove the cotter pin [A], and loosen the axle nut [B].
- Loosen the both chain adjuster locknuts [C].
- ★ If the chain is too loose, turn out the left and right chain adjuster [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 or position [G] that the right indicator notch aligns with.



**⚠ WARNING**

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

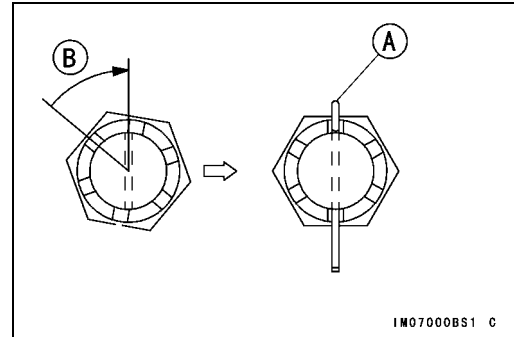
## 2-32 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- Tighten both chain adjuster locknuts securely.
- Tighten the axle nut.  
**Torque - Rear Axle Nut: 127 N·m (13 kgf·m, 94 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

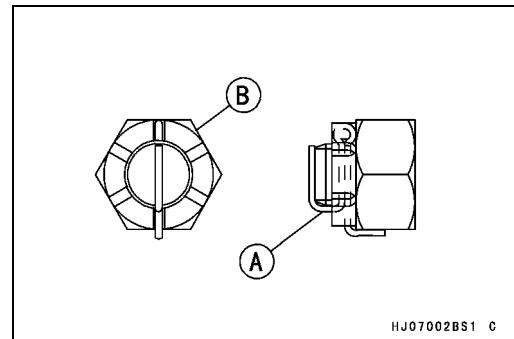
- When inserting the cotter pin, if the slots in the nut do not align with the cotter pin hole in the axle, tighten the nut clockwise [B] up to next alignment.
- It should be within 30 degree.
- Loosen once and tighten again when the slot goes past the nearest hole.



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

#### **⚠ WARNING**

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

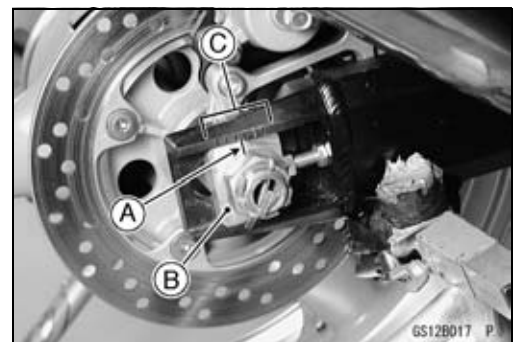


#### Wheel Alignment Inspection/Adjustment

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

#### NOTE

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

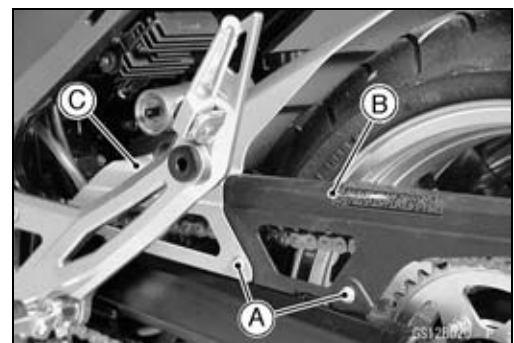


#### **⚠ WARNING**

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

#### Drive Chain Wear Inspection

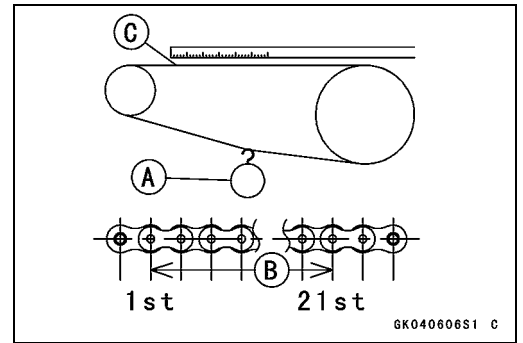
- Remove:
  - Left Side Muffler Body (see Engine Top End chapter)
  - Chain Cover Screws [A]
  - Chain Cover [B]
  - Mud Guard [C] (see Frame chapter)





**Periodic Maintenance Procedures**

- 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: EK525MVXL2  
 Link: 112 Links

*Drive Chain Lubrication*

- 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.

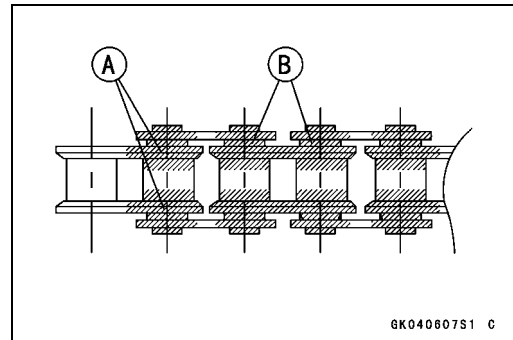
Immediately blow the chain dry with compressed air after cleaning.

Complete cleaning and drying the chain within 10 minutes.

## 2-34 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- 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-ring [B]



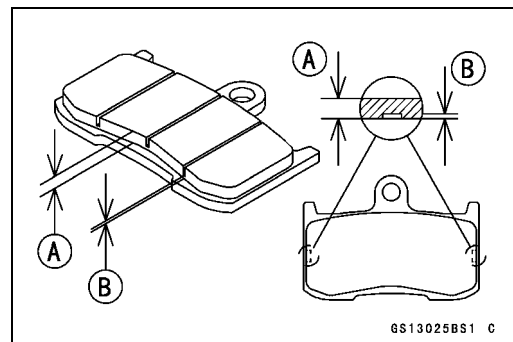
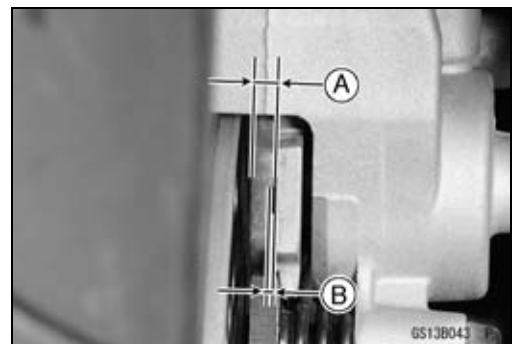
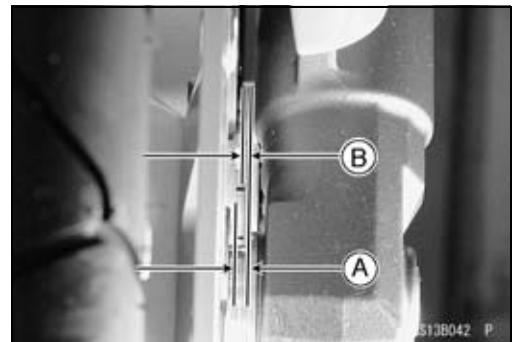
### Brakes

#### 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 mm (0.16 in.)
	Rear	5 mm (0.20 in.)
Service Limit:		1 mm (0.04 in.)



#### Rear Brake Light Switch Inspection/Adjustment

- Turn on the ignition switch.
- Check the operation of the rear brake light switch by depressing the brake pedal. The brake light should go on after about **10 mm (0.39 in.)** of the pedal travel [A].



**Periodic Maintenance Procedures**

- ★ If it does not, adjust and inspect 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.**



- Remove the right side cover (see Frame chapter).
- Disconnect the connector [A].
- Using a hand tester, inspect to see that only the connection shown in the table have continuity (about zero ohms).

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

**Rear Brake Light Switch Connections:**

	BR	BL
When brake pedal is pushed down	○ — ○	
When brake pedal is released		



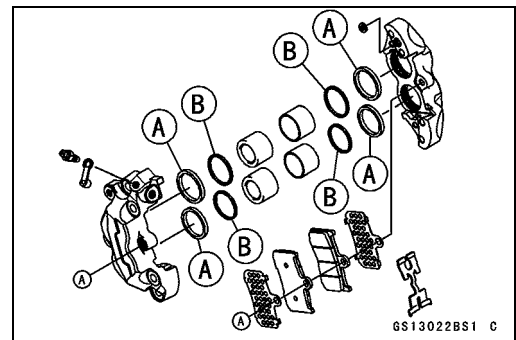
- ★ If the switch has an open or short, replace it with a new one.

**Caliper Fluid Seal Damage**

The fluid seals [A] around the piston maintain the proper pad/disc clearance. If the seals are not satisfactory, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

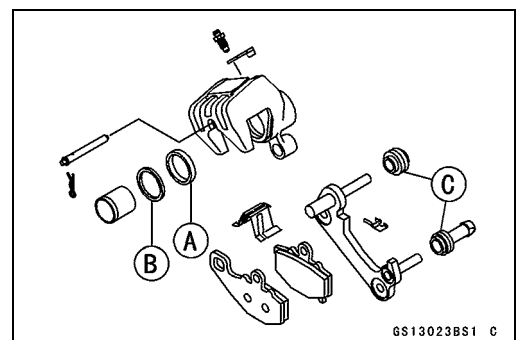
- Replace the fluid seals under any of the following conditions; (a) fluid leakage around the pad; (b) brakes over-heat (c) there is a large difference in inner and outer pad wear; (d) the seal is stuck to the piston.

- ★ If the fluid seal is replaced, replace the dust seal [B] as well. Also, replace all seals every other time the pads are changed.



**Caliper Dust Seal/Friction Boot Damage**

- Check that the dust seals [B] and friction boot [C] are not cracked, worn, swollen, or otherwise damaged.
- If they show any damage, remove the caliper bracket and replace them.



## 2-36 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

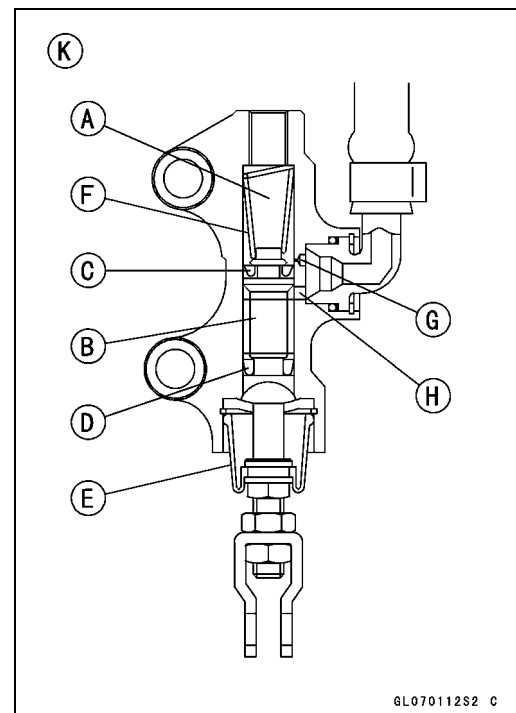
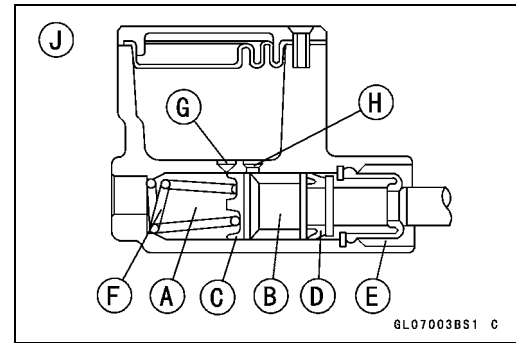
#### Master Cylinder Inspection (Visual Inspection)

- 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]



**Periodic Maintenance Procedures**

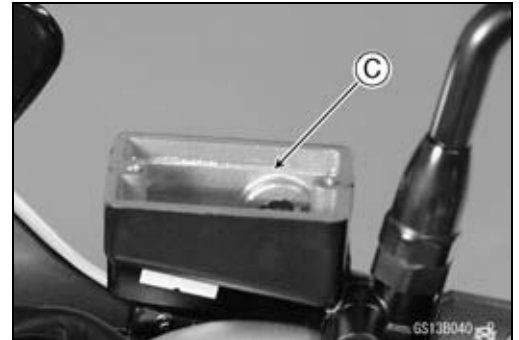
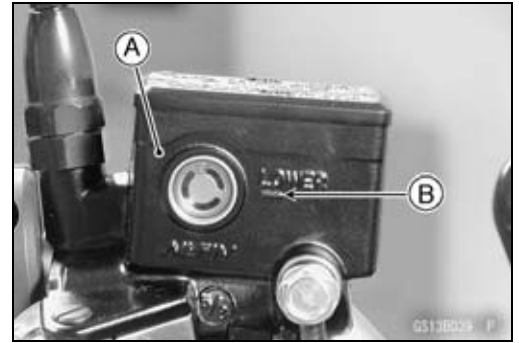
*Level Inspection*

- 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**

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



*Brake Fluid Change*

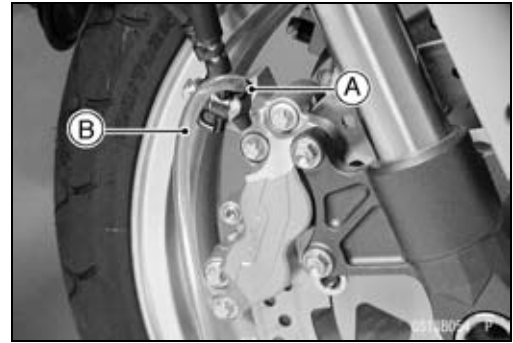
**NOTE**

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

## 2-38 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

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



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

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

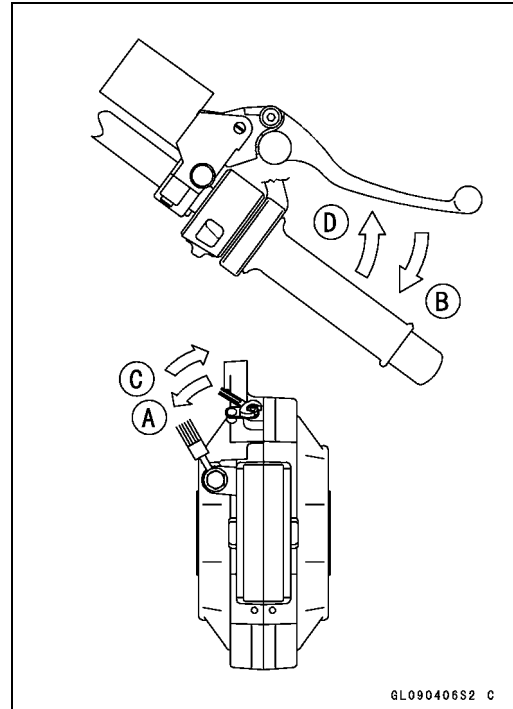
#### NOTE

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

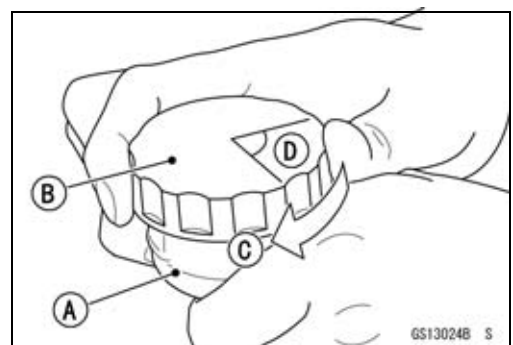
- Remove the clear plastic hose.
- Install the reservoir cap.
- Tighten:

**Torque - Front Reservoir Cap Screw: 1.5 N·m (0.15 kgf·m, 13 in·lb)**

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



GL090406S2 C



GS13024B S

- 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.

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## Periodic Maintenance Procedures

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### *Brake Line Bleeding*

The brake fluid has a very low compression coefficient so that almost all the movement of the brake lever or pedal is transmitted directly to the caliper for braking action. Air, however, is easily compressed. When air enters the brake lines, brake lever or pedal movement will be partially used in compressing the air. This will make the lever or pedal feel spongy, and there will be a loss in braking power.

### **WARNING**

**Be sure to bleed the air from the brake line whenever brake lever or pedal action feels soft or spongy after the brake fluid is changed, or whenever a brake line fitting has been loosened for any reason.**

### **NOTE**

○ *The procedure to bleed the front brake line is as follows. Bleeding the rear brake line is the same as for the front brake.*

- Remove the reservoir cap and diaphragm.
- Fill the reservoir with fresh brake fluid to the upper level line in the reservoir.
- With the reservoir cap off, slowly pump the brake lever several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir.
- Bleed the air completely from the master cylinder by this operation.
- Remove the rubber cap from the bleed valve on the caliper.
- Attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.

## 2-40 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- 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:

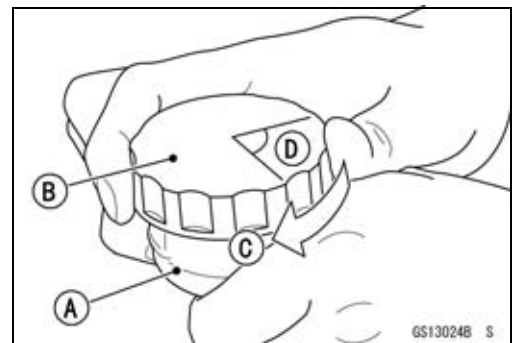
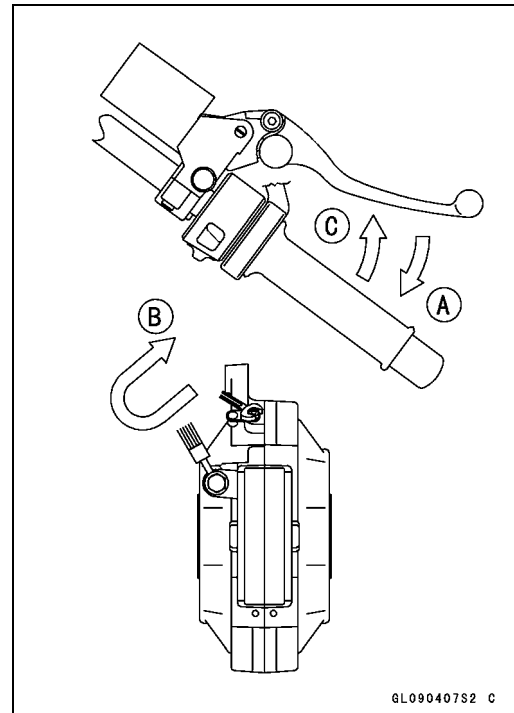
**Torque - Front Reservoir Cap Screw: 1.5 N·m (0.15 kgf·m, 13 in·lb)**

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

- 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.





## Periodic Maintenance Procedures

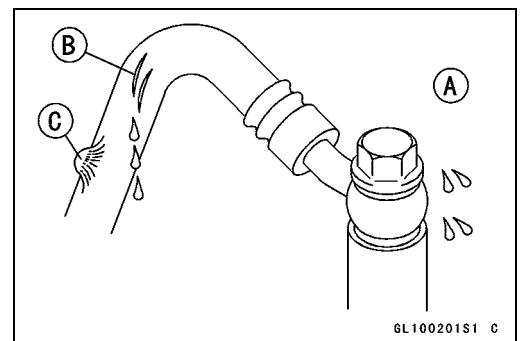
### **⚠ WARNING**

**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 Hoses and Connections Inspection*

- Inspect the brake hose 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 cracks [B] or bulges [C] are noticed.
- ★ Tighten any loose fittings.



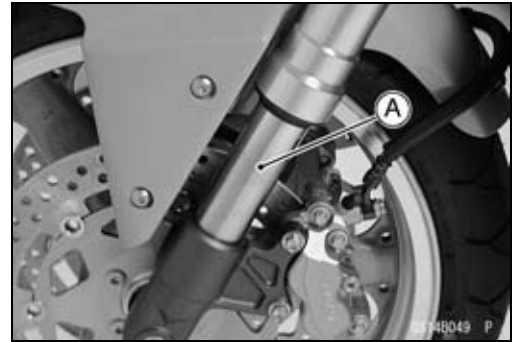
## 2-42 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

#### Suspension

##### *Front Fork Oil Leak Check*

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



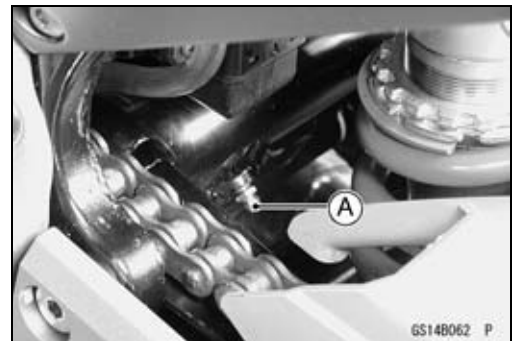
##### *Rear Shock Absorber Oil Leak Check*

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



##### *Swingarm Pivot Lubrication*

- The grease nipple [A] is equipped for the lubrication of swingarm bearing. Force grease into the nipple until the grease comes out from right side of the swingarm pivot, and wipe off any excess of it.



##### *Uni-trak Linkage Lubrication*

In order for the tie-rod and rocker arm to function safely and wear slowly, it should be lubricated in accordance with the Periodic Maintenance Chart.

- For the rocker arm and tie-rod needle bearings, there are grease nipples [A] on the rocker arm and swingarm for lubrication. Force grease into the nipples until it comes out at both sides of the rocker arm and tie-rod, and wipe off any excess.

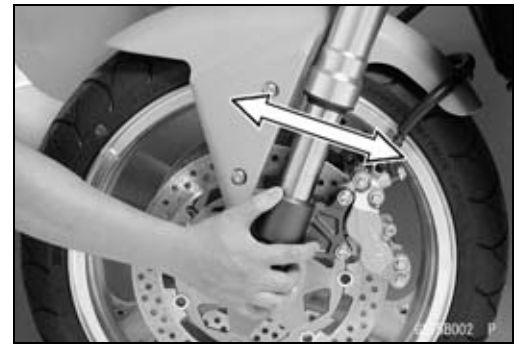


**Periodic Maintenance Procedures**

**Steering**

*Steering Inspection*

- Lift the front wheel off the ground using the jack.
- Special Tool - Jack: 57001-1238**
- 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.

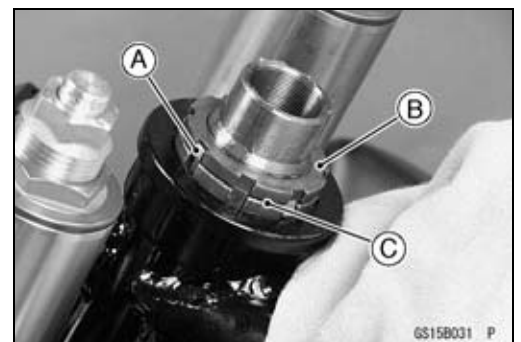
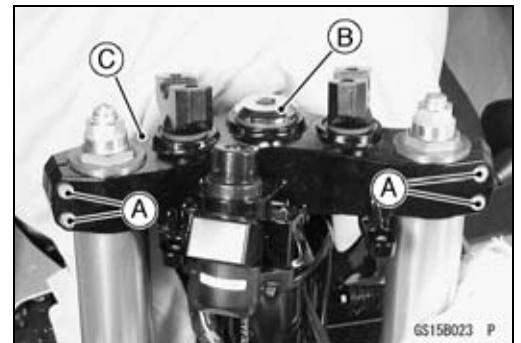


**NOTE**

- *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.*

*Steering Adjustment*

- ★ Adjust the steering, if necessary.
- Remove:
  - Windshield and Bracket (see Frame chapter)
  - Inner Cover (see Frame chapter)
  - Fairing and Bracket (see Frame chapter)
  - Handlebar (see Steering chapter)
- Loosen the upper fork clamp bolts [A] on both side.
- Remove the steering stem head bolt plug and the stem head bolt [B].
- Remove the steering stem head [C].
- Bend the claw washer tabs [A].
- Remove the steering stem locknut [B] and claw washer [C].



## 2-44 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

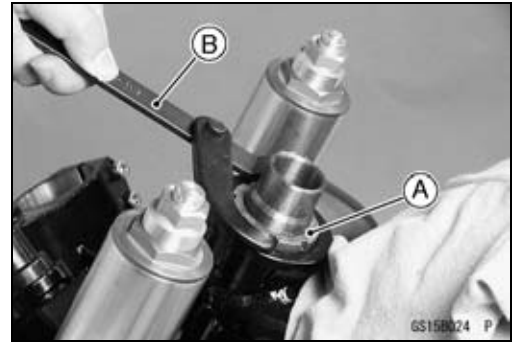
- Adjust the steering.

**Special Tool - Steering Stem Nut Wrench: 57001-1100 [B]**

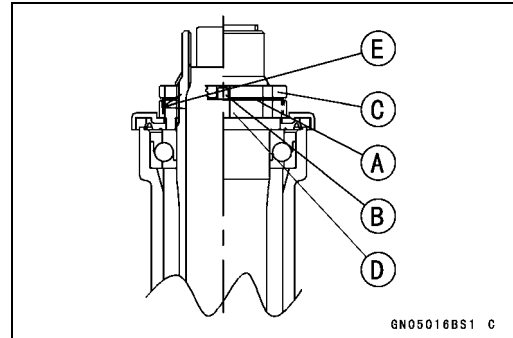
- ★ If the steering is too tight, loosen the stem nut [A] a fraction of a turn.
- ★ If the steering is too loose, tighten the stem nut a fraction of a turn.

#### 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):**

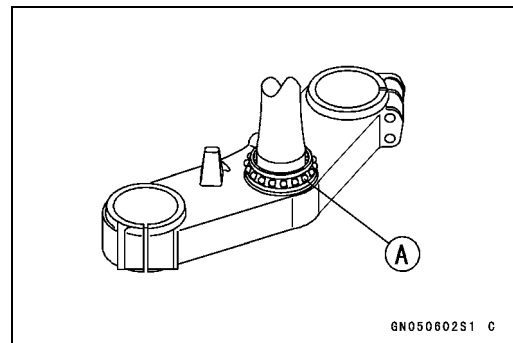
**8.8 N·m (0.90 kgf·m, 78 in·lb)**

**13 N·m (1.3 kgf·m, 113 in·lb) ZR1000-A2 ~**

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

#### Stem Bearing Lubrication

- Remove the steering stem.
- 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

### Spark Plug Cleaning and Inspection

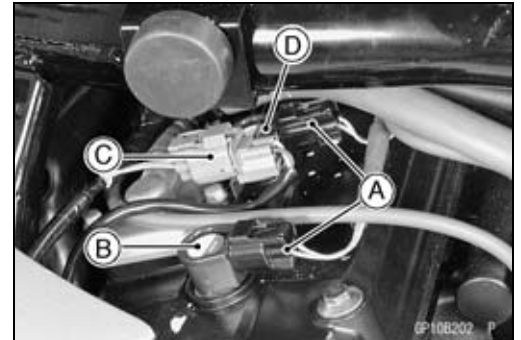
- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)

**Periodic Maintenance Procedures**

- Unscrew the thermostat bracket bolt [A].  
○ If removing the spark plug #2 or #3.



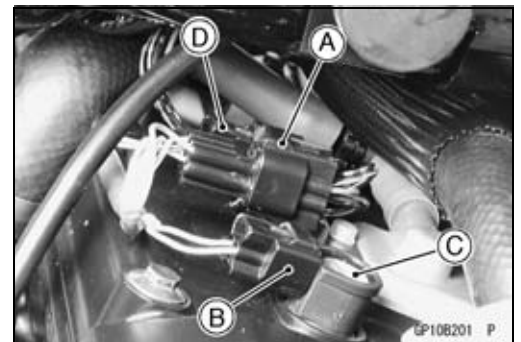
- Disconnect:  
Stick Coil Connectors [A]
- Pull out the stick coil #1 [B].
- Take out the camshaft position sensor connector [C] from the bracket.
- Pull out the stick coil #2 [D].



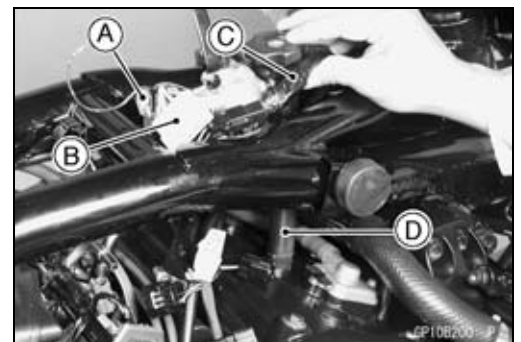
**CAUTION**

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

- Remove the stick coil subharness connector [A] from the bracket.
- Remove:  
Stick Coil Connector #4 [B] (disconnect)  
Stick Coil #4 [C]  
Stick Coil Connector #3 [D] (disconnect)



- Disconnect:  
Water Temperature Sensor Connector [A]  
Left Switch Housing Connector [B]
- Pull the main harness [C] upward and remove the stick coil #3 [D].



- Remove the spark plugs using the 16 mm plug wrench [A].  
**Owner's Tool - Spark Plug Wrench, 16 mm: 92110-1132**



## 2-46 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

- 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 tool.
- ★ If the spark plug center electrode [A] and/or side electrode [B] are corroded or damaged, or if the insulator [C] is cracked, replace the plug. 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.)**

- 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: 92110-1132**

- Tighten:

**Torque - Spark Plugs: 13 N·m (1.3 kgf·m, 113 in·lb)**

- Insert the coils as shown being careful of the coil head [A] direction.

- Fit the coils securely.

#### CAUTION

**Do not tap the coil head while installing the coil.**

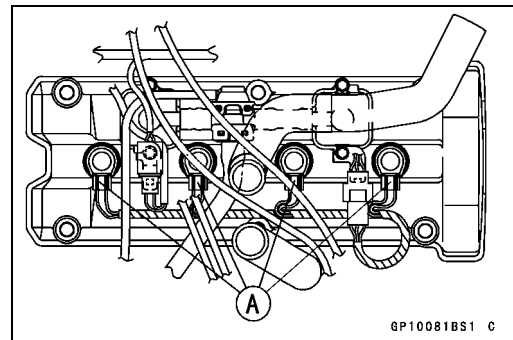
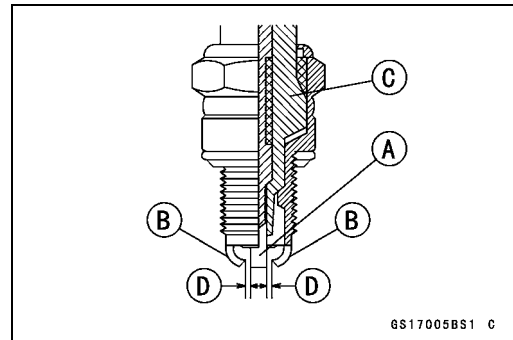
- Be sure the stick coils are installed by pulling up [B] it lightly.

- Connect and/or install the connectors.

- Install:

Fuel Tank (see Fuel System (DFI) chapter)

Thermostat Bracket Bolt (see Cooling System chapter)



**Periodic Maintenance Procedures**

**General Lubrication**

*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**

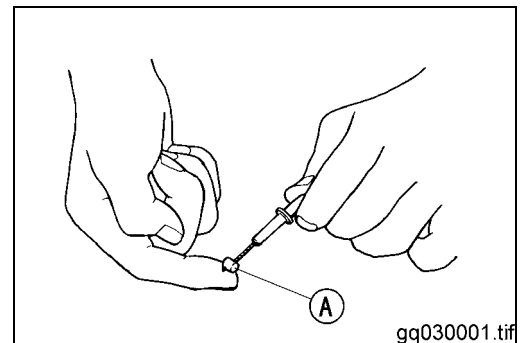
○ *Whenever the vehicle has been operated under wet or rainy conditions, or especially after using a high-pressure water spray, perform the general lubrication.*

**Pivots: Lubricate with Motor Oil**

Rear Brake Rod Joint

**Points: Lubricate with Grease**

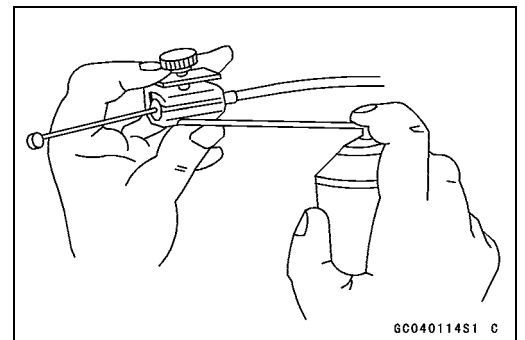
- Throttle and Choke Inner Cable Upper Ends [A]
- Clutch Lever Pivot
- Brake Lever Pivot (Apply silicone grease)
- Brake Pedal Pivot
- Side Stand
- Tie-Rod Pivots
- Rocker Arm Pivots
- Swingarm Pivot



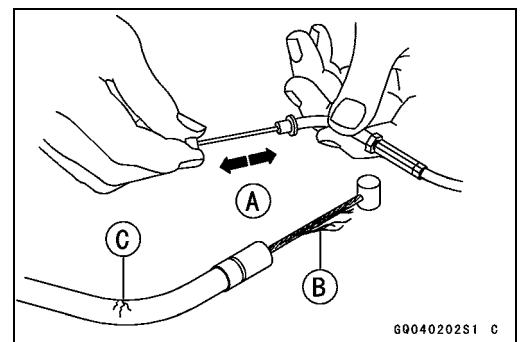
**Cables: Lubricate with Cable Lubricant**

- 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.



## 2-48 PERIODIC MAINTENANCE

### Periodic Maintenance Procedures

---

#### Nut, Bolt, and Fastener Tightness

##### *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.

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

##### Wheels:

- Front Axle
- Front Axle Clamp Bolts
- 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 Bolt
- Rear Shock Absorber Mounting Nuts
- Swingarm Pivot Shaft Nut
- Swingarm Pivot Shaft Lock Nut
- Uni-Trak Link Nuts

##### Steering:

- Stem Head Nut
- Handlebar Clamp Bolts

##### Engine:

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

##### Others:

- Sidestand Bolt
- Footpeg Stay Bolts
- Rear Frame Mounting Bolts



# Fuel System (DFI)

## Table of Contents

Exploded View.....	3-3	Crankshaft Sensor (Service Code 21).....	3-55
DFI Parts Location.....	3-8	Crankshaft Sensor Removal/Installation.....	3-55
DFI Wiring Diagram.....	3-10	Crankshaft Sensor Inspection.....	3-55
Specifications.....	3-12	Camshaft Position Sensor (Service Code 23).....	3-56
Special Tools.....	3-14	Camshaft Position Sensor Removal/Installation.....	3-56
DFI Servicing Precautions.....	3-15	Camshaft Position Sensor Inspection.....	3-56
Troubleshooting the DFI System.....	3-17	Speed Sensor (Service Code 24, 25).....	3-57
Outline.....	3-17	Speed Sensor Removal/Installation.....	3-57
Inquiries to Rider.....	3-21	Speed Sensor Inspection.....	3-57
DFI System Troubleshooting Guide ..	3-24	Input Voltage Inspection.....	3-57
Self-Diagnosis.....	3-33	Output Voltage Inspection.....	3-57
Self-diagnosis Outline.....	3-33	Vehicle-down Sensor (Service Code 31).....	3-59
Self-diagnosis Procedures.....	3-33	Removal.....	3-59
Service Code Clearing Procedures.....	3-34	Installation.....	3-59
How to Read Service Codes.....	3-36	Inspection.....	3-59
How to Erase Service Codes.....	3-36	Subthrottle Sensor (Service Code 32).....	3-62
Service Code Table.....	3-37	Subthrottle Sensor Removal/Adjustment.....	3-62
Backups.....	3-38	Input Voltage Inspection.....	3-62
Main Throttle Sensor (Service Code 11).....	3-40	Output Voltage Inspection.....	3-63
Main Throttle Sensor Removal/Adjustment.....	3-40	Resistance Inspection.....	3-64
Input Voltage Inspection.....	3-40	Stick Coils (#1, #2, #3, #4: Service Code 51, 52, 53, 54).....	3-65
Output Voltage Inspection.....	3-41	Removal/Installation.....	3-65
Resistance Inspection.....	3-42	Input Voltage Inspection.....	3-65
Inlet Air Pressure Sensor (Service Code 12).....	3-43	Subthrottle Valve Actuator (Service Code 62).....	3-67
Removal.....	3-43	Subthrottle Valve Actuator Removal.....	3-67
Installation.....	3-43	Audible Inspection.....	3-67
Input Voltage Inspection.....	3-43	Visual Inspection.....	3-67
Output Voltage Inspection.....	3-44	Resistance Inspection.....	3-67
Inlet Air Temperature Sensor (Service Code 13).....	3-48	Input Voltage Inspection.....	3-68
Removal/Installation.....	3-48	FI Indicator LED Light.....	3-69
Output Voltage Inspection.....	3-48	LED Light Inspection.....	3-70
Sensor Resistance Inspection.....	3-49	ECU.....	3-71
Water Temperature Sensor (Service Code 14).....	3-50	ECU Identification.....	3-71
Removal/Installation.....	3-50	ECU Removal.....	3-71
Output Voltage Inspection.....	3-50		
Sensor Resistance Inspection.....	3-51		
Atmospheric Pressure Sensor (Service Code 15).....	3-52		
Removal.....	3-52		
Input Voltage Inspection.....	3-52		
Output Voltage Inspection.....	3-53		

## 3-2 FUEL SYSTEM (DFI)

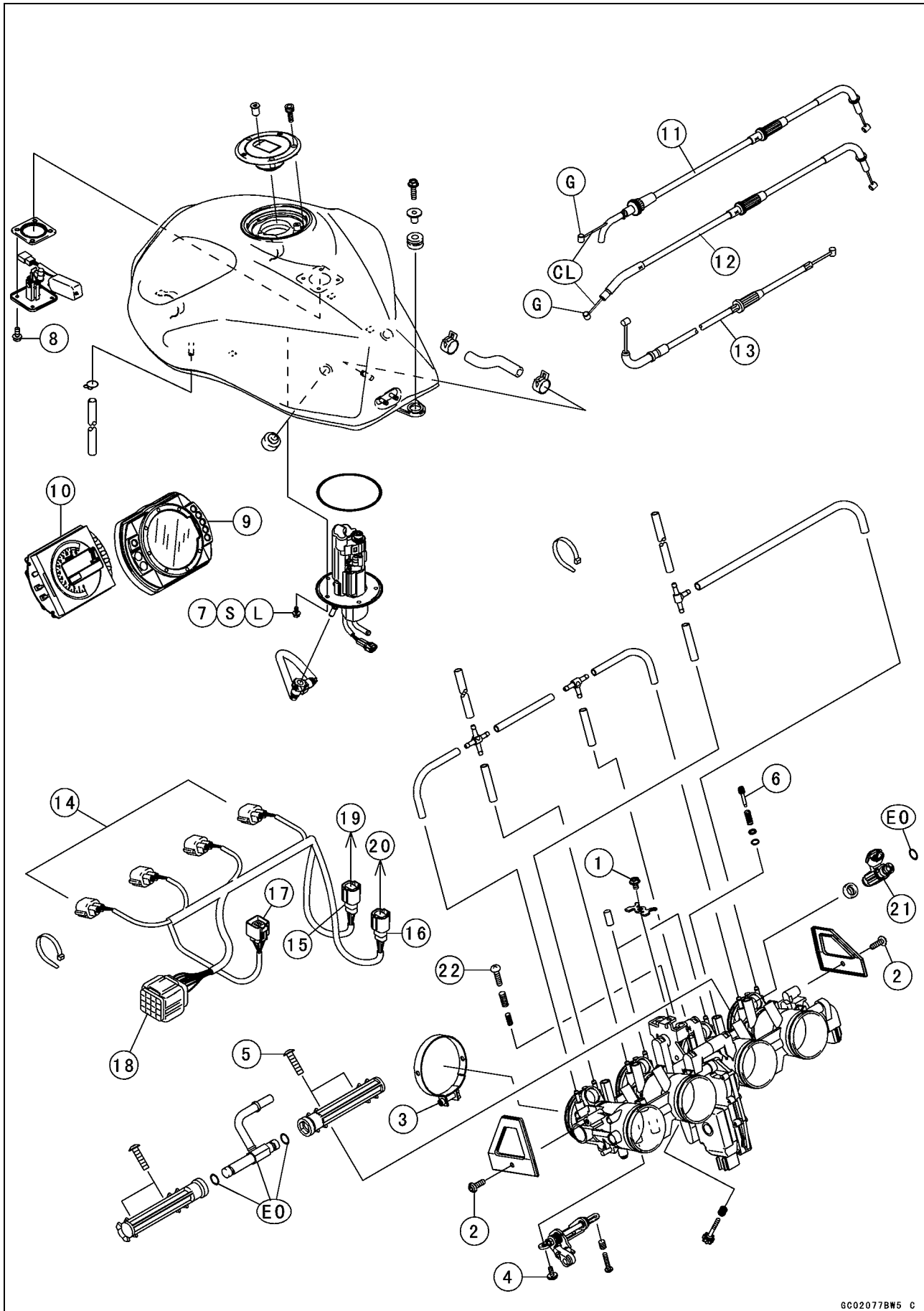
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ECU Installation .....	3-71	Choke Lever Operation.....	3-88
ECU Power Supply Inspection .....	3-72	Choke Lever Play Inspection .....	3-88
DFI Power Source .....	3-74	Choke Lever Play Adjustment.....	3-88
ECU Fuse Removal .....	3-74	Cable Removal/Installation .....	3-88
ECU Fuse Installation .....	3-74	Cable Lubrication and Inspection.	3-88
ECU Fuse Inspection .....	3-74	Throttle Body Assy .....	3-89
ECU Main Relay Removal .....	3-74	Idle Speed Inspection/Adjustment	3-89
ECU Main Relay Inspection .....	3-74	Throttle Bore Cleaning .....	3-89
Fuel Line.....	3-75	Engine Vacuum Synchronization	
Fuel Pressure Inspection .....	3-75	Inspection/Adjustment.....	3-89
Fuel Flow Rate Inspection .....	3-76	High Altitude Performance	
Fuel Pump .....	3-78	Adjustment .....	3-89
Fuel Pump Removal .....	3-78	Throttle Body Assy Removal.....	3-89
Fuel Pump Installation .....	3-78	Throttle Body Assy Installation.....	3-91
Operation Inspection.....	3-79	Throttle Body Assy Disassembly .	3-92
Operating Voltage Inspection.....	3-79	Throttle Body Assy Assembly .....	3-93
Pressure Regulator Removal.....	3-80	Air Cleaner.....	3-94
Pump Screen, Fuel Filter		Element Removal/Installation .....	3-94
Cleaning .....	3-80	Air Cleaner Oil Draining .....	3-94
Fuel Pump Relay Removal .....	3-81	Air Cleaner Housing Removal.....	3-94
Fuel Pump Relay Inspection .....	3-81	Fuel Tank.....	3-95
Fuel Injectors .....	3-82	Fuel Tank Removal .....	3-95
Removal/Installation.....	3-82	Fuel Tank Installation .....	3-97
Audible Inspection.....	3-82	Fuel Tank and Cap Inspection .....	3-98
Power Source Voltage Inspection	3-82	Fuel Tank Cleaning .....	3-98
Output Voltage Inspection.....	3-83	Evaporative Emission Control	
Injector Signal Test.....	3-84	System.....	3-99
Injector Resistance Inspection .....	3-85	Parts Removal/Installation .....	3-99
Injector Unit Test .....	3-85	Canister Installation .....	3-99
Injector Fuel Line Inspection .....	3-85	Hose Inspection .....	3-99
Throttle Grip and Cables .....	3-88	Separator Inspection.....	3-99
Throttle Grip Play		Separator Operation Test.....	3-100
Inspection/Adjustment.....	3-88		



# 3-4 FUEL SYSTEM (DFI)

## Exploded View



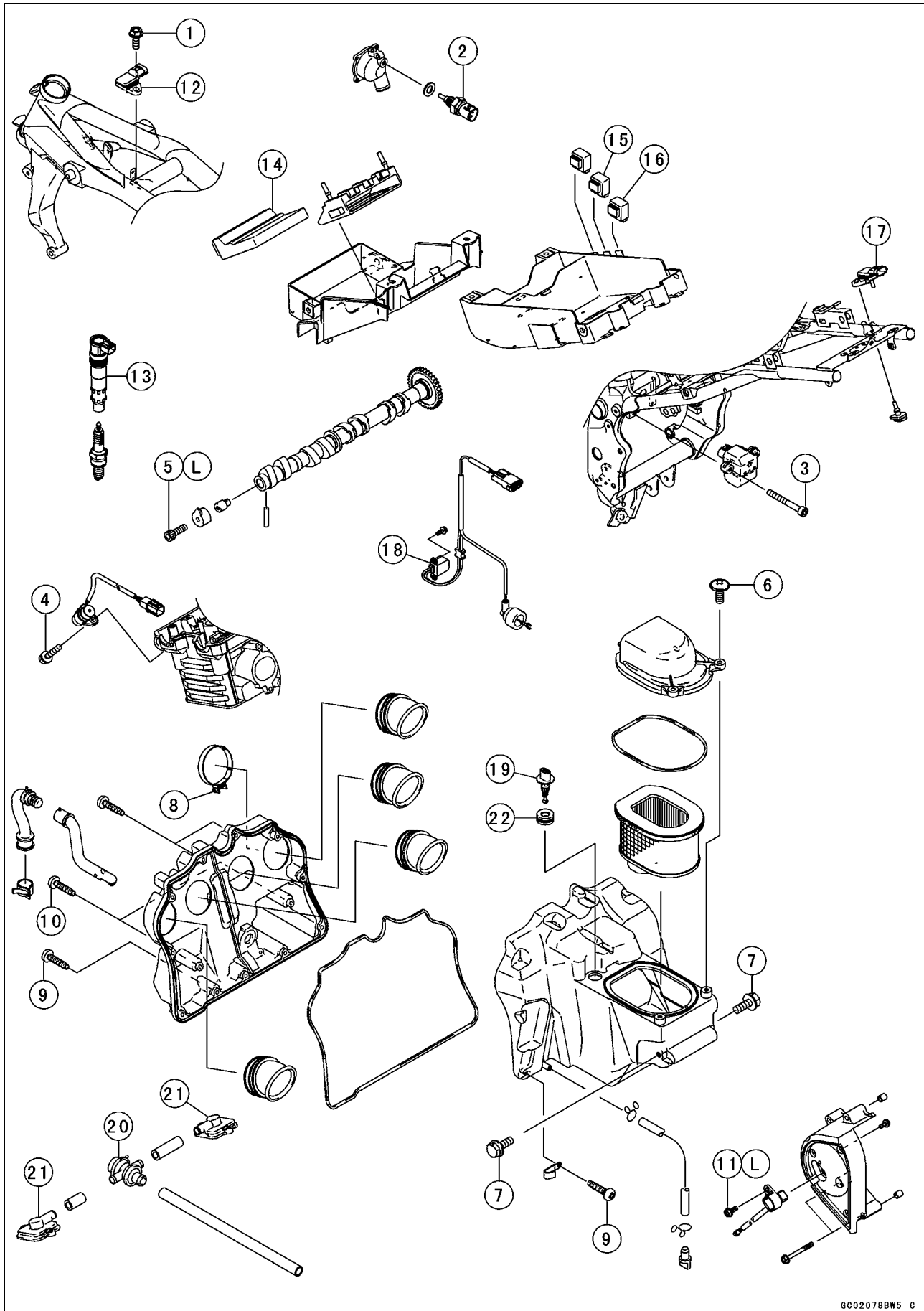
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Throttle cable plate bolt	6	0.6	52 in·lb	
2	Throttle body cover bolts	7	0.7	61 in·lb	
3	Throttle assy holder clamp bolts	2	0.2	17 in·lb	
4	Choke link holder screws	2.1	0.21	18 in·lb	
5	Delivery pipe screws	3.4	0.35	30 in·lb	
6	Bypass screws	0.2	0.02	1.7 in·lb	
7	Fuel pump bolts	9.8	1.0	87 in·lb	S, L
8	Fuel level sensor bolts	6.9	0.7	62 in·lb	

- 9. FI indicator LED light
- 10. Meter unit
- 11. Throttle cable (accelerator)
- 12. Throttle cable (decelerator)
- 13. Choke cable
- 14. Injector connectors
- 15. Main throttle sensor connector (grey)
- 16. Subthrottle sensor connector (black)
- 17. Subthrottle valve actuator connector
- 18. Throttle body assy connector
- 19. Main throttle sensor
- 20. Subthrottle sensor
- 21. Injectors
- 22. Center adjusting screw
- CL: Apply cable lubricant.
- EO: Apply engine oil to the seals and O-rings.
- 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



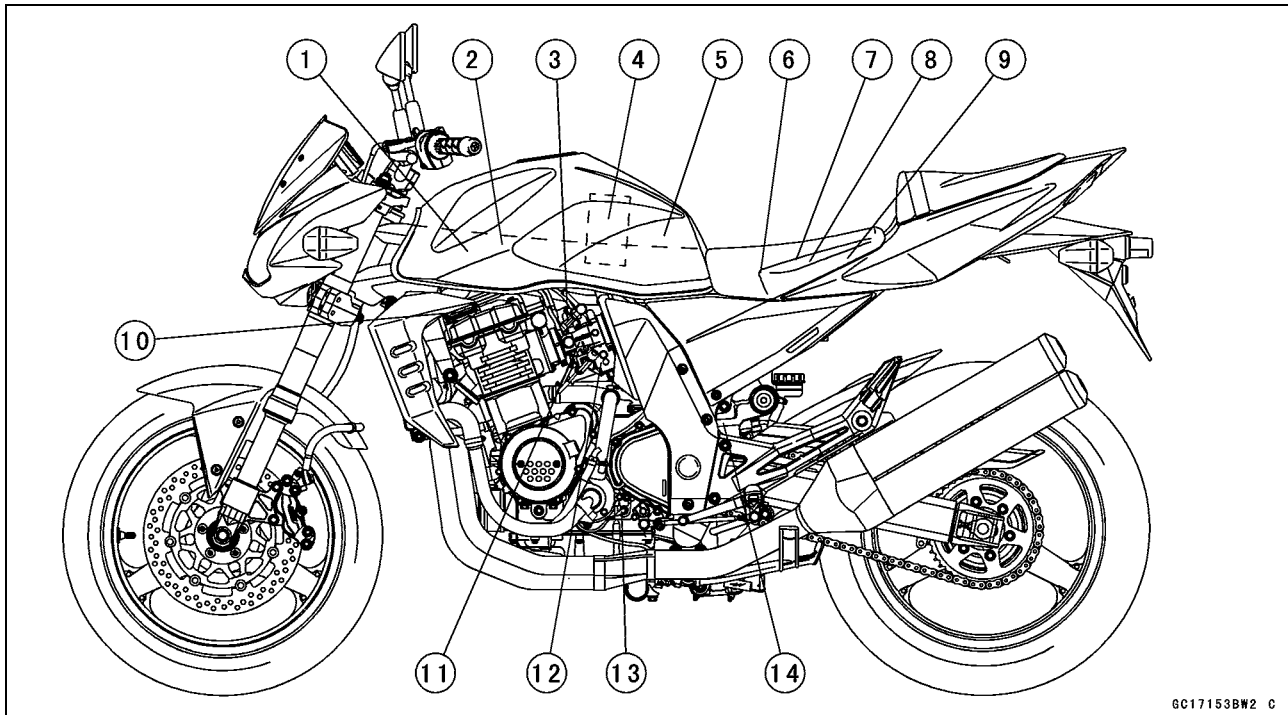
**Exploded View**

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 downsensor bolts	2	0.2	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	0.2	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	0.7	62 in·lb	L

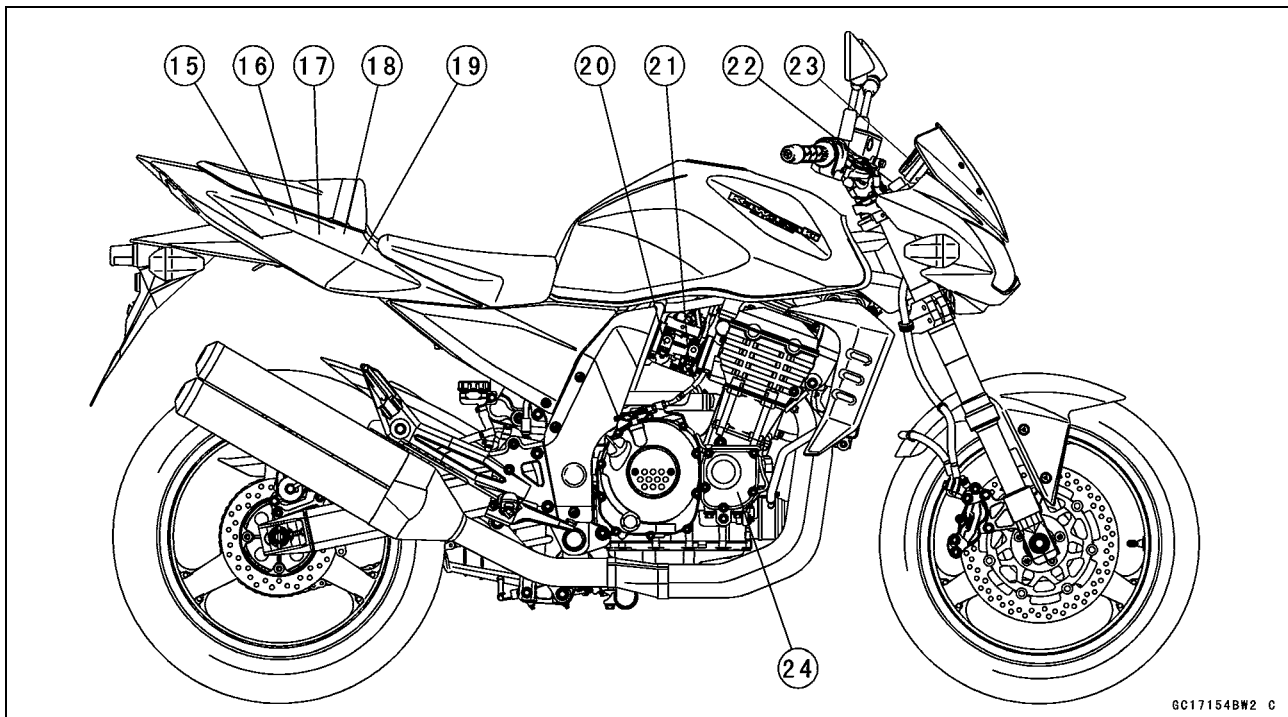
- 12. Inlet air pressure sensor
  - 13. Stick coils (see Electrical System chapter)
  - 14. ECU
  - 15. Fuel pump relay
  - 16. ECU main relay
  - 17. Atmospheric pressure sensor
  - 18. Crankshaft sensor (see Electrical System chapter)
  - 19. Inlet air temperature sensor
  - 20. Vacuum switch valve (see Engine Top End chapter)
  - 21. Air suction valves
  - 22. Grommet
- L: Apply a non-permanent locking agent.

## 3-8 FUEL SYSTEM (DFI)

### DFI Parts Location



6C17153B#2 C



6C17154B#2 C

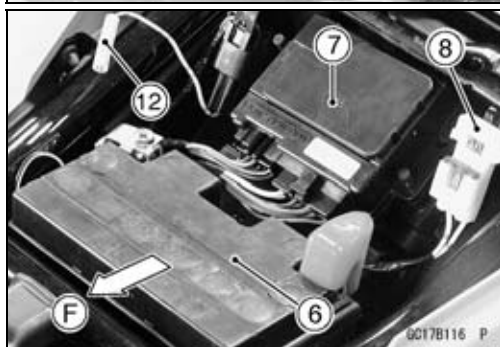
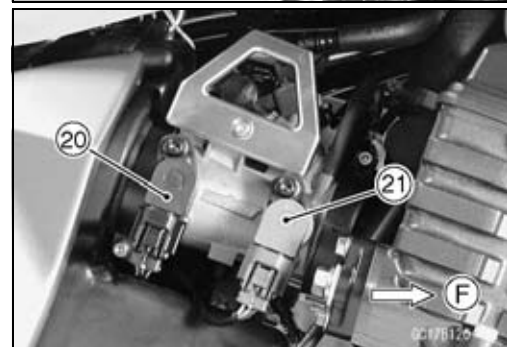
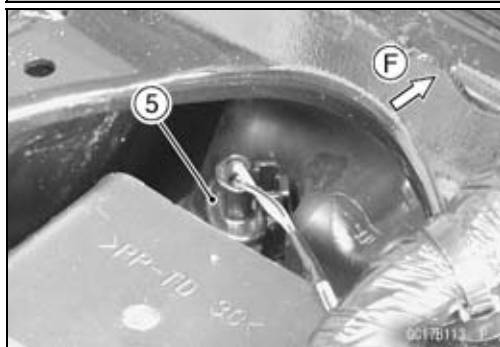
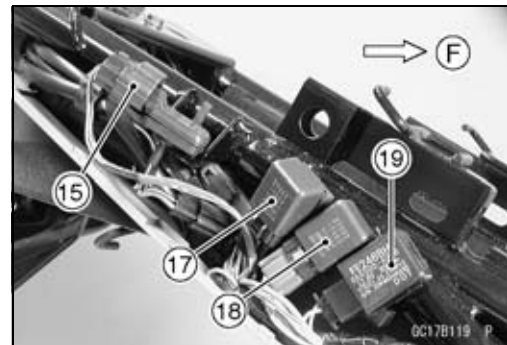
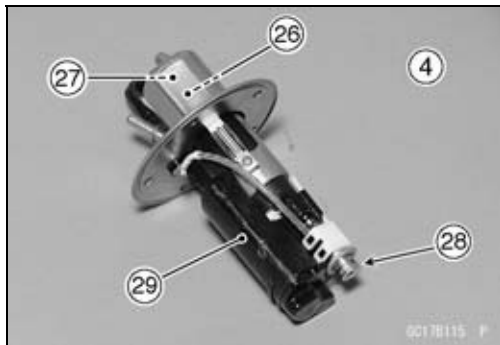
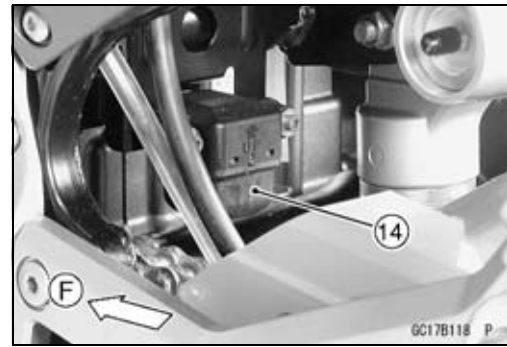
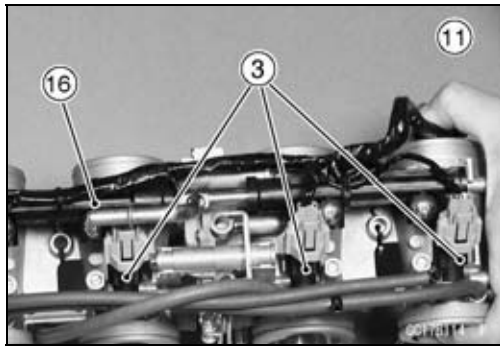
DFI: DFI Parts (this chapter)

F: Front

- |                                       |                                       |                                  |
|---------------------------------------|---------------------------------------|----------------------------------|
| 1. Water temperature Sensor (DFI)     | 8. ECU Fuse 15A                       | 19. Turn Signal Relay            |
| 2. Inlet Air Pressure Sensor (DFI)    | 9. ECU (DFI)                          | 20. Subthrottle Sensor (DFI)     |
| 3. Injectors (DFI)                    | 10. Stick Coils                       | 21. Main Throttle Sensor (DFI)   |
| 4. Fuel Pump (DFI)                    | 11. Throttle Body Assy                | 22. Ignition Switch              |
| 5. Inlet Air Temperature Sensor (DFI) | 12. Self-diagnosis Terminal           | 23. FI Indicator LED Light (DFI) |
| 6. Sealed Battery                     | 13. Neutral Switch                    | 24. Crankshaft Sensor            |
| 7. Junction Box                       | 14. Vehicle Down Sensor (DFI)         | 25. Camshaft Position Sensor     |
|                                       | 15. Atmospheric Pressure Sensor (DFI) | 26. Fuel Pump Screen             |
|                                       | 16. Delivery Pipe                     | 27. Return Fuel Check Valve      |
|                                       | 17. ECU Main Relay                    | 28. Pressure Regulator           |
|                                       | 18. Fuel Pump Relay (DFI)             | 29. Fuel Filter                  |



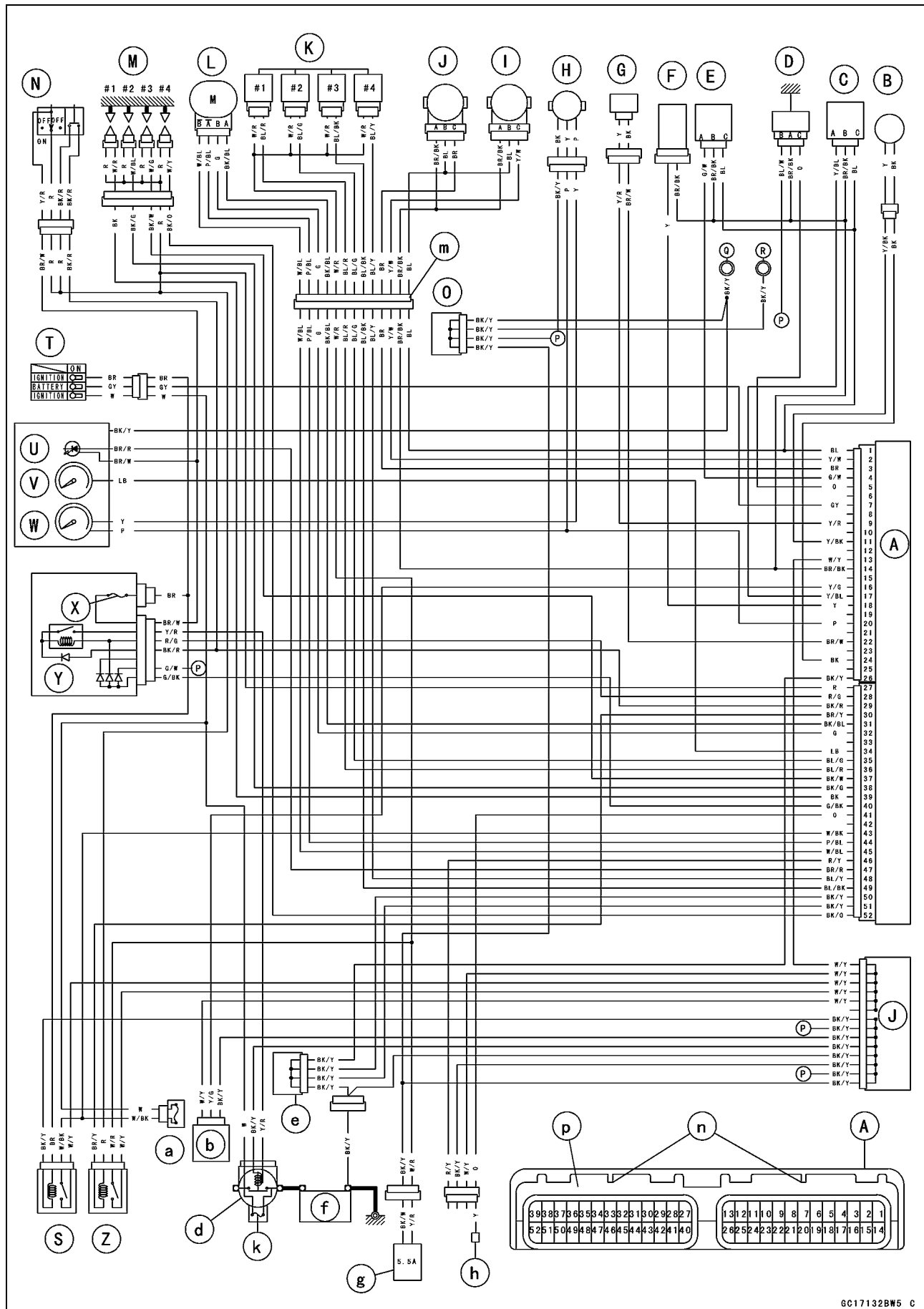
DFI Parts Location



[1], [2], [10], [13], [22] and [24] are not included.

# 3-10 FUEL SYSTEM (DFI)

## DFI Wiring Diagram



DFI Wiring Diagram

Terminal Names

1. Power Supply to Sensors (inlet air pressure, atmospheric pressure, and throttle sensors) from ECU.
2. Main Throttle Sensor Signal
3. Subthrottle Sensor Signal for ECU
4. Atmospheric Pressure Sensor Signal
5. Water Temperature Sensor Signal (+)
- 6.7.8.—
9. Camshaft Position Sensor Signal (+)
10. —
11. Crankshaft Sensor Signal (+)
12. —
13. Power Supply to ECU, Injectors, and Fuel Pump
14. Sensor Ground (inlet air temperature, water temperature, inlet air pressure, atmospheric pressure, vehicle-down, and throttle sensors)
15. —
16. Vehicle-down Sensor Signal
17. Inlet Air Pressure Sensor Signal
18. Inlet Air Temperature Sensor Signal (+)
19. —
20. Speed Sensor Signal
21. —
22. Camshaft Position Sensor Signal (–)
23. —
24. Crankshaft Sensor (–)
25. —

26. ECU Power Source Circuit Ground to Battery (–) Terminal
27. Engine Stop Switch Signal
28. Starter Lockout Switch Signal
29. Electric Starter Button Signal
30. Signal For Fuel Pump Relay
31. Subthrottle Valve Actuator Drive Signal
32. Subthrottle Valve Actuator Drive Signal
33. —
34. Tachometer Signal
35. Injector #2 Signal
36. Injector #1 Signal
37. Stick Coil #3 Signal
38. Stick Coil #2 Signal
39. Stick Coil #1 Signal
40. Interlock Circuit Signal
41. Self-diagnosis Signal (generated by grounding this terminal and shown by FI indicator LED light)
42. —
43. Battery Power ON-OFF Signal
44. Subthrottle Valve Actuator Drive Signal
45. Subthrottle Valve Actuator Drive Signal
46. —
47. FI Indicator LED Light Signal
48. Injector #4 Signal
49. Injector #3 Signal
50. DFI System Ground
51. Ignition System Ground
52. Stick Coil #4 Signal

Part Name

- A. ECU (Electronic Control Unit)
- B. Crankshaft Sensor
- C. Inlet Air Pressure Sensor
- D. Water Temperature Sensor
- E. Atmospheric Pressure Sensor
- F. Inlet Air Temperature Sensor
- G. Camshaft Position Sensor
- H. Speed Sensor
- I. Main Throttle Sensor
- J. Subthrottle Sensor
- K. Injectors #1, #2, #3, #4
- L. Subthrottle Valve Actuator
- M. Stick Coils #1, #2, #3, #4
- N. Engine Stop Switch
- O. Joint Connector D
- P. see Electrical System chapter
- Q. Ground Terminal
- R. Ground Terminal
- S. ECU Main Relay

- T. Ignition Switch
- U. FI Indicator LED Light
- V. Tachometer
- W. Speedometer
- X. Ignition Fuse 10A
- Y. Junction Box
- Z. Fuel Pump Relay (for fuel pump and injectors)
- a. ECU Fuse 15A
- b. Vehicle-down Sensor
- d. Starter Relay
- e. Joint Connector D
- f. Sealed Battery
- g. Fuel Pump
- h. Self-diagnosis Terminal
- j. Joint Connector B
- k. Main Fuse 30A
- m. Throttle Body Assy Connector
- n: Connector Locks
- p: ECU Connector

## 3-12 FUEL SYSTEM (DFI)

### Specifications

Item	Standard
<b>Digital Fuel Injection System</b>	
Idle Speed	1 100 ± 50 r/min (rpm)
Throttle Assy:	
Type	Four barrel type
Bore	φ38 mm (1.5 in.)
ECU (Electronic Control Unit):	
Make	Denso
Type	Digital memory type, with built in IC igniter, sealed with resin
Usable engine speed	100 ~ 11 160 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 sec 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 (2.3 US oz) or more for 3 seconds
Fuel Injectors:	
Type	INP-250
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

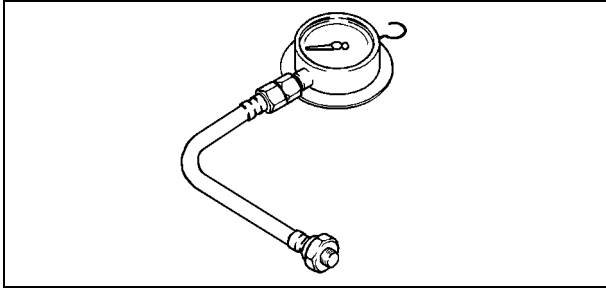
**Specifications**

Item	Standard
Detection time	Within 0.5 ~ 1.0 sec.
Output voltage	with the sensor tilted 60 ~ 70° or more: 3.7 ~ 4.4 V
	with sensor arrow mark pointed up: 0.4 ~ 1.4 V
Subthrottle Sensor:	Non-adjustable and non-removal
Input Voltage	4.75 ~ 5.25 V DC between BR and BR/BK leads
Output voltage at idle throttle opening	0.48 ~ 0.52 V DC between BR and BR/BK leads
Output voltage at full throttle opening	3.6 ~ 3.8 V DC between BR and BR/BK leads
Resistance	4 ~ 6 kΩ
Subthrottle Valve Actuator:	
Resistance	about 5 ~ 7 kΩ
Input voltage	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.)

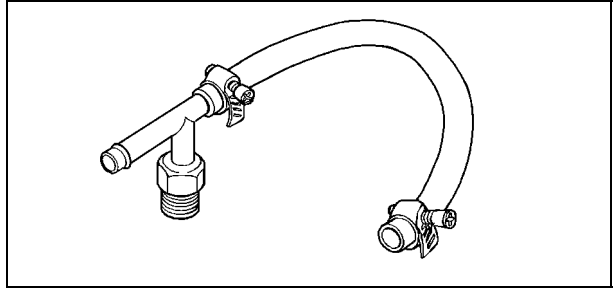
# 3-14 FUEL SYSTEM (DFI)

## Special Tools

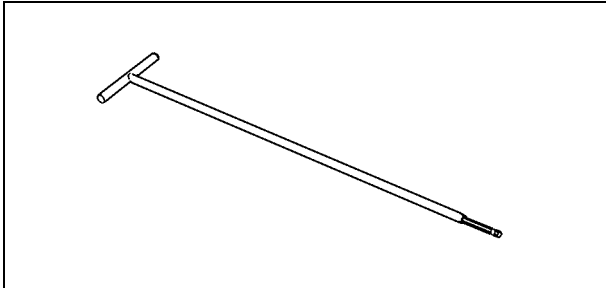
**Oil Pressure Gauge:**  
57001-125



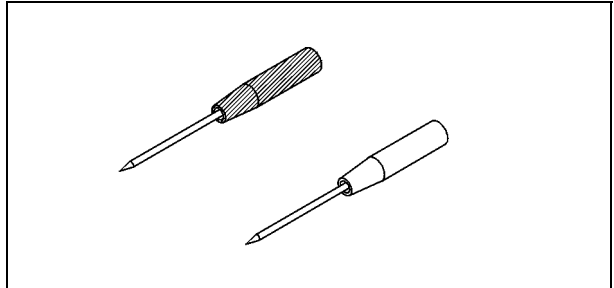
**Fuel Pressure Gauge Adapter:**  
57001-1417



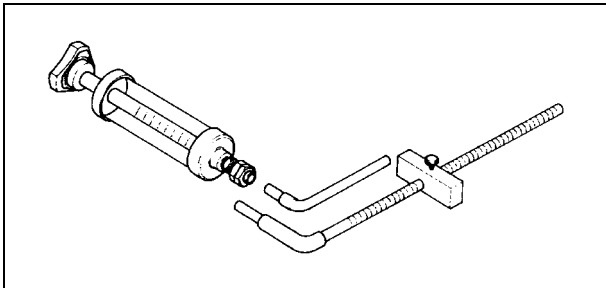
**Carburetor Drain Plug Wrench, Hex 3:**  
57001-1269



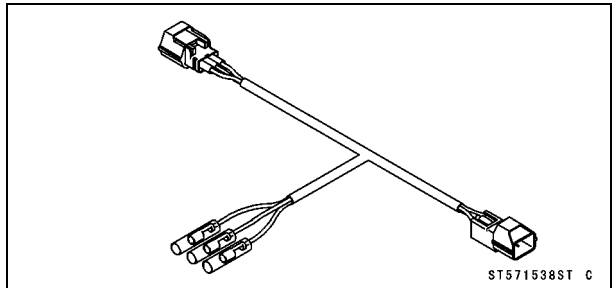
**Needle Adapter Set:**  
57001-1457



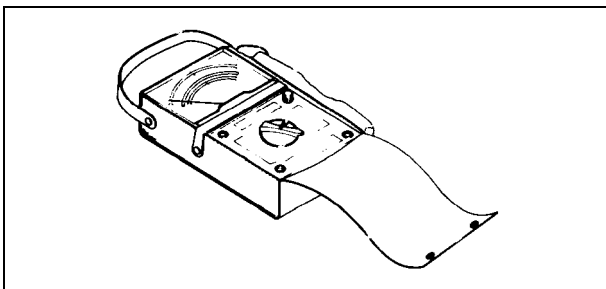
**Fork Oil Level Gauge:**  
57001-1290



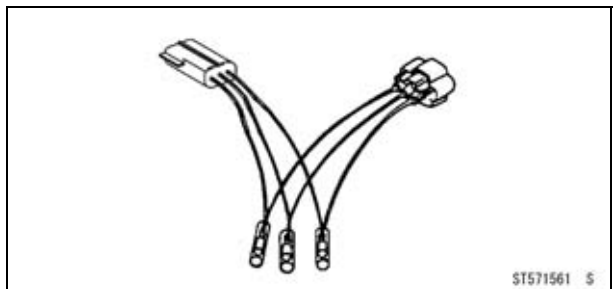
**Throttle Sensor Setting Adapter:**  
57001-1538



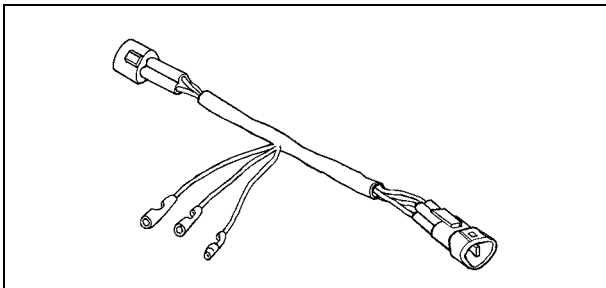
**Hand Tester:**  
57001-1394



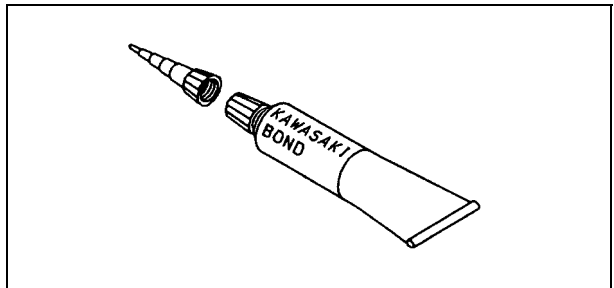
**Sensor Harness Adapter:**  
57001-1561



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



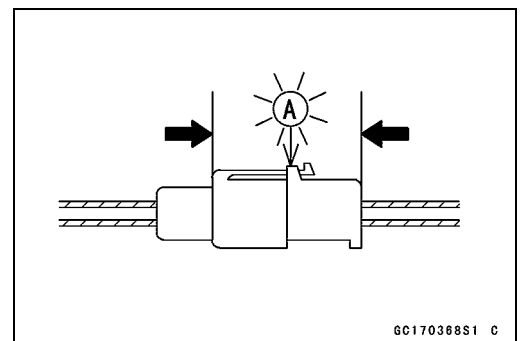
**Kawasaki Bond (Silicone Sealant):**  
56019-120



## 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. Never water a vehicle with connectors unplugged because seals don't work and terminals could corrode.
- If a transceiver is installed on the motorcycle, make sure that the operation of the DFI system is not influenced by electric wave radiated from the antenna. Check operation of the system with the engine at idle. Locate the antenna as far as possible away from the ECU.
- When any fuel hose is disconnected, do not turn on the ignition switch. Otherwise, the fuel pump will operate and fuel will spout from the fuel hose.
- Do not operate the fuel pump if the pump is completely dry. This is to prevent pump seizure.
- Before removing the fuel system parts, blow the outer surfaces of these parts clean with compressed air.
- When any fuel hose is disconnected, fuel may spout out by residual pressure in the fuel line. Cover the hose joint with a piece of clean cloth to prevent fuel spillage.
- To prevent corrosion and deposits in the fuel system, do not add to fuel any fuel antifreeze chemicals.
- Whenever the DFI electrical connections are to be disconnected, first turn off the ignition switch. Conversely, make sure that all the DFI electrical connections are firmly reconnected before starting the engine.
- 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.
- When disconnecting the vehicle-down sensor connector, raise the lock of the connector. Push the lock of the other connectors.



## 3-16 FUEL SYSTEM (DFI)

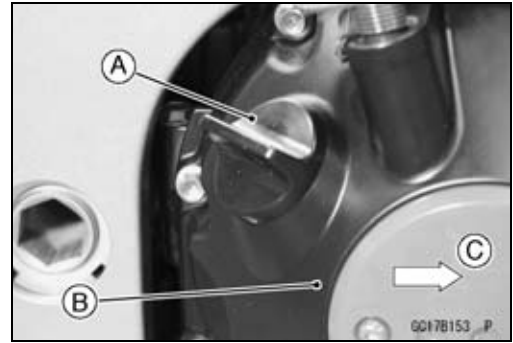
### DFI Servicing Precautions

○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]

Front [C]

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





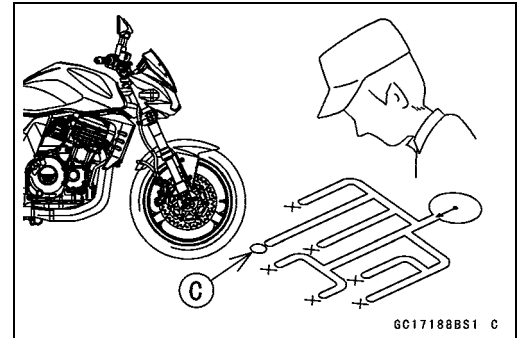
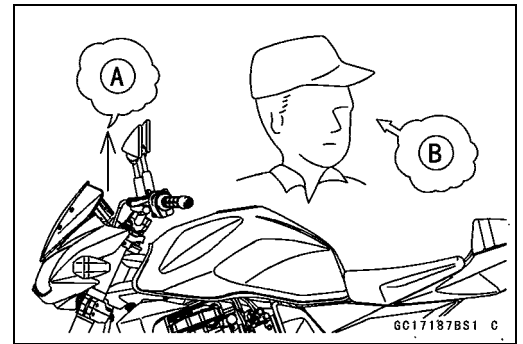
## Troubleshooting the DFI System

### 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.

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 fault 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.



## 3-18 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 (special tool) [C] inside the seal [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

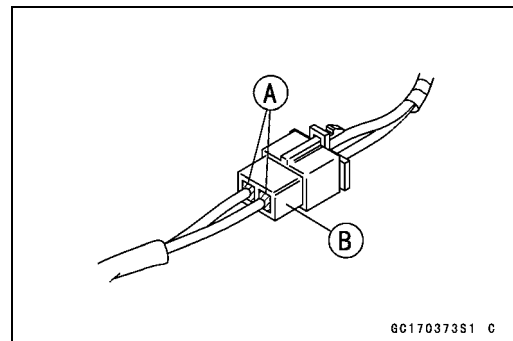
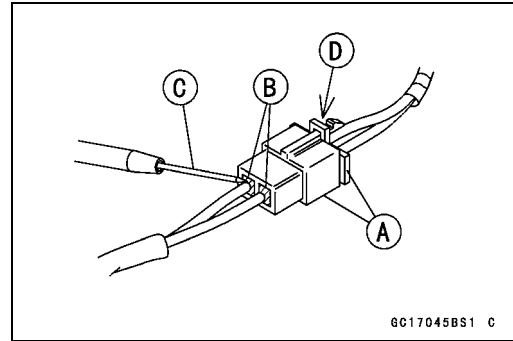
**Incorrect, reverse connection or short circuit by needle adapters could damage the DFI or electrical system parts.**

- 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)**

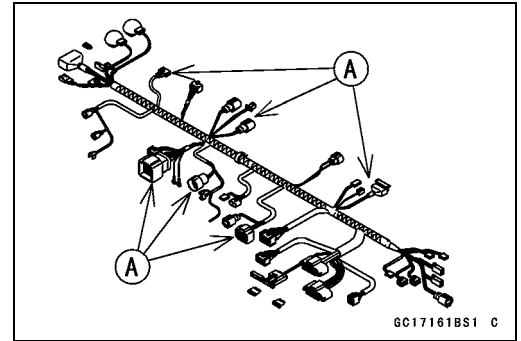
#### - Seals of Connector

- 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.

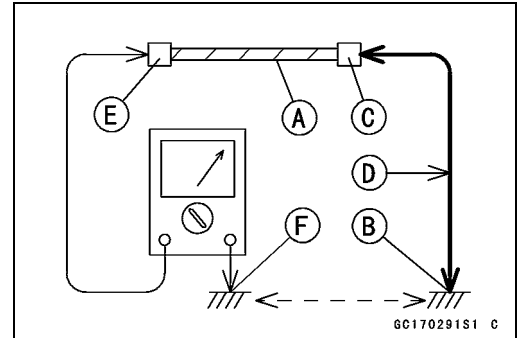


**Troubleshooting the DFI System**

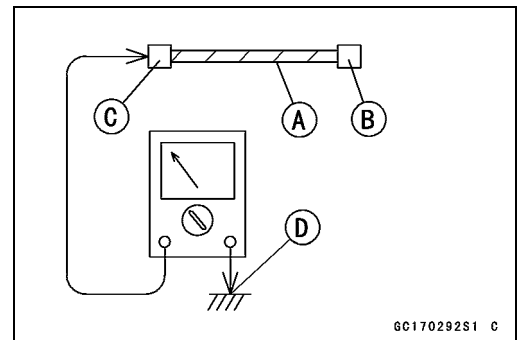
- Pull each connector [A] apart and inspect it for corrosion, dirt, and damage.
- ★ If the connector is corroded or dirty, clean it carefully. If it is damaged, replace it. Connect the connectors securely.
- Check the wiring for continuity.
- Use the wiring diagram to find the ends of the lead which 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

## 3-20 FUEL SYSTEM (DFI)

### Troubleshooting the DFI System

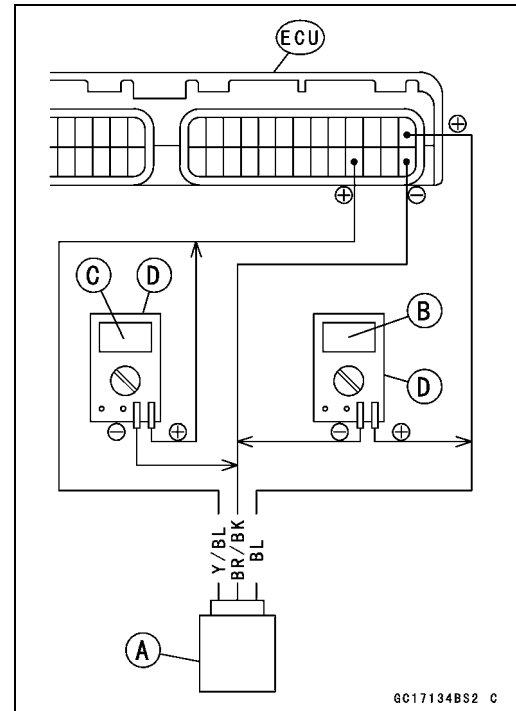
○ There are two ways to inspect the DFI system. One is voltage Check Method and the other is Resistance Check Method.

(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.



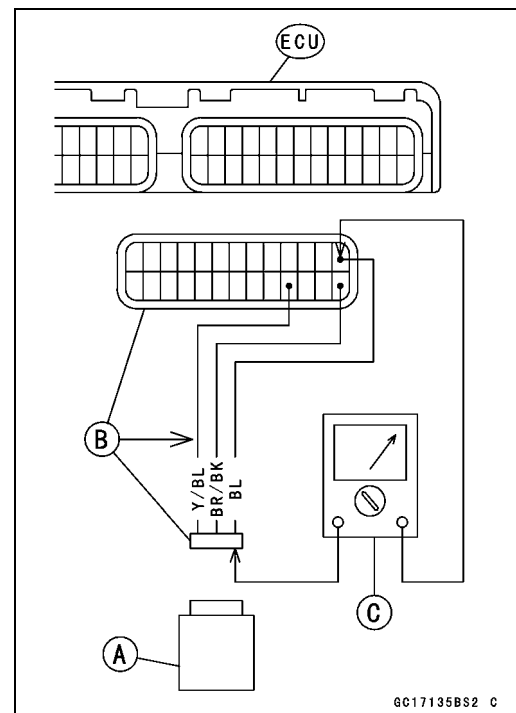
(Resistance Check Method)

○ 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.

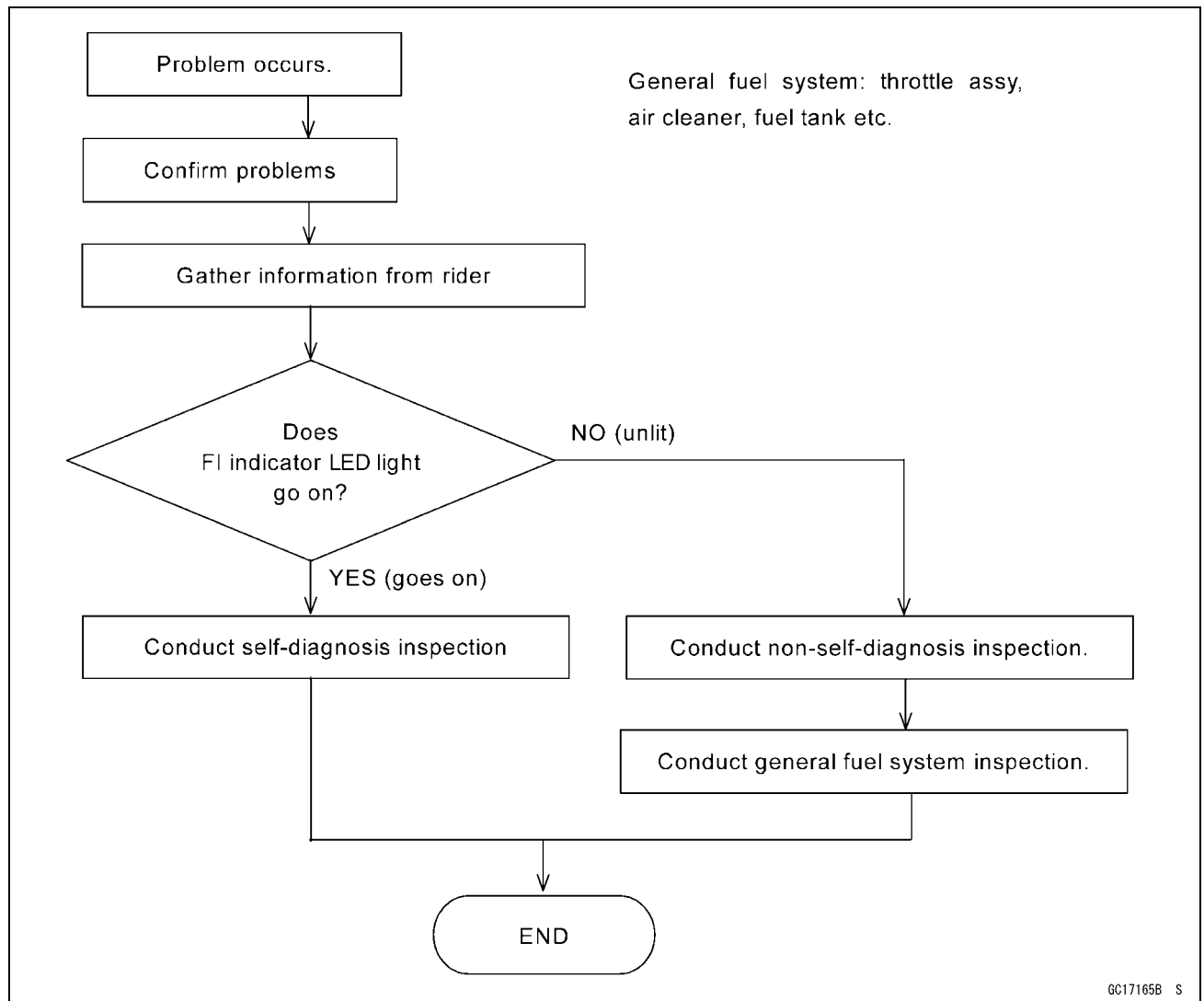
**Special Tool - Hand Tester: 57001-1394**

★ 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**

- 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.

## 3-22 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 (3 281 ft) or more)	
<b>Motorcycle conditions when problem occurred.</b>		
FI indicator LED light	<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 (LED light, 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	

**Troubleshooting the DFI System**

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
	<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	

## 3-24 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 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 9).
Starter idle gear trouble	Inspect (see chapter 9).
<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	Clean spark plugs and adjust plug gap (see chapter 2).
Starting technique faulty	When flooded, don't crank engine with throttle fully opened.
<b>No spark or spark weak :</b>	



**DFI System Troubleshooting Guide**

<b>Symptoms or possible Causes</b>	<b>Actions (chapter)</b>
Ignition and engine stop switches not ON	Turn both switches ON .
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	Pull the lever in and shift the gear in neutral.
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	Clean spark plug and adjust plug gap (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 16) .
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).

## 3-26 FUEL SYSTEM (DFI)

### DFI System Troubleshooting Guide

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

### 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	Clean spark plugs and adjust plug gap (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 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).
Choke lever pulled	Push it (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).

**DFI System Troubleshooting Guide**

<b>Symptoms or Possible Causes</b>	<b>Actions (chapter)</b>
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).
<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).

## 3-28 FUEL SYSTEM (DFI)

### DFI System Troubleshooting Guide

Symptoms or Possible Causes	Actions (chapter)
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).
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>	
Choke lever pulled	Push it (see chapter 3).
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	Clean spark plugs and adjust plug gap (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>	

**DFI System Troubleshooting Guide**

<b>Symptoms or Possible Causes</b>	<b>Actions (chapter)</b>
Spark plug dirty, broken or gap maladjusted	Clean spark plugs and adjust plug gap (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).
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	Adjust plug gap or replace plug (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 switch trouble	Inspect and repair or replace (see chapter 16).
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).

## 3-30 FUEL SYSTEM (DFI)

### DFI System Troubleshooting Guide

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

Symptoms or Possible Causes	Actions (chapter)
<b>Firing incorrect :</b>	
Spark plug dirty, broken or maladjusted	Clean spark plug and adjust plug gap (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).
Stick coil trouble	Inspect (see chapter 16).
<b>Fuel/air mixture incorrect :</b>	
Choke lever pulled	Push it (see chapter 3).
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 ECU 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).

**DFI System Troubleshooting Guide**

<b>Symptoms or Possible Causes</b>	<b>Actions (chapter)</b>
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).
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 3).
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).
Choke lever pulled	Push it (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).

## 3-32 FUEL SYSTEM (DFI)

### DFI System Troubleshooting Guide

<b>Symptoms or Possible Causes</b>	<b>Actions (chapter)</b>
Too low fuel pressure	Inspect fuel line and fuel pump (see chapter 3).
Water temperature sensor trouble	Inspect and replace (see chapter 3).
Inlet air temperature sensor trouble	Inspect and replace (see chapter 3).



## Self-Diagnosis

### 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 LED light emits service code(s) to show the problem(s) which the DFI 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 and ignition system had in the past.

### Self-diagnosis Procedures

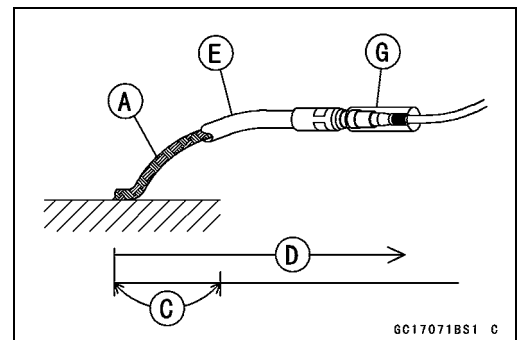
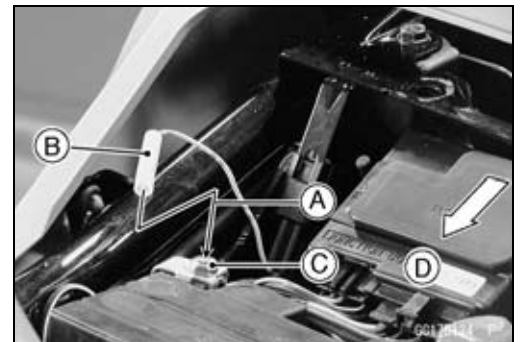
○When a problem occurs with the DFI system and ignition system, the DFI indicator LED light [A] goes on.

#### NOTE

- Use a fully charged battery when conducting self-diagnosis. Otherwise, the LED light blinks very slowly or doesn't blink.
- Keep the self-diagnosis terminal grounded during self-diagnosis, with an auxiliary lead.

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

- 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 LED light to read the service code. Keep the auxiliary lead ground until you finish reading the service code.



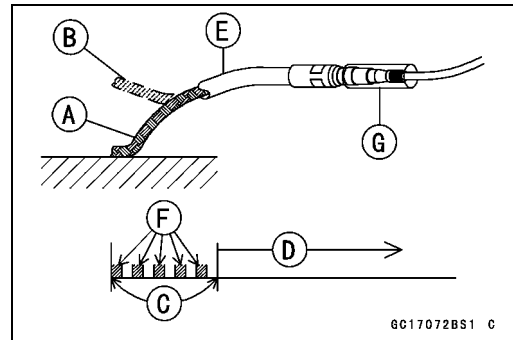
## 3-34 FUEL SYSTEM (DFI)

### 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 LED light to read the service code. Keep the auxiliary lead ground until you finish reading the service code.

#### NOTE

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



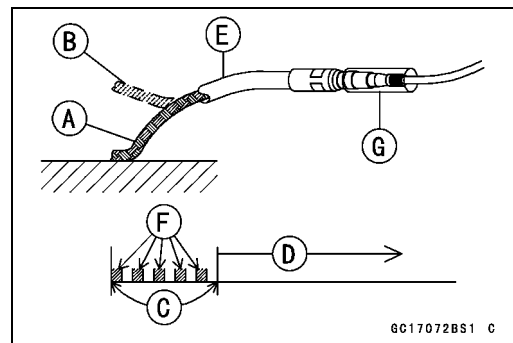
### Service Code Clearing Procedures

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

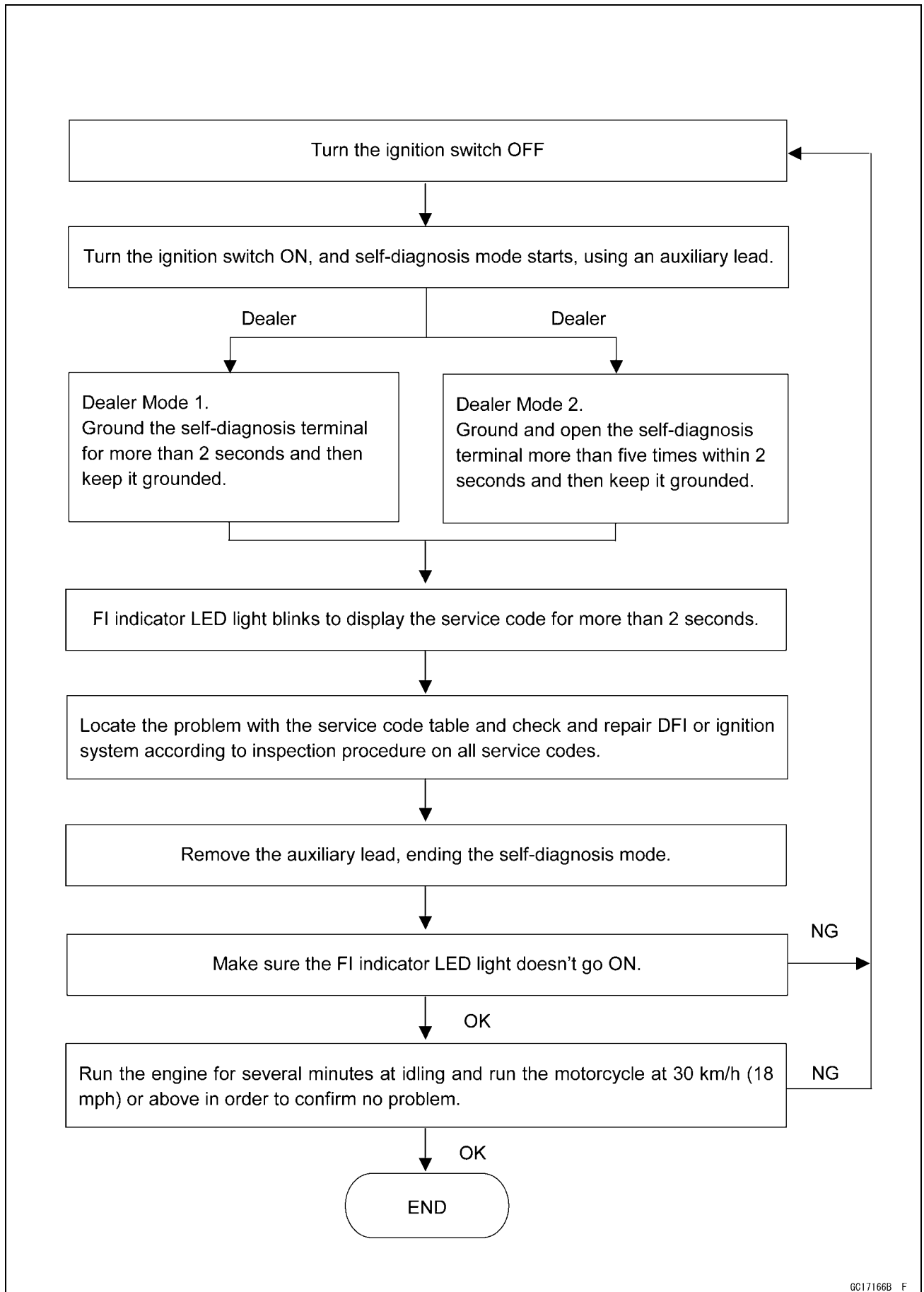
#### NOTE

- 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.



Self-Diagnosis

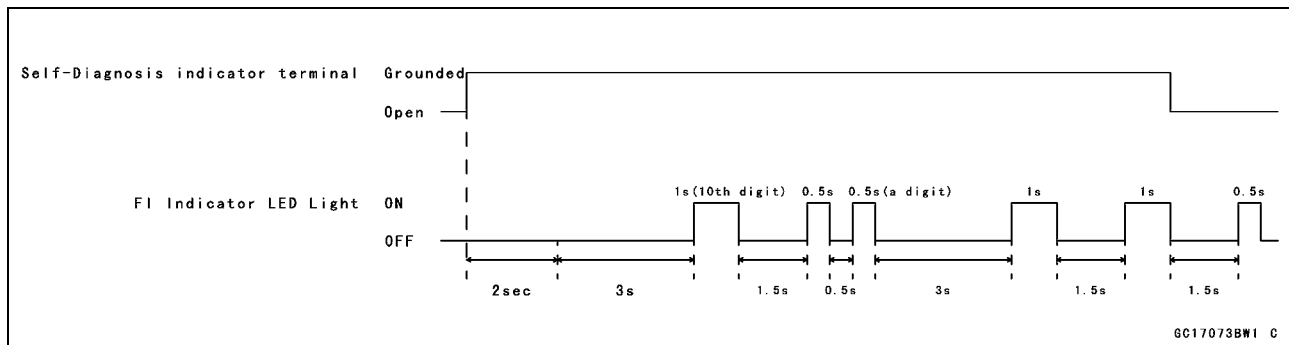


## 3-36 FUEL SYSTEM (DFI)

### Self-Diagnosis

#### How to Read Service Codes

- Service codes are shown by a series of long and short blinks of the FI indicator LED light as shown below.
- Read 10th digit and unit digit as the FI indicator LED light 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)



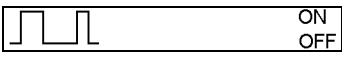
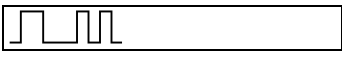
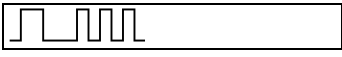
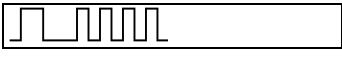

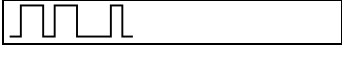

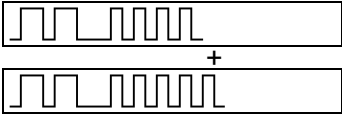
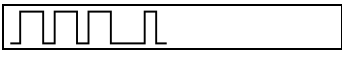

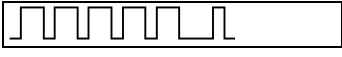
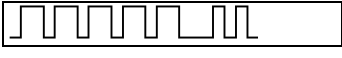
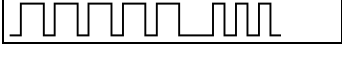


- If the problem is with the following parts, the ECU cannot memorize these problems, the FI indicator LED light doesn't go on, and no service codes can be displayed.
  - FI Indicator LED Light
  - Fuel Pump
  - Fuel Pump Relay
  - DFI Main Relay
  - ECU Power Source Wiring and Ground Wiring (see ECU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

#### 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.

Self-Diagnosis

Service Code Table

Service Code	FI Indicator LED Light	Problems
11		Main throttle sensor malfunction, wiring open or short
12		Inlet air pressure sensor malfunction, wiring open or short
13		Inlet air temperature sensor malfunction, wiring open or short
14		Water temperature sensor malfunction, wiring open or short
15		Atmospheric pressure sensor malfunction, wiring open or short
21		Crankshaft sensor malfunction, wiring open or short
23		Camshaft position sensor malfunction, wiring open or short
24 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
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.

## 3-38 FUEL SYSTEM (DFI)

### Self-Diagnosis

#### 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 0.2 ~ 4.8 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 $\alpha$ -N method.
12	Inlet Air Pressure Sensor	Inlet Air Pressure (absolute) $P_v = 100 \text{ mmHg} \sim 900 \text{ mmHg}$	If the inlet air pressure sensor system fails (the signal $P_v$ is out of the usable range, wiring short or open), the ECU sets the DFI in the $\alpha$ - N method.
13	Inlet Air Temperature Sensor	Inlet Air Temperature $T_a = -47^\circ\text{C} \sim +178^\circ\text{C}$	If the inlet air temperature sensor fails (the signal is out of the usable range, wiring short or open), the ECU sets $T_a$ at $40^\circ\text{C}$ .
14	Water Temperature Sensor	Water Temperature $T_w = -30^\circ\text{C} \sim +120^\circ\text{C}$	If the water temperature sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets $T_w$ at $80^\circ\text{C}$ .
15	Atmospheric Pressure Sensor	Absolute Atmospheric Pressure $P_a = 100 \text{ mmHg} \sim 900 \text{ mmHg}$	If the atmospheric pressure sensor system fails (the signal is out of the usable range, wiring short or open), the ECU sets $P_a$ 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) $V_d = 0.4 \text{ V} \sim 4.4 \text{ V}$	If the vehicle-down sensor system has failures (the output voltage $V_d$ is more than usable range, wiring open), the ECU shuts off the fuel pump, the fuel injectors and the ignition system.
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.

**Self-Diagnosis**

<b>Service Codes</b>	<b>Parts</b>	<b>Output Signal Usable Range or Criteria</b>	<b>Backups by ECU</b>
<b>51</b>	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.
<b>52</b>	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.
<b>53</b>	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.
<b>54</b>	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.
<b>62</b>	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.

## 3-40 FUEL SYSTEM (DFI)

### Main Throttle Sensor (Service Code 11)

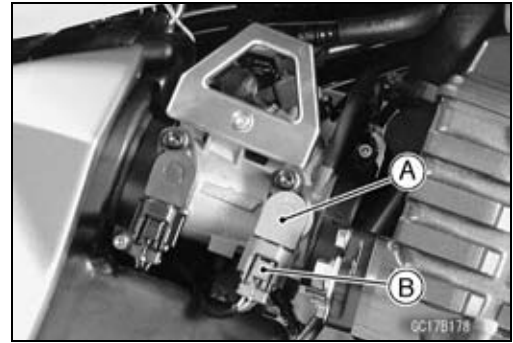
#### Main Throttle Sensor Removal/Adjustment

#### 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) [A] and connect the harness adapter [B] 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.

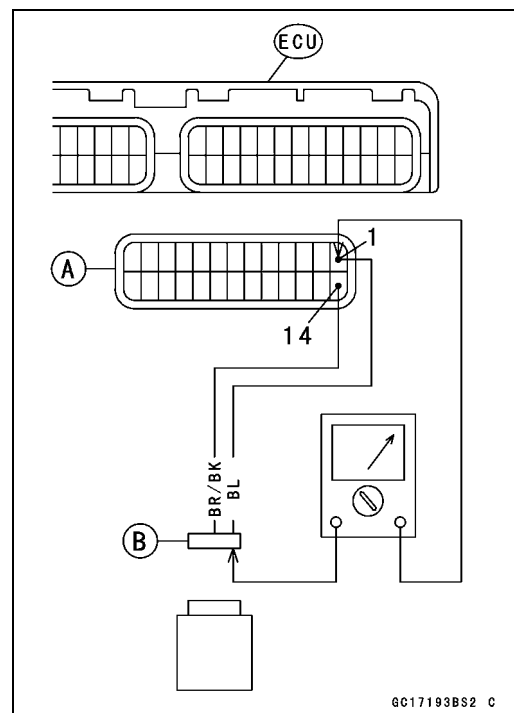
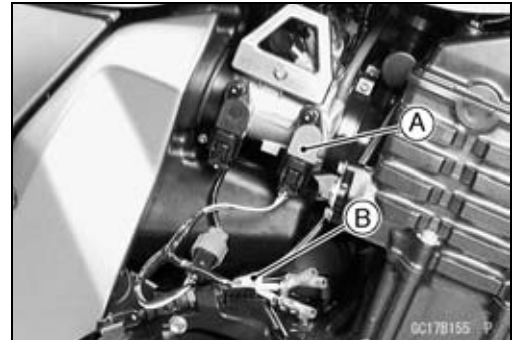
#### Wiring Connection

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

BL lead (ECU terminal 1)

BR/BK lead (ECU terminal 14)

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





**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) [A] and connect the harness adapter [B] 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 (+) → W (sensor Y/W) lead**

**Meter (-) → BK (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.

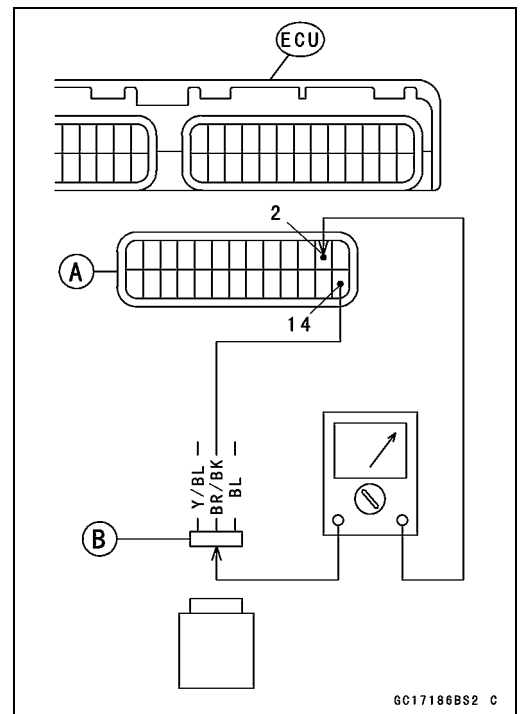
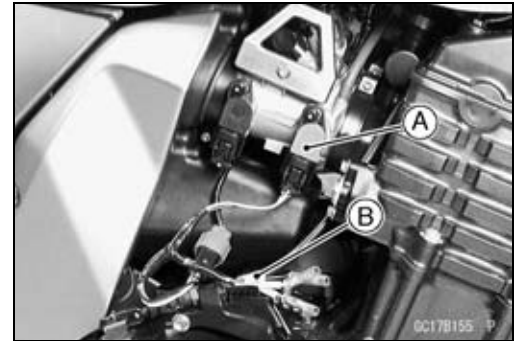
**Wiring Connection**

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

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

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

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



## 3-42 FUEL SYSTEM (DFI)

### 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.

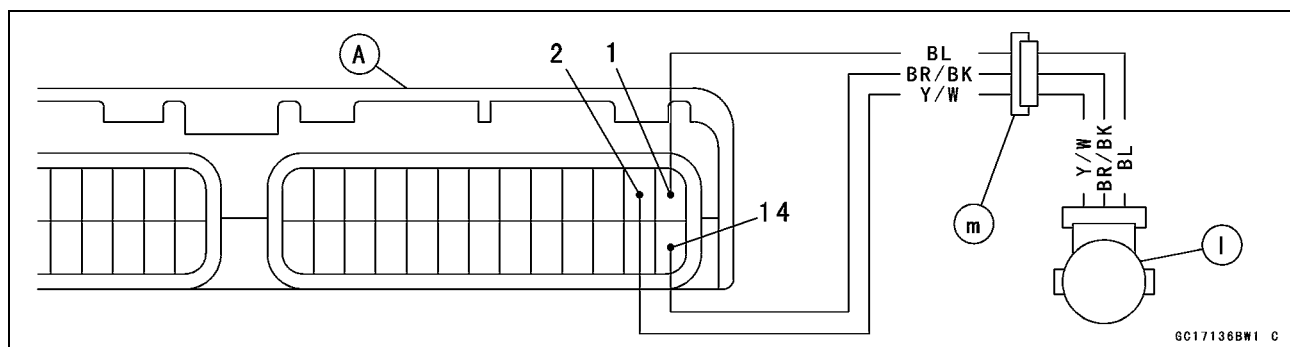
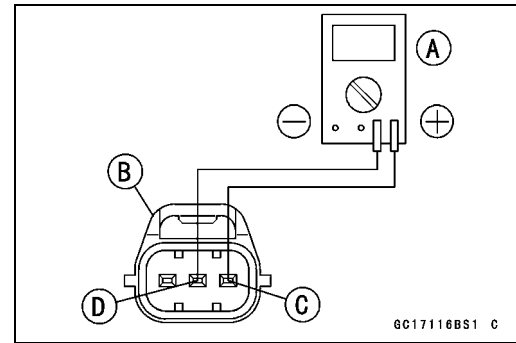
#### Main Throttle Sensor Resistance

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).



A. ECU

I. Main Throttle Sensor

m. Throttle Body Assy Connector

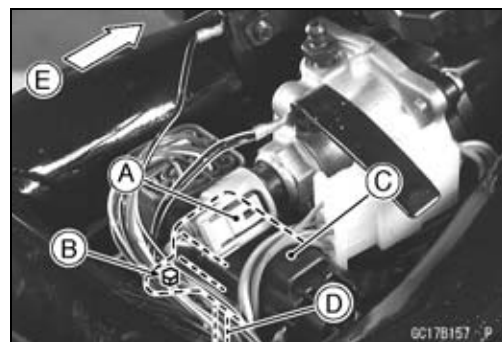
**Inlet Air Pressure Sensor (Service Code 12)**

**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 System 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 and the vacuum hose [D].
- Front [E]



*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.

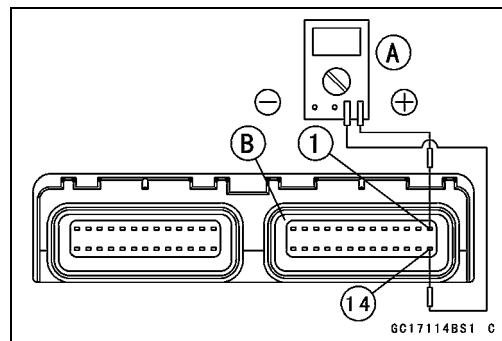
- Install:
    - Vacuum Hose
    - Inlet Air Pressure Sensor
- Torque - Inlet Air Pressure Sensor Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)**

*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.

- 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)**

**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).

## 3-44 FUEL SYSTEM (DFI)

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

#### 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)

**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.
- ★ 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**

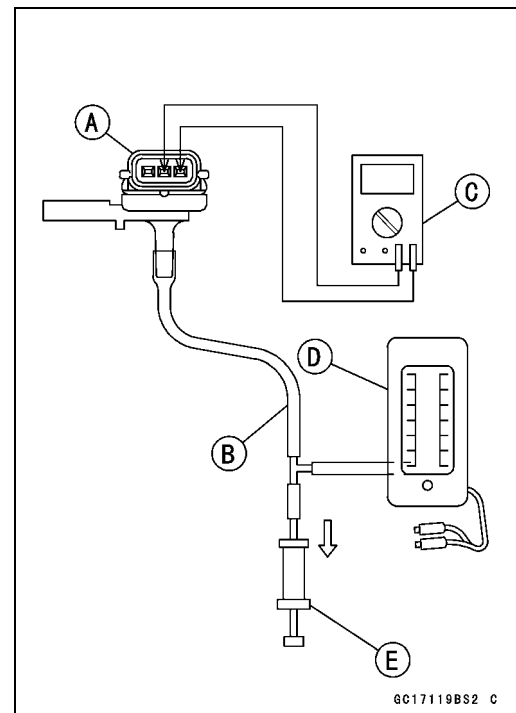
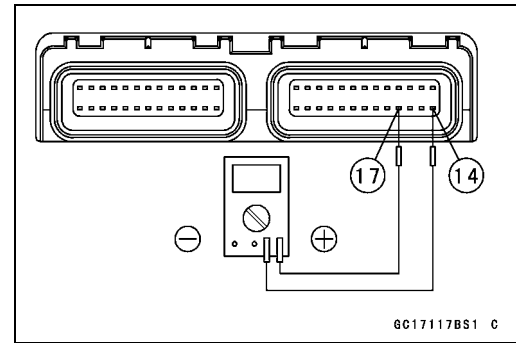
**Sensor Harness Adapter: 57001-1561**

#### Inlet Air Pressure Sensor Output Voltage

##### Connection to Adapter

Meter (+) → BL (sensor Y/BL) lead

Meter (-) → Y/W (sensor BR/BK) lead



## Inlet Air Pressure Sensor (Service Code 12)

---

- 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 (barometer 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.

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

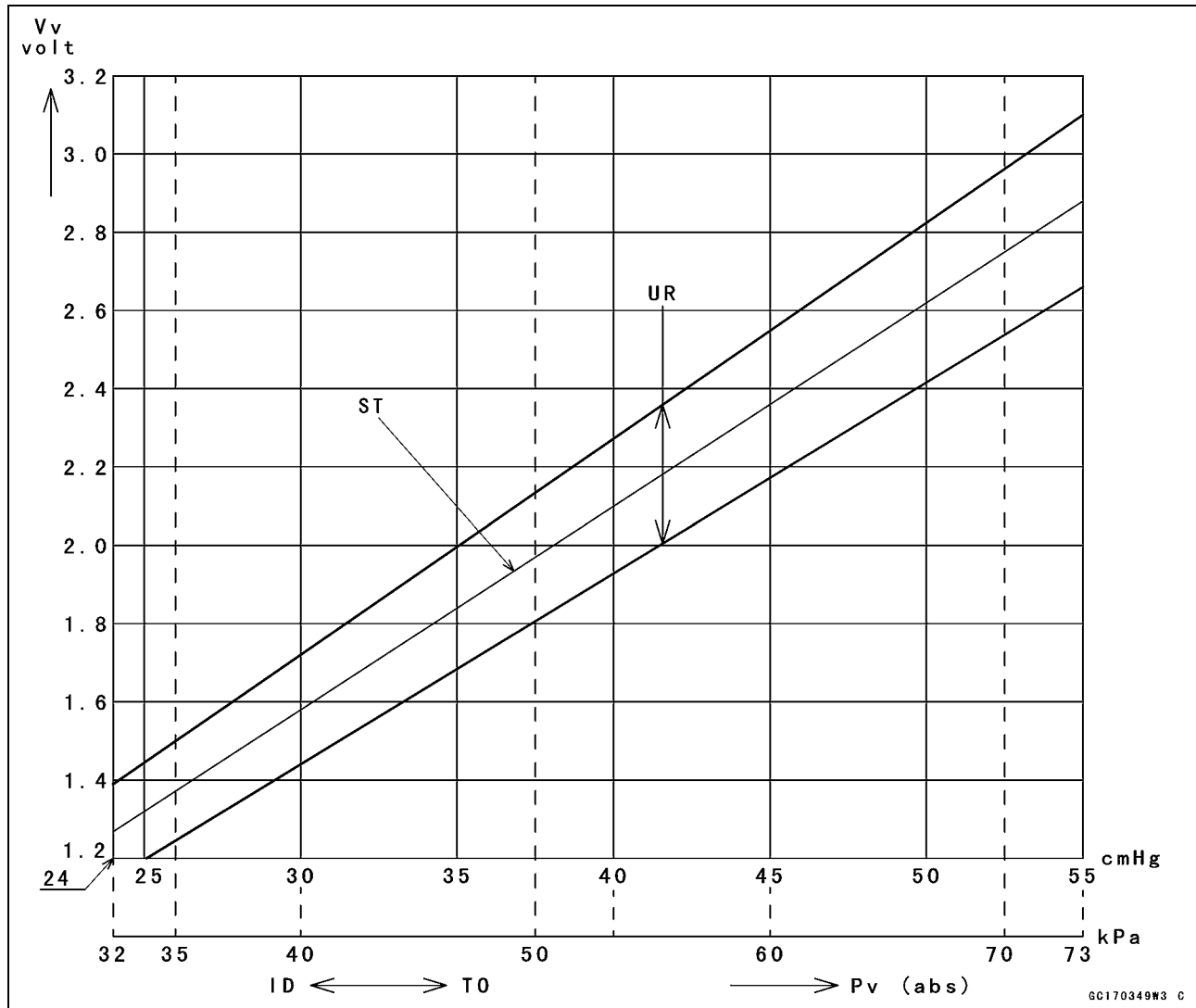
Plot Vv (3.2 V) on the vertical line. → Point [3].

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

### 3-46 FUEL SYSTEM (DFI)

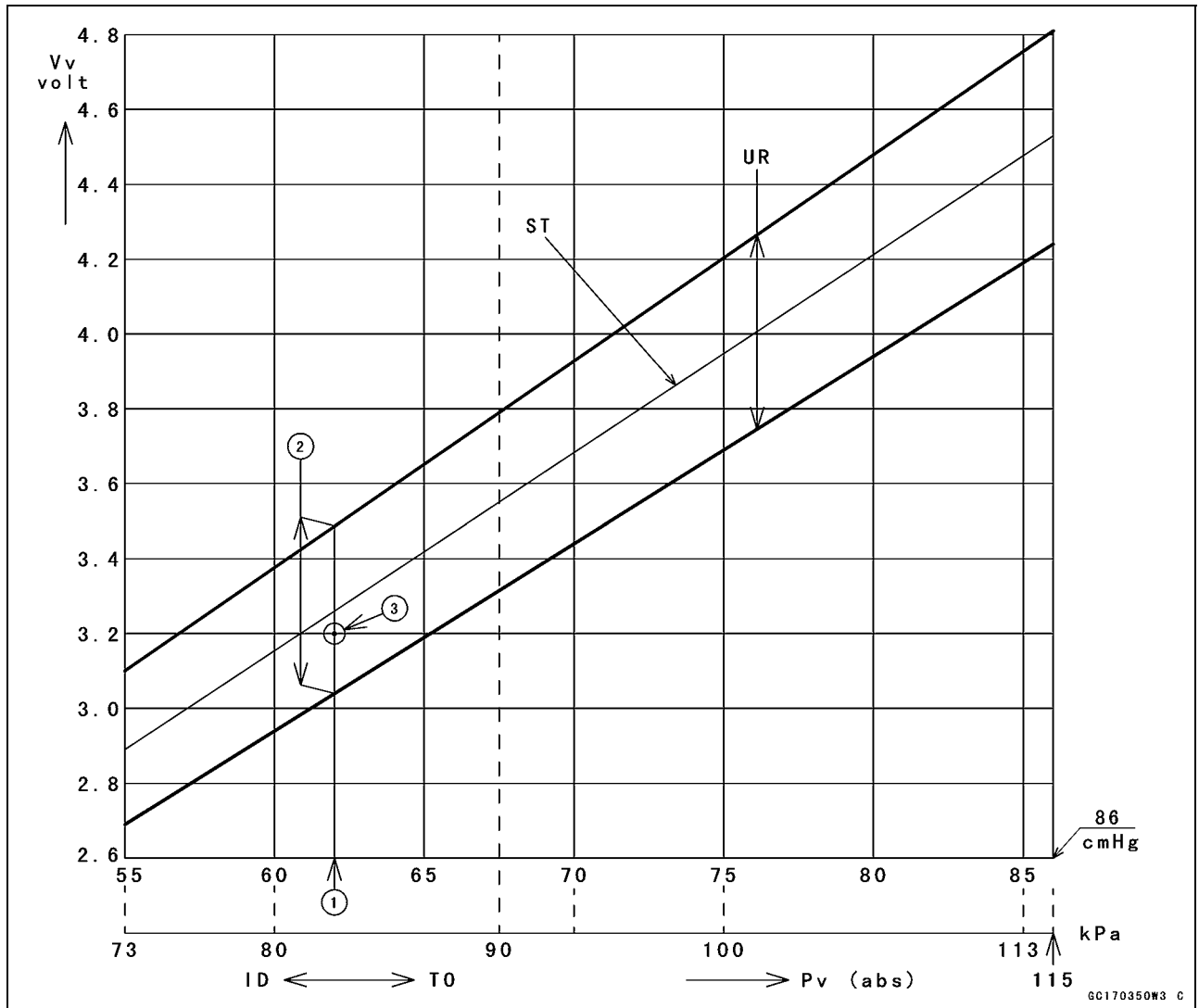
#### Inlet Air Pressure Sensor (Service Code 12)

Pv = 24 ~ 55 cmHg

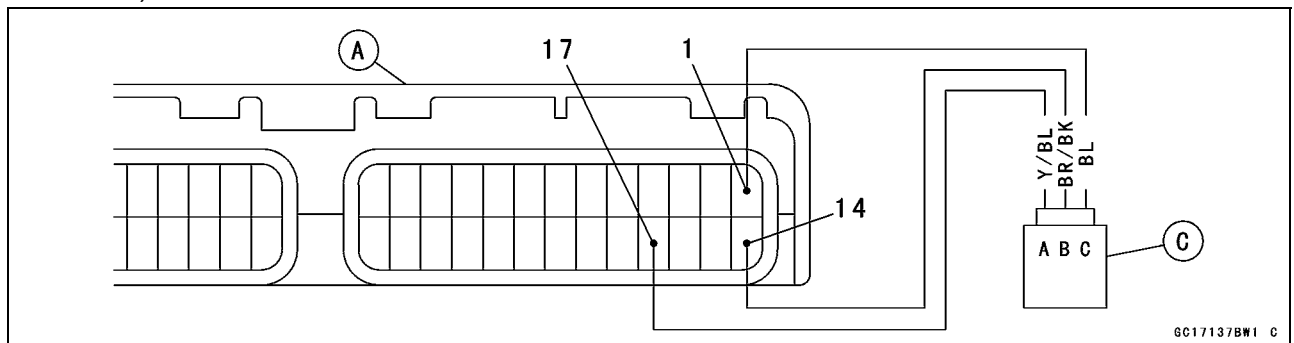


Inlet Air Pressure Sensor (Service Code 12)

Pv = 55 ~ 86 cmHg



- 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)



- A. ECU
- C. Inlet Air Pressure Sensor

## 3-48 FUEL SYSTEM (DFI)

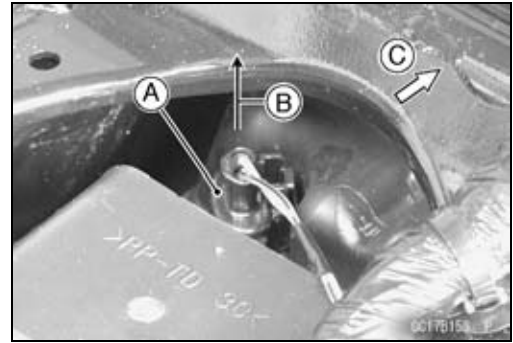
### Inlet Air Temperature Sensor (Service Code 13)

#### 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 [B] the inlet air temperature sensor.
- Put the inlet air temperature sensor into the grommet. Front [C]



#### 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)

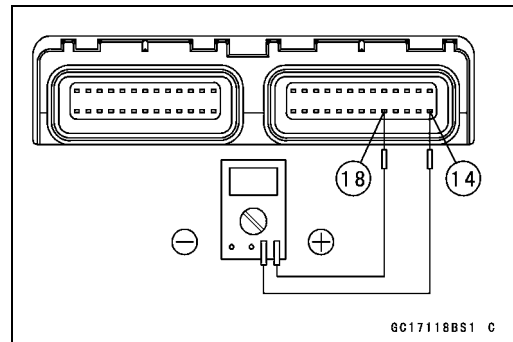
Meter (-) → BR/BK lead (terminal 14)

**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 (see this section).
- 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**

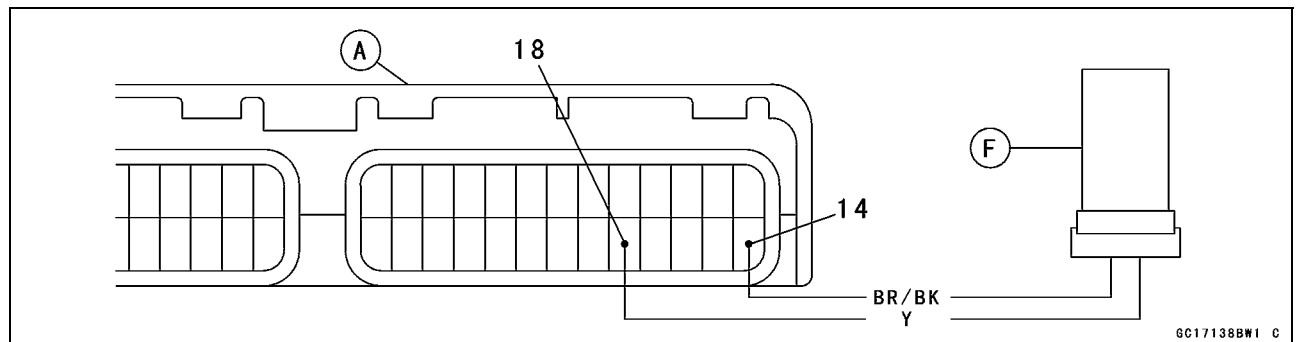
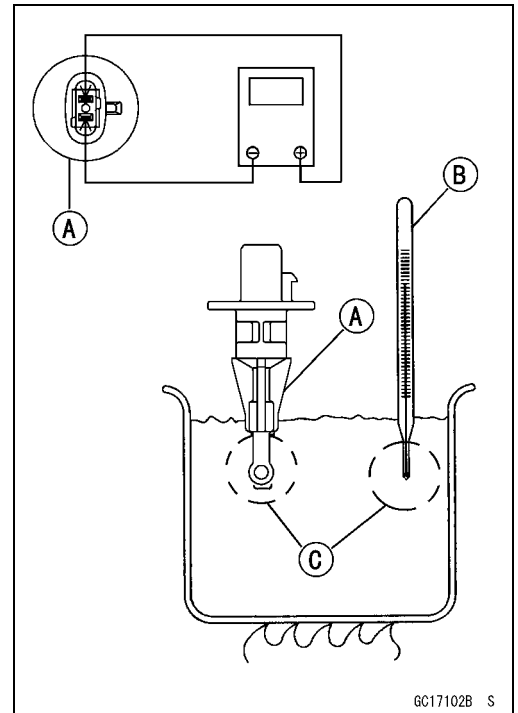
- *The sensor and thermometer must not touch the container side or bottom.*
- Place the container over a source of heat and gradually raise the temperature of the oil while stirring the oil gently for even temperature.
- Using a digital meter, measure the internal resistance of the sensor across the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



A. ECU

F. Inlet Air Temperature Sensor

## 3-50 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 about 200 mL (6.76 US oz).
- Disconnect the sensor connector, and unscrew the water temperature sensor [A].

Front [B]

**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 this chapter). 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)

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

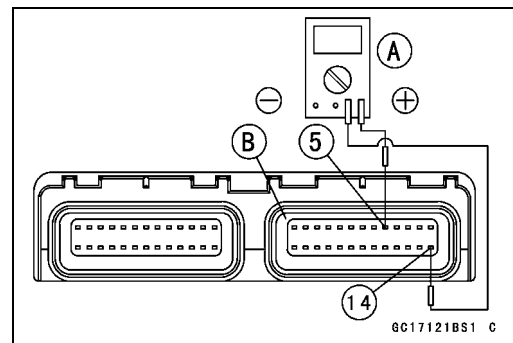
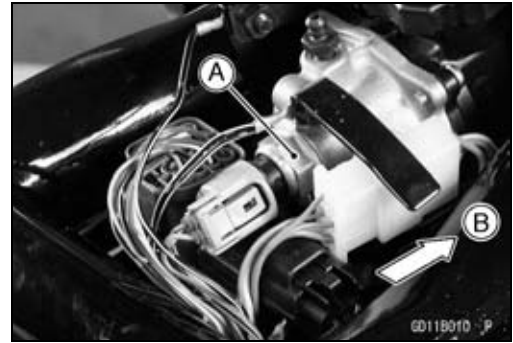
#### NOTE

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

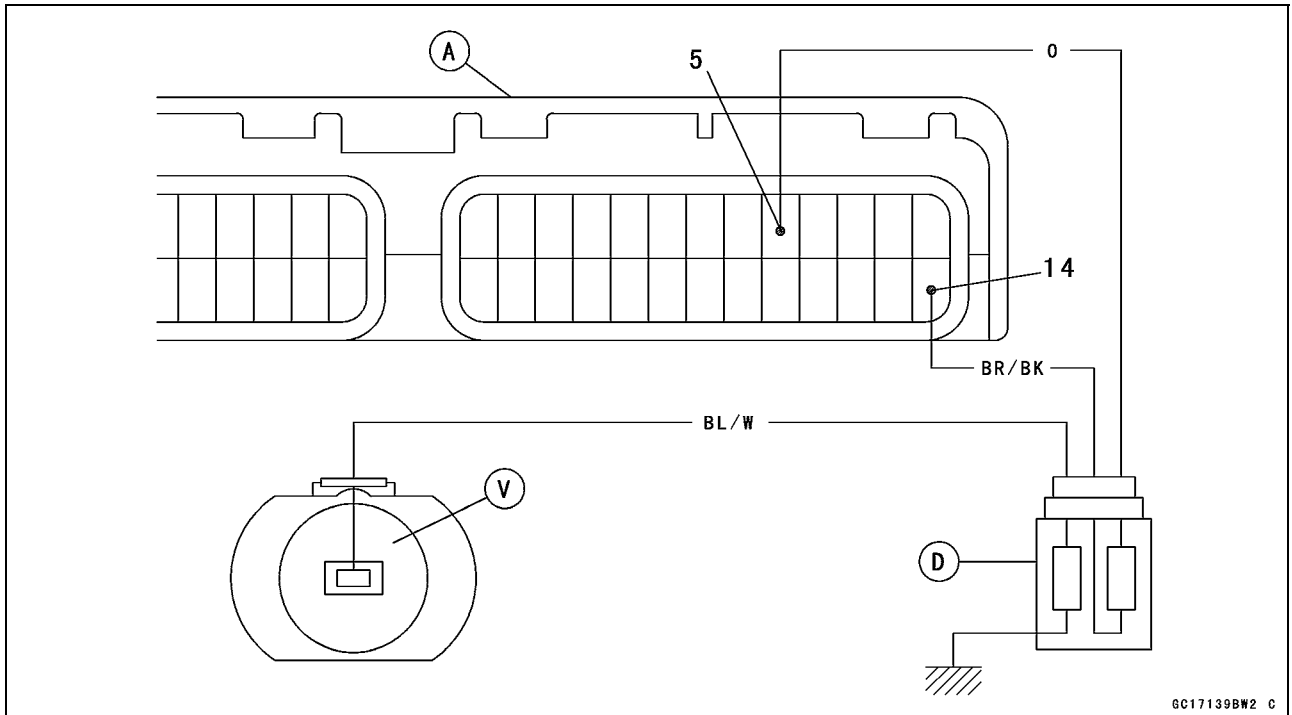
- Turn the ignition switch OFF.
- ★If the output voltage is within the standard, check the ECU for its ground, and power supply (see this chapter).
- ★If the output voltage is out of the standard, remove the fuel tank and check the wiring. And if the output voltage is 4.8 V, the ECU is normal.
- ★If the 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 (Service Code 14)



- A. ECU
- D. Water Temperature Sensor
- V. Coolant Temperature Gauge in Tachometer

**Sensor Resistance Inspection**

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

## 3-52 FUEL SYSTEM (DFI)

### Atmospheric Pressure Sensor (Service Code 15)

#### CAUTION

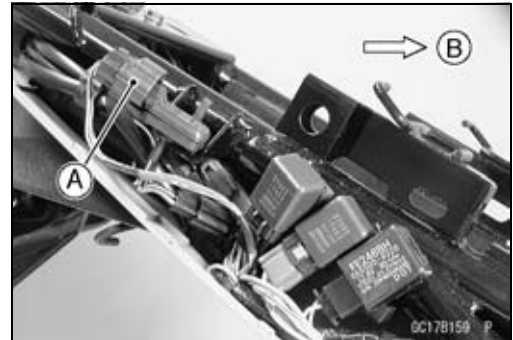
Never drop the sensor, especially on a hard surface. Such a shock to the sensor can damage it.

#### 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.  
Front [B]



#### 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 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.

#### Atmospheric Pressure Sensor Input Voltage

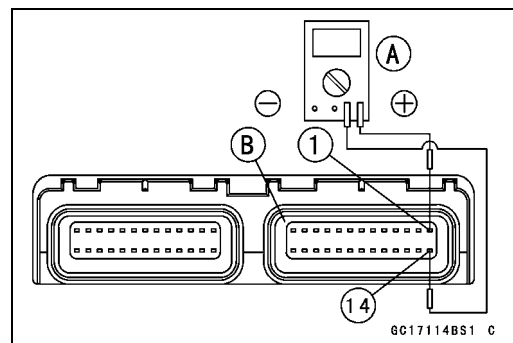
##### Connections to ECU

Meter (+) → BL lead (terminal 1)

Meter (-) → BR/BK lead (terminal 14)

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)**

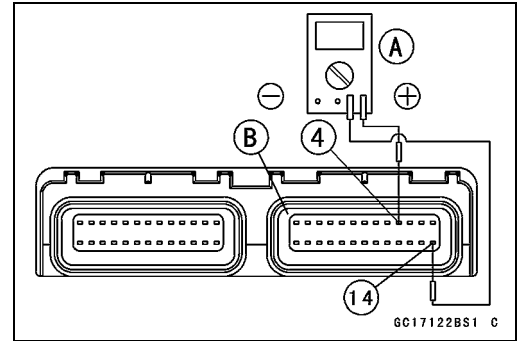
*Output Voltage Inspection*

- 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)

**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 this chapter).
- ★ 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 in this chapter).
- 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 (4 265 ft) and the sensor output voltage Va is 3.3 V.

Plot this H (1 300 m, 4 265 ft) 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.

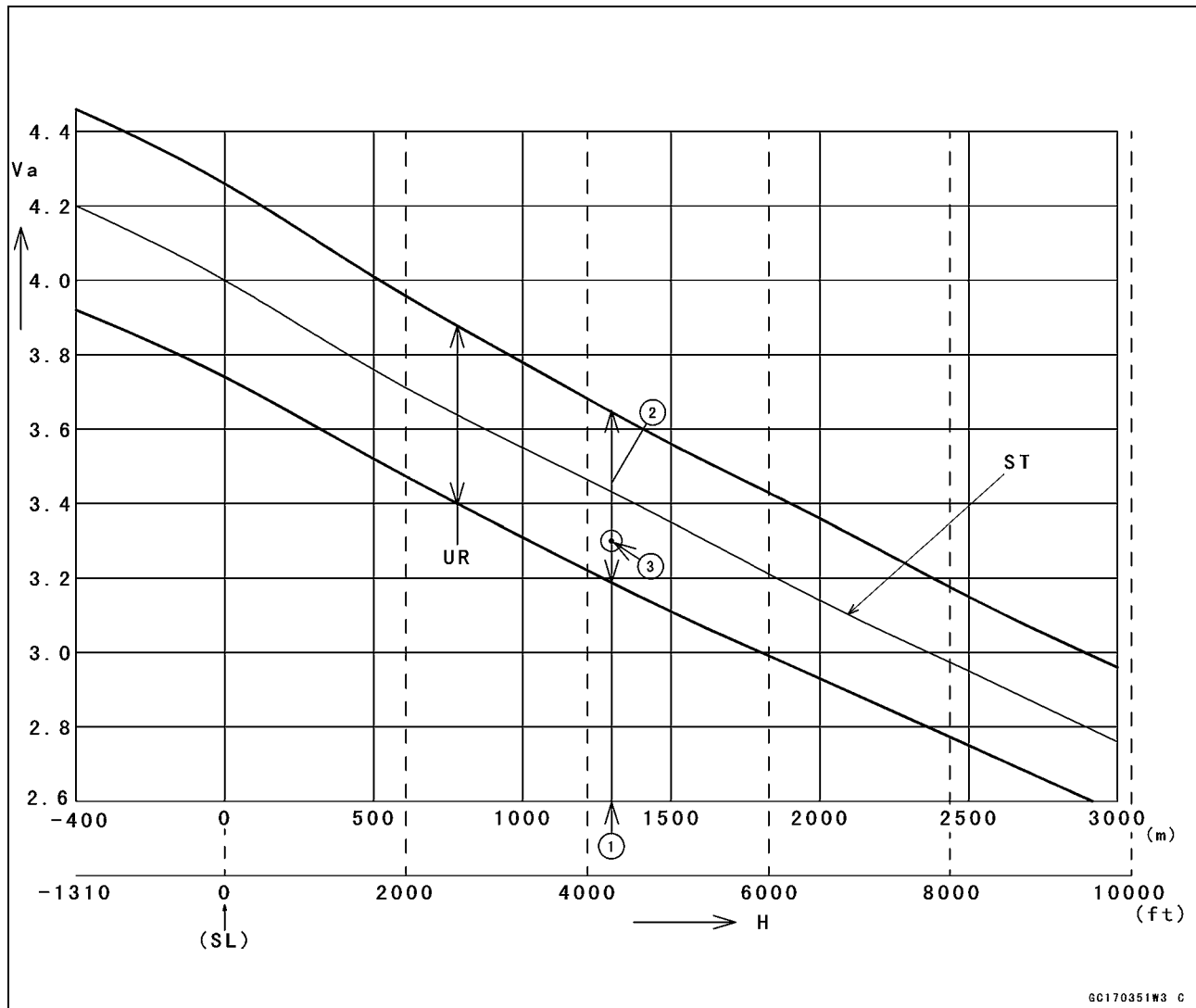
Usable Range = 3.2 ~ 3.64 V

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.**

### 3-54 FUEL SYSTEM (DFI)

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

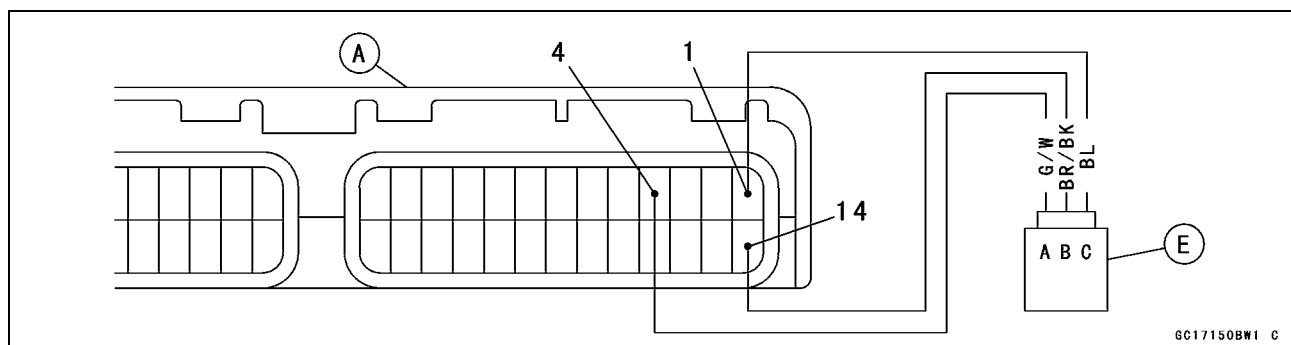


$V_a$ : Atmospheric Pressure Sensor Output Voltage (v)

ST: Standard of Sensor Output Voltage (v)

UR: Usable Range of Sensor Output Voltage (v)

H: Altitude (m or feet)



A. ECU

E. Atmospheric Pressure Sensor

**Crankshaft Sensor (Service Code 21)**

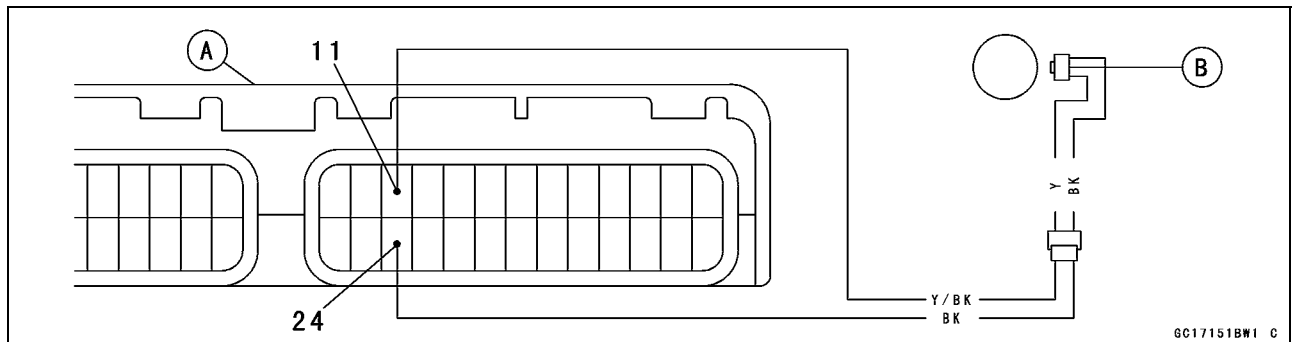
Start the engine and switch the diagnosis mode to Dealer 1 mode to know all the problem that the DFI system has at the time of self-diagnosis. If the engine cannot be started, the self-diagnosis system does not detect dynamic condition of the crankshaft sensor. In this case, turn off the ignition switch 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.



- A. ECU
- B. Crankshaft Sensor

## 3-56 FUEL SYSTEM (DFI)

### 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.

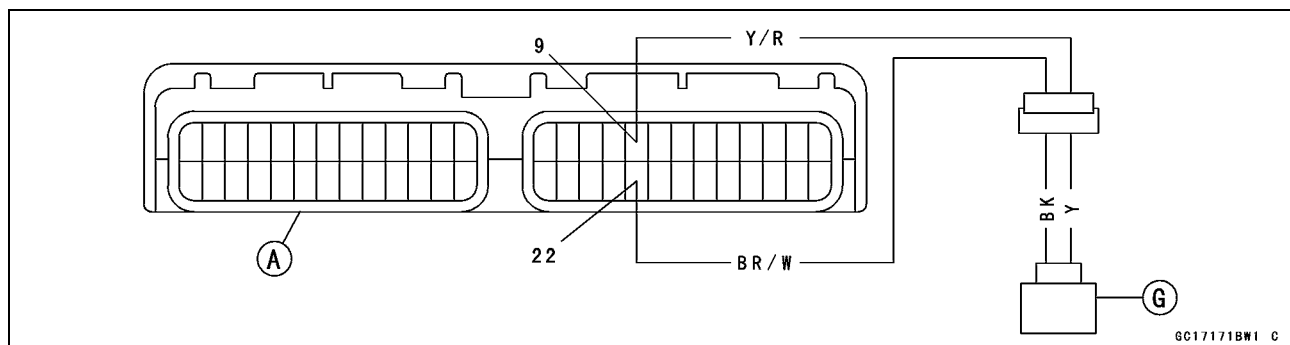
#### *Camshaft Position Sensor Removal/Installation*

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



**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] under the left side of the air cleaner housing 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:  
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.

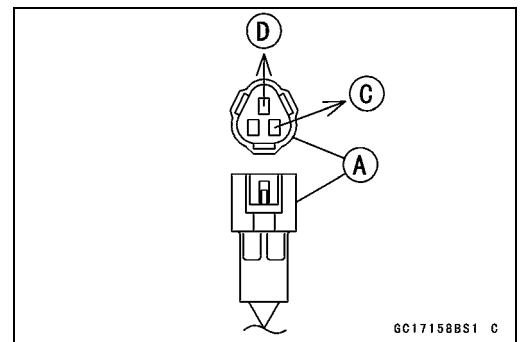
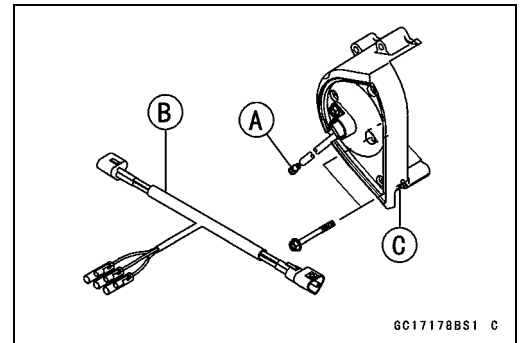
*Output Voltage Inspection*

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

**NOTE**

○ Be sure the battery is fully charged.

- Turn the ignition switch OFF.



## 3-58 FUEL SYSTEM (DFI)

### 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:**  
**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]

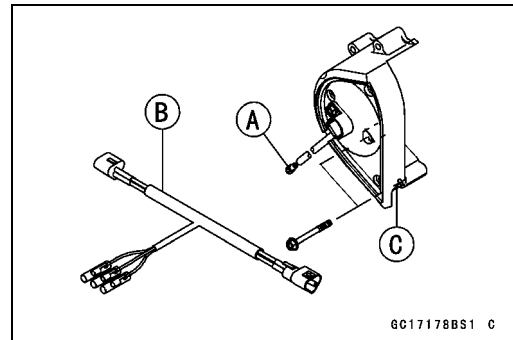
**Standard: About 0.05 ~ 0.07 V DC**

#### NOTE

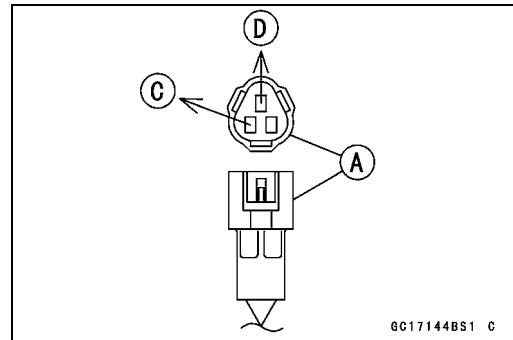
○ If you rotate the engine sprocket, the output voltage will be increased.

- ★ 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).

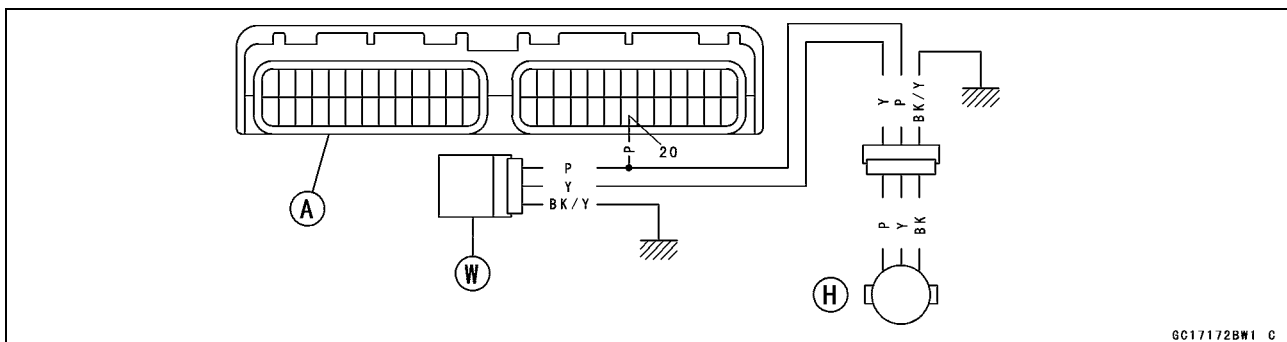
- ★ If the reading, speed sensor operation and wiring are good, check the ECU for its ground, and power supply (see ECU section).



GC17178BS1 C



GC17144BS1 C



GC17172BW1 C

A. ECU

W. Speedometer Unit

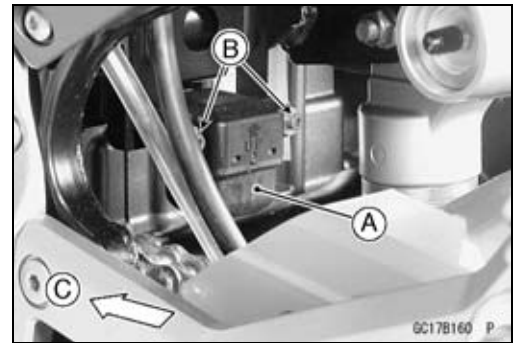
H. Speed Sensor

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

*Removal*

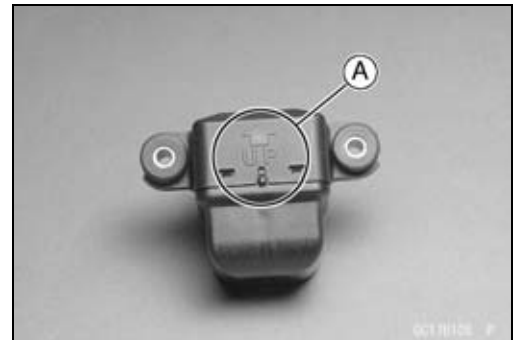
<b>CAUTION</b>
<b>Never drop the down-sensor, especially on a hard surface. Such a shock to the sensor can damage it.</b>

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



*Installation*

- The UP mark [A] of the sensor should face upward.
  - Torque - Vehicle-down Sensor Bolts: 2 N·m (0.2 kgf·m, 17 in·lb)



<b>⚠ WARNING</b>
<b>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.</b>

*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]

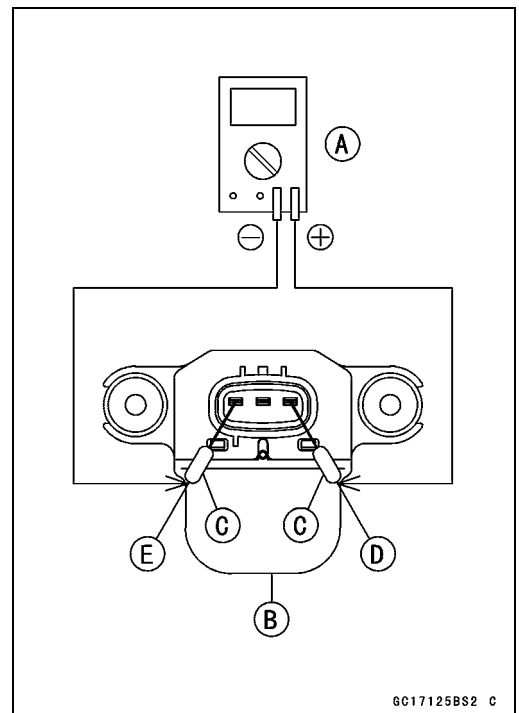
Meter (-) → BK/Y lead [E]

- 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 diagram)
- ★ If the power source is normal, check the output voltage.



## 3-60 FUEL SYSTEM (DFI)

### 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

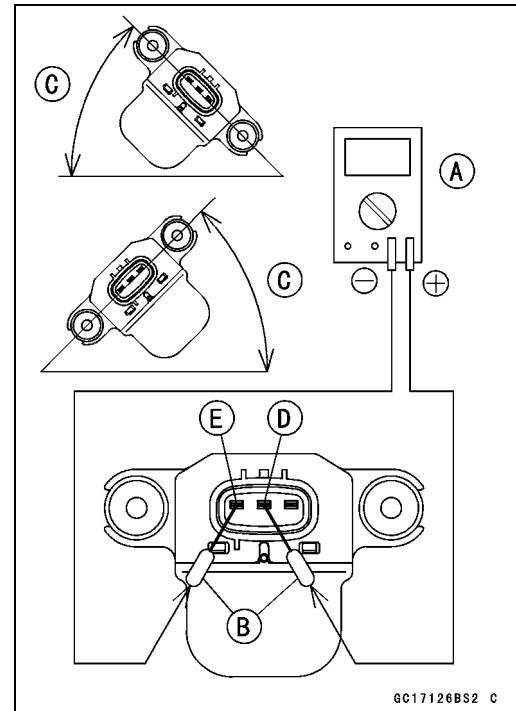
○ If you need to test again, turn the ignition switch OFF, and then ON.

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

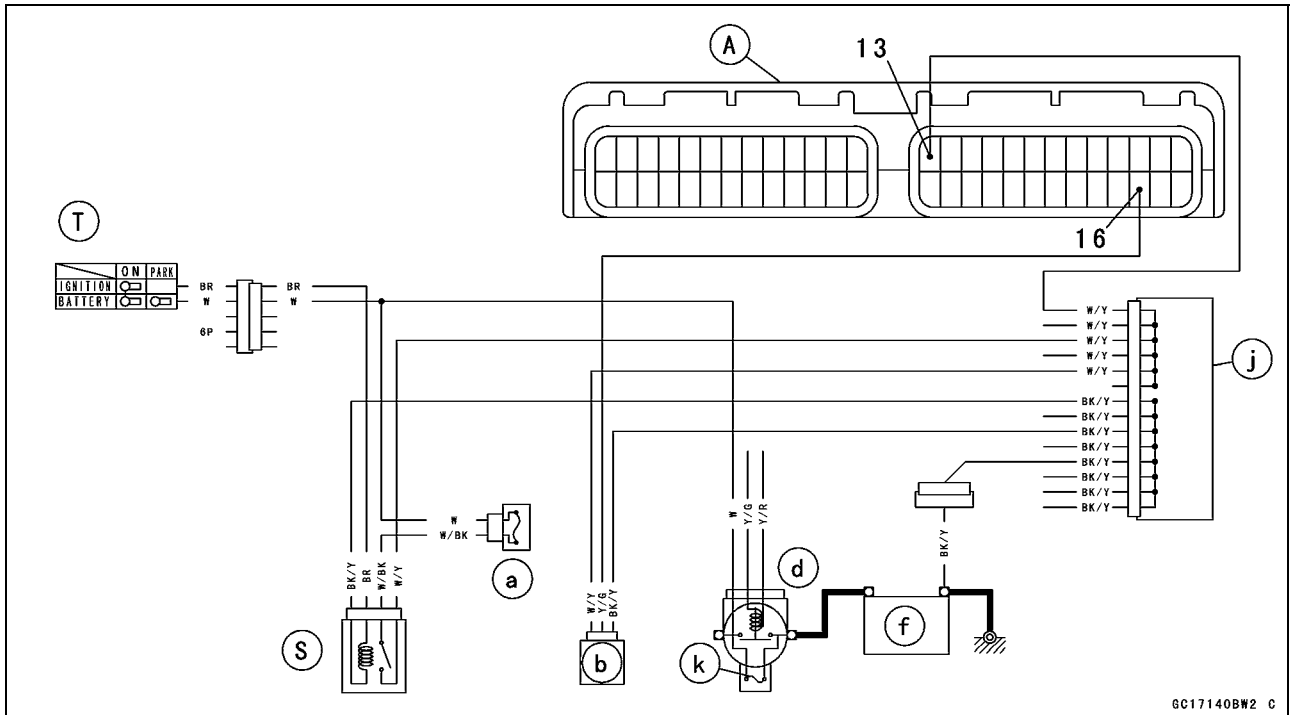
**Silicone Sealant (Kawasaki Bond: 56019-120)**

##### - 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.



Vehicle-down Sensor (Service Code 31)



A. ECU  
S. ECU Main Relay  
T. Ignition Switch

a. ECU Fuse 15A  
b. Vehicle-down Sensor  
d. Starter Relay

f. Sealed Battery  
j. Joint Connector B  
k. Main Fuse 30 A

## 3-62 FUEL SYSTEM (DFI)

### Subthrottle Sensor (Service Code 32)

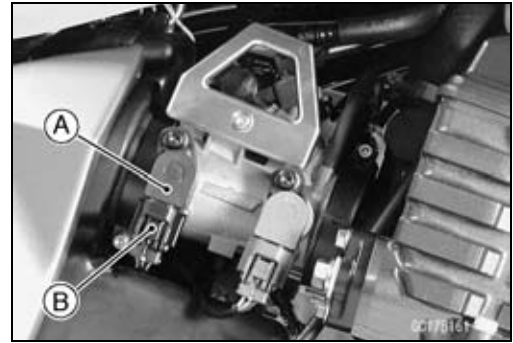
#### Subthrottle Sensor Removal/Adjustment

#### 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) [A] and connect the harness adapter [B] 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

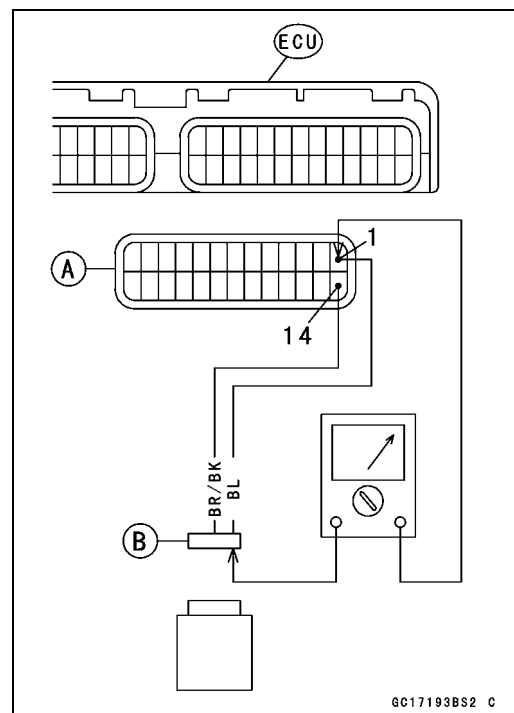
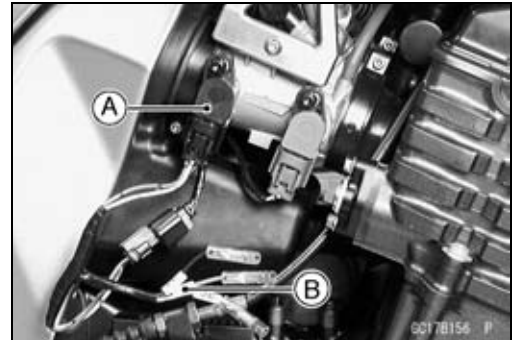
ECU Connector [A] ←→

Subthrottle Sensor Connector [B]

BL lead (ECU terminal 1)

BR/BK lead (ECU terminal 14)

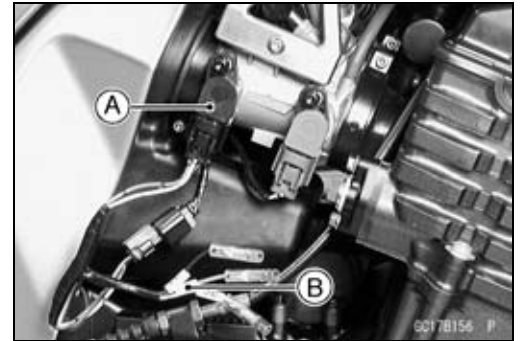
- ★If the wiring is good, check the ECU for its ground and power supply (see ECU section).



**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) [A] and (black) connect the harness adapter [B] 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**

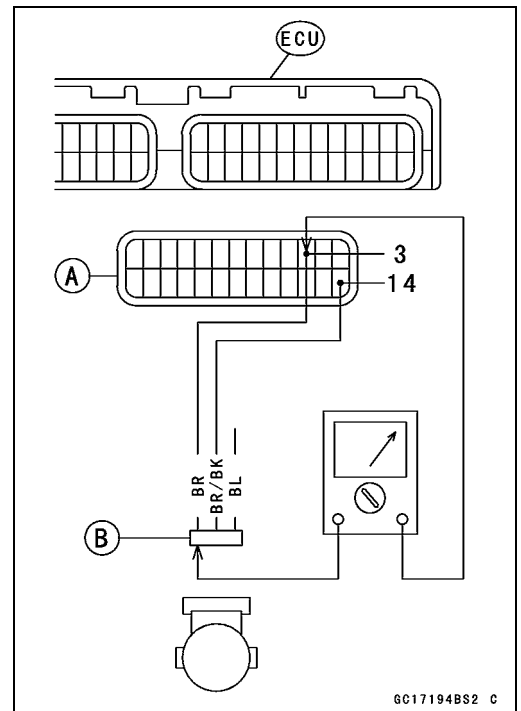
**ECU Connector [A] ↔**

**Subthrottle Sensor Connector [B]**

**BR lead (ECU terminal 3)**

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

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



## 3-64 FUEL SYSTEM (DFI)

### 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.

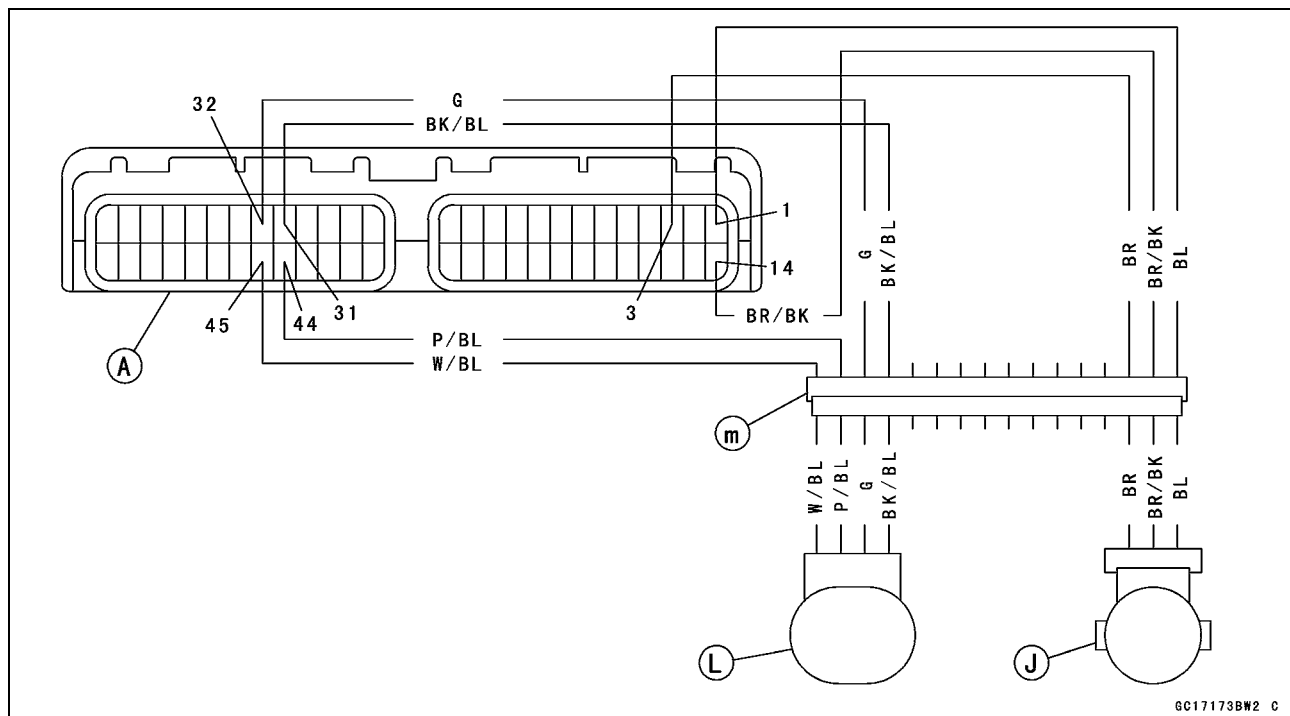
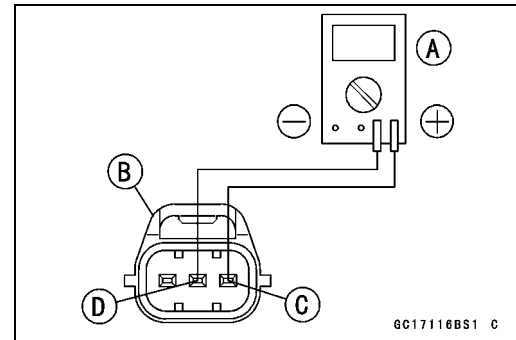
#### Throttle Sensor Resistance

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

Standard: 4 ~ 6 k $\Omega$

★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).



A. ECU

J. Subthrottle Sensor

L. Subthrottle Valve Actuator

m. Throttle Body Assy Connector



**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*

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

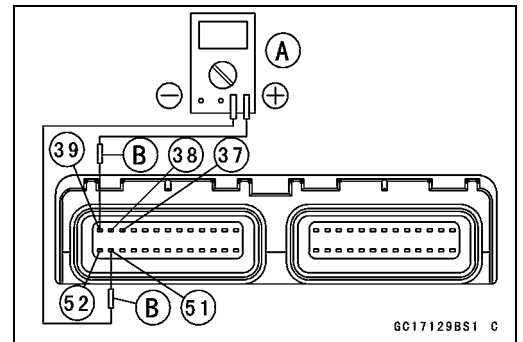
- See Ignition System section in the Electrical System chapter.

*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 stick 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)

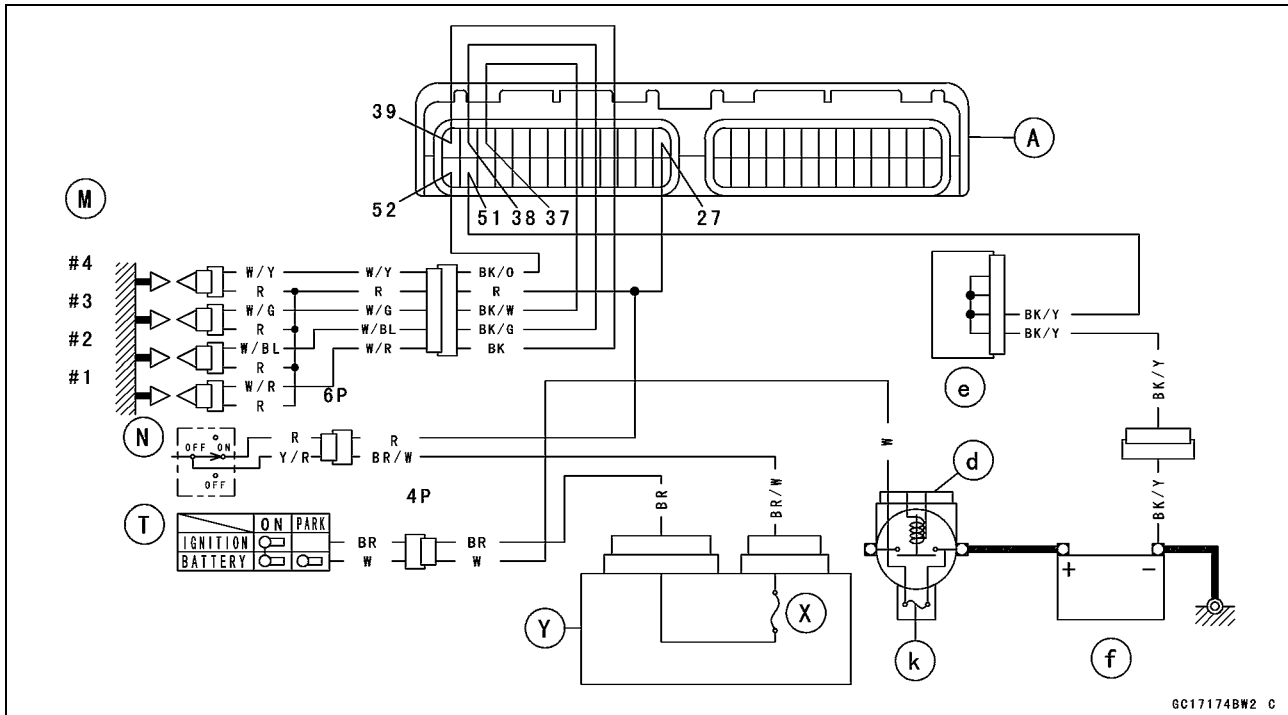
**Input Voltage at ECU**

**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.

### 3-66 FUEL SYSTEM (DFI)

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



GC17174BW2 C

A. ECU  
M. Stick Coils  
N. Engine Stop Switch  
T. Ignition Switch

X. Ignition Fuse 10 A  
Y. Junction Box  
d. Starter Relay  
e. Joint Connector D

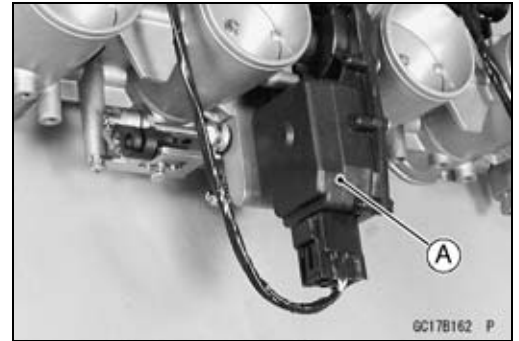
f. Sealed Battery  
k. Main Fuse 30 A

**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.

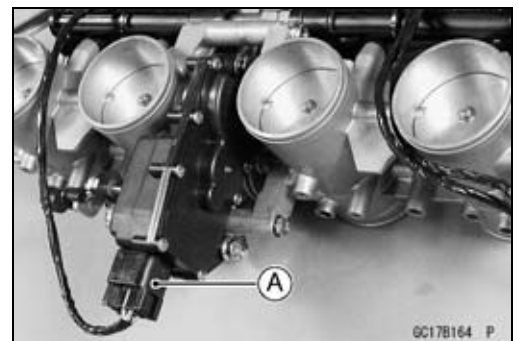
*Visual Inspection*

- 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.

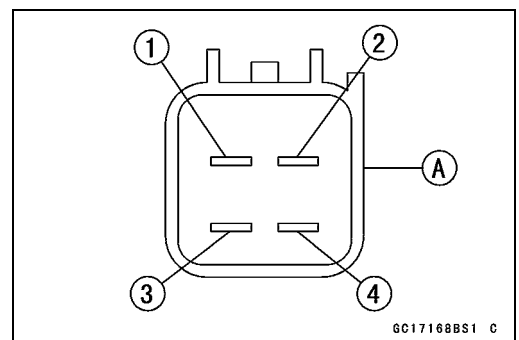
**Subthrottle Valve Actuator Resistance**

**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).



GC17168BS1 C

## 3-68 FUEL SYSTEM (DFI)

### 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].

##### Recommended Tool - Peak Voltage Adapter

Type: KEK-54-9-B

Brand: KOWA SEIKI

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

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

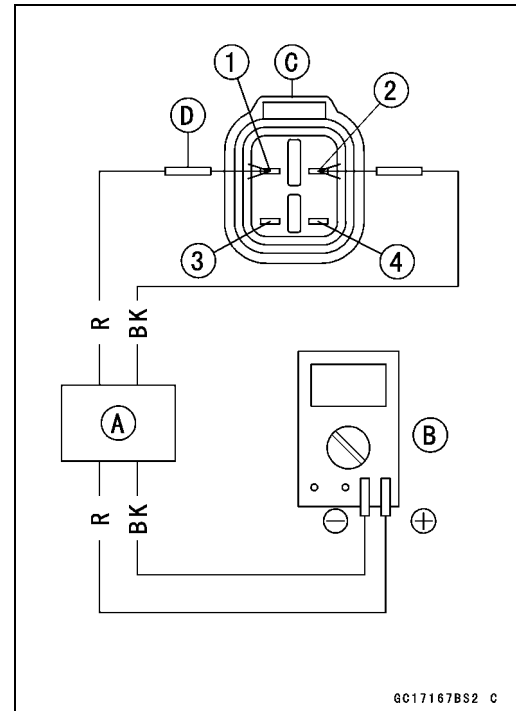
- (I) Meter (+) → BK/BL lead [1]  
Meter (-) → P/BL lead [2]
- (II) Meter (+) → G lead [3]  
Meter (-) → W/BL lead [4]

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

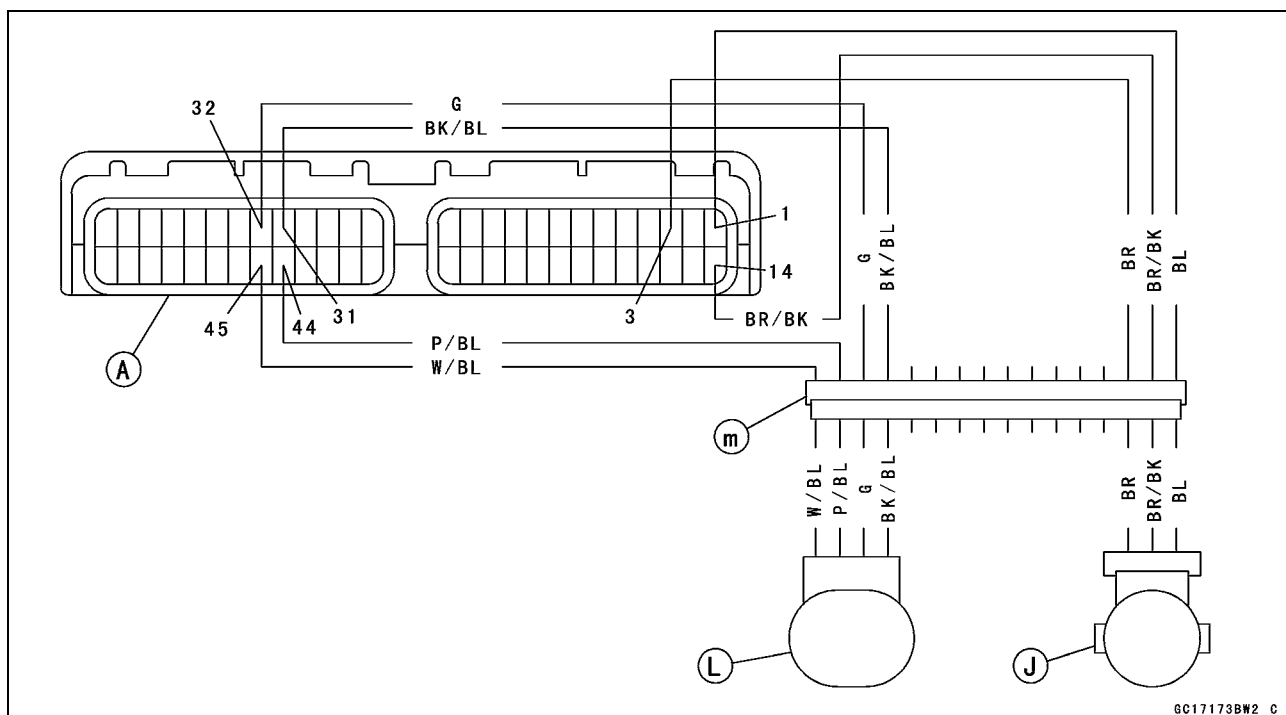
#### Input Voltage at Actuator

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).



GC17167BS2 C



GC17173BW2 C

A. ECU

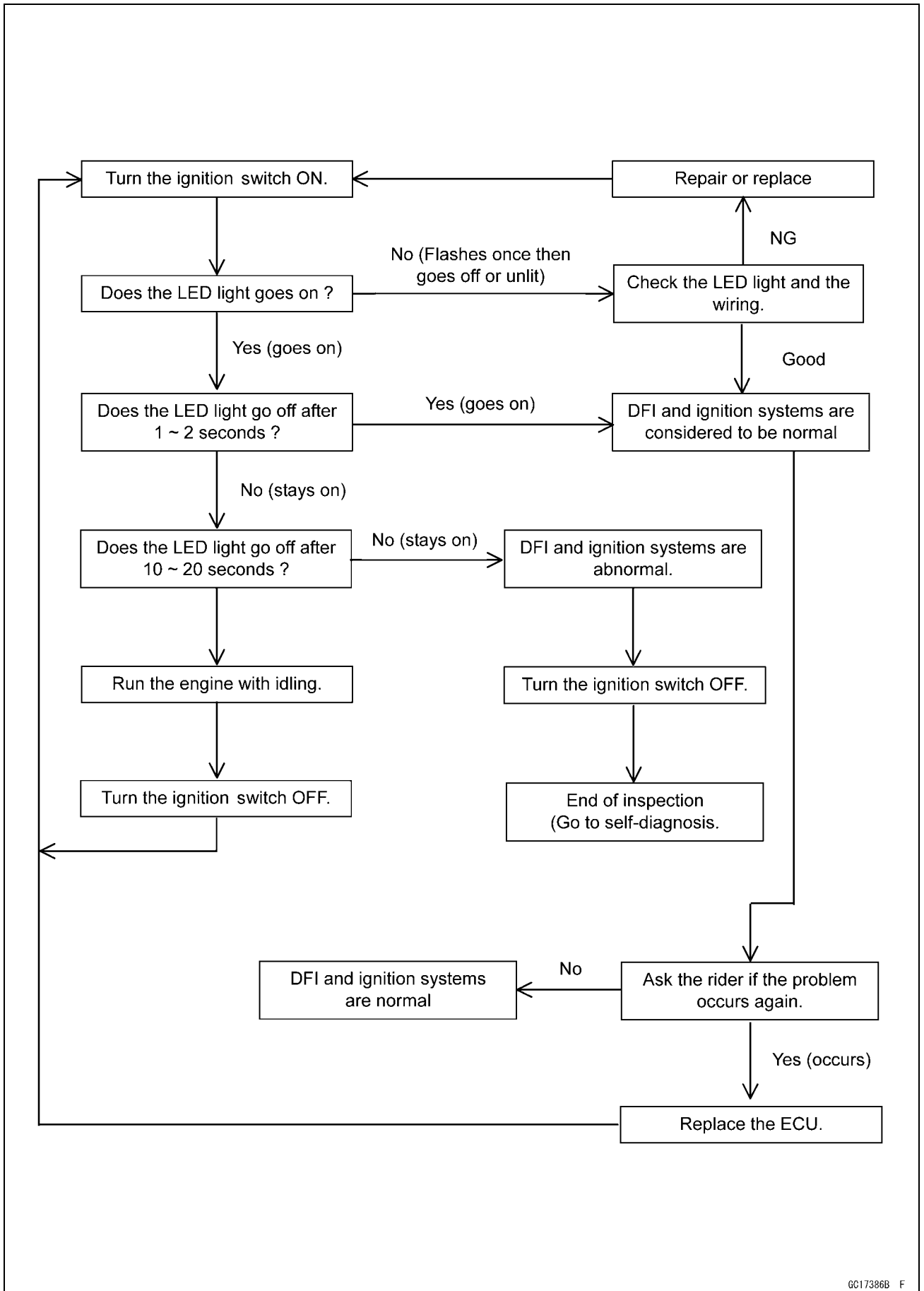
J. Subthrottle Sensor

L. Subthrottle Valve Actuator

m. Throttle Body Assy Connector

FI Indicator LED Light

Inspection Flow Chart



## 3-70 FUEL SYSTEM (DFI)

### FI Indicator LED Light

#### LED Light Inspection

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

#### FI Indicator LED Light Check

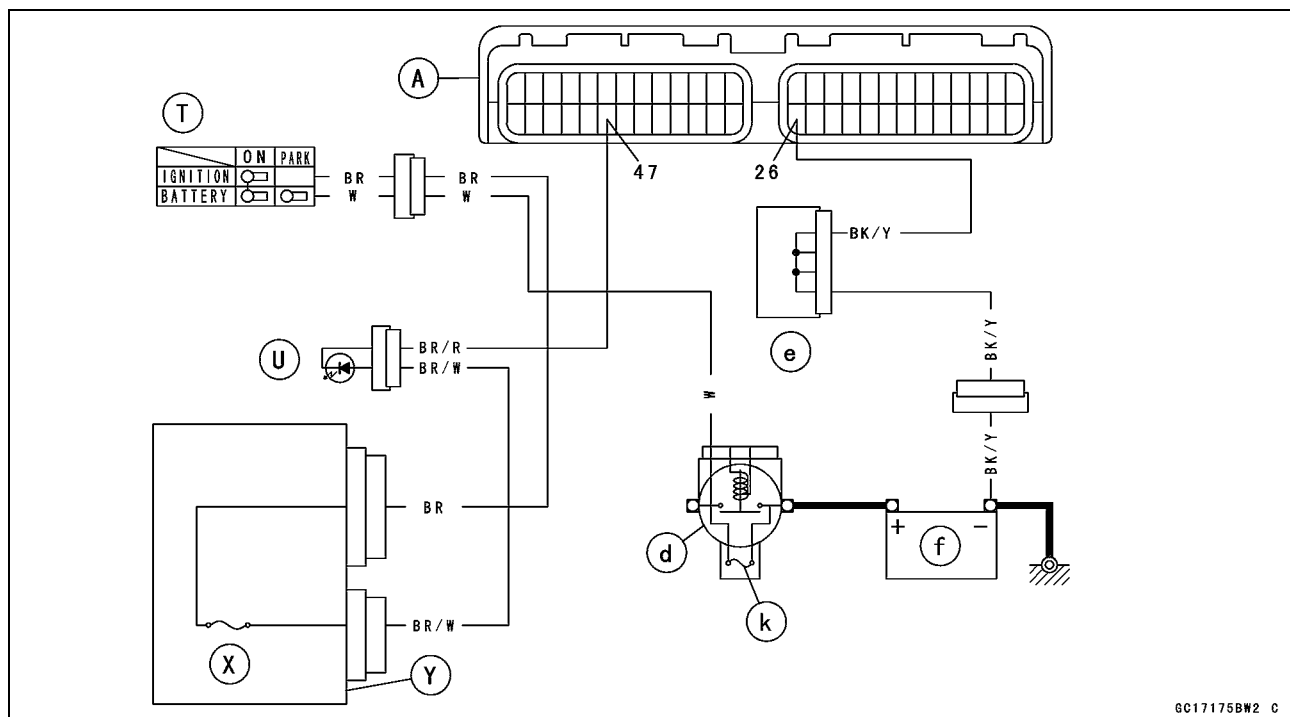
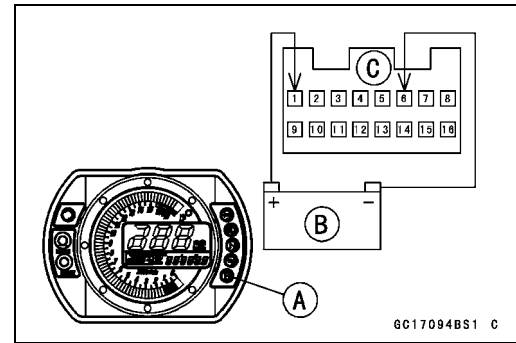
**Connector:** Meter Connector [C] (disconnected)

**Connection:** BR/W Lead Terminal [1] of the Meter  
→ Battery (+) Terminal

BR/R Lead Terminal [6] of the Meter  
→ Battery (-) Terminal

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

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



A. ECU

T. Ignition Switch

U. FI Indicator LED Light

X. Ignition Fuse 10 A

Y. Junction Box

d. Starter Relay

e. Joint Connector D

f. Sealed Battery

k. Main Fuse 30 A

**ECU**

**CAUTION**

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

*ECU Identification*

○Most countries have their own regulations, so each ECU has different characteristic. So, do not confuse ECU's with each other and use only the ECU's for your country. Otherwise, the motorcycle could not clear the regulation.

**ECU Identification**

Models	Type [A]	Part No. [B]
CA and US	TBCF25	21175-0007
EUR	TBCF19	21175-1097
AU and MY	TBCF27	21175-0006

- CA: Canadian Model
- US: United States of America Model
- EUR: European Model
- AU: Australian Model
- MY: Malaysian Model

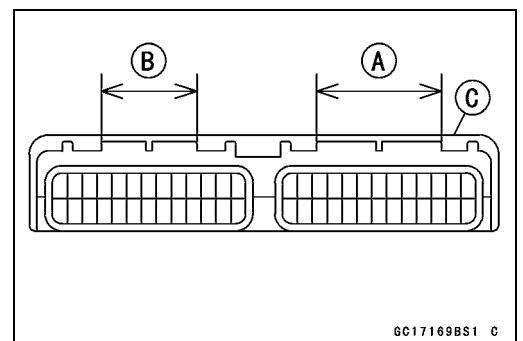
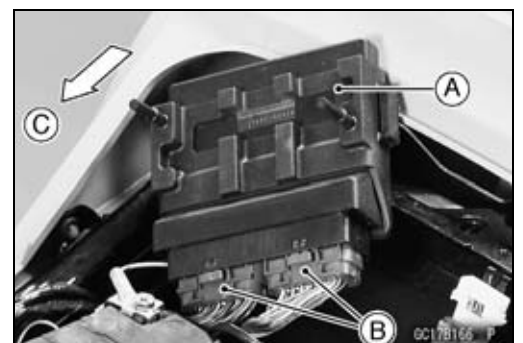
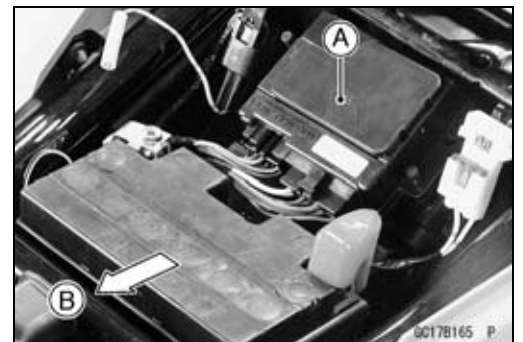
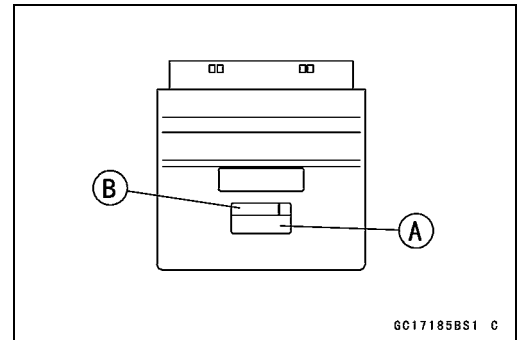
*ECU Removal*

- Remove:
  - Front and Rear Seats (see Frame chapter)
  - Regulator/rectifier [A]
  - Front [B]

- Take the ECU [A] out along with the harness.
- Disconnect the ECU lead connectors [B].
- Front [C]

*ECU Installation*

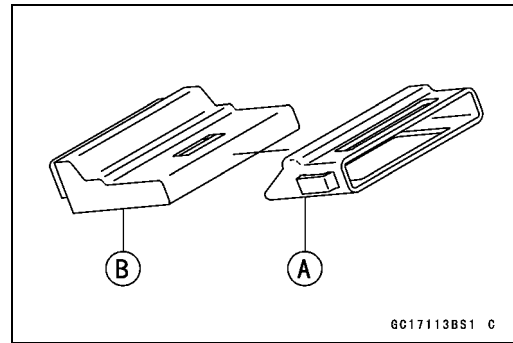
- Connect the ECU connectors, noting the length of the locks.
  - Longer Lock [A]
  - Shorter Lock [B]
  - ECU [C]



## 3-72 FUEL SYSTEM (DFI)

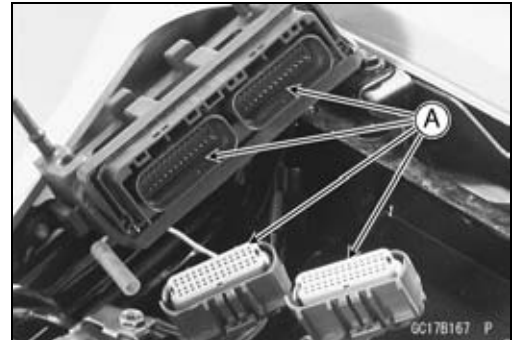
### ECU

- ★ If the rubber protector [A] is removed, install it.  
ECU [B]



#### ECU Power Supply Inspection

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



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

#### ECU Grounding Inspection

26, 50, or 51 (BK/Y)

Terminal ↔ Battery (-) Terminal: 0 Ω

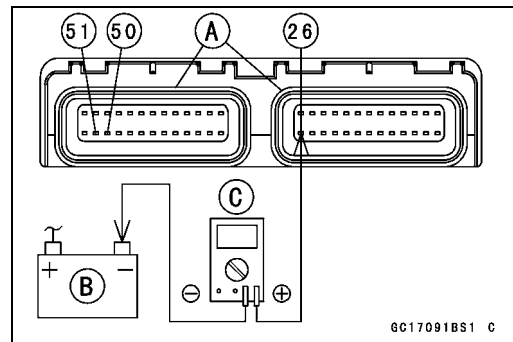
Engine Ground ↔ Battery (-) Terminal: 0 Ω

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

Battery [B]

Tester [C]

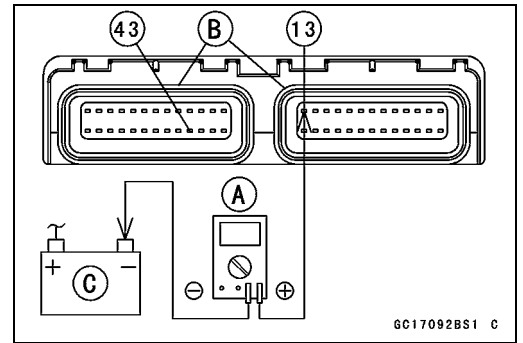
Special Tool - Needle Adapter Set: 57001-1457





## ECU

- 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

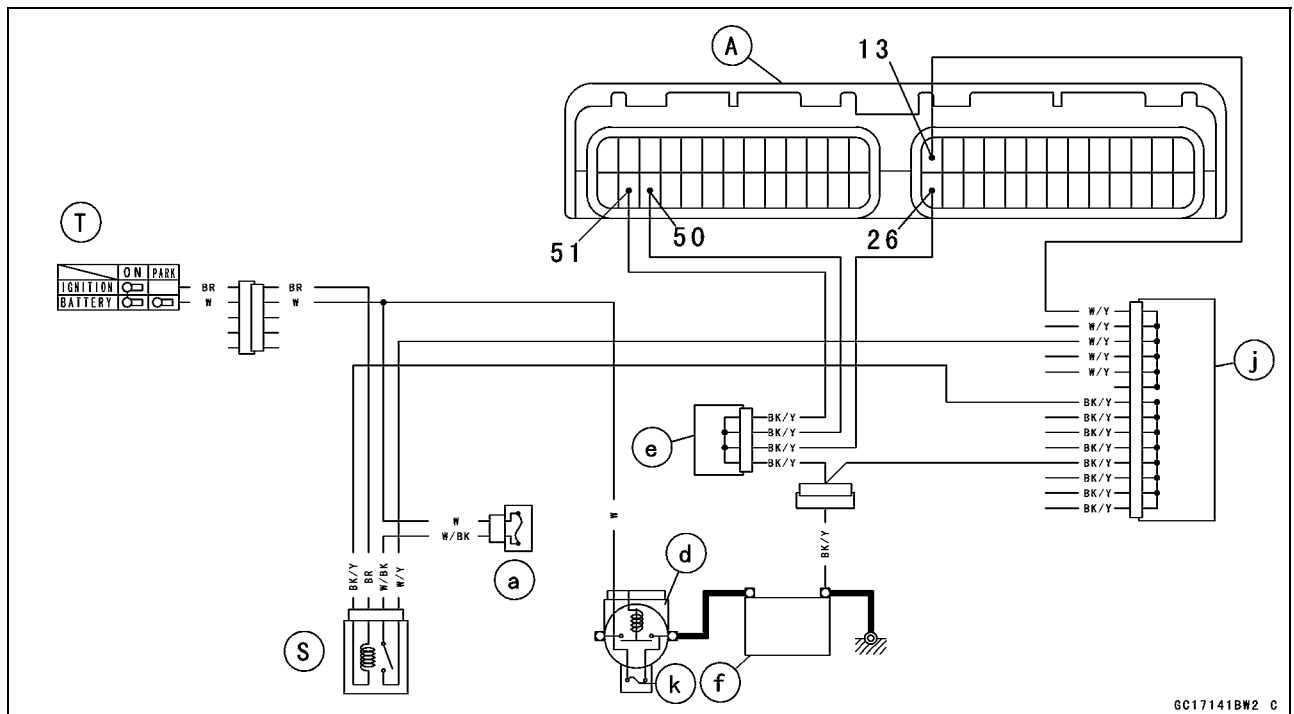
<b>Meter</b>	between Terminal 13 (W/Y) and
<b>Connections:</b>	Battery (-) Terminal
	between Terminal 43 (W/BK) and
	Battery (-) Terminal
<b>Ignition switch</b>	Terminal 13 (W/Y) : 0 V,
<b>OFF:</b>	Terminal 43 (W/BK) : 12.6 V or more
<b>Ignition switch</b>	Both: Battery Voltage (12.6 V or
<b>ON:</b>	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.

### ECU Power Source Circuit



A. ECU  
S. ECU Main Relay  
T. Ignition Switch

a. ECU Fuse 15 A  
d. Starter Relay  
e. Joint Connector C

f. Sealed Battery  
j. Joint Connector B  
k. Main Fuse 30 A

## 3-74 FUEL SYSTEM (DFI)

### 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

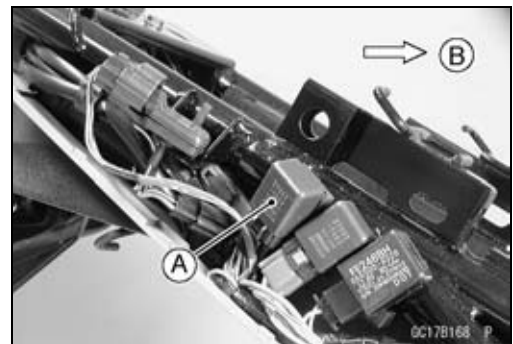
- Refer to the Electrical System chapter for the ECU Fuse Inspection.

#### ECU Main Relay Removal

#### 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 ECU main relay [A] from the tongue of the storage compartment and disconnect the connector. Front [B]



#### 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]

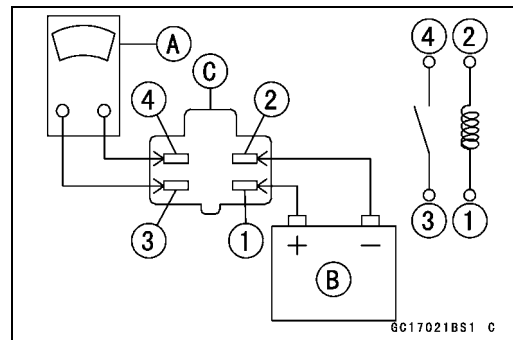
#### Testing Relay

Tester range: **1  $\Omega$  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.



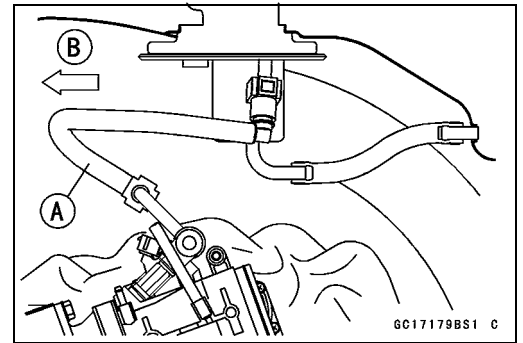
## Fuel Line

### 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] 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).

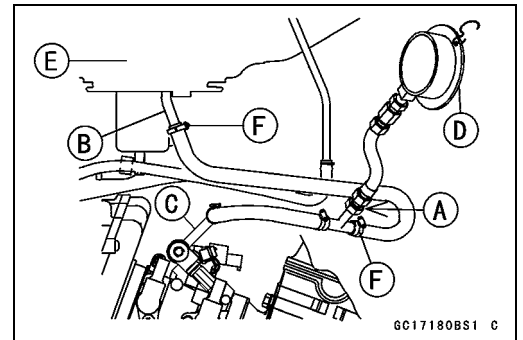
Special Tools - Oil Pressure Gauge: 57001-125

Fuel Pressure Gauge Adapter: 57001-1417

#### ⚠ 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.

## 3-76 FUEL SYSTEM (DFI)

### 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 oil 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.*

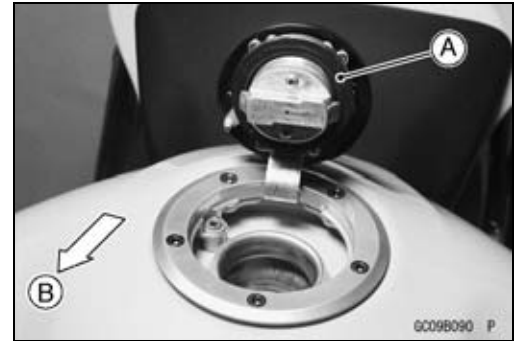
#### WARNING

**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.**

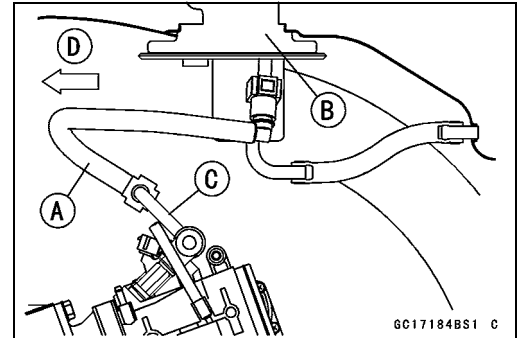
- Turn the ignition switch, and engine stop switch OFF.
- Wait until the engine cools down.
- Prepare a plastic hose of the inside diameter 7.5 mm (0.30 in.) and a measuring cylinder.
- Remove the fuel tank bolt (see Fuel Tank Removal).

**Fuel Line**

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



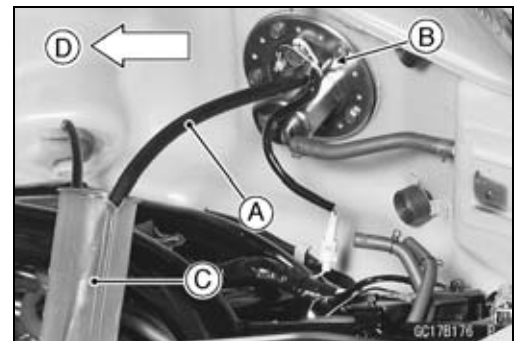
- Be sure to place a piece of cloth around the fuel pump outlet hose.
- Remove the fuel pump outlet hose [A] from the fuel pump [B] and the delivery pipe [C] (see Fuel Pump Removal).  
Front [D]



**⚠ 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 instal 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 (2.3 US oz) 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.

## 3-78 FUEL SYSTEM (DFI)

### 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.

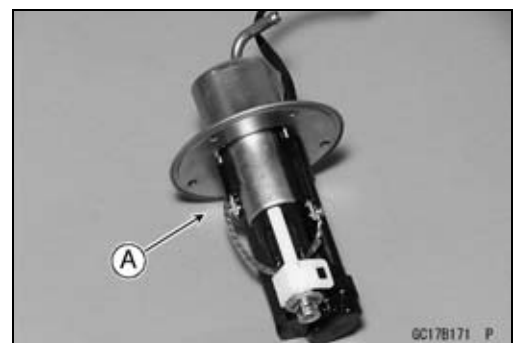
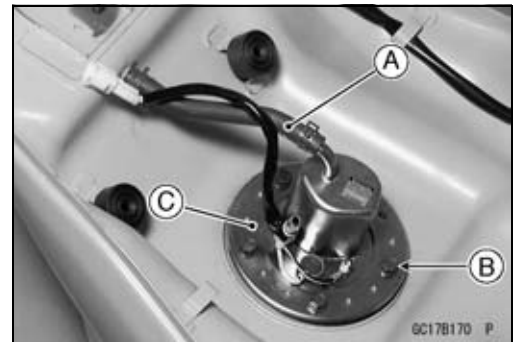
- Draw the fuel out from the fuel tank with a commercially available electric pump.
- Remove the fuel tank (see Fuel Tank Removal).
- Be careful of fuel spillage from the fuel tank since fuel still remains in the fuel tank and fuel pump. Plug the fuel pipe of the fuel tank.
- Turn the fuel tank upside down.
- Remove the fuel pump inlet hose [A].
- Unscrew the fuel pump bolts [B], and take out the fuel pump [C] and gasket.
- Discard the fuel pump gasket.

#### CAUTION

Do not pull the leads 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.



## Fuel Pump

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



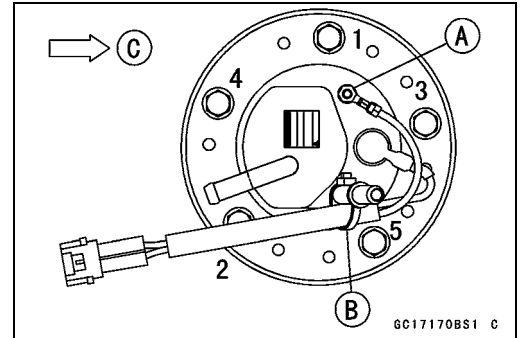
- Check that the fuel pump (-) terminal [A] and band [B] are in place.

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 fuel tank bolt and lift up the fuel tank.

## 3-80 FUEL SYSTEM (DFI)

### Fuel Pump

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

**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.**

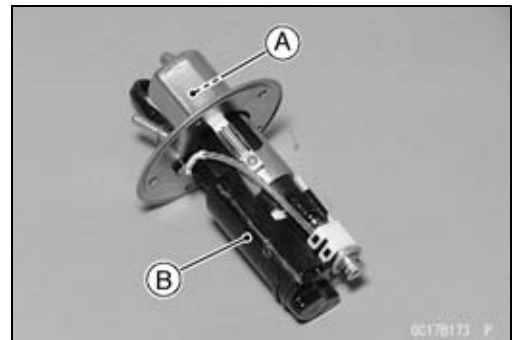
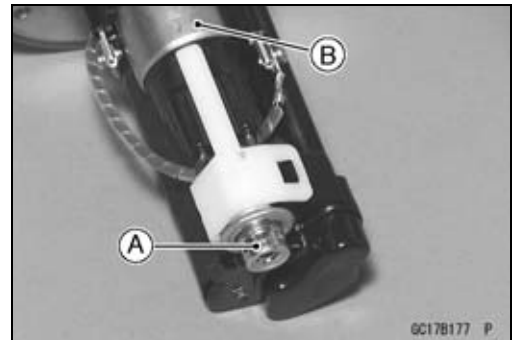
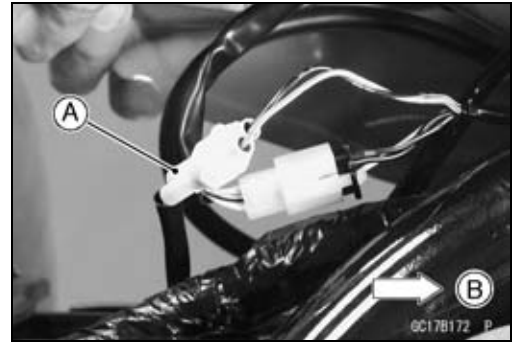
- ★ If the reading stays on battery voltage, and never shows 0 V. Check the ECU and fuel pump relay.
- ★ If the voltage is in specification, but the pump doesn't work, replace the pump.
- ★ If there is still no battery voltage, check the pump relay (see this chapter).

#### *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.





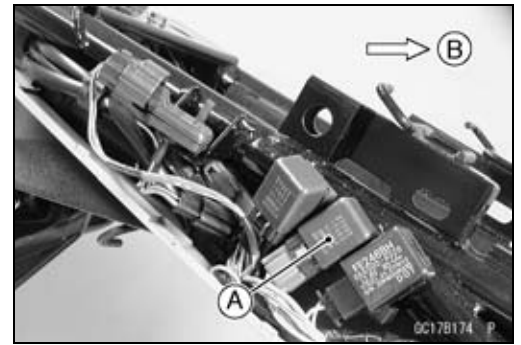
## Fuel Pump

### 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.  
Front [B]



### 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.

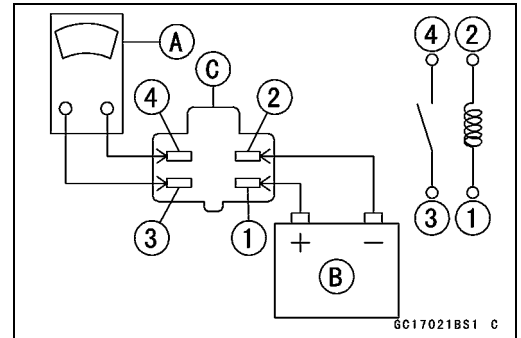
**Special Tool - Hand Tester: 57001-1394**

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

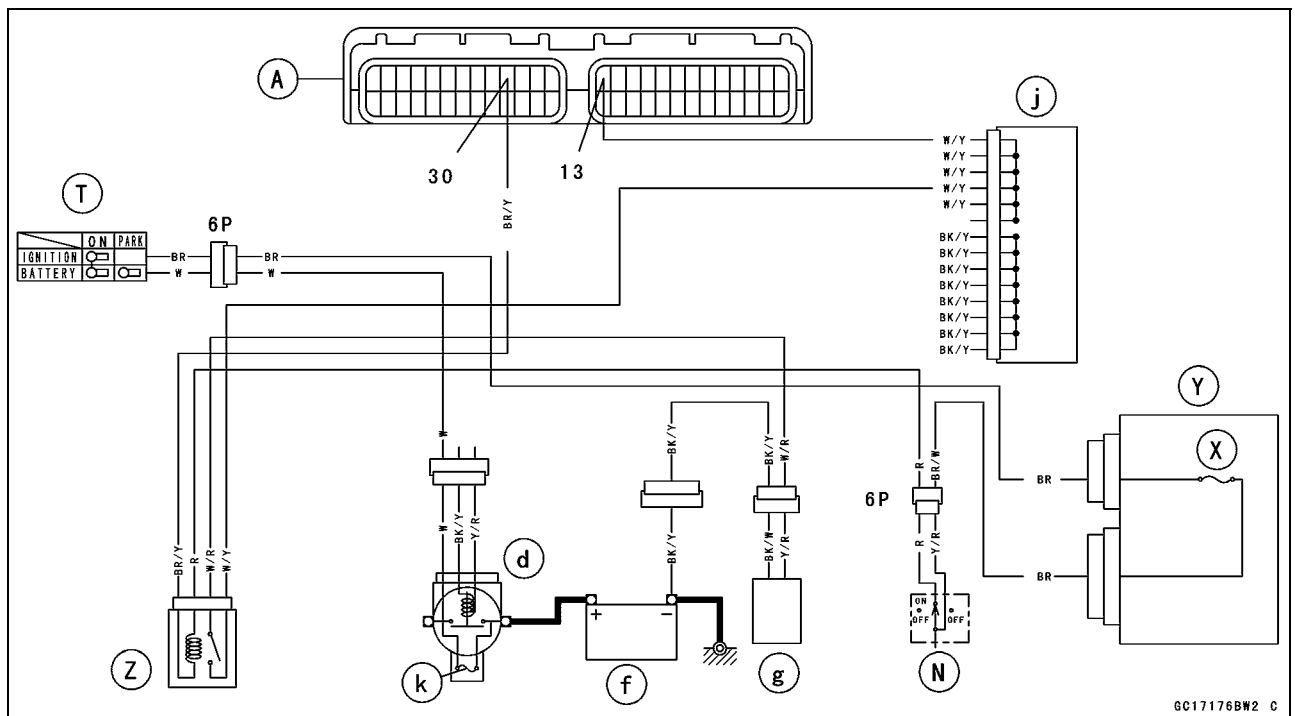
#### Testing Relay

**Tester range: 1 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.



- A. ECU
- N. Engine Stop Switch
- T. Ignition Switch
- X. Ignition Fuse 10 A

- Y. Junction Box
- Z. Fuel Pump Relay (for fuel pump and injectors)
- d. Starter Relay

- f. Sealed Battery
- g. Fuel Pump
- j. Joint Connector B
- k. Main Fuse 30A

## 3-82 FUEL SYSTEM (DFI)

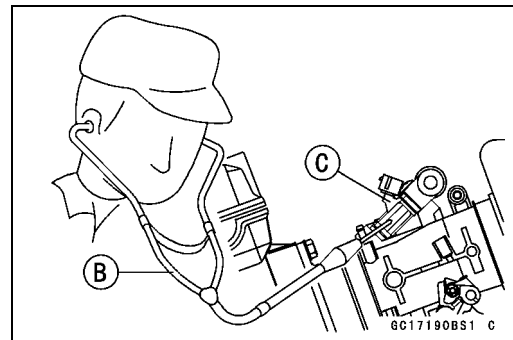
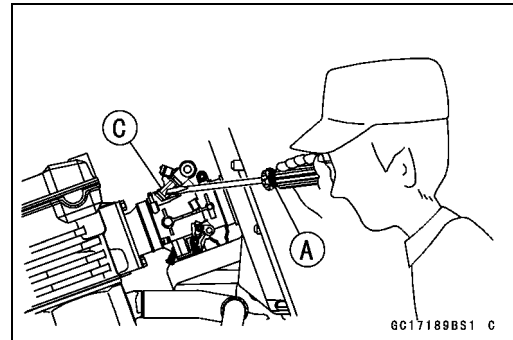
### Fuel Injectors

#### 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.

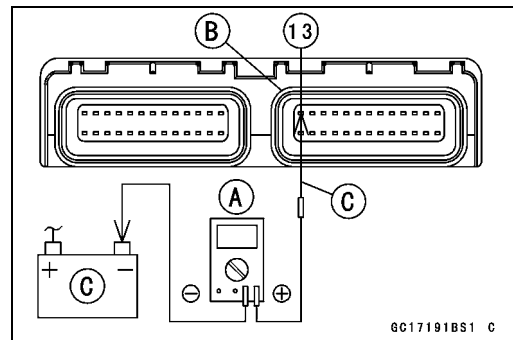


#### Power Source Voltage Inspection

- 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

**Service Limit:** Voltage (12.6 V or more)

- ★ If the meter doesn't read as specified, check the following.
  - Main Fuse 30A (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)

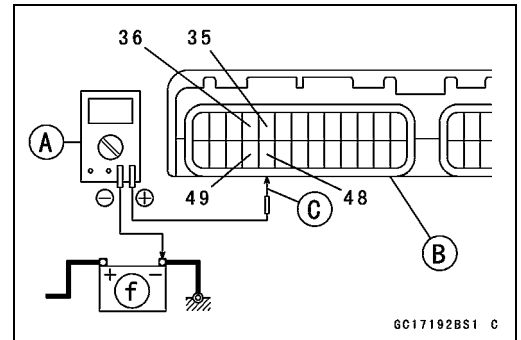
Terminal 35 → Injector #2 Terminal (BL/G)

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 in chapter).

- Remove the needle adapter.
- Apply silicone sealant to the seals of the ECU connector for waterproofing.



## 3-84 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.**

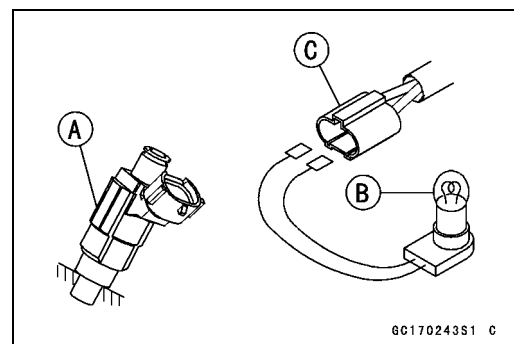
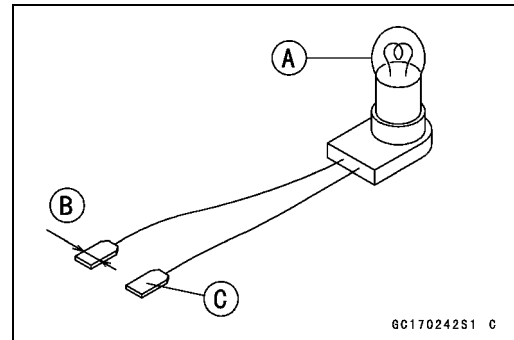
**Be sure to connect bulbs in series. The bulb works as a current limiter to protect the solenoid in the injector from excessive current.**

- Remove the fuel tank.
- Remove connectors for injector [A].
- Connect each test light set [B] to the injector subharness 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).



## 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].  
Front [C]

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.

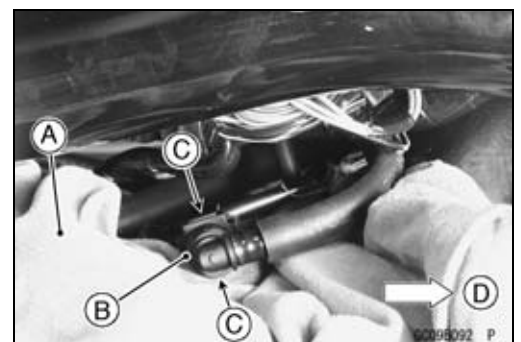
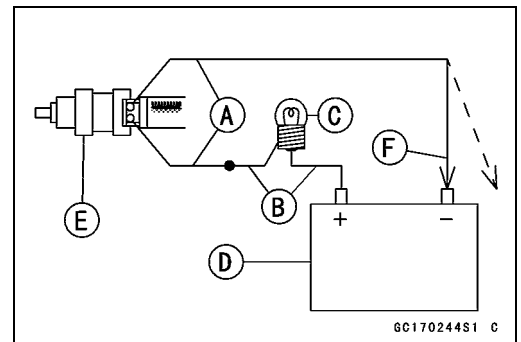
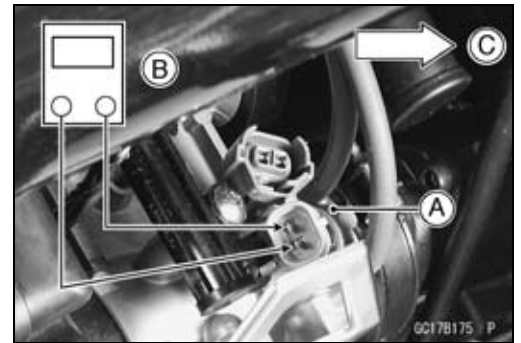
### Injector Fuel Line Inspection

- While pinching the fuel pump outlet hose joint locks [C] with fingers, pull the joint out along the delivery pipe (see Fuel Tank Removal).

Cloth [A]

Pump Outlet Hose Joint [B]

Front [D]



## 3-86 FUEL SYSTEM (DFI)

### Fuel Injectors

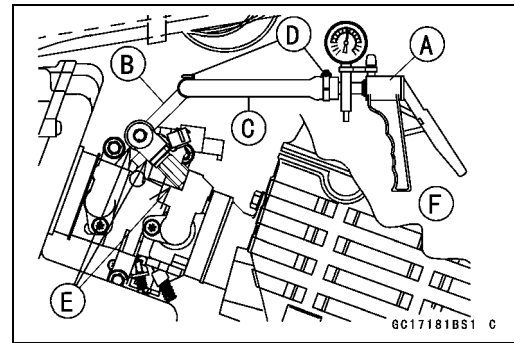
- Check the injector fuel line for leakage as follows:
  - Connect a commercially available vacuum/pressure pump [A] to the nipple of the delivery pipe [B] with a high-pressure fuel hose [C] (both ends connected with the clamps [D]) as shown.

**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)**

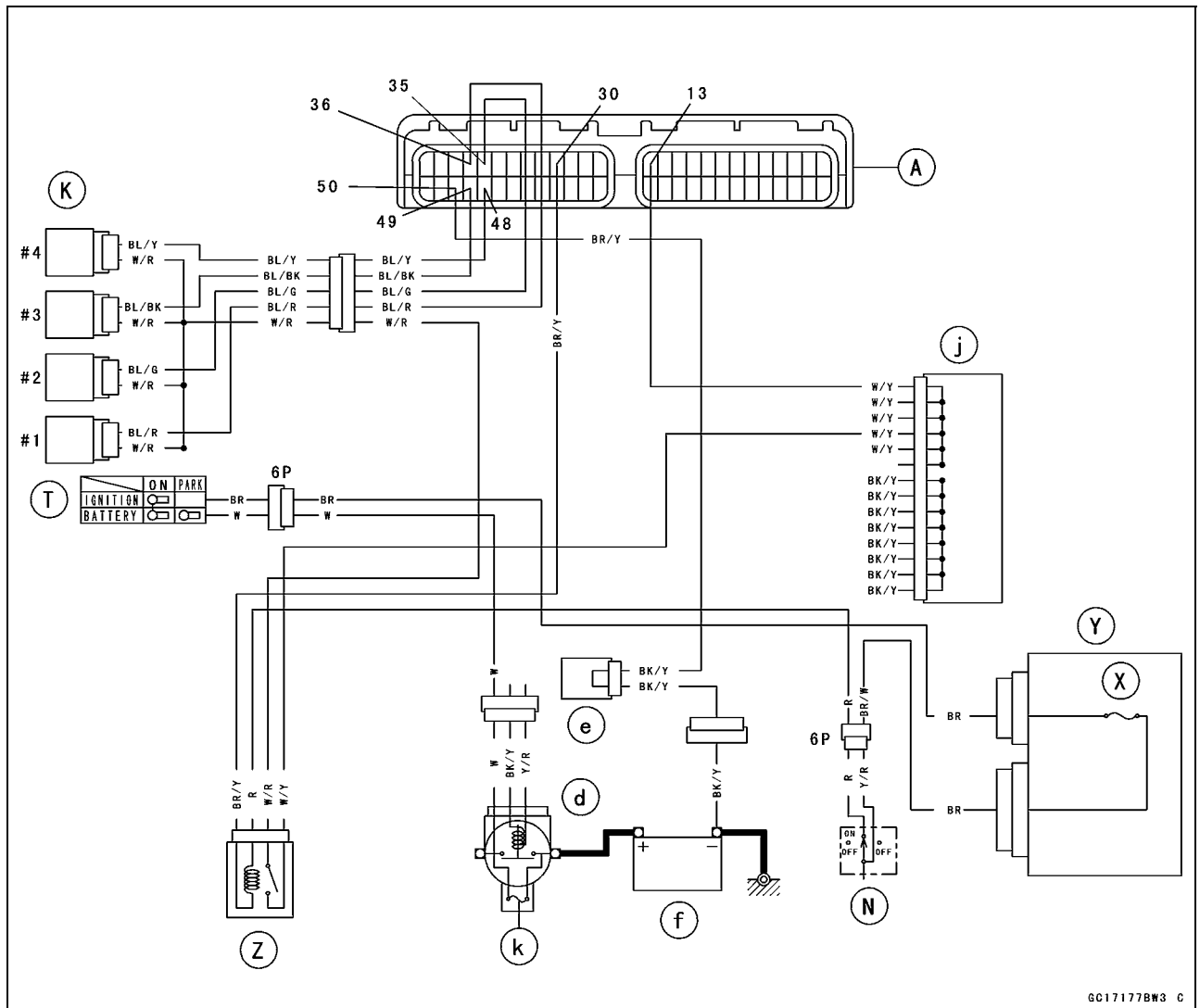


#### CAUTION

**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 Appendix chapter).

Fuel Injectors



GC17177BW3 C

- A. ECU
- K. Fuel Injectors
- N. Engine Stop Switch
- T. Ignition Switch
- X. Ignition Fuse 10 A

- Y. Junction Box
- Z. Fuel Pump Relay (for fuel pump and injectors)
- d. Starter Relay
- e. Joint Connector C

- f. Sealed Battery
- j. Joint Connector B
- k. Main Fuse 30 A

## 3-88 FUEL SYSTEM (DFI)

### Throttle Grip and Cables

#### Throttle Grip Play Inspection/Adjustment

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

#### Choke Lever Operation

- Do not use the choke lever except when the engine has a starting difficulty like in cold weather (10 °C, 50 °F or below) or at high altitude. The DFI system has an automatic choke system, using a water temperature sensor, and an atmospheric pressure sensor, which provide startability.

#### NOTE

- Pull [A] the choke lever fully when using. The choke doesn't work with the lever knob halfway.

Front [B]

- When flooded, do not crank the engine with the throttle fully opened like a carburetor. This promotes engine flooding because more fuel is supplied automatically by the DFI system.

#### Choke Lever Play 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

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

- Pull [C] the choke lever fully and ensure that the choke cam turns the choke link [D].

Front [E]

- ★ If the free play is incorrect, adjust the choke cable.

#### Choke Lever Play Adjustment

- Remove the fuel tank (see this chapter).
- 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.

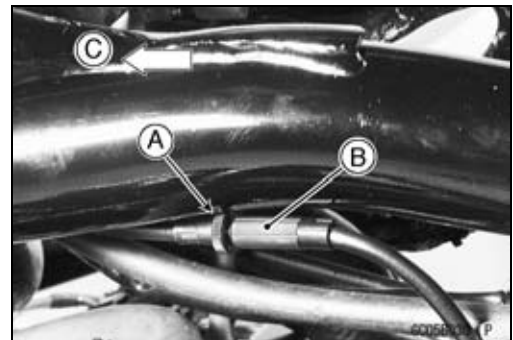
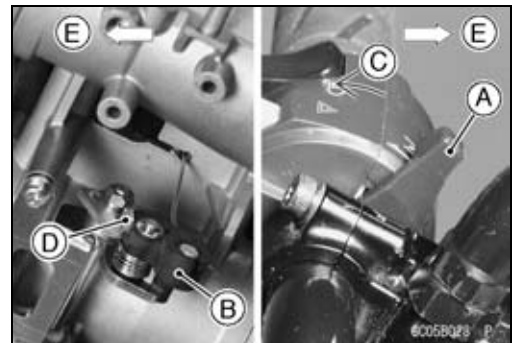
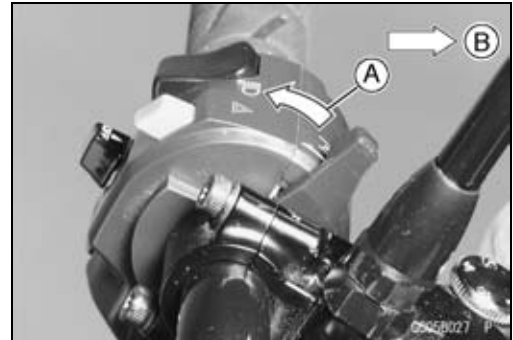
Front [C]

#### Cable Removal/Installation

- Refer to the Throttle Assy section in this chapter for removal/installation of the throttle cables and choke cable.

#### Cable Lubrication and Inspection

- Refer to the General Lubrication in the Periodic Maintenance Chapter.





## Throttle Body Assy

### Idle Speed Inspection/Adjustment

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

### Throttle Bore Cleaning

- Refer to the Throttle Control System 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.

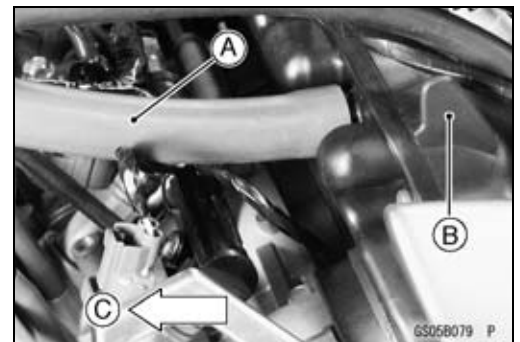
### Throttle Body Assy Removal

#### **⚠ WARNING**

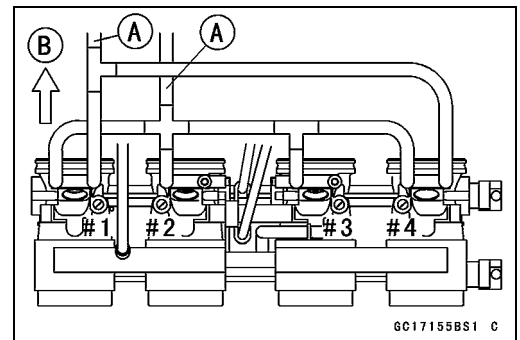
**Gasoline is extremely flammable and can be explosive under certain conditions. Turn the ignition switch OFF. Disconnect the battery (-) cable terminal. Do not smoke. Make sure the area is well-ventilated and free from any source of flame or sparks; this includes any appliance with a pilot light.**

**Be prepared for fuel spillage: any spilled fuel must be completely wiped up immediately.**

- Remove:
  - Fuel Tank (see Fuel Tank Removal)
  - Vacuum Switch Valve Vacuum Hose [A] (from air cleaner housing [B])
  - Front [C]



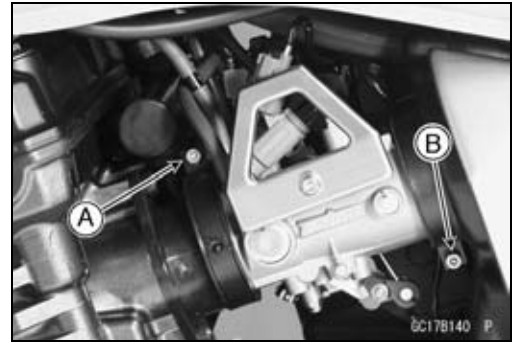
- Remove the vacuum hoses from the positions [A] shown. Front [B]



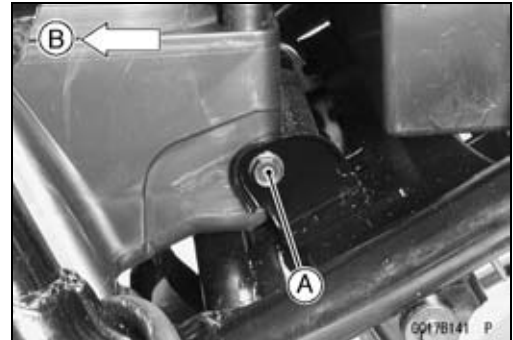
## 3-90 FUEL SYSTEM (DFI)

### Throttle Body Assy

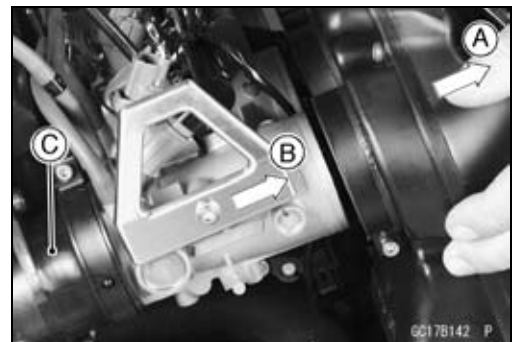
- Loosen:
    - Throttle Assy Holder Clamp Bolts [A]
    - Air Cleaner Duct Clamp Bolts [B]
- Special Tool - Carburetor Drain Plug Wrench, Hex 3: 57001-1269**



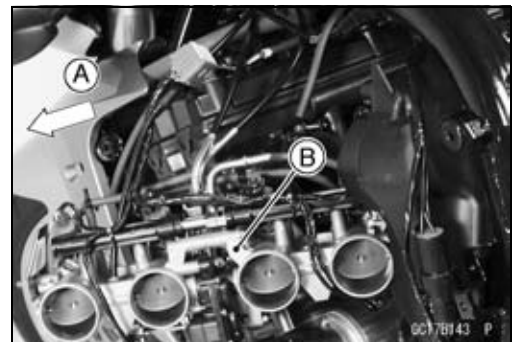
- Remove:
  - Right and Left Side Covers (see Frame chapter)
  - Coolant Reserve Tank (see Coolant Change in the Periodic Maintenance chapter)
  - Starter Relay, Junction Box (right)
  - Crankcase Breather Hose
  - Right and Left Air Cleaner Housing Mounting Bolts [A]
  - Front [B]



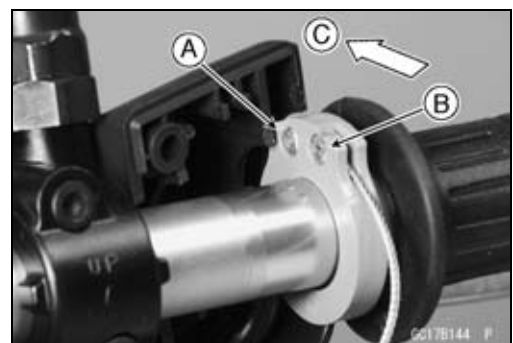
- Move [A] the air cleaner housing backwards.
- Pull [B] the throttle body assy out of the holders [C].



- Slide [A] the throttle body assy [B] left and remove it.

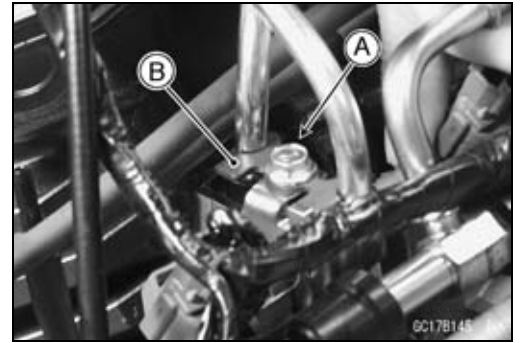


- Loosen the locknut and screw in the throttle cable adjuster fully to give the cables plenty of play.
- Remove the right handlebar switch housing and take out the accelerator cable upper end [A] and the decelerator cable upper end [B].  
Front [C]



## Throttle Body Assy

- Remove the bolt [A] and the throttle cable plate [B] from the throttle body front side.
- Remove the throttle cable lower ends from the throttle pulley.



- Remove:
  - Choke Cable Upper End (From choke lever)
  - Choke Cable Lower End [A]
  - Throttle Body #2 [B]
- After removing the throttle body assy, stuff pieces of lint-free, clean cloth into the throttle body holders.

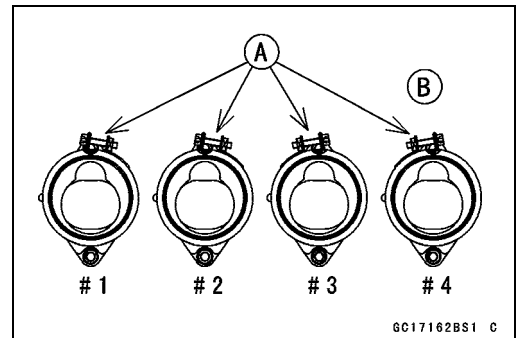


### CAUTION

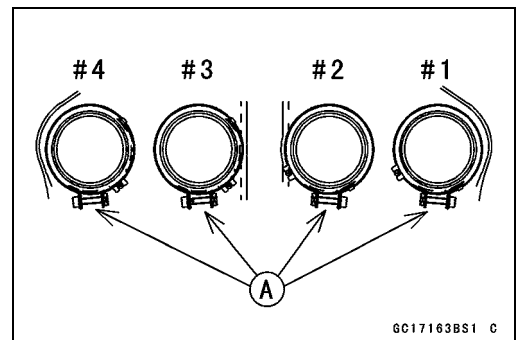
If dirt gets into the engine, excessive engine wear and possible engine damage will occur.

### Throttle Body Assy Installation

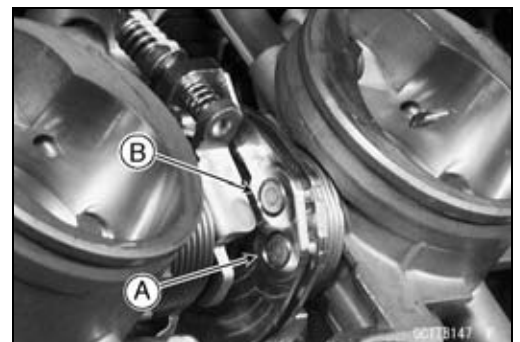
- Install the holder clamp bolts [A] in the direction shown with each bolt heads, facing outwards.
  - Cylinder Head [B]
- Tighten:
  - Torque - Throttle Body Assy Holder Clamp Bolts: 2 N·m (0.2 kgf·m, 17 in·lb)



- Tighten:
  - Torque - Air Cleaner Duct Clamp Bolts [A]: 2 N·m (0.2 kgf·m, 17 in·lb)
- Run the vacuum hoses as shown in the Cable, Wire, and Hose Routing section of the Appendix chapter.



- Fit the accelerator cable end [A] and the decelerator cable end [B] into the throttle pulley (front view).
- Tighten the throttle plate bolt (see Throttle Body Assy Removal).
- Check fuel leakage from the throttle body assy.



### ⚠ WARNING

Fuel spilled from the carburetors is hazardous.

## 3-92 FUEL SYSTEM (DFI)

### Throttle Body Assy

- Apply a thin coating of grease to the throttle cable upper ends.
- Install the upper ends of the throttle cables in the grip (see Throttle Body Assy Removal).
- Fit the projection [A] of the right switch housing into the hole [B] of the handlebar (front view).
- 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 Throttle Grip Free Play Inspection).

#### **⚠ 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

#### Throttle Body Assy Disassembly

#### **CAUTION**

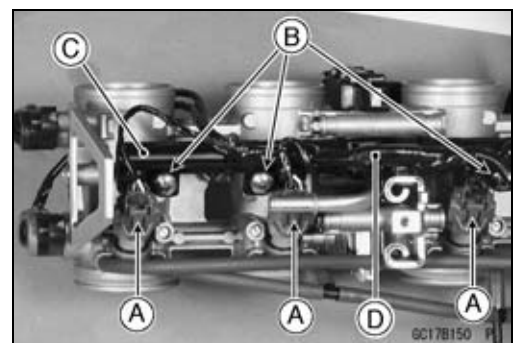
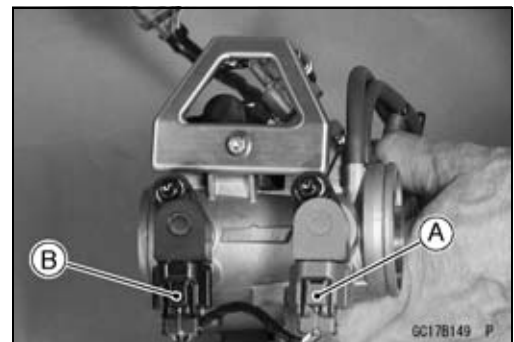
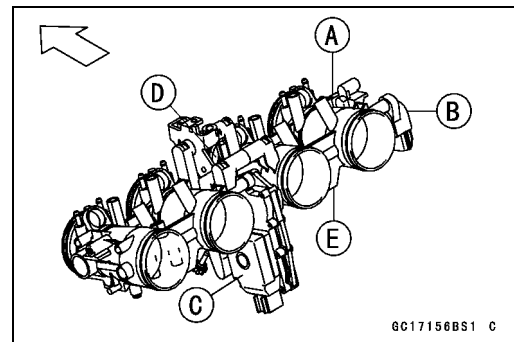
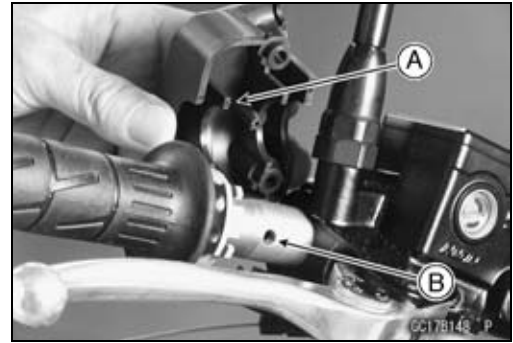
**Do not remove, disassemble or adjust the main throttle sensor [A], subthrottle sensor [B], subthrottle valve actuator [C], throttle link mechanism [D] and throttle body assy [E], because they are adjusted or set at the manufacturer. Adjustment of these parts could result in poor performance, requiring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

- Remove the throttle body assy (see Throttle Body Assy Removal).
- Push the lock and disconnect:
  - Main Throttle Connector (gray) [A]
  - Subthrottle Connector (black) [B]
  - Subthrottle Valve Actuator Connector

#### **CAUTION**

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

- Push the lock and disconnect the injector connectors [A].
- Remove:
  - Screws [B]
  - Delivery Pipe [C] along with harness [D] and injectors
- ★ If necessary, cut straps and take the harness off the delivery pipe.

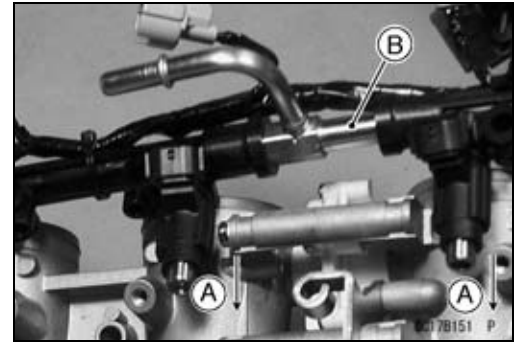


Throttle Body Assy

**CAUTION**

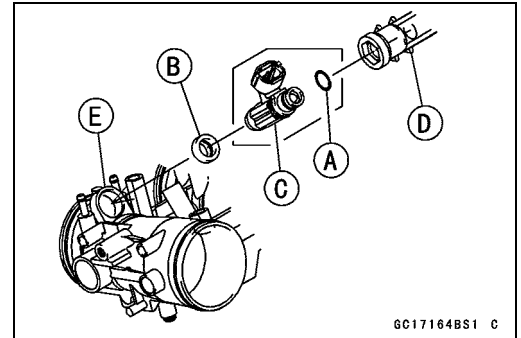
**Never drop the injector, especially on a hard surface. Such a shock to the injector can damage it.**

- Pull out [A] the injectors along with the delivery pipe [B].
- ★ If necessary, remove the injectors from the delivery pipe. Replace the O-rings of the indicators.
- ★ If necessary, cut straps and take the harness off the delivery pipe.



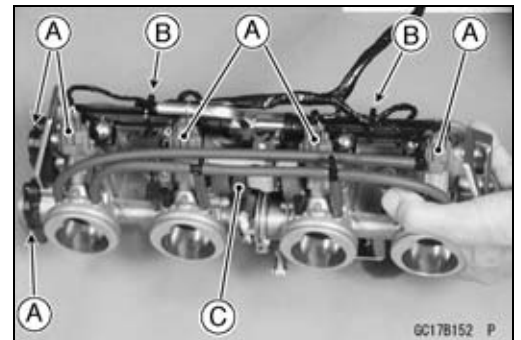
*Throttle Body Assy Assembly*

- Replace the O-rings [A] of injectors and the 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)**

- Connect all the connectors [A], including the subthrottle valve actuator connector [C] and bind the leads with straps [B].
- Insert the each hoses onto the throttle body fittings.
- Install the throttle body assy (see Throttle Body Assy Installation).



## 3-94 FUEL SYSTEM (DFI)

### Air Cleaner

#### *Element Removal/Installation*

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

#### *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.

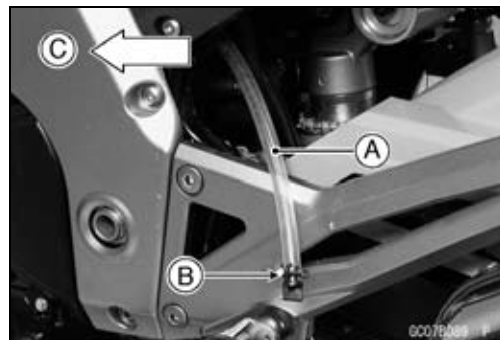
- Visually check the drain hose [A] if the water or oil accumulates.

★ If any water or oil accumulates in the hose, remove the plug [B] from the drain hose and drain it.

Front [C]

#### **⚠ 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.**

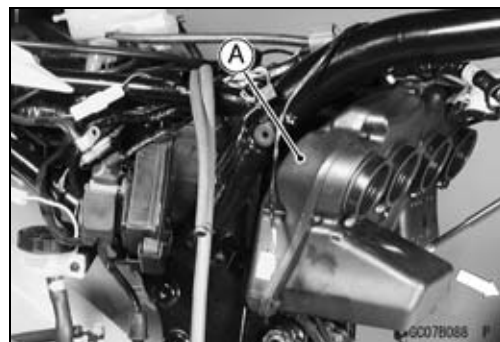


#### *Air Cleaner Housing Removal*

- 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.



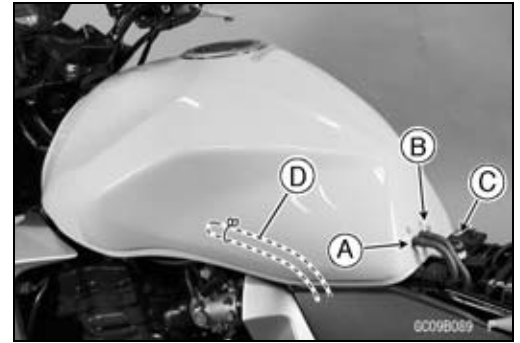
Fuel Tank

Fuel Tank Removal

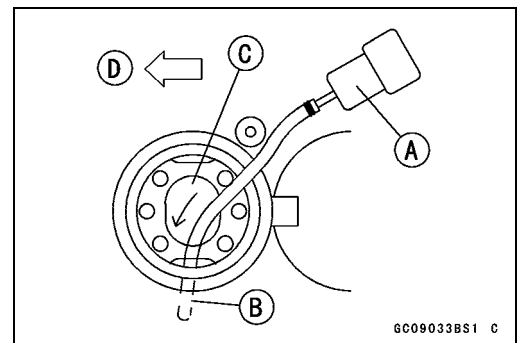
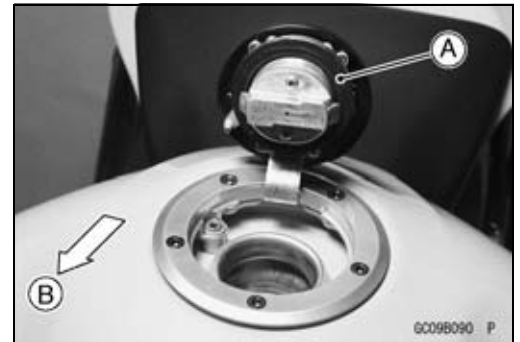
**⚠ WARNING**

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:
  - Rear and Front Seats (see Frame chapter)
  - California Fuel Return Hose (left, red) [A]
  - California Fuel Tank Breather Hose (right, blue) [B]
  - Fuel Tank Bolt [C]
  - Drain Hose [D]
- Disconnect the battery (–) terminal.
- Turn both 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.
  - Front [B]
- During tank removal, keep the tank cap open to release pressure in the tank. This makes fuel spillage less.



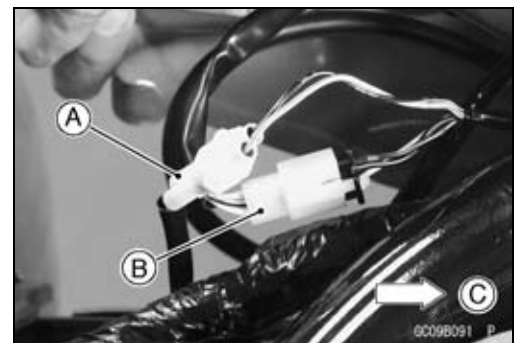
- Draw the fuel out from the fuel tank with a commercially available pump [A].
- Use a soft plastic hose [B] as a pump inlet hose in order to insert the hose smoothly.
- Put the hose through the fill opening [C] into the tank and draw the fuel out.
  - Front [D]



**⚠ WARNING**

The fuel could not be removed completely from the fuel tank. Be careful for remained fuel spillage.

- Raise the fuel tank and disconnect the fuel pump lead connector [A] and fuel level sensor lead connector [B].
  - Front [C]



## 3-96 FUEL SYSTEM (DFI)

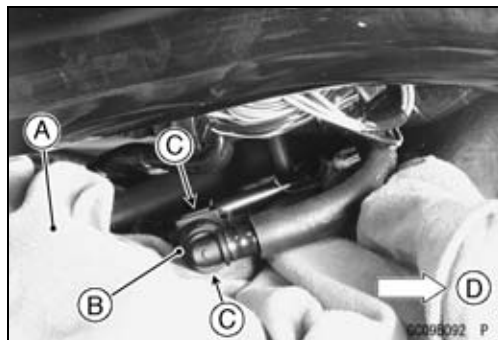
### Fuel Tank

- 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.  
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.**

- Close the fuel tank cap.
  - Remove the fuel tank, and place it on a flat surface.
- Do not remove the pump inlet hose [A].



- 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.**

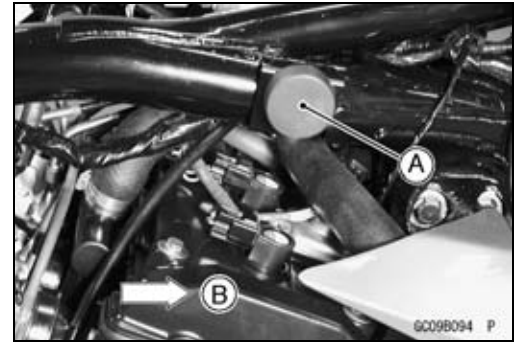


**Fuel Tank**

*Fuel Tank 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.

Front [B]



- Check that the dampers [A] are in place on the fuel tank as well.

Front [B]

- ★ If the dampers are damaged or deteriorated, replace them.

- ★ If the dampers are damaged or deteriorated, replace them.

- For California Model, note the following:

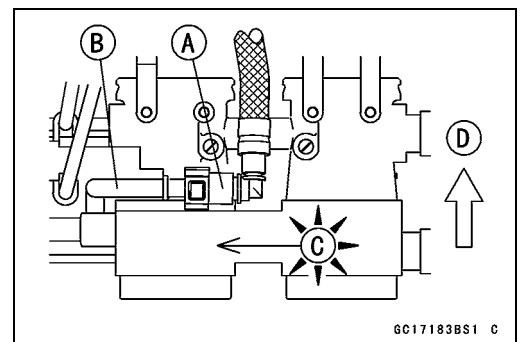
- To prevent the gasoline from flowing into or out of the canister, hold the separator perpendicular to the ground.

- Connect the hoses according to the diagram of the system (see Cable, Wire, and Hose Routing section in the Appendix chapter). Make sure they do not get pinched or kinked.

- Route hoses with a minimum of bending so that the air or vapor will not be obstructed.

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

Front [D]



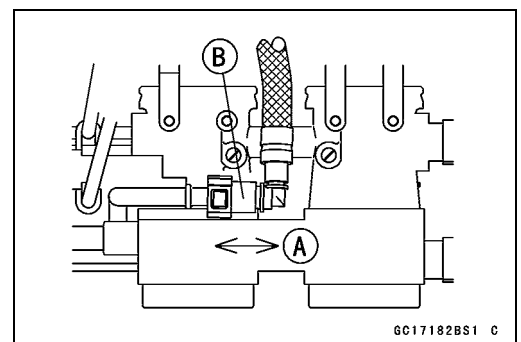
- Push and pull [A] the hose joint [B] back and forth more than two times and make sure it is locked and doesn't come off. When the hose joint is correctly installed, it should slide on the delivery pipe about 5 mm (0.2 in.).

**⚠ 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.



## 3-98 FUEL SYSTEM (DFI)

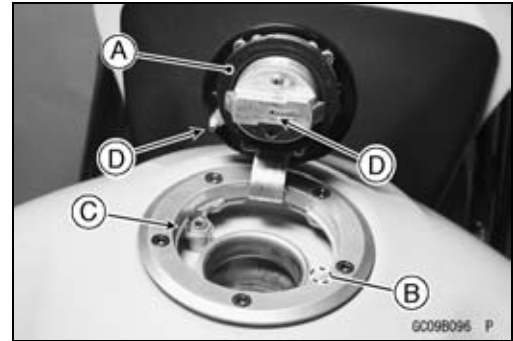
### Fuel Tank

#### *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] 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).

---

## Evaporative Emission Control System

---

### *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.
- Be sure to plug the return hose to prevent fuel spilling before fuel tank removal.
- ★ If liquid or gasoline flows into the breather hose, remove the hose and blow it clean with compressed air.
- Connect the hoses according to the diagram of the system (see Cable, Wire, and Hose Routing section in the Appendix chapter). Make sure they do not get pinched or kinked.
- Route hoses with a minimum of bending so that the air or vapor will not be obstructed.

### *Canister Installation*

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

### *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.

## 3-100 FUEL SYSTEM (DFI)

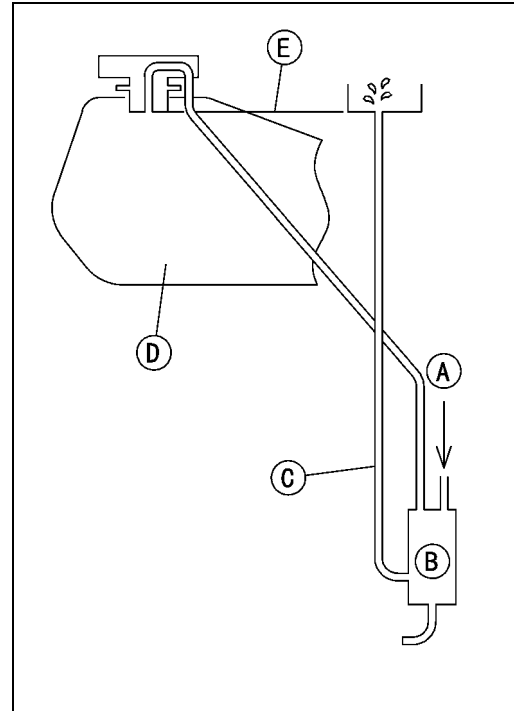
### Evaporative Emission Control System

#### 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 evaporative 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.



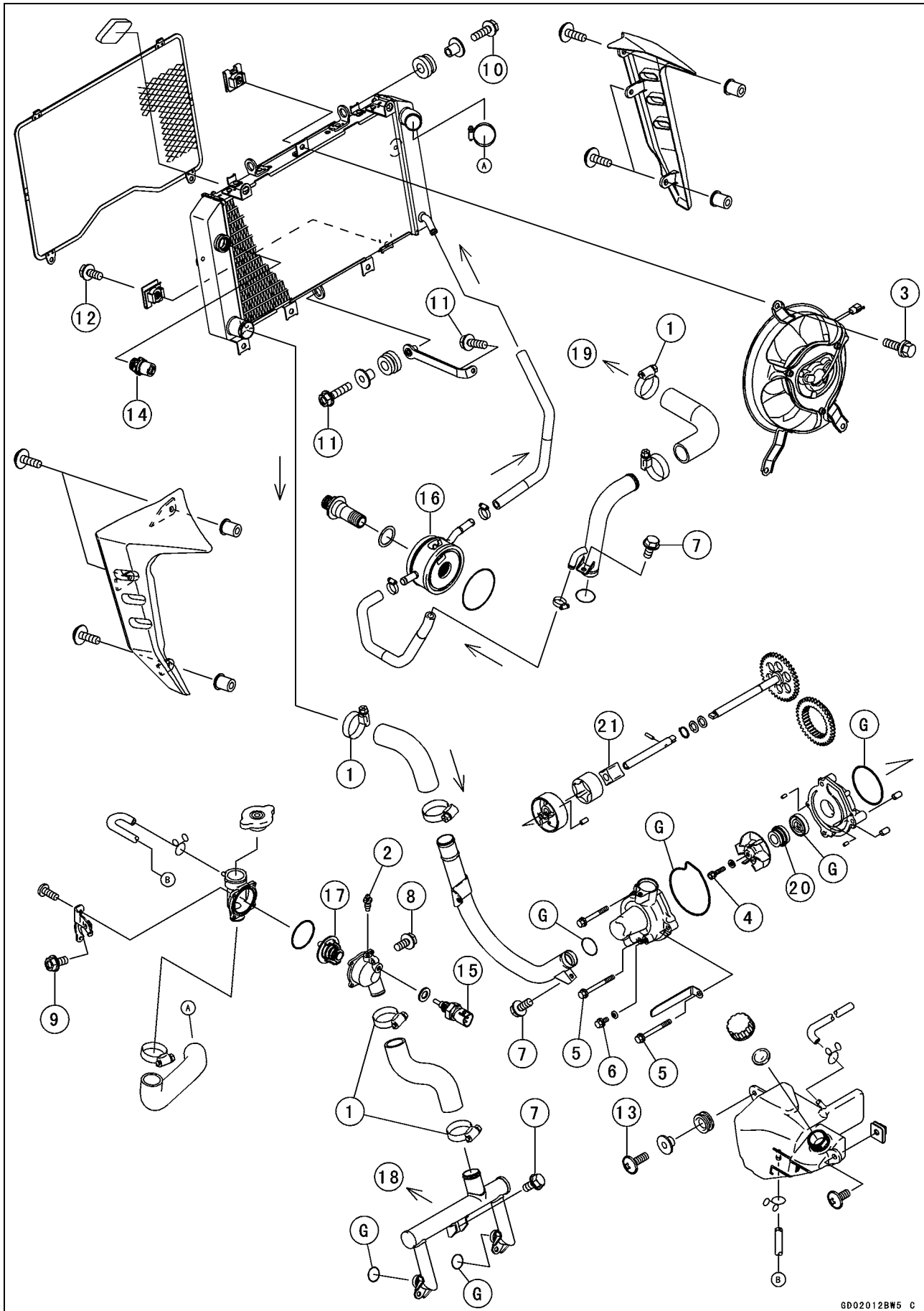
# Cooling System

## Table of Contents

Exploded View .....	4-2
Coolant Flow Chart.....	4-4
Specifications .....	4-6
Special Tool .....	4-7
Coolant .....	4-8
Coolant Deterioration Inspection.....	4-8
Coolant Level Inspection.....	4-8
Coolant Draining .....	4-8
Coolant Filling .....	4-8
Pressure Testing .....	4-9
Cooling System Flushing .....	4-9
Coolant Reserve Tank Removal/Installation .....	4-9
Water Pump.....	4-10
Water Pump Removal.....	4-10
Water Pump Installation.....	4-10
Water Pump Inspection.....	4-10
Mechanical Seal Replacement .....	4-10
Radiator .....	4-12
Radiator Removal .....	4-12
Radiator Inspection .....	4-13
Radiator Cap Inspection .....	4-13
Radiator Filler Neck Inspection .....	4-14
Thermostat .....	4-15
Thermostat Removal.....	4-15
Thermostat Installation.....	4-15
Thermostat Inspection .....	4-15
Hose and Pipes .....	4-17
Hose Installation .....	4-17
Hose Inspection .....	4-17
Radiator Fan Switch, Water Temperature Sensor .....	4-18
Radiator Fan Switch Removal .....	4-18
Radiator Fan Switch Installation .....	4-18
Radiator Fan Switch Inspection .....	4-18
Water Temperature Sensor Removal.....	4-18
Water Temperature Sensor Inspection .....	4-18

# 4-2 COOLING SYSTEM

## Exploded View



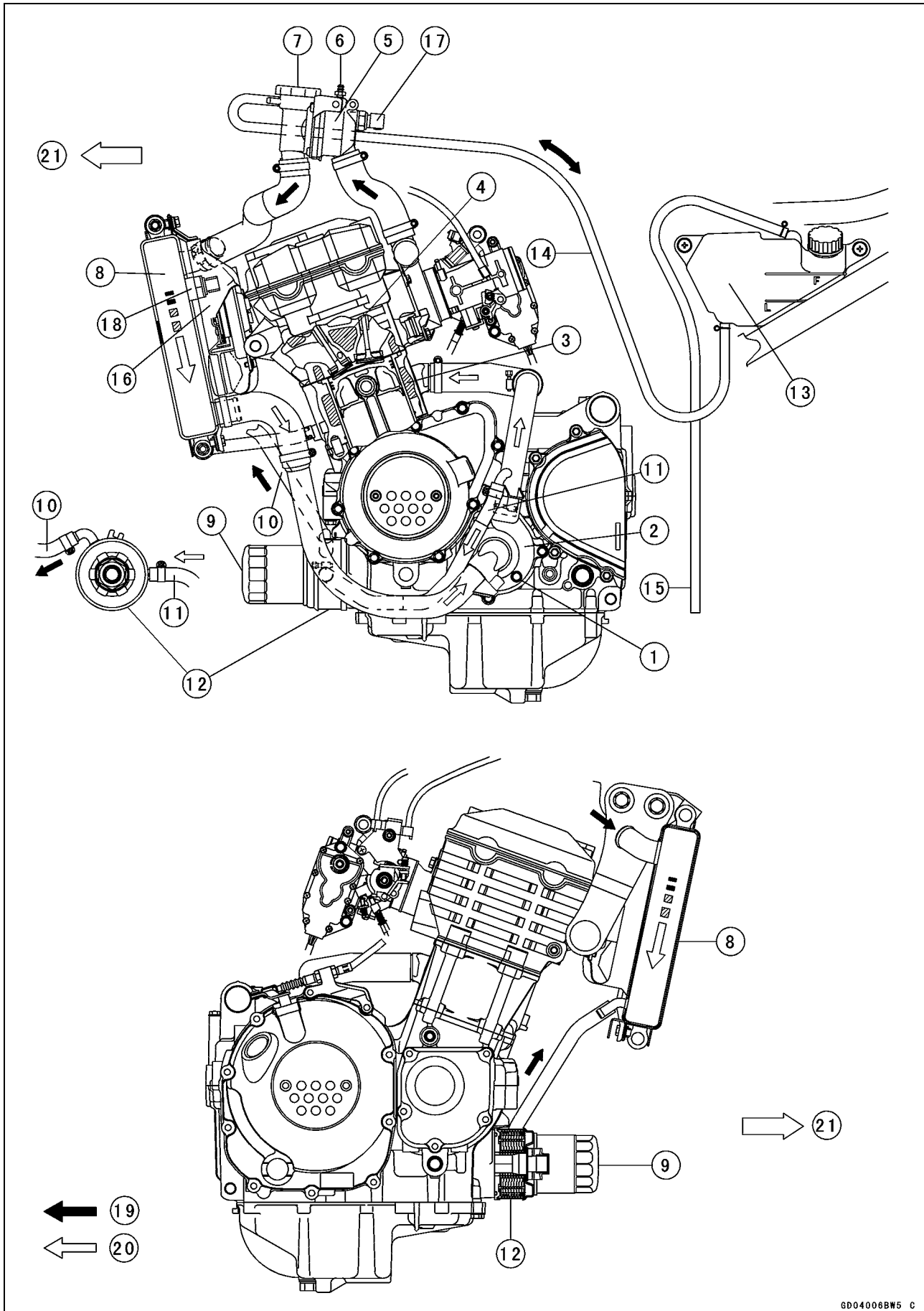
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Radiator hose clamp screws	2	0.2	17 in·lb	
2	Thermostat air bleeder bolt	7.8	0.80	69 in·lb	
3	Radiator fan bolts	8.3	0.85	74 in·lb	
4	Water pump impeller bolt	9.8	1.0	87 in·lb	
5	Water pump cover bolts	11	1.1	95 in·lb	
6	Water pump drain bolt	11	1.1	95 in·lb	
7	Water pipe bolts	11	1.1	95 in·lb	in/outlet
8	Thermostat housing ground bolt	7	0.7	61 in·lb	
9	Thermostat bracket bolt	7	0.7	61 in·lb	
10	Radiator upper bolts	7	0.7	61 in·lb	
11	Radiator lower bolts	7	0.7	61 in·lb	
12	Radiator screen bolt	7	0.7	61 in·lb	
13	Coolant reserve tank screws	7	0.7	61 in·lb	
14	Radiator fan switch	18	1.8	13	
15	Water temperature sensor	25	2.5	18	

- 16. Oil cooler
- 17. Thermostat
- 18. To cylinder head
- 19. To cylinder
- 20. Mechanical seal
- 21. Oil pump rotor
- G: Apply grease.

# 4-4 COOLING SYSTEM

## Coolant Flow Chart





**Coolant Flow Chart**

---

- |                                |                                |                              |
|--------------------------------|--------------------------------|------------------------------|
| 1. Drain Bolt                  | 9. Oil Filter                  | 17. Water Temperature Sensor |
| 2. Water Pump                  | 10. Outlet Hose                | 18. Radiator Fan Switch      |
| 3. Cylinder Jacket             | 11. Inlet Hose                 | 19. Hot Coolant              |
| 4. Cylinder Head Jacket        | 12. Oil Cooler                 | 20. Cold Coolant             |
| 5. Thermostat Housing          | 13. Reserve Tank               | 21. Front                    |
| 6. Thermostat Air Bleeder Bolt | 14. Reserve Tank Hose          |                              |
| 7. Radiator Cap                | 15. Reserve Tank Overflow Hose |                              |
| 8. Radiator                    | 16. Radiator Fan               |                              |

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

The thermostat is a wax pellet type which opens or closes with coolant temperature changes. The thermostat continuously changes its valve opening to keep the coolant temperature at the proper level. When coolant temperature is less than 55 ° (131 °F), the thermostat closes so that the coolant flow is restricted through the air bleeder hole, causing the engine to warm up more quickly. When coolant temperature is more than 58 ~ 62 °C (136 ~ 144 °F), the thermostat opens and the coolant flows.

When the coolant temperature goes up beyond 93 ~ 103 °C (199 ~ 217 °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 temperature is below 85 ~ 100 °C (185 ~ 212 °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>, 13.5 ~ 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>, 13.5 ~ 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.

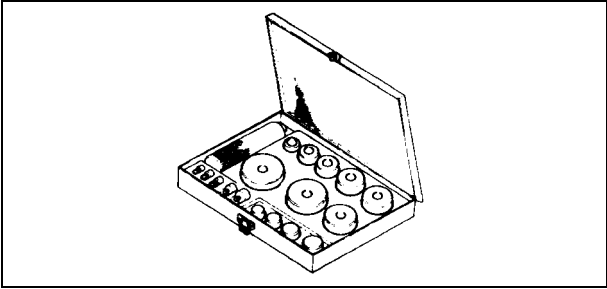
## 4-6 COOLING SYSTEM

### Specifications

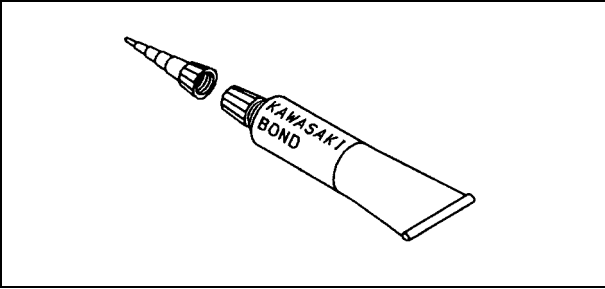
Item	Standard
<b>Coolant provided when shipping:</b> Type (recommended)  Color Mixed ratio Freezing point Total amount	Permanent type of antifreeze (soft water and ethylene glycol plus corrosion and rust inhibitor chemicals for aluminum engines and radiators)  Green Soft water 50%, coolant 50% – 35°C (– 31°F) 2.9 L (3.1 US qt) (reserve tank full level, including radiator and engine)
<b>Radiator cap</b> Relief pressure	93 ~ 123 kPa (0.95 ~ 1.25 kgf/cm <sup>2</sup> , 13.5 ~ 17.8 psi)
<b>Thermostat:</b> Valve opening temperature Valve full opening lift	58 ~ 62°C (136 ~ 144°F) 8 mm (0.31 in.) or more @75°C (167°F)

**Special Tool**

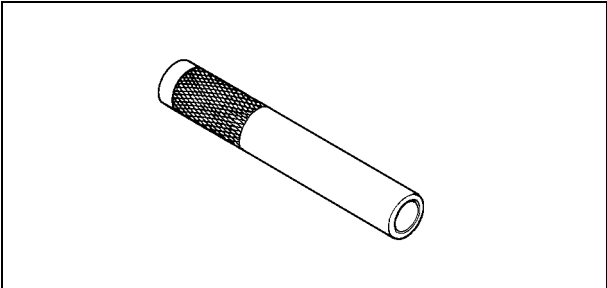
**Bearing Driver Set:  
57001-1129**



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



**Bearing Driver:  
57001-382**



## 4-8 COOLING SYSTEM

### Coolant

#### Coolant Deterioration Inspection

- Remove the left side cover (see Frame chapter).
- Visually inspect the coolant [A] in the reserve tank.  
Front [B]
- ★ 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.

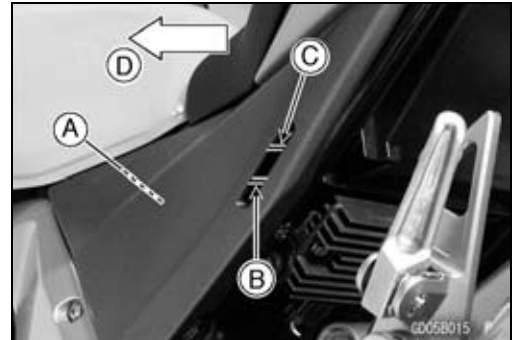


#### Coolant Level Inspection

##### NOTE

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

- Check the coolant level in the reserve tank [A] with the motorcycle held perpendicular (Do not use the sidestand).
- ★ If the coolant level is lower than the “L” level line [B], unscrew the reserve tank cap and add coolant to the “F” level line [C].  
“L”: low  
“F”: full  
Front [D]



##### 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.**

#### Coolant Draining

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

#### Coolant Filling

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

**Coolant**

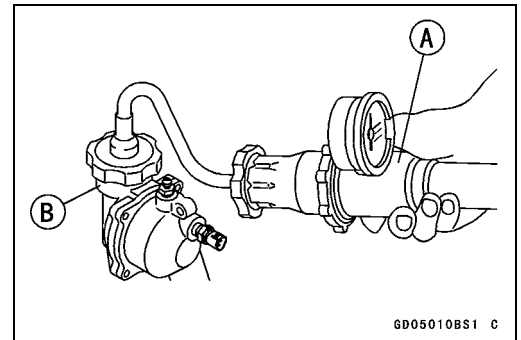
*Pressure Testing*

- 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.

*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**

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

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

*Coolant Reserve Tank Removal/Installation*

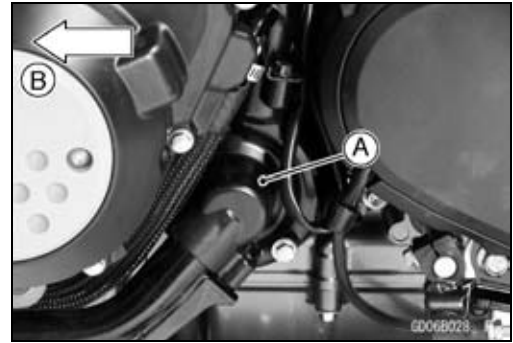
- The coolant reserve tank is removed and installed during coolant change (see Coolant Change in the Periodic Maintenance chapter).

## 4-10 COOLING SYSTEM

### Water Pump

#### *Water Pump Removal*

- Refer to Oil Pump Removal in the Engine Lubrication System chapter.  
Water Pump [A]  
Front [B]

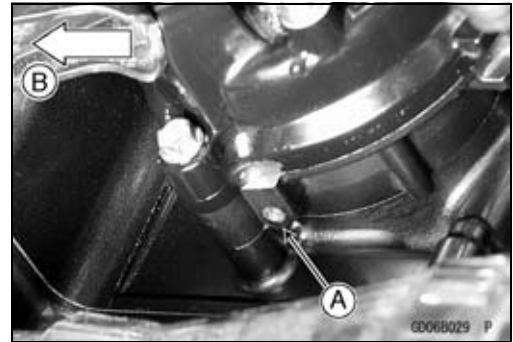


#### *Water Pump Installation*

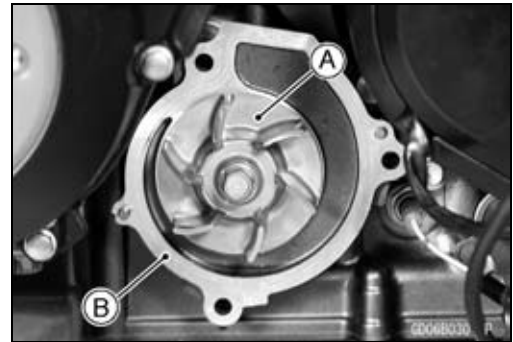
- Refer to Oil Pump Installation in the Engine Lubrication System chapter.

#### *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 in the water pump body (see this section).  
Front [B]

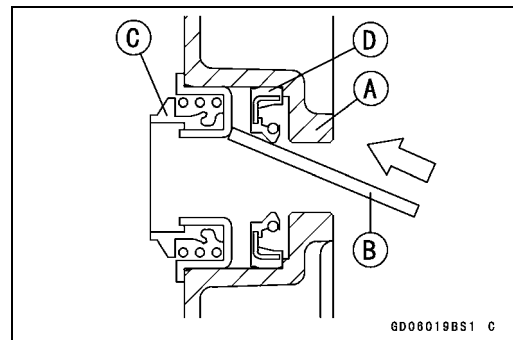


- Visually inspect the water pump impeller [A].
- ★ If the surface is corroded or if the blades are damaged, replace the impeller.  
Water Pump Body [B]



#### *Mechanical Seal Replacement*

- Remove the water pump body [A] (see Oil Pump Removal in the Engine Lubrication System chapter).
- Insert a metal rod [B] into the water pump body and tap evenly around the mechanical seal [C] until the seal comes off.
- Replace the mechanical seal with a new one.
- Using a thin-bladed screwdriver, pry out the oil seal [D].



**Water Pump**

- Be sure to replace the mechanical seal, oil seal, and O-ring with new ones because these parts will be damaged by removal.
- Apply plenty of high temperature grease to the oil seal lips.
- Apply oil to the outer circumference of the oil seal.
- Press the oil seal [A] into the water pump body [B] with the bearing driver [C] so that the spring side [D] of the seal lips is toward the inside of the water pump body.
- Press the oil seal until it bottoms out.

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

**NOTE**

○ Since the replacement mechanical seal has an adhesive coated body, do not apply a liquid gasket to the exterior surface of the body.

- Press the flange [A] of the mechanical seal, using a collar [B] and a bearing driver [C] until the seal flange touches the step.

**Collar Inside Dia. :**

**26.5 mm (1.043 in.) ~ 28 mm (1.102 in.)**

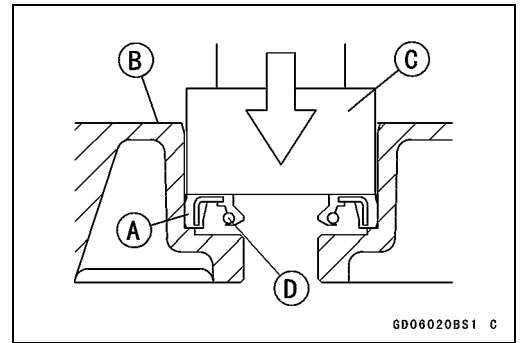
**Collar Outside Dia. :**

**31.7 mm (1.248 in.) or more**

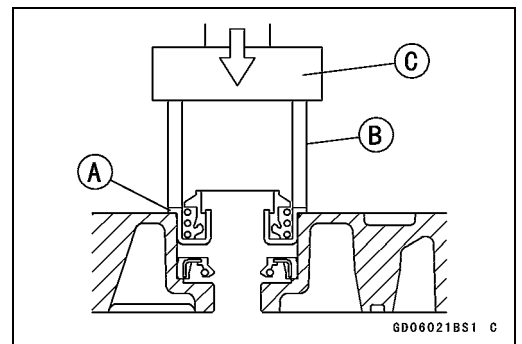
**Special Tool - Bearing Driver Set: 57001-1129**

- Clean both sliding surfaces of a new mechanical seal with a high-flash point solvent (e.g. ethyl alcohol), and apply a little coolant to the sliding surface to give the mechanical seal initial lubrication.
- Apply coolant to the surface of the rubber seal [A] and sealing seat [B], and press [C] the rubber seal and sealing seat into the impeller by hand until the seat bottoms out.

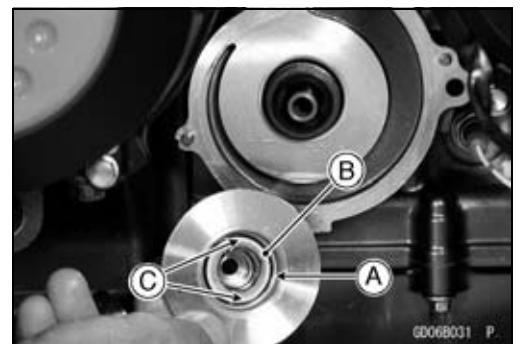
**Torque - Water Pump Impeller Bolt: 9.8 N·m (1.0 kgf·m, 87 in·lb)**



GD06020BS1 C



GD06021BS1 C



GD060031 P

## 4-12 COOLING SYSTEM

### Radiator

#### Radiator Removal

#### **⚠ WARNING**

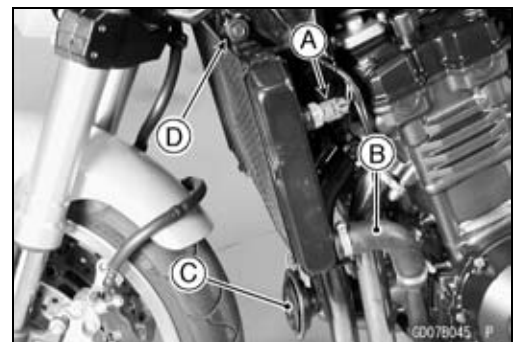
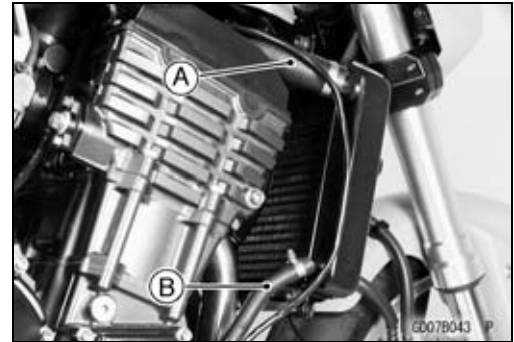
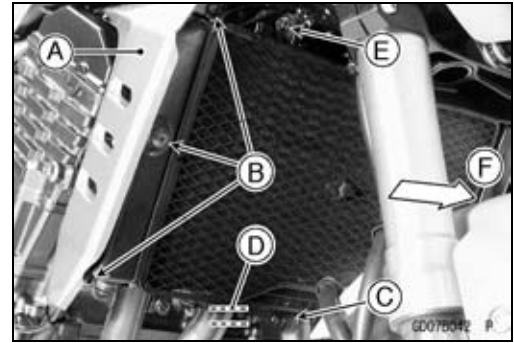
The radiator fan is connected directly to the battery. The radiator fan may start even if the ignition switch is off. **NEVER TOUCH THE RADIATOR FAN UNTIL THE RADIATOR FAN CONNECTOR IS DISCONNECTED. TOUCHING THE FAN BEFORE THE CONNECTOR IS DISCONNECTED COULD CAUSE INJURY FROM THE FAN BLADES.**

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove:
  - Right Radiator Cover [A] and Screws [B]
  - Lower Bolt [C]
  - Bolt and Bracket [D] (from cylinder)
  - Right Radiator Upper Bolt [E]
  - Left Radiator Cover
  - Front [F]
- Remove:
  - Right Radiator Hose [A] and Oil Cooler Hose [B]
- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Radiator Fan Motor Connector [A] (BL/W, BK/Y leads)
  - Front [B]

- Remove:
  - Fan Switch Lead Connector [A]
  - Left Radiator Hose [B]
  - Horn and Connectors [C]
  - Left Radiator Upper Bolt [D]
- Remove the radiator.

#### **CAUTION**

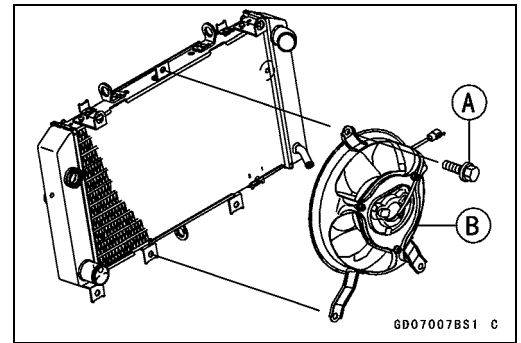
**Do not touch the radiator core. This could damage the radiator fins, resulting in loss of cooling efficiency.**





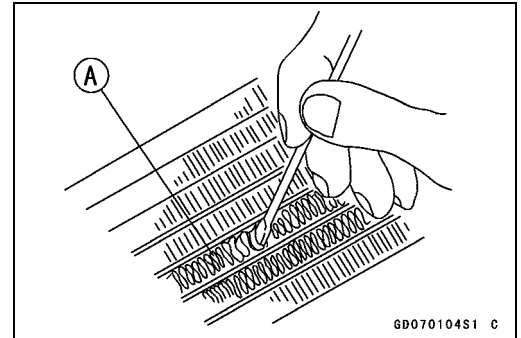
## Radiator

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



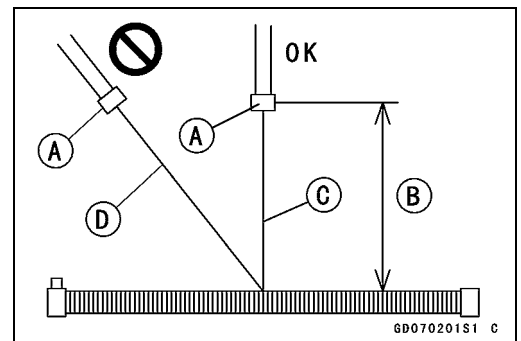
### Radiator Inspection

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



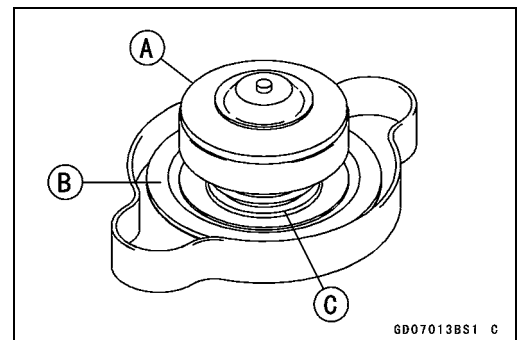
### CAUTION

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



### Radiator Cap Inspection

- Remove:  
Fuel Tank (see Fuel System (DFI) chapter)  
Radiator Cap
- Check the condition of the bottom valve seal [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.



## 4-14 COOLING SYSTEM

### Radiator

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

#### NOTE

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

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

#### Radiator Cap Relief Pressure

Standard: 93 ~ 123 kPa

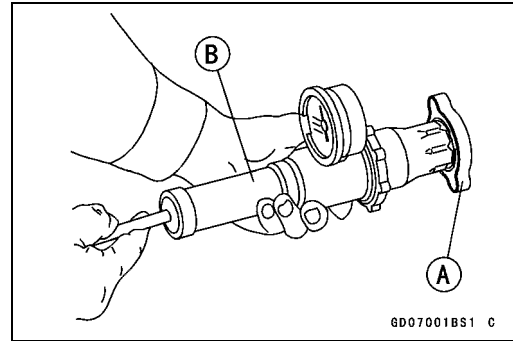
(0.95 ~ 1.25 kgf/cm<sup>2</sup>, 13.5 ~ 17.8 psi)

- ★If the cap cannot 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.

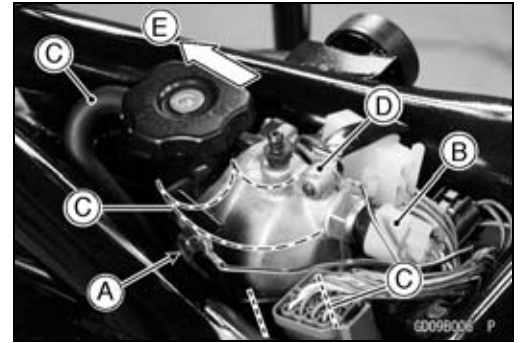
Front [B]



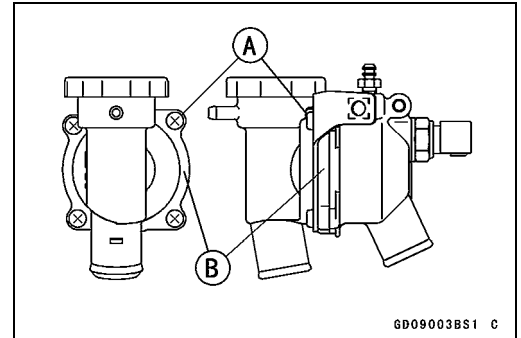
**Thermostat**

*Thermostat Removal*

- Remove:
  - Coolant : Drain about 200 mL
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Thermostat Bracket Bolt [A]
  - Water Temperature Sensor Connector [B]
  - Three Water Hoses [C]
- Remove the thermostat housing [D].
- Front [E]

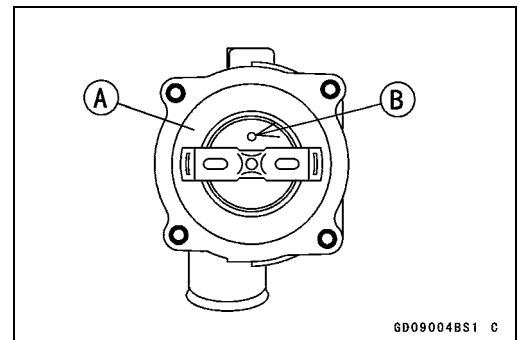


- Remove the screws [A], take off the cap [B], and take out the thermostat.



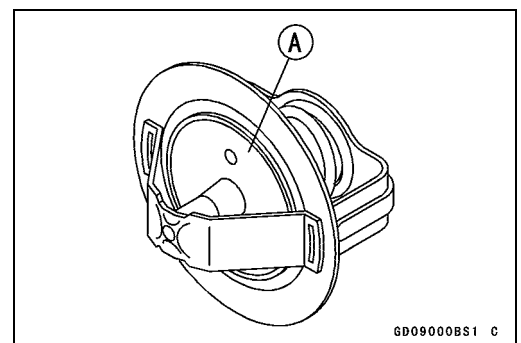
*Thermostat Installation*

- 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 Coolant Change in the Periodic Maintenance chapter).



*Thermostat Inspection*

- Remove the thermostat, and inspect the thermostat valve [A] at room temperature.
- ★If the valve is open, replace the thermostat with a new one.



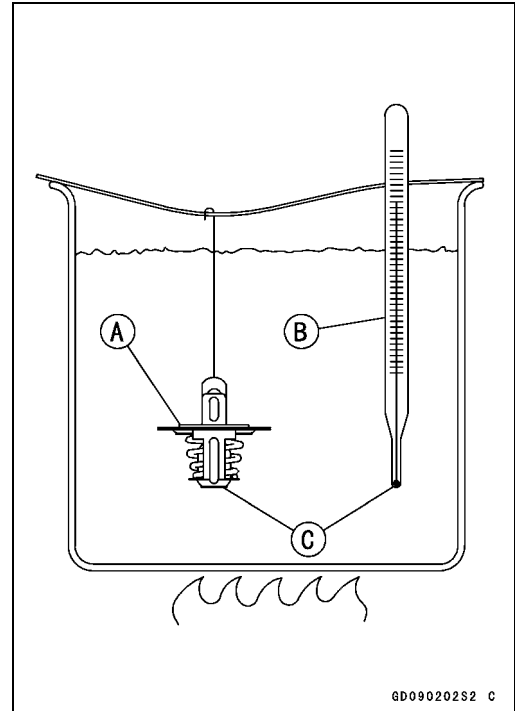
## 4-16 COOLING SYSTEM

### 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

## Hose and Pipes

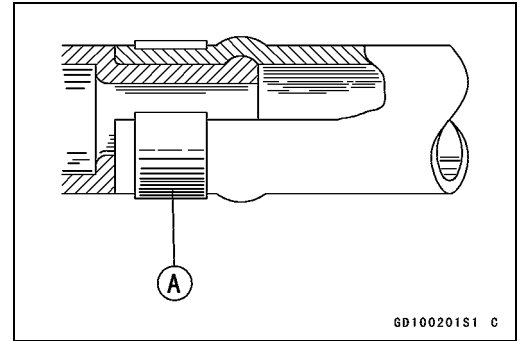
### *Hose Installation*

- Install the hoses and pipes, being careful to follow bending direction. Avoid sharp bending, kinking, flattening or twisting.
  - Run the hoses in accordance with the Cable, Wire, and Hose Routing section in the Appendix chapter.
  - Wet the internal diameter of both ends of the water hose with water or coolant and install the hose onto the pipe.
  - 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 - Hose Clamp Screws: 2.0 N·m (0.2 kgf·m, 17 in·lb)**

### *Hose Inspection*

- Refer to the Cooling System in the Periodic Maintenance chapter.



## 4-18 COOLING SYSTEM

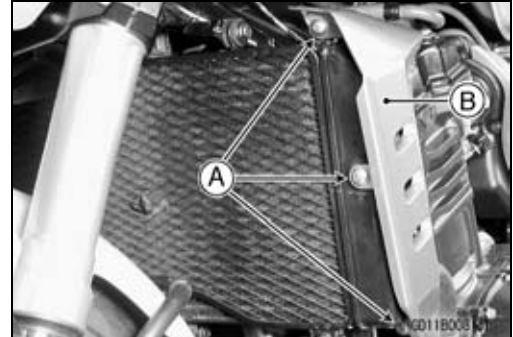
### Radiator Fan Switch, Water Temperature Sensor

#### CAUTION

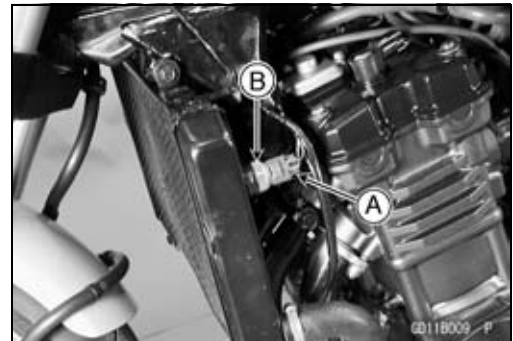
The fan switch or the water temperature sensor should never be allowed to fall on a hard surface. Such a shock to their parts can damage them.

#### *Radiator Fan Switch Removal*

- Drain the coolant (see Coolant Change in the Periodic Maintenance chapter).
- Remove the screws [A] and take off the left radiator cover [B].



- Remove:
  - Radiator Fan Switch Lead Connector [A]
  - Radiator Fan Switch [B]



#### *Radiator Fan Switch Installation*

- Tighten:
  - Torque - Radiator Fan Switch : 18 N·m (1.8 kgf·m, 13 ft·lb)
- Fill the coolant and bleed the air from cooling system (see Coolant Change in the Periodic Maintenance chapter).

#### *Radiator Fan Switch Inspection*

- Refer to the Electrical System chapter for its inspections.

#### *Water Temperature Sensor Removal*

- Refer to the Fuel System (DFI) chapter.
  - Water Temperature Sensor [A]
  - Front [B]



#### *Water Temperature Sensor Inspection*

- Refer to the Electrical System chapter for the water Temperature Sensor Inspection.

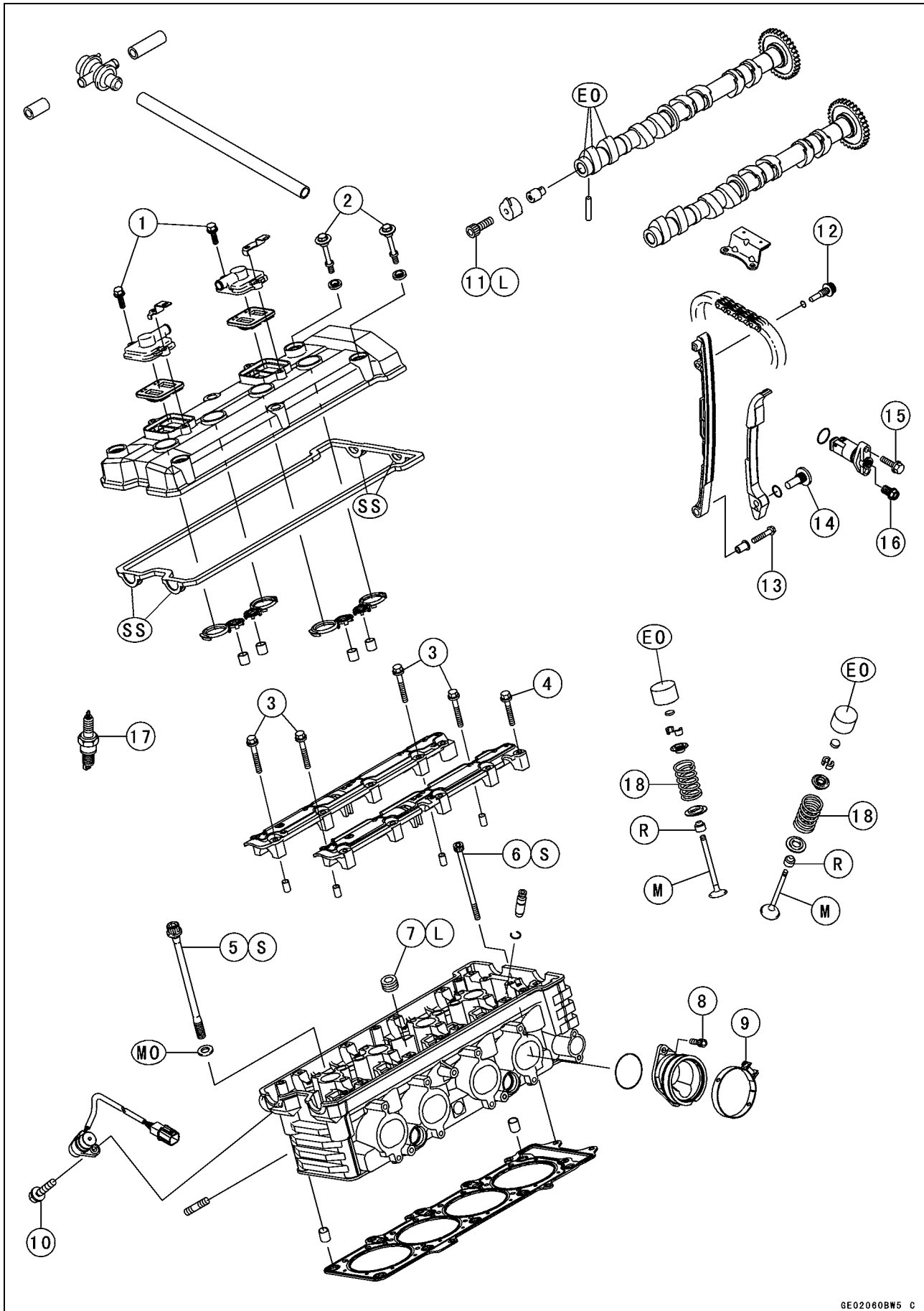
# Engine Top End

## Table of Contents

Exploded View .....	5-2	Cylinder Head Warp.....	5-21
Specifications .....	5-6	Valves .....	5-22
Special Tools and Sealant .....	5-8	Valve Clearance Inspection .....	5-22
Clean Air System.....	5-10	Valve Clearance Adjustment.....	5-22
Air Suction Valve Removal.....	5-10	Valve Removal .....	5-22
Air Suction Valve Installation.....	5-10	Valve Installation .....	5-22
Air Suction Valve Inspection .....	5-10	Valve Guide Removal .....	5-22
Vacuum Switch Valve Removal ...	5-10	Valve Guide Installation .....	5-23
Vacuum Switch Valve Installation	5-10	Valve-to-Guide Clearance	
Vacuum Switch Valve Test.....	5-11	Measurement (Wobble	
Clean Air System Hose		Method).....	5-23
Inspection.....	5-11	Valve Seat Inspection .....	5-24
Cylinder Head Cover .....	5-12	Valve Seat Repair .....	5-24
Cylinder Head Cover Removal ....	5-12	Cylinder, Pistons.....	5-29
Cylinder Head Cover Installation .	5-12	Cylinder Removal.....	5-29
Camshaft Chain Tensioner .....	5-14	Cylinder Installation.....	5-29
Camshaft Chain Tensioner		Piston Removal.....	5-29
Removal.....	5-14	Piston Installation.....	5-30
Camshaft Chain Tensioner		Cylinder Wear .....	5-31
Installation.....	5-14	Piston Wear .....	5-31
Camshaft, Camshaft Chain .....	5-15	Piston Ring, Piston Ring Groove	
Camshaft Removal .....	5-15	Wear.....	5-31
Camshaft Installation .....	5-15	Piston Ring Groove Width.....	5-32
Camshaft, Camshaft Cap Wear ...	5-17	Piston Ring Thickness .....	5-32
Camshaft Runout.....	5-17	Piston Ring End Gap .....	5-32
Cam Wear.....	5-17	Throttle Body Holder.....	5-33
Camshaft Chain Removal.....	5-18	Throttle Body Holder Installation..	5-33
Cylinder Head.....	5-19	Muffler.....	5-34
Cylinder Compression		Muffler Body Removal.....	5-34
Measurement .....	5-19	Exhaust Pipe Removal.....	5-34
Cylinder Head Removal.....	5-20	Muffler Body and Exhaust Pipe	
Cylinder Head Installation .....	5-20	Installation .....	5-34

# 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	10	1.0	87 in·lb	
2	Cylinder head cover bolts	10	1.0	87 in·lb	
3	Camshaft cap bolts (L=45 mm)	12	1.2	104 in·lb	
4	Camshaft cap bolts (L=40 mm)	12	1.2	104 in·lb	
5	Cylinder head bolts (M10 new bolts)	54	5.5	40	MO, S (Washer)
5	Cylinder head bolts (M10 used bolts)	49	5.0	36	MO, S (Washer)
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 holder clamp screws	2.0	0.2	17 in·lb	
10	Camshaft sensor bolt	12	1.2	104 in·lb	
11	Camshaft sensor rotor bolt	12	1.2	104 in·lb	L
12	Front camshaft chain guide bolts (upper)	25	2.5	18	
13	Front camshaft chain guide bolts (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	

18: Closed coil end faces downward.

EO: Apply engine oil.

L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil.

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

R: Replacement Parts

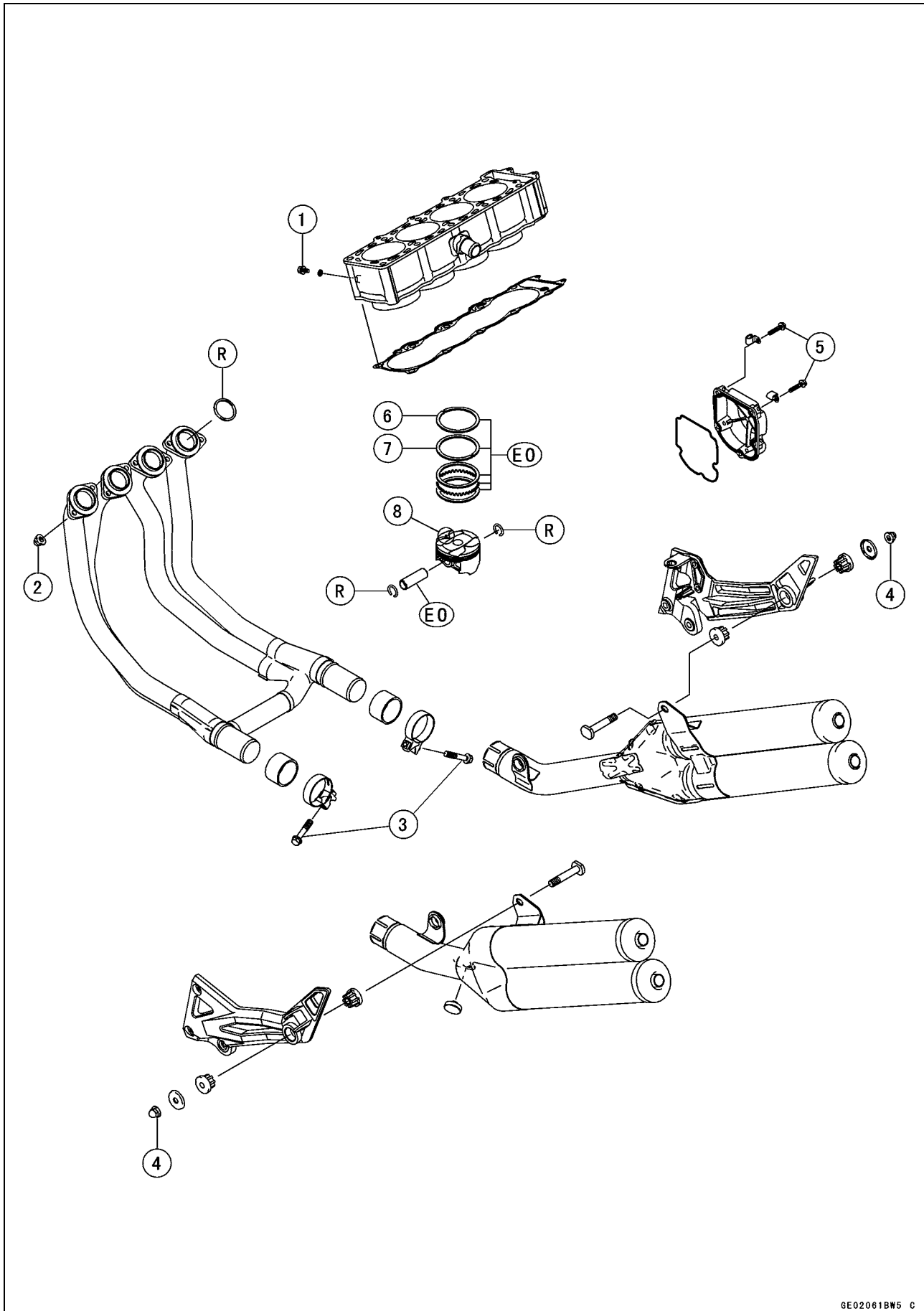
S: Follow the specific tightening sequence.

SS: Apply silicone sealant (Kawasaki Bond: 56019-120).

CAL: California model

# 5-4 ENGINE TOP END

## Exploded View



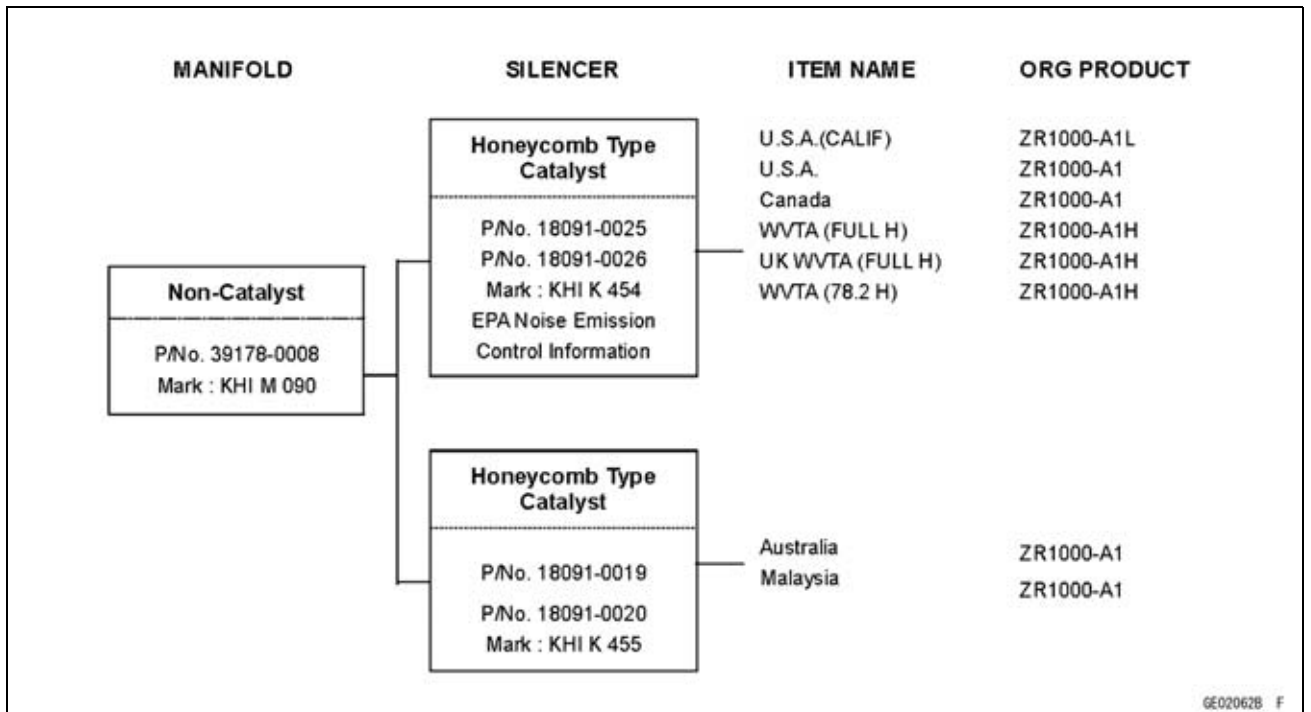
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Coolant Drain Plug (Cylinder)	10	1.0	87 in·lb	
2	Exhaust pipe manifold holder nuts	17	1.7	12	
3	Muffler body clamp bolts	17	1.7	12	
4	Muffler body mounting bolts and nuts	34	35	25	
5	Crankshaft sensor cover bolts	11	1.1	95 in·lb	

- 6: "R" marked side faces up.
- 7: "RN" marked side faces up.
- 8. Hollow mark faces forward.

EO: Apply engine oil.  
R: Replacement Parts

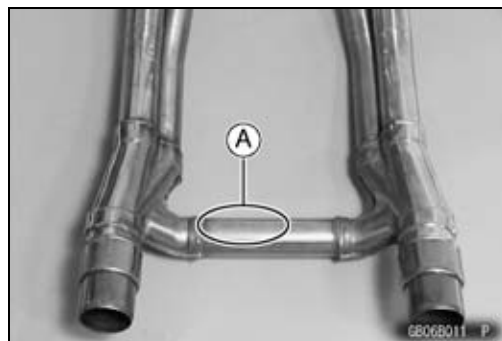
**Exhaust System**



UK: U.K. Model  
Full: Full Power

78.2: Horsepower 78.2 kW (106.3 ps)  
H: Honeycomb Type Catalyst

- [A] Manifold Mark Position
- The silencer mark position is outside of the lower silencer.



## 5-6 ENGINE TOP END

### Specifications

Item	Standard	Service Limit
<b>Clean Air System:</b>		
Vacuum switch valve closing pressure:	Open → Close 45 ~ 53 kPa (340 ~ 400 mmHg, 6.5 ~ 7.7 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) 1 070 ~ 1 620 kPa (10.9 ~ 16.5 kgf/cm <sup>2</sup> , 155 ~ 235 psi) @320 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	0.8 mm (0.031 in.)	0.4 mm (0.016 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 (0.02 in.)
Valve stem diameter: Exhaust	4.455 ~ 4.470 mm (0.1754 ~ 0.1760 in.)	4.44 mm (0.175 in.)
Inlet	4.475 ~ 4.490 mm (0.1762 ~ 0.1768 in.)	4.46 mm (0.176 in.)
Valve guide inside diameter: Exhaust	4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)	4.58 mm (0.180 in.)
Inlet	4.500 ~ 4.512 mm (0.1772 ~ 0.1776 in.)	4.58 mm (0.180 in.)

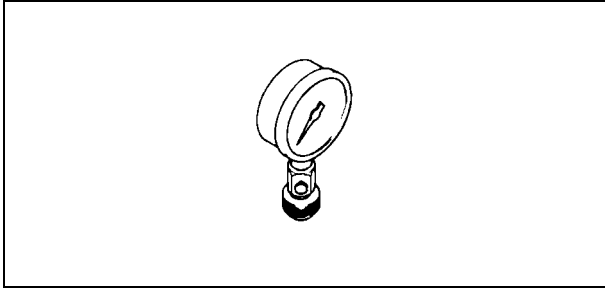
**Specifications**

Item	Standard	Service Limit
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	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	- - -
Inlet	0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)	- - -
Outside diameter: Exhaust	25.2 ~ 25.4 mm (0.992 ~ 1.000 in.)	- - -
Inlet	29.4 ~ 29.6 mm (1.1575 ~ 1.1654 in.)	- - -
Valve spring free length: Exhaust	39.0 mm (1.535 in.)	37.4 mm (1.472 in.)
Inlet	39.0 mm (1.535 in.)	37.4 mm (1.472 in.)
<b>Cylinder, Piston:</b>		
Cylinder inside diameter	77.194 ~ 77.206 mm (3.0391 ~ 3.0396 in.)	77.30 mm (3.0433 in.)
Piston diameter	77.174 ~ 77.184 mm (3.0383 ~ 3.0389 in.)	77.02 mm (3.0323 in.)
Piston/cylinder clearance	0.010 ~ 0.037 mm (0.0004 ~ 0.0015 in.)	- - -
Piston ring/groove clearance: Top	0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in.)	0.18 mm (0.0071 in.)
Second	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)
Piston ring groove width: Top	0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)	0.93 mm (0.037 in.)
Second	0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)	0.92 mm (0.036 in.)
Piston ring thickness: Top	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Second	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Piston ring end gap: Top	0.20 ~ 0.30 mm (0.0079 ~ 0.0118 in.)	0.6 mm (0.024 in.)
Second	0.35 ~ 0.50 mm (0.0138 ~ 0.0197 in.)	0.8 mm (0.031 in.)

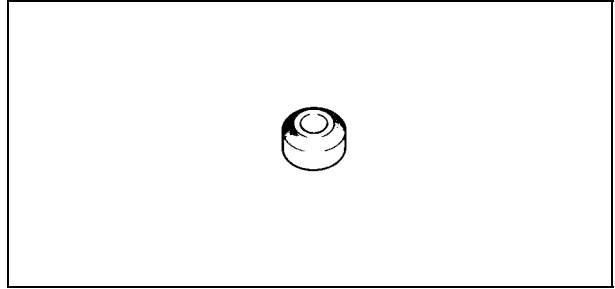
# 5-8 ENGINE TOP END

## Special Tools and Sealant

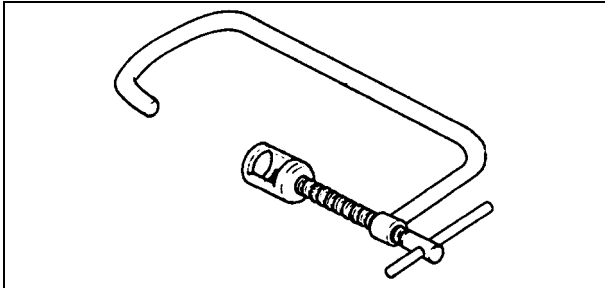
Compression Gauge:  
57001-221



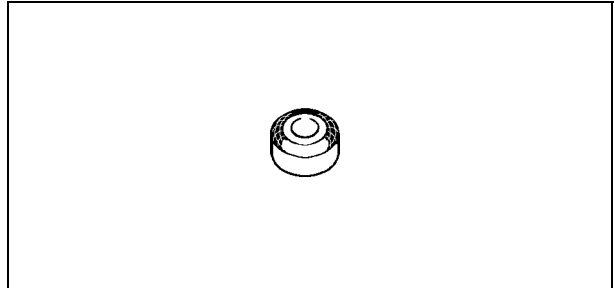
Valve Seat Cutter, 32° -  $\phi$ 28:  
57001-1119



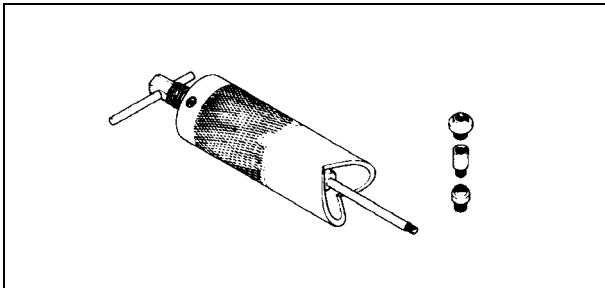
Valve Spring Compressor Assembly:  
57001-241



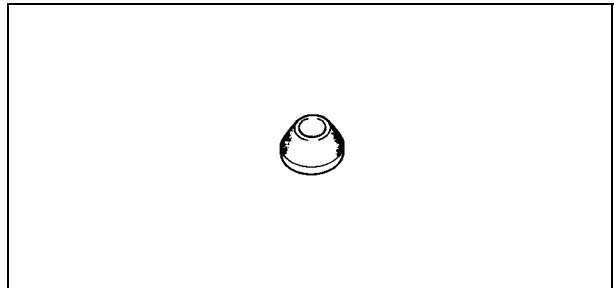
Valve Seat Cutter, 32° -  $\phi$ 30:  
57001-1120



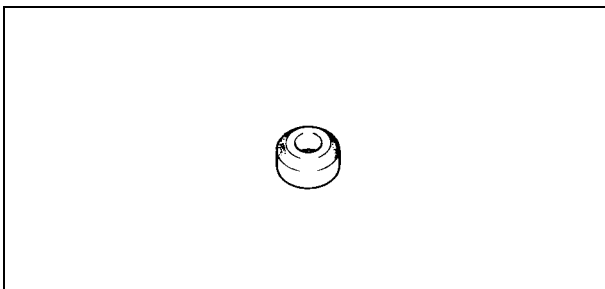
Piston Pin Puller Assembly:  
57001-910



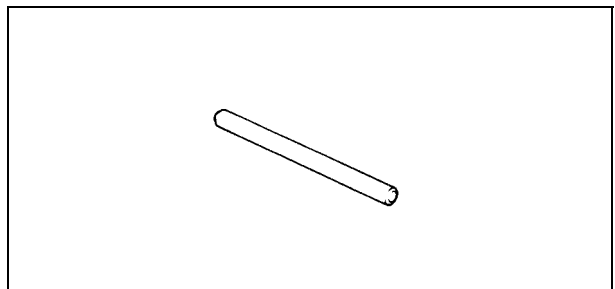
Valve Seat Cutter, 60° -  $\phi$ 30:  
57001-1123



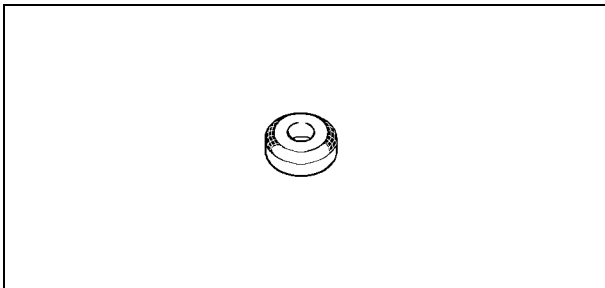
Valve Seat Cutter, 45° -  $\phi$ 27.5:  
57001-1114



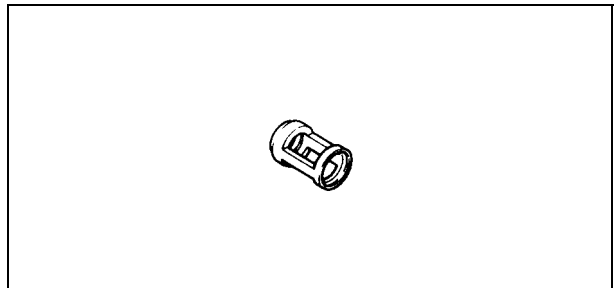
Valve Seat Cutter Holder Bar:  
57001-1128



Valve Seat Cutter, 45° -  $\phi$ 32:  
57001-1115

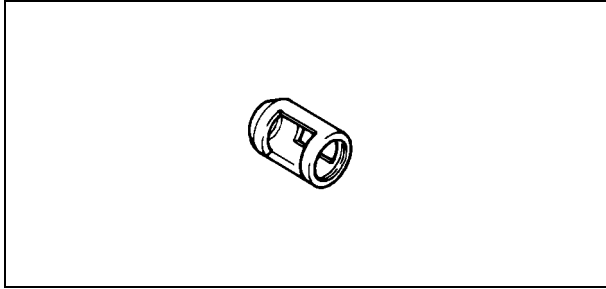


Valve Spring Compressor Adapter,  $\phi$ 20:  
57001-1154

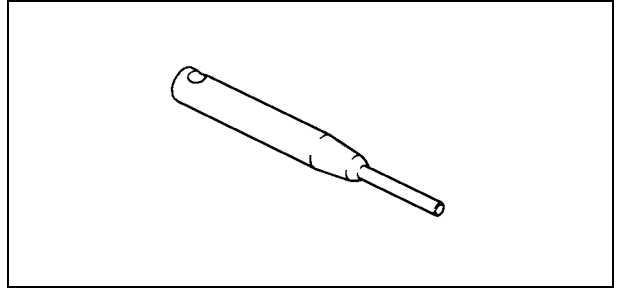


**Special Tools and Sealant**

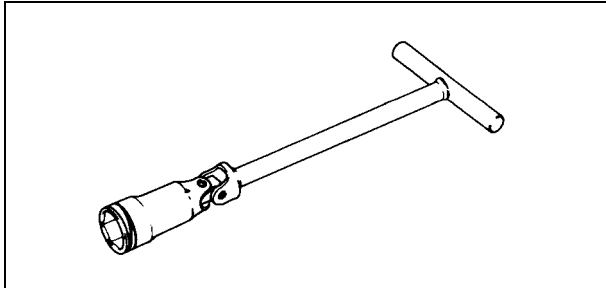
**Valve Spring Compressor Adapter,  $\phi 22$ :  
57001-1202**



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



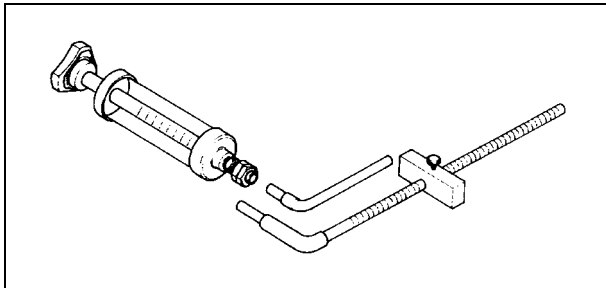
**Spark Plug Wrench, Hex 16:  
57001-1262**



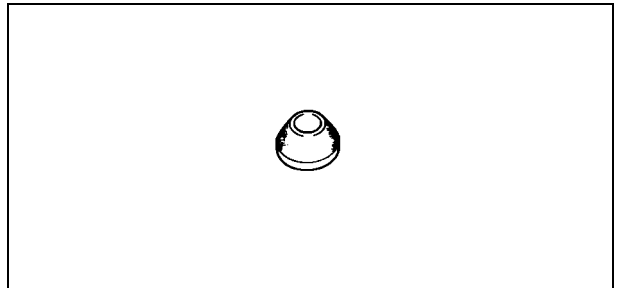
**Valve Guide Reamer,  $\phi 4.5$ :  
57001-1333**



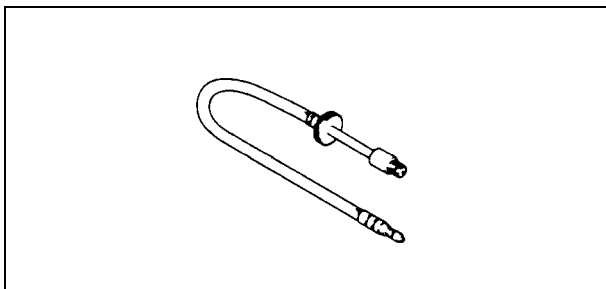
**Fork Oil Level Gauge:  
57001-1290**



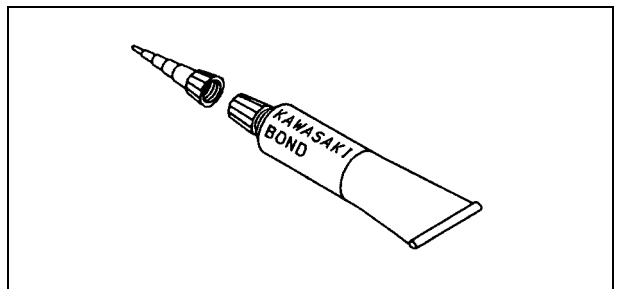
**Valve Seat Cutter, 60° -  $\phi 33$ :  
57001-1334**



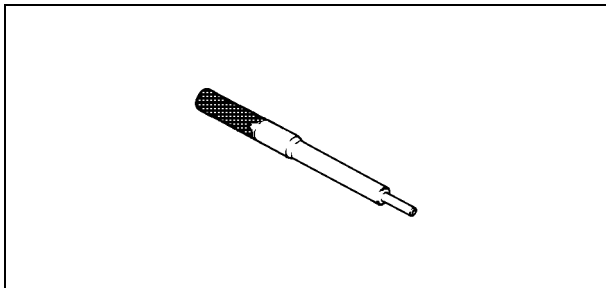
**Compression Gauge Adapter, M10  $\times$  1.0:  
57001-1317**



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



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

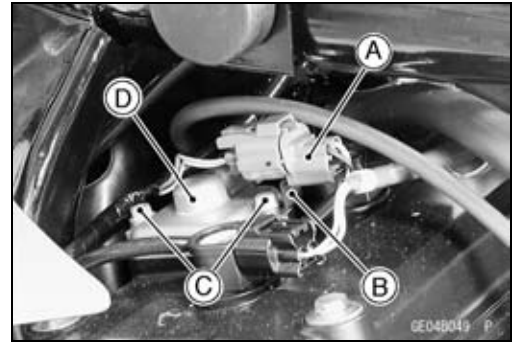


## 5-10 ENGINE TOP END

### Clean Air System

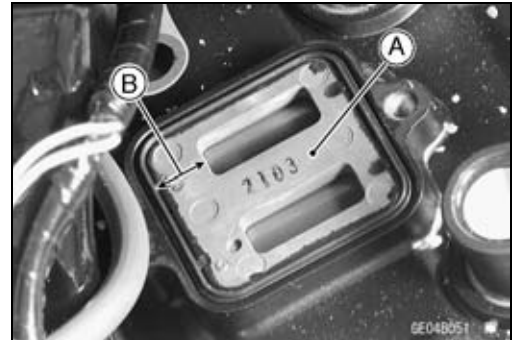
#### *Air Suction Valve Removal*

- 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*

- Refer to the Engine Top End in the Periodic Maintenance chapter.

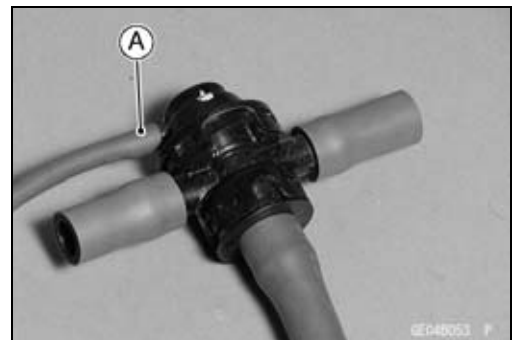
#### *Vacuum Switch Valve Removal*

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Vacuum Switch Valve [A]



#### *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).





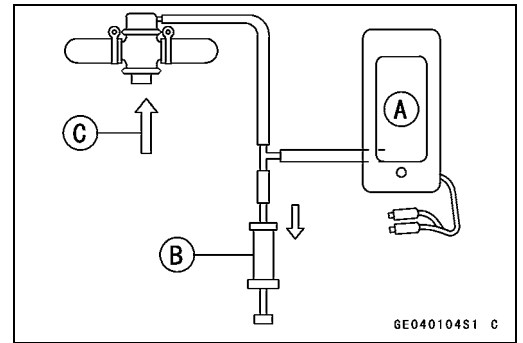
**Clean Air System**

*Vacuum Switch Valve Test*

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Vacuum Switch Valve
- 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.

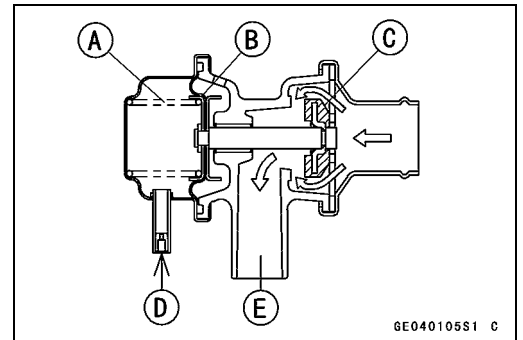
Spring [A]

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**

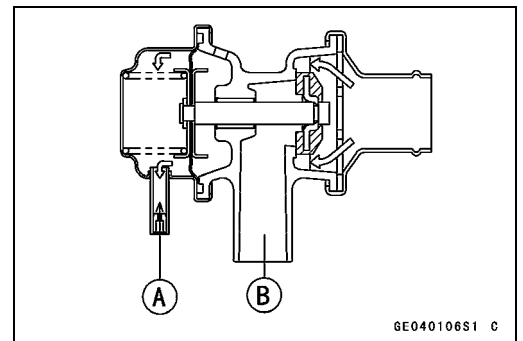
○ To check air flow through the vacuum switch valve, just blow through the air cleaner hose.

**Vacuum Switch Valve Closing Pressure (Open → Close)**

**Standard: 45 ~ 53 kPa (340 ~ 400 mmHg, 6.5 ~ 7.7 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

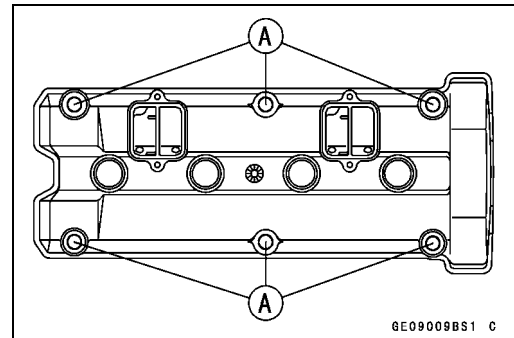
### Cylinder Head Cover

#### Cylinder Head Cover Removal

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Vacuum Switch Valve and Hoses
  - Stick Coils (see Electrical System chapter)
  - Air Suction Valve Covers [A]

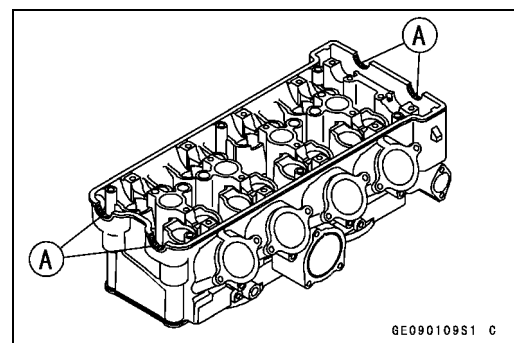


- Remove the cylinder head cover bolts [A] and take off the cover.

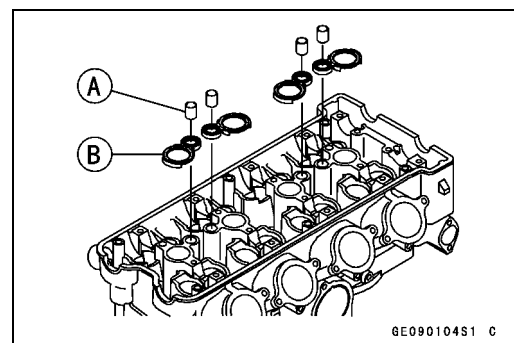


#### Cylinder Head Cover Installation

- Replace the head cover gasket with a new one if damaged.
- Apply silicone sealant [A] to the cylinder head as shown.  
**Sealant - Kawasaki Bond (Silicone Sealant): 56019-120**



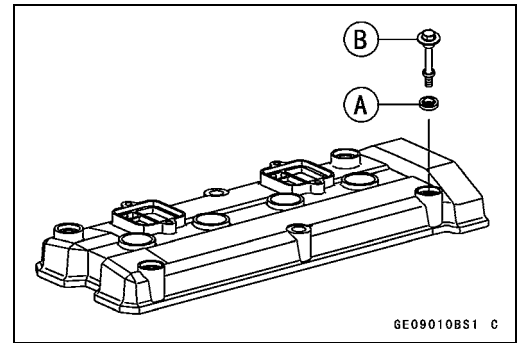
- Install:
  - Dowel Pins [A]
  - Plug Hole Gaskets [B]



## Cylinder Head Cover

- Install the washer [A] with the metal side faces upward.
- Tighten:

**Torque - Cylinder Head Cover Bolts [B]: 10 N·m (1.0 kgf·m,  
87 in·lb)**



## 5-14 ENGINE TOP END

### Camshaft Chain Tensioner

#### Camshaft Chain Tensioner Removal

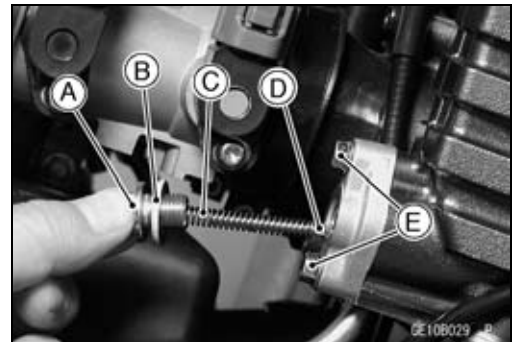
#### CAUTION

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."

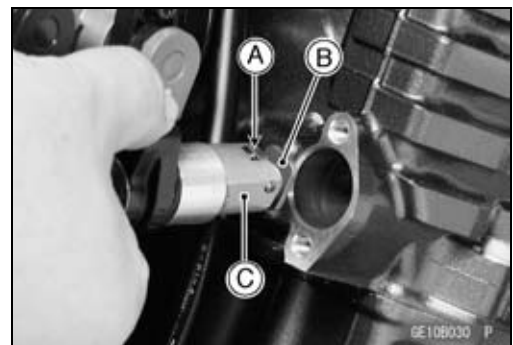
Do not turn over the crankshaft while the tensioner is removed. This could upset the camshaft chain timing, and damage the valves.

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Cap Bolt [A]
  - Washer [B]
  - Spring [C]
  - Rod [D]
- Remove the mounting bolts [E] and take off the camshaft chain tensioner.

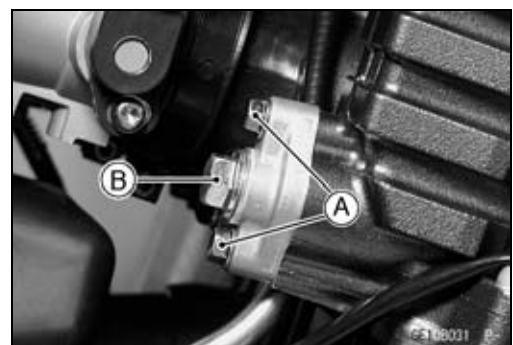


#### Camshaft Chain Tensioner Installation

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



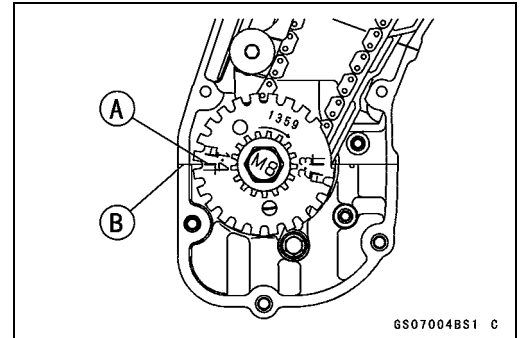
- Tighten the tensioner mounting bolts [A].  
**Torque - Camshaft Chain Tensioner Mounting Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**
- Install the rod, spring and washer.
- Tighten the cap bolt [B].  
**Torque - Camshaft Chain Tensioner Cap Bolt: 28 N·m (2.9 kgf·m, 21 ft·lb)**
- Turn the crankshaft 2 turns clockwise to allow the tensioner to expand and recheck the camshaft chain timing.



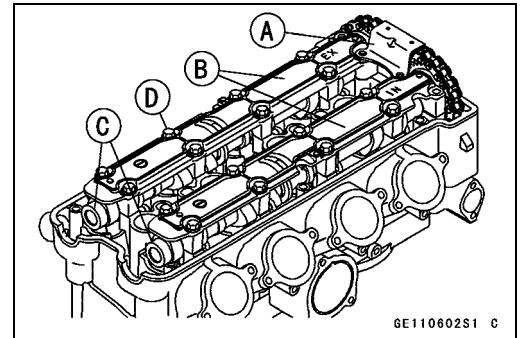
## Camshaft, Camshaft Chain

### Camshaft Removal

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Stick Coils (see Electrical System)
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
  - Pickup Coil Cover
- Position the crankshaft at #1, 4 piston TDC.
  - [A] TDC mark for #1, 4 Pistons
  - [B] Timing Mark (crankcase halves mating surface)



- Remove:
  - Camshaft Chain Tensioner (see Camshaft Chain Tensioner Removal)
  - Camshaft Cap Bolts [D]
  - Chain Guide [A]
  - Camshaft Caps [B]
  - Camshafts [C]
- Stuff a clean cloth into the chain tunnel to keep any parts from dropping into the crankcase.

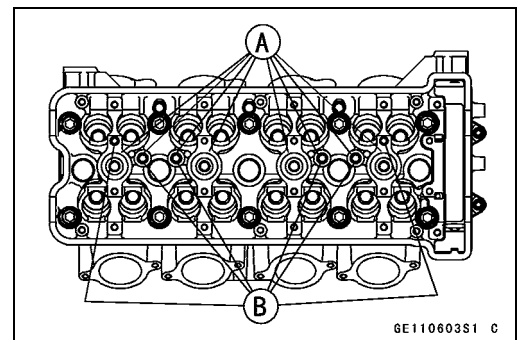


### CAUTION

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]



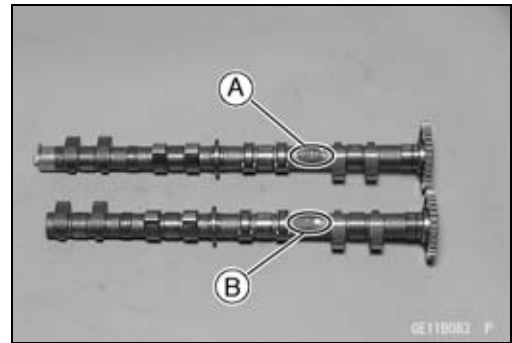
## 5-16 ENGINE TOP END

### Camshaft, Camshaft Chain

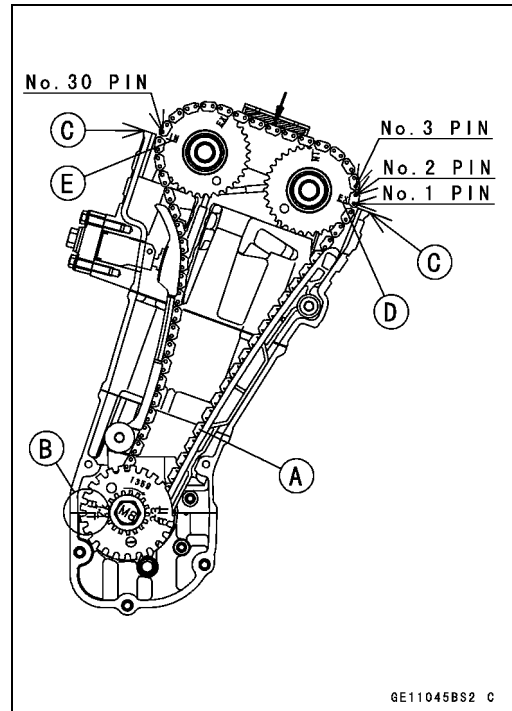
- Apply engine oil to all cam parts and journals.
- If a new camshaft is to be used, apply a thin coat of molybdenum disulfide grease to the cam surfaces.

#### NOTE

○ The exhaust camshaft has a 030 EX mark [A] and the inlet camshaft has a 030 IN mark [B]. Be careful not to mix up these shafts.



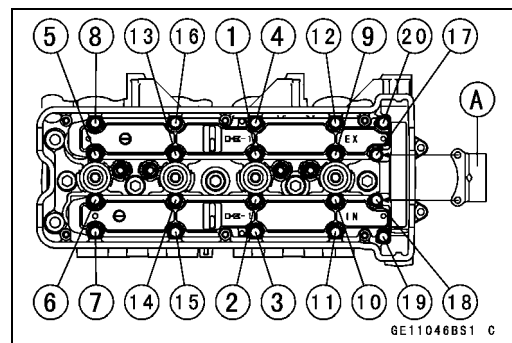
- Position the crankshaft at #1, 4 piston TDC.
- Pull the tension side (exhaust side) [A] of the chain taut to install the chain.
- Engage the camshaft chain with the camshaft sprockets so that the timing marks on the sprockets are positioned as shown.
  - The timing marks of #1, 4T must be aligned with the lower surface of crankcase of rear side [B].
  - The timing marks must be aligned with the cylinder head upper surface [C].
    - [D] EX mark
    - [E] IN mark
- Before installing the camshaft cap and chain guide, install the camshaft chain tensioner body temporarily.



- Install the camshaft cap and chain guide [A].
- First tighten the 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: 12 N·m (1.2 kgf·m, 104 in·lb)**  
**Camshaft Chain Guide Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)**

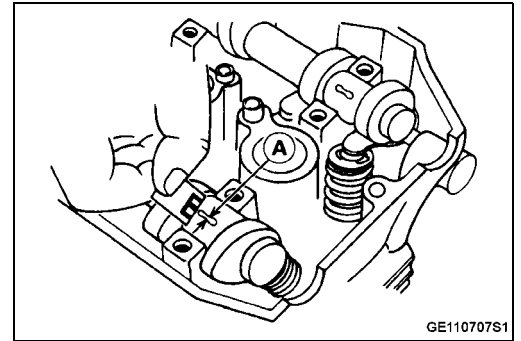
- Tighten the camshaft chain tensioner (see Camshaft Chain Tensioner Installation).
- Install the cylinder head cover (see Cylinder Head Cover Installation).



## Camshaft, Camshaft Chain

### 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)**



GE110707S1

### 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.)

- ★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.)

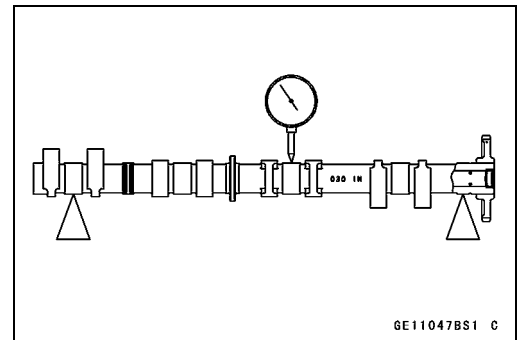
- ★If the camshaft journal diameter is less than the service limit, replace the camshaft with a new one and measure the clearance again.
- ★If the clearance still remains out of the limit, replace the cylinder head unit.

### Camshaft Runout

- Remove the camshaft.
- 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.)



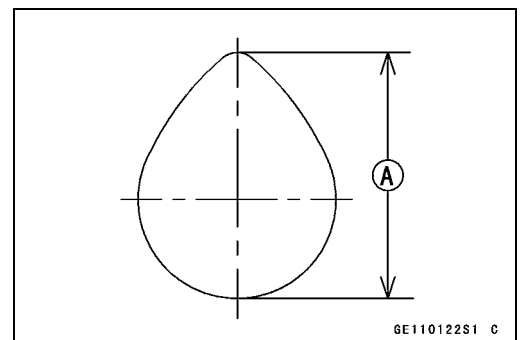
GE11047BS1 C

### Cam Wear

- Remove the camshaft.
- 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

	Inlet	Exhaust
<b>Standard:</b>	36.746 ~ 36.854 mm (1.4467 ~ 1.4509 in.)	36.146 ~ 36.254 mm (1.4231 ~ 1.4273 in.)
<b>Service Limit:</b>	36.65 mm (1.443 in.)	36.05 mm (1.419 in.)



GE110122S1 C

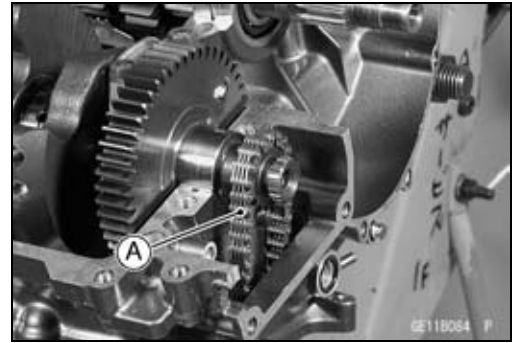
## 5-18 ENGINE TOP END

### Camshaft, Camshaft Chain

---

#### *Camshaft Chain Removal*

- Split the crankcase (see Crankshaft/Transmission chapter).
- Remove the camshaft chain [A] from the crankshaft sprocket.





## Cylinder Head

### Cylinder Compression Measurement

**NOTE**

○ Use the battery which is fully charged.

- Warm up the engine thoroughly.
- Stop the engine.
- Remove:
  - Seats (see Frame chapter)
  - Fuel Tank (see Fuel System (DFI) chapter)
  - Stick Coils
  - Spark Plugs

**Owners Tool - Spark Plug Wrench, Hex 16**

- 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: 57001-221**  
**Compression Gauge Adapter, M10 × 1.0: 57001-1317**

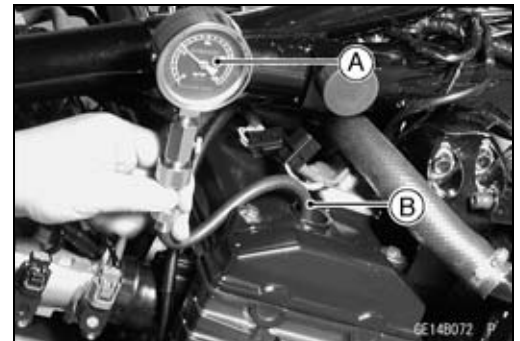
**Cylinder Compression**

**Usable Range :** 1070 ~ 1620 kPa (10.9 ~ 16.5 kgf/cm<sup>2</sup>, 155 ~ 235 psi) @ 320 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.



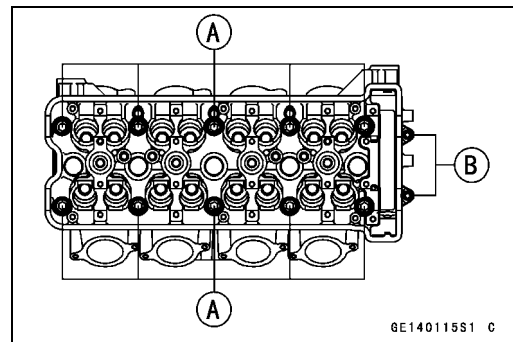
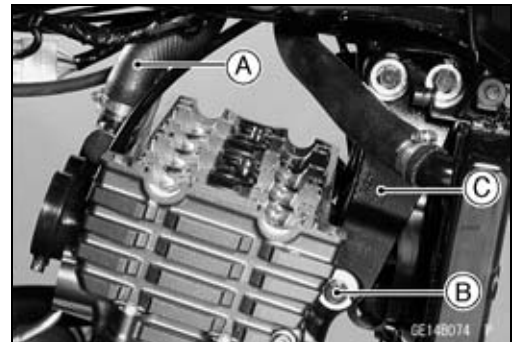
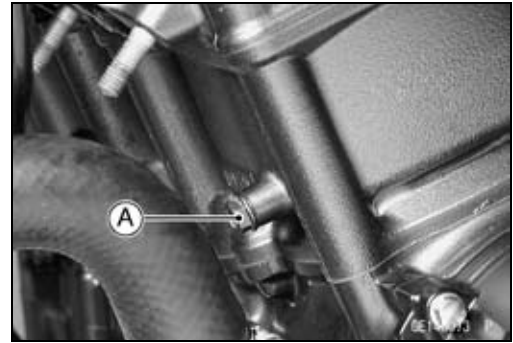
Problem	Diagnosis	Remedy (Action)
Cylinder compression is higher than usable range	Carbon accumulation on piston and in combustion chamber possibly due to damaged valve stem oil seal and/or damaged piston oil rings (This may be indicated by white exhaust smoke).	Remove the carbon deposits and replace 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 check gasket and cylinder head warp.
	Bad condition of valve seating	Repair if necessary.
	Incorrect valve clearance.	Adjust the valve clearance.
	Incorrect piston/cylinder clearance	Replace the piston and/or cylinder.
	Piston seizure.	Inspect the cylinder and replace/repair the cylinder and/or piston as necessary.
	Bad condition of piston ring and/or piston ring grooves	Replace the piston and/or the piston rings.

## 5-20 ENGINE TOP END

### Cylinder Head

#### Cylinder Head Removal

- Drain the coolant (see Cooling System chapter).
- Remove:
  - Exhaust Pipes (see Exhaust Pipe Removal)
  - Coolant Drain Bolt [A] (cylinder)
- Remove:
  - Cylinder Head Cover (see Cylinder Head Cover Removal)
  - Camshaft Position Sensor (see Electrical System chapter)
  - Camshafts (see Camshaft Removal)
  - Throttle Body (see Fuel System (DFI) chapter)
  - Water Hose [A]
  - Bracket Bolt [B]
  - Engine Bracket [C]
  - Cam 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.

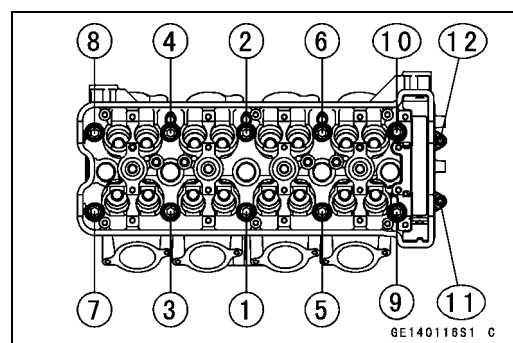
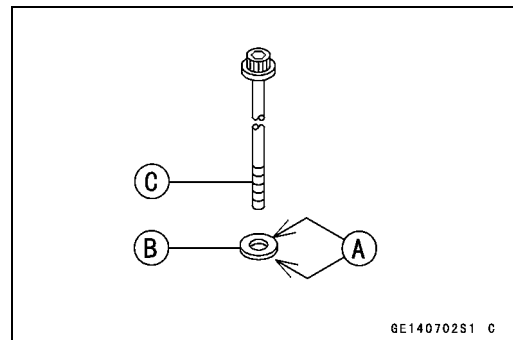
- Install a new cylinder head gasket and dowel pins.
- Apply molybdenum disulfide oil solution to both sides [A] of the cylinder head bolt washers [B] and the thread of head bolts [C].
- Tighten the M10 cylinder head bolts following the tightening sequence [1 ~ 10].

##### 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)

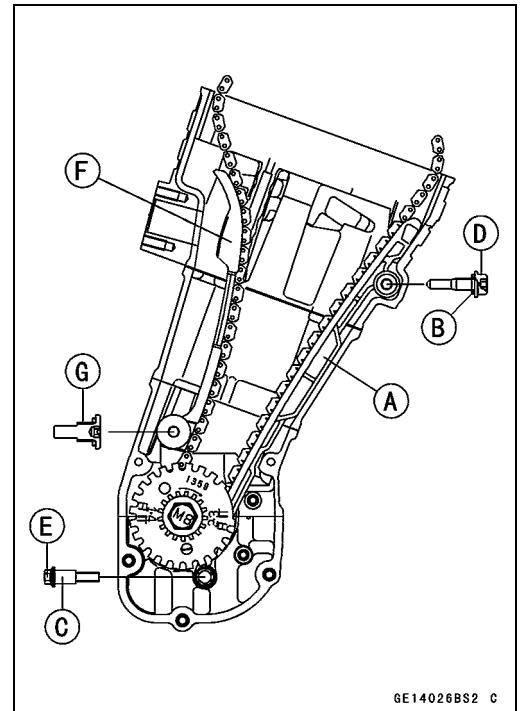
- Tighten the M6 cylinder head bolts [11 ~ 12].

**Torque - Cylinder Head Bolts (M6): 12 N·m (1.2 kgf·m, 104 in·lb)**



## 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:
  - Rear Camshaft Chain Guide [F]
- Tighten:
  - Torque - Rear Camshaft Chain Guide Bolt [G]:**  
25 N·m (2.5 kgf·m, 18 ft·lb)
- Install the camshafts (see Camshaft Installation).



### Cylinder Head Warp

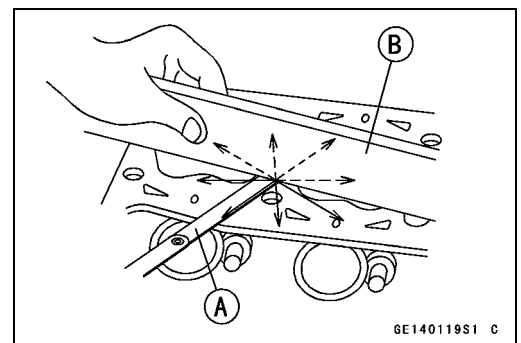
- Clean the cylinder head.
- Lay a straightedge across the lower surface of the cylinder head at several positions.
- Use a thickness gauge [A] to measure the space between the straightedge [B] and the head.

#### 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).



## 5-22 ENGINE TOP END

### Valves

#### Valve Clearance Inspection

- Refer to the Engine Top End in the Periodic Maintenance chapter.

#### Valve Clearance Adjustment

- Refer to the Engine Top End 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]

Adapter,  $\phi 22$ : 57001-1202 [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.

[A] Valve Stem

[B] Oil Seal

[C] Spring Seat

[D] Closed Coil End

[E] Valve Spring (Yellow)

[F] Retainer

[G] Split Keepers

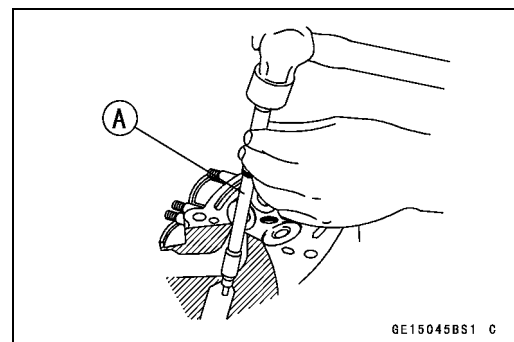
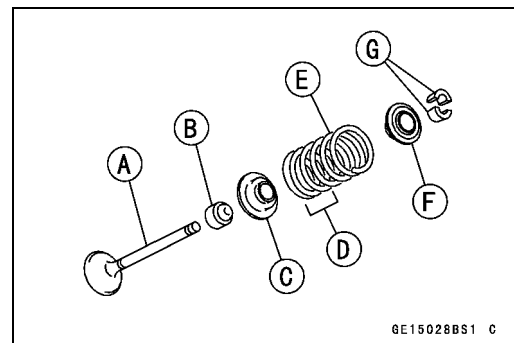
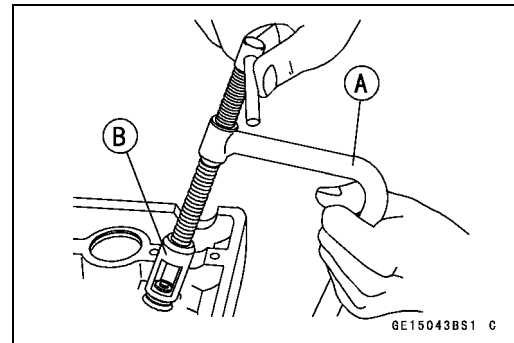
#### Valve Guide Removal

- Remove:
  - Valve (see Valve Removal)
  - Oil Seal
  - Spring Seat
- Heat the area around the valve guide to 120 ~ 150°C (248 ~ 302 °F), and hammer lightly on the valve guide arbor [A] to remove the guide from the top of the head.

#### CAUTION

**Do not heat the cylinder head with a torch. This will warp the cylinder head. Soak the cylinder head in oil and heat the oil.**

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



## Valves

### Valve Guide Installation

- Apply oil to the valve guide outer surface before installation.
- Heat the area around the valve guide hole to about 120 ~ 150 °C (248 ~ 302 °F).
- 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, $\phi 4.5$ : 57001-1331

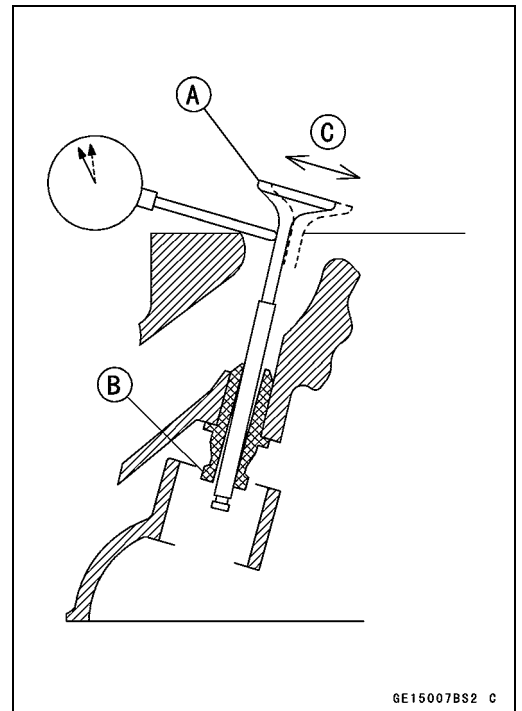
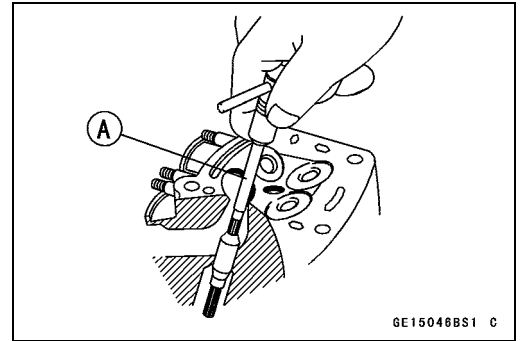
- Wait until the cylinder head cools down and then ream the valve guide with the valve guide reamer [A] even if the old guide is reused.
- Turn the reamer in a clockwise direction until the reamer turns freely in the guide. Never turn the reamer counter-clockwise or it will be dulled.
- Once the guides are reamed they must be cleaned thoroughly.

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

### Valve-to-Guide Clearance Measurement (Wobble Method)

If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method as indicated below.

- Insert a new valve [A] into the guide [B] and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface.
- Move the stem back and forth [C] to measure valve/valve guide clearance.
- Repeat the measurement in a direction at a right angle to the first.
- ★ If the reading exceeds the service limit, replace the guide.



### NOTE

- The reading is not actual valve/valve guide clearance because the measuring point is above the guide.

### Valve/Valve Guide Clearance (Wobble Method)

	Inlet	Exhaust
Standard:	0.03 ~ 0.12 mm (0.0012 ~ 0.0047 in.)	0.09 ~ 0.18 mm (0.0035 ~ 0.0071 in.)
Service Limit:	0.33 mm (0.013 in.)	0.40 mm (0.016 in.)

## 5-24 ENGINE TOP END

### 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:

Inlet 29.4 ~ 29.6 mm (1.1575 ~ 1.1654 in.)

Exhaust 25.2 ~ 25.4 mm (0.992 ~ 1.000 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:

Inlet 0.5 ~ 1.0 mm (0.020 ~ 0.039 in.)

Exhaust 0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)

#### Valve Seat Repair

- Repair the valve seat with the valve seat cutters [A].

Special Tools - Valve Seat Cutter Holder,  $\phi 4.5$ : 57001-1330[B]

Valve Seat Cutter Holder Bar: 57001-1128[C]

##### [For Inlet Valve Seat]

Valve Seat Cutter, 45° -  $\phi 32$ : 57001-1115

Valve Seat Cutter, 32° -  $\phi 30$ : 57001-1120

Valve Seat Cutter, 60° -  $\phi 33$ : 57001-1334

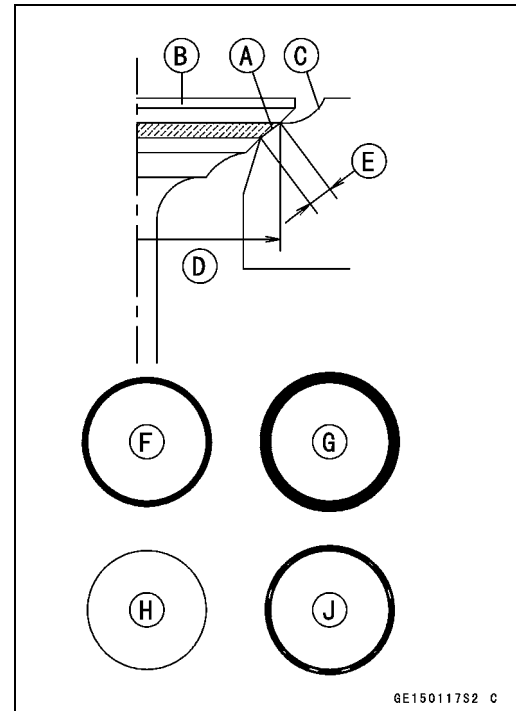
##### [For Exhaust Valve Seat]

Valve Seat Cutter, 45° -  $\phi 27.5$ : 57001-1114

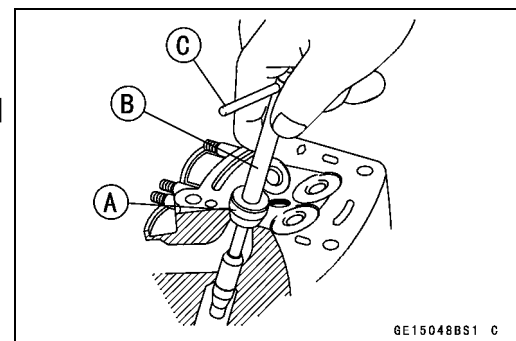
Valve Seat Cutter, 32° -  $\phi 28$ : 57001-1119

Valve Seat Cutter, 60° -  $\phi 30$ : 57001-1123

- ★ If the manufacturer's instructions are not available, use the following procedure.



GE150117S2 C



GE15048BS1 C

## 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

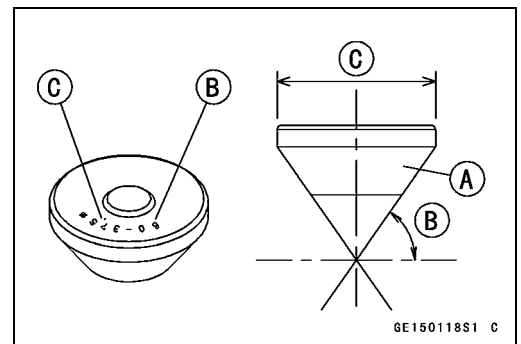
○Prior to grinding, apply engine oil to the cutter and during the operation, wash off any ground particles sticking to the cutter with washing oil.

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]  
 $\phi 37.5$  ..... 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.**

## 5-26 ENGINE TOP END

### Valves

- Measure the outside diameter of the seating surface with a vernier caliper.

★ If the outside diameter of the seating surface is too small, repeat the 45° grind until the diameter is within the specified range.

Widened Width [A] of engagement by machining with 45° cutter

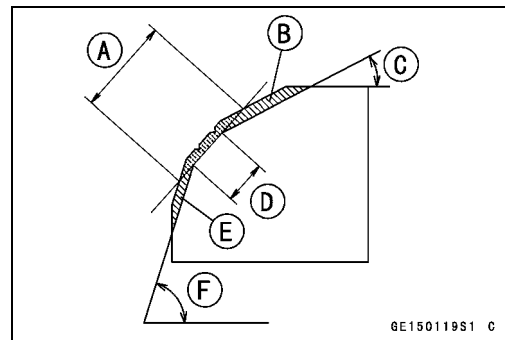
Ground Volume [B] by 32° cutter

32° [C]

Correct Width [D]

Ground Volume [E] by 60° cutter

60° [F]



- Measure the outside diameter of the seating surface with a vernier caliper.

★ If the outside diameter of the seating surface is too small, repeat the 45° grind [A] until the diameter is within the specified range.

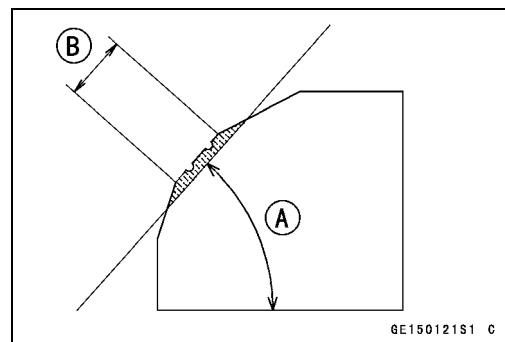
Original Seating Surface [B]

#### NOTE

○ Remove all pittings of flaws from 45° ground surface.

○ After grinding with 45° cutter, apply thin coat of machinist's dye to seating surface. This makes seating surface distinct and 32° and 60° grinding operation easier.

○ When the valve guide is replaced, be sure to grind with 45° cutter for centering and good contact.



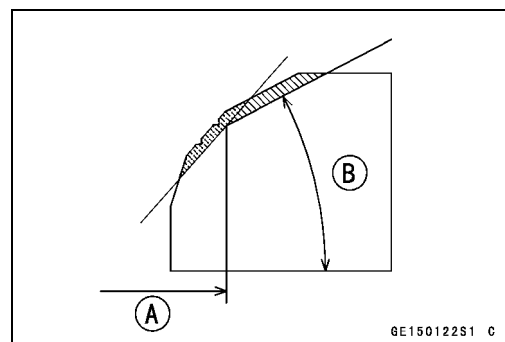
★ If the outside diameter [A] of the seating surface is too large, make the 32° grind described below.

★ If the outside diameter of the seating surface is within the specified range, measure the seat width as described below.

- Grind the seat at a 32° angle [B] until the seat O.D. is within the specified range.

○ To make the 32° grind, fit a 32° cutter into the holder, and slide it into the valve guide.

○ Turn the holder one turn at a time while pressing down very lightly. Check the seat after each turn.



#### CAUTION

**The 32° cutter removes material very quickly. Check the seat outside diameter frequently to prevent overgrinding.**

○ After making the 32° grind, return to the seat O.D. measurement step above.

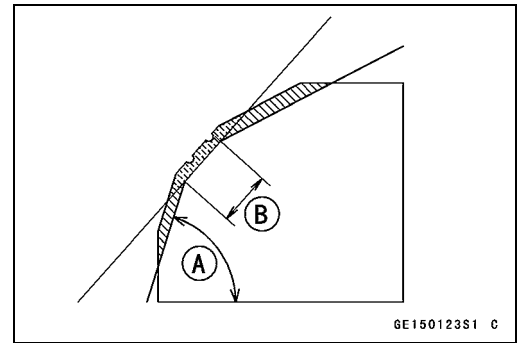
● To measure the seat width, use a vernier caliper to measure the width of the 45° angle portion of the seat at several places around the seat.

★ If the seat width is too narrow, repeat the 45° grind until the seat is slightly too wide, and then return to the seat O.D. measurement step above.

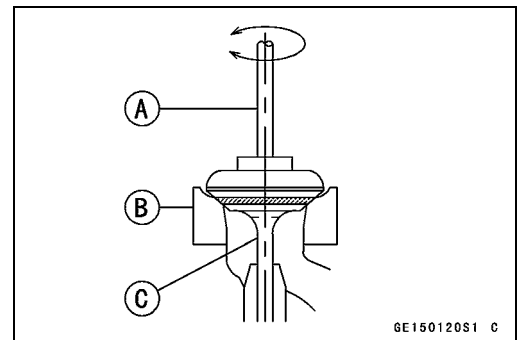


## Valves

- ★ If the seat width is too wide, make the 60° [A] grind described below.
  - ★ If the seat width is within the specified range, lap the valve to the seat as described below.
  - Grind the seat at a 60° angle until the seat width is within the specified range.
  - To make the 60° grind, fit 60° cutter into the holder, and slide it into the valve guide.
  - Turn the holder, while pressing down lightly.
  - After making the 60° grind, return to the seat width measurement step above.
- Correct Width [B]

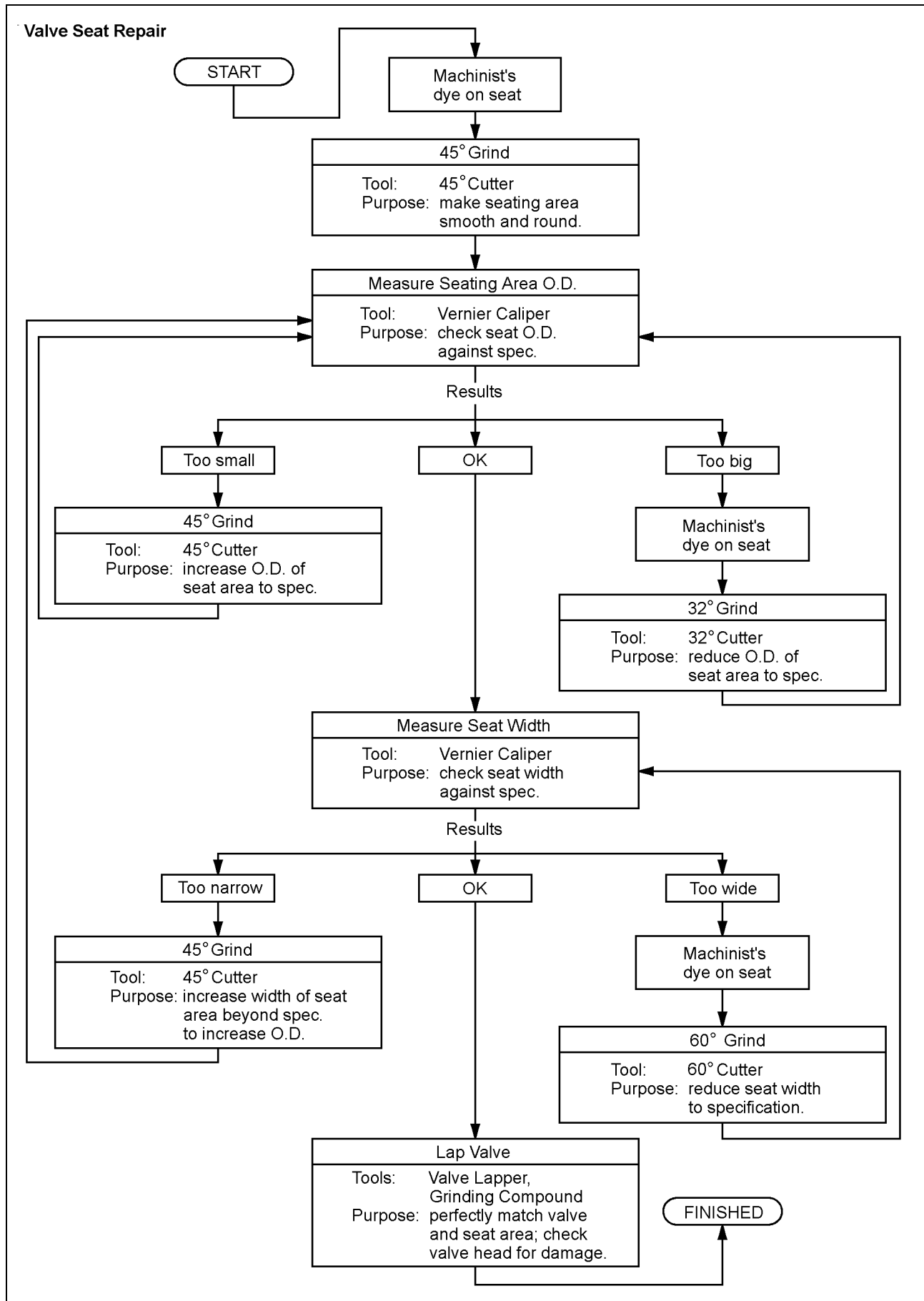


- Lap the valve to the seat, once the seat width and O.D. are within the ranges specified above.
  - Put a little coarse grinding compound on the face of the valve in a number of places around the valve head.
  - Spin the valve against the seat until the grinding compound produces a smooth, matched surface on both the seat and the valve.
  - Repeat the process with a fine grinding compound.
- [A] Lapper  
[B] Valve Seat  
[C] Valve
- 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 section of the Periodic maintenance chapter).



# 5-28 ENGINE TOP END

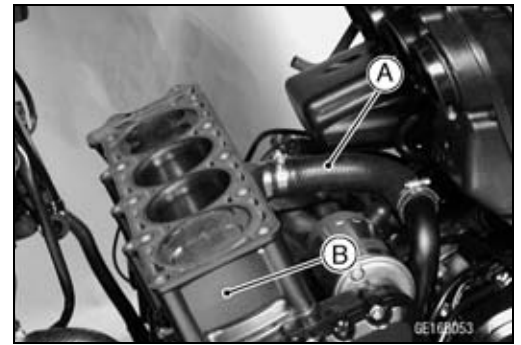
## Valves



## Cylinder, Pistons

### Cylinder Removal

- Remove:
  - Cylinder Head (see Cylinder Head Removal)
  - Water Hose [A]
- Remove the cylinder [B].

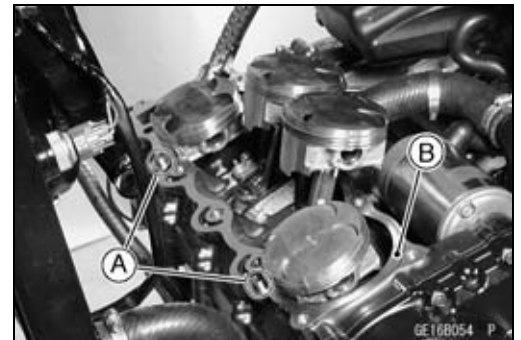


### Cylinder Installation

#### NOTE

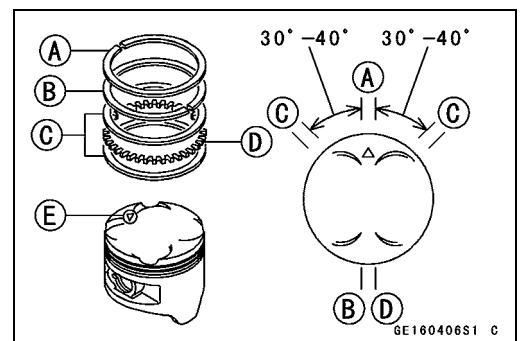
○ If a new cylinder is used, use new piston ring.

- Install the pins [A] and new cylinder gasket [B].
- Apply engine oil to the cylinder bore.

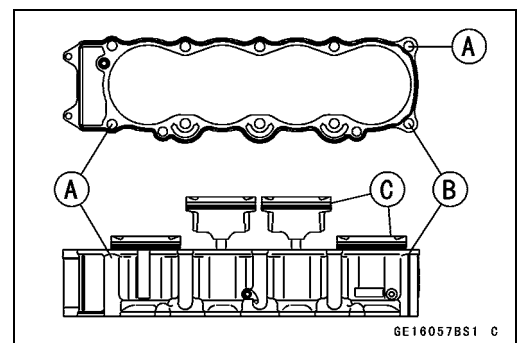


- The piston ring openings must be positioned as shown in the figure. The openings of the oil ring steel rails must be about 30 – 40° of angle from the opening of the top ring.

- [A] Top Ring
- [B] Second Ring
- [C] Oil Ring Steel Rails
- [D] Oil Ring Expander
- [E] Hollow



- 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.



### Piston Removal

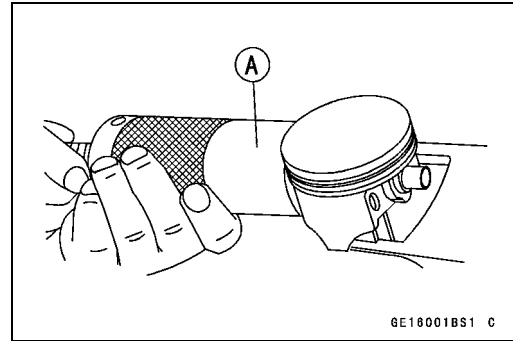
- Remove the cylinder (see Cylinder Removal).
- Place a clean cloth under the pistons and remove the piston pin snap ring [A] from the outside of each piston.



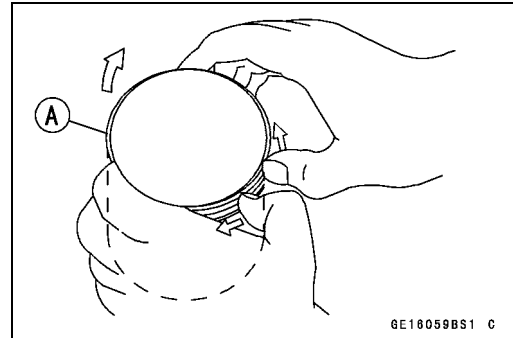
## 5-30 ENGINE TOP END

### Cylinder, Pistons

- Remove the piston pins.
  - Special Tool - Piston Pin Puller Assembly: 57001-910 [A]
- Remove the pistons.

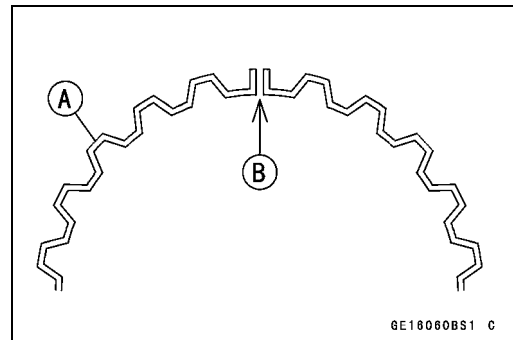


- Carefully spread the ring opening with your thumbs and then push up on the opposite side of the ring [A] to remove it.
- Remove the 3-piece oil ring with your thumbs in the same manner.



#### Piston Installation

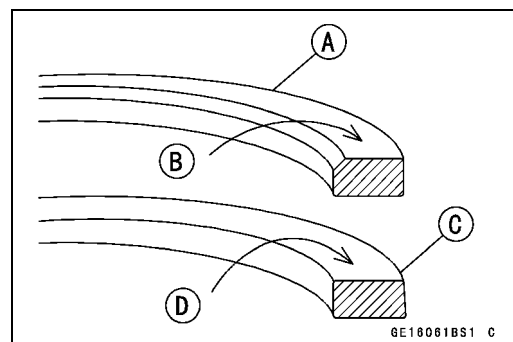
- Apply molybdenum disulfide oil solution to the oil ring expander, and install the oil ring expander [A] in the bottom piston ring groove so the ends [B] butt together.
  - Apply molybdenum disulfide oil solution to the oil ring steel rails, and install the oil ring steel rails, one above the expander and one below it.
- Spread the rail with your thumbs, but only enough to fit the rail over the piston.
  - Release the rail into the bottom piston ring groove.



#### NOTE

○The oil ring rails have no "top" or "bottom".

- Do not mix up the top and second ring.
- Install the top ring [A] so that the "R" mark [B] faces up.
- Install the second ring [C] so that the "RN" mark [D] faces up.
- Apply molybdenum disulfide oil solution to the piston rings.

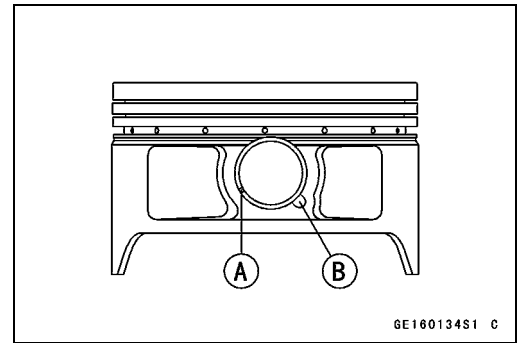


**Cylinder, Pistons**

**NOTE**

○ If a new piston is used, use new piston ring.

- Install the piston with its 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).

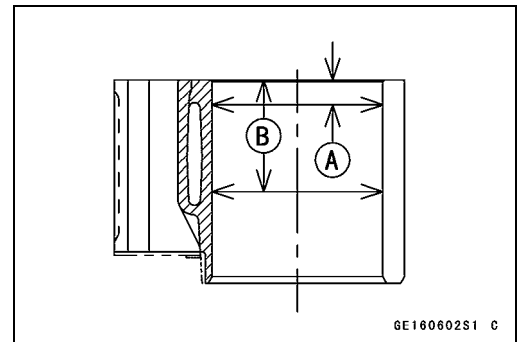
**Cylinder Wear**

- 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.

[A] 10 mm (0.39 in.)

[B] 60 mm (2.36 in.)



**Cylinder Inside Diameter**

**Standard:** 77.194 ~ 77.206 mm (3.0391 ~ 3.0396 in.)

**Service Limit:** 77.30 mm (3.0433 in.)

**Piston Wear**

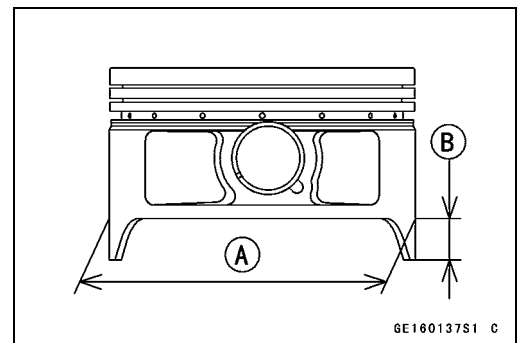
- Measure the outside diameter [A] of each piston 5 mm (0.20 in.) [B] up from the bottom of the piston at a right angle to the direction of the piston pin.

★ If the measurement is under service limit, replace the piston.

**Piston Diameter**

**Standard:** 77.174 ~ 77.184 mm (3.0383 ~ 3.0389 in.)

**Service Limit:** 77.02 mm (3.0323 in.)

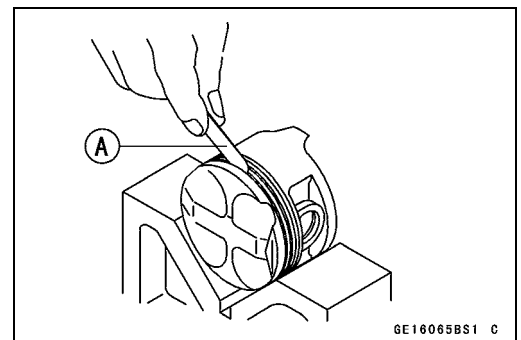


**Piston Ring, Piston Ring Groove Wear**

- Check for uneven groove wear by inspecting the ring seating.

★ The rings should fit perfectly parallel to groove surfaces. If not, replace the piston and all the piston rings.

- With the piston rings in their grooves, make several measurements with a thickness gauge [A] to determine piston ring/groove clearance.



**Piston Ring/Groove Clearance**

	Standard	Service Limit
Top	0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in.)	0.18 mm (0.0071 in.)
Second	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in.)	0.17 mm (0.0067 in.)

## 5-32 ENGINE TOP END

### Cylinder, Pistons

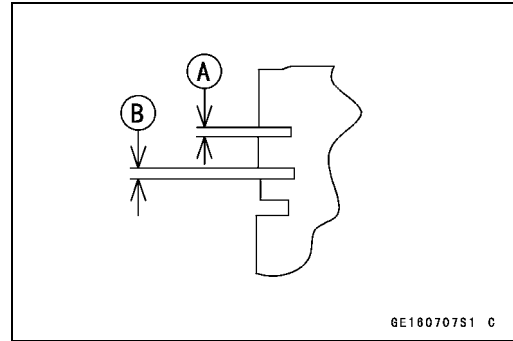
#### Piston Ring Groove Width

- Measure the piston ring groove width.
- Use a vernier caliper at several points around the piston.

#### Piston Ring Groove Width

	Standard	Service Limit
Top [A]	0.83 ~ 0.85 mm (0.0327 ~ 0.0335 in.)	0.93 mm (0.037 in.)
Second [B]	0.82 ~ 0.84 mm (0.0323 ~ 0.0331 in.)	0.92 mm (0.036 in.)

- ★ If the width of any of the two grooves is wider than the service limit at any point, replace the piston.



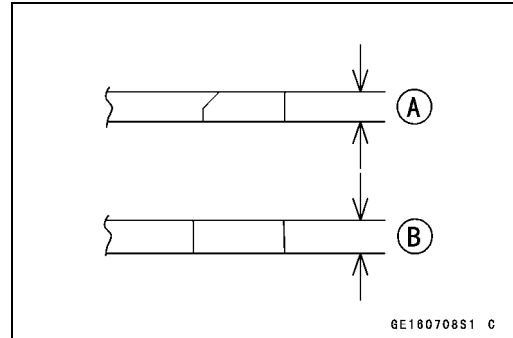
#### Piston Ring Thickness

- Measure the piston ring thickness.
- Use the micrometer to measure at several points around the ring.

#### Piston Ring Thickness

	Standard	Service Limit
Top [A]	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)
Second [B]	0.77 ~ 0.79 mm (0.0303 ~ 0.0311 in.)	0.70 mm (0.028 in.)

- ★ If any of the measurements is less than the service limit on either of the rings, replace all the rings.



#### NOTE

- When using new rings in a used piston, check for uneven groove wear. The rings should fit perfectly parallel to the groove sides. If not, replace the piston.

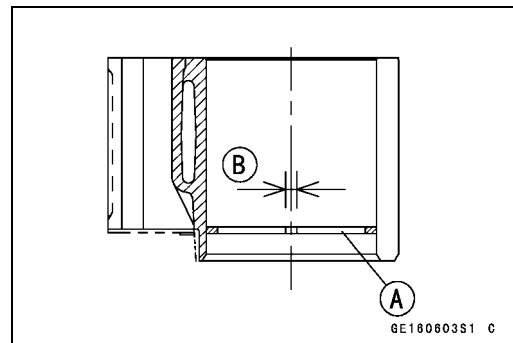
#### Piston Ring End Gap

- Place the piston ring [A] inside the cylinder, using the piston to locate the ring squarely in place. Set it close to the bottom of the cylinder, where cylinder wear is low.
- Measure the gap [B] between the ends of the ring with a thickness gauge.

#### Piston Ring End Gap

	Standard	Service Limit
Top	0.20 ~ 0.30 mm (0.0079 ~ 0.0118 in.)	0.6 mm (0.024 in.)
Second	0.35 ~ 0.50 mm (0.0138 ~ 0.0197 in.)	0.8 mm (0.031 in.)

- ★ If the end gap of either ring is greater than the service limit, replace all the rings.



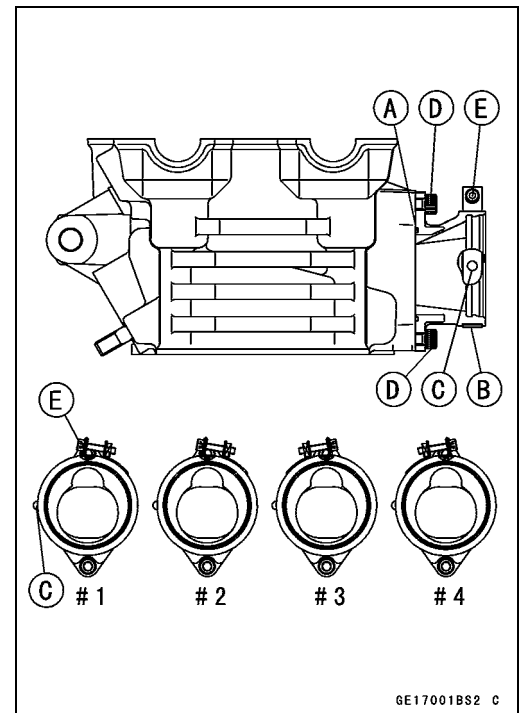
## Throttle Body Holder

### *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]: 12 N·m (1.2 kgf·m, 104 in·lb)**

**Throttle Body Holder Clamp Screws [E]: 2.0 N·m (0.2 kgf·m, 17 in·lb)**



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## 5-34 ENGINE TOP END

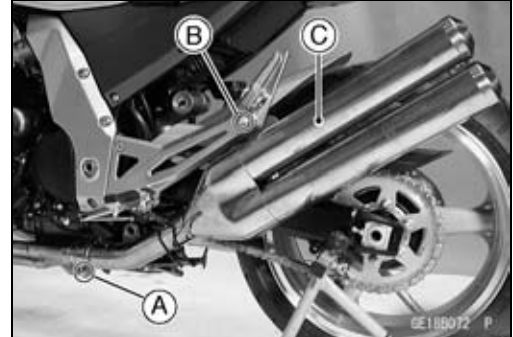
### Muffler

#### **⚠ WARNING**

To avoid a serious burn, do not remove the mufflers when the engine is still hot. Wait until the mufflers cool down.

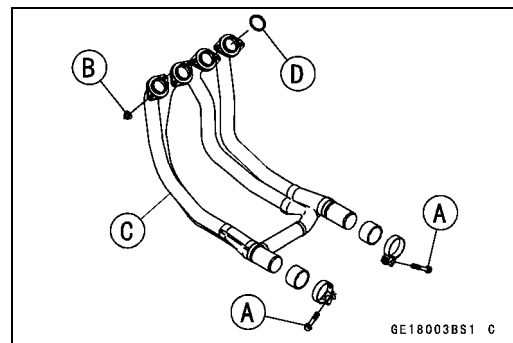
#### *Muffler Body Removal*

- Remove:
  - Muffler Body Clamp Bolts [A]
  - Muffler Body Mounting Bolts [B]
  - Muffler Body [C]



#### *Exhaust Pipe Removal*

- Remove:
  - Muffler Body Clamp Bolts [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]
- Install the muffler body until it is bottomed [E].
- Install:
  - Dampers [F]
  - Washer [G]
- Tighten:
  - Torque - Exhaust Pipe Manifold Holder Nuts [H]: 17 N·m (1.7 kgf·m, 12 ft·lb)**
  - Muffler Body Mounting Bolts [I] and Nuts [J]: 34 N·m (3.5 kgf·m, 25 ft·lb)**
  - Muffler Body Clamp Bolts [K]: 17 N·m (1.7 kgf·m, 12 ft·lb)**



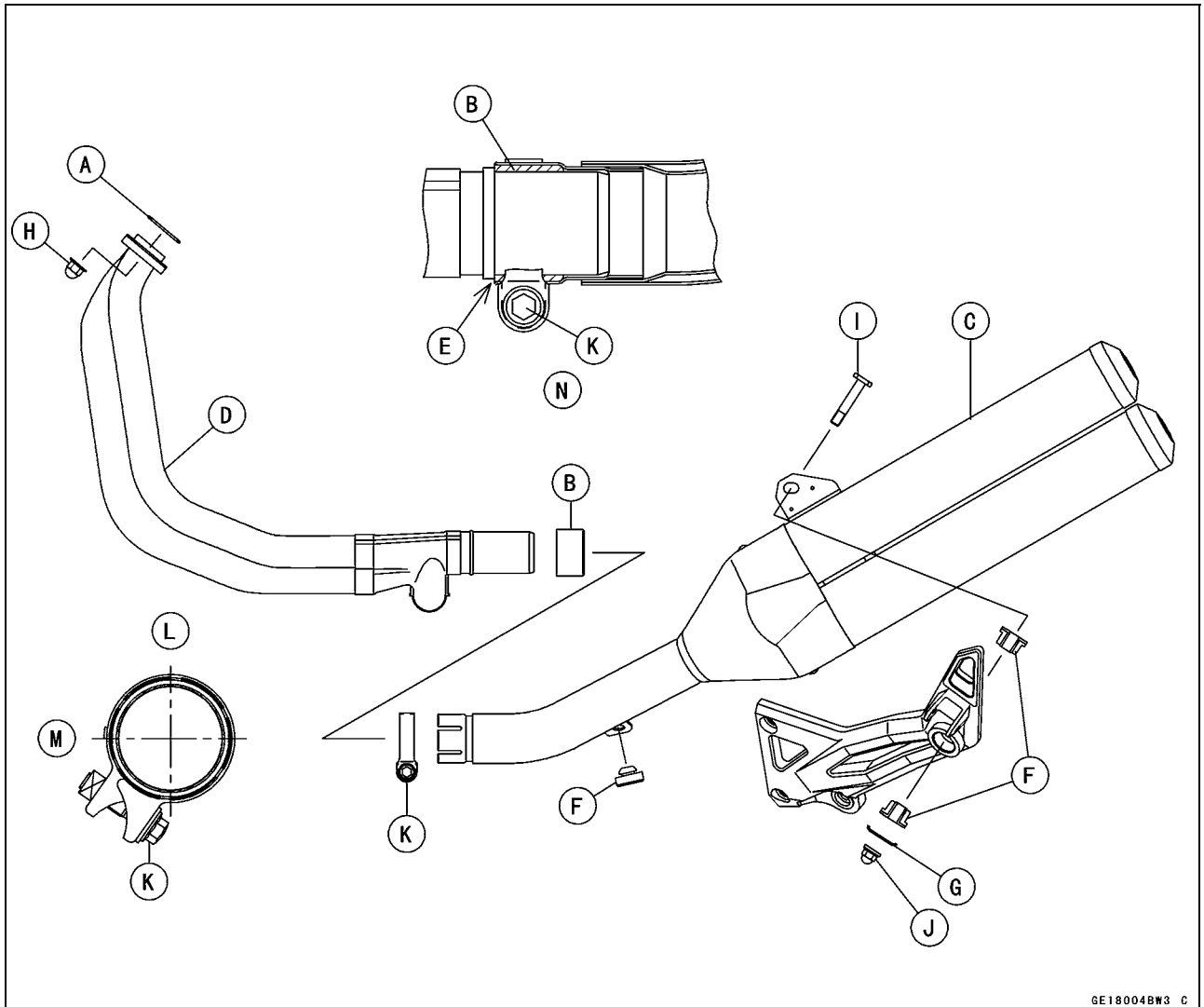
**Muffler**

○ Install the muffler body clamp bolts as shown.

[L] Upper Side

[M] Inside

[N] Connection Part Detail



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- Thoroughly warm up the engine, wait until the engine cools down, and retighten all the bolts and nuts.



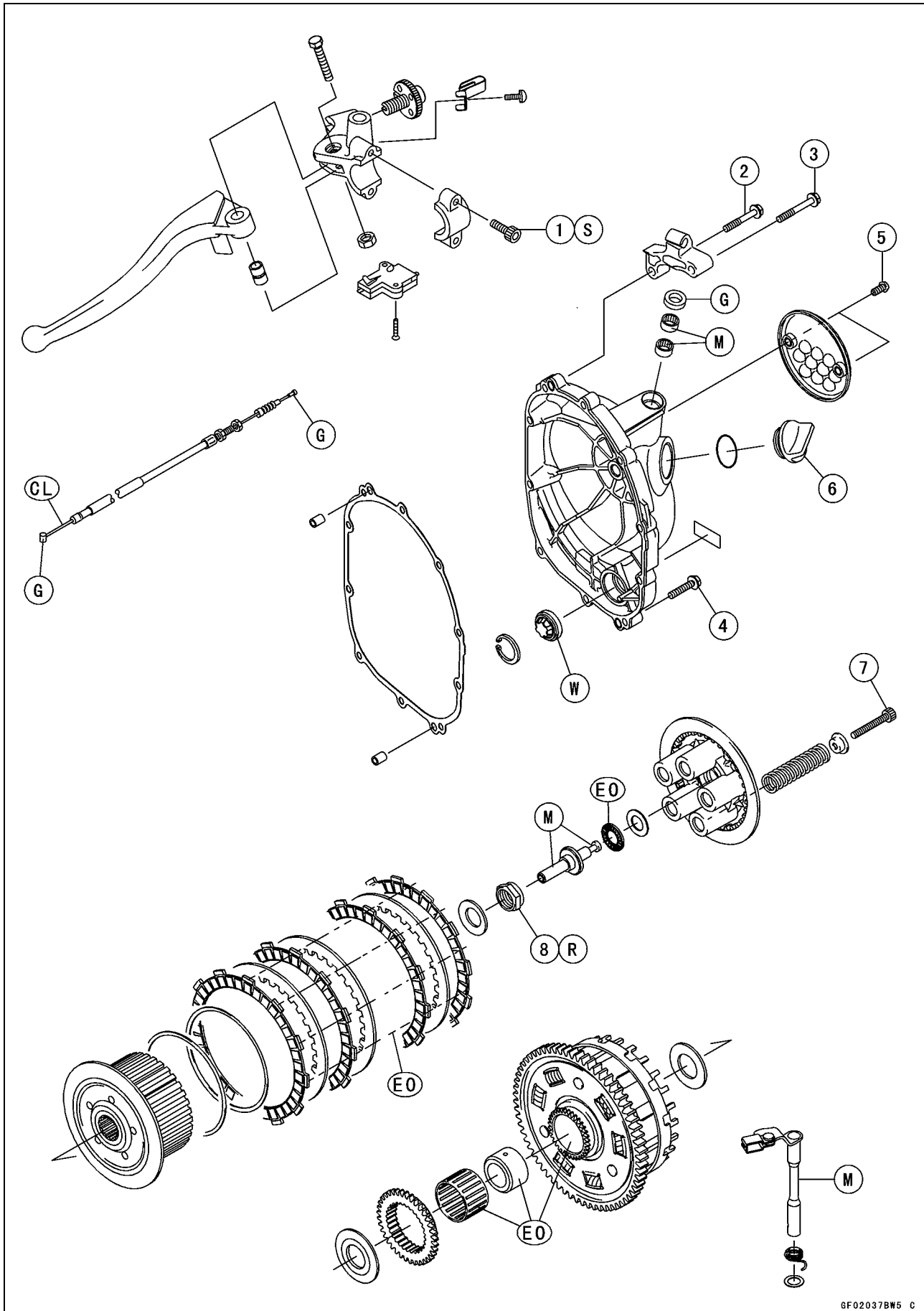
# Clutch

## Table of Contents

Exploded View .....	6-2
Specifications .....	6-4
Special Tools and Sealant .....	6-5
Clutch Lever and Cable .....	6-6
Clutch Lever Free Play Inspection .....	6-6
Clutch Lever Free Play Adjustment .....	6-6
Cable Removal .....	6-6
Cable Installation .....	6-6
Cable Lubrication .....	6-6
Clutch Lever Installation .....	6-6
Clutch Cover .....	6-7
Clutch Cover Removal .....	6-7
Clutch Cover Installation .....	6-7
Release Shaft Removal .....	6-7
Release Shaft Installation .....	6-7
Clutch Cover Disassembly .....	6-8
Clutch Cover Assembly .....	6-8
Clutch .....	6-9
Clutch Removal .....	6-9
Clutch Installation .....	6-9
Clutch Plate Assembly Inspection .....	6-11
Clutch Plate Assembly Adjustment .....	6-12
Clutch Plate, Wear, Damage Inspection .....	6-12
Clutch Plate Warp Inspection .....	6-12
Clutch Spring Free Length Measurement .....	6-12

# 6-2 CLUTCH

## Exploded View



## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Clutch lever clamp bolts	7.9	0.8	69 in·lb	S
2	Clutch cover bolts (L = 32 mm)	11	1.1	95 in·lb	
3	Clutch cover bolts (L = 45 mm)	11	1.1	95 in·lb	
4	Clutch cover bolts (L = 30 mm)	11	1.1	95 in·lb	
5	Clutch cover bolts	11	1.1	95 in·lb	
6	Oil filler plug	1.5	0.15	13 in·lb	
7	Clutch spring bolts	8.8	0.9	78 in·lb	
8	Clutch hub nut	135	14	100	R

CL: Apply cable lubricant.

EO: Apply engine oil.

G: Apply grease.

M: Apply molybdenum disulfide grease.

R: Replacement Parts

S: Follow the specific tightening sequence.

W: Apply water.

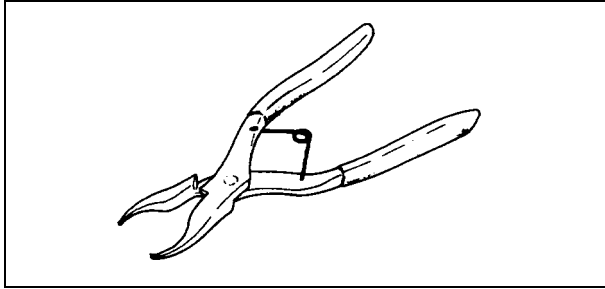
## 6-4 CLUTCH

### Specifications

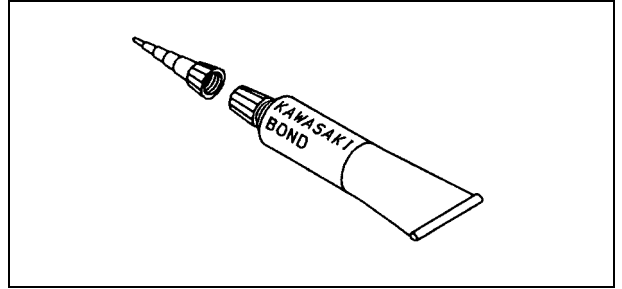
Item	Standard	Service Limit
<b>Clutch Lever Free Play</b>	2 ~ 3 mm (0.08 ~ 0.12 in.)	- - -
<b>Clutch:</b>		
Clutch plate assembly	48.4 ~ 49.0 mm (1.91 ~ 1.93 in.)	- - -
Friction plate thickness	2.72 ~ 2.88 mm (0.107 ~ 0.113 in.)	2.4 mm (0.094 in.)
Friction and steel plate warp	0.2 mm (0.008 in.) or less	0.3 mm (0.012 in.)
Clutch spring free length	75.42 mm (2.97 in.)	71.8 mm (2.83 in.)

**Special Tools and Sealant**

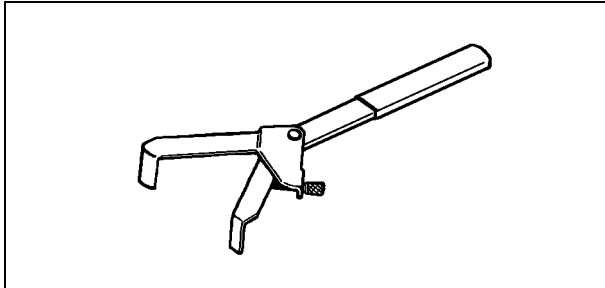
**Inside Circlip Pliers:**  
**57001-143**



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



**Clutch Holder:**  
**57001-1243**



## 6-6 CLUTCH

### Clutch Lever and Cable

#### Clutch Lever Free Play Inspection

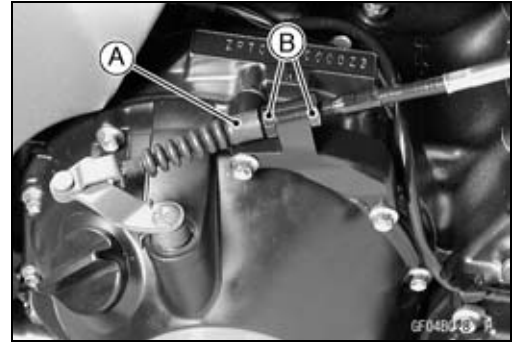
- Refer to the Clutch Adjust Inspection in the Periodic Maintenance chapter.

#### Clutch Lever Free Play Adjustment

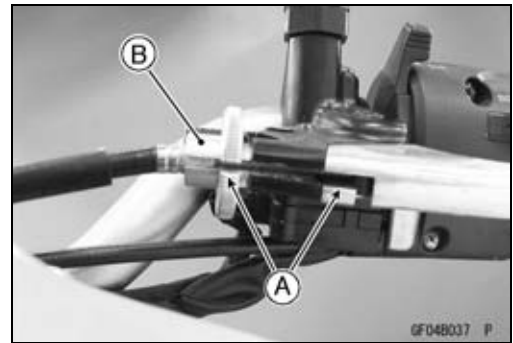
- Refer to the Clutch Adjust Inspection in the Periodic Maintenance chapter.

#### 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 in the Periodic Maintenance chapter).

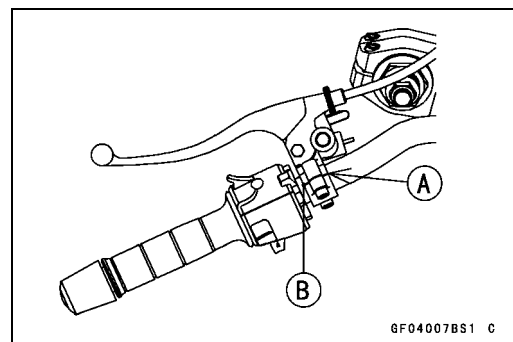
#### Cable Lubrication

- Refer to the General 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 Holder Bolts: 7.8 N·m (0.80 kgf·m, 69 in·lb)**

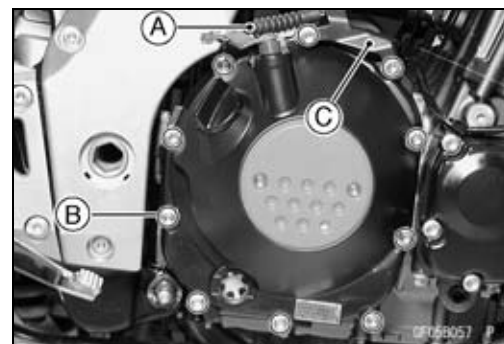




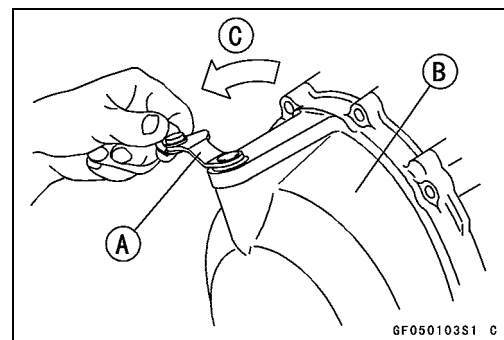
## Clutch Cover

### Clutch Cover Removal

- Remove:
  - Engine Oil (drain, see Engine Oil Change section in the Periodic Maintenance chapter)
  - Clutch Cable Lower End [A]
  - Clutch Cover Mounting Bolts [B]
  - Clutch Cable Bracket [C]

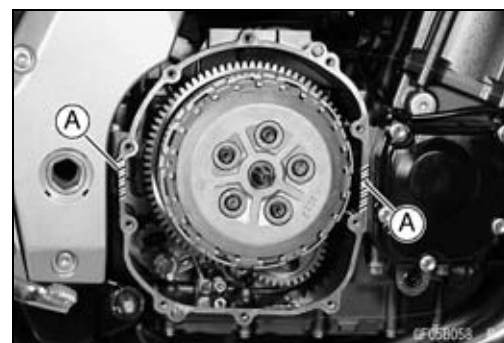


- Turn the release lever [A] toward the rear as shown, and remove the clutch cover [B]. [C] about 90°



### 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): 56019-120**
- Replace the cover gasket with a new one.
- Tighten the cover bolts.
  - Torque - Clutch Cover Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**

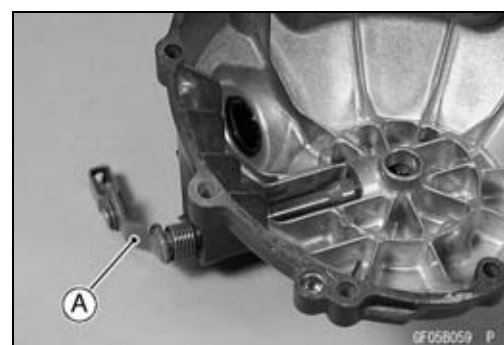


### Release Shaft Removal

#### CAUTION

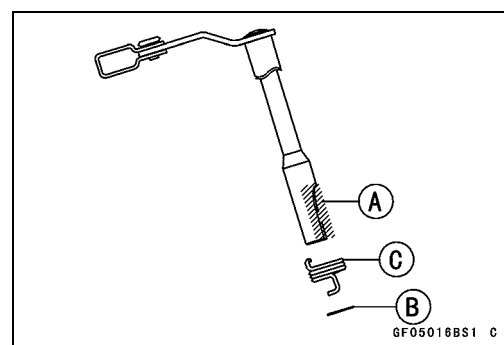
**Do not remove the clutch release lever and shaft assembly unless it is absolutely necessary. If removed, the oil seal replacement may be required.**

- Remove the clutch cover (see Clutch Cover Removal).
- Pull the lever [A] and shaft assembly 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 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.



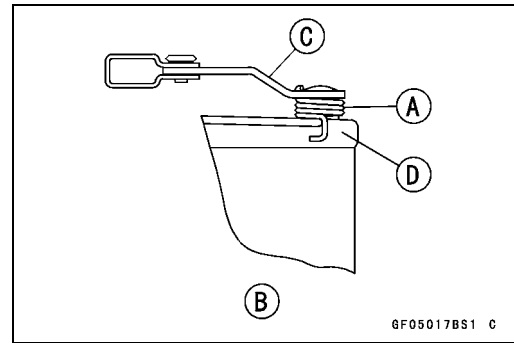
#### CAUTION

**When inserting the release shaft, be careful not to remove the spring of the oil seal.**

## 6-8 CLUTCH

### Clutch Cover

- Fit the spring [A] as shown.  
[B] Viewed from Rear  
[C] Release Shaft  
[D] Clutch Cover

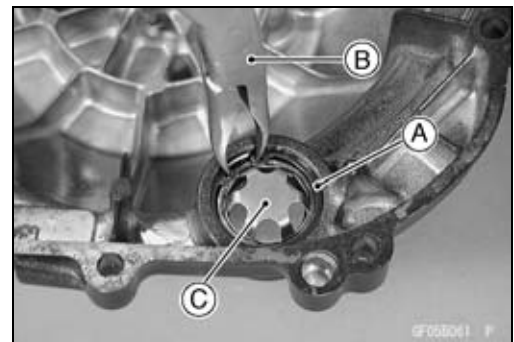


### Clutch Cover Disassembly

- Remove:  
Oil Seal [A]  
Needle Bearings



- Remove:  
Circlip [A]  
**Special Tool - Inside Circlip Pliers [B]: 57001-143**
- Remove:  
Oil Level Gauge [C]



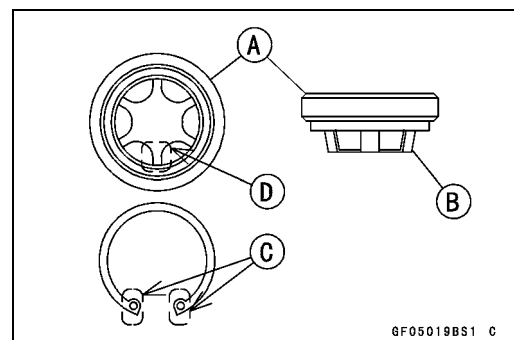
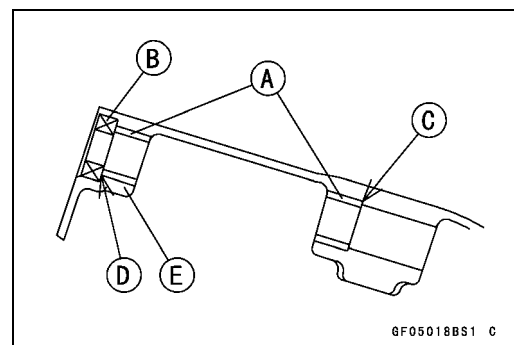
### Clutch Cover Assembly

- Replace the needle bearings and oil seal with new ones.

#### NOTE

○ Install the needle bearings so that the manufacturer's mark face out.

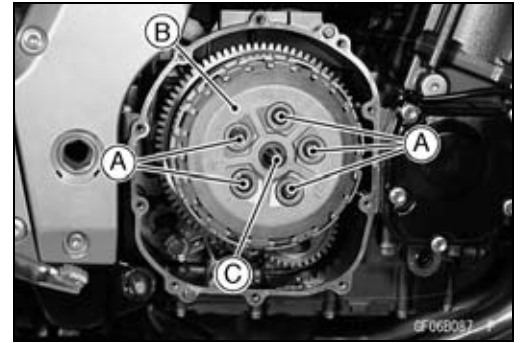
- Install the needle bearings [A] and oil seal [B] position as shown.  
[C] Press the bearing until the bottom.  
[D] Press the bearing so that the bearing surface is flush with the housing end of clutch cover [E].
- Apply water to the rubber of the oil gauge [A] and press it so that the projections [B] face inside.
- Install a new circlip so that the circlip ends [C] do not wrap over the projection [D].



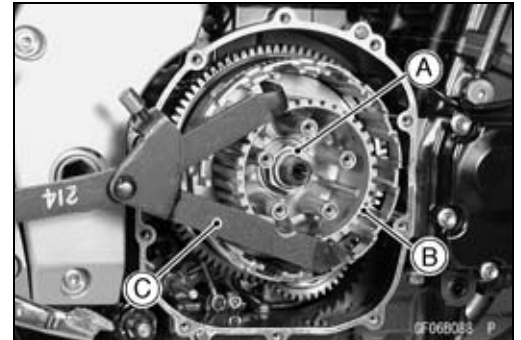
**Clutch**

*Clutch Removal*

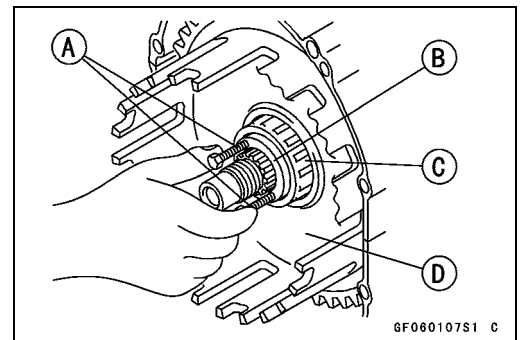
- Remove:
  - Engine Oil (drain, see Engine Oil Change section in the Periodic Maintenance chapter)
  - Clutch Cover (see Clutch Cover Removal)
  - Clutch Spring Bolts [A]
  - Clutch Springs
  - Clutch Spring Plate [B] (with thrust bearing and pusher [C])



- Remove:
  - Friction Plates, Steel Plates
  - Spring, Spring Seat
  - Clutch Hub Nut [A]
- Holding the clutch hub [B], remove the nut.
  - Special Tool - Clutch Holder [C]: 57001-1243**

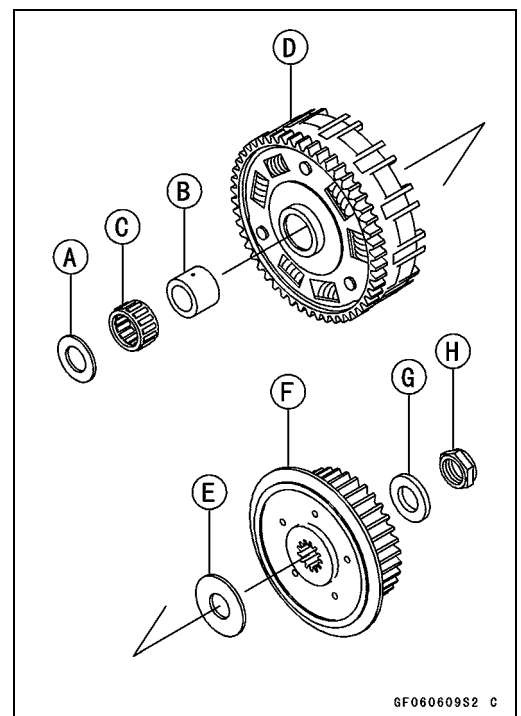


- Remove:
  - Clutch Hub
  - Spacer
- Using the two 4 mm (0.16 in.) bolts [A], pull out the sleeve [B], needle bearing [C] and clutch housing [D].
- Remove the spacer.



*Clutch Installation*

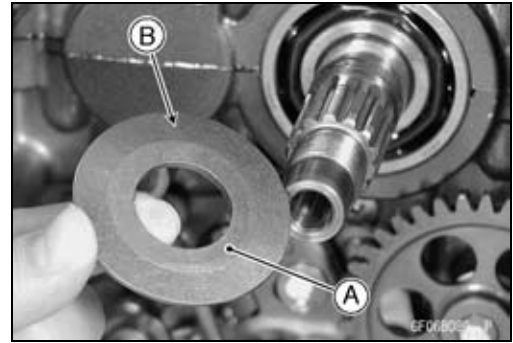
- Install the following parts on the drive shaft.
  - [A] Spacer
  - [B] Sleeve
  - [C] Needle Bearing
  - [D] Clutch Housing
  - [E] Spacer
  - [F] Clutch Hub
  - [G] Washer
  - [H] Nut



## 6-10 CLUTCH

### Clutch

- Install the spacer [A] so that the tapered side [B] faces inward.



- Install the washer [A] so that the OUT SIDE mark faces outward.

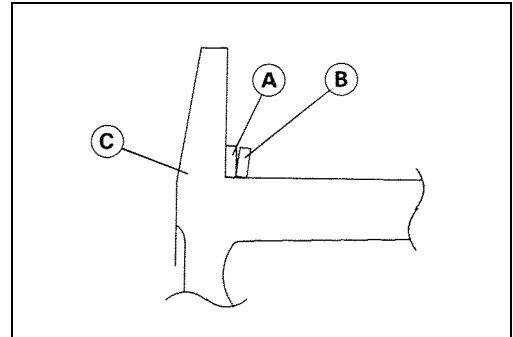


- Replace the clutch hub nut with a new one.
- Holding the clutch hub, tighten the clutch hub nut.

**Special Tool - Clutch Holder: 57001-1243**

**Torque - Clutch Hub Nut: 135 N·m (14 kgf·m, 100 ft·lb)**

- Install the spring seat [A] and spring [B] as shown. [C] Clutch Hub

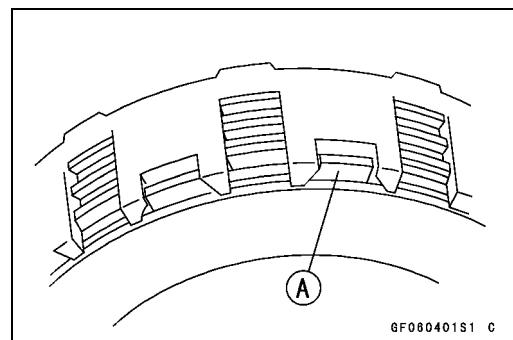


- Install the friction plates and steel plates, starting with a friction plate and alternating them.

#### CAUTION

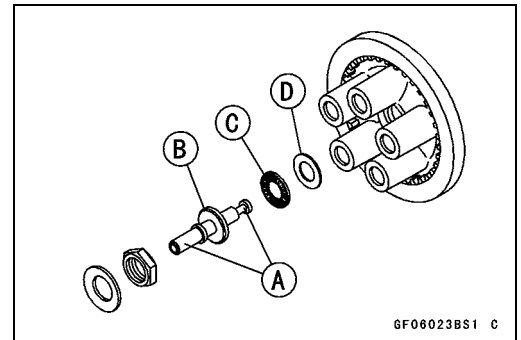
**If new dry friction plates and steel plates are installed, apply engine oil to the surfaces of each plate to avoid clutch plate seizure.**

- Install the last friction plate [A] fitting the tangs in the grooves in the housing as shown.



**Clutch**

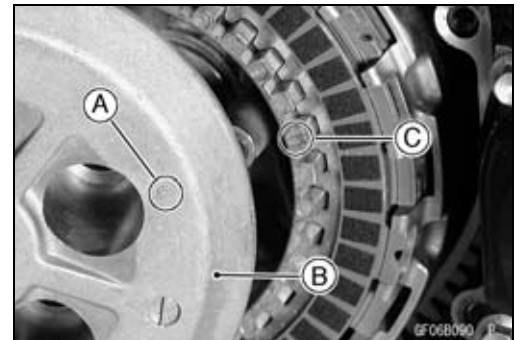
- Apply molybdenum disulfide grease to the pusher ends [A] and install the pusher [B].
- Apply engine oil to the needle bearing [C] and install it.
- Install the washer [D].



- Align the mark [A] of the clutch spring plate [B] with the groove [C] of the clutch hub.
- Install the clutch spring plate and spring, and tighten the clutch spring bolts.

**Torque - Clutch Spring Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)**

- Install the clutch cover (see Clutch Cover Installation).



**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:

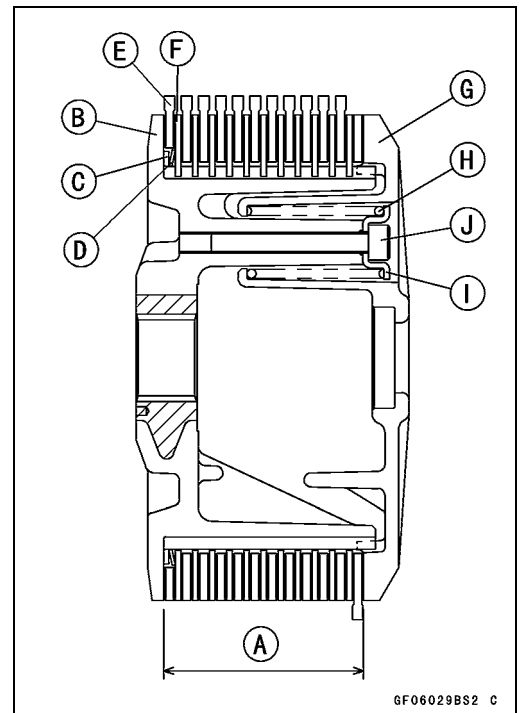
- Clutch Hub [B]
- Spring Seat [C]
- Spring [D]
- Friction Plates [E]
- Steel Plates [F]
- Spring Plate [G]
- Springs [H]
- Spring Holders [I]
- Spring Bolts [J]

**Torque - Clutch Spring Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)**

**Clutch Plate Assembly**

**Standard: 48.4 ~ 49.0 mm (1.91 ~ 1.93 in.)**

- ★ If the length is not within the specified range, adjust the length (see Clutch Plate Assembly Adjustment).



## 6-12 CLUTCH

### Clutch

#### 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
13089-1073	2.0 mm (0.08 in.)
13089-1084	2.3 mm (0.09 in.) (STD)
13089-1115	2.6 mm (0.10 in.)

#### NOTE

○Do not use the steel plate of 2.0 mm (0.08 in.) and 2.6 mm (0.10 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 (0.9 kgf·m, 78 in·lb)**

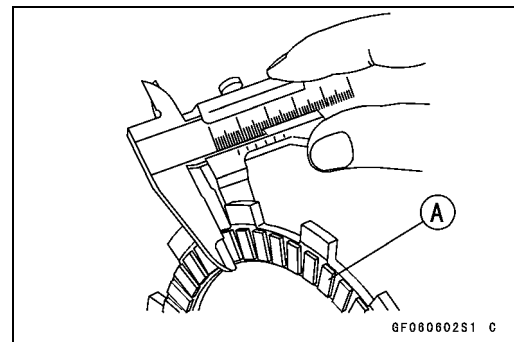
#### Clutch Plate, Wear, Damage Inspection

- 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.)



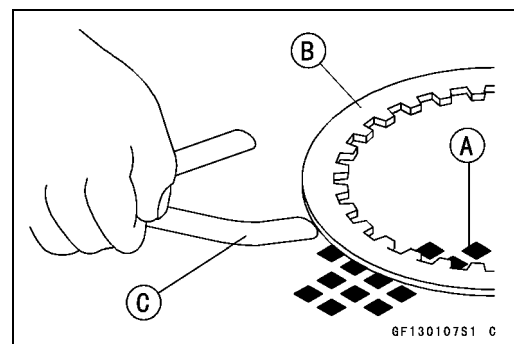
#### Clutch Plate Warp Inspection

- 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.)



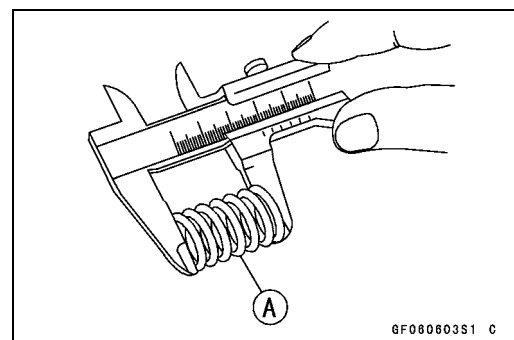
#### Clutch Spring Free Length Measurement

- 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:** 75.42 mm (2.97 in.)

**Service Limit:** 71.8 mm (2.83 in.)



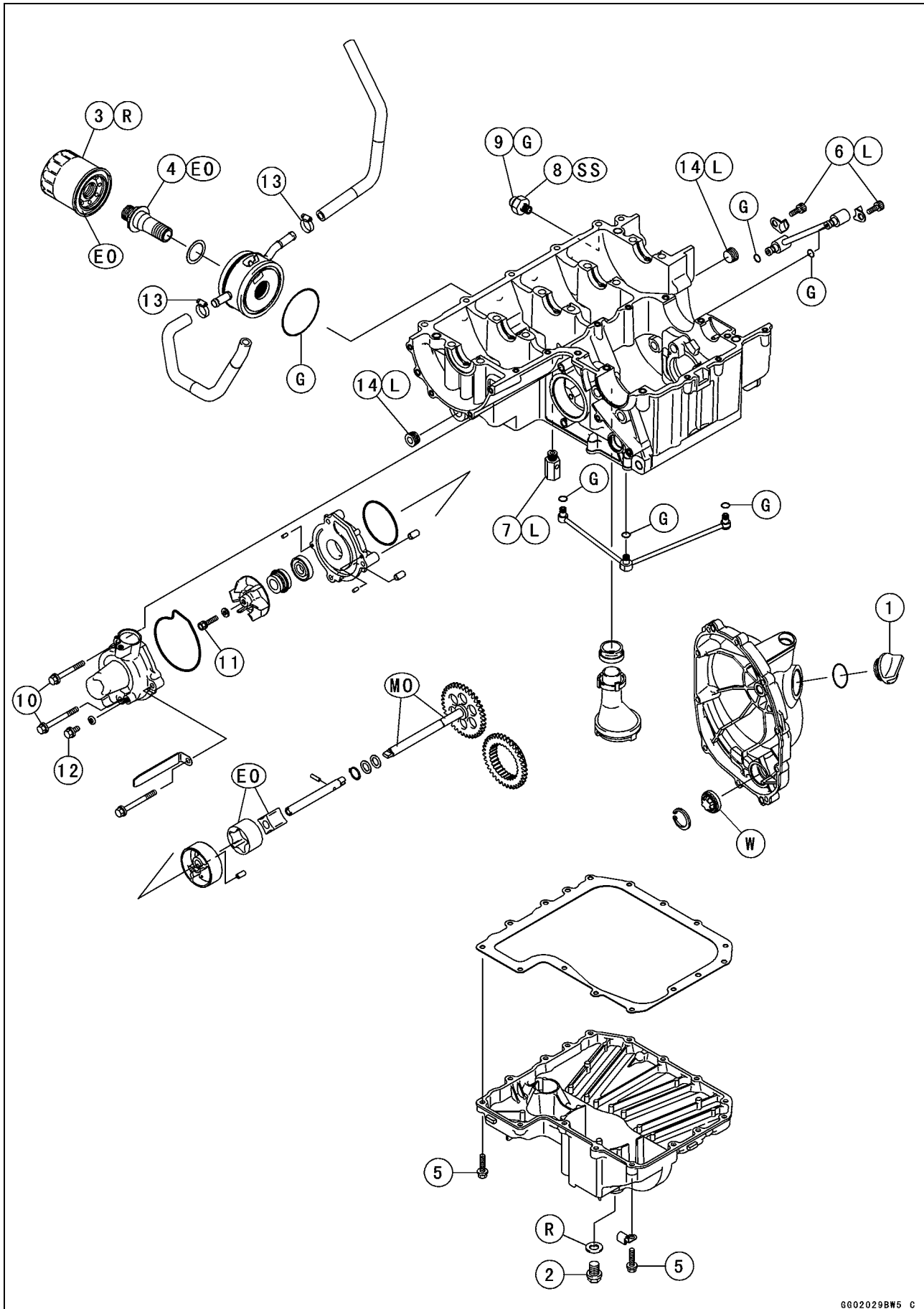
# Engine Lubrication System

## Table of Contents

Exploded View .....	7-2
Engine Oil Flow Chart.....	7-4
Specifications .....	7-6
Special Tools and Sealant .....	7-7
Engine Oil and Oil Filter.....	7-8
Oil Level Inspection.....	7-8
Engine Oil Change.....	7-8
Oil Filter Replacement .....	7-8
Oil Pan.....	7-9
Oil Pan Removal .....	7-9
Oil Pan Installation .....	7-9
Oil Pressure Relief Valve.....	7-10
Oil Pressure Relief Valve Removal .....	7-10
Oil Pressure Relief Valve Installation .....	7-10
Oil Pressure Relief Valve Inspection.....	7-10
Oil Pump.....	7-11
Oil Pump Removal .....	7-11
Oil Pump Installation .....	7-11
Oil Pump Drive Gear Removal.....	7-13
Oil Pump Drive Gear Installation.....	7-13
Oil Cooler.....	7-14
Oil Cooler Removal.....	7-14
Oil Cooler Installation.....	7-14
Oil Pressure Measurement.....	7-15
Oil Pressure Measurement .....	7-15
Oil Pressure Switch .....	7-16
Oil Pressure Switch Removal .....	7-16
Oil Pressure Switch Installation .....	7-16

# 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 drain plug	20	2.0	14.5	
3	Oil filter (cartridge type, P/No. 16097–1070)	26	2.7	20	EO, R
3	Oil filter (cartridge type, P/No. 16097–0002)	31	3.2	23	EO, R
4	Oil cooler 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	
10	Water pump cover bolts	11	1.1	95 in·lb	
11	Water pump impeller bolt	10	1.0	87 in·lb	
12	Coolant drain plug (water pump)	11	1.1	95 in·lb	
13	Water hose clamp screws	2.0	0.2	17 in·lb	
14	Oil passage plugs	20	2.0	14.5	L

EO: Apply engine oil.

G: Apply grease.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil.

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

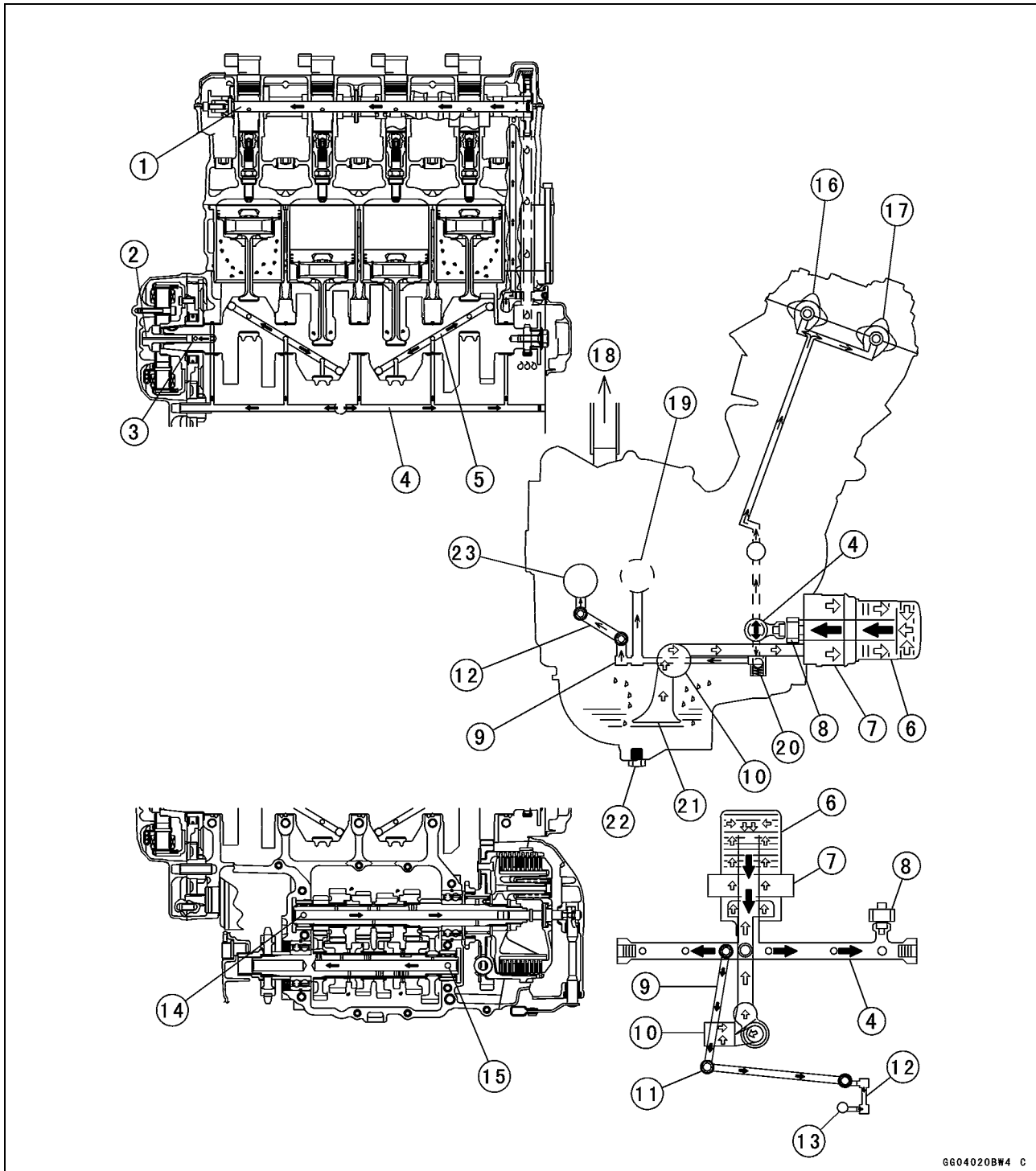
R: Replacement Parts

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 Cooler
8. Oil Pressure Switch
9. Oil Pipe
10. Oil Pump
11. To Drive Shaft
12. Oil Pipe
13. To Output Shaft
14. Drive Shaft Oil Passage Hole
15. Output Shaft Oil Passage Hole
16. Inlet Camshaft
17. Exhaust Camshaft
18. To Air Cleaner
19. Drive Shaft
20. Relief Valve
21. Oil Screen
22. Oil Drain Plug
23. Output Shaft

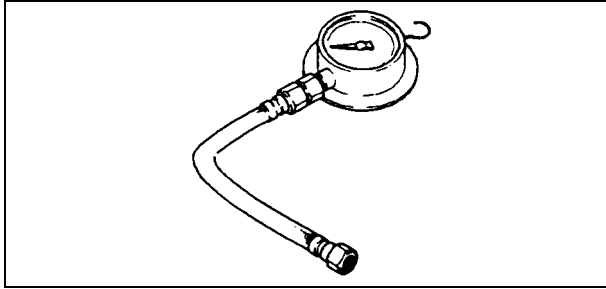
## 7-6 ENGINE LUBRICATION SYSTEM

### Specifications

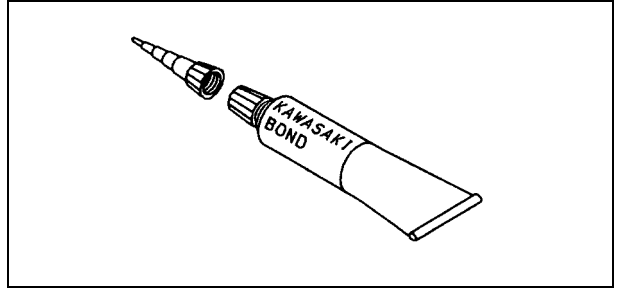
Item	Standard
<b>Engine Oil:</b> Type Viscosity Capacity: Level	API SE, SF or SG API SH or SJ with JASO MA SAE 10W-40 3.1 L (3.3 US qt) (when filter is not removed) 3.3 L (3.5 US qt) (when filter is removed) 3.8 L (4.0 US qt) (when engine is completely dry) Between upper and lower level lines
<b>Oil Pressure Measurement:</b> Oil pressure@4 000 r/min (rpm), oil temp. 90°C (194°F)	255 ~ 314 kPa (2.6 ~ 3.2 kgf/cm <sup>2</sup> , 37 ~ 46 psi)

## Special Tools and Sealant

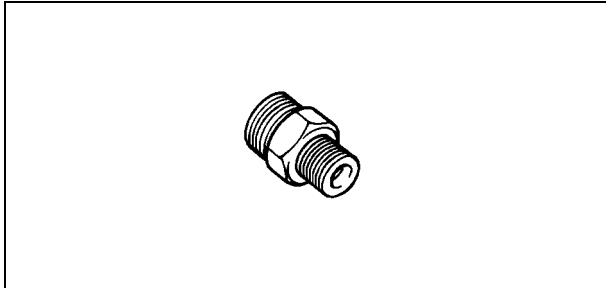
**Oil Pressure Gauge, 10 kgf/cm<sup>2</sup>:**  
57001-164



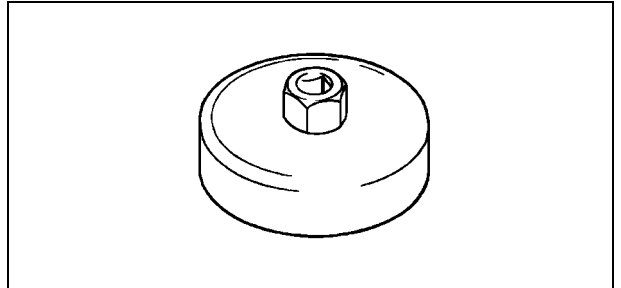
**Kawasaki Bond (Silicone Sealant):**  
56019-120



**Oil Pressure Gauge Adapter, PT3/8:**  
57001-1233



**Oil Filter Wrench:**  
57001-1249



## 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 Periodic Maintenance chapter.

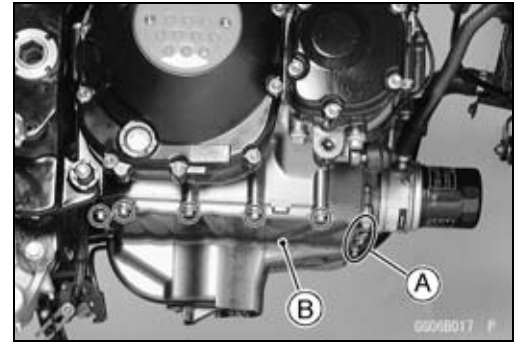
#### *Oil Filter Replacement*

- Refer to the Periodic Maintenance chapter.

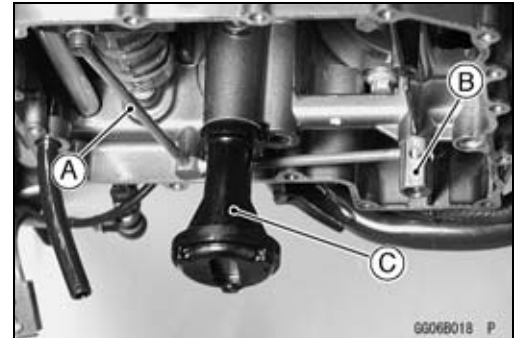
## Oil Pan

### Oil Pan Removal

- Remove:
  - Engine Oil (drain, see Periodic Maintenance chapter)
  - Muffler (see Engine Top End chapter)
  - Oil Pan Bolts [A]
  - Oil Pan [B]

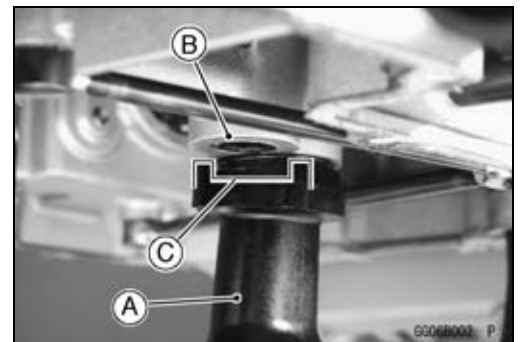


- Remove the oil pipe [A], oil pressure relief valve [B] and oil screen [C] as necessary.



### 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 was removed, install it.
- Apply a non-permanent locking agent to the threads of the oil pressure relief valve, and tighten it.



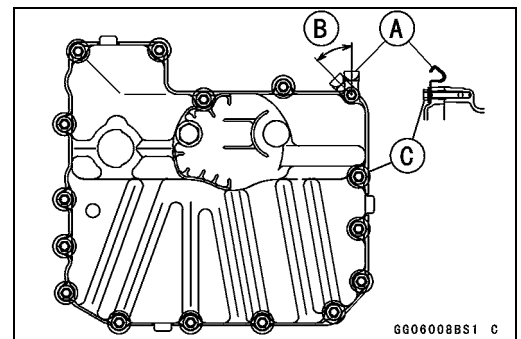
### CAUTION

**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**

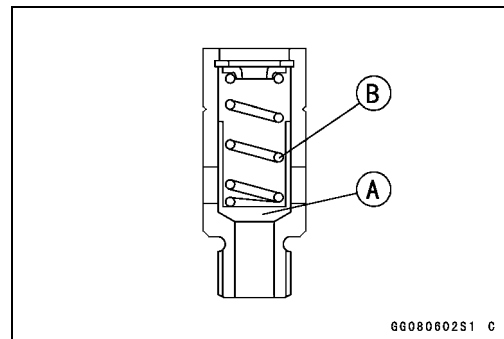
○ *Inspect the valve in its assembled state. Disassembly and assembly may change the valve performance.*

- ★ 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.

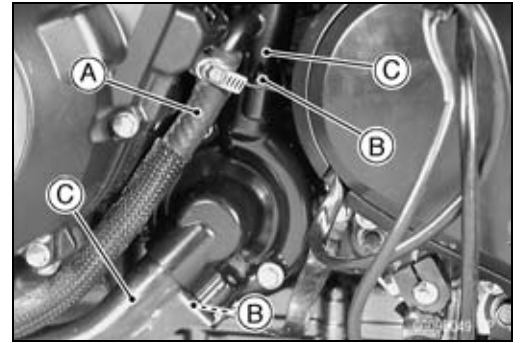




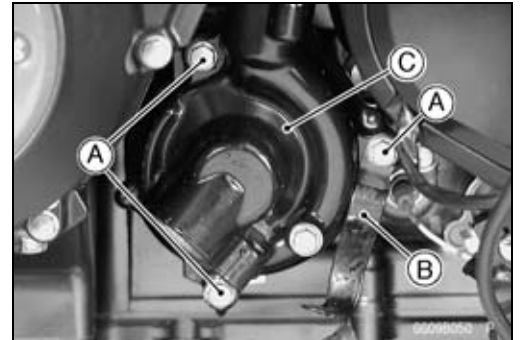
## Oil Pump

### Oil Pump Removal

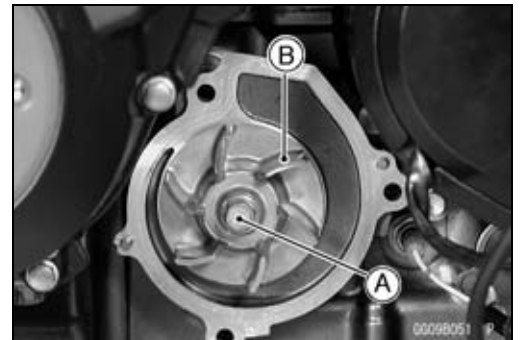
- Drain:
  - Coolant (see Periodic Maintenance chapter)
  - Engine Oil (see Periodic Maintenance chapter)
- Remove:
  - Water Hose [A]
  - Water Pipe Fitting Bolts [B]
  - Water Pipes [C]



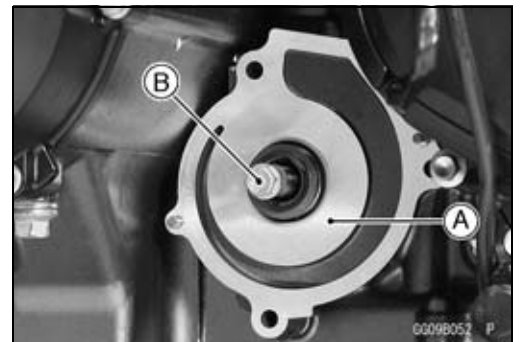
- Remove:
  - Water Pump Cover Bolts [A]
  - Clamp [B]
  - Water Pump Cover [C]



- Remove:
  - Water Pump Impeller Bolt [A]
  - Water Pump Impeller [B]



- Remove:
  - Water Pump Body
  - Oil Pump Cover
  - Oil (Water) Pump Shaft
  - Outer Rotor and Inner Rotor

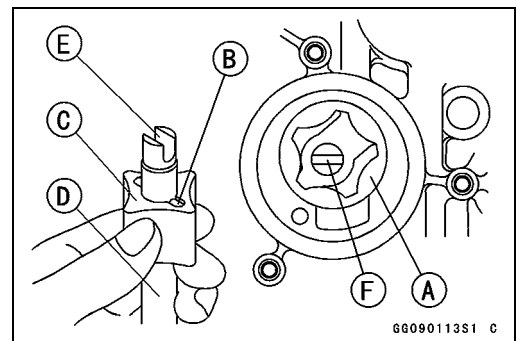


### NOTE

- The oil (water) pump assembly [A] can easily be removed by installing water pump cover bolt [B] into the oil (water) pump shaft and pulling them.

### Oil Pump Installation

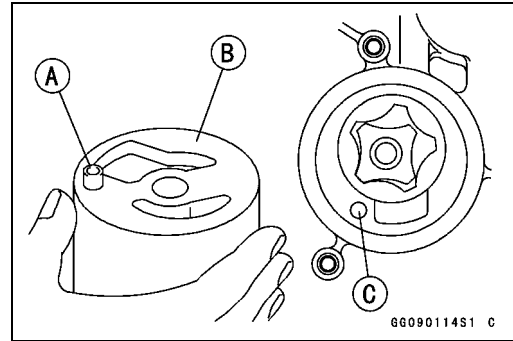
- Install the outer rotor [A] into the crankcase.
- Install the pin [B], inner rotor [C] and oil (water) pump shaft [D].
- Turn the pump shaft so that the slot [E] in its shaft fits onto the projection [F] of the pump drive gear shaft.



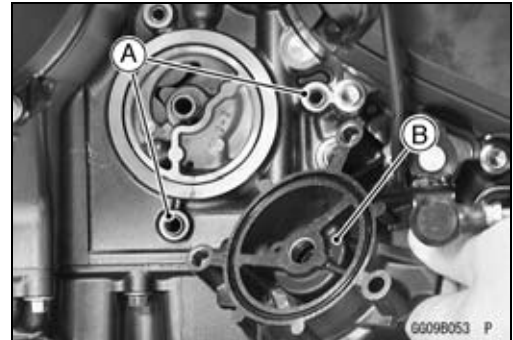
## 7-12 ENGINE LUBRICATION SYSTEM

### Oil Pump

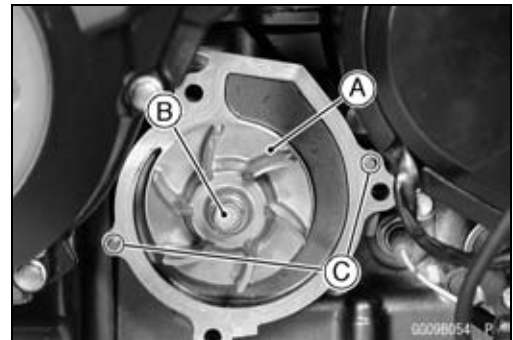
- Fit the pin [A] of the oil pump cover [B] into the hole [C] in the crankcase.



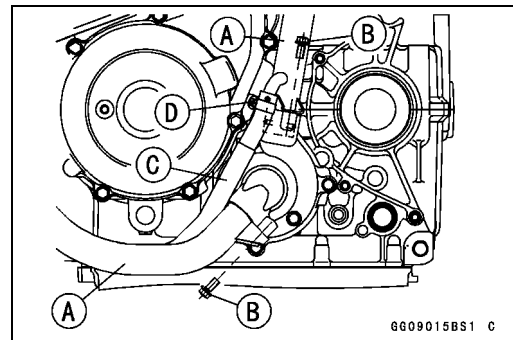
- Install:
  - Pins [A]
  - Water Pump Body [B]



- Install:
  - Impeller [A] and Bolt [B]
- Tighten:
  - Torque - Water Pump Impeller Bolt: 10 N·m (1.0 kgf·m, 87 in·lb)**



- Install:
  - Pins [C]
  - Water Pump Cover and Bolts
- Tighten:
  - Torque - Water Pump Cover Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**

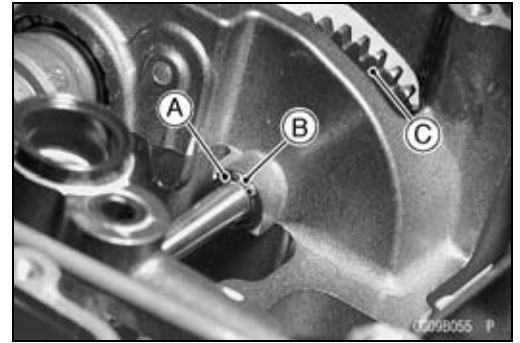


- Install:
  - Water Pipes [A]
- Tighten:
  - Torque - Water Pipe Fitting Bolts [B]: 11 N·m (1.1 kgf·m, 95 in·lb)**
- Install the water hose [C] so that the white mark faces outward.
- Tighten:
  - Torque - Water Hose Clamp Screws [D]: 2.0 N·m (0.2 kgf·m, 17 in·lb)**

## Oil Pump

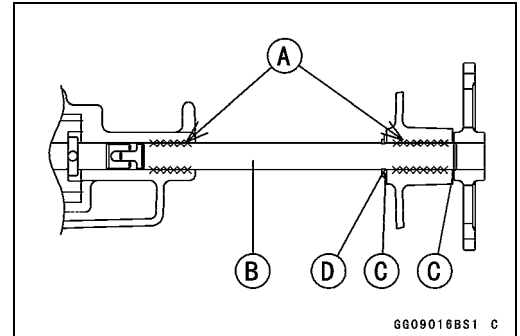
### *Oil Pump Drive Gear Removal*

- Remove:
  - Clutch (see Clutch chapter)
  - Oil Pan (see Oil Pan Removal)
  - Circlip [A] and Washer [B]
  - Oil Pump Drive Gear [C]



### *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 circlip new [D] into the groove of the oil pump drive gear shaft.



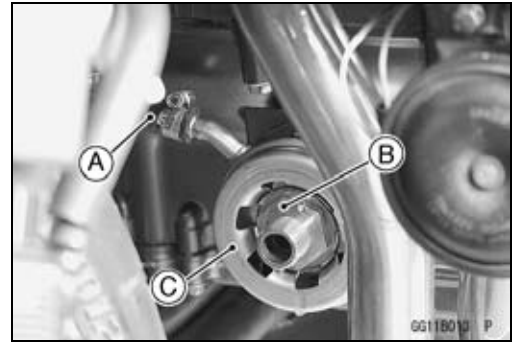
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## 7-14 ENGINE LUBRICATION SYSTEM

### Oil Cooler

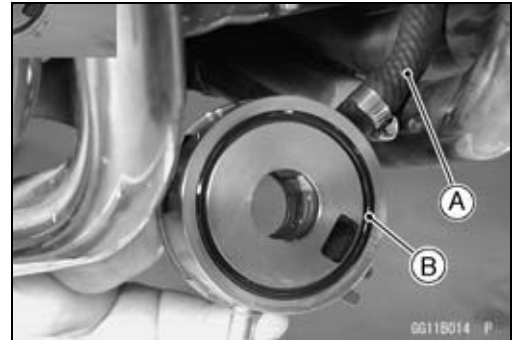
#### Oil Cooler Removal

- Drain:
  - Coolant (see Periodic Maintenance chapter)
  - Engine Oil (see Periodic Maintenance chapter)
- Remove:
  - Oil Filter (see Periodic Maintenance chapter)
  - Water Hose [A]
  - Oil Cooler Mounting Bolt [B] and Washer
  - Oil Cooler [C] and Water Hose

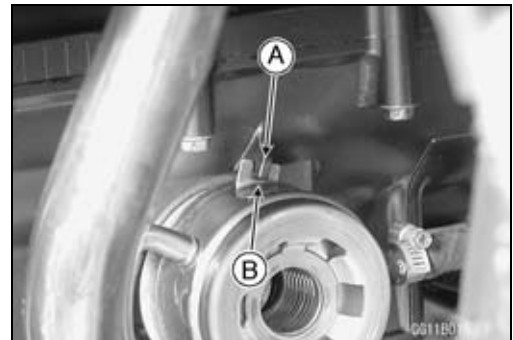


#### Oil Cooler Installation

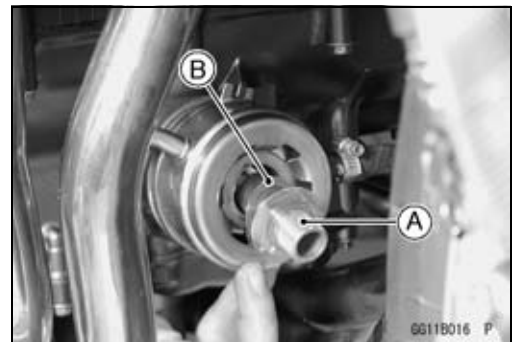
- Install:
  - Water Hose [A]
- Tighten:
  - **Torque - Water Hose Clamp Screws: 2.0 N·m (0.2 kgf·m, 17 in·lb)**
- Apply grease to the O-ring [B] before installation.



- Install the oil cooler so that the crankcase rib [A] fits the slot [B] of the cooler.



- Apply engine oil to the oil cooler mounting bolt [A] before installation.
- Install:
  - Washer [B]
- Tighten:
  - **Torque - Oil Cooler Mounting Bolt: 78.5 N·m (8.0 kgf·m, 58 ft·lb)**
- Install:
  - Oil Filter (see Periodic Maintenance chapter)
- Pour:
  - Coolant (see Periodic Maintenance chapter)
  - Engine Oil (see Periodic Maintenance chapter)

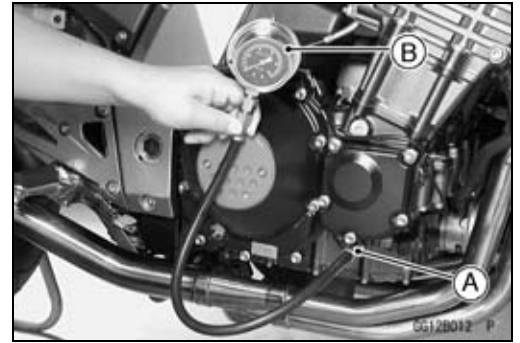


## Oil Pressure Measurement

### 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, PT 3/8:**  
**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 temp. 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.

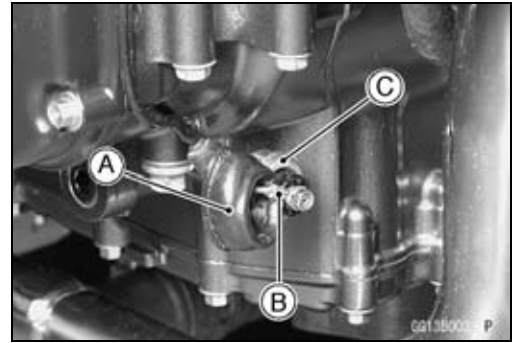
**Torque - Oil Passage Plug (Right): 20 N·m (2.0 kgf·m, 14.5 ft·lb)**

## 7-16 ENGINE LUBRICATION SYSTEM

### Oil Pressure Switch

#### *Oil Pressure Switch Removal*

- Remove:
  - Engine Oil (drain, see Periodic Maintenance chapter)
  - Switch Cover [A]
  - Switch Terminal [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 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.

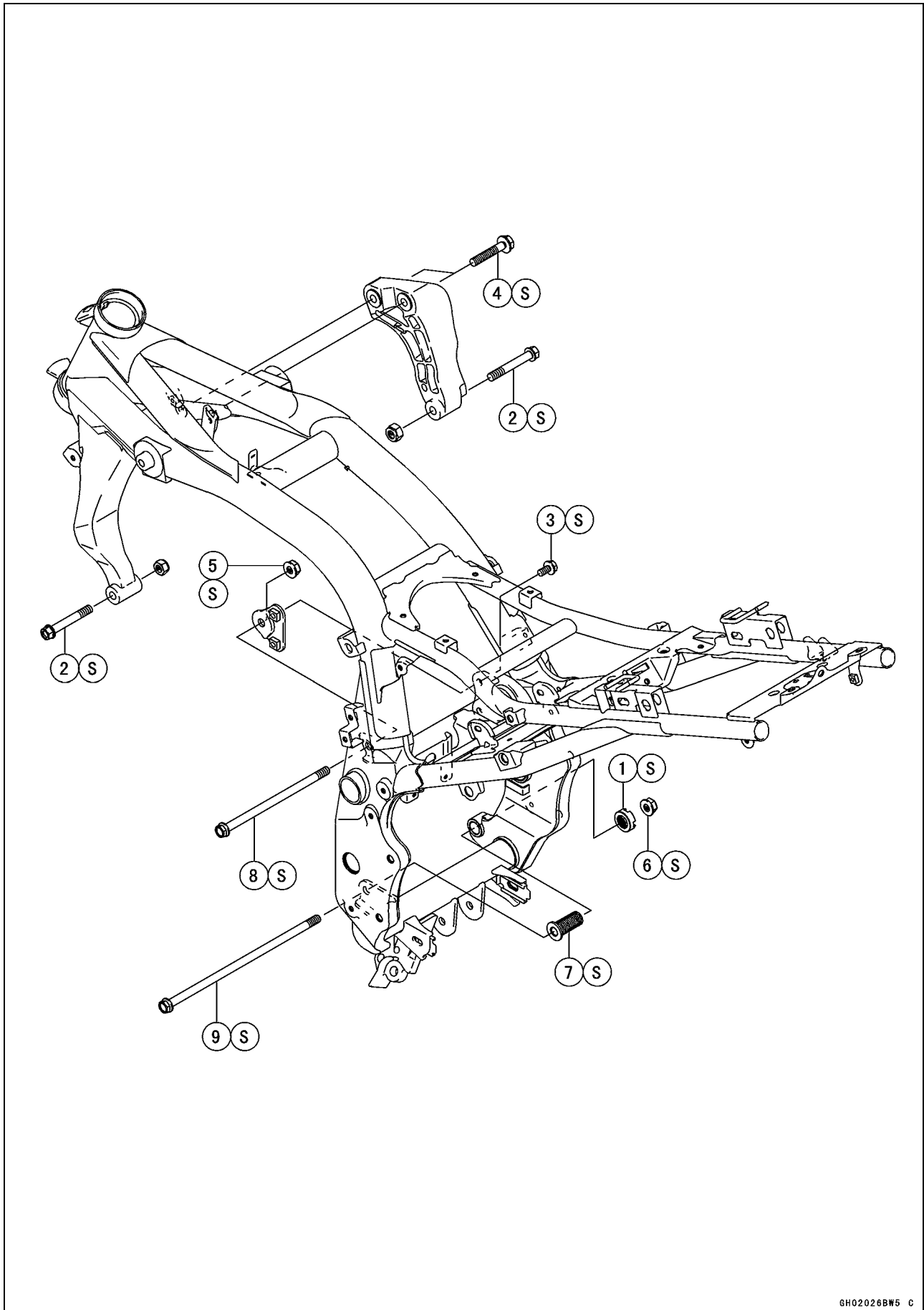
# Engine Removal/Installation

## Table of Contents

Exploded View .....	8-2
Special Tools .....	8-4
Engine Removal/Installation .....	8-5
Engine Removal.....	8-5
Engine Installation.....	8-9

# 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	32	S
3	Rear engine bracket bolts	25	2.5	18	S
4	Front engine bracket bolts	44	4.5	32	S
5	Middle engine mounting nut	44	4.5	32	S
6	Lower engine mounting nut	44	4.5	32	S

7. Adjusting Collar

8. Middle Engine Mounting Bolt

9. Lower Engine Mounting Bolt

S: Follow the specific tightening sequence.

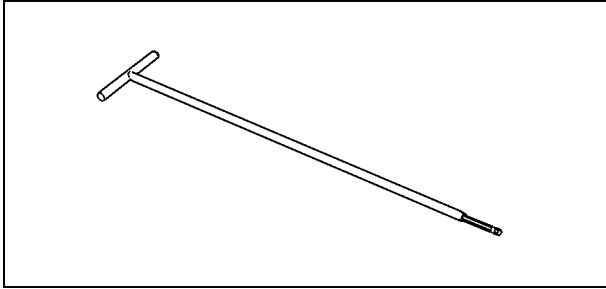
## 8-4 ENGINE REMOVAL/INSTALLATION

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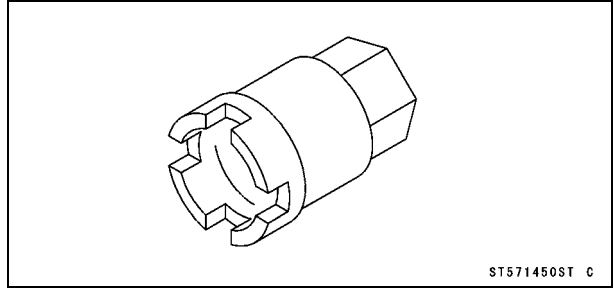
### Special Tools

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**Carburetor Drain Plug Wrench, Hex3:**  
**57001-1269**



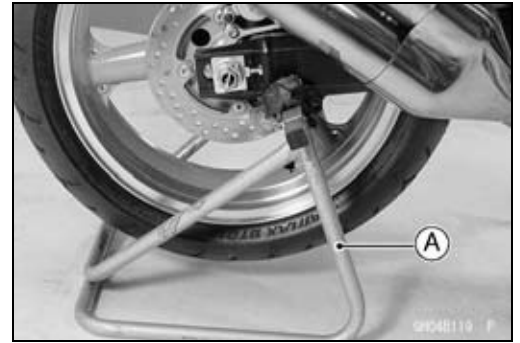
**Engine Mount Nut Wrench:**  
**57001-1450**



## Engine Removal/Installation

### Engine Removal

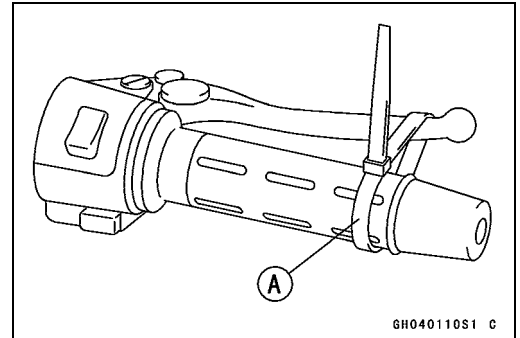
- Support the rear part of the swingarm with a stand [A].



- 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.**

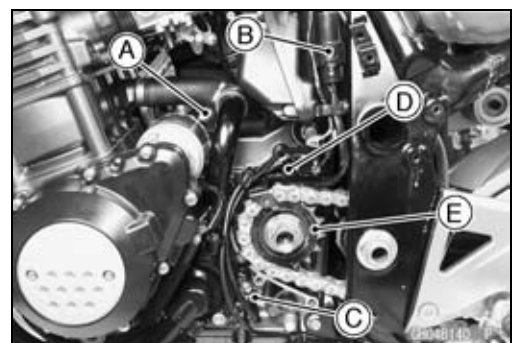
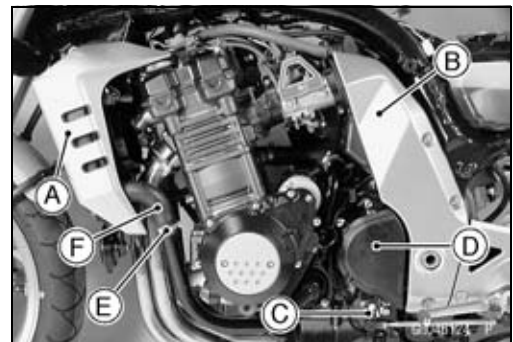
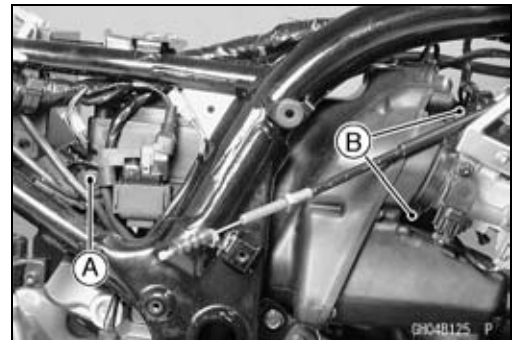
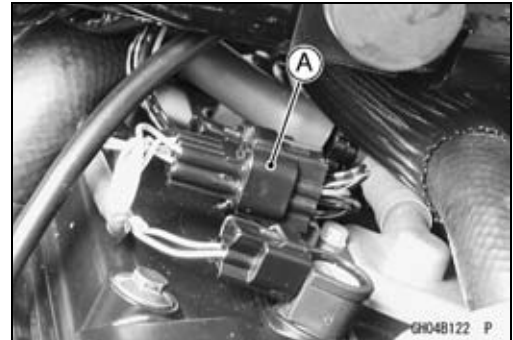
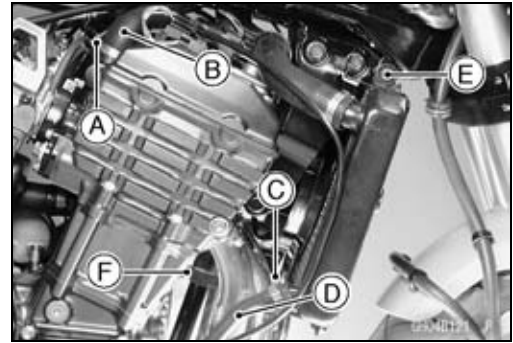
- Drain:
  - Engine Oil (see Periodic Maintenance chapter)
  - Coolant (see Periodic Maintenance chapter)
- Remove:
  - Seats (see Frame chapter)
  - Fuel Tank (see Fuel System chapter)
  - Side Covers (see Frame chapter)
  - Right Frame Cover [A] (see Frame chapter)
  - Right Radiator Cover [B] (see Cooling System chapter)
  - Clutch Cable Lower End [C] (see Clutch chapter)



## 8-6 ENGINE REMOVAL/INSTALLATION

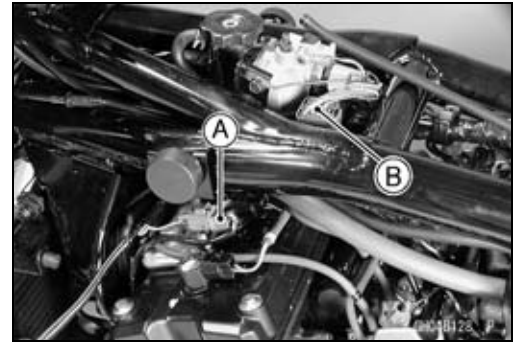
### Engine Removal/Installation

- Remove:
    - Radiator Hose Clamp [A] (Loosen)
    - Radiator Hose [B]
    - Oil Cooler Water Hose Clamp [C] (Loosen)
    - Oil Cooler Water Hose [D]
    - Radiator Bolt [E] (Loosen)
    - Radiator Bracket Bolt [F]
  
  - Disconnect
    - Crankshaft Sensor Lead Connector (see Electrical System chapter)
    - Stick Coil Harness Connector [A]
  
  - Remove:
    - Air Cleaner Housing Bolt [A]
  - Loosen:
    - Throttle Body Assy Clamps Bolts #3, 4 [B] (see Fuel System (DFI) chapter)
- Special Tool - Carburetor Drain Plug Wrench, Hex3: 57001-1269**
- Remove:
    - Left Radiator Cover [A] (see Cooling System chapter)
    - Left Frame Cover [B] (see Frame chapter)
    - Shift Lever [C] (see Crankshaft/Transmission chapter)
    - Engine Sprocket Cover [D] (see Final Drive chapter)
    - Radiator Hose Clamp [E] (Loosen)
    - Radiator Hose [F]
  
  - Pull off the connectors from the engine and free the wiring from the clamps.
  - For California Model, remove the separate.
    - Starter Motor Lead [A] (see Electrical System chapter)
    - Alternator Lead Connector [B]
    - Neutral Switch Lead Connector [C]
    - Side Stand Switch Lead Connector [D]
  - Remove:
    - Engine Sprocket (see Final Drive chapter) [E]

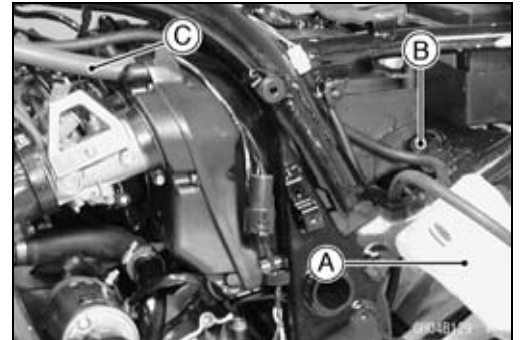


## Engine Removal/Installation

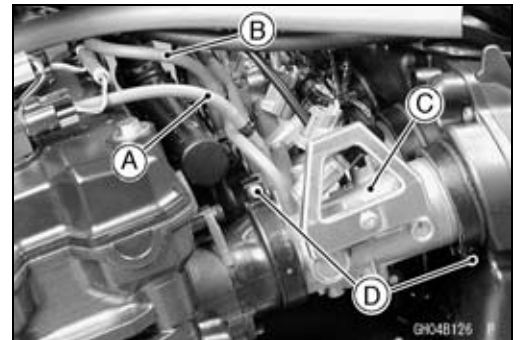
- Remove:
  - Camshaft Position Sensor Connector [A]
  - Injector Harness Connector [B]



- Coolant Reserve Tank [A] (see Cooling System chapter)
- Air Cleaner Housing Bolt [B]
- Vacuum Switch Valve Hose [C]



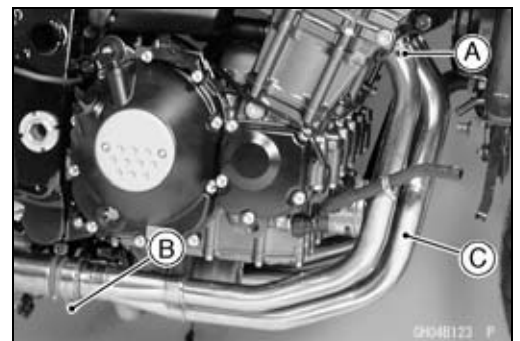
- Remove:
  - Vacuum Switch Valve Tube [A]
  - Inlet Air Pressure Sensor Tube [B]
  - Throttle Body Assy [C]
- Loosen the #1,2 body assy clamps [D] and pull the throttle body out of the holders, and then remove it to the left side.
  - Special Tool - Carburetor Drain Plug Wrench, Hex3: 57001-1269**



- Remove:
  - Breather Hose End [A]



- Remove:
  - Nuts [A]
  - Clamp Bolts [B]
  - Exhaust Pipe Assy [C]



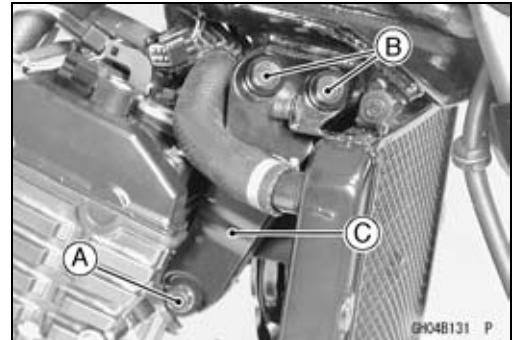
## 8-8 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

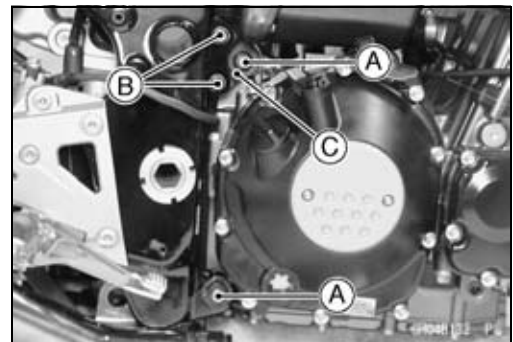
- Support the engine with a suitable stand [A].
- Put a plank [B] onto the suitable stand for engine balance.



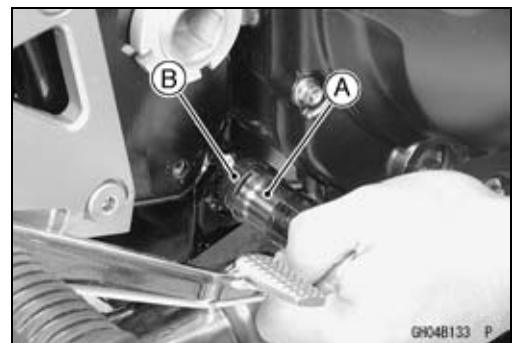
- Remove:
  - Right and Left Engine Upper Mounting Bolts [A]
  - Front Engine Bracket Bolts [B]
  - Front Engine Bracket [C]



- Remove the middle and lower engine mounting nuts [A] and bolts.
- Remove:
  - Rear Engine Bracket Bolts [B]
  - Rear Engine Bracket [C]

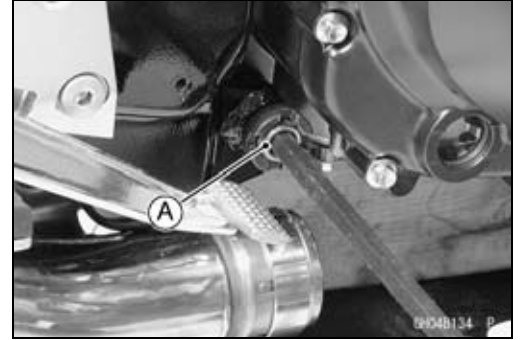


- Using the nut wrench [A], loosen the locknut [B].  
**Special Tool - Engine Mount Nut Wrench: 57001-1450**

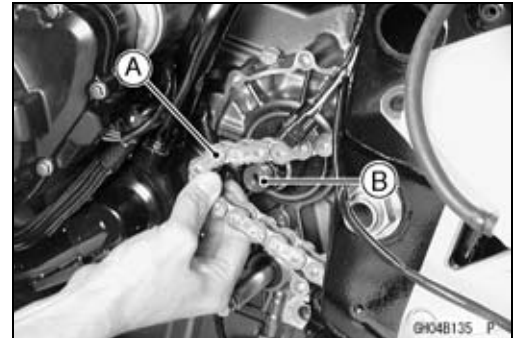


### Engine Removal/Installation

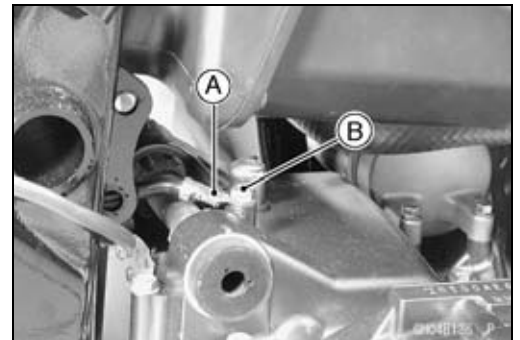
- Using the Hexagon Wrench, turn the adjusting collar [A] counter clockwise to mark the gap between the engine and flame adjusting collar.



- Remove the drive chain [A] from the output shaft [B].

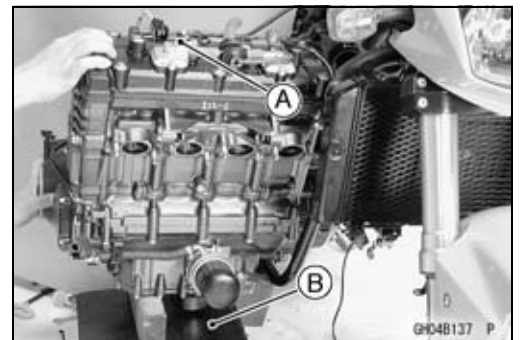


- Down the rear portion of the engine a little and remove the engine ground [A].
- Unscrew the ground bolt [B].
- Using the stand, take out the engine.
- Clear the camshaft position sensor from the frame.



### 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 [A] 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)**

## 8-10 ENGINE REMOVAL/INSTALLATION

### Engine Removal/Installation

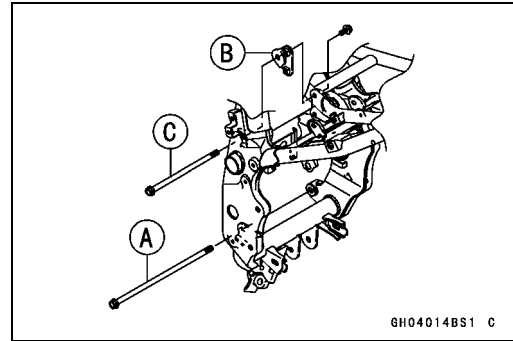
- Install the engine mounting bolts and nuts, following the specified installing sequence.

○First, hang the drive chain over the output shaft just before moving the engine into its final position in the frame.

○Second, insert the lower engine mounting bolt [A].

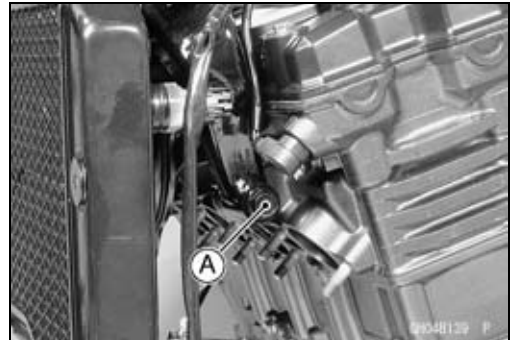
○Third, install the rear engine bracket [B] temporarily.

○Fourth, insert the middle engine mounting bolts [C].



○Fifth, install the left upper engine mounting bolt [A] and tighten it.

**Torque - Left Upper Engine Mounting Bolt : 44 N·m (4.5 kgf·m, 32 ft·lb)**

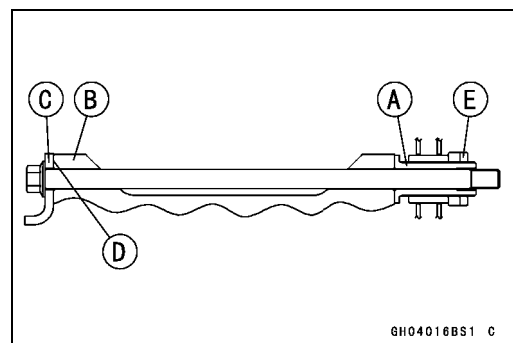


○Sixth, tighten the adjusting collar [A] until the clearance between the crankcase [B] and frame bracket [C] come to zero mm [D].

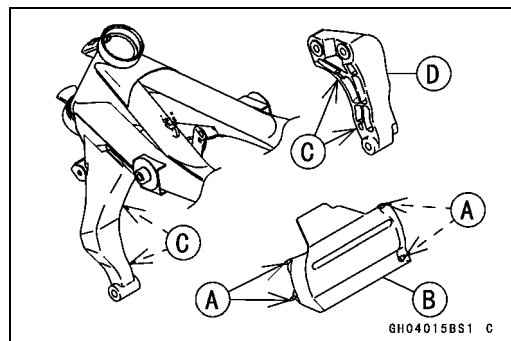
○Seventh, tighten the collar locknut [E].

**Torque - Adjusting Collar Locknut : 49 N·m (5.0 kgf·m, 36 ft·lb)**

**Special Tool - Engine Mount Nut Wrench : 57001-1450**



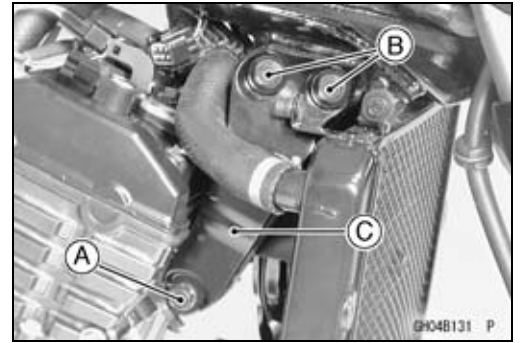
○Eighth, fit the projections [A] of the baffle plate [B] in the holes [C] of the frame and front bracket [D].





### Engine Removal/Installation

- Ninth, temporarily install:
  - Front Engine Bracket [A]
  - Front Right Engine Mounting Bolt [B]



- Tenth, tighten the rear bracket bolts.
  - Torque - Rear Engine Bracket Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Eleventh, tighten securely:
  - Middle Engine Mounting Nut
  - Lower Engine Mounting Nut
  - Torque - Engine Mounting Nut: 44 N·m (4.5 kgf·m, 32 ft·lb)**
- Twelfth, tighten the right upper engine mounting bolt.
- Lastly, tighten the front bracket bolts.
  - Torque - Right Upper Engine Mounting Bolt : 44 N·m (4.5 kgf·m, 32 ft·lb)**
  - Front Bracket Bolts: 44 N·m (4.5 kgf·m, 32 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 Periodic Maintenance chapter)
  - Choke Cable (see Fuel System (DFI) chapter)
  - Clutch Cable (see Periodic Maintenance chapter)
  - Drive Chain (see Periodic Maintenance chapter)
- Fill the engine with engine oil (see Periodic Maintenance chapter).
- Fill the engine with coolant and bleed the air from the cooling system (see Periodic Maintenance chapter).



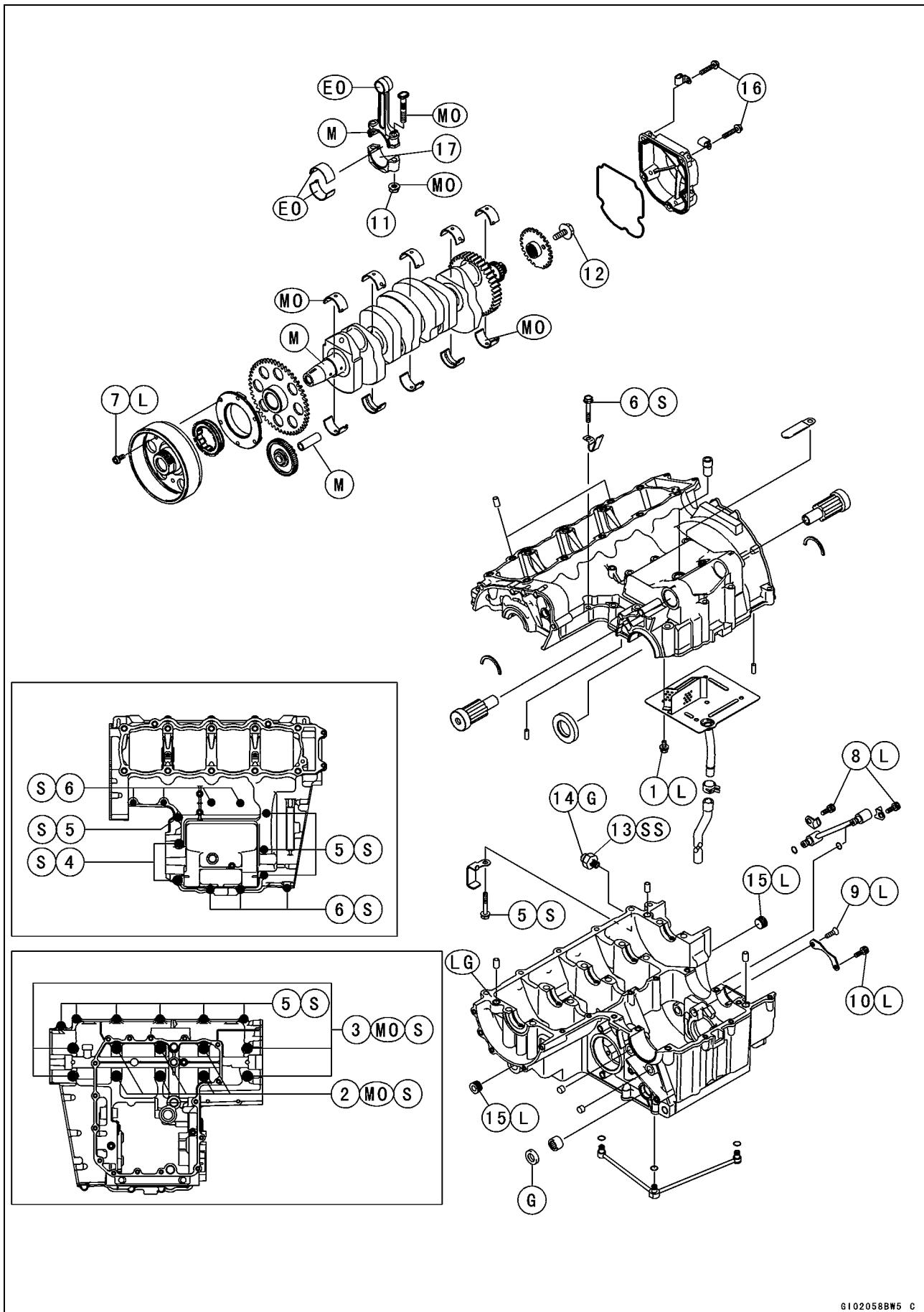
# Crankshaft/Transmission

## Table of Contents

Exploded View .....	9-2	Starter Motor Clutch Assembly ....	9-21
Specifications .....	9-6	Starter Motor Clutch Inspection ...	9-21
Special Tools and Sealant .....	9-8	Transmission .....	9-22
Crankcase Splitting.....	9-9	Shift Pedal Removal .....	9-22
Crankcase Splitting .....	9-9	Shift Pedal Installation .....	9-22
Crankcase Assembly .....	9-9	External Shift Mechanism	
Crankshaft and Connecting Rods.....	9-12	Removal .....	9-23
Crankshaft Removal .....	9-12	External Shift Mechanism	
Crankshaft Installation .....	9-12	Installation .....	9-24
Connecting Rod Removal .....	9-12	External Shift Mechanism	
Connecting Rod Installation .....	9-12	Inspection .....	9-24
Crankshaft/Connecting Rod		Transmission Shaft Removal .....	9-25
Cleaning .....	9-15	Transmission Shaft Installation ....	9-25
Connecting Rod Bend.....	9-16	Transmission Shaft Disassembly .	9-25
Connecting Rod Twist.....	9-16	Transmission Shaft Assembly.....	9-26
Connecting Rod Big End Side		Shift Drum and Fork Removal.....	9-28
Clearance .....	9-16	Shift Drum and Fork Installation...	9-29
Connecting Rod Big End Bearing		Shift Drum Disassembly.....	9-29
Insert/Crankpin Wear .....	9-17	Shift Drum Assembly .....	9-29
Crankshaft Side Clearance .....	9-18	Shift Fork Bending .....	9-29
Crankshaft Runout.....	9-18	Shift Fork/Gear Groove Wear .....	9-30
Crankshaft Main Bearing		Shift Fork Guide Pin/Drum	
Insert/Journal Wear.....	9-19	Groove Wear .....	9-30
Starter Motor Clutch .....	9-21	Gear Dog and Gear Dog Hole	
Starter Motor Clutch		Damage.....	9-30
Removal/Installation.....	9-21		

# 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	10	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)	49	5.0	36	MO,S
4	Crankcase bolts (M8)	27	2.8	20	S
5	Crankcase bolts (M7)	20	2.0	14.5	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	4.0	29	
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	14.5	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: 92104–1063).

M: Apply molybdenum disulfide grease.

MO: Apply molybdenum disulfide oil.

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

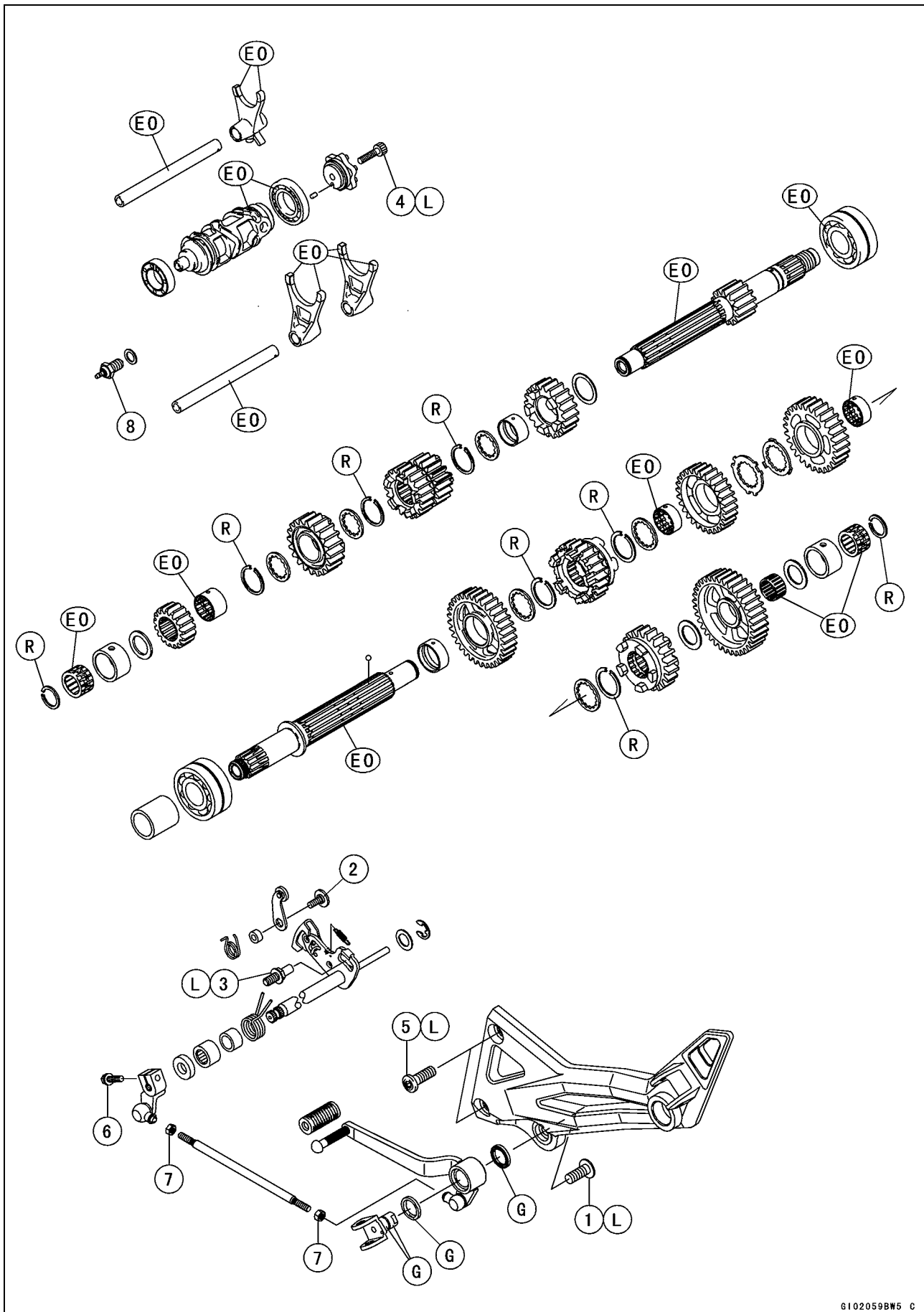
R: Replacement Parts

S: Tightening the fasteners following the specified sequence.

SS: Apply silicone sealant (Kawasaki Bond: 56019–120).

# 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	0.7	61 in·lb	
7	Tie-rod locknuts	6.9	0.7	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	---																							
	○	---																							
Connecting rod big end inside diameter:	38.000 ~ 38.016 mm (1.4961 ~ 1.4967 in.)	---																							
Marking	None	---																							
	○	---																							
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>Black</td> <td>92139-1109</td> </tr> <tr> <td>○</td> <td>○</td> <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	- - -
	1	- - -
Crankcase main bearing inside diameter:	36.000 ~ 36.016 mm (1.4173 ~ 1.4179 in.)	- - -
Marking	○	- - -
	None	- - -
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	Crankshaft Main Journal Diameter Marking	Bearing Insert*		
		Size	Color	Journal Nos.
○	1	Brown	92028-1868	3, 5
			92028-1829	1, 2, 4
None	1	Black	92028-1867	3, 5
			92028-1828	1, 2, 4
None	None	Blue	92028-1866	3, 5
			92028-1827	1, 2, 4

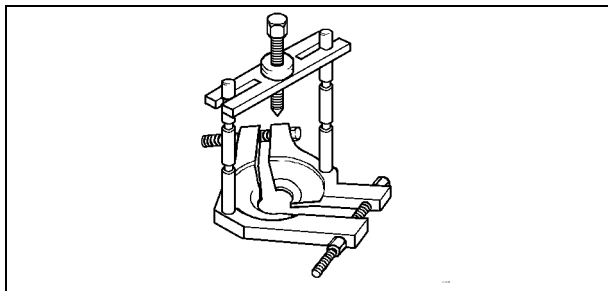
\*The bearing inserts for Nos. 1, 2 and 4 journals have an oil groove, respectively.

<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.)

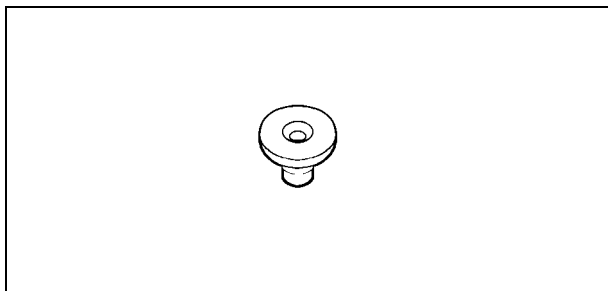
## 9-8 CRANKSHAFT/TRANSMISSION

### Special Tools and Sealant

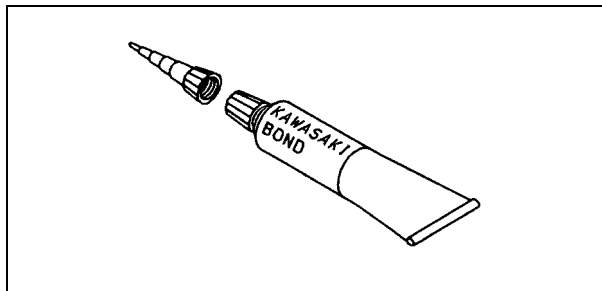
**Bearing Puller:**  
57001-135



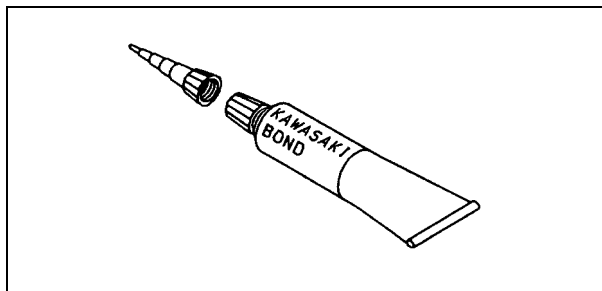
**Bearing Puller Adapter:**  
57001-317



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



**Kawasaki Bond (Silicone Sealant):**  
92104-1063



## Crankcase Splitting

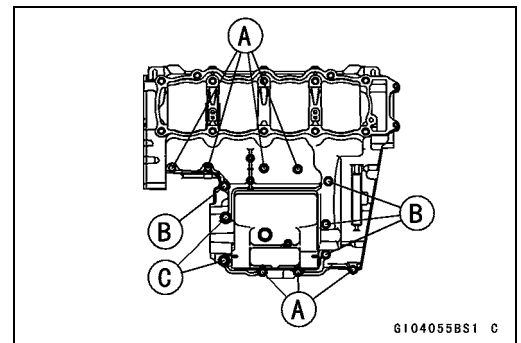
### Crankcase Splitting

- 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 Periodic Maintenance chapter)
  - Oil Cooler (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]



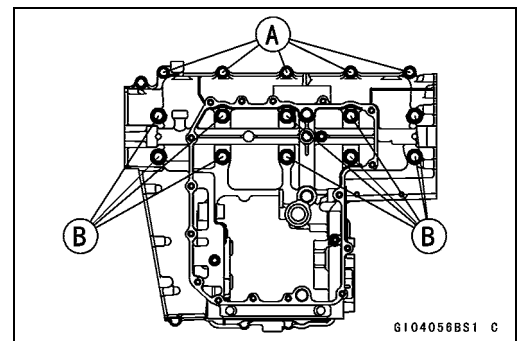
- Remove the oil pan, oil pressure relief valve, oil screen and oil pipes (see Engine Lubrication System chapter).

- Remove the lower crankcase bolts and clamp.

○ 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.**

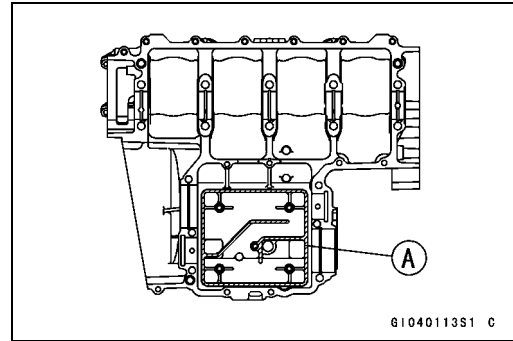
- With a high-flash point solvent, clean off the mating surfaces of the crankcases halves and wipe dry.
- Using compressed air, blow out the oil passages in the crankcase halves.

## 9-10 CRANKSHAFT/TRANSMISSION

### Crankcase Splitting

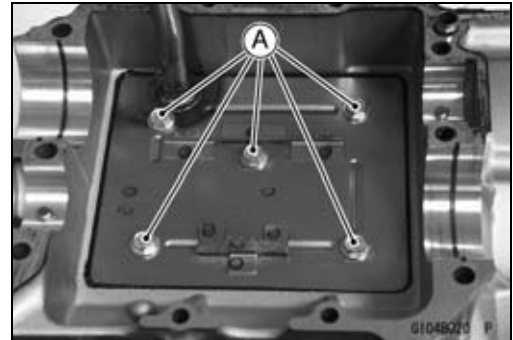
- Apply liquid gasket to the breather plate mating surface [A] 1 to 1.5 mm (0.04 to 0.06 in.) thick, and then install the breather plate.

**Sealant - Three Bond: 1207B**

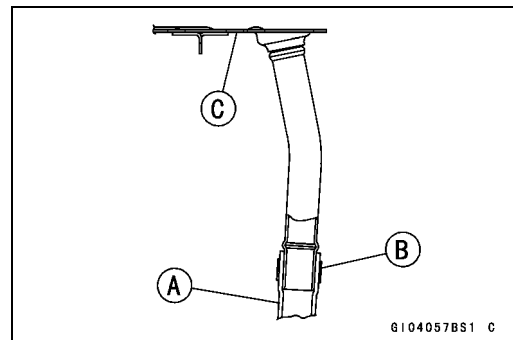


- Apply a non-permanent locking agent to the threads and tighten the bolts [A].

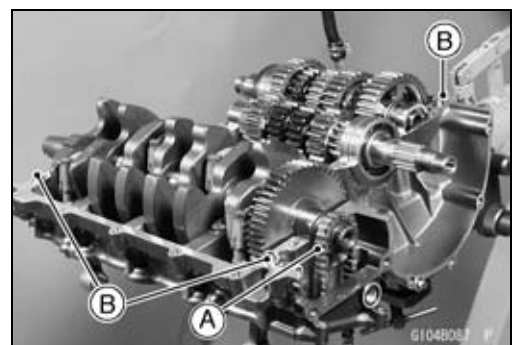
**Torque - Breather Plate Bolts: 10 N·m (1.0 kgf·m, 87 in·lb)**



- Install the breather 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 right side.
- [C] Breather Plate



- 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.



**Crankcase Splitting**

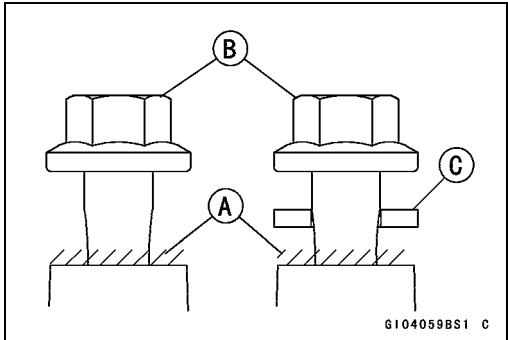
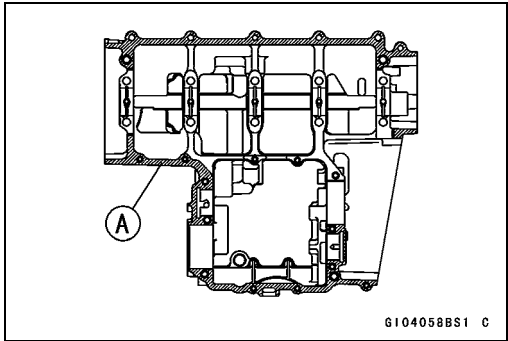
- Apply liquid gasket [A] to the mating surface of the lower crankcase half.

Sealant - Kawasaki Bond (Silicone Sealant): 92104-1063

**CAUTION**

**Do not apply liquid gasket around the crankshaft main bearing inserts, and oil passage holes.**

- Fit the lower crankcase to the upper crankcase.
- Apply molybdenum disulfide grease to the seating surface [A] on the lower crankcase for the M9 bolts [B].  
[C] Washer



- 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.).
- Tighten the M9 bolts [7 ~ 10] L= 95 mm (3.74 in.) with washers.
- Tighten the M7 bolts [A].

**Torque - Crankcase Bolts (M9): 42 N·m (4.3 kgf·m, 30 ft·lb)**

**Torque - Crankcase Bolts (M9): 49 N·m (5.0 kgf·m, 36 ft·lb)**

**Torque - Crankcase Bolts (M6): 20 N·m (2.0 kgf·m, 14.5 ft·lb)**

[B] Clamp

- 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, 14.5 ft·lb)**

[B] L= 85 mm (3.35 in.)

[C] L= 50 mm (1.97 in.)

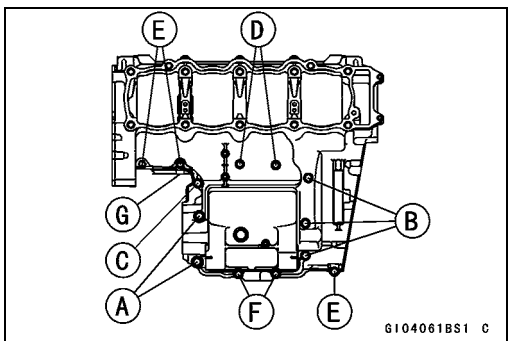
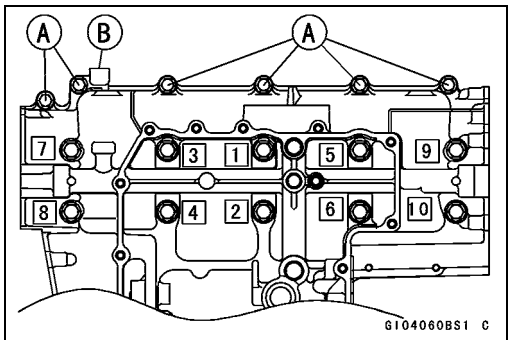
**Crankcase Bolts (M6): 12 N·m (1.2 kgf·m, 104 in·lb)**

[D] L= 60 mm (2.36 in.)

[E] L= 40 mm (1.57 in.)

[F] L= 90 mm (3.54 in.)

[G] Clamp



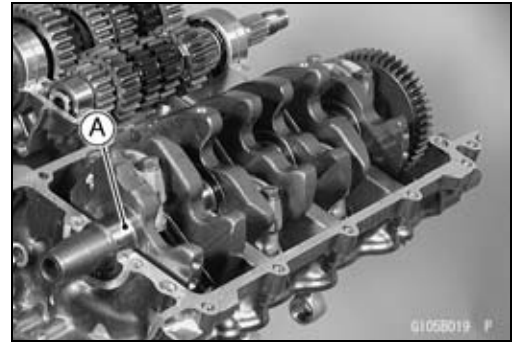
- After tightening all crankcase bolts, check the following items.
- Crankshaft and transmission shafts turn freely.
- While spinning the output shaft, gears shift smoothly from the 1st to 6th gear, and 6th to 1st.
- When the output shaft stays still, the gear can not be shifted to 2nd gear or other higher gear positions.

## 9-12 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

#### Crankshaft Removal

- Split the crankcase (see Crankcase Splitting).
- Remove the crankshaft [A].

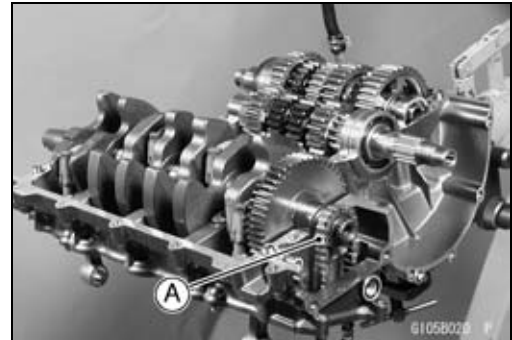


#### Crankshaft Installation

##### 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

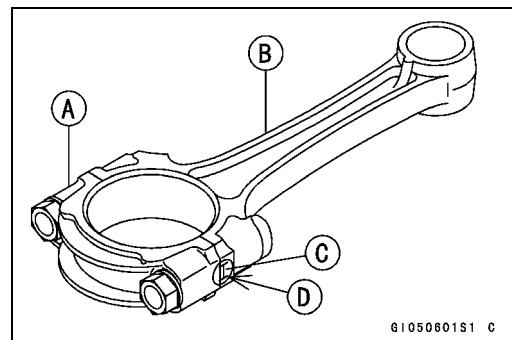
Discard the connecting rod bolts. To prevent damage to the crankpin surfaces, do not allow the connecting rod bolts to bump against the crankpins.

#### 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]: "○" or no mark

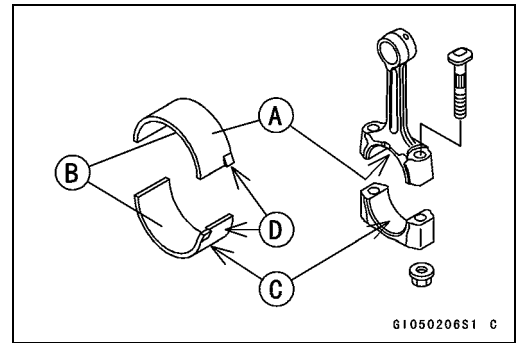


##### CAUTION

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.

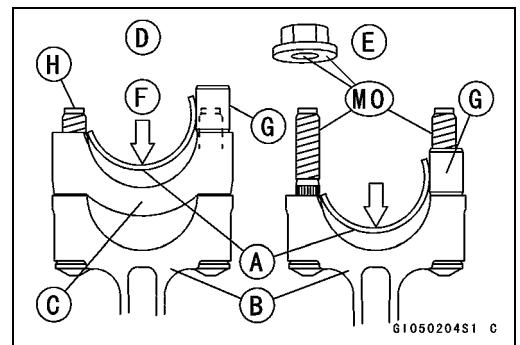
**Crankshaft and Connecting Rods**

- 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 mass and diameter marks.
- Remove debris and clean the surface of inserts.
- Apply molybdenum disulfide oil [MO] to the threads and seating surfaces of the big end nuts and bolts.



- Install the crankshaft (see Crankshaft Installation).
- Install each connecting rod on its original crankpin.
- 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 mass.
- There are two types of the plastic region fastening. One is a bolt length measurement method and other is a rotation angle method. Observe one of the following two, but the bolt length measurement method is preferable because this is a more reliable way to tighten the big end nuts.

<b>CAUTION</b>
<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>

<b>CAUTION</b>
<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>

## 9-14 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

#### (1) Bolt Length Measurement Method

- Be sure to clean the bolts, nuts, and connecting rods thoroughly with a high-flash point solvent, because the new connecting rods, bolts, and nuts are treated with an anti-rust solution.

#### **⚠ WARNING**

**Clean the bolts, nuts, and connecting rods in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. This includes any appliance with a pilot light. Because of the danger of highly flammable liquids, do not use gasoline or low-flash point solvents to clean them.**

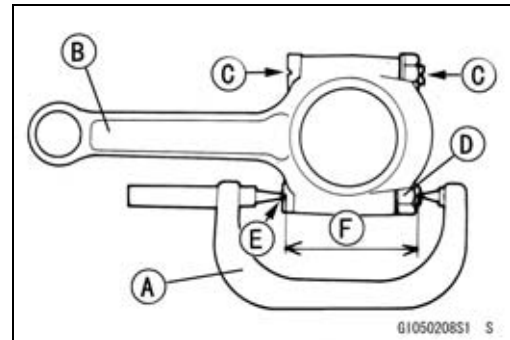
#### **CAUTION**

**Immediately dry the bolts and nuts with compressed air after cleaning.  
Clean and dry the bolts and nuts completely.**

- 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.

$$\begin{array}{r} \text{Bolt Length} \\ \text{after tightening} \end{array} - \begin{array}{r} \text{Bolt Length} \\ \text{before tightening} \end{array} = \text{Bolt Stretch}$$

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	





**Crankshaft and Connecting Rods**

(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.

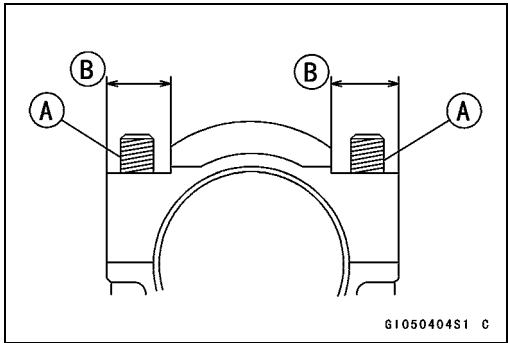
**⚠ WARNING**

**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.**

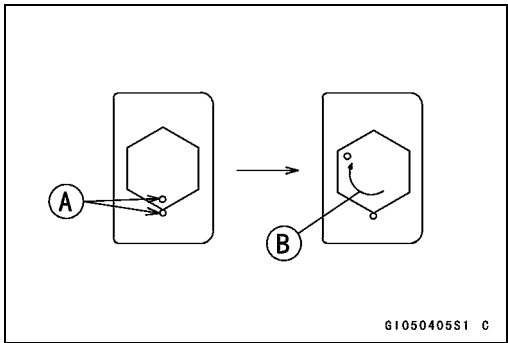
**CAUTION**

**Immediately dry the bolts and nuts with compressed air after cleaning. Clean and dry the bolts and nuts completely.**

- 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°
		New	20 (2.0, 14.5) + 120°
Used	Replace the bolts with new ones	Used	24 (2.4, 17.4) + 120°
		New	25 (2.6, 18.8) + 120°

***Crankshaft/Connecting Rod Cleaning***

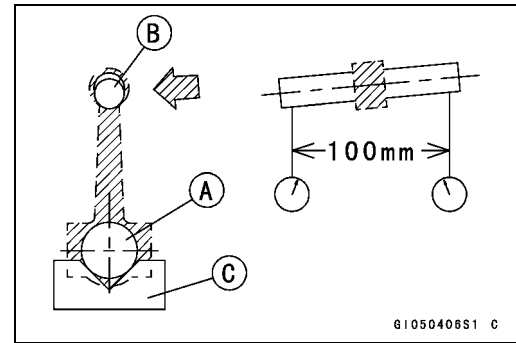
- After removing the connecting rods from the crankshaft, clean them with a high-flash point solvent.
- Blow the crankshaft oil passages with compressed air to remove any foreign particles or residue that may have accumulated in the passages.

## 9-16 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

#### Connecting Rod Bend

- Remove the connecting rod big end bearing inserts, and reinstall the connecting rod big end cap.
  - Select an arbor [A] of the same diameter as the connecting rod big end, and insert the arbor through the connecting rod big end.
  - Select an arbor of the same diameter as the piston pin and more than 105 mm (4.13 in.) long, and insert the arbor [B] through the connecting rod small end.
  - On a surface plate, set the big-end arbor on V blocks [C].
  - With the connecting rod held vertically, use a height gauge to measure the difference in the height of the arbor above the surface plate over a 100 mm (3.94 in.) length to determine the amount of connecting rod bend.
- ★ If connecting rod bend exceeds the service limit, the connecting rod must be replaced.

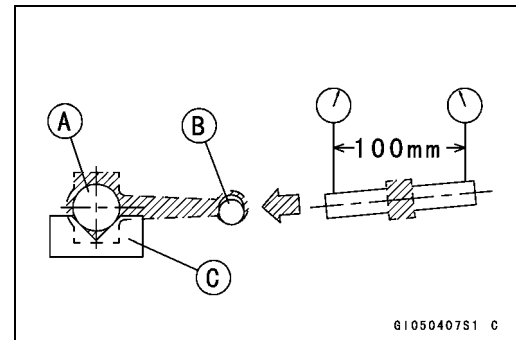


#### Connecting Rod Bend

**Service Limit: TIR 0.2/100 mm (0.008/3.94 in.)**

#### Connecting Rod Twist

- With the big-end arbor [A] still on V block [C], hold the connecting rod horizontally and measure the amount that the arbor [B] varies from being parallel 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

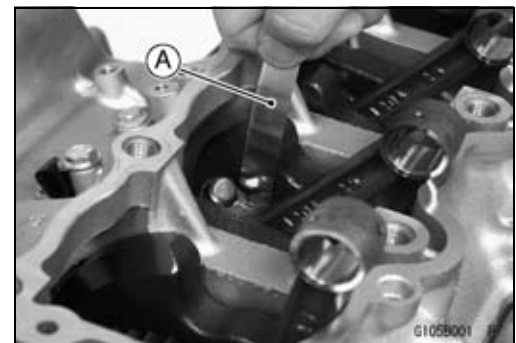
- Measure connecting rod big end side clearance.
- Insert a thickness gauge [A] between the big end and either crank web to determine clearance.

#### 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.



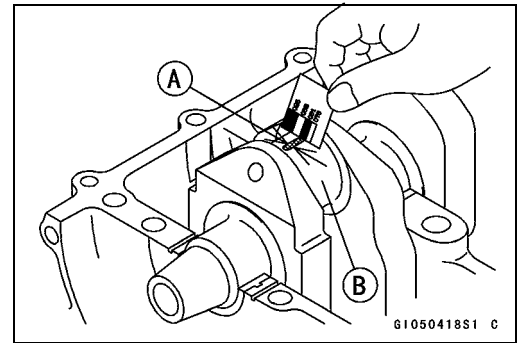
**Crankshaft and Connecting Rods**

*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.



**CAUTION**

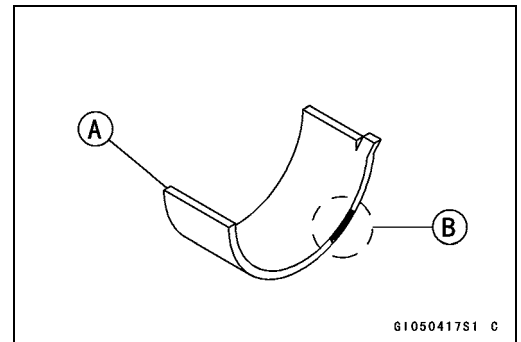
**After measurement, replace the connecting rod bolts.**

**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.)

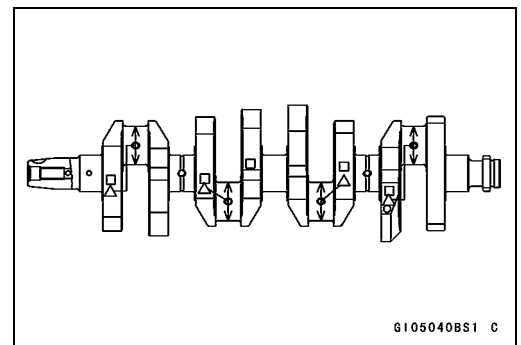
- ★ If any crankpin has worn past the service limit, replace the crankshaft with a new one.
- ★ If the measured crankpin diameters are not less than the service limit, but do not coincide with the original diameter markings on the crankshaft, make new marks on it.

**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.

# 9-18 CRANKSHAFT/TRANSMISSION

## Crankshaft and Connecting Rods

### Connecting Rod Big End Inside Diameter Marks

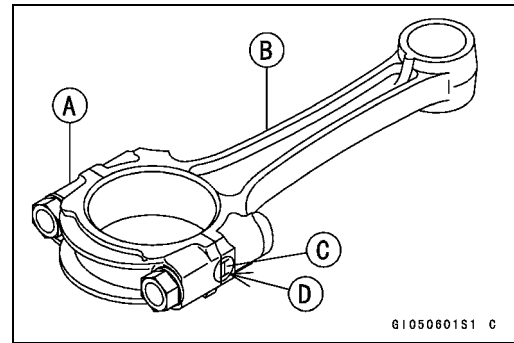
- None 38.000mm ~ 38.008mm (1.4961 ~ 1.4964 in.)
- 38.009 ~ 38.016 mm (1.4964 ~ 1.4967 in.)

Big End Cap [A]

Connecting Rod [B]

Weight Mark, Alphabet [C]

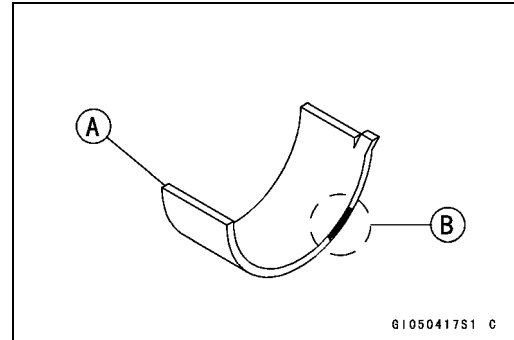
Diameter Mark (Around Weight Mark) [D]: “○” or no mark



G1050601S1 C

- 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



G1050417S1 C

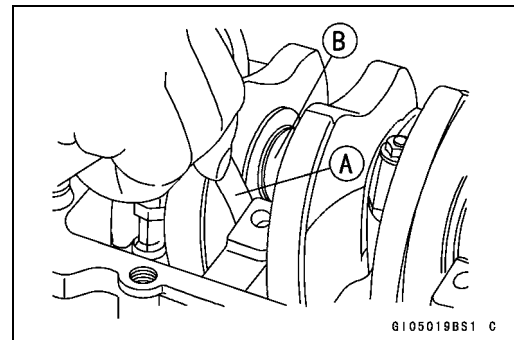
- Install the new inserts in the connecting rod and check insert/crankpin clearance with the plastigage.

### Crankshaft Side Clearance

- Insert a thickness gauge [A] between the 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.



G1050198S1 C

### Crankshaft Side Clearance

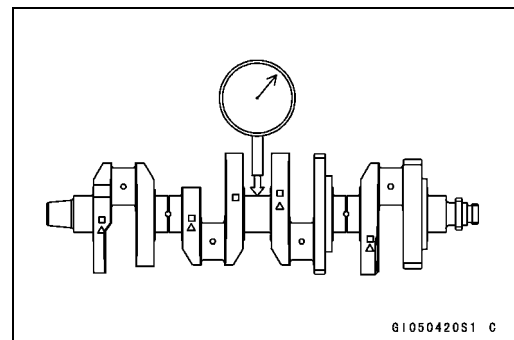
- Standard: 0.05 ~ 0.20 mm (0.0020 ~ 0.0079 in.)
- Service Limit: 0.40 mm (0.0157 in.)

### 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.)



G1050420S1 C

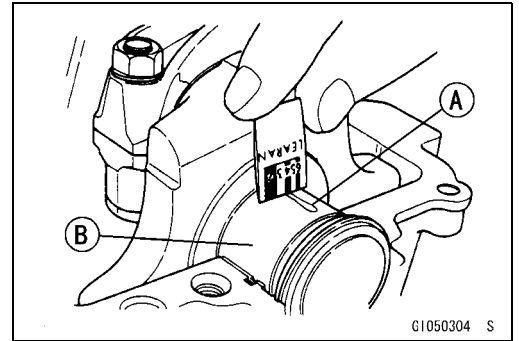
**Crankshaft and Connecting Rods**

*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.

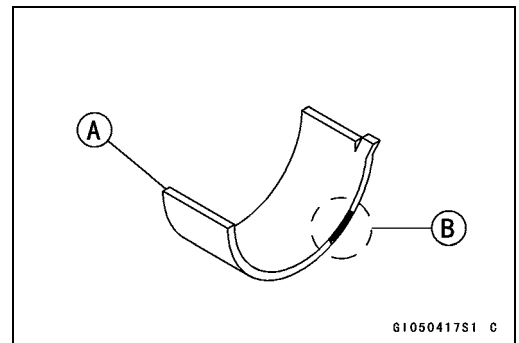


**Crankshaft Main Bearing Insert/Journal Clearance**

**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.

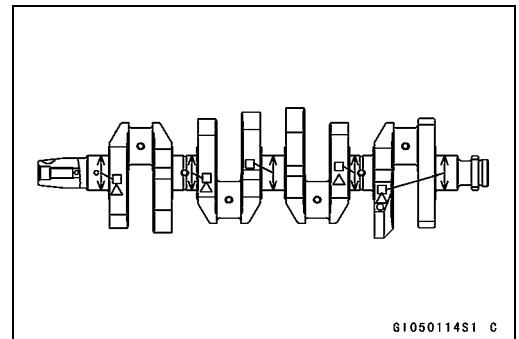


**Crankshaft Main Journal Diameter**

**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.

## 9-20 CRANKSHAFT/TRANSMISSION

### Crankshaft and Connecting Rods

- 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

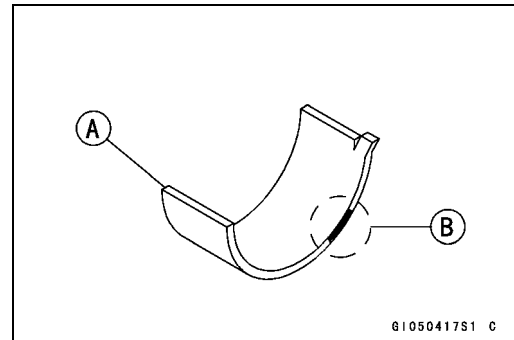
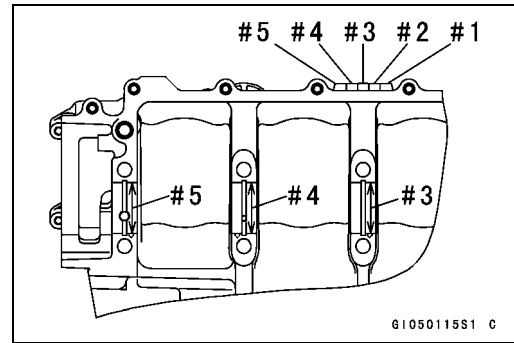
- The mark already on the upper crankcase half should almost coincide with the measurement.

#### 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.

## Starter Motor Clutch

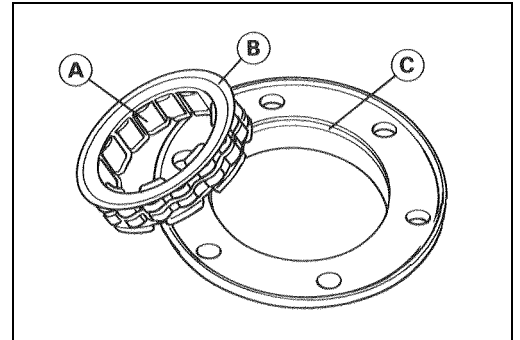
### Starter Motor Clutch Removal/Installation

- Refer to the Alternator Rotor Removal and Installation in the Electrical System chapter.

### Starter Motor Clutch Assembly

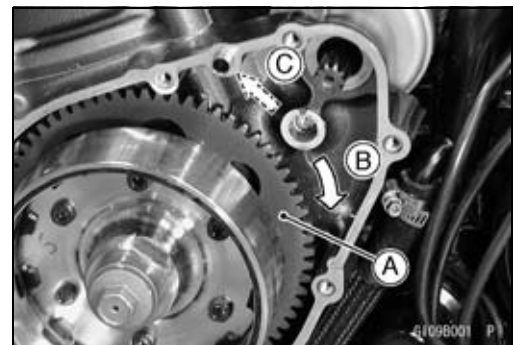
- Be sure to install the one-way clutch [A] so that its flange [B] fits in the holder recess [C].
- Apply a non-permanent locking agent to the threads of the starter motor clutch bolts, and tighten them.

**Torque - Starter Motor Clutch Bolts: 12 N·m (1.2 kgf·m, 104 in·lb)**



### 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

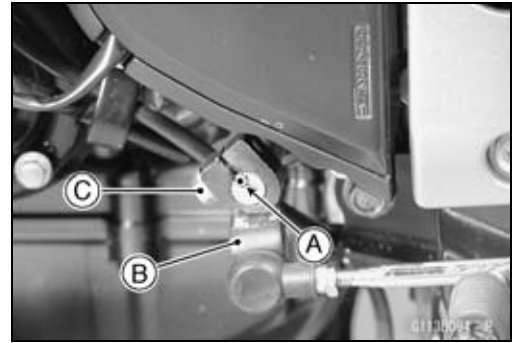
- Examine the starter motor clutch gear as well. Replace it if it is worn or damaged.

## 9-22 CRANKSHAFT/TRANSMISSION

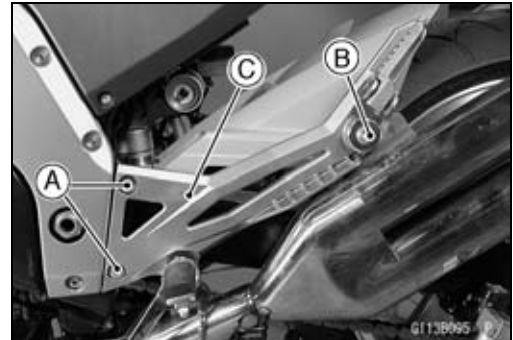
### Transmission

#### Shift Pedal Removal

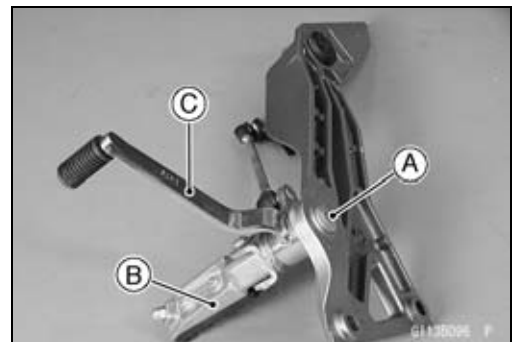
- Mark [A] the position of the shift lever [B] on the shift shaft so that it can be installed later in the same position.
- Remove:
  - Shift Lever Bolt [C]
  - Shift Lever



- Remove:
  - Footpeg Bracket Bolts [A]
  - Muffler Mounting Bolt [B]
  - Footpeg Bracket [C]

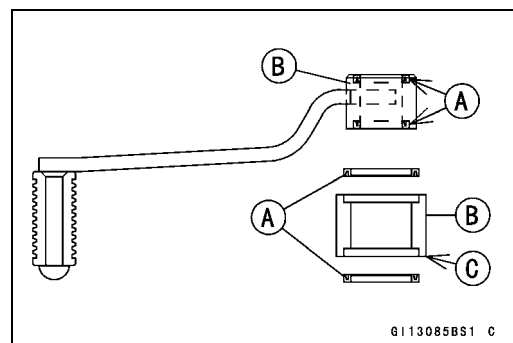


- Remove the bolt [A], footpeg [B], and shift pedal [C].



#### Shift Pedal Installation

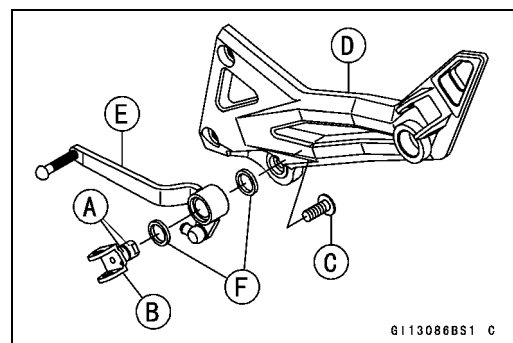
- Apply grease to the oil seal lip.
- Press the oil seals [A] in the shift pedal housing [B] so that the oil seal surfaces are flush with the housing end [C] as shown.



- 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)**

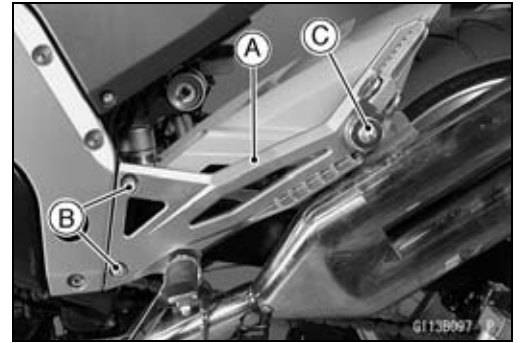
- [D] Footpeg Bracket
- [E] Shift Pedal
- [F] Oil Seals



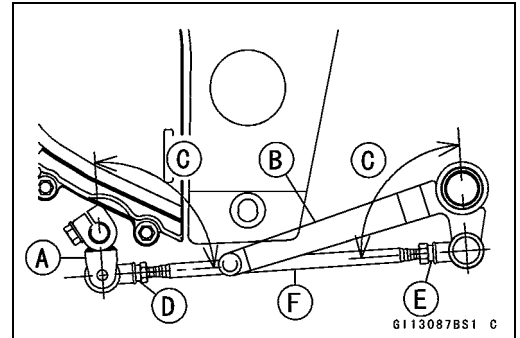


**Transmission**

- Install the footpeg bracket [A].
- Apply a non-permanent locking agent to the footpeg bracket bolts [B].
- Tighten:
  - Torque - Footpeg bracket Bolts: 34 N·m (3.5 kgf·m, 25 ft·lb)**
  - Muffler Mounting Bolt and Nut [C]: 29 N·m (3.0 kgf·m, 22 ft·lb)**

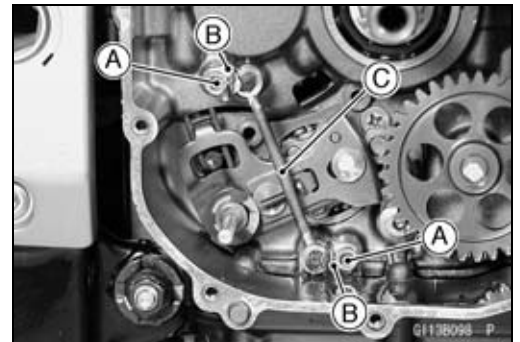


- Install the shift lever [A], aligning the mark (previously marked).
- Tighten:
  - Torque - Shift Lever Bolt: 6.9 N·m (0.7 kgf·m, 61 in·lb)**
- Install the shift pedal [B] as shown.
  - [C] Right Angle (90°)
- To adjust the pedal position, loosen the front locknut [D] (left-hand threads) and rear locknut [E] and then turn the tie-rod [F].
- Tighten:
  - Torque - Tie-rod Locknuts: 6.9 N·m (0.7 kgf·m, 61 in·lb)**



**External Shift Mechanism Removal**

- Remove:
  - Engine Oil (drain, see Engine Lubrication System 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-ring



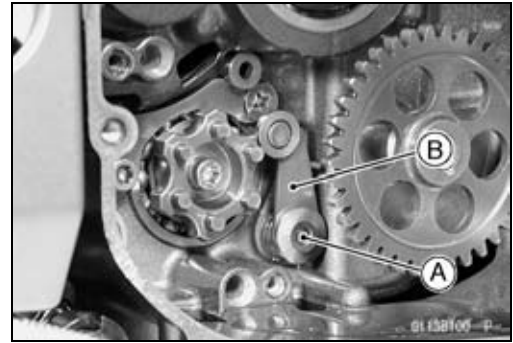
- Remove the shift shaft assembly [A] while pulling the shift mechanism arm [B] to the direction of the arrow.



## 9-24 CRANKSHAFT/TRANSMISSION

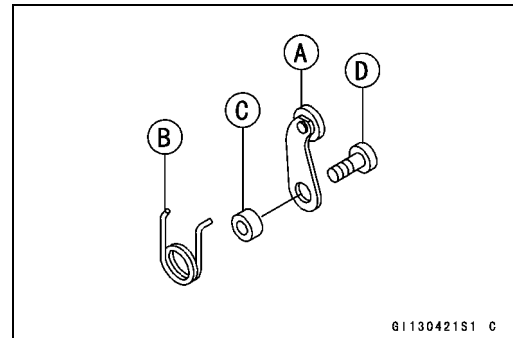
### Transmission

- Remove:
  - Gear Positioning Lever Bolt [A]
  - Gear Positioning Lever [B], Collar and spring



#### External Shift Mechanism Installation

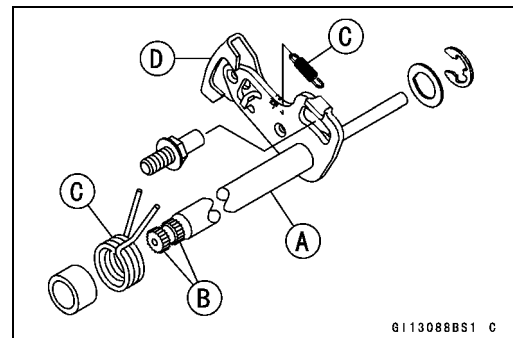
- Install the gear positioning lever [A] as shown.
  - Spring [B]
  - Collar [C]
  - Bolt [D]
- Tighten:
  - Torque - Gear Positioning Lever Bolt: 12 N·m (1.2 kgf·m, 104 in·lb)**
- Apply grease to the O-ring on the oil pipe ends.
- Apply a non-permanent locking agent to the oil pipe holder bolts and tighten them.



**Torque - Oil Pipe Holder Bolts: 13 N·m (1.3 kgf·m, 113 in·lb)**

#### External Shift Mechanism Inspection

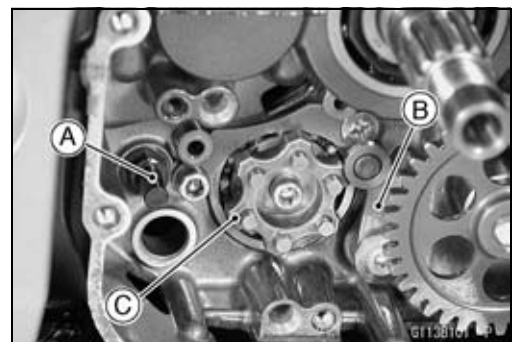
- Examine the shift shaft [A] for any damage.
- ★ If the shaft is bent, straighten or replace it.
- ★ If the serration [B] are damaged, replace the shaft.
- ★ If the springs [C] are damaged in any way, replace them.
- ★ If the shift mechanism arm [D] is damaged in any way, replace the arm.



- 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)**

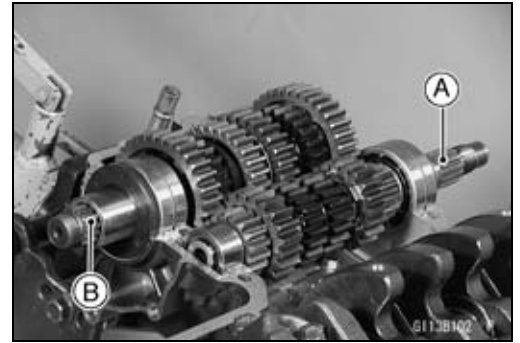
- Check the gear positioning lever [B] and its spring for breaks or distortion.
- ★ If the lever or spring are damaged in any way, replace them.
- Visually inspect the shift drum cam [C].
- ★ If they are badly worn or if they show any damage, replace it.



**Transmission**

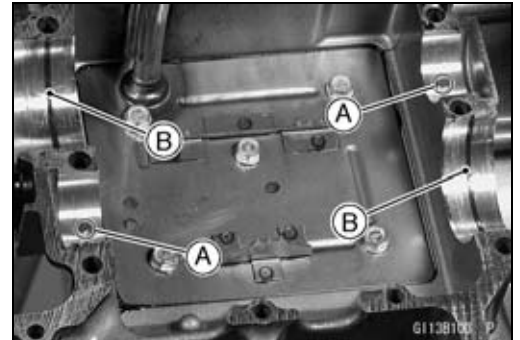
*Transmission Shaft Removal*

- Split the crankcase (see Crankcase Splitting).
- Remove the drive shaft [A] and output shaft [B].



*Transmission Shaft Installation*

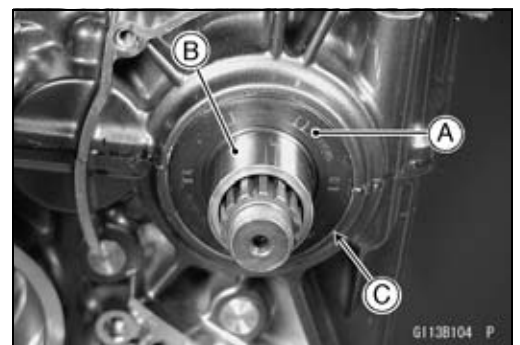
- Check to see that the set pins [A] and set rings [B] are in place.



- Install the drive shaft and output shaft into the upper crankcase half.
- Apply engine oil to the sliding surfaces of the gears and 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.

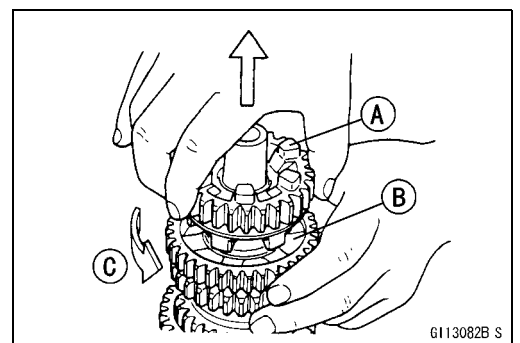


- Assemble the crankcase.
- Press in the oil seal [A] onto collar [B] so that the surface of the oil seal is flush with the counterbore bottom surface [C] of the crankcase.



*Transmission Shaft Disassembly*

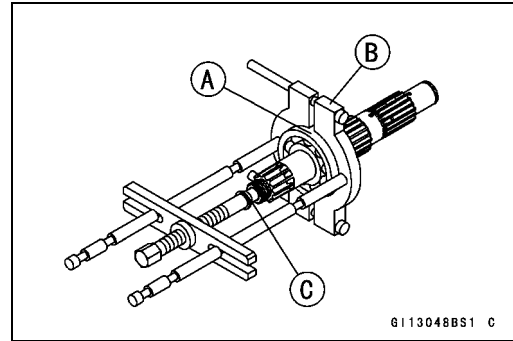
- Remove the transmission shafts (see Transmission Shaft Removal).
- Remove the circlips, disassemble the transmission shafts.
- The 5th gear [A] on the output shaft has three steel balls assembled into it for the positive neutral finder mechanism.
- Remove the 5th gear as follows.
  - Set the output shaft in a vertical position holding the 3rd gear [B].
  - Spin the 5th gear quickly [C] and pull it off upward.



## 9-26 CRANKSHAFT/TRANSMISSION

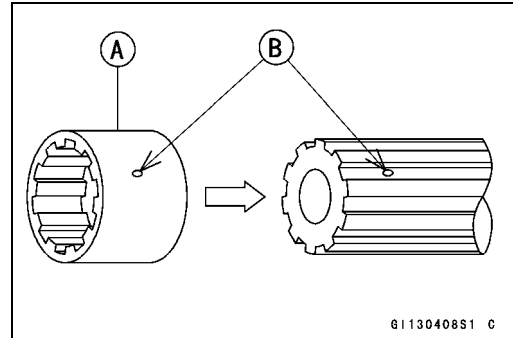
### Transmission

- Remove the ball bearing [A] from each shafts.  
**Special Tools - Bearing Puller: 57001-135 [B]**  
**Bearing Puller Adapter: 57001-317 [C]**
- Discard the bearing.

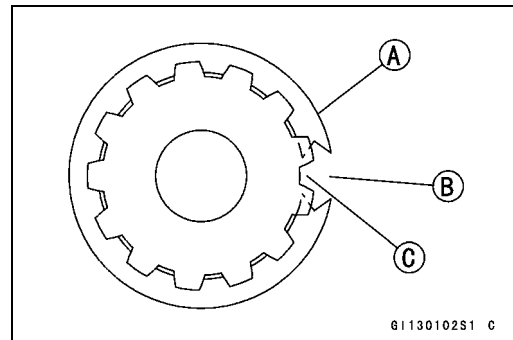


#### Transmission Shaft Assembly

- Apply engine oil to the sliding surfaces on the transmission shafts, gears and bushings.
- 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].

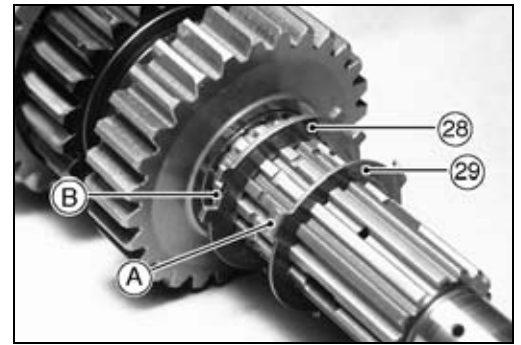


- The drive shaft gears can be recognized by size: the gear with the smallest diameter is 1st gear, and the largest one is 6th gear. Be sure that all parts are put back in the correct sequence and all circlips and washers are properly in place (see Transmission Assembly illustration).
- Install the 3rd/4th 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 (see Transmission Assembly illustration).
- Install the 5th and 6th gears onto the output shaft with their oil holes aligned.
- Install the 3rd/4th gear bushings onto the output shaft with their oil holes aligned.

Transmission

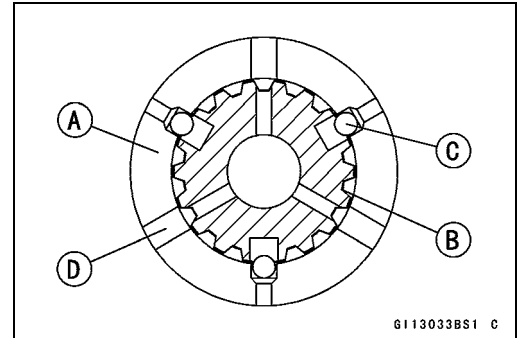
**NOTE**

- 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].



- Fit the steel balls into the 5th gear holes in the output shaft, aligning three oil holes [D] (see Section BB in the output shaft illustration).

- 5th Gear [A]
- Output Shaft [B]
- Steel Balls [C]



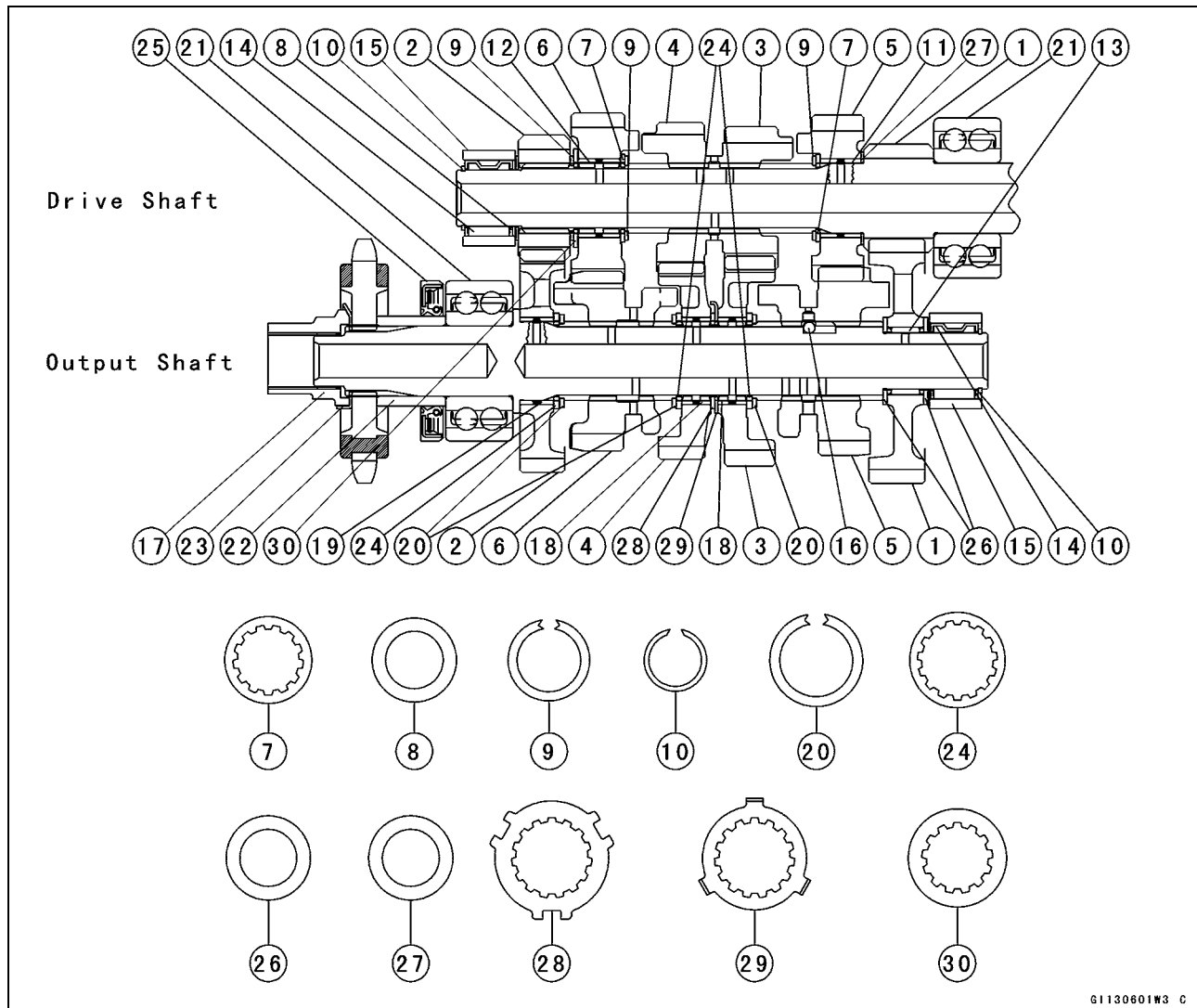
**CAUTION**

**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.

# 9-28 CRANKSHAFT/TRANSMISSION

## Transmission

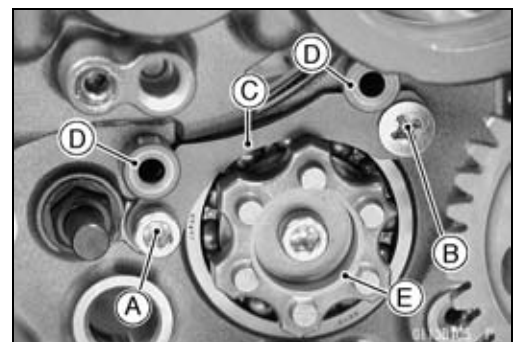


G1130601W3 C

- |  |                        |   |
|--|------------------------|---|
| 1. 1st Gear                                | 11. Bushing            | 23. Washer                                  |
| 2. 2nd Gear                                | 12. Bushing            | 24. Toothed Washer                          |
| 3. 3rd Gear                                | 13. Needle Bearing     | 25. Oil Seal                                |
| 4. 4th Gear                                | 14. Needle Bearing     | 26. Thrust Washer, $\phi 31$ mm (1.22 in.)  |
| 5. 5th Gear                                | 15. Bearing Outer Race | 27. Thrust Washer, $\phi 33$ mm (1.30 in.)  |
| 6. 6th (Top) Gear                          | 16. Steel Ball         | 28. Toothed Washer                          |
| 7. Toothed Washer, $\phi 31$ mm (1.22 in.) | 17. Nut                | 29. Toothed Washer                          |
| 8. Thrust Washer, $\phi 30$ mm (1.18 in.)  | 18. Bushing            | 30. Toothed Washer, $\phi 35$ mm (1.38 in.) |
| 9. Circlip                                 | 19. Bushing            |   |
| 10. Circlip                                | 20. Circlip            |   |
|  | 21. Ball Bearing       |   |
|  | 22. Collar             |   |

### Shift Drum and Fork Removal

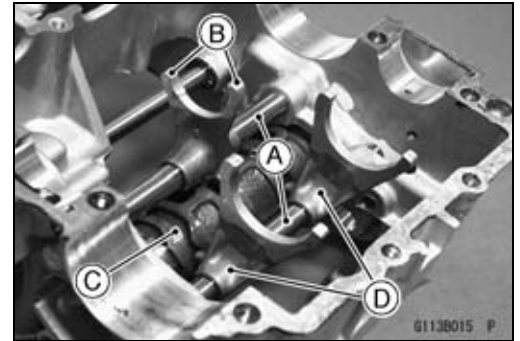
- Remove:
  - Lower Crankcase Half (see Crankcase Splitting)
  - Transmission Shafts
  - External Shift Mechanism (see External Shift Mechanism Removal)
  - Bolt [A] and Screw [B]
  - Shift Drum Bearing Holder [C]
- Pull out the shift rods [D], and take off the shift forks.
- Pull out the shift drum [E].



**Transmission**

*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 as shown.
- Apply a non-permanent locking agent to the threads of the shift drum bearing holder bolt and screw, and tighten them.

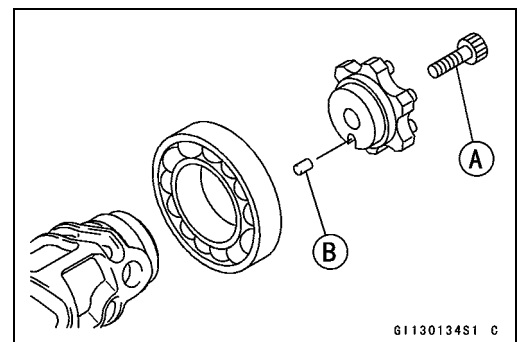


**Torque - Shift Drum Bearing Holder Bolt: 13 N·m (1.3 kgf·m, 113 in·lb)**

**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.
  - [A] Shift Drum Cam Holder Bolt
  - [B] Dowel Pin



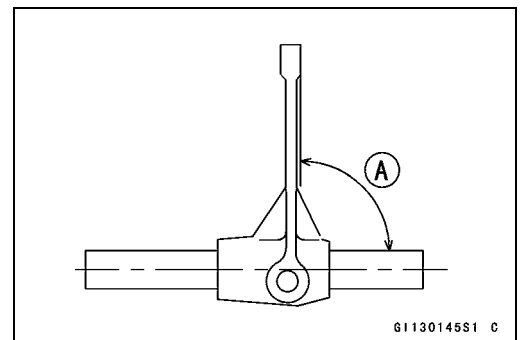
*Shift Drum Assembly*

- 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)**

*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]



## 9-30 CRANKSHAFT/TRANSMISSION

### Transmission

#### 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.

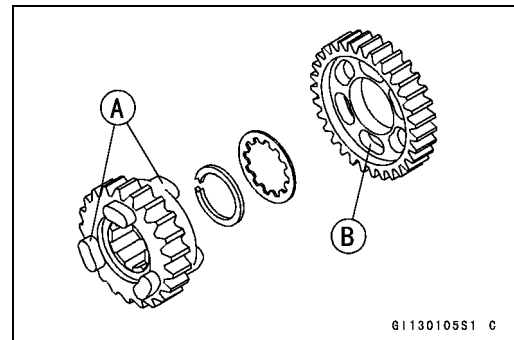
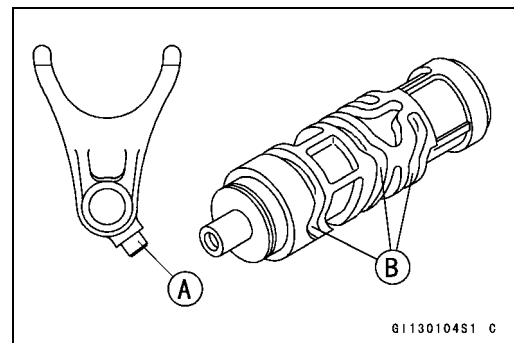
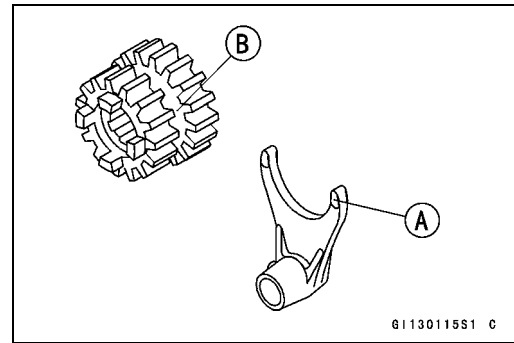
##### Shift Drum Groove Width

**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.





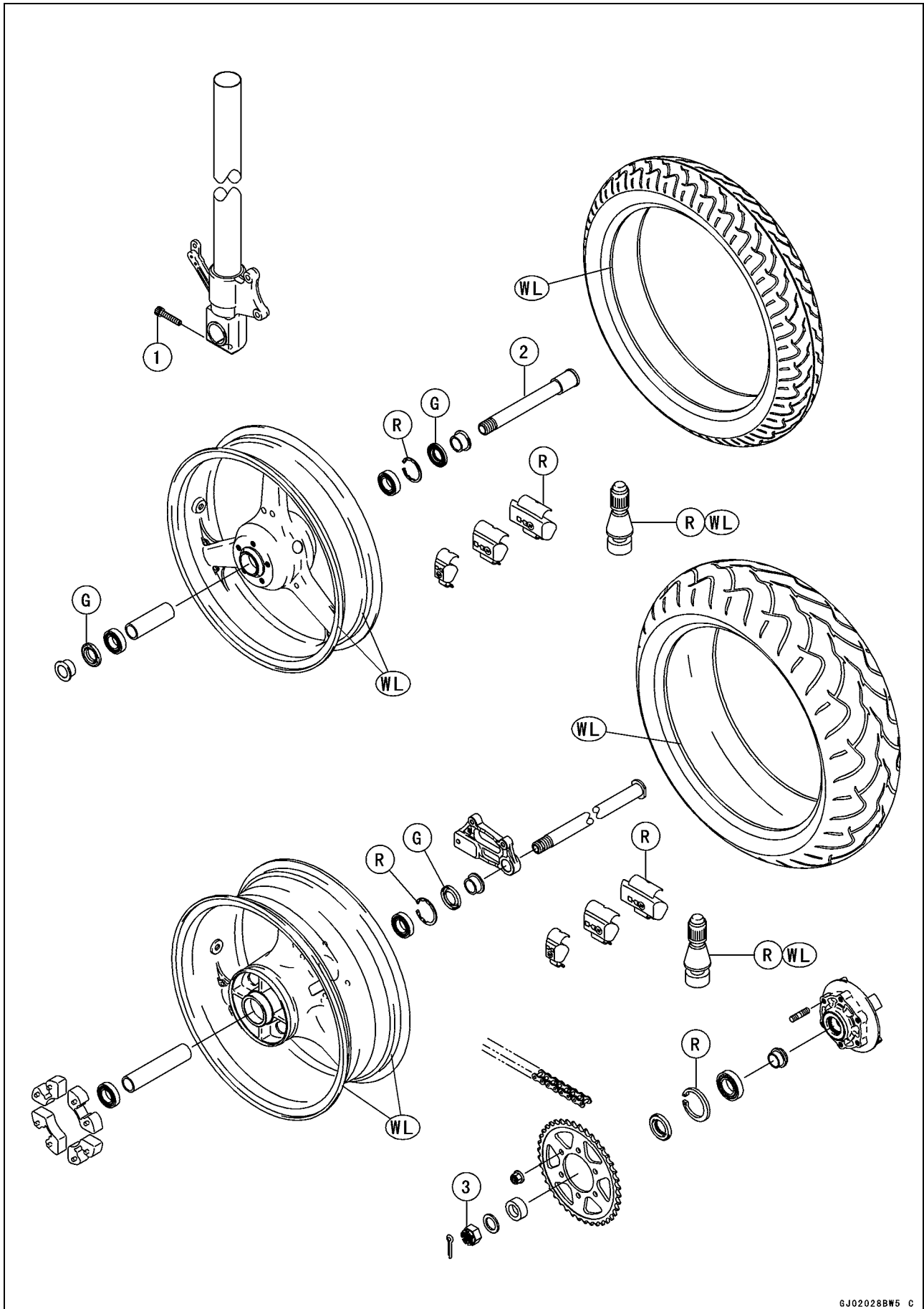
# Wheels/Tires

## Table of Contents

Exploded View .....	10-2
Specifications .....	10-4
Special Tools .....	10-5
Wheels (Rims) .....	10-6
Front Wheel Removal .....	10-6
Front Wheel Installation .....	10-6
Rear Wheel Removal .....	10-7
Rear Wheel Installation .....	10-8
Wheel Inspection .....	10-9
Axle Inspection .....	10-10
Balance Inspection .....	10-10
Balance Adjustment .....	10-10
Balance Weight Removal .....	10-10
Balance Weight Installation .....	10-11
Tires .....	10-13
Air Pressure Inspection/Adjustment .....	10-13
Tire Inspection .....	10-13
Tire Removal .....	10-13
Tire Installation .....	10-13
Tire Repair .....	10-15
Hub Bearing .....	10-16
Hub Bearing Removal .....	10-16
Hub Bearing Installation .....	10-16
Hub Bearing Inspection .....	10-16

# 10-2 WHEELS/TIRES

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front axle clamp bolt	20	2.0	15	
2	Front axle	127	13	94	
3	Rear axle nut	127	13	94	

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 US oz) or less		- - -
Balance weights		10 g (0.35 US oz), 20 g (0.71 US oz), 30 g (1.06 US oz)		- - -
<b>Tires:</b>				
Air pressure: (when cold)	Front	Up to 180 kg (396 lb) load:	250 kPa (2.5 kgf/cm <sup>2</sup> , 36 psi)	- - -
	Rear		290 kPa (2.9 kgf/cm <sup>2</sup> , 41 psi)	- - -
Tread depth:	Front	BRIDGESTONE	3.4 mm (0.13 in.)	1 mm (0.04 in.) 1.6 mm (0.06 in.) (DE, AT, CH)
	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.)
<b>Standard tires:</b>				
		Make, Type		Size
Front		BRIDGESTONE, BATTLAX BT-019F RADIAL		120/70 ZR17 M/C (58 W)
Rear		BRIDGESTONE, BATTLAX BT-012R RADIAL J		190/50 ZR17 M/C (73 W)

### WARNING

**Use the same manufacturer's tires on both front and rear wheels.**

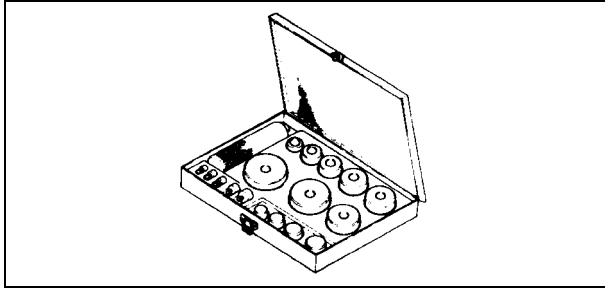
AT: Republic of Austria

CH: Swiss Confederation

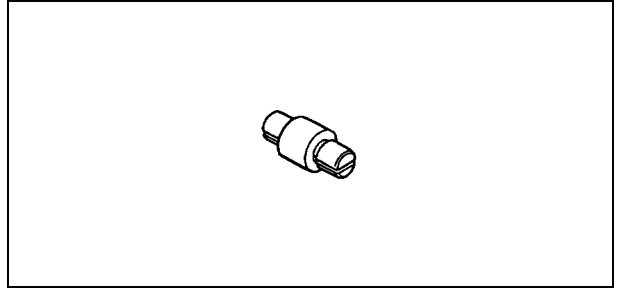
DE: Federal Republic of Germany

**Special Tools**

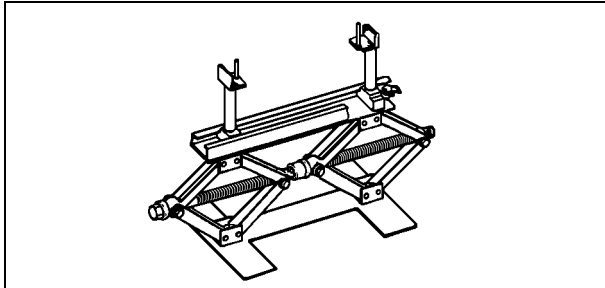
**Bearing Driver Set:  
57001-1129**



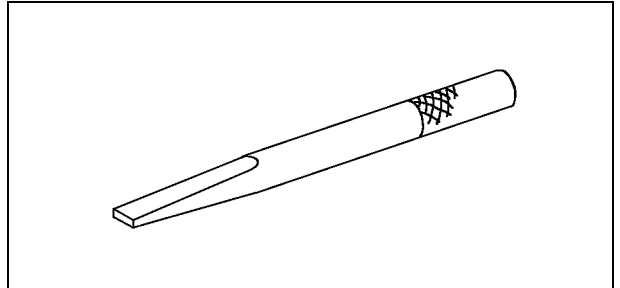
**Bearing Remover Head,  $\phi 25 \times \phi 28$ :  
57001-1346**



**Jack:  
57001-1238**



**Bearing Remover Shaft,  $\phi 13$ :  
57001-1377**



## 10-6 WHEELS/TIRES

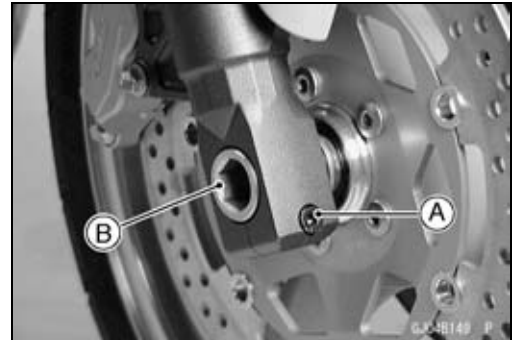
### Wheels (Rims)

#### Front Wheel Removal

- Remove:  
Brake Caliper Mounting Bolts [A]



- Loosen:  
Right Side Axle Clamp Bolt [A]  
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

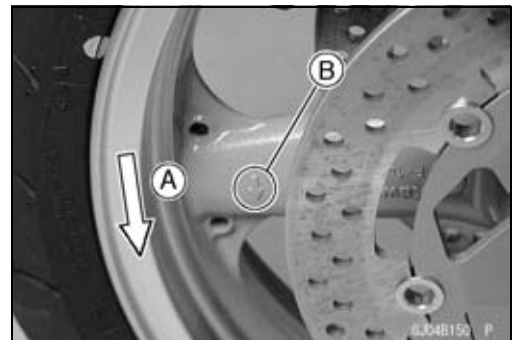
Do not lay the wheel down on one of the discs. This can damage or warp the disc. Place blocks under the wheel so that the disc does not touch the ground.

#### Front Wheel Installation

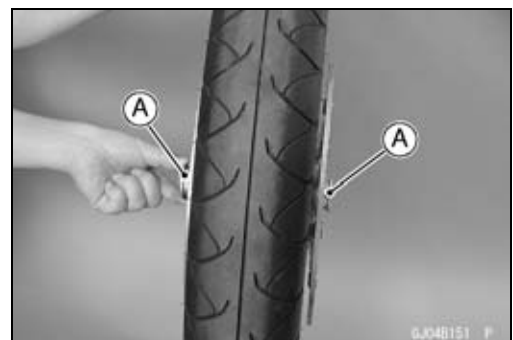
##### NOTE

○ The direction of the wheel rotation [A] is shown by an arrow [B] on the wheel spoke.

- Check the wheel rotation mark on the front wheel and install it.



- Fit the collars [A] on the both sides of the hub.



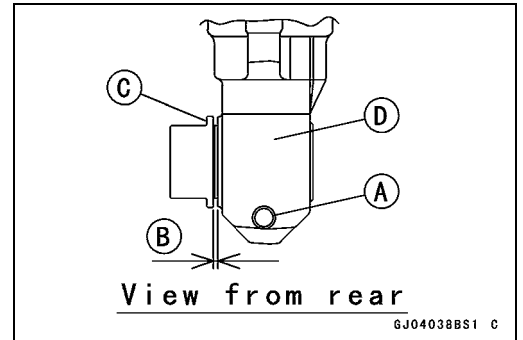
**Wheels (Rims)**

- Tighten the axle.  
**Torque - Front Axle: 127 N·m (13 kgf·m, 94 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] on the right fork leg first.  
**Torque - Front Axle Clamp Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**
- Check the clearance [B] between the right fork leg [D] and collar [C] with the thickness gauge.  
**Standard: 2.0 mm (0.0787 in.)**  
**Usable range: 1.1 ~ 2.9 mm (0.043 ~ 0.114 in.)**
- ★If the clearance is out of this range, remove the front wheel again and check the axle, wheel hub and other related parts for damage.
- Tighten the axle clamp bolt on the left fork leg.  
**Torque - Front Axle Clamp Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**
- Install the front brake calipers (see Brakes chapter).
- Check the front brake effectiveness (see Brakes chapter).



**⚠ WARNING**

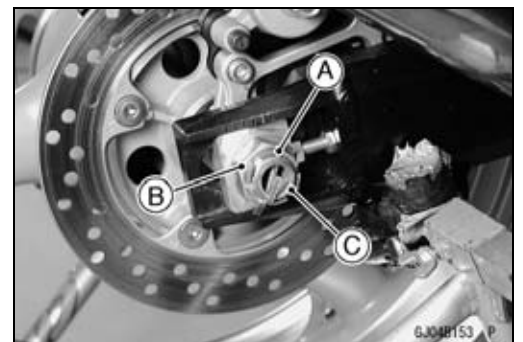
**Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

*Rear Wheel Removal*

- Using the stand [A], raise the rear wheel off the ground.



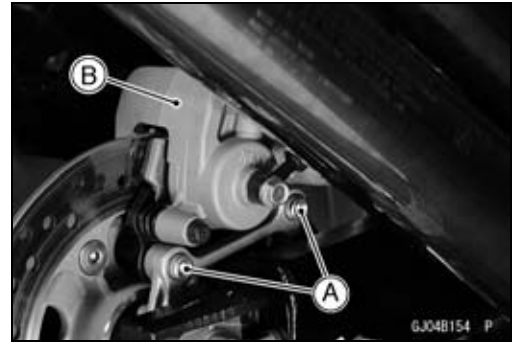
- Remove:  
 Cotter Pin [A]  
 Axle Nut [B]  
 Axle [C]



# 10-8 WHEELS/TIRES

## Wheels (Rims)

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



- Remove the drive chain [A] from the rear sprocket toward the left.
- Move the rear wheel back and remove the wheel from the rear caliper.
- Remove the rear wheel.



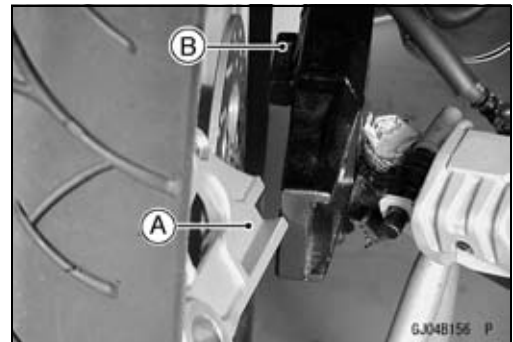
### CAUTION

**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

- Engage the drive chain with the rear sprocket.
- Install the caliper bracket [A] onto the swingarm stop [B].
- Insert the axle from the right side of the wheel, and tighten the axle nut.

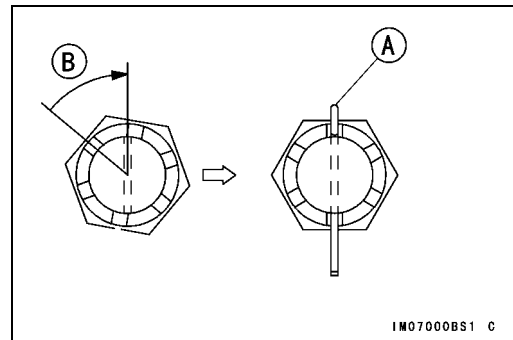
**Torque - Rear Axle Nut: 127 N·m (13 kgf·m, 94 ft·lb)**



- 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.

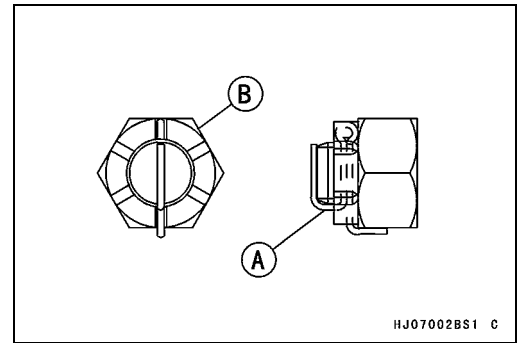




**Wheels (Rims)**

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

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



- Adjust the drive chain slack after installation (see Final Drive 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.**

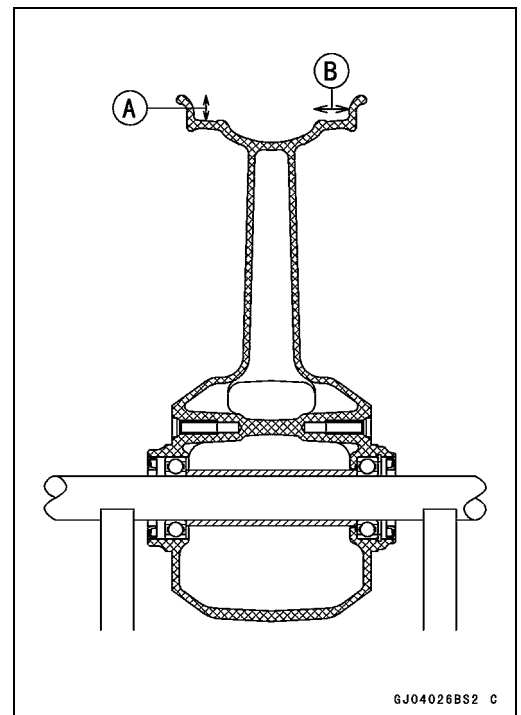
*Wheel Inspection*

- 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:	<b>Axial</b>	<b>TIR 0.5 mm (0.020 in.)</b>
	<b>Radial</b>	<b>TIR 0.8 mm (0.031 in.)</b>

**⚠ 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)

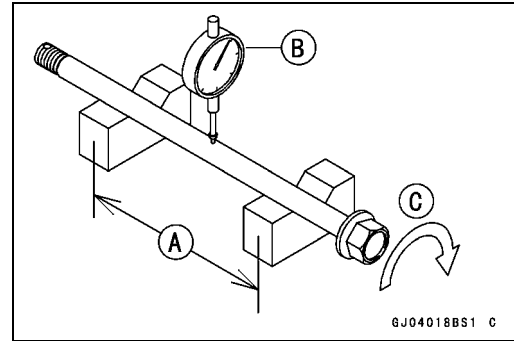
### Axle Inspection

- 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.)

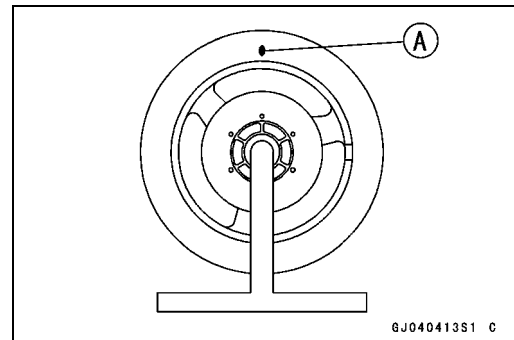
**Standard:** TIR 0.05 mm (0.0020 in.) or less

**Service Limit:** TIR 0.2 mm (0.008 in.)



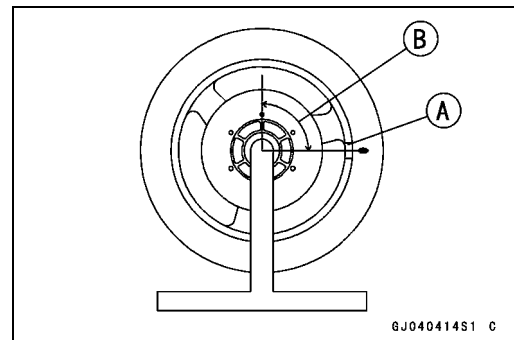
### Balance Inspection

- 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.



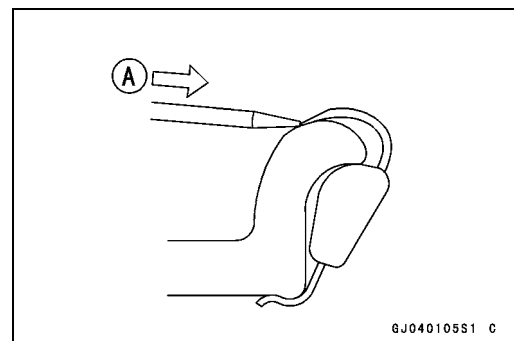
### Balance Adjustment

- 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

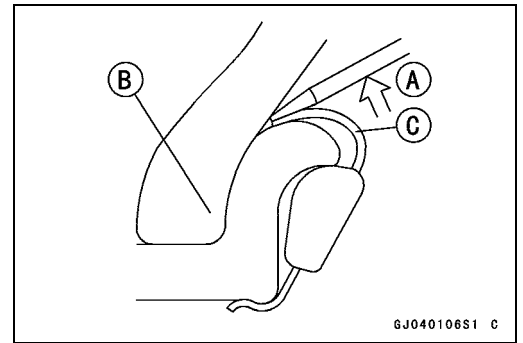
- (a) When the tire is not on the rim.
- Push [A] the blade portion toward the outside with a regular tip screw-driver, and slip the weight off the rim flange.
  - Discard the used balance weight.



**Wheels (Rims)**

(b) When the tire is on the rim.

- Pry [A] the balance weight off the rim flange using a regular tip screwdriver as shown in the figure.
- Insert a tip of the screwdriver between the tire bead [B] and weight blade [C] until the end of the tip reaches the end of the weight blade.
- Push the driver grip toward the tire so that the balance weight slips off the rim flange.
- Discard the used balance weight.



**Balance Weight Installation**

- Check if the weight portion has any play on the blade and clip.
- ★ If it does, discard it.

<p><b>⚠ WARNING</b></p>
<p>If the balance weight has any play on the rim, the blade and/or 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.</p>

- Lubricate the balance weight blade, tire bead, and rim flange with a soap and water solution or rubber lubricant. This helps the balance weight slip onto the rim flange.

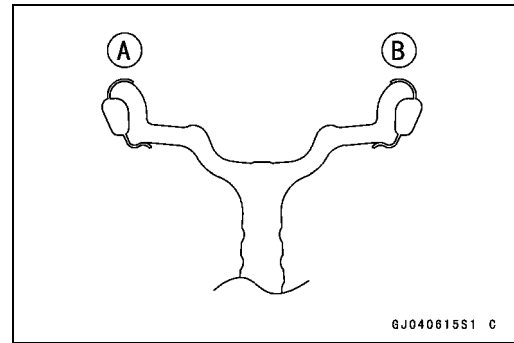
<p><b>CAUTION</b></p>
<p>Never lubricate with engine oil or petroleum distillates because they will deteriorate the tire.</p>

# 10-12 WHEELS/TIRES

## Wheels (Rims)

- When required total weight exceeds 20 g (0.71 US oz), install balance weight at both sides of rim flange as shown.

Required Total Weight: g (US oz)	Weight Selection: g (US oz)	
	One Side [A]	Other Side [B]
20 (0.71)	10 (0.35)	10 (0.35)
30 (1.06)	20 (0.71)	10 (0.35)
40 (1.41)	20 (0.71)	20 (0.71)
50 (1.76)	30 (1.06)	20 (0.71)
60 (2.12)	30 (1.06)	30 (1.06)
70 (2.47)	20 + 20 (0.71 + 0.71)	30 (1.06)
80 (2.82)	20 + 20 (0.71 + 0.71)	20 + 20 (0.71 + 0.71)
90 (3.17)	20 + 30 (0.71 + 1.06)	20 + 20 (0.71 + 0.71)



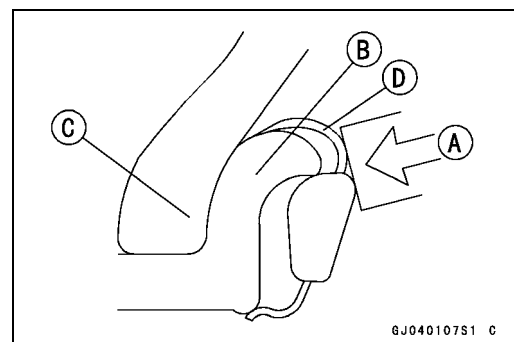
### Balance Weight

Part Number	Weight (grams)
41075-1014	10
41075-1015	20
41075-1016	30

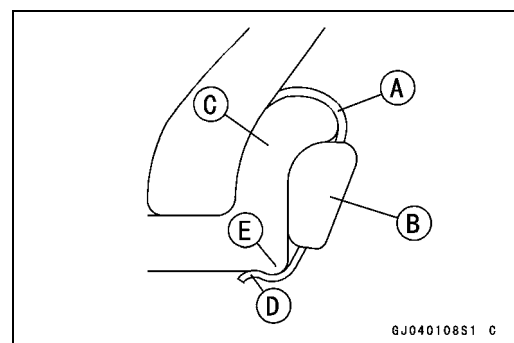
### NOTE

- Balance weights are available from Kawasaki dealers in 10, 20, and 30 grams (0.35, 0.71, and 1.06 US oz). An imbalance of less than 10 grams (0.35 US oz) will not usually affect running stability.
- Do not use four or more balance weight (more than 90 gram, 3.17 US oz). If the wheel requires an excess balance weight, disassemble the wheel to find the cause.

- Install the balance weight on the rim.
- Slip the weight on the rim flange by pushing or lightly hammering the weight in the direction shown in the figure.
  - Push or Hammer [A]
  - Rim Flange [B]
  - Tire Bead [C]
  - Blade [D]



- Check that the blade [A] and weight [B] seat fully on the rim flange [C], and that the clip [D] is hooked over the rim ridge [E] and reaches rim flat portion.



**Tires**

*Air Pressure Inspection/Adjustment*

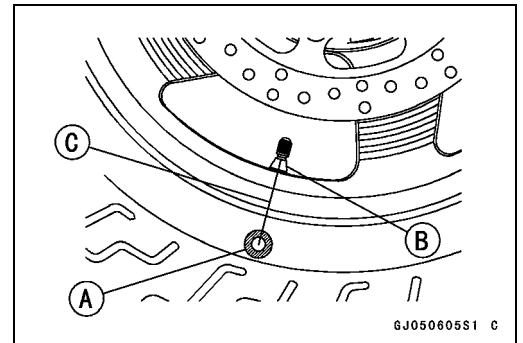
- Refer to the Air Pressure Inspection/Adjustment in the Periodic Maintenance chapter.

*Tire Inspection*

- Refer to the Tire Inspection in the Periodic Maintenance chapter.

*Tire Removal*

- Remove:
  - Wheel (see Front Wheel Removal, Rear Wheel Removal)
  - Disc (s)
  - 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.**

- Apply a soap and water solution, or rubber lubricant to the rim flange and tire beads.

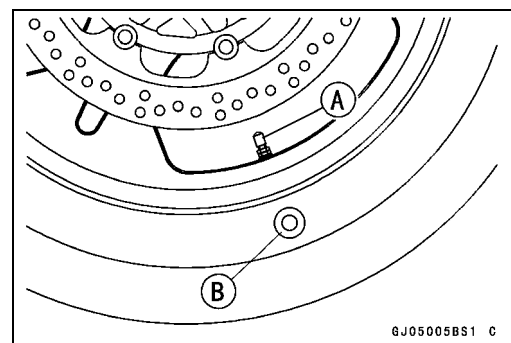
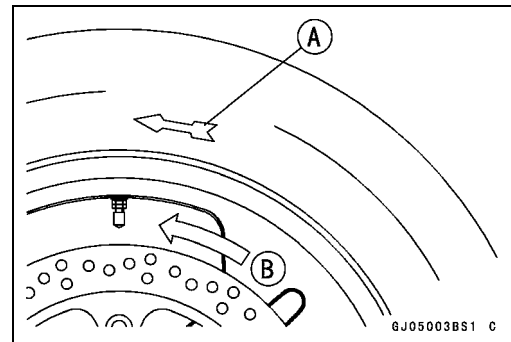
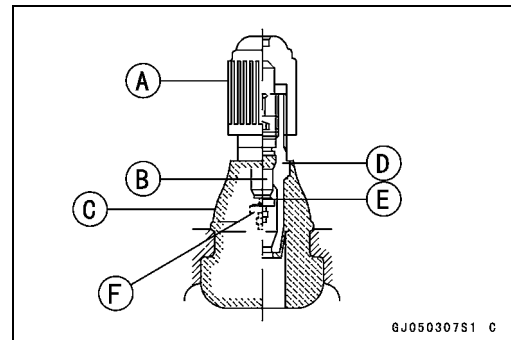
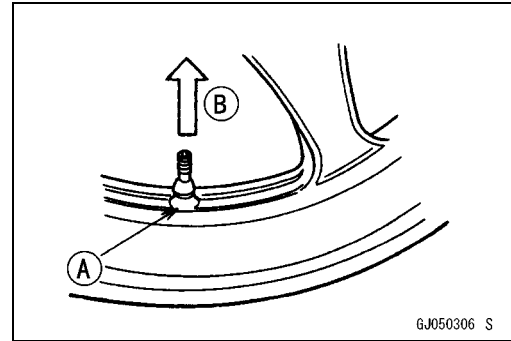
○ The air valve is shown in the figure.

- [A] Valve Cap
- [B] Valve Core
- [C] Stem Seal
- [D] Valve Stem
- [E] Valve Seat
- [F] Valve Opened

- 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] is at the tire balance mark [B] (the chalk mark made during removal, or the yellow paint mark on a new tire).
- Install the tire bead on 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.

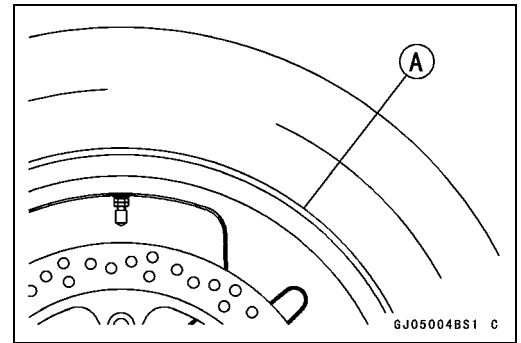


### ⚠ WARNING

**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).
- Install the air valve cap.
- Install the brake disc(s) so that the marked side faces out (see Brakes chapter).
- Adjust the wheel balance.



### *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
  - Circlips
- 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 Shaft,  $\phi 13$ : 57001-1377 [B]**  
**Bearing Remover Head,  $\phi 25 \times \phi 28$ : 57001-1346 [C]**

### 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 circlips with new ones.
  - 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]**

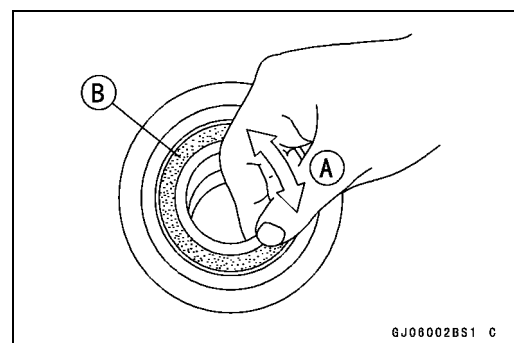
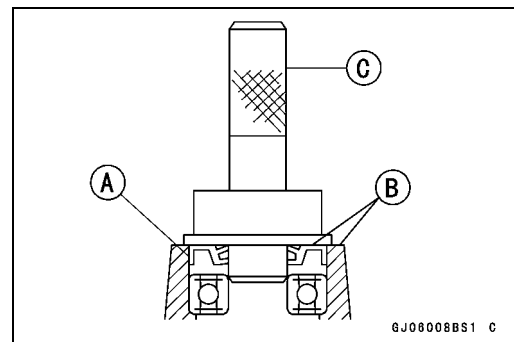
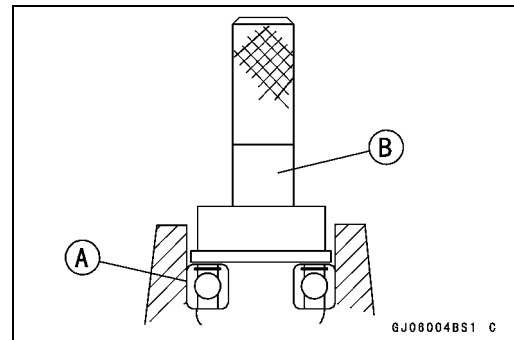
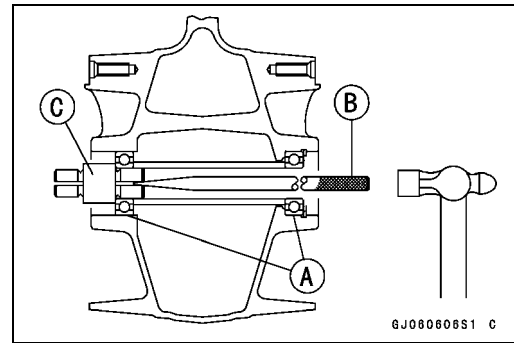
### Hub Bearing Inspection

Since the hub bearings are made to extremely close tolerances, the clearance cannot 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.





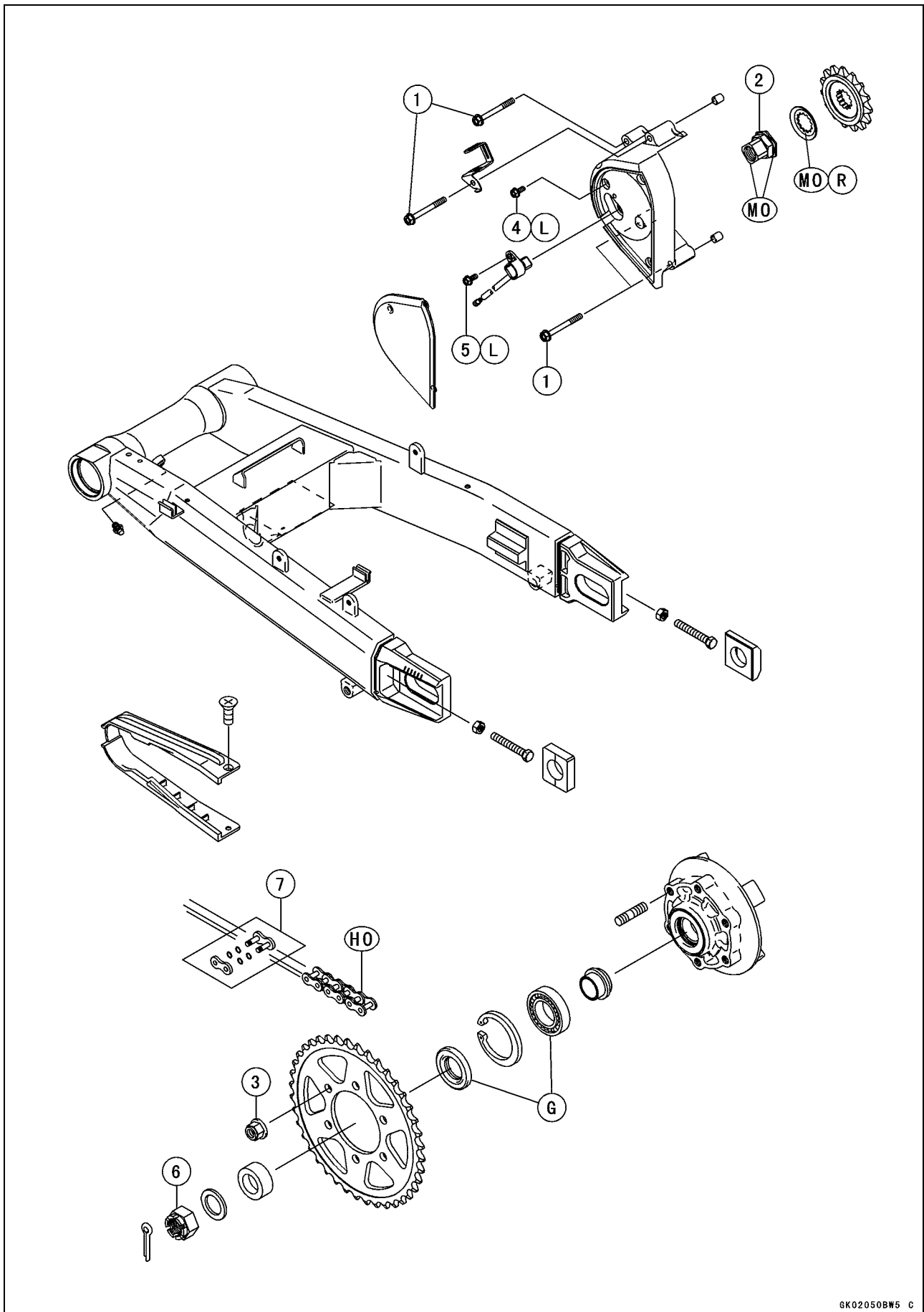
# Final Drive

## Table of Contents

Exploded View .....	11-2
Specifications .....	11-4
Special Tools .....	11-5
Drive Chain.....	11-6
Drive Chain Slack Inspection .....	11-6
Drive Chain Slack Adjustment .....	11-6
Wheel Alignment Inspection/Adjustment .....	11-6
Drive Chain Wear Inspection .....	11-6
Drive Chain Lubrication.....	11-6
Drive Chain Removal .....	11-6
Drive Chain Installation .....	11-6
Drive Chain Replacement.....	11-6
Sprocket, Coupling .....	11-10
Engine Sprocket Removal .....	11-10
Engine Sprocket Installation .....	11-10
Rear Sprocket Removal.....	11-11
Rear Sprocket Installation.....	11-11
Coupling Bearing Removal .....	11-11
Coupling Bearing Installation .....	11-11
Coupling Installation.....	11-12
Coupling Bearing Inspection .....	11-12
Coupling Bearing Lubrication.....	11-12
Coupling Damper Inspection.....	11-12
Sprocket Wear Inspection.....	11-13
Rear Sprocket Warp Inspection .....	11-13

# 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	127	13	94	MO
3	Rear sprocket nut	59	6.0	43	
4	Engine sprocket cover damper bolts	6.9	0.7	61 in·lb	L
5	Speed sensor bolt	6.9	0.7	61 in·lb	L
6	Rear axle nut	127	13	94	

7. Drive chain joint (ZR1000-A2 ~ )

G: Apply grease.

HO: Apply heavy oil.

L: Apply a non-permanent locking agent.

MO: Apply molybdenum disulfide oil.

R: Replacement Parts

## 11-4 FINAL DRIVE

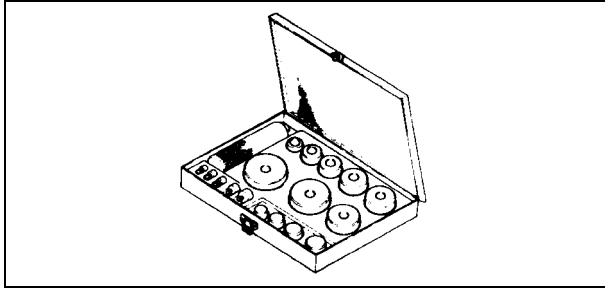
### Specifications

Item	Standard	Service Limit
<b>Drive Chain:</b>		
Chain slack	20 ~ 30 mm (0.8 ~ 1.2 in.)	- - -
20-link length	317.5 ~ 318.2 mm (12.50 ~ 12.53 in.)	323 mm (12.7 in.)
Standard chain		
Make	ENUMA	- - -
Type	EK525UVXL2, Endless	- - -
Link	112 links	- - -
<b>Sprockets:</b>		
Rear sprocket warp	0.4 mm (0.016 in.) or less	0.5 mm (0.020 in.)

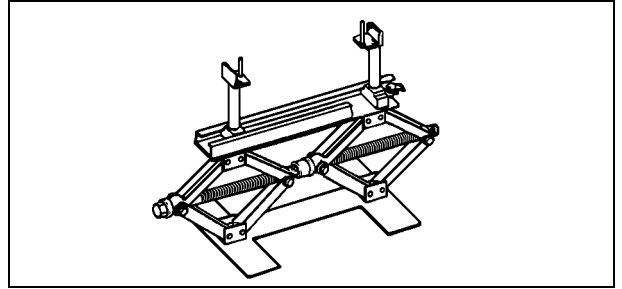
**Special Tools**

---

**Bearing Driver Set:  
57001-1129**



**Jack:  
57001-1238**



## 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/Adjustment in the Periodic Maintenance chapter.

#### *Drive Chain Wear Inspection*

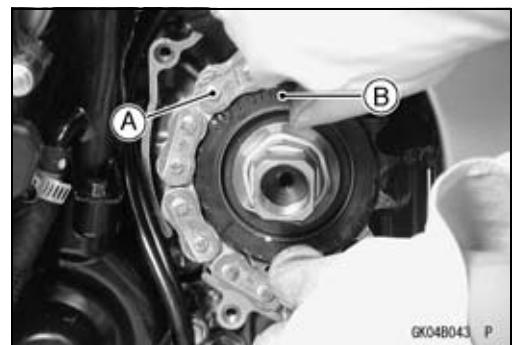
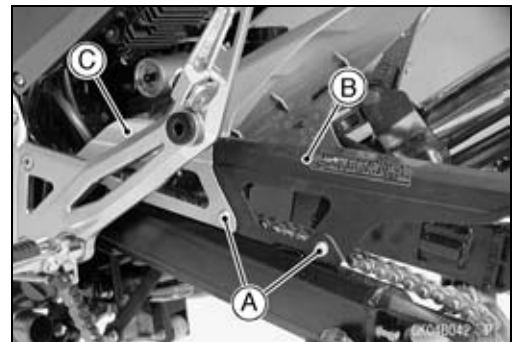
- Refer to the Drive Chain Wear Inspection in the Periodic Maintenance chapter.

#### *Drive Chain Lubrication*

- Refer to the Drive Chain Lubrication in the Periodic Maintenance chapter.

#### *Drive Chain Removal*

- Remove:
  - Rear Wheel (see Wheels/Tires chapter.)
  - Right Side Muffler Body (see Engine Top End chapter.)
  - Chain Cover Screws [A]
  - Chain Cover [B]
  - Mud Guard [C] (see Frame chapter.)
  - 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
  - Mud Guard
  - Chain Cover
  - Right Side Muffler Body
- Adjust the chain slack after installing the chain (see Slack Adjustment).

#### *Drive Chain Replacement*

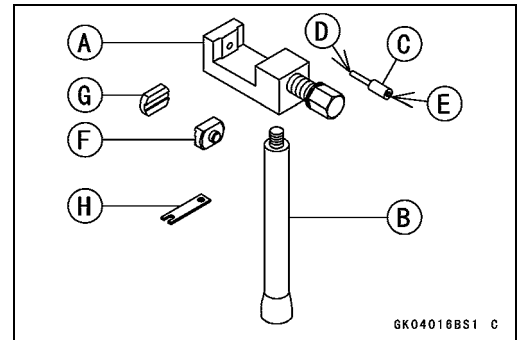
- Remove:
  - Chain Cover (see Drive Chain Removal)
  - Engine Sprocket Cover (see Engine Sprocket Removal)

Drive Chain

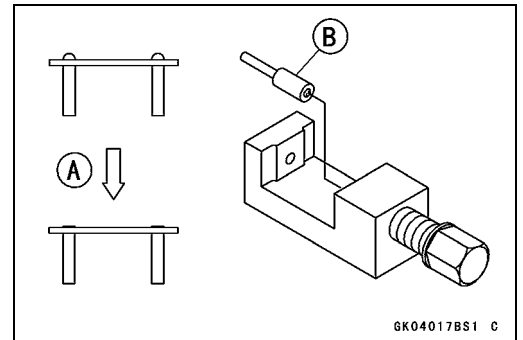
EK JOINT TOOL #50

- Body [A]
- Handlebar [B]
- Cutting and Riveting Pin [C]
- For Cutting [D]
- For Riveting [E]
- Plate Holder (A) [F]
- Plate Holder (B) [G]
- Gauge [H]

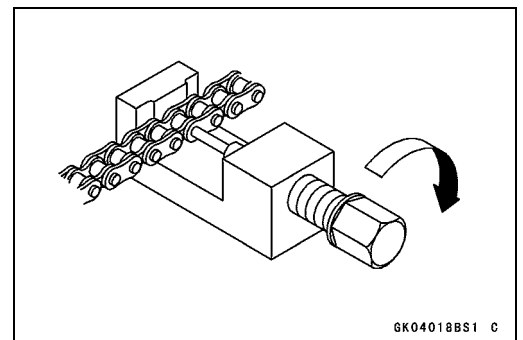
- Grind [A] pin head to make it flat.
- Set cutting and riveting pin [B] as shown.



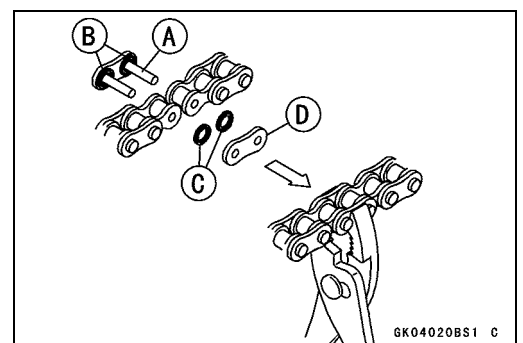
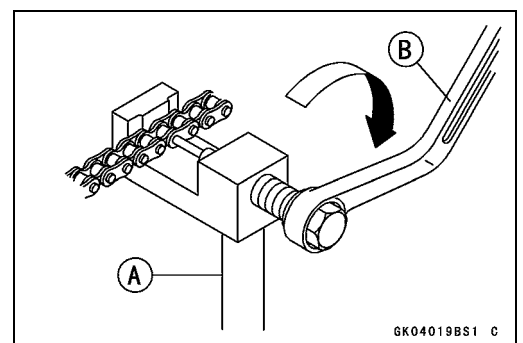
- Screw pin holder until it touches chain pin.
- Be sure that cutting pin hits center of chain pin.



- Screw handlebar [A] into body.
- Turn pin holder with wrench [B] clockwise to extract chain pin.



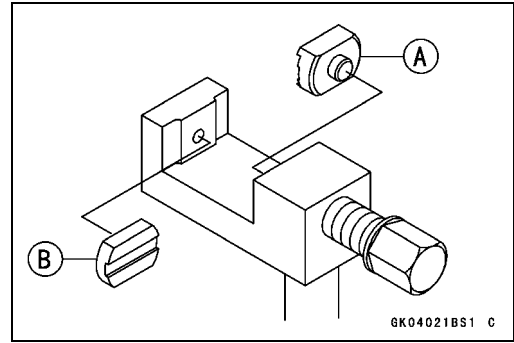
- Replace the link pin, link plate and grease seals.
- Apply grease to the link pins [A] and grease seals [B] [C].
- Engage the drive chain on the engine and rear sprockets.
- Insert the link pins in the drive chain ends.
- Install the grease seals [C].
- Install the link plate so that the mark [D] faces out.
- Push link plate by hand or plier to fix it.
- In case of grease seal chain, be sure to set grease seals correctly.



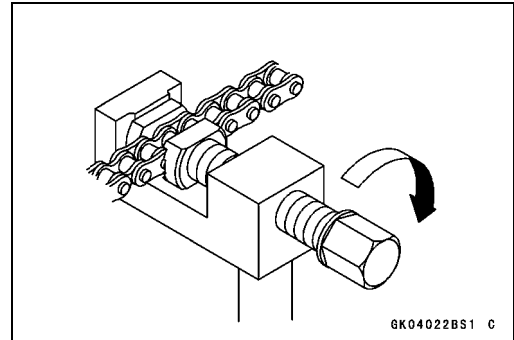
# 11-8 FINAL DRIVE

## Drive Chain

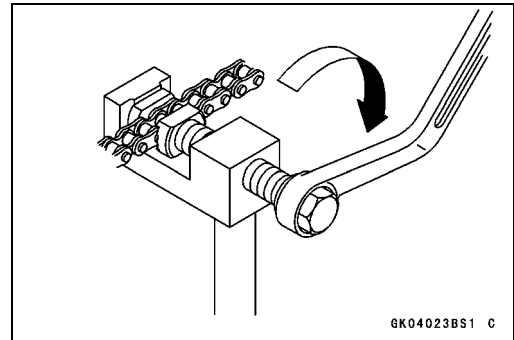
- Set plate holder (A) [A] and plate holder (B) [B] on the body.



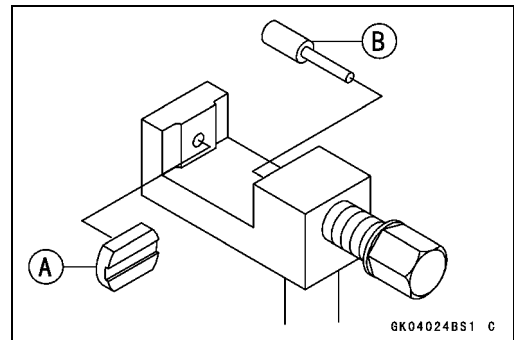
- Fit plate holder (A) to link plate.
- Turn pin holder by hand until plate holder (B) touches the other link plate.



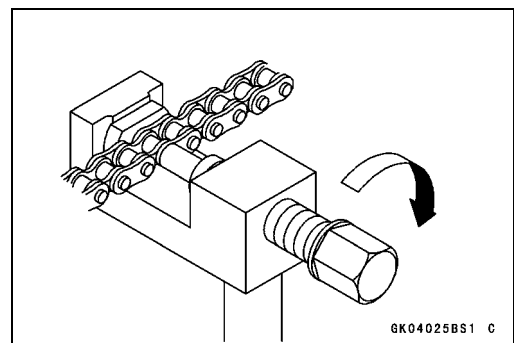
- Turn pin holder by wrench clockwise until two pins of link come into groove of plate holder (A).
- Take off plate holder.



- Set plate holder (B) [A] and cutting and riveting pin [B] as shown.



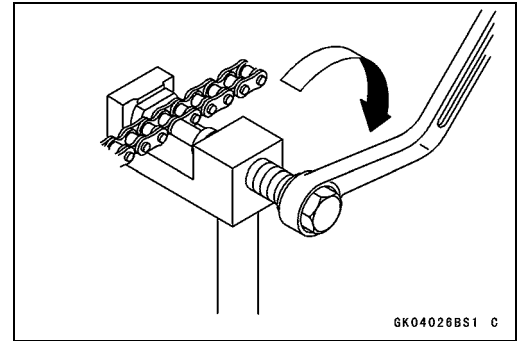
- Turn pin holder until riveting pin touches link pin.





**Drive Chain**

- Turn wrench clockwise until tip of riveting pin hits of link pin.
- Rivet it.
- Some work for the other link pin.



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- After staking, check the staked area of the link pin for cracks.
- Measure the outside diameter [A] of the link pin and link plates outside width [B].

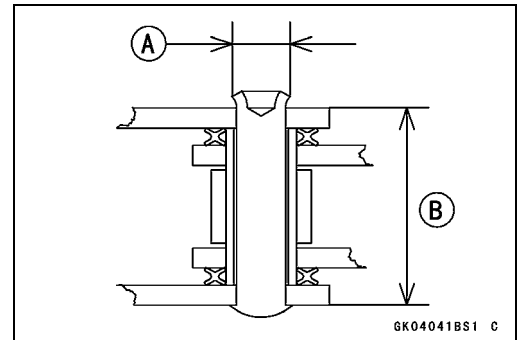
**Link Pin Outside Diameter**

**Standard:** 5.6 ~ 6.0 mm (0.22 ~ 0.24 in.)

**Link Plates Outside Width**

**Standard:** 19.85 ~ 20.00 mm (0.781 ~ 0.787 in.)

- ★ If the reading exceeds the specified length, cut and rejoin the chain again.
- Check:
  - Movement of the rollers
- Adjust the drive chain slack after installing the chain (see Drive Chain Slack Adjustment in the Periodic Maintenance chapter).



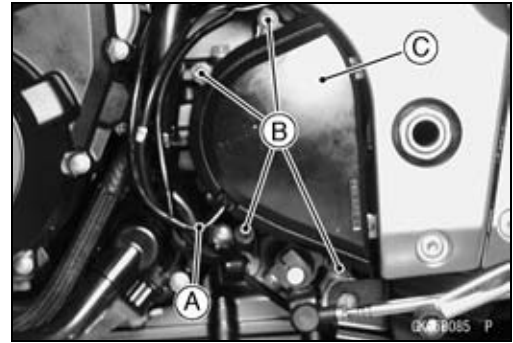
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## 11-10 FINAL DRIVE

### Sprocket, Coupling

#### Engine Sprocket Removal

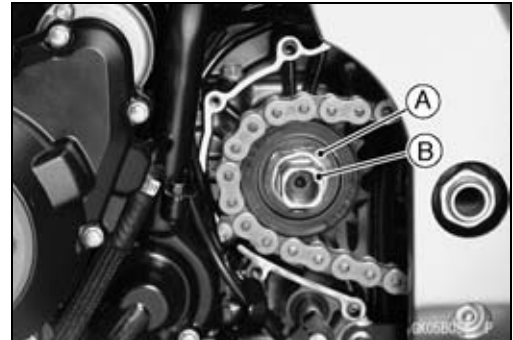
- Remove:
  - Speed Sensor [A] Connector
  - Engine Sprocket Cover Bolts [B]
  - Engine Sprocket Cover [C] with Speed Sensor



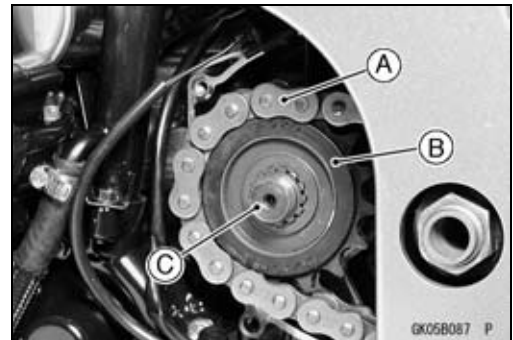
- Flatten out the bended washer [A].
- Remove the engine sprocket nut [B] and washer.

#### NOTE

○When loosening the engine sprocket nut, hold the rear brake on.



- Using the jack, raise the rear wheel off the ground.  
**Special Tool - Jack : 57001-1238**
- Loosen the drive chain (see Slack Adjustment).
- 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 [A] so that "OUTSIDE" letters [B] face outward.
- Apply molybdenum disulfide oil 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 : 127 N·m (13 kgf·m, 94 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 Drive Chain Slack Adjustment in the Periodic Maintenance chapter).



## Sprocket, Coupling

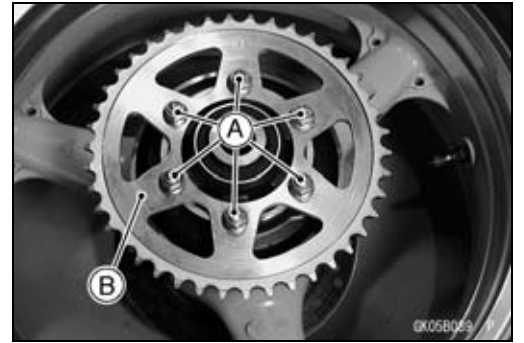
### Rear Sprocket Removal

- 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].



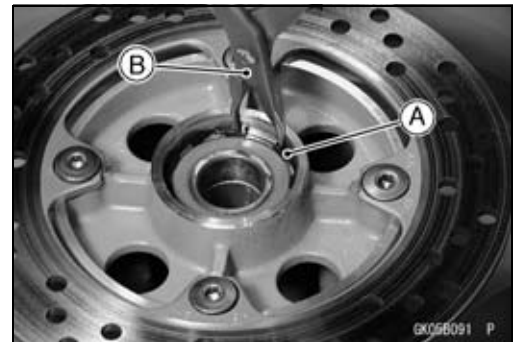
### Rear Sprocket Installation

- 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).

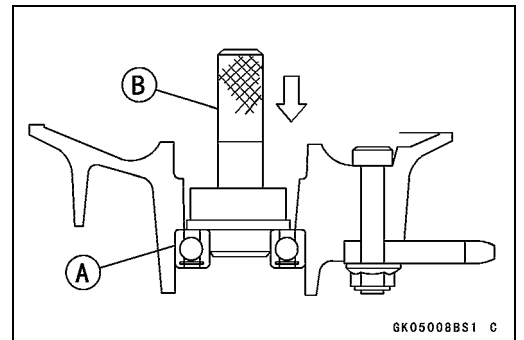


### Coupling Bearing Removal

- Remove:
  - Coupling
  - Grease Seal
  - Circlip [A]

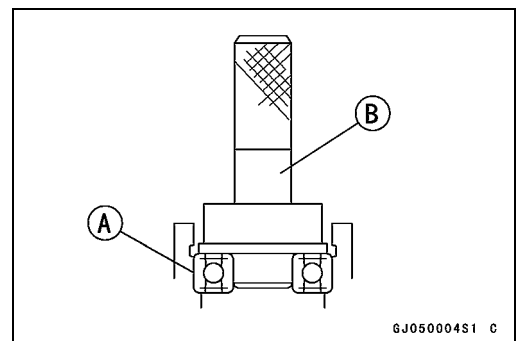


- Remove the bearing [A] by tapping from the wheel side.
- Special Tool - Bearing Driver Set: 57001-1129 [B]**



### 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]**
- Pack the bearing with high temperature grease.
  - Replace the circlip with a new one.



# 11-12 FINAL DRIVE

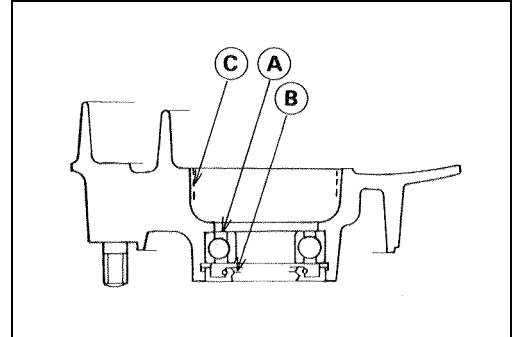
## Sprocket, Coupling

- 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.
  - Ball Bearing [A]
  - Coupling Grease Seal [B]
  - Coupling Internal Surface [C]



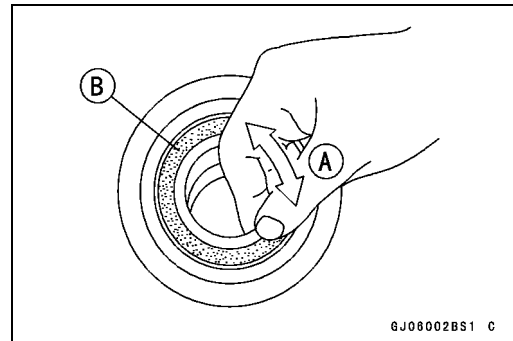
### Coupling Bearing Inspection

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.



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### Coupling Bearing Lubrication

- Pack the bearing with good quality bearing grease. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing.

### Coupling Damper Inspection

- Remove the rear wheel coupling, and inspect the rubber dampers [A].
- Replace the damper if it appears damaged or deteriorated.

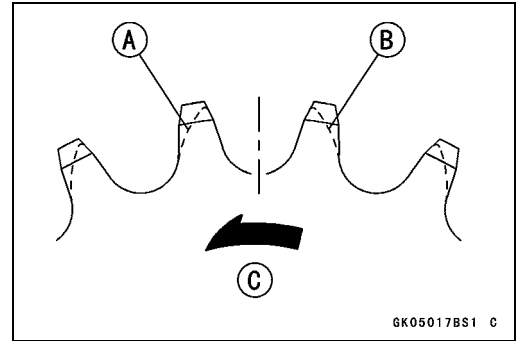


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## Sprocket, Coupling

### 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 Drive Chain Wear Inspection).
- [A] Worn Tooth (Engine Sprocket)  
 [B] Worn Tooth (Rear Sprocket)  
 [C] Direction of Rotation

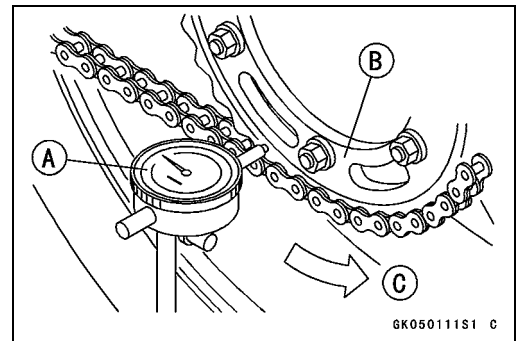


### NOTE

- 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 (see Wheels/Tires chapter) so that it will turn freely.
- Set a dial gauge [A] against the rear sprocket [B] near the teeth as shown, and rotate [C] the rear wheel to measure the sprocket runout (warp). The difference between the highest and lowest dial gauge readings is the amount of runout (warp).
- ★ If the runout exceeds the service limit, replace the rear sprocket.



### Rear Sprocket Warp

- Standard:** 0.4 mm (0.016 in.) or less  
**Service Limit:** 0.5 mm (0.020 in.)



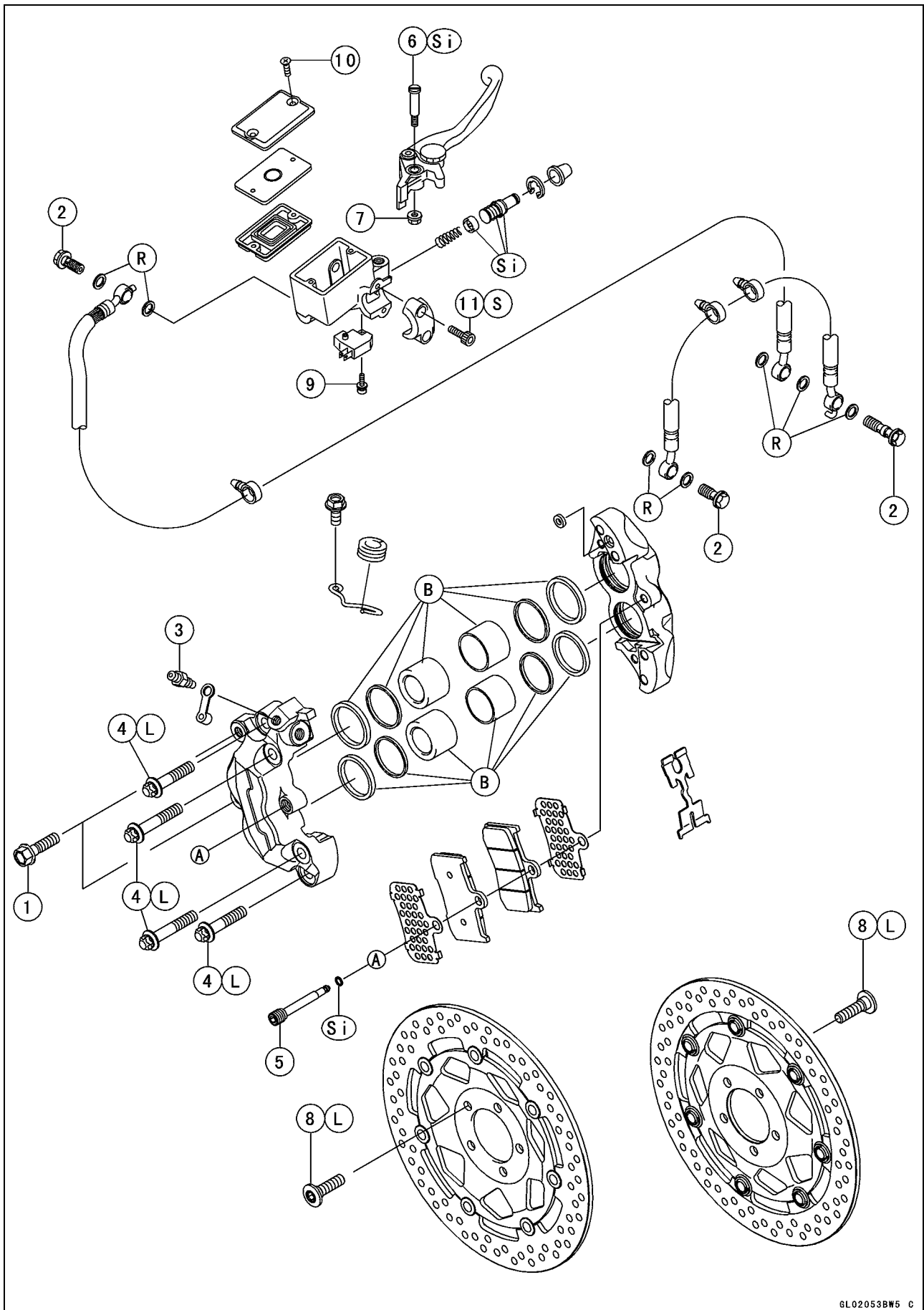
# Brakes

## Table of Contents

Exploded View .....	12-2	Brake Pad Wear Inspection .....	12-16
Specifications .....	12-6	Master Cylinder .....	12-17
Special Tool .....	12-7	Front Master Cylinder Removal ...	12-17
Brake Lever, Brake Pedal.....	12-8	Front Master Cylinder Installation	12-17
Brake Lever Position Adjustment.	12-8	Rear Master Cylinder Removal....	12-18
Brake Pedal Position Inspection ..	12-8	Rear Master Cylinder Installation.	12-18
Brake Pedal Position Adjustment.	12-8	Front Master Cylinder	
Calipers .....	12-9	Disassembly.....	12-18
Front Caliper Removal .....	12-9	Rear Master Cylinder	
Rear Caliper Removal.....	12-9	Disassembly.....	12-19
Caliper Installation .....	12-10	Master Cylinder Assembly .....	12-19
Front Caliper Disassembly.....	12-10	Master Cylinder Inspection (Visual	
Front Caliper Assembly.....	12-11	Inspection).....	12-19
Rear Caliper Disassembly .....	12-12	Brake Disc .....	12-20
Rear Caliper Assembly .....	12-13	Brake Disc Removal .....	12-20
Caliper Fluid Seal Damage .....	12-13	Brake Disc Installation .....	12-20
Caliper Dust Seal/Friction Boot		Brake Disc Wear .....	12-20
Damage.....	12-13	Brake Disc Warp .....	12-20
Caliper Piston and Cylinder		Brake Fluid .....	12-21
Damage.....	12-14	Brake Fluid Level Inspection.....	12-21
Caliper Holder Shaft Wear .....	12-14	Brake Fluid Change .....	12-21
Brake Pads .....	12-15	Brake Line Bleeding.....	12-21
Front Brake Pad Removal.....	12-15	Brake Hose .....	12-22
Front Brake Pad Installation.....	12-15	Brake Hose Removal/Installation.	12-22
Rear Brake Pad Removal .....	12-15	Brake Hose Inspection.....	12-22
Rear Brake Pad Installation .....	12-16		

# 12-2 BRAKES

## Exploded View





## Exploded View

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front caliper mounting bolts	25	2.5	18	
2	Brake hose banjo bolt	25	2.5	18	
3	Bleed valve	7.8	0.80	69 in·lb	
4	Front caliper assembly bolts	22	2.2	16	L
5	Front brake pad pin bolt	17	1.7	12	
6	Brake lever pivot bolt	1.0	0.10	9 in·lb	Si
7	Brake lever pivot bolt locknut	5.9	0.60	52 in·lb	
8	Brake disc mounting bolts	27	2.8	20	L
9	Front brake light switch screws	1.2	0.12	11 in·lb	
10	Front reservoir cap screws	1.5	0.15	13 in·lb	
11	Front master cylinder clamp bolts	8.8	0.9	78 in·lb	S

B: Apply brake fluid.

L: Apply a non-permanent locking agent.

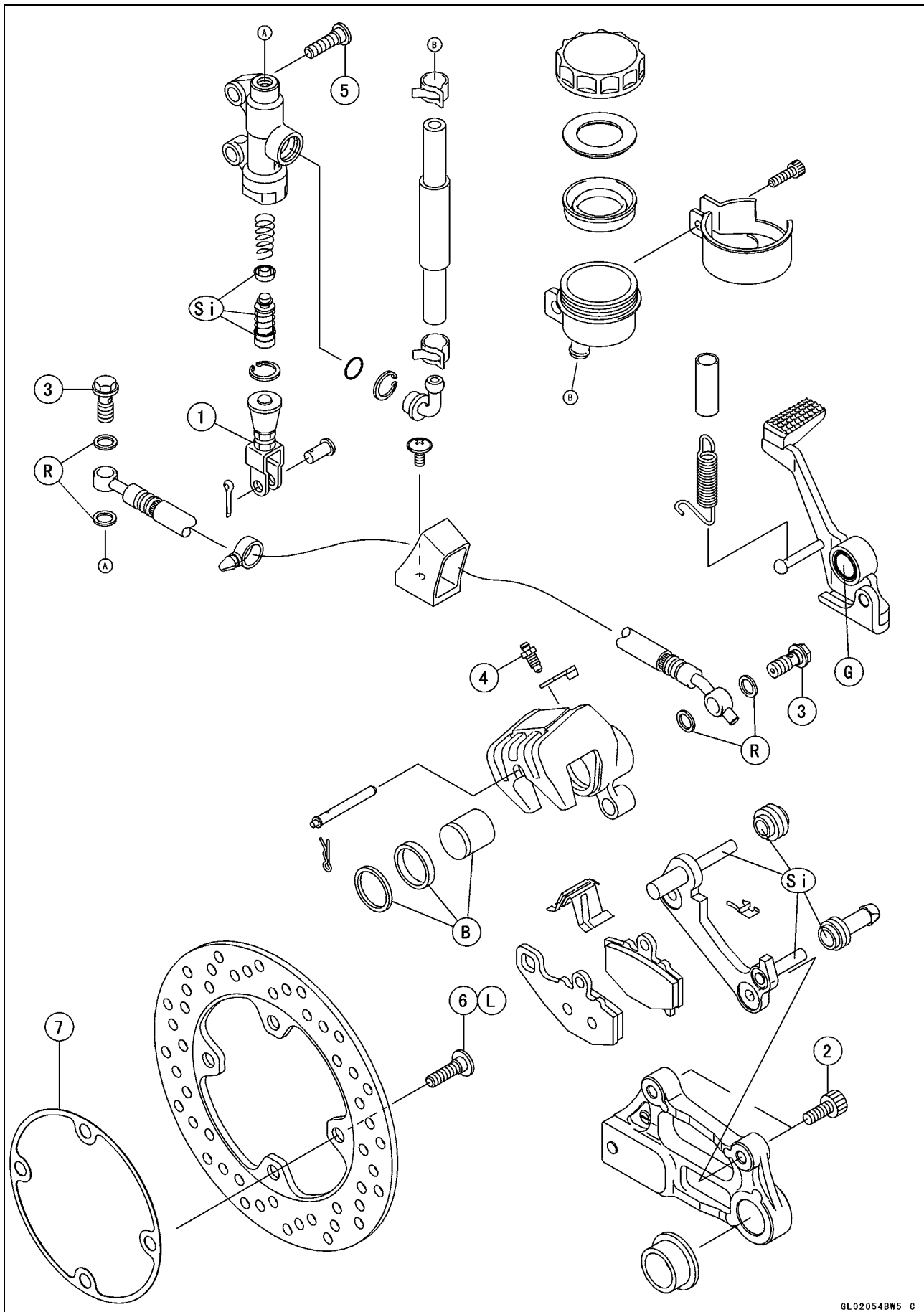
R: Replacement parts

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 lod locknut	18	1.8	13	
2	Rear caliper mounting bolts	25	2.5	18	
3	Brake hose banjo bolts	25	2.5	18	
4	Bleed valve	7.8	0.80	69 in·lb	
5	Rear master cylinder mounting bolts	25	2.5	18	
6	Brake disc mounting bolts	27	2.8	20	L

7. Gasket (Before Frame No. 005854)

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

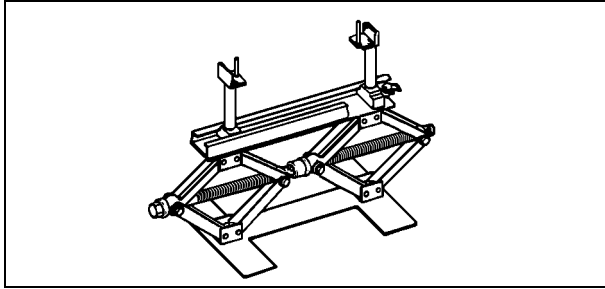
### Specifications

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 mm (0.16 in.)	1 mm (0.04 in.)
Rear	5 mm (0.20 in.)	1 mm (0.04 in.)
<b>Brake Discs:</b>		
Thickness:		
Front	5.8 ~ 6.2 mm (0.23 ~ 0.24 in.)	5.5 mm (0.217 in.)
Rear	4.8 ~ 5.2 mm (0.19 ~ 0.20 in.)	4.5 mm (0.177 in.)
Runout	Not more than 0.2 mm (0.008 in.)	0.3 mm (0.012 in.)

**Special Tool**

---

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



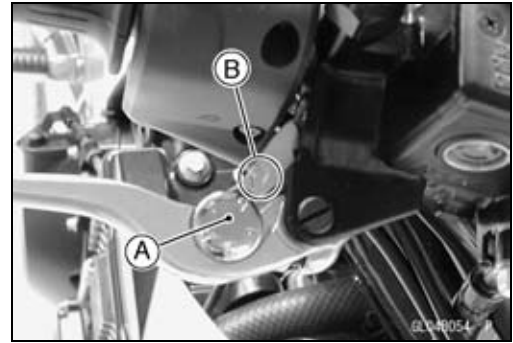
## 12-8 BRAKES

### 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.



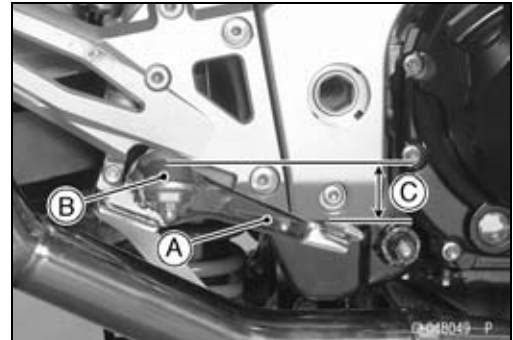
#### Brake Pedal Position Inspection

- Check that the brake pedal [A] is in the correct position. [B] Footpeg

##### Pedal Position

**Standard:** About 47 mm (1.85 in.) [C] below top of footpeg

- ★ If it is incorrect, adjust the brake pedal position.

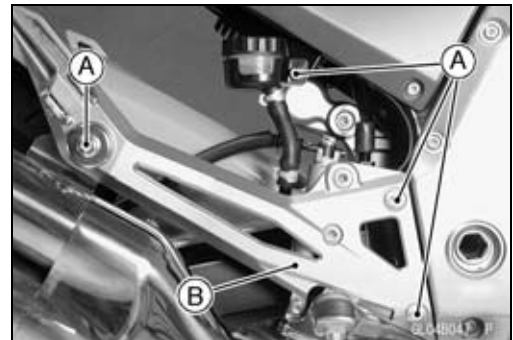


#### Brake Pedal Position Adjustment

##### NOTE

○ Usually it is not necessary to adjust the pedal position, but always adjust it when the push rod locknut has been loosened.

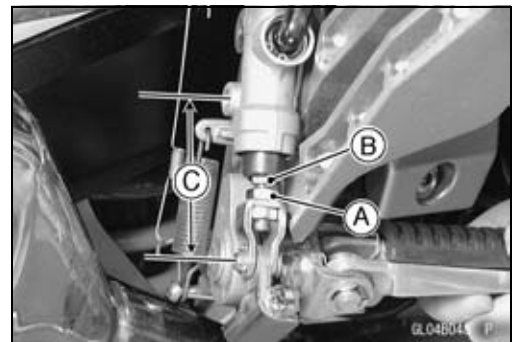
- Unscrew the bolts [A] and remove the guard bracket [B].



- Loosen the locknut [A] and turn the push rod with the hex head [B] to achieve the correct pedal position.
- ★ If the length [C] shown is  $70 \pm 1$  mm ( $2.76 \pm 0.04$  in.), the pedal position will be within the standard range.
- Tighten:

**Torque - Rear Master Cylinder Push Rod Locknut:**  
**18 N·m (1.8 kgf·m, 13.0 ft·lb)**

- Check the brake light switch operation (see Brake Light Timing Inspection/Adjustment in the Periodic Maintenance chapter).



## Calipers

### Front Caliper Removal

- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.

#### CAUTION

**Do not loosen the caliper assembly bolts [D]. Take out only the caliper mounting bolts for caliper removal. Loosening the caliper assembly bolts will cause brake fluid leakage.**

- Unscrew the banjo bolt and remove the brake hose [E] from the caliper (see Brake Hose Removal/Installation).

#### CAUTION

**Immediately wash away any brake fluid that spills.**

#### NOTE

○If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Front Caliper Disassembly).

### Rear Caliper Removal

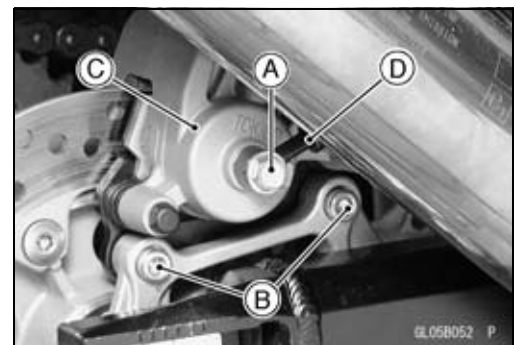
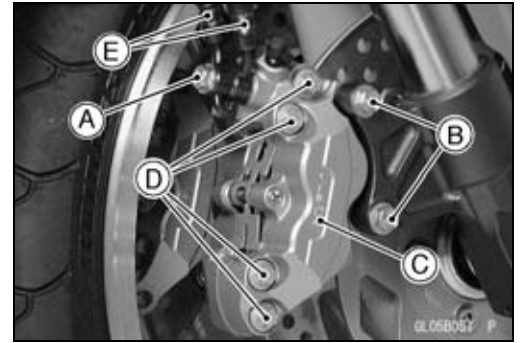
- Loosen the banjo bolt [A] at the brake hose lower end, and tighten it loosely.
- Unscrew the caliper mounting bolts [B], and detach the caliper [C] from the disc.
- Unscrew the banjo bolt and remove the brake hose [D] from the caliper (see Brake Hose Removal/Installation).

#### CAUTION

**Immediately wash away any brake fluid that spills.**

#### NOTE

○If the caliper is to be disassembled after removal and if compressed air is not available, disassemble the caliper before the brake hose is removed (see Rear Caliper Disassembly).



## 12-10 BRAKES

### Calipers

#### 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): 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Caliper Mounting Bolts (Rear): 25 N·m (2.5 kgf·m, 18 ft·lb)**
  - Brake Hose Banjo Bolt: 25 N·m (2.5 kgf·m, 18 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.**

#### Front Caliper Disassembly

- Loosen the front caliper assembly bolts [A] and banjo bolt [B] and tighten them loosely.
- Remove:
  - Front Caliper (see Caliper Removal) [C]
  - Brake Pad
  - Front Caliper Assembly Bolts
  - O-rings

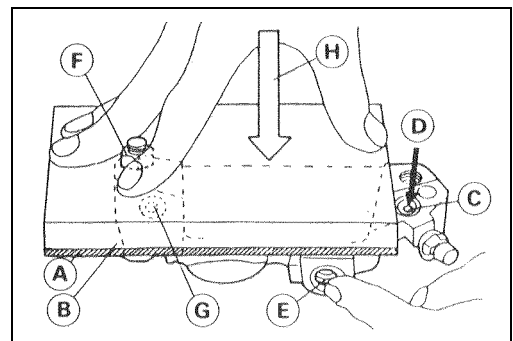


- Using compressed air, remove the pistons. One way to remove the pistons is as follows.
- Install a rubber gasket [A] and a wooden board [B] more than 10 mm (0.4 in.) thick on the caliper half, and fasten them together with a suitable bolt and nut as shown. Leave one of the oil passages [C] open.
- Lightly apply compressed air [D] to the oil passage until the pistons hit the rubber gasket. Block the hose joint opening [E] during this operation if the caliper half has the opening.

[F] Bolt and Nut

[G] Oil Passage sealed by Rubber Gasket

[H] Push down.





## Calipers

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

**NOTE**

- If compressed air is not available, do as follows for both calipers coincidentally, with the brake hose connected to the caliper.
- Prepare a container for brake fluid, and perform the work above it.
- Remove the spring and pads (see *Front Brake Pad Removal*).
- Pump the brake lever until the pistons come out of the cylinders, and then disassemble the caliper.

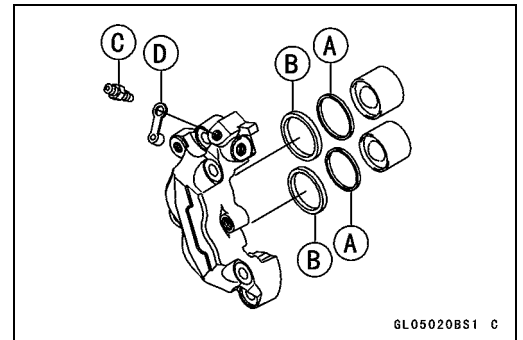
*Front Caliper Assembly*

- Clean the caliper parts except for the pads.

**CAUTION**

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

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

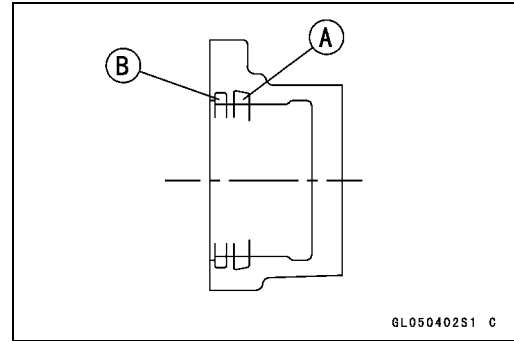


GL05020BS1 C

## 12-12 BRAKES

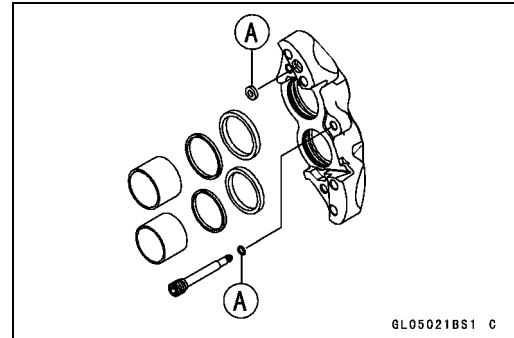
### Calipers

- 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.



- Replace the O-rings [A] if they are damaged.
- Apply brake fluid to the outside of the pistons, and push them into each cylinder by hand.
- Be sure to install the O-rings.
- Apply a non-permanent locking agent the caliper assembly bolts and torque them.

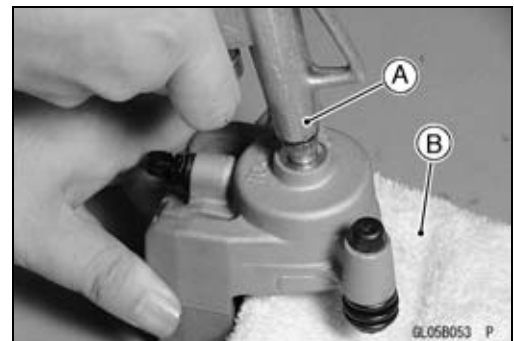
**Torque - Front Caliper Assembly Bolts: 22 N·m (2.2 kgf·m, 16 ft·lb)**



- Install the pads (see Front Brake Pad Installation).
- 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 Rear Brake Pad Removal).
- Using compressed air, remove the piston.
- Cover the caliper opening with a clean, heavy cloth [B].
- Remove the piston by lightly applying compressed air [A] to where the brake line fits into the caliper.



### **⚠ WARNING**

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

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

#### **NOTE**

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

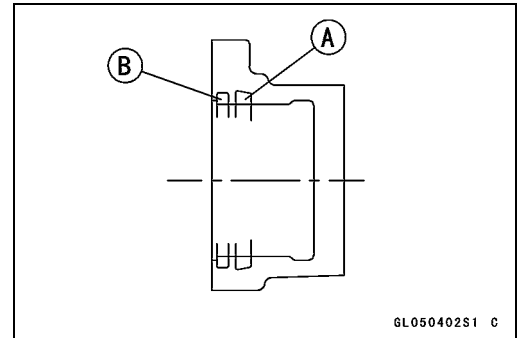
## Calipers

### Rear Caliper Assembly

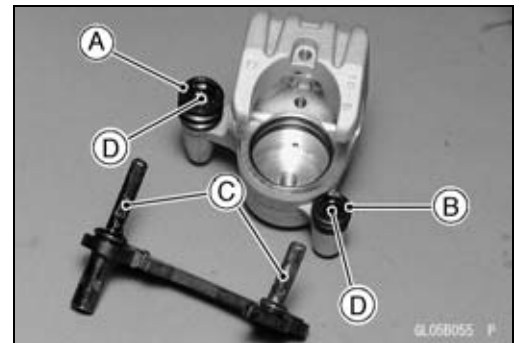
- Clean the caliper parts except for the pads.

<b>CAUTION</b>
<b>For cleaning the parts, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol.</b>

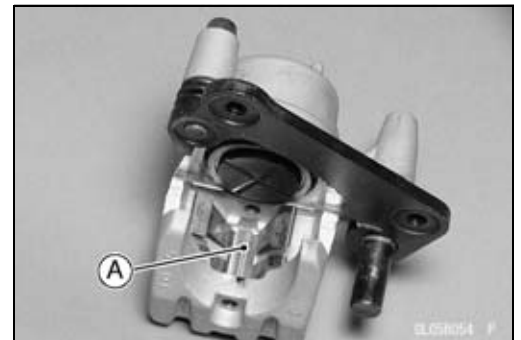
- Install the bleed valve and rubber cap.
  - Torque - Bleed Valve: 7.8 N·m (0.80 kgf·m, 69 in·lb)**
- Replace the fluid seal [A] with a new one.
  - Apply brake fluid to the fluid seal, and install it into the cylinder by hand.
- Replace the dust seal [B] with a new one if it is damaged.
  - Apply brake fluid to the dust seal, and install it into the cylinder by hand.



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



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



### Caliper Fluid Seal Damage

- Refer to Caliper Fluid Seal Damage in the Periodic Maintenance chapter.

### Caliper Dust Seal/Friction Boot Damage

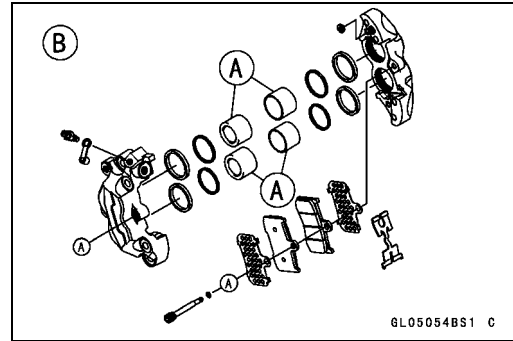
- Refer to Caliper Dust Seal/Friction Boot Damage in the Periodic Maintenance chapter.

## 12-14 BRAKES

### Calipers

#### *Caliper Piston and Cylinder Damage*

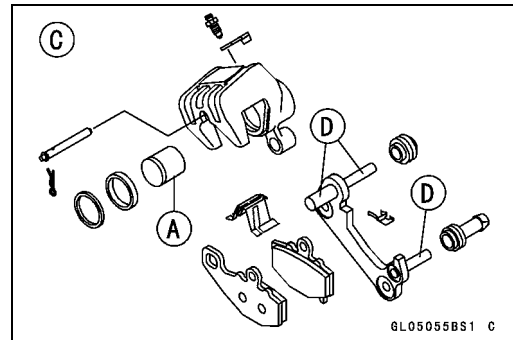
- Visually inspect the piston [A] and cylinder surfaces.
- ★ Replace the caliper if the cylinder and piston are badly scores or rusty.
  - Front Caliper [B]
  - Rear Caliper [C]



#### *Caliper Holder Shaft Wear*

The caliper body must slide smoothly on the caliper holder shaft [D]. 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 rubber friction boots are not damaged.
- ★ If the rubber friction boot is damaged, replace the rubber friction boot. To replace the friction boot, remove the pads and the caliper bracket.
- ★ If the caliper holder shaft is damage, replace the caliper bracket.



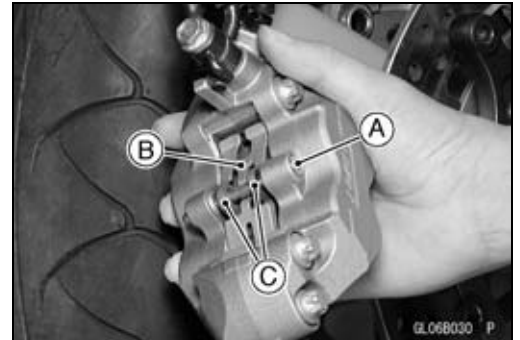
## Brake Pads

### Front Brake Pad Removal

- Remove:
  - Mounting Bolts [A]



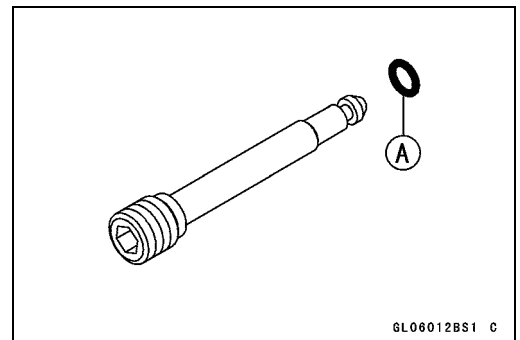
- Remove:
  - Pad Pin Bolt [A]
  - Pad Spring [B]
  - Brake Pads [C]



### Front Brake Pad Installation

- Push the caliper pistons in by hand as far as they will go.
- Apply silicone grease to the stopper ring [A].
- Install:
  - Brake Pads
  - Pad Spring
  - Pad Pin Bolts

**Torque - Front Brake Pad Pin Bolts: 17 N·m (1.7 kgf·m, 12 ft·lb)**

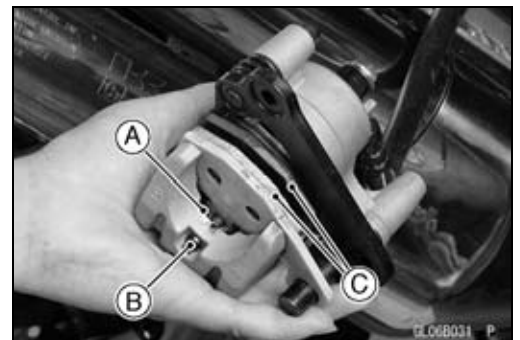


### **⚠ WARNING**

**Do not attempt to drive the motorcycle until a full brake lever is obtained by pumping the brake lever until the pads are against the disc. The brake will not function on the first application of the lever if this is not done.**

### Rear Brake Pad Removal

- Remove the caliper with the hose installed.
- Remove:
  - Clip [A]
  - Pad Pin [B]
  - Brake Pads [C]



## 12-16 BRAKES

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### Brake Pads

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#### *Rear Brake Pad Installation*

- Push the caliper piston in by hand as far as it will go.
- Install:
  - Brake Pads
  - Pad Pin
  - Clip
- 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.**

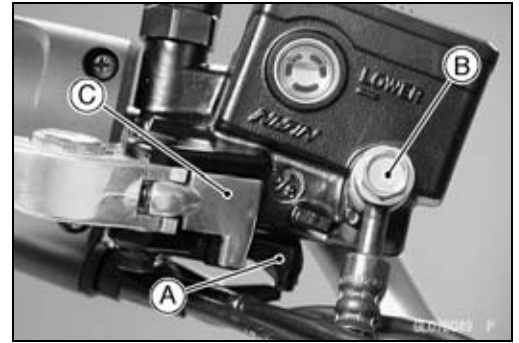
#### *Brake Pad Wear Inspection*

- Refer to the Brake Pad Wear Inspection in the Periodic Maintenance chapter.

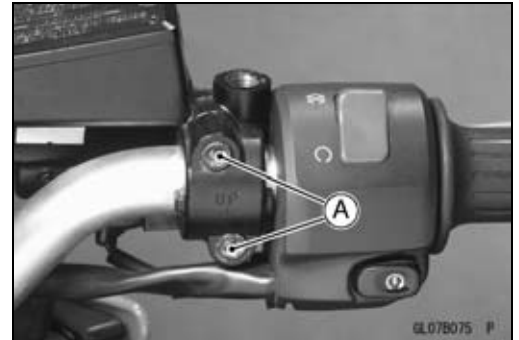
## Master Cylinder

### Front Master Cylinder Removal

- Disconnect the front brake light switch connectors [A].
- Remove the banjo bolt [B] to disconnect the brake hose from the master cylinder [C] (see Brake Hose Removal/Installation).
- Remove the rear view mirror (see Steering chapter).

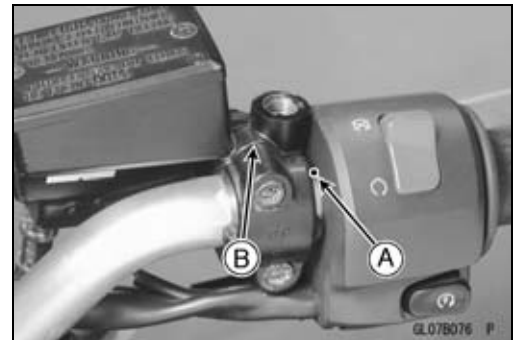


- Unscrew the clamp bolts [A], and take off the master cylinder as an assembly with the reservoir, brake lever, and brake switch installed.



### 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.



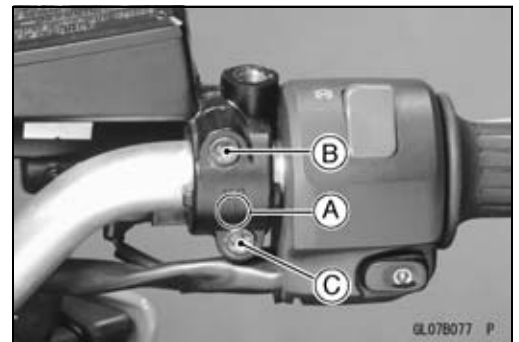
- The master cylinder clamp must be installed with the arrow mark [A] upward.
- Tighten the upper clamp bolt [B] first, and then the lower clamp bolt [C]. There will be a gap at the lower part of the clamp after tightening.

**Torque - Front Master Cylinder Clamp Bolts: 8.8 N·m (0.9 kgf·m, 78 in·lb)**

- Replace the washers on each side of the hose fitting with new ones.
- Tighten the brake hose banjo bolt.

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

- Bleed the brake line (see Brake Line Bleeding in the Periodic Maintenance chapter).
- Check the brake for good braking power, no brake drag, and no fluid leakage.
- Install the rear view mirror (see Steering chapter).



## 12-18 BRAKES

### Master Cylinder

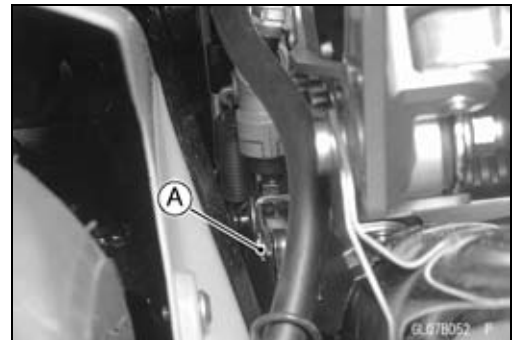
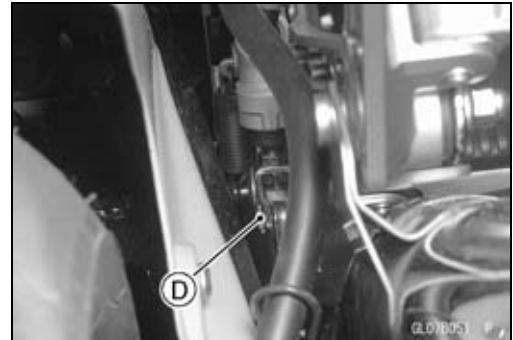
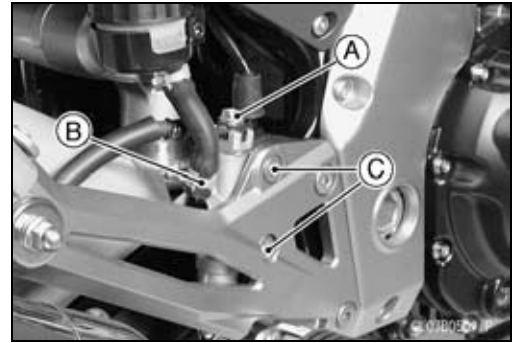
#### Rear Master Cylinder Removal

- Unscrew the brake hose banjo bolt [A] on the master cylinder (see Brake Hose Removal/Installation).
- Pull off the reservoir hose lower end [B], and drain the brake fluid into a container.
- Loosen the master cylinder mounting bolts [C] lightly.
- Remove the cotter pin [D].

#### NOTE

○ Pull off the joint pin while pressing down the brake pedal.

- Unscrew the master cylinder mounting bolts, and remove the master cylinder.



#### Rear Master Cylinder Installation

- Replace the cotter pin [A] with a new one.
- Replace the washers on each side of hose fitting with new ones.
- Tighten the following bolts.

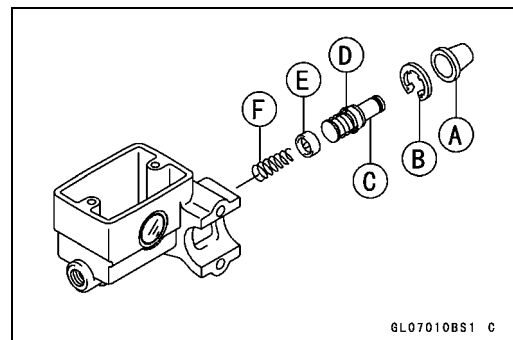
**Torque - Rear Master Cylinder Mounting Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**

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

- Bleed the brake line (see Brake Line Bleeding in the Periodic Maintenance chapter).
- Check the brake for good braking power, no brake drag, and no fluid leakage.

#### Front Master Cylinder Disassembly

- Remove the front master cylinder (see Front Master Cylinder Removal).
- 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].
- 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.**



## Master Cylinder

### Rear Master Cylinder Disassembly

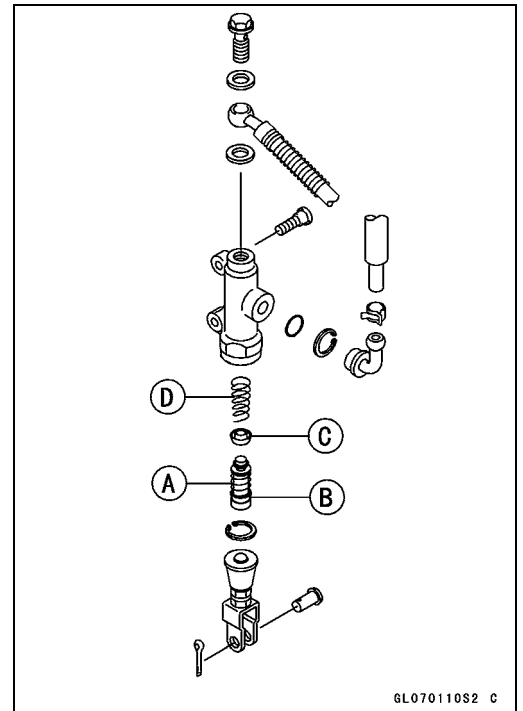
#### NOTE

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

- Remove the rear master cylinder (see Rear Master Cylinder Removal).
- Slide the dust cover on the push rod out of place, and remove the circlip.
- Pull out the push rod with the piston stop.
- Take off the piston [A], secondary cup [B], primary cup [C], and return spring [D].

#### CAUTION

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



### Master Cylinder Assembly

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

#### CAUTION

Except for the disc pads and disc, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning 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.

- Apply brake fluid to the removed 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)

### Master Cylinder Inspection (Visual Inspection)

- Refer to the Master Cylinder Inspection (Visual Inspection) in the Periodic Maintenance chapter.

## 12-20 BRAKES

### Brake Disc

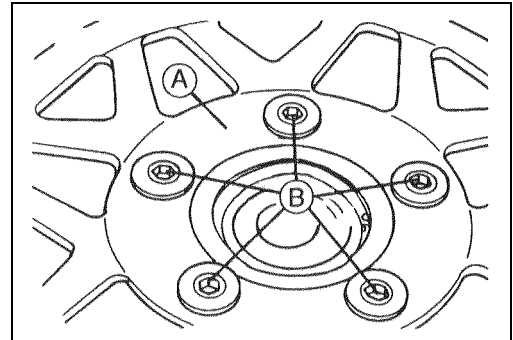
#### Brake Disc Removal

- Remove the wheel (see Wheels/Tires chapter).
- Unscrew the mounting bolts, and take off the disc.

#### Brake Disc Installation

- 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.
- [B] Measuring Area

#### Front Disc Thickness

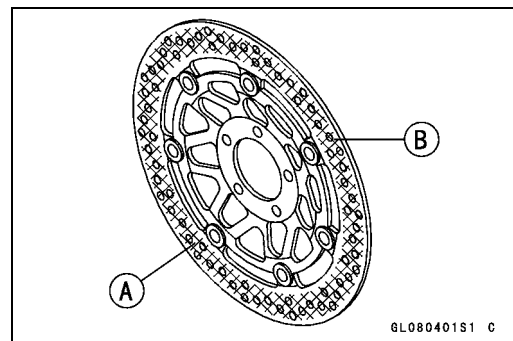
**Standard: 4.8 ~ 5.1 mm (0.19 ~ 0.20 in.)**

**Service Limit: 4.5 mm (0.18 in.)**

#### Rear Disc Thickness

**Standard: 4.8 ~ 5.1 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**

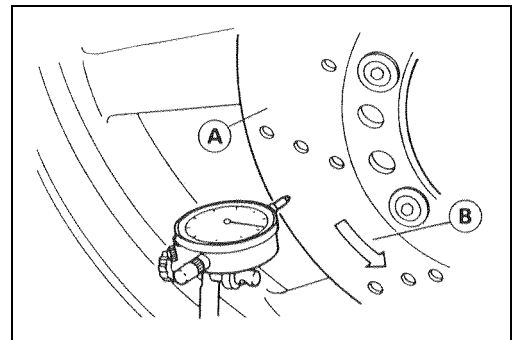
- For front disc inspection, turn the handlebar fully to one side.
- Set up a dial gauge against the disc [A] as shown and measure disc runout, while turning [B] the wheel by hand.
- ★ If runout exceeds the service limit, replace the disc.

#### Disc Runout

**Standard: Not more than 0.2 mm (0.008 in.)**

**Service Limit: 0.3 mm (0.012 in.)**

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



**Brake Fluid**

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*Brake Fluid Level Inspection*

- Refer to the Brake Fluid Level in the Periodic Maintenance chapter.

*Brake Fluid Change*

- Refer to the Brake Fluid Change in the Periodic Maintenance chapter.

*Brake Line Bleeding*

- Refer to the Brake Line Bleeding in the Periodic Maintenance chapter.

## 12-22 BRAKES

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### Brake Hose

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#### *Brake Hose Removal/Installation*

CAUTION
<p><b>Brake fluid quickly ruins painted or plastic surfaces; any spilled fluid should be completely wiped up immediately with wet cloth.</b></p>

- When removing the brake hose, take care not to spill the brake fluid on the painted or plastic parts.
- When removing the brake hose, temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
- There are washers on each side of the brake hose fitting. Replace them with new ones when installing.
- When installing the hoses, avoid sharp bending, kinking, flattening or twisting, and route the hoses according to Cable, Wire and Hose Routing section in General Information chapter.
- Tighten:
  - Torque - Brake Hose Banjo Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**
- Bleed the brake line after installing the brake hose (see Brake Line Bleeding in the Periodic Maintenance chapter).

#### *Brake Hose Inspection*

- Refer to the Brake Hoses and Connection Inspection in the Periodic Maintenance chapter.

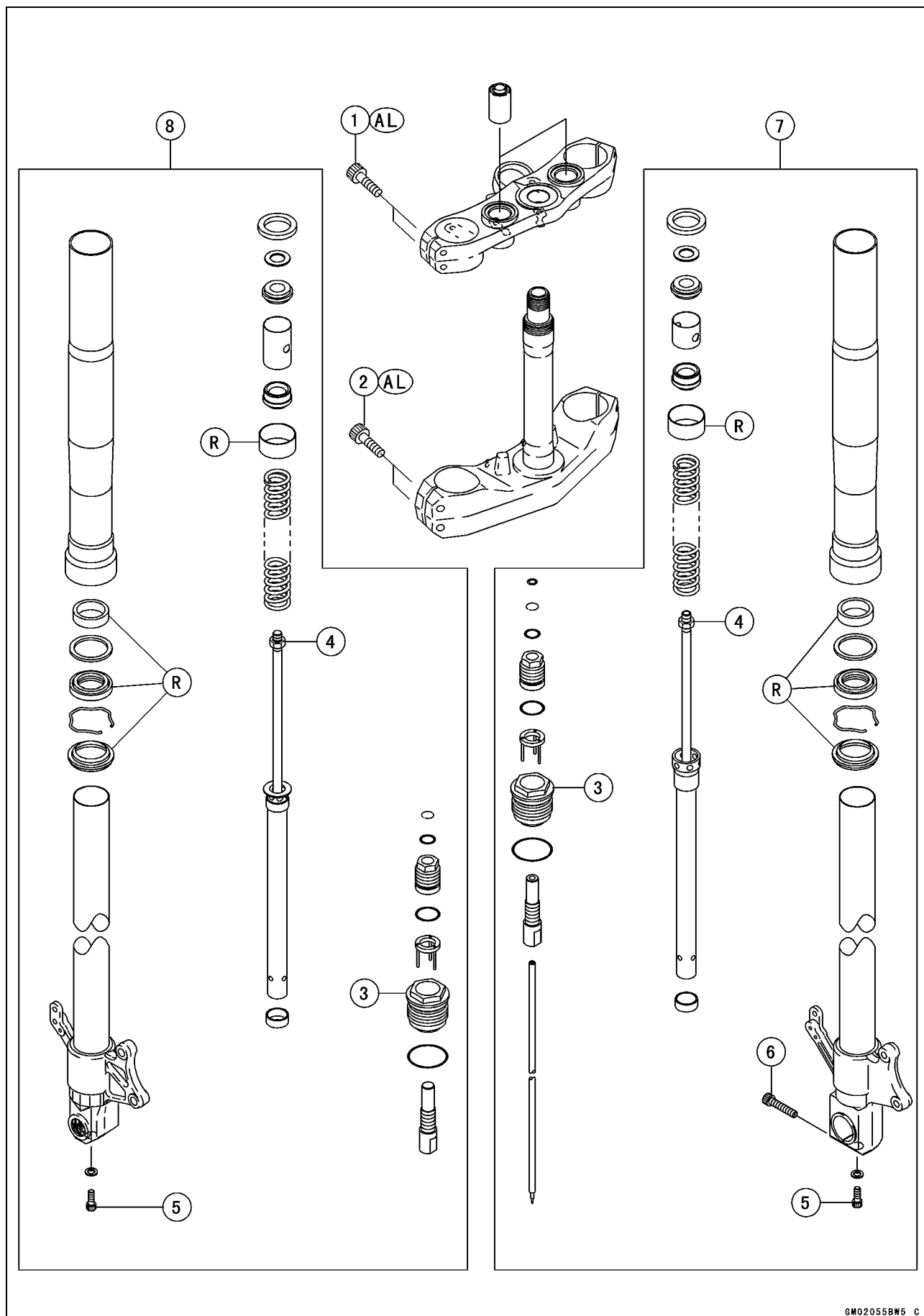
# Suspension

## Table of Contents

Exploded View .....	13-2
Specifications .....	13-6
Special Tools .....	13-7
Front Fork .....	13-8
Rebound Damping Force Adjustment (Only Right Fork Leg) .....	13-8
Spring Preload Adjustment .....	13-8
Front Fork Removal (each fork leg) .....	13-9
Front Fork Installation .....	13-9
Fork Oil Change .....	13-10
Front Fork Disassembly .....	13-13
Front Fork Assembly .....	13-14
Inner Tube, Outer Tube Inspection .....	13-15
Dust Seal Inspection .....	13-15
Spring Tension .....	13-16
Rear Shock Absorber .....	13-17
Rebound Damping Force Adjustment .....	13-17
Spring Preload Adjustment .....	13-17
Rear Shock Absorber Removal .....	13-18
Rear Shock Absorber Installation .....	13-19
Rear Shock Absorber Inspection .....	13-19
Rear Shock Absorber Scrapping .....	13-19
Swingarm .....	13-20
Swingarm Removal .....	13-20
Swingarm Installation .....	13-21
Swingarm Bearing Removal .....	13-21
Swingarm Bearing Installation .....	13-22
Swingarm Bearing, Sleeve Inspection .....	13-22
Swingarm Pivot Lubrication .....	13-22
Chain Slider Inspection .....	13-22
Tie-Rod, Rocker Arm .....	13-23
Tie-Rod Removal .....	13-23
Tie-Rod Installation .....	13-23
Rocker Arm Removal .....	13-23
Rocker Arm Installation .....	13-24
Rocker Arm/Tie-Rod Bearing, Sleeve Inspection .....	13-24
Unit-track Linkage Lubrication .....	13-24

# 13-2 SUSPENSION

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Front fork clamp bolts (Upper)	8.8	0.90	78 in·lb	AL
	Front fork clamp bolts (Upper): ZR1000-A2 ~	13	1.3	113 in·lb	
2	Front fork clamp bolts (Lower)	20	2.0	15	AL
	Front fork clamp bolts (Lower): ZR1000-A2 ~	30	3.1	22	
3	Front fork top plugs	35	3.6	26	
4	Piston rod nuts	20	2.0	15	
5	Front fork bottom Allen bolts	20	2.0	15	
6	Front axle clamp bolt	20	2.0	15	

7. Right fork leg

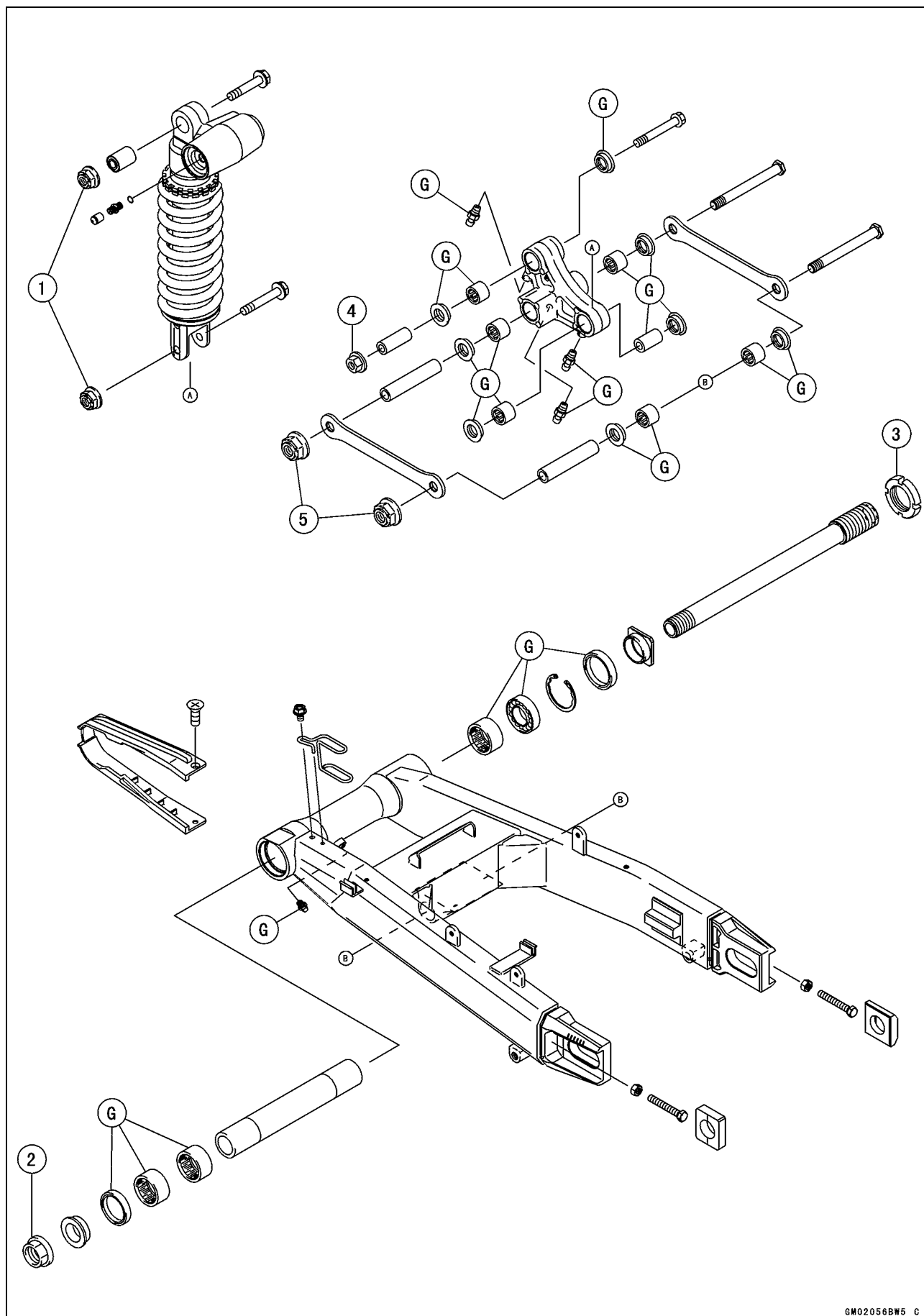
8. Left fork leg

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

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	127	13	94	
3	Swingarm pivot shaft locknut	98	10	72	
4	Rocker arm nut	34	3.5	25	
5	Tie-rod nuts	59	6.0	43	

G: Apply or add grease.

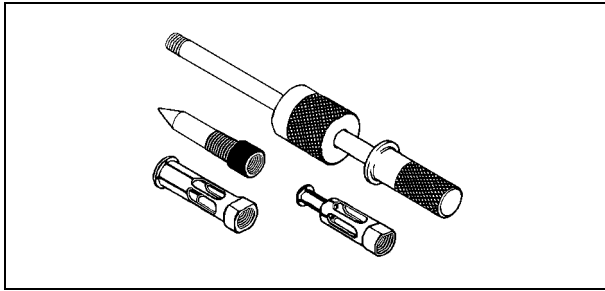
## 13-6 SUSPENSION

### Specifications

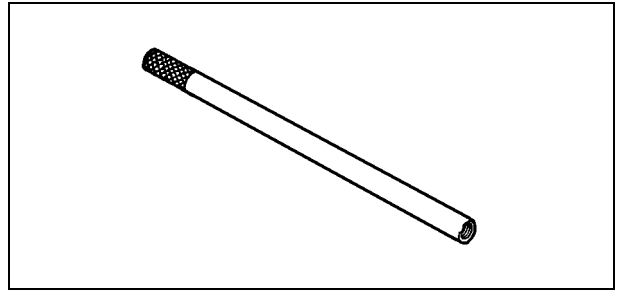
Item	Standard
<p><b>Front Fork (per one unit):</b></p> <p>Fork inner tube outside diameter</p> <p>Air Pressure</p> <p>Rebound damper setting (only right fork leg)</p> <p>Fork spring preload setting</p> <p>Fork oil viscosity</p> <p>Fork oil capacity:</p> <p>    Right fork leg</p> <p>    Left fork leg</p> <p>Fork oil level:</p> <p>    Right fork leg</p> <p>    Left fork leg</p> <p>Fork spring free length</p>	<p>41 mm (1.61 in.)</p> <p>Atmospheric pressure (Non-adjustable)</p> <p>1 turns out from the fully clockwise position (Usable Range: 0 ←→ 1 4/5 ~ 2 2/5 turns out)</p> <p>Adjuster protrusion is 19 mm (0.75 in.) (Usable Range: 10 ~ 25 mm (0.39 ~ 0.98 in.))</p> <p>SHOWA SS-8 (SAE 10W-20)</p> <p>450 ± 2.5 mL (15.21 ± 0.085 US oz) (completely dry) approx. 385 mL (13.01 US oz) (when changing oil)</p> <p>468 ± 2.5 mL (15.82 ± 0.085 US oz) (completely dry) approx. 400 mL (13.52 US oz) (when changing oil)</p> <p>Fully compressed, without fork spring, below from inner tube top</p> <p>62 ± 2 mm (2.44 ± 0.08 in.)</p> <p>47 ± 2 mm (1.85 ± 0.08 in.)</p> <p>282.7 mm (11.13 in.) (Service limit 277 mm (10.91 in.))</p>
<p><b>Rear Shock Absorber:</b></p> <p>Rebound damper set</p> <p>Spring setting position</p> <p>    Standard</p> <p>    Usable range</p> <p>Gas pressure</p>	<p>1 turns out from the fully clockwise position (Usable Range: 0 ←→ 3 ~ 4 turns out)</p> <p>Spring length 188.4 mm (7.42 in.)</p> <p>Spring length 193.4 ~ 183.4 mm (7.61 ~ 7.22 in.) (weaker to stronger)</p> <p>980 kPa (10 kgf/cm<sup>2</sup>, 142 psi, Non-adjustable)</p>

Special Tools

Oil Seal and Bearing Remover:  
57001-1058



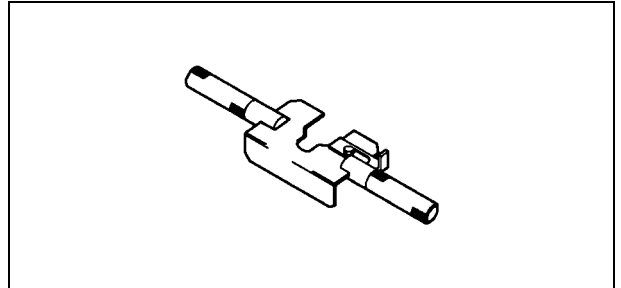
Fork Piston Rod Puller, M10 × 1.0:  
57001-1298



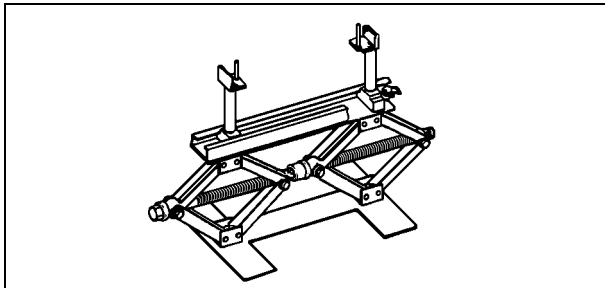
Bearing Driver Set:  
57001-1129



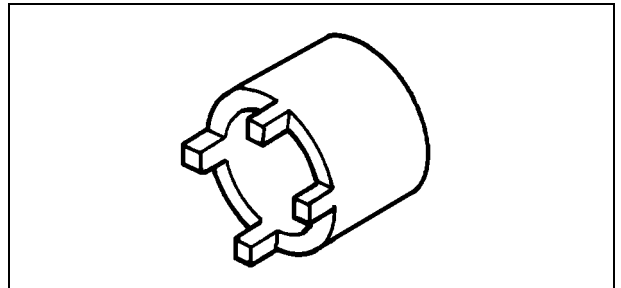
Front Fork Spring Compressor:  
57001-1338



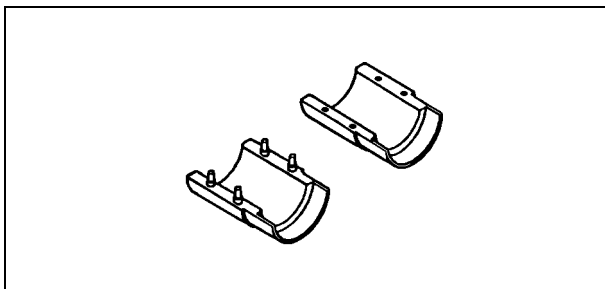
Jack:  
57001-1238



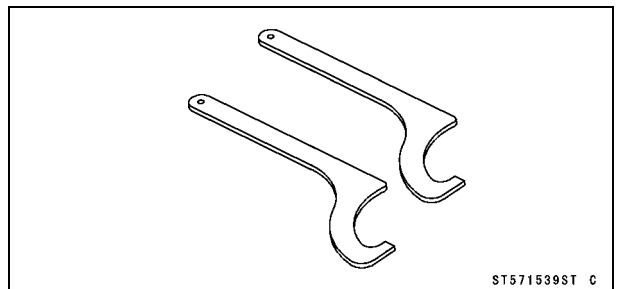
Socket Wrench:  
57001-1370



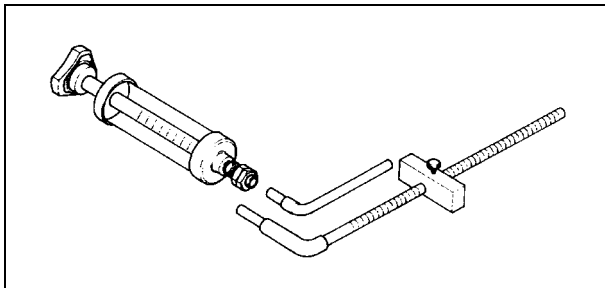
Front Fork Oil Seal Driver:  
57001-1288



Hook Wrench:  
57001-1539



Fork Oil Level Gauge:  
57001-1290



# 13-8 SUSPENSION

## Front Fork

### Rebound Damping Force Adjustment (Only Right Fork Leg)

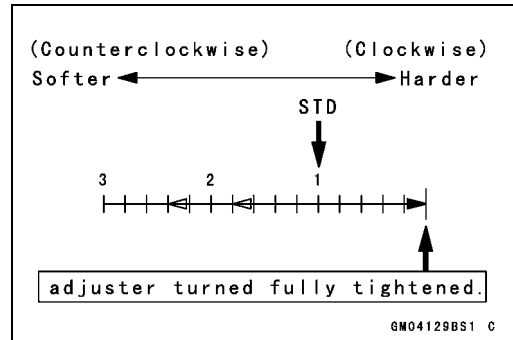
- To adjust the rebound damping force, turn the rebound damping adjuster [A] on top of the right front fork leg to the desired position.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is 1 turn out of the fully clockwise position.



- The damping force can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the damping feels too soft or too stiff, adjust it in accordance with the following table.

### Rebound Damping Force Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
1 4/5 ~ 2 2/5	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
1					
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High

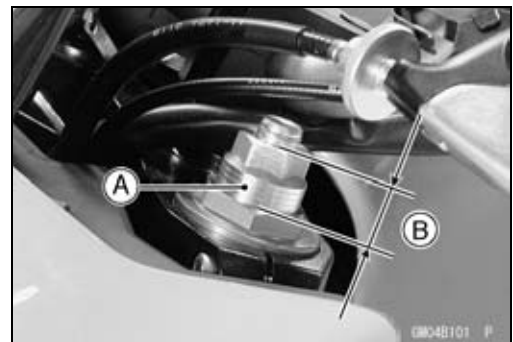


### Spring Preload Adjustment

- Turn the spring preload adjuster [A] to change spring preload setting.
- The standard adjuster setting for the average-build rider of 68 kg (150 lb) with no passenger and no accessories is the 19 mm [B] from top as shown.

#### Adjuster Protrusion (from top)

- Standard: 19 mm (0.75 in.)
- Usable Range: 10 ~ 25 mm (0.39 ~ 0.98 in.)



### ⚠ WARNING

**If both adjusters are not adjusted equally, handling may be impaired and a hazardous condition may result.**

- The spring preload can be left soft for average riding. But it should be adjusted harder for high speed riding or riding with a passenger. If the spring action feels too soft or too stiff, adjust it in accordance with the following table.

### Spring Action

Adjuster Position	Damping Force	Setting	Load	Road	Speed
25 mm (0.98 in.)	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
STD 19 mm (0.75 in.)					
↓	↓	↓	↓	↓	↓
10 mm (0.39 in.)	Strong	Hard	Heavy	Bad	High

## Front Fork

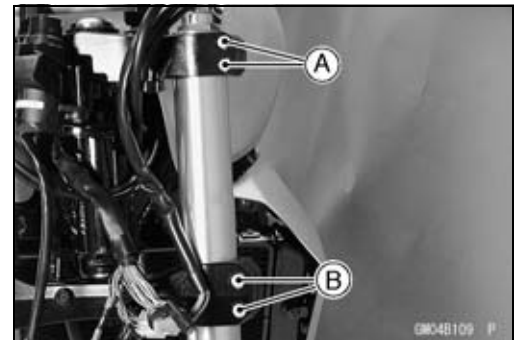
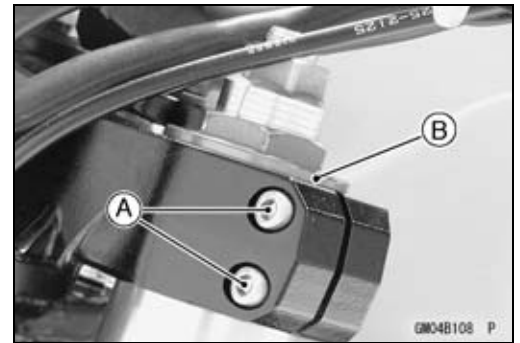
### Front Fork Removal (each fork leg)

- Remove:
  - Front Wheel (see Wheels/Tires chapter.)
  - Front Fender (see Frame chapter.)
  - Windshield and Bracket (see Frame chapter.)
  - Inner Cover (see Frame chapter.)
  - Fairing and Bracket (see Frame chapter.)
- ★ Loosen the upper fork clamp bolts [A] and fork top plug [B] before-hand if the fork leg is to be disassembled.

#### NOTE

○ Loosen the top plug after loosening the upper fork clamp bolts.

- Loosen the upper fork clamp bolts [A] and lower fork clamp bolts [B].
- With a twisting motion, work the fork leg down and out.



### Front Fork Installation

- Install the fork so that the top end [A] of the outer tube is flush with the upper surface [B] of the steering stem head bracket.
- Tighten:
  - Torque - Front Fork Clamp Bolts (Lower):**
    - 20 N·m (2.0 kgf·m, 15 ft·lb)
    - 30 N·m (3.1 kgf·m, 22 ft·lb): ZR1000-A2 ~
  - Front Fork Top Plug: 35 N·m (3.6 kgf·m, 26 ft·lb)**

#### NOTE

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

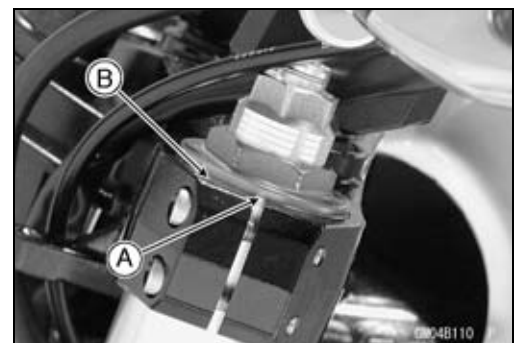
○ Tighten the top plug before tightening the upper fork clamp bolts.

- Tighten:
  - Torque - Front Fork Clamp Bolt (Upper):**
    - 8.8 N·m (0.90 kgf·m, 78 in·lb)
    - 13 N·m (1.3 kgf·m, 113 in·lb): ZR1000-A2 ~

#### NOTE

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

- Adjust the spring preload and the damping force (right fork leg only).



## 13-10 SUSPENSION

### Front Fork

#### Fork Oil Change

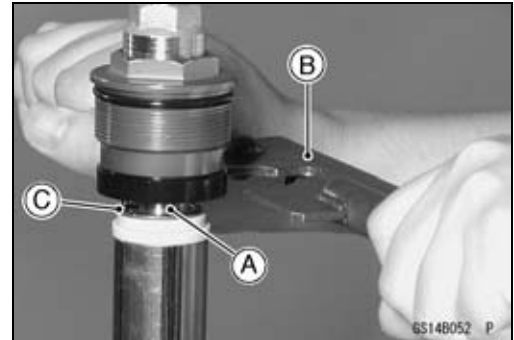
- Remove the front fork (see Front Fork Removal).
- Turn the spring preload adjuster [A] counterclockwise until the fully position.
- Unscrew the top plug [B] out of the inner tube.



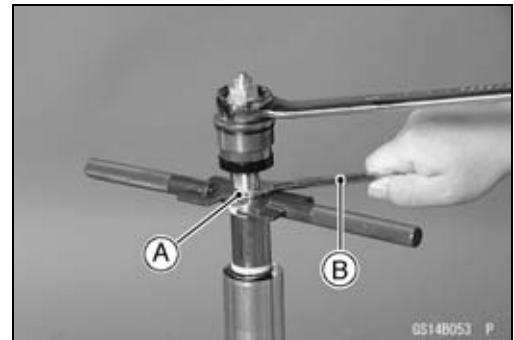
- Avoiding the pins [A], set the front fork spring compressor set [B] on the washer [C].

**Special Tool - Front Fork Spring Compressor:**  
**57001-1338**

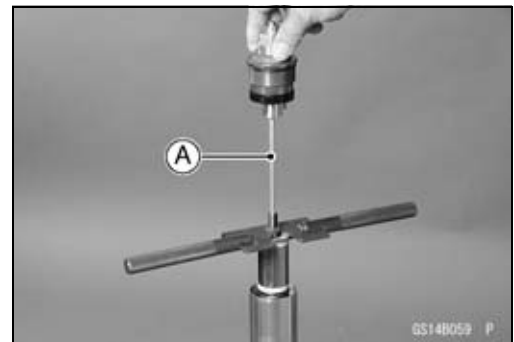
- Compress the fork spring.



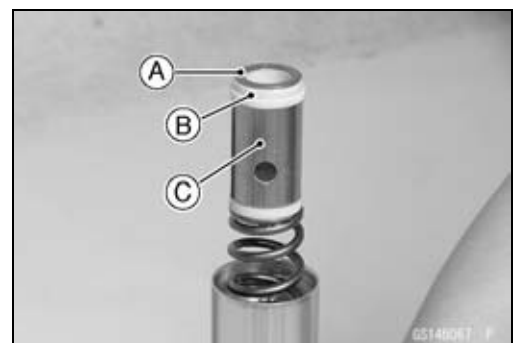
- Holding the piston rod nut [A] with a wrench [B], remove the fork top plug from the piston rod.



- For the right fork leg, remove the fork top plug with the rebound damping adjuster rod [A].

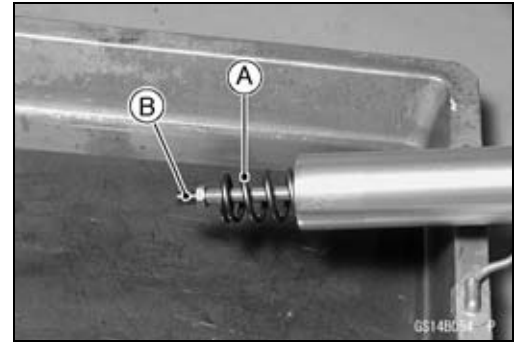


- Remove:
  - Washer [A]
  - Slider [B]
  - Spacer [C]



## Front Fork

- Drain the fork oil into a suitable container.
- Remove the fork spring [A].
- Pump the piston rod [B] up and down at least ten times to expel the oil from the fork.



- Hold the fork tube upright, press the inner tube and the piston rod all the way down.
- Pour in the type and amount of fork oil specified.

### Fork Oil

**Viscosity:** SHOWA SS-8

#### Amount (Right fork leg)

**When changing oil:** approx. 385 mL (13.01 US oz)  
**After disassembly and completely dry:** 450 ± 2.5 mL (15.21 ± 0.085 US oz)

#### Amount (Left fork leg)

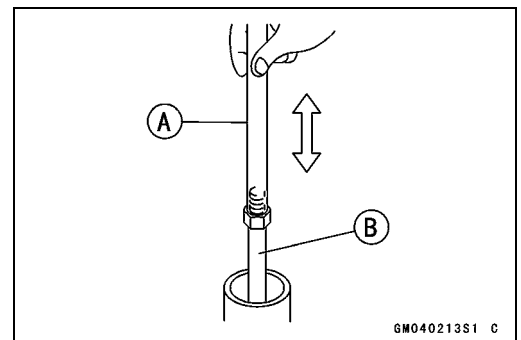
**When changing oil:** approx. 400 mL (13.52 US oz)  
**After disassembly and completely dry:** 468 ± 2.5 mL (15.82 ± 0.085 US oz)

★ If necessary, measure the oil level as follows.

- Hold the inner tube vertically in a vise.
- Pump the inner tube several times to expel air bubbles.
- Using the piston rod puller [A], move the piston rod [B] up and down more than ten times in order to expel all the air from the fork oil.

**Special Tool - Fork Piston Rod Puller, M10 ×1.0:**  
**57001-1298**

- Wait until the oil level settles.
- With the fork fully compressed and the piston rod [B] fully pushed in, insert a tape measure or rod into the inner tube, and measure the distance from the top of the inner tube to the oil.



# 13-12 SUSPENSION

## Front Fork

### Oil Level (fully compressed, without spring)

#### Standard:

Right fork leg	62 ± 2 mm (2.44 ± 0.08 in.)
Left fork leg	47 ± 2 mm (1.85 ± 0.08 in.)

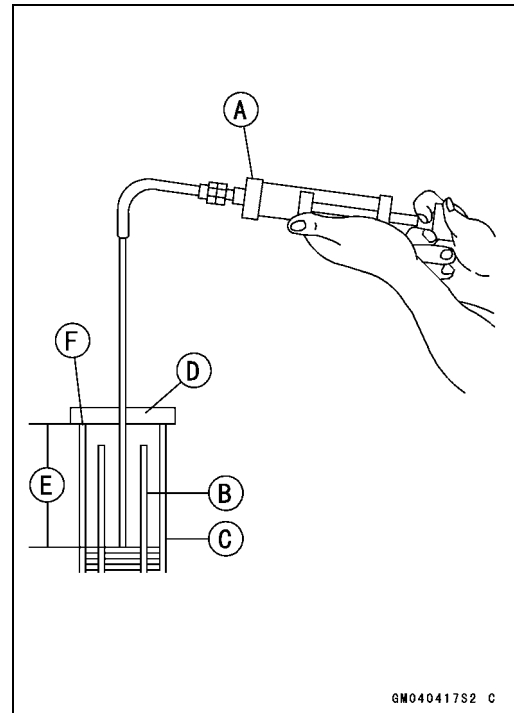
(from the top of the outer tube)

#### NOTE

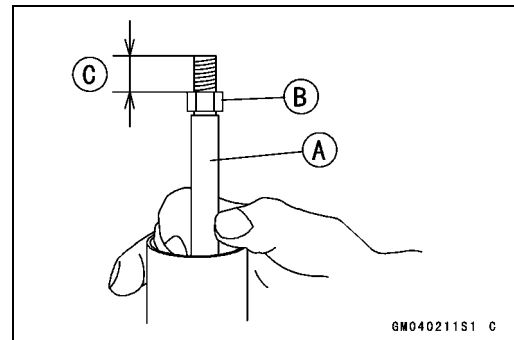
○ Fork oil level may also be measured using the fork oil level gauge.

#### Special Tool - Fork Oil Level Gauge: 57001-1290 [A]

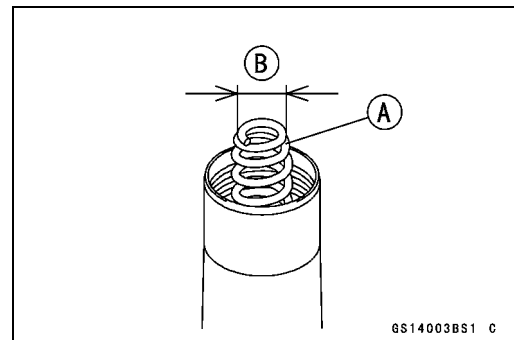
- With the fork fully compressed and without fork spring, insert the gauge tube into the inner tube [B] and position the stopper across the top end [F] of the outer tube [C].
- Set the gauge stopper [D] so that its lower side shows the oil level distance specified [E].
- Pull the handle slowly to pump out the excess oil until the oil no longer comes out.
- ★ If no oil is pumped out, there is insufficient oil in the inner tube. Pour in enough oil, then pump out the excess oil as shown above.



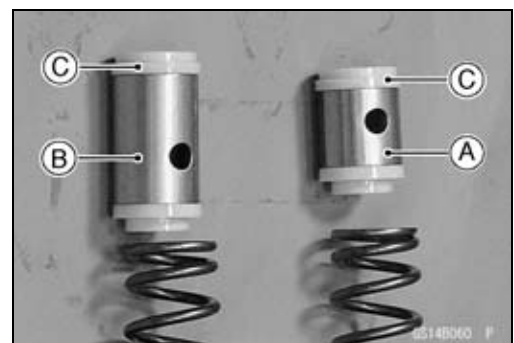
- Pull the piston rod [A] up above the inner tube top.
- Screw the rod nut [B] on to the piston rod with the chamfered side down.
- Check that the visible thread length is 12.5 mm (0.492 in.) [C].



- Install the fork spring [A] with the smaller end [B] facing upward.



- Install the spacer.
- The right fork leg spacer [A] is shorter than the left fork leg spacer [B].
- Install the slider [C] and washer.

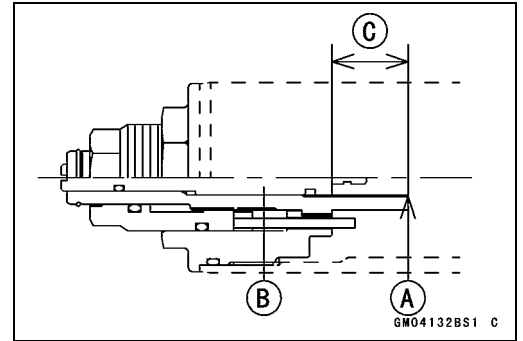


- Screw the fork piston rod puller onto the end of the rod.
- Special Tool - Fork Piston Rod Puller, M10 × 1.0:  
57001-1298



## Front Fork

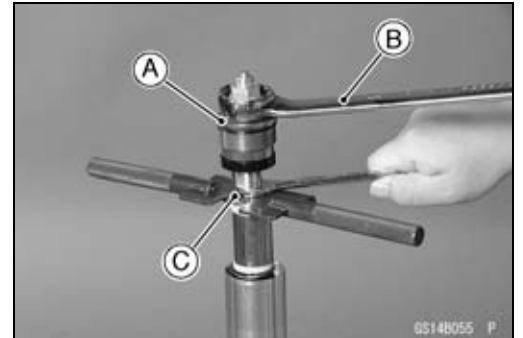
- Check the O-ring on the top plug and replace it with a new one if damaged.
- For the right fork leg, check the distance [C] between the bottom end [A] of the top plug and rebound damping adjuster [B] with a pair of vernier caliper.  
[C] 20 mm (0.79 in.)



- Holding the top plug [A] with a wrench [B], tighten the piston rod nut [C] against the top plug.

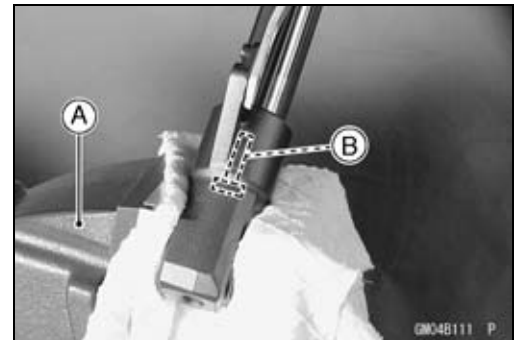
**Torque - Piston Rod Nut: 20 N·m (2.0 kgf·m, 15 ft·lb)**

- For the right fork leg, the top plug has the rebound damping adjuster rod.
- Raise the outer tube and screw the top plug into it.
- Install the front fork (see Front Fork Installation).

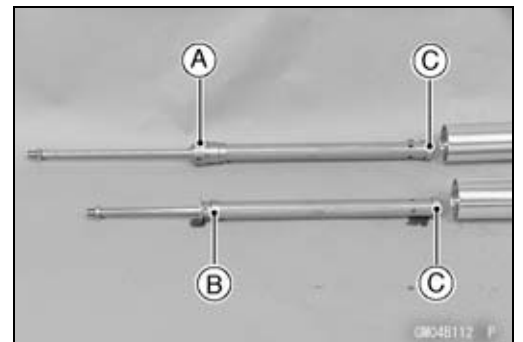


### Front Fork Disassembly

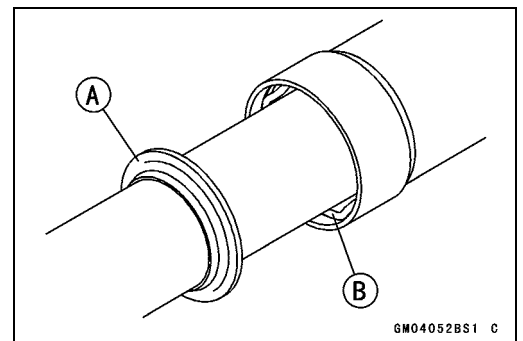
- Remove the front fork (see Front Fork Removal).
- Hold the fork leg with a vise [A].
- Loosen the Allen bolt [B] and tighten it loosely.
- Drain the fork oil (see Fork Oil Change).



- Unscrew the Allen bolt, then take the bolt and gasket out of the bottom of the inner tube.
- Take the cylinder unit and centering plate out of the inner tube.
- Do not disassemble the cylinder unit.  
Cylinder Unit [A] and Center Ring Plate [C] for Right Fork Leg  
Cylinder Unit [B] and Center Ring Plate [C] for Left Fork Leg



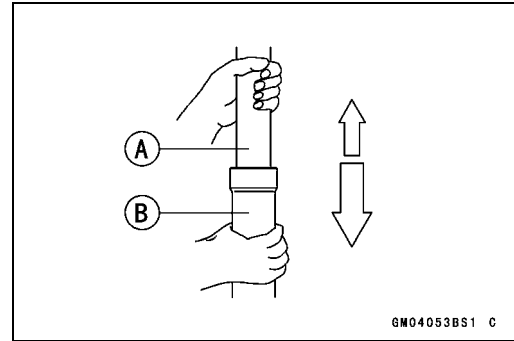
- Separate the inner tube from the outer tube as follows.
  - Slide up the dust seal [A].
  - Remove the retaining ring [B] from the outer tube.



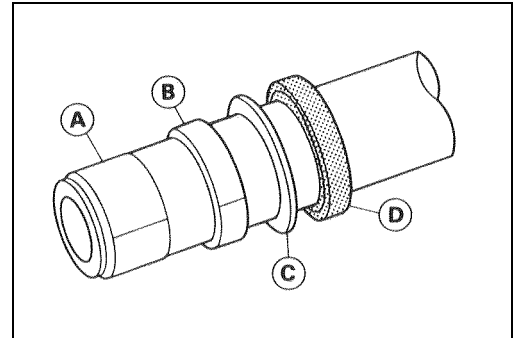
## 13-14 SUSPENSION

### Front Fork

- Holding the inner tube [A] by hand, pull the outer tube [B] several times to pull out the outer tube.



- Remove the inner tube guide bushing [A], outer tube guide bushing [B], washer [C], oil seal [D] from the inner tube.



#### Front Fork Assembly

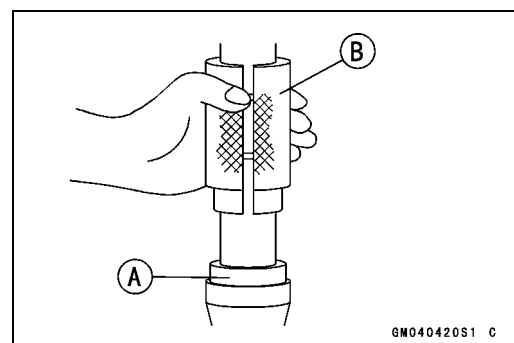
- Replace the following parts with new one.
  - Oil Seal
  - Guide Bushings
  - Bottom Allen Bolt Gasket
- Install the following parts onto the inner tube.
  - Dust Seal
  - Retaining Ring
  - Oil Seal
  - Washer
  - Outer Tube Guide Bushing
  - Inner Tube Guide Bushing
- Insert the inner tube to the outer tube.
- Fit the new outer tube guide bush [A] into the outer tube.

#### NOTE

○ When assembling the new outer tube guide bushing [A], hold the washer against the new one and tap the washer with the fork oil seal driver [B] until it stops.

#### Special Tool - Front Fork Oil Seal Driver: 57001-1288

- After installing the washer, install the oil seal by using the fork oil seal driver.
- Install the retaining ring and dust seal by hand.



## Front Fork

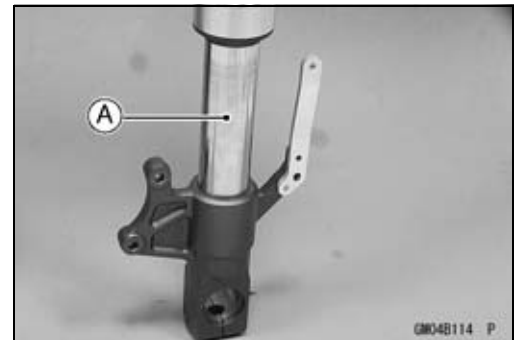
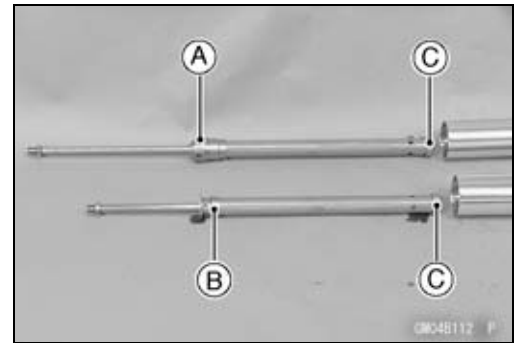
- Install the center ring plate on the cylinder unit.
- Insert the center ring plate and cylinder unit as a set into the inner tube.
  - Cylinder Unit [A] and Center Ring Plate [C] for Right Fork Leg
  - Cylinder Unit [B] and Center Ring Plate [C] for Left Fork Leg
- Hold the front fork in a vise.
- Torque the Allen bolt.

**Torque - Front Fork Bottom Allen Bolt: 20 N·m (2.0 kgf·m, 15 ft·lb)**

- Pour in the specified type of oil (see Fork Oil Change.)

### Inner Tube, Outer Tube Inspection

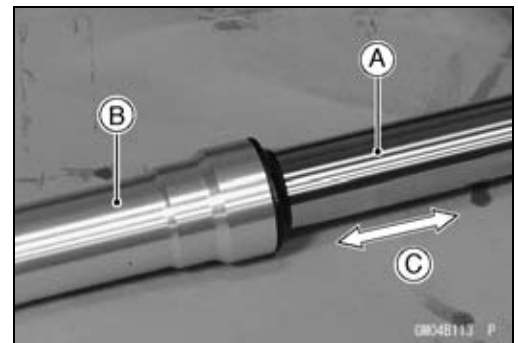
- Visually inspect the inner tube [A], and repair any damage.
- Nick or rust damage can sometimes be repaired by using a wet-stone to remove sharp edges or raised areas which cause seal damage.
- ★ If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.



### CAUTION

**If the inner tube is badly bent or creased, replace it. Excessive bending, followed by subsequent straightening, can weaken the inner tube.**

- Temporarily assemble the inner tube [A] and outer tube [B], and pump [C] them back and forth manually to check for smooth operation.
- ★ If you feel binding or catching, the inner and outer tubes must be replaced.

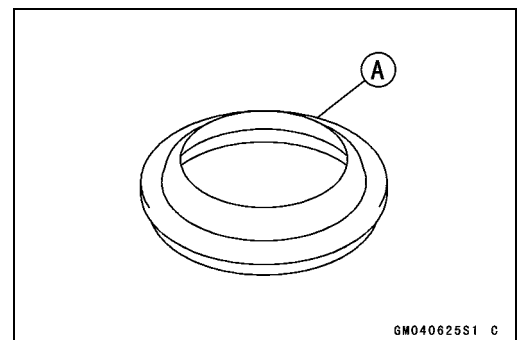


### ⚠ WARNING

**A straightened inner or outer fork tube may fall in use, possibly causing an accident. Replace a badly bent or damaged inner or outer tube and inspect the other tube carefully before reusing it.**

### Dust Seal Inspection

- Inspect the dust seals [A] for any signs of deterioration or damage.
- ★ Replace it if necessary.



## 13-16 SUSPENSION

### Front Fork

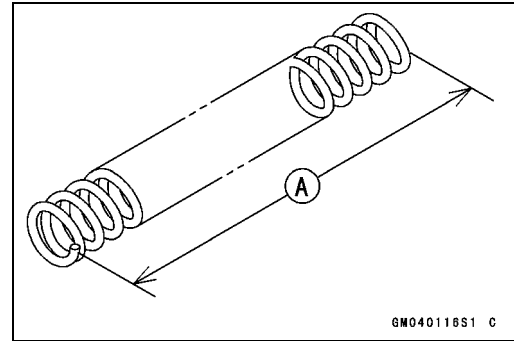
#### *Spring Tension*

- Since a spring becomes shorter as it weakens, check its free length [A] to determine its condition.
- ★ If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.

#### **Spring Free Length**

**Standard:** 282.7 mm (11.13 in.)

**Service Limit:** 277 mm (10.91 in.)



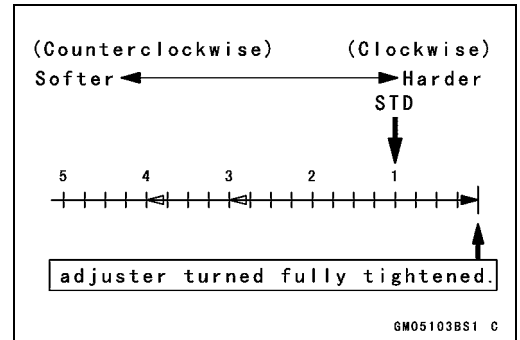
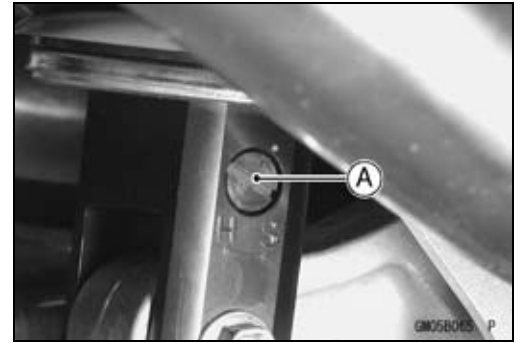
**Rear Shock Absorber**

*Rebound Damping Force Adjustment*

- To adjust the rebound damping force, turn the rebound damping adjuster [A] to the desired position.
- The standard adjuster setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories 3/4 turns out of the fully clockwise position.

**Rebound Damping Force Adjustment**

Adjuster Position	Damping Force	Setting	Load	Road	Speed
3 ~ 4	Weak	Soft	Light	Good	Low
↑	↑	↑	↑	↑	↑
STD 1					
↓	↓	↓	↓	↓	↓
0	Strong	Hard	Heavy	Bad	High



*Spring Preload Adjustment*

- Remove the rear shock absorber from the frame (see Rear Shock Absorber Removal).
- Loosen the locknut and turn out the adjusting nut to free the spring.

**Special Tools - Hook Wrenches: 57001-1539**

- Measure the spring free length.

**Spring Free Length**

**Standard: 198.2 mm (7.80 in.)**

- To adjust the spring preload, turn in the adjusting nut [A] to the desired position and tighten the locknut [B].

**Spring Preload Setting**

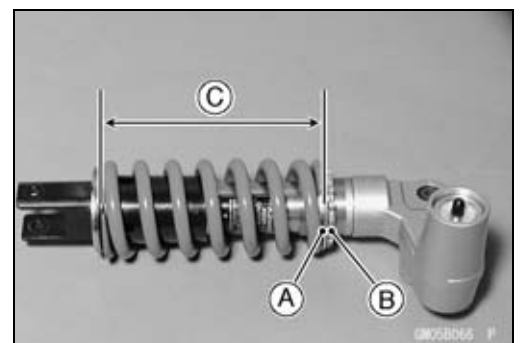
**Standard: Spring length 188.4 mm (7.42 in.)**

**Usable Range: Spring length 193.4 ~ 183.4 mm (7.61 ~ 7.22 in.) (weaker to stronger)**

- The standard adjusting nut setting for an average-build rider of 68 kg (150 lb) with no passenger and no accessories is 188.4 mm (7.42 in.) spring length.

★ If the spring action feels too soft or too stiff, adjust it.

- Remove:
  - Right Side Muffler Body (see Engine Top End chapter.)
  - Chain Cover (see Drive Chain Removal in the Final Drive chapter.)
  - Mud Guard (see Frame chapter.)



# 13-18 SUSPENSION

## Rear Shock Absorber

Special Tools - Hook Wrench: 57001-1539 [A]

### Spring Adjustment

Adjuster Position	Damping Force	Setting	Load	Road	Speed
193.4 mm (7.61 in.)	Weak	Soft	Light	Good	Low
↑ ↓	↑ ↓	↑ ↓	↑ ↓	↑ ↓	↑ ↓
183.4 mm (7.22 in.)	Strong	Hard	Heavy	Bad	High



### Rear Shock Absorber Removal

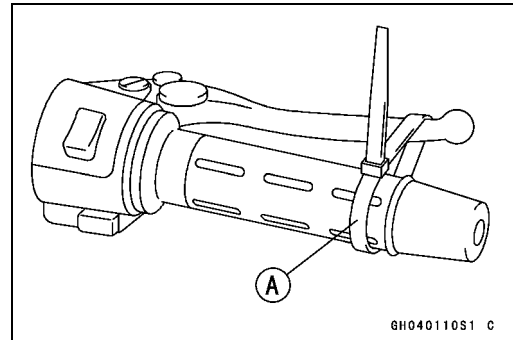
- Using the jack, raise the rear wheel off the ground.

Special Tool - Jack: 57001-1238

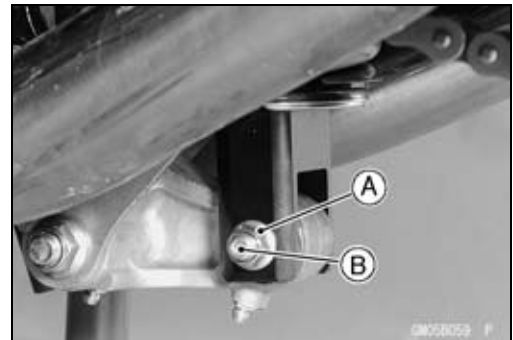
- Squeeze the brake lever slowly and hold it with a band [A].

### **⚠ WARNING**

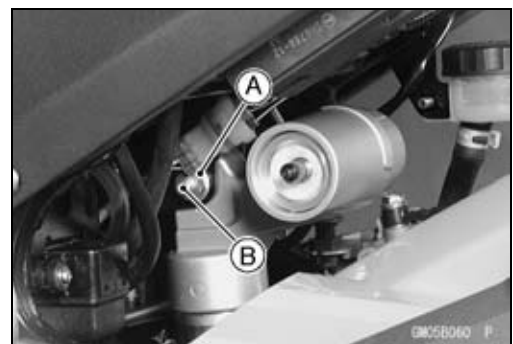
Be sure to hold the front brake when removing the shock absorber, or the motorcycle may fall over. It could cause an accident and injury.



- Remove:
  - Lower Shock Absorber Nut [A]
  - Lower Shock Absorber Bolt [B]



- Remove:
  - Upper Shock Absorber Nut [A]
  - Upper Shock Absorber Bolt [B]



## Rear Shock Absorber

- Remove the shock absorber [A] from upside.



### Rear Shock Absorber Installation

- Tighten:
  - 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.

### Rear Shock Absorber Scrapping

#### **⚠ WARNING**

Since the reservoir tank of the rear shock absorber contains nitrogen gas, do not incinerate the reservoir tank without first releasing the gas or it may explode.

- Remove the valve cap [A] and release the nitrogen gas completely from the gas reservoir.
- Remove the valve.

#### **⚠ WARNING**

Since the high pressure gas is dangerous, do not point the valve toward your face or body.



## 13-20 SUSPENSION

### Swingarm

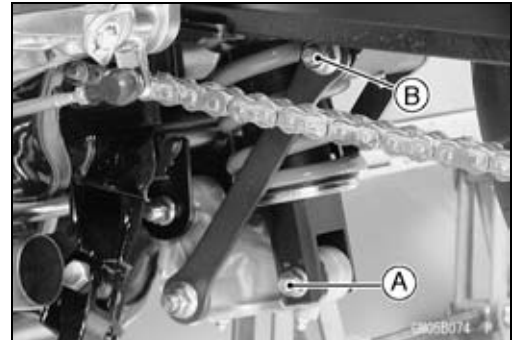
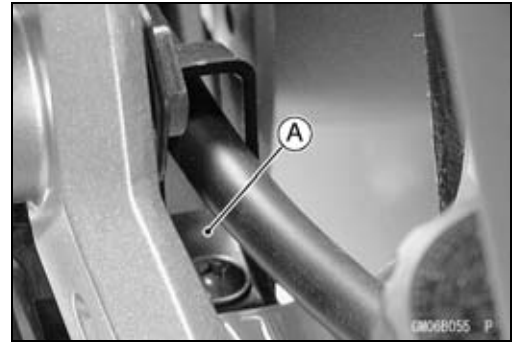
#### Swingarm Removal

- Remove the muffler bodies (see Engine Top End chapter.)
- Raise the rear wheel off the ground with jack.

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

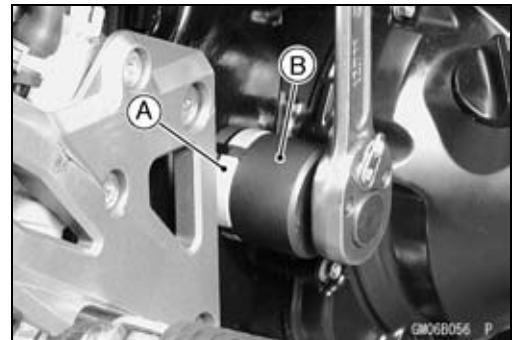
- Remove:
  - Rear Wheel (see Wheels/Tires chapter.)
  - Chain Cover (see Final Drive chapter.)
  - Mud Guard (see Frame chapter.)
  - Brake Hose Clamp [A]

Lower Shock Absorber Nut and Bolt [A]  
Upper Tie-Rod Nut and Bolt [B]



- Remove the right frame cover (see Frame chapter).
- Loosen the upper shock absorber nut.
- Unscrew the swingarm pivot locknut [A], using the socket wrench [B].

**Special Tool - Socket Wrench: 57001-1370**



- 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

- Apply plenty of grease to the ball bearing, needle bearings and grease seals, and add plenty of grease to the grease nipple.
- Install the collars [A].

○ Place the right 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 [A] and the frame [C] come to zero mm.
- Tighten:

**Torque - Swingarm Pivot Shaft Nut: 127 N·m (13 kgf·m, 94 ft·lb)**

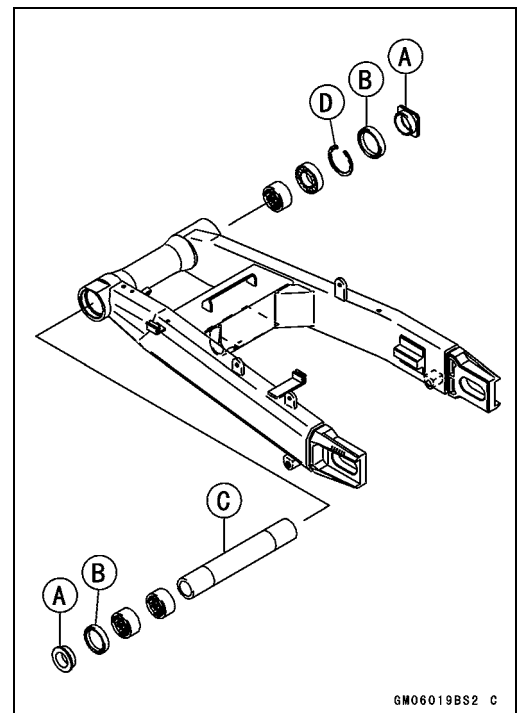
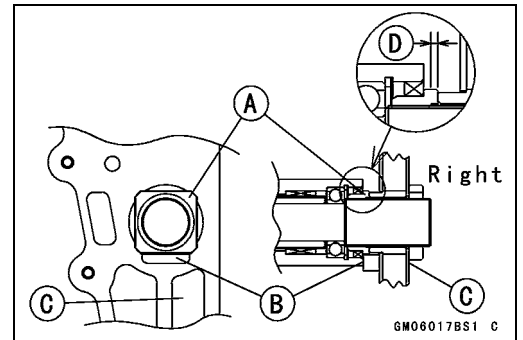
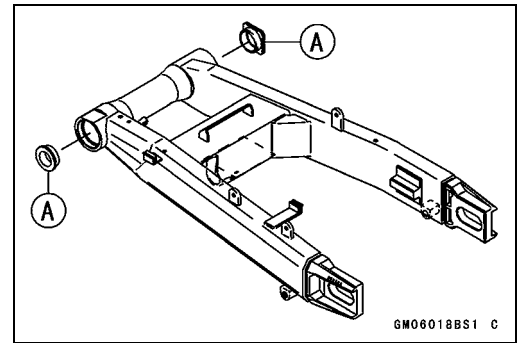
- Tighten the pivot locknut, using the socket wrench.

**Special Tool - Socket Wrench: 57001-1370**

**Torque - Swingarm Pivot Shaft Locknut: 98 N·m (10.0 kgf·m, 72 ft·lb)**

### Swingarm Bearing Removal

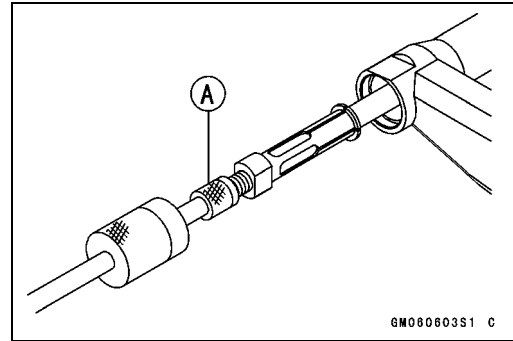
- Remove:
  - Swingarm
  - Collars [A]
  - Grease Seals [B]
  - Sleeve [C]
  - Circlip (right side) [D]



## 13-22 SUSPENSION

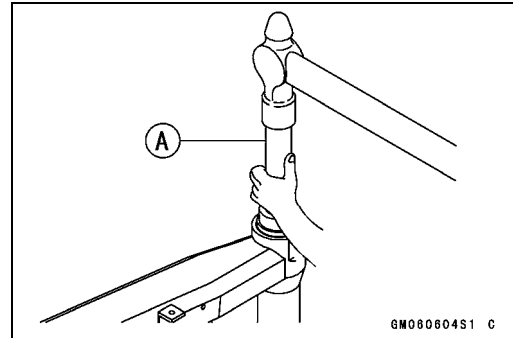
### Swingarm

- Remove the ball bearing and needle bearings.  
**Special Tool - Oil Seal and Bearing Remover: 57001-1058 [A]**



#### Swingarm Bearing Installation

- Apply plenty of grease to the ball bearing and needle bearings.
  - Install the needle bearings so that the manufacturer's marks face in.
  - Install the ball bearing so that the manufacturer's marks faces out.
- Special Tool - Bearing Driver Set: 57001-1129 [A]**

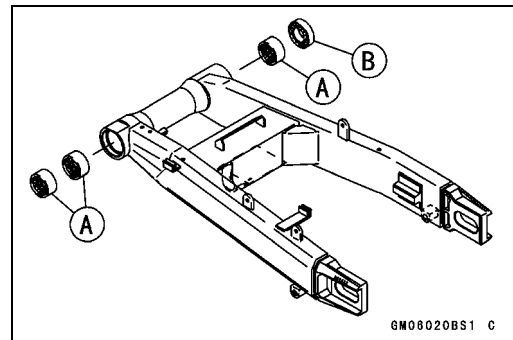


#### Swingarm Bearing, Sleeve Inspection

##### 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 bearing, ball bearing, and sleeve show any signs of abnormal wear, discoloration, or damage. replace them as a set.



#### Swingarm Pivot Lubrication

- Refer to Swingarm Pivot Lubrication in the Periodic Maintenance chapter.

#### Chain Slider Inspection

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



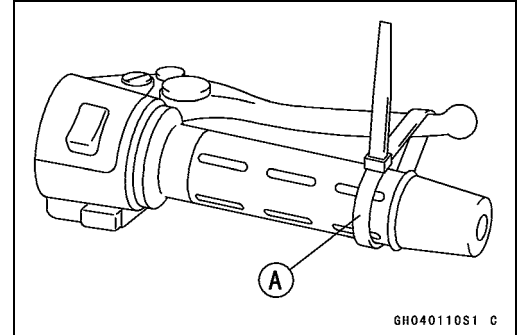
## Tie-Rod, Rocker Arm

### Tie-Rod Removal

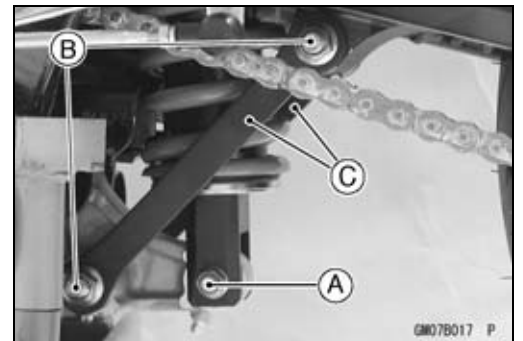
- Remove the muffler bodies (see Engine Top End chapter.)
- Remove the side stand (see Frame chapter.)
- Using the jack, raise the rear wheel off the ground.

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

- 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 Bolts and Nuts [B]
  - Tie-Rods [C]



### Tie-Rod Installation

- Apply grease to the inside of the needle bearings and grease seals.
- Install the tie-rods so that the marked side faces the bolts and nuts.
- Tighten:

**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)**

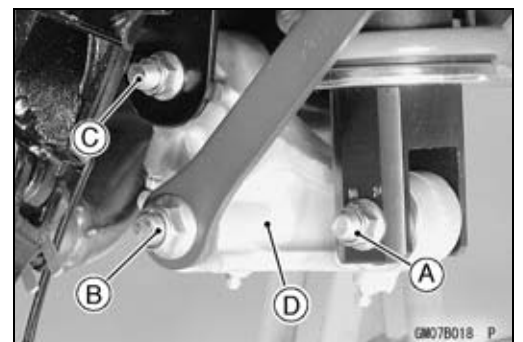
### Rocker Arm Removal

- Remove the right side muffler body (see Engine Top End chapter.)
- Using the jack, raise the rear wheel off the ground.

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

- Squeeze the brake lever slowly and hold it with a band.

- Remove:
  - Lower Rear Shock Absorber Bolt and Nut [A]
  - Lower Tie-Rod Bolt and Nut [B]
  - Rocker Arm Bolt and Nut [C]
  - Rocker Arm [D]



## 13-24 SUSPENSION

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### Tie-Rod, Rocker Arm

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#### *Rocker Arm Installation*

- Apply grease to the inside of the needle bearings and oil seal lips, and add grease to the grease nipple.
- Tighten:
  - Torque - Rocker Arm Bolt: 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)**

#### *Rocker Arm/Tie-Rod Bearing, Sleeve Inspection*

- Visually inspect the rocker arm/tie-rod sleeves and needle bearings.
- 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.

#### *Unit-track Linkage Lubrication*

- Refer to Unit-track Linkage Lubrication in the Periodic Maintenance chapter.

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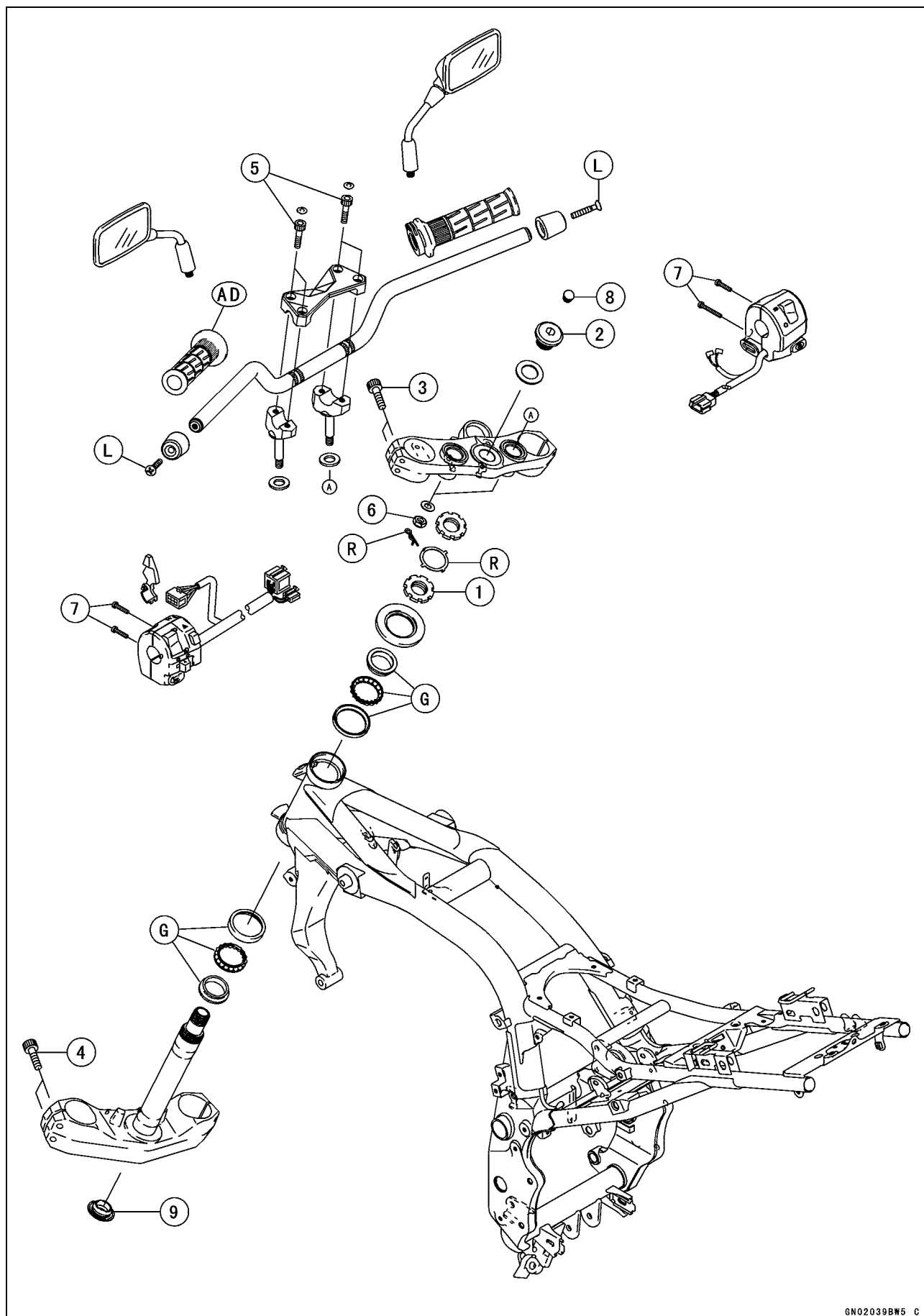
# Steering

## Table of Contents

Exploded View .....	14-2
Special Tools .....	14-4
Steering .....	14-5
Steering Inspection .....	14-5
Steering Adjustment.....	14-5
Steering Stem.....	14-6
Stem, Stem Bearing Removal.....	14-6
Stem, Stem Bearing Installation.....	14-7
Stem Bearing Lubrication.....	14-9
Steering Stem Warp.....	14-9
Handlebar .....	14-10
Handlebar Removal .....	14-10
Handlebar Installation .....	14-10
Rear View Mirrors Removal .....	14-11
Rear View Mirrors Installation .....	14-11

# 14-2 STEERING

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Steering stem nut	27	2.75	20	
2	Steering stem head bolt	108	11	80	
3	Front fork clamp bolts (Upper)	8.8	0.90	78 in·lb	AL
	Front fork clamp bolts (Upper): ZR1000-A2 ~	13	1.3	113 in·lb	
4	Front fork clamp bolts (Lower)	20	2.0	15	AL
	Front fork clamp bolts (Lower): ZR1000-A2 ~	30	3.1	22	
5	Handlebar clamp bolts	25	2.5	18	S
6	Handlebar lower clamp nuts	34	3.5	25	
7	Handlebar housing switch screws	3.4	0.35	30 in·lb	

8. Steering stem head bolt plug

9. Plug (ZR1000-A2 ~ )

AD: Apply adhesive.

G: Apply grease.

L: Apply a non-permanent locking agent.

R: Replacement part

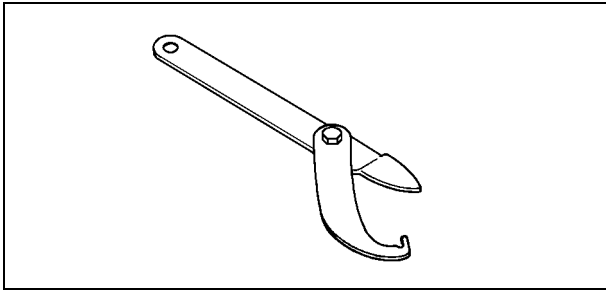
AL: Tighten the two clamp bolts alternately two times to ensure even tighten torque.

S: Follow the specific tightening sequence.

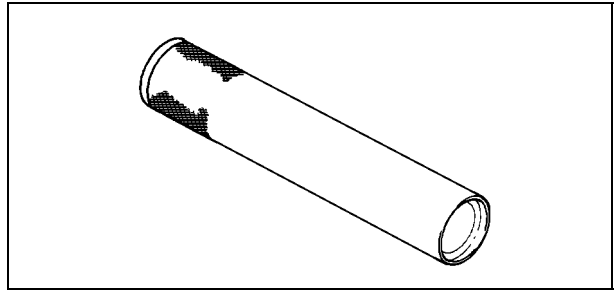
## 14-4 STEERING

### Special Tools

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



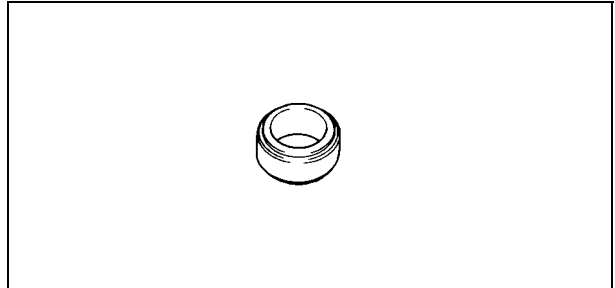
**Steering Stem Bearing Driver:**  
57001-1344



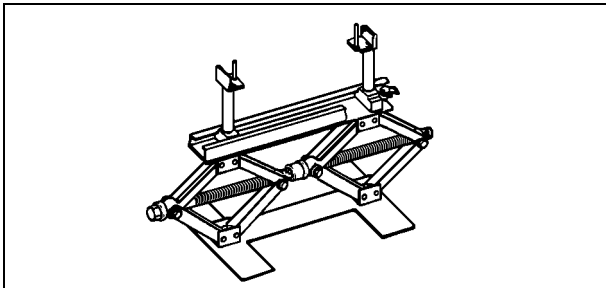
**Bearing Driver Set:**  
57001-1129



**Steering Stem Bearing Driver Adapter:**  
57001-1345



**Jack:**  
57001-1238





**Steering**

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*Steering Inspection*

- Refer to the Steering Inspection in the Periodic Maintenance chapter.

*Steering Adjustment*

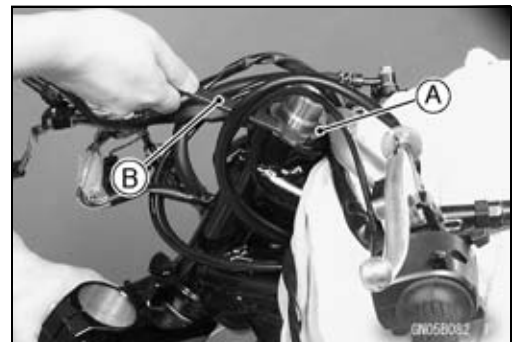
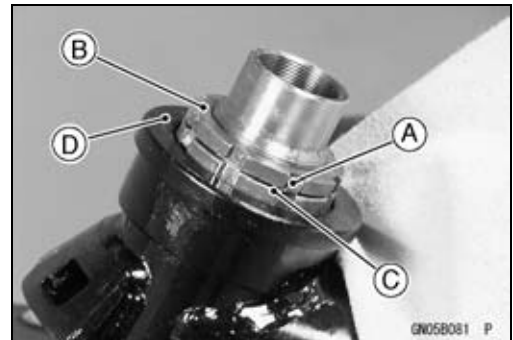
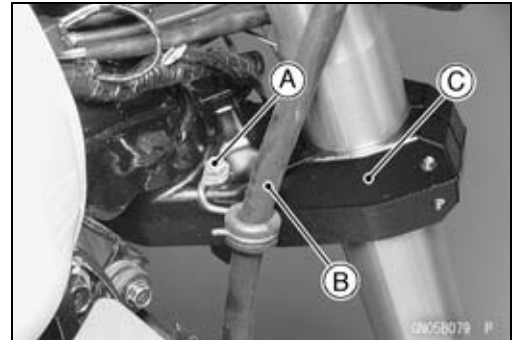
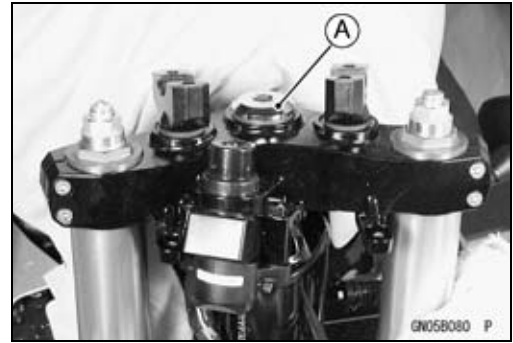
- Refer to the Steering Adjustment in the Periodic Maintenance chapter.

## 14-6 STEERING

### Steering Stem

#### Stem, Stem Bearing Removal

- Remove:
  - Windshield and Bracket (see Frame chapter.)
  - Inner Cover (see Frame chapter.)
  - Fairing and Bracket (see Frame chapter.)
  - Front Wheel (see Wheels/Tires chapter.)
  - Handlebar (see Handlebar Removal.)
  - Steering Stem Head Bolt Plug
  - Steering Stem Head Bolt [A] and Washer
  - Steering Stem Head
- Remove the brake hose clamp bolt [A] and take the hose [B] off the steering stem [C].
- Remove the front fork (see Suspension chapter).
- Bend the claw washer tabs [A].
- Pushing up the stem base, and remove the steering stem locknut [B] and claw washer [C].
- Stem Cap [D]
- Remove the steering stem nut [A].
  - Special Tool - Steering Stem Nut Wrench: 57001-1100 [B]**
- Remove the stem cap.
- Remove the upper stem bearing inner race.

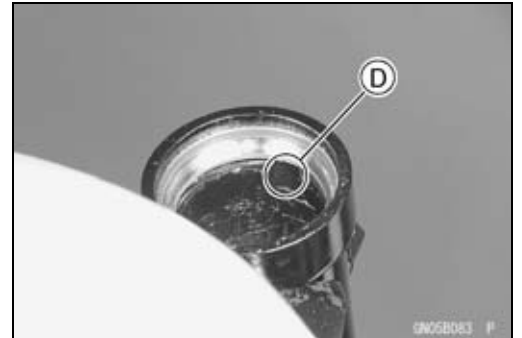
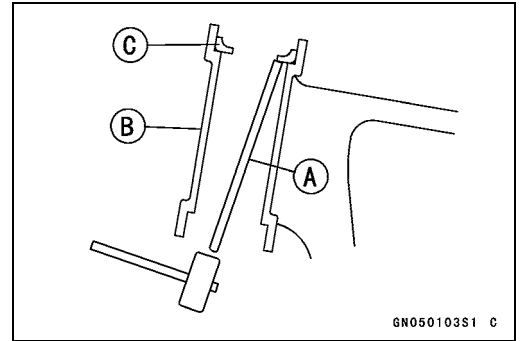


**Steering Stem**

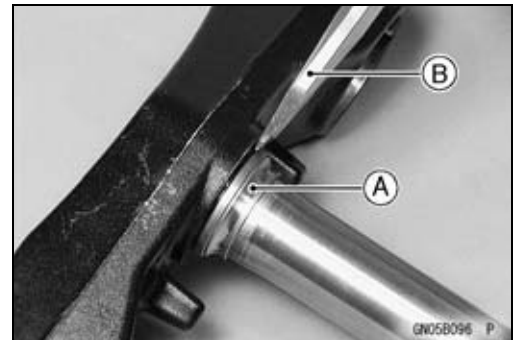
- To remove the bearing outer races [C] pressed into the head pipe [B], insert a bar [A] into the recesses [D] of head pipe, and applying it to both recess alternately hammer it to drive the race out.

**NOTE**

○ If either steering stem bearing is damaged, it is recommended that both the upper and lower bearings (including outer races) should be replaced with new ones.



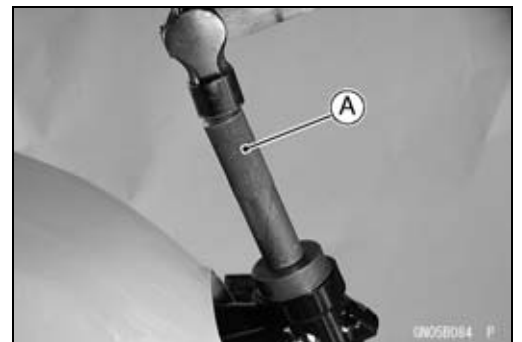
- Remove the lower bearing inner race [A] which is pressed onto the steering stem with a suitable commercially available chisel [B].



**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.

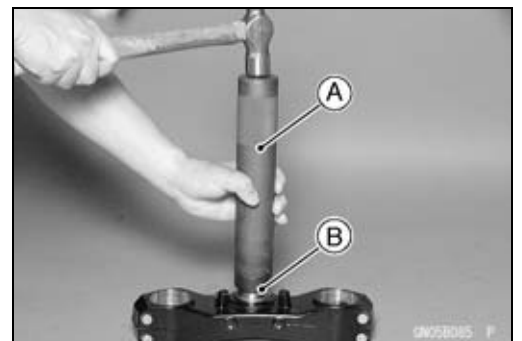
**Special Tools - Bearing Driver Set: 57001-1129 [A]**



- Replace the bearing inner races with new ones.
- Drive the lower ball bearing inner race applied the grease onto the stem.

**Special Tools - Steering Stem Bearing Driver: 57001-1344 [A]**

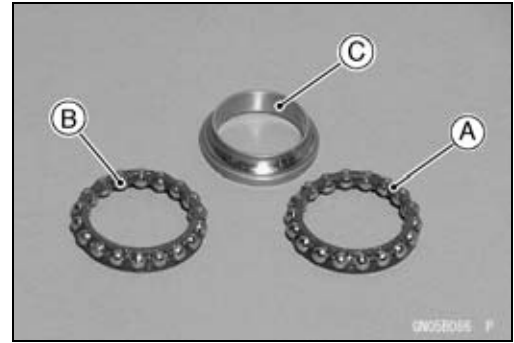
**Steering Stem Bearing Driver Adapter: 57001-1345 [B]**



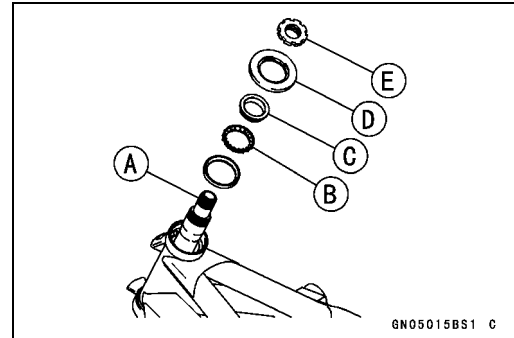
## 14-8 STEERING

### Steering Stem

- 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].

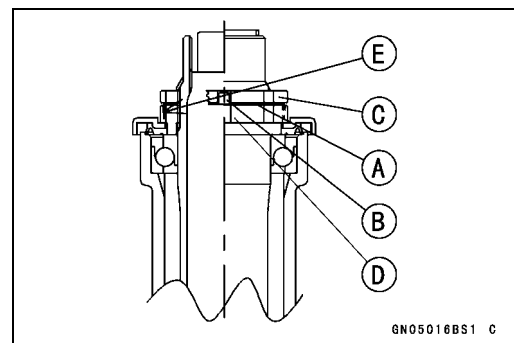
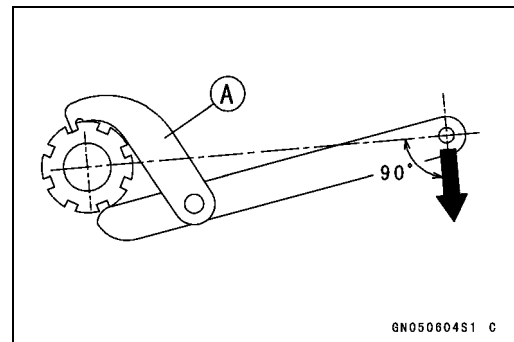


- Settle the inner races in place as follows:
  - Tighten the steering stem nut with 39 N·m (4.0 kgf·m, 29 ft·lb) of torque first, and loosen it a fraction of a turn until it turns lightly. Afterward tighten it again with specified torque using a stem nut wrench [A] in the direction shown.
  - Check 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 (2.75 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 the stem head.
- Install the washer, and tighten the stem head bolt with specified torque.
- Install the steering stem head bolt plug.
- Install the front fork (see Suspension chapter).



## Steering Stem

### NOTE

○Tighten the fork upper clamp bolts first, next the stem head nut, last the fork lower clamp bolts.

**Torque - Steering Stem Head Bolt : 108 N·m (11 kgf·m, 80 ft·lb)**

**Front Fork Clamp Bolts (Upper):**

8.8 N·m (0.90 kgf·m, 78 in·lb)

13 N·m (1.3 kgf·m, 113 in·lb): ZR1000-A2 ~

**Front Fork Clamp Bolts (Lower):**

20 N·m (2.0 kgf·m, 15 ft·lb)

30 N·m (3.1 kgf·m, 22 ft·lb): ZR1000-A2 ~

### NOTE

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

### ⚠ WARNING

**Do not impede the handlebar turning by routing the cables, harnesses and hoses improperly (see General Information chapter).**

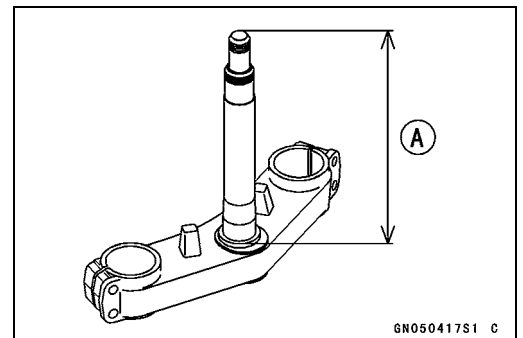
- Install the removed parts (see appropriate chapter).

#### Stem Bearing Lubrication

- Refer to Stem Bearing Lubrication in the Periodic Maintenance chapter.

#### Steering Stem Warp

- Whenever the steering stem is removed, or if the steering cannot be adjusted for smooth action, check the steering stem for straightness.
- ★If the steering stem [A] is bent, replace the steering stem.



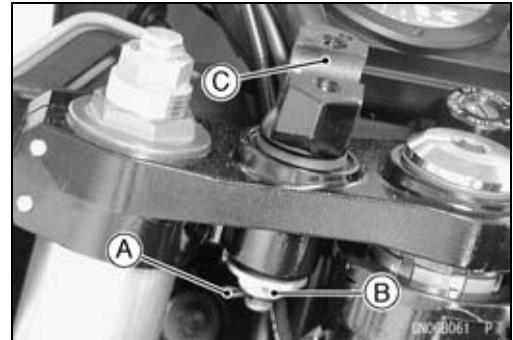
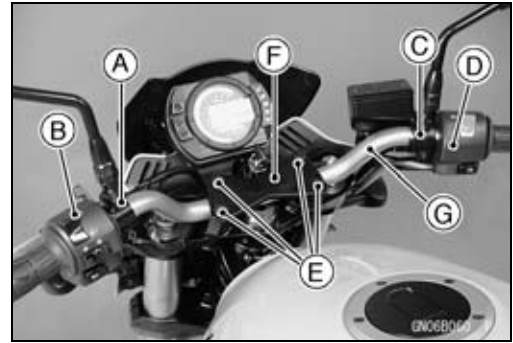
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## 14-10 STEERING

### Handlebar

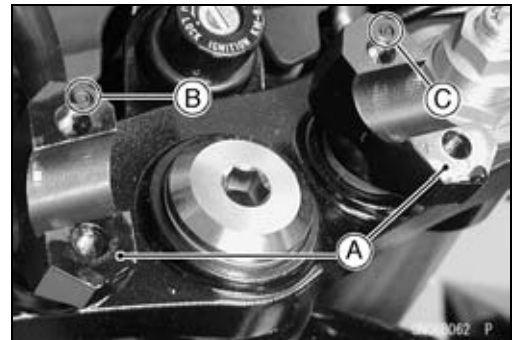
#### Handlebar Removal

- Remove:
  - Clutch Lever Assembly [A]
  - Left Handlebar Switch Housing [B]
  - Front Brake Master Cylinder [C]
  - Right Handlebar Switch Housing [D]
  - Handlebar Holder Bolts [E]
- Remove the handlebar holders [F] and then pull out the handlebar [G].
- Remove the cotter pins [A].
- Unscrew the mounting nuts [B] and remove the handlebar lower clamps [C].

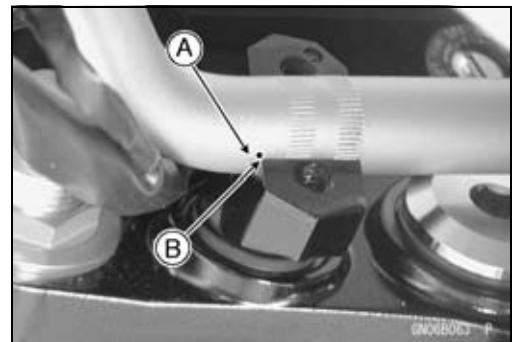


#### Handlebar Installation

- Install the handlebar lower clamps [A], noting the letters "L" [B] and "R" [C].
- Tighten:
  - Torque - Handlebar Lower Clamp 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 clamp.



- Tighten the front clamp bolts first, and then the rear clamp bolts. There will be a gap [A] at the rear part of the clamp after tightening.

**Torque - Handlebar Clamp Bolts: 25 N·m (2.5 kgf·m, 18 ft·lb)**



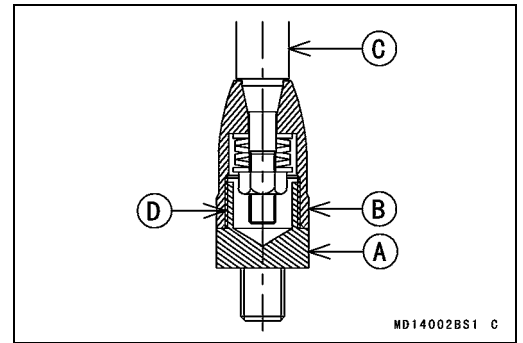
**Handlebar**

*Rear View Mirrors Removal*

- Loosen the lower hexagonal area [A] for tightening to remove the rear view mirror from the holder.

**CAUTION**

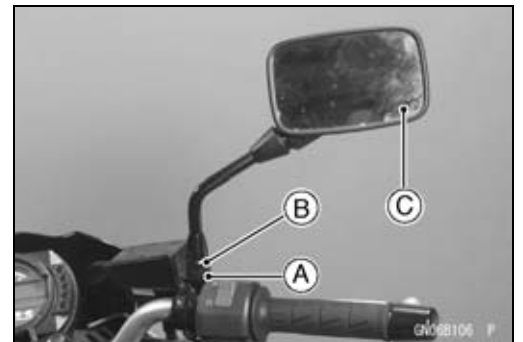
**Do not force to tighten and/or loosen the upper hexagonal area (Adapter) [B] with a pair of spanners. Disassembly of this area is Not Available. Non-permanent locking agent [D] is already applied to the threads of this inner area. Forcible loosening may damage the adapter and/or the turning mechanism of the stay [C].**



*Rear View Mirrors Installation*

- Screw the mounting area of the right rear view mirror into the holder all the way, and tighten the lower hexagonal area for tightening securely.

- [A] Lower Hexagonal Area for Tightening
- [B] Upper Hexagonal Area (Adapter)
- [C] Rear View Mirror (Right)







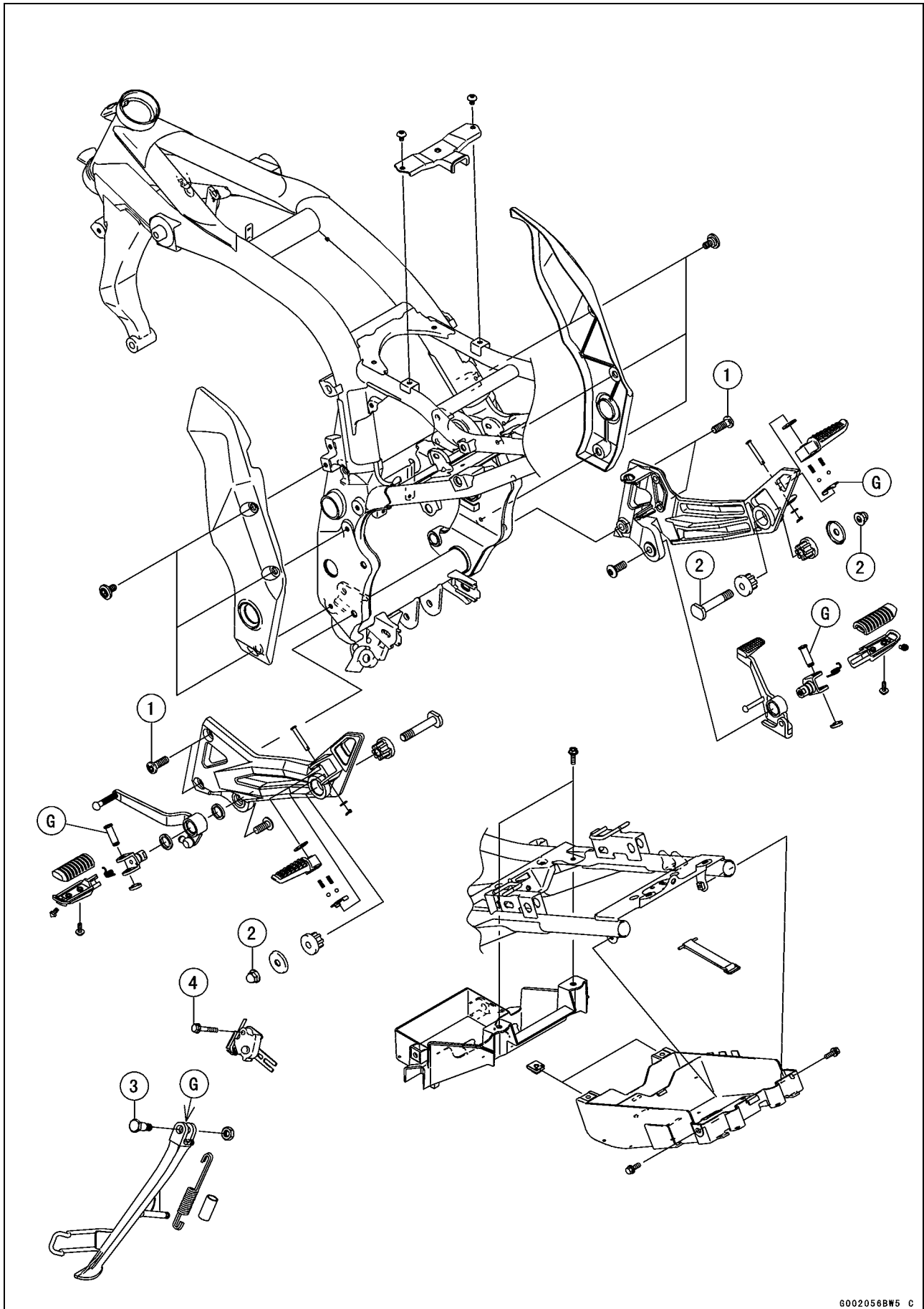
# Frame

## Table of Contents

Exploded View .....	15-2
Seats .....	15-7
Rear Seat Removal.....	15-7
Rear Seat Installation.....	15-7
Front Seat Removal .....	15-7
Front Seat Installation .....	15-7
Side Covers.....	15-8
Side Cover Removal.....	15-8
Side Cover Installation .....	15-8
Fairings.....	15-9
Windshield Removal .....	15-9
Windshield Installation .....	15-9
Inner Cover Removal.....	15-9
Inner Cover Installation .....	15-9
Fairing Removal.....	15-9
Fairing Installation.....	15-10
Faring Bracket Removal .....	15-10
Seat Covers.....	15-11
Seat Cover Removal.....	15-11
Seat Cover Installation.....	15-11
Mud Guard.....	15-12
Mud Guard Removal.....	15-12
Mud Guard Installation.....	15-12
Fenders .....	15-13
Front Fender Removal.....	15-13
Front Fender Installation .....	15-13
Rear Fender Rear Removal.....	15-13
Rear Fender Rear Installation.....	15-14
Frame Cover.....	15-15
Frame Cover Removal.....	15-15
Battery Case.....	15-16
Battery Case Removal .....	15-16
Battery Case Installation .....	15-16
Side Stand.....	15-17
Side Stand Removal .....	15-17
Side Stand Installation .....	15-17
Frame .....	15-18
Frame Inspection .....	15-18

# 15-2 FRAME

## Exploded View



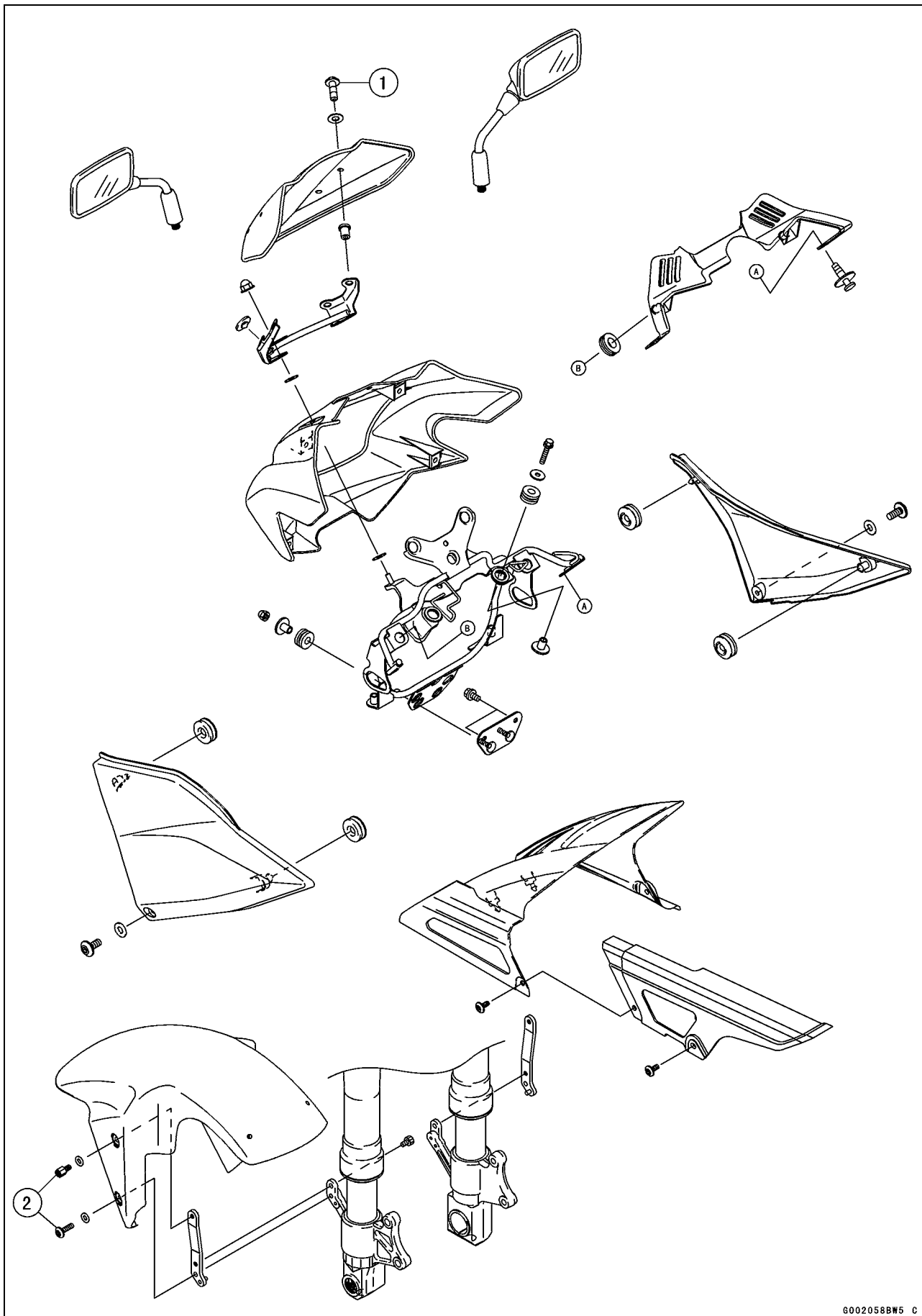
**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Footpeg holder bolts	34	3.5	25	
2	Muffler mounting nuts	29	3.0	22	
3	Side stand bolt	44	4.5	33	
4	Side stand switch bolt	8.8	0.9	78 in·lb	

G: Apply grease.

# 15-4 FRAME

## Exploded View

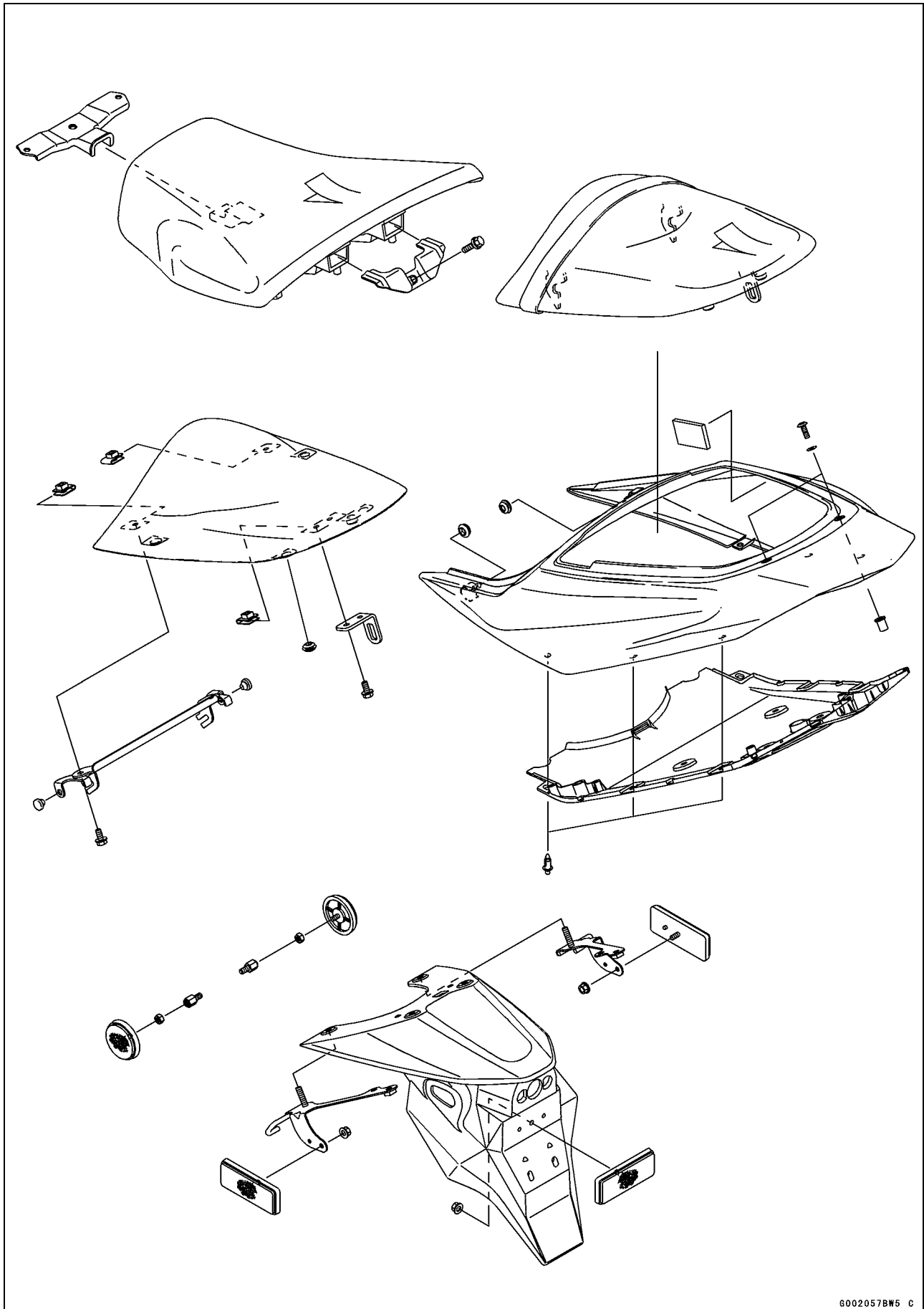


**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Windshield screws	0.35 ~ 0.50	0.035 ~ 0.050	3 ~4 in·lb	
2	Front fender bolts	3.9	0.4	34.7 in·lb	L

# 15-6 FRAME

## Exploded View



## Seats

### Rear Seat Removal

- Insert the ignition switch key into the seat lock [A], turning the key counterclockwise, pulling up on the rear of the seat [B], and pulling the seat backward.

#### **⚠ WARNING**

The muffler surface is hot once the engine has been started. When operating the seat lock be careful not to touch the muffler or you may be burned.

#### **NOTE**

- Insert the ignition key to the bottom of the seat lock, and turn the key counterclockwise while strongly pushing down the rear of the seat for easier removal.

### Rear Seat Installation

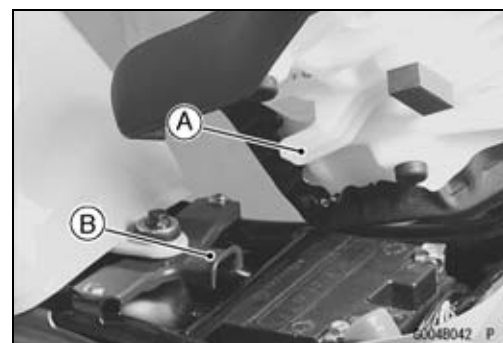
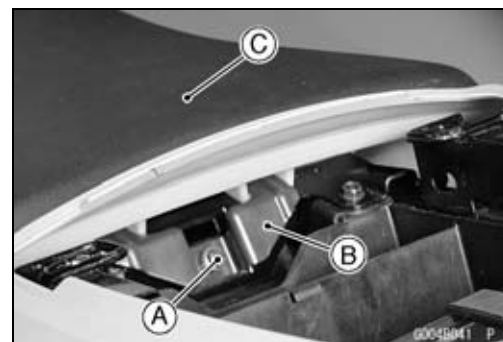
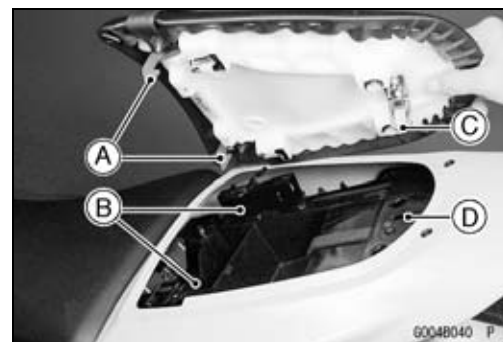
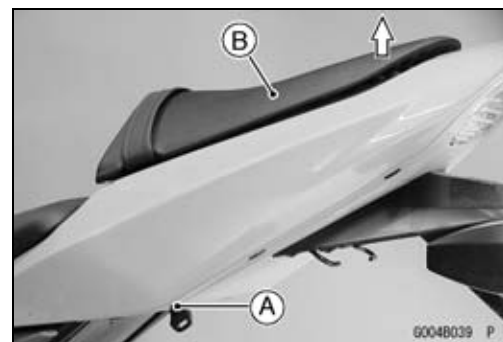
- Slip the rear seat hooks [A] into the hollow-cubic bracket [B] on the frame.
- Insert the seat latch [C] into the latch hole [D].
- Push down the rear part of the seat until the lock clicks.

### Front Seat Removal

- Remove:
  - Rear Seat (see Rear Seat Removal)
  - Mounting Bolts [A]
  - Seat Bracket [B]
- Remove the front seat [C] by pulling it up on the rear and to the rear.

### Front Seat Installation

- Slip the front seat hook [A] under the brace [B] on the fuel tank bracket.



## 15-8 FRAME

### Side Covers

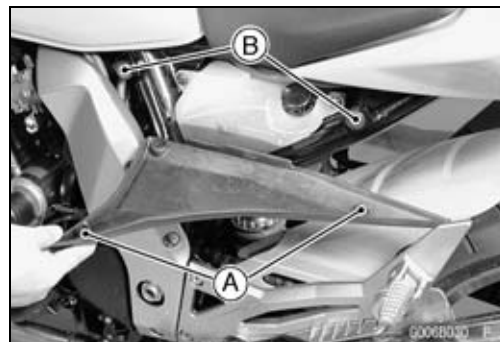
#### *Side Cover Removal*

- 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.

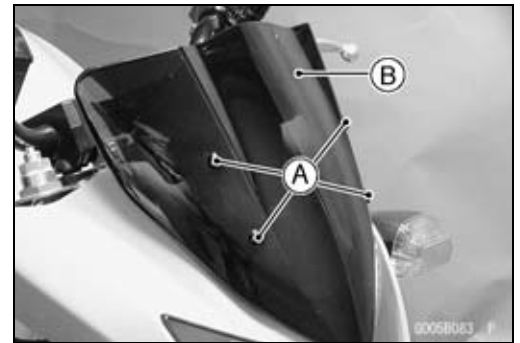




## Fairings

### Windshield Removal

- Remove:
  - Bolts [A]
  - Windshield [B]

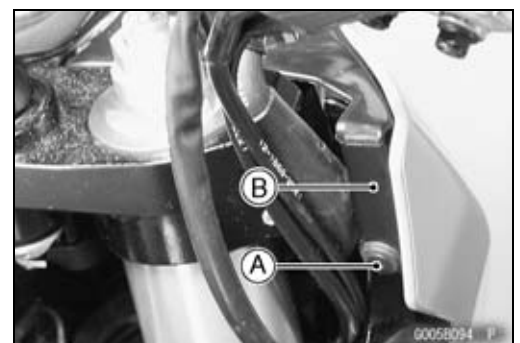


### Windshield Installation

- Windshield Installation is the reverse of removal.
  - Torque - Windshield Screw: 0.35 ~ 0.50 N·m**  
(0.035 ~ 0.050 kgf·m, 3 ~ 4 in·lb)

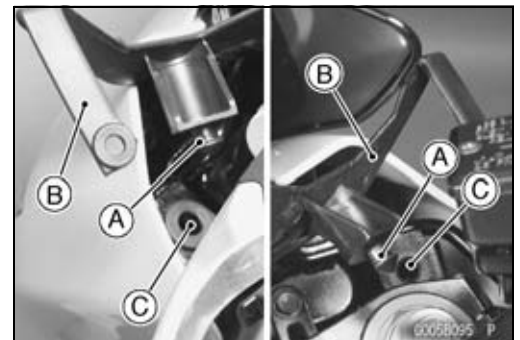
### Inner Cover Removal

- Remove:
  - Inner Cover Screws [A] (both side)
  - Inner Cover [B]



### Inner Cover Installation

- Fit the projections [A] on the inner cover [B] into the holes [C] in the firing bracket.
- Install the inner cover screws.



### Fairing Removal

- Remove:
  - Windshield
  - Windshield Bracket nuts [A]



## 15-10 FRAME

### Fairings

- Remove:
  - Fairing Mounting Bolts [A] (both side)
  - Headlight Connectors

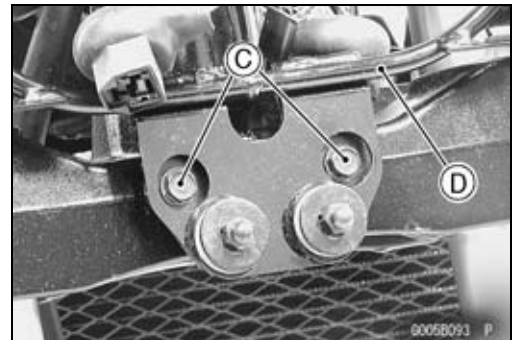
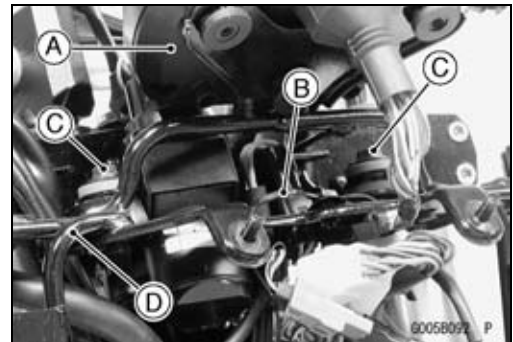


#### *Fairing Installation*

- Fairing installation is the reverse of removal.

#### *Fairing Bracket Removal*

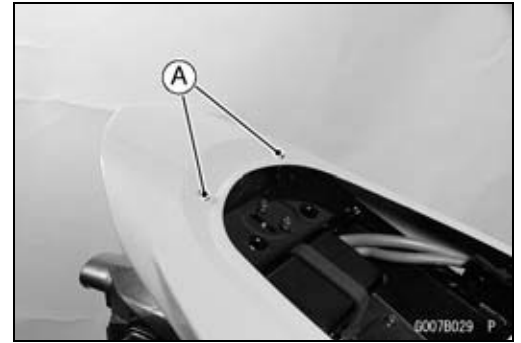
- Remove:
  - Fairing (see Fairing Removal)
  - Turn Signal Lights (see Electrical System chapter)
  - Meter Unit [A] (see Electrical System chapter)
  - Clamp [B]
  - Bolts [C]
  - Firing Bracket [D]



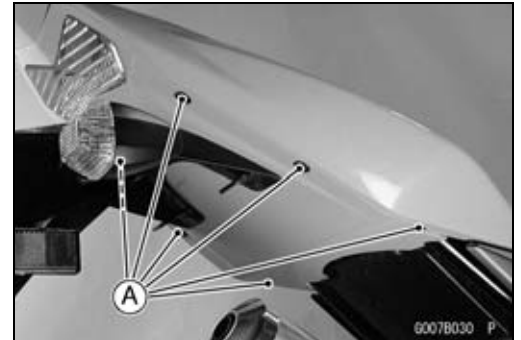
## Seat Covers

### Seat Cover Removal

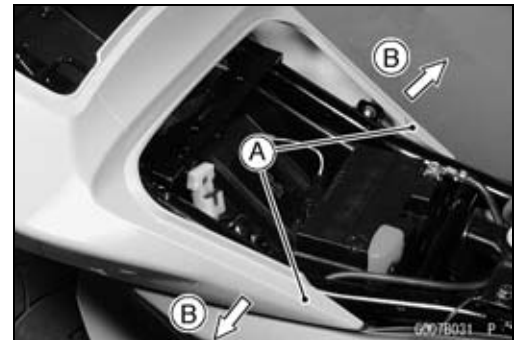
- Remove:
  - Seats
  - Screws [A]



- Push the central pin, and then remove the quick rivets [A].

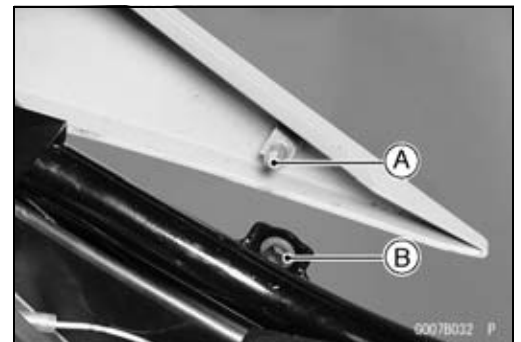


- Pull the front portions [A] of the seat cover outside [B], and then remove the seat cover backward.



### Seat Cover Installation

- Installation is reverse of removal.
- Put the projections [A] into the grommets [B] on the frame.

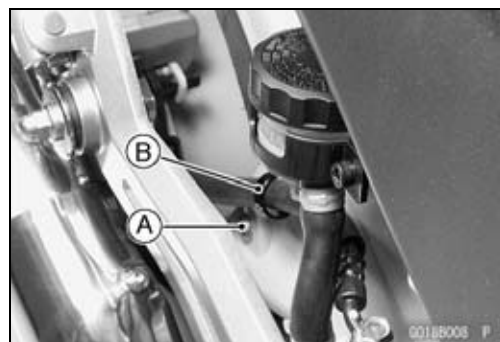


## 15-12 FRAME

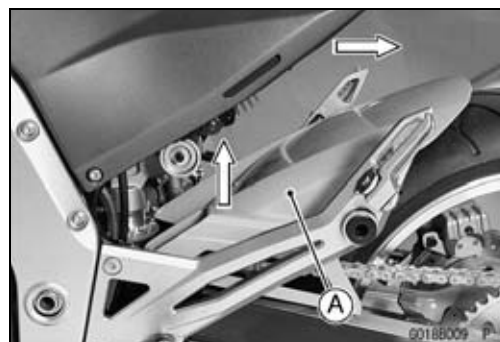
### Mud Guard

#### *Mud Guard Removal*

- Remove:
  - Chain Cover (see Final Drive chapter)
  - Bolt [A]
  - Clamp [B]

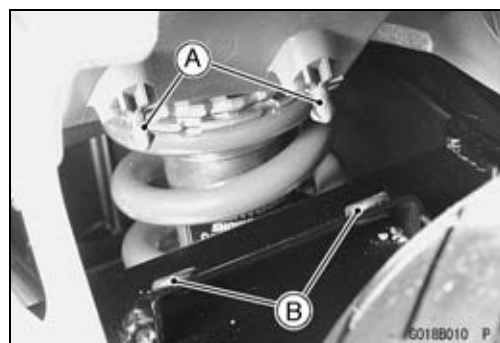


- Lift up the mud guard [A], and then pull it out backward.



#### *Mud Guard Installation*

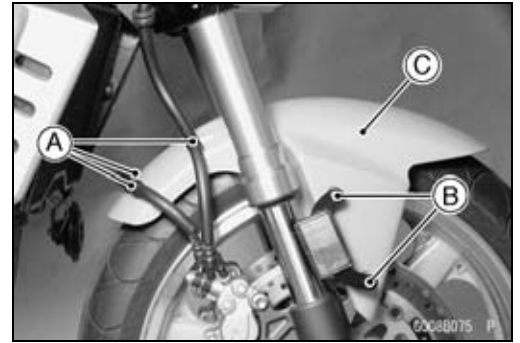
- Put the projections [A] into the grommets [B].



## Fenders

### Front Fender Removal

- Remove:
  - Brake Hose Clamps [A]
  - Bolts [B] (both side)
- Remove the front fender [C].

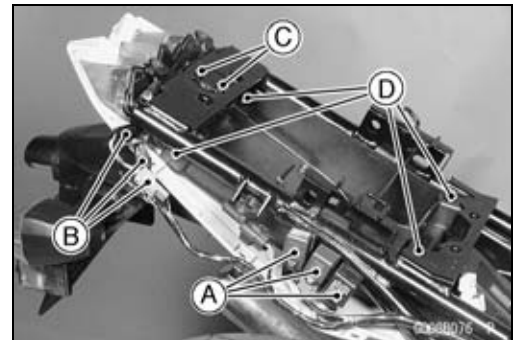


### Front Fender Installation

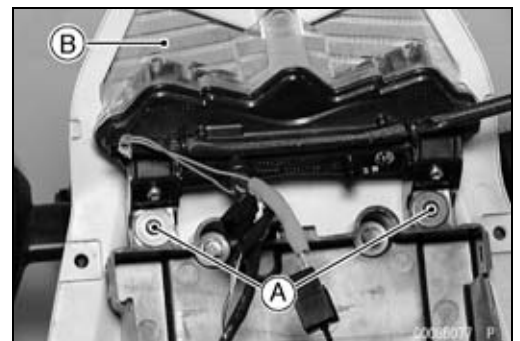
- Install the brake hose clamps to the front fender holes.

### Rear Fender Rear Removal

- Remove:
  - Seats
  - Seat Cover
  - Canister (California model only)
  - Diodes [A] (pull out)
  - Stop and Turn Signal Light Lead Connectors [B]
  - Seat Lock Mounting Bolts [C]
  - Rear Fender Assy Bolts [D]



- Remove:
  - Screws and Washers [A]
  - Tail Lamp Assembly [B]



- Remove:
  - Bolts [A]
  - Storage Compartment [B]



## 15-14 FRAME

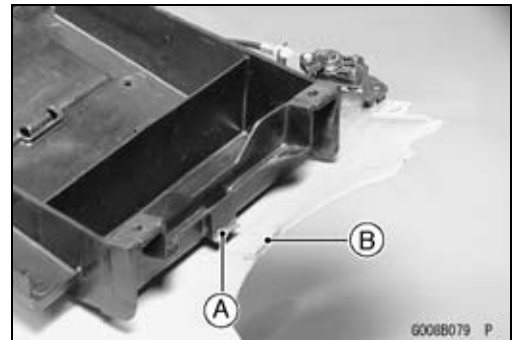
### Fenders

- Remove:
  - Quick Rivets [A]
  - Rear Fender Rear [B]

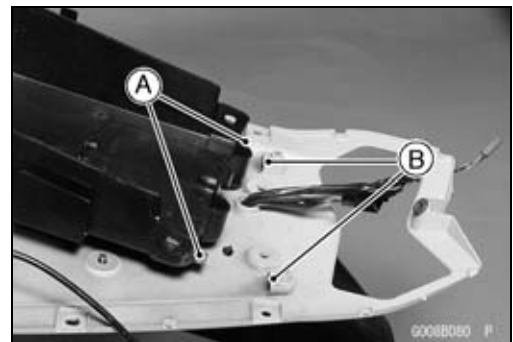


#### *Rear Fender Rear Installation*

- Put the projection [A] into the hole [B].



- Put the projections [A] into the holes [B].
- Installation is reverse of removal.



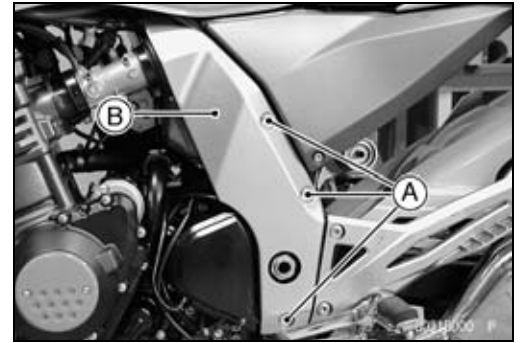
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## Frame Cover

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### *Frame Cover Removal*

- Remove:
  - Bolts [A]
  - Frame Cover [B] (both side)



## 15-16 FRAME

### Battery Case

#### *Battery Case Removal*

- Remove:
  - Seats
  - Seat Cover
  - Rear Fender Assy
  - Side Covers
  - Battery
  - Left Side Screw [A] (with reserver tank)
- Pull out the battery case [B] backward [C].



#### *Battery Case Installation*

- Put the battery case attachments [A] at the projections [B] on the frame.

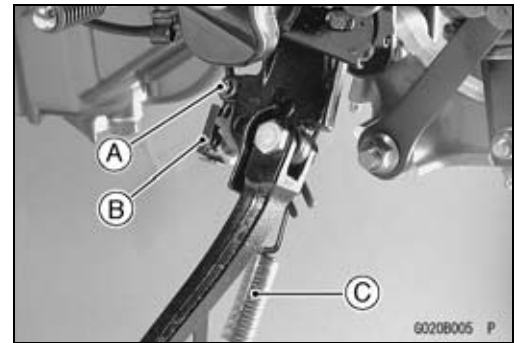




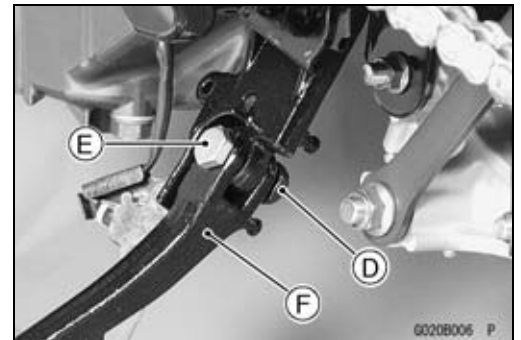
## Side Stand

### Side Stand Removal

- Raise the rear wheel off the ground with the stand.
- Remove:
  - Muffler (both side)
  - Exhaust pipe
  - Side Stand Switch Bolt [A]
  - Side Stand Switch [B]
  - Spring [C]



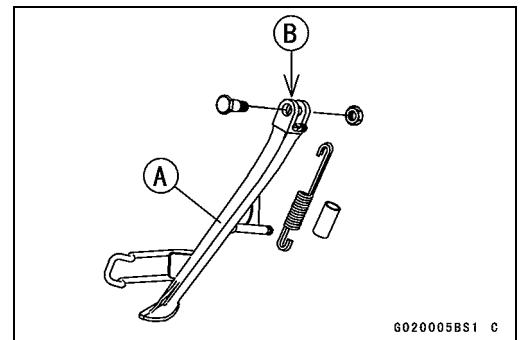
- Side Stand Nut [D]
- Side Stand Bolt [E]
- Side Stand [F]



### 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, 32 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 (0.9 kgf·m, 78 in·lb)**



## 15-18 FRAME

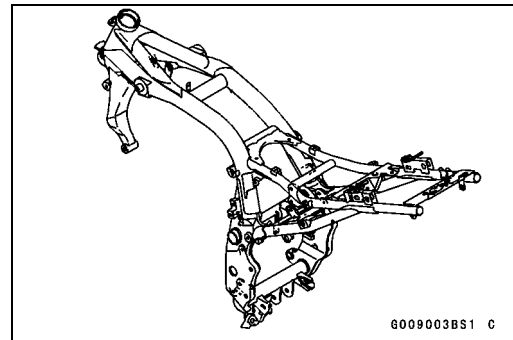
### Frame

#### *Frame Inspection*

- Visually inspect the frame for cracks, dents, bending, or warp.
- If there is any damage to the frame, replace it.

#### **⚠ WARNING**

**A repaired frame may fail in use, possibly causing an accident. If the frame is bent, dented, cracked, or warped, replace it.**



# Electrical System

## Table of Contents

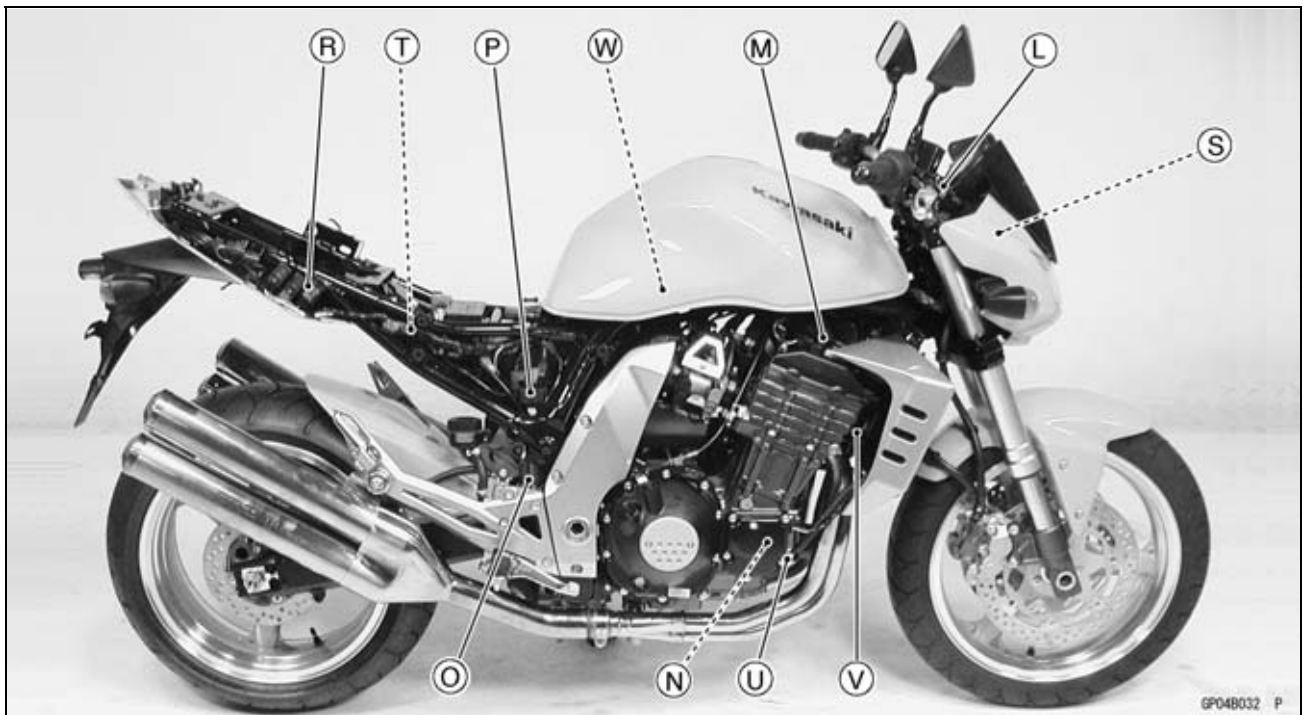
Parts Location.....	16-3	Camshaft Position Sensor Peak	
Exploded View.....	16-4	Voltage Inspection.....	16-41
Specifications .....	16-10	Stick Coil (Ignition Coil together	
Special Tools and Sealant.....	16-11	with Spark Plug Cap) Removal .	16-41
Wiring Diagram (U.S.A. and Canada)	16-12	Stick Coil (Ignition Coil together	
Wiring Diagram (Australia) .....	16-14	with Spark Plug Cap)	
Wiring Diagram (Other than U.S.A.,		Installation .....	16-42
Canada, Australia, and Malaysia)...	16-16	Stick Coil (Ignition Coil together	
Wiring Diagram (Malaysia) .....	16-18	with Spark Plug Cap) Inspection	16-43
Precautions.....	16-20	Stick Coil Primary Peak Voltage ..	16-43
Electrical Wiring.....	16-22	Spark Plug Removal .....	16-44
Wiring Inspection .....	16-22	Spark Plug Installation .....	16-44
Battery .....	16-23	Spark Plug Cleaning and	
Battery Removal .....	16-23	Inspection.....	16-44
Battery Installation .....	16-23	Spark Plug Gap Inspection .....	16-44
Electrolyte Filling.....	16-23	Interlock Operation Inspection ....	16-45
Initial Charge.....	16-25	IC Igniter Inspection.....	16-46
Precautions .....	16-26	Electric Starter System.....	16-49
Interchange .....	16-27	Starter Motor Removal.....	16-49
Charging Condition Inspection.....	16-27	Starter Motor Installation.....	16-49
Refreshing Charge.....	16-27	Starter Motor Disassembly.....	16-49
Charging System .....	16-29	Starter Motor Assembly .....	16-50
Alternator Cover Removal.....	16-29	Brush Inspection .....	16-51
Alternator Cover Installation.....	16-29	Commutator Cleaning and	
Stator Coil Removal .....	16-29	Inspection.....	16-51
Stator Coil Installation.....	16-30	Armature Inspection.....	16-51
Alternator Rotor Removal .....	16-30	Brush Lead Inspection .....	16-52
Alternator Rotor Installation .....	16-30	Brush Plate and Terminal Bolt	
Alternator Inspection .....	16-32	Inspection.....	16-52
Regulator/Rectifier Inspection.....	16-33	Starter Relay Inspection.....	16-52
Charging Voltage Inspection.....	16-35	Lighting System .....	16-54
Ignition System.....	16-37	Headlight Beam Horizontal	
Crankshaft Sensor Removal.....	16-37	Adjustment .....	16-54
Crankshaft Sensor Installation .....	16-38	Headlight Beam Vertical	
Crankshaft Sensor Inspection.....	16-38	Adjustment .....	16-54
Crankshaft Sensor Peak Voltage		Headlight Bulb Replacement .....	16-55
Inspection.....	16-39	Headlight Removal/Installation ....	16-56
Timing Rotor Removal .....	16-39	City Light Bulb Replacement	
Timing Rotor Installation .....	16-39	(European Model) .....	16-56
Camshaft Position Sensor		Turn Signal Light Bulb	
Removal.....	16-40	Replacement.....	16-59
Camshaft Position Sensor		Turn Signal Relay Inspection .....	16-61
Installation.....	16-40	Tail/Brake Light (LED) Removal...	16-61
Camshaft Position Sensor		Tail/Brake Light (LED) Installation	16-62
Inspection.....	16-40	Radiator Fan System.....	16-63
		Fan System Circuit Inspection .....	16-63

## 16-2 ELECTRICAL SYSTEM

---

Fan Motor Inspection .....	16-63	Fuel Reserve Switch Inspection...	16-79
Meter, Gauge, Indicator Unit.....	16-65	Diode (Rectifier) Inspection.....	16-80
Meter Unit Removal .....	16-65	Junction Box.....	16-81
Meter, Gauge Disassembly.....	16-65	Junction Box Fuse Circuit	
Electronic Combination Meter		Inspection.....	16-81
Unit Inspection .....	16-66	Starter Circuit/Headlight Relay	
Switches and Sensors .....	16-75	Inspection.....	16-82
Brake Light Timing Inspection.....	16-75	Diode Circuit Inspection .....	16-83
Brake Light Timing Adjustment ....	16-75	Fuse.....	16-84
Switch Inspection .....	16-75	30A Main Fuse Removal.....	16-84
Radiator Fan Switch Inspection ...	16-75	Junction Box Fuse Removal .....	16-84
Water Temperature Sensor		Fuse Installation.....	16-84
Inspection.....	16-76	15A ECU Fuse Removal.....	16-84
Speed Sensor Inspection.....	16-77	Fuse Inspection.....	16-84
Fuel Level Sensor Inspection.....	16-79		

Parts Location



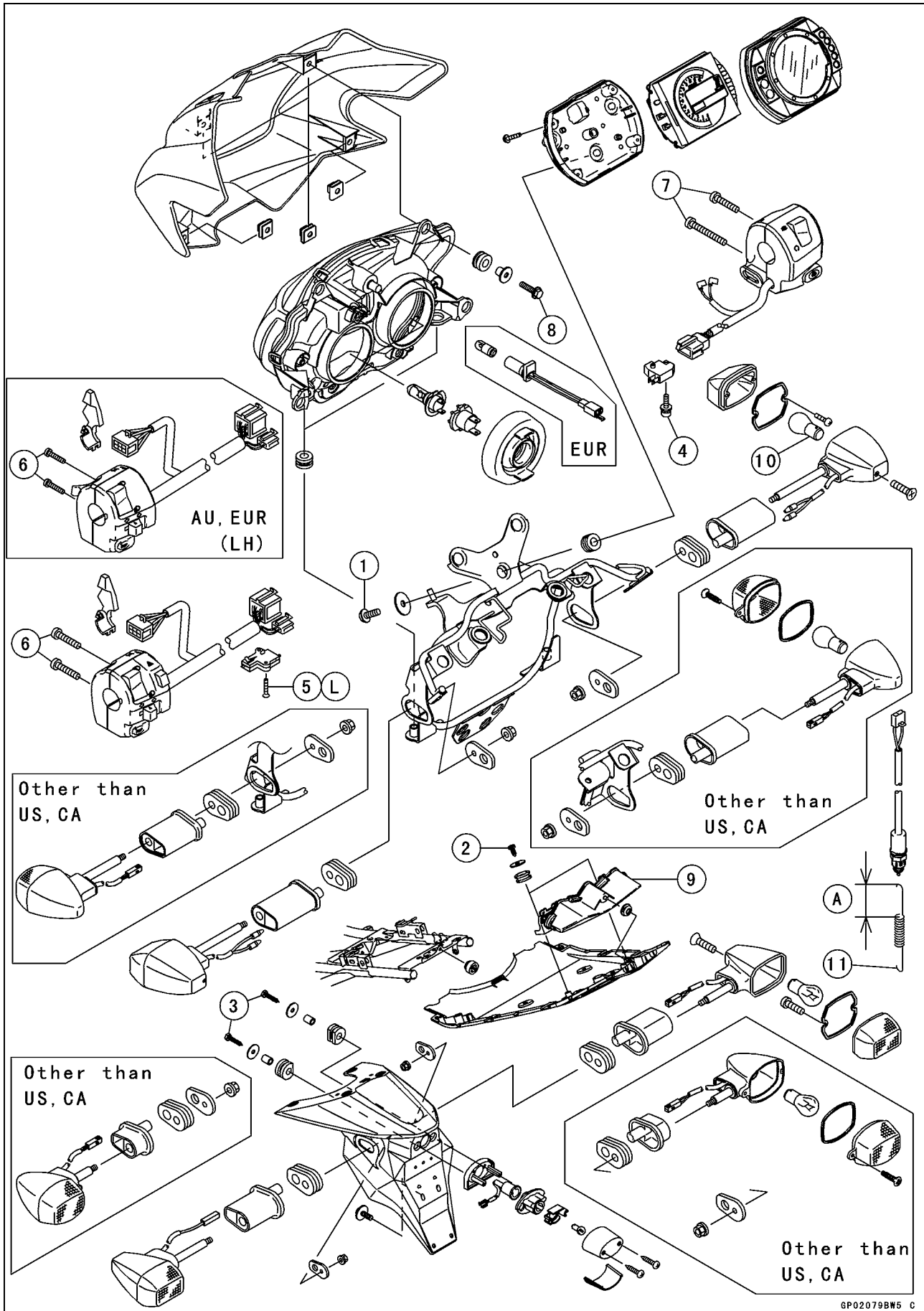
- [A] Starter Lockout Switch
- [B] Camshaft Position Sensor
- [C] Radiator Fan Switch
- [D] Starter Motor
- [E] Alternator
- [F] Speed Sensor
- [G] Neutral Switch
- [H] Side Stand Switch

- [I] Water Temperature Sensor
- [J] Battery
- [K] Junction Box
- [L] Front Brake Light Switch
- [M] Stick Coils
- [N] Crankshaft Sensor
- [O] Rear Brake Light Switch
- [P] Starter Relay and Main Fuse

- [Q] ECU Fuse
- [R] Turn Signal Relay
- [S] Diode (Rectifier)
- [T] ECU  
(Electronic Control Unit)
- [U] Oil Pressure Switch
- [V] Radiator Fan
- [W] Fuel Level Sensor

# 16-4 ELECTRICAL SYSTEM

## Exploded View



**Exploded View**

No.	Fastener	Torque			Remarks
		N·m	kgf·m	ft·lb	
1	Meter mounting screws	1.2	0.12	11 in·lb	
2	Tail/brake light mounting screws	1.2	0.12	11 in·lb	
3	License plate light mounting screws	1.2	0.12	11 in·lb	
4	Front brake light switch screw	1.2	0.12	11 in·lb	
5	Starter locknut switch screws	-	-	-	L
6	Left switch housing screws	3.4	0.35	30 in·lb	
7	Right switch housing screws	3.4	0.35	30 in·lb	
8	Headlight mounting bolts	5.9	0.6	53 in·lb	

9. Tail/brake lights (LED)

10. Vibration Resistance Bulb

11. Install the rear brake spring as shown.

Longer Side [A]

L: Apply a non-permanent locking agent.

EUR: European Community

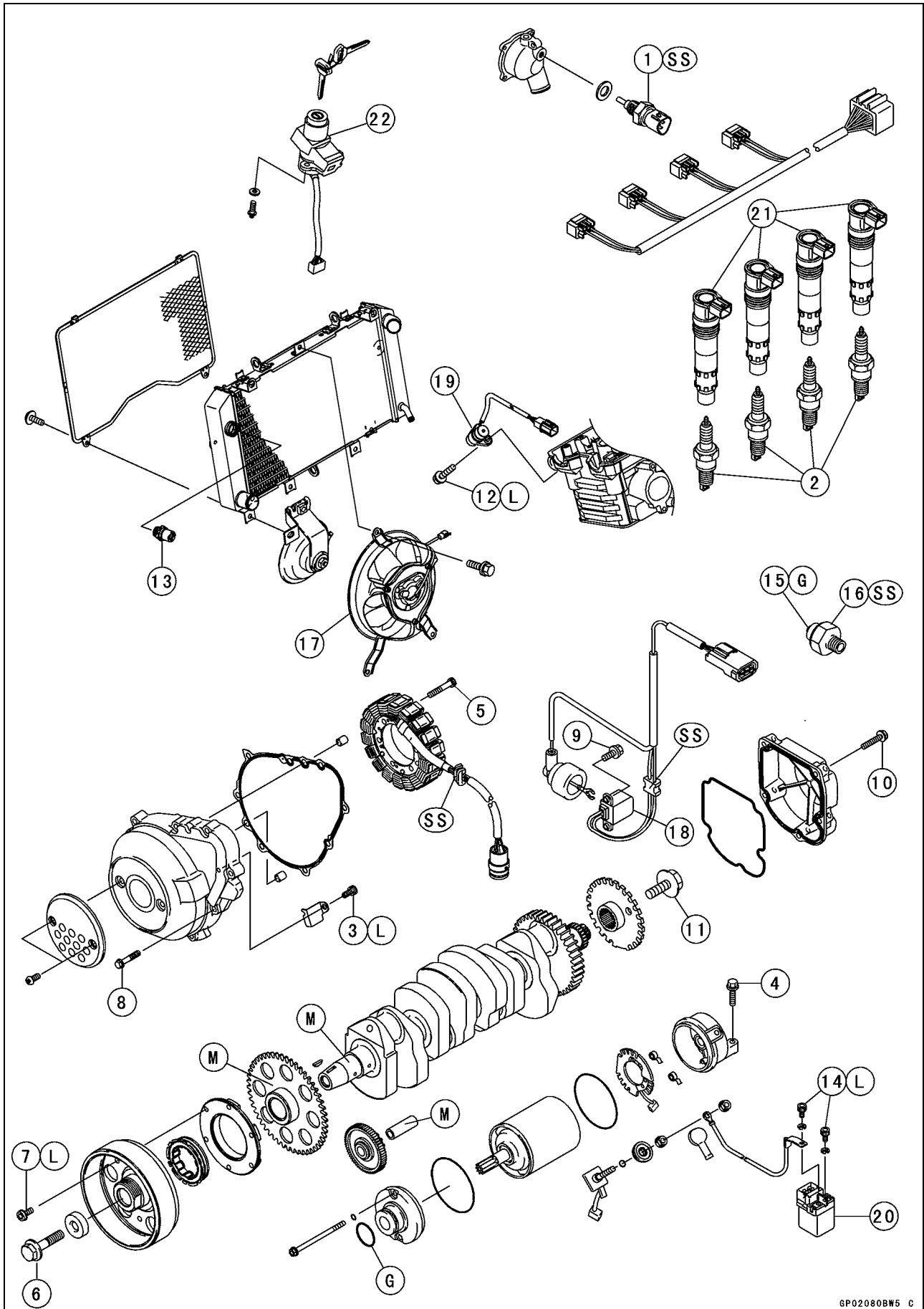
AU: Australia

CA: Canada

US: U.S.A.

# 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	115 in·lb	
3	Alternator lead holding plate bolts	11	1.1	95 in·lb	L
4	Starter motor mounting bolts	11	1.1	95 in·lb	
5	Stator motor coil bolts	11	1.1	95 in·lb	
6	Alternator rotor bolt	110	11	80	
7	Starter 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	0.6	53 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	0.4	35 in·lb	L
15	Oil pressure switch terminal bolts	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

G: Apply grease.

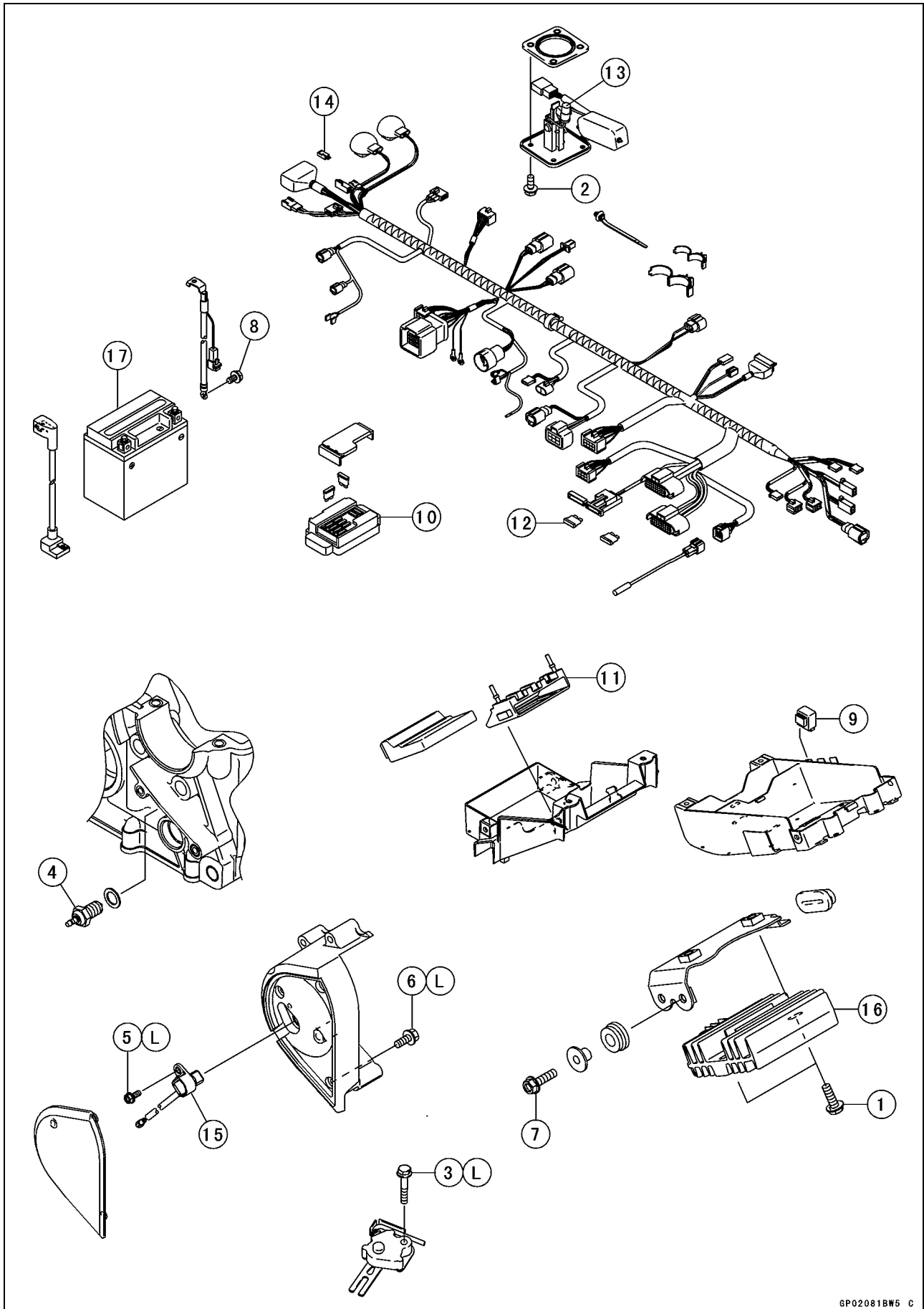
L: Apply a non-permanent locking agent.

M: Apply molybdenum disulfide grease.

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	0.7	62 in·lb	
2	Fuel level sensor bolts	6.9	0.7	62 in·lb	
3	Side stand switch bolt	8.8	0.9	78 in·lb	
4	Neutral switch	15	1.5	11	
5	Speed sensor bolt	6.9	0.7	62 in·lb	L
6	Speed sensor cover bolts	6.9	0.7	62 in·lb	L
7	Regulator/rectifier bracket bolts	6.9	0.7	62 in·lb	
8	Engine ground cable terminal bolt	9.8	1.0	87 in·lb	

- 9. Turn signal relay
  - 10. Junction box
  - 11. ECU (Electrical 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.

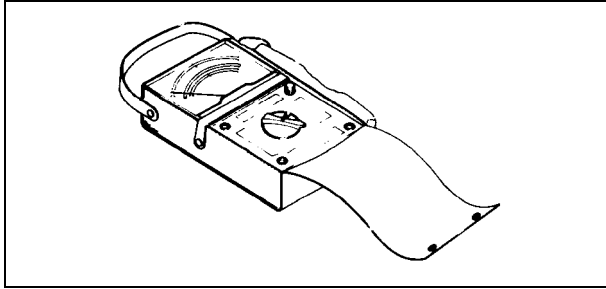
## 16-10 ELECTRICAL SYSTEM

### Specifications

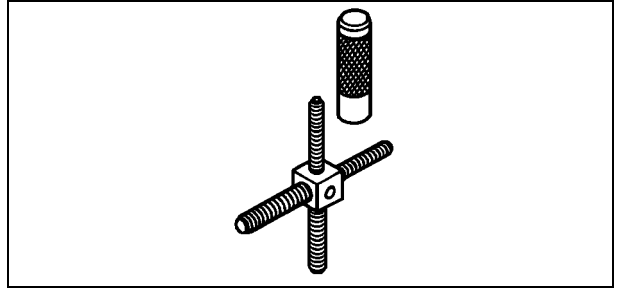
Item	Standard
<b>Battery:</b> Type Capacity Voltage	Sealed Battery 12 V 8 Ah 12.6 V or more
<b>Charging System:</b> Type Alternator output voltage Stator coil resistance Charging voltage (regulator/rectifier output voltage)	Three-phase AC 42 V or more 0.3 ~ 0.4 Ω 14.7 ± 0.5 V
<b>Ignition System:</b> Crankshaft sensor resistance Crankshaft sensor peak voltage Camshaft Position Sensor resistance Camshaft Position Sensor peak voltage Stick coil: Primary winding resistance Secondary winding resistance Primary peak voltage Spark plug: Spark plug gap IC igniter inspection:	376 ~ 564 Ω 1.9 V or more 400 ~ 460 Ω 0.2 V or more 1.04 ~ 1.56 Ω 10.8 ~ 16.2 kΩ 88 V or more 0.7 ~ 0.8 mm (0.028 ~ 0.031 in.) in the text
<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> Speedometer sensor 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 Fuel reserve switch	in the text 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 Ω OFF: More than 10 MΩ in the text 4 ~ 10 Ω 90 ~ 100 Ω in the text

**Special Tools and Sealant**

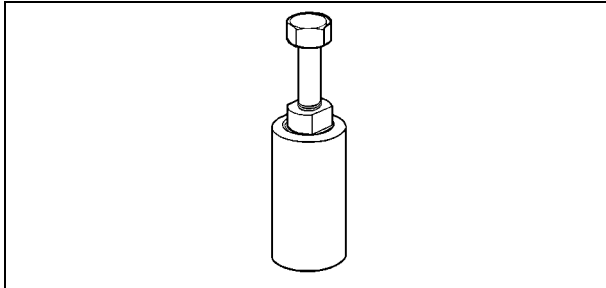
**Hand Tester:**  
57001-1394



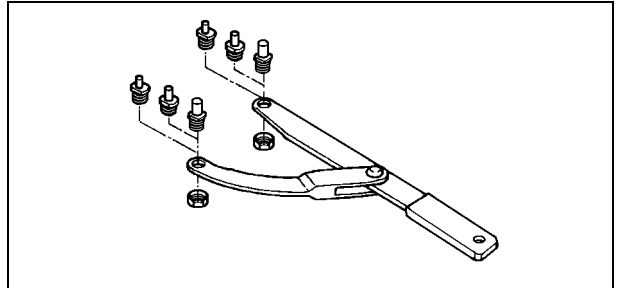
**Rotor Puller, M16/M18/M20/M22 × 1.5:**  
57001-1216



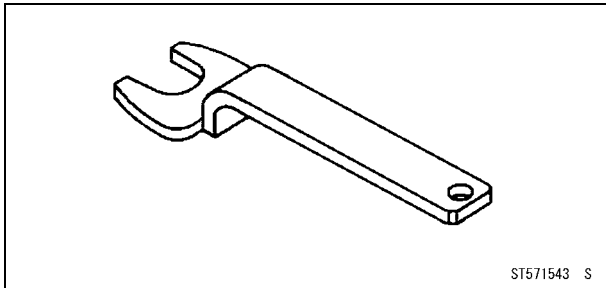
**Flywheel Puller, M38 × 1.5:**  
57001-1405



**Flywheel and Pulley Holder:**  
57001-1343

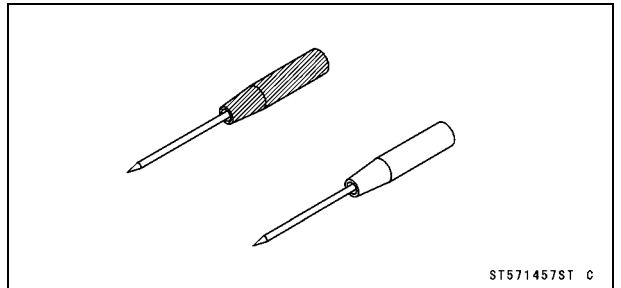


**Rotor Holder:**  
57001-1543



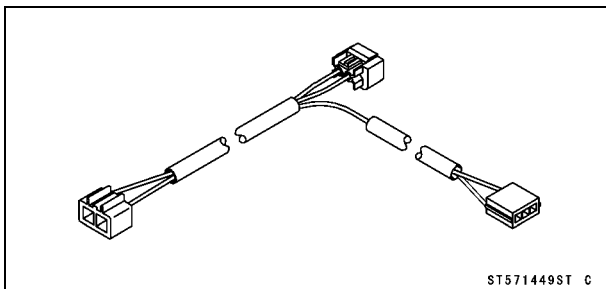
ST571543 S

**Needle Adapter:**  
57001-1457



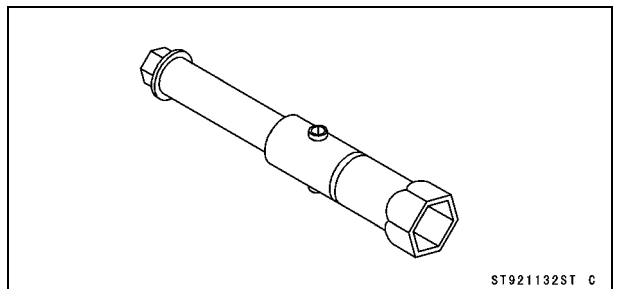
ST571457ST C

**Lead Wire-Peak Voltage Adapter:**  
57001-1449



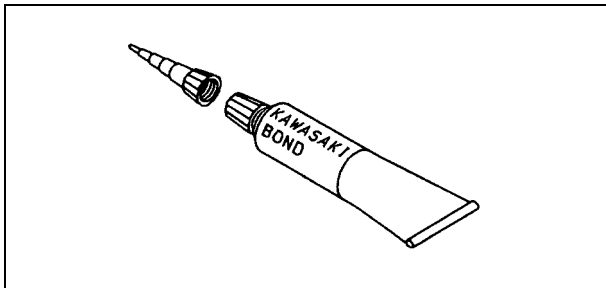
ST571449ST C

**Spark Plug Wrench (Owner's Tool):**  
92110-1132

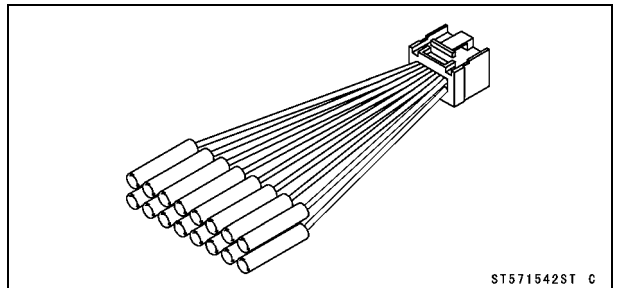


ST921132ST C

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



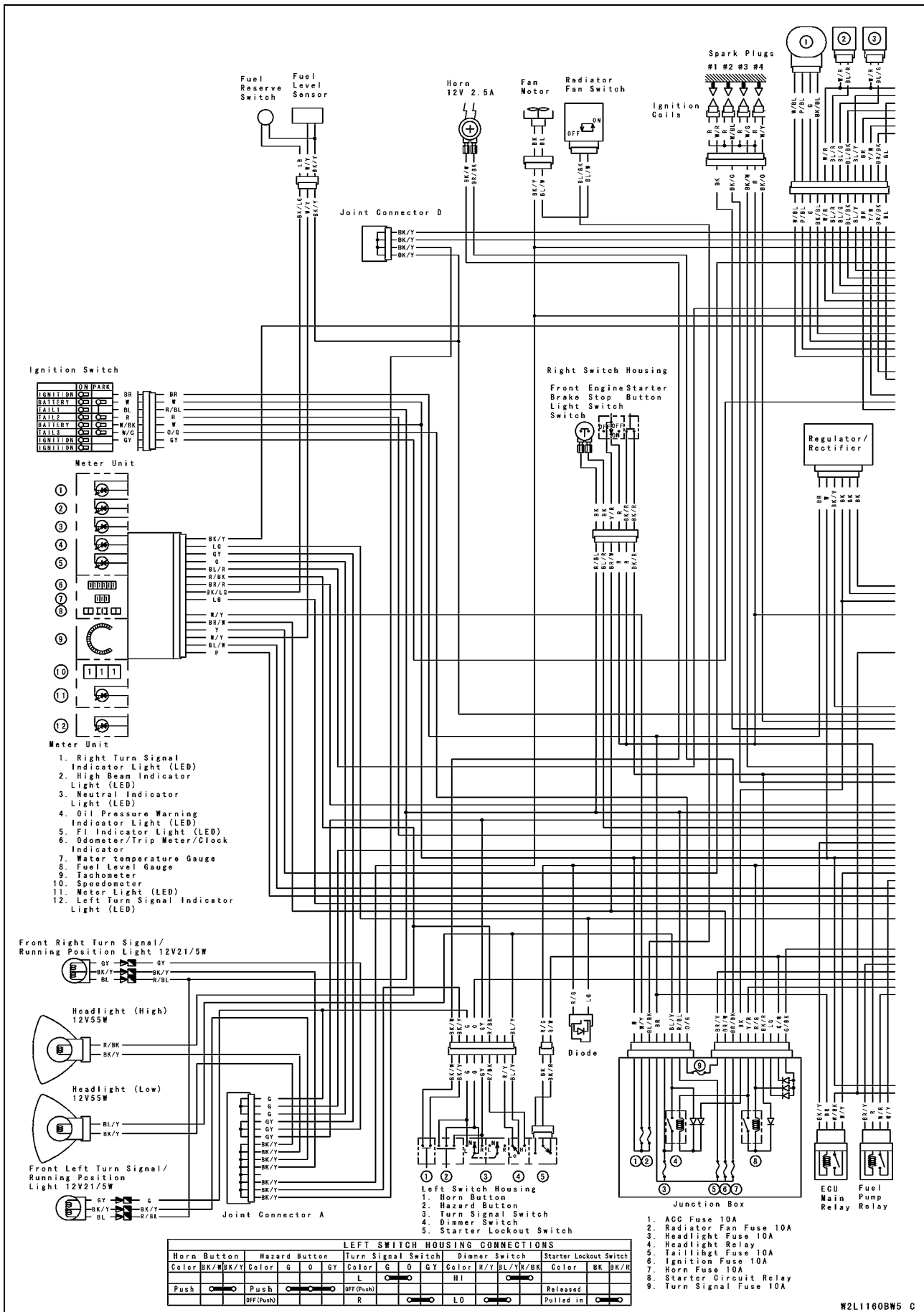
**Harness Adapter:**  
57001-1542



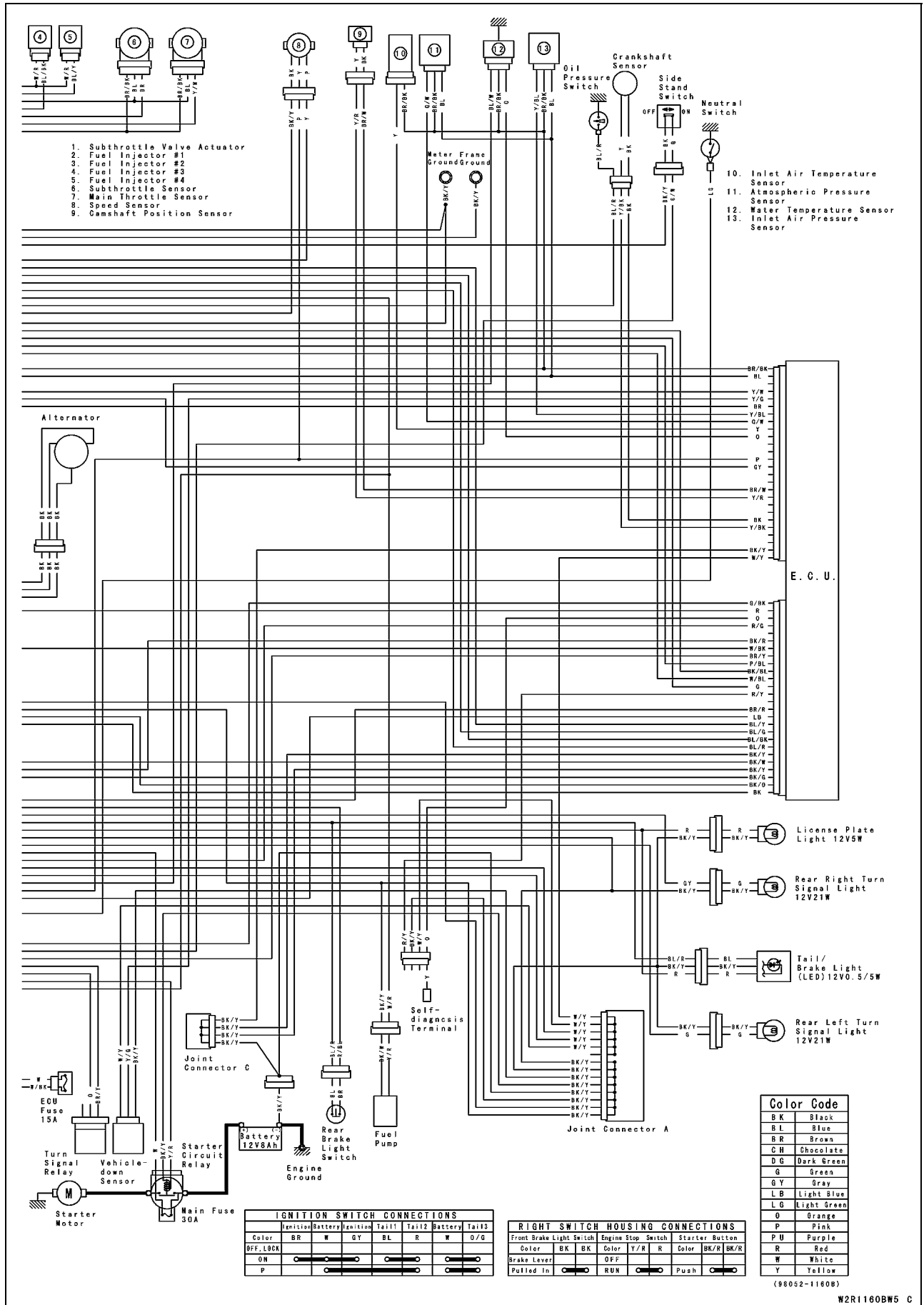
ST571542ST C

# 16-12 ELECTRICAL SYSTEM

## Wiring Diagram (U.S.A. and Canada)

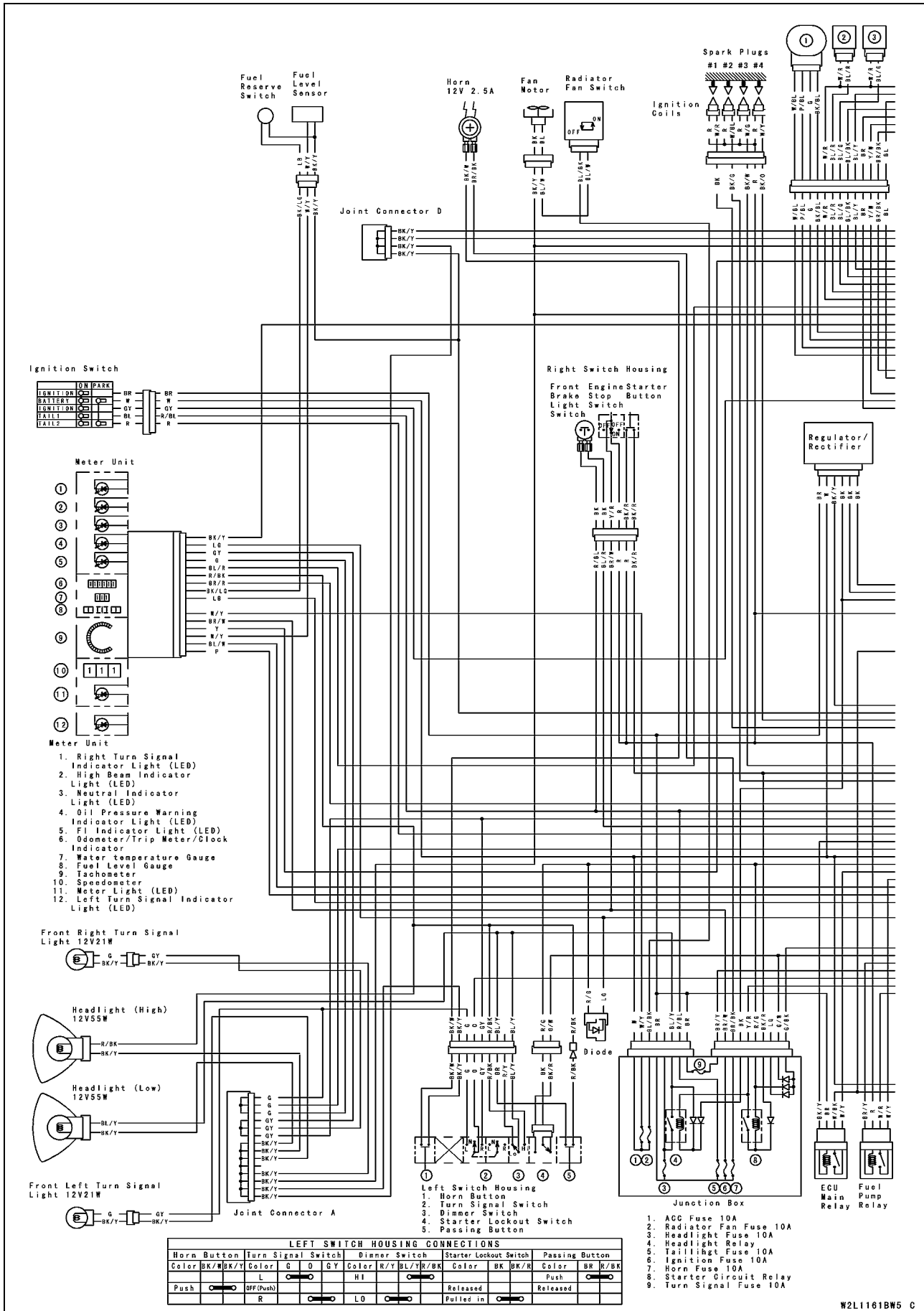


## Wiring Diagram (U.S.A. and Canada)



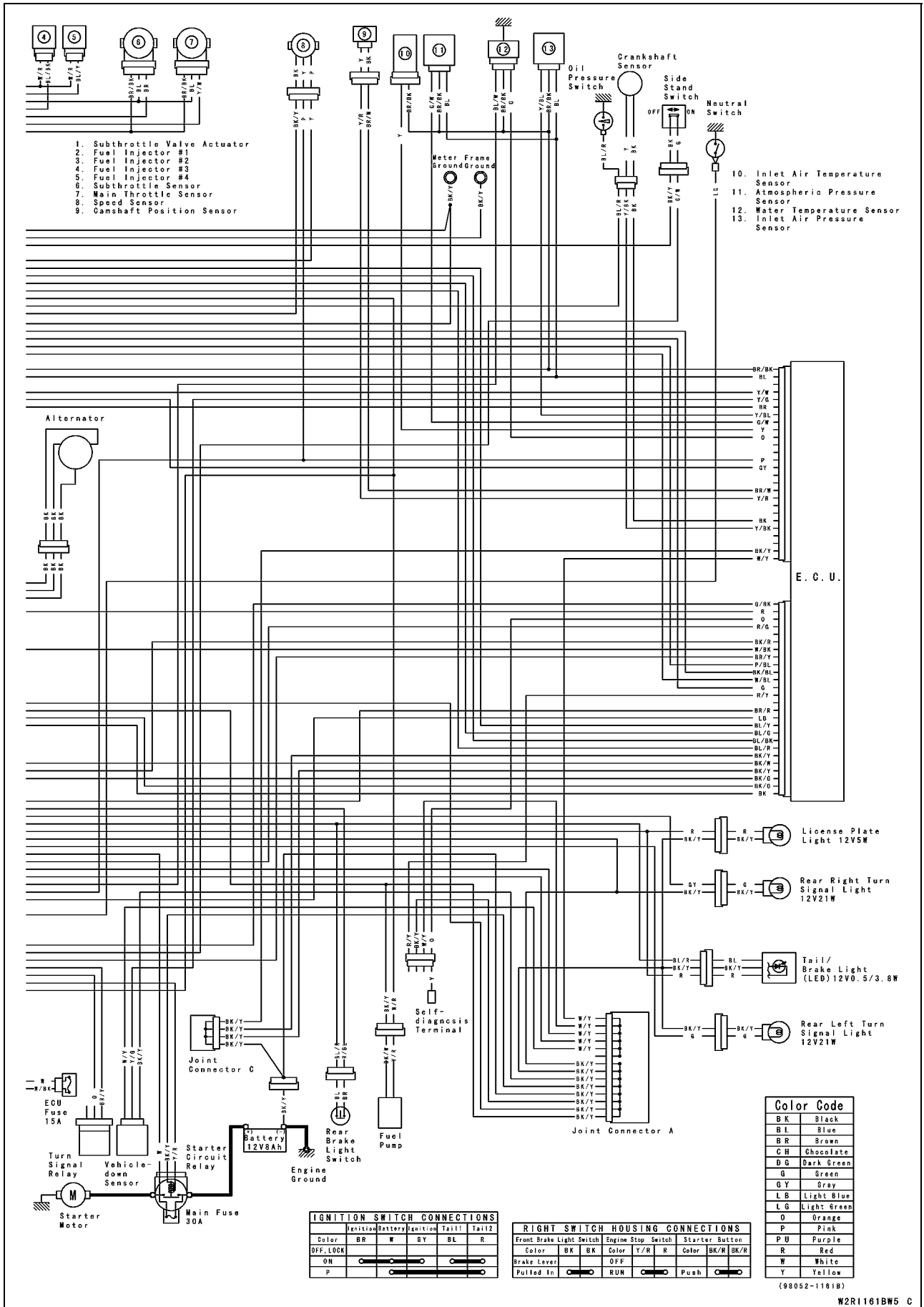
# 16-14 ELECTRICAL SYSTEM

## Wiring Diagram (Australia)



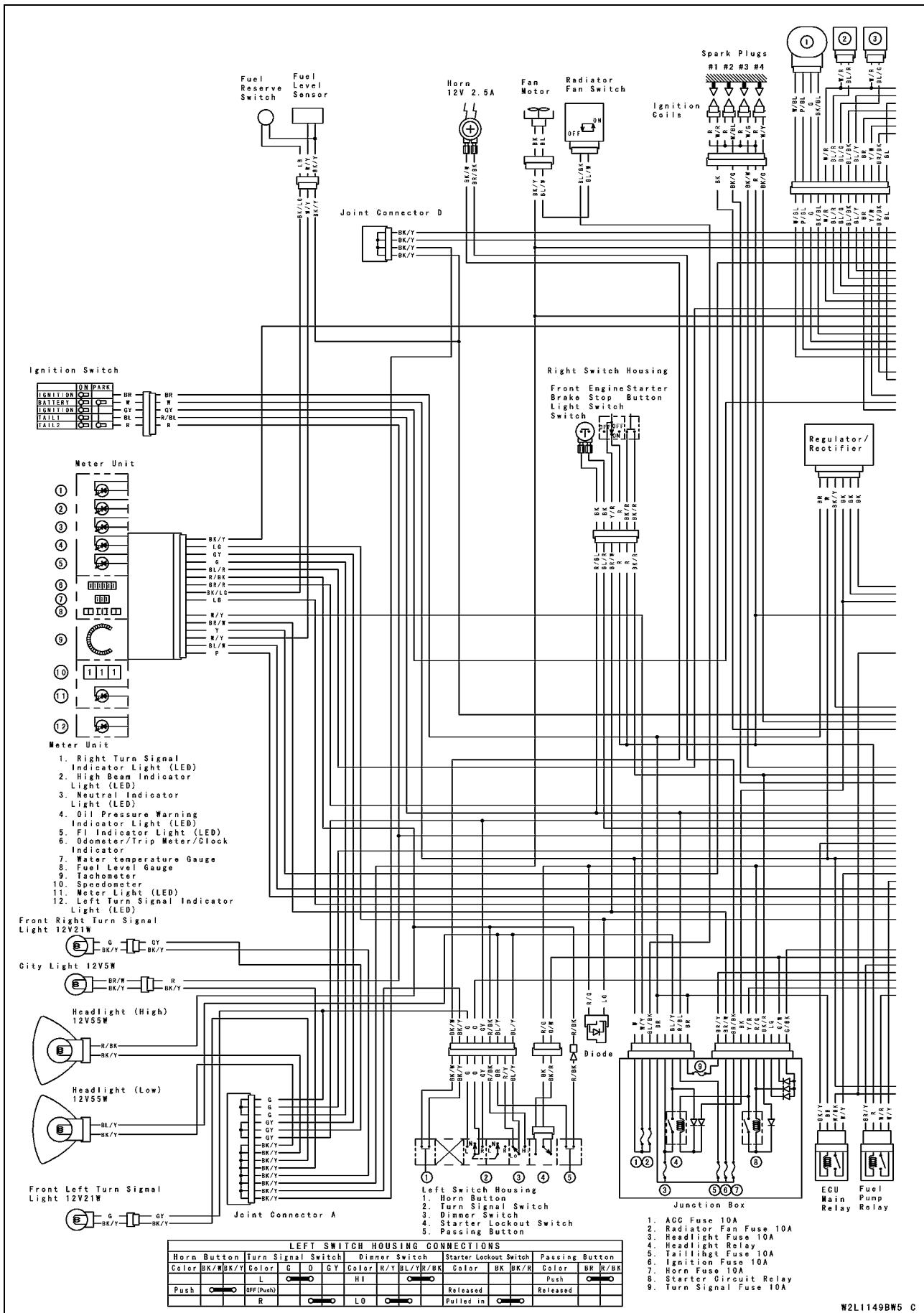


## Wiring Diagram (Australia)



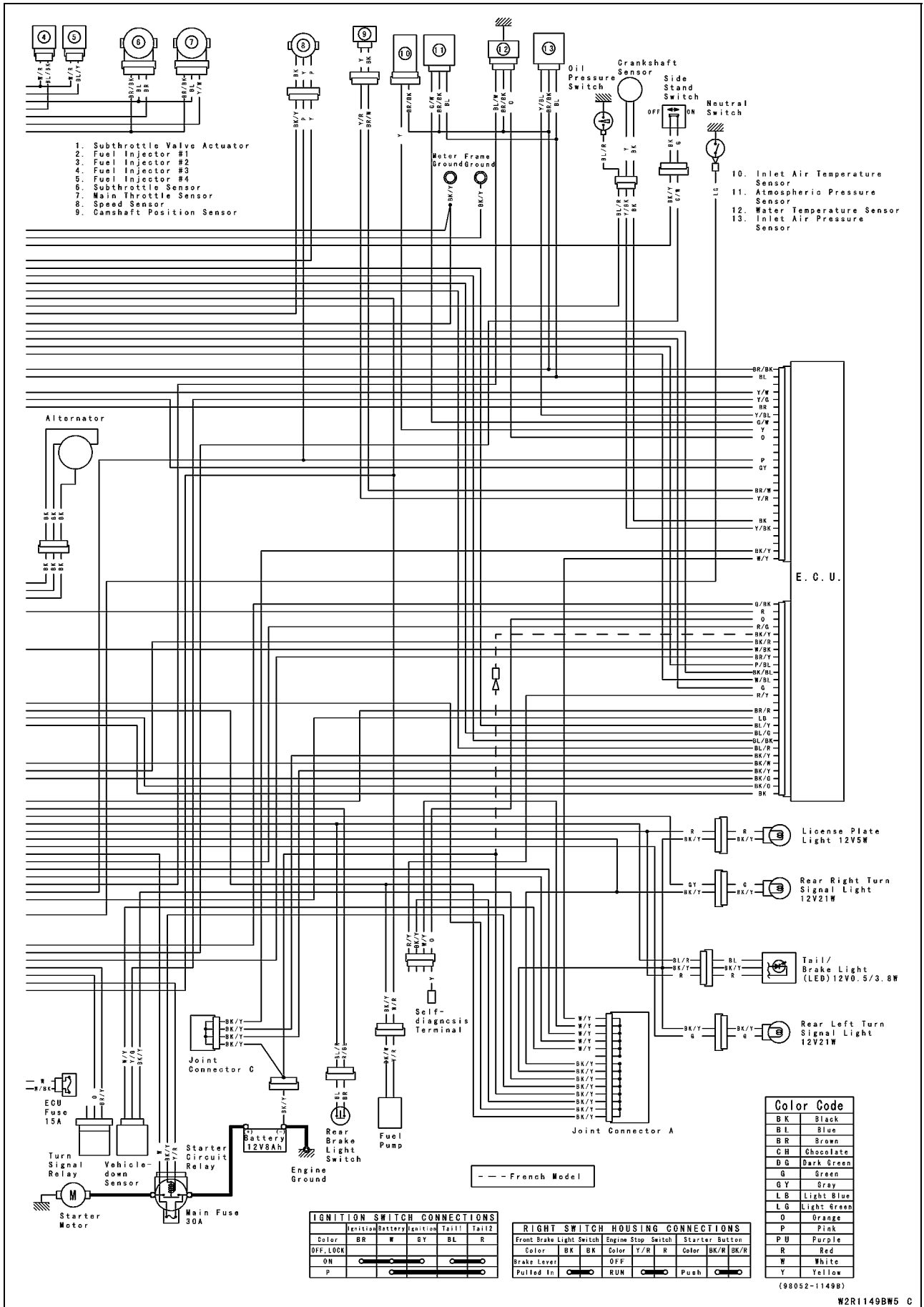
# 16-16 ELECTRICAL SYSTEM

## Wiring Diagram (Other than U.S.A., Canada, Australia, and Malaysia)



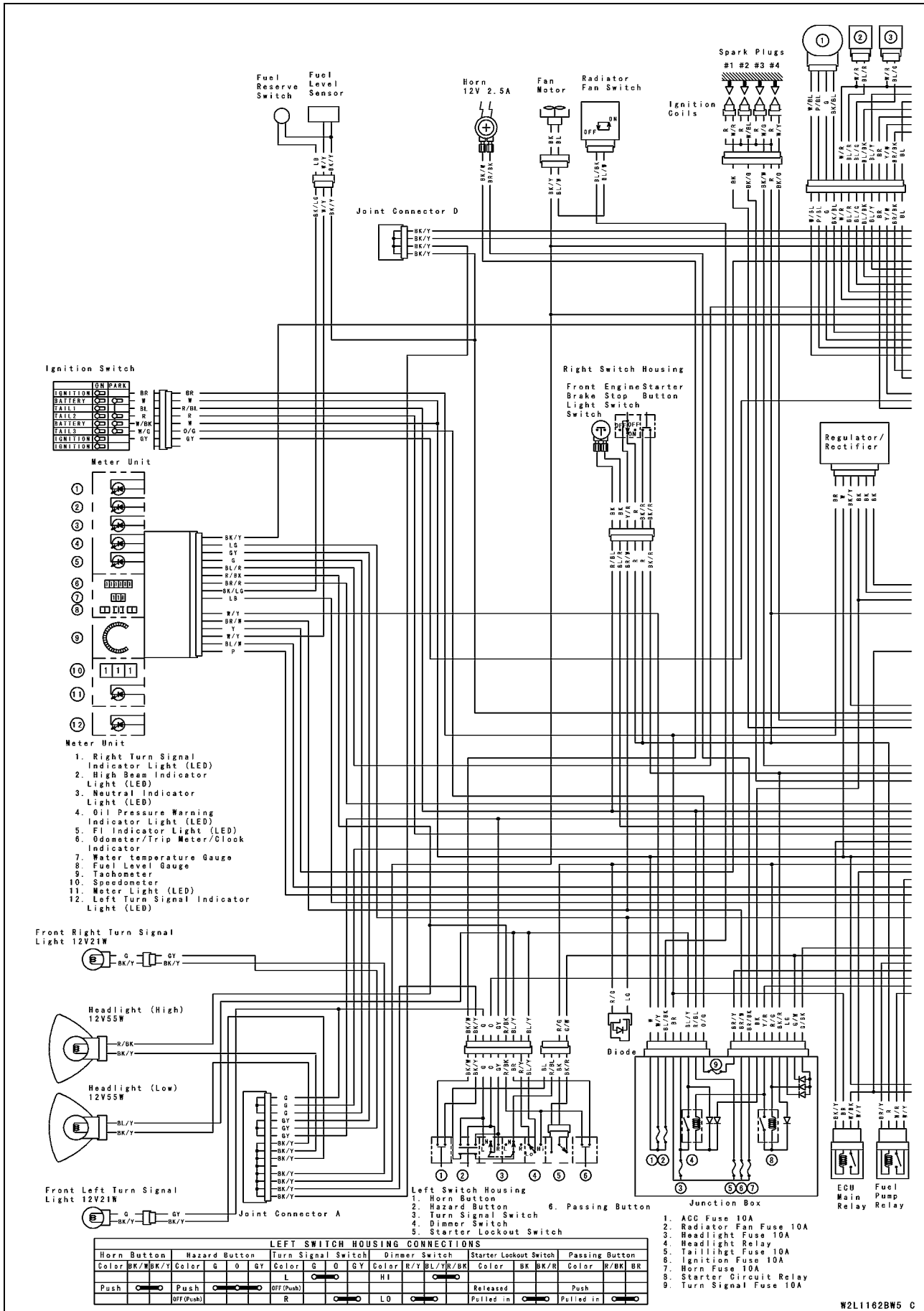
# ELECTRICAL SYSTEM 16-17

## Wiring Diagram (Other than U.S.A., Canada, Australia, and Malaysia)

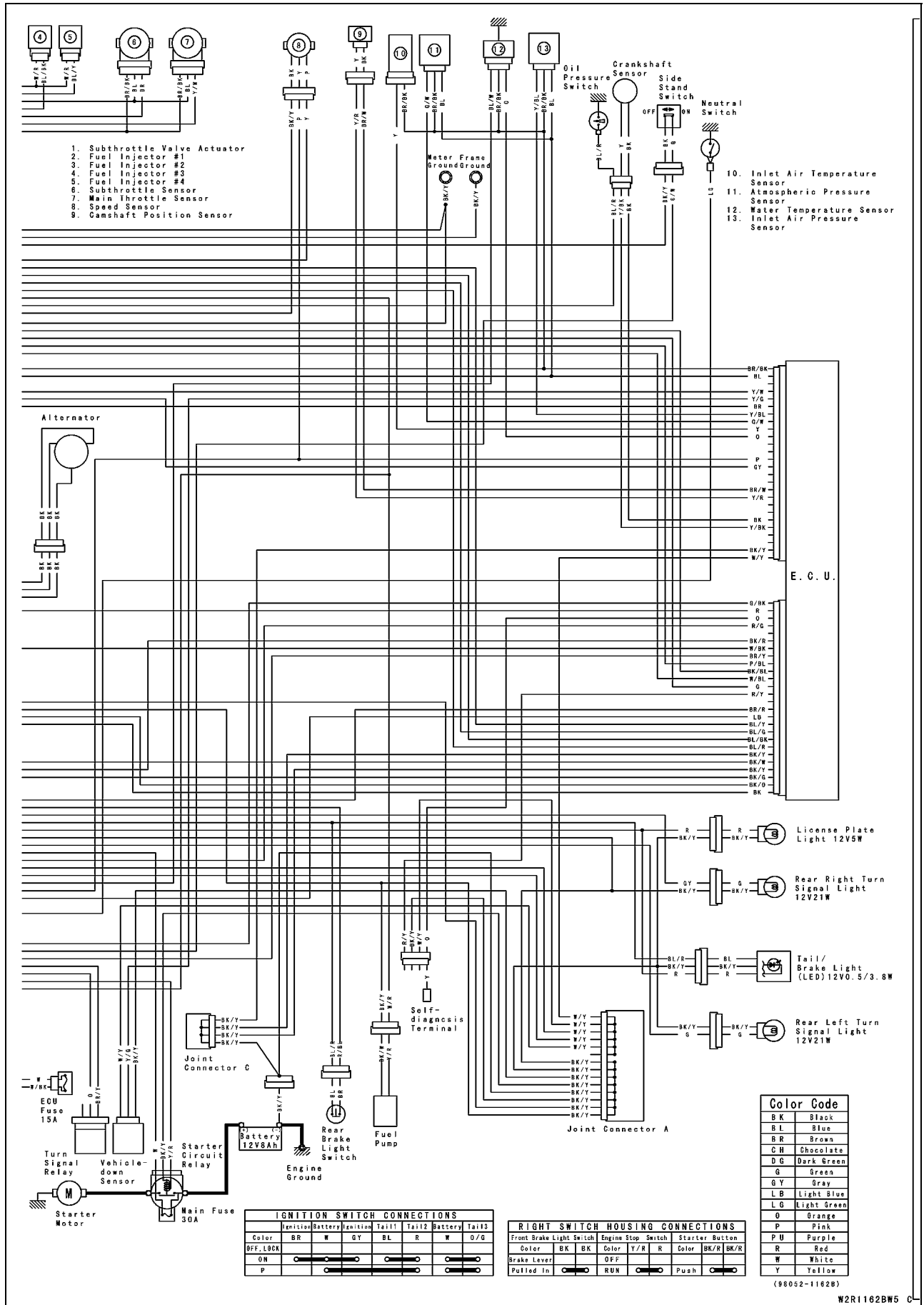


# 16-18 ELECTRICAL SYSTEM

## Wiring Diagram (Malaysia)



## Wiring Diagram (Malaysia)



# 16-20 ELECTRICAL SYSTEM

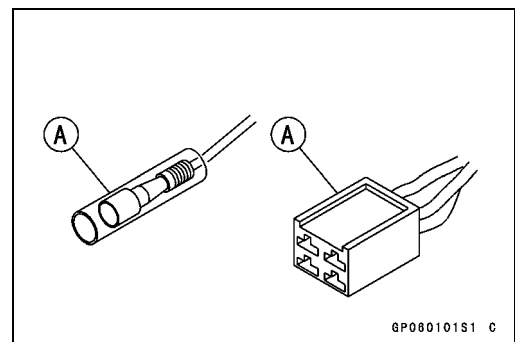
## Precautions

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

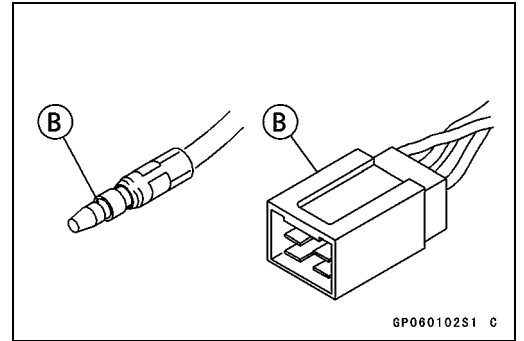
- Electrical Connectors  
Female Connectors [A]



GP080101S1 C

**Precautions**

Male Connectors [B]



## 16-22 ELECTRICAL SYSTEM

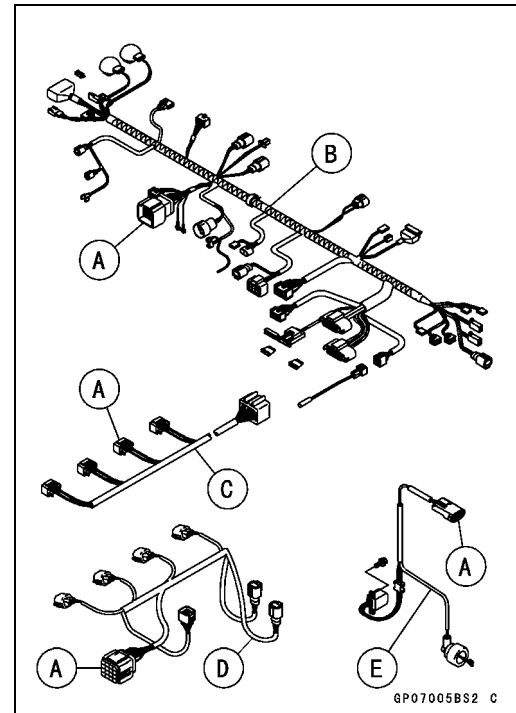
### Electrical Wiring

#### 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] 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].

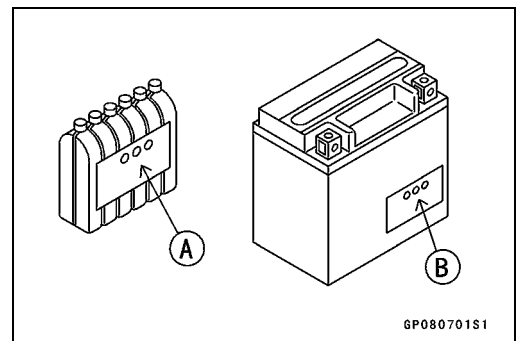
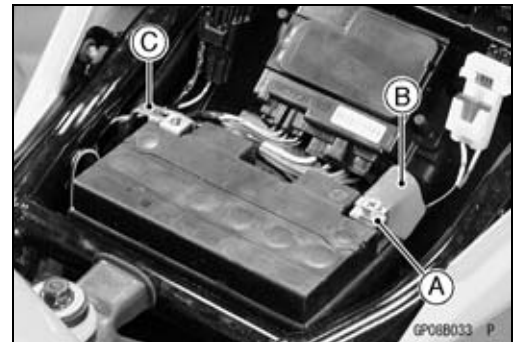
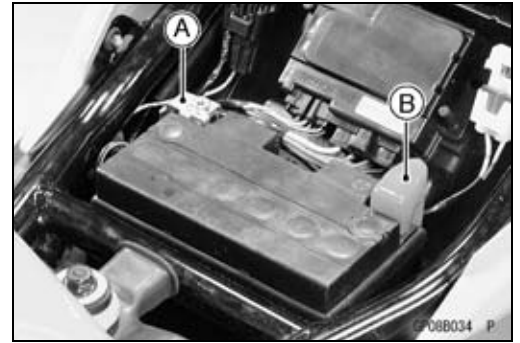
### Electrolyte Filling

- 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 ZR1000–A1 ~ : 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.



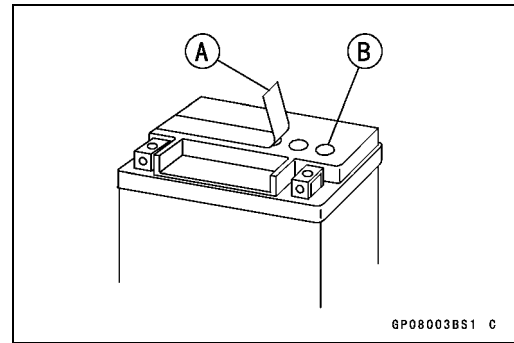
# 16-24 ELECTRICAL SYSTEM

## Battery

### CAUTION

**Do not remove the aluminum seal sheet [A] sealing the filler ports [B] until just before use.**

- Check to see that there is no peeling, tears or holes in the seal sheet on the top of the battery.
- Place the battery on a level surface.
- Remove the seal sheet.



### NOTE

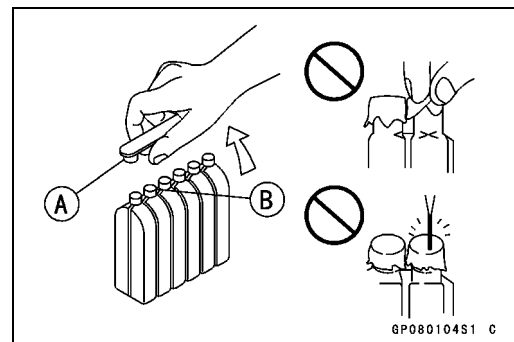
○A battery whose sealing sheet has any peeling, tears, holes, or from which the air-sucking sound was not heard requires a refreshing charge (initial charge).

- Take the electrolyte container out of the vinyl bag.
- Detach the seal caps [A] from the container.

### NOTE

○Do not discard the seal caps because it is used as the battery plugs later.

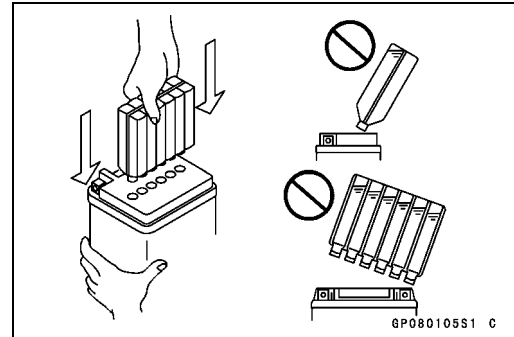
○Do not peel back or pierce the seals [B] on the container.



- Place the electrolyte container upside down aligning the six seals with the six battery filler ports.
- Push the container down strongly enough to break the seals. Now the electrolyte should start to flow into the battery.

### NOTE

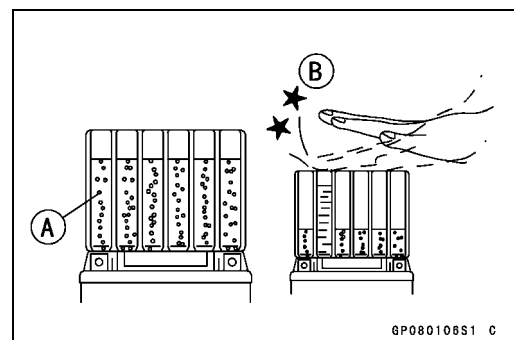
○Do not tilt the container as the electrolyte flow may be interrupted.



- Make sure air bubbles [A] are coming up from all six filler ports.
- Leave the container this way for 5 minutes or longer.

### NOTE

○If no air bubbles are coming up from a filler port, tap [B] the bottom of the bottle two or three times. Never remove the container from the battery.



### CAUTION

**Fill the electrolyte into the battery until the container is completely emptied.**

- Be certain that all the electrolyte has flowed out.
- Tap the bottom the same way as above if there is any electrolyte left in the container.
- Now pull the container gently out of the battery.
- Let the battery sit for **20** minutes. During this time, the electrolyte permeates the special separators and the gas generated by chemical reaction is released.

**Battery**

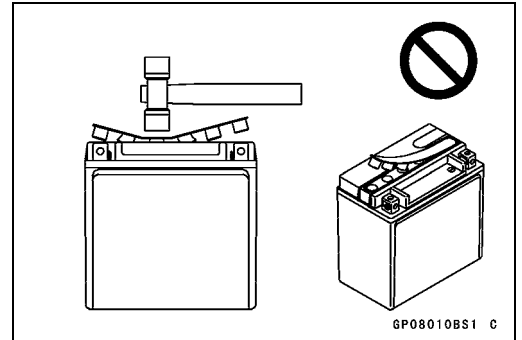
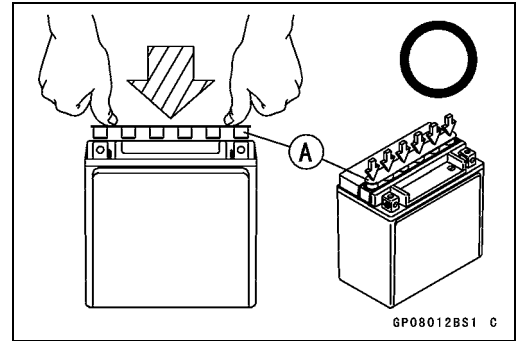
- Fit the seal caps [A] tightly into the filler ports until the seal caps are at the same level as the top of the battery.

**NOTE**

○Do not hammer. Press down evenly with both hands.

**CAUTION**

**Once you installed the seal caps after filling the battery, never remove it, nor add any water or electrolyte.**



**Initial Charge**

While the sealed battery can be used after only filling with electrolyte, the battery may not be able to sufficiently move a starter motor to start an engine in the cases shown in the table below, where an initial charge is required before use. However, if a battery shows the terminal voltage of 12.6 V or more, using a digital voltmeter, after 10 minutes of filling, no initial charge is necessary.

**NOTE**

○To measure battery terminal voltage, use a digital voltmeter which can be read one decimal place voltage.

Condition requiring initial charge	Charging method
At low temperatures (lower than 0°C)	0.9 A × 2 ~ 3 hours
Battery has been stored in high temperature and humidity.	0.9 A × 15 ~ 20 hours
Seal has been removed, or broken – peeling, tear or hole. (If you did not hear the air-sucking sound "Shoosh!" as you removed the seal.)	
Battery as old as 2 years or more after manufacture. Battery manufacturing date is printed on battery top. Example) <u>12</u> <u>10</u> <u>01</u> <u>T1</u> Day      Month      Year      Mfg. location	

## 16-26 ELECTRICAL SYSTEM

### Battery

#### Precautions

- 1) No need of topping-up  
No topping-up is necessary in this battery until it ends its life under normal use. Forcibly prying off the sealing plug 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 the 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 caps 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.**

**Battery**

*Interchange*

The sealed battery can fully display its performance only when combined with a proper vehicle electric system. Therefore, replace the sealed battery only on a motorcycle which was originally equipped with the 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.

*Charging Condition Inspection*

Battery charging condition can be checked by measuring battery terminal voltage.

- Remove the seats (see Frame chapter).
- Disconnect the battery (-) cables.

**CAUTION**

**Be sure to disconnect the negative (-) cable first.**

- Measure the battery terminal voltage.

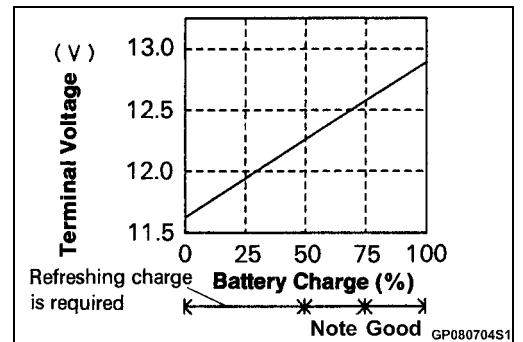
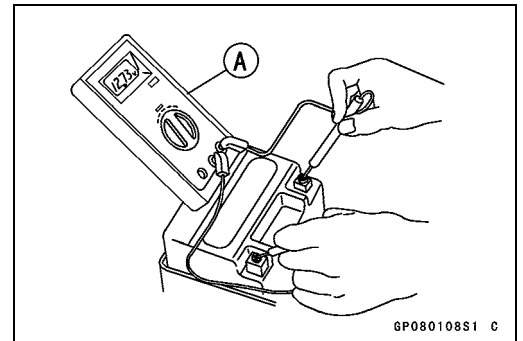
**NOTE**

○ Measure with a digital voltmeter [A] which can be read to one decimal place voltage.

★ If the reading is below the specified, refreshing charge is required.

**Battery Terminal Voltage**

Standard: 12.6 V or more

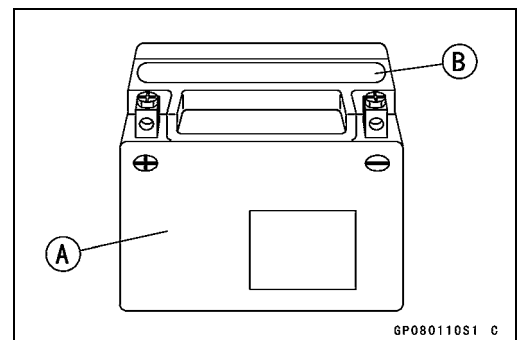


*Refreshing Charge*

- Remove the battery [A] (see Battery Removal).
- Refresh-charge by following method according to the battery terminal voltage.

**⚠ WARNING**

**This battery is sealed type. Never remove seal cap [B] even at charging. Never add water. Charge with current and time as stated below.**



# 16-28 ELECTRICAL SYSTEM

## Battery

Terminal Voltage: 11.5 ~ less than 12.6 V

Standard Charge

0.9 A × 5 ~ 10 h

Quick Charge

4.0 A × 1.0 h

Battery Terminal Voltage (V) [A]

Charge Time (h) [B]

### CAUTION

**If possible, do not quick charge. If the quick charge is done due to unavoidable circumstances, 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]

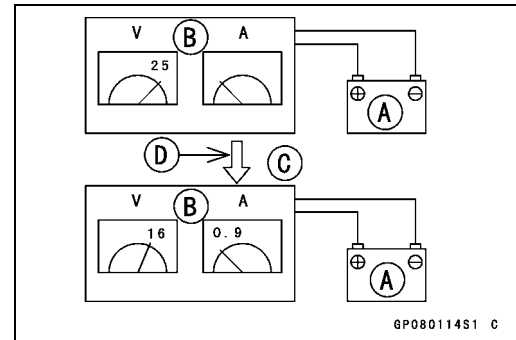
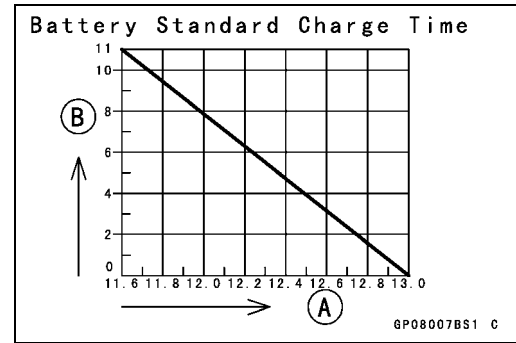
Battery Charger [B]

Standard Value [C]

Current starts to flow [D]

- Determine battery condition after refreshing charge.
- Determine the condition of the battery 30 minutes after completion of the charge by measuring the terminal voltage according to the table below.

Criteria	Judgement
12.6 V or higher	Good
12.0 ~ 12.6 V or lower	Charge insufficient → Recharge.
12.0 V or lower	Unserviceable → Replace



## Charging System

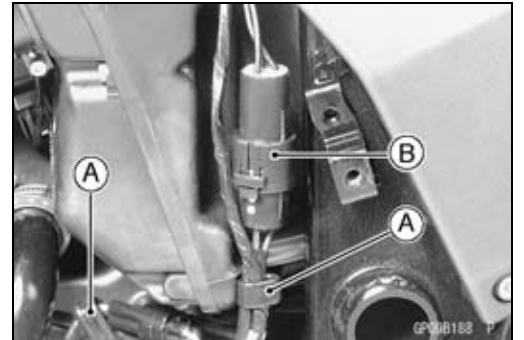
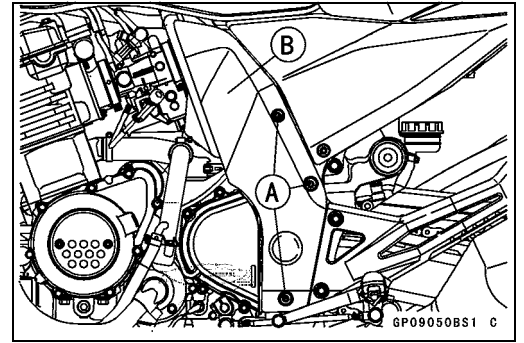
### Alternator Cover Removal

- Remove:
  - Frame Cover Bolts [A]
  - Left Frame Cover [B]

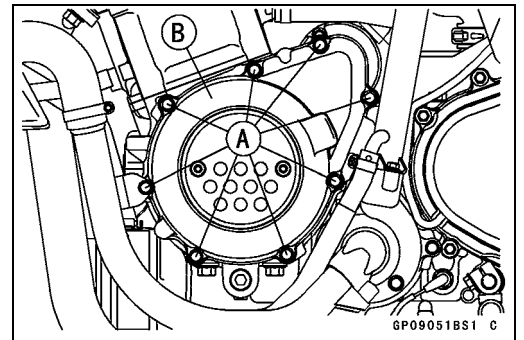
Clamp (open) [A]

Alternator Lead Connector [B]

- For California model, remove the separator.



- Place a suitable container under the alternator cover [A], and remove the cover bolts [B].
- Pull the alternator cover outside.



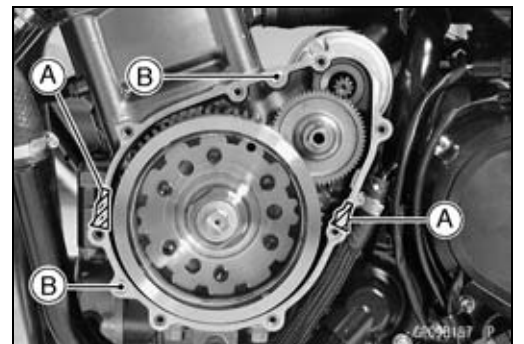
### Alternator Cover Installation

- 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): 56019- 120**

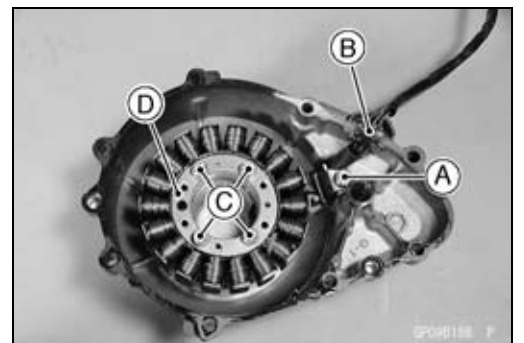
- Check that knock pins [B] are in place on the crankcase.
- Install a new gasket and the alternator cover.
- Tighten:

**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.



# 16-30 ELECTRICAL SYSTEM

## Charging System

### Stator Coil Installation

- Apply a non-permanent locking agent to the stator coil bolts and tighten it.

**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 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.

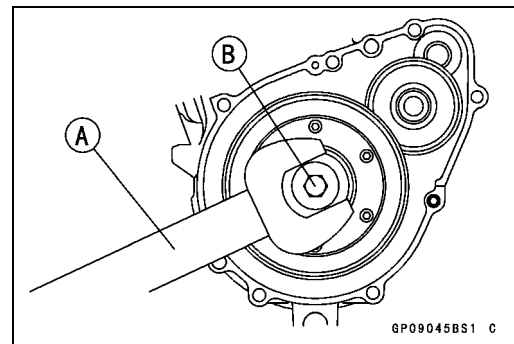
**Sealant - Kawasaki Bond (Silicone Sealant): 56019-120**

- 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].

**Special Tool - Rotor Holder: 57001-1543**



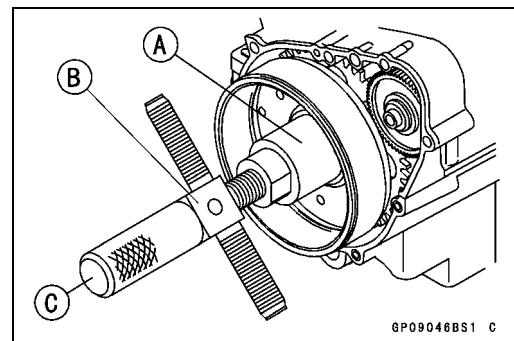
- Using the flywheel puller [A] and rotor puller [B], remove the alternator rotor from the crankshaft.

**Special Tools - Flywheel Puller, M38 × 1.5: 57001-1405**

**Rotor Puller, M16/M18/M20/M22 × 1.5: 57001-1216**

### 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.**

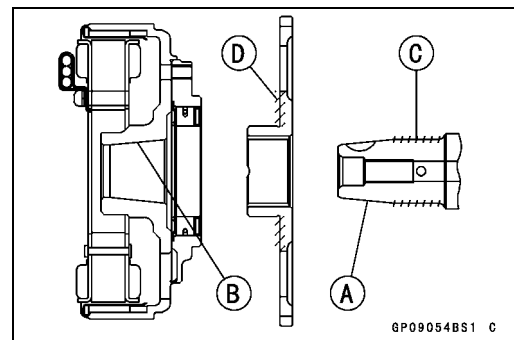
### Alternator Rotor Installation

- Using a cleaning fluid, clean off any oil or dirt on the following portions and dry them with a clean cloth.

[A] Crankshaft Tapered Portion

[B] Alternator Rotor Tapered Portion

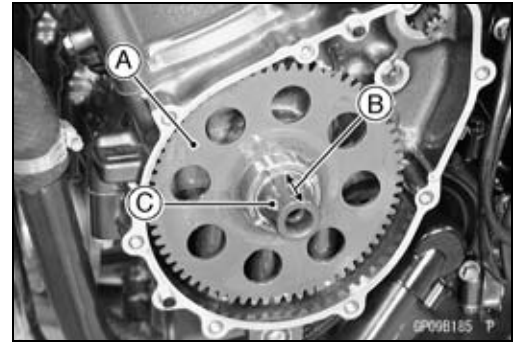
- Apply a thin coat of molybdenum disulfide grease to the crankshaft [C] and the face [D] of the starter clutch gear.





## 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 in the crankshaft before installing the alternator rotor.



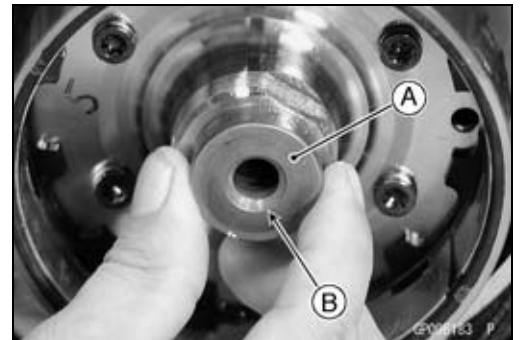
- Install the alternator rotor [A] while turning [B] the starter clutch gear [C].



- 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 kgf·m, 52 ft·lb) of torque.
  - Remove the washer and rotor bolt.
  - Check the tightening torque with rotor puller.
  - ★ If the rotor is not pulled out with 20 N·m (2 kgf·m, 15 ft·lb) of drawing torque, it is installed correctly.
  - ★ If the rotor is pulled out with under 20 N·m (2 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 (11.0 kgf·m, 80 ft·lb)**

# 16-32 ELECTRICAL SYSTEM

## Charging System

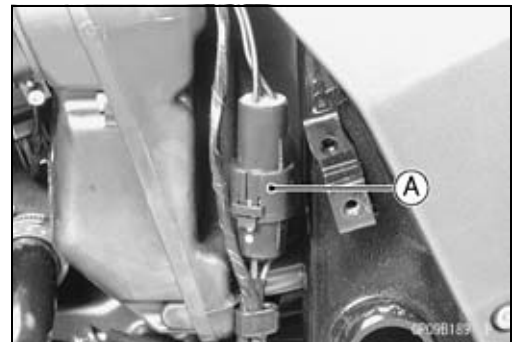
- Apply a thin coat of molybdenum disulfide grease to the shaft [A], and install it and starter idle gear [B].
- Install the alternator cover (see Alternator Cover Installation).



### 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 the frame cover (see Alternator Cover Removal).
  - 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	
× 1 Ω	One Black lead	Another Black lead	0.3 ~ 0.4 Ω

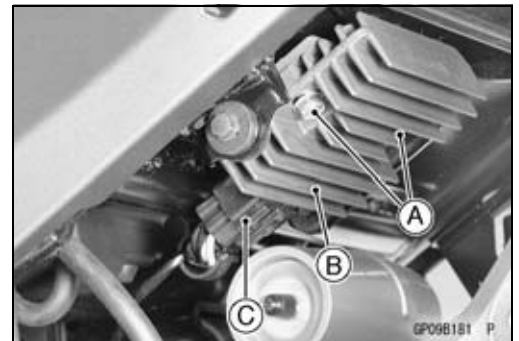
## Charging System

- ★ 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.

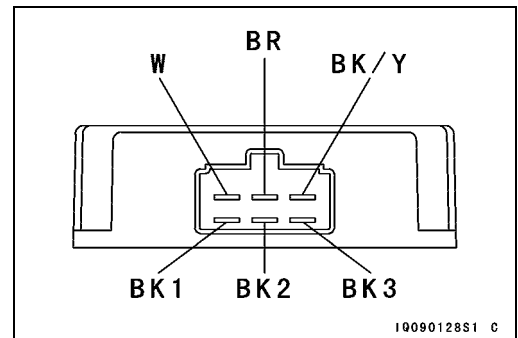
### Regulator Circuit Check:

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.**

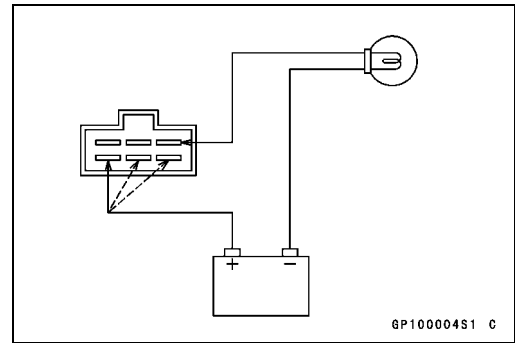
- Check to be sure the rectifier circuit is normal before continuing.



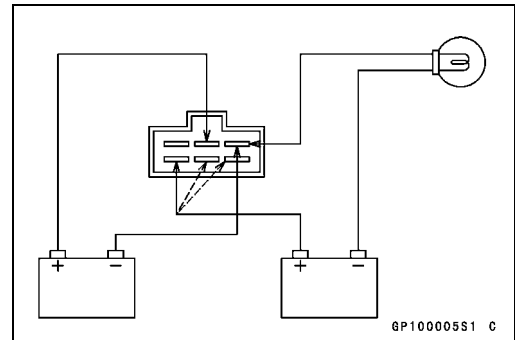
# 16-34 ELECTRICAL SYSTEM

## Charging System

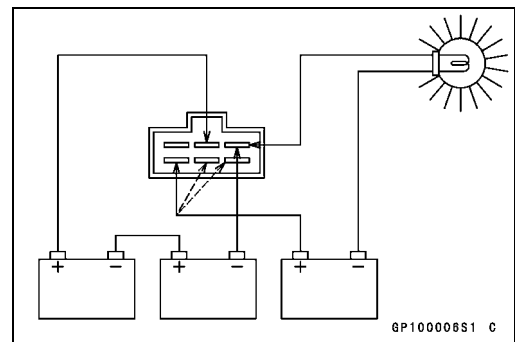
- Do the 1st step regulator circuit test:
  - Connect the test light and the 12 V battery to the regulator/rectifier as shown.
  - Check BK1, BK2, and BK3 terminal respectively.
  - ★ If the test light turns on, the regulator/rectifier is defective. Replace it.
  - ★ If the test light does not turn on, 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.**

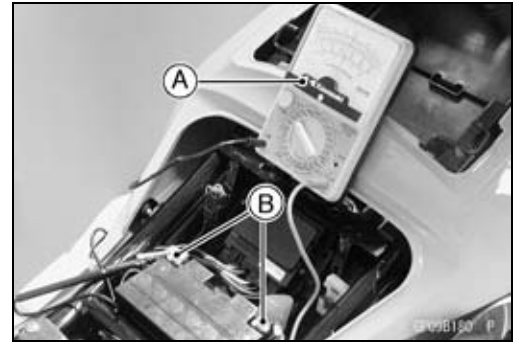
- ★ If the test light did not light when the 24 V was applied momentarily to the voltage monitoring terminal, the regulator/rectifier is defective. Replace it.
- ★ If the regulator/rectifier passes all of the tests described, it may still be defective. If the charging system still does not work properly after checking all of the components and the battery, test the regulator/rectifier by replacing it with a known good unit.

## Charging System

### Charging Voltage Inspection

- Check the battery condition (see Battery section).
- Warm up the engine to obtain actual alternator operating conditions.
- Remove the seats (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

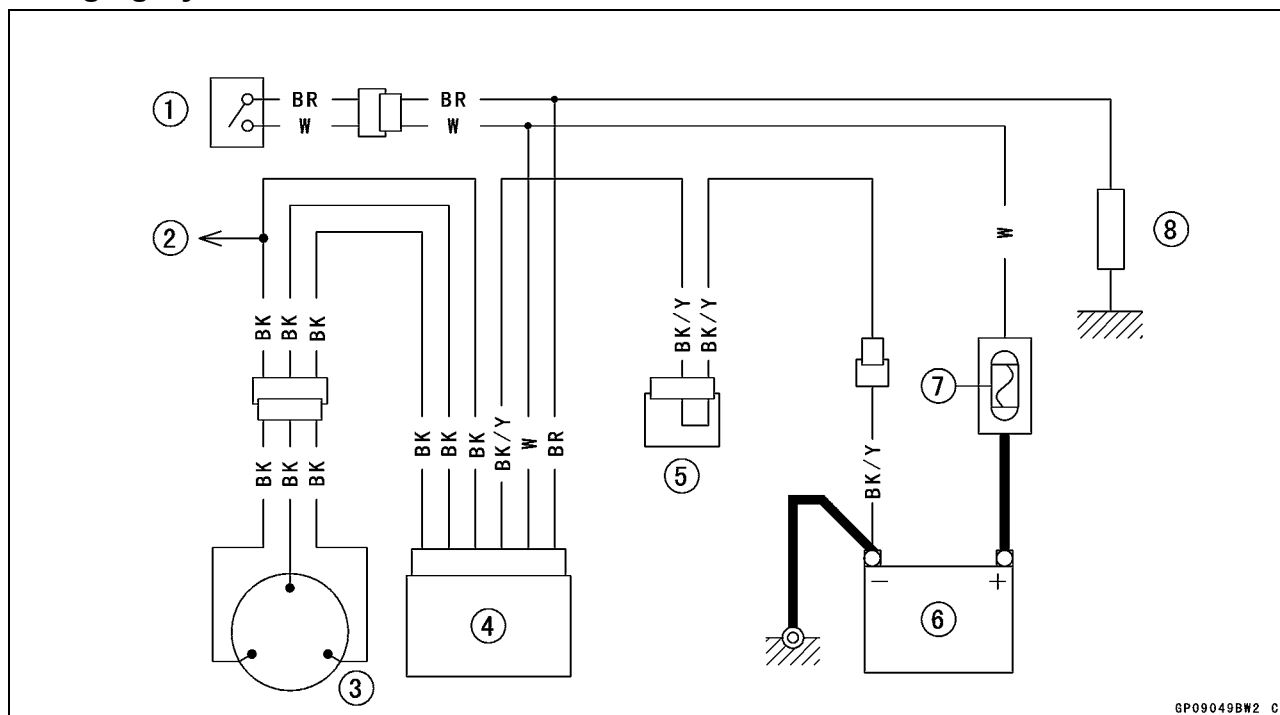
Tester Range	Connections		Reading
	Tester (+) to	Tester (-) to	
25 V DC	Battery (+)	Battery (-)	14.2 ~ 15.2 V

- 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.

# 16-36 ELECTRICAL SYSTEM

## Charging System

### Charging System Circuit



GP09049BW2 C

- 1. Ignition Switch
- 2. To Starter Circuit Relay
- 3. Alternator

- 4. Regulator/Rectifier
- 5. Joint Connector C
- 6. Battery 12 V 8 Ah

- 7. Main Fuse 30A
- 8. Load

## 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.

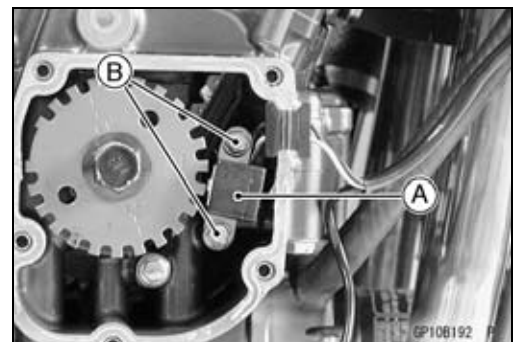
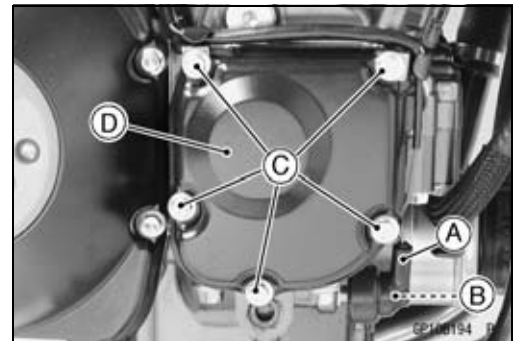
### **CAUTION**

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 (Electrical 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:
  - 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].



## 16-38 ELECTRICAL SYSTEM

### 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 (0.6 kgf·m, 53 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): 56019-120**

- 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)**

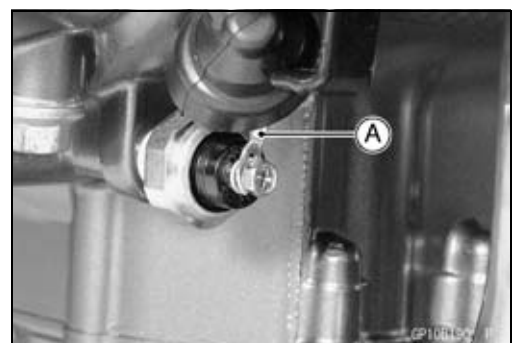
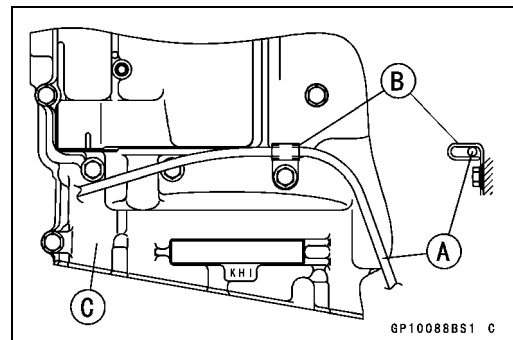
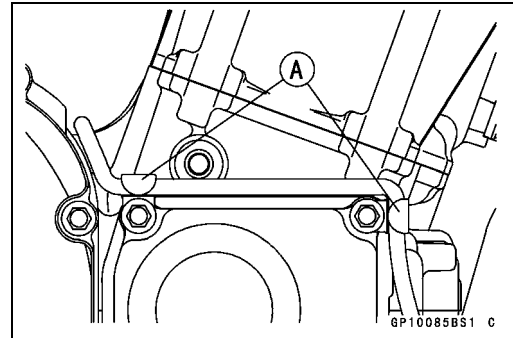
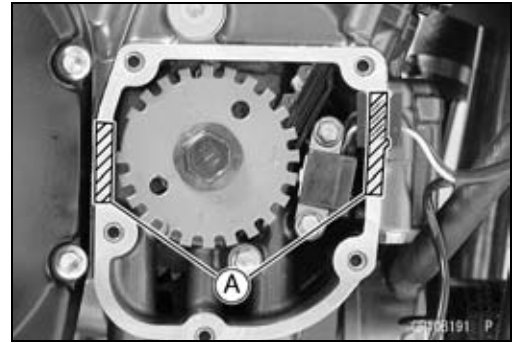
- Install the other removed parts.

#### Crankshaft Sensor Inspection

- Remove:
  - 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.





## Ignition System

### Crankshaft Sensor Resistance: 375 ~ 565 Ω

- 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:
  - Frame Cover (see Frame chapter)
  - Crankshaft Sensor Lead Connector (see Crankshaft Sensor Removal)
- Set the hand tester [B] to the  $\times 10$  V DC range, and connect it a commercially available 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 [C].
- 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 Tool - Hand Tester: 57001-1394

Recommended Tool- Peak Voltage Adapter

Type: KEK-54-9-B

Brand: KOWA SEIKI

- ★ If the tester reading is not specified one, check the crankshaft sensor.

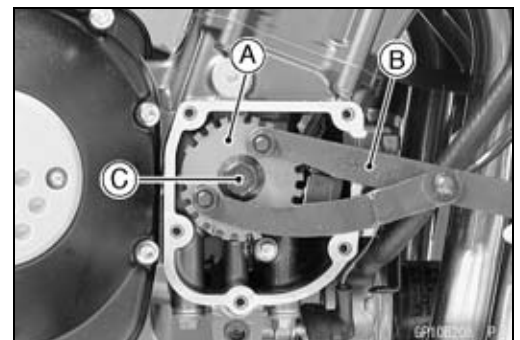
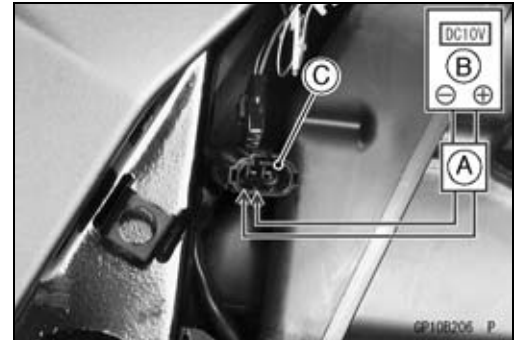
### Timing Rotor Removal

- 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 unscrew the bolt [C].

Special Tool - Flywheel and Pulley Holder : 57001-1343

### 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).

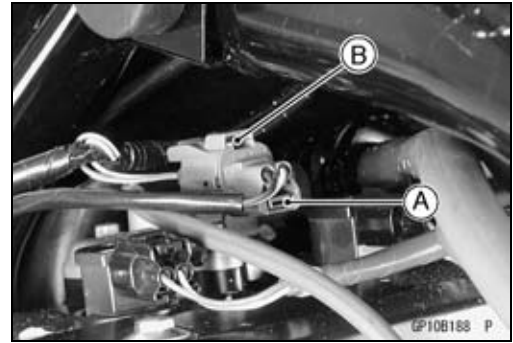


## 16-40 ELECTRICAL SYSTEM

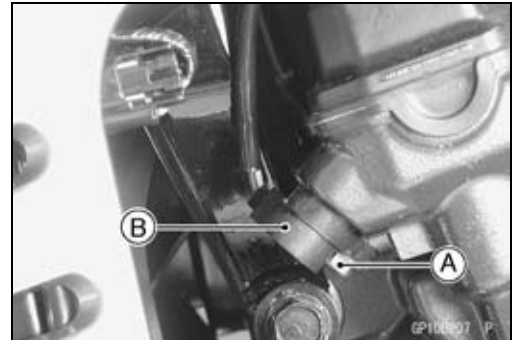
### Ignition System

#### Camshaft Position Sensor Removal

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - 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)**

#### Camshaft Position Sensor Inspection

- Remove:
  - Fuel Tank (see Fuel System (DFI) chapter)
  - 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.



## Ignition System

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

**Recommended Tool- Peak Voltage Adapter**  
**Type: KEK-54-9-B**  
**Brand: KOWA SEIKI**

#### 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.

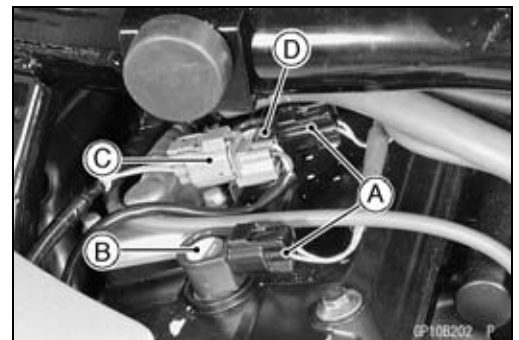
### Stick Coil (Ignition Coil together with Spark Plug Cap) Removal

- Remove the fuel tank (see Fuel System (DFI) chapter).
- Unscrew the thermostat bracket bolt [A].
- If removing the stick coil #2 or #3.

- Disconnect the stick coil 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

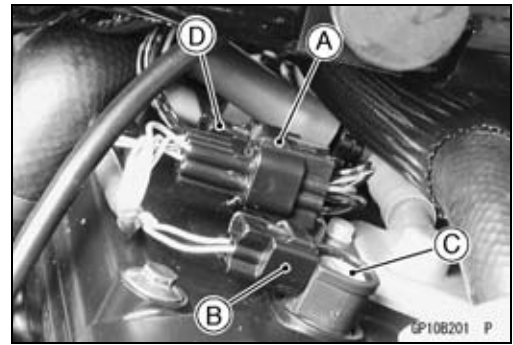
**Do not pry the connector part of the coil while removing the coil.**



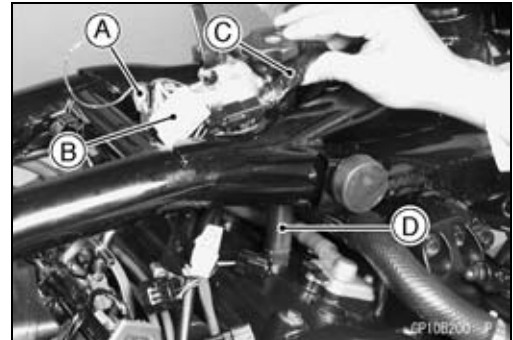
# 16-42 ELECTRICAL SYSTEM

## Ignition System

- Remove the stick coil harness [A] from the bracket.
- Remove:
  - Stick Coil Connector #4 [B] (disconnect)
  - Stick Coil #4 [C]
  - Stick Coil Connector #3 [D] (disconnect)

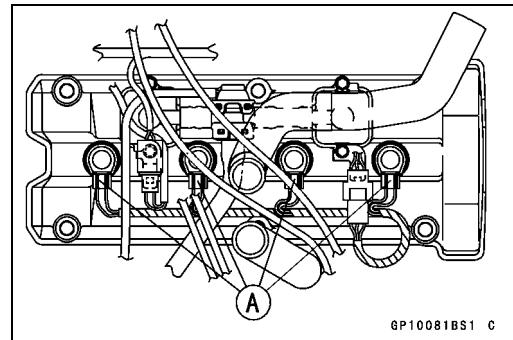


- Disconnect:
  - Water Temperature Sensor Connector [A]
  - Left Switch Housing Connector [B]
- Pull the main harness [C] upward and remove the stick coil #3 [D].



### 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 head [A] direction.



- Be sure the stick coils are installed by pulling up [B] it lightly.
- Connect and/or install the connectors.

### CAUTION

**Do not tap the coil head while installing the coil.**

- Install the thermostat bracket bolt.



## Ignition System

### Stick Coil (Ignition Coil together with Spark Plug Cap) Inspection

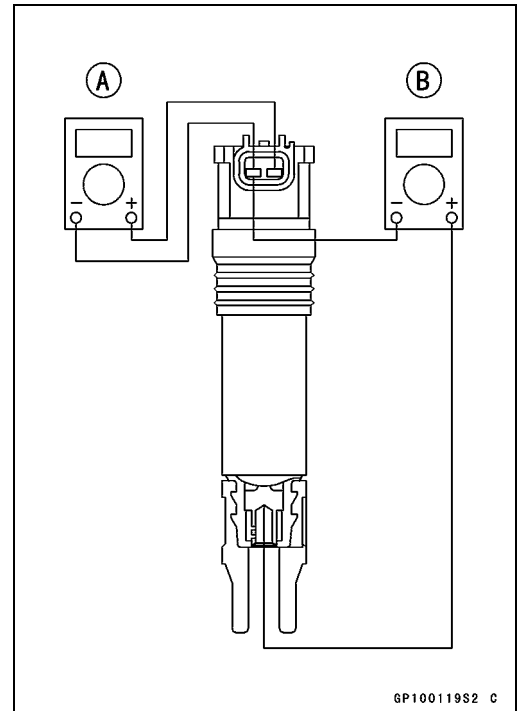
- Remove the stick coils (see this chapter).
- Measure the primary winding resistance [A] as follows.
  - Connect the hand tester between the coil terminals.
  - Set the tester to the  $\times 1 \Omega$  range, and read the tester.
- Measure the secondary winding resistance [B] as follows.
  - Connect 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.

- 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  $\times 250 \text{ V DC}$  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.

[F] ECU

[G] Battery



**Recommended Tool- Peak Voltage Adapter**

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

**Brand: KOWA SEIKI**

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

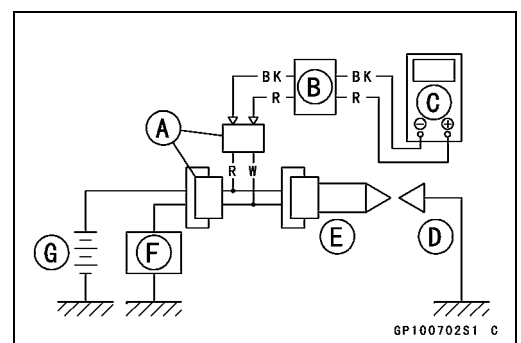
**Lead Wire-Peak Voltage Adapter:**

**57001-1449**

#### Primary Lead Connection

Adapter (R, +) to lead wire-peak voltage adapter (W)

Adapter (BK, -) to lead wire-peak voltage adapter (R)



## 16-44 ELECTRICAL SYSTEM

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### Ignition System

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#### **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 Electrical System in the Periodic Maintenance chapter.

#### *Spark Plug Installation*

- Refer to the Electrical System in the Periodic Maintenance chapter.

#### *Spark Plug Cleaning and Inspection*

- Refer to the Electrical System in the Periodic Maintenance chapter.

#### *Spark Plug Gap Inspection*

- Refer to the Electrical System in the Periodic Maintenance chapter.

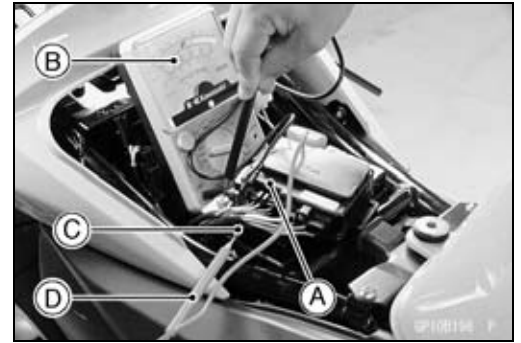
## Ignition System

### Interlock Operation Inspection

- Remove:
  - Seats (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 needle adapter [B] in the Green/Black lead terminal.
- Set the tester [C] to the 25 V DC range, connect it to the needle adapter and 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

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

- 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.

#### 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

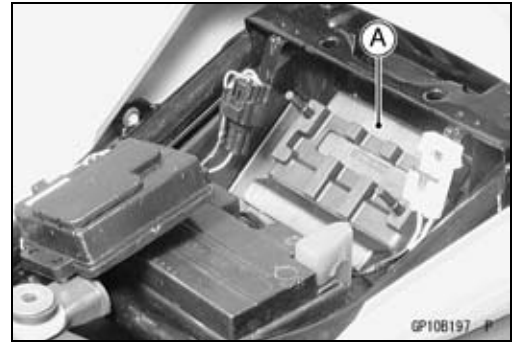
- Set the side stand on the ground, then the engine will stop.
- ★ If whichever may not be stopped, inspect the starter lockout switch, side stand switch and junction box.
- ★ If their parts are normality, replace the ECU.

## 16-46 ELECTRICAL SYSTEM

### Ignition System

#### *IC Igniter Inspection*

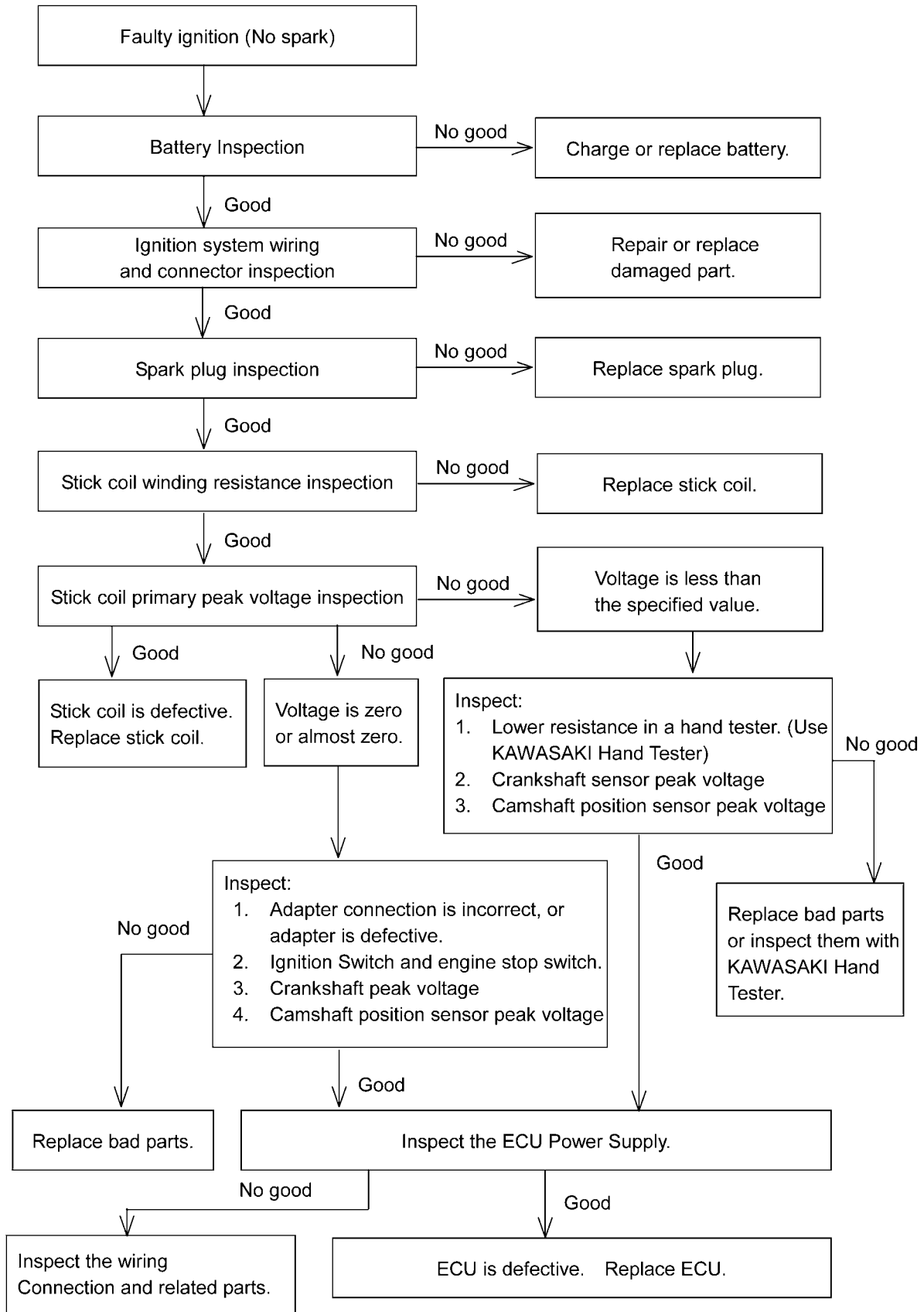
- The IC Igniter is built in the ECU [A].
- Refer to the Interlock Operation Inspection, Ignition System Troubleshooting Chapter and Fuel System (DFI) chapter for ECU Inspection.





Ignition System

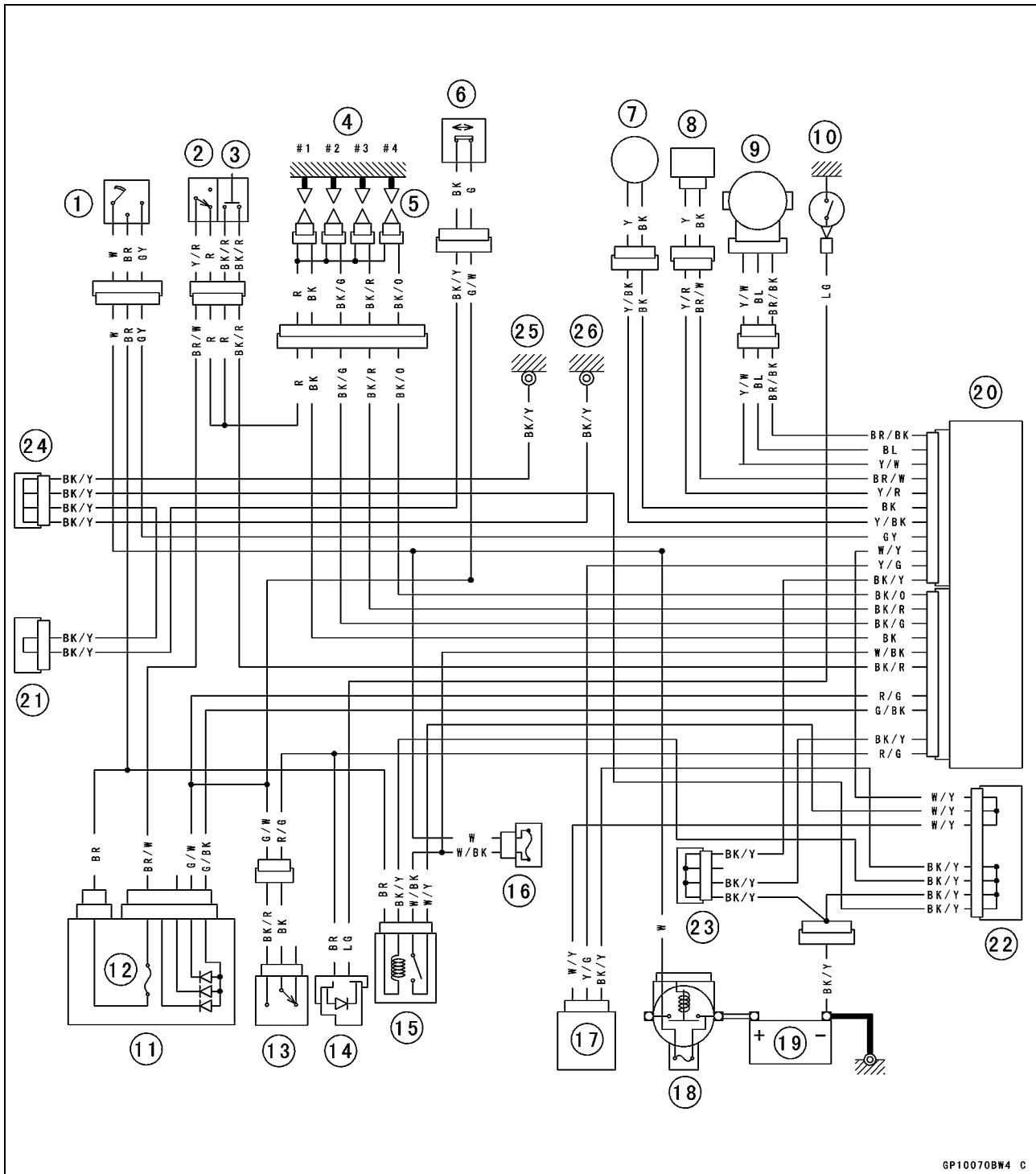
Ignition System Troubleshooting



# 16-48 ELECTRICAL SYSTEM

## Ignition System

### Ignition System Circuit



- |                             |                            |                           |
|-----------------------------|----------------------------|---------------------------|
| 1. Ignition Switch          | 9. Throttle Sensor         | 18. Main Fuse 30A         |
| 2. Engine Stop Switch       | 10. Neutral Switch         | 19. Battery 12 V 8 Ah     |
| 3. Starter Button           | 11. Junction Box           | 20. ECU                   |
| 4. Spark Plugs              | 12. Ignition Fuse 10A      | (Electrical Control Unit) |
| 5. Stick Coils              | 13. Starter Lockout Switch | 21. Joint Connector A     |
| 6. Side Stand Switch        | 14. Diode                  | 22. Joint Connector B     |
| 7. Crankshaft Sensor        | 15. ECU Main Relay         | 23. Joint Connector C     |
| 8. Camshaft Position Sensor | 16. ECU Fuse 15A           | 24. Joint Connector D     |
|                             | 17. Vehicle-down Sensor    |                           |

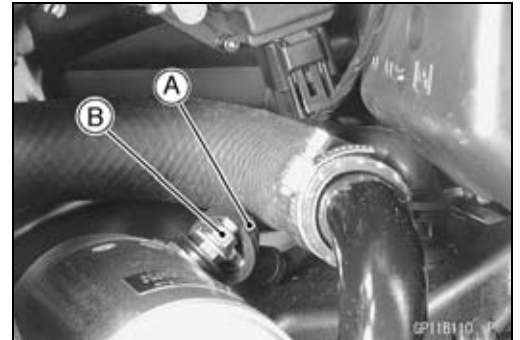
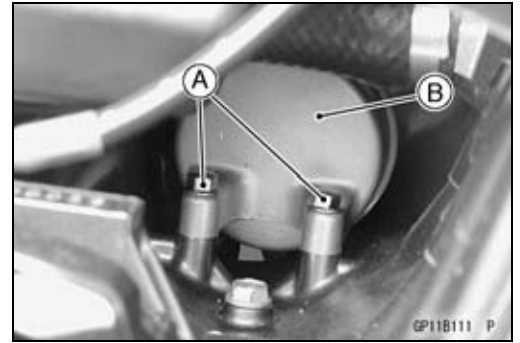
## Electric Starter System

### Starter Motor Removal

#### CAUTION

**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- Remove the mounting bolts [A].
  - Pull out the starter motor [B].
- 
- Slide back the rubber cap [A].
  - Remove the starter motor terminal nut [B].

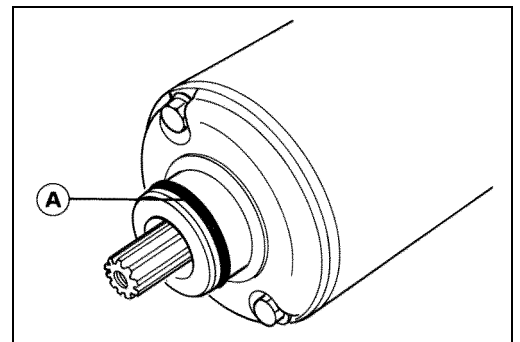
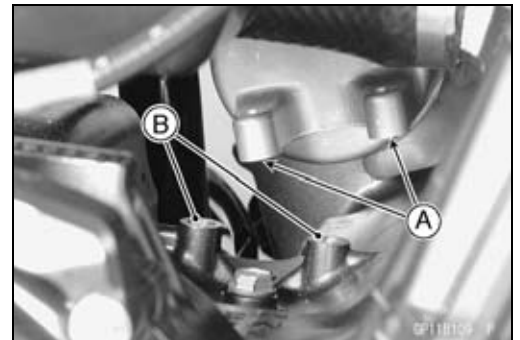


### Starter Motor Installation

#### CAUTION

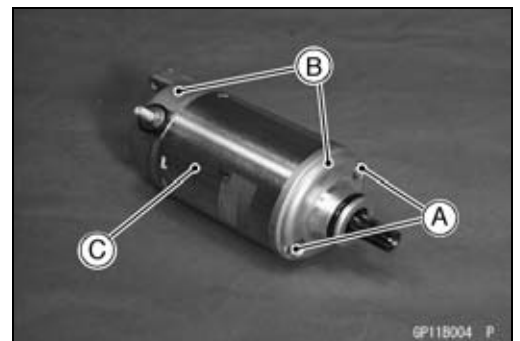
**Do not tap the starter motor shaft or body. Tapping the shaft or body could damage the motor.**

- 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 a small amount of engine oil to the O-ring.
  - Tighten:
    - Torque - Starter Motor Mounting Bolts: 11 N·m (1.1 kgf·m, 95 in·lb)**



### Starter Motor Disassembly

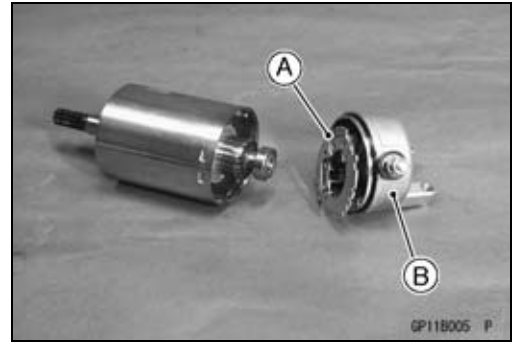
- Take off the starter motor through bolts [A] and remove both end covers [B] and pull the armature out of the yoke [C].



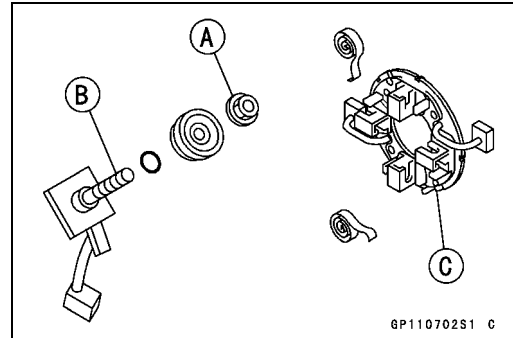
## 16-50 ELECTRICAL SYSTEM

### Electric Starter System

○The brush plate [A] and brushes come off with the right-hand end cover [B].

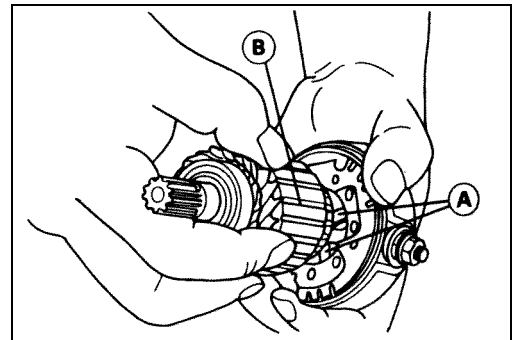


- Remove the terminal locknut [A] and terminal bolt [B], and then remove the brush with the brush plate [C] from the right-hand end cover.

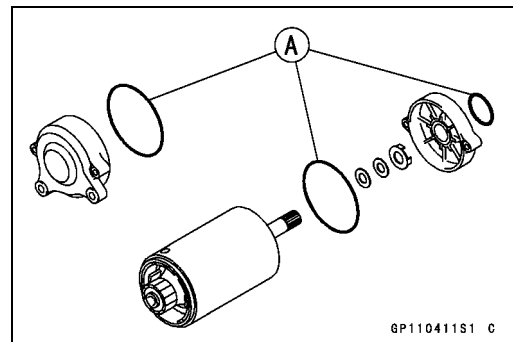


#### Starter Motor Assembly

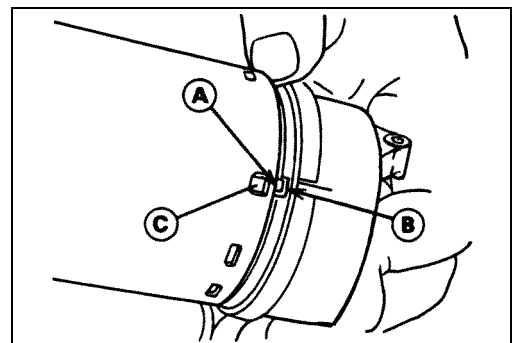
- Install the brush plate and brushes [A], and then put the armature [B] among the brushes.



- Install the O-rings [A] as shown.

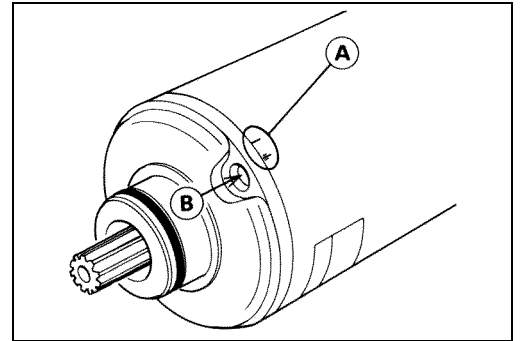


- Align the notch [A] in the brush plate with the end cover notch [B] and the mark [C] on the yoke.



## Electric Starter System

- Align the line [A] marked on the yoke with the through bolt hole [B].

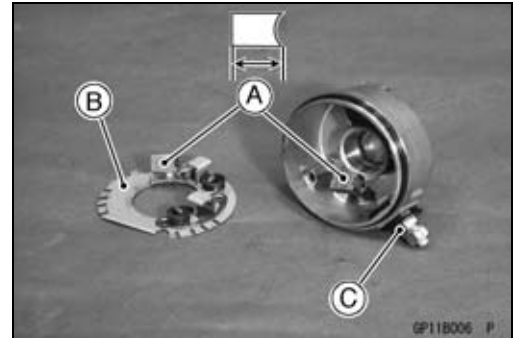


### Brush Inspection

- 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].

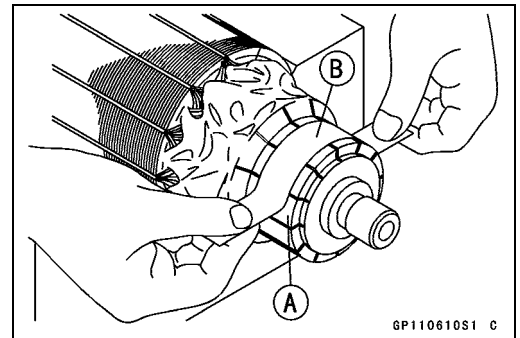
#### Starter Motor Brush Length

- Standard: 12 mm (0.47 in.)
- Service Limit: 8.5 mm (0.33 in.)



### Commutator Cleaning and Inspection

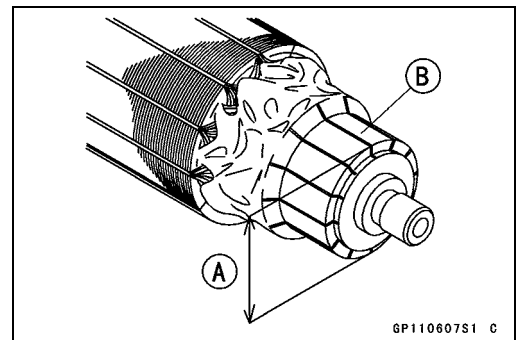
- Smooth the commutator surface [A] if necessary with fine emery cloth [B], and clean out the grooves.



- 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.)

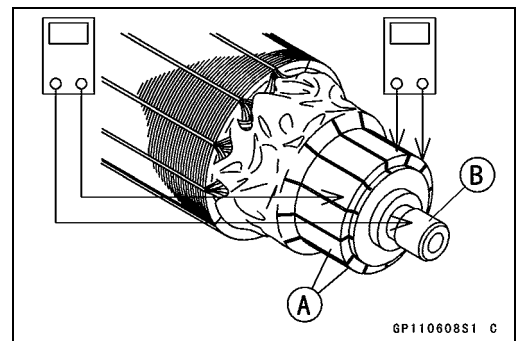


### Armature Inspection

- 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.



# 16-52 ELECTRICAL SYSTEM

## 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.

- [A] Terminal Bolt and Positive Brush
- [B] Brush Plate and Negative Brush

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

- ★If there is not close to zero 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.

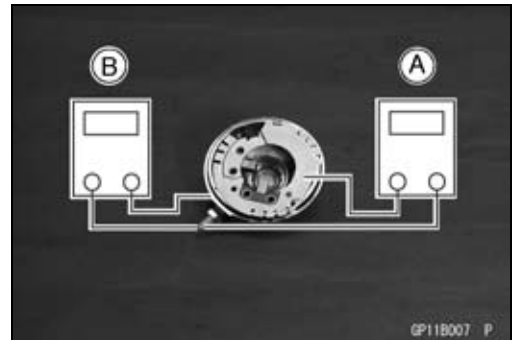
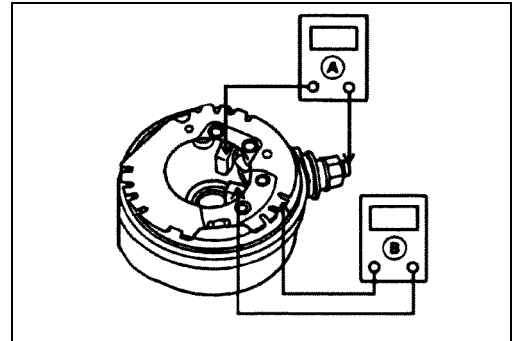
- [A] Terminal Bolt and Brush Plate
- [B] Terminal Bolt and Right-hand End Cover

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

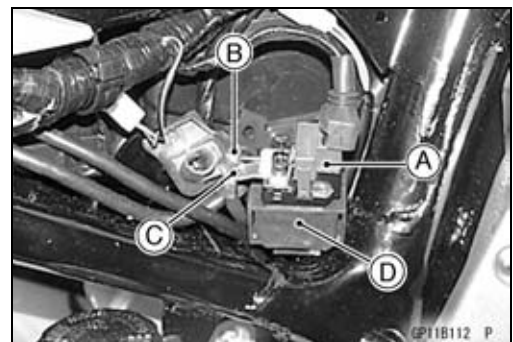
- ★If there is any reading, the brush holder assembly and/or terminal bolt assembly have a short. Replace the brush holder assembly and the terminal bolt assembly.

### Starter Relay Inspection

- Remove the battery negative (-) cable from the battery negative (-) terminal (see Battery Removal).
- Remove the right side cover.
- Pull out the starter relay.
- Disconnect the connector [A]
- Disconnect the starter motor cable [B] and battery positive (+) cable [C] from the starter relay [D].



<b>CAUTION</b>
<b>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.</b>



**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**

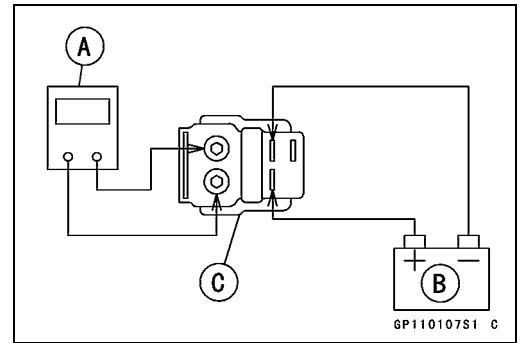
- ★ If the relay does not work as specified, the relay is defective. Replace the relay.

**Testing Relay**

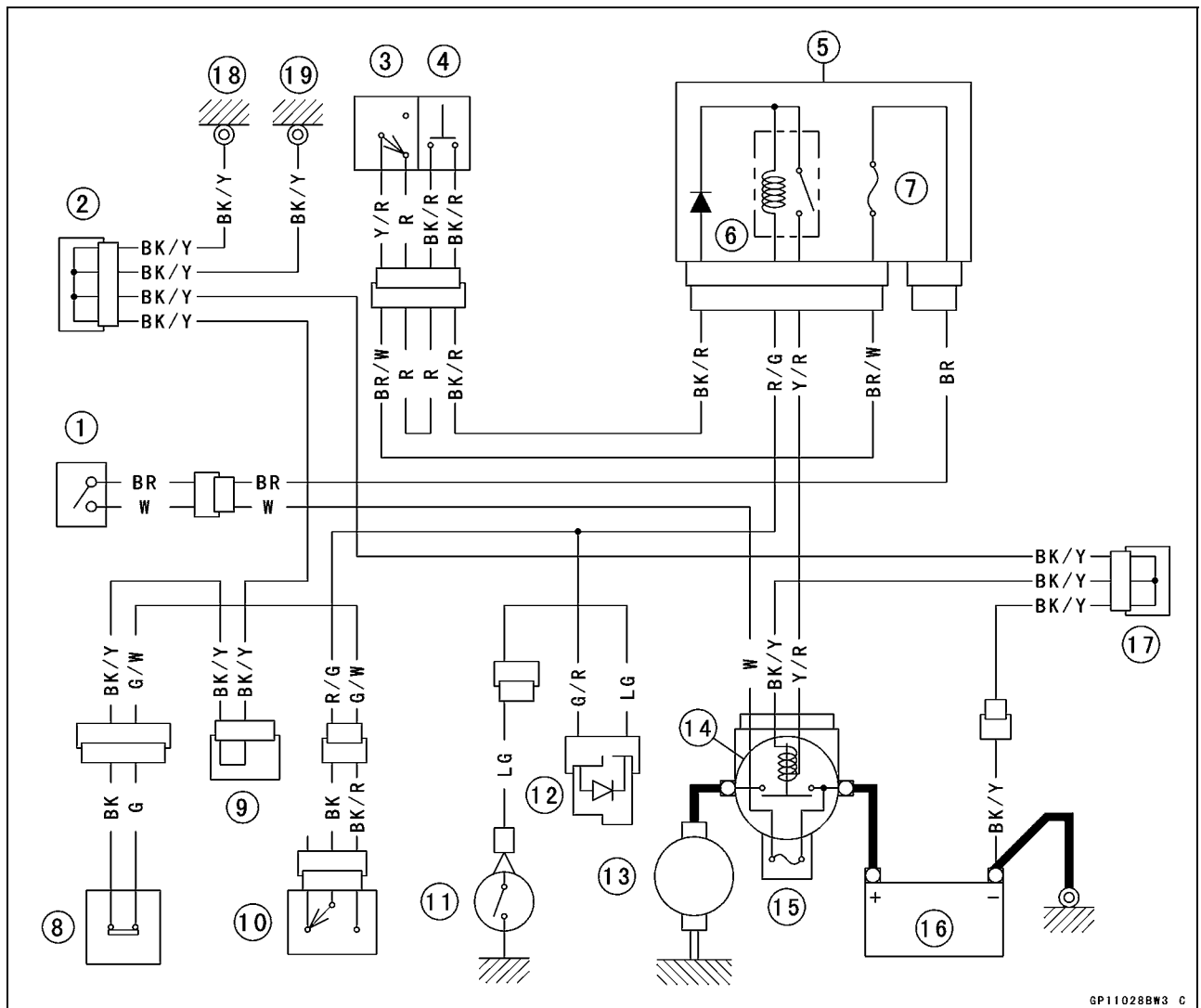
**Tester Range:** × 1 Ω range

**Criteria:** When battery is connected → 0 Ω

When battery is disconnected → ∞ Ω



**Electric Starter Circuit**



- |                          |                            |                       |
|--------------------------|----------------------------|-----------------------|
| 1. Ignition Switch       | 8. Side Stand Switch       | 15. Main Fuse 30A     |
| 2. Joint Connector D     | 9. Joint Connector A       | 16. Battery 12 V 8 Ah |
| 3. Engine Stop Switch    | 10. Starter Lockout Switch | 17. Joint Connector B |
| 4. Starter Button        | 11. Neutral Switch         | 18. Meter Ground      |
| 5. Junction Box          | 12. Diode (Rectifier)      | 19. Frame Ground      |
| 6. Starter Circuit Relay | 13. Starter Motor          |                       |
| 7. Ignition Fuse 10A     | 14. Starter Relay          |                       |

# 16-54 ELECTRICAL SYSTEM

## 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

- Turn the horizontal adjuster [A] on the headlight with the screwdriver [B] in or out until the beam points straight ahead.

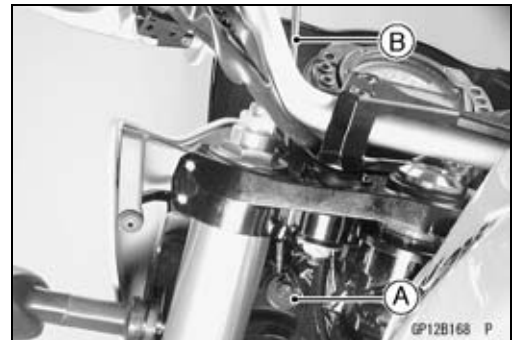


### Headlight Beam Vertical Adjustment

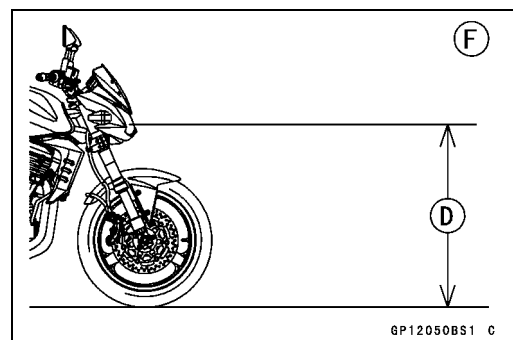
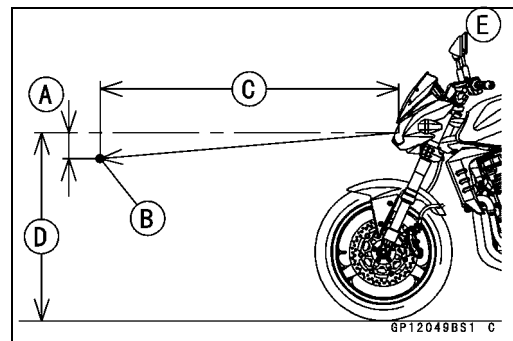
- Turn the vertical adjusters [A] on the headlight with the screwdriver [B] in or out to adjust the headlight vertically.

#### NOTE

- On high beam, the brightest points should be slightly below horizontal with the motorcycle on its wheels and the rider seated. Adjust the headlight(s) 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 headlights 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]
- Height of Headlight Center [D]
- Low Beam [E]
- High Beam [F]

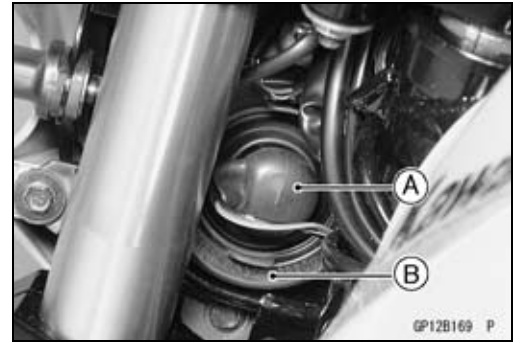




## Lighting System

### Headlight Bulb Replacement

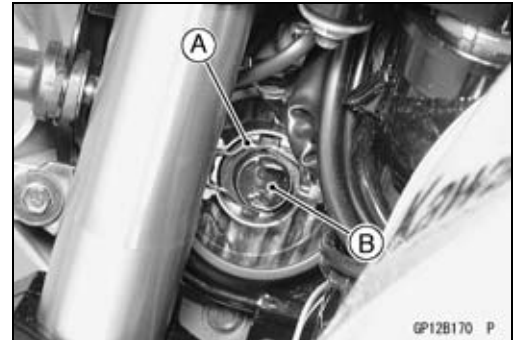
- Remove:
  - Headlight Connector [A]
  - Headlight Bulb Dust Cover [B]



- Remove:
  - Hook [A]
  - Headlight Bulb [B]

### CAUTION

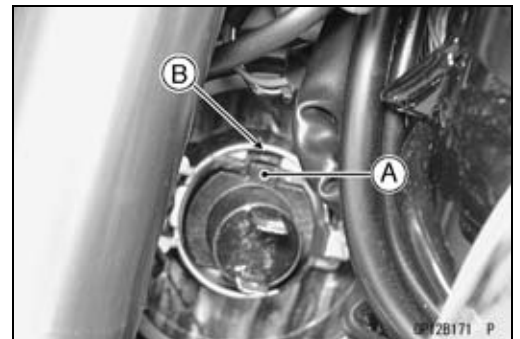
When handling the quartz–halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination from hands or dirty rags can reduce bulb life or cause the bulb to explode.



### NOTE

○Clean off any contamination that inadvertently gets on the bulb with alcohol or soap and water solution.

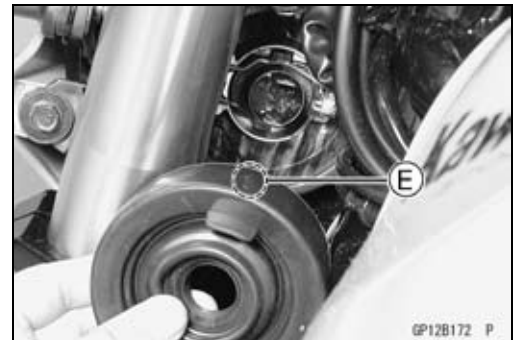
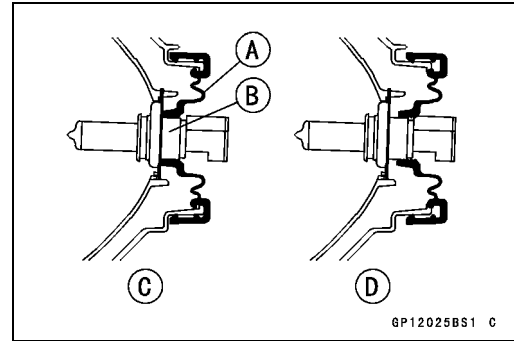
- Replace the headlight bulb.
- Fit the projection [A] of the bulb in the hollow [B] of the headlight.



# 16-56 ELECTRICAL SYSTEM

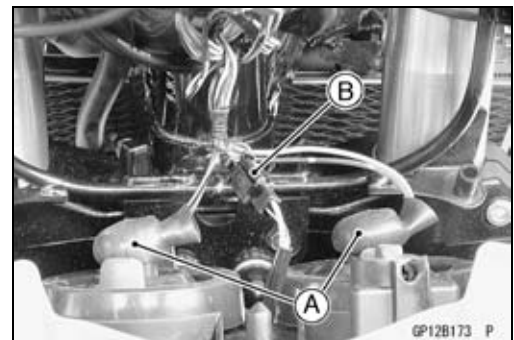
## Lighting System

- 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 this chapter).

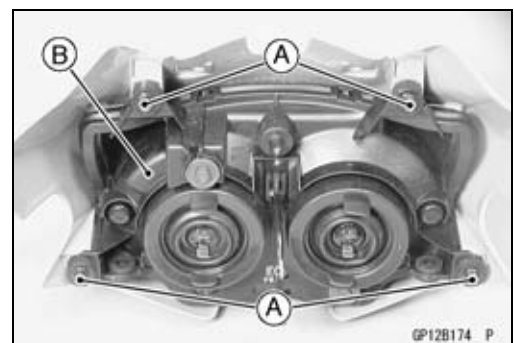


### Headlight Removal/Installation

- Remove:
  - Fairing (see Frame chapter)
  - Disconnect the headlight connectors [A].
  - For the European model disconnect the city light connector [B].

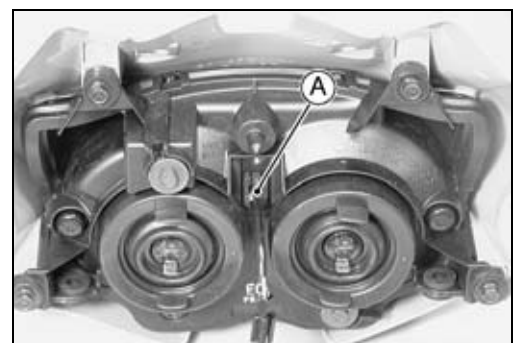


- Remove:
  - Bolts [A]
  - Headlight Assy [B]
- Headlight installation is reverse of removal.
- Torque - Headlight Mounting Bolts : 5.9 N·m (0.6 kgf·m, 5.3 in·lb)



### City Light Bulb Replacement (European Model)

- Remove the fairing (see Frame chapter).
- Pull out the socket [A] together with the bulb.



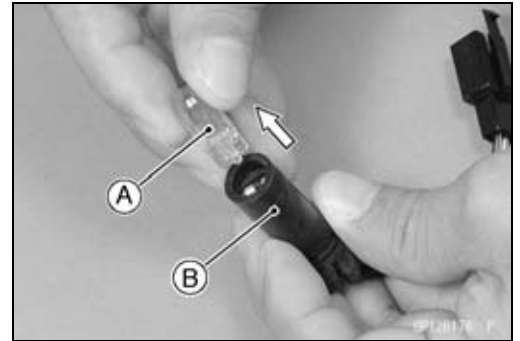
## Lighting System

- Pull the bulb [A] out of the socket [B].

**CAUTION**

**Do not turn the bulb. Pull the bulb out to prevent damage to the bulb. Do not use bulb rated for greater wattage than the specified valve.**

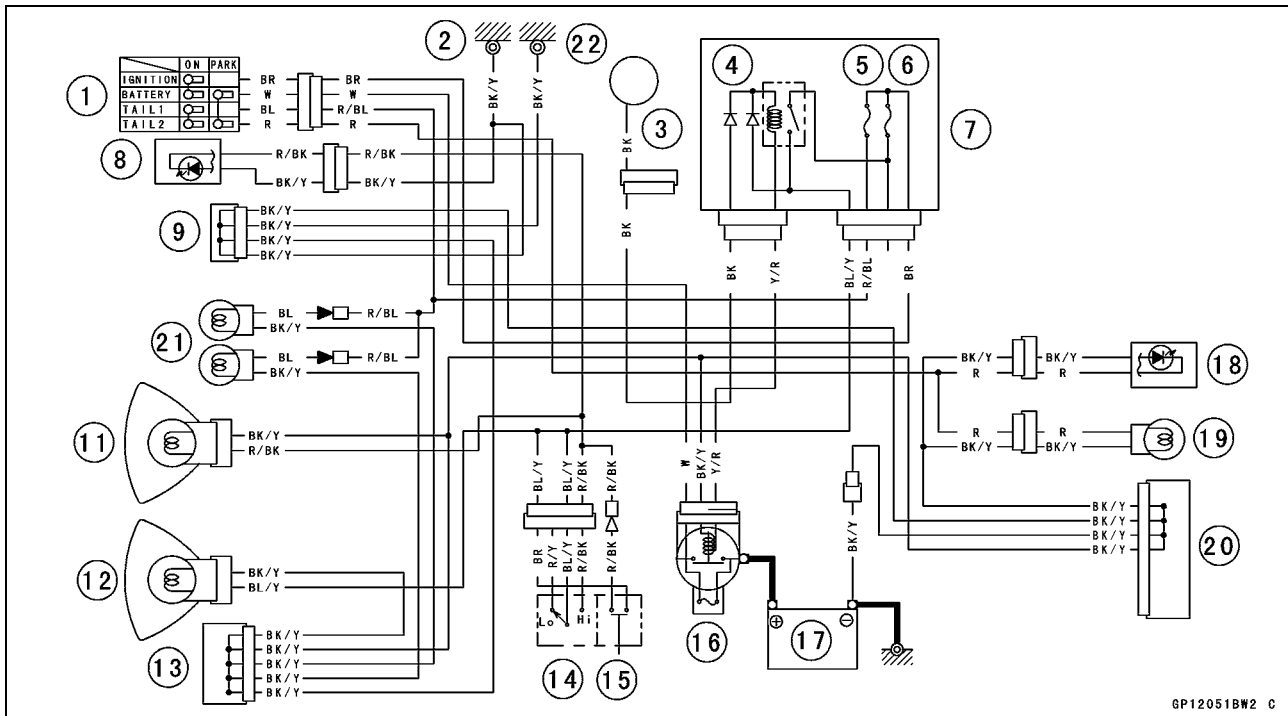
- Replace the bulb with a new one.



# 16-58 ELECTRICAL SYSTEM

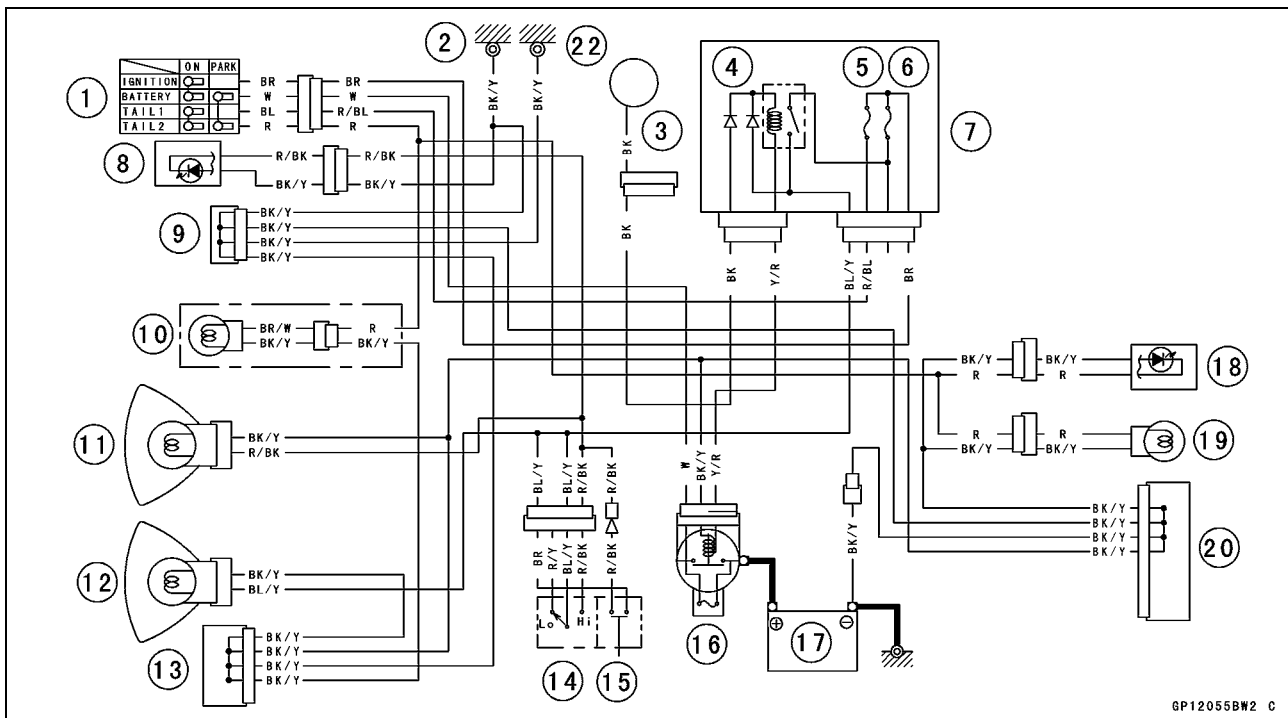
## Lighting System

### Headlight/Tail Light Circuit (US, CA, AS)



GP12051BW2 C

### Headlight/Tail Light Circuit (Other than US, CA, AS)



GP12055BW2 C

US: United States of America  
 CA: Canada  
 AS: Australia

1. Ignition Switch  
 2. Meter Ground

3. Alternator  
 4. Headlight Diodes  
 5. Taillight Fuse 10A  
 6. Headlight Fuse 10A

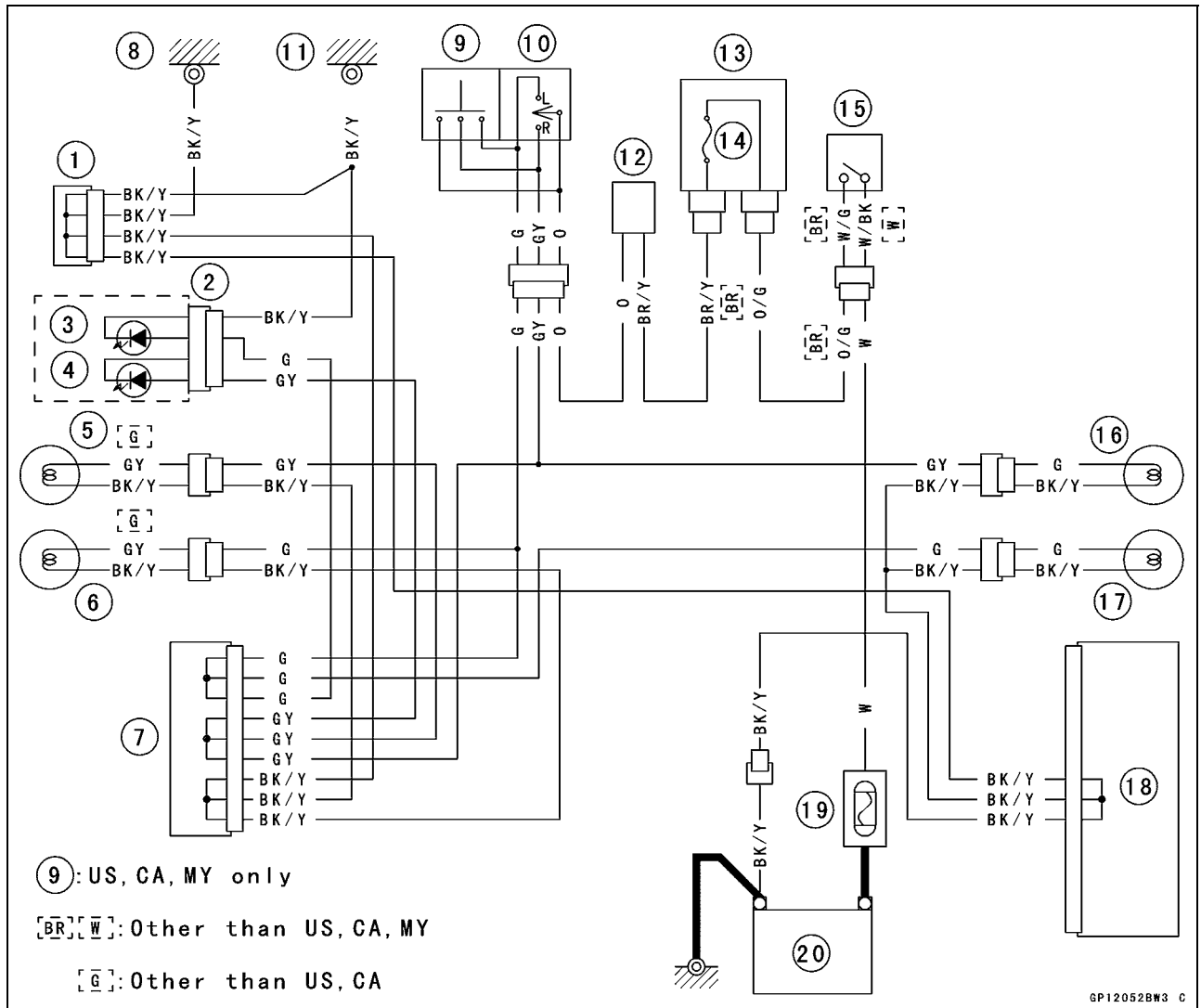
7. Junction Box  
 8. High Beam Indicator Light (LED)

9. Joint Connector D  
 10. City Light (European Model)  
 11. Headlight (High)  
 12. Headlight (Low)  
 13. Joint Connector A

14. Dimmer Switch  
 15. Pushing Button  
 16. Main Fuse 30A  
 17. Battery 12 V 8 Ah  
 18. Taillight (LED)  
 19. License Plate Light  
 20. Joint Connector B  
 21. Running Position Light  
 22. Frame Ground

Lighting System

Turn Signal Light Circuit



US: U.S.A. model

CA: Canada model

MY: Malaysia model

1. Joint Connector D
2. Meter Unit
3. Right Turn Signal Indicator Light (LED)
4. Left Turn Signal Indicator Light (LED)
5. Front Right Turn Signal Light
6. Front Left Turn Signal Light
7. Joint Connector A
8. Frame Ground
9. Hazard Button

10. Turn Signal Switch

11. Meter Ground

12. Turn Signal Relay

13. Junction Box

14. Turn Signal Fuse 10A

15. Ignition Switch

16. Rear Right Turn Signal Light

17. Rear Left Turn Signal Light

18. Joint Connector B

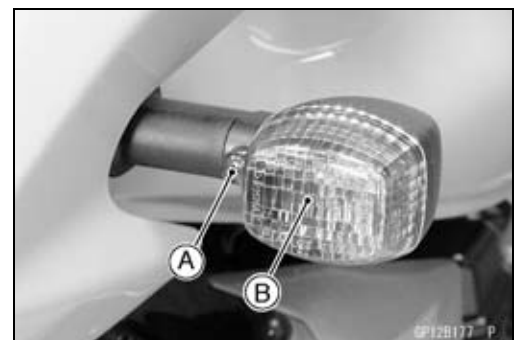
19. Main Fuse 30A

20. Battery 12 V 8 Ah

Turn Signal Light Bulb Replacement

For the European, Malaysian and Australian Models:

- Unscrew the screw [A] and remove the lens [B].



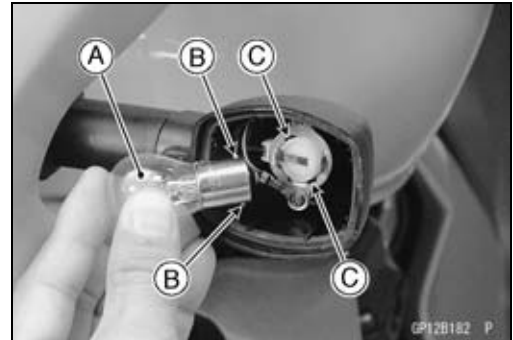
## 16-60 ELECTRICAL SYSTEM

### Lighting System

- Push and turn the bulb [A] counterclockwise and remove it.

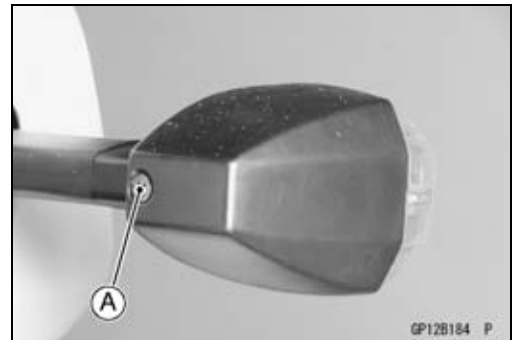


- Insert the new bulb [A] by aligning its upper and lower pins [B] with the upper and lower grooves [C] in the socket, and turn the bulb clockwise.
- Turn the bulb about 15° degrees.



#### For the U.S.A. and Canadian Models:

- Unscrew the screw [A].



- Unscrew the screws [A].



- Push and turn the bulb [A] counter clockwise and remove it.

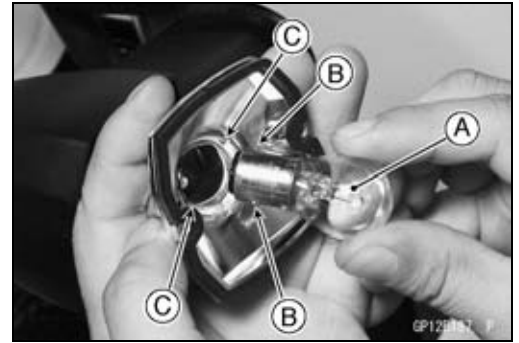


## Lighting System

- 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.

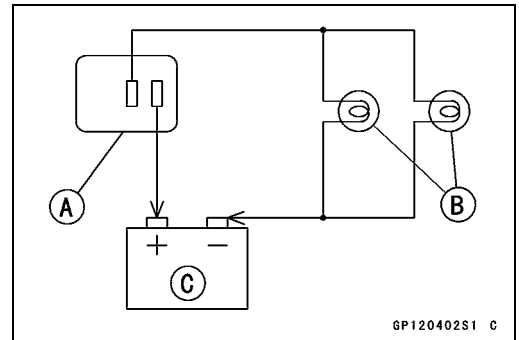
### CAUTION

The front turn signal/running position lights use a vibration resistant bulb. Replacement of the front turn signal/running position bulbs with a non-vibration resistant bulb may result in premature bulb failure.



### Turn Signal Relay Inspection

- Remove:
  - Seats (see Frame chapter)
  - Upper 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

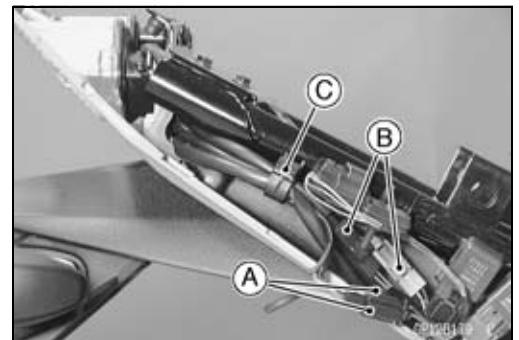
Load		Flashing times (c/m*)
The Number of Turn Signal Lights	Wattage (W)	
1**	21 or 23	140 - 250
2	42 or 46	75 - 95

(\*): Cycle(s) per minute

(\*\*): Corrected to "one light burned out".

### Tail/Brake Light (LED) Removal

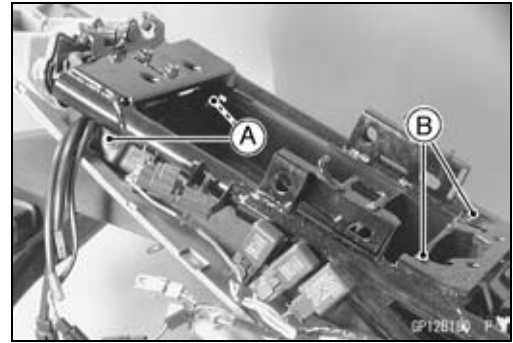
- Remove:
  - Seats (see Frame chapter)
  - Upper Seat Cover (see Frame chapter)
- Disconnect the tail/brake light (LED) connector [A] and rear turn signal connectors [B].
- Open the clamp [C].



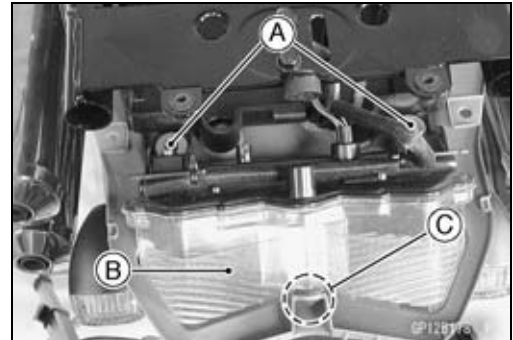
## 16-62 ELECTRICAL SYSTEM

### Lighting System

- Unscrew the bolts [A].
- Loosen the bolts [B].



- Unscrew the mounting screws [A].
- Remove the tail/brake light (LED) [B].
- Pull out the mount portion [C].



#### *Tail/Brake Light (LED) Installation*

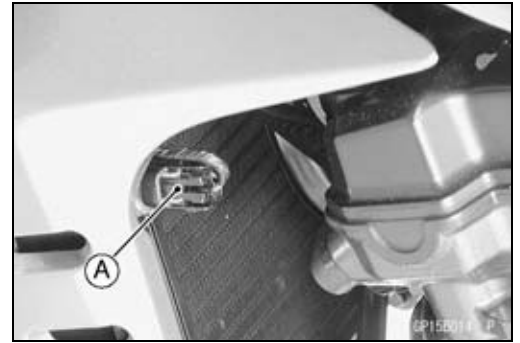
- Tighten the tail/brake light mounting screws.
- Torque - Tail/Brake Light Mounting Screws: 1.2 N·m (0.12 kgf·m, 11 in·lb)**



## Radiator Fan System

### Fan System Circuit Inspection

- Disconnect the lead connector [A] from the radiator fan switch.

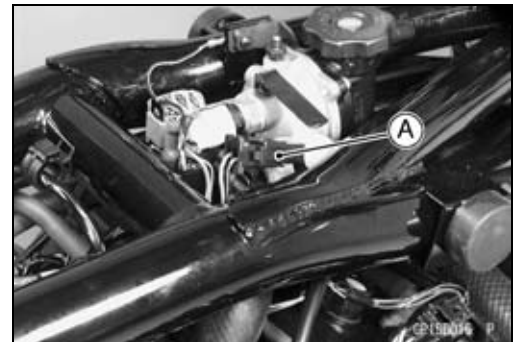


- Using an auxiliary wire [A], connect the radiator fan switch leads.
- ★ If the fan rotates, inspect the fan switch.
- ★ If the fan does not rotate, inspect the following.
  - Leads and Connectors
  - Main Fuse and Fan Fuse
  - Fan Motor

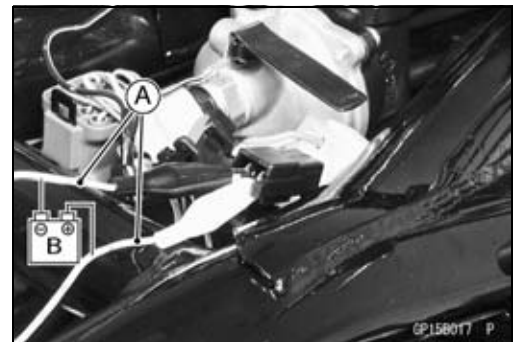


### Fan Motor Inspection

- 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.



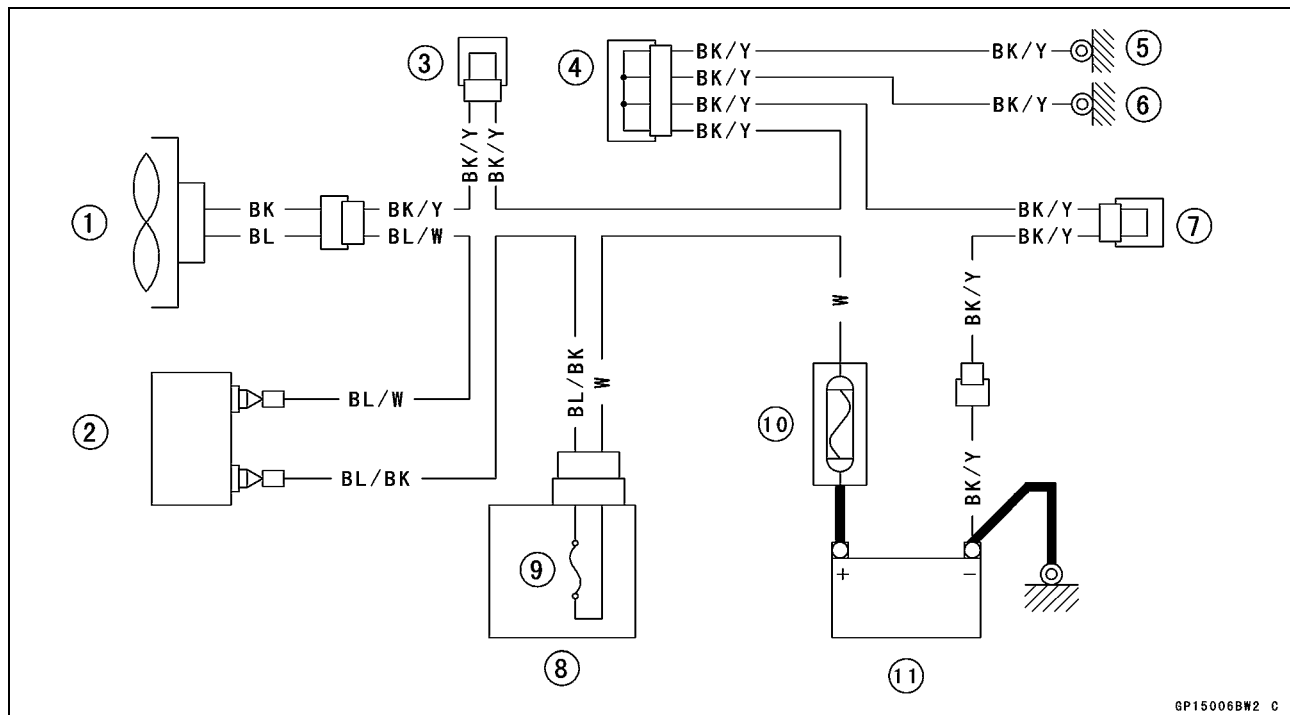
- Using two auxiliary wires [A], supply battery [B] power to the fan motor.
- ★ If the fan does not rotate, the fan motor is defective and must be replaced.



# 16-64 ELECTRICAL SYSTEM

## Radiator Fan System

### Radiator Fan Circuit



1. Radiator Fan
2. Radiator Fan Switch
3. Joint Connector A
4. Joint Connector D

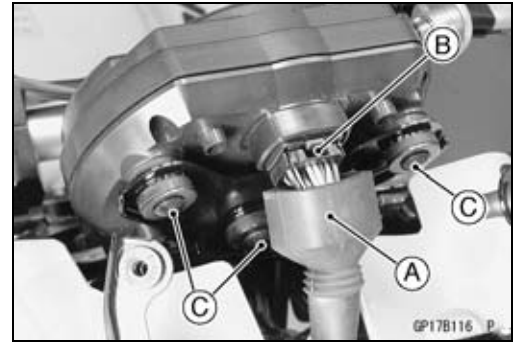
5. Meter Ground
6. Frame Ground
8. Junction Box

9. Fan Fuse 10A
10. Main Fuse 30A
11. Battery 12 V 8 Ah

## Meter, Gauge, Indicator Unit

### Meter Unit Removal

- Remove:  
Wind Sealed (see Frame chapter)
- Slide the dust cover [A] and remove the wiring connector [B].
- Remove the meter unit by taking off the mounting screws [C] with the washers.

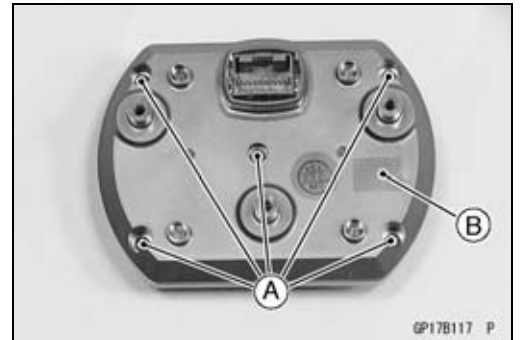


### CAUTION

Place the meter or gauge so that the face is up. If a meter or gauge is left upside down or sideways for any length of time, it will malfunction.

### Meter, Gauge Disassembly

- Remove:  
Meter Unit (see Meter Unit Removal)  
Screws [A]  
Lower Meter Cover [B]
- Separate the meter assembly [A] and upper meter cover [B].



# 16-66 ELECTRICAL SYSTEM

## Meter, Gauge, Indicator Unit

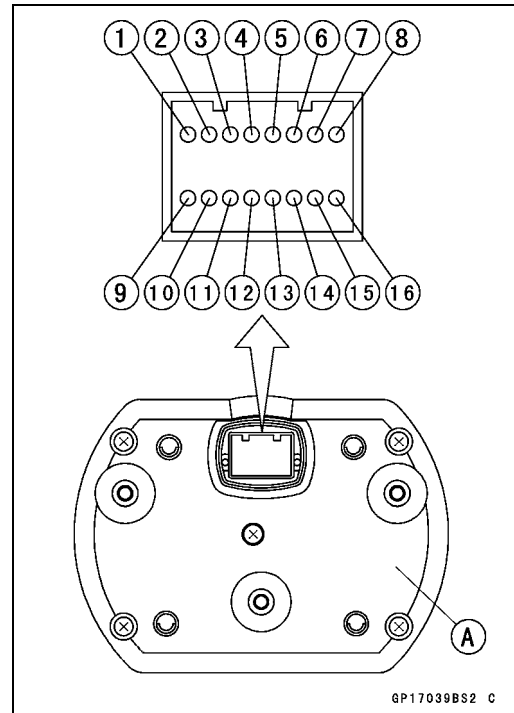
### Electronic Combination Meter Unit Inspection

- Remove the meter unit [A].

[1] Ignition	[10] Battery (+)
[2] Fuel Reserve Switch	[11] Oil Pressure Warning Indicator Light (LED)
[3] Unused	Ground (-)
[4] Fuel Level Sensor	[12] Speed Sensor Supply Voltage
[5] Neutral Indicator Light (LED) Ground (-)	[13] Right Turn Signal Light (LED) (+)
[6] FI Indicator Light (LED) Ground (-)	[14] Left Turn Signal Indicator Light (LED) (+)
[7] Tachometer Pulse Sensor	[15] High Beam Indicator Light (LED)
[8] Water Temperature Sensor	[16] Speed Sensor Pulse
[9] Ground (-)	

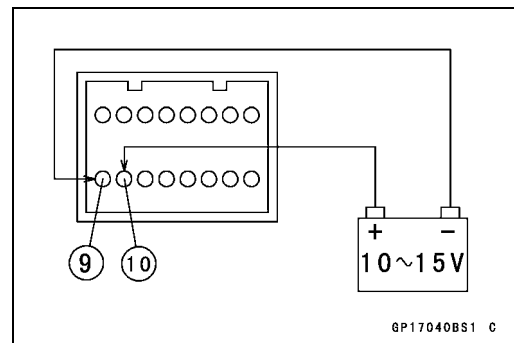
### CAUTION

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.

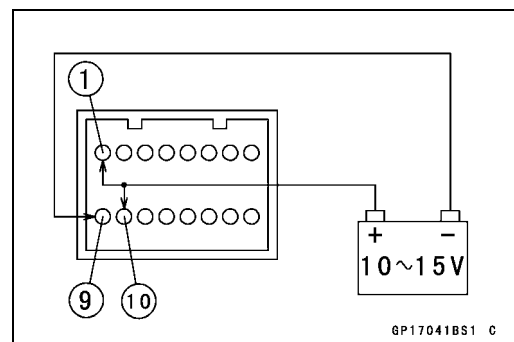


### Liquid Crystal Display (LCD) Segments Check:

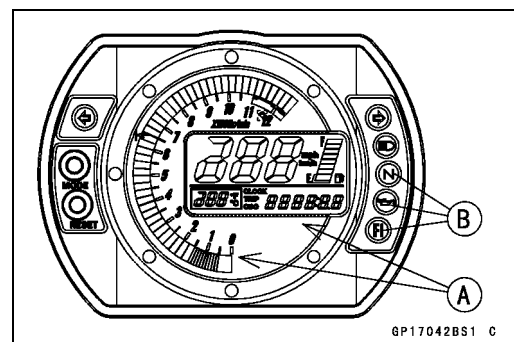
- Use the harness adapter for meter inspection.
- Special Tool - Harness Adapter : 57001-1542**
- Using the auxiliary wires, connect the 12 V battery to the meter unit connector as follows.
  - Connect the battery positive terminal to the terminal [10].
  - Connect the battery negative terminal to the terminal [9].



- Connect the terminal [1] to the terminal [10].



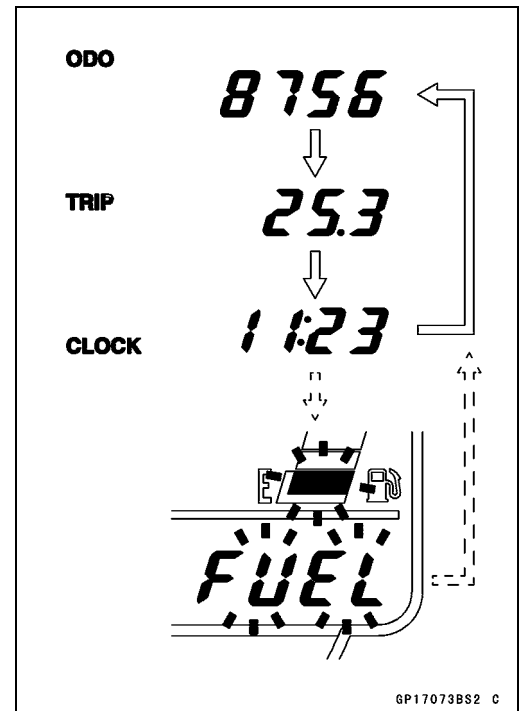
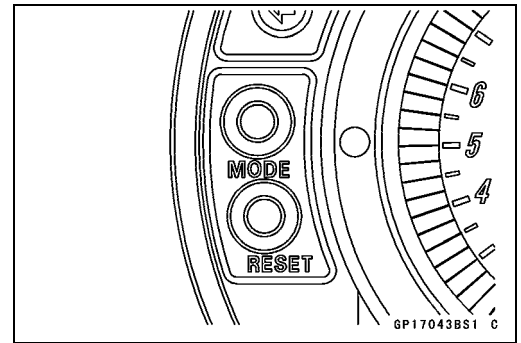
- The tachometer LCD segments momentarily to it last readings two times and segment movement is reversal.
- When the terminals are connected, all the LCD segments [A] and LED warning light [B] appear for three seconds.
- ★If the LCD segments and LED warning light will not appear, replace the meter assembly.
- Disconnect the terminal [1].
- All the LCD segments and LED warning light disappear.
- ★If the segments do not disappear, replace the meter assembly.



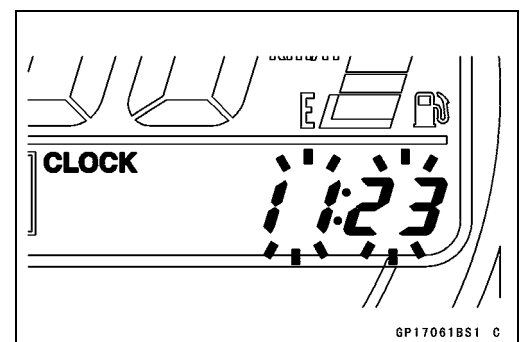
## Meter, Gauge, Indicator Unit

### MODE AND RESET BUTTON Operation Check:

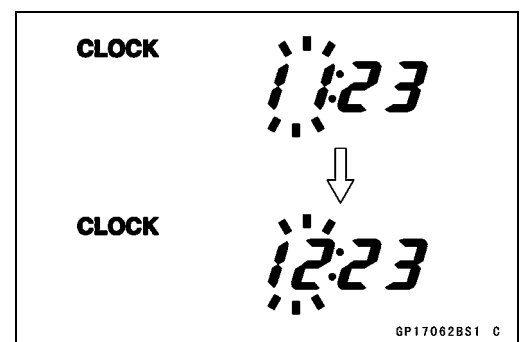
- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Check that the display change to the ODO, TRIP, and CLOCK displays each time the MODE button [A] is pressed.
- If the fuel level gauge flashed, display change to ODO, TRIP, CLOCK and FUEL.
- ★ 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.



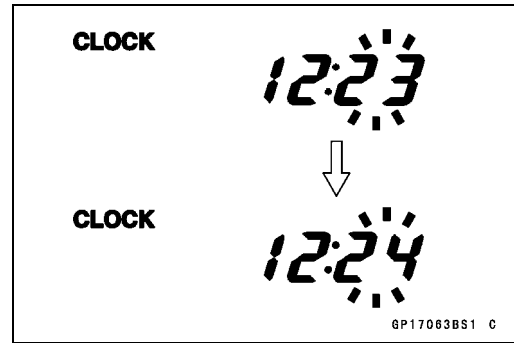
- In the HOUR/MINUTE setting mode, press the RESET button again to effect the HOUR setting mode.
- The hour display flashes on the display.
- Press the MODE button to set the hour.



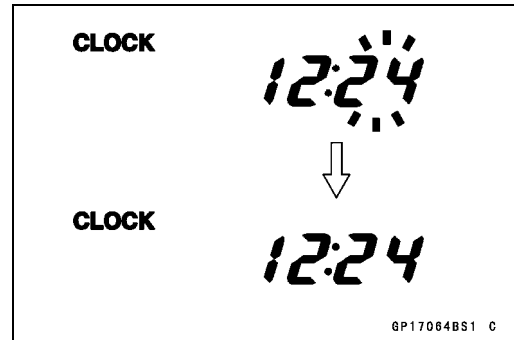
# 16-68 ELECTRICAL SYSTEM

## 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.



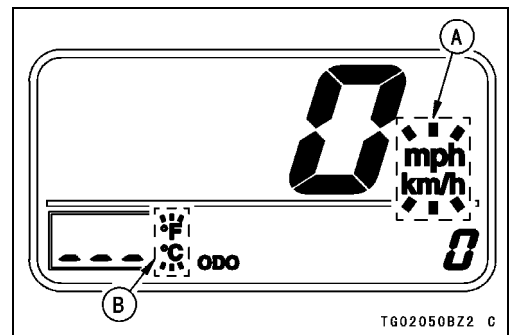
- In the MINUTE setting mode, press the RESET button to return to the HOUR/MINUTE setting mode.
- Press the MODE button to complete the time setting process.
- The clock starts counting the seconds as soon as the MODE button is pressed.



- Indicate the ODO mode.
- Check that the display [A] [B] change to the mile and °F, Mile and °C, km and °F, km and °C display each time by pushing the RESET bottom while MODE bottom pushed in.

### NOTE

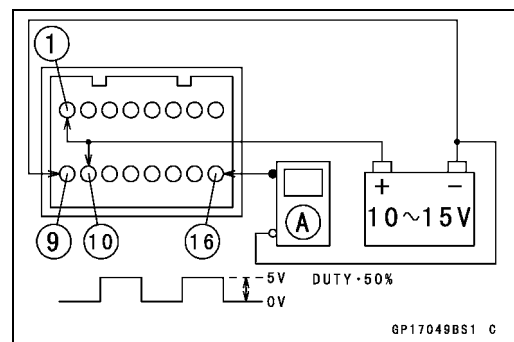
○ Mile/Km Display can alternate between English and metric modes (mile and km) in the digital meter. Make sure that km or mile according to local regulations is correctly displayed before riding.



★ If the display function does not work and adjust, replace the meter 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 141 Hz.
- Indicates approximately 60 km/h in case the input frequency would be approximately 88 Hz.

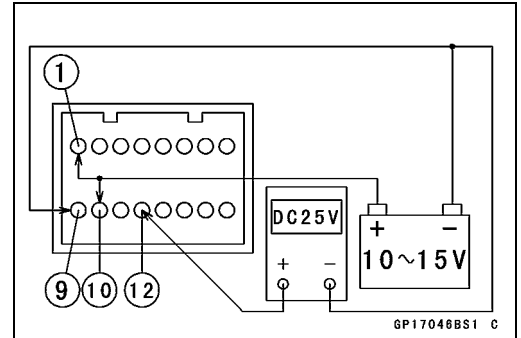


## Meter, Gauge, Indicator Unit

- 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.

### 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 DC25 V range and connect it to the terminals [12] and [9].
- ★ If the voltage is less than 8 V, replace the meter assembly.

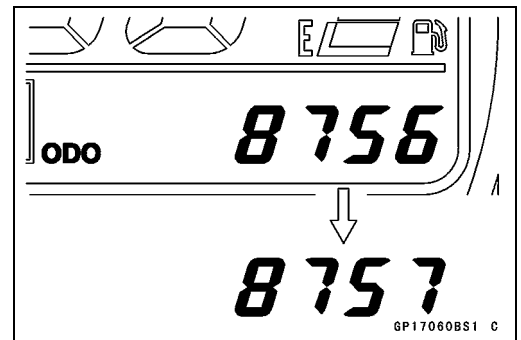


### Odometer Check:

- Check the odometer with the speedometer in the same way.
- ★ If value indicated in the odometer is not added, replace the meter assembly.

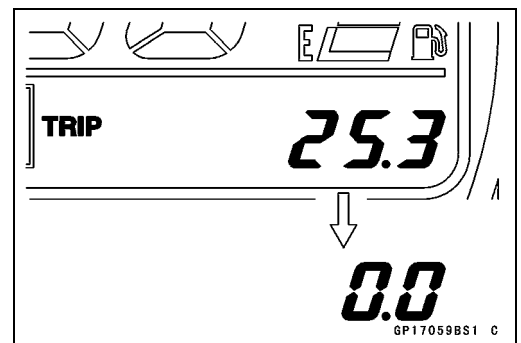
#### NOTE

- The data is maintained even if the battery is disconnected.
- When the figures come to 999999, they are stopped and locked.



### Trip Meter Check:

- Check the trip meter with the speedometer in the same way.
- ★ If value indicated in the trip meter is not added, replace the meter 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.

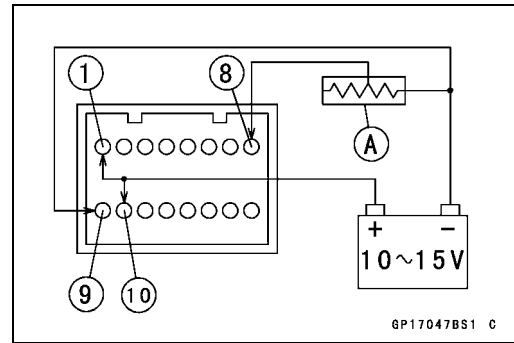


# 16-70 ELECTRICAL SYSTEM

## Meter, Gauge, Indicator Unit

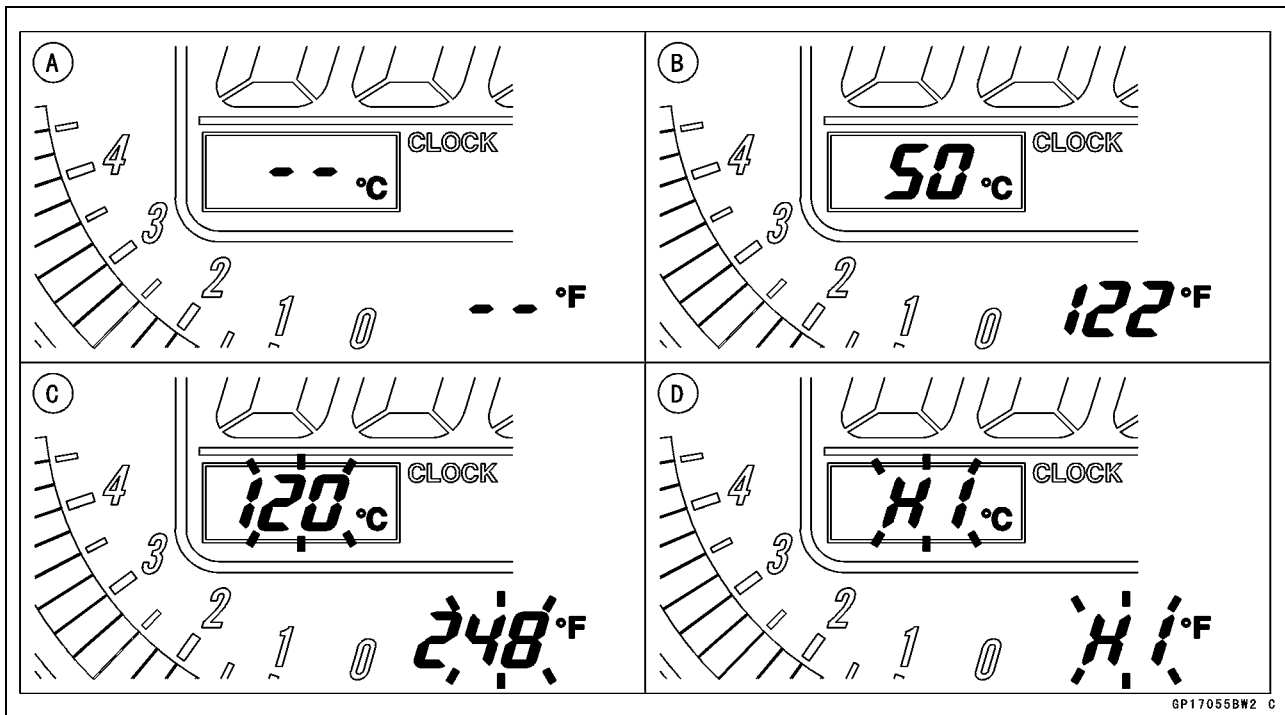
### Water Temperature Meter Check:

- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- Connect the variable rheostat [A] to the terminal [8] as shown.
- Check that the number of segments matches the resistance value of the variable rheostat.



Resistance Value ( $\Omega$ )	Temperature Meter	Warning Indicate
	–	[A] –
209.8	50°C (122°F)	[B] –
69.1	80°C (176°F)	[B] –
21.2	120°C (248°F)	[C] Flash
17	HI	[D] Flash

- If any display function does not work, replace the meter unit.





Meter, Gauge, Indicator Unit

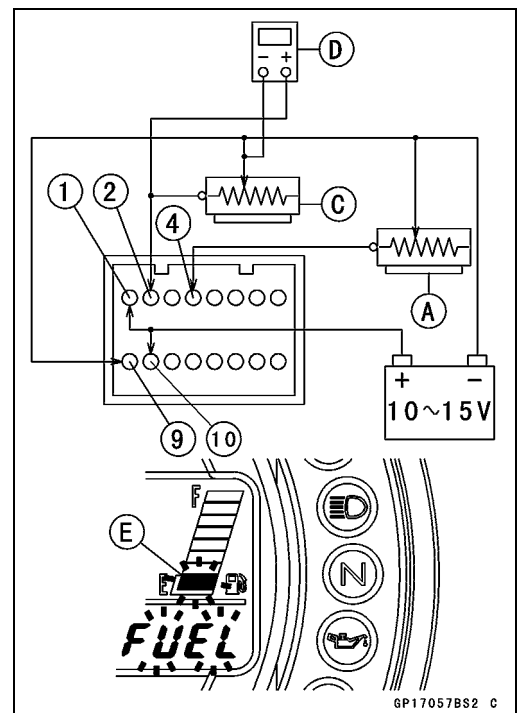
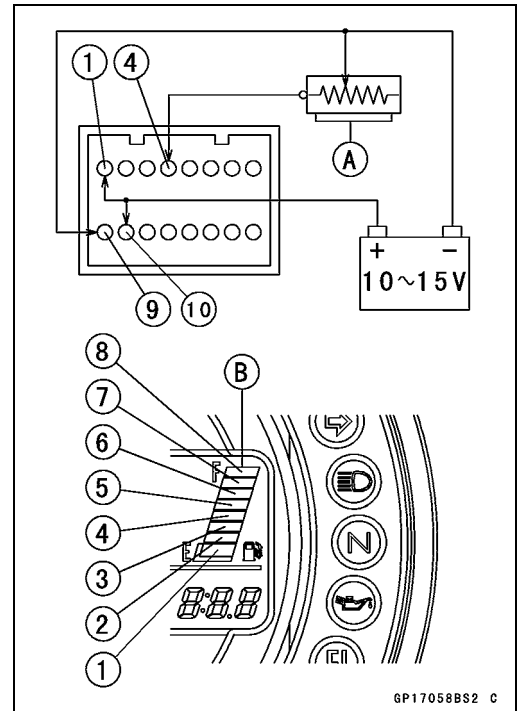
Fuel Level Gauge Inspection:

- 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 ( $\Omega$ )	Number of Segments	
0 ~ 16.5	F	8
11.5 ~ 28.5		7
21.5 ~ 40.5		6
31.5 ~ 52.5		5
41.5 ~ 64.5		4
51.5 ~ 76.5		3
61.5 ~ 88.5		2
71.5 ~ above	E	1

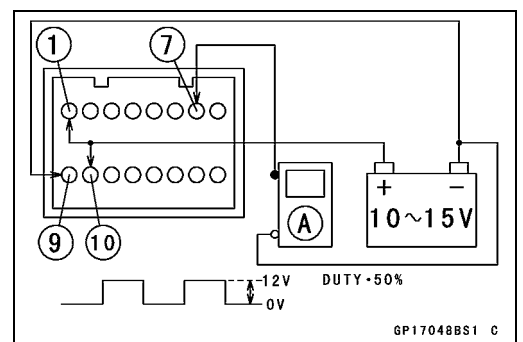
★If this display function does not work, replace the meter assembly.

- Connect an other variable rheostat [C] to terminal [2] and [9].
- 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 5.7 V.
- Then the 1 and FUEL segments should flush.
- ★If this display function does not flush, replace the meter assembly.



Tachometer Check:

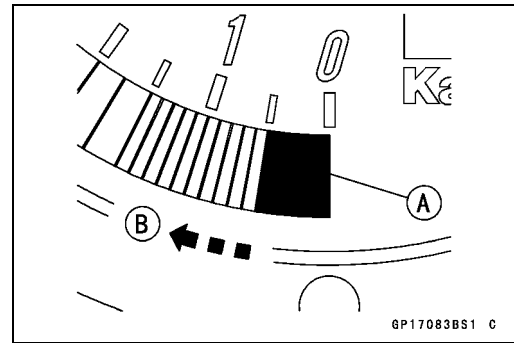
- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments Check".
- The revolutions per minute (rpm) equivalent to the input frequency is indicated in the oscillator [A] if the square wave (illustrated as shown) would be input into the terminal [7].
- Indicates approximately 6 000 rpm in case the input frequency would be approximately 200 Hz.



# 16-72 ELECTRICAL SYSTEM

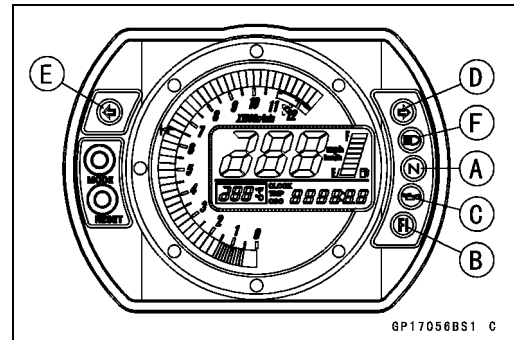
## Meter, Gauge, Indicator Unit

- 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 segment [A] should flick [B].
- ★ If the segment does not flick, replace the meter assembly.



### LED Lights Inspection:

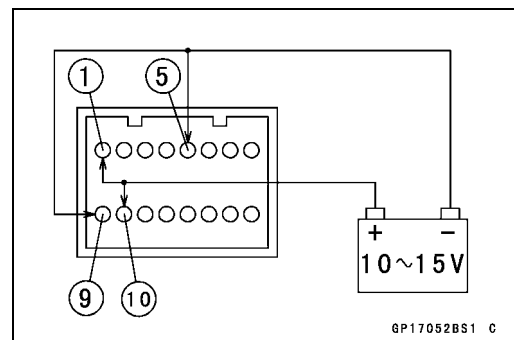
- Connect the 12 V battery and terminals in the same manner as specified in the "Liquid Crystal Display (LCD) Segments check."
  - Neutral Indicator Light (LED) [A]
  - FI Indicator Light (LED) [B]
  - Oil Pressure Warning Indicator Light (LED) [C]
  - Right Turn Signal Indicator Light (LED) [D]
  - Left Turn Signal Indicator Light (LED) [E]
  - High Beam Indicator Light (LED) [F]



- Using the auxiliary leads, connect a 12 V battery to the meter unit connector as follows.

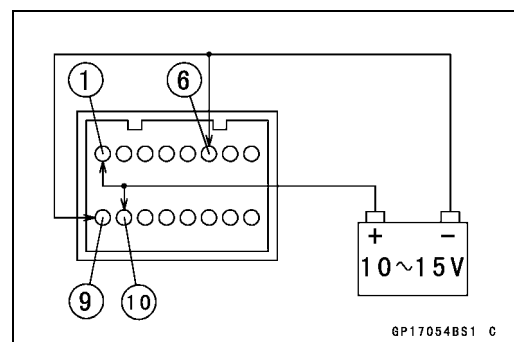
### Neutral Indicator Light (LED):

Battery Negative (-) Terminal To Terminal [5]



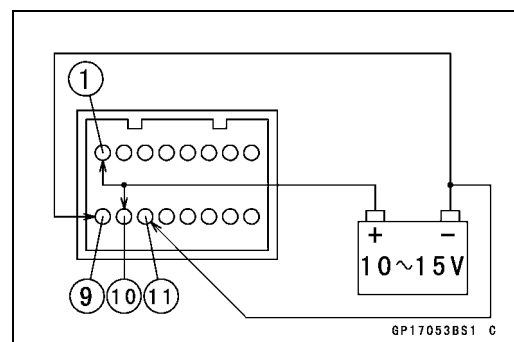
### FI Indicator Light (LED):

Battery Negative (-) Terminal To Terminal [6]



### Oil Pressure Warning Indicator Light (LED):

Battery Negative (-) Terminal To Terminal [11]

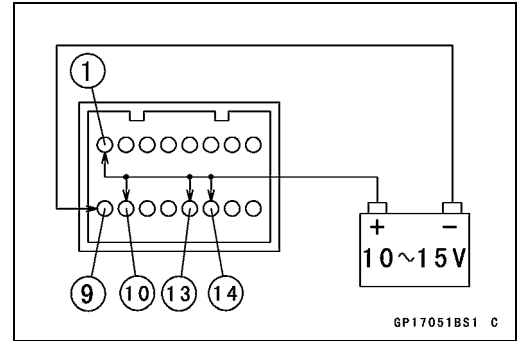


## Meter, Gauge, Indicator Unit

### Right and Left Turn Signal Indicator Light (LED):

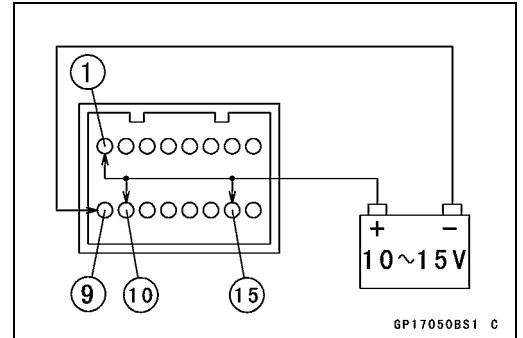
For Right Turn Signal Indicator Light (LED)  
Battery Positive (+) Terminal to Terminal [13]

For Left Turn Signal Indicator Light (LED)  
Battery Positive (+) Terminal to Terminal [14]



### High Beam Indicator Light:

Battery Positive (+) Terminal to Terminal [15]

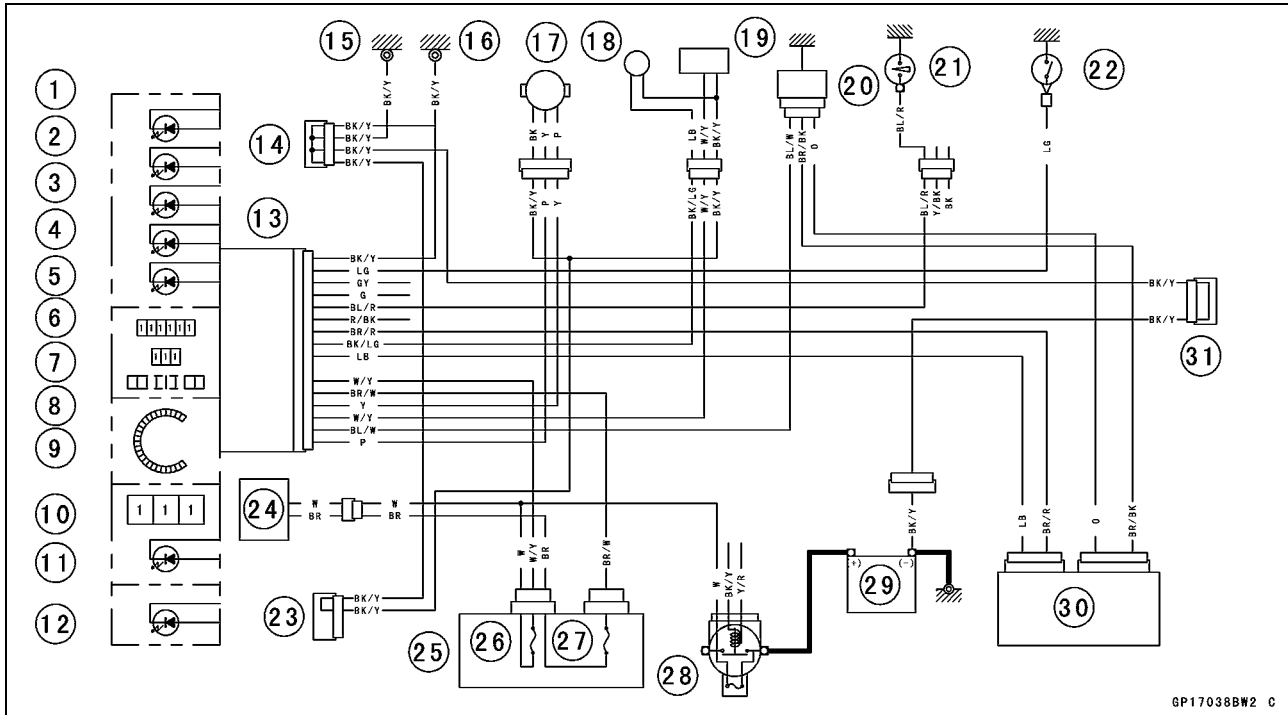


- If each LED lights does not go on, replace the meter assembly.

# 16-74 ELECTRICAL SYSTEM

## Meter, Gauge, Indicator Unit

### Meter Circuit



GP17038BW2 C

- |   |                              |
|---|------------------------------|
| 1. Right Turn Signal Indicator Light (LED)    | 17. Speed Sensor             |
| 2. High Beam Indicator Light (LED)            | 18. Fuel Reserve Switch      |
| 3. Neutral Indicator Light (LED)              | 19. Fuel Level Sensor        |
| 4. Oil Pressure Warning Indicator Light (LED) | 20. Water Temperature Sensor |
| 5. FI Indicator Light (LED)                   | 21. Oil Pressure Switch      |
| 6. Odometer/Trip Meter/Clock/Fuel Indicator   | 22. Neutral Switch           |
| 7. Water Temperature Gauge                    | 23. Joint Connector A        |
| 8. Fuel Level Gauge                           | 24. Ignition Switch          |
| 9. Tachometer                                 | 25. Junction Box             |
| 10. Speedometer                               | 26. ACC Fuse 10A             |
| 11. Meter Light (LED)                         | 27. Ignition Fuse 10A        |
| 12. Left Turn Signal Indicator Light (LED)    | 28. Main Fuse 30A            |
| 13. Meter Unit                                | 29. Battery 12 V 8 Ah        |
| 14. Joint Connector D                         | 30. E.C.U.                   |
| 15. Frame Ground                              | 31. Joint Connector B        |
| 16. Meter Ground                              |                              |

## Switches and Sensors

### Brake Light Timing Inspection

- Refer to the Brakes in the Periodic Maintenance chapter.

### Brake Light Timing Adjustment

- Refer to the Brakes in the Periodic Maintenance chapter.

### Switch Inspection

- Using a hand tester, check to see that only the connections shown in the table have continuity (about zero ohms).
- For the 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		

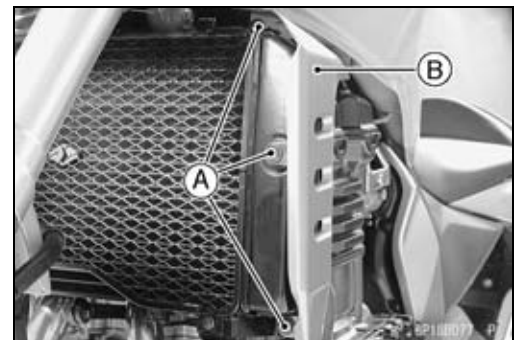
### Oil Pressure Switch Connections\*

	SW. Terminal	TTT
When engine is stopped	○ — ○	
When engine is running		

\*: Engine lubrication system is in good condition

### Radiator Fan Switch Inspection

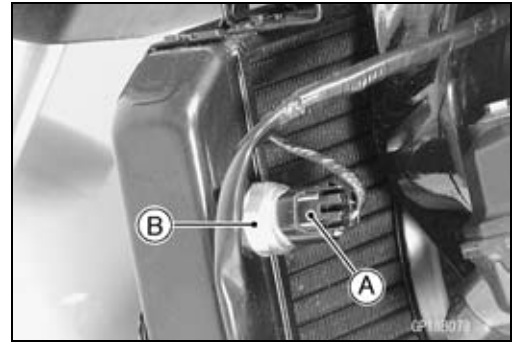
- Unscrew the radiator cover screws [A] and remove the left radiator cover [B]



# 16-76 ELECTRICAL SYSTEM

## Switches and Sensors

- Disconnect the connector [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:**

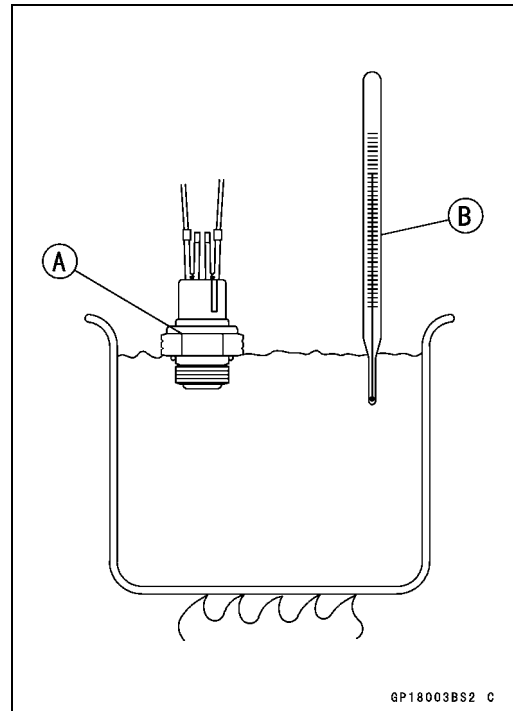
**From OFF to ON at 93 ~ 103°C (199 ~ 217°F)**

**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**

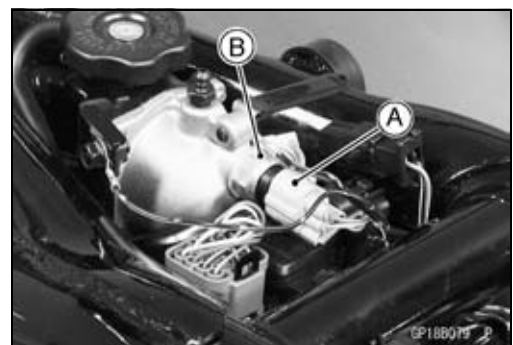
**OFF: More than 10 MΩ**



GP18003BS2 C

### Water Temperature Sensor Inspection

- Remove the fuel tank (see Fuel System (DFI) chapter).
- Disconnect the water temperature sensor connector [A].
- Remove the water temperature sensor [B] (see Fuel System (DFI) chapter).

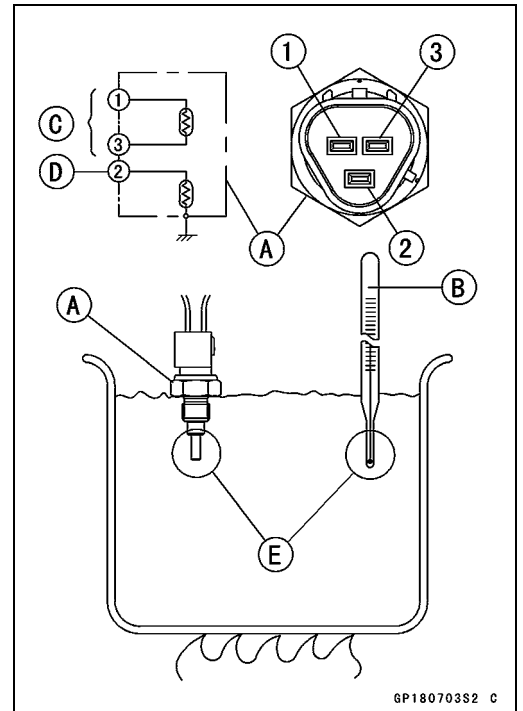


**Switches and Sensors**

- 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.



GP180703S2 C

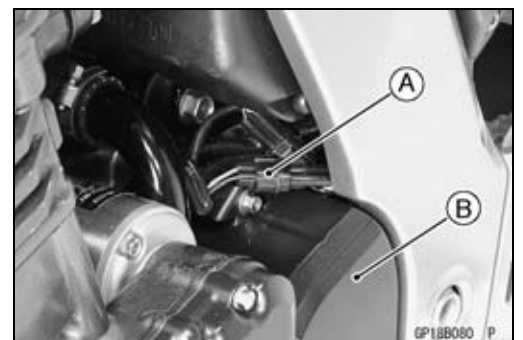
**Water Temperature Sensor**

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

**Speed Sensor Inspection**

- Disconnect:  
Speed Sensor Connector [A]
- Remove:  
Engine Sprocket Cover [B] (see Final Drive chapter)



GP18B080 P

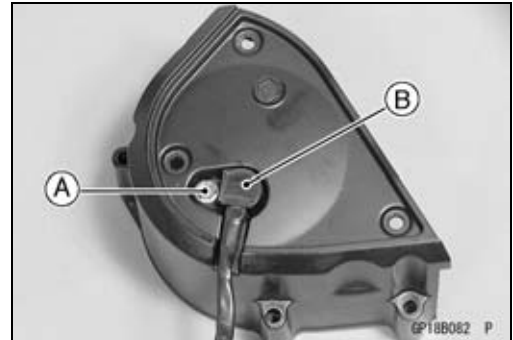
# 16-78 ELECTRICAL SYSTEM

## Switches and Sensors

- Remove:
  - Bolts [A]
  - Speed Sensor Cover

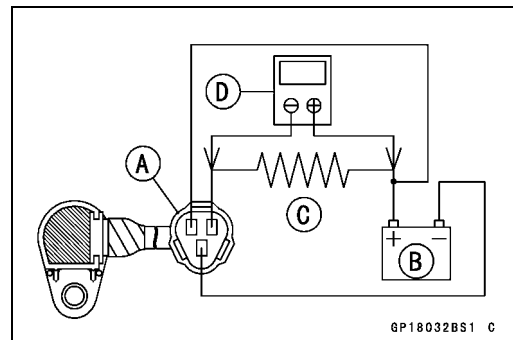


- Remove:
  - Bolt [A]
- Take out the speed sensor [B].

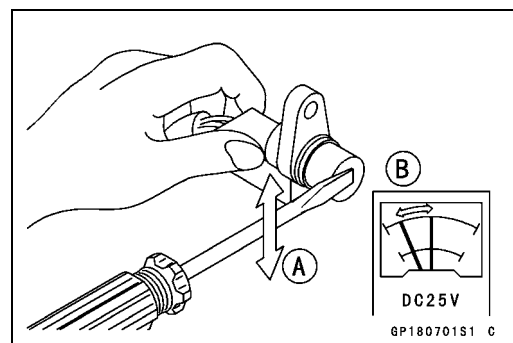


- Connect the speed sensor connector [A] with the battery [B], 10 kΩ resistor [C] and hand tester [D] as shown.
- Set the tester to the DC 25 V range.

**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.

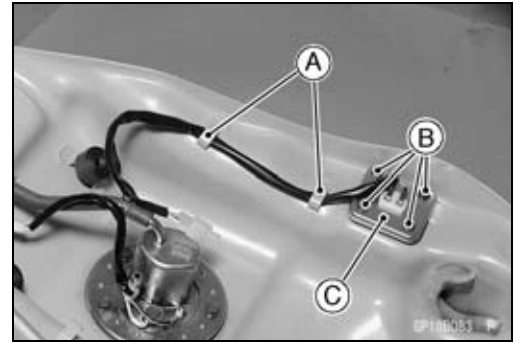
**Torque - Speed Sensor Bolt : 6.9 N·m (0.7 kgf·m, 62 in·lb)**  
**Speed Sensor Cover Bolts : 6.9 N·m (0.7 kgf·m, 62 in·lb)**



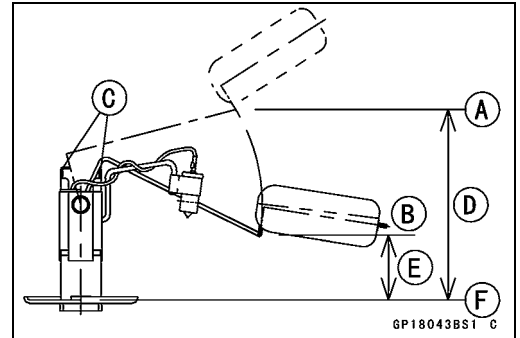
## Switches and Sensors

### 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.

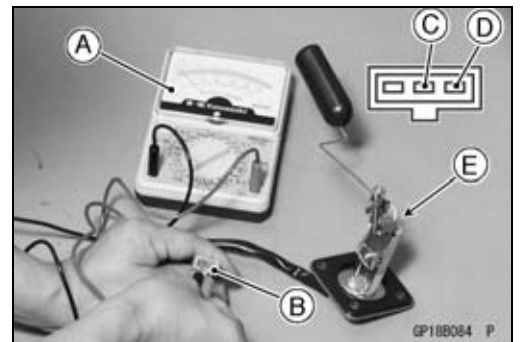
### Fuel Level Sensor Resistance

**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 (0.7 kgf·m, 61 in·lb)**



### Fuel Reserve Switch Inspection

- Fill the fuel tank with fuel.
- Close the fuel tank cap surely.
- Remove:
  - Frame Cover (see Frame chapter)
- Disconnect the fuel level sensor connector [A].



# 16-80 ELECTRICAL SYSTEM

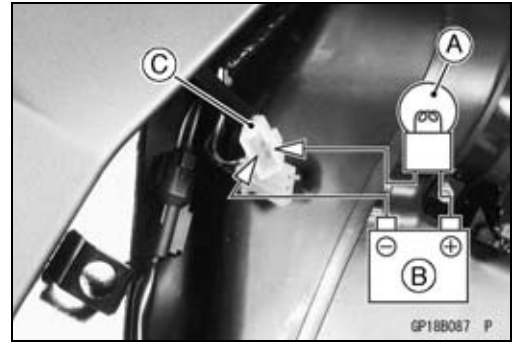
## Switches and Sensors

- 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**

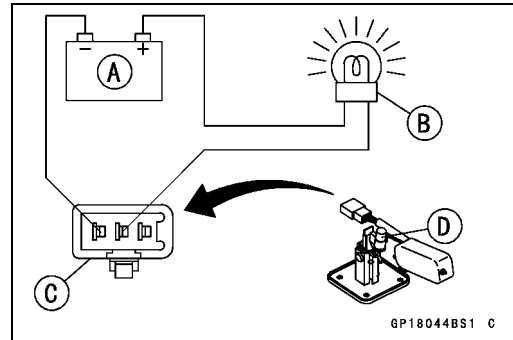
- ★ If the test light turn on, the reverse switch is defective. Replace the fuel level sensor.



- 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

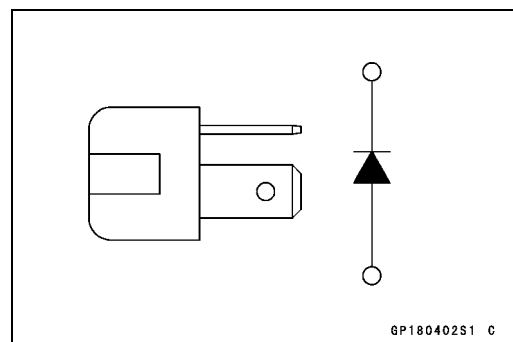
○ It may take a long time to turn on the test light in case that the fuel reserve switch is inspected just after the fuel level sensor is removed. Leave the fuel reserve switch with leads for inspection connected for ten (10) minute.

### Diode (Rectifier) Inspection

- Remove the fairing (see Frame chapter)
- Cut the vinyl tape.
- Disconnect the diode [A].



- 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.

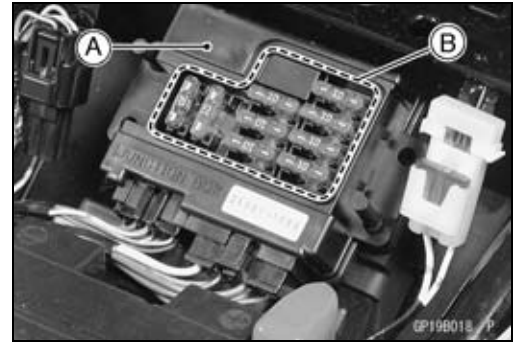


### NOTE

○ 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.

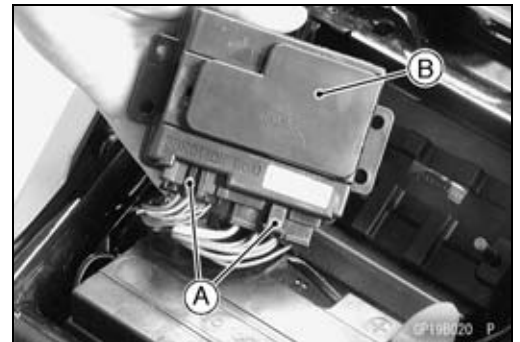


### Junction Box Fuse Circuit Inspection

- 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		

# 16-82 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**

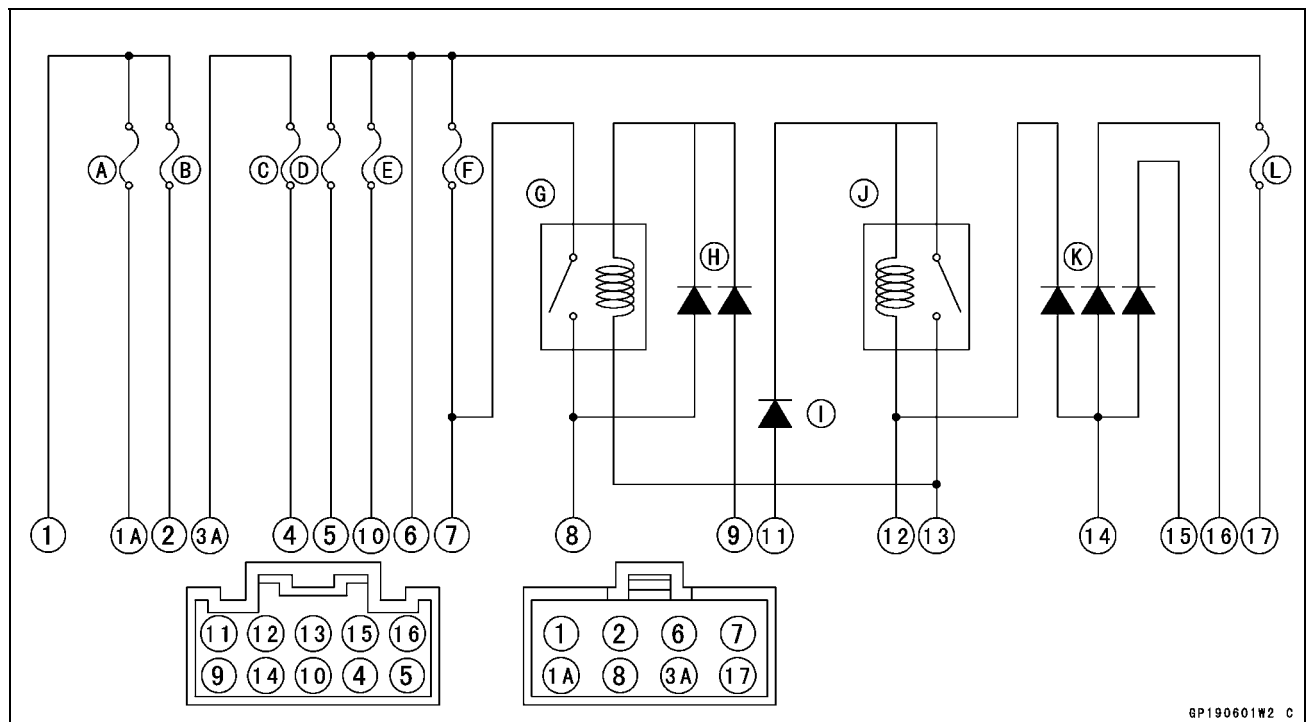
Tester Connection	13-8, 13-9, 12-11, 12-14, 15-14, 16-14
-------------------	--

★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**



6P190601W2 C

- A. Accessory Fuse 10A
- B. Fan Fuse 10A
- C. Turn Signal Relay Fuse 10A
- D. Horn Fuse 10A

- E. Ignition Fuse 10A
- F. Headlight Fuse 10A
- G. Headlight Relay
- H. Headlight Diodes
- I. Starter Diode

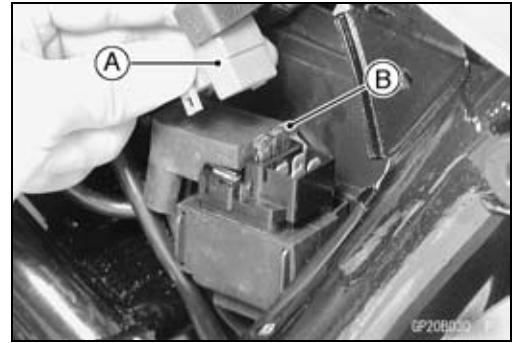
- J. Starter Circuit Relay
- K. Interlock Diodes
- L. Taillight Fuse 10A

# 16-84 ELECTRICAL SYSTEM

## Fuse

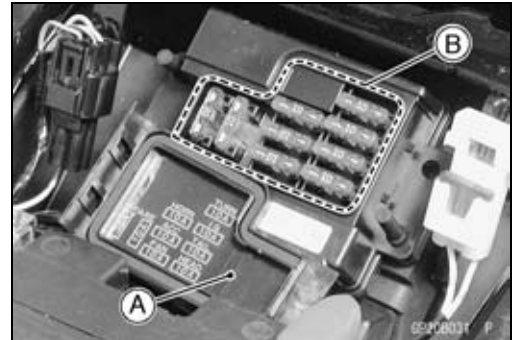
### 30A Main Fuse Removal

- Remove:
  - Right Side Cover (see Frame chapter)
  - 30A Main Fuse Connector [A]
- Pull out the main fuse [B] from the starter relay with needle nose pliers.



### Junction Box Fuse Removal

- Remove the seats (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.

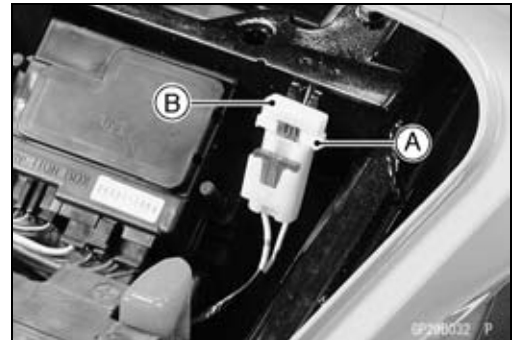


### Fuse Installation

- 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.

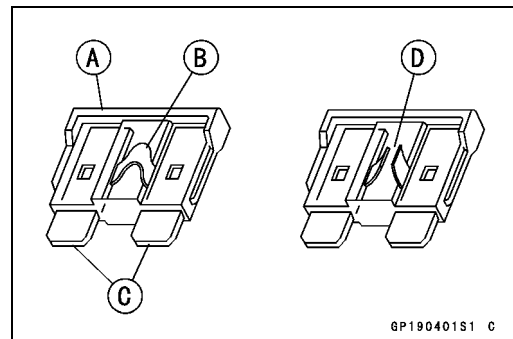
### 15A ECU Fuse Removal

- Remove:
  - Seats (see Frame chapter)
- Unlock the hook [A] to pull the lid [B].
- Pull out the ECU Fuse from the fuse box.



### 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]



### CAUTION

**When replacing a fuse, be sure the new fuse matches the specified fuse rating for that circuit. Installation of a fuse with a higher rating may cause damage to wiring and components.**

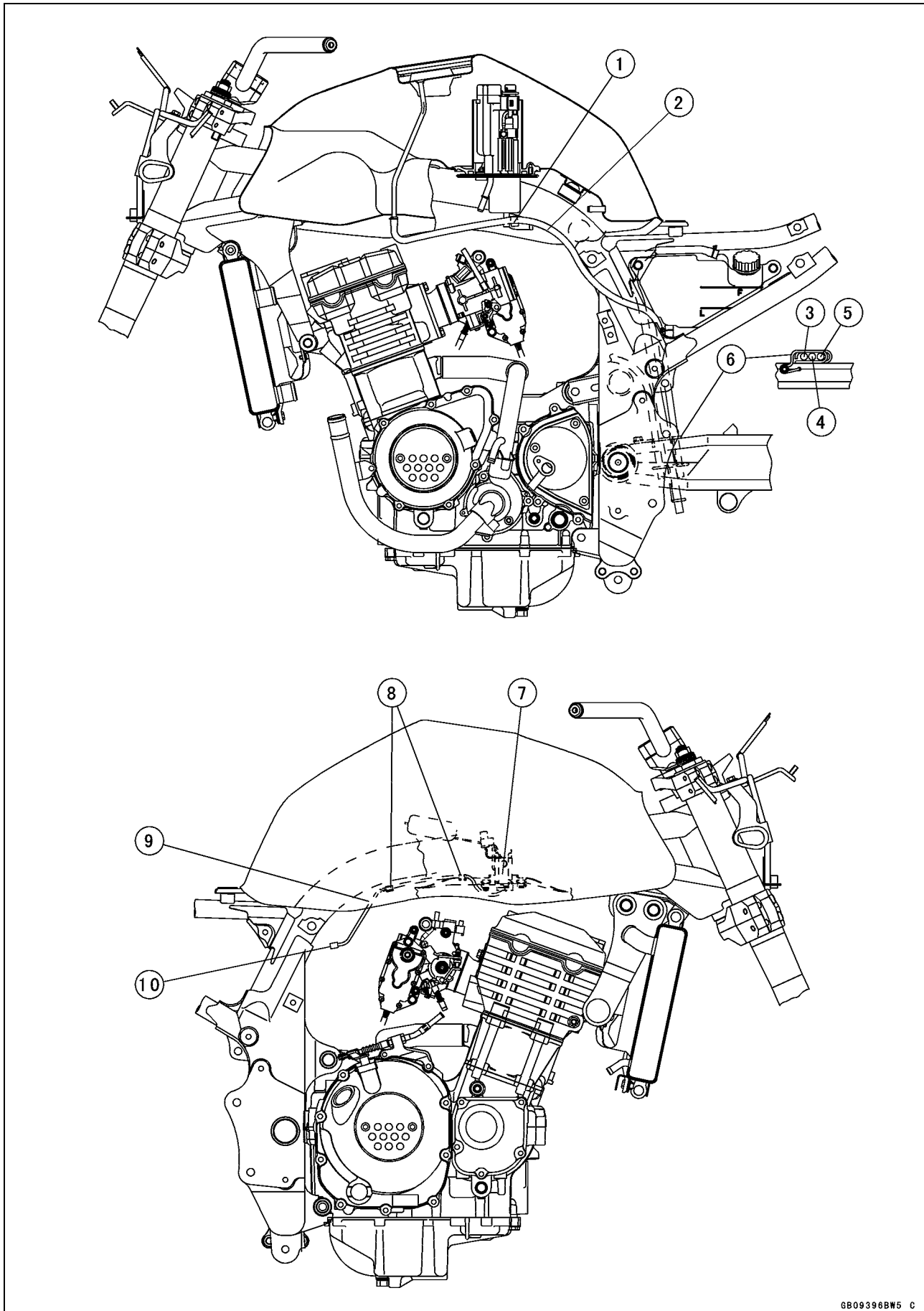
# Appendix

## Table of Contents

Cable, Wire, and Hose Routing .....	17-2
Troubleshooting Guide .....	17-20

## 17-2 APPENDIX

### Cable, Wire, and Hose Routing





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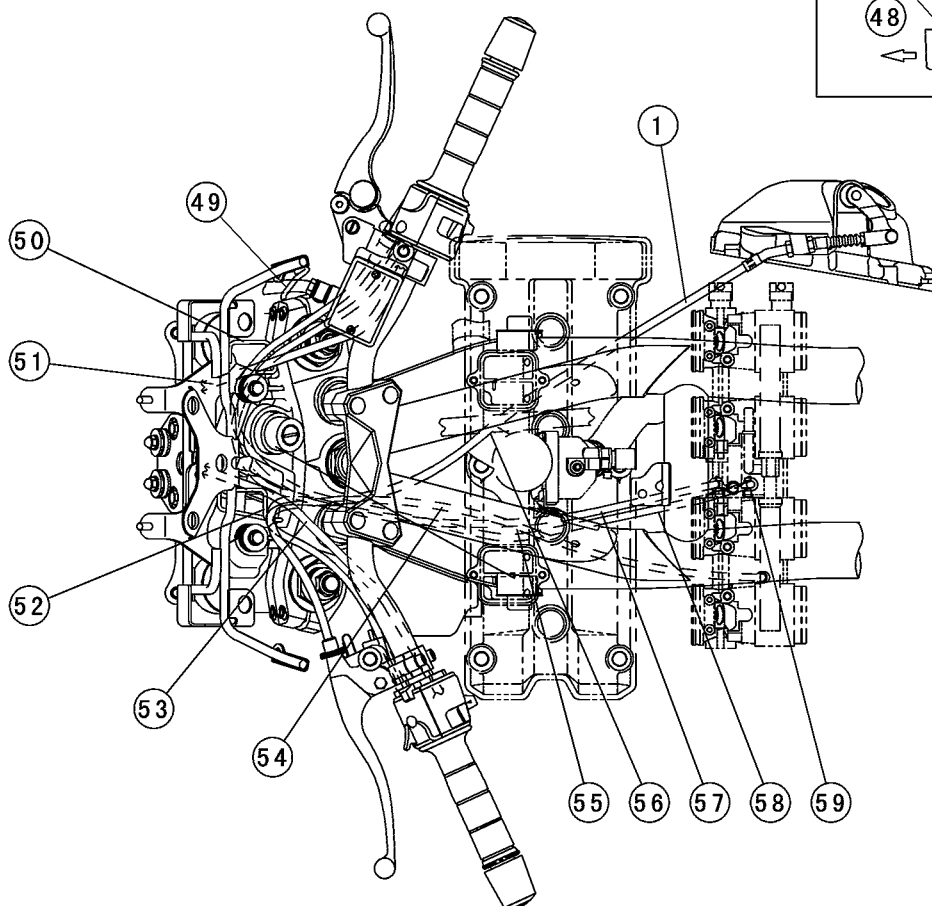
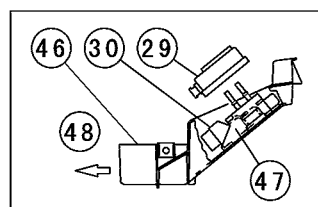
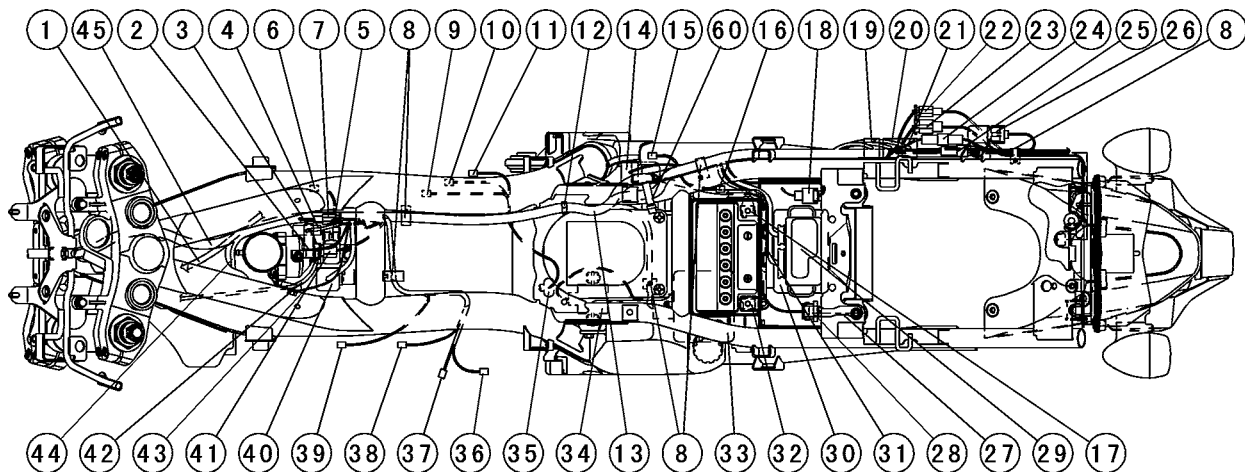
**Cable, Wire, and Hose Routing**

---

1. Fixes by the left side clamp of the tank.
2. Tank drain hose passes the side cover installation under the bracket.
3. Air cleaner drain hose
4. Fuel tank drain hose
5. Cooling reserve tank hose
6. Fixes by the swingarm clamp
7. Fuel level sensor
8. Fixes by the right side clamps two places of the tank.
9. The outside of the frame passed
10. Fuel level sensor lead

# 17-4 APPENDIX

## Cable, Wire, and Hose Routing



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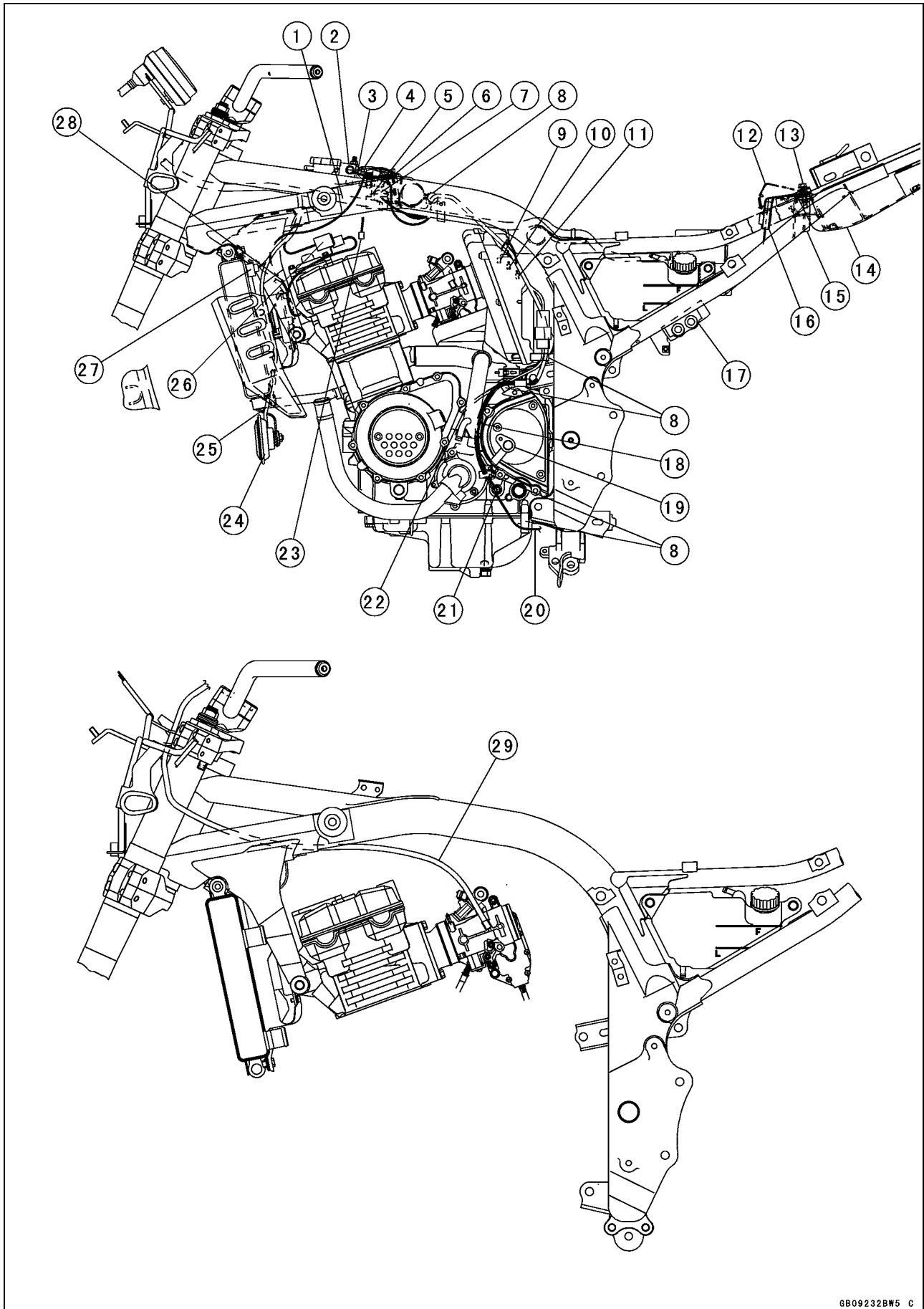
**Cable, Wire, and Hose Routing**

---

1. Clutch cable
2. Meter ground
3. Clamp (Ignition switch connector)
4. Ignition switch connector
5. Inlet air pressure sensor
6. To ignition coil
7. Fan motor connector (Connect the connector on the inlet air pressure sensor.)
8. Clamp
9. To fuel pump
10. To fuel level gauge and fuel reserve switch
11. To pickup coil and oil pressure switch
12. Insert the clamp of mainharness into the flame hole.
13. Mainharness
14. Starter relay
15. To rear brake switch
16. Connect the battery negative cable and battery.
17. Battery negative cable
18. Self-diagnosis indicator terminal
19. Turn signal relay
20. Fuel pump relay
21. ECU main relay
22. License light connector
23. Tail light connector
24. Rear right turn signal light connector
25. Rear left turn signal light connector
26. Atmospheric pressure sensor
27. Bracket
28. ECU fuse
29. Junction Box
30. ECU
31. Run the lead of ECU under the end surface of battery case.
32. Battery Positive Cable (to starter relay)
33. Regulator/rectifier
34. Vehicle-down sensor
35. Inlet air temperature sensor
36. Side stand switch
37. Neutral Switch
38. Speed sensor
39. Alternator
40. Engine harness
41. Water temperature sensor
42. Run the lead of ignition switch above the hose connected with the thermostat body, and the front of inlet air pressure sensor as well.
43. Frame ground (with thermostat)
44. To cam sensor, fan switch, horn
45. The harness passes on the clutch cable.
46. Battery case
47. Damper
48. Front
49. Run the brake hose between upper bracket and clamp of bracket.
50. Run the Throttle Cable together with the Right Grip Switch wire through the of Cowl Bracket clamp.  
Run the wire through the center of the frame, which has to be located nearer to the center than the cable.
51. Right switch housing lead
52. Run the Clutch Cable, the Starter Cable and the Left Grip Switch wire through the space made between the Cowl Bracket clamp and the Upper Bracket.  
Run the Main Harness under the right side of the thermostat body.
53. Left switch housing lead
54. Starter cable
55. Run the starter cable through under the throttle cable.
56. Run the clutch cable between the water hose and the mainharness.
57. Throttle cable (decelerator)
58. Throttle cable (accelerator)
59. No slip of cable
60. Band (near of the air cleaner duct holder screw)

# 17-6 APPENDIX

## Cable, Wire, and Hose Routing



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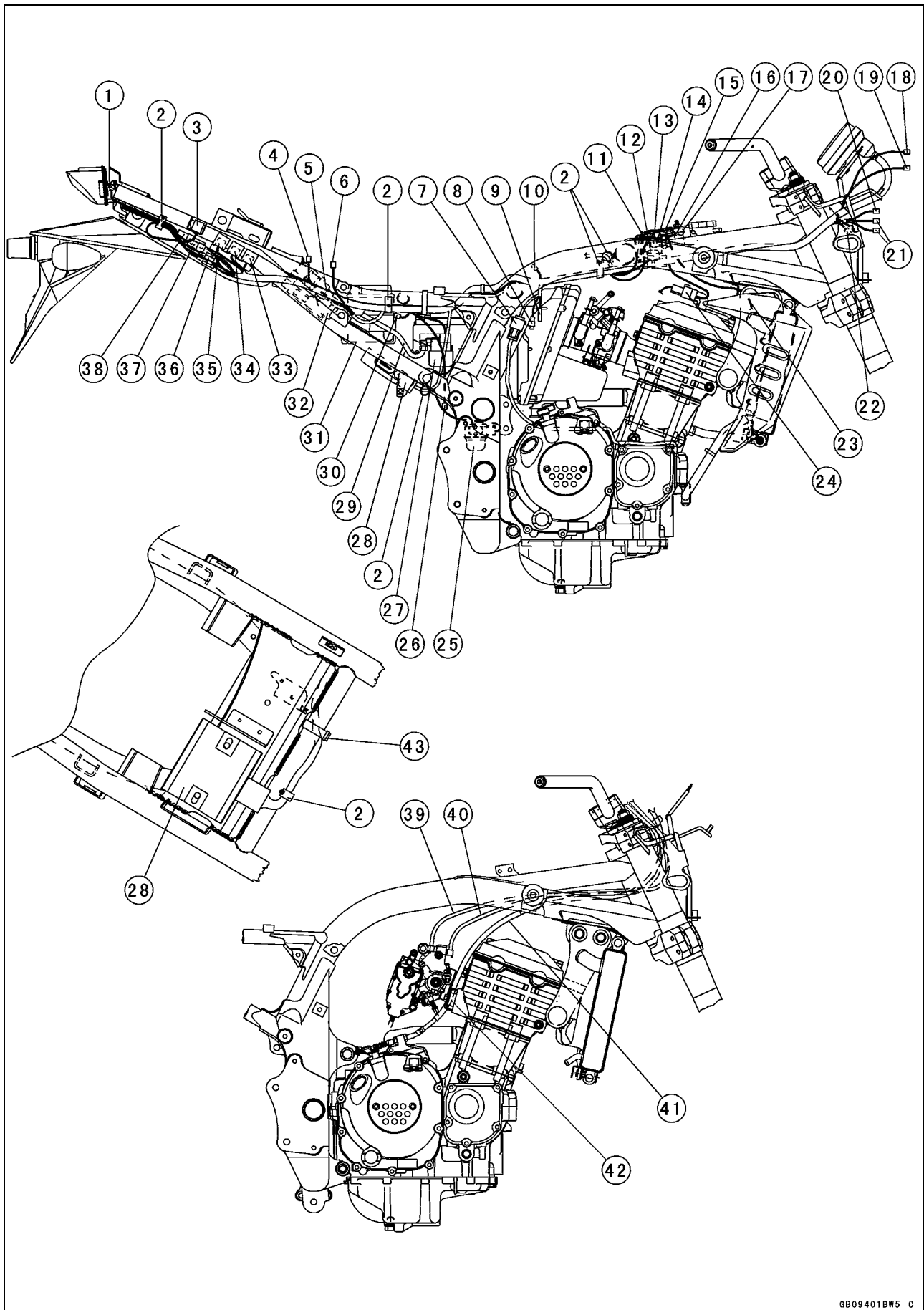
**Cable, Wire, and Hose Routing**

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1. Run the main harness through lower and right side of the thermostat.
2. Frame ground (with thermostat bracket)
3. Ignition switch connector
4. Meter ground (with thermostat)
5. Engine harness (Connect the harness on the cross pipe.)
6. Water temperature sensor
7. Inlet air pressure sensor
8. Clamp
9. To pickup coil and oil pressure switch
10. To fuel level gauge and fuel reserve switch
11. To fuel pump
12. Bracket
13. Insert the fuse holder under the left side bolt that connects the battery case with tool case to tighten temporarily.
14. Storage compartment
15. Battery case
16. ECU fuse
17. Regulator/rectifier
18. Run the lead through the inside of the pipe.
19. Speed sensor
20. Side stand switch
21. Neutral switch
22. To alternator
23. To ignition coil
24. Horn
25. Horn lead
26. Cam sensor
27. Fan switch
28. Run the harness between the engine bracket and the left side space of the baffle plate.
29. Starter cable

# 17-8 APPENDIX

## Cable, Wire, and Hose Routing



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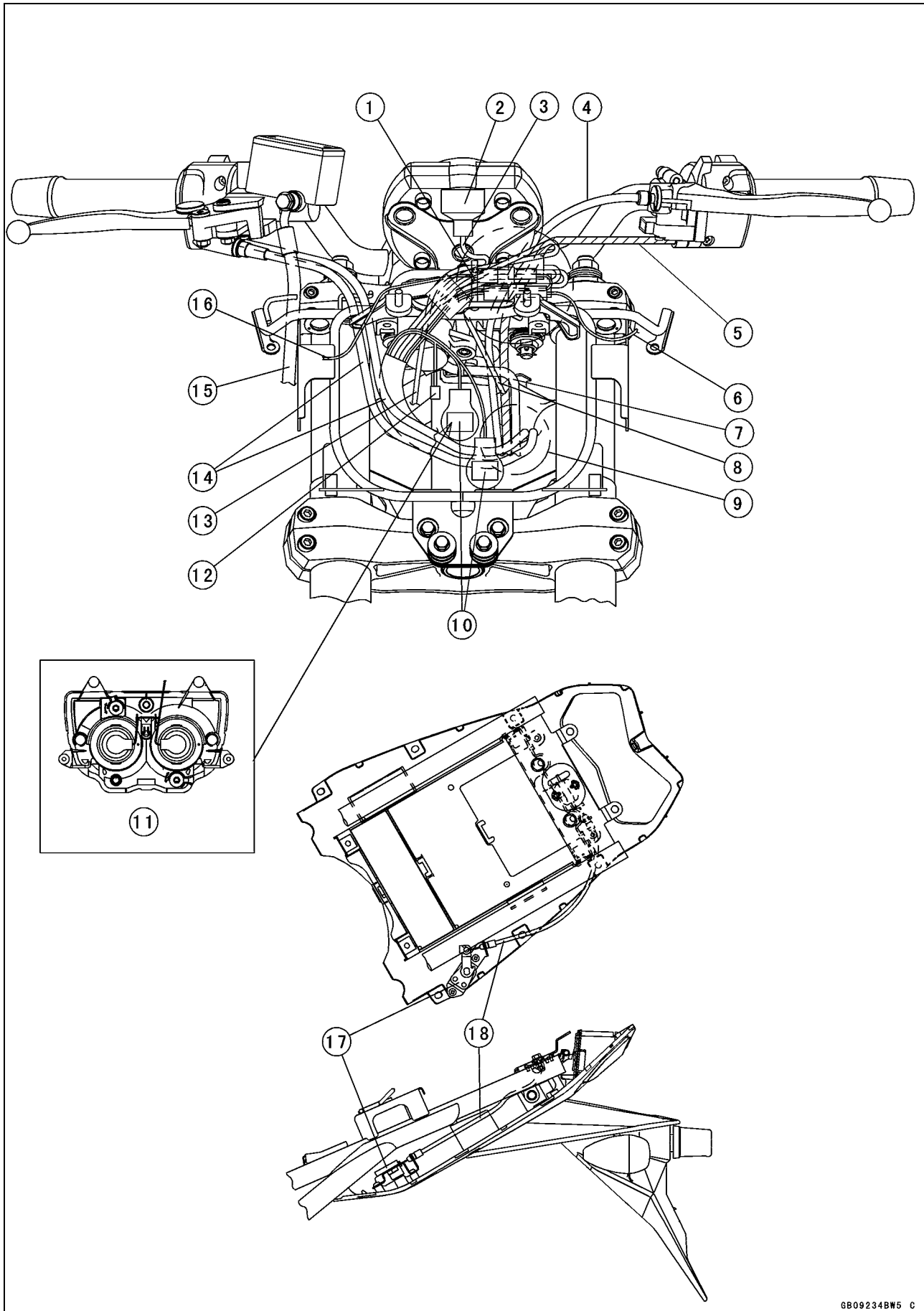
**Cable, Wire, and Hose Routing**

---

1. Tail light
2. Clamp
3. Atmospheric pressure sensor
4. To ECU fuse
5. Junction Box
6. To self-diagnosis indicator terminal
7. Pickup coil and oil pressure switch
8. Fuel pump
9. Fuel level gauge and fuel reserve switch
10. To inlet air temperature sensor
11. Fan motor connector
12. Inlet air pressure sensor
13. Water temperature sensor
14. Engine harness
15. Meter ground
16. Ignition switch
17. Frame ground (with thermostat)
18. Right switch housing lead
19. Left switch housing lead
20. Running position lights
21. Headlight
22. Turn signal lights
23. Fun motor
24. Ignition coil
25. Vehicle-dwon sensor
26. To rear brake switch
27. Starter relay
28. Regulator/rectifier
29. Battery positive cable
30. Connect the battery negative cable and battery.
31. Battery
32. ECU
33. Turn signal light relay
34. Fuel pump relay
35. ECU main relay
36. License light
37. Rear right turn signal light
38. Rear left turn signal light
39. Throttle cable (accelerator)
40. Throttle cable (decelerator)
41. Clutch cable
42. Run the clutch cable inside the chain tensioner.
43. Band (ZR1000-A2 ~ )

# 17-10 APPENDIX

## Cable, Wire, and Hose Routing





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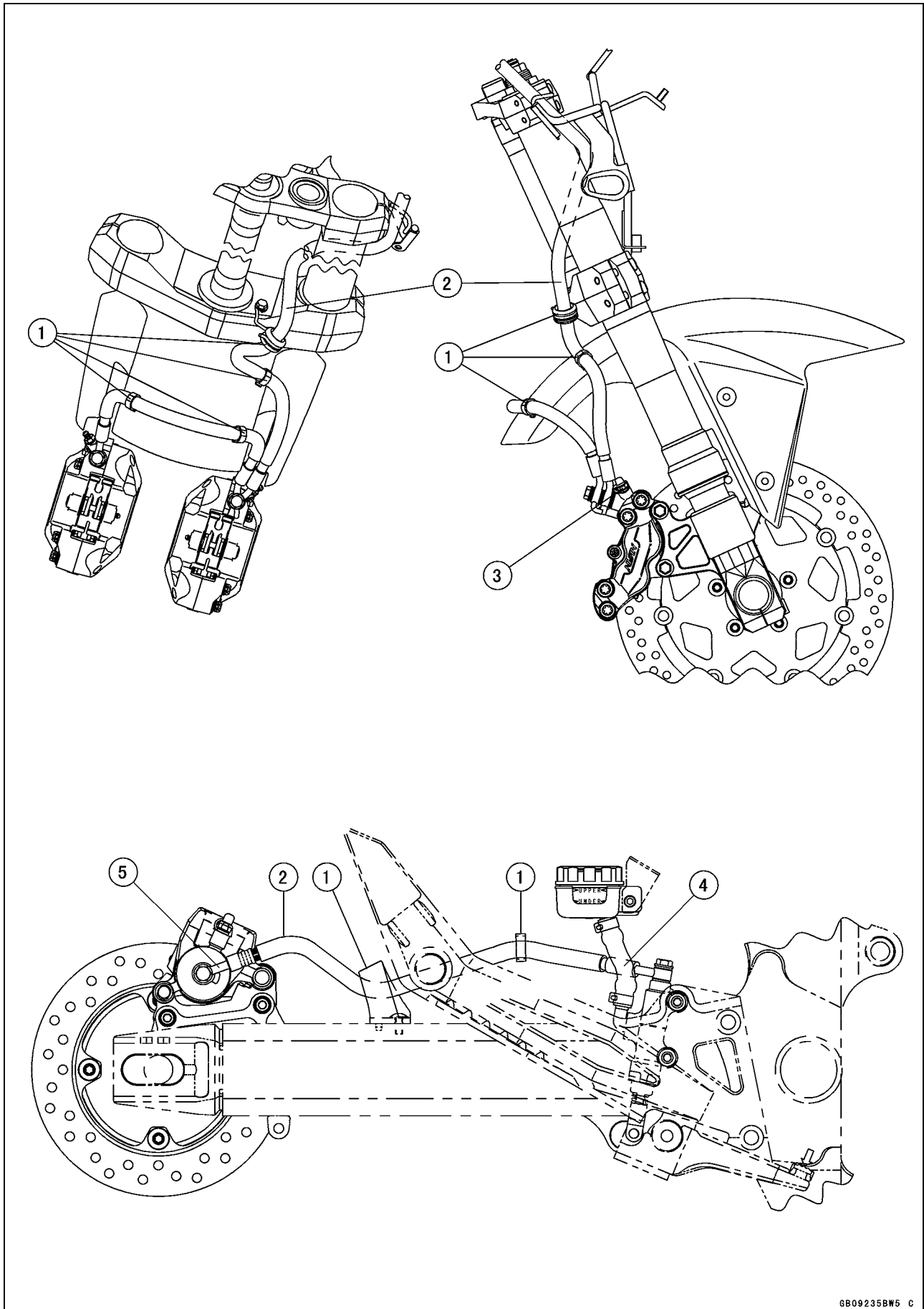
**Cable, Wire, and Hose Routing**

---

1. Clamp all the wires as shown in the encircled area.
2. Meter
3. Take out the lead of the meter from the right side of the tie lap to connect with the meter.
4. Clutch cable
5. Starter cable
6. To front left turn signal light (Run the harness above the bolt for fairing installation.)
7. Run the ignition switch lead front the clutch cable and starter cable.
8. To left switch housing
9. Run the leads for the clutch starter and the ignition switch in order from the head pipe then run the cables with their acceleration side facing outward.
10. Headlight high and low
11. Install the lead with its inner side facing inward.
12. Running position light
13. To right switch housing
14. Throttle cable (Run the cable through the front of main harness.)
15. Brake hose (to caliper right side)
16. To front right turn signal light (Run the harness above the bolt for fairing installation.)
17. Seat lock
18. Seat lock cable

# 17-12 APPENDIX

## Cable, Wire, and Hose Routing



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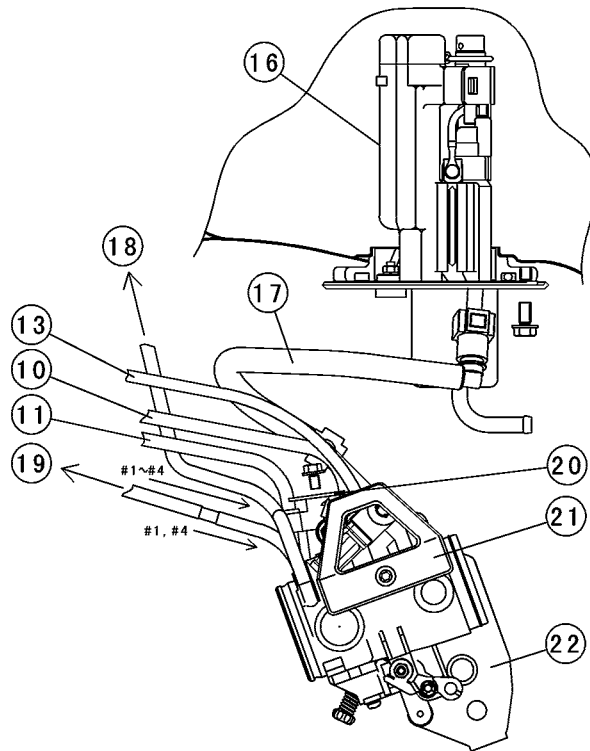
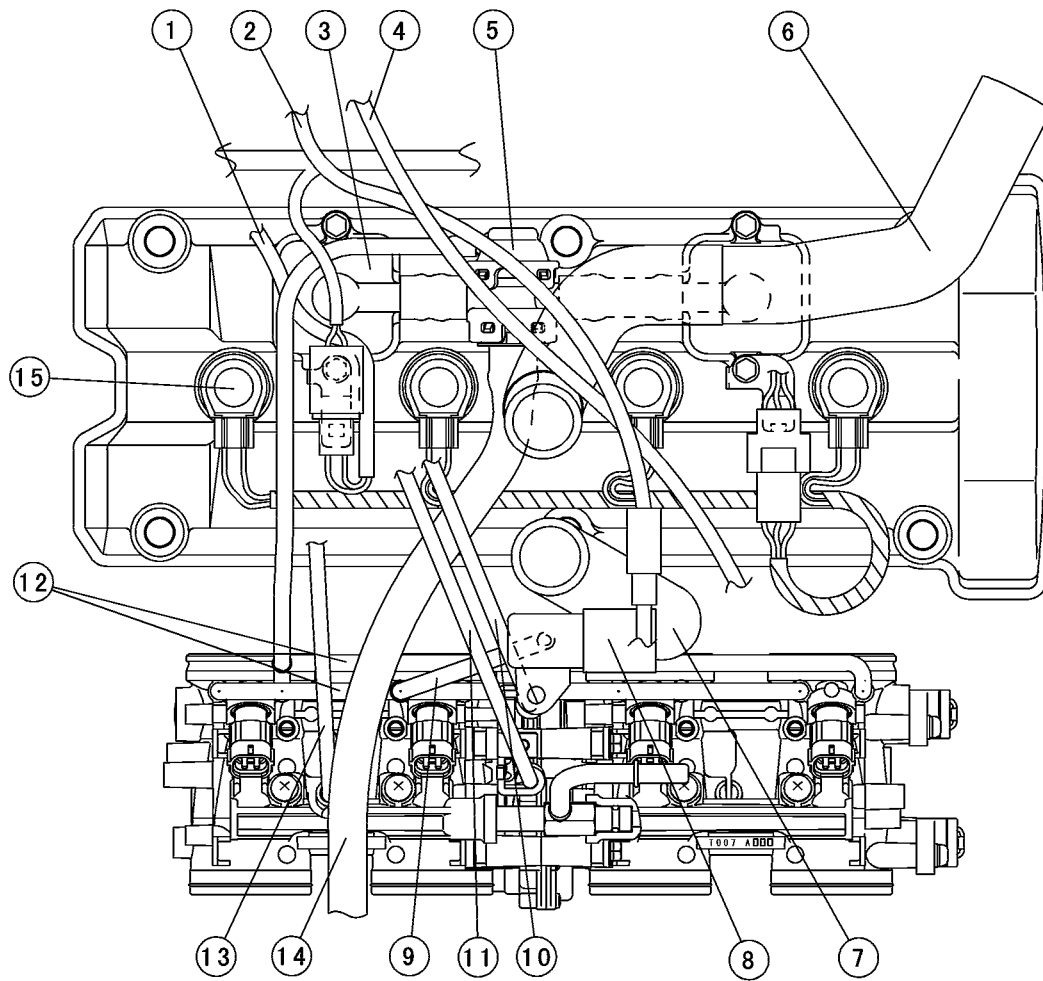
**Cable, Wire, and Hose Routing**

---

1. Clamp
2. Brake hose
3. Punch mark
4. Run the brake hose through the inside of the frame.
5. Tight the bolt to the specified torque with the stopper (for turning prevention) applied.

# 17-14 APPENDIX

## Cable, Wire, and Hose Routing



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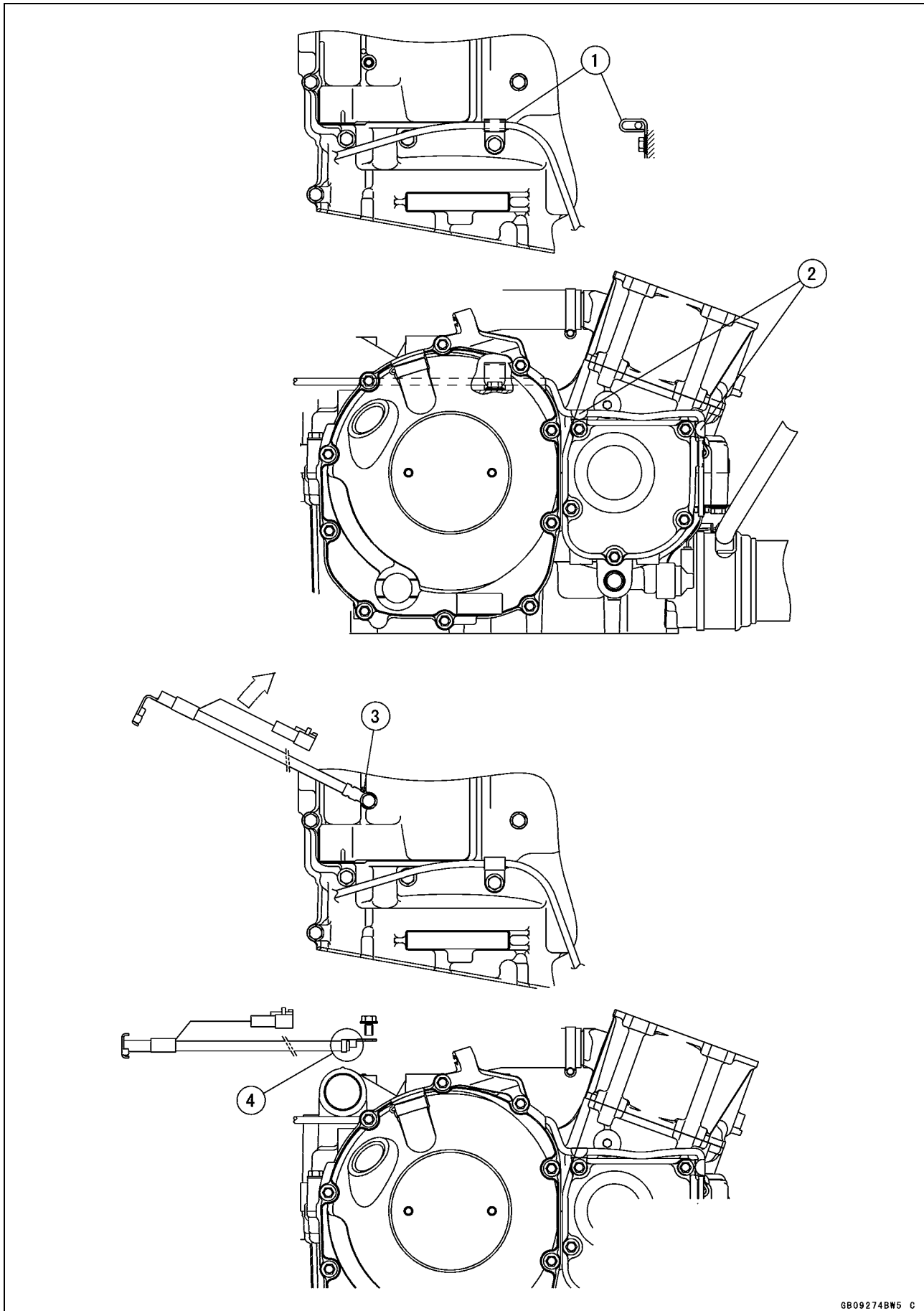
**Cable, Wire, and Hose Routing**

---

1. Cam sensor lead (Run the lead between the convex area of cap center and bolt head to secure the coupler.)
2. Radiator fan switch lead (Run the lead through into the water hose.)
3. Cap
4. Catch cable (Run the cable through forward the water hose.)
5. Air suction valve
6. Water hose (Thermostat – Radiator)
7. Water hose (Head – Thermostat)
8. Inlet air pressure sensor
9. Vacuum hose (Run the vacuum hose under the throttle cable to connect with the inlet air pressure sensor.)
10. Throttle cables (accelerator)
11. Throttle cables (decelerator)
12. Vacuum balance tube
13. Choke Cable
14. Hose (air suction valve – air cleaner)
15. Stick coil
16. Fuel pump
17. Fuel hose
18. To inlet air pressure sensor
19. To air suction valve
20. To prevent the throttle cable from unexpected coming down.
21. Cover
22. Throttle body

# 17-16 APPENDIX

## Cable, Wire, and Hose Routing



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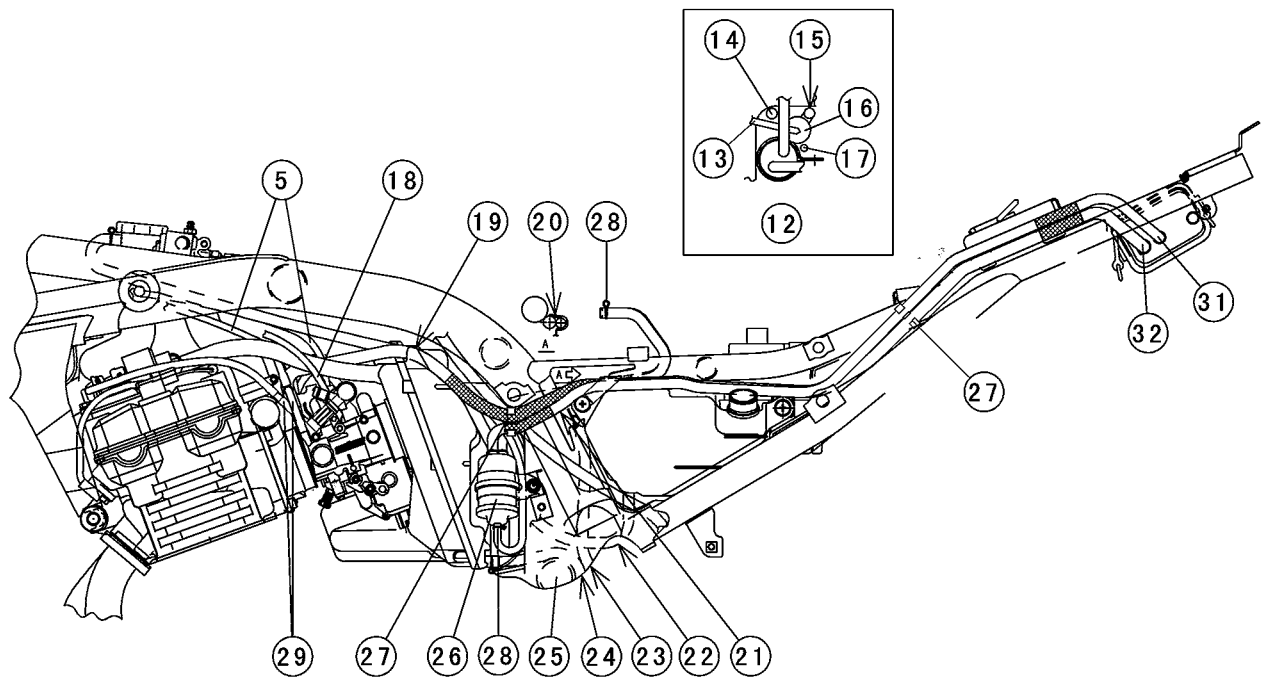
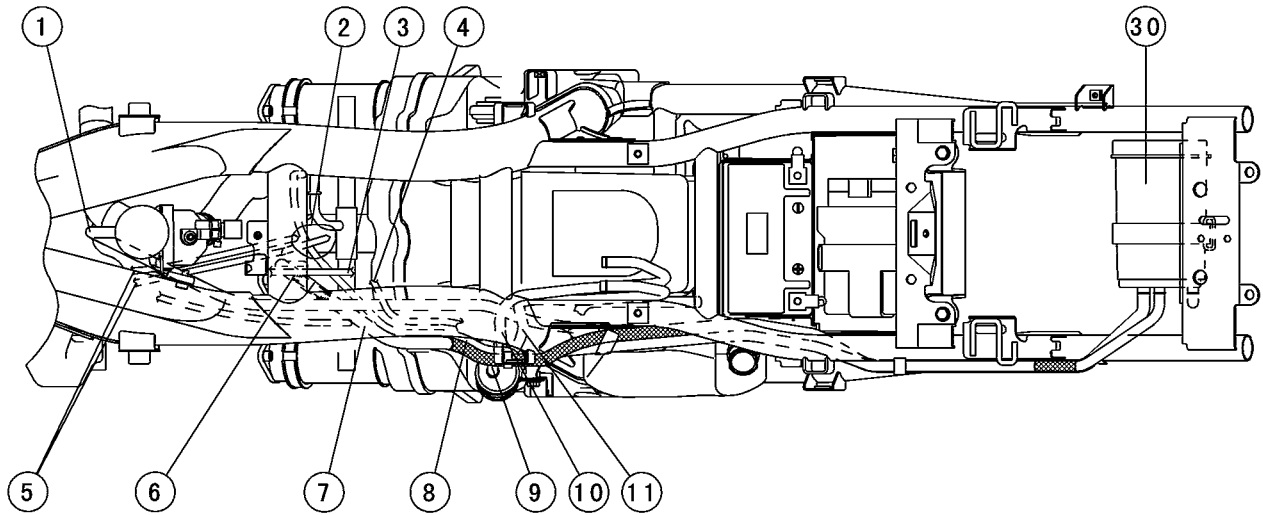
**Cable, Wire, and Hose Routing**

---

1. Bend the bracket as shown to secure the lead.
2. Bend the bracket.
3. Run the lead end till it touches the boss of the crankcase.
4. Install the exterior of the lead with staking area facing downward.

# 17-18 APPENDIX

## Cable, Wire, and Hose Routing





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**Cable, Wire, and Hose Routing**

---

1. Run the hose (cap – reserve) through upside of the throttle cable.
2. Run the hose (white) through into the throttle cables.
3. Run the throttle body harness throttle upside of the hose (white) and hose (throttle – fitting).
4. Run the harness through upside of the hose.
5. Throttle cables
6. Hose (fitting – throttle body #2 right)
7. Hose (canister – fitting) (green)
8. Hose (throttle body #3 right – under the separator) (white)
9. Hose (canister – upside the separator) (blue)
10. Hose (tank (blue) – upside the separator) (blue)
11. Hose (tank (red) – side the separator) (red)
12. A top view (separator)
13. Harness
14. Hose (cap – reserve)
15. Run the hose (red) through inside the frame.
16. Connector
17. Run the hose (white) through inside the bracket.
18. Choke cable
19. Run the hose (green) through inside the rib.
20. Clamp the hose
21. Run the hose (blue) through outside the flame.
22. Run the hose (cap – reserve) through upside the cross pipe.
23. Run the hose (reserve tank drain hose) through backside the cross pipe.
24. Run the air cleaner drain hose through backside the cross pipe.
25. Cross pipe
26. Separator
27. Band
28. Cramp
29. Vacuum hose
30. Canister
31. To separator
32. To fitting

## 17-20 APPENDIX

### Troubleshooting Guide

---

#### NOTE

- Refer to the *Fuel System* chapter for most of DFI trouble shooting guide.
- This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties.

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

##### Starter motor not rotating:

- 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
- Vehicle-down sensor (DFI) coming off

##### 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
- Throttle body assy holder loose

## Troubleshooting Guide

---

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

## 17-22 APPENDIX

### Troubleshooting Guide

---

#### **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

#### **Compression high:**

Carbon built up in combustion chamber

#### **Engine load faulty:**

Clutch slipping

Engine oil level too high

Engine oil viscosity too high

Drive train trouble

Brake dragging

#### **Lubrication inadequate:**

Engine oil level too low

Engine oil poor quality or incorrect

#### **Oil cooler incorrect:**

Oil cooler clogged

#### **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

## Troubleshooting Guide

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### 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
- 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

## 17-24 APPENDIX

### Troubleshooting Guide

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#### 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)
- 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.
2003	ZR1000-A1	JKAZRCA1□3A000001 ZRT00A-000001 JKAZRT00AAA000001
2004	ZR1000-A2	JKAZRCA1□ 4A015001 JKAZRT00AAA015001 ZRT00A-015001

□:This digit in the frame number changes from one machine to another.



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